

## AGGREGATES, CEMENT AND READY-MIX CONCRETE MARKET INVESTIGATION

### Addendum to the provisional findings: further analysis on GGBS and GBS and provisional findings

#### Introduction

1. In our provisional findings, we presented our analysis of the supply of GGBS and PFA in GB. This analysis is contained in paragraphs 7.110 to 7.130 of the provisional findings, as well as Appendix 7.6. We analysed evidence on:
  - (a) substitutability between PFA and GGBS (paragraphs 7.110 and 7.111 and Appendix 7.6 of the provisional findings);
  - (b) GGBS production, sales and market shares, including information on imports of GGBS into GB (paragraphs 7.112 to 7.117);
  - (c) PFA production, sales and market shares (paragraphs 7.118 to 7.121 and Appendix 7.6);
  - (d) the relative size of GGBS and PFA markets (paragraph 7.122 and Appendix 7.6);
  - (e) the contract between Hanson and Tarmac for the supply of GBS (paragraphs 7.123 to 7.126 and Appendix 7.6);
  - (f) evidence on trends in sales, prices and margins for GGBS (paragraphs 7.128 and 7.129 and Appendix 7.6); and
  - (g) internal documentary evidence on GGBS (paragraph 7.130 and Appendix 7.6).
  
2. Our competitive assessment of the supply of GGBS was set out in paragraphs 8.288 to 8.292 of the provisional findings. We provisionally found that:

Hanson supplies the vast majority of GGBS in the UK as a result of its exclusive long-term contract with Tarmac (now Lafarge Tarmac) for the purchasing of GBS for grinding into GGBS, and Lafarge Tarmac's exclusive agreements with the GB steel producers for the production of GBS. There are no other suppliers of GB-produced GGBS, and there is

evidence that imported GBBS faces disadvantages compared with GB-produced GGBS. Our comparison of Hanson's GGBS volumes, prices and margins with its cement volumes, prices and margins was consistent with Hanson possessing a degree of market power in relation to GGBS, resulting in higher prices for GGBS in GB than might otherwise be the case.

We therefore found that Lafarge Tarmac's exclusive agreements with the GB steel producers for the production of GBS, and Hanson's exclusive long-term contract with Lafarge Tarmac for the production of GGBS, in combination with Lafarge Tarmac's and Hanson's participation in the GB cement markets, were features that gave rise to an AEC [adverse effect on competition] in the GB cement markets, resulting in higher prices for cement than might otherwise be the case.<sup>1</sup>

3. We have received submissions in response to our provisional findings that challenged our AEC finding arising from the conduct features in the GGBS supply chain. In light of these comments, we considered it appropriate to undertake further work in this area and therefore sought further information from the parties. The purpose of this addendum is to present the further evidence we have received on GGBS and GBS, and further analysis we have conducted, since the provisional findings were published, as well as to set out our augmented provisional findings on AECs related to the supply of GGBS in GB. In this addendum we present this further evidence and analysis, in particular:
  - (a) further evidence on the supply of PFA;
  - (b) further evidence on the relevant product and geographic market for GGBS;

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<sup>1</sup> Paragraphs 8.291 & 8.292 of the provisional findings.

- (c) further evidence relevant to the competitive assessment of the supply of GGBS in GB, including:
- (i) further evidence on market outcomes: an assessment of the profitability of the suppliers of GGBS and GBS and evidence on prices and margins for GGBS over time;
  - (ii) further evidence on market characteristics: analysis of the impact of the BFS and GBS agreements on competition in GGBS, and analysis of the impact of the structural link between GGBS and cement markets on Hanson and Lafarge Tarmac's incentives.
- (d) identification of a distinct AEC in the GGBS market itself, in addition to the GGBS-related AEC that has previously been identified in the cement markets, including an analysis of the mechanisms by which Hanson's participation in both the GGBS and the GB cement markets contributes to the AEC in GGBS and the GGBS-related AEC in the GB cement markets that we identified in our provisional findings;<sup>2</sup> and
- (e) an analysis of the customer detriments arising from the AEC in the GGBS market we have provisionally found, and the GGBS-related AEC in the GB cement markets that we identified in our provisional findings.

### **Further evidence on the supply of PFA in GB**

4. Following publication of the provisional findings, we received further evidence on the supply of PFA in GB from Drax (one of the main producers of cementitious PFA in GB) and from Hanson. As a result of this additional evidence, we have revised our estimates of the size of the PFA market.

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<sup>2</sup> It will be recalled that, under section 134(1) of the Enterprise Act, the CC is required to 'decide whether any feature, or combination of features, of a *relevant market* prevents, restricts or distorts competition in connection with the supply or acquisition of *any goods or services* in the United Kingdom or a part of the United Kingdom' (emphasis added). Such an effect on competition is defined by section 134(2) as an 'adverse effect on competition'. An AEC may therefore in principle be found in connection with any market within the UK, as long as the feature giving rise to the effect on competition can be regarded as a feature of a market in goods or services specified in the reference: see the definition of 'relevant market' in section 134(3) and the definition of 'feature of a market' in section 131(2), in particular subsection (2)(b) (and see further footnote 33 below).

## ***Evidence from Drax***

5. Drax, one of the largest suppliers of PFA in GB, told us that it produced PFA that could be sold as a cement substitute and which required no further processing. Drax told us that it sold around [REDACTED] tonnes of PFA for cementitious uses per year. The production of PFA was seasonal, with more being produced in the winter months when the power station was working at increased capacity. However, this did not match the demand for PFA by the construction industry, which was higher during the summer months when the majority of construction work took place.<sup>3</sup>
  
6. Drax told us that the main purchasers of Drax's PFA were [REDACTED]—accounting together for about 80 per cent of Drax's sales. Small volumes were also sold to independent RMX producers through Drax's agent, Power Minerals.<sup>4</sup>
  
7. Drax told us that it sold PFA to the market for between £[REDACTED] and £[REDACTED] per tonne ex-works, and that the prices of PFA it charged had only increased in line with inflation in recent years. Drax told us that, in setting the price of PFA, it did not monitor or take into account the price of cement. The price of PFA was generally dependent on what the cement industry was prepared to pay, since customers understood that Drax would have to pay for landfill if it could not sell PFA. Drax told us that it was aware of which firms supplied GGBS but it had little visibility of the GGBS price. Drax was often confronted with the situation that if it tried to increase its price of PFA then purchasers would discuss moving to GGBS. Although GGBS was more expensive than PFA, it told us that it was a superior product for cement replacement, because (a) it was manufactured explicitly as a cement replacement and was therefore of a very consistent quality and (b) as a result of its chemical composition, it could be blended with cement in greater proportions than PFA. Cement firms used the lack of reliability

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<sup>3</sup> Note of call with Drax power station, 1 August 2013, paragraphs 2–6.

<sup>4</sup> Note of call with Drax power station, 1 August 2013, paragraph 7.

in the supply of PFA to beat the price down. Drax told us that, as the material was very cheap, it was the cost of transport that was the determining factor in purchasing decisions. Drax believed that Cottam and West Burton were its closest competitors but competition was generally dictated by the location of the purchaser and the transport costs of moving PFA.

8. Drax told us that over the coming years it would move from coal fired to increasingly biomass powered and would therefore not be producing as much PFA. It told us that over the next few years, it was anticipated that UK PFA production would reduce significantly due to the closure of UK coal-powered stations, as a result of various EU environmental directives. PFA production would halve over the next three years at Drax. The initial tranche of coal-fired power station closures (~10GW capacity) would occur by 2015 with the remaining coal-fired stations likely to close by the early 2020s. Due to the UK carbon tax and the British Government having its own unilateral emissions targets, the European directives did not have the same effect across Europe, for example in Germany new coal stations were being built.

### ***Total sales of PFA for cementitious use in GB***

9. Hanson told us that we had done insufficient analysis of PFA and limestone in the provisional findings, and in particular noted that we had understated the size of the PFA market relative to GGBS volumes.<sup>5</sup> In particular, Hanson noted that we had underestimated the volumes of PFA used in CEM II. Hanson provided its own estimates of total PFA volumes; it estimated that (a) 336 kt of PFA are used to produce CEM II; (b) 200 kt of limestone are used to produce CEM II.<sup>6</sup> When added to the estimates in the provisional findings of 500 kt of PFA sold as stand-alone, this

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<sup>5</sup> [Hanson response to the provisional findings](#), paragraph 26.6.

<sup>6</sup> We note that, unlike GGBS and PFA, limestone does not have cementitious or pozzolanic properties and therefore, whilst the specification for CEM II provides for clinker to be blended with limestone to make CEM II, limestone is unlikely to be a substitute for PFA and GGBS.

would equal a total PFA and limestone sales in the region of 1 million tonnes per year.<sup>7</sup>

10. The estimates of total PFA sales in GB that were contained in the provisional findings were based on several sources:
  - (a) MPA data on total sales of cementitious products;
  - (b) estimates contained in Hanson internal documents; and
  - (c) sales and production of PFA by the GB cement producers.
  
11. Based on these sources of information, we had found that PFA sales in GB were small compared with GGBS sales. However, we also noted that there was imprecision in these estimates because we understood that both the estimates from Hanson's internal documents and MPA data only report sales of cementitious products sold to RMX producers, but do not include PFA and GGBS sales which are used by cement producers to produce blended cement.
  
12. We have now received further information on total sales of PFA in GB. In particular, we obtained information from Drax on its total sales of cementitious quality PFA in GB, and estimates from the UK Quality Ash Association (UKQAA) on total sales of cementitious quality PFA in GB. The UKQAA estimates that total sales of cementitious quality PFA in GB were 922,000 tonnes in 2011.
  
13. Our own estimates, based on data on sales by Drax, Lafarge, Cemex and Aggregate Industries, are that sales of PFA in GB were around 940,000 tonnes in 2011. This includes about [§<] tonnes of PFA produced by Drax and sold mainly to the Majors (who then resell some of this PFA, either to their in-house RMX or to independents),

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<sup>7</sup> Hanson subsequently provided further estimates of total PFA sales in GB; the most conservative of which suggested that we had underestimated PFA sales by at least 35 per cent.

as well as PFA produced by the Majors (through various joint ventures) or by the other power plants.

14. We therefore find that total PFA used in GB (either as an input to CEM II or used by RMX producers to mix with cement at the RMX plant) is likely to be in the region of 950,000 tonnes in 2011. This compares to total sales of GGBS of around 1,400,000 tonnes in 2011. Therefore, PFA usage in GB is equivalent to about two-thirds of total GGBS usage in GB.

### **Market definition for GGBS**

15. In the provisional findings, we presented evidence on the extent of substitution between GGBS and PFA (see Appendix 7.6, paragraphs 7 to 18). We concluded on substitution between GGBS and PFA as follows:

Views on the substitutability between PFA and GGBS, and on their relative merits, varied (see Appendix 7.6). We were told by some parties that PFA tended to be of more variable quality, but that it was available from more sources and generally cheaper, whereas the supply of GGBS was more restricted. Some parties told us that GGBS had superior cementitious properties. We were also told that there were pros and cons for both GGBS and PFA, and that each had its own merits depending on the particular application.<sup>8</sup>

16. We have since given further consideration to the relevant market definition for GGBS and examined further evidence we received on this, which we set out below.

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<sup>8</sup> Paragraph 7.111 of the provisional findings.

### ***Hanson submission on market definition for GGBS***

17. Hanson told us that the relevant product market for GGBS included at least CEM I and PFA, so that GGBS was part of a wider cementitious products market. Hanson told us that the share of GGBS in this wider cementitious product market was below 15 per cent.
  
18. Hanson told us that:
  - (a) CEM I was practically always a direct, strong substitute to GGBS, as CEM I could fully replace GGBS in almost all applications. It noted that GGBS is marketed as a direct substitute to using CEM I in blends. It told us that as a result, CEM I pricing directly constrained the pricing of GGBS, and that if prices of GGBS rise relative to CEM I, customers can and do switch to increasing the proportion of CEM I they use in blends. It told us that the pricing tool it used for GGBS showed that CEM I prices constrained GGBS prices. It also provided examples of customers switching, or threatening to switch, away from GGBS to CEM I.
  - (b) PFA was a strong, direct and regular substitute to GGBS as it could fully replace GGBS in almost all applications, and that PFA and PFA blends impacted directly on the pricing of GGBS. It pointed to the pricing evidence and empirical evidence to support this (see paragraph 19 below).
  - (c) There was an effective constraint from imports of GGBS and that there are import terminals with spare capacity.
  - (d) There were a range of other products that could replace GGBS in certain applications and so provided additional constraints on GGBS, such as the pre-blended GGBS product produced by Lafarge Tarmac, limestone fines, Cenin and silica fume/microsilica.
  
19. In support of its views, Hanson provided evidence on:
  - (a) its pricing tool for GGBS;

- (b) internal documentary evidence; and
- (c) a survey it conducted with RMX customers.

Hanson also told us that the CC should adopt the same market definition for GGBS in the UK as the European Commission did in its decision on the merger between Heidelberg Cement and Hanson in 2007<sup>9</sup> or, where the CC deviated from the European Commission's position, it should be based on compelling contrary evidence.<sup>10</sup>

20. We review the evidence provided by Hanson, as well as other further evidence, in the following paragraphs.

### ***Evidence on pricing of GGBS and constraints on prices of GGBS***

21. In order to analyse the relevant market definition, we present evidence on the pricing of GGBS and how it compares to pricing of potential substitutes (PFA and CEM I), in order to understand the constraints on pricing of GGBS.

### ***Price levels***

22. Table 1 shows average annual delivered prices (in pounds/tonne) of PFA (sold by Lafarge),<sup>11</sup> GGBS (sold by Hanson) and CEM I (sold by Lafarge and Hanson). These are all based on delivered prices. We see that GGBS is about £[REDACTED] cheaper than cement on average (20 per cent cheaper), and PFA is about £[REDACTED] cheaper than cement on average (60 per cent cheaper) and £[REDACTED] cheaper than GGBS on average (50 per cent cheaper).

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<sup>9</sup> Case COMP/M.4719 HeidelbergCement/Hanson, decision dated 7 August 2007.

<sup>10</sup> Hanson's response to the provisional findings report dated 16 July 2013, paragraph 28.11.

<sup>11</sup> Lafarge provided detailed data on its monthly sales of PFA, which is why we used Lafarge data on PFA prices here.

TABLE 1 Average annual prices of PFA, GGBS and CEM I

	<i>£/ tonne (delivered, nominal prices)</i>			
	<i>Lafarge PFA price to external customers</i>	<i>Hanson GGBS price to external customers</i>	<i>Lafarge CEM I to independents</i>	<i>Hanson CEM I to independents</i>
2007	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
2008	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
2009	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
2010	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
2011	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

Source: CC, based on Lafarge and Hanson data.

23. Due to its chemical characteristics, GGBS can be substituted in larger quantities for cement than PFA. We were told that CEM II contains between 6 and 35 per cent of PFA or GGBS; whereas CEM III contains between 36 and 95 per cent of GGBS. We can therefore estimate the price of mixing 1 tonne of CEM II and CEM III compared with the price of cement, as set out in Table 2.

TABLE 2 Comparison of prices of CEM I, CEM II and CEM III

	<i>Price per tonne</i>
1 tonne of CEM I	£[REDACTED]
CEM II (using PFA as an input)	Between £[REDACTED] (35% PFA) and £[REDACTED] (6% PFA)
CEM III (using GGBS as an input)	Between £[REDACTED] (95% GGBS) and £[REDACTED] (36% GGBS)

Source: CC calculations.

24. When GGBS and PFA are blended at the RMX site rather than purchased pre-blended as CEM II and CEM III, we were told that GGBS could generally substitute up to about 60 per cent for CEM I, whereas PFA could substitute up to about 30 per cent for PFA. If we use these proportions, Table 3 suggests that using GGBS at the RMX level may be slightly more expensive than using PFA, on average, but the difference in price is not large (about £[REDACTED] per tonne, or 6 per cent price difference). Moreover, we understand that RMX produced using a mix of GGBS and CEM I will generally require a lower 'extra over' level than RMX produced using a mixture of

PFA and CEM I;<sup>12</sup> if this effect were taken into account, this would result in the overall price of producing RMX using PFA increasing relative to that of using GGBS.

TABLE 3 Comparison of costs of CEM I and costs of blending CEM I with GGBS or PFA

	Price per tonne
CEM I	[X]
Mix of 70% CEM I and 30% PFA	[X]
Mix of 40% CEM I and 60% GGBS	[X]

Source: CC calculations.

25. The comparison of the costs of producing RMX and blended cement with PFA and GGBS, or with pure CEM I, set out in Tables 2 and 3 above, suggest that blended cements created through mixing in PFA are broadly in the same price ranges as blended cements created through mixing in GGBS. Therefore, it seems plausible that the current GGBS prices may be constrained by the combination of PFA and CEM I prices, ie set to the level where mixing GGBS with cement is only marginally more expensive than mixing it with PFA. This could suggest that, at current prices, a small increase in the price of GGBS could result in switching to PFA and cement (because PFA can be used in much smaller proportions, we would expect that a reduction in demand of GGBS by 1 tonne would result in substitution to increased volumes of both PFA and CEM I to produce equivalent blended cement). This would mean that at current GGBS prices, GGBS prices may be constrained by a combination of PFA and cement prices.

### *Hanson pricing model*

26. To support its views on the relevant product market for GGBS, Hanson provided evidence on the way in which it set prices for GGBS and examples of the pricing tool

<sup>12</sup>Hanson told us that replacing CEM I with GGBS and PFA would affect the 28-day strength of concrete made from that cement; therefore, blended cement required higher levels of cementitious materials relative to pure CEM I in order to maintain the 28-day strength. The 'extra over' level is the additional amount of cementitious materials required to maintain the equivalent 28-day strength.

regularly used by Hanson's sales team to set prices of GGBS to individual customers.

27. This pricing tool compares the prices to the given customer of:
  - (a) producing RMX using pure CEM I;
  - (b) producing RMX using a blend of CEM I and PFA; and
  - (c) producing RMX using a blend of CEM I and GGBS.
  
