TAVIS HOUSE

BREEAM UK RFO 2014 (RFO-NC)

WST 01 PRE-REFURBISHMENT AUDIT REPORT

FOR

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1	Tavis House – BREEAM Wst 01 Pre-Refurbishment Audit Report	v1.01	26th January 2022	Pre-Refurbishment Audit Report – issued for comment/approval	Tempus Realty Holdings 1 (Jersey) Ltd / BREEAM Assessor
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Executive Summary

The aim of this report is to contribute to the sustainable management of materials arising from the refurbishment of Tavis House, located at 1-6 Tavistock Square, Bloomsbury, London. The recommendations in the report are based on plans and associated documents provided to ADW Developments by Tempus Realty Holdings 1 (Jersey) Limited. The report has been prepared by Toby Balson and Katherine Adams on behalf of ADW Developments. See Appendix A for details of the report authors.

A non-invasive visual survey of the buildings was carried out; access to all areas was provided.

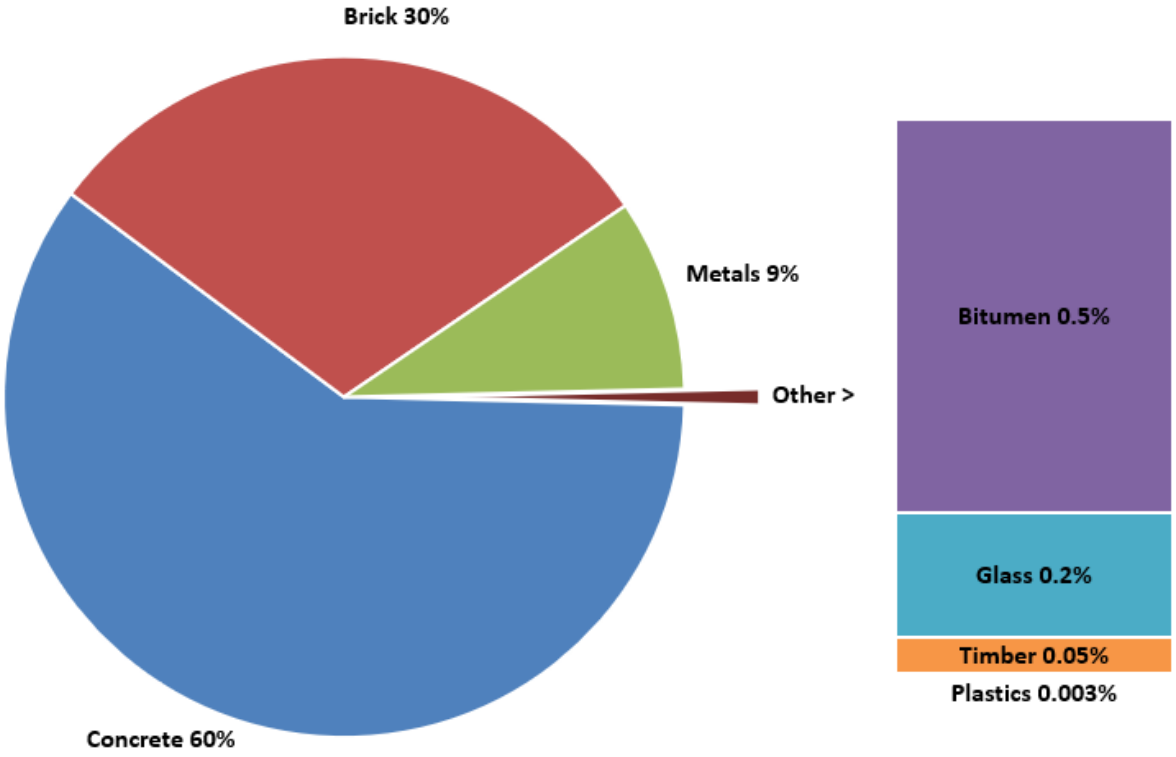
The estimated Key Demolition Products (KDP) by weight are Concrete (60%), Brick (30%) and Metals (9%), with smaller amounts of Bitumen, Glass, Timber and Plastics.

