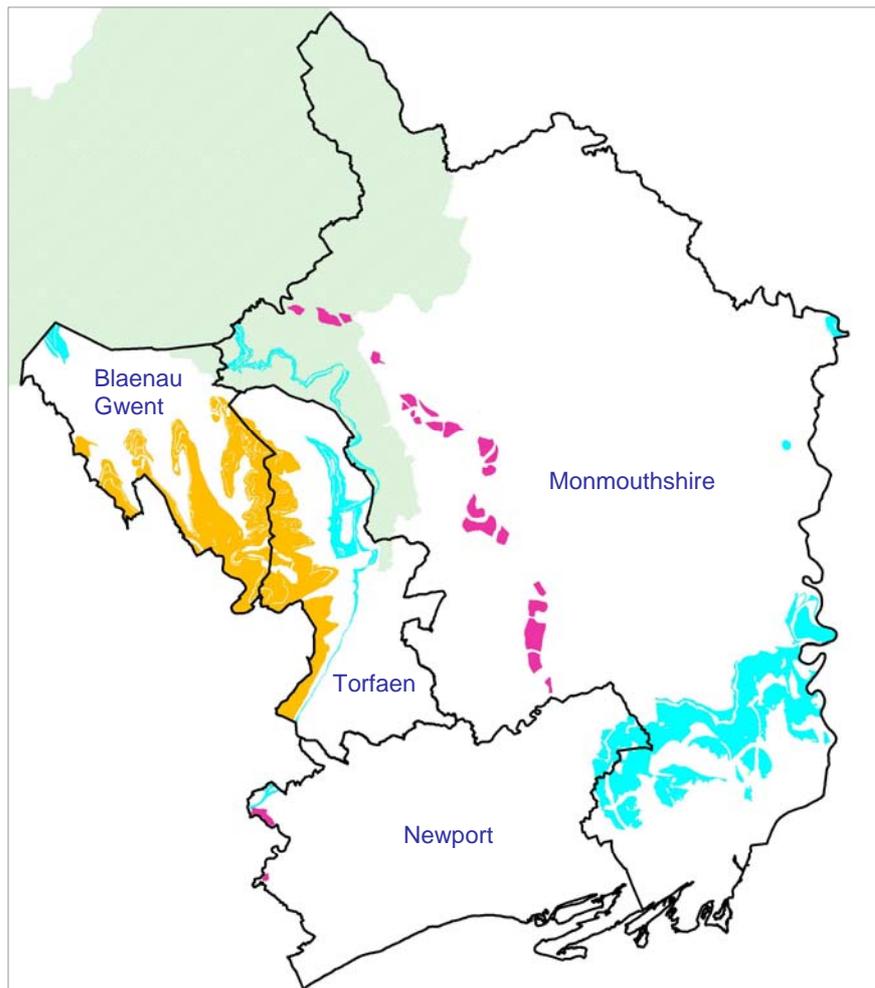


**Torfaen Borough Council; Blaenau Gwent
Borough Council; Newport City Council;
Monmouthshire County Council**

**'Former Gwent'
Aggregates Safeguarding Study**



Final Report
May 2009

Cuesta Consulting Limited

Cuesta

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1. Introduction and Terms of Reference

- 1.1 This report presents the findings of a study commissioned jointly by the four Mineral Planning Authorities (MPAs) which comprise the former County of Gwent in South East Wales: Torfaen Borough Council, Blaenau Gwent Borough Council, Newport City Council and Monmouthshire County Council.
- 1.2 The aim of the study was to provide the geological input required by the MPAs in order for them to address the aggregate mineral safeguarding and apportionment requirements of the first edition of the South Wales Regional Technical Statement (RTS), published in 2008.
- 1.3 For Torfaen the RTS states: -
- In order to meet a proportionate share of demand, the MPA should assess the potential to make a resource allocation in the LDP of 5 - 6 Mt; and
 - Limestone / sandstone resources should be investigated and safeguarded for possible future use.
- 1.4 For Blaenau Gwent the RTS states: -
- In order to meet a proportionate share of demand, the MPA should assess the potential to make a resource allocation of at least 3 Mt in the LDP. Where feasible, this should be of limestone.
 - Additional Carboniferous Limestone resources need to be examined and safeguarded.
 - Alternative Carboniferous sandstone resources should be investigated and selectively safeguarded for possible future use.
- 1.5 For Newport the RTS states: -
- The MPA should examine the feasibility of making allocations which go an appreciable way towards meeting the estimated 8 - 8.5 Mt of demand for aggregates arising within its area.
 - The secondary aggregate stockpiles should be monitored and where available used to replace the shortfall in primary aggregate reserves.
 - (Existing and prospective wharves should be identified for protection in the LDP to safeguard the marine sand and gravel and possibly other minerals flow into the area).
 - (The rail sidings at Mon Bank should be safeguarded to maintain existing and potential use for the transportation of aggregates by rail).
 - The feasibility of sea borne rock imports should be explored
 - Land won sand and gravel resources and possibly small areas of limestone which may be workable, need to be safeguarded in the LDP.
- 1.6 For Monmouthshire the RTS states: -
- (On the basis of the information on permitted reserves available and in the light of MTAN1 policy (para 49), and applying Method A and Method B apportionment, no resource allocation is required at present. However, in preparing Local Development Plans, consideration should be given to whether the factors in Box 1 above give rise to any requirement for resource allocations).
 - (Existing and potential wharves should be identified for protection in the LDP to safeguard marine sand supplies to the area).

- Additional resources of limestone should be investigated and safeguarded for possible future use in the LDP.
- Land based sand and gravel resources need to be safeguarded in the LDP.

1.7 The requirements shown in brackets were not included in the work covered by this study. It was also agreed at the outset that the study would provide only a desk-based geological assessment, using British Geological Survey (BGS) digital mapping; sand & gravel resource blocks previously identified by Symonds Group Ltd for the Welsh Assembly Government (WAG); discussions with industry; and limited field visits, with a view to identifying Mineral Safeguarding Areas (MSAs). As the study progressed it was confirmed that, whilst this report would also offer guidance on the delineation, within the MSAs, of Areas of Search and Preferred Areas (see Chapter 2 for definitions), the actual determination of these would be undertaken by the MPAs within their own Geographic Information Systems (GIS), by combining the geological MSA boundaries identified by Cuesta with urban areas, environmental constraints and other data held by the MPAs.

