

Response to The Source Segregation Requirement in Paragraph 7A of Schedule 3 to the Waste Management Licensing Regulations 1994: A Consultation Document, Defra, January 2006

Co-ordinated by Essex County Council

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Executive Summary

This response includes:

1. A recommendation for an alternative exemption approach
2. Responses to general questions Q1 to Q5 asked by Defra
3. A critique of the options appraisal in the consultation document, with reference to the questions asked by Defra
4. Provision of evidence requested by Defra

Key findings are summarised below.

Recommendation for an Exemption Approach

A modification of Option 1 is suggested, i.e.: *Remove the requirement to source segregate from the paragraph 7A exemption and put in place a matrix-based regulatory approach with a more comprehensive range of organic matter types and land uses (illustrated below).*

		Land Uses					
		Use 1	Use 2	Use 3	Use 4	Use 5	Use n
Organic Matter Types	Type 1	Criteria – <i>see extract below</i>					
	Type 2						
	Type n						

This matrix would map organic matter types against land uses and for each land use identify criteria for beneficial use and environmental acceptability.

An example of a list of organic matter types is as follows (for purposes of illustration only):

- Source Segregated green waste compost (no household inputs)
- Source Segregated green waste compost (with household inputs)
- Source segregated composts including industrial feedstocks
- Source segregated Digestates etc
- MBT output type A
- MBT output type B
- MBT output type C etc
- Sewage sludge compost
- Sewage sludge digestate
- Agricultural wastes - plant origin - untreated
- Agricultural wastes - animal origin - untreated
- Agricultural wastes - plant origin - treated
- Agricultural wastes - animal origin - treated
- Source segregated Digestates etc
- etc

An example of a list of land uses is as follows (for purposes of illustration only):

- Soil improvement for crops for human consumption
- Soil improvement for crops for animal consumption
- Soil improvement for crops for energy production
- Soil improvement for crops for industrial feedstocks

- Soil formation *in situ*¹
- Use in *in-situ* risk management / pollution control (e.g. wetlands, PRBs, phytoremediation / *in situ* stabilisation / containment)
- Use in *ex situ* risk management / pollution control (e.g. biofilters)
- Landscaping applications - limited access
- Use in homes, gardens, parks and leisure facilities
- Use in habitat management
- Use as an engineering material (sound banks, fill, drainage layers etc)
- Use as daily cover

Criteria would need to encompass *beneficial use* and environmental acceptability to be in compliance with the Waste Framework Directive. Products standards could serve as criteria for beneficial use, and be adopted in Waste Management Licence (WML) exemption regulations. Existing standards may be applicable as beneficial use criteria for source segregated materials, but no suitable standards exist for other materials. The use of standards as surrogates for beneficial use will require their integration with the protocols for secondary materials under discussion (Article 5) in the current EC consultation on the Waste Framework Directive.

Key criteria for determinations of environmental acceptability in WML exemption regulations would be:

- Human health – potentially toxic elements (PTEs)
- Human health - organic substances
- Human health - bioaerosols
- Human health - pathogens
- Animal health
- Soil Capacity
- Impacts on surface and groundwater
- Ecological impacts
- Nuisance issues

These criteria for environmental acceptability relate therefore to the nature of the organic material to be applied, the nature of the application and the nature of the site / land. These criteria may be seen as unnecessarily onerous by some organic matter users who have not had to explicitly consider protection of human health and the environment. In addition, the cost of appraisal and monitoring could add substantially to the cost of using organic matter on land. These negative consequences have to be balanced against the economic consequences of inappropriate organic matter applications, which may be irreversible from both market and land use perspectives, as well as directly impacting river basin management.

One possible way forward to mitigate these negative consequences is to consider the available evidence for the different environmental acceptability criteria for different organic matter types. For example, evidence for past studies and ongoing monitoring may allow regulators to make generic conclusions such as: toxic organic pollutants will not need to be assessed at all for organic matter type X, and only on a screening basis for type Y; or appraisal of ecological impacts is not a requirement for organic matter used in gardens (although it may indeed benefit garden wildlife). Such conclusions will simplify and reduce the cost of regulations for both the regulators and the regulated, but they can only be made if sufficient evidence exists.

It is not appropriate for WML exemption guidance to second guess commercial and market preferences. However, the matrix-based approach suggested here could serve as the basis for a parallel discussion by a range of stakeholders (e.g. regulators, farmers, land owners and organic matter

¹ For example as part of a land restoration project

producers) on market perceptions, land value considerations and other commercial considerations. This discussion could be used to develop supplementary technical and market advice.

The matrix approach would benefit land holders and producers of organic outputs by providing a more finely tuned regulatory approach. It avoids the confusion that “broad brush” approaches using wide ranging and poorly defined terms such as “agricultural land” and “contaminated land”. It avoids the contentious reliance on “source segregation” in Paragraph 7A and 9A, and provides a more effective tool for environmental protection, to prevent unacceptable applications of organic matter (whatever its origin) on agricultural or other land.

It may also be appropriate that the proposers of a particular application are able to make a wider sustainable development case, taking into account economic and social considerations as well environmental considerations in favour of a particular application. For example, it *may* be appropriate to accept a lower grade of material on an economically marginal brownfield site and so stimulate its re-use for biomass, whereas it would not be acceptable for an urban brownfield site.

The existing Agency Land Recovery guidance is useful and comprehensive, and could support the matrix-based approach suggested with relatively straightforward amendments, as follows:

1. Adoption of the matrix-based approach and criteria
2. All organic matter applied to land should be regulated in the same way
3. Guidance should be updated to reflect fully water and soil protection needs taking into account the different rates of release of plant nutrients from organic materials
4. Better definitions of “Agriculture or Ecological Improvement” or better terms should be provided
5. Supporting guidance is needed to enable a more consistent regulatory approach by local and regional regulators

The exemption mechanism needs to be effectively policed. However, good policing is needed whether or not the matrix-based approach is adopted.

The next steps in developing these recommendations might be

- to review and agree criteria for beneficial use, the criteria for environmental acceptability, the sustainable development rationale for applications, a list of organic output types and a list of land uses / applications
- to determine which standards might immediately address the beneficial use criterion
- to determine where there is sufficient evidence to decide on a general basis that particular organic output in a particular applications are acceptable for particular criteria and so can travel via a “fast track” for that particular appraisal
- to identify the further evidence collection and standards development needed to fast track other criteria for other organic output applications.

Example Matrix Extract:

Soil improvement for crops for energy production				
	Criteria	Threshold	Notes	
MBT output type B (yet to be defined)	Beneficial Use Criterion	"A standard"	Yet to be elaborated	
	Environmental Acceptability Criteria	Human health - PTEs	Meet risk-based generic quality criteria	E.g. set by a contaminated site risk management strategy
		Human health - organic substances	Meet risk-based generic quality criteria AND appraisal of the organic material using a rapid general screening technique	Evidence may allow the Agency to assume this is unnecessary for this material type, e.g. from WRT 313, review studies etc
		Human health - bioaerosols	Compliance with codes of practice for production and use	E.g. Composting Association Code of Practice
		Human health - pathogens	Compliance with codes of practice for production and use	E.g. Composting Association Code of Practice
		Animal health	Animal Byproduct regulations where appropriate	
		Soil Capacity	Maximum application rates using criteria linked to soil protection	Yet to be elaborated, but should take into account availability of N, P etc
		Impacts on surface and groundwater	Maximum application rates using criteria linked to water protection	Yet to be elaborated, but should take into account availability of N, P etc
		Ecological impacts	Site specific consideration	Yet to be elaborated, but could use "red", "amber" and "green" sites: green application permitted, amber ecological risk assessment required, red, not permitted
		Nuisance issues	Compliance with codes of practice for production and use	

Q1: Should the source segregation requirement in paragraph 7A remain in place?

No, the source segregation requirement in paragraph 7A should be replaced by a matrix-based approach to considering organic matter types and land uses, supported by enhanced WML exemption guidance.

The descriptions of land use as *agricultural* in Paragraph 7A and *contaminated* in Paragraph 9A are rather vague and not particularly useful from an environmental risk management perspective, and several categories of land use are not considered. In addition, it is not true to assume that applications to *contaminated* land² will always be more tolerant of lower grades of organic materials than applications to *agricultural* land.

The source segregation requirement in Paragraph 7A also impacts use of organic matter on *contaminated land* as organic matter applications change from “restoration” to “maintenance”, if maintenance of a crop such as biomass is considered *agricultural*. This will prevent the development of long term markets for mechanical-biological treatment (MBT) derived “compost like output” (CLO) even on land affected by contamination or brownfields.

Source segregation is not necessarily such an effective approach to environmental protection that separately collected materials should receive favoured treatment under licensing and permitting regimes, whatever the philosophical, administrative and market attractions of such a simple approach. Source segregated materials do not have substantially different ranges of contaminants to “better” mixed waste origin materials. Source segregation as a management approach cannot prevent uncontrolled inputs to feedstocks. All organic matter can cause unacceptable environmental impacts from a wide range of factors, some of which may be perceived as beneficial such as nitrogen and phosphorous content.

It is unclear how source segregated wastes from industrial processes are considered in this guidance, as these are often added by compost producers to separately collected garden and household waste feedstocks. However, industrial biowastes may contain materials of potential concern, such as antibiotic residues or chemicals used in product extraction.

The source segregation requirement in Paragraph 7A is inconsistent with considerations of how organic matter from sewage and agricultural sources is used on land. Uncontrolled inputs from domestic premises can enter sewerage, and sewage sludge may contain substances of potential environmental concern (such as oestrogenic substances). However, sewage sludge is widely applied to agricultural land and is accepted as an input material for PAS-100 composts. A dominant organic matter input to land is from agricultural wastes which may contain high levels of potentially toxic elements (e.g. copper and zinc) and organic substances (such as antibiotic residues).

The source segregation requirement in paragraph 7A is not even handed in its treatment of organic matter applications to land. It may be easier to find consensus on appropriate recovery of materials to land using the matrix-based approach suggested in this response.

Q2: Is it environmentally acceptable (in terms of the relevant objectives of Article 4 of the Waste Framework Directive) to treat agricultural land with non-source segregated biodegradable outputs from MBT (or other similar processes)?

Whether it is environmentally acceptable to treat agricultural land with non-source segregated biodegradable outputs from MBT (or other similar processes) depends on the environmental impacts

² Throughout this response document the expression *contaminated land* is used to refer to “land affected by contamination”, and not specifically contaminated land as defined under Part IIA of the Environmental Protection Act 1990

of the material applied to land. Source segregation alone does not prevent the possibility of unacceptable environmental impacts from organic matter inputs.

A consistent approach to organic matter application to soil is needed that is the same for all feedstocks, but which allows (a) higher grade materials to be used for higher grade purposes, and (b) is linked to environmental risks and impacts of the organic matter applied rather than subjective judgements about feedstock origins.

With regard to the 1975 and 1991 Article 4 text versions, it is unsafe for Defra to rely on a source segregation requirement in paragraph 7A or 9A of the WML exemption regulations as a means of preventing: (1) risk to water, air, soil and plants and animals, (2) nuisance through noise or odours, or (3) adverse affects on the countryside or places of special interest.