It is recommended that a target of 95% diversion of waste from landfill (by weight) should be set, with a 0.2% target for material reuse.

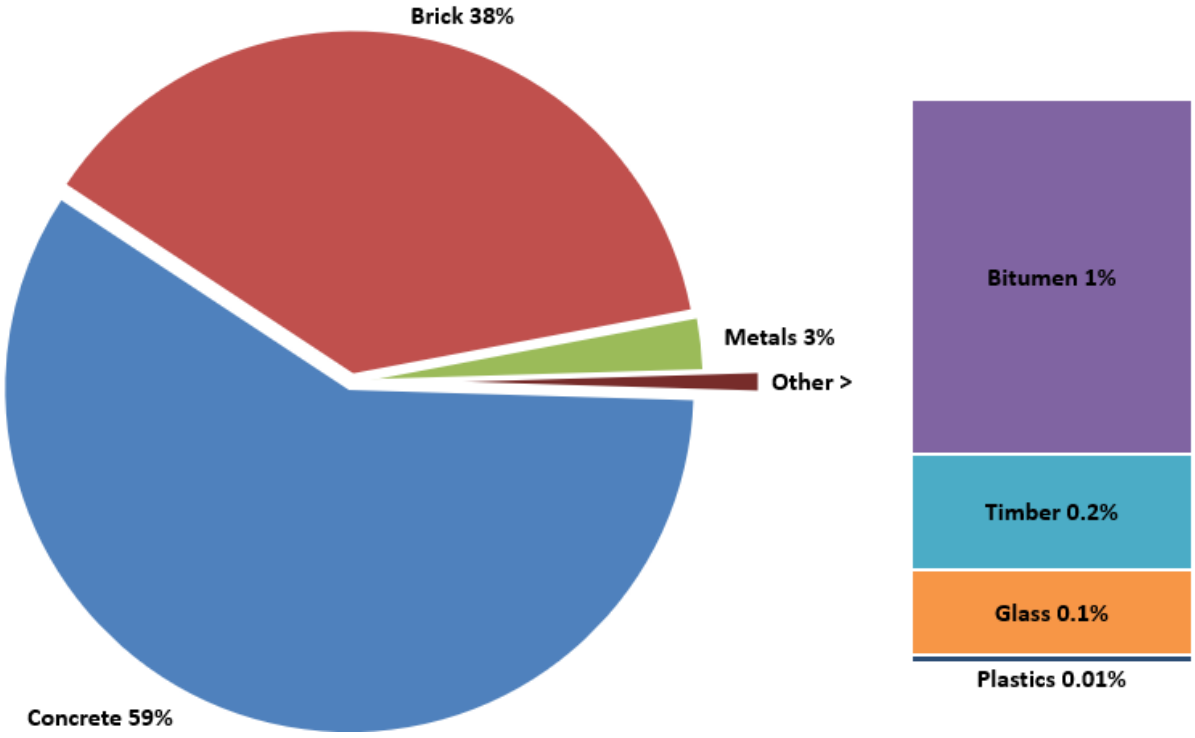
Key Demolition Products (KDP)

Key Demolition Products	Weight (tonnes)	Volume (m^3)	European Waste Catalogue number
Concrete	2,473	1,149	17 01 01
Brick	1,253	737	17 01 02
Metals	378	49	17 04 05
Bitumen	22	12	17 03 02
Glass	7	3	17 02 02
Timber	2	4	17 02 01
Plastics	0.1	0.3	17 02 03
Grand Total	**4,135**	**1,953**	

Key Demolition Products (KDP) by percentage weight



Key Demolition Products (KDP) by percentage volume



1. Project Introduction

At the request of Tempus Realty Holdings 1 (Jersey) Limited, a pre-refurbishment audit of Tavis House located at 1-6 Tavistock Square, Bloomsbury, London has been undertaken. This audit addresses the potential for reusing and recycling components and materials from the building and aims to:

- provide an understanding of the materials likely to arise from the refurbishment in order to help with the development of a waste management plan
- maximise the management of material removed from the building in line with the waste hierarchy i.e. maximise reuse and recycling and minimise waste to landfill
- provide evidence for any external assessment such as BREEAM

The pre-refurbishment audit covers the entire building, as described in Section 2 below.

