M8/M73/M74 Network Improvements

Stage 3 Report
Part 1: Environmental Statement

Volume 1
Main Statement and Technical Appendices

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1 Introduction

1.1 The Environmental Statement

This Environmental Statement (ES) presents the findings of an Environmental Impact Assessment (EIA) of the proposed network improvement scheme developed under the M8/M73/M74 Network Improvements. The improvement is referred to throughout this report as the M8/M73/M74 Network Improvements (the Scheme). The proposed scheme is an improvement to the road network generally comprising the M8 immediately west of Baillieston Interchange, the M73 between Baillieston Interchange and Maryville Interchange and the M74 from west of Maryville to the Hamilton Junction.

Volume 1 contains the Environmental Statement and Appendices; Volume 2 contains Figures referenced in Volume 1. The location of the scheme is shown in Figure 1.1. The ES is issued in accordance with EC Directive 85/337 as applied by the Roads (Scotland) Act 1984, as amended by the Environmental Impact Assessment (Scotland) Regulations 1999 and is a Public Statement.

Any person wishing to make representations about the scheme and the Environmental Statement may do so in writing, addressed to:

Chief Road Engineer
Transport Scotland
Major Transport Infrastructure Projects
Buchanan House
58 Port Dundas Road
Glasgow G4 0HF

Written responses are invited within 42 days of the advertised date of publication of the Environmental Statement. Scottish Ministers will take into consideration any representations so made before deciding whether or not to proceed with the scheme with or without modifications.

A Non-Technical Summary has been published to accompany this Environmental Statement and is available free of charge. Copies of the Environmental Statement and the Non-Technical Summary are available for download from the website www.transportscotland.gov.uk.

The Environmental Statement is available for public viewing at the above address and at the locations listed in the Non-Technical Summary.

1.2 Background to the Scheme

The Central Scotland Transport Corridor Studies (CSTCS) identified and investigated specific interventions to resolve or ameliorate the transport problems within the A8, A80

and M74 corridors in order to meet the Government's five policy objectives in respect of Environment, Economy, Safety, Integration and Accessibility.

At an Investment Decision Makers Meeting held at the Scottish Executive, Victoria Quay, Edinburgh on 13th January 2005**,** MouchelFairhurst JV reported under the M8 Baillieston to Newhouse and Associated Improvements commission the need to investigate options for capacity improvements on the M73, M74 and M8 adjacent to Baillieston and Maryville Interchanges. This need was based upon studies of the future road network in 2010 following construction of several significant schemes including the M74 Completion, the M80 Stepps to Haggs and the M8 Baillieston to Newhouse schemes.

Traffic modelling of the proposed network demonstrates that traffic congestion will occur at the following locations:

- M8 eastbound approaching Baillieston Interchange (at A89 diverge) ;
- M8 westbound approaching Baillieston Interchange
- M73 northbound and southbound between Baillieston and Maryville Interchanges;
- M74 northbound and southbound to Maryville Interchange
- M74 southbound from Maryville Interchange to Raith Junction

Improvement works would therefore be required at the above five areas.

The engineering and environmental studies for potential improvements to reduce this congestion need to be set in the context of the Scottish Ministers' policy on strategic traffic growth. However, this area of the motorway network comprises vital links in the trunk road network of Central Scotland and serves substantial existing developments as well as some of the most substantial future development sites in Scotland.

The development of the M8/M73/M74 Network Improvement strategies resulted from the studies for the M8 Baillieston to Newhouse and Associated Improvements. The need for the Scheme became apparent during the development of the traffic models which highlighted a number of consequential impacts on the wider road network.

During the initial modelling of the 'Do Minimum' road network in the year 2010 it became apparent that due to traffic congestion on the periphery of the M8 Baillieston to Newhouse scheme the full economic and traffic benefits of the proposed M8 would not be realised. This led to modelling of an 'Enhanced Do Minimum' network with measures to relieve congestion applied with the objective of providing reasonable network operation. These enhancements formed the basis for the Scheme proposals.

Approval was granted for MouchelFairhurst JV to commence studies into capacity improvement options to relieve congestion which could include carriageway widening, hardshoulder running and demand management measures.

The existing road network is shown on Figure 1.1. The figure shows the geographical relationship of the M8, M73 and M74 in and around the Baillieston and Maryville Interchanges.

The construction of the M74 Completion Scheme to the south of Glasgow will reroute strategic traffic onto areas of the network which are currently close to saturation capacity. General traffic growth patterns will also have a detrimental impact on the operation of the Network.

1.2.1 Scheme Objectives

The objective of the scheme is provide a network that allows the full benefits of previously committed schemes, i.e. the Do minimum network to be realised.

Specific objectives were identified for the scheme, drawing on the recommendations of CSTCS Executive Decision 16. The objectives were to:

- Relieve traffic congestion
- Minimise impacts on the environment
- Design to reflect Scottish Minister's general policy on strategic traffic growth
- Optimise benefits of the M8 Baillieston to Newhouse works by improving east – west traffic movement between the M8 and M74.
- Integrate Benefits realised from other works such as the M74 Completion and the M80 Stepps to Haggs scheme.

1.2.2 The Assessment Team

The Scottish Executive appointed MouchelFairhurst JV (a joint venture comprising Mouchel Parkman and WA Fairhurst & Partners) to investigate alternatives and develop a preferred scheme. MouchelFairhurst JV (MFJV) is supported by SiAS (Traffic & Transport Consultants), Young Associates (Environmental Consultants) and Roger Tym & Partners (Economic Development Consultants), with specialist inputs from Air Quality Consultants (AQC) and Hamilton and McGregor (Noise and Vibration Consultants).

1.2.3 Previous Studies

A number of possible strategies to address congestion issues were prepared and given initial consideration against the identified objectives for the scheme. Six alternative strategies were given initial consideration, from which three revised strategies were assessed and compared as part of a Stage 2 DMRB assessment. The assessment of alternative strategies and the selection of the preferred scheme are discussed further in Chapter 2.

2 Scheme Selection

2.1 Introduction

The purpose of this chapter is to provide a summary of the process that identified the preferred scheme.

2.2 Consideration of Options for Improvement

The Associated Network Improvements, Stage 1, Preliminary Assessment Report considered six possible strategies with increasing levels of complexity. Strategies 1, 2 and 6 were excluded from further assessment on the basis of the following:

- Strategy 1, Demand Management. Implementation of this strategy would not offer a realistic solution to the problematic weaving manoeuvres that exist, in particular on the M73, and it was considered difficult to monitor traffic on short motorway links.

- Strategy 2, Hardshoulder running. In general this was considered unsuitable as long sections of road with few junctions are required for effective implementation. Furthermore, signing on the M73 was considered difficult due to the short distances between junctions.

- Strategy 6. This was considered to be out of step with the scheme objectives and did not offer value for money.

The remaining strategies (Strategies 3, 4 and 5) involved online widening of the existing carriageway over the extents of the study. In addition Strategies 4 and 5 included new carriageway construction over sections of the M73 generally around the area of Baillieston Interchange.

2.3 Stage 2 Assessment

The Stage 2 Route Option Assessment Report and Stage 2 Environmental Assessment Report were produced in October 2005 and February 2007 respectively. The reports described and made comparative assessments of the three remaining Strategies, shown schematically on Figures 2.1a, 2.1b and 2.1c.

2.3.1 Preferred Scheme

From the strategies considered, Strategy 3 was selected as the preferred scheme to be taken forward to full conceptual design and assessment.

This strategy offered:

- least land take
- least impact on developable land; and

- best Net Present Value and the highest benefits.

2.4 Traffic Assessment

Traffic and transportation modelling and forecasting assessments for the proposed scheme were based on a two-tier transport modelling hierarchy comprising:

- Higher Tier – Strategic Model (4-Stage Transport Model); and
- Lower Tier – Local Model (Traffic Microsimulation Model).

The higher-tier Strategic Model, CSTM3A, is an enhanced four-stage multi-modal transport model that incorporates trip generation, mode choice, destination choice and route assignment capabilities. CSTM3A was developed (as an update of CSTM3) for the Central Scotland Transport Corridor Studies (CSTCS) by MVA on behalf of the Scottish Executive.

The Strategic Model is used to provide travel demand forecasts and inputs to the environmental and economic assessments. In addition, the Strategic Model forecasts provide estimates of traffic growth that are applied to the lower tier, Local Model.

The use of CSTM3A ensures a consistent approach with the methodologies adopted for the M74 Completion and M80 Stepps to Haggs commissions in modelling the strategic and multi-modal aspects of the proposed scheme.

The lower tier, Local Model is a Paramics traffic microsimulation model covering the main strategic routes within the immediate sphere of influence of the Scheme. The function of the Local Model is to provide more detailed outputs to aid the design and operational assessments of Scheme options.

During the CSTCS, the Scottish Executive approved forecast planning and economic scenarios for the application of CSTM3A in forecast mode. A range of scenarios was devised and tested during CSTCS that resulted in two scenarios, Scenario 1 (S1) and Scenario 2 (S2), being carried forward for the plan development of the study corridors. These have been adopted for the M8 Baillieston to Newhouse Study to ensure consistency with the CSTCS. In general, S1 represents a higher level of growth than S2. Strategic Model runs, which were used for the economic and environmental assessments, were undertaken for Scenarios S1 and S2 and years 2010 and 2020.

Outputs from the Strategic Model (Scenario 1) were used to assist with the air quality and traffic noise and vibration assessments that have been carried out and reported in this Environmental Statement. Scenario 1 was used to provide higher growth and hence 'worst case' predictions for the air quality and traffic noise and vibration assessments.

After consideration of the output for CSTM3A Scenario 1 and Scenario 2 predictions and in the context of presently observed levels of traffic flows and growth, it was agreed that Scenario 2 provided a more realistic estimate of traffic flows in the year of opening.

Designs have been taken forward on the basis of free-flow traffic on A725 in the peak hours with CSTM3A Scenario 2 traffic levels in 2010.

2.4.1 Committed Do-Minimum and Enhanced Do-Minimum Networks

Committed Do-Minimum

There is a number of transport schemes planned or due for implementation that influence traffic flow in the locality of the M8/M73/M74 Network Improvements. The Scheme assessment assumes that these measures are in place prior to the Preferred Scheme proceeding. This network is commonly referred to as the Do-Minimum or Committed Do-Minimum (CDM) and has been defined as comprising the road improvement schemes shown in Table 2.1 below and other transportation improvement initiatives that are planned to be in place prior to implementation of the Scheme.

The Do Minimum road and public transport networks were based largely on the assumptions adopted for the CSTCS Do Minimum network with the addition of the M74 Completion and M80 Stepps to Haggs commissions.

Table 2.1 2010 Committed Schemes, Do Minimum Network (Additional Projects to Existing Network)

Ref	Authority	Scheme
1	Edinburgh	A8000 dualling
2	Falkirk	M876 Junction 2 Slip Roads
3	Glasgow	Quality Bus Corridor (QBC) 1 - Faifley to Baillieston
4	Glasgow	Kingston Bridge - Removal of Restrictions
5	Glasgow	Finnieston Bridge
6	North Lanarkshire	Gartcosh Park & Ride and Public Transport Interchange
7	North Lanarkshire	Bargeddie Signals to roundabout conversion
8	North Lanarkshire	Closure of A8011 Central Way, Cumbernauld
9	North Lanarkshire	Ravenscraig Link Roads
10	ScotRail	May 2001 timetable improvements
11	ScotRail	September 2001 timetable improvements
12	ScotRail	Twice daily Carstairs to Edinburgh service

Ref	Authority	Scheme
13	Transport Scotland	A8 Baillieston to Newhouse Major Maintenance
14	Transport Scotland	A876 Kincardine Bridge Eastern Link
15	Transport Scotland	A876 Kincardine Bridge
16	South Lanarkshire	Rutherglen Town Centre Improvements
17	South Lanarkshire	Cambuslang Town Centre Improvements
18	South Lanarkshire	A71/A72 Garrion Bridge Improvements
19	Stirling	Stirling - Alloa Sustainable corridor
20	East Renfrewshire	Glasgow Southern Orbital
21	Transport Scotland	M77 Fenwick to Malletsheugh
22	Glasgow	QBC Measures - Battlefield Road
23	Glasgow	QBC Measures - Dundrennan Rd
24	Glasgow	QBC Measures - Rhannan Rd
25	Glasgow	QBC Measures - Tollcross
26	Glasgow	QBC Measures - Possil Road
27	Glasgow	QBC Measures - Clarkston
28	Glasgow	QBC Measures - Great Western Road
29	Glasgow	QBC Measures - Paisley Road West
30	Glasgow	QBC Measures - Maryhill Road
31	Glasgow	QBC Measures - Dumbarton Road
32	Glasgow	QBC Measures - Gallowgate/Shettleston
33	Transport Scotland	M8 Junction 21 (Seaward Street) Improvements
34	Glasgow	Dumbreck Road Traffic Management/Bus Priority Measures
35	Glasgow	East End Regeneration Route
36	South Lanarkshire	Larkhall Rail Service
37	Transport Scotland	M80 Stepps to Haggs Including Auchenkilns Roundabout Improvement

Ref	Authority	Scheme
38	Transport Scotland	M74 - Polmadie Road/Aikenhead Road Connection
39	Transport Scotland	M74 Completion - Fullarton to Kingston Area
40	Strathclyde Developments Limited	Strathclyde Business Park Road Infrastructure Improvements

Enhanced Do-Minimum (ARF) and With-Scheme (APR)

Although not part of the defined Do-Minimum, both the M8 Baillieston to Newhouse scheme and the planned improvement of Raith Junction (Junction 5, M74) are associated with the Scheme. The Enhanced Do-Minimum, or ARF, is the Network Improvements Scheme reference case and includes also the proposed M8 Baillieston to Newhouse Scheme, and M74 Junction 5, Raith Scheme, but excludes the Network Improvements Scheme itself. The With-Scheme (APR) is the Network Improvements variance case, which includes the M8 Baillieston to Newhouse and M74 Junction 5, Raith Schemes and the M8/M73/M74 Network Improvements Scheme.

3 The Preferred Scheme

3.1 Introduction

This chapter provides a detailed description of the preferred Scheme. The plan of the proposed scheme is shown on Figures 3.1a – 3.1f.

The proposed scheme is the improvement to the existing M8 between Junction 8 and 10 together with the M74 between Junction 2 and 6 and the M73 between Junction 1 and 2. It is envisaged that the scheme will provide an improved strategic motorway network in the vicinity of the M8 Baillieston to Newhouse scheme; catering for traffic movements between the M8 corridor and the M74 corridor via the connecting length of M73 motorway.

3.2 Description of the Preferred Scheme

The scheme widens the existing carriageway at the following locations:

- eastbound M8 from Junction 10 to Baillieston Interchange;
- northbound and southbound carriageways of the M73 between Baillieston Interchange and Maryville for part of its length;
- northbound and southbound carriageways of the M74 between Junction 2 and Junction 5; and,
- southbound carriageway of the M74 between Junction 5 and Junction 6.

The scheme will maintain the existing slip road arrangements through Baillieston Interchange.

3.2.1 M8 Junction 10 to Baillieston Interchange

The M8 motorway between Junction 10 and Baillieston Interchange will be widened to the north side of the existing eastbound carriageway to provide an additional running lane. The additional running lane will be introduced on the existing hardshoulder and a new hardshoulder added after Junction 10 with the slip road merge providing a lane gain. Widening to the north of the carriageway will affect the existing earthworks profile. The existing cutting will need to be steepened or an earth retaining solution devised to allow the carriageway to be extended within the existing road boundary.

The M8 widening passes under three existing road bridges (Westerhouse Road Bridge, Easterhouse Road Bridge and Wardie Road Bridge), each of which will require alterations to protect existing piers. To avoid major alteration or reconstruction of the bridges discontinuous hardshoulders will be required at all three locations.

The following work, integral to the Network Improvements proposal, has to date been included in the M8 Baillieston to Newhouse Scheme:

- The north side of the M8 carriageway will transition from cutting to embankment 300 m west of the existing railway bridge. The embankment footprint will be adequate to provide the width needed for an additional running lane.

- The railway bridge 50 m west of the M8 lane drop to the M73 and the A89 will be widened to accommodate an additional running lane or a discontinuous hard shoulder will be provided. This additional lane will run directly into the existing M73/A89 lane drop off the M8 eastbound carriageway and will alter the existing single lane drop to a two lane drop, with two lanes maintained through the interchange on the M8 eastbound carriageway.

3.2.2 Baillieston Interchange to Maryville

The M73 will be widened between Baillieston Interchange and Maryville Interchange with the provision of an additional running lane in each direction utilising the existing hardshoulder.

On the M73 (S) a third lane is provided by modifying the on slip from the Baillieston Interchange Roundabout (BIR) to form a lane gain. The additional fourth lane commences at the point where the M8 (E) on slip and the M73 (S) connect. This four lane carriageway continues over the existing North Calder Water Bridge utilising the existing hardshoulder as a traffic lane. Consequently, the hardshoulder is discontinuous over the length of the bridge. Thereafter, the bifurcation at Maryville is amended to provide two lanes to M74 (S) and two lanes to the M74 Completion.

Similarly the M73 (N) carriageway commences at Maryville where the existing two lane merge from the M74 (N) and the single lane merge amended to two lanes from the M74 Completion join. A discontinuous hardshoulder is proposed over the North Calder Water Bridge on the northbound carriageway. Immediately after the North Calder Water Bridge the northbound Lane 1 diverges to the M8 (W) and northbound Lane 2 diverges to the BIR. The remaining two lanes continue northbound on the existing M73.

The proposed works immediately north of Maryville are in cutting and will require slope steepening measures. Beyond this the M73 is elevated over the North Calder Water and thereafter continues on embankment to the tie into the existing road.

3.2.3 M74 Junction 2 to Junction 4

The M74 motorway between Junction 2 and Junction 4 will be widened on line and consist of an additional running lane in both directions. The widening of the existing carriageway occurs 800m west of Junction 3 and continues in an easterly direction until Junction 4.

The proposed widened section of the M74 (E), including a hardshoulder, is accommodated under the existing Daldowie Junction Overbridge. The existing M74 off-slip to Daldowie (Junction 3) is retained and increased from one lane to two lanes.

It is proposed to modify how the local traffic flows gain access to the M73 (N). The existing on slip (from Glasgow Road) to the M73 (N) will be closed and a new access for this traffic flow provided from a new on slip at an amended Daldowie Junction. This new on slip from Daldowie Junction necessitates widening of the existing bridge carrying the M74 over the North Calder Water.

Traffic accessing on the new on slip from Daldowie Junction is precluded from merging with the M74 (S) traffic at this location on safety grounds. Therefore the new on slip from Daldowie Junction allows access to the M73 (N) only. Local traffic connection to the M74 (S) is retained as per the existing junction access, which is located to the east of Maryville, where it joins the M73(S) on slip to the M74(S).

The existing single lane drop from M74 Completion to M73 (N) is replaced by a two lane drop, with the remaining two lanes of the M74 continuing to the M74 (S) as existing.

For M74 (N) traffic the existing M73 diverge slip to Daldowie Junction is retained unaltered. However, the existing two lanes from the M73 (S) connect with the two lanes from the M74 (N) as a two lane gain, providing four traffic lanes. Beyond this merge, widening from the existing three lane layout to four lanes commences and continues west with full hard shoulder provided.

The merge from Daldowie Junction to M74 (W) is altered from a two lane ghost island merge to a single lane merge. Traffic flows here are appropriate to a single lane on-slip. This reduction allows the promotion of an increased number of M74 lanes. The additional fourth lane is dropped prior to M74 Junction 2, reverting to the existing three lanes plus hardshoulder width of carriageway.

3.2.4 M74 Junction 4 to Junction 6

The M74 motorway continues from Junction 4, Maryville in a south easterly direction to Junction 6, Hamilton. It is proposed to widen the M74 to provide an additional running lane; in both directions between Junction 4 and Junction 5 and southbound only between Junction 5 and Junction 6.

The widening to the M74 (S) carriageway commences where the existing M73 (S) on slip merges with the M74 (S). It is proposed to provide a two lane M73 (S) on slip merge to join the M74 (S) at this location, which will achieve a single lane gain. Existing structures constrain the motorway widening at Blantyre Farm Road Bridge, Glasgow Road Bridge and Fallside Road Bridge. At these locations a discontinuous hardshoulder will be required together with bridge pier protection/strengthening works. Furthermore, slope steepening measures, notably adjacent to residential properties along Glasgow Road, will be necessary to minimise land take.

Elsewhere, where the M74 crosses over the railway or over side roads the proposal is to provide an additional fourth lane and hardshoulder.

On southbound approach to the Raith Junction the widened M74 carriageway will be reduced by one lane, with a lane drop at the off-slip to the Raith Junction. The M74 southbound continues through the Raith Junction utilising the existing three lane layout.

Southbound M74 beyond the Raith Junction to the Hamilton Junction the carriageway is widened to four running lanes by providing a single lane gain from the Raith on-slip. Thereafter at Hamilton Junction 6, a two lane drop will be provided in place of the existing single lane drop.

For the M74 (N) traffic the motorway widening and development of the additional lane, with discontinuous hardshoulder, commences at the Raith Junction on-slip by addition of a single lane gain. At Maryville Junction 4 the existing slip road to the M73 (N) is amended to a two lane drop thus maintaining the existing two lanes through Maryville.

North of the Raith Junction the existing accommodation bridge to Bothwell House will be replaced as part of the separate Raith Junction Scheme (M74 Junction 5, Raith Environmental Statement, MFJV 2007). This structure will not be impaired by the proposed Scheme or cause any reduction in motorway cross section.

Immediately north of the Raith Junction the M74 is in cutting and thus will require slope steepening to minimise land take to accommodate the additional lane. Slope steepening will also be required south of the Raith Junction where the M74 is elevated on embankment above the River Clyde.

3.3 Amount and Nature of Landtake

The overall scheme requires the purchase of a small area of land to allow its construction, future operation and maintenance. The majority of the land that is necessary is already in the ownership of Scottish Ministers. The total landtake necessary for the scheme (including existing roads and land within the road boundary) is approximately 79 ha.

3.3.1 Road Drainage

A description of the River Clyde, North Calder Water and its tributaries and water features is provided in Chapter 15, Road Drainage and the Water Environment. The nature of the existing floodplain, flooding and drainage outfall locations are also described there.

3.3.2 Proposed Drainage for the New Road

The overall drainage strategy has been developed in accordance with guidance contained in the Design Manual for Roads and Bridges (DMRB), Sustainable Drainage (SUDS) design principles, Planning Advice Note (PAN) 61 advice on good practice and other relevant information. The proposed new drainage facilities will be an improvement on the current situation in providing attenuation and treatment of road drainage before it discharges to the environment. The primary function of the road drainage is to drain the carriageway and associated road construction. The adopted drainage strategy will follow

the 'management train approach'. The main objective would be to treat and control runoff as near to the source as possible, thus protecting downstream habitats.

Solutions developed will thus provide suitable habitats for flora and fauna reducing flood risk and protecting the downstream watercourses from point source, diffuse and accidental contamination.

The outfall design will include 20m^3 volume of storage, as recommended by DMRB, for defence against accidental spillage, for example from overturned lorries.

The SUDS proposals for the scheme will promote the use of source control methods such as filter drains and swales. Facilities such as extended detention basins, with wet pool for attenuation and treatment of surface runoff prior to discharge to the existing watercourses, will be an essential part of the drainage design. In accordance with DMRB the attenuation basins will be designed to cater for the 1 in 100 year flood event. Preliminary designs have assumed that peak discharge rates will be limited to the 1 in 2 year 'greenfield' runoff.

3.4 Construction Programme

The construction period is expected to be approximately two years. The aim of the construction sequence will be to minimise disruption to the existing environment and avoid unnecessary delay and disruption to existing road users and the surrounding area. Individual operations, such as earthworks and piling operations, will be restricted in terms of the working hours and noise/vibration levels during the course of the construction contract to achieve this mitigation.

3.5 Earthworks

The assessment of the earthworks quantities has been based on the conceptual alignment of the scheme. For the purposes of undertaking this assessment the engineering slopes have been assessed to be 1V:2.5H in cuttings and 1V:2H in embankments. The soils encountered and their suitability for classification as engineering fill has been based on the ground investigations undertaken during MFJV studies.

The bulk earthworks for the complete scheme are:

Cut Material – 204,000 m^3

Fill Material – 46,450 m^3

3.6 Structures

Given the provision of additional lanes on various sections of the M8, M73 and M74 motorways, as described above, the Scheme requires modification of several structures within the extent of the scheme to accommodate the widened operational carriageways.

Where appropriate the impacts of such modifications are considered in the relevant Chapters of this Environmental Statement.

3.7 Property Demolished

No private residencies or other properties will be demolished.

3.8 Hours of Working

Hours of working and permitted noise levels/durations will be agreed in advance with the relevant Local Authority departments and stipulated as a requirement of the contract.

3.9 Construction Site Access Routes

Construction will take place mostly within the existing road boundary. Additional land will be acquired for construction of the new slip road at Daldowie and for the construction of road drainage management facilities.

Access points to construction areas from the road network will be stipulated within the Employer's Requirements and will be determined on the basis of safety, proximity to the site boundary and to protected sites (for example Hamilton Low Parks Site of Special Scientific Interest, and Laighlands Site of Interest for Nature Conservation), and to minimise disruption.

3.10 Lighting

BS 5489 and associated technical documents containing new lighting classifications and design criteria, aimed at improving the safety of the road user and creating optimum cost effective design solutions will be considered when compiling the applicable carriageway lighting designs. Lighting design will reflect the additional carriageway along the relevant sections of motorway, whilst taking due cognisance of the maintaining authorities requirements, with the specification and provision of appropriate columns, lanterns and control equipment.

The design of the new lighting will aim to minimise the lighting footprint, avoid light spill/pollution and attempt to match or better the lighting footprint of the existing lighting equipment.

3.11 Fencing

Temporary and permanent fencing will be required during the construction and operation of the scheme to maintain public safety, define and limit working areas, prevent unauthorised access and to protect adjacent land.

3.12 Temporary Compounds and Storage Areas

Contractor's compounds and material storage areas will be established at appropriate locations in the vicinity of construction activities. The precise location of the storage areas have not yet been determined, and will be considered by the Contractor at a later

stage. However, the compounds will be sited appropriately, away from watercourses and locations identified as sensitive and/or vulnerable so that, after site restoration, there are no permanent environmental impacts.

The reinstatement of the compound area(s) will require the removal of temporary services, surfacing and sub-base and the area finished to the satisfaction of the landowner.

3.13 Traffic Management

Disturbance to and restrictions upon existing traffic will be avoided wherever possible. Traffic management will however be required during the construction phase, and may comprise temporary road diversion to avoid conflict with construction site traffic/activities, access and speed restrictions and traffic signalling. A detailed traffic management plan for the scheme will be developed by the Contractor, and agreed in advance in accordance with the requirements of the contract.

The construction of the scheme will require the adoption of significant traffic management measures on the M74, M73 and M8 motorways and associated slip roads and side roads. The design and phasing of traffic management will be undertaken to comply with the principles of Chapter 8 of the Traffic Signs Manual. Traffic management is likely to comprise contraflow works, which will seek to minimise disruption to existing traffic flows. Traffic management is also likely to include speed restrictions to provide a safer working environment for the construction workforce and for drivers and passengers.

3.14 Pollution Prevention

The Contractor will be required to comply at all times with the requirements of the contract specification with regard to prevention of pollution. Consultation has been undertaken with SEPA with respect to measures required to prevent pollution to watercourses, and to deal with accidental spillages and discharge points to watercourses. The specific measures to be utilised during construction works will be agreed between the Contractor and SEPA in advance of any works on site.

3.15 Landscaping

A conceptual landscaping design has been developed for the scheme. The aim of the final planting scheme will be to blend the scheme into the surrounding landscape as much as possible and reflect the fact that sections of the motorway are defined as ‘Corridors of wildlife and landscape importance’ in Local Plans. Planting will be in keeping with existing natural vegetation patterns and types and native species (of local provenance and where practicable local origin) will generally be used. It is envisaged that sufficient topsoil will be available from site to accommodate required landscape contours using material from construction excavation.

4 Approach and Methods

4.1 Introduction

The aims of the DMRB Stage 3 Environmental Assessment are:

- to expand on the DMRB Stage 2 information collated regarding the environment of the study area and to focus on the most significant aspects;
- to identify and assess predicted environmental impacts associated with the scheme; and
- to identify measures to avoid or mitigate adverse impacts and enhance beneficial impacts so that these can be incorporated into the scheme detailed design, construction and operation.

This chapter describes the general approach to the environmental assessment and methods used in the assessment process for each environmental subject area.

4.2 General Approach to the Assessment

4.2.1 The Design Manual for Roads and Bridges Volume 11

The ES has been prepared in general accordance with the guidance provided by DMRB (1993 and amendments).

DMRB, Volume 11 (Environmental Assessment) provides guidance on the level of environmental impact assessment required at key stages in the development of such schemes and the requirements for reporting of the potential effects on the environment.

As advised in DMRB, the Environmental Assessment for proposed road schemes comprises three stages that progressively require greater levels of assessment detail. A Stage 1 Environmental Assessment is a preliminary assessment aimed at identifying environmental advantages, disadvantages and constraints associated with broad route corridors or improvement strategies. An indication of potential effects is provided which at this stage is unlikely to take into account detailed road alignments or mitigation measures.

A Stage 2 Environmental Assessment aims to identify factors and effects that require investigation in order to select a preferred route or improvement strategy.

At Stage 3 a detailed assessment of the preferred scheme is undertaken. This will involve an environmental impact assessment and the production of an Environmental Assessment Report (EAR) or the publishing of an ES.

This Stage 3 Environmental Assessment has been undertaken with respect to the twelve environmental topics described in DMRB Volume 11:

- Air Quality;
- Cultural Heritage;
- Disruption Due to Construction;
- Ecology and Nature Conservation;
- Landscape Effects;
- Land Use;
- Traffic Noise and Vibration;
- Pedestrians, Cyclists, Equestrians and Community Effects;
- Vehicle Travellers;
- Water Quality and Drainage;
- Geology and Soils; and
- Policies and Plans

4.2.2 Assessment Methods

The assessment of impacts has been undertaken in accordance with the following general process for all environmental parameters:

- identify baseline conditions of the site and its environs;
- consider potential impacts and assess their significance, taking into account sensitivity of resources and magnitude of impact;
- identify appropriate mitigation measures to address the impacts identified; and
- assess the significance of residual impacts.

Consideration has also been given to the potential for cumulative/interactive (also in-combination) impacts. In a broad sense, cumulative impacts refer to the accumulation of effects on the environment relative to other past, present or foreseeable actions that occur in an additive or interactive manner.

The impact assessment for each environmental parameter has been undertaken in comparison with a 'baseline' situation. The 'baseline' generally refers to the existing conditions and how these are predicted to change if the scheme did not proceed and no other work was undertaken (Do Nothing). As described in Section 2.4, a number of transport schemes are planned, or due for implementation, that influence the proposed scheme and these have been taken into account in the Air Quality, and Traffic Noise and Vibration assessments.

Baseline information has been gathered through site visits, the review of maps, data collection, reports obtained from statutory and non-statutory organisations, and field surveys.

4.2.3 Predicted Impacts

Predicted impacts arising from the scheme have been identified and described and an assessment of the level of significance for each effect determined as far as practicable in relation to the topic area under consideration.

Significance varies according to the environmental aspect or topic area being considered and the context in which the assessment is made, and depends to a large degree on the availability of data relating to existing environmental conditions and the value applied to these conditions. However, in general, the level of significance of impacts has been defined using a combination of the sensitivity of the environmental feature and the magnitude of impact. The significance of impacts has been defined as far as is practicable in the appropriate chapters of this Environmental Statement.

Sensitivity has generally been defined according to the relative value or importance of the feature, i.e. whether it is of national, regional or local importance, or by the sensitivity of the receptor in the case of the air quality and noise assessments.

Magnitude of impact has been determined by reference to any applicable legislative or policy standards or guidelines, and the following factors:

- the degree to which the environment is affected, e.g. whether the quality is enhanced or impaired;
- the scale of the receptors of change, e.g. the size of land area or number of people affected and degree of change from the existing situation;
- the scale of change resulting from impacts; and
- whether the effect is temporary or permanent.

The nature of impacts may vary and may be direct or indirect, secondary, cumulative, short, medium or long-term, reversible or irreversible. Impacts may be positive (beneficial) or negative (adverse).

4.2.4 Mitigation

Where possible, mitigation measures have been developed based on guidance provided in Planning Advice Note 58[1] on EIA as illustrated in Table 4.2. This considers mitigation as a hierarchy of measures ranging from prevention of environmental effects by avoidance, through to compensatory measures for effects that cannot be remedied. At this stage, the conceptual design has a series of specific mitigation strategies identified and incorporated into the scheme, which will be expanded upon and form part of Contractual documents. The mitigation strategies will require further design and refinement by the Contractor as part of the final design prior to the commencement of construction activities.

[1] Planning Advice Note 58 (1999). The Scottish Executive.

Table 4.2 Hierarchy of Mitigation Measures

Level of Mitigation	Definition
Prevent	To prevent adverse environmental effects at source for example through choice of site or specification of construction equipment.
Reduce	If adverse effects cannot be prevented, steps taken to reduce them through such methods as minimisation of cause of impact at source, abatement on site and abatement at receptor.
Remedy/offset	When effects remain that cannot be prevented or reduced, they are offset by such remedial or compensatory action as provision of environmental improvements, opportunities for access and informal recreation, creation of alternative habitats and prior excavation of archaeological features..

The approach to the mitigation of adverse environmental impacts is to avoid them where possible. This will be achieved by consideration of ways in which to prevent adverse effects at source, rather than relying on measures to mitigate the effects. This can include consideration of scheme design and the incorporation of special features into the design (such as access arrangements for vehicles or pedestrians), Employer's Requirements, or by proposals relating to operational equipment or working methods for inclusion in the Contract Documents.

Where avoidance of impacts is not feasible (due to engineering or economic requirements), measures will be included to minimise or reduce potential impacts through abatement measures either at source, at the site (for example, by the use of noise attenuation measures or screen planting and landscaping), or at the receptor (for example, translocation of plant species).

4.2.5 Residual Impacts

The assessment of significance of residual impacts takes into account mitigation measures that will be adopted in each chapter of this ES. Mitigation measures that are possible, but not definite, are not included in the residual impact assessment since they cannot be guaranteed at the present time. Further detailed requirements will be included in Contractual documents as appropriate.

5 Consultations

5.1 Introduction

The purpose of a consultation exercise is to:

- ensure that statutory consultees (i.e. those with responsibilities for protecting the environment and regulating any activities which may adversely affect existing environmental conditions) and other non-statutory bodies with a particular interest in the environment are informed of the proposed scheme and are provided with an opportunity to comment;
- obtain baseline information regarding existing environmental site conditions;
- establish key environmental issues and identify potential impacts to be considered during the environmental assessment;
- identify those issues which are likely to require more detailed study and those which can be justifiably excluded from further assessment; and
- provide a means of identifying the most appropriate methods of impact assessment.

5.1.1 List of Consultees

Consultees (see Table 5.1) were initially contacted by letter as part of the DMRB Stage 2 assessment; providing information on the details of the proposed scheme and requesting baseline information, records and comments concerning the proposals. The information requested was tailored specifically for each consultee and a location plan showing the proposed section of road for improvement provided.

Further consultation meetings, emails, letters and telephone calls during 2006 supplemented the consultations and maintained ongoing liaison with key stakeholders over the development of the proposed scheme and associated mitigation.

5.1.2 Consultee responses

The issues raised by the individual consultees are addressed in the relevant chapters of this report.

Table 5.1 List of Consultees

Statutory Consultee	Non-statutory Consultee *
Glasgow City Council (various Departments) Health and Safety Executive Historic Scotland North Lanarkshire Council (various Departments) Scottish Environment Protection Agency (SEPA) Scottish Executive Scottish Natural Heritage South Lanarkshire Council (various Departments)	Botanical Society of the British Isles British Horse Society British Trust for Ornithology Butterfly Conservation (Scotland) Central Scotland Forest Trust Clyde Amphibian and Reptile Group Clyde Bat Group Clyde River Foundation Clyde Ringing Group Concern for Swifts (Scotland) Plantlife Scotland River Clyde Fisheries Management Trust Royal Society for the Protection of Birds Scottish Badgers Scottish Ornithologists Club Scottish Rights of Way and Access Society Scottish Wildlife Trust Smiths Gore (For Coal Authority) Strathclyde Country Park Ranger Service Sustrans Scotland West of Scotland Archaeology Service

* Other non-environmental organisations, such as Utilities, were also consulted

6 Air Quality

6.1 Introduction

This chapter describes the expected air quality impacts associated with the proposed M8/M73/M74 Network Improvements (the Scheme). The impacts assessed are those resulting from construction activity and those caused by emissions from traffic. Construction impacts are only likely to occur within the immediate vicinity of the works, but the proposed Scheme has the potential to influence traffic movements, and thus air quality, on roads that are some distance from the works themselves.

The air quality assessment begins with the same study area as the transport model, which includes the whole of Central Scotland, as well as a representation of roads much further away. Within this large area the "local" air quality assessment focuses on those roads significantly affected by the Scheme and at those locations where impacts are expected to be greatest. Such locations include residential properties, schools, and any potentially sensitive ecosystems which are near to affected roads. The local assessment focuses on two pollutants: nitrogen dioxide and fine particles (PM_{10}), which are the pollutants of greatest concern from road vehicles in a local context. The "wider-scale"[2] assessment focuses on five pollutants: carbon monoxide; nitrogen oxides; total hydrocarbons; PM_{10} and carbon dioxide and calculates the change in total emissions from the entire modelled road network.

Existing conditions are defined for the year 2006; this being the most recent full calendar year at the time that the assessment was carried out. The local air quality assessment focuses on the year 2010, which, in terms of air quality, is a worst-case estimate for the opening year of the Scheme. A range of measures introduced at the national level to steadily reduce vehicle emissions mean this is also expected to be the worst-case year for the Scheme. The wider-scale air quality assessment focuses on 2010 and on the design year of 2020.

6.2 Baseline Assumptions

The proposed Scheme is one of three road upgrade proposals that are all closely linked; the other two being the M8 Baillieston to Newhouse and the M74 Junction 5 (Raith) Improvement. Both of these other proposals have been the subject of separate assessment (Environmental Statements for Baillieston to Newhouse and M74 Junction 5 upgrades), however, traffic modelling carried out as part of the assessment of the proposed Scheme indicates that the objectives and benefits of the Scheme will only be realised if the two other proposals also go ahead. Thus, if the air quality assessment

[2] DMRB 11.3.1 refers to this "wider-scale" assessment as a "regional" assessment. The term "wider-scale" is used here in recognition that some of the pollutants (e.g. carbon dioxide) are relevant at much larger scale than is implied by the term "regional". The assessment is unchanged by the name used to describe it.

were based on traffic data which simulated the construction of the proposed Scheme in isolation, it is considered that this assessment would be based on an underestimate of the traffic flows and operational characteristics most likely to ultimately materialise for the Scheme. The road traffic model has therefore not been run to predict the impacts of the proposed Scheme against a future year baseline of the existing network.

In common with the other sections of this Environmental Statement that deal with impacts related to road traffic, a pragmatic approach has been taken in order to assess the impacts associated with the Scheme. The approach describes the air quality impacts that the Scheme is likely to bring about, assuming that each of the other two proposals also goes ahead. It relies on assessing the with-Scheme scenario against an Enhanced Do-Minimum scenario (EDM) which is described in Chapter 2. This road traffic model includes committed developments and also both the M8 Baillieston to Newhouse scheme and the Raith Improvements. Thus, the with-Scheme results predict the impacts with each of the three proposals in place. The difference between the EDM and the with-Scheme is the impact attributable to the Scheme alone.

Because each of the three separate road proposals will clearly influence the same road network, the opportunity has been taken to assess their cumulative impacts. This has been done by comparing the predicted with-Scheme traffic flows against those associated with the Committed Do-Minimum (CDM) traffic network (which includes committed developments only). The difference between the CDM and with-Scheme will thus be the cumulative impacts of all three proposals together. The approach can be summarised thus:

- Scheme-only impacts = with-Scheme minus EDM
- Cumulative impacts = with-Scheme minus CDM

It should also be noted that the air quality assessment is based on traffic growth predictions modelled under CSTM using the high growth “Scenario 1”. It is thus a worst-case assessment which is considered unlikely to be achieved in reality. Scenario 2, representing a moderate growth prediction has been used as the basis of other aspects of the Scheme design and assessment, but for the air quality and noise and vibration assessments (see Chapter 13 Noise and Vibration), a precautionary approach assessing potential worst-case conditions has been adopted in line with guidance set out in Design Manual for Roads and Bridges (DMRB).

6.3 Methods

The air quality assessment has been carried out in accordance with the DMRB Volume 11, Section 3, and with reference to the following documents:

- The Environment Act 1995, Part IV;
- The Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007;

- The Air Quality (Scotland) Regulations 2000;
- The Air Quality (Scotland) Amendment Regulations 2002.

The DMRB guidance on air quality assessments has recently been updated. The latest (2007) guidance has been followed here.

6.3.1 Policy Context and Assessment Criteria

The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Defra and the DAs, 2007a) provides the policy framework for air quality management and assessment in the UK. It provides air quality standards and objectives for key air pollutants, which are designed to protect human health and the environment. It also sets out how the different sectors: industry, transport and local government, can contribute to achieving the air quality objectives. Local authorities are seen to play a particularly important role. The strategy describes the Local Air Quality Management (LAQM) regime that has been established, whereby every authority has to carry out regular reviews and assessments of air quality in its area to identify whether the objectives have been, or will be, achieved at relevant locations, by the applicable date. If this is not the case, the authority must declare an Air Quality Management Area (AQMA), and prepare an action plan which identifies appropriate measures that will be introduced in pursuit of the objectives.

Health-Criteria

The air quality standards are set as concentrations below which effects are unlikely even in sensitive population groups, or below which risks to public health would be exceedingly small. They are based purely upon the scientific and medical evidence of the effects of a pollutant. The objectives set out the extent to which the Government expects the standards to be achieved by a certain date. They take account of economic efficiency, practicability, technical feasibility and timescale. The objectives for use by local authorities are prescribed within the Air Quality (Scotland) Regulations, 2000 (Stationery Office, 2000 (Scottish Statutory Instrument 2000 No. 97)). The objectives for nitrogen dioxide had to be achieved by 2005 and will also continue to apply in 2010. The objectives for PM_{10} had to be achieved by 2004 and will continue to apply in 2010. The Air Quality (Scotland) Amendment Regulations 2002 (Stationary Office 2002 (Scottish Statutory Instrument 2002 No. 297)) define more stringent objectives for PM_{10}, that will apply in 2010. A summary of these objectives is provided in Table 6.1. The 1-hour nitrogen dioxide objective is in practice less stringent than the annual mean objective. An analysis of national roadside monitoring data has shown that an exceedence of the 1-hour objective is only likely if the annual mean is greater than 60 $\mu g/m^3$ (Laxen and Marner, 2003). It is therefore not considered further in this assessment.

The European Union has also set limit values for both nitrogen dioxide and PM_{10}. Achievement of these values is a national obligation rather than a local one. The EU limit value for nitrogen dioxide is the same level as the UK objective but is to be achieved by the later date of 2010 (Stationery Office, 2007 (Scottish Statutory Instrument 2007 No.

182)). The EU limit values for PM_{10} are the same level as the 2004 UK objectives, and had to be achieved by 2005. Thus, assessing against the nitrogen dioxide and PM_{10} objectives for Scotland provides the most stringent approach.

Table 6.1 Relevant Air Quality Objectives

Pollutant	Air Quality Objective		Strategy Compliance Date
	Concentration: µg/m^3	Measured as	
Nitrogen dioxide (NO_2)	200	1 hour mean; not to be exceeded more than 18 times per year	31/12/2005
	40	Annual mean	31/12/2005
Particles (PM_{10}) (gravimetric)	50	24 hour mean; not to be exceeded more than 35 times per year	31/12/2004
	40	Annual mean	31/12/2004
	50	24 hour mean; not to be exceeded more than 7 times per year	31/12/2010
	18	Annual mean	31/12/2010

The health-related air quality objectives only apply at locations where members of the public are likely to be exposed to air pollution for the time period specified in the objective. Thus, for the annual mean and 24-hour objectives that are the focus of this assessment, the primary receptors will be residential properties.

Vegetation and Ecosystem Criteria

Objectives for the protection of vegetation and ecosystems have been set by the UK Government. They are summarised in Table 6.2 and are the same as the EU limit values. The objectives only strictly apply a) more than 20 km from an agglomeration (about 250,000 people), and b) more than 5 km from Part A industrial sources, motorways and built up areas of more than 5,000 people. However, Scottish Natural Heritage has adopted a more precautionary approach and applies the objective to all internationally designated conservation sites and SSSIs. DMRB 11.3.1 follows this approach and requires an assessment of the impacts of roads traffic emissions on conservation sites (Designated Sites) within 200 m of an affected road.

Table 6.2 Relevant Vegetation and Ecosystem Objectives (Critical Levels)

Pollutant	Concentration: µg/m^3	Measured as	Compliance Date
Nitrogen Oxides (expressed as NO_2)	30	Annual Mean	31/12/2000

Critical loads for nitrogen deposition to sensitive ecosystems have been specified by the United Nations Economic Commission for Europe (UNECE). They are defined as the amount of pollutant deposited to a given area over a year, below which significant harmful effects on sensitive elements of the environment do not occur, according to present knowledge. The critical loads for the ecosystem under consideration in this assessment, as defined in the Air Pollution Information System (APIS, 2007), are provided in Table 6.3.

Table 6.3 Relevant Vegetation and Ecosystem Critical Loads

Habitat[a]	Critical Load (kg-N/ha/yr)
Deciduous and temperate forest	10-20

[a] Habitat definition based on the most relevant UNECE category. Critical loads are given as ranges

Policy relating to Wider-Scale Impacts

The UK has international commitments to reduce emissions of a range of pollutants through UNECE protocols. These are pollutants which can act on both local and regional scales. The DMRB Volume 11.3.1 defines the pollutants that are of greatest concern and which provide the best indication of emissions from road traffic. These are carbon monoxide, hydrocarbons, NOx and PM_{10}.

The Kyoto Protocol recognises six greenhouse gases but carbon dioxide is the main greenhouse gas in the UK (CCUKP, 2006) and is used as the key indicator for assessing the impacts of transport options on climate change.

The UK Government has a legally-binding target under the Kyoto Protocol to reduce its greenhouse gas emissions by 12.5% below 1990 levels by around 2010 (excluding aviation emissions). There is also an EU goal to stabilise carbon dioxide concentrations at 550 parts per million. In line with this target, the UK Government has set itself domestic goals which go beyond those required under the Kyoto Protocol. These are to reduce carbon dioxide emissions by 20% below 1990 levels by 2010 and to reduce carbon dioxide emissions by 60% by around 2050; with real progress evident by 2020. The UK Climate Change Programme (CCUKP, 2006) aims to deliver these reductions.

The UK transport sector currently (in 2004) accounts for 27% of total carbon dioxide emission, and a range of policies is already in place to deliver savings from this sector (CCUKP, 2006). The UK Government estimates that, as a result of these measures, carbon dioxide emissions from the transport sector in 2010 will be 13% lower than they would have been if the measures were not in place (CCUKP, 2006). This does not, however, mean that emissions are expected to fall. For the UK as a whole, carbon dioxide emissions from transport rose by 8% between 1990 and 2000 and, based on the assumptions within the CCUKP, are expected to rise by a further 8% between 2000 and 2010 (CCUKP, 2006). The UK Government accepts that a growing economy will have a rising demand for transport fuel and that emission reductions from other sectors will need to compensate for the increases in emissions from transport and also that additional policy measures will be required to reduce carbon dioxide emissions from transport (CCUKP, 2006). Progress on the Climate Change Programme is set out in the Annual Report to Parliament, July 2007 (UKCCP, 2007).

The 'Scottish Share' of the emissions reductions set in the UK's domestic goal has been calculated as 1.7 million tonnes of carbon per year from 1990 to 2010 (SCCP, 2006 – emissions based on all greenhouse gases converted into carbon equivalent units). The Scottish Executive has set its own domestic target not only to achieve its 'Share', but to exceed it by 1 million tonnes of carbon per year by 2010 (SCCP, 2006). Approximately 17% of Scotland's greenhouse gas emissions come from the transport sector (SCCP, 2006). As in the UK as a whole, transport emissions have been increasing and, based on the assumptions behind the SCCP, are expected to continue to increase concurrently with reductions in emissions from other sectors (SCCP, 2006). The Scottish Executive is pursuing several policy routes to reduce emissions from the transport sector. Progress on Scotland's Climate Change Programme is set out in the Annual Report which was laid before the Scottish Parliament in March 2007 (SCCP, 2007).

Delivering carbon savings is a central feature of Scotland's National Transport Strategy (NTS, 2006). The Scottish Executive intends to present a 'carbon balance sheet' for transport in future reviews of the NTS. This will present the impact of all Scottish transport policies and projects that are expected to have a significant impact on carbon. The aim will be to show that the Scottish Government is reducing the overall impact of transport measures. The National Transport Strategy makes it clear that this does not mean that any one single project, or policy, which increases emissions cannot go ahead. Greenhouse gas emissions are thus being addressed on national and international platforms. Local measures will undoubtedly be important, but any impacts must be assessed with regard to the overall picture in both Scotland and the UK as a whole.

Construction Dust Criteria

There are no formal assessment criteria for dust. In the absence of formal criteria, a set of distance based criteria has been developed. These criteria are based on the professional experience of the consultants, drawn from many years of involvement with assessments of many different types of project, together with discussions with many

practitioners in the field, and consideration of a range of published reports. They are set out in Table 6.4.

Table 6.4 Assessment Criteria for Dust from Construction Activities, with Standard Mitigation in Place

Source		Potential Distance for Significant Effects (Distance from source)		
Scale	**Description**	**Soiling**	**PM_{10} [a]**	**Vegetation effects**
Major	Large construction sites, with high use of haul routes	100 m	25 m	25 m
Moderate	Moderate sized construction sites, with moderate use of haul routes	50 m	15 m	15 m
Minor	Minor construction sites, with limited use of haul routes	25 m	10 m	10 m

Significance Criteria

In order to simplify interpretation of the predicted local air quality impacts, a series of descriptors has been defined which describe impact magnitude and overall impact significance. The definition of impact magnitude is solely related to the degree of change in pollutant concentrations. Impact significance takes account of the impact magnitude and also of the absolute concentrations and how they relate to the air quality objectives or other relevant standards.

There is no official UK guidance on defining air quality impact magnitude and significance, and the criteria used are ultimately based on professional judgement. The criteria used in this assessment are the same as those defined by the Irish National Roads Authority in its Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes (NRA, 2006) and are presented as an example in the Planning for Air Quality guidance prepared by the National Society for Clean Air and Environmental Protection (NSCA, 2006). They are set out in Appendix 6.1.

Because the assessment of construction impacts is ultimately subjective, it is not appropriate to simplify the predicted same impacts using descriptive criteria. The wider scale impacts are assessed according to the same impact magnitude criteria as those used for local air quality impacts. The significance of the impacts of the Scheme as a whole is ultimately assessed subjectively, based on professional judgement.

6.3.2 Local Air Quality Assessment Methods

Scoping

The update to DMRB 11.3.1 issued in May 2007 recommends that a scoping assessment is carried out in order to define the level of detail required in each assessment. Depending on the outcome of the scoping assessment, additional assessment may not be required, or may take the form of either a "simple" or a "detailed" assessment. DMRB explains that the first step in the scoping exercise is to identify those roads that meet any of the following criteria:

a) road alignment will change by 5m or more: or

b) daily traffic flows will change by 1,000 AADT or more: or

c) Heavy Duty Vehicle (HDV) flows will change by 200 AADT or more; or

d) Daily average speeds will change by 10 km/hr or more; or

e) Peak hour speed will change by 20 km/hr or more.

As is explained in Appendix 6.2, the traffic data used in the air quality assessment have been supplied by SiAS. SiAS provided these data as 1-way flows but the criteria given above relate to 2-way flows. The traffic flows have thus been "paired up" to calculate the combined 2-way flow on each link in the traffic model. This analysis has taken account of dual carriageways (i.e. the combined flow on dual carriageways has been calculated). Figure 6.1 shows all of the roads that meet the DMRB criteria[3]. It also shows the residential properties[4] and designated sites[5] within 200m of any of the roads. Since the Scheme might affect air quality at any of the properties or habitats, the DMRB suggests that either a "simple" or a "detailed" assessment is carried out. Professional judgement suggests that given the relative complexity of assessing this road network, a "detailed" assessment is most appropriate. The assessment described below is thus a "detailed" assessment.

