JACOBS Consultancy

The Moray Council

ETM - Elgin Western Distributor Road Interim DMRB Stage 2 Option Assessment Report

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EXECUTIVE SUMMARY

Background

Jacobs Consultancy has been commissioned by The Moray Council to undertake scheme assessment work to develop options for a western distributor road in the city of Elgin

The first part of this commission was completed by the preparation of a Design Manual for Roads and Bridges (DMRB) Stage 1 report accompanied by STAG Part 1 Appraisal Report and a Main Issues Report.

This Interim DMRB Stage 2 Option Assessment Report, prepared in advance of a public consultation exercise, records the second stage of the scheme assessment process undertaken as part of this commission comparing four options against a standard reference case. The options considered are:

- Existing Network Enhancements Option: entailing improvements to the existing road network;
- Urban (Inner) Route: Developed from that considered at Stage 1 including sub options for the junction between the A96 and Wittet Drive;
- Rural (Outer) Route: A developed version of the Stage 1 Assessment Rural (Outer) Corridor Option; and
- Rural (Inner) Route: A value engineered route, developed following consideration of the Stage 1 Assessment Rural (Outer) Corridor Option.

The 'Do nothing' standard reference case encompasses committed improvement measures to the existing road network, including the provision of access to the proposed Bilbohall housing development site. It should be noted that layout options may be subject to further refinement during detailed design.

Key Findings: Engineering Assessment

With regard to the Rural (Outer) Route Option, provision of a culverted embankment rather than a viaduct structure across the River Lossie flood plain was determined a viable alternative. Whilst the full impact to the flood plains storage capacity would require detailed assessment the viability of such an alternative facilitated the introduction of a moderate cost saving for this option. However, the multiple structures crossing the River Lossie and the railway line introduce engineering complexities and the project costs associated with this option remain significant.

The Rural (Inner) Route Option, a value engineered rural route minimises the length of flood plain crossing, reduces the number of structures necessary with a single River Lossie crossing and a railway crossing whilst shortening the overall option length. However, there are adverse impacts on properties around the Palmers Cross area and no connectivity provided to the B9010 Pluscarden Road.

Consideration of sub options for the A96 / Wittet Drive junction forming part of the Urban (Inner) Route Option resulted in an alternative offline roundabout junction being developed to the west of the existing T- junction. Whilst a detrimental impact to residential properties on Wittet Drive remains, there are fewer engineering

constraints and the sub option offers access to the land to the west of Wittet Drive, which is zoned for housing. The mainline alignment south of the railway line has been optimised to minimise impact to housing at Fairfield and a junction included to retain access the planned Bilbohall housing site.

The Existing Network Enhancements Option has been refined and indicative layouts developed for each location. This exercise highlighted physical constraints located out with the existing highway boundary that will require further consideration prior to concluding a robust design during any Stage 3 detailed design process.

Key Findings: Environmental Assessment

The environmental assessment considered the key impacts of two route options; the Urban (Inner) Route and the Existing Network Enhancements. It was agreed that the rural routes would not undergo Stage 2 environmental assessment as it became apparent that these routes achieved limited operation benefits and involved significant engineering complexities. Further environmental assessment work on the rural corridor was therefore not progressed in the interest of achieving best value.

Air quality assessment highlights that the predicted changes associated with both routes are predominantly of Negligible significance. Where slight adverse impacts are predicted, the existing air quality is generally good and neither route is likely to result in air quality objectives being breached.

With regard to Ecology and Nature Conservation, the Existing Network Enhancements option is predominantly online and would not result in significant habitat loss in comparison with other route options. The Urban (Inner) Route would result in greater habitat loss predicting adverse impacts of Minor significance. However, the presence of watervole has yet to be confirmed and if found, adverse impacts of Moderate significance are predicted.

With regard to Landscape and Visual, the Existing Network Enhancements option would potentially have Negligible to Slight adverse impacts on two Local Landscape Character Areas (LLCAs). Four visual receptors are predicted to experience significant adverse impacts (Moderate or greater), however, these can be reduced with mitigation measures. The Urban (Inner) Route would potentially result in Slight impacts on three LLCAs and three visual receptors are predicted to experience significant adverse impacts, however, these can be reduced with mitigation measures.

With regard to noise and vibration, potential short term impacts during the construction phase of both the Urban (Inner) Route and Existing Network Enhancements options can be expected.

For the Existing Network Enhancements option, Moderate adverse noise impacts are predicted for a number of residential properties, however, certain properties are expected to experience Substantial noise benefits. For the Urban (Inner) Route, Substantial adverse noise impacts are predicted for 56 residential properties and three other sensitive receptors. In addition, a further 250 residential properties and 3 other sensitive receptors are anticipated to experience perceptible increases in noise levels. However, several properties are predicted to experience Substantial benefits.

Key Findings Traffic and Economics Assessment

The developed model forecasts increases in traffic flow in both peak periods throughout the general network in both opening year and design year. There are a few locations where traffic levels decrease as routes become less attractive in the future year scenarios with vehicles choosing other alternative lower cost routes.

The Existing Network Enhancements option is predicted to redistribute traffic from the existing A96 corridor onto the Wittet Drive, Wards Road and Pluscarden Road Corridor with particular benefits associated with modifications introducing a roundabout at the A96 / Wittet Drive junction.

For the Urban (Inner) Route the forecast flows indicate an increase in flows using the Wittet Drive corridor for access between the A96 and the Edgar Road area via the new distributor road, while a reduction occurs on the section of the A96 between Wittet Drive and Dr Gray's Roundabout. The Pluscarden Road / South Street corridor also becomes an attractive route for traffic travelling between the Edgar Road and the city centre as Wards Road is now severed.

For the Rural (Inner) Route the forecast flows indicate a significant decrease on flows using Wittet Drive and the A96 corridor between Wittet Drive and Northfield Terrace. Results indicate the main effects of this option is a proportion of the traffic travelling between the A96 west and the Edgar Road / A941 south areas now diverts to the new route. The Pluscarden Road / South Street corridor as with the Urban Inner route remains an attractive corridor for traffic travelling between the Edgar Road development areas and the city centre. A reduction in traffic levels on some radial routes such as Reiket Lane and Thornhill Drive and Glen Moray Drive indicate a level of trip reassignment away from the A96 corridor.

Way Forward

It is proposed the findings of this Interim Stage 2 Assessment report will be presented at a public consultation exercise, follow which a final Stage 2 Assessment report will be prepared incorporating the findings of the public consultation.

1 INTRODUCTION

1.1 Background

Elgin is the commercial and administrative centre of Moray and is a major destination for regional and local trips. The south west quadrant of Elgin currently has residential and commercial development and further development is planned for this area in the future. The south west of the city has been identified as requiring improvements to the transport network to manage current and future traffic demand. Access to the south west of Elgin is currently constrained by the Aberdeen to Inverness Railway Line, the presence of mainly residential roads which have on road parking and the limited capacity of the heavily trafficked strategic roads (A96 and A941). A location plan of the study area is included below as Figure 1-A. In response to decisions taken by The Moray Council, Jacobs Consultancy has been commissioned to undertake scheme assessment work to develop options to address identified constraints.

The first part of this commission was completed by the preparation of a Design Manual for Roads and Bridges (DMRB) Stage 1 report accompanied by STAG Part 1 Appraisal Report and a Main Issues Report.

This Interim DMRB Stage 2 Option Assessment Report, combined with other associated reports referred to herein, records the second stage of the scheme assessment process undertaken as part of this commission. A final Stage 2 Option Appraisal Report will be completed following a public consultation exercise.

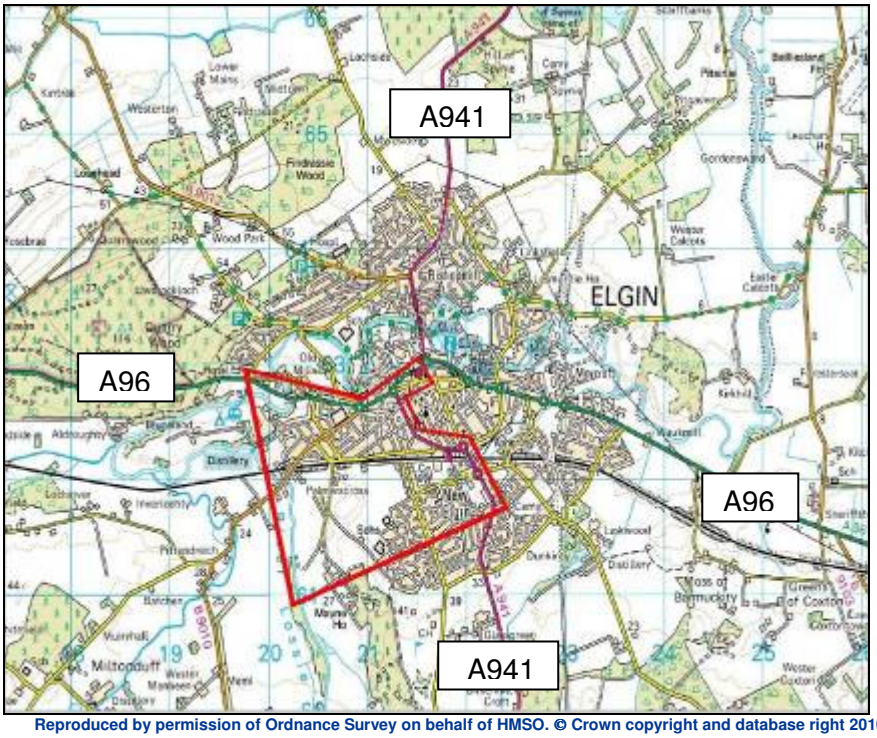

Figure 1-A Stage 2 Option Assessment, Study Extents

1.2 Stage 1 Report Conclusion

The Stage 1 report concluded that the following recommendations be undertaken as part of the Stage 2 and corresponding STAG part 2 appraisal work:

- The Existing Network Enhancement Option should be tested incrementally to determine the best balance between cost and benefits for the measures included within that package;
- The Urban (Inner) Corridor Option should consider variants for the junction between Wittet Drive and the A96 that minimise the effects on residential property;
- The Rural (Outer) Corridor Option should be subject to a value engineering review to establish the extent to which significant cost reductions can be achieved. This work should include review of the interaction of this option with the River Lossie flood plain, which will require a flood model acceptable to Scottish Environment Protection Agency to be prepared for this area if it is not already available; and
- The potential development value that can be realised by the Rural (Outer) Corridor Option should be evaluated to support a more detailed consideration of the contribution this option may make to the wider economy.

1.3 Study Methodology

The Stage 2 Option Assessment and associated Report has been undertaken in accordance with DMRB Volume 5 Section 1 TA 37/93 - Scheme Assessment Reporting and STAG guidance.

It is anticipated that the findings of this report and corresponding STAG Appraisal work will be documented as Interim Reports, which will form the basis of public consultation.

The feedback from that public consultation will then be reflected in the final DMRB Stage 2 Option Assessment Report and STAG appraisal work, enabling a decision to be taken on the preferred scheme.

1.4 Report Purpose

This report presents the interim findings of the Stage 2 option assessment activities undertaken in respect of the options under consideration. A final Stage 2 Assessment Report will be concluded following a public consultation exercise. Further information on the structure of this report is provided below.

1.5 Report Structure

The remaining sections of this report adopt the structure set out in TA 37/93 of the DMRB, as follows:

- Section 2: Existing Conditions;
- Section 3: Description of Scheme Options;
- Section 4: Engineering Assessment;
- Section 5: Environmental Appraisal;
- Section 6: Traffic and Economic Assessment;
- Section 7: Conclusions; and
- Section 8: References.

1.6 Supporting Information

Information supporting the findings documented within this report is included in the Appendices to this report.

- Appendix A Drawings;
- Appendix B Road Traffic Accident Data;
- Appendix C Pavement Condition Data ;
- Appendix D Air Quality Modelling;
- Appendix E Ecology and Nature Conservation Baseline Information;
- Appendix F Habitat Survey Target Notes;
- Appendix G Confidential Badger Data;
- Appendix H Noise Definitions; and
- Appendix I Environmental Assessment Figures.

2 EXISTING CONDITIONS

2.1 Introduction

Elgin is a former Royal Burgh and is the administrative and economic centre for the Moray region. Elgin generates tourism, leisure, commercial, retail and employment trips in the region. Elgin is bisected by the A96 trunk road which generally runs east to west connecting wider geographical areas and the cities of Aberdeen and Inverness. The city is also bisected by the A941 district distributor road which generally runs north to south from Lossiemouth to Dufftown. Elgin can be considered geographically as four quadrants delineated by the A96, running east to west and the A941 running north to south.

The Aberdeen to Inverness railway line which runs parallel to the A96 severs Elgin and constrains connectivity in the area to the south of the railway as there are a limited number of crossing points for motorised and non-motorised road users. The A96 trunk road and A941 district distributor road are the most heavily trafficked roads in the south west quadrant of Elgin with notably high volumes of traffic at the A941 railway overbridge and A96 Alexandra Road. Whilst the A96 provides an essential function within the national strategic road network, both it and the A941 function as key transport links for localised journeys within Elgin itself.

Over recent years new developments have taken place within Elgin, resulting in increased traffic volumes and congestion during peak periods. The Elgin economy is heavily dependent on the Royal Air Force (RAF) stations at Lossiemouth and Kinloss and the stations are responsible for contributing, directly or indirectly, to traffic movements within Elgin. The south west quadrant of Elgin does not at present have an efficient route for traffic to access the existing and planned developments there. The Stage 1 works identified route corridor options for providing improved accessibility and connectivity to this area.

2.2 Description of the Existing Road Network

2.2.1 Trunk Road Description

This section of the report describes the A96 trunk road within the study area.

The A96 is managed and maintained by Transport Scotland on behalf of the Scottish Ministers and serves as a trunk road for strategic traffic both in Moray and the wider geographic area between the cities of Aberdeen and Inverness. The route also serves as a local transport route and provides access to residential properties and numerous local amenities including: Tesco, Elgin Bus Station, Dr Gray's Hospital, Elgin Health Centre, and city centre parking facilities. The Alexandra Road section of the A96 links the north and south sections of the A941 and is a heavily trafficked section of the route. The high traffic volumes and restricted width in certain locations make the A96 an undesirable route for non motorised users such as cyclists.

2.2.2 Local Authority Road's Description

This section of the report describes the A941 and other Local Authority maintained roads within the study area.

- The A941 is categorised as a district distributor road in the Elgin Road Hierarchy, approved by the Economic Development and Infrastructure Committee (EDIC) 20th April 2010, and links Elgin to the A95 Aviemore to Keith trunk road to the south. To the north it provides the main route to the town and RAF station at Lossiemouth. It is generally a two lane single carriageway road through the urban confines of Elgin and provides the main access to Elgin railway station, which is located to the west of the A941 New Elgin Bridge.

- The Wards (U171E) is categorised as a district distributor road in the Elgin Road Hierarchy linking the business services and retail premises to the residential areas west of Elgin city centre. The Wards traverses the Aberdeen to Inverness railway line by means of an at grade level crossing marking the boundary between industrial/commercial and residential areas.

- Wards Road (C22E) is categorised as a district distributor road in the Elgin Road Hierarchy providing access from areas of housing to the west of Elgin city centre to the city centre, railway station and the business services and retail premises via The Wards.

- Wittet Drive (C22E) from its junction with the A96 trunk road to its junction with Wards Road is categorised as a district distributor road in the Elgin Road Hierarchy providing access from areas of housing to the west of Elgin city centre westwards along the A96 trunk road or into the urban centre of Elgin via Wards Road.

- Edgar Road (U171e) is categorised as a district distributor road in the Elgin Road Hierarchy linking business services and retail premises to the A941. Edgar Road provides transport links to New Elgin and the Springfield Retail Park. To the west of the Springfield Retail Park, Edgar Road also provides access to housing, Greenwards Primary School and Elgin High School.

- The B9010 Pluscarden Road links Elgin to a number of rural hamlets south west of the city and is a sign posted tourist route to the Glen Moray Distillery. Within Elgin, Pluscarden Road provides access to residential areas in the south west of the city, Dr Gray's Hospital and two care homes. Pluscarden Road also provides the western most crossing of the Aberdeen to Inverness railway line and crosses the River Lossie adjacent to The Grove.

- The existing road network provides a number of crossing points of the Aberdeen to Inverness Railway Line in addition to the A941 New Elgin Bridge. West of the A941 these crossing points are: a pedestrian footbridge at Elgin Railway Station; a level crossing on The Wards; a single lane road bridge over the railway on Mayne Road; and a road bridge over the railway on the B9010 Pluscarden Road.

2.2.3 Major and Minor Junctions

As the section of A96 through Elgin is within a built up environment there are numerous minor and private junctions which have direct access on to the A96 trunk road. There are also six major junctions on the A96 trunk road between the western speed limit gateway into Elgin and the Roundabout south of Halfords as follows:

Sheriffmill junction is an intersection between the A96 trunk road and Morriston Road which leads to areas of residential housing on the north of Elgin. Access to the Riverside Caravan Park to the south is also attained via this junction. The junction

has ghost islands in both the east and westbound directions of travel providing storage for right turning vehicles into Morriston Road and Riverside Caravan Park. There is a nearside diverging taper present for eastbound vehicles turning left into Morriston Road and a nearside auxiliary lane for westbound vehicles turning left into the Riverside Caravan Park access. The auxiliary lane provides additional road width which also functions as a bus lay-by. Street lighting is present throughout the junction and illuminated keep left bollards are present on the physical central island within the Morriston Road junction bellmouth.

Wittet Drive junction is a simple 'T' arrangement between the A96 trunk road and Wittet Drive. There are private residential properties on the south side of the A96 and a significant slope with a substantial level difference exists between the A96 road level and the surrounding ground to the north.

Dr Gray's Roundabout is a four arm mini roundabout with a 30 metre inscribed circle diameter formed with east and westbound A96 links, Pluscarden Road and South Street. Accesses from the hospital, health centre and Old Mills Road also join the A96 on approach and exits to Dr Gray's Roundabout. Street lighting is present at the roundabout and illuminated keep left bollards are present on the physical central and approach islands.

High Street Roundabout is a four arm roundabout with a 35 metre inscribed circle diameter formed with the east and westbound A96 links, High Street and the A941 Northfield Terrace. The High Street arm is one way and this arm of the roundabout functions solely as an exit with no access onto the roundabout. Street lighting is present at the roundabout and illuminated keep left bollards are present on the physical central and approach islands. A controlled pedestrian crossing is located directly north of this roundabout on the A96 trunk road facilitating east to west pedestrian movements to and from the city centre.

Tesco's roundabout is a four arm roundabout with a 45 metre inscribed circle diameter formed with the east and westbound A96 links, Haugh Road and the Tesco supermarket access. Street lighting is present at the roundabout and illuminated keep left bollards are present on the physical central and approach islands.

Halfords Roundabout is a three arm roundabout with a 30 metre inscribed circle diameter formed with the east and westbound A96 links and the A941 Cumming Street. Street lighting is present at the roundabout and illuminated keep left bollards are present on the physical central and approach islands.

The A941 through Elgin is within a built up environment and there are minor and private junctions which have direct access on to the A941. There are also three major junctions on the A941 between Edgar Road and its junction with the A96 and the High Street Roundabout as follows;

Edgar Road Roundabout is a four arm roundabout with a 35 metre inscribed circle diameter formed with the north and southbound A941 New Edgar Road links, Edgar Road and Linkwood Road. Street lighting is present at the roundabout and illuminated keep left bollards are present on the physical central and approach islands.

Station Road Roundabout is a four arm roundabout with a 30 metre inscribed circle diameter formed with Station Road, New Elgin Road, Maisondieu Road and Moss Street. Street lighting is present at the roundabout and illuminated keep left bollards are present on the physical central and approach islands.

The A941 Hay Street junction with Moray Street is a simple crossroads where the A941 has priority. A controlled pedestrian crossing is located directly north of this junction on the A941 facilitating east to west pedestrian movements to and from the city centre.

2.2.4 Structures

There are a number of significant structures located within the study area including:

- River Lossie crossing on the A96 west of Wittet Drive;
- Alexandra Road pedestrian underpass on A96;
- B9010 Pluscarden Road railway crossing;
- B9010 Pluscarden Road River Lossie crossing;
- Mayne Road railway crossing; and
- New Elgin Road railway crossing on the A941.

2.2.5 Traffic Accidents

An analysis of traffic accident data between 2005 and 2009 was carried out to assist in assessing current road safety conditions within the study area.

Traffic accidents in the study area have been split into two distinct categories, damage only accidents and injury accidents. Traffic accidents which cause an injury are categorised into fatal, serious and slight types dependant on the most severely injured casualty.

Fatal accidents are recorded where the level of injuries sustained cause death within 30 days of the accident. Serious accidents are recorded where a casualty is detained in hospital or sustain fractures, concussion, severe cuts or where death occurs 30 or more days after the accident. Slight accidents are recorded when a casualty sustains a sprain, bruise or slight cut.

Traffic accidents on the A96 trunk road shall be considered first. Analysis of the data showed that 73 damage only accidents occurred on the A96 between 2005 and 2009. Annual accident numbers is included in Table 2-A below and Figure 2-A indicates the location of these damage only accidents is also included below.

Year	Number of Accidents
2005	17
2006	12
2007	16
2008	11
2009	17
Total	**73**

Table 2-A A96 Damage Only Accidents

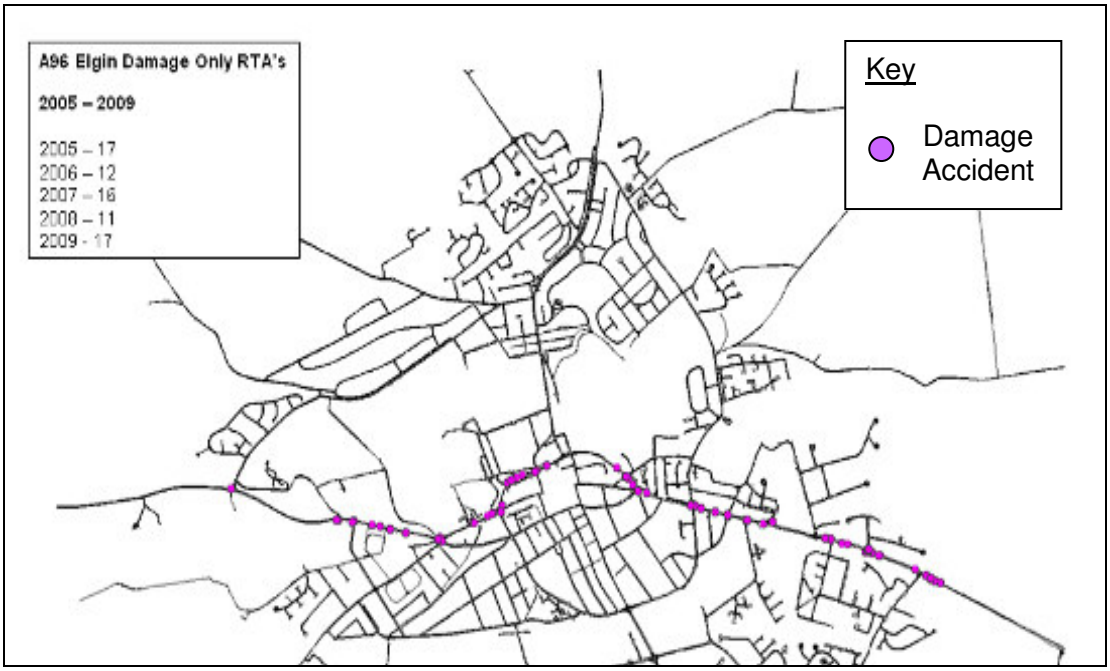

Figure 2-A Location of A96 Damage Only Accidents

Analysis of the data supplied showed that a total of 34 injury accidents occurred on the A96 between 2005 and 2009. Annual accident numbers and injury categories are included in Table 2-B below and a further breakdown and description of each accident is included in Appendix B. Figure 2-B indicates the location of these injury accidents and is also included below.

Year	Number of Slight Accidents	Number of Serious Accidents	Number of Fatal Accidents
2005	5	2	0
2006	7	1	1
2007	7	0	0
2008	7	1	0
2009	3	0	0
Total	**29**	**4**	**1**

Table 2-B A96 Injury Accidents

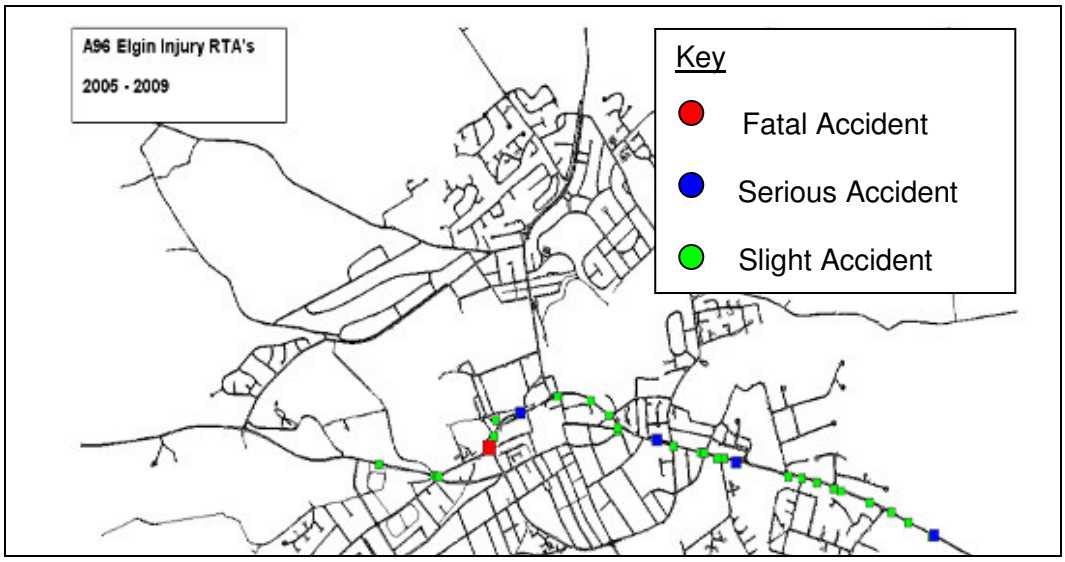

Figure 2-B Location of A96 Injury Accidents

Traffic accidents on the A941 and other local authority roads within the study area shall now be considered.

Analysis of the data supplied showed that a total of 70 damage only accidents occurred on the A941 and other local authority roads between 2005 and 2009. Annual accident numbers are included in Table 2-C below and figures indicating the location of these damage only accidents are also included below.

Year	Number of Accidents
2005	15
2006	12
2007	14
2008	17
2009	12
Total	**70**

Table 2-C Local Authority Roads Damage Only Accidents

Analysis of the data supplied showed that a total of 24 Injury Accidents occurred on the A941 and other local authority roads between 2005 and 2009. Annual accident numbers and injury categories are included in Table 2-D below and a further breakdown and description of each accident is included in Appendix B. Figures indicating the location of these injury accidents are also included below.

Year	Number of Slight Accidents	Number of Serious Accidents	Number of Fatal Accidents
2005	3	1	0
2006	3	0	0
2007	4	2	0
2008	4	0	0
2009	7	0	0
Total	**21**	**3**	**0**

Table 2-D Local Authority Roads Injury Accidents

Figure 2-C Local Authority Roads Damage and Injury Accidents (1 of 2)

Figure 2-D Local Authority Roads Damage and Injury Accidents (2 of 2)

2.2.6 Road Pavement Condition Summary

A desk study of the road pavement condition within the study area was undertaken. Information on the residual pavement life of the A96 trunk road was obtained from the Scottish Executive Road Information System (SERIS) whilst information relating to the A941 and other local authority roads was received in the form of Scottish

Road Maintenance Condition Survey (SRMCS) data received from The Moray Council. Carriageway pavement condition data for the A96 trunk road shall be considered first.

SERIS data for the A96 contains information relating to a number of carriageway condition parameters including Deflectograph results, profile, rutting, scrim and texture. A copy of the SERIS graphs which give further detail on each of these condition parameters is included in Appendix C of this report.

The residual life graph indicates that the A96 carriageway generally has between 0 and 9 years residual life through the extents of the study area. Towards the eastern extents, within the city centre, the values of residual life are at the lower end of the aforementioned range.

In order to address the particularly poor condition of the A96 pavement between the River Lossie Bridge and Morriston Road Junction, a structural maintenance scheme was constructed in late 2009. The scheme extended from a point approximately 10 metres west of the River Lossie bridge through Morriston Road junction to a point approximately 360 metres west of Morriston Road junction. Works undertaken within the scheme included minor realignment, widening and reconstruction of the A96 carriageway and Morriston Road. Associated works included construction of kerbing, footways, grassed separation strips and modifications to lengths of the existing drainage network. As a result of this work, the A96 carriageway through this section of the route is considered to have a residual life of 20 years measured from late 2009.

The A941 and other local authority roads shall now be considered. SRMCS data awards a particular stretch of road an overall banding: red, amber or green. The overall band is worked out from the data picked up when assessing profile, rutting and texture over 10m sections. It takes the worst score in these categories and bands sections accordingly. Table 2-E below summarises the content of each banding.

Band	Description
Green	Road is in acceptable condition.
Amber	Road condition indicates that further investigation is needed to establish if treatment is required.
Red	Road has deteriorated to the point at which repairs to prolong future life should be considered.

Table 2-E SRMCS Banding Description

Table 2-F below summarises the banding awarded to local authority roads in the study area.

Road / Street	Link	Award
Wittet Drive	A96 Jcn - Pluscarden Road Jcn	Green
Wittet Drive	Pluscarden Road Jcn - Petrie Crescent Jcn.	Amber
Wittet Drive	Petrie Crescent Jcn - Wards Road Jcn	Green
Edgar Road	A941 Jcn - Greenwards Primary School	Green
A941	South of Edgar Road Jcn	Amber
A941	Edgar Road Jcn - Station Road Jcn	Amber
A941	Station Road Jcn	Green / Red
A941	Station Road Jcn - Academy Street	Red
A941	Academy Street - Reidhaven Street	Amber

Table 2-F Local Authority Road SRMCS Banding

Figures which show the condition of these roads and others in the area graphically are included in Appendix C of this report.

2.3 Description of the Existing Environment

2.3.1 Land Use

The study area encompasses both the built up urban environment within the boundary of the city and the rural environment located outside the periphery of developed land. The urban environment relates to the developed area of the city itself, and comprises a mixture of housing, retail, business, commercial, educational and health land uses. The historic core of Elgin is a conservation area containing around 350 Listed Buildings and six Scheduled Ancient Monuments (SAMs). The main residential areas surround the city centre, which comprises of business services and retail premises. The main concentration of commercial land use on the west side of Elgin is located north and south of the A96 trunk road and includes a distillery, Caravan Park, business park and a hotel. Land within the south west quadrant of the Elgin urban cordon also accommodates educational and health establishments. It is therefore a relatively densely populated area, and key environmental issues include noise, vibration and air quality, the quality of which are greatly influenced by traffic volumes utilising existing transport corridors.

The rural environment surrounding Elgin contains known archaeological sites and statutorily designated nature conservation sites, the most significant of which is the internationally designated Loch Spynie Special Protection Area (SPA), located outside the study area to the north of Elgin. Other features of biodiversity interest located within the south west quadrant of Elgin are; the River Lossie, the Wards Wildlife Site and areas of woodland. The geographical area to the west of the meandering River Lossie is a known flood plain.

2.3.2 Topography

The area around Elgin is designated a coastal plain and can be described as a flat to generally undulating large scale plain rising to no more than 100 metres above sea level which borders the coast of the Moray Firth and narrows towards the east. Small rolling hills and valleys mark the transition between the coastal plain and the uplands landscape character to the southwest. A further assessment of the local topography present for each option is included in section 4 of this report.

2.3.3 Climate

Elgin has a temperate maritime climate having mainly cool summers and relatively mild winters. Its proximity to the sea means that the heat retentive properties of seawater help keep the winter temperatures higher and the barrier of the mountain ranges to the west and southwest where most of the moisture gathered in Atlantic depressions is deposited help keep annual rainfall in Elgin to a relatively small amount.

The average annual temperature ranges from 0^{o}C to 18^{o}C and the average monthly rainfall in the area varies between approximately 39mm and 65mm. These are statistics reported by the Met Office as climate averages between 1971 and 2000.

2.3.4 Geology

The drift geology of the area comprises largely of glacial sands and gravels. In addition the area of the Wards Wildlife Site is identified as being underlain by peat deposits. This is confirmed by historical ground investigations identifying sands and gravels with organic components including peats overlying pockets of boulder clay. The solid geology of the area comprises of Upper Old Red Sandstone from the

Cornstone Group and is located at depths of between 6.0 and 19.4 metres below ground level.

There are no geological Sites of Special Scientific Interest (SSSI) within the vicinity of the study area.

2.3.5 Hydrology

Of particular importance with regard to hydrology is the River Lossie which is the main watercourse in the study area.

The Scottish Environment Protection Agency (SEPA's) 'Indicative River and Coastal Flood Map (Scotland)' predicts that the River Lossie will flood at the 0.5% annual exceedance probability (1:200-year return period event) to the west of Elgin, over agricultural areas, with significant inundation of the floodplain particularly to the southern side of the river. The predicted risk of flooding continues along the river as it enters Elgin city centre with the SEPA flood map predicting flood risk particularly to the southern side of the river. The areas at risk of flooding include a section of the Aberdeen-Inverness railway line, a number of main roads within Elgin including the A941 and A96, as well as urban areas in the east part of Elgin (SEPA, 2010).

Previous work considering a distributor route for the south west quadrant of Elgin included a Royal Haskoning assessment which offered advice on hydraulic constraints associated with the River Lossie within the specific study area. Figure 2-E shown below is an excerpt from this assessment and indicates the extensive extents of flooding associated with the 1 in 200 year rainfall event south west of Elgin.

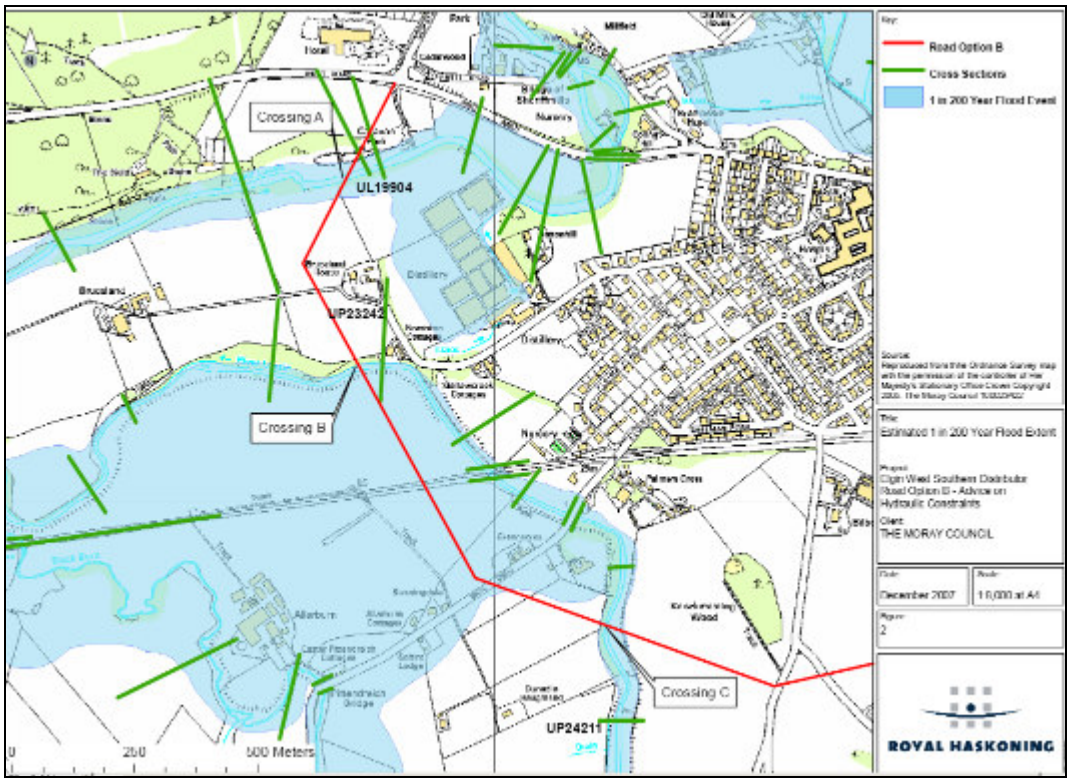

Figure 2-E South West Elgin, Estimated 1 in 200 Year Flood Event Extents

2.4 Description of Existing Traffic Conditions

Elgin is an important destination within the Moray area, and this is illustrated in Figure 2-F which shows the proportional distribution of traffic travelling into and beyond Elgin. Between 70% and 81% of all traffic approaching Elgin via the A96 and A941 has a point within Elgin as its destination. The proportions of through traffic that would seek to make use of the distributor routes avoiding the city centre are therefore limited. However, it must also be recognised that these distributor routes are important both for a proportion of the traffic having locations in Elgin other than the city centre as its destination, and for local journeys originating and terminating within Elgin.

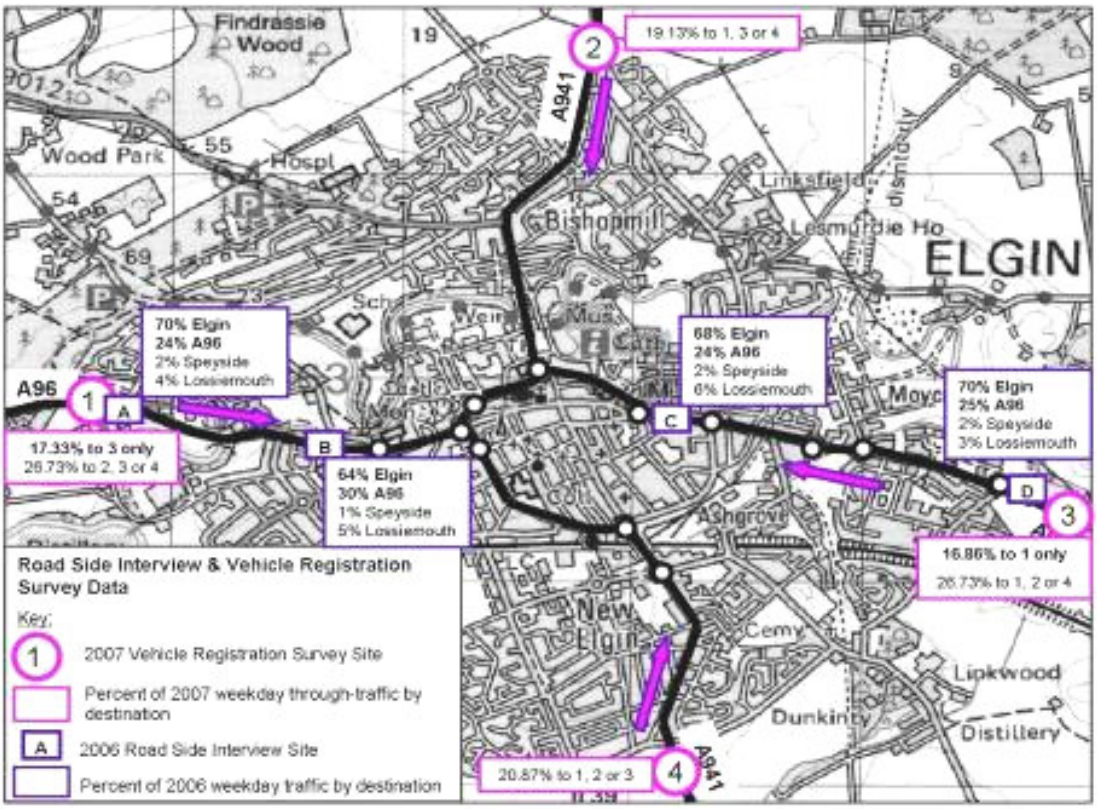

Figure 2-F A96 and A941 Destinations

While in general the A96 corridor operates well, there are occasions when congestion is observed. The route also represents a major line of severance to the town and this is exacerbated during heavy traffic conditions. Further details of traffic flows at a number of locations on the existing road network are provided in Section 6 of this report.

