Cromwell Wood Estate Company Limited
Butterfield House
59 Oakenshaw Lane
Walton
Wakefield
WF2 6NJ

BANKSWOOD QUARRY

Dust Report & Action Plan for Mineral Working and Backfilling

Nov 2007

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Plans :

Bankswood Quarry Extension B/02/1875/PR

DUST ASSESSMENT & ACTION PLAN

1 Introduction

This report is provided to fulfil Condition 3 of Planning Permission B/02/1875/PR granted by Barnsley MBC on 10 November 2006 to extend the mineral workings to the west of the operator's existing Bankswood Quarry in its ownership. The land currently has conditional permission for the extraction of blue shale, fireclay and incidental coal and will be restored with discarded material from the nearby Naylor Pipeworks factory at Clough Green. The quarry has been worked for clay, shale and coal progressively for a number of years.

The extraction of mineral by surface methods and the deposit of waste have the potential to cause dust arisings as the mineral is subjected to breaking, crushing and loading and the backfill waste is deposited and pushed out in layers. The quarry is relatively dry and any excess water flows through settling lagoons and then into the Banks Bottom Dike to the north of the quarry.

The minerals are taken to the Clough Green factory across an internal haul road which has a single crossing point on the public highway, South Lane. The hauling of the minerals and returning waste over the quarry haul road also has the potential for dust as the material on the haul road is crushed into a medium to coarse powder.

The clay mineral usually has a moisture content of about 13% and will have the potential to break down into finer particles of dust if it is dry and traffic runs on the clay in dry periods of weather.

2 Concerns about Dust

Dust forms an inherent part of the environment, being dispersed from a variety of natural and anthropogenic sources by wind and water. Therefore, the meteorological conditions in any locality are of paramount importance when considering the potential for dust dispersal - the most significant cause of dust emission from surface operations being wind blow.

Fugitive dust emissions from surface operations, of the same type as the operations that will occur at Bankswood Quarry, are generally a localised phenomenon and comprise of dust particles in the size range of 0.1 µm to 100 µm, typically averaging 70 µm, and they are produced through the action of crushing and abrasive forces on materials. These larger dust fractions consequently have relatively large settling velocities, resulting in them being deposited over relatively short distances.

3 Public Perception

The public's perception of the nuisance caused by the generation of dust is variable, making the analysis of dust complaints extremely difficult. It is considered that, amongst other things, perception is influenced by:

- The effects on people, the nuisance they experience and complaints they register is affected by many socio-economic factors and their tolerance
- Some individuals may be sensitive to the presence of the operations and simply complain because it is there rather than there being a real nuisance.

The main potential effect of dust in relation to this site is considered to be visual – the coating and soiling of surfaces leading to annoyance.

4 Current Regulations

As previously stated, the amount of dust that might cause a potential nuisance is extremely difficult to determine. Similarly, numerous attempts have been made at identifying a nuisance standard for dust, without success. A number of non-statutory standards are used as a guide for the assessment of nuisance, including the concept of dinginess developed by Carey (1959), Shillito (1978), and Beaman and Kingsbury (1984).

Currently, there are no statutory or recommended levels of dust deposition that may constitute an official nuisance. It is normally left to the local Environment Health Officer, under Part III Section 791(d) of the Environmental Protection Act, to determine if, in his opinion, a statutory nuisance exists.

Planning permissions incorporate a number of conditions for the minimisation of dust emissions, and these were generally based on the principle of the Best Practical Environment Option appropriate to the site under consideration.

5 Description of the Site

The site lies on the southern flank of a small valley containing the Banks Bottom Dike to the southwest of Cawthorne and west of Silkstone.

The proposed operations on site are mineral extraction but in the future the work will also be related to the engineering works for waste tipping and the deposit of waste from the nearby pipeworks. The site is presently a mature wood in a rural location which it is mainly upland pasture with farms and residential properties dotted around the area. A wide belt of mature trees would remain around the perimeter of the site with new woodland planting to take place to the east of the site.

The proposals are to extend the mineral working to the west of the existing site in order to maintain the supply of raw material for the operator's nearby Clough Green pipe-making factory.

