Environmental Statement

Appendix G
Noise Data

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Noise Data

Glossary of Terminology

A Glossary of Terminology

A.1 Glossary of Acoustic Terminology

dB (decibel) The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure (2×10^{-5} Pa).

dB(A) A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. 'A' weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.

L_{Aeq} L_{Aeq} is defined as the notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the A - weighted fluctuating sound measured over that period.

L_{Amax} L_{Amax} is the maximum A - weighted sound pressure level recorded over the period stated. L_{Amax} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the *fast* sound level meter response.

L_{10} & L_{90} If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The L_n indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence L_{10} is the level exceeded for 10% of the time and as such can be regarded as the 'average maximum level'. Similarly, L_{90} is the 'average minimum level' and is often used to describe the background noise. It is common practice to use the L_{10} index to describe traffic noise.

Free-field Level A sound field determined at a point away from reflective surfaces other than the level ground with no significant contributions due to sound from other reflective surfaces. Generally as measured outside and away from buildings.

Façade Level Sound field defined 1 metre from a solid, reflecting surface, such as a building. Typically 3.0 dB higher than a free-field level.

Sound Pressure Level The human ear responds to rapidly fluctuating variations in air pressure above and below atmospheric pressure, which cause vibration in the auditory

frequency range in the eardrum. Variation in pressure above and below atmospheric pressure is called *sound pressure*, and is measured in units of pascals (Pa).

The human ear is very sensitive and a young person with normal hearing can often detect sound pressure levels as low as 0.00002 Pa (the minimum threshold of hearing). By contrast, the onset of pain due to sound level is generally accepted to be in the order 63-200 Pa. Because there is such a wide range of sound pressures that the ear responds to, sound pressure is an awkward quantity to use in graphs and tables, particularly given that the ear does not respond to increases in sound pressure in a linear manner. For this reason, a logarithmic scale is used to express a sound pressure (P) relative to the minimum detectable sound pressure level ($P_0 = 2 \times 10^{-5}$ Pa) in decibels (dB):

$$SPL = 10 \bullet Log_{10}\left(\frac{P}{P_0}\right) \text{ dB}$$

As stated above, one advantage of this convention is that the range of typical sound pressure levels can be stated as 0 dB to 140 dB which is a usable range of numbers. The other significant benefit is that the human ear responds to increases and decreases in sound pressure in a logarithmic manner.

Sound Power Level   A sound source emits a measurable level of power; it is this *sound power* that causes variations in *sound pressure* in the surrounding air. The relationship between sound power and sound pressure is analogous to the *electrical power* of a heating element and the *air temperature* that results. If an object emits sound power evenly in all directions, it is said to be a spherical or point source. The sound pressure that results will be a function of the sound power of the source, the distance between the source and the point of interest, and the character of the surfaces (if any) surrounding the source.

The *sound power level (SWL)* is the sound power (W) of a source expressed as the logarithm of the ratio of the sound power to a reference sound power ($W_0 = 10^{-12}$ watts) in decibels:

$$SWL = 10 \bullet Log_{10}\left(\frac{W}{W_0}\right) \text{ dB}$$

It is common for manufactures to quote the *sound power level* emitted by plant and equipment. This information can then be used to calculate the resulting *sound pressure level* that the ear would detect at a receiving position based on the intervening distance, relative heights, reflective elements and potential screening from barriers, walls or buildings.

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Noise Data

**Noise Study Area
Figures 13.1 & 13.2**

M 1: 10000

y / m

4004000
4003000
4002500
4002000
4001500
4001000

288500   289000   x / m   290000

MP4
MP2
MP3
MP1
MP1a

Day Level dB	
>..-35	
>35-40	
>40-45	
>45-50	
>50-55	
>55-60	
>60-65	
>65-70	
>70-75	
>75-80	
>80-..	

