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PLANNING AND NOISE FROM MINERAL WORKINGS

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1. INTRODUCTION

To the acoustician planning can often seem a vague and difficult area to work in and good advice or guidelines are very welcome. This paper looks at the relevant legislation and Government advice on planning and mineral workings and what it has to say about noise and vibration. The uses and limitations of this advice are discussed. Suggestions are given on how to deal with minerals planning matters in practice.

2. THE LEGISLATION

The Local Government Act 1985 redefined a mineral planning authority as the county planning authority in respect of a site in a non-metropolitan county and the local authority in respect of a site in a metropolitan district or London borough [1]. Within National Parks some functions are discharged by the National Parks Committees unless a site straddles a park boundary, the relevant mineral planning authority then have responsibility. New planning applications are made under the Town and Country Planning Act 1971 [2]. However, some existing permissions may date back as far as 1945. In May 1986 the provisions of the Town and Country Planning (Minerals) Act 1981 came into force [3]. The provisions of this Act are explained in DOE Circular 11/86 [4]. The Act places a duty on mineral planning authorities to periodically review all their minerals sites (including dormant sites worked within a 5 year period prior to the review). The purpose of the review is to ensure that conditions are consistent with current minerals planning practice. The Act enables mineral planning authorities to impose conditions on the continued use of land for mineral working.

The Council of the European Communities on 27 June 1985 issued Directive (85/337/EEC) on the assessment of the effects of certain public and private projects on the environment [5]. In response to this the British Government introduced the Town and Country Planning (Assessment of Environmental Effects) Regulations 1988 [6]. These Regulations require that for certain types of scheduled development the developer must submit an "environmental statement" which the planning authority must consider before they can grant planning permission. This statement (usually called an environmental impact assessment or AIE) should contain information which includes likely significant effects of the development, direct and indirect, on the environment and on human beings. Opencast mineral extraction is a Schedule 2 type development which means that the requirement for an environmental statement is at the discretion of the planning authority or, in the case of a dispute, the Secretary of State. Whether mineral workings require an EIA will depend on the location, the scale and type of the activities proposed.

3. ADVICE AND GUIDANCE

Advice on conditions for minerals permissions is given in the DOE Minerals Planning Guidance Note MPG2 [7]. This Note includes sections on noise and blasting and states that factors to consider when examining ways to reduce noise disturbance include the siting of plant in relation to dwellings, prevailing wind direction and existing screens all of which have a bearing on noise levels. It mentions the use of The Control of Pollution Act 1974 [8] by local authorities or individuals to control noise amounting to a nuisance but advocates preference for control to be exercised from the outset by the use of planning conditions. DOE Circular 10/73 Planning and Noise [9] is stated as containing the principles and criteria by which Secretaries of State will be guided in taking planning decisions. The Note recommends, among other things, that conditions should be imposed limiting levels of noise (in dB(A) terms) at the boundaries of the site or outside key nearby buildings. Exceptionally noisy short term operations, such as the construction and removal of earth banks and blasting, may need to be excluded or provided for separately. Other possible planning conditions also mentioned are: the requirement to fit efficient silencers to all plant, the provision of acoustic screens or baffle banks, restrictions on plant operating hours and general restrictions on working hours (to meet the needs of traffic noise objections). MPG2 also says it is desirable to set limits on ground vibration and air overpressure. It does not say at what location these limits should be specified nor does not say where advice on setting levels of noise or vibration may be sought.

It should be borne in mind that any conditions imposed must satisfy the tests for planning conditions set out in DOE Circular 1/85 [10]. That is, they must be: necessary, relevant to planning, relevant to the development permitted, enforceable, precise and reasonable in all other respects.

DOE Circular 10/73 states that where by reference to BS 4142 [11] the noise from a proposed development "is likely to give rise to complaint" it will hardly ever be right to give permission. But the Circular also states: "There will however be times when it is appropriate - or even desirable in order to meet other planning objectives - to allow some form of industrial or similar development near houses etc. Minerals have sometimes to be worked although there are houses nearby..... The need then is to take every precaution to ensure that noise emitted by the development in question does not on the whole make the area a less pleasant place in which to live."

It might appear, from that particular paragraph in 10/73, that minerals working applications should not be refused on grounds of noise. However, Gloucester County Council refused permission for sand and gravel extraction at Twyning near Tewksbury. Reporting on the subsequent Appeal Inquiry (October 1987) the Inspector said that despite the fact that the plant was mobile and the working would be limited to 10 years he considered that the noise assessment should be made according to BS 4142. He decided that BS 5228 [12] was not applicable because it does not rate noise for complaint potential. In his view the predicted increase of 14 to 20 dB(A) above

background might give rise to complaints and would make the area a less pleasant place in which to live. He recommended upholding the Council's refusal.

