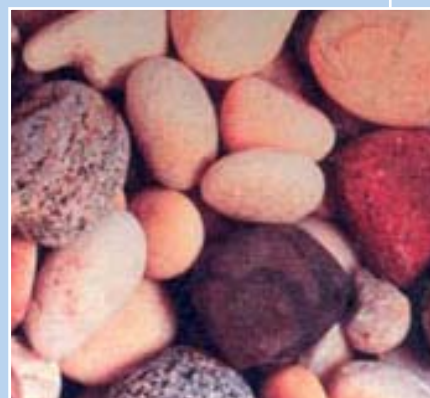


APPENDIX B
Sub-Regional Apportionment of
Aggregates Provision in the
West Midlands Region 2005 –
2020 Draft Report



Prepared for West Midlands
Regional Assembly
by Land Use Consultants

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DRAFT REPORT

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December 2009

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I. INTRODUCTION

- I.1. Following the recent publication of the national and regional guidelines for aggregates provision in England 2005-2020¹, and in accordance with Minerals Policy Statement I, the West Midlands Regional Assembly (the Regional Planning Body for the West Midlands) is required to apportion the West Midlands regional figure for primary aggregates provision contained in the guidelines to a sub-regional level. This needs to be done in collaboration with the West Midlands Minerals Planning Authorities (MPAs) and the Regional Aggregates Working Party (WMRAWP).
- I.2. The current apportionment of primary aggregates within the West Midlands region is based on a superseded revision of the National and Regional guidelines for aggregates provision in England 2001-2016². The current apportionment methodology is based largely on historical shares and an assumption that provision would remain largely consistent during the period covered by the guidelines.
- I.3. The West Midlands Regional Assembly (WMRA) and Advantage West Midlands (AWM) commissioned Land Use Consultants (LUC) in November 2009 to prepare alternative options for the apportionment of primary aggregates in the West Midlands for the period 2005-2020. Alternative options should take into consideration the location of the resource as well as planning and environmental designations and population / household growth projections.
- I.4. In a separate exercise, the WMRAWP is developing a further set of options for apportionment of aggregates based primarily on past sales or 'historical shares'.
- I.5. A project Steering Group has been established and consists of:
 - David Clarke: West Midlands Regional Assembly
 - Paul Wilcox: Technical Secretary WMRAWP
 - Chris Blakeley: West Midlands Regional Assembly

STRUCTURE OF REPORT

- I.6. This report sets out the proposed sub-regional apportionment methodology and a quantification of the primary resources apportioned to each sub-region under five different scenarios (termed 'options').
- I.7. The remainder of the report is structured into the following chapters:

Chapter 2: Discusses the project method in more detail outlining the factors proposed for inclusion within the methodology and their reasons for inclusion or exclusion. The datasets used in quantifying the factors included in the methodology are described. Five options for weightings are introduced.

¹ National and Regional Guidelines for Aggregate Provision in England 2005-2020. Department for Communities and Local Government, June 2009.

² National and Regional Guidelines for Aggregate Provision in England 2001-2016. Department for Communities and Local Government, 2003.

Chapter 3: Sets out the results of the five apportionment options.

Chapter 4: Summarises the conclusions of the proposed apportionment methodology and implications for its use by WMRA and the sub-regions.

2. METHOD

2.1. This chapter describes the stages in the development of the methodology for generating alternative options for a sub-regional apportionment of the total aggregate supply figure for the West Midlands Region (165mt of land-won sand and gravel and 82mt land-won crushed rock over the period 2005-2020). The methodology has been developed in association with the project Steering Group and representatives from WMRAWP.

2.2. The methodology has been developed in a number of stages described below:

Stage 1: Factors for consideration were discussed at a meeting held with the Steering Group and a group of MPAs on 13th November 2009.

Stage 2: Draft options for apportionment were presented to the Steering Group and WMRAWP at a meeting held on 4th December 2009.

Stage 3: A revision of draft options followed which incorporated suggestions and recommendations which had emerged from the 4th December meeting. These have been written up in this draft report which will be circulated for consultation.

Stage 4: Technical stakeholder consultation on the draft options is to be held 18th December 2009 to 22nd January 2010.

Stage 5: Revised options for appraisal will take into account the results of the stakeholder consultation and will be documented in a final version of the report in February 2010.

BACKGROUND

The current sub-regional apportionment and the target regional supply figure (Policy M2)

2.3. The current apportionment of the regional supply figure is based on past sales figures. While the basis for the apportionment is judged to be logical and reasonably robust, it is essentially derived from past rates of production, rather than an appraisal of future needs and the likely availability of materials, taking into account a more strategic analysis of environmental and other constraints.

2.4. The current apportionment is shown in **Tables 2.1 and 2.2**.

Table 2.1 Current apportionment for sand and gravel resources

Sub-regions	Current apportionment 2001-2016 (million tonnes per annum)	Percentage of regional total (%)
Herefordshire	0.283	2.80%
Shropshire	0.820	8.10%
Staffordshire	6.602	65.20%
Warwickshire	1.043	10.30%
West Midlands County	0.506	5.00%
Worcestershire	0.871	8.60%
West Midlands Region	10.125	100%
West Midlands 2001-2016	162 (mt)	

Source: West Midlands Regional Spatial Strategy Phase Two Revision – Draft. Preferred Option
December 2007

Table 2.2 Current apportionment for crushed rock

Sub-regions	Current apportionment 2001-2005 (million tonnes per annum)	Current apportionment 2005-2016 (million tonnes per annum)	Percentage of regional total (%) 2005-2016
Herefordshire	0.424	0.424	7.30%
Shropshire	2.662	2.949	50.75%
Staffordshire	1.395	1.395	24.01%
Warwickshire	0.593	0.88	15.14%
West Midlands County	0.575	0	0%
Worcestershire	0.163	0.163	2.81%
West Midlands Region	5.812	5.812	100%
West Midlands 2001- 2016	93 (mt)		

Source: West Midlands Regional Spatial Strategy Phase Two Revision – Draft. Preferred Option
December 2007

Sub-regions for the apportionment

- 2.5. The revised sub-regional apportionment will enable the regional supply figure for sand and gravel and crushed rock to be apportioned between all the sub-regions and

will be applicable if overall national and regional guideline figures change in future following review. The sub-regions or planning units are:

- Herefordshire
- Shropshire (includes Telford and Wrekin Council)
- Staffordshire (includes Stoke-on-Trent)
- Warwickshire
- West Midlands County (includes Birmingham, Dudley, Wolverhampton, Coventry, Sandwell, Solihull and Walsall)
- Worcestershire

2.6. It was agreed early on in the study that a separate apportionment for soft sand and sharp sand was not needed.

STAGE 1: FACTORS FOR CONSIDERATION

2.7. LUC proposed that the key considerations that might influence the supply and use of primary aggregates fall into one of three categories. The first reflects demand, with the intention being to establish a reliable measure of where building materials are likely to be required in large quantities in the future. Existing population and future housing fall into this category. The second category relates to supply, reflecting the location of unsterilised resources. The third category is termed constraints, and includes those considerations that may constrain the ability of a sub-region to provide for the supply of material. Generally it is assumed that these would be environmental (nature conservation and landscape designations) and heritage constraints. The categorisation is summarised in **Table 2.3**.

Table 2.3: Key considerations influencing the provision of primary aggregates

Demand	Supply	Constraint
Future development pressure Population / households Past use (Sales)	Unsterilised Resource Sustainable transport Existing contracts and patterns of supply	Environmental designations

2.8. The key considerations above were translated into a number of possible factors which were presented to the Steering Group and MPAs at a meeting on 13th November 2009. The initial proposed set of factors is discussed below.

