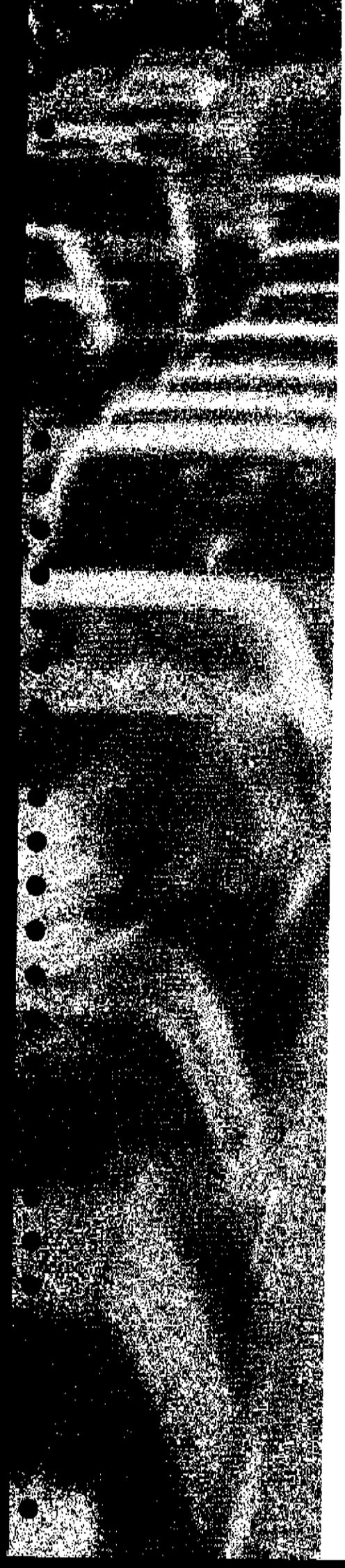

Traffic Noise and Vibration

A228 Leybourne & West Malling Bypass
Environmental Statement
Volume 2 (part)

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Kent County Council
HIGHWAYS & TRANSPORTATION

July 1995

CONTENTS

1.0 INTRODUCTION

1.1 THE ASSESSMENT

1.1.1 This report is a detailed assessment of the noise and vibration effects emanating from the proposed Leybourne Bypass and the widening of West Malling Bypass. It has been produced in accordance with the latest Department of Transport guidance, the Design Manual for Roads and Bridges (DMRB) Volume 11: Environmental Assessment, Section 3 Part 7 August 1994. It forms part of Volume 2 of the Environmental Statement for the proposed Scheme.

1.2 THE PROPOSED SCHEME

1.2.1 The proposed scheme commences at a modified junction 4 on the M20 comprising improvements to the existing roundabout and linking of the west facing slip roads to a new roundabout some 400 metres further west. New west facing slip roads would connect the M20 to this roundabout and the A228 would run southwards from this junction thus bypassing Castle Way and the village of Leybourne.

1.2.2 The dual 2 lane bypass would pass under the A20 and form a new grade separated roundabout junction adjacent to The Hermitage immediately south of the A20. A short link connecting the new roundabout would be constructed to join the A20 at an enlarged roundabout at the existing Castle Way/A20 junction.

12.3 The bypass would then join the existing single carriageway West Malling Bypass at the Lucks Hill bridge which would be re-built to accommodate the new dual 2 lane carriageway. The scheme would then continue to the roundabout junction at Tower View.

1.3 YEAR OF ASSESSMENT

1.3.1 The noise effects for the existing and proposed situations along the A228 corridor between the M20 and the Tower View Roundabout at Kings Hill have been assessed for the following years:

- 1998 Assumed year of opening
- 2013 Design year, 15 years after the proposed year of opening

1.3.2 Noise levels in 1998 represent the situation prior to opening the new road and show the noise levels along Castle Way and West Malling Bypass with the predicted traffic levels for that year. The opening of Leybourne Bypass introduces some instant changes to noise levels as traffic is switched from Castle Way to the new road. Changes in noise levels are assessed for the existing and proposed situations.

1.3.3 The design year 2013 is taken to represent the worst case in terms of noise levels 15 years after the scheme has opened. The design year noise levels have been used to determine which properties may qualify for noise insulation under the Noise Insulation Regulations 1975 and Amendment 1988. A final assessment to determine eligible properties will be undertaken when detailed design of the scheme has been completed.

2.0 Approach to the Assessment

2.1 Introduction

2.1.1 The approach adopted is that given in the Design Manual for Roads and Bridges (DMRB) Volume 11: Environmental Assessment, Section 3 Part 7 August 1994. An assessment has been made for all properties, schools, public footpaths and other noise sensitive locations where noise levels change due to the proposed scheme.

2.1.2 Locations have been classified according to their ambient noise levels in bands of 50 to 60 dB(A), 60 to 70 dB(A) and >70 dB(A). For each ambient noise band, the number of properties and other locations subject to the following increases or decreases have been included: 1-<3dB(A), 3-<5dB(A), 5-<10dB(A), 10–15dB(A) and over 15dB(A).

2.1.3 A noise nuisance assessment has been made showing the number of properties subject to increases or decreases in the percentage of people bothered by noise. This has been made in accordance with the guidance in DMRB and the results are produced in the recommended format.

2.2. Noise Units

2.2.1 The human ear is sensitive to a wide range of sound levels. The sound pressure level of the threshold of pain is over a million times that of the quietest audible sound. Sound is measured on a logarithmic scale which has been adopted as a convenient measure due to the relative magnitude of the numbers involved. This scale is based on reference level of the lowest audible sound; units are given in decibels (dB) and the scale ranges to the threshold of pain at 140 dB.

2.2.2 As the response of the human ear is not constant over all frequencies and does not respond equally to different frequencies at the same level, the decibel scale is not a good measure of loudness. It is therefore usual to weight the measured frequencies to approximate to the human response. This is achieved by using an 'A' weighted electronic filter for noise measurements. The resulting 'A' weighted decibel reading dB(A) has been found to correlate closely to the non-linear and subjective human response. Typical levels of sound expressed in dB(A) are shown in Figure 1.

2.2.3 People's impression of sound intensity is called the 'loudness' of the sound. An increase in sound level of 10 dB(A) is perceived as a doubling in loudness. Hence, 50 dB(A) is twice as loud as 40 dB(A) and 80 dB(A) is twice as loud as 70 dB(A).

2.2.4 Some sounds are acceptable and can be pleasant. When sound becomes annoying or unwanted then it is termed as noise. The reasons why a sound may become annoying are complex. Many factors influence people's perception of sound and to account for this complexity, noise is often expressed in some form of index to represent the level of annoyance or dissatisfaction expected.

2.2.5 Traffic noise is expressed in the UK terms of the $L_{10(18\text{-hour})}$ index. This is the level exceeded for 10 per cent of the time in each of the 18 hours between 6am and midnight and is expressed in $L_{10(18\text{-hour})}$ dB(A) units. A good correlation has been found between this index and the dissatisfaction expressed by residents with existing traffic noise. The Department of Transport has adopted the $L_{10(18\text{-hour})}$ index for the assessment of traffic noise.

2.2.6 Generally, people are able to distinguish a change in noise level of 1 dB(A) when listening to a pure and continuous tone. However, different levels of long term dissatisfaction with traffic noise are found not to occur with $L_{10(18hour)}$ noise levels less than 3 dB(A) apart. A 3 dB(A) increase is typically generated by a doubling in traffic flow.

2.2.7 When two sources of traffic noise occur together the resultant noise level is calculated by adding a correction to the higher of the two levels. The correction is dependent on the difference between the two noise levels. Where the difference between the two noise levels is zero, ie, the two levels are identical, 3dB(A) is added to either noise level to obtain the combined value. Where there is a difference of 6dB(A) the combined level is obtained by adding only 1dB(A) to the higher of the two levels. The procedure for combining noise levels from several sources is given in Calculation of Road Traffic Noise (CRTN), DTp 1988.

2.3 Noise Calculations

2.3.1 All noise calculations were carried out in accordance with the standard method set out in Calculation of Road Traffic Noise, 1988, Department of Transport (Welsh office). This method is based on traffic flows, speeds and the percentage of heavy vehicles which provide a basic noise level. This level is then corrected for such factors as gradient of the road, distance of the receiver from the road, intervening ground cover, angle of view, the shielding effect of barriers and buildings and façade reflection.