The roads defined above have been used to define a Study Area for the local air quality assessment. DMRB 11.3.1 requires representative locations within 200m of the affected roads to be assessed. In order to encompass relevant monitoring that has been made by the local Councils, the local air quality Study Area for this assessment has been arbitrarily

[3] A small number of additional isolated links distant from the Scheme also fulfil the criteria, but these have been excluded from the assessment following discussions with SiAS.
[4] Residential properties have been identified using Ordnance Survey Address Point data. Properties are classed as residential if they do not have a business name and do not have an address beginning "Unit" (e.g. Unit 2, Clyde Industrial Estate).
[5] DMRB 11.3.1 specifies designated habitats as SACs, SPAs, Ramsar Sites or SSSIs.

set at a distance of 2.2km (i.e. 2km beyond the minimum specified in the DMRB). This area is shown in Figure 6.1.

Detailed Assessment Methods

Information on existing and predicted future levels of air pollutants has been obtained from:

a) Discussion with, and review of air quality review and assessment reports by: North Lanarkshire Council, Glasgow City Council, and South Lanarkshire Council;

b) Monitoring data from continuous analysers and diffusion tubes supplied by North Lanarkshire Council, Glasgow City Council and South Lanarkshire Council;

c) Estimated background concentrations of nitrogen oxides (NO_x), nitrogen dioxide and PM_{10} published by Defra and the Devolved Administrations (DAs) (2007a); and

d) Dispersion modelling, as described below.

The calculations have been performed using the AAQuIRE dispersion model (described in detail at www.fabermaunsell.com), which is one of the models accepted by Defra and the DAs (2007b) for use in air quality review and assessment. The road-transport facet of this model is based around algorithms from the internationally validated CALINE 4 dispersion model.

All of the roads identified as potentially significant during the scoping study have been included in the dispersion model. In addition, a number of additional roads have been included in each run of the dispersion model in order to provide a more detailed impression of local air quality and of the impacts of the Scheme near to the affected roads. All of the roads included in the dispersion model are shown in Figures 6.2 to 6.4 for the existing year baseline, and future year Enhanced Do-Minimum and with-Scheme scenarios. The main roads shown on these figures are labelled. Each label refers to the link identifier given in Table A6.2.1 of Appendix 6.2; which sets out the flows and speeds for each link included in the dispersion model.

Emissions from those roads that have not been explicitly included (i.e. roads not shown in Figure 6.2 to 6.4) will have been accounted for by addition of predicted background concentrations, which have been taken from the national maps published by Defra and the DAs (2007c). These background maps include emissions from both traffic and non-traffic sources. There will inevitably be some double-counting of the traffic emissions. Further details of the modelling methodology are given in Appendix 6.3.

The meteorological data required for modelling pollutant dispersion were taken from the Met Office site at Glasgow Centre, this being the closest to the Study Area. Meteorological data for three years from the beginning of 2004 until the end of 2006 have been collated. Appendix 6.4 provides a detailed analysis of how the choice of year affects the predicted concentrations. As is explained in Appendix 6.4, the assessment

presents results calculated using meteorological data for the year 2004, since this will give worst-case results.

DMRB 11.3.1 recommends that dispersion modelling takes account of diurnal variation in both flows and speeds. None of the dispersion models accepted by Defra and the DAs (2007b) for use in air quality review and assessment, and none of dispersion models commercially-available in the UK can take account of diurnal variations in speed without running them in a non-standard way. Appendix 6.5 sets out a detailed analysis of how taking explicit account of diurnal variations in speed would have altered the predicted impacts. As explained in Appendix 6.5, all of the results presented outside of Appendix 6.2 have used annual average daily traffic flows and speeds.

Air quality has been modelled at thirty-seven worst-case receptors, which are shown in Figure 6.5. These locations have been chosen to represent the roadside façade of the closest residential property to roads where the largest changes in traffic flows are expected.

Transport Analysis Guidance Assessment Methods

The Local Air Quality Sub-objective of the Department for Transport's Transport Analysis Guidance (TAG) sets out an approach to calculate the overall impact a scheme (DfT, 2004). The method summarises the overall local change in exposure to both nitrogen dioxide and PM_{10}. It produces a numerical assessment score that takes account of the changes in concentration and the number of residential properties exposed to these changes. It relies on property counts in 50m bands out to 200m from the centre of each road that might be significantly affected by the Scheme. TAG recommends that concentrations within these bands are predicted using the "simple" modelling methodology described in DMRB 11.3.1. Since this current assessment is being carried out following the more precise "detailed" methodology, the detailed dispersion model has been used to model concentrations at each individual property shown in Figure 6.5[6]. The "simple" method is considered less robust than the "detailed method", particularly in this current situation where a large number of separate roads converge within 200m.

The TAG guidance using the "simple" DMRB modelling methodology is to model average concentrations within each of the distance bands described above. These average concentrations are then multiplied by the number of properties in that distance band. Summing across all of the links included in the assessment gives a total net score which approximates the sum of all concentrations at all properties. Subtracting this value

[6] For the TAG assessment, concentrations have been modelled at the centre of each Ordnance Survey address point shown in Figure 6.5 (i.e. all of the properties within 200m of any of the roads highlighted as significant during the scoping exercise). While this centre-point might not be the worst-case location within the boundary of each property, the method is still more precise than the standard TAG methodology; which typically also uses Ordnance Survey address point data. The locations chosen for the sensitive receptor modelling differ (by a matter of metres) from those used for the TAG modelling for the same residential address.

without the scheme from the same value with the proposed scheme gives the overall net change in pollutant concentration. A negative score indicates a net benefit while a positive score indicates a net deterioration in air quality. In this current assessment, the only deviation from this standard methodology is that since pollutant concentrations have been predicted at each individual property, there is no requirement to infer an average concentration within each distance band. The net score across all links has been derived by summing all of the predicted concentrations at every property.

The TAG method also requires a count of the number of properties at which improvements or deteriorations in air quality are expected. Since concentrations have been modelled at distances out to 200m from any roads, in order to present the data in a meaningful way, any predicted changes that are smaller than one quarter of one percent of the relevant objective level (i.e. 0.1 µg/m^3 for nitrogen dioxide and 0.045 µg/m^3 for PM_{10} in 2010) have been classified as "no change".

6.3.3 Ecological Air Quality Impact Assessment Methods

Scoping

Figure 6.1 shows that there are three nature conservation sites within the local air quality Study Area. These are Bothwell Castle Grounds SSSI; Calder Glen SSSI; and Hamilton Low Parks SSSI. There are no European designated sites in this area. The feature of interest at Hamilton Low Parks is birds, which will not be directly influenced by nitrogen deposition. This site has thus been scoped out of the assessment. Calder Glen is a geological SSSI, and as such air quality will not affect the feature of interest (carboniferous rock sequence). This site has also been scoped out of the assessment. The assessment thus focuses Bothwell Castle Grounds, where the feature of interest is woodland and assemblage of vascular plants.

Method for Assessing against Critical Levels and Critical Loads

DMRB 11.3.1 states that the DMRB screening model should be used to carry out the calculations unless the method is not appropriate for the scheme being assessed. While it is argued above that close to the complex junctions shown in Figure 6.2 the screening model is not appropriate; this is not the case at Bothwell Castle Grounds SSSI which is more than 1km away from any of the motorway sections being assessed. The DMRB screening model has thus been used for the assessment of ecological impacts.

NOx and nitrogen dioxide concentrations for the base year (2006), and the year of opening (2010) both with and without the Scheme, have been calculated using the DMRB screening model (Highways Agency, 2007), with results adjusted following the latest guidance from Defra and the DAs regarding the relationship between NOx and nitrogen dioxide (Laxen *et al.*, 2007). Estimates of nitrogen deposition have been calculated following the method set out in DMRB 11.3.1. This involves adjusting local estimates of total nitrogen deposition published on the UK Air Pollution Information System website (APIS, 2007) to take specific account of the effect of local NOx emissions. DMRB 11.3.1

recommends a deposition velocity for nitrogen dioxide of 0.001 m/s, which, when multiplied by the concentration gives a deposition rate (m/s x $\mu g/m^3$ = $\mu g/m^2/s$, which is then transformed into kg-N/ha/yr).

6.3.4 Wider-Scale Air Quality Assessment Methods

Scoping

DMRB 11.3.1 suggests that a wider scale (regional) assessment is carried out if any road is expected to experience:

a) A change of more than 10% AADT; or

b) A change of more than 10% to the number of heavy duty vehicles; or

c) A change in daily average speeds of more than 20km/hr.

The traffic data has been used to generate 2-way flows as described in section 6.3.2. There are fewer than 80 links that meet these criteria (out of more than 20,000 links in the traffic model). Since the DMRB regional criteria do not define an absolute flow criterion, they include roads with extremely low flows which will not be significant at a regional or wider-scale level. For example, 15 of the links classed as significant by the DMRB scoping method have a predicted total daily flow in 2010 of less than 50 vehicles per day both without and with the proposed Scheme. Only three of the roads that are classed as significant according to the DMRB regional scoping criteria have a predicted flow in 2010 greater than 5000 vehicles per day.

The assessment of wider-scale emissions follows the method set out in DMRB 11.3.1 for a “simple” regional assessment, but has taken account of more links than are specified in the DMRB. DMRB 11.3.1 suggests that this assessment should be carried out for the links that meet the significance criteria given above. Professional experience suggests that a small percentage change in flow along the M74 (which the DMRB methodology classes at not significant) is likely to be more important to wider-scale emissions than a large percentage change in flow along a road carrying fewer than 50 vehicles per day. Thus every road that is included in the traffic model has been included in the calculation of wider-scale emissions.

An estimate of the total emissions of five pollutant categories: carbon monoxide (CO); nitrogen oxides (NOx); total hydrocarbons (THC); particulate matter (PM_{10}) and carbon dioxide (CO_2) has been carried out, using the DMRB spreadsheet V1.03c (July 2007). This assessment addresses the change in total emissions that would result from the proposed Scheme compared to the Do-Minimum alternatives. The assessment has been carried out for base years 2006 (with the 2006 traffic data derived as described in Appendix 6.2), the opening year (2010) and the design year (2020).

6.3.5 Construction Impact Assessment Methods

Locations sensitive to dust emitted during construction will be places where members of the public are regularly present. Residential properties and commercial operations close to the works will be most sensitive to construction dust. Any sensitive vegetation or ecology that is very close to dust sources might also suffer some negative effects.

It is very difficult to quantify dust emissions from construction activities. It is thus common practice to provide a qualitative assessment of potential impacts, making reference to the assessment criteria set out in Table 6.4 as well as focusing on mitigation measures to minimise emissions.

The approach adopted for assessing potential construction dust impacts is a count of the number of properties that might be affected. The property counts are based on Ordnance Survey Address point data. The precise approach used is described in detail in the assessment section.

6.3.6 Treatment of PM_{10} Data

The PM_{10} data included in this assessment are based on measurements made with Tapered Element Oscillating Microbalance (TEOM) monitors which are known to under predict the mass of volatile particles. In recent studies (Bureu Veritas, 2006) the TEOM method failed to demonstrate equivalence with the EU reference method. National guidance has been to multiply TEOM measurements by 1.3 to predict gravimetric equivalent data (Defra and the DAs 2007b and 2007c). Local authorities in Scotland (e.g. North Lanarkshire Council, 2007) have found that using the 1.3 factor may cause PM_{10} concentrations to be over-predicted. The Scottish Executive advises that in the absence of further information, 1.3 should be used as the official conversion factor, but that smaller factors, based on local studies, can provide useful comparisons. North Lanarkshire Council (2006) presents a factor of 1.2 based on its own co-location study. Edinburgh City Council (2004) derived a factor of 1.14. North Lanarkshire Council (2007) derived a factor of 0.92 but noted that this might not be representative. The 1.3 factor has been used for all of the measurements presented in this assessment. This will give higher concentrations than any of the other factors and thus provides a worst-case assessment. The measurements presented here are thus higher than those presented by North Lanarkshire Council (2007), simply because a different factor has been used.

The dispersion model has been verified using TEOM measurements adjusted using the worst-case 1.3 factor. This is in addition to the model being run using traffic data generated under a high growth assumption. Coupled together, these factors may significantly over-predict local PM_{10} concentrations. While this makes the current assessment worst-case, it means that exceedences of the Scottish 2010 PM_{10} objectives are predicted, even though the local Councils' own assessments do not suggest that exceedences are likely. Regardless of any uncertainties regarding absolute concentrations, the impact of the Scheme, and particularly whether an improvement or a deterioration is expected, can be predicted with some confidence.

6.4 Baseline Conditions

All three local authorities that are within the local air quality Study Area have carried out reviews and assessments of air quality over a number of years. Their principal conclusions are summarised below:

In 2004, North Lanarkshire Council identified likely exceedences of the 2010 PM_{10} objectives at three locations (North Lanarkshire Council, 2004) and thus declared AQMAs in Motherwell, Coatbridge and Chapelhall. More recent evidence (North Lanarkshire Council, 2007) supports the continuation of these AQMAs. Recent monitoring has also indicated that exceedences of the PM_{10} objectives are likely at Croy and Harthill. The Council is thus in the process of declaring one additional AQMA at Harthill. Further monitoring is being conducted at Croy, but the Council has no immediate plans to declare an AQMA in this area. North Lanarkshire Council also predicts exceedences of the annual mean nitrogen dioxide objective within the Coatbridge AQMA and in Moodiesburn. The Coatbridge AQMA is thus likely to be declared for nitrogen dioxide as well as PM_{10}. Further monitoring is being carried out in Moodiesburn and the Council has no immediate intentions to declare this area as an AQMA (North Lanarkshire Council, 2007). Figure 6.1 shows the location of the Motherwell AQMA, which lies partly within the local air quality Study Area. None of the other areas highlighted by the Council are within the Study Area.

Glasgow City Council declared the centre of the city an AQMA in 2001, because exceedences of the annual mean nitrogen dioxide objective were predicted. The first Updating and Screening Assessment (Glasgow City Council, 2003) included monitoring data from locations outside the AQMA, where the nitrogen dioxide objective was also likely to be exceeded. The report also acknowledged that there was a risk of the 2010 PM_{10} objectives being exceeded at locations across the city. The Updating and Screening Assessment was followed by a Detailed Assessment (Glasgow City Council, 2005) which concluded that additional AQMAs for nitrogen dioxide were required and that exceedence of the 2010 PM_{10} objectives both within the city centre and also outside of the city centre were likely. More recently, a second Updating and Screening Assessment was completed in 2006 (Glasgow City Council, 2006), which concluded that the current AQMA for nitrogen dioxide is still valid and that exceedences of nitrogen dioxide and PM_{10} are still expected outside of the AQMA. There is the possibility that the Council will declare the entire city an AQMA for PM_{10}, but no decisions will be made until further monitoring has been carried out. Although Glasgow City Council has not currently declared any AQMAs within the Study Area, this assessment has taken account of the possibility that AQMAs might be declared in the future.

South Lanarkshire Council has carried out regular reviews and assessments of air quality (e.g. South Lanarkshire Council, 2005) and has not needed to declare any AQMAs (Defra and the DAs 2007c). They did, however, carry out a Detailed Assessment of PM_{10} concentrations at a single junction (Whirlies Roundabout) that was of particular concern. This involved both monitoring and modelling of PM_{10} concentrations close to the junction.

The Detailed Assessment recommended an AQMA was not required and in any case, this junction is outwith the Study Area.

6.4.1 Baseline Measurements

North Lanarkshire Council has operated one automatic monitor within the local air quality Study Area at Motherwell Cross (Merry Street). This monitor measures real-time concentrations of both nitrogen dioxide and PM_{10}. North Lanarkshire Council also operates a network of passive diffusion tubes measuring ambient concentrations of nitrogen dioxide within the Study Area. Glasgow City Council has operated four diffusion tube sites within the Study Area. South Lanarkshire Council has operated six diffusion tube sites in the Study Area. Indicative positions of all of these monitors are shown in Figure 6.5. Tables 6.5 and 6.6 sets out the measurements of nitrogen dioxide and PM_{10} concentrations respectively made during 2006.

The annual mean nitrogen dioxide objective was exceeded during 2006 at five of the monitoring sites shown in Table 6.5. One of these (New Edinburgh Road) was adjacent to the M74, two were within the Motherwell AQMA (Motherwell Cross and Merry Street), one was adjacent to the A8 (Showcase Cinema), and one was a kerbside location within a street canyon near to Celtic Park stadium. Elsewhere, measured concentrations were below the objective; falling as low as 13 $\mu g/m^3$ in background locations in both North Lanarkshire and South Lanarkshire.

Measurements of PM_{10} made at Motherwell Cross showed that the annual mean concentration was well below the objective. The 98^{th} percentile of 24-hour mean PM_{10} concentrations is presented following the approach of North Lanarkshire Council (2007). This measurement suggests that the 7^{th} highest daily measurement was 54 $\mu g/m^3$ (when measured as TEOM x 1.3). Since the 2004 objective allows 35 days with concentrations above 50 $\mu g/m^3$, experience suggests that it is highly unlikely that the objective was exceeded.

Table 6.5 Measured Baseline Annual Mean Nitrogen Dioxide Concentrations within the Local Air Quality Study Area

Location	Site Type	Annual Mean Concentration (µg/m^3)
Automatic Measurement[a]		
Motherwell Cross (AQMA)	Roadside	**41**
North Lanarkshire Council Diffusion Tube Measurements [ab]		
Alpine Grove	other (motorway)	28
New Edinburgh Road	other (motorway)	**42**
Fallside Road	other (motorway)	34
Tinkers Lane	Roadside	26
Kethers Lane	Background	16
Showcase Cinema	other (motorway)	**49**
Merry Street (AQMA)	Roadside	**48**
Watsonville (AQMA)	Urban Background	26
Emily Drive	Background	13
Camp Street (AQMA)	Background	26
Health Centre (AMQA)	Roadside	19
Glasgow City Council Diffusion Tube Measurements [c]		
Drumhead Road	kerbside	18
Easterhouse	Urban background	24
Westmuir Street	kerbside	**48**
Sacone SW	kerbside	21
South Lanarkshire Diffusion Tube Measurements [d]		
Burnpark Avenue, Uddingston	Roadside	29
Wordsworth Way, Bothwell	Background	22
North British Road, Uddingston	Background	26
Cadzow Street, Hamilton	Roadside	31
Glen Esk, East Kilbride		16
Balfron Crescent, Hamilton	Background	13
Objective		**40**

[a] Data taken from North Lanarkshire Council, 2007.
[b] Diffusion tubes were supplied and analysed by Glasgow Scientific Services using 20% Triethanolamine (TEA) in water. Results have been adjusted for bias by North Lanarkshire Council using a factor of 0.96.
[c] Data taken from Glasgow City Council 2006. Measurements were made during 2005 and have been factored to predict concentrations during 2006 using factors published by Defra and the DAs (2007b). Diffusion tubes were supplied and analysed by Glasgow Scientific Services using 20% TEA in water. Results have been adjusted for bias by Glasgow City Council based on a collocation study at Glasgow Centre. The adjustment factor was 0.652.
[d] Data supplied by South Lanarkshire Council. Diffusion tubes were supplied and analysed by Glasgow Scientific Services using 20% TEA in water. Results have been adjusted for bias using the factor provided by Defra and the DAs (2007b) (sheet version 03/07). The adjustment factor for 2006 was 0.96.

Table 6.6 Measured Baseline PM_{10} Concentrations[a] within the Local Air Quality Study Area

Location	Type of Site	Annual Mean ($\mu g/m^3$)	98th Percentile of 24-hour Mean PM_{10} Concentrations
Motherwell Cross	Roadside	30	54 [b]
Objective		**40**	**n/a** [b]

[a] Results are taken from North Lanarkshire Council, 2007. Presented as gravimetric equivalent (estimated by Tapered Element Oscillating Microbalance (TEOM) x 1.3). The values are thus higher than those presented by North Lanarkshire Council (2007).
[b] North Lanarkshire present their data using a different TEOM adjustment factor. The 98th percentile relates to the 2010 objective rather than the 2004 objective. The 98th percentile has been used following the format in which North Lanarkshire present their data (North Lanarkshire Council, 2007).

6.4.2 Baseline Modelled Predictions

In addition to defining baseline conditions using measurements, the dispersion model has been run to predict baseline conditions in 2006 and 2010 at thirty-seven receptors. The complete results are presented in Appendix 6.6, and the results for a selection of eleven of these receptors are reproduced in Tables 6.7 and 6.8. These eleven receptors have been chosen to represent those locations where concentrations are highest and where the predicted impacts of the Scheme are most significant. They are shown in Figure 6.6. A comparison of the model results with the measurements is provided in Appendix 6.3.

Table 6.7 shows that the largest predicted annual mean nitrogen dioxide concentrations in 2006 are at the properties beside the M8 in Glasgow (Receptors 4 and 6). Even here, the objective is unlikely to have been exceeded; although the margin by which the objective was achieved is very small. Concentrations close to the objective level were also predicted near to the M74 and M73 (e.g. Receptors 23, 27, and 29). By 2010, a range of measures introduced at national and international levels is expected to have reduced concentrations of nitrogen dioxide. Thus, all of the predicted levels in the 2010 baseline are lower than those in 2006. The largest predicted concentration in the 2010 baseline case is adjacent to the M74 (Receptor 27). No exceedences of the annual mean nitrogen dioxide objective are expected in the 2010 baseline.

Table 6.8 shows that the spatial pattern of PM_{10} concentrations in 2006 follows that for nitrogen dioxide, with the largest predicted concentrations close to the motorways (e.g. Receptors 4, 6 and 27). The largest predicted annual mean PM_{10} concentration in 2006 is 28 $\mu g/m^3$, which is well below the relevant objective level. As with nitrogen dioxide, concentrations are expected to fall between 2006 and 2010 as a result of a range of measures introduced at national and international levels. However, a set of more stringent PM_{10} objectives will apply in Scotland in 2010 and the anticipated reductions will not be sufficient to prevent widespread exceedences of these objectives. The predictions indicate that in the 2010 baseline, the annual mean PM_{10} objective will be exceeded at

twenty-nine of the thirty-seven receptors presented in Appendix 6.6 and at all eleven receptors shown in Table 6.8[7].

Table 6.7 Predicted Baseline Annual Mean Nitrogen Dioxide (µg/m^3) Concentrations within the Local Air Quality Study Area

Location	Site Type	2006	2010 (CDM)[a]
4 10 Kildermorie Road	Roadside	39	33
6 85 Wardie Road	Roadside	39	33
7 441 Hamilton Road	Roadside	34	30
8 542 Hamilton Road	Roadside	32	29
12 The Sheddings	Roadside	34	31
15 495 Glasgow Road	Roadside	31	26
23 21 Maryville View	Roadside	37	33
27 38 Sheepburn Road	Roadside	38	34
29 6 Alpine Grove	Roadside	37	33
31 19 Croft Wynd	Roadside	31	28
32 16 Rowans Gardens	Roadside	28	25
Range of Background Concentrations[b]	Background	16-23	12-20
Objective		**40**	

[a] The 2010 data are for the CDM model as this will best represent the baseline case.
[b] The range of background concentrations across the range of receptor locations as published by Defra and the DAs (2007a).

Table 6.8 Predicted Baseline PM_{10} Concentrations within the Local Air Quality Study Area

Location	Site Type	Annual Mean (µg/m^3)		Number of 24-hour exceedences	
		2006	2010 (CDM)[b]	2006	2010 (CDM)[a]
4 10 Kildermorie Road	Roadside	27	**26**	19	**14**
6 85 Wardie Road	Roadside	28	**26**	20	**15**
7 441 Hamilton Road	Roadside	24	**23**	10	**8**
8 542 Hamilton Road	Roadside	22	**22**	6	6
12 The Sheddings	Roadside	23	**23**	9	**8**
15 495 Glasgow Road	Roadside	23	**22**	7	6
23 21 Maryville View	Roadside	26	**26**	15	**14**
27 38 Sheepburn Road	Roadside	28	**27**	20	**17**
29 6 Alpine Grove	Roadside	27	**26**	17	**14**
31 19 Croft Wynd	Roadside	23	**22**	7	6
32 16 Rowans Gardens	Roadside	21	**20**	5	4
Range of Background Concentrations		14-17	14-16	0-1	0
Objective		**40**	**18**	**35**	**7**

[a] The 2010 data are for the CDM model as this will best represent the baseline case.
[b] The range of background concentrations across the range of receptor locations as published by Defra and the DAs (2007a); the number of 24-hour exceedences has been predicted from the annual mean following the approach given in Appendix 6.3.

[7] As noted in section 6.3.6, this assessment is worst-case and may over-predict PM_{10} concentrations.

The predicted number of exceedences of 50 µg/m^3 as a 24-hour PM_{10} concentration is below the relevant objective level in 2006 at all thirty-seven receptors. As with annual mean PM_{10} levels, reductions are expected between 2006 and 2010, but these will not be sufficient to prevent exceedences of more stringent the 24-hour objective that will apply in 2010. The 2010 24-hour PM_{10} objective will be exceeded at fourteen of the thirty-seven receptors presented in Appendix 6.6 and at six of the receptors shown in Table 6.8.

To avoid unnecessary repetition, baseline conditions with respect to the ecological air quality impact assessment and the wider-scale assessment are set out in the Impact Assessment sections.

6.5 Local Air Quality Impacts

The Scheme impacts are predicted for 2010, which is the proposed Scheme opening year and will thus be the worst-case year for local air quality impacts. As is explained in the Baseline Assumptions section, the with-Scheme predictions can be compared against the predictions for the Enhanced Do-Minimum scenario (EDM) to estimate the air quality impacts of the proposed Scheme. The predicted impacts of the Scheme are appraised using the descriptive criteria set out in Appendix 6.1. The predicted concentrations of nitrogen dioxide and PM_{10} at thirty-seven receptors are set out in Appendix 6.6. The results are also summarised in Figure 6.7, which highlights the most significant predicted change in air quality (for either nitrogen dioxide or PM_{10}[8]) at each of the thirty-seven receptors. In order to simplify presentation, the results for eleven of the receptors, which have been chosen to represent a sample of the most significant impacts across the Study Area, are reproduced in Tables 6.9, 6.10 and 6.11. The precise positions of these eleven receptors are described in Figure 6.6.

6.5.1 Nitrogen Dioxide Impacts

No exceedences of the annual mean nitrogen dioxide objective are likely in 2010 at any of the receptors either with or without the proposed Scheme. The proposed Scheme will improve conditions at some locations and worsen them at others.

The largest predicted deterioration is a 3.1% increase in concentrations at Receptor 27 which is immediately adjacent to a section of the M74 that would be widened as part of the proposed Scheme. The largest predicted improvement is a 4.1% reduction in concentrations at Receptor 15 which is near to the junction of the A724 with the B758. Both of these predicted changes are described as very small according to the criteria set out in Appendix 6.1. Because the baseline and with-Scheme concentrations near to the motorway are more than 75% of the objective level, while those beside the A724 are less than 75% of the objective level, the deterioration is classed as slight adverse, while the improvement is classed as negligible.

[8] Depending on which is most significant in terms of the descriptors set out in Appendix 6.1

Predicted nitrogen dioxide impacts at thirty of the thirty-seven receptors are classed as negligible. Those at the remaining seven receptors are all classed as slight adverse. All seven of these receptors are short listed in Table 6.9. Two of these are beside the M74 southeast of Junction 4, where widening is proposed. A further two are beside the M8 between Junctions 9 and 10, where similar road widening is proposed. The final three receptors with slight adverse impacts are near to the proposed works around Junction 1 of the M73 and Junctions 3 to 4 of the M74.

The EU limit values for nitrogen dioxide will not be exceeded with or without the proposed Scheme.

Table 6.9 Predicted Annual Mean Nitrogen Dioxide Concentrations (µg/m^3) With and Without the Proposed Scheme at Eleven Receptors

R	Description	2006	2010 Without Scheme [a]	2010 With Scheme	Change due to Scheme (%)	Impact Magnitude [b]	Impact Significance [b]
4	10 Kildermorie Road	39	33	33	1.3	Very Small	Slight Adverse
6	85 Wardie Road	39	33	34	1.4	Very Small	Slight Adverse
7	441 Hamilton Road	34	30	30	1.2	Very Small	Slight Adverse
8	542 Hamilton Road	32	29	30	3.0	Very Small	Negligible
12	The Sheddings	34	30	31	1.7	Very Small	Slight Adverse
15	495 Glasgow Road	31	25	24	-4.1	Very Small	Negligible
23	21 Maryville View	37	33	33	1.2	Very Small	Slight Adverse
27	38 Sheepburn Road	38	34	35	3.1	Very Small	Slight Adverse
29	6 Alpine Grove	37	33	33	2.3	Very Small	Slight Adverse
31	19 Croft Wynd	31	28	29	2.5	Very Small	Negligible
32	16 Rowans Gardens	28	26	26	3.0	Very Small	Negligible
Objective			**40**				

[a] Under the ARF scenario. These predictions are different from those presented in the baseline section, which reflected the CDM scenario.
[b] The predicted concentrations have been rounded to make the table easier to read, but so that the impacts of the Scheme are not hidden, the predicted changes were calculated before the numbers were rounded. The Impact magnitude and significance descriptors also describe unrounded numbers.

6.5.2 Annual Mean PM_{10} Impacts

The annual mean PM_{10} objective is expected to be exceeded at twenty-nine of the thirty-seven receptors with or without the proposed Scheme in place. There are no receptors at which the proposed Scheme would cause or prevent an exceedence of the objective. Eleven of these receptors are short listed in Table 6.10; in which the objective exceedences are highlighted.

In terms of annual mean PM_{10} concentrations, the proposed Scheme will improve conditions at some locations and worsen them at others. The largest predicted deterioration is a 3.5% increase in concentrations at Receptor 27 which is immediately adjacent to a section of the M74 that would be widened as part of the proposed Scheme. The largest predicted improvement is a 1.2% reduction in concentrations at Receptor 15 which is near to the junction of the A724 with the B758. Both of these predicted changes are described as very small according to the criteria set out in Appendix 6.1. The impact at Receptor 27 is described as slight adverse, while the impact at Receptor 15 is described as slight beneficial.

Impacts at eight of the thirty-seven receptors set out in Appendix 6.7 are described as negligible; impacts at twenty-six of the receptors are described as slight adverse, and impacts at three receptors are described as slight beneficial. All of the adverse impacts are adjacent to the motorways; the beneficial impacts are near to the B758 and B7001.

The EU limit value for annual nitrogen PM_{10} concentrations will not be exceeded with or without the proposed Scheme.

Table 6.10 Predicted Annual Mean PM_{10} Concentrations (µg/m^3) With and Without the Proposed Scheme at Eleven Receptors

R	Description	2006	2010 Without Scheme [a]	2010 With Scheme	Change due to Scheme (%) [b]	Impact Magnitude [b]	Impact Significance [b]
4	10 Kildermorie Road	27	**26**	**27**	1.7	Very Small	Slight Adverse
6	85 Wardie Road	28	**27**	**27**	2.3	Very Small	Slight Adverse
7	441 Hamilton Road	24	**23**	**23**	1.0	Extremely Small	Slight Adverse
8	542 Hamilton Road	22	**22**	**22**	2.8	Very Small	Slight Adverse
12	The Sheddings	23	**23**	**23**	2.3	Very Small	Slight Adverse
15	495 Glasgow Road	23	**21**	**20**	-1.2	Very Small	Slight Beneficial
23	21 Maryville View	26	**25**	**26**	1.1	Very Small	Slight Adverse
27	38 Sheepburn Road	28	**27**	**28**	3.5	Very Small	Slight Adverse
29	6 Alpine Grove	27	**25**	**26**	2.8	Very Small	Slight Adverse
31	19 Croft Wynd	23	**22**	**23**	2.5	Very Small	Slight Adverse
32	16 Rowans Gardens	21	**20**	**21**	2.6	Very Small	Slight Adverse
Objective		**40**	**18**	**18**			

[a] Under the ARF scenario. These predictions are different from those presented in the baseline section, which reflected the CDM scenario.

[b] The predicted concentrations have been rounded to make the table easier to read, but so that the impacts of the Scheme are not hidden, the predicted changes were calculated before the numbers were rounded. The Impact magnitude and significance descriptors also describe the unrounded numbers.

6.5.3 24-hour PM_{10} Impacts

Without the proposed scheme, the 2010 24-hour PM_{10} objective would be exceeded at fourteen of the thirty-seven receptors. With the scheme, the objective would be exceeded at sixteen receptors. The two receptors at which exceedences would be caused are short listed in Table 6.11. They are Receptor 8, which is near to the M74 at Junction 3, and Receptor 31, which is adjacent to the M74 at Uddingston. The impact at Receptor 8 is classified as moderate adverse in terms of the criteria given in Appendix 6.1. Because the predicted change at Receptor 31 is less than a full day, the impact here is classified as slight adverse. Elsewhere, impacts at are expected to be slight adverse at a further thirteen receptors, negligible at twenty-one receptors, and slight beneficial at one receptor.

The EU limit value for 24-hour PM_{10} concentrations will not be exceeded with or without the proposed Scheme.

Table 6.11 Predicted Number of Exceedences of 50 µg/m^3 as a 24-hour Mean PM_{10} Concentration With and Without the Proposed Scheme at Eleven Receptors

R	Description	2006	2010 Without Scheme[a]	2010 With Scheme	Impact Magnitude [b]	Impact Significance [b]
4	10 Kildermorie Road	19	**16**	**17**	Very Small	Slight Adverse
6	85 Wardie Road	20	**17**	**18**	Very Small	Slight Adverse
7	441 Hamilton Road	10	**8**	**9**	Extremely Small	Slight Adverse
8	542 Hamilton Road	6	6	**7**	Very Small	Moderate Adverse
12	The Sheddings	9	**8**	**9**	Very Small	Slight Adverse
15	495 Glasgow Road	7	4	4	Extremely Small	Negligible
23	21 Maryville View	15	**13**	**14**	Extremely Small	Slight Adverse
27	38 Sheepburn Road	20	**17**	**20**	Very Small	Slight Adverse
29	6 Alpine Grove	17	**13**	**15**	Very Small	Slight Adverse
31	19 Croft Wynd	7	6	**7**	Extremely Small	Slight Adverse
32	16 Rowans Gardens	5	4	5	Extremely Small	Negligible
Objective		**35**	**7**	**7**		

[a] Under the EDM scenario. These predictions are different from those presented in the baseline section, which reflected the CDM scenario.
[b] The predictions have been rounded to make the table easier to read, but so that the impacts of the Scheme are not hidden, the Impact magnitude and significance descriptors describe the unrounded numbers (i.e. they take account of changes smaller than one full day).

6.5.4 Overall Local Air Quality Impacts

As is explained in the methodology section, the Local Air Quality Sub-objective of the DfTs TAG methodology has been followed to indicate the net overall impact of the Scheme on local air quality. The only divergence from the DfTs standard methodology is that instead of using the simple screening model to infer concentrations at properties within each distance band; the dispersion model has been used to calculate concentrations at each individual property. Detailed results are set out in Appendix 6.7. The TAG appraisal summary tables are given as Tables 6.12 and 6.13 for nitrogen dioxide and PM_{10} respectively.

Table 6.12 shows that the net total assessment score for nitrogen dioxide is +16. This shows that the proposed Scheme will lead to a net deterioration in air quality but the score is fairly well balanced between those properties showing improvements and those showing deteriorations. To put the value into context, it shows that the sum total property-weighted change in annual mean nitrogen dioxide concentrations across all 3885 properties will be 16 ug/m^3; or an average of 0.004 µg/m^3 per property. Table 6.12 also shows that more properties would experience an improvement in annual mean nitrogen dioxide concentrations than a deterioration[9, 10]. Figure 6.8 shows where these changes are predicted. It shows that a large number of properties near to the B758 through Blantyre, as well as a small number of properties near to the B7001 at Birkenshaw and a few additional properties at Coatbridge Road at Swinton will experience improvements[11]. Elsewhere, including locations near to all of the motorways included in the assessment, deteriorations are expected; but fewer people live near to motorways than near to the minor roads that would be relieved by the Scheme.

Table 6.13 shows that the Scheme will also lead to a net deterioration in concentrations of PM_{10}. The net score of +225 is equivalent to an average net change of 0.06 µg/m^3 at each of the 3885 properties included in the assessment[12]. The Scheme will also lead to many more properties experiencing a deterioration than an improvement with respect to PM_{10}. Figure 6.9 shows where these changes are predicted. The spatial pattern of changes is essentially the same as that described for nitrogen dioxide, but the reductions associated with reduced traffic flows on the B758 will be less widespread for PM_{10} than for nitrogen dioxide.

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[9] This is based on discounting any predicted change smaller than 0.1 µg/m^3 , but even if these changes were included, the pattern would remain the same, with more properties expecting an improvement than a deterioration with regard to nitrogen dioxide.

[10] The reason that the overall score shows a deterioration even though more properties show benefits than deteriorations is that the deteriorations are, on average, larger than the improvements.

[11] Two of the properties within 200m of the B758 through Blantyre show a deterioration. This would be due to the complex, meteorology-dependent, interaction of changes in emissions from each road in the model.

[12] The reason that this value is greater than the equivalent value for nitrogen dioxide is not that the PM_{10} changes at each property are greater, but that for nitrogen dioxide, the improvements came closer to cancelling out the deteriorations

Table 6.12 TAG Local Air Quality Appraisal Summary Table for Nitrogen Dioxide (NO_2) in 2010

	0-50m (i)	50-100m (ii)	100-150m (iii)	150 - 200m (iv)	0-200m (v = i+ii+iii+iv)
Total properties across all routes (min)[a]	558	984	1136	1207	3885
Do-minimum NO_2 assessment across all routes[b]	10402	20708	24716	26283	**Total assessment NO_2 (I)** 82108
Do-something NO_2 assessment across all routes[b]	10265	20711	24785	26363	**Total assessment NO_2 (II)** 82124
Net total assessment for NO_2 , all routes (II-I)					**16**
Number of properties with and improvement	493	523	271	140	*1427*
Number of properties with no change [c]	18	138	449	639	*1244*
Number of properties with a deterioration	47	323	416	428	*1214*
Reference sources	DfT (2004) Transport Appraisal Guidance (TAG) Unit 3.3.3 Local Air Quality Sub-objective; Air Quality Archive website for background concentrations:-www.airquality.co.uk. Modelling carried out for each Ordnance Survey Address Point using the AAQuIRE dispersion model				
Quantitative measures	1214 Properties experiencing worse air quality; 1427 properties experiencing improved air quality				
Assessment scores	16 - Overall deterioration due to the Scheme				
Qualitative comment	The improvements are due to reduced flows on minor roads in the area; the deteriorations are mainly the result of increased flows on, and widening of, motorways that are near to residential properties. The proposals would not affect any existing AQMAs. None of the predictions exceed the annual mean nitrogen dioxide objective. There would be no increases in annual mean nitrogen dioxide concentrations of 2 µg/m^3 or more.				

[a] i.e. the total number of residential address point data within each distance band from the centre of any of the roads identified in the scoping exercise described above.
[b] i.e. the sum of all predicted nitrogen dioxide concentrations at each property
[c] any predicted change smaller than 0.1 µg/m^3 (i.e. one quarter of one percent of the objective level).

Figure 6.10 presents the constraints map as required in DMRB 11.3.1. It repeats much of the information from Figure 6.1, but also shows those properties where exceedences are predicted in 2010 without the Scheme and how this would change with the Scheme in place. None of the 3885 properties at which air quality was modelled are expected to experience an exceedence of the annual mean nitrogen dioxide objective with or without the Scheme. Without the Scheme, the predictions show that annual mean PM_{10} objective will be exceeded at 1728 of the 3885 addresses assessed. Concentrations at 1446 of

these locations will deteriorate[13] as a result of the Scheme; with concentrations remaining effectively unchanged[14] at 276 addresses and improving at five addresses. The Scheme will also lead to exceedences of the annual mean PM_{10} objective at a further thirty-six addresses[15]; but will prevent an exceedence at one address.

Table 6.13 TAG Local Air Quality Appraisal Summary Table for PM_{10} in 2010

	0-50m (i)	50-100m (ii)	100-150m (iii)	150 - 200m (iv)	0-200m (v = i+ii+iii+iv)
Total properties across all routes (min)	558	984	1136	1207	3885
Do-minimum PM_{10} assessment across all routes	9427	17654	20442	21515	**Total assessment PM_{10} (I)** 69039
Do-something PM_{10} assessment across all routes	9417	17731	20526	21590	**Total assessment PM_{10} (II)** 69264
Net total assessment for NO_2 , all routes (II-I)					**225**
Number of properties with and improvement	369	189	60	30	***648***
Number of properties with no change	138	443	564	567	***1712***
Number of properties with a deterioration	51	352	512	610	***1525***
Reference sources	DfT (2004) Transport Appraisal Guidance (TAG) Unit 3.3.3 Local Air Quality Sub-objective; Air Quality Archive website for background concentrations:-www.airquality.co.uk. Modelling carried out for each Ordnance Survey Address Point using the AAQuIRE dispersion model				
Quantitative measures	1936 Properties experiencing worse air quality; 316 properties experiencing improved air quality				
Assessment scores	150 - Overall deterioration due to the Scheme				
Qualitative comment	The improvements are due to reduced flows on minor roads in the area; the deteriorations are mainly the result of increased flows on, and widening of, motorways that are near to residential properties. The proposals would not affect any existing AQMAs. There would be no increases in annual mean PM_{10} concentrations of 1 µg/m^3 or more.				

[a] i.e. the total number of residential address point data within each distance band from the centre of any of the roads identified in the scoping exercise described above.

[13] By more than one quarter of one percent of the objective level.
[14] i.e. any predicted improvements and deteriorations are less than one quarter of one percent of the objective level.
[15] The predicted change at three of these addresses is less than one quarter of one percent of the objective level and thus could be classed as no change.

[b] i.e. the sum of all predicted nitrogen dioxide concentrations at each property
[c] any predicted change smaller than 0.045 µg/m^3 (i.e. one quarter of one percent of the objective level).

6.5.5 Impacts on Vegetation

Table 6.14 shows that predicted NOx concentrations for 2006 at Bothwell Castle Grounds SSSI are below the critical level. Anticipated improvements brought about at national and international levels are expected to lead to concentrations falling between 2006 and 2010. The Scheme is expected to reduce NOx concentrations by a very small amount 115m from the centre of the road (i.e. the closest edge of the SSSI) and by an extremely small amount further away. These changes are described as negligible according to the criteria set out in Appendix 6.1.

The critical loads for nitrogen deposition are likely to be exceeded within Bothwell Castle Grounds in the baseline case and also in 2010 with or without the proposed Scheme. The Scheme is expected to bring about an extremely small reduction in nitrogen deposition flux at all of the locations assessed. These changes amount to slight beneficial impacts according to the criteria defined in Appendix 6.1.

Table 6.14 Concentrations of Nitrogen Oxides (NOx) Within Bothwell Castle Grounds SSSI

Distance from Road Centre (m)	NOx Annual Mean (µg/m^3)			% Change [b]	Change as % of 30 µg/m^3 [b]
	2006	2010 Without Scheme [a]	2010 With Scheme		
115[c]	20	16	16	-1.0%	-0.6%
150	19	16	16	-0.5%	-0.3%
200	19	16	16	-0.2%	-0.1%
Critical Level	**30**				

[a] Under the ARF Scenario
[b] The predicted concentrations have been rounded to make the table easier to read, but so that the impacts of the Scheme are not hidden, the predicted changes were calculated before the numbers were rounded.
[c] Bothwell Castle Grounds is approximately 115m from the centre of the nearest affected road.

Table 6.15 Nitrogen Deposition Rates to Bothwell Castle Grounds SSSI

Distance from Road Centre (m)	Nitrogen Deposition (kg-N/ha/yr)			% Change [b]	Change as % of 10 kg-N/ha/yr [b]
	2006	2010 Without Scheme [a]	2010 With Scheme		
115[a]	**27**	**24**	**24**	<-0.1% [d]	-0.1%
150	**27**	**24**	**24**	<-0.1% [d]	<-0.1% [d]
200	**27**	**24**	**24**	<-0.1% [d]	<-0.1% [d]
Critical Load	**10-20**				

[a] Under the ARF Scenario
[b] The predicted deposition rates have been rounded to make the table easier to read, but so that the impacts of the Scheme are not hidden, the predicted changes were calculated before the numbers were rounded.
[c] Bothwell Castle Grounds is approximately 115m from the centre of the nearest affected road.

[d] i.e. a reduction between zero and -0.1%. 200m from the road, the predicted change is smaller than one quarter of one percent of the lower bound Critical Load.

6.5.6 Cumulative Local Air Quality Impacts

As is explained in the Baseline Assumptions section, comparing the predicted with-Scheme concentrations with those under the Committed Do-Minimum (CDM) scenario provides an indication of the combined impacts of the proposed Scheme along with those of the proposed M8 Baillieston to Newhouse upgrade and the proposed Raith junction improvements. The same modelling exercise as that described above for the Scheme-only impacts has been carried out for the cumulative impacts[16]. The predicted impacts at each of the thirty-seven receptors are set out in Appendix 6.8. The tables in Appendix 6.8 also highlight whether the cumulative impact significance at any receptor is different from the Scheme-only impact (as described previously).

For nitrogen dioxide, thirteen out of the thirty-seven receptors would experience cumulative impacts that would be described differently to the Scheme-only impacts. Four of these would experience a slight adverse impact from the Scheme alone, but a negligible cumulative impact. Eight receptors would move from negligible to slight beneficial; while one would move from negligible to slight adverse.

For annual mean PM_{10} concentrations, sixteen of the thirty-seven receptors would experience cumulative impacts that would be described differently to the Scheme-only impacts. At three of these receptors, the cumulative impacts would be worse than the Scheme-only impacts. At the remaining thirteen receptors, the cumulative impact would be better than that the Scheme-only impact. Six receptors would experience a negligible impact from the Scheme alone, but a slight beneficial cumulative impact. One would experience a negligible impact from the Scheme, but a moderate beneficial cumulative impact. Five receptors (including short listed Receptor 23) would move from a slight adverse impact to a slight beneficial cumulative impact and one (short listed Receptor 15) would move from slight beneficial to substantial beneficial. The deteriorations would involve one receptor moving from a negligible impact to a slight adverse cumulative impact, with a further two moving from slight adverse to substantial adverse. These last two receptors are receptors 36 and 37. Both are immediately adjacent to Raith Junction and the effects of the Raith junction improvements are discussed in detail within the ES for M74 Junction 5.

The cumulative 24-hour PM_{10} impacts would be described differently to the Scheme-only impacts at six receptors. Two (including short listed Receptor 23) would move from slight adverse to slight beneficial, while a further two (including short listed Receptor 15) would move from negligible to slight beneficial. One (Receptor 8) would move from moderate

[16] The modelled road network has not been redefined for the cumulative impacts analysis, so the network of links explicitly included (as well as the choice of receptors) is based on the Scheme-only impacts.

adverse to slight adverse, while one (Receptor 31) would move from slight adverse to moderate adverse.

6.5.7 Cumulative Impacts on Vegetation

Tables 6.16 and 6.17 set out the predicted cumulative impacts of the proposed Scheme along with the proposed M8 Baillieston to Newhouse and M74 Junction 5 schemes at Bothwell Castle Grounds. The cumulative impacts would bring about a greater improvement than the Scheme-only impacts but would still be described as negligible in terms of NOx and as slight beneficial in terms of nitrogen deposition.

Table 6.16 Cumulative Impacts on Concentrations of Nitrogen Oxides (NOx) Within Bothwell Castle Grounds SSSI

Distance from Road Centre (m)	NOx Annual Mean (µg/m^3)		% Change [a]	Change as % of 30 µg/m^3 [a]
	2010 CDM	2010 With Scheme		
115[b]	17	16	-4%	-2%
150	16	16	-2%	-1%
200	16	16	-1%	-0.4%
Critical Level	**30**			

[a] The predicted concentrations have been rounded to make the table easier to read, but so that the impacts of the Scheme are not hidden, the predicted changes were calculated before the numbers were rounded.
[b] Bothwell Castle Grounds is approximately 115m from the centre of the nearest affected road.

Table 6.17 Cumulative Impacts Relating to Nitrogen Deposition Rates to Bothwell Castle Grounds SSSI

Distance from Road Centre (m)	Nitrogen Deposition (kg-N/ha/yr)		% Change [a]	Change as % of 10 kg-N/ha/yr [a]
	2010 CDM	2010 With Scheme		
115[b]	**24**	**24**	-0.1%	-0.2%
150	**24**	**24**	<-0.1% [c]	-0.1%
200	**24**	**24**	<-0.1% [c]	<-0.1% [c]
Critical Load	**10-20**			

[a] The predicted concentrations have been rounded to make the table easier to read, but so that the impacts of the Scheme are not hidden, the predicted changes were calculated before the numbers were rounded.
[b] Bothwell Castle Grounds is approximately 115m from the centre of the nearest affected road.
[c] i.e. a reduction between zero and -0.1%. 200m from the road, the predicted change as a percentage of the baseline level is smaller than one quarter of one percent of the lower bound Critical Load.

6.6 Wider-Scale Impacts

Table 6.18 sets out the total emissions of five pollutants from all vehicles on the road network included in the transport model during 2006, and both 2010 and 2020 with and without the proposed Scheme. As is explained in the introduction, the modelled road network includes the whole of Central Scotland, as well as a representation of roads much further away. In order to provide a context for these data, some national and local emissions estimates are provided in Tables 6.19 and 6.20. As noted in section 6.3.1,

assessing the change in greenhouse gas emissions from individual schemes in isolation is not the best way of appraising Scotland's ability to achieve its emission reduction targets. Thus, in order to provide further context, Table 6.20 also includes some projections of emission reductions that are expected to be delivered by the Scottish Executive before the Scheme is complete.

Table 6.18 Total Emissions from the Entire Modelled Road Network

	Carbon Monoxide (Kt/yr)	THC (Kt/yr)	Nitrogen Oxides (Kt/yr)	PM_{10} (Kt/yr)	Carbon Dioxide (as Carbon) [b] (Mt/yr)
2006 [a]	41 - 42	7.0 - 7.1	57	1.7	3.2
2010 Enhanced Do Minimum (ARF)	37	6.2	44	1.2	3.4
2020 Enhanced Do Minimum (ARF)	39	6.3	32	0.82	3.6
2010 with Scheme	37	6.2	44	1.2	3.4
2010 change (ARF To Scheme)	-0.007	-0.00057	0.0028	0.000083	-0.000018
2010 % change (ARF To Scheme)	-0.018 %	-0.0093 %	0.0062 %	0.0070 %	-0.00054 %
2020 with Scheme	39	6.4	32	0.82	3.6
2020 change (ARF To Scheme)	0.016	0.0015	0.010	0.00045	0.0016
2020 % change (ARF To Scheme)	0.040 %	0.024 %	0.033 %	0.055 %	0.045 %

[a] As is explained in Appendix 6.2, the traffic flows for 2006 have been derived by interpolation between traffic flows modelled during 2000 and those projected for the 2010 committed do minimum (CDM). As is also explained in the Appendix, there are some differences between the two road networks (where new roads have been / will be built etc). When carrying out the local assessment, it was relatively simple to identify whether each road was present during 2006. This was not possible for the much larger network modelled for the wider-scale impacts. The emissions for 2006 have thus been predicted both with and without the additional roads. The data are thus presented as a range where the two datasets give different results. This lack of precision relates only to the 2006 data and clearly makes no difference to the assessment.

[b] The 2007 update of DMRB 11.3.1 changes the convention for reporting carbon dioxide emissions from units of carbon dioxide, to units of carbon. A tonne of carbon is equal to 3.7 tonnes of carbon dioxide (the full mass of the gas molecule is made up of the carbon atom and the two oxygen atoms).

Table 6.19 Comparison Emissions for the Non-Greenhouse Gas Pollutants

Description of Emission Estimate [a]	Carbon Monoxide (Kt/yr)	THC (Kt/yr)	Nitrogen Oxides (Kt/yr)	PM_{10} (Kt/yr)
2004 Total UK emissions (UNECE)	2930	1024	1621	154
2003 Total UK emissions (IPCC)	2757	1087	1569	-
2003 UK Transport emissions (IPCC)	1402	164	709	-
2005 Emissions from Glasgow, North Lanarkshire and South Lanarkshire	336	175	171	1.69
2005 Road Transport Emissions from Glasgow, North Lanarkshire and South Lanarkshire	198	21	104	0.63

[a] All data taken from Defra and the DAs (2007d), using the most recent published years available. These datasets may be revised by Defra and the DAs in the future. Statistics on a United Nations Economic Commission for Europe (UNECE) basis are used to report progress against international targets for sulphur dioxide, nitrogen oxides, ammonia and volatile organic compounds. UNECE excludes land use change and also shipping in UK ports, but includes aviation emissions below 1000 metres to cover take-off and landing cycles. IPCC emission formats are reported to the United Nations Framework on Climate Change. IPCC includes land use and all emissions from domestic aviation and shipping, but excludes international marine and aviation bunker fuels.

