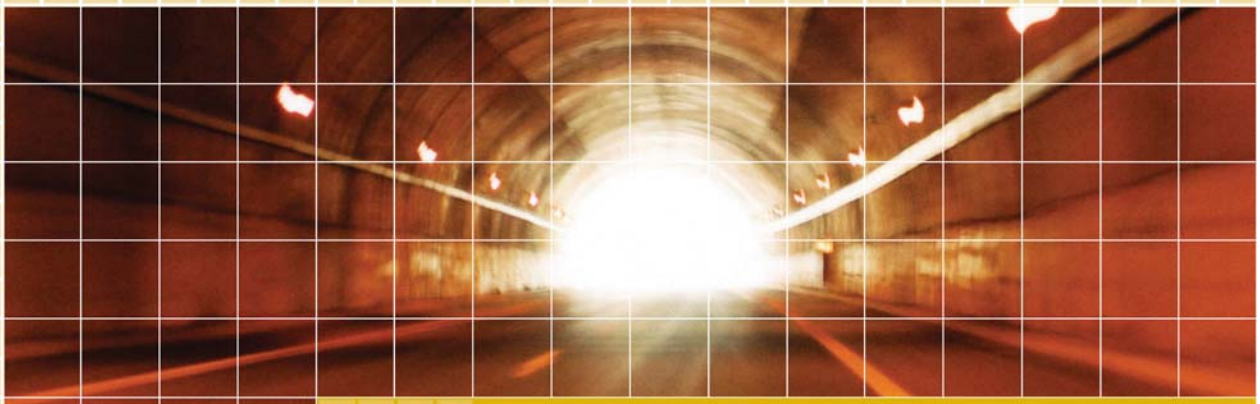
B APPENDIX B

Environmental Assessment



Haudagain STAG Part 2
Environmental Report

SIAS Ltd

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SIAS transport planners

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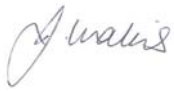
Signature				
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1 Introduction

1.1 OVERVIEW

1.1.1 This chapter presents the findings of the STAG Part 2 environmental appraisal of the transport and access strategies being considered for the Haudagain Roundabout. The assessment has considered environmental effects on a range of STAG environmental sub-objectives (such as noise, air quality, biodiversity, landscape etc) and the predicted effects are reported in Sections 1.3 to 1.10. A summary of the findings of the assessment and a comparison of the environmental effects of the three options assessed along with the do-minimum is presented in the concluding part of the chapter in Section 1.11.

1.2 APPROACH TO STAG PART 2 APPRAISAL

1.2.1 The method of assessment of the potential environmental impacts has involved the following:

- the identification of the transport and access interventions which may have an impact on the environment;
- the determination of the sensitivity of the environmental baseline in the locations where transport interventions are proposed as part of each strategy;
- an assessment of the impact magnitude of the predicted environmental impacts of each transport and access intervention;
- Identification of appropriate mitigation measures; and
- Based on the above, an assessment of the magnitude and significance of the predicted residual environmental effects of the three proposed transport and access packages.

1.2.2 In addition to assessing the "do-minimum", three options have been taken forward for assessment at STAG Part 2. Table 1.1 below summarises the options which have been included in this assessment of environmental effects.

Table 1.1 Transport Options for Assessment

Option	Description
5	Retention of the existing roundabout at Haudagain. A new dual carriageway link road is proposed to connect North Anderson Drive (the southern arm of the roundabout) with Auchmill Road (the western arm). This link road would also provide access to the proposed regeneration area at Middlefield. The junctions for this link road would be traffic signal controlled.
11	Removal of the roundabout and signalisation of the junction in its place. It is also proposed to widen the approach to the roundabout from Mugiemoss Road (the northern arm of the roundabout) which would involve widening of the railway bridge which carries Mugiemoss Road over the railway line to the north of Haudagain Roundabout. A new dual carriageway link road is proposed to connect North Anderson Drive (the southern arm of the roundabout) with Auchmill Road (the western arm). This link road would also provide access to the proposed regeneration area at Middlefield.
12	Enlargement of the area of the roundabout to just under twice its current size (to a diameter of approximately 70m). It also involves widening of Mugiemoss Road (the northern arm of the roundabout) to a dual two lane road from Haudagain Roundabout northwards to the Mugiemoss Road/Persley Bridge roundabout. This will involve building a new wider bridge just west of the existing line to carry Mugiemoss Road over the railway to the north of the roundabout.

1.2.3 The environmental appraisal has followed a project level approach where possible, drawing on the information available to the assessment team including plans of the options and outputs from the traffic model. These have been supported with consultations and site visits. The following organisations have been consulted:

- Scottish Natural Heritage (SNH);
- Scottish Water;
- Scottish Environment Protection Agency (SEPA);
- Historic Scotland;
- Scottish Executive Environment & Rural Affairs Department; and
- Aberdeen City Council.

1.2.4 The environmental appraisal has concentrated on the operational (eg traffic related) and permanent effects which have been predicted for the transport options. Where identifiable at this stage, the difference in construction effects between options has also been assessed, although a robust assessment of construction effects will be required at the appropriate later stage in the planning process (for example as part of a project level EIA if this is required) when more detail is available on the nature of the proposals and the construction processes involved.

1.2.5 The assessment of noise and air quality effects has concentrated on operational effects using information from the microsimulation traffic model developed by SIAS. For each option, roadside noise and air quality predictions have been undertaken for road links where potentially significant changes in traffic queues (compared with the 2012 do minimum) were identified from the traffic model outputs. Predictions were undertaken at a number of receptors considered by the assessment team to be representative of those in the wider area, and the number of properties which would be subject to these effects were estimated from existing Ordnance Survey (OS) plans and from information about the potential housing areas and densities in the new development area.

1.2.6 The assessment has assumed, as a worst case scenario, that some properties will be demolished to accommodate the options. However, in reality it is likely that those properties will already have been demolished as a result of the wider regeneration works in the area.

1.2.7 A summary of the findings of the environmental assessment of each option is presented in the accompanying Appraisal Summary Tables (AST).

2 Noise and Vibration

2.1 APPROACH

Scottish Transport Appraisal Guidance

2.1.1 The noise and vibration assessment described in this chapter follows the guidance set out in the STAG for a Part 2 appraisal. For this level of assessment STAG recommends that the appraisal method proposed in WebTAG 3.3.21 is followed.

TAG Unit 3.3.2 - The Noise Sub-Objective (November 2006)

2.1.2 Transport is a major source of noise. Exposure to transport noise can have an adverse impact on human health and the perceived quality of life. Nuisance arising from noise exposure varies between individuals, but generally at the community level there is a reasonable correlation between physical measurements of noise and the degree of bother or annoyance.

2.1.3 In principle, the overall objective of the appraisal is to estimate the number of people who are likely to be annoyed in the future comparing the 'without scheme' (do-minimum) scenario and the 'with scheme' (do-something) scenarios (Options 5, 11 and 12). Haudagain Roundabout currently experiences high levels of congestion at peak times which results in long queues of near stationary traffic. The remaining STAG options aim to decrease the intensity of this congestion by altering the existing junction. An additional factor anticipated to affect traffic flows through the junction is the Aberdeen Western Peripheral Route (AWPR), due to open in 2012. The predicted effects of the AWPR have been factored into the traffic data supplied by SIAS. This topic also focuses on the relative likely positive or negative impacts and significance of each option on notional receptors.

2.1.4 For the purposes of this comparative assessment, three points in time have been selected in accordance with the TAG Unit 3.3.2 appraisal methodology, based on guidance contained within the Design Manual for Roads and Bridges (DMRB). These are as follows:

- Base year: 2004 (which is the base year in the transport model)
- Year of scheme opening: 2012
- Worst case year (15 years after opening): 2027

2.1.5 The specified appraisal methodology facilitates the comparison of various scheme options, all designed to relieve the existing pressure on the junction, especially during peak periods, during which traffic is currently virtually static. All three 'do-something' options (see the plan included in Appendix A1) and future do-minimum scenarios for 2012 and 2027, also consider the predicted influence on road traffic flows of the AWPR, which will provide an alternative route for traffic currently using roads such as North Anderson Drive. While the introduction of the AWPR is predicted to ease traffic flows through Haudagain Roundabout initially, it is considered likely that flows will have increased again by the assessment year (2027) above and beyond those currently experienced.

2.1.6 In accordance with TAG Unit 3.3.2, the following comparisons have been undertaken as required by:

- Base year (2004) v Year of opening (2012) do-minimum
- Base year v Year of opening do-something (options 5, 11 and 12)
- Base year v Worst case year (2027) do-minimum
- Base year v Worst case year do-something (options 5, 11 and 12)

2.1.7 TAG Unit 3.3.2 describes two levels of appraisal, Strategy and Plan, with the latter requiring the higher level of detail. In this case the extent and quality of available data is considered commensurate with a Strategy Level appraisal.

[1] WebTAG is the Department for Transport's web-based guidance on the conduct of transport studies

2.1.8 TAG Unit 3.3.2 acknowledges that a Strategy Level assessment would not enable impacts to be identified at specific receptor sites and that the appraisal is more 'broad brush'. The simplifying assumptions made to arrive at estimates of the change in people annoyed are set out in this chapter. However, the approximate nature of these estimates does not invalidate comparisons between options providing that the assumptions are applied consistently.

2.1.9 A summary of the appraisal methodology is provided below, and a glossary of acoustics terms is included in Appendix A1.

Methodology for Strategy Level Appraisal

2.1.10 The potential noise impacts of the link road, an integral part of options 5 and 11, have not been assessed in this section in respect of noise sensitive receptors in the vicinity. It is understood that Middlefield, the area through which the link road will pass, is intended for complete redevelopment. Until the existing dwellings are demolished, it will not be possible to build the link road. Therefore the plans for redevelopment of the area will have to examine the route and associated potential noise impacts of the link road when considering the suitability of the site for residential redevelopment. This constitutes a completely separate assessment from this STAG assessment and will require a greater level of detail to be available with regard to the Middlefield redevelopment proposals. The two schemes will, however, influence each other and this should be acknowledged in considering the most suitable option for altering Haudagain junction.

2.1.11 Generically, adoption of the 'do something' options could influence receptor noise levels in one or more of the following respects:

- changes in traffic flow, composition and speed;
- changes in alignment (e.g. road moving closer to, or further from, sensitive receptors); and
- changes to the intervening topography, which in turn affects the view of the road (e.g. inclusion of cuts, embankments and purpose-built screens). This type of change may occur in Options 5 and 11 where a link road is proposed.

2.1.12 For the purposes of this assessment, it is not possible to take into account any changes in road alignment or intervening topography as this level of detail is not currently available, and so it is only changes in source data - the traffic flow, composition (proportion of heavy vehicles) and average vehicle speed - that have been taken into account.

2.1.13 The Calculation of Road Traffic Noise (CRTN, 1988) sets out methodology for predicting road traffic noise levels from either 18 hour (0600-0000h) or peak hour total two way flows. For the purposes of this appraisal, it is not considered relevant to assess 18 hour flow data as the issue which the options are designed to resolve concerns queueing of traffic at peak hours; assessing 18 hour values could dilute the impact of these problematic peak hours over a full day and therefore potentially produce misleading results. Consequently, this assessment focuses on morning (0730-0830h) and evening (1730-1830h) peak hour flows. CRTN also sets out methodology for correcting the predicted noise levels for percentage of heavy goods vehicles (HGV), average speed, road surface type, barriers and reflections etc. For the purposes of this assessment, it has been assumed that the only variables are traffic flow, percentage HGV and mean velocity.

2.1.14 Chart 4 in CRTN presents a formula and graphical representation for correcting predicted road traffic noise levels for percentage HGV and mean traffic speed (see Appendix A2). The graphical representation shows a minimum velocity on the x-axis of 20km/h, where the graph lines appear to level out or show a slight trend upwards at higher percentage HGV. The formula presented infers that the lines could be extrapolated further for speeds of less than 20km/h. In the road traffic data provided by SIAS, there are several examples of mean speeds which are below this 20km/h threshold. Observations made during the monitoring period confirmed that this is indeed currently the case. However, calculations incorporating speeds slower than 20km/h into the formula predict a sharp uplift in noise levels as speed decreases. This uplift is even more pronounced at higher percentage HGV. Comparative calculations are presented in Tables 2.1 and 2.2 below to illustrate this point. Values in bold represent those flows of average speed <20km/h. Although it is possible that there may be a slight increase in road traffic noise levels at lower speeds, it is considered that the predicted sharp increase does not reflect the actual situation. Therefore, in

order to avoid potentially misleading results, a minimum speed of 20km/h has been assumed throughout this assessment.

Table 2.1: Example of calculation data for comparison of Do minimum scenarios - Auchmill Road (a.m. peak 0730-0830)

Assessment year	Direction	Average Peak Hour Traffic Flow	%HGV	Mean speed (km/h)
2004	**East bound**	**1546**	**8.5%**	**9.7**
	West bound	1589	8.3%	58.3
2012	**East bound**	**1416**	**7.4%**	**8.2**
	West bound	1515	7.1%	58.4
2027	**East bound**	**1416**	**7.6%**	**8.4**
	West bound	1589	6.7%	58.4

Table 2.2: Example of differences between predicted noise emissions when CRTN Chart 4 formula is extrapolated below 20km/h and when 20km/h is assumed as the minimum velocity - Auchmill Road: Comparison of Do-minimum Scenarios (a.m. peak 0730-0830h)

Assessment year	Direction	Basic Noise Level (BNL) (dB) (extrapolated below 20km/h)	BNL (dB) (minimum velocity 20km/h)
2004	**East bound**	**79.0**	**74.1**
	West bound	74.9	74.9
2012	**East bound**	**79.8**	**73.3**
	West bound	74.4	74.4
2027	**East bound**	**79.6**	**73.4**
	West bound	74.5	74.5

2.1.15 For each scenario, the average noise emission level has been taken as the Basic Noise Level (BNL) at a notional receptor 10m from each source, calculated in accordance with the methodology set out in the Calculation of Road Traffic Noise (CRTN). Peak hour traffic flows provided by SIAS have been used for this purpose as previously discussed. This approach is appropriate because it is the change in noise levels that is of interest and not the absolute noise level.

2.1.16 Comparisons of the calculated BNL values for the base/future year do-minimum/do-something scenarios have been carried out and the predicted resultant change in noise levels assessed for their significance against the significance of impact criteria outlined below.

Significance of Impact

2.1.17 The predicted impact of the options under consideration has been assessed in terms of the significance of the predicted noise change. This is based on the magnitude of noise change and receptor sensitivity.

2.1.18 Several sensitive receptors lying within the study area are residential and as such would be regarded as having a high sensitivity to changes in environmental noise. As a consequence, an equivalent scale to that for the magnitude of impact would apply to the significance of impact. The seven point scale has been aligned with changes and differences in noise based on the Institute of Acoustics/Institute of Environmental Management and Assessment (IoA/IEMA) Working Party draft Guidelines for Noise Impact Assessment. These guidelines, which were circulated for comment in 2002 but to date remain unpublished, provide an example of how changes or differences in noise levels may be categorised by significance. The draft guidelines state that in any assessment the noise level threshold and significance statement should be determined by the assessor, based upon the specific evidence and likely subjective response to the noise. Hence, Table 2.3 below presents the following scale of significance which has been devised for this particular situation.

Table 2.3: Impact scale for comparison of changes or differences in noise levels

Change or difference	Noise level dB(A)	Magnitude of impact	Significance of impact
Increase or positive difference	5.0 or more	Major negative	Major negative
	3.0 – 4.9	Moderate negative	Moderate negative
	1.0 – 2.9	Minor negative	Minor negative
	0 – 0.9	Neutral	Not significant
Decrease or negative difference	1.0 – 2.9	Minor positive	Minor positive
	3.0 – 4.9	Moderate positive	Moderate positive
	5.0 or more	Major positive	Major positive

2.1.19 The significance scale is based on some key benchmarks that relate to human perception of noise. TAG Unit 3.3.2 provides the following advice in this respect:

"It should be recognised that, in many situations, relatively large changes in traffic flows are required to bring about significant changes in the response to noise levels in the longer term. For freely flowing traffic, a difference of about 3 dB in noise level is required before there is a statistically significant change in the average assessment of nuisance. The assessment of nuisance however could still be affected even if there is only a 1 dB change in the noise level if the change is associated with changes in the view of traffic, or if the change occurs suddenly."

2.2 BASELINE

2.2.1 The Haudagain Roundabout is the meeting point for a number of major roads in Aberdeen to the north west of the city centre. The A96(T) Auchmill Road, A90(T) North Anderson Drive, A90(T) Mugiemoss Road and the A96 Great Northern Road all require access through the junction. These trunk roads serve as the main access into and around Aberdeen from the north and north west. Surrounding the roundabout is a mixture of residential, retail and light industrial land uses.

2.2.2 It is understood that at certain times during peak periods, the junction can operate at up to 25% over its capacity leading to significant queues and delays on all approach arms. Observations made during the monitoring period confirmed this to be the case with large queues of near static traffic during both the morning and evening peak periods.

2.2.3 The study area has been divided into the four arms of the roundabout with peak hour road traffic data having been provided separately for carriageways approaching and leaving the roundabout. This approach reflects the fact that traffic velocities and flows vary widely depending on the direction of travel. As such, the eight sections which have been considered in this assessment are as follows:

- Auchmill Road east bound (EB)
- Auchmill Road west bound (WB)
- Mugiemoss Road north bound (NB)
- Mugiemoss Road south bound (SB)
- Great Northern Road east bound (EB)
- Great Northern Road west bound (WB)
- North Anderson Drive north bound (NB)
- North Anderson Drive south bound (SB)

2.2.4 It is anticipated that the noise environment at the majority of the receptors in the study area is dominated by road traffic noise. There is a railway line which passes in a cutting under Mugiemoss Road, approximately 60m to the north of the roundabout, although noise from movements on this line were not audible in the vicinity of the roundabout and the surrounding sensitive receptors.

2.2.5 The assessment and comparison of options is based on a desktop assessment, using the calculations previously described. However, a series of measurements were undertaken at the existing Haudagain Roundabout during a.m. and p.m. peak hours in order to help the assessor understand better the nature of the issues. These results are presented in summary in Table 2.4 below.

Table 2.4: Summary of peak a.m. and p.m. measurements, 22nd -23rd June, 2007

Period	Road link	$L_{Aeq,15min}$ (dB)	L_{Amax} (dB)	L_{A90} (dB)	L_{A10} (dB)
a.m. peak	Auchmill Road	72.3	91.4	65.9	75.0
	Mugiemoss Road	73.8	96.7	64.1	74.6
	Great Northern Road	71.6	90.3	66.6	74.1
	North Anderson Drive	80.4	101.3	66.7	77.9
p.m. peak	Auchmill Road	74.1	86.7	68.9	77.0
	Mugiemoss Road	73.7	88.4	63.4	76.6
	Great Northern Road	74.3	87.1	68.6	77.3
	North Anderson Drive	74.5	88.6	68.8	76.7

2.3 IMPACT ASSESSMENT

2.3.1 The road traffic noise level along each link in the study area has been determined using the methodology contained within CRTN, based on the morning and evening peak hour flows (0730-0830h and 1730-1830h) provided by SIAS. These calculations consider road traffic noise from the link in question and not the contribution from any other roads or carriageways. The BNL predictions have been undertaken at a notional distance of 10m.

2.3.2 Noise levels at other receptors which lie further away from each link will obviously be less than those predicted (as a result of additional distance and possibly screening attenuation), assuming that noise from the specific link under consideration still dominates the overall level. While this cannot be accounted for on a case specific basis, it should be noted that the cumulative noise level experienced at any given notional receptor will probably have contributions from all eight sources, to a greater or lesser extent. Therefore, some additional calculations have been undertaken which look at four selected notional receptors (see Figure 1). These cumulative calculations are discussed in detail later in this report.

2.3.3 The following Tables 2.5 to 2.8 below detail the predicted changes in morning and evening peak hour BNL for the four comparisons. Changes are presented as an increase (+) or decrease (-) in noise level (dB) compared to the base year (2004).

Table 2.5: Comparison of base year (2004) and year of opening (2012) do minimum

Road link	Direction of travel	Change (dB) a.m peak	Change (dB) p.m. peak
Auchmill Rd	EB	-0.8	-0.6
	WB	-0.5	+0.1
Mugiemoss Rd	NB	-0.3	-0.5
	SB	+0.2	-0.7
Great Northern Rd	EB	+0.7	+0.2
	WB	+0.4	-1.0
North Anderson Dr	NB	-1.5	+0.1
	SB	-0.6	-1.0

Table 2.6: Comparison of base year (2004) and year of opening (2012) options 5, 11 and 12

Road link	Direction of travel	Option 5		Option 11		Option 12	
		Change (dB)a.m peak	Change (dB)p.m. peak	Change (dB)a.m peak	Change (dB)p.m. peak	Change (dB)a.m peak	Change (dB)p.m. peak
Auchmill Rd	EB	-2.7	-3.8	-2.4	-2.9	-0.7	-0.5
	WB	-4.2	-4	-4.6	-4.9	-0.8	-0.3
Mugiemoss Rd	NB	-0.1	-0.8	+0.2	-0.6	-0.2	-1
	SB	+0.2	-0.7	-0.3	-0.7	+0.4	+0.2
Great Northern Rd	EB	+0.9	+0.3	+0.3	+2.3	+1.1	+0.4
	WB	+0.7	-0.4	+0.3	-1.1	+0.6	-0.1
North Anderson Dr	NB	-4.6	-3.5	-4.6	-3.3	-0.6	+0.2
	SB	-3	-3	-2.7	-2.5	-0.5	-0.3

Table 2.7: Comparison of base year (2004) and worst case year (2027) do minimum

Road link	Direction of travel	Change (dB) a.m. peak	Change (dB) p.m. peak
Auchmill Rd	EB	-0.7	-0.5
	WB	-0.4	+0.4
Mugiemoss Rd	NB	-0.1	-0.3
	SB	-0.4	-0.8
Great Northern Rd	EB	+0.8	+0.6
	WB	+0.5	-0.4
North Anderson Dr	NB	-1.2	+0.3
	SB	-0.8	-0.7

Table 2.8: Comparison of base year (2004) and worst case year (2027) options 5, 11 and 12

Road link	Direction of travel	Option 5		Option 11		Option 12	
		Change (dB) a.m. peak	Change (dB) p.m. peak	Change (dB) a.m. peak	Change (dB) p.m. peak	Change (dB) a.m. peak	Change (dB) p.m. peak
Auchmill Rd	EB	-2.1	-3.5	-2	-2.9	-0.6	-0.3
	WB	-4.1	-3.7	-4.5	-4.7	-2	-0.1
Mugiemoss Rd	NB	-0.2	-0.5	+0.3	-1	-0.1	-0.6
	SB	-0.2	-0.8	-0.5	-0.5	-0.1	0.2
Great Northern Rd	EB	+1.1	+0.5	+2.6	+2.7	+1.3	+0.9
	WB	+0.7	0	+0.4	-0.6	+0.6	+0.2
North Anderson Dr	NB	-4.5	-2.9	-4.5	-3	-0.7	+0.4
	SB	-3.1	-3.3	-2.9	-5.2	-0.6	-0.3

2.3.4 The following Tables 2.9 to 2.12 detail the results of the significance of impact assessment for each of the comparisons shown in the Tables above.

Table 2.9: Significance of impact of year of opening (2012) do minimum in comparison to base year (2004)

Road link	Direction of travel	Change (dB) a.m. peak	Change (dB) p.m. peak
Auchmill Rd	EB	neutral	neutral
	WB	neutral	neutral
Mugiemoss Rd	NB	neutral	neutral
	SB	neutral	neutral
Great Northern Rd	EB	neutral	neutral
	WB	neutral	minor positive
North Anderson Dr	NB	minor positive	neutral
	SB	neutral	neutral

Table 2.10: Significance of impact of year of opening (2012) options 5, 11 and 12 in comparison to base year (2004)

Road link	Direction of travel	option 5		option 11		option 12	
		Change (dB) a.m. peak	Change (dB) p.m. peak	Change (dB) a.m. peak	Change (dB) p.m. peak	Change (dB) a.m. peak	Change (dB) p.m. peak
Auchmill Rd	EB	minor positive	moderate positive	minor positive	minor positive	neutral	neutral
	WB	moderate positive	moderate positive	moderate positive	moderate positive	neutral	neutral
Mugiemoss Rd	NB	neutral	neutral	neutral	neutral	neutral	minor positive
	SB	neutral	neutral	neutral	neutral	neutral	neutral
Great Northern Rd	EB	neutral	neutral	neutral	minor negative	minor negative	neutral
	WB	neutral	neutral	neutral	minor positive	neutral	neutral
North Anderson Dr	NB	moderate positive	moderate positive	moderate positive	moderate positive	neutral	neutral
	SB	moderate positive	moderate positive	minor positive	minor positive	neutral	neutral

Table 2.11: Significance of impact of worst case year (2027) do minimum in comparison to base year (2004)

Road link	Direction of travel	Change (dB) a.m peak	Change (dB) p.m. peak
Auchmill Rd	EB	neutral	neutral
	WB	neutral	neutral
Mugiemoss Rd	NB	neutral	neutral
	SB	neutral	neutral
Great Northern	EB	neutral	neutral

Road link	Direction of travel	Change (dB) a.m peak	Change (dB) p.m. peak
Rd	WB	neutral	neutral
North Anderson Dr	NB	minor positive	neutral
	SB	neutral	neutral

Table 2.12: Significance of impact of worst case year (2027) options 5, 11 and 12 in comparison to base year (2004)

Road link	Direction of travel	option 5		option 11		option 12	
		a.m peak	p.m. peak	a.m peak	p.m. peak	a.m peak	p.m. peak
Auchmill Rd	EB	minor positive	moderate positive	minor positive	minor positive	neutral	neutral
	WB	moderate positive	moderate positive	moderate positive	moderate positive	minor positive	neutral
Mugiemoss Rd	NB	neutral	neutral	neutral	minor positive	neutral	neutral
	SB	neutral	neutral	neutral	neutral	neutral	neutral
Great Northern Rd	EB	minor negative	neutral	minor negative	minor negative	minor negative	neutral
	WB	neutral	neutral	neutral	neutral	neutral	neutral
North Anderson Dr	NB	moderate positive	minor positive	moderate positive	moderate positive	neutral	neutral
	SB	moderate positive	moderate positive	minor positive	major positive	neutral	neutral

2.3.5 As may be seen from the Tables presented above, the majority of road sections would not experience any significant positive or negative impacts in comparison to base year for the do minimum scenarios (2012 and 2027).

2.3.6 Option 5 shows minor to moderate benefits for notional receptors on Auchmill Road and North Anderson Drive in both the year of opening and worst case years. The fifteen year gap between year of opening and the worst case year has not had any significant effects on the benefits seen in the opening year. It is difficult to identify therefore whether the benefits seen are attributable to the opening of the AWPR or the option-specific changes at Haudagain Roundabout.

2.3.7 Option 11 also shows positive benefits on Auchmill Road and North Anderson Drive, the distribution of which is slightly different to those seen in Option 5. However, there is again little difference between the year of opening and worst case year, which may be linked with the opening of the AWPR.

2.3.8 Option 12 shows the fewest positive impacts in terms of road traffic noise levels associated with the changes to the road scheme. There is virtually no difference between the do minimum and do something scenarios for either of the assessment years, either in terms of road traffic noise level changes or resultant significance of impact. Therefore from an acoustics perspective, this option is the least favourable of the three.

Cumulative impacts

2.3.9 As discussed previously, it is prudent to compare the cumulative impacts of changes associated with the various options with the cumulative base year noise levels. The following calculations aim to examine whether the cumulative road traffic noise impact from all eight road sections associated with the roundabout cancels out any benefit shown in any of the eight unidirectional sections described previously.

These calculations have only been conducted for options 5 and 11, as option 12 shows no trend for significant changes associated with the proposals when compared with the base year scenario.

2.3.10 Analysis of the data presented above for options 5 and 11 has shown that the roads most likely to experience changes in noise levels are Auchmill Road and North Anderson Drive. Therefore, for the purposes of these calculations, four fixed points have been selected as representative notional receptors: 10m east and west of North Anderson Drive and 10m north and south of Auchmill Road. Notional receptors associated with other two arms of the roundabout are considered sufficiently far away as to experience a less significant change in noise levels than these four points and, as such, have not been considered. However, the relative contributions of road traffic noise from Mugiemoss Road and the Great Northern Road have been included in the calculations.

2.3.11 For each notional receptor, distance correction calculations have been undertaken to estimate the relative road traffic noise contribution from each of the eight road sections. The BNL values at 10m used in the calculations for Tables 2.5 to 2.8 above were used as the basis for the calculations. The logarithmic sum of these noise levels has been calculated for each notional receptor and is presented in Table 2.13 below. Table 2.14 compares the calculated values for options 5 and 11 with the base year. These values have then been compared with the unidirectional (single segment) changes in noise level presented in Tables 2.5 to 2.8 to assess whether the overall noise impact is similar to that identified for individual road segments.

2.3.12 In order to limit the volume of data generated by these calculations, only the worst case year (2027) for Options 5 and 11 has been calculated cumulatively at each of the four notional receptors; the base year has also been calculated. The a.m. peak hour has been chosen as a representative period for comparative purposes.

Table 2.13: Predicted absolute cumulative noise levels at notional receptors (dB) (a.m. peak)

Notional receptor / **Scenario**	**10m north of Auchmill Road**	**10m south of Auchmill Road**	**10m east of North Anderson Drive**	**10m west of North Anderson Drive**
Base year (2004)	77.1	77.5	77.2	76.9
Option 5 (2027)	75.0	74.6	75.0	74.0
Option 11 (2027)	75.1	74.6	75.2	74.2

Table 2.14: Predicted changes in cumulative noise levels (dB) (a.m. peak)

Notional receptor / **Scenario**	**10m north of Auchmill Road**	**10m south of Auchmill Road**	**10m east of North Anderson Drive**	**10m west of North Anderson Drive**
Option 5 (2027)	-2.1	-2.9	-2.3	-2.8
Option 11 (2027)	-2.0	-2.9	-2.0	-2.7

2.3.13 When compared with the results for unidirectional sections presented in Tables 2.6 and 2.8 above, it can be seen that the overall cumulative noise levels at each of these notional receptors are broadly similar but the overall benefit gained in terms of change is less for both options. This reflects the expected situation where several noise sources are combined and is considered to provide a more realistic impression of the magnitude of improvement in noise levels which could be expected from implementing either of these options.

Predicted Impacts: Percentage of people bothered by change in noise levels

2.3.14 In accordance with the recommendations set out in DMRB, the predicted changes in noise level for each of the eight sections should be expressed as a change in the percentage of people bothered. For each option, the base year (2004) percentage bothered has been compared against the year of opening (2012) do minimum and do something scenarios. These calculations have been repeated for the worst case

year (2027) do minimum and do something scenarios. Again, this assessment only considers options 5 and 11.

2.3.15 The results of these calculations are presented below as a predicted percentage increase (+) or percentage decrease (-) in people bothered by road traffic noise when compared to the base year scenario.

Table 2.15: Predicted change in percentage of people bothered by road traffic noise (DMRB)

Road link	Direction of travel	Option 5				Option 11			
		Year of opening		Worst case year		Year of opening		Worst case year	
		Do minimum	Do something	Do minimum	Do something	Do minimum	Do something	Do minimum	Do something
Auchmill Road	EB	-2.4	-7.8	-2.1	-6.1	-2.4	-7	-2.1	-5.8
	WB	-1.5	-12.2	-1.2	-11.9	-1.5	-13.3	-1.2	-13
Mugiemoss Road	NB	-0.8	-0.2	-0.2	-0.5	-0.8	0.6	-0.2	0.9
	SB	0.5	0.5	-1.1	-0.6	0.5	-0.8	-1.1	-1.4
Great Northern Road	EB	2	2.6	2.3	3.2	2	0.9	2.3	7.6
	WB	1.1	1.4	1.4	2	1.1	0.9	1.4	1.1
North Anderson Drive	NB	-4.3	-12.7	-3.5	-12.5	-4.3	-12.7	-3.5	-12.5
	SB	-1.8	-8.7	-2.4	-9	-2.1	-7.9	-2.4	-8.4

2.4 MITIGATION

2.4.1 It has been shown in the preceding sections that for the majority of road links in the study area noise levels changes will be sufficiently small such that no mitigation is required.

2.4.2 However, it is recommended that, should either option 5 or 11 be implemented and a new dual-carriageway link road be constructed between North Anderson Drive and Auchmill Road, appropriate consideration is given to the inclusion of noise mitigation measures. The following are some generic noise mitigation measures that might be considered:

- realigning a route away from residential areas (or other sensitive locations);
- keeping a route low within the natural topography to exploit any natural screening;
- providing environmental noise barriers such as earth mounding or acoustic fencing; and
- the application of a low noise road surface.

2.4.3 Initially, the use of a low noise surface (such as a stone mastic asphalt (SMA) wearing course) should be considered as it is always preferable to reduce noise at source. Such a road surface could typically attenuate noise levels by around 2.5 dB to 3.0 dB. However, the ability of the road surface to reduce noise levels is linked to the speed of the vehicles using the road. Where vehicle speeds are low then the noise level reduction is likely to be minimal as the dominant source of noise is from the engine, transmission and exhaust, rather than the tyre/road interface. Consequently, it is likely that the use of a low noise road surface would only be of benefit if faster moving traffic is anticipated.

2.4.4 Where a quiet road surface would not be effective, or where a greater noise level reduction is required i.e. where there are sensitive receptors in the vicinity, the use of acoustic barriers could be considered. Barriers, which can be in the form of acoustic fences, walls/ buildings or earth mounds, can only be used where there is sufficient space and where access and driver visibility is not an issue. In a built-up area such as this, the opportunity to erect barriers will be limited. The principal objective of a barrier is to prevent a line of sight between the noise source and the noise receptor. Typically, the inclusion of a roadside barrier could attenuate noise by 5-10 dB.

2.4.5 Mitigation of road traffic noise should also be considered in the context of Middlefield regeneration proposals. Insufficient information is currently known to comment on the nature of any mitigation measures which may be required, however it is recommended that further acoustic assessment is undertaken when this becomes available.

1.3.5 Predicted Residual Effects

2.4.6 Appropriate noise mitigation measures should be included in the design the new dual carriageway between North Anderson Drive and Mugiemoss Road, if either option 5 or 11 is to be implemented. Similarly, these should be considered in the context of Middlefield redevelopment plans, when more detailed information becomes available. Providing such measures are carefully considered and designed, it is likely that residual effects will be minimal.

Table 2.16: Predicted Residual Noise and Vibration Effects

Transport Strategy	Predicted Effects	Magnitude and Significance of Predicted Effect
Do Minimum	Very little difference in road traffic noise levels from base year to both year of opening and worst case year.	• Range from -1.0 to +0.8dB • Neutral to minor positive significance
Option 5	Minor to moderate benefits for notional receptors on Auchmill Road and North Anderson Drive in both the year of opening and worst case years. Little significant benefit for notional receptors on Great Northern Road and Mugiemoss Road in either future year.	• Range from +1.1 to -4.6dB. • Neutral to moderate positive significance
Option 11	Minor to moderate benefits for notional receptors on Auchmill Road and North Anderson Drive in both the year of opening and worst case years. Little significant benefit for notional receptors on Great Northern Road and Mugiemoss Road in either future year.	• Range from +2.3 to -5.2dB • Minor negative to major positive significance
Option 12	Virtually no overall difference between the do minimum and do something scenarios at any assessment years in any location.	• Range from +1.3 to -2.0dB • Minor negative to minor positive significance

3 Global and Local Air Quality

3.1 BACKGROUND

3.1.1 Emissions from road transport can impact on air quality at both the local and global level. At the local level, high pollution concentrations may have an impact on human health and ecology. The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (2007) outlines a number of standards and objectives for nine key pollutants with regard to their impact to human health namely benzene (C_6H_6), 1,3-butadiene (C_4H_6), carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), particulate matter (PM_{10} and $PM_{2.5}$)sulphur dioxide (SO_2), ozone (O_3) and polycyclic aromatic hydrocarbons (PAHs). Of these pollutants the most relevant to emissions arising from road vehicle emissions are NO_2 and PM_{10}, thus only these pollutants have been considered in this assessment. PM2.5 has recently been included in the Air Quality Regulations but as yet there is no methodology or requirement for assessment. The AQS Standards and Objectives for NO_2 and PM_{10} are illustrated in Table 3.1 below.

Table 3.1: AQS Standards and Objectives for NO_2 and PM_{10}

	Standard		Objective	
Pollutant	**Concentration**	**Measured as**	**Annual Exceedances Allowed**	**Target Date**
Nitrogen Dioxide (NO_2)	40 µg/m^3	Annual mean		31/12/2005
	200 µg/m^3	1 hour mean	18	31/12/2005
Particulate Matter not exceeding 10µm in diameter (PM_{10})	40 µg/m^3	Annual mean		31/12/2004
	50 µg/m^3	24 hour mean	35	31/12/2004
	18 µg/m^3	Annual mean	-	31/12/2010
	50 µg/m^3	24 hour mean	7	31/12/2010

3.1.2 At a global level, carbon dioxide (CO_2) which is also released from vehicle exhausts is a key greenhouse gas. As the proposed options will not generate additional traffic rather it will result in redistribution of existing traffic, it is considered unlikely that the scheme will produce a significant additional amount of CO_2. An assessment of global impacts has therefore been scoped out.

3.2 METHODOLOGY

3.2.1 In order to undertake a local air quality assessment at the project level, the STAG guidance recommends that an appraisal method following the procedure outlined in the Design Manual for Roads and Bridges (DMRB) Vol. 11 Part 1 Section 3 is carried out. A summary of this method is detailed below.

3.2.2 For each route the change in roadside pollutant concentrations were determined using the method described in DMRB 11.3.1. The exposure of properties to this change was then determined using the banded property counts (0-50m, 50m – 100m, 100 – 150m, 150m – 200m) and the distance weightings provided in Table 8 of DMRB Volume 11.3.1.

3.2.3 For the assessment, the following scenarios were assessed:

- 2004 baseline;
- 2012 do minimum;
- 2012 with Option 5;
- 2012 with Option 11; and
- 2012 with Option 12.

3.2.4 2012 is the proposed year of opening for the scheme, and 2004 has been used as the baseline year in line with the remainder of the STAG assessment. Traffic data for the year 2027 was also provided, however this was not included in the assessment as background concentrations cannot be accurately calculated beyond the year 2020 and the DMRB methodology cannot predict concentrations beyond the year 2025.

3.2.5 As the particular problem at Haudagain roundabout is one of congestion in peak hour times, an additional assessment has been included to determine the difference in the schemes in these time periods. Pollutant concentrations at a number of receptor locations adjacent to the main road links at Haudagain roundabout have been calculated using the DMRB methodology and peak hour flows. As the DMRB methodology requires the use of Annual Average Daily Traffic Flows, the concentrations obtained using peak hour flows will not be comparable with Air Quality Strategy (AQS) objective levels. However, they will provide a useful indication of the relative difference between the options.

3.2.6 In addition a qualitative comparison of queue lengths along each of the link roads to the roundabout during the morning and afternoon peak periods for each option has been undertaken.

Significance of Impact

3.2.7 In addition to the assessment of the change in pollutant emissions arising from the proposed scheme as compared to the future do-minimum scenario, the impact of the proposed scheme has also been considered in terms of the significance of the predicted change in pollutant levels based on the magnitude of the change and receptor sensitivity, in accordance with the guidance in STAG.

3.2.8 The magnitude of the impact of each proposal has been determined by consideration of the number of properties impacted by the changes. The significance of each proposal has been determined by comparison of the predicted roadside pollutant levels to the relevant AQS objective levels.

3.3 BASELINE

Existing Air Quality

3.3.1 The study area is located in the northern area of Aberdeen. It consists of a roundabout (Haudagain Roundabout) and the associated link roads: A96(T) Auchmill Road; A90(T) North Anderson Drive; A90(T) Mugiemoss Road and the A96 Great Northern Road. Emissions from vehicles using these roads will be the main source of pollution at the location of the proposed scheme.

3.3.2 The Scottish Pollutant Release Inventory[2] indicates that there are 9 authorised processes[3] operating within a 2 mile radius of Haudagain Roundabout. These include 2 paperboard manufacturing plants, a sewage treatment works and a chicken slaughterhouse.

Aberdeen City Council's Review and Assessment of Air Quality

3.3.3 Under Part IV of the *Environment Act 1995*, local authorities must review and document local air quality within their area by way of staged appraisals and respond accordingly, with the aim of meeting the air quality objectives by the years defined in the Regulations. Where the objectives of the Air Quality Regulations are not likely to be achieved by the objective year, an authority is required to designate an Air Quality Management Area (AQMA). For each AQMA the local authority is required to draw up an Air Quality Action Plan (AQAP) to secure improvements in air quality and show how it intends to work towards achieving air quality standards in the future.

3.3.4 .Aberdeen City Council (ACC) has completed the first and second rounds of the review and assessment process and recently published their 2006 Updating and Screening Assessment. As a result of these assessments, ACC has declared an Air Quality Management Area (AQMA) based on predicted exceedences of the AQS objectives for NO_2 and PM_{10} concentrations. The AQMA is centred on Union Street and Market Street and is located approximately 4km south east of Haudagain Roundabout.

Local Monitoring

[2] http://www.sepa.org.uk

[3] Processes authorised by either SEPA or the local authority

3.3.5 ACC undertakes automatic monitoring of local air quality at 4 continuous monitors within Aberdeen City. The majority of these monitoring stations are roadside or kerbside monitors. Only one of these monitoring stations is an urban background site and is located at Errol Place approximately 3.5km southeast of the site. Monitored concentrations at this site are below the current annual mean objectives for concentrations of NO_2 and PM_{10}.

3.3.6 ACC also undertakes monitoring of NO_2 within Aberdeen City using a network of diffusion tubes. The monitoring results obtained from the diffusion tubes closest to the Haudagain Roundabout are presented in Table 3.2 below.

Table 3.2: Results from Diffusion Tube Monitoring (µg/m^3)

Diffusion Tube	Type	Distance to RB	2001		2002		2003		2004	
			1	2	1	2	1	2	1	2
2, 885 Great Northern Road	Roadside	160m	41	36	55	48	46	45	58	52
3, 549 North Anderson Drive	Roadside	850m	33	29	43	38	35	34	43	38
13, Northfield swimming pool, Kettleshill Crescent	Background	1.1km	16	14	21	18	17	17	22	19
15, 785 Great Northern Road	Roadside	130m	31	27	40	35	34	33	48	42
16, 40 Auchmill Road	Roadside	1.5km	36	32	43	38	36	35	52	46

Notes:
1 Bias adjusted applying mean of 3 continuous monitoring sites
2 Bias adjusted applying factor from Errol Place continuous monitor

3.3.7 The results of the diffusion tube survey illustrated the table above show that at the background location the annual mean AQS Objective was met. This objective was exceeded at the roadside locations presented above. It should be noted, however, that at roadside locations the annual mean AQS objectives would not be applicable due to lack of relevant exposure i.e. members of the public would not be present at roadside locations for long periods of time.

Background Concentrations

3.3.8 There are no suitable automatic monitoring stations in the immediate vicinity of the study area from which background concentrations can be obtained; therefore suitable estimates have been taken from the UK Air Quality Archive (UKAQA)[4], where background concentrations of pollutants included in the Air Quality Strategy (AQS) have been estimated for the whole of the UK at a resolution of 1x1km grid squares.

3.3.9 Table 3.3 shows the average estimated background concentrations of oxides of nitrogen (NO_x), NO_2, and PM_{10} for the study area. Estimated concentrations of NO_x, NO_2 and PM_{10} are available for 2004, 2005 and 2010. Concentrations for 2012 have been calculated using the scaling factors provided by the UKAQA.

[4] http://www.airquality.co.uk

Table 3.3: Estimated background concentrations used in the assessment (µg/m^3)

Pollutant	2004	2012
NO_x	19.8	14.3
NO_2	16.2	11.5
PM_{10}	15.2	14.0

3.3.10 The table above shows that for the assessment years, estimated background concentrations of NO_2 are below the objective limit of 40µg/m^3 to be achieved by 2005. Estimated background concentrations of PM_{10} are below the objective limit of 18µg/m^3 to be achieved by 2010.

Sensitive Receptors

3.3.11 There are a number of sensitive receptors within the study area which may be affected by changes in local air quality as a result of the proposals. The main impacts would be on those receptors located adjacent to the arms of the roundabout and the proposed new link road which may experience a change in traffic flow as a result of the proposals. A banded property count has been undertaken along the key road links, these are presented in Table 3.4 below.

Table 3.4: Property Counts used in the Assessment

Bands	Baseline and Do-Minimum				
	Auchmill Rd	**Mugiemoss Rd**	**Great Northern Rd**	**North Anderson Drive**	**Link Road**
Roadside to 50m from roadside	69	13	87	141	-
50m to 100m from roadside	22	59	44	224	-
100m to 150m from roadside	26	115	73	177	-
150m to 200m from roadside	50	93	56	159	-
Total	**167**	**280**	**260**	**701**	**-**
	Option 5				
Roadside to 50m from roadside	69	13	87	141	94
50m to 100m from roadside	22	59	44	224	104
100m to 150m from roadside	26	115	73	177	137
150m to 200m from roadside	50	93	56	159	73
Total	**167**	**280**	**260**	**701**	**408**
	Option 11				
Roadside to 50m	69	27	87	141	94

Bands	Baseline and Do-Minimum				
	Auchmill Rd	Mugiemoss Rd	Great Northern Rd	North Anderson Drive	Link Road
from roadside					
50m to 100m from roadside	22	93	44	224	104
100m to 150m from roadside	26	58	73	177	137
150m to 200m from roadside	50	110	56	159	73
Total	167	288	260	701	408
	Option 12				
Roadside to 50m from roadside	67	27	87	137	-
50m to 100m from roadside	22	93	44	224	-
100m to 150m from roadside	26	58	73	177	-
150m to 200m from roadside	50	110	56	159	-
Total	165	288	260	697	-

3.3.12 A number of sensitive receptors have been included in this assessment, these are detailed in Table 3.5 below. Receptor 8 is located close to the position of the bypass link road proposed in Options 5 and 11.

Table 3.5: Sensitive Receptors included in this assessment

Receptor	Name	Grid Reference
Receptor 1	438/440 Auchmill Road	391042, 809178
Receptor 2	885/895 Auchmill Road	391151, 809150
Receptor 3	817/819 Great Northern Road	391293, 809132
Receptor 4	561 North Anderson Drive	391322, 809038
Receptor 5	551/553 North Anderson Drive	391361, 808971
Receptor 6	842/852 Great Northern Road	391359, 809165
Receptor 7	735 Great Northern Road	391522, 809078
Receptor 8	25/27 Manor Avenue	391313, 808883

3.4 PREDICTED IMPACTS

Construction Phase

3.4.1 The impact of the construction phase will be similar in nature for each proposed option, and has therefore been scoped out of further consideration in this assessment.

Operational Phase

3.4.2 The impact of the proposed scheme options on local air quality will be to change the pollutant emissions in the vicinity of the roads associated with the roundabout and junctions. The results of the assessment are illustrated in Table 3.6 and Table 3.7 and discussed below.

3.4.3 It should be noted that this assessment is based on the current numbers and locations of residential properties in the area. It is understood that the Mugiemoss area is to be completely redeveloped, although the masterplan for the redevelopment is still in the process of being finalised. The plans for redevelopment will have to examine the preferred option and associated potential air quality impacts of the link road, should Options 5 or 11 be chosen, when considering the suitability of the site for any residential redevelopment, should this form part of the finalised masterplan.

3.4.4 As a result, it is acknowledged that this assessment therefore assumes a reasonable "worst case" scenario given the potential for these existing properties to have been removed as part of the overall regeneration plans for this area, and therefore that the numbers of properties likely to be exposed to any changes in local air quality may be less in reality than that presented in this assessment. However, without accurate and finalised information in this regard, it is considered that the more cautious approach adopted in this assessment is the most appropriate.

Table 3.6: Assessment Results for NO_2

Road Link	Exposure Difference (Compared to Future Do-Minimum)			Exposure Difference (Compared to Baseline)
	Option 5	Option 11	Option 12	Do- Minimum
Auchmill Road	-36.68	89.08	-19.68	-1359.78
Mugiemoss Road	-27.915	147.037	125.081	-1593.016
Great Northern Road	-108.243	-60.135	22.0495	-1788.014
North Anderson Drive	-538.381	-627.24	-149.512	-4918.607
Link Road	4730.816	4767.584	-	-
Overall Score	**4019.597**	**4316.326**	**-22.0615**	**-9659.417**

Table 3.7: Assessment Results for PM_{10}

Road Link	Exposure Difference (Compared to Future Do-Minimum)			Exposure Difference (Compared to Baseline)
	Option 5	Option 11	Option 12	Do- Minimum
Auchmill Road	-50.266	31.876	-18.968	-622.808
Mugiemoss Road	-17.721	175.784	153.1185	-605.736
Great Northern Road	-86.3625	-44.1	-60.6375	-791.9625
North Anderson Drive	-162.2075	-222.456	-77.5835	-1724.034
Link Road	4243.944	4293.165	-	-
Overall Score	**3927.387**	**4234.269**	**-4.0705**	**-3744.5405**

3.4.5 Following the STAG methodology, using annual average traffic data and banded property counts, the results indicate that Option 5 will lead to a reduction in both NO_2 and PM_{10} concentrations along all road links of the roundabout. Due to the introduction of the bypass link road, an increase in both NO_2 and PM_{10} concentrations are predicted along the length of this road. An assessment following the STAG methodology and consideration of property numbers and locations indicated that the overall impact of this option will be an increase in public exposure to poor air quality. This is due to the route of the proposed link road passing through an area that is currently predominantly in residential use where there is currently no road.

3.4.6 Option 11 will lead to a reduction of both NO_2 and PM_{10} concentrations along the Mugiemoss Road, the Great Northern Road and North Anderson Drive but an increase in pollution levels along Auchmill Road. In addition, the new alignment of Mugiemoss Road brings more properties currently located within the Mugiemoss area within proximity of the road leading to a greater exposure of residents to air pollution along this road. Following the STAG assessment methodology and consideration of current property numbers and locations, the overall impact of this option is an increase in public exposure to poor air quality.

3.4.7 Option 12 will lead to a reduction in NO_2 concentrations along Mugiemoss Road and North Anderson Drive and an increase in NO_2 concentrations along Auchmill Road and Great Northern Road. The enlargement of Haudagain Roundabout leads to the removal of a number of properties to the southwest of the roundabout along Auchmill Road and North Anderson Drive. The removal of these properties leads to a lower exposure of properties along these roads to the predicted NO_2 concentrations. In contrast, although pollutant concentrations arising from Mugiemoss Road as a result of the proposal are lower, the new alignment brings more properties currently located within Mugiemoss within proximity of the road leading to greater exposure along this road. The results indicate that the overall impact of this option with regards to NO_2 is an overall decrease in public exposure.

3.4.8 For PM_{10}, this proposal will lead to a reduction in concentrations along the Mugiemoss Road, Great Northern Road and North Anderson Drive and an increase in concentrations along Auchmill Road. As for NO_2 the removal of a number of properties along Auchmill Road and North Anderson Drive will lead to a lower exposure of properties along these roads and the realignment of Mugiemoss Road leads to an increased exposure of residential properties currently present. However, given the likelihood of these properties no longer being in existence at the time of operation of this scheme, the results have been interpreted to indicate an overall slight decrease in public exposure to PM_{10}.

3.4.9 Option 12 is the only option that is predicted to decrease public exposure to poor air quality. The results rank the options in order of their impact on exposure to air pollution as Option 12 first, then Option 5 and Option 11 being the worst.

3.4.10 Roadside pollutant concentrations predicted by the DMRB assessment for all assessment scenarios were considerably lower than the relevant AQS objectives. This is contradictory to the results of the monitoring undertaken by ACC presented in Table 3.2 above, which suggests that roadside annual NO_2 concentrations in this area are close the objective level. It is therefore likely that the DMRB methodology is underpredicting. The results should therefore be used to provide a comparison between the options rather than an indication of actual pollutant levels.

3.4.11 Further assessment was undertaken to compare the relative pollutant levels at key receptors during the am and pm peak times and to compare the length of queues. Predicted concentrations are illustrated in Tables 3.8 and 3.9 below. The presented concentrations were determined from the peak hour flows. It should be noted that as the DMRB methodology requires the use of annual average traffic flows, these levels cannot be compared to the AQS objective levels and should only be used as an indication of relative levels arising from the different options.

Table 3.8: Relative NO_2 levels predicted at each Sensitive Receptor in Year 2012 (µg/m^3)

Receptor	Do Minimum		Option 5		Option 11		Option 12	
	AM	PM	AM	PM	AM	PM	AM	PM
Receptor 1	12.8	12.4	12.6	12.3	12.7	12.3	12.8	12.3
Receptor 2	12.7	12.3	12.3	11.6	12.3	12.0	12.9	13.4

Receptor	Do Minimum		Option 5		Option 11		Option 12	
	AM	PM	AM	PM	AM	PM	AM	PM
Receptor 3	14.3	13.4	13.3	12.8	12.9	12.9	-	-
Receptor 4	12.6	12.5	12.3	12.1	12.2	12.1	-	-
Receptor 5	12.3	12.3	12.3	12.1	12.3	12.1	12.3	12.1
Receptor 6	13.9	13.4	13.0	12.7	13.1	12.6	12.8	12.5
Receptor 7	12.4	12.2	12.2	11.9	12.4	12.0	12.2	11.9
Receptor 8	11.6	11.6	11.8	11.7	11.8	11.7	11.6	11.6

Notes:
Receptors 3 and 4 are removed by Option 12

Table 3.9: Relative PM_{10} levels predicted at each Sensitive Receptor in Year 2012 (µg/m^3)

Receptor	Do Minimum		Option 5		Option 11		Option 12	
	AM	PM	AM	PM	AM	PM	AM	PM
Receptor 1	14.4	14.3	14.4	14.3	14.4	14.3	14.4	14.3
Receptor 2	14.4	14.3	14.2	14.2	14.3	14.2	14.4	14.3
Receptor 3	14.9	14.7	14.6	14.5	14.6	14.5	-	-
Receptor 4	14.4	14.4	14.3	14.2	14.2	14.2	-	-
Receptor 5	14.3	14.3	14.3	14.2	14.3	14.2	14.3	14.2
Receptor 6	14.8	14.7	14.5	14.4	14.5	14.4	14.4	14.3
Receptor 7	14.3	14.3	14.2	14.1	14.3	14.2	14.2	14.1
Receptor 8	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.0

Notes:
Receptors 3 and 4 are removed by Option 12

3.4.12 The results indicate that each option has very little impact on the concentrations of NO_2 and PM_{10} experienced in the peak hours at the sensitive receptors. It should be noted that the DMRB methodology is a screening methodology which uses annual average daily traffic flows. The results in the tables above were obtained by using the peak hour flows. The accuracy of methodology to predict concentrations from such low traffic flows is not known, and therefore the findings from this section of the assessment should be treated with caution.

3.4.13 The number of cars queuing in the am and pm peak hours is illustrated in Table 3.10 below.

Table 3.10: Average number of vehicles queuing per hour in the peak am and pm periods

Link Road	Do Minimum		Option 5		Option 11		Option 12	
	AM	PM	AM	PM	AM	PM	AM	PM
Auchmill Road	175	65	20 (-155)	15 (-50)	11 (-164)	10 (-55)	139 (-36)	37 (-28)
Mugiemoss Road	94	120	37 (-57)	27 (-93)	9 (-85)	27 (-93)	12 (-82)	12 (-108)
Great Northern Road	29	215	9 (-20)	14 (-201)	2 (-27)	2 (-213)	9 (-20)	11 (-204)
North Anderson Drive	26	168	16 (-10)	20 (-148)	7 (-19)	6 (-162)	15 (-11)	26 (-142)

Notes: The change from the Do-Minimum scenario is presented in brackets.

3.4.14 As illustrated in the table above, each option shows a significant improvement in the queue lengths compared to the Do-Minimum scenario, which will be reflected in the air quality experienced at nearby

sensitive receptors. The option which most significantly reduces the queue lengths is Option 11, then Option 5 then Option 12.

3.4.15 The majority of sensitive receptors within the vicinity of the roundabout are located along North Anderson Drive. Improvements in congestion along this road will therefore have the most beneficial impact. When compared with weighted property counts along each link, Option 11 showed the greatest reduction in queuing traffic along links with most sensitive receptors followed by Option 5.

3.4.16 The findings of this assessment are summarised in Table 3.11 below.

Table 3.11 Predicted Impacts

Transport Option	Predicted Impacts	Magnitude and Significance of Predicted Impact
Do Minimum	• Do minimum scenario which is a future baseline is predicted to lead to an overall improvement in air quality and reduction in public exposure in comparison with the existing base year scenario.	• Magnitude of impact is positive moderate • Significance of impact is positive moderate
Option 5	• Operation is likely to lead to an overall increase in exposure to NO_2 and PM_{10} concentrations when compared to the future Do-Minimum scenario. This is due to the introduction of a new road link through what is currently a residential area. Localised decreases in NO_2 and PM_{10} concentrations are likely along all arms of the roundabout.	• Magnitude of operational impacts over the whole area is negative moderate. Properties along the arms of the roundabout may experience an improvement in air quality as a result of the changes, the magnitude of this is likely to be positive minor. • Significance of this option is minor negative.
Option 11	• Operation is likely to lead to an overall increase in exposure to NO_2 and PM_{10} concentrations when compared to the future Do-Minimum scenario. This is due to the introduction of a new road link through what is currently a residential area. Localised decreases in NO_2 and PM_{10} concentrations are likely along Mugiemoss Road, Great Northern Road and North Anderson Drive.	• Magnitude of operational impacts over the whole area is negative moderate. Properties along Mugiemoss Road, Great Northern Road and North Anderson Drive may experience an improvement in air quality as a result of the changes, the magnitude of this is likely to be positive minor. • Significance of this option is minor negative.
Option 12	• Operation is likely to lead to an overall reduction in exposure to NO_2 and PM_{10} concentrations when compared to the future Do-Minimum scenario. Localised increases in NO_2 and PM_{10} concentrations are likely along Auchmill Road	• Magnitude of operational impacts over the whole area is positive minor. Properties along the Auchmill Road and Great Northern Road may be adversely affected by the changes, the magnitude of this is likely to be negative minor.

Transport Option	Predicted Impacts	Magnitude and Significance of Predicted Impact
	and increased NO_2 concentrations also along Great Northern Road.	• Significance of this option is minor positive.

3.5 MITIGATION

3.5.1 Given the nature of the proposals, options for mitigation are limited. Consideration should be given to the positioning of residential properties within the proposed redevelopment of Middlefield. Increasing the distance between residential properties and busy roads would help reduce to exposure of new residents to elevated levels of pollution.

3.6 PREDICTED RESIDUAL EFFECTS OF STRATEGIES

3.6.1 Residual impacts of each option are presented in Table 3.12 below

Table 3.12 Predicted Residual Air Quality Effects

Transport Strategy	Predicted Effects	Magnitude and Significance of Predicted Effect
Option 5	• Residual Effects of Operational phase is overall increase in exposure to pollution largely due to the location of a proposed road through what is currently a residential area, but some local improvements close to all arms of the roundabout.	• Magnitude of residual effects of operational impacts over the whole area is negative moderate and positive minor in localised areas in close proximity each arm of the roundabout. • Significance of this option is currently minor negative. However, depending on the number and locations of any residential properties to be included in the finalised masterplan, the significance may be reduced.
Option 11	• Residual Effects of Operational phase is overall increase in exposure to pollution largely due to the location of a proposed road through what is currently a residential area, but some local improvements close to Mugiemoss Road, Great Northern Road and North Anderson Drive.	• Magnitude of residual effects of operational impacts over the whole area is negative moderate and positive minor in localised areas in close to Mugiemoss Road, Great Northern Road and North Anderson Drive. • Significance of this option is minor negative. However, depending on the number and locations of any residential properties to be included in the finalised masterplan, the significance may be reduced.
Option 12	• Residual Effects of Operational phase is overall reduction in exposure to pollution but some local increased levels close to Auchmill Road and Great	• Magnitude of residual effects of operational impacts over the whole area is positive minor and negative minor in localised areas in close proximity to Auchmill Road

Transport Strategy	Predicted Effects	Magnitude and Significance of Predicted Effect
	Northern Road.	and Great Northern Road. • Significance of this option is minor positive.

4 Water Quality, Drainage and Flood Defence

4.1 APPROACH

4.1.1 Water quality is of critical importance to people, biodiversity, agriculture and recreation. The development and operation of new transport infrastructure has the potential to have a significant effect on water quality, for example through entrainment of sediments during construction or runoff containing pollutants once the proposal is in operation, increases in transport movements adding to the risk of pollution or disturbance to marine or littoral environments, or new structures affecting the capacity of flood plains or flood defences. The maintenance and improvement of the quality of drinking water, and the quality of watercourses is a core theme of European and UK government policy.

4.1.2 Impacts on surface water and groundwater have been evaluated by reference to statutory and non-statutory requirements and guidelines. The assessment has drawn on guidance in various documents including DMRB, Scottish Planning Policy, CIRIA reports, Planning Advice Notes and Local Plans.

4.1.3 A baseline desk study of the surface water environment and hydrogeology within 1km of the development options was undertaken and incorporated river classifications, information on flooding, land drainage and aquifers within the area.

4.1.4 In summary the methodology has:

- identified all surface water bodies and groundwater within 1km of the proposed options;
- considered the potential for adverse and/or positive impacts arising from the proposed options; and
- reviewed options for mitigation of any adverse impacts that could arise.

4.1.5 The following key sources of information were used in the qualitative assessment of water quality, drainage and flood defence:

- Ordnance Survey 1:50,000 mapping;
- Aerial photography;
- SEPA — Water quality (classification of river quality, coastal waters, lochs and estuaries);
- SEPA — Indicative River and Coastal Flood Map (Scotland)
- SEPA — Groundwater vulnerability maps and policy statements;
- SEPA — Groundwater Protection Policy for Scotland (1997);
- Scottish Executive – Natural Flood Storage and Extreme Flood Events (2005)
- Scottish Executive - Scottish Planning Policy (SPP) 7 - Planning and Flooding (2004).

4.2 BASELINE

Surface watercourses

4.2.1 The options are located within the catchment of the River Don, which is located approximately 400m to the northwest of the existing Haudagain Roundabout at its closest point. The river flows from west to east before discharging into the North Sea approximately 4km to the east of the roundabout.

4.2.2 For the purposes of this assessment, only those watercourses or water bodies identified within 1km of each of the options have been considered. A review of 1:50,000 Ordnance Survey Mapping and aerial photography indicates that three watercourses are present within this search area and details of these are summarised in Table 4.1. Their water quality, as indicated on SEPA's River Quality Classification Interactive Map (2006), are also presented.

Table 4.1 Surface Watercourses

Option	Watercourse	Distance	Water Quality[1]
5	• Scatter Burn • River Don • Bucks Burn	• 150m • 225m • 930m	• C • A2 • B
11	• Scatter Burn • River Don • Bucks Burn	• 150m • 225m • 930m	• C • A2 • B
12	• River Don • Scatter Burn • Bucks Burn	• Adjacent (crosses river) • Adjacent (crosses burn) • 550m	• A2 • C • B

[1] SEPA river water quality classification categories: A1 (Excellent), A2 (Good), B (Fair), C (Poor) and D (Seriously Polluted).

4.2.3 Consultation with Aberdeen City Council indicates that an unspecified section of the River Don has been declared as a Water Framework Directive (WFD) 1a water body which is at risk of failing to achieve WFD good water quality and ecological status.

4.2.4 The River Don is also designated as Salmonid Water under the Surface Waters (Fishlife) (Classification) (Scotland) Amendment Regulations 2003 and the EC Freshwater Directive (78/659/EEC).

4.2.5 The section of the River Don from just upstream of Persley Bridge, located approximately 500m to the northwest of the existing roundabout, to the tidal limit is designated as a Sensitive Area (Eutrophic) under the EC Urban Waste Treatment Directive (91/271/EEC).

4.2.6 Given the good water quality rating of the River Don and its designation as a Salmonid Water and Sensitive Area, it is considered to by a highly sensitive water resource.

Groundwater

4.2.7 The BGS 1:625,000 Hydrogeological Map of Scotland (1988) indicates that the River Don basin is underlain by Quaternary sands and gravels forming a locally important aquifer with significant intergranular flow. Outwith the river basin, bedrock is indicated as comprising impermeable intrusive rocks which generally do not hold groundwater. Given the nature of the bedrock geology indicated on geological plans throughout the development area (as discussed in Section 1.6: Geology, Agriculture and Soils), it is considered likely that the sands and gravels indicated underlying the river basin lie on top of intrusive rock and allow groundwater base flow to the River Don.

4.2.8 SEPA does not attribute a groundwater resource classification to the aquifers in Scotland. The BGS 1:625,000 scale Groundwater Vulnerability Map of Scotland (2001) indicates that the bedrock strata beneath the River Don basin is moderately permeable, likely referring to the sand and gravel, while the remainder of the development area is indicated as being weakly permeable.

Drainage

4.2.9 Given that the development area is situated within the catchment of the River Don, natural surface and groundwater flows are likely to be directed towards the river. Depending on the nature of superficial deposits, the use of suitably designed Sustainable Urban Drainage Systems (SUDS), such as swales and filter drains, would allow for suitable treatment of surface waters prior to discharge to surface watercourses i.e. the River Don. Wastewater drainage systems would require to be connected to the public foul sewer system to ensure adequate treatment.

Flood Defence

4.2.10 A review undertaken by SEPA of the Indicative River and Coastal Flood Map (Scotland) – 0.5% annual probability layer for the area surrounding the Haudagain Roundabout shows the River Don may be affected by flooding in the area between the Mugiemoss Road roundabout and the roundabout serving the Tesco superstore directly across the river. No flood defence schemes are indicated as being in place along this stretch of the River Don.

4.3 PREDICTED IMPACTS

4.3.1 All three options have potential to impact on water quality, drainage and flood defence during both the construction and operational phases, as summarised below:

Construction

4.3.2 Pollution of watercourses: Watercourses within 500m of activities may be impacted by spillage or leakage of fuels, oils and concrete, the use of herbicides and increased sediment loading from surface water run-off, erosion of stockpiles or the banks of watercourses.

4.3.3 Alteration of water quality: Any temporary works on or proximate to the banks of the River Don are likely to cause a slight change in water quality caused by increased mobilisation of sediments.

4.3.4 Alteration of groundwater flows and quality: Intrusive works such as excavations or piling may alter groundwater flows and quality.

Operation

4.3.5 Pollution of watercourses: There is potential for contaminated surface waters to discharge into watercourses unless suitably designed drainage systems and levels of treatment are installed. The volume of surface water run-off generated may rise with the introduction of increased impermeable surfaces associated with any new or widened roads.

4.3.6 Flooding: Alterations to natural drainage and increased discharges to watercourses may increase the risk of flooding.

Table 4.2 Predicted Impacts

Option	Predicted Impacts	Magnitude and Significance of Predicted Impact
Do Minimum	• Construction No significant impacts • Operation No significant impacts	• Magnitude: Neutral • Significance: No impact
5	• Construction Pollution of watercourses Alteration of groundwater flow and quality Flooding • Operation Pollution of watercourses Flooding	• Magnitude: Negative Slight • Significance: Minor Negative Impact
11	As above	• Magnitude: Negative Slight • Significance: Minor Negative Impact
12	As above	• Magnitude: Negative Slight • Significance: Minor Negative Impact

4.3.7 In summary, there is potential for slight adverse impacts on surface waters and groundwater during the construction and operational phases, although no significant differences have been identified between the three options.

4.4 MITIGATION

4.4.1 As appropriate, and in discussion with SEPA, the drainage system for the preferred option during both construction and operation will incorporate SUDS features, which will contribute towards achieving the following:

- minimising any increase in the volume of surface water run-off from new areas of hard standing reaching surface water drains and watercourses;
- attenuation of run-off during rainfall events – basins, ponds and wetlands could be incorporated into system; and
- removal of contaminants in the run-off.

4.4.2 Guidelines contained in CIRIA Document C521: "SUDS – Design Manual for Scotland and Northern Ireland" will be followed during the detailed design stage of the preferred option.

4.5 PREDICTED RESIDUAL EFFECTS

4.5.1 As highlighted in the table below, no significant residual effects are predicted on water quality, drainage and flood defence. There is considered to be potential for temporary construction impacts, but it is considered that mitigation measures in the form of construction best practice will further ensure that no significant impacts arise.

Table 4.3: Predicted Residual Water Quality, Drainage and Flood Defence Effects

Transport Strategy	Predicted Effects	Magnitude and Significance of Predicted Effect
Do Minimum	No significant residual effects are predicted	■ Magnitude: Neutral ■ Significance: No effect
Option 5	No significant residual effects are predicted	■ Magnitude: Neutral ■ Significance: No Effect
Option 11	No significant residual effects are predicted	■ Magnitude: Neutral ■ Significance: No Effect
Option 12	No significant residual effects are predicted	■ Magnitude: Neutral ■ Significance: No Effect

5 Geology, Agriculture and Soils

5.1 APPROACH

Geology

5.1.1 The underlying geology has played a fundamental role in determining the landscape character of Scotland. Transport proposals, particularly during construction works, could have a direct impact on the strata by imposing different loads, which could cause ground to collapse, by altering hydrogeological processes or by burying or damaging important deposits or outcrops. In addition, some geological or geomorphological features are of scientific interest and educational value. They may be designated as statutory Sites of Special Scientific Interest (SSSIs) or non-statutory Regionally Important Geological Sites (RIGS). Transport proposals could also prejudice the future working of important mineral reserves or have an indirect impact on resources through, for example, the demand for construction materials.

5.1.2 The following primary data sources were used in the assessment of geology:

- The British Geological Survey Geological Maps - Sheet 77, Aberdeen, Solid and Drift Editions (1:50,000 scale) (1969);
- Scottish Natural Heritage, GIS Database; and
- County Series Ordnance Survey Mapping (1:10,560 scale) 1869 to 1995.

5.1.3 A consultation exercise was undertaken to gather geological baseline information which was used to inform the impact assessment in the options appraisal process. The following organisations were consulted:

- Scottish Natural Heritage (SNH);
- Scottish Environment Protection Agency (SEPA);
- Aberdeen Council Planning Department;
- Aberdeen Council Environment Department; and
- The British Geological Survey, Scottish RIGS coordinator.

Agriculture and Soils

5.1.4 The loss or severance of agricultural land by new transport infrastructure may affect the viability of farm holdings. This can be particularly important in marginal agricultural areas. Soils close to any new construction can be affected by pollution from runoff and aerial deposition. Construction can cause the loss of valuable agricultural soil such as land identified as being of prime agricultural quality, which even if kept and stored is likely to degrade in quality. If soil is taken from a site of nature conservation interest there is the possibility of losing valuable seed banks. Land that is contaminated with toxic and hazardous materials can pose a threat to human health and safety if disturbed.

5.1.5 The following primary data source was used in the assessment of soils:

- Macaulay Institute for Soil Research – Soil Survey of Scotland, Sheet 77, Aberdeen, scale 1:63,360.

5.1.6 The following organisations were consulted for the assessment of agriculture and soils:

- Scottish Natural Heritage (SNH);
- Scottish Environment Protection Agency (SEPA);
- Aberdeen Council Environment Department.

5.2 BASELINE

Table 5.1 Baseline

Option	Geology affected by each intervention	
	Solid	Drift
Do Minimum	Not applicable.	Not applicable.
Option 5	Foliated muscovite-biotite-granite	Till: widespread mantle of glacial deposited rock debris consisting of unsorted, generally unstratified, clay, sandy clay or sand, usually containing many pebbles and boulders.
Option 11	Foliated muscovite-biotite-granite	Till: widespread mantle of glacial deposited rock debris consisting of unsorted, generally unstratified, clay, sandy clay or sand, usually containing many pebbles and boulders.
Option 12	Foliated muscovite-biotite-granite	Glacial meltwater deposits: moundy deposits and terrace like spreads of water sorted sand and fine to coarse gravel. Till.

5.2.1 No geologically designated sites were identified at or in the vicinity of the proposed interventions.

Mineral Reserves

5.2.2 Information supplied by the Coal Authority and Law Society of Scotland indicates that underground or opencast coal mining activity has not taken place within the vicinity of any of the interventions.

5.2.3 Most of the subject area is underlain by Till, which does not represent a significant resource in terms of aggregates (i.e. sand and gravel). Areas to the north of Haudagain Roundabout are underlain by Glacial meltwater deposits. These deposits may locally comprise sands and gravels, with limited potential for extraction as an aggregate resource.

Agriculture and Soils

5.2.4 The study area is predominantly a built up residential area; therefore there is limited potential for any significant soil or agricultural resource being present, any resources previously present on site would have been lost during the development of the current road network and the residential properties.

Soil Survey Sheet 77, Aberdeen, 1:63,360 shows the area of the proposed options to be urban.

Contaminated Land

5.2.5 All road options incorporate the Haudagain Roundabout. Historically, a road junction has been present at the location of the Haudagain roundabout since before the mid 1800s, gradually the roads have been widened, but have maintained the same layout as is currently present. The roundabout was first recorded on the 1990 map edition. Option 12 incorporates the widening and enlargement of these existing routes and roundabout. Option 11 would replace the existing roundabout with a signalised junction.

5.2.6 Option 5 maintains the current road layout and incorporates a proposed new link road with traffic signals at each end. The area of this link road was previously undeveloped land with Middlefield House and Cottage near Auchmill Road present until pre 1959 when the current housing development was constructed. Option 11 also incorporates this new link road.

5.2.7 Denhead Gas Works was located approximately 150m west of the proposed new link road and approximately 50m south of the Auchmill Road pre 1869 until pre 1974. A caravan park is currently recorded on this area. It is considered that there is a potential for residual contaminants to be present which may have migrated to impact on a localised section of the study area.

5.3 PREDICTED IMPACTS

5.3.1 Impacts on agriculture are considered to be minimal given the built up nature of the area. The options proposed have a varying potential to impact on geology primarily through the construction process. Impacts on soils will be localised to the vicinity of the proposed developments and predominantly associated with loss of land through widened road sections, new link roads and new junctions.

5.3.2 The potential impacts on geology and soils have therefore been considered for both the construction and operation of all of the options:

Construction

5.3.3 Loss of Drift Deposits: During site works drift deposits / soils may be lost or re-distributed. Loss of soil will be dependent upon the nature of the option: Options 5 and 11 involve a new link road and therefore more earthworks resulting in a greater loss of deposits. However, given the built up nature of the area the potential for loss of any significant soil resources is considered to be limited.

5.3.4 Increased Erosion Potential: During site works the removal of surface cover through stripping or direct loss from site works may result in an increase in soil erosion. However, given that much of the area is underlain by Till, the potential for soil erosion is considered to be lessened.

5.3.5 Encountering Contaminated Land: During site works there is the potential for works to locally encounter contaminated land. The potential significance of such an impact will vary based on the nature and extent of contamination. However given that much of the area is underlain by impermeable Till deposits, potential for migration of contamination to the study area is considered reduced.

Operation

5.3.6 Increased Erosion Potential: Depending upon the design of constructed road sides / embankments, there is the potential for increased erosion of soils associated with changes in run-off both directly from road sections and also from new embankments.

Table 5.2 Predicted Impacts

Transport Option	Predicted Impacts	Magnitude and Significance of Predicted Impact
Do Minimum	• Construction No significant impacts • Operation No significant impacts	• Magnitude: Neutral • Significance: No impact
Option 5	• Construction Loss of drift deposits. Increased erosion potential. Encountering contaminated land. • Operation Increased erosion potential.	• Magnitude: Negative Minor • Significance: Minor Negative Impact
Option 11	• Construction Loss of drift deposits. Increased erosion potential.	• Magnitude: Negative Minor • Significance: Minor Negative Impact

	Encountering contaminated land. • Operation Increased erosion potential.	
Option 12	• Construction Loss of drift deposits. Increased erosion potential. Encountering contaminated land. • Operation Increased erosion potential.	• Magnitude: Negative Minor • Significance: Minor Negative Impact

5.3.7 In summary, there is potential for minor adverse impacts on geology and soils during the construction and operational phases, although no significant differences have been identified between the three options.

5.4 MITIGATION

5.4.1 Mitigation measures proposed in order to address impacts on geology and soils associated with the proposed options will be those predominantly associated with construction site best practice.

5.4.2 The scheme design will aim to reduce the potential for surface run-off during the operational phase causing erosion. This will primarily be through suitable road drainage.

5.5 PREDICTED RESIDUAL EFFECTS

Table 5.3: Predicted Residual Geology, Agriculture and Soils Effects

Transport Strategy	Predicted Effects	Magnitude and Significance of Predicted Effect
Do Minimum	No significant residual effects are predicted	▪ Magnitude: Neutral ▪ Significance: No effect
Option 5	No significant residual effects are predicted	▪ Magnitude: Neutral ▪ Significance: No Effect
Option 11	No significant residual effects are predicted	▪ Magnitude: Neutral ▪ Significance: No Effect
Option 12	No significant residual effects are predicted	▪ Magnitude: Neutral ▪ Significance: No Effect

5.5.1 It is not predicted that any of the options would result in significant residual effects upon geology, agriculture and soils. Implementing any of the options other than the do-minimum would result in the potential for short-term effects throughout the construction period, but it is considered that the mitigation measures in the form of construction best practice will prevent significant impacts from arising.

6 Biodiversity

6.1 APPROACH

6.1.1 This section presents the findings of the STAG Part 2 biodiversity appraisal of the transport and access strategies being considered for Haudagain Roundabout. This assessment is based on data collected through a desk study. This aims to determine whether any designated sites or protected species records are present within 2km of Haudagain roundabout and whether these designated sites or protected species may be affected by any of the interventions.

6.1.2 The broad habitat types present were identified using recent photographs of the site area and therefore identify the potential for protected or locally important species to be present.

6.1.3 Information was obtained from the following organisations:

- Scottish Natural Heritage
- Scottish Environment Protection Agency
- Aberdeen City Council
- National Biodiversity Network Gateway
- North East Scotland Biological Records Centre

6.2 BASELINE

6.2.1 The table below presents the baseline for each of the options. There are no statutory sites within, or adjacent to, any of the proposed option areas, although there is one Site of Special Scientific Interest approximately 3km away at Scotstown Moor. Nine locally designated District Wildlife Sites (DWS) are present within 2km of the Haudagain Roundabout site and are listed below:

- Aberdeen, Inverness and Kittybrewster Railway;
- Woodside;
- River Don Valley;
- Monument Wood;
- Persley Quarries;
- Lower and Upper Persley Woodland;
- Braes of Don;
- Hilton Wood; and
- Bucksburn Gorge.

6.2.2 In addition, there are four Local Nature Reserves (LNR) in proximity. The nearest is Den of Maidencraig (approximately 2km away); and the remainder are Donmouth, Kincorth Hill and Scotstown Moor, which is also a SSSI (all approximately 3km away).

6.2.3 The designated DWS identified are of local importance. DWS are areas designated by Aberdeen City Council with support from SNH as the best examples of habitat types in the local area or are particularly valued by the local community as a recreational, landscape and educational resource. Table 6.1 below details the designated sites, habitats and species which may be affected by each transport option.

Table 6.1 – Ecological Baseline

Option	Designated Sites	Habitats and Species
Option 5	No direct impact on designated sites. The nearest designated site is Aberdeen, Inverness and Kittybrewster Railway Line DWS which is approximately 50m to the north of the proposed junction on Great Northern Road. The proposals affect this DWS indirectly. The woodland adjacent to the River Don is listed in the SNH Ancient Woodland Inventory and is long-established of plantation origin	Woodland listed in the Ancient Woodland Inventory (AWI) (long established of plantation origin) and woodland listed in the Semi-natural Woodland Inventory is present within 250 metres of the option. Ancient and semi-natural woodland may provide habitat for protected species such as bats (*Chirpotera sp*), badger (*Meles meles*) and nesting birds. The woodland is also adjacent to the River Don and therefore may provide shelter for species such as otter (*Lutra lutra*) The Inverness and Kittybrewster railway line DWS may act as a wildlife corridor for several species. The River Don flows approximately 400m to the north of the proposed option area. The river may provide habitat for a number of species including Atlantic salmon, otter and water vole. The river may also be important for foraging species such as bats and birds.
Option 11	This option will have a direct impact on the Aberdeen, Inverness and Kittybrewster Railway Line DWS and Woodside DWS. The option may impact indirectly on River Don Valley DWS. The woodland adjacent to the River Don is listed in the SNH Ancient Woodland Inventory and is Long-Established of Plantation Origin.	Bats may use the bridge over the railway for roosting depending on the construction of the bridge and availability of suitable features to support roosting bats. Woodland listed in the Ancient Woodland Inventory (AWI) (Long Established of Plantation Origin) and woodland listed in the Semi-natural Woodland Inventory is present within 250 metres of the option. These woodlands may provide habitat for protected species such as bats, badger and nesting birds. The woodland is also adjacent to

Option	Designated Sites	Habitats and Species
		the River Don and therefore may provide shelter for species such as otter. The Inverness and Kittybrewster Railway Line DWS may act as a wildlife corridor for several species. The River Don flows approximately 100m to the north of the proposed option. The river may provide habitat for a number of species including Atlantic salmon, otter and water vole. The river may also be important for foraging species such as bats and birds.
Option 12	This option will have a direct impact on the Aberdeen, Inverness and Kittybrewster Railway Line DWS and Woodside DWS. The option may impact indirectly on River Don Valley DWS. The woodland adjacent to the River Don is listed in the SNH Ancient Woodland Inventory and is Long-Established of Plantation Origin	Bats may use the bridge over the railway for roosting depending on the construction of the bridge and availability of suitable features to support roosting bats. Ancient woodland (Long-Established of Plantation Origin) and semi-natural woodland is present within 250 metres of the option. Ancient and semi-natural woodland may provide habitat for protected species such as bats, badger and nesting birds. The woodland is also adjacent to the River Don and therefore may provide shelter for species such as otter. The Aberdeen, Inverness and Kittybrewster Railway Line DWS may act as a wildlife corridor for several species. The River Don flows approximately 100m to the north of the proposed option area. The river may provide habitat for a number of species including Atlantic salmon, otter and water vole. The river may also be important for foraging species such as bats and birds.

6.3 PREDICTED IMPACTS

6.3.1 Table 6.2 below summarises the predicted impacts for each intervention.

Table 6.2 Predicted Impacts

Transport Option	Predicted Impacts	Magnitude and Significance of Predicted Impact
Do Minimum	• There will be no impacts on designated sites or protected species from Haudagain Roundabout itself. • Any change in land use in the vicinity of the roundabout could affect the Aberdeen, Inverness and Kittybrewster Railway Line DWS indirectly and any protected species associated with the DWS.	None
Option 5	**Construction** • There will be no direct impacts on designated sites from option 5. • There may be an indirect impact on the Aberdeen, Inverness and Kittybrewster Railway Line DWS from lighting and noise disturbance associated with construction activities • Construction activities may lead to indirect disturbance of wildlife within the designated and ancient woodland areas • Construction activities may result in species, such as badger or otter becoming trapped or killed, for example through collision with construction traffic. • Construction may result in a loss of amenity planting and shrubs **Operation** • Increased traffic as a result of the improvements may result in an increase in wildlife colliding with traffic, particularly otter and badger. • Increases in road lighting may result in disturbance to foraging species.	Moderate negative impact
Option 11	**Construction** • Widening of the bridge over the railway may impact on roosting and foraging bats. • There will be a direct impact on the Aberdeen, Inverness and Kittybrewster Railway Line DWS and Woodside DWS resulting from construction activities. • There may be an indirect impact on the River Don Valley DWS from lighting and noise associated with construction activities. • There may be an impact on the function of the railway line as a wildlife corridor through modifications to the railway bridge. • Construction activities may affect ancient or semi-natural woodland in the vicinity of the River Don. • Construction activities may result in pollution which may enter the River Don. • Construction activities may lead to indirect disturbance of wildlife within the designated and ancient woodland areas, particularly otter in the vicinity of the River Don. • Construction activities may result in species, such as	Major negative impact

Transport Option	Predicted Impacts	Magnitude and Significance of Predicted Impact
	badger or otter becoming trapped or killed, for example through collision with construction traffic. • Construction may result in a loss of amenity planting and shrubs **Operation** • Increased traffic as a result of the improvements may result in an increase in wildlife colliding with traffic, particularly otter and badger. • Increases in road lighting may result in disturbance to foraging species.	
Option 12	**Construction** • New bridge over the railway may impact on roosting and foraging bats. • There will be a direct impact on the Aberdeen, Inverness and Kittybrewster Railway Line DWS and Woodside DWS resulting from construction activities • There may be an indirect impact on the River Don Valley DWS from lighting and noise associated with construction activities. • There may be an impact on the function of the railway line as a wildlife corridor through modifications to the railway bridge. • Construction activities may affect ancient or semi-natural woodland in the vicinity of the River Don. • Construction activities may result in pollution which may enter the River Don. • Construction activities may lead to indirect disturbance of wildlife within the designated and ancient woodland areas, particularly otter in the vicinity of the River Don. • Construction activities may result in species, such as badger or otter becoming trapped or killed, for example through collision with construction traffic. • Construction may result in a loss of amenity planting and shrubs **Operation** • Increased traffic as a result of the improvements may result in an increase in wildlife colliding with traffic, particularly otter and badger. • Increases in road lighting may result in disturbance to foraging species.	Major negative impact

6.4 MITIGATION

Designated Sites

6.4.1 Two locally designated sites will be impacted upon directly by option 11 and option 12: Aberdeen, Inverness and Kittybrewster Railway Line DWS and Woodside DWS. The River Don DWS may be also affected indirectly by option 11 and 12. The Inverness and Kittybrewster Railway Line DWS may be affected indirectly by option 5. In addition, AWI listed Long-Established Woodland of Plantation Origin and semi-natural woodland is present adjacent to the River Don. In order to ensure that these are not significantly impacted upon, appropriate measures will be required to ensure their integrity is retained as far as is reasonably practicable. Small areas of ancient woodland may be encroached by option 11 and 12 and, should either of these options be developed, mitigation measures will be required to minimise impacts, such as through replacement planting and habitat enhancements.

Habitats

6.4.2 The Aberdeen, Inverness and Kittybrewster Railway Line DWS may function as a wildlife corridor. This corridor may be directly affected by option 11 and option 12. Mitigation and enhancement measures will be required at the detailed design stage to ensure that habitat linkages are maintained and the function of the wildlife corridor is retained.

6.4.3 The removal of mature trees in proximity to the options should be avoided wherever possible. Small areas of Ancient Woodland Inventory (AWI) listed woodland may be encroached by option 11 and 12 and, should these options be developed, mitigation measures will be required to minimise impacts, such as through replacement planting and habitat enhancements. Replanting of native broadleaved trees should be carried out to replace any tree loss, and all retained trees in proximity to the works should be protected from construction activities in accordance with BS5837:2005 "Trees in Relation to Construction".

6.4.4 All three options may result in the loss of amenity planting. Mitigation measures will be required to minimise impacts, such as through replacement planting and habitat enhancement.

6.4.5 Pollution prevention measures following best practice from SEPA should be implemented to prevent pollution to the River Don resulting from option 11 and 12.

Protected Species

6.4.6 Mitigation for protected species can only be developed after specific survey work has been undertaken at the more detailed stages of environmental assessment. Dedicated surveys will be required for bats, badgers and otter. Roosting bats may be present within the bridges over the railway.

6.4.7 This appraisal assumes that if a protected species is found to be present then reasonable mitigation measures will be developed and implemented to protect the species, for example, specialised fencing to prevent road mortality and direction of strong lighting away from watercourses and woodland areas.

6.4.8 Removal of vegetation should be avoided, where possible, within the nesting bird season (March – July). If removal of vegetation is essential then a nesting bird survey will be required and all active nests protected from disturbance until the young have fledged.

6.5 PREDICTED RESIDUAL EFFECTS

6.5.1 Without mitigation, Option 5 will result in a moderate negative significance before mitigation measures, with options 11 and 12 resulting in a major negative significance. Assuming that the mitigation measures identified above are implemented, the significance of Option 5 during construction will be reduced to minor and Option 11 and 12 will be reduced to moderate. Overall, the magnitude and significance of the predicted effect for each package is predicted to be minor.

Table 6.3 Predicted Residual Biodiversity Effects

Transport Strategy	Predicted Effects	Magnitude and Significance of Predicted Effect
Do Minimum	• The Do Minimum option is not predicted to have any effects.	▪ Magnitude: Neutral ▪ Significance: No Effect
Option 5	Summary of key effects of Option 5: **Construction** • Indirect effect on DWS • Effects on protected species. • Indirect effects on habitats and species in locally designated sites, for example, DWSs.	▪ Magnitude: Negative Minor ▪ Significance: Minor Negative Impact

Transport Strategy	Predicted Effects	Magnitude and Significance of Predicted Effect
	Operation • Effects on protected species.	
Option 11	Summary of key effects of Option 11: **Construction** • Direct and indirect effect on DWSs • Effects on protected species, including European Protected Species. • Direct and Indirect effects on habitats and species in locally designated sites, for example, DWSs. **Operation** • Effects on protected species.	▪ Magnitude: Negative Minor ▪ Significance: Minor Negative Impact
Option 12	Summary of key effects of Option 12: **Construction** • Direct and indirect effect on DWSs • Effects on protected species, including European Protected Species • Direct and indirect effects on habitats and species in locally designated sites, for example, DWSs. **Operation** • Effects on protected species.	▪ Magnitude: Negative Minor ▪ Significance: Minor Negative Impact

7 Landscape

7.1 APPROACH

7.1.1 An assessment of the effects of the 3 different options (plus the Do Minimum) on the landscape has been undertaken at a strategic level to broadly assess the Landscape Character and quality of the site area, identify specific designations or key features relevant to the site and surroundings, and to identify the character of the surrounding area. To determine landscape character, reference was made to the National Landscape Character Assessment undertaken by the Countryside Agency and Scottish Natural Heritage (SNH).

7.1.2 The landscape assessment has been undertaken in general accordance with the following documents:

- Scottish Transport Appraisal Guidance (STAG) 2003; by the Scottish Executive (September 2003);
- The Design Manual for Roads and Bridges, Volume 11 (DMRB) Section 3 Part 5 taking into account the Supplementary Guidance for Landscape and Visual Assessment by the Scottish Executive (February 2002);
- Guidelines for Landscape and Visual Impact Assessment (GLVIA) (the Landscape Institute and Institute of Environmental Management and Assessment: IEMA; 2002); and
- Landscape Character Assessment Guidance for England and Scotland. The Countryside Agency and SNH, 2002.

7.1.3 The baseline assessment was undertaken through a desk study, with photos of the immediate area also taken to give a better understanding of the Landscape Character. The Desk Study involved a review of the following to gather data relating to the existing landscape resource:

- Current ordnance survey maps and photographs of the site and environs;
- Aerial photographs;
- Consultation responses such as Scottish Natural Heritage;
- Review of relevant structure and local plans; and
- Review of Aberdeen Landscape Character Assessment (1996).

7.1.4 Tables setting out the criteria for assessing landscape quality and significance are detailed in **Appendix B.**

7.2 BASELINE

7.2.1 This section presents a summary of the baseline landscape environment.

Topography

7.2.2 The central island of Haudagain roundabout lies at approximately 45m Above Ordnance Datum (AOD), and is the central point of the three development proposals. The topography rises to the south of the site, to an eventual level of 125m AOD after 1km. To the north of the site, the topography slopes downwards into the valley, crossing over the River Don at a level of 25m AOD. To the east, the topography slopes gently away from the site to a level of 43.8m AOD after 1km, whilst to the west the topography rises gently to a height of 48.6m AOD 1km from the site. The area of the proposed road options is approximately level, with a drop into the river valley, crossed by the Mugiemoss Ross.

Landscape Character

7.2.3 A national programme of landscape character assessments for Scotland was commissioned by SNH in 1994. These National and Regional Character Area assessments describe those cultural and historical elements that are manifest in the landscape and are intended to contribute towards policy

development and local planning, action and development. There are 21 dedicated zones of landscape character, Aberdeen falls into zone 9 of the 21.

Zone 9 Character Area: North East Coastal Plain

7.2.4 The dominant landscape character type in this zone is various types of agricultural landscapes which cover 85% of its area. The other main landscape characters types are determined by the presence of rivers and the coast. The largest urban areas are located along the coastal region.

7.2.5 The landform of the zone is almost all gently undulating, and over two thirds of the zone is situated no higher the 100m AOD.

Key Features of Built and Infrastructure Development in the North East Coastal Plain

7.2.6 Many urban developments evolved due to their harbours. Development is traditional in style and is built from local stone, predominantly granite. Aberdeen is famously called the 'Granite City' this association with a building material is an important component of the landscape character of this zone.

7.2.7 Recent economic growth particularly in Aberdeen has led to the construction of large numbers of new houses. These areas of new house have considerable impacts on the landscape character of the zone as they tend to be more visible being on the edges of urban areas and are often built with materials that contrast with traditional use of granite and slate. Industrial development in the zone is predominately in Aberdeen, on the edges of the city, often visible from the approached and surrounding countryside there are many offices, industrial units, retail sites and storage yards.

Aberdeen Landscape Character Assessment

7.2.8 The Haudagain Roundabout options fall within the Aberdeen Landscape Character Assessment. Although the site is defined only as 'urban' with no identified landscape features, there are a number of localised character areas which can be broadly identified, as described below:

7.2.9 Character Area 1: Commercial, industrial, and transport corridor areas. This character area is defined by larger units, busy often noisy areas. Areas of derelict land, disused, or underused land and buildings are occasionally seen. Landscape quality is Medium-low.

7.2.10 Character Area 2: Residential Character areas. This broad character area identifies areas of residential housing, associated access roads and community facilities, including public open space. Residential streets are generally more tranquil than the transport corridors and commercial areas, and tend to be of lower in building height. Quality of the landscape is generally Medium.

7.2.11 Character Area 3: Large managed green spaces. This character area includes large sports fields and golf course, which provide an area of green space, predominantly of mown grass, but with a variety of other vegetation including tree planting and hedgerows, particularly along the boundaries. Although there are many attractive elements, there are also intrusive elements such as pylons and areas of poorer managed vegetation. The areas are often tranquil and landscape quality is Medium.

7.2.12 Character Area 4: River Don Corridor. A mix of tree belts and open ground interspersed with industrial uses along the banks of the River. Largely tranquil and of Medium landscape quality.

7.2.13 Character Area 5: Arable Farmland. Typified by a patchwork of field sizes bounded by trees, hedgerows, ditches or roads. The farmland has a largely tranquil feel and is important in providing a more rural feel on the fringes of the urban development, linking the built environment into the countryside. Landscape quality is typically Medium to Medium-high.

7.2.14 These character areas are illustrated in Figure 3: Local Landscape Character Areas. The area of the proposals fall generally within Local Landscape Character Area 1: Commercial, industrial, and transport corridor areas.

History

7.2.15 The City of Aberdeen has grown around the mouth of the Rivers Dee and Don. The Rivers and proximity to the sea have provided the City with crucial transport links and contributed to the growth of much of the city's industry. Throughout the 19th Century the rivers provided sites for the production of textiles and

paper. Water power could be harnessed and a series of mills were built along the banks of the River Don with its steep gradient between Dyce and the sea. In 1850 the railway reached Aberdeen and generated additional housing and industrial development along the River Dee. A comprehensive rail network soon provided links between the growing small communities and by the turn of the Century the city was approximately 27 square kilometres in area.

7.2.16 By the mid 20th Century however, Aberdeen's traditional industries were in decline and it was not until the discovery of oil in the North Sea in 1970 that the City was transformed into a boomtown, expanding the city's physical area to 186 square kilometres. Oil remains the cornerstone of the city's economy.

Key Landscape Features

7.2.17 The historical evolution of Aberdeen is reflected in its continued industrial and water links, as well as being reflected in the built and natural environment. Some of the key features within the local landscape that contribute to the character of the area are identified below.

7.2.18 Scotstown Moor Local Nature Reserve (LNR) is located approximately 3km north-east of the Haudagain Roundabout area and covers some 34 hectares. The southern area of the reserve is designated as a Site of Special Scientific Interest (SSSI) due to the variety of habitats and flora. The variety of vegetation offers to further bring a wide variety of birds, mammals and invertebrates to the site.

7.2.19 There are a further three Local Nature Reserves within 2-3km of the development proposals area:

- Den of Maidencraig LNR, approximately 2km from the proposals area. It has a wide diversity of habitats including ancient and new woodland, marshy grassland, a pond and a burn. The reserve is home to a variety of birds, foxes and roe deer;
- Donmouth LNR, approximately 3km from the proposals area has a rich and varied wildlife including plants, insects, seals and a wide variety of birds; and
- Kincorth Hill , approximately 3km from the proposals area is located on the southern edge of Aberdeen City and was designated a Local Nature Reserve in 1997. It is home to a variety of species including Foxes and Roe Deer, smaller mammals, a large variety of birds and an abundance of butterflies.

7.2.20 In addition, there are a number of Listed Buildings and one Scheduled Ancient Monument (SAM) identified in the study area and are discussed in detail in Section 1.10).

Existing Landscape Quality

7.2.21 Landscape quality is a term used to indicate the value of the landscape based on its character, condition and aesthetic appeal.

7.2.22 Most of the study area is not of notable quality, being comprised of transport networks, mixed retail, commercial, and industrial areas. However, parts of the River Don corridor and newer residential areas adjacent to which some of the proposals span include belts of mature trees and green open spaces which are of a more notable quality, as are the nearby listed buildings and Scheduled Ancient Monuments. Overall the landscape in the immediate vicinity is assessed as medium-low.

Townscape

7.2.23 The Haudagain improvement proposals may have an impact on the urban fringe settlements of Danestone, Grandholm and Persley, as well as impacting on the existing settlement area of Woodside. Potential road widening and realignments will result in loss of existing vegetation (including tree planting areas), potentially several buildings and may impact on the setting on some of the nearby listed buildings.

7.3 PREDICTED IMPACTS

7.3.1 The following table is a summary of the potential landscape impacts of each of the three Haudagain Improvement options. Further site surveys will take place following the selection of the preferred option.

7.3.2 The predicted significance of each intervention is based on the likely magnitude of the impact of the option on the existing landscape character and quality within and surrounding the improvement option area. Criteria for assessing magnitude and significance are detailed in Appendix B. The predicted impacts at this stage are indicative, as the proposals are not available in detail, but alignments and potential scale are provided, so that an initial assessment can be undertaken. The predicted significance of an effect is presented on a positive to negative scale and major, moderate, or minor in significance, in line with the requirements of STAG. Construction impacts are considered to be similar for each of the options and have therefore been scoped out.

Table 7.1 Predicted Impacts

Transport Strategy	Summary of the option	Predicted Impacts	Magnitude and Significance of Predicted Impact
Do Minimum	No change to the existing landscape	There would be no impact on the existing site and surrounding in terms of existing landscape character and quality.	Magnitude: neutral Significance: no impact
Option 5	New dual carriageway connecting North Anderson Drive with Auchmill Road; new access point to Middlefield	A number of existing buildings and associated access roads would be lost. Although the proposals would remain in keeping with the urban fringe character, the scale of the proposed road would be potentially slightly larger than those in the immediate surroundings. Sensitivity of existing landscape character: Medium (as it covers Character area 2 only).	Magnitude: Negative medium Significance: Moderate negative
Option 11	Replace roundabout with signalisation; widen approach to roundabout from Mugiemoss Road (including widening of the railway bridge); new dual carriageway connecting	Whilst the option proposals would be in keeping with the urban fringe character, they would contribute to the encroachment of the urban fringe into the more rural character of the adjacent river corridor, particularly where the widening of the railway bridge occurs, and alteration to the existing wooded railway embankment and green open space beyond. Sensitivity of existing landscape character: Medium (as it impacts Character areas 1, 2, 3 & 4).	Magnitude: Negative Medium to High Significance: Moderate to Major negative

Transport Strategy	Summary of the option	Predicted Impacts	Magnitude and Significance of Predicted Impact
	North Anderson Drive with Auchmill Road; new access point to Middlefield		
Option 12	Double the size of the existing roundabout; widen Mugiemoss Road to dual carriageway (including widening the railway bridge).	Whilst the option proposals are in keeping with the urban fringe and transport corridor characters, it contributes to the encroachment of the urban fringe into the more rural and tranquil character of the adjacent river corridor. There would also be direct adverse impacts on the open space to the north of the existing roundabout due to the alteration to the existing wooded railway embankment and green open space beyond. Sensitivity of existing landscape character: Medium (as it impacts Character areas 1, 2, 3 & 4).	Magnitude: Negative Medium to High Significance: Moderate to Major negative

7.4 MITIGATION

7.4.1 Until more detailed information is available, precise mitigation measures cannot be determined. However, the following measures would help retain and maintain the existing character of the area within which the Haudagain roundabout options fall:

Table 7.2 Potential mitigation measures

Transport Strategy	Summary of the option	Potential mitigation measures
Do Minimum	No change to the existing landscape	There would be no impact on the existing site and surrounding in terms of landscape character and quality.
Option 5	New dual carriageway connecting North Anderson Drive with Auchmill Road; new access point to Middlefield	Tidy site management during construction. Planting along dual carriageway to act as visual screen to adjacent units and housing. Opportunity to enhance the area through new planting along road verges. Good quality design and materials encouraged for reinstatement and new works.
Option 11	Replace roundabout with signalisation; widen approach to	Tidy site management during construction. New and replacement planting including the thick

Transport Strategy	Summary of the option	Potential mitigation measures
	roundabout from Mugiemoss Road (including widening of the railway bridge); new dual carriageway connecting North Anderson Drive with Auchmill Road; new access point to Middlefield	woodland belt between Mugiemoss Road and Hutcheon Low Drive and along proposed dual carriageway. Existing vegetation on roundabout ineffectual so no mitigation required. However, opportunity to enhance the area through new planting along road verges. Good quality design and materials encouraged for reinstatement and new works.
Option 12	Double the size of the existing roundabout; widen Mugiemoss Road to dual carriageway (including widening the railway bridge).	Tidy site management and appropriate hoardings during construction. New and replacement planting including of woodland belts between Mugiemoss Road and Hutcheon Low Drive, along the proposed dual carriageways and adjacent to Persley Bridge. Existing vegetation on roundabout ineffectual so no mitigation required. However, opportunity to enhance the area through new planting along road verges & create roundabout as a Gateway feature with new planting. Good quality design and materials encouraged for reinstatement and new works.

7.5 PREDICTED RESIDUAL EFFECTS OF STRATEGIES

7.5.1 Based on the information currently available, and the assumed potential mitigation measures identified above, the residual effects of the options are identified in the table below.

Table 7.3 Predicted Residual Landscape Effects

Transport Strategy	Predicted Effects	Magnitude and Significance of Predicted Effect
Do Minimum	There would be no impact on the existing site and surrounding in terms of existing landscape character and quality.	Magnitude: Neutral Significance: No impact
Option 5	Summary of key effects of Option 5: • Loss of some existing vegetation, residential buildings, and access routes. Potential to create new tree lined avenues.	Magnitude: Negative minor Significance: Minor to moderate negative
Option 11	Summary of key effects of Option 11: • Loss of mature woodland planting and replacement with new planting. Loss of residential buildings and	Magnitude: Negative

Transport Strategy	Predicted Effects	Magnitude and Significance of Predicted Effect
	access routes. Potential to create new soft landscaped areas and planting blocks.	moderate Significance: Moderate negative
Option 12	Summary of key effects of Option 12: • Loss of mature woodland planting and replacement with new planting. Loss of residential buildings and access routes. Potential to create new tree lined avenues and planting blocks and a new central roundabout feature to act as a focal point.	Magnitude: Negative moderate Significance: Moderate negative

7.5.2 Based on the information presented in the above table, it is concluded that option 5 will have the least impact on the existing landscape character due to its location (i.e. retained within the existing urban fringe and townscape character). The proposals do not significantly impact on surrounding open space or River Don corridor.

8 Visual Amenity

8.1 APPROACH

8.1.1 An assessment of the effects of the three options on the existing visual amenity of sensitive receptors has been undertaken at a strategic level to broadly assess the relationship between the proposals and receptors. Although road alignments are available (and required for a project level assessment), no details on levels, heights, or construction methods are available to use in this assessment. It is therefore difficult to determine the precise relationship between the proposals and receptors as the impacts on views of the proposals is not yet clear. A subjective assessment has therefore been made, drawing upon desk studies and map exercises to identify key views which could potentially be affected by a proposal, and the sensitivity of identified receptors.

8.1.2 The Visual assessment has been undertaken in general accordance with the following documents:

- Scottish Transport Appraisal Guidance (STAG) 2003; by the Scottish Executive (September 2003);
- The Design Manual for Roads and Bridges, Volume 11 (DMRB) Section 3 Part 5 taking into account the Supplementary Guidance for Landscape and Visual Assessment by the Scottish Executive (February 2002); and
- Guidelines for Landscape and Visual Impact Assessment (GLVIA) (the Landscape Institute and Institute of Environmental Management and Assessment: IEMA; 2002).

8.1.3 The baseline assessment was undertaken primarily through a desk study although some photographs looking out from the main Haudagain roundabout were taken to illustrate potential views. The Desk Study involved review of the following documents to gather data relating to potentially important views and sensitive receptors:

- Current ordnance survey maps and photographs of the site and environs;
- Aerial photographs; and
- Review of relevant structure and local plans.

8.1.4 Tables setting out the criteria for assessing visual significance are detailed in Appendix C.

8.1.5 The study area for visual impact encompasses the day time visual envelope. Desktop analysis of topography and built up areas has been used to help define the potential extent of views and potential sensitive receptors around the development option sites generally up to a distance of 1km from the centre point of the option proposals. Figure 4 provides images of the surrounding area from the existing Haudagain Roundabout.

8.1.6 Changes in visual impact would arise as a result of the loss of existing components e.g. the loss of existing vegetation, the restriction of long distance views and changes to landscape character, and the introduction of new features such as earthworks, structures and lighting, as well as traffic using the new road. The visual impact assessment considers the impact on a summers day of year fifteen after opening including any mitigation measures which would be effective, for example potential fencing or planting.

8.2 BASELINE

8.2.1 The topography within which the option proposals fall is relatively flat, with a gentle slope eastwards. To the north of the site the levels drop down to the River Don, but rises more significantly to the south of the site to a high point of 125m after 1km. The extent of built form, particularly Woodside and the large urban expanse of Aberdeen city to the south serve to limit views over a very short distance, and even to the north within 1km. Beyond this distance, the site is seen in the context of the wider urban setting.

8.2.2 There are a number of topographically high locations identified from maps in the surrounding areas of the development from which the different transport options and development site might be visible. These high points include the following locations:

- Cummings Park; and

- Auchmill Golf Course.

8.2.3 Concentrations of residential housing are particularly found in the adjacent urban areas to the south including those in the following areas:

- Heathryfold;
- Northfield; and
- Woodside.

8.2.4 Residential properties on the outskirts of these areas will be considered to be sensitive receptors, particularly those directly adjacent to the proposed option areas. These houses will have direct views over the area for proposed road alterations, potentially altering their existing views significantly. The retail, office and industrial units in the immediate surrounds of this area will be considered to be of lower sensitivity.

8.2.5 Extension of the urban built form is also extending northwards, into Persley and Daneston, and whilst the site is visible from the nearer housing edges, the proposed options would be seen against the urban context of Woodside and the City beyond. Views are also impeded by the vegetation along the River Don, and along the existing railway embankments.

8.2.6 Whilst the urban areas as a whole are likely to have a very low sensitivity to any of the proposed changes, the houses on the edges of the urban area (up to 2 streets deep) and those directly adjacent to and overlain (i.e. to be demolished) by the highway option proposals are considered to be more sensitive receptors than those further away.

8.2.7 A number of other sensitive receptors have been identified from the desk study. Sensitive receptors within and around the proposed option areas include the following:

- Persley Bridge Listed Building (0.2 km from the site);
- 17 Queen Street Woodside Listed Building (0.5 km from the site);
- Woodside Parish Church Listed Building (0.75 km from the site);
- Woodside House, Mugiemoss Road Listed Building (0.75 km from the site);
- 85 Western Road, Woodside Hall Listed Building (0.5 km from the site);
- Clifton Manor, 325 Clifton Road Listed Building (0.5 km from the site);
- Remains of Aberdeenshire Canal, Station Rd, Woodside (Scheduled Ancient Monument approximately 0.75 km from the site);
- Scotstown Moor Local Nature Reserve (LNR). The southern area of the reserve is also designated as a Site of Special Scientific Interest (SSSI);
- Den of Maidencraig LNR, approximately 2km from the proposals area;
- Donmouth LNR, approximately 3km from the proposals area; and
- Kincorth Hill, approximately 3km from the proposals area.

8.2.8 The following table identifies the potential extent of views of the proposals for each option and the potential sensitive receptors that could be affected by them.

Table 8.1 Potential Extent of Views

Option	Potential extent of view	Potential sensitive receptors
Option 5	Adjacent residential, industrial, retail properties and users of the highway up to 0.5km away. Potential views from the nearby golf course and surrounding	Viewers from adjacent residential properties, particularly along North Anderson Drive, Auchmill Road, Great Northern Road, Hutcheon Low Drive, Logie Avenue, Logie Place, Manor

Option	Potential extent of view	Potential sensitive receptors
	residential area in elevated positions south/ south west of the site	Avenue, Manor Drive, Manor Park and Clifton Road (B986); some listed buildings may be visible from the site; users of any public footpaths.
Option 11	Adjacent residential, industrial, retail properties and users of the highway up to 1km away. Potential views from the golf course and surrounding residential area in elevated positions south/south west of the site, and to the north due to the realigned and larger railway bridge construction.	Viewers from adjacent residential properties, retail, office and industrial units and highway users. particularly along North Anderson Drive, Auchmill Road, Great Northern Road, Hutcheon Low Drive, Logie Avenue, Logie Place, Manor Avenue, Manor Drive, Manor Park and Clifton Road (B986); some listed buildings may be visible from the site; users of any public footpaths; adjacent sports fields; and potentially train users.
Option 12	Adjacent residential, industrial, retail properties and user of the highway up to 1km away from current roundabout. Potential views from a golf course and surrounding residential area in elevated positions south/south west of the site	Viewers from adjacent residential properties, retail, office and industrial units and highway users. particularly along North Anderson Drive, Auchmill Road, Great Northern Road, and Hutcheon Low Drive; Some listed buildings around the site may also be visible from the site; users of any public footpaths; adjacent sports fields; and potentially train users.

8.3 PREDICTED IMPACTS

8.3.1 This section provides a strategic overview and evaluation of the potential visual impacts and sensitive receptors for each of the Haudagain options and identifies their potential positive and negative impacts. The assessment is based on currently available information and further site survey work to identify viewpoints and impacts on individual properties and sensitive receptors will take place following the selection of a preferred option.

8.3.2 The magnitude and significance of each intervention is based on the predicted impact of the option on the identified visual receptors. Criteria for assessing magnitude and significance are detailed in Appendix C.

Option 5

8.3.3 There are many sensitive residential receptors adjacent to the proposed new dual carriageway. A number of the buildings will require demolition so views from adjacent private residential viewpoints will change considerably. The construction period would entail the siting of construction plant and site facilities

and include demolition as well as construction, impacting on the visual nature of their surrounding area. It is likely that any vegetation along the existing road will be lost. Although proposed upgrade is likely to remain in keeping with the urban fringe character of the area, this improvement option is likely to have a negative impact on adjacent sensitive receptors and views.

Option 11

8.3.4 Sensitive residential receptors are adjacent to the proposals and some would have to be demolished. There would be a potential loss of existing views from the surrounding area during construction and replacement with unattractive hoardings and construction plant. Longer distance views may be partially interrupted depending on the height of the proposed new railway bridge. Vegetation along the existing roads and bridge embankments will be lost and views from sports areas and public open space will also be impeded, particularly during the construction phase. However, there is potential for enhancement of views from sensitive receptors if the external environment is sensitively and appropriately designed.

Option 12

8.3.5 There are several sensitive residential receptors adjacent to the route. There would be a potential loss of existing views during construction through the use of hoardings and construction plant, which may also potentially interrupt longer distance views. Vegetation along the existing roads and adjacent embankments (including the thick woodland belt) would be lost. New widened tarmac roads and a more substantial bridge over the railway would impinge on attractive views across the river corridor. There would be a potential loss of existing areas of open space and views to and from these. However, there is opportunity for potential enhancement of views from sensitive receptors if the external environment is sensitively and appropriately designed

Table 8.2 Predicted Impacts

Transport Option	Predicted Impacts	Magnitude and Significance of Predicted Impact
Do Minimum	• There would be no impact on the existing site and surrounding visual receptors if no proposals were undertaken	Magnitude: Neutral Significance: No impact
Option 5	• Many sensitive receptors adjacent to route (particularly residential) • Impact during the construction period due to the construction plant; site facilities, demolition works etc; • Any vegetation along the existing road will be lost; • New dual carriageway road link.	Magnitude: Negative minor to moderate Significance: Moderate negative
Option 11	• Many sensitive receptors adjacent to route; • Impact during the construction period due to the construction plant; site facilities, demolition works etc; • Potential loss of existing views during construction and replacement with hoardings and construction plant • Longer distance views may be partially interrupted through new road bridge; • Vegetation along the existing roads and embankments will be lost; and	Magnitude: Negative moderate to major Significance: Moderate to major negative

Transport Option	Predicted Impacts	Magnitude and Significance of Predicted Impact
	• New dual carriageway road link	
Option 12	• Many sensitive receptors adjacent to route (views from residential properties and users of highways); • Potential loss of existing views during construction and replacement with hoardings and construction plant longer distance views may be partially interrupted; • Vegetation along the existing roads and embankments will be lost; and • New widened roads and more substantial road bridge impinging on views across river corridor; Potential loss of existing areas of open space and views to and from them.	Magnitude: Negative moderate to major Significance: Moderate to major negative

8.4 MITIGATION

8.4.1 Effects of the proposed options could potentially be mitigated through high quality design and the planting of trees and vegetation. This would help enhance the visual amenity of the local areas and provide enhanced longer distance views, particularly once trees have become more mature. Although precise mitigation measures cannot be determined until more detailed information is available, the following suggestions would help mitigate adverse impacts on identified receptors and maintain the visual amenity of the area within which the Haudagain options fall. The significance of each option, taking into account the mitigation measures, is shown in the table below.

Table 8.3 Mitigation

Option	Mitigation
Do minimum	None required
Option 5	Tidy site management and attractive hoardings to reduce the visual clutter associated with construction and demolition works; the use of street trees as an avenue along the road with planted verges wherever practical; high quality design of the new roads and streetscape to replace existing access roads and buildings.
Option 11	The use of high quality hoardings, including the use of art and/ or advertising should be considered to create interest and variety. This could also apply to external scaffolding covers; tidy site management to reduce the visual clutter associated with construction and demolition works; use of planting and tree belts to replace those lost and create new planting blocks or avenues.
Option 12	The use of high quality hoardings, including the use of art and/ or advertising should be considered to create interest and variety. This could also apply to external scaffolding covers; tidy site management to reduce the visual clutter associated with

Option	Mitigation
	construction and demolition works; use of planting and tree belts to replace those lost and create new planting blocks or avenues; enlargement of the roundabout could be considered as a focal point or gateway into/ out of Woodside and designed accordingly.

8.5 PREDICTED RESIDUAL EFFECTS

8.5.1 Based on the information currently available, the following residual effects of the three options are as follows.

Table 8.4 Predicted Residual Visual Effects

Transport Strategy	Predicted Effects	Magnitude and Significance of Predicted Effect
Do Minimum	There are no predicted effects	• Magnitude: Neutral • Significance: No impact
Option 5	Summary of key effects of Option 5: • Loss of existing views during construction and replacement with hoardings and construction plant. • Any existing vegetation likely to be lost. • Many sensitive receptors adjacent. • New road link created. • Views generally localised (up to 0.5km).	• Magnitude: Negative minor to moderate • Significance: Minor to moderate negative
Option 11	Summary of key effects of Option 11: • Loss of existing views during construction and replacement with hoardings and construction plant. • Existing vegetation likely to be lost including existing mature trees. • Many sensitive receptors adjacent. • New road link and road bridge widening created. • Views potentially visible over longer distance (probably up to 1km).	• Magnitude: Negative moderate to major • Significance: Moderate negative
Option 12	Summary of key effects of Option 12: • Loss of existing views during construction and replacement with hoardings and construction plant. • Existing vegetation likely to be lost, including existing mature trees. • Many sensitive receptors adjacent. • New road link and road bridge created. • Views potentially visible over longer distance (probably up to 1km).	• Magnitude: Negative moderate to major • Significance: Moderate negative

8.5.2 Based on the information provided in the above table, it is concluded that Option 5 of the three options would provide the least negative effect on the existing visual amenity of the area compared to the 'do minimum' scenario, primarily due to its retention within an existing urban fringe area. Options 11 and 12

impact on a greater number of potentially sensitive visual receptors due to their encroachment into the River Don corridor and elevated new road bridge therefore having a greater negative impact

9 Cultural Heritage

9.1 APPROACH

9.1.1 This section presents baseline information on cultural heritage resources in relation to the three proposed transport packages developed in the STAG Part 1 Report. The impact on cultural heritage resources from each component intervention from the packages will be assessed followed by an assessment of the impact of the packages as a whole.

9.1.2 This assessment has been carried out in accordance with standards set by the Institute of Field Archaeologists (IFA 2001) and STAG part 2 methodology. Consultation has primarily taken place with Historic Scotland and the Royal Commission for Ancient and Historic Monuments Scotland (RCAHMS) as these authorities retain all information regarding known archaeological and cultural heritage features of national and regional importance with which this document is principally concerned.

9.1.3 The location of cultural heritage features from the Aberdeen Scheduled Monuments Record (SMR), National Monuments Record of Scotland (NMRS) and Listed Buildings which lie within an approximately 0.5km search area around the option routes are tabled in Appendix D and indicated on Figure 5. The SMR identifiers are shown in brackets in the text e.g. [NS75NE 21].

9.1.4 Construction impacts for all of the options are considered to be the same, and have therefore been scoped out of this assessment.

9.2 BASELINE

Designated Sites

9.2.1 There is one Scheduled Ancient Monument (SAMs) just under 1km away (remains of Aberdeenshire Canal, Station Road, Woodside). There are no Historic Gardens and Designed Landscapes in proximity to the roundabout.

9.2.2 There are no Category A Listed Buildings adjacent to or in the immediate vicinity of any intervention options. Most of the noted designated buildings are Category B listed, which are viewed as of regional importance under STAG guidance (refer to Appendix D). The structures are not concentrated geographically in any particular location, although by virtue of its larger footprint there are five listed buildings proximate to Option 12. Options 5 and 11, while constituting different footprints, will largely impact upon the same smaller area which encompasses two listed buildings. By comparison, the 'do minimum' option may have a wider influence if the projected traffic increases materialise and as such has six listed buildings proximate, and possibly more in the wider area depending on where the heavier loads of traffic influence.

9.2.3 The key cultural heritage designated sites and features are identified on Figure 5.

9.3 PREDICTED IMPACTS

Do Minimum

9.3.1 The Do Minimum Option has the potential to have significant indirect impacts upon the extant built remains in the wider area in operational terms only. As with all of the options being considered, the expansion of traffic volume has the potential to impact negatively on the known Listed Buildings as well as the general character of the area which constitutes several entries on the NMRS ([NJ90NW.0.8], [NJ90NW.1526]). There is unlikely to be any impact upon buried archaeological remains assuming that no significant maintenance occurs.

Option 5

9.3.2 The areas likely to be impacted upon by the changes associated with Option 5 mainly cover sites dated to the Post-Medieval period or later (an appreciable number relate to modern developments). Most numerous are the series of boundary stones noted in Middlefield and Upper Middlefield ([NJ90NW.61.], [NJ90NW.1767], [NJ90NW.1768], [NJ90NW.1825], [NJ90NW.1826], [NJ90NW.1827], [NJ90NW.1828]). Many of these have been removed as a consequence of other infrastructure and residential developments and as such their original locations will not be further impacted upon. A country house is also known from the Post-Medieval/early modern period [NJ90NW.1675], though this too has been replaced by a Modern housing estate, as well as a villa [NJ90NW.1100] built in the style of John Smith (c1830). A significant proportion of the entries do not specifically provide dating evidence, though are likely to relate to relatively recent events.

9.3.3 Option 5 would involve the construction of a dual carriageway link road and retention of the Haudagain Roundabout. The impact of the Option is therefore reliant on the precise position of the link road. The principle archaeological and cultural heritage receptors are extant structures (mostly residential) and views across the area; disturbance of setting is therefore the principle nature of impact. The only recorded buried evidence in the zone of disturbance is a bronze spearhead ([NJ90NW.66.]), which has now been lost. It cannot be currently determined based on the available data if this represents a chance find or evidence of human activity of a more substantial nature. There is a possibility, therefore, of loss of buried archaeological remains of unknown character. Operationally, this Option has the potential to relieve the visual impact of heavy traffic on Listed Buildings in the vicinity, although this volume of traffic, and therefore effect, would be transferred to the southwest.

Option 11

9.3.4 This option would involve construction of the link road (as per Option 5) and replacement of the roundabout with a signalised junction. The sphere of impact is therefore similar to Option 5 in that the setting of the extant structures may be impacted upon, as well as the loss of as yet uncharacterised buried archaeological deposits. The additional works required to the north of the Haudagain roundabout is the main addition, but there are no additional sites or structures which will be affected as a result. The main construction and operational impacts are therefore similar.

Option 12

9.3.5 This option would involve the enlargement of the Haudagain Roundabout as well as widening a limited section of Mugiemoss Road to the north. In common with all of the options, the changes to the roundabout have the potential to impact upon as yet uncharacterised buried archaeological deposits. As with Option 5, several Post Medieval marker stones are known in the area ([NJ90NW.1436], [NJ90NW.1766], [NJ90NW.1768] etc). Construction impacts are therefore as discussed for Option 5. The alterations associated with Option 12 would not result in direct changes to Persley Bridge (a category B Listed Building) but may impact upon its setting dependant on the exposure of the structure to the additional traffic; this operational impact is in addition to those identified in association with Option 5 and 11.

Table 9.1 Predicted Impacts

Transport Option	Predicted Impacts	Magnitude and Significance of Predicted Impact
Do Minimum	• As with all of the options, a general expansion of the volume of traffic in the area may result in the disturbance of some presently known cultural heritage assets (including Listed Buildings).	• Magnitude: minor negative. • Significance: minor negative effect.
Option 5	• The general expansion of the volume of traffic in the area of the new link road may result in the disturbance of some presently known cultural heritage assets, though there may be some diversion of existing traffic volume away from cultural heritage assets to the northeast of the roundabout.	• Magnitude: minor negative. • Significance: minor negative effect.

Transport Option	Predicted Impacts	Magnitude and Significance of Predicted Impact
Option 11	• The general expansion of the volume of traffic in the area of the new link road may result in the disturbance of some presently known cultural heritage assets, though there may be some diversion of existing traffic volume away from cultural heritage assets to the northeast of the roundabout; this may be offset by the widening of the rail bridge.	• Magnitude: minor negative. • Significance: minor negative effect.
Option 12	• The general expansion of the volume of traffic in the area of expanded roundabout may result in the disturbance of some presently known cultural heritage assets, though the incremental impact may not be significant from the current situation apart from the setting of the Persley Bridge.	• Magnitude: minor negative. • Significance: minor negative effect.

9.4 MITIGATION

9.4.1 There is limited specific mitigation required for the proposed options given the absence of nationally designated cultural heritage sites at or in the immediate vicinity of the location of the proposed interventions. The locations of the Category B Listed Buildings particularly along the northern arm of the roundabout may require a detailed assessment on setting at the appropriate time to gauge the buildings sensitivity to any proposed change and propose mitigation strategies to minimise negative impacts; this could, for example, be in the form of natural screening.

9.5 PREDICTED RESIDUAL EFFECTS

9.5.1 A summary of the predicted residual effects of each option following implementation of mitigation measures is presented in Table 9.2.

Table 9.2: Predicted Residual Cultural Heritage Effects

Transport Strategy	Predicted Effects	Magnitude and Significance of Predicted Effect
Do Minimum	Screening may be effectively used to prevent excessive escalation of traffic impact on the setting of Listed Buildings and extant sensitive cultural heritage assets.	• Magnitude: Neutral • Significance: No impact
Option 5	Screening may be effectively used to prevent excessive escalation of traffic impact on the setting of Listed Buildings and extant sensitive cultural heritage assets.	• Magnitude: Negative neutral/Minor • Significance: Minor negative
Option 11	Screening may be effectively used to prevent excessive escalation of traffic impact on the setting of Listed Buildings and	• Magnitude: Neutral/Minor negative • Significance: Minor negative

Transport Strategy	Predicted Effects	Magnitude and Significance of Predicted Effect
	extant sensitive cultural heritage assets.	
Option 12	Screening may be effectively used to prevent excessive escalation of traffic impact on the setting of Listed Buildings and extant sensitive cultural heritage assets.	• Magnitude: Neutral/Minor negative • Significance: Minor negative

10 Summary of Effects

10.1.1 A summary of the findings of the environmental appraisal of each Option is presented in Table 10.1.

Table 10.1 Summary of Effects

Sub Objective	Do Minimum	Option 5	Option 11	Option 12
Noise and vibration	No effect	Moderate positive	Moderate positive	No effect
Global and local air quality	No effect	Minor negative	Minor negative	No effect
Water quality, drainage and flood defence	No effect	No effect	No effect	No effect
Geology, Agriculture and Soils	No effect	No effect	No effect	No effect
Biodiversity	No effect	Minor negative	Minor negative	Minor negative
Landscape	No effect	Minor/moderate negative	Moderate negative	Moderate negative
Visual	No effect	Minor/moderate negative	Moderate negative	Moderate negative
Cultural heritage	No effect	Minor negative	Minor negative	Minor negative

10.1.2 On balance, the appraisal of environmental effects indicates that there would be no significant shift from baseline environmental conditions if the 'Do Minimum' option is followed.

10.1.3 Option 5 is considered likely to have moderate benefits associated with noise for notional receptors on Auchmill Road and North Anderson Drive in both the year of opening and worst case years. However, minor to moderate negative effects on landscape and views are predicted. Minor negative effects are also predicted on biodiversity, mainly associated with increased traffic leading to increased collisions with wildlife and disturbance to wildlife foraging. There may also be minor negative effects on the setting of Listed Buildings and extant sensitive cultural heritage assets. Construction of the link road is considered likely to cause a minor negative change to air quality for nearby residential properties.

10.1.4 The predicted effects of Option 11 are generally similar to those of Option 5, with moderate positive noise effects considered likely for notional receptors on Auchmill Road and North Anderson Drive and minor negative effects associated with air quality, biodiversity and the setting of cultural heritage resources. However, the loss of mature woodland planting and changes to long distance views are considered to be moderate negative effects on the landscape and visual amenity of the area.

10.1.5 It is considered unlikely that Option 12 will cause a significant change in air quality or noise levels. However, as with Option 11, the loss of mature woodland planting and changes to long distance views are considered to be moderate negative effects on the landscape and visual amenity of the area. Minor negative effects on biodiversity and cultural heritage resources are also predicted.

10.1.6 None of the options appraised are considered likely to have any significant positive or negative effects in hydrological or geological resources.

10.1.7 Based on the assessment of the proposals, it is considered that option 5 will have the least environmental impact. Options 11 and 12 appear to be generally similar in level of effect.

Appendix A Noise and Vibration

A1 - Glossary of Acoustics Terms

Term	Definition
Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level (Sound Level)	The sound level is the sound pressure relative to a standard reference pressure of 20μPa ($20x10^{-6}$ Pascals) on a decibel scale.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s_1 and s_2 is given by $20 \log_{10} (s_1 / s_2)$. The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20μPa.
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
$L_{eq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level during the period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{90,T}$	A noise level index. The noise level exceeded for 90% of the time over the period T. L_{90} can be considered to be the "average minimum" noise level and is often used to describe the background noise.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m
Fast Time Weighting	An averaging time used in sound level meters. Defined in BS5969.
Ambient Noise Level	The totally encompassing sound in a given situation at a given time, usually composed of a sound from many sources both distant and near ($L_{Aeq,T}$).

In order to assist the understanding of acoustic terminology and the relative change in noise, the following background information is provided.

The human ear can detect a very wide range of pressure fluctuations, which are perceived as sound. In order to express these fluctuations in a manageable way, a logarithmic scale called the decibel, or dB scale is used. The decibel scale typically ranges from 0 dB (the threshold of hearing) to over 120 dB. An indication of the range of sound levels commonly found in the environment is given in the following table.

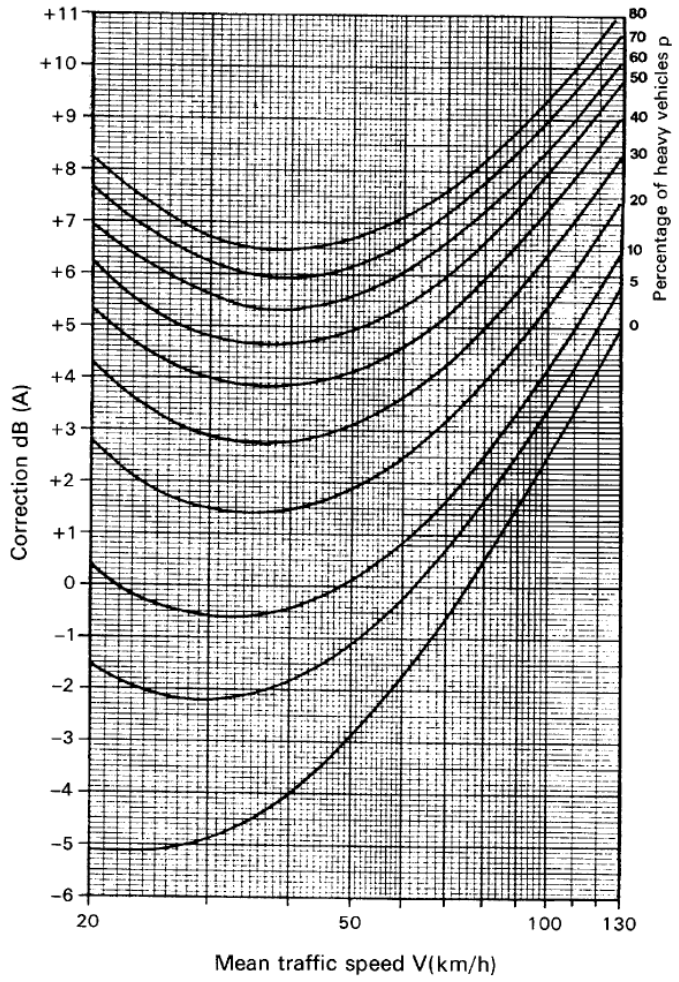
Typical Sound Levels found in the Environment

Sound Level	Location
0dB(A)	Threshold of hearing
20 to 30dB(A)	Quiet bedroom at night
30 to 40dB(A)	Living room during the day
40 to 50dB(A)	Typical office
50 to 60dB(A)	Inside a car
60 to 70dB(A)	Typical high street
70 to 90dB(A)	Inside factory
100 to 110dB(A)	Burglar alarm at 1m away
110 to 130dB(A)	Jet aircraft on take off
140dB(A)	Threshold of Pain

The ear is less sensitive to some frequencies than to others. The A-weighting scale is used to approximate the frequency response of the ear. Levels weighted using this scale are commonly identified by the notation dB(A). In accordance with logarithmic addition, combining two sources with equal noise levels would result in an increase of 3 dB(A) in the noise level from a single source. A change of 3 dB(A) is regarded as the smallest change in broadband continuous noise which the human ear can detect. A 2 dB(A) increase would not be perceptible. A 10 dB(A) increase in noise represents a subjective doubling of loudness.

A2 - Chart 4 from Calculation of Road Traffic Noise (CRTN)

Chart 4 **CORRECTION FOR MEAN TRAFFIC SPEED V AND PERCENTAGE HEAVY VEHICLES p**



$$\text{Correction} = 33\ \text{Log}_{10}(V + 40 + \frac{500}{V}) + 10\ \text{Log}_{10}(1 + \frac{5p}{V}) - 68.8\ \text{dB(A)}$$

Appendix B Landscape Character, Quality, And Significance Criteria

The following tables set out the criteria for assessing landscape quality and significance.

Table B1: Criteria for Determining Landscape Quality

Landscape/ Townscape Quality	Key Landscape Characteristics	Key Townscape Characteristics	Level of Significance
High	Landscape of exceptional scenic quality, harmonious and unified with pleasing landscape patterns and combinations of landscape features. Landscape containing many attractive features and no visually intrusive or incongruous features. Vegetation in good condition and where appropriate, well maintained. Typically considered very attractive by most people. Designated landscapes of international or national importance Qualities typically found within Areas of Outstanding Natural Beauty and National Parks	Townscape/streetscape containing many attractive and harmonious features and few visually intrusive or incongruous features. Buildings and streetscape maintained in good condition and kept clean. Typically considered very attractive by most people. Qualities typically found within Conservation Areas or comprehensive high quality modern developments containing feature buildings of exceptional architectural quality.	Very Important
Medium-High	An attractive landscape but with some minor blemishes, such as unattractive buildings. Vegetation generally in good condition and well maintained. Designated landscapes of regional, county or district importance. A quality typically exhibited by Areas of Great Landscape Value.	An attractive townscape/streetscape with some attractive features but also minor blemishes, such as unattractive buildings. Buildings and streetscape generally in good condition and well maintained. Typically considered attractive by most people. Includes areas of high quality comprehensive redevelopment.	Important
Medium	A reasonably attractive landscape with a mix of attractive features and intrusive elements. Vegetation condition varies in quality. Typical of many landscapes throughout Britain.	A reasonably attractive townscape/streetscape with a mix of attractive features and intrusive elements. Buildings and streetscape vary in quality. Considered pleasant but unremarkable by most people. Typical of most townscapes in England.	Moderately Important
Medium-Low	A pleasant but ordinary landscape with numerous blemishes, such as industrial areas and pylons. Vegetation structure and management poor. Typically an urban fringe landscape.	An unremarkable townscape/streetscape with numerous blemishes, such as major road structures, industrial areas, pylons and unattractive facades. Some plots awaiting redevelopment, some derelict buildings, litter and dirt. Typical of areas identified for regeneration.	Minor Importance
Low	A degraded or disturbed landscape with a severely damaged landscape structure, for example many hedges removed. Many unattractive and intrusive features. Typical of urban fringe landscapes in need of restoration.	A degraded or disturbed townscape/streetscape with derelict buildings and extensive open, but previously developed areas, awaiting development. Many unattractive and intrusive features, litter and dirt. Typical of areas identified for comprehensive redevelopment.	Negligible Importance or Unimportant

The overall impact is determined by assessing the sensitivity of a receptor and the magnitude of change and then combining the results to derive an overall significance of effect. The magnitude of change depends upon a combination of factors including scale of change, the nature of change and the ability to appreciate the change. Sensitivity relates to sensitivity of a landscape to change. The criteria used for assessing the magnitude and sensitivity of landscape receptors are outlined below:

Table B2: Criteria for Determining Landscape Sensitivity

Landscape	Sensitivity			
	10.1.7.B.0.0.1.1 Low	10.1.7.B.0.0.1.2 Medium	10.1.7.B.0.0.1.3 High	10.1.7.B.0.0.1.4 Very High
Landscape Recognition	Typically of local recognition, undesignated areas	Typically of designated district recognition or undesignated but value expressed through consensus	Typically of national or regional recognition	Typically internationally recognised
Landscape Features	No townscape features worthy of conservation, evidence of degradation, frequent detracting features	Typically some distinguishing features	Typically strong townscape features some worthy of conservation	Typically strong townscape features many worthy of conservation

Table B3: Criteria for Determining Magnitude of Change for Landscape Impact

Magnitude	10.1.7.B.0.0.1.5 Low	10.1.7.B.0.0.1.6 Medium	10.1.7.B.0.0.1.7 High
Scale of change	Development occupies a small portion of the view.	Development occupies a significant portion of the view	Development occupies the majority of the view and may even obstruct a significant portion of the view.
Nature of change	Development similar to the other main components of the townscape; Virtually imperceptible change in townscape or components.	Development dissimilar to the main component of the view, but similar to other components; Moderate changes in a localised area.	Development a new component within the townscape; Ranging from notable changes in townscape characteristics over an extensive area to intensive change over a more limited area.
Appreciation	Not readily noticeable	Readily noticeable	Very noticeable

The significance of effect for a landscape character area is a function of the character area or receptor sensitivity combined with the magnitude of change. It should be emphasised that while the methodology is designed to be robust and transparent, professional judgement is ultimately applied to determine the significance of each impact. This is particularly the case where the positive attributes of a development need to be balanced with its negative aspects to determine a combined impact. In some cases positive and negative attributes can balance out to create a neutral impact. For this Stage 2 STAG assessment, the likely development proposals are not yet fully determined, and therefore the assessment of significance will be primarily based on assessment of positive or negative impacts rather than level of significance.

The duration of the effect depends on the length of time over which it occurs, Long Term (more than 5 years) are defined as permanent impacts. Medium Term (1-5 years) and Short Term (less than 12 months) are categorised as temporary/ short lived impacts within the assessment.

Table B4: Combined Impact of Sensitivity and Magnitude

Sensitivity	**Magnitude**		
	10.1.7.B.0.0.1.7.1 High	10.1.7.B.0.0.1.7.2 Medium	10.1.7.B.0.0.1.7.3 Low
10.1.7.B.0	**Major impact/significance** Where the development would result in a major beneficial or adverse visual impact.	**Moderate impact/significance** Where the development would result in a moderate beneficial or adverse visual impact.	**Moderate impact/significance** Where the development would result in a moderate beneficial or adverse visual impact.
10.1.7.B.0	**Moderate impact/significance** Where the development would result in a moderate beneficial or adverse visual impact.	**Moderate impact/significance** Where the development would result in a moderate beneficial or adverse visual impact.	**Minor impact/significance** Where the development would result in a minor beneficial or adverse visual impact
10.1.7.B.0	**Moderate impact/significance** Where the development would result in a moderate beneficial or adverse visual impact.	**Minor impact/significance** Where the development would result in a minor beneficial or adverse visual impact.	**Negligible impact** Where the development would cause an insignificant improvement or deterioration to the existing view.

Appendix C Visual Receptor Sensitivity and Magnitude Criteria

Table C1: Criteria for Determining Visual Receptor Sensitivity

Viewpoint characteristics	**Sensitivity**			
	10.1.7.C.0.0.1.1	**10.1.7.C.0.0.1.2 Medium**	**10.1.7.C.0.0.1.3 High**	**10.1.7.C.0.0.1.4 Very High**
Context of Viewpoint/ Number of Potential Viewers	Few viewers, quick transient views such as from vehicles	Several viewers, longer transient views such as from public open space and recreational areas	Many viewers, static viewpoint e.g. from residential property	Many viewers, extensive portrayal of the view in the media and of noted tourism value.
Importance of View	Poor quality landscape, low importance.	Moderately valued townscape. Moderate importance.	Nationally valued townscape (such as Conservation Areas, Historic Parks and Gardens). High importance.	Includes features of International importance in terms of townscape value. Very high importance.
Nature/ Expectation of Receptor	Industrial area, land awaiting development	Retail area, offices, formal sports facilities where the landscape is secondary to enjoyment of the sport	Residential area, Public Open Space, recreational, historical or cultural site where landscape is a significant factor in its enjoyment.	Internationally important public open space. Residential area.

Table C2: Criteria for Determining Magnitude of Change for Visual Impact

Magnitude	**10.1.7.C.0.0.1.5 Low**	**10.1.7.C.0.0.1.6 Medium**	**10.1.7.C.0.0.1.7 High**
Scale of change	Development occupies a small portion of the view.	Development occupies a significant portion of the view	Development occupies the majority of the view and may even obstruct a significant portion of the view.
Nature of change	Development similar to the other main components of the townscape; Virtually imperceptible change in townscape or components.	Development dissimilar to the main component of the view, but similar to other components; Moderate changes in a localised area..	Development a new component within the townscape; Ranging from notable changes in townscape characteristics over an extensive area to intensive change over a more limited area.
Appreciation	Not readily noticeable	Readily noticeable	Very noticeable

The significance of effect for a visual receptor is a function of the receptor sensitivity combined with the magnitude of change. It should be emphasised that while the methodology is designed to be robust and transparent, professional judgement is ultimately applied to determine the significance of each impact. This is particularly the case where the positive attributes of a development need to be balanced with its negative aspects to determine a combined impact. In some cases positive and negative attributes can balance out to create a neutral impact.

The duration of the effect depends on the length of time over which it occurs, Long Term (more than 5 years) are defined as permanent impacts. Medium Term (1-5 years) and Short Term (less than 12 months) are categorised as temporary/ short lived impacts within the assessment.

Table C3: Combined Impact of Sensitivity and Magnitude

Sensitivity **Magnitude**

	10.1.7.C.0.0.1.7.1 High	10.1.7.C.0.0.1.7.2 Medium	10.1.7.C.0.0.1.7.3 Low
10.1.7.C.0.	**Major impact/significance** Where the development would result in a major beneficial or adverse visual impact.	**Moderate impact/significance** Where the development would result in a moderate beneficial or adverse visual impact.	**Moderate impact/significance** Where the development would result in a moderate beneficial or adverse visual impact.
10.1.7.C.0.	**Moderate impact/significance** Where the development would result in a moderate beneficial or adverse visual impact.	**Moderate impact/significance** Where the development would result in a moderate beneficial or adverse visual impact.	**Minor impact/significance** Where the development would result in a minor beneficial or adverse visual impact
10.1.7.C.0.	**Moderate impact/significance** Where the development would result in a moderate beneficial or adverse visual impact.	**Minor impact/significance** Where the development would result in a minor beneficial or adverse visual impact.	**Negligible impact** Where the development would cause an insignificant improvement or deterioration to the existing view.

Appendix D Cultural Heritage Designated Sites

Table D1 Scheduled Ancient Monuments (SAM)

Ref	Address	Distance from Roundabout (m)	Direction
10424	Remains of Aberdeenshire Canal, Station Road, Woodside	845	East

Table D2 Listed Buildings in the vicinity of Haudagain Roundabout

Ref	Address	Category	Distance from Roundabout (m)	Direction
20451	The Colwyn, 820 Great Northern Road [Note. Now demolished]	B	35	North
20029	March Stone No. 49, on the west side of Scatter Burn where it joins the River Don near Persley Bridge.	B	460	Northwest
15696	Persley Bridge	B	500	Northwest
20111	Woodside House, Mugiemoss Road	B	515	Northwest
20110	Woodside House, off Mugiemoss Road	B	465	Northeast
20031	March Stone No. 51, at top of Deer Road and west corner of Clifton Road opposite Woodside School	B	920	East southeast
20034	March Stone No. 54, at junction of Provost Rust Drive and Smithfield Drive	B	825	Southeast
20028	March Stone No. 48, on north side of Marchburn Drive at its junction with Oldtown Place.	B	850	Southwest
19975	Clifton Manor, 352 Cllifton Road	B	1040	East southeast
20454	17 Queen Street, Woodside	C(S)	1060	East southeast
19976	Woodside Parish Church	B	1140	East southeast
50052	85 Western Road, Woodside Hall	C(S)	1185	Southeast

Table D3 NMRS Sites

Site Number	NMRS Name	Key facts	Class/Age
NJ90NW.143.-	Aberdeen, Persley Bridge, Boundary Marker 49. Alternative: Aberdeen, March Stone 49, Scatter Burn, River Don	Style of the stone suggests that it is a relatively recent replacement of the late-18th-/early-19th-century stone which formerly stood here.	Boundary Marker/ Post Medieval~ Early Modern
NJ90NW.2.-	Aberdeen, 91 Hilton Road. Alternative: -	None	Barbed-And-Tanged, Flint Arrowhead/General Prehistoric
NJ90NW.61.-	Aberdeen, 8-16 Marchburn Drive, Boundary Marker 48. Alternative: Aberdeen, March Stone 48, Boundary Stone No. 48, Oldtown Place	The style of the stone suggests that it is a relatively recent replacement of the late-18th-/early-19th-century stone which formerly stood here.	Boundary Stone/Post Medieval~ Early Modern
NJ90NW.66.-	Woodside. Alternative: Aberdeen	The present whereabouts of this spearhead, which was sold at auction in 1898, is not known.	Bronze Spearhead/General Prehistoric
NJ91SW.7.-	Persley Quarry. Alternative: -	Short stone cist containing an imperfect adult male skeleton and an imperfect urn of red clay, an arrowhead and a flint knife.	Cist, Beaker/ Early Bronze Age
NJ90NW.0.8	Aberdeen, Woodside. Alternative: -	None	General View/Undated
NJ90NW.286.-	Aberdeen, Persley Bridge, Pillbox. Alternative: -	Pillboxes of this design fall into H Will's (1985) type-22 category.	Pillbox/Modern
NJ90NW.325.-	Aberdeen, Persley Bridge. Alternative: Woodside House, Summer House	May be the ruin a summer house belonging to Woodside House (NJ90NW 659).	Summer House (Possible), Loopholed Wall/Modern
NJ90NW.339.-	Aberdeen, Persley Bridge. Alternative: River Don	By engineer P M Barnett.	Road Bridge/ ?Modern

Site Number	NMRS Name	Key facts	Class/Age
NJ90NW.396.0	Aberdeen, Woodside Mills. Alternative: Woodside Works	Site recorded during a general reconnaissance in advance of a prospective archaeological field survey.	Mill/Undated
NJ90NW.396.1	Aberdeen, Woodside Mills, Lade. Alternative: -	Site recorded during a general reconnaissance in advance of a prospective archaeological field survey.	Mill Lade/Undated
NJ90NW.408.-	Aberdeen, Anderson Road, Stewart Park. Alternative: -	This urban park was opened in 1894 and contains whalebones and a fountain.	Park/Early Modern
NJ90NW.1100.-	Aberdeen, 868 Great Northern Road, The Colwyn. Alternative [Note. Now demolished]: -	Style of John Smith c.1830. 2-storey villa.	-/Early Modern
NJ90NW.658.-	Aberdeen, Mugiemoss Road, Woodside House, Persley Castle Nursing Home. Alternative: Old Woodside House, Former Stables, 'The Old Castle'	None	Stables/ Undated
NJ90NW.659.0	Aberdeen, Mugiemoss Road, Woodside House. Alternative: -	House, built 1769 with main part c. 1840/50.	House, Stables/ Post-Medieval~ Early Modern
NJ90NW.659.1	Aberdeen, Woodside House Cottage. Alternative: Mugiemoss Road	None	Cottage/ Undated
NJ90NW.789.-	Aberdeen, Middlefield, Fowler Avenue, Middlefield Parish Church And Church Hall. Alternative: Manor Avenue	None	Church, Hall/ Undated
NJ90NW.1294.-	Aberdeen, Danestone Shopping Centre, Tesco Store. Alternative: -	None	Supermarket/Undated

Site Number	NMRS Name	Key facts	Class/Age
NJ90NW.1235.-	Aberdeen, Marchburn Drive, Granitehill House. Alternative: -	None	-/Undated
NJ90NW.1453.-	Aberdeen, 1-23 Oldtown Place. Alternative: -	None	Residential/Undated
NJ90NW.1454.-	Aberdeen, 2-24 Oldtown Place. Alternative: -	None	Residential/ Undated
NJ90NW.1410.-	Aberdeen, Great Northern Road, Murray Court. Alternative: 'A' Phase Two Development	None	Residential/ Undated
NJ90NW.1411.-	Aberdeen, Great Northern Road, Fullarton Court. Alternative: 'A' Phase Two Development	None	Residential/ Undated
NJ90NW.1526.-	Aberdeen, Jessiebank. Alternative: Lands Of Woodside	None	General View/ Undated
NJ90NW.1524.-	Aberdeen, Woodside United Presbyterian Church. Alternative: St John's United Free Church	Architect: Alexander Ellis Opened 1881	Ecclesiastical/Post Medieval
NJ90NW.1764.-	Persley Cottage. Alternative: Persley	The site of this cottage, which lay on the N side of an un-named minor road, was probably removed when the road was widened in recent years. The cottage is depicted roofed on both the 1st and 2nd editions of the OS 6-inch map	Cottage/Post Medieval
NJ90NW.1765.-	Persley Bridge. Alternative: Persley	Nothing is visible of this cottage, which stood immediately E of the N end of Persley Bridge and is depicted roofed on both the 1st and 2nd editions of the OS 6-inch map	Cottage/Post Medieval

Site Number	NMRS Name	Key facts	Class/Age
NJ90NW.1766.-	Persley Bridge, Boundary Stone. Alternative: River Don	A relatively modern replacement of the late-18th-early-19th-century stone (NJ90NW 143), which stood at the confluence of the Scatterburn and the River Don	Boundary Stone/Post Medieval
NJ90NW.1767.-	Upper Middlefield, Boundary Stone. Alternative: Aberdeen, Middlefield, North Anderson Drive	Nothing is visible of this boundary stone, which stood on land that is now occupied by modern housing.	Boundary Stone/ Post Medieval
NJ90NW.1768.-	The Colwyn. Alternative: Aberdeen, Middlefield	Nothing is now visible of this stone, which is first depicted on the 2nd edition of the OS 6-inch map	Stone/Post Medieval
NJ90NW.1775.-	Grove, Gravel Pit. Alternative: -	The site of this disused gravel-pit, which is first depicted on the 2nd edition of the OS 6-inch map	Sand And Gravel Workings/ Post Medieval
NJ90NW.1776.0	Persleydean. Alternative: -	None	Country House/ Undated
NJ90NW.1776.1	Persleydean Lodge. Alternative: -	None	Lodge/ Undated
NJ90NW.1677.-	Hilton Bank. Alternative: Aberdeen, Hilton, Hilton Drive	Nothing is visible of the steading of this croft, which stood on land that now carries a public road	Cottage, Croft/Post Medieval
NJ90NW.1684.-	Grove. Alternative: Aberdeen, Lower Bucksburn	Nothing is visible of a large house and its garden, which stood on land that has since been developed for industrial use.	Country House/Post Medieval
NJ90NW.1685.-	Grove. Alternative: Aberdeen, Lower Bucksburn, Mugiemoss Road	Nothing is visible of this farmsteading, which stood on land that has since been developed for industrial use	Farmstead-ing/Post Medieval
NJ90NW.1686.-	Grove. Alternative: Aberdeen, Lower Bucksburn, Mugiemoss Road	Nothing is visible of what were probably two cottages, which stood on land that has been developed for industrial use.	Cottages/ Post Medieval

Site Number	NMRS Name	Key facts	Class/Age
NJ90NW.1687.-	Woodside House. Alternative: Aberdeen, Woodside	Now occupied by a modern housing estate.	Sand And Gravel Workings/ Post Medieval
NJ90NW.1688.-	Ladeside. Alternative: Aberdeen, Woodside House	Nothing is visible of this farmsteading, which stood at the edge of what is now a sports field SE of Woodside House	Farmstead-ing/Post Medieval
NJ90NW.659.2	Aberdeen, Woodside House, Lodge. Alternative: Mugiemoss Road	None	Lodge/ Undated
NJ90NW.1674.-	Cummings Park. Alternative: Aberdeen, Northfield, Caperstown Crescent	Nothing is visible of this cottage, which stood about 380m NW of Cummings Park House (NJ90NW 1670.00) on land that has since been developed as part of a housing estate	Cottage/Post Medieval
NJ90NW.1675.-	Upper Middlefield. Alternative: Aberdeen, Middlefield, Newton Road, Smithfield Drive, Upper Middlefield Private Lunatic Asylum	Probably originally built as a private country house, and stood on land that has since been developed as part of a housing estate.	Country House, Lunatic Asylum, Cottages/ Post Medieval~ Early Modern
NJ90NW.1676.-	Smithfield. Alternative: Aberdeen, Hilton, Hilton Drive, Smithfield Reservoir, Aberdeen Water Works	Nothing is visible of this farmsteading, which stood on land that has since been developed as part of a housing estate	Farmhouse, Farmstead-ing, Mill Pond/ Post Medieval~ Early Modern
NJ90NW.659.3	Aberdeen, Woodside House, Walled Garden. Alternative: -	None	Walled Garden/Undated
NJ90NW.1821.-	Grove. Alternative: Aberdeen	Cottage is depicted on the 1st/2nd ed. of the OS 6" map. Probably removed for the adjacent works as on modern OS	Cottage/Post Medieval~ Early Modern

Site Number	NMRS Name	Key facts	Class/Age
NJ90NW.1825.-	Aberdeen, Middlefield, Boundary Stone. Alternative: Woodside, North Anderson Drive, Great Northern Road	This boundary stone has been removed and its site is now occupied by the junction of the A947 and the Great Northern Road.	Boundary Stone/Post Medieval
NJ90NW.1826.-	Aberdeen, Middlefield, Boundary Stone. Alternative: Woodside, North Anderson Drive, Great Northern Road	This boundary stone has been removed and its site is now occupied by the junction of the A947 and the Great Northern Road.	Boundary Stone/Post Medieval
NJ90NW.1827.-	Aberdeen, Middlefield, Boundary Stone. Alternative: Woodside, Manor Avenue	This boundary stone has been removed and its site is now lies beneath a modern housing estate	Boundary Stone/Post Medieval
NJ90NW.1828.-	Aberdeen, Upper Middlefield, Boundary Stone. Alternative: Woodside, Manor Avenue, North Anderson Drive	This boundary stone has been removed and its site is now lies beneath a modern housing estate	Boundary Stone/Post Medieval
NJ90NW.1829.-	Aberdeen, Upper Middlefield, Boundary Stone. Alternative: Woodside, Clifton Road	This boundary stone has been removed and its site is now lies beneath a modern housing estate	Boundary Stone/Post Medieval
NJ90NW.2616.-	Aberdeen, Persley, Mugiemoss Road, Grove Cemetery. Alternative: -	None	Cemetery/ Undated
NJ91SW.189.-	Grandhome. Alternative: -	Extremely worn fragment of a Middle Bronze Age bronze flanged axehead	Axe-Head/Bronze Age

N

Legend

- Notional Receptor
- Monitoring Location

GREAT NORTHERN ROAD

LOGIE AVENUE

GARDENS

NORTH ANDERSON DRIVE

Haudagain Retail Park

The Colwyn

870

885 to 895

873 to 883

871

839

833

829

823 to 827

821

819

817

815

565

563

561

14

25

1

17

13

15

11

9

24

854 to 864

842 to 852

830 834 838

832 836 840

818 to 828

808 812 816

806 810 814

794 to 804

782 to 792

770 to 780

801

801a

785

El Sub Sta

608

604

596 to 602

588 to 594

Notes

Figure 1
Notional Noise Receptors & Monitoring Points

Size: A3
Scale: 1:1,000
Project: 12151211 - Haudagain STAG

WSP

Date: 07.05.08
Revision: 1
Drawn by: SB
Checked by: AM

12151211 - Haudagain STAG

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Lochside/Denmore
Monument Wood
Persley Quarries
Lower and Upper Persley Wood
Kinta Valley
Danestone House
Woodside
Braes of Don
River Don Valley
River Don Valley
Don Estuary
Inverness and Kittybrewster Railway Line
Crook of Don
Braes of Don
Bucksburn Gorge
Site Location
Hilton Wood
Cornhill Hospital

Legend

Site Location

Protected Species

- Barn Owl
- Goldeneye
- Song Thrush

Ecological Designations

- Ancient Woodland Inventory
- District Wildlife Site

Notes

District Wild Sites and Protected Species digitised from information supplied by the North East Scotland Biological Records Centre (NESBReC).

Ancient Woodland Inventory data obtained from Scottish Natural Heritage (SNH).

Figure 2
Ecological Designations and Protected Species Plan

Size: A3
Scale: 1:18,000
Project: 12151211 - Haudagain STAG

WSP

Date: 07.05.08
Revision: 1
Drawn by: SB
Checked by: AM

12151211 - Haudagain STAG

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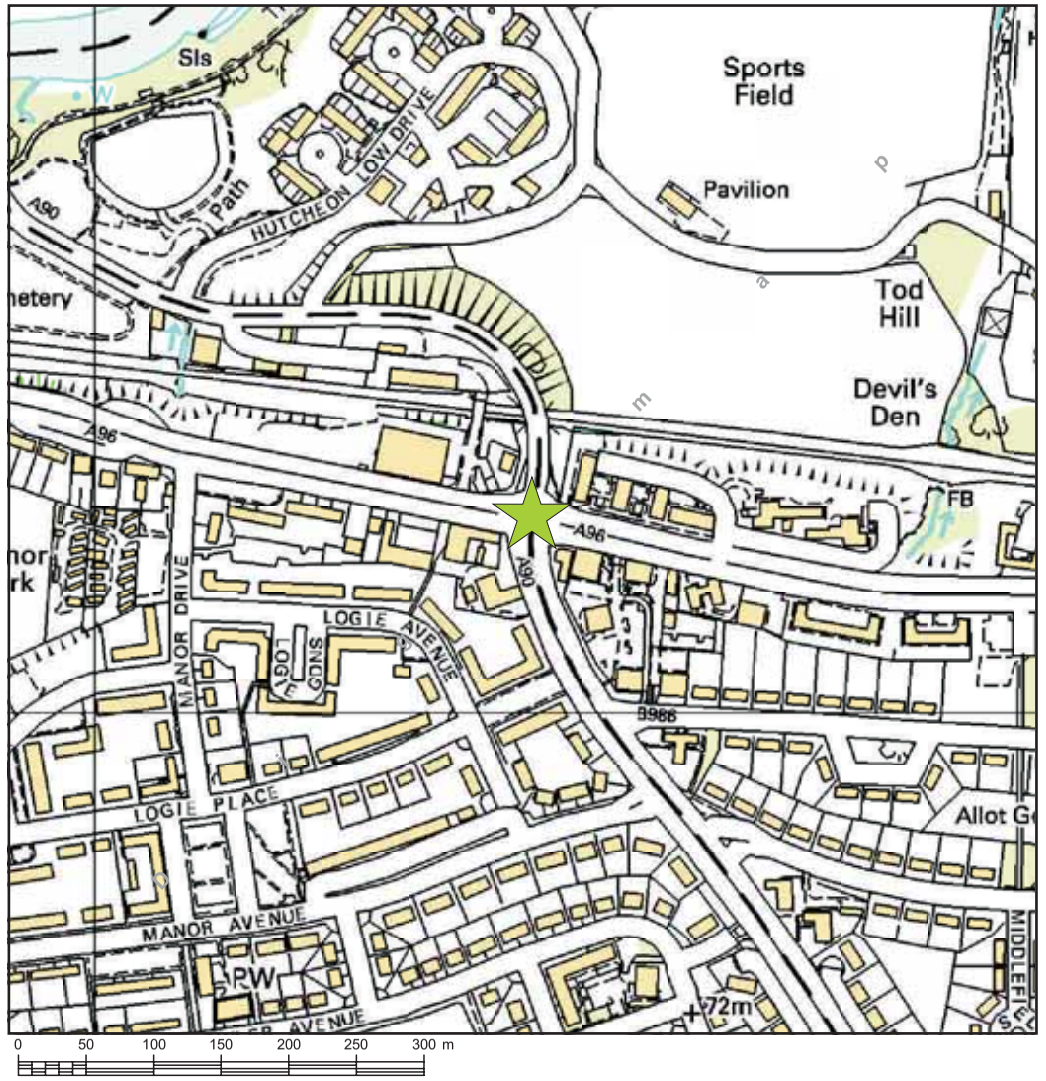

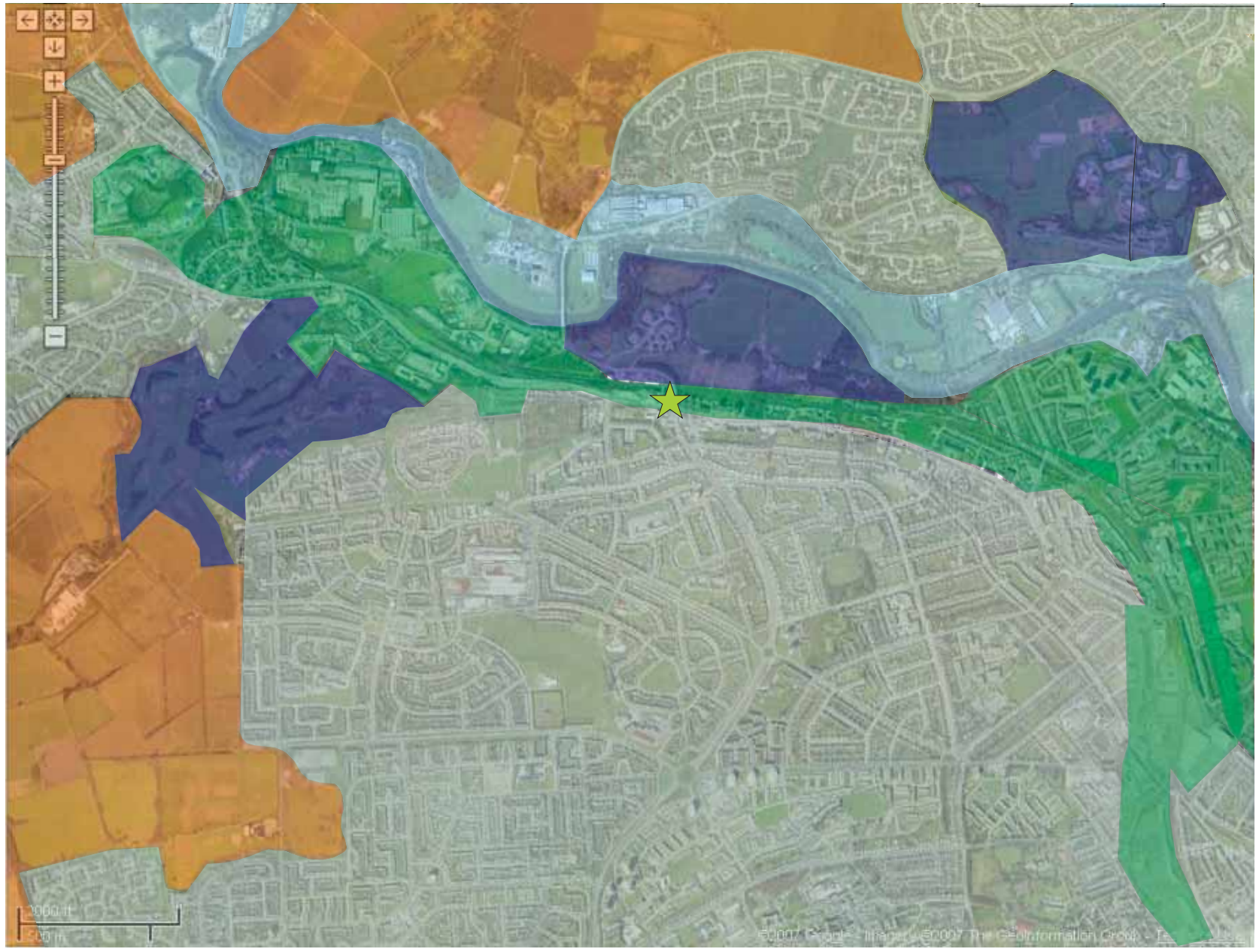

The site is immediately surrounded by the Haudagain Retail Park, an Esso Petrol Station and local authority housing. Views to the North East shows picturesque views across the valley in which the River Don runs. The skyline is dominated by a series of 3 storey houses and flats with the addition of skyscrapers all used as local authority dwellings.

KEY:-

- Haudagain Roundabout Location
- Character Area:1 Commercial, industrial and transport networks
- Character Area 2 Residential
- Character Area 3: Large managed green spaces
- Character Area 4: River Don Corridor
- Character Area 5: Farmland

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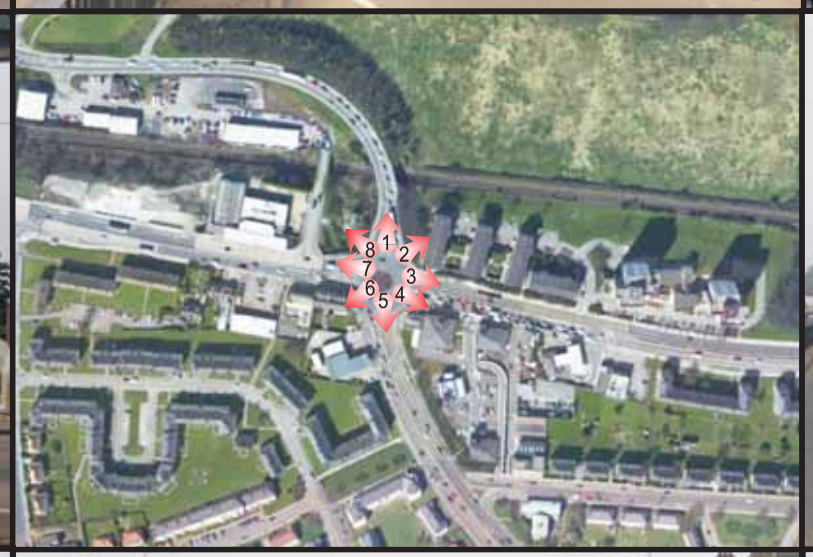

KEY:-

2 Photo Number

3 View Point Number and Direction

N

PROJECT : Haudagain Roundabout - Visual Assessment

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Mugiemoss Road

Haudagain Roundabout

820 Northern Road

Woodside House

Woodside Hs (off Mugiemis)

Persley Bridge

March Side No49

Persley Castle

Football Ground

Sports Field

Sports Centre

Bleachfield House

Pavilion

Lodge

Cemetery

Works

Outfall

Weir

Path

Track

Drain

Woodside

Downie Hill

Woodlea

Linden

Tod

El Sub Sta

Den

Jacob's Ladder

Allot Gdns

Manor Park

Football Ground

Playing Field

Pav

Middlefield

Council Depot

Industrial Estate

School

Resr

Sports Centre

Stewart Park

Hilton

Northfield

Northfield Playing Field

Quarry Centre

Cummings Park

Swimming

Sch

PO

Liby

1821 1686 1775 1685 1684 1765 339 143 325 1687 1688 286 1766 20029 659.3 659.2 2616 1768 1100 1526 1826 1825 1411 1410 1524 1829 1828 1827 1767 66 0.8 1235 1453 1454 61 20028 789 1676 1675 1674 408 2 20033 20050 20034 1776 1776.1 396 396.1 659.1 20110 659 658 20030 20031 19975 20032 19935

Legend

Haudagain Roundabout

Cultural Heritage

Scheduled Ancient Monument

Listed Building (Classes A, B and C(S))

National Monuments Record of Scotland (NMRS)

Notes

Listed Buildings and NMRS data obtained from the Royal Commission on the Ancient and Historical Monuments of Scotland (RCAHMS).

Figure 5
Cultural Heritage Plan

Size: A3
Scale: 1:6,000
Project: 12151211 - Haudagain STAG

WSP

Date: 07.05.08
Revision: B
Prepared by: SB
Checked by: AM

12151211 - Haudagain STAG

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