- 2.9. An apportionment methodology which reflected these considerations could also be designed to accommodate weighting, thereby making it possible to formulate and test different apportionment scenarios. The Steering Group and WMRAWP discussed these considerations at a second meeting on 4th December 2009 and through a series of iterations, agreed a final set of factors for inclusion in the apportionment methodology, thus not all of the factors below appear in the final methodology (e.g. floodplains, Groundwater Protection Zones and Green Belt). The reasons for this are described under Stages 2, 3 and 4 below.
- 2.10. A list of the attendees at the 13 November and 4 December meetings can be found in **Appendices 1 and 2**.

FUTURE DEVELOPMENT PRESSURE

What the factor is designed to measure

- 2.11. This factor is designed to measure future development pressure over a defined planning horizon. Future development pressure is simply another way of expressing construction demand. The planning system will guide development to certain strategic locations, leading to a demand for construction materials in those locations. Consequently, this factor is focussed on existing urban areas (in which it is intended that a significant amount of new housing and associated development will be accommodated), and proposed housing locations. As such, population and household projections and economic and employment forecasts have already been taken into account.

Key data and limitations

- 2.12. The housing proposals in the Regional Spatial Strategy have been subject to a number of reviews. It was proposed that the best available data to be used in the apportionment would be the table of Regional Housing Trajectory Indicative Average Annual Rates for 5 year periods presented in the Addendum to the Panel Report of the WM RSS Phase Two Revision. These proposals reflect the phasing policy and present the housing numbers in five year bands for each Local Authority. These figures represent the net housing requirements for the plan period (2006-2026).
- 2.13. Additionally, there are figures available for the number of demolitions planned per Local Authority over the plan period (2006-2026). The best available data for demolitions is the West Midlands Regional Spatial Strategy Phase Two Revision – Draft Preferred Option December 2007 (Table 2). It was agreed that these demolitions also represent a demand for aggregates and that the demolition figures should be added to the housing proposals figures.
- 2.14. In order to best match the apportionment time period, it was agreed that the planned housing and demolitions for the end of the Plan period (2021-2026) should be excluded from the apportionment calculations. The demolitions figures are presented as an annual average over the plan period with no additional information

on phasing. For the purpose of the apportionment, it has been assumed that there will be no phasing over the period 2006-2021.

Issues to consider

- 2.15. The Steering Group agreed that this factor needed to be included in the methodology. It is anticipated that there will be revisions to these proposals made by the Secretary of State in the near future, but these figures will not be available within the timeframe of this study.

POPULATION / HOUSING PROVISION

What the factor is designed to measure

- 2.16. This factor is designed as a measure of the existing distribution of the population in the Region. Such a measure is considered necessary because of the close correlation between concentrations of people and development activity. In simple terms, the greater the number of people, the greater the rate of development as people extend their houses, new schools are built and urban land is redeveloped. Therefore the methodology should take account of the demand for construction material arising from this activity. In effect, the factor reflects the latent demand that exists in urban areas.

Key data and limitations

- 2.17. The principal data source would be the Mid Year Population Estimates produced by the Office for National Statistics, with population disaggregated by mineral planning sub-region. Data was downloaded from the Office for National Statistics website.

PAST SALES

What the factor is designed to measure

- 2.18. This factor forms the basis of the existing apportionment. It provides a measure of sales over a preceding defined period. As such, it provides an accurate proxy of recent demand; however, it is necessarily backward looking and does not reflect where demand patterns may change in the future.
- 2.19. As a separate exercise, the WMRAWP is developing a set of alternative apportionment options which are 'sales-based'. As such, no 'sales-led' option has been developed as part of this commission, although sales is still included as a factor with a low weighting.

Key data and limitations

- 2.20. The principal data source is the Annual Report produced by the WMRAWP. The most recent publication is the 2007 Annual Report. Data for crushed rock sales were aggregated or not available for confidentiality reasons. This data were not

available to WMRAWP so an alternative proxy for past sales needed to be sought for crushed rock.

Issues to consider

- 2.21. It was felt that past sales was an important factor to reflect the supply of aggregates in the Region. It was agreed that the data should be an average of the previous three reported sales years. In the absence of a full set of sales data for crushed rock, it was agreed that the current apportionment should be used as a proxy for supply as it was based on past sales.

UNSTERILISED RESOURCE

What the factor is designed to measure

- 2.22. This factor is the distribution of unsterilised mineral resource (i.e. mineral resources not sterilised by urban areas and major transportation links). In order to approximate the amount of mineral resource available in each sub-region, the resource data should also exclude any worked out sites. The data are available as GIS layers and can therefore be quantified as an area in hectares. This is important in the context of the apportionment because extraction can only take place where the different resource types occur.

Key data and limitations

- 2.23. The British Geological Survey (BGS) data shows the distribution of minerals in the region in GIS. The best available data at the regional scale is the DiGMapGB-100 Mineral Resource dataset at 1:50 000. There is some evidence that there are gaps in the BGS data (e.g. incomplete coverage of the Shropshire 'fault line' and SW Herefordshire). Some MPAs have done further work with the BGS to map their resource more accurately, but there is not complete coverage for the Region.
- 2.24. This data does not exclude the areas sterilised by urban areas and major transport infrastructure), so needs to be further processed before being included in the methodology. There is no data on the depth of the resource or the quality of the resource.

Issues to consider

- 2.25. Some MPAs were concerned with the use of the DiGMapGB-100 Mineral Resource dataset given the gaps highlighted above. A request for more detailed resource data was made at the 4 December 2009 meeting for possible inclusion in the methodology, but no data has been provided to date.
- 2.26. It was agreed that the BGS GIS minerals data with sterilised areas and worked out sites removed would be the data source for this factor as it ensured a consistent dataset across the sub-regions. The data would be used as an area (hectares) in the methodology. It was requested that a sensitivity test be undertaken to estimate the

volume of the resource associated with the area, but information on the thickness of the resource across the region was not available.

Seeking your view

At the 4 December 2009 meeting, some MPAs and industry representatives asked if more weight could be given to the amount of resource within existing supply areas. We would like your view on whether this should be included as a separate factor in the apportionment, and if so, what data should be used?

SUSTAINABLE TRANSPORT

What the factor is designed to measure

- 2.27. This factor highlights the importance of transport in the use of primary aggregates, with a particular emphasis on what are termed sustainable modes (rail and water rather than road). Adequate transport links between the locations where minerals are worked, where they are processed, and where they are used are essential. Ideally these three things should occur in close proximity.

Key data and limitations

- 2.28. It was initially suggested that sustainable transport could be used as a factor by assessing the location of wharves, road and rail (including depots) provision in the Region in relation to the location of the resource. It was also proposed that proximity to the Primary Road Network be assessed.
- 2.29. Data on the locations of these sustainable transport links were not available across the region.

Issues to consider

- 2.30. The Steering Group agreed that sustainable transport should be omitted as a factor in the sub-regional apportionment. This is because it is misleading to assume that just because a mineral resource is near to a particular transport mode or transhipment point, it could easily be transported. When seeking to divert aggregate transportation from road to rail or water (i.e. towards, in principle, more sustainable forms of transport), capacity of the network and ability to tranship aggregates become key considerations.

CONTRACTS AND PATTERNS OF MOVEMENT

What the factor is designed to measure

- 2.31. This factor was included as a means of reality testing any conclusions reached with respect to transport. The factor would ensure that the methodology takes account of processing and transport capacity that is already committed through existing contractual arrangements.

Key data and limitations

- 2.32. It was anticipated that data relating to major planned developments (not including housing development) would be very difficult to obtain, both in terms of availability and commercial sensitivity.

Issues to consider

- 2.33. The Steering Group agreed that contracts and patterns of movement should be omitted as a factor as the apportionment period is too long to predict all major developments. There would also be significant difficulty in assembling the relevant information.

