Appendix 3B
Air Quality

RPS

N5 Strategic Corridor

Route Corridor Selection Report

Air Quality

DOCUMENT CONTROL SHEET

Client	Roscommon County Council					
Project Title	N5 Strategic Corridor					
Document Title	Phase 3 Route Corridor Selection Report, Air Quality					
Document No.	MDE0614RP0001D03					
This Document Comprises	DCS	TOC	Text	List of Tables	List of Figures	No. of Appendices
	1	1	22	1	-	2

Rev.	Status	Author(s)	Reviewed By	Approved By	Office of Origin	Issue Date
01	Draft	Martin Doherty	Paul Chadwick	Paul Chadwick	West Pier	17/05/07
02	Draft	Martin Doherty			West Pier	24/07/07
03	Draft	Martin Doherty			West Pier	17/08/07

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1 EXECUTIVE SUMMARY

RPS was commissioned by the National Roads Design Office (Roscommon) to carry out the air quality assessment for the Phase 3- Route Corridor Selection of the N5 Strategic Corridor. This report outlines the assessment procedure used in the evaluation of the route corridor options in relation to air quality.

The extent of the proposed scheme is east of Ballaghaderreen at Teevnacreeva to Scramoge. Seven route corridor options have been identified by the NRDO. The seven options are assessed for potential impacts on air quality using the NRA Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes, Chapter 3, Route Corridor Selection.

The preferred Route Option in relation to air quality is 1A. The least preferred route is Route Option 3.

Table 1.1 Ranking of route options in relation to air quality.

Route Option
1A
2A
1
2B
2
4
3

2 METHODOLOGY

The air quality assessment was carried out using the methodology contained in the NRA Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes, Chapter 3, Route Corridor Selection and the UK Design Manual for Roads and Bridges (DMRB), Volume 11, Section 3, Air Quality Assessment.

The assessment focuses on nitrogen oxides (NO_x) and particulate matter (PM_{10}), as these are the key traffic-derived pollutants of most concern in relation to the current and future air quality standards limit values.

Using the procedure described in the NRA Guidelines, the overall change in exposure to nitrogen oxides and particulate matter is calculated for the existing route and each of route options for the opening year (2015). Only exposure to NO_x and PM_{10} is assessed here as these pollutants are of most concern in relation to road schemes. The DMRB Local Air Quality Assessment spreadsheet is used to calculate the concentrations of NO_x and PM_{10} at sensitive receptors within 50m of the centreline for all road links with a significant change in traffic volumes as a result of the scheme.

The affected links include the existing and the proposed schemes as well as any link likely to be impacted by the proposed scheme (a greater than 10% change in Annual Average Daily Traffic figures).

The number of sensitive receptors in the 50m band is then multiplied by the predicted change in pollutant emission rate (kg/yr) along each affected link, and then summed for all affected links. If there is a decrease in the pollutant concentrations and resultant improvement in air quality, a negative value is assigned. If there is an increase in concentrations and thus deterioration in air quality a positive value is assigned.

In step 2 the pollutant concentrations with and without the scheme in place are calculated at the receptors most likely to be affected by the proposed emerging preferred route. If designated habitats are within 200m of the road centre, then NO_x impacts must be assessed. This is done for the current year and the opening year for the emerging preferred route option. The DMRB local assessment spreadsheet is used to calculate these concentrations.

3 LEGISLATION AND STANDARDS

The Irish ambient Air Quality Standards have been adopted from the European Commission Framework Directive (96/62/EC) and the associated Daughter Directives on air quality (1999/30/EC, 2000/69/EC, 2002/3/EC)) and are cited as the Air Quality Standards Regulations, which came into force on 17th June 2002 (S.I. No. 271 of 2002). These limit values are presented in Appendix A as tables A1 and A2.

The Air Quality Standards Regulations specify limit values in ambient air for sulphur dioxide (SO_2), lead, particulate matter (PM_{10}) (Stage I) and carbon monoxide (CO), which came into effect on 1st January 2005. For nitrogen dioxide (NO_2) and oxides of nitrogen (NO_x), particulate matter (PM_{10} and $PM_{2.5}$) and benzene the effective date is 1st January 2010. Alert thresholds for SO_2 and NO_2 are specified. The Regulations also specify margins of tolerance for exceedance of the new limit values in the period prior to their entry into force, which have relevance to the air quality assessment responsibilities assigned to the Environment Protection Agency in the Regulations.

Pollutant concentrations recorded during the baseline survey and calculated using the methods outlined in the NRA Guidelines are compared to the Air Quality Standards to give an indication of air quality along each route option and predicted air quality in the year of opening.

4 DESCRIPTION OF CORRIDORS

Seven route corridors have been identified and are assessed in relation to air quality. The existing N5 is the online option; there are five northern options (north of existing N5) and one southern option. Each corridor is a minimum of 500m, except Route Option 3, which is 150m wide, and varies in length between 33.7 and 38 kilometres.