2. Methodology and Definitions

Definition of Mineral Safeguarding

- 2.1 Minerals Planning Policy for Wales (MPPW) notes, at paragraph 13, that *"It is important that access to mineral deposits which society may need is safeguarded"*; and that this means developing policies which *"protect them from other types of permanent development which would either sterilise them or hinder extraction"*.
- 2.2 The same paragraph makes clear that safeguarding *"does not necessarily indicate an acceptance of working, but that the location and quality of the mineral is known, and that the environmental constraints associated with extraction have been considered"*.
- 2.3 It is not clear from this statement to what extent environmental constraints need to be taken into account in defining the areas to be safeguarded. However, the South Wales RTS specifically requires the safeguarding of potential aggregate resources within National Parks (even though resource allocations in those areas are not required). For consistency with this, it is logical that Mineral Safeguarding Areas (MSAs) should also extend, where necessary, through other types of national (and international) environmental constraints, and beneath urban areas, so as to include the whole outcrop of geological formations that are considered likely to be suitable for use as aggregates.
- 2.4 This view is supported, with qualifications, by the BGS Guide to Mineral Safeguarding (McEvoy et al., 2008), which notes that *"Mineral safeguarding should not be curtailed by other planning designations such as urban areas and environmental designations without sound justification"*. No further explanation is given as to what might constitute 'sound justification', although the guide points out that *"Any modifications made by an MPA such as decisions not to include a resource or reduce or extend a resource boundary, will need to be based on robust and credible evidence to withstand the scrutiny of a public examination"*.
- 2.5 In some circumstances it may be argued that designated areas might be excluded from MSAs if there are plentiful known resources in unconstrained areas nearby. This, however, may only stand up to detailed scrutiny if those alternative resources were known to be viable, based on detailed geological information. That is generally not the case in this particular study, where (as explained below) the potential resources are defined only on the basis of BGS mapping of geological formations which are known to have been successfully exploited *elsewhere in the region* (or, in the case of sand & gravel deposits, geomorphological mapping of associated landforms). Whilst these provide a reasonable indication of their suitability, geological characteristics are known to vary from one part of an outcrop to another, and it cannot be assumed, without more detailed geological information, that all areas within the same formation are equally suitable for use as aggregates. For this reason, it would seem appropriate that **MSAs in the former Gwent area should include relevant outcrops within areas protected by environmental constraints.**
- 2.6 With regard to areas of existing built development, the view put forward by industry during the course of this project is that these should also be disregarded in terms of identifying the extent of MSAs, since safeguarding is a long term concept which aims to protect resources beyond the life of existing development. The BGS guide provides examples of specific minerals which it may be sensible to extract within urban areas during regeneration projects etc. It also points out, however, that the *"definition of MSAs beneath urban areas may not be appropriate when resources occur extensively elsewhere within the plan area, or where the working methods required are likely to be unacceptable in an urban environment, such as the extraction by blasting of hard rock"*. For the latter of these reasons, unless otherwise directed by the Welsh Assembly

Government (WAG), it would seem appropriate that **MSAs for hard rock aggregate resources within the former Gwent area should exclude areas of existing urban development, as defined by the MPAs.**

- 2.7 The foregoing observations are made in good faith and based on national policy and available good practice guidance. They should not, however, be taken as formal recommendations. Final decisions on whether or not the MSAs should include or exclude environmental constraints and urban areas, and on the content of associated safeguarding policies within local plans, will be a matter for the individual MPAs (who may wish to seek further guidance from WAG).
- 2.8 The main remit of this study is to define the geological outcrops which represent potential resources, irrespective of other factors.

Identification of Geological Formations Suitable for Safeguarding

Hard Rock Formations

- 2.9 As noted above, in the absence of detailed, sub-surface geological information across the whole of the study area, the identification of potential hard rock aggregate resources has largely been based on the mapped distribution of 'solid' geological formations which either are, or are known to have been, exploited for use as aggregates elsewhere within the region. Other formations which are known to be of similar lithology (rock type) to those which have been or are being quarried, or which have been shown by aggregate quality testing to be potentially suitable, have also been considered for inclusion, through a process of elimination, described below. In all cases, the geological boundaries used have been those shown on the latest available BGS digital mapping for the area.
- 2.10 The 'former Gwent' area encompasses a very wide range of geological formations, from Silurian to Triassic in age, and an equally wide range of sedimentary rock types, from limestones of various types through to mudstones, clays, shales, coal seams, siltstones, sandstones and conglomerates. There are no igneous or metamorphic rocks within the area.
- 2.11 The suitability of an individual formation for use as aggregate depends on a combination of physical properties, which in turn are related (among other things) to the age and lithology of the material. Young sedimentary rocks tend to be relatively weak, compared with older formations, and generally do not possess sufficient strength and/or durability to be used as hard rock construction aggregates. Similarly, fine grained sedimentary rocks including mudstones and shales are generally too weak to be used as aggregates, not least because of their thinly-bedded nature which causes the rocks to break down into thin, 'flaky' particles when crushed. Coarser-grained sediments, such as siltstone and sandstone can provide good quality aggregates, but only if they are sufficiently strong. They also have the particular ability to provide aggregates with a high degree of resistance to polishing (high Polished Stone Value - PSV) which, if the rock is also strong and durable, enables it to be used in skid-resistant road surfacing materials (Thompson *et al.*, 1993, 2005). Limestone, by contrast, polishes too easily to be used in road surfacing, but hard Carboniferous Limestones generally provide high quality general purpose construction aggregates, for use in the lower layers of road construction and in concrete.
- 2.12 One further geological characteristic which has a major influence on the suitability of sedimentary rock types as potential aggregate resources is the nature of the bedding. Rocks which would otherwise be suitable, but which are closely interbedded with inferior rock types (mudstones, shales, coal seams etc) cannot be commercially exploited because of the difficulty, cost and inefficiency of separating the good quality aggregate from inferior, interbedded material.

- 2.13 Taking all of these characteristics into account – those associated with age, lithology and bedding characteristics – only a small proportion of the wide range of available rock types are actually capable of yielding aggregates with acceptable physical properties and economic potential. Within the 'former Gwent' study area, all Triassic and Jurassic strata, all fine-grained sediments, all Carboniferous sandstones except for the Pennant Measures, and most if not all Devonian strata are ruled out by one or more of these criteria. It is only the Carboniferous Limestones and 'Pennant' sandstones which are generally strong enough to meet aggregate specifications and capable of being economically worked. This is underlined by the fact that it is only these formations which are (or recently have been) commercially quarried within the region.
- 2.14 In both cases, although the best available geological mapping has been used, this does not purport to show the extent of economically workable resources. The resulting delineation of potential resources (see Chapter 3) should therefore not be taken to infer that all such areas are necessarily capable of being worked, commercially, for the production of aggregates of any particular quality. In all cases, more detailed geological exploration and laboratory testing will be necessary in order to prove (or disprove) the existence and quality of aggregate reserves within these areas.

