5 Air Quality

5.1 Introduction

5.1.1 Background

This section provides the air quality assessment for the proposed A68 Pathhead to Tynehead Improvement Scheme.

DMRB Chapter 11 Section 3, HA207/07, May 2007 provides guidance on the assessment of air quality. This guidance has been used as the basis of the air quality assessment for the proposed road improvement scheme.

A DMRB Stage 1 report was prepared on behalf of the Scottish Executive in June 2004. This indicated that potential changes in existing local air quality resulting from the completed scheme are unlikely to be significant issues, due to the predicted low increase in future traffic flows and the small number of residential properties in the vicinity of the scheme. A Stage 2 assessment was then completed in June 2005 for several road scheme options. The report concluded that all three scheme options considered have an insignificant impact on air quality at each receptor location examined. All air pollutant concentrations were found to be well below the National Air Quality Standard Objectives for all years assessed.

Due to the fact that the Stage 2 assessment was completed in 2005 and that updated traffic data is now available, it was not considered appropriate to refer in detail to the results of the Stage 2 assessment. Although the Stage 2 assessment indicated that the proposed scheme would have an insignificant impact on air quality the Stage 3 assessment has been carried out to take into account the final chosen scheme and the latest traffic data which refers to an opening year of 2010 and a design year of 2025.

5.1.2 The Proposed Scheme and Existing Road Network

The section of the A68 proposed for the Pathhead to Tynehead Improvement Scheme covers a length of approximately 2.51km and does not include the village of Pathhead.

The proposed road improvement scheme will not cause changes in traffic flows on the A68 route of +/-10%. However, the scheme will result in changes in average traffic speeds on the A68 and the scheme will incorporate some alterations to the alignment and at several junctions where roads connect to the existing A68.

The stretch of the A68, which is relevant to the Pathhead scheme, has several small roads that connect to it. These are:

- The U60 Longfaugh Road
- The U77 Fala Dam Road

- The U78 Costerton Road and
- The B6458 Tynehead & Saughland Road.

5.1.3 Final Road Alignment

The final road alignment includes a new junction arrangement with the U60 Longfaugh Road, a new junction arrangement with the U77 Fala Dam Road and a new junction with the B6458 Tynehead and Saughland Road.

- In addition to the new junction arrangement with the U77, there is a new proposed link, which will connect the A68 with the U77 Fala Dam Road as an alternative route to the U78, which will be closed. The existing U77 junction with the A68 will also be shut off.

5.1.4 Scope of Air Quality Assessment Works

This section provides the air quality assessment for the proposed Pathhead to Tynehead Improvement Scheme.

The air quality assessment has been carried out in accordance with guidance found in the Design Manual for Roads and Bridges Chapter 11 Section 3 (DMRB HA207/07, May 2007). The May 2007 guidance does not use the staged approach to assessing air quality (included in the 2003 version) but instead suggests that four assessment levels (scoping, simple, detailed and mitigation) are used to determine the impact of the scheme on air quality.

For each assessment level, there are two components; local and regional air quality. The pollutants assessed are: nitrogen dioxide, fine particulates (PM_{10}) carbon monoxide, benzene and 1,3-butadiene. Changes in concentrations of specific pollutants at a local level are assessed at specific receptor locations and compared against the air quality criteria set to protect human health. The regional impact assessment examines the change in emissions of the assessed pollutants as a result of the operation of the scheme.

In summary, the objectives of the air quality assessment are to:

- Indicate whether there are likely to be significant impacts associated with the proposed road scheme by identifying the number of properties within 200 metres of the alignment and within 200 metres of other routes affected by the scheme.
- Predict air pollutant concentrations using the ‘Local’ application of the DMRB spreadsheet. Using the predicted air pollutant concentrations the difference in population exposure from a do-minimum and a do-something scenario can then be found.

- Predict air pollutant concentrations using the 'Regional' application of the DMRB spreadsheet to analyse how the impact of the road scheme affects air quality on a larger scale.

Guidance from Department for Transport "Scottish Transport Appraisal Guidance (STAG)" May 2008 has also been used to assess the impact on air quality from the development.