All route corridor options are described from west to east.

4.1 Route Corridor Option 1

33.7km from Ratra/Teevnacreeva to Scramoge, north of existing N5. Route passes north of Frenchpark town, crossing the R361. There are numerous sensitive receptors in the vicinity of the crossing. The route then runs through rural locations for 2.5km and crosses the N61 6km north of Tulsk. The route runs 1.2km east of Strokestown and rejoins the N5 at Scramoge.

4.2 Route Corridor Option 1A

34.2km from Ratra/Teevnacreeva to Scramoge. West of Bellanagare it runs south of existing N5, east of Bellanagare it runs north of N5. It merges with Route Option 1 1km north of Bellanagare.

4.3 Route Corridor Option 2

34.6km from Ratra/Teevnacreeva to Scramoge. West of Bellanagare and east of Ardakillin it is located south of exuisting N5 and remaining section is north of N5.

Passes 1km south of Frenchpark, approx. 1km north of Bellanagare and crosses the N61 1.4km north of Tulsk. It meets the existing N5 at Corbally passing approx. 1km south of Strokestown.

4.4 Route Corridor Option 2A

35.0km from Ratra/Teevnacreeva to Scramoge. 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.

4.5 Route Corridor Option 2B

34.5km from Ratra/Teevnacreeva to Scramoge. 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.

4.6 Route Corridor Option 3

34.5km from Ratra/Teevnacreeva to Scramoge. This corridor is centred along the existing N5 National Primary Route and passes through the towns/ villages of Frenchpark, Bellanagare, Tulsk and Strokestown.

4.7 Route Corridor Option 4

38km from Ratra/Teevnacreeva to Scramoge. 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 her is diverges a little north but south of Option 2 passing approx. 1.9km south of Strokestown.

5 ASSESSMENT OF ROUTE CORRIDOR OPTIONS

5.1 BASELINE MONITORING

Passive diffusion tubes were used to assess the existing ground level concentrations of nitrogen dioxide (NO_2) along the existing N5 and along each of the route corridor options. Locations were chosen to give an indication of baseline air quality along each route corridor (see Figure 1.1 in Appendix A). Descriptions of the locations are presented in Table 5.1. Monitoring was carried out over a one-month periods at the 20 locations. The results presented in Table 5.2 are compared with the relevant air quality limit values contained in the Air Quality Standards Regulations (Appendix A).

PM_{10} concentrations were recorded at two locations over a fifteen-day period. One rural and one urban location were chosen to give an indication of typical PM_{10} concentrations along the route.

Table 5.1: Description of NO_2 diffusion tube monitoring locations.

Location	Description
A1	Roadside location on existing N5 at Teevnacreeva. At junction with road to Fairymount
A2	Roadside location on existing N5 at Churchstreet, next to Into the West Public House
A3	Roadside location on N361 at northern edge of Frenchpark
A4	10m off N361 at Mullen
A5	Roadside location 500m south of Bellanagare at junction with road for Castlerea
A6	Rural background location at crossroads on Brackloon Road. No pollutant sources nearby
A7	Off Elphin Road
A8	Outside Mantua National School
A9	Outside residential property at junction of Elphin Road and Cartronsgor
A10	At junction of Elphin Road and N61
A11	Roadside location on N61 Outside Cloonyquinn National School
A12	6km west of Tulsk, outside residential property on sign for Toberelva cemetery
A13	Roadside location in centre of Tulsk
A14	Roadside location on N5 at junction for Cartron
A15	Roadside location outside residential property on N5 at Cloonfree
A16	10m from roundabout in centre of Strokestown
A17	North of Strokestown at Y junction for Clooneen
A18	North outskirts of Strokestown, outside new housing development
A19	South of Strokestown at crossroads for Carrowclogher
A20	On N5 west of Scramoge outside residential property

Nitrogen Dioxide (NO_2)

Nitrogen dioxide is classed as both a primary pollutant and a secondary pollutant. As a primary pollutant NO_2 is emitted from all combustion processes (such as a gas/oil fired boiler or a car engine). As a secondary pollutant NO_2 is derived from atmospheric reactions of pollutants that are themselves, derived mainly from traffic sources (ground level ozone). Long-term exposure to high concentrations of NO_2 can cause a range of effects, primarily in the lungs, but also in the liver and blood.

Nitrogen oxides (NO_x) are also one of the precursors for ozone formation. Elevated ozone concentrations cause damage to vegetation.NO_x concentrations also impact directly on ecosystems. Nitrate containing particles and nitric acid contribute to wet and dry deposition of nitrogen in areas both close to and remote from sources.

At each of the monitoring locations, levels of NO_2 were measured using a specially prepared diffusion tube with adsorbent material. The tubes were then analysed using UV spectrophotometry, at a UKAS accredited laboratory (Gradko International, Winchester), giving an average concentration over the exposure period. The results of this monitoring are outlined in Table 5.2.