Table 6.20 Comparison Emissions and Emission-Reduction Estimates for Greenhouse Gases

Description of Emission Estimate		Carbon Dioxide (as Carbon) (Mt/yr)
2004 Total UK emissions (UNECE) (Defra and the DAs 2007c) [a]		154
2003 Total UK emissions (IPCC) (Defra and the DAs 2007c) [a]		156
2003 UK Transport emissions (IPCC) (Defra and the DAs 2007c) [a]		34
2002 Scotland total emissions (IPCC) (Defra and the DAs 2007c) [a]		17
2010 Total UK emissions (CCUKP, 2006)[b]		144
2020 Total UK emissions (CCUKP, 2006) [b]		147
2010 UK transport emissions (CCUKP, 2006) [b]		37
2020 UK transport emissions (CCUKP, 2006) [b]		39
Estimates of Greenhouse Gas Savings Published in Scotland's Climate Change Programme (2006)[c]		**Greenhouse Gases (as Carbon) (Mt/yr)[c]**
Reductions Already Achieved	Reductions in Scotland's total Carbon Dioxide Emissions between 1990 and 2003	1.3
	Increase in Scotland's carbon dioxide removals (i.e. emissions removed from the atmosphere by forests and soils) between 1990 and 2003	0.4
Expected reductions from measures in the CCUKP (2006) and the SCCP (2006)	Total savings in 2010 from reserved policy measures in the CCUKP	14
	Scottish share of savings in 2010 from reserved policy measures in the CCUKP	1.1
	Total savings in 2010 from devolved policy measures in the CCUKP	21
	Scottish share of savings in 2010 from devolved policy measures in the CCUKP	1.7
	Total savings in 2010 from devolved policy measures in the SCCP	2.6
	Sum of savings in Scotland associated with devolved and reserved policies introduced since the CCUKP and SCCP were first published in 2000 (SCCP, 2006)	3.7

[a] All data taken from Defra and the DAs (2007d), using the most recent published years available. These datasets may be revised by Defra and the DAs in the future. Statistics on a United Nations Economic Commission for Europe (UNECE) basis are used to report progress against international targets for sulphur dioxide, nitrogen oxides, ammonia and volatile organic compounds. UNECE excludes land use change and also shipping in UK ports, but includes aviation emissions below 1000 metres to cover take-off and landing cycles. IPCC emission formats are reported to the United Nations Framework on Climate Change. IPCC includes land use and all emissions from domestic aviation and shipping, but excludes international marine and aviation bunker fuels.

[b] CCUKP data are as reported in SCCP, 2006

[c] The SCCP data include all greenhouse gases presented as carbon equivalents. On average, carbon dioxide is likely to make up more than 80% of these totals. Devolved policies are those where the Scottish Executive has policy levers. Reserved policies are those where the Executive does not have policy levers.

In 2010 the proposed Scheme is expected to cause an extremely small increase in the emissions of nitrogen oxides and PM_{10}, and an extremely small reduction in emissions of carbon monoxide, total hydrocarbons, and carbon dioxide. In 2020, the proposed Scheme is expected to cause an extremely small increase in the emissions of all five pollutants. All of the anticipated increases amount to less than one tenth of one percent (<0.1%). Furthermore, all of the predicted changes in the non-greenhouse gas pollutants are less than one thousandth of one percent (<0.001%) of each national total estimate

and less than two thousandths of one percent (<0.002%) of the 2003 predictions of national total transport emissions.

For carbon dioxide, the predicted increase due to the Scheme in 2020 is approximately one thousandth of one percent (0.001%) of each prediction of national total emissions presented in Table 6.20. The predicted increase is less than five thousandths of one percent (<0.005%) of UK total transport emissions. The predicted increase is also less than one hundredth of one percent (<0.01%) of Scottish total emissions in 2002, but since the modelled road network is larger than Scotland, this comparison is less relevant.

Table 6.20 also shows that the predicted increase in carbon dioxide emissions due to the proposed Scheme in 2020 would amount to less than half of one percent (<0.5%) of the increase in the amount of carbon dioxide removed by forests and soils achieved in Scotland between 1990 and 2003. It would also offset less than five hundredths of one percent (<0.05%) of greenhouse gas savings in Scotland associated with policies introduced since the CCUKP and SCCP were first published in 2000. The extremely small increase due to the proposed Scheme is not inconsistent with the aim for an overall reduction.

The wider-scale (regional) impacts of the proposed Scheme are judged to be not significant.

6.6.1 Cumulative Impacts

Table 6.21 sets out the total emissions of the five wider-scale pollutants from all vehicles on the modelled road network under the CDM modelling scenario and compares these figures with the with-Scheme data from Table 6.18. The cumulative impacts of the proposed Scheme along with the M8 Baillieston to Newhouse upgrade and Raith junction proposals would be much larger than those predicted for the Scheme alone and have been assessed in the other Environmental Statements. It is clear, however, that even the combined impacts of the three schemes together would amount to less than one hundredth of one percent (<0.01%) of national totals for the non-greenhouse gas emissions and to only six hundredths of one percent (0.06%) of greenhouse gas savings in Scotland associated with policies introduced since the CCUKP and SCCP were first published in 2000. All of the predicted cumulative wider-scale impacts are extremely small and are judged to be not significant.

It should be noted that at present, the only practical method of calculating total emissions across such an expansive road network relies on the average speed of vehicles along each road. Along a free-flowing road, this speed is likely to be fairly representative, but on roads which are congested for part of the time, the average speed might be taken across a wide range of speeds.

SiAS predict that without any road improvement works (i.e. the CDM scenario), this road network is likely to become increasingly congested over the next fifteen years. The three road proposals discussed here are expected to relieve this congestion. It is thus likely

that the CDM emissions have been under-predicted, particularly in the 2020 scenario. This will mean that the increase in emissions attributed to the Scheme has been over-predicted. Transport Scotland is currently exploring ways to improve the calculation procedures, so as to improve the accuracy of the calculation of emissions and to allow the true benefits of reducing congestion and queuing at junctions to be reflected in the emissions calculations.

Table 6.21 Cumulative Wider-Scale Impacts

	Carbon Monoxide (Kt)	THC (Kt)	Nitrogen Oxides (Kt)	PM_{10} (Kt)	Carbon Dioxide (as Carbon) [a] (Mt)
2010 CDM	37	6.2	44	1.2	3.3
2020 CDM	39	6.3	32	0.81	3.6
2010 with Scheme	37	6.2	44	1.2	3.4
2010 change (CDM to Scheme)	0.24	0.020	0.15	0.0081	0.021
2010 % change (CDM to Scheme)	0.64 %	0.33 %	0.34 %	0.69 %	0.64 %
2020 with Scheme	39	6.4	32	0.82	3.6
2020 change (CDM to Scheme)	0.22	0.016	0.14	0.0079	0.024
2020 % change (CDM to Scheme)	0.56 %	0.25 %	0.46 %	0.97 %	0.67 %

[a] The 2007 update of DMRB 11.3.1 changes the convention for reporting carbon dioxide emissions from units of carbon dioxide, to units of carbon. A tonne of carbon is equal to 3.7 tonnes of carbon dioxide (the full mass of the gas molecule is made up of the carbon atom and the two oxygen atoms).

6.7 Construction Impacts

Construction impacts on air quality are addressed in Chapter 9 Disruption Due to Construction. Impacts on air quality are likely to result from both general construction activities and changes in the number and type of vehicles accessing construction areas. The impact of the construction phase on local air quality is likely to involve a temporary increase in dust and vehicle emissions.

6.8 Mitigation

This assessment has identified no specific requirement to mitigate the effects of emissions from road traffic. On the other hand, measures to mitigate dust emissions would be required during the construction phase. This mitigation should be straightforward, as the necessary measures are routinely employed as 'good practice' on construction sites. The measures to be employed during construction would include:

- avoiding non-essential use of unpaved haul routes;

- locating any unpaved haul routes as far as possible from occupied residential properties and using water-sprays to ensure that they are maintained in a damp condition when in use;
- imposition and enforcement of a 5 mph speed limit on unpaved ground;
- sheeting of lorries carrying dusty material on and off site;
- early sealing of open ground with vegetation;
- locating any concrete crushing plant well away from residential areas;
- location of stockpiles of potentially dusty material as far from sensitive locations as possible;
- regular use of a water-assisted dust sweeper on local roads if necessary, to remove any material tracked out of the site;
- regular cleaning of paved areas on-site;
- use of a jet-spray vehicle and wheel wash for all vehicles leaving the site;
- use of water suppression during any demolition works near to occupied residential properties and
- use of water suppression during any cutting of stone or concrete.

Where mitigation measures rely on water, it is expected that only sufficient water to damp down the material will be applied. There should not be any excess to potentially contaminate local watercourses.

During all stages of the construction works there will be close liaison with the local community, including the setting up of a well-publicised hotline, together with a rapid response to concerns that may arise.

Whilst the research and investigations undertaken have not identified any significant degree of contamination within the Scheme boundaries (see Chapter 16 Geology and Soils), vigilance should be maintained during earthmoving. Where potentially harmful contamination is suspected, the normal methods of assessment should be applied and appropriate action taken.

6.9 Conclusions

A Stage 3 DMRB assessment of the potential air quality impacts associated with the proposed M8/M73/M74 Network Improvements Scheme has been carried out. Attention has been given to impacts during the construction phase, and to local air quality impacts, impacts on sensitive ecosystems, and wider-scale impacts including greenhouse gas emissions during the operational phase.

In terms of local air quality impacts, the proposed Scheme is expected to improve air quality in some locations and to cause a deterioration in others. At most locations, any change in local air quality will be negligible. Near to the M74, M73 and M8 motorways on

which upgrades are planned, there would impacts ranging from slight to moderate adverse. Conversely, there would be some slight beneficial impacts near to roads that would be relieved by the Scheme. Overall, the effect of the proposed Scheme on local air quality is expected to be minor adverse. The Scheme is not expected to have any effect on air quality within existing Air Quality Management Areas (AQMAs).

The Scheme would have a slight beneficial impact on rates of nitrogen deposition at Bothwell Castle Grounds SSSI.

In terms of wider-scale impacts in the design year, the Scheme is expected to bring about an extremely small increase in the total emissions of relevant air pollutants across the road network. In context, this increase is not judged to be significant. The Scheme would increase emissions of carbon dioxide, but the increase would be extremely small and would amount to less than 0.04% of the expected greenhouse gas savings in Scotland associated with policies contained in UKCCP (2006) and SCCP (2006) that have been introduced since the UKCCP and SCCP were first published in 2000 (SCCP, 2006). The increase in carbon dioxide emissions would not, therefore, run counter to the assumptions made in Scotland's Climate Change Programme (2006), which shows how reductions in emissions from non-transport sectors can offset the increases associated with road-vehicles.

Any effect of construction vehicle emissions on local air quality will be negligible. The construction works do, however, have the potential to create dust. During construction it would be necessary to apply a package of mitigation measures to minimise dust emissions. Even with these mitigation measures in place, those properties that are closest to the construction works and to site entrances might experience some dust soiling. Any effects would be temporary and any events would be infrequent, depending on the weather conditions and occurrence of dust raising activities.

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7 Cultural Heritage

7.1 Introduction

This section provides an assessment of the potential effects associated with the proposed road improvement scheme with respect to cultural heritage using guidance set out in DMRB Volume 11 (Environmental Assessment).

Cultural heritage refers to archaeological remains, Listed Buildings, Conservation Areas, Historic Gardens, Designed Landscapes and other heritage designations.

Generally, four categories of archaeological remains may be encountered comprising:

- upstanding remains: built structures such as buildings, field boundaries, and features such as standing stones and stone circles;
- earthworks: soil-covered remains that can be seen as surface undulations at ground level. These can include ruined buildings or their foundations, banks, mounds, ramparts, ditches, gullies and hollows;
- buried features: soil-covered remains which have no visible trace at ground level (possibly revealed by aerial photography); and
- artefact scatters: scatters of potsherds, flint, tools, metal objects, animal bones, worked stone, mortar or human remains.

Palaeoenvironmental evidence may also be found in association with archaeological remains and this can be used for dating purposes and to provide evidence of past land use or landform change.

The objective of a cultural heritage assessment is to undertake sufficient investigations to identify the significant archaeological impacts likely to arise from construction of the preferred route, to identify and characterise archaeological constraints and identify mitigation options associated with that route.

The assessment of effects on cultural heritage is largely based on the location and footprint of the scheme. Information regarding specific scheme components, such as excavation during the construction phase, will be further developed by the Contractor. Any activities that may cause disruption or damage to, for example, previously unrecorded features which cannot reasonably be anticipated as part of the Environmental Statement, will need to be considered and addressed by the Contractor in consultation with Historic Scotland.

7.2 Methods

The key objectives of the assessment approach have been to:

- identify the known and potential cultural heritage resources on and around the proposed scheme options and to evaluate the importance of sites and features recorded;
- describe the potential effects of the option locations on these resources; and
- recommend any measures to mitigate significant adverse impacts.

These objectives were achieved through establishing baseline conditions and subsequently defining any potential effects of the conceptual design on this baseline resource.

7.2.1 Baseline Methods

Information regarding existing and potential cultural heritage features within the vicinity of the proposed options has been collated through a desk-based review of existing archaeological data and through consultation with Historic Scotland and West of Scotland Archaeology Service (WoSAS).

7.2.2 Impact Assessment Methods

As outlined in Chapter 4, Approach and Methods, impacts were considered in terms of site value and the magnitude of the impact; the significance of predicted impacts was then determined through a combination of value and magnitude.

7.2.3 Site Value

The site value, or status, of each site was determined as detailed in Table 7.1 below.

Table 7.1 Definition of Site Value for Cultural Heritage

Value or Status	Criteria
National	Scheduled Ancient Monuments Listed Buildings (Category A)
Regional	Listed Buildings (Category B), archaeological sites deemed to be of regional interest
Local	Listed Building (Category C), archaeological sites deemed to be of local interest
Negligible	Sites of less than local or negligible importance or sites that have been completely destroyed or otherwise leave no physical trace (and therefore cannot be assigned a value).

Historic Designed Landscapes are not specifically listed in the above table, as the designation may apply to areas of varying significance, from local to national. Levels of importance, based on professional judgement, have been individually assigned to any Designed Landscapes in the vicinity of the scheme.

7.2.4 Impact Magnitude

The severity, or magnitude, of impact was assessed independently of the site value, based on professional judgement informed by planning policy and other relevant guidance, and assigned to one of the categories described in Table 7.2 below.

Table 7.2 Impact Magnitude Criteria

Impact Magnitude	Criteria
Major, adverse	Between approximately 50% and 100% demolition or loss of a site, or where there would be complete severance of important parts of a site such as to significantly affect the value of the site.
Moderate, adverse	Loss of part (between approximately 15% and 50%) of a site, major severance, major effects on setting, or substantial increases in noise or disturbance, such that the value of a site would be diminished but to a minor degree.
Slight, adverse	Minimal effect on a site (up to 15%) or a medium effect on its setting, or where there would be minor severance, increases in noise, vibration, disturbance or amenity, such that there would be no effect on its value.
Negligible, adverse	Very little appreciable effect on a site, a minimal effect on its setting, or where there are impacts which are not considered relevant to the historic value of a site.
No impact	
Negligible, beneficial	Very little appreciable effect on a site, a minimal benefit to its setting, or where there are impacts which are not considered relevant to the historic value of a site.
Slight, beneficial	Minimal enhancement of a site, a medium beneficial effect on its setting, or where there would be a minor reduction of severance, noise, vibration, disturbance or amenity such that there would be no effect on its value.
Moderate, beneficial	Major reduction of severance, a major beneficial effect on setting, or substantial reductions in noise or disturbance such that the value of a site would be enhanced to a minor degree.

These definitions are based on professional judgement and are necessarily approximate due to the need to address non-tangible issues, such as the relative importance of the specific part of a site to be affected within the context of the overall site.

7.2.5 Impact Significance

The significance of impact (beneficial and adverse) was determined as a combination of the value of the site and the magnitude of impact as shown in Table 7.3.

Table 7.3 Assessment of Significance Criteria

Site Value	Magnitude of Impact			
	Major	Moderate	Slight	Negligible
National	Major	Major	Moderate	Slight
Regional	Major	Moderate	Slight	Negligible
Local	Moderate	Slight	Slight	None
Negligible	Slight	Negligible	Negligible	None

Impacts on sites may be direct (such as damage or severance), or indirect impacts on setting (such as a road in close proximity creating noise or visual impacts on a site). Impacts on the setting of local sites were not considered significant and the setting of local sites was therefore not assessed. The concept of 'setting' is largely a visual concept and, for those sites of more than local importance, has been considered as part of the Landscape Effects assessment (Chapter 11).

7.3 Baseline Conditions

7.3.1 Planning Policy Context

The following national and local policies provide a framework within which the archaeological assessment has been undertaken and mitigation measures recommended. These policies are also discussed in Chapter 17 – Policies and Plans.

- National Planning Policy Guideline (NPPG) 5 - Archaeology and Planning states that the preservation of ancient monuments and their setting is a material consideration in determining proposals for development. NPPG5 provides guidance to the planning authority in determining applications of development that could have effects on sites of importance and the scope for mitigation where necessary and appropriate;
- NPPG18 - Planning and the Historic Environment considers wider issues associated with the historic environment, stating that planning authorities should ensure that planning applications are accompanied by information about the historical, architectural, environmental and archaeological significance of the site affected by proposals, so the effects of proposals can be fully evaluated;
- Planning Advice Note (PAN) 42 - The Planning Process and Scheduled Ancient Monuments focuses on development control and its role in safeguarding archaeological resources. It defines where remains should be preserved in situ, and where it may be appropriate to excavate and record them; and
- The North Lanarkshire Southern Area (Planning Policies ENV20 and ENV 21), the Monklands Local Plan (Planning Policy Env18) and the Glasgow City Plan

(Planning Policies ENV9, HER1, HER2, HER4 and HER5) note the importance of cultural heritage features including listed buildings, Scheduled Ancient Monuments, Designed Landscapes and other archaeological features. Scheduled Ancient Monuments and Designed Landscapes are identified as being of national significance, with a high degree of protection being attached to them. Locally important archaeological sites are also identified in the plan, stating that development proposals must have regard for such sites and plans must respect them.

7.3.2 Consultations

Historic Scotland and WoSAS were contacted in respect of the provision of the following baseline information:

- details of sites of archaeological or built heritage value (national, regional or local);
- details of any Historic Gardens, Designed Landscapes, Listed Buildings or Conservation Areas;
- the potential for unidentified or unrecorded archaeological features or remains; and,
- comments on the proposed scheme.

Information has been provided based on records detailed in the National Monuments Record of Scotland (NMRS) and the regional Sites and Monuments Record (SMR). The NMRS comprises the national collection of material relating to the archaeological and architectural heritage of Scotland, whereas the SMR contains regional information (in this case for the West of Scotland) for all known archaeological sites and finds.

7.3.3 Results of the Desk Study

Consultation with Historic Scotland indicates that there are no designated features of cultural heritage within the area of proposed works, although two Scheduled Ancient Monuments and six Listed Buildings lie within 1km. There still however remains the potential for unrecorded archaeological features which are not listed on the NMRS. Previous disturbance associated with road construction, mining, industrial development plus development of nearby residential areas is likely to have significantly reduced the likelihood of such features.

Historic Scotland (HS) generally assess the information gathered during the Stage 1 and 2 desk studies (and any walkover studies) and establish whether further field survey is required. Historic Scotland has determined during Stage 3 consultations that the desk-based collation of information is sufficient to characterise the nature of the identified heritage resource of the study area. However, the issue of previously uncovered remains will still need to be addressed as part of a mitigation strategy.

During consultation, Historic Scotland determined that neither a formal Phase 1 desk assessment nor Phase 2 field evaluation need be undertaken for route planning

purposes. Historic Scotland also advised that the information gathered to date on the location and description of sites of cultural heritage interest within the study area is sufficient and serves the purpose of the formal phases of archaeological work detailed above.

North Lanarkshire Council noted that the study area cuts across an archaeological consultation trigger zone to the north-east of the M74 around Tannochside and Birkenshaw. This zone exists in order to alert the Council to consult the West of Scotland Archaeological Service (WoSAS) in respect of development within the area.

WoSAS was further consulted with specific reference to the identified trigger zones that lie in the vicinity of the scheme corridor. In response (Appendix 7.1) they note that the on-line nature of the scheme means that the cultural heritage features in the area are unlikely to be affected by the proposed works.

The locations of designated sites are shown in Figure 7.1a-f.

Scheduled Ancient Monuments (SAMs)

SAMs are nationally important sites and monuments that are legally protected under the Ancient Monuments and Archaeological Areas Act 1979. One Scheduled Ancient Monument (Hamilton Low Parks motte) lies within 100m of the scheme, south of Hamilton Services and adjacent to the northbound carriageway of the M74. The SAM is on the opposite side of the motorway to where the carriageway widening will occur.

Conservation Areas and Historic Designed Landscapes

Bothwell Conservation Area, with associated listed buildings, is located to the east of the Raith Junction.

Designed Landscape exists at the south-eastern limit of the Scheme. Hamilton Palace designed landscape encompasses 409 hectares of land adjacent to the River Clyde. In addition, designed landscape exists at Craighead Retreat House and a school close to the A724.

Listed Buildings

Listed buildings are those buildings of special architectural or historic interest that help enrich cultural history. The list of buildings in Scotland is aimed at safeguarding the built heritage and promoting its understanding and is compiled and maintained by Historic Scotland on behalf of the Scottish Ministers, in accordance with the Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997. The listings are divided into three categories (A, B and C(S)) based on different levels of interest or importance.

Consultation confirmed that there are no listed buildings within the scheme extents or adjacent to it. Listed buildings are present in the wider area.

Listed Buildings occur throughout the general area through which the existing M73 and M74 motorways run, as shown on Figures 7.1a–f. None will be directly affected by the scheme.

7.3.4 Unscheduled/unlisted Sites

Many sites of archaeological interest and value that are not specifically designated on the above listings have been recorded across Scotland. Many of these have been uncovered as the result of aerial surveys, geophysics and through ongoing development planning and are recorded in the National Monuments Record Scotland (NMRS) and/or the relevant regional Sites and Monuments Record (SMR). Within the survey area four NMRS sites have been recorded close to the scheme. These are:

- Next to Wardie Road Easterhouse
- Easterhouse Road M8 (Off-slip)
- B7071 Main St. M8 Overbridge Powburn
- M8 Widening Southbound Powburn

7.3.5 Importance of Sites Identified

The importance and, where applicable, status of the archaeological sites described above has been determined through consultation with Historic Scotland and reference to the criteria in Table 7.1. SAMs such as Hamilton Low Parks motte, Bothwellhaugh Roman Fort and Roman Bath House in addition to Grade A listed buildings are considered to have National importance. B Listed buildings are categorised as having Regional importance, C(s)-listed as Local and all other sites including the four NMRS sites are be considered to be of Negligible value in the context of the scheme proposal.

7.3.6 Potential for Unrecorded Sites

It is considered that the land affected by the scheme is likely to be of very limited interest, when considering previous disturbance associated with industrial activity, road development and agricultural land use which is likely to have removed existing upstanding remains and buried features. However, there may be remains of previously unrecorded sub-surface features present and therefore a general programme of archaeological sampling may be required as detailed in Section 7.5.

7.4 Predicted Impacts

7.4.1 Introduction

The assessment of potential impacts has been undertaken based on the alignment of the scheme, as shown in Figure 3.1a-f National policy and guidance emphasises the need to take into account the effects of development on both designated and undesignated sites, as well as known and unknown remains. Potential impacts have been assessed based

on the footprint of the proposed Scheme and the consequential direct or indirect effects on the sites identified in Section 7.3.

Potential adverse impacts associated with road development on recorded and previously unrecorded archaeological resources may include:

- physical loss or damage;
- severance;
- disturbance due to vibration, compaction or subsidence; and
- effects on setting and loss of amenity.

7.4.2 Physical Damage/Loss/Severance of Sites or Remains

There will be no physical loss, damage or severance to identified or designated archaeological sites or features resulting from the scheme. Construction activity will be restricted to within the existing road boundary apart from small areas of land take associated with the creation of road drainage management features and new slip roads at Daldowie. The magnitude of potential impact relating to physical damage/loss/severance of identified sites is assessed as negligible for SAMs and Grade A listed buildings, and therefore of slight significance. The potential impact is negligible for B listed Buildings and none for C listed buildings and other NMRS sites, and is not significant.

7.4.3 Disturbance due to Compaction, Vibration and Subsidence

Potential indirect effects may occur as a result of the vehicular access to the site during the construction period and certain activities such as piling (if required). Settlement (or subsidence) may also occur should areas of groundwater be affected within the working corridor which has the potential to destabilise the ground beneath sites and possibly result in erosion of the site. Hamilton Low Parks, motte SAM is most at risk from this type of disturbance as it lies adjacent to the area of proposed works. However, as it has and continues to experience indirect effects from the existing motorway, the additional impact of construction (on the far side of the carriageway) is likely to be negligible. For the remaining sites of local/negligible value, no significant effect is predicted.

Although areas of shallow groundwater may be encountered within the working corridor, for example close to the Raith Junction, appropriate methods will be employed to ensure that water levels are not detrimentally affected (locally lowered or raised) during the construction period. It is therefore anticipated that effects of settlement and subsidence would be unlikely to occur and are therefore assessed to be of negligible magnitude and significance.

7.4.4 Effects on Setting and Amenity

In terms of visual intrusion on the archaeological sites or features identified, affecting their setting during operation, all types of site have been taken into account.

The effect of the scheme on the setting on all sites in the vicinity of the scheme options have been assessed as being of negligible magnitude and of no overall significance as the change will result in the widening of an existing road feature. There will be slight effects on the visual setting of sites in the immediate vicinity of the working corridor during the construction period, however, this will be temporary and not significant.

Potential visual implications on the scheme as a whole are assessed in Chapter 11.

7.4.5 Effects on Unrecorded features

Construction of the scheme will take place within land of which most has already been subject to extensive disturbance and excavation in the past. Unrecorded finds are therefore considered unlikely.

If items or features of interest are uncovered, their value and any potential impacts will be assessed on a case-by-case basis in discussion with Historic Scotland.

7.5 Mitigation

Although no significant effects are predicted, the possibility exists that further sites may be unrecorded and may be disturbed during construction of the new facilities for managing road runoff. The Contractor would be required as part of the Employer's Requirements to ensure that in such circumstances, works stops at the affected location and Historic Scotland is informed.

During site clearance and construction, the Contractor will be made aware of the possibility of unrecorded finds and careful construction techniques will be employed. If any features are uncovered by the Contractor during excavation works that may be of cultural heritage significance, works should be halted to enable Historic Scotland to determine whether any archaeological recording or removal is required.

7.6 Residual Impacts

Providing the above mentioned mitigation measures are in place, no residual impacts on the cultural heritage resource are predicted as a result of the scheme.

7.7 References

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Development Department, The National Assembly of Wales and The Department of the Environment for Northern Ireland.

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West of Scotland Sites and Monuments Record (data provided by West of Scotland Archaeology Service).

8 Land Use

8.1 Introduction

This section examines the likely effects on land use of proposed improvements to those sections of the existing M8, M73 and M74 motorway network studied in association with the proposed upgrading to motorway standard of the A8 trunk road between Baillieston and Newhouse. The objective is to identify and assess potential constraints and opportunities relevant to land use planning and the predicted land take requirements of the Scheme described in Chapter 3.

The study area for consideration of Land Use effects is a flexible corridor broadly based on the line of the existing motorway routes shown on Figure 1.1. It has no precisely defined boundary but encompasses land which may be influenced by the proposed works including the contextual setting of the scheme as indicated on Figures 8.1a-f and 8.2a-f.

Following the Stage 2 assessment, Strategy 3 as described in Chapter 3 has been brought forward as the preferred scheme. This assessment considers the permanent effects of the scheme in the context of possible demolition of property and associated land take, loss of agricultural and development land, and loss of land used by the community.

8.2 Baseline and Impact Assessment Methods

The assessment has been prepared in accordance with the principles and techniques outlined in Chapter 4 and with the provisions of DMRB Volume 11 (Environmental Assessment), Section 3 Environmental Assessment Techniques, Part 6 - Land Use. A desk study was undertaken which comprised the review of relevant plans and other published documents listed in Section 8.8 of this Chapter, including previous assessment reports. Consultation with the Local Authorities and statutory agencies has taken place.

Baseline land use information is presented principally by means of drawing based records which form an integral part of the assessment report. Figures 8.1a-f refer to development and community land; agricultural land is covered in Figures 8.2 a-f. The schematic outline of the proposed scheme is overdrawn in order to illustrate the effects on land within the study area. Figures 8.2a-f also show the boundaries of land expected to be taken to facilitate the road improvement.

8.3 Baseline Conditions

8.3.1 Private Property

Due to the proximity of built development there is extensive residential and commercial property in the vicinity of the proposed scheme. No private property is, however, directly affected by the scheme although two residential curtilages at Powburn will adjoin the road boundary.

8.3.2 Community Land

In Scotland, land used by the public (community land) is defined in DMRB as being 'Common', including town or village greens, and 'Open Space' which is any land laid out as public parks or used for the purpose of public recreation or which is a disused burial ground. Land in these categories which could be lost to road construction is subject to legal restrictions requiring suitable exchange land to be provided. Land used as public footpaths or for other public access is considered in Chapter 13 (Pedestrians, Cyclists, Equestrians etc). See Figure 8.1a-f, Land Use Development & Community Land.

Details of land used by the public which meets the criteria defined in DMRB are presently unavailable; and could not be provided by the Local Authorities. It seems unlikely, however, that the proposed works will encroach upon any such land although there is the possibility of some marginal land take to accommodate earthworks re-profiling where public open space adjoins carriageway widening.

North Lanarkshire Council does not maintain records of land used by the community in the designated categories listed above and reliable determination has not, therefore, been possible. At the suggestion of the Local Authority, areas shown as Community Land in Figures 8.1a-f constitute land which is in public ownership and which, by implication or observation, is deemed to fall within one of the designated categories.

8.3.3 Development Land

The study area is covered by four approved development plans: the Glasgow City Plan (Adopted 2004) the North Lanarkshire (Monklands District) Local Plan 1995 (Finalised First Alteration 1996), the North Lanarkshire (Southern Area) Local Plan (Finalised Draft, modified 2005,) and the South Lanarkshire (Hamilton District) Local Plan (Adopted 2000). All of the plans are currently subject to review but at present the relevant adopted statutory development plans remain the baseline circumstance.

Both North and South Lanarkshire Councils are currently preparing single Local Plans intended to reflect current development and land use issues more closely and which will replace the various current documents applicable to component Districts. In October 2005 South Lanarkshire published a consultative draft of the new Local Plan which has been used as a source of development designation updating. A consultation document "Local Planning Issues for the Hamilton Area" published by South Lanarkshire in May 2003 has also been taken into account. Further consultation on a number of new "pressure for change" sites was also undertaken in February/ March 2006.

The issues document outlined key principles of sustainable economic growth, community regeneration, quality of environment, and design, including community safety. Protection of natural heritage and the Green Belt is considered to be important, but so too are strategic sites for business development in the Green Belt, as identified in the Glasgow and Clyde Valley Joint Structure Plan. The document highlights improvement of major transportation routes in the context of exploiting economic development opportunities.

The South Lanarkshire Draft Local Plan reflects and develops the above policies. It identifies a number of "Pressure for Change Sites" which developers and owners are known to wish to promote. Many of these are closely associated with the M74 including land in the current Green Belt. A new Green Network policy is introduced based also on Structure Plan strategy and aimed, inter-alia, at protecting and enhancing the quality of the environment together with enabling access to recreation and open space. There will be a presumption against development likely to have an adverse effect on the integrity or character of the Green Network; enhancement will be expected where development is permitted. Major Green Network areas are defined adjacent to the M74.

Local Authority development planning designations are shown on Figure 8.1 a-f. Land use planning policy throughout the study area emphasises environmental quality and biological diversity in the context of both the built and natural heritage. Relevant land use designations include exclusive Green Belt and Country Parks, Designed Landscape, countryside access, and various open space and woodland protection including Green Network, Ancient Woodland, and Tree Preservation Orders. Nature conservation protection is also significant and covers a wetland Site of Special Scientific Interest (SSSI) and several Sites of Importance for Nature Conservation (SINCs). The Glasgow Plan also includes a number of Sites of Special Landscape Importance (SSLI) due to the sites having particular visual or ecological significance or important landscape features, considered to contribute positively to local amenity. This concept is extended to several transport routes, including the existing M8, M73 and M74, which are afforded protected status as Corridors of Wildlife and Landscape Importance. Potential loss or erosion of any of these designated areas is perceived as being detrimental to the environment and there is a general presumption by all of the Local Authorities against development which adversely affects them.

There are also various areas adjoining both the M8 and the M74 which are designated for commercial, industrial and business use and include the South Lanarkshire "Pressure for Change Sites". West of Maryville, the existing M74 is bounded on both sides by extensive landfill operations which are being progressively restored to woodland and open space.

8.3.4 Agricultural Land

In the Glasgow and Clyde Valley Landscape Assessment prepared by Scottish Natural Heritage (SNH), a proportion of the study area falls within the regional character area described as Clyde Basin Farmlands, but, in practice, only a small part of the land is productive farmland. Much of the improvement scheme is located in areas categorised as being urban in nature; the remainder of the study area mostly falls within landscape types described by SNH as Broad Urban Valley or Fragmented Farmland. The former rural character has been substantially lost in both the areas falling within the Broad Urban Valley and the Fragmented Farmland, and, although extensive planted features exist, these landscapes are heavily influenced by urban characteristics including major highway infrastructure and recreation green space as well as the built environment of neighbouring settlements.

Surviving conventional farmland is confined to the area around Baillieston Interchange and the M73 corridor with a smaller area around Bothwell Park to the north west of the M74 Raith Interchange. Agriculture is also the principal land use on the south side of the River Clyde at Maryville and Daldowie but has no direct relevance to the proposed works. Pasture land predominates in all of these farmland areas, with cattle and some horses grazing relatively small fields where original hedgerow enclosure is in need of restoration.

In Scotland agricultural land is classified by the Macaulay Land Use Research Institute (MLURI) according to its capability for crop production. The system provides for seven grades of land quality with a number of sub-divisions, each capable of producing specified crops to an acceptable yield standard. The defined categories can be further modified by sub-class limitations of climate, gradient, soil, wetness, or erosion. Grades 1, 2 and 3.1 are recognised as being the best and most versatile agricultural land and are collectively known as Prime Quality Land. Land around urban areas is often not classified by MLURI whether or not it is in agricultural use.

Due to their urban or recreational nature, large parts of the study area are unclassified by the MLURI Land Capability for Agriculture Classification. Strathclyde Country Park and the associated Hamilton Low Parks wetlands occupy extensive areas east and west of the M74 between Raith and Hamilton Junctions; similarly, unclassified land west of Maryville constitutes the grounds of Daldowie crematorium, a golf course, and the site of the former Glasgow Zoo. Other land at Maryville is typically urban fringe in character and used for casual horse grazing. Farmland east of Crosshill is also unclassified despite its continuity with adjoining pasture used for cattle grazing.

Some land in the Crosshill area included in the MLURI classification is now occupied by built development and has been disregarded. Other classified land, notably north east and north west of the Baillieston Junction, is either unused or occupied by existing highway. There is some Prime Quality Land situated to the north of Baillieston and south of Maryville. The former is classified as Grade 3.1 (high yield of selected crops within wider moderate production) and the latter as Grade 2 (high yield of a wide range of crops) but neither will be directly affected by the scheme. The majority of classified land is Grade 3.2 (average production of a moderate range of crops); the smaller area at Bothwell Park is Grade 4.1 (variable yields of a narrow range of crops). Both categories are downgraded by application of sub-class soil, wetness and gradient limitations as shown on Figures 8.2a–f. (Land Capability for Agriculture).

The Scottish Executive Environmental and Rural Affairs Department (SEERAD) can designate agricultural land as an Environmentally Sensitive Area (ESA) where it has special landscape, wildlife or historic interest which can be protected or enhanced by supporting specific agricultural practices. There are no designated ESAs or other non-statutory agricultural designations within the study area.

8.4 Predicted Effects

The estimated land take for the scheme is set out in Table 8.1 at the end of this section.

8.4.1 Demolition of Property

No private property is situated directly on the line of any part of the proposed scheme and no demolition is required.

Two residential properties at the junction of Glasgow Road (B7071) and New Edinburgh Road (A721) Powburn, shown as receptor XVI on Figure 11.3d – Landscape Effects Landscape Character and Quality will be indirectly affected by the proposed widening works. The buildings themselves will not be affected but the proposed widening, although accommodated within the existing highway boundary, will involve a cutting slope immediately adjacent to the residential curtilage.

The overall direct effect of the scheme proposal on private property can, therefore, be considered to be negligible.

8.4.2 Community Land

In the absence of baseline information a reliable assessment of the effects on land used by the public cannot be made but it is unlikely to be a significant constraint. There will be minor encroachments to accommodate widening adjoining the public park at Easterhouse (M8) and an extended underpass and footpath diversion at the south end of Strathclyde Park (M74), but these works will be located within the highway boundary.

8.4.3 Development Land

Consideration of development effects is an interactive process which examines how the scheme options might affect Local Planning Authority development intentions and, conversely, how restrictive development designations might affect the scheme proposal.

In general terms, development effects will be positive in that the scheme becomes an enabling mechanism for the realisation of development potential. However, there may be initial negative impacts as the scheme may compromise Green Belt and environmental protection objectives applicable to the highway corridors and adjacent land. Loss of existing highway planting is inevitable and although this may only be temporary, long term change in landscape character is probable and will prejudice environmental quality, both of the route itself and in adjoining development areas.

The prevalence of restrictive environmental designations is an advantage so far as the improvement scheme is not constrained by direct conflict with any sites designated for future built development. Existing motorway crossings are incorporated or improved so that there is also no conflict with development proposals for strategic recreation routes.

A beneficial development effect is that the scheme supports emerging planning policy objectives to improve accessibility in the M8, M74 and A725 corridors as a means of promoting strategic economic development opportunities.

There may also be some ultimately beneficial landscape effect arising from the need to mitigate adverse environmental impacts as discussed further in Chapters 11 and 14.

Overall, there are likely to be net minor effects on development land due principally to possible conflict with environmental planning designations.

Agricultural Land

The approximate total area of land expected to be utilised for the road scheme at construction is approximately 79.2 ha of which 60.7 ha is already owned by Scottish Ministers. 8.5 hectares of this land is classified as being capable of agricultural production, as shown on Figures 8.2 a-f. Only 1.3 hectares are classed as prime agricultural land.

Due to the need for Sustainable Drainage (SUDS) as part of the Scheme, to attenuate and treat road runoff before it enters the natural drainage system, there will be some agricultural land take for the drainage facilities and the accesses to them for maintenance. The locations of the SUDS, in relation to agricultural land, are shown on Figures 8.2 a-f.

In total the SUDS within the scheme have a land take figure of 6.9 hectares. Only 1.4 hectares of this land is agriculturally classified, and none of the land is Prime Agricultural Land. 0.4 hectares is grade 5.2 land which is Land capable of use as improved grass land and 1.0 hectares is grade 3.2 which is Land capable of producing a moderate range of crops.

Table 8.1 – Provisional Estimated Land Take

Total Land Requirement	Classified Agricultural Land
70.7 hectares	Unclassified Land
	Non Prime Land
2.0 hectares	Grade 5.2 - Land capable of use as improved grass land
1.9 hectares	Grade 4.1 – Land capable of producing a narrow range of crops
3.3 hectares	Grade 3.2 - Land capable of producing a moderate range of crops
	Prime Land
1.3 hectares	Grade 3.1 – Land Capable of producing a moderate range of crops

8.5 Mitigation Strategy

Mitigation to minimise new land take has been an inherent element of the road design. The Scheme is essentially an on-line widening of the existing motorways, a fundamental objective of which is containment within existing highway boundaries.

Otherwise, no site-specific land use mitigation proposals have been agreed to date. The general principles outlined below are recommended as the basis of a Strategy to mitigate predicted land use effects.

8.5.1 Private Property

As no residential properties have to be demolished and no land within residential cartilages is affected, no mitigation measures are required.

8.5.2 Community Land

Despite the absence of reliable determination, it is almost certain that no areas of publicly used land would be lost to the proposed Scheme. It will not be necessary, therefore, to identify exchange land which could be made available in mitigation of such loss.

8.5.3 Development Land

There would normally be a presumption against development where restrictive environmental planning designations apply. The defined landscape and wildlife importance of the transport corridors means that mitigation measures applied to the scheme are especially robust to justify its potential environmental intrusion.

Land take has been minimised, but where feasible includes elements that may assist environmental integration. There will be replacement of disturbed roadside planting where practicable and appropriate as part of the mitigation strategy.

Loss of Green Belt and any areas of localised nature conservation value can be compensated by appropriate landscape enhancement and habitat creation.

Roads which become redundant as a consequence of the proposed scheme should be incorporated into areas of environmental mitigation associated with the highway.

Scheme design should ensure that planning policy requirements for improved recreation access on safe and attractive routes are not prejudiced.

8.5.4 Agricultural Land

Actual loss of agricultural land cannot be mitigated but has been minimised through careful route alignment and reducing land take wherever possible.

Access to operational land severed by the scheme would in principle be restored and may usefully be combined with mitigation of pedestrian route severance. Agricultural

severance mitigation would include new field tracks and gates and will also require provision of accommodation overbridges and/or underpasses.

Re-organisation of field sizes and relocation of boundaries is not necessary to mitigate operational disruption and rationalise fragmented farming land.

Isolated small areas not viable for agriculture or not economically accessible can be planted to support landscape enhancement or visual mitigation objectives and may afford opportunities for encouragement of local biodiversity.

No demolition effects of this scheme have been identified.

8.6 Residual Effects

8.6.1 Private Property

Due to minimal impact of the proposed Scheme on private property, no residual effects are anticipated.

8.6.2 Community Land

Assessment of effects on land used by the public due to no land take of community land would be insignificant. The community land which is the closest to the development is a small area on the western edge of Strathclyde Park and another on the Southern edge of the open space at Easterhouse. The effects on both areas of land can be adequately mitigated and there would be no noticeable change in the baseline circumstance following construction of the Scheme.

8.6.3 Development Land

None of the proposed improvement schemes involve loss of land designated for future developments in the current Local Plans or from opportunity sites identified for consideration by the Local Planning Authority. Unless further land take becomes necessary to satisfy environmental mitigation or ancillary road works there will be no direct adverse effect on development land.

Any alterations to the road network would be likely to adversely affect the existing landscape and wildlife interest of the motorway corridors. The identified environmental value of transport corridors could be further degraded by rigorous application of design standards which restrict the extent of tree planting adjacent to carriageways.

However, appropriate and adequate mitigation of adverse impact on the existing highway landscape could help to ensure continued validity of nature conservation and environmental planning designations. Most of the benefit would be derived from restorative tree and hedgerow planting associated with the improvement Scheme.

Provision for properly designed overbridges or underpasses on the designated lines of selected footpaths and cycleways will facilitate safe crossings for the significant

recreation routes to which the Local Authorities are committed. This is discussed further in Chapter 13.

A positive effect of the Scheme will be to increase the attraction and marketability of the M74, M8, and A725 corridors as development locations through improved accessibility.

8.6.4 Agricultural Land

The proposed Scheme has no effect on land in active farming use and there would be no change in current agricultural operations.

Loss of land per se is not a major effect but there would be disproportionate substantial effects on operational disturbance due to fragmentation, severance, and reduction in size of holding. Conversely, required mitigation would be likely to lead to access improvements which could also benefit recreational routes.

8.7 Evaluation of the Scheme

The focus of the assessment of land use is to determine the extent and degree to which land required for implementation of the Scheme would affect current or proposed land use. As shown in Table 8.1 the provisional total land take is approximately 79 ha. Land acquisition requirements are relatively low, since the majority of the land required lies within the existing road boundaries or is already owned by the Scottish Ministers.

Land take is unlikely to have significant adverse impacts on land use.

The design philosophy for the Scheme is primarily one of road widening. The Scheme will have more effect on land within the existing highway boundary than any which is beyond it.

The Scheme is not constrained by effects on land used by the public (Community Land). Similarly there are no demolition effects and land take from private property is limited to two minor instances where the boundary of development will meet the cartilages of two properties at the junction of Glasgow Road (B7071) and New Edinburgh Road (A721) Powburn.

The Scheme has virtually no effect on either agricultural land take or operations and does not directly affect sites designated for future development but has the potential to adversely affect the environmental sensitivity of development planning designations relevant to the existing motorway route and its immediate surroundings.

The positive effects associated with the Scheme are mainly that it provides the benefit of improved accessibility in realising the economic development potential of identified employment opportunity sites.

Simultaneously with development of the proposed Scheme, consideration is being given to upgrading schemes for the A8 trunk road between Baillieston and Newhouse and for

the intersection of the M74 and A725 at Raith. These are addressed in separate Environmental Statements.

8.8 References

Design Manual for Roads and Bridges Volume 11 Environmental Assessment (1993, amended and updated 2003), The Highways Agency, The Scottish Executive Development Department, The National Assembly of Wales and The Department of the Environment for Northern Ireland.

Glasgow City Plan Finalised Draft (Parts One, Two and Three) 2000 Glasgow City Council.

Glasgow and Clyde Valley Landscape Assessment. Review No 116 (1999) Scottish Natural Heritage

Land Capability Classification for Agriculture. Sheet 64. Macaulay Land Use Research Institute

North Lanarkshire (Monkland District) Local Plan 1991 (finalised First Alteration, September 1996) North Lanarkshire Council Planning and Environment Department.

North Lanarkshire Southern Area Local Plan (Finalised Draft 1998, Modified June 2001) North Lanarkshire Council Planning and Environment Department

South Lanarkshire (Hamilton District) Local Plan, (Adopted August 2000) South Lanarkshire Council Planning and Building Control Services.

Local Planning Issues for the Hamilton Area: Consultation Document, (May 2003) South Lanarkshire Council

South Lanarkshire Local Plan (Consultative Draft, October 2005), South Lanarkshire Council Planning and Building Control Services.

M8 Baillieston to Newhouse and Associated Improvements: Associated Network Improvements- Stage 1 Report (June 2005) Mouchel Fairhurst Joint Venture.

Ordnance Survey Data.

9 Disruption Due to Construction

9.1 Introduction

This section presents the assessment undertaken to determine the potential disruption to the environmental parameters discussed in Chapters 6 - 16 as a result of construction activities, referring as appropriate to the guidelines set out in Volume 11 of the Design Manual for Roads and Bridges (DMRB).

'Disruption due to construction' is a term that covers the effects on people and on the natural environment that can occur between the commencement of pre-construction works and the end of the contract maintenance period. At this stage in the road detailed design and construction period is estimated at approximately two years. Disruption due to construction is usually a localised phenomenon. However, some impacts can create effects over a wider area.

This assessment takes into account nuisance related impacts on local residents, workers, vehicle and non-vehicle travellers arising from noise, vibration, dust, changes in journey times and loss of amenity associated with the operation of equipment or from the movement of heavy construction traffic. Construction activities can impact routes utilised by different types of user including pedestrians and cyclists. There is also the potential for impacts on the natural environment through disturbance associated with drainage, accidental spillage and dust generation, noise, lighting as well as effects on ecology and cultural heritage.

The assessment of disruption due to construction is based on the conceptual design described in Chapter 3. The detailed construction programme and methods will be finalised by the Contractor as part of his design and will be subject to further consultation and refinement.

9.2 Methods

Site visits during the assessment of the various topic areas were used to identify the location of properties and features which may be sensitive to disruption.

Resource quality and sensitivity criteria applied in the assessment of construction phase impacts are as stipulated within the appropriate chapters of the report.

9.3 Baseline Conditions

DMRB Volume 11 states that studies have shown that at least half of the people living within 50 m either side of a site boundary were seriously bothered by construction nuisance in one form or another, but that beyond 100 m less than 20% of people affected were seriously bothered. In line with DMRB guidance, the study area for the assessment of disruption due to construction comprises a corridor 100 m either side of the proposed scheme.

Chapter 3 (The Preferred Scheme) describes the key elements of the Scheme. It is anticipated that conventional methods of construction will be used with the precise nature of works being determined by the Contractor commissioned to undertake the works and agreed with the appropriate authorities. Baseline conditions are discussed in detail in the appropriate chapters of this report.

Table 9.1 shows the approximate number of properties present within 100 m of each side of the Scheme route. Designated features such as Listed Buildings and Scheduled Monuments are described in Chapter 7, Cultural Heritage. Two Listed Buildings, shown on Figure 7.1a-f as Obelisk and Bothwell Bridge, lie near to the southernmost part of the scheme. Neither feature will be affected during construction work. One Scheduled Ancient Monument lies within approximately 100m of the scheme.

Other associated areas of potential disruption, such as site compounds, will be located within the defined footprint of the Scheme, but their exact locations have not yet been confirmed.

Table 9.1 Approximate Numbers of Properties and Distances from the Proposed Scheme.

	Distance from the Scheme Footprint		
	0 – 50 m	50 – 100 m	Total Number
Number of Properties	155	352	507

9.4 Predicted Impacts

Disruption impacts considered under the following headings are generally those that are considered likely to be temporary in nature, although it is recognised that certain impacts arising during the (temporary) construction period may be permanent. Potential impacts relating to specific topic area are discussed along with the mitigation that will be set in place. Impacts are also considered in detail in the relevant topic chapters, as they may persist following construction of the scheme.

In addition to specific mitigation measures outlined, the potential construction-related impacts of the scheme will be controlled through the Employer's Requirements and an Environmental Management Plan (EMP). The Contractor will be required to develop and implement the EMP prior to the commencement of work on site.

Construction operations that, without mitigation, could cause significant local impacts include:

- stripping and storage of topsoils and sub-soils;
- traffic and other access diversions affecting traffic flows in the vicinity of the junction and potentially across the wider network;

- noise, vibration, vehicle emissions and dust generation during earthmoving and operation of vehicles and plant on-site along with the passage of construction vehicles along the road network;
- dewatering of excavation areas, creation of site runoff management features and temporary alterations to local drainage;
- landscape and visual changes caused by construction activities, earthworks, vegetation removal and presence of construction plant; and,
- temporary lighting and night-time working.

9.4.1 Earthworks and Major Structures

The approximate earthworks quantities associated with construction of the scheme are:

Cut Material – 204,000 m^3

Fill Material – 46,450 m^3

It is likely that a proportion of the excavated material could be used for construction of the scheme and for landscaping or environmental features, but that the majority will be unsuitable and will require to be disposed of off-site. Surplus material will either require disposal to a landfill, or could be re-used elsewhere subject to the engineering properties of the soil. It may be possible to re-use the material on other trunk road schemes where additional fill material is required during construction.

There is likely to be some requirement for importing geotechnically acceptable fill material for embankments. These will most probably be won from existing stockpiles such as colliery spoil tips. The West Lothian oil shale tips have supplied large volumes of material in the past for central Scotland road schemes due to its easy availability and geotechnical properties. The shale (burnt blaes) is classified as an all-weather, granular material and, although stocks are now dwindling, this is a possible source of off-site fill. Closer sources of fill may be identified but these will depend on other construction activity which may be taking place at the appropriate time. Also, the condition of these alternative materials and certainty of supply will be less able to be guaranteed. Dedicated borrow-pits on or close to the scheme are improbable since the known geology of the area does not suggest any nearby source of higher quality materials. Clean sands and gravels would also command a premium price and therefore would be unlikely to be considered for general fill.

Landfill tax costs make it probable that off-site disposal of waste materials is an increasingly unattractive option. It is expected that almost all of the excavated material will be used on site, and that where this cannot be made acceptable as engineering fill, it will be put to productive use in landscape and environmental features such as earth bunds. Hence, it is anticipated that off-site tipping areas and export traffic will be reduced to the minimum possible.

9.4.2 Haul Routes and Construction Traffic

Localised haul routes will be restricted to land within the scheme boundary, with the majority on-line with the existing roads.

Access points to the construction area from the local road network will be stipulated within the Employer's Requirements and will be determined on the basis of safety, proximity to the sensitive receptors and to minimise disruption.

The Contractor will be required to seek opportunities to re-use excavated material which is not suitable for on-site use (although this will be kept to a minimum) on other construction schemes.

Given the high traffic flows on the motorway network, and the quantities of materials that may require to be exported/imported, the impact of additional construction vehicle movements may be significant at times of peak working activity. The degree of impact cannot be determined until the actual quantities to be exported are confirmed.

The construction of the road pavement will also require the import of the various constituent materials. Remaining operations, such as import of concrete to construction points or delivery of materials are less intensive and restricted to relatively short periods of time and to isolated locations within the scheme extents.