ENVIRONMENTAL CONSTRAINTS

What the factor is designed to measure

- 2.34. The presence of internationally and nationally important environmental features, some of which are represented by planning designations, will constrain mineral development in certain locations, and the methodology should reflect the degree of constraint. For example, it would be contrary to policy and only acceptable in exceptional circumstances to build new processing facilities in an AONB, compared to less constrained locations.

Key data and limitations

- 2.35. The key data source for this factor would be planning / environmental / heritage designations in extant development plans (as well as other sources), and the land area covered. It should be noted that the inclusion of these international and national designations within the apportionment methodology seeks to address potential effects of mineral workings on the designated areas, but does not in itself satisfy the requirements of the SA. For this reason, a separate SA needs to be undertaken, to address the wider potential benefits and impacts on the natural environment.
- 2.36. If local designations (i.e. lower than national) are introduced to the apportionment methodology, there would be difficulties in obtaining comprehensive GIS data, and achieving consistency of interpretation across different planning authority areas. Sub-regions will need to appraise the potential heritage / ecological effects and opportunities of delivering the necessary sites to meet their County level apportionment through lower tier SAs of Minerals Development Documents.

Issues to consider

- 2.37. The Steering Group discussed a number of 'constraints' which could be included in this factor. Each of these is discussed in turn below and the justification for their inclusion or exclusion from the apportionment methodology is provided:

International and national nature/ landscape and cultural heritage designations

- 2.38. It was agreed that the following represented real planning constraints on minerals extraction and should therefore be **included** in the methodology:
- Nature Conservation Designations: Ramsar sites, Special Areas of Conservation, Special Protection Areas, Sites of Special Scientific Interest and National Nature Reserves;
 - Landscape Designations – Areas of Outstanding Natural Beauty and National Parks;
 - Heritage Assets – Listed Buildings, World Heritage Sites, Registered Parks and Gardens, Scheduled Ancient Monuments and Historic Battlefields.

Flood Risk Zones

- 2.39. This type of development (i.e. primary aggregate extraction) is considered ‘water compatible’ - the very nature of the material means that it is mainly going to be found in floodplains. Flood Risk Zones are therefore **excluded** from the methodology.

Green Belt

- 2.40. Mineral extraction is an acceptable use in the Green Belt and it was therefore **excluded** from the methodology.

Conservation Areas

- 2.41. Data was unlikely to be consistently available across the region and these areas are most likely to be within urban areas, which are considered as ‘sterilised’ with respect to available minerals resource. Conservation areas have therefore been **excluded** from the methodology.

Agricultural Land Grade I

- 2.42. The best quality agricultural land may be in areas where there is underlying aggregate. It is possible to restore land to Grade I standard following extraction and therefore such land has been **excluded** from the methodology.

Local nature conservation and landscape designations

- 2.43. Inclusion of local level designations was not considered appropriate at the regional level due to the strategic nature of the sub-regional apportionment. It would also be difficult to obtain GIS data for these designations. They were therefore **excluded** from the methodology.

Ancient Woodland

- 2.44. Based on PPS9, most ancient woodland should already have been designated under national SSSI designations. If there are areas that are not designated as SSSI, the assumption is that these will be local designations, and for the same reasons as other local designations, have been **excluded** from the methodology.

STAGE 2: REVISED FACTORS AND DATASETS USED

- 2.45. As a result of the consultation with the Steering Group, and WMRAWP representatives (meeting held on 4th December 2009), a revised list of factors to be used in the sub-regional apportionment methodology was established. For each factor, this section describes the source of data, how the data has been processed, and any limitations. The revised factors are:

- Factor 1: Demand (with a ratio of 6:4 for 1a and 1b)
 - Factor 1a: Future (Housing provision)
 - Factor 1b: Current (Existing population)
- Factor 2: Past Sales
- Factor 3: Unsterilised resource
- Factor 4: Constraints

FACTOR 1: DEMAND

- 2.46. Representatives of the Mineral Products Association advised that approximately 60% of demand for aggregates for construction is for development associated with meeting future housing/infrastructure targets/needs for the Region whilst the remaining 40% of demand is for existing redevelopment/refurbishment.
- 2.47. It was therefore agreed that Factor 1 would be made up of two factors – future and existing demand and these two factors (1a and 1b respectively) would be combined using a ratio of 6:4 to reflect this information.

Factor 1a: Future housing

- 2.48. The data used to quantify this factor are the Regional Housing Trajectory Indicative Average Annual Rates for 5 year periods presented in the Addendum to the Panel Report of the WM RSS Phase Two Revision for the period 2006-2021 with demolitions from West Midlands Regional Spatial Strategy Phase Two Revision – Draft Preferred Option December 2007 (Table 2) added. Data for this factor were supplied by WMRA and are shown in **Table 2.4**.

- 2.49. Data were presented by Local Authority and have been aggregated into the six sub-regions. **Figure 1** illustrates criterion 1a.

Table 2.4: Future housing and demolitions (2006-2026) by sub-region

Sub-region	Housing proposals 2006-2021	Demolitions 2006-2021	Total 2006-2021 (housing plus demolitions)	% of total
Herefordshire	12,050	375	12,425	3.90
Shropshire	37,100	420	37,520	11.77
Staffordshire	51,400	4,215	55,615	17.45
Warwickshire	29,075	1,515	30,590	9.60
West Midlands County	109,975	44,505	154,480	48.47
Worcestershire	27,075	1,005	28,080	8.81
West Midlands	266,675	52,035	318,710	100.00

Source: West Midlands RSS Phase 2 Revision Draft December 2007 and Addendum to the Panel Report of WM RSS Phase 2 Revision.

Factor 1b: Current (Existing population)

- 2.50. The data used to quantify the existing population were sourced from the Office for National Statistics. The most current data available are the 2008 mid-year estimates at district level. The data were presented by district or unitary authority, and so were assimilated into the six sub-regions for the purposes of the apportionment. The data for existing population are shown in **Table 2.5** below and **Figure 2** at the end of the chapter.

Table 2.5: Existing population 2008

Sub-region	2008 population	% of total
Herefordshire	179,300	3.31
Shropshire	454,900	8.41
Staffordshire	1,069,000	19.76
Warwickshire	530,700	9.81
West Midlands County	2,619,600	48.41
Worcestershire	557,600	10.30
West Midlands Region	5,411,100	100.00

Source: Office for National Statistics 2008 mid-year population estimates

FACTOR 2: PAST SALES

- 2.51. The source of data for past sales was the WMRAWP Annual Report 2007. It was agreed that a three year average of annual sales would be used as the data for sand and gravel. Data for crushed rock sales over a three year period is not available for

confidentiality reasons. It was therefore agreed that for crushed rock, the existing apportionment would be used as a proxy for past sales as this apportionment was based on past sales. **Tables 2.6 and 2.7** below show the data for sand and gravel and crushed rock.