Quaternary 'Drift' Deposits

- 2.15 Within many parts of the study area, the solid geology is overlain by a relatively thin cover of superficial 'drift' deposits of Quaternary age. These range from glacial tills ('boulder clay') and glacial sand & gravel 'outwash' deposits associated with the last (Devensian) and earlier glaciations; post-glacial river terrace and alluvial fan deposits along the sides of the main valleys; more recent alluvium beneath the modern river floodplains, and Holocene peat deposits in both lowland and upland areas. Commercially exploitable sand & gravel resources are associated with some of these deposits.
- 2.16 In the identification of such resources, this study has relied on a previous report for the Welsh Assembly by Symonds Group Limited (Thompson *et al.*, 2000), which identified potential sand & gravel resource blocks across the whole of south east Wales through a combination of existing BGS mapping, new geomorphological mapping and limited borehole data.
- 2.17 The Symonds Group study noted that clean sand & gravel deposits tend to be associated only with sediments that have been transported reasonably long distances in fast-flowing water which has winnowed-out the finer-grained silts and clays. This effectively rules out most glacial deposits, including tills deposited beneath, in front of and on top of the ice, as well as most alluvial fan sediments, overbank flood deposits on river floodplains, glacial lake sediments and peat. The Symonds Group study therefore focused its attention on glacio-fluvial outwash sediments (former valley 'sandur' surfaces), river terraces and the coarser-grained sediments which can often be found beneath the overbank silts and clays within river alluvium.
- 2.18 The Symonds Group study was based primarily on the geomorphological analysis of landforms associated with these various types of depositional environment, supported by variable (but generally limited) borehole data and very limited laboratory testing. As a consequence, the 'resource blocks' identified in that study have to be regarded as being indicative of the presence of 'potential' rather than proven aggregate resources. In all cases, further drilling and testing is needed before the presence (or absence) of viable resources can be demonstrated in any of the identified areas.

Identification of Areas for Future Working

- 2.19 As well as safeguarding potential resources, MPPW and the RTS require Mineral Planning Authorities to consider allocations for future working. In this regard, para. 14 of MPPW states that *"Policies and proposals in development plans should make clear where mineral extraction should, or is most likely to, take place"* and that these areas *"should be clearly identified on a proposals map, and should take the form of:*
- o **Specific Sites** where mineral resources of commercial significance exist, and where any planning applications which come forward for those sites are likely to be acceptable in planning terms;
 - o **Preferred Areas** which will be areas of known resources with some commercial potential, and where planning permission might reasonably be anticipated; or,
 - o **Areas of Search** where it is likely that some sites will be appropriate for mineral extraction, depending on economic and/or environmental circumstances. Areas of search will define broad areas that are believed to contain mineral resources of commercial significance but whose extent is uncertain. Within these areas, it is likely that appropriate mitigation measures can overcome all environmental effects. Within areas of search, planning permissions could be granted to meet a shortfall in supply should specific sites, preferred areas, or extensions to existing sites identified in the plan, not come forward."
- 2.20 The same paragraph also makes reference to **"Other Areas"**, which may be considered *"where the mineral is needed to make good a proven shortfall in supply, and where the proposal is demonstrably proven to be environmentally acceptable and to have no adverse impact on the amenity of nearby residents or communities."*
- 2.21 Only the first three of these allocation types are required by MPPW to be identified in Development Plans. Logically, all of these should fall within, and be covered by the same policies as the Mineral Safeguarding Area. In reverse order, they can be considered as a progressive refinement of the MSA, focusing in to more localised areas where there is progressively increasing confidence about the economic viability of the resource and, in planning terms, increasing likelihood of mineral extraction being permitted at some time in the future.
- 2.22 The Mineral Safeguarding Areas (MSA) identified within a particular MPA should therefore include within them broad Areas of Search, as defined above, which in turn should encompass one or more Preferred Areas and, if sufficient information exists, one or more Specific Sites. Whilst these will generally form a hierarchical sequence, it is conceivable that Specific Sites may sometimes be identified outside Areas of Search, though still within the MSA. This is explained in more detail below.
- 2.23 Although MPPW provides broad definitions of these various terms, it does not prescribe what criteria should be used to identify them on the ground. In the absence of such guidance, the following sections attempt to provide a logical basis for determining which parts of safeguarded areas should be identified in each of the above minerals allocation categories. Further general guidance, linked to the slightly different definitions within the English planning system, is given in Mineral Planning Statement 1 "Planning and Minerals" (MPS1) and its accompanying Practice Guide.

Areas of Search

- 2.24 MPPW defines Areas of Search as areas that are *"believed to contain mineral resources of commercial significance but whose extent is uncertain"*. The phrase *"believed to"* arguably dilutes the normal planning criteria of requiring *"robust and credible evidence"* to justify inclusion. As a consequence, all of the geological outcrops recommended for safeguarding in this study can be described in these terms. Not all of them, however, will also meet the second MPPW criterion of being *"where it is likely that some sites will be appropriate for mineral extraction, depending on economic and/or*

environmental circumstances". To meet this second requirement, Areas of Search should logically exclude those parts of the MSA where it cannot be said that mineral extraction is *"likely to be appropriate"*. Such a statement could not be made, for example, in areas which are protected by certain National and International designations – particularly National Parks, Areas of Outstanding Natural Beauty (AONBs), Special Areas of Conservation (SACs), Special Protection Areas (SPAs), Ramsar Sites and the Blaenavon Industrial Landscape World Heritage Site. Whilst MPPW Policies 21 to 24 do not preclude mineral extraction in these areas, they make it clear that this would be possible only in *"exceptional circumstances"* (in the case of National Parks and AONBs) or where there are either *"no alternatives"* or *"imperative reasons of overriding public interest"* (in the case of SACs, SPAs and Ramsar Sites).

