

14. Air Quality

14.1 Introduction

- 14.1.1 Compounds released to the air by motor vehicles, both Light Duty Vehicles (LDV), including cars and small vans, and Heavy Duty Vehicles (HDV) including buses and articulated lorries, result in a variety of environmental effects. The pollutants can travel for various distances through the air and can be greater at certain times of the day depending on traffic volume, wind direction and wind speed. Over time, repeated exposure to vehicle fumes can cause soiling of buildings and materials in the vicinity, as well as having a detrimental affect on people's health.
- 14.1.2 The present route of the A2 Shore Road carries traffic close to a significant number of residential properties, ribboning along either side of this road, with a relatively low proportion of HDV traffic, the major contributor to air pollution. The proposed Scheme will entail online widening between Jordanstown and Station Road, which will do little to alter the volume and proximity of passing traffic to receptors; however it will inevitably relieve congestion. Between Station Road and Seapark, the proposed Scheme will veer offline which will invariably result in a change in traffic flows in this locality in terms of vehicle numbers and speed, and will vary the proximity of some properties to the Scheme, thus having a corresponding impact on air quality. Road projects are usually perceived as having only negative effects, however in some cases the overall effect will be beneficial.
- 14.1.3 The principal objective of the Air Quality Assessment is to indicate whether there are likely to be significant air quality impacts associated with the proposed Scheme ('Do-Something' scenario) in comparison with the 'Do-Minimum' scenario, and existing conditions. In order to fully appraise the potential impact of the proposed Scheme on existing air quality, both local and regional air quality assessments must be conducted in accordance with DMRB 11.3.1.3 requirements (Assessment Procedure), as described below.
- 14.1.4 Traffic data for the air quality assessment has been extracted from CUBE Voyager computer software, prepared as part of the Traffic and Economic Assessment for the Scheme. Data has been extracted for the base year (2006) and projected flows for the 'Do-Minimum' and 'Do-Something' scenarios in the assumed year of opening (2010) and the design year (2024) (assuming high growth).

14.2 Local Air Quality Assessment

Approach and Methods

- 14.2.1 The local air quality assessment is an initial test to establish whether a Scheme requires more detailed air quality modelling. Initially, a count of the number of properties within 200 metres (from the roadside) of the existing and proposed routes (in 50-metre increment bands) is undertaken. DMRB 11.3.1.3, paragraph 3.8(b) states that the bands closely relate to the diminishing contribution that vehicle emissions make to the local air pollution. Beyond 200 metres, the contribution of vehicle emissions from the roadside to the local pollution levels is not significant.
- 14.2.2 This assessment culminated in the preparation of two banding maps showing the properties that might possibly be affected by air pollution by both the existing and proposed routes (Figures 14.1 and 14.2). Tables have also been produced listing the number of properties within 200 metres of the routes, by distance band (Tables 14.1

and 14.3), along with a note of possible benefits from relieving congestion on the existing road network.

14.2.3 The method also involves the estimation of air pollutant concentrations at selected locations, otherwise termed receptor sites, in proximity to the existing and proposed road network that are likely to experience a significant change in terms of air pollution (be it an improvement or deterioration). Estimates are made for the most significant contaminants associated with vehicle emissions, which are Carbon Monoxide (CO), Oxides of Nitrogen (NO_x), Non-Methane HydroCarbons (NMHC) and suspended Particulates (PM₁₀). Carbon Dioxide (CO₂) is not considered at this stage since it is not toxic and causes no adverse environmental effects on a local scale. These estimates are made for (a) the existing situation (Year 2006), (b) the 'Do-Minimum' scenario in the assumed year of opening (Year 2010) and (c) with Scheme implementation ('Do-Something' scenario) in the assumed year of opening (Year 2010). All three sets of figures are then compared to the Relevant Air Quality Standard (RAQS), as set by the UK National Air Quality Strategy. The method takes into account Annual Average Daily Traffic (AADT) numbers, annual average speed, the percentage and traffic composition of Heavy Duty Vehicles (HDV), road type (A-Class, urban road, rural road etc.), the distance of the receptor from the centre of the roads conveying the traffic, traffic growth with time (assuming high growth), and changes in exhaust emissions brought about by more stringent legislation.

14.2.4 If after this initial assessment, pollutant concentrations are found to be in breach of the RAQS, then DMRB 11.3.1.3, paragraph 3.12 suggests that a detailed air quality assessment be carried out. This would also include an air quality assessment in the fifteenth year after opening.