6 Assessment of Potential Dust Generating Activities

The amount of dust generated and emitted from a surface operation and its impact varies with respect to:

(a) The type of working
(b) The character and composition of the surrounding area
(c) Climate and topography
(d) The excavation of mineral for capping and engineering
(e) The crushing of waste to aggregate for drainage
(f) The tipping of mineral waste
(g) The hauling of mineral from the site prior to waste deposition
(h) The haulage of waste material from the reception area by dump trucks
(i) The tipping of the waste material in the quarry void
(j) The spreading of the waste by small dozers/front end loaders

The operations at Bankswood have been examined for the particular site and they are as follows;

i) The excavation and movement of overlying soil to expose the mineral

ii) Excavating and loading of mineral into tipper trucks by a front-end loader and transporting the mineral to the processing works

iii) The tipping of waste and the levelling out with a bulldozer or similar piece of plant.

iv) Subsequent replacement of soil for restoring the land

The above activities will operate through the life of the site and will have a potential to cause dust emissions.

The excavation of the mineral and haulage to the processing works are not thought to have a high potential to cause dust nuisance to others. The site is on a north-facing slope and therefore is relatively sheltered from prevailing wind from the south west. The perimeter of the quarry is well screened by mature woodland which will be retained. The haul road runs through agricultural land and only crosses the public highway in one location and the vehicles travel fairly slowly along the haul road, which will be regularly maintained and watered if necessary.

The potential for dust generation is a function of the speed of vehicles, the degradability of the surface and the wind speed, which in this case is thought to be minimal. The potential for dust generation from the loading of mineral into tipper trucks and the transporting of mineral to the works will be minimised by incorporating best practice into the operations.

As the mineral excavation progresses, the operational area will be on a lower level than the land. The process is then offered some protection from the elements by being shielded in the quarry void. Any dust generated will generally travel in the direction of the wind horizontally and will coat the quarry face rather than travel outside the site.

Any unwanted intervening material will be loaded at the working horizon and the excavator will gather the material and load it into a dumper where it will be taken to the backfilling area. The operation will seek not to crush the material to powder but load it

as integral lumps of material. The mineral and all material will be handled on site efficiently to minimise the amount of degradation of the mineral and other clay like materials.

The main causes of dust are the degradation of the internal running road at the base of the void and along the haul road. These areas will be regularly sprayed in periods of dry weather and cleaned up and graded on a regular basis. Particular attention will be given to the crossing point on South Lane to ensure that potential for dust generation on the highway is not created. If necessary, a vehicle will be deployed to spray and sweep the road.

Backfilling the void with pipework waste could have the potential to create dust but it is only in periods of dry weather that the deposited materials can turn to dust as they are crushed by traffic. In this event, the backfill can be wetted and the wastes capped with moist clays and shale.

All of the above activities continue to have the potential for dust generation. The potential for dust to be generated by the operations (ii) and (iii) above is a function of the degradability of the quarry surface and the haul road materials and dryness, wind speed and the speed of the vehicles using the haul road.

The potential for dust generation from operations (i) and (iv) above is a function of the nature of the soil material, operating plant and wind speed.

The excavation of mineral will be by a 360 degree hydraulic excavator and has the potential to create dust. However, the potential for dust generation will be low as the material is loaded straight from the face into a vehicle to take it to the processing works or for capping and engineering. The shale and clay will be wetted in periods of dry weather to mitigate dust emissions.

The tipping of inert waste will be in the exhausted workings or in the backfilled areas so that the potential to generate dust will be low. The imported waste will be dumped in piles and pushed out by a slow moving dozer or a front-end loader to layer the waste and provide compaction. The coarser waste fraction will be tipped at the base of the site and finer material will be tipped to cover the coarse waste. The area will be levelled up and covered with some clay material to seal the imported waste material.

The spreading of the material, either by dozer or front end loader, involves the slow movement of these items of plant and therefore vehicle speed is not a significant factor when considering the potential for a dust nuisance being caused.

7 Site Sensitivity

The three main factors which potentially affect the sensitivity of the site with regard to dust are:

- The distance of inhabited areas from site activities
- The location of the inhabited areas relative to the prevailing winds
- The density of habitation

The most critical element in the consideration of the potential for a dust nuisance to be caused is the direction of the prevailing winds. The general prevailing wind in the UK is

south westerly wind (blowing from the southwest to the northeast). To determine the sensitivity of the surrounding area, the location of residential areas to the site activities has to be examined.

The location plan in the planning permission referred to shows the location of the site at Bankswood quarry in relation to the nearby occupied properties which are described in table 1 below.