Table 5.2: Results of NO_2 diffusion tube monitoring.

Location	NO_2 Concentration (µg/m^3)
A1	14.5
A2	17.3
A3	9.9
A4	5.6
A5	5.0
A6	4.9
A7	3.5
A8	4.7
A9	5.3
A10	15.3
A11	8.7
A12	9.1
A13	22.3
A14	14.9
A15	6.1
A16	30.1
A17	14.1
A18	17.5
A19	(2)
A20	12.9
Limit Value	40(1)

(1) S.I No 271 of 2002 (as an annual average).
(2) Tube damaged. No result determinable

The results of the baseline nitrogen dioxide survey show a typical spatial variation in accordance with the various site locations. The concentrations at A16 and A13 are the highest as they are roadside location in Tulsk and Strokestown respectively. Vehicles slowing, idling and accelerating at these junction locations, result in the greatest concentrations of NO_2.

The remaining locations show a variety of concentrations with the higher concentrations in closer proximity to traffic sources. These results suggest that the main source of nitrogen oxide in the study area is from motor vehicle exhausts. The results indicate that at all locations the concentrations of NO_2 determined are below the Air Quality Standards annual air quality limit value for nitrogen dioxide of 40µg/m^3.

Particulate Matter (PM_{10})

PM_{10} is emitted as a primary pollutant from road vehicle exhausts. Wear and tear from brake pads and tyres is a further source of particulates. A large proportion of background PM_{10} is as a result of other combustion, mining and construction processes as well as from natural sources such as sea salt and sand. PM_{10} may also be formed as secondary pollutants from the condensation or reaction of chemical vapours in the atmosphere. Health effects associated with PM_{10} in the long term include chronic effects such as increased rates of bronchitis and reduced lung function.

Baseline monitoring of PM_{10} was carried out at two locations within the Constraints area. A rural location north of Bellanagare (B1), (Figure 1.1) was used to assess background rural PM_{10} concentrations and a location in Strokestown (B2) was used to assess PM_{10} in a more built up environment.

PM_{10} was measured over a 15-day period at both locations using the USEPA approved Partisol Sequential analyser. The results of the monitoring are presented in Tables 5.3 and 5.4 below.

Table 5.3: Results of baseline PM_{10} monitoring at Mr. Bell property north Bellanagare (B1).

Reference	Location	Exposure Date	PM_{10} Concentration (µg/m^3)
B1	North of Ballangare (Mr. Bell property)	12/02/07	5.8
		13/02/07	6.7
		14/02/07	8.2
		15/02/07	8.1
		16/02/07	9.0
		17/02/07	5.6
		18/02/07	6.7
		19/02/07	5.1
		20/02/07	9.8
		21/02/07	6.7
		22/02/07	5.8
		23/02/07	3.2
		24/02/07	6.8
		25/02/07	7.7
		26/02/07	6.5
24-hour Limit for the Protection of Human Health			50

Table 5.4: Results of baseline PM_{10} monitoring at Old Fire Station, Strokestown (B2).

Reference	Location	Exposure Date	PM_{10} Concentration ($\mu g/m^3$)
B2	Old Fire station, Strokestown	27/02/07	15.4
		28/02/07	12.6
		01/03/07	19.8
		02/03/07	18.6
		03/03/07	20.2
		04/03/07	17.6
		05/03/07	15.6
		06/03/07	10.7
		07/03/07	11.8
		08/03/07	17.8
		09/03/07	21.2
		10/03/07	22.1
		11/03/07	23.1
		12/03/07	20.2
		13/03/07	19.4
24-hour Limit for the Protection of Human Health			50

The results of the baseline PM_{10} monitoring at the rural location north of Ballanagare indicate an average level of PM_{10} over the 15-day period of 6.8$\mu g/m^3$. These concentrations are typical of winter rural PM_{10} concentration and are well below the air quality standard limit values.

The results of the baseline PM_{10} monitoring at the old fire station in Strokestown site indicate an average level of PM_{10} over the 15-day period of 17.7$\mu g/m^3$. Again, these concentrations are typical of the type of location, a regional town with mixed vehicular traffic. All levels detected are within the statutory daily limit for the protection of human health.

5.2 INDEX OF CHANGE IN EXPOSURE

The regional assessment calculation sheet of the DMRB was used to calculate the overall change in exposure to NO_x and PM_{10} along each route corridor option. The score is determined by calculating the annual change in emissions along all affected links in a corridor and multiplying this by the number of properties within 50m of centreline of each link. The total for all affected links is summed to give a score for NO_x and PM_{10}.