14.2.5 As mentioned, for the purposes of assessment, it is necessary to identify representative locations along the existing and proposed routes, which may experience a significant improvement or deterioration in air quality. Hence the location of properties and sensitive facilities were examined and representative receptor sites carefully chosen in close proximity to these routes, between Jordanstown and Seapark.

Selection of Representative Receptor Sites

14.2.6 In order to establish 'Existing', 'Do-Minimum' and 'Do-Something' local air quality pollutant concentrations, a mix of eight residential/sensitive receptor sites were selected in the study area (Figure 14.3), to represent locations that may experience significant changes or be particularly sensitive to changes in air quality. In order to compare the respective impacts of the various scenarios, the location of the eight receptor sites remains unchanged throughout the assessment.

14.2.7 Receptor Site 1: 1-4 Schooner Court, Langley Hall (Grid Ref: J369 840). This is a block of apartments comprising four individual residences, which may experience a slight deterioration in air quality with implementation of the proposed Scheme, as although traffic volume will remain largely unchanged, it would be brought marginally closer than currently. This receptor was chosen because it represents one of the closest properties to the proposed route, on the landward side of the A2 Shore Road, south of Station Road.

14.2.8 Receptor Site 2: Belfast High School (Grid Ref: J370 841). With implementation of the proposed Scheme, this sensitive facility may experience a slight change in air quality, with similar volumes of traffic and only a negligible change in the Preliminary Scheme Design in relation to the school. It was chosen because it is classified as a particularly sensitive location.

14.2.9 Receptor Site 3: 31 Shore Road (Grid Ref: J375 844). This residential property may experience a marginal improvement in air quality with implementation of the proposed

Scheme, as traffic would be moved marginally further away than currently. This receptor was chosen because it represents one of the closest properties to the existing route, on the coastal side of the A2 Shore Road, south of Station Road, and thus is expected to currently experience the poorest air quality of all receptors assessed.

- 14.2.10 Receptor Site 4: 132 Shore Road (Grid Ref: J379 850). This is a residential property, which may experience deterioration in air quality with implementation of the proposed Scheme, as traffic would be brought much closer to the property than currently.
- 14.2.11 Receptor Site 5: 146 Shore Road (Grid Ref: J381 851). This is a residential property, which may experience an improvement in air quality, due to the reassignment of a significant proportion of traffic away from this location. This receptor was chosen because it represents one of the closest properties to the existing route, on the landward side of the A2 Shore Road, north of Station Road.
- 14.2.12 Receptor Site 6: Ravenhill Private Nursing Home (Grid Ref: J382 851). With Scheme implementation, this Home may experience an improvement in air quality, due to the reassignment of a significant proportion of traffic away from this location. It was chosen as it is a sensitive facility.
- 14.2.13 Receptor Site 7: 87 Shore Road (Grid Ref: J383 852). This is a residential property, which may experience an improvement in air quality, due to the reassignment of a significant proportion of traffic away from this location. This receptor was chosen because it represents one of the closest properties to the existing route, on the coastal side of the A2 Shore Road, north of Station Road.
- 14.2.14 Receptor Site 8: 19 Whinfield Lane (Grid Ref: J383 855). This is a residential property, which may experience a deterioration in air quality with implementation of the proposed Scheme, as a significant proportion of traffic would be brought much closer to the property than currently. This receptor was chosen because it represents the closest property to the proposed route, north of Station Road.

Background Concentrations

- 14.2.15 As part of the air quality assessment, it is necessary to establish background pollutant concentrations for the area under study. Guidance in DMRB 11.3.1.2, paragraph 2.7 suggests that no specific on-site ambient monitoring is required as part of the assessment, unless there are other dominant sources in very close proximity to the proposed road, such as power stations or incinerators. This is because the DMRB screening method has been calibrated in a variety of situations. As there are no such dominant sources between Jordanstown and Seapark, then no on-site measurements were made and the prevailing background concentrations for the local area were accepted. The local background concentrations for these sites were obtained from the Local Air Quality Management (LAQM) section of the National Environmental Technology Centre (NETCEN) website. In Northern Ireland, these are available on a council-by-council basis. The monitored location of background concentrations in relation to each of the receptor sites was obtained by closest grid reference (Appendix M).

Baseline Conditions

- 14.2.16 The objective is to determine existing air quality for the base year (2006) associated with the current alignment of the A2 between Jordanstown and Seapark. In terms of local air quality, this includes establishing the number of properties within 200 metres, and carefully selecting suitable receptor site locations to represent properties likely to experience significant changes in air quality with the proposed Scheme.