Table 1: Relationship with nearby properties

Property	Type	Distance (m)	Direction
"Roger Royd"	Dwelling	150	South east
Bull Haw Farm	Farm, 3 dwellings	300	East
Small Lanes Farm	Farm,1 dwelling	250	North west
Water Slack	Dwelling	500	North west
Haddon Farmhouse	Dwelling	500	North

The attached plan BW/Dust/1 indicates the relationship of the centre of the site's activities with the two zones of influence, generally recognised as being those affected by dust blow from mineral activity. This plan indicates that there are no properties to the north east of the site which is the most sensitive direction for wind borne dust. The closest property is "Roger Royd" lying 150m to the south east of the site which could be potentially affected by dust blow in periods when the prevailing wind is from the north or north east. These infrequent winds are usually dry winds from the Arctic circle and could cause dust to be lifted in periods of dry weather. The properties to the east at Bull Haw Farm lie within the potentially slightly sensitive zone of 250-300m. Small Lanes Farm also lies within the slightly sensitive zone 250m to the north west. There are two further properties which are 500m distant and outside any sensitive zones. The nearest villages lie considerable distance from the site.

Wind speed and direction information in the attached appendix has been obtained for the Bingley weather station.

The potential for dust generation from the activities on the site is generally considered to be when there have been three or more days when the rainfall has been less than 0.1 mm. Properties to the north and east of the site have the greatest sensitivity to the operations as they are in the path of the prevailing winds. As the operations will be within a fairly low key minerals and waste site, it is considered that the operator can manage the mineral extraction and backfilling operations in a manner that ensures the potential for a dust nuisance to be caused is minimal.

8 Control and Management

The operator shall appoint a responsible person for dealing with environmental issues on the site. That person will keep a daily log of the weather conditions, including the direction of the prevailing wind with a brief description of its type, i.e. gentle, breeze, moderate, strong or gale force. This log will include any complaints received, with a record of any investigations carried out and changes to the working practices on that day. The log will be available for inspection on the site.

The following shall be implemented:

- All unsurfaced roads to be dampened when necessary
- The crossing point on South Lane will be dampened and swept if necessary
- Vehicles used for the movement of materials on the site, where appropriate, shall be fitted with exhausts pointing away from the ground
- A speed restriction shall be imposed on the site and haul road of 15mph.

In the event that the wind is blowing towards any sensitive properties, the responsible person, identified above, shall satisfy himself that the control measures are adequate. If the control measures are insufficient to prevent dust blow from the operations to the sensitive locations, the operations shall cease until the weather conditions improve.

9 Conclusions and Recommendations

The area surrounding the site generally comprises of a relatively isolated residential and farm dwellings in the four cardinal directions around the site at a distance of between 150-500m. The nearest larger settlements are Cawthorne (2.5km to the north east) and Silkstone (1.7km east) which are too distant to be affected by dust blow.

The quarrying and filling operations at the site are dependent on the requirements of the works. It is therefore considered that, with the adoption of a Best Practical Environmental Option and the cessation of the quarrying and filling operations during adverse weather conditions, the potential contribution to the current level of dust in the atmosphere, as a result of the filling operations is minimal.

It is recommended that any water make in the quarry is stored and used in periods of dry weather to suppress any potential for dust as discussed earlier in the report. The water is to be collected in a lagoon system at the northeast part of the quarry and can be used for dust suppression. If dust does become a problem then dust monitoring can take place using a number of methods one of which is a sticky pad on a pole which will be fixed permanently in the ground on the perimeter of the site.

Restoration of the existing quarry will also reduce the potential for dust generation as the vegetation will cover the soils and prevent dust emissions to air. Additional tree planting on land to the east will further reduce dust emissions.

The house nearest to the quarry is situated to the south which reduces the potential to be affected by dust. The houses at Bull Hall Farm are to the east but all the nearest receptors are uphill and separated from the quarry by farmland and woodland. It is unlikely that the houses will be affected by dust blow from the medium to coarse particles on the quarry as the houses are more than 100 metres away. There is a large area of open country and woodland before any village settlements are reached. There has been no record of any dust complaints by the public connected with Bankswood Quarry as far as the operator is aware of.

Signed

Cromwell Wood Estate Company Limited
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S. & D. Garritt Ltd.

Noise & Vibration
Design & Consultancy

Vicarage Cottage, High Street, Wadworth, Doncaster DN11 9BG. Telephone & Fax: 01302 854303

REPORT

of

NOISE IMPACT ASSESSMENT

at

PROPOSED MINERAL EXTRACTION & WASTE DISPOSAL, BANKSWOOD SITE, CAWTHORNE, BARNSLEY, SOUTH YORKS S75 4AD.

