SECOR

SKELBROOKE QUARRY AND LANDFILL

ASSESSMENT OF ENVIRONMENTAL IMPACT OF NOISE AND DUST EMISSIONS FROM EASTERN EXTENSION

Prepared for

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TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 At the request of Darrington Quarries Limited (DQL), *SECOR* Limited (*SECOR)* have undertaken assessments of the potential impacts arising from noise and dust emissions associated with a proposed eastward extension to DQL's Skelbrooke Quarry.

1.2 The proposal involves the extraction of Upper Magnesian Limestone from an area of arable land lying to the south of Skelbrooke Village followed by restoration of the land to agriculture by controlled landfilling.

1.3 This study assesses the potential impacts arising from noise and dust emissions relating to both of these activities and commenced with a site inspection and survey of existing noise levels around the site which was undertaken on 16 April 1996.

2.0 SITE INSPECTION

2.1 Site Setting

2.1.1 The extension site is located approximately 750 metres to the west of the A1 trunk road and approximately 300 metres to the south of the centre of the village of Skelbrooke. To the west of the site lies an extensive area of land from which limestone has been extracted and which is in the course of being restored by landfilling. At the time of the site inspection, quarry face activities were not taking place and the quarry plant was running only intermittently. It is understood that, if the extension proposals are accepted, the quarry plant would be moved from its current position to a location on the quarry floor beneath and to the immediate west of, the site weighbridge.

2.1.2 The site weighbridge lies on the line of the track of a disused railway which has now been removed. The former railway provides a good surfaced access to a C-class road known as Straight Lane.

2.1.3 The proposed extension area lies in a shallow valley which opens out to the east towards the A1. A topographic survey of the extension area, and an area of associated farmland which lies immediately to its northeast, indicates that ground levels drop from between 40 and 37 maOD, in the north of the site, to between 27 and 32 maOD in the floor of the valley before rising again to c. 36 maOD in the southern part of the extension area. Skelbrooke Hall, and the surrounding properties in the centre of Skelbrooke Village, lie in an adjacent gentle valley feature which also opens out to the east. To the immediate north of the site, a line of residential properties lies along the extension of Straight Lane lying between its junction with Doncaster Lane and towards Skelbrooke Church. These properties lie on the very gentle ridge which separates the two valleys described above and some of them have views over the southern part of the extension site.

2.1.4 The nearest residential property to the proposed extension area is a pair of semi-detached houses fronting Doncaster Lane immediately adjacent to its junction with Straight Lane. These properties lie at a minimum distance of 130 metres from the proposed closest approach of the proposed limestone excavation and landfilling activities. The remainder of the village of Skelbrooke lies at greater distances from the extension site. The closest properties, in other directions, are Priory Farm, which lies 860 metres to the south of the site, and Manor Farm, which lies 800 metres to the east of the site, adjacent to the A1.

2.2 Brief Description of Proposed Development

2.2.1 The proposed development involves an extension of the quarry over part of an arable field lying to the east of the current quarry and landfill site. It is intended that the limestone would be extracted using a hydraulic face excavator which would be powerful enough to extract the material without it being necessary to employ blasting techniques. This extraction method is

already used successfully at Skelbrooke Quarry and minimises potential generation of noise and dust as a result of the excavation activities.

2.2.2 A geological investigation undertaken by DQL indicates that the limestone horizon, in the extension site, is in the order of 9 m thick which, together with the overlying overburden, implies that the floor of the excavation would be c.10 m below existing ground levels, at elevations of between 17 and 22 maOD, in the northern part of the extension area rising gently to c. 26 maOD in the southern part of the extension area.

2.2.3 Once limestone extraction has been substantially completed, the excavation area would be restored progressively by controlled landfilling, following the construction of a landfill containment system within the quarry. Construction of the containment system would involve the use of the Middle Permian Marl, which underlies the Upper Magnesian Limestone. Once the landfilling of imported materials had been completed, the landfill would be capped with impermeable materials before being soiled and returned to agriculture.

3.0 NOISE SURVEY DETAILS

3.1 Survey Instrumentation

A Cirrus CRL 703A integrating sound level meter was utilised to monitor the noise climate at four locations surrounding the proposed extension area. The meter, which was set in a low response mode, was calibrated before and after the monitoring exercise and no significant drift in calibration was observed. The meter was set with A type frequency weighting to mimic the response of the human ear to noise. This setting filters out certain noise frequencies to which the human ear responds poorly.

3.2 Survey Dates and Personnel

The noise climate in the area surrounding Skelbrooke Quarry was measured between the hours of 09.00 and 17.00 hours on 16 April 1996. The survey was conducted by Mr K D Owen of *SECOR*.

3.3 Meteorological Conditions Prevailing During the Survey

Between 09.00 and 09.30 the weather was dry, still and overcast but by 09.30 a light wind from the south-east had sprung up. A period of heavy showers, between 10.20 and 14.30, caused noise monitoring operations to be suspended, after which the wind from the south-east continued with variable intensity and direction.

4.0 SURVEY METHOD

4.1 Introduction

The methodology described below was employed during the survey of the noise climate surrounding Skelbrooke Quarry.

4.2 Noise Measurement Techniques

At all survey locations the microphone was placed 1.5 metres above the ground and at least 3.5 metres from the nearest reflecting surface. The sound level meter was programmed to monitor over 10 to 20 minute periods and the following parameters were recorded:

- L_{Aeq}/dB(A)
- L_{A90}/dB(A)

4.3 Noise Measurement Locations

The four noise monitoring locations, which were visited, are listed below and were selected as being representative of the closest potential, and existing, noise receptors in the Skelbrooke area.

Location Number	Location Description
1.	Properties at Junction of Doncaster Lane and Straight Lane
2.	Centre of Skelbrooke Village
3.	Priory Farm
4.	Home Farm, Skelbrooke Village

The location of these monitoring sites is shown, together with that of the extension site, in Drawing SKD1.

4.4 Results of Noise Monitoring Survey

A summary of the results of the Noise Climate Survey is given in Table SK1. The survey showed that noise receptors in the Skelbrooke area receive considerable amounts of road noise from the A1 which is visible from the southern part of the village.

5.0 NOISE CRITERIA WITH RESPECT TO MINERAL & LANDFILL SITES

5.1 Noise Parameters

5.1.1 The ambient environmental noise at any location will vary according to activities taking place around that location. In the vicinity of a busy road, such as the A1, the noise level will remain fairly constant due to the relatively steady noise generated by the road traffic. At a site where the noise level varies, such as a quarry, where mobile plant can be a significant noise generator, the noise will vary over a much wider range. It is necessary, therefore, to consider how to quantify the existing noise levels in an area in order to accurately assess the environmental impact of the introduction of a new noise source.

5.1.2 Background noise level, defined as the L_{A90} parameter, represents the noise level which is exceeded for 90% of a given measurement period and represents, therefore, the "troughs" in an analogue representation of varying noise levels. It ignores the effects of short term higher level events.

5.1.3 The equivalent continuous sound pressure level, or L_{Aeq} parameter, is a measure of the average sound energy over a given period of time. It will include noise from all contributing sources.

