

7. LIKELY SIGNIFICANT EFFECTS

7.1 Introduction

One site has been identified that could be impacted by continued quarrying at the Site: the Peak District Dales Special Area for Conservation (SAC).

This SAC covers approximately 2,326ha and comprises a number of constituent Sites of Special Scientific Interest (SSSIs). The SAC lies to the west and south of Tunstead Quarry and the south and east of Old Moor Quarry. The closest approach to the quarries is in the Great Rocks Dale, where it borders Buxton Central, which is being restored currently but the planning boundary is coincident with the SAC boundary along Flag Dale to the east of Old Moor Quarry.

7.2 Features of European interest

The SAC qualifies for the presence of a number of Annex 1 habitats. Two of these are a primary reason for its designation;

- Semi-natural dry grasslands and scrubland facies: on calcareous substrates (Festuco-Brometalia) and
- Tilio-Acerion forests of slopes, screes and ravines

Three other Annex 1 habitats are present but are not primary reasons for designation of the SAC. However, for the purposes of assessment of impacts, these are required to be considered under any appropriate Assessment for the Habitat Regulations. The habitats are:

- European dry heaths; Calaminarian grasslands of the *Violetalia calaminariae*;
- Alkaline fens;
- Calcareous and calcshist screes of the mountain to alpine levels (*Thlaspietea rotundifolii*) and;
- Calcareous rocky slopes with chasmophytic vegetation.

The site is also designated on account of the presence of an Annex II species;

- White-clawed (or Atlantic stream) crayfish (*Austropotamobius pallipes*) Two further Annex II species are present but are not primary reasons for designation of the SAC:
- brook lamprey and
- bullhead

The continued permitted quarrying at the Site does not result in the direct loss of any of the SAC. Thus, the potential for impact is through indirect effects including dust and hydrology (surface and groundwater).

7.3 Scope of Assessment

Natural England in a letter dated 29th January 2013 to Limestone Research Consultancy (Professor John Gunn), confirmed the features of interest within the Peak District Dales SAC that could be impacted through changes in hydrology resulting from continued quarrying. These features were reiterated in a letter to Hafren Water on the 13th March 2013 (See Appendix E1).

The sensitive wetland features confirmed by Natural England are:

- SSSI monitoring Units 70 and 71 on the River Wye in the Wye Vale SSSI;
- An alkaline fen community within monitoring Unit 4 in Woo Dale in the Wye Vale SSSI;
- Alkaline fen community in Unit 20 in the Wye Valley SSSI;
- Alkaline fen communities in Monk's Dale SSSI (unidentified monitoring units).

The MPAs confirmed at EIA Scoping that they considered potential hydrological impacts of the Scheme to be the focus of the ES.. Natural England confirmed in the letter of 29th January 2013 that they were not aware of any other sensitive (hydrological) features within the SAC or SSSIs that required consideration and this included the qualifying species. Thus, the only relevant

qualifying feature is Alkaline Fens, none of the other qualifying habitats being identified as sensitive to hydrological effects

Potential dust impacts were raised as requiring consideration without reference to the SAC as a sensitive receptor. It has therefore been concluded that dust is not considered by the consultees to be a key environmental consideration for the features for which the SAC is designated, and thus no additional or detailed assessment is required over and above that which would normally be required from an EIA Dust Risk Assessment. However, the information is presented below to demonstrate that the conclusions of the ES with respect to dust i.e. no likely significant effect is expected on the features for which the SAC is designated as a result of dust.

7.4 Historic Trends and Current Conditions

The most recent condition assessments of the SSSI units that underpin the Peak District Dales SAC identified by Natural England in their letters of 29th January and 13th March 2013 are shown below in Table 2 for the Units in which the sensitive habitats occur.

For Monk's Dale SSSI the units that could contain sensitive features are not identified by Natural England.