28. Hanson told us that the total prices to the customers of producing RMX with pure CEM I or with a blend of PFA and CEM I were born in mind when its salespersons calculate the price for GGBS which would make it cost-effective for the customer to purchase GGBS rather than PFA or pure CEM I, and that this price was used to begin the negotiation with the customer. Hanson told us that this clearly showed that both CEM I prices and PFA prices impacted GGBS prices directly.
  
29. We reviewed the five examples provided by Hanson of its pricing tool for GGBS.<sup>13</sup> Out of these five examples, in four cases the starting negotiation price for GGBS appeared to have been set with reference to the cost to the customer of switching to pure CEM I and/or blending CEM I with PFA, and in one case the starting negotiation price for GGBS appeared to have been set with reference to the cost to the customer of purchasing pure CEM I and/or imported GGBS from Paragon. For these examples, the maximum price was highest for the customer whose next best alternative appeared to be to switch to imported GGBS than for the customers whose next best alternative appeared to be switching to PFA. We agreed that this pricing tool suggested that the price of GGBS set by Hanson to individual customers were currently directly constrained by the pricing of PFA and CEM I. This was also

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<sup>13</sup> The examples were selected by Hanson; Hanson told us that in its view, these examples are representative of Hanson's experience more generally.

consistent with the other evidence we reviewed on the prices of GGBS (see paragraphs 22 to 25, and paragraphs 31 and 32).

30. The examples provided by Hanson of its pricing tool also suggested that:
- (a) The pricing of GGBS to individual customers did not appear to take into account the costs of delivering GGBS to individual customers—in other words, prices to any given customer appeared to depend mainly on prices of PFA and CEM I alternatives, rather than on the specific costs of delivering GGBS to this particular customer.
  - (b) The prices of GGBS were set individually to customers so as to realize, for each customer, a price which is close to the maximum price that this customer will be willing to pay before switching to alternatives (reservation price).
  - (c) From the small sample of examples provided, it appeared that costs of switching to PFA and CEM I or to pure CEM I were a stronger constraint on Hanson's GGBS prices than prices of purchasing imported GGBS.

#### *Changes in prices over time*

31. Figures 1 and 2 show changes in the monthly average prices of GGBS, PFA and CEM I (January 2007 to December 2011), as well as changes in their average annual prices. We see from both charts that the GGBS price seems to be very highly correlated with CEM I prices, with PFA less correlated with either CEM I or GGBS prices.<sup>14</sup> This could suggest that GGBS and CEM I are closer substitutes than GGBS and PFA.

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<sup>14</sup> We also computed correlation coefficients: GGBS/ CEM I correlation is over 0.8; GGBS/ PFA price correlation is 0.5. These coefficients are all statistically significant at the 99 per cent level.

FIGURE 1

**Monthly average prices of GGBS, PFA and CEM I (nominal)**



Source: [✂]

FIGURE 2

**Annual average prices of GGBS, PFA and CEM I (nominal)**



Source: [✂]

32. Table 4 (below), included in Appendix 7.6 of our provisional findings, shows demand for GGBS and for cement for 2007 to 2011. Demand for GGBS reduced more than demand for cement in the downturn (relative prices of GGBS to cement also increased slightly in the period, which could be one explanation, as did relative prices of GGBS to PFA). Although this analysis is high level and there could be a number of other factors explaining the differences in changes in demand for cement and GGBS, it could suggest that some substitution to cement and PFA has taken place as GGBS prices increased relative to cement and PFA prices during the period.

TABLE 4 Demand for GGBS and cement, 2007 to 2011

	Volumes (kt)			Year-on-year changes (%)		
	PFA and GGBS sales to RMX operators	Cement sales	GGBS sales total (including also sold to mix with cement)	PFA and GGBS sales to RMX operators	Cement sales	GGBS sales total (including also sold to mix with cement)
2007	2,758	13,025	2,496.615			
2008	2,433	11,228	2,104.973	-12	-14	-16
2009	1,680	8,657	1,382.93	-31	-23	-34
2010	1,534	8,980	1,291.595	-9	4	-7
2011	1,736	9,575	1,418.039	13	7	10

Source: MPA and Appendix 7.6.

**Further evidence provided by Hanson**

33. Hanson provided results of market research by B2B that it commissioned in 2010 on GGBS. Hanson told us that the purpose of this research was to inform the marketing and brand name of Hanson's GGBS business (REGEN) such that the product could

perform better against its competitor products such as cement and PFA. As part of this research, a survey of RMX producers was conducted. RMX producers were asked what alternatives there were to using GGBS as a cement additive, substitute or replacement in RMX (cement itself was not offered as an option to the respondents in the survey), and whether they had bought any of these alternatives in the previous two years. Just under 60 per cent of respondents (base: 50) identified PFA as an alternative, and almost 40 per cent had bought PFA in the previous two years. Other alternatives identified by respondents were microsilica (about 20 per cent), limestone (about 8 per cent) and metakaolin (about 5 per cent). RMX producers were also asked whether they would increase their use of PFA and GGBS in the future; 53 per cent said they would grow their use of PFA in the future (base 50), against 26 per cent who said they would grow their use of GGBS in the future (base 29).

34. Hanson also provided a selection of emails from the inbox of [REDACTED], Hanson Cement's Bulk sales director. Our review of these emails suggested that, in sales negotiations with customers over GGBS, the threat of switching to PFA was the most common threat used (majority of cases), though there were also examples of customers threatening to switch to CEM I and to imported GGBS from Paragon.
35. Hanson also provided examples of situations where it had lowered its GGBS price in order to defend an existing customer. There were examples of GGBS customers defended against PFA, cement and GGBS imports.

36. We also obtained further evidence from Mittal in relation to the substitutability of GGBS and PFA. Mittal told us that [redacted].<sup>15</sup>

***Preliminary conclusions on the relevant market for GGBS***

37. Taking into account all of the evidence gathered to date on the extent of substitution between GGBS and PFA (set out in both our provisional findings report and this working paper), we consider that:
- (a) The closest substitutes to GGBS are PFA and CEM I.
  - (b) The pricing evidence, the evidence from Hanson emails and the evidence by Hanson on threats to switch that we reviewed suggests that GGBS prices are likely to be currently constrained by CEM I and PFA prices.
  - (c) Although imports of GGBS may also exert a constraint on Hanson prices for GGBS, overall imports of GGBS remain low (around 10 per cent of GGBS sales in GB—see Table 7.9 and paragraphs 7.112 to 7.117 of the provisional findings).
  - (d) Hanson directly takes into account the pricing of PFA and CEM I when setting GGBS prices to individual customers.
38. On the face of it, this suggests that, at the current levels of GGBS prices, GGBS is part of a wider product market including CEM I as well as PFA (a broad cementitious market). However, because Hanson is the only producer of GGBS in GB, we considered whether this may be due to a ‘cellophane fallacy’—this concept is described in the next paragraphs.
39. The CC guidelines highlight the problem of market definition in market investigations:
- There are some practical difficulties in using the HMT in market investigations. If significant market power is already being exercised, using

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<sup>15</sup> Mittal hearing summary, paragraph 11.

prevailing prices can lead to defining markets too broadly and possibly to an incorrect inference that significant market power does not exist. In theory, the HMT could be implemented in the presence of market power using notional competitive prices, but in many cases it is difficult to assess what those prices would be. There is also a risk that using a notional benchmark in effect assumes the existence of significant market power as part of the framework within which the competitive assessment is being undertaken.<sup>16</sup>

40. In order to understand whether the relevant market may be too broad because of the existence of market power, we looked at the results from our analysis of profitability in GGBS, which are summarized in paragraphs 66 and 67 and set out in detail in Appendix A. Indeed, as set out in the Guidelines, one approach to the question of whether prices are above competitive levels is to consider the profitability of the business activity being investigated.<sup>17</sup>
41. Our analysis of GGBS profitability found that Hanson's profitability for the supply of GGBS in GB was well in excess of the estimate of Hanson's cost of capital, in each year 2007 to 2012, and for all of the measures of profitability we considered [see paragraphs 68 to 70 of Appendix A]. These results strongly suggest that current prices of GGBS may be in excess of the prices we would expect in a competitive market, as a result of Hanson exercising market power in GGBS. We also note that the other evidence that we examined in the provisional findings as well as further in this Addendum also indicate that the GGBS market is not fully competitive and that Hanson is able to exercise market power.<sup>18</sup> This evidence taken together indicates

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<sup>16</sup> *Guidelines for market investigations*, CC3 (CC Guidelines), [paragraph 139](#).

<sup>17</sup> CC Guidelines, [paragraph 114](#).

<sup>18</sup> See paragraphs 52 onwards; see also the internal documentary evidence reviewed in the provisional findings (paragraphs 44 to 52 of Appendix 7.6, where we found internal documentary evidence that Hanson [§]).

that a market that encompasses all cementitious products (CEM I, CEM II, CEM III, GGBS and PFA) may therefore be too broad because current prices are higher than those that would prevail in a well-functioning market.

42. In other words, Hanson, because it has exclusive rights to produce GGBS in GB, has an incentive to set prices of GGBS at the level at which CEM I and/or a mixture of CEM I and PFA are substitutes to GGBS. Therefore, the pricing of GGBS is likely to be currently constrained by the pricing of PFA and CEM I. This is consistent with the approach taken by Hanson through its pricing tool, where prices to individual customers appear to be constrained mainly by the costs to customers of switching to CEM I or CEM I and PFA. If there were several competing producers of GGBS in GB, we would expect these to be more focused on competing between themselves for selling GGBS to GB customers, rather than on competition with CEM I and PFA. We would therefore expect that, if prices for GGBS were at competitive levels, the extent of substitution between GGBS on the one hand and CEM I and PFA on the other would be significantly more limited than that which we observe at current GGBS prices.
43. Therefore, in light of our analysis of GGBS profitability, we consider that the evidence we have reviewed on pricing and substitution between GGBS on the one hand and PFA and CEM I on the other is affected by the fact that current GGBS prices are likely to be above the prices that would prevail in a well-functioning market. This is likely to result in a product market definition, at current GGBS prices, which is broader (ie in which there would appear to be more substitutability with non-GGBS alternatives) than that which would prevail in a well-functioning market with several competing producers of GGBS in GB in which GGBS prices would be lower and substitutability with non-GGBS alternatives would be much more limited. We therefore consider that there is a distinct relevant product market for GGBS, which is

closely related to cement and PFA, given that GGBS is both a partial substitute to cement and PFA, as well as an input into the production of CEM III and of downstream cement products (such as RMX and other concrete products).

44. We consider that the geographic market for the supply of GGBS is likely to be very similar in scope to the geographic market for cement. The economics of transportation of GGBS are likely to be very similar; if anything, transport costs may represent a larger proportion of the overall price of GGBS because GGBS is relatively cheaper than cement (which could result in narrower geographic markets). We therefore focus primarily on a GB-wide market for GGBS (as for cement), taking into account the fact that some of the GGBS which is sold in GB is imported, though we note that such imports remain limited.<sup>19</sup> In this relevant market, our analysis indicates that Hanson had a market share of 90 per cent in 2011, the remaining 10 per cent being accounted for by imported GGBS.

### ***GGBS analysis in the European Commission Heidelberg/Hanson decision***

45. Hanson told us that there was precedent on the UK GGBS market definition in the European Commission decision on the Heidelberg/Hanson merger (2007).<sup>20</sup> In that decision, one of the questions was whether the merger between Heidelberg (a cement producer in GB) and Hanson (a GGBS producer in GB, with no cement operations) might raise competition concerns.
46. The European Commission decision noted that Hanson had a strong position in GGBS as a result of the acquisition of Civil & Marine in 2006,<sup>21</sup> and analysed whether GGBS and cement were part of the same relevant product market in the UK.

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<sup>19</sup> As set out in Table 7.9 of the provisional findings, imported GGBS accounted for about 10 per cent of sales of GGBS in GB in 2011.

<sup>20</sup> Case No COMP/M.4719 – Heidelberg Cement/Hanson, dated 7 August 2007. Full text available at: [http://ec.europa.eu/competition/mergers/cases/decisions/m4719\\_20070807\\_20310\\_en.pdf](http://ec.europa.eu/competition/mergers/cases/decisions/m4719_20070807_20310_en.pdf).

<sup>21</sup> *ibid*, paragraph 15.

The European Commission found that UK concrete producers could easily switch to cementitious products other than GGBS within a short period of time and through little additional costs, and overall the Commission found that a vast majority of the respondents to the market investigation agreed with a product market including at least all cement additives (GGBS and fly ash).<sup>22</sup> However, the decision did not conclude on whether there was a separate product market for GGBS or whether GGBS was part of a wider cementitious product market. The Commission found that the exact market definition could be left open because in all alternative market definitions considered, effective competition would not be significantly impeded.<sup>23</sup>

47. We note that in the context of the above decision, the parties to the merger (Hanson and Heidelberg) submitted that GGBS was a separate product market from cement.<sup>24</sup> They submitted that although GGBS could in some respects be used as a substitute to cement, such substitution could not occur completely for practical, standards and commercial reasons; that the price of GGBS was a little lower than the price of cement; and that the proportion of GGBS used as a substitute for cement modified some characteristics of concrete such as the hardness or colour of the product.
48. Overall, the assessment of the European Commission on product market definition in the context of the Heidelberg/Hanson merger decision is consistent with the views that we summarized in the provisional findings in relation to the extent to which GGBS, PFA and CEM I are substitutable (as set out in paragraph 15 above). We note that the context for our assessment of market definition is different from that of the European Commission: we have looked at the market in the context of a market investigation, which considers a different test than that considered by the European Commission, namely the incremental change from the merger between these two

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<sup>22</sup> [ibid](#), paragraph 20.

<sup>23</sup> [ibid](#), paragraph 20.

<sup>24</sup> [ibid](#), paragraph 18.

parties. We also note that we are examining the question of market definition six years after the merger decision; and that the European Commission did not conclude on the precise product market and did not consider the possible cellophane fallacy issues that we have considered in further detail as part of our analysis.

49. In relation to the geographic market definition, the European Commission decision examined whether markets for cement additives or cementitious products may be national or wider than national. The decision stated that European Continental cement, fly ash and GGBS exerted a price pressure as regards the UK. However, the exact geographic market definition was left open because, regardless of alternative market definitions considered, effective competition would not in the European Commission's view be significantly impeded.<sup>25</sup>
  
50. The section of the European Commission decision which sets out the competitive assessment in relation to vertical foreclosure theories of harm provides further details on imports of GGBS in GB. The Commission found that the most of the cement producers which were currently purchasing GGBS could turn to alternative supply sources. It gave the example of Cemex, which imported GGBS from Germany for its own use in the UK, and increased its share of GGBS production (including imports) in the UK from less than 5 per cent in 2004 to around 5 to 15 per cent in 2006.<sup>26</sup> It also gave the example of Holcim, which, although it only had a small presence in UK GGBS, was a significant player in Continental Europe, and therefore would be in a position to react to a hypothetical foreclosure strategy.<sup>27</sup> The Commission decision

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<sup>25</sup> [ibid](#), paragraph 31.

<sup>26</sup> [ibid](#), paragraph 103.

<sup>27</sup> [ibid](#), paragraph 105.

noted that overall GGBS imports, excluding Hanson's, had increased from virtually zero in 2001 to approximately [10–20] per cent in 2006.<sup>28</sup>

51. We note that imports of GGBS into GB have reduced since the European Commission decision: in 2011, imports of GGBS accounted for 10 per cent of GGBS sales in GB.<sup>29</sup> We also note that, although there are some imports of GGBS into GB, these are small compared with the market share of Hanson in GB of 90 per cent. We also note that the ability of imported GGBS to exert a pricing pressure on GB-produced GGBS would also be affected by the cellophane fallacy we identified in paragraph 43 above. Given these facts, and for essentially the same reasons as set out in paragraph 48 above, we concluded that the 2006 European Commission decision would not lead us to amend our own analysis of the geographic market definition for GGBS.

### **Competitive assessment of the supply of GGBS in GB**

52. As set out above, our preliminary conclusion on product market definition is that the pricing of GGBS is currently constrained by the pricing of PFA and CEM I, but that this is likely to be a result of the fact that Hanson is a sole producer of GGBS in GB and therefore able to set prices of GGBS at or just below the level where switching to PFA and CEM I blending is attractive.
53. In this section, we provide further evidence on our competitive assessment of the GGBS market in GB. We first present further evidence on the outcomes of competition in the GGBS market (profitability, prices and margins), and then present further analysis on the way in which competition operates both in the GGBS market, and (to the extent necessary to understand fully the GGBS market), in the GGBS

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<sup>28</sup> [ibid](#), paragraph 104.

<sup>29</sup> See Table 7.9 of the provisional findings.

supply chain more broadly, including analysis of the incentives of the Hanson and Lafarge Tarmac.

### **Market outcomes**

54. In this section, we look at the profitability of both GBS and GGBS, along with pricing and margins for GGBS.
55. Our analysis of the profitability of Lafarge Tarmac's GBS operations is presented in Appendix B. We found that the returns on capital employed are broadly in line with the estimate of GB cement producers' cost of capital that we had previously used when assessing the profitability of cement (10 per cent).<sup>30</sup>
56. In contrast, our analysis of the profitability of Hanson's GGBS operations strongly supports a conclusion that Hanson is earning excess profits in GGBS. Table [5] shows our calculations of Hanson's return on capital employed on a current cost basis for the period 2007 to 2012. It can be seen that the return on capital, regardless of whether it is evaluated before or after impairment, is well in excess of the 10 per cent estimate of the relevant cost of capital for Hanson's GB GGBS activities. Further details of this profitability assessment can be found in Appendix A.

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<sup>30</sup> As we explain in the context of our analysis of cement profitability, the profitability of Lafarge Tarmac's GBS operations may have been adversely affected by the severe and prolonged economic downturn that occurred during the period covered by our analysis. However, unlike the GB cement producers' pricing of cement, Lafarge Tarmac has little freedom regarding the prices it receives for GBS by virtue of the contractual provisions described in paragraphs 66 and 78. Therefore there is no direct read across from our conclusions regarding Lafarge Tarmac's GBS profitability to our conclusions regarding the profitability of the GB cement producers' cement operations.

