

# Quantifying Hazardous Waste Capacity Needs

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# Background: Need for contingency planning?

## Brief from DEFRA:

- Review relevant reports, and collate all information on:
  - arisings (best estimate; probable range; impact of HW Regs)
  - treatment/disposal capacity (different descriptions; best estimate; probable range; potential for rapid implementation; WWT plants; minimisation)
- Develop matrix of treatment options cf. EWC types, based on extg work
- Propose combination/proportions for assessment; incl. sensitivity analysis
- Agree with DEFRA, plus T&C subgroup ESA
- Compare data and options, and present conclusions as charts with commentary on timing issues and effect of materials acceptability to co-incineration
- Develop ESA work on constraints and timing for development of treatment/disposal option for which a shortfall is projected

# Approach: Arisings

Determined currently landfilled Special Waste requiring Alternative Treatment Capacity

- Special wastes currently landfilled quantified using info. from EA, SEPA and EHS
  - approximately 2.5 MTpa of special waste is landfilled in the UK.
- Also determined the quantity of special waste sent for high temperature incineration (approximately 100,000 tonnes) to consider the potential impacts of changes in co-incineration.

Estimated impact of the change in definition from Special to Hazardous

- Assessed by considering the hazardous properties that different waste types may possess (detailed assumptions set out in spreadsheet).
- Approx 0.8 MTpa added to arisings

# Approach: Alternative Treatment Routes

The probable alternative treatment routes for these wastes were assessed by EWC codes (6-digit code), to give capacity requirement by treatment route (to 4-digit code level). The treatment routes considered were :

- Stabilisation/Solidification
- Physico-chemical treatment
- Solvent recovery
- Bioremediation
- WW treatment works
- HTI
- Co-incineration: use as cement kiln fuel/raw material
- Landfill (for hazardous waste or separate cell in non-hazardous landfill)

**The effect of minimisation has *not* been considered at this stage.**

## Approach: Output

A best estimate of the capacity required by each treatment route for special wastes currently landfilled or incinerated, plus estimated newly-hazardous wastes.

*Key assumptions in the best estimate:*

- Certain waste streams can be landfilled (either haz waste landfill or separate cell in non-haz landfill) without treatment
- Stabilisation/solidification will increase the weight of waste by a factor of 2;
- All stabilised/solidified waste that was previously EWC\* remains hazardous – assuming that RA cannot be used in WAC
- Physico-chemical treatment will produce a residue requiring landfill equivalent to 75% of the waste input by weight;
- Changes to the Substitute Fuel Protocol will transfer some wastes from HTI to Co-incineration (estimated based on waste types).

Options are interlinked; reductions in one matched by appropriate increase in others

Sensitivity analyses have been carried out

# Approach: Available capacity

Information gathered by DEFRA:

	Estimated Capacity in 2004	Capacity Currently Utilised	Available Capacity Estimate 2004
Stabilisation/ Solidification	575,000	100,000	475,000
Physico-chemical	1,500,000	1,200,000	300,000
Solvent recovery	-	-	Unknown
Bio-remediation	-	-	Unknown
WWT	-	-	Unknown
HTI	110,000	N/a	110,000
Co-incineration	400,000	100,000	300,000
Landfill	400,000	-	400,000