TABLE 2: Assessment of Condition of SSSI Units

Vegetation	SSSI Unit	Size of Unit (ha)	Date Assessed	Status	Notes
Wye Valley SSSI					
Calcareous grassland - lowland	4	1288	15th August 2009	Favourable	Scrub clearance carried out very effectively though future clearance will be required. Important that site is grazed sufficiently this year-previous year was undergrazed.
Calcareous grassland - lowland	20	886	23rd June 2009	Unfavourable recovering	MG2,U4, CG2, Pinguicula flush Scrub clearance scheduled
Rivers and streams	70	319	21st Dec 2010	Unfavourable no change	Feb 2013 Remedies - DWPP in preparation but not yet agreed with EA, hence timescale shifted to 2013/14. Discharge / ROC remedy relates to Buxton STW, which is the source of elevated p levels, options for resolving will come out of DWPP, currently no timescale
Rivers and streams	71	598	21st Dec 2010	Unfavourable no change	Feb 2013 Remedies - DWPP in preparation but not yet agreed with EA, hence timescale shifted to 2013/14. Discharge / ROC remedy relates to Tideswell STW, due for completion this FY but not confirmed yet from EA.

7.5 Conservation Objectives

Natural England has identified a number of general Conservation Objectives for the SAC, which seek, subject to natural change, to maintain or restore:

- The extent and distribution of qualifying natural habitats and habitats of qualifying species;
- The structure and function (including typical species) of qualifying natural habitats and habitats of qualifying species;
- The supporting processes on which qualifying natural habitats and habitats of qualifying species rely;
- The populations of qualifying species;
- The distribution of qualifying species within the site.

The Views About Management (VAM) statement produced by Natural England for the SSSI contains more details of management objectives and those relevant to the wetland habitats identified as being sensitive by Natural England are provided in detail in Appendix E2 but briefly are as follows.

7.5.1 Wye Valley SSSI Flush and spring fen

- Groundwater sometimes breaks out on the surface, either as gentle seepages, which give rise to flushes, or through greater flows that are evident as springs. The plants and animals that occur in and around these habitats are dependent on the water chemistry and flow rate.
- The quantity and quality of the groundwater must be maintained, though the quantity is not likely to be naturally constant throughout the seasons or between wet and dry years.
- Grazing is often required to keep the vegetation short and open around springs and flushes. The precise timing and intensity of grazing will vary according to local conditions and requirements but should aim to keep a relatively open sward without causing excessive poaching.
- Drainage schemes should not intercept the source of groundwater to springs or flushes, or reduce the area of surface they irrigate.

Rivers and streams

- The rivers natural structure and form should be maintained. This will support a natural flow regime that will help conserve the geomorphological features of interest.
- Management should maintain the natural flow regime of the river or stream, including natural erosion and sedimentation processes, in order to meet the requirements of the full range of flora and fauna it supports. Abstraction levels should be managed to protect the characteristic flow regime, including seasonal base flows and flushing flows.
- Bank-side vegetation should be allowed to develop, allowing characteristic plants to flourish as well as benefiting those animals that spend part of their life-cycle out of the water.
- The characteristic aquatic plant communities associated with in-channel vegetation should be allowed to flourish, including fringing emergent vegetation and beds of submerged plants.
- Of particular importance for invertebrates are exposed riverine sediments, which include sand and shingle bars or spits as well as eroding banks and river cliffs.
- Rivers and streams are susceptible to the introduction of invasive plant and animal species e.g. mink and signal crayfish.
- The maintenance of good water and sediment quality are essential to maintaining a healthy river system. Management should minimise pollution of the river from point and diffuse sources, including discharges of domestic and industrial effluent, and run-off from agriculture, forestry and urban land.

7.5.2 Monk's Dale SSSI

Flush and Spring Fen

- Groundwater sometimes breaks out on the surface, either as gentle seepages, which give rise to flushes, or through greater flows that are evident as springs.
- The quantity and quality of the groundwater must be maintained, though the quantity is not likely to be naturally constant throughout the seasons or between wet and dry years.
- Grazing is often required to keep the vegetation short and open around springs and flushes. The precise timing and intensity of grazing will vary according to local conditions and requirements but should aim to keep a relatively open sward without causing excessive poaching.
- Drainage schemes should not intercept the source of groundwater to springs or flushes, or reduce the area of surface they irrigate.