1. Organic materials prepared from source segregated and mechanically prepared organic feedstocks do vary in their content of toxic substances, but ranges of contamination overlap hence source segregation does not necessarily lead to risk reduction. In addition, other properties common to organic materials of source segregated or mixed origin have potential to adversely impact water, air, soil and plants and animals.
2. Source segregation has no relationship to the potential of the use of organic materials to land to cause nuisance through noise or odours.
3. Source segregation does not remove the potential of the use of organic materials to land to cause adverse affects on the countryside or places of special interest, for example via undesired impacts on water, air, soil, plants and animals.

The draft Waste Framework Directive includes some substantive changes, although its aims are consistent with the existing Directive. Article 5 which provides for *secondary materials and substances* which are *deemed to have ceased being waste*. This should address a concern of the UK waste sector that there is no mechanism for conversion of organic wastes to secondary materials, other than at the end of a recovery process to land.

Defra, the Environment Agency and WRAP are working on protocols for a number of secondary materials, including PAS-100 composts which partially address this concern. However, there is no initiative for a similar protocol for materials that might be produced from mixed waste sources. The absence of such an initiative sends out a strongly negative message to those contemplating the use of MBT or investing in MBT projects. A rapid solution might be for the Defra research proposal WRT314 Criteria for different uses of CLOs, digestates and composts to be aligned with the development of a further secondary material protocol, in line with Agency *Guidance for the Technical Assessment of Waste to Land Recovery Activities* and the matrix-based approach to exemption regulation proposed here.

Q3: Is it agriculturally acceptable to treat agricultural land with non-source segregated biodegradable outputs from MBT (or other similar processes)?

The use of a source segregation requirement and vague land use definitions in the exemption regulations is too crude a tool for either environmental protection or supporting appropriate use of secondary materials.

The agricultural acceptability of non-source segregated biodegradable outputs from MBT (or other similar processes) is a function of several factors, as previously discussed:

- The environmental impacts of the material applied
- The fitness for purpose of the material applied
- The perceptions of land markets and markets for agricultural produce.

Exemption regulations should confine themselves to ensuring acceptable environmental use and ensuring beneficial use through fitness for purpose.

While there are wider commercial and economic considerations for land use, it is more appropriate for this to be addressed through advisory guidance from a stakeholder-based discussion involving all interested parties. This discussion could provide a more general “organic matter use matrix” that reflects the interests of different sectors, which might supplement the WML exemption documents.

Q4: Is it environmentally acceptable to treat any land type with non-source segregated biodegradable outputs from MBT (or other similar processes)?

It is *not* appropriate to treat land with *any* organic matter amendment in an uncontrolled way, whether it is from a mixed waste or source segregated feedstock. An application should be demonstrably beneficial, not give rise to unacceptable harm and should be a sustainable development. However, similar judgements should hold true for *any* organic matter application to land, whatever the source of the organic material.

Q5: What are the potential human health impacts that need to be taken into account?

This question is narrow in its scope as there are important environmental impacts that need equal consideration. The principal human health impacts that need to be considered for any soil improver have already been elaborated in some detail by CEN TC 223³ and include:

- Toxic substances
- Pathogens
- Dust, odour and bioaerosols / allergens (particularly during processing and application)
- Sharps

These various human health effects can potentially apply to any organic materials whatever the feedstock.

Options Appraisal

The options under consideration are:

1. Remove the requirement to source segregate from the paragraph 7A exemption. This would permit the spreading of non-source segregated compost, liquor and digestate from aerobic or anaerobic treatment processes applied to agricultural land under the terms of the exemption.
2. Do Nothing. Keep the requirement to source segregate the inputs to plant producing compost, liquor and digestate from aerobic and anaerobic treatment processes under paragraph 7A and keep the arrangement under paragraph 9A so that non-source segregated compost can be spread under the terms of that exemption.
3. Add the requirement to source segregate to paragraph 9A. This would ensure consistency across the regime but it would close down even further the options for recovering the waste to land

The decision on how organic matter use on land is regulated by exemptions will have major impacts on the UK waste management sector. Potentially the use of MBT would be ruled out by the selection of Option 3, and would be severely constrained by Option 2, perhaps to the point of being non-viable.

³ BSI (1999) PD CR 13455:1999: Soil improvers and growing media. Guidelines for the safety of users, the environment and plants, British Standards Institute, London, UK <http://www.bsonline.bsi-global.com/server/index.jsp>, Based on the work of CEN TC 223, web link: <http://www.cenorm.be/CENORM/BusinessDomains/TechnicalCommitteesWorkshops/CENTechnicalCommittee/WP.asp?param=6204&title=CEN/TC%20223>

Option 1 offers a wider range of potential land uses for CLOs derived from MBT. The Defra consultation document suggests that “Option 1” is not sufficiently protective of the environment whereas that source segregation achieves adequate protection. However, this response concludes that the source segregation requirement in Paragraph 7A will not prevent unacceptable waste derived material use on land.

A modified Option 1 using the matrix-based approach suggested above would support a more finely tuned approach creating both opportunities for appropriate use of MBT derived materials and better environmental protection.

If this matrix-based approach to regulating organic matter use on land suggested in this response is adopted, then producers would need to monitor a range of environmental acceptability criteria. Additional analytical requirements could be seen as particularly affecting users of source segregated feedstocks, as users of feedstocks from mixed waste sources would likely need to offer this level of information in any case for exemptions or “environmental permits”. However, it can be argued that the impacts of collecting this information on users of source segregated materials may not be substantially greater than that which is likely to take place for other reasons. Indeed, over time, the demand for analytical data may well reduce on the basis of “weight of evidence” and an associated reduction in the calculated potential risk.

Under the current regulatory regime, (Option 2) confidence in MBT among waste disposal authorities, major waste management companies and investors as a viable waste management approach is being severely stifled. That is not to say that these stakeholder believe MBT is an inappropriate waste management technique, but rather that it is governed by a regulatory framework that contains too much uncertainty for projects to develop successfully to reach market. For MBT to remain a practical and affordable waste management option a more transparent and pragmatic regulatory approach is needed than currently set out in Option 2.

The Option 3 suggestion of adding a source segregation requirement to Paragraph 9A would mean that the only possible MBT applications are to produce energy and/or outputs sufficiently stabilised to be landfilled within the available Landfill Allowances held by a given authority. As a minimum this would result in a significant lost opportunity for materials recovery from municipal wastes and associated lost benefits to a wide range of soil environments. At worst, for some authorities, it may result in waste being demoted down the waste hierarchy to waste management techniques such as incineration where wider future resource recovery opportunities are lost.

Given the recent emphasis stressed in the April 2006 Defra/DTI Biomass Task Force Report about the important role biomass crops can play in contributing to the UK’s sustainable energy challenges, the significant function that MBT technologies can provide in producing soil improving products to assist in delivery this agenda needs to be properly recognised. Failure to remove the current climate of uncertainty around permissible uses of non-source segregated outputs from MBT will result in lost opportunities if alternative approaches are not pursued as a matter of urgency. Essex County Council believes that a shift to a transparent matrix based approach will assist greatly in this respect.

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1 Scope of Response

Three options are being considered for the regulation of compost, liquor and digestate from aerobic and anaerobic treatment processes through the exemptions regime:

OPTION 1: Remove the requirement to source segregate from the paragraph 7A exemption. This would permit the spreading of non-source segregated compost, liquor and digestate from aerobic or anaerobic treatment processes applied to agricultural land under the terms of the exemption.

OPTION 2: Do Nothing. Keep the requirement to source segregate the inputs to plant producing compost, liquor and digestate from aerobic and anaerobic treatment processes under paragraph 7A and keep the arrangement under paragraph 9A so that non-source segregated compost can be spread under the terms of that exemption.

OPTION 3: Add the requirement to source segregate to paragraph 9A. This would ensure consistency across the regime but it would close down even further the options for recovering the waste to land

In summary, and after consideration of the cost-benefit analysis in the Consultation document, the Government recommends the most appropriate solution is option 2: 'do nothing'. According to current knowledge, option 1 would pose an unacceptable risk on the environment and human health, whilst option 3 is too onerous on business and does not provide a practical solution.

Views are being sought on each option; specific questions asked by Defra are set out in Table 1 below

General comments have been requested for the following questions:

1. Should the source segregation requirement in paragraph 7A remain in place?
2. Is it environmentally acceptable (in terms of the relevant objectives of Article 4 of the Waste Framework Directive) to treat agricultural land with non-source segregated biodegradable outputs from MBT (or other similar processes)?
3. Is it agriculturally acceptable to treat agricultural land with non-source segregated biodegradable outputs from MBT (or other similar processes)?
4. Is it environmentally acceptable to treat any land type with non-source segregated biodegradable outputs from MBT (or other similar processes)?
5. What are the potential human health impacts that need to be taken into account?

In addition evidence is requested on the potential impact of spreading MBT outputs derived from either source segregated or non-source segregated waste on human health and the environment. In particular regarding:

1. the contaminants likely to be present in such outputs, and their likely impact;
2. the potential effect that these waste types could have on the soil and in particular on repeat application to the soil;
3. the possible impact on water quality and the potential for diffuse water pollution;
4. nitrate vulnerable zones;
5. the potential impact on the food chain;
6. any other potential impacts on human health or the environment;
7. how practicable it would be to characterise, monitor and, if necessary, remove the contaminants likely to be present in the outputs of MBT or similar plant fed with non-source segregated waste.

This response to the Defra consultation includes:

1. A recommendation for an alternative exemption approach
2. Responses to general questions Q1 to Q5 asked by Defra

3. A critique of the options appraisal in the consultation document, with reference to the questions asked by Defra, as set out in Table 1
4. Provision of evidence requested by Defra

Table 1: Questions Asked by Defra for Each Option

Issue	Option 1	Option 2	Option 3
Sectors and groups affected	<ul style="list-style-type: none"> • Information is sought on the number of processors who are likely to benefit from this option? • What cost savings would be made by implementation of this option? • How many of these processors are up and running? • How many operators would intend to open facilities that accept non-source segregated material if this proposal was taken forward? • What effect will this option have on schemes for the separate collection of waste? 	<ul style="list-style-type: none"> • How many operators would still intend to open facilities that accept non-source separated material if this proposal was taken forward? • How many would convert to source segregation? 	
Benefits	<ul style="list-style-type: none"> • Evidence is sought on the quality of outputs from existing processors. • Is there evidence to suggest that the outputs are suitable for spreading to land for agricultural benefit? 		
Regulator costs	<ul style="list-style-type: none"> • Information is sought on the likely added financial cost to the Agency of evaluating notifications? • Information on the types and quantity of tests required? 		
Cost to business	<ul style="list-style-type: none"> • Information is sought on the likely financial cost of providing the required information to the Agency to satisfy them that the spreading is safe. • Information on the likely Agency charging levels for analysis work, administration and inspection? 	<ul style="list-style-type: none"> • Information is sought on how many processors are likely to be affected and at what cost? • What proportion of this cost would fall on local authorities and what would the cost be to private business? • What would be the cost of converting to a source segregation 	

		<p>system?</p> <ul style="list-style-type: none"> • What would be the cost of landfilling the material? • How would this affect local authority LATS targets? 	
Environmental Costs	<ul style="list-style-type: none"> • Evidence is sought on the potential impact of the spreading non-source segregated compost, liquor and digestate from aerobic and anaerobic processors on land may potentially have on land and water? • Evidence is sought on the potential cost to the environment & human health of the repeat spreading of the waste to land over a period of years? 		
Social Costs	<p>Is there a risk under this option of land becoming sufficiently contaminated as to affect the food chain?</p>	<ul style="list-style-type: none"> • Views are sought on whether small firms will be affected by this option? 	<ul style="list-style-type: none"> • Views are sought on whether small firms will be affected by this option?