Table 2.6: Past sales for sand and gravel

Sub-Region	Sales 2005 (mt)	Sales 2006 (mt)	Sales 2007 (mt)	3 year average (mt)	% of total
Herefordshire	0.24	0.19 (est.)	0.19	0.21	2.13
Shropshire	0.83	0.77	0.78	0.79	8.18
Staffordshire	5.8	6.8	6.44	6.35	65.41
Warwickshire	0.9	0.98	1.19	1.02	10.55
West Midlands County	0.58	0.55	0.61	0.58	5.98
Worcestershire	0.75	0.7	0.81	0.75	7.76
West Midlands	9.1	9.99	10.02	9.70	100.00

Source: WMRAWP Annual Report 2007

Table 2.7: Current apportionment figures for crushed rock to be used as a proxy for past sales

Sub-regions	Current apportionment 2005-2016 (million tonnes per annum)	Percentage of regional total (%) 2005-2016
Herefordshire	0.424	7.30%
Shropshire	2.949	50.75%
Staffordshire	1.395	24.01%
Warwickshire	0.88	15.14%
West Midlands County	0	0%
Worcestershire	0.163	2.81%
West Midlands Region	5.812	100%

Source: West Midlands Regional Spatial Strategy Phase Two Revision – Draft. Preferred Option December 2007

FACTOR 3: UNSTERILISED RESOURCE

- 2.52. Data for this factor were the GIS layers for mineral resources as defined by the BGS collated in GIS into a single layer for sand and gravel and a single layer for crushed rock. The data is subject to the limitations discussed in paragraphs 2.23-2.24.
- 2.53. These layers did not take account of resource that has been sterilised by urban development and associated infrastructure. It also did not take account of worked-out sites. It was therefore necessary to process the data further to more accurately estimate the distribution of the resource within each sub-region.
- 2.54. In a recent BGS study³ undertaken for the former South East Regional Assembly (now South East England Partnership Board) a methodology for determining the extent of the sterilised resource was developed. This methodology has been drawn upon for this study. Factors that sterilise the resource are:
- The road network – based on the Primary Road Network with a 5m buffer of the line features in GIS to approximate the footprint on the ground;
 - Railways – based on railway data supplied by WMRA with a 5m buffer of the line features in GIS to approximate the footprint on the ground;
 - Urban areas – based on the 2001 Census Urban Areas dataset; and
 - Worked-out sites – see next paragraph.
- 2.55. No comprehensive GIS layer of worked-out sites was available for the Region. Each of the MPAs was asked to provide this data for their MPA in GIS format and these were collated by Staffordshire County Council and passed on to Land Use Consultants to use in GIS.
- 2.56. Data for historic/worked-out sites were only available for some of the MPAs. The list below summarises the data collection exercise:
- Shropshire: Historical sites available as GIS layer and have been removed from the resource layer;
 - Staffordshire: Historical sites available as GIS layer and have been removed from the resource layer;
 - Worcestershire: No GIS data on historical sites available;
 - Herefordshire: No GIS data on historical sites available;

³ South East England Regional Assembly: South East Plan – Review of Mineral Supply and Demand. Economic Minerals Programme Commissioned Report CR/06/147. British Geological Society 2006.

- Warwickshire: Data on some worked-out sites provided as GIS layer. Not data available for historic sites;
- Walsall: Historical sites available as GIS layer and have been removed from the resource layer; and
- Solihull: Historical sites available as GIS layer and have been removed from the resource layer.

2.57. **Table 2.8 and 2.9** show the breakdown of unsterilised resource area by sub-region for sand and gravel and crushed rock and **Figures 3 and 4** show the mapped resource.

Table 2.8: Area (ha) of unsterilised sand and gravel by sub-region

Sub-region	Area of unsterilised sand and gravel (ha)	% of total
Herefordshire	24,653.77	10.79
Shropshire	80,134.19	35.06
Staffordshire	54,194.83	23.71
Warwickshire	36,797.88	16.10
West Midlands County	7,751.05	3.39
Worcestershire	25,036.40	10.95
West Midlands	228,568.13	100.00

Source: BGS and MPAs (for worked-out/historic sites)

Table 2.9: Area (ha) of unsterilised crushed rock by sub-region

Sub-region	Area of unsterilised crushed rock (ha)	% of total
Herefordshire	4,806.46	13.30
Shropshire	21,713.22	60.07
Staffordshire	6,697.91	18.53
Warwickshire	1,919.17	5.31
<i>West Midlands County*</i>	<i>65.12</i>	<i>0.18</i>
Worcestershire	947.40	2.62
West Midlands	36,149.27	100.00

Source: BGS and MPAs (for worked-out/historic sites)

* Although the BGS data shows 65.12ha of unsterilised crushed rock in West Midlands County, the reserves are known to be exhausted and this will be set to zero for the apportionment. See para 2.58

2.58. Despite the BGS data showing that there is some crushed rock resource in West Midlands County, the reserves have been exhausted and the last quarry in the area

has ceased production⁴. For this reason, the area used in the apportionment methodology for crushed rock will be set to zero so that West Midlands County receives no apportionment for crushed rock.

- 2.59. Unfortunately the thickness of the resource is not known, so it is not possible to translate the hectares mapped by the BGS into a volume (million tonnes).

FACTOR 4: CONSTRAINTS

- 2.60. Data for this factor were the area (ha) of unsterilised resource outside of international and national designations. All of this data are available as GIS layers from Natural England and English Heritage, and are shown in **Figures 5 and 6**.

- 2.61. The four international designations considered for this factor are listed below:

- Special Areas of Conservation;
- Special Protection Areas;
- Ramsar sites; and
- World Heritage Sites

- 2.62. The eight national designations considered for this factor are listed below:

- Sites of Special Scientific Interest;
- Areas of Outstanding Natural Beauty;
- National Nature Reserves;
- National Parks;
- Scheduled Ancient Monuments;
- Registered Parks and Gardens;
- Registered Battlefields; and
- Listed Buildings.

- 2.63. All of the layers are available as polygons (i.e. they have an area or footprint) except for the Listed Building data, which are available as both points (i.e. with no associated footprint/area) and polygons. When considering Listed Buildings, both the point and polygon layers need to be taken into account. The polygon Listed Buildings layer was converted to centre points and appended to the point dataset to create one layer for Listed Buildings.

⁴ West Midlands Regional Aggregate Working Party Annual Report 2007.

- 2.64. In order to accommodate the polygon constraints layers and the Listed Buildings points into this factor, a two stage approach had to be developed.
- 2.65. The first stage was to assimilate all the polygon layers into a single data layer, and calculate the area of mineral resource (for each resource type) outside of these international and national designations. This value, calculated in GIS, was then normalised to achieve a number between 0 and 1. In order to include Listed Buildings (which were now collated as a point layer) within the single ‘constraints factor’, the density of heritage features per hectare of mineral resource was calculated. This value was then translated into a value for the inverse density per hectare of resource, and normalised⁵.
- 2.66. The second stage was to combine these two normalised values using a ratio of 11:1 (11 other international and national constraints: 1 Listed Building designation) to achieve one normalised value for national constraints to feed into the apportionment methodology. The 11:1 ratio reflects the fact that Listed Buildings is 1 of 12 constraint features that need to be accounted for in this factor. This two stage approach is seen as the best way to incorporate these two different data types into one factor. This approach was used in the apportionment of primary aggregates in the South East Region, and was agreed with English Heritage for that study.
- 2.67. **Tables 2.10 and 2.11** show the areas of resource outside of international and national designations that were used in this calculation. **Tables 2.12 and 2.13** show the calculation of the density and inverse density of Listed Buildings per sub-region. **Figures 7 and 8** show the spatial relationship between each of the resource types and these designations.

Table 2.10: Areas (ha) of unsterilised sand and gravel outside of constraints

Sub-region	Area of unsterilised sand and gravel outside of international and national designations (ha)	% of total
Herefordshire	22,127.95	10.56
Shropshire	74,235.63	35.41
Staffordshire	47,414.90	22.62
Warwickshire	34,762.71	16.58

⁵ The inverse is used in order to positively weight the potential constraint to the use of the mineral resource represented by a Listed Building. In effect, a high inverse density will mean that there is a low Listed Building density per hectare of mineral resource within a sub-region, and that sub-region should therefore receive more of the apportionment. If the inverse density is not used, a sub-region with a low density of Listed Buildings per hectare of mineral resource would have a low normalised value compared to other sub-regions with higher densities of Listed Buildings per hectare of mineral resource. Thus, even though the low density of Listed Buildings represents a higher amount of potentially unconstrained mineral resource in that sub-region, when weighting is applied to this criterion, that sub-region would receive a lower sub-regional apportionment, which would not reflect its level of potentially unconstrained (by Listed Buildings) mineral resource.