TABLE [5] Summary financial results for Hanson's GGBS activities on a current cost basis and calculation of ROCE thereon over the period 2007 to 2012

	£ million for profits and capital employed/% for ROCE						
	2007	2008	2009	2010	2011	2012	Average
<i>Profit and loss account</i>							
Profits before impairment	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Impairment	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Profits after impairment	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
<i>Balance sheet</i>							
Capital employed before impairment	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Capital employed after impairment	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
<i>ROCE</i>							
Before impact of impairment	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[25–30]
After impact of impairment	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[25–30]

Source: Table 7 of the Appendix A.

57. Volumes of GGBS sales have fallen by over 40 per cent during the period of review, and the level of profits and associated profitability has fallen in response, particularly from 2009 onwards. This was the year in which Hanson mothballed and impaired its assets at Teesport. Profitability, however, remains well above the costs of capital with there being plenty of spare capacity to process GBS into GGBS should demand pick up in the future.
58. As part of our GGBS profitability analysis, we obtained a fair valuation report that was prepared for Hanson by [REDACTED], after Hanson's acquisition of Civil and Marine (Holdings) Ltd in 2006. This report placed value on the contractual arrangements between Civil and Marine and Tarmac on the basis that 'these Supply Agreements, together with the limited supply of granulated slag in the UK, lead to a situation where Civil and Marine is the predominant supplier of UK sourced GGBS', although the report noted that there was an element of subjectivity in any valuation of intangible assets.<sup>31</sup> The report noted that granulated slag could only be imported in small

<sup>31</sup> Hanson told us that this report was prepared for US GAAP purposes and made no attempt to establish economic or true market values. It also told us that the report relied on information provided by the then management of Hanson, as well as publicly available information, and that the report stated that [REDACTED] did not undertake a detailed financial review of Civil and Marine for the purposes of the preparation of the report. We note that the title of the report suggests that it was undertaken both for US GAAP and for UK purposes, as it states that the valuation was done for IFRS 3 and SFAS 141. The report states that it should not be relied upon for any purpose other than for those accounting requirements. We also note that the report states, at

quantities and at higher cost than purchasing from Tarmac, and therefore that the GBS used at that time by Civil and Marine and supplied by Tarmac could not be easily replaced at an equivalent cost. The report stated, based on management estimates, that the Supply Agreements provided Civil and Marine 'with a significant cost advantage'.<sup>32</sup>

59. Hanson told us that GGBS sales had fallen by significantly more than cement sales because there was a large surplus of cement and because GGBS had become relatively more expensive than cement, in that inflation in electricity prices had a greater impact on GGBS production costs, reducing the pricing differential between cement and GGBS. Hanson told us that it had reduced its GGBS prices to defend its business, albeit it told us that any price reduction was dictated by keeping an acceptable margin in order to maintain ROCE to a level that was satisfactory to its shareholders.
60. We examined the evolution in Hanson's prices and accompanying changes on volume of sales and margins.
61. Table 6 below shows Hanson's average nominal and real prices of GGBS to external customers for years 2007 to 2011. We see from Table 6 that, despite the very large drop in demand for GGBS in 2008, 2009 and 2010, prices of GGBS (in both nominal and real terms) increased between 2007 and 2011. We also see that real prices of GGBS peaked in 2009, to then reduce by 6 per cent between 2009 and 2011.

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paragraph 5.19, that [redacted] 'reviewed the tangible assets at the various operations of C&M and inspected a number of the major facilities'.

<sup>32</sup> The competitive constraint from imported GBS is analysed further in Appendix 6 to the provisional decision on remedies.

TABLE 6 **Hanson GGBS prices, 2007 to 2011**

	<i>Hanson average nominal GGBS price to external customers £/tonne</i>	<i>Hanson average real GGBS price to external customers*</i> £/tonne	<i>Changes in volumes of GGBS sold by Hanson %</i>
2007	[REDACTED]	[REDACTED]	
2008	[REDACTED]	[REDACTED]	[REDACTED]
2009	[REDACTED]	[REDACTED]	[REDACTED]
2010	[REDACTED]	[REDACTED]	[REDACTED]
2011	[REDACTED]	[REDACTED]	[REDACTED]

Source: CC, based on Hanson data.

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\*Nominal average prices were calculated by dividing total revenues in a year by total volumes in the same year, for sales of GGBS to external customers. They were converted to real prices using the CPI index (based to 100 for 2011).

62. We have also conducted an analysis of variable cost margins for GGBS for financial years 2007 to 2012. This analysis is presented in Appendix C. We found that, in percentage terms, Hanson's margins over variable costs had decreased between FY07 and FY12, from [REDACTED] per cent in 2007 to [REDACTED] per cent in 2012. During the same period, volumes of GGBS sold by Hanson reduced by 45 per cent, from [REDACTED] Mt in FY07 to [REDACTED] Mt in FY12.
63. Hanson's unit variable profits increased somewhat during the period in nominal terms, from £[REDACTED] per tonne in FY07 to £[REDACTED] per tonne in FY12, and they remained stable in real terms, despite the large fall in Hanson's GGBS sales. In particular in FY09, which was the year with the sharpest decline in demand (27 per cent fall), unit variable profit increased on prior year from £[REDACTED] to £[REDACTED], whilst unit earnings before interest, tax, depreciation and amortization (EBITDA) increased slightly from £[REDACTED] to £[REDACTED]. In other words, despite a large reduction in the demand for GGBS following the demand slump, although there was evidence of some reduction in margins on variable costs in percentage terms, this did not translate into a substantial reduction in Hanson's absolute margins or prices which we might expect to see in a competitive market. This further points towards a degree of pricing power by Hanson.

## ***Market characteristics***

64. In the provisional findings, we presented evidence on competitive effects in the supply of GGBS, and in particular an analysis of Hanson's GGBS market share, an analysis of GGBS imports and an analysis of the agreements between Lafarge Tarmac and the UK steel producers for the supply of BFS and of the arrangements between Hanson and Lafarge Tarmac for the supply of GBS and the impact of these contracts on competition in the GGBS supply chain.<sup>33</sup>
65. In this section, we present further analysis of certain characteristics of the GGBS market, and their impact on competition, including:
- (a) further analysis of the impact of agreements between the UK steel producers and Lafarge Tarmac (BFS agreements) and of the agreements between Lafarge Tarmac and Hanson (GBS agreements) on competition in the GGBS market; and
  - (b) further analysis of the structural links between the cement markets and GGBS market and the impact of these links on Hanson and Lafarge Tarmac's incentives.

### *Further analysis of the impact of the BFS and GBS agreements on competition*

66. As set out in the provisional findings, in the UK, Lafarge Tarmac and the GB steel producers (Tata Steel and SSI) have entered agreements whereby Lafarge Tarmac currently has exclusive rights to produce GBS from each of the three GB steel plants: Lafarge Tarmac owns the equipment required to water-cool the slag so as to transform it into a cementitious granulate material (ie GBS). The agreements between Lafarge Tarmac and the GB steel producers were concluded for a duration of 30 years and run until 2029. Lafarge Tarmac then sells GBS to Hanson under three exclusive long-term contracts (whereby Lafarge Tarmac must sell all granulated

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<sup>33</sup> See paragraphs 7.112 to 7.117, 7.123 to 7.126 and 8.291 of the provisional findings.

slag destined for cementitious use in the UK to Hanson, though Hanson is not required to take any minimum volume from Lafarge Tarmac<sup>34</sup>). Hanson undertakes the drying and grinding to transform the GBS into GGBS. The price paid by Hanson to Lafarge Tarmac for GBS is reviewed [X] and is based on a percentage of Hanson's average ex-works price per tonne of GGBS sales [X], subject to a [X]. The [X] is reviewed either annually with respect to the GGBS sales from Purfleet and Port Talbot or at the end of every [X] year with respect to the GGBS sales from Teesside and Scunthorpe.

67. Hanson and Lafarge Tarmac entered into long-term exclusive supply agreements which were all varied in 1999 and expire in 2029. The contracts have over 15 years remaining to run.
68. BFS is the main raw material input into the production of GBS, which in turn is the main raw material input into the production of GGBS. As a result of the agreements between the UK steel producers and Lafarge Tarmac for BFS, which give Lafarge Tarmac exclusive rights to produce GBS from each of the three GB steel plants, Lafarge Tarmac is the sole GB producer of GBS and it currently owns all the plants used in GB for the production of GBS. The combination of the fact that Lafarge Tarmac is the sole GB producer of GBS and that it has entered and maintained exclusive agreements with Hanson for the supply of GBS to produce GGBS, results in Hanson being the sole GB producer of GGBS and Hanson owning all the grinding plants currently used in GB for production of GGBS (in relation to which, it is also important to note that imports of GGBS are limited—see paragraph 85(e).

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<sup>34</sup> Lafarge Tarmac or Hanson (at Lafarge Tarmac's suggestion) may sell any surplus material, but only to an end-user identified by Lafarge Tarmac who does not intend to grind the granulate in the UK for sale in the domestic cement market.

69. The situation is therefore one where Lafarge Tarmac is the only firm in a position to obtain supplies of BFS as an input to GBS in GB, and Hanson has a very high market share (90 per cent) for the supply of GGBS in GB. There is therefore potential for market power at both levels of the GGBS supply chain: for the supply of GBS to be ground into GGBS, and for the supply of GGBS.
70. This market structure is largely a result of the exclusivity arrangements at both levels of the supply chain, which create a strategic barrier to entry in GB production of GBS and a strategic barrier to entry in GB production of GGBS respectively by preventing access to the key inputs for the production of GBS and GGBS in GB.

*Structural links between GGBS and cement markets and impact on Hanson and Lafarge Tarmac's incentives in the GGBS market*

71. We analysed further the mechanism by which Lafarge Tarmac's and Hanson's decisions to be active in both the GB cement market and the GGBS supply chain contribute to their incentives to exercise market power in the GGBS supply chain. Throughout this section, we focus mainly on the unilateral exercise of market power, though we discuss how coordination in the cement market would affect Hanson and Lafarge Tarmac incentives in GGBS in paragraph 83.

*Hanson incentives*

72. There are two effects which may lead to prices of GGBS being higher than they would be if there were several competing (and, in the case of the second effect, independent ie non-cement-producing) producers of GGBS:
- (a) By virtue of providing the great majority of GGBS consumed in GB, Hanson's incentives are to set prices of GGBS at the point where demand for GGBS is elastic, and therefore prices may be higher than if there were competing producers of GGBS in GB. The strength of this effect depends on how close a

substitute PFA (combined with CEM I) is for GGBS combined with CEM I<sup>35</sup> and on how close a substitute imported GGBS is for domestically-produced GGBS.

(b) There is also an additional incentive on Hanson to further increase the price of GGBS because of Hanson's presence in the cement market.

73. The first effect is standard economic price theory and would apply to any owner in the same position as Hanson (whether or not a cement producer). In the following paragraphs, we expand on the second effect (the additional incentive on Hanson to increase GGBS prices because it is a cement producer), and the conditions/factors which will impact on this incentive. This effect occurs because a change in price of GGBS may also have an impact on cement demand because of partial substitution, and therefore on Hanson's cement volumes and profits.

74. In order to understand how Hanson's incentives for GGBS pricing are affected because it is also a cement producer, we now consider the impact on Hanson's profits of a reduction in GGBS prices. If Hanson were to (unilaterally) reduce prices of GGBS by a small amount:

(a) First of all, we would expect demand for GGBS produced by Hanson to increase if prices of GGBS charged by Hanson were to reduce. The amount by which GGBS demand would increase will depend on the price elasticity of demand for GGBS.

(b) Second, if Hanson reduced its GGBS prices, all other things being equal, we would expect GGBS to become relatively cheaper compared with CEM I, and may therefore expect a reduction in demand for CEM I and CEM II—it might not be one-for-one (ie there may be overall increase in demand for cementitious products), but there would most likely be some substitution effect. This may in

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<sup>35</sup> Or how close CEM I and pre-blended CEM II are substitutes for CEM III.

turn affect Hanson cement sales. If we assume that Hanson would be affected in proportion to its market share, this would mean that demand for cement produced by Hanson would be reduced by about 20 per cent of the overall reduction in cement demand due to substitution to GGBS.

(c) Third, because GGBS is an input into blended cement as well as an input into RMX, a reduction in the prices of GGBS may also have the impact of reducing the costs to competing cement producers of producing blended cement, and of reducing the costs to competing RMX producers of producing RMX (vertical effects). We do not look at this effect in detail, but note that this vertical effect would go in the same direction as effect (b) above in the sense of reducing Hanson's incentives to lower GGBS prices because of its presence as a cement and RMX producer.

75. Appendix D sets out the effect on Hanson's profits in both cement and GGBS of a small reduction in its GGBS prices. We find that, compared with a situation where Hanson is not a cement producer, Hanson has comparatively less incentive to lower the price of GGBS because of an additional impact, namely that the reduction in GGBS prices may cannibalize some of its cement sales. The overall effect is likely to depend mainly on three factors:

- (a) The relative GGBS and cement margins: if cement margins are high compared with GGBS margins, loss of sales of cement will have more negative impact on profits than additional sales in GGBS.
- (b) The amount of substitution between GGBS and cement: if there is a high degree of substitution (which is likely to be the case if GGBS prices are set on the elastic part of demand curve), the impact of lost cement sales will be larger.
- (c) Cement market share: the larger the cement market share of Hanson, the more impact on its cement sales.

76. From the information that we have to date on these various factors, we know that:
- (a) Cement unit margins over variable costs are similar, though slightly higher, than GGBS variable margins.<sup>36</sup>
  - (b) Hanson's share of the cement market, of about 20 per cent, means that, if Hanson were to cut the price of GGBS, 1 in every 5 tonnes of reduced cement demand would on average relate to reduced sales by Hanson.
  - (c) Cross-elasticity of demand for cement to GGBS prices: though we do not have any estimates, the evidence we gathered on GGBS prices and how it compares to CEM I prices in paragraphs 22 to 25, 31 and 32 above could suggest relatively high cross-elasticities at current GGBS and CEM I prices (the evidence suggests that GGBS prices are currently set at levels where small changes in GGBS prices may translate into increased CEM I and PFA use instead).
77. Overall, and compared to a hypothetical situation where Hanson was not present in the GB cement market, there is therefore likely to be an additional incentive on Hanson to raise prices of GGBS because of Hanson's activities in the cement market, because lower GGBS prices may reduce Hanson's cement profits.

*Lafarge Tarmac incentives*

78. Lafarge Tarmac's ability to exercise market power for the supply of GBS is currently restricted by the terms under which it produces GBS. In particular, given both the process of steel production (whereby the supply of BFS that is processed to produce GBS is determined by the iron and steel production decisions at the steelworks), and its obligations under the GBS agreements (where it is obliged to maximize the production of GBS and ensure its adequate supply to Hanson), Lafarge Tarmac currently has restricted ability to influence GBS volumes. Furthermore, under the

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<sup>36</sup> See Appendix 6.5 of the provisional findings for cement margins; and Appendix C for GGBS margins.

GBS agreements, the price paid by Hanson to Lafarge Tarmac for its GBS is determined as a percentage of achieved prices for GGBS, which restricts Lafarge Tarmac ability to influence the prices of GBS and GGBS.

79. However, although the GBS agreements currently limit Lafarge Tarmac ability to influence prices of GBS and GGBS in GB, the GBS agreements between Lafarge Tarmac and Hanson have the effect of aligning Lafarge Tarmac and Hanson's incentives, through the contractual prohibition on Lafarge Tarmac making GBS available to any third party for GGBS production in the UK, and through the contractual provision under which Lafarge Tarmac obtains a price for GBS from Hanson which is proportional to the price of GGBS achieved by Hanson.
80. In addition to this, because Lafarge Tarmac is active both in the GGBS supply chain and as a GB cement producer, it has similar incentives to those of Hanson as described in paragraphs 72 to 77 above. Lafarge Tarmac will benefit from high GGBS prices both through obtaining higher prices for its GBS (as set out in the previous paragraph) and additionally through the indirect impact that these high prices for GGBS have on Lafarge Tarmac's profits from cement sales: the higher the price of GGBS, the lower the constraint on cement prices from GGBS, and the higher Lafarge Tarmac's profits in the GB cement market. This effect is all the more pronounced because of Lafarge Tarmac's large share of GB cement sales, which means that Lafarge Tarmac will benefit all the more from high cement prices.
81. The beneficial effect of high GGBS prices on Lafarge Tarmac's cement profitability means that Lafarge Tarmac has limited incentives to seek to introduce more

competition in the supply of GGBS, eg by attempting to renegotiate the terms of its GBS agreements with Hanson.<sup>37</sup>

*Conclusion on Hanson and Lafarge Tarmac incentives*

82. We therefore find that, because Hanson and Lafarge Tarmac are active both in the GGBS supply chain and as GB cement producers, they have additional incentives (over and above those arising from their positions as sole producers of GGBS and GBS respectively) unilaterally to maintain high prices of GGBS because this leads to higher cement prices, with beneficial effects on the profitability of their cement operations. The GBS agreements between Lafarge Tarmac and Hanson, though they restrict Lafarge Tarmac ability to influence the pricing of GBS and GGBS, further contribute to aligning Lafarge Tarmac and Hanson incentives through the contractual prohibition on Lafarge Tarmac making GBS available to any third party for GGBS production in the UK, and through the contractual provision under which Lafarge Tarmac obtains a price for GBS from Hanson which is proportional to the price of GGBS achieved by Hanson.
83. The analysis above does not take into account the possible presence of coordination in the cement market. We note that, if there is coordination in the cement market as we have provisionally found, this is likely to act as a further disincentive on Lafarge Tarmac and on Hanson to seek lower GGBS prices. Indeed, the incentive for Lafarge Tarmac and Hanson not to disrupt the prices of cement through lower GGBS prices is likely to be stronger in a coordinated market. In particular, if there is coordination in cement, lowering GGBS prices could be interpreted by other cement producers as a deviation from the coordination, and thereby provoke a reaction from the other cement producers (punishment in the cement or the GGBS market), which would

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<sup>37</sup> In this respect, we note that our review of internal documents indicate that Lafarge were aware of the scope of possible re-negotiation of contracts under the grounds of competition law compatibility; see paragraphs 38 and 39 of Appendix 7.14 of the provisional findings, and paragraphs 140 and 149 of Appendix 8.2 of the provisional findings.

further reduce their incentives to seek lower GGBS prices. Evidence for the fact that punishments for deviations in cement had in the past taken place in the GGBS market, was set out in our provisional findings. In particular, we noted the following in footnote 194 to paragraph 8.218 of the provisional findings: ‘For example, in response to Hanson’s 2009 internalization, Lafarge internalized its own purchases from Hanson, some of which were GGBS purchases switched to PFA—see paragraph 7.206(a). See also Appendix 8.3, paragraph 17, in which Hanson anticipates retaliation on GGBS for actions in packed cement.’