- 2.25 During the course of this study, the Mineral Products Association¹ has argued that *"the presumption against mineral extraction in National Parks, AONBs, SACs, SPAs and Ramsar Sites is not in my view so strong as to pre-empt the outcome of the exceptional circumstances that might apply to each proposal in or adjacent to such areas by excluding them from Areas of Search"*. However, the fact that the industry perceives there to be a presumption against mineral extraction in these designated areas serves only to emphasise that they cannot be described as areas where mineral extraction is *"likely to be appropriate"*. On this basis, it is difficult to see how these designated areas could be included within Areas of Search, as currently defined by MPPW.
- 2.26 Sites of Special Scientific Interest (SSSIs), though also national designations, do not have such a clear presumption against mineral extraction. Many SSSIs were created by former mineral workings and, in some cases at least, it may be possible for extraction to continue or recommence without necessarily causing adverse impacts. Even where impacts are likely to be significant, MPPW para 25 requires only that proposals *"should be subject to the most rigorous examination"*, and that *"the need for the mineral must be balanced against environmental and other relevant considerations"*. In view of the balance of judgment required, in these cases, it may be reasonable to deduce that SSSIs can be included within Areas of Search.
- 2.27 Based on the arguments presented above, unless otherwise directed by WAG, it would seem appropriate that **Areas of Search within the former Gwent area should include all parts of the identified Mineral Safeguarding Areas other than National Parks, AONBs, SACs, SPAs, Ramsar Sites and the Blaenavon World Heritage Site.**

Preferred Areas

- 2.28 Preferred Areas represent a further level of refinement in the identification of areas for future working and, logically, should fall within Areas of Search. MPPW (para 14) makes clear that *"it will not usually be appropriate for an authority to identify only Areas of Search in a plan"*. In other words, Preferred Areas and/or Specific Sites also need to be identified unless a *"full justification"* can be given for not doing so.
- 2.29 Other than stating that Preferred Areas *"will be areas of known resources with some commercial potential, and where planning permission might reasonably be anticipated"*, MPPW gives no prescriptive guidance on how they should be identified. Logically, however, the identification of such areas should take a balanced view of both:
- o **opportunities** (e.g. areas, if any, that are identified by industry – or by the MPAs - as having known *"commercial potential"* (see below), including any areas or specific sites that have been put forward for inclusion in the LDP); and
 - o **constraints** (e.g. areas where it is known that no suitable or workable mineral exists; and designations or issues which would affect whether or not *"planning permission might reasonably be expected"*).

¹ pers. comm. Ken Hobden, Director of Planning, Minerals Products Association, 9th April 2009

- 2.30 In considering opportunities, much depends on the interpretation of the phrase "*known resources with some commercial potential*". If this was taken to include all of the resources identified for safeguarding, the identification of Preferred Areas would be a relatively simple matter of subtracting from the MSA those areas affected by relevant constraints (see below). As already noted, however, geological characteristics (and thus, commercial potential) are known to vary from one part of an outcrop to another, and it cannot be assumed, without more detailed geological information, that all areas within the same formation are equally suitable for use as aggregates. In order to withstand the level of scrutiny required by the planning system, it would seem logical that Preferred Areas should only be identified in areas where more specific information is available regarding the quality and economic viability of the resource. At present, such information is only available for areas that have been investigated and tested by industry.
- 2.31 In considering potential constraints, allowance should be made for the fact that many potential impacts of mineral working (e.g. on groundwater, noise, dust, ecology and traffic) can be overcome or mitigated to an acceptable degree through the use of conditions and/or good design (including ideas put forward by operators in connection with proposed sites). For this reason, Preferred Areas should not necessarily exclude areas which are close to national or European designations, or those which are within, close to, or overlapping with any 'lesser' designations. They might, however, exclude the most visually intrusive locations (where the MPA considers that no amount of screening would be able to mitigate the impact), and areas where there is currently no feasible access to transportation routes (e.g. due to topographic constraints or being completely surrounded by urban development).

Specific Sites

- 2.32 Specific Sites represent the highest level of refinement at the Development Plan stage. MPPW defines these as sites "*where mineral resources of commercial significance exist, and where any planning applications which come forward for those sites are likely to be acceptable in planning terms*". The inclusion of such sites within the Development Plan must therefore be based on the usual planning requirement for "*robust and credible evidence*" regarding all of these things (Planning and Compulsory Purchase Act 2004).
- 2.33 Since the introduction of the 2004 Act, those responsible for proposing Specific Sites have generally been expected by MPAs to demonstrate the quality and quantity of the mineral, the need for the mineral (in general terms, subject to more precise evidence at the application stage), and the feasibility (again, in general terms) of being able to address at least the most obvious planning concerns relating to the site in question. By virtue of doing this, it is conceivable that Specific Sites might sometimes be identified beyond the limits of Preferred Areas and perhaps even beyond the limits of Areas of Search (that is, within those parts of an MSA which fall within National or European environmental designations). The latter could only happen where the sites in question are considered likely to meet the criteria set out in MPPW (para's 21 to 24), but the possibility of this cannot be ruled out.
- 2.34 The level of investigation that is necessary to support the designation of Specific Sites is, in most cases, only likely to be carried out by a prospective developer. However, as the Mineral Products Association has pointed out (K. Hobden, *ibid.*), it should not be assumed that it is the sole responsibility of developers to do this: if an authority wanted to take full advantage of the opportunities provided by the plan led system, they may wish to assemble their own data.

3. Geological Formations Suitable for Safeguarding

3.1 An initial shortlist of 'solid' geological formations potentially capable of yielding construction aggregates was drawn up for the purposes of consultation with both the British Geological Survey (BGS) and the aggregates industry in South Wales. This was based on the formations shown on the latest available BGS digital mapping, excluding those which were known to be unsuitable by virtue of their age (strength / durability), lithology and/or bedding characteristics (see paragraphs 2.9 to 2.14, above). In chronological order (youngest listed at the top), this initial list included the following geological formations (stratigraphic units). The observations shown in the right hand column, based on consultation and limited field observations, indicate (in Bold text) which of these are recommended as being suitable for safeguarding.