Sub-region	Area of unsterilised sand and gravel outside of international and national designations (ha)	% of total
West Midlands County	7,642.62	3.65
Worcestershire	23,457.55	11.19
West Midlands	209,641.37	100.00

Table 2.11: Areas (ha) of unsterilised crushed rock outside of constraints

Sub-region	Area of unsterilised crushed rock outside of international and national designations (ha)	% of total
Herefordshire	3,034.61	20.40
Shropshire	8,915.46	59.92
Staffordshire	1,940.27	13.04
Warwickshire	738.37	4.96
West Midlands County*	52.18	0.35
Worcestershire	197.63	1.33
West Midlands	14,878.51	100.00

Source: BGS, MPAs, Natural England and English Heritage

* Although the BGS data shows 52.18ha of unsterilised crushed rock outside of designations in West Midlands County, the reserves are known to be exhausted and this will be set to zero for the apportionment. See para 2.58

Table 2.12: Density of Listed Buildings per hectare of unsterilised sand and gravel

Sub-region	Area of unsterilised sand and gravel (ha)	Number of Listed Buildings on resource	Density of Listed Buildings (Listed Buildings per hectare)	Inverse density (1 - Listed Building density)
Herefordshire	24,653.77	430	0.017	0.983
Shropshire	80,134.19	1417	0.018	0.982
Staffordshire	54,194.83	651	0.012	0.988
Warwickshire	36,797.88	764	0.021	0.979
West Midlands County	7,751.05	121	0.016	0.984
Worcestershire	25,036.40	776	0.031	0.969
West Midlands	228,568.13	4159	0.018	0.982

Source: BGS, MPAs and English Heritage

Table 2.13: Density of Listed Buildings per hectare of unsterilised crushed rock

Sub-region	Area of unsterilised crushed rock (ha)	Number of Listed Buildings on resource	Density of Listed Buildings (Listed Buildings per hectare)	Inverse density (1 - Listed Building density)
Herefordshire	4,806.46	136	0.028	0.972
Shropshire	21,713.22	259	0.012	0.988
Staffordshire	6,697.91	148	0.022	0.978
Warwickshire	1,919.17	31	0.016	0.984
<i>West Midlands County*</i>	<i>65.12</i>	<i>1</i>	<i>0.015</i>	<i>0.985</i>
Worcestershire	947.40	24	0.025	0.975
West Midlands	36,149.27	599	0.017	0.983

Source: BGS, MPAs and English Heritage

* Although the BGS data shows 65.12ha of unsterilised crushed rock in West Midlands County, the reserves are known to be exhausted and this will be set to zero for the apportionment. See para 2.58

STAGE 3: DEVELOPMENT OF OPTIONS

- 2.68. For the purposes of discussion at the December Steering Group/WMRAWP meeting, LUC presented a number of potential options for generating the sub-regional apportionment figures. There was a clear rationale for generating each of the options, which was to demonstrate to the meeting participants the principle of weighting, and the effect that each factor has on the overall apportionment. Each of the options included all of the factors. The initial options are listed below:
- **Supply-led** - Giving the highest weighting to the location of the resource, and distributing equal weighting to the remaining factors;
 - **Growth-led** - Giving the highest weighting to demand, and distributing equal weighting to the remaining factors;
 - **Environment-led** - Giving the highest weighting to the amount of resource outside of environmental constraints, and distributing equal weighting to the remaining factors;
 - **Equal weighting** - where all factors are given equal weighting.
- 2.69. No sales-led option was presented as sales/ historical shares is the basis of the options being generated by WMRAWP.
- 2.70. Despite being based on data that was subsequently revised, these options formed the basis of a very useful discussion at the Steering Group / WMRAWP meeting about developing realistic options which could be appraised. The outcome of the

discussion was the inclusion of a further option and firming up of the initial proposed options which are presented in the next section.

STAGE 4: REVISED OPTIONS FOR APPRAISAL

2.71. With the involvement of the Steering Group and WMRAWP members the following options were developed:

- **Option A: Supply-led** weighted 70% on the supply (i.e. the location of the unsterilised resource), and 10% for each of the other factors (with a 6:4 ratio for future : current demand);
- **Option B: Growth-led** weighted 70% on demand (with a 6:4 ratio for future: current demand), and 10% for each of the other factors;
- **Option C: Environment-led** weighted 70% on constraints (i.e. the area of sterilised resource outside of environmental, landscape and heritage constraints), and 10% for each of the other factors (with a 6:4 ratio for future : current demand);
- **Option D: Equal weighting** weighted 25% for all the factors (with a 6:4 ratio for future : current demand); plus an additional option:
- **Option E: Demand and resource** weighted 40% on demand (with a 6:4 ratio for future: current demand), 40% on supply (the location of the unsterilised resource) and 10% each for past sales and constraints.

2.72. The weightings presented in these options are 'extreme' in order to show the differences between the options. The method allows for the weightings to be adjusted by adjusting the value of the percentages (e.g. the highest weighting could be set to 50% instead of 70%) to make the options less 'extreme'.

2.73. **Table 2.14** illustrates these options and **Table 2.15** shows the final percentages to be used once the ratios have been applied for Factor I.

Table 2.14: Weighting for five alternative options (to the current apportionment)

Factor	Option A: Supply-led	Option B: Growth- led	Option C: Environment- led	Option D: Equal weighting	Option E: Demand and resource
I: Demand (split 60/40 between Ia: future housing/infrastructure and Ib: current refurbishment and redevelopment)	10%	70%	10%	25%	40%

Factor	Option A: Supply-led	Option B: Growth- led	Option C: Environment- led	Option D: Equal weighting	Option E: Demand and resource
2: Past sales	10%	10%	10%	25%	10%
3: The resource	70%	10%	10%	25%	40%
4: Constraints	10%	10%	70%	25%	10%

Table 2.15: Final weighting for five alternative options once the ratios have been applied

Factor		Option A: Supply- led	Option B: Growth- led	Option C: Environment- led	Option D: Equal weighting	Option E: Demand and resource
I: Demand	a: future housing/infrast ructure	6%	42%	6%	15%	24%
	Ib: current refurbishment and redevelopmen t)	4%	28%	4%	10%	16%
2: Past sales		10%	10%	10%	25%	10%
3: The resource		70%	10%	10%	25%	40%
4: Constraints		10%	10%	70%	25%	10%

- 2.74. Factors I to 4 were fed into the Microsoft Excel based database, and using multi-criteria analysis, the weightings of each factor could be adjusted to reflect the options that were developed.
- 2.75. The results of applying these options to the sub-regional apportionment are discussed and illustrated in **Chapter 3**.

3. FINDINGS

3.1. The resulting sub-regional apportionment for each of the five options introduced at the end of **Chapter 2** is shown below. For both sand and gravel and crushed rock, a summary graph and table illustrate the outcomes of applying the apportionment methodology for each of the five options. The full database used to generate these options can be found in **Appendix 3**. The sub-regional apportionment has been expressed as a percentage of the regional total that each sub-region will need to provide for each resource type. Percentages have been used so that if the overall regional supply figures change, the methodology is flexible enough to accommodate these changes. These percentages have then been translated into volumes (million tonnes) based on the regional target. The current apportionment is also included in the tables and charts for comparison.

Sand and Gravel

3.2. **Table 3.1** and **Figure 9** show the results of the sub-regional apportionment options for land-won sand and gravel. A comparison has been made between the options and the current apportionment. **Table 3.2** shows the percentages translated into million tonnes (mt) based on achieving an overall Regional total of 165 mt.