7.6 Key Environmental Conditions

The following key environmental conditions were identified for this SAC, given the conservation objectives identified in the previous section. These effectively identify the key vulnerabilities of the designated features in addition to the key structural and functional relationships that create the European Site's integrity.

List of Key Environmental Conditions:

- Avoidance of changes to overall hydrological processes;
- Maintenance/introduction of sustainable grazing;
- Maintenance of water quality

7.7 Likely Significant Effects Assessment Hydrology

The following is a summary of the relevant findings of the Hafren Water technical annex provided in the Environmental Statement.

7.7.1 Potential Effects

Possible changes in the hydrological regime within the limestone as a result of quarrying to permitted limits have been identified as the most likely effect that could impact significantly on sensitive features within the SAC. These features are; Alkaline fens, brook lamprey and bullhead.

There has been detailed and comprehensive hydrological data collection, analysis and interpretation over the last two years and there is historical data from previous investigations at the Site and other quarries within the area. The results of these investigations are provided in summary in Chapter 10 of the Environmental Statement and are provided below.

7.7.2 Background & Scope

The principal objective agreed with Natural England (NE), Environment Agency (EA), Derbyshire County Council (DCC) and Peak District National Park Authority (PDNPA) was to develop and test a conceptual model of groundwater movement to evaluate the magnitude and significance of risks to the hydrological environment in the locality and the design of mitigation measures, as required.

A draft report on the findings of the investigations was circulated to statutory consultees in early February 2013 and meetings were held with the EA, NE, DCC and PDNPA subsequently to obtain feedback. All of the comments highlighted have been incorporated into Chapter 10, which.

- Determines the lowest level of limestone working that may be allowed in Tunstead Quarry and whether the 227 mAOD level in Old Moor remains appropriate;
- Predicts water conditions at the base of the two quarries post-extraction to inform the restoration proposals; and
- Determines the potential impacts on the wider water environment, most notably the sites

afforded statutory protection in the Wye Valley and its local

tributaries. **7.7.3 Conceptual Hydrology**

The results of fieldwork undertaken, together with consideration of findings of previous studies, indicate that karstification of drainage and conduit flows are present to the east of, and most probably at depth beneath the quarry. However, no conduits have been encountered in the Old Moor and Tunstead quarry workings to date.

Instead, the limestone in the quarried area, and extending down to the permitted depth of extraction in Old Moor (227 mAOD) and the proposed maximum depth of extraction in Tunstead (230/240 mAOD) is characterised by having low bulk hydraulic conductivity and storage and an inferred small volume of groundwater within it. The rapid response of groundwater levels to rainfall in monitoring boreholes and the absence of groundwater seepage in the quarry, even after periods of high rainfall, corroborates this view.

The extremely slow dispersal of tracer from the three boreholes into which it was injected and the disparity of elevations between groundwater levels recorded within monitoring boreholes adjacent to lower, dry areas of the quarry void, also demonstrate the low hydraulic conductivity characteristics of the limestone.

Geological faults occur frequently within and in the vicinity of the two quarries. The potential of the faults to convey groundwater has been considered. Observation of the faults within both quarries shows them to be clay-filled. Prolonged site experience of quarry personnel indicates that groundwater has not been seen to be associated with any of the faults exposed within the quarry voids.

Geophysical logging was undertaken to the full depth of permitted mineral extraction within Old Moor Quarry (227 mAOD) and to 230 mAOD and 240 mAOD in the south and north of Tunstead Quarry respectively. Conductivity and temperature logs were run specifically to identify the presence of flow horizons (i.e. inception horizons). There was no evidence within any of the boreholes of flow: in fact the results of the heat pulse flow log were at the limits of detection in each case.