Date of report: 31st March 2006

Prepared for: Naylor Industries PLC

Consultants: Fennel, Green & Bates,
25 Smyth Street,
Wakefield,
West Yorks WF1 1ED.

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1.0 Summary and Conclusions

A planning application is being submitted for mineral extraction and waste disposal at Bankswood Site, Cawthorne, Barnsley. The operations will involve the conventional use of mobile earthmoving plant for clay extraction and waste handling, plus road going lorries for the transport of materials in and out of the site. There are existing dwellings located near the boundaries of the site and for this reason the LPA has called for an assessment of noise from the proposal.

The objective of this report is to predict the sound levels from the site operations making use of results taken at similar plant items to those proposed for use at Hill Side Quarry.

1.1 It is predicted that the sound levels at the nearest dwellings caused by the proposed activities at the quarry will be: (dBA L_{eq} 1-hour):

Roger Royd	43 dBA
Bull How Carrs	37 dBA
Cooper Lane	37 dBA
Small Lanes Farm	36 dBA
Banks Hall	30 dBA

1.2 Background sound levels have been measured at these receptors during weekdays and on a Saturday morning, being the periods when activities are proposed at the quarry. The predicted sound levels are below the background levels at all times and locations except at Roger Royd.

1.3 At Roger Royd the quarry sound is predicted 2-6 dBA above the background generally. On one occasion when a low background level was measured at 34 LA_{90}, in the complete absence of wind, the site sound would be predicted at 9 dBA above the background.

1.4 The sound sources causing the exceedance above the background at Roger Royd are an excavator or a dozer used to extract and load clay. An overall sound power level of 113 dBA has been assumed for this plant. If plant with a lower sound power level is used then the predictions at dwellings will be reduced correspondingly.

1.5 The predicted sound levels are generally well below the nominal limit of 55 dBA L_{eq} (1-hour) set by MPG11. However this nominal limit may be considered inappropriate because of the low background levels at all receptors.

2.0 Noise Assessment Criteria

This report adopt the guidance of the following documents.

2.1 PPG 24: 'Planning and Noise'

Guidance to local authorities on the considerations of noise affecting dwellings was issued in 1994 as Planning Policy Guidance 24: 'Planning and Noise'. Annex 3 deals with noise from specific types of source as affecting dwellings:

- Paragraph 19 of Annex 3 covers noise from industrial developments and calls for a complaints assessment to BS 4142.
- Paragraph 19 specifically mentions noise from surface mineral workings and suggests using the guidance of MPG 11.

2.2 BS 4142: 1997

BS 4142 provides a method by which complaints or their potential can be assessed at dwellings. The method is to measure outdoor sound levels at dwellings during emission of the site noise, measure the background level at the same location in the absence of the noise, and apply a correction factor to the measured levels for some specific factors which affect its acceptability (eg. hiss, whine, bangs, thumps, etc.). The corrected measured level is then compared with the background. From the comparison of levels it is concluded that:

- complaints are likely if the rating level exceeds the background by about 10 dBA or more,
- a difference about 5 dBA is described as 'of marginal significance',
- at differences below 5 dBA the lower the value the less likelihood there is of complaint.

At the time of submission of this report BS 4142 is currently under review. Its replacement has not been finalised to the extent where it can be used as an alternative in this application. Some authorities are regarding BS 4142 as being suspended whereas in our experience others are not. For this reason and since it remains the reference given in PPG24, an assessment is given by the method of BS 4142.

2.3 MPG 11

Minerals Planning Guidance 11 is aimed specifically at noise from surface workings of minerals and landfill. It describes limits on the sound levels reaching dwellings from these long term activities. MPG 11 uses the noise prediction method of BS 5228 to which it adds some further considerations applicable to large outdoor sites - sound attenuation of large expanses of soft ground, sound reflections off quarry faces and climatic effects on sound transmission over large distances.

The general guidance of MPG11 is that "the daytime nominal limit at noise-sensitive properties used at dwellings should normally be 55 dB LA_{eq} 1-hour". Daytime is defined as 07.00 to 19.00 hours.

MPG11 then provides a rider to this general guidance by stating that a lower daytime limit might be appropriate in quieter rural areas if a limit set at 55 dB LA_{eq} would exceed the existing background levels by more than 10 dBA. By this statement MPG11 accepts that the assessment method of BS 4142 must override the general recommendation of a 55 dBA limit.

MPG11 recognises that it is often necessary to raise noise limits to allow temporary but exceptionally noisy phases in a development. Examples include baffle mound construction, soil stripping, removal of spoil heaps and construction of new permanent landforms. A limit of 70 dB LA_{eq} is suggested for periods of up to 8 weeks per year.