Local Air Quality Management Areas

- 14.2.17 The UK Air Quality Strategy (AQS) sets out Air Quality Objectives for key pollutants. Local authorities are obliged to carry out assessments of local air quality and if any Air Quality Objectives are unlikely to be met, an Air Quality Management Area (AQMA) must be declared and improvement plans implemented.
- 14.2.18 In September 2004, Carrickfergus Borough Council declared that the Greenisland area (Gortalee Ward) would be an AQMA, which means that it has been identified as being unlikely to meet AQS objectives. This was due to the relatively high levels of PM₁₀, which is produced when solid fuel is burned for domestic heating. The AQMA covers the Housing Executive area on the south side of Station Road from the railway line to the rear of the Shorelands estate. The boundary of this AQMA is just beyond the 200-metre zone of influence of the Scheme.
- 14.2.19 Newtownabbey Borough Council has also declared an AQMA in Ballyclare and thus is remote from the Scheme.
- 14.2.20 The report 'Air Quality Monitoring in Northern Ireland 2003', compiled by the Environment & Heritage Service indicates that there has been a substantial increase in the amount of monitoring in the last five years and that air quality in Northern Ireland is generally improving. A range of pollutants are monitored nationally, but the nearest air quality monitoring taking place to the study area, is that for Nitrogen Dioxide (NO₂). Roadside automatic monitoring has taken place on the Shore Road in the Whitehouse district (J3477 8048) since April 2003. Results have shown that NO₂ levels are well below that set in the AQS objectives. The principal source of NO₂ is road transport emissions.

Property Banding (Existing Route)

- 14.2.21 As mentioned above, properties along the existing A2 should be segregated into 50-metre bands on either side of the road. This banding is depicted for the existing route on Figure 14.1, with the results of the property count given in Table 14.1.

Table 14.1: Number of properties within 200 metres of the existing A2 between Jordanstown and Seapark.

	Roadside – 50m	50 – 100m	100 – 150m	150 – 200m	Total
Number of Properties	316	144	83	74	617

- 14.2.22 There are a range of property types within 200 metres of the existing A2, though dominated by individual residential properties and residential developments. Other property types between Jordanstown and Seapark include some small commercial developments and a number of particularly sensitive facilities. Although the land to the rear of the residential developments on the landward side of the A2 is in agricultural usage, farm properties in the study area are not common.
- 14.2.23 With reference to Table 14.1, it is evident that at present, airborne pollutants attributable to vehicular activity would affect up to approximately 316 properties within 50 metres of the existing roadside, and as expected, the majority are residential. In total, approximately 617 properties are located within 200 metres. The variation in the number of properties within each band is very much reflective of the attraction that this road has had upon ribbon development, with just over 50% of the total number of properties located within the first 50 metres, with only 12% of the total number of properties located within the last 50 metres.

- 14.2.24 In terms of locations that may be particularly sensitive to changes in air quality, such as schools, hospitals, nursing homes or areas of outdoor communal activity, it is evident that there are approximately eleven such facilities within 200 metres of the existing A2 Shore Road. These include four educational facilities, the closest of which is Rostulla Special School on the Jordanstown Road, which is within 50 metres of the existing alignment. Other educational facilities include Belfast High School, the University of Ulster at Jordanstown, and Silverstream Primary School playing field.
- 14.2.25 Other sensitive facilities close to the road include three nursing homes, two of which are within 50 metres; these include Greenisland House Nursing Home and Ravenhill Private Nursing Home, both of which are located on the coastal side of the Shore Road. Seapark Nursing Home, located just off the Belfast Road at Seapark, is within 50-100 metres of the road. There are two churches in close proximity to the road, one of which (Ebenezer Chapel on Station Road) is located with 100-150 metres, and the other (St Colman's, also on Station Road) is located within 150-200 metres of the existing alignment. The remaining sensitive facilities include Loughshore Park, which is within 50 metres of the Shore Road, at Jordanstown, and although Greenisland Surgery is beyond 200 metres, the grounds and parking area fall within 200 metres of the existing alignment.

Receptor Assessment

- 14.2.26 With the use of the eight receptor site locations and base year traffic flow data, local air quality pollutant concentrations have been calculated and summarised in Table 14.2.