### ***Assessment of the evidence on competition in GGBS***

84. As set out above, since provisional findings we have gathered further evidence to enable us to analyse GGBS profitability, margins and prices. We have also conducted further analysis of how the BFS and GBS agreements affect competition in the GGBS supply chain, and how the structural link between cement and GGBS markets affects the incentives of Hanson and Lafarge Tarmac in GGBS. This evidence is in addition to the evidence already considered in the provisional findings on competitive effects in GGBS, in particular the analysis on Hanson’s GGBS market share, of GGBS imports and of the contract between Hanson and Lafarge Tarmac for GBS and GGBS [see paragraphs 7.112 to 7.117 and paragraphs 7.123 to 7.126 of the provisional findings].
85. Taken together, we find that the GGBS supply chain is characterized by the following:
- (a) GGBS is both an input into cement production and a substitute for cement in the production of RMX and other downstream uses of cement;
  - (b) the main participants in the GBS/GGBS supply chain in GB are Lafarge Tarmac and Hanson, each of which is also one of the top three GB cement producers;

- (c) Lafarge Tarmac and Hanson's extensive participation in both the GB cement markets and the GGBS supply chain gives them incentives that would not otherwise exist to take into account the interaction between these products in a way which is liable to distort competition both in the GGBS market and in the cement market;
- (d) Lafarge Tarmac is the sole producer of GBS in GB by virtue of having entered and maintained its BFS agreements with the GB steel producers (thereby creating a strategic barrier to entry into GBS production in GB), and Hanson is the sole producer of GGBS in GB by virtue to having entered and maintained its GBS agreements with Lafarge Tarmac, giving Hanson exclusive rights to use all GBS produced in GB for the production of GGBS (thereby creating a strategic barrier to entry into GGBS production in GB).
- (e) Lafarge Tarmac currently owns all the plants used in GB for the production of GBS, and Hanson currently owns all the grinding plants used in GB for producing GGBS.
- (f) Imports of GGBS into GB are very limited (the evidence on imports of GGBS is set out in paragraphs 7.112 to 7.117 of the provisional findings), with Hanson accounting for around 90 per cent of GGBS sales in GB in 2011.

86. Our findings in relation to competitive effects in the GGBS market are as follows:

- (a) Hanson's profitability for the supply of GGBS, though it has reduced between 2007 and 2012, remained considerably in excess of our benchmark for the cost of capital for each year in the period 2007 to 2012.
- (b) Although prices of CEM I and PFA are likely to constrain prices of GGBS currently, this is because Hanson is the sole GB producer of GGBS and can therefore set GGBS prices at or just below levels at which customers would switch to alternatives; in other words, the cost of producing RMX (or other

downstream concrete products) with CEM I and/or CEM I and PFA provides a 'price ceiling' for the inflated GGBS prices.

- (c) Prices and margins for GGBS were not substantially affected by the large reduction in GGBS demand, which suggests a degree of pricing power by Hanson.
- (d) The pricing policy of Hanson in relation to GGBS, whereby prices of GGBS to individual customers appear to be set mainly in reference to the maximum price that each customer is willing to pay (and therefore depending, among others, on the price of PFA and CEM I an individual customer is able to obtain), also suggest that Hanson has market power in the supply of GGBS and is able to price discriminate depending on the willingness to pay of different customers.

87. In relation to GBS, we find that:

- (a) At the GBS level, under the Lafarge Tarmac–Hanson GBS agreements (i) the price of GBS is currently set as a percentage of Hanson's selling price of GGBS, and (ii) Lafarge Tarmac has the obligation to supply Hanson with all the GBS it needs and can only supply any excess GBS to other end-users who do not intend to grind the granulate in the UK for sale in the UK. Together this implies that, under the current agreements, Lafarge Tarmac has restricted ability to influence the price of GBS and GGBS in GB.
- (b) Our analysis of the profitability of Lafarge Tarmac's GBS operations does not suggest that Lafarge Tarmac is earning excess profits in GBS (suggesting that Lafarge Tarmac is not benefitting directly, through its sales of GBS, from Hanson's ability to exercise market power in the GGBS market).
- (c) However, Lafarge Tarmac benefits from higher GGBS prices (i) because the price it obtains for GBS from Hanson is proportional to the price of GGBS achieved by Hanson, and (ii) indirectly through its impact on prices in the cement market. Lafarge Tarmac therefore has limited incentives to seek to introduce

more competition in relation to either GBS or GGBS (eg through attempting to renegotiate its contract terms with Hanson).

88. Overall, this evidence leads us to the provisional conclusion that Hanson has the ability to exercise significant market power in the supply of GGBS in GB, resulting in prices for GGBS in excess of what we would expect in a well-functioning market.
89. This market power is derived primarily from the fact that Hanson is the sole producer of GGBS in GB, which in turn arises because : (a) Lafarge Tarmac is the sole producer of GBS in GB by virtue of owning all the plants currently used in GB for producing GBS and of having entered into and maintained the exclusive BFS agreements it has with the GB steel producers; (b) Hanson owns all the grinding plants currently used in GB for the production of GGBS, Hanson's position being reinforced and secured because Hanson and Lafarge Tarmac have entered into and maintained exclusive GBS agreements with each other which grant Hanson exclusive rights to use all GBS produced in GB for the production of GGBS; and (c) Hanson and Lafarge Tarmac are both active as two of the top three GB cement producers, which further contributes to their incentives to keep the exclusive arrangements in place and to maintain high prices of GGBS, given the effects that high GGBS prices have on cement prices.
90. Hanson's ability and incentive to exercise significant market power in the supply of GGBS in GB is likely to result in prices of GGBS in excess of what we would expect in a well-functioning market. Hanson's exercise of significant market power in the supply of GGBS is also likely to result in prices in the GB cement market higher than they would otherwise be.

91. Lafarge Tarmac both contributes to Hanson's ability to exercise market power (by virtue of Lafarge Tarmac having entered into and maintained long-term exclusive agreements with the GB steel producers and with Hanson) and benefits from Hanson's ability to exercise market power because of the impact that high GGBS prices have on GBS prices and cement prices (since Lafarge Tarmac is active both in the GBS supply chain and in GB cement production).

### **Augmented provisional findings in relation to the supply of GGBS in GB**

92. In the provisional findings, we concluded:

We therefore found that Lafarge Tarmac's exclusive agreements with the GB steel producers for the production of GBS, and Hanson's exclusive long-term contract with Lafarge Tarmac for the production of GGBS, in combination with Lafarge Tarmac's and Hanson's participation in the GB cement markets, were features that gave rise to an AEC in the GB cement markets, resulting in higher prices for cement than might otherwise be the case. [Paragraph 8.292.]

93. As a result of our further analysis of GGBS, we consider that it is appropriate to augment this provisional finding by specifying more exactly the markets in which an AEC is found. We stated in our provisional findings report that Hanson had significant market power for the supply of GGBS in GB, and that the features we had identified were resulting in a prevention, restriction or distortion of competition both directly in the GGBS market itself, and also in the cement markets.<sup>38</sup> The body of evidence we have reviewed leads us to augment our provisional findings specifically to identify an AEC in relation to the GGBS market, to identify more clearly the adverse effects on

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<sup>38</sup> Indeed we set out in paragraph 8.291 of our provisional findings that Hanson had a degree of market power in relation to GGBS, resulting in higher GGBS prices in GB than might otherwise be the case. See also footnote 2 above on the CC's jurisdiction to find an AEC in any market within the UK, so long as the effect on competition results from a feature of a market for goods or services that are specified in the reference.

competition arising from the operation of the GGBS supply chain and its interaction with the GB cement markets.

94. Our augmented provisional findings in relation to the GGBS supply chain are as follows. We provisionally find that the following features of the GB cement markets combine to give rise to an AEC in the market for the supply of GGBS in GB (the AEC in GGBS) as well as for the supply of cement in GB (the GGBS-related AEC in cement), resulting in higher prices for GGBS and for cement than might otherwise be the case:

- (a) The extensive participation of Lafarge Tarmac and Hanson in both the GGBS supply chain on the one hand, and the GB cement markets on the other, whereby Lafarge Tarmac and Hanson are two of the top three GB cement producers and between them own all of the GBS and GGBS plants in GB.<sup>39</sup>
- (b) Lafarge Tarmac's entering into and maintaining of exclusive long-term agreements with GB steel producers for the supply by the GB steel producers of BFS for Lafarge Tarmac to produce GBS.<sup>40</sup>
- (c) Lafarge Tarmac and Hanson's entering into and maintaining of exclusive long-term agreements with each other for the supply by Lafarge Tarmac of GBS for Hanson to produce GGBS.<sup>41</sup>

***Customer detriment arising from the AEC in the GGBS market and the GGBS-related AEC in the cement market***

95. In the provisional findings, we set out our preliminary findings in relation to the detriment arising from the coordination in cement in paragraphs 8.271 to 8.273. We noted, in a footnote to paragraph 8.271, that:

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<sup>39</sup> This is a structural feature of the GB cement markets (and we recognise that this is also a characteristic of the GGBS market).

<sup>40</sup> The definition of a 'feature' of a market in section 131(2)(b) of the Enterprise Act provides that any conduct (whether or not in the market concerned) of any participants in the market concerned can be considered to be a feature of that market. It follows that Lafarge Tarmac and Hanson's conduct in the GGBS supply chain can be regarded as a feature of a 'relevant market', within the meaning of section 134(3) of the Act, namely the markets in cement.

<sup>41</sup> See previous footnote.

We also consider that there is material customer detriment in the GB cement markets arising from the features we identify in paragraph 8.292 that relate to arrangements for the production of GBS and GGBS and that give rise to a separate AEC in the GB cement markets. The profitability-based estimate of the detriment we present in the following paragraphs covers the detriment arising from coordination in cement and- in part- from the arrangements for the production of GBS and GGBS, in so far as these result in higher cement profitability than would otherwise be the case (our estimate does not cover other forms of detriment from the AEC arising from these arrangements, for example detriment arising from higher GGBS prices than might otherwise be the case). We expect to carry out further work on estimating the detriments arising from the AECs we have identified in the context of our work on remedies.

96. We now set out our estimates of the detriments which arise from the AEC in the GGBS market and the GGBS-related AEC in the cement markets. As set out in paragraph 94, we expect these AECs to result in customer detriment in the form of:
- (a) higher GGBS prices; and
  - (b) higher cement prices.

*Quantification of the detriment arising from high GGBS prices*

97. A standard approach to assessing the detriment associated with high GGBS prices is on the basis of industry profitability. Thus excess profits earned by Lafarge Tarmac and/or Hanson in the supply of GBS and GGBS in GB provide a measure of the amount by which GGBS prices are above the level that would prevail in a well-functioning market, with a consequent detriment to customers of GGBS and of other

products in which GGBS is incorporated (such as cement and RMX, as discussed further below).

98. Following publication of the provisional findings, we analysed the profitability of Hanson's GGBS operations and of Lafarge Tarmac's GBS operations, as set out in paragraphs 55 and 56 above and in Appendixes A and B. We did not find evidence of excess profitability in Lafarge Tarmac's GBS operations: our analysis of Lafarge Tarmac GBS profitability showed that the returns on capital employed are broadly in line with the estimate of Tarmac's cost of capital that has been previously used when assessing the profitability of cement (10 per cent). In contrast, we found that Hanson GGBS profitability was considerably in excess of the cost of capital for each year in the period 2007 to 2012 (see paragraph 56 and Appendix A). Using our analysis of Hanson profitability, we estimated that the overcharge in GGBS prices was of the order of £[10–15] per tonne for the period 2007 to 2012. We estimate the total detriment associated with high GGBS prices to be of the order of £15–20 million a year on average for the period 2007 to 2012.<sup>42</sup> Details of our calculations are set out in Appendix E. We note that the period for which we estimated this detriment includes a very severe and prolonged economic downturn. As a result of this, our estimate of overcharging for GGBS substantially underestimates the harm to customers that would be avoided by the introduction of effective measures to remedy AEC in the GGBS market and the GGBS-related AEC in the GB cement markets. This is discussed further in Section 6 of our provisional decision on remedies.
99. Those calculations are an estimate of the customer detriment flowing directly from the AEC we have identified in the GGBS market, in the form of excessively high GGBS prices. In addition to this, we also expect the GGBS-related AEC in the

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<sup>42</sup> This is likely to represent most of the detriment on cement prices arising from the GGBS-related AEC, though there is also additional detriment, which is incorporated in cement profitability, arising from the GGBS-related AEC. See paragraph 102.

cement markets to result in further customer detriment in the form of higher cement prices. In order to avoid double-counting we distinguish between two distinct ways in which cement prices are increased as a result of these AECs:

- (a) Substitution effect: because GGBS is a partial substitute to CEM I, a higher GGBS price is also likely to result in higher CEM I prices (this depends on the nature of competition in the cement market—see below).
- (b) Component effect: GGBS is a component of pre-blended cements (CEM II and CEM III), as opposed to CEM I which may instead be blended with GGBS (or PFA) at a downstream RMX production site.<sup>43</sup>

### *Substitution effect*

100. GGBS is a partial substitute to CEM I. The fact that the price of GGBS is higher than it would be in a well-functioning market is also likely to result in higher equilibrium prices for CEM I because the strength of the constraint on CEM I prices from substitution to GGBS will be less if GGBS prices are high. The strength of the impact will depend on:

- (a) The nature of competition in the cement market: if there is a lack of competition between cement producers, prices of outside options/less perfect substitutes will affect the equilibrium prices more than if there is some degree of competition in the cement market. Therefore the less prices of cement are constrained by competition within the cement market, the stronger the impact of higher GGBS prices on CEM I prices.
- (b) The elasticity of substitution between CEM I and GGBS: for a given GGBS price, the closer the substitution between CEM I and GGBS, the stronger the impact of the GGBS price on CEM I prices.

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<sup>43</sup> In the rest of this document, when we refer to RMX production, we mean all downstream use of cement in the manufacture of building products for onward sale.

101. As set out in paragraph 8.285 of our provisional findings, we provisionally concluded that there was coordination in the GB cement market among Cemex, Hanson and Lafarge, giving rise to an AEC in the cement market. Given this lack of competition in the cement market, we therefore consider that the additional impact of lack of competition in the GGBS market, and high prices of GGBS which would result from Hanson's market power, is likely to result in CEM I prices being higher than they would otherwise be if GGBS was a well-functioning market.
102. To the extent that cement prices rise as a result of the substitution effect described above, we would expect such higher prices to result in higher profits for GB cement producers. As such, part of the customer detriment that we have provisionally found to be associated with high cement prices (eg through our profitability analysis) may be attributed to the competition shortcomings in the GGBS supply chain and their consequent distortion of cement markets, rather than from coordination in cement. While we cannot separate the effect of coordination from the effect arising because shortcomings in competition in the GGBS supply chain, we consider that most of the detriment as measured by our cement profitability analysis is likely to result from the coordination AEC which is the more direct effect on cement profitability. The impact of higher GGBS prices on cement profitability is, in our view, less substantial, although nonetheless significant.

#### *Component effect*

103. As set out above, RMX is generally produced using as an input either pre-blended cements (CEM II and CEM III) or CEM I and GGBS or PFA blended at the RMX site. Therefore, higher prices of GGBS will result in higher costs of cement inputs to RMX producers, whether these producers purchase pre-blended cements or blend cement on site. Both of these cement-related detriments are captured by the calculations in Appendix E.

## Analysis of Hanson's profitability in the supply of GGBS

### Introduction

1. The purpose of this appendix is to analyse the profitability of the supply of GGBS by Hanson in GB<sup>1</sup> in accordance with the profitability framework adopted for each of the reference markets as set out in the provisional findings, Appendix 4.1. This framework sets out various purposes to which we seek to put the resulting profitability analysis and the methodological approach adopted to derive our chosen measure of profitability.
2. Most facets of the framework for assessing profitability, for example our chosen measure of profitability and the overarching framework to valuing a firm's asset base are common across all three reference products being investigated and as such were set out once in the provisional findings, Appendix 4.1. However, where we have tailored our approach specifically for the purposes of analysing the profitability of GGBS, we set out these GGBS-specific methodologies in this appendix.
3. We also explain how we have modelled the adjustments we have needed to make to convert the two inputs into our chosen measure of profitability, namely returns and capital employed prepared on a (modified) historical cost accounting (HCA) basis, on to a current cost accounting (CCA) basis,<sup>2</sup> the basis which we intended to use in our analysis.

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<sup>1</sup> Hanson has a depot in Belfast in Northern Ireland which is part of the UK but not GB. For the purposes of this analysis, there is no material distinction between Hanson's UK and GB operations, and therefore there has been no attempt to exclude the Northern Ireland element.

<sup>2</sup> See second footnote to paragraph 4.14 for an overview explanation of the (modified) HCA and CCA bases of preparation.

4. We make a distinction between adjustments to the basis of preparation, the need for which can and does vary between the different reference products, and the scope<sup>3</sup> of the operating revenues, costs, assets and liabilities relevant to our analysis, which does not. Furthermore the scope of what falls within our profitability analysis remains unaltered between the HCA and CCA bases of preparation. This means that any analysis of HCA profitability<sup>4</sup> we present reflects as far as practically possible our view of what is relevant, rather than necessarily the activities the firm itself would reflect within financial information prepared for its own purposes.
5. When responding to our request for information from Hanson so that we could undertake this profitability analysis, Hanson took the opportunity to supply us with a supplementary report that explained, in its view, the key factors that we should take into account when both undertaking and then subsequently interpreting this profitability analysis. We considered this report in detail when preparing this appendix and refer to it as appropriate.
6. In the request we sent Hanson we noted that we intended to take an approach to analysing GGBS profitability similar to the approach we had undertaken for its cement activities, ie restricting the scope of revenues, costs, assets and liabilities to operational assets<sup>5</sup> and assessing plant and machinery asset values on a current cost basis.