5.2 Relevant British Standards and Planning Guidance Documents

5.2.1 British Standard (BS) 5228, 1984 (Reference 1), describes "Noise Control on Construction and Open Sites". British Standard (BS) 4142 (Reference 2), originally published in 1967, describes the "Method of Rating Industrial Noise Affecting Mixed Residential and Industrial Areas". BS 5228 sets out how to predict noise levels associated with construction and open sites whilst BS 4142 rates industrial noise. It should be noted that industrial noise sources are taken to be static whereas noise from construction and open sites will be, in many instances, from mobile plant and different assessment criteria may, therefore, be appropriate.

5.2.2 In recognition of this potential discrepancy, the Department of the Environment (DoE) commissioned W S Atkins Engineering Sciences Limited to undertake a study into the Control of Noise at Surface Mineral Working the results of which were published in 1990 (Reference 3). This led to the DoE producing detailed recommendations to Mineral Planning Authorities in the Mineral Planning Guidance Note 11 (MPG 11) "Control of Noise at Surface Mineral Workings" (Reference 4), which was issued in April 1993. MPG 11 recommends that, with some modifications, BS 5228 can be used to predict noise levels from the operations of proposed minerals extraction and waste disposal sites. However, it goes on to give advice with regard to the acceptability of noise levels which differs from that contained in BS 4142 which merely identified noise levels at which complaints might become likely. BS 4142 suggested that this was done by comparing pre-development background levels to noise levels which would be generated by the development and indicated that, if these noise levels exceeded the background levels by more than 10 dB(A), then complaints were likely.

5.2.3 MPG 11 introduces the concept of maximum acceptable daytime noise levels, which are set, at properties surrounding minerals or waste disposal sites, at a level of 55 dB(A) L_{Aeq} reducing during night time hours to maximum levels of 42 dB(A) L_{Aeq}.

5.2.4. MPG 11 also recommends that the long term benefits of the construction of screen mounds and noise baffle banks, in positions relatively close to surrounding properties, should be recognised. In paragraph 42 it states that:

> *"...it will often be necessary to raise the noise limits to allow temporary but exceptionally noises phases in the mineral extraction operation which cannot meet these limits. A prime example would be to allow for the construction of baffle mounds, but there are other activities including soil stripping, removal of spoil heaps and the construction of new permanent land forms which would merit a temporary raised limit".*

5.2.5 Paragraph 61 of MPG 11 suggests that, for periods of up to six weeks per year, a 70 dB(A) L_{Aeq} limit should be allowed, by Planning Authorities, to facilitate such activities. The Planning Guidance note also leaves open the possibility of operators negotiating even higher noise limits for shorter periods of time and vice versa.

6.0 NOISE LEVEL PREDICTIONS

6.1 Introduction

6.1.1 Noise can be defined as sound which is undesired by a receptor. The effects of noise on human receptors are varied and complicated but can lead to interference with work or with sleep patterns and, in extreme cases, can give rise to increased levels of stress. It should be borne in mind, however, that individuals have different responses to noise.

6.1.2 The measure of environmental noise which is in general use, and which is accepted for the assessment of the environmental impact of noise from new developments, is the L_{Aeq} parameter. In the preceding section, various recommended noise limits contained in MPG 11 are described which utilise the L_{Aeq} parameter.

6.1.3 The level of noise surrounding a development site and experienced at local properties will depend upon a number of factors the most significant of which are:

- the sound power levels (SWL's) of the plant or equipment being used on the site
- the periods of operation of the plant on the site
- the distance between the source noise and the receiving position
- the presence or absence of screening effects due to barriers or ground absorption
- reflection effects due to the other sides of buildings or quarry faces etc

6.2 Prediction Methodology

6.2.1 The prediction method utilised by *SECOR* in this study is based on that outlined in BS 5228. MPG 11 accepts that with some modifications, BS 5228 can be used to predict the noise levels from operations at proposed minerals extraction or waste disposal sites.

6.2.2 The most significant modifications to BS 5228 which MPG 11 suggests, relate to two important attenuators of noise, which are the effect of barriers between the noise source and the receptor and the absorption effect of soft ground lying between the noise source and the receptor.

6.2.3 BS 5228 originally suggested that a maximum barrier attenuation of 10 dB(A) should be adopted whereas MPG 11 suggests that the amount of attenuation, which can be attributed to barriers, should be calculated. In order to more accurately assess the attenuation of noise from the minerals and landfill activities in the proposed extension site at Skelbrooke Quarry, the methods used in the 1988 DTp document, Calculation of Road Traffic Noise (CRTN) (Reference 5), have been employed. This document describes the method for estimating barrier attenuation by determining the path difference, along which noise is propagated, and which is caused by the inclusion of the barrier. It should be noted that, although maximum barrier attenuation of up to 25 dB per frequency band may be obtainable, a maximum barrier attenuation of 15 dB(A) has

been assumed in this study.

6.2.4 With regard to the attentuative capacity of soft ground, lying between a noise source and a receptor, MPG 11 suggests that these attenuative effects should be considered and, once again, the techniques to determine soft ground attenuation described in CRTN are utilised.

6.2.5 It should be noted that where both barrier and soft ground attenuation are available, MPG 11 suggests that only the most significant source of attenuation should be recognised and this approach has been adopted by *SECOR* in this study.

6.3 Complement of Plant

6.3.1 Three distinct phases of developments for the extension site are recognised, relating to overburden stripping and screen mound construction, mineral extraction and landfilling phases of development. For each of these phases of developments, separate complements of mobile plant would be utilised and have been recognised in the noise level predictions which are described below. The plant complements are based on information provided by DQL and are set out in Table SK 2 together with appropriate sound power levels derived from BS 5228 or from plant manufacturers.

6.4 Assumptions made in Noise Predictions

6.4.1 For the purposes of the prediction exercise, the worst case scenarios have been considered at all times. Whilst these typically represent situations where mobile plant is working at the closest approach to surrounding properties, alternative scenarios where plant is working in the direct line of site of properties, albeit at greater distances than the closest approach, have also been considered.

6.4.2 It should also be noted that worst case assumptions have been made with regard to the "on-time" of the items of mobile plant which would be utilised during the various phases of the site development. In all but one case, it has been assumed that plant would be operating for 100% of the time which is, necessarily, a conservative assumption.

7. RESULTS OF NOISE PREDICTION CALCULATIONS

7.1 Introduction

A summary of the worst case noise level predictions, at the four representative receptors described above, is given in Tables SK3, SK4 and SK5. Each table represents a different phase of development of the extension site. The results of the noise prediction exercises are described below for each of the phases.

7.2 Overburden Stripping and Earth Moving Activities

7.2.1 The first phase of development of the extension site would involve the removal of soils and overburden materials which overlie the Upper Magnesian Limestone deposit. The majority of these materials would be utilised immediately to construct a visual and noise screening and baffling mound to the north of the proposed extraction area. The soils and overburden materials would be stripped using a combination of hydraulic backacter, articulated dump truck and a light D6 bulldozer. These items of plant would also be used to construct and shape the screen/baffle mound.