Tables 5.5 to 5.11 outline the assessment scores for NO_x and PM_{10} for each route option. A negative score is assigned where there will be a net improvement in air quality as a result of the scheme. If there were to be deterioration in air quality as a result of the scheme a positive score is obtained. A score of zero indicates no change in regional air quality as a result of the option.

5.2.1 Route Corridor Option 1

Table 5.5. Assessment scores for NO_x and PM_{10} for **Route Option 1** in 2015.

	Link	Receptors within 50m	Link Length (km)	Do-nothing 2015	Do-something 2015	Change (kg/yr)	Rate (kg/km/yr)	NO_x Score
NO_x	Route1	28	33.7	0	54,704	54,704	1623.26	45451
	N5	423	35.7	73,825	26,973	-46,852	-1312.38	-555136
	N361	40	7	4,565	4,771	206	29.46	1178
	N369	40	11	5,534	4,244	-1,290	-117.24	-4689
	N61	9	13	12,332	12,914	581	44.73	403
	N368	50	15	6,139	3,866	-2,273	-151.50	-7575
	N367	40	6	1,403	1,403	0	0.00	0
								-520369

	Link	Receptors within 50m	Link Length (km)	Do-nothing 2015	Do-something 2015	Change (kg/yr)	Rate (kg/km/yr)	PM_{10} Score
PM_{10}	Route1	28	33.7	0	1,087	1,087	32.25	903
	N5	423	35.7	1,467	569	-897	-25.14	-10632
	N361	40	7	104	109	5	0.67	27
	N369	40	11	119	93	-26	-2.36	-94
	N61	9	13	270	277	7	0.57	5
	N368	50	15	147	98	-49	-3.26	-163
	N367	40	6	36	36	0	0.00	0
								-9955

5.2.2 Route Corridor Option 1A

Table 5.6. Assessment score for NO_x and PM_{10} for **Route Option 1A** in 2015.

	Link	Receptors within 50m	Link Length (km)	Do-nothing 2015	Do-something 2015	Change (kg/yr)	Rate (kg/km/yr)	NO_x Score
NO_x	Route1A	30	34.2	0	56,965	56,965	1666	49969
	N5	423	35.7	73,825	25,260	-48,564	-1360	-575428
	N361	40	7	4,565	4,330	-235	-34	-1340
	N369	40	11	5,534	4,685	-849	-77	-3088
	N61	9	13	12,332	12,910	578	44	400
	N368	50	15	6,139	3,511	-2,627	-175	-8758
	N367	40	6	1,403	1,403	0	0	0
								-538245

	Link	Receptors within 50m	Link Length (km)	Do-nothing 2015	Do-something 2015	Change (kg/yr)	Rate (kg/km/yr)	PM_{10} Score
PM_{10}	Route1A	30	34.2	0	1,147	1,147	34	1006
	N5	423	35.7	1,467	533	-933	-26	-11060
	N361	40	7	104	101	-3	0	-17
	N369	40	11	119	91	-28	-3	-102
	N61	9	13	270	277	7	1	5
	N368	50	15	147	89	-58	-4	-193
	N367	40	6	36	36	0	0	0
								-10361

5.2.3 Route Corridor Option 2

Table 5.7 Assessment score for NO_x and PM_{10} for **Route Option 2** in 2015.

	Link	Receptors within 50m	Link Length (km)	Do-nothing 2015	Do-something 2015	Change (kg/yr)	Rate (kg/km/yr)	NO_x Score
NO_x	Route 2	39	34.64	0	58,232	58,232	1681.05	65561
	N5	423	35.7	73,825	28,138	-45,687	-1279.75	-541333
	N361	40	7	4,565	4,566	2	0.23	9
	N369	40	11	5,534	5,143	-391	-35.51	-1420
	N61	9	13	12,332	8,590	-3,742	-287.87	-2591
	N368	50	15	6,139	5,082	-1,057	-70.45	-3522
	N367	40	6	1,403	1,403	0	0.00	0
								-483297

	Link	Receptors within 50m	Link Length (km)	Do-nothing 2015	Do-something 2015	Change (kg/yr)	Rate (kg/km/yr)	PM_{10} Score
PM_{10}	Route 2	39	34.64	0	1,173	1,173	33.86	1320
	N5	423	35.7	1,467	567	-900	-25.21	-10662
	N361	40	7	104	104	0	0.01	0
	N369	40	11	119	110	-8	-0.76	-31
	N61	9	13	270	185	-85	-6.57	-59
	N368	50	15	147	122	-25	-1.69	-85
	N367	40	6	36	36	0	0.00	0
								-9516

5.2.4 Route Corridor Option 2A

Table 5.8. Assessment score for NO_x and PM_{10} for **Route Option 2A** in 2015.