# Calculation: Huge 48 Column x 133 row spreadsheet!

EWC Code	ShortClass	Estimated Total to Landfill	Stabilisation/Solidification/ No Treatment			Physico-Chemical			Biological/ Bioremediation			Thermal/ Co-incineration		
			Agencies Guidance	EA R&D Report P1-484	ESA	Agencies Guidance	EA R&D Report P1-484	ESA	Agencies Guidance	EA R&D Report P1-484	ESA	Agencies Guidance	EA R&D Report P1-484	ESA
0101	waste from mineral excavation	42												
0102	waste from mineral dressing	0												
0103	waste from the further physical and chemical processing of metamorphic minerals	10	0110305											
0104	waste from the further physical and chemical processing of non-metamorphic minerals	72	0110407											
0105	drilling muds and other drilling wastes	5,593												
0201	primary production waste	170												
0202	waste from the preparation and processing of meat, fish and other foods of animal origin	208												
0303	waste from fruit, vegetables, cereals, edible oils, cocoa, coffee and tobacco preparation, processing, conserve, product	322												
0304	waste from sugar processing	0												
0305	waste from the dairy products industry	5												
0306	waste from baking and confectionery industry	31												
0307	waste from the production of alcoholic and non-alcoholic beverages (excluding coffee, tea and cocoa)	1,143												
0308	waste from wood processing and the production of panels and furniture	96												
0309	wood preservation waste	527	030204											
			030205											
0303	waste from pulp, paper and cardboard production and processors	81												
0401	waste from the leather industry	251												
0402	waste from textile industry	736	040216											
			040219											
0501	city sludges and solid waste	13,784	050102											
			050109											
0502	non oily sludges and solid wastes	533												
0503	spent catalysts	1,091												
0504	spent flour clays	689												
0505	oil desulphurisation waste	1,779												
0506	waste from the pyrolytic treatment of coal	87,261												
0507	waste from natural gas purification	2,255	050701											
0508	waste from oil regeneration	2,815												
0601	waste acidic solutions	3,451												
0602	alkaline solutions	5,653												

Alternative Treatment Routes									Non-haz under EWC2002	Check	Summary of treatment allocation	Effect of proposed amendment to Substitute Fuels Protocol (if adopted)		Resultant Capacities	
Stabilisation/Solidification/ No treatment	Physico-chemical	Solvent recovery	Bio-remediation	WWT	HTI	Co-incineration	Landfill	Current hazardous to HTI				Potential transfer to Co-incineration	HTI	Co-incineration	

Potential wastes where no treatment necessary (from Stabilisation/Solidification/ No treatment column)			Landfill Capacity for Hazardous Wastes (assumption: waste is still hazardous after stabilisation/solidification, stabilisation/solidification doubles weight of waste and residue from Physico-chemical)				HTI/Co-incineration Split		
Assumption	%	Quantity	Direct to Landfill	Landfill via Stabilisation/Solidification	Landfill of residues from other treatment options	TOTAL	HTI	Co-incineration	Assumptions

Total Capacity Required Currently Landfilled and Incinerated							
Stabilisation/Solidification	Physico-chemical	Solvent recovery	Bio-remediation	WWT	HTI	Co-incineration	Landfill
10	21	-	-	-	-	-	47
-	-	-	-	-	-	13	-
-	0	-	-	-	-	-	0
72	-	-	-	-	-	-	145
-	5,593	-	-	-	-	1	4,195