2. Project scope

The existing building has already been stripped back to structural elements throughout; much of the rear elevation will be demolished, as well as core areas and extensive areas of floor slab.

Indicative demolition plans for a typical floor are shown below.

3. Pre-Refurbishment Audit Methodology

A non-invasive visual survey of the buildings was carried out; access to all areas was provided.

The building was analysed in accordance with the gathered information, and the volume (m^3) figures calculated for each construction material have been converted into tonnages using standard density figures for each material assessed.

Please note that as the survey was non-invasive, certain aspects have been assumed based on typical practice, including but not limited to e.g. presence of insulation within wall partitions, the nature and dimensions of hidden structural elements, etc. MEP has been noted where visible, e.g. lighting.

Note: The findings and values contained in this report represent the best estimate of the materials and components within the units by means of using drawings and photographs of the areas. We did not receive a complete inventory of the types of materials and construction used, and where necessary construction details have been inferred. Material conversion rates used to calculate volume (m^3) into tonnages have been undertaken using standard density factors.

4. Audit Results

A number of Key Demolition Products (KDP) that presented the greatest potential for reuse and recycling were identified. An estimate of the overall volume and tonnage of waste likely to be generated during the demolition are shown in Table 1 and in Chart 1 and 2.

The estimated Key Demolition Products (KDP) by weight are Concrete (60%), Brick (30%) and Metals (9%), with smaller amounts of Bitumen, Glass, Timber and Plastics.

The largest KDPs by volume are Concrete (59%), Brick (38%) and Metals (3%), with smaller amounts of Bitumen, Timber, Glass and Plastics.

Table 1: Summary of Key Demolition Products arising from the refurbishment

Key Demolition Products	Weight (tonnes)	Volume (m^3)	European Waste Catalogue number
Concrete	2,473	1,149	17 01 01
Brick	1,253	737	17 01 02
Metals	378	49	17 04 05
Bitumen	22	12	17 03 02
Glass	7	3	17 02 02
Timber	2	4	17 02 01
Plastics	0.1	0.3	17 02 03
Grand Total	**4,135**	**1,953**	