5.2 Methodology

5.2.1 The Air Quality Assessment

This air quality assessment follows guidance contained in DMRB, Volume 11, Section 3, Part 1, HA207/07 May 2007 and the guidance from Department for Transport "Scottish Transport Analysis Guidance (STAG)", May 2008.

Identification of Sensitive Receptor Locations

The air quality assessment identifies those areas which are likely to be significantly affected by the chosen scheme option. This stage involves the counting of the number of properties in distance bands within 200 metres from the centre of each affected route. The distance bands are 0 – 50m, 50 – 100m, 100 – 150m and 150 - 200m. STAG recommends that roads affected by a +/- 10% change in traffic or more, as a result of the new scheme, should be assessed. In summary the following has been assessed:

- Receptors within 200 metres of the A68 have been considered although the changes in traffic characteristics will relate to speeds and any changes in vehicle numbers will be less than +/- 10%. The properties less than 200 metres from the relevant stretch of the A68 are Hope, Marldene and Old Crichton Dean.

- Receptors within 200m of the U77 Fala Dam Road (west of the U78 Junction with the U77) have been considered as this route will be closed for the 'do something' scenario' and vehicle numbers will therefore drop by greater than 10%. The properties less than 200 metres from the U77 (west of the U78 junction with U77) are Marldene, Old Crichton Dean, Haugh Head House and Routhenhill.

- Any receptors within 200 metres of the new side road have been considered, as this is a new route. The properties less than 200 metres from the new side road are Haugh Head House and Routhenhill.

- Any receptors within 200 metres of the section A68 subject to improvement works. The properties less than 200 metres from the relevant stretch of the A68 are Hope, Marldene and Old Crichton Dean.

The information above indicates that some of the property locations assessed are more than 200 metres from the A68; however they are less than 200 metres from an affected

route and therefore need to be considered. Further information regarding the receptor locations assessed, are included in section 5.3.1 of this chapter.

Estimated Pollutant Concentrations

DMRB requires that pollutant concentrations are calculated for representative properties along each affected route and compared to the National Air Quality Strategy (NAQS) objectives as set out in the Air Quality (Scotland) Regulations, 2000 and amended 2002. The pollutant concentrations are calculated using the DMRB spreadsheet "The Local Impacts Screening Method".

The DMRB assessment has been carried out for three different years. The details are as follows:

- The base year 2008.
- The proposed opening year 2010: This is considered for both a do-minimum and a do-something scenario.
- The design year 2025: This year is considered for both a do-minimum and a do-something scenario.

For the purposes of this assessment the air pollutant concentrations predicted for future years without the proposed scheme in place are referred to as a 'do-minimum' scenario and future years with the proposed scheme in place as a 'do-something' scenario.

The DMRB assessment has therefore been carried out for a total of five scenarios for existing receptors within 200m of each affected route:

- Scenario 1: 2008 Base Year
- Scenario 2: 2010 Do-minimum
- Scenario 3: 2010 Do-something
- Scenario 4: 2025 Do-minimum
- Scenario 5: 2025 Do-something

The traffic flows, speeds and HGV percentages have been provided by SIAS Transportation Consultants. Traffic flows for the DMRB 'local' assessment are shown in Appendix 2 (Tables A and B). The closest available traffic data node to each receptor has been used as this is considered to be the most representative value. The seven links used in the DMRB 'local' assessment are as follows:

- Link 1: Section of the A68 closest to the Hope receptor

- Link 2: Section of the A68 closest to the Marldene receptor
- Link 3: Section of the A68 closest to the Old Crichton Dean receptor
- Link 4: The U78 Costerton Road (do minimum scenarios only)
- Link 5: The U77 Fala Dam Road closest to the Marldene, Old Crichton Dean and Haugh Head House receptors (do-minimum scenarios only)
- Link 6: The U77 Fala Dam Road closest to the Routhenhill receptor
- Link 7: Proposed new link road between the U77 and the A68 (do-something scenarios only)

Links 4 and 5 are not included in the do-something scenarios as this road will be closed once the new scheme is in place. Link 7 will only be developed if the proposed road scheme goes ahead and is therefore included in the do-something scenarios only. Each of the links is shown on Figure 5.3 (Air Quality Network Diagram).

The base traffic flows, i.e. “do-minimum” scenarios for the DMRB ‘local’ assessment are shown in Appendix 2, Table A.