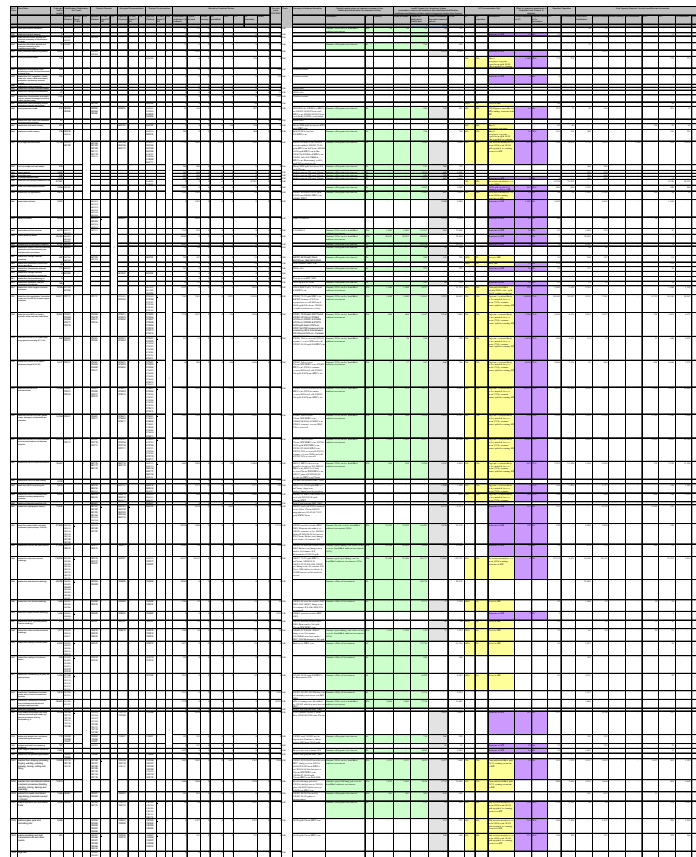


# Calculation:

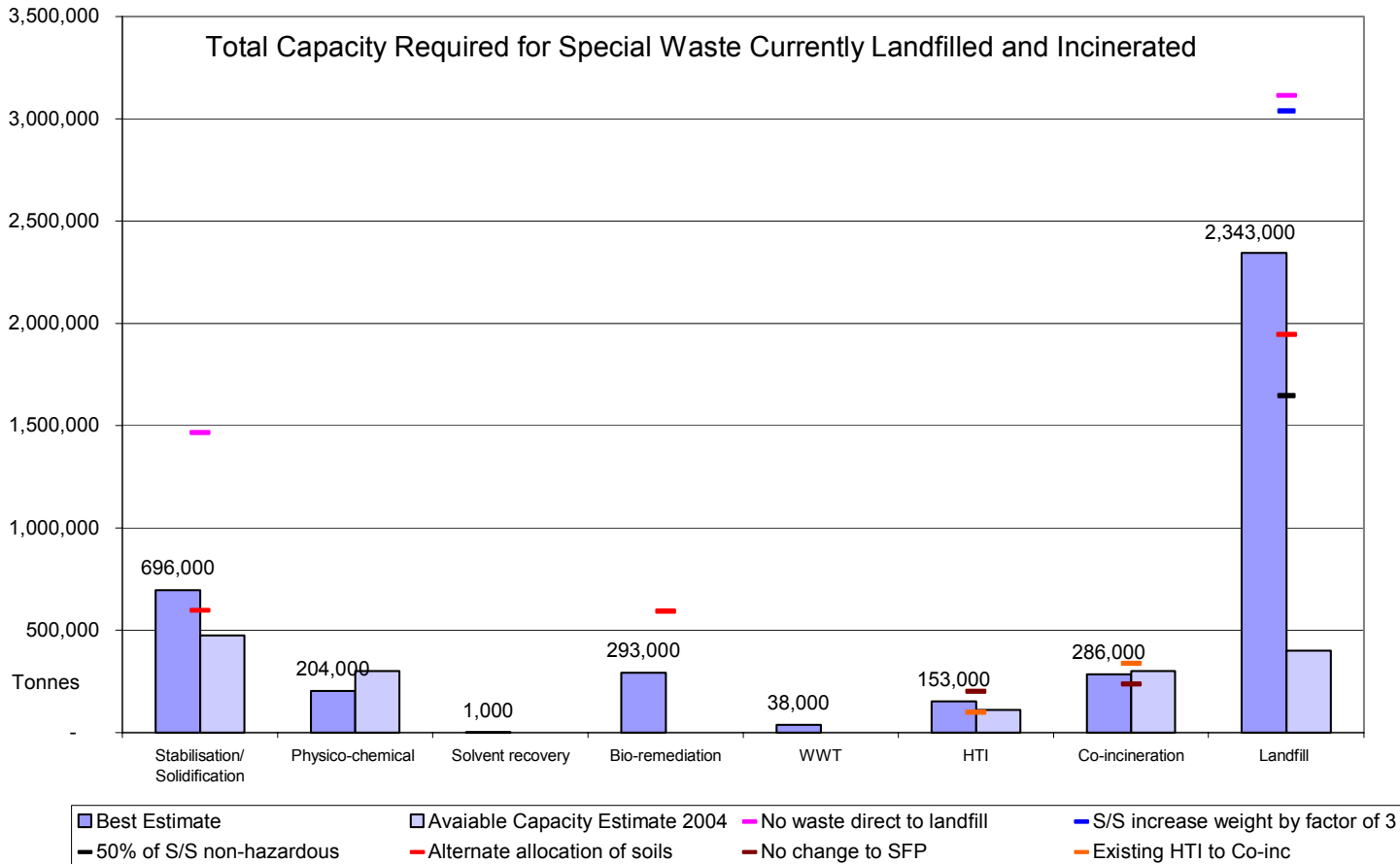
Discussed so far only with DEFRA and T&C subgroup