Chart 1: Key Demolition Products (KDP) by percentage weight

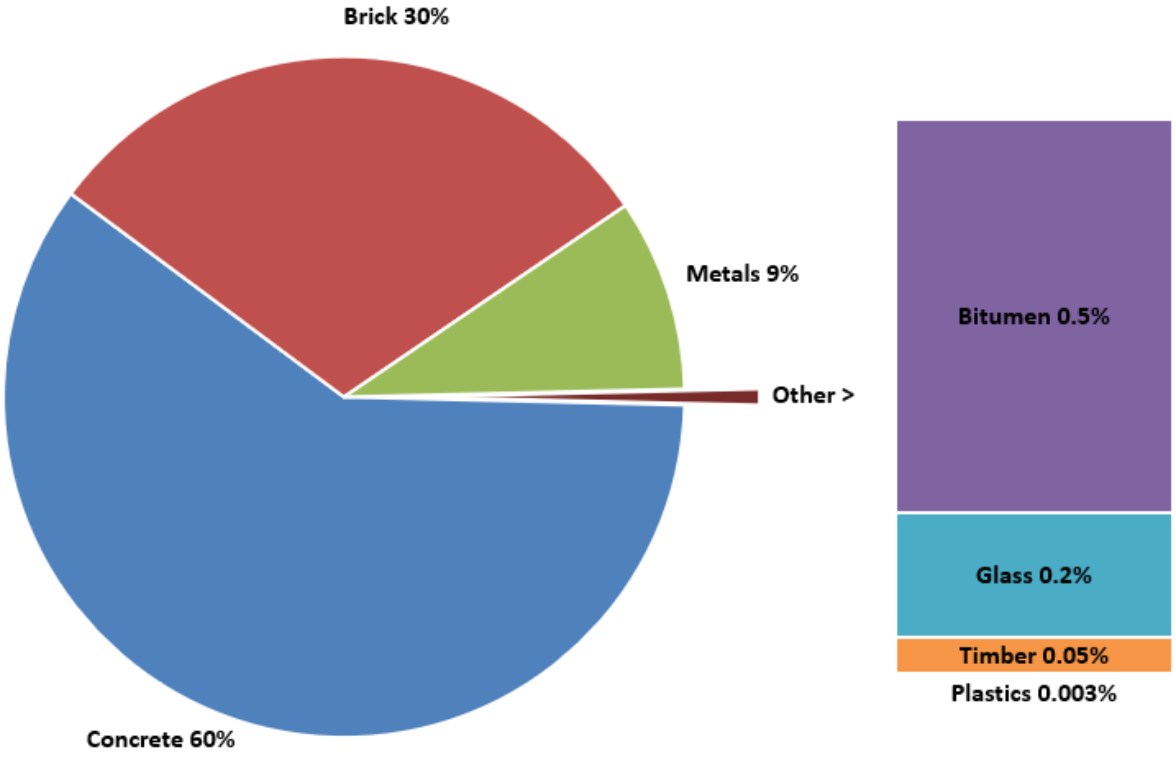
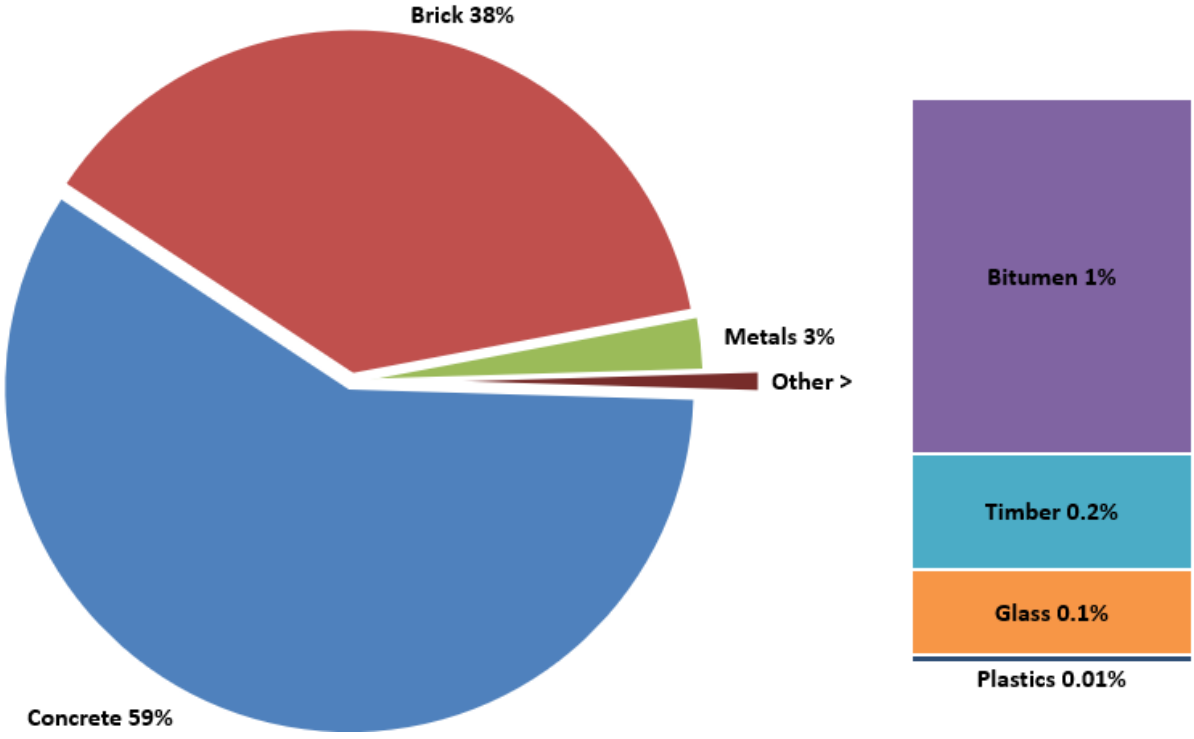


Chart 2: Key Demolition Products (KDP) by percentage volume



The Key Demolition Products (KDP) are now described.