The traffic flows for “do-something” scenarios for the DMRB ‘local’ assessment are shown in Appendix 2, Table B.

Traffic flows for the DMRB ‘regional’ assessment are shown in Appendix 3. The several traffic nodes that make up each road link were averaged to get an overall value for each link. The six links used in the DMRB ‘regional’ assessment are as follows:

- Link A: The A68: From the Hope receptor to the proposed U77 junction
- Link B: The A68: B6458 Junction to the U78 Costerton Road Junction
- Link C: The A68: U78 Costerton Road Junction to Fala Tunnel
- Link D1: The U77 Fala Dam Road (without development scenarios only)
- Link D2: The A68 and U77 New Side Road and the U77 Fala Dam Road (with development scenarios only)
- Link E: U78 Costerton Road (without development scenarios only)

Link E is not included in the do-something scenarios as this road will be stopped up as part of the proposed scheme. Link D2 will only be relevant if the proposed road scheme goes ahead and it is therefore included in the do-something scenarios only.

The base traffic flows, i.e. “do-minimum” scenarios for the DMRB ‘regional’ assessment are shown in Appendix 3, Table A.

The traffic flows for "do-something" scenarios for the DMRB 'regional' assessment are shown in Appendix 3, Table B.

Once pollutant concentrations have been calculated, DMRB/STAG requires a quantitative assessment of the two major road traffic pollutants PM_{10} and NO_2. The purpose of the quantitative assessment is to estimate the change in people's exposure to concentrations in PM_{10} and NO_2. The quantitative assessment should be carried out for either the year for which the objective concentration needs to be achieved, or for the opening year of the scheme. Pollutant concentrations need to be assessed for both the "do-minimum" and "do-something" scenarios for all affected routes.

For the purpose of this air quality assessment the opening year, 2010, has been assessed.

DMRB requires pollutant concentrations to be estimated for sensitive receptors, i.e. residential properties and properties where there are likely to be vulnerable occupants, such as schools, nursing homes and hospitals.

5.2.2 Air Pollutant Data

DMRB states that for local impact assessments it is necessary to specify background concentrations upon which the local, traffic-derived pollution is superimposed. These may be through local, long term, ambient measurements at background sites, remote from immediate sources of pollution. Data from a representative background site was not available. As an alternative to measured background levels, DMRB recommends the use of background concentrations obtained from default concentration maps, which are produced by the National Environmental Technology Centre (NETCEN) on behalf of the Department for Environment Food and Rural Affairs (DEFRA).

Background pollutant concentrations have been obtained from NETCEN and corrected for the years 2008, 2010 and 2025 (using the NETCEN Air Pollution – Year Adjustment Calculator updated January 2006 in accordance with TG(03)) as shown in Tables 5.1, 5.2 and 5.3.

Table 5.1. Annual Average Background Air Pollutant Concentrations for 2008 for all receptors.

Pollutant	Concentration for each receptor (µg/m^3)				
	Hope	Marldene	Old Crichton Dean	Haugh Head House	Routhenhill
Benzene	0.18	0.17	0.15	0.14	0.14
1,3-Butadiene	0.04	0.04	0.03	0.03	0.03
Carbon Monoxide	0.10	0.10	0.09	0.09	0.09
Oxides of Nitrogen	6.38	6.23	6.01	5.93	5.93
Nitrogen Dioxide	5.24	5.11	4.94	4.87	4.87
Particles (PM_{10})	11.33	11.24	11.05	10.96	10.96

Table 5.2. Annual Average Background Air Pollutant Concentrations for 2010 for all receptors.

Pollutant	Concentration for each receptor (µg/m^3)				
	Hope	Marldene	Old Crichton Dean	Haugh Head House	Routhenhill
Benzene	0.20	0.19	0.17	0.15	0.15
1,3-Butadiene	0.03	0.03	0.03	0.03	0.03
Carbon Monoxide	0.09	0.09	0.09	0.09	0.09
Oxides of Nitrogen	5.77	5.6	5.42	5.32	5.32
Nitrogen Dioxide	4.52	4.39	4.25	4.17	4.17
Particles (PM_{10})	11.3	11.2	11.0	10.9	10.9

Table 5.3. Annual Average Background Air Pollutant Concentrations for 2025 for all receptors.

