Appendix 3H
Noise and Vibration

N5
Strategic Corridor

ROUTE CORRIDOR SELECTION REPORT

Noise and Vibration

July 2007

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1 EXECUTIVE SUMMARY

1.1 Introduction

Roscommon National Roads Design Office was commissioned by Roscommon County Council, in collaboration with the National Roads Authority, to advance the development of the N5 Strategic Corridor Study in accordance with the National Roads Project Management Guidelines.[1]

This report outlines the process followed in the assessment and evaluation of the seven route corridor options in relations to the noise and vibration environmental topic.

1.2 The Assessment and Conclusions

The assessment was carried out for the seven route corridor options based on the Potential Impact Rating (PIR) of each as modified by considerations of the changes in traffic flow and the opportunities for mitigation presented within each corridor.

The PIR was determined by counting the number of receptors[2] within various bands based on the centreline[3] of each route corridor option.

The above assessment led to the identification of the following route corridor preference from a noise and vibration perspective:

Corridor Number	Ranking
1A	1
2A	2
2	3
4	4
2B	5
1	6
3	7

Table 1.1 Corridor Preference (Noise and Vibration)

Corridor 1A is the emerging preferred route corridor based on noise and vibration factors.

It should be noted that each of the corridors is a minimum of 500m wide and therefore presents significant opportunity for further mitigation by avoidance during the remaining route development stages. In addition, the number and location of receptors identified within each band is valid for route comparison purposes, however, due to the width of each corridor and the interaction between the various environmental, engineering and economic factors the exact impact on individual receptors can only be identified during the next design phase – Preliminary Design.

[1] National Roads Project Management Guidelines, 2000 – National Road Authority. Forms part of the NRA Design Manual for Roads and Bridges, Section 5.1.2.
[2] Receptors were identified based on the address points obtained from the An Post/ Ordnance Survey GeoDirectory (November 2006),.
[3] The centreline for each corridor was established at an early stage and is used for comparison purposes only. It may not be the actual centre of the corridor because many areas of particular constraint were widened locally.