Figure: **13.1 Noise Measurement Positions**
Project: **Eastside, Gibraltar**
Client: **MCB (Gibraltar) Ltd**
Proj. Code: **DSCBGA004**
Consultant: **S. Williams**
Print Date: **23/07/2007**
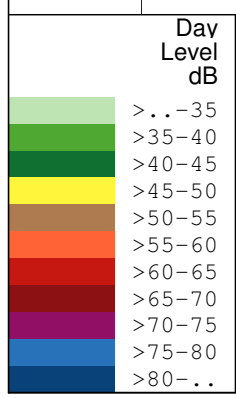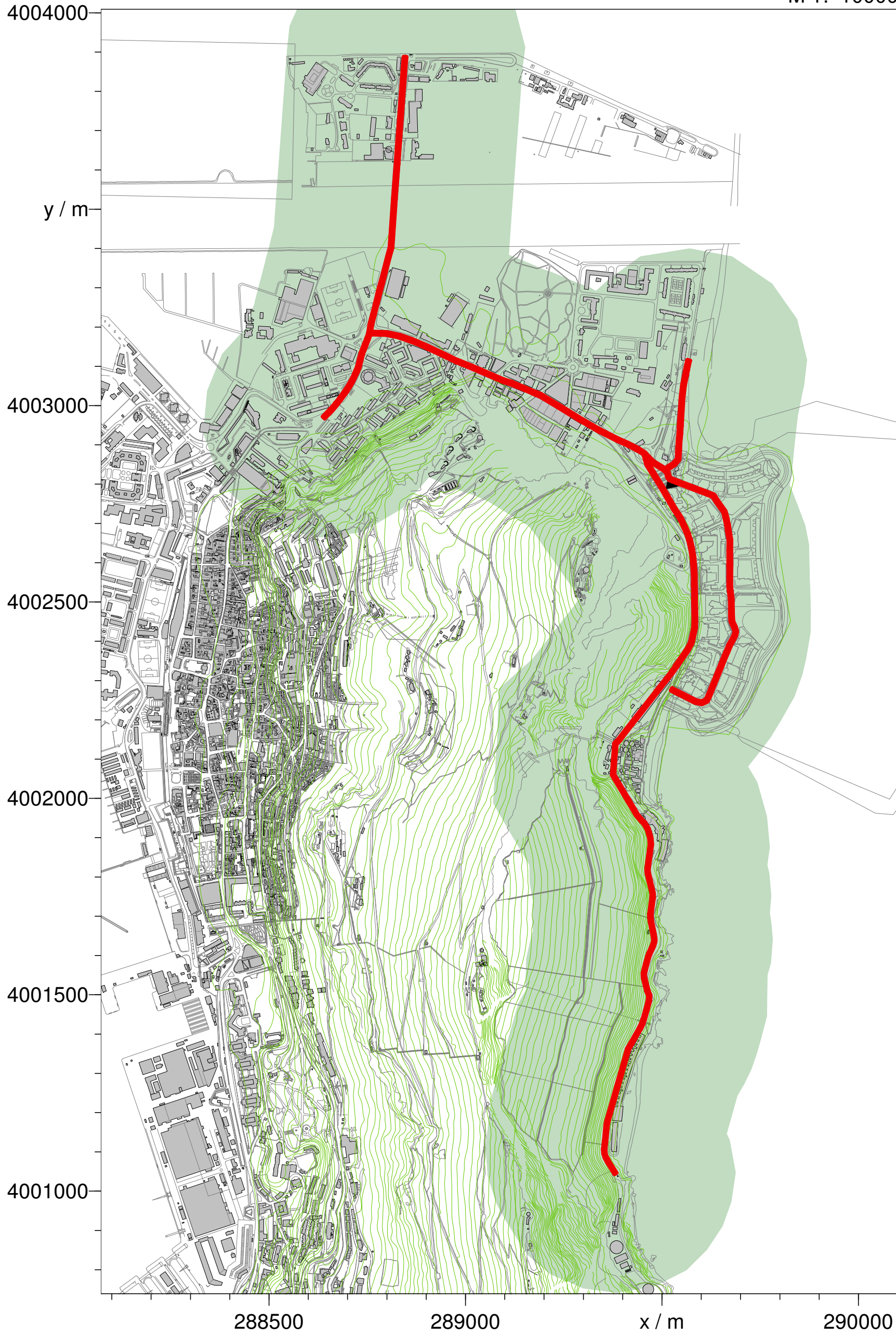
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IMMI 6.0

M 1: 10000

y / m

4004000
4003000
4002500
4002000
4001500
4001000

288500   289000   x / m   290000

Day Level dB	
	>..−35
	>35−40
	>40−45
	>45−50
	>50−55
	>55−60
	>60−65
	>65−70
	>70−75
	>75−80
	>80−..