Pollutant	Concentration for each receptor (µg/m^3)				
	Hope	Marldene	Old Crichton Dean	Haugh Head House	Routhenhill
Benzene	0.20	0.19	0.17	0.15	0.15
1,3-Butadiene	0.03	0.03	0.03	0.03	0.03
Carbon Monoxide	0.08	0.08	0.08	0.08	0.08
Oxides of Nitrogen	4.94	5.18	4.64	4.55	4.55
Nitrogen Dioxide	4.18	4.06	3.93	3.86	3.86
Particles (PM_{10})	11.02	10.92	10.72	10.63	10.63

The NETCEN background concentrations included in Tables 5.1, 5.2 and 5.3 show that the background pollutant concentrations are well below the objective levels shown in Appendix 4. The low background concentrations suggest that with the inclusion of road traffic emissions, concentrations are likely to remain well below the Air Quality Objectives.

5.2.3 DMRB/STAG Assessment: National Air Quality Strategy

Part IV of the Environment Act 1995 requires the Secretary of State to draw up a National Air Quality Strategy. The UK National Air Quality Strategy (NAQS)[2] was published in March 1997 fulfilling the requirement under the Environment Act 1995 for a national air quality strategy setting out policies for the management of ambient air quality. The Strategy sets objectives for eight pollutants, which may potentially occur in the UK at levels that give cause for concern. These pollutants are: nitrogen dioxide, sulphur dioxide, carbon monoxide, lead, fine particulates (PM_{10}), benzene, 1,3–butadiene and ozone.

The Strategy was reviewed and a Review Report[3] and Consultation Document[4] published by the Department of the Environment, Transport and the Regions in 1999. A revised version (The Air Quality Strategy (AQS) 2000), which supersedes the 1997 Strategy was published in January 2000. The AQS 2000 strengthens the objectives for

[2] Department for the Environment, Transport and the Regions 2000. The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, Working Together for cleaner air.

[3] Department of the Environment, Transport and the Regions, January 1999. Report on the Review of the National Air Quality Strategy, Proposals to amend the Strategy.

[4] Department of the Environment, Transport and the Regions 1999, The Air Quality Strategy for England, Scotland, Wales and Northern Ireland. A consultation document.

a number of pollutants with the exception of that for particulates, which was replaced with the less stringent EU limit value.

The objectives for the eight pollutants in the Strategy provide the basis of the implementation of Part IV of the Environment Act 1995. The Air Quality Strategy objectives for each pollutant, except ozone, have been given statutory status in the Air Quality (Scotland) Regulations, 2000[5]. The objectives have been amended by the Air Quality (Scotland) (Amendment) Regulations 2002[6] ('the Regulations'). The current objectives are included in Appendix 4.

In 2007 the Air Quality Strategy was revised. This latest strategy[7] does not remove any of the objectives set out in the previous strategy or its addendum, apart from replacing the provisional 2010 objective for PM_{10} in England, Wales and Northern Ireland (from the 2000 Strategy and 2003 Addendum) with the exposure reduction approach for $PM_{2.5}$. However this change does not apply in Scotland

Local Air Quality Management

The Local Air Quality Management (LAQM) legislation in the Environment Act 1995 requires local authorities to conduct periodic reviews and assessments of air quality. There are two rounds of review and assessment, which comprise of the following:

The first round of review and assessment

The first round of review and assessment followed a phased approach consisting of series of stages.

- Stage 1 review and assessment: All local authorities were required to carry out a first stage review and assessment to identify areas likely to exceed the AQS objectives. If the results indicate that there is the potential for one or more exceedences of the AQS objectives, then a second stage review and assessment is required.

- Stage 2 review and assessment: This focused on the areas that the first stage identified as likely to exceed the AQS objectives. The second stage required monitoring of air pollutants and modelling to predict whether the AQS objectives were unlikely to be met by the end of 2005.

[5] The Air Quality (Scotland) Regulations 2000.

[6] The Air Quality (Scotland) (Amendment) Regulations 2002.

[7] Department of Environment, Food and Rural Affairs, The Air Quality Strategy for England, Scotland, Wales and Northern Ireland. July 2007.