9.4.3 Disruption to Traffic

Traffic management to enable the construction of the scheme will disrupt existing road users, and local and regional traffic movements will inevitably experience some disruption due to construction of the scheme, the extent of which cannot be determined until a more detailed site works programme has been prepared.

Additional HGV movements will result from construction activities as described above. Most construction traffic is expected to use the M8, M73, M74 and other main strategic routes – already carrying high traffic flows. Heavy vehicles would be expected to avoid the local network of minor roads, hence reducing the potential level of disturbance to residents.

9.4.4 Air Quality

Impacts on air quality are likely to result from both general construction activities and changes in the number and type of vehicles accessing construction areas. The impact of the construction phase on local air quality is likely to involve a temporary increase in dust and vehicle emissions. These impacts will vary in severity according to the prevailing weather conditions and construction activities being undertaken.

Dust might be generated from a wide range of on-site activities, but the main dust sources are likely to be earth movement during site preparation, vehicles travelling over unpaved ground during dry weather, concrete crushers (if used), and lime stabilisation processes. There will also be the potential for some dust generation from construction

activities such as handling of dusty materials and cutting of stone or concrete. Site material may also be tracked out along roadways by vehicles leaving the site. During dry weather this material might subsequently be raised as dust by passing vehicles. Mitigation of these impacts is discussed in the next section.

Most of the activities proposed as part of the Scheme are unlikely to generate significant amounts of dust, since the majority of works entail widening of existing roadways. However, it is not possible at this stage to state with any certainty what activities are likely to take place and where.

There are no formal assessment criteria for dust. In the absence of formal criteria, a set of distance based criteria has been developed. Dust has the potential to be deposited over residential areas, however particle size affects the distance that dust will be blown. Large particles (>100μm) are generally deposited within a few metres of their source, with finer particles (30-100 μm) deposited within 100m (assuming a wind speed of 4 m/second).

The assessment of construction dust is thus indicative, but the worst-case approach that has been adopted should provide a reasonably robust assessment. Figures 3.1a-f show the extent of works associated with the scheme including roadways, verges etc. Most of the construction works are expected to be contained within these boundaries. It has thus been assumed that major dust raising activities might occur anywhere within these boundaries. According to Table 6.4, and assuming that standard mitigation measures are in place, there might thus be significant dust soiling up to 100m from the works and significant PM_{10} and vegetation effects up to 25m from the works.

It is not known at this time where construction vehicles would exit the site onto the local road network and so the worst-case assumption has been made that they might exit the site onto any existing road although construction vehicles will not be permitted to use local roads. This is followed by a second worst-case assumption, that dirt might be tracked up to 500m along any of these roads. Vehicles passing along these roads are then judged to be a minor source of dust. There might thus be some dust soiling within 25m of the centreline of any of these roads and some PM_{10} and vegetation impacts within 10m of the centreline.

Table 9.2 shows the number of properties potentially affected by construction dust. It should be stressed that these numbers do not represent the number of properties likely to be affected, but those properties which, based on the information currently available, are thought to have a risk of possible impacts. It is highly unlikely that construction vehicles would leave the site by every possible route, and there will inevitably be only a small number of site exits. The true number of properties at risk of experiencing dust impacts due to tracking out is thus likely to be a small fraction of the number presented in Table 9.2. Even at these properties, the assessment does not imply that significant impacts would be likely, or that if incidents did occur, they would be frequent. Any dust incidents would be highly dependent on the weather, requiring dry conditions and winds blowing towards a receptor. These conditions would also need to be combined with an activity

creating dust close to the receptor. This should only be the case if there had been an inadequate application of the mitigation measures, which experience suggests can happen from time to time. Dust-creating activities would not occur at all of the identified locations for the duration of the works. In many locations, the duration will be limited.

There will inevitably be some dust raised outside of this boundary, for example from the construction compounds and from any haul routes that are not within the planned new roadways. However, these activities will be situated as far as possible from any residential properties and are unlikely to add significantly to the counts presented in Table 9.2.

Table 9.2 below illustrates the approximate number of properties within 100m of each strategy, which may be affected by dust from construction.

Table 9.2 Number of Properties Potentially Affected by Construction Dust

	Dust Soiling		PM_{10} Impacts
	Residential	Businesses	Residential
Number of properties potentially affected by dust raised directly from the proposed works.	490	21	25
Additional number of properties that could be affected by the tracking out of dirt along local roads.	35	3	1

The businesses that might be affected include: building and home appliance suppliers; a car dealership; a car auction house; transportation and communications companies; work wear suppliers; hotels, public houses and restaurants; a bookmakers, a marketing and management office for a property service business; counselling services; and a golf club. Also affected would be a church and a school.

The edges of Hamilton Low Parks SSSI (M74 between Junctions 5 and 6) that are nearest to the proposed works may experience some dust-related impacts, but these will be temporary and are likely to be of limited duration.

The number of construction vehicles and plant operating on site will be so small in comparison to existing flows on the surrounding road network that any impacts of exhaust emissions on local air quality will be negligible.

9.4.5 Cultural Heritage

One Scheduled Ancient Monument (Hamilton Low Parks motte) lies within 100m of the scheme, south of Hamilton Services and adjacent to the northbound carriageway of the M74. The SAM is on the opposite side of the carriageway to where the carriageway widening will occur, and is highly unlikely to be affected in any way. The setting of this site is already influenced by past mining activity and construction of the existing road network.

A number of sites of cultural heritage interest (see Chapter 7, Cultural Heritage) in the wider area were identified and. The majority of these sites lie more than 100m from the

proposed scheme and are extremely unlikely to experience direct adverse impacts through construction activity. Indirect impacts upon the setting of or views from these features may potentially occur where they overlook construction areas. These impacts will occur for the duration of the works but are not considered to be significant.

Cultural heritage constraints are not considered to be a significant issue in relation to the proposed scheme. The impact of the scheme on recorded cultural heritage features during construction is assessed as low. However, a limited potential exists for the discovery of unrecorded features during the works period.

9.4.6 Land Use

Effects on land used by the public (Community Land) are negligible. There will be no demolition of private property associated with the Scheme, and therefore no impacts requiring mitigation. Disruption and severance effects on the use by landowners of land in the vicinity of construction activity are low. The amount of off-line land required for the construction of new Sustainable Drainage facilities is relatively small (Chapter 8 Land Use).

The Contractor will be required to provide the following mitigation measures:

- maintain continued communication with local landowners, local residents and businesses;
- restrict land take to that made available for the scheme and to the minimum necessary for construction of the scheme and ancillary works;
- provide designated temporary access points should continued accessibility and severance be considered a temporary problem;
- access arrangements to properties (and for non-motorised users and vehicles in general) to be fully considered prior to works on site and necessary facilities constructed before any works that may cause disruption are undertaken; and
- where agreed to do so, re-instate areas of temporary land-take to their former land use as quickly as possible upon completion of the Scheme.

9.4.7 Ecology and Nature Conservation

Impacts on ecology and nature conservation arising during the construction phase may often persist through the operation of the scheme. In view of this, construction and disruption related impacts are addressed in detail in Chapter 10 Ecology and Nature Conservation.

Widening of the M74 bridge over the North Calder Water will take place near to recorded otter activity, and construction impacts on otters have the potential therefore to be adverse and significant without mitigation measures in place. A European Protected Species licence will almost certainly be required for work at this particular location.

No bat roosts have been recorded within or adjacent to the footprint of the scheme, with roadside planting comprising trees that are generally unsuitable for roosting. Pre-construction bat surveys will however be required as a precautionary approach to the works.

Construction activity in the bird breeding season may disrupt or even displace some sensitive species close the working areas of the scheme. Although birds in this area will have become habituated to traffic noise from the motorway and junction, offline construction such as excavation of the SUDS basin is likely to have a low to moderate adverse impact over the short-term if carried out during the breeding season. Wintering birds which use the area are on the whole likely to be less sensitive to disruption due to construction of the scheme as they are more mobile and there are alternative habitats in the vicinity to which they can move on a temporary basis.

Construction activity will be confined to the footprint of the scheme, i.e. there will not be additional temporary land take and associated disturbance outwith the scheme extents. This restricts the extent of potential ecological disturbance.

There is likely to be an elevated risk of accidental pollution to watercourses during construction (e.g. from concrete batching, asphalt mix, oils and other chemicals etc.) that could have significant adverse effects on the North Calder Water or River Clyde and their tributaries. Wetland habitat within the Hamilton Low Parks SSSI and SINCs may also be directly or indirectly at risk from contaminated site runoff or dewatering activities.

Construction related impacts are likely to include noise disturbance from machinery and plant use, which may affect breeding birds if carried out during the March-August period. Temporary floodlighting may have the effect of disorientating birds, bats and invertebrates if affecting sensitive areas or allowed to light non-operational areas to excess. Animals may become trapped in culverts, exposed pipes and open trenches, especially where these new features block or interrupt established movement routes.

Construction phase impacts without mitigation measures in place have been assessed overall as low-medium adverse with respect to protected species, nationally important ecological resources and the importance of the River Clyde, and therefore are considered to be significant.

Mitigation measures are recommended to ensure that indirect disruption is minimised.

Suitable mitigation measures in relation to ecology and road drainage and the water environment are described in Chapters 10 and 15 respectively but will require to be expanded and set out in more detail during the preparation of the specimen design, and in the Contractor's design. It should be noted that mitigation measures for these two topic areas frequently overlap and interlink. A summary of the required measures which will be included in contractual documents is set out as follows:

- a water quality protection plan to minimise risks to receiving waters;

- detailed procedures for minimising drainage and groundwater management impacts on wetland habitat to be agreed with SNH and SEPA.
- protected species surveys, including for otters, bats and badgers, to be undertaken in the correct survey season prior to the commencement of works on site;
- European Protected Species licence for work potentially affecting otters in the vicinity the M74 North Calder Water bridge.
- pre-construction surveys to identify the extent of any stands of non-native invasive plants, and required control and/or removal measures.
- should operations occur close to a known badger sett, but not so close as to need licensing, a "people and machinery exclusion zone" extending to a 50 m radius around the sett to be fenced off. Works close to setts may require a licence;
- implementation of good construction site management to avoid/minimise generation of excessive litter, dust, noise and vibration;
- topsoil handling, storage and re-use plan to be implemented by the Contractor to maintain as far as practicable the viability of soils and preserve soil microfauna and flora;
- location of storage and construction compounds agreed in consultation with an ecologist to protect habitats or species of nature conservation value;
- working areas, including temporary access tracks, kept to a practical minimum through areas of vegetated habitat, and their boundaries clearly delineated at the commencement of works;
- existing vegetation to be retained as far as practicable;
- nests, eggs and young of all species of wild bird to be protected during the breeding season (generally March to August inclusive). To minimise the potential for such damage, vegetation likely to be used by breeding birds within working areas to be removed outwith the breeding season;
- measures to protect birds at other times of year will include fencing and protecting sensitive habitats adjacent to the scheme extents and minimising local disruption effects as far as practicable.

During construction, the contractual documents, including the Employer's Requirements, will require the Contractor to prepare an Environmental Management Plan addressing the environmental impacts and mitigation identified in this Environmental Statement. The Contractor will work in accordance with the Controlled Activities Regulations (CAR), SEPA's Special Requirements, and Pollution Prevention Guidance (PPGs). The Contractor will also be required through the Employer's Requirements to produce and implement suitable Method Statements to protect sensitive environmental receptors prior to the commencement of work on the site.

9.4.8 Landscape and Visual

Excavation and construction processes, temporary accommodation works and the use of vehicles and machinery will result in temporary adverse visual impacts to overlooking receptors, at a local level during the construction phase (e.g. at Calderbraes, Bothwell, Uddingston and Birkenshaw), where road construction is raised on embankment or where new bridge structures are constructed. Visual impacts arising from these changes, as well as due to vehicle and machinery movements, will affect both road users and local residents and non-motorised users (NMU) crossing the road network (generally pedestrians and cyclists). The works will generally be highly visible to road travellers, NMUs and to local residents due to the topography of the area and proximity of works to residential areas.

The use of temporary floodlighting and security lighting at night (if required) would also cause visual intrusion. It is anticipated that the most intrusive activities will relate to:

- vehicles and machinery, including HGVs, excavators and cranes;
- earthworks;
- vegetation removal, soil stripping and excavation;
- transient features such as fencing, lighting and signage.

The Contractor will be required to implement the following mitigation measures in accordance with an agreed Method Statement to minimise potential landscape and visual impacts:

- retaining existing vegetation where possible to provide screening during works;
- limiting the size and extent of working and storage areas. Timing and phasing works to minimise the duration of impacts at any one location/set of visual receptors. Use of fencing to define the working areas;
- good housekeeping of the construction site and storage areas, keeping the site tidy and free of litter and debris so far as is possible;
- use of temporary floodlighting only when strictly necessary; lighting and night-time working to be in line with Local Authority requirements;
- careful selection and placement of site compounds, material storage areas and spoil heaps to minimise detriment to the landscape and to visual receptors;
- using spoil to create temporary screening of working areas where applicable; and
- early planting of trees, shrubs and grassed areas as well as new ponds and wetland creation to establish the structure of the longer-term visual and landscape mitigation.

9.4.9 Noise and Vibration

Noise and some degree of localised vibration in the vicinity of working areas will be unavoidable, arising from the movement and loading/unloading of vehicles and

machinery, earthworks and general construction activities. However, much of the working activity will be at distances greater than 100m from residential areas. Without mitigation it is likely that pedestrians and cyclists and, to a lesser extent, vehicle travellers travelling around the road network will experience elevated noise levels. Current roads-dominated background noise will however tend to mask much of the construction-related noise where residential areas lie close to the existing M74 and other heavily-trafficked roads. Evening and night-time working would be likely to increase short-term noise impacts on local residents.

The contractor will be required to work within agreed times of the day to limit noise impacts. These limits will be detailed within the Employer's Requirements and will be agreed in consultation with the relevant Local Authority to mitigate these impacts.

Noise mitigation will follow statutory guidance and requirements agreed and set in place with the Scottish Executive and relevant local authorities. These may include restrictions on workings hours, avoidance of unsocial hours where working closest to residential areas, and use of noise screening.

9.4.10 Pedestrians, Equestrians, Cyclists and Community Effects

Pedestrians and cyclists using non-motorised user (NMU) routes across the existing M8, M73 and M74 will experience temporary severance or diversion during the construction period. This is likely to be in the immediate vicinity of work on or around the Scheme. Such diversions may mean longer journeys and some loss of amenity for pedestrians and cyclists while they occur at individual locations.

Diversions to other roads and associated pavements/footpaths and cycleways will be avoided where possible, but may have an indirect effect on traffic on the wider network, in particular where new roads are connected at intersections to the existing network. Likewise, road closures may cause temporary disruption to local residents and businesses without mitigation. Mitigation measures will be determined when the construction programme and phasing has been confirmed and agreed with the Local Authority and Transport Scotland as appropriate. Temporary diversions will be agreed with the Local Authority where required, and no significant adverse impacts are anticipated on non-motorised users.

An increase in HGV movements will be result from construction activities. Most construction traffic is expected to use the main motorways – already strategic routes carrying high traffic flows. Heavy vehicles would be expected to avoid the local network of minor roads, hence reducing the potential level of disturbance to residents.

9.4.11 Road Drainage and the Water Environment

Impacts on surface waters may be direct, through runoff from working areas entering the watercourse or waterbody in or next to the site; or indirect where pollution and runoff enter downstream of the working area. Dewatering, excavations, vehicle washing and

storage areas are all potential sources of contaminated runoff, in particular of sediments and silts which may pollute watercourses and cause ecological damage (for example silt smothering of stream beds and benthic fauna). Such impacts are generally temporary, but their after-effects on the ecological quality of a watercourse can be longer lasting, although generally not permanent.

Direct physical impacts are also possible where construction requires modification of watercourse banks, temporary or permanent diversion or culverting of watercourses, or infilling of a pond. This is also likely to have significant adverse impacts where the aquatic, bankside or riparian habitats are of ecological or landscape value.

There are potential adverse impacts associated with the following activities or events where they can result in pollution of nearby watercourses and wetlands:

- temporary disruption to hydrological and hydrogeological flows during construction (including temporary dewatering and recharge, burn diversion and culverting, creation of new ditches and new wetland areas);
- accidental spillage/mobilisation of sediments into local watercourses;
- Mobilisation of contaminants from contaminated soil/ groundwater;
- accidental spillage of liquid contaminants into local watercourses; and/or
- inputs of leachate derived from on-site stored construction materials.

Sensitive receptors include watercourses (the North Calder Water, the River Clyde and minor tributaries), Hamilton Low Parks SSSI (between Junctions 5 and 6 of the M74), and locally designated Sites of Interest for Nature Conservation (SINCs) containing wetland habitats.

A full discussion of suitable measures in relation to road drainage and flood protection is contained in Chapter 15. Road drainage management, the water environment and ecological mitigation measures (Chapter 10) overlap and interlink to a degree. Groundwater impacts are also discussed in Chapter 16.

Certain effects are also applicable to the operational stage of the Scheme and these aspects are discussed in Chapter 15.

A method statement for construction between Junctions 5 (Raith) and Junction 6 (Hamilton), where the scheme runs adjacent and parallel to (but does not impinge upon), Hamilton Low Parks SSSI, will be drawn up and discussed with SNH. The method statement will ensure that works near to this sensitive receptor are carried out so as to avoid indirect or accidental impacts on the SSSI.

All works affecting watercourses, such as the construction of outfalls or new ditches will require careful controls to minimise potential impacts upon the aquatic environment and wetland habitats. Works affecting watercourses will be subject to consultation in advance

and will generally require a licence from SEPA under the Controlled Activities Regulations (CAR) in advance of any activity on site.

Overall potential construction phase impacts upon surface water features, including the North Calder Water, River Clyde and Strathclyde Loch are assessed as having no impact/negligible to slight beneficial impact with mitigation in place. Small areas of new wetland habitat will be created as a result of the drainage and flood management design for the scheme, including a number of new SUDS facilities and new open ditches.

In order to safeguard against potentially adverse impacts upon water quality and drainage, all works during the construction phase will be carried out in line with best practice guidelines, including SEPA's Special Requirements and Pollution Prevention Guidelines. An appropriate drainage system will be constructed and implemented during the construction phase. This will be further developed by the Contractor and agreed with SEPA well in advance of any works on site.

The early establishment of temporary drainage facilities in line with standard construction good practice will avoid the majority of potential problems during construction.

It is assumed for the purpose of assessment that construction operations would adopt standard practices in line with guidance provided by SEPA including Pollution Prevention Guidelines (PPGs) and supported by consultation with the local SEPA Environmental Protection Team. PPGs relevant to this project are likely to include:

PPG 1: General Guide to the Prevention of Pollution;

PPG 2: Above Ground Oil Storage Tanks;

PPG 5: Works in, near or liable to affect watercourses; and

PPG 6: Working at Construction and Demolition Sites.

Mitigation measures (to be incorporated into Contract requirements) will include:

- safe storage of on-site materials such as oils, fuels, concrete and cement products, to prevent potentially contaminating spillage events. Bunded storage areas to be established for oil and fuel storage away from watercourses, waterbodies, ditches and drains. No batching or mixing of concrete, or refuelling, to be carried out near to watercourses, ditches or ponds;
- provision of erosion control measures, cut-off ditches, silt traps, containment bunds and storage reservoirs of appropriate size in line with SEPA requirements, in order to intercept runoff and prevent sediments entering local watercourses and to minimise soil erosion;
- the provision of clearly defined 'no access' areas indicated on site plans and on site adjacent to sensitive watercourses, and the installation of protective fencing to prevent unauthorised staff, plant and machinery access;

- runoff interception and control measures for grouting operations (where required) to include settlement ponds and provision for the removal and safe disposal of settled material off site as necessary; and
- contingency procedures in case of emergencies/unforeseen events to be set in place by the Contractor as part of the Environmental Management Plan (EMP).

9.4.12 Geology and Soils

The proposed Scheme will require the excavation and import of material. Current estimates of volumes are approximate and earthworks quantities will be addressed in more detail during preparation of the Specimen design and contractual documents to provide a balanced approach, such that construction as far as possible re-utilises acceptable or treated material excavated from the scheme.

The proposed widening scheme will result in much less disruption to third parties than would be generally expected from a new road construction contract. The scheme will inevitably result in a requirement for both excavation of cuttings and filling of embankments, but the quantities involved will be relatively small.

There might be some scope for re-use of material but it is likely that most excavated material will be unsuitable. High landfill tax ensures that off-site disposal of waste materials is an increasingly unattractive option. Although it is expected that there will be a desire to accommodate all of the soils on site treatment of these soils to improve their engineering characteristics is unlikely to be viable in this case given the quantities and disparate locations involved. Where soils cannot be made acceptable as engineering fill, they might be used in landscape and environmental features such as earth bunds.

It is anticipated that there may be some requirement for importing geotechnically-acceptable soils for embankment and capping construction purposes. These will most probably be won from existing stockpiles such as colliery spoil tips. The West Lothian oil shale tips have supplied large volumes of material in the past for central Scotland road schemes due to its easy availability and geotechnical properties. The shale (burnt blaes) is classified as an all-weather, granular material and, although stocks are now dwindling, this is expected to be the most probable source of off-site fill. Closer sources of fill may be identified but these will depend on other construction activity which may be taking place at the appropriate time. Also, the condition of these alternative materials and certainty of supply will be less able to be guaranteed. Dedicated borrow-pits on or close to the scheme are improbable since the known geology of the area doesn't suggest any nearby source of higher quality materials. In any case, clean sands and gravels would command a premium price and therefore would be unlikely to be considered for general fill. Surplus materials from adjacent construction projects could provide another source of suitable material, where a significant quantity of surplus material is anticipated.

Disturbance to geological and soil attributes during scheme construction will be minimised through the adoption of the following mitigation measures:

- limitation of the extent and location of working and storage areas;
- implementation of erosion and sediment controls;
- appropriate handling and storage of spoil;
- re-use of excavated materials as part of the scheme landscaping strategy wherever possible; and
- removal of surplus material off-site to a suitable disposal facility.

9.5 Mitigation

This section describes general mitigation 'good practice' measures applicable to the whole Scheme. Specific construction-related mitigation measures as described above and in the relevant topic chapters will be set in place during the construction phase to reduce adverse effects on sensitive receptors. Disruption at any individual construction location will be reduced as far as possible through a combination of good practice measures, agreed as necessary with SNH, SEPA and the relevant Local Authority.

The potential impacts of the proposed scheme will be controlled through the development and implementation of an Environmental Management Plan (EMP) and through Construction Method Statements. The Contractor will be required to implement the EMP prior to the commencement of work on site.

Further measures should be taken during the construction period to ensure that the contractors follow the recommendations contained within the above guidelines. Specific measures will be required of the Contractor as part of the final design and Environmental Management Plan (EMP) for appropriate and adequate pollution mitigation with regards to the type of facilities required and the methodology adopted.

General mitigation measures will include:

- minimising land take by defining specific working areas during construction and protecting sensitive receptors through signage, fencing and specific instruction of site staff;
- programming work to reduce impacts from construction activities, and in particular to avoid cumulative or repetitive disruption to local communities and road users;
- working practices and hours agreed in advance with the appropriate Local Authorities. Site operation hours to be restricted as required, especially where site activity could cause disruption to adjacent sensitive properties;
- the Local Authority maximum allowable noise levels on working sites written into contract documents;
- Network Rail consulted on works planned close to their operational infrastructure and land;
- work on Sundays generally restricted to "quiet" operations, although some work may have to be undertaken on Sundays to minimise disruption to traffic during the

rest of the week. Night-time working only undertaken where it is not practicable to undertake work during normal site hours;

- rights of way redirected and kept open (unless specific circumstances necessitate short periods of closure, e.g. for safety reasons) so as to limit disturbance to pedestrians, equestrians and cyclists;
- road closures and temporary diversions, should they occur, kept to a minimum and, if necessary, phased to minimise inconvenience and delays to road users and occupiers;
- safety fencing and warning signs used to safeguard the public, redirect NMUs temporarily and prevent unauthorised access to working areas; and
- physical control measures implemented as part of good working practices, including runoff control, damping down haul roads and washing vehicles before entry onto the public road, selection of low noise/vibration equipment, fencing as appropriate and minimise floodlighting at night.

Specific mitigation measures are set out in the main topic Chapters of this report.

9.6 Residual Impacts

Impacts caused during the construction phase of the proposed scheme are typically short-term or temporary in nature. When coupled with the implementation of mitigation measures specified in the Environmental Management Plan (EMP) and Method Statements prepared by the Contractor prior to commencement of works on site, many of these impacts can be successfully avoided or reduced. As such, the overall residual construction phase impacts are assessed as being low adverse with the exception of possible localised and temporary dust soiling, visual and landscape impacts and impacts upon driver views and driver stress which may be moderate adverse at times. These latter impacts are short-term in nature, but are difficult to mitigate other then through good site practice, use of temporary screening where appropriate and careful phasing of works.

Providing the mitigation measures are put in place then most properties within 100 m are likely to experience intermittent low to moderate adverse impacts. However, properties closer to proposed working areas (within 50m) may experience a greater degree of disruption at certain times during the construction period. It is not possible to eliminate airborne emissions or noise entirely from construction sites, but the residual impact upon receptors overall is assessed as not significant.

With the implementation of generally accepted good practice measures and appropriate mitigation measures the residual impact of construction activity on ecology is likely to be reduced. Impact severity will depend on the location of particular working areas in relation to identified sensitive ecological receptors. While much of the construction activity will affect ecological receptors of relatively low importance and sensitivity; the risk of significant adverse impacts will be increased for those receptors within or near to statutory designated sites and watercourses where otters may be present. Residual impacts, with mitigation measures in place to protect sensitive habitats and species, most

notably those associated with the nearby SSSI and SINC areas, are considered to be slight adverse and not significant.

With mitigation measures in place, construction activity will nonetheless cause direct and indirect disruption on the road network and pedestrian and cyclist access, albeit on a temporary basis. Construction traffic using the existing network, including heavy equipment movements, may also cause intermittent disruption. Residual disruption to pedestrians and cyclists is considered to be low adverse and not significant, leading to improvements in overall safety and amenity for non-motorised users on completion of the scheme.

Taking into account mitigation measures, visual impacts are anticipated to remain adverse with respect to both nearby properties and road users, but will be temporary in nature and potentially lessened throughout the construction period by the phasing of different activities.

Groundwater management and the potential impacts of this process on nearby properties, surface water features and wetland habitats will be monitored and controlled throughout the construction period. Identified mitigation measures and ongoing monitoring of sensitive receptors, developed in consultation with the statutory bodies, will ensure that adverse impacts will be no more that low adverse and not significant.

Similarly, surface water quality will be maintained and protected through the implementation of the Contractor's EMP, ensuring that there are no significant impacts on watercourses, ditches, ponds, the River Clyde and associated wetland habitats and the protected species they support.

9.7 Reference

Design Manual for Roads and Bridges (DMRB) Vol. 11 Environmental Assessment.

10 Ecology and Nature Conservation

10.1 Introduction

This chapter provides an Ecological Impact Assessment of the preferred road improvement scheme for M8/M73/M74 Network Improvements, hereafter referred to as the Scheme. It presents information on baseline conditions and the nature conservation value of the area with the potential to be affected by the proposals. It then outlines the nature and significance of the potential impacts on flora and fauna within and adjacent to the scheme alignment. Mitigation measures are proposed to avoid, minimise or compensate for potential adverse effects, and enhancement measures to maximise the biodiversity value of new habitats created by the improvement scheme are set out. The chapter concludes with an assessment of the residual impacts of the scheme on ecology and nature conservation.

10.2 Methods

The methodology followed for this Ecological Impact Assessment (EcIA) is as described for a Stage 3 assessment in the Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 4 Ecology and Nature Conservation.

10.2.1 Consultations and Desk Study

Consultations were carried out with relevant statutory and non-statutory organisations in April and November 2005 to provide an understanding of the study area's ecological interest and to elicit the views of consultees on the potential ecological impacts of the proposed strategies.

A Stage 2 DMRB Environmental Impact Assessment Report was submitted to the Transport Scotland (MFJV, 2007).

The nature conservation organisations consulted are presented in Table 5.1 in Chapter 5.

In addition to consultations and review of the Stage 2 assessment, the desk study for the current Stage 3 DMRB assessment included review of the following sources of information:

- http://www.bto.org – for detailed descriptions of UK bird status and trends;
- http://www.rspb.org.uk – for UK bird status;
- http://www.jncc.gov - for statutory European sites;
- http://www.scottishwildlifetrust.org.uk - for non-statutory wildlife sites;
- http://www.sepa.org.uk - for salmonid fisheries information;
- http://www.northlan.gov.uk – planning / biodiversity for North Lanarkshire;

- http://www.southlanarkshire.gov.uk – planning / biodiversity for South Lanarkshire;
- http://www.searchnbn.net - for species records;
- http://www.scotland.gov.uk - for Scotland's Biodiversity Strategy; and
- http://www.ukbap.org.uk - for the UK Biodiversity Action Plan (BAP) and North and South Lanarkshire Councils' Local Biodiversity Action Plans (LBAPs).

Survey data gathered for the following associated Transport Scotland schemes were also reviewed:

- M8 Baillieston to Newhouse Environmental Statement. MFJV, March 2006
- M74 Junction 5, Raith, Environmental Statement. MFJV March 2007.

10.2.2 Field Survey

To establish baseline information regarding the area potentially affected by the proposed strategies, ecological surveys were carried out in 2005, with further work in 2006.

Extended Phase 1 Habitat Survey

The scheme was subject to an extended Phase 1 Survey in July 2005, with the study area extending 250m either side of line of the existing roads, or beyond where ground conditions required. Phase 1 survey is a standardised method of recording habitat types and characteristic vegetation, as set out in the "Handbook for Phase 1 Habitat Survey – a technique for Environmental Audit" (JNCC, 1993). This habitat survey method was extended in accordance with the "Guidelines for Baseline Ecological Assessment" (IEA, 1995) through the additional recording of specific features indicating the presence, or likely presence, of protected species or other species of nature conservation significance. Descriptive "target notes" (Appendix 10.4), were recorded to provide details of characteristic habitats, features of ecological interest, or any other features which required note to aid ecologically sensitive design or mitigation. Figures 10.1a-f describe the habitats as surveyed.

Whilst not a full botanical or protected species survey, the extended Phase 1 method of survey enables experienced ecologists to obtain an understanding of the ecology of a site such that it is possible either:

1. to confirm the conservation significance of the site and assess the potential for impacts on habitats/species likely to represent a material consideration in planning terms, or,

2. to establish the scope and extent of any additional specialist ecological surveys that will be required before such confirmation can be made.

Additional Surveys

Parts of the survey corridor have been subject to additional survey as part of ecological assessments for other road improvement schemes; specifically relevant was survey carried out at Baillieston as part of the M8 Baillieston to Newhouse Scheme and at Raith in relation to the M74, Junction 5 Scheme. These data have been integrated into this report where relevant.

Specific surveys were carried out along the scheme route in relation to birds, otters and badgers. In addition, further habitat survey was undertaken in 2007 in relation to the proposed locations for new Sustainable Urban Drainage (SUDS) facilities, which comprised the only significant off-line land-take element of the scheme.

- Appendix 10.1 Breeding Bird Survey
- Appendix 10.2 Wintering Bird Survey
- Appendix 10.3 Extended Phase 1 Habitat Survey of proposed SUDs locations, 2007.
- Appendix 10.4 Scheme Corridor Extended Phase 1 Habitat Survey Target Notes
- Appendix 10.5 SSSI Citations and SNH consultation.
- A Confidential Annex (Otter Survey 2006/2007) is available on request from Transport Scotland.
- A Confidential Annex (Badger survey) is available on request from Transport Scotland.

10.2.3 Data Limitations

As the extended Phase 1 habitat survey was conducted in July, some earlier - flowering species may not have been fully visible at the time of the survey. However, experienced botanical surveyors carried out the work and it is considered that the survey results are representative of the flora of the site, and include all the dominant and characteristic species.

The extended Phase 1 habitat survey is not a full protected species survey and in particular, badger signs can be obscured by vegetation in summer.

10.2.4 Assessment Methods

The EcIA was undertaken in accordance with appropriate guidance and with reference to current best practice.

10.2.5 Evaluation

Criteria are applied to assess the nature conservation value of the habitats and species / populations that the site supports. As there is rarely comprehensive quantitative data on

the habitat or species population resource, particularly at the Regional to Local level, the nature conservation evaluation process necessarily also involves a qualitative component. This requires a suitably trained and experienced ecologist to make a professional judgement based upon a combination of published sources, consultation responses and knowledge of both the site and the wider area. A second stage of evaluation entails a collective review of the differing levels of importance of the various habitats and species present, in order to reach an evaluation of the site as a whole. Ultimately, this evaluation is also a matter of professional judgement, guided by published sources, consultation responses and local knowledge.

The categories of nature conservation value used in this Chapter are as follows:

- International – sites, habitats and species of significance in a European context;
- National – sites, habitats and species of significance in the context of Scotland;
- Regional – habitats/species of significance in context of Clyde Valley;
- Local – sites, habitats and species of significance in the context of Glasgow City, North Lanarkshire and South Lanarkshire areas;
- Low – habitats and species of less than Local significance, but of some value;
- Negligible – Less than low conservation value, i.e. not significant.

10.2.6 Impact Magnitude

The magnitude of an impact depends upon the nature and sensitivity of a receptor and the range of potential effects arising from the implementation and operation of a proposed development. In assessing the likely magnitude of an effect, it is necessary to have as great an understanding as possible of its timing, intensity, frequency, duration and reversibility. For the purposes of this assessment, the nature of the effects on specific receptors is described in the Impacts section, and then the magnitude of these combined effects is summarised as being in one of the categories “imperceptible”, “low”, “medium” or “high”, depending upon the extent of the area or population deemed likely to be affected by the development.

Table 10.1 below provides an indication of the terms in which the magnitude of ecological impacts is considered in this Chapter. The following definitions have been applied in respect of timescales:

- “immediate” within approximately 12 months;
- “short-term” within approximately 1 to 5 years;
- “medium-term” within approximately 6 to 15 years; and
- “long-term” 16 years or more.

Table 10.1 Levels of Impact Magnitude

Magnitude	Description
Imperceptible	Not expected to affect the conservation status of the site, habitat or species under consideration in any way, therefore no noticeable effects on the ecological resource, even in the short-term.
Low	Noticeable effects, but either of sufficiently small scale or short duration to cause no harm to the conservation status of the site, habitat or species. Detectable in short- but not in medium-term.
Medium	Significant effect on the nature conservation status of the site, habitat or species, but would not threaten the long-term integrity of the system. Detectable in short- and medium-term.
High	Significant effect on the nature conservation status of the site, habitat or species, likely to threaten the long-term integrity of the system. Detectable in short-, medium- and long-term.

10.2.7 Significance of Impacts

The determination of impact significance involves the interaction of both the nature conservation value of the site, habitat or species concerned, together with the magnitude of the various impacts upon it. The more ecologically valuable a site and the greater the magnitude of the impact, the higher the significance of that impact is likely to be.

Table 10.2 shows in general terms the way in which the significance of ecological impacts is considered in this Chapter. It is important to appreciate that this does not represent a rigid framework for assessment - there are gradations between different categories of site and impact, and on occasion the significance of a particular impact may not accord precisely with the categories shown below. Impacts identified as minor are considered not to be significant for the purposes of this EcIA.

Table 10.2 Generalised Impact Significance Matrix

Nature Conservation Value	Magnitude of Potential Impact			
	High	Medium	Low	Imperceptible
International	Exceptional	Major	Moderate	Minor
National (including both UK and Scotland)	Exceptional	Major	Moderate	Minor
Regional – Clyde Valley	Major	Moderate	Minor	Minor
Local – South and North Lanarkshire	Moderate	Minor	Minor	Negligible
Low – less than Local	Minor	Negligible	Negligible	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

10.3 Baseline Conditions

Background information on the legislative and planning policy context that underpins this EcIA is provided at Chapter 17.

10.3.1 Nature Conservation Designations

There are no internationally designated sites within the vicinity of the Scheme. There are four statutory designated Sites of Special Scientific Interest (SSSIs) within 2km of the proposed scheme (SSSI citations are contained in Appendix 10.5). Designated sites within the route corridor are shown on Figures 10.2a-f.

Table 10.3 lists these SSSIs and provides an indication of their approximate distance from the closest part of the scheme.

The River Clyde is part of the wider Clyde catchment and is designated as baseline salmonid waters under EC Directive 78/659/EEC.

Table 10.3 Statutory Nature Conservation Designations

Site Name	Designation	Approximate Distance from nearest point of Scheme
Hamilton Low Parks SSSI (including a section of the River Clyde) (Figures 10.2e and 10.2f) NS 718575 and NS727567	Ornithological interest. The Site includes areas of wet grassland and open pools in close association with deciduous woodland. An exceptional breeding bird community includes water rail, snipe, sparrow hawk and green woodpecker.	Directly adjacent
Bothwell Castle Grounds SSSI (Figure 10.2d) NS 686594	Semi-natural woodland habitats with high invertebrate interest, especially beetles living in old or dead wood.	1.3 km
Bishop Loch SSSI (Not shown) NS 688668	One of a group of base-rich lochs rich in freshwater invertebrates. Site contains a good transition of habitats from open water to fen, marsh, grassland and woodland. .	1.4 km
Woodend Loch SSSI (Not shown) NS 705667	One of a group of base-rich lochs to the north east of Glasgow. Rich in freshwater invertebrates and attracting large numbers of wildfowl.	2 km

SINCs

Sites of Interest for Nature Conservation (SINCs) are shown on Figures 10.2a-f. SINCs are non-statutory locally designated sites considered to be of Local ecological importance, and are afforded some protection under planning policy NPPG14. There are 29 SINCs within 1km of the scheme, however given the very restricted extent of the scheme, only seven of these lie close enough to the route corridor to have any likelihood of being affected by the proposals.

Table 10.4 below lists the seven SINCs with potential to be affected and provides an indication of their approximate distance from the closest part of the scheme.

Table 10.4 Non-statutory Sites of Nature Conservation Interest

Site Name and Designation	Proximity to Scheme (approximate)	Summary and features designated for:
Greenwells SINC (Figure 10.2b)	Directly adjacent to M73	Hawthorn scrub
North Calder Water SINC (Figure 10.2b)	Nearest point of this SINC lies adjacent to the M73 where it crosses the North Calder Water between Baillieston and Newhouse.	Includes a number of sub sites important for its diversity of flora and fauna found here, with blocks of Ancient Woodland and European protected species, including otters.
Bothwell Park Wood and Disused Railway SINC (Figure 10.2d)	Directly adjacent to M74 just north of Junction 5, Raith	A topographically and ecologically complex site, mostly woodland and scrub with a stand of W10 *Quercus robur – Pteridium aquilinum- Rubus fruticosus*. Possibly relict of Ancient Woodland.
Laighland/Bothwell Park Wetlands SINC (Figure 10.2e)	SINCs lie either side of the M74 just north of Junction 5, Raith	Includes three sub-sites referred to as Laighland Wetland 1, 2 and 3. Wetland and swamp communities with some mesotrophic grassland. The sites support a variety of breeding and wintering bird species.
North Lanarkshire SINC 75/1a Strathclyde Country Park (Figure 10.2f)	Within 100m east of the M74	Comprises Strathclyde Loch and native woodland.

Wildlife Corridors

Sections of the M8, M73 and M74 lying within the scheme are designated as 'Wildlife Corridors' (North Lanarkshire Southern Area Local Plan) and 'Corridors of Wildlife and Landscape Importance' (Hamilton District Local Plan). These are shown on Figures 8.1a-f.

The SINCs and Hamilton Low Parks SSSI at the M74 Junction 5, Raith form part of a "green network" of regional importance (Glasgow and the Clyde Valley Structure Plan Joint Committee, 2000). The Clyde Valley is the most important wildlife corridor in the area and the Raith junction area is considered an important link in the chain of wildlife habitats of this corridor.

Ancient woodland

Scottish Natural Heritage provided the locations of areas within the survey corridor that are included in its inventory of Ancient Woodland sites (locations of areas of ancient woodland are shown on Figures 11.1a-f). Ancient Woodland is not a formal designation as such, but in Scotland is a term applied to sites whose documented history shows them to have been continuously wooded since approximately 1750. Long-established woodlands are secondary woodland with a documented history extending back from 100 – 250 years. Ancient Woodland sites and their mature soils are considerably more complex and biodiverse ecosystems than secondarily wooded sites, and long-established woodland more complex than recent plantings. Ancient and long-established woodlands therefore represent environmental capital that should be considered to be a finite resource, as it is not renewable in a human timescale.

There are a number of ancient woodland sites within the scheme study area, the majority of which are situated more than 100-200m away from the proposed scheme and will not be directly affected. Part of one area of ancient woodland (within the North Calder Water SINC) lies within metres of the existing M73 as it bridges the North Calder Water.

An area designated as Ancient Woodland will be directly affected by the proposed new slip road to the M73 (Junction3) at Daldowie (Figure 8.1c) and associated construction. Designated land will therefore be permanently lost to the scheme. Habitat survey at this location (Figure 10.1c) indicates that the existing habitat comprises scattered trees and scrub, with the main area affected being grassland. Past activity in this area, possibly including the construction of the M73 and the nearby crematorium, has caused disruption to the habitat such that there is virtually no extant and continuous woodland cover remaining. Nonetheless, the area that will be directly lost to construction has the potential to contain remnant ecological interest related to the Ancient Woodland designation, for example soil micro-flora and fauna.

10.3.2 Habitats

Figures 10.1a-f show the Phase I habitat types recorded within the survey area along the route of the scheme, along with the locations of target note (TN) descriptions, which are set out in full in Appendix 10.4. Appendix 10.3 provides information on the habitats associated with the proposed SUDs facilities outwith the existing road corridor.

The following habitats listed in order of abundance from high to low, are present within the survey corridor:

- Semi-improved neutral grassland
- Species-poor semi-improved grassland
- Amenity grassland
- Improved grassland
- Semi-natural broad-leaved woodland
- Broad-leaved plantation woodland
- Arable
- Dense scrub
- Scattered scrub
- Neutral unimproved grassland
- Marshy grassland
- Standing water
- Running water
- Loch
- Tall ruderal
- Swamp
- Mixed plantation woodland.

The habitats surrounding the proposed scheme are mainly part of a fragmented agricultural landscape with extensive areas of a variety of grassland types ranging from improved to marshy grassland. These grassland habitats are not particularly diverse and are common and widespread both locally and throughout the UK.

Wooded habitats that are present throughout the survey area include some ancient woodland, semi-natural and plantation broad-leaved woodland and mixed plantation woodland. Semi-natural broad-leaved woodland is fairly extensive through the study area whereas other types are patchy in distribution.

There are several habitats of formally recognised nature conservation value within the survey corridor. Hamilton Low Parks SSSI is an area designated for its ornithological interest, including a large heronry, water rail *Rallus aquaticus* and snipe *Gallinago gallinago* as well as wetland habitat adjacent to the River Clyde. The SSSI is bisected by the M74 south from Junction 5 to Junction 6, Hamilton. There are a number of SINCs that are near to the proposed scheme (see Table 10.4). These include the semi-natural broadleaved woodland (TN3) adjacent to North Calder Water and the North Calder Water itself in places. The Laighlands Wetland SINC at Junction 5, Raith, comprises areas of marsh, tall herb fen and swamp habitat.

There are a number of different aquatic habitats within the survey corridor including standing water, running water, streams, rivers and lochs. Part of Strathclyde Loch SINC is located approximately 100m from the proposed scheme east of the M74 between Junctions 5 and 6. The M74 crosses the River Clyde just to the south of Junction 5. The North Calder Water is crossed by the M74 and proposed Network Improvements scheme in two places, the first half way between Baillieston and Maryville Interchange, and the second between Junctions 3 and 4 of the M74.

The remaining small areas of other semi-natural vegetation, mainly dense and scattered scrub, add an element of structural diversity to the habitats locally, but are of low to local nature conservation value.

10.3.3 Flora

Species of Conservation Interest

The extended Phase 1 survey included recording of all higher plant species identified during July 2005. No higher plant species of nature conservation significance was found, and it is considered unlikely that any such species are present in the areas with potential to be affected by the majority of the strategy alignments, namely the constructed embankments and cuttings immediately adjacent to the road.

Survey of the off-line areas of land affected by the proposed SUDs facilities (Appendix 10.3) also did not record any notable or protected plant species.

Invasive Species

Evidence of invasive species was noted along the survey corridor. There is a small stand of the invasive alien Japanese knotweed *Fallopia japonica* adjacent to a short section of watercourse (see Appendix 10.4, TN8) next to the M8 and a small stand to the north (TN63). Japanese knotweed is a highly invasive alien species that is listed in Schedule 9 of the Wildlife and Countryside Act 1981, as amended. It is an offence to introduce it to a site or cause it to spread in the wild and its disposal is strictly regulated.

At the western side of the M73 embankment there is a small stand of giant hogweed *Heracleum mantegazzianum* (TN9). Giant hogweed is also an invasive species which is

listed on Schedule 9 of the Wildlife and Countryside Act 1981 as amended, making it an offence to plant or cause giant hogweed to grow in the wild.

10.3.4 Terrestrial Fauna

Roe deer and rabbit are to be found within the survey area and especially within Hamilton Low Parks SSSI.

Amphibians and Reptiles

Great crested newt is a European Protected Species (EPS), protected by the EC Habitats Directive as implemented by the Conservation (Natural Habitats, &c) Regulations 1994 and The Conservation (Natural Habitats & c.) Amendment (Scotland) Regulations 2007. Several water bodies lie within 500m of the proposed scheme (TN6, 7, 14 and 39). None of these will be lost as a result of the scheme.

Amphibians surveys were carried out in association with the Stage 3 DMRB assessments of the proposed M8 Baillieston to Newhouse, and M74 Junction 5, Raith Improvement Schemes (MFJV 2006 and 2007), but no great crested newts were recorded. Additional surveys at the few additional ponds within 500m of the proposed Scheme (within Broomhouse quarry) was attempted but conditions at the site made a full great crested newt survey impossible for health and safety reasons.

No reptiles were observed during the baseline surveys, and no records of reptiles were available for the study area through consultation. It is considered unlikely that reptiles are present in the area.

Bats

All bats in Scotland are European protected species, and they and their roosts are protected by the EC Habitats Directive as implemented by the Conservation (Natural Habitats, &c) Regulations 1994 and The Conservation (Natural Habitats & c.) Amendment (Scotland) Regulations 2007. As part of the extended Phase 1 survey a number of trees were observed with potential to support bat roosts which were noted in Target Notes (Appendix 10.3 and 10.4), including a row of large lime trees along the M8 (TN1), a row of large ash trees in a relic hedge line (TN4) north of the M8 and trees within an area of amenity grassland south of the M73 (TN22). Additionally, a number of trees present within woodland habitats throughout the survey corridor were considered to be potentially suitable as bat roosts (e.g. TNs 11, 13, 17). None of these trees will be affected by the scheme. If any were likely to require pruning or felling as part of the scheme, they would need to be surveyed in advance, in the appropriate season, by a licensed bat worker. A bridge considered to be potentially suitable for roosting bats was found east of the Baillieston Interchange (TN57), but this also will not be affected by the scheme. Bat survey in the vicinity of Junction 5, Raith as part of the Stage 3 assessment of the proposed Raith improvement scheme (MFJV 2007) did not record any roost sites

adjacent to the M74 at that location, although bats are active along the corridor of the River Clyde.

The wooded habitats within the wider survey corridor provide suitable foraging for bats. Strathclyde Country Park contains buildings with potential as bat roost sites, but these lie outwith the scheme. No buildings will be affected by the scheme. Inspection of road bridges within the ecological study area by a licensed bat worker indicated that they were generally unsuitable as potential bat roosts.

Otter

Otter *Lutra lutra* is afforded protection as a European Protected Species (EPS), protected by the EC Habitats Directive as implemented by the Conservation (Natural Habitats, &c) Regulations 1994 and The Conservation (Natural Habitats & c.) Amendment (Scotland) Regulations 2007. Otter is also a priority species in the South and North Lanarkshire BAPs and has a Species Action Plan (SAP) to address otter conservation issues in North and South Lanarkshire.

Consultation indicated that suitable habitat for this species exists within the survey corridor along the North Calder Water and the River Clyde. As part of the extended Phase 1 habitat survey evidence confirming presence of otter was found along both water courses (TN21 and 56). Evidence included footprints and an otter spraint. Further otter survey (Confidential Otter Annex held by Transport Scotland) identified several active and disused holts adjacent to the line of the scheme, in particular on the North Calder Water near the M74.

Water vole

The water vole *Arvicola terrestris* is afforded partial protection in Great Britain under the Wildlife and Countryside Act 1981, as amended. Consultation identified the North Calder Water and the River Clyde as providing potentially suitable habitat for water vole. The extended Phase 1 habitat survey indicated that some suitable habitat for this species is present within the scheme survey corridor, including a short section of minor water course south of the M8 (TN8), a fast flowing partly culverted stream north of the Baillieston Interchange (TN54) and a small fast flowing stream in a steep valley east of Baillieston Interchange (TN60).

Survey for water vole included searching upstream and downstream along both banks of watercourses and ditches within the survey corridor as well as adjacent wetland areas. No signs of water vole were recorded.

The area surrounding Myers Burn (TN19) and the stream through Clydeneuk Park (TN20) is considered to be sub-optimal habitat for water voles and no evidence of this species was found during survey along these watercourses.

Badger

Badgers *Meles meles* and their setts are protected under the Wildlife and Countryside Act 1981, as amended, and the Protection of Badgers Act 1992. Two badger setts were located during survey. The location of setts is not indicated in this report in order to protect the welfare of badgers. Further information on badgers is provided in the Confidential Badger Annex provided to Transport Scotland and Scottish Natural Heritage.

One sett comprised six holes in amongst fallen branches and tree stumps. Three holes were considered to be well-used, evidenced by free digging, prints, hair and dry bedding at sett entrances. The other three, although free from vegetation, had not been very recently used. Paths present led into the adjacent woodland and residential gardens but not towards the existing motorway. A further sett exists three to five metres from the above described sett, comprising five holes. This was considered to be inactive or partially active, but the sett could be reused by these badgers with minimal effort in the future.

Birds

Several bird species were recorded as incidental sightings during the extended Phase 1 habitat survey. Kingfisher *Alcedo atthis* has been recorded on the North Calder Water (TN62) and is also present on the River Clyde. Barn owl *Tyto alba* was also recorded flying into a block of plantation woodland south of Baillieston Interchange (TN51). Kingfisher and barn owl are species that benefit from special protection as they are listed on Schedule 1 of the Wildlife and Countryside Act 1981, as amended.

Breeding and wintering bird surveys were carried out along the scheme corridor, focused on key locations (identified during the Phase 1 Habitat Survey) which were considered to be of most potential value to birds. The results of the breeding bird and wintering bird surveys are presented in Appendix 10.1 and Appendix 10.2 respectively.

Breeding and wintering bird surveys conducted separately as part of the assessment of improvement proposals for M74 Junction 5, Raith are also relevant to the scheme. Hamilton Low Parks SSSI is designated for two ornithological qualifying features, namely its assemblage of breeding birds generally and, in particular, the largest breeding population of grey heron in Scotland, in the woodland within the SSSI to the south of the River Clyde. The SSSI is also known to support water rail *Rallus aquaticus*, snipe *Gallinago gallinago*, sparrowhawk *Accipiter nisus* and green woodpecker *Picus viridis*.

The majority of data indicate the presence of a range of breeding songbirds that are green-listed by the RSPB, i.e. of favourable long-term conservation status. A number of species of moderate UK conservation status (either priority LBAP species and / or RSPB amber list BoCC) were also recorded during survey. These were; goldcrest *Regulus regulus*, willow tit *Parus montanus*, northern lapwing *Vanellus vanellus*, house martin *Delichon urbica*, dunnock *Prunella modularis*, tree pipit *Anthus trivialis* and willow warbler *Phylloscopus trochilus*. Seven species of high UK conservation status (UK BAP priority

species and / or RSPB red list BoCC) were recorded during the survey. These are skylark *Alauda arvensis*, reed bunting *Emberiza schoeniclus*, bullfinch *Pyrrhula pyrrhula*), song thrush *Turdus philomellos*, house sparrow *Passer domesticus*, starling *Sturnus vulgaris* and grasshopper warbler *Locustella naevia*. There is a slight possibility that bullfinch could utilise the area as a breeding species.

Water bodies to the north, west and south of Raith Junction host breeding reed bunting (a species listed as a priority species in the South Lanarkshire LBAP). Open farmland to the north supports breeding lapwing, sedge warbler, willow warbler and skylark. Water bodies north of the Junction hosted a range of breeding water birds, with adjacent habitat supporting common songbirds such as siskin, greenfinch, sedge warbler, willow warbler, wood pigeon, blue tit, great tit, magpie, chaffinch and starling.