Table 3.1: Summary of sand and gravel sub-regional apportionment options (percentages)

Sub-region	Option A: Supply-led	Option B: Growth-led	Option C: Environment-led	Option D: Equal weighting	Option E: Demand and resource	Current apportionment
Herefordshire	9.24%	4.96%	9.40%	6.91%	7.10%	2.80%
Shropshire	29.79%	15.01%	29.06%	21.88%	22.40%	8.10%
Staffordshire	27.19%	23.99%	26.24%	32.41%	25.59%	65.20%
Warwickshire	14.95%	11.10%	15.24%	13.23%	13.03%	10.30%
West Midlands County	8.29%	35.32%	9.10%	15.64%	21.81%	5.00%
Worcestershire	10.55%	9.62%	10.95%	9.94%	10.08%	8.60%
West Midlands	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Figure 9: Illustrative comparison of sand and gravel sub-regional apportionment options

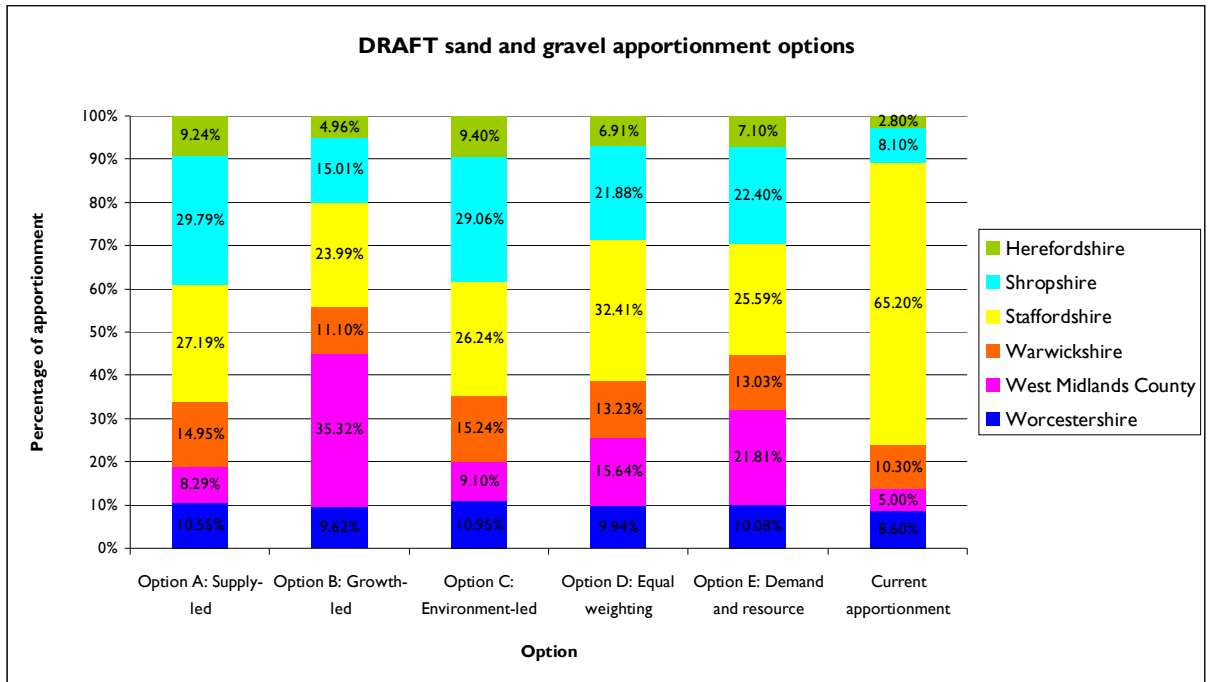


Table 3.2: Summary of sand and gravel sub-regional apportionment options (million tonnes)

Sub-region	Option A: Supply-led	Option B: Growth-led	Option C: Environment-led	Option D: Equal weighting	Option E: Demand and resource	Current apportionment
Herefordshire	15.24	8.19	15.52	11.40	11.71	4.61
Shropshire	49.15	24.76	47.95	36.10	36.95	13.36
Staffordshire	44.86	39.58	43.30	53.47	42.22	107.59
Warwickshire	24.67	18.32	25.15	21.83	21.49	17.00
West Midlands County	13.68	58.28	15.01	25.80	35.98	8.25
Worcestershire	17.40	15.87	18.07	16.40	16.64	14.19
West Midlands	165.00	165.00	165.00	165.00	165.00	165.00

- 3.3. Under the current apportionment, Staffordshire are required to provide over 65% of the regional sand and gravel total. Under all of the options A to E there is a reduction in Staffordshire’s apportionment. The result of this decrease for Staffordshire is an increase in the apportionment for all other sub-regions under all the options.
- 3.4. It is acknowledged that some options may result in a significant increase in the amount of aggregates that a sub-region is expected to supply which may be

unrealistic, but as discussed in paragraph 2.72, the weighting presented here are 'extreme' and can be modified if deemed unsuitable. An example of this is Option B, which is growth-led and therefore there is a dramatic increase in the amount apportioned to West Midlands County compared to the other options and the current apportionment. No check has been undertaken to establish whether there is sufficient sand and gravel resource to meet the implied volume for a particular sub-region from the apportionment options. Views on issues such as these from consultees would be very useful in informing the evolution and selection of options.

Crushed Rock

- 3.5. **Table 3.3** and **Figure 10** show the results of the sub-regional apportionment options for crushed rock expressed as a percentage of the Regional total. A comparison has been made between the options and the current apportionment. **Table 3.4** shows the percentages translated into million tonnes (mt) based on achieving an overall Regional total of 82 mt.
- 3.6. As per para 2.58, no apportionment has been given to West Midlands County on account of the reserves having been exhausted⁶ - despite the BGS resource data showing that there is a very small amount of resource (approximately 65ha).

Table 3.3: Summary of crushed rock sub-regional apportionment options (percentages)

Sub-region	Option A: Supply-led	Option B: Growth-led	Option C: Environment-led	Option D: Equal weighting	Option E: Demand and resource	Current apportionment
Herefordshire	12.81%	9.08%	17.06%	12.04%	10.94%	7.30%
Shropshire	54.90%	30.93%	52.88%	46.99%	42.92%	50.75%
Staffordshire	20.32%	30.57%	17.38%	22.97%	25.45%	24.01%
Warwickshire	7.74%	15.82%	8.29%	11.37%	11.78%	15.14%
Worcestershire	4.23%	13.61%	4.38%	6.64%	8.92%	2.81%
West Midlands	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

⁶ West Midlands Regional Aggregate Working Party Annual Report 2007.

Figure 10: Illustrative comparison of crushed rock sub-regional apportionment options