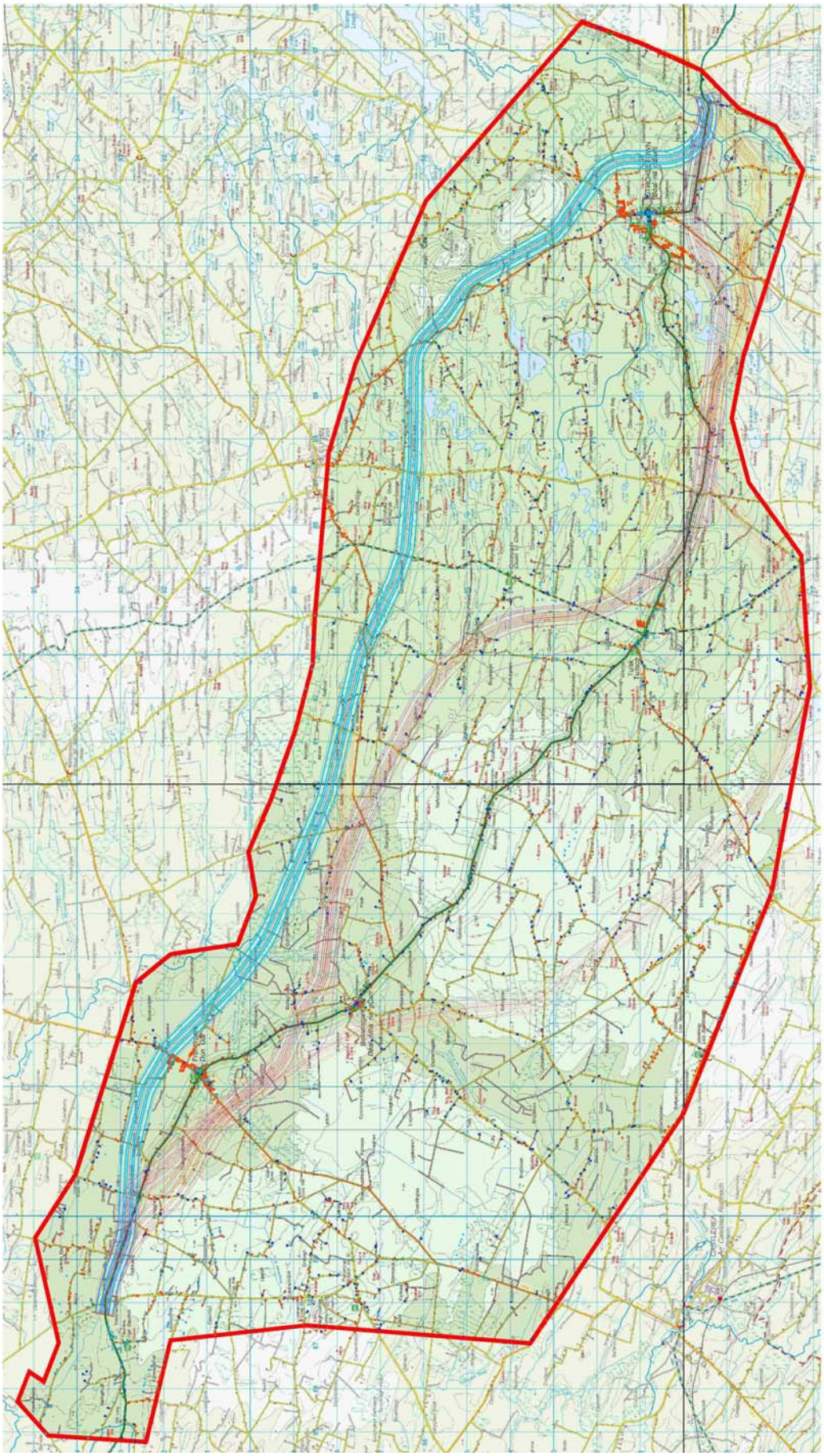

Figure 1.1 Sensitive Receptors

2 INTRODUCTION

2.1 Introduction

Roscommon National Roads Design Office was commissioned by Roscommon County Council, in collaboration with the National Roads Authority (NRA[4]), to advance the development of the N5 Strategic Corridor Study in accordance with the National Roads Project Management Guidelines. [5]

The proposed scheme stretches from Teevnacreeva (east of Ballaghaderreen) to Scramoge (East of Strokestown) and involves the upgrading of the existing N5 National Primary Road between these locations. Seven route corridor options have been identified. The exact length of the scheme will depend on the route finally chosen but the length of the existing road is approx. 35.7km and any new route is likely to be of a similar length.

2.2 Objective for the Noise and Vibration Report

The overall objectives of the Route Selection Report are:

- To carry out an assessment of the feasible route corridor options in order to evaluate and compare them based on engineering, environmental and economic grounds.
- Based on the assessment outlined above, to determine the overall preferred Route Corridor.

This Noise and Vibration Report forms part of the environmental factors used to determine the emerging preferred route. The principal objectives of this report include:

- To ensure detailed consideration of Noise and Vibration considerations in the preferred route corridor and subsequent design stages.
- To carry out an assessment of the feasible route corridor options in order to evaluate and compare them based on noise and vibration criteria taking account of interaction with other environmental, engineering and economic parameters.
- Based on the above assessment, to determine the preferred route corridor having regard to Noise and Vibration parameters.

[4] National Roads Authority
[5] NRA National Roads Project Management Guidelines, March 2003 (NRA DMRB 5.1.2). National Roads Authority

3 METHODOLOGY

3.1 Methods Used

The Noise and Vibration assessment and evaluation of the route corridor options has been undertaken broadly in accordance with the legislation, standards and guidance documents outlined below. The assessment involved a desk study and a fieldwork component complimented by input from a range of sources. The following are the main data sources used:

- Roscommon National Roads Design Office
    - Feasible Route Corridors overlaid on Ordnance Survey (OSi) background mapping,
    - Digital Ground Model Contours overlaid on OSi background mapping,
    - Sensitive Structures identified in the Constraints Study Report[6],
- Ordnance Survey/ An Post
    - GeoDirectory (all postal addresses were mapped as points onto OSi background mapping by Roscommon NRDO),
    - Discovery Series Mapping (1:50,000),
    - Six Inch Raster Maps (1:10,560),
    - 5000 Mapping (Raster and Vector 1:5000)
    - 2500 Mapping (Raster and Vector 1:2500) (Partial Coverage),
    - 1000 Mapping (Vector 1:1000 – Towns only – Partial Coverage),
- Other Sources
    - Other Environmental Reports, e.g. Landscape and Visual, etc
    - Other Engineering Reports, e.g. Traffic Report,
    - Site inspections by members of the design team.