7.2.2 Noise level predictions have been made assuming that site noise would be attenuated as a function of the distance of site operations from receptors and as a result of attenuation by the intervening soft ground. It has been assumed that, during this phase of development, the worst case situation would be one in which no barrier attenuation was taking place. This would be especially so during the formation of the screen mound where mobile plant would be operating on the barrier which would eventually attenuate noise levels during the subsequent operation of the site.

7.2.3 Predicted noise levels, relating to the overburden stripping, earth moving and embankment construction phase of development of the extension site, are set out in table SK3 to contrast it with the current noise climate. At location numbers 1 and 4, which are relatively close to the extension site, the predicted noise levels are well above observed background noise levels. However, the predicted noise levels at all potential receptors are significantly below the 70 dB(A) L_{Aeq} level suggested in paragraph 61 of MPG 11 specifically in relation to these temporary phases of development.

7.2.4 It can be concluded, therefore, that noise levels generated during the overburden removal and screen bank construction phase of development would be acceptable with respect to the recent guidance given in MPG 11.

7.3 Quarry Operations Phase

7.3.1 The limestone is extracted directly from the quarry face by a large hydraulic excavator and is then loaded into a 25 tonne dump truck for transportation to the quarry processing plant.

7.3.2 It is intended that the quarry processing plant would be moved closer to the extension site if consent is granted. The plant would be relocated at quarry floor level in an area adjacent to the quarry weighbridge and some 8 to 10 metres below weighbridge level. As such, it can be expected that the plant would be well screened from potential noise receptors. However, since plant details and elevations are not fully known, it has been assumed that some plant noise may propagate in direct line of sight to surrounding receptors and, therefore, only soft ground attenuation of the processing plant noise has been assumed. In reality, it is likely that some barrier attenuation would take place and the resulting calculations are, therefore, once again, conservative.

7.3.3 The results of noise prediction exercises relating to the mineral extraction processing phase are set out in Table SK4. As would be expected, noise levels generated by this phase of operation are highest at the pair of semi-detached houses on Doncaster Lane at monitoring location No. 1. At this location, worst case noise levels are predicted to be 54.0 dB(A) which lies within the 55 dB(A) limit proposed in MPG 11.

7.3.4 Given the conservative nature of the noise predictions, together with the short length of time over which limestone would be extracted at the closest approach to the property at monitoring Location 1, it is considered that the noise levels at this property would be acceptable. It should also be noted that the predicted noise levels lie within 10 dB(A) of the monitored average L_{A90} level at this location.

7.3.5 At all other locations, predicted noise levels during the mineral extraction processing phase are well within the 55 dB(A) limit suggested in MPG 11.

7.4 Landfilling Phase

7.4.1 During the landfilling phase, much of the development would take place beneath existing ground level and would benefit, therefore, from considerable barrier attenuation with respect to the propagation of noise beyond the site boundary. However, during the latter stages of development and restoration of the landfill site, mobile plant items would be operating at or above the original ground surface and there would be little potential, in these instances, for barrier attenuation of noise to take place.

7.4.2 On the advice of DQL, the plant complement for this phase of development is considered to be a CAT 826, or similar, compactor accompanied by a hydraulic backacter which would be used to assist the unloading of articulated trucks which import the waste to the site. Due to the

intermittent nature of deliveries of waste to the site an adjustment has been made for the on-time in respect of the backacter and road vehicles and an equivalent sound power level has been derived from Reference No. 44 in Table 7 of BS 5228 for an excavator/lorry combination.

7.4.3 In the case of the closest approach to noise monitoring location No. 1, it is assumed that the peripheral screen bank would still be in place and that significant barrier attenuation would be available. The worst case, in this instance, is at a stand-off of 240 metres where a direct line of sight between the upper surface of the landfill and the receptor would be available. In this latter instance, only soft ground attenuation of the noise generated by site activities can be assumed in the prediction process.

7.4.4 In all other instances, only soft ground attenuation of the noise resulting from the landfill operations has been allowed for in the worst case noise prediction calculations.

7.4.5 The results of the prediction exercises in respect of the landfill operations are contained in Table SK5. This indicates that predicted noise levels would be lower than those associated with the mineral extraction operations and, in all cases, less than 50 dB(A), and well within the 55 dB(A) limit set out in MPG 11.

8.0 RECOMMENDATIONS WITH RESPECT TO NOISE EMISSIONS

8.1 If the development proceeds it is recommended that the following steps should be taken in order to minimise noise levels associated with the development and surrounding properties.

8.2 Upon commencement of earth moving operations, a baffle mound should be constructed immediately to the north and north east of the excavation site boundary to a height of between 3 and 4 m.

8.3 Enquiries should be made with plant manufacturers or the suppliers of rented plant to ensure that plant utilised during the earth moving phase of development operates at sound power levels equivalent to, or lower than, those used in the prediction calculations.

8.4 Although barrier attenuation of the noise emitted by the mobile processing plant has not been allowed for in the noise predictions carried out in this study, it is recommended that, if the plant is relocated as envisaged, efforts should be made to ensure that all noise emitting parts of the plant should be located below the level of the adjacent original ground surface to ensure that barrier attenuation is achieved.

8.5 During the latter stages of development and surcharging of the landfill site, care should be taken to ensure that the sound power level of plant used to compact and then soil the landfill should be equivalent to, or less than, that used in the prediction calculations. Alternatively, some form of short term additional baffle screening could be employed for the short time that this particular part of this phase of development takes place. This could take the form of a row of large hay bales placed along the crest of the screen mound and along the north-eastern side of the boundary.

9.0 CONCLUSIONS WITH REGARD TO NOISE ASSESSMENT

9.1 Worst case noise prediction calculations carried out in respect of 3 discrete phases of development of the proposed extension to the Skelbrooke Quarry and Landfill indicate that, in each case, predicted noise levels at representative receptor locations would be within the 55 dB(A) L_{Aeq} standard suggested in MPG 11.

9.2 The existing noise climate in the vicinity of the quarry is heavily influenced by the proximity of the site and surrounding receptors to the A1.

9.3 Given the worst case nature of the noise predictions, and the high existing background noise levels as determined by the monitoring exercise, it is considered that, subject to observing the recommendations given above, the noise levels which would arise if the development proceeds would be acceptable with regard to recent Government guidance.

10.0 ENVIRONMENTAL IMPACT OF DUST EMISSIONS

10.1 Introduction

The potential environmental impact of dust emissions, from the proposed mineral extraction and processing and the landfilling activities at Skelbrooke Quarry, has been investigated. This task included a site inspection, carried out in conjunction with the noise monitoring exercise described above, and has involved an investigation into the meteorological conditions which prevail in the Skelbrooke area. Dust emissions from crushed rock quarry processes are now controlled by statute and the regulatory framework, within which the proposed extension to the quarry and landfill would operate, is set out in some detail.

10.2 The Regulatory Framework

10.2.1 There are, as yet, no statutory or universally recommended levels of dust deposition which are deemed in the UK to constitute a statutory nuisance. However, there are occupational exposure limits for dust in air which have been set recently by the Health and Safety Executive.