	Link	Receptors within 50m	Link Length (km)	Do-nothing 2015	Do-something 2015	Change (kg/yr)	Rate (kg/km/yr)	NO_x Score
NO_x	Route 2A	34	34.92	0	64,365	64,365	1843.20	62669
	N5	423	35.7	73,825	24,000	-49,825	-1395.65	-590361
	N361	40	7	4,565	4,563	-2	-0.23	-9
	N369	40	11	5,534	5,262	-272	-24.73	-989
	N61	9	13	12,332	14,339	2,007	154.38	1389
	N368	50	15	6,139	5,066	-1,073	-71.54	-3577
	N367	40	6	1,403	1,403	0	0.00	0
								-530878

	Link	Receptors within 50m	Link Length (km)	Do-nothing 2015	Do-something 2015	Change (kg/yr)	Rate (kg/km/yr)	PM_{10} Score
PM_{10}	Route 2A	34	34.9	0	1,262	1,262	36.16	1230
	N5	423	35.7	1,467	520	-947	-26.51	-11215
	N361	40	7	104	104	0	-0.01	0
	N369	40	11	119	111	-8	-0.71	-28
	N61	9	13	270	308	38	2.92	26
	N368	50	15	147	119	-29	-1.92	-96
	N367	40	6	36	36	0	0.00	0
								-10084

5.2.5 Route Corridor Option 2B

Table 5.9. Assessment score for NO_x and PM_{10} for **Route Option 2B** in 2015

	Link	Receptors within 50m	Link Length (km)	Do-nothing 2015	Do-something 2015	Change (kg/yr)	Rate (kg/km/yr)	NO_x Score
NO_x	Route 2B	33	34.56	0	60,415	60,415	1748.11	57688
	N5	423	35.7	73,825	26,051	-47,774	-1338.21	-566064
	N361	40	7	4,565	4,333	-232	-33.08	-1323
	N369	40	11	5,534	5,298	-235	-21.41	-856
	N61	9	13	12,332	13,996	1,664	128.01	1152
	N368	50	15	6,139	5,317	-822	-54.77	-2738
	N367	40	6	1,403	1,403	0	0.00	0
								-512142

	Link	Receptors within 50m	Link Length (km)	Do-nothing 2015	Do-something 2015	Change (kg/yr)	Rate (kg/km/yr)	PM_{10} Score
PM_{10}	Route 2B	33	34.56	0	1,200	1,200	34.73	1146
	N5	423	35.7	1,467	532	-934	-26.17	-11069
	N361	40	7	104	101	-3	-0.41	-17
	N369	40	11	119	114	-5	-0.46	-18
	N61	9	13	270	301	31	2.36	21
	N368	50	15	147	128	-20	-1.31	-66
	N367	40	6	36	36	0	0.00	0
								-10002

5.2.6 Route Corridor Option 3

Table 5.10. Assessment score for NO_x and PM_{10} for **Route Option 3** in 2015

	Link	Receptors within 50m	Link Length (km)	Do-nothing 2015	Do-something 2015	Change (kg/yr)	Rate (kg/km/yr)	NO_x Score
NO_x	N5	423	35.7	73,825	73,825	0	0.00	0
	N361	40	7	4,565	4,565	0	0.00	0
	N369	40	11	5,534	5,534	0	0.00	0
	N61	9	13	12,332	12,332	0	0.00	0
	N368	50	15	6,139	6,139	0	0.00	0
	N367	40	6	1,403	1,403	0	0.00	0
								0

	Link	Receptors within 50m	Link Length (km)	Do-nothing 2015	Do-something 2015	Change (kg/yr)	Rate (kg/km/yr)	PM_{10} Score
PM_{10}	N5	423	35.7	1,467	1,467	0	0.00	0
	N361	40	7	104	104	0	0.00	0
	N369	40	11	119	119	0	0.00	0
	N61	9	13	270	270	0	0.00	0
	N368	50	15	147	147	0	0.00	0
	N367	40	6	36	36	0	0.00	0
								0

5.2.7 Route Corridor Option 4

Table 5.11 Assessment score for NO_x and PM_{10} for **Route Option 4** in 2015

	Link	Receptors within 50m	Link Length (km)	Do-nothing 2015	Do-something 2015	Change (kg/yr)	Rate (kg/km/yr)	NO_x Score
NOx	Route 4	48	38	0	52,560	52,560	1383.15	66391
	N5	423	35.7	73,825	38,489	-35,336	-989.79	-418681
	N361	40	7	4,565	4,341	-224	-32.00	-1280
	N369	40	11	5,534	5,359	-175	-15.93	-637
	N61	9	13	12,332	12,493	161	12.36	111
	N368	50	15	6,139	5,235	-904	-60.27	-3013
	N367	40	6	1,403	1,060	-343	-57.20	-2288
								-359397