4.1 Key Demolition Products arising from the refurbishment

4.1.1 Concrete

Concrete accounts for an estimated 2,473 tonnes or 60% of total waste arisings by weight; sources can be seen in Table 2.

As it is a major waste source, it is recommended reuse and recycling plans for concrete are carefully considered. The major element is the concrete floor slab, assumed to be standard reinforced concrete. Other sources include staircases, and mortars used for brickwork and blockwork; as it will not be possible to fully separate the mortar these will need to be disposed of along with those materials.

It is recommended that the concrete should be segregated either onsite or at a waste facility and crushed to produce recycled concrete aggregate (RCA)[1] in accordance with the WRAP Quality Protocol for aggregates[2] from inert waste. If sufficient space is available on site, consideration should be given to potentially reprocessing on site, to avoid transit and other costs.

There may an opportunity to use some of the RCA in the new construction or in nearby locations via a concrete supplier. RCA can be used in:

1. Bitumen bound materials: e.g. base course or binder course mixtures.
2. Concrete: RCA can potentially be used to replace 20% of the coarse aggregate in concrete up to Grade 50.
3. Pipe bedding: suitably graded recycled concrete aggregate is used in pipe bedding.
4. Hydraulically bound mixtures (HBM) for subbase and base: RCA can be used in the construction of car parks, estate/minor roads and hard standing.
5. Unbound mixtures for subbase: suitably graded recycled concrete aggregate is used as subbase.
6. Capping: recycled concrete aggregate is suitable for capping applications.

Table 2: sources of concrete

Item	Tonnes	Volume
Floor slabs	1,821	759
Mortar and render	234	123
Screed	157	157
Encasement (beams)	157	65
Staircases	65	27
Perimeter capping	22	9
External canopies	13	5
Block walls	4	3
Total	**2,473**	**1,149**

Local waste management companies that could manage the concrete waste include:

- Brewsters Waste Management, www.brewsterswaste.co.uk, 020 7474 3535
- Ohara Bros http://oharabros.co.uk/services/aggregates-recycling, 020 8424 2220
- RTS Waste, www.rtswaste.co.uk, 020 7232 1711
- Days Group, http://www.daygroup.co.uk/, 0845 065 4655

[1] Recycled concrete aggregate is aggregate resulting from the processing of inorganic material previously used in construction and principally comprising crushed concrete [BS 8500-1: 2002].

[2] https://www.gov.uk/government/publications/quality-protocol-production-of-aggregates-from-inert-waste

4.1.2 Brick

Brick accounts for an estimated 1,253 tonnes of KDP, 30% of total waste arisings by weight.

The sources are shown in Table 3 below.

Due to the age of the building, the presence of lime mortar should be investigated; if present, this would make potential separation and reuse more feasible; there may be some value in potentially reclaiming some of the bricks. A mortar investigation could be undertaken to better understand the potential to separate the bricks for reuse.

If the bricks cannot be separated, it is recommended that the brick waste is segregated either onsite or at a waste facility and crushed to produce recycled aggregate (RA). Waste management options are similar to concrete, depending on the level of contamination with other materials including pipe bedding, drainage, granular fill, general fill and capping and for sub base.

Finished recycled aggregates should not contain more than 1% (by weight of clay, soil, metals, wood, plastic, rubber and gypsum plaster, in line with the limits set within the aggregates standard It is recommended that they are processed where possible into recycled aggregates (RA). The Quality Protocol for inert materials should be followed.