10.2.2 The latest Government advice relevant to the proposal to extend the quarry is "Pollution Guidance Note" PG3/8/91, Quarry Processes Including Roadstone Plants and the Size Reduction of Bricks, Tiles and Concrete" (Reference 6). This emphasises suitable dust control measures that can be undertaken to prevent nuisance and also sets standards for emissions of pollutants from "contained" sources only. These standards are not applicable to plant at Skelbrooke Quarry which does not operate on a contained basis.

10.2.3 British Standard BS 3405: 1983 (Reference 7), defines dust as *"solid particles that are smaller than grit but above 1 micron in diameter"*. Grit is defined as *"solid particles retained on a sieve of aperture size 75 microns"* and, therefore, dust is particulate matter in the size range 1- 74 microns in diameter.

10.2.4 The Control of Substances Hazardous to Health (COSHH) Regulations, 1988 (Reference 8) place a requirement on employers to prevent employees ingesting or coming into contact with substances harmful to health. The Health & Safety Executive publication EH 40 (Reference 9) lists the occupational exposure limits for employees to various substances including limestone dust. DQL have, therefore, an obligation under the COSHH Regulations to control dust emissions within the quarry workings in order to achieve compliance with the relevant exposure limited.

10.2.5 With regard to potential receptors of dust pollution located outside the quarry, the Environmental Protection Act (EPA), 1990 (Reference 10) brought in substantial changes to the control of polluting activities. Prior to the introduction of the EPA, pollution of the atmosphere from quarry processing activities was controlled by the Air Pollution Branch of Her Majesty's

Inspectorate of Pollution (HMIP). Operators were under a duty to use the "best practical means" to control emissions from their sites.

10.2.6 Part 1 of the EPA came into force on 1 April 1991 and repealed much of this previous legislation. The EPA introduced new concepts in pollution control for the minerals industry. The main change was that a new system of controlling "scheduled processes" was introduced and these processes are categorised as being "Part A" or "Part B" processes. Part A processes include those which are potentially more polluting and these remain subject to control by HMIP. Most mineral extraction, and associated processing operations, are placed in the "Part B" category and the control of these processes became the responsibility of the Local Authority.

10.2.7 At Skelbrooke Quarry, the Part B "Processes" include crushing, screening, handling and storage of limestone. The Local Authority is Doncaster Metropolitan Borough Council. As required by the legislation, DQL applied to register the process at Skelbrooke Quarry and a formal authorisation was issued by Doncaster MBC under Authorisation No. EPA 32. The authorisation, in common with normal practice, was subject to Conditions which, among other matters, required the submission for approval of an upgrading programme of dust emission control measures. DQL submitted their Upgrading Schedule, detailing the works proposed in respect of the plant at Skelbrooke Quarry, on 25 April 1993, and a copy of this submission is attached at Appendix 1. If the proposed development proceeds, the Quarry plant would be relocated to its new position on the quarry floor adjacent to and below the quarry access road and the upgrading programme improvements would be made as required by Doncaster MBC.

10.3 Recent Research

10.3.1 In 1995, the DoE published research findings regarding "The Environmental Effects pf Dust from Surface Mineral Workings" (Reference 11) following a project carried out by Arup Environmental. This research examined public perceptions of dust emissions from various mineral workings and noted that "previous research indicates that the majority of dust particles from mineral workings will deposit within 100 m of the source".

10.3.1 The report concluded that, inter alia,

> *"Stand-off distances from significant dust emitting sources (such as active storage mounds), should in most cases be between 100 - 200 m, though this can be reduced if appropriate and effective mitigation measures can be implemented".*

11.0 SOURCES OF DUST EMISSIONS AND APPROPRIATE CONTROL MEASURES

11.1 Dust generation, associated with quarrying, derives from two main operations; the winning of the rock from the quarry face (and associated soil stripping and rock transportation activities) and then from the crushing, screening and handling of the rock in the quarry plant. The quarry operations which can be identified as potential generators of dust emissions are considered to be as follows:

- Soils and overburden removal and replacement
- Extraction of rock from quarry face
- Loading at the quarry face and haulage to the processing plant
- Processing of the excavated rock, ie. crushing and screening
- Storage and stock piling of aggregates
- Loading and haulage of finished products off the site

11.2 The dust generating activities associated with landfilling operations can be identified separately and it is considered that these activities are as follows:

- The construction of the mineral liner for the landfill containment system
- Deposition of waste within the landfill together with its associated daily capping and compaction
- Landfill restoration

11.3 Each of these potential dust generating activities has been considered in turn and, where necessary, appropriate mitigation strategies have been identified. In addition, consideration has been given to the prevailing meteorological conditions in the vicinity of Skelbrooke Quarry since this is of importance in understanding the likelihood of potential receptors, of dust, from the extension site, being affected by any residual dust emissions which may occur following the implementation of the mitigation measures set out below.

12.0 ASSESSMENT OF DUST GENERATING ACTIVITIES

12.1 Soils and Overburden Removal and Placement

12.1.1 The geological survey carried out by DQL has indicated that the thickness of soil and overburden, resting on the limestone in the extension site, is in the order of between 1.0 and 1.5 metres. The total volume of material to be handled therefore, is relatively small and the overburden stripping scheme would take place in a phased manner, each phase being of short duration.

12.1.2 The construction of the screening mound, to the north of the proposed extraction site, would be the dust generating activity which would take place in closest proximity to properties in the southern part of Skelbrooke. The closest approach of these potential dust generating activities to a dust sensitive property would be 100 metres. However, construction of the screen mound would be an activity of short duration due to the relatively small quantities of soils required for its construction. Research into the environmental effects of dust from surface mineral workings (Reference 7) indicates that soil stripping and storage operations have the potential for a high level of dust emissions.

12.1.3 Given this situation, and the relative proximity of the area in which the screen mound would be constructed, in relation to the village, suitable mitigation strategies should be employed to ensure that dust emissions during the creation of the screen mound are minimised. The prime strategy would be to ensure that soil stripping does not take place when soils are dry and excessively friable. However, care must also be taken to avoid stripping soils when they are too moist as this can damage soil structure. A practical mitigation strategy would be to employ a water bowser during soil stripping operations, to damp down the soil as appropriate. Once completed, the screen mound should be soiled and seeded at the earliest opportunity to minimise the opportunity for windblow from the surface of the mound.

12.2 Extraction of Rock from the Quarry Face

12.2.1 As has already been indicated, the limestone at Skelbrooke Quarry is excavated from the quarry face using a hydraulic shovel. Drilling and blasting activities, which can potentially give rise to high levels of fugitive dust emissions, are not employed at this quarry and would not be necessary in the proposed extension area. The potential for dust emissions from extraction operations at the quarry face is considered, therefore, to be low.

12.2.2 There would be the potential for moderate to high levels of dust emissions arising from the transport of face rock to the processing plant. A well tried and tested mitigation measure in respect of dust generated from quarry haul roads is to employ a water bowser during periods of dry weather. In the case of Skelbrooke Quarry, a bowser is already employed as appropriate and would continue to be utilised if the extension area were to be developed.