3.2 Legislation and Standards

Currently there are no Irish standards or limit values governing the assessment of noise and/ or vibration associated with roads. Road traffic noise is considered in European Directive 2002/49/EC that is to be transposed into Irish law. The current NRA Guidelines have taken cognisance of this.

The European Communities (Noise Emission by Equipment for Use Outdoors) Regulations, 2001 sets noise limits for certain categories of plant and equipment commonly used on construction sites. Again the current NRA Guidelines have taken cognisance of this.

Section 77 of the Roads Act, 1993, provides the Minister with powers to make regulations in relation to noise associated with roads. To date, none have been made.

[6] N5 Strategic Corridor Constraints Study Report, Roscommon County Council (NRDO), 2006

3.3 Guidelines

The NRA has prepared Guidelines for the Treatment of Noise and Vibration in National Road Schemes[7] and this report has been completed in accordance with that document. This involves considering three aspects of the noise and vibration environment and using these to rank each corridor:

- Receptor Counts – carried out using the GeoDirectory information supplemented by OSi mapping information, field/ windscreen surveys and information gathered during the Constraints Phase,
- Traffic Flow Change forecasts based primarily on the Traffic Report,
- Review of Mitigation – based on a consideration of the potential for mitigation along each of the corridors.

Route selection allows for mitigation by avoidance and the primary aim of this phase is to identify the route that has the least overall impact and greatest benefits based on engineering, environmental and economic factors. This report, in accordance with the NRA Guidelines, identifies the route option with the least overall impact having regard to the above aspects.

Construction generated noise and vibration, for the purposes of this report, is assumed to have an potential impact rating proportional to that for road traffic noise. It is therefore included in the road traffic noise assessment.

[7] Guidelines for the Treatment of Noise and Vibration in National Road Schemes, NRA, Revision 1, 25th October 2004

4 CORRIDOR ASSESSMENT

4.1 Description of Corridors

4.1.1 Introduction

The design team, including the environmental and technical sub-consultants, developed seven route corridor options through an iterative design process. These are assessed in relation to noise and vibration. Each corridor is nominally 500m wide with local widening to accommodate particular constraints. Each starts and finishes at the same point and varies in length between 33.7km and 38km. Taking the existing N5 as a baseline, there are five northern options, an online option (do minimum) and a southern option.

4.1.2 Route Corridor Option 1

Route Corridor Option 1 stretches from Ratra/ Teevnacreeva at its western extremity to Scramoge/ Treanaceeve at its eastern tie-in, representing a length of approx. 33.7km. It is generally 0.5km (500m) wide, is located north of the existing N5.

This route follows a relatively flat topography passing north of Frenchpark town crossing Regional Road R361 outside the speed limit zone but, due to the urban sprawl and ribbon development, there are an increased number of premises in the vicinity of the crossing. From here on the route traverses through predominately rural landscape passing approx. 2.5km north of Bellanagare and crossing the N61 National Secondary Road approx. 6km north of Tulsk. The route continues in a predominately easterly direction passing along the northern periphery of Clooncullaan Lough. From here the route veers south and the topology changes to follow the undulations of a number of hills for approx. 4.5km. It then descending to the lowlands immediately east of Strokestown passing approx. 1.2km from the town and rejoining with the existing N5 at Scramoge.

4.1.3 Route Corridor Option 1A

Route Corridor Option 1A stretches from Ratra/ Teevnacreeva at its western extremity to Scramoge/ Treanaceeve at its eastern tie-in, representing a length of approx. 34.2km. It is generally 0.5km (500m) wide. West of Bellanagare it is located generally south of the existing N5 while east of Bellanagare it is generally north of the existing N5.

This route follows a relatively flat topography passing approx. 1km south of Frenchpark town before veering north of Bellanagare (approx. 1km) where it merges with Route Option 1.

4.1.4 Route Corridor Option 2

Route Corridor Option 2 stretches from Ratra/ Teevnacreeva at its western extremity to Scramoge/ Treanaceeve at its eastern tie-in, representing a length of approx. 34.6km. It is generally 0.5km (500m) wide. West of Bellanagare and East of Ardakillin the corridor is located generally south of the existing N5 while in the reaming middle section it is generally north of the existing N5.