2.4 BS 5228: Part 1: 1997

BS 5228: Part 1: 1997 provides a comprehensive method of predicting the noise emission from the plant and machinery used on open sites. It provides typical base data for over 300 items of plant in common usage and a full method of translating their sound energy over outdoor distances to dwellings.

3.0 Background Sound Levels

Background sound levels have been measured at dwellings at the following five positions representing different directions from the quarry boundary, as shown on the attached plan.

1. Roger Royd (south)
2. Bull How Carrs (southeast)
3. Cooper Lane (southwest)
4. Small Lanes Farm (northwest)
5. Banks Hall (northeast).

Background measurements were taken during the morning of Tuesday 7th February 2006 from 10.00 to 12.00, afternoon of Thursday 9th February from 14.00 to 16.00 and on Saturday 4th February from 8.00 am to 9.30 am. This gives a representative sample of background sound levels at times when the site operations are proposed. A Bruel & Kjaer precision sound level meter type 2260 was used on all occasions.

The dominant background sound source at all receptors during all of the survey periods was distant road traffic and birdsong.

Position & Time	Ambient LA_{eq}	Background LA_{90}
1. Roger Royd		
Morning	38.9	37.4
Afternoon	37.1	34.4
Saturday	45.4	41.0
2. Bull How Carrs		
Morning	40.0	38.6
Afternoon	38.6	37.4
Saturday	44.3	40.2
3. Cooper Lane		
Morning	49.6	45.8
Afternoon	43.9	37.4
Saturday	46.6	38.8
4. Small Lanes Farm		
Morning	48.5	42.8
Afternoon	42.2	35.4
Saturday	43.3	34.6
5. Banks Hall		
Morning	43.0	39.8
Afternoon	41.1	38.6
Saturday	39.1	36.8

4.0 Proposed Site Operations

Operations at the site will consist of:

(a) clay extraction over a 10-week period from April to September using conventional diesel-powered mobile plant (excavator or dozer),

(b) waste disposal at all times throughout the year using the same mobile plant item and road-going lorries.

The period of noise assessment during the daytime is one hour. In order to assess the worst-case situation it is assumed that during the one-hour assessment period the excavator or dozer will be operating with 100% utilisation and that there will be two lorry movements in and out of the site.

5.0 Plant Sound Levels

Excavator or Dozer

There are no firm proposals at this stage on the excavator or dozer. Sound power data is given in BS 5288 for both types of machine and this typical data is used in the calculations.

Lorries

The sound power level of a 35 tonne lorry is given in BS 5228 as being 105 dBA, and 10-tonne / 6m^3 lorries are shown from 98-112 dBA. The calculation of lorry noise when passing along a site access road, as received at a distant receptor, is given by the 'haul road formula' of BS 5228 and is shown in the Appendix to this report.

The sound sources and power levels are summarised below:

Machine	Power Rating	Number Used	Sound Power Level
Excavator	46-298 kW	1	108-113 dBA
(or Dozer	200-240 kW	1	109-117 dBA)
Lorries	10t / 6m^3	2 per hour	98-112 dBA

6.0 Predicted Sound Levels at Dwellings

6.1 Source Location

The existing clay extraction workings are below ground level such that sound sources in the quarry are shielded from dwellings by the quarry rim. Clay extraction in the new cells will initially be at ground level and as it proceeds the sound sources will be progressively below the rim. It is assumed in these calculations that the first operation in each new cell will be to strip the existing top and subsoils to create bunds around the new cell. The sound predictions at the nearest dwellings show this to be necessary.

For the purpose of sound estimation it is assumed that the haul road is completely exposed at all times.

6.2 Barrier and Ground Absorption Attenuation

The sound attenuation achieved by an outdoor barrier depends on the 'path difference' between the actual sound path from the source to the receptor up and over the barrier, and that of the straight line path if it had existed as a direct open view between the two points.

The screening of a noise source by a barrier such as an earth bund depends on the simple geometry of the source location, the receptor location and the barrier position and height. Research work by Maekawa quantified the sound reduction achieved by outdoor barriers and forms the recognised basis of such predictions. For the convenience of usage and of illustration, Maekawa's formulae and method have been summarised by other technical authors into graphical methods, which are easier to use. The graphical method shown in *Woods Practical Guide to Noise Control* is used in this report to predict the sound reduction achieved by earth bunds along the boundaries of the new cells and of the quarry rim.