2.3.2 The aim of the CRTN method is to enable calculation of road traffic noise levels to be carried out for most situations. Advice is given on the procedures to be adopted in special situations such as at road junctions or for roads with very low traffic flow.

2.3.3 The final figure calculated is strictly applicable to only one position, usually one metre from the façade of a building at a stated height above ground. However, by carrying out a number of calculations at representative positions other façade levels can be interpolated with acceptable accuracy.

2.3.4 The traffic flows on which the noise calculations are based have been derived from the traffic data for the scheme as set out in the Traffic Report. The principal flows used are set out in Table 3.1.

Table 3.1: Principal Traffic Flows

	Without Bypass 1998 18hr Flow	With Bypass	
		1998	2013
Castle Way	27500	3700	4700
Park Road	5500	5500	6500
A20	12700	12700	16700
Leybourne Bypass	–	23800	37200
West Malling Bypass	20700	20700	36800

2.3.5 Road Details

All information related to the road configuration has been obtained from engineering drawings. Details of levels, widths, cuttings embankments and earth mound mitigation measures have been used to carry out the noise calculations. The road surfaces have been assumed to be of impervious bitumen for both the new roads and existing roads.

2.3.6 Ground Details

Field visits provided information on the form, height and location of residential development within the area affected by the scheme. First and ground floor receiver heights were generally taken as 4 metres and 1.8 metres above ground level respectively and free field receiver locations were taken to be 1.5 metres above ground level. Most of the noise levels have been calculated at 4 metres above ground level and therefore represent worst case impacts for two storey buildings.

2.3.7 Noise Measurements

Noise measurements are only necessary in certain circumstances and a recommended procedure is given in CRTN to sample levels that can provide an estimated 18 hour L_{10} noise level. As the rear façades of some Castle Way properties will receive additional noise from the Leybourne Bypass, measurements were taken at three locations to obtain representative existing noise levels. The principal source of noise is from traffic using Castle Way with some additional effects at the northern end from the M20 motorway. The existing noise level was estimated from the sample measurements to give an $L_{10\ 18\ hours}$ level of 54 dB(A).

3.0 Description of Results

3.1 Existing Noise Effects

In 1988, the assumed year of opening, traffic flows on Castle Way would be 27,500 vehicles per day and around 21,000 vehicles per day on West Malling Bypass. Flows on the A20 would be around 13,000 vehicles per day west of Castle Way and 18,000 east of Castle Way.

3.1.1 The resultant noise climate is that properties on Castle Way experience noise levels in excess of 70dB(A) including the school and church. High noise levels are also experienced by properties close to the A20 including some of those in Pump Close. By comparison with Castle Way, there are very few properties along the West Malling Bypass and distances from the road are much greater and noise levels are correspondingly lower, typically below 60dB(A). The remaining properties that are affected by the proposed scheme are along Park Road and Birling Road. In this area the M20 traffic is the dominant noise source and noise levels vary from around 65dB(A) along Park Road to over 70dB(A) in Birling Road close to the M20.

3.2 The Effects of the Scheme

3.2.1 The principal effect of the Leybourne Bypass is to remove the majority of traffic from Castle Way giving reductions in noise levels of over 10dB(A). This very noticeable improvement in the noise climate will benefit around 40 properties and also the Leybourne School and the church. The properties, with indications of the noise level reductions, are

shown on Figure 2 and are also included in the summary Table 1. The other areas affected by the scheme are discussed in the following sections.

3.2.2 Park Road and Birling Road

The proposed road would pass under Park Road in a 5 metre deep cutting and minimise the impact on nearby properties. Four properties close to the road experience increases of 3 to 6 dB(A) and details are shown on Figs 2 and 8. Properties on Birling Road close to the Park Road junction and the M20 experience increases in noise level of 3 to 4 dB(A) the worst affected being No 181 Birling Road where levels increase from 76dB(A) to 79dB(A). The high noise levels experienced at Spiders Hall would be mitigated by a noise fence, a landscaped screen mound and the provision of new higher connector roads which would screen M20 traffic noise. Noise levels would reduce from 74dB(A) to 68dB(A) due to this mitigation. Properties on Birling Road further south would experience an increase from around 56dB(A) to 61dB(A).

3.2.3 Pump Way/Castle Way

The proposed earth mound between the scheme and Pump Close would minimise the effect on the remaining Pump Close properties and limit the noise increase to properties 8, 10 and 12 Pump Close to between 3 to 5 dB(A).

This earth mound was introduced as a design amendment following the public consultation exercise into the Orange and Green Routes. Prior to this a noise fence was proposed adjacent to the bypass and increases in noise level at Nos 2 to 12 Pump Close were in the range of 10 to 15 dB(A). It is considered, therefore, that although four properties close to the new road need to be demolished, the earth mound produces a more satisfactory environmental solution for this location.

The rear of properties 11 to 73 Castle Way experience increases in noise level of berween 5 to 10 dB(A) for number 11 to 41 (15 properties) reducing to 3 to 5 dB(A) for numbers 43 to 53 (6 properties) and 0 to 3 dB(A) for numbers 53 to 73 (10 properties). These increases are generally from a current level of 54dB(A) and therefore forecast levels range from 56 dB(A) at No. 73 to 63 dB(A) at No. 15. These increases compare with reductions to the front facades of the same properties from a level of around 70dB(A) to less than 60 dB(A). As the major change in noise climate is to the front façade of these properties they are shown in Table 1 as properties experiencing a reduction in noise levels.

3.2.4 The Hermitage and More Park Catholic School

The effects of the new road junction have been mitigated by landscaped earth mounds to reduce the effects of noise as much as possible. The noise levels increase by 5 to 10dB(A) from a current level of around 62dB(A) at the Hermitage to a predicted level of 68dB(A). The noise level at the school increases from 60dB(A) to 66dB(A).

3.2.5 Properties along West Malling bypass

Typically noise levels are below 60dB(A) due to the considerable distance from the road. Earth mounds reduce the effects of noise as much as possible and typically increase levels by 5 to 10dB(A) giving predicted levels of 62 to 63dB(A). The closest property to the road on this section is Rathshan and the current level of 61dB(A) increases to 67dB(A).

3.3 Noise Nuisance

3.3.1 The World Health Organisation's definition of noise nuisance is a 'feeling of displeasure evoked by noise'. There is a correlation between public satisfaction and traffic issues. The correlation relates to noise levels to which people have become accustomed and refer to 'steady state' long term dissatisfaction. In the short term people are more sensitive to abrupt changes in traffic noise associated with new road schemes and may find appreciable benefits or disbenefits where noise changes are below 3dB(A). These benefits or disbenefits may last for number of years. In the longer term the perceived noise nuisance levels will settle at a level of dissatisfaction with the new ambient noise level.

3.3.2 The Department of Transport's Design Manual for Roads and Bridges, Volume 11 provides a method for assessing nuisance due to traffic noise. This method has been employed and locations have been classified according to their ambient noise levels in bands of 50 – <60 dB(A), 60 – <70 dB(A) and ≥ 70 dB(A). The results are given in Table 1 and shows that in the 50 to 60 dB(A) range nuisance levels increase by 30 to 40% for 22 properties; in the 60 to 70dB(A) range nuisance levels increase by 30 to 40% for 17 properties and over 40% for 2 properties; in this range noise nuisance decreases by less than 10% for 23 properties, 10 to 20% for 16 properties and 20 – 30% for 1 property; in the 70 to 80 dB(A) range, 1 property experiences an increase in nuisance level of 30 to 40% and 3 properties by more than 40%, 20 properties experience a reduction in nuisance level of 20 to 30%.

3.4 Noise Insulation

3.4.1 Approximately 15 properties may be entitled to insulation against traffic noise through the Noise Insulation Regulations. These properties will be identified when detailed design of the Scheme has been completed and will need to satisfy all the requirements stipulated in the Regulations; viz:

i. they are situated within three hundred metres of the new or altered carriageway;

ii. they will experience noise levels of 68 dB(A) and above in the year 2013;

iii. they will experience noise levels exceeding the 'prevailing noise level' by at least 1 dB(A);

iv. they will experience noise levels whose contribution from traffic using the new or altered highways is not less than 1dB(A).