### **Structure of the appendix**

7. This appendix sets out:
  - (a) a short history of Hanson's/Civil and Marine's GB GGBS activities;

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<sup>3</sup> See Appendix 4.1, paragraphs 58–61.

<sup>4</sup> As explained in paragraph 46 the unadjusted profitability analysis reflects Hanson's estimation of the fair value as at 2006 and 2007 of its assets and liabilities.

<sup>5</sup> The scope as was set out within the provisional findings, Appendix 4.1, paragraphs 58–61.

- (b) overview of approach taken to assessing the profitability of Hanson's GB GGBS activities;
- (c) application of our approach to assessing Hanson's GGBS profitability;
- (d) results of the GGBS profitability analysis; and
- (e) findings from the GGBS profitability analysis.

### **A short history of Hanson's/Civil and Marine's GGBS activities**

8. Hanson acquired the UK business of Civil and Marine<sup>6</sup> in March 2006 for £[§] million. Civil and Marine owned the exclusive rights to undertake the grinding of GBS generated as a by-product of iron-making at GB steelworks to produce GGBS for sale in the UK.
  
9. Civil and Marine was founded by Mike Uren as a small shipping business in 1955. Mike Uren, a civil engineer by professional background, grew the business to become the UK's largest producer of GGBS—which is used as a substitute for cement.<sup>7</sup> According to Hanson, Civil and Marine had taken big risks in buying and establishing grinding mills at, or easily accessible to, each of the then four operational steelworks<sup>8</sup> in order to process GBS into GGBS. Civil and Marine had taken these risks on the basis of securing access to the slag from the steelworks via long-term exclusive contracts. Hanson further explained that Civil and Marine was the company that first marketed GGBS in a big way in the UK. At the time GGBS was not a generally acceptable product, the main cement substitute at the time being PFA.
  
10. Hanson further explained that it was only in the early 1990s that it became possible to switch at each individual blast furnace between (a) rapidly water-cooling the

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<sup>6</sup> The legal entity acquired by Hanson was Civil and Marine (Holdings) Ltd.

<sup>7</sup> [www.telegraph.co.uk/finance/2933435/Hanson-shells-out-400m-on-bolt-ons.html](http://www.telegraph.co.uk/finance/2933435/Hanson-shells-out-400m-on-bolt-ons.html).

<sup>8</sup> A further grinding mill was located at Purfleet on the River Thames near London to which GBS from the Teesside and Port Talbot steelworks could be shipped.

molten slag to produce a cementitious product (namely GBS), and (b) air-cooling the molten slag to produce a construction aggregate.

11. In the past most of the blast-furnace slag cement had been produced by grinding the slag and the clinker together. As slag was harder to grind than the clinker this 'inter-grinding' left the slag coarser than the cement, which was the exact opposite of the desirable situation. Grinding the slag separately from the cement had the advantage of permitting the slag and the cement to be ground to their own optimum finenesses. Another innovation was the separate marketing of the GGBS, with the slag and cement being combined downstream, for example, in the concrete mixer. This permitted proportions to be varied to suit the particular job needs. This procedure began in England in the 1970s.<sup>9</sup>
  
12. Mike Uren became involved in the commercial production of GGBS as least as early as 1993 when he became a director of North East Slag Cement Limited.<sup>10</sup> Exclusive contracts were negotiated with the producer of GBS at each of the then operational steelworks, Tarmac (now Lafarge Tarmac):  
  
1993 Scunthorpe (contract renegotiated in 1999)  
  
1999 Teesside (Redcar)  
  
1999 Port Talbot (near Swansea)<sup>11</sup>  
  
1999 Llanwern (near Newport)
  
13. Further information about the grinding stations associated with these steelworks is set out in Table 3 below. There was an additional investment in a grinding plant at Purfleet, on the north shores of the River Thames just inside the M25, to serve the

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<sup>9</sup> Donald W Lewis, PE, Chief Engineer, National Slag Association, *History of Slag Cements*, presented at University of Alabama Slag Cement Seminar, April 30 1981, p6:

[www.nationalslag.org/archive/legacy/nsa\\_181-6\\_history\\_of\\_slag\\_cements.pdf](http://www.nationalslag.org/archive/legacy/nsa_181-6_history_of_slag_cements.pdf). See also the discussion of GGBS under *Developments after 1970*, [www.cementkilns.co.uk/cement.html](http://www.cementkilns.co.uk/cement.html) (last edit 12/08/13) for a similar analysis.

<sup>10</sup> North East Slag Cement is now called now Civil & Marine Holdings Ltd, a subsidiary of Civil and Marine Limited.

<sup>11</sup> This contract (and the one for Llanwern) was with Civil and Marine Slag Cement Ltd.

London and South-East markets. As well as grinding home-produced GBS at its Purfleet works, Civil and Marine (now Hanson) also grinds into GGBS some GBS imported by sea from ArcelorMittal Ghent (a subsidiary of Mittal Steel) in Belgium.

14. The contracts agreed in 1999 gave Civil and Marine the exclusive right to grind GBS emanating from GB steelworks into GGBS for sale into the UK market for a further 30 years, ie until 2029.
15. The signing of these exclusive contracts occurred after the investment in some of the existing mills used to grind GBS into GGBS over the period of review. For example, the [redacted] at Purfleet were constructed in [redacted] and [redacted], the [redacted] associated with the Teesside steelworks was constructed in [redacted], and the [redacted] at Llanwern was built in [redacted]. Other investment occurred after the signing of the exclusive contracts, most notably the [redacted] at Purfleet in [redacted] and the [redacted] at Scunthorpe in [redacted].<sup>12</sup>
16. HeidelbergCement acquired Hanson in August 2007, a year or so after Hanson acquired Civil and Marine. Hanson now markets GGBS under the name of Regen (pronounced 're-gen' to enhance its environmentally friendly credentials).
17. The Llanwern steelworks was permanently closed in 2002. Civil and Marine (now Hanson) continued to grind some GBS at its Llanwern grinding station up until 2008 using GBS transported by road from Port Talbot. Production of steel at Teesside stopped in 2009 but resumed again in 2012. The grinding station at Llanwern was mothballed in 2008 and that at Teesport in 2009. Both these grinding stations remain mothballed, any grinding required of GBS produced at the Teesside steelworks being undertaken at Purfleet, to which the GBS can be shipped.

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<sup>12</sup> See paragraph 58 [redacted].

18. The steelworks at Scunthorpe and Port Talbot remain operational. Hanson highlighted that there had been speculation about the future of Port Talbot and Scunthorpe. There has also been very recent speculation about the future of the Teesside steel plant under its new owners but we understand from our own dealings with SSI that this reflects an overly pessimistic and out-of-date view.<sup>13,14</sup>

### **Overview of the approach taken to assessing the profitability of Hanson's GB GGBS activities**

19. As explained in the provisional findings, Appendix 4.1, we assess profitability in this market investigation by comparing the return on capital employed (ROCE) determined on a current cost basis with its cost of capital over a relatively limited and recent segment of the likely total lifespan of the fixed assets used in production where these assets are long-lived. The cost of capital used was a generic one applicable to all three reference markets being investigated, namely aggregates, cement and RMX.
20. The fixed assets needed to commercially produce GGBS from GBS are long-lived and we told Hanson that we planned to take the same approach to analysing GGBS profitability that we took with our analysis of the profitability of cement. The fixed assets needed to produce cement tend to have an even longer operational life than that of plant and machinery used to produce GGBS.
21. Hanson challenged the validity of our plan to analyse profitability using the same overall approach adopted for that for cement, for the following reasons:
- (a) assessing profitability over a limited segment of an activity's total life cycle;
  - (b) the use of a generic cost of capital for the assessment of GGBS; and
  - (c) the exclusion of certain intangible assets.

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<sup>13</sup> *The Sunday Times*, 'Teesside Steel in peril', 22 September 2013: [www.thesundaytimes.co.uk/sto/business/Industry/article1317013.ece](http://www.thesundaytimes.co.uk/sto/business/Industry/article1317013.ece) (article is behind a paywall).

<sup>14</sup> See paragraphs 52 & 53 for more information about Teesside.

### ***Assessment of profitability over a limited segment of an activity's total life cycle***

22. Hanson argued that a risk-adjusted returns approach (similar to that used in project appraisal) would be appropriate to calculate profitability as this would have been the thought process at the point where the 30-year contracts were struck and investments made.
23. Our analysis has focused on the profitability of Hanson's investment in GGBS (its period of ownership largely coincides with the period over which we have assessed its profitability). We have therefore been able to assess the returns that Hanson has made during the period of its ownership. We also note in paragraph 30 that American Appraisal estimated a cost of capital of 10.3 per cent for Civil and Marine at the time of Hanson's acquisition, indicating a similar risk to the one faced by the rest of Hanson's business.
24. We have no reason to believe that the Civil and Marine business accumulated substantial losses prior to Hanson's ownership that Hanson should now be recompensed for.
25. We therefore believe that the period over which we have conducted our analysis, including as it does a reduction in GGBS sales volumes and a difficult economic environment, is appropriate.

### ***Use of a generic 'cost of capital' for the assessment of GGBS***

26. The cost of capital we applied across all the relevant markets in this market investigation in our provisional findings was 10 per cent. Hanson disagreed with this approach, arguing that a higher cost of capital would be appropriate to reflect a venture as risky as that undertaken by Civil and Marine.

27. Hanson argued that the appropriate benchmark cost of capital was the one that applied when the original investments and 30-year contracts were struck. This cost of capital would have been higher than 10 per cent for various reasons including: Civil and Marine being a small, private company and the significant risk this type of long-lived, relationship-specific investment would have created.
28. Hanson proposed that a risk premium should be included in the WACC that we used to assess the profitability of its GGBS business 'given the significant risks that faced the GGBS business at its start (and that it continues to face today)'. In addition Hanson stated that 'the appropriate benchmark against which to compare returns is the cost of capital that faced the business at the point of making the investment (when the 30 year contracts were entered into), ie the WACC that faced Civil and Marine is the relevant benchmark'.
29. We considered these arguments, noting that there may have been some risk incurred at the start of the project some 15 years ago when Civil and Marine entered into the 30-year contracts (and before Hanson acquired the business), although we have received no evidence of the scale of those risks given that slag had been used in cement for many years. We have also received no evidence that the business continues to face any such risks. Hanson indicated that Civil and Marine may have faced initial low returns, although Hanson also stated that the profitability of GGBS had fallen very significantly.
30. In 2006, when Hanson acquired Civil and Marine, it was a profitable business with a stable customer base and secure supply agreements and was not suffering from low returns. Hanson did not appear to have taken a risk in acquiring the business at this stage for which it should be rewarded for now.

31. We note that Hanson has not suffered low returns at the start of its ownership which needed to be recouped later: the time period over which we are assessing its profitability is very similar to the period of Hanson's ownership.
32. We considered whether it would be reasonable for a business that accumulated losses in the early years of its life to earn profits substantially in excess of its cost of capital in later years that offset these early losses.
33. We have seen no evidence that the GGBS business acquired by Hanson had accumulated losses in the period before Hanson's ownership. If any losses had been accumulated by the Civil and Marine business, we have received no evidence that these losses were so substantial that Hanson would not have already been remunerated for them during the last six years (noting our finding of profits in each of these years in excess of its cost of capital). Finally we have no reason to believe that Hanson should continue to be rewarded with profits substantially in excess of its cost of capital in the future.
34. We also note that the cost of capital in the DCF analysis used by [REDACTED] in the purchase price allocation report commissioned by Hanson<sup>15</sup> was 10.3 per cent for the GGBS UK operations and that this is very close to the cost of capital which we consider appropriate to assess its profitability.
35. We therefore do not consider that the appropriate cost of capital should be that faced by Civil and Marine in 1999 (or earlier). We consider that the cost of capital we have used in our analysis of the rest of Hanson's operations is also appropriate to our assessment of GGBS and that it would be wrong to ascribe a higher cost of capital in our analysis.

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<sup>15</sup> See paragraph 58 for more details about this report.

### ***Scope of revenues, costs & assets and liabilities included/exclusion of intangibles***

36. In line with our previously articulated approach as referred to in paragraph 6 we requested that only the operational revenues, costs, assets and liabilities be included in Hanson's response. Intangible operational assets would only be considered to be included in the analysis if they were separable, ie they must be capable of being purchased separately from purchasing the business as a whole.<sup>16</sup> Hanson argued that we had unjustifiably excluded the intangible asset associated with its capitalized supply agreements with Tarmac.
37. We have therefore looked more closely as what the capitalized supply agreement asset within Hanson's intangible operating assets relates to. The value of the supply agreements was estimated by [X] as part of the exercise to attribute the price Hanson paid for its acquisition of Civil and Marine across the assets and liabilities of the businesses acquired, with any residual which had not been able to be attributed to an asset or liability recognized under international accounting standards being ascribed to goodwill.
38. [X] adopted the 'direct income' approach, commonly referred to as the discounted earnings method under the cost savings method, to estimate the value of the Supply Agreements. This approach identifies the cost savings associated with ownership of a particular asset when non-ownership would lead to the likelihood of higher operating costs.
39. According to [X] the extra costs likely to be incurred if Hanson had to purchase GBS from suppliers other than Tarmac (eg from mainland Europe) would be on average £6 per tonne for the purposes of this calculation. Although these supply agreements

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<sup>16</sup> As explained in the provisional findings, Appendix 4.1, paragraph 67.

had a further 24 years unexpired life at the date Hanson acquired Civil and Marine, [X] limited its evaluation of the extra costs that Hanson would incur should the supply agreements need to be replaced to the period of time that Hanson would need to replace the Tarmac supply of GBS with GBS sourced from another supplier, and not the whole of the length of the exclusive supply agreement.

40. From Hanson's perspective these supply agreements are indeed a valuable intangible asset associated with its purchase of the Civil and Marine business. However, the value to Hanson derives from the fact that any UK-based would-be competitor would face a permanent cost disadvantage for the essential input into the production of GGBS for the next 24 years estimated by [X] to be worth around £6 per tonne of GBS in 2006 prices.
  
41. As we are attempting to assess the profitability of Hanson as if it operated in a situation where the inputs to the production process were available at the price they would fetch in a competitive market (see the provisional findings, Appendix 4.1, paragraph 65), it would be inappropriate to include these assets in our analysis as this would make the exercise circular. We therefore excluded this asset from our analysis.

### **Application of our approach to assess Hanson's GB GGBS profitability**

42. We present profitability assessed on two bases, the first determined using the asset values used by Hanson in its own reporting and the second based on valuing assets on a current cost basis. The rest of this subsection primarily focuses on the adjustments needed to restate the first basis on to the second. However, we also discuss the nature of the asset values used by Hanson in its own reporting.

43. The information provided by Hanson relates to its GGBS activities as carried out from the beginning of 2008 through its subsidiary Civil and Marine Limited. The figures provided for 2011 and 2012, both regarding the profit and loss and balance sheet, have been reconciled to the audited financial statements for 2011 and draft statements for 2012.

***The approach taken to determine the current cost values for GGBS assets***

44. As explained in Appendix 4.1 we seek to value long-lived assets which are worth replacing using the modern equivalent asset (MEA) principle. Here the gross MEA value is what it would cost to replace an old asset with a technically up-to-date new one with the same service capability, allowing for any differences both in the quality of output and in operating costs. The net MEA value is the depreciated value taking into account the remaining service potential of an old asset compared with a new one.
45. Normally the carrying value of long-lived assets in firms' accounting statements can, among other things, be eroded by the cumulative impact of price inflation over a significant period. However, the GGBS assets acquired by Hanson from Civil and Marine were revalued on to a fair value basis as at March 2006 for the purposes of their incorporation into the then Hanson's group financial statements. These values, suitably further depreciated and/or impaired, have been used for internal management reporting purposes ever since<sup>17</sup> and were the values supplied to us in Hanson's information response.

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<sup>17</sup> A subsequent revaluation of these GGBS assets was not deemed to be further needed for HeidelbergCement group reporting purposes when HeidelbergCement acquired Hanson in August 2007 owing to the relatively short lapse in time between the two events.

## ***Valuation of tangible fixed assets and associated depreciation***

46. For the purpose of this analysis we have adopted two approaches to valuing tangible fixed assets:

- (a) At the carrying values used by Hanson for management purposes. These are the values provided by Hanson in its information response. These values relate to the 'fair values'<sup>18</sup> as assessed by American Appraisal as at March 2006 when Hanson acquired Civil and Marine and again when HeidelbergCement acquired Hanson in August 2007.<sup>19</sup> We refer to this approach as 'based on fair values at 2006/07'.
- (b) At an estimate of the net replacement cost of the tangible assets at each of the five grinding stations now owned by Civil and Marine Limited using Hanson's estimate of the gross cost of replacing the assets it supplied. We refer to this approach as 'on a current cost basis'.

47. Hanson provided us with a report in which it set out its view of the gross replacement cost of the assets, site by site, at each of its GB operational sites.<sup>20</sup> This report had been prepared by the technical operations manager of its GB GGBS activities, [X]. Hanson explained that he had 25 years' experience in engineering, maintenance, capital projects and operational improvement within the GGBS business. The gross replacement cost estimates reflected a combination of approaches, mainly based on inflated historical costs inflated at 3.3 per cent per year<sup>21</sup> but with some reference to the cost of similar equipment acquired more recently. We used the cost figures summarized in this report as an input into our net replacement cost estimates (reduced by depreciation as described below in paragraph 51).

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<sup>18</sup> Fair value is the amount which an asset could be exchanged between knowledgeable, willing, in an arm's length transaction (IAS16, the Property Plant and Equipment international accounting standard). In practice fair value can mean either net replacement cost, net realizable value or value in use. The valuation basis for plant and machinery was depreciated replacement cost.