Winter bird survey indicated that the River Clyde, especially during frozen conditions, appears to act as a recipient for large numbers of diving ducks from nearby waterbodies. The land which will be required for the scheme contained no key species *in situ* during the period in which the surveys were completed. Transitory use of the area by wintering birds was recorded, including by thrush species and roaming flocks of tits, including the usual 'attached' species such as goldcrest and treecreeper. The survey did not find obvious visual evidence of any riverside banks suitable for use by kingfisher and sand martin within the study area.

Key species which could nest in the area and which are likely to be directly impacted by the road widening are song thrush, dunnock and possibly goldcrest in the conifers. However the majority of the bird interest is in the habitat adjacent to the proposed scheme, and not within the footprint of the scheme itself.

10.3.5 Aquatic Fauna

The survey corridor falls within the catchment of two main rivers, the River Clyde and the North Calder Water. Both are designated salmonid fisheries, The River Clyde is designated as a SSSI and Special Protection Area for Birds (SPA) further downstream, but neither watercourse has a nature conservation designation for aquatic interest within the survey area. The scheme involves works across a watercourse only at one location, where the M74 bridge over the North Calder Water will be widened.

10.3.6 Assessment of Nature Conservation Value

Table 10.5 summarises the nature conservation value given to the key habitats and species assessed as being of significance within the study area.

Table 10.5 Summary of Features of Nature Conservation Value

Ecological Feature	Nature Conservation Value
Site of Special Scientific Interest (SSSI). Qualifying features of the Hamilton Low Parks SSSI, i.e. assemblage of breeding birds and largest heronry in Scotland.	National – UK
Site of Interest for Nature Conservation (SINC). (qualifying interest not specified)	Local value
Ancient Woodland	Regional/Local (woodland previously cleared, remnant habitat only)
Floodplain of the River Clyde Valley – mosaic of open water, fen, swamp, marsh, semi-improved neutral grassland and riparian woodland habitats	Habitats either side of the M74 between Junctions 5 and 6 contribute substantively to the Clyde Valley wildlife corridor – a feature of Regional nature conservation value
Wildlife Corridor (encompassing existing sections of motorway)	Local
Otter – European species present along North Calder Water and River Clyde – holts and feeding habitat adjacent to the scheme.	International (European Protected Species)
Bats - European species present in woodlands and wider area, and along riparian corridor of the North Calder Water and River Clyde	International (European Protected Species)
Breeding birds – presence of a range of species of conservation value across survey area	National in relation to the SSSI. Elsewhere Local to Regional
Wintering birds – presence of a range of species of conservation value in survey area	Local
Badger – present along route corridor	National (UK protected species)
Other fauna, e.g. amphibians, deer, brown hare	Low
Other habitats and plant species	Low

10.4 Predicted Impacts

10.4.1 General Effects

Potential ecological impacts relating to the scheme are identified below. These mainly relate to construction activities and the associated disturbance caused by these activities but also include operational impacts, where relevant to ecology. Although general impacts during the construction period are considered under Disruption due to Construction (Chapter 9), ecological impacts arising during construction often have implications post construction during scheme operation. For this reason such impacts are

discussed in this Chapter. Section 10.5 discusses mitigation and Section 10.6 summarises predicted residual impacts, with mitigation in place.

10.4.2 Do-minimum Scenario

In this scenario, there is no new road construction and the existing baseline conditions will remain. These would however alter over time due to:

- natural ecological succession if the habitats are left undisturbed by human activity, for example resulting in loss of open water and 'scrubbing up' of ponds;
- other influences and impacts arising from new development in the surrounding area in the future; and
- continued human disturbance.

Overall, the predicted impacts from a do-minimum scenario will depend on the rate of other non-Scheme development and loss of habitat in the surrounding area. This is in turn reliant upon a number of factors, including wider economic conditions. As a result, future impacts have the potential to range from negligible to high adverse for all ecological receptors and hence from negligible to major significance over time.

10.4.3 Site Clearance/Construction Stage

During the construction period there will be various phases of work across the scheme extents. There are five principal categories of potential ecological impact identified for the site clearance and construction stages, as follows:

- habitat loss;
- habitat fragmentation/barriers;
- direct physical damage to wildlife;
- disturbance due to human activity and noise, vibration, dust and light; and
- effects on surface water levels and flows, and quality.

Habitat Loss

Habitat loss will result from site clearance and construction of the scheme, involving widening of the existing carriageway, with widening restricted to within the road boundary. Habitat loss will therefore be largely confined to the embankment/cutting slopes, comprising amenity, improved and neutral semi-improved grassland with areas of dense and scattered scrub.

An area of land designated as Ancient Woodland will be directly lost as a result of constructing the new slip road (Junction 3) to the M73 at Daldowie. This loss will be permanent within the footprint of the scheme. While Ancient Woodland is generally assessed as being of National value, at this location the area has been heavily disturbed

and its species composition significantly altered in the past. Therefore it is considered to be of Regional/Local value. The impact of habitat loss due to the construction of motorway slip roads at Daldowie is assessed to be moderate, and significant without mitigation in place. Loss of ancient woodland habitat cannot be mitigated by new planting, however preservation and reuse of the (former) woodland soils, and the associated microflora and fauna, is recommended. It should be noted that the affected area does not contain mature trees, which have been previously cleared and the habitat now comprises scattered trees, scrub and grassland.

The M74 bridges over the River Clyde just south of Raith junction. The adjoining land is part of Hamilton Low Parks SSSI, designated for its ornithological interest and mosaic of wetland habitat. As a site of national importance, its value as an ecological receptor is High. The scheme will utilise the existing bridge, hence impacts upon the River Clyde and riparian habitats are likely to be low so long as standard safeguards (which form part of normal construction practice near to watercourses) are set in place.

There will be no direct loss of, or encroachment into, nationally or locally designated sites of nature conservation importance. There will be (during construction) temporary loss of habitat within the road boundary, which comprises roadside landscape planting along sections of the M8, M73 and M74 motorways. While being of low ecological value, such habitat forms part of designated Wildlife Corridors, or Corridors of Wildlife and Landscape Importance, which encompass the soft landscaping adjacent to the carriageway, including embankment and cutting slopes.

Several SINCs lie directly adjacent to the existing motorway boundaries. Again, as the scheme involves on-line widening, using the existing hard shoulder, impacts upon these locally designated sites will be negligible, with no direct land take within their boundaries.

The scheme has passed through a number of design iterations over the course of the Stage 2 and Stage 3 DMRB assessments, resulting in a preferred scheme with the least land-take requirement of all the alternatives considered. As the footprint of the construction area is effectively the same as that of the completed scheme, the impacts of habitat loss are discussed in relation to the construction phase.

As the scheme conceptual design has developed, encroachment upon significant ecological features of the survey area has been reduced as far as practicable. The majority of habitats affected by the scheme land-take comprise undesignated grassland, hawthorn, willow, birch scrub or young woodland, and roadside planting of low nature conservation value, but will provide a local habitat resource for some species of bird and invertebrates. This loss will be of imperceptible magnitude in terms of the functioning of the local ecosystem, and is thus a negligible impact.

The majority of land to be lost to the scheme lies within the road boundary, and comprises roadside grassland and woodland landscape planting and naturally regenerated scrub. Land take and habitat loss associated with the construction of new

SUDs facilities and associated outfalls (Appendix 10.4) largely affects grassland and scrub habitats, none of which has more than low or local nature conservation value. The loss of these low value habitats, is considered to be an impact of low magnitude in the absence of mitigation and not significant.

No other valuable plants or habitats will be lost to the scheme. The grassland, tree plantings and scrub habitats which will be lost during the site clearance stage are typical of the surrounding area and have no substantive nature conservation value in their own right, although they do have value in supporting a range of bird species. They are widespread in the local area. Roadside vegetation contributes to the Wildlife Corridor value of sections of the M8, M73 and M74 as designated by the Local Authorities. The loss of small areas of these habitats will be an impact of low magnitude, i.e. a negligible impact.

Habitat Fragmentation/Barriers

The footprint of the proposed scheme aligns closely to the existing road layout and new construction will affect only very limited areas of adjacent land. It is considered that no additional habitat fragmentation or barrier effects will result from construction of the proposed scheme. During construction, widening of the M74 bridge over the North Calder Water is likely to cause temporary disruption to wildlife, such as otter, moving along the watercourse. However, whilst otters are secretive, they are known to be capable of crossing exposed and apparently unsuitable habitats, even including built up areas, and it is therefore considered unlikely that the construction stage would result in a barrier to the movement of otters across the study area along the valleys of the North Calder Water and its tributaries. The existing bridge has a vertical concrete face which enters the watercourse without any natural bank slope (Confidential Appendix 10.3, Plate 5) and otters must therefore currently swim past the bridge in order to move along the watercourse corridor. Although the otter is an internationally protected species, the predicted impact of the proposed scheme will be low (noticeable effects, but either of sufficiently small scale or short duration to cause no harm to the conservation status of the site, habitat or species) and hence of minor (or at worst-case, moderate) significance in the absence of mitigation.

The proposed carriageway widening is likely to adversely affect existing vegetation along those sections of the existing motorways which are to be widened, affecting stretches locally designated as Corridors of Wildlife and Landscape Importance. Current design standards which restrict the extent of tree planting adjacent to carriageways may affect the degree to which wooded habitat can develop within the road boundary. Partial clearance of roadside vegetation necessary during construction to steepen some cutting and embankment slopes could cause short-term fragmentation impacts as the continuity of vegetation cover along the roadside will in places be interrupted. The impact of this is likely to be low and of minor significance while replacement planting matures.

Winter bird survey identified the movement of wildfowl species across the M74 between Junctions 5 and 6, especially during conditions where Hamilton Services Loch is in the process of freezing and birds move to the River Clyde. The scheme will not entail changes to the existing lighting or road height across the motorway and therefore there is no additional barrier to bird movements resulting from the proposed Scheme. The flight heights of wildfowl between Hamilton Services loch and the River Clyde were observed during survey to be above that of any HGV impact height. Similarly, wildfowl flights were not affected by the height of the existing trees currently between the river and the M74 motorway, that is, they did not need to raise their flight to clear the trees. There are therefore no impacts predicted in relation to the movement of birds across the road sections affected by the Scheme.

Disturbance/Damage to Wildlife and Areas used for Breeding/Shelter

Site clearance activities alongside the existing roads where embankment and cutting slopes are to be re-profiled will potentially disturb, or damage, wildlife that is present in the areas of habitat being cleared. The species and groups discussed below all benefit from varying degrees of statutory protection, so it should be stressed that the concept of an impact in the absence of any mitigation (as assessed below) is purely theoretical, as mitigation measures – including working under licence where appropriate – will be a mandatory legal requirement of the construction phase.

Signs of otter, including holts, spraints and footprints, were recorded both upstream and downstream of the M74 bridge crossing the North Calder Water. Widening works to the bridge will be approximately 30m away from the nearest holt site (discussed further in Confidential Otter Annex associated with this Environmental Statement) , and will have the potential therefore to impact upon otters moving along the watercourse corridor. The potential impact, in the absence of mitigation, is considered to be low, as it will not cause the loss of these holts or permanently damage the integrity of the local otter population, but is likely to have perceptible effects in the short/medium term if the otters are deterred from using the holts near to the working area during the construction phase at the bridge. The otter is a European Protected Species, and is considered to be present on most watercourses across Scotland. Potential impacts upon otters in the vicinity of the scheme are estimated to of medium magnitude (no direct impact on holts, and temporary disturbance along a relatively short section of watercourse). In the absence of mitigation this would be of moderate significance but would not affect the viability of the local otter population.

The proposed widening works to the bridge carrying the M74 over the North Calder Water also has the potential to cause a localised but permanent loss of woodland habitat along its banks, as clearance for construction and for the physical structure itself will be required.

Badger setts identified (Confidential Badger Annex) during the surveys lie within 30 m of the proposed construction activities. Two badger setts were discovered in close proximity to each other, which have the potential to be indirectly affected by the scheme in the

absence of mitigation. Badgers may also be affected by a permanent loss of some foraging habitat immediately alongside the existing motorways (within the road boundary) as a result of the proposed scheme, however there is no evidence from survey that badgers are approaching this close to the motorway.

There are no great crested newts recorded in the study area, and no waterbodies will be lost as a result of the scheme. New wetland areas, in the form of constructed SUDS facilities which will include permanent wet pools, will be created as part of the scheme (Chapter 15). This creates new opportunities for colonisation by amphibians from nearby existing waterbodies, and provides additional wetland habitat near to the existing watercourses of potential value to otters. New wetland creation in areas where the existing habitat is of low/local value will result in a low but positive impact as a result.

A range of breeding birds, including species of conservation concern, will be present in the areas affected by clearance works, especially in wooded and scrub areas, but also elsewhere such as at Bothwell Pool north of the A725 which is valuable for passage hirudines and water rail.

None of the individual bird species with potential to be affected is of high nature conservation value, and even though the breeding and wintering birds of the area alongside the scheme are assessed as being collectively of local nature conservation value. The exception to this is the bird assemblage associated with Hamilton Low Parks SSSI, which is of national importance. Temporary effects on the sub-set of the wider bird population in the area would be assessed as being an impact of low magnitude, resulting in a minor impact, i.e. not significant.

Given the legislative protection afforded to birds whilst breeding, mitigation will be required to protect birds during the breeding season, and site clearance activities would normally take place outside the bird breeding season.

Disturbance due to Human Activity, Noise, Dust and Light

The presence of humans and vehicular activity within and adjacent to the construction working corridor may have the effect of deterring use of the area by certain species, particularly during working hours and indirectly disturb sensitive species beyond the footprint of the scheme. The main species likely to be affected are otters, badgers and breeding birds, including ground-nesting species such as willow warbler, which have been recorded close to the M74. Birds are likely to be deterred from establishing nest sites close to the main centres of human presence and construction activity, but further away from these may become habituated to construction activity given that it has a restricted footprint.

The low magnitude of temporary disturbance on what is considered to be a general breeding bird assemblage within the study area of local value is predicted to constitute a minor impact in population terms, i.e. not significant.

Potential impacts on otter would be highly localised, where the scheme crosses watercourses, and physical impacts are likely only at the proposed M74 bridge widening. At other locations due to the online nature of the scheme and construction activity, impacts on watercourses are likely to be low and temporary.

No bat roosts were identified during survey within the area of works, and there are few structures or trees that could be considered suitable for roosts. Bats are highly likely to be using the riparian corridor of the River Clyde and North Calder Water, hedgerows and nearby woodland areas as commuting routes and foraging areas. Bats may experience indirect impacts during the construction of the scheme from increased levels of human activity, lighting and noise in the vicinity of working areas which could potentially temporarily disrupt their flyways and foraging activities. Assuming that construction activity will largely take place in daylight, such disruption is likely to be low and temporary.

Badgers in the vicinity of works will be less affected by the daytime presence of people and machinery, as they are largely nocturnal. Vibration effects on animals within setts (generally if within approximately 30m) may occur, but this will depend on the nature of the proposed engineering in the vicinity of the identified setts. Should vibration inducing work be likely, mitigation measures will be required. Night-working under floodlights would be likely to deter animals from working areas but so long as this does not take place in close proximity to a sett or movement route, impacts are considered to be low and temporary.

Other species, including brown hare and deer, can be expected to move away from points of disturbance, which will be confined to the footprint of the works, and hence these receptors of low nature conservation value will experience low magnitude, minor impacts.

Site clearance and construction activities are commonly associated with noise and vibration disturbance, however the existing motorways already generate significant noise adjacent to the carriageway which would tend to dominate most of the construction related noise. The songbird populations within and immediately adjacent to the proposed scheme extents are evaluated as being of low value. The behaviour of these songbirds will already be adjusted to background noise because of pre-existing high levels of noise and disturbance emanating from the motorway, major roads and junction. The impact of additional noise, i.e. noise perceptible above current levels, resulting from construction, will be limited to the times of the day when the construction site is active (generally 0700 – 1900 hours). This makes it unlikely that any perceptible additional noise will coincide with main periods of dawn and dusk singing activity. The generation of additional noise is considered to be of low magnitude, and therefore a negligible impact is predicted.

Other species using the vegetated areas adjacent to the carriageways are similarly likely to be habituated to noise and less likely to be disturbed by construction activity.

During dry weather, wind and/or the use of vehicles on exposed substrates may cause dust to rise up and settle on adjacent vegetation. Measures to suppress dust generation

for the benefit of construction site and other workers/residents/motorists are addressed in Chapter 6 Air Quality, and Chapter 9 Disruption Due to Construction. Dust deposition is considered to represent negligible additional impact in respect of the kind of habitats present in the vicinity of the works.

The existing roads which comprise the scheme route are generally lit. The proposed scheme will therefore not significantly add to current light levels along the motorway routes. The height of any new lighting will not be elevated above current levels. During the winter, temporary lighting associated with construction may overlap slightly with periods when badgers will be actively foraging. In the absence of mitigation, it is conceivable that insensitive lighting could contribute towards disturbing the regular movements of these mammals, although negligible impacts are predicted from this source of disturbance in isolation given the very restricted extent of the works.

Potential Pollution to Wetlands and Watercourses

There is a requirement for new SUDs facilities, as well as associated road runoff management features and culverts as part of the scheme, as set out in Chapter 15. These comprise the main off-line element of the scheme.

In the absence of mitigation, the construction of these features could result in the release of sediment and/or otherwise polluted runoff into watercourses near to and/or downstream of working areas. There is a legislative requirement for works to watercourses to be subject to licence, and this in turn requires that strict environmental protection measures will be implemented during both construction and operational phases of the proposed development. Further details on this aspect are given in Chapter 15.

The potential for impacts on these aquatic habitats and the species they support in the event of an accidental release of pollutants during construction cannot be entirely ruled out, although in the tightly regulated and well-managed operation of a major trunk road construction site, the risk of such an accident is likely to be low and should be addressed through contingency plans included within the EMP and contractual documents.

As any such incident would be a result of an accidental release (with a low probability of occurring), it is not possible to be definitive about the nature, scale or duration of potential impacts. The scheme drainage management design is an improvement upon the current situation as it will prevent the direct drainage of road runoff to the receiving environment, including Hamilton Low Parks SSSI. The proposed scheme will improve upon the current drainage situation by intercepting and treating motorway runoff before it reaches the SSSI and receiving watercourses.

The SSSI wetlands will be unaffected by the introduction of managed road runoff as the quantitative contribution of road runoff to surface waters in the SSSI is of negligible significance, and no adverse impacts are anticipated as a result of the implementation of a SUDs management system.

However, should an accidental release occur during the construction phase, the impact would be likely to be of imperceptible - low magnitude and highly localised in extent, affecting aquatic communities that consultations and water quality assessment suggest are likely to be of low conservation value. A minor impact, i.e. of no significance is therefore predicted.

Groundwater and Surface Water Flows

The construction of the scheme will not cause material alteration of surface water flows, as no culverts, drains or watercourses require diversion. Similarly, there will not be any large-scale below ground excavation, hence no significant dewatering or change to local groundwater levels. Impacts are considered to be negligible and not significant.

10.4.4 Post Construction/Scheme Operation

There are four main categories of impact identified for the operational stage, listed below:

- habitat loss (permanent), fragmentation or severance;
- wildlife mortality;
- wildlife disturbance; and,
- effects on water flows and quality.

Habitat Loss, Fragmentation or Severance

Impacts arising from habitat loss, fragmentation and/or severance are largely the same as described previously for the construction phase. The scheme has been developed to minimise land take, however some encroachment to construct new slip roads at Daldowie and new drainage treatment facilities has been unavoidable, requiring approximately 7 ha of land in total. Habitat loss for SUDS facilities construction will be permanent at the operation phase of the scheme, but other areas alongside the roads (i.e. embankments and cutting slopes) that fall within the scheme extents, will naturally re-vegetate and/or be planted and seeded and in time will provide new roadside habitat.

The scheme follows very closely the current layout of the roads in this area and involves the loss of only narrow strips of adjoining habitat, lying within the road boundary. There is a small amount of additional land take required for SUDs drainage management. Operation of the scheme will entail no additional fragmentation or barrier effects compared to the existing situation. During operation of the scheme, the existing fragmentation effect of the motorways (in potentially presenting a barrier to movement across the carriageways) will be unaltered. The operation of the widened motorways will present a negligible change to the existing level of fragmentation/severance. Impacts are therefore determined to be imperceptible and of negligible significance.

Wildlife Mortality

Once the scheme is operational, it is predicted that there will be little difference in the levels of disturbance experienced by wildlife to that currently experienced. The scheme will not result in any new road crossings for wildlife. The scheme does not involve interruption or fragmentation of any existing badger movement routes, there will be no increase in the existing level of risk to this species from the scheme, i.e. negligible impact.

Otter casualties have been recorded since 1985 on the M74 south of Raith junction. The addition of a widened motorway will not significantly alter (for better or worse) the existing risks to otters.

Deer represent a feature of low nature conservation value, and collisions lead to low magnitude impacts on the population within the study area, i.e. a negligible impact in ecological terms.

Wildlife Disturbance

The wildlife in this area is already habituated to locally high levels of disturbance from current traffic levels along the motorways, and the proposed scheme will not materially alter the current situation.

Water Flows and Quality

The incorporation of drainage management features into the scheme improves upon the current situation where runoff from the motorways discharges to the receiving environment with no attenuation or treatment.

Increases in run-off and containment of contaminants will be controlled as an integral part of the scheme design, which includes a road drainage scheme incorporating SUDs, with attenuation and treatment of road drainage (Chapter 15). This would be a statutory requirement as drainage discharges are subject to regulation by SEPA. The effects on water quality in receiving waters such as the River Clyde, which is of regional value where it crossed by the scheme, is predicted to be of imperceptible magnitude given the large dilution effect of the receiving watercourse and therefore assessed as a minor impact and not significant.

10.5 Mitigation

The design of the proposed scheme has passed through a series of iterations, designed to minimise the potential for adverse environmental effects, and during that process ecological impacts have been reduced as far as practicable by limiting landtake and avoiding sensitive areas where possible. Mitigation provision is illustrated in Figures 19.1a-h. General measures to reduce adverse effects on ecology and nature conservation include:

- minimising the footprint of the works as far as practicable;
- restricting the extent of working areas and using fencing to protect adjacent habitats and prevent access to working areas by animals such as badger;
- managing the timing and phasing of works;
- avoiding key habitats, and areas used by protected species;
- minimising pollution; and,
- implementing appropriate site restoration and new habitat creation.

Ecologically sensitive design of features such as SUDs facilities and soft landscaping within the road boundary will mitigate and in places, enhance local habitats by providing new wetland features near to existing watercourses, and replacement native-species scrub, woodland and species-rich grassland areas.

These measures will be carried forward and included in Contractual documents and the Environmental Management Plan as applicable.

10.5.1 Detailed Design and Pre-Construction Stage

Maximising Biodiversity Value

Ecologists will provide input to designs for new drainage arrangements and site landscaping, to ensure that opportunities are taken to maximise the ecological value of new habitats created by the proposals. It is important to ensure that biodiversity enhancement proposals are appropriate to the locality, local BAP objectives and the existing interest of the surrounding area.

Protected Species and Species of Biodiversity Importance

Pre-construction surveys shall be carried out to provide up to date information on the status of protected species in the proposed construction area. This is essential given the time period that can elapse between baseline surveys carried out during the development of the scheme, and its final approval and construction. The surveys should include for otter, bats and badger.

Any work likely to affect protected species will be subject to consultation with SNH to agree appropriate avoidance and mitigation measures and where necessary these would only be carried out under licence from the Scottish Government. Although no bat roosts will be affected by the scheme on the basis of current survey information, as a precautionary approach, the contractual documents/Employer's Requirements will require pre-construction survey and Reasonable Avoidance Measures (RAMs) for bats to be set in place in advance of any felling of trees.

10.5.2 Site Clearance and Construction stage

Definition of Working Areas

The working areas, including temporary access, will be kept to a practical minimum through areas of vegetated habitat, and their boundaries will be clearly delineated at the commencement of works. This is especially important in the vicinity of Hamilton Low Parks SSSI, Strathclyde Country Park and works affecting SINCs and watercourses, and a requirement to carry this out will be included in contractual documents. An ecologist will be consulted in decision-making over areas proposed for use as construction compounds or site storage areas, so that sensitive habitats are avoided.

Protective Fencing

Existing vegetation to be retained, or other sensitive areas such as ditches or mature trees will be defined in Contractual documents and an Environmental Management Plan (EMP) to be drawn up by the Contractor as requiring protection from accidental damage or disturbance. These areas will be securely fenced prior to the commencement of site clearance. The area defined by the fencing will include the root systems of the vegetation affected i.e. a minimum of the canopy width around all trees. Fencing will be fit for purpose and be clearly visible to drivers of large construction vehicles. No materials storage will be permitted within the fenced areas. The fences will be maintained to ensure their continued function throughout construction, but will be removed from site on completion of the works.

Fencing shall be erected where considered necessary to keep vulnerable species, in particular otters and badgers out of working areas and excavations. The fencing specification shall be appropriate for the species concerned and shall be specified in Contractual documents and the EMP.

Control of Invasive Species

Pre-construction survey will be carried out to identify the occurrence and extent of any invasive species within the working area of the scheme in order that eradication or safe and complete removal measures can be set in place before construction starts. Control of Japanese knotweed will form part of the EMP and will be carried out in accordance with the requirements of SEPA. Any giant hogweed (if present) will also be removed in accordance with a method statement to be agreed with SEPA. Post construction monitoring for the appearance of these species will be included within the landscape mitigation period and if plants/spread are found these will be exterminated within the disturbance area. This measure will be a contractual commitment through the Employer's Requirements.

Planning to Minimise Risk of Nuisance

Good construction site management will be implemented to avoid/minimise generation of excessive litter, dust, noise and vibration. This will be controlled and monitored through the contractual documents and the EMP.

Ground Preparation and Restoration

Topsoil will be removed and stored separately from the underlying subsoil in piles less than 3m high. When ground affected by construction works is being restored, subsoils should be placed beneath topsoil, and steps taken to ensure that the new surfaces will settle so as to be flush with the surrounding ground level.

Minimising Potential for Impacts on Breeding Birds

The nests, eggs and young of all species of wild birds are protected from deliberate damage during the breeding season (generally March to August inclusive) under the terms of the Wildlife and Countryside Act 1981, as amended. It is best practice to minimise the potential for such damage by removing vegetation likely to be used by breeding birds outside of the breeding season. As a last resort, bearing in mind that careful planning can avoid this, a detailed search of vegetation by the site ecologist immediately prior to clearance must be carried out, so that breeding sites (including for ground nesting species such as skylark) can be identified and their clearance delayed until any young have fledged and the nest is no longer in use.

Minimising Potential Impacts on Otters

Detailed mitigation for otters will be required. Mitigation is likely to include retaining linear vegetation cover along bankside areas of watercourses as far as possible, and avoiding disturbing activities such as 24 hour working or lighting of the watercourse where otters are present. As otters are known to move along the River Clyde and North Calder Water, open trenches anywhere near watercourses should be ramped at a shallow angle in at least one location to provide a means of escape.

Detailed mitigation will need to be agreed with SNH and the Scottish Government and appropriate licences obtained before works likely to disturb otters can be lawfully implemented by the Contractor. Specific mitigation, including pre-construction survey, will be agreed to protect identified otter holts and other places of shelter in relation to the proposed widening of the M74 bridge over the North Calder Water. This work is highly likely to require a European Protected Species licence. A lead-in time of at least 12 months should be allowed for mitigation to be fully designed in detail and agreed with the authorities, so that a licence prior to commencement of all works can be applied for.

Minimising Potential Impacts on Badgers

If pre-construction surveys indicate that badgers have excavated setts within the footprint of the scheme, suitable mitigation measures will need to be drawn up by the Contractor and agreed with SNH and carried out under the appropriate licence before construction activity could commence at that location.

Where operations are occurring close to a known sett, but not so close as to need licensing, a "people and machinery exclusion zone" extending to a 50 m radius around the sett will be fenced off using Heras or similarly robust temporary fencing. This will ensure legislative compliance by protecting the sett from accidental damage, whilst still allowing the nocturnal mammals free passage away from their shelter at night time.

Construction activity should not limit the free movement of badgers across the site other than to protect against accidental harm. Areas of sensitivity, such as setts, should not be directly illuminated. Open trenches should be shallow ramped in at least one location to provide a means of escape in case of animals falling in.

10.5.3 Post-Construction Monitoring and Management

Measures will be put in place to ensure that any exclusion fencing is checked and maintained as appropriate, on a regular and ongoing basis.

Although it is considered (Chapter 15) that there will be negligible impacts on surface waters due to the construction of the scheme, the Contractor will be required through contractual documentation to set in place a surface water monitoring programme during construction. The monitoring will check that the impacts of construction are not causing adverse impacts. Contingency measures will be identified by the Contractor to manage any identified adverse impacts.

Post-construction monitoring is likely to be required in respect of any protected species mitigation carried out under licence, and the nature and timing of such monitoring will be agreed between the Contractor and the relevant authorities at the time when the licence is applied for.

10.6 Residual Impacts

It is predicted that, if all mitigation measures are implemented as recommended, there should overall be no significant permanent residual adverse impacts resulting from this scheme other than the loss of a small area of designated Ancient Woodland as described above.

Habitat loss

The scheme primarily involves on-line widening of existing motorway carriageways. The majority of the habitats affected are of negligible/low nature conservation value, forming part of the roadside planting. Additional habitat loss arising from off-line construction of

road drainage management features affects areas of low value. With mitigation in place, there is predicted to be a residual impact of imperceptible magnitude on the ecological functioning of the habitats alongside the scheme, and thus a minor impact and not significant.

The exception to this is the residual impact due to habitat loss at Daldowie, where the loss of a small area of land (approximately 7330m^2) designated as Ancient Woodland cannot be fully mitigated by new planting. Here, residual impacts in relation to the new slip road to the M73 remain moderate adverse and significant although no actual ancient woodland remains and past disturbance has left the current habitat as scattered trees, scrub and grassland within the affected area.

Habitat fragmentation/barriers

The temporary effects of roadside vegetation removal along sections of road will be offset over time as replacement planting on re-profiled slopes matures. No other specific mitigation is proposed as the overall potential impact of fragmentation is imperceptible to low.

Direct physical damage to wildlife

Residual impacts on otter, with mitigation measures agreed with SNH in place and implemented as part of a European Protected Species licence are likely to be minor and not significant.

Disturbance due to human activity and noise, vibration, dust and light, with controls on construction activities implemented through and Environmental Management Plan (EMP) will be short-term, temporary, minor and not significant.

Effects on surface water levels and flows, and quality.

The proposed mitigation measures will help reduce or avoid adverse ecological impacts arising from the construction and operation of the proposed scheme. In the medium and long term, creation of new wetland areas adjacent to watercourses, as part of the SUDs provision will provide some localised biodiversity benefits.

Potential impacts on surface waters and associated wetland habitats will be avoided through ongoing monitoring and the implementation of measures to maintain natural surface water levels. Assuming that SEPA guidance is adhered to and all appropriate controls are set in place through an EMP and working, residual impacts on pond/wetland water levels would be imperceptible and not significant as a result.

10.7 References

Design Manual for Roads and Bridges (DMRB) Vol. 11 Environmental Assessment.

Forestry Commission Scotland, 2003. Towards a Glasgow and Clyde Valley Community Forest – an invitation to comment on next steps, Woodland in and Around Towns Conference, Cumbernauld, December 2003.

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North Lanarkshire Council, 2001. North Lanarkshire Biodiversity Action Plan, November 1999 – November 2001.

South Lanarkshire Biodiversity Partnership, 2003. South Lanarkshire Biodiversity Action Plan, March 2003

Stace, C., 1997. New Flora of the British Isles (2nd Edition), Cambridge University Press.

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11 Landscape and Visual

11.1 Introduction

The objective of this Chapter is to establish the significance of landscape and visual effects for the proposed M8/M73/M74 Network Improvements and its conceptual design, and to identify suitable mitigation measures. The assessment re-evaluates baseline conditions established at Stage 2 which determines the value or sensitivity of landscape character, quality and visual receptors. Assessments will comprise a full consideration of a scheme's likely impact, not just on the views which people experience now and in the future, but on the landscape as an amenity in its own right and as a resource for future generations.

This chapter has been prepared in accordance with the principles and techniques outlined in DMRB Volume 11 (Environmental Assessment), Section 3, Part 5. Information was gathered principally by means of desk study, but supported by site visits aimed particularly at an analysis of landscape character and quality within the study area as shown within the supporting illustrative drawings, Landscape Effects - Baseline Landscape (Figures 11.1 a-f), Landscape Appraisal (Figures 11.2 a-f), and Landscape Character and Quality (Figure 11.3 a-f). The study area is centred around the road network improvements along the M8, M73 and the M74, and includes the areas immediately surrounding the junctions, extending out to the highlighted potential viewpoints (as shown on the Landscape Appraisal Drawings, Figures 11.2 a-f) within the theoretical area of visibility. The Landscape and Visual Impact Assessment has also been undertaken with reference to the methodology set out in *The Landscape Institute and The Institute of Environmental Management Assessment's Guidelines for Landscape and Visual Impact Assessment (2002)* in order to incorporate the most current and accepted techniques; 'Landscape Character Assessment Guidance for England and Scotland' published by the Countryside Agency and Scottish Natural Heritage; and Planning Advice Notice 58 – Environmental Impact Assessment, as published by the Scottish Executive.

Relevant published documents were reviewed as detailed in Section 11.12, References. Site specific information was also gathered via consultation with statutory bodies including Scottish Natural Heritage (SNH), the Royal Commission on the Ancient and Historical Monuments of Scotland, North Lanarkshire Council and Glasgow City Council. The visual assessment at Stage 3 requires illustrated description of the anticipated significant effects of the development proposal to identify receptors; properties and areas/ routes of public access affected. The Photo Viewpoint illustrations (Figures 11.4 – 11.36) show the existing views and landscape features that are visible from the receptors and in addition to the Landscape Effects - Baseline Landscape (Figures 11.1 a-f), Landscape Appraisal (Figures 11.2 a-f), and Landscape Character and Quality (Figure 11.3 a-f), help to determine details of the visual baseline, predicted effects, mitigation measures, the magnitude of effects and significance of effects.

Data collection was undertaken by way of familiarisation with the site (principally by car from the surrounding minor roads and tracks), desk study and field survey on foot. Since

landscape and visual impact assessment are closely related, the data collected have been used for both as appropriate.

11.2 Landscape Effects Methodology

11.2.1 Landscape Assessment Methods

The five main steps in the landscape assessment process are:

- Data collection;
- Description of landscape baseline;
- Classification (character) and evaluation (value and sensitivity)
- Identification of potential positive/ negative effects; and
- Assessment of significance of identified effects.

Landscape assessment consists initially of the collection of baseline data relating to the components, character and scenic quality of the landscape, and an assessment of the sensitivity of the landscape to change. In undertaking the assessment, consideration was given to the following factors:

- Experience of the landscape is not only visual, but involves all five senses;
- Data relating to the components of the landscape, its character and quality will include reference to baseline information presented in separate related sections (e.g. Ecology and Nature Conservation, Cultural Heritage);
- The value placed on an area is dependant not only on its inherent scenic quality, but on its situation, rarity and usage;
- Historical and cultural associations may contribute to the value placed on landscape not generally considered to be of visual or other importance; and
- Landscapes which, although not of a quality to warrant national or regional designation may be of great local value.

11.2.2 Landscape Resource

The landscape resource refers to landscape elements or an assemblage of elements that may be directly or indirectly affected by the proposed development. This may include topography, geological or man made elements, woodland, trees and hedgerows, land use, and combinations of these elements that create distinctive landscape character.

Landscape effects associated with the proposed scheme are determined by reference to the predicted changes to the physical landscape, the character and quality of the landscape resource (the receptor), and how this is perceived and experienced. Landscape assessment considers the different aspects of the landscape resource, which are outlined below:

Elements – individual landscape components such as hills, valleys, woods, trees and hedges, ponds, buildings and communication routes (including prominent or eye-catching features that are quantifiable and easily described);

Characteristics – elements, or combinations of elements, that contribute to the particular character of an area (including intangible characteristics such as tranquillity, wilderness and cultural associations); and,

Character – a distinct, recognisable and consistent pattern of elements and characteristics that creates distinctiveness and a sense of place. Areas of similar character can be described and identified on maps. Designated landscapes, such as historic gardens, conservation areas or National Scenic Areas, for example, are often acknowledged for their unique landscape character.

The aim of the desk study is to identify the landscape resource components:

- Landscape designations;
- Landscape character;
- Topography;
- Vegetation of significant landscape value;
- Areas of important features of historical, cultural or local importance.

The desk study also helps to identify possible mitigation measures.

The field survey was undertaken as part of the assessment process to confirm the information obtained during the desk study and to gain any additional in-situ details. The extent of the study area for the landscape baseline study was determined following desk study and site survey to identify those areas of the landscape which may be affected directly or indirectly by the proposals. As part of the field survey a theoretical area of visibility was identified, showing the principal visual receptors from which the road or traffic may be visible, concentrated around Visually Intrusive Highway elements and assessed the significance of potential effects, as stated within DMRB Guidelines Stage 3. This is considered further in section 11.5 Visual Effects Methodology.

Public use of open spaces, roads and footpaths was observed during the course of the field survey. This has a direct bearing on landscape as a human resource and is taken into account in the evaluation process. Further information relating to public use of the environment is provided within Pedestrians, Cyclists, Equestrians and Community Effects (Chapter 13).

11.2.3 Landscape Character

Recent National Planning Policy Guidelines (NPPG's 1, 14 & 18) highlight the importance of sound analysis of the character of an area. The assessment analyses the baseline conditions highlighting the unique features (landscape resource) which can be attributed

to a recognised landscape character. The landscape is classified into broadly homogenous units of character based on existing character assessments (such as that carried out by Scottish Natural Heritage, SNH), regional or local landscape character assessments or designations (such as that which may be carried out by a local authority) and detailed analysis of the landscape resource baseline data to determine site specific character areas for the purposes of this assessment.

The significance of landscape effects depends upon the extent to which the landscape changes are perceptible in the wider context. In the context of the Network Improvements, this includes the relationship of the scheme to the identified landscapes within the study area, Local Plan and the SNH Character Areas.

Value and Sensitivity of the Landscape Resource

The landscape resource has an associated value and sensitivity. Value is a measure of the perceived importance of the components and features of the landscape to users. Sensitivity is a measure of the capacity of the landscape to accommodate change without impacts on character.

Landscape Value

For the purpose of this assessment, landscape value has been defined as “the importance ascribed to the landscape by public perception, value to the community or professional judgement.” In this study, informal public use of open spaces, roads and footpaths as observed during the course of the field survey, together with professional judgement of landscape sensitivity (see below), was used to ascertain the value of the landscape and whether this was considered to be of local, regional or national importance.

The guidelines stated within SNH and The Countryside Agency “Landscape Character Assessment: Guidance for England and Scotland” recommend the development of thresholds of landscape value and Table 11.1 provides a definition of the criteria used to assess value for the purpose of this study. The assessment of landscape value aims to reflect the perceived value of the landscape at a specific scale. For the purposes of this study the following criteria is used to assist in determining landscape value and describe why it is important.

Table 11.1 – Criteria for Assessing Landscape Value

Value		Typical Criteria	Typical Scale	Typical Examples
High	Exceptional	High importance and rarity; No or very limited potential for substitution	Designated at International or National level	World Heritage site, National Park, Area of Outstanding Natural Beauty (AONB), National Scenic Area (NSA), Environmentally Sensitive Area (ESA).
	High	High importance and rarity Limited potential for substitution	Designated at a National or Regional level.	National Park, AONB, National Scenic Area, Areas of Great Landscape Value (AGLV), Regional Scenic Area.
Moderate	Medium	Medium importance and rarity Limited potential for substitution	Designated at a Regional or Local level.	AGLV, Regional Scenic Areas, ESA
	Medium - Low	Medium importance and rarity Some or good potential for substitution	Undesignated but of Regional or, local scale value	Undesignated but value expressed for instance in demonstrable use
Low	Poor	Low importance and rarity	Local	Areas identified as having some redeeming feature or features and possibly identified for improvement
	Very poor	Degraded condition	Local	Areas identified for restoration or improvement.

Table 11.1 establishes general guidance on the perceived level of landscape value. A landscape may have international, national, regional or local level planning and environmental designations, which can be used as an indicator of landscape value.

Landscape value can be assessed based on the perception of particular characteristics that contribute to a sense of place, or to user experiences of the landscape.

A protected or designated landscape reflects the perceived value of the landscape to society as a whole and assigns a scale of the value (national, regional or local). The

'broad brush' nature of any designations as stated within Table 11.1, and their boundaries require more detailed study at a site-specific scale. This establishes what is locally important about the affected landscape and to whom it is important.

In addition landscapes that are not of a value to warrant national or regional designation may be of great local amenity value, in particular natural features, semi-natural vegetation, local parks and gardens in urban areas. Quality is a factor which contributes to the value of a landscape and considers the condition of a landscape and its constituent elements and characteristics. Quality can be classified as low, medium, high or unclassified.

Landscape Sensitivity

Landscape Sensitivity equates to the degree to which a particular landscape can accommodate change arising from a particular development, without detrimental effects on its character, quality or value Sensitivity is influenced by the following:

- Existing land use;
- The pattern and scale of the landscape;
- Visual enclosure/openness of views of the landscape, and distribution of visual receptors; and
- Landscape value, including landscape designations (as set out in Table 11.1).

Table 11.2 below determines criteria for assessing the sensitivity of the landscape resource.

Table 11.2 – Landscape Sensitivity Criteria

Sensitivity	Criteria
High	Important elements of a landscape of a particularly distinctive and valued character (e.g.: National Park, AONB) susceptible to relatively small changes. Landscape features of particularly distinctive character such as broadleaf woodland and mature trees, old intact diverse or visually significant hedgerows, significant landforms, natural watercourses, historic/archaeological features, natural and semi-natural vegetation.
Medium	A landscape of moderately valued characteristics, perhaps of local or regional significance and reasonably tolerant to changes; or a formerly highly sensitive landscape whose sensitivity has been degraded by the presence of intrusive features. Landscape features such as coniferous forest and scrub, young fragmented or species poor hedgerows, young or senescent trees, recent or fragmented walls.
Low	Low value or degraded landscape tolerant of substantial change without adverse impact on character. Landscape features such as arable land or improved grassland, derelict or reclaimed land, fences, degraded or remnant hedgerows, dead, moribund or diseased trees, general landform without significant features.

Magnitude of Effects

Magnitude of effects are the extent and degree to which the fabric and character of the landscape changes as a result of the proposed development. An evaluation of the magnitude of the proposed changes on the elements of the landscape, through which the preferred route option will pass, was carried out through a review of the nature, scale and extent of the change, together with its duration and degree of permanence, using the criteria outlined in Table 11.3.

Table 11.3 – Landscape Magnitude of Effects Criteria

Magnitude	Criteria
Severe	Total loss of, or major change in key landscape characteristics over an extensive area.
Substantial	Notable change in landscape characteristics over an extensive area ranging to very intensive change over a more limited area.
Moderate	Minor changes in landscape characteristics over a wide area ranging to notable changes in a more limited area.
Slight	Minor changes in landscape characteristics over a limited area.
Negligible / None	No change or virtually imperceptible change to landscape components.

11.2.4 Significance of Effects

Significance is not absolute and is defined in relation to individual developments and their context and location. The two principal criteria determining significance are the magnitude of the effects and the sensitivity of the receptor. A higher level of significance is generally attached to large-scale effects or changes to sensitive or highly sensitive receptors; thus moderate effects on highly sensitive sites can be more important than severe/substantial effects on less sensitive sites. Professional judgement is required to make a balanced and objective assessment taking all of these criteria into account.

Significance thresholds can therefore be determined from different combinations of sensitivity of the landscape resource and magnitude of effects, which is simplified in Table 11.4.

Table 11.4 –Significance of Landscape Effect

Resulting Significance of Effect					
Sensitivity (Table 11.2)	**Magnitude of Effects (Table 11.3)**				
	Severe	**Substantial**	**Moderate**	**Slight**	**Negligible / None**
High	Substantial Effect (significant)	Substantial Effect (significant)	Substantial Effect (significant)	Moderate Effect (significant)	Slight Effect (not significant)
Medium	Substantial Effect (significant)	Substantial Effect (significant)	Moderate Effect (significant)	Slight Effect (not significant)	No change (not significant)
Low	Moderate Effect (significant)	Moderate Effect (significant)	Slight Effect (not significant)	Slight Effect (not significant)	No change (not significant)

Overall significant effects may be adverse, neutral or beneficial, and are assigned a level on the scale: No change/Negligible-Slight-Moderate-Substantial, taking into account mitigation measures and different stages of the project lifecycle. Intermediate levels, such as slight to moderate, may also apply. The following Table 11.5 assigns criteria to each level of landscape effect, as applied in this assessment.

Effects of “moderate” or greater significance are considered “significant” in terms of the Environmental Impact Assessment (Scotland) Regulations 1999.

Table 11.5 –Criteria for Significant Landscape Effects

Significant Effect	Definition – The Proposed Scheme Residual Effects
Substantial Adverse Effect	Cannot be fully mitigated. Effects at complete variance with character landform, scale and pattern Will be substantially damaging to a high quality landscape.
Moderate Adverse Effect	Out of scale with landscape resource, leaving an adverse effect on a landscape of recognised quality.
Slight Adverse Effect	Does not quite fit into the landform and scale of the landscape affecting an area of recognised landscape character.
No Change (Negligible)	Does not affect the landscape or complements the scale, landform and pattern of the landscape, maintaining existing quality
Slight Beneficial Effect	Potential to improve landscape quality & character fitting scale, landform, and landscape pattern.
Moderate Beneficial Effect	Potential to improve landscape quality & character to enable restoration of previously removed valued features.
Substantial Beneficial Effect	Environmental fit responds well within the site context, improving the quality of the valued landscape character through the removal of damage caused by existing land uses or addition of beneficial features.

Separate assessments concentrating upon discrete sections of road and each aspect of the landscape have been undertaken due to the complexity of the road scheme.

11.3 Baseline Conditions

The proposed route corridor is to the east of Glasgow, centred around the M8, the M73 and the M74, and the settlements of Easterhouse, Barlanark, Swinton, Crosshill, Bargeddie, Broomhouse, Kylepark, Calderbraes, Uddingston, Bothwell and Hamilton, as well as settlements of isolated dwellings and buildings including Daldowie Crematorium, agricultural dwellings; Bothwell Park Woodhead; East Haughhead; Ellismuir and Newlands Farms. The network improvements include online widening, SUDS facilities, junction adjustments and widening, and a replacement accommodation bridge over the M73.

The landscape through which the route corridor travels includes fragmented patterns of agricultural land, of both pastoral and arable uses, narrow steep-sided valleys cutting into plateau farmlands, areas of significant semi-natural vegetation and rich broadleaf woodlands. The existing road corridors of the M8, M73 and M74 planting schemes, large bodies of water, grassland and woodland in the Strathclyde Country Park dominate within

the valley floor in this area. Pockets of remnant pastoral farming along the route corridor retain an important recognised landscape structure of mature farmland hedges and trees in some areas whilst in others suffer serious decline.

The extents of the study area includes the areas immediately surrounding the junctions, extending out to the highlighted potential viewpoints (which are shown on the Landscape Appraisal Drawings, Figures 11.2 a-f) within a theoretical area of visibility and the landscape of the area surrounding the road network improvements (along the M8, M73 and M74) which may be affected upon by the predicted direct or indirect impacts.

11.3.1 Landscape Designations

The associated relevant planning designations, as designated by North Lanarkshire Council and South Lanarkshire Council, are summarised below (see Figures 11.2 a-f Landscape Appraisal for details of designated areas);

- Green Belt;
- Conservation Area;
- Nature Conservation Designations;
  - Site of Special Scientific Interest (SSSI);
  - Sites of Importance for Nature Conservation (SINC's); and
  - Local Nature Reserves.
  - Corridor of Landscape and Wildlife Importance
- Sites of Special Landscape Importance
- Historic Gardens, designated landscapes and settlements, archaeological sites; and
- Urban greenspace (Strathclyde Country Park), river landscapes (SSSI, SINC, SSLI), deciduous woodland in the form of farm woodlands and hedgerow trees (some designated as Ancient Woodland, Protected Urban Woodland, Protected Trees (TPO).

Figures 11.1a-f and 11.2a-f (Baseline Landscape and Landscape Appraisal) and Figures 8.1 a-f (Land Use, Development and Community Land) illustrate the existing landscape elements / features identified within the study area.

11.3.2 Landscape Character

In a regional context the study area forms part of the Clyde Basin Farmlands Regional Character Area (RCA) identified in the Glasgow and the Clyde Valley Landscape Assessment, prepared for Scottish Natural Heritage (SNH), which comprises much of the lowland area of the Clyde Basin surrounding the Glasgow conurbation.

Key features of the Clyde Basin Farmlands (RCA) include;

- Drumlins and other glacial or fluvial glacial landforms;
- River landscapes;
- Deciduous woodland in the form of farm woodlands and field boundary trees;
- Pastoral and some arable farming;
- Historic settlements and archaeological sites;
- Castles and historic houses with associates estates;
- Numerous features relating to the area's industrial heritage; and
- Current mineral working.

The study area lies within three landscape types as described below, and six landscape units, as defined by SNH in the Glasgow and Clyde Valley Landscape Assessment and as shown on Landscape Character and Quality, Figures 11.3 a-f. These landscape types are described below:

- Fragmented Farmland (including the Landscape Units of M73/ Drumpelier and North Calder Water);
- Incised River Valley (including the Landscape Units of Uddingston Clyde and North Calder Water); and
- Broad Urban Valley (including the Landscape Units of Bothwell – Motherwell and Carmyle - Newton);

The detailed character of urban areas is not considered within the SNH Landscape Assessment. In addition to the three SNH landscape types above, for the purposes of this assessment the following category has been identified which addresses the urban areas within the study area.

- Urban Area (west of Baillieston to Easterhouse and west of Raith to Calderbraes)

Evaluation of the three SNH landscape types has been undertaken even though the Incised River Valley is not significantly affected by the road proposals. This highlights the valued landscape components and features which help to determine the regional and local character, and which provide its unique sense of place and subsequent perceived landscape value.

The three key components of the landscape, as described in the SNH Landscape Character descriptions, are; landform, vegetation/landcover of significance and cultural/ historical associations. Relevant characteristics are summarised below from the original report No. 116; Glasgow and the Clyde Valley landscape assessment, prepared by Scottish Natural Heritage (SNH).

Fragmented Farmland (including the Landscape Units of M73/ Drumpelier and North Calder Water)

Landform:

Key Characteristics:

- The Fragmented Farmlands defined by their damaged and fragmented character, occurring where urban fringe and industrial activity has broken up previous farming patterns to the extent that they are no longer predominant in the landscape.
- Visual influence of the urban edge of former and current urban development and transportation infrastructure.
- These Fragmented Farmland landscapes occur along major road routes at the urban fringes (A8/M8) and are therefore important strategic 'gateways' into Glasgow and form many people's first impression of the city.

Vegetation / Landcover: (of significance)

Key Characteristics:

- Pockets of remnant pastoral farming, in some areas retaining an important recognised landscape structure of mature farmland hedges and trees, but in others suffering from serious decline.
- Areas of significant semi-natural vegetation occur mostly in the under-developed river valleys.
- Unique physical features associated with the recognised designated (Green Belt/ SINC's) and designed landscapes are most commonplace.

Cultural and Historical Associations:

Key Characteristics:

- Urban fringe and industrial activity fragments the agricultural, rural character. Historical industrial heritage sometimes difficult to perceive, but the urban areas have a direct or indirect adverse effect on this landscape type.
- Rich archaeological and historical qualities. Industrial heritage features such as bings, tip, quarries, derelict railways and canals as well as remnants of pre-industrial estate landscapes.
- Re-opened tracts of canal (e.g. Monklands Canal) provide recreational and tourism opportunities.

- Development pressure due to good access to major transport routes has led to reclamation/ regeneration activities, which are removing these historical landscape remnants.
- Urban fringe issues of blight, management decline and anti-social behaviour such as fly tipping.

Incised River Valley (including the Landscape Units of Uddingston Clyde and North Calder Water)

Landform:

Key Characteristics:

- Narrow, steep sided valleys cut deeply into the plateau farmlands with gorge areas, burns, rivers and rapids forming waterfalls. Elsewhere erosion is evident and subsidence is common place;
- Agriculture within wider valley floodplain with a mixture of pastures and arable land use; and
- Transport routes run along the flat valley floor with steep and sinuous connecting routes running perpendicular down the valley sides.