	Link	Receptors within 50m	Link Length (km)	Do-nothing 2015	Do-something 2015	Change (kg/yr)	Rate (kg/km/yr)	PM_{10} Score
PM_{10}	Route 4	48	38	0	1,151	1,151	30.28	1454
	N5	423	35.7	1,467	679	-787	-22.05	-9328
	N361	40	7	104	102	-3	-0.39	-16
	N369	40	11	119	115	-4	-0.34	-14
	N61	9	13	270	268	-2	-0.13	-1
	N368	50	15	147	126	-22	-1.45	-72
	N367	40	6	36	23	-13	-2.09	-84
								-8061

All routes apart from Route 3 will result in a net improvement in the regional exposure to NO_x and PM_{10}. This is because the on-line option (Route 3) has the greatest number of receptors within 50m and all other route options will not have significant number of receptors within 50m. This results in a net improvement in exposure for all routes in comparison with the existing route. The route options ranked from an air quality perspective are presented in Table 5.12.

5.2.8 Ranking of Route Corridor Options in relation to Air Quality

Table 5.12 NO_x and PM_{10} scores ranked from air quality perspective.

Route Option	NO_x Score	Better or Worse	PM_{10} Score	Better or Worse
1A	-538245	Better	-10361	Better
2A	-530878	Better	-10084	Better
1	-520369	Better	-9955	Better
2B	-512142	Better	-10002	Better
2	-483297	Better	-9516	Better
4	-359397	Better	-8061	Better
3	0	No change	0	No change

Local Assessment

The emerging preferred route is 1A. Using the DMRB spreadsheet, the pollutant concentrations with and without the scheme in place in 2015 were predicted at a number of sensitive receptors (R1, R2 and R3).

- R1: On the N361 south of Frenchpark, 50m from proposed Route Option 1A.
- R2: In Tulsk village on existing N5.
- R3: in centre of Strokestown on existing N5.

These receptors were chosen to reflect the likely impacts on local air quality from the emerging preferred route (1A). The locations were chosen to reflect the scenarios where air quality will improve as well as deteriorate with the scheme in place in 2015.

At a receptor R1 50m from route option 1A in 2015, there is a slight deterioration in air quality. The predicted concentrations are significantly below all limit values and only slightly higher than the Do-minimum scenario.

For receptors R2 and R3 in Tulsk and Strokestown respectively, there will be a significant improvement in air quality under the 2015 do-something scenario for the preferred route. This will be same for all route options as they remove traffic from the local area.

Table 5.13 to 5.15 present the predicted concentrations of key pollutants at the selected receptors for the existing scenario and the 2015 do-nothing and do-something scenarios.

Table 5.13: Screening Air Quality Assessment, Predicted Air Quality at dwelling (R1) on N361 south of Frenchpark. For Emerging Preferred Route 1A.

Scenarios	**Carbon Monoxide (mg/m^3)**	**Benzene ($\mu g/m^3$)**	**Nitrogen oxide ($\mu g/m^3$)**	**Nitrogen Dioxide ($\mu g/m^3$)**	**Particulates (PM_{10}) ($\mu g/m^3$)**
	Annual Average	Annual Average	Annual Average	Annual Average	Annual Average
Existing 2007	0.16	0.53	25.97	16.85	16.17
Do-minimum 2015	0.14	0.41	19.28	13.32	15.04
Do-something 2015	0.14	0.42	22.32	14.25	15.24
Air Quality Limit Values	10(2)	5(2)	30(1)	40(1)	40(1)

1) EU Council Directive (1999/30/EC).
(2) EU Council Directive (2000/69/EC).

Table 5.14: Screening Air Quality Assessment, Predicted Air Quality at dwelling (R2) north of Tulsk. For Emerging Preferred Route 1A.

Scenarios	Carbon Monoxide (mg/m^3)	Benzene ($\mu g/m^3$)	Nitrogen oxide ($\mu g/m^3$)	Nitrogen Dioxide ($\mu g/m^3$)	Particulates (PM_{10}) ($\mu g/m^3$)
	Annual Average	Annual Average	Annual Average	Annual Average	Annual Average
Existing 2007	0.16	0.53	25.97	16.85	16.17
Do-minimum 2015	0.14	0.41	20.83	13.81	15.11
Do-something 2015	0.13	0.41	18.83	13.18	14.98
Air Quality Limit Values	10(2)	5(2)	30(1)	40(1)	40(1)

1) EU Council Directive (1999/30/EC).

(2) EU Council Directive (2000/69/EC).

Table 5.15: Screening Air Quality Assessment, Predicted Air Quality at dwelling (R3) in Strokestown. For Emerging Preferred Route 1A

Scenarios	**Carbon Monoxide (mg/m^3)**	**Benzene ($\mu g/m^3$)**	**Nitrogen oxide ($\mu g/m^3$)**	**Nitrogen Dioxide ($\mu g/m^3$)**	**Particulates (PM_{10}) ($\mu g/m^3$)**
	Annual Average	Annual Average	Annual Average	Annual Average	Annual Average
Existing 2007	0.16	0.53	25.97	16.85	16.17
Do-minimum 2015	0.15	0.42	25.39	15.15	15.47
Do-something 2015	0.14	0.41	19.25	13.31	15.03
Air Quality Limit Values	10[(2)]	5[(2)]	30[(1)]	40[(1)]	40[(1)]

5.3 IMPACT ON SENSITIVE ECOSYSTEMS

If there are designated habitat sites within 200m of the centreline of any link with significant changes in emissions, the NRA Guidelines require that the nitrogen oxides concentrations and nitrogen deposition rates be calculated at these locations.