- Stage 3 review and assessment: This required detailed monitoring and modelling to estimate the magnitude and geographical extent of potential exceedances of AQS objectives. Areas where AQS objective exceedences are identified at this stage should be declared as an Air Quality Management Area (AQMA) under Section 82(3) of the Environment Act 1995. Local authorities are then required to undertake a further, more detailed review and assessment (A stage 4 review and assessment) for public consultation and in preparation for the Air Quality Action Plan to state the local authority's schemes for improvement in air quality in pursuit of the AQS objectives.

The second round of review and assessment

Following the first round of review and assessment, in September 2001, DEFRA and the Devolved Administrations commissioned a detailed evaluation of the first round of air quality review and assessments undertaken by local authorities under Part IV of the Environment Act 1995. The evaluation report was published in March 2002 and one of the key recommendations was that the second round of air quality review and assessments should be carried out in two steps. Details of the two steps are provided in Policy Guidance document LAQM.PG (03) and are summarised below.

- Step 1: Updating and Screening Assessment (USA): The purpose of the USA is to identify those aspects that have changed since the first round of review and assessment. The USA should also include an explanation of the conclusion reached as to whether the local authority should proceed to the second step comprising a Detailed Assessment.

- Step 2 Detailed Assessment: This should consider those pollutants and specific locations that have been identified as requiring further work in the USA – i.e. where members of the public are likely to be exposed over the averaging period of the AQS objective.

Scottish Borders District Council Local Air Quality Management Review and Assessment

In accordance with the procedures detailed in DEFRA Technical Guidance TG (03) Scottish Borders District Council has undertaken an Updating and Screening Assessment (USA), 2006. This confirmed that none of the UK air quality objectives is likely to be breached and it did not identify the need for any Air Quality Management Areas (AQMA) to be declared. The proposed improvement scheme and surrounding area does not therefore lie in an AQMA.

Air Quality Monitoring

Scottish Borders Council has not carried out any ambient air quality monitoring in the vicinity of the scheme therefore it has not been possible to obtain any representative ambient air quality information to use for the purposes of the verifying the results of the DMRB assessment.

However taking into consideration the low NETCEN background concentrations (Tables 5.1, 5.2 and 5.3), which are well below the current AQS objectives, any potential increase in air pollutants generated by the operation of the proposed scheme is, on initial assessment, unlikely to cause the Air Quality Objectives to be exceeded and create the need for the designation of an AQMA.

5.2.4 Assessment of Significance

In order to assess the significance of the impact of the proposed alignment, the criteria shown in Appendix 5, Table A has been used. The criteria are based on the guidance in DMRB. The criteria relate to nitrogen dioxide (NO_2) and PM_{10} only as these are the pollutants most likely to exceed the air quality objectives.

The significance of an air quality impact was determined by considering the magnitude of the impact together with the sensitivity of the location as shown in Appendix 5, Table B. Appendix 5, Table C shows the impact significance matrix and the methodology used for determining sensitivity for this assessment.

5.3 Potential Impacts

5.3.1 Identification of Sensitive Receptor Locations

DMRB/STAG requires the number of properties to be identified within 200m of the centreline of all routes affected. Beyond 200 metres air pollutant concentrations will have declined sufficiently to become reduced to background levels. As the change in air pollutant concentration is dependent upon dispersion over distance, the number of properties exposed are separated into four distance bands of 0 - 50m, 50 – 100m, 100 – 150m, 150 – 200m. The properties in each band are assigned either a likely improvement or deterioration in air quality when the proposed road improvement scheme is in place.

Five properties have been identified within 200m of the proposed new alignment or routes affected by the scheme. These are therefore the receptors referred to and used in this assessment. These receptors are shown on Figures 5.1a and b and Figures 5.2a and b.

The properties identified are:

- Receptor 1: Hope
- Receptor 2: Marldene
- Receptor 3: Old Crichton Dean
- Receptor 4: Haugh Head House
- Receptor 5: Routhenhill

The details of each receptor are shown in Table 5.4.

Table 5.4. Receptor Locations.