Table 3: sources of brick

Item	Tonnes	Volume
Brick walls	883	520
Clay pots (floor slabs)	263	155
Brick encasement - columns	106	62
Total	**1,253**	**737**

Local reclamation companies that can be contacted with regard to reclaiming the bricks and the value in doing so include:

- London Reclaimed Brick Merchants, www.lrbm.com, 020 8452 1111
- Premier Reclaimed Bricks, www.premierreclaimedbricks.co.uk, 020 8864 3537
- Salvo, www.salvoweb.com/

Local waste management companies that could manage the waste (which are the same as the concrete) include:

- Brewsters Waste Management, www.brewsterswaste.co.uk, 020 7474 3535
- Ohara Bros http://oharabros.co.uk/services/aggregates-recycling, 020 8424 2220
- RTS Waste, www.rtswaste.co.uk, 020 7232 1711
- Days Group, http://www.daygroup.co.uk/, 0845 065 4655

Alternatively, licensed waste management contractors should be able to reprocess the brick waste into aggregates.

4.1.3 Metals

Metals account for an estimated 378 tonnes of KDP, 9% of total waste arisings by weight. The sources are shown in Table 4.

There is potential to reuse some of the columns and beams, depending on condition following removal. Many of the other items are likely to be unsuitable for reuse but should be recycled. Note, demolition contractors will price their contracts dependant on the value they obtain for scrap metal.

Table 4: sources of metal

Item	Tonnes	Volume
Rebar	219	28
Beams	104	13
Columns	42	5.4
Railings	7	0.9
Window frames	2	1
Miscellaneous	2	0.2
Total	**378**	**50**

With regard to the reuse of steel, the SCI has produced a protocol for its reuse including how to test for recertification (https://steel-sci.com/assets/downloads/steel-reuse-protocol-v06.pdf). This describes the following process:

- A building is offered for salvage of the steelwork for reuse. Considerations include the acceptability of the source material, the demountability of the structure, the increased cost of careful demolition, etc.
- A business case is established between the holder of stock and the company responsible for demolition.
- Important details of the anticipated salvaged steel are recorded as described in the document.
- Salvaged steelwork is received by the stockholder, grouped and listed as described in the document. The necessary grouping has an important impact on the extent of testing required.
- Members are inspected and tested in accordance with the guidance with the information appended to the stock data. The testing regime involves a combination of non- destructive and optional destructive testing, with the opportunity to make conservative assumptions about certain material characteristics. Testing may be completed at any convenient time, but the seller of the stock is responsible for declaring the necessary characteristics as the material is sold.
- Material is sold, with an accompanying declaration of the material characteristics by the holder of salvaged stock.
- Structural design and member verification is completed with certain modifications, as described in the document.

Reuse and recycling options include:

- Capital Metal Recycling, http://capitalmetalrecycling.co.uk/, 0208 964 2120
- London Scrap Metal Recycling, http://www.londonscrapmetalrecycling.com, 0208 809 1019

4.1.4 Additional Material Types

Additional materials likely to arise from the refurbishment are summarised below:

- **Bitumen:** there are approximately 22 tonnes of bituminous roof coverings which will be removed prior to the construction of the additional floors, 0.5% of waste by weight. These may potentially be classed as hazardous waste and should be tested prior to removal. If hazardous, collection and disposal by a licensed hazardous waste carrier will be required.

- **Glass:** accounts for around 7 tonnes of waste (0.2% by weight), and mainly occurs as window glazing; this is unlikely to be suitable for reuse. Any glass unsuitable for reuse could be crushed alongside the brickwork and used as Recycled Aggregate as described in the brick section above. Glass recyclers are:
  - RTS Waste (www.rtswaste.co.uk T: 020 7232 1711). Note they may require the glass to be removed and stacked as panels.
  - URM Group (https://www.urmgroup.co.uk/ E: info@urmgroup.co.uk
  - May Glass Recycling (http://www.mayglassrecycling.co.uk/); may only take new glass
  - Viridor https://www.viridor.co.uk/siteassets/document-repository/brochures/glass-recycling-ukviridor-low-res.pdf.