2.5 Proposed Committed Changes to the Study Area

A number of improvement schemes and planned developments have been identified for implementation within the study area subject to public services budgetary constraints. These are:

- A96 / North Street right turn ban - the order to ban right turns from the A96 onto North Street has been made, signing to that effect will be erected within financial year 2010;

- A96 / Halfords Roundabout - resurfacing works are proposed within the planned maintenance programme, however, these measures will not provide additional capacity at this roundabout;

- An Order put in place to remove the 40mph speed limit buffer zones on the periphery of Elgin to provide a consistent 30mph speed limit on the A96 trunk road through Elgin's built up environment;

- Edgar Road extension - proposals to extend Edgar Road to the west of the point where it currently terminates providing a roundabout and a further road extension and service facilities to access to the Bilbohall affordable housing site. This proposal is currently being progressed by The Moray Council as a condition attached to the sale of the land for affordable housing; and

- The Moray Council is currently developing proposals for improved cycle facilities in south west Elgin as part of an active travel cycle network.

3 DESCRIPTION OF SCHEME OPTIONS

3.1 Description

3.1.1 Overview

Following the DMRB Stage 1 Assessment and associated STAG appraisal, a number of corridor options have been selected for further Stage 2 Assessment. As part of the Stage 2 Assessment, consideration was given to the development of these corridor options into route options which has subsequently identified further sub-options to be assessed. This section of the report provides an overview of each of these options:

- 'Do-nothing' scenario: this option has been included to provide a continued reference case against which each of the options involving infrastructure improvements can be assessed;
- 'Existing Network Enhancements' Option: this has been included to test the extent to which congestion and journey time reductions are capable of being delivered by adapting the existing road network infrastructure;
- 'Urban (Inner) Route: this option is based on the previously named 'Option A' as developed during previous studies undertaken. Through development of this corridor into a route, sub-options for the A96 / Wittet Drive junction have been identified for stage 2 assessment;
- 'Rural (Outer) Route: this option is based on the previously named 'Option B' as developed during previous studies undertaken. Through development of this corridor into a route, a sub-option has been identified for stage 2 assessment; and
- Rural (Inner) Route, a value engineered version of the Rural (Outer) Route.

These route options considered in the Stage 2 assessment are described below.

3.1.2 Do-Nothing Scenario

This scenario assumes that there are no road network infrastructure improvements brought into place beyond those currently committed to by The Moray Council and Transport Scotland.

The only committed improvement included is an access road from the western end of Edgar Road to serve the proposed Bilbohall affordable housing site.

The locations of the network modifications included in this scenario are shown on Drawing No. JC0061A0/D/T/001 (Rev. 2) included in Appendix A of this report.

3.1.3 Existing Network Enhancements Option

This option comprises localised junction improvements on key routes which can be implemented as a series of discrete projects, each contributing towards an improved road network. This is therefore a 'Do-minimum' approach to addressing the issues of concern, however, it should be noted that some of the measures proposed may

require the acquisition of land and the promotion of statutory orders to enable their implementation.

By addressing the traffic issues on key routes within the existing road network that will also serve planned development access routes in this quadrant of the city, the Existing Network Enhancements option can be considered a comparable alternative to the delivery of a new western distributor road.

a) Trunk Road based elements include:

- Geometric improvements to Dr Gray's Roundabout incorporating amendments to accommodate the one-way arrangement on South Street; (ENE Option T1)
- Dualling of A96 Alexandra Road between the Tesco and Halfords Roundabouts and providing a footway along this link which requires widening and possibly closure of the existing underpass; (ENE Option T2)
- Provision of a roundabout junction on the A96 in the vicinity of Wittet Drive. (ENE Option T3)

b) Local road network based elements include:

- Junction capacity improvements to enhance capacity/operations at the A941 / Edgar Road and A941 / Station Road junctions; (ENE Option L1 & L2)
- Signalisation of the Moray Street / A941 Hay Street junction, relocating the existing controlled pedestrian facilities to align with pedestrian desire lines; (ENE Option L3)
- Amendments to South Street to provide a one-way westbound route from Hay Street to West Road; (ENE Option L4)

The elements of the Existing Network Enhancements Option are shown on the following drawings:

- JC0061A0/D/T/003 (Rev. 1)
- JC0061A0/D/T/004 (Rev. 2)

Elements of the Existing Network Enhancements Option that were considered at Stage 1 assessment have not been selected for further Stage 2 assessment. These are as follows:

- Re-design of the Tesco Roundabout to three arm with alternative access provisions to Tesco; and
- Signalisation of Mayne Road / Wards Road Junction.

With regard to the Tesco Roundabout, testing during the Stage 1 assessment suggested large queues on Haugh Road if the Tesco access were closed. In addition, given the development has only been open for a short time it was considered unlikely Tesco or the Council would favour closing the main Tesco access from the roundabout.

Signalisation of the Mayne Road / Wards Road Junction was considered during the Stage 1 assessment, however, subsequent examination determined that there was

insufficient traffic congestion at this location to merit introduction of such measures. If Bilbohall bridge over the railway line were to be upgraded, for which presently there is no commitment to do so, and the development to the south completed, there maybe a case for implementing a form of shuttle signals at this location.

3.1.4 Urban (Inner) Distributor Route

In keeping with the nature of the distributor routes already in existence in the three other quadrants of Elgin, the Urban (Inner) Route proposes the upgrade and extension of Wittet Drive to provide a high quality route between the A96 and A941.

This option includes the provision of a new crossing of the Aberdeen to Inverness railway line, which enables the access road to be provided for proposed housing zones south of the railway line to be linked with Wittet Drive north of the railway line.

This scheme option comprises the following elements:

- Provision of a new roundabout on the A96 linking Wittet Drive to the trunk road. In developing this element of the route, the following sub-options have been identified:

Option U1 – Online A96 Junction

- The first option considered is an on-line option, at the existing A96/Wittet Drive priority junction. A number of constraints exist at this site, including a 14m slope immediately north of the trunk road and residential properties south of the trunk road.

Option U2 – Offline A96 Junction

- The alternative considered is an off-line option, approximately 130 metres to the west of the existing junction which would require a new section of offline carriageway from the northern part of Wittet Drive. Access will be provided from this link into a newly formed cul de sac at the northern extent of Wittet Drive and also to the field located to the west of the new link.

Beyond these sub options, the route includes a number of common elements from north to south as follows:

- Carriageway improvement and road marking works, including parking restrictions, as necessary on Wittet Drive;

- Traffic signals at the junction of Wittet Drive and the B9010 Pluscarden Road;

- Continuation of Wittet Drive in a south easterly direction via a newly constructed link which includes provision of a structure over the Aberdeen to Inverness railway line. Access to Mayne Road from Wittet Drive will be retained, however, Wards Road will require stopping up on each side of Wittet Drive due to the difference in height to the new link;

- Continuation of Wittet Drive in a south easterly direction beyond the railway structure via a new link including provision of a right hand turning lane into the R5 housing development; and

- Continuation of Wittet Drive in a south easterly direction via a new link towards the Edgar Road extension proposed under the Do Nothing Scenario.

The measures proposed as part of the Urban (Inner) Distributor Route scheme are shown on Drawing No. JC0061A0/D/T/004 (Rev. 2) in Appendix A of this report.

3.1.5 Rural (Outer) Distributor Route

The Rural (Outer) Corridor Option identified at Stage 1 assessment proposed a distributor route for the south west quadrant of Elgin out-with the developed area. This option involved the provision of three crossings of the River Lossie, associated flood plain and a new crossing of the Aberdeen to Inverness railway line, linking Edgar Road with the A96 at Morriston Road.

Following the Stage 1 assessment it was recognised that there may be benefit refining the structural provision over the flood plain to produce more cost effective option. As a result of this value engineering exercise, the viaduct over the flood plain included at Stage 1 assessment has been replaced with a culverted embankment which will still allow flood water to flow through the plain.

The specific elements of this option are:

- Provision of an at-grade roundabout on the A96 to link the new distributor road to the wider road network;
- Continuation of the route in a southerly direction from the junction with the A96 at Morriston Road;
- Continuation of the route in a southerly direction to cross the River Lossie south of the caravan park;
- Continuation of the route in a southerly direction to cross a local access road which serves farms west of the distillery;
- Continuation of the route in a southerly direction to cross the River Lossie approximately 300 metres south west of the distillery;
- Continuation of the route in a south-easterly direction through the River Lossie flood plain on culverted embankment rather than a viaduct structure to cross over the Aberdeen to Inverness Railway approximately 300 metres north west of the proposed B9010 Pluscarden Road junction;
- Continuation of the route in a south-easterly direction to cross the B9010 Pluscarden Road at which point an at-grade roundabout is provided;
- Continuation of the route in an easterly direction to cross the River Lossie approximately 400 metres south east of the proposed B9010 Pluscarden Road. This section of the route crosses a local access road and a local footpath; and
- Extension of the access from Edgar Road to proposed housing zones in a westerly direction towards a proposed junction for future development and / or a future bypass. A local footpath is crossed approximately half-way between proposed junctions.

The measures proposed as part of this option are shown on Drawing No. JC0061A0/D/T/006 (Rev. 0) in Appendix A of this report.

3.1.6 Rural (Inner) Distributor Route

Following the Stage 1 assessment it was recognised that there may be alternative alignment opportunities within the rural corridor to be explored with the aim of providing a more cost effective option.

A further value engineering exercise on the rural corridor was undertaken and a Rural (Inner) Distributor Route has been developed for Stage 2 assessment.

The specific elements of this option are:

- Provision of an at-grade roundabout on the A96 to link the new distributor road to the wider road network;
- Continuation of the route in a southerly direction from the proposed at-grade roundabout with the A96;
- Continuation of the route in a southerly direction to cross the River Lossie north west of the distillery;
- Continuation of the route in a southerly direction with an access provided for properties located on Bruceland Road west of the route;
- Continuation of the route in a south easterly direction to cross the B9010 Pluscarden Road and the Aberdeen to Inverness Railway;
- Continuation of the route in an easterly direction towards a proposed junction with Mayne Road; and
- Continuation of the route in an easterly direction to connect to the extension of the R5 housing zone access road from Edgar Road.

The measures proposed as part of this option are shown on Drawing No. JC0061A0/D/T/007 (Rev. 0) included in Appendix A of this report.

3.2 Preliminary Cost Estimate

3.2.1 Introduction

The following section of the report provides a summary of the preliminary cost estimate for all the scheme options under consideration. Cost estimates for the scheme options have been prepared by developing the Stage 1 estimates. Each estimate can be broken down into a number of distinct sub-sections. These are:

- Construction costs;
- Preparation costs; and
- Public Utility related works costs.

3.2.2 Cost Estimates Assumptions

Cost estimates for each scheme option have been prepared using rates from previous highways projects and then factored to reflect costs at Quarter 4, 2010 rates. In preparing cost estimates certain assumptions have been made using data from previous highways projects.

- Preliminaries have been quantified as a percentage of all construction costs;
- Site Clearance, Traffic Signs and Road Markings, Landscaping and Accommodation works costs have been quantified as a percentage of the measured construction costs;
- The Rural (Outer) Route earthworks excavation is assumed as 20% acceptable / 80% unacceptable;
- The Urban (Inner) and Rural (Inner) Routes cut earthworks are assumed as 100% unacceptable. All fill material shall be considered as imported fill.
- Public Utility diversions costs will have to be confirmed through consultation with the relevant provider during the detailed design stage.
- Typical value for agricultural land is £7,500 per hectare;
- Typical value for residential land is £300,000 per property;
- A risk allowance has been added for construction costs, preparation costs and Public Utility costs;
- An Optimism Bias Adjustment of 44% has been added to the estimate.

3.2.3 Cost Estimate

The preliminary cost estimates that have been prepared for the options considered in this study are provided in Table 3-A below. The associated economic assessment of each option is included within section 6 of this report.

All costs in Table 3-A below are in £M and none of the do something option estimates include the estimated costs associated with the extension of Edgar Road identified as the do nothing.

	Do - Nothing : (Edgar Rd Ext & R5 Housing access)	Existing Network Enhancement	Urban (Inner) Route	Rural (Outer) Route	Rural (Inner) Route
Construction Costs	£1.25	£3.15	£4.0	£34.0	£8.7
Construction Risk	£0.3	£0.8	£1.0	£8.6	£2.2
Construction Total	**£1.55**	**£3.95**	**£5.0**	**£42.6**	**£10.9**
Preparation Costs	£0.3	£0.5	£3.0	£3.9	£5.0
Preparation Risk	£0.05	£0.05	£0.3	£0.4	£0.5
Preparation Total	**£0.35**	**£0.55**	**£3.3**	**£4.3**	**£5.5**
Public Utilities Costs	£0.1	£0.4	£0.38	£0.5	£0.5
Public Utilities Risk	£0.05	£0.1	£0.09	£0.1	£0.1
Public Utilities Total	**£0.15**	**£0.5**	**£0.47**	**£0.6**	**£0.6**
Optimism Bias Adjustment	£0.9	£2.2	£3.9	£20.9	£7.5
Scheme Total	**£2.95**	**£7.2**	**£12.7**	**£68.40**	**£24.50**

Table 3-A Stage 2 Cost Estimates

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4 ENGINEERING ASSESSMENT

4.1 Introduction

This chapter presents an engineering assessment of the DMRB Stage 2 route options for the Elgin Western Distributor Road.

4.2 Engineering Standards

In preparation of route options for the Stage 2 assessment, each option has over its full length been designed utilising the technical guidance provided by Aberdeenshire Council's Standards for Road Construction Consent and Adoption and the Design Manual for Roads and Bridges (DMRB) where applicable. Use of Aberdeenshire Council's guidance is standard practice for Road Construction Consent and Adoption within the extents of The Moray Council and the following DMRB guidance is applicable;

- TD 9/93 Highway Link Design;
- TD 27/05 Cross-Sections and Headrooms;
- TD16/07 Geometric Design of Roundabouts;
- TD 42/95 Geometric Design of Major/Minor Priority Junctions; and
- TD 50/04 The Geometric Layout of Signal-Controlled Junctions and Signalised Roundabouts.

Each route option has been designed to desirable minimum standards where achievable.

The Scottish Government's policy document: Designing Streets aims to ensure that urban streets are designed to an appropriate standard so as to accommodate the many functions of a street. The document puts focus on a street being a place rather than to simply facilitate the movement of vehicles. Whilst Wittet Drive contains residential access, it does not exhibit further public functions typical of a street. Consequently, application of the Designing Streets document is limited in this instance.

4.3 Engineering Considerations

In addition to the implementation of best practice through the use of the relevant design standards, the following constraints have been considered:

- Existing topography;
- Physical constraints such as residential and commercial properties;
- Environmental constraints;
- Clearance requirements with regard to road, railway and watercourse structures; and
- Connections to the existing road network.

The design of the options for the Stage 2 assessment has been undertaken using a ground survey contour model. Produced from LiDAR Survey, this model does not recognise all of the features associated with the existing topography of the area.

To support the accurate preparation of detailed design work associated with the Stage 3 assessment, a topographical survey model in the form of a detailed ground survey will be required. This will enable the horizontal and vertical geometry of the preferred route to be further refined and structural / geotechnical elements of the design developed to an appropriate level of detail.

4.4 Engineering Assessment of Scheme Options

4.4.1 Existing Network Enhancements – Dr Gray's Roundabout (ENE Option T1)

(a) Engineering Description

Dr Gray's Roundabout forms an important junction between the A96 trunk road and local road network within the western extents of Elgin. The existing roundabout consists of 4 arms providing access to the A96 eastbound and westbound, South Street and Pluscarden Road. A further arm is provided off the western side of the roundabout which at one time may have allowed vehicular access into Dr Gray's hospital from the roundabout. This has since been stopped up through placement of bollards across the access which now allows pedestrian access only to the hospital from the roundabout.

The requirements of this element of the overall option are to make modifications to the roundabout rather than provide a completely new layout. An entirely new layout designed to current DMRB standards would require re-alignment of each approach and possible acquisition of adjacent land and associated property in order to achieve visibility.

The primary modification to the roundabout is to accommodate the conversion of South Street to one-way westbound operation. To facilitate this modification, it is proposed to construct a pedestrian build out area on the existing South Street exit lane. This will have the effect of preventing vehicles on the roundabout's circulatory carriageway from entering South Street. If the current layout were retained and South Street converted to one-way operation the potential exists that vehicles might misinterpret the junction form and travel against the circulatory flow of traffic resulting in the risk of a head on collision

On other approaches to the roundabout it is intended that the current lane provision shall be retained with slight modifications to approach alignments to provide the appropriate lane widths.

A detailed design considering road restraint systems on approach to and on the roundabout itself are not required as part of the Stage 2 appraisal. Hazard locations in accordance with TD 19/06 – Requirements for Road Restraint Systems will be identified and assessed and a suitable design provided for the preferred route taken forward to Stage 3 assessment.

The detailed design of traffic signs, delineation and road markings at the roundabout are not required as part of the Stage 2 appraisal. The provision of such details will be considered as part of the Stage 3 appraisal process with reference paid to

relevant design standards including The Traffic Signs Regulations and General Directions 2002 and the Traffic Signs Manual.

(b) Engineering Constraints

Geometric modifications to Dr Gray's Roundabout takes into consideration the following physical engineering constraints:

- The existing links from each arm of the roundabout, including accesses located on these links in the vicinity of the roundabout;
- Residential and commercial properties located immediately adjacent to the southern extents of the roundabout; and
- Existing topography of the land.

(c) Structures

There are no known structures in the vicinity of Dr Gray's Hospital roundabout that require to be considered in the development of this element of the overall scheme option. Presently, the design of this element of the overall option does not include any structural provision.

(d) Departures from Standard

The junction layout in its current form departs from standard on many accounts including circulatory carriageway width, entry path radius and approach lane widths. The proposed modifications to the roundabout mean that these departures remain and therefore consultation with Transport Scotland's Standards Branch will be required.

(e) Climate, Topography and Land Use

Details of the climate currently experienced within Elgin and the surrounding area are included within Section 2.1 of this report.

The topography of land in the immediate vicinity of Dr Gray's Roundabout is generally flat at 24 metres above ordinance datum (AOD). Land to the north and west of the roundabout generally rises away from the roundabout whilst land to the south and west is generally at the same level as the roundabout.

Land use adjacent to the highway boundary at this location is a mixture of commercial and residential properties. Several shops with flats above are located immediately next to the southern extent of the roundabout. Dr Gray's hospital is located to the west of the roundabout with pedestrian access provided from the roundabout itself. A health centre is located to the north of the roundabout taking access from the A96 east of the roundabout.

(f) Geology, Geomorphology and Ground Conditions

Geology, Geomorphology and Ground Conditions present are not expected to pose a significant risk to the construction of geometric modifications to the roundabout. The nature of the works involved mean that most of the construction work will be conducted at existing ground level. Any minor excavation activities are likely to be shallow and generally within the extents of made ground.

(g) Hydrology, Hydrogeology and Drainage

Hydrology and Hydrogeology are not expected to pose a significant risk to the construction of geometric modifications to the roundabout. There are no known watercourses and associated flooding areas in the immediate vicinity of the roundabout.

It is anticipated that the existing carriageway drainage regime at the roundabout shall be assessed in preparing the detailed design of the junction layout. Any new drainage infrastructure required as a result of the works will be designed to tie-in to the existing drainage infrastructure at appropriate locations.

(h) Public Utilities

Public utilities located within the vicinity of Dr Gray's Roundabout have been identified from plans made available from utility suppliers and are listed as follows:

- Trunk Road and Local Authority Road street lighting apparatus;
- Scottish Water drainage plant;
- Scottish Water supply plant;
- Openreach underground plant;
- Scotia Gas Networks supply plant; and
- Scottish and Southern Energy supply plant.

4.4.2 Existing Network Enhancements – Alexandra Road Dualling (ENE Option T2)

(a) Engineering Description

The A96 Alexandra Road between the Tesco and Halfords Roundabouts is presently an urban single carriageway link. This option upgrades the link to an urban dual carriageway. Table 4-A below provides a description of the A96 Alexandra Road Dualling element of the Existing Network Enhancements Option.

Design Criteria	Design Details	Design Requirement
Length	270 metres	None
Design Speed	70kph	70Akph *(TD 9/93 Clause 1.8)*
Road Type	Dual 2 lane urban all purpose carriageway (D2UAP)	Trunk Road
Carriageway Cross Section	7.3m running carriageway 1.8m central reserve 2.0m footway where practicable 1.2m verge along retaining structure	7.3m carriageway 1.8m central reserve *(TD 27/05 Figure 4-4a)*
Horizontal Alignment	Minimum horizontal radius: 1020m on the mainline carriageway 200m at roundabout to tie-in to existing (2 steps below desirable minimum with 7% superelevation)	1020m minimum without elimination of adverse camber & transitions *(TD 9/93 Table 3)*
Vertical Alignment	Minimum crest K: 33 Minimum sag K: 20 Maximum gradient: 1.3% Minimum gradient 0.1% to tie-in to existing alignment, subject to detailed topographical survey	Desirable minimum crest K: 30 Absolute minimum sag K: 20 *(TD 9/93 Table 3)* Desirable max. gradient: 4% *(TD 9/93 Clause 4.1)* Minimum gradient: 0.5% *(TD 9/93 Clause4.3)*
Pedestrian facilities	At grade staggered 2.4m wide puffin crossing on Alexandra Road 2.4m wide pedestrian crossing at a new signalised junction on North Street to access the Bus Station. Closure of existing grade separated pedestrian crossing of Alexandra Road at Elgin Bus Station. New 2.0m wide north footway/footpath along Alexandra Road. Existing south footway retained.	2.4m wide staggered crossing *(LTN 2/95)*
Minor road access junctions	Details to be confirmed at Stage 3, all junctions to be at grade incorporating existing corner radii where practicable.	6m corner radii where no provision for large goods vehicles 10m radius with 1:5 taper *(TD 42/95)*

Table 4-A Alexandra Road Dualling Engineering Description

In addition to the engineering details described in the table above, consideration has been given to the potential for promoting sustainable transport modes. The additional lanes on the dual section may be used as bus lanes at peak times and there is potential for bus priority signals to be installed at the Elgin Bus Station exit.

The design and modelling of these potential bus priority improvements should be determined in consultation with bus operators, The Moray Council and Transport Scotland at Stage 3 assessment.

Blackfriars Road, which runs parallel to Alexandra Road on the north side, is signed as a cyclist route to the National Cycle Route (NCR) 1. Cyclists are currently advised to dismount to access the existing underpass on foot. The Alexandra Road Dualling option permits cyclists to use North Street, North Street Mews and Lossie Wynd to access the eastern section of NCR 1. Cyclists are considered to form part of the on-street traffic on these lightly trafficked roads. Cyclists wishing to access Elgin Bus Station from Blackfriars Road and vice versa are required to dismount and use the new pedestrian crossing.

(b) Engineering Constraints

The design of the Alexandra Road dualling takes into consideration the following physical engineering constraints:

- The existing roundabouts at either end of the link;
- Minimising impact on the existing junctions and properties on the south side of the link, such as Elgin Bus Station and the access to St Giles Centre;
- Existing topography, particularly at the pedestrian underpass;
- Minimising the impact on existing carriageways and properties on the north side of the link;
- Interaction with the National Cycle Network; and
- The provision of non-motorised user provisions in compliance with the Disability Discrimination Act.

(c) Structures

Closure of the existing pedestrian underpass is required under this scheme option as the proximity of properties to the north prevents the provision of a Disability Discrimination Act Good Practice Guide for Roads (DDAGPG) compliant route to the underpass, within the lands available. Drainage and topographical considerations have also influenced the decision to close the underpass.

(d) Departures from Standard

The Alexandra Road Dualling scheme option generally adheres to standards and it is anticipated that the substandard characteristics of the mainline carriageway can be eliminated through design optimisation at detailed design stage.

The 200 metre radius horizontal curve represents a relaxation of 2 design speed steps below the absolute minimum. This section of the alignment is inherited from the existing carriageway geometry at the junction and is likely to be acceptable.

The flat gradients recorded at the tie-in points to the existing roundabouts are due to LiDAR based ground model tolerances and are anticipated to be resolved following detailed topographical survey of the route.

The alignment shows a consistent 1.8m wide central reserve throughout the length of the dualling. The central reserve will require to be widened to a minimum of 3.0m at the staggered crossing to adhere to design standards. The topography and existing properties on Blackfriars Road and the need to maintain a pedestrian route along Ladyhill Road to Elgin Bus Station will constrain the layout and location of this crossing and may lead to departures at Stage 3 assessment.

Should this option be taken forward to Stage 3 assessment, the development of the design shall be discussed with Transport Scotland's Standards Branch and any departures from standard will be highlighted at an early stage.

(e) Junctions and Side Roads

The junction strategy will largely remain unchanged to minimise the impact of the scheme on the adjacent city centre facilities. Right turn bans already exist at North Street and at Ladyhill Road and will be retained under this scheme.

In order to minimise the impact on fronting properties and reduce the need for additional land acquisition, corner radii and visibility at the junctions shall largely be determined by existing conditions. It is anticipated that closure of the subway will allow measures to be put in place to improve junction visibility at North Street.

Further discussion relating to the interaction between the mainline works and the existing junctions will be determined at DMRB Stage 3 assessment.

(f) Climate Topography and Land Use

Details of the climate currently experienced within Elgin and the surrounding area are included within Section 2.1 of this report.

Alexandra Road passes through the city centre which includes a mixture of commercial and retail properties. The A96 is a strategic route of national importance on the Aberdeen to Inverness Transport Corridor and is also the main public transport route in the city. The Alexandra Road section of the A96 also caters for traffic on the A941 which is a key strategic route in Moray.

The existing mainline carriageway lies between 0 metres and 3 metres above the ground either side of it due to the presence of the pedestrian underpass. As a result, road restraint systems are observed on the eastern half of the link.

The north side of the proposed dual carriageway is approximately 2.0m higher than the existing ground level. A retaining structure with an integral road restraint system is thus required. On the south side, levels at the edge of carriageway are close to existing levels and it is anticipated that minor works will be required to achieve suitable tie-ins. Due to limited existing ground survey information at the roundabouts, the impact of the new north footpath on the Aldi car park is unclear. For the same reason, the earthworks shown on the drawings are indicative only.

(g) Geology, Geomorphology and Ground Conditions

Information relating to the likely geology and geomorphology conditions present in the area is contained within the Geotechnical Desk Study Report completed by Jacobs Consultancy and included as part of the DMRB Stage 1 assessment.

In the initial development of design, earthworks slopes of 1:2 (vertical:horizontal) for the embankment supporting the extra A96 carriageway have been implemented. This is a reasonable inclusion at this stage and is based on the consideration that any material used to construct the embankment will consist of imported material suitable to construct such and embankment.

An intrusive geotechnical investigation in the vicinity of the proposed earthworks shall be required to provide further guidance on the earthworks slopes which may be implemented through design development.

(h) Hydrology, Hydrogeology and Drainage

An intrusive geotechnical investigation in the vicinity of the proposed earthworks shall be required to provide further guidance on the hydrological and hydrogeological conditions present at this location.

It is anticipated that the existing carriageway drainage regime at the roundabout shall be assessed in preparing the detailed design of the junction layout. Any new drainage infrastructure required as a result of the works will be designed to tie into the existing drainage infrastructure at appropriate locations.

(i) Public Utilities

Public utilities located in the vicinity of the junction have been identified from plans as follows:

- Trunk Road and Local Authority Road Street lighting apparatus;
- Scottish Water drainage plant;
- Scottish Water supply plant;
- Highway drainage infrastructure;
- Openreach underground plant;
- Scotia Gas Networks supply plant; and
- Scottish and Southern Energy supply plant.

4.4.3 Existing Network Enhancements – A96 / Wittet Drive Roundabout (ENE Option T3)

(a) Engineering Description

Previous design work proposed an on-line option south of the existing junction to minimise the requirements for earthworks at the slope north of the junction. However, this option fails to meet the required deflection for eastbound traffic on the A96.

As part of this study a design was developed north of the existing junction to minimise impacts on properties, but requiring a large amount of fill. However, to tie-in the A96 and achieve the required deflection, properties on the north side of the A96 will need to be demolished. Therefore, this option was ruled out in favour of centring the proposed roundabout on the existing junction, which impacts upon fewer properties and requires less fill.

(b) Engineering Constraints

The design of the A96 / Wittet Drive Roundabout takes into consideration the following physical engineering constraints:

- Existing topography, particularly to the north of the existing A96; and
- Existing properties located on the A96 and Wittet Drive.

(c) Structures

There are no known structures in the vicinity of the A96 / Wittet Drive junction to be considered in the development of this element of the overall scheme option. Further investigation shall be given to alternative supporting methods for the roundabout at this location, such as a structural retaining wall, should this option be considered the preferred option.

(d) Departures from Standard

A preliminary design has been carried out for the centred option, which meets DMRB standards. However, this may need to be revised as the detailed design develops to ensure flare lengths are appropriate for the traffic flows. Multiple accesses adjacent to the junction depart from standards.

(e) Climate Topography and Land Use

Details of the climate currently experienced within Elgin and the surrounding area are included within Section 2.1 of this report.

The topography in the vicinity of the existing junction includes a 14 metre embankment immediately north of the A96.

Land use within the study area is almost entirely residential. Wittet Drive is lined with residential properties along its length and the trunk road has properties on the south side from 50 metres west of the existing junction eastwards, and on the north side from 25 metres east of the existing junction eastwards. To the west of the houses on Wittet Drive lies a field which has been zoned in the local plan for potential future housing.

(f) Geology, Geomorphology and Ground Conditions

Information relating to the likely geology and geomorphology conditions present in the area is contained within the Geotechnical Desk Study Report completed by Jacobs Consultancy and included as part of the DMRB Stage 1 assessment.

In the initial development of the design, an earthworks slope of 1:2 (vertical: horizontal) for the embankment supporting the proposed roundabout has been implemented. This is a reasonable inclusion at this stage and is based on the consideration that any material used to construct the embankment will consist of imported material suitable to construct such an embankment.

An intrusive geotechnical investigation in the vicinity of the proposed earthworks will be required to provide further guidance on the earthworks slopes which may be implemented through design development.

(g) Hydrology, Hydrogeology and Drainage

Hydrology and Hydrogeology are not expected to pose a significant risk to the construction of amendments to the junction's form. There are no known watercourses and associated flooding areas in the immediate vicinity of the roundabout.

It is anticipated that the present carriageway drainage regime will be assessed in preparing the detailed design of the junction layout. Any new drainage infrastructure required shall be designed to tie-in to existing infrastructure at appropriate locations.

(h) Public Utilities

Public utilities located in the vicinity of the junction have been identified from plans as follows:

- Trunk Road and Local Authority Road Street lighting apparatus;
- Scottish Water drainage plant;
- Scottish Water supply plant;
- Openreach underground plant;
- Highway drainage infrastructure;
- Scotia Gas Networks supply plant; and
- Scottish and Southern Energy supply plant.

4.4.4 Existing Network Enhancements – A941 New Elgin Road / Edgar Road Junction Capacity Improvements (ENE Option L1)

(a) Engineering Description

The New Elgin Road South Junction is currently a 4 arm roundabout with a 14m central island diameter and 34 metre inscribed circle diameter. Each arm of the roundabout consists of 2 entry lanes and one exit lane.

The requirements of this element of the overall option are to alter the junction form to provide more capacity and improved operation. In light of proposed development in the vicinity of this junction it should be noted that further detailed consideration of the precise junction form is required.

Table 4-B below provides a description of the engineering aspects of the junction modifications.

Design Criteria	Design Details	Design Requirement
Stopping Sight Distance approaching junction	90m on both New Elgin Road approaches 90m on Edgar Road 90m on Linkswood Road	90m for all approaches. (TD 50/04 Clause 2.6) (60kph D.S. / 30mph S.L.)
Junction Intervisibility	Restricted due to property located south east of the junction.	2.5m behind each stop line. (TD 50/04 Clauses 2.10 – 2.18)
Corner radii	10 m on all corners Tapers provided on all exits.	10.7m (ACG, Table 18.1) 10m (TD 50/04 Table 2/1) Guidance in DMRB considered most appropriate at this location
Carriageway width	Lane width = 3m on Edgar Road, Linkwood Road and New Elgin Road southbound approach. 3.65m approach provided on New Elgin Road northbound approach.	Lane width =3-3.65m (TD 50/04 Clause 2.22 – 2.24)
Swept path requirements	Swept path of a LGV has been considered appropriate for all approaches.	(TD 50/04 Clause 2.35)
Pedestrian Crossings	Provided on each approach.	(TD 50/04 Clause 4.4 – 4.17)
Pedestrian Refuge	Provided on each arm.	(TD 50/04 Clause 4.4 – 4.17)

Table 4-B New Elgin Road South Junction Engineering Description

A detailed design considering road restraint systems in the vicinity of the junction has not been developed as part of this Stage 2 assessment. Hazard locations in accordance with TD 19/06 – Requirements for Road Restraint Systems will be identified and assessed and a suitable design provided for the preferred route taken forward to DMRB Stage 3 assessment.

The detailed design of traffic signs, delineation and road markings in the vicinity of the junction has not been considered as part of the Stage 2 assessment. The

provision of such details will be considered as part of the Stage 3 assessment process with reference paid to relevant design standards including The Traffic Signs Regulations and General Directions 2002 and the Traffic Signs Manual.

(b) Engineering Constraints

The design of New Elgin Road South signalised junction takes into consideration the following physical constraints.

- Existing highway boundary; and
- Existing carriageway alignment, cross section and in particular the gradient on approach to the railway structure located north of the junction.

(c) Structures

The existing structure over the railway line located to the north of the junction is unlikely to be impacted by the proposed modifications to the junction. There are no other known structures in the vicinity of the junction to be considered. Presently the design of this element of the overall option does not include any structural provision.

(d) Departures from Standard

Restricted junction intervisibility results in a departure from standard at this location. This lack of visibility is due to a property boundary located immediately adjacent to the highway extents.

(e) Junctions and Side Roads

An access off New Elgin Road to the 'Hewden' business forecourt is located immediately in advance to the roundabout give way line. Consideration should be given to relocating this access as part of the detailed junction design. Access to a yard behind Hewden is also provided directly from the roundabout. An alternative arrangement for access to this yard via the Hewden forecourt could be explored. Consultation with the property owners regarding any potential change to access provision shall be required at Stage 3 Assessment.

(f) Climate Topography and Land Use

Details of the climate currently experienced within Elgin and the surrounding area are included within section 2.1 of the report.

The topography of the land in the immediate vicinity of the junction is generally flat, however, the A941 is built up artificially on made ground to the north in order to achieve the appropriate clearance across the Aberdeen to Inverness Railway line.

Land use in the vicinity of the junction contains a mixture of commercial and industrial units. The Springfield Retail Park is located to the west of the junction and to the east lies a number of industrial units. To the north of the junction lies the Aberdeen to Inverness Railway line with Elgin Railway Station located North West of the junction.

(g) Geology, Geomorphology and Ground Conditions

Geology, Geomorphology and Ground Conditions present are not expected to pose a significant risk to the construction of amendments to the junction's form. The

nature of the works involved mean that most of the construction work will be conducted at existing ground level. Any minor excavation activities are likely to be shallow and generally within the extents of made ground.

(h) Hydrology, Hydrogeology and Drainage

Hydrology and Hydrogeology are not expected to pose a significant risk to the construction of amendments to the junction's form. There are no known watercourses and associated flooding areas in the immediate vicinity of the roundabout.

It is anticipated that the present carriageway drainage regime shall be assessed in preparing the detailed design of the junction layout. Any new drainage infrastructure required shall be designed to tie into existing infrastructure at appropriate locations.

(i) Public Utilities

Public utilities located in the vicinity of the junction have been identified from plans as follows:

- Local Authority Road street lighting apparatus;
- Scottish Water drainage plant;
- Scottish Water supply plant;
- Highway drainage infrastructure;
- Openreach underground plant;
- Scotia Gas Networks supply plant; and
- Scottish and Southern Energy supply plant.

4.4.5 Existing Network Enhancements – A941 New Elgin Road / Station Road Junction Capacity Improvement (ENE Option L2)

(a) Engineering Description

The New Elgin Road North Junction is currently a 4 arm roundabout with an 8.5m central island diameter and a 29 metre inscribed circle diameter. The Moss Street arm has 1 entry and 1 exit lane while the other arms have 2 entry lanes and 1 exit lane.

The requirements of this element of the overall option are to alter the junction form to provide greater capacity and improved operation. In light of proposed development in the vicinity of this junction it should be noted that further detailed consideration of the precise junction form is required.

Table 4-C below provides a description of the engineering aspects of the junction.

Design Criteria	Provision at Junction	Requirement
Stopping Sight Distance approaching junction	90m on New Elgin Road 90m on Station Road 90m on Maisondieu Road 90m on Moss St.	90m for all approaches. (TD 50/04 Clause 2.6) (60kph D.S. / 30mph S.L.)
Junction Intervisibility	Only New Elgin Road approach meets the intervisibility requirements.	2.5m behind each stop line. (TD 50/04 Clauses 2.10 – 2.18)
Corner radii	10 m on all corners. Tapers provided on Station Road and New Elgin Road exits.	10.7m (ACG, Table 18.1) 10m (TD 50/04 Table 2/1) Guidance in DMRB considered most appropriate at this location
Carriageway width	Lane width = 3m on all approaches 2 lanes provided on New Elgin Road, Station Road and Maisondieu Road approaches. Single lane approach on Moss St.	Lane width =3-3.65m (TD 50/04 Clause 2.22 – 2.24)
Swept path requirements	Swept path of a LGV has been considered appropriate for all approaches except for Moss St. Refuse lorry used for Moss St.	(TD 50/04 Clause 2.35)
Pedestrian Crossings	Provided on each approach.	(TD 50/04 Clause 4.4 – 4.17)
Pedestrian Refuge	Provided on each arm except for Moss St where carriageway width is restricted.	(TD 50/04 Clause 4.4 – 4.17)

Table 4-C New Elgin Road North Junction Engineering Description

A detailed design considering road restraint systems in the vicinity of the junction has not been developed as part of this Stage 2 assessment. A broad-based assessment has been undertaken for cost estimate purposes only. Hazard locations in accordance with TD 19/06 – Requirements for Road Restraint Systems will be identified and assessed and a suitable design provided for the preferred route taken forward to Stage 3 assessment.

The detailed design of traffic signs, delineation and road markings in the vicinity of the junction has not been considered as part of the Stage 2 assessment, a broad-based assessment having been undertaken for cost estimate purposes only. The provision of such details will be considered as part of the Stage 3 assessment process with reference paid to relevant design standards including The Traffic Signs Regulations and General Directions 2002 and the Traffic Signs Manual.

(b) Engineering Constraints

The design of New Elgin Road North signalised junction takes into consideration the following physical constraints.

- Existing highway boundary; and
- Existing carriageway alignment, cross section and in particular the gradient on approach to the railway structure located south of the junction.

(c) Structures

The existing structure over the railway line located to the south of the junction is unlikely to be impacted by the proposed modifications to the junction. There are no other known structures in the vicinity of the junction to be considered in the development of this element of the overall scheme option. Presently the design of this element of the overall option does not include any structural provision.