2 Recommendation for an Exemption Approach

A modification of Option 1 is suggested, i.e.: *Remove the requirement to source segregate from the paragraph 7A exemption and put in place a matrix-based regulatory approach with a more comprehensive range of organic matter types and land uses (illustrated below).*

		Land Uses					
		Use 1	Use 2	Use 3	Use 4	Use 5	Use n
Organic Matter Types	Type 1	Criteria – <i>see extract below</i>					
	Type 2						
	Type n						

This matrix would map organic matter types against land uses and for each land use identify criteria for beneficial use and environmental acceptability. This matrix approach partly develops suggestions made in the 2002 *Safe Compost Matrix* proposal⁴.

An example of a list of organic matter types is as follows (for purposes of illustration only):

- Source Segregated green waste compost (no household inputs)
- Source Segregated green waste compost (with household inputs)
- Source segregated composts including industrial feedstocks
- Source segregated Digestates etc
- MBT output type A
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An example of a list of land uses is as follows (for purposes of illustration only):

- Soil improvement for crops for human consumption
- Soil improvement for crops for animal consumption
- Soil improvement for crops for energy production
- Soil improvement for crops for industrial feedstocks
- Soil formation *in situ*⁵
- Use in *in situ* risk management / pollution control (e.g. wetlands, PRBs, phytoremediation / *in situ* stabilisation / containment)
- Use in *ex situ* risk management / pollution control (e.g. biofilters)
- Landscaping applications - limited access
- Use in homes, gardens, parks and leisure facilities
- Use in habitat management
- Use as an engineering material (sound banks, fill, drainage layers etc)
- Use as daily cover

⁴ Godley, A. R., Evans, T. D., Alker, G and Davis, R. D. (2002) Research Analysis of the market potential for lower grade composted materials in the UK. Research Report. WRAP, Banbury, UK. www.wrap.org.uk

⁵ For example as part of a land restoration project

Criteria would need to encompass *beneficial use* and environmental acceptability to be in compliance with the Waste Framework Directive. Products standards could serve as criteria for beneficial use, and be adopted in Waste Management Licence (WML) exemption regulations. Existing standards may be applicable as beneficial use criteria for source segregated materials, but no suitable standards exist for other materials. The use of standards as surrogates for beneficial use will require their integration with the protocols for secondary materials under discussion (Article 5) in the current EC consultation on the Waste Framework Directive.

Key criteria for determinations of environmental acceptability in WML exemption regulations would be:

- Human health – Potentially Toxic Elements (PTEs): two routes might be open, one based on generic risk assessment (viz SGVs, SNIFFER framework)⁶, which would necessarily be conservative, or site specific risk assessment
- Human health – organic substances – site specific risk assessment using existing “TOX” guidance⁷ where it exists
- Human health – bioaerosols: – there is existing Composting Association guidance for compost production⁸, however, bioaerosols may be generated by spreading organic matter, similar controls should be applied to composts and digestates as to sewage sludge and agricultural waste applications
- Human health - pathogens: demonstrating compliance with an appropriate HACCP based protocol (e.g. the Composting Association code of practice)⁹
- Animal health - demonstrating compliance with animal by-product regulations, and *perhaps* criteria related to levels of “contraries”
- Soil Capacity - N / P loading limits from soil protection policy, impacts on soil pH, redox, metal loading limits from sewage sludge regulations¹⁰, toxic organic substances would be addressed by ecological risk assessment
- Impacts on surface and groundwater, relating to the Nitrate Directive, the Water Framework Directive and Groundwater Daughter Directive
- Ecological impacts: ecological risk assessment based on the Agency framework and test kit, referenced in the reply to Question 1.
- Nuisance issues: litter, odour

These criteria for environmental acceptability relate therefore to the nature of the organic material to be applied, the nature of the application and the nature of the site / land. These criteria may be seen as unnecessarily onerous by some organic matter users who have not had to explicitly consider protection of human health and the environment. In addition, the cost of appraisal and monitoring could add substantially to the cost of using organic matter on land. These negative consequences have to be balanced against the economic consequences of inappropriate organic matter applications, which may be irreversible from both market and land use perspectives, as well as directly impacting river basin management.

One possible way forward to mitigate these negative consequences is to consider the available evidence for the different environmental acceptability criteria for different organic matter types. For example, evidence for past studies and ongoing monitoring may allow regulators to make generic

⁶ UK risk assessment page on EUGRIS (European soil and water information portal)

http://www.eugris.info/EUGRISmain.asp?EUGRISID=483&Category=Country_Digests

⁷ UK risk assessment page on EUGRIS (European soil and water information portal)

http://www.eugris.info/EUGRISmain.asp?EUGRISID=483&Category=Country_Digests

⁸ The Composting Association (2004) Health and safety at composting sites. A Guide for Site Managers. The Composting Association, Wellingborough, UK. ISBN 0-9532546-9-0.

⁹ The Composting Association - TCA (2005) The Composting Industry Code of Practice. The Composting Association, Wellingborough, UK. www.compost.org.uk

¹⁰ Statutory Instrument (1989) The Sludge (Use in Agriculture) Regulations SI 1263, as amended by The Sludge (Use in Agriculture) (Amendments) Regulations 1990, SI 880. HMSO, London

conclusions such as: toxic organic pollutants will not need to be assessed at all for organic matter type X, and only on a screening basis for type Y; or appraisal of ecological impacts is not a requirement for organic matter used in gardens (although it may indeed benefit garden wildlife). Such conclusions will simplify and reduce the cost of regulations for both the regulators and the regulated, but they can only be made if sufficient evidence exists. Data from the proposed Defra research projects will contribute to the evidence base:

- WRT312 Impact of treated biowastes applied to soil
- WRT313 Extending characterisation of biowastes and sludges to include a broad range of organic pollutants,
- WRT314 Criteria for different uses of CLOs, digestates and composts.

It is not appropriate for WML exemption guidance to second guess commercial and market preferences. However, the matrix-based approach suggested here could serve as the basis for a parallel discussion by a range of stakeholders (e.g. regulators, farmers, land owners and organic matter producers) on market perceptions, land value considerations and other commercial considerations. This discussion could be used to develop supplementary technical and market advice.

The matrix approach would benefit land holders and producers of organic outputs by providing a more finely tuned regulatory approach. It avoids the confusion that “broad brush” approaches using wide ranging and poorly defined terms such as “agricultural land” and “contaminated land”. It avoids the contentious reliance on “source segregation” in Paragraph 7A and 9A, and provides a more effective tool for environmental protection, to prevent unacceptable applications of organic matter (whatever its origin) on agricultural or other land.

It may also be appropriate that the proposers of a particular application are able to make a wider sustainable development case, taking into account economic and social considerations as well environmental considerations in favour of a particular application. For example, it *may* be appropriate to accept a lower grade of material on an economically marginal brownfield site and so stimulate its re-use for biomass, whereas it would not be acceptable for an urban brownfield site.

The existing Agency Land Recovery guidance is useful and comprehensive, and could support the matrix-based approach suggested with relatively straightforward amendments, as follows:

1. Adoption of the matrix-based approach and criteria
2. All organic matter applied to land should be regulated in the same way
3. Guidance should be updated to reflect fully water and soil protection needs taking into account the different rates of release of plant nutrients from organic materials
4. Better definitions of “Agriculture or Ecological Improvement” or better terms should be provided
5. Supporting guidance is needed to support a more consistent regulatory approach by local and regional regulators

The exemption mechanism needs to be effectively policed. However, good policing is needed whether or not the matrix-based approach is adopted.

The next steps in developing these recommendations might be

- to review and agree criteria for beneficial use, the criteria for environmental acceptability, the sustainable development rationale for applications, a list of organic output types and a list of land uses / applications
- to determine which standards might immediately address the beneficial use criterion
- to determine where there is sufficient evidence to decide on a general basis that particular organic output in a particular applications are acceptable for particular criteria and so can travel via a “fast track” for that particular appraisal
- to identify the further evidence collection and standards development needed to fast track other criteria for other organic output applications.

Government may also wish to encourage the development of market tools such as insurance backed warranties of performance that give users and regulators confidence in products applied to agricultural land, and ensure that costs of damage and enforcement caused by inappropriate use do not fall to regulators, local authorities or other innocent parties.

Where the Agency remains concerned about possible wider ecological impacts of “unknown” substances in waste materials, perhaps there could be a requirement for a formal ecological risk assessment using guidance under development by the Agency¹¹. This could run in parallel with a series of ecological “screening” tests for all organic materials to be applied to land. There are also a number of sensor-based techniques¹² or portable analytical systems that offer the potential for lower cost, rapid screening of compost samples for a range of organic pollutants, as set out in Box 1 and for screening general soil toxicity, such as luminescence-based microbial biosensors¹³.

It may be worth considering whether the Agency could require producers of organic materials, that they are doubtful of, to demonstrate that levels of particular toxic substances are comparable with levels commonly encountered in PAS 100 composts. There are difficulties in this approach in that there is no set of UK PAS 100 compost data to support such benchmarking, and PAS-100 is unrelated to risk assessment, hence this suggestion merely compares levels in an unfavoured material with one that is perceived as being more favoured. It does not take account of impacts *per se*. Stimulating and making use of rapid screening approaches may offer lower costs, rapid decision making and better environmental protection.

The idea of “policing” seems to run counter to the idea of a “light touch”. Yet the existing land recovery guidance and the suggested paragraph 7A source segregation requirement require policing if they are to support environmental protection and appropriate recovery of wastes to land. The complexity of the guidance already carries a significant regulatory load that would not be enormously increased by requirements for fuller ecological risk assessments for materials of possible concern.

Box 1: (Comparatively) Low Cost Determinations for Organic Pollutants

Rapid field based approaches such as use of sensors and portable analytical instruments may permit low costs screening of materials and delivery of decision making information in real time.

Sensors

A range of sensors are under development for land management, for applications including:

- **Soil air volatile organic compound assessment:** Metal oxide (MOX) sensors and quartz microbalance sensors (QMB) have been tested so far for measurement of VOC in the subsurface. The latter sensors detect changes in mass in a sorptive polymer coating. These sensors have been used in arrays, along with temperature and moisture sensors, and are able to discern different contaminant groups such as chlorinated hydrocarbons and mineral oil hydrocarbons as well as determine concentration range of these contaminants.
- **Dissolved contaminants in groundwater:** Fibre-optic fluorometer techniques are being developed for the measurement of dissolved PAH in groundwater

Portable analytical instruments

¹¹ Ecological risk assessment, A public consultation on a framework and methods for assessing harm to ecosystems from contaminants in soil, Environment Agency, December 2003.