Vegetation/Landcover: (of significance)

Key Characteristics:

- Ecologically rich broadleaf woodlands (SINC's) on steep valley sides sheltered and settled areas, often hidden within the wider landscape;
- Unique physical features of woodland, characteristic patterns of land use and settlement has created a recognised landscape character; and
- The North Calder Water and River Clyde Valley represents an important surviving corridor of undeveloped land in an area increasingly pressurised by urban fringe activities.

Cultural and Historical Associations:

Key Characteristics:

- Historic landscape features such as woodlands, walls, bridges, large houses, and designed landscapes including Glasgow Zoo and Daldowie Crematorium;
- A number of Incised River Valleys provide a recreational resource, such as the River Clyde Walkway combining access and interpretation; and
- Settlements lie within less constrained and more accessible sites which are visible from within the valley.

Broad Urban Valley (including the Landscape Units of Bothwell – Motherwell and Carmyle - Newton)

Landform:

Key Characteristics:

- Well-defined floodplain up to 1km wide bordered by valley slopes inhabited by urban areas.(Daldowie and Strathclyde Country Park);
- Settlements/ urban areas located on higher ground above the valley slopes are visible from within the valley. (Broomhouse, Bothwell, Orbiston); and
- Valley floor is dominated by road infrastructure occur along major road routes at the urban fringes (M8/M73/M74/A725) and are therefore important strategic 'gateways' into the conurbation's of Glasgow and form many people's first impression of the city.

Vegetation / Landcover: (of significance)

Key Characteristics:

- Strong settlement edge and motorway corridor has led to fragmented pattern of farm and policy woodlands;
- Introduced road corridor planting schemes and large water body, grassland and woodland planting in Strathclyde Country Park dominate within the valley floor;
- The rural character of the valley has suffered as tree cover has declined and the visual influence of settlements, transport infrastructure and mineral workings increased.(Daldowie and Bothwell Park); and
- Some unique physical features associated with the recognised designated (Green Belt/ SSSI/ SINC/ SSLI) and designed landscapes are still evident. (Raith Haugh/ Bothwell Park/Strathclyde Country Park).

Cultural and Historical Associations:

Key Characteristics:

- Rich archaeological (Scheduled Ancient Monument) and historical qualities (Conservation Area Uddingston/Bothwell). Industrial heritage features such as bings, tip, quarries, derelict railways and designed landscapes (Hamilton Palace) as well as remnants of pre-industrial estate landscapes;
- Urban fringe and industrial activity fragments the agricultural, rural character. Historical industrial heritage sometimes difficult to perceive, but the urban areas have a direct or indirect adverse effect on this landscape type;

- Development pressure due to good access to major transport routes (M8/M73/M74/A725) has led to reclamation/ regeneration activities, which are removing these historical landscape remnants; and
- Various development, past and present are defined by their damaged and fragmented rural character, occurring where urban fringe and major elements of transport infrastructure has created visual, aural and severance effects (M74/M73 A725/ Daldowie and Strathclyde Country Park).

Urban Areas (west of Baillieston to Easterhouse and west of Raith to Calderbraes)

A significant proportion of the study area lies outwith the areas described in the SNH Landscape Types, and lies within the **Urban** landscape category. The SNH Landscape Character Types consider regional character areas, and as such, the following section describes those areas with the urban category at a local level. The urban fringes still retain some rural influences, therefore the resulting character is similar to the common urban fringe features stated within 'Fragmented Farmland', notably within the environs of Baillieston and Maryville Interchanges, where there is a more open and 'rural' character and prevalence of farmland activity. The existing road corridors are a significant and dominant feature of the landscape in many parts of these areas. Urban fringe issues of blight, management decline and anti-social behaviour such as fly tipping are more common place. The SNH Landscape Character Types have no precise boundaries as indicated on Figures 11.3 a-f.

11.3.3 Landscape Classification – Assessment of Value

The assessment of landscape baseline conditions, as illustrated on Figures 11.1 to 11.3 has highlighted the individual features and components of value at a local level and indicates any national or regional designations and descriptions. The landscape quality (or condition) relates more closely to landscape features and the associated physical appearance of these elements in terms of a visual (woodland screening/ prominent landform/ built form edge), functional and ecological perspective (Landscape Designations / Characters), as illustrated on Figures 11.2 a-f, Landscape Effects Landscape Appraisal and contributes to the value ascribed to a landscape.

The Landscape Quality & Appraisal Summary and Landscape Resource Assessment tables, read in conjunction with Figures 11.2 a-f, provide an overview of the landscape resource.

The landscape character within the road corridor setting is not of a quality to warrant national or regional designation. It is assessed to be of local value therefore moderate (medium to low value) with ranging levels of quality, set predominantly within, the urban fringe. A field study was undertaken from public roads and footpaths noting the physical and human influences on the landscape and any current trends/pressures for change. The resulting local landscape descriptions of the study area are shown on Figures 11.3 a–f and are generally categorised as follows;

Fragmented Farmland (including Landscape Units M73/Drumpelier and North Calder Water) is medium quality typically;

Noticeable detracting features; dismantling strong landscape structure; degrading the original characteristic with a weakened pattern due to the part removal of landform/cover; a lack of management or intervention due to development pressure resulting in a localised degradation. Elsewhere the continued agricultural management retains worthy features contributing to a unique sense of place, as illustrated in Photo Viewpoints 4, 29 and 30.

Elements – The individual elements of the predominantly managed area of open farmland with pasture or cereals, woodland block and hedgerows contribute to this agricultural area. Development of settlements and road infrastructure are more obvious due to their scale and contribute to the urban fringe features.

Characteristics – The characteristics of this particular area are formed by the combination of elements of farmland trees and hedgerows within a patchwork of arable/pasture that contribute to this area of agriculture and informal recreational activities. More urban development close to Coatbridge, Crosshill and Birkenshaw increase the encroachment into the rural setting creating a more prominent 'green wedge' between the settlements.

Character – This agricultural area has a damaged and fragmented pattern of features due to the historic industrial/ urban fringe developments. The removal of hedgerows and field patterns provides a greater scale to the landscape forming strategic gateways to Glasgow. Where agricultural practices remain the recognised farmsteads and associated land uses preserve the more rural character, predominantly to the north of Baillieston Interchange.

Sensitivity – Low sensitivity due to the degraded character of the landscape features and its tolerance to change without adverse effect on the character.

Incised River Valley (including Landscape Units Uddingston Clyde to North Calder Water) is high quality typically;

This area has a recognised landscape structure, characteristic, pattern and combinations of landform/ cover are still evident. There are unique natural features worthy of conservation. Few detracting features (predominately the existing road infrastructure) are present, and typical characteristics are as illustrated on Photo Viewpoints 8, 12, 29 and 30.

Elements – This is predominantly riparian / wet woodland adjacent to the steep sided river valley which contains woodland, scrub, reeds and wet marginal grassland. Flat open valley floor provides a mixture of arable and pastoral land, typically located to the south of the Maryville Junction.

Characteristics – The characteristics of this particular area are formed by the combination of elements of ecologically rich broadleaved woodland with some scrub and wetland that contribute to this area's character. These areas provide shelter and are often hidden within the wider setting. Well defined field pattern within the agricultural land.

Character – This area to the north of the Maryville towards the Baillieston interchanges has a distinctive pattern of elements, it is dominant wooded linear feature following the river and liable to flooding. Parts are classed as a 'Site of Importance for Nature Conservation' (SINC), Site of Special Landscape Importance.

Sensitivity – Medium sensitivity due to its recognisable character and features, which make it less tolerant to change without an adverse effect on the character.

Broad Urban Valley (including Landscape Units Bothwell – Motherwell and Carmyle - Newton) is medium/high quality typically;

Rare or occasional detracting features, strong landscape structure; characteristic, balanced pattern and combinations of landform/cover with distinct features worthy of conservation, creating a definitive sense of place typical characteristics, are illustrated in Photo Viewpoints 9, 16, 23, 24, 28 and 34.

Elements – The individual elements that contribute to the quality of The Strathclyde Country Park are predominantly the managed area of open amenity grassland, large boating lake, dense wooded vegetation and transportation routes contribute to this recreational area. Daldowie Crematorium is of a similar parkland character but smaller in size, adjacent to the River Clyde.

Characteristics – The characteristics of this particular area are formed by the combination of elements of trees, scrub and wetland that contribute to this area of community land use for informal sports and recreational activities.

Character – This area has a consistent pattern of features such as roadside planting, amenity grassland areas and large water bodies/ tree lined river habitat. This parkland and crematorium is a valued community landscape resource within the Broad Urban valley.

Sensitivity – Medium sensitivity due to its distinctive character and features, which make it less tolerant to change without an adverse effect on the character.

Urban (west of Baillieston to Easterhouse and west of Raith to Calderbraes) – Locally medium / low quality typically.

Noticeable infrastructure features related to settlements and communication routes, introducing strong structure into the landscape; degrading the original rural characteristic with a weakened pattern due to the part removal of landform/cover. A lack of

management or intervention due to development pressure results in a localised degradation. Typical characteristics are illustrated in Photo Viewpoints 1, 3 and 6.

Elements – Development of settlements and road infrastructure are more obvious due to their scale and contribute to the urban fringe features. The individual elements of open space include urban farmland with recreational corridors, roadside woodland and hedgerows, contributing to the valuable greening of the urban fringe area.

Characteristics – The characteristics of this particular area are formed by the combination of elements of limited farmland trees and hedgerows within a patchwork of open space and settlements linked by communication routes linear in nature which contribute to this disjointed area of agriculture and informal recreational activities and urban fringe. More urban development close to Coatbridge, Crosshill and Birkenshaw increase the encroachment into the rural setting creating a more prominent 'green wedge' between the settlements.

Character – The settlement expansion into the surrounding rural areas has resulted in fragmented pattern of features of contrasting character. The historic industrial/ urban fringe developments are masked by a combination of naturalistic features some original, most introduced. These valuable green spaces provide a greater scale to the urban landscape forming strategic recreational areas and routes within the outer conurbations of Glasgow.

Sensitivity – Low sensitivity due to the degraded character and landscape features in addition to its tolerance to change without adverse effect on the character.

11.3.4 Local Landscape Descriptions

The majority of the road improvements occur within the urban areas and it is therefore likely that any changes to the road will have an effect on these areas more than any other. The Urban character areas within the study area have been broken down into smaller, more localized areas which have a distinct character. These areas are as follows:

- Easterhouse, Swinton and Crosshill;
- Bargeddie and the area around Baillieston Junction;
- Broomhouse;
- Calderbraes and Uddingston; and
- Bothwell

Within the SNH Landscape Type *Fragmented Farmland*, an additional local character area has been identified as an important area in relation to the proposed development, which is:

- Tannochside, which is located between the North Calder Water and Calderbraes.

A brief description of the character of these areas is provided below.

Urban: Easterhouse, Swinton and Crosshill

These areas have pockets of dense residential properties, which are interspersed with pockets of commercial and industrial warehouses and factories. The M8 passes through this area and is a dominant feature within the landscape, contributing to the character of this area both visually and audibly. There are pockets of open space, which create open and exposed character in parts. Vegetation in these areas is predominantly amenity grassland or unimproved grassland and tall ruderal species. The road corridor is lined with large shrubs and trees on both sides. This area has a low/medium quality.

Urban: Bargeddie and the area around Baillieston Junction

This area is dominated visually by the presence of the large Baillieston Junction. Surrounding this junction is a mixture of fields to the south, which share the character of the *Fragmented Farmland Landscape Type* and small areas of woodland to the north of the junction. The character is predominantly open and exposed with panoramic views across the broad valley to the south. Small farmsteads are dispersed through the area. This area has a low/medium quality.

Urban: Broomhouse

This area is dominated by large areas of mature woodland and there is also a large area of ancient woodland between Broomhouse and the M74. The landform around Broomhouse rises up on to a hill, which has its highest point just to the north of Broomhouse. The M74 is not a dominant feature in this character area, as it is screened by the large areas of woodland. This area has a low/medium quality.

Urban: Calderbraes and Uddingston

These areas are mainly residential detached or semi-detached properties surrounding a large area of retail warehouses and industrial factories to the east and west of the M74 around Bellshill Road. The M74 has mature roadside planting on both sides, which makes the road corridor a less prominent feature in the landscape. This area has a low/medium quality.

Urban: Bothwell

This area is predominantly residential properties, a large part of which are in a conservation area. There are two large areas of tree preservation orders within the settlement. The local designations in this area result in a landscape of medium quality.

Fragmented Farmland: Tannochside

This area is with the *Fragmented Farmland Landscape Type* and therefore is made up of fields with degraded boundaries. This area lies at the top of the valley and has a very open and exposed character with clear panoramic views across the valley, which look over the North Calder Water and fields beyond. Due to the open nature of this area, the M73 is clearly visible and is a dominant feature in the landscape. This area has a medium quality.

11.3.5 Landscape Classification – Summary

The urban fringe landscape context of the scheme combined with no nationally recognised designations suggests the perceived value is predominantly moderate (medium to low) using the criteria set out in Table 11.1 – Criteria for Assessing Value.

A detailed field survey provided quantification of the landscape value perceived by the local community and society affected by the road scheme and the higher value placed upon it due to the accessibility and landscape resource within the existing site context.

For the purposes of this assessment the determination of landscape quality has been based on the condition of the described landscape elements and features that contribute to the differing characters as stated.

This established the subjective landscape quality areas of low, medium, high & unclassified, using the above methodology, modified by the observed 'urban fringe' influence upon the landscape resource. This led to localised downgrading or upgrading in areas where perceived scenic value is considered to increase quality. Landscape Quality for the study area is illustrated on Figures 11.3 a–f Landscape Effects - Landscape Character and Quality.

SNH have identified policies for the three LCAs that are within the study area. These include guidelines which have been considered when developing mitigation measures:

- *Incised River Valleys*- Landscape planning and management should aim to conserve and enhance the distinctive combination of landform, land cover and settlement features that distinguish the Incised River Valleys within Glasgow and the Clyde Valley. Conservation and appropriate management of woodlands, together with the sensitive control of development are central to this objective.
- *Fragmented Farmland*- Planning and management should aim to conserve and restore the surviving rural character of this landscape type, to enhance areas which have become degraded as a result of past patterns of industrial activity and to reduce the visual intrusion of urban and transport features.
- *Broad Urban Valleys*- Planning and management should aim to manage the existing landscape to reduce the visual influence of urban and transport features and to create a new and integrated landscape where former areas of countryside have been lost, and derelict or damaged land left in its place. A framework for the long term restoration of such areas should be established.

11.4 Predicted Landscape Effects

11.4.1 Introduction

The methodology and criteria described in Section 11.2 have been used to assess the predicted landscape effects of the preferred scheme, taking into account the likely magnitude of effects, and the sensitivity of the landscape resource being affected, in

order to determine the significance of the effect. See Table 11.6 and 11.7, Figures 11.4 - 11.36 (Photo Viewpoints 1-34)

The conceptual design for the scheme has the potential for significant effects on the landscape resource - directly within the proposed development footprint and indirectly upon the wider site context. The nature of the impacts have been assessed considering the following factors:

- Direct / indirect.
- Permanent / temporary.
- Short / long term.
- Positive / negative.

11.4.2 Landscape Effects

The main potential negative effects on landscape character are briefly summarised as:

- Permanent change in land use/management as a result of the proposed land take associated with the chosen option/ preferred route;
- Permanent alteration to topography and skyline due to the introduced landform of road embankments, cuttings, bridge structures and elevated slip roads;
- Temporary/permanent loss of woodland during construction phase and disturbance to flora and fauna as a result of associated activities;
- Some changes to land cover resulting from mitigation measures e.g. native mixed broad-leaved woodland planting around major new junction layouts. Change in perceived landscape pattern and environmental fit;
- Permanent alteration to public access and recreation routes linking the main settlement/leisure/commercial destinations. Increased possible severance caused by proposed option and new provision of linkages to the wider community surrounding the new road alignment (See Chapter 8); and
- Cumulative effects as a result of the proposed development in relation to; heritage and nature conservation sites; watercourses and drainage regimes, human beings and surrounding amenity.

The landscape effects assessment above relates to the Network Improvements scheme. Other road improvement schemes associated with the M8 and M74 networks are addressed in the M8 Baillieston to Newhouse Environmental Statement (MFJV March 2006) and M74 Junction 5, Raith Environmental Statement (MFJV March 2006).

Effects on Landscape Character

Table 11.6 summarises the areas, and the features within them, which will be affected by the proposals.

Table 11.6 – Landscape Receptors (see Figures 11.4 -11.36, Photo Viewpoints 1 – 34)

Location Area	Sheet	Source of Impact / Quality / Value	Affected Landscape
Easterhouse	1 of 6	Route widening – Medium	Corridor of Landscape and Wildlife Importance, Green Belt, Site of Special Landscape Importance , Roadside planting (Other planted features)
Swinton	1 of 6	Route widening – Medium	Corridor of Landscape and Wildlife Importance, Green Belt, Site of Special Landscape Importance , Roadside planting (Other planted features)
Bargeddie/ Baillieston Interchange	2 of 6	Route widening – Medium	Corridor of Landscape and Wildlife Importance, Roadside planting (Other planted features)
North Calder Water	2 of 6	Route widening – High/ Medium)	Greenbelt, SINC, Corridor of Landscape and Wildlife Importance, Roadside planting (Other planted features) around M73.
Calderbraes	3 of 6	Route widening – High	Roadside planting (Other planted features)
Daldowie/ Broomhouse	3 of 6	Route widening – High/ Medium/ Low	SSSI, Greenbelt, Corridor of Landscape and Wildlife Importance, Roadside planting (Other planted features, TPO)
Calderbraes/ Kylepark	4 of 6	Route widening – Medium	Green Belt, Roadside planting (Other planted features, TPO)
Uddingston	4 of 6	Route widening – Medium	Greenbelt, Roadside planting (Other planted features)
Bothwell/ Bothwell Park	5 of 6	Route widening – Medium/ Low	Green Belt, SINC, Roadside planting (Other planted features)

Location Area	Sheet	Source of Impact / Quality / Value	Affected Landscape
Raith Junction	5 of 6	Route widening – Medium/ Low	SSSI, Designated Landscapes/ Historic Gardens, Green Belt, Roadside planting (Other planted features)
Strathclyde Country Park	6 of 6	Route widening – Medium	SSSI, Designated Landscapes/ Historic Gardens, Green Belt, Roadside planting (Other planted features)
Hamilton Low Parks	6 of 6	Route widening – Medium	Designated Landscapes/ Historic Gardens, Green Belt, Roadside planting (Other planted features)

Effects on Landscape Elements

The following section sets out the predicted impacts upon landscape elements. These are also summarised in Table 11.7, with residual impacts being those remaining after implementation of mitigation measures (see also Section 11.7).

Effects on Landform

The existing landform is dominated by the various road corridors within the broad urban valley, with agriculture in between urban fringe located on the elevated valley sides.

The scheme will involve localised re-modelling of topography and skylines due to the route widening and construction of bridge structures including the widening of the M74 bridge and the rebuilding of accommodation bridge. The proposed route will remove existing landcover in the form of mature roadside planting due to the extended road footprint.

Changes to landform are predominantly localised to the area immediately adjacent to the existing road pavement due to the extended road footprint (, although there will be some changes to the landform caused by the SUDS facilities. These works will cause little change to the existing landform due to their design and scale and will not cause widespread or notable alterations to the landscape resource in the long-term due the mitigation strategy.

Overall the changes to the landform are considered to be of Slight Magnitude due to the scale/ degree of permanence of change upon the landscape resource.

Changes to Land Use / Management

Predominantly the road widening and re construction of the bridge structures will take place within the existing highway corridor. No significant long term changes will alter land use post construction. There will be some minor change in land use due to the SUDS facilities. Reinstatement mitigation measures will look to reintroduce the features removed initially.

Overall the changes to land use are considered to be of Slight Magnitude due to the scale/ degree of permanence of change upon the landscape resource.

Effects on Vegetation / Land Cover

The loss of roadside planting along the existing M74/M73 and M8 corridors (on embankments) because of road widening, will affect the edge of the roadside woodland. The proposed route will remove existing landcover in the form of mature roadside planting due to the extended road footprint. This will also result in loss of some land designated as ancient woodland at Broomhouse. There will be some loss of vegetation due to the creation of the SUDS facilities. Mitigation measures will look to reintroduce the features removed initially.

Overall the changes to vegetation/ landcover are considered to be of Moderate Magnitude due to the scale/ degree of permanence of change upon the landscape resource.

Effects on Designated Areas

Site of Special Scientific Interest (SSSI)

The new road widening proposals of the southbound M74 are limited to within the existing highway boundary but may indirectly affect, during construction, the Hamilton Low Parks SSSI within the Broad Urban Valley (See Figures 11.28 – 11.30, Photo Viewpoints 25 - 28).

Overall the changes to SSSI are considered to be of Negligible Magnitude due to the scale/ degree of permanence of change upon the landscape resource.

Local Nature Reserves & Site of Importance for Nature Conservation (SINC's)

The SINC to the west of the Raith Junction may be adversely affected indirectly by the new road provision, but not significantly (see Photo Viewpoints 24 and 34). It may also be affected in the short term by the proposed SUDS facility at Bothwell, although once established, the SUDS facility will benefit the SINC.

Overall the changes are considered to be of Negligible Magnitude due to the scale/ degree of permanence of change upon the landscape resource.

Corridor of Landscape and Wildlife Importance

Disruption of infrastructure roadside woodland planting has been minimised due to the soil engineering design. Loss of roadside planting along the existing M74/M73/M8 corridor due to the 4 lane running (with hard shoulder) and around new slip road widening proposals at Easterhouse and Broomhouse (see Photo Viewpoints 1-4 and 9–10).

Overall the changes are considered to be of Negligible Magnitude due to the scale/ degree of permanence of change upon the landscape resource.

Tree Preservation Orders

The proposed road improvements at Maryville will directly affect protected trees around Daldowie and Powburn within the study area. Overall the changes are considered to be of Moderate Magnitude due to the scale/ degree of permanence of change upon the landscape resource.

Historic Gardens / Designed Landscapes

The effects of the proposed road improvements on this designated area (Hamilton Low Park), will involve some initial loss of mature roadside planting (M74) that will be replaced through mitigation planting. Overall the changes are considered to be of Negligible Magnitude due to the scale/ degree of permanence of change upon the landscape resource.

Effects on other cultural heritage features

There are numerous National Monuments Record of Scotland (NMRS) sites, Scheduled Ancient Monuments and Listed Buildings within the study area, which are shown on Figures 11.1 a-f. Four NMRS sites may be affected directly/indirectly as a result of the changes to the landform caused by the road widening proposals. Chapter 7, Cultural Heritage describes the extent of possible effects on archaeological and heritage features in detail.

Overall the landscape changes to cultural heritage are considered to be of Negligible Magnitude due to the scale/ degree of permanence of change upon the landscape resource.

Table 11.7 – Landscape Elements Assessment (See Figures 11.2 & 11.3 Landscape Effects – Landscape Appraisal / Landscape Character and Quality)

Resource	Description	Sensitivity & Value	Magnitude of Effects	Nature of Effect	Mitigation	Short Term Impact (0-15 Years)	Residual Impact (15+ Years)
Landform / Topography	Existing road corridor within broad urban valley with agriculture in between urban fringe on the elevated valley sides (north, west and south)	Low:	Slight: Direct effect to immediate landform surrounding new junction and road corridors.	Re-modelling of topography and skylines due to introduced landform of road embankments/ cuttings, structures, slip roads and SUDS facilities.	Road alignment better integrated by responding to existing landform and retains significant existing vegetation particular affinity with the surroundings. New embankments/ cutting profiles to assist with the retention of existing visual screening (sensitive integration into existing resource) Elevated road design to consider future tree planting. Sensitive integration of SUDS facility.	Slight Adverse	Negligible
Landcover-Tree & Woodland	Irregular woodland cover enclosed rural character (east), often mature hedgerow and farmland woodland blocks. Maturing screen planting around communication routes M74/ M73/ M8 and industry.	Medium/ High:	Moderate: Direct effect to immediate tree and woodland surrounding new junction and road widening areas.	Changes to landcover around the new junction at Broomhouse. There will be a change to existing woodland due to structures, earthworks, and elevated roads throughout the scheme. Roadside woodland removal due to road widening and new over bridges. Some trees will need to be removed from the SUDS facilities locations.	Mitigation and enhancement planting of native mixed broad-leaved woodland with particular affinity with the surroundings. New enhancement planting to assist with creating ecological links whilst addressing landscape and visual effects.	Moderate Adverse	Slight Adverse
Landcover-Ancient Woodland	Areas of ancient woodland, particularly around Broomhouse,	High	Substantial: Direct effect to immediate	Existing ancient woodland will be removed due to the new junction at Broomhouse and the widening and	Ancient woodland cannot be mitigated by simply replanting so it is recommended that where there	Substantial Adverse	Moderate Adverse

Resource	Description	Sensitivity & Value	Magnitude of Effects	Nature of Effect	Mitigation	Short Term Impact (0-15 Years)	Residual Impact (15+ Years)
	where there is a substantial spread of it.		ancient woodland surrounding the new junction and road widening	earthworks of the M74 adjacent to the new junction.	is loss of ancient woodland, careful management and regeneration of the woodland edge will ensure that self seeding of the existing stock occurs in these areas.		
Landcover-Valuable Habitats	Nationally important SSSI. Locally important wildlife corridor associated with the road corridor. Isolated habitats with wetland, ponds within SINC's and Local Nature Reserves around Raith Junction of M74. Agricultural woodland, scrub and grassland habitats either side of M73.	High:	Slight: Direct effect to immediate habitats surrounding the road corridors and new junction.	Direct loss of roadside habitats during construction activities. Disturbance to existing flora and fauna adjacent to the development through operational activities. Some loss of habitats during the process of creating the SUDS facilities.	Enhancement and management of existing roadside flora and fauna. Protective measures to minimise disturbance to valuable habitats. Wildlife movement/ migratory requirements to link into green corridors. SUDS facilities to encourage as much habitat diversity as possible and once established will compensate for original loss of habitats.	Moderate Adverse	Slight Adverse

Resource	Description	Sensitivity & Value	Magnitude of Effects	Nature of Effect	Mitigation	Short Term Impact (0-15 Years)	Residual Impact (15+ Years)
Land use-Road/ rail Networks and Non Motorised User Routes	Mainline railway and road corridor containing M74, M73, M8 & minor roads. Access to countryside/ recreational resource PROW, Clyde Walkway, National Cycleway and designated paths	Low/ Medium:	Slight: Transient off site effect from receptors and restricted access within site context	Temporary restrictions/ diversions during construction phase. Improved layout addressing; visual intrusion; physical severance and travelling distances/ times for non road users.	Enhancement of native mixed broad-leaved woodland planting to assist in screening the proposed development. Continued provision for links to the wider community surrounding the development during the construction stage.	Slight Adverse	Slight Beneficial
Landcover-Drainage	Strathclyde Loch, Raith Haugh, River Clyde, North Calder and associated minor water courses/bodies	Low/ Medium:	Slight: Direct/ indirect effect to resource	Disturbance to existing resource adjacent to the development through construction/operational activities and any indirect affect on surface water bodies and water courses. The proposed SUDS facilities will treat and attenuate runoff and will reduce the likelihood of flash flooding.	Road alignment better integrated by responding to existing landform and retains significant existing watercourses/water bodies. New embankments/ cuttings profiles to assist with visual screening (sensitive integration into existing resource. The SUDS facilities will be designed and located so they do not have an adverse impact on the existing water courses and bodies and do not result in loss of habitats.	Slight Adverse	Negligible

11.5 Visual Effects Methodology

11.5.1 Visual Assessment Methodology

Visual effects relate closely to landscape effects, but arise from changes in the composition and character of available views resulting from the proposed development, from identified points, which are referred to as “receptors”. Visual assessment concerns people’s perception and response to changes in visual amenity. Effects may result from:

- new elements in the view, or;
- new features that obstruct views, or;
- loss of existing features.

As with landscape effects, visual effects can be positive or negative.

The assessment considers the approximate visibility of the development when taking into account landform and landcover; identifying principal representative viewpoints and sensitive visual receptors from publicly accessible areas within the study area.

The assessment criteria for visual effects is stated below:

- Visual Analysis – (identification of potential sources of effects) - extent to which the road will be visible (road line predicted as Visually Intrusive Highway, where cuttings/embankments are 4m above/below existing topography) from identified receptors and identification of receptors for the inclusion in a Visual Impact Schedule; residential properties, public buildings (workplaces), recreational resources and designated landscapes are illustrated on Landscape Effects - Landscape Character and Quality (Figure 11.3 a-f) and Photo Viewpoints 1-34 (Figures 11.4 to 11.36).
- Sensitivity of Visual Receptors – capacity of visual amenity to accept change are illustrated on Photo Viewpoints 1-34 (Figures 11.4 to 11.36).
- Magnitude of effects to views
- Significance of visual impacts is determined through a combination of sensitivity and magnitude of change. Significance of visual effects is illustrated on Landscape Effects - Landscape Character and Quality (Figure 11.3 a-f).
- Mitigation – measures by which effects are reduced or the road is integrated into its landscape setting. The residual visual effects of the proposed scheme have been assessed taking into account any mitigation 15 years after the scheme opens, are illustrated within the Conceptual Mitigation Strategy (Figure 19.1 a-h).

11.5.2 Sensitivity of Visual Receptors

The sensitivity of the visual receptors/ was assessed by evaluation of a range of factors, including:

- The nature and context of the receptors/;

- The nature of the existing view;
- The expectations of users/receptors (occupants of dwellings were considered to have higher expectations and more sensitive than occupants of industrial buildings/ or vehicle users);
- The importance and value of the development site in the view.

The criteria used to determine the sensitivity of the receptors to the proposed changes are shown below in Table 11.8.

Table 11.8 Sensitivity of Visual Receptors

High Sensitivity	Residential properties / public rights of way –footpaths/bridleways and waterways – where the landscape to be changed is an important element in the view
Medium Sensitivity	Local roads, tourist routes and railway lines/ Other non residential buildings - Sporting / recreational facilities/ listed buildings/ where the landscape to be changed is an important element in the view; Residential properties PROW's/ where the landscape to be changed is less important element in the view
Low Sensitivity	Roads such as motorways and strategic routes/ Other non residential buildings - Sporting / recreational facilities/ where the landscape to be changed is less important element in the view

11.5.3 Magnitude of Effects to Visual Amenity

The assessment of magnitude of effects involves the prediction of the changes to views which will result form the construction of the proposals. It takes into consideration the scale of the change to the landscape, the addition or loss of visual elements, and the amount/ of the view affected. The criteria for the magnitude of effects are presented below.

The main elements of magnitude evaluation include:

- Proportion of views effected
- Duration of activity apparent in view
- The extent of the receptors view affected by the development as a proportion of the view available;
- The distance of the receptor from the proposals;
- The angle of the view relative to the main activity of the receptor;

- The level of integration or contrast created by the proposals, and associated elements such as traffic, or construction plant during the construction phase;

The following definitions are used to determine magnitude of effects (Table 11.9):

Table 11.9 – Magnitude of Visual Effects

Severe Magnitude	All viewers affected / proposal forms majority or all of the view and alters all the components and significantly alters the character of the view.
Substantial Magnitude	Majority of viewers affected / the proposals dominate the view and fundamentally change its character and components
Moderate Magnitude	Many viewers affected / the proposals are noticeable in the view, affecting its character and altering some of its components and features
Slight Magnitude	Few viewers affected / the changes are only a minor element of the overall view that are likely to be missed by the casual observer and/or scarcely appreciated.
Negligible / None	Barely any viewers affected / change in view is virtually imperceptible.

The changes brought about by a proposal may be long or short term, permanent or temporary. Mitigation may or may not be achievable.

11.5.4 Significance of Visual Effects

Significance is not absolute and can only be defined in relation to each development and its location. For the purposes of this assessment a 'significant effect' in terms of the Environmental Impact (Scotland) Regulations 1999, whether adverse or beneficial is considered to be of either moderate or substantial significance.

The two principle criteria determining significance are the magnitude of the effects to views, and the sensitivity of the receptor. A higher level of significance is generally attached to large-scale changes and changes to high sensitivity receptors; thus small changes on highly sensitive receptors can be more important than large changes on less sensitive receptors.

Table 11.10 shows the combinations used to determine significance of the resulting effects:

Table 11.10 –Significance of Visual Effect

Resulting Significance of Effect					
Sensitivity (Table 11.8)	**Magnitude of Effects (Table 11.9)**				
	Severe	**Substantial**	**Moderate**	**Slight**	**Negligible / None**
High	Substantial Effect (significant)	Substantial Effect (significant)	Substantial Effect (significant)	Moderate Effect (significant)	Slight Effect (not significant)
Medium	Substantial Effect (significant)	Substantial Effect (significant)	Moderate Effect (significant)	Slight Effect (not significant)	No change (not significant)
Low	Moderate Effect (significant)	Moderate Effect (significant)	Slight Effect (not significant)	Slight Effect (not significant)	No change (not significant)

The thresholds for significance of effects on visual amenity are defined according to the following scale:

- Substantial adverse or beneficial effect – where the scheme would result in a significant deterioration (or improvement) in the existing view;
- Moderate adverse or beneficial effect – where the scheme would result in a noticeable deterioration (or improvement) in the existing view;
- Slight adverse or beneficial effect – where the scheme would result in a barely perceptible deterioration (or improvement) in the existing view; and
- None (Neutral) – no discernible deterioration (or improvement) in the existing view.

11.6 Predicted Visual Effects

11.6.1 Introduction

The visual assessment considers the preferred option and its surrounding context, focusing on identified visual receptors that will experience visual effects, as stated previously within the methodology. Key Photo Viewpoint Locations have been determined (locations shown on the Landscape Effects – Landscape Character and Quality Figure 11.3 a-f) and used to establish theoretical area of visibility ; the overall baseline position; and the anticipated visual effects of the proposed scheme, based on the existing view. The results of the visual assessment determine the significance of effects on views from publicly accessible viewpoints, in terms of the magnitude of effects that would be generated by the proposed development and the sensitivity of the receptor. Views identified in Figures 11.4 to 11.36 (Photo Viewpoints 1-34) have been assessed from an average height of approximately 1.8m above ground level from publicly accessible areas within the study area.

Although the scheme may be visible to a degree beyond the highlighted receptors shown on Figure 11.2 a-f, and the Photo Viewpoints 1-34 (Figures 11.4-11.36); it is considered that any potential visual effects would not be significant and, therefore, are not considered further in this Chapter.

11.6.2 Visual Assessment

The assessment identifies a number of visual receptors, and representative viewpoints within the study area, using the criteria set out above. The visual receptors and Photo Viewpoints 1-34 (illustrated on Figures 11.3 a-f and 11.4 – 11.36) establish the Visual Impact Schedule. The resulting significance of effects from identified receptors and viewpoints is categorised as severe, substantial, moderate, slight or none (no change) when taking into account the following criteria;

Visual features are illustrated on Figures 11.2 a-f, including major visual barriers, landform, woodland screening, intervening built form, cuttings and embankments (visually intrusive highway).

The likely negative visual effects of the proposals are identified as:

- Intrusion of the road into valuable existing features and undisturbed high quality landscapes.
- Large earthworks, which intrude into views from nearby property and public places.
- Intrusive embankments, structures, traffic, lighting or signage crossing valleys and low-lying land, associated with the immediate road corridor.
- Cutting which creates notches on the skyline or scars on hillsides and sidelong ground.

- Unsympathetic junctions between new and existing landscapes.
- Land takes required for large earthworks affecting heritage and nature conservation sites.
- Changes to watercourses and drainage regimes.
- At night, road lighting is likely to be visually intrusive.

The following text should be read in conjunction with the Landscape Effects Figures - Baseline Landscape (11.1a-f) /Landscape Appraisal (11.2a-f) /Landscape Character and Quality (11.3a-f); it seeks to establish the associated visual effects upon the visual receptors. The receptors considered in the assessment include residencies, urban areas, communication routes, places of work and recreational facilities using the methodology shown above.

The following Visual Impact Schedule lists the sensitivity of the receptor, the magnitude of the effects, and the significance of the resulting effect for visual receptors.

Table 11.11 – Visual Impact Schedule (refer to Figure 11.3 Landscape Quality and Visual Effects)

Visual Receptor	Sheet and Type of Receptor	Existing View	Change in View	Mitigation	Sensitivity	Magnitude of Effects	Short Term Significance of Effects (Year of opening)	Residual Significance of Effects (Year 15)
I. Easterhouse (Wardie Road) – southern edge of residential area	11.3a Residential	Residences along the southern boundary of Easterhouse are well screened with mature vegetation, which currently mitigates against the visual effects of the existing main motorway M8 route, which is in a cutting (see Photo Viewpoints 1,2,3 & 4). The properties along Kildermore Road are situated in close proximity to the current route and experience partial views.	There will be a significant loss in the established mature roadside planting due to the widening of the M8, which is in close proximity to these residential receptors. This will result in a loss of vegetation and will open up new views to the road corridor from Easterhouse. However, the mitigation measures will ensure that the views of the road are only short term.	Replacement and enhancement of native mixed broad- leaved woodland planting to assist in screening the road.	High	Moderate	Substantial Adverse	No Change
II. Easterhouse (PROW)– southern edge		Due to the cutting of the M8 and the roadside	The widening to 4 lanes running, with hard shoulder,	Not Applicable	High	None	Slight Adverse	No Change

Visual Receptor	Sheet and Type of Receptor	Existing View	Change in View	Mitigation	Sensitivity	Magnitude of Effects	Short Term Significance of Effects (Year of opening)	Residual Significance of Effects (Year 15)
of recreation area	1 of 6 PROW and recreation area	screening vegetation, there are currently no or few views of the existing road (see photo viewpoints 2 and 3).	of the M8 route will see the re-engineering of soil walls required in certain embankment locations, this will minimise the loss of significant roadside vegetation in places and due to the distance and elevation of the public footpath off Baldinnie Road, and due to the intervening land cover, landform and built form, no significant change in views are anticipated from Easterhouse and subsequently no magnitude of effects.					
III. Swinton (Springhill Parkway) northern edge		This area has mid distant views towards the existing road	There will be limited views of the widened route due to the loss of road side	Replacement and enhancement of	Medium	Slight	Slight Adverse	Slight Adverse

Visual Receptor	Sheet and Type of Receptor	Existing View	Change in View	Mitigation	Sensitivity	Magnitude of Effects	Short Term Significance of Effects (Year of opening)	Residual Significance of Effects (Year 15)
of employment area	1 of 6 Employment	network (M8). Due to the topography of the area and the road network, only existing vegetation limits views from the northern boundary.	vegetation through slope steepening required around the slip to Easterhouse Road, off the M8 (see Photo Viewpoint 3).	native mixed broad- leaved woodland planting to assist in screening the road.				

Visual Receptor	Sheet and Type of Receptor	Existing View	Change in View	Mitigation	Sensitivity	Magnitude of Effects	Short Term Significance of Effects (Year of opening)	Residual Significance of Effects (Year 15)
IV. Easterhouse (Aberdalgie Rd) – southern edge of residential area	1 of 6 Residential	Due to the cutting of the M8 and the roadside screening vegetation, there are currently no or few views of the existing road (see photo viewpoints 2, 3 and 4).	The widening to 4 lanes running, with hard shoulder, of the M8 route will see the re-engineering of soil walls required in certain embankment locations, this will minimise the loss of mature roadside vegetation in places and due to the distance and elevation of receptors at Aberdalgie Road, but due to the intervening land cover, landform and built form, no significant views are anticipated and subsequently no magnitude of change.	Not Applicable	High	None	Slight Adverse	No Change

Visual Receptor	Sheet and Type of Receptor	Existing View	Change in View	Mitigation	Sensitivity	Magnitude of Effects	Short Term Significance of Effects (Year of opening)	Residual Significance of Effects (Year 15)
V. Public Bridge over M73	2 of 6 Local Road	The bridge passes over the M73 and has clear views of the existing road and the surrounding fields and countryside.	Users of this road will have clear views of the widening of the road and may have views of the proposed SUDS facility. However, the topography may block views of the main SUDS facility from this location but the access track will be visible. This receptor already has clear views of the road and so any change in view will be seen in the context of the existing road corridor, and any change is considered to be minimal, particularly as users will be passing through and are unlikely to have reason to stop and	Not Applicable	Low	Slight	Slight Adverse	Slight Adverse

Visual Receptor	Sheet and Type of Receptor	Existing View	Change in View	Mitigation	Sensitivity	Magnitude of Effects	Short Term Significance of Effects (Year of opening)	Residual Significance of Effects (Year 15)
			look at the view.					
VI. Isolated Dwellings – Ellismuir Farm west of M73	2 of 6 Residential	These dwellings overlook the existing interchange at Baillieston. Due to the similar elevation and mature roadside planting in the area residences do not currently experience significant open views towards the M73.	The residents of the farm are likely to experience some adverse effects during the construction phases of this scheme from construction plant, but due to the distance and elevation of these receptors, the magnitude of visual effects will be slight.	Not Applicable	High	Slight	Moderate Adverse	No Change
VII. Isolated Dwellings – Newlands Farm east of M73	2 of 6	These dwellings overlook the existing interchange at Baillieston (see Photo Viewpoint 8). Due to the similar elevation and mature roadside	The residents of the farm are likely to experience some adverse effects during the construction phases of this scheme from construction plant, but due to the distance and	Not Applicable	High	Slight	Moderate Adverse	No Change

Visual Receptor	Sheet and Type of Receptor	Existing View	Change in View	Mitigation	Sensitivity	Magnitude of Effects	Short Term Significance of Effects (Year of opening)	Residual Significance of Effects (Year 15)
	Residential	planting in the area residences do not currently experience significant open views towards the M73.	elevation of these receptors, the magnitude of visual effects will be slight.					
VIII. Isolated Dwellings – Woodhead Farm west of M73	3 of 6 Residential	This dwelling overlooks the existing M73 motorway route but due to the combination of topography, screen planting and the orientation of the dwelling, the residence does not experience significant views (see Photo Viewpoint 12).	The residents of the farm are likely to experience some adverse effects during the construction phases of this scheme, such as the noise, vibrations, and sight of construction plant but these will be limited in duration, and the magnitude of visual effects will be slight. There may be partial views of the SUD facility below the farm but if so this will be a beneficial effect in the long	Planting around the SUDS facility will help to screen views.	High	Slight	Moderate Adverse	Slight Beneficial

Visual Receptor	Sheet and Type of Receptor	Existing View	Change in View	Mitigation	Sensitivity	Magnitude of Effects	Short Term Significance of Effects (Year of opening)	Residual Significance of Effects (Year 15)
			term.					
IX. Calderbraes Golf Course Club House	3 of 6 Recreation/ Leisure	Existing vegetation and landform limit any views of the road network and Maryville junction.	There will be views of the SUD facility and this may remove some screening vegetation but it is likely that the road will still remain screened by vegetation. The views of the SUDS facility are likely to be beneficial in the long term and will create an attractive environment and habitat. Visitors to the golf course are likely to experience some adverse visual effects during the construction phases of this scheme but due to the distance and elevation of the receptors, there are no significant views anticipated of the	Replacement and enhancement of native mixed broad-leaved woodland planting to assist in screening the road.	Low	Slight	Slight Adverse	Slight Beneficial

Visual Receptor	Sheet and Type of Receptor	Existing View	Change in View	Mitigation	Sensitivity	Magnitude of Effects	Short Term Significance of Effects (Year of opening)	Residual Significance of Effects (Year 15)
			road.					
X. Roundknowe Lodge and Farm	3 of 6 Residential	The dwellings are well screened with significant mature roadside planting which currently mitigates against the adverse visual effects of the existing M74 route (see Photo Viewpoint 10).	The dwellings are likely to have clear views of the proposed SUDS facility. However, this could be a beneficial effect in the long term, as it has potential to be an attractive habitat for wildlife. The SUDS facility might remove some of the mature roadside vegetation, which could open up the views of the M74 in places.	Replacement and enhancement of native mixed broad-leaved woodland planting to assist in screening the road and ensure that the SUDS facility is designed in a way that creates an attractive wildlife habitat.	High	Moderate	Substantial Adverse	Slight Beneficial

Visual Receptor	Sheet and Type of Receptor	Existing View	Change in View	Mitigation	Sensitivity	Magnitude of Effects	Short Term Significance of Effects (Year of opening)	Residual Significance of Effects (Year 15)
XI. Broomhouse (Hamilton Rd) – southern edge of residential area	3 of 6 Residential	Residences within Broomhouse are well screened with significant mature roadside planting which currently mitigates against the adverse visual effects of the existing M74 route (see Photo Viewpoints 9 and 10).	The distance from the proposed improvements to the route (roundabouts and on-slip to the M74) and the associated loss of roadside vegetation mean that the changes to the visual amenity of receptors will be limited to first floor windows from properties along Calderpark Avenue and Lusshill Terrace. Due to the intervening land cover/form and buildings, no significant views are anticipated from these residential areas of Broomhouse and subsequently no impact. The properties along	Replacement and enhancement of native mixed broad-leaved woodland planting to assist in screening the road	High	Moderate	Substantial Adverse	No Change

Visual Receptor	Sheet and Type of Receptor	Existing View	Change in View	Mitigation	Sensitivity	Magnitude of Effects	Short Term Significance of Effects (Year of opening)	Residual Significance of Effects (Year 15)
			Rosebank Gardens and Hamilton Road will have more open views of the widened route due to the loss of road side vegetation through slope steepening that will be required around the on-slip Junction 3 of the M74 (see Photo Viewpoint 9) and subsequently the magnitude of effects is moderate. The Broomhouse residents will not have views of the proposed SUD facility.					
XII. Private Place of Worship – Greyfriars Road	3 of 6 Listed	Due to the mature planting surrounding the property and the raised level of the M73, there are currently no views of	Depending on how much planting is removed during construction of the proposed SUDS facilities, this receptor may have partial views of the new	Replacement and enhancement of native mixed broad-leaved woodland	Medium	Moderate	Substantial Adverse	Slight Beneficial

Visual Receptor	Sheet and Type of Receptor	Existing View	Change in View	Mitigation	Sensitivity	Magnitude of Effects	Short Term Significance of Effects (Year of opening)	Residual Significance of Effects (Year 15)
	Building	the existing road.	SUDS facilities. However, if this is the case, this may be a beneficial effect in the long term. This receptor is unlikely to have anything more than partial views of the new road, due to the topography and mature planting, providing that most of the planting is retained.	planting to assist in screening the road and ensure that the SUDS facilities are designed in a way that creates an attractive wildlife habitat.				
XIII. Isolated Dwelling – Clydeneuk Cottage (Haughhead Bridge Tollhouse)	3 of 6 Residential Listed Building	This property has planting to the front which screens the majority of views. There are partial views through the planting to the pastoral field beyond and occasional glimpses of the road behind.	There will be no views of the road alterations but there will be views of the new SUDS facility and the construction associated with creating them, especially in winter when the planting in front of the property loses its leaves. However, any views of the	Ensure that the SUDS facility is designed in a way that creates an attractive wildlife habitat.	High	Moderate	Substantial Adverse	Slight Beneficial

Visual Receptor	Sheet and Type of Receptor	Existing View	Change in View	Mitigation	Sensitivity	Magnitude of Effects	Short Term Significance of Effects (Year of opening)	Residual Significance of Effects (Year 15)
			SUDS facility may be a beneficial effect in the long term, as it will create an attractive habitat for wildlife.					
XIV. Kylepark - northern edge of residential area	3 of 6 Residential	Residences along the northern boundary of the settlement overlook the existing M74 route (see Photo Viewpoints 14, 15, 17 and 18). Due to the topography of the area and intervening land cover dwellings towards the south of the settlement do not experience significant views of the current motorway route.	The properties along Clydeneuk Drive experience visual effects of the widened route with minimal loss in vegetation in this location (see Photo Viewpoints 14, 15 and 32). The residential properties along the north west edge of Kyle Park will have views of the proposed SUDS facility and the construction associated with creating them. This however, in the long term, may be a beneficial effect.	Ensure that the SUDS facility is designed in a way that creates an attractive wildlife habitat. Replacement and enhancement of native mixed broad-leaved woodland planting to assist in screening the road.	High	Moderate	Substantial Adverse	Slight Beneficial

Visual Receptor	Sheet and Type of Receptor	Existing View	Change in View	Mitigation	Sensitivity	Magnitude of Effects	Short Term Significance of Effects (Year of opening)	Residual Significance of Effects (Year 15)
XV. Calderbraes (A74) - southern edge of residential area	4 of 6 Residential	Residences along the southern and western boundary of the settlement overlook the existing M74 route (see Photo Viewpoints 14, 15, 17 and 18). Although the topography of the area becomes more elevated towards the north of the settlement, the intervening land cover and built form will mean that these areas do not experience significant views of the current motorway route.	The widening to 4 lanes running, with hard shoulder of the route will see the re-engineering of slopes required around the Glasgow Road Bridge. . The properties situated along the A74 route will experience partial views of the widened route with minimal loss of roadside planted features along the M74 (see Photo Viewpoints 17 and 18) and the associated visual effects will be of slight magnitude.	Replacement and enhancement of native mixed broad-leaved woodland planting to assist in screening the road	High	Slight	Moderate Adverse	No Change
XVI. Isolated Dwellings (A74) – Powburn	4 of 6	These residences have no views of the existing M74 road, as there is tall	A small area of vegetation will be lost during the road improvements but this will	Replacement and enhancement of	High	Slight	Moderate Adverse	No Change

Visual Receptor	Sheet and Type of Receptor	Existing View	Change in View	Mitigation	Sensitivity	Magnitude of Effects	Short Term Significance of Effects (Year of opening)	Residual Significance of Effects (Year 15)
	Residential	mature planting along the length of the road.	be minor and is not considered to result in a significant change in the view. However, there will be adverse effects from the construction process.	native mixed broad-leaved woodland planting to assist in screening the road.				
XVII. Uddindston North (Spindlehowe Road)	4 of 6 Residential	Due to the high elevation of Uddingston (North) some residences along Spindlehowe Road overlook the M74 corridor.	The visual envelope towards the site will be predominantly retained assisting with the screening of the road network at this point. Although the topography within Uddingston (North) is elevated the land cover and built form indicates that there will be no magnitude of visual effects. The properties located above 60m AOD will not	Replacement and enhancement of native mixed broad-leaved woodland planting to assist in screening the road.	High	None	Slight Adverse	No Change

Visual Receptor	Sheet and Type of Receptor	Existing View	Change in View	Mitigation	Sensitivity	Magnitude of Effects	Short Term Significance of Effects (Year of opening)	Residual Significance of Effects (Year 15)
			experience more open views of the widened route as the preferred engineering solution to the new slope design of the proposed road widening retains roadside screening in this location.					
XVIII. Uddingston North (New Edinburgh Road) – South west edge of residential area	4 of 6 Residential	Residences along the southern and western boundary of Uddingston (North) are well screened with vegetation which interrupts views of the existing M74 route. (See Photo Viewpoints 20 and 21).	Due to the elevated position of the houses along the New Edinburgh Road partial views from first floor windows may be possible from these residences, but intervening landcover or built form mean that the receptors do not experience significant views of the road widening and subsequently no	Not Applicable	High	None	Slight	No Change

Visual Receptor	Sheet and Type of Receptor	Existing View	Change in View	Mitigation	Sensitivity	Magnitude of Effects	Short Term Significance of Effects (Year of opening)	Residual Significance of Effects (Year 15)
			magnitude of effects					
XIX. Uddingston North (New Edinburgh Road) - Industrial Estate	4 of 6 Industrial	Industrial units on the southern boundary of Uddingston (North) are well screened with significant visual vegetation which currently mitigate against the impact of the existing main M74 route. (See Photo Viewpoints 20, 21 and 33).	Due to the elevated location of the industrial units on New Edinburgh Road partial views of the motorway may be possible but intervening landcover or built form mean that the receptors do not experience significant views of the road widening or SUDS facility and subsequently no magnitude of impact	Not Applicable	Low	None	No Change	No Change
XX. Railway line south of Edinburgh Road	4 of 6 Transport	Views across the motorway for rail users are well screened with significant visual vegetation which	Passengers will have a clear view of the proposed SUDS facility and a large area of roadside vegetation will need to be removed for	Replacement and enhancement of native mixed broad-leaved	Medium	Slight	Slight Adverse	No Change