Figure: **13.2 Noise Study Area**
Project: **Eastside, Gibraltar**
Client: **MCB (Gibraltar) Ltd**
Proj. Code: **DSCBGA004**
Consultant: **S. Williams**
Print Date: **23/07/2007**

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IMMI 6.0

Appendix G

Noise Data

Construction Noise Tables

Construction Plant Noise Levels

Project Title	Eastside Gibraltar
Name	J Kennett
Date	13th October 2006

Phase: **Land Remdiation and Marine Works**

Phase of Works	Plant Information			
	Plant Type	**BS5228 Reference**	**Number of Vehicles**	**SWL**	**LAeq at 10m**
Grading	Tracked Excavator	C.8/33	3	102	74
	Bulldozer	C.3/27	3	109	81
	Dumper Trucks	Volvo	5	99	71
	Dozer	C.9/1	3	113	85
	Wheeled Excavator/Loader	C.6/28	3	102	74
	Vibratory Roller	C.8/27	2	104	76
	Trenching Machine	C.3/106	2	105	77
	Generators	C.7/53	3	102	74
	Water Pumps	C.3/86	3	100	72
Reclamation	Backhoe Dredger	*	1	109	81
	Small trailing suction dreger hopper	*	1	109	81
	Barge with side stone dumping vehicle	C.9/1	1	113	85
	Split Barges	*		103	
	Barge mounted crane	C.7/112	1	102	74
	Tracked Excavator	C.8/33	2	102	74
	Loader	C.6/28	2	102	74
	Dumper Trucks	Volvo	2	99	71
Demolition	Tracked crane with fitted breaker	C.2/1	1	121	93
	Dozer	C.9/1	1	113	85
	Tracket excavator with fitted breaker	C.2/4	1	119	91
	Tracked Excavator	C.8/33	1	102	74
	Loader	C.6/28	1	102	74
Foundation	Installation of pre cast bassions (harbour)	C.4/30	1	123	87
	Tracked crane	C.98/120	1	104	76
	Driven/cast in place displacement piling	C.4/35	1	113	85
Concreting	Concrete mixer	C.5/2	3	100	72
	Batching plant	C.5/10	1	106	78
	Truck mixer	C.5/15	3	109	81
	Poker vibrators	C.5/20	3	102	81
	Compressors	C.6/43	3	105	77
	Tracked crane	C.6/26	3	116	88

Construction Plant Noise Levels

Project Title	Eastside Gibraltar
Name	J Kennett
Date	13th October 2006

Phase: **Site Infrastruture**

Phase of Works	Plant Information				
	Plant Type	BS5228 Reference	Number of Vehicles	SWL	LAeq at 10m
Earthworks	Tracked Excavator	C.8/33	3	102	74
	Dump Trucks	C.9/28	5	106	78
	Lorries	C.8/25	3	108	80
Foundations	Installation of pre cast bassions	C.4/30	1	123	87
	Tracked crane	C.98/120	1	104	76
	Driven/cast in place displacement piling	C.4/35	1	113	85
Concreting	Concrete mixer	C.5/2	3	100	72
	batching plant	C.5/10	1	106	78
	truck mixer	C.5/15	3	109	81
	poker vibrators	C.5/20	3	102	81
	compressors	C.6/43	3	105	77
	tracked crane	C.6/26	3	116	88
Utilities Buildings	Hand Held Equipment	C.6/54	5	112	84
	Pneumatic Drills	C.6/55	5	114	95
	Fork Lift Trucks	C.7/96	3	105	77
	diesel generators	C.7/53	3	102	74
	petrol generators	C.7/52	3	98	66
Roads	Lorries	C.8/25	3	108	80
	Dozer	C.9/1	3	113	85
	Wheeled Excavator/Loader	C.6/28	2	102	74
	Vibratory Roller	C.8/27	1	104	76
	Groove/Disc Cutter	C.8\32	1	115	87
	Asphalt Pavers	C.8/23	1	114	86