¹² <http://www.cysense.com/index.asp?PageID=68>

¹³ Bardos, R.P. (2002) Report of the NICOLE Workshop: Cost-effective Site Characterisation - Dealing with uncertainties, innovation, legislation constraints, 18-19 April 2002, Pisa. Land Contamination and Reclamation 10 (3) 189-219 <http://www.nicole.org/publications/library.asp?listing=1>

A range of commercial *on site* analytical tools have been developed to measure aged PAHs and other organic compounds:

- ultraviolet absorption spectrophotometry,
- ultraviolet emission fluorimetry,
- colorimetry,
- turbidimetry and
- immunoenzymology (two kits studied).

Other techniques are under development, for example: Rapid Optical Screening Tools (ROST), based on contamination fluorescence and Laser Induced Breakdown Spectroscopy (LIBS).

ROST uses fluorescence spectroscopy based on emissions of UV and visible light from compounds to detect and characterise contaminants, and can be applied to contaminants in situ via a miniaturised system operated with a Geoprobe. Nearly all compounds absorb UV or visible light, but only a few will fluoresce. Most fluorescent organic compounds contain aromatic rings, but not all aromatic compounds fluoresce. In any given mixture of organic compounds it is likely that many compounds will absorb, but only a few will fluoresce. Most fuel products are unique in that many of the chemical components will fluoresce.

LIBS relies on the emission of a plasma induced by a laser shot. Typically the laser delivers up to 300 – 500 MJ per shot at 1.06 μ m wavelength. The light emerging from the spark is collected fibre optically and then analysed by a high resolution spectrometer. The combination of high power laser and high resolution spectrometer is transportable but not yet as miniaturised as the fluorescence based detector.

Table 2 Example Matrix of Land Applications for Various Organic Outputs

	Soil improvement for crops for human consumption	Soil improvement for crops for animal consumption	Soil improvement for crops for energy production	Soil improvement for crops for industrial feedstocks	Soil formation <i>in situ</i> , e.g. for land restoration	Use in <i>in situ</i> risk management / pollution control (e.g. containment, wetlands, PRBs, phytoremediation)	Use in <i>ex situ</i> risk management / pollution control (e.g. biofilters)	Landscaping applications - limited access	Use in homes, gardens, parks and leisure facilities	Use in habitat management	Use as an engineering material (sound banks, fill, drainage layers etc)	Use as daily cover
Source Segregated green waste compost (no household inputs)	Beneficial Use Criterion											
	Environmental Acceptability Criteria											
Source Segregated green waste compost (with household inputs)	Beneficial Use Criterion											
	Environmental Acceptability Criteria											
Source segregated composts including industrial feedstocks	Beneficial Use Criterion											
	Environmental Acceptability Criteria											
Source segregated Digestates etc												
MBT output type A												
MBT output type B												
MBT output type C etc												
Sewage sludge compost												
Sewage sludge digestate												
Agricultural wastes - plant origin - untreated												
Agricultural wastes - animal origin - untreated												
Agricultural wastes - plant origin - treated												
Agricultural wastes - animal origin - treated												
Source												

segregated Digestates etc												
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Following two matrix extracts:

Soil improvement for crops for human consumption				
	Criteria	Threshold	Notes	
Source Segregated green waste compost (no household inputs)	Beneficial Use Criterion	PAS-100 APEX Other		
	Environmental Acceptability Criteria	Human health - PTEs	Meet risk-based generic quality criteria	Evidence may allow the Agency to assume compliance with a PAS 100 or APEX is sufficient
		Human health - organic substances	Use of a rapid screening technique	Evidence may allow the Agency to assume this is unnecessary for this material type, e.g. from WRT 313
		Human health - bioaerosols	Compliance with codes of practice for production and use	E.g. Composting Association Code of Practice
		Human health - pathogens	Compliance with codes of practice for production and use	Evidence may allow the Agency to assume this is not a concern for this material type
		Animal health	Animal Byproduct regulations where appropriate	
		Soil Capacity	Maximum application rates using criteria linked to soil protection	Yet to be elaborated, but should take into account availability of N, P etc
		Impacts on surface and groundwater	Maximum application rates using criteria linked to water protection	Yet to be elaborated, but should take into account availability of N, P etc
		Ecological impacts	Site specific consideration	Yet to be elaborated, but could use "red", "amber" and "green" sites: green application permitted, amber ecological risk assessment required, red, not permitted
		Nuisance issues	Compliance with codes of practice for production / use	

Soil improvement for crops for energy production				
	Criteria	Threshold	Notes	
type B (yet to be output mentally)	Beneficial Use Criterion	"A standard"	Yet to be elaborated	
	Acceptability	Human health - PTEs	Meet risk-based generic quality criteria	E.g. set by a contaminated site risk management strategy

Human health - organic substances	Meet risk-based generic quality criteria AND appraisal of the	Evidence may allow the Agency to assume this is unnecessary for this material type, e.g. from WRT 313, review studies etc
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		CLO using a rapid general screening technique	
	Human health - bioaerosols	Compliance with codes of practice for production and use	E.g. Composting Association Code of Practice
	Human health - pathogens	Compliance with codes of practice for production and use	E.g. Composting Association Code of Practice
	Animal health	Animal Byproduct regulations where appropriate	
	Soil Capacity	Maximum application rates using criteria linked to soil protection	Yet to be elaborated, but should take into account availability of N, P etc
	Impacts on surface and groundwater	Maximum application rates using criteria linked to water protection	Yet to be elaborated, but should take into account availability of N, P etc
	Ecological impacts	Site specific consideration	Yet to be elaborated, but could use "red", "amber" and "green" sites: green application permitted, amber ecological risk assessment required, red, not permitted
	Nuisance issues	Compliance with codes of practice for production and use	

2 Responses to General Questions

Q1: Should the source segregation requirement in paragraph 7A remain in place?

No, the source segregation requirement in paragraph 7A should be replaced by a matrix-based approach to considering organic matter types and land uses, supported by enhanced WML exemption guidance. The existing guidance suffers problems of terminology. The requirement for source segregation is inconsistently applied. Source segregation does not necessarily adequately control contaminants in organic matter and there are a range of other potential environmental impacts of organic matter independent of their level of contamination. A requirement for source segregation in Paragraph 7A does not necessarily achieve a “light touch” for regulation.

Terminology

The descriptions of land use as *agricultural* in Paragraph 7A and *contaminated* in Paragraph 9A are rather vague and not particularly useful from an environmental risk management perspective, and several categories of land use are not considered. In addition, it is not true to assume that applications to *contaminated* land¹⁴ will always be more tolerant of lower grades of organic materials than applications to *agricultural* land.

The consultation document discusses two broad classes of land use for recovery of materials: agricultural land and contaminated land. Hence the use of composts in forestry land, urban and derelict land, habitats, and possibly land uses such as for biomass energy is apparently unregulated or excluded. The terms contaminated land and brownfield are inadequately defined and used interchangeably. However:

- Contaminated land has a specific legal usage under Part IIA of the EP Act which excludes mine spoil and other forms of degraded land where compost and re-use for non food crops (such as bioenergy) could be beneficial
- Brownfield land is not necessarily contaminated, for example landfill caps or many instances of previously used land such as urban gardens.

Some of uses of restored contaminated land may be every bit as sensitive from a risk management point of view as land use for food crops, whereas some forms of agricultural use such as for bio-diesel crops may be more tolerant.

A generic distinction between agricultural land and any contaminated land application may not be valid in terms of their “tolerance” of composts / CLOs. Composts applied on brownfields and contaminated sites may be used for a variety of functional applications in a variety of locations, for example: risk management, soil formation, landscaping, soil improvement, mulching, in embankments, contouring of the land. It may also be at a wide range of sites with a range of end uses from colliery spoil sites being restored for amenity, biomass production and grassland, to gardens in housing developed on remediated contaminated land. The choice of organic amendments should not create new risks / pollutant linkages. In addition applications to contaminated land or brownfield sites may be as likely to be sensitive to the same aesthetic considerations (the appearance of the organic matter) and odour concerns as applications to agricultural land.

The demonstration of beneficial use depends on showing *agricultural benefit* or *ecological improvement*. However, the available description of *agricultural benefit* is incomplete, and the

¹⁴ Throughout this response document the expression *contaminated land* is used to refer to “land affected by contamination”, and not specifically contaminated land as defined under Part IIA of the Environmental Protection Act 1990

description of *ecological improvement* inconsistent. The Agency uses work carried out by WRC (Davis and Rudd 1998¹⁵) to describe “agricultural benefit” and “ecological improvement”, which are seen as the beneficial uses of organic matter applied to land. The Agency Land Recovery guidance states that:

Davis and Rudd have described the achievement of agricultural benefit associated with waste to land activities as the improvement of the soil condition for plant growth (growing of crops or grazing) while ensuring the protection of environmental quality in the broadest sense. The potential benefit to agriculture claimed can usually be considered in terms of one or more of the following criteria:

- *Crop yield and quality (e.g. nutrients);*
- *Soil chemical properties (e.g. liming and pH);*
- *Soil physical properties (e.g. organic matter and soil structure);*
- *Soil water content (e.g. watery wastes) and*
- *Land levelling.*

Davis and Rudd defined ecological improvement as being associated with the maintenance of habitats and their biodiversity where these would otherwise deteriorate, the provision of new habitats for wildlife and the development or restoration of existing habitats to give greater biodiversity and sustainability. With the exception of land levelling the criteria outlined above may also be used to assess claimed ecological improvement. The importation of waste soil and waste soil making materials may, however, lead to ecological improvement where it is required for the creation or improvement of a habitat. ...

Ecological improvement will usually be planned soil improvement of non agricultural land under the provisions of a paragraph 8A¹⁶ or 9A(1)(b) exemption. This may include the reclamation of derelict or degraded land or the restoration of mineral extraction or waste management facilities, provided there is no existing conservation value or specialised habitat. In such cases, ecological improvement may be associated with the creation of public open spaces, green links and corridors in urban areas, regional park resources and even public gardens associated with residential developments. The substitution of one habitat for another as a result of the application of wastes should only be permitted in accordance with full consultation with the appropriate conservation Agencies.

The description of agricultural benefit does not directly refer to soil biological processes, yet these underpin sustainable agricultural function in the long term. More worrying is the description, and even the concept, of “ecological improvement”. “Improvement” can only be assessed on some assessment of quality, which can only be subjectively based, as “quality” *per se* is not an intrinsic property of ecological systems. Whatever management is applied to an area will change its ecology. As described above, the concept of “ecological improvement” is more correctly ecological substitution to achieve a use of land that is better for some human purpose such as public open spaces, green links and corridors in urban areas. This is indirectly recognised in the text which recognises that some brownfield habitats may have a “conservation value”. A more accurate description of what is being covered by “ecological improvement” might be “other land improvement”. This is likely to be too vague to be helpful, so perhaps a range of categories are needed such as “restoration of marginal land”, “amenity and leisure improvement”, “enhancement of biodiversity”. It would be interesting to know whether the past development of several brownfields sites as golf courses, such as at Pumpherstons¹⁷, would have been regulated under paragraph 7A or 9A, and if regulated under 9A whether ongoing use of MBT outputs as top dressing such a golf course would be allowed.