12.3 Processing Activities

12.3.1 The crushing and screening of hard rocks such as limestone can give rise to fugitive dust emissions due to the agitation of rock and dust particles by the crushers and associated screens and also due to the winnowing action of wind on material being discharged from a conveyor onto a stock pile.

12.3.2 However, it is recognised (Reference 7), that appropriate regulatory controls over dust emissions from processing plant are the responsibility of the Local Authority's Environmental Health Department and that the effectiveness of dust control measures can be high.

12.3.3 Given that the quarry plant would be upgraded in line with the EPA Authorisation if it were moved as part of the extension proposals, it is considered that dust emissions from this source would be kept to a satisfactory level.

12.4 Storage and Stock Piling of Aggregates

12.4.1 At Skelbrooke Quarry processed aggregates are stock piled on the quarry floor. Stock piles are recognised (Reference 7) as having moderate potential to contribute to site dust emissions. Since the stock piles are situated on the floor of the quarry they are relatively well screened from exposure to wind. As such, it is considered that specific dust control measures, with respect to stock piles, are not required save for a requirement for the stock piles to be retained on the quarry floor and not placed at ground level.

12.5 Loading and Transport of Finished Products

12.5.1 As has been described above, processed aggregates at Skelbrooke Quarry are retained on the floor of the quarry. They are then loaded directly into road vehicles using a wheeled loader. In accordance with the requirements of the EPA, all lorries, carrying aggregates, with a diameter of less than 75 mm, are sheeted before they leave the quarry.

12.5.2 The quarry haul road is surfaced and is swept as necessary to reduce dust emissions by vehicles travelling along it. Vehicles leaving the site pass through a wheel rinsing device to remove dust and mud from their wheels before they travel along the access road thus further reducing the potential for dust emissions from this source.

12.6 Construction of Landfill Containment System

12.6.1 The landfill site at Skelbrooke Quarry is operated on a containment basis. Containment is provided by a mineral liner which is placed to specified engineering standards. The liner material is derived from the Middle Permian Marl, which underlies the Upper Magnesian

Limestone. The Marl is a stiff, non-friable clay and it is considered that its extraction and subsequent placement would not give rise to appreciable dust emissions. Nevertheless, a water bowser would be used to damp down the haul roads used during the construction operations if this were necessary.

12.7 Waste Disposal

Commercial and domestic waste does not normally contain a significant dust fraction. It is considered, therefore, that these activities are unlikely to give rise to fugitive dust emissions.

12.8 Landfill Restoration

12.8.1 Restoration of the landfilled quarry to agriculture would take place following the capping of the wastes with a layer of engineered clay and then placement of soils. The Middle Permian Marl would be utilised for the capping of the site. Since it is likely that the extension of the site would be the last part of the landfill and quarry to be restored, the Marl would have to be stockpiled and then recovered from the stockpile for use in the capping exercise. Similarly, the soil resources would have to be taken from stockpiles to allow the restoration of the landfill cap to agriculture. Spreading of the soils could give rise to dust emissions and, to mitigate these potential emissions, it would be necessary to ensure that the soiling operation took place during appropriate weather conditions.

12.8.2 Similar comments apply to the removal of the screen mound which would be constructed to the north of the extension site.

13.0 METEOROLOGY

13.1 Introduction

In contrast to other atmospheric pollutants, the transport of fugitive dust is particularly dependent upon weather conditions. In particular, wind speed and direction and precipitation are key meteorological conditions affecting the potential for dust dispersion with the highest potential occurring on dry, windy days. The risk of dust deposition at a vulnerable location is determined by the frequency of those dry day winds blowing towards it from a dust generating activity and its distance from that activity.

13.2 A dry wind rose, thought to be representative of conditions at Skelbrooke Quarry, has been constructed by correlating observations of dry days with wind frequency and strength. The data relates to a ten year period from 1985 - 1994 and are derived from a wind monitoring site at Finningley Airfield. Rainfall data were obtained from a rain gauge at Barnsley Sewage Works.

13.3 The data show that dry days, defined as those with less than 0.2mm of precipitation in 24 hours, occur for 59% of the year, ie on 215 days, on average. The wind rose is representative, therefore, of the directions in which any residual dust emissions would blow on these days.

13.4 The wind rose is presented as Drawing SKD2. Each arm of the rose represents the frequency at which winds blow from 30° sectors, together with a representation of the strength of these winds. The rose shows that the predominant dry wind direction is from the western sector. It can be calculated that dry winds will blow from the proposed extension site towards Skelbrooke, which is due north of the site, for as little as 6.5% of the year. These southerly winds are characterised by being relatively gentle and are predominantly of Beaufort Scale Force 3 or less. Dry winds of Beaufort Force 4, ie a moderate breeze, only blow towards Skelbrooke for 0.5% of the time.

13.5 It is considered, therefore, that there would be limited potential for residual dust emissions, occurring after the implementation of the mitigating measures described above, to reach the village of Skelbrooke. Such residual emissions would predominantly be carried over the arable fields which extend from north east, through east, to south of the proposed extension site or, alternatively, and on rare occasions, back over the existing landfill site itself.

14.0 RECOMMENDATIONS IN RESPECT OF POTENTIAL DUST EMISSIONS

14.1 The most sensitive operations, with respect to potential dust emissions, would relate to the construction and ultimate removal of the screen bank which would be constructed to the north of the proposed extraction and landfilling area. These activities would be carried out approximately 100 metres from the nearest potential receptor and at a distance recognised as being at the lower end of a recommended stand-off between sensitive receptors and medium to high dust generating activities of a continuous nature (Reference 7). Soil movement activities should ideally take place, therefore, when the soil is not in a friable condition.

14.2 Arrangements should be made to damp down quarry and landfill haul roads, during periods of dry weather, by use of a water bowser.

14.3 Stock piles should be kept on the quarry floor to minimise potential windblow effects.

14.4 The quarry access road should be kept free of dust by sweeping when necessary and by ensuring that vehicles leaving the site pass through the wheel rinsing device.

15.0 CONCLUSIONS IN RESPECT OF DUST ASSESSMENT

15.1 The closest approach of the proposed extension site at Skelbrooke Quarry, to the outskirts of the village of Skelbrooke, lies at the lower end of the recommended stand-off between sensitive receptors and moderate to high dust generating activities, of a continuous nature, as recommended by a recent DoE research project (Reference 7).

15.2 The most significant dust generating activities are considered to be in relation to soil stripping and the construction of a screen mound at the closest approach to the village of Skelbrooke. This particular activity would be of a short duration. Thereafter, the limestone extraction and processing operations are considered to have a low potential for dust emissions. The transport of face rock to the processing plant has the potential for moderate to high dust emissions but these can be mitigated successfully by use of a water bowser to damp down the haul road between quarry face and processing plant.

15.3 It is considered that the proposed landfill construction and waste disposal activities would have limited potential to generate fugitive dust emissions. Care would have to be taken, however, when the landfill site was being restored to agriculture, to ensure that dust emissions were minimised.

15.4 Any residual fugitive dust emissions remaining following the implementation of the recommended mitigating measures are unlikely to reach Skelbrooke since prevailing meteorological conditions indicate that dry day winds only blow northwards towards Skelbrooke for 6.5% of the time and then only at low wind speeds. Prevailing dry winds blow from the south west and west quadrants.