4. SOME PRACTICAL CONSIDERATIONS

Noise and vibration may need to be considered in the following cases: modifications to existing permissions or planning applications for; new workings, extensions to existing workings or reopening of disused workings. For the last three the mineral planning authority may require the applicant to provide an EIA along with the application. Guided by 10/73, BS4142 and MPG2 the authority will need, if permission is granted, "to take every precaution to ensure that noise emitted by the development in question does not on the whole make the area a less pleasant place in which to live." If this cannot be achieved then refusal is justified. If existing mineral workings are causing noise problems then modifying the existing permission could be a means of achieving improvements instead of relying on the Control of Pollution Act 1973.

In the majority of cases comprehensive, long term noise surveys will be required. It will rarely be sufficient to pop out one afternoon and take a few 5 minute noise readings with a hand held meter. Mineral workings today generally operate on a very large scale. They are most often situated in rural areas and the locations of the noise sources are widespread and variable.

If sufficient time is available noise surveys should include several measurements of 24 hours or more taken at relevant locations around the application site and repeated several times over a period of a year. These should be supplemented by manual surveys of the whole area conducted at various times to include day, evening and night periods. Only then will a reliable picture of the noise climate and the effects of meteorological conditions be seen. Such surveys can be made a regular part of the authority's review procedures under the 1981 Act. (It is interesting to note that when Parliament considered this provision, during the passage of the 1981 legislation, it was made clear that the duty to carry out periodical reviews was not expected to impose an additional burden on authorities' staff or financial resources.)

Analysis of the survey data will reveal any trends in the background levels for different periods of the day including any seasonal changes and the effects of meteorological conditions. It should be possible to deduce average values of L90 that adequately describe the background level for various periods of the day. Where the ambient noise already includes noises from quarries or other industrial sources it may be reasonable to treat these as part of the background if they are shown to be causing no problem. Caution should be exercised however because a lack of complaint history does not necessarily mean there is no community dissatisfaction [13]. In any case 10/73 warns against the 'creeping background.' If distant sources do

contribute to the background level then this may vary significantly with wind direction and other atmospheric conditions. Differences of 20 dB(A) are not uncommon. If there are wide variations then background levels should be assessed for the relevant meteorological conditions (wind direction and temperature inversions). This approach is adopted in ISO 1996 [14] and the draft revision of BS 4142 [15]. It is also interesting to note that MPG2 mentions the relevance of the prevailing wind direction. Large scale workings may potentially affect two or more residential areas in different directions and therefore at different times. The different locations should be assessed separately, there should be no attempt to average the conditions over a large area.

Mineral workings are often in remote and otherwise quiet rural areas. Some of the problems this causes have been presented before [16]. Natural night time background levels can be very low, often around 20 dB(A). It has been suggested that a BS 4142 assessment is not valid in such circumstances unless a minimum threshold background level, of say 35 dB(A), is assumed. This approach may be valid though that threshold level may be wrong. Limited data on individuals' reactions to quarrying and other industrial noise in Somerset suggests that at levels of less than 35 dB(A) complaints are unlikely and at levels of 45 dB(A) or over there are complaints. This leaves a 10 dB(A) 'grey area'. BS 5228 states that facade noise levels at night may need to be as low as 40 - 45 dB(A) Leq(1 hour) to avoid sleep disturbance. Sleep disturbance is not necessarily the only consideration for night time noise. If an area has very low background levels (silence) then this is an amenity which can be enjoyed. That amenity is destroyed by continuous intrusive noise even at levels of 35 - 40 dB(A).

Where quiet areas are subjected to intermittent noises of high level, such as from roads or aircraft or even animals, the Leq levels can be very much higher than the L90. A remote location has been surveyed where the day time L90 (1 hour) was 28 dB(A) and the Leq for the same hour was 55 dB(A). (It does not take many seconds of noise from a low flying jet to cause this.) Leq should not be used as the background noise level. In such situations it may be very difficult to monitor the level of a industrial noise if it is only about 10 dB(A) above the L90. Automatic monitors are not much use in such cases although if an intrusive noise is continuous and fairly steady it will produce a detectable shift in the L90.

5. NOISE PREDICTIONS

Quarries use a lot of noisy plant, some static and some mobile. In addition to the dry stone production there are often secondary products such as coated stone, asphalt, concrete, concrete blocks, lime and limestone powder. The major operations and their noise sources are listed below.

In addition to the major sources large quarries will usually have many other vehicles such as smaller dumpers, tractors, tankers, sweepers etc. and auxilliary machinery such as pumps, generators and compressors.

Operation	Noise source(s)
overburden stripping	excavators, dumpers, dozers or graders
embankment construction	
shot hole preparation	mobile drilling rig
blasting	(ground vibration and air overpressure)
ripping	hydraulic chisel
fragmenting	"
face working	loaders, dumpers or conveyors
crushing and grading	primary, secondary and tertiary crushers and screens, conveyors
stockpile movement	loaders, dumpers, conveyors
loading	hoppers, conveyors
transport	heavy road vehicles, or railway trains
stone coating	burners, fans, conveyors
lime or concrete products	kilns, burners, fans, conveyors
concrete blocks	mould vibrator
limestone powder	mills

Noise is produced at almost every stage in the extraction process. To the distant listener these sounds merge into a general rumble of machinery and moving stone with occassional noises of vehicle engines, brakes, warning bleepers and mechanical clankings sounding above the rest.