¹⁵ Davis and Rudd (1998) WRC report Investigation of the criteria for, and guidance on, the landspreading of industrial wastes. Final report to DETR, the Environment Agency and MAFF, May 1998, WRC/ADAS report no 4088/7. This report is not available on line.

¹⁶ 7A?

¹⁷ <http://www.pumpherstongolfclub.co.uk/> - a Scottish example but relevant to the whole of the UK

This use of terminology complicates the application of ecological risk assessment to determine acceptable use of organic matter on land because the improvement may not be related to intrinsic ecological measurements. It also does not reflect what actually happens on many large brownfield sites restored to “soft” end uses, where land use may include a combination of recreational and amenity areas, agricultural areas such as for grazing, and crop areas, for example for biomass. For example, a site restored with some grassland, some willow biomass and some woodland for aesthetic reasons will have a greatly changed ecology from an original condition of perhaps rough grazing. Populations of some mammals and birds may be reduced across the site, with others increased. However, biodiversity might be greater in willow and woodland areas for plants and invertebrates than under original conditions. Furthermore, a large part of the site might pass over time from “brownfield” land to land in agricultural use for a non-food crop: biomass. The soil and risk management of the site might be built on ongoing relatively high levels of organic matter input, greater than those routinely considered for agricultural land. The passage of the land from restoration to regular biomass use would prevent the use of non-source segregated wastes under the current regime if regulation passed from Paragraph 9A to 7A. Hence, the possibility of transition of land from one class to another means that the application of materials such as MBT organic outputs can only be short term, even if applied to contaminated land as a management strategy, as a direct result of the existing source segregation requirement in Paragraph 7A

However, there seems to be little logic in switching the organic matter input that had led to the changed land use and the switch could have negative consequences for the land management as new materials have to be identified and secured, as well as for the original organic matter producer whose application route would vanish.

Source segregation itself is undefined as a term in the WML exemption regulation. Neither is a level of achievement or quality for source segregation specified, so that it is conceivable that very poor quality feedstocks produced by poor regimes would be regulated in the same as materials produced from high grade feedstocks.

If the source segregation of household wastes is to be a practical environmental protection tool which allows a “looser” regulation, it is a pre-requisite that source segregation processes must be adequately defined. Specification of the type of allowable source segregation and acceptable source segregation streams is needed, and at what point inappropriate waste categories in the separately collected stream invalidate its “privileged” regulatory position. For example, at what level to contrary materials in separately collected green waste mean that it falls into a different regulatory context. This approach implies a need to monitor the composition of separately collected waste streams, which is entirely consistent with verifying environmental protection, but adds to costs.

Inconsistent Requirements for Source Segregation

It is implied in the consultation that the source segregation requirement applies only to municipal solid waste materials. The regulations should more explicitly consider biowastes from industrial sources under paragraphs 7A and 9A, as well as sewage sludge and agricultural wastes, to ensure an equivalent regulation of all organic material recovered to land.

It is not clear whether the current presumption in favour of source segregated materials under Paragraph 7A is intended to refer only to wastes from domestic sources (in which case sewage sludge must be excluded) or also from industrial sources. Separate waste streams from industrial sources, for example, some fermentation residues may be of a high “quality”, others may be of a low grade, whilst others again may be generally of high quality but contain product related contaminants of possible concern such as an antibiotic, or residues from an extraction process. It is fairly common that composting operations using green wastes, for example for civic amenity sites, also accept industrial residues.

The application of a source segregation requirement advocated in the existing Paragraph 7A is inconsistent with the management of other waste streams applied to land. The Defra consultation document states that “The Government is not aware of any country that permits the spreading to land of outputs where there are no controls on inputs and minimal controls on outputs.” Yet uncontrolled waste inputs from UK households may enter sewerage. Substances in sewage of domestic origin are causes for concern, such as *endocrine disrupting substances*. Yet sewage sludge is widely applied to agricultural land, and indeed is an allowable constituent of PAS 100 composts.

The Defra consultation document further states that “It should be noted that this category was never intended to cover outputs from the new breed of MBT plant producing compost derived from waste, since this technology was not around at the time”. The original date of the exemption guidance was in 1994 when MBT-like plants were in operation, or had recently operated in the UK, such as the *Secondary Resources* plant in Birmingham, albeit with limited success.

Limited Effectiveness of Source Segregation for Environmental Protection

Source segregation is not sufficiently effective as an approach to environmental protection that it should receive favoured treatment under licensing and permitting regimes. The reliance on source segregation under paragraph 7A is not justified from a technical point of view, whatever its philosophical, administrative and market attractions. Source segregation as currently practiced may not be a sufficient barrier to contaminants of concern for a number of reasons. (a) Evidence from large scale schemes of separately collected wastes indicates that a noticeable amount of inappropriate materials are discarded into the collected compostable stream. (b) Separately collected materials may contain elevated levels of organic pollutants, such as bonfire ash, treated soils and growing media, treated plant materials collected at civic amenity sites.

One of the reasons given in the consultation document for suggesting source segregation prior to agricultural land recovery of organic materials is to take a precautionary approach to soil protection for contaminants not regularly assessed in organic amendments, and not specified in standards such as PAS 100. The Agency presentation at the 3 March 2006 Stakeholder Workshop¹⁸ outlined their concern about the potential environmental impacts from any of up to 30,000 substances used in household products. The Agency has identified the following contaminants as being of particular concern:

<p><i>Persistent Substances:</i></p> <ul style="list-style-type: none"> • Polychlorinated biphenyls (PCBs) • Brominated flame retardants such as penta, octa and deca bromodiphenyl ether & hexabromocyclododecane • Tert-Dodecanethiol (tert - dodecylmercaptan, tdm) • Triclosan; • Perfluorooctane Sulphonate (PFOS), PFOS derivatives and substances that degrade to form PFOs 	<p><i>Endocrine Disrupting Substances:</i></p> <ul style="list-style-type: none"> • Phthalates such as DINP, DIDP, DNOP and others • Tributyl tin compounds 	<p><i>Metals:</i></p> <ul style="list-style-type: none"> • Cadmium • Mercury • Nickel • Zinc
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However, a wide range of toxic substances are used in gardening and household maintenance (such as pesticides, herbicides, wood preservatives and paints), and bonfires and leisure activities such as

¹⁸ Defra (2006 – unpublished) Meeting Note - Stakeholder Workshop 3 March 2006 for the Source Segregation Requirement in Paragraph 7A of Schedule 3 to the Waste Management Licensing Regulations 1994 : A Consultation Document. At Ashdown House, 123, Victoria Street, London. SW1E 6DE.

fireworks and barbecues are sources of products of incomplete combustion such as dioxins, and these should also be considered as potential hazards for separately collected “green” wastes.

A wider question is whether source segregation from domestic premises achieves a sufficient level of change in content of undesirable substances in feedstocks that they no longer need as stringent regulation as feedstocks prepared mechanically or by other means. This level of change needs to be sufficient that there are demonstrably reduced environmental risks from source segregated materials, and that this reduced level of risk is consistent and unlikely to be breached. It should also include a safety factor so that any intermittent difficulty will not lead to undesirable content of toxic substances. Hence one might expect that composts or digestates from source segregated materials need to have, say, 50%, 10% or 5% of the contents of toxic substances of concern found in organic materials produced by other means, depending on the findings of substantive measurement and risk assessment studies.

One might expect that the range of contamination levels found in one group of materials would be distinct from the range found in the other. In fact, the ranges of metals and organic contaminants in source segregated materials and the ranges in CLO¹⁹s from mechanically derived feedstocks overlap²⁰ (see Section 5). There is therefore no technical rationale for separate regulatory approaches. Inappropriate materials should be prevented from being recovered to land whatever their origin.

Amlinger *et al* (2004)²¹ suggest *Due to the comparatively much higher concentrations [of PCBs, PCDD/F and PAHs] found in mixed waste compost they should be measured, instead, when mixed waste compost is used as amendment. The authors recommend to restrict the use of mixed waste compost to limited non-food areas such as land reclamation of brown fields and surface layers on landfill sites or on noise protecting walls beside roads or railways.*

However, the data they base this conclusion on is highly variable. The effectiveness of source segregation as a control on organic pollutant levels is unproven (as set out in the reply to Question 1). A study recently commissioned for Defra (reference SP0547)²² concluded that: *[The suggestion of Amlinger et al 2004] would appear to be an overly precautionary measure given the absence of environmental effects of POP²³s, their accumulation in compost amended soil is negligible and the concentrations present in mixed waste compost are below conservative and risk-derived limits for POPs in sewage sludge intended for agricultural use.* The Defra report showed how this finding was supported by a number of other studies.

The SP0547 Defra report also suggested that *given the high persistence/toxicity of wood preservatives, a precautionary measure would be to exclude pesticide treated wood from the production of marketable compost products or for recycling in agriculture.* Treated woods are a potential contaminant of source segregated green wastes

The SP0547 Defra report drew attention to the possible pesticide content of mushroom composts: *the estimated production of mushroom compost applied to land remains a significant volume, equivalent to approximately 400,000 t y (fresh weight) and, given the uncertainty about the extent of its contamination with pesticide residues, a chemical survey of the material is warranted.* Mushroom composts would also be regarded as a source segregated compost under paragraph 7A.

¹⁹ Compost Like Outputs

²⁰ Bardos, R.P. (2005) Composting of Mechanically Segregated Fractions of Municipal Solid Waste – A Review. Project Carried out for SITA Environmental Trust, The Barn, Brinkmarsh Lane, Falfield, GL12 8PT. www.compostinfo.info

²¹ European Commission (2004) Heavy metals and organic compounds from wastes used as organic fertilisers. Amlinger, F., Pollak, M. and Favoino, E. Report ENV.A2/ETU/2001/024, July 2004, European Commission, Rue de la Loi, Brussels, Belgium. http://europa.eu.int/comm/environment/waste/compost/pdf/hm_finalreport.pdf

²² Defra code SP0547, Stephen Smith, Imperial College, Personal Communication

²³ Persistent organic pollutants

It is salient to note that the best documented instance of organic pollutants in compost causing environmental impacts was in the USA and New Zealand where compost from separately collected green waste was contaminated with a common garden herbicide used in the USA²⁴.

Other Potential Environmental Impacts

Organic material use on land may give rise to a range of environmental impacts whatever the material's source, for example:

- Effects on soil pH / redox conditions
- Downstream impacts on pH / redox in surface / ground water
- Excessive loadings of soil phosphorus
- Downstream impacts of nitrogen and phosphorus on surface / ground water²⁵
- Plant and animal pathogen inputs.

Some of these impacts are potentially serious if organic matter is inappropriately used, and may occur for any organic matter type. Hence organic matter addition, in general, requires a consistent management framework that takes into account a range of impacts on different "receptors", and not just impacts related to potentially toxic elements and organic pollutants. The exemption mechanism should ensure that compost addition does not result in "harm", and does not exceed the "capacity" of the receiving soil, water and ecology to absorb the addition. Factors such as N and P content may become a greater controlling influence than issues related to environmental risks from toxic substances, in particular in areas with high surface water quality vulnerability, such as Nitrate Vulnerable Zones.