15.4 Subject to the implementation of the recommendations described above, it is considered that the environmental impact of dust emissions from the proposed extension to the quarry and landfill at Skelbrooke Quarry would be acceptable.

REFERENCES

1. British Standards Institution, Noise Control on Open Sites, BS 5228, 1984

2. British Standards Institution, Method of Rating Industrial Noise Affecting Mixed Residential and Industrial Areas, BS 4142, 1967

3. W S Atkins Engineering Sciences Limited, The Control of Noise at Surface Mineral Workings, 1990

4. Department of the Environment, Control of Noise at Surface Mineral Workings, Mineral Planning Guidance Note 11 (MPG 11), 1993

5. Department of Transport, Calculation of Road Traffic Noise, 1988

6. Department of the Environment, Quarry Processes including Roadstone Plants and the Size Reduction of Bricks, Tiles and Concrete, PG3/8(91), 1991

7. British Standards Institution, Simplified Methods for the Measurement of Grit and Dust Emissions, BS 3405, 1971

8. Health & Safety Executive, Control on Substances Hazardous to Health Regulations, 1988

9. Health & Safety Executive, Guidance Note EH40 - Occupational Exposure Limited, 1995

10. H M Government, Environmental Protection Act 1990

11. Arup Environmental, The Environmental Effects of Dust from Surface Mineral Workings, 1995

TABLES

SKELBROOKE QUARRY AND LANDFILL

TABLE SK 1

Results of Noise Climate Monitoring Exercise Carried out on 15 April 1996

Location		Monitoring Start Time	Monitoring Duration/Mins	L_{Aeq}/dB	L_{A90}/dB	Comments
No.	Site					
1.	Doncaster Lane	09.50 10.00 15.28	10 20 15	51.4 53.4 46.7	47.8 48.7 42.4	A1 visible and dominant noise source Quarry plant now operational Quarry plant inactive. Slight change in wind direction causes reduction in road noise.
2.	Bannister Lane	09.27 15.48	20 12	52.7 49.3	43.5 45.9	Occasional cars passing and tractors in fields. A1 road noise prominent. Reduced noise levels due to change in wind direction.
3.	Priory Farm	09.00	20	52.2	46.7	*Constant noise from A1 and A638*
4.	Home Farm, Skelbrooke	16.07	15	53.9	37.6	A1 road noise dominant although mobile plant or quarry/landfill audible

SKELBROOKE QUARRY AND LANDFILL

TABLE SK 2

PLANT COMPLEMENT

ACTIVITY	PLANT COMPLEMENT	SOUND POWER LEVEL (SWL)/dB(A)
Overburden Stripping/Earth Moving	CAT 235 Backacter Articulated Dumptruck CAT D6 Dozer	109[1] 110[2] 108[1]
Quarry Operations	Hydraulic Face Shovel Dump Truck (25 tonne) Mobile Quarry Processing Plant	116[2] 114[2] 116[2]
Landfill Operations	CAT 826 Compactor CAT 235 Backacter	113[1] 109[1]

Data Sources:

[1] - Manufacturer's data
[2] - Data from BS 5228

TABLE SK3

NOISE PREDICTIONS RELATING TO OVERBURDEN STRIPPING AND EARTHMOVING PHASE

Location		Closest Activity Approach/m	Predicted Noise Level/L_{Aeq}	Current Noise Climate[1] dB(A)	
No.	Site			L_{Aeq}	L_{A90}
1.	Doncaster Lane	100	57.0	49.1	45.2
2.	Bannister Lane	340	43.6	51.0	44.3
3.	Priory Farm	860	30.4	51.9	46.7
4.	Home Farm	230	46.9	51.9	37.6

[1] - Average of noise level measurements taken with plant non operational

TABLE SK4

NOISE PREDICTIONS RELATING TO MINERAL EXTRACTION AND PROCESSING PHASE

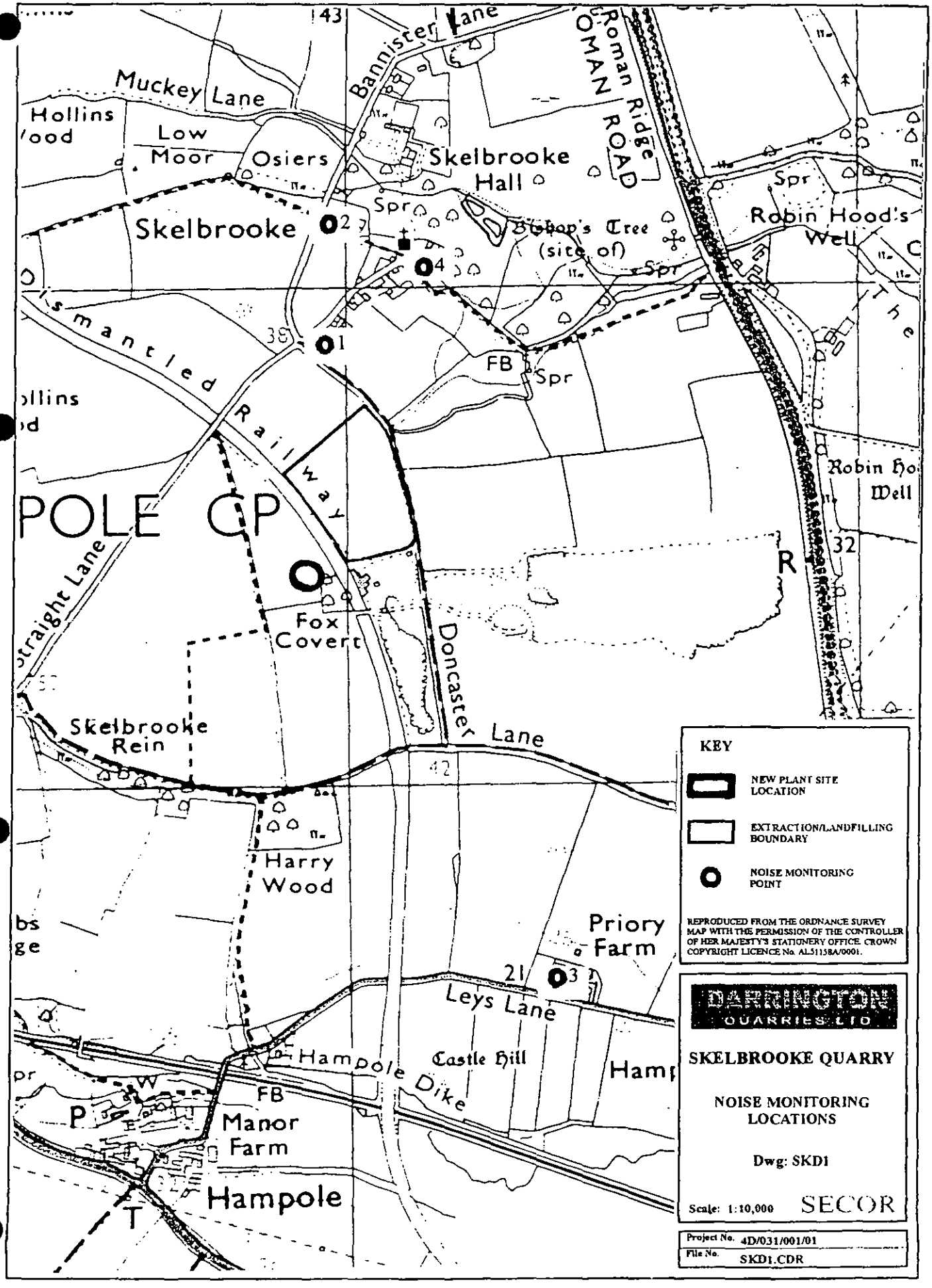
Location		Closest Activity Approach/m	Noise Predictions		
No.	Site		Face Operation Noise at Receptor/dBA	Plant Operation Noise at Receptor/dBA	Total Noise/dBA
1.	Doncaster Lane	130	52.8	47.7	54.0
2.	Bannister Lane	410	42.8	44.1	46.5
3.	Priory Farm	860	36.5	33.9	38.4
4.	Home Farm	260	46.8	45.7	49.3