4.0 Possible Vibration Effects

4.1 Vibration caused by traffic is a low frequency disturbance producing both possible movement in buildings and annoyance to the occupants. Vibration can be transmitted through the ground or the air. The frequency of airborne vibration from traffic is typically below 200 Herts (Hz) and is produced by engines and exhausts of the vehicles (principally heavy goods vehicles). The effect of airborne vibration is to cause annoyance by causing elements of the building to vibrate. Ground borne vibration is produced either by the interaction of the vehicle's rolling wheels and road irregularities or by plant used by the contractor during the construction of the road. This type of vibration is usually in the 8 to 10 Hz range.

4.2 Extensive research on a wide variety of buildings of various ages and types has been carried out, and no evidence has been found to support the theory that traffic induced vibrations are a source of significant damage to buildings. Minor cracking of plaster may possibly occur at high exposure sites but this is often only experienced when traffic vibrations trigger other stresses in the building (such as differential settlement).

4.3 The reduction in traffic flows on Castle Way, particularly heavy goods vehicles, will reduce any effect of airborne vibration and groundborne vibration caused by road surface irregularities. Relief from rattling windows and vibrating 'live' flows often associated with traffic induced vibration, is perceived as a considerable environmental benefit for these properties.

4.4 Where noise levels are above 74 dB(A) appreciable vibration nuisance may be experienced by residents of the exposed properties. Very few properties come into this category and are, in the main, close to the M20 and already experiencing high noise levels. It is therefore considered that nuisance from vibration will not become significantly greater.

4.5 The vibration experienced by the properties adjacent to the proposed carriageway due to construction work will be dependent upon the distance between the source and the receiver, the energy of the cycle, the ground conditions and the construction of the receiver structure. As the exact method of working, and the numbers and type of plant to be employed on the construction site are not known, it is not practicable to attempt to calculate vibration levels at this time. In order to keep construction noise and vibration to acceptable levels suitable clauses will be incorporated into the contract documents, particularly concerning working practices, together with night and weekend working times.

SUMMARY TABLE 1

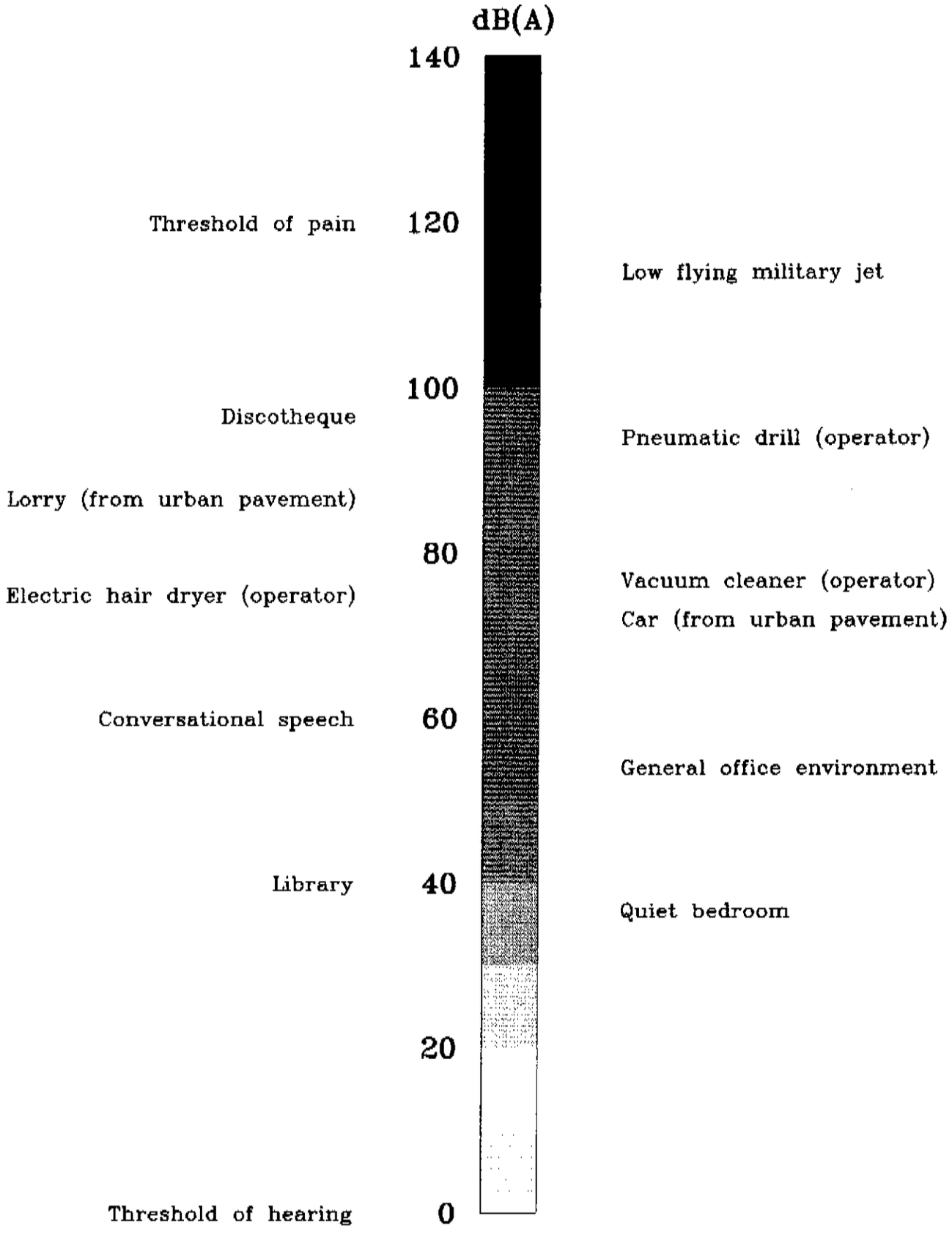
		Residential Property	Community Facilities	Comments
Ambient Noise Band $L_{A10\ 18HR}$ dB	50–60			
Increase in Noise Level $L_{A10\ 18HR}$ dB	1<3	0	Manor Park Country Park – Public Footpath MR130 Wood Meadow	Footpaths used by very few people per day
	3<5	7		
	5<10	15		
	10<15	0		
	≥15	0		
Increase in Nuisance Level	<10%	0	–	–
	10<20%	0		
	20<30%	0		
	30<40%	22		
	≥40%	0		
Decrease in Noise Level $L_{A10\ 18HR}$ dB	1<3	0	–	–
	3<5	0		
	5<10	0		
	10<15	0		
	≥15	0		
Decrease in Nuisance Level	<10%	0	–	–
	10<20%	0		
	20<30%	0		
	30–40%	0		
	≥40%	0		

SUMMARY TABLE 1 (CONTINUED)

		Residential Property	Community Facilities	Comments
Ambient Noise Band $L_{A10,18hrdB}$	60–70			
Increase in Noise Level	1<3	0	Including Thomas More Church & The Hermitage Including More Park School	Grade II Listed Building Primary School 250 pupils
	3<5	10		
	5<10	7		
	10<15	2		
	≥15	0		
Increase in Nuisance Level	<10%	0		–
	10<20%	0		
	20<30%	0		
	30<40%	17		
	≥40%	2		
Decrease in Noise Level $L_{A10,18hrdB}$	1<3	0	Including Leybourne School Leybourne Castle and grounds	Primary School 240 pupils Scheduled Ancient Monument and Listed Building
	3<5	23		
	5<10	16		
	10<15	1		
	≥15	0		
Decrease in Nuisance Level	<10%	23		–
	10<20%	16		
	20<30%	1		
	30–40%	0		
	≥40%	0		

SUMMARY TABLE 1 (CONTINUED)

		Residential Property	Community Facilities	Comments
Ambient Noise Band $L_{A10,18h}$ dB	70–80			
Increase in Noise Level $L_{A10,18h}$ dB	1<3	1	–	
	3<5	3		
	5<10	0		
	10<15	0		
	≥15	0		
Increase in Nuisance Level	<10%	0		–
	10<20%	0		
	20<30%	0		
	30<40%	1		
	≥40%	3		
Decrease in Noise Level $L_{A10,18h}$ dB	1<3	0	St Peter and St Pauls church	–
	3<5	0		
	5<10	1		
	10<15	20		
	≥15	0		
Decrease in Nuisance Level	<10%	0		–
	10<20%	1		
	20<30%	20		
	30–40%	0		
	≥40%	0		



A228 LEYBOURNE AND WEST MALLING BYPASS

Typical sound levels on the dB(A) scale

Figure 1

HA 044/027/000141 1

ENVIRONMENT & LANDSCAPE
Environmental Statement

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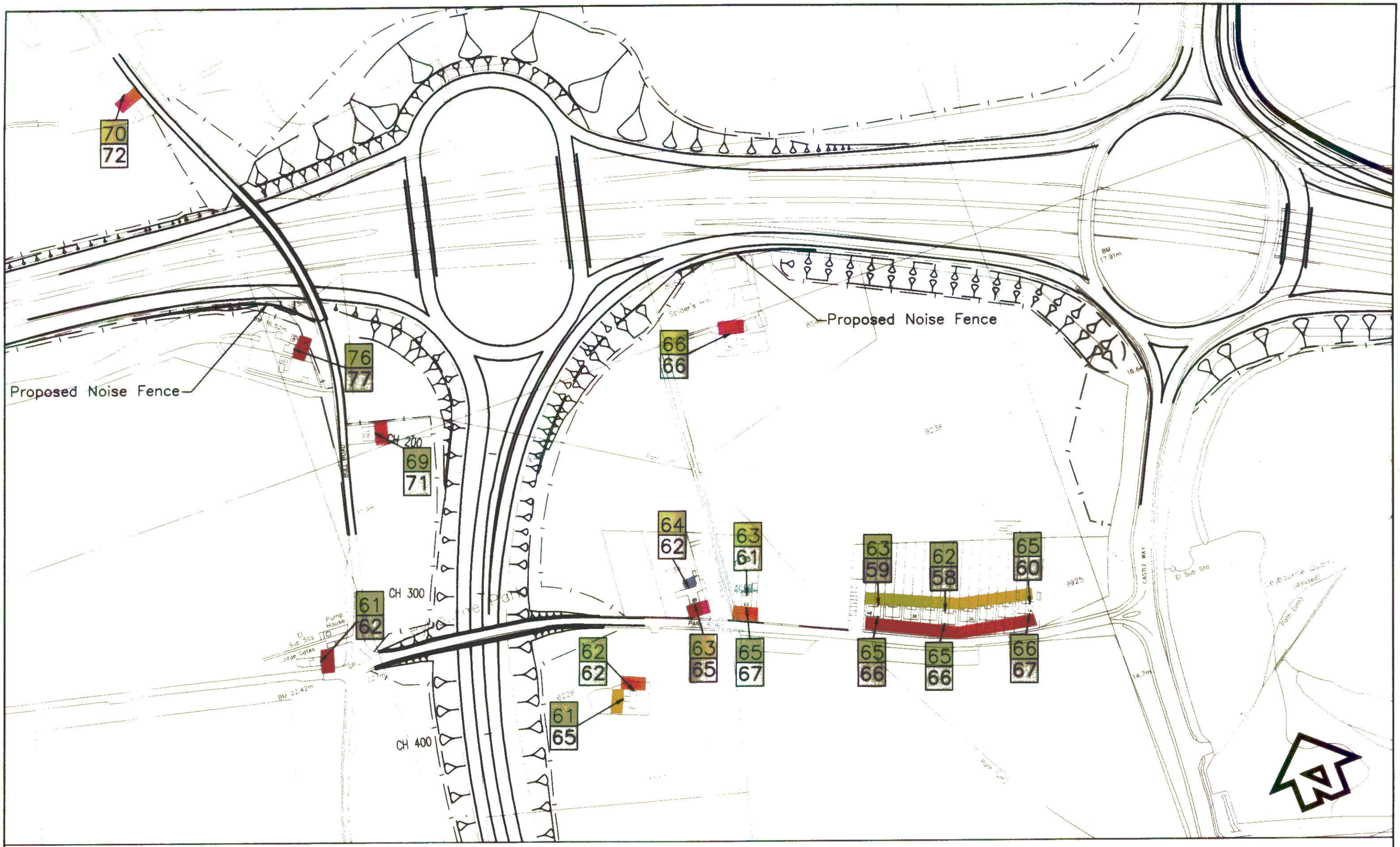
A228 LEYBOURNE & WEST MALLING BYPASS – ENV. STATEMENT VOLUME 2 – TRAFFIC NOISE & VIBRATION 07/95



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NOISE PLANS
Figure 2

sheet 1 of 6

LEGEND

- Increase in noise of between 0 & 3dBA
- Increase in noise of between 3 & 5dBA
- Increase in noise of between 5 & 10dBA
- Increase in noise of between 10 & 15dBA
- Reduction in noise of between 0 & 3dBA
- Reduction in noise of between 3 & 5dBA
- Reduction in noise of between 5 & 10dBA
- Reduction in noise of between 10 & 15dBA

KEY

57 / 62 — Existing 1998 Noise Level / Proposed 1998 Noise Level

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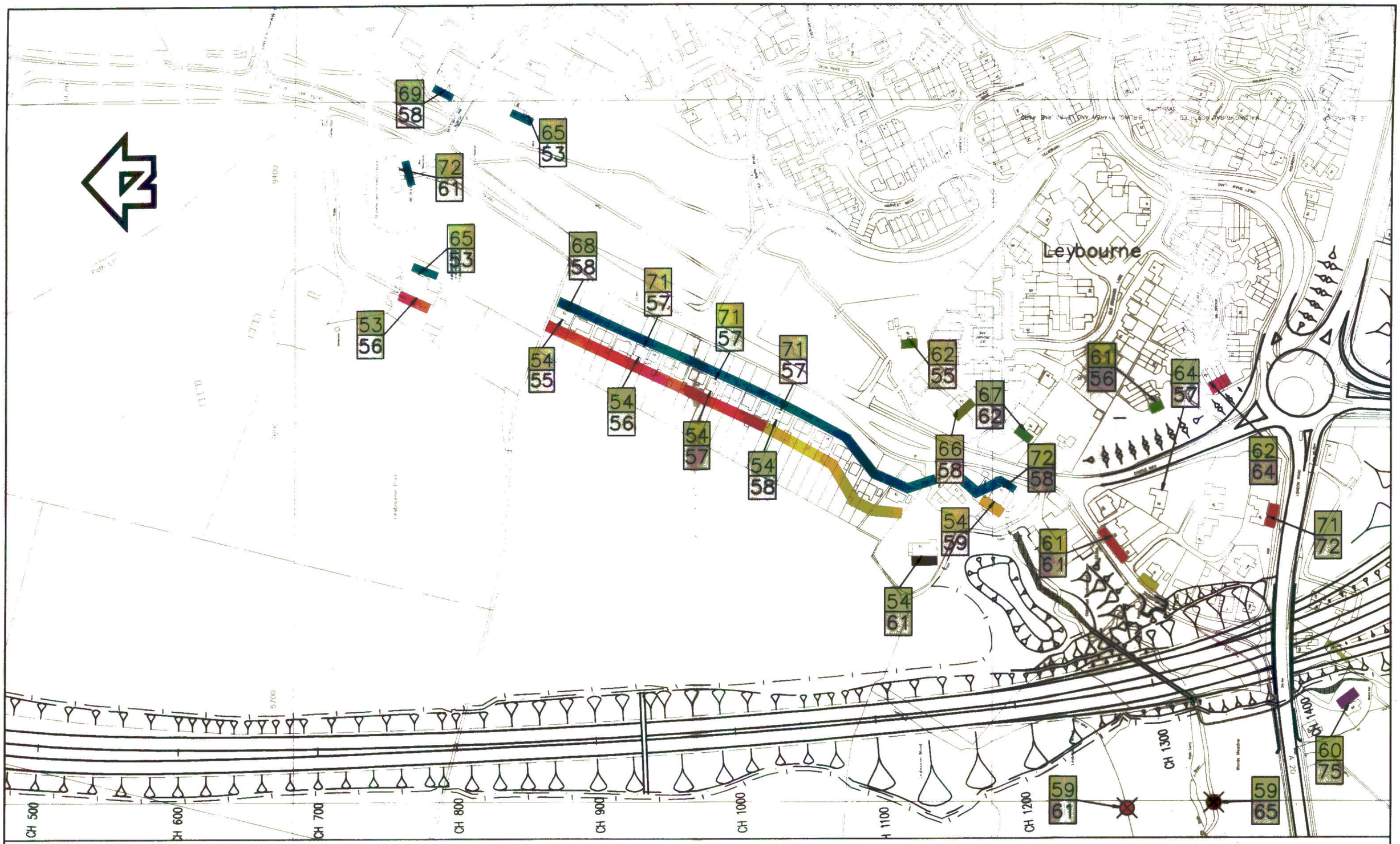
NOISE PLANS
Figure 3

LEGEND

- Increase in noise of between 0 & 3dBA
- Increase in noise of between 3 & 5dBA
- Increase in noise of between 5 & 10dBA
- Increase in noise of between 10 & 15dBA
- Reduction in noise of between 0 & 3dBA
- Reduction in noise of between 3 & 5dBA
- Reduction in noise of between 5 & 10dBA
- Reduction in noise of between 10 & 15dBA

KEY

57 / 62 — Existing 1998 Noise Level / Proposed 1998 Noise Level



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NOISE PLANS
Figure 4

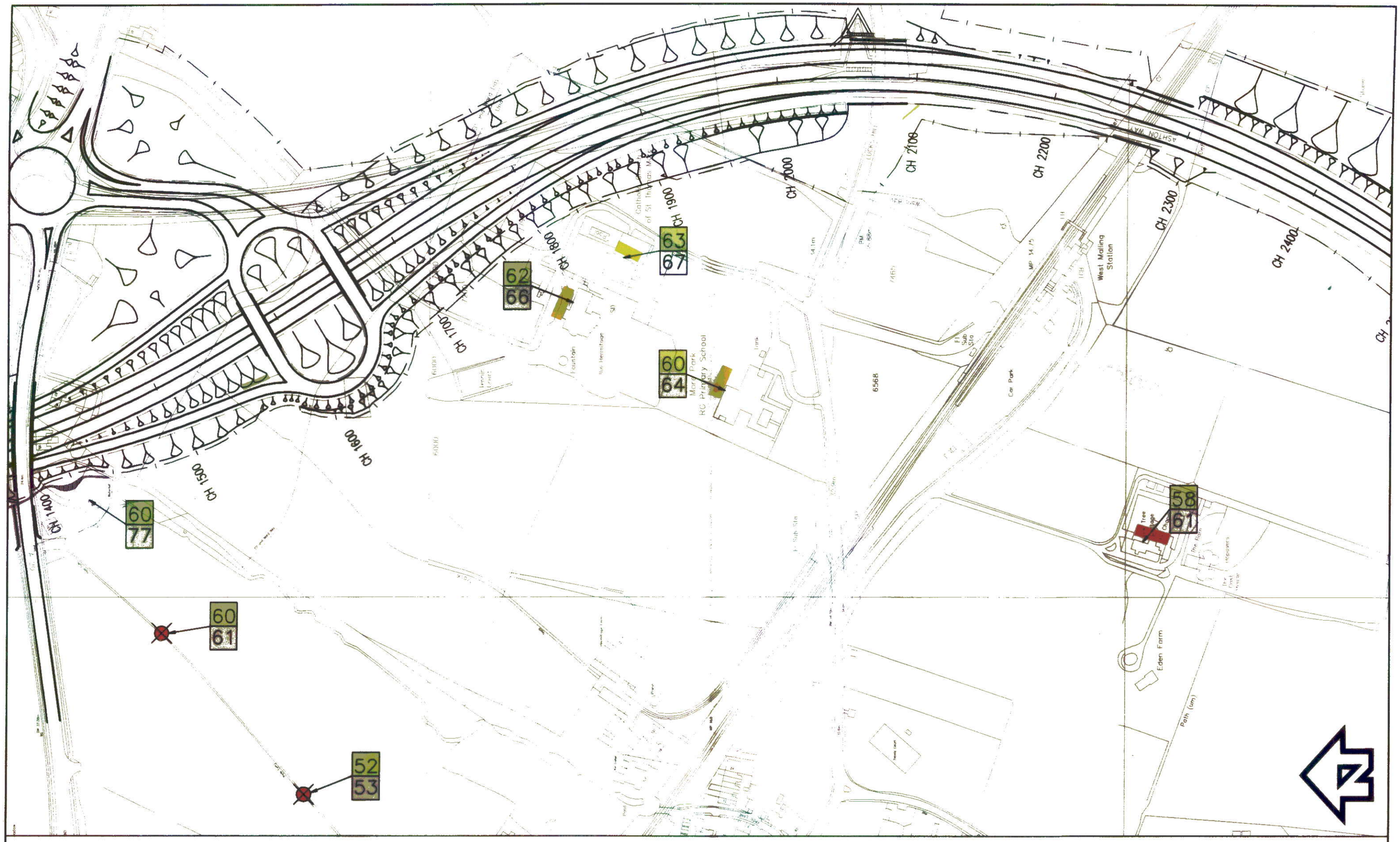
sheet 3 of 6

LEGEND

- Increase in noise of between 0 & 3dBA
- Increase in noise of between 3 & 5dBA
- Increase in noise of between 5 & 10dBA
- Increase in noise of between 10 & 15dBA
- Reduction in noise of between 0 & 3dBA
- Reduction in noise of between 3 & 5dBA
- Reduction in noise of between 5 & 10dBA
- Reduction in noise of between 10 & 15dBA

KEY

57 Existing 1998 Noise Level
62 Proposed 1998 Noise Level



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NOISE PLANS
Figure 5

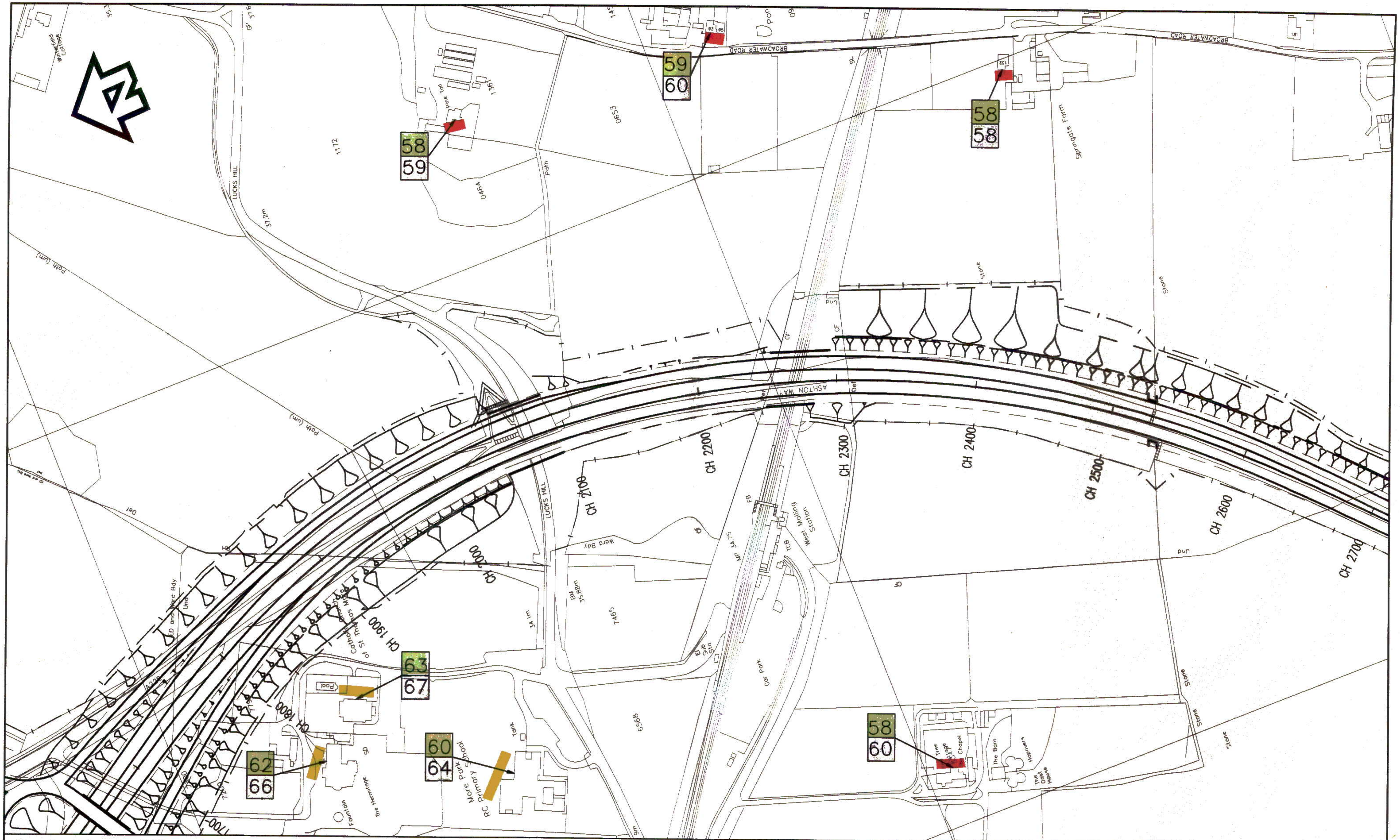
sheet 4 of 6

LEGEND

- Increase in noise of between 0 & 3dBA
- Increase in noise of between 3 & 5dBA
- Increase in noise of between 5 & 10dBA
- Increase in noise of between 10 & 15dBA
- Reduction in noise of between 0 & 3dBA
- Reduction in noise of between 3 & 5dBA
- Reduction in noise of between 5 & 10dBA
- Reduction in noise of between 10 & 15dBA