Table 14.2: Localised air quality assessment for existing conditions (2006)

Receptor Number and Name		Pollutant Concentrations at Receptor					
		CO	Benzene	1,3-butadiene	NO ₂	PM ₁₀	
		Annual mean mg/m ³	Annual mean µg/m ³	Annual mean µg/m ³	Annual mean µg/m ³	Annual mean µg/m ³	Days >50µg/m ³
1	1-4 Schooner Court at Langley Hall	0.48	0.95	0.34	22.24	21.74	5.88
2	Belfast High School	0.37	0.78	0.19	18.45	19.74	3.09
3	31 Shore Road	0.55	1.06	0.43	24.45	23.06	8.22
4	132 Shore Road	0.32	0.65	0.13	15.88	18.47	1.79
5	146 Shore Road	0.46	0.87	0.31	21.25	21.17	4.99
6	Ravenhill Private Nursing Home	0.39	0.77	0.23	19.00	19.95	3.34
7	87 Shore Road	0.51	0.96	0.38	23.08	22.24	6.72
8	19 Whinfield Lane	0.29	0.61	0.10	14.92	18.10	-
UK National Air Quality Standards	Current	10.0	16.25	2.25	40.0	40.0	35
	Future	10.0	3.25 by 2010	2.25	40.0	20.0 by 2010	7 by 2010

- 14.2.27 Under existing conditions, all contaminants screened at the various receptor locations fall well within the current UK National Air Quality Standards.

- 14.2.28 Of the receptor sites selected, and as would be expected, the lowest pollutant concentrations are at those furthest from the existing A2, namely Receptors 2, 4 and 8 (Belfast High School, 132 Shore Road and 19 Whinfield Lane respectively). Generally, the greater the distance a property is away from the A2 Shore Road, and to a much lesser extent, away from Station Road, the lower the level of airborne contaminants which a receptor will be exposed to, which in the case of 19 Whinfield Lane, is little above, if not at, background levels.
- 14.2.29 As expected, under existing conditions, those receptors located closest to the existing A2, namely Receptors 1, 3, 5 and 7 (1-4 Schooner Court at Langley Hall, 31 Shore Road, 146 Shore Road and 87 Shore Road respectively) are exposed to the highest airborne pollutant concentrations. Of these, Receptor 3 (31 Shore Road) which is the closest of all receptors to the existing route and is exposed to comparatively the highest volume of passing traffic, south of Station Road experiences the highest concentration of airborne pollutants of all receptors under consideration, although as previously stated, it remains well within the current RAQS.
- 14.2.30 Generally, as traffic volumes are significantly higher on the A2, south of Station Road, properties along this stretch are exposed to higher contaminant levels than those to the north.
- 14.2.31 The screening model predicts pollution concentrations based on annual average vehicle speeds. However in the case of the Shore Road at Jordanstown, traffic is often queuing and stationary at peak periods due to excessive traffic congestion caused by a 'bottleneck' effect. In turn, this is likely to significantly contribute to pollution levels. Hence, in reality current pollution concentrations are likely to be higher than those estimated in Table 14.2 above.
- 14.2.32 The existing Shore Road between Jordanstown and Seapark is in a comparatively narrow canyon-like corridor, and can be classified as a 'street canyon'. In this context, a street canyon typically has buildings and trees on both sides, where the height of the buildings is generally greater than the width of the road. After consultation with EHS and to avoid missing potential exceedences of the Nitrogen Dioxide objective in such locations, advice in the Local Air Quality Management Technical Guidance (LAQM, TG (03)) of the Environment Act 1995 Part IV (section 6.30 of the guidance document) suggests that the predicted Annual Mean NO₂ 'road traffic component' concentration in the 'local output' sheet in the DMRB Screening Model (v.1.02, November 2003) be multiplied by a factor of 2, to take account of the potential under-prediction of the model in such specific cases. This value should then be added to the background concentration to give the total concentration.
- 14.2.33 For this purpose, and as a worst case scenario, Receptor 3 (31 Shore Road) was subject to this revised assessment, as it is predicted to currently have the highest NO₂ concentration of all receptors under consideration. The new NO₂ Annual Mean figure for this property is now 33.0µg/m³ (previously 24.45µg/m³). Even allowing for this increase, it is still within the current RAQS.
- 14.2.34 When compared with the on-site monitoring data from the Whitehouse district of the Shore Road, southwest of the A2/M5 junction, certain similarities are noted. The monitored Annual Hourly Mean for NO₂ for the Whitehouse district (approximately 3.25km south of Jordanstown) in 2005 was 22µg/m³ (Source : Air Quality in Northern Ireland website). To date in 2006, the average is 18µg/m³. The roadside calculated NO₂ values on the Shore Road between Jordanstown and Seapark are typically 22-25µg/m³ and are thus largely similar to the monitored values.

Predicted Impacts

- 14.2.35 The objective for the local air quality assessment is to determine forecasted emissions for the 'Do-Minimum' and 'Do-Something' scenarios in the assumed year of opening, using the same receptor site locations to give an indication of forecasted pollutant concentrations in the vicinity of the road network.