TABLE SK5

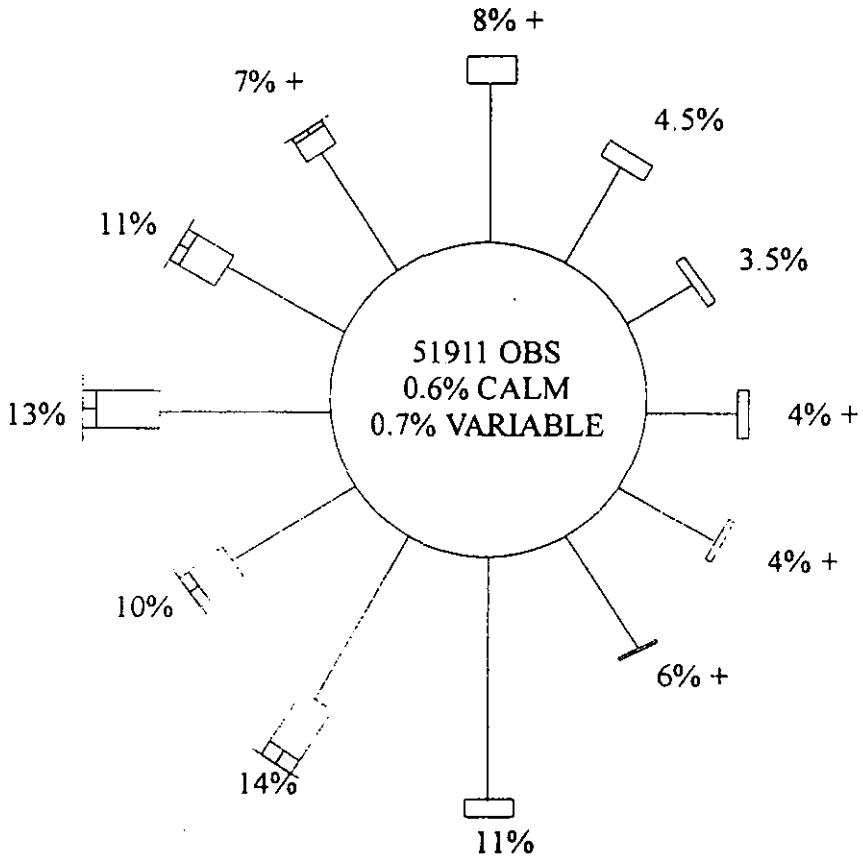
NOISE PREDICTIONS RELATING TO LANDFILLING AND RESTORATION PHASE

Location		Closest Activity Approach/ m	Total Attenuation /dB(A)	Predicted Noise Level/dB(A)	Current Noise Climate/dB(A)	
No.	Site				L_{Aeq}	L_{A90}
1.	Doncaster Lane	240 130	64.5 65.3	49.9 49.1	49.1	45.2
2.	Bannister Lane	410	70.2	44.1	51.0	44.7
3.	Priory Farm	860	78.7	35.7	51.9	46.7
4.	Home Farm	260	63.5	48.9	51.9	37.6

DRAWINGS


Muckey Lane
Hollins Wood
Low Moor
Osiers
Bannister Lane
Roman Ridge
ROMAN ROAD
Skelbrooke Hall
Skelbrooke
Spr
Bishop's Tree (site of)
Robin Hood's Well
Ismantled Railway
FB
POLE GP
Fox Covert
Doncaster Lane
Skelbrooke Rein
Harry Wood
Priory Farm
Leys Lane
Castle Hill
Hampole Dike
Manor Farm
Hampole
KEY
NEW PLANT SITE LOCATION
EXTRACTION/LANDFILLING BOUNDARY
NOISE MONITORING POINT
REPRODUCED FROM THE ORDNANCE SURVEY MAP WITH THE PERMISSION OF THE CONTROLLER OF HER MAJESTY'S STATIONERY OFFICE. CROWN COPYRIGHT LICENCE No. AL51158A/0001.
DARRINGTON QUARRIES LTD
SKELBROOKE QUARRY
NOISE MONITORING LOCATIONS
Dwg: SKD1
Scale: 1:10,000
SECOR
Project No. 4D/031/001/01
File No. SKD1.CDR

NORTH



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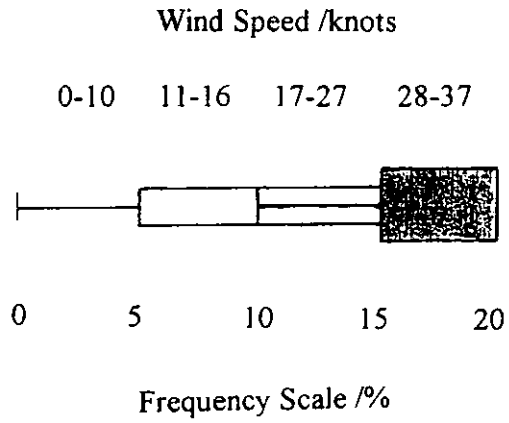


DARRINGTON QUARRIES LTD

SKELBROOKE QUARRY

DRY DAY WIND ROSE

Dwg: SKD2

SECOR

Project No.	4D/031/001/01
File No.	SKD2.CDR

APPENDIX 1

Fao I P Kellett, Esq,
Doncaster Metropolitan Borough Council,
Directorate of Environmental Services,
PO Box 257,
The Council House,
College Road,
DONCASTER,
South Yorkshire,
DN1 1RN

Your Ref: IPK/JF
Our Ref: DQL/50/DRH

25 April 1993

Dear Sir,

ENVIRONMENTAL PROTECTION ACT 1990 PART 1
AUTHORISATION (EPA 32)

As required by the above authorisation, please find enclosed an upgrading schedule detailing the works proposed in respect of the plant at Skelbrooke Quarry.

With regard to Sutton Quarry, (authorisation EPA 33), it is currently dormant and the plant has been removed to prevent theft and vandalism. No upgrading schedule is therefore necessary.