Route Option 2 follows a similar path to Option 1A passing approx. 1km south of Frenchpark, approx. 1km north of Bellanagare. From here it diverges from Option 1A and follows a depression approx. 2.5km north of Rathcroghan before undulating along a number of small hillocks and then falling back to cross the N61 road approx. 1.4km north of Tulsk. From here, the route rises slightly again across Ardkeenagh “Hill” before descending to the existing N5 at Corbally and following a relatively flat terrain passing approx. 1km south of Strokestown.

4.1.5 Route Corridor Option 2A

Route Corridor Option 2A stretches from Ratra/ Teevnacreeva at its western extremity to Scramoge/ Treanaceeve at its eastern tie-in, representing a length of approx. 35.0km.

Route Corridor Option 2A is substantially similar to Route Option 2, with a minor variation near the western tie-in, west of the N5 crossing at Corbally. From here the option begins to take a more southern route passing approx. 2.2km south of Strokestown before veering northeastwards towards the eastern tie-in.

4.1.6 Route Corridor Option 2B

Route Corridor Option 2B stretches from Ratra/ Teevnacreeva at its western extremity to Scramoge/ Treanaceeve at its eastern tie-in, representing a length of approx. 34.5km.

This option is substantially similar to Route Option 2 between the western tie-in and the N61 crossing. From here, it follows a more northerly path following the undulations of Derryquirk and Correagh hillocks before crossing the existing N5 west of Strokestown and following the path of Option 2A to the eastern tie-in.

4.1.7 Route Corridor Option 3

Route Corridor Option 3 stretches from Ratra/ Teevnacreeva at its western extremity to Scramoge/ Treanaceeve at its eastern tie-in, representing a length of approx. 35.7km. It is generally 0.15km (150m) wide. This corridor is centred along the existing N5 National Primary Route and passes through the towns/ villages of Frenchpark, Bellanagare, Tulsk and Strokestown.

4.1.8 Route Corridor Option 4

Route Corridor Option 4 stretches from Ratra/ Teevnacreeva at its western extremity to Scramoge/ Treanaceeve at its eastern tie-in, representing a length of approx. 38.0km. It is generally 0.5km (500m) wide and is located generally south of the existing N5.

This corridor passes approx. 1km south of Frenchpark and 0.7km south of Bellanagare where it climbs to cross the periphery of Bellanagare Bog before descending down to the Owennaforeesha river. From here the route rises gently and continuously along the side of Ballyglass/ Rathkineely Hill and on to a peak at Rathmoyle Hill before falling down towards the N61 approx. 3.5km south of Tulsk and on down to the N5 at Ardakillin. From Ardakillin to the R368 road crossing this option follows Option 2A. From here it diverges a little north but south of Option 2 passing approx. 1.9km south of Strokestown.

4.2 Potential Impact Ratings

All receptors within 300m of the centreline of each corridor has been identified and put into one of five "band". These bands have been arbitrarily rated in reverse order to give a single number Potential Impact Rating (PIR) for each route. The larger the PIR the greater the potential impact, however, this has to be moderated against the following two paragraphs to ensure traffic flow changes and mitigation opportunity are considered. The following Tables 4.1 to 4.7 show the un-moderated PIR for each route corridor option:

Route Corridor Option 1			
Band	**No of Receptors**	**Rating**	**Result**
0m – 50m	27	4	108
50m – 100m	30	3	90
100m – 200m	87	2	174
200m – 300m	111	1	111
Total	255		
		Potential Impact Rating (PIR)	483

Table 4.1 PIR (Un-moderated) Route Corridor Option 1

Route Corridor Option 1A			
Band	**No of Receptors**	**Rating**	**Result**
0m – 50m	30	4	120
50m – 100m	33	3	99
100m – 200m	77	2	154
200m – 300m	74	1	74
Total	214		
		Potential Impact Rating (PIR)	447

Table 4.2 PIR (Un-moderated) Route Corridor Option 1A

Route Corridor Option 2			
Band	**No of Receptors**	**Rating**	**Result**
0m – 50m	39	4	156
50m – 100m	42	3	126
100m – 200m	79	2	158
200m – 300m	72	1	72
Total	332		
		Potential Impact Rating (PIR)	512