Property Banding (Proposed Scheme)

- 14.2.36 The property banding for the proposed route is shown on Figure 14.2, with the results of the property count given in Table 14.3.

Table 14.3: Number of properties within 200 metres of the proposed route between Jordanstown and Seapark (adjusted for property loss)

	Roadside – 50m	50 – 100m	100 – 150m	150 – 200m	Total
<i>Number of Properties</i>	222	141	112	97	572

- 14.2.37 As the proposed Scheme entails online widening between Jordanstown and Station Road, and thus coincident with the alignment of the existing route, the range of properties within 200 metres of the Preliminary Scheme Design does not vary much over existing conditions for this stretch. Differences in property counts in this area are attributable to both the demolition of a small number of properties to accommodate the proposed Scheme, and the wider footprint and subsequent zone of influence, marginally changing the counts in each band. Where the proposed Scheme veers offline, north of Station Road, land becomes progressively less developed and increasingly agricultural with relatively few properties in proximity to the proposed route.
- 14.2.38 With reference to Table 14.3, it is evident that with Scheme implementation, airborne pollutants attributable to vehicular activity would affect up to 222 properties within 50 metres of the proposed route, and as expected, the majority are residential. This is significantly less than the current situation, and thus a net benefit of the Scheme for a substantial proportion of residents. In total, approximately 572 properties would be within 200 metres of the Scheme. As mentioned previously very few properties are located close to the offline section of the proposed route. Between Station Road and the Belfast Road at Seapark, only approximately 15 properties would be located within 50 metres, all of which are already located close to the existing route, with approximately 133 properties being located within 200 metres.
- 14.2.39 In terms of locations which may be more sensitive to changes in air quality, as the proposed route is broadly coincident to the alignment of the existing route, south of Station Road, largely the same sensitive facilities would be located within 200 metres of the Preliminary Scheme Design. In total there are approximately nine sensitive facilities within 200 metres of the proposed route (two fewer than the existing situation). These include the same four educational facilities - Rostulla Special School on the Jordanstown Road, Belfast High School, the University of Ulster at Jordanstown, and Silverstream Primary School playing field.
- 14.2.40 There is now only one nursing home located close to the proposed route, that of Seapark Nursing home, within 50-100 metres. There are the same two churches in close proximity to the road, one of which (Ebenezer Chapel on Station Road) would be located with 50-100 metres, and the other, St Colman's (also on Station Road) would be located within 100-150 metres of the proposed route. The remaining sensitive facilities include Loughshore Park which would be within 50 metres of the proposed

route, at Jordanstown, and Greenisland Surgery, which due to the offline alignment would be just within 200 metres of the Scheme.

Receptor Assessment

'Do-Minimum' Scenario

- 14.2.41 With the use of projected traffic data (assuming high growth as a worst case scenario) to the assumed year of opening, Table 14.4 represents forecasted pollutant concentrations at the various receptor site locations for the 'Do-Minimum' scenario.

Table 14.4: Localised air quality assessment under 'Do-Minimum' scenario (2010)

Receptor Number and Name		Pollutant Concentrations at Receptor					
		CO	Benzene	1,3-butadiene	NO ₂	PM ₁₀	
		Annual mean mg/m ³	Annual mean µg/m ³	Annual mean µg/m ³	Annual mean µg/m ³	Annual mean µg/m ³ Days >50µg/m ³	
1	1-4 Schooner Court at Langley Hall	0.45	0.88	0.30	18.71	19.86	3.23
2	Belfast High School	0.36	0.73	0.18	15.67	18.50	1.81
3	31 Shore Road	0.51	0.97	0.37	20.51	20.75	4.39
4	132 Shore Road	0.31	0.61	0.12	13.36	17.48	1.03
5	146 Shore Road	0.43	0.81	0.27	17.66	19.31	2.60
6	Ravenhill Private Nursing Home	0.38	0.72	0.20	15.84	18.48	1.80
7	87 Shore Road	0.48	0.88	0.33	19.14	20.04	3.44
8	19 Whinfield Lane	0.29	0.59	0.10	12.60	17.20	-
UK National Air Quality Standards	Current	10.0	16.25	2.25	40.0	40.0	35
	Future	10.0	3.25 by 2010	2.25	40.0	20.0 by 2010	7 by 2010

- 14.2.42 Several observations can be made regarding the 'Do-Minimum' scenario for 2010 (i.e. the proposed dual carriageway is not constructed and only minimal improvements are made to the existing road infrastructure). With the forecasted traffic growth, it would naturally be anticipated that pollutant concentrations would increase accordingly. However, with reference to Table 14.4, pollutant concentrations are actually forecasted to reduce slightly from current levels at all receptor site locations. This is attributable to the fact that with modern technology and subsequent design of more efficient engines and cleaner fuels, traffic emissions are actually forecasted to fall in future years, accounting for the marginal reduction in pollutant concentrations between the existing levels (2006) and the 'Do-Minimum' scenario (2010).