The impacts of organic matter addition are highly dependent on the nature of the organic matter, the degree to which it has been biodegraded, the capacity of the receiving soil / water / ecology and the benefit for which the addition was intended. For example, "immature" compost may be of greater benefit to the development of organic matter in a sandy soil than a more "mature" compost as specified in PAS 100. On the other hand, such compost may have a larger proportion of mobile forms of nitrogen and have a higher biological oxygen demand. Hence, the arguments in favour of benefit versus harm may seem finely balanced from a regulatory point of view, and may require a case by case approach. Some aspects of regulatory approaches in other policy areas are unnecessarily unhelpful, for example reliance on total as opposed to available measures of nitrogen content in the context of compliance with the Nitrate Directive.

"Light Touch" for Regulation.

A "light touch" approach to the regulation of organic matter to land needs to be squared with a need to ensure benefit and avoid harm from a wide range of materials inputs, applications, and site and soil specific conditions. What is needed is a consistent approach for determining beneficial organic matter inputs to soils, whatever their origin. The specification of "source segregation" in Paragraph 7A does not automatically guarantee better environmental protection, and the technical case for reliance on source segregation as a means of human health and environmental protection for agricultural land is not made.

The Agency guidance on recovery to land²⁶ is comprehensive. It covers the following:

- Chapter Two - Waste Characterisation

²⁴ Rynk, R. (2002) Industries Respond to the Clopyralid Controversy- Ongoing Investigations. BioCycle 42 (12) 66-67.

²⁵ Sensor-based techniques are also available or under development for macro-parameters such NO₃⁻ (mg/l), K⁺ (mg/l), Ca²⁺ (mg/l), Na⁺ (mg/l), NH₄⁺ (mg/l), pH, dissolved oxygen (mg/l).

²⁶ "Guidance For the Technical Assessment of Waste to Land Recovery Activities"

- Chapter Three - Soil Characterisation
- Chapter Four - The Determination of Benefit to Agriculture or Ecological Improvement
- Chapter Five - Environmental risk assessment
- Chapter Six - Benefits and potential negative environmental impacts associated with wastes commonly applied to land.

This guidance provides an integrated framework for the assessment of land recovery of organic wastes which is designed to prevent inappropriate use of organic materials. It does not seem a “light touch” to practitioners, as mentioned by delegates at the March 3rd 2006 meeting. While there are developments that could improve this guidance²⁷, its broad principles and procedures seem quite adequate to prevent the inappropriate application of materials to land, including “sham recoveries” like those that resulted in recent prosecutions. Hence as well as being inconsistent and unjustified from a technical point of view, the source segregation requirement in paragraph 7A seems unnecessary from a regulatory point of view.

Q2: Is it environmentally acceptable (in terms of the relevant objectives of Article 4 of the Waste Framework Directive) to treat agricultural land with non-source segregated biodegradable outputs from MBT (or other similar processes)?

Whether it is environmentally acceptable to treat agricultural land with non-source segregated biodegradable outputs from MBT (or other similar processes) depends on the environmental impacts of the material applied to land. Source segregation alone does not prevent the possibility of unacceptable environmental impacts from organic matter inputs and, in any case, does not take place for applications of sewage sludge and agricultural wastes which are the dominant sources of organic matter applied to agricultural soils.

A consistent approach to organic matter application to soil is needed that is the same for all feedstocks, but which allows (a) higher grade materials to be used for higher grade purposes, and (b) is linked to environmental risks and impacts of the organic matter applied rather than subjective judgements about feedstock origins.

Waste policy in the EU is driven by a number of non-technical considerations, and a variety of national opinions. There is clearly a desire among some countries for source segregated composting and digestion to receive some sort of preferential treatment to promote their more rapid adoption across the EU, and that materials from mixed waste origins should be more closely regulated. This desire is related to issues of perception and past experience of mixed waste composting in some countries, as well as fundamental differences in how wastes are collected and managed. It would be difficult, if not impossible, for the UK to adopt a regulatory approach that ran contrary to European Commission (EC) waste policy and its direction of travel. Nevertheless, the use of the exemption mechanism with waste management licences is unique and, according to the Agency at the 3rd March 2006 meeting, secure for the future. The matrix-based approach suggested in Section 5 of this response may be consistent with both better environmental regulation and the direction of travel of EC waste policy.

Article 4 of the original 1975 Waste Framework Directive states that *Member States shall take the necessary measures to ensure that waste is recovered or disposed of without endangering human health and without using processes or methods which could harm the environment, and in particular:*

- *without risk to water, air, soil and plants and animals,*
- *without causing a nuisance through noise or odours,*

²⁷ Perhaps several are already planned in the light of the Water Framework Directive and developing soil protection strategy

— *without adversely affecting the countryside or places of special interest.*

Member States shall also take the necessary measures to prohibit the abandonment, dumping or uncontrolled disposal of waste.

Article 4 of the 1991 revision of the 1975 Waste Framework Directive states that *Member States shall take the necessary measures to ensure that waste is recovered or disposed of without endangering human health and without using processes or methods which could harm the environment, and in particular:*

- *without risk to water, air, soil and plants and animals,*
- *without causing a nuisance through noise or odours,*
- *without adversely affecting the countryside or places of special interest.*

Member States shall also take the necessary measures to prohibit the abandonment, dumping or uncontrolled disposal of waste.

In the current consultation, Article 4 of the draft revised Waste Framework Directive states: *Member States shall use economic instruments to attain the objective of this Directive where they are appropriate, and shall co-ordinate the application of such instruments with other Member States where necessary in order to ensure the smooth functioning of the internal market.*

With regard to the 1975 and 1991 Article 4 text versions, it is unsafe for Defra to rely on a source segregation requirement in paragraph 7A or 9A of the WML exemption regulations as a means of preventing: (1) risk to water, air, soil and plants and animals, (2) nuisance through noise or odours, and (3) adverse affects on the countryside or places of special interest.

1. Organic materials prepared from source segregated and mechanically prepared organic feedstocks do vary in their content of toxic substances, but ranges of contamination overlap hence source segregation does not necessarily lead to risk reduction. In addition, other properties common to organic materials of source segregated or mixed origin have potential to adversely impact water, air, soil and plants and animals.
2. Source segregation has no relationship to the potential of the use of organic materials to land to cause nuisance through noise or odours.
3. Source segregation does not remove the potential of the use of organic materials to land to cause adverse affects on the countryside or places of special interest, for example via undesired impacts on water, air, soil, plants and animals.

The draft Waste Framework Directive includes some substantive changes, although its aims are consistent with the existing Directive. Article 5 in the draft provides for *secondary materials and substances which are deemed to have ceased being waste*; Article 6 for *classification as recovery or disposal* and Article 7 for *general obligations* which cover points related to those in the former Article 4 in the 1975/1991 version. It would seem sensible for revisions to the WML exemption regulations to also be consistent with this drafting in particular in relation to *secondary materials and substances which are deemed to have ceased being waste*.

A key concern of the UK waste sector is their perception that there is no mechanism for conversion of organic wastes to secondary materials, and that recovery of organic matter is not considered to have taken place before it has been applied appropriately to land. Defra, the Environment Agency and WRAP are working on protocols for a number of secondary materials, including PAS-100 composts which partially addresses this concern. However, there is no initiative for a protocol for materials that might be produced from mixed waste sources. The lack of such a protocol sends out a strongly negative message to those contemplating the use of MBT or investing in MBT projects, as it indicates that product benchmarks are not likely in the near term. A rapid solution might be for the Defra research proposal WRT314 Criteria for different uses of CLOs, digestates and composts to be aligned with the development of a further secondary material protocol, in line with Agency *Guidance For the*

Technical Assessment of Waste to Land Recovery Activities and the matrix-based approach to exemption regulation proposed in this response.

At the 3rd March 2006 meeting the Agency suggested that The EA envisaged the current Environmental Permitting Programme (EPP)²⁸ might produce a permitting regime that represents a mid point between exemptions and full licensing regimes. However it did not expect to be in a position to develop a detailed approach before summer 2007. This date will be too late to be of use to Essex County Council in delivering its long term waste management plans because the Essex authorities need to go to market for MBT plants with immediate effect if the risks of failure against LATS are to be fully mitigated. It also seems disproportionate to subject MBT outputs to a higher level of regulatory load than other wastes such as sewage sludge or agricultural wastes, particularly given the limited effectiveness of source segregation as an environmental protection measure, as outlined in the reply to Question 1, above.

Q3: Is it agriculturally acceptable to treat agricultural land with non-source segregated biodegradable outputs from MBT (or other similar processes)?

The agricultural acceptability of non-source segregated biodegradable outputs from MBT (or other similar processes) is a function of several factors:

- The environmental impacts of the material applied, as raised in Question 2
- The fitness for purpose of the material applied
- The perceptions of land markets and markets for agricultural produce.

Fitness for purpose describes whether or not an organic material achieves the benefit intended for its use: for example, if soil improvement is the desired benefit, but little improvement in soil biological, chemical or physical properties takes place, then the material was not fit for purpose. Source segregation alone does not guarantee fitness for purpose, but it can certainly assist in developing a higher grade product, for example with a higher content of plant nutrients. Fitness for purpose should be addressed by appropriate product standards, such as CEN TC 223 or BS 3882 and not prescribed environmental regulation such as WML exemptions. Environmental regulation does need to be assured that an application is beneficial, and benefit can more easily be assessed against particular benchmarks. However, these benchmarks need to be developed elsewhere and should apply to the use of any organic matter in soil, including those from agricultural or sewage sources.

The development of the “Safe Sludge Matrix” by ADAS²⁹ and the British Retail Consortium has shown that users of agricultural products may have substantial commercial interests in how the land use to grow products is managed. These interests may be more strongly related to perception of risks than measured or estimated risks. One might assume that there will be a similar sensitivity for the use of MBT outputs in food production, *and potentially source segregated MSW fractions as a result of the so called “faecal aversion factor”*³⁰. Acceptable materials may also differ greatly between organic and non-organic farming sectors.

Industry representatives at the 3rd March 2006 consultation meeting called for a special case for “non-food agriculture” under Paragraph 7A, where mixed waste feedstocks such as MBT derived CLOs might be used. A potential danger of this approach is that accepting MBT-outputs to land used for

²⁸ Department for Environment, Food and Rural Affairs - Defra (2006) Environmental Permitting Programme Consultation on options for creating a streamlined environmental permitting and compliance system. Defra, Nobel House, 17 Smith Square, London SW1P 3JR

<http://www.compostinfo.info/www.defra.gov.uk/environment/epp>

²⁹ http://www.adas.co.uk/news/publications.html?podlet_id=42&article_id=52

³⁰ A euphemism to describe the reluctance of most consumers to buy food products which they feel might have been grown on land fertilised by human wastes

non-food crops a might blight the land in the future for growing other agricultural crops given the paragraph 7A exemption. This would reduce its utility and its value³¹. It also implies a need for a record keeping system able to log where different types of organic matter application had taken place to ensure that land that had accepted MBT outputs was not subsequently used for food crops, even though sewage sludge and agricultural waste applications would not need to be similarly recorded. The specification of source segregation in paragraph 7A in particular complicates the use of land apparently considered under Paragraph 9A for non-food crops, such as biomass on brownfield sites, as set out in the answers to Questions 1 and 2.