Table 4.3 PIR (Un-moderated) Route Corridor Option 2

Route Corridor Option 2A			
Band	**No of Receptors**	**Rating**	**Result**
0m – 50m	34	4	132
50m – 100m	40	3	120
100m – 200m	78	2	156
200m – 300m	76	1	76
Total	228		
		Potential Impact Rating (PIR)	484

Table 4.4 PIR (Un-moderated) Route Corridor Option 2A

Route Corridor Option 2B			
Band	**No of Receptors**	**Rating**	**Result**
0m – 50m	34	4	132
50m – 100m	38	3	114
100m – 200m	78	2	176
200m – 300m	78	1	78
Total	228		
		Potential Impact Rating (PIR)	500

Table 4.5 PIR (Un-moderated) Route Corridor Option 2B

Route Corridor Option 3			
Band	**No of Receptors**	**Rating**	**Result**
0m – 50m	488	4	1952
50m – 100m	179	3	537
100m – 200m	245	2	490
200m – 300m	152	1	152
Total	1064		
		Potential Impact Rating (PIR)	3131

Table 4.6 PIR (Un-moderated) Route Corridor Option 3

Route Corridor Option 4			
Band	**No of Receptors**	**Rating**	**Result**
0m – 50m	**48**	**4**	**192**
50m – 100m	**42**	**3**	**126**
100m – 200m	**65**	**2**	**130**
200m – 300m	**87**	**1**	**87**
Total	**242**		
	Potential Impact Rating (PIR)		**570**

Table 4.7 PIR (Un-moderated) Route Corridor Option 4

Based on the above tables, Option 1A will have the least potential impact on sensitive receptors followed by Options 1, 2A, 2B, 2, 4 and 3. Option 3, the online options, has by far the greatest potential impact rating.

4.3 Traffic Flow Changes

A detailed traffic Model has been developed for the N5 Strategic Corridor Study incorporating each of the seven route corridor options (see Section 4 of the Route Selection Report). This traffic model was used to determine:

- Traffic flows on the existing road network within the study area, and
- For each of the seven route corridor options, those roads where traffic flow is expected to increase or decrease by 25% or more as a result of developing a route within that corridor (25%roads).

All sensitive receptors within 300m of these 25%roads were identified for each corridor as outlined in Table 4.8 to 4.14 below:

Route Corridor Option 1			
Road Number	**Change in Traffic Flow**	**No. of Receptors**	
		0-100m	**0-300m**
Route 1	≧25% increase	57	255
Existing N5	≧25% decrease	-488	-1064
R368 North	≧25% decrease	34	52

Table 4.8 Traffic Flow Change – Route Corridor 1

Route Corridor Option 1A			
Road Number	**Change in Traffic Flow**	**No. of Receptors**	
		0-100m	**0-300m**
Route 1A	≧25% increase	66	214
Existing N5	≧25% decrease	-488	-1064
R368 North	≧25% decrease	34	52

Table 4.9 Traffic Flow Change – Route Corridor 1A

Route Corridor Option 2			
Road Number	**Change in Traffic Flow**	**No. of Receptors**	
		0-100m	**0-300m**
Route 2	≧25% increase	81	232
Existing N5	≧25% decrease	-488	-1064
N61 North	≧25% increase	0	39
R368 North	≧25% decrease	34	52

Table 4.10 Traffic Flow Change – Route Corridor 2

Route Corridor Option 2A			
Road Number	Change in Traffic Flow	No. of Receptors	
		0-100m	0-300m
Route 2A	≧25% increase	74	228
Existing N5	≧25% decrease	-488	-1064
N61 North	≧25% increase	0	39
R368 North	≧25% decrease	34	52

Table 4.11 Traffic Flow Change – Route Corridor 2A

Route Corridor Option 2B			
Road Number	Change in Traffic Flow	No. of Receptors	
		0-100m	0-300m
Route 2B	≧25% increase	72	228
Existing N5	≧25% decrease	-488	-1064
N61 North	≧25% increase	0	39

Table 4.12 Traffic Flow Change – Route Corridor 2B

Route Corridor Option 3			
Road Number	Change in Traffic Flow	No. of Receptors	
		0-100m	0-300m
Route 3	0%	N/A	N/A
Existing N5	0%	0	0

Table 4.13 Traffic Flow Change – Route Corridor 3

Route Corridor Option 4			
Road Number	Change in Traffic Flow	No. of Receptors	
		0-100m	0-300m
Route 4	≧25% increase	90	242
Existing N5	≧25% decrease	-488	-1064
R367 South	≧25% decrease	41	46

Table 4.14 Traffic Flow Change – Route Corridor 4

The data from the above tables has been summarised in Fig. 4.1 below to show the numbers of receptors benefiting (reduction in traffic by 25% or more) and disbenefiting (increase in traffic by 25% or more) for each of the proposed route corridor options. There is approx. equal net benefit to be derived from each of the route corridor options with the exception of option 3 where no benefits can be derived because it follows the existing N5 road.