<sup>19</sup> Hanson explained that the view taken in August 2007 was that another 'fair value' valuation exercise was not necessary due to the relatively short time that had elapsed since the previous 'fair value' valuation exercise. There had been no further fair valuation exercises since.

<sup>20</sup> GGBS Plants, Replacement Costs Estimate, 29 August 2013

<sup>21</sup> Under 'assumptions' the report referred to inflation rates 'based on the Bank of England inflation calculator'.

48. A comparison of the values given for plant and machinery assets on the 2006/07 fair value basis (Table 2) and on a current cost basis, ie estimate of net replacement cost (Table 5) shows that there is a significant disparity between these two values.
49. There appears to have been a modest need for further capital investment in the recent past on the part of Hanson. The cost of tangible fixed asset additions in Civil and Marine Limited's statutory accounts has ranged between £[redacted] and £[redacted] per year over the period 2008 to 2012.<sup>22</sup>

#### *Approach to depreciation*

50. Under the first approach the carrying values in Hanson's management accounts already reflected depreciated amounts. Hanson depreciation methodology is straight-line over asset lives up to 25 years. There was no need to modify the depreciation charges shown in the profit and loss account as these were consistent with the approach to asset valuation in the balance sheet.
51. Under the second approach we modelled depreciated asset values also on the basis of straight-line depreciation but this time across 30 years, the period over which Hanson suggested. We calculated a revised depreciation charge to be consistent with the modelled depreciated asset values.

#### ***Treatment of impairment during the period of review***

52. One of the steelworks—that at Teesside—was mothballed by its then owner, Tata Steel, in 2009 during the period of review after the customers who had agreed to buy its steel ended that agreement. In turn Hanson also mothballed its nearby grinding station at Teesport which had up to that time processed all of the GBS output from

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<sup>22</sup> We have not taken into account Hanson's limited investment in its business during the period of review in the modelling of asset values.

Teesside. Hanson recognized an impairment of £[redacted] million of its Teesport assets in both its statutory and management accounts in that year.

53. Subsequently Tata was able to sell the Teesside steelworks to SSI who wanted to acquire steel production capacity in the UK to vertically integrate with its downstream operations. When production of steel at Teesside resumed in April 2012, Hanson decided to ship all the GBS output from Teesside to its plant at Purfleet for subsequent processing into GGBS. [redacted]
54. Another of Hanson's grinding plants is co-located within the former steelworks at Llanwern, which closed in 2002. Hanson continued to use its facilities at Llanwern by transporting some of the GBS output of Port Talbot by road to the Llanwern plant to be ground into GGBS. No grinding activity has taken place at Llanwern, however, since 2008 when Hanson mothballed the plant. Hanson has not impaired this plant. In the 2012 profit and loss account figures it supplied us, and which are included in the analysis presented, Hanson identified £[redacted] of operating costs relating to Llanwern, of which £[redacted] related to depreciation.
55. As explained in our updated cement profitability analysis, our preferred approach towards the treatment of impairment losses is to recognize these losses in our analysis only when the firm itself has impaired the assets in question in its own accounts and/or when the firm has permanently retired the assets. This means that in our analysis across the six years between 2007 and 2012 we have [redacted]. This latter plant is reflected at its depreciated value throughout the period of analysis.

### ***Calculation of profitability on a current cost basis***

56. We did not need to make any adjustment to the asset values, and the associated depreciation and impairment charges, provided by Hanson to calculate profitability at

the carrying values used by Hanson for management purposes (approach (a) referred to in paragraph 46). However, in order to estimate the net replacement cost of Hanson's assets (approach (b) referred to in paragraph 46) we needed to establish both the dates at which the plant and machinery was acquired at each of its grinding stations and its replacement cost.

*Estimation of the net replacement cost of plant and machinery, depreciation and impairment charges*

57. Hanson was not able to definitively confirm the dates of Civil and Marine's first investment in grinding stations at each of its locations as Hanson had only acquired the business in 2006. Hanson explained it understood that investments commenced in 1993 when the first exclusive contract was signed in respect of Scunthorpe. The investments continued through to 1999 when exclusive contracts in respect of GBS output from the other three then operational GB steelworks were first signed. Some of the historical earlier investment in grinding plant and property may have commenced earlier than 1993.<sup>23</sup>
58. Hanson provided us with a copy of the report it commissioned to allocate the price it had paid for Civil and Marine (Holdings) Ltd across the tangible and intangible assets and liabilities it had acquired, so that it could account for this acquisition in its group accounts in accordance with the relevant international accounting standards, most notably International Financial Reporting Standard (IFRS) 3 on Business Combinations.<sup>24</sup> In this report there is a table of the key operational features of the European sites Hanson acquired. For each operational location the mill type is given and the year in which it was built. We have used the years in which each of the mills was built, as provided in this table, as the dates from which the gross values attributed to plant and machinery for each site should be depreciated.

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<sup>23</sup> The article on the history of slag cement referred to in the footnote to paragraph 11 implies that separate grinding of slag (or GBS) started in England in the 1970s.

<sup>24</sup> [X]

59. We estimated the net replacement cost at 31 December from 2006 (ie as at 1 January 2007) through to 2012 as follows:
- (a) We restated the replacement cost estimates we had been provided as described in paragraph 47 (assumed to be as at 1 January 2013 prices) on to 1 January 2007 prices by deflating these costs for six years by the same annual average inflation rate of 3.3 per cent per year that Hanson had used to restate Civil and Marine's historical investments onto current prices.
  - (b) We modelled the net replacement cost of plant and machinery in 1 January 2007 prices at each balance sheet date on a straight-line depreciation basis using the years in which each of the mills had been built as described in paragraph 58 as the date of acquisition for depreciation purposes. We assumed that the assets had a useful economic life of 30 years, the life Hanson told us in its information response that it believed these assets had.
  - (c) We calculated (expected) operating capability maintenance<sup>25</sup> (OCM) depreciation charges for each year of our analysis as the difference between the opening and closing balance sheet values.
  - (d) We modelled the impairment charge (ie unexpected depreciation) as the write-off in the year of mothballing of the carrying value of those assets which Hanson impaired in its accounts.
  - (e) Finally we restated all these values (ie net replacement cost estimate, the depreciation charge and the impairment charge) in nominal prices, rather than 1 January 2007 prices. We did this by inflating the costs by 3.3 per cent per year as necessary. 'Holding gains' were calculated as the difference between the nominal change in net asset value between the adjacent balance sheet dates and the OCM depreciation charge in nominal terms.

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<sup>25</sup> Maintenance of the ability to supply the amount of goods and services which a business is able to supply with its existing resources in the relevant period. This definition is as set out in the glossary of the Byatt Report, Volume II, p136.

### *Treatment of land in the current cost analysis*

60. Land was treated separately from plant and machinery as land is not a depreciable asset, ie unlike plant and machinery its value is not 'consumed' with use or the passing of time. As for plant and machinery the values provided by Hanson (this time as at 1 January 2007) were inflated by the generic inflation rate, 3.3 per cent from year to year. The increase in the nominal value of land from year to year was included in the profit and loss as a holding gain.

### *Restatement of the profit and loss account on a current, rather than a modified historical cost, basis*

61. We substituted the values given by Hanson to its plant and machinery assets, and the related depreciation and impairment charges, with the estimates for their equivalents we generated on a current cost basis as described in paragraphs 58 to 59. We did the same for the values given by Hanson to its land values as described in paragraph 60.

### ***Approach taken to central costs***

62. When analysing profitability it is important to take account of all costs causally related (but only those costs causally related) to the production, distribution and sale of GGBS into account.
63. Since 2008 (after the acquisition of Hanson by Heidelberg in August 2007) Hanson has attributed [£] per year of costs not incurred at the local operational level (ie not incurred by Civil and Marine Limited) to its GGBS activities. These have been split between costs incurred in the UK by Hanson and a smaller level of costs incurred by Heidelberg. Hanson took a similar approach when attributing 'central' costs to its GB cement activities. Hanson has attributed [£] per year of these 'central' costs to its cement activities since 2008. In revenue terms the GB cement business is roughly worth double the GGBS business (2011 revenues were [£] for cement versus [£])

for GGBS), which may suggest that Hanson may be over-attributing these costs to its GGBS activities.

64. In its reconciliation between the numbers it supplied us and the numbers appearing in its statutory accounts, Hanson identified some Hanson Quarry Products Europe (HQPE) 'overheads' costs of the order of [£] per year that it books in its statutory accounts. Hanson explained the difference in these costs as being attributable to 'varying accounting methodologies'. It further explained that, although there is a difference in the figures, it had not 'over-attributed' central costs to its GGBS activities.
65. For the time being, however, the profitability analysis presented uses Hanson's estimate of central costs incurred by its GGBS activities but which are not incurred at the local operational level by Civil and Marine Limited. In this respect it seems likely that profitability will be understated.

### **Results of the GGBS profitability analysis**

66. Below we provide six tables setting out across the six years from 2007 to 2012 for Hanson's GB GGBS activities:
- (a) the profit and loss account based on 2006/07 fair values (Table 1);
  - (b) the balance sheet based on 2006/07 fair values (Table 2).
  - (c) the profit and loss account on a current cost basis (Table 4);
  - (d) the balance sheet on a current cost basis (Table 5);
  - (e) summary financial results based on 2006/07 fair values and calculation of ROCE thereon (Table 6); and
  - (f) summary financial results and calculation of ROCE thereon based on current costs (Table 7).

67. There is a further table (Table 3) which sets out a breakdown provided by Hanson of its estimate of the gross replacement cost of the plant and value of the land at its grinding stations and depots. GGBS production volumes at each site over the six years from 2007 to 2012 have also been given in this table.

TABLE 1 Profit and loss account for Hanson's GGBS activities over the period 2007 to 2012 based on 2006/07 fair values

	<i>£ million unless otherwise stated</i>					
	2007	2008	2009	2010	2011	2012
<i>Volumes</i>						
Sales volumes (tonnes millions)	[X]	[X]	[X]	[X]	[X]	[X]
<i>Prices</i>						
Gross unit price (£ per tonne)	[X]	[X]	[X]	[X]	[X]	[X]
<i>Sales value</i>						
Sales	[X]	[X]	[X]	[X]	[X]	[X]
Distribution costs	[X]	[X]	[X]	[X]	[X]	[X]
Net sales	[X]	[X]	[X]	[X]	[X]	[X]
<i>Variable costs</i>						
GBS purchases from Tarmac*	[X]	[X]	[X]	[X]	[X]	[X]
Raw materials other	[X]	[X]	[X]	[X]	[X]	[X]
Electricity	[X]	[X]	[X]	[X]	[X]	[X]
Fuels	[X]	[X]	[X]	[X]	[X]	[X]
Other 'variable' costs	[X]	[X]	[X]	[X]	[X]	[X]
Total 'variable' costs	[X]	[X]	[X]	[X]	[X]	[X]
Gross margin	[X]	[X]	[X]	[X]	[X]	[X]
<i>Fixed costs</i>						
Depreciation†	[X]	[X]	[X]	[X]	[X]	[X]
Impairment on Teesport assets	[X]	[X]	[X]	[X]	[X]	[X]
Wages & salaries	[X]	[X]	[X]	[X]	[X]	[X]
Repairs & maintenance	[X]	[X]	[X]	[X]	[X]	[X]
Other expenses	[X]	[X]	[X]	[X]	[X]	[X]
Restructuring costs	[X]	[X]	[X]	[X]	[X]	[X]
General & administrative costs‡	[X]	[X]	[X]	[X]	[X]	[X]
Other operating income	[X]	[X]	[X]	[X]	[X]	[X]
Subtotal 'fixed' costs	[X]	[X]	[X]	[X]	[X]	[X]
<i>Apportioned costs</i>						
Central costs incurred in the UK	[X]	[X]	[X]	[X]	[X]	[X]
Central costs incurred in Europe	[X]	[X]	[X]	[X]	[X]	[X]
Operating profit	[X]	[X]	[X]	[X]	[X]	[X]

Source: CC analysis based on Hanson's 30/07/13 response to information request.

\*Hanson was only able to split its purchase of raw material between Tarmac (for GBS) and other suppliers from 2009.

†Depreciation charge is as included in Hanson's response and is based on fair values as at 2006/ 2007.

‡These are the general and administrative costs incurred by the Civil and Marine business.

TABLE 2 Balance sheet for Hanson's GGBS activities over the period 2007 to 2012 based on 2006/07 fair values

	<i>£ million</i>					
	2007	2008	2009	2010	2011	2012
<i>Fixed assets</i>						
Plant & machinery	[X]	[X]	[X]	[X]	[X]	[X]
Impairment on Teesport assets	[X]	[X]	[X]	[X]	[X]	[X]
Land & buildings	[X]	[X]	[X]	[X]	[X]	[X]
Fixtures, fittings etc	[X]	[X]	[X]	[X]	[X]	[X]
<i>Net current assets</i>						
Stock	[X]	[X]	[X]	[X]	[X]	[X]
Trade debtors	[X]	[X]	[X]	[X]	[X]	[X]
Other operational debtors	[X]	[X]	[X]	[X]	[X]	[X]
Accruals and deferred income	[X]	[X]	[X]	[X]	[X]	[X]
Other creditors	[X]	[X]	[X]	[X]	[X]	[X]
Trade creditors	[X]	[X]	[X]	[X]	[X]	[X]
<i>Provisions</i>						
Restoration	[X]	[X]	[X]	[X]	[X]	[X]
Onerous lease + restructuring	[X]	[X]	[X]	[X]	[X]	[X]
<i>Net assets</i>						
At carrying value after impairment	[X]	[X]	[X]	[X]	[X]	[X]
Average capital employed	[X]	[X]	[X]	[X]	[X]	[X]

Source: CC analysis based on Hanson's 30/07/13 response to information request.



TABLE 4 Profit and loss for Hanson's GGBS activities over the period 2007 to 2012 on a current cost basis

*£ million unless otherwise stated*

	2007	2008	2009	2010	2011	2012
<i>Volumes</i>						
Sales volumes (tonnes millions)	[x]	[x]	[x]	[x]	[x]	[x]
<i>Prices</i>						
Gross unit price (£ per tonne)	[x]	[x]	[x]	[x]	[x]	[x]
<i>Sales value</i>						
Sales	[x]	[x]	[x]	[x]	[x]	[x]
Distribution costs	[x]	[x]	[x]	[x]	[x]	[x]
Net sales	[x]	[x]	[x]	[x]	[x]	[x]
<i>Variable costs</i>						
GBS purchases from Tarmac*	[x]	[x]	[x]	[x]	[x]	[x]
Raw materials other	[x]	[x]	[x]	[x]	[x]	[x]
Electricity	[x]	[x]	[x]	[x]	[x]	[x]
Fuels	[x]	[x]	[x]	[x]	[x]	[x]
Other 'variable' costs	[x]	[x]	[x]	[x]	[x]	[x]
Total 'variable' costs	[x]	[x]	[x]	[x]	[x]	[x]
Gross margin	[x]	[x]	[x]	[x]	[x]	[x]
<i>Fixed costs</i>						
OCM depreciation†	[x]	[x]	[x]	[x]	[x]	[x]
Holding gains	[x]	[x]	[x]	[x]	[x]	[x]
Impairment on Teesport P&M assets			[x]			
Wages & salaries	[x]	[x]	[x]	[x]	[x]	[x]
Repairs & maintenance	[x]	[x]	[x]	[x]	[x]	[x]
Other expenses	[x]	[x]	[x]	[x]	[x]	[x]
Restructuring costs	[x]	[x]	[x]	[x]	[x]	[x]
General & administrative costs‡	[x]	[x]	[x]	[x]	[x]	[x]
Other operating income	[x]	[x]	[x]	[x]	[x]	[x]
Subtotal 'fixed' costs	[x]	[x]	[x]	[x]	[x]	[x]
<i>Apportioned costs</i>						
Central costs incurred in the UK	[x]	[x]	[x]	[x]	[x]	[x]
Central costs incurred in Europe	[x]	[x]	[x]	[x]	[x]	[x]
Operating profit	[x]	[x]	[x]	[x]	[x]	[x]

Source: CC analysis based on Table 1.

\*Hanson was only able to split its purchase of raw material between Tarmac (for GBS) and other suppliers from 2009.  
 †OCM (operating capability maintenance) depreciation, holding gains and impairment charges are based on current costs.  
 ‡These are the general and administrative costs incurred by the Civil and Marine business.

TABLE 5 Balance sheet for Hanson's GGBS activities over the period 2007 to 2012 on a current cost basis

	£ million					
	2007	2008	2009	2010	2011	2012
<i>Fixed assets</i>						
Plant & Machinery	[x]	[x]	[x]	[x]	[x]	[x]
Land (& Buildings)	[x]	[x]	[x]	[x]	[x]	[x]
Fixtures, fittings etc	[x]	[x]	[x]	[x]	[x]	[x]
<i>Net current assets</i>						
Stock	[x]	[x]	[x]	[x]	[x]	[x]
Trade debtors	[x]	[x]	[x]	[x]	[x]	[x]
Other operational debtors	[x]	[x]	[x]	[x]	[x]	[x]
Accruals and deferred income	[x]	[x]	[x]	[x]	[x]	[x]
Other creditors	[x]	[x]	[x]	[x]	[x]	[x]
Trade creditors	[x]	[x]	[x]	[x]	[x]	[x]
<i>Provisions</i>						
Restoration	[x]	[x]	[x]	[x]	[x]	[x]
Onerous lease + restructuring	[x]	[x]	[x]	[x]	[x]	[x]
<i>Net assets</i>						
At carrying value after impairment	[x]	[x]	[x]	[x]	[x]	[x]
Average capital employed	[x]	[x]	[x]	[x]	[x]	[x]

Source: CC analysis based on Table 2.

TABLE 6 Summary financial results for Hanson's GGBS activities based on 2006/07 fair values and calculation of ROCE thereon over the period 2007 to 2012

	£ million for profits and capital employed/% for ROCE						
	2007	2008	2009	2010	2011	2012	Average
<i>Profit and loss account</i>							
Profits before impairment	[x]	[x]	[x]	[x]	[x]	[x]	[x]
Impairment	[x]	[x]	[x]	[x]	[x]	[x]	[x]
Profits after impairment	[x]	[x]	[x]	[x]	[x]	[x]	[x]
<i>Balance sheet</i>							
Capital employed before impairment	[x]	[x]	[x]	[x]	[x]	[x]	[x]
Capital employed after impairment	[x]	[x]	[x]	[x]	[x]	[x]	[x]
<i>ROCE</i>							
Before impact of impairment	[x]	[x]	[x]	[x]	[x]	[x]	[45–50]
After impact of impairment	[x]	[x]	[x]	[x]	[x]	[x]	[45–50]

Source: CC analysis based on Tables 1 and 2.