There is a contradiction between the apparently high hydraulic conductivity recorded within borehole PZ-46, the observation that a large volume of water could be pumped into it without increasing the water level and the absence of movement of tracer from the borehole. This is probably explained by the borehole being in continuity with a fracture network which, although locally quite extensive, has very poor hydraulic continuity with surrounding fracture systems. This behaviour is characteristic of a patchy aquifer.

The effect of the inferred discrete fracture systems can be inferred within Old Moor Quarry where the floor of the quarry void is entirely dry at an elevation of 241 mAOD whereas groundwater levels significantly above this are recorded in nearby monitoring borehole PZ- 31.

In summary, there is no indication, based on the extensive field investigations, that a large, water-bearing conduit will be encountered during future permitted development of the quarries. The degree of risk of intercepting such a feature is considered to be extremely low, based on all the evidence.

It is concluded that the groundwater which occurs in small fissures within the mass of the limestone down to the proposed bases of extraction in the two quarries is hydraulically isolated from that of the larger conduit systems.

7.7.4 Potential Impacts during Mineral Extraction

Groundwater Quality

The operation of mobile plant, storage of chemicals and cement and lime manufacture all possess the potential to release chemical contaminants into the water environment. In addition operations could mobilise fines generated from the site and adjacent quarry areas, which could enter the local water system.

The most significant pollution incident to have occurred historically at the site was the discharge of silt-laden water adjacent to B Pond, which occurred in 2000. An investigation of the effects

upon the ecology of the River Wye, undertaken immediately after the incident, indicated that there were no significant or residual impacts upon the ecology of the River Wye. Measures have been taken to reduce the probability of the recurrence of such an event.

The permitted development is a continuation of the current works and safeguards that are currently in place will continue to apply during all future working.

Groundwater Abstraction

To date there is no evidence to suggest that groundwater is being drawn into the Site from outside the curtilage of the quarry and it is considered most unlikely that lowering of the quarry floor will intersect conduits transmitting groundwater. Hence, the permitted development will not significantly affect groundwater levels.

Groundwater Flow

The magnitude of groundwater flow within the limestone above the conceptual watertable is small. Calculations and direct observation indicate that groundwater flow is largely through the secondary porosity (fractures). No tertiary porosity elements (conduits) have been identified during drilling investigations undertaken in the course of this study although it is considered highly likely that conduit flow is important at greater depth.

In limestone areas conduits draining from areas of point recharge may pass through or beneath 'conduit-free' areas. Hence, it is impossible to totally exclude the possibility that a water bearing conduit or conduits could be intersected as the quarry floor continues to lower. However, the hydrogeological investigations suggest that the chances of intersecting water-filled conduits above 230m AOD in Tunstead and above 227m AOD in Old Moor are very low. This conclusion is supported by the fact that to date no conduit systems have been intercepted despite the removal of a very large volume of rock. In the unlikely event of a water-bearing conduit being intercepted there is a low possibility that the volumes would necessitate removal by pumping off-site through existing consents.

As the quarry floor is lowered a very small volume of groundwater storage will be removed but there will be little, if any, modification of sub-surface groundwater flow to springs on the banks or in the bed of the River Wye.

Surface Water Quality

There is currently no discharge of water off-site, although discharge permits issued by the EA are held. All recharge to the quarry void must ultimately flow to the River Wye and some will almost certainly be discharged via springs. However, the flow velocities are too low to transport sediment, which only takes place through conduits.

Surface water quality has previously been adversely impacted by the discharge of slurry from B Pond, as described above. However, this was a one-off occurrence and measures were swiftly put in place to prevent its recurrence. It should be noted that suspended

solids within the river which resulted from the loss of slurry dispersed rapidly and investigation showed that there was no significant impact upon ecology, nor residual impact.

Surface Water Flow

It is not expected that there will be any need to pump water from the quarry off-site, although existing discharge consents will be retained. Consequently, there is no potential for direct impact upon surface water flows.