Both nitrogen dioxide and nitric oxide (referred to together as nitrogen oxides) are absorbed by vegetation. Their effects on plants are additive and so the ambient limit value for the protection of vegetation is expressed as NO_x.

Nitrogen is an essential plant nutrient and low exposure to nitrogen oxide can promote growth. However, higher exposures can cause adverse effects including leaf or needle damage and reduced growth.

Ballinagare NHA is within 200m of the emerging preferred route option; therefore an assessment was carried out to quantify the potential impact from NOx emissions associated with the scheme. A DMRB screening approach was employed to determine the concentration of Nitrogen Oxides (NO_X) at the nearest boundary of Ballinagare NHA. As a worst-case, the NHA boundary was assumed to be 100m from the Route Option.

This assessment has been carried out using the procedures outlined in the DMRB, February 2003. The calculations were carried out for traffic speeds of 80km/hr for the proposed road using background NO_x concentrations typical of a rural location.

The model predicts that the traffic associated with the emerging preferred route option will not generate significant levels of NO_x and when added to typical rural NO_x concentrations is well below the limit value for the protection of ecosystems (30 µg/m^3).

Table 5.16 NO_x impacts on Ballinagare NHA for Route Option 1A.

	NO_x (µg/m^3)
Contribution from Route Option 1A	0.96
Rural background NO_x concentration	16.20
Total NOx concentration at Ballinagare NHA boundary	17.16
Annual limit for protection of ecosystems	30

APPENDIX A

Table A1 EU Ambient Air Standard - Council Directive 1999/30/EC.