- 14.2.43 However, as UK National Air Quality Standards are to be revised for some pollutants by 2010, with acceptable concentrations lowered, not all receptor sites are forecasted to comply with the new standards for 2010 under the 'Do-Minimum' scenario. With reference to Table 14.4, Receptors 3 and 7 (31 Shore Road and 87 Shore Road respectively) which represent two of the closest properties to the existing route, either side of Station Road, are both predicted to breach the limit of 20 µg/m³ set for Particulate Matter (PM₁₀). With projected traffic levels (assuming high growth), all other receptors are forecasted to comply with the RAQS at future levels across all screened contaminants.

- 14.2.44 As previously discussed, the road traffic component of Nitrogen Dioxide should be multiplied by a factor of 2. In the case of Receptor 3 (31 Shore Road) with the highest

predicted NO₂ concentration, the revised assessment indicates a new Annual Mean figure for this property of 27.4µg/m³ (previously 20.5µg/m³). Even allowing for this increase, it is still within the future RAQS.

'Do-Something' scenario

- 14.2.45 With the use of projected traffic data (assuming high growth as a worst case scenario) to the assumed year of opening, Table 14.5 represents forecasted pollutant concentrations at the receptor locations under the 'Do-Something' scenario, i.e. the proposed dual-carriageway Scheme is implemented.

Table 14.5: Localised air quality assessment under 'Do-Something' scenario (2010)

Receptor Number and Name		Pollutant Concentrations at Receptor					
		CO	Benzen e	1,3- butadiene	NO ₂	PM ₁₀	
		Annual mean mg/m ³	Annual mean µg/m ³	Annual mean µg/m ³	Annual mean µg/m ³	Annual mean µg/m ³	Days >50µg/ m ³
1	1-4 Schooner Court at Langley Hall	0.39	0.80	0.23	18.38	19.28	2.58
2	Belfast High School	0.34	0.69	0.15	15.48	18.27	1.62
3	31 Shore Road	0.39	0.78	0.22	18.09	19.18	2.47
4	132 Shore Road	0.33	0.64	0.14	15.12	17.90	1.32
5	146 Shore Road	0.30	0.59	0.11	13.01	17.31	0.92
6	Ravenhill Private Nursing Home	0.30	0.59	0.10	12.70	17.23	0.87
7	87 Shore Road	0.29	0.59	0.10	12.60	17.20	-
8	19 Whinfield Lane	0.31	0.61	0.12	13.90	17.55	1.07
UK National Air Quality Standards	Current	10.0	16.25	2.25	40.0	40.0	35
	Future	10.0	3.25 by 2010	2.25	40.0	20.0 by 2010	7 by 2010

- 14.2.46 Under the 'Do-Something' scenario, again, several observations can be made. Firstly and most importantly, in contrast to the 'Do-Minimum' scenario, all contaminants screened at the various receptor site locations fall within the current and future UK National Air Quality Standards. Secondly, and as expected, when compared with the 'Do-Minimum' scenario, it is evident that the local air quality for some of the receptors will change; some will experience an improvement and some will experience a deterioration in air quality, however in both cases these changes are largely marginal.
- 14.2.47 The variation in concentration of pollutants experienced at these receptor sites relates not only to distance from the emission source, but also to variations in the volume of passing traffic. Increasing distance relates to the diminishing contribution that vehicle emissions make to the local air pollution; therefore beyond 200 metres from the road, the contribution of vehicle emissions to local air pollution levels is not significant. As mentioned previously, the extensive property development along the route of the proposed widening, south of Station Road, coupled with higher traffic flows on this stretch, means that properties close to the proposed Scheme, south of Station Road, may expect exposure to a higher concentration of airborne pollutants than similarly located properties, north of Station Road where the Scheme is offline.
- 14.2.48 The deterioration in air quality is in most cases minimal, due to the fact that the overall traffic flows are relatively low, when compared to the UK as a whole and the major contributor to their local air quality is still the background concentrations, attributable to sources other than the road network.