Phase: **Building Works**

Phase of Works	Plant Information				
	Plant Type	BS5228 Reference	Number of Vehicles	SWL	LAeq at 10m
Foundation	Tracked crane	C.98/120	3	104	76
	Driven/cast in place displacement piling	C.4/35	1	113	85
Concrete	Concrete mixer	C.5/2	3	100	72
	batching plant	C.5/10	1	106	78
	truck mixer	C.5/15	3	109	81
	poker vibrators	C.5/20	3	102	81
	compressors	C.6/43	3	105	77
Structure	tracked crane	C.6/26	3	116	88
	Electric handdrills	C.6/54	5	112	84
	Pneumatic drills	C.6/55	5	114	95
	Timber saws	C.7/79	5	103	75
	Disc cutter	C.6/53	5	112	84
Fit Out	Cranes	C.6/26	3	116	88
	Fork lift trucks	C.6/26	3	116	88
	Diesel Generators	C.7/53	3	102	74
	Petrol Generators	C.7/52	3	94	66
	Lorries	C.7/121	5	98	70

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Noise Data

DMRB Assessment Summary Tables

Ambient Noise Band $L_{A10\ 18hr}$ <50 dB		Residential		Commercial		Industrial		Community		
		Preferred Route	Do Minimum	Preferred Route	Do Minimum	Preferred Route	Do Minimum	Preferred Route	Do Minimum	Comments
Increase in Noise Level $L_{A10\ 18hr}$ dB	1 to <3	**100**	0	0	0	0	0	**1**	0	
	3 to <5	**47**	0	0	0	0	0	0	0	
	5 to <10	**9**	0	**2**	0	0	0	0	0	
	10 to <15	0	0	0	0	0	0	0	0	
	≥15	0	0	0	0	0	0	0	0	
Increase in Nuisance Level	<10%	-	-	-	-	-	-	-	-	
	10 to <20%	-	-	-	-	-	-	-	-	
	20 to <30%	-	-	-	-	-	-	-	-	
	30 to <40%	-	-	-	-	-	-	-	-	
	≥40%	-	-	-	-	-	-	-	-	
Decrease in Noise Level $L_{A10\ 18hr}$ dB	1 to <3	**3**	0	0	0	0	0	0	0	
	3 to <5	0	0	0	0	0	0	0	0	
	5 to <10	0	0	0	0	0	0	0	0	
	10 to <15	0	0	0	0	0	0	0	0	
	≥15	0	0	0	0	0	0	0	0	
Decrease in Nuisance Level	<10%	-	-	-	-	-	-	-	-	
	10 to <20%	-	-	-	-	-	-	-	-	
	20 to <30%	-	-	-	-	-	-	-	-	
	30 to <40%	-	-	-	-	-	-	-	-	
	≥40%	-	-	-	-	-	-	-	-	

Ambient Noise Band $L_{A10\ 18hr}$ 50-60 dB		Residential		Commercial		Industrial		Community		Comments
		Preferred Route	Do Minimum	Preferred Route	Do Minimum	Preferred Route	Do Minimum	Preferred Route	Do Minimum	
Increase in Noise Level $L_{A10\ 18hr}$ dB	1 to <3	**63**	0	0	0	**2**	0	0	0	
	3 to <5	**22**	0	0	0	0	0	**1**	0	
	5 to <10	**4**	0	0	0	0	0	0	0	
	10 to <15	0	0	0	0	0	0	0	0	
	≥15	0	0	0	0	0	0	0	0	
Increase in Nuisance Level	<10%	-	-	-	-	-	-	-	-	
	10 to <20%	-	-	-	-	-	-	-	-	
	20 to <30%	-	-	-	-	-	-	-	-	
	30 to <40%	-	-	-	-	-	-	-	-	
	≥40%	-	-	-	-	-	-	-	-	
Decrease in Noise Level $L_{A10\ 18hr}$ dB	1 to <3	0	0	0	0	0	0	0	0	
	3 to <5	0	0	0	0	0	0	0	0	
	5 to <10	0	0	0	0	0	0	0	0	
	10 to <15	0	0	0	0	0	0	0	0	
	≥15	0	0	0	0	0	0	0	0	
Decrease in Nuisance Level	<10%	-	-	-	-	-	-	-	-	
	10 to <20%	-	-	-	-	-	-	-	-	
	20 to <30%	-	-	-	-	-	-	-	-	
	30 to <40%	-	-	-	-	-	-	-	-	
	≥40%	-	-	-	-	-	-	-	-	