Baseline/Do-Minimum				
Receptor	**Details**	**Distance from A68 (metres)**	**Distance from U77 Fala Dam Road (metres)**	**Distance from New A68 U77 Link Road (metres)**
1	Hope	40	1093	N/A
2	Marldene	96	90	N/A
3	Old Crichton Dean	170	13	N/A
4	Haugh Head House	207	10	N/A
5	Routhenhill	270	10	N/A
Do-Something				
1	Hope	40	1625	1617
2	Marldene	96	500	502
3	Old Crichton Dean	170	13	200
4	Haugh Head House	207	10	75
5	Routhenhill	270	10	200

The receptor locations considered in this air quality assessment are residential in nature. These are considered to be moderately sensitive. Premises such as hospitals and nursing homes would be identified as highly sensitive. However, no premises of this type were identified within 200m of the affected routes.

No sites of special interest with regards to nature conservation are located along the affected route; therefore only the five receptors indicated above are included in the assessment.

5.3.2 Estimation of Air Pollutant Concentrations

DMRB requires that air pollutant concentrations are predicted for sensitive receptors within 200m of the affected routes. DMRB further requires that air pollutant concentrations are predicted at the same sensitive receptors for the base year, and opening year of the development for both a do-minimum and a do-something scenario. For the purposes of this assessment the air pollutant concentrations have been predicted for each of the following five scenarios:

- 2008 Base Year

- 2010 Do-minimum
- 2010 Do-something
- 2025 Do-minimum
- 2025 Do-something

The air pollutant concentrations have been calculated for all five receptors and have been calculated using the "Local" DMRB worksheet for each of the roads affected for the five scenarios.

5.3.3 Predicted Concentrations at Selected Receptor Locations

Air pollutant concentrations have been predicted for the five receptors identified. The results of the DMRB 'Local' assessment for all air pollutant concentrations are shown in Appendix 6. The results for PM_{10} and NO_2 for the years 2008, 2010 and 2025 are shown in Table 5.5. The change in air pollutant concentrations from a do minimum (do-min) and a do something (do-som) scenario are also shown in Table 5.5. The receptor locations for the do-min scenario are shown in Figures 5.1a and b and the receptor locations for the do-som scenario are shown in Figures 5.2a and b.

Table 5.5. Nitrogen Dioxide and Particulate Concentrations at Receptors within 200 metres of the affected roads.

Receptor	New route	Calculated Annual Mean Concentration					
		NO_2 µg/m^3			PM_{10} µg/m^3		
		2008	**2010**	**2025**	**2008**	**2010**	**2025**
Receptor 1	Do-min	7.88	6.85	6.22	12.01	11.86	11.49
Hope	Do-som	N/A	6.87	6.23	N/A	11.87	11.49
	Do-som – Do-min	*N/A*	*+0.02*	*+0.01*	*N/A*	*+0.01*	*0.00*
Receptor 2	Do-min	5.87	5.06	4.64	11.42	11.35	11.04
Marldene	Do-som	N/A	5.08	4.65	N/A	11.36	11.05
	Do-som – Do-min	*N/A*	*+0.02*	*+0.01*	*N/A*	*+0.01*	*+0.01*
Receptor 3	Do-min	5.17	4.45	4.11	11.10	11.04	10.76
Old Crichton Dean	Do-som	N/A	4.48	4.13	N/A	11.05	10.77
	Do-som – Do-min	*N/A*	*+0.03*	*+0.02*	*N/A*	*+0.01*	*+0.01*
Receptor 4	Do-min	4.90	4.20	3.89	10.97	10.91	10.64
Haugh Head House	Do-som	N/A	4.23	3.91	N/A	10.92	10.64
	Do-som – Do-min	*N/A*	*+0.03*	*+0.02*	*N/A*	*+0.01*	*0.00*
Receptor 5	*Do-min*	4.90	4.20	3.89	10.97	10.91	10.64
Routhenhall	*Do-som*	N/A	4.19	3.88	N/A	10.91	10.63
	Do-som – Do-min	*N/A*	*-0.01*	*-0.01*	*N/A*	*0.00*	*-0.01*

The predicted DMRB results in Table 5.5 and Appendix 6 show that all receptor locations are well below the NAQS objectives for all years and that any increases in NO_2 or PM_{10} concentrations (Do-Som - Do-Min) are all less than 1µg/m^3.

Verification of the DMRB model could not be undertaken because there is no monitoring data available for the local area. Therefore all results shown in this assessment have not been corrected using a verification derived factor. This is a limitation to the assessment; however due to the rural location of the scheme and the low background concentrations it is considered unlikely that verification would significantly affect the overall conclusions of the assessment.

5.3.4 Statement of Significance

According to the significance criteria (Appendix 5) included in this assessment, the results of the PM_{10} and NO_2 predictions show that the change in air pollutant concentration between a do-minimum and a do-something scenario are insignificant as changes of less than 1µgm^{-3} or 2.5% occur. The impact of the proposed new road scheme alignment is not therefore significant.

Taking into account the sensitivity of the receptors and the impact magnitude as indicated in Appendix 5, the impact of the proposed development is insignificant / negligible. Taking into consideration the findings of the air quality assessment it is not therefore necessary to undertake further detailed air quality assessment works.

5.3.5 DMRB/STAG Quantitative Assessment

STAG/DMRB requires a quantitative assessment of the overall change in people's exposure to NO_2 and PM_{10}. The number of properties experiencing an improvement or deterioration in air quality for each segment has been determined for the proposed road improvement scheme and the overall assessment scores for the aggregation of routes are shown for PM_{10} and NO_2 in Tables 5.6 and 5.7 respectively.

Table 5.6. PM_{10} Summary of Routes: The Aggregated Table.

	0 – 50m	50 – 100m	100–150m	150–200m	0 – 200m
Total properties across all routes (min)	0	0	2	3	5
Total properties across all routes (some)	0	0	2	3	5
Do-minimum PM_{10} assessment across all routes	0	0	22.26	33.81	55.84
Do-something PM_{10} assessment across all routes	0	0	22.27	33.84	55.86
Net total assessment for PM_{10} all routes	0	0	0.01	0.03	0.02
Number of properties with an improvement	0	0	0	0	0
Number of properties with no change	0	0	1	0	1
Number of properties with a deterioration	0	0	1	3	4

Table 5.6 shows that four properties experience a slight deterioration in PM_{10} concentration and one property experiences no change in PM_{10} concentration.

Table 5.7. NO_2 Summary of Routes: The Aggregated Table.

	0 – 50m	50 – 100m	100– 150m	150– 200m	0 – 200m
Total properties across all routes (min)	0	0	2	3	5
Total properties across all routes (some)	0	0	2	3	5
Do-minimum NO_2 assessment across all routes	0	0	9.26	15.50	24.76
Do-something NO_2 assessment across all routes	0	0	9.27	15.58	24.85
Net total assessment for NO_2 all routes	0	0	+0.01	+0.08	+0.09
Number of properties with an improvement	0	0	0	0	0
Number of properties with no change	0	0	0	1	1
Number of properties with a deterioration	0	0	2	2	4

Table 5.7 shows that four properties experience a deterioration in NO_2 concentration and one property shows no change in NO_2 concentration.

No concentrations of PM_{10} increase by more than the 2$\mu g/m^3$ (which STAG considers to be significant) and no concentrations of NO_2 increase by more than the 4$\mu g/m^3$ (which STAG considers to be significant). All predicted concentrations are well below the Air Quality Objectives for NO_2 and PM_{10}.

5.3.6 DMRB/STAG Regional Air Quality Assessment

DMRB/STAG require that the total emissions are determined for the base year and that the change in total emissions is found between a do-minimum and do-something scenario for the opening year and the design year of the scheme. The pollutants carbon monoxide (CO), total hydrocarbons (THC), oxides of nitrogen (NO_x), particulates (PM_{10}) and carbon dioxide (CO_2) have been assessed using the 'Regional' application of the DMRB spreadsheet. The change in total emissions between a do-minimum and a do-something scenario has been calculated for the proposed opening year 2010, and the design year 2025.

The results are presented in Appendix 7. The change in total emissions for a do-minimum and do-something scenario for the air pollutants, NO_x and $PM_{10,}$ are shown in Table 5.8. The percentage changes in total emissions of CO_2 are shown in Table 5.9.

NO_x and PM_{10}

Table 5.8 compares the opening year and design year 'do minimum' and 'do something' scenarios.

Table 5.8. Regional Assessment of NO_x and PM_{10}.