Note: Calculated averages do not take account of changes to the value of money over the period of review.

TABLE 7 **Summary financial results for Hanson's GGBS activities on a current cost basis and calculation of ROCE thereon over the period 2007 to 2012**

	<i>£ million for profits and capital employed/% for ROCE</i>						
	2007	2008	2009	2010	2011	2012	Average
<i>Profit and loss account</i>							
Profits before impairment	[X]	[X]	[X]	[X]	[X]	[X]	[X]
Impairment	[X]	[X]	[X]	[X]	[X]	[X]	[X]
Profits after impairment	[X]	[X]	[X]	[X]	[X]	[X]	[X]
<i>Balance sheet</i>							
Capital employed before impairment	[X]	[X]	[X]	[X]	[X]	[X]	[X]
Capital employed after impairment	[X]	[X]	[X]	[X]	[X]	[X]	[X]
<i>ROCE</i>							
Before impact of impairment	[X]	[X]	[X]	[X]	[X]	[X]	[25–30]
After impact of impairment	[X]	[X]	[X]	[X]	[X]	[X]	[25–30]

Source: CC analysis based on Tables 4 and 5.

Note: calculated averages do not take account of changes to the value of money over the period of review.

## Findings from the GGBS profitability analysis

68. As shown in Tables 6 and 7 above, profitability (ROCE) measured under the two approaches set out in paragraph 46 over the period of review (2007 to 2012), and regardless of whether it is evaluated before or after impairment, is well in excess of the 10 per cent estimate of the relevant cost of capital for Hanson's GB GGBS activities.

69. As already mentioned in paragraph 48, there is a significant disparity between the book values for tangible fixed assets, which are based on fairly recently (ie 2006 & 2007) assessed fair values, and the estimate of the net replacement cost of these assets. Even so, profitability using these higher values is still substantially above the 10 per cent cost of capital we regard as relevant here.

## Trend in profitability over the period of review

70. Volumes of GGBS sales have fallen by over [X] per cent during the period of review and in consequence the level of profits and associated profitability has fallen in response, particularly from 2009 onwards. This was the year in which Hanson mothballed and impaired its assets at Teesport. Profitability, however, remains well

above the costs of capital with there being plenty of spare capacity to process GBS into GGBS should demand pick up in the future.

71. Hanson has explained that levels of profitability have reduced in recent years as a result of the drop in demand and, because the production of GGBS is very energy intensive (more so than for cement), and most recently by the rise in the cost of electricity by 20 per cent from 2011 to 2012.

### **Further information on Hanson's accounting treatment of its GB GGBS activities**

1. The purpose of this annex is to explain why the GGBS assets and liabilities reflected in Hanson's internal reporting management came to be based on 2006 and 2007 fair values. As previously explained in paragraph 8, Hanson acquired the UK business of Civil and Marine business in March 2006.

### **The incorporation into Civil and Marine Limited of the trade and net assets of associated with the GGBS activities**

2. The term 'hive up' is commonly used to describe a type of restructure within a group of companies when the net assets of, and business undertaken by, a subsidiary are transferred up into the parent company.<sup>1</sup> This is what occurred on 31 December 2007 when Civil and Marine Limited, the legal entity through which Hanson has conducted its GGBS activities since this date, acquired the trade and net assets/net liabilities of:<sup>2</sup>
  - (a) Civil and Marine Slag Cement Limited (this had the contracts for Port Talbot and Llanwern) for £161 million;
  - (b) Civil and Marine (Holdings) Limited (formerly North East Slag Cement Ltd which had the contracts for Scunthorpe and Teesside) for £25 million;
  - (c) Appleby Group Limited for £74 million (NB Appleby is near Scunthorpe); and
  - (d) The Purfleet Ship to Shore Conveyor Company Limited for £75,000.
  
3. When a company acquires shares in another, separate recognition of goodwill is not appropriate. However, where the underlying trade and assets are then subsequently 'hived up' to the parent, companies are required to value the assets (and liabilities) so transferred at their fair value, for example at depreciated replacement cost.

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<sup>1</sup> Definition taken from [www.icaew.com/en/members/advisory-helplines-and-services/technical-faqs/hive-up-accounting](http://www.icaew.com/en/members/advisory-helplines-and-services/technical-faqs/hive-up-accounting).

<sup>2</sup> Directors' Report, Report and Financial Statements in respect of year ended 31 December 2007 for Civil and Marine Limited, p1

According to the analysis shown in the 2007 accounts for Civil and Marine Limited, it was Hanson's judgement that the tangible fixed assets so acquired equated to their existing book values.

4. This may suggest that the book asset values provided to us, and used in this analysis, are fair values. If this were to be the case then Hanson's book value may not be a completely out-of-date proxy for the MEA value for these assets.

#### **Differences between Hanson's statutory and internal accounting for its GB GGBS activities**

5. The main difference between the information provided by Hanson, and analysed below, and that given in the statutory financial statements, relating to its *operations* appears to relate to the treatment of tangible fixed assets. For the purposes of preparing its statutory accounts for Civil and Marine Limited, Hanson appears to reverse out (the relatively modest) Hanson's fair value adjustments, so that the asset values in the balance sheet and depreciation charges in the profit and loss account are shown at historical cost.

## Tarmac's profitability in the supply of GBS

### Introduction to the appendix

1. The purpose of this appendix is to analyse the profitability of the supply of GBS by Tarmac in GB over the period 2007 to 2012 in accordance with the profitability framework adopted for each of the reference markets as set out in the provisional findings, Appendix 4.1. This framework sets out various purposes to which we seek to put the resulting profitability analysis and the methodological approach adopted to derive our chosen measure of profitability.
2. Most facets of the framework for assessing profitability, for example our chosen measure of profitability and the overarching framework to valuing a firm's asset base are common across all three reference products being investigated and as such were set out once in the provisional findings, Appendix 4.1. However, where we have tailored our approach specifically for the purposes of analysing the profitability of GBS, we set out these GBS-specific methodologies in this appendix.
3. We also explain how we have modelled the adjustments we have needed to make to convert the two inputs into our chosen measure of profitability, namely returns and capital employed prepared on a (modified) historical cost accounting (HCA) basis, on to a current cost accounting (CCA) basis,<sup>1</sup> the basis which we intended to use in our analysis.
4. We make a distinction between adjustments to the basis of preparation, the need for which can and does vary between the different reference products, and the scope<sup>2</sup> of the operating revenues, costs, assets and liabilities relevant to our analysis, which

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<sup>1</sup> See the second footnote to paragraph 4.14 of the provisional findings for an overview explanation of the (modified) HCA and CCA bases of preparation.

<sup>2</sup> See the provisional findings, Appendix 4.1, paragraphs 58–61.

does not. Furthermore the scope of what falls within our profitability analysis remains unaltered between the HCA and CCA bases of preparation. This means that any analysis of HCA profitability we present reflects as far as practically possible our view of what is relevant, rather than necessarily the activities the firm itself would reflect within financial information prepared for its own purposes.

5. Our analysis uses data supplied by Lafarge Tarmac.<sup>3</sup> In our information request to Lafarge Tarmac we noted that we intended to take an approach to analysing GBS profitability similar to the approach we had undertaken for its cement activities ie restricting the scope of revenues, costs, assets and liabilities to operational assets and assessing plant and machinery asset values on a current cost basis.

### **Structure of the appendix**

6. The rest of this appendix sets out:
  - (a) a short history of Tarmac's GBS activities;
  - (b) approach taken to analysing GBS profitability;
  - (c) results of the GBS profitability analysis; and
  - (d) findings from the GBS profitability analysis.

### ***A short history of Tarmac's GBS activities***

7. GBS is one of two construction material products that can be generated as a by-product of iron-making at steel works. GBS is the glassy, granular product resulting from the *rapid*<sup>4</sup> quenching of the molten slag. Quenching with water is the most common process, but air or combinations of air and water may be used. The slag glass, once ground into GGBS, consists of the same major oxides as Portland

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<sup>3</sup> The information request we sent to obtain the information necessary to conduct this analysis of Tarmac's GBS activities was sent to Lafarge Tarmac, the JV between Lafarge and the Tarmac element of the Anglo American's group activities, which came into being after the end of 2012.

<sup>4</sup> The alternative product is generated by air-cooling. The air-cooled slag has little or no cementitious properties and is primarily utilized as a mineral aggregate used in all types of construction.

cement (but relative proportions differ considerably), has excellent hydraulic properties, and with a suitable activator sets in a manner similar to Portland cement.<sup>5</sup>

8. In contrast to the history of Hanson's/Civil and Marine's involvement in the production of GGBS there is relatively little information regarding the history of Tarmac's contracts with the steelworks to produce the water-cooled slag by-product. However, there has been a much longer history of GBS production in the UK than there has been of stand-alone grinding of GBS into GGBS.
9. The generation of GBS and the subsequent production of Portland blast furnace cement may have been undertaken by the same company/within the same corporate group.<sup>6</sup>
10. It was only in the early 1990s that it became possible to switch at each individual blast furnace between (a) rapidly cooling the molten slag to produce a cementitious product (namely GBS), and (b) air-cooling the molten slag to produce a construction aggregate.
11. Tarmac, in parallel with negotiations over the supply of GBS to Civil and Marine, negotiated with the then four operational steelworks to attach its granulators to the iron blast furnaces so that it could produce GBS. These negotiations resulted in a 30-year exclusive deal (between 1999<sup>7</sup> and 2029) whereby Tarmac was required to process and dispose of all of the slag generated by the steelworks. Its contracts with Civil and Marine (now Hanson) required Tarmac to generate sufficient GBS to satisfy

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<sup>5</sup> Donald W Lewis, PE, Chief Engineer, National Slag Association, *History of Slag Cements*, presented at the University of Alabama Slag Cement Seminar, April 30 1981, p6:

[www.nationalslag.org/archive/legacy/nsa\\_181-6\\_history\\_of\\_slag\\_cements.pdf](http://www.nationalslag.org/archive/legacy/nsa_181-6_history_of_slag_cements.pdf).

<sup>6</sup> The North East Slag Company, the company which subsequently became Civil and Marine (Holdings) Ltd and has the contracts to grind GBS into GGBS at Scunthorpe and Teesport, purchased on 9 November 1993, the assets and undertakings of East Coast Slag Products Limited. This latter company subsequently entered into contracts with British Steel to produce GBS.

<sup>7</sup> The contract for Scunthorpe was first signed in 1993 and renegotiated in 1999.

Civil and Marine's demands with any spare molten slag capacity used to (a) generate a stockpile of GBS; (b) produce air-cooled slag which could be used like any other ordinary aggregate; (c) sell GBS to someone else in the UK but not for the purposes of subsequently grinding it into GGBS; and (d) sell it abroad where it could be ground into GGBS.

12. Exclusive contracts were negotiated in respect of each of the then operational steelworks via East Coast Slag Products Limited and Cambrian Stone Limited:  
1993 Scunthorpe (contract renegotiated in 1999)  
1999 Teesside (Redcar)  
1999 Port Talbot (near Swansea)  
1999 Llanwern (near Newport)
13. Tarmac was absorbed into the JV between Lafarge and Anglo American at the beginning of 2013, after the end of the period of review (2007 to 2012 inclusive) and so it is now Lafarge Tarmac, the name of the JV, which holds the exclusive contracts with the steelworks and Hanson.
14. The Llanwern steel works was permanently closed in 2002. Production of steel at Teesside stopped in 2009 but resumed again in 2012. The steelworks at Scunthorpe and Port Talbot remain operational although in the current recession there is some talk of them closing down.

### **Approach taken to analysing GBS profitability**

15. We assess Tarmac's profitability in GBS by comparing its return on capital employed (ROCE) with its cost of capital. The cost of capital we have applied across all the relevant markets in this market investigation in our provisional findings was 10 per cent.

16. We have assessed the value of capital employed on three different bases as explained further in paragraph 19.

### ***Scope of revenues, costs & assets and liabilities included***

17. [X] there is no difference between the assets and liabilities Lafarge Tarmac has supplied us with and the (operational) assets and liabilities included in our profitability analysis.
18. Lafarge Tarmac has provided a partial reconciliation between the values it has provided us for its operational assets and liabilities and the values included in the two relevant sets of statutory financial statements for 2011 for East Coast Slags Product Limited/Cambrian Stone Limited. The former entity has the contracts for Teesside and Scunthorpe whereas the latter has the contract for Port Talbot and pre-2002 for Llanwern. We have assumed that the assets at Llanwern were written off when the steelworks there closed down.

### ***Valuation of tangible fixed assets and associated depreciation and impairment charges***

19. For the purpose of this analysis three approaches have been taken to valuing tangible fixed assets:
- (a) At the book (or carrying) values used by Tarmac. These are the values provided by Lafarge Tarmac in its information response. These have been prepared on the basis of historical cost.
- (b) At an estimate of the CCA<sup>8</sup> value assuming a 30-year asset life,<sup>9</sup> and that the assets are on average 15 years old, and each granulator costs £16 million, an

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<sup>8</sup> In this case the CCA value would be depreciated replacement cost.

<sup>9</sup> Lafarge Tarmac told us that the economic life of any individual granulator would be the same as the steelworks' blast furnaces to which it is attached (response to Q6 provided 26 July 2013). Subsequently Lafarge Tarmac told us that all capital expenditure relating to granulators was treated as one category of expenditure, and was depreciated usually over a 20-year period. We have assumed for the purposes of this analysis a 30-year life in line with the expected economic asset life ascribed by Hanson to its GGBS grinding mills.

average of the £12–£20 million range estimate of the replacement cost of each granulator provided by Lafarge Tarmac in its response.

(c) As (b) above but assuming the upper figure of £20 million per granulator.

20. The approach adopted for estimating the CCA values reflects a simplified approach where we use a point estimate. As confirmed by Lafarge Tarmac the granulator is a composite asset with some major engineering parts, such as the drum, having a different expected useful life to that of other major engineering parts (which would include the shell) of the broader asset. In addition major refurbishment work is required from time to time, which, for example, includes replacement of the de-watering drum drives, replacement of the exhaust chimney inclusive of fitting of water sprays, together with major refurbishment works on the two sets of molten slag runners. In the absence of being provided with a breakdown of the cost of the major engineering parts/shell for a 'typical' granulator and their respective expected useful economic lives, we have not attempted to factor these capital expenditures into our estimate of capital employed. In respect of this sort of expenditure our estimate of capital employed is likely to be an underestimate.
21. In keeping with the simplified evaluation of profitability of GBS supply, we did not deflate Lafarge Tarmac's estimate of the replacement cost of a granulator, assumed to be in 2013 prices, into the prices of each year falling within the period of review.
22. No current cost value was placed on the single pelletizer operated by Tarmac. As explained in paragraph 25 and shown in Table 1, this technology is quite old now, and is therefore likely to have a low depreciated replacement cost in any case.

23. No adjustment has been made to depreciation as 1/30 of the *gross* replacement cost has been calculated to be £1.3–£1.7 million a year, a figure which is broadly in keeping with the values shown in the profit and loss account (see Table 2).

*Note about the information given by Lafarge Tarmac re its specialized plant and machinery at GB iron blast furnaces*

24. Lafarge Tarmac gave us more information about its plant at the iron blast furnaces as shown in the following table.

TABLE 1 Analysis of granulators/pelletizers over the period 2007 to 2012

Site	Blast furnace	Granulation type	Granulate or pelletizer	Capacity (Mt)	Year installed	Year last rebuild	Operational status (running/mothballed)						First ½ 2013
							2007	2008	2009	2010	2011	2012	
Port Talbot	No4	Paul Wurth INBA system	Granulator	0.5	1997	2013	[X]	[X]	[X]	[X]	[X]	[X]	[X]
	No5	Paul Wurth INBA system	Granulator	0.5	2002		[X]	[X]	[X]	[X]	[X]	[X]	[X]
Teesside	Yes	Cold water	Granulator	0.5	2000	2012	[X]	[X]	[X]	[X]	[X]	[X]	[X]
Teesside	Yes	Cold water	Pelletizer	0.5	1975	2012	[X]	[X]	[X]	[X]	[X]	[X]	[X]
Scunthorpe	Queen Bess	Cold water	Granulator	0.2	2000		[X]	[X]	[X]	[X]	[X]	[X]	[X]
Scunthorpe	Queen Anne Queen Victoria	Warm water	Granulator	0.5	1984	Drum 2012	[X]	[X]	[X]	[X]	[X]	[X]	[X]

Source: CC analysis based on Lafarge Tarmac information.

Notes:

1. Capacity is nameplate capacity, actual throughput is limited both by the capacity of the blast furnace and, given this capacity, the quantity of the slag produced. Tarmac's own target for throughput is approximately 85 per cent of the nameplate capacity.
2. [X] indicates the plant was operational; [X] that the plant was mothballed.

25. It is noteworthy that some of the plant pre-dates the signing of the exclusive contracts. There are two types of plants that can produce slag with cementitious properties. The pelletizer is an older piece of technology that has been superseded over the years, with granulators now being the kit used across the industry. Hanson no longer purchases any pelletized slag.

### ***Approach taken to central costs***

26. When analysing profitability it is important to take account of all costs causally related (but only those costs causally related) to the production, distribution and sale of GBS into account.
27. It appears that Lafarge Tarmac has attributed some additional costs under the label of 'centrally attributed support costs' ranging between £[~~XX~~] million and £[~~XX~~] million.  
[~~XX~~]

### **Results of the profitability analysis**

28. Below we provide four tables setting out across the six years from 2007 to 2012:
- (a) the profit and loss account for GBS activities (Table 2);
  - (b) the balance sheet for GBS activities (Table 3). The values given for individual assets or liabilities reflect the values provided by Lafarge Tarmac;
  - (c) the estimates of Tarmac's total net assets using the estimates of the net replacement value of its plant and machinery fixed assets as set out in Table 4 (Table 5); and
  - (d) the value of capital employed based on the three bases explained in paragraph 19 and the ROCE generated using these values (Table 6).
29. We also present the estimates of the gross and net replacement value of Tarmac's plant and machinery fixed assets at a single point in time (Table 4).

