Devon Waste Plan

Waste Topic Paper 7: Addendum on Incinerator Bottom Ash

March 2014
PREPARED BY
Name: Christina Davey
Position: Senior Planning Officer
Date: February 2014

Name: Emily Harper
Position: Graduate Planner
Date: February 2014

AGREED BY
Name: Andy Hill
Position: Principal Planning Officer – Minerals and Waste
Date: March 2014

ISSUED BY
Name: Joe Keech
Position: Chief Planner
Date: March 2014
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1. Introduction

1.1. Background

1.1.1. The way in which waste generated in Devon is managed will change significantly over the next year following the completion of two new energy from waste incinerators at Exeter and Plymouth.

1.1.2. The facility in Exeter, located on Marsh Barton Trading Estate, will process up to 60,000 tonnes of residual (black bag) local authority collected waste generated in Exeter, East Devon and a small part of northern Teignbridge. The facility in Plymouth, which is much larger with a capacity of 245,000 tonnes per annum, will deal with residual local authority collected waste from Plymouth, Torbay and southern Devon (including the South Hams, West Devon and the remainder of Teignbridge not covered by the Exeter plant) and with commercial and industrial waste.

1.1.3. These facilities will play a vital role in diverting waste from landfill and driving waste up the waste hierarchy. Energy will also be created from the waste, including an element of renewable energy, reducing the reliance upon fossil fuels. In addition to production of electricity, heat is also a product of the process, and there is potential to utilise this waste product beneficially through space heating of buildings and/or using the heat for commercial processes.

1.1.4. Other than energy, there are a number of outputs that are produced from the process of incineration. These include Incinerator Bottom Ash (IBA), Air Pollution Control (APC) residues and emissions to the atmosphere. Emissions represent approximately 70%-75% of the output from the original waste; emissions are strictly regulated by the Environment Agency, with the controls set by the Industrial Emissions Directive, which has replaced the Waste Framework Directive. The APC residues, which include fly-ash, represent 2-6% of the output, and are hazardous waste that require suitable treatment or disposal. These outputs offer no scope to recycle and APC residue is a small proportion of the waste that will need to be exported to existing facilities.

1.2. Purpose and Structure of this report

1.2.1. The recent Pre-submission Consultation for the Devon Waste Plan attracted some responses that suggested a lack of reference in the Plan and its evidence base to IBA. This update to Waste Topic Paper 7 therefore outlines the nature, quantities and treatment methods for this material to assist consultees.

1.2.2. This report will focus on the IBA that is produced from the incineration process, estimating the amount that will be produced, the nature of IBA and the scope of its use. Finally, the approach taken by the Devon Waste Plan to its management will also be outlined.
2. IBA – an overview

2.1. How is IBA produced?

2.1.1. As noted, IBA is an output of the incineration process. The combustion of municipal solid waste leads to the production of carbon dioxide and water, if the waste is combustible, and non-combustible materials remain as solid residues, the major element of which is IBA.

2.2. Composition of IBA

2.2.1. IBA is a coarse-grained, heterogeneous material containing varying proportions of glass, ceramics, brick, concrete, grit and stones in addition to clinker, ash and metals. Metals, ferrous and non-ferrous, are estimated to be an additional 2%-6%, which can be recovered separately for recycling. Once the metal is extracted, the IBA can be recycled as a secondary aggregate.

2.3. Nature of IBA

2.3.1. Generally IBA is considered as non-hazardous; however, the Environmental Services Association (ESA) note there is the risk of some material being hazardous. Operators are responsible for classifying correctly the IBA that they produce and IBA can be classified as either hazardous or non-hazardous depending on its properties.

2.3.2. To encourage a consistent approach to classifying IBA, in 2010 the ESA developed an IBA Sampling and Testing Protocol\(^1\) which sets out in detail how plants should sample and analyse IBA. Although following the Protocol is voluntary, ESA has discussed the Protocol extensively with the Environment Agency to ensure that it reflects good practice. Through these discussions, the Agency has also supported the use of the Protocol.

2.3.3. If the IBA is hazardous it must either be disposed of at a hazardous waste landfill site or go for further treatment. The nearest hazardous waste sites to Devon that treat and/or dispose of IBA are in Gloucestershire and Wiltshire.

2.3.4. If the IBA is non-hazardous it can be disposed of at a non-hazardous landfill site or processed into a secondary aggregate with a number of uses.

2.4. Uses for IBA

2.4.1. IBA can be recycled as a secondary aggregate in a variety of construction applications, and there has been research into its utilisation. IBA can be used in two major applications. Unbound it can be used for bulk fill and sub bases or, when bound, it is ideal for road paving, cement and construction blocks. It can also be used for landfill engineering and brownfield remediation.