Stratigraphic Unit	Lithology	BGS Code (LEX_RCS)	Observations
Grovesend Sandstone	sandstone	GDB-SDST	INCLUDE - High PSV sandstone , worked at Gilfach
Hughes Sandstone	sandstone	H-SDST	INCLUDE - High PSV sandstone , worked at Hafod Fach and formerly at Gelligaer
Brithdir Sandstone	sandstone	BD-SDST	INCLUDE - High PSV sandstone , worked at Craig-yr-Hesg and Cwm Nant Lleici
Rhondda Sandstone	sandstone	RA-SDST	INCLUDE - High PSV sandstone (but not currently or recently worked as such)
Deri Sandstone	sandstone	DER-SDST	
Llynfi Sandstone	sandstone	LLFB-SDST	
M Coal Measures Sandstone	sandstone	SWMCM-SDST	Possible sources of crushed rock sand? (notably the LCM sandstones formerly known as the 'Farewell Rock', which were considered for this purpose in a BGS report to the Welsh Assembly Government – Harrison <i>et al</i> 2000). But, no requirement at present for safeguarding sources of crushed rock sand, so EXCLUDE.
M/L Coal Measures Sandstone	sandstone	SWLMC-SDST	
L Coal Measures Sandstone	sandstone	SWLCM-SDST	
Bishopston Fm Sandstone	sandstone	BISHM-SDST	
Twrch Sandstone	sandstone	TWR-SDST	Possible source of crushed rock sand? (but not considered as such in the BGS study). EXCLUDE
Twrch Conglomerate	sandstone and conglomerate, interbedded	TWR-SCON	Possible source of sand & gravel? (but probably requiring too much energy to break down) . EXCLUDE
Dowlais Limestone	limestone	DWL-LMST	INCLUDE – Carboniferous Limestone , worked at Trefil and formerly at Vaynor
Hunts Bay Oolite	ooidal limestone	HBO-LMOOL	INCLUDE – Carboniferous Limestone , formerly worked at Ifton, where substantial permitted reserves and additional proven resources remain
Cromhall Sandstone	sandstone	CHSA-SDST	Possible source of high PSV sandstone but no testing data available and probably too weak
Gully Oolite	ooidal limestone	GUO-LMOOL	INCLUDE – Carboniferous Limestone , worked at Forest Wood, Lithalun & Pant
Abercriban Oolite	ooidal limestone	ABO-LMOOL	INCLUDE – Carboniferous Limestone (not currently worked but lithologically comparable to those which are)
Gilwern Limestone	dolomitised limestone and dolomite	GWO-DLDO	
Gilwern Oolite	ooidal limestone	GWO-LMOOL	
Clydach Limestone	dolomitised limestone and dolomite	CLD-DLDO	
Clydach Dolostone	dolostone	CLD-DOLO	
Clydach Oolite	ooidal limestone	CLD-LMOOL	
Black Rock Limestone	dolostone	BRL-DOLO	INCLUDE – Carboniferous Limestone , formerly worked at Penhow (also Stowfield)
Castell Coch Limestone	limestone	CCL-LMST	INCLUDE – Carboniferous Limestone (not currently worked)
Avon Limestone	mudstone & limestone, interbedded	AVO-MDLM	INCLUDE – Carboniferous Limestone , worked at Clearwell & Stowe Hill in England
Pembroke Limestone	dolomitic limestone	PEMB-DOLMST	INCLUDE – Carboniferous Limestone , worked at Machen, Taffs Well and formerly at Cwmyncoscow
			(table continues ...)

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Stratigraphic Unit	Lithology	BGS Code (LEX_RCS)	Observations
Quartzitic Sandstone	sandstone	QSG-SDST	Possible sources of sand & gravel (but probably too hard, requiring too much energy to break down). EXCLUDE
Quartz Conglomerate Sandstone	sandstone	QCG-SDST	
Quartz Conglomerate	sandstone and conglomerate, interbedded	QCG-SCON	
Quartz Conglomerate Formation	sandstone and conglomerate, interbedded	QC-SCON	
Quartz Conglomerate Fm Conglomerate	conglomerate and sandstone, interbedded	QC-COSD	
Tintern Sandstone	sandstone	TSG-SDST	Possible source of High PSV sandstone (Travers Morgan Report, 1993), but insufficient test data to justify inclusion. EXCLUDE
Senni Formation	sandstone and argillaceous rocks, interbedded	SB-SDAR	Possible source of High PSV sandstone (Travers Morgan Report, 1993), but problem of interbedded mudrocks. EXCLUDE
Brownstones Sandstone	sandstone	BRS-SDST	Possible source of crushed rock sand, but mostly rejected as such by the BGS study (Harrison <i>et al</i> 2000) on the basis of being unacceptably fine grained. Also probably contain too many impurities (iron and/or mica). EXCLUDE
Brownstones Micaceous Sandstone	micaceous sandstone	BRS-MCASST	
St Maughan's Sandstone	sandstone	SMG-SDST	
Raglan Sandstone	sandstone	RG-SDST	Possible sources of High PSV sandstone / siltstone, based on the fact that similar lithologies of this age elsewhere in Wales have been used as such, but no direct evidence on the properties of these specific formations. EXCLUDE
Downton Castle Sandstone	sandstone	DCS-SDST	
Ton Siltstone	siltstone	TSF-SLST	
Usk Limestone	limestone	ULF-LMST	Possible source of limestone, but no evidence of suitability and outcrops very limited in extent. EXCLUDE

- 3.2 As noted in Chapter 2, the process of eliminating formations that are unlikely to be suitable for use as crushed rock aggregates leaves only two basic groups of rocks in need of safeguarding within the former Gwent area: The Carboniferous Limestones (for use as general purpose aggregates, including concrete manufacture), and the high PSV Carboniferous 'Pennant' Sandstones (for specific use as High Specification Aggregates in skid-resistant road surfacings).
- 3.3 Figure 3.1, below, shows the outcrop of these two groups of strata within the study area, based on the latest available BGS digital mapping. **It is recommended that, subject to decisions by the MPAs on whether or not urban areas should be excluded (see para. 2.6, above), the whole of these outcrops, together with an appropriate buffer zone around them, should be identified as Mineral Safeguarding Areas.** More detailed digital outlines of these areas have been provided directly to the four MPAs.
- 3.4 Figure 3.1 also shows the distribution of potential sand & gravel resource blocks identified within the former Gwent area in the earlier Symonds Group study (Thompson *et al.*, 2000). Unlike the solid geology outcrops discussed above, these areas already exclude existing built development and major roads. Again, **it is recommended that the whole of these areas, and appropriate buffer zones around them, should be identified as Mineral Safeguarding Areas.**