(d) Departures from Standard

Restricted junction intervisibility results in a departure from standard at this location.

This lack of visibility between approaches is due to property boundaries located immediately adjacent to the highway extents on the northern side of the junction.

(e) Junctions and Side Roads

An access off Moss Street to the adjacent Laichmoray Hotel is currently located immediately in advance of the roundabout give way line. Consideration should be given to closing this access under proposals to provide a signalised junction. A further access to the hotel is located on Maisondieu Road offset approximately 15m from the junction which could be retained to provide access to the hotel and associated car park. Consultation with the property owners regarding any potential change to access provision should be undertaken as the detailed design progresses.

(f) Climate Topography and Land Use

Details of the climate currently experienced within Elgin and the surrounding area are included within Section 2.1 of this report.

The land is predominantly flat throughout the extents of the current roundabout junction; however, the A941 is built up artificially to the south in order to achieve the appropriate clearance across the Aberdeen to Inverness Railway line.

Land use adjacent to the junction is mainly commercial including two hotels, a small business park with associated car park and a supermarket. Further west lies Elgin Railway Station and associated car park.

(g) Geology, Geomorphology and Ground Conditions

Geology, Geomorphology and Ground Conditions present are not expected to pose a significant risk to the construction of amendments to the junction's form. The nature of the works involved mean that most of the construction work will be conducted at existing ground level. Any minor excavation activities are likely to be shallow and generally within the extents of made ground.

In the initial development of design, an earthworks slope of 1:2 (vertical: horizontal) for the embankment supporting the extra carriageway width required to accommodate the junction taper have been implemented. This is a reasonable inclusion at this stage and is based on the consideration that any material used to construct the embankment will consist of imported material suitable to construct such and embankment.

An intrusive geotechnical investigation in the vicinity of the proposed earthworks shall be required to provide further guidance on the earthworks slopes which may be implemented through design development.

(h) Hydrology, Hydrogeology and Drainage

Hydrology and Hydrogeology are not expected to pose a significant risk to the construction of amendments to the junction's form. There are no known watercourses and associated flooding areas in the immediate vicinity of the roundabout.

It is anticipated that the present carriageway drainage regime shall be assessed in preparing the detailed design of the junction layout. Any new drainage infrastructure required shall be designed to tie into existing infrastructure at appropriate locations.

(i) Public Utilities

Public utilities located in the vicinity of the junction have been identified from plans as follows:

- Local Authority Road street lighting apparatus.
- Scottish Water drainage plant;
- Scottish Water supply plant;
- Highway drainage infrastructure;
- Openreach underground plant;
- Scotia Gas Networks supply plant; and
- Scottish and Southern Energy supply plant.

4.4.6 Existing Network Enhancements – A941 Hay Street / Moray Street Junction Signalisation (ENE Option L3)

(a) Engineering Description

The existing junction between Moray and Hay Street consists of a simple crossroads arrangement.

The requirements of this element of the overall option are to alter the junction form from a crossroads arrangement to a fully signalised arrangement. Table 4-D below provides a description of the engineering aspects of the junction.

Design Criteria	Provision at Junction	Requirement
Stopping Sight Distance approaching junction	90m on Hay St. 90m on Moray St.	90m on all approaches. (60kph D.S. / 30mph S.L.)
Junction Intervisibility	Not achieved on any arm.	2.5m behind each stop line.
Corner radii	10.7m on all corners to match existing.	A.C.G. = 10.7m DMRB = 10m
Carriageway width	Lane width = 3.65m on Hay St. Lane width = 3m on Moray St.	Lane width = 3 – 3.65m
Swept path requirements	Swept path of a refuse lorry has been considered appropriate at this location.	Undertake assessment of most appropriate vehicle to use to check swept path.
Pedestrian Crossings	Provided on each approach.	Where pedestrians are expected to cross.
Pedestrian Refuge	Not provided due to carriageway width constraints.	Required on wide crossings

Table 4-D Moray & Hay Street Signalisation Engineering Description

A detailed design considering road restraint systems has not been developed as part of this Stage 2 assessment. Whilst an assessment may be undertaken as part of the Stage 3 assessment it is unlikely that safety barriers will be required at this location due to the low anticipated speeds of vehicles and the nature of hazards present.

The detailed design of traffic signs, delineation and road markings in the vicinity of the junction has not been considered as part of the Stage 2 assessment, a broad-based assessment having been undertaken for cost estimate purposes only. The provision of such details will be considered as part of the Stage 3 assessment process with reference paid to relevant design standards including The Traffic Signs Regulations and General Directions 2002 and the Traffic Signs Manual.

(b) Engineering Constraints

The design of a signalised junction between Moray Street and Hay Street takes into consideration the following physical constraints.

- Residential / commercial properties located adjacent to the existing highway boundary on all approaches to the junction; and
- Existing carriageway alignments and cross sections.

(c) Structures

There are no known structures in the vicinity of the Moray and Hay Streets junction to be considered in the development of this element of the overall scheme option.

Presently the design of this element of the overall option does not include any structural provision.

(d) Departures from Standard

Restricted junction intervisibility as indicated in the above table, results in a departure from standard at this location with respect to the requirements detailed in TD 50 /04. This lack of visibility between approaches is due to properties and their associated boundaries located immediately adjacent to the highway extents.

(e) Junctions and Side Roads

A number of properties include direct access onto the road in the vicinity of the junction. These accesses are set back a distance from the junction and are unlikely to interfere with the performance of the junction. This shall be confirmed or otherwise through the road safety audit process which shall be required should this proposal be taken forward in the assessment process.

(f) Climate Topography and Land Use

Details of the climate currently experienced within Elgin and the surrounding area are included within section 2.1 of the report.

Topography within the immediate extents of the junction can be considered flat at 25 metres AOD which provides good visibility on all approaches to the junction.

Land use at this location is a mixture of residential and commercial properties including a hotel located south west of the junction. Pedestrian footpaths are provided on all approaches to the junction and mark the extent of the highway boundary in this area.

(g) Geology, Geomorphology and Ground Conditions

Geology, Geomorphology and Ground Conditions present are not expected to pose a significant risk to the construction of amendments to the junction's form. The nature of the works involved mean that most of the construction work will be conducted at existing ground level. Any minor excavation activities are likely to be shallow and generally within the extents of made ground.

(h) Hydrology, Hydrogeology and Drainage

Hydrology and Hydrogeology are not expected to pose a significant risk to the construction of amendments to the junction's form. There are no known watercourses and associated flooding areas in the immediate vicinity of the roundabout.

It is anticipated that the present carriageway drainage regime shall be assessed in preparing the detailed design of the junction layout. Any new drainage infrastructure required shall be designed to tie into existing infrastructure at appropriate locations.

(i) Public Utilities

Public utilities located in the vicinity of the junction have been identified from plans as follows:

- Local Authority Road street lighting apparatus;

- Scottish Water drainage plant;
- Scottish Water supply plant;
- Highway drainage infrastructure;
- Openreach underground plant;
- Scotia Gas Networks supply plant; and
- Scottish and Southern Energy supply plant.

4.4.7 Existing Network Enhancements – South Street - One Way Operation (ENE Option L4)

(a) Engineering Description

The modification of South Street to one way operation includes alterations to a number of side road accesses along the street. Accesses on the southern side of the street have been designed in accordance with the arrangement shown in layout 4 of TD 41/95 in the DMRB for left in - left out movements. In order to accommodate this layout, areas of land will be required out with the current highway boundary.

Accesses on the northern side of the street have been developed to accommodate right in - right out movements. No layout for this type of arrangement was obtained within the technical guidance; therefore a specific layout has been created for this instance. Further refinement to this layout will be required at DMRB Stage 3 assessment including consultation with the Council.

A detailed design considering road restraint systems has not been developed as part of this Stage 2 assessment. Whilst an assessment may be undertaken as part of the Stage 3 assessment it is unlikely that safety barriers will be required at this location due to the low anticipated speeds of vehicles and the nature of hazards present.

The detailed design of traffic signs, delineation and road markings has not been considered as part of the Stage 2 assessment, a broad-based assessment having been undertaken for cost estimate purposes only. The provision of such details will be considered as part of the Stage 3 assessment process with reference paid to relevant design standards including The Traffic Signs Regulations and General Directions 2002 and the Traffic Signs Manual.

(b) Engineering Constraints

The design of south street one way operation takes into consideration the following physical constraints.

- Existing highway boundary.

(c) Structures

There are no known structures in the vicinity of South Street to be considered in the development of this element of the overall scheme option. Presently the design of this element of the overall option does not include any structural provision.

(d) Departures from Standard

As stated above, the arrangement provided for accesses on the northern side of the street have been created without guidance from a technical standard. Discussions about refining this design will be required at Stage 3 assessment to ensure that the most appropriate layout is provided at these locations.

(e) Junctions and Side Roads

A number of further local roads and side accesses are located along South Street. The preliminary design of modifications to each junction to facilitate one way operation has been completed.

(f) Climate Topography and Land Use

Details of the climate currently experienced within Elgin and the surrounding area are included within section 2.1 of the report.

The topography of South Street is generally flat. Levels at each end of the street are typically between 24 and 25 metres AOD with a small crest located in-between.

Land use along the street includes a mix of residential and commercial properties.

(g) Geology, Geomorphology and Ground Conditions

Geology, Geomorphology and Ground Conditions present are not expected to pose a significant risk to amendments made to the operation on South Street. The nature of the works involved mean that any construction work will be conducted at existing ground level. Any minor excavation activities are likely to be shallow and generally within the extents of made ground.

(h) Hydrology, Hydrogeology and Drainage

Hydrology and Hydrogeology are not expected to pose a significant risk to amendments made to the operation on South Street. There are no known watercourses and associated flooding areas in the immediate vicinity of the roundabout.

It is anticipated that the present carriageway drainage regime shall be assessed in preparing the detailed design of the junction layout. Any new drainage infrastructure required shall be designed to tie-in to existing infrastructure at appropriate locations.

(i) Public Utilities

Public utilities located within the extents of South Street have been identified from plans made available from utility suppliers and are listed as follows:

- Local Authority Road street lighting apparatus;
- Scottish Water drainage plant;
- Scottish Water supply plant;
- Highway drainage infrastructure;
- Openreach plant;
- Scotia Gas Networks supply plant; and
- Scottish and Southern Energy supply plant.

4.5 Urban (Inner) Distributor Route

(a) Engineering Description

The Urban (Inner) Route consists of three main elements:

- An offline carriageway construction south of Wittet Drive including a new structure over the Aberdeen to Inverness Railway line;
- Online improvements to central and southern sections of Wittet Drive; and
- Two sub options for the northern section of Wittet Drive incorporating a junction with the A96 Trunk Road.

Table 4-E and Table 4-F below, provide a description of the Urban (Inner) Route mainline carriageway design. A design speed of 70 kph has been adopted following a review of the Stage 1 assessment and decisions made following consideration of that work by The Moray Council.

	Urban (Inner) Distributor Road
Length	1.1km
Design Speed	70 Kph

Table 4-E Urban (Inner) Route Design Speed & Length

The cross sectional dimensions have been determined in accordance with Aberdeenshire Council's Standards for Road Construction Consent and Adoption and are detailed in Table 4-F below.

Road Type	Verge Width (m)	Footpath Width (m)	Lane Width (m)	Total Width (m)
Primary / District Distributor Road	2 x 2.0 1 x 0.5	1 x 3.0	2 x 3.65	14.8
Existing Wittet Drive	-	2 x 1.85	2 x 4.25	12.2

Table 4-F Urban (Inner) Route Carriageway Cross Section

Each element of the overall route including the sub options shall now be discussed in further detail.

Offline Carriageway Construction

The offline section of the route commences at the south western corner of the R5 housing zone at which point it connects to the committed R5 housing zone access road from Edgar Road.

From the connection with the committed housing zone access road northwards, the route follows the edge of the R5 housing zone towards the Aberdeen to Inverness main Railway line on a gentle crest curve. A ghost island junction with right turn lane is proposed to provide access into the adjacent R5 housing zone.

To facilitate crossing the Aberdeen to Inverness main Railway line and achieve the appropriate headroom requirements, the corridor then rises at the maximum permissible gradient of 6%.

The embankment approaching the railway structure is between 4 and 8 metres in height above existing ground levels.

A 360 metre reverse curve with associated transition lengths aligns the offline section of the route with the southern end of Wittet Drive. To the north of the railway crossing, the Mayne Road crossroads would require to be re-profiled to accommodate the height difference between the offline section and surrounding road network. It is proposed to tie-in to the existing Wittet Drive alignment a short distance beyond the Mayne Road junctions. Wards Road is to be stopped up as new levels cannot accommodate the retention of this connection.

The horizontal and vertical alignment elements of the offline section of the route are described in Table 4-G below. Ch. 0 is taken at the southern end of the alignment.

Chainage	Horizontal Alignment	Chainage	Vertical Alignment
0 -17	Curve, LH R=255 (1b) (tie in to housing zone access road)	0 -130	Crest Curve, K=55
17 - 95	Transition, LH, RL=78m	130 - 272	Sag Curve, k =20
95 -140	Straight	272 - 302	Constant grade 6%
140 - 208	Transition, LH, RL = 68m	302 - 515	Crest Curve, k =30
208 - 306	Curve, LH, R = 360m	515 - 584	Sag Curve, k =20
306 - 374	Transition, LH, RL = 68m		
374 - 442	Transition, RH, RL = 68m		
442 - 459	Curve, RH, R = 360m		
459 - 527	Transition, RH, RL = 68m		
527-584	Straight (tie in with Wittet Dr.)		

Table 4-G Offline Carriageway Construction Alignment Elements

Online improvements to Wittet Drive

North of Mayne Road, the route incorporates the existing horizontal and vertical alignment of Wittet Drive. The route continues on a generally straight horizontal alignment at a 2.3% grade. Traffic signals are proposed at the B9010 Pluscarden Road junction with uncontrolled layouts retained at Petrie Crescent and Bruceland Road.

Beyond the junction with Bruceland Road two sub-options have been considered connecting the route with the A96 trunk road.

Option U1 – Online A96 Junction

From the Bruceland Road junction, option U1 continues to incorporate the existing horizontal and vertical alignment of the Wittet Drive northwards towards the A96. From a high point Wittet Drive falls back towards the A96 junction at approximately 3.5%.

An on-line option for an A96 roundabout centred to the south of the existing junction to minimise the requirements for earthworks at the slope north of the junction was considered. However, this solution fails to meet the required deflection for eastbound traffic on the A96.

A layout centred north of the existing junction to minimise impacts on properties, requires a geotechnical solution coupled with a large amount of fill. However, to tie-in to the A96 and achieve the required deflection, properties on the north side of the A96 would also need to be demolished. Therefore, this option was ruled out in favour of centring the proposed roundabout on the existing junction, which balances property and geotechnical impacts.

A preliminary design has been carried out for the preferred on-line option where geometry meets DMRB standards; however, multiple accesses adjacent to the junction introduce departures. The layout is shown as an insert of drawing number JC0061A0/D/T/004 (Rev. 2)

Option U2 – Offline A96 Junction

From the junction with Bruceland Road, this option utilises an offline alignment in a north westerly direction joining the A96 at a proposed roundabout in the vicinity of the existing priority junction with Sheriffmill Road.

The Wittet Drive realignment complies with DMRB horizontal standards, as dictated by Local Council design standards and is close to being a straight continuation of Wittet Drive. A vertical alignment compliant with the DMRB requires up to 3 metres of cutting past properties which prevents access being maintained for four houses. The vertical alignment therefore introduces a two-step below standard crest curve. The proximity of junctions to this relaxation constitutes a departure. Furthermore, the sub-standard crest curve limits visibility and departures are required for through visibility and for the two priority junctions described above.

Sheriffmill Road has been redesigned to tie-in to the proposed roundabout as a housing road to Local Council standards.

The Wittet Drive cul-de-sac has been completed by stopping-up the northern end and providing a footway across it adjacent to the A96. To allow vehicles to make turning manoeuvres, a turning-head designed to Local Council design standards is provided east of the cul-de-sac.

The preliminary design includes an embankment under the A96 junction approximately 6 metres in height.

The horizontal and vertical alignment elements of the offline carriageway construction is summarised in Table 4-H below. Ch. 0 is taken at the southern end of the alignment.

Chainage	Horizontal Alignment	Chainage	Vertical Alignment
0 - 33	Curve, LH, R = 510m	0 - 60	Sag Curve, k =20
33 - 81	Transition, LH, RL = 48m	60 - 166	Crest Curve, k =10 (2b)
81 - 149	Transition, RH, RL = 68m	166 - 185	Constant Grade, -3.4%
149 - 185	Curve, RH, R = 360m		

Table 4-H Option U2 - Offline A96 Junction Alignment Elements

(b) Engineering Constraints

The design of the route takes into consideration the following physical engineering constraints.

- Existing topography;
- Junction provision and connectivity to the existing road network;
- Side road crossings;
- Aberdeen to Inverness Railway; and

- Residential properties on Wittet Drive.

(c) Structures

This route requires one major structure across the Aberdeen to Inverness railway line which is in a cutting at the proposed structure location with an observed level of approximately 19 metres AOD.

The proposed railway structure will be of appropriate width to accommodate the 14.8 metre cross section. This will be a single span structure involving standard construction operations. Correspondence with Network Rail highlights the need to provide appropriate clearance both horizontally and vertically as follows:

- Horizontal clearance from nearest rail = 4.50m
- Vertical clearance from highest rail level = 4.86m

A high containment parapet will be required across the structure with associated high containment safety barriers provided on each approach to the structure.

(d) Departures from Standard

Whilst certain substandard alignment characteristics can be eliminated during the detailed design stage, the risk remains that in option U2 (offline roundabout) the proposed vertical alignment north west of Wittet Drive incorporates a relaxation in crest curvature K value of 10.

Whilst permissible in isolation, this relaxation in the vicinity to junctions is not and hence a departure from standard. This has been introduced to limit the land take and impact on surrounding properties on Wittet Drive.

(e) Junctions and Side Roads

To provide strategic and local access to the route, alternative junction forms were considered for each location. Table 4-I below provides an overview of the indicative junction arrangements developed for the route.

Corridor	Junction Description
Urban (Inner) Route	Offline Carriageway Construction **R5 Housing Zone Access** • Ghost Island Junction with right turn lane facility provided to allow access to the proposed housing zone located to the west of the route. **Mayne Road** • Modified priority junctions providing access into adjacent housing areas. Online improvements to Wittet Drive **Petrie Crescent Priority Junction** • Retained in existing form. **B9010 Pluscarden Road** • Existing mini roundabout to be replaced by signalised junction providing access to adjacent housing areas. Pedestrian crossing facilities provided on all approaches.

Corridor	Junction Description
	Bruceland Road Crossroads • Existing priority junctions retained in present form. Sub Option U1 **A96 Roundabout Junction** • Normal sized roundabout provided. Sub Option U2 **Wittet Drive Cul-de-sac Junction** • New priority junction provided to allow access to northern extent of Wittet Drive. **R8 Housing Zone Access** • New priority junction provided to allow access to proposed housing zone located to the south of the A96. **A96 Roundabout Junction** • Normal sized roundabout provided. • Access retained to Sheriffmill Road.

Table 4-I Urban (Inner) Route Indicative Junction Arrangements

(f) Climate Topography and Land Use

Details of the climate currently experienced within Elgin and the surrounding area are included within Section 2.1 of this report.

Offline Carriageway Construction

The topography of the land south of the Aberdeen to Inverness railway line is generally flat at 15 metres AOD. To the west of the southern section of the route lies a significant outcrop which rises in height to approximately 32 metres AOD. The southern section of the route generally follows the foot of this outcrop to avoid excessive cutting. On approach to the railway the existing ground rises to a height of 22 metres AOD. The railway itself is located within a shallow cutting at 19 metres AOD on a gradual incline travelling from east to west.

Online improvements to Wittet Drive

To the north of the railway the ground continues to rise along Wittet Drive to a height of 36 metres AOD. The local high point of 37 metres AOD is located to the west of Wittet Drive within the residential area.

Sub Option U1

Beyond the high point on Wittet Drive the ground then falls back on approach to the A96 route. At the existing junction between Wittet Drive and the A96 a level of approximately 31 metres AOD is observed.

Sub Option U2

The houses located on the west side of Wittet drive are generally located on ground of level 35 - 36 metres AOD. Beyond the houses the ground falls away towards the River Lossie valley.

Beneath the proposed A96 junction the ground is observed to have a level of approximately 23 – 25 metres AOD however the existing A96 corridor is built up at a level of 28 metres AOD.

Land use along the length of the Urban (Inner) Route varies. A concentration of residential properties is found on the western extent of Elgin including along the length of Wittet Drive between the A96 and the Aberdeen to Inverness railway line. Community land use in the vicinity of the route includes The Wards Wildlife Site located immediately east of the proposed route. Areas designated for development identified within the Moray Local Plan (The Moray Council, 2008) are located within the vicinity of the route. These include R5 and R9 residential zones.

(g) Geology, Geomorphology and Ground Conditions

The geological map from The Institute of Geological Sciences (IGS), Scotland Sheet 95, Drift Edition (1969; scale 1:50,000) for the area records the ground conditions beneath the Urban (Inner) Route to be composed of 'Recent and Pleistocene glacial sand and gravel'

Deposits of 'Recent and Pleistocene alluvium of flood plains and undifferentiated alluvium' lie 200-500 metres to the west of the proposed route. These flood plain alluvial deposits comprise clays, silts, sands and gravel. Localised areas of peat (lacustrine deposits) are indicated under the footprint of the proposed route south of the railway line, broadly covering the area of The Wards Wildlife Site.

The IGS geological map (Scotland Sheet 95; Solid Edition; 1969; scale 1:50,000) indicates that the underlying bedrock consists of 'Cornstone Beds of upper old red sandstone' for all the proposed route options. There are no geological faults shown on the geological maps reviewed in the vicinity of the proposed options.

In the initial development of the design of the Urban (Inner) Route, an earthworks slope of 1:2 (vertical: horizontal) for embankment slopes has been assumed.

This inclusion of 1:2 (vertical: horizontal) embankment slopes at this stage is based on the consideration that any material used to construct the embankment will consist of imported material suitable to construct such and embankment. There is considered to be little opportunity to obtain material from within the site as the route contains minimal cutting.

An intrusive geotechnical investigation along the length of the route shall be required to provide further guidance on ground conditions during design development.

(h) Hydrology, Hydrogeology and Drainage

The most significant hydrology feature that lies within the vicinity of the proposed route is the wetlands, situated to the south of the Aberdeen to Inverness railway line and to the east of the proposed route. The Urban (Inner) Route is also located out with the defined flood plain of the River Lossie.

An intrusive geotechnical investigation in the vicinity of the proposed earthworks shall be required to provide further guidance on the hydrological and hydrogeological conditions present at this location.

It is anticipated that the carriageway drainage regime shall be assessed in preparing the detailed design should this option be taken forward as the preferred option.

(i) Public Utilities

Public utilities located along the route have been identified as follows:

- Scottish Water drainage plant;
- Scottish Water supply plant;
- Highway drainage infrastructure;
- Openreach plant;
- Scotia Gas Networks plant;
- Scottish and Southern Energy plant; and
- Trunk Road and Local Authority Road Street lighting apparatus.

4.6 Rural (Outer) Distributor Route

(a) Engineering Description

The Rural (Outer) Route consists of three main elements:

- An offline carriageway construction between the A96 and the B9010 Pluscarden Road junctions;
- An offline carriageway construction between the B9010 Pluscarden Road junction and a new junction located south west of Elgin High School; and
- An offline carriageway construction between a new junction located south west of Elgin High School and a junction at the western extent of the Edgar Road extension to be developed by The Moray Council.

Tables 4-J, 4-K and 4-L below, provide a description of the Rural (Outer) Route mainline carriageway design.

A design speed of 100 kph has been adopted for the Rural (Outer) Route between the A96 junction and the junction located south west of Elgin High School. Such geometry is consistent with a strategic bypass route on the southern side of Elgin. A design speed of 70 kph has been adopted for the link connecting to the western extent of Edgar Road.

	Existing Network Enhancements
Corridor Length	2.5km
Design Speed	100 kph / 70 kph

Table 4-J Rural (Outer) Distributor Road Design Speed & Length

The cross sectional dimensions have been determined in accordance with the DMRB and are detailed in Table 4-N below.

Road Type	Verge Width (m)	Footpath Width (m)	Lane Width (m)	Total Width (m)
Primary / District Distributor Road	1 x 2.5 1 x 0.5	1 x 2.0	2 x 3.65 2 x 1.0 H/S	14.3

Table 4-K Rural (Outer) Distributor Road Carriageway Cross Section

A96 Junction to B9010 Pluscarden Road Junction

The route traverses south from the junction with the A96 towards the River Lossie Valley. A 720 metre radius curve sweeps the alignment round towards the south east. The route is initially in a shallow cutting approximately 2 metres deep through fields south of the A96 however this transitions to an embankment on approach to the first River Lossie crossing.

The proposed level of the route over the first River Lossie crossing has been determined in order that the road is above the 1 in 200 year flooding level. Beyond this crossing the road is founded on an embankment approximately 3 metre high which then transitions into a cutting to the south west of Bruceland House.

The route crosses the line of the Bruceland access road within the extents of the cutting and it is therefore proposed that an over bridge be provided to carry the local

road across the proposed route. The maximum depth of cutting is approximately 5 metres.

The route then emerges from the cutting onto a further short length of embankment on approach to the second River Lossie crossing which marks the start of the River Lossie flood plain.

At this point it is proposed that the route crosses the flood plain by means of a culverted embankment which allows through-flow for flood water. The maximum height of this embankment is approximately 7.5 metres.

Beyond the railway crossing the route drops back to existing ground level to form a junction with Pluscarden Road. The culverted embankment extends for a length of 450 metres, terminating on the approach to the proposed junction with Pluscarden Road.

B9010 Pluscarden Road junction to South West junction

South of the Pluscarden Road junction the route continues to head in a south easterly direction at existing ground level. The horizontal alignment of this stretch is initially straight followed by a 2040 metre radius curve.

A further crossing of the River Lossie is required through this stretch of the route and the proposed crossing level has been determined in order that the road is above the 1 in 200 year flooding level. Beyond the third River Lossie crossing the route is on an embankment with a maximum height of 3 metres for a further 0.5 kilometres.

South West Junction to Edgar Road Extension Junction

Provision of a junction south west of the high school allows the route to turn north eastward, to meet an Edgar Road extension. This link contains both areas of cutting and embankment.

The horizontal and vertical alignment of the Rural (Outer) Route is summarised in Table 4-L below.

Chainage	Horizontal Alignment	Chainage	Vertical Alignment
0-1090	Curve, LH, R = 720m	0-402	Sag Curve, k =166
1090 - 1340	Straight	402 - 711	Constant Grade, +1.4%
1340 – 2020	Curve, LH, R = 2040m	711 - 1007	Crest Curve, k =55
2020 – 2330	Curve, RH, R = 510m	1007 - 1020	Constant Grade, -4.0%
2330 - 2510	Curve, LH, R = 360m	1020 - 1072	Sag Curve, k =26
		1072 – 1091	Constant Grade, -2.0%
		1091 – 1800	Constant Grade, +0.5%
		1800 - 1934	Crest Curve, k =100
		1934 - 2020	Sag Curve, k =26
		2020 - 2040	Constant Grade, +1.8%
		2040 - 2310	Crest Curve, k =30
		2310 - 2440	Sag Curve, k =26
		2440 - 2510	Constant Grade, -2.1%

Table 4-L Rural (Outer) Route Alignment

(b) Engineering Constraints

The design of the route takes into consideration the following physical engineering constraints.

- Existing topography;
- Junction provision and connectivity to the existing road network;
- Side roads;
- River Lossie;
- Flood plain extents; and
- Aberdeen to Inverness railway.

(c) Structures

The Rural (Outer) Route requires three crossings of the River Lossie, a single crossing of the Aberdeen to Inverness railway line and a single crossing of a local access road. It also requires a culverted embankment across the River Lossie flood plain. The major structures required are described below.

River Lossie Under Bridge 1

A new structure is required for the first crossing of the River Lossie. It is likely to be a multi-span structure with a report previously prepared by Royal Haskoning titled: *Elgin West Southern Distributor Road Option B - Advice on Hydraulic Constraints* indicating a requirement for a spanning length of approximately 100 metres to accommodate the design peak flood flows in the river.

The hydraulic constraints report also indicated that the minimum soffit level for the structure should be 22.16 metres AOD to allow the 1 in 200 year flood water to pass underneath the structure with appropriate freeboard. The vertical alignment of the route over the structure has been designed in accordance with this requirement.

Bruceland Road Over Bridge

An over bridge is provided to allow access along Bruceland Road to be retained. The cutting depth at this location is approximately 4.3 metres deep which means that the local road will have to be built up on either side to provide the appropriate headroom on the mainline.

River Lossie Under Bridge 2

A new structure is required for the second crossing of the River Lossie. It is likely to be a multi-span structure with a requirement for a spanning length of approximately 100 metres to accommodate the design peak flood flows in the river.

The hydraulic constraints report also indicated that the minimum soffit level for the structure should be 25.63 metres AOD to allow the 1 in 200 year flood water to pass underneath the structure with appropriate freeboard. The vertical alignment of the route over the structure has been designed in accordance with this requirement.

Aberdeen to Inverness Railway Under Bridge

A new structure is required to allow the route to cross the Aberdeen to Inverness railway line. The railway line is located at existing ground level at the proposed structure with an observed level of approximately 25 metres AOD.

The proposed railway structure will be of appropriate width to accommodate the cross section. This will be a single span structure involving standard construction operations. Correspondence with Network Rail has highlighted the need to provide appropriate clearance both horizontally and vertically as follows:

- Horizontal clearance from nearest rail = 4.50 metres
- Vertical clearance from highest rail level = 4.86 metres

A high containment parapet will be required across the structure with associated high containment safety barriers provided on each approach to the structure.

River Lossie Under Bridge 3

A new structure is required for the third crossing of the River Lossie. It will to be a multi-span structure with a spanning length of approximately 60 metres to accommodate the design peak flood flows in the river.

The hydraulic constraints report also indicated that the minimum soffit level for the structure should be 27.86 metres AOD to allow the 1 in 200 year flood water to pass underneath the structure with appropriate freeboard. The vertical alignment of the route over the structure has been designed in accordance with this requirement.

Culverted Embankment

A culverted embankment is required to cross the River Lossie flood plain. This flood plain extends from the second river crossing to the junction with the B9010 Pluscarden Road. Within the extents of this structure the route crosses the River Lossie and the Aberdeen to Inverness railway line. At these points separate structures will be required in order to provide the appropriate span widths.

(d) Departures from Standard

The proposed horizontal and vertical alignment elements of the Rural (Outer) Route do not contain any relaxations nor departures from standard. Whilst the present design does not include provision of transition lengths, these elements will be added at the detailed design stage should this option be taken forward.

(e) Junctions and Side Roads

To provide strategic and local access to the Rural (Outer) Route alternative junction forms were considered for each location. Table 4-M below gives an overview of the indicative junction arrangements developed for the Rural (Outer) Route.

Corridor	Junction Description
Rural (Outer) Route	**A96 Junction** • Normal sized roundabout required. • Access retained to Morriston Road. **Pluscarden Road Junction** • New 4 arm roundabout junction providing access to local road network. **Bypass Continuation Junction** • New 3 arm roundabout junction with the potential to provide a continuation of the route round south Elgin.

Table 4-M Rural (Outer) Route Indicative Junction Arrangements

(f) Climate Topography and Land Use

Details of the climate currently experienced within Elgin and the surrounding area are included within section 2.1 of the report.

The topography of the land along this route is mainly flat apart from a few distinct locations where the land can be considered more undulating.

The ground immediately south of the proposed A96 junction initially rises then falls back, gradually at first then more steeply immediately before the River Lossie. South of the river the land gradually rises from a level of 18 metres AOD at the river itself to a high point of 31 metres AOD to the west of Bruceland House. From this high point the land again falls back towards the River Lossie which is at a level of approximately 21 metres AOD. South of the river the land is generally flat within the extents of the flood plain with only a very gradual rise over towards the proposed junction with Pluscarden Road which itself is found at 24 metres AOD.

South east of Pluscarden Road the existing ground continues to be flat with only a shallow valley containing the River Lossie. A further flat area is found beyond the River Lossie valley before the ground gradually rises up to a height of 28 metres AOD in the vicinity of the proposed development junction.

As the route turns to head north eastwards the topography changes from being generally flat towards a more undulating form. A significant outcrop is located with a height of 37metres AOD to the south of the route. Beyond this the land falls steeply at first then more gradually towards the proposed junction with the Edgar Road Extension.

Land use along the route can be considered mainly agricultural.

(g) Geology, Geomorphology and Ground Conditions

The geological map from The Institute of Geological Sciences (IGS), Scotland Sheet 95, Drift Edition (1969; scale 1:50,000) for the area shows that the majority of the proposed Rural (Outer) Route is underlain by 'Recent and Pleistocene alluvium of flood plains and undifferentiated alluvium' comprising clays, silts, sands and gravels. 'Recent and Pleistocene glacial sands and gravels' are shown below the proposed route approximately 400m south of the tie-in with the A96, at the crossing with Bruceland Road. The published data indicate that the drift geology changes to 'Recent and Pleistocene glacial sand and gravel' at the southern end of the Rural (Outer) Route and the tie-in with the extended Edgar Road.

The IGS geological map (Scotland Sheet 95; Solid Edition; 1969; scale 1:50,000) indicates that the underlying bedrock consists of 'Cornstone Beds of upper old red sandstone' for all the proposed route options. There are no geological faults shown on the geological maps reviewed in the vicinity of the proposed options.

In the initial development of the design of the Rural (Outer) Route, an earthworks slope of 1:2 (vertical:horizontal) for embankment and cutting slopes has been assumed.

This inclusion of 1:2 (vertical:horizontal) embankment slopes is based on the consideration that material to construct the embankment will primarily be imported material suitable to construct such an embankment. Cut material will arise from the cutting south west of Bruceland House, however, the acceptability of this material is not known at this stage and a proportion of material excavated will not be suitable for construction of embankments.

An intrusive geotechnical investigation along the length of the route shall be required to provide further guidance on the earthworks slopes which may be implemented through design development.

(h) Hydrology, Hydrogeology and Drainage

The most significant hydrology feature that lies within the vicinity of the proposed route is the River Lossie

An intrusive geotechnical investigation in the vicinity of the proposed earthworks shall be required to provide further guidance on the hydrological and hydrogeological conditions present at this location.

It is anticipated that the carriageway drainage regime shall be assessed in preparing the detailed design should this option be taken forward as the preferred option.

(i) Public Utilities

Public utilities located along the corridor have been identified as follows:

- Scottish Water supply;
- Highway drainage at the A96 junction shall be affected;
- Openreach apparatus - overhead and underground lines;
- Scottish Gas Network Medium Pressure Mains (multiple crossings);
- Scottish and Southern Energy apparatus; and
- Street lighting.

4.7 Rural (Inner) Distributor Route

(a) Engineering Description

The Rural (Inner) Route consists of a single element:

- An offline carriageway construction between the A96 and the area zoned for housing at Bilbohall. The route crosses the River Lossie, the Aberdeen to Inverness railway line and the B9010 Pluscarden Road to the north of the meander in the River Lossie.

Tables 4-N, 4-O and 4-P below provide a description of the Rural (Inner) Route mainline carriageway design. A design speed of 70 kph has been adopted for the Rural (Inner) Route following consideration of the guidance contained initially within Aberdeenshire Council's Standards for Road Construction Consent and Adoption and the Design Manual for Roads and Bridges (DMRB).

	Existing Network Enhancements
Corridor Length	1.6km
Design Speed	70 Kph

Table 4-N Rural (Inner) Route Design Speed & Length

The cross sectional dimensions have been determined in accordance with Moray Council's Standards for Road Construction Consent and Adoption and are detailed in Table 4-O below.

Road Type	Verge Width (m)	Footpath Width (m)	Lane Width (m)	Total Width (m)
Primary / District Distributor Road	2 x 2.0 1 x 0.5	1 x 3.0	2 x 3.65	14.8

Table 4-O Rural (Inner) Route Carriageway Cross Section

The Rural (Inner) Route provides a new offline route between the A96 and retail and housing areas of south west Elgin.

Departing the A96 junction southwards the route passes through the existing caravan park as it approaches a single River Lossie crossing.

Beyond the River Lossie crossing the route sweeps round the western extents of the distillery and flood plain on a 600 metre radius left hand horizontal curve. The horizontal and vertical alignment through this section is dictated by the flooding extents of the River Lossie as indicated in figures included in the aforementioned report prepared by Royal Haskoning.

The corridor severs Bruceland Road to the south west of the distillery and access provision for properties to the west of the corridor shall be included in the form of a priority junction.

Beyond this junction the corridor follows the route of the north eastern bank of the River Lossie on 510 metre and 1020 metre radius left hand horizontal curves and gains elevation to cross the Aberdeen to Inverness railway line and B9010 Pluscarden Road.

The headroom requirements for the railway crossing were determined through consultation with Network Rail. The corresponding figure for the road crossing was

determined from guidance contained within TD27/05 of the DMRB: *'Cross Section and Headroom's'*. The detailed requirements for headroom's shall be included as part of the DMRB Stage 3 assessment which shall include the detailed design of structures required along the route.

Beyond the two structures, the corridor descends at the maximum permissible gradient of 6% to tie into of the access road planned to serve the Bilbohall R5 housing zone.

Thereafter, the corridor follows the northern boundary of the R5 housing zone and will tie into the R5 housing zone access road continued from Edgar Road roundabout.

The horizontal and vertical alignment of the Urban (Inner) Route is summarised in Table 4-P below.

Chainage	Horizontal Alignment	Chainage	Vertical Alignment
30 -117	Straight	30 - 75	Sag Curve, k =20
117 - 158	Transition, LH, RL = 41m	75 - 193	Crest Curve, k =30
158 - 471	Curve, LH, R = 600m	193 - 278	Sag Curve, k =20
471 - 488	Transition, LH, RL = 17m	278 - 343	Crest Curve, k =30
488 - 822	Curve, LH, R = 510m	343 - 404	Constant Grade, -1%
822 - 846	Transition, LH, RL = 24m	404 - 513	Sag Curve, k =20
846 - 1467	Curve, LH, R = 1020m	513 - 587	Crest Curve, k =30
1467 - 1575	Straight	587 - 606	Constant Grade, +2%
		606 -667	Crest Curve, k =30
		667 - 755	Sag Curve, k =20
		755 - 895	Crest Curve, k =30
		895 - 944	Sag Curve, k =20
		944 - 1188	Crest Curve, k =30
		1188 - 1199	Constant Grade, -6%
		1199 - 1299	Sag Curve, k =20
		1299 - 1465	Constant Grade, -1%
		1465 - 1525	Sag Curve, k =20
		1525 - 1572	Crest Curve, k =30

Table 4-P Rural (Inner) Route Alignment

(b) Engineering Constraints

The design of the Rural (Inner) Route takes into consideration the following physical engineering constraints.

- Existing topography;
- Junction provision and connectivity to the existing road network;
- Side road crossings;
- River Lossie Crossing;
- Flood Plain location; and
- Aberdeen to Inverness Railway.

(c) Structures

This route requires three major structures and may also require minor culverts for local watercourses.

River Lossie Crossing

A new structure will be required to cross the River Lossie. The span length of the structure will be similar to that required for the structure on the Rural (Outer) Route located a short distance upstream of this location. A 100 metre span is required to accommodate the design peak flood flows in the river and the minimum soffit level for the River Lossie crossing should be 22.16 metres AOD.

Aberdeen to Inverness Railway Crossing

A new structure will be required to cross the Aberdeen to Inverness railway line.