- **Timber:** around 2 tonnes of timber waste are expected to occur, 0.05% of the total weight. This mainly occurs as doors and frames to core areas, although a small quantity of timber windows are also present. None are expected to be suitable for reuse. Where reclamation is not possible the timber should be segregated on site if space permits, or offsite and sent to a licensed waste management contractor for recycling. Suitable organisations include:
  - Community Wood Recycling, www.communitywoodrecycling.org.uk
  - Solo Wood Recycling; www.solowoodrecycling.co.uk
  - St Albans Wood Recycling, www.stalbanswoodrecycling.org.uk, 01727 56820

- **Plastics:** around 0.1 tonnes (0.003% by weight) of plastics have been identified, from a small quantity of UPVC window frames. Please note however it is likely that further concealed plastic items are present across the building. The plastic is unlikely to be suitable for recycling and should be sent for energy recovery.

5. Notes on reuse

Experts advise that a long lead-in time and maximum exposure are required to enable the reuse of products and components. The best chances for reuse, with the best environmental and economic benefits, are as near to site as possible:

- Used by the same client locally
- Sold or given away locally

The following recommendations may assist in maximising the reclamation potential of KDPs identified:

- Consult the client on the findings of this report and consider any options for closed-loop re-use in this project itself, or a similar project.
- Consider setting aside storage on site for segregation of salvage items.
- Advertise specific salvage items for free on www.salvo.co.uk or low value materials or use companies such as GlobeChain (www.globechain.com); Reyooz (www.reyooz.com/about/clients) and Collecteco: https://www.collecteco.co.uk/ Salvo also operate a demolition/refurbishment alert service on their website which serves to bring forthcoming demolition products to the attention of potential buyers or users.
- Use local organisations such as the London Community Resource Network: http://lcrn.org.uk/Contact local architectural salvage merchants about specific items. Salvo publish a directory on their website (https://www.salvoweb.com/). Ensure that salvaged items are removed and stored in such a way that all components remain together, e.g. hinges and fixings with doors, etc.

6. Targets

Reuse of materials

Reuse, rather than recycling, of items should always be prioritised.

It is believed that approximately 18 tonnes of material could potentially be reused, representing around 0.4% of total weight.

A reuse target of **0.2% by weight** is recommended.

Recycling of materials - diversion from landfill

It is recommended that an overall recycling target is set prior to the project commencing based on the recommendations of this report in conjunction with the selected contractor(s). An estimate of the total percentage of waste materials that can be recycled is 99.9% by weight.

A total diversion from landfill target of **95% by weight** is recommended.

Note that 90% by weight, or 80% by volume is required to achieve the relevant BREEAM credits; a more ambitious target representing an exemplary level would be 95% diverted from landfill.

Appendix A

Report Authors

Toby Balson

Toby has over 16 years' experience in energy consultancy, building design and construction resource efficiency. His career began at BRE where he worked closely with the Energy Saving Trust and other clients developing sustainable construction training and guidance, including designing for material efficiency and reuse, as well as work on embodied carbon within buildings. He subsequently worked as Environmental Officer at the University of Cambridge, leading development of sustainable construction standards to be applied to their £0.5 billion build programme and leading implementation of ISO 14001 across the university, including minimisation of waste and options for reuse and recycling of different waste streams. He has extensive site survey experience having delivered multiple audits as part of ESOS, as well as energy performance contracting, post-occupancy-evaluation and pre-demolition audits across the UK.

Katherine Adams

Katherine has worked in the area of construction resource efficiency for 17 years, mostly at BRE, where she has been instrumental in shaping the construction industry to achieve high levels of diversion of waste from landfill and reducing waste. She has much experience of pre-demolition audits, having undertaken and reviewed many for various clients, which has involved the development of a robust methodology. She has been responsible for developing waste reporting, including the online system Smartwaste. She enjoys working closely with many elements of the industry, at both a sector and project level. She is currently undertaking a PhD at Loughborough University looking how circular economy can be embedded in the building sector and continues to assist BRE and other organisations such as ASBP.

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