I trust that the above is satisfactory. If there are any matters you would like to discuss, do not hesitate to contact me.

Yours faithfully,
for Darrington Quarries Ltd.,

D R Harper

SKELBROOKE QUARRY:
AUTHORISATION (EPA 32)

1. Plant feeder, grizzly, crusher: no action required.
2. Grizzly discharge chute: (a) in place.
3. Grizzly product conveyor: (b) in place, (c) & (d) required.
4. Scalping screen, oversize chute and product conveyor: no action required.
5. Scalping screen, undersize chute and product conveyor: (a) in place.
6. Primary crusher product chute: (a) in place.
7. Primary crusher product conveyor: (c) in place, (d) required.
8. Intermediate conveyor: (b) in place, (c) & (d) required.
9. Grading screen feed conveyor: (b) in place (c) & (d) required.
10. Grading screen, oversize product chute and conveyor: no action required.
11. Intermediate product chute and conveyor: no action required.
12. Grading screen, undersize product chute and conveyor: (a) in place, (c) & (d) required.
13. Secondary crusher: no action required.
14. Secondary crusher product chute and conveyor: (a) & (b) in place, (c) & (d) required.
15. Sub-base conveyor: (b) in place, (c) & (d) required.

(a) DISCHARGE CHUTES ONTO CONVEYORS

The base of the discharge chute will be fitted with a rubber skirt. This will be clamped to the sides and back so as to form a seal between the chute and the moving conveyor. The front of the chute will have "rubber fingers" covering the discharge apperture, but allowing the free flow of material.

(b) CONVEYOR FEED BOOTS

Mild steel feed boots will be attached to the conveyor stringers on two sides and back, independent of the discharge chute. A seal will be formed between three sides of the boot and the moving conveyor belt using strips of rubber clamped to the steel structure. Rubber skirts running along the length of the conveyor will be nominally 80mm less than the conveyor width and the feed boot will project nominally 1.0m forward of the discharge chute.

(c) CONVEYOR WIND BOARDS

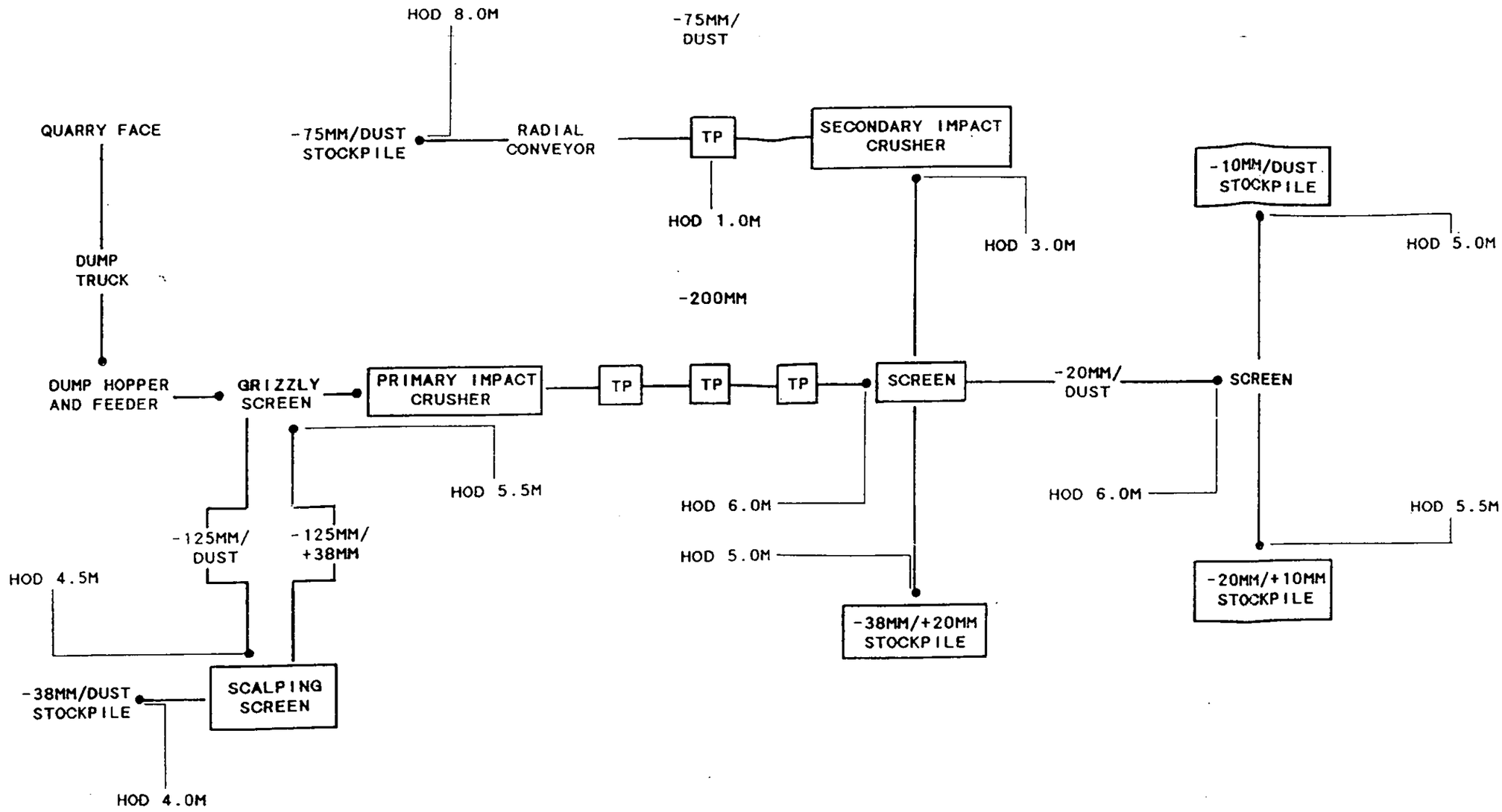
150mm high mild steel wind boards will be installed nominally 25mm above and 50mm inset along both sides of the conveyor belt. They will run the full length of the conveyor from the feed boot to the discharge point and if required they will be supplemented with rubber skirts which will form a seal between the board and the belt.

(d) CONVEYOR DISCHARGE POINTS

A sheet steel box will be constructed to form a conveyor head guard in accordance with Statutory Instrument 1992 No.3073, The Supply Of Machinery (Safety) Regulations 1992. Where the conveyor belt enters the head guard unit, it will pass through "rubber fingers". Where the head guard forms the discharge point of the conveyor, a rubber sock will be constructed.

Where the conveyor discharges onto another conveyor, the sock will be long enough to make contact with that conveyor, the front of the sock being fingered vertically.

Where the conveyor discharges onto a stockpile, the sock will be nominally 1.0m long.



DARRINGTON QUARRIES LTD.

Darrington Leys,
Cridling Stubbs,
Knottingley,
Yorkshire, WF11 0AH

PROJECT: SKELBROOKE APPLICATION

DRAWING TITLE: TYPICAL PLANT CONFIGURATION

DRAWING NUMBER: DQL/06/69

REVISION:

SCALE:

DRAWN BY:

DATE: DECEMBER 1995

KEY: