CONTENTS

6.0 LIKELY IMPACT ON THE ENVIRONMENT

Key points

- Any short to medium term impacts on flora and fauna by the No. 1 Open Cut Extension can be minimised by mitigatory measures;
- Soil resources will be collected after stripping for topdressing and reuse in rehabilitation;
- Once mining is complete the land will be rehabilitated to sustain previous cattle grazing activities and the re-instatement of vegetation and habitat;
- The relevant blasting criteria for overpressure and ground vibration are predicted to be achieved at all residential receivers under "worst case" conditions;
- Noise goals are predicted to be met at most residential receiver locations, even under adverse meteorological conditions;
- Some infrequent minor exceedances of noise goals by 1 or 2 dB(A) are predicted under specific adverse conditions;
- Traffic impacts from the No. 1 Open Cut Extension will be unchanged from those currently experienced;
- A small number of catchments will be modified with negligible impacts on the environment;
- The proposed No. 1 Open Cut Extension will have negligible impact on water levels and aquifers;
- No properties would be expected to experience concentrations of either PM_{10} or TSP, or dust deposition levels that are above the appropriate goal or standard;
- The proposed mining area contains four known Aboriginal occupation sites and two scarred trees;
- MCC anticipates spending an average $10 million per year in wages, $36.5 million per year on materials and services, contributing $4.8 million per year to port and rail facilities and paying $2.5 million per year in royalties to the NSW Government.
- There will be no adverse impact upon the provision of services in the Hunter Valley.
- The No. 1 Open Cut Extension will provide direct employment for approximately 69 fulltime workers and other direct, indirect and induced employment positions;
- Current and potential mines in the area are not expected to significantly affect air quality in the area that will be affected by the proposed No. 1 Open Cut Extension; and
- The proposal offers certainty in the elimination of spontaneous combustion and safety issues associated with subsidence for affected lands.

6.1 Introduction

This section incorporates the findings of the specialist studies and the likely impact the proposed No. 1 Open Cut Extension will have on the environment. The measures MCC will take to mitigate likely impacts on the environment are outlined in **Section 7** and the specialist studies included as Appendices.

6.2 Flora and Fauna

The impacts of the proposed No. 1 Open Cut Extension on flora and fauna have been investigated by HLA-Envirosciences Pty Limited. A copy of the full report can be found in **Appendix F**.

Open cut mining impacts on the flora within the footprint of the mine by the removal of vegetation and habitat. The flora, soil, ground and arboreal habitat features that will be removed as part of the proposed No. 1 Open Cut Extension are an important resource. This resource can be used in creation of compensatory habitat as part of the rehabilitation of mine.
The Flora and Fauna Assessment made the following conclusions on the likely impact of the proposed No. 1 Open Cut Extension on the flora and fauna environment:

- The scope of vegetation clearing will have a short to medium term impact on the population of the Grey-crowned Babbler present within the proposed No. 1 Open Cut Extension. This impact will be minimised by medium to long-term mitigatory measures targeting the rehabilitation and re-instatement of habitat for this species;

- The scope of vegetation clearing will have a short to medium term impact on local species vulnerable to the clearance of native vegetation. This impact will be minimised by medium to long-term mitigatory measures targeting the rehabilitation and re-instatement of vegetation and habitat, particularly focusing on the improvement of local vegetation connectivity;

- The proposed No. 1 Open Cut Extension is unlikely to result in a significant impact on threatened species or their habitats such that a viable local population will be placed at risk of extinction provided that appropriate mitigatory measures are developed and implemented; and

- The proposed No. 1 Open Cut Extension will not aid in the promotion of the key threatening process referred to as 'Clearing of Native Vegetation' in the medium to long-term, provided an appropriate management plan targeting the re-instatement of local flora and fauna habitat values and wildlife connectivity is implemented.

6.3 Soils

Open cut mining impacts on the soils within the footprint of the mine by the removal of all soil and the disruption of the natural processes of in-situ soil formation. The soil that will be removed as part of the proposed No. 1 Open Cut Extension is an important resource in the successful rehabilitation of mine spoil piles. Topsoil will be collected for topdressing overburden emplacement areas. The soils have been assessed for topsoil dressing suitability by using the Elliot and Veness (1985) scheme. The quantities of topsoils material and constraints in their use are summarised in **Table 6.1**. The topsoil estimates are included as a guide to quantities of topdressing materials available, however because of poor structure and high sand and gravel content, these soils do not meet the standards as described by Elliot and Veness.

The Yellow Duplex Soils with mottled subsoils fail to meet the criteria in that the soil structure is weak and the sand and gravel content exceeds the recommendations. It does contain valuable native plant seed and micro-organisms. If planned as a single topsoil stripping and re-spreading operation for rehabilitation of low erosion potential areas, successful results could be achieved under favourable conditions. Mixing with the bleached A2 horizon would need to be avoided.

TABLE 6.1
TOPSOIL STRIPPING

Soil Type	Average Depth (cm)	Area (ha)	Volume (m^3)	Constraints
Yellow Duplex Soils Mottled Subsoils	5	25.5	12800	Weak structure sand and gravel
Yellow Duplex Soils Whole Coloured Subsoils	5	24.7	12350	Structure, consistence, pH
Mining and Infrastructure Areas	-	30.4	-	Structure
Brown Subsoils on Ridgelines	5	14.4	7200	Structure, salinity consistence

The Yellow Duplex Soils with whole coloured subsoils have poor structure and high sand and gravel contents above recommended levels (sandy loam texture, gravelly). These areas will contribute some useful material but care is required to ensure contamination with bleached A2 material is avoided.

The Brown Soils on the Ridgelines are again dominated by conspicuously bleached A2-horizon requiring careful separation. Limitations include the degree of existing erosion, poor structure, excess sand and gravel.

The mining and infrastructure areas contain soil material used to rehabilitate the previously rehabilitated lands. This material can be reclaimed but suffers from previous handling and possible mixing with the underlying overburden material. A rapid weathered interface may have developed assisting with recovery of usable topdressing material.

6.4 Land Use and Capability

The pre-mining land use of the proposed No. 1 Open Cut Extension area was for cattle grazing. During mining operations the land is removed from agricultural production. Once mining is completed the land will be rehabilitated to a condition that is able to once again sustain cattle grazing activities.

The natural vegetation of the area was greatly reduced by activities designed to promote grazing such as vegetation clearing and the planting of introduced grass species. MCC's rehabilitation programme aims to resow the area with a ratio of 50% pasture and 50% trees. Trees will be sown for use as shade for stock and to provide forest for native animal corridors, in accordance with the MOP and within the framework and aims of the report "Synoptic Plan: Integrated Landscapes for Coal Mine Rehabilitation" by the DMR.

The aims of the Synoptic Plan include the promotion of visual amenity, biodiversity and sustainable post-mining land use.

The outcome of conducting rehabilitation activities in accord with the Synoptic Plan for integrating rehabilitation activities will be that the proposed No. 1 Open Cut Extension site will be returned to similar or greater levels of agricultural productivity to that which existed prior to mining. In terms of the DLWC's Rural Land Capability and NSW Agriculture's Agricultural Suitability classifications, the rehabilitation lands of the proposed No. 1 Open Cut Extension area should meet or exceed the pre-mining classifications. An exception to this will be the final voids which may be used in the future for waste disposal purposes by MSC. However, final void use would be subject to a separate development application and is not a component of the No. 1 Open Cut Extension Proposal.

6.5 Acoustic Environment

The predicted acoustical impacts of the proposed No. 1 Open Cut Extension have been investigated by HLA - Envirosciences Pty Limited. A copy of the full report can be found in **Appendix H**.

6.5.1 Noise and Vibration Assessment

The acoustic study addressed the following noise and vibration issues:

- Noise emissions during operational phases;
- Noise impacts from road transport of coal; and
- Overpressure and vibration from blasting.

Potential impacts from noise and vibration have been assessed against current NSW EPA policy. Noise modelling was conducted using RTA Technology's ENM software. This software is well known to the EPA and planningNSW. Site-specific equations for blast overpressure and vibration levels have been developed from standard equations with corrections determined from MCC blast data.

As discussed in **Section 3.10.1**, modelling was conducted for the following prevailing atmospheric conditions:

- *Inversion* – 10^0C, 70% R.H., +3°C/100 m vertical temperature gradient; and,
- *Prevailing wind* – 20^0C, 70% R.H., 3 m/s wind from NW (winter) and SE (summer).

The Acoustic study modelled the following scenarios:

- Scenario A: Hydraulic excavator operating in the far north-western corner of the No. 1 Open Cut Extension, behind face at 10 m below ground. Overburden dumping in No. 1 Open Cut. Coal

handling/crushing/stockpiling as per existing operations. No. 2 Open Cut as per existing operations with excavation by hydraulic excavator and shovel, and ripping coal with dozer. No activity on No. 2 Open Cut overburden dump;

- Scenario B: As above (Scenario A) except excavator in No. 1 Open Cut Extension operating at ground level above existing highwall;
- Scenario C: As above (Scenario B) except excavator 20 m below ground level; and,

- Scenario D: Mining at ground level in the centre of the No. 1 Open Cut Extension area (near existing offices). No operations in No. 2 Open-Cut.

Scenarios A to C are potentially the worst case for receivers to the north and west, while scenario D represents the worst case for receivers to the south.

6.5.2 Noise Impacts

Predicted noise levels for the operational scenarios and atmospheric conditions outlined in **Section 6.5.1** are summarised in **Tables 6.2** to **6.5**. EPA noise goal exceedances in all tables are highlighted in bold. Noise contour plots are shown in **Figures 6.1** to **6.9**.

It has been assumed that operational noise levels may occur at any time during the day, evening or night so the night-time project specific noise goals in **Table 6.2** have been taken as the governing criteria.

TABLE 6.2
PREDICTED NIGHT-TIME OPERATIONAL NOISE LEVELS – dB(A),Leq(15-minute)
COAL HANDLING + No 2 OPEN-CUT + **YEAR 1** IN NO. 1 OPEN CUT EXTENSION
EXCAVATOR IN FAR NORTH-WESTERN AREA (Scenario A)

Location	Predicted level			Criterion	Exceedance		
	NW Wind	Inversion	SE Wind		NW Wind	Inversion	SE Wind
(1) K Watts	<25	25	26	38	0	0	0
(2) J French	<25	25	26	38	0	0	0
(3) Reg J. Watts	<25	25	26	38	0	0	0
(4) Reynolds	<25	25	27	38	0	0	0
(5) McKean	<25	30	33	38	0	0	0
(6) V M French	<25	34	35	38	0	0	0
(7) R G & G A Watts	<25	34	36	38	0	0	0
(8) Aird	<25	35	37	38	0	0	0
(9) Neilsen	<25	34	36	38	0	0	0
(10) R G & G A Watts	<25	34	36	38	0	0	0
(12) J Madden	<25	36	38	38	0	0	0
(13) McMaster	25	37	39	38	0	0	**1**

TABLE 6.2 PREDICTED NIGHT-TIME OPERATIONAL NOISE LEVELS – dB(A),Leq(15-minute) COAL HANDLING + No 2 OPEN-CUT + **YEAR 1** IN NO. 1 OPEN CUT EXTENSION **EXCAVATOR IN FAR NORTH-WESTERN AREA (Scenario A)**							
(14) F Madden	26	35	39	40	0	0	0
(15) Collins	<25	34	33	35	0	0	0
(16) Tuckey	<25	33	31	35	0	0	0
(17) Colvin	<25	32	25	35	0	0	0
(18) Shephard	25	25	<25	37	0	0	0
(20) Gordon	31	30	<25	37	0	0	0
(21) Ardee Holdings	34	31	<25	37	0	0	0
(22) M Bowman	34	32	<25	37	0	0	0
(23) N Bowman	34	32	<25	37	0	0	0

The results in **Table 6.2** show no noise goal exceedances, with the exception of a 1 dB(A) exceedance at Location 13 under south-east wind conditions.

TABLE 6.3 PREDICTED NIGHT-TIME OPERATIONAL NOISE LEVELS – dB(A),Leq(15-minute) COAL HANDLING + No 2 OPEN-CUT + **YEAR 1** IN NO. 1 OPEN CUT EXTENSION **EXCAVATOR OPERATING AT GROUND LEVEL (Scenario B)**							
Location	Predicted level			Criterion	Exceedance		
	NW Wind	Inversion	SE Wind		NW Wind	Inversion	SE Wind
(1) K Watts	<25	27	28	38	0	0	0
(2) J French	<25	27	28	38	0	0	0
(3) Reg J. Watts	<25	27	28	38	0	0	0
(4) Reynolds	<25	26	28	38	0	0	0
(5) G McKean	<25	32	32	38	0	0	0
(6) V M French	<25	34	35	38	0	0	0
(7) R G & G A Watts	<25	34	36	38	0	0	0
(8) Aird	<25	35	37	38	0	0	0
(9) Neilsen	<25	34	36	38	0	0	0
(10) R G & G A Watts	<25	34	36	38	0	0	0
(12) J Madden	<25	38	39	38	0	0	**1**
(13) McMaster	25	39	40	38	0	**1**	**2**
(14) F Madden	25	36	40	40	0	0	0
(15) Collins	<25	35	35	35	0	0	0
(16) Tuckey	<25	35	34	35	0	0	0
(17) Colvin	<25	34	29	35	0	0	0
(18) Shephard	25	25	<25	37	0	0	0
(20) Gordon	34	30	<25	37	0	0	0
(21) Ardee Holdings	36	31	<25	37	0	0	0

(22) M Bowman	34	32	<25	37	0	0	0
(23) N Bowman	34	32	<25	37	0	0	0

The results in **Table 6.3** suggest that minor noise goals exceedances may be experienced at Locations 12 and 13 during adverse weather conditions.

Table 6.4 shows predicted noise levels for a few weeks after the above scenario, when the excavator has dug down one bench height (approximately 10 m). Only results for inversions and SE winds are shown, as these were the atmospheric conditions that produced the minor exceedances shown in **Table 6.3**.

TABLE 6.4
PREDICTED NIGHT-TIME OPERATIONAL NOISE LEVELS – dB(A),Leq(15-minute)
COAL HANDLING + No 2 OPEN-CUT + **YEAR 1** IN NO. 1 OPEN CUT EXTENSION
EXCAVATOR OPERATING 10m BELOW GROUND LEVEL (Scenario C)

	Predicted level			Exceedance	
Location	Inversion	SE Wind	Criterion	Inversion	SE Wind
(1) K Watts	27	28	38	0	0
(2) J French	27	28	38	0	0
(3) Reg J. Watts	27	28	38	0	0
(4) Reynolds	26	28	38	0	0
(5) McKean	32	32	38	0	0
(6) V M French	34	35	38	0	0
(7) R G & G A Watts	34	36	38	0	0
(8) Aird	35	37	38	0	0
(9) Neilsen	34	36	38	0	0
(10) R G & G A Watts	34	36	38	0	0
(12) J Madden	36	38	38	0	0
(13) McMaster	38	39	38	0	**1**
(14) F Madden	34	26	40	0	0
(15) Collins	34	33	35	0	0
(16) Tuckey	33	31	35	0	0
(17) Colvin	32	26	35	0	0
(18) Shephard	25	<25	37	0	0
(20) Gordon	30	<25	37	0	0
(21) Ardee Holdings	31	<25	37	0	0
(22) M Bowman	32	<25	37	0	0
(23) N Bowman	32	<25	37	0	0

The results in **Table 6.4** suggest that a minor 1 dB(A) exceedance may be experienced at Location 13 at night-time during south-easterly winds, once the excavator above the No. 1 Open Cut highwall has dug down one bench height.

TABLE 6.5
PREDICTED NIGHT-TIME OPERATIONAL NOISE LEVELS – dB(A),Leq(15-minute)
COAL HANDLING + **YEAR 5** IN NO. 1 OPEN CUT EXTENSION
EXCAVATOR OPERATING AT GROUND LEVEL (Scenario D)

Location	Predicted level			Criterion	Exceedance		
	NW Wind	Inversion	SE Wind		NW Wind	Inversion	SE Wind
(1) K Watts	<25	<25	<25	38	0	0	0
(2) J French	<25	<25	<25	38	0	0	0
(3) Reg J. Watts	<25	<25	<25	38	0	0	0
(4) Reynolds	<25	<25	<25	38	0	0	0
(5) McKean	<25	26	26	38	0	0	0
(6) V M French	<25	27	27	38	0	0	0
(7) R G & G A Watts	<25	29	29	38	0	0	0
(8) Aird	<25	30	30	38	0	0	0
(9) Neilsen	<25	29	29	38	0	0	0
(10) R G & G A Watts	<25	30	30	38	0	0	0
(12) J Madden	<25	35	38	38	0	0	0
(13) McMaster	25	38	39	38	0	0	**1**
(14) F Madden	28	35	36	40	0	0	0
(15) Collins	25	35	35	35	0	0	0
(16) Tuckey	29	35	33	35	0	0	0
(17) Colvin	31	33	28	35	0	0	0
(18) Shephard	31	25	<25	37	0	0	0
(20) Gordon	38	34	<25	37	**1**	0	0
(21) Ardee Holdings	39	35	25	37	**2**	0	0
(22) M Bowman	39	34	<25	37	**2**	0	0
(23) N Bowman	39	34	<25	37	**2**	0	0

Low Frequency Noise

The ENM calculations summarised in the above tables were conducted at octave-band centre frequencies and analysed manually in a spreadsheet to determine the C-weighted minus A-weighted noise levels. This allowed an assessment of the low frequency content of the received noise. Typical C-A levels were in the range 5-10 dB under the noise-enhancing atmospheric scenarios, and up to 12 dB under neutral condition.

The higher C-A levels under neutral conditions reflects the fact that barriers and ground surfaces absorb most efficiently in the mid to high frequency range, thereby increasing the proportion of low frequency noise content. Under noise-enhancing conditions, the effect of barriers and the ground surface is reduced, increasing overall noise levels but decreasing the proportion of low frequency noise. The INP specifies a modifying factor of 5 dB(A) to noise criteria if the C-A levels exceed 15 dB. Such a factor is not applicable for the No. 1 Open Cut Extension proposal.

The issue of low frequency noise/vibration impact has developed as a real concern with Muswellbrook residents in recent years, with some quite significant cases having been discovered. In all cases, the offending source has been identified as reciprocating machinery (breakers and screens) operating inside coal washing plants. Noise generated in the 16 Hz and 31.5 Hz third-octave bands has been known to be felt in the ears and body, rather than heard, giving rise to the perception of vibration, rather than noise.

This proposal will result in no changes to the current coal handling operations at MCC, so that any potential for low frequency noise/vibration impact has been present for many years. The phenomenon is usually so intrusive that strong complaints are generated, and the absence of such complaints in relation to MCC's operations suggests that this problem will not emerge as a result of the No 1 Open Cut expansion project.

Sleep Arousal

Table 6.6 shows predicted Lmax noise levels at five representative locations, compared with the sleep arousal criteria of 'night-time background level + 15dB(A)'. In each case the two loudest individual noise sources over *all* modelled scenarios are listed with Lmax in brackets.

TABLE 6.6
PREDICTED NIGHT-TIME MAXIMUM NOISE LEVELS – dB(A),Lmax
COAL HANDLING, No 2 OPEN-CUT (NO DUMPING) AND **YEAR 1**
IN NO. 1 OPEN CUT EXTENSION
EXCAVATOR(S) AT HIGHEST LEVEL

Location	Criterion	Atmospheric Condition	Sources*
(7) Watts	48	NW Wind	Excavator #2 (27), Truck from No 2 O/C (25)
		Inversion	Excavator #2 (38), Stockpiling coal (35)
		SE Wind	Truck from No 2 O/C (36), Excavator #2 (35)
(14) Madden	50	NW Wind	Excavator #1 (42), Excavator #2 (41)
		Inversion	Excavator #2 (48), Excavator #1 (45)
		SE Wind	Excavator #2 (49), Excavator #1 (47)
(15) Collins	45	NW Wind	Excavator #2 (28), Excavator #1 (28)
		Inversion	Excavator #2 (34), Excavator #1 (32)
		SE Wind	Excavator #2 (36), Excavator #1 (31)
(17) Colvin	50	NW Wind	Excavator #2 (36), Excavator #1 (32)
		Inversion	Excavator #2 (39), Excavator #1 (34)
		SE Wind	Excavator #2 (37), Excavator #1 (28)
(20) Gordon	47	NW Wind	**Excavator #3 (48)**, Coal stockpiling (43)
		Inversion	Excavator #3 (42), Coal stockpiling (39)
		SE Wind	Coal stockpiling (29), Hopper (22)

** Excavator #1 = Excavator in NW tongue of No. 1 Open Cut extension*

Excavator #2 = Excavator above highwall in No. 1 Open Cut extension

Excavator #3 = Excavator at ground level in Year 5 of extension

Blasting

Table 6.7 shows predicted 95th percentile blast overpressure and ground vibration levels at several residential locations based on the site-specific curves above for a large blast (maximum instantaneous charge weight of 600 kg). Quoted distances are to the nearest point on the boundary of the proposed No. 1 Open Cut Extension, with the exception that no blasting will take place in the north-western tongue of the Year 1 workings.

TABLE 6.7
PREDICTED IMPACTS FROM BLASTING (95th PERCENTILE)*

Location	Distance, m	Overpressure, Db	PPV, mm/s
R10 – R.G. & G.A. Watts	2800	109	0.95
R13 – McMaster	1900	112	1.7
R14 – Madden	2000	111	1.6
R15 – Collins	1600	114	2.2
R17 – Colvin	1900	112	1.7
R20 – Gordon	3000	108	0.85

* 95th Percentile means 5% of blasts may exceed the values in the table.

The values contained in **Table 6.7** represent a "worst-case" assessment of blasting impacts. In practice maximum instantaneous charge weights in the order of 600 kg will be rare with values more likely to be in the order of 200-400 kg. A 400 kg MIC will reduce predicted 95th percentile overpressure levels by 1 or 2 dB. The predicted values of blasting impacts are for the one time when blasting operations will be at their closest to a particular residential receiver. At all other times blasting operations will be conducted at more distant locations. Consequently predicted values will be lower than those indicated in **Table 6.7** for the worst case. As an example a blast with a maximum instantaneous charge weight of 400 kg is predicted to generate an overpressure (95th percentile) of 113 dB at 1,600 m but when blasting operations are at 3,000 m the predicted overpressure (95th percentile) expected to be generated is 106 dB.

The relevant blasting criteria for overpressure and ground vibration are predicted to be achieved at all residential receivers under "worst case" conditions.

6.6 Transportation

6.6.1 Roads and Traffic

The existing road network and traffic flow was discussed in **Section 3.11.1**. A full assessment of the traffic impacts of the proposal appears in **Appendix L**.

The TPK & Associates study, which reviewed the previous traffic assessment conducted by Hallam & Associates for the Sandy Creek Colliery EIS for MCC, concluded that this study was still appropriate for the proposed No. 1 Open Cut Extension as *"a new detailed traffic analysis at this time would only utilise identical intersection layouts and lower traffic flows for modelling."*

Of relevance is the fact that the Hallam Associates study considered the road haulage of 2.2 Mtpa while the No. 1 Open Cut Extension proposal is for a maximum of 2.0 Mtpa.

The Hallam & Associates Assessment found the following:

- The intersection of Muscle Creek Road with the private Coal Haul Road is currently operating at a high level of service;
- The intersection of Muscle Creek Road and the New England Highway is also currently operating at a high level of service, which would remain even if extra truck traffic was added and extra traffic from the new rural residential subdivision on Muscle Creek Road were to be included;
- The Muscle Creek Road and New England Highway intersection will not require improvement works;
- As there will be no increase in truck movements on the road network all roads will remain at a high level of service;
- The proposed No. 1 Open Cut Extension would be expected to have an acceptable traffic impact; and
- Consideration of the traffic implications of a 94 lot rural residential subdivision to the south of Muscle Creek Road would add about 850 vehicles/day to the traffic flow, which would still be within the limit for level of service A.

6.6.2 Mine Employee Traffic

There will be no increase in employee numbers and no increase in the number of vehicles utilising public roads to access the mine.

6.7 Visual and Night Lighting

6.7.1 Visual Aspects

There will be no new service infrastructure as a result of the proposed No. 1 Open Cut Extension therefore there will not be any additional visual impact. All overburden emplacement will be within the pits of the No. 1 and No. 2 Open Cuts.

Due to the location of the No. 1 Open Cut Extension and the surrounding landforms, the existing mining operations are excluded from sight in most of the areas neighbouring the mine. All overburden will be emplaced inpit, therefore the visual impact will not be substantially different to the current visual impact.

6.7.2 Night Lighting

There will be minimal impact from the proposal in terms of affects on the night time lighting environment. MCC's operations are screened from direct view of residents or the travelling public by existing overburden emplacement areas, and the natural topography of the surrounding area. MCC will continue to utilise the existing night lighting equipment for the proposed No. 1 Open Cut Extension which will be relocated from the No. 2 Open Cut Operations. The relocation of night lighting equipment will produce minimal change in impacts to the present operations. As such, no adverse impacts due to night lighting are anticipated when mining occurs in this area.

The greatest risk of direct light "spill" from the site is in respect of mobile lighting plant used to illuminate open cut mining operations. If this plant is located on the highwall, then it is important to ensure the light is directed down onto the working area. Whilst, at times, the lighting plant will be located on the highwall it is more effective to locate the lighting plant at the same level as the mining operations and behind the mining equipment so as to "back light" the mining face. This is often a safer way to conduct mining operations as it has the effect of reducing the glare of lights shining directly into the eyes of machine operators.

The overall effect is that mobile lighting will tend to be used within the mining pit where direct impact of light off site is eliminated. The existing spoil emplacement to the west of the No. 1 Open Cut void provides a barrier to light, noise and dust between the No. 1 Open Cut Extension and North Muswellbrook.

There will be no new infrastructure constructed that will require lighting. There will be no change to the lighting requirements or its location for infrastructure such as workers' amenities, workshops or the Coal Handling Plant.

6.8 Surface Water Assessment

The proposed No. 1 Open Cut Extension will occur on high ground and will be limited in extent, compared to the area covered by all mining operations. A number of small catchments will be modified by open cut mining. These catchments mostly contain 1st order ephemeral streams that are dry for most of the year. A portion of a second order stream is affected in the northeast. These impacts are considered negligible.

Water quality in Sandy Creek and Muscle Creeks will not be affected, by the proposed No. 1 Open Cut Extension.

6.9 Groundwater Assessment

The proposed No. 1 Open Cut Extension mines through strata and groundwater regimes that have been previously disturbed by mining. Mining will lower the water levels in the Greta Coal Measures to the base of the Loder Seam over a small area. In the wider area, water levels will fall to the Lewis Seam

when the Sandy Creek Colliery commences. The Loder Seam contains brackish water and is not considered a groundwater resource.

The proposed mining should improve the groundwater regime in the area because a large portion of mined workings will have been removed and replaced with spoil, creating a better environment for groundwater recovery and improvement in groundwater quality.

6.9.1 Post Mining Water Levels

The final void of the proposed No. 1 Open Cut Extension will be located at the proposed alternative entry to Sandy Creek Colliery, which will be mined at Year 4 or 5. This area will remain dewatered so that the proposed Sandy Creek Colliery can proceed. Recovery of water levels after mining will occur after completion of the Sandy Creek Colliery.

The post-mining water levels in the spoil-filled, and open, voids of the proposed Extensions A and B should be evaluated once a MOP for the Sandy Creek Colliery is finalised, so that the ground disturbance from those workings is considered.

In general terms, the post-mining hardrock water levels in the proposed No. 1 Open Cut Extension area will depend on the fate of the void (Sandy Creek Colliery entrance), once the mining in the Sandy Creek Colliery ceases.

6.10 Air Quality

The impacts of the proposed No. 1 Open Cut Extension on air quality have been investigated by Holmes Air Sciences Pty Limited. A copy of the full report can be found in **Appendix E**. The annual average PM_{10} concentration, the annual average TSP concentration and the annual average dust deposition from the proposed No. 1 Open Cut Extension has been predicted for Years 1, 4 and 9. To assess air quality impacts the predicted concentration and deposition levels are compared with air quality criteria that apply in NSW. The NSW air quality criteria are as follows:

- EPA 24-hour PM_{10} Standard of 50 $\mu g/m^3$ for PM_{10};
- EPA annual average PM_{10} long term reporting goal of 30 $\mu g/m^3$ for PM_{10};
- NHMRC annual average TSP goal of 90 $\mu g/m^3$; and,
- NSW EPA annual average deposition goal of 2 g/m^2/month as a maximum acceptable increase over existing dust fallout levels.

Based on available monitoring data the following background levels have been assumed for assessment purposes:

- Annual average PM_{10} – 18.6 µg/m^3;

- Annual average TSP – 46.6 µg/m^3; and,
- Annual average deposition – 1 g/m^2/month.

Annual Average PM_{10} Concentrations

The annual average PM_{10} concentration at the most affected residential receiver is predicted to be less than approximately 4 µg/m^3 in Year 1 and 3 µg/m^3 in Years 4 and 9, due to emissions from the proposed No. 1 Open Cut Extension. This is a very small fraction of the 30 µg/m^3 EPA annual average long term goal. Contours of predicted annual average PM_{10} concentrations for Years 1 and 9 are shown in **Figures 6.10** and **6.13**.

Annual Average TSP Concentrations

The annual average TSP concentration at the most affected residential receiver is predicted to be less than approximately 7 µg/m^3 in Year 1 and 5 µg/m^3 in Years 4 and 9, due to emissions from the proposed No. 1 Open Cut Extension. This is a very small fraction of the 90 µg/m^3 NHMRC annual average guideline value. Contours of predicted annual average TSP concentrations for Years 1 and 9 are shown in **Figures 6.11** and **6.14**.

Annual Average Dust Deposition

The predicted increase in annual average dust deposition at the most affected residential receiver is approximately 0.8 g/m^2/month in Year 1. This is well below EPA's incremental goal of 2 g/m^2/month that applies in areas experiencing existing dust deposition levels of 2 g/m^2/month and below. The annual average dust deposition rate is predicted to be approximately 0.5 g/m^2/month in Years 4 and 9. This is below EPA's incremental goal of 2 g/m^2/month that applies in areas experiencing existing dust deposition levels of 2 g/m^2/month. Contours illustrating predicted annual average dust deposition rates for Years 1 and 9 are shown in **Figures 6.12** and **6.15**.

6.10.1 Greenhouse Gas Emissions

The project will require energy in the form of electricity for fixed plant, diesel and petrol for mobile plant and diesel for explosives. Use of this electrical energy and fuel will cause emissions of CO_2. In addition the combustion of the coal produced by the mine will result in the release of CO_2.

The MCC has provided estimates of annual petrol, diesel and electricity consumption for 2001 and the ten-years during which the project would operate. These have been used to estimate CO_2 emissions for this period. The results are summarized in **Table 6.8**

TABLE 6.8
ESTIMATED CO_2 EMISSIONS

Year	Diesel including fuel for lighting-plant, pumps and earthmoving plant (L)	Diesel for explosives (L)	Petrol for light duty vehicles (L)	Electrical energy (kWh)	Annual production from No. 1 O/C Extension (t)	CO_2 Equivalent due to energy usage (kg)
2001	6,587,323	116,799	30,000	4,968,589	-	23,282,121
Y1	1,018,738	-	30,000	151,781	99,700	2,978,957
Y2	1,684,831	25,251	30,000	757,536	497,600	5,468,658
Y3	3,368,825	50,490	30,000	1,840,405	1,208,900	11,192,679
Y4	3,535,945	52,995	30,000	2,976,530	1,507,600	12,830,540
Y5	5,645,539	84,612	30,000	5,031,205	1,514,500	20,727,259
Y6	5,521,378	82,761	30,000	5,020,548	1,507,500	20,377,204
Y7	5,550,357	83,186	30,000	5,009,130	1,500,000	20,444,426
Y8	5,604,729	84,001	30,000	5,009,130	1,500,000	20,592,879
Y9	5,536,674	82,981	30,000	5,007,608	1,499,000	20,405,484
Y10	1,790,349	26,833	30,000	921,040	605,000	5,926,801
Total	45,844,688	689,909	330,000	36,693,502	11,439,800	164,227,008

The estimates of CO_2 emissions in **Table 6.8** have been based on the following:

- For electricity usage the CO_2 emission factor is 0.00104 t CO_2 eq/kWh;
- For diesel and petrol usage the CO_2 emission factor is 2.69 kg/L.

The estimates do not include emissions for land clearing (i.e. from removed vegetation). It has been assumed that rehabilitation would ensure that there is no net emission after the 10-year mining period.

Exposed coal seams will release methane to the atmosphere. It has a shorter life in the atmosphere (about 12 years compared with 50 to 200 years for CO_2 – (**IPCC 1996**) before it is converted to CO_2 and water vapour. Nevertheless methane is a very "effective" greenhouse gas, with a warming potential of 21 compared with the warming potential for CO_2 of 1. Methane emissions from open cut mining are not accurately known, but the effective carbon emitted via methane emissions is believed to be minor compared with the emissions from the combustion of the coal and the other sources considered above.

There will be emissions of other greenhouse gases such as carbon monoxide and nitrogen oxides and non-methane volatile organic compounds etc. However these are not currently included in the Australian Greenhouse Offices' National Aggregated Inventory. Other gases such as those used in air-cooling etc will be used in sealed systems and recycled to the maximum extent possible. CO_2 will be the only significant greenhouse gas emitted by the project.

The combustion of the coal product by customers will result in the release of CO_2, which will add to the quantity of carbon in the atmosphere. This is of course the largest contributor to greenhouse emissions that will occur as a result of the project. The mine plans to produce approximately 11.4 Mt over its ten year life. Approximately 16.3% of this is estimated to be ash and so the carbon content will be slightly less than 9.5 Mt. This will produce approximately 35.0 Mt of CO_2 on combustion over the ten year life of the mine.

In summary the annual average CO_2 emission (averaged over the ten year life of the mine) will be:

- 14,094 t/y attributable to use of electrical energy and fuels for equipment and blasting
- 3,500,000 t/y due to combustion of the coal produced.

These emissions can be compared with the 458.2 Mt CO_2 equivalent estimated by Environment Australia to have been produced by Australia in 1999 (excluding land clearing) (see http://www.greenhouse/facts/pdfs/nggifs1s.pdf). The greenhouse gas emissions (excluding the emissions when customers burn the coal) are estimated to be 0.003% of Australia's 1999 emissions.

Since energy consumption is a significant cost in mining, the mine plan is automatically designed to achieve minimum fuel consumption compatible with efficient operation of the mine and efficient use of capital. Thus measures to minimise emissions are an integral part of the mine plan.

6.11 Indigenous and Non - Indigenous Heritage Impacts

The impacts of the proposed No. 1 Open Cut Extension on Indigenous and Non- Indigenous Heritage have been investigated by HLA-Envirosciences Pty Limited. A copy of the full report can be found in **Appendix I**.

The proposed No. 1 Open Cut Extension will require the total removal of the entire soil deposit throughout the impacted area. The complete removal of this soil profile will therefore result in the destruction of any archaeological material within these areas.

There will be no additional impacts of the proposed No. 1 Open Cut Extension on the surrounding areas through movement of the mined materials and the entry and exit of workers and materials because the existing infrastructure will be utilised.

Legislative Framework

Sites of cultural heritage significance are protected or controlled by a number of varying levels of statutory control that vary according to Authority and site type. The two main pieces of legislation that apply to archaeological and cultural heritage are the *NP&W Act 1974* and *Heritage Act 1977* (as amended 1998). An outline of the nature and levels of controls on the project area are set out below.

National Parks and Wildlife Act (1974)

Under the provisions of the *NP&W Act 1974,* Aboriginal archaeological sites are defined as "relics". A "relic" means any deposit, object or material evidence (not being handicraft made for sale) relating to Indigenous and non-European habitation of the area that comprises NSW, being habitation both prior to and concurrent with the occupation of that area by persons of European extraction, and includes Aboriginal remains.

Under Section 91 of the *NP&W Act 1974*: "A person who is aware of the location of a relic that is the property of the Crown or, not being the property of the Crown, is real property, and does not, in the prescribed manner, notify the Director-General thereof within a reasonable time after he first becomes aware of that location is guilty of an offence against this Act unless he believes on reasonable grounds that the Director-General is aware of the location of that relic." This means that if a relic is found the NPWS must be informed.

Under Sections 86 and 90 of the *NP&W Act 1974* a person is not allowed to disturb or excavate on any land for the purpose of discovering a relic or knowingly destroy, deface or damage or cause or permit the destruction, defacement or damage of a relic. Permits can be obtained to allow excavations or destruction of a relic.

It should be noted that because an item is not on a register or that an area has no items registered does not mean that there are no items of heritage significance in an area. This is because an area may not have been systematically surveyed for heritage items or that an item has been overlooked or that the heritage significance of an item or area has not been realised.

The impact from the proposed development will essentially destroy any archaeological materials contained within the study area, as the extension of the open cut mine will entail the total removal of the entire soil deposit. Therefore the following sites will be destroyed under current planning:

- M1 (an occupation site);
- M2 (an occupation site);
- M3 (an occupation site);
- M4 (an occupation site); and
- M5 (a scarred tree).

Site M6 (a scarred tree) is positioned on the boundary of the proposed MCC development area. At present, its destruction as a result of the development is also assumed. However, it is noted that it is potentially possible for the tree be retained through a minor modification to the proposed development plan, which is further discussed in the management recommendations for the site.

Although no non-Indigenous heritage items have been identified within the study area, the proximity of the Muswellbrook Brickworks to the proposed development has been identified as a heritage issue. The

brickworks are removed from the existing No. 1 Open Cut by approximately 200 m, and therefore could be indirectly impacted by the proposed works. These impacts could feasibly include dust, noise and vibration impacts. However, it is also noted that the bulk of Extension A works will begin at the existing limit of the No. 1 Open Cut, as the extension of the open cut is essentially moving east from the existing No. 1 Open Cut highwall. The Brickworks are removed from this area by approximately 1,000 m.

As such, although indirect impacts have been identified for the Brickworks, they are considered to be minimal. Therefore, no specific management recommendations are presented for the Brickworks during development. However, if any alterations are made to the existing development plans, the development impact on the Muswellbrook Brickworks will require reassessment.

6.12 Social Impacts

At June 30, 2001, MCC employed a permanent workforce of 69 personnel. In addition to the permanent workforce, MCC enlists an extended range of contractor services in all areas of operations. The number of contractor positions vary greatly according to the operating needs of mining operations. It is anticipated that the workforce for the No. 1 Open Cut Extension will be a similar level to the current permanent workforce. The mix of MCC employee numbers to contractor numbers is not known at this time.

Over half of MCC's workforce resides in the Muswellbrook Shire. **Table 6.9** shows almost 39% of the workforce resides in Aberdeen, Denman, Singleton and Scone, such that over 96% of employees are from the Upper Hunter.

TABLE 6.9
RESIDENTIAL LOCALITIES FOR MCC MINE EMPLOYEES
(30 JUNE 2001)

Local Government Area	Number	Percentage of Total
Muswellbrook	39	57
Aberdeen	11	16
Scone	10	14
Denman	4	6
Singleton	2	3
Other	3	4
Total	69	100

6.12.1 Impacts on Provision of Service

As previously mentioned there will be no increase in employment numbers for the No. 1 Open Cut Extension. The workforce will require and utilise the same or similar levels of services that are currently available in the Upper Hunter. These services include health or support services, children's services, aged services, recreation or leisure and community services. As there will be no expansion in MCC's workforce there will be no increase in population caused by new employees moving into the area. There

will also be no adverse impact upon the provision of services and there will be no increased demand or pressure placed upon services and facilities provided by Federal, State or Local Government, or on private providers.

6.12.2 Housing Impacts

As there is to be no increase in workforce numbers, the No. 1 Open Cut Extension proposal will not require additional housing for employees. There will be no adverse impacts on housing supply as a result of the mine extensions.

6.12.3 Employment

Employment levels are expected to remain at similar levels to the current situation.

However, the major impact from the mine extensions will be the provision long term employment. MCC will complete overburden removal in the No. 2 Open Cut during 2004 and the removal of coal during 2005. The No. 1 Open Cut Extension will allow the life of the mine to be extended by approximately 9 years till around 2013. Closure of the mine would have significant impacts in the Muswellbrook area as well as being felt in other LGAs in the Upper Hunter.

The 2001 Coal Industry Profile reported that the number of people employed by mines in the Hunter Coalfields has dropped steadily over the years from 1997 to 2000. The numbers employed by mines in the area has dropped by 1588, from 6,358 to 4,770 employees during 1997 to 2000. This represents a loss of 25% of jobs in three years.

The DMR released the Strategic Study of Northern NSW Coalfields in 1999. That document predicted a further 700 direct job losses from northern coalfield mines up until 2002. The job loss from 1999 to 2000 is consistent with this prediction, indicating further job losses in the industry are likely.

The proposed No. 1 Open Cut Extension will not only provide direct employment but will also provide indirect and induced employment in the areas surrounding the mine. Such employment opportunities would occur in the mine servicing industry, retail trade and employment related to the provisions of services (e.g. government, health care, childcare, community and recreational services).

There have been a number of attempts to quantify the multiplier effect relating to mine employment. Many of these studies have been in relation to specific coal mining operations in the Upper Hunter. Some calculated multiplier effects and their sources are listed below in **Table 6.10**.

TABLE 6.10 INDICATIVE INDUSTRY EMPLOYMENT MULTIPLIER		
Activity	Source	Multiplier
Dartbrook Mine 1990	Hunter Valley Research Foundation	2.437
Bulga Coal Mine	Hunter Valley Research Foundation	2.00
Ravensworth East Mine, 1999	Hunter Valley Research Foundation	2.65
1995	Australian Bureau of Statistics	2.977
		Average 2.516

The figures listed in **Table 6.10** show a range of multipliers from 2.0 to 3.0 with an average of 2.5. Applying the average multiplier to the MCC workforce it is possible that 173 people could be directly or indirectly employed through the mine's operation. That is, 69 existing employees at MCC, plus 104 other direct, indirect and induced employment positions. The closure of the mine could result in a total of 99 job losses in Muswellbrook (57% of 173) or 166 job losses in the Upper Hunter (96% of 173). The closure of MCC and the associated job losses would cause significant social and economic hardships in the area.

6.12.4 Economic Impacts

As previously discussed in **Section 3.18**, the coal mining industry is the major contributor to the local and regional economy. It also plays a significant role in State and national economies.

MCC has made a number of estimates relating to economic statistics for the extended life of the mine. The figures are produced in **Table 6.11**. This table shows MCC anticipates spending an average $10 million per year in wages, $ 36.5 million per year on materials and services, contribute $ 4.8 million per year to port and rail facilities and pay $ 2.5 million per year in royalties to the NSW Government.

TABLE 6.11 ESTIMATED ECONOMIC STATISTICS - MCC EXTENDED COAL MINE 2003 – 2008								
Year	2003	2004	2005	2006	2007	2008	Total	Average
Wages + On-costs (million)	9.2	9.5	9.8	10.2	10.5	10.9	60.1	10.0
Total Site Costs (million)	49.0	24.1	26.8	39.1	40.1	40.2	219.3	36.5
Capital Expenditure (million)	0.2	0.7	0.2	0.2	0.2	0.3	1.8	0.3
Rail & Port Facilities (million)	4.2	4.4	4.5	4.7	4.9	6.1	28.8	4.8
Royalty (million)	2.5	2.5	2.5	2.5	2.5	2.6	15.1	2.5

As with the case for employment generation, as discussed in **Section 6.12.3**, attempts have been made to identify and quantify multiplier effects relating to various economic factors.

An income multiplier of 1.66 has been used in assessing the impacts of a number of Upper Hunter Valley Coal Mines such as Nardell, Ravensworth East and Mount Pleasant, based on information supplied by the Hunter Valley Research Foundation. The income multiplier is applied to the wages and salary component of the mines' expenditure.

Using the multiplier, the proposed No. 1 Open Cut Extension can be expected to generate an additional flow-on from income ranging between $ 4.4 million and $ 5.3 million per year and averaging $ 4.8 million per year. These figures appear in **Table 6.12**.

TABLE 6.12
INCOME MULTIPLIERS

Income Direct Payments to Employees	Multiplier	Total Income (million)	Flow-on Income (million)
Minimum: $ 6.7 million (in 2003)	1.66	$ 11.1	$ 4.4
Maximum: $ 8.0 million (in 2008)	1.66	$ 13.3	$ 5.3
Average: $ 7.3 million	1.66	$ 12.1	$ 4.8

As identified in **Section 6.12**, 57 % of the workforce live in or around Muswellbrook and 96% live in the Upper Hunter Valley. It can reasonably be expected that 80% of wages and flow-on income will remain in the locality. This represents an average yearly benefit of $ 9.3 million for these localities (i.e. $ 7.3 million x 1.66 x 0.80 x 0.96). In light of the economic and employment situation presently being experienced in the Upper Hunter, the income benefits in terms of salaries and wages are substantial.

The mine, once extended, expects to outlay an average of $36.5 million per year for site costs. It is also anticipated that over the life of the mine capital expenditure average of $308,000 will occur. This means that an average yearly output of $36.8 million is possible. Again, output multipliers have been determined for other coal mines in the Upper Hunter Region by the Hunter Valley Research Foundation. A summary of multipliers used appears in **Table 6.13**. Applying an average multiplier of 1.66, to the annual yearly output of $36.8 million it can be expected that the extended mine will generate an additional flow-on expenditure of $24 million or $144 million over the life at the mine. This expenditure is expected to be concentrated in the Hunter Valley but the economic benefits from the mine will not be limited to the region. For example, in respect of the formerly proposed Kayuga Coal Mine it was estimated that 20 % of proposed capital and operating expenditure would remain in the Hunter Valley with 75 % remaining in Australia. (Kayuga Coal Project, 1997).

Through income taxes alone, the Commonwealth government can be expected to raise average revenue in the order of $2.2 million per year from direct employees, or $ 17.5 million over the life of the mine. This estimate is based on a tax rate of 30%. Including indirect flow on employment and the use of an income multiplier of 1.66, the tax revenue per year is in the order of $3.64 million.

TABLE 6.13 OUTPUT MULTIPLIERS		
Activity	Source	Multiplier
Dartbrook Mine, 1990	Hunter Valley Research Foundation	2.1285
Bulga Coal Mine, 1990	Hunter Valley Research Foundation	1.5
Ravensworth East Mine, 1999	Hunter Valley Research Foundation	1.86
1995	Australian Bureau of Statistics	1.136
	Average	1.66

It is anticipated that most if not all, of the coal produced by the extended mine will be exported. The Asian market is expected to be the destination for the majority of the coal. The extended mine will improve Australia's balance of payments and reduce the trade deficit.

6.13 Hazards

The proposal will enable an area of land to the north of Coal Road that is affected by the 'potholing' from mine subsidence to be treated in such a way to eliminate the associated risk to human safety. The area affected by potholing has been fenced by the MSB to exclude members of the public inadvertently straying onto the portion of the mine that could pose as a risk to safety. The areas of ground that may collapse into a 'pothole' cannot be accurately predicted in terms of timing and only generally predicted in terms of location. The No. 1 Open Cut Extension is proposed to mine through the 'pothole' area and rehabilitate the land after mining to a stable landform that does not pose a risk to human safety.

As mentioned in **Section 4.8** MCC operates a MSMS for its current operations and this system would be continued for the No. 1 Open Cut Extension. There will be no change to the quantities of, or storage arrangement for dangerous goods as listed on MCC's Licence for the Keeping of Dangerous Goods No 35/021999 as issued by Work Cover.

It should be noted that as the development proposal is not a hazardous industry, as defined in the *SEPP No. 33 Hazardous and Offensive Development,* the requirement under the SEPP for a formal Preliminary Hazard Analysis does not apply.

6.14 Cumulative Impacts

6.14.1 Water

The changes in groundwater levels in the coal measures are largely dictated by the strategy for the No. 2 Underground.

The proposed No. 1 Open Cut Extension will have negligible impact on water levels and aquifers. Water levels will lower the to the base of the Loder Seam instead of the Lewis Seam, which is a drop in elevation of around 10 m. The impacts of the proposed No. 1 Open Cut Extension are expected to be

substantially masked by the development of the Sandy Creek Colliery which will depressurise the St Helliers and Muswellbrook Seams over a large area.

6.14.2 Air Quality

The most significant sources of particulate matter in the future would be expected to be mining, agriculture and human activity in and natural sources. Emissions from local human activity, agriculture and natural sources would be expected to remain at a more or less constant level over the next 10 years. Mining sources may change depending on a number of factors many of which would be difficult to predict. However, because of the prevailing meteorological conditions the principal existing sources of particulate matter, namely Bengalla, Drayton, Dartbrook and Mt Arthur Coal contribute very little to concentrations of particulate matter in the area affected by emissions from the proposed No. 1 Open Cut Extension. The potential future mine of Mt Pleasant is in a similar position in the sense that it would not be expected to significantly affect air quality in the area that will be affected by the proposed No. 1 Open Cut Extension. Therefore it is reasonable to assume that current monitoring represents background conditions that are likely to apply for the life of the project.

6.14.3 Noise Impacts

Worst-case noise impacts at Muswellbrook residences will be during winds generally from the southeastern quadrant. Other operating or approved mines nearest to these residences include Bengalla, Mount Pleasant and Dartbrook, which are all further west/north-west. Therefore, under southeasterly winds, these mines will have their lowest noise impact on Muswellbrook residences when MCC is having its greatest impact.

Conversely, nearby mines will have their maximum noise impact on Muswellbrook residences when winds are from the west to north-west. Under these conditions, this study has shown that the noise level contribution from MCC will drop to well below 25 dB(A).

The above considerations suggest that the proposed MCC No 1 Open Cut Extension will not give rise to cumulative noise impacts at Muswellbrook residences.

6.14.4 Visual Impacts

The proposed No. 1 Open Cut Extension will have a negligible cumulative visual impact with other coal mines or industrial developments.

6.14.5 Hazards

There are no known interactions of the proposed operation of the No. 1 Open Cut Extension that would generate a cumulative effect in relation to environmental or public safety hazards.

6.14.6 Blasting Impacts

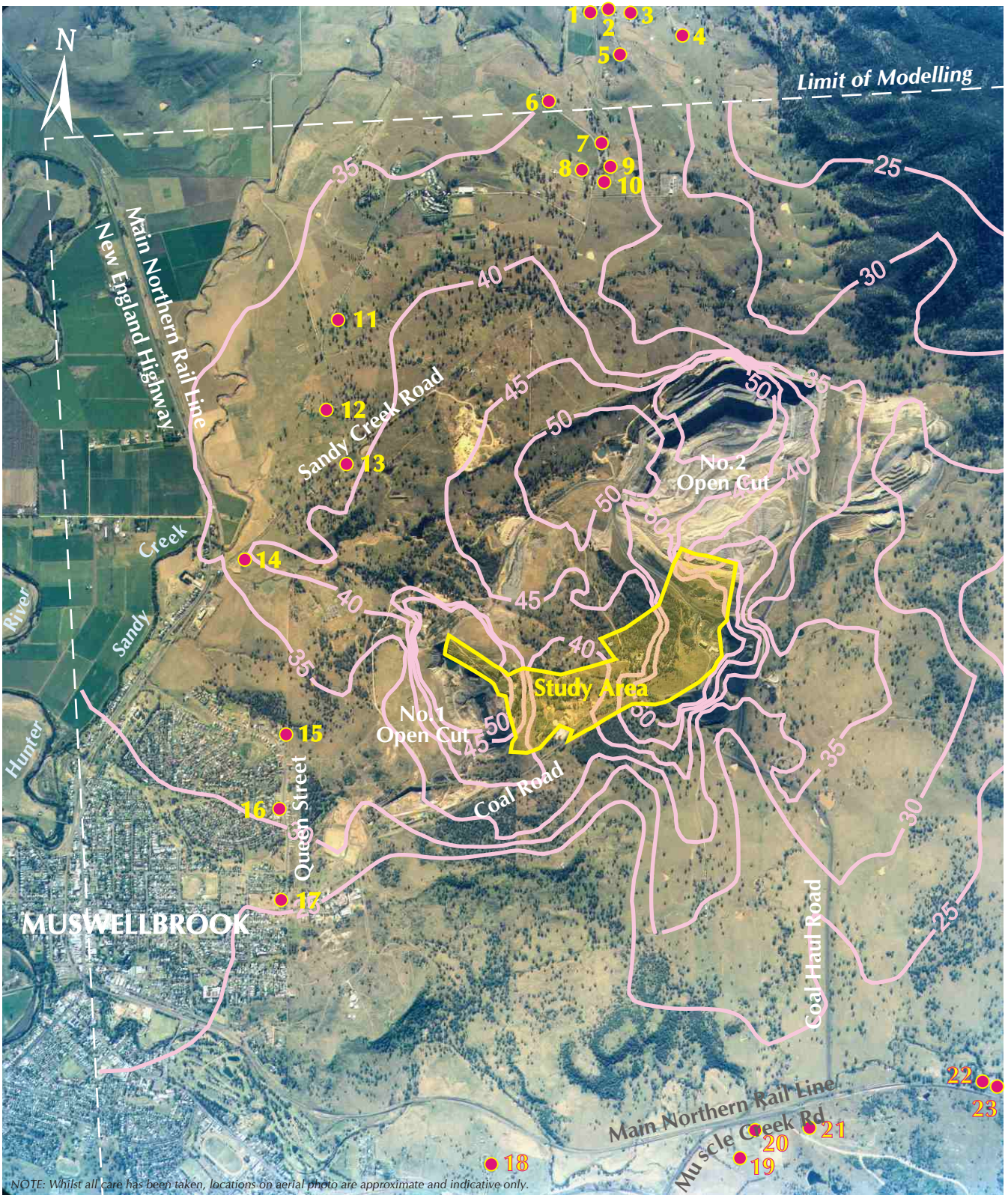
There are no mines immediately adjacent to the existing or planned operations by MCC. Residents that are closest to the No. 1 Open Cut Extension are distant from other mining operations in the Muswellbrook district and vice versa. Impacts from blasting in terms of air quality are encompassed in **Section 6.14.2**. In a similar manner to air quality and noise impacts, it is not expected that the No. 1 Open Cut Extension will give rise to cumulative impacts at Muswellbrook residences.

6.14.7 Rail/Traffic Impacts

There will be no significant change to currently experienced impacts on the local or regional rail and road networks. The cessation of road transport of coal from Mount Arthur Coal's facilities has removed one potential interaction with other mining operations.

6.14.8 Loss of Vegetation and Habitat Impacts

There will be a general regional cumulative impact with the temporary loss of vegetation and faunal habitat due to the No.1 Open Cut Extension. The planned revegetation of much of the mined land with habitat suitable for fauna will alleviate this impact. The revegetation plan specifically seeks to establish a habitat corridor between Bells Mountain and Skeletar Ridge.



LEGEND

8 ● Denotes Residence

Noise Contour dB(A), L_{eq}

SCALE

0 1 2

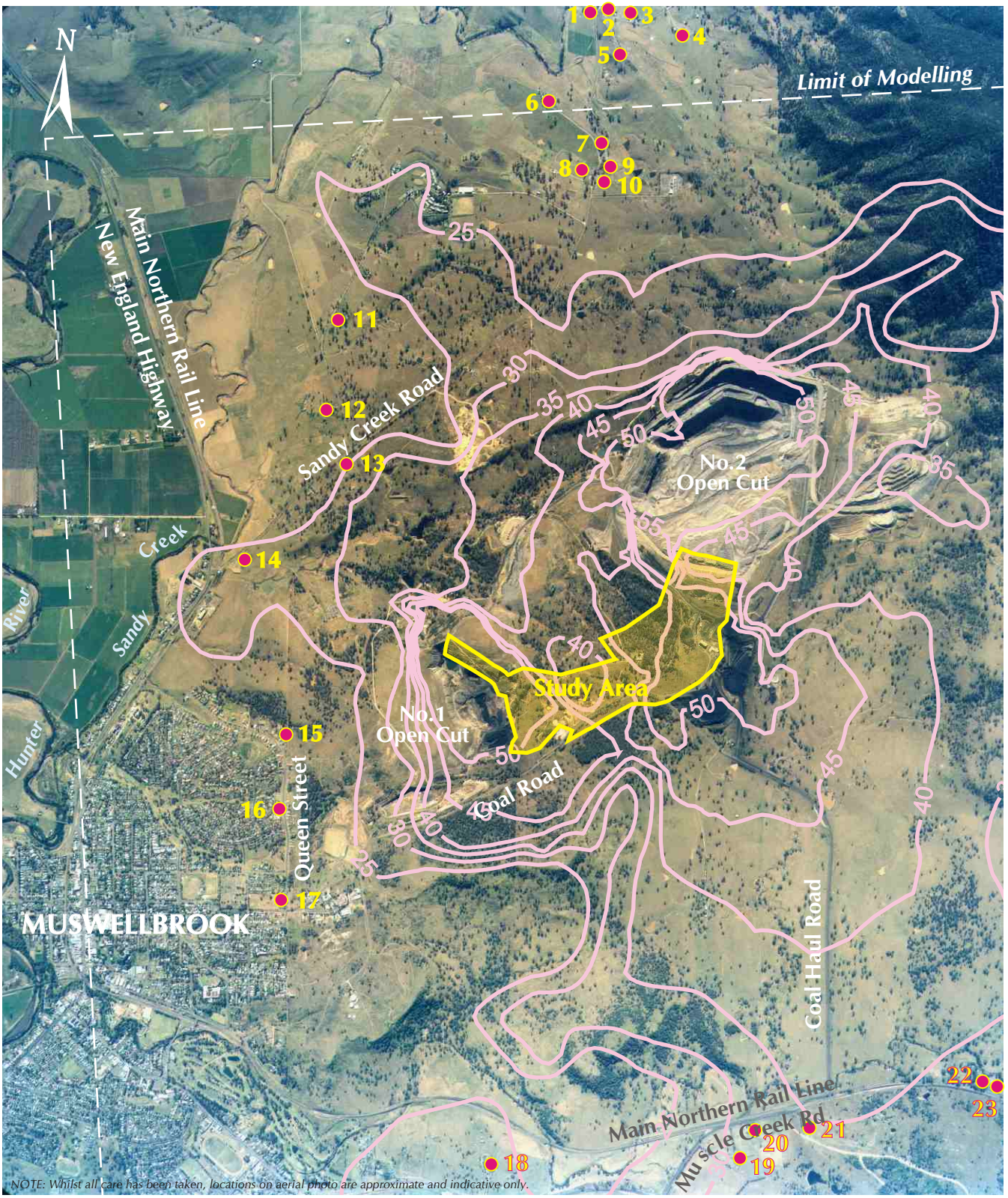
Kilometres

File Name: Y1DLEQSE.CDR

MUSWELLBROOK COAL COMPANY LIMITED

Noise Contours: Year 1 - Excavator in NW Tongue 10m Below Ground SE Wind

FIGURE 6.1



LEGEND

8 ● Denotes Residence

Noise Contour dB(A), L_{eq}

SCALE

0 1 2

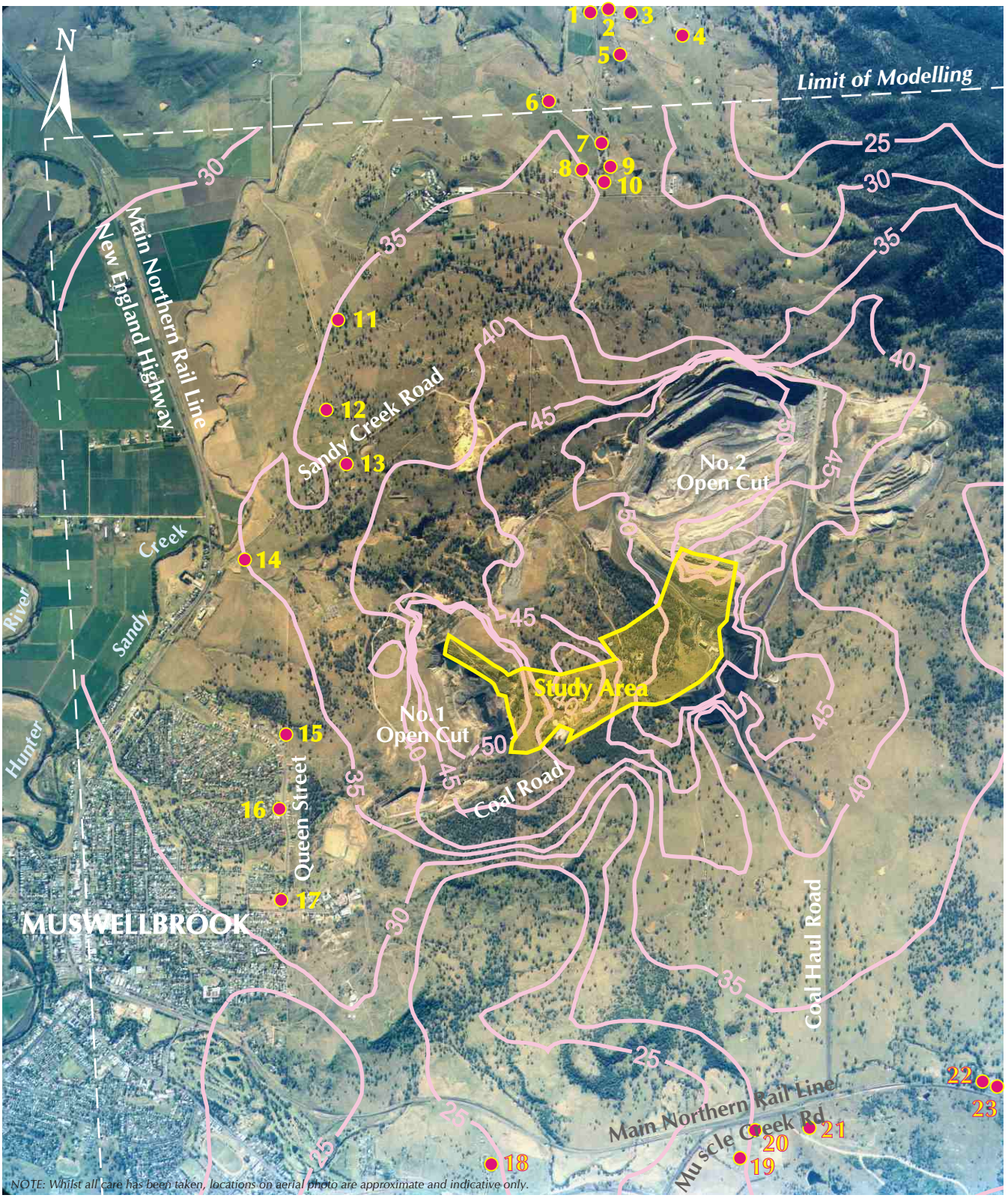
Kilometres

File Name: Y1DLEQNW.CDR

MUSWELLBROOK COAL COMPANY LIMITED

Noise Contours: Year 1 - Excavator in NW Tongue 10m Below Ground NW Wind

FIGURE 6.2



LEGEND

8 ● Denotes Residence

Noise Contour dB(A), L_{eq}

SCALE

0 1 2

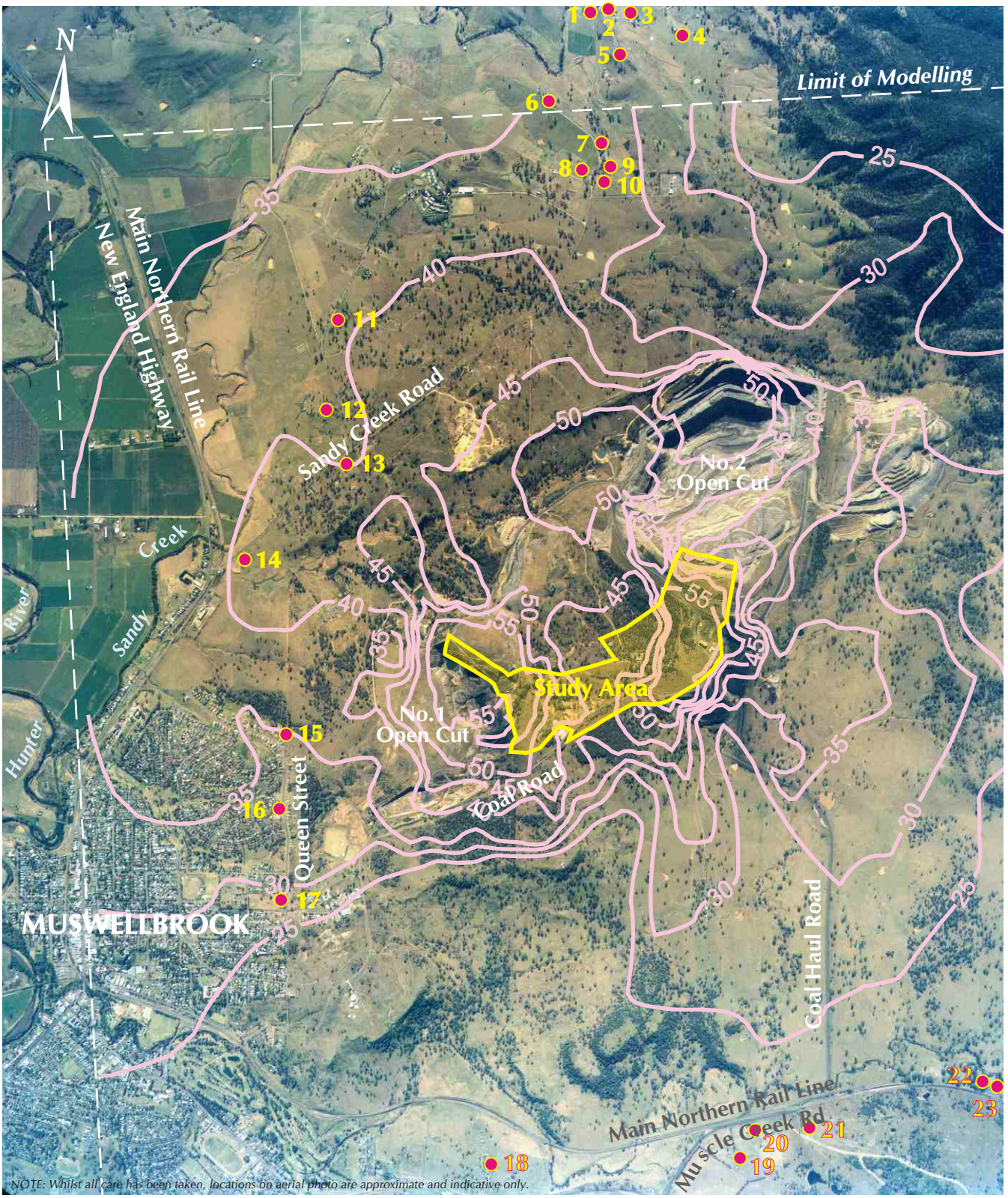
Kilometres

File Name: Y1DLEQIN.CDR

MUSWELLBROOK COAL COMPANY LIMITED

Noise Contours: Year 1 - Excavator in NW Tongue 10m Below Ground Inversion

FIGURE 6.3



NOTE: Whilst all care has been taken, locations on aerial photo are approximate and indicative only.

LEGEND

8 ● Denotes Residence

Noise Contour dB(A), L_{eq}

SCALE

0 1 2

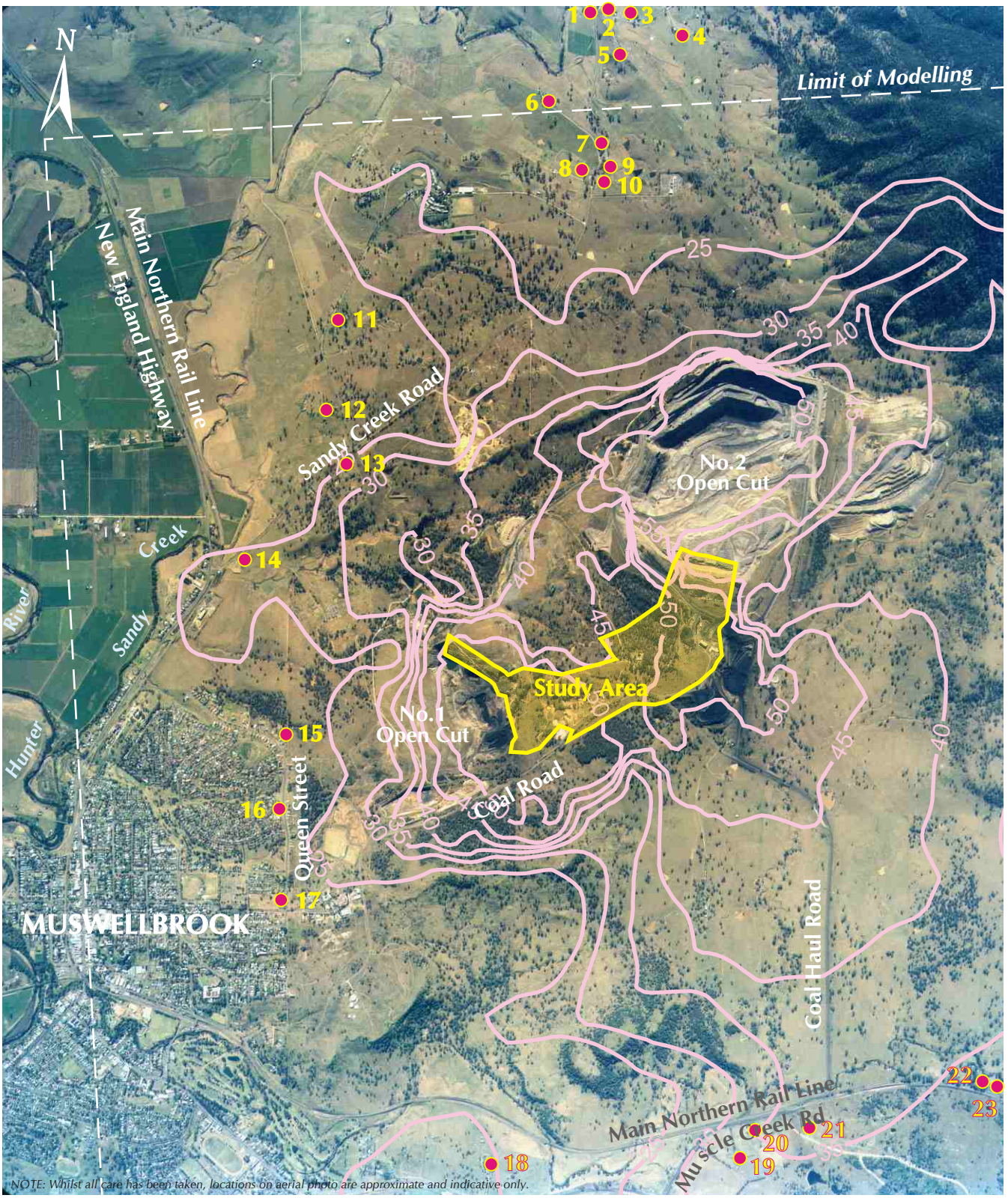
Kilometres

File Name: Y1CLEQSE.CDR

MUSWELLBROOK COAL COMPANY LIMITED

Noise Contours: Year 1 - Excavator at Ground Level Above No.1 Open Cut Highwall SE Wind

FIGURE 6.4



LEGEND

8 ● Denotes Residence

Noise Contour dB(A), L_{eq}

SCALE

0 1 2

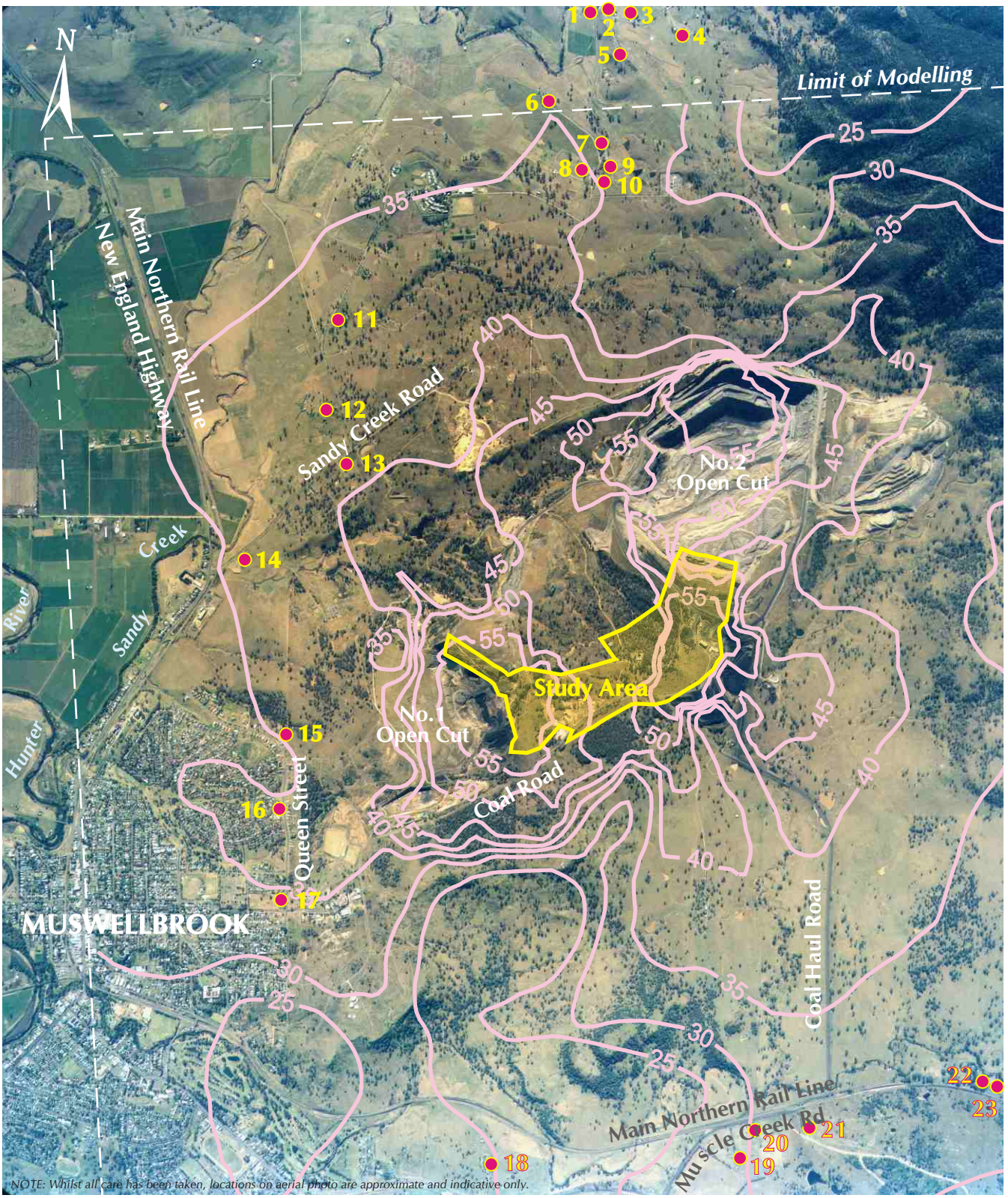
Kilometres

File Name: Y1CLEQNW.CDR

MUSWELLBROOK COAL COMPANY LIMITED

Noise Contours: Year 1 - Excavator at Ground Level Above No.1 Open Cut Highwall NW Wind

FIGURE 6.5



LEGEND

8 ● Denotes Residence

Noise Contour dB(A), L_{eq}

SCALE

0 1 2

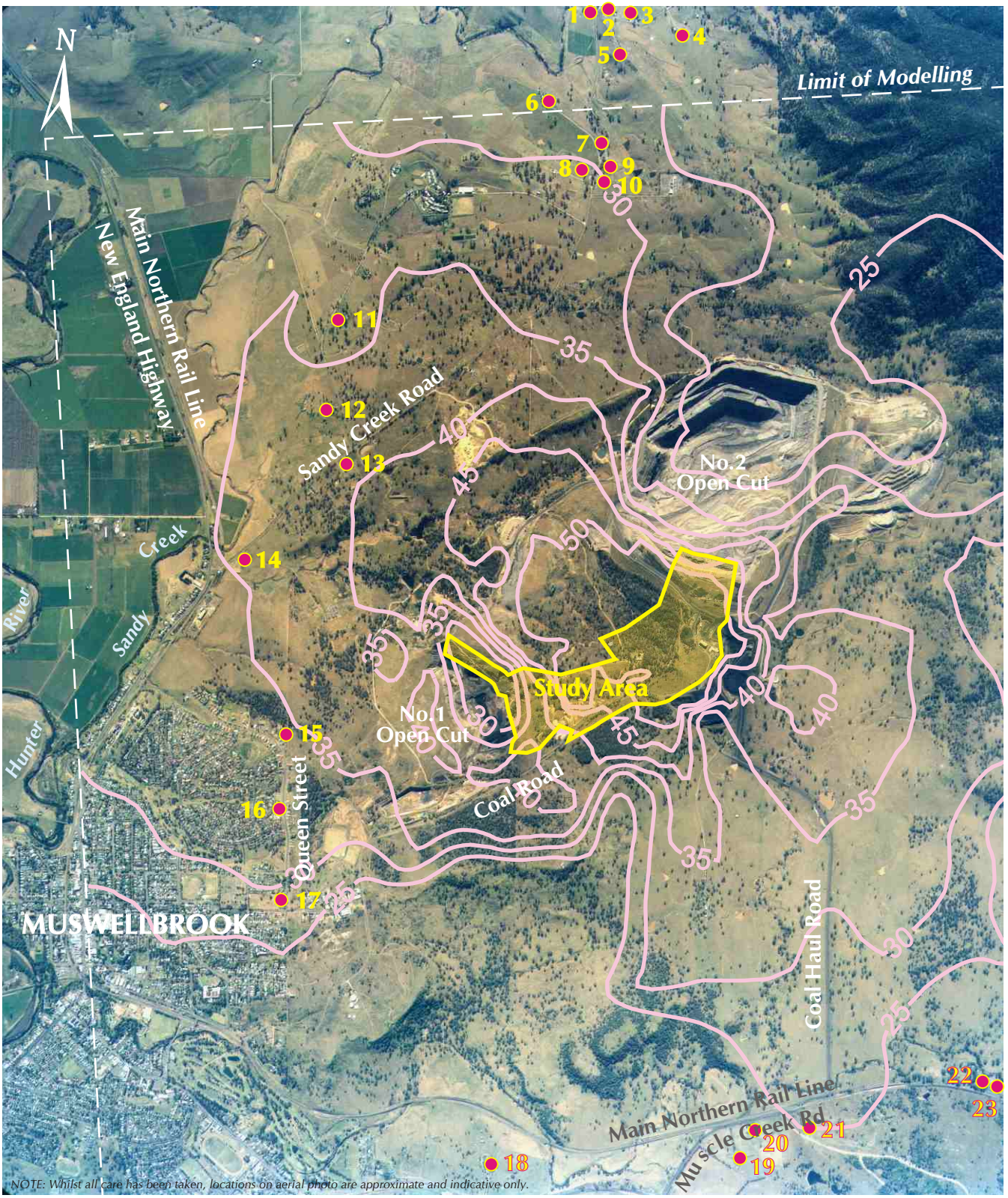
Kilometres

File Name: Y1CLEQIN.CDR

MUSWELLBROOK COAL COMPANY LIMITED

Noise Contours: Year 1 - Excavator at Ground Level Above No.1 Open Cut Highwall Inversion

FIGURE 6.6



LEGEND

8 ● Denotes Residence

Noise Contour dB(A), L_{eq}

SCALE

0 1 2

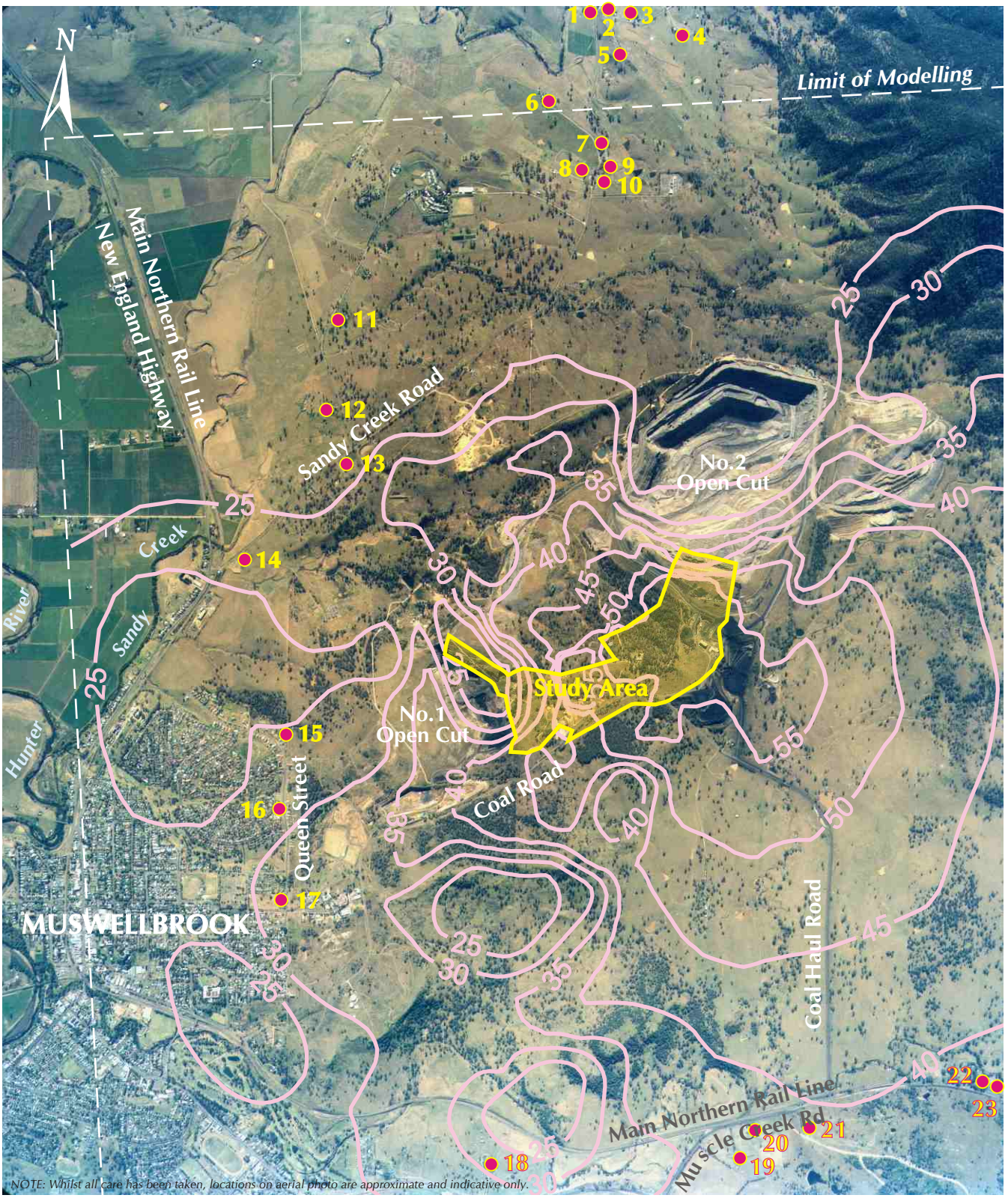
Kilometres

File Name: Y5CLEQSE.CDR

MUSWELLBROOK COAL COMPANY LIMITED

Noise Contours: Year 5 - Excavator at Ground Level Highest Point in Study Area SE Wind

FIGURE 6.7



LEGEND

8 ● Denotes Residence

Noise Contour dB(A), L_{eq}

SCALE

0 1 2

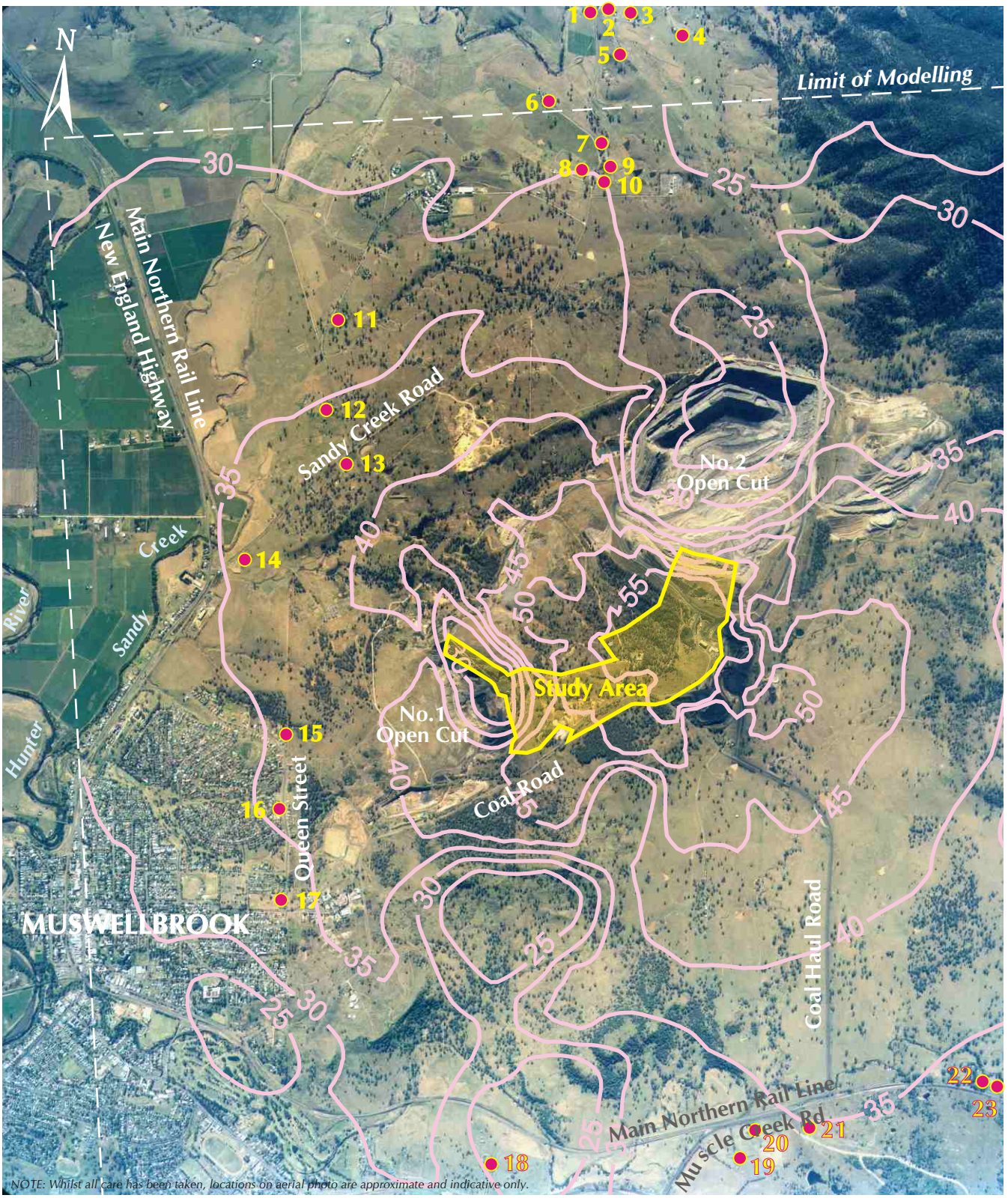
Kilometres

File Name: Y5CLEQNW.CDR

MUSWELLBROOK COAL COMPANY LIMITED

Noise Contours: Year 5 - Excavator at Ground Level Highest Point in Study Area NW Wind

FIGURE 6.8



LEGEND

8 ● Denotes Residence

Noise Contour dB(A), L_{eq}

SCALE

0 1 2

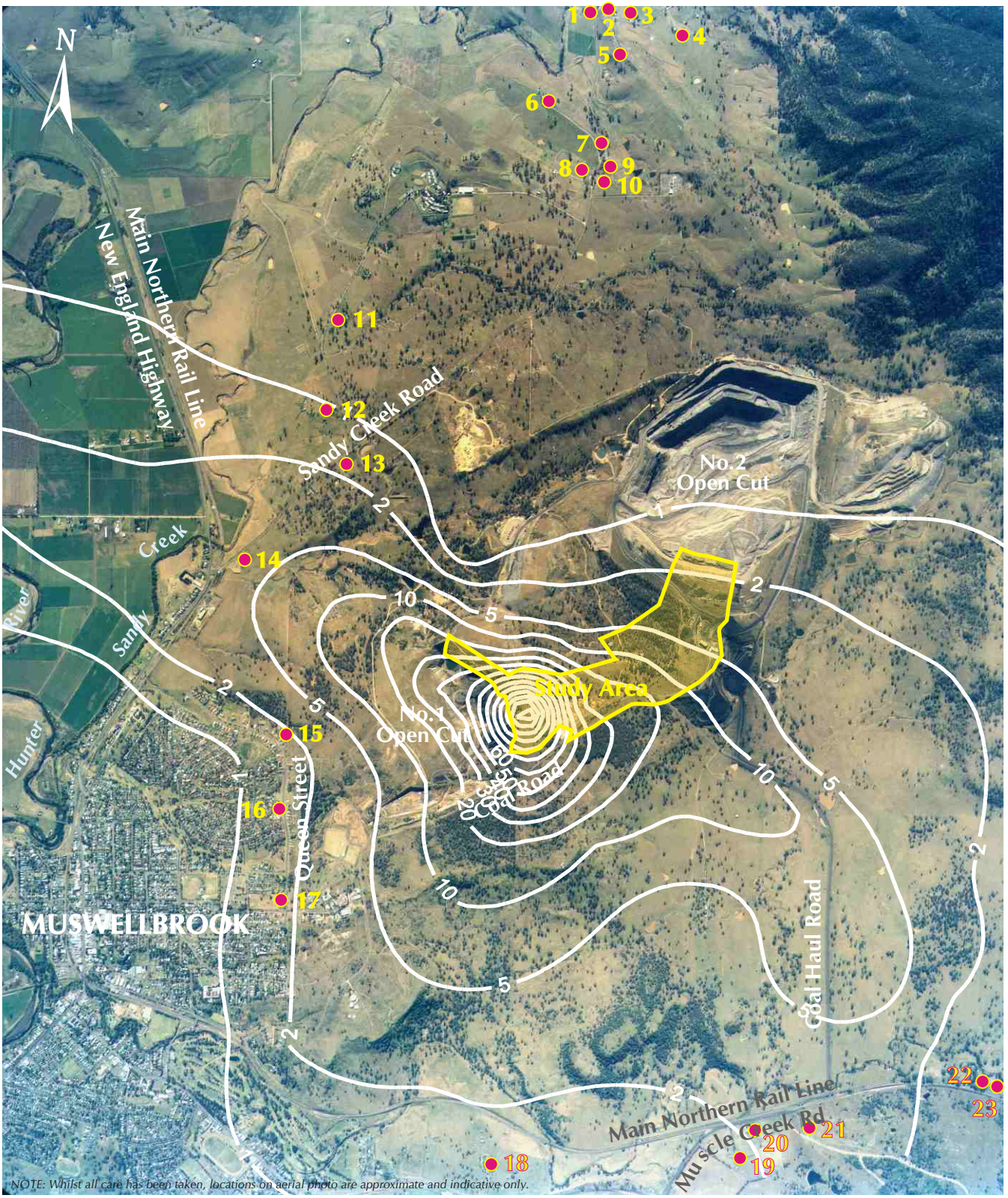
Kilometres

File Name: Y5CLEQIN.CDR

MUSWELLBROOK COAL COMPANY LIMITED

Noise Contours: Year 5 - Excavator at Ground Level Highest Point in Study Area Inversion

FIGURE 6.9



Prepared by: Holmes Air Sciences

LEGEND

8 ● Denotes Residence

SCALE

0 1 2

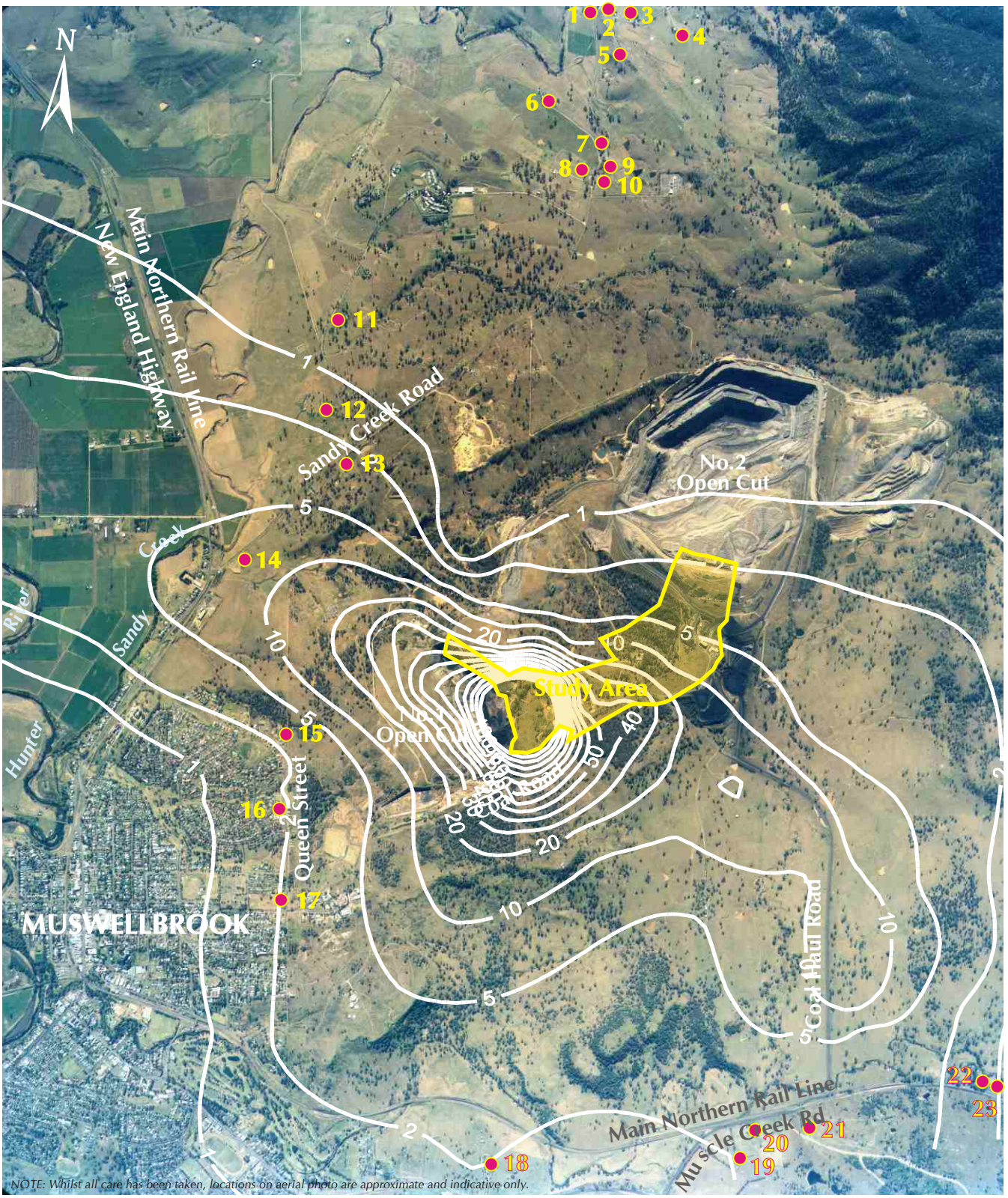
Kilometres

File Name: PM101UGM3.CDR

MUSWELLBROOK COAL COMPANY LIMITED

Predicted Annual Average PM10 Concentrations Due to Emissions from No.1 Open Cut Extension in Year 1 µg/m³

FIGURE 6.10



Prepared by : Holmes Air Sciences

LEGEND

8 ● Denotes Residence

SCALE

0 1 2

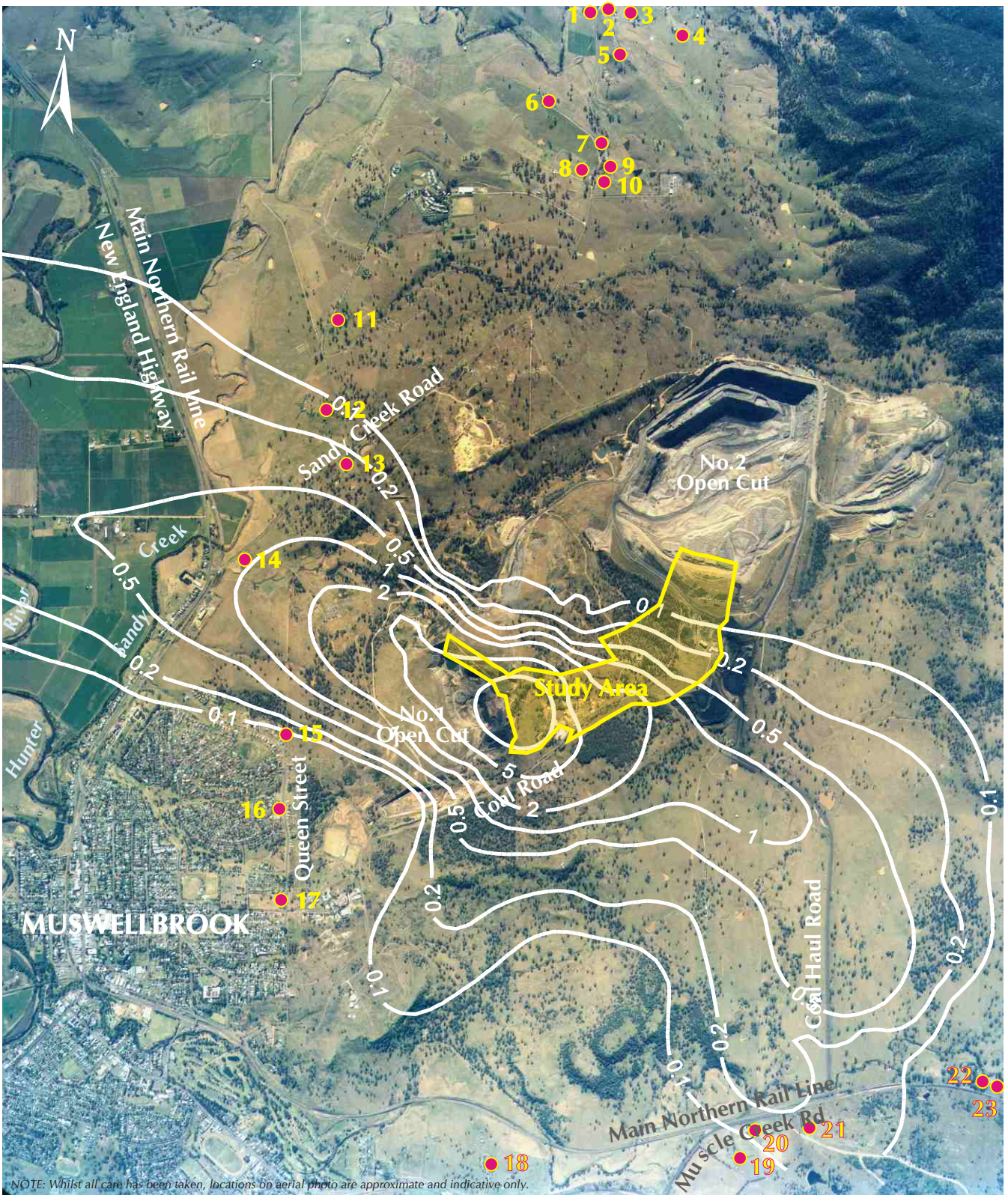
Kilometres

File Name: TSP1UGM3.CDR

MUSWELLBROOK COAL COMPANY LIMITED

Predicted Annual Average TSP Concentrations
Due to Emissions from No.1 Open Cut Extension
in Year 1 µg/m³

FIGURE 6.11



Prepared by: Holmes Air Sciences

LEGEND

8 ● Denotes Residence

SCALE

0 1 2

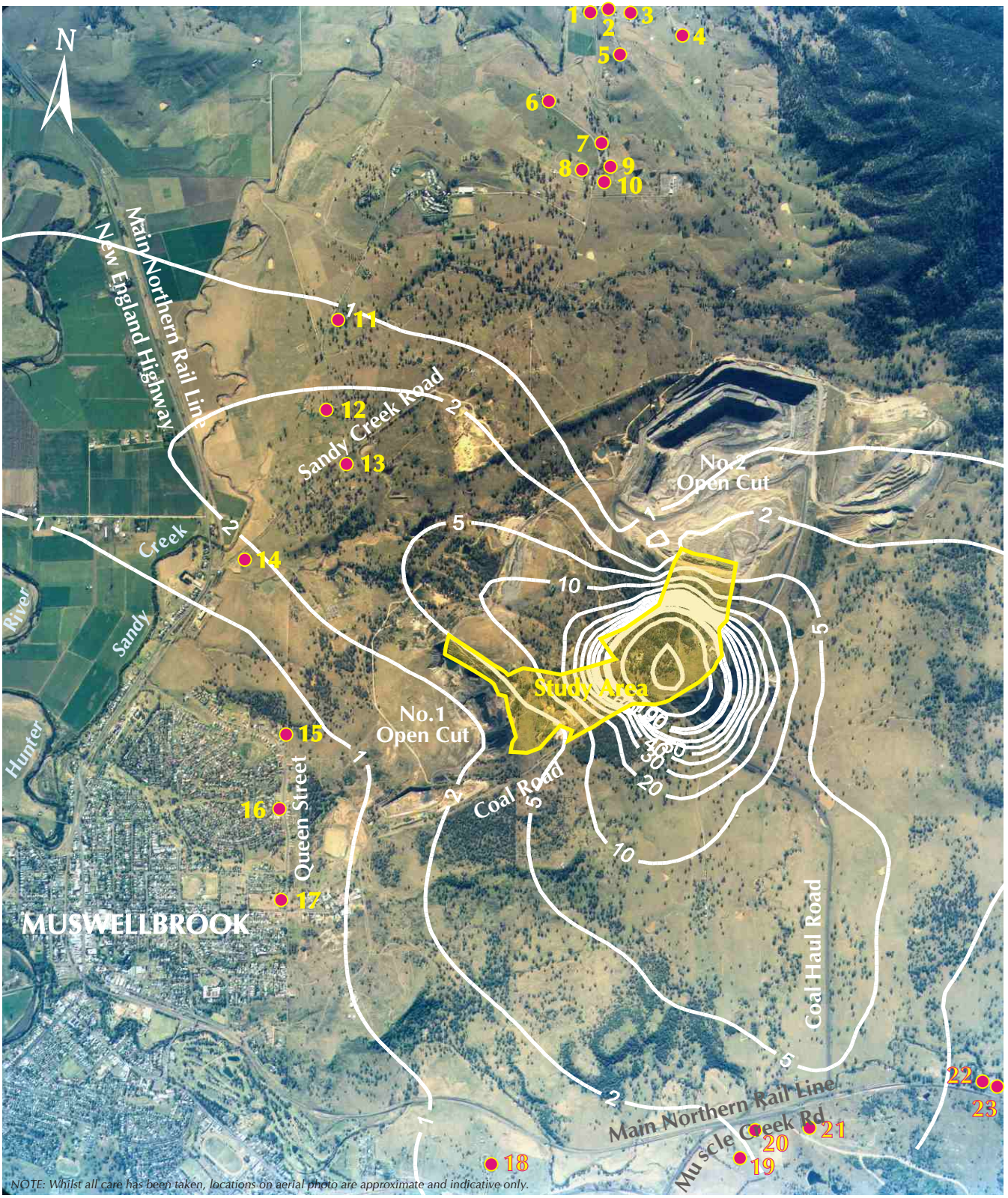
Kilometres

File Name: DUST1UGM3.CDR

MUSWELLBROOK COAL COMPANY LIMITED

Predicted Annual Average Dust Deposition
Due to Emissions from No.1 Open Cut Extension
in Year 1 g/m²/month

FIGURE 6.12



Prepared by : Holmes Air Sciences

LEGEND

8 ● Denotes Residence

SCALE

0 1 2

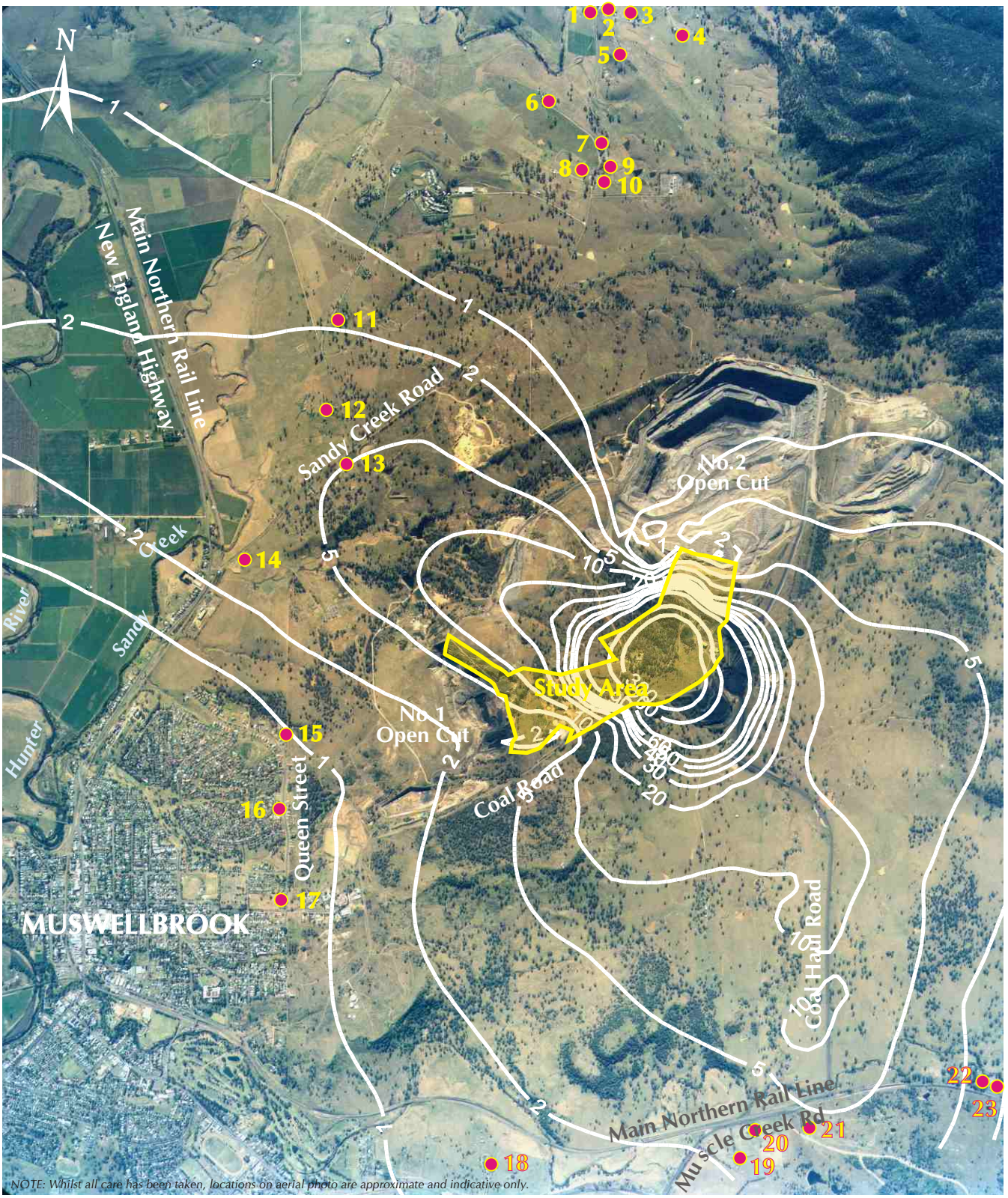
Kilometres

File Name: PM109UGM3.CDR

MUSWELLBROOK COAL COMPANY LIMITED

Predicted Annual Average PM10 Concentrations Due to Emissions from No.1 Open Cut Extension in Year 9 µg/m³

FIGURE 6.13



Prepared by : Holmes Air Sciences

LEGEND

8 ● Denotes Residence

SCALE

0 1 2

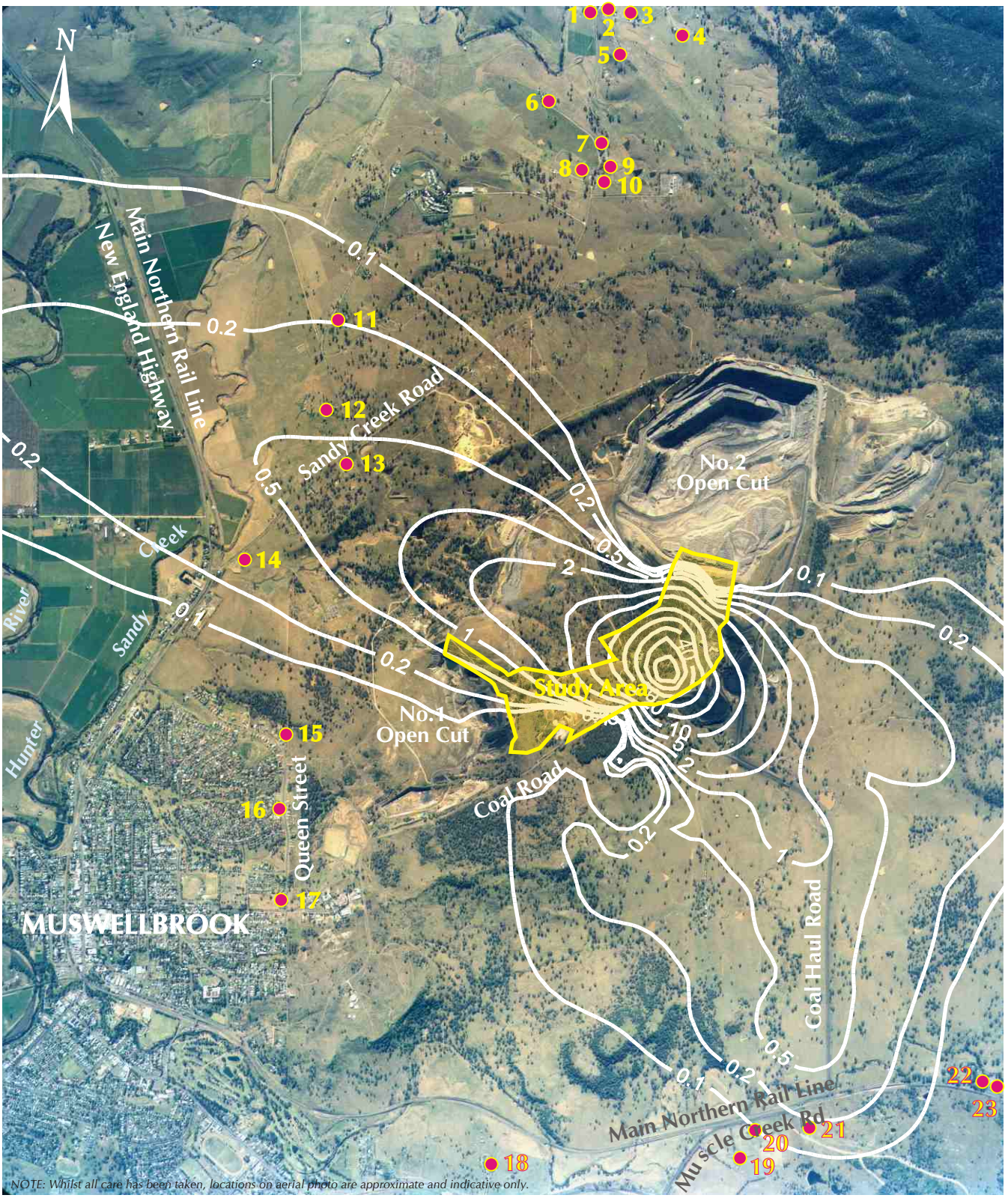
Kilometres

File Name: TSP9UGM3.CDR

MUSWELLBROOK COAL COMPANY LIMITED

Predicted Annual Average TSP Concentrations Due to Emissions from No.1 Open Cut Extension in Year 9 µg/m³

FIGURE 6.14



Prepared by: Holmes Air Sciences

LEGEND

8 ● Denotes Residence

SCALE

0 1 2

Kilometres

File Name: DUST9UGM3.CDR

MUSWELLBROOK COAL COMPANY LIMITED

Predicted Annual Average Dust Deposition
Due to Emissions from No.1 Open Cut Extension
in Year 9 g/m²/month

FIGURE 6.15