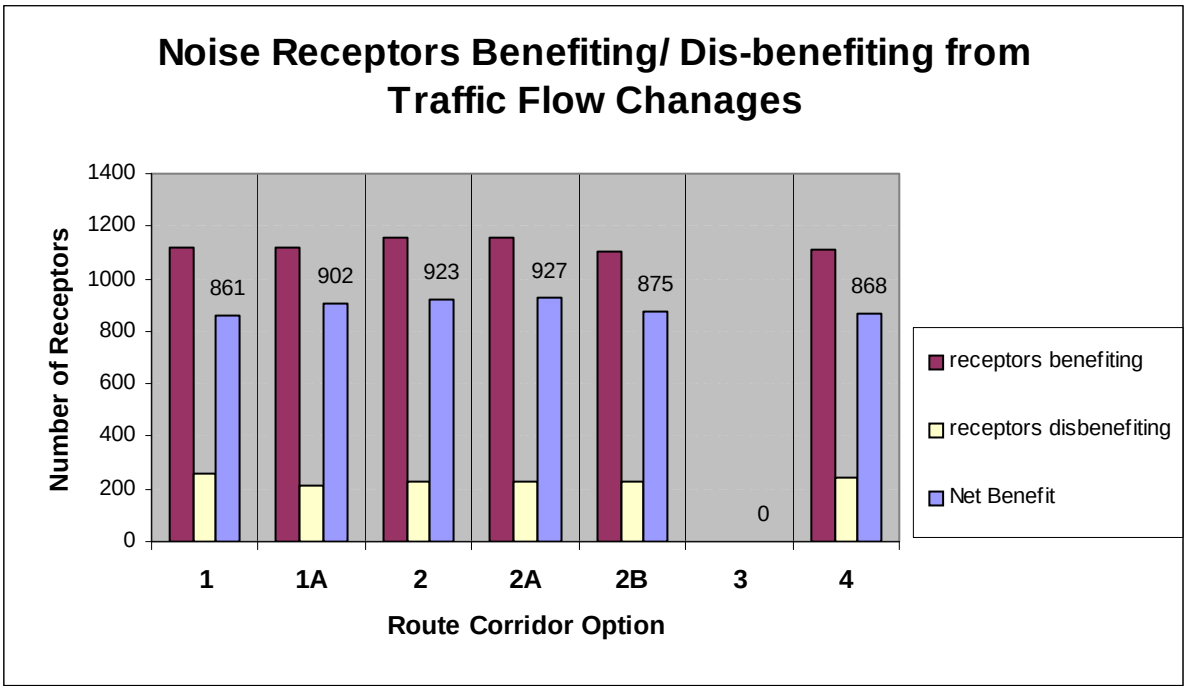

Figure 4.1 Noise Receptors and Traffic Flow Changes

4.4 Mitigation Review

The opportunities for mitigation, away from population centres, through design measures such as cuttings, provision of bunds and specifically designed noise barriers is broadly similar for each route corridor option with the exception of Corridor 3. This corridor is broadly online with a large number of sensitive receptors and access points that militates against the provision of designed mitigation opportunities. In addition, its routing through existing populations centres (Frenchpark, Bellanagare, Tulsk and Strokestown) means that mitigation opportunities are further reduced in these areas.

Route corridor option 1 passes approx. 900m north of Frenchpark, outside the current speed limit zone but due to ribbon development and urban sprawl there is an increased density of dwellings in the vicinity of the road that would hamper the ability to provide mitigation in that area. Furthermore, it would appear, probably because of the ground conditions, that there is a propensity for a greater proportion of new developments (planning applications) to be concentrated towards the north/ north west of the town.

4.5 PIR, Traffic and Mitigation

As stated above the assessment of route corridor options in relation to noise and vibration depends primarily on the number of receptors affected (PIR) but this is moderated by the change in traffic flow pattern and the likely need for mitigation measures.