Designed to allow Forum to consider variations in assumptions

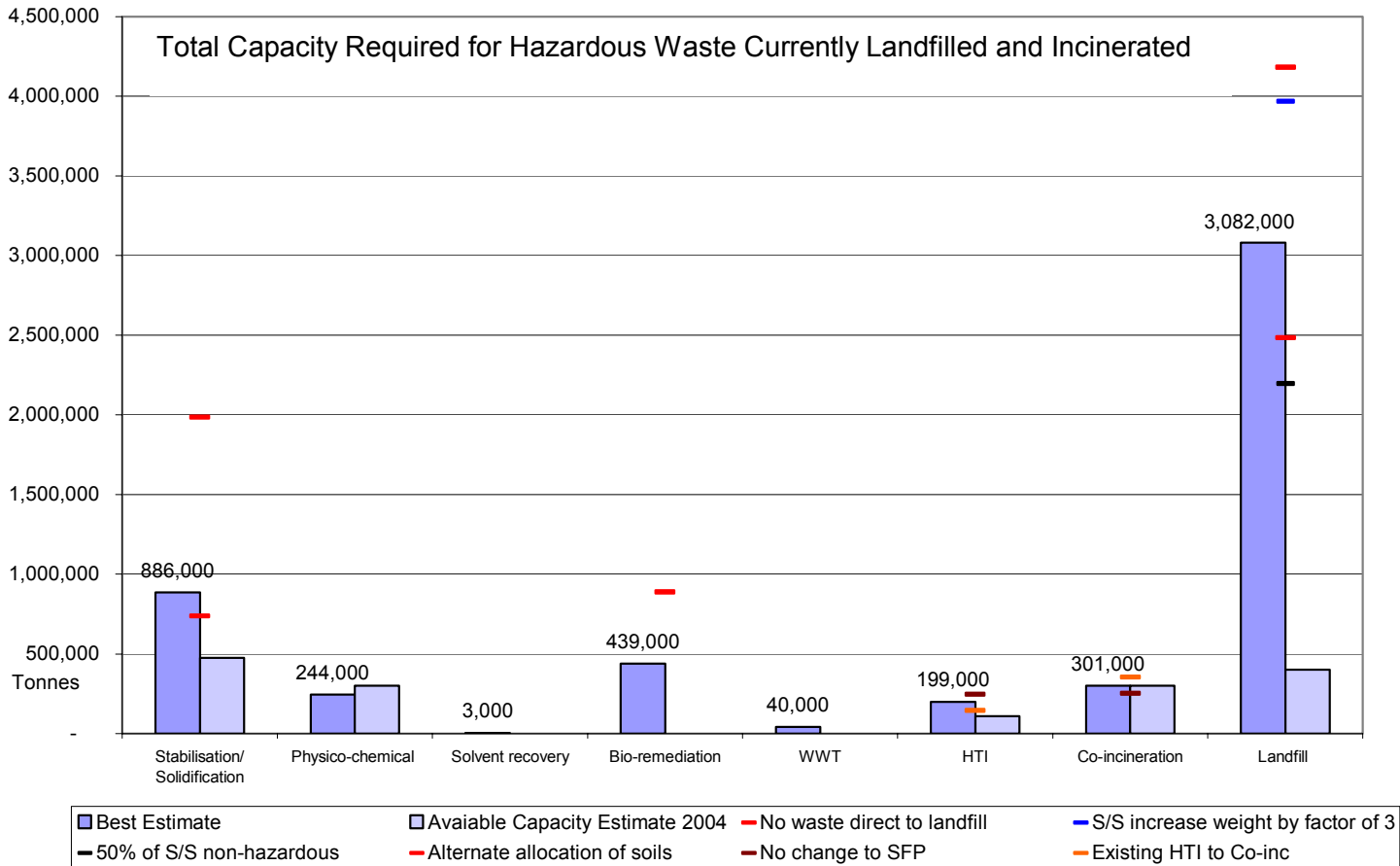
Some sensitivity analysis has been carried out  
 – see dashes on graphs