- 14.2.49 In terms of those receptors that would experience the greatest change in air quality, Receptor 4 (132 Shore Road) would marginally experience the greatest deterioration, and Receptor 7 (87 Shore Road) would experience the greatest improvement, although in both cases the changes are marginal.
- 14.2.50 The receptor experiencing the poorest local air quality, is forecasted to be Receptor 1 (1-4 Schooner Court at Langley Hall), as widening of the existing route to accommodate the proposed Scheme would bring traffic much closer than currently, thus increasing the exposure to airborne pollutants attributable to vehicular activity. However, the property would still experience an improvement over both 'Existing', and 2010 'Do-Minimum' conditions with Scheme implementation. Even allowing for a multiplication factor of 2 for the road traffic component of NO₂, the revised assessment indicates a new Annual Mean figure for this property of 23.2µg/m³ (previously 18.38µg/m³). Even allowing for this increase, it is still within the future RAQS.
- 14.2.51 The receptor site predicted to have the best local air quality will be Receptor 7 (87 Shore Road), changing from one of the worst affected properties, in terms of local air quality under both the 'Do-Minimum' and existing conditions, and was actually one of the receptor sites forecasted to breach the limit of 20 µg/m³ set for Particulate Matter (PM₁₀) in 2010 under the 'Do-Minimum' scenario.
- 14.2.52 In essence, with Scheme implementation, even those receptor sites that will be located close to the online section of the proposed Scheme south of Station Road, are forecasted to experience a marginal improvement in local air quality over both the existing situation (2006) and the 'Do-Minimum' scenario (2010), as the proposed Scheme will relieve congestion, causing vehicles to travel more freely. Vehicles operate most efficiently and produce least emissions when they are driven in freely flowing traffic at moderate speeds. As traffic will follow an offline alignment, north of Station Road, the relatively high pollutant levels currently experienced at Receptors 5, 6, 7 along this stretch of the Shore Road would be transferred away from these receptors, resulting in the greatest change and consequently the greatest improvement in local air quality experienced. Conversely, where the traffic will be re-routed, Receptor 4 and 8 (132 Shore Road and 19 Whinfield Lane respectively) will experience a marginal deterioration in air quality over the 'Do-Minimum' scenario, but an improvement over existing levels, though forecasted contaminant levels at these receptor sites still represent some of the lowest of those assessed.
- 14.2.53 As stated earlier, the projected traffic data used for the proposed Scheme was subject to a high growth factor, as a worst case scenario. In reality, if the growth in traffic is lower than this, then accordingly the forecasted pollutant concentrations at the various selected receptor sites, and in the vicinity of the Scheme as a whole, would be lower.

Mitigation

- 14.2.54 The selection of the offline alignment of the proposed dual carriageway north of Station Road has significantly reduced the number of properties within 200 metres (especially 50 metres) of the route between Jordanstown and Seapark, from the existing alignment.
- 14.2.55 The forecasted local air quality concentrations for the proposed Scheme are not in breach of current and future UK air quality standards. On the basis of the above results, no further detailed air quality assessment or mitigation is required.

Residual Impact

- 14.2.56 The forecasted local air quality concentrations for the proposed Scheme are not in breach of current and future UK air quality standards, unlike the 'Do-Minimum'

scenario, which would breach with the limit of $20 \mu\text{g}/\text{m}^3$ set for Particulate Matter (PM_{10}) at Receptors 3 and 7.

- 14.2.57 There are a total of approximately 617 properties within 200 metres of the existing route between Jordanstown and Seapark, the majority of which are residential. With Scheme implementation, there would be approximately 572 properties within 200 metres of the mainline, an overall net benefit reduction of approximately 7% (Figure 14.4).
- 14.2.58 The greatest change in air quality is experienced within the first 50 metres from the roadside. The existing route has 316 properties within the 50-metre band, whereas the proposed route has 222 in the 50-metre band, a net benefit reduction of approximately 30%.
- 14.2.59 Under the local air quality assessment for the proposed Scheme, in the assumed year of opening, there is a forecasted overall reduction in pollution concentrations at all selected receptor sites, over the existing situation (2006).

14.3 Regional Air Quality Assessment

Approach and Methods

- 14.3.1 The regional air quality assessment is a method used to calculate a Scheme's net contribution to overall pollution within a region. This is used to identify the concentrations of pollutants that contribute to a more wide spread decline in air quality such as acid rain deposition and the greenhouse effect. As with local air quality, the method takes into account AADT, road length, road type, annual average speed, percentage of HDV, traffic growth, and changes in exhaust emissions with time. Estimates are then made for (a) the existing situation base year (Year 2006), (b) the 'Do-Minimum' and 'Do-Something' scenarios in the assumed year of opening (Year 2010) and (c) the 'Do-Minimum' and 'Do-Something' scenarios in the design year (Year 2024) for the total emissions of Carbon Monoxide, Non-Methane HydroCarbons, Oxides of Nitrogen, Particulate Matter and Carbon Dioxide. The procedure requires the calculation of total forecast emissions after the proposed project has been built and deduction of the estimated emissions from the existing road network where traffic patterns are affected by the Scheme.