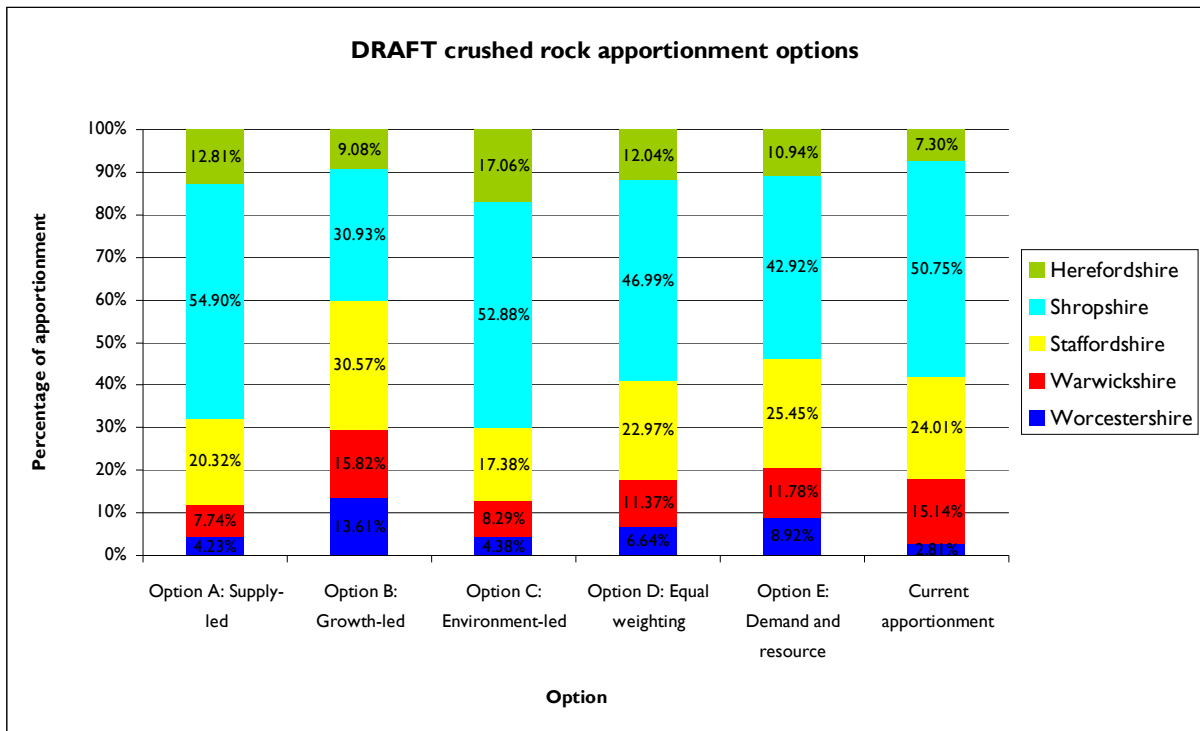


Table 3.4: Summary of crushed rock sub-regional apportionment options (million tonnes)

Sub-region	Option A: Supply-led	Option B: Growth-led	Option C: Environment-led	Option D: Equal weighting	Option E: Demand and resource	Current apportionment
Herefordshire	10.50	7.45	13.99	9.87	8.97	5.98
Shropshire	45.02	25.36	43.36	38.53	35.19	41.61
Staffordshire	16.67	25.07	14.25	18.83	20.87	19.69
Warwickshire	6.35	12.97	6.80	9.32	9.66	12.42
Worcestershire	3.47	11.16	3.60	5.44	7.31	2.30
West Midlands	82.00	82.00	82.00	82.00	82.00	82.00

3.7. Under the current apportionment, Shropshire has the highest apportionment at just over 50%. Under all options A to E, Shropshire continues to have the highest apportionment. All options result in an increase for Herefordshire and all options with the exception of Option B result in a reduction in Warwickshire’s apportionment.

4. CONCLUSIONS

- 4.1. The development of the sub-regional apportionment methodology for the West Midlands Region has been guided by the input from the Steering Group and members of WMRAWP, and provides a transparent means for identifying the contribution that each sub-region should make towards the regional supply figures for sand and gravel, and crushed rock. Five options based on different weightings scenarios for the factors to be included in the sub-regional apportionment, have been formulated by the Steering Group and members of WMRAWP to reflect a range of different priorities within the region relevant to supply of land-won primary aggregates, and to illustrate how sub-regions would be affected in terms of their sub-regional apportionment under each option.
- 4.2. The methodology is flexible, and datasets can be revised as needed, especially if new data become available. Specific data for each sub-region can be revised if necessary and the weightings for each factor can be adjusted. By expressing the final sub-regional apportionment figures as percentages for each sub-region, the actual tonnages for each sub-region can also be adjusted if the regional supply figure were to be altered in the future.
- 4.3. The next stage of the process will be for a preferred apportionment option to be developed for consideration by the Regional Assembly in February 2010. The preferred apportionment option will take account of the range of alternative options presented in this report, together with the range of options developed by WMRAWP, the Sustainability Appraisals thereof and responses to the technical consultation.

Land Use Consultants

18 December 2009

S:\4700\4795 WM Aggregates Apportionment\Documents\Report\LUC WM Final Draft report 18.12.09.doc

APPENDIX I

List of attendees at 13 November 2009 meeting

LIST OF MEETING ATTENDEES 13 NOVEMBER 2009

Jon Grantham, Diana Manson, Taran Livingston - Land Use Consultants

Steve Owen – URSUS Consulting

David Clarke - WMRA

Paul Wilcox - Staffordshire County Council

Chris Blakeley - WMRA

Dawn Harris- Walsall Metropolitan Borough Council

Mohammed Salim- Sandwell Metropolitan Borough Council

Matt Griffin – Staffordshire County Council

Tony Lyons – Warwickshire County Council

Malcolm Bell - Shropshire Council

APPENDIX 2

List of attendees at 4 December 2009 meeting

LIST OF MEETING ATTENDEES 4 DECEMBER 2009

Paul Wilcox - WMRAWP Chairman/ Staffordshire County Council
Jasbir Kaur - Technical Secretary/ Warwickshire County Council
Matt Griffin - Staffordshire County Council
Malcolm Bell - Shropshire Council
Chris Blakeley - West Midland Regional Assembly
Nick Dean - Worcestershire County Council
Malcolm Bell - Shropshire Council
Mick Daynes - MPA / Hanson UK
Tony Lyons - Warwickshire County Council
Ray Colbourne - GOWM
Mohammed Salim - Sandwell MBC
Malcolm Lawer - MPA /Tarmac
Tim Deal - MPA/ Lafarge
Colin d'Oyley - MPA/ Ennstone UK
Anthony Rowley - Cemex
Debby Klein - Herefordshire Council
Adrian Cooper - Shropshire Council
Ken Hobden - MPA
Dave Clarke - West Midlands Regional Assembly
Dawn Harris - Walsall MBC
Stephen Owen - URSUS Consulting Ltd
Jon Grantham - LUC
Taran Livingston - LUC

Apologies:

Rob Haig – Coventry CC
Jim Davies – Environment Agency
Craig Rowbottom – Wolverhampton CC
Brian Davies - Stoke CC
Andy Ambrose – Consultant
Brian Dore - Birmingham City Council

APPENDIX 3

Database of apportionment options

Sand and gravel: The raw and normalised data

Sub Region	Factor 1: Demand				Factor 2: Past sales		Factor 3: Unsterilised resource		Factor 4: Unsterilised resource outside of International and National Designations		
	Factor 1a Housing provision	Normalised factor 1a	Factor 1b Existing population	Normalised factor 1b	Factor 2 Past sales	Normalised factor 2	Factor 3 Area (ha) of resource	Normalised factor 3	Factor 4a Area(ha) of resource outside of International and National Designations	Factor 4b Inverse density of Listed Buildings per ha of resource	Normalised factor 4
Herefordshire	12,425	0.04	179,300	0.03	0.21	0.02	24,653.77	0.11	22,127.95	0.983	0.11
Shropshire	37,520	0.12	454,900	0.08	0.79	0.08	80,134.19	0.35	74,235.63	0.982	0.34
Staffordshire	55,615	0.17	1,069,000	0.20	6.35	0.65	54,194.83	0.24	47,414.90	0.988	0.22
Warwickshire	30,590	0.10	530,700	0.10	1.02	0.11	36,797.88	0.16	34,762.71	0.979	0.17
West Midlands County	154,480	0.48	2,619,600	0.48	0.58	0.06	7,751.05	0.03	7,642.62	0.984	0.05
Worcestershire	28,080	0.09	557,600	0.10	0.75	0.08	25,036.40	0.11	23,457.55	0.969	0.12
TOTAL	318,710	1.00	5,411,100	1.00	9.70	1.00	228,568.13	1.00	209,641.37	5.89	1.00

The options for appraisal

	Factor	Weighting
Option A: Supply-led	Factor 1a: Future housing	6%
	Factor 1b: Existing population	4%
	Factor 2: Past sales	10%
	Factor 3: Unsterilised resource	70%
	Factor 4: Unsterilised resource outside of International and National Designations	10%
SUM	100%	
Sub region	Apportionment %	Apportionment (mt)
Herefordshire	9.24%	15.2
Shropshire	29.79%	49.1
Staffordshire	27.19%	44.9
Warwickshire	14.95%	24.7
West Midlands County	8.29%	13.7
Worcestershire	10.55%	17.4
TOTAL	100.00%	165.0