Ambient Noise Band $L_{A10\ 18hr}$ 60-70 dB		Residential		Commercial		Industrial		Community		
		Preferred Route	Do Minimum	Preferred Route	Do Minimum	Preferred Route	Do Minimum	Preferred Route	Do Minimum	Comments
Increase in Noise Level $L_{A10\ 18hr}$ dB	1 to <3	**47**	0	0	0	0	0	0	0	
	3 to <5	**16**	0	0	0	0	0	0	0	
	5 to <10	**3**	0	0	0	0	0	0	0	
	10 to <15	0	0	0	0	0	0	0	0	
	≥15	0	0	0	0	0	0	0	0	
Increase in Nuisance Level	<10%	-	-	-	-	-	-	-	-	
	10 to <20%	-	-	-	-	-	-	-	-	
	20 to <30%	-	-	-	-	-	-	-	-	
	30 to <40%	-	-	-	-	-	-	-	-	
	≥40%	-	-	-	-	-	-	-	-	
Decrease in Noise Level $L_{A10\ 18hr}$ dB	1 to <3	0	0	0	0	0	0	0	0	
	3 to <5	0	0	0	0	0	0	0	0	
	5 to <10	0	0	0	0	0	0	0	0	
	10 to <15	0	0	0	0	0	0	0	0	
	≥15	0	0	0	0	0	0	0	0	
Decrease in Nuisance Level	<10%	-	-	-	-	-	-	-	-	
	10 to <20%	-	-	-	-	-	-	-	-	
	20 to <30%	-	-	-	-	-	-	-	-	
	30 to <40%	-	-	-	-	-	-	-	-	
	≥40%	-	-	-	-	-	-	-	-	

Ambient Noise Band $L_{A10\ 18hr} \geq 70$ dB		Residential		Commercial		Industrial		Community		
		Preferred Route	Do Minimum	Preferred Route	Do Minimum	Preferred Route	Do Minimum	Preferred Route	Do Minimum	Comments
Increase in Noise Level $L_{A10\ 18hr}$ dB	1 to <3	**4**	0	0	0	0	0	0	0	
	3 to <5	**28**	0	0	0	0	0	0	0	
	5 to <10	**1**	0	0	0	0	0	0	0	
	10 to <15	0	0	0	0	0	0	0	0	
	≥15	0	0	0	0	0	0	0	0	
Increase in Nuisance Level	<10%	-	-	-	-	-	-	-	-	
	10 to <20%	-	-	-	-	-	-	-	-	
	20 to <30%	-	-	-	-	-	-	-	-	
	30 to <40%	-	-	-	-	-	-	-	-	
	≥40%	-	-	-	-	-	-	-	-	
Decrease in Noise Level $L_{A10\ 18hr}$ dB	1 to <3	0	0	0	0	**1**	0	0	0	
	3 to <5	**1**	0	0	0	0	0	0	0	
	5 to <10	**1**	0	0	0	0	0	0	0	
	10 to <15	0	0	0	0	0	0	0	0	
	≥15	0	0	0	0	0	0	0	0	
Decrease in Nuisance Level	<10%	-	-	-	-	-	-	-	-	
	10 to <20%	-	-	-	-	-	-	-	-	
	20 to <30%	-	-	-	-	-	-	-	-	
	30 to <40%	-	-	-	-	-	-	-	-	
	≥40%	-	-	-	-	-	-	-	-	