Baseline Conditions

- 14.3.2 The contribution of the existing road between Jordanstown and Seapark to the overall regional air quality has been established for the base year. This gives a comparator for future 'Do-Minimum' and 'Do-Something' scenarios in the assumed year of opening and the design year. Base year regional air quality conditions are summarised in Table 14.6 and detailed in Appendix M.

Table 14.6: Regional air quality assessment for existing conditions (2006)

Year	Network	Pollutant (Tonnes/yr)				
		CO	THC	NO _x	PM ₁₀	CO ₂
2006	Existing	89.3	10.9	31.8	1.3	9786

Predicted Impacts

14.3.3 In terms of regional air quality, both scenarios were assessed for the year of opening and the design year. Temporary changes in air quality as a result of the construction phase have been addressed in Section 18.5 and will therefore not be examined here.

14.3.4 The following table (Table 14.7) is a summary of the net effect of the proposed Scheme in 2010 and design year 2024 in comparison to the equivalent 'Do-Minimum' alternatives. A list of the entire road network link data ('Do-Minimum' and 'Do-Something') spreadsheet calculations of the regional assessment is given in Appendix M for both scenarios.

Table 14.7: Regional air quality assessment for existing and proposed road network in proposed year of opening and design year.

Year	Road Network	Pollutant (Tonnes/yr)				
		CO	THC	NO _x	PM ₁₀	CO ₂
2010	Existing	78.3	9.2	25.2	0.9	9995
	Proposed	44.6	5.5	24.2	0.7	8709
	% Change	-43.0	-40.2	-4.0	-22.2	-12.9
2024	Existing	90.3	10.5	20.5	0.7	11691
	Proposed	54.4	6.3	20.7	0.5	10199
	% Change	-39.8	-40.0	+0.97	-28.6	-12.8

14.3.5 To draw conclusions from the regional air quality assessment it is necessary to compare the 'Do-Minimum' scenario with the 'Do-Something' scenario for the year of opening and the design year. The percentage changes in both years indicate a significant decrease in pollutant concentration with the proposed Scheme for all contaminants, except Oxides of Nitrogen which is estimated to marginally increase by 0.97% over the 'Do-Minimum' in 2024. The greatest estimated improvement as a result of the proposed Scheme would be for Carbon Monoxide and Total Hydrocarbons, both of which equate to an approximate 40% improvement in the year of opening and design year.

14.3.6 In summary, the comparison of the 'Do-Minimum' and 'Do-Something' scenarios for the year of opening (2010) and design year (2024) provides a conservative estimate of the likely changes in regional emissions. On this basis, it can be seen that the decreases in emissions with Scheme implementation would significantly reduce the impact of this road on regional air quality, reducing impacts such as formation of photochemical oxidants, acid deposition and greenhouse effects.

Mitigation

14.3.7 No mitigating measures are proposed, due to the forecasted significant improvement in regional air quality expected with implementation of the proposed Scheme.

Residual Impact

14.3.8 In terms of regional air quality, with Scheme implementation, the percentage changes in both future year scenarios indicate a significant decrease in pollutant concentration

over the 'Do-Minimum' for all contaminants, except Oxides of Nitrogen which is estimated to marginally increase by 0.97% in 2024.

14.4 Summary

An air quality assessment has been carried out in accordance with the requirements of the Design Manual for Roads and Bridges, which is the standard methodology for major road Schemes. The results indicate there will be no significant effect on either local or regional air quality as a result of the proposed Scheme. Local air quality pollutant concentrations would remain within the Relevant Air Quality Standards and are actually forecasted to marginally decrease from existing levels in the proposed year of Scheme opening. Moreover, there would be fewer properties in proximity to the proposed dual carriageway, than along the existing A2 and hence with strategic traffic reassigning to the proposed dual carriageway from the existing Shore Road, there would be a net benefit with improved air quality for the majority of properties between Station Road and Seapark. In terms of regional air quality, generally there would be an overall significant reduction in concentrations from existing levels.

14.5 References

- Local Air Quality Management Technical Guidance LAQM TG (03). Part IV of the Environment Act 1995. Department for Environment Food and Rural Affairs, 2003:
- Air Quality Monitoring in Northern Ireland 2003. Report Number AEAT/ENV/R/1868. Department of Environment, 2005:
- Design Manual for Roads and Bridges, Volume 11, Environmental Assessment. Department of the Environment for Northern Ireland et al (August 1994, as amended up to August 2006).