The total volume of water abstracted from the two licensed boreholes (at Woodale and Blackwell Mill) has been reduced significantly in recent years due to efficiency initiatives. These boreholes are located on the banks of the River Wye with which they are assumed to have good hydraulic connectivity. The reduction in abstraction from the boreholes will have a beneficial effect on total flows within the river.

7.7.5 Impacts on Identified Sensitive Features within the SAC

Water will not be discharged off-site to a receiving watercourse thereby precluding adverse potential impacts that could occur from changes to water quality or volume. The only potential to impact adversely upon water-supported ecology is therefore considered to be by indirect effects

upon the flow regimes of individual springs or the River Wye. However, for the reasons presented above such impacts are not anticipated.

The alkaline fen in Woo Dale (Unit 4 Wye Valley SSSI), which was identified by Natural England as being an area of interest, is located on a small limestone outcrop high up on the western side of Woo Dale. Given its location, Natural England has accepted that it is isolated from Tunstead and Old Moor Quarries hydrologically and therefore unlikely to be impacted from any mineral workings.

The alkaline fen feature in Monk's Dale SSSI is located on the western edge of the valley at NGR SK 1371 7407 and runs adjacent to the main stream. It is fed by a number of springs and seepages, which discharge into a tributary running directly through the feature and into the main stream. The springs were investigated in a tracer study by the Environment Agency and have been the subject of detailed study in connection with workings at Dove Holes Quarry (Cemex). It is understood that the springs are some 2 km east of the eastern boundary of Old Moor Quarry at 220 m to 230 mAOD and are largely perched on the Lower Millers Dale Lava. These facts, in themselves, make it highly unlikely that the springs could receive any flow from Tunstead/Old Moor. Moreover, there is a strong hydrogeological barrier between Old Moor and Monks Dale, the known northwest-southeast flow system to the Wormhill and Chee Dale springs. In the absence of any hydrological continuity between the quarry and the springs, which flow out of the limestone in Monks Dale, it is logical to conclude that there can be no impacts from the quarry workings at Tunstead or Old Moor upon these alkaline fen communities in Monks Dale SSSI.

Cheedale Spring 3 (which discharges into the River Wye several hundred metres downstream of Wormhill Springs) is associated with a large tufa mound of ecological importance. It is fed by local groundwater perched on the Lower Millers Dale Lava and is distinct hydrologically from the upstream Cheedale Spring 2 which forms part of the Wormhill Springs conduit complex. No tracer was detected at Cheedale Spring 3 and it can be concluded with confidence that there can be no impacts on the tufa mound from quarry working at Tunstead and Old Moor. Cheedale Spring 3 appears to be located within Unit 20 of Wye Valley SSSI and Cheedale Spring 2 and the Wormhill Springs complex Unit 70 of the Wye Valley SSSI.

The magnitude of potential to impact upon water-supported ecology is therefore assessed to be 'negligible' and the significance as 'minor'.

7.8 Likely Significant Effects Assessment Dust

7.8.1 Potential Effects

Dust generated from mineral extraction and associated activities; processing, soil stripping and relaying, truck movements and loading unloading, dust generated from bare rock and spoil areas has the potential to impact on vegetation within the SAC. This can be through physical smothering thus reducing photosynthesis and transpiration of water and/or chemical changes on the leaves themselves or through interaction with the soil.

There is some evidence within the scientific literature that dust deposition rates of between 100 – 200 mg/m²/day could represent the threshold at which complaints from receptors might be generated and these values have been applied at mineral extraction sites¹. Significant impacts on vegetation are unlikely to occur at deposition rates of less than 1000 mg/m²/day.

Any dust incidents are highly dependent upon local weather, with extended periods of dry weather combined with winds blowing from the source of dust to the receptor being the conditions that significant dust related impacts are most likely to occur. These conditions would need to be combined with an activity creating dust close enough to the receptor for increases in dust soiling rates to be perceptible. However, this would only be the case when there is an inadequate application of the mitigation measures being employed on site.