Visual Receptor	Sheet and Type of Receptor	Existing View	Change in View	Mitigation	Sensitivity	Magnitude of Effects	Short Term Significance of Effects (Year of opening)	Residual Significance of Effects (Year 15)
	Route	currently mitigate against the visual impact of the existing main M74 route. (See Photo Viewpoints 20, 21 and 33).	the construction of the SUDS facility, which could open up the views of the M74 from the railway. However, views will only be very brief as passengers will be travelling past at a fast speed and are unlikely to notice any significant change.	woodland planting to assist in screening the road and ensure that the SUDS facility is designed in a way that creates an attractive wildlife habitat.				
XXI. Bellshill Road Industrial Estate North of M74	4 of 6 Industry	The commercial business and warehouse areas situated along Bellshill Road experiences mid distant views towards the existing road network (M74).	Due to the topography of the area and the road network, only the existing vegetation limits views. The widening of route will require the re-engineering of soil slopes which minimises the loss of screening vegetation, especially adjacent to the	Replacement and enhancement of native mixed broad-leaved woodland planting to assist in screening the road and ensure	Low	Slight	Slight Adverse	No Change

Visual Receptor	Sheet and Type of Receptor	Existing View	Change in View	Mitigation	Sensitivity	Magnitude of Effects	Short Term Significance of Effects (Year of opening)	Residual Significance of Effects (Year 15)
			southbound carriageway. The industrial units may have partial views of the SUD facility but this is a beneficial effect. The visual envelope around the site will be predominantly retained assisting with the screening of the road network at this point. (See Photo Viewpoints 20 & 21) and subsequently the magnitude of change is slight.	that the SUDS facility is designed in a way that creates an attractive wildlife habitat.				
XXII. Bellshill Road Industrial Estate South of M74	4 of 6 Industry	The industrial units situated along Bellshill Road to the south of the M74 experience mid distant views towards the existing road network although most	The industrial units may have views of the new road network as the expansion of the M74 will result in loss of some of the roadside planting.	Replacement and enhancement of native mixed broad-leaved woodland planting to	Low	Slight	Slight Adverse	No Change

Visual Receptor	Sheet and Type of Receptor	Existing View	Change in View	Mitigation	Sensitivity	Magnitude of Effects	Short Term Significance of Effects (Year of opening)	Residual Significance of Effects (Year 15)
		of these views are screened by roadside planting (see photo viewpoint 21)		assist in screening the road				
XXIII. Falside Road Industrial Estate North of M74	4 of 6 Industry	The commercial business and warehouse areas situated along Falside Road experiences mid distant views towards the existing road network (M74) although most of these views are screened by roadside planting (see photo viewpoint 21)	Due to the topography of the area and the road network, only the existing vegetation limits views. The widening of the motorway will require the re-engineering of soil slopes which will minimise the loss of screening vegetation, especially adjacent to the southbound carriageway.	Replacement and enhancement of native mixed broad-leaved woodland planting to assist in screening the road	Low	Slight	Slight Adverse	No Change

Visual Receptor	Sheet and Type of Receptor	Existing View	Change in View	Mitigation	Sensitivity	Magnitude of Effects	Short Term Significance of Effects (Year of opening)	Residual Significance of Effects (Year 15)
XXIV. Bothwell North (Falside Road) - northern edge of residential area	4 of 6 Residential	These residents have few/ no views of the existing M74, as the tall roadside planting screens most of the houses.	Due to the topography of the area, the low elevation of the road (i.e. in cutting), and the significant roadside planting, the residences of Bothwell along the northern settlement boundary will not experience any adverse views from the proposed scheme.	Not Applicable	High	None	Slight Adverse	No Change
XXV. Isolated Dwellings – Bothwell Park Farm north of M74	5 of 6 Residential	These receptor experience limited views of the existing road infrastructure, although seasonal variation of roadside woodland screening does increase the visual prominence of the M74 lighting (see Photo Viewpoints 22-24).	Due to the topography of the area (M74 in cutting) and the existing significant roadside planting, no views are anticipated from these residencies and the proposed changes to the route are not expected to have any magnitude of visual effects.	Not Applicable	High	None	Slight Adverse	No Change

Visual Receptor	Sheet and Type of Receptor	Existing View	Change in View	Mitigation	Sensitivity	Magnitude of Effects	Short Term Significance of Effects (Year of opening)	Residual Significance of Effects (Year 15)
XXVI. Bothwell (Olifard Avenue) – East Edge of Residential Area	5 of 6 Residential	Residences along the north eastern boundary of Bothwell look onto the existing main motorway M74 route (see Photo Viewpoints 23 and 24) but all views of the road are screened by mature vegetation.	Minor roadside vegetation may be lost during the road improvements but views of the road will still be screened by the existing vegetation. Effects arising from proposed improvements to M74 Junction 5, Raith and the accommodation bridge immediately to the north of it are addressed as part of the Raith scheme assessment (MFJV 2007).	Not Applicable	High	None	Slight Adverse	No Change
XXVII. Bothwell (Laighlands Road) - Houses adjoin Local Nature Reserve	5 of 6 Residential	Residences along the eastern boundary of Bothwell look over the local nature reserve to the existing roundabout junction and the main	These residences will have clear views of the proposed SUD facility and the construction process of creating them. In the long term this has the potential	Ensure that the SUDS facility is designed in a way that creates an attractive	High	Moderate	Substantial Adverse	Slight Beneficial

Visual Receptor	Sheet and Type of Receptor	Existing View	Change in View	Mitigation	Sensitivity	Magnitude of Effects	Short Term Significance of Effects (Year of opening)	Residual Significance of Effects (Year 15)
		motorway M74 route (see Photo Viewpoints 23 and 24).	to be a beneficial effect as it could provide an attractive feature and habitat. Effects arising from proposed improvements to M74 Junction 5, Raith and the accommodation bridge immediately to the north of it are addressed as part of the Raith scheme assessment (MFJV 2007).	wildlife habitat.				
XXVIII. Bothwell (Grebe Avenue) – Residential Area	5 of 6 Residential	Residences along the eastern boundary of Bothwell are raised above the height of the road network and look over the local nature reserve to the existing roundabout junction and	These residences will have clear views of the proposed SUD facility and the construction process of creating them. In the long term this has the potential to be a beneficial effect as it could provide an	Ensure that the SUDS facility is designed in a way that creates an attractive wildlife habitat.	High	Moderate	Substantial Adverse	Slight Beneficial

Visual Receptor	Sheet and Type of Receptor	Existing View	Change in View	Mitigation	Sensitivity	Magnitude of Effects	Short Term Significance of Effects (Year of opening)	Residual Significance of Effects (Year 15)
		the main motorway M74 route (see Photo Viewpoints 23 and 24).	attractive feature and habitat. Effects arising from proposed improvements to M74 Junction 5, Raith and the accommodation bridge immediately to the north of it are addressed as part of the Raith scheme, assessment (MFJV2007).					
XXIX. Bothwell (Laighlands Road) – East edge of Residential Area	5 of 6 Residential	Residences along the eastern boundary of Bothwell look over the local nature reserve to the existing roundabout junction and the main motorway M74 route (see Photo Viewpoints	These residences will have clear views of the proposed SUD facility and the construction process of creating them. In the long term this has the potential to be a beneficial effect as it could provide an	Ensure that the SUDS facility is designed in a way that creates an attractive wildlife habitat.	High	Moderate	Substantial Adverse	Slight Beneficial

Visual Receptor	Sheet and Type of Receptor	Existing View	Change in View	Mitigation	Sensitivity	Magnitude of Effects	Short Term Significance of Effects (Year of opening)	Residual Significance of Effects (Year 15)
		23 and 24).	attractive feature and habitat. Effects arising from proposed improvements to M74 Junction 5, Raith and the accommodation bridge immediately to the north of it are addressed as part of the Raith scheme assessment (MFJV 2007).					
XXX. Strathclyde Country Park – PROW underpass linking Hamilton Low Parks	6 of 6 PROW	Due to mature roadside planting there are no views of the existing M74 on the approach and the path then goes under the road so there are no views from this point either.	Views will remain the same as the roadside planting will be retained and there will be no views of the road.	Not Applicable	High	None	Slight Adverse	No Change

Table 11.12: Photo Viewpoint Assessment

Photo viewpoints	Sheet	Receptors represented by viewpoint	Magnitude of Effects	Residual Significance of Effects
Photo Viewpoint 1	1 of 6	Receptor I	None	No Change
Photo Viewpoint 2	1 of 6	Receptor I Receptor II Receptor III	None None Slight	No Change No Change No Change
Photo Viewpoint 3	1 of 6	Receptor II Receptor III Receptor IV	None Slight None	No Change No Change No Change
Photo Viewpoint 4	1 of 6	West Maryston	None	No Change
Photo Viewpoint 5	2 of 6	Receptor V Crosshill Residential Area	Slight	Slight Adverse
Photo Viewpoint 6	2 of 6	Bargeddie Residential Area	None	No Change
Photo Viewpoint 7	2 of 6	Place of worship	None	No change
Photo Viewpoint 8	2 of 6	Receptor VIII Receptor XI	Slight Moderate	Slight No Change

Photo viewpoints	Sheet	Receptors represented by viewpoint	Magnitude of Effects	Residual Significance of Effects
		Crosshill Bargeddie		
Photo Viewpoint 9	3 of 6	Receptor XI	Moderate	No Change
Photo Viewpoint 10	3 of 6	Receptor IX Receptor X Receptor XI Receptor XII	Slight Moderate Moderate Moderate	Slight Beneficial Slight Beneficial No Change Slight Beneficial
Photo Viewpoint 11	3 of 6	Receptor IX	Slight	Slight Beneficial
Photo Viewpoint 12	3 of 6	Receptor VI Receptor VIII Muirhead Crosshill	Slight Slight	No Change Slight
Photo Viewpoint 13	3 of 6	Calderbraes	None	No Change
Photo Viewpoint 14	3 of 6	Receptor XIII Receptor XIV	Moderate Moderate	Slight Beneficial Slight Beneficial

Photo viewpoints	Sheet	Receptors represented by viewpoint	Magnitude of Effects	Residual Significance of Effects
Photo Viewpoint 15	3 of 6	Receptor XIV Receptor XV Receptor XVI Calderbraes	Moderate Slight Slight	Slight Beneficial No Change No Change
Photo Viewpoint 16	3 of 6	Daldowie Crematorium	None	No Change
Photo Viewpoint 17	3 of 6	Receptor XIV Receptor XV Receptor XVI	Moderate Slight Slight	Slight Beneficial No Change No Change
Photo Viewpoint 18	3 of 6	Receptor XV Receptor XVI Powburn	Slight Slight	No Change No Change
Photo Viewpoint 19	4 of 6	Receptor XV Receptor XVI Kylepark	Slight Slight	No Change No Change
Photo Viewpoint 20	4 of 6	Uddingston Receptor XVII	None	No Change

Photo viewpoints	Sheet	Receptors represented by viewpoint	Magnitude of Effects	Residual Significance of Effects
		Receptor XVIII	None	No Change
		Receptor XIX	None	No Change
		Receptor XX	Slight	No Change
Photo Viewpoint 21	4 of 6	Receptor XX	Slight	No Change
		Receptor XXII	Slight	No Change
		Receptor XXIII	Slight	No Change
		Receptor XXVII	Moderate	Slight Beneficial
Photo Viewpoint 22	4 of 6	Receptor XXIV	None	No Change
Photo Viewpoint 23	5 of 6	Receptor XXIV	None	No Change
		Receptor XV	None	No Change
		Receptor XXVI	None	No Change
Photo Viewpoint 24	5 of 6	Receptor XXV	None	No Change
		Receptor XXVI	None	No Change
		Receptor XVII	Moderate	Slight Beneficial
		Receptor XXVIII	Moderate	Slight Beneficial
		Receptor XXIX	Moderate	Slight Beneficial

Photo viewpoints	Sheet	Receptors represented by viewpoint	Magnitude of Effects	Residual Significance of Effects
Photo Viewpoint 25	6 of 6	Strathclyde Loch and Country Park	None	No Change
Photo Viewpoint 26	6 of 6	Hamilton Service Area	None	No Change
Photo Viewpoint 27	6 of 6	Strathclyde Country Park	None	No Change
Photo Viewpoint 28	5 of 6	Raith Visitor Centre	None	No Change
Photo Viewpoint 29	2 of 6	Receptor V Receptor VII Receptor VIII	Slight Slight Slight	Slight Adverse No Change Slight Beneficial
Photo Viewpoint 30	2 of 6	Receptor V Receptor VII Receptor VIII	Slight Slight Slight	Slight Adverse No Change Slight Beneficial
Photo Viewpoint 31	3 of 6	Receptor IX	Slight	Slight Beneficial
Photo Viewpoint 32	3 of 6	Receptor XIII Receptor XIV	Moderate Moderate	Slight Beneficial Slight Beneficial
Photo Viewpoint 33	4 of 6	Receptor XIX Receptor XX	Moderate Slight	Slight Beneficial No Change

Photo viewpoints	Sheet	Receptors represented by viewpoint	Magnitude of Effects	Residual Significance of Effects
		Receptor XXI	Slight	No Change
		Receptor XXII	Slight	No Change
Photo Viewpoint 34	5 of 6	Receptor XXVI	None	No Change
		Receptor XXVII	Moderate	Slight Beneficial
		Receptor XXVIII	Moderate	Slight Beneficial
		Receptor XXIX	Moderate	Slight Beneficial

N.B. Detailed descriptions of impacts to individual receptors are shown in Table 11.11

The following text provides detailed descriptions of the key visual receptors.

Views from Residential & Urban Areas

Within the 10 settlement areas predicted to be impacted upon surrounding the proposed scheme, there are receptors that have a range of partial and open, short and mid distance views of the road and SUDS facilities, concentrated around the existing road corridors of the M8, M74 and M73, due to intervening combination of landform, landcover and built form. More long distance views are possible from Coatbridge, Viewpark, Barlanark, Motherwell and Hamilton, but these views would be from tall or high rise buildings only. Due to the distance from the scheme any effects would not be a significant part in the view. The visual envelope is a result of the existing landform and significant vegetation, which restrict views of the road in places. There will however be seasonal variations in the extent of screening of the road by the existing vegetation, as well as any mitigation planting.

The extent that the Scheme will be visible from surrounding residential & urban areas and individual dwellings is discussed further below.

Easterhouse (Sheet 1 of 6)

Residences along the southern boundary of Easterhouse are well screened with significant vegetation, which currently mitigates against the visual effects of the existing main motorway M8 route, which is in a cutting (see Photo Viewpoints 1,2,3 & 4). The properties along Kildermore Road are situated in close proximity to the current route and experience views of the road due to the significant loss in the established mature roadside planting during the widening of the M8. This will result in a loss of vegetation and will open up new views to the road corridor from Easterhouse. However, the mitigation measures will ensure that the views of the road are only short term. Due to the intervening land cover, landform and built form, there will be no significant changes in views from the rest of Easterhouse, and subsequently there will be no visual impact.

The widening to 4 lanes running, with hard shoulder, of the M8 route will require the re-engineering of soil walls at certain embankment locations, steepening parts of the slopes. Working on part of the slopes will minimise as far as practicable the loss of 'significant' roadside vegetation in places. Due to the distance and elevation of certain receptors at Arnisdale Road, Struie Street, Aberdalgie Road and the public footpath off Baldinnie Road, but due to the intervening land cover, landform and built form, therefore no significant changes in views are anticipated from Easterhouse, and subsequently no visual impact.

The properties along Kildermore Road will have open views towards the widened route, but the loss of any roadside vegetation in this location will be minimal (see Photo Viewpoint 1). More limited views will be possible from the residences along Buchlyvie Street and Freuchie Street and partial views of the route will remain visible to residences along Duntarvie Road. There will be no significant loss in the established mature roadside

planting and due to the intervening land cover, landform and built form, therefore no significant changes in views are anticipated, and subsequently no visual impact.

Swinton (Sheets 1and 2 of 6)

The commercial business park situated along Springhill Parkway experiences mid distant views towards the existing road network (M8). Due to the topography of the area and the road network, only existing vegetation limits views from the northern boundary. There will be limited views of the widened route due to the loss of road side vegetation through slope steepening that will be required around the slip to Easterhouse Road, off the M8 (see Photo Viewpoint 3) and subsequently the magnitude of effect is Slight.

Residences along the north eastern boundary of Swinton overlook the existing main M8 motorway route (see Photo Viewpoints 2, 3 and 4). Rhindmuir Road / Drive and Springcroft Road experience no views of the current route, due to the extent of significant roadside screening.

Because of the distance from the proposed improvements to the Baillieston junction no visual effects are anticipated. There will be no significant loss in the established mature roadside planting and due to the intervening land cover, landform and built form, therefore no significant views are anticipated from Swinton and subsequently no magnitude of effects.

Crosshill (Sheet 2 of 6)

Properties along the eastern boundary of the settlement overlook the existing interchange at Baillieston (see Photo Viewpoint 5). Due to the high elevation topography of the area residences along the south of the settlement do not experience significant views.

It is anticipated that there will be no significant change in visual impact upon the residences of Crosshill as the main improvements occur on the North Calder Bridge Crossing M73, due to the landform and orientation of the dwellings in close proximity to the route no living areas will experience direct views of the site, therefore no significant views are anticipated from dwellings within Crosshill and subsequently no magnitude of effects.

Bargeddie (Sheet 2 of 6)

Residences along the western boundary of the settlement overlook the existing interchange at Baillieston (see Photo Viewpoint 6). Due to the intervening landform of the area, the low elevation of the road (i.e. in cutting), and the significant roadside planting, views towards the interchange are limited. It is anticipated that there will be no change in visual effects upon the residences of Bargeddie with no significant views anticipated, no magnitude of effects.

Broomhouse (Sheet 3 of 6)

Residences within Broomhouse are well screened with significant mature roadside planting which currently mitigates against the adverse visual effects of the existing M74 route (see Photo Viewpoints 9 and 10).

The distance from the proposed improvements to the route (roundabouts and on-slip to the M74) and the associated loss of roadside vegetation mean that the changes to the visual amenity of receptors, will be limited to first floor windows from properties along Calderpark Avenue and Lusshill Terrace. Due to the intervening land cover/form and buildings, no significant views are anticipated from these residential areas of Broomhouse and subsequently no impact. The properties along Rosebank Gardens and Hamilton Road will have more open views of the widened route due to the loss of road side vegetation through slope steepening that will be required around the on-slip Junction 3 of the M74 (see Photo Viewpoint 9) and subsequently the magnitude of effects is moderate.

Kylepark (Sheet 3 of 6)

Residences along the northern boundary of the settlement overlook the existing M74 route (see Photo Viewpoints 14, 15, 17, 18 and 32). Due to the topography of the area and intervening land cover dwellings towards the south of the settlement do not experience significant views of the current motorway route.

The widening to 4 lanes running, with hard shoulder, of the route will require the re-engineering of soil walls around the B758 bridge crossing which will minimise the loss of some visually important vegetation and due to the distance and elevation of the receptors, the magnitude of visual effects will be slight. The properties along Clydeneuk Drive experience similar visual effects of the widened route with minimal loss in vegetation in this location (see Photo Viewpoints 14 and 15). However, these properties will have views of the proposed SUDS facility (see photo viewpoint 32) and the construction phase will cause disruption to these views. Once the SUDS are established, they should provide an attractive wildlife habitat and therefore have a beneficial effect.

Calderbraes (Sheets 3 & 4 of 6)

Residences along the southern and western boundary of the settlement overlook the existing M74 route (see Photo Viewpoints 14, 15, 17 and 18). Although the topography of the area becomes more elevated towards the north of the settlement, the intervening land cover and built form will mean that these areas do not experience significant views of the current motorway route.

The widening to 4 lanes running, with hard shoulder of the route will see the re-engineering of slopes required around the Glasgow Road Bridge. . The properties situated along the A74 route will experience partial views of the widened route with minimal loss of roadside planted features along the M74 (see Photo Viewpoints 17 and 18) and the associated visual effects will be of slight magnitude.

Uddingston (Sheet 4 of 6)

Uddingston (South) – Residential areas along the northern and eastern boundary of Uddingston are well screened with vegetation belts which currently filters views reducing the visual impact of the existing main M74 route (see Photo Viewpoints 19 and 20). The properties along Croft Wynd are situated in close proximity to the current route and experience partial views of the M74 and railway. The widening of some route will see the re-engineering of soil slopes required in certain locations, this design solution has minimised the loss of 'significant' roadside planting in places, especially around the existing Railway Bridge, pedestrian underpass to be extended and Motorway Bridge that are to be retained. Due to the distance from the route and low elevation of most residences within Uddingston (South), it is anticipated that there will be no change in visual effects upon the residences of Uddingston (South) with no significant views anticipated, no magnitude of effects. The properties along Croft Wynd will have partial views of the widened route due to the loss of visually significant vegetation in this location. More limited views will be possible from the properties along North British Road and the associated visual effects will be of slight magnitude.

Uddingston (North) – Residences along the southern and western boundary of Uddingston are well screened with significant visual vegetation which currently mitigate against the impact of the existing main M74 route. (See Photo Viewpoints 19, 20 and 33). Due to the high elevation of Uddingston (North) some residences along Spindlehowe Road overlook the M74 corridor. The widening of route will see the re-engineering of soil slopes required here and this design solution has minimised the loss of visual significant vegetation, especially adjacent to the southbound carriageway. The visual envelope towards the site will be predominantly retained assisting with the screening of the road network at this point. Although the topography within Uddingston (North) is elevated the land cover and built form indicates that there will be no magnitude of visual effects.

The properties located above 60m AOD will not experience more open views of the widened route as the preferred engineering solution to the new slope design of the proposed road widening retains roadside screening in this location. Due to the elevated location of the houses along the New Edinburgh Road partial views from first floor windows may be possible from these residences, but intervening landcover or built form mean that the receptors do not experience significant views of the road widening and subsequently no magnitude of effects. The commercial business and warehouse areas situated along Bellhills Road experiences mid distant views towards the existing road network (M74). Due to the topography of the area and the road network, only existing vegetation limits views. The widening of route will see the re-engineering of soil slopes required here and this design solution has minimised the loss of visual significant vegetation, especially adjacent to the southbound carriageway. The visual envelope towards the site will be predominantly retained assisting with the screening of the road network at this point. (See Photo Viewpoints 20 & 21) and subsequently the magnitude of effects is slight.

Bothwell (Sheet 5 of 6)

Residences along the eastern boundary of Bothwell overlook the existing roundabout junction and the main motorway M74 route (see Photo Viewpoints 23, 24 and 34) but, due to the topography of the area, the low elevation of the road (i.e. in cutting), and the significant roadside planting, the residences of Bothwell along the northern settlement boundary will not experience any adverse views from the proposed road scheme. They will however have views of the proposed SUDS facility, especially houses along Laighlands Road, which protrude into the Local Nature Reserve area. The views of the SUDS facility will be adverse in the short term due to the construction vehicle traffic and noise but will be beneficial in the long term, as it will create an attractive wildlife habitat. The bridge immediately to the north of the junction is to be demolished and replaced as part of the Raith Junction scheme, therefore any associated effects will be covered within that assessment.

Hamilton (Sheet 6 of 6)

Due to the distance from the junction, (approximately 2.5km) and because the likely receptors will be limited to tall or high rise buildings, intervening landcover or built form mean that the receptors do not experience significant views of the road widening and subsequently no magnitude of effects.

Individual Dwellings and Recreational Areas

Newlands Farm & Ellismuir Farm (Sheet 2 of 6)

These dwellings overlook the existing interchange at Baillieston (see Photo Viewpoints 8 and 29 for Newlands Farm). Due to the similar elevation and mature roadside planting in the area both residences do not currently experience significant open views towards the M73. Newlands Farm will have partial views of the proposed SUDS facility, which will be a slight beneficial view in the long term. The residents of both farms are likely to experience some adverse effects during the construction phases of this scheme from construction plant, but due to the distance and elevation of these receptors, the magnitude of effects will be slight.

Daldowie Crematorium (Sheet 3 of 6)

The crematorium area experiences limited short-range views of the existing M74 road with existing vegetation limiting any views from this location (see Photo Viewpoint 16). No significant views are anticipated from Daldowie Crematorium and the proposed changes to the route are not expected to have any magnitude of effects.

Woodhead Farm (Sheet 3 of 6)

This dwelling overlooks the existing M73 motorway route but due to the combination of topography, screen planting and the orientation of the dwelling, the residence does not experience significant views (see Photo Viewpoint 12). There may be partial views of the

proposed SUDS facility but this has the potential to be a beneficial effect in the long term. The residents of the farm are likely to experience some adverse effects during the construction phases of this scheme, such as the noise, vibrations, and sight of construction plant but these will be limited in duration, and the magnitude of impacts will be slight.

East Haughhead Farm (Sheet 3 of 6)

This dwelling overlooks the existing interchange at Maryville, but due to the intervening landcover within the area and along the River Clyde, and the distance away from the interchange, existing views are limited. No significant views are anticipated from this residence and the proposed changes to the route will have no magnitude of impacts.

Bothwell Park House & Farm (Sheet 5 of 6)

These receptors experience limited views of the existing road infrastructure, although seasonal variation of roadside woodland screening does increase the visual prominence of the M74 lighting (see Photo Viewpoints 22- 24). Due to the topography of the area (M74 in cutting) and the existing significant roadside planting, no views are anticipated from these residencies and the proposed changes to the route are not expected to have any magnitude of impacts.

Recreational Areas (Calderbraes Golf Course, Driving Range at Kylepark, Crosshill Memorial Park and Sports Ground, Hamilton Low Parks, and Strathclyde Country Park)

Existing vegetation and landform limit any views of the road from these recreational areas. The Hotel, the amusement park and picnic areas adjacent to the Strathclyde Loch in Strathclyde Country Park are most likely to experience limited views of the existing road infrastructure, seasonal variation of roadside woodland screening does increase the visual prominence of the M74 traffic. Visitors are likely to experience some adverse effects during the construction phases of this scheme but due to the distance and elevation of the receptors, there are no significant views anticipated and subsequently no magnitude of impact. The Calderbraes Golf Club House and parts of the Strathclyde Country Park have views of the SUDS facilities but this is a small part of the view and is not considered to be significant and in the long term will be slightly beneficial.

Views from Transport Routes

The following major and minor highways have been identified as crossing, or passing near to the proposed M8/M73/M74 Network Improvements and so are likely to experience a visual effect. It should be noted that views from roads are considered transient due to the nature of receptors. See also Chapter 14: Vehicle Travellers, for assessment of impacts on the view from the road.

M8 Easterhouse – Bargeddie (Sheet 1 of 6)

The road widening to four lanes with hard shoulder improvements are minor, but will be visible when travelling from the north during winter months, especially towards the residential areas of Easterhouse close to the motorway. Vehicles will be travelling at such a speed and within a cutting that any changes will be less prominent. Some associated mature roadside infrastructure planting either side of the existing bridge structure along Wardie Road may be lost, but this is not considered to be significant. Due to the distance and elevation of the receptors from the development along this route the magnitude of impacts will be negligible. (See Photo Viewpoints 1 & 2).

The road improvements around the Jimmy Young Bridge similar to those outlined above will again involve some minor loss of mature roadside infrastructure, but not significant. The low elevation of the M8 at Junction 9 and the speed of the vehicles will limit views from the road network. The slip road improvements will have a minor effect on the slope profile along the northern boundary of the highway. Due to the distance and elevation of the receptors from the development along this route the magnitude of impacts will be negligible. (See Photo Viewpoint 3 & 4)

M8 Bargeddie (Sheet 2 of 6)

The road improvements proposed at the Baillieston Interchange are minor and no visual effects of any magnitude are anticipated. (Refer to Photo Viewpoints 6 & 7.)

A8 Bargeddie (Sheet 2 of 6)

The road improvements proposed at the Baillieston Interchange are minor and no significant visual effects are anticipated from the existing A8 east of the interchange, therefore the magnitude of impacts will be negligible (Refer to Photo Viewpoints 6 & 7).

M73/A89/A8 Baillieston (Sheet 2of 6)

The M73 runs north/south across the site and intersects the A8/M8 at the Baillieston Interchange. Partial views of the M8/A8 from the North Calder bridge crossing will be possible in the direction of Bargeddie and Crosshill; however, when travelling in a northerly direction, vehicles will be travelling at such a speed that any changes will be less prominent. Associated mature roadside infrastructure planting will again minimise the visual envelope when approaching the interchange around the A8 & A89 around Crosshill/ Swinton. Due to the distance and elevation of the receptors from the development along this route the magnitude of impacts will be negligible.

M74 Daldowie – Maryville Interchange (Sheet 3 of 6)

The M74 runs east/west separating Daldowie and Broomhouse west of the Maryville Interchange. The slip roads and roundabout improvements will affect the slope profile along the northern boundary of the highway resulting in some roadside vegetation being removed. The low elevation of the M74 at this junction and the speed of the vehicles will

limit views from the road network. The magnitude of impacts will be slight (Refer to Photo Viewpoints 9 & 10).

M74 Calderbraes (Sheet 3 of 6)

The road improvements proposed at the Maryville Interchange are minor and no significant visual effects are anticipated from the existing M74, therefore the magnitude of impacts will be negligible (Refer to Photo Viewpoints 13 & 14).

The road widening to four lanes with hard shoulder will initially add to the visible road infrastructure when viewed from the south, especially towards the residential areas of Kylepark close to the motorway. Vehicles will be travelling at such a speed and within a cutting making any changes less prominent. Some associated mature roadside infrastructure planting east of the existing bridge structure along B758 will be lost, but will not significantly widen the visual envelope. Due to the distance and elevation of the receptors from the development along this route the magnitude of impacts will be slight. (Refer to Photo Viewpoints 15 & 17).

A74 Calderbraes (Sheet 4 of 6)

The road improvements are minor and no significant visual effects are anticipated from the A74 when viewed travelling from the north, especially towards the residential areas of Powburn close to the motorway. Vehicles will be travelling along this route are well screened by mature roadside tree cover as illustrated within Photo Viewpoint 17. Due to the distance and elevation of the receptors from the development along this route the magnitude of impacts will be slight. (Refer to Photo Viewpoints 15 & 17).

A721 (Connects Calderbraes and Uddingston) (Sheet 4 of 6)

The road improvements proposed along this part of the M74 are minor and no significant visual effects are anticipated from the A721. Due to the distance and elevation of the receptors from the development along this route the magnitude of impacts will be slight. (Refer to Photo Viewpoints 13 & 14).

B7071 (Uddingston and Bothwell) (Sheet 4 of 6)

The B7071 currently runs from Uddingston to Bothwell parallel to the M74. Views from this road are limited to the bridge crossing the M74 at Powburn. Associated mature roadside infrastructure planting will minimize the visual envelope towards the M74. Due to the distance and elevation of the receptors from the development along this route the magnitude of impacts will be slight. (Refer to Photo Viewpoint 17 & 18.)

Minor road crossing motorways (bridges - Uddingston and Bothwell) (Sheet 4 of 6)

The road widening to four lanes with hard shoulder will initially add to the visible road infrastructure when viewed from the north along Bellshill Road and Fallside Road, especially from the industrial areas of Bothwell close to the motorway. Vehicles travelling

along this route are well screened by mature roadside tree cover as illustrated within Photo Viewpoint 20 & 21. Due to the distance and elevation of the receptors from the development along this route the magnitude of impacts will be negligible.

A725 Raith Interchange (Sheet 5 of 6)

The road improvements proposed along this part of the M74 are minor and no significant visual effects are anticipated from the A725, therefore no magnitude of visual effects is anticipated. (Refer to Photo Viewpoints 24 & 28.)

A723 Hamilton Interchange (Sheet 6 of 6)

The road improvements proposed along this part of the M74 are minor and no significant visual effects are anticipated from the A723, therefore no magnitude of visual effects is anticipated.

Railway Network

The widening of existing structures and necessary construction works will in the short term alter some isolated visual envelopes from the railway routes within the Study area in particular Swinton and Uddingston. Any visual effects will be low, and the magnitude of visual effects will be negligible.

11.7 Conceptual Mitigation Strategy

11.7.1 General

Mitigation measures look to prevent, reduce, or offset, where practicable, adverse effects as identified in the previous section. This section describes in general terms a range of landscape and visual mitigation measures that will be used to offset identified adverse effects arising from the scheme. Mitigation for landscape and visual effects are generally closely linked, and these aspects have therefore been addressed jointly in this section. Mitigation measures associated with individual impacts are cross-referred to receptors within Tables 11.7 and 11.11 in the previous section. Monitoring of mitigation will be undertaken as part of the requirements of the contract.

The central focus of landscape and visual mitigation is to achieve integration within the surrounding landscape where the proposed alignment deviates from the existing road corridor. The scheme context is essentially urban fringe, where existing mature vegetation is highly valued. Therefore, new planting of woodland and shrub/scrub areas is an important element of the mitigation strategy.

Figures 19.1 a-h provides an overview of the Conceptual Mitigation Strategy. In summary the mitigation measures are focused upon primary and secondary measures;

Primary mitigation measures generally relate to basic design elements such as;

- Sensitive location and siting of road infrastructure including Sustainable Urban Drainage (SUDs features);
- Site layout and access during construction and operational stages;
- Choice of site level or vertical alignment;
- Appropriate form, materials and design of built structures;
- Lighting and signage;
- Ground modelling; and
- Protection of existing/proposed new planting.

Secondary mitigation measures (e.g. screen planting and choice of materials) seek to address significant negative effects of the final road design as identified during the landscape and visual assessment and described within the Mitigation Strategy, which responds to the differing landscape context around the junction.

11.7.2 Mitigation Strategy

The following measures will be incorporated into the detailed final design for the scheme:

- Minimise identified potential adverse effects on the existing landform and avoid disruption of major topographical, ecological and other significant landscape features;
- Use the existing landform and retain existing vegetation (landcover) to good effect, thereby minimising the scale of earthworks and enhancement planting that is required;
- Replacement planting of native mixed broad-leaved woodland that has been lost or removed during construction and enhancement of the woodland areas throughout the scheme where possible;
- New structures (including gantries/signage) and slope profiles will follow existing natural topography where possible and new features will be integrated into the surrounding landscape context. (e.g. woodland, hedges, mature trees, surface water features);
- Develop new SUDS facilities so that they respond to the context of the area and strive to enhance the visual character and create a diverse habitat for wildlife.
- Retain the least amount of highway land, where this does not conflict with the need to provide mitigation by planting, mounding, earth shaping and new surface water features;
- Develop new landforms, such as mounds and false cutting, to screen the road from the identified receptors, but balancing this with the need to avoid additional encroachment into designated habitats and valued landscapes; and
- Develop site restoration, landscape features and planting proposals that link with and reinforce positive features of the landscape character. The detailed landscape design will be in accordance with the Scottish Executive Landscape Design and Management Policy ‘Cost Effective Landscape: Working with Nature’ to ensure that the landscape design will be fully integrated with the ecological requirements, biodiversity and contribute to sustainable development.

11.7.3 Natural Processes, Materials & Features

Re-use of stripped topsoil and of selected existing vegetation (grassland/wetland) where this is to be cleared (for example on embankments, around SUDS facilities respectively) will help conserve biodiversity and perpetuate existing seed banks.

Vegetation will be established on newly created cutting or embankment slopes primarily by means of seed application, probably on a hydra seeding basis in locations where steep embankments are left and an engineered soil solution is required. Aided by the process of regeneration those species most suited to the location will develop naturally to address the negative visual effects of this structure from the road users. Planted areas are generally established using plants of an older transplanted material, which are typical of urban-style planting, yet are appropriate and respond to the road context. Within the more rural areas more large scale planting is intended to be smaller native stock which is more likely to establish quickly and survive the exposure and relatively hostile conditions of the site.

The proposed new planting consists mostly of native species appropriate to the locality; plants produced from seed of local provenance are likely to be most successful and will be used wherever possible. The availability of wild flower and grass seed of local provenance will also be explored in the interests of maximising ecological benefit.

Where not in conflict with road safety sight lines and other engineering requirements, disturbed areas around new junctions, will be stripped of topsoil and seeded with wild flower mixes direct into low fertility substrate material. Such variety of ground conditions will promote diversity of both sward and visual interest, permit more sustainable maintenance, and assist in consolidating existing fragmented habitat.

New cutting slopes are potentially significant elements of the scheme; similar features within the existing locality that demonstrate the natural characteristics will look to be replicated on engineered slopes and offer a benchmark illustration of such treatment and subsequently, becomes a dominant linear feature. Mitigation looks to respond better to the open agricultural character of the surroundings with grassland and ornamental planting. Tree and shrub planting, as is incorporated in the scheme, will have similar aspirations and be based on natural characteristics of informal arrangement and varied density.

The immediate environs of the road are characterised by planting which is mostly of scrub/woodland nature. Extensive new planting would be inappropriate and serve only to emphasise the road line in the landscape; the preferred objective is to introduce only modest planted areas of discontinuous character which will best reflect and complement the existing pattern.

The existing road corridor, with its maturing vegetation cover, illustrates how good landscape planting design can achieve effective mitigation around elevated structures. This approach has been reflected within the mitigation proposals for the scheme.

Planting generally will seek to introduce ecologically appropriate species whilst retaining an evergreen element for winter interest. In a wildlife context the scheme will aim to benefit long term any identified protected species found within the locality (for example planting of berry-bearing shrubs to contribute to local food resources).

Earthworks

Maximum use will be made of existing subsoil and topsoil both as landscape fill and as a finished surface for soft landscape treatment; no importation of soils is anticipated. As far as is reasonably practicable, stripped soils, especially from cutting slopes, will be stored (for as short a time as possible and such that the viability of the soil is maintained) in separate locations to assist in replicating particular habitats where required.

A principal design aim will be to achieve sensitive gradients in new earthworks to avoid the adverse effects of artificiality in landform. The softening effects of planting will be utilised as a mitigating technique where deemed to assist the environmental 'fit' of the proposed road.

11.7.4 Opportunities & Benefits

Visual Amenity

The essence of visual interest for road users lies in exploiting the potential for outward views. Where scenic views of the wider landscape are available, the objective here is to maximise opportunities for their enjoyment and avoid foreground obstruction. At a more local level, visual interest will be enhanced by the introduction of wild flower seeding to verge areas, ornamental shrub within the road corridor and more native species within the locality of the SSSI/ SINC/ Nature Reserves.

The effects of lighting upon the identified receptors and surrounding landscape resource relate to the preferred route alignment and new junction layouts. Modern lighting columns and lamp detailing will improve visibility for road users without significant light pollution. However, the new lighting will not have a significant impact, as there is already existing lighting along the road corridor's and therefore the new lighting will usually be replacing the old. Lighting and planting mitigation strategy responds to the site context, within an urban environment where a precedent has been established, lighting provision will be considered to an acceptable standard for road safety and light pollution guidelines. Further consideration by the Contractor through the development of final design will be required with regard to a comprehensive mitigation strategy where lighting provision is required in line with national guidelines. Mitigation planting design here has looked to minimise adverse effects from light pollution whilst responding to visibility and highway safety requirements.

11.7.5 Sustainability & Biodiversity (see Conceptual Mitigation Strategy, Figures 19.1 a-h for specific locations)

Design development recognises the principles set out in the Scottish Executive's "Cost Effective Landscape: Learning from Nature" and "Trunk Road Biodiversity Action Plan"

documents. It aims to maximise sustainability and biodiversity both during construction and in the longer term.

Design based on natural characteristics is expected to produce a more sustainable scheme in which the commitment to ongoing management is reduced. Long-term maintenance is intended to be minimal and in particular to avoid the need for continuation of frequent verge mowing except where road safety or visibility requirements need to be observed.

Excavations to create interesting cutting features or SUDS attenuation facilities, sensitively shaped with generally rounded topographical formation and with species-rich grassland, and wet planting will create both ecological and landscape benefits in the longer-term.

Potentially hostile growing conditions will be turned to advantage by discouraging unsuitable cosmetic treatment and focusing on the need for native species used in a manner which reflects the "natural" habitat in the vicinity, and in particular, sites designated for their nature conservation value. New planting has been limited in SUDs basins to encourage natural regeneration, but overall will provide an enhancement of the existing vegetation resource. Where plant material is introduced it is substantially based on native species intended to be of local provenance thus optimising survival and growth prospects. The scheme includes the re-introduction of hedgerows to some of the new road boundaries, which have a valuable integrating/linking function.

In combination, all of these elements contribute to increased ecological variety, a more diverse landscape character, and greater visual interest around the road network without prejudice to existing outward views.

The natural characteristics of the scheme design will not only minimise the requirement for landscape maintenance, but also provide a varied series of grassland and scrub/ woodland and wetland habitats the value of which is increased by linkages throughout the scheme. In the long term it is expected that a highway landscape environment will develop which is largely self-maintaining and the outer habitat features contributes to nature conservation and local biodiversity. Future liaison with local stakeholders will influence the long-term strategy for aftercare and management.

11.7.6 Indicative Planting Schedule

It is envisaged that the proposed Network Improvement Scheme will result in a loss of approximately 10.2Ha of vegetation. Below is a list of the proposed planting species. The species mix within planting types are intended to be locally variable to integrate with existing landscape elements.

Semi Natural Woodland, 55,426m^2

- *Fraxinus excelsior* (Ash);
- *Quercus robur* (Oak);

- *Fagus sylvatica* (Beech);
- *Pinus sylvestris* (Scots Pine);
- *Prunus avium* (Gean/Wild Cherry);
- *Sorbus aucuparia* (Rowan/Mountain Ash);
- *Acer pseudoplatanus* (Sycamore);
- *Crataegus monogyna* (Hawthorn);
- *Ilex aquifolium* (Holly);
- *Ligustrum vulgare* (Privet);
- *Prunus spinosa* (Blackthorn);
- *Rosa canina* (Dog Rose);
- *Corylus avellana* (Hazel); and
- *Salix cinerea* (Grey/Sallow)

Wet Woodland, 13,089m^2

- *Fraxinus excelsior* (Ash);
- *Alnus glutinosa* (Common Alder);
- *Betula pubescens* (Downy Birch);
- *Salix caprea* (Goat Willow/Great Sallow);
- *Salix fragilis* (Crack willow);
- *Salix viminalis* (Osier); and
- *Viburnum opulus* (Guelder Rose)

Grass Seed Mixes

All seeded and herbaceous plant mixes should be of at least UK but preferably local provenance and will be finalised in conjunction with the relevant Local Authority ecologist before work commences. Natural regeneration is to be encouraged. Planted areas will not be seeded.

Grass Verges, 35,462m^2

Road verges, visibility splays, and other areas intended for regular mowing as short grass are to be seeded onto 100mm topsoil at 20g/m2 with a minimum maintenance/wide tolerance grass mix including minimum 50% Fescues based on BSH mix A18 or equivalent.

Conservation Grassland, 37,032m²

Cutting slopes, embankments and other informal highway land not the subject of tree and shrub planting to be seeded onto low nutrient substrate or 100mm economy grade topsoil at 5g/m2 with grass and wildflower mix in an 80/20 combination based on BSH mixes A4 and WFG13 and including a high percentage of Fescues and at least a proportion of Yellow Rattle, Common Knapweed, Ribwort Plantain Yarrow, Ox-eye Daisy, Meadow Buttercup, and Red Campion.

Marginal Wetland, 21,504m²

Where wet woodland/scrub planting is not proposed around SUD's attenuation facilities, 50% of the exposed excavated surface is to be seeded when there is least risk of flooding at 5g/m2 with a grass and wildflower mix in an 80/20 combination based on BSH mix WFG9 and including at least Greater Spearwort, Meadow Cranesbill, Purple Loosetrife, Water Speedwell, Greater Burnet, and Crested Dogstail and Meadow Fescue as grass components.

A further 25% of the available area will be randomly planted with informal groups of emergent marginal herbaceous plants at average 4/m2 selected from Common Reed, Marsh Marigold, Hard Rush, Jointed Rush, Soft Rush, Lesser Spearwort, and Purple Loosetrife. Excessively invasive plants such as Typha spp will not be included.

The remaining 25% of the exposed surface shall remain as bare earth to permit colonisation by indigenous pond edge plant communities.

Woodland, scrub and shrub areas planted at 1m2 using minimum 1+1 transplants 400 – 600mm high and with feathered trees at average 5m c/c where appropriate. Specimen or ornamental/ semi-natural trees minimum 8-10cm standards; grown at varying density according to species.

11.8 Landscape Summary

11.8.1 Landscape Baseline Summary

The Landscape Baseline has identified that the study area lies within the Clyde Basin Farmlands Regional Character Area (RCA) and within three local landscape character areas (LLCAs) as shown on Landscape Character and Quality, Figures 11.3 a-f. These areas and "Urban Area" local descriptions are characterised as follows:

- Incised River Valley (Uddingston Clyde and North Calder);
- Fragmented Farmland (M73/ Drumpelier and North Calder);
- Broad Urban Valley (Bothwell – Motherwell and Carmyle - Newton); and
- Urban Area (west of Baillieston to Easterhouse and west of Raith to Calderbraes).

These character areas have been assessed as having varying levels of landscape value and quality. The Broad Urban Valley has a typically medium/high quality, the Incised River Valley has a typically high quality, the Fragmented Farmland has a typically medium quality and the Urban Area is typically of locally medium/low quality.

The study area also has a number of planning designations within its boundaries, which include areas of Green Belt, Conservation Areas, SSSI's, SINC's, Local Nature Reserves and Corridors of Landscape and Wildlife Importance.

Generally, the existing landform is dominated by the various road corridors within broad urban valley, with agriculture in between urban fringe located on the elevated valley sides. Woodland and tree cover is typically irregular with enclosed rural character (east), often mature hedgerow and farmland woodland blocks. There is also maturing screen planting around the communication routes M74/ M73/ M8 and industrial units.

Valuable habitats include nationally important SSSI's, a locally important wildlife corridor associated with the road corridor, isolated habitats with wetland, ponds within SINC's, Local Nature Reserves around Raith Junction of M74 and agricultural woodland, scrub and grassland habitats either side of M73.

The main transport routes are the mainline railway and road corridor containing M74, M73, M8 & minor roads. There are also numerous access routes to the countryside and recreational resources, such as PROW, Clyde Walkway, National Cycleway and designated paths. Water courses and bodies include the Strathclyde Loch, Raith Haugh, River Clyde, North Calder and associated water bodies.

11.8.2 Landscape Impact Summary

Providing that the stated mitigation measures are implemented, the proposed road improvements will have an overall slight adverse impact (not significant) on the surrounding landscape at the year of opening, although with some individual significant impacts. There will be no 'significant' impacts in the long term period of 15+ years as all are either negligible or slight adverse and are not considered to be significant).

The impacts to landform and topography will be slight adverse in the short term and negligible in the long term. The impacts include the remodelling of topography and skylines due to road embankments, cuttings, structures, slip roads and SUDS facilities.

The impacts to tree and woodland landcover will be slight adverse in the short term and negligible in the long term due to changes in landcover and landscape pattern which will be altered during the construction of new junctions and SUDS creation. There will also be minor roadside planting removal due to road widening and new over bridges. However, providing that all tress that are removed, are then replaced during restoration, the long term residual impact should be negligible. There will be a substantial adverse impact to ancient woodland in the short term and a moderate adverse in the long term. This is due to a small area of ancient woodland being lost at Broomhouse which cannot be fully mitigated against.

There will be a direct loss of valuable habitats during construction. The SUDS facilities and planting restoration will go someway to replacing lost habitat. The residual long term impact is slight adverse and therefore not significant.

There will be a slight adverse impact on land use and management in the short term within the development footprint. The residual long term impact will be negligible.

The land use of roads/ rail/ and non-motorised user routes will suffer a slight adverse impact in the short term due to the construction phase causing restrictions and diversions. However, in the long term there will be a slight beneficial impact due to improved layout of the transport routes.

The impact to landcover-drainage will be slightly adverse in the short term due to disturbance during construction of existing resources adjacent to the road. The proposed SUDS systems will reduce the likelihood of flash flooding and will improve the quality of drainage to the natural environment through attenuation and an initial level of treatment. In the long term, the impact will be negligible as ground reinstatement will ensure surface water drainage patterns will not be disrupted.

11.8.3 Landscape Residual Effects Summary

The landscape resource sensitivity and associated magnitude of effects of the proposed development route produce the 'significance' of effects. When mitigation has been taken into account the associated residual effects can be stated. Table 11.7 (Landscape Resource Assessments) states the anticipated effects; sensitivity; magnitude; nature of effect; mitigation, significance, and the residual effect. For the purposes of this assessment a 'significant effect', either positive or negative is considered to be either moderate or substantial (see Table 11.4 above). The following comparative evaluation provides a comprehensive statement on the anticipated residual effects on the landscape character within the study area.

Significant vegetation and other valuable features/habitats contribute towards the recognised landscape character type and perceived scenic value around the existing M8/M73/M74 road corridors. The visual envelope of the proposed scheme also relates closely to the surrounding landform and landcover. The proposed route will remove existing valuable landcover in the form of mature roadside planting due to the extended road footprint (four lane running with hard shoulder, slope steepening/ soil engineering, plus 5m vegetation clearance from edge of carriageway), as illustrated within 11.1 a-f Landscape Effects Baseline Landscape and summarised within Table 11.8 Landscape Resource Assessment.

Mitigation measures will reduce the adverse impacts of these localised changes and the residual effect on the landscape resource effect in the long term (15 plus years) would be no more than slight adverse/negligible.

Incised River Valley (Uddingston Clyde to North Calder Water)

The changes within the Incised River Valley area will be most apparent during the construction phase when the road is being widened and engineering works/ excavation for the proposed SUDS facilities will be created. The extent of impact upon the landform will be limited to these features, and construction activity related to these areas will be minimal and attempt to lose as little vegetation as possible. In the long term, the new wetland features will complement the local landscape character and help to enhance local biodiversity. The residual effect, when mitigation planting and wetland areas have matured, will be negligible in the long-term.

Broad Urban Valley (Bothwell – Motherwell and Carmyle - Newton)

During the construction phase, the main change will be where the road widening will remove screening vegetation. This loss of vegetation cover and localised landform alteration will be adequately mitigated in the long term by new planting. The creation of the SUDS facilities will result in some minor loss of vegetation but will be an attractive diverse habitat for wildlife in the long term and will complement the landscape character. The residual significance of effects in these areas will be negligible in the long- term.

Fragmented Farmland (Daldowie to North Calder Water)

The scheme will not encroach into the area of Fragmented Farmland, but may possibly be visible from certain parts of it, such as West Maryston and the land north of Calderbraes. These areas will have minimal views and there will be little change in the character as the changes to the road will be online. Therefore, the residual effects on these areas will be negligible in the long term.

Urban Area (west of Baillieston to Easterhouse and west of Raith to Calderbraes)

A large part of the Network Improvement Scheme lies within this character area. The main impact on the character will be loss of vegetation through road widening and SUDS creation. However, these will be replaced after construction and the residual effect in the long term will be negligible.

11.9 Visual Summary

11.9.1 Visual Baseline Summary

The existing views of the area vary from short distance to long distance. Views from the road network are usually short distance due to views being screened by a combination of mature roadside planting, landform and built form. The section of road on the M73 between the Baillieston Interchange and the Maryville Interchange has open long distant views of the North Calder Valley, with woodland in the valley bottom and fields and farmsteads above.

There are 10 settlements surrounding the proposed scheme. Views of the existing road network from the surrounding settlements and areas are limited for the same reason that

the views are limited from the road, i.e. roadside planting, landform and built form. Most settlements have no or minor partial views of the road and it is usually only residential properties on the edge of the settlement that have clear views of the road and even these tend to be interrupted or partial views.

11.9.2 Visual Impacts Summary

The majority of visual receptors surrounding the scheme will experience no significant impact due to the road improvements being online and therefore not changing the views greatly. The impacts to views are also reduced by existing roadside planting, topography and built form. The main impacts to the visual receptors are caused by loss and removal of screening vegetation and the change in views associated with the SUDS facilities. However, the SUDS facilities have the potential to be a beneficial impact on the view, as they can create a visually attractive habitat and encourage wildlife.

The loss of screening vegetation has an adverse impact in the short term but providing that this is mitigated by planting new trees and screening vegetation in the restoration phase, this should be negligible in the long term.

11.9.3 Residual Visual Effects

The visual effects associated with the proposed development, highlights the 'magnitude of impact. When mitigation has been taken into account, the associated significance of residual effects can be stated. The Visual Impact Schedule (see Table 11.11) outlines sensitivity; magnitude; change in view; mitigation and the residual significance of effect. The following section provides a comprehensive summary of the anticipated residual effects on the visual amenity within the study area.

The existing topography and visually significant vegetation will be affected by the proposed scheme in a number of ways due to the introduction of new re-profiled embankments; bridges and widened slip roads, as illustrated within Figure 11.2 a-f and Table 11.9. Most significantly around the widening of the M74 bridge over the North Calder Water, near Daldowie and the new slips at Daldowie and the rebuilding of the roundabouts, as these will have the most significant visual and environmental effect on nearby receptors; residential properties; road networks and Non Motorised User Routes.