Ambient Noise Band $L_{A10\ 18hr}$ <50 dB		Residential		Commercial		Industrial		Community		
		Preferred Route	Do Minimum	Preferred Route	Do Minimum	Preferred Route	Do Minimum	Preferred Route	Do Minimum	Comments
Increase in Noise Level $L_{A10\ 18hr}$ dB	1 to <3	**77**	0	0	0	0	0	**1**	0	
	3 to <5	**44**	0	0	0	0	0	0	0	
	5 to <10	**9**	0	**2**	0	0	0	0	0	
	10 to <15	0	0	0	0	0	0	0	0	
	≥15	0	0	0	0	0	0	0	0	
Increase in Nuisance Level	<10%	-	-	-	-	-	-	-	-	
	10 to <20%	-	-	-	-	-	-	-	-	
	20 to <30%	-	-	-	-	-	-	-	-	
	30 to <40%	-	-	-	-	-	-	-	-	
	≥40%	-	-	-	-	-	-	-	-	
Decrease in Noise Level $L_{A10\ 18hr}$ dB	1 to <3	**3**	0	0	0	0	0	0	0	
	3 to <5	0	0	0	0	0	0	0	0	
	5 to <10	0	0	0	0	0	0	0	0	
	10 to <15	0	0	0	0	0	0	0	0	
	≥15	0	0	0	0	0	0	0	0	
Decrease in Nuisance Level	<10%	-	-	-	-	-	-	-	-	
	10 to <20%	-	-	-	-	-	-	-	-	
	20 to <30%	-	-	-	-	-	-	-	-	
	30 to <40%	-	-	-	-	-	-	-	-	
	≥40%	-	-	-	-	-	-	-	-	

Ambient Noise Band $L_{A10\ 18hr}$ 50-60 dB		Residential		Commercial		Industrial		Community		
		Preferred Route	Do Minimum	Preferred Route	Do Minimum	Preferred Route	Do Minimum	Preferred Route	Do Minimum	Comments
Increase in Noise Level $L_{A10\ 18hr}$ dB	1 to <3	**41**	0	0	0	**2**	0	0	0	
	3 to <5	**22**	0	0	0	0	0	**1**	0	
	5 to <10	**4**	0	0	0	0	0	0	0	
	10 to <15	0	0	0	0	0	0	0	0	
	≥15	0	0	0	0	0	0	0	0	
Increase in Nuisance Level	<10%	-	-	-	-	-	-	-	-	
	10 to <20%	-	-	-	-	-	-	-	-	
	20 to <30%	-	-	-	-	-	-	-	-	
	30 to <40%	-	-	-	-	-	-	-	-	
	≥40%	-	-	-	-	-	-	-	-	
Decrease in Noise Level $L_{A10\ 18hr}$ dB	1 to <3	0	0	0	0	0	0	0	0	
	3 to <5	0	0	0	0	0	0	0	0	
	5 to <10	0	0	0	0	0	0	0	0	
	10 to <15	0	0	0	0	0	0	0	0	
	≥15	0	0	0	0	0	0	0	0	
Decrease in Nuisance Level	<10%	-	-	-	-	-	-	-	-	
	10 to <20%	-	-	-	-	-	-	-	-	
	20 to <30%	-	-	-	-	-	-	-	-	
	30 to <40%	-	-	-	-	-	-	-	-	
	≥40%	-	-	-	-	-	-	-	-	

Ambient Noise Band $L_{A10\ 18hr}$ 60-70 dB		Residential		Commercial		Industrial		Community		
		Preferred Route	Do Minimum	Preferred Route	Do Minimum	Preferred Route	Do Minimum	Preferred Route	Do Minimum	Comments
Increase in Noise Level $L_{A10\ 18hr}$ dB	1 to <3	**20**	0	0	0	0	0	0	0	
	3 to <5	**16**	0	0	0	0	0	0	0	
	5 to <10	**2**	0	0	0	0	0	0	0	
	10 to <15	0	0	0	0	0	0	0	0	
	≥15	0	0	0	0	0	0	0	0	
Increase in Nuisance Level	<10%	-	-	-	-	-	-	-	-	
	10 to <20%	-	-	-	-	-	-	-	-	
	20 to <30%	-	-	-	-	-	-	-	-	
	30 to <40%	-	-	-	-	-	-	-	-	
	≥40%	-	-	-	-	-	-	-	-	
Decrease in Noise Level $L_{A10\ 18hr}$ dB	1 to <3	0	0	0	0	0	0	0	0	
	3 to <5	0	0	0	0	0	0	0	0	
	5 to <10	0	0	0	0	0	0	0	0	
	10 to <15	0	0	0	0	0	0	0	0	
	≥15	0	0	0	0	0	0	0	0	
Decrease in Nuisance Level	<10%	-	-	-	-	-	-	-	-	
	10 to <20%	-	-	-	-	-	-	-	-	
	20 to <30%	-	-	-	-	-	-	-	-	
	30 to <40%	-	-	-	-	-	-	-	-	
	≥40%	-	-	-	-	-	-	-	-	