Sound attenuation is provided by 'soft' ground surfaces, eg. arable land, grassland, heath, etc. The attenuation depends on distance, on the average height of the sound path above the ground and on the type of vegetation. Quantitative guidance is adopted from the Department of Transport document 'Calculation of Road Traffic Noise' (CRTN) which provides ground absorption figures based on results where the ground cover provides minimum absorption. Some areas of this site will have long rough grass, bushes, trees and generally more

absorptive vegetation than is allowed for in the CRTN data. This gives the worst-case sound predictions at dwellings and provides a conservative tolerance margin. Ground absorption applies only where there is no screening attenuation from the bund or quarry rim.

6.3 Distances from Dwellings

The distances from the dwellings to the nominal source position within the cells to be worked, and to the centre of the haul road are:

Dwelling	Quarry	Haul Road
1. Roger Royd	150m	350m
2. Bull How Carrs	350m	400m
3. Cooper Lane	350m	700m
4. Small Lanes Farm	400m	400m
5. Banks Hall	750m	700m

6.4 Sound Predictions

The sound power levels of the mobile plant items as listed in section 5.0 have been translated over the appropriate distances to dwellings by the method of BS 5228. The attenuation caused by ground absorption has been applied to all activities which are assumed at this stage in the calculations to be at surface level. No sound attenuation from screening has been assumed.

The calculations are given in the Appendix and the resulting sound predictions are:

Dwelling	Excavator/ Dozer	Lorries on Haul Road	All Site Sources
1. Roger Royd	43 dBA	18 dBA	**43 dBA**
2. Bull How Carrs	37 dBA	19 dBA	**37 dBA**
3. Cooper Lane	37 dBA	16 dBA	**37 dBA**
4. Small Lanes Farm	36 dBA	21 dBA	**36 dBA**
5. Banks Hall	30 dBA	17 dBA	**30 dBA**

7.0 Impact Assessment

7.1 Rating to BS 4142

Acoustic Feature
The sound will be generated by a diesel-powered plant item. It will not contain any impulses, tones or other characteristics which atract a correction factor for 'acoustic feature'. The rating levels thereby equal the overal sound levels shown in 6.4.

Comparison of the rating levels with the measured background levels at each receptor position shows:

Dwelling	Rating Level dB	Background Level LA_{90}	Comparison v. Background
1. Roger Royd			
Morning	43	37	6 dB above
Afternoon	43	34	9 dB above
Saturday	43	41	2 dB above
2. Bull How Carrs			
Morning	37	39	2 dB below
Afternoon	37	37	equal
Saturday	37	40	3 dB below
3. Cooper Lane			
Morning	37	46	9 dB below
Afternoon	37	37	equal
Saturday	37	39	2 dB below
4. Small Lanes Farm			
Morning	36	43	7 dB below
Afternoon	36	35	1 dB above
Saturday	36	35	1 dB above
5. Banks Hall			
Morning	30	40	10 dB below
Afternoon	30	39	9 dB below
Saturday	30	37	7 dB below

The comparison between the predicted sound levels from the quarry and the existing background levels shows:

- The predicted levels from all site operations are predicted generally below the background levels at all times and locations except at Roger Royd.

- At Roger Royd the sound from the site is predicted generally 2 dB to 6 dB above the background.

- During our survey there was one particular period when the background levels were lower at all receptors than on the other occasions. There was noted to be absolutely no wind on that occasion. The predicted sound level from the site would be 9 dB above the 34 LA_{90} background at Roger Royd on that occasion, which was believed to be untypical.

- If BS 4142 is used as a rating method then the site sound levels are predicted 'of marginal significance' at Roger Royd only. Complaints are unlikely from any other location.

- Examination of the sound levels from the various sources at the quarry (quantified in the Appendix) shows that the exceedances above the background at Roger Royd are predicted from the mobile plant used to extract and load clay, not from lorry movements. The sound level of the mobile plant items used in these predictions are taken from typical data give in BS 5288 and in this respect the actual sound levels on site can be varied by choice of equipment. Lower sound levels than those of this report are predicted if the mobile plant items used to extract and load clay have an overall sound power level less than 113 dBA.

7.2 Noise Limit of MPG11

The nominal limit of MPG11 is 55 dB LA_{eq} 1-hour at dwellings, provided this would not exceed the existing background levels by more than 10 dBA. In this application a 55 dBA limit would exceed the background by 10 dBA or more at all receptors.

It is predicted that the sound levels from the site will be well within the nominal limit recommended by MPG11 at all times and at all locations. However the MPG11 limit may be considered inappropriate because of the low existing background levels at all receptors.

APPENDIX TO REPORT

SOUND LEVEL CALCULATIONS

A. Screening Effect of Bunds

For the purpose of calculation the earth bunds at the boundaries of the cells are taken as being of height 3m and a nominal depth of the sound source below the rim of the quarry is taken at 3m. The geometry of the source / barrier / dwelling positions for the dwellings which will be protected by the bund will be:

Dwelling Positions	Angle Turned By Sound	Effective Barrier Height
1. Roger Royd	15°	5.5m
2, 3 & 4 (350-400m)	12°	6m
5. Banks Hall	11°	6m

The *Woods* method needs a comparison to be made between the effective barrier height (h_e) and the wavelength of sound emitted by the source, in each musical octave across the audible range. The table below shows this relationship for the geometry of this application.

Frequency (Hz)	63	125	250	500	1k	2k	4k	8k
1. Roger Royd:								
he / wavelength	1.0	2.0	3.9	7.9	15.7	31.4	63	126
Other receptors:								
he / wavelength	0.92	1.8	3.7	7.3	14.6	29	59	117

From the values of 'h_e / wavelength' in the above table and the values of 'angle turned by sound' the sound reductions achieved by the barrier can be read off the graph from *Woods*. These are:

Frequency (Hz)	63	125	250	500	1k	2k	4k	8k
1. Roger Royd:								
Sound attenuation dB	11	13	15	18	20	22	22	22
Other receptors:								
Sound attenuation dB	10	12	14	17	19	21	22	22

The sound power levels of the mobile plant items are given in BS 5288 but there is no sound frequency data. Our own measurements on diesel-powered mobile plant at other premises has included sound frequency analyses. From these results the sound frequency spectrum corresponding to an overall sound power level of 113 dBA is estimated at:

Sound power level, dBA

Frequency (Hz)	63	125	250	500	1k	2k	4k	8k
Mobile plant at 113 dBA	96	99	102	109	106	102	101	98

After attenuation by the bund the above values become:

Sound power level, dBA

Frequency (Hz)	63	125	250	500	1k	2k	4k	8k
1. Roger Royd:								
SWL of mobile plant	85	86	87	91	86	80	79	76
Other receptors:								
SWL of mobile plant	86	87	88	92	87	81	79	76

The overall sound power levels represented by the above spectra are 95 and 96 dBA indicating that the bunds are predicted to reduce the mobile plant sound levels by:

a screening reduction of 18 dBA towards Roger Royd, and
a screening reduction of 17 dBA towards all other receptors.

B. Excavator / Dozer

The sound pressure level (SPL) at dwellings is predicted from the sound power level of the source (SWL) by the equation given in BS 5288:

SPL = SWL - 20 log (distance) - 8 dBA

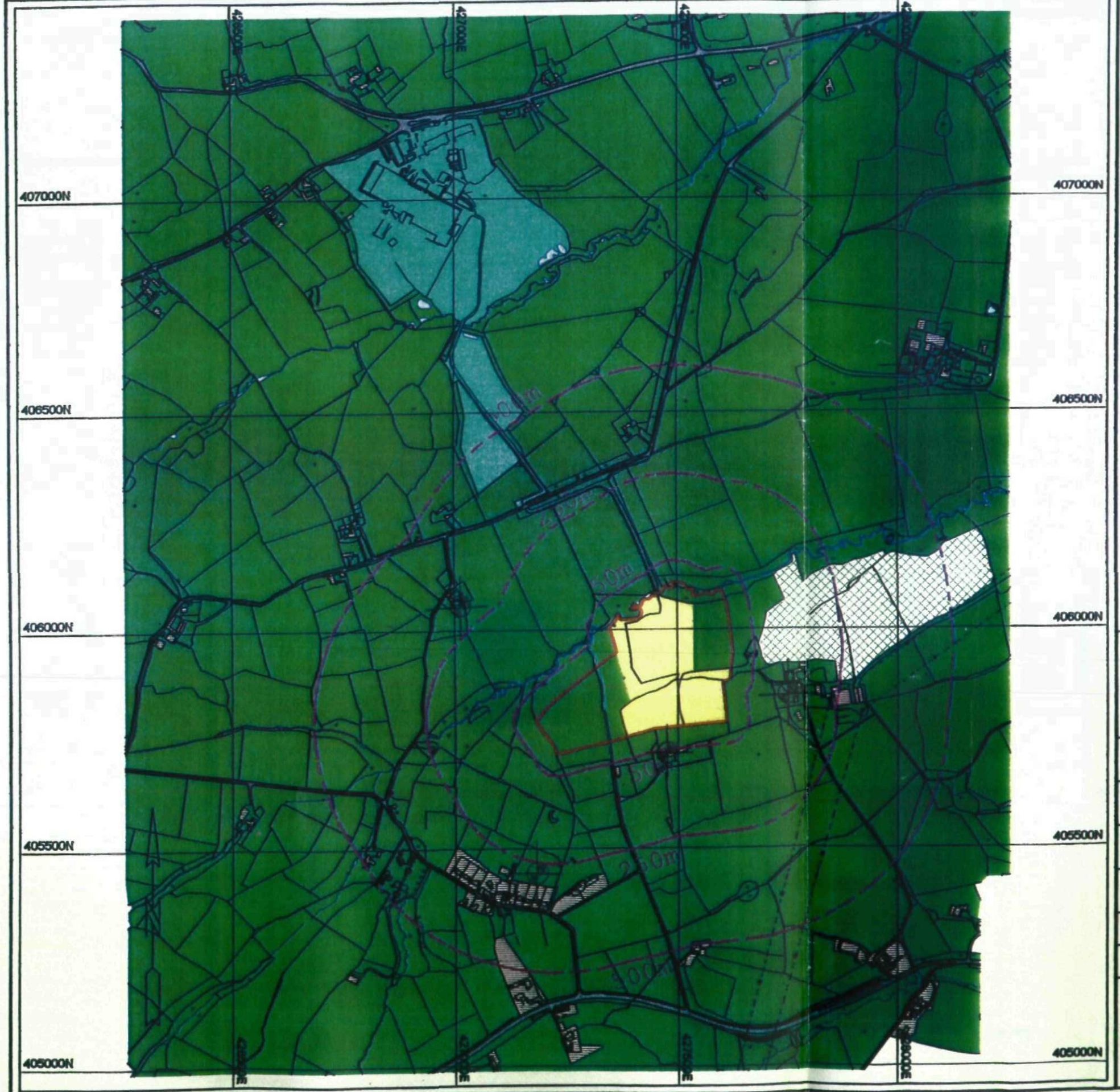
The proposed utilisation of plant during a typical one-hour period of assessment is 100% for an excavator or a dozer. The SWL of the plant items have average values of 110.5 dBA (excavator) and 113 dBA (dozer). The higher value of 113 dBA for the dozer is used in the calculations

= 104 - 33 + 6 - 13.8 - 10 log d + 10 log (angle/180)
less ground attenuation

= 63 - 10 log d + 10 log (angle/180) - (ground attenuation)

expressed as dBA L_{eq} (1-hour).

Dwelling	10 log d	10 log angle/180	Ground Atten.	SPL at Dwelling
Roger Royd	25.4	- 9.5	10	**18**
Bull How Carrs	26.0	- 7.8	10	**19**
Cooper Lane	28.5	- 8.6	10	**16**
Small Lanes Farm	26.0	- 6.0	10	**21**
Banks Hall	28.5	- 7.8	10	**17**



Legend:

- Installation Boundary
- Zones from Installation Boundary
- Residential Areas
- Schools
- Recreational Areas
- Waterways
- Water Bodies
- Agricultural Areas
- Roads/Railways
- Quarry Area
- Industrial Land
- Filled Cell

Notes:

1. Based upon the Ordnance Survey Landline map with the permission of The Controller of Her Majesty's Stationery Office. Crown Copyright Licence No. SR100026694.
2. All levels are in metres above Ordnance Survey datum.

SOUND MEASUREMENT POSITIONS

Client Name: **Naylor Industries PLC**

Site Name: **Bankswood Tip**

Project Title: **PPC Application**

Plan Title	Environment Agency Ref No
Environmental Site Setting	**60559**

Drawn by	Checked by	Site centre OS Grid Coordinates	
SW	JC	427000 E	406000 N
Drawing No	Date	Scale	Revision
NLBWPPC-DBS02	April 2006	1:10000	

Naylor Industries
Bankswood Tip
Cawthorne
Barnsley
South Yorkshire
S75 4AD
Tel - 01226 790591
Fax - 01226 790531

Agent's Address:
FENNELL GREEN & BATES
25 Smyth Street
Wakefield
West Yorkshire
WF1 1ED
Tel - 01924 372107
Fax - 01924 366550