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2.4.2. By 2000, over 40% of bottom ash from England’s 11 municipal waste incinerators was being recycled as aggregate – this was over 200,000 tonnes per annum.

2.4.3. Approximately 1 million tonnes of IBA are currently produced in England and Wales each year. In 2011, 86% of IBA produced was reused (Source: EA Pollution Inventory Returns & Waste Returns). The Environment Agency has predicted that the amount of IBA produced per year is expected to increase to over 2 million tonnes per year by 2020.

2.5. How is IBA recycled?

2.5.1. Following the recovery of metals using magnets, the IBA typically undergoes a conditioning stage by being stored in the open air, followed by processing with crushing and screening plant. While similar to the recycling process for (inert) construction and demolition waste, the non-hazardous nature of IBA will usually require additional measures to control potential emissions including impermeable surfaces and surface water management.

2.5.2. Examples of IBA recycling plants in England include those operated by Ballast Phoenix², which process between 50,000 and 175,000 tonnes. These sites occupy a range of location types, including industrial estates, a landfill site and a port, within urban and urban fringe locations.

2.6. Benefits of IBA recycling

2.6.1. Recycling of IBA presents many environmental benefits, including:

- it avoids landfilling, therefore leaving void space available for other wastes which cannot be treated further up the waste hierarchy;
- it reduces the carbon footprint of waste management by producing valuable secondary aggregate locally; and
- it reduces the use of natural resources such as quarried aggregates.

2.6.2. However, it should be acknowledged that IBA processing carries risks of harm to local communities and the environment if not properly managed.

² http://www.ballastphoenix.co.uk/
2.7. **Projects where IBA has been used beneficially**

2.7.1. There are a number of examples of projects across the country that have used incinerator bottom ash in a beneficial way, some which are outlined below. These case studies have been taken from the AggRegain pages of the WRAP website\(^3\).

2.7.2. **Recycled asphalt and incinerator bottom ash in Stansted Airport car park surfacing**

2.7.3. The BAA Infrastructure team used a mix of 30% incinerator bottom ash and recycled asphalt containing incinerator bottom ash to surface 4,000 car park spaces at a new long stay facility at Stansted Airport. Approximately 54,000 tonnes of primary aggregate were replaced and cost savings of £20,000 achieved.

2.7.4. **The use of recycled and secondary aggregates for constructing access roads on a housing development in Billingham, Teesside**

2.7.5. This project involved the construction of 68 bungalows and access roads in Billingham on Teesside. Frank Haslam Milan Ltd, the contractor, had to submit an environmental statement that showed positive cost savings for the client. The use or recycled and secondary materials for the access roads was therefore investigated. Subsequently, a capping layer made from 4,000 tonnes of locally sourced construction, demolition and excavation waste was used. The Type 1 sub-base was made from a blend of Recycled asphalt and processed Incinerator bottom ash, totalling 1,200 tonnes; 600 tonnes of foamed asphalt was manufactured from Recycled asphalt planings and Incinerator bottom ash.

2.7.6. **The use of processed Incinerator bottom ash as a protection liner at Burnhills landfill site**

2.7.7. All landfill sites have to make sure that the waste deposited in the cells does not pollute the surrounding environment. This can be done by surrounding the cells with a clay liner or by using clay with the added protection of a plastic liner. To protect the plastic liner from the waste deposited, sand is the recognised product, usually 3 or 6 mm down. This project was undertaken to ascertain if primary aggregates could be replaced with recycled materials without any loss of engineering characteristics. No direct financial gains were proposed. At Burnhills landfill west of Newcastle upon Tyne, processed Incinerator bottom ash aggregate was used as the protective sand layer. This was found to be lighter and with improved permeability compared to alternative primary aggregates. 6,000 tonnes of Incinerator bottom ash aggregate was delivered to the site in June 2000 and was subsequently laid on the protective plastic layer. The Environment Agency were fully consulted and given access to all the technical data on the Incinerator bottom ash aggregate and they gave permission for its use on this site.

\(^3\) [http://www2.wrap.org.uk/applications/aggregain/casestudysearch/index.rm](http://www2.wrap.org.uk/applications/aggregain/casestudysearch/index.rm)
3. IBA production and management in Devon

3.1. IBA Production in Devon

3.1.1. The amount of IBA produced in modern energy from waste incinerators is typically 20%-30% of the total amount of waste input by weight, and only 10% by volume. This depends on the level of pre-treatment the waste receives prior to receiving treatment. Taking the mean of this estimated output, a figure of 25% can be assumed. The Exeter facility is therefore expected to produce up to 16,000 tonnes of IBA per year once it is fully operational. The facility in Plymouth, which is much larger than the Exeter plant, will produce around 60,000 tonnes of IBA per year.

3.1.2. There are currently no additional proposals for energy from waste incinerators within Devon. Whilst the Waste Plan identifies the need for additional energy recovery provision, the Plan is not technology specific and therefore there is no certainty that any additional facilities will produce IBA, as incineration may not be the technology brought forward. However, other thermal treatment processes such as gasification produce similar residues that are capable of being processed for aggregate use, and similar considerations will therefore apply to these other technologies.

3.1.3 The energy from waste incinerator nearing completion at Exeter received planning permission in 2008, with an accompanying legal agreement requiring the operator “to use reasonable endeavours to market the bottom ash derived from the incineration process for use as a secondary aggregate”. It is understood that IBA from the Exeter facility will initially be disposed of at a non-hazardous landfill site prior to the operator developing a recycling facility.

3.1.4 The planning permission for the Plymouth energy from waste incinerator includes a condition requiring that “at least 95% of the IBA produced at the plant shall be recycled and not sent to landfill…The details shall also include the procedures that will be followed to try to secure the use of treated bottom ash as an aggregate for local infrastructure and engineering projects and the mechanisms for ensuring a landfill diversion factor of at least 95%”.

3.1.5 To meet their obligations to secure the recycling of the IBA from their Plymouth facility, MVV UK submitted a planning application for an IBA processing facility (together with other development including the recycling of construction and demolition waste) at Whitecleaves Quarry near Buckfastleigh in Devon\(^4\). This facility was intended to manage the IBA derived from MVV UK’s Plymouth incinerator.

3.1.6 This planning application was refused by Devon County Council in May 2012 on the grounds of impacts on the amenity of the local community and the lack of consideration of alternative sites. A subsequent appeal against

this decision was dismissed in October 2013\(^5\). Given the requirement of the planning permission for the Plymouth incinerator for at least 95% of the IBA to be recycled, the lack of a suitable processing facility within Greater Devon will currently require its transportation out of the county for recycling.

### 3.2. The Devon Waste Plan’s approach to IBA

3.2.1. The Devon Waste Plan has a strong commitment to the sequential application of the waste hierarchy (as stated in Objective 1 and Policy W2). Policy W5 (Reuse, Recycling and Materials Recovery) therefore positively provides for the necessary capacity for recycling and materials recovery, including at sites “located at or close to the source of the waste or opportunities for its beneficial use” (criterion 2(a)). Supporting text to this policy (paragraph 3.5.4) notes the generation of “residual materials [from energy recovery facilities] that are capable of recycling into new products such as aggregates”.

3.2.2. Policy W6 (Energy Recovery) supports Policy W5 by requiring “the maximum feasible level of reuse or recycling of the residual materials remaining after energy recovery”. In addition, Policy W7 (Waste Disposal) limits new non-hazardous disposal capacity to residual waste that is incapable of recycling or recovery”.

3.2.3. The Waste Plan’s spatial strategy (Policy W3) provides for the provision of strategic recycling facilities within or close to Exeter, Barnstaple and Newton Abbot. However, criterion 2(a) of Policy W5 provides the flexibility for the development of a recycling facility close to the source of the waste.

3.2.4. It is considered that the policy context outlined above enables delivery of one or more IBA recycling facilities to manage the residual material arising from the forthcoming incinerators at Plymouth and Exeter. For material originating at the Plymouth plant, criterion 2(a) of Policy W5 potentially provides the necessary justification for a recycling facility to be located within the Waste Plan area close to Plymouth (although it is recognised that the availability of a suitable site within Plymouth should also be investigated).

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4. **Further information sources**

4.0.1 Further information on the issue of IBA is available from a range of sources including, in addition to those noted above, the following webpages. These include information from parties questioning the merits of IBA recycling as well as waste industry sources. It should be noted that Devon County Council does not endorse the content of these sources, but is providing them for information purposes.

MIRO case study:  
http://www.smartwaste.co.uk/filelibrary/Incineratorbottomash_Manufactured_Agg.pdf

Environmental Services Association:  
http://www.esauk.org/energy_recovery/iba_-_incinerator_bottom_ash.html

Veolia position statement:  

Friends of the Earth briefing paper:  
http://www.foe.co.uk/sites/default/files/downloads/safety_incinerator_ash.pdf

Buckfastleigh Community Forum paper:  