Ambient Noise Band $L_{A10\ 18hr} \geq 70$ dB		Residential		Commercial		Industrial		Community		Comments
		Preferred Route	Do Minimum	Preferred Route	Do Minimum	Preferred Route	Do Minimum	Preferred Route	Do Minimum	
Increase in Noise Level $L_{A10\ 18hr}$ dB	1 to <3	**4**	0	0	0	0	0	0	0	
	3 to <5	**28**	0	0	0	0	0	0	0	
	5 to <10	**1**	0	0	0	0	0	0	0	
	10 to <15	0	0	0	0	0	0	0	0	
	≥15	0	0	0	0	0	0	0	0	
Increase in Nuisance Level	<10%	-	-	-	-	-	-	-	-	
	10 to <20%	-	-	-	-	-	-	-	-	
	20 to <30%	-	-	-	-	-	-	-	-	
	30 to <40%	-	-	-	-	-	-	-	-	
	≥40%	-	-	-	-	-	-	-	-	
Decrease in Noise Level $L_{A10\ 18hr}$ dB	1 to <3	0	0	0	0	**1**	0	0	0	
	3 to <5	**1**	0	0	0	0	0	0	0	
	5 to <10	**1**	0	0	0	0	0	0	0	
	10 to <15	0	0	0	0	0	0	0	0	
	≥15	0	0	0	0	0	0	0	0	
Decrease in Nuisance Level	<10%	-	-	-	-	-	-	-	-	
	10 to <20%	-	-	-	-	-	-	-	-	
	20 to <30%	-	-	-	-	-	-	-	-	
	30 to <40%	-	-	-	-	-	-	-	-	
	≥40%	-	-	-	-	-	-	-	-	

Appendix G

Noise Data

**Predicted Road Traffic Noise Levels
Figures 13.3, 13.4 & 13.5**

M 1: 10000

y / m

4004000
4003000
4002500
4002000
4001500
4001000

288500   289000   x / m   290000

Day
Level
dB

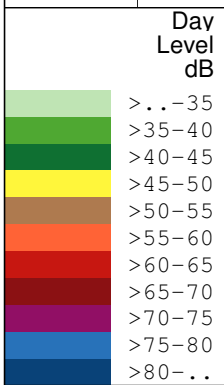|	
	>..−35
	>35−40
	>40−45
	>45−50
	>50−55
	>55−60
	>60−65
	>65−70
	>70−75
	>75−80
	>80−..
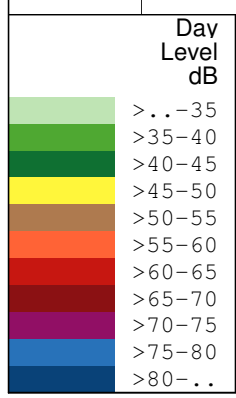
Figure: 13.3 2006 DM (Existing)
Project: Eastside, Gibraltar
Client: MCB (Gibraltar) Ltd
Proj. Code: DSCBGA004
Consultant: S. Williams
Print Date: 23/07/2007

Halcrow

IMMI 6.0

M 1: 10000

y / m

4004000
4003000
4002500
4002000
4001500
4001000

288500 289000 x / m 290000

Day Level dB	
	>..−35
	>35−40
	>40−45
	>45−50
	>50−55
	>55−60
	>60−65
	>65−70
	>70−75
	>75−80
	>80−..

Figure: 13.4 2020 DS (Eastside)
Project: Eastside, Gibraltar
Client: MCB (Gibraltar) Ltd
Proj. Code: DSCBGA004
Consultant: S. Williams
Print Date: 23/07/2007