KEY

57 / 62 — Existing 1998 Noise Level / Proposed 1998 Noise Level



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NOISE PLANS
Figure 6

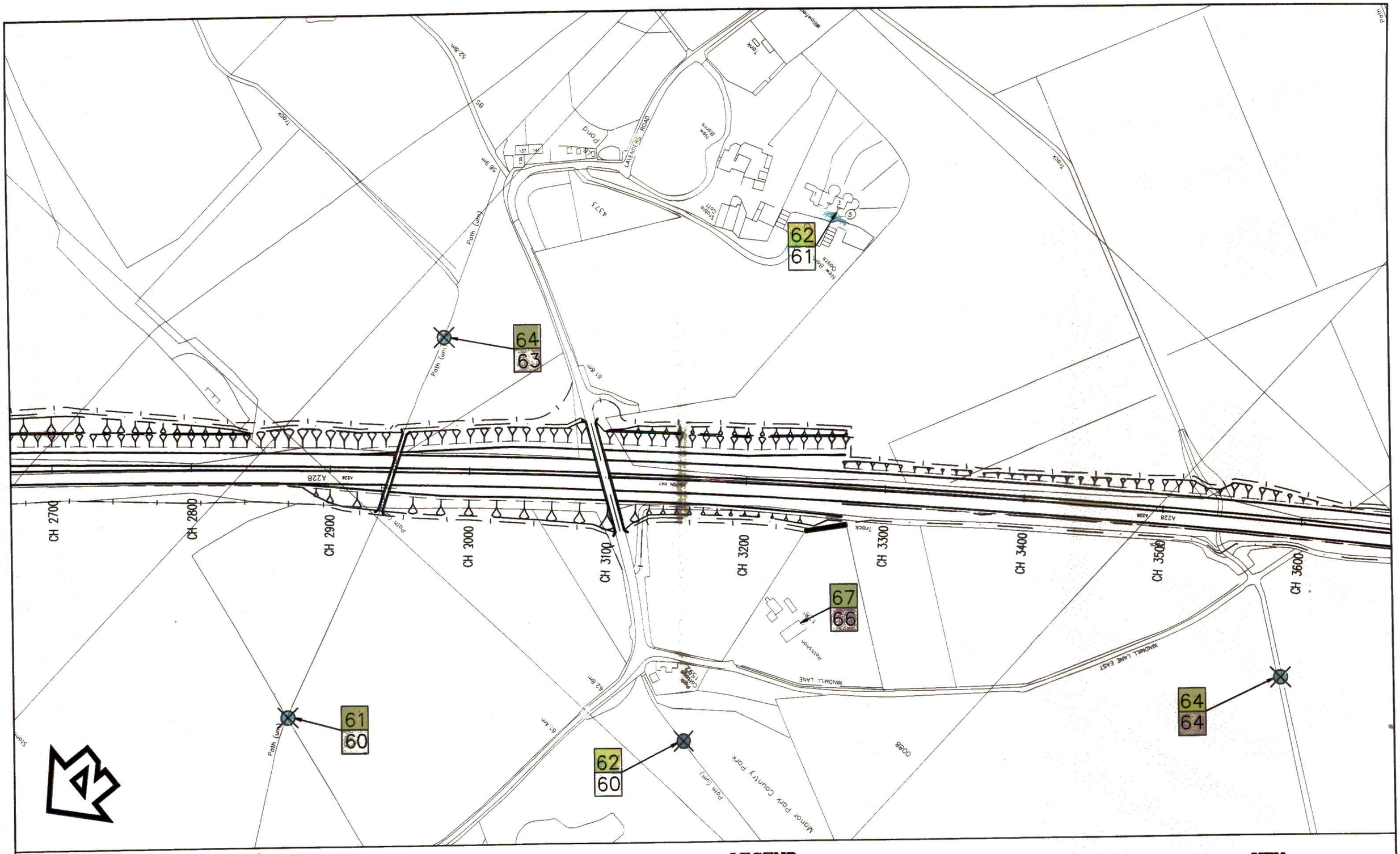
sheet 5 of 6

LEGEND

Increase in noise of between 0 & 3dBA	Reduction in noise of between 0 & 3dBA
Increase in noise of between 3 & 5dBA	Reduction in noise of between 3 & 5dBA
Increase in noise of between 5 & 10dBA	Reduction in noise of between 5 & 10dBA
Increase in noise of between 10 & 15dBA	Reduction in noise of between 10 & 15dBA