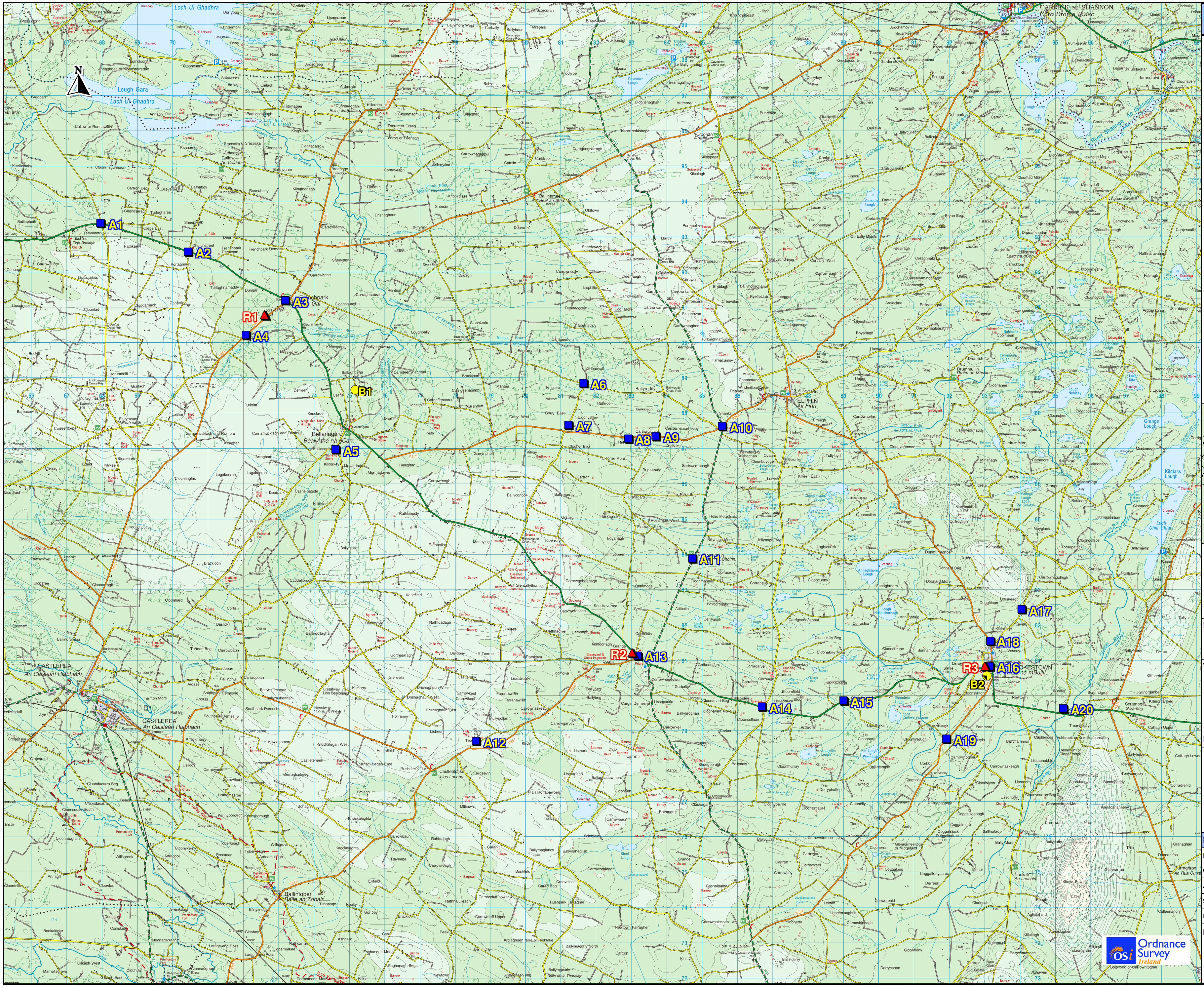
Pollutant	Regulation	Limit Type	Margin of Tolerance	Value
Nitrogen Dioxide	1999/30/EC	Hourly limit for protection of human health - not to be exceeded more than 18 times/year	50% until 2001 reducing linearly to 0% by 2010	200 µg/m^3 NO_2
		Annual limit for protection of human health	50% until 2001 reducing linearly to 0% by 2010	40 µg/m^3 NO_2
		Annual limit for protection of vegetation	None	30 µg/m^3 NO + NO_2
Lead	1999/30/EC	Annual limit for protection of human health	100% until 2001 reducing linearly to 0% by 2005	0.5 µg/m^3
Sulphur dioxide	1999/30/EC	Hourly limit for protection of human health - not to be exceeded more than 24 times/year	43% until 2001 reducing linearly until 0% by 2005	350 µg/m^3
		Daily limit for protection of human health - not to be exceeded more than 3 times/year	None	125 µg/m^3
		Annual & Winter limit for the protection of ecosystems	None	20 µg/m^3
Particulate Matter Stage 1	1999/30/EC	24-hour limit for protection of human health - not to be exceeded more than 35 times/year	50% until 2001 reducing linearly to 0% by 2005	50 µg/m^3 PM_{10}
		Annual limit for protection of human health	20% until 2001 reducing linearly to 0% by 2005	40 µg/m^3 PM_{10}
Particulate Matter Stage 2	1999/30/EC	24-hour limit for protection of human health - not to be exceeded more than 7 times/year	To be derived from data and to be equivalent to Stage 1 limit value	50 µg/m^3 PM_{10}
		Annual limit for protection of human health	50% until 2005 reducing linearly to 0% by 2010	20 µg/m^3 PM_{10}

Table A2: EU Ambient Air Standard – Council Directive 2000/69/EC.

Pollutant	Regulation	Limit Type	Margin of Tolerance	Value
Benzene	2000/69/EC	Annual limit for protection of human health	100% until 2003 reducing linearly to 0% by 2010	5 $\mu g/m^3$
Carbon Monoxide	2000/69/EC	8-hour limit (on a rolling basis) for protection of human health	50% until 2003 reducing linearly to 0% by 2005	10 mg/m^3

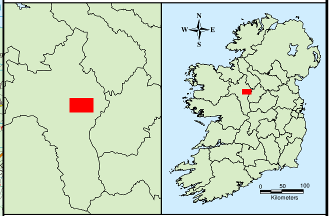
Table A3: Proposed EU Ambient Air Standard – COM(2005) 447 Final.

Pollutant	Regulation	Limit Type	Margin of Tolerance	Value
PM_{10}	COM(2005) 447 Final	Annual limit for protection of human health	20%	40 $\mu g/m^3$
$PM_{2.5}$	COM(2005) 447 Final	Target Value for protection of human health	20% on entry into force, reducing linearly to reach 0% by 1 January 2010	25 $\mu g/m^3$



Legend

- Baseline Air Monitoring Location
- Sensitive Receptors for Local Assessment
- PM_{10} Monitoring Location



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Project

N5 Strategic Corridor

Title

Baseline Air Monitoring Locations

Figure 1.1

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Issue Details

Drawn: C. Reilly		**Project No.** MDE0614	
Checked: M. Doherty		**File Ref.** MDE0614MI0001D03	
Approved: M. Doherty			
Scale: 1:100,000 @ A3		**Drawing No.** MI0001	**Rev.** D03
Date: 17/08/2007			

Notes
1. This drawing is the property of RPS group Ltd.. It is a confidential document and must not be copied, used, or its contents divulged without prior written consent.
2. All levels are referred to Ordnance Datum, Malin Head.
3.