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IMMI 6.0

M 1: 10000

Day Level dB

>..−35	
>35−40	
>40−45	
>45−50	
>50−55	
>55−60	
>60−65	
>65−70	
>70−75	
>75−80	
>80−..	
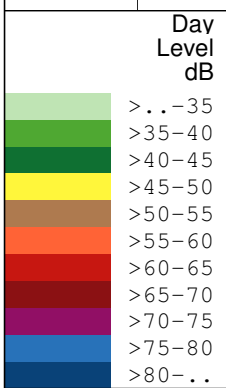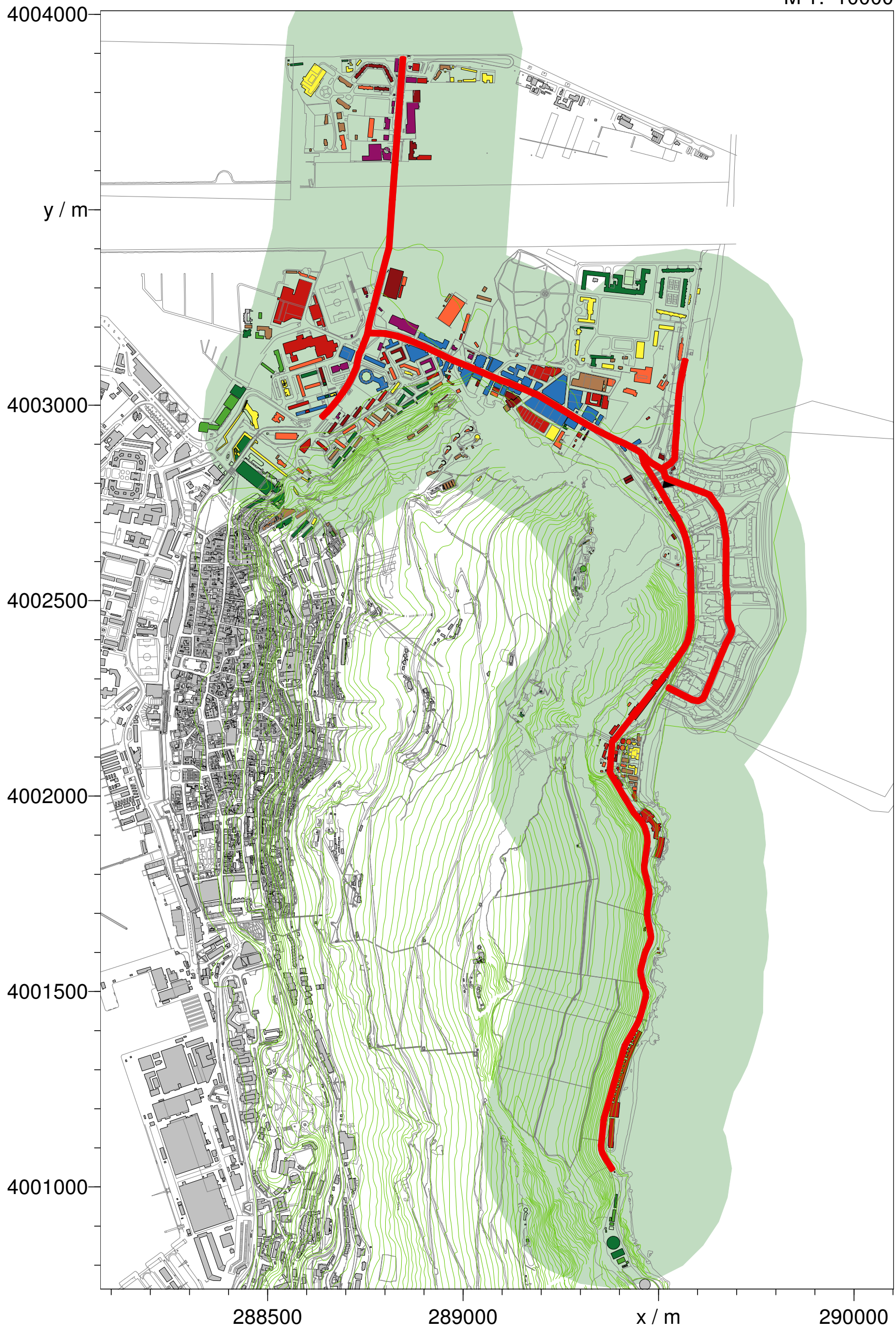
Figure: 13.5 2020 DS (Eastside & Both W)
Project: Eastside, Gibraltar
Client: MCB (Gibraltar) Ltd
Proj. Code: DSCBGA004
Consultant: S. Williams
Print Date: 23/07/2007

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IMMI 6.0