The railway line is located at existing ground level at the proposed structure location with an observed level of approximately 24.5 metres AOD.

The proposed railway structure will be of appropriate width to accommodate the cross section. This will be a single span structure involving standard construction operations. Correspondence with Network Rail has highlighted the need to provide appropriate clearance both horizontally and vertically as follows:

- Horizontal clearance from nearest rail = 4.50m
- Vertical clearance from highest rail level = 4.86m

The vertical alignment of the mainline has been designed to reflect this requirement.

A high containment parapet will be required across the structure with associated high containment safety barriers provided on each approach to the structure.

B9010 Pluscarden Road Crossing

A further structure carrying the route over the B9010 Pluscarden Road is required. This will be a single span structure involving standard construction operations.

The headroom required on Pluscarden road has been assumed to be 5.3 metres in accordance with Table 6.1 of TD27/05 of the DMRB. The vertical alignment of the mainline has been designed to reflect this requirement.

(d) Departures from Standard

The proposed horizontal and vertical alignment elements of the Rural (Inner) Route do not contain any relaxations nor departures from standard. Whilst the present design does not include provision of transition lengths, these elements will be added at the detailed design stage should this option be taken forward.

(e) Junctions and Side Roads

To provide strategic and local access to the Rural (Inner) Route alternative junction forms were considered for each location. Table 4-Q below gives an overview of the indicative junction arrangements developed for the Rural (Inner) Route.

Corridor	Junction Description
Rural (Inner) Route	**A96 Junction** • Normal sized roundabout required. • Access retained to Morriston Road. **Bruceland Road Junction** • New priority junction providing access to properties and farm to the west of the corridor. **Mayne Road Junctions** • New pair of priority junction providing access to Mayne road north and south of corridor.

Table 4-Q Rural (Inner) Route Junction Arrangements

(f) Climate Topography and Land Use

Details of the climate currently experienced within Elgin and the surrounding area are included within section 2.1 of the report.

The topography of the land at the proposed A96 junction is predominantly flat before falling, gradually at first, then steeply towards the River Lossie valley. The height difference between the proposed A96 Junction and the River is approximately 6.5 metres. South of the river crossing the ground is largely flat at 19 metres AOD adjacent to the distillery with an area of elevated ground located to the west. The ground then rises towards the access road which serves Bruceland Farm at 26 metres AOD. Beyond the access road the land then falls again to a further flat area at 23 metres AOD. The land then rises again towards the Aberdeen to Inverness railway line and B9010 Pluscarden Road at 24 and 25 metres AOD respectively. Beyond the B9010, the land undulates before rising significantly towards an outcrop which has a height of 39 metres. Mayne road is intersected at a height of approximately 21 metres AOD. To the east of Mayne Road at the connection to the committed housing zone access road the land rises again to a natural out crop at 32 metres AOD located to the south of the corridor.

With regard to land use, the northern bank of the River Lossie includes a Caravan Park and a number of the surrounding fields are utilised for livestock grazing. To the south of the River Lossie and west of the distillery the land can be described as largely rural flood plain which is also used for agricultural purposes. A small area of woodland is located between these fields and the Bruceland access road. South east of the access road further agricultural fields are located that extend across to the Aberdeen to Inverness Railway line. Beyond the railway line, the land consists of residential areas with a number of properties located in the Palmers Cross area north of the River Lossie. East of Palmers Cross, the route enters a further agricultural area that extends across to Mayne Road. East of Mayne road an area of ground which has been developed in part into housing is found.

(g) Geology, Geomorphology and Ground Conditions

In the initial development of the design of the Rural (Inner) Route, an earthworks slope of 1:2 (vertical:horizontal) for embankment and cutting slopes has been assumed.

This inclusion of 1:2 (vertical:horizontal) embankment slopes is based on the consideration that material to construct the embankment will primarily be imported material suitable to construct such an embankment. Cut material will arise from the cutting south east of Palmers Cross however the acceptability of this material is not known at this stage and a proportion of material excavated will not be suitable for construction of embankments.

An intrusive geotechnical investigation along the length of the route shall be required to provide further guidance on the earthworks slopes which may be implemented through design development.

(h) Hydrology, Hydrogeology and Drainage

The most significant hydrology feature that lies within the vicinity of the proposed route is the River Lossie

An intrusive geotechnical investigation in the vicinity of the proposed earthworks shall be required to provide further guidance on the hydrological and hydrogeological conditions present at this location.

It is anticipated that the carriageway drainage regime shall be assessed in preparing the detailed design should this option be taken forward as the preferred option.

(i) Public Utilities

Public utilities located along the corridor have been identified as follows:

- Scottish Water supply - several supply pipes crossed - multiple crossings of one pipe;
- Highway drainage at the A96 junction shall be affected;
- Openreach apparatus - overhead and underground lines;
- Scotia Gas Networks apparatus - 2 x medium pressure pipes crossed.
- Scottish and Southern Energy apparatus; and
- Street lighting apparatus.

4.8 Discussion

Following the engineering assessment and review of the costs associated with each option it was decided that whilst a cost saving could be achieved through amending the Rural (Outer) Route design from a viaduct structure to culverted embankment, the level of cost reduction achieved did not merit further assessment of this route. As a result of this decision the Rural (Outer) Route has not been assessed with regard to environmental and traffic / economic conditions at Stage 2.

The routes to be further assessed with regard to environmental and traffic / economic conditions are:

- Existing Network Enhancements; and

- Urban (Inner) Distributor Route.

The Rural (Inner) Route has been assessed with regard to traffic / economic conditions only.

5 ENVIRONMENTAL APPRAISAL

5.1 Overview of Environmental Appraisal

5.1.1 Introduction

This chapter outlines the general approach followed for the environmental appraisal of the proposed route options for the Elgin Traffic Management Scheme, as reported in Chapters 2 to 4 and 6. More detailed methodologies are provided in the respective chapters.

Following completion of the DMRB Stage 1 Report it was decided that further environmental assessment of the Rural (Outer) Route was not appropriate. This decision was taken since the route exhibited numerous engineering complexities which consequently resulted in an unattractive Benefit to Cost Ratio. From the Stage 1 Environmental Assessment it was reported that this route had the most significant impacts on the environment including Ecology, Landscape, Land Use and the Water Environment.

Similarly, it was decided that an environmental assessment of the Rural (Inner) Route was not appropriate. Whilst containing less engineering complexities than the Rural (Outer) Route, the cost of the Rural (Inner) Route was still considered expensive in comparison to the potential benefits returned. Shortcomings with this route include a significant length built on embankment, limited connectivity to the local road network and also impacts on residential properties at various points on the route.

5.1.2 Scope and Guidance

(a) Scope of Environmental Appraisal

An Environmental Assessment was undertaken in July 2010 (Jacobs Consultancy, 2010) following guidance in the Design Manual for Roads and Bridges (DMRB) (Highways Agency et al., 1993a) for Stage 1. In accordance with the guidance, assessment of all 11 environmental parameters was undertaken. The Stage 1 assessment identified where potential environmental effects could arise as a result of the proposed corridor options.

Based on the results of the Stage 1 assessment, the following environmental parameters were identified as the priorities for further assessment:

- Air Quality;
- Ecology and Nature Conservation;
- Landscape and Visual; and
- Noise and Vibration.

These environmental parameters have been assessed for the Existing Network Enhancements Option and Urban (Inner) Option following DMRB Stage 2 and ‘simple level’ assessment methodology, the results of which are reported in this Environmental Appraisal.

However, it should be noted that a full Stage 2 assessment of these options would include consideration of additional environmental parameters rather than only those identified as priorities from the outcome of the Stage 1 assessment.

The objectives of Stage 2 and simple assessments are to identify the factors and effects to be taken into account in the selection of route options and to identify the environmental advantages, disadvantages and constraints associated with these proposed route options. The appraisal reported in this document, although not a complete Stage 2 assessment, provides useful and pertinent information on the environmental impacts of the Existing Network Enhancements and Urban (Inner) Route.

(b) Study Area

The study area required or recommended by DMRB and best practice guidance varies depending on the specific environmental parameter being assessed. The defined study area for each parameter is therefore provided in the respective chapters.

(c) Proposed Route Options

The following proposed route options of the Elgin Traffic Management Scheme have been assessed and are presented in this report:

- Existing Network Enhancements; and
- Urban (Inner) Option.

The Do Nothing Scenario will be considered where appropriate as a baseline to assess the proposed route options.

The proposed route options are shown on Figure 1 contained in Appendix I and descriptions are contained in previous chapters.

5.1.3 Environmental Reporting

(a) Chapter Structure

Each environmental chapter as listed above provides the following:

- Approach and methods used in the assessment (including reference to legislation and policy where relevant);
- Baseline conditions;
- Potential environmental effects of the proposed route options (construction and operational);
- Potential mitigation, focussing on standard or typical mitigation that is anticipated would be developed for the preferred route at DMRB Stage 3 (construction and operational); and
- Summary of the route options assessment (taking account of potential mitigation where appropriate).

A reference list for each environmental parameter is provided in Chapter 8 of this report.

(b) General Approach

(i) Baseline Conditions

The assessment of impacts on each environmental parameter is undertaken in comparison to baseline conditions, which were determined though field survey (landscape and ecology only) and desk-based review. Baseline conditions describes the existing environmental conditions at the site (and in the wider area as pertinent to the particular environmental parameter) including, where applicable, if/how this would be expected to change if the proposed scheme did not go ahead (i.e. the 'Do Nothing' Scenario).

(ii) Potential Environmental Effects

The general approach to assessment is based on the determination of impact significance from a combination of the sensitivity or importance of the baseline conditions (i.e. the current site and its environs, including the sensitivity of receptors) and the magnitude of potential impacts. This process is described in the respective environmental chapters.

It should be noted that the magnitude and significance reported within the 'Potential Environmental Effects' section of each chapter have been considered in the absence of mitigation. The 'Summary of Options Assessment' then takes into account potential mitigation where appropriate.

Construction and operational impacts are addressed separately in the respective environmental chapters. For the purposes of this Environmental Appraisal, construction impacts are considered temporary. Any exceptions to this are noted. Operational impacts are considered long term or permanent, again with any exceptions being noted.

(iii) Potential Mitigation

As noted within the respective environmental chapters, the detailed design has not been developed at this stage, and mitigation detail therefore cannot be confirmed. The assessments identify 'generic' or 'anticipated' mitigation taking into account best practice, legislation and guidance and experience.

Generally, potential impacts of 'Moderate' or greater significance would be identified as priorities for mitigation. However, the need for mitigation should be confirmed through a more detailed assessment at DMRB Stage 3.

(iv) Summary of Options Assessment

This Section provides a summary of the assessment for each option and, where applicable, identifies residual impacts taking into account identified potential mitigation. A robust basis for comparative assessment and for the selection of a preferred route option to be taken forward to DMRB Stage 3 is provided.

(v) Scope of Stage 3 Assessment

This Section briefly sets out further work which should be carried out at DMRB Stage 3.

5.1.4 Review of Previous Consultation

Consultation was undertaken in July 2010 as part of the DMRB Stage 1 assessment. The responses were used to inform the assessment and are referred to in the Elgin Western Distributor Route – DMRB Stage 1 Report (Section 5 Environmental Assessment) (Jacobs Consultancy, 2010).

Due to the short time period since the Stage 1 consultation, it was not considered necessary to consult again as part of this Environmental Appraisal for air quality, landscape, noise and vibration. A review of the information gathered through the previous consultation was therefore undertaken to inform this assessment. Further consultation should take place as part of the Stage 3 assessment for these parameters.

As part of the ecology and nature conservation assessment, further consultation has taken place to inform obtain more detailed baseline information. The list of consultees and the information they provided is discussed in Chapter 3 (Ecology and Nature Conservation).

5.2 Air Quality

5.2.1 Introduction

This chapter presents the assessment of the potential air quality impacts of the Existing Network Enhancements Option and the Urban (Inner) Option. The Do Nothing Scenario is included in the assessment as the baseline scenario against which the proposed route options are compared. The assessment has been undertaken following guidance in the Design Manual for Roads and Bridges (DMRB) (Highways Agency et al, 2007) for a Simple Assessment.

The results of this assessment will be used to determine whether or not a Detailed Assessment is required.

Nitrogen oxides are formed principally by the combination of oxygen and nitrogen during combustion in air. Nitrogen oxides comprise nitric oxide (NO) which is harmless, and the regulated pollutant NO2. Both gases are emitted during combustion in air, and some NO is hence also converted to NO2. Since 2006, attention has been drawn to the phenomenon of increasing primary emissions of NO2 from vehicle exhausts. This is believed to be as a result of the introduction of particulate traps and other abatement equipment to the vehicle fleet.

PM_{10} in the atmosphere has primary and secondary sources. Primary PM_{10} is emitted from the same combustion sources as NO, with the exception of gas combustion. Other sources of primary PM_{10} include sea salt, crustal matter and suspended particles from roads and brake wear. Secondary PM_{10} is formed in the atmosphere from gaseous pollutants (including NO_2s).

5.2.2 Legislation and National Policy

The Air Quality Strategy for England, Scotland and Northern Ireland (DEFRA, 2007) sets the policy framework for air quality in the UK. Air Quality (AQ) Objectives are policy targets derived from standards and take into account economic efficiency, practicability, technical feasibility and timescale. The Air Quality Strategy states that the annual mean objective for nitrogen dioxide (NO_2) is still not expected to be met at some roadside locations in the UK by 2020, despite the need to comply with European legislation by 2010.

Based on the evidence of the Air Quality Management Areas (AQMAs) currently declared for traffic emissions, if the annual mean NO_2 AQ Objective is being met, then the AQ Objectives for particulate matter (PM_{10}), carbon monoxide, benzene and 1-3-butadiene will also be met (except where there is a major industrial source of PM_{10}). Carbon monoxide, benzene and 1,3-butadiene are therefore screened out of this assessment.

The Air Quality Objectives for NO_2 and PM_{10} are listed in Table 5-A below as set out in guidance for Local Air Quality Management, TG (09) (DEFRA/Scottish Executive, 2009).

Pollutant	Objectives		Date to be achieved by
	Concentration	Measured as	
Nitrogen Dioxide NO_2	200 µg/m^3 not to be exceeded more than 18 times a year	1 hour mean	31 December 2005
	40 µg/m^3	Annual mean	31 December 2005
Particulate Matter PM_{10}	50 µg/m^3 not to be exceeded more than 7 times a year	24 hour mean	31 December 2010
	18 µg/m^3	Annual mean	31 December 2010

Table 5-A Relevant Air Quality Objectives

Under the Air Quality Strategy, local authorities have delegated responsibilities from national government for air quality in their areas. Whilst the UK government retains ultimate responsibility for air quality, local authorities have statutory duties with respect to air quality, known collectively as Local Air Quality Management (LAQM). Local authorities are required to assess air quality against the AQ Objectives. Where AQ Objectives are not being met, local authorities are required to declare AQMAs and draw up Air Quality Action Plans, which set out a strategy of how the AQ Objectives will be met. Whether an AQMA has been declared or not, local authority officers with responsibility for air quality are expected to provide professional advice on the air quality impact of planning determinations.

5.2.3 Approach and Methods

The key approach to this air quality assessment is to determine whether the potential impacts of the proposed route options will compromise the UK AQ Objectives as discussed above.

In addition to the DMRB methodology, guidance provided in the Local Air Quality Management, TG(09) (DEFRA/Scottish Executive, 2009) and the document 'Development Control: Planning for Air Quality, 2010 Update' (Environment Protection UK, 2010) has been used to undertake this assessment.

Predictions of current and future pollutant concentrations arising from vehicle emissions, both with and without the proposed route options in place, were made using the DMRB methodology, which uses an excel -based screening model. A summary of the model is provided below, further information is presented in Appendix D (Air Quality Modelling).

The screening model was produced in general accordance with the methodology described in the Local Air Quality Management, TG(09) (DEFRA/Scottish Executive, 2009). This included the treatment of NO_2 using the updated TG(09) method for deriving NO_2 from NO_x using a spreadsheet calculator from the Air Quality Information Archive (DEFRA, 2010). This approach takes account of the difference between fresh emissions of NO_x and background NO_x, the concentration of ozone, and the different proportions of primary NO_2 emission in different years.

The DMRB screening criteria for changes in traffic flow, speed and alignment have been used to select roads and receptors for inclusion in the screening model. The main criterion is for a change in Annual Average Daily Traffic (AADT) of more than 1,000 vehicles. These roads are referred to as 'affected roads'.

Routes along the network have been classed as 'B' (urban roads that are neither motorways or 'A' roads) where flows are less than 10,000 AADT. Road distances between centreline and receptors have been estimated using computer assisted tools and professional judgement.

Where average traffic speeds were not identified, national speed limits were applied to the model. Flows on roundabouts have been calculated in accordance with the DMRB guidance.

Using the traffic data, the screening model calculations predict the concentrations of pollutants at specified locations. A total of 24 specific receptors have been identified in the vicinity of the proposed route options and along roads assessed to be affected and which meet DMRB assessment criteria.

The following scenarios have been assessed:

- Baseline 2006 - This scenario models the existing air quality in the area for 2006 for model verification purpose (refer to Appendix D, Air Quality Modelling);
- Do Nothing – Opening Year. This scenario considers the existing air quality in the area unchanged in 2014;
- Do Something - Opening Year. This scenario considers the Existing Network Enhancements Option in 2014; and
- Do Something - Opening Year. This scenario considers the Urban (Inner) Option in 2014.

As recommended in DMRB, the air quality impacts are not predicted for the Design Year (2029), as pollutant release rates and baseline concentrations cannot be accurately predicted that far ahead.

(a) Baseline Conditions

The first stage of this assessment was to establish existing air quality in the vicinity of the proposed route options in order to:

- Provide background levels to compare potential air quality impacts of the proposed route options (both positive and negative) against;
- Identify current 'hot spots' in terms of air quality; and
- Gain an understanding of important existing local sources of air pollution close to the proposed route options.

Background concentrations of pollutants are normally obtained from two sources, local monitoring and/or national pollution modelling. No specific monitoring has been carried out for this assessment. Monitoring data from diffusion tubes monitored by The Moray Council are therefore used in this assessment.

Diffusion tube measurements should be bias corrected against a local continuous monitor, and there should be evidence that quality assurance procedures have been adhered to in obtaining the measurements. Where a local continuous monitor is not available for bias correction, default bias correction values can be used from diffusion tubes of the same type analysed by the same laboratory. The diffusion tube

measurements used for this assessment have been corrected as described in Appendix D (Air Quality Modelling).

Baseline air quality at 'hotspots' is normally represented by 'roadside' or 'kerbside' measurements. Most measurements made by a local authority are to identify the high pollution concentrations in the area (hotspots), in order to assess maximum human exposure.

The baseline air quality presented in this chapter is the result of a desk study only, however, this is considered to be adequate for the purposes of a Simple Assessment.

(b) Impact Assessment

Environment Protection UK provides a method to assess the impact significance and impact magnitude in air quality assessments, as presented in Table 5-B and Table 5-C below. All residential properties are considered to be equally sensitive receptors.

Magnitude of Change	Annual Mean Change in Pollutant Concentrations
Large	Increase/decrease >10% or > 4 µg/m3
Medium	Increase/decrease 5-10 % or 2 – 4 µg/m3
Small	Increase/decrease 1-5% or 0.4 – 2 µg/m3
Imperceptible	Increase/decrease <1% or < 0.4 µg/m3

Table 5-B Definition of Impact Magnitude for changes in pollutant concentrations as a percentage of the assessment level for NO_2 and PM_{10}

The significance criteria are set out in Table 5-C below. The significance of impact may be beneficial or adverse. Only the criteria for adverse impacts are shown in the table below; a similar matrix has been used for beneficial impacts.

Absolute Concentration in Relation to Objective/Limit Value	Impact Significance (Change in Concentration)		
	Small	Medium	Large
Above Objective/Limit Value With Scheme (>40 µg/m^3 or *>18 µg/m^3*)	Slight Adverse	Moderate Adverse	Substantial Adverse
Just Below Objective/Limit Value With Scheme (36-40 µg/m^3 or *16.2-18 µg/m^3*)	Slight Adverse	Moderate Adverse	Moderate Adverse
Just Below Objective/Limit Value With Scheme (30 – 36 µg/m^3 or *13.5-16.2 µg/m^3*)	Negligible	Slight Adverse	Slight Adverse
Well Below Objective/Limit Value With Scheme (<30 µg/m^3 or *<13.5 µg/m^3*)	Negligible	Negligible	Slight Adverse

Table 5-C Impact Significance Descriptors for changes to annual mean NO_2 and PM_{10}

5.2.4 Baseline Conditions

This section sets out the baseline air quality within Elgin and establishes the existing pollutant concentrations of traffic related pollutants within the study area defined by the screening model.

The transport network within Moray comprises the A96 trunk road linking Aberdeen, Elgin and Inverness. Alternative sources of air pollution in the vicinity of the proposed route options include a mainline rail link which passes east-west to the north of Moray and several industrial installations within Elgin, which do not contribute significantly to pollutant concentrations in the area. The current main source of atmospheric emissions in Elgin is road traffic. Domestic and commercial heating and cooking, and pollution transported from other authorities comprise lesser sources.

(a) Updating and Screening Assessment for Moray Council, May 2009

The Moray Council has undertaken a number of reviews of air quality within the authority in order to comply with the requirements of the Air Quality Strategy. The most recent Air Quality Progress Report has not yet been published, therefore the Updating and Screening Assessment (USA) published in May 2009 (BMT Cordah Ltd, 2009) is referred to below to describe the baseline air quality across Elgin.

A detailed assessment of PM_{10} emissions from road traffic was carried out in 2005 at two adjacent busy road junctions in Elgin. The monitoring and detailed modelling undertaken indicated that it was unlikely that AQ Objectives would be exceeded.

Additional modelling was carried out in the vicinity of RAF Kinloss and RAF Lossiemouth to determine the impact on air quality with regard to aircraft operations.

The report concludes that a review of new monitoring data and all emission sources in the area showed that the AQ Objectives were being met and there was no further assessment was required. Existing concentrations of most of the priority pollutants in Moray are low and air quality is considered to be good. Moray Council has therefore not declared an Air Quality Management Area (AQMA) in Elgin.

However, NO_2 concentrations close to the annual mean AQ Objective in 2008 were reported at the west end of Elgin High Street. The Moray Council has agreed to undertake additional monitoring around Elgin in response to this, given the regional trend of increasing NO_2 concentrations and likely traffic growth in Elgin.

The Moray Council's network of diffusion tubes measure levels of the traffic related pollutant NO_2. These are positioned at road or kerbside locations to identify local pollution 'hotspots'. Elgin has six roadside, one intermediate and one background diffusion tube. Results from a selection of these are presented in Table 5-D below.

PM_{10} has not been measured in recent years as there is considered to be little risk of breaching AQ Objectives.

(b) Nitrogen Dioxide (NO_2)

ID	Location		Annual mean NO_2 Concentrations ($\mu g/m^3$)			
	x	y	2006	2007	2008	2009
E1	321105	862669	34.5	39.0	38.3	39.2
E2	322348	862745	28.6	31.0	30.6	30.8
E4	322249	862630	10.9	12.0	11.1	12.2
E5	322233	861869	18.8	22.7	23.9	24.8
E6	322029	862832	20.6	24.0	22.7	22.4

Table 5-D NO_2 Diffusion Tube Annual mean Concentrations $\mu g/m^3$ (bias adjusted)

As shown in the table above, the roadside concentrations are consistent and all measurements are below the annual mean AQ Objective despite being roadside concentrations. Concentrations along the High Street (E1) are close to the AQ Objective which is expected as it is located adjacent to the busy A96 and close to Elgin city centre. The background location (E4) is typical of an urban background site, influenced by minimal road or industrial source contributions.

(c) Updated National Background Pollution Maps

In 2010, new national mapping of background air pollution was published on the Air Quality Information Archive (AQIA) (DEFRA 2010), for the pollutants NO_2 and PM_{10}.

The data from four 1 kilometre x 1 kilometre grid squares covering Elgin were reviewed and the grid square covering the northeast of Elgin was selected. This is considered the most appropriate as a background given the differing environmental character of the surrounding grids and its similarity to the measured background data in 2009 at E4 within the same grid square.

Pollutant	Pollutant Concentration (µg/m^3)	
	2009	2014
Nitrogen Dioxide (NO_2)	11.7	9.9
Nitrogen Oxides (NOx)	17.0	14.1
Particulate Matter (PM_{10})	8.4	7.9

Table 5-E Mapped Estimated Background Concentrations for 1km by 1km square centre (Grid Ref. 321500, 862500)

A review of the available monitoring data shows that even at roadside locations, pollutant concentrations are within AQ Objectives in Elgin. The monitoring data available for Elgin is considered to be consistent and representative for model verification purposes, although it is noted that there are large variations in the measured concentrations between roadside locations on roads of similar character.

The background monitoring site available (E4) is considered a suitable site for use as a background and is similar to the AQIA mapped estimate for its grid square. The measured data is slightly elevated, which is likely to be the result of its built environment and the vicinity of busy roads. The mapped estimates are therefore considered to be the most appropriate values to use as background concentrations for the assessment.

(d) Air Quality Receptors

As part of this assessment, future baseline air quality has been predicted at specific locations. Changes in air pollution arising from the change in traffic flows are predicted by the screening model at specific locations (receptors) considered likely to be worst affected. The receptors are chosen to represent exposure relevant to the AQ Objectives and are listed in Table 5-F below with their associated grid reference coordinates. For annual mean objectives, these are taken to be residential dwellings.

Figure 2 (Air Quality Receptors) shows the location of the receptors and selected The Moray Council diffusion tubes (DT).

Recept or No.	Receptor Location	X Co-ordinate	Y Co-ordinate
1	5 Wittet Drive	320449	862645
2	Braeview West Road (A96)	320489	862676
3	56 Pluscarden Road	320597	862397
4	19 Fairfield Way	320764	862015
5	3 West Road (A96)	320900	862633
6	19 Pluscarden Road	320770	862449
7	South Street/Gray's Roundabout (house)	320961	862589
8	278 High Street (A96)	321068	862632
9	DT High Street (A96)	321105	862669
10	9 Murdoch's Wynd (A96)	321255	862779
11	25 Murdoch's Wynd (A96)	321280	862849
12	Scottish Agricultural College 34 Moray Street	321400	862460
13	Wards Road (house)	321289	862219
14	Edgar Road (house)	321360	861760
15	13 College Street	322000	862913
16	DT High Street/South Street (A96)	322029	862832
17	54 South College Street (A96)	322212	862814
18	DT Maisondieu Road/East Road	322348	862745
19	1-2 Ashgrove Road	322655	862370
20	29 Maisondieu Rd	322288	862410
21	Moss Street (office)	321983	862311
22	New Elgin Road (house)	322187	861978
23	DT New Elgin Road	322233	861869
24	2-8 Hay Street	321583	862312

Table 5-F Specific Receptor Locations

5.2.5 Potential Environmental Effects

The prediction of future air quality in the Year of Opening (2014) takes into account the predicted improvements in background air quality and the predicted reduction in emissions from traffic as a result of improved engine technologies. As noted previously, the Year of Opening (2014) Do Nothing Scenario is the baseline scenario against which the proposed route options are compared to assess their impact on air quality. A comparative assessment against the AQ Objectives has also been undertaken.

The receptors identified are considered to represent the worst affected locations.

'Relevant exposure' is a term used to describe where members of the public are likely to be regularly present and are likely to be exposed for a period of time.

(a) Do Nothing

Table 5-G below presents the predicted pollutant concentrations at the identified receptors without any of the proposed route options in place for the Year of Opening (2014).

Receptor No.	Receptor Location	Annual Average PM_{10} ($\mu g/m^3$) 2014	Annual Average NO_2 ($\mu g/m^3$) 2014
1	5 Wittet Drive	8.9	18.9
2	Braeview West Road (A96)	10.1	28.6
3	56 Pluscarden Road	8.5	15.2
4	19 Fairfield Way	8.0	10.3
5	3 West Road (A96)	9.8	26.7
6	19 Pluscarden Road	8.1	12.0
7	South Street/ Gray's Roundabout (house)	10.9	34.1
8	278 High Street (A96)	9.2	21.5
9	DT E1 High Street (A96)	9.7	25.3
10	9 Murdoch's Wynd (A96)	10.0	26.3
11	25 Murdoch's Wynd (A96)	9.6	23.0
12	Scottish Agricultural College 34 Moray Street	9.0	18.6
13	Wards Road (house)	8.5	13.9
14	Edgar Road (house)	8.1	11.0
15	13 College Street	9.5	22.9
16	DT E6 High Street/South Street (A96)	10.1	28.4
17	54 South College Street (A96)	9.6	24.9
18	DT E2 Maisondieu Road/East Road	10.9	33.1
19	1-2 Ashgrove Road	8.3	13.1
20	29 Maisondieu Rd	9.0	19.1
21	Moss Street (office)	9.1	20.1
22	New Elgin Road (house)	9.6	22.1
23	DT E5 New Elgin Road	9.6	22.5
24	2-8 Hay Street	9.0	19.3

Table 5-G Do Nothing Opening Year (2014) annual mean NO_2 and PM_{10} Concentrations ($\mu g/m^3$)

Under the Do Nothing Scenario, the pollutant concentrations for the Year of Opening (2014) are predicted to be within AQ Objectives at all of the selected receptors. Concentrations would be elevated at roadside locations, given the proximity to traffic emissions. However, these locations are not considered to be of relevant exposure and are therefore of reference value only. Receptors considered to be of reference value only include 9, 16, 18, 21 and 23.

(b) Existing Network Enhancements Option

(i) Construction

The only potentially significant impact on air quality arising from the construction of the Existing Network Enhancements Option is anticipated to be a result of the generation of nuisance dust. Nuisance dust may affect locations up to 200 metres from the dust source, dependent on meteorological conditions and the source strength. However, nuisance dust does not have significant public health implications, would be of short duration, and can be mitigated.

It is not anticipated that there will be any long term air quality impacts as a result of the construction of this proposed scheme option.

(ii) Operation

Table 5-H and Table 5-I below present the predicted pollutant concentrations at the identified receptors with the Existing Network Enhancements Option in place during the Year of Opening (2014).

Nitrogen Dioxide (NO_2)

Receptor No.	Receptor Location	Annual mean NO_2 (µg/m^3)		% Change in relation to AQ Objective
		Existing Network Enhancements Option 2014	Do Nothing Scenario 2014	
1	5 Wittet Drive	21.9	18.9	7.5
2	Braeview West Road (A96)	28.9	28.6	0.9
3	56 Pluscarden Road	19.7	15.2	11.3
4	19 Fairfield Way	10.3	10.3	-0.1
5	3 West Road (A96)	24.7	26.7	-5.1
6	19 Pluscarden Road	14.1	12.0	5.2
7	South Street/ Gray's Roundabout (house)	31.1	34.1	-7.7
8	278 High Street (A96)	21.5	21.5	0.0
9	DT E1 High Street (A96)	25.3	25.3	0.0
10	9 Murdoch's Wynd (A96)	26.1	26.3	-0.7
11	25 Murdoch's Wynd (A96)	23.2	23.0	0.3
12	Scottish Agricultural College 34 Moray Street	17.4	18.6	-3.0
13	Wards Road (house)	13.8	13.9	-0.3
14	Edgar Road (house)	10.9	11.0	-0.3
15	13 College Street	23.6	22.9	1.9
16	DT E6 High Street/South Street (A96)	27.8	28.4	-1.5
17	54 South College Street (A96)	24.4	24.9	-1.3
18	DT E2 Maisondieu Road/East Road	31.1	33.1	-5.0

Receptor No.	Receptor Location	Annual mean NO_2 ($\mu g/m^3$)		% Change in relation to AQ Objective
		Existing Network Enhancements Option 2014	Do Nothing Scenario 2014	
19	1-2 Ashgrove Road	13.2	13.1	0.2
20	29 Maisondieu Rd	16.1	19.1	-7.4
21	Moss Street (office)	16.1	20.1	-9.9
22	New Elgin Road (house)	19.85	22.1	-5.5
23	DT E5 New Elgin Road	20.18	22.5	-5.7
24	2-8 Hay Street	18.3	19.3	-2.6

Table 5-H Do Something – Existing Network Enhancements Option NO_2 Concentrations ($\mu g/m^3$) 2014

With the Existing Network Enhancements Option in place, most NO_2 levels at the identified receptors are predicted to be well within the AQ Objective. 15 receptors are predicted to experience a reduction in pollutant concentration. The greatest reduction (of relevant exposure) is predicted at receptor 7, (3.1$\mu g/m^3$) which equates to a 7.7 % reduction compared to the AQ Objective. This would appear to be a direct consequence of the traffic redistribution. Conversely, six receptors are predicted to experience an increase in pollutant concentration, the greatest increase anticipated at receptor 3, (4.5 $\mu g/m^3$), which is approximately a 11.3 % increase compared to the AQ Objective.

Particulate Matter (PM_{10})

Receptor No.	Receptor Location	Annual mean PM_{10} ($\mu g/m^3$)		% Change in relation to AQ Objective
		Existing Network Enhancements Option 2014	Do Nothing Scenario 2014	
1	5 Wittet Drive	9.2	8.9	1.9
2	Braeview West Road (A96)	10.2	10.1	0.4
3	56 Pluscarden Road	9.0	8.5	2.7
4	19 Fairfield Way	7.9	8.0	0.0
5	3 West Road (A96)	9.6	9.8	-1.2
6	19 Pluscarden Road	8.3	8.1	1.1
7	South Street/ Gray's Roundabout (house)	10.5	10.9	-2.6
8	278 High Street (A96)	9.2	9.2	0.0
9	DT E1 High Street (A96)	9.7	9.7	0.0
10	9 Murdoch's Wynd (A96)	10.0	10.0	-0.2
11	25 Murdoch's Wynd (A96)	9.6	9.6	0.1
12	Scottish Agricultural College 34 Moray Street	8.8	9.0	-0.9
13	Wards Road (house)	8.4	8.5	-0.1
14	Edgar Road (house)	8.0	8.1	-0.1
15	13 College Street	9.6	9.5	0.6

Receptor No.	Receptor Location	Annual mean PM_{10} (µg/m^3)		% Change in relation to AQ Objective
		Existing Network Enhancements Option 2014	Do Nothing Scenario 2014	
16	DT E6 High Street/South Street (A96)	10.1	10.1	-0.1
17	54 South College Street (A96)	9.6	9.6	-0.1
18	DT E2 Maisondieu Road/East Road	10.7	10.9	-1.4
19	1-2 Ashgrove Road	8.3	8.3	-0.1
20	29 Maisondieu Rd	8.7	9.0	-1.8
21	Moss Street (office)	8.6	9.1	-2.6
22	New Elgin Road (house)	9.0	9.6	-3.3
23	DT E5 New Elgin Road	9.0	9.6	-3.4
24	2-8 Hay Street	8.9	9.0	-0.7

Table 5-I Do Something – Existing Network Enhancements Option PM_{10} Concentrations (µg/m^3) 2014

With the Existing Network Enhancements Option in place, all of the receptors identified are predicted to be well within the AQ Objectives for PM_{10}, with most of them anticipated to experience a reduction in pollutant concentration. The greatest of which, is predicted at receptor 22 (of relevant exposure) and is 0.6 µg/m^3, which equates to a 3.3 % reduction compared to the AQ Objective. Six receptors are predicted to experience an increase in pollutant concentration. The greatest of which is anticipated to be occur at receptor 3, (0.5 µg/m^3), which equates to a 2.7 % increase compared to the AQ Objective.

(iii) Impact Significance

The impact significance assessment has been undertaken for residential receptors as these are relevant locations for the annual mean AQ Objectives of NO_2 and PM_{10}. Receptors 9, 16, 18, 21 and 23 are either roadside monitoring locations or occupational buildings and therefore not considered.

The significance of the impact of the predicted concentration changes for both NO_2 and PM_{10} are presented in Table 4-J below, taking into account sensitivity and magnitude of change.

Receptor No.	Receptor Location	Change with Existing Network Enhancements Option in place (2014)	
		NO_2	PM_{10}
1	5 Wittet Drive	Negligible	Negligible
2	Braeview West Road (A96)	Negligible	Negligible
3	56 Pluscarden Road	Slight Adverse	Negligible
4	19 Fairfield Way	Negligible	Negligible
5	3 West Road (A96)	Negligible	Negligible
6	19 Pluscarden Road	Negligible	Negligible
7	South Street/ Gray's Roundabout	Negligible	Negligible

Recept or No.	Receptor Location	Change with Existing Network Enhancements Option in place (2014)	
		NO_2	PM_{10}
	(house)		
8	278 High Street (A96)	Negligible	Negligible
9	DT E1 High Street (A96)	Negligible	Negligible
10	9 Murdoch's Wynd (A96)	Negligible	Negligible
11	25 Murdoch's Wynd (A96)	Negligible	Negligible
12	Scottish Agricultural College 34 Moray Street	Negligible	Negligible
13	Wards Road (house)	Negligible	Negligible
14	Edgar Road (house)	Negligible	Negligible
15	13 College Street	Negligible	Negligible
16	DT E6 High Street/South Street (A96)	Negligible	Negligible
17	54 South College Street (A96)	Negligible	Negligible
18	DT E2 Maisondieu Road/East Road	Negligible	Negligible
19	1-2 Ashgrove Road	Negligible	Negligible
20	29 Maisondieu Rd	Negligible	Negligible
21	Moss Street (office)	Negligible	Negligible
22	New Elgin Road (house)	Negligible	Negligible
23	DT E5 New Elgin Road	Negligible	Negligible
24	2-8 Hay Street	Negligible	Negligible

Table 5-J Impact Significance, for annual mean NO_2 and PM_{10}

Based on the results of the screening model, there are predicted to be both increases and decreases in pollutant levels across Elgin. The overall impact at selected receptors is anticipated to be predominantly Negligible for NO_2, the exception being at receptor 3, which is predicted to experience a Slight Adverse impact significance. The predicted impacts for PM_{10} are predicted to be Negligible.

Based on the results of the air quality screening model, it is anticipated that there would no risk of exceedance of either NO_2 or PM_{10} with the Existing Network Enhancements Option in place.

(c) Urban (Inner) Option

(i) Construction

The only potentially significant impact on air quality arising from the construction of the Urban (Inner) Option is anticipated to be a result of the generation of nuisance dust. Nuisance dust may affect locations up to 200 metres from the dust source, dependent on meteorological conditions and the source strength. However, nuisance dust does not have significant public health implications, would be of short duration, and can be mitigated.

It is not anticipated that there will be any likely long term air quality impacts as a result of this proposed scheme option.

(ii) Operation

Table 5-K and Table 5-L below present the predicted pollutant concentrations at the identified receptors with the Urban (Inner) Option in place during the Year of Opening (2014).