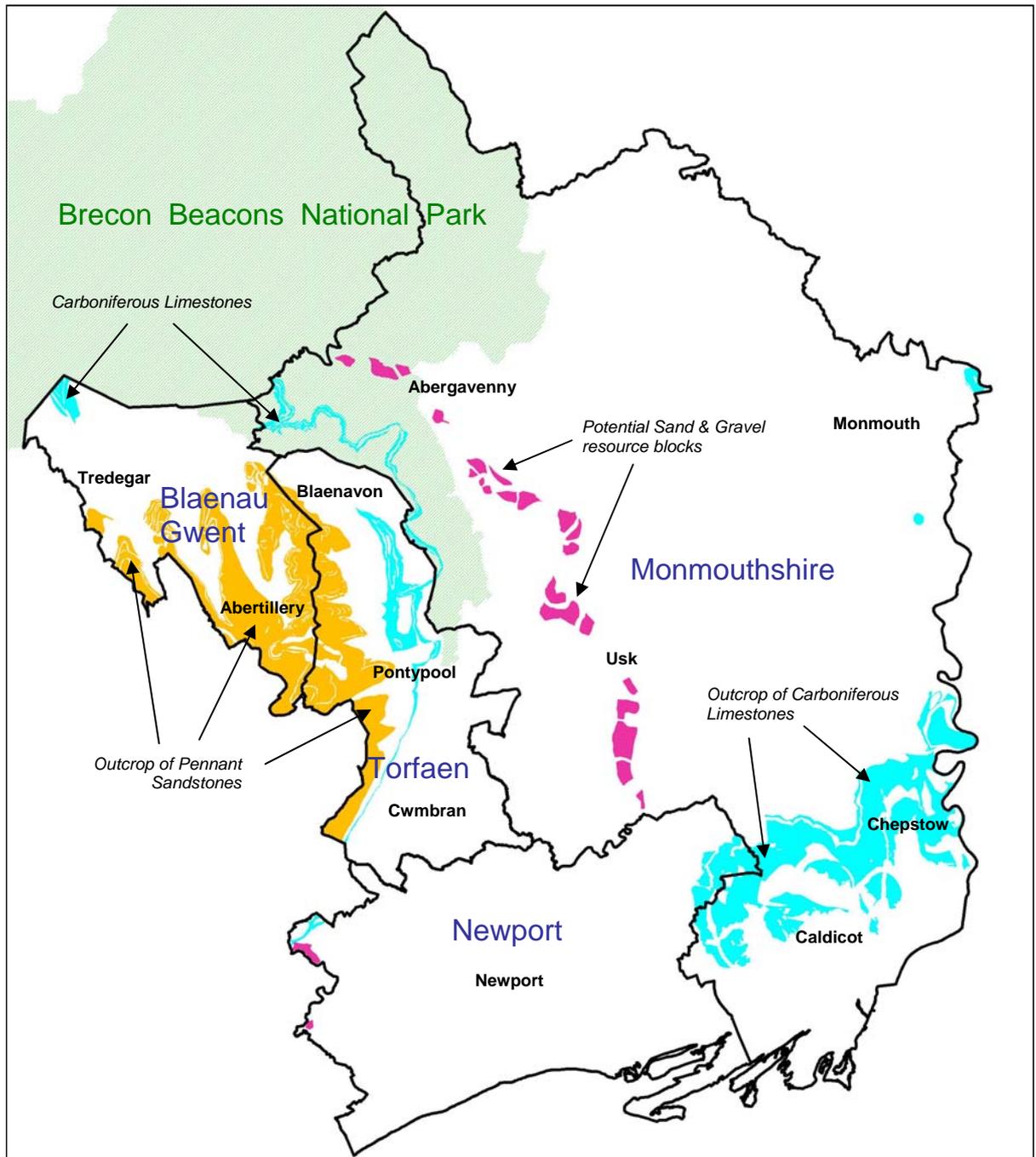


Figure 3.1: Distribution of Geological Outcrops that are recommended for Safeguarding within Blaenau Gwent, Torfaen, Newport and Monmouthshire

4. Allocations for Development Plans

- 4.1 As noted in Chapter 1, Torfaen, Blaenau Gwent and Newport are required by the RTS to 'assess the potential' for (or to assess the feasibility of) making specific allocations for future mineral working. Monmouthshire is not currently required to do so.

Torfaen

- 4.2 Torfaen is required to assess the potential to make a resource allocation in the LDP of 5 - 6 Mt. This study has demonstrated that plentiful resources of both Pennant Sandstone and Carboniferous Limestone exist within the borough, although the latter generally occur in relatively narrow outcrops along the eastern edge of the coalfield, and many of them are currently sterilised by existing development and infrastructure.
- 4.3 If consideration is given to the criteria suggested in paragraphs 2.19 *et seq.*, above, there should be scope for defining extensive Areas of Search within the Pennant Outcrop and, perhaps, within very localised parts of the limestone outcrop (e.g. to the north east of Abersychan). This will depend on the extent to which any of these areas are protected by European environmental designations or the Blaenavon World Heritage Site, details of which are held by the MPA.
- 4.4 It is more difficult to see how Preferred Areas or Specific Sites can be identified, at present, within any of these areas since, as explained in para. 2.30, above, this would require more detailed knowledge than is currently available regarding the quality of the resources and their commercial potential. The only proposal for mineral extraction in this area that has been put forward by industry to date relates to the reworking of a very large spoil heap from former opencast workings to the north of Tir Pentwys, west of Pontypool. This lies within the outcrop of the Pennant Sandstone, and within the proposed Safeguarding Area. Limited sampling and testing information presented by the applicant suggests that the spoil is capable of yielding both High Specification Aggregate and lower quality general fill material. However, the application has yet to be determined and there are outstanding planning (economic and environmental) issues to be resolved.

Blaenau Gwent

- 4.5 Blaenau Gwent is required by the RTS to assess the potential to make a resource allocation of at least 3 Mt (preferably of limestone) within the LDP. The only outcrop of Carboniferous Limestone within the borough is at and around Trefil Quarry, located immediately adjacent to the border with the Brecon Beacons National Park.
- 4.6 Since the publication of the RTS, planning permission has been granted by the MPA (on 12th December 2008) for the deepening of Trefil Quarry, releasing more than 2 Million Tonnes of new reserves. Consideration is also being given through the Candidate Site process to a lateral extension of the quarry.
- 4.7 The only alternative prospects for identifying further allocations within Blaenau Gwent lie within the Pennant Sandstone outcrop, which covers extensive upland areas to the south of the A465 Heads of the Valleys road, between the Ebbw, Sirhowy and Rhymney valleys. As in Torfaen, it is likely that extensive Areas of Search will be able to be defined within these areas, but there might also be a possibility of identifying at least one, and perhaps two Preferred Areas or Specific Sites.
- 4.8 The first of these relates to the outcrop between Ebbw Vale and Abertillery where a developer has identified a prospect for a major new high PSV aggregate quarry. The site has not yet been formally proposed and its precise location has not yet been revealed, though the developer is understood to have options on virtually the whole of

the mountain between the A4046 and the A467 from Aberbeeg northwards. Borehole information is understood to indicate at least 90 metres of massively-bedded Hughes Formation sandstone with very limited clay partings, and the potential reserves in the Phase 1 indicative area are understood to be in the order of 60 Mt gross². Subject to MPA's views in implementing the advice set out in paragraphs 2.28 *et seq.*, above, and to the receipt of more detailed information from the prospective applicant regarding the commercial viability of the resources, it may be appropriate to identify some or all of this area as a Preferred Area, or even a Specific Site (depending on the level of information which the developer is willing to provide, and the MPA's views on the likelihood of planning permission being granted).