Exemption regulations should confine themselves to ensuring acceptable environmental use and ensuring beneficial use through fitness for purpose.

While, there are wider commercial and economic considerations for land use, it is more appropriate for this to be addressed through advisory guidance from a stakeholder-based discussion involving all interested parties. This discussion could provide a more general “organic matter use matrix” that reflects the interests of different sectors, which might supplement the WML exemption documents.

Q4: Is it environmentally acceptable to treat any land type with non-source segregated biodegradable outputs from MBT (or other similar processes)?

It is *not* appropriate to treat land with *any* organic matter amendment in an uncontrolled way, whether it is from a mixed waste or source segregated feedstock. An application should be demonstrably beneficial, not give rise to unacceptable harm and should be a sustainable development. However, similar judgements should hold true for *any* organic matter application to land, whatever the source of the organic material.

Determination of an appropriate application of organic materials to land is highly case specific depending on the nature of the organic material added, the properties of the soil it is being added to, the ecological and hydrological context of the site being treated the intended purpose and nature of the application. This determination is not directly relatable to whether or not the organic material came from a source segregated origin.

Q5: What are the potential human health impacts that need to be taken into account?

This question is narrow in its scope as there are important environmental impacts that need to be considered such as the capacity of soil and water systems to absorb plant nutrients such as nitrogen and phosphorous and the ecological impacts of organic matter addition to land. Ecological impacts might arise from desired benefits as well as from undesired effects such as excessive plant nutrient loadings, presence of litter and the hazard it can pose to wildlife, and perturbations in ecological communities. There is also some concern that ammonia emissions from compost processing may have environmental impacts, although their significance is not well understood³².

³¹ This might take place even if there were some recovery process for the land in question

³² Chou C-H. and Buyuksonmez, F. (2006) Biogenic emissions from green waste and comparisons to the emissions resulting from composting (Part 1: ammonia). *Compost Sci Utilisation* 14 (1) 16-22

The principal human health impacts that need to be considered for any soil improver have already been elaborated in some detail by CEN TC 223³³ and include:

- Toxic substances
- Pathogens
- Dust, odour and bioaerosols / allergens (particularly during processing and application)
- Sharps

These various human health effects can potentially apply to all organic materials whatever the feedstock.

The human health impact of toxic substances in soil (and groundwater) has been the subject of a great deal of work in the contaminated land sector, where risk assessment guidance exists³⁴ which might be adaptable for organic matter to land considerations³⁵. A large body of work also exists in relation to the EC Directive on Sewage Sludge³⁶, which is currently under review.

Current guidance related to the use of CLO's and composts on land includes a number of quality criteria and thresholds. However, these are not derived from any formal appraisals of human health or environmental risks. The BSI/WRAP PAS-100 compost specification³⁷, based on a former Composting Association standard³⁸, also includes a series of criteria relating to potentially toxic elements. However, these are not directly related to either possible human health or environmental risks, and therefore PAS-100 would not seem to have a direct bearing on environmental regulation of compost use. An EC working group³⁹ also elaborated draft proposals for standards for composts and biostabilised residues. However, these also were not directly related to any appraisal of human health or environmental risks.

Pathogen issues are dealt with in part by the animal by-products regulations⁴⁰ though human health protection is not their principal goal.

Defra have found that compost processing emissions to air⁴¹ were not well understood. It recommended: *a study to characterise and quantify emissions of particulates, micro-organisms, VOCs and methane from in-vessel and/or windrow composting of MSW*
This is a significant area of uncertainty at present, and could become more

³³ BSI (1999) PD CR 13455:1999: Soil improvers and growing media. Guidelines for the safety of users, the environment and plants, British Standards Institute, London, UK <http://www.bsonline.bsi-global.com/server/index.jsp>, Based on the work of CEN TC 223, web link: <http://www.cenorm.be/CENORM/BusinessDomains/TechnicalCommitteesWorkshops/CENTechnicalCommittee/s/WP.asp?param=6204&title=CEN/TC%20223>

³⁴ UK risk assessment page on EUGRIS (European soil and water information portal) http://www.eugris.info/EUGRISmain.asp?EUGRISID=483&Category=Country_Digests

³⁵ Note: adaptation would probably need to include additional pathways

³⁶ <http://europa.eu.int/comm/environment/waste/sludge/index.htm>

³⁷ British Standards Institution - BSI - and Waste Recycling Action Programme - WRAP (2002) PAS 100 - Specification for compost. WRAP, Banbury, UK. <http://www.wrap.org.uk>

³⁸ The Composting Association - TCA (2000) The Compost Association Standards for Composts. Working Document. The Composting Association, Wellingborough, UK. ISBN 0-9532546-3-1.

³⁹ European Commission (2001) Biological treatment of biowaste. Working document. 2nd Draft. Brussels, 12 February 2001, DG ENV.A.2/LM/biowaste/2nd draft.

http://europa.eu.int/comm/environment/waste/facts_en.htm

⁴⁰ Department for Environment Food and Rural Affairs - Defra (2006) Guidance Notes (Non Statutory) On The Disposal Of Animal By-Products, Including Former Foodstuffs Of Animal Origin, From Food Outlets Regulation (EC) No 1774/2002 laying down health rules concerning animal by-products not intended for human consumption. Defra, London. <http://www.defra.gov.uk/animalh/by-prods/pdf/ffguidance1774-2002.pdf>

⁴¹ Department for Environment, Food and Rural Affairs - Defra (2004) Review of Environmental and Health Effects of Waste Management: Municipal Solid Waste and Similar Wastes. Product code PB9052A Defra Publications, Admail 6000, London, SW1A 2XX. www.defra.gov.uk

important if composting of MSW becomes more widespread. Bioaerosols are seen as the most likely potential cause of human health impacts from compost production⁴². Perhaps the same may apply to compost use.

The application of organic matter to land can also cause far reaching odour problems, and may also be visually unpleasant. Odour problems can greatly reduce quality of life for affected individuals, and odour issues may include a strong element of perception as well as measurable effects.

Approaches such as milling or pelleting that will be applied in a number of planned facilities may greatly reduce risks from sharps⁴³.

⁴² Wheeler, P.A., Stewart, I., Dumitrean, P. and Donovan, B. (2001) Health Effects of Composting - A Study of Three Compost Sites and Review of Past Data. WRC Report P1-315/TR, ISBN 1857056809, October 2001.

⁴³ Bardos, R.P. (2005) Composting of Mechanically Segregated Fractions of Municipal Solid Waste – A Review. Project Carried out for SITA Environmental Trust, The Barn, Brinkmarsh Lane, Falfield, GL12 8PT. www.compostinfo.info

3 Critique of Defra Options Appraisal (Cost Benefit Analysis)

This critique includes responses to the Defra questions summarised in Table 1.

3.1 Sectors and groups affected

3.1.1 Overview Response

The options under consideration are:

1. Remove the requirement to source segregate from the paragraph 7A exemption. This would permit the spreading of non-source segregated compost, liquor and digestate from aerobic or anaerobic treatment processes applied to agricultural land under the terms of the exemption.
2. Do Nothing. Keep the requirement to source segregate the inputs to plant producing compost, liquor and digestate from aerobic and anaerobic treatment processes under paragraph 7A and keep the arrangement under paragraph 9A so that non-source segregated compost can be spread under the terms of that exemption.
3. Add the requirement to source segregate to paragraph 9A. This would ensure consistency across the regime but it would close down even further the options for recovering the waste to land

The decision on how organic matter use on land is regulated by exemptions will have major impacts on the UK waste management sector. The use of MBT would be ruled out by the selection of Option 3, and is severely constrained by Option 2, perhaps to the point of being non-viable.

Option 1 offers a wider range of potential land uses for CLOs derived from MBT. The Defra consultation document suggests that “Option 1” is not sufficiently protective of the environment whereas that source segregation achieves adequate protection. However, this response concludes that the source segregation requirement in Paragraph 7A will not prevent unacceptable waste derived material use on land.

A modified Option 1 using the matrix-based approach suggested above would support a more finely tuned approach creating both opportunities for appropriate use of MBT derived materials and better environmental protection.

If this matrix-based approach to regulating organic matter use on land suggested in this response is adopted, then producers would need to monitor a range of environmental acceptability criteria. Additional analytical requirements could be seen as particularly affecting users of source segregated feedstocks, as users of feedstocks from mixed waste sources would likely need to offer this level of information in any case for exemptions or “environmental permits”. However, it can be argued that the impacts of collecting this information on users of source segregated materials may not be substantially greater than that which is likely to take place for other reasons, and indeed could reduce over time on the basis of “weight of evidence”.

Under the current regulatory regime, (Option 2) confidence in MBT among waste disposal authorities, major waste management companies and investors as a viable waste management approach is rapidly diminishing. That is not to say that these stakeholder believe MBT is an inappropriate waste management technique, but rather that it is regulated inappropriately. For MBT to remain a practical waste management option a better regulatory approach is needed than Option 2.

The vision for England's waste strategy⁴⁴ is:

Protection of human health and the environment by producing less waste and by using it as a resource wherever possible. Through more sustainable waste management – reduction, re-use, recycling, composting and using waste as a source of energy – the Government aims to break the link between economic growth and the environmental impact of waste.

The review goes on to find: *Modelling indicates that LATS is the main pressure on Local Authorities, which is predicted to drive national household waste recycling rates above current targets. The figure illustrates modelling outcomes based on a range of waste growth and infrastructure assumptions (shown by the different coloured trend lines). This outcome requires major acceleration in materials reclamation facility and composting infrastructure, and includes development of mechanical biological treatment (MBT) of residual wastes.*

MBT management of wastes is being undermined as a viable waste management technology in the light of the current exemption position, which makes a global assumption that organic matter from mixed waste can never be suitable for any kind of agricultural use, whatever its quality. It is clearly the Environment Agency's duty to prevent inappropriate materials being used as organic amendments on land. However the current regulatory position is being interpreted by the waste sector and its investors as a signal that the use of MBT outputs on land is a major project uncertainty.

Waste Disposal Authorities pursuing MBT are therefore finding that although MBT is seen as an important waste management approach, higher in the waste management hierarchy than mass burn incineration or landfill, when it comes to practical implementation, projects are stalled by uncertainty over the use of their outputs to land.

The major "losers" from the current uncertainty over the use of outputs from MBT to land are therefore the waste disposal authorities, and the communities they represent who will have to bear the costs of both fines and the development of alternative local waste strategies, if a compromise way forward cannot be reached.

Other losers will include investors in existing MBT-based projects and specialist MBT technology and service providers. Major waste companies able to offer a portfolio of possible solutions may be less severely affected, but will have to make major changes to their current business strategies where MBT is seen as a desirable waste management alternative to mass burn incineration.

3.1.2 Specific Comments Regarding Option 1

A modified Option 1 could benefit a number of processors in the short term, by increasing market confidence in MBT as a solution.

The most significant cost savings would be those of waste disposal authorities who would no longer need to carry out major revisions to existing waste management strategies and plans, who would be better able to meet their LATs goals.