	Base Year	Do-minimum		Do-something		Do Something Compared with Do Minimum percentage changes (%)	
	2008	Opening Year (2010)	Design Year (2025)	Opening Year (2010)	Design Year (2025)	Opening Year (2010)	Design year (2025)
PM_{10} kg/yr	263	215	183	205	180	-4.65	-1.64
NO_X kg/yr	9655	8265	7167	7652	6944	-7.42	-3.11

Table 5.8 shows that the operation of the A68 road improvement scheme will cause a reduction in the amount of NO_x and PM_{10} produced compared with a do-minimum scenario. The regional assessment for NO_x and PM_{10} therefore confirms that the scheme will have an overall benefit.

CO_2

In accordance with the method outlined in STAG the difference in CO_2 emissions due to the scheme is determined by comparing the do-something to a do-minimum scenario. The results are shown in Table 5.9.

Table 5.9. Regional Assessment of CO_2.

	Base Year	Do-minimum		Do-something		Do Something Compared with Do Minimum percentage changes (%)	
	2008	Opening Year (2010)	Design Year (2025)	Opening Year (2010)	Design Year (2025)	Opening Year (2010)	Design year (2025)
CO_2 kg/yr	7938	7607	9136	7412	8727	-2.56	-4.48

Table 5.9 shows that the operation of the A68 road improvement scheme will cause a reduction in the amount of CO_2 produced compared with a do-minimum scenario. The regional assessment for CO_2 therefore confirms that the scheme will have an overall benefit.

The benefits illustrated in Tables 5.8 and 5.9 can be contributed to an overall increase in road traffic speeds once the scheme is operational.

5.4 Mitigation and Residual Impacts

All of the air pollutant concentrations for all receptors are well below the NAQS objectives for all years. As the overall impact of the scheme will be insignificant, no mitigation measures are required.

As no mitigation measures are proposed as part of the development the residual impacts will remain unchanged.

5.5 Conclusions

5.5.1 DMRB Assessment

The air quality assessment for the A68 Pathhead to Tynehead Junction has been carried out in accordance with the requirements of the Design Manual for Roads and Bridges (DMRB), Volume 11, Section 3, Part 1, HA207/07, May 2007 and the "Scottish Transport Appraisal Guidance (STAG)", May 2008.

Air pollutant concentrations have been predicted for the five receptors identified within 200m of the proposed road scheme and within 200m of affected routes. The air pollutant concentrations were predicted using the DMRB spreadsheet "The Local Impacts Screening Method". The concentrations were predicted for the base year (2008), the opening year 2010 (do-minimum and do-something) and the design year 2025 (do-minimum and do-something). The results of the DMRB assessment indicate that the proposed road scheme will have an insignificant impact on air quality at the receptor locations. Taking into account the sensitivity of the receptors and the impact magnitude the impact of the proposed development is insignificant / negligible.

Taking into consideration the findings of the air quality assessment it has not been necessary to undertake further detailed air quality assessment works.

The regional DMRB assessment shows that the proposed scheme would cause a reduction in the amount of NO_x, PM_{10} and CO_2 produced (kg/yr) and the scheme would therefore have an overall benefit. This reduction is due to the increasing traffic speeds due to the road improvement scheme.

The DMRB models have not been verified due to the unavailability of air quality monitoring locations in the vicinity of the proposed site. This is a limitation of the model; however given that the concentrations are significantly below the Air Quality Objectives this not considered a significant limitation.

5.5.2 STAG Assessment

The overall change in NO_2 and PM_{10} experienced at the receptor locations has been assessed. The representative number of receptors experiencing a change in pollutant concentration at each distance was assessed to identify the overall number of properties experiencing an improvement, deterioration or no change in concentration. The number of properties experiencing a slight deterioration in air quality for NO_2 and PM_{10} is four. One property experiences no change in concentration for both NO_2 and PM_{10}.

5.5.3 Sensitivity and Significance

The significance of an air quality impact of vehicular emissions on existing sensitive receptors has been determined by considering the magnitude of the impact together with the sensitivity of the location of each receptor. The change in concentration of pollutants was determined to be insignificant; therefore the magnitude of the change is considered to be insignificant / negligible.

All air pollutant concentrations were predicted to be well below the National Air Quality Standard objectives, and the overall impact of the scheme was found to be insignificant. The scheme will not create the need for an Air Quality Management Area to be declared and no mitigation measures are considered necessary.