Option 1A has the lowest PIR (447) and passes to the south of Frenchpark in an area with a relatively low density of receptors. Option 1 has the second lowest PIR (483), it passes close to the northern part of Frenchpark where there is an increased density of receptors and mitigation measures would be more difficult to provide.

The results of the traffic model indicate that there will be little difference in traffic levels on roads other than the new and existing N5.

Mitigation potential for options 1A, 2, 2A, 2B and 4 would be considered approximately equal. In the case of option 1, mitigation in the vicinity of Frenchpark would be more difficult due to the proximity of developments as a result of urban sprawl. Mitigation along option 3 (online) would be impossible for the majority of receptors in urban areas and even in the majority of rural areas it would be difficult.

Having regard to the PIRs, the potential to mitigate and the implication from predicted traffic flow changes the Table 4.15 below outlines the relative ranking of the route options from a noise and vibration perspective:

Route Option	Ranking
1A	1
2A	2
2B	3
2	4
4	5
1	6
3	7

Table 4.15 Route Options Preference – Noise and Vibration

5 EMERGING PREFERRED ROUTE CORRIDOR

5.1 Conclusions

Noise and vibration is primarily based on the proximity of receptors to the centreline of each corridor option based on bands. This is arbitrarily weighted by using the reverse order of the bands as a multiplier (i.e. the closer to the centreline the greater the multiple) giving a Potential Impact Rating (PIR) for each corridor. This PIR is moderated by having regard to changes in traffic flow pattern as a result of the proposed scheme and by the ability to provide mitigation measures within each corridor. Combining these factors, Route Corridor Option 1A emerged as the preferred option in relation to noise and vibration.

Appendix 1 Traffic Flow Data

Road	Do Min. AADT	RouteOption 1			RouteOption 1A			RouteOption 2		
		AADT	Change	%	AADT	Change	%	AADT	Change	%
N5-A	6684	3923	2761	41	2749	3935	59	2749	3935	59
R361-South	1421	1683	-262	-18	1422	-1	0	1423	-2	0
R361-North	4334	4333	1	0	4333	1	0	4334	0	0
N5-E	5603	2538	3065	55	2721	2882	51	1659	3944	70
R367-South	1295	1295	0	0	1295	0	0	1295	0	0
N61-South	5335	5313	22	0.4	5311	24	0.4	5400	-65	-1
N61-North(a)	3583	3618	-35	-1	3615	-32	-0.9	4569	-986	-28
N5-G	6203	2538	3665	59	2721	3482	56	1079	5124	83
R368-North	1871	704	1167	62	305	1566	84	1388	483	26
R368-South	2252	2251	1	0	2251	1	0	2181	71	3
N5-H	6937	2602	4335	62	2834	4103	59			

Road	Do Min. AADT	RouteOption 2A			RouteOption 2B			RouteOption 3		
		AADT	Change	%	AADT	Change	%	AADT	Change	%
N5-A	6684	2369	4315	65.5	2749	3935	59	6684	0	0
R361-South	1421	1421	0	0	1422	-1	0	1421	0	0
R361-North	4334	4334	0	0	4334	0	0	4334	0	0
N5-E	5603	1700	3903	70	1664	3939	70	5603	0	0
R367-South	1295	1295	0	0	1295	0	0	1295	0	0
N61-South	5335	5447	-112	-2	5311	24	0.4	5335	0	0
N61-North(a)	3583	4744	-1161	-32	4577	-994	-27	3583	0	0
N5-G	6203	1592	4611	74	1425	4778	77	6203	0	0
R368-North	1871	1247	624	33	1468	403	22	1871	0	0
R368-South	2252	2181	71	3	2251	1	0	2252	0	0
N5-H	6937				2308	4629	67	6937	0	0

Road	Do Min. AADT	RouteOption 4		
		AADT	Change	%
N5-A	6684	3385	3299	49
R361-South	1421	1431	-10	-0.7
R361-North	4334	4334	0	0
N5-E	5603	1977	3926	65
R367-South	1295	708	587	45
N61-South	5335	4095	1240	23
N61-North(a)	3583	4464	-881	25
N5-G	6203	1279	4924	79
R368-North	1871	1462	409	22
R368-South	2252	2181	71	3
N5-H	6937	2227	4710	32

Source: TPi Ltd (see Traffic Report)