Nitrogen Dioxide (NO_2)

Receptor No.	Receptor Location	Annual mean NO_2 (µg/m^3)		% Change in relation to AQ Objectives
		Urban (Inner) Option 2014	Do Nothing Scenario 2014	
1	5 Wittet Drive	22.0	18.9	7.7
2	Braeview West Road (A96)	24.3	28.6	-10.6
3	56 Pluscarden Road	22.8	15.2	19.1
4	19 Fairfield Way	11.2	10.3	2.3
5	3 West Road (A96)	25.4	26.7	-3.4
6	19 Pluscarden Road	17.2	12.0	13.0
7	South Street/ Gray's Roundabout (house)	36.8	34.1	6.7
8	278 High Street (A96)	21.9	21.5	0.9
9	DT E1 High Street (A96)	25.8	25.3	1.1
10	9 Murdoch's Wynd (A96)	27.5	26.3	3.0
11	25 Murdoch's Wynd (A96)	23.9	23.0	2.1
12	Scottish Agricultural College 34 Moray Street	18.9	18.6	0.8
13	Wards Road (house)	12.5	13.9	-3.6
14	Edgar Road (house)	13.1	11.0	5.1
15	13 College Street	24.8	22.9	4.8
16	DT E6 High Street/South Street (A96)	29.0	28.4	1.4
17	54 South College Street (A96)	25.4	24.9	1.2
18	DT E2 Maisondieu Road/East Road	33.5	33.1	1.0
19	1-2 Ashgrove Road	13.2	13.1	0.3
20	29 Maisondieu Rd	18.0	19.1	-2.8
21	Moss Street (office)	18.9	20.1	-3.0
22	New Elgin Road (house)	22.6	22.1	1.4
23	DT E5 New Elgin Road	23.0	22.5	1.4
24	2-8 Hay Street	20.4	19.3	2.8

Table 5-K Do Something – Urban (Inner) Option NO_2 Concentrations (µg/m^3) 2014

With the Urban (Inner) Option in place, all receptors identified are predicted to be well within the AQ Objective for NO_2. Five receptors are anticipated to experience a reduction in pollutant concentration. The greatest reduction is predicted at receptor

2, (4.3 µg/m^3), which equates to a 10.6 % decrease compared to the AQ Objective. This is likely to be a direct consequence of the redirected traffic away from the receptor and onto the Urban (Inner) Option road instead of travelling along Wittet Road. 19 receptors are predicted to experience an increase in pollutant concentration. The greatest increase is predicted at receptor 3, (7.6 µg/m^3), which is approximately a 19.1 % increase compared to the AQ Objective. However, the total concentration at this receptor would be well below the AQ Objective.

Particulate Matter (PM_{10})

Recept or No.	Receptor Location	Annual mean PM_{10} (µg/m^3)		% Change in relation to AQ Objective
		Urban Inner Option 2014	Do Nothing Scenario 2014	
1	5 Wittet Drive	9.2	8.9	1.9
2	Braeview West Road (A96)	9.5	10.1	-3.4
3	56 Pluscarden Road	9.4	8.5	4.8
4	19 Fairfield Way	8.1	8.0	0.6
5	3 West Road (A96)	9.7	9.8	-0.8
6	19 Pluscarden Road	8.7	8.1	3.1
7	South Street/ Gray's Roundabout (house)	11.5	10.9	2.9
8	278 High Street (A96)	9.2	9.2	0.2
9	DT E1 High Street (A96)	9.7	9.7	0.3
10	9 Murdoch's Wynd (A96)	10.2	10.0	1.1
11	25 Murdoch's Wynd (A96)	9.7	9.6	0.7
12	Scottish Agricultural College 34 Moray Street	9.0	9.0	0.3
13	Wards Road (house)	8.2	8.5	-1.2
14	Edgar Road (house)	8.3	8.1	1.4
15	13 College Street	9.7	9.5	1.2
16	DT E6 High Street/South Street (A96)	10.2	10.1	0.5
17	54 South College Street (A96)	9.7	9.6	0.4
18	DT E2 Maisondieu Road/East Road	11.0	10.9	0.4
19	1-2 Ashgrove Road	8.3	8.3	-0.1
20	29 Maisondieu Rd	8.9	9.0	-0.6
21	Moss Street (office)	9.0	9.1	-0.7
22	New Elgin Road (house)	9.5	9.6	-0.3
23	DT E5 New Elgin Road	9.6	9.6	-0.3
24	2-8 Hay Street	9.2	9.0	0.9

Table 5-L Do Something – Urban (Inner) Option PM_{10} Concentrations (µg/m^3) 2014

With the Urban (Inner) Option in place, all receptors identified are predicted to be well within the AQ Objective for PM_{10}. However, of the 24 sites, it is anticipated that

there will be an overall increase in pollutant concentration. The greatest increase is predicted at receptor 3 (0.9 µg/m^3), which equates to a 4.8 % increase compared to the AQ Objective. Eight receptors are predicted to experience a reduction in pollutant concentration, the greatest of which anticipated to be at receptor 2, (0.6 µg/m^3), which equates to a 3.4 % reduction compared to the AQ Objective.

Impact Significance

The significance of the impact of the predicted concentration changes for both NO_2 and PM_{10} are presented in Table 5-M below.

Receptor No.	Receptor Location	Impact Significance with Urban (Inner) Option in place 2014	
		NO_2	PM_{10}
1	5 Wittet Drive	Negligible	Negligible
2	Braeview West Road (A96)	Slight Beneficial	Negligible
3	56 Pluscarden Road	Slight Adverse	Slight Adverse
4	19 Fairfield Way	Negligible	Negligible
5	3 West Road (A96)	Negligible	Negligible
6	19 Pluscarden Road	Slight Adverse	Negligible
7	South Street/ Gray's Roundabout (house)	Negligible	Negligible
8	278 High Street (A96)	Negligible	Negligible
9	DT E1 High Street (A96)	Negligible	Negligible
10	9 Murdoch's Wynd (A96)	Negligible	Negligible
11	25 Murdoch's Wynd (A96)	Negligible	Negligible
12	Scottish Agricultural College 34 Moray Street	Negligible	Negligible
13	Wards Road (house)	Negligible	Negligible
14	Edgar Road (house)	Negligible	Negligible
15	13 College Street	Negligible	Negligible
16	DT E6 High Street/South Street (A96)	Negligible	Negligible
17	54 South College Street (A96)	Negligible	Negligible
18	DT E2 Maisondieu Road/East Road	Negligible	Negligible
19	1-2 Ashgrove Road	Negligible	Negligible
20	29 Maisondieu Rd	Negligible	Negligible
21	Moss Street (office)	Negligible	Negligible
22	New Elgin Road (house)	Negligible	Negligible
23	DT E5 New Elgin Road	Negligible	Negligible
24	2-8 Hay Street	Negligible	Negligible

Table 5-M Impact Significance for annual mean NO_2 and PM_{10}

With the Urban (Inner) Option in place, there is anticipated to be an overall Negligible impact significance. However, two receptors are predicted to experience

Slight Adverse impacts for NO_2 and one receptor is expected to experience a Slight Adverse impact for PM_{10}. These receptors are adversely affected as a result of a combination of increased traffic flows and a shorter distance between road and receptor. One receptor is predicted to experience a Slight Beneficial impact.

Based on the results of the air quality screening model, it is anticipated that there would no risk of exceedance of either NO_2 or PM_{10} with the Urban (Inner) Option in place.

5.2.6 Potential Mitigation

(a) Construction

Best practice should be applied to control dust emissions from the construction site, as described below.

The generation of dust from construction activities can be reduced substantially through mitigation techniques and effective management. The most effective technique is to control dust at source and prevent it from becoming airborne. The measures that should be employed include the following:

- Identification of dust generating activities before the start of the project and preparation of action plans to minimise emissions;
- Preparation of environmental risk assessments for all dust generating processes and activities and agreement of method statements for dust prevention and suppression;
- Ensuring that all personnel on site recognise the importance of dust minimisation. Specified personnel should ensure that dust generation is effectively controlled;
- Provision of training for relevant personnel on controlling dust emissions;
- Consideration of PM10 and dust deposition monitoring; and
- Excavation and construction works should not commence until the dust suppression measures have been put in place.

These measures will assist in reducing any potentially significant residual effects from dust nuisance.

(b) Operation

Operational mitigation of the air quality impacts of highway schemes is not generally considered to be effective. The design of the preferred option should provide adequate distance between traffic and receptors such that traffic emissions do not cause unacceptable adverse impacts on receptors.

5.2.7 Summary of Options Assessment

As described in the sections above, the proposed route options have the potential to worsen or benefit the local air quality in their vicinity, depending on the changes in traffic flow. The potential impacts are a result of the following:

- Shorter distances from receptor to road centreline and subsequent increase in pollutant concentrations;
- Introduction of traffic related pollutants to new receptors; and
- Reduction in congestion due to traffic diversions and subsequent increase in traffic flow elsewhere on the network.

The impact significance tables show that the predicted changes in air quality are localised and predominantly of Negligible significance. Where Slight Adverse impacts are predicted, the existing air quality is generally good.

It is important to recognise that all of the results have been corrected using a conservative adjustment factor and thus are likely to over estimate predictions. This may be more evident in areas that are relatively free flowing, given that the adjustment was based on the models performance against measured NO_2 at a congested and busy street on the network.

In conclusion, neither proposed route option is likely to result in AQ Objectives being breached. In addition, neither proposed route option is predicted to affect the local air quality of Elgin significantly but localised changes to parts of the network may cause Slight Adverse impacts under either option.

The results of the Simple Assessment suggest that no significant air quality impacts are predicted.

5.2.8 Scope of Stage 3 Assessment

Based on the results of this Simple Assessment, there is no indication that a Detailed Assessment of the air quality impact of either proposed route option would be required. At Stage 3, consideration should be given to whether the Simple Assessment should be repeated with refined traffic data and design for the preferred option.

5.3 Ecology and Nature Conservation

5.3.1 Introduction

This chapter presents the assessment of the potential ecology and nature conservation impacts of the Existing Network Enhancements Option and the Urban (Inner) Option. The Do Nothing Scenario is also considered for comparative purposes.

5.3.2 Approach and Methods

The assessment has been undertaken using the methodology provided in the DMRB (Highways Agency et al., 1993c) and best practice guidance for ecological assessment including the Guidelines for Ecological Impact Assessment in the United Kingdom (Institute of Ecology and Environmental Management (IEEM), 2006).

(a) Baseline Conditions

Baseline information was collected by a desk study, field survey and consultation, as described below.

(i) Desk Study

The desk study included review of the information collated as part of the Stage 1 assessment, as reported in Elgin Western Distributor Route – DMRB Stage 1 Report (Jacobs Consultancy, 2010), which covered a study area of two kilometres. At Stage 1, European designated sites (i.e. Special Areas of Conservation (SAC), Special Protection Areas (SPA), Ramsar Sites) beyond two kilometres were considered for their potential to be affected by the proposed route options.

Various online resources were used to update the Stage 1 information including the National Biodiversity Network, Scottish Natural Heritage (SNH) Interactive Map and Red Squirrels of the Highlands (refer to References for links to these sites).

(ii) Field Survey

An Extended Phase 1 Habitat Survey (hereafter referred to as the habitat survey), was carried out in October 2010. The survey area is more focused than the study area for the desk study and covers a one kilometre wide corridor centred on the Urban (Inner) Option and a 100 metre corridor around the proposed roundabout at the top of Wittet Drive. A corridor of 50 metres either side of existing roads was used to assess the current site locations for the Existing Network Enhancements Option. The size of the survey area was determined taking into account potential land-take requirements associated with the proposed route options.

The objective of the habitat survey was to confirm or otherwise, the information collected during Stage 1 and provide a preliminary review of the ecological characteristics of the area.

Habitats were identified and mapped in accordance with Phase 1 Habitat Survey methodology (JNCC, 2010). Specific points of ecological interest were identified on the map as numbered 'Target Notes' (TN).

For each habitat type within the survey area, dominant and readily identified species were noted to provide a basic habitat description and to indicate the likely nature conservation value of each habitat type. Habitats were also assessed for the presence of, and/or their potential to support protected species, Biodiversity Action Plan (BAP) priority species and other species of conservation concern.

(iii) Consultation

As part of this assessment, further consultation was undertaken with the following organisations:

- Cairngorms Amphibian and Reptile Group;
- Forestry Commission (Highland & Islands Conservancy);
- Grampian Badger Surveys and Consultative Services;
- Highlands Badger Network;
- Inverness Bat Group;
- North East Scotland Biological Records Centre (NESBReC);
- Scottish Badger Development Officer; and
- SNH.

The information provided by NESBReC is shown in Appendix E (Figure E1).

(b) Overview of Legislation

Features of ecological value are protected to varying degrees by a range of designations implemented through statute, international convention and local authority planning controls. Non-designated sites can also be important for nature conservation, for example, providing links between semi-natural habitats, and supporting a wider range of species than just those present in specifically designated areas.

(i) Legal Protection of Habitats and Species

Natura 2000 Sites include SACs, designated under the European Union (EU) Directive (92/43/EEC) on the Conservation of Natural Habitats and of Wild Fauna and Flora (the Habitats Directive, 1992), and SPAs, designated under the EU Directive on the Conservation of Wild Birds (79/409/EEC) (the Birds Directive). Sites occurring above the mean low water mark will generally have already been notified as Sites of Special Scientific Interest (SSSIs).

The protection of such sites is achieved through a combination of the provisions within the Conservation (Natural Habitats, & c) Regulations 1994 (HMSO, 1994), as amended (the Habitats Regulations), and Section 28 of the Wildlife and Countryside Act, 1981 (WCA) (HMSO 1981); as amended by the Nature Conservation (Scotland) Act 2004 (NCSA) (Scottish Government, 2004) allows for the notification, protection and management of SSSIs.

Ramsar Sites, an additional international designation, are identified under the Convention on Wetlands of International Importance.

The WCA and the Habitats Regulations also allow for the protection of breeding birds, other animals and plants. This legislation requires that the presence of protected species be regarded as a material consideration by a planning authority when determining a planning application.

(ii) Local Designations

Local planning authorities and the Scottish Wildlife Trust often identify locally important sites of nature conservation value as Sites of Biological Importance (SBIs), Sites of Importance for Nature Conservation (SINCs), Sites of Wildlife Importance (SWIs) or Listed Wildlife Sites (LWS) for planning purposes. These are often identified in the local development plan and are usually afforded a degree of protection through the planning process.

(iii) Other Policies and Guidance

The UK Biodiversity Action Plan (BAP) was published in January 1994 in response to Article 6 of the Biodiversity Convention, to develop national strategies for the conservation of biological diversity and the sustainable use of biological resources. The NCSA placed new duties on all public bodies in respect of the conservation of biodiversity. Section 1 places a general duty on public bodies and office-holders to further the conservation of biodiversity. Scottish Ministers have published a list of species and habitats which they consider to be of principal importance in relation to conservation of biodiversity (The Scottish Biodiversity List, 2010).

The Scottish Planning Policy (SPP): Landscape and Natural Heritage (Scottish Government, 2010) provides guidance on the protection of biodiversity and geological conservation through the planning system.

(c) Impact Assessment

The impact significance was determined by reference to any designations and by the results of the desk study, field survey and following DMRB guidance. This is described in detail below in terms of sensitivity and magnitude.

(i) Sensitivity

The sensitivity of ecological receptors has been defined with reference to the potential 'value' of individual features or locations of populations of protected species. The evaluation of ecological features has been undertaken within a geographical frame of reference (rather than as 'High', 'Medium', 'Low') and has been evaluated at one of the following levels:

- International (European);
- National (UK);
- Regional;
- Authority area;
- Local; and
- Less than local (i.e. any geographic scale smaller than local).

(ii) Impact Magnitude

The impact magnitude is determined through assessing the scale of change, as detailed in Table 5-N below.

Magnitude	Criteria
High Negative	The change is likely to permanently affect the integrity of an ecological receptor in terms of the coherence of its ecological structure and function across its whole area, thus altering its ability to sustain the habitat/s and/or the population levels of species of interest at a regional or higher level.
Medium Negative	The change is not likely to permanently affect the ecological receptor's integrity but the effect on the receptor is likely to be substantial in terms of its ecological structure and function and may change its evaluation. Likely to result in changes in the local distribution of a species but not affect its population status at a regional level.
Low Negative	The change may affect the ecological receptor in the short term, but there will probably be no permanent effect on its integrity and/or key attributes and is unlikely to change its evaluation.
Neutral	There will be changes to the receptor, but they will cause no short-term or long-term affects on its integrity, key attributes or species populations.
No change	There will be no observable impact on the ecological receptor.

Table 5-N Ecological Impact Magnitude Criteria

(iii) Impact Significance

The significance of impacts has been determined according to the matrix of value/sensitivity and magnitude as illustrated in Table 5-O.

Magnitude / Importance	Neutral	Low	Medium	High
International	Neutral	Moderate	Major	Major
National	Neutral	Moderate	Major	Major
Regional	Neutral	Minor	Moderate	Moderate
Authority Area	Neutral	Minor	Moderate	Moderate
Local	Neutral	Minor	Minor	Minor
Less than Local	Neutral	Negligible	Negligible	Minor

Table 5-O Example Matrix for Determination of Impact Significance

5.3.3 Baseline Conditions

This section provides a description of the baseline conditions in and around Elgin across the ecological study area (two kilometres) and survey area (one kilometre, 100 metres and 50 metres as noted earlier).

The information in this section is based on consultation responses received in June 2010 during the Stage 1 assessment and a desk-based review of existing information. In addition, recent information received from NESBReC has been reported here. The distribution of species is presented in Appendix E (Figure E1).

(a) Designated Sites

Designated sites are shown on Figure 3 (Ecological Designated Areas).

There is only one statutorily designated site within the study area (over 600 metres northwest of the survey area), which is called Quarry Wood Site of SSSI. It is designated for its nature conservation interest, more specifically for its ancient semi-natural woodland composed of sessile oak (*Quercus petraea*) with some holly (*Ilex* aquifolium) birch (*Betula* spp.) Scots pine (*Pinus* sylvestris) and beech (*Fagus* sylvatica). The nearest internationally designated site (Loch Spynie SPA) is over 2.4 kilometres northeast of the study area boundary.

Areas of biodiversity interest located within the study area include:

- The Wards Wildlife Site (local designation, Scottish Wildlife Trust);
- The River Lossie; and
- Areas of woodland (including woodland listed on the Ancient Woodland Inventory (AWI)).

The River Lossie is designated under the Surface Waters (Fishlife) (Classification) (Scotland) Amendment Regulations (2007) (Scottish Government, 2007) as a salmonid river, on account of its high water quality and fish populations.

Four woodlands listed on the AWI are present within the study area all of which are long-established woodlands of plantation origin. These include:

- Mayne Woodland, directly adjacent to and southwest of the Urban (Inner) Option survey area; and
- Oak Wood, Quarry Wood and woodland surrounding The Bield, which are all adjacent to each other and are approximately 550 metres northwest of the edge of the Urban (Inner) Option survey area.

(b) Local Biodiversity Action Plan (LBAP)

North East Scotland Biodiversity Partnership has designated 195 local priority species, many of which are also included in the UK BAP as priority species (North East Scotland Local Biodiversity Action Plan, 2009). Actions for most species are carried out through the appropriate Habitat Action Plans (HAPs). However, some individual Species Action Plans (SAPs) are being implemented for those species where habitat action alone will not fully address the needs of that particular species. These include Daubenton's bat (*Myotis daubentonii*), red squirrel (*Sciurus vulgaris*), water vole (*Arvicola terrestris*) and wych elm (*Ulmus glabra*).

NESBReC provided information regarding records of wych elm. Locations include wooded areas along the live railway line in the west of the Urban (Inner) Option survey area, and woodland alongside the River Lossie in the north of the survey area. Records of other LBAP species present within the study area are included below.

(c) Fauna

Results of the consultation and desk study are detailed in Table 5-P below. No records of great crested newt or reptiles were identified through the desk study within the study area.

Data source	Records of Species
Amphibians - Protected under national legislation.	
NESBReC	One record respectively of common frog (*Rana temporaria*) and common toad (*Bufo bufo*) was confirmed for the Wards Wildlife Site in 1997.
NBN Gateway	Palmate newt (*Lissotriton. helveticus*) –1994 within a 1km grid square (NJ 21 62) covering Elgin city.
Badger (*Meles meles*) –Protected under national legislation.	
	Records of badger from consultation responses are provided in Appendix G (Confidential Badger Data) of this report.
Bats – Protected under European legislation.	
SNH	Twenty records of bat roosts within buildings and other structures in Elgin city dating from between 1983 and 2006. Records included bats of unknown species and pipistrelle bat species.
NBN Gateway	Records of four species of bats within 2km of the Urban (Inner) Option survey area. Species included common pipistrelle (*Pipistrellus pipistrellus*) and soprano pipistrelle (*Pipistrellus pygmaeus*), Daubenton's and Natterer's bat (*Myotis nattereri*).
NESBReC	A record of a brown long-eared bat (*Plecotus auritus*) roost in the 1km square to the north of Elgin city centre (NJ 21 63).
Red squirrel (*Scurris vulgaris*) - Protected under national legislation.	
Red Squirrels of the Highlands	One record from 2009. The exact location is not clear, but it appears that the squirrel was recorded approximately 700m east of the Wards Wildlife Site along Linkwood Road.
NBN Gateway	27 records of red squirrel (refer to Appendix E (Figure E2)). These records ranged from between 1994 – 2009 and included locations such as near Quarry Wood, which is approximately 400m northwest of the Urban (Inner) Option survey area; and Oak Wood, which is adjacent to Quarry Wood approximately 1km north of the Urban (Inner) Option survey area boundary.
NESBReC	Three records - Spynie Hospital (NJ 20 62, approximately 1km northeast of the Urban (Inner) Option survey area, one individual sighting, no date); Reidhaven at Moray Street junction (NJ 216 625) in 2007 just outside of the Urban (Inner) Option survey area to the east; and adjacent to Linkwood Road (NJ 22350 62150), 900m east of the Urban (Inner) Option survey area in 2009.
Scottish Squirrel Survey (2007)	The closest records of grey squirrel (*Sciurus carolinensis*) are at Quarrywood over 2km northwest of the Urban (Inner) Option.
Otter (*Lutra lutra*) - Protected under European legislation. **Water Vole (*Arvicola terestris*)** - Water vole habitat protected under national legislation since.	
NBN Gateway	Eleven records of otter dating from between 1978 and 1991. These included records from the River Lossie, Burn of Pittendreich and an unnamed tributary of the River Lossie, to the east of Elgin. Two records of water vole - one historical record from 1969, location unknown; and a dead water vole next to a drain recorded in Borough Briggs, Elgin (NJ 210 630, 2008) approximately 300m north of the Urban (Inner) Option survey area.
NESBReC	Two records of otter which include a sighting along the River Lossie in 2006, downstream of the Urban (Inner) Option, and one at

Data source	Records of Species
	Glassgreen in 2007. Glassgreen is approximately 1.2km southeast of the Urban (Inner) Option.
Freshwater pearl mussels *(Margaritifera margaritifera)* - Protected under European legislation.	
NBN Gateway	Historic record of Freshwater pearl mussels, location withheld.

Table 5-P Ecological Baseline Conditions

5.3.4 Habitat Survey Results

The habitat survey was carried out over a period of two days on 12 and 13 October 2010, the results of which are described below.

Results of the habitat survey are shown on Figure 4 (Extended Phase 1 Habitat Survey) and target notes are detailed in Appendix F (Table F-1).

(a) Existing Network Enhancements Option

Proposed works associated with the Existing Network Enhancements Option are within built-up areas of Elgin and limited semi-natural habitats exist within these areas.

Habitats present alongside these sections include tall ruderal vegetation, rank grassland and scattered scrub and trees (refer to Plates 1 and 2). The potential presence of fauna within these areas may include badger, bats and breeding birds.

Plate 1: South to north along the A941 (New Elgin Road) towards the roundabout. Road verges of scattered scrub and trees, rank grassland and tall ruderal vegetation.

Plate 2: West to east along the A96 (Alexandra Road). Built-up areas surrounding road verges. Verges comprising amenity grassland, scattered trees and introduced shrub.

(b) Urban (Inner) Option

(i) Habitats and Vegetation

The survey area is located to the west of Elgin city centre, with a high proportion to the northeast comprising residential areas with private gardens and areas of amenity grassland. The residential areas were not surveyed due to access restrictions.

Out-with residential areas, the predominant habitats within the survey area were recorded as agricultural land comprising improved and poor semi-improved grassland and arable fields. Such habitats are generally intensively managed and therefore of limited ecological value.

The River Lossie is not designated as a SPA, SAC or SSSI, but comprises a number of important riparian habitats including stretches of mature woodland. Water quality appeared to be good during the site visit.

Many of the semi-natural habitats within the survey area are located within the Wards Wildlife Site, comprising unimproved neutral grassland, marshy grassland, scattered broadleaved trees, dense/continuous scrub, broadleaved plantation woodland, ponds and ditches (refer to TN 1 – 3).

Over 86 plant species were recorded during the habitat survey at the Wards Wildlife Site including northern marsh orchid (Dactylorhiza purpurella), and a high number of wetland herb species including intermediate water-starwort (Callitriche hamulata), marsh marigold (Caltha palustris), marsh willowherb (Epilobium palustre), water horsetail (Equisetum fluviatile), marsh horsetail (Equisetum palustre), water cress (Rorippa nasturtium-aquaticum agg.), marsh woundwort (Stachys palustris) and brooklime (Veronica beccabunga).

Out-with the Wards Wildlife Site, the most extensive semi-natural habitat present within the survey area is woodland, comprising broadleaved semi-natural woodland, broadleaved and coniferous plantation woodland. None of the woodland sites within the survey area are listed on the AWI. However, as noted previously, there are areas of Ancient Woodland located within the wider study area.

Other semi-natural habitats recorded within the survey area include small fragmented areas of semi-improved neutral grassland, tall ruderal vegetation and scattered scrub. Riparian habitats were also recorded alongside watercourses and other waterbodies.

A view across the Wards Wildlife Site, from the western boundary looking northeast, is shown below in Plate 3.

Plate 3: West to northeast across the Wards Wildlife Site.

Fauna

No specific surveys were undertaken for protected species during the habitat survey. However, the information gathered during survey of available habitat areas, their extent and connectivity, and incidental records of field signs indicating the presence of protected species, were used to assess the potential of the survey area to support protected species.

Amphibians

The habitat survey identified numerous waterbodies and terrestrial habitat such as woodland, which could support amphibian populations. Two ponds within the Wards Wildlife Site were recorded as providing suitable conditions for amphibians, with the larger of the ponds having minimal shading and abundant submerged vegetation (TN 8). The additional presence of marshy grassland adds to the potential of the Site to support amphibians. As there were no records returned of great crested newt (GCN) from NESBReC or NBN Gateway, and no information to suggest the presence of GCN during the survey, it is unlikely that GCN will be present within the survey area.

Badger

A badger sett and field signs were discovered during the habitat survey. Results can be found in Appendix G (Confidential Badger Data).

Bats

Three features of potential importance to bats were recorded in the survey area: a mature Scots pine located in a private garden on Wards Road (TN 9); a two-span bridge over the River Lossie (TN 10), this only provided low roost potential owing to recent signs of renovation; and a row of pollarded cherry trees with cavities leading into hollow trunks at Dr. Gray's Hospital (TN 14).

There are a number of old bungalows and associated outhouses present within the survey area (TN 15), which were assessed for their suitability to support roosting bats. Some of these buildings had missing roof tiles, rotting fascia boards, gaps under the lead flashing and ridge tiles and other structural gaps offering potential roost access points. None of these features at the time of the visit, showed any indications of having been used by bats (e.g. bat droppings or staining). Nonetheless, their use by bats as roosts cannot be discounted.

The River Lossie is likely to be an important foraging habitat resource for bats. In addition to the river, a number of other linear features including the railway embankment running east to west through the centre of the survey area, a row of pollarded trees at Dr Gray's Hospital (TN 14), and woodland edges and shelterbelts across the survey area are likely to provide suitable features along which bats can commute between roosts and foraging areas.

Birds

Several bird species observed during the habitat survey included snipe (*Gallinago gallinago*), carrion crow (*Corvus corone*), kestrel (*Falco tinnunculus*), herring gull (*Larus argentatus*), buzzard (*Buteo buteo*), robin (*Erithacus rubecula*), blackbird (*Turdus merula*) and chaffinch (*Fringilla coelebs*).

Of these, herring gull is listed by the Royal Society for the Protection of Birds (RSPB) as red status due to severe historic population declines in the UK and the limiting of breeding birds to small numbers of nest sites; snipe and kestrel are amber status reflecting moderate declines historically; the other species are green status and occur regularly in the UK.

Despite recent declines, the bird species observed remain relatively common and widespread. The mixture of wetland and woodland habitats present in the survey area is considered to support locally significant populations of breeding birds.

Invertebrates

The survey area contains several areas of semi-natural vegetation and running water which may support invertebrate species of note. Invertebrates are considered to be of local importance.

Fish

The River Lossie and several minor watercourses including ditches, were recorded as being of variable water quality, and have the potential to support fish populations. As noted previously, the River Lossie is designated as a salmonid river on account of its high water quality and fish populations.

Red Squirrel

Signs indicating the presence of red squirrel were not recorded within the survey area, although several woodland areas provide potential to support populations of this species. Large woodland areas with high connectivity, diverse age structure and a favourable species mix (e.g. Scots pine, spruce (*Picea* spp.) and hawthorn (*Crataegus monogyna*)) are present within the survey area.

No grey squirrels (*Sciurus carolinensis*) were observed during the habitat survey, and no records of grey squirrel were noted during the desk study.

Woodland edges are located within the survey area, connecting to large continuous stands of semi-natural and plantation woodland outside of the survey area and there are records identifying the presence of red squirrel within the wider study area.

Reptiles

Observations during the habitat survey of available habitats offering reptile potential, their extent and connectivity, indicate that reptiles are likely to be present within the survey area.

Reptiles have fairly broad habitat requirements but do require key areas such as scrub, rough grass, heath and features such as log/stone piles and south facing slopes for key parts of their life cycle. Linear features such as hedgerows and drystone walls provide suitable corridors for them to move and maintain links with different habitat areas. The species most likely to be present in the predominantly agricultural landscape of the survey area are common lizard (*Zootoca vivipara*) and slow worm.

The population size and status of reptiles within the local area is unknown, but based on their declining numbers throughout Britain and the recent inclusion of all UK reptiles on the UK BAP, they are assessed as being of local importance.

Riparian Mammals

Signs of otter (fresh spraints and adult prints) were recorded along the River Lossie (TN 11) during the habitat survey, but no resting or breeding sites were confirmed. The River Lossie offers good fish habitat and therefore provides foraging opportunities for otters. It should be noted that otters are generally widespread throughout Scotland (Strachan, 2007).

No signs of water vole were recorded during the habitat survey, however the results of the desk study confirm the presence of water vole within the wider study area. There is therefore potential for the presence of water vole within the survey area, particularly along ditches within the Wards Wildlife Site. The section of the River Lossie within the survey area is considered to be unsuitable for water vole though more suitable riparian habitat exists both up and downstream. Water voles have become rare, especially in lowland Scotland (Strachan & Jeffries, 1993).

(c) Limitations to Assessment

The habitat survey was carried out at a sub-optimal time of year (outside of the recommended period of April – September). This may have resulted in species that are most visible early in the optimal field season being missed, however it was still possible to gather sufficient information to enable the robust identification of habitat types.

(d) Summary of Baseline

The baseline assessment is based primarily on the review and interpretation of previously prepared reports, consultation information and the habitat survey.

Within the survey area of the Existing Network Enhancements Option, the following species and groups could potentially be present:

- Badger (local importance);
- Bats (authority area importance or local importance); and
- Breeding birds (local importance).

Within the survey area of the Urban (Inner) Option, the following species and groups could potentially be present:

- Amphibians (local importance);
- Badger (local importance);
- Bats (authority area or local importance, depending on the numbers of bats and types of roosts actually present within the survey area);
- Breeding birds (local importance);
- Freshwater fish (authority area importance);

- Red squirrel (authority area importance);
- Reptiles (local importance);
- Terrestrial and freshwater invertebrates (local importance); and
- Riparian mammals (otter (local importance) and water vole (authority area importance)).

5.3.5 Potential Environmental Effects

This assessment is based on potential impacts (i.e. without mitigation), and based on the intrinsic value of habitats and species encountered during the habitat survey, and their potential value to support plant and animal species of conservation concern.

As noted previously, the Do Nothing Scenario serves as a baseline for the impact assessment.

The range of potential impacts of road schemes and their significance on nature conservation will depend on the individual circumstances of each scheme. However, it is possible to identify a number of main areas of concern, which have general applicability (Highways Agency et al., 1993c). These include:

- Direct mortality;
- Habitat loss;
- Habitat fragmentation and isolation;
- Disturbance; and
- Pollution and other indirect impacts (where applicable).

Construction impacts are considered as temporary and operational impacts to be long term or permanent.

(a) Do Nothing Scenario

With the Do Nothing Scenario there are predicted to be no significant impacts on habitats and species of nature conservation value within the area. Impacts associated with occasional disturbance during road maintenance operations are assessed as being of Negligible significance to habitats and species.

(b) Existing Network Enhancements Option

(i) Construction

Designated Sites

Due to the scale of the proposed route option, distance to designated sites and the lack of ecological connections, no construction impacts are predicted on statutorily designated sites or areas of woodland listed on the AWI in the study area.

Habitats and Vegetation

There is potential for temporary habitat loss due to the siting of storage areas and construction compounds. As this proposed route option is largely online, and adjacent habitats along the existing road are of limited value, temporary habitat loss is predicted to be negligible and is therefore assessed as being of low negative magnitude and Minor significance.

Bats

It is anticipated that there would be negligible disturbance impacts associated with the construction of this proposed route option if lighting is used during construction, resulting in a low negative magnitude and Minor significance.

Birds

Pre-construction vegetation clearance for the provision of construction compounds, storage facilities and/or access roads has potential to cause impacts of habitat loss of scattered scrub and trees, which may impact on bird populations through disturbance, particularly during the breeding season, which is typically March – August inclusive. Potential impacts are assessed as being of low negative magnitude and Minor significance.

(ii) Operation

Designated Sites

Due to the scale of the proposed route option, distance to designated sites and the lack of ecological connections, no operational impacts are predicted on statutorily designated sites or areas of woodland listed on the AWI in the study area.

Habitats and Vegetation

The Existing Network Enhancements Option could potentially result in minimal losses of semi-natural broadleaved woodland, pasture land and the temporary clearance of scrub and tall ruderal vegetation alongside road verges. As this proposed route option is largely online, habitat loss is predicted to be negligible. Impacts are therefore assessed as being of low negative magnitude and Minor significance.

Badger

This proposed route option could result in the permanent loss of small areas of woodland to the north of the proposed route option and agricultural habitat that are important foraging areas for badgers. The woodland areas on steep embankments north of West Road, opposite Wittet Drive may provide opportunities for badger setting habitat. The permanent loss of these habitats could potentially result in an impact of low negative magnitude and Minor significance.

Bats

It is anticipated that there would be negligible disturbance impacts associated with the operation of this proposed route option if lighting is used during construction and there are predicted to be minimal loss of habitats important for roosting and foraging bats. Due to the online nature of this proposed route option, impacts are assessed as being of low negative magnitude and Minor significance.

Birds

Operation of this proposed route option could potentially result in the permanent loss of tall ruderal and scattered scrub and trees that are identified as habitats that provide suitable nesting opportunities for birds between the months of March and August, and are important foraging areas for bird species all year round. Land-take will be minimal for this proposed route option, resulting in potential impacts on bird populations being lower than for the Urban (Inner) Option. Potential impacts are therefore assessed as being of low negative magnitude and Negligible significance.

Other Species

No potentially significant impacts are predicted to occur to other habitats and species of nature conservation value as a result of the construction and operation of this proposed route option.

(iii) Summary of Potential Environmental Effects (Existing Network Enhancements Option)

Table 5-Q provides a summary of potential environmental effects associated with the construction and operation of the Existing Network Enhancements Option.

Receptor	Value	Scheme Phase	Magnitude	Significance
Terrestrial habitat-Broadleaved semi-natural woodland	Local	Construction	Low	Minor
		Operation	Low	Minor
Badger	Local	Construction	n/a	n/a
		Operation	Low	Minor
Bats*	Authority Area	Construction	Low	Minor
		Operation	Low	Minor
Birds	Local Area	Construction	Low	Minor
		Operation	Low	Negligible

*Group or species protected under European legislation.

Table 5-Q Summary of Potential Environmental Effects – Existing Network Enhancements Option

(c) Urban (Inner) Option

(i) Construction

Designated Sites

Due to the scale of the proposed route option, distance to the designated site and the lack of ecological connections, no impacts are predicted on Quarry Woods SSSI or areas of woodland listed on the AWI in the study area.

Without mitigation, the construction of the proposed Urban (Inner) Option could potentially cause temporary severance of the Wards Wildlife Site from other adjacent semi-natural habitats to the west of the site, which is assessed as a negative impact of low magnitude and Minor significance.

Habitats and Vegetation

There is potential for temporary habitat loss due to the siting of storage areas and construction compounds. As this proposed route option is largely offline, and in close proximity to wetland habitats, temporary habitat loss is predicted to be of medium negative magnitude and Minor significance.

Amphibians

Potential impacts on amphibians may occur during construction of the southern extent of the Urban (Inner) Option resulting in the temporary loss of terrestrial habitat that may support amphibians. The loss of tall ruderal and semi-improved grassland to the west of the Wards Wetland Site from the siting of storage areas and site compounds is likely to be of particular importance as it provides good terrestrial amphibian habitat. Temporary habitat loss and direct mortality are therefore predicted to be of medium negative magnitude and Minor significance.

Badger

The Urban (Inner) Option is far enough away from any recorded setts that there are predicted to be no impacts of disturbance or disruption to existing setts within the survey area.

Badgers are naturally inquisitive animals and may investigate construction sites during the night. There is therefore an increased probability of mortality through badgers becoming trapped in any pits, piping, fuel containers, wire mesh or similar hazards. Night works may also lead to badgers being run over by construction vehicles. Impacts of direct mortality are predicted to be of medium magnitude and Minor Significance.

Bats

Habitat fragmentation/severance and disturbance to woodlands and adjacent fields as a result of siting storage facilities and site compounds close to habitats important to bats have the potential to cause disruption to bat flight lines and commuting corridors. The scale of these impacts cannot be confirmed until the relative importance of flight lines and foraging areas for bats have been determined. Impacts are predicted to be of low negative magnitude and Minor significance.

Birds

Pre-construction vegetation clearance for the provision of construction compounds, storage facilities and/or access roads has potential to cause impacts of habitat loss of scattered scrub and trees, which may impact on bird populations through disturbance, particularly during the breeding season, which is typically March – August inclusive. Potential impacts are assessed as being of low negative magnitude and Minor significance.

Fish

This proposed route option would require works adjacent to the River Lossie in the northern section of the survey area. Waterbodies adjacent to the proposed route option (approximately 30 – 40 metres to the east) in the southern section of the survey area include ponds and ditches located within the Wards Wildlife Site.

It is predicted that without mitigation, construction of this proposed route option may impact upon fish populations in the River Lossie through potential pollution events, if fish occur in these areas. This proposed route option would not cross any significant watercourses within the survey area. Impacts on fish species are therefore likely to be indirect and are assessed as being of low negative magnitude and Minor significance.

Invertebrates

Assessment of the impacts on invertebrates is limited due to the lack of information available on invertebrate populations. Construction of this proposed route option will result in temporary losses of habitats that have the potential to support invertebrate populations. Impacts are predicted to be of low negative magnitude and Minor significance.

Red Squirrel

Potential impacts associated with the Urban (Inner) Option on red squirrel may include disturbance during construction adjacent to woodland areas. Red squirrel is protected under the WCA (1981) (as amended) which affords protection from disturbance. Impacts are predicted to be of low negative magnitude and Minor significance.

Reptiles

This proposed route option is predominantly offline and cuts largely through pasture land, tall ruderal vegetation, and scattered trees and scrub. Although there are no records of reptiles within the vicinity of the survey area of the Urban (Inner) Option, there are areas of potential suitable reptile habitat along the embankments of the active railway line running east to west through the centre of the survey area, and rank grassland to the south of the railway line that could be negatively impacted. Potential impacts during construction include disturbance, fragmentation and direct mortality to reptiles during pre-construction vegetation clearance for the provision of construction compounds, storage facilities and/or access roads. Impacts are predicted to be of low negative magnitude and Minor significance.