¹ Vallack H W and Shillito D E (1998), Suggested Guidelines for Deposited Ambient Dustfall. Atmospheric Environment, Vol. 32, pp. 2737 – 2744

7.8.2 Assessment of Effects

The table below is taken from Chapter xx and shows the published guidance distances for a significant adverse effect taken from Mineral Policy Statement 2: Controlling and mitigating the environmental effects of mineral extraction in England.

Description	Potential Distance for Significant Adverse Effects (distance from source)		
	Soiling	PM10*	Vegetation
Large sites with high use of haul roads	100 m	25-50 m	25 m
Moderate sized sites, with intermediate use off haul roads	50 m	15-30 m	15 m
Minor sized sites with limited use of haul roads	25 m	10-20 m	10 m

It can be seen that beyond 25m from the dust source it is not expected that a significant adverse impact on vegetation would be expected.

The closest the SAC comes quarrying activities is 200m south of Tunstead Quarry and 100m east of Old Moor Quarry and so using the guidelines in the table above no significant likely impact is expected.

In addition to this, the wind direction, although variable is generally from the south and west, with occasional periods from the east and north-west (Folder 6 Technical Annex G) and analysis of the rainfall record collected at the on-site weather station shows that during 2012 there was a total of 1,574mm of rainfall and on 273 days rainfall was of measurable quantity and exceeded 0.2 mm.

The most recent (2012) measured levels of dust at the recording points around the quarry were within the range 96 to 129mg/m²/day, clearly below the 200mg/m²/day for nuisance to be expected and well below the 1000 mg/m²/day.

One of the aspects considered by Natural England when undertaking Condition Site Monitoring within SSSIs is the effects on the vegetation from impacts such as drainage, grazing and airborne pollutants. Where such an impact is shown, this is recorded as one or more of the reasons why a feature is not meeting its required condition. None of the Units monitored within the Wye Valley SSSI within 1km of the Site records dust or other airborne pollutants being a contributory factor to any of these units should they not be achieving favourable conservation status. As no increase in dust or other emissions is expected from continued quarrying, then the situation is not expected to change.

Based on the above, it is concluded that there is no likely significant effect on the features for which the SAC is designated from fugitive dust.

7.9 Potential for Cumulative Impacts

Due to the presence of Doveholes Quarry and Topley Pike Quarry in the vicinity of the Site, it might reasonably be inferred that there could be cumulative impacts upon the water environment.

However, the absence of pumped discharges off-site at Tunstead/Old Moor Quarries is such that there will be no changes to flows in watercourses. Similarly, the anticipated absence of significant groundwater level drawdown is such that there will be no cumulative impact between the quarries. Similarly, the River Wye constitutes a hydrological divide between most elements of the water environments on opposite banks, consequently any effects associated with the Topley Pike or Tunstead/Old Moor Quarries will not increase the magnitude of each other.

7.10 Conclusion of Likely Significant Effects

It is considered unlikely that the project will, either alone or in combination with other plans or projects, have a significant effect on the integrity of the Peak District Dales SAC.

The detailed hydrological and hydrogeological investigations have shown that it is very unlikely that there will be any adverse effect on the groundwater or surface water resources of the area from the continuing operations at the Site and thus the sensitive features within the SAC identified by Natural England.

The magnitude of potential to impact upon water-supported ecology is therefore assessed to be 'negligible' and the significance as 'minor'.

It has been demonstrated that significant dust deposition impacts are unlikely from continued working at the quarries particularly and industry best practice measures will be followed to minimise dust creation and to suppress any that is generated.

It is thus concluded that it has been demonstrated that continued quarrying as proposed by the Scheme is unlikely to have a significant effect on the integrity of the Peak District Dales SAC. Thus, continued quarrying is not considered to be contrary to the provisions of Regulation 61 of the Conservation of Habitats and Species Regulations 2010 and the EU Habitats Directive and an Appropriate Assessment is not considered necessary.