KEY

57 Existing 1998 Noise Level
62 Proposed 1998 Noise Level



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NOISE PLANS
Figure 7

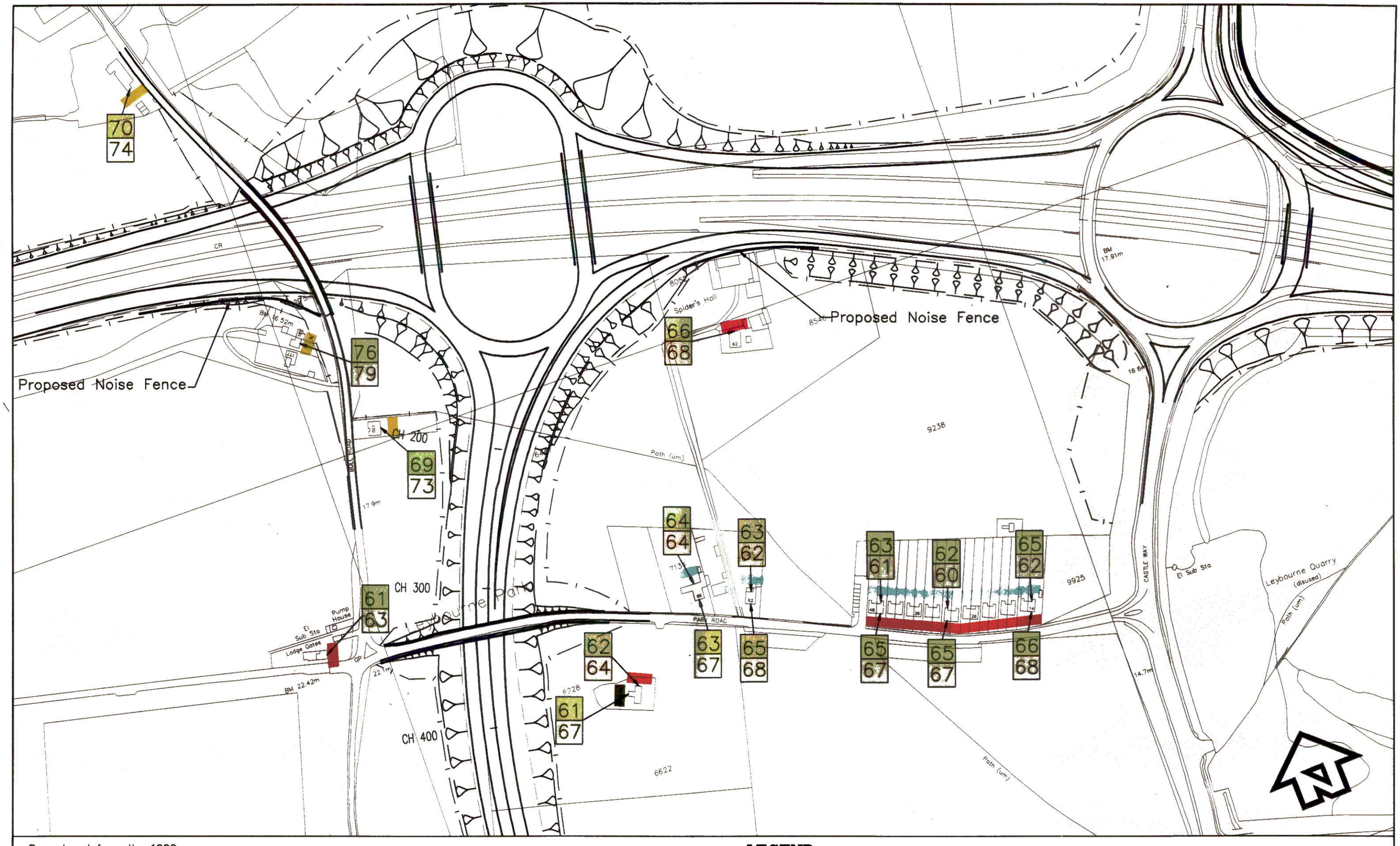
sheet 6 of 6

LEGEND

- Increase in noise of between 0 & 3dBA
- Increase in noise of between 3 & 5dBA
- Increase in noise of between 5 & 10dBA
- Increase in noise of between 10 & 15dBA
- Reduction in noise of between 0 & 3dBA
- Reduction in noise of between 3 & 5dBA
- Reduction in noise of between 5 & 10dBA
- Reduction in noise of between 10 & 15dBA

KEY

- 57 Existing 1998 Noise Level
- 62 Proposed 1998 Noise Level



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NOISE PLANS
Figure 8

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LEGEND

- Increase in noise of between 0 & 3dBA
- Increase in noise of between 3 & 5dBA
- Increase in noise of between 5 & 10dBA
- Increase in noise of between 10 & 15dBA
- Reduction in noise of between 0 & 3dBA
- Reduction in noise of between 3 & 5dBA
- Reduction in noise of between 5 & 10dBA
- Reduction in noise of between 10 & 15dBA

KEY

57 Existing 1998 Noise Level
62 Proposed 2013 Noise Level

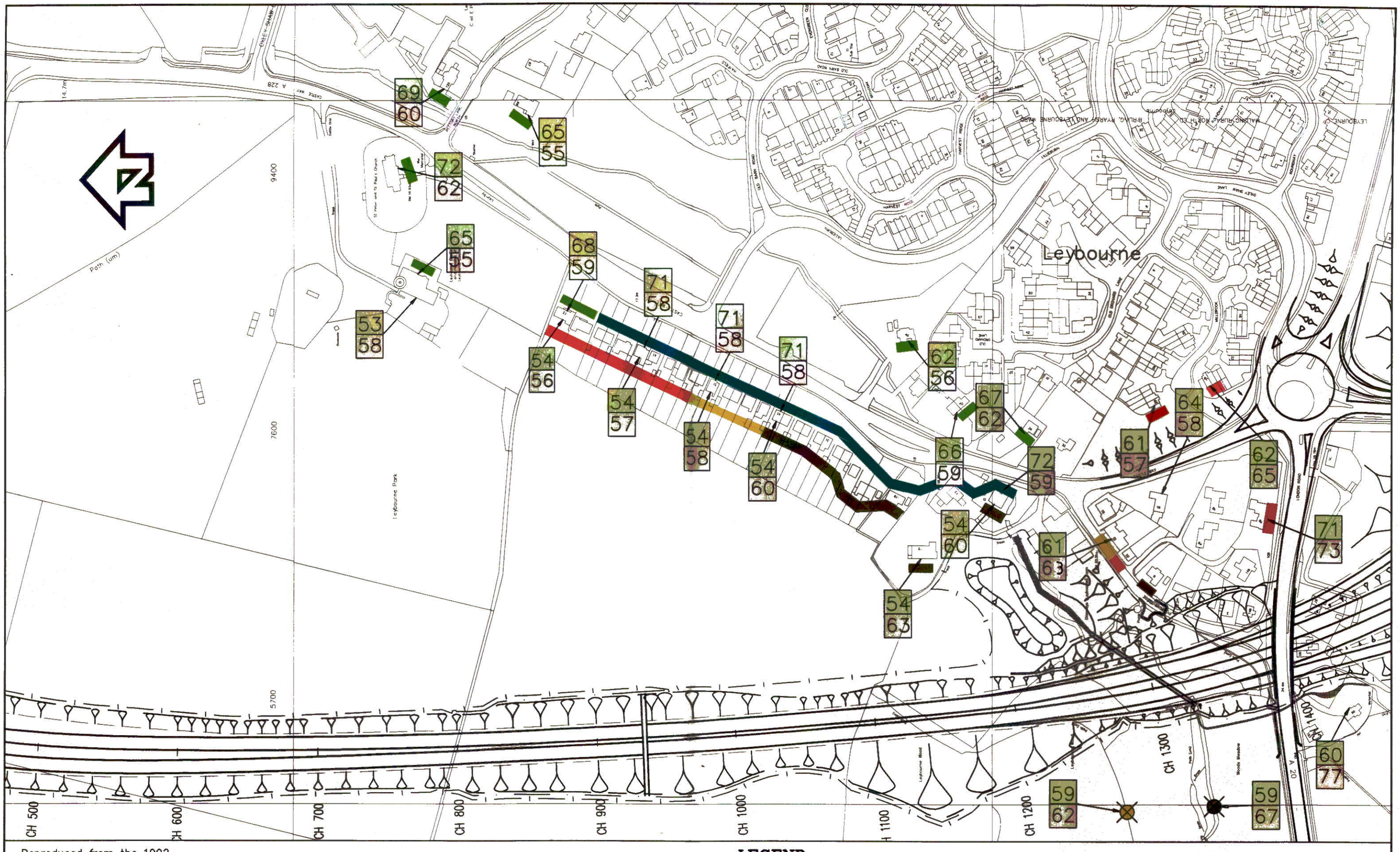
NOISE PLANS
Figure 9

LEGEND

- Increase in noise of between 0 & 3dBA
- Increase in noise of between 3 & 5dBA
- Increase in noise of between 5 & 10dBA
- Increase in noise of between 10 & 15dBA
- Reduction in noise of between 0 & 3dBA
- Reduction in noise of between 3 & 5dBA
- Reduction in noise of between 5 & 10dBA
- Reduction in noise of between 10 & 15dBA