The claim that, by supporting the adoption of MBT plants, Option 1 would remove market opportunity for SMEs specialising in composting or otherwise processing source segregated wastes does not withstand scrutiny for several reasons.

- o Local waste management strategies, in accordance with waste policy, place a strong emphasis on maximising recovery of wastes at source. Source segregated materials and their products have better established markets and have local community support. MBT is seen as a 'second

⁴⁴ Defra (2006) Waste Strategy 2006 Review of England's Waste Strategy - A Consultation Document, February 2006 and Defra (2005) Securing the Future, the UK Government Sustainable Development Strategy, March 2005 <http://www.sustainable-development.gov.uk/publications/uk-strategy/uk-strategy-2005.htm>

bite' at dealing with the remaining waste stream, and this approach would not be changed by the adoption of Option 1 especially if it is modified in the way outlined in this response. Hence MBT will not reduce the scale the "source segregated" waste stream, which is likely to continue to grow

- o Major waste management companies are already directly involved in composting source segregated wastes and are increasing their activities in this sector, so sme's involved in composting are already under competitive pressure. This competitive pressure is strong whichever option (1, 2 or 3) is chosen

3.1.3 Specific Comments Regarding Option 2

If Option 2 is adopted, the waste management sector is likely to presume the worst case in terms of bidding for future waste management contracts involving MBT. Market evidence is showing that waste management companies will not take on the CLO marketing risks in the current climate and they will assume CLOs from MBT will be consigned to landfill. This is resulting in the bid costs for MBT escalating to unaffordable levels in some instances and the subsequent amendment of projects to exclude the opportunity of exploring MBT as a viable waste management method.

3.1.4 Specific Comments Regarding Option 3

The value of Paragraph 9A as currently drafted for supporting the use of MBT outputs is unclear for several reasons:

- o Inconsistent and inappropriate terminology is used: "brownfield" and "contaminated land". For example, a landfill cap might be considered brownfield, but might not be considered contaminated, particularly in the context of Part IIA.
- o The benefit "ecological improvement" is poorly defined, and in a way that allows for highly subjective interpretations
- o The existing guidance does not explain how brownfield land restored to a use such as biomass would be considered in the future. For example, would it begin to be considered as agricultural and so prevent further use of materials of mixed waste origin?
- o A range of land uses (including "urban land" would appear to fall outside either paragraph 7A or paragraph 9A.

This vagueness would make the outcome of any application to regulators for use of MBT outputs under Paragraph 9A highly uncertain, and perhaps highly variable from decision to decision, even on the basis of similar evidence being presented. Even if an application is allowed, further applications may be prevented if the land is seen as transitioning from "contaminated" to "agricultural". This is an insufficient basis for planning the use of MBT derived CLO's and so adds to the low viability of MBT as a waste management solution under the current regulatory regime.

The Option 3 suggestion of adding a source segregation requirement to Paragraph 9A would mean that the only possible MBT applications are to produce energy and/or outputs sufficiently stabilised to be landfilled within the available Landfill Allowances held by a given authority. As a minimum this would result in a significant lost opportunity to generate high quality CLOs from municipal wastes and associated lost benefits to a wide range of soil environments. At worst, for some authorities, it may result in waste management taking place lower in the waste hierarchy using waste management techniques such as incineration so that wider future resource recovery opportunities are lost.

3.2 Benefits

A wide range of qualities of MBT materials are possible and many MBT providers claim to be able to produce materials able to meet PAS-100 quality criteria. This would seem to suggest that mixed waste

origin composts and digestates of a suitable quality for use on agricultural land can be produced, even if there have been recent instances of poor quality material applications to land.

Organic pollutants have been raised as a concern for composts of mixed waste origin. However, as discussed above, the technical literature suggests that organic pollutants are a problem also for source segregated materials and that the levels of organic pollutants in mixed waste composts do not justify a separate regulatory approach for this material stream.

3.3 Regulator costs

No further opinion is offered in this response.

3.4 Cost to business

The major impact on business is regulatory uncertainty. If the matrix-based approach to regulating organic matter use on land suggested in this response is adopted then some producers would need to deal with the following additional regulatory issues:

- Human health – potentially toxic elements (PTEs)
- Human health - organic substances
- Human health - bioaerosols
- Human health - pathogens
- Animal health
- Soil Capacity
- Impacts on surface and groundwater
- Ecological impacts
- Nuisance issues

This could impact most substantially on users of source segregated feedstocks, as users of feedstocks from mixed waste sources would likely need to offer this level of information in any case for exemptions or “environmental permits”, if these are developed.

However, it can be argued that the impacts of collecting this information on users of source segregated materials may not be substantially greater than that which is likely to take place for other reasons, and indeed could reduce over time on the basis of “weight of evidence”. These arguments are as follows.

- **Human health – potentially toxic elements (PTEs):** PAS -100 does not address human health issues and may not have an adequate sampling regime, which invalidates it as a tool for environmental regulation. This is apparently the subject of some debate between the Agency and WRAP. A set of risk-based criteria and an effective sampling regime would be of general benefit, and PAS-100 could be adapted to use these limit values, or more stringent limit values if it felt there was a market perception benefit in doing so. The matrix-based approach allows market tools to be distinguished from environmental regulation. A weight of evidence approach could be used to justify lower sampling rates over time.
- **Human health - organic substances:** source segregated and mixed waste origin may contain organic pollutants, and the significance of this is unclear. It is an urgent requirement to collect data on the presence of organic pollutants and their environmental and ecological significance for all organic matter added to land, whatever the outcome of this consultation.
- **Human health – bioaerosols:** – already regulated / subject to codes of practice
- **Human health - pathogens:** – already regulated / subject to codes of practice
- **Animal health:** – already regulated / subject to codes of practice
- **Soil Capacity:** – all organic matter addition to land will be subject to similar concerns about soil capacities, such as ability to absorb N and P inputs
- **Impacts on surface and groundwater:** – all organic matter addition to land will be subject to similar concerns about river basin management impacts

- **Ecological impacts:** – a simplified approach to considering ecological impacts might be based on criteria relating to the application and the land receiving the compost, for example compost being sold for use in gardens may not require an appraisal of ecological impacts, however compost being used in habitat management clearly would need an appraisal of ecological impacts.
- **Nuisance issues:** – already regulated / subject to codes of practice

3.5 Environmental Costs

(See responses to Q1 – Q5) Impacts of compost use from mixed waste sources are reviewed on: www.compostinfo.info. However, detailed and specific information on the two specific questions raised by Defra is only poorly available in the technical literature. It is addressed in part by the Defra report for project SP0547. Direct data will become available from the Defra project WRT312 Impact of treated biowastes applied to soil when it is initiated.

The Defra questions are:

- Evidence is sought on the potential impact of the spreading non-source segregated compost, liquor and digestate from aerobic and anaerobic processors on land may potentially have on land and water?
- Evidence is sought on the potential cost to the environment & human health of the repeat spreading of the waste to land over a period of years?

These questions should be considered also for source segregated organic matter applied to land.

3.6 Social Costs

There is no specific appraisal of costs to local authorities and impacts on community taxation in the Defra consultation document for any of the three options considered. A study of these costs and impacts should be carried out as a matter of urgency.

Neither option seems likely to change the competition position of sme's involved in the composting of source segregated materials for the reasons outlined in Section 3.1.2. Option 1 would most favour sme's involved in the development and provision of new waste management technologies.

The consultation document raises the concern that oil might become irreversibly contaminated through organic matter applications. There is a large body of information in the sewage sludge sector about the impact of metal loadings on soil from sewage sludge over time and the impact that this might have on the suitability of land for food production. The obvious approach is that where soils receiving organic matter (whether it be sewage sludge, source segregated compost or mixed waste compost), the soils as well as the materials themselves, should be monitored for levels of potentially toxic elements. Where loadings of metals or other pollutants to an area of land are unacceptable they should not be permitted.

4 Provision of Available Evidence

Evidence was requested on the potential impact of spreading MBT outputs derived from either source segregated or non-source segregated waste on human health and the environment. In particular regarding:

- 1. the contaminants likely to be present in such outputs, and their likely impact;*

2. *the potential effect that these waste types could have on the soil and in particular on repeat application to the soil;*
3. *the possible impact on water quality and the potential for diffuse water pollution;*
4. *nitrate vulnerable zones;*
5. *the potential impact on the food chain;*
6. *any other potential impacts on human health or the environment;*
7. *how practicable it would be to characterise, monitor and, if necessary, remove the contaminants likely to be present in the outputs of MBT or similar plant fed with non-source segregated waste.*

A web site and technical review, which bring together the technical information available about the composting of mechanically segregated fractions of municipal solid waste (MSW) were produced by r³ Environmental Technology Limited with AEA Technology PLC in 2005. This project was made possible with funding from SITA Environmental Trust, through the Landfill Tax Credit Scheme. This review contains detailed information relating to points 1, 2, 3, 6 and 7 in the evidence requested in the consultation.

The web site provides access to a bibliography of 1,700 references and can be accessed at www.compostinfo.info

The technical review⁴⁵ is available as web pages and in pdf format on the web site. It collates together the large body of existing, and apparently forgotten information about composting mechanically separated fractions of municipal solid waste (MSW). The review uses more than 650 of the bibliography references and provides a general grounding in the subject and signposts readers to sources of further detailed information. A list of contents follows:

1. Introduction
 - 1.1 Aims
 - 1.2 Context
 - 1.3 Approach
 - 1.4 Project Team
2. Composting: Past and Present
3. Feedstocks and composition
 - 3.1 Physical characteristics
 - 3.2 Chemical characteristics
 - 3.3 Biological characteristics
4. Sampling and analysis
 - 4.1 Sampling and Sample Handling
 - 4.1.1 Designing the sampling scheme
 - 4.1.2 Sample Collection
 - 4.1.3 Sub-sampling, Sample Preparation, Preservation and Transport
 - 4.1.4 Interlaboratory Comparisons
 - 4.1.5 Health and Safety Issues
 - 4.2 Physical Methods
 - 4.3 Chemical Methods
 - 4.4 Biological Methods
5. Biology of Composting

⁴⁵ Bardos, R.P. (2005) Composting of Mechanically Segregated Fractions of Municipal Solid Waste – A Review. Project Carried out for SITA Environmental Trust, The Barn, Brinkmarsh Lane, Falfield, GL12 8PT. www.compostinfo.info

- 5.1 Terms and Definitions
- 5.2 Process Description
- 5.3 Process Optimisation
- 6. Pre-Processing Methods
 - 6.1 Separation Technologies
 - 6.1.1 Hand Picking
 - 6.1.2 Size Separation
 - 6.1.3 Density Based Separation
 - 6.1.4 Use of Electric or Magnetic Fields
 - 6.2 Size Reduction Approaches
 - 6.3 Process Integration
 - 6.4 Other Conditioning Approaches
 - 6.5 Materials Handling Issues
- 7. Composting Techniques
 - 7.1 Turned Windrow Approaches
 - 7.2 Open Aerated Systems
 - 7.3 Contained Systems
 - 7.3.1 Horizontal Units
 - 7.3.2 Mechanically Agitated Systems
 - 7.3.3 Vertical Units
 - 7.3.4 Rotating Drums
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