If the sound power levels and locations of all the plant are known then a BS 5228 type assessment can be done to calculate the noise level at a given reception point. In practice this will be a very complicated exercise. It is better to work from actual noise measurements of similar plant in similar situations. Not all the data required will be in BS 5228 and in any case the sound power levels given will not include such noises as stone crashing into the body of a dump truck. The calculation really requires the use of a computer prediction model that can allow for topography, barriers and a variety of atmospheric conditions (with the worst conditions allowed for). If this cannot be done then a simple worst case assessment can be made by treating the quarry as a point source with the total calculated sound power and applying the simple hemispherical propagation formula. This has been found to work in practice. It gives levels which are close to those measured downwind at night (or during inversions) at distances of more than one kilometre. No excess attenuation is assumed. The results of such calculations can be compared with the measured background levels to assess whether complaints are likely.

6. NOISE CONTROL MEASURES

There are various practical measures that can be taken to control noise levels at source. Some of them are much easier to apply to new than to existing plant. These measures include the efficient silencing of all vehicles and drilling rigs including where necessary fitting radiator fan

attenuators, side and belly plates and improved exhaust silencers. Static plant such as screens and crushers can be enclosed in noise insulating housings and critical components can be isolated with anti-vibration mounts. Screens can be made of rubber and rubber can be used to line shutes, conveyor housings and dump truck bodies. The layout of plant should be designed carefully to make the best use of screening either from man-made or natural barriers. The design of haul roads and site access roads should be such as to minimise vehicle noise. Mobile barriers could be used to attenuate the noise from drilling rigs, and permanent screens in the form of earth banks can be used at the site boundaries.

Any or all of the above measures could be included in a planning permission. Another control measure to consider is a condition limiting noise and vibration levels. A suitable noise level at the nearest noise sensitive location could be translated to a level at a nearer location that would be a more convenient monitoring site. Leq (15 minute) levels are specified in Somerset with different day and night time levels.

Local experience has shown that the threshold for complaints about ground vibration from blasting is around 1.5 mm/sec ppv (as measured near the house foundation). Fear of structural damage seems to be a common concern (cracks in the plaster are always pointed out). BS 6472 'Evaluation of human exposure to vibration in buildings (1 Hz to 80 Hz)' [17] provides a method of establishing vibration levels below which 'adverse comments or complaints are rare'. For impulsive events human response is not so well understood and the 'trade off' between number of events per day, their magnitudes and durations is not well established. The calculation for one event per day gives a 'satisfactory' level range of 8.6 to 12.9 mm/sec ppv. BS 6472 is currently being revised and unless the new Standard gives clearer advice it is likely that setting vibration conditions will continue to be somewhat arbitrary. UK Local Authorities set planning limits between 2.5 and 12 mm/sec. Lower vibration levels can be achieved by careful blast design. Good blast design together with down-the-hole detonation and the elimination of surface detonation cord can also help to reduce the air blast.

7. CONCLUSION

Current legislation provides mineral planning authorities with the means to control noise and vibration from new or existing workings.

Those involved in mineral planning matters are perhaps fortunate in having more specific advice than is available in other areas of planning. Still more guidelines would be useful such as for determining limits for ground vibration. In the final assessment we may be left grapling with abstract concepts like pleasantness or reasonableness. But noise is a subjective issue and there will never be a thin line dividing the acceptable from the unacceptable.

Mineral workings are often very large projects in rural areas. Applications

may need to be accompanied by an EIA and noise assessments will require comprehensive background survey work. Consideration should be given to the effects of meteorological conditions especially on night time noise levels.

When all the relevant facts have been gathered assessments can be made by reference to BS 4142 even though much of the plant is not 'fixed'.

Noise and vibration can be controlled by conditions attached to a planning permission setting limits at certain reference locations. Further conditions may be applied requiring specific noise control measures to be taken on site. Limits on hours of operations may also be imposed.

REFERENCES

[1] The Local Government Act 1985

[2] Town and Country Planning Act 1971

[3] Town and Country Planning (Minerals) Act 1981

[4] Circular 11/86 Town and Country Planning (Minerals) Act 1981 Department of the Environment April 1986

[5] EEC Directive 85/337/EEC (OJ No.L175, 5.7.85, p.40) on the assessment of the effects of certain public and private projects on the environment. 27 June 1985

[6] The Town and Country Planning (Assessment of Environmental Effects) Regulations 1988 Statutory Instruments no. 1199 15 July 1988

[7] Minerals Planning Guidance Note MPG2 Applications, permissions and conditions. Department of the Environment 1988

[8] The Control of Pollution Act 1974 Part III s(58), s(59)

[9] Circular 10/73 Planning and noise. Department of the Environment 1973

[10] Circular 1/85 The use of conditions in planning permissions. Department of the Environment 1985

[11] British Standard BS 4141:1967 Method of rating industrial noise affecting mixed residential and industrial areas. British Standards Institution

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[17] British Standard BS 6472:1984 Guide to Evaluation of human exposure to vibration in buildings (1 Hz to 80 Hz). British Standards Institution.