KEY

57 Existing 1998 Noise Level
62 Proposed 2013 Noise Level



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NOISE PLANS
Figure 10

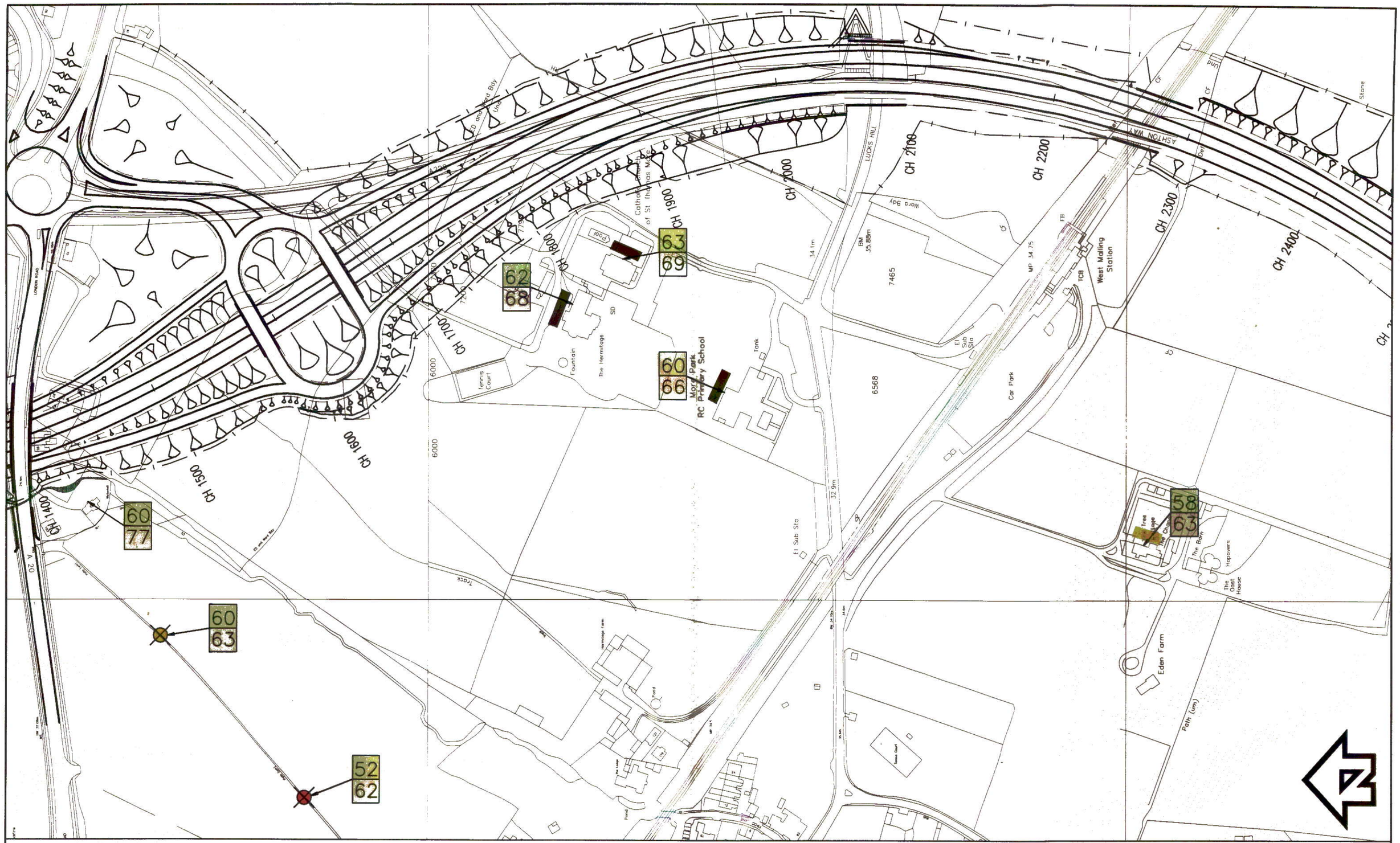
sheet 3 of 6

LEGEND

- Increase in noise of between 0 & 3dBA
- Increase in noise of between 3 & 5dBA
- Increase in noise of between 5 & 10dBA
- Increase in noise of between 10 & 15dBA
- Reduction in noise of between 0 & 3dBA
- Reduction in noise of between 3 & 5dBA
- Reduction in noise of between 5 & 10dBA
- Reduction in noise of between 10 & 15dBA

KEY

57 / 62 — Existing 1998 Noise Level / Proposed 2013 Noise Level



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NOISE PLANS
Figure 11

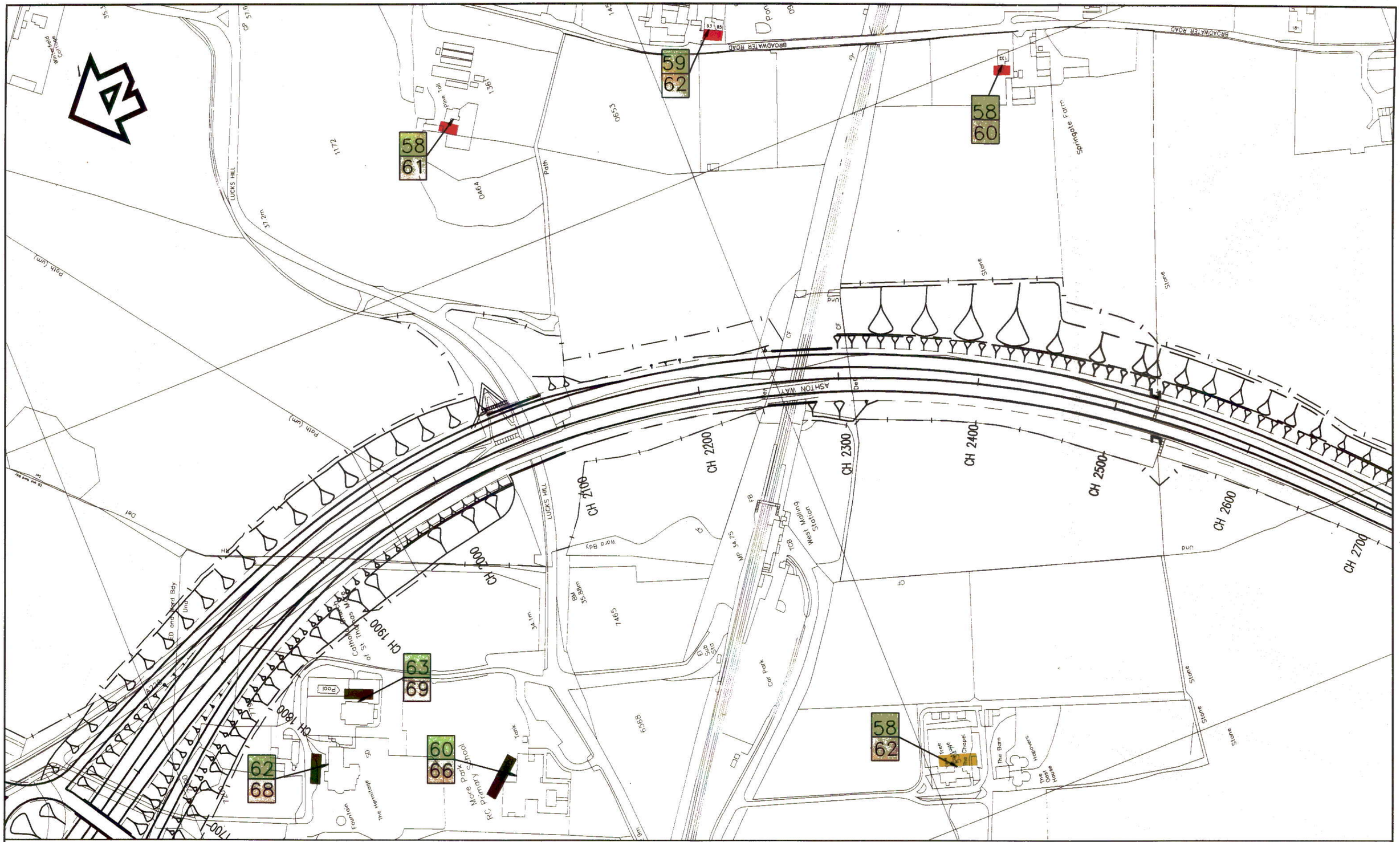
sheet 4 of 6

LEGEND

- Increase in noise of between 0 & 3dBA
- Increase in noise of between 3 & 5dBA
- Increase in noise of between 5 & 10dBA
- Increase in noise of between 10 & 15dBA
- Reduction in noise of between 0 & 3dBA
- Reduction in noise of between 3 & 5dBA
- Reduction in noise of between 5 & 10dBA
- Reduction in noise of between 10 & 15dBA

KEY

57 / 62 — Existing 1998 Noise Level / Proposed 2013 Noise Level



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NOISE PLANS
Figure 12

sheet 5 of 6

LEGEND

- Increase in noise of between 0 & 3dBA
- Increase in noise of between 3 & 5dBA
- Increase in noise of between 5 & 10dBA
- Increase in noise of between 10 & 15dBA
- Reduction in noise of between 0 & 3dBA
- Reduction in noise of between 3 & 5dBA
- Reduction in noise of between 5 & 10dBA
- Reduction in noise of between 10 & 15dBA

KEY

57 Existing 1998 Noise Level

62 Proposed 2013 Noise Level

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NOISE PLANS
Figure 13

sheet 6 of 6

LEGEND

- Increase in noise of between 0 & 3dBA
- Increase in noise of between 3 & 5dBA
- Increase in noise of between 5 & 10dBA
- Increase in noise of between 10 & 15dBA
- Reduction in noise of between 0 & 3dBA
- Reduction in noise of between 3 & 5dBA
- Reduction in noise of between 5 & 10dBA
- Reduction in noise of between 10 & 15dBA

KEY

57 / 62 — Existing 1998 Noise Level / Proposed 2013 Noise Level