Riparian Mammals

Although there is potential for pollution events associated with construction activities, it is anticipated that the adoption of appropriate best-practice will preclude the occurrence of any such events. Consequently, the majority of impacts upon otters and water voles could be temporary i.e. disturbance associated with the construction of the road such as noise disturbance, and disturbance associated with temporary roads and traffic diversions. Impacts on otter are predicted to be of low negative magnitude and Minor significance. Impacts on water vole, if confirmed at the Wards Wildlife Site, are predicted to be of low negative magnitude and Minor significance.

(ii) Operation

Designated Sites

Without mitigation, the proposed Urban (Inner) Option could potentially sever the Wards Wildlife Site from other adjacent semi-natural habitats to the west of the site.

The southwest corner of the Wards Wildlife Site is the most natural part of the wetland. Many of the natural heritage interests of the site are dependent on the maintenance of the existing hydrological and drainage conditions. As such, any development including introduction of hard standing, Sustainable Drainage Systems (SuDS) and other drainage changes has potential to cause a negative impact of low magnitude and Minor significance on the wetland area.

Habitats and Vegetation

Small areas of broadleaved semi-natural woodland could be permanently lost as a result of this proposed route option in the north of the survey area, north of West Road and adjacent to Sheriffmill Road at Connet Hill. Additional impacts to the remaining woodland may occur as a result of disturbance, localised hydrological changes and changes to the micro-climatic conditions. Impacts are assessed as being of low negative magnitude and Minor significance.

Amphibians

This proposed route option may increase the likelihood of adverse impacts such as permanent loss and degradation of habitats, mortality and fragmentation/severance of habitats if unmitigated. Impacts are therefore predicted to be of medium negative magnitude and Minor significance.

Badger

This proposed route option could potentially result in the permanent loss of pasture land and associated features such as woodland, tall ruderal and scattered scrub vegetation. These areas may provide suitable habitat for foraging and sett building. Additionally, this proposed route option, if unmitigated, may cause severance of badger territories, which could increase competition between neighbouring badger social groups, and increase the frequency of badger road traffic accidents (RTAs). Impacts are predicted to be of medium negative magnitude and Minor significance.

Bats

The desk study returned records of roosting bats in buildings in Elgin. Potential impacts associated with the offline sections of the Urban (Inner) Option in the north of the survey area may result in the loss of bat roosts in trees and/or buildings that are situated along the proposed alignment of this option. The loss of bat roosts cannot be assessed at this stage due to the lack of information.

Impacts of direct habitat loss, habitat fragmentation/severance and disturbance on woodlands and adjacent fields have the potential to cause disruption to bat flight lines and commuting corridors. The scale of these impacts cannot be confirmed until the relative importance of flight lines and foraging areas for bats have been determined. Impacts are predicted to be of low negative magnitude and Minor significance.

Birds

Construction and operation of this proposed route option could result in the loss of habitats including tall ruderal, scattered scrub and trees, which are likely to provide habitat for breeding birds. As these habitats are abundant within the local and wider area, impacts are predicted to be of low negative magnitude and Minor significance.

Fish

It is predicted that without mitigation, this proposed route option could potentially impact upon fish populations in the River Lossie through potential pollution events, if fish occur in these areas.

This proposed route option would not cross any significant watercourses within the survey area. Impacts on fish species are therefore likely to be indirect and are assessed as being of low negative magnitude and Minor significance.

Invertebrates

Assessment of the impacts on invertebrates is limited due to the lack of information available on invertebrate populations. However, it is anticipated that this proposed route option could result in permanent losses of habitats that have the potential to support invertebrate populations. Impacts are predicted to be of low negative magnitude and Minor significance.

Red Squirrel

Small areas of woodland identified within the survey area are predicted to be lost to the proposed route option and there are unlikely to be impacts of fragmentation and habitat severance on red squirrels commuting between different woodland stands. Impacts are predicted to be of low negative magnitude and Minor significance.

Reptiles

Suitable habitat along the embankments of the active railway line running east to west through the centre of the survey area, and rank grassland to the south of the railway line could potentially be impacted through permanent habitat loss, which has potential to cause fragmentation of habitat to reptiles. Impacts are predicted to be of low negative magnitude and Minor significance.

Riparian Mammals

No watercourses within the survey area are predicted to be crossed by this proposed route option. However, there is predicted to be a permanent loss of habitats adjacent to these watercourses, particularly close to the River Lossie and the Wards Wildlife Site, which might provide suitable habitat in terms of shelter and food for otter and water vole populations.

In the absence of mitigation, the presence of new offline sections of road adjacent to the Wards Wildlife Site could increase the risk of direct mortality due to otters attempting to cross the carriageway.

Impacts on otter are predicted to be of low negative magnitude and Minor significance. Impacts on water vole, if confirmed at the Wards Wildlife Site, are predicted to be of medium negative magnitude and Moderate significance.

(iii) Summary of potential environmental effects (Urban (Inner) Option)

Table 5-R provides a summary of potential impacts associated with the construction and operation of the Urban (Inner) Option.

Receptor	Value	Scheme Phase	Magnitude	Significance
Designated Site - Wards Wildlife Site	Local	Construction	Low	Minor
		Operation	Low	Minor
Terrestrial habitat- Broadleaved semi-natural woodland	Local	Construction	Medium	Minor
		Operation	Low	Minor
Amphibians	Local	Construction	Medium	Minor
		Operation	Medium	Minor
Badger	Local	Construction	Medium	Minor
		Operation	Medium	Minor
Bats*	Authority Area	Construction	Low	Minor
		Operation	Low	Minor
Birds	Local	Construction	Low	Minor
		Operation	Low	Minor
Invertebrates	Local	Construction	Low	Minor
		Operation	Low	Minor
Fish	Authority Area	Construction	Low	Minor
		Operation	Low	Minor
Red Squirrel	Authority Area	Construction	Low	Minor
		Operation	n/a	n/a
Reptiles	Local	Construction	Low	Minor
		Operation	Low	Minor
Otter*	Local	Construction	Low	Minor
		Operation	Low	Minor
Water Vole	Authority Area	Construction	Low	Minor
		Operation	Medium	Moderate

*Group or species protected under European legislation.

Table 5-R Summary of Potential Environmental Effects - Urban (Inner) Option

5.3.6 Potential Mitigation

A precautionary approach has been taken to identify the potential environmental effects as described above. However, a number of these potential impacts may be reduced through the implementation of mitigation, examples of which are provided below.

(a) Existing Network Enhancements Option

(i) Construction

Mitigation measures that should be considered for implementation during construction of the Existing Network Enhancements Option include:

- Adhering to Scottish Environment Protection Area (SEPA) best practice guidelines with regards to preventing pollution incidents (e.g. Pollution Prevention Guideline (PPGs) 1, 3, 5 and 6);
- Avoid vegetation clearance during the breeding bird season (March – August inclusive);
- Cover any pits in working areas at night to avoid animals becoming trapped; and
- Minimise the felling and/or removal of trees and other structures that may provide suitable roosting and foraging opportunities for bats. Where this is not possible, adhere to appropriate best practice guidance to avoid committing an offence under European and national legislation. European Protected Species (EPS) licences should be applied for where required.

(ii) Operation

Mitigation measures that should be considered for implementation during operation of the Existing Network Enhancements Option include:

- Adherence to PPGs to avoid pollution to sensitive habitats from road run-off and incorporation of SuDS;
- Replacement habitat to mitigate for the loss of ecologically-valuable habitats; and
- The design of the route should seek to avoid severance and isolation of habitats important for commuting badger and bats.

(b) Urban (Inner) Option

(i) Construction

Mitigation measures that should be considered for implementation during construction of the Urban (Inner) Option include:

- Adhering to Scottish Environment Protection Area (SEPA) best practice guidelines with regards to preventing pollution incidents (e.g. Pollution Prevention Guideline (PPGs) 1, 3, 5 and 6);
- Avoid vegetation clearance during the breeding bird season (March – August inclusive);
- Cover any pits in working areas at night to avoid animals becoming trapped;
- Where protected mammal species (badger and otter) are known to be active, temporary mammal-proof fencing should be erected around the construction areas in such a way that commuting routes are not disrupted. Where temporary fencing is erected, it will require to be positioned to guide mammals to safe crossing points;
- Minimise the felling and/or removal of trees and other structures that may provide suitable roosting and foraging opportunities for bats. Where this is not possible, adhere to appropriate best practice guidance to avoid committing an offence under European and national legislation. EPS licences should be applied for where required; and

- Retain 'wildlife corridors' to and from the Wards Wildlife Site and between other habitats of ecological value.

(ii) Operation

Mitigation measures that should be considered for implementation during operation of the Urban (Inner) Option include:

- Adherence to PPGs to avoid pollution to sensitive habitats from road run-off and incorporation of SUDS;
- Replacement habitat to mitigate for the loss of ecologically-valuable habitats; and
- The design of the proposed route option should seek to avoid severance and isolation of habitats important for commuting otter, badger and bats. Furthermore, linkages between the semi-natural wetland habitats associated with the southwest corner of the Wards Wildlife Site should be maintained.

5.3.7 Summary of Options Assessment

(a) Do Nothing Scenario

The Do Nothing Scenario is not predicted to result in significant impacts on habitats or species of nature conservation value.

(b) Existing Network Enhancements Option

This proposed route option is predominantly online and, as such, would not result in significant habitat loss in comparison with the Urban (Inner) Option. Negative impacts of Minor significance could potentially occur on terrestrial habitats, badger, bats and breeding birds.

(c) Urban (Inner) Option

This proposed route option is predominantly offline and results in the greatest habitat loss when compared to the Existing Network Enhancements Option and Do Nothing Scenario. Unless water vole populations are confirmed on or in the vicinity of the Wards Wildlife Site, no potential negative impacts of greater than Minor significance are predicted. If water vole is found to be present, then without mitigation, negative impacts of Moderate significance are predicted.

5.3.8 Scope of Stage 3 Assessment

(a) Existing Network Enhancements

Should the Existing Network Enhancements Option be taken forward to the next stage of assessment, an updated Extended Phase 1 Habitat Survey could be undertaken to ensure no changes to the baseline have occurred.

(b) Urban (Inner) Option

Should the Urban (Inner) Option be taken forward to the next stage of assessment, the following could be undertaken:

- Further consultations with statutory and non-statutory bodies to establish the existence of new and/or updated ecological data relating to the study area and, where appropriate to confirm acceptance of the approach being undertaken (e.g. SNH); and

- Review and assessment of the results of further field surveys undertaken. Surveys for the following ecological receptors should be considered:

  i. Amphibians;

  ii. Bat roost potential and activity;

  iii. Badger;

  iv. Breeding birds;

  v. Detailed botanical surveys of areas of semi-natural vegetation;

  vi. Fish;

  vii Aquatic invertebrates;

  viii Red squirrel;

  ix Reptiles;

  x Otter; and

  xi Water vole.

- Input to the design of the proposed scheme including incorporation of mitigation as required, such as specification of underpasses, mammal fencing, and requirements for replacement habitat or enhancements of existing habitat.

5.4 Landscape and Visual

5.4.1 Introduction

This chapter describes the assessment of the landscape and visual impacts of the Existing Network Enhancements Option and the Urban (Inner) Option in accordance with the Design Manual for Roads and Bridges (DMRB) Stage 2 assessment methodology (Highways Agency et al., 1993d). A Do Nothing Scenario is also considered for comparative purposes.

The assessment identifies the potential impacts on the character of the landscape based on Local Landscape Character Areas (LLCAs) and on buildings, outdoor recreation spaces, footpaths and transport routes (collectively referred to as receptors) that will notice a discernible change to the character and visual amenity of their views as a result of the proposed options.

5.4.2 Approach and Methods

This assessment was undertaken with reference to the guidance in DMRB and the Guidelines for Landscape and Visual Impact Assessment by The Landscape Institute and the Institute of Environmental Management and Assessment (2002).

For a Stage 2 assessment, DMRB Volume 11 Section 3 Part 5 requires that the main landscape and visual impact assessment is undertaken at Stage 2 and refined at Stage 3. This includes an assessment of the significance of impact on the landscape for each proposed route option and a statement of the estimated visual impact on affected properties and the degree to which their visual amenity might change. The assessment is required to make 'an overall judgement on the impact of each section of the route, allowing for likely or proposed mitigation' (paragraph 5.7). The assessment therefore includes an indicative assessment of the residual impacts incorporating mitigation measures.

(a) Baseline Conditions

Baseline information was collected by a desk study and a field survey. The desk study included review of the following reports:

- Elgin STAG 2 Environmental Assessment Report. (Halcrow Group Limited, 2007);
- ETM - Elgin Western Distributor Road DMRB Stage 1 Report (Jacobs, 2010);
- Integration of New Developments into the Landscape – Elgin (Grant, 2005); and
- Moray and Nairn Landscape Character Assessment. (Turnbull Jeffrey Partnership, 1998).

The Local Landscape Character Areas (LLCA) are shown on Figure 5 (Local Landscape Character Areas). Visual receptors are identified on Figure 6 (Visual Impact), and include areas of outdoor recreational space, local footpaths, built up areas and public roads. The most sensitive receptors are considered to be those within 500 metres of the proposed route options passing through rural areas, whilst in the urban area, sensitive receptors are considered to be those directly adjacent to the proposed route option.

(b) Impact Assessment

(i) Landscape Impact Assessment

The landscape assessment was undertaken in accordance with the DMRB (Highways Agency et al., 1993d), Landscape & Visual Assessment and Supplementary Guidance (Scottish Executive, 2002) and Guidelines for Landscape and Visual Impact Assessment (Landscape Institute and Institute of Environmental Management & Assessment, 2002).

The SNH Landscape Character Assessment covering the study area, namely Moray and Nairn Character Assessment (MNCA) (Turnbull Jeffrey Partnership, 1998) was used as the basis for the landscape character assessment. This document defines the national Landscape Character Types (LCTs) present within the region, and within these LCTs identifies Landscape Character Areas (LCAs) specific to the area covered by the study.

A detailed desk based assessment and field survey were undertaken to refine the boundaries of the regional LCTs at a more local scale relevant to the study area for this assessment and provide a level of detail to enable the evaluation of sensitivity and impact assessment. In some cases, this has meant the subdivision of land which is identified in the SNH assessments as being of a single LCT into smaller units, or Local Landscape Character Areas (LLCAs), to better reflect local variations in character.

The desk study included the examination of structure and local plans, Geographical Information Systems data, aerial photographs, and 1:25,000 and 1:50,000 Ordnance Survey maps.

The field survey included identification of specific landscape constraints and verification/supplementation of data collected in the desk study.

(ii) Sensitivity to Change

Once the LLCAs were identified, the sensitivity of each area to change due to development was assessed in accordance with Landscape & Visual Assessment Supplementary Guidance (Scottish Executive, 2002). Table 5-S outlines the criteria used to define the overall evaluation of landscape sensitivity.

Sensitivity	Criteria
High	Landscape or landscape elements of particular distinctive character, highly valued and considered susceptible to relatively small changes.
Medium	A landscape of moderately valued characteristics considered reasonably tolerant of change.
Low	A landscape of generally low valued characteristics considered potentially tolerant of substantial change.

Table 5-S Landscape Sensitivity Criteria

(iii) Magnitude of Change

Evaluation of the magnitude of change on the landscape as a result of the proposed route options used the criteria in Table 5-T.

Magnitude	Criteria
High	Notable change in landscape characteristics over an extensive area ranging to very intensive change over a more limited area.
Medium	Minor changes in landscape characteristics over a wide area ranging to notable changes in a more limited area.
Low	Minor change in any area or landscape components.
Negligible	Virtually imperceptible change in any area or landscape components.

Table 5-T Landscape Magnitude of Change Criteria

(iv) Significance of Landscape Impact

The criteria in Table 5-U were used to help determine the thresholds of adverse or beneficial impact significance using a matrix of sensitivity and magnitude. It should be noted, however, that this is only a framework to aid consistency of reporting and provide an initial indication of the likely impact arising from the assessment of magnitude and sensitivity. Given that the significance levels of Negligible/Slight/ Moderate/Substantial/Severe represent levels on a continuum or continuous gradation, application of the framework also requires professional judgement and awareness of the relative balance of importance between sensitivity and magnitude.

Magnitude / Sensitivity	Negligible	Low	Medium	High
High	Slight	Moderate	Substantial	Severe
Medium	Negligible to Slight	Slight	Moderate	Substantial
Low	Negligible	Negligible to Slight	Slight	Moderate

Table 5-U Landscape Impact Significance

For the purposes of this assessment, impacts are considered to be adverse unless otherwise stated.

Impacts assessed as being of Moderate or greater are considered to represent significant landscape changes and therefore mitigation would generally be required to reduce these where possible.

(v) Visual Impact Assessment

The visual assessment follows guidance provided in DMRB (Volume 11 Section 3 Part 5) (Highways Agency et al., 1993d), Landscape & Visual Assessment and Supplementary Guidance Scottish Executive (2002), and Guidelines for Landscape and Visual Impact Assessment (Institute of Environmental Management and Assessment: IEMA; 2002).

The assessment has been carried out through:

- A review of the proposed route options to ascertain the likely visually intrusive elements of the proposals; and
- A field survey to identify receptor areas likely to experience a change of visual amenity in relation to each proposed route option.

The study area for the visual assessment was identified through a combination of desk study and field survey. The assessment identified the locations of properties

likely to experience a visual change as a result of each proposed option. The study area was limited to an approximate 3 kilometres distance from the proposed options as this was considered to be the maximum distance from which elements of the scheme could have a discernible visual impact on a receptor.

The assessment considers both built and outdoor receptors. Built receptors are identified as dwellings, workplaces and recreational buildings. Outdoor receptors are identified as major and well-used minor roads, outdoor recreational spaces, Rights of Way, footpaths (in accordance with the Scottish Paths Record), cycleways and equestrian routes.

The significance of visual impacts was determined through consideration of both the sensitivity of the visual receptors and the predicted magnitude of change as a result of the proposed options.

(vi) Sensitivity to Change

The sensitivity of visual receptors to changes in their views was evaluated in accordance with the criteria provided in Table 5-V, based on the following factors:

- Nature and context of the viewpoint;
- Expectations of users/receptors; and
- Importance* and value of the view to the receptor.

In the case of building receptors, 'importance' relates principally to the number and type (where known) of windows/rooms/gardens looking towards the view.

Sensitivity	Criteria
High	Receptors where the changed view is of high value and importance and/or where the receptor will notice any change to visual amenity by reason of the nature of use and their expectations, (generally only remote dwellings situated to take advantage of panoramic scenic views or outdoor receptors where the view is important to users will be considered to be of high sensitivity).
Medium	Receptors where the changed view is incidental but not critical to amenity and/or the nature of the view is not a primary consideration of the users (the majority of dwellings have been assessed as being of medium sensitivity, as well as outdoor receptors where users are likely to spend time outside of participation in their activity looking at the view and industrial receptors that have offices with windows that take advantage of views).
Low	Receptors where the changed view is unimportant/irrelevant and/or users are not sensitive to change (the majority of industrial receptors are considered to be of low sensitivity unless they have a significant number of windows, which may raise their sensitivity to low/medium; outdoor receptors where users are unlikely to consider the views an important element of their usage of the site will generally be assessed to be of low sensitivity).

Table 5-V Visual Sensitivity Criteria

(vii) Magnitude of Visual Change

Evaluation of the magnitude of visual change affecting receptors was carried out by considering the scale of change in the view due to the addition or loss of features, change in character and the amount/extent of the view affected.

The main elements taken into account in the evaluation of magnitude of change included:

- The extent of the receptor's available view affected by the development (including the distance from the proposed route option);
- The angle of view relative to the main activity of the receptor; and
- The level of integration or contrast created by the proposed route option and its associated elements within the view.

The criteria used to determine the magnitude of visual change are shown in Table 5-W.

Sensitivity	Criteria
High	Where the proposed scheme or elements of the scheme will dominate the view and fundamentally change its character and components.
Medium	Where the proposed scheme or elements of the scheme will be noticeable in the view, affecting its character and altering some of its components and features.
Low	Where the proposed scheme or elements of the scheme will be only a minor element of the overall view that are likely to be missed by the casual observer and/or scarcely appreciated.

Table 5-W Magnitude of Visual Change

(viii) Significance of Visual Impact

To help determine the impact significance using sensitivity and magnitude, the same approach was used for the visual assessment as used for the landscape assessment (refer to Table 5-U).

(c) Limitations to Assessment

The visual assessment was undertaken based on a general field survey to provide an indicative visual envelope for each of the proposed route options. As recommended in DMRB, a detailed survey to identify specific receptors and assess impacts should be carried out following the selection of a preferred route.

It should be noted, however, that the information available from the general field survey was considered sufficient for the purposes of Stage 2 assessment.

5.4.3 Baseline Conditions

Baseline conditions are common to both proposed route options and are therefore described in general below.

(a) Landform

Landform in the study area comprises undulating ground resulting in small hill and ridge formations rising to 100 metres Above Ordnance Datum (AOD). These form distinctive features in the local landscape but are common to the gently undulating low lying plain in the surrounding landscape. The most notable local hills lie to the west of the study area. A series of hills form a ridgeline to the southwest of the area rising to 50 metres AOD and a further hill rises to 127 metres AOD to the northwest.

The old part of the city of Elgin is also situated on a small hill and plateau of approximately 35 metres AOD.

Low lying ground to the west of the study area forms the floodplain for the River Lossie.

The River Lossie meanders through the west and north of the study area and forms the main hydrological feature. Other hydrological features include the Burn of Tyock to the east of the area, the Black Burn to the west of the area and a pond in park land to the northeast of the area. A series of field drains occur in a marshy wildlife site (the Wards Wildlife Site) to the centre of the study area.

(b) Landscape and other Designations

The historic centre of the Elgin is designated as a Conservation Area. There are no further designated landscape areas identified in the vicinity of the proposed options.

(c) Local Landscape Character Areas (LLCAs)

There are five distinctive LLCAs in the study area. These are outlined in Table 5-X below with their associated sensitivities.

LLCA	Description	Sensitivity
Floodplain	▪ Low lying land ▪ Large agricultural fields ▪ Level open aspects with long range views ▪ Hedgerows with trees along field boundaries ▪ Scattered dwellings and farms ▪ River and tributaries ▪ Telegraph poles ▪ Post and wire fencing ▪ Busy rural roads	Medium
Enclosed River Basin	▪ Low lying land ▪ River and weir. Lade. ▪ Wooded escarpment ▪ Local roads ▪ Dilapidated dry stone walls ▪ Agricultural fields with improved grassland ▪ Rough grassland to the east ▪ Vernacular mill buildings ▪ Mature trees	Medium
Wetlands	▪ Low lying land ▪ Marsh and rough ground ▪ Scrub and patches of woodland ▪ Footpath network ▪ Shallow marshy ponds and field drains	Medium
Urban	There are three distinct areas. These include: • Old town – old stone buildings, civic buildings, distinctive skyline with domes, monuments and spires, mature trees and small copses, situated on elevated plateau. Conservation Area status. • Developed area to the northwest – medium density housing built on sloping ground with southerly	Medium to High

LLCA	Description	Sensitivity
	aspect. Trees in gardens and in avenues along residential roads help integrate into surrounding wooded hill. • Developed area to the south – medium to high density housing on flatter ground. Industrial / commercial area.	
Ridgeline Wooded Farmland	▪ Low undulating ridge ▪ Tracks and footpath network ▪ Mixed woodland (Ancient Woodland designation), predominantly coniferous ▪ Isolated clumps of Scots pine ▪ Agricultural fields	Medium to High
Wooded Slope	• Southwest facing slopes of a small hill • Mixed woodland – deciduous on lower slope (Ancient Woodland designation), coniferous on higher • Busy A96 along lower slopes, network of footpaths and access tracks. • Caravan park and medium density housing to lower southeast slopes. Farm buildings to south. • River Lossie cutting through lower area	Medium to High

Table 5-X Local Landscape Character Areas

(d) Vegetation

Vegetation cover in the study area varies to reflect the natural influences of local geology, landform, microclimate, drainage, soil, colonisation and biodiversity and the influence of man upon land use and management. The resulting vegetation pattern is intrinsic to the integrity of regional and local distinctiveness.

Mature mixed woodland occurs on the higher ground to the west of the area. The lower areas of the hill are mainly deciduous Ancient Woodland with coniferous woodland to the higher ground. The woodland on the ridgeline to the southwest is also mixed Ancient Woodland. Distinctive clumps of Scots pine are located on small hill formations and along bluffs to the south and west of the area. Areas of native deciduous woodland are also found along the River Lossie.

The majority of agricultural land within the study area is arable with hedges used extensively to reflect the exposed nature of the plains setting.

The topography also provides a distinctive marshland area at the Wards Wildlife Site which contains native riparian vegetation species.

Mature trees and native and non-native shrubs feature in the townscape in private gardens.

(e) Visual

The elevated position of the old part of Elgin affords views over the surrounding flatter areas where local topography and vegetation permits. Properties situated on the south facing slopes experience views over the Wards Wildlife Site, agricultural fields and low lying ground some of which to the east has been more recently developed with commercial buildings and residential developments. Long distance views however are restricted by the wooded undulating ridgeline.

Views north from the central elevated old town (south of the River Lossie and north of the rail line) are generally over the river valley toward the wooded hills and residential developments to the north. The majority of views however are restricted by wooded belts along steeply rising bluffs.

To the north of the study area (north of the River Lossie) the views are generally south facing over the low lying agricultural land at the River Lossie basin and towards the steep wooded bluffs of the old part of the city.

To the south of the study area (south of the rail line) the flat landscape affords few views within the built up areas. However the edges of the residential areas have views over the surrounding landscape. To the west, long range views are restricted by the wooded ridgeline and are predominantly to the northwest over the Wards Wildlife Site and towards the rail line.

The majority of views within the city centre are contained and influenced by the surrounding buildings and townscape.

5.4.4 Potential Environmental Effects

(a) Introduction

This section describes the assessment of the potential impacts on the landscape character (Figure 5, Local Landscape Character Areas) and visual receptors (Figure 6, Visual Impact), without any mitigation in place.

Impacts on LLCAs are described as 'direct' where the impact occurs within an LLCA. 'Indirect' impacts on a LLCA refer to impacts that occur out-with the LLCA but affect its setting or character from a distance.

(b) Do Nothing

For the purposes of this assessment, it is assumed that there will be no landscape or visual changes associated with the Do Nothing Scenario.

(c) Existing Network Enhancements Option

(i) Construction

During the construction phase, landscape and visual impacts for the Existing Network Enhancement Option could potentially include:

- Damage to vegetation and private garden ground;
- Landscape and visual impacts from the location of site compounds and plant and materials storage areas;
- Disruption due to prolonged programme of works;
- Landscape and visual impacts from congestion and traffic management; and
- Landscape and visual impacts during night-time working as a result of light pollution/glare.

(ii) Operation

Landscape

The Existing Network Enhancements Option would have potential direct impacts without mitigation on two LLCAs. No indirect impacts are anticipated on the other four LLCAs. The direct impacts are outlined in Table 5-Ybelow.

LLCA	Sensitivity	Description of Impact	Magnitude of Change	Significance of Impact
Urban	Medium to High	• Junction improvemnts and realignment of pavement at Linkwood Road and Station Road. • Upgraded junction at Moray Street. • Realignment of junctions along South Street with loss of stone walls and garden. • Widening of paving at Dr Grays roundabout. • Widening of Alexandra Road. • Introduction of new roundabout at Wittet Drive / A96 Junction with loss of trees and housing.	Low to Medium	Moderate
Enclosed River Basin	Medium	Introduction of earthworks to form roundabout to south of the LLCA. Views opened up to the south.	Low	Slight

Table 5-Y Potential Direct Landscape Impacts (without mitigation)

Visual

The Existing Network Enhancements Option includes proposals to upgrade the junction at Elgin Road. Commercial and industrial receptors at the New Elgin Road South Junction could potentially experience alterations of their views. The receptors have low sensitivity and would experience a low magnitude of change to views, potentially resulting in a Negligible to Slight impact.

Receptors at the New Elgin Road North Junction would experience alteration of their views. Some earthworks would be visible from the south and east and there would be a loss of vegetation and setting of a car parking area. The receptors have medium sensitivity and would experience a low to medium magnitude of change to views, potentially resulting in a slight to moderate impact.

The Existing Network Enhancements Option would realign junctions along South Street. Receptors at the South Street/Mayne Road junction realignment would have views opened up as a section of stone wall and part of a garden are demolished. The receptors in this area are within a Conservation Area and therefore have a medium to high sensitivity. They would experience medium magnitude of change to views, potentially resulting in a moderate to substantial impact.

Receptors at the South Street/Hawthorn Road junction realignment would have views opened up as sections of stone wall and part of a garden are demolished. The

receptors in this area are within a Conservation Area and have a medium to high sensitivity. They would experience medium magnitude of change to views, potentially resulting in a moderate to substantial impact.

The Existing Network Enhancements Option would introduce a widened footway at Dr Grays Roundabout. Receptors would have views of the widened footpath and realigned road at the junction. The receptors in this area are within a Conservation Area and have a medium to high sensitivity. They would experience low magnitude of change to views, potentially resulting in a slight beneficial impact.

Receptors at Old Mills Road and Jock Inksons Brae currently experience rural views south towards a wooded escarpment. The Existing Network Enhancements Option would introduce a roundabout at the top of the escarpment with mature trees cleared and extensive earthworks. The receptors have medium sensitivity and would experience a medium to high magnitude of change to views, potentially resulting in a moderate to substantial impact.

Receptors at Trinity Road and Blackfriars Road currently experience views south to a grassed embankment and underpass beneath Alexandra Road. The Existing Network Enhancements Option would introduce a retaining wall and realigned footway as the Alexandra Road is widened for dualling. The underpass would be stopped up and closed and the grass embankment would be replaced by hard landscaping elements. Commercial receptors in the area have a low sensitivity to change and would experience a low magnitude of change to views, resulting in a Negligible to Slight impact significance. Dwellings and church buildings have a medium sensitivity and would experience a low magnitude of change to views, potentially resulting in a slight impact.

The potential visual impacts without mitigation are outlined in Table 5-Z.

Receptor	Sensitivity	Magnitude	Significance
Commercial and industrial receptors at the New Elgin Road South Junction	Low	Low	Negligible to Slight
Receptors at the New Elgin Road North Junction	Medium	Low to Medium	Slight to Moderate
Receptors at the South Street/Mayne Road Junction	Medium to High	Medium	Moderate to Substantial
Receptors at the South Street/ Hawthorn Road Junction	Medium to High	Medium	Moderate to Substantial
Receptors at the Dr Grays Roundabout	Medium to High	Low	Slight beneficial
Receptors at the Old Mills Road and Jock Inksons Brae	Medium	Medium to High	Moderate to Substantial
Receptors at the Trinity Road and Blackfriars Road (commercial receptors)	Low	Low	Negligible to Slight
Receptors at the Trinity Road and Blackfriars Road	Medium	Low	Slight

Receptor	Sensitivity	Magnitude	Significance
(residential and church receptors)			

Table 5-Z Potential Visual Impacts (without mitigation)

(d) Urban (Inner) Option

(i) Construction

During the construction phase, landscape and visual impacts for the Urban (Inner) Option could potentially include:

- Damage to vegetation and collateral damage to private garden ground;
- Landscape and visual impacts from the location of site compounds and plant and materials storage areas;
- Disruption due to prolonged programme of works;
- Landscape and visual impacts from congestion and traffic management; and
- Landscape and visual impacts during night-time working as a result of light pollution/glare.

(ii) Operation

The proposed Urban (Inner) Option would be situated in the western area of the city traversing an area to the west of the Wards Wildlife Site and continuing northwest across rough ground on embankment. The route would cross the Inverness to Aberdeen railway line on a bridge structure and connect to the south end of Wittet Drive. A further section of road on embankment would be added to the northern end of Wittet Drive to accommodate a roundabout connecting the route with the A96.

Landscape

The proposed option could have potential direct impacts on three LLCAs. No impacts on the other three LLCAs are anticipated. The direct impacts are outlined in Table 5-AA below.

LLCA	Sensitivity	Description of Impact	Magnitude of Change	Significance of Impact
Urban	Medium to High	• Road on embankment to south of Wittet Drive • Road on embankment and creation of roundabout on embankment to north of Wittet Drive • Loss of dwellings / urban fabric north of Wittet Drive	Low to Medium	Moderate
Wetlands	Medium	• Road on embankment in area disturbed by housing development	Low to Medium	Slight to Moderate
Ridgeline	Medium to	• Introduction of road at	Low	Slight

LLCA	Sensitivity	Description of Impact	Magnitude of Change	Significance of Impact
Wooded Farmland	High	grade and in slight cut on low lying land to the northeast edge of the LLCA.		

Table 5-AA Potential Direct Landscape Impacts (without mitigation)

Visual

Elgin High School, adjacent primary school and surrounding dwellings on Glen Lossie Drive, Cockmuir Place and Warden Place currently experience views to the north over the Wards Wildlife Site and across open fields towards the end of an undulating ridgeline. The Urban (Inner) Option would introduce views of the southern section of this route as it passes adjacent to the Wards Wildlife Site. The majority of receptors would experience winter only views through trees. The receptors have medium sensitivity and would experience a low magnitude of change to views, potentially resulting in a Negligible to Slight impact.

The Wards Wildlife Site is an outdoor visual receptor and currently experiences views west through trees to local hills and an undulating ridgeline. A footpath runs along the outer edge of the site and there is an entrance point to the western edge with information boards. The Urban (Inner) Option would run in close proximity to the western edge of the site and would introduce views of traffic and the embankment. The informal path to the western entrance point would also be severed. The receptor has medium sensitivity and would experience a medium magnitude of change to views, potentially resulting in a Moderate impact.

Receptors at Fairfield Avenue currently experience views east to the Wards Wildlife Site. The Urban (Inner) Option would introduce an embankment at close proximity that would disturb the views and the peaceful setting of the development. Views would also include the proposed bridge structure over the railway line to the north of the development. The receptors have medium sensitivity and due to the continuing construction on the development, would experience a medium magnitude of change to views and a Moderate impact.

Receptors at Wards Road, Forteath Avenue, Mayne Road, Young Street and St Catherine's Place have elevated south facing views over the Wards Wildlife Site and the ridgeline wooded farmland and surrounding landscape. Receptors would experience views of the Urban (Inner) Option on embankment. The receptors have medium sensitivity and would experience a low to medium magnitude of change to views, potentially resulting in a Slight to Moderate impact.

Receptors at the junction of Wards Road and Wittet Drive have elevated south facing views over the Wards Wildlife Site, the undulating ridgeline wooded farmland and surrounding landscape. Receptors would experience some loss of garden ground and boundary walls and an interruption to views as the Urban (Inner) Option rises on embankment to cross the railway line bridge structure. The receptors have medium sensitivity and would experience a high magnitude of change to views, potentially resulting in a Substantial impact.

Receptors to the north of Wittet Drive and Bruceland Road currently experience rural views to the northwest over the River Lossie and towards the busy A96. Receptors would experience views of the Urban (Inner) Option as it crosses a field to the northwest of the receptors on embankment. They would also experience views of the roundabout junction on embankment. The receptors have medium

sensitivity and would experience a medium to high magnitude of change to views, potentially resulting in a Moderate to Substantial impact.

Receptors to the south of Sheriffmill Road are set back from the A96 and have elevated positions with views south through mature trees at the junction with the A96. The Urban (Inner) Option would introduce a roundabout and realigned junction to replace the existing junction. The receptors would experience a loss of mature trees and garden ground affecting the setting of the dwellings and would experience views opened up of the realigned junction. The receptors have medium sensitivity and would experience a high magnitude of change to views, potentially resulting in a Substantial impact.

The potential visual impacts without mitigation are outlined in Table 5-BB.

Receptor	Sensitivity	Magnitude	Significance
Receptors at Elgin High School, adjacent primary school and surrounding dwellings on Glen Lossie Drive, Cockmuir Place and Warden Place	Medium	Low	Negligible to Slight
The Wards Wildlife Site	Medium	Medium	Moderate
Receptors at Fairfield Avenue	Medium	Medium	Moderate
Receptors at Wards Road, Forteath Avenue, Mayne Road, Young Street and St Catherine's Place	Medium	Low to Medium	Slight to Moderate
Receptors at the junction of Wards Road and Wittet Drive	Medium	High	Substantial
Receptors north of Wittet Drive and Bruceland Road	Medium	Medium to High	Moderate to Substantial
Receptors south of Sheriffmill Road	Medium	High	Substantial

Table 5-BB Potential Visual Impacts (without mitigation)

5.4.5 Potential Mitigation

It is not appropriate to develop detailed mitigation proposals at DMRB Stage 2 before the identification of a preferred route. However, opportunities for mitigation proposals are identified below in general terms.

(a) Existing Network Enhancements Option

(i) Construction

During the construction phase, landscape and visual mitigation for the Existing Network Enhancements Option could potentially include:

- Protection of vegetation and avoidance of damage to garden ground;
- Sensitive locating of site compounds and plant and materials storage areas to minimise their landscape and visual impact;

- Programming of works to reduce disruption, including keeping the construction programme to the minimum practicable time;
- Efficient traffic management and pedestrian diversions; and
- Avoidance of night-time working where possible. Where necessary, directed lighting used to minimise light pollution/glare.

(ii) Operation

The opportunities for landscape and visual mitigation measures are outlined below.

- Use of paving surfaces that integrate with the existing paving elements to blend upgraded junctions into the urban setting. This would reduce adverse impacts on receptors throughout the Existing Network Enhancements Option;
- Ornamental planting on the earthworks to the southeast of New Elgin Road North Junction to replace lost planting and reinstate the setting at the junction approach. This would reduce impacts on receptors with views from the east;
- Retain original stone walls where possible and reinstatement of stone boundary walls at South Street to match existing form and material to retain the urban character within the Conservation Area. This would reduce impacts on receptors in South Street;
- Stone facing on retaining structure at Alexandra Road to tie in with surrounding stone built elements. This would reduce visual impacts of views from the north;
- Reinstatement of boundary walls to properties matching local materials in urban areas to integrate the road into the urban fabric. This would reduce the visual impact on receptors at Wittet Drive; and
- Mixed woodland planting to replace lost woodland to the north of the Wittet Drive roundabout and integrate earthworks into wooded escarpment. This would reduce visual impacts for receptors at Wittet Drive, Old Mills Road and Jock Inksons Brae.

(b) Urban (Inner) Option

(i) Construction

During the construction phase, landscape and visual mitigation for the Urban (Inner) Option would be the same as that for the Existing Network Enhancements Option, as described below.

- Protection of vegetation and avoidance of collateral damage to private garden ground;
- Sensitive locating of site compounds and plant and materials storage areas to minimise their landscape and visual impact;
- Programming of works to reduce disruption, including keeping the construction programme to the minimum practicable time;
- Efficient traffic management and pedestrian diversions; and

- Avoidance of night-time working where possible. Where necessary, directed lighting used to minimise light pollution/glare.