# Results: Capacity required and available: **Special**



# Results: Capacity required and available: **Hazardous**



# Results: Key points

Treatment option	Potential shortfall (hazardous) Ktpa	Issues
Landfill	1,800 to 3,800	WAC RA; Contaminated Soils; If waste can go direct to landfill; S/S weight addition
Stabilisation/ Solidification	260 to 1,500	WAC RA; Contaminated Soils; If waste can go direct to landfill
Bio-remediation	440 to 880	Extg capacity unknown; contaminated soils
HTI	90	Interaction with co-incineration
WWT	40	Extg capacity unknown; ?limited suitability
Solvent recovery	3	Extg capacity unknown
Co-incineration	~ OK	Interaction with Hti; SFP
Physico-chemical	~ OK	

# Constraints on development of new capacity: ESA:

Treatment Options	Considerations										
	Typical Capacity Range (tonnes per annum)	Planning issues State whether: 1. New Build 2. Add-on 3. Conversion	Ease of Planning Rank on scale of 1-10	Licensing issues Note requirement for and rank ease in achieving the following on scale of 1-10				Financial risk Indicate capital cost per unit of capacity	Market barriers List barriers of concern	Political barriers List barriers of concern	Time scale for Commissioning (inclusive of planning issues)
				PPC	WML	AE	S/E D				
Stabilisation	25,000	New Build Add-on	10 7	6 6	NA	2	2	£40/tonne £40/tonne	Require full capacity	NIMBY NIMBY	5 years (6m for construction) 5-6 years (12m for construction)
Stabilisation using cementitious products	3-5 million	Dependant on analysis etc.	5	5				Each case different	Fiscal		1 Year
Physico-chem treatment	150,000	New Build	10	7	NA	2	2	£40/tonne	Require full capacity	NIMBY	5-6 years (18m for construction)
Solvent recovery	The Oil Recycling Association believes that it is unlikely that the waste industry solvent recovery business would require any new capacity in the next few years as the VOC Directive is reducing solvent usage and PPC will probably encourage more in-house recovery in the chemical industries. Planning for anything other than add-on to existing site is almost impossible. ORA foresees a capacity need in the region of 200,000 tpa in the UK for new physico-chem treatment technologies for heavy oil. There is an unspecified need for waste oil regeneration capacity in the next 2-3 years due to Waste Oil Directive – approx. 100,000 tpa – again difficult to get planning permission on anything other than existing oil site. Capital is likely to be in the region of \$350/tonne.										
Bioremediation											
WW treatment works	Water UK reported that the general consensus seems to be that WWTW are unlikely to accept hazardous waste as this would be detrimental to the waste water treatment process, unless particular chemicals are already present in the discharge effluent currently being treated. Those WWTW with associated waste management divisions eg. Severn Trent and Biffa, would be more inclined to accept some hazardous waste.										
HTI	40-50,000	New Build	10	7	NA	NA	7	£50m £1000/tonne	1.Reducing market 2. <u>Ckilns</u> 3.PPC 4.Landfill	1. NIMBY 2.Green Lobby 3.Recovery / Disposal issue	5 to 7 Years
Co-incineration: use as cement kiln fuel	400,000	2	3	8				Considered confidential		SFP which is subject to political influence	Some already in place – new 2 years
Co-incineration: use as raw material in cement kiln	1,500,000	2	3	8				Considered Confidential	Fiscal	Permit issues	6 months for specific large streams
Landfill – hazardous site	3-400,000	New Build	10	7	NA	2	4	£12/tonne	Require full capacity	NIMBY	5 years (2m for construction)
Landfill – haz cell in non-haz site	3-400,000	New Build (need permission to accept haz waste in non-haz landfill)	8	7	NA	2	4	£3.50/tonne	Require full capacity	NIMBY	5 years (1m for construction)

PPC = Pollution Prevention and Control permit, WML = Waste Management Licence, AE = airborne emission control, S/ED = sewer/estuarine discharge  
Scale of 1-10: 1=very easy, 10=very difficult

## Conclusions: Need for contingency planning?

- c.3.5MTpa of new treatment and disposal capacity, and possibly more, is likely to be needed to manage Hazardous wastes by, at the latest, 2005.
- but this capacity is likely to take at least five years to be available, ie 2009 at the earliest.
- we recommend that DEFRA should review these projections;
  - if then appropriate, consider appropriate contingencies:
    - technical
    - legal
    - political