- 4.9 The second prospect is a westward extension of the Tir Pentwys spoil reclamation proposal in neighbouring Torfaen, as discussed in para. 4.4, above. Again, this lies within the outcrop of the Pennant Sandstone, and within the proposed Safeguarding Area. No sampling or testing information for the western part of this area has been seen, but it is likely that it will contain both High Specification Aggregate (HSA) and lower quality general fill material. As with Tir Pentwys, the commercial viability of working this site will depend to a large extent on the proportion of HSA which is able to be produced.

Newport

- 4.10 Newport City Council is required by the RTS to examine the feasibility of making allocations of 8 to 8.5 Mt within its LDP. Options for doing so would appear to be very limited. Subject to the implementation of the suggested criteria, Areas of Search may be able to be identified within the Carboniferous Limestone outcrops in the far east of the MPA's area and, to a far more limited extent, in the far west, to the north east of Lower Machen village. Areas of Search may also be identified within the localised sand & gravel deposits in the Rhymney valley, directly south of Lower Machen.
- 4.11 In the absence of any known industry proposals and the lack of other detailed resource information, the only prospect for identifying Preferred Areas or Specific Sites within Newport at the present time would be in the land immediately adjacent to Penhow Quarry, which ceased working several years ago. Based on discussions with the site owners, Hanson Aggregates, the only realistic prospects for extending that quarry would be to the east, where the workings would be increasingly exposed to view from the village of Llanvaches. Deepening the quarry would not, in Hanson's view, be a viable option because of the deteriorating quality of the rock within and below the lower bench. Whilst alternative prospects might be discovered in other parts of the Carboniferous Limestone outcrops nearby, no resource information for these areas is available and it is therefore not feasible to identify either Preferred Areas or Specific Sites. Hanson has pointed out, however, that substantial permitted limestone reserves, and significant additional resources exist nearby at Ifton Quarry in Monmouthshire, less than 5km from the Newport border (see para. 4.14, below). Although Ifton Quarry is currently inactive, it has a valid permission with modern conditions and could quickly be reactivated if there was sufficient demand.
- 4.12 A similar situation exists in the far west of the borough, where Hanson's Machen Quarry is located less than 200 metres beyond Newport's border with neighbouring Caerphilly. Machen is a very large Carboniferous Limestone quarry supplying aggregate by road throughout the local area, as well as supplying more distant markets by rail. The fact that Ifton Quarry in Monmouthshire is currently inactive is, not least, because Machen is able to supply to the whole of that area (including all of Newport City Council).

² pers. comm. John Cowley, mineral planning consultant, 4th March 2009.

- 4.13 In view of the difficulty faced by Newport in meeting the RTS requirement for new allocations, the possibility of relying on the resources available within neighbouring parts of Monmouthshire and/or Caerphilly may need to be considered. This would be in line with the RTS, which notes (in para. 6 of the Foreword) that: *"Some authorities may, however, need to agree the level of apportionment between themselves as some may find it difficult to meet their specific apportionment requirements due to environmental constraints"*. Given the close proximity of both Ifton and Machen to the Newport border, this would also still be in line with the Proximity Principle.

Monmouthshire

- 4.14 Monmouthshire is not explicitly required by the RTS to make a resource allocation within its LDP. It may have scope to do so, however, should this become necessary. In particular, as noted above, workable resources of Carboniferous Limestone are known to exist adjacent to Ifton Quarry. Hanson Aggregates has advised that land within its control, immediately to the west and north west of the quarry, contains an estimated 30 Million tonnes of proven reserves (in addition to the 11Mt of existing permitted reserves at this site).

5. Secondary and Imported Aggregates in Newport

- 5.1 For Newport City Council, the South Wales RTS notes that *"The secondary aggregate stockpiles should be monitored and where available used to replace the shortfall in primary aggregate reserves"*. It also requires that *"The feasibility of sea borne rock imports should be explored"*.

Secondary aggregate stockpiles

- 5.2 Whilst the monitoring of secondary aggregate stockpiles is an ongoing requirement and therefore beyond the remit of this study, it was agreed that the study should cover an assessment of the feasibility of secondary aggregates in Newport being used to replace some or all of the shortfall in primary reserves.
- 5.3 Two secondary aggregate stockpiles are known to exist within Newport, these being the stockpiles of steel slag at the Llanwern steel works site, and the stockpile of spent railway ballast at Monmouthshire Bank (Mon Bank) sidings.

Llanwern

- 5.4 The Llanwern site formerly produced aggregates from blast furnace slag on an ongoing basis, but this ceased when the blast furnace closed in July 2001. The same site does, however, continue to produce Basic Oxygen Steel (BOS) slag from the stockpiles of this material which have accumulated over many decades of steel production.
- 5.5 When first produced, BOS slag has a high content of soluble free lime and magnesia which can expand on contact with water, making it unsuitable for use as a construction aggregate at that stage. This problem is overcome, however, by utilising stockpiled slag which has been allowed to weather before being processed into aggregate (and, if necessary, by allowing further weathering of the processed aggregate before it is used).
- 5.6 The physical and mechanical properties of the processed material are significantly better than those for blast furnace slag and comply with the criteria for High Specification Aggregates in all but Polished Stone Value (PSV). However, as noted by Thompson *et al.* (2005), the in-service performance of BOS slag, in terms of skidding resistance, is considerably better than would be expected from laboratory determined PSV results, and the material has been accepted by the Highways Agency as being equivalent to a natural aggregate with a measured PSV of 60. Although this is less than the very high PSVs (67+) achieved by the Pennant Sandstones of South Wales, it is in greater overall demand because of the requirement for using PSV 60 aggregate on a greater proportion of roads.
- 5.7 The Llanwern BOS slag aggregate is therefore used almost exclusively for the production of road surfacing asphalt materials. Discussions with Paul Williams of Tarmac (who process and sell the aggregate) suggest an average annual output from Llanwern of approximately 100,000 tonnes of aggregate within asphalt products, and a further 50,000 tonnes of 'dry' aggregate, transported further distances for use in asphalt production elsewhere.
- 5.8 Mr Williams advised that widely varying estimates had been made regarding the tonnage of 'reserves' represented by the remaining stockpiles at Llanwern, ranging up to 'millions of tonnes'. More conservatively, he estimated that production would be able to be maintained at current rates for 'at least 10 years'.
- 5.9 On this basis, secondary aggregate production at Llanwern can be said to be a feasible replacement for part of the shortfall in primary aggregate reserves for much (but not necessarily all) of the period covered by the RTS.