TABLE 2 Profit and loss account for Tarmac's GBS activities over the period 2007 to 2012

*£ million unless otherwise stated*

	2007	2008	2009	2010	2011	2012
<i>Volumes</i>						
Sales volume (tonnes millions)	[X]	[X]	[X]	[X]	[X]	[X]
<i>Prices</i>						
Gross unit price (£ per tonnes)	[X]	[X]	[X]	[X]	[X]	[X]
<i>Sales value</i>						
Sales	[X]	[X]	[X]	[X]	[X]	[X]
Distribution costs	[X]	[X]	[X]	[X]	[X]	[X]
Net sales	[X]	[X]	[X]	[X]	[X]	[X]
<i>'Variable' costs</i>						
Blastfurnace slag from steelworks	[X]	[X]	[X]	[X]	[X]	[X]
Energy	[X]	[X]	[X]	[X]	[X]	[X]
Load & haul	[X]	[X]	[X]	[X]	[X]	[X]
Other variable costs	[X]	[X]	[X]	[X]	[X]	[X]
Contract crushing	[X]	[X]	[X]	[X]	[X]	[X]
Other materials	[X]	[X]	[X]	[X]	[X]	[X]
Total 'variable' costs	[X]	[X]	[X]	[X]	[X]	[X]
Gross margin	[X]	[X]	[X]	[X]	[X]	[X]
<i>'Fixed' costs</i>						
Repairs & maintenance	[X]	[X]	[X]	[X]	[X]	[X]
Depreciation of tangible fixed assets	[X]	[X]	[X]	[X]	[X]	[X]
Plant hire	[X]	[X]	[X]	[X]	[X]	[X]
Centrally attributed support costs	[X]	[X]	[X]	[X]	[X]	[X]
Payroll	[X]	[X]	[X]	[X]	[X]	[X]
Legal & professional	[X]	[X]	[X]	[X]	[X]	[X]
Rent & rates	[X]	[X]	[X]	[X]	[X]	[X]
Sundry other 'fixed' costs	[X]	[X]	[X]	[X]	[X]	[X]
Stock movement	[X]	[X]	[X]	[X]	[X]	[X]
Total 'fixed' costs	[X]	[X]	[X]	[X]	[X]	[X]
Operating profit	[X]	[X]	[X]	[X]	[X]	[X]

Source: CC analysis based on Lafarge Tarmac information.

30. There is a spike in depreciation in 2009. Depreciation was accelerated in 2009 for the Teesport assets as a consequence of the mothballing of the Teesside blast furnace by its then owner of the steelworks.

TABLE 3 Balance sheet for Tarmac's GBS activities over the period 2007 to 2012

	<i>£ million</i>					
	2007	2008	2009	2010	2011	2012
<i>Tangible fixed assets</i>						
Plant & machinery	[X]	[X]	[X]	[X]	[X]	[X]
Assets under course of construction	[X]	[X]	[X]	[X]	[X]	[X]
Land & buildings	[X]	[X]	[X]	[X]	[X]	[X]
<i>Current assets</i>						
Stock	[X]	[X]	[X]	[X]	[X]	[X]
Trade & other receivables	[X]	[X]	[X]	[X]	[X]	[X]
Prepayments and accrued income	[X]	[X]	[X]	[X]	[X]	[X]
Operating debtors—non-trade	[X]	[X]	[X]	[X]	[X]	[X]
Operating debtors—inter-company	[X]	[X]	[X]	[X]	[X]	[X]
<i>Current liabilities</i>						
Operating creditors—trade	[X]	[X]	[X]	[X]	[X]	[X]
Accruals	[X]	[X]	[X]	[X]	[X]	[X]
Operating creditors—non-trade	[X]	[X]	[X]	[X]	[X]	[X]
Other	[X]	[X]	[X]	[X]	[X]	[X]
Operating creditors—inter-company	[X]	[X]	[X]	[X]	[X]	[X]
<i>Provisions</i>						
[None provided by Lafarge Tarmac]	[X]	[X]	[X]	[X]	[X]	[X]
<i>Net assets</i>						
At HCA values	[X]	[X]	[X]	[X]	[X]	[X]

Source: CC analysis based on Lafarge Tarmac information.

TABLE 4 Estimate of gross and net replacement cost of specialized plant and machinery at each blast furnace using Lafarge Tarmac's range estimate of the cost of replacing each granulator

	<i>£ million (2013 prices)</i>	
Unit replacement cost of granulator	16.0	20.0
Total gross replacement cost (ie x5)	80.0	100.0
Total net replacement cost (ie /2)	40.0	50.0

Source: CC analysis based on Lafarge Tarmac information.

TABLE 5 Estimates of Tarmac's total net assets using the estimates of the net replacement value of its plant and machinery fixed assets over the period 2007 to 2012

	<i>£ million</i>					
	2007	2008	2009	2010	2011	2012
<i>Plant and machinery</i>						
HCA	[x]	[x]	[x]	[x]	[x]	[x]
CCA I	[x]	[x]	[x]	[x]	[x]	[x]
CCA II	[x]	[x]	[x]	[x]	[x]	[x]
<i>Delta</i>						
CCA I over HCA	[x]	[x]	[x]	[x]	[x]	[x]
CCA II over HCA	[x]	[x]	[x]	[x]	[x]	[x]
<i>Total net assets</i>						
HCA	[x]	[x]	[x]	[x]	[x]	[x]
CCA I	[x]	[x]	[x]	[x]	[x]	[x]
CCA II	[x]	[x]	[x]	[x]	[x]	[x]

Source: CC analysis based Tables 3 and 4.

Note: HCA = historical cost accounting (value); CCA = current cost accounting (value)—in this case depreciated replacement cost.

TABLE 6 Measures of capital employed for Tarmac's GBS activities and ROCEs based thereon over the period 2007 to 2012

	<i>£ million for operating profits and total net assets / % for ROCE</i>					
	2007	2008	2009	2010	2011	2012
<i>Operating profit</i>						
HCA / CCA basis	[x]	[x]	[x]	[x]	[x]	[x]
<i>Total net assets</i>						
HCA	[x]	[x]	[x]	[x]	[x]	[x]
CCA I*	[x]	[x]	[x]	[x]	[x]	[x]
CCA II*	[x]	[x]	[x]	[x]	[x]	[x]
<i>ROCE (%) on</i>						
HCA net assets	[x]	[x]	[x]	[x]	[x]	[x]
CCA I net assets	[x]	[x]	[x]	[x]	[x]	[x]
CCA II net assets	[x]	[x]	[x]	[x]	[x]	[x]

Source: CC analysis based on Tables 2, 3 and 5.

\*Based on Tarmac's estimate of the replacement cost of each of its five granulators divided by 2 (ie assuming the assets are half way through their useful lives if one were to assume straight line depreciation). CCA I assumes that the gross replacement cost of each granulator is £16 million, and CCA II assumes that this figure is £20 million.

## Findings

31. Profitability (ROCE) when measured on a the simplified CCA basis as explained in paragraphs 19 to 23 calculated over the period 2007 to 2012, suggests that returns are broadly in line with the estimate of GB cement producers' cost of capital we have previously used in our profitability assessment of the relevant markets averaged over the period of review (10 per cent).

***Trend in profitability over the period of review***

32. The absolute level of profits has been relatively constant despite a drop in volumes of 30 per cent across the period of review, perhaps reflecting the formula negotiated between Tarmac and Civil and Marine (now Hanson). The level profits was relatively small in absolute terms (ie [x] million per year) compared with that earned by Hanson for GGBS, ie £[x] million per year before impairments, £[x] million after impairments).

## Key financial ratios for the GBS and GGBS operations

### Introduction

1. This appendix sets out the key financial ratios of the GBS and GGBS operations.

### GBS operations: key financial ratios

2. In Table 1 below, we show GBS sales volumes and the key financial ratios for Lafarge Tarmac's consolidated GBS operations between FY07 and FY12.

TABLE 1 Financial performance ratios of Lafarge Tarmac's consolidated GBS operations, 2007 to 2012

	<i>£ per tonne</i>					
	2007	2008	2009	2010	2011	2012
Unit gross revenue*	[X]	[X]	[X]	[X]	[X]	[X]
Unit net revenue*	[X]	[X]	[X]	[X]	[X]	[X]
Unit variable profit*	[X]	[X]	[X]	[X]	[X]	[X]
Unit EBITDA*	[X]	[X]	[X]	[X]	[X]	[X]
Variable profit margin (%)†	[X]	[X]	[X]	[X]	[X]	[X]
EBITDA margin (%)†	[X]	[X]	[X]	[X]	[X]	[X]
Sales volumes (kt)	[X]	[X]	[X]	[X]	[X]	[X]
% change	[X]	[X]	[X]	[X]	[X]	[X]

Source: Lafarge Tarmac.

\*Unit figures have been calculated by dividing the relevant financial measure by total sales volumes.

†Margins based on profit as a percentage of net revenues.

3. Based on Table 1 above, we note that Lafarge Tarmac's unit gross and net revenues, proxy measures for the average delivered and ex-works price respectively, as well as unit variable profit and unit EBITDA, increased year-on-year between FY07 and FY11 whilst sales volumes declined from around [X] Mt in FY07 to [X] Mt in FY11. These ratios fell in FY12. It is also worth noting that during FY09, GBS sales fell by its sharpest over the period concerned, when volumes fell by around [X] per cent, whilst unit net revenue increased from [X] per tonne.
4. In Figure 1 below, we show the trends in some of the figures presented in Table 1 above, by rebasing them to 100, taking FY07 as the base year.

FIGURE 1

**Lafarge Tarmac's unit financial ratios and sales volumes, 2007 to 2012  
(rebased to 100 from 2007)**

[X]

Source: [X]

Note: [X]

**GGBS operations: key financial ratios**

5. In Table 2 below, we show GGBS sales volumes and the key financial ratios for Hanson's consolidated GGBS operations between FY07 and FY12.

TABLE 2 Financial performance ratios of Hanson's consolidated GGBS operations, 2007 to 2012

	<i>£ per tonne</i>					
	2007	2008	2009	2010	2011	2012
Unit gross revenue*	[X]	[X]	[X]	[X]	[X]	[X]
Unit net revenue*	[X]	[X]	[X]	[X]	[X]	[X]
Unit variable profit*	[X]	[X]	[X]	[X]	[X]	[X]
Unit EBITDA*	[X]	[X]	[X]	[X]	[X]	[X]
Variable profit margin (%)†	[X]	[X]	[X]	[X]	[X]	[X]
EBITDA margin (%)†	[X]	[X]	[X]	[X]	[X]	[X]
Sales volumes (kt)	[X]	[X]	[X]	[X]	[X]	[X]
% change	[X]	[X]	[X]	[X]	[X]	[X]

Source: Hanson.

\*Unit figures have been calculated by dividing the relevant financial measure by total sales volumes.

†Margins based on profit as a percentage of net revenues.

6. Based on Table 2 above, over the period FY07 to FY12, Hanson's GGBS sales volumes declined [X] from [X] in FY07 to [X] in FY12. Against this backdrop of declining volumes, however, unit gross revenue and unit net revenue, proxy measures for the average delivered price and the average ex-works price respectively, both increased: unit gross revenue increased [X], whilst unit net revenue increased by [X]. Hanson told us that these price increases were driven by the need to recover significant increases in costs in particular energy and input costs. Unit variable profit also increased by [X], whilst unit EBITDA increased by just [X], thereby maintaining unit EBITDA at £[X] between the start and end of the period considered.

7. In Figure 2 below, we show the trends in some of the figures presented in Table 2 above, by rebasing them to 100, taking FY07 as the base year.

FIGURE 2

**Hanson's unit financial ratios and sales volumes, 2007 to 2012  
(rebased to 100 from 2007)**

[✂]

Source: [✂]

Note: [✂]

### Effect of Hanson's participation in both cement and GGBS markets on GGBS pricing

1. In this appendix, we provide more detail on the effect of Hanson's participation in both cement and GGBS markets on GGBS pricing.
2. The incentives for Hanson to reduce prices of GGBS by (say) 5 per cent, from a starting point of margin  $m$ , can be written as follows:
  - (a) GGBS profit impact: increase in sales of GGBS by  $X$  tonnes (dependent on elasticity of demand).
  - (b) Cement profit impact: reduction in sales of cement by Hanson by 20% \* (up to  $X$  tonnes; depending on the cross-elasticity of demand for cement to price of GGBS).<sup>44</sup>
3. Compared with a situation where Hanson is not a cement producer, Hanson has less incentive to lower the price of GGBS because of an additional impact, namely that the reduction in GGBS prices may cannibalize some of its cement sales. The overall effect is likely to depend mainly on three factors:
  - (a) The relative GGBS and cement margins: if cement margins are high compared with GGBS margins, loss of sales of cement will have more negative impact on profits than additional sales in GGBS.
  - (b) The amount of substitution between GGBS and cement: if there is a high degree of substitution (which is likely to be the case if GGBS prices are set on the elastic part of demand curve), the impact of lost cement sales will be larger.

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<sup>44</sup> There may also be an impact on downstream internal sales of RMX by Hanson if it reduces the price of GGBS to competing RMX producers; in the following we do not take into account this effect because we found that RMX was competitive and therefore we implicitly assume that Hanson cares about overall sales of GGBS, not whether these sales are through internal RMX or to competitors.

(c) Cement market share: the larger the cement market share of Hanson, the more impact on its cement sales.

4. We can see the above effects by looking at a formal representation of a simple model of Hanson's profits, focusing on the interaction between GGBS and CEM I and leaving aside the complexities associated with blended cement and concrete. For a given price of CEM I, we can think of Hanson's profit function ( $\pi$ ) as:

$$\pi = (p^G - c^G)Q^G(p^G, p^C) - F^G + (p^C - c^C)S^H Q^C(p^G, p^C) - F^C$$

where  $p$  are prices,  $c$  are the variable costs,  $F$  are fixed costs,  $Q$  are quantities demanded in the relevant market, and superscript  $G$  stands for GGBS and superscript  $C$  stands for CEM I.  $S^H$  is the market share of Hanson in the cement market.

5. For a given price of CEM I and assuming that total cement demand is distributed among cement suppliers in proportion of their market share (so that, if total cement demand reduces by 100 tonnes, Hanson would lose 20 tonnes corresponding to a 20 per cent market share), Hanson's optimal GGBS price will solve:

$$\left[ Q^G - (p^G - c^G) \times \varepsilon^G \times \frac{Q^G}{p^G} \right] + \left[ (p^C - c^C)S^H \times \varepsilon^{\frac{C}{G}} \times \frac{Q^C}{p^G} \right] = 0$$

where  $\varepsilon^G$  is the own price elasticity of GGBS, and  $\varepsilon^{\frac{C}{G}}$  is the cross-elasticity of CEM I demand to price of GGBS.

6. Were Hanson not to active in cement, the left-hand-side of the equation would contain only the terms within the first square brackets. As it is, there is an additional set of terms, those within the second square brackets, which will be factored into Hanson's pricing decision for GGBS and which represents the impact of any increase in GGBS price on cement demand. This factor will mean that the optimal price of

GGBS is higher than it would be if this effect was not taken into account. The strength of the effect will depend mainly on:

- (a) The cross-elasticity of CEM I demand to price of GGBS: the more CEM I demand increases when GGBS prices increase, and the higher the optimal GGBS price.
- (b) The cement margin (and how this compares to the GGBS margin): the larger the CEM I margins relative to GGBS margin, the higher the optimal GGBS price because an increase in cement sales will be 'worth more', in profit terms, than the losses as a result of a reduction in GGBS demand.
- (c) The market share of Hanson in the cement market: the larger Hanson's market share, the higher the optimal GGBS price because Hanson is better able to make up for lost GGBS sales as cement sales increase.

### Estimate of the detriment in GGBS based on the the GGBS profitability analysis

1. In this appendix, we set out our calculations of the estimated customer detriment arising from the GGBS-related AEC on cement prices, based on our analysis of the profitability of Hanson's GGBS activities (Appendix A).
  
2. Table 1 below is based on Appendix A, Table 7. We have calculated the excess profitability as Hanson's return on capital less a cost of capital of 10 per cent. This cost of capital represents the midpoint of our estimate of the GB cement producers' cost of capital, as set out in Appendix 4.2 of the provisional findings. Excess profit in each year is excess profitability in that year multiplied by capital employed in that year (ie total net assets). Excess profit per tonne is excess profit divided by Hanson's GGBS sales. This is our estimate of the amount by which GGBS prices are overcharged, which translates into an equivalent overcharge in the ultimate price of cement paid by RMX producers.

TABLE 1 **Overcharge in GGBS prices**

	2007	2008	2009	2010	2011	2012	Period average
Total net assets (£m)	[£]	[£]	[£]	[£]	[£]	[£]	[£]
Profits based on continuing costs of supply	[£]	[£]	[£]	[£]	[£]	[£]	[£]
Profits/average capital employed (%)	[%]	[%]	[%]	[%]	[%]	[%]	[25–30]
GGBS sales (m tonnes)	[£]	[£]	[£]	[£]	[£]	[£]	[£]
Excess industry return	[%]	[%]	[%]	[%]	[%]	[%]	[15–20]
Excess industry profit (£m)	[£]	[£]	[£]	[£]	[£]	[£]	[15–20]
Excess profit per tonne (£)	[£]	[£]	[£]	[£]	[£]	[£]	[10–15]

Source: CC, based on Appendix A, Table 7.

3. The estimated excess profit per tonne varies from year to year between [£]/tonne in 2009 and [£]/tonne in 2010. We have calculated excess profit per tonne based on average capital employed across the period, average profit across the period and average annual sales of GGBS across the period. This results in an average excess

profit per tonne of £[10–15] between 2007 and 2012, and average excess profits of £[15–20] million per year between 2007 and 2012.