	Factor	Weighting
Option B: Growth-led	Factor 1a: Future housing	42%
	Factor 1b: Existing population	28%
	Factor 2: Past sales	10%
	Factor 3: Unsterilised resource	10%
	Factor 4: Unsterilised resource outside of International and National Designations	10%
SUM	100%	
Sub region	Apportionment %	Apportionment (mt)
Herefordshire	4.96%	8.2
Shropshire	15.01%	24.8
Staffordshire	23.99%	39.6
Warwickshire	11.10%	18.3
West Midlands County	35.32%	58.3
Worcestershire	9.62%	15.9
TOTAL	100.00%	165.0

	Factor	Weighting
Option C: Environment-led	Factor 1a: Future housing	6%
	Factor 1b: Existing population	4%
	Factor 2: Past sales	10%
	Factor 3: Unsterilised resource	10%
	Factor 4: Unsterilised resource outside of International and National Designations	70%
SUM	100%	
Sub region	Apportionment %	Apportionment (mt)
Herefordshire	9.40%	15.5
Shropshire	29.06%	48.0
Staffordshire	26.24%	43.3
Warwickshire	15.24%	25.2
West Midlands County	9.10%	15.0
Worcestershire	10.95%	18.1
TOTAL	100.00%	165.0

	Factor	Weighting
Option D: Equal weighting	Factor 1a: Future housing	15%
	Factor 1b: Existing population	10%
	Factor 2: Past sales	25%
	Factor 3: Unsterilised resource	25%
	Factor 4: Unsterilised resource outside of International and National Designations	25%
SUM	100%	
Sub region	Apportionment %	Apportionment (mt)
Herefordshire	6.91%	11.4
Shropshire	21.88%	36.1
Staffordshire	32.41%	53.5
Warwickshire	13.23%	21.8
West Midlands County	15.64%	25.8
Worcestershire	9.94%	16.4
TOTAL	100.00%	165.0

	Factor	Weighting
Option E: Demand and resource	Factor 1a: Future housing	24%
	Factor 1b: Existing population	16%
	Factor 2: Past sales	10%
	Factor 3: Unsterilised resource	40%
	Factor 4: Unsterilised resource outside of International and National Designations	10%
SUM	100%	
Sub region	Apportionment %	Apportionment (mt)
Herefordshire	7.10%	11.7
Shropshire	22.40%	37.0
Staffordshire	25.59%	42.2
Warwickshire	13.03%	21.5
West Midlands County	21.81%	36.0
Worcestershire	10.08%	16.6
TOTAL	100.00%	165.0

Current apportionment		
Sub region	Apportionment (mt)	Apportionment %
Herefordshire	0.28	2.80%
Shropshire	0.82	8.10%
Staffordshire	6.60	65.20%
Warwickshire	1.04	10.30%
West Midlands County	0.51	5.00%
Worcestershire	0.87	8.60%
TOTAL	10.13	100.00%

Crushed rock: The raw and normalised data

Sub Region	Factor 1: Demand				Factor 2: Past sales		Factor 3: Unsterilised resource		Factor 4: Unsterilised resource outside of International and National Designations		
	Factor 1a Housing provision	Normalised factor 1a	Factor 1b Existing population	Normalised factor 1b	Factor 2 Past sales	Normalised factor 2	Factor 3 Area (ha) of resource	Normalised factor 3	Factor 4a Area(ha) of resource outside of International and National Designations	Factor 4b Inverse density of Listed Buildings per ha of resource	Normalised factor 4
Herefordshire	12,425	0.08	179,300	0.06	0.42	0.07	4,806.46	0.13	3,034.61	0.972	0.20
Shropshire	37,520	0.23	454,900	0.16	2.95	0.51	21,713.22	0.60	8,915.46	0.988	0.57
Staffordshire	55,615	0.34	1,069,000	0.38	1.40	0.24	6,697.91	0.19	1,940.27	0.978	0.14
Warwickshire	30,590	0.19	530,700	0.19	0.88	0.15	1,919.17	0.05	738.37	0.984	0.06
Worcestershire	28,080	0.17	557,600	0.20	0.16	0.03	947.40	0.03	197.63	0.975	0.03
TOTAL	164,230	1.00	2,791,500	1.00	5.81	1.00	36,084.15	1.00	14,826.33	4.90	1.00

The options for appraisal

	Factor	Weighting
Option A: Supply-led	Factor 1a: Future housing	6%
	Factor 1b: Existing population	4%
	Factor 2: Past sales	10%
	Factor 3: Unsterilised resource	70%
	Factor 4: Unsterilised resource outside of International and National Designations	10%
	SUM	100%
Sub region	Apportionment %	Apportionment (mt)
Herefordshire	12.81%	10.5
Shropshire	54.90%	45.0
Staffordshire	20.32%	16.7
Warwickshire	7.74%	6.3
Worcestershire	4.23%	3.5
TOTAL	100.00%	82.0

	Factor	Weighting
Option B: Growth-led	Factor 1a: Future housing	42%
	Factor 1b: Existing population	28%
	Factor 2: Past sales	10%
	Factor 3: Unsterilised resource	10%
	Factor 4: Unsterilised resource outside of International and National Designations	10%
	SUM	100%
Sub region	Apportionment %	Apportionment (mt)
Herefordshire	9.08%	7.4
Shropshire	30.93%	25.4
Staffordshire	30.57%	25.1
Warwickshire	15.82%	13.0
Worcestershire	13.61%	11.2
TOTAL	100.00%	82.0

	Factor	Weighting
Option C: Environment-led	Factor 1a: Future housing	6%
	Factor 1b: Existing population	4%
	Factor 2: Past sales	10%
	Factor 3: Unsterilised resource	10%
	Factor 4: Unsterilised resource outside of International and National Designations	70%
	SUM	100%
Sub region	Apportionment %	Apportionment (mt)
Herefordshire	17.06%	14.0
Shropshire	52.88%	43.4
Staffordshire	17.38%	14.3
Warwickshire	8.29%	6.8
Worcestershire	4.38%	3.6
TOTAL	100.00%	82.0

	Factor	Weighting
Option D: Equal weighting	Factor 1a: Future housing	15%
	Factor 1b: Existing population	10%
	Factor 2: Past sales	25%
	Factor 3: Unsterilised resource	25%
	Factor 4: Unsterilised resource outside of International and National Designations	25%
	SUM	100%
Sub region	Apportionment %	Apportionment (mt)
Herefordshire	12.04%	9.9
Shropshire	46.99%	38.5
Staffordshire	22.97%	18.8
Warwickshire	11.37%	9.3
Worcestershire	6.64%	5.4
TOTAL	100.00%	82.0

	Factor	Weighting
Option E: Demand and resource	Factor 1a: Future housing	24%
	Factor 1b: Existing population	16%
	Factor 2: Past sales	10%
	Factor 3: Unsterilised resource	40%
	Factor 4: Unsterilised resource outside of International and National Designations	10%
	SUM	100%
Sub region	Apportionment %	Apportionment (mt)
Herefordshire	10.94%	9.0
Shropshire	42.92%	35.2
Staffordshire	25.45%	20.9
Warwickshire	11.78%	9.7
Worcestershire	8.92%	7.3
TOTAL	100.00%	82.0

Current apportionment		
Sub region	Apportionment (mt)	Apportionment %
Herefordshire	0.42	7.30%
Shropshire	2.95	50.75%
Staffordshire	1.40	24.01%
Warwickshire	0.88	15.14%
Worcestershire	0.16	2.81%
TOTAL	5.81	100.00%