Monmouthshire Bank

- 5.10 The Monmouthshire Bank sidings in Newport were, until recently, an area where spent rail ballast was stockpiled and reprocessed into secondary aggregate. According to the South Wales RTS the annual production here was in the order of 150,000 tonnes.
- 5.11 As with Llanwern, the site was operated by Tarmac, but is owned by Network Rail. In March 2009, aggregate production at this site ceased and Network Rail redistributed the remaining stocks to other sites, outside Newport City Council's area.
- 5.12 This site therefore no longer represents a source of future supply.

Imports of sea-borne crushed rock aggregate

- 5.13 Newport has three wharf facilities for the landing of marine-dredged aggregates, sourced from the Bristol Channel. These comprise a combined Hanson/Tarmac operation at Felnax/Great Western Wharf; a CEMEX UK operation at Eastern Wharf, and an operation run by Severn Sands Limited at North Dock.
- 5.14 Discussions with both Hanson and Tarmac suggest that the scope for landing additional tonnages of crushed rock aggregate is extremely limited. The operations are geared up for the landing and processing of marine dredged sand. Whilst it would be theoretically possible to land crushed rock, there is insufficient space for both operations to co-exist. In the absence of any current land-based sand & gravel operations in South East Wales, the marine sand is vital to the local construction industry and is therefore unlikely to be displaced by crushed rock imports.
- 5.15 Moreover, crushed rock imports could only be sourced from areas (e.g. Scotland, Ireland, Northern Ireland, Norway, Northern France or Spain) where there are coastal quarries which are geared up for the export of this material. At present, imports from these sources are primarily focused on destinations such as the Thames estuary in southern England and Rotterdam in Holland, where there is much better access for large vessels, much greater access to major development markets and higher prices, and a lack of indigenous crushed rock aggregate sources to compete with. None of these advantages apply to Newport.
- 5.16 It is therefore concluded that seaborne imports of crushed rock aggregate into Newport docks is unlikely to be a feasible prospect for the foreseeable future.

6. Conclusions

- 6.1 This study has examined the requirements, set out in the South Wales Regional Technical Statement, for the safeguarding of primary aggregate resources and the identification of potential allocations for future working, within the four Mineral Planning Authorities making up the former County of Gwent (Torfaen, Blaenau Gwent, Newport and Monmouth).
- 6.2 Through a process of elimination based on known information about aggregate properties and bedding characteristics, the study has identified the outcrops of Carboniferous Pennant Sandstone and Carboniferous Limestone as prospective Mineral Safeguarding Areas (MSAs).
- 6.3 Detailed digital outlines of these areas, and of the potential sand & gravel resource blocks identified in an earlier study by Symonds Group Limited, have been supplied to the four MPAs. It has been recommended that the whole of these areas (with the possible exclusion of urban land) should be safeguarded by policies within the LDPs.
- 6.4 Guidance has been given on the identification, within these MSAs, of more detailed areas for future working, including Areas of Search, Preferred Areas and Specific Sites. It is for the individual MPAs to identify the boundaries of these areas, taking account of appropriate environmental factors and known information regarding resources. This report has noted, however, that there is potential for the following allocations to be made:
- o In Torfaen: Areas of Search within the Pennant Sandstone outcrop and, perhaps, within very localised parts of the Carboniferous Limestone outcrop, together with the possibility of a specific site focused on the former opencast workings at Tir Pentwys (subject to the planning issues here being resolved);
 - o In Blaenau Gwent: extensive Areas of Search within the Pennant Sandstone outcrop and (to a much smaller extent) within the Carboniferous Limestone outcrop immediately adjacent to Trefil Quarry. More specific allocations include more than 2 Million tonnes of additional limestone reserves at Trefil (granted permission in December 2008), the possibility of a further, lateral extension at this site (currently being considered), the prospect of a Preferred Area containing upwards of 60Mt of high PSV sandstone to the south east of Ebbw Vale (though this has yet to be formally brought forward by the developer), and the possibility of a further allocation at the western extension of the Tir Pentwys site;
 - o In Newport: limited Areas of Search within outcrops of Carboniferous Limestone, mainly in the far east of the borough, and localised potential sand & gravel resource blocks in the far west, but no clear prospects for Preferred Areas or Specific Sites;
 - o In Monmouth: broad Areas of Search in the Carboniferous Limestone outcrops which fall outside the AONB. Although there is no requirement in the RTS for Monmouthshire to identify more specific allocations, significant proven reserves are understood to exist adjacent to the currently inactive Ifton Quarry.
- 6.5 Areas of Search can thus be defined in all four MPA areas. However, in Newport, and perhaps in Torfaen, there is likely to be a shortage of more detailed allocations (Preferred Areas and Specific Sites) compared with the allocation tonnages required by the RTS. This is largely because of the lack of detailed geological resource information within those areas. No proposals have formally been brought forward by industry in Newport and none has been suggested in the consultations undertaken as part of this study. In Torfaen, an application is currently being determined at the Tir Pentwys site, but no other proposals have been received. Equally, no prospecting of potential resources has been carried out by the MPAs, other than the desk-based review

presented in this report. Whilst further site investigations could be undertaken, this would be an expensive process for the MPAs, and there would be no guarantee of proving viable reserves. In the short term, at least, it may therefore be necessary for any shortfall in allocations within Torfaen and Newport to be addressed through discussions with neighbouring MPAs, in accordance with guidance given in the RTS.

- 6.6 A brief review of secondary aggregate sources in Newport has found that, while road surfacing aggregates are likely to continue to be supplied from stockpiles of BOS slag at the former Llanwern steelworks at a rate of approximately 150,000 tonnes per year for at least 10 years, the supply of spent rail ballast from Monmouthshire Bank has now ceased.
- 6.7 The concept of importing crushed rock aggregates by sea into Newport docks seems unlikely to be feasible for the foreseeable future.

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