(c) Operation

Opportunities for landscape mitigation measures are outlined below:

- Scrub woodland planting in the triangular area of land to the northwest of the Wards Wildlife Site and along the east embankment of the Urban (Inner) Option. This would extend the woodland and integrate the road into the surrounding mosaic. This would also provide screening of views from receptors at Wards Road, Forteath Avenue, Mayne Road, Young Street and St Catherine's Place;

- Patches of scrub woodland on the west embankment adjacent to Fairfield Avenue would soften the embankment and integrate the road into the surrounding landscape. This would also soften the embankment and provide some screening of views from Fairfield Avenue to the west. Planting to the west in the triangular area of land to the northwest of the Wards Wildlife Site and along the east embankment of the Urban (Inner) Option would extend the woodland on the edge of the Wards Wildlife Site and integrate the road into the surrounding mosaic;

- Reinstatement of boundary walls to properties matching local materials in urban areas to integrate the road into the urban fabric;

- Protection of existing mature trees where possible at the proposed roundabout with the A96 and mixed woodland planting around the roundabout to integrate the junction with the surrounding mature trees and wooded setting. This would also provide screening for receptors to the south of Sheriffmill Road and receptors at Wittet Drive and Bruceland Road;

- Mixed woodland planting at the proposed roundabout on the A96 to integrate the junction with the surrounding mature trees and wooded setting; and

- The Ridgeline Wooded Farmland LLCA would benefit from species rich grass planting to earthworks.

5.4.6 Summary of Options Assessment

This section takes the proposed mitigation measures into account and summarises the residual impacts associated with each proposed route option for the summer fifteen years after completion/opening. This time lapse enables mitigation planting to establish and mature.

The Do Nothing Scenario is not anticipated to have any impact on LLCAs or visual receptors.

(a) Existing Network Enhancements Option

The Existing Network Enhancements Option would potentially have direct impacts on two LLCAs resulting in residual impacts of Slight and Negligible to Slight.

Four visual receptors are predicted to experience significant residual impacts (Moderate or greater). These are outlined below with reference to the proposed mitigation.

- Receptors at South Street/Mayne Road junction, at South Street/Hawthorn Road junction and at Old Mills Road and Jock Inksons Brae would benefit from retention of stone walls and reinstatement of stone boundary walls and mixed woodland planting to replace lost woodland to the north of the Wittet Drive roundabout. With this mitigation in place, the potential impact would reduce to a residual Moderate impact; and

- Receptors at Wittet Drive Roundabout would benefit from the reinstatement of boundary walls to properties using local materials. With this mitigation in place, the potential impact would reduce to a Moderate to Substantial adverse in the summer of the Design Year (2029).

There is a potential slight beneficial impact for receptors at Dr Gray's Roundabout which would remain unchanged in the summer of the Design Year (2029). Other residual visual impacts could potentially be reduced to Slight or Negligible with the incorporation of the proposed mitigation.

(b) Urban (Inner) Option

The Urban (Inner) Option would potentially have direct impacts on three LLCAs resulting in residual impacts of Slight on each.

Three visual receptors are predicted to experience significant residual impacts (Moderate or greater) for visual receptors for the Urban (Inner) Option. These are outlined below with reference to the proposed mitigation.

- Although receptors south of Sheriffmill Road would benefit from screening planting, they would remain exposed to major change due to the removal of large mature trees and proximity to the roundabout. However, with this mitigation in place, the potential impact would reduce to a Moderate to Substantial residual impact; and

- Receptors at the Junction of Wards Road and Wittet Drive would benefit from the reinstatement of boundary walls. With this mitigation in place, the potential impact would reduce to a moderate to substantial in the summer of the Design Year (2029).

Receptors where impacts are expected to reduce from a significance of Moderate or above include the Wards Wildlife Site receptors at Fairfield Avenue and receptors North of Wittet Drive and Bruceland Road.

5.4.7 Scope of Stage 3 Assessment

The Stage 3 assessment should be based on the following tasks as set out in DMRB Volume 11, Section 3, Part 5:

- Updated/supplementary baseline landscape assessment, if necessary;

- Identification of detailed mitigation and compulsory purchase order land required, incorporating agricultural, surface water, ecological and noise mitigation; and

- Updated impact assessment to take account of detailed mitigation proposals.

In addition, should if the Urban (Inner) Option is taken forward, photomontages should be prepared in consultation with SNH.

5.5 Noise and Vibration

5.5.1 Introduction

This Section describes the assessment of the potential noise and vibration impacts of the Existing Network Enhancements Option and the Urban (Inner) Option. Reference is made to the Do Nothing Scenario for comparative purposes. The assessment has been undertaken following guidance in the Design Manual for Roads and Bridges (DMRB) (Highways Agency et al, 2007) for a Simple Assessment. In order to aid the understanding of this section, Appendix H (Noise Definitions) provides definitions of some of the terms used.

5.5.2 Approach and Methods

(a) Construction

(i) Noise

At this stage it is not possible to undertaken a detailed assessment of construction noise and vibration as details, such as programme and plant, are not available. However, examples of plant and equipment with associated noise data are provided in British Standard (BS) 5228 (British Standards Institution, 2009), as provided in Table 5-CC below and these are used for the purpose of this assessment.

It should be noted that the noise levels are predicted at a distance of 10 metres. Earthworks are generally considered to be the noisiest phase of the construction and therefore the noise levels below represent the worst case scenario.

	Octave Band Centre Frequency								
	63 Hz	125 Hz	250 Hz	500 Hz	1k	2k	4k	8k	L_{Aeq}
Large Tracked Excavators(BS 5228, Table C2, Ref 14)	85	78	77	77	73	71	68	63	79
Articulated Dump Trucks (BS 5228, Table C4, Ref 1 and 2, Table C5 Ref 16 and 17)	87	86	78	76	76	72	67	61	80
Vibratory Compactor (BS 5228, Table C2, Ref 42)	81	76	72	73	72	72	68	63	78
Dumpers (BS 5228, Table C4, Ref 3, 4, 6 and 7)	86	82	75	73	71	69	63	62	77
Mini Tracked Excavator 5 T (BS 5228, Table C4, Ref 67)	87	79	76	70	68	64	57	48	74

Table 5-CC Assumed Plant and Associated Noise Data (decibels, dB)

(ii) Vibration

BS 5228-2: 2009 (British Standards Institution, 2009) provides guidance on human responses to vibration and building structural responses to vibration. The standard provides guidance for construction vibration in terms of Peak Particle Velocity (PPV), which is the instantaneous maximum velocity reached by a vibrating element

as it oscillates about its rest position. Table 5-DD provides guidance on the effects of vibration levels on occupants of buildings as detailed in BS 5228-2: 2009.

Based on likely construction activities and the guidance provided in BS 5228-2: 2009, professional judgement was used to assess potential vibration impacts.

Vibration level PPV	Effect
0.14 mm/s-1	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.3 mm/s-1	Vibration might be just perceptible in residential environments.
1.0 mm/s-1	It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents.
10 mm/s-1	Vibration is likely to be intolerable for any more than a very brief exposure.

Table 5-DD Guidance on the effects of Vibration Levels

(b) Operation

Noise modelling (CadnaA) has been undertaken in order to predict likely noise levels for the Do Nothing Scenario, the Urban (Inner) Option and the Existing Network Enhancements Option. Predictions have been undertaken for the Year of Opening (2014), and the Design Year (2029).

Within a DMRB Simple Assessment, consideration is given to existing and new routes where there is likely to be a change of 1 dB (A) or more. Noise calculations are required at each sensitive receptor (including residences, schools, hospitals, etc) within a maximum distance of 600 metres either side of the centreline of affected routes. For residential properties and other sensitive receptors that are within two kilometres of the project boundary (but not within 600 metres of an affected route), a qualitative assessment has been undertaken.

(c) Baseline Conditions

For the purposes of this assessment, the baseline scenario is represented by the predicted ambient noise levels immediately before the change produced by the proposed options, as set out in DMRB. This is taken as the noise levels from the existing roads i.e. the Do Nothing Scenario in Year of Opening (2014).

(d) Impact Assessment

The impact significance is assessed in terms of sensitivity of the receptor, and the magnitude of impact (e.g. high, medium, low and negligible). Further details on this methodology are provided below.

(i) Sensitivity

In order to determine the significance of an impact, the sensitivity of the receptor is determined, as presented in Table 5-EE. At this stage of assessment, only receptors of high sensitivity (i.e. residential and non-residential) are considered.

Receptor Type	Sensitivity
Industrial premises and warehouses	Low
Commercial premises	Medium
Residential properties, hospitals, schools, churches and open spaces where existing ambient noise levels are low	High

Table 5-EE Sensitivity of Receptors

(ii) Impact Magnitude

The classification of impacts in relation to changes in road traffic noise provided within DMRB, as detailed in Table 5-FF below, has been used for this assessment.

Noise Change L_{A1018h}	Magnitude of Impact
0	No change
0.1 – 0.9	Negligible
1.0 – 2.9	Minor
3.0 – 4.9	Moderate
5+	Major

Table 5-FF Noise Change Criteria

(iii) Impact Significance

The overall significance of effect is defined using a combination of the impact magnitude and receptor sensitivity, as shown in Table 5-GG below.

Magnitude / Sensitivity	Major	Moderate	Minor	Negligible
High	Substantial	Moderate	Slight	Slight
Medium	Moderate	Moderate	Slight	Negligible
Low	Slight	Negligible / Slight	Negligible	Negligible

Table 5-GG Matrix for Determination of Impact Significance

5.5.3 Baseline Conditions

For the purposes of this noise and vibration assessment, baseline conditions are considered to be represented by the predicted Do Nothing noise levels for the Year of Opening (2014). Traffic model predictions for 2014 assume changes in traffic from the current (2010) situation as a result of general traffic growth.

The Urban (Inner) Option model identifies 3,799 residential receptors and 60 non-residential sensitive receptors within the Urban (Inner) study area. The Existing Network Enhancements Option model identifies 3,033 residential receptors and 60 non-residential sensitive receptors.

Examples of predicted baseline noise levels at properties in 2014 are provided in Table 5-HH below.

Receptor Name	Baseline Noise Level (derived $L_{Aeq(16\text{-}hr)}$	Nearest Road within Noise Model
52 Burnside Place, Elgin, IV30 6EN	31	A941 Main Street north of Thornhill Road (150 metres)
5 Golf View Crescent, Elgin, IV30 6JP	32	Glen Moray Drive (south of Edgar Road) (100 metres m)
75 Springfield Road, Elgin, IV30 6BZ	41	Edgar Road (west of A941) (275 metres)
40 Bruceland Road, Elgin, IV30 1SF	45	Wittet Drive (between A96 and Brucefield) (85 metres)
11 Maisondieu Place, Elgin, IV30 1RD	48	Maisondieu Road at A941 New Elgin Road (50 metres)
22 Wittet Drive, Elgin, IV30 1SW	59	Wittet Drive (between Bruceland and Pluscarden) (10 metres)
Dunbarney House West Road, Elgin, IV30 1SA	72	A96 (between Wittet and Dr Gray's) (4 metres)

Table 5-HH Predicted Baseline Noise Levels (2014)

(a) Limitations to Assessment

The traffic information used to develop the noise models is extracted from the traffic model. The accuracy of predictions of road traffic noise effects is subject to the accuracy of the data entered into the model, i.e. traffic model, road design details and topography.

In the noise model, buildings within approximately 100 metres of affected routes with the Urban (Inner) Option and 150 metres with the Existing Network Enhancements Option, have been modelled as buildings or screens. Outside this area, as a result of limitations with regard to the modelling software, buildings have not been included within the model. However, it should be noted that predictions have been undertaken in the vicinity of all sensitive receptors within the 600 metres requirement and therefore the assessment includes all sensitive receptors.

5.5.4 Potential Environmental Effects

(a) Introduction

This Section describes the changes in noise levels predicted as a result of the construction and operation of the proposed route options without provision of any noise mitigation, and details the environmental effects that could potentially occur.

The noise change predictions are shown on Figures 7-9 as noise contours for each of the proposed route options for Year of Opening (2014) and Design Year (2029).

Free field noise levels have been predicted, at a height of 1.5 metres above ground level.

(b) Do Nothing

This Section considers the situation if neither the Existing Network Enhancements Option or the Urban (Inner) Option are in place. Predicted noise levels in 2014 are as described under the baseline (refer to section 5.5.3 and Table 5-HH above).

(c) Existing Network Enhancements

(i) Construction

Construction impacts relating to the Existing Network Enhancements Option are the same as those predicted for the Urban (Inner) Option in general, as described below. However, the receptors affected will vary between options according to where the construction activities are taking place.

As noted in Table 5-CC, with noise levels from individual plant items of between 74 and 80 dB at 10 m, there is the potential for construction noise levels in excess of 75 dB L_{Aeq} at the closest sensitive receptors.

Short term noise and vibration impacts may occur when plant and equipment is in close proximity to sensitive properties, some of which may be significant. Table 5-DD refers to vibration levels of different types of equipment which may be used during construction.

Vibration may be perceptible in those properties closest to construction activities. However, it is envisaged that no damage to property will occur as a result of the construction activities.

(ii) Operation

Table 5-II below details the potential operational impacts in the Year of Opening (2014) for the Existing Network Enhancements Option. Table 5-JJ details the potential operational impacts in the Design Year (2029) for the Existing Network Enhancements Option.

Change in noise level $L_{A10,18h}$	Number of residential properties subject to a change in noise level		Number of other sensitive receptors subject to a change in noise level		Significance
	Increase in noise level	Decrease in noise level	Increase in noise level	Decrease in noise level	
0	0	200	0	0	No Change
0.1 – 0.9	865	1,239	20	33	Slight
1 – 2.9	315	356	2	5	Slight
3 – 4.9	12	41	0	0	Moderate
5+	0	5	0	0	Substantial
Total	1,192	1,841	22	38	N/A

Table 5-II Existing Network Enhancements Option - Changes in Noise Levels (Year of Opening, 2014)

During the Year of Opening (2014), 12 residential properties are predicted to experience Moderate Adverse noise impacts as a result of the Existing Network Enhancements Option. These receptors are all located on Wittet Drive, at the junction with the A96.

Five residential properties are predicted to experience Substantial Benefits in terms of noise decreases as a result of this option (these receptors are located south of Edgar Road), while 41 residential properties are predicted to experience Moderate Benefits (these are generally located south of Edgar Road, East of Maisondieu Road and along South Street).

No non residential sensitive receptors are predicted to experience Moderate or Substantial Adverse impacts. All other receptors are predicted to experience impacts ranging from No Change to Slight Adverse or Beneficial.

Change in noise level $L_{A10,18h}$	Number of residential properties subject to a change in noise level		Number of other sensitive receptors subject to a change in noise level		Significance
	Increase in noise level	Decrease in noise level	Increase in noise level	Decrease in noise level	
0	0	217	0	3	No Change
0.1 – 0.9	1,069	1090	18	30	Slight
1 – 2.9	405	207	5	4	Slight
3 – 4.9	15	25	0	0	Moderate
5+	0	5	0	0	Substantial
Total	1,489	1,544	23	37	N/A

Table 5-JJ Existing Network Enhancements Option - Changes in Noise Levels (Design Year, 2029)

In the Design Year (2029), 15 residential properties are predicted to experience Moderate Adverse noise impacts as a result of the Existing Network Enhancements Option. These receptors are all located on Wittet Drive, at the junction with the A96.

Five residential properties are predicted to experience Substantial Benefits in terms of noise decreases as a result of this proposed route option (these receptors are located south of Edgar Road), while 25 residential properties are predicted to experience Moderate Benefits (these are generally located south of Edgar Road and East of Maisondieu Road).

No non residential sensitive receptors are predicted to experience Moderate or Substantial Adverse impacts.

All other receptors are predicted to experience impacts ranging from No Change to Slight Adverse or Beneficial.

For residential properties, and other sensitive receptors, that are within two kilometres of the project boundary (but not within 600 metres of an affected route) it is considered unlikely that there would be a perceptible changes in noise levels in the Design Year (2029) compared to the Year of Opening (2014). Most of these receptors, approximately 3,100, are located to the north of Elgin city centre(including Duffus Road and Lossiemouth Road), with significant number also located on the southeast side of Elgin city centre (including Birnie Road and Thornhill Road), approximately 1,900.

(d) Urban (Inner) Option

(i) Construction

As noted in Table 5-CC, with noise levels from individual plant items of between 74 and 80 dB at a distance of 10 metres, there is the potential for construction noise levels in excess of 75 dB L_{Aeq} at the closest sensitive receptors.

Short term noise and vibration impacts may occur when plant and equipment are in close proximity to sensitive properties, some of which may be significant. Table 5-DD refers to vibration levels of different types of equipment which may be used during construction.

Vibration may be perceptible at those properties closest to construction activities. However, it is considered that vibration as a result of the construction activities is not likely to cause damage to property.

(ii) Operation

Table 5-KK below details the potential operational impacts in Year of Opening (2014) with the Urban (Inner) Option in place. Table 5-LL details the potential operational impacts in the Design Year (2029) with the Urban (Inner) Option in place.

Change in noise level $L_{A10,18h}$	Number of residential properties subject to a change in noise level		Number of other sensitive receptors subject to a change in noise level		Significance
	Increase in noise level	Decrease in noise level	Increase in noise level	Decrease in noise level	
0	0	538	0	1	No Change
0.1 – 0.9	2,047	428	44	8	Slight
1 – 2.9	456	86	2	0	Slight
3 – 4.9	183	8	2	0	Moderate
5+	49	4	3	0	Substantial
Total	2,735	1,064	51	9	N/A

Table 5-KK Urban (Inner) Option - Changes in Noise Levels (Year of Opening, 2014)

During the Year of Opening (2014), 49 residential properties and 3 non residential sensitive receptors (Greenwards School, the playground at Ben Aigen Walk and Elgin High School) are predicted to experience Substantial Adverse noise impacts as a result of this proposed route option. The majority of these residential receptors are located south of the Urban (Inner) option (e.g. Wardend Place), with a few located to the north where Wittet Drive meets the Urban (Inner) Option. The remaining affected receptors are located on Pluscarden Road (near Dr Gray's roundabout) and close to the new roundabout being introduced on the A96 as part of the Urban (Inner) Option.

Four residential properties are predicted to experience Substantial Benefits in terms of noise decreases as a result of this option (6, 8, 10, 12 Wittet Drive).

All other receptors are predicted to experience impacts ranging from No Change to Moderate Adverse or Beneficial.

Change in noise level $L_{A10,18h}$	Number of residential properties subject to a change in noise level		Number of other sensitive receptors subject to a change in noise level		Significance
	Increase in noise level	Decrease in noise level	Increase in noise level	Decrease in noise level	
0	0	499	0	11	No Change
0.1 – 0.9	1,293	910	18	20	Slight
1 – 2.9	689	91	5	0	Slight
3 – 4.9	250	7	3	0	Moderate
5+	56	4	3	0	Substantial
Total	2,288	1,511	29	31	N/A

Table 5-LL Urban (Inner) Option - Changes in Noise Levels (Design Year, 2029)

In the Design Year (2029), 56 residential properties and three non residential sensitive receptors (Greenwards School, playground at Ben Aigen Walk and Elgin High School) are predicted to experience Substantial Adverse noise impacts. The residential receptors are located in the same areas as those experiencing Substantial Adverse impacts during the Year of Opening (2014).

Four residential properties are predicted to experience a Substantial Benefit as a result of this noise decreases (6, 8, 10, 12 Wittet Drive).

All other receptors are predicted to experience impacts ranging from No Change to Moderate Adverse or Beneficial.

For residential properties, and other sensitive receptors, that are within two kilometre of the project boundary (but not within 600 metres of an affected route) it is considered unlikely that there would be a perceptible change in noise levels in the Design Year (2029) compared to the Year of Opening (2014). Most of these receptors, approximately 2,000, are located to the north of Elgin city centre (including Duffus Road and Lossiemouth Road), with approximately 900 located to the southeast of Elgin city centre (including Birnie Road and Thornhill Road).

5.5.5 Potential Mitigation

This section describes potential mitigation for both the Existing Network Enhancements Option and the Urban (Inner) Option. As the mitigation proposed is generic at this stage it applies to both proposed route options.

(a) Construction

Properties nearest to the construction activities may experience noise levels in excess of 70 dBL_{Aeq}, however, it is anticipated that this will be for a short time period only. These properties may therefore not be eligible for noise insulation as specified by the Noise Insulation (Scotland) Regulations (NISR) (HMSO, 1975) during construction.

All construction work would be undertaken using best practicable means, following guidance such as BS 5228: Parts 1 and 2 – Code of practice for noise and vibration control on construction and open sites (British Standards Institution, 2009).

Mitigation measures are likely to take the form of localised temporary barriers and the use of modern, low-noise emission plant and equipment. Mitigation measures may also include the following:

- Fitting of more efficient exhaust sound reduction equipment to earth moving plant where possible;
- Fitting of more efficient sound reduction equipment to compressors and generators;
- Manufacturers' enclosure panels on compressors and generators to be kept closed;
- Construction of acoustic screens between static plant and noise sensitive receptors;
- Pneumatic tools to be fitted with suitably designed muffler or sound reduction equipment to reduce noise without impairing efficiency;
- Ensuring that air lines to pneumatic equipment do not leak;
- Enclosures or screens to minimise noise from pneumatic tools, pumps and other static plant to noise sensitive receptors;
- Optimising haul roads to minimise noise emissions to noise sensitive receptors; and
- Switching off plant and equipment when not in use.

Discussions regarding acceptable noise and vibration levels should be held with the Local Authority to discuss mitigation measures such as restrictions on working hours.

(b) Operation

As a result of anticipated long-term noise increases at a number of properties associated with both the Urban (Inner) Option and the Existing Network Enhancements Option, some properties may be eligible for noise insulation as specified by the Noise Insulation (Scotland) Regulations (NISR) (HMSO, 1975). Further consideration of properties eligible for insulation should be undertaken.

For the purposes of this assessment it has been assumed that the existing and future road surfaces are conventional hot rolled asphalt. Consideration could be given to a lower noise road surface. However, it should be noted that the advice given in DMRB regarding the benefits of thin surfacing systems only applies to roads where the mean traffic speed is ≥ 75 kilometres per hour. DMRB states that, although it is likely that thin surfacing systems will provide an acoustic benefit at lower speeds, until further research is carried out to provide reliable estimates as to the level of benefit that could be expected. It is advised that a qualitative statement highlighting the possible acoustic benefits be produced. For the vast majority of the roads considered within the study, speeds are such that there would be no allowable benefit for a lower noise road surface.

Consideration could be given to screening parts of the proposed route option to reduce noise emissions. At this stage of the assessment, it is not possible to provide detailed guidance on where such screening barriers will be beneficial, or

what heights and extents would be necessary to provide the required level of noise control. Based on the initial results and observations, it is considered that screening would be effective at providing significant benefits in terms of noise reduction at properties south of Edgar Road for the Urban (Inner) Option. Although screening could also be considered on other affected roads for both the Urban (Inner) Option and Existing Network Enhancements Option, it is likely to be difficult to implement on existing roads.

5.5.6 Summary of Options Assessment

There are potential short term noise and vibration impacts during the construction phase of both the Urban (Inner) Option and Existing Network Enhancements Options. It is therefore considered unlikely that any property would be eligible for construction noise insulation during construction.

With the Urban (Inner) Option in place, Substantial adverse noise impacts are predicted for 56 residential properties and three other sensitive receptors in the Design Year (2029) compared to the Do Nothing Scenario in the Year of Opening (2014). In addition, a further 250 residential properties and 3 other sensitive receptors are anticipated to experience perceptible increases in noise level with associated Moderate adverse noise impacts in the Design Year (2029) compared to the Do Nothing Scenario in the Year of Opening (2014). Four residential properties are anticipated to experience Substantial noise benefits. A further seven residential properties are anticipated to experience perceptible decreases in noise level with an associated Moderate noise benefit.

With the Existing Network Enhancements Option in place, Moderate adverse noise impacts are predicted for 15 residential properties in the Design Year (2029) compared to the Do Nothing Scenario in the Year of Opening (2014). Five residential properties are anticipated to experience Substantial noise benefits, while a further 25 residential properties are anticipated to experience perceptible decreases in noise level with an associated Moderate noise benefit.

With either the Urban (Inner) Option or the Existing Network Enhancements Option in place, residential properties and other sensitive receptors within two kilometres of the project boundary (but not within 600 metres of an affected route) are considered unlikely to experience perceptible changes in noise levels in the Design Year (2029) compared to the Year of Opening (2014).

With the Do Nothing Scenario in place, no residential properties are anticipated to experience a perceptible change in noise level in the Design Year (2029), compared to the Year of Opening (2014).

5.5.7 Scope of Stage 3 Assessment

Given the predicted noise increases for the Urban (Inner) Option, a ‘Detailed Assessment’, in accordance with the DMRB guidance, should be considered if this proposed route option is taken forward as a preferred option. In addition, consideration should be given to potential mitigation measures, such as acoustic screening. The noise modelling during the detailed assessment should include all buildings within the modelling area.

6 TRAFFIC AND ECONOMIC ASSESSMENT

6.1 Modelling

6.1.1 Introduction

The traffic and economic assessment of the 'Do Nothing' and three option scenarios has been undertaken using the VISSIM (version 5.2) microsimulation package and the Program for Economic Assessment of Road Schemes (PEARS, v2008.1) software.

VISSIM was used to compare alternative options in terms of performance indicators such as changes to traffic flows, speeds, journey times and travel distances. These outputs were then input to PEARS to identify the economic performance of each option compared to a Do-Nothing scenario. Output from VISSIM was also used in the environmental appraisal of each option in relation to air quality, traffic noise and vibration.

This section of the assessment report describes the operation of the traffic model and a review of its outputs. Section 6.2 (Effects of Options) summarises the primary effects of the route options considered, whilst the economic performance of the various route options are presented in section 6.3 (Economic Performance of Route Options).

6.1.2 VISSIM Microsimulation Model

The microsimulation model covers the city of Elgin in its entirety, including all major routes in and out of the city. The model is an updated / revised version of the Elgin VISSIM Model (EVM) developed by Halcrow in partnership with The Moray Council. The EVM was utilised by Jacobs during the DMRB Stage 1 assessment period.

The use of the EVM during the Stage 1 assessment identified a number of areas where the model could be enhanced to give an improved level of performance. This was considered to be required in order to support the Stage 2 assessment where more detail appraisal has taken place. In particular, this improved the way in which the model represented the performance of the network in future years

Therefore, it was considered necessary to revise some of the model elements to ensure robustness for the assessment. It was also considered that if these amendments were to be incorporated, they should be done so in the latest version of VISSIM, version 5.20 and the model re-based to this version. The model continues to represent a base year of 2006.

6.1.3 VISSIM Representation of Base Conditions

The VISSIM Model is designed to replicate 2006 travel patterns across the modelled area as closely as possible. Consequently, following updating of the models, baseline conditions in the model are consistent with the original model used for the previous assessment.

6.1.4 Forecasting

Trip matrices for the future years of 2014 (assumed opening year) and 2029 (assessment year), were derived utilising a combination of National Road Traffic Forecast (NRTF) growth forecasts and incorporating forecast trip generations from Local Plan development sites from the 2008 - 2013 Moray Local Plan.

(a) Opening Year

Opening year forecasts allow for no background traffic growth in the model. This decision was based on a review of A96 Automatic Traffic Count (ATC) data through Elgin which indicated there had been little or no growth on the trunk road between 2005 and 2009. In addition, given the current economic climate it was envisaged that traffic growth between 2009 and 2014 would be unlikely to occur.

However, a range of committed development proposals identified in the Local Plan are included, some of which are already in place in the future year scenario. The proposed developments and their associated generated trips included in the model, are detailed in table 6-A.

		AM		PM	
Development	**Land Use**	**In**	**Out**	**In**	**Out**
ALDI	Retail	15	11	47	49
LIDL	Retail	20	14	61	64
Pets at Home	Retail	1	0	3	3
Pizza Hut	Fast Food	0	0	16	9
Tesco	Superstore	8	7	11	16
ASDA	Superstore	17	13	33	38
Neighbourhood Centre	Retail / Office	30	4	13	35
Alan Milne Car Showroom	Car Showroom	15	6	9	15
Robertson's Site: Non Food Retail	Non Food Retail	14	5	34	39
Garden Centre	Garden Centre	17	5	15	30
Housing R1	Residential	4	12	11	6
Housing R2	Residential	9	30	27	16
Housing R3	Residential	26	87	79	45
Housing	Residential	1	4	4	2
Housing R4	Residential	14	47	43	24
Housing R5	Residential	31	104	94	54
Housing R7	Residential	13	45	40	23
Housing R8	Residential	4	12	11	6
Housing R9	Residential	34	116	105	60
Housing	Residential	2	6	5	3
BP 1 + BP2	Business Park	94	11	13	86
BP 3	Business Park	9	1	1	9
16 Linkwood East	Ind. Est	150	69	76	120
12 Chanonry	Ind. Est	119	44	25	67
McDonalds Est - car mart	Car Showroom	53	22	31	53

Table 6-A Committed Developments Included in Future Year Assessments.

(b) Assessment Year (Opening Year + 15)

By 2029 it is envisaged that growth in movements through Elgin along the A96 and A941 will have occurred. However it is considered that the growth level is likely to be consistent with NRTF low growth forecasts of approximately 11%. Committed development proposals identified in the Local Plan are also included.

6.1.5 Do Nothing Scenario Network

The VISSIM model is intended to assess the impact of the proposals by comparing the intervention scenarios against a Do-Nothing or reference case scenario, such that the difference between the two identifies the impacts.

It is therefore necessary to define the committed and most likely changes that will be made to the transport network between 2006 and the two appraisal years of 2014 and 2029 to obtain the most representative appraisal results. These committed and likely interventions form the VISSIM 'Do-Nothing' scenario and were defined in consultation with Transport Scotland and The Moray Council. The 'Do-Nothing' interventions included within the VISSIM model are listed in Table 6-B.

Location	Intervention
Reiket Lane / A96 junction	Upgrade of ghost island to roundabout junction
Edgar Road	Extension of Edgar Road to the west to facilitate access to local plan sites
Reiket Lane	Mini Roundabout on Reiket Lane / Barlink Road
Reiket Lane	Removal of shuttle signals on bridge and upgrade to two way operation

Table 6-B Interventions in VISSIM Do-Nothing Scenario

6.1.6 Do Nothing Scenario Forecasts

Drawing Nos. JC0061A0/T/T/004 (Rev. 1) and JC0061A0/T/T/005 (Rev. 1) included in Appendix A of this report present details of the forecast AM and PM peak period flows on key links in the network for both the opening year (2014) and the consequent design year (2029).

Drawing No. JC0061A0/T/T/004 (Rev. 1) indicates the forecast AM flows for the Do Nothing Scenario in 2014 and 2029. The forecast flows indicate a general increase in traffic across the network, with significant growth occurring at locations adjacent to the large scale committed developments i.e. residential sites on the western side of Edgar Road, the A941 south near Glass Green and Reiket Lane in particular. The knock on effect from these development trips is broadly impacted across the network at large. A small reduction is forecast on South Street. This would seem to be a result of access to the A96 and A941 becoming more difficult from South Street due to increased traffic levels along these major routes.

The pattern largely stays the same through to 2029, however there are additional increases in traffic levels particularly on Morriston Road, Wittet Drive and Pluscarden Road demonstrating a reassignment effect away from the A96 corridor in the west of Elgin due to the increase in the volume of through traffic.

Drawing No. JC0061A0/T/T/005 (Rev. 1) indicates the forecast PM flows for the Do Nothing scenario in 2014 and 2029. The forecast flows indicate a similar trend to the AM peak with increases in traffic levels generally throughout the city on most routes. However, noticeable increases are forecast along radial routes such as Reiket Lane and Ashgrove Road while there are reductions forecast on the A96 Alexandra Road and Hay Street routes. This would suggest that as the city centre gets busy, traffic is inclined to choose routes other than the A96 which is perceived as being congested.

By 2029 the model is forecasting increases in traffic flow network wide with the A96 Alexandra Road and Hay Street now experiencing additional levels of traffic compared with the 2029 base.

Drawing No. JC0061A0/T/T/006 (Rev 1) indicates AADT figures for the Do Nothing scenario in 2014 and 2029.

6.1.7 Summary

The model is forecasting increases in traffic flow in both peak periods throughout the general network in both opening year and design year. There are a few locations where traffic levels decrease as routes become less attractive in the future year scenarios with vehicles choosing other alternative lower cost routes.

6.2 Effect of Options

6.2.1 Definition of Options

Following the DMRB Stage 1 assessment and discussions with The Moray Council, three options were selected for further assessment at Stage 2 as summarised below:

- Existing Network Enhancement option;
- Urban (Inner) Distributor Route; and
- Rural (Inner) Distributor Route.

Whilst the Rural (Outer) Distributor Route was assessed at Stage 1, the lack of change to the scheme that would impact journey time and the stability of the model changes in this part of the model, meant that there was no benefit in running the model in the Stage 2 assessment. Any changes would have a marginal impact on the result of poor economic performance reported in Stage 1.

A description of each of the above options can be found in section 3 of this report and drawings of each option are included in Appendix A.

6.2.2 Traffic Flows

(a) Existing Network Enhancements Option

Drawing Nos. JC0061A0/T/T/004 (Rev. 1) and JC0061A0/T/T/005 (Rev. 1) included in Appendix A of this report present details of the forecast AM and PM peak period flows on key links in the network for both the opening year (2014) and the consequent design year (2029).

Drawing No. JC0061A0/T/T/004 (Rev. 1) presents the forecast AM flows for Existing Network Enhancement (ENE) Option in 2014 and 2029. The forecast indicates increased flows using the Wittet Drive corridor for access between the A96 and Edgar Road / A941 south via the Wards Road while a reduction occurs on the section of the A96 between Wittet Drive and Dr Gray's Hospital roundabout.

The Pluscarden Road corridor becomes an attractive corridor for traffic travelling between the south west area of Elgin and the A96 at the city centre as demonstrated by the increase in flows along the corridor. South Street shows a reduction in flow given the one way priority now in operation.

The A96 along Alexandra Road maintains the same level of flow through the section, but the added road space prevents queued vehicles blocking back through the Tesco's or Halfords junctions.

The trends in traffic routing and assignment between the opening year and design year are generally similar.

Observations indicate that the inclusion of the roundabout on Wittet Drive opens up an attractive alternative route to the A941 south and Edgar Road areas, relieving the A96 on approach to Dr Gray's Roundabout. The one way provision on South Street is not forecast to lead to an obvious additional benefit as the flows on the surrounding links remain the same. However, junction capacity improvements at A941 New Elgin Road would appear to facilitate easier access from the side roads.

Drawing No. JC0061A0/T/T/005 (Rev. 1) indicates the forecast PM flows for the ENE Option in 2014 and 2029. Similar effects to the AM peak are forecast to occur in the PM with the Wittet Drive route attracting traffic away from the A96 between Wittet Drive and Northfield Terrace to the Wittet Drive corridor.

Drawing No. JC0061A0/T/T/006 (Rev. 1) indicates the AADT figures for the Existing Network Enhancements Option in 2014 and 2029.

(b) Urban (Inner) Distributor Route

Drawing Nos. JC0061A0/T/T/004 (Rev. 1) and JC0061A0/T/T/005 (Rev. 1) included in Appendix A of this report indicate forecast AM and PM peak period flows on key links in the network for both the opening year (2014) and the consequent design year (2029).

Drawing No. JC0061A0/T/T/004 (Rev. 1) indicates the forecast AM flows for Urban (Inner) Route in 2014 and 2029. The forecast flows indicate an increase on flows using the Wittet Drive corridor for access between the A96 and the Edgar Road area via the new distributor road, while a reduction occurs on the section of the A96 between Wittet Drive and Dr Gray's Roundabout.

The Pluscarden Road / South Street corridor also becomes an attractive corridor for traffic travelling between the Edgar Road development areas and the city centre as Wards Road is now severed.

The trends in traffic routing and assignment between the opening year and design year are generally similar.

Drawing No. JC0061A0/T/T/005 (Rev. 1) indicates the forecast PM flows for Urban (Inner) Route in 2014 and 2029. The forecast flows indicate a similar trend to the

AM peak with the Wittet Drive / Pluscarden Road / South Street / Edgar Road corridors showing increases in traffic levels

An increase in traffic levels on some radial routes such as Reiket Lane / Thornhill Drive and Glen Moray Drive indicate a level of trip reassignment away from the A96 corridor. This reassignment is a consequence of shorter distance local trips filling the spare capacity on the A96 caused by diversion to the urban distributor route. As a result of this infilling, local pockets of congestion at the junctions along the A96 corridor are discouraging the longer trips from using the A96 corridor.

Drawing JC0061A0/T/T/006 (Rev 1) indicates the AADT figures for the Urban (Inner) Route in 2014 and 2029.

(c) Rural (Inner) Distributor Route

Drawing Nos. JC0061A0/T/T/004 (Rev. 1) and JC0061A0/T/T/005 (Rev. 1) included in Appendix A of this report indicate forecast AM and PM peak period flows on key links in the network for both the opening year (2014) and the consequent design year (2029).

Drawing No. JC0061A0/T/T/004 (Rev. 1) indicates the forecast AM flows for the Rural (Inner) Route in 2014 and 2029. The forecast flows indicate a significant decrease on flows using the Wittet Drive and on the A96 corridor between Wittet Drive and Northfield Terrace.

Results indicate the main effects of this option is a proportion of the traffic travelling between the A96 west and the Edgar Road / A941 south areas now diverts to the new Rural Distributor Road.

The Pluscarden Road / South Street corridor as with the Urban Inner route remains an attractive corridor for traffic travelling between the Edgar Road development areas and the city centre. A reduction in traffic levels on some radial routes such as Reiket Lane and Thornhill Drive and Glen Moray Drive indicate a level of trip reassignment away from the A96 corridor.

The trends in traffic routing and assignment between the opening year and design year are generally similar.

Drawing No. JC0061A0/T/T/005 (Rev. 1) indicates the forecast PM flows for Rural (Inner) Route in 2014 and 2029. The forecast flows indicate a similar trend to the AM peak with reductions on the Wittet corridor and A96 corridor between Wittet Drive and Northfield Terrace.

In 2014 there is an increase in traffic flows on the A96 between the Tesco's roundabout and Pansport Road. This is, similar to the Urban (Inner) Route, short local trips infilling the spare capacity released on the A96 by trips diverting to the Rural (Inner) Route. By 2029 however, the spare capacity has been soaked up by the increase in external to external trips i.e. between the A96 and A941.

Drawing No. JC0061A0/T/T/006 (Rev. 1) indicates the AADT figures for the Rural (Inner) Route in 2014 and 2029.

6.3 Economic Performance of Route Options

6.3.1 Introduction

The economic evaluation of the route options has been carried out using the TUBA (Transport User Benefit Appraisal) transport economic appraisal software developed by Mott MacDonald on behalf of the Department for Transport. The purpose of TUBA is to carry out transport scheme economic appraisal in accordance with the DfT's published guidance in Units 3.5 of the WebTAG guidance. It implements a 'willingness to pay' approach to economic appraisal for multi-modal schemes with fixed or variable demand.

6.3.2 Method of Appraisal

TUBA carries out trip-based assessments of changes in travel time costs and vehicle operating costs. The scheme benefits are calculated by comparing the total costs of travel (including travel time, vehicle operating costs and tolls) for the Do-Nothing Scenario and three Do-Something options.

The analysis described in this report is based on road transport only, and assumes no modal transfer occurs as a result of any of the options.

In accordance with Her Majesty's Treasury 'Green Book' guidance and DMRB guidance, the benefit stream is calculated for a 60 year period between years 2014 (the planned opening year) and 2074 inclusive. The summed monetised units of benefit are expressed in 2002 prices and discounted to 2002 at 3.5% per annum for the first 30 years and at 3.0% per annum for the next 30 years.

The summed benefits and costs are denoted by PVB (Present Value of Benefits) and PVC (Present Value of Costs); from these are calculated the NPV (Net Present Value = PVB-PVC) and the BCR (Benefit to Cost Ratio = PVB/PVC). Where an option produces a positive NPV (i.e. a future stream of forecast benefits in excess of scheme costs) and a BCR>1 then it will be considered more favourable than the Do-Nothing Scenario subject to affordability of the proposal.

6.3.3 Basic Data

For these initial economic assessments, the Do Nothing Scenario against which the benefits of the options were measured was taken to be the network as defined in section 3 of this report.

6.3.4 Scheme Specific Data

VISSIM simulation runs were undertaken for the AM and PM peak periods for all scenarios for the appraisal year of 2014. Given the general level of growth on the demand matrix levels between the opening year and design year is insignificant, it is envisaged that the level of benefits in 2014 are indicative of future years beyond that point. This in turn suggests that benefits for the interventions are slightly underestimated given they do not include the small difference in demand between opening and design year.

The following factors were used to factor road traffic demand outputs from the two modelled time periods to annual benefits as output by PEARS:

AM – 253
PM – 253

6.3.5 Construction Costs

Estimates of the construction costs for each option are detailed in Table 6-C below at 2010 Q2 prices.

Option	Cost (£M)
Existing Network Enhancements	£7.2
Urban (Inner) Route	£12.7
Rural (Inner) Route	£24.5
Rural (Outer) Route	£68.4

Table 6-C Construction Cost Estimates

All costs includes preparatory costs, works costs, utilities costs, risk costs and optimism bias adjustment.

6.3.6 Delays During Construction

No assessment of the economic impacts of delays during the construction period of a particular option has been undertaken at this stage of assessment.

6.3.7 Accidents

It is not expected that the cost of accidents will vary significantly between the options.

6.3.8 Results

The economic performance for each option is set out in Table 6-D below, for comparison. They are expressed in 2002 prices, discounted to 2002.

Option	Present Value of Benefits (£,m)	Present Value of Costs (£,m)	Net Present Value (NPV) (£,m)	Benefit To Cost Ratio (BCR)	BCR Classification
Existing Network Enhancements	5.8	4.9	9.2	1.2	
Urban (Inner) Route	9.2	8.7	0.6	1.1	
Rural (Inner) Route	3.9	16.1	-12.2	0.2	

Table 6-D Economic Performance of Options

Results from Table 6-D above indicate Existing Network Enhancements (ENE) and the Inner Urban route produce positive Benefit to Cost Ratios (BCR). The Outer Rural option produces a BCR of less than one.

As stated previously the Rural (Outer) Route has not been considered in detail at this stage of the assessment. The economic result of this option was documented in the DMRB Stage 1 Report. However, as they were derived using a different method to that outlined above it would not be appropriate to include these results at this stage.

6.3.9 Summary

This Section reports an evaluation of the economic costs and benefits of the various 'Do Something' options assessed at Stage 2.

The economic evaluation program PEARS was used for the evaluation, as it has been specifically designed for use with the output from traffic microsimulation models, in this case VISSIM.

A summary of the Net Present Values (NPV) and Benefit to Cost Ratios (BCR) is presented in Table 6-D.

7 CONCLUSIONS

7.1 Engineering Conclusions

The three route options comprising; existing network enhancements, urban (inner) and rural (outer), reported during the Stage 1 scheme assessment were carried through into the Stage 2 assessment process. These were supplemented by a fourth rural (inner) corridor which is a value engineered version of the rural (outer) corridor.

7.1.1 Existing Network Enhancements

The existing network enhancements comprise of junction layout reconfigurations coupled with the introduction of a traffic signal control to improve traffic flows and road safety within Elgin.

An enhancement introducing a roundabout at the existing A96 and Wittet Drive junction location involves significant geotechnical complexities and the built environment adjacent to the improvement constrains layout standards necessitating the introduction of departures from standard. Furthermore the introduction of a roundabout at the existing junction location would require the demolition of adjacent private residential properties. The detrimental impact to properties, geotechnical complexities and substandard layout characteristics suggest this proposal is an unfavourable solution. However, an alternative roundabout location to the west of the existing A96 and Wittet Drive junction is considered within the Urban Inner Route.

The upgrading of the A96 at Alexandra Road to form an urban dual carriageway is constrained by adjacent infrastructure and properties necessitating retaining structures at the northern trunk road boundary. Land constraints dictate that a consequence of the road widening is the closure of the existing underpass leading to Elgin bus station with pedestrians redirected to an alternative at grade signal controlled crossing. Whilst road widening enhances road capacity there is a effect to current pedestrian facilities and as the proposal is on the periphery of the south west study area, the benefits to the south western quadrant of Elgin are limited.

The potential alteration of South Street to accommodate west bound traffic only helps facilitate a reduction of egresses onto Dr Gray's roundabout which may enhance road safety at this location.

The introduction of a signal controlled junction at the Moray and Hay Street, and junction capacity improvements at Station Road / New Elgin Road, and Edgar Road / New Elgin Road are feasible with relatively minor alterations to the existing road configuration, signage and road markings. Further detailed consideration of these options will be required in light of proposed development within the vicinity to determine the exact functional layout of the junctions.

7.1.2 Urban (Inner) Route

The urban (inner) route comprises of a new roundabout on the A96 and connecting arms at the northern end of Wittet Drive, a reconfigured crossroads introducing a traffic signal control junction between Pluscarden Road and Wittet Drive, a new structure crossing over the Aberdeen to Inverness railway line and a new link road south of the railway line connecting to the western end of Edgar Road.

The engineering measures associated with this route are relatively straight forward and the urban (inner) route generally complies with current standards. It is envisaged that localised relaxations in standard can be refined during the detailed design phase to remove elements of reduced standard.

Two alternative roundabout arrangements were considered to upgrade the existing A96 and Wittet Drive junction at the northern end of the urban (inner) route. A roundabout at the existing A96 and Wittet Drive junction location involves significant geotechnical complexities and the built environment adjacent to the improvement necessitates the need for multiple accesses adjacent to the junction introducing departures from standard. Furthermore the introduction of a roundabout at the existing junction location would require the demolition of adjacent private residential properties. The detrimental impact to properties, geotechnical complexities and substandard layout characteristics suggest this proposal is an unfavourable solution.

However, an alternative roundabout location to the west of the existing A96 and Wittet Drive junction is also considered. This four arm roundabout incorporating arms for the east and westbound A96, access to Sheriffmill Road and a realigned Wittet Drive link would meet current roundabout design standards and the new Wittet Drive link would facilitate access into the area of development land locked between the A96 trunk road, the River Lossie and existing housing. This proposed junction alternative would however require the demolition of private residential properties on the west side of Wittet Drive as the proposed link road connects back to Wittet Drive.

Both roundabout options between the A96 and Wittet Drive have detrimental effects to a comparable number of individual residential properties, however, option U2 to the west of the existing junction achieves a higher standard of junction and involves less engineering complexities.

7.1.3 Rural (Outer) Route

The rural (outer) route alignment is designed to a very high engineering standard with a mind that this route may form part of a bypass with a national speed limit around the southern side of Elgin at some point in the future. The railway crossing, three River Lossie crossings and extensive length of culverted embankment crossing the River Lossie flood plain introduce significant engineering complexities.

7.1.4 Rural (Inner) Route

The rural (inner), value engineered route, reduces the engineering complexities associated with a rural route. The engineering standard is reduced to match an anticipated speed limit of 40 mph and as the route remains tighter to the periphery of urban Elgin, the length is significantly reduced. Whilst crossings of the River Lossie, Aberdeen to Inverness railway line and the B9101 Pluscarden Road are required, the route has a limited impact on the River Lossie flood plain reducing the need for engineering measures to traverse such a constraint. The route does not provide a connection to the B9010 Pluscarden Road.

However, the route does have a detrimental effect on private residential properties near Palmers Cross with the need to undertake demolition works.

7.2 Environmental Conclusions

7.2.1 Existing Network Enhancements

The Existing Network Enhancements option is not anticipated to result in significant impacts in terms of air quality, ecology or noise. However, substantial adverse visual impacts may occur as a result of the new roundabout.

Beneficial impacts in terms of air quality and noise are envisaged at a number of properties in and around Elgin as a result of this option.

7.2.2 Urban (Inner) Route

The Urban (Inner) Route is on embankment directly south of the Aberdeen to Inverness railway crossing and therefore moderate adverse visual impacts are envisaged particularly to the existing houses at Fairfield Avenue. However, mitigation is expected to reduce this. Minor adverse impacts on ecology are predicted as a result of habitat loss adjacent to the Wards Wildlife Site.

7.2.3 Rural (Outer) Route

It was agreed that the environmental assessment of the Rural (Outer) Route would not progress beyond Stage 1 due to engineering constraints and a low cost benefit ratio.

The Stage 1 assessment predicted moderate adverse impacts on ecology as a result of the severance of woodland corridors and moderate adverse impacts on landscape and visual receptors. Noise decreases were predicted at a number of properties. For information on the other parameters assessed, refer to the ETM – Elgin Western Distributor Road, DMRB Stage 1 Report, 2010).

7.2.4 Rural (Inner) Route

An environmental assessment was not undertaken for the Rural (Inner) Option as it demonstrated a low cost benefit ratio and therefore did not present value for money.

7.3 Traffic and Economic Conclusions

7.3.1 Existing Network Enhancements

The existing network enhancements introducing a roundabout at the A96 / Wittet Drive junction to facilitate right turn manoeuvres, and junction capacity improvements at Station Road / New Elgin Road and Edgar Road / New Elgin Road junctions have a beneficial effect managing traffic movements through the south west quadrant of Elgin.

A new roundabout at the A96 and Wittet Drive junction opens an attractive alternative route for motorists travelling between the A96 and Edgar Road whilst also relieving pressure on the A96 approaching Dr Gray's roundabout. A reduction in traffic volumes at Dr Gray's roundabout may also potentially reduce accident numbers at this locus and improve road safety performance.

The junction capacity improvements at the Station Road and Edgar Road junctions with New Elgin Road, which will require further detailed consideration in light of potential development in the vicinity, will facilitate improved traffic movements at these locations.

The existing network enhancements at the A96 Alexandra Drive and South Street provide limited benefits to traffic congestion in Elgin.

The existing network enhancements require the least capital investment, when compared with alternatives, of £7.2 million and the network upgrades demonstrate a good benefit cost ratio. Furthermore the opportunity is likely to exist that funding contributions towards network enhancements could be pursued with the Trunk Roads Authority Transport Scotland and private developers as benefits to such stakeholders are clearly demonstrated.

7.3.2 Urban (Inner) Route

The urban (inner) route attracts significant volumes of traffic travelling between the A96 and south of Edgar Road whilst providing additional capacity on road links within the city centre of Elgin. The A96 trunk road between Wittet Drive and Dr Gray's roundabout in particular sees a reduction in traffic volumes which may reduce the accident numbers and improve the road safety performance at Dr Gray's roundabout. With the severance of Wards Road at its connection with Wittet Drive the B9010 Pluscarden Road and South Street corridor also becomes an attractive route for traffic travelling between Edgar Road and the city centre.

The route requires a moderate capital investment of £12.7 million and demonstrates a low benefit cost ratio indicating the route may not demonstrate best value.

7.3.3 Rural (Outer) Route

The rural (outer) route was assessed as part of the stage 1 work and observed to attract a proportion of traffic travelling between the A96 and the Edgar Road area. The route therefore does provide some additional capacity on road links within the city centre of Elgin, however the overall volumes of traffic attracted to the route are relatively small as the routes connection to the A96 is too far west to be attractive to the high proportion of motorist undertaking internal journeys within Elgin.

Assessment work undertaken for this route highlighted that a significant capital investment is required to deal with engineering constraints and that the route demonstrates a poor benefit cost ratio.

7.3.4 Rural (Inner) Route

The rural (inner) route attracts a proportion of traffic travelling between the A96 and south of Edgar Road and does provide additional capacity on road links within the city centre of Elgin. However this additional capacity is soaked up by additional network trips in the future year 2029. The overall volumes of traffic attracted to the route are relatively small as the routes connection to the A96 appears be too far west, whilst this connection suits strategic through traffic it does not appear to be attractive to the high proportion of motorists undertaking internal journeys within Elgin.

The route requires a significant capital investment of £24.5 million and demonstrates a low benefit cost ratio indicating the route does not demonstrate value for money.

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APPENDIX A DRAWINGS

APPENDIX B ROAD TRAFFIC ACCIDENT DATA

APPENDIX C PAVEMENT CONDITION DATA

APPENDIX D AIR QUALITY MODELLING

D.1 DMRB Screening Assessment

In order to assess the potential air quality impacts arising from vehicle activity generated by the proposed route options, a DMRB screening assessment of the pollutant emissions was undertaken using traffic predictions.

The methodology used is as outlined in the Design Manual for Roads and Bridges (DMRB), Volume 11, Section 3, Part 1 (Air Quality) HA207/07 (Highways Agency et al., 2007). The Highways Agency has created an Excel-based Screening Model in order to calculate the concentrations effectively. The latest version (Version 1.03c, 12.07.07) was downloaded from the air quality archive website (http://www.airquality.co.uk/archive/laqm/tools.php) and has been used for this assessment. In addition, the Local Air Quality Management Technical Guidance LAQM TG(09) has been followed to calculate nitrogen dioxide and PM_{10} levels (DEFRA/Scottish Executive, 2009).

D.2 Base Year 2006 Model Verification

The traffic model is an amended version of the base 2006 model developed by Halcrow. Due to various constraints and the requirement of a significant data collection programme, the model has not been re-based to 2009 and remains at a base year 2006.

Initial Modelling Results

The initial modelling results for annual mean NO_2 are presented in Table D-1 below for the roadside monitoring locations in Elgin.

Receptor ID	Annual mean NOx (µg/m^3)		Measured / Modelled	% Difference from measured	Within +/- 10%	Within +/-10-25%	Greater than +/- 25%
	Modelled	Measured					
E1	31.0	62.6	1.69	-50.5	0	0	1
E2	50.9	43.7	0.86	16.6	0	1	0
E5	27.4	17.7	0.64	55.1	0	0	1
E6	43.9	22.1	0.50	99.3	0	0	1

TableD-1 Base Model Verification 2006 and % variation from measured

As indicated in the table above, the model under-predicts the measured concentration at E1 and over-predicts at E2, E5 and E6. In accordance with the verification procedure within TG (09), the results are predominantly greater than +/- 25 % of the measured data and an adjustment has therefore been made to the road-NOx contribution from the model. Given the range in over-prediction percentages between sites E2, E5 & E6 it is difficult to justify the application of one adjustment factor, which will accurately represent the road network. This factor would also not address the under-prediction indicated at E1. As a conservative measure and to avoid under-predicting at any of the receptors, the adjustment ratio for site E1 is used on all NO_2 results.

Improved Modelling Results

The improved model results using the derived adjustment factor are presented in Table D-2 below.

Receptor ID	Annual mean NOx (µg/m^3)		% Difference from measured	Within +/- 10%	Within +/-10 – 25%	Greater than +/- 25%
	Modelled	Measured				
E1	62.6	62.6	0.0	1	0	0
E2	102.9	43.7	135.5	0	0	1
E5	55.4	17.7	213.3	0	0	1
E6	88.8	22.1	302.6	0	0	1

Table D-2: Adjusted 2006 Base Model Results and % variation from measured

The modelled result at E1 is now consistent with the monitored data although it is only for one location. The adjustment is based on data from a congested, busy high street and roadside location. The other sites now over-predict considerably, but are located at roadside locations where traffic is free-flowing. The correction factor is applied to all of the modelled NOx results and then adjusted using the NOx to NO_2 calculator[1] into modelled NO_2. It is likely that the predicted concentrations are conservative away from the monitoring point due to the road characteristics of the monitoring point.

Receptor	Location	Annual Average PM (µg/m^3) 2006	Annual Average NO_2 (µg/m^3) 2006
1	5 Wittet Drive	11.6	25.4
2	Braeview West Road (A96)	14.3	38.9
3	56 Pluscarden Road	10.6	18.5
4	19 Fairfield Way	9.7	11.6
5	3 West Road (A96)	13.7	36.8
6	19 Pluscarden Road	10.7	14.1
7	House South Street/ Gray's Roundabout	16.2	46.4
8	278 High Street (A96)	12.3	29.2
9	DT E1 High Street (A96)	13.3	34.5
10	9 Murdoch's Wynd (A96)	14.1	36.8
11	25 Murdoch's Wynd (A96)	13.1	32.2
12	Scottish Agricultural College 34 Moray Street	11.8	24.9
13	House Wards Road	10.6	17.0
14	House Edgar Road	9.8	12.3
15	13 College Street	13.1	33.2
16	DT E6 High Street/South Street (A96)	15.0	41.3
17	54 South College Street (A96)	13.8	36.5
18	DT E2 Maisondieu Road/East Road	15.9	44.6
19	1-2 Ashgrove Road	10.2	15.6
20	29 Maisondieu Rd	11.6	24.4
21	Office Moss Street	11.9	25.7

[1] www Ww11w.airquality.co.uk/archive/laqm/tools.php

Receptor	Location	Annual Average PM ($\mu g/m^3$) 2006	Annual Average NO_2 ($\mu g/m^3$) 2006
22	House New Elgin Road	12.4	30.5
23	DT E5 New Elgin Road	12.5	31.1
24	2-8 Hay Street	12.0	26.9

Table D-3: Base year (2006) Adjusted annual mean NO_2 and PM10 Concentrations (µg/m3)

The results presented in Table D-3 above indicate that the majority of the receptors are within AQ Standards. There are exceedances predicted at some locations on the network for NO_2. However, most of these are receptors that are not considered to be relevant exposure. The exception to this is at Receptor 7. However, it is noted that the adjustment factor is a conservative measure and is therefore likely to over-predict, especially where roads are less congested or busy compared with the verification site. There are no exceedances on the network for PM_{10}.

APPENDIX E ECOLOGY AND NATURE CONSERVATION BASELINE INFORMATION

E.1 Location of Species Records (NESBReC).

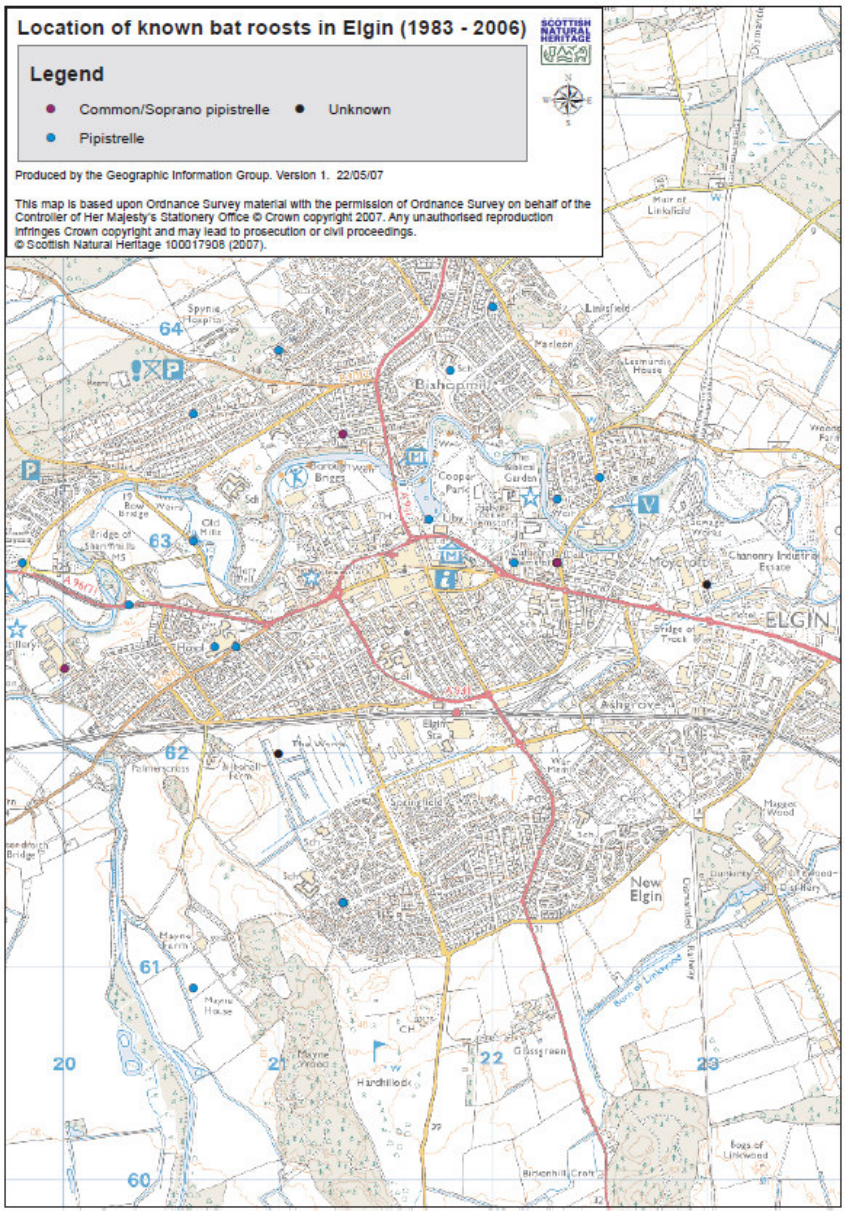
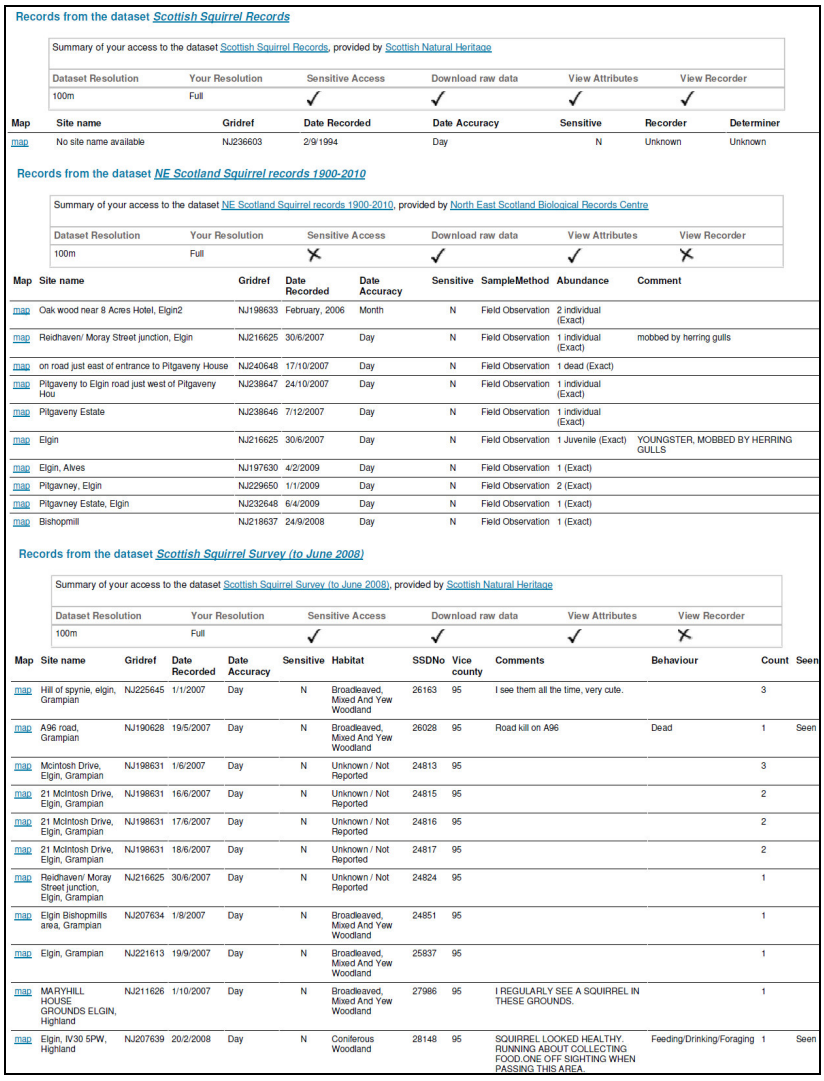


Figure E1: Bat Roost Records within Elgin, 1983 – 2006 (SNH).



Records from the dataset *Scottish Squirrel Records*

Summary of your access to the dataset Scottish Squirrel Records, provided by Scottish Natural Heritage

Dataset Resolution	Your Resolution	Sensitive Access	Download raw data	View Attributes	View Recorder
100m	Full	✓	✓	✓	✓

Map	Site name	Gridref	Date Recorded	Date Accuracy	Sensitive	Recorder	Determiner
map	No site name available	NJ236603	2/9/1994	Day	N	Unknown	Unknown

Records from the dataset *NE Scotland Squirrel records 1900-2010*

Summary of your access to the dataset NE Scotland Squirrel records 1900-2010, provided by North East Scotland Biological Records Centre

Dataset Resolution	Your Resolution	Sensitive Access	Download raw data	View Attributes	View Recorder
100m	Full	✗	✓	✓	✗

Map	Site name	Gridref	Date Recorded	Date Accuracy	Sensitive	SampleMethod	Abundance	Comment
map	Oak wood near 8 Acres Hotel, Elgin2	NJ198633	February, 2006	Month	N	Field Observation	2 individual (Exact)	
map	Reidhaven/ Moray Street junction, Elgin	NJ216625	30/6/2007	Day	N	Field Observation	1 individual (Exact)	mobbed by herring gulls
map	on road just east of entrance to Pitgaveny House	NJ240648	17/10/2007	Day	N	Field Observation	1 dead (Exact)	
map	Pitgaveny to Elgin road just west of Pitgaveny Hou	NJ238647	24/10/2007	Day	N	Field Observation	1 individual (Exact)	
map	Pitgaveny Estate	NJ238646	7/12/2007	Day	N	Field Observation	1 individual (Exact)	
map	Elgin	NJ216625	30/6/2007	Day	N	Field Observation	1 Juvenile (Exact)	YOUNGSTER, MOBBED BY HERRING GULLS
map	Elgin, Alves	NJ197630	4/2/2009	Day	N	Field Observation	1 (Exact)	
map	Pitgavney, Elgin	NJ229650	1/1/2009	Day	N	Field Observation	2 (Exact)	
map	Pitgavney Estate, Elgin	NJ232648	6/4/2009	Day	N	Field Observation	1 (Exact)	
map	Bishopmill	NJ218637	24/9/2008	Day	N	Field Observation	1 (Exact)	

Records from the dataset *Scottish Squirrel Survey (to June 2008)*

Summary of your access to the dataset Scottish Squirrel Survey (to June 2008), provided by Scottish Natural Heritage

Dataset Resolution	Your Resolution	Sensitive Access	Download raw data	View Attributes	View Recorder
100m	Full	✓	✓	✓	✗

Map	Site name	Gridref	Date Recorded	Date Accuracy	Sensitive	Habitat	SSDNo	Vice county	Comments	Behaviour	Count	Seen
map	Hill of spynie, elgin, Grampian	NJ225645	1/1/2007	Day	N	Broadleaved, Mixed And Yew Woodland	26163	95	I see them all the time, very cute.		3	
map	A96 road, Grampian	NJ190628	19/5/2007	Day	N	Broadleaved, Mixed And Yew Woodland	26028	95	Road kill on A96	Dead	1	Seen
map	Mcintosh Drive, Elgin, Grampian	NJ198631	1/6/2007	Day	N	Unknown / Not Reported	24813	95			3	
map	21 McIntosh Drive, Elgin, Grampian	NJ198631	16/6/2007	Day	N	Unknown / Not Reported	24815	95			2	
map	21 McIntosh Drive, Elgin, Grampian	NJ198631	17/6/2007	Day	N	Unknown / Not Reported	24816	95			2	
map	21 McIntosh Drive, Elgin, Grampian	NJ198631	18/6/2007	Day	N	Unknown / Not Reported	24817	95			2	
map	Reidhaven/ Moray Street junction, Elgin, Grampian	NJ216625	30/6/2007	Day	N	Unknown / Not Reported	24824	95			1	
map	Elgin Bishopmills area, Grampian	NJ207634	1/8/2007	Day	N	Broadleaved, Mixed And Yew Woodland	24851	95			1	
map	Elgin, Grampian	NJ221613	19/9/2007	Day	N	Broadleaved, Mixed And Yew Woodland	25837	95			1	
map	MARYHILL HOUSE GROUNDS ELGIN, Highland	NJ211626	1/10/2007	Day	N	Broadleaved, Mixed And Yew Woodland	27986	95	I REGULARLY SEE A SQUIRREL IN THESE GROUNDS.		1	
map	Elgin, IV30 5PW, Highland	NJ207639	20/2/2008	Day	N	Coniferous Woodland	28148	95	SQUIRREL LOOKED HEALTHY, RUNNING ABOUT COLLECTING FOOD.ONE OFF SIGHTING WHEN PASSING THIS AREA.	Feeding/Drinking/Foraging	1	Seen

Figure E2: Red Squirrel Records (NBN Gateway).

APPENDIX F HABITAT SURVEY TARGET NOTES

Target Note	Site Name	Grid Reference	TN Type	Description
1	Cedar Wood (the Wards Wildlife Site)	NJ 21357 61839	Phase 1	Cedar Wood forms part of the Wards Wildlife Site which is an urban wetland area within Elgin and is recognised as being of considerable value for biodiversity. Cedar Wood is located in the southeast of the site and consists of areas of neutral grassland with patches of planted broadleaved trees and scrub. The area is bordered by residential and commercial sites with some small amenity grassland areas to the south with open access. The area of semi-natural broadleaved woodland to the east of Cedar Wood contains species such as alder (*Alnus glutinosa*), oak (*Quercus* spp.), silver birch (*Betula pendula*), Norway maple (*Acer platanoides*), rowan (*Sorbus aucuparia*), horse chestnut (*Aesculus hippocastanum*), whitebeam (*Sorbus aria*), lime (*Tilia* sp.), sycamore (*Acer pseudoplatanus*), hazel (*Corylus avellana*), aspen (*Populus tremula*), ash (*Fraxinus excelsior*), larch (*Larix decidua*), osier (*Salix viminalis*), lombardy poplar (*Populus nigra* var. *italica*), goat willow (*S. caprea*) and wild cherry (*Prunus avium*). Ground flora within the site varies from the marshy grassland to neutral grassland and scrub species including common sorrel (*Rumex acetosa*), common knapweed (*Centaurea nigra*), common nettle (*Urtica dioica*), hogweed (*Heracleum sphondylium*), soft rush (*Juncus effusus*), white clover (*Trifolium repens*), false oat-grass (*Arrhenatherum elatius*), cocksfoot (*Dactylis glomerata*), creeping thistle (*Cirsium arvense*), broad-leaved dock (*Rumex obtusifolius*), cow parsley (*Anthriscus sylvestris*), creeping buttercup (*Ranunculus repens*), raspberry (*Rubus idaeus*), broom (*Cytisus scoparius*), gorse (*Ulex europaeus*), bracken (*Pteridium aquilinum*), broad-leaved willowherb (*Epilobium montanum*), tufted hair-grass (*Deschampsia cespitosa*), sweet cicely (*Myrrhis odorata*) and sow thistle (*Sonchus* sp)
2	Cedar Wood (the Wards Wildlife Site)	NJ 21261 61879	Phase 1	Scattered broadleaved trees and scrub within wetland habitat to the south and west of the wildlife site. Broadleaved trees are 15-20 years old, relatively immature and consist of mainly aspen, sycamore, alder and European hornbeam (*Carpinus betulus*).
3	Cedar Wood (the Wards Wildlife Site)	NJ 21150 62096	Phase 1	Area of marshy grassland, making up the majority of the site. This area is dominated by soft rush, with a ground flora consisting of species such as silverweed (*Potentilla anserina*), broad-leaved willlowherb, marsh thistle (*Cirsium palustre*) and northern marsh orchid (*Dactylorhiza purpurella*).
4		NJ 20439 62056	Phase 1	Broadleaved plantation woodland – area of woodland borders a semi improved grassland area and may be associated with a local estate. Trees are of mixed age with some very mature trees present. Tree species present include beech (*Fagus sylvatica*), Norway maple, oak, silver birch, larch, Scots pine (*Pinus sylvestris*), sycamore, lime and common hawthorn (*Crataegus monogyna*).
5	Coniferous woodland to the	NJ 20 61	Badger	Area of mature coniferous plantation woodland surrounded by arable and improved grassland to the west of Wards Road. Refer to Appendix G (Confidential Badger Data) for further information.

Target Note	Site Name	Grid Reference	TN Type	Description
	southwest of Fairfield			
6	Coniferous wood to west of Wards Road	NJ 20888 61968	Phase 1	Area adjacent to the construction site for the new housing development within the Fairfield Estate (to the west of the Wards Wildlife Site). Largely poor semi-improved grassland with tall ruderal vegetation on the large earth bund in the centre of the site. Some areas of marshy grassland with soft rush and small ephemeral pools of water.
7	Site to west of the Wards Wildlife Site (plus housing development within Fairfield Estate)	NJ 21014 61627	Phase 1	Marshy grassland with species present including soft rush, heath rush (*J. squarrosus*), buttercup species (*Ranunculus* spp), ribwort plantain (*Plantago lanceolata*), marsh thistle, northern marsh orchid, cleavers (*Galium aparine*). A wet ditch bisects the field from southwest to northeast and is choked with overgrown vegetation. The ditch has shallow banks and while no signs of water vole were identified, it has water vole potential. Surrounding vegetation comprises semi-improved neutral grassland with species present such as yarrow (*Achillea millefolium*), false oat-grass, creeping thistle and yellow rattle (*Rhinanthus minor*).
8	The Wards Wildlife Site - Pond	NJ 21038 61843	Amphibians	Large pond (possibly man-made) to the west of the Wards wildlife site. No overhanging trees/ vegetation which would provide shade but there is a high amount of submerged vegetation which is likely to provide suitable conditions for breeding amphibians. Plant species present include bulrush (*Typha latifolia*), yellow iris (*Iris pseudacorus*) and horsetail species (*Equisetum* spp.). The bulrushes may provide shelter for ground nesting birds.
8	The Wards Wildlife Site - Pond	NJ 20976 61989	Phase 1	Smaller pond located closer to the north-western edge of the Wards Wildlife Site. It is highly shaded by mature trees and has a higher level of aquatic vegetation. Estimated size of the pond is 10 metres x seven metres.
9	Wards Road	NJ 20659 62008	Bat	Mature Scots pine located in the garden of a private property along Wards Road (in the west if the survey area). The tree is identified as having bat potential, with the presence of flaking bark dominating its outer surface. Medium bat roost potential.
10	Bridge over the River Lossie	NJ 20211 62693	Bat	Two span bridge over the river. (The river only ran under the eastern span at the time of the survey). The bridge appears to have been recently pointed, which provides little access points for bats either in the spans of the bridge or on the stone facing. However, the structure does offer bat roost potential and a more detailed survey for bats is recommended. The banks along the river to the south of the bridge are heavily vegetated with tall ruderal species. Further up the bank, the tall ruderal vegetation appears to have been strimmed to ground level and is now considered to be an area of bare ground.
11	River Lossie - river bank	NJ 20223 62610	Otter	Numerous otter prints visible in sand on the western bank of the River Lossie. Appear to be adult prints given their size. Numerous fresh spraints were visible along the river bank - on a sandbank, on a clump of protruding clay in the water and on a sandbank under the bridge. The bank overhangs in places and there are areas where trees have fallen which may provide a suitable opportunity for a lying up site. No other obvious lying up or resting places were identified but a further more detailed survey for otters should be completed. Along the banks of the river, reed

Target Note	Site Name	Grid Reference	TN Type	Description
				canary grass (*Phalaris arundinacea)* dominates but this is accompanied by great willowherb (*Epilobium hirsutum*), broad-leaved dock, broad-leaved willowherb, foxglove (*Digitalis purpurea*) and white campion (*Silene latifolia*).
12	Woodland	NJ 20286 62750	Phase 1	An area of mature, semi-natural broadleaved woodland to the northwest of the survey area. The woodland is dominated by beech but also contains a mixture of sycamore, alder, wych elm (*Ulmus glabra*), hazel , ash and holly (*Ilex aquifolium*). Ground flora is species-poor with ivy (*Hedera helix)* and great wood-rush (*Luzula sylvatica*) being dominant.
13	Burn	NJ 20450 62792	Phase 1	Burn with shallow banks flowing through an area of poor semi-improved grassland to the northwest of the survey area. The water course has become heavily vegetated and the water is stagnant. It is bordered by tall ruderal vegetation which contains species such as meadowsweet (*Filipendula ulmaria*), rosebay willowherb and broad-leaved willowherb. The watercourse is fenced off on both sides and is bordered on both sides by poor semi-improved grassland. It is a water course that flows from east to west, issuing from underground east of a housing estate, and sinks underground on reaching the field boundary and minor road in the west. Assessed as unsuitable for water vole.
14	Dr. Grays Hospital – the grounds	NJ 20883 62572	Bat	A row of ~10-15 pollarded wild cherry trees. These may offer some value to bats for either roosting/foraging/ commuting purposes. Trees are relatively immature, however there are many cavities on trees which provide direct access into the hollow trunks. Medium roost potential for bats. Further survey is recommended
15		NJ 20494 62510	Bat	Buildings located directly under the footprint of the Urban (Inner) Option – Four bungalows and associated outhouses with moderate bat potential. Old buildings with high pitched roofs (but roof space has been converted into dormer), loose/missing tiles, fascia boards on outer walls, gaps under lead flashing. Further surveys for bats recommended prior to any works going ahead.

Table F1: Target Notes Associated with the Extended Phase 1 Habitat Survey Figure (Figure 4)

APPENDIX G CONFIDENTIAL BADGER DATA

This appendix presents information on the location of badger setts within the study area and is therefore not included within this report. A copy may be provided on request.

APPENDIX H NOISE DEFINITIONS

The sound wave travelling through the air is a regular disturbance in atmospheric pressure. These pressure fluctuations, when within the audible range are detected by the human ear, producing the sensation of hearing.

Noise is often defined as sound that is undesired by the recipient. For the purposes of this assessment, it is taken to be the perceived sound emitted by road traffic or other sources near the site of the proposed route options.

It is impossible to measure nuisance caused by noise directly, but it is possible to measure the loudness of that noise. "Loudness" is related to both sound pressure and frequency, both of which can be measured. The human ear is sensitive to a wide range of sound levels. The sound pressure level of the threshold of pain is over a million times that of the quietest audible sound. In order to reduce the relative magnitude of the numbers involved, a logarithmic scale of decibels (dB) based on a reference level of the lowest audible sound is normally used.

The response of the human ear is not constant over all frequencies. It is therefore common practice to weigh the measured frequencies to approximate the human response. This is achieved by using an "A" weighted decibel reading dB(A) and has been shown to correlate closely to the non-linear and subjective human response.

When measuring traffic noise, the instantaneous noise level is constantly changing due to variation in the traffic flow and vehicle composition. To obtain a single representative figure for traffic noise, the level that is exceeded for 10% of the time is used. This is known as the L10 noise level. To depict the noise levels experienced throughout the day, the hourly L10 noise levels are averaged over the 18 hour period from 06.00 - 24.00 on a normal working day.

When related to perceived changes in noise, a change of 10 decibels from, for example, 60dB(A) to 70dB(A) would represent a doubling in "loudness". It is also useful to note that traffic noise level changes of less than 3dB(A) cannot normally be perceived by the human ear.

Equivalent Continuous Sound Level (L_{Aeq}) is the level of a Notional Steady Sound which at the same position and over a defined period of time, would have the same "A"-weighted acoustic energy as the fluctuating noise. The unit is mainly used in connection with construction noise rather than traffic noise.

Free field is where sound is measured or calculated in the absence of any influence of reflections from nearby surfaces apart from the ground. In practice, a measurement is considered to be free field if it was taken at a distance of 3.5m or more from any reflecting surfaces.

Facade level is where sound is measured or calculated one metre from the façade of a building or other substantial reflecting surface. The reflecting effect results in a level, 2.5dB(A) higher than if the reflecting surface were not there.

APPENDIX I ENVIRONMENTAL ASSESSMENT FIGURES