In the short-term the resulting landform will significantly alter the existing views of road users and established visual envelopes from the identified receptors along the proposed route especially properties located in Broomhouse and Easterhouse surrounding the Maryville interchange, this would result in a Slight / Moderate adverse short term visual effect, where the scheme will have a noticeable deterioration in the existing view due to the magnitude of change and the sensitivity of the receptors (see Photo Viewpoints 9 &10). The residential areas between Calderbraes and Kyle Park directly adjacent to the existing road corridor will also be adversely affected, as some visually significant vegetation will be removed. Within these areas this would result in a Slight adverse short term visual effect, where the scheme will have a barely perceptible change in the existing view due to the magnitude of change and the sensitivity of the receptors. Overall, due to the scale of the likely short-term effects and any long-term benefits of any mitigation

measures, which would look to address visual elements within the landscape, the residual effect would be Slight adverse barely perceptible change in the existing view around the Maryville Interchange.

Incised River Valley (Uddingston Clyde to North Calder Water)

The changes within the Incised River Valley area will be most apparent during the construction phase when the road is being widened and engineering works/ excavation for the proposed SUDS facilities will be created. Construction activity related to these areas will be minimal and attempt to lose as little vegetation as possible. However, it is inevitable that some screening vegetation will be lost, which could open up views of the road in the short term. In the long term, the new planting will replace any lost vegetation and ensure that the screening effects of vegetation continues when mitigation planting and wetland areas have matured, and will therefore be negligible in the long-term.

Broad Urban Valley (Bothwell – Motherwell and Carmyle - Newton)

During the construction phase, the main change will be where the road widening will remove screening vegetation. This loss of vegetation cover and localised landform alteration will be adequately mitigated in the long term by new planting. The creation of the SUDS facilities will result in some minor loss of vegetation but will be an attractive diverse habitat for wildlife in the long term. The residual significance of effects in these areas will be negligible in the long- term.

Fragmented Farmland (Daldowie to North Calder Water)

The scheme will not encroach into the area of Fragmented Farmland, but may possibly be visible from certain parts of it, such as West Maryston and the land north of Calderbraes. These areas will have minimal views and the views that they have will not change significantly, as the changes to the road will be online. Therefore, the residual effects on these areas will be negligible in the long term.

Urban Area (west of Baillieston to Easterhouse and west of Raith to Calderbraes)

A large part of the Network Improvement Scheme lies within this character area. The main impact on the views will be loss of vegetation through road widening and SUDS creation. However, lost vegetation will be replaced after construction and therefore, the residual effect in the long term will be negligible.

11.10 References

Highways Agency, The Scottish Executive Development Department, The National Assembly of Wales and The Department of the Environment for Northern Ireland The Design Manual for Roads and Bridges Volume 11 Environmental Assessment, Section 3 Part 5 (1993, amended and updated 1998/1999/2000/2001/2003)

The Landscape Institute, the Institute of Environmental Management & Assessment – Guidelines for Landscape and Visual Effects Assessment (Second Edition)

South Lanarkshire (Hamilton District) Local Plan, South Lanarkshire Council Planning and Building Control Services (Adopted August 2000)

Local Planning Issues for the Hamilton Area: Consultation Document, South Lanarkshire Council (May 2003)

Ordnance Survey Map Data

Scottish Natural Heritage (1999) 'No. 116: Glasgow and the Clyde Valley landscape assessment'

Scottish Executive's Cost Effective Landscape: Learning from Nature and Trunk Road Biodiversity Action Plan

12 Traffic Noise and Vibration

12.1 Introduction

The objective of this chapter is to assess the noise impact of the proposed Scheme using the guidance contained within the Design Manual for Roads and Bridges Volume 11, Section 3, Part 7 Traffic Noise and Vibration (DMRB). The Scheme under assessment, which is described in Chapter 3, is based on Strategy 3 presented at the DMRB Stage 2 assessment stage.

The Scheme is an on-line improvement Scheme and although the full extent of the works is described in Chapter 3 they are summarised here for clarification. The Scheme widens the existing carriageway at the following locations:

- eastbound M8 from Junction 10, Easterhouse to Baillieston Interchange;
- northbound and southbound carriageways of the M73 between Baillieston Interchange and Maryville Interchange for part of its length;
- northbound and southbound carriageways of the M74 between Junction 2, Carmyle and Junction 5, Raith;
- southbound carriageway of the M74 between Junction 5 Raith and Junction 6 Hamilton.

The Scheme will maintain the existing slip road arrangements through Baillieston Interchange.

There are elements of new construction and these will comprise:

- at M74 Junction 3, Daldowie, relocation of the existing slip road to the M73 northbound, to west of its current position.
- at M74 Junction 3, Daldowie, remodelling of two existing roundabouts.

The Scheme will maintain design speeds of 120kph (70mph). New interchange links have been designed for 85kph (50mph) and 70 kph (40mph) as appropriate. All road surfaces will remain as they are on the existing roads and the data on road surfaces has been taken from the Transport Scotland SERIS database.

The proposed Scheme is one of three road upgrade proposals that are all closely linked; the other two being the M74 (Raith) Junction 5 Improvement and the M8 Baillieston to Newhouse Scheme. Both of these other proposals have been assessed in separate reports. However, the following work, integral to the M8/M73/M74 Network Improvements, has to date been included in the M8 Baillieston to Newhouse Scheme:

- The north side of the M8 carriageway will transition from cutting to embankment 300 m west of an existing railway bridge.

- The railway bridge 50 m west of the M8 lane drop to the M73 and the A89 will be widened to accommodate an additional running lane or a discontinuous hard shoulder will be provided. This additional lane will run directly into the existing M73/A89 lane drop off the M8 eastbound carriageway and will alter the existing single lane drop to a two lane drop, with two lanes maintained through the interchange on the M8 eastbound carriageway.

The assessment of noise is in terms of the difference in noise level that is likely to be experienced with the proposed Scheme in place for the With-Scheme scenario, APR, (Do-something scenario) as compared with the Do-Minimum scenario, ARF, for both the Year of Opening and the Design Year, together with a consideration of the existing noise climate. The APR and the ARF traffic scenarios effectively isolate the effects of the Scheme and it is therefore not necessary to consider a Committed Do Minimum to isolate the effects of the Scheme under consideration as was necessary for the DMRB Stage 3 assessment for the M8 to isolate the effects of the Scheme. It is acknowledged that a DMRB noise assessment requires that the Design Year is 15 years after the Year of Opening; however traffic modelling work for this Scheme uses the CSTM3A traffic model that was developed for the Central Scotland Transport Corridor Studies, ensuring a consistent approach with the methodologies adopted for other recent studies across Scotland. CSTM3A provides data for the years 2010 and 2020. The Scenario 1 high growth rate was shown to be greater than historical trends in the area and hence, the use of this scenario was considered to represent a "worst case". It was considered that projecting this forward to 2025 may have overestimated the realistic amount of growth in the area, and therefore the year 2020 (Scenario 1 High Growth) provides a sufficiently robust dataset upon which to base the assessment of traffic noise and vibration. Traffic assessment and CSTM3A is further explained in Chapter 2.

This chapter firstly explains the basis of road traffic noise and vibration assessments and then outlines the scope of the study area and the methods used for the assessment of the noise and vibration prior to presentation of the assessment findings.

A glossary of acoustical terminology is included as Appendix 12.1.

12.1.1 Traffic Noise

Firstly, the World Health Organisation (1999) has defined noise as unwanted sound, and sound is measured in terms of decibels (dB). The decibel is not an absolute unit of measurement. It is a ratio between a measured quantity and an agreed reference level. The measured quantity is the variation in atmospheric pressure and the reference level is taken as the lowest pressure to which the ear can respond, i.e. 2×10^{-5} Pa. However, although the audible frequency range extends from 20Hz to 20,000 Hz, the ear does not respond equally across this range of frequencies and therefore corrections or "weightings" require to be applied to the measured linear levels to simulate the response of the ear. Consequently, the A-weighting is used to simulate the response of the human ear, so environmental noise is generally measured in terms of dB(A). With noise being assessed as a logarithmic ratio of pressure levels, i.e. decibels, it is sometimes helpful to consider the relationship between the subjective evaluation of noise and the actual

objective levels. The following description may provide some assistance in understanding this relationship.

dB(A)	Description
120	Threshold of pain
95	Pneumatic drill (unsilenced); 7m distance
83	Heavy diesel lorry (40 km/h at 7m distance)
81	Modern twin-engined jet (at take-off at 152m distance)
70	Passenger car (60 km/h at 7m distance)
60	Office environment
50	Ordinary conversation
40	Library
35	Quiet bedroom
0	Threshold of hearing

In terms of noise, road traffic can be separated into two components. The first is generated by the engine, exhaust system and transmission and is the dominant noise source when traffic is not freely flowing. This is particularly apparent from heavy vehicles, when accelerating, braking or changing of gears, and this contributes a significant proportion of low frequency noise. The second noise source component is generated from the interaction of tyres with the road surface. This is the dominant noise source under free flow traffic conditions at moderate to high road speeds and contributes a significant proportion of higher frequency noise.

The sound from a stream of traffic at a reception point is an aggregation of noise from each of a number of vehicles at various distances. The factors that influence the noise level experienced by any listener include the volume of traffic, vehicle speed, the composition of the traffic (i.e. the percentage of heavy goods vehicles (HGVs)), the gradient and the surface characteristics of the carriageway. In addition to the aforementioned variables there is the actual propagation of the sound from the source to the receiver to consider. The propagation is affected by characteristics, such as the distance of the receptor from the source, the topography and characteristics of the ground between the source and receptor, the presence of any screening or barrier effects, and the wind strength and direction.

12.1.2 Measurement of Traffic Noise

The Design Manual for Roads and Bridges, Volume 11 (DMRB) reports that the “A” weighting has been found to give one the best correlations with perceived noisiness of vehicles. Therefore road traffic sound is measured and/or predicted in terms of dB(A).

As the sound from a traffic stream is not constant and varies with time it is necessary to use an index of measurement that will be suitable for the assessment of this sound. An analysis of the statistical distributions of sound levels is a useful tool when assessing

noise. For example, L_{90}, is the level exceeded for 90% of the measurement time, and L_{10} is the level exceeded for 10% of the measurement time period. The index adopted by the Government to assess traffic noise is the $L_{A10(18hr)}$, which is the arithmetic mean of the noise levels exceeded for 10% of the time in each of the one hour periods between 06.00 hours and midnight. In general environmental noise is described in terms of the equivalent continuous sound pressure level, L_{Aeq}.

12.1.3 Traffic Induced Vibration

Traffic-induced vibration is a low frequency disturbance, which can be transmitted through the air or ground. Air-borne vibration from traffic is produced by the drive-train of the vehicle, the engines and exhausts, whereas ground-borne vibration is produced by the interaction between rolling wheels and the road surface.

There are two effects of traffic vibration that need to be considered, these being the effects on buildings and the disturbance caused to occupiers of properties. Extensive research has been carried out on a range of buildings of various ages and types, and no evidence has been found to support the theory that traffic-induced ground-borne vibration is a source of significant damage to buildings (Watts 1990). Ground-borne vibration is also much less likely to be the cause of disturbance to occupiers than air-borne vibration (Baughan and Martin 1981, Watts 1984).

Neither is there any evidence that traffic induced air-borne vibration can cause even minor damage to buildings. However, it can be a source of annoyance to local people, causing vibrations of flexible elements within the building, such as doors, windows and, on occasions, the floors of properties close to the carriageway. This section, therefore, also addresses the issue of nuisance at properties caused by vibration.

12.1.4 Requirements of a DMRB Stage 3 Assessment

Where alterations or improvements are made to the existing road network and where the nature of the changes triggers an assessment in terms of The Environmental Assessment (Scotland) Regulations 1999 an environmental impact assessment has to be undertaken. As part of this assessment the significance of the potential changes in traffic-generated noise has been assessed. In accordance with the requirements of DMRB Volume 11, Section 3, Part 7, a Stage 3 assessment has been carried out by:

- identifying noise sensitive locations and calculating the ambient and proposed noise levels to determine possible noise changes due to the Scheme. As stated above, properties in the vicinity of the proposed road and side roads where traffic increases as a result of the Scheme by 25% or decreases by 20% have been assessed (+25%, -20% represents ±1dB noise level changes);
- identifying appropriate mitigation methods to reduce the impact of any adverse effects;
- undertaking a noise nuisance assessment for properties which experience a noise change of ±1dB(A) or more;

- a note on traffic induced vibration; and
- an estimate of the number of properties potentially eligible under the Noise Insulation (Scotland) Regulations 1975.

12.2 Scope of Study Area and Methods

12.2.1 Scope of Study Area

The operational noise has been considered in terms of the Scheme Study Area. The Study Area comprises the Core Study Area and the Wider Study Area, with the area 300m either side of the Scheme road centre line known as the Core Study Area. The area outwith 300m of the road centre line, where the road traffic generated noise levels will change (by plus or minus one decibel), as a consequence of changes to traffic flows, percentage of HGVs and traffic speeds, due to the proposed Scheme is known as the Wider Study Area.

For the Wider Study Area, which extends as shown in Figure 12.3, an assessment of the impacts as a consequence of the Scheme have been made on the basis of changes, as described in the previous paragraph, and the number of properties affected within 50m either side of roads where 1dB changes occur. The areas that are clearly geographically isolated from the Scheme can be taken as “model noise” and have not been included in the building counts. Note that by using changes in traffic flow as well as changes in percentage of HGVs and changes in traffic speed provides a more accurate indication of the change in noise level when compared with the simpler basis of a 25% increase or a 20% decrease in traffic flow arising as a consequence of the Scheme as mentioned in DMRB Volume 11, Section 3, Part 7. As described above for the Wider Study Area a geographical analysis of properties within 50m of all identified links has been undertaken. (50m distance based on Scottish Transport Appraisal Guidance (STAG), see http://www.scot-tag.org.uk/stag/exec.htm.

12.2.2 Impact Assessment Methods

Where predictions of noise were required they have been calculated using the Department of Transport publication ‘*Calculation of Road Traffic Noise’* 1988 (CRTN) and are quoted as façade levels for buildings and free field for amenity areas unless otherwise indicated. Because the Scheme works comprises essentially of lane widening and alterations to slip roads, the creation of a three dimensional model of the Core Study Area was not considered necessary and a two dimensional model has been created using default building heights of 8m and the noise predicted using Cadna® noise prediction software. Noise levels have been calculated for both Do-Minimum (ARF) and With-Scheme option (APR) in the Year of Opening, (2010) and the Design Year, which in this case is 2020. All calculations are based on the predicted traffic flows and associated variables as supplied by SIAS. All traffic variables used for the noise assessment were provided by SIAS. All traffic flows were supplied as 18 hour AAWT (Annual Average Weekday Traffic). The speeds were modelled as am, pm and interpeak speeds and were corrected by SIAS to give 18hr average speeds for use with the 18hr traffic flows.

The Do-Something scenario merely consists of road widening of existing roads, as such, it is proposed that where there are existing embankments or cuts these will be steepened. Moreover, where existing roads are at grade they will remain at grade. The effect of these changes is simply to move the road traffic source line approximately 3.5m closer to properties alongside the route, yet the intervening topography between the source and receiver will essentially remain constant between road traffic Schemes. In addition, it was deemed that at the time of undertaking the assessment the available contour data would not be detailed enough to show these changes. Therefore the noise impact assessment has been undertaken using a 2D noise model. As a consequence the predicted absolute road traffic noise level due to each road traffic scenario is likely to be overestimated. However, since the attenuation of the road traffic noise, due to the topography between road sources and receivers, remains constant between scenarios, also, since the noise impact assessment is based on changes in noise levels between the road Schemes, the effect of topography can be ignored.

For the Scheme Core Study Area the traffic noise assessment has classified locations according to their ambient noise levels, in bands of <50 dB(A), 50 to <60 dB(A), 60 to <70 dB(A) and ≥70 dB(A), as required by DMRB. For each ambient noise band, the number of properties, and other receptors, subject to the following increases or decreases have been assessed: 1 to <3 dB(A), 3 to <5 dB(A), 5 to <10 dB(A), 10 to 15 dB(A) and over 15 dB(A).

For the properties within the Scheme Core Study Area the assessment of the significance of noise impacts has been based on the magnitude of in the predicted noise levels (between the ARF and the With–Scheme (APR) option for the proposed Year of Opening and Design Year and the sensitivity of noise receptors. In effect, it is a future year comparison.

12.2.3 Significance of Impacts

Whilst DMRB gives no guidance on assessing the significance of effects, this assessment assesses the significance of noise impacts based on the predicted noise levels and magnitude of noise change and the sensitivity of noise receptors. The criteria used for classification of sensitivity of receptors to impacts from noise for this Scheme are defined in Table 12.1, the magnitude of impacts in Table 12.2 and the significance of impact in Table 12.3.

Table 12.1 Criteria used to Define Noise Sensitive Receptors

Sensitivity	Description	Examples of Receptors
High	Receptors where people or operations are particularly susceptible to noise	Residential Quiet outdoor areas used for recreation Conference facilities Auditoria/studios Schools in daytime Hospitals/residential care homes
Medium	Receptors moderately sensitive to noise, where it may cause some distraction or disturbance	Offices Restaurants
Low	Receptors where distraction or disturbance from noise is minimal	Residences and other buildings not occupied during working hours. Factories and working environments with existing high noise levels.

To facilitate an understanding of the magnitude of change it is necessary to appreciate that when considering two sounds of similar acoustic properties, i.e. similar spectral and temporal characteristics, a change of more than 3 dB(A) is regarded as being just perceptible to the human ear under normal conditions. The magnitude of impact can therefore be based on this acoustic 'rule of thumb', supplemented with the evidence contained within DMRB Vol. 11 Section 3 Part 7 Chapter 3 Paragraph 3.5. The latter highlights that "*people are more sensitive to abrupt changes in traffic noise associated with new road Schemes than would be predicted from the steady state evidence. In the period following a change in traffic flow, people may find benefits or disbenefits when the noise changes are as small as 1 dB(A)".*

The magnitude of impact has therefore been assessed by comparison between the increase or decrease in noise levels between the Do-Minimum (ARF) and With-Scheme (APR) options as defined as shown in Table 12.2.

Table 12.2 Magnitude of Impacts due to Changes in Road Traffic Noise

Change in Noise Level	Magnitude of Impact
5 dB(A) and greater	High adverse
3 to < 5 dB(A)	Medium adverse
1 to < 3 dB(A)	Low adverse
0 to < 1 dB(A)	Negligible adverse
0 dB(A)	No impact
0 to < -1 dB(A)	Negligible beneficial
-1 to < -3 dB(A)	Low beneficial
-3 to < -5 dB(A)	Medium beneficial
-5 dB(A) and greater	High beneficial

The significance of noise impacts is determined according to the relationship between magnitude and sensitivity as shown in Table 12.3.

Table 12.3 Significance of Noise Impacts

Magnitude	Sensitivity		
	Low	Medium	High
High	Moderate	Moderate/Substantial	Substantial
Medium	Slight/Moderate	Moderate	Moderate/Substantial
Low	Negligible/Slight	Slight/Moderate	Moderate
Negligible	Negligible	Negligible/Slight	Slight
No Impact	None	None	None

Whilst all properties have been assessed in accordance with DMRB, for discussion purposes some properties and locations have been selected as representative on the basis of one or more of the following principles:

- where it has been considered that buildings may qualify for sound insulation;
- where it has been anticipated that properties will experience significant changes in noise level; and
- where properties are representative of surrounding buildings and the effects of noise will be similar.

Mitigation has been considered where the significance of impact is identified as being greater than “slight adverse”. It should also be noted that mitigation is primarily aimed at the ground floor of properties.

12.2.4 Determination of Baseline Noise

To facilitate a nuisance assessment as required by DMRB it is first of all necessary to know the existing ambient noise level within the area potentially affected by the change. DMRB advises that there are three basic types of ambient noise situations which can occur:-

(i) where the ambient noise is dominated by traffic noise;

(ii) where the ambient noise is comprised of a combination of several undefined sources such as might be encountered in low noise sites in rural settings; or

(iii) where the ambient noise is dominated by noise from non-road traffic sources such as aircraft or trains.

For condition (i) the ambient noise should be measured using L_{A10}. For condition (ii) it is advised that the L_{A10} may be inappropriate and suggests that while the L_{Aeq} parameter could be considered, the L_{A90} scale is a suitable alternative. For condition (iii) DMRB recommends the L_{A90}. Generally, the properties potentially affected by the Scheme have a noise climate presently determined by road traffic noise the L_{A10} parameter is therefore used to describe the existing noise climate.

However, because the existing noise climate is dominated by road traffic the baseline levels have been determined prediction using the methodology set out in CRTN. To validate the use of the predicted levels sample measurements were undertaken. Since the noise models are based on a 2D model it was necessary to find measurement locations giving clear line of sight to the motorways and where the intervening topography is fairly flat. Two locations were identified that fulfilled these two criteria. One was located near to the M74 at the Tourist Information Centre (and shown on Figures 12.1-D and 12.2-D). The second location was west of the Baillieston Interchange north of the M8 at approximate OS Grid Reference 268483,665076. Both of these locations are adjacent to sections of road where additional road lanes are proposed. Table 12.4 presents a comparison between the actual measured and the modelled noise levels for the year 2005.

Table 12.4 Baseline Predicted /Measured Noise Levels

Sample Receiver Locations	Measured Free Field Noise Level $L_{A10(18hr)}$dB	Predicted Free Field Noise Level $L_{A10(18hr)}$ dB
Tourist Information Centre	72	71
West of Baillieston Interchange North of M8 (OS 268483,665076)	79	78

As shown in Table 12.4 the predicted and measured road traffic noise levels are in reasonable agreement. However, whilst the existing noise climate, where road noise dominates, can be determined using the methodology set out in CRTN it should be noted that the DMRB does not expect perfect agreement between measured and predicted levels. It is stated in DMRB that with regard to the actual measured levels "*Care is needed in the interpreting of the levels of the $L_{A10,18h}$ recorded. These will vary from day to day during the year, depending on the influence of varying traffic and weather conditions and seasonal effects.*" It is therefore recommended, that, where the ambient levels are determined by road traffic the predicted levels of $L_{A10,18h}$ provide a more reliable measure for an average day and these are therefore used in the assessment.

To aid in the appreciation of potential noise impacts a number of properties have be chosen that are deemed to be representative of the properties within their locality. These properties are as shown in Table 12.4a.

Table 12.4a Sample Properties

Location	Address
1	THE SHEDDINGS, (268057,662334)
2	85 WARDIE ROAD
3	5 RHINDMUIR PATH
4	20 CROSSVIEW PLACE
5	542 HAMILTON ROAD
6	38 GLASGOW ROAD
7	12 HOLMWOOD AVENUE
8	15 KINGSLEY COURT
9	ST. JOHN THE BAPTIST PRIMARY SCHOOL, NORTH BRITISH ROAD
10	18 WORDSWORTH WAY
11	STRATHCLYDE PARK INN, HAMILTON ROAD
12	TOURIST INFORMATION CENTRE, STRATHCLYDE PARK
13	127 DENMILNE STREET
14	DEANS STABLES, LAIGHLANDS ROAD
15	WOODHEAD FARM,
16	KIRKLANDS HOSPITAL, FALLSIDE ROAD
17	RAITH COTTAGE, STRATHCLYDE COUNTRY PARK

12.2.5 Vibration

The previous Stage 2 assessment required an assessment of the number of buildings likely to be exposed to perceptible vibrations along the route. However a Stage 3 assessment (which this is) only requires a note on traffic induced vibration where necessary. The vibration nuisance assessments presented here are for comparison only and are not indicative of individual response. The survey of vibration nuisance was, in accordance with DMRB, restricted to properties within 40m of the carriageway, and only a very small percentage of people are expected to be bothered by vibration at exposure levels below 58dB(A). Therefore, only those properties within approximately 40m of the road, and with predicted or measured levels greater than 58dB(A), have been included.

12.2.6 Noise Nuisance

DMRB states that a noise nuisance assessment should be carried out. DMRB also makes clear that because of the variability in individual noise responses, practical research has moved from the idea of explaining individual attitudes or annoyance to noise and has, instead, adopted the concept of community annoyance ratings. It is therefore important to realise that the results of the nuisance assessment should not be related to individual annoyance response. The term 'nuisance' is assessed as the percentage of people bothered by traffic noise (i.e., those who say they are 'very much' or 'quite a lot' bothered on a four point worded scale).

DMRB details procedures for estimating changes in traffic noise nuisance when a new road Scheme is planned. This procedure relies on the results from surveys which have examined the relationship between objective measures of road traffic noise outside residential properties and the percentage of people bothered by road traffic noise. The National Environmental Survey 1977 (Harland and Abbot, 1977), has shown that once people become accustomed to a change in noise, their general dissatisfaction with traffic noise does not alter until changes in level on the $L_{A10,18h}$ scale exceed at least 3 dB(A). However, in the period immediately following the completion of a road Scheme, people may find appreciable benefits or disbenefits when noise changes are less than 3 dB(A). Recent research indicates that an abrupt change in traffic noise as small as 1 dB(A) may result in a 21% change in the number of people bothered very much or quite a lot by road traffic noise. A noise disturbance assessment is, therefore, made for all properties where the noise change is expected to be 1 dB(A) or greater. A change in noise level of this magnitude will be produced by a change in traffic flow of approximately +25%/-20% assuming that other factors, such as the average speed and the percentage of HGV's, remain unchanged.

DMRB defines a 'steady-state' relationship between noise exposure and noise nuisance and also shows a relationship between changes in noise nuisance (on the same nuisance scale) and changes in noise exposure. It shows that the change in nuisance soon after a sudden change in noise is much greater than would be predicted from the steady state curve. Noise nuisance predictions for the Scheme are based on the highest nuisance levels expected during the first 15 years after opening. These assessments have been undertaken in accordance with the predictive technique presented in DMRB, although the method has limitations as discussed in the following paragraphs. Although it is important to note that a selection of properties is used as an indication of community annoyance ratings.

The surveys on which the DMRB assessment method were based were conducted at sites where road traffic was the dominant noise source, noise levels ranged from 65 to 78 dB $L_{A10,18h}$, the changes in traffic noise were up to 10 dB $L_{A10,18h}$, and properties were up to 18m from the road. Therefore, it is only at these noise levels and distance ranges that the method is strictly valid. The DMRB method is also valid only for noise changes caused by alterations in traffic flow variables. It will not necessarily give a good prediction if traffic noise changes are brought about by other means such as barriers or low noise road surfaces. However, DMRB, Volume 11, Section 3, Part 7, Chapter 8 Paragraph 5.10 states that "*Strictly, the method should not be used outside the noise and distance ranges covered by the surveys, or when the ambient noise is not from traffic. However, it seems likely that the mechanisms underlying the survey results will operate outside these ranges. Until better information becomes available, it is recommended that the method is used to predict nuisance changes outside these noise and distance ranges, albeit with caution*".

12.2.7 Vibration Nuisance

Investigations have determined a relationship between the number of people affected by the traffic noise and those adversely impacted by air-borne vibration. It was found that the $L_{A10,18h}$ index was among the physical variables most closely associated with average vibration disturbance ratings. The relationships between the percentage of people affected by largely air-borne vibration and this noise exposure index are similar to that for noise nuisance. However, it is recommended in DMRB that the percentage of people bothered by vibration is 10% lower than the corresponding noise nuisance figure, and that at noise levels below 58dB $L_{A10,18h}$, it should be assumed that no people would be affected.

In general, when using DMRB Volume 11 to predict disturbance caused by air-borne vibration it applies directly only to properties within 40m of the road which are un-screened. Outside these conditions, the results of the assessment are considered as only broadly indicative.

12.2.8 Noise Insulation

DMRB also requires an indication of the number of properties which are likely to be eligible for statutory insulation. The Noise Insulation (Scotland) Regulations 1975 provide for noise insulation to be offered in respect of residential properties. The qualifying criteria are detailed within the Regulations and within the Memorandum on the Noise Insulation (Scotland) Regulations 1975 (NISR), regulations 3 and 6. The NISR qualifying criteria are as follows:

- the properties are situated within 300 metres of the new or altered carriageway;
- the properties lie within the triangular area at the terminal point of the new highway, the apexes of which are 50m along the centre-line of the existing highway from the terminal points and the bases of which extend from points 300m on either side of the highway to the nearest point on the carriageway at right angles to the centre line of the carriageway;
- a straight line can be drawn from any point of the property to a point on the carriageway without passing through another building;
- the use of the highway causes or is expected to cause noise at a level not less than 68 dB(A); and
- the property will experience noise levels exceeding the ‘prevailing noise level’ by at least 1.0 dB(A).

The prediction method detailed within the aforementioned Memorandum has been improved over the years and the present methodology contained within CRTN is more accurate and detailed. While DMRB does allow for the use of the method detailed within the Memorandum the predictive tool employed in this assessment is Cadna® and it uses the predictive methods set out in CRTN to calculate noise levels. While the CRTN methodology is more detailed and accurate than that contained within the Memorandum, the NISR requires that eligibility be assessed in terms of the Memorandum. Therefore,

this assessment uses a CRTN predicted level of 65dB(A) as a preliminary indicator of the need to utilise the full Memorandum methodology assessment of eligibility where all the other qualifying criteria are met.

12.3 Baseline Conditions

A description of the existing network has been provided both in Chapter 3 and in the introduction to this chapter. The existing noise climate is dominated by existing road traffic.

As previously explained in Section 1.2.4 because the noise climate within the area is dominated by road traffic the baseline conditions were assessed by means of a prediction of road traffic noise using CRTN as permitted in the DMRB guidance. Actual on-site monitoring was undertaken to verify the model predictions and the actual measured levels at selected sites are shown in Table 12.4 above.

Measurements were undertaken on Friday 9th of November 2007 and Monday 12th of November 2007. The instrumentation used was as follows:-

- Brüel & Kjær Hand Held Analyser Type 2250 (Serial Number 2507254)
- Brüel & Kjær Microphone Type 4189 (Serial Number 2542984)
- Brüel & Kjær Sound Analysis Software BZ 5503
- Brüel & Kjær Sound Level Calibrator Type 4231 (Serial Number 2545421)

The monitoring equipment was calibrated both before and after the measurement period using an acoustic calibrator, which has itself been calibrated against a reference set traceable to National and International Standards. There was no shift in the observed calibration level.

In addition to the properties included in the Table 12.4a there are also other noise sensitive areas worthy of note at this stage; namely-

- Areas of Strathclyde Country Park
- Bothwell Park
- Woods at Bothwell Park
- Laighlands Stables
- Community Centre at Knockburnie Road
- Auchinlea Park
- Tennis Courts at Blairtummock
- Playground at Wardie Road
- Football Pitch at Easterhouse Road
- Daldowie Crematorium
- Calderbraes Golf Course

- Playground at Rhindmuir Road
- Playground at Easthall Primary School
- Bowling Green at Blairtummock
- Blairtummock Primary School
- Swinton Primary School;
- Muiredge Primary School

To assist in the preparation of the DMRB Noise Summary Tables, as shown in Appendix 12.2, the number of properties within the existing <50 dB(A), 50 to <60 dB(A), 60 to <70 dB(A) and ≥70 dB(A) noise bands for the Core Network are detailed in Table 12.5. The properties are split by seven implied uses from address point, namely residential, commercial/industrial, farms, religious, health, schools and recreational amenity use. These implied uses are based on whether an address has an organisation associated with it (if it does not, a residential use is assumed).

Table 12.5 Number of Properties/Areas Within 300m Either Side of the Scheme Categorised According to Existing Noise Band (LA10,18hr dB(A))

Distance Band	Residential			Commercial / Industrial			Amenity / Recreational Areas			Farms			Education			Health		Religious
Metres (m)	50 to <60	60 to <70	≥70	50 to <60	60 to <70	≥70	50 to <60	60 to <70	≥70	50 to <60	60 to <70	≥70	50 to <60	60 to <70	≥70	60 to <70	≥70	60 to <70
0 – 50	0	23	91	0	0	10	0	0	5	0	0	0	0	0	1	0	0	0
50 – 100	6	167	220	0	1	15	0	7	6	0	0	1	0	0	0	0	1	1
100 – 200	379	697	95	0	24	4	0	6	2	0	1	0	0	0	0	1	0	0
200 – 300	1005	580	18	4	15	2	3	3	1	1	1	0	3	1	0	1	0	0
Total	1390	1467	424	4	40	31	3	16	14	1	2	1	3	1	1	2	1	1

12.3.1 Existing Vibration Assessment

The estimated percentage of people bothered very much or quite a lot by vibration, before any change in traffic, is shown in Tables 12.6 and 12.7. It should be noted that as DMRB states that, *"on average, traffic induced vibration is expected to affect a very small percentage of people at exposure levels below 58dB(A) and therefore zero percent should be assumed in these cases*," receiver locations reported in Table 12.6 with predicted levels of less than 58dB $L_{A10(18hr)}$ have been omitted. Also, as previously stated only properties within approximately 40m which exceed the DMRB threshold (greater than 58dB $L_{A10(18hr)}$) have been included. There are 42 residential properties within the Core Network which meet these criteria (represented by the entries in Tables 12.6 and

12.7). Only one of the sample properties lies within 40m of the Core Network. The other properties are as shown in Table 12.7. As can be seen the estimated vibration nuisance is highest at 85 Wardie Road. However, it should be appreciated that since absolute noise levels are used, the estimation of people disturbed by traffic vibration will indeed be an over estimate, or worst case (since the noise model is a 2-Dimensional model the predicted noise level does not include the detailed effects of ground topography). In Table 12.7 the Max Estimation of Traffic Vibration Nuisance has been derived using the maximum noise level at the most exposed building at each location.

Table 12.6 Existing Vibration Assessment – Sample Properties

Location ID	Sample Receiver Location	Modelled $L_{A10(18hr)}$ dB	Estimation of Traffic Vibration Nuisance (% of people bothered by vibration)
2	85 Wardie Road	78.8	49

Table 12.7 Existing Vibration Assessment – Summary of Non-Sample Properties

Location	Number of Properties	Max Estimation of Traffic Vibration Nuisance (% of people bothered by vibration)
BURNACRE GARDENS	8	40
CALDERPARK TERRACE	12	40
DALCHARN PATH	6	41
GLASGOW ROAD	2	40
MOUNT LOCKHART	1	31
ROSEBANK GARDENS	1	31
SHEEPBURN ROAD	2	44
SWORDALE PLACE	6	43

12.4 Predicted Impacts

12.4.1 Do-minimum Scenario (ARF): Noise

The number of properties falling within the commercial/industrial, farms, education, recreational/amenity classifications, residential, health and religious for the ARF, classified in terms of <50 dB(A), 50 to <60 dB(A), 60 to <70 dB(A) and ≥70 dB(A), existing noise bands are detailed in Table 12.8 (a) and 12.8(b) for the Core Study Area for 2010 and 2020 respectively.

Table 12.8(a) Number of Properties/Areas Within Core Study Area 300m Either Side of the Scheme Categorised According to Noise Band (LA10,18hr dB(A)) ARF 2010

Distance Band	Residential			Commercial / Industrial			Amenity / Recreational Areas			Farms		Education			Health		Religious
Metres (m)	50 to <60	60 to <70	≥70	50 to <60	60 to <70	≥70	50 to <60	60 to <70	≥70	60 to <70	≥70	50 to <60	60 to <70	≥70	60 to <70	≥70	60 to <70
0 – 50	0	21	93	0	0	10	0	1	4	0	0	0	0	1	0	0	0
50 – 100	1	126	266	0	0	16	0	1	12	0	1	0	0	0	0	1	1
100 – 200	278	784	109	0	21	7	0	7	1	1	0	0	0	0	1	0	0
200 – 300	940	640	23	4	15	2	3	4	0	2	0	3	1	0	1	0	0
Total	1219	1571	491	4	36	35	3	13	17	3	1	3	1	1	2	1	1

Table 12.8(b) Number of Properties/Areas Within the Core Study Area 300m Either Side of the Scheme Categorised According to Noise Band (LA10,18hr dB(A)) ARF 2020

Distance Band	Residential			Commercial / Industrial			Amenity / Recreational Areas			Farms		Education			Health		Religious
Metres (m)	50 to <60	60 to <70	≥70	50 to <60	60 to <70	≥70	50 to <60	60 to <70	≥70	60 to <70	≥70	50 to <60	60 to <70	≥70	60 to <70	≥70	60 to <70
0 – 50	0	0	114	0	0	10	0	1	4	0	0	0	0	1	0	0	0
50 – 100	1	120	272	0	0	16	0	1	12	0	1	0	0	0	0	1	1
100 – 200	273	787	111	0	20	8	0	5	3	1	0	0	0	0	1	0	0
200 – 300	937	641	25	4	15	2	3	4	0	2	0	2	2	0	1	0	0
Total	1211	1548	522	4	35	36	3	11	19	3	1	2	2	1	2	1	1

12.4.2 ARF: Vibration

The estimation of the percentage of people bothered very much, or quite a lot by vibration for the 2010 and 2020 ARF within the Core Network is represented by the property shown in Table 12.9. Note, levels less than 58dB $L_{A10(18hr)}$ are not assessed as they are below the DMRB threshold and only properties within approximately 40m of the centre

line are included. This is because the DMRB vibration bother relationship is only validated up to 40m.

Table 12.9 Estimation of Traffic Vibration Nuisance (ARF 2010 and 2020 Unmitigated) (% of people bothered by vibration)

Location ID	Sample Receiver Location	2010 ARF Modelled $L_{A10(18hr)}$ dB (facade)	2020 ARF Modelled $L_{A10(18hr)}$ dB (facade)	2010 Estimation of Traffic Vibration Nuisance (% of people bothered by vibration)	2020 Estimation of Traffic Vibration Nuisance (% of people bothered by vibration)
1	85 Wardie Road	78.8	79.8	49	52

12.4.3 With Scheme (APR)

The numbers of residential, commercial/industrial properties, recreational amenity areas, schools, farms, health and religious in terms of <50 dB(A), 50 to <60 dB(A), 60 to <70 dB(A) and ≥70 dB(A) APR predicted noise bands are detailed in Tables 12.10(a) and 12.10(b) for 2010 and 2020, respectively, within the Core Study Area.

Table 12.10(a) Number of Properties/Areas Within the Core Study Area 300m Either Side of the Scheme (APR) Categorised According to Noise Band (LA10,18hr dB(A)) 2010

Distance Band	Residential			Commercial / Industrial			Amenity / Recreational Areas			Farms		Education			Health		Religious
Metres (m)	50 to <60	60 to <70	≥70	50 to <60	60 to <70	≥70	50 to <60	60 to <70	≥70	60 to <70	≥70	50 to <60	60 to <70	≥70	60 to <70	≥70	60 to <70
0 – 50	0	20	94	0	0	10	0	1	4	0	0	0	0	1	0	0	0
50 – 100	1	104	288	0	0	16	0	1	12	0	1	0	0	0	0	1	1
100 – 200	224	809	138	0	20	8	0	7	1	1	0	0	0	0	1	0	0
200 – 300	861	717	25	4	15	2	3	4	0	2	0	1	3	0	1	0	0
Total	1086	1650	545	4	35	36	3	13	17	3	1	1	3	1	2	1	1

Table 12.10(b) Number of Residential Properties/Areas Within the Core Study Area 300m Either Side of the Scheme (APR) Categorised According to Noise Band (LA10,18hr dB(A)) Do-something 2020

Distance Band	Residential			Commercial / Industrial			Amenity / Recreational Areas			Farms		Education			Health		Religious
Metres (m)	50 to <60	60 to <70	≥70	50 to <60	60 to <70	≥70	50 to <60	60 to <70	≥70	60 to <70	≥70	50 to <60	60 to <70	≥70	60 to <70	≥70	60 to <70
0 – 50	0	0	114	0	0	10	0	1	4	0	0	0	0	1	0	0	0
50 – 100	1	78	314	0	0	16	0	1	12	0	1	0	0	0	0	1	1
100 – 200	215	808	148	0	17	11	0	5	3	1	0	0	0	0	1	0	0
200 – 300	833	742	28	4	15	2	3	4	0	2	0	1	3	0	1	0	0
Total	1049	1628	604	4	33	39	3	11	19	3	1	1	3	1	2	1	1

12.4.4 Wider Network

The numbers of residential properties outwith the Core Network, i.e. in the Wider Study Area (as shown in Figure 12.3), which will be subject to a change in noise level of plus or minus 1dB or greater, based on changes in flow, percentage of HGV and traffic speeds, with the preferred Scheme in place in 2020 occur at residential properties only as follows:

Greater than or equal to 1dB: **17 properties**

Less than or equal to minus 1dB: **223 properties**

12.4.5 With Scheme (APR): Vibration

The estimations of the percentage of people bothered very much or quite a lot by vibration are shown in Table 12.11 for 2010 and 2020 for the sample property within 40m. Note that levels less than 58dB $L_{A10(18hr)}$ are not assessed as they are below DMRB threshold, and only properties within approximately 40m of the centre line are included. This is because the DMRB vibration bother relationship is only validated up to 40m. There are 42 properties within the Core Network which meet these criteria. The maximum estimated vibration nuisance for the other 41 properties, by locality can be viewed in Table 12.12. In Table 12.12 the Max Estimation of Traffic Vibration Nuisance has been derived using the maximum noise level at the most exposed building at each location.

Table 12.11 Estimation of Traffic Vibration Nuisance (Do-something 2010 and 2020 Unmitigated) (% of people bothered by vibration)

Location ID	Sample Receiver Location	2010 APR Modelled $L_{A10(18hr)}$ dB (facade)	2020 APR Modelled $L_{A10(18hr)}$ dB (facade)	2010 Estimation of Traffic Vibration Nuisance (% of People Bothered by Vibration)	2020 Estimation of Traffic Vibration Nuisance (% of People Bothered by Vibration)
1	85 Wardie Road	79.2	80.2	50	53

Table 12.12 APR Estimated Vibration Nuisance – Summary of Non-Sample Properties

Location	Number of Properties	Maximum 2010 Estimation of Traffic Vibration Nuisance (% of people bothered by vibration)	Maximum 2020 Estimation of Traffic Vibration Nuisance (% of people bothered by vibration)
BURNACRE GARDENS	8	47	48
CALDERPARK TERRACE	12	47	49
DALCHARN PATH	6	42	45
GLASGOW ROAD	2	47	49
MOUNT LOCKHART	1	36	38
ROSEBANK GARDENS	1	36	37
SHEEPBURN ROAD	2	50	52
SWORDALE PLACE	6	43	46

To reiterate, it should be appreciated that estimated traffic vibration nuisance values are worst case; the noise model is 2-Dimensional and, thus, attenuation due to the underlying topography between the source and receiver is not accounted for in the model.

12.4.6 Significance of Impact

The significance of impacts for the APR, derived as described in paragraph 12.2.3.for both 2010 and 2020 unmitigated noise levels are presented in Tables 12.13(a) and Table 12.13(b) respectively together with the difference between the calculated Do-minimum (ARF) and Do-something (APR) noise levels for both 2010 and 2020. Figures 12.1(A – D) provide a graphical representation of this data, at the ground floor level. In addition, for information only, the difference between the calculated Existing and Do-something (APR) 2010 and 2020, noise levels are presented. Figures 12.2 (A – D) provides a similar graphical representation, but at the first floor level. A comparison of the numbers of commercial/industrial properties recreational amenity areas, schools, farms and community facilities in terms of <50 dB(A), 50 to <60 dB(A), 60 to <70 dB(A) and ≥70 dB(A) predicted noise bands are presented in the DMRB Noise Summary Tables included as Appendix 12.2.

Table 12.13(a) Proposed Scheme Significance of Impact for 2010 and 2020 Unmitigated Levels at 1.5m (LA10,18hr dB(A)) (Ground Floor)

Location ID	Location	APR Minus ARF (dB)		Proposed Scheme Significance of Impact (unmitigated at ground floor level)	
		2010	2020	2010	2020
1	The Sheddings	0.3	0.5	Slight Adverse	Slight Adverse
2	85 Wardie Road	0.4	0.4	Slight Adverse	Slight Adverse
3	5 Rhindmuir Path	-0.1	0.2	Slight Beneficial	Slight Adverse
4	20 Crossview Place	0.0	0.1	No Benefit	Slight Adverse
5	542 Hamilton Road	0.5	0.8	Slight Adverse	Slight Adverse
6	38 Glasgow Road	0.0	0.0	No Benefit	No Benefit
7	12 Holmwood Avenue	0.8	0.9	Slight Adverse	Slight Adverse
8	15 Kingsley Court	0.0	0.0	No Benefit	No Benefit
9	St. John The Baptist Primary School	0.3	0.4	Slight Adverse	Slight Adverse
10	18 Wordsworth Way	0.8	0.9	Slight Adverse	Slight Adverse
11	Strathclyde Park Inn	-0.1	-0.1	Negligible/ Slight Beneficial	Negligible/ Slight Beneficial
12	Tourist Information Centre	0.1	0.0	Negligible/ Slight Adverse	No Benefit
13	127 Denmilne Street	0.1	0.6	Slight Adverse	Slight Adverse
14	Deans Stables	0.1	0.0	Slight Adverse	No Benefit
15	Woodhead Farm	0.1	0.1	Negligible Adverse	Negligible Adverse
16	Kirklands Hospital	0.2	0.2	Slight Adverse	Slight Adverse
17	Raith Cottage	0.1	0.2	Negligible/ Slight Adverse	Negligible/ Slight Adverse

Table 12.13(b) Proposed Scheme Significance of Impact for 2010 and 2020 Unmitigated Levels at 1.5m (LA10,18hr dB(A)) (First Floor)

Location ID	Location	APR Minus ARF (dB)		Proposed Scheme Significance of Impact (unmitigated at ground floor level)	
		2010	2020	2010	2020
1	The Sheddings	0.1	0.3	Slight Adverse	Slight Adverse
2	85 Wardie Road	0.3	0.3	Slight Adverse	Slight Adverse
3	5 Rhindmuir Path	0.0	0.3	No Benefit	Slight Adverse
4	20 Crossview Place	0.0	0.1	No Benefit	Slight Adverse
5	542 Hamilton Road	0.5	0.7	Slight Adverse	Slight Adverse
5	38 Glasgow Road	0.0	0.1	No Benefit	Slight Adverse
7	12 Holmwood Avenue	0.5	0.6	Slight Adverse	Slight Adverse
8	15 Kingsley Court	0.1	0.1	Slight Adverse	Slight Adverse
9	St. John The Baptist Primary School	0.2	0.3	Slight Adverse	Slight Adverse
10	18 Wordsworth Way	0.6	0.6	Slight Adverse	Slight Adverse
11	Strathclyde Park Inn	-0.1	0.0	Negligible/ Slight Beneficial	No Benefit
12	Tourist Information Centre	0.1	0.1	Negligible/ Slight Adverse	Negligible/ Slight Adverse
13	127 Denmilne Street	0.1	0.5	Slight Adverse	Slight Adverse
14	Deans Stables	0.1	0.1	Slight Adverse	Slight Adverse
15	Woodhead Farm,	0.1	0.1	Negligible Adverse	Negligible Adverse
16	Kirklands Hospital	0.2	0.2	Negligible/ Slight Adverse	Negligible/ Slight Adverse
17	Raith Cottage	0.0	0.0	No Benefit	No Benefit

12.5 Mitigation

As was stated in Paragraph 12.2.3 mitigation is to be considered where the significance of impact has been determined to be greater than “slight adverse”. The noise assessment has shown that there are no residential properties where the significance of impact is greater than slight adverse. Hence this noise assessment demonstrates that mitigation of road traffic noise is not required. This outcome is not surprising when considering that, for example, an increase of twenty five percent in traffic flows is required in order to give a 1dB increase in the road traffic noise level. Since the M8/M73/M74 Network Improvements simply consist of the widening of existing Motorway roads there would need to be are fairly large increase in the absolute number of vehicles using the Motorway to give a 1dB increase in noise levels. .

12.6 Nuisance

As was stated in Section 12.2.6 DMRB makes clear that because of the variability in individual responses, practical research has moved from the idea of explaining individual attitudes or annoyance to noise and has instead adopted the concept of community

annoyance ratings. It is therefore important to realise that the results of the nuisance assessment should not be related to individual annoyance response. The 'nuisance assessment' provided in the DMRB summary Tables, included as Appendix 12.2, allow a comparison of changes in reported community noise nuisance level only. The results should not be considered in terms of the response likely at individual properties. Moreover, absolute predicted noise levels as well as relative changes in noise levels are both used in the analysis of nuisance and it should be appreciated that the results of this analysis will be in terms of a worse case scenario. This is because the absolute noise levels do not include the effects of the underlying topography between road source and receivers: the noise model is a 2-Dimensional model.

12.7 Wider Network Assessment

DMRB requires that an assessment be made of all properties where there is a change of 1dB, or more in the noise level due to the proposed road Scheme. However, as was described earlier, the operational noise was considered in terms of a Scheme Study Area, which comprised of the Core Study Area, i.e. 300m either side of the road centre line and the Wider Study Area, i.e. any area outwith the 300m previously defined.

For the Core Study Area an assessment was undertaken of all properties by the creation of two dimensional surface model, using default building heights, and a CRTN calculation implemented by Cadna® noise prediction software. For the Wider Study Area the assessment was undertaken by first of all identifying all roads where road traffic generated noise levels were predicted to change by at least 1dB as a consequence of changes to the road traffic flows, percentage of HGVs and traffic speeds, in the Design Year (ARF versus APR). The CRTN Basic Noise Level (BNL) for these roads was then calculated. The extent of the Wider Network Analysis is shown in Figure 12.3.

The assessment of properties within the Wider Study Area was then undertaken by evaluation of the consequent change in population annoyed as per Scottish Transport Appraisal Guidance (STAG), see http://www.transportscotland.gov.uk. This was undertaken by a geographical analysis of population data to estimate the population within 50m of all identified links with a 1dB or more change within the Wider Study Area. The STAG tables are reproduced as Tables 12.14(a) and 12.14(b) for the Year of Opening (2010) and the Design Year (2020) respectively.

With the Scheme in place, the results over the Wider Study Area (i.e. outwith the Core Study Areas), show the net annoyance change in the design year. The results show that 20 fewer people, out of a total of 566 people (number of properties multiplied by 2.36) within the assessed Wider Network, will be annoyed by noise than would be annoyed by noise without the Scheme in place.

Table 12.14(a): No. of Households Experiencing 'Do Minimum' & 'Do Something' Noise Levels (given in dBLeq) In Opening Year

	Do Something	<45	45-47.9	48-50.9	51-53.9	54-56.9	57-59.9	60-62.9	63-65.9	66-68.9	69-71.9	72-74.9	75-77.9	78-80.9	81+
Do Minimum															
<45		0	0	0	0	0	0	0	0	0	0	0	0	0	0
45-47.9		0	0	0	0	0	0	0	0	0	0	0	0	0	0
48-50.9		0	0	0	0	0	0	0	0	0	0	0	0	0	0
51-53.9		0	0	0	0	0	0	0	0	0	0	0	0	0	0
54-56.9		0	0	0	0	4	5	0	0	0	0	0	0	0	0
57-59.9		0	0	0	0	44	22	3	0	0	0	0	0	0	0
60-62.9		0	0	0	0	0	92	28	1	0	0	0	0	0	0
63-65.9		0	0	0	0	0	0	35	2	0	0	0	0	0	0
66-68.9		0	0	0	0	0	0	0	4	0	0	0	0	0	0
69-71.9		0	0	0	0	0	0	0	0	0	0	0	0	0	0
72-74.9		0	0	0	0	0	0	0	0	0	0	0	0	0	0
75-77.9		0	0	0	0	0	0	0	0	0	0	0	0	0	0
78-80.9		0	0	0	0	0	0	0	0	0	0	0	0	0	0
81+		0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 12.14(b) No. of Households Experiencing 'Do Minimum' & 'Do Something' Noise Levels (given in dB Leq) in Design year

	Do Something	<45	45-47.9	48-50.9	51-53.9	54-56.9	57-59.9	60-62.9	63-65.9	66-68.9	69-71.9	72-74.9	75-77.9	78-80.9	81+
Do Minimum															
<45		0	0	0	0	0	0	0	0	0	0	0	0	0	0
45-47.9		0	0	0	0	0	0	0	0	0	0	0	0	0	0
48-50.9		0	0	0	0	0	0	0	0	0	0	0	0	0	0
51-53.9		0	0	0	0	0	0	0	0	0	0	0	0	0	0
54-56.9		0	0	0	0	0	6	0	0	0	0	0	0	0	0
57-59.9		0	0	0	0	35	15	3	0	0	0	0	0	0	0
60-62.9		0	0	0	0	0	83	33	3	0	0	0	0	0	0
63-65.9		0	0	0	0	0	0	48	8	0	0	0	0	0	0
66-68.9		0	0	0	0	0	0	0	6	0	0	0	0	0	0
69-71.9		0	0	0	0	0	0	0	0	0	0	0	0	0	0
72-74.9		0	0	0	0	0	0	0	0	0	0	0	0	0	0
75-77.9		0	0	0	0	0	0	0	0	0	0	0	0	0	0
78-80.9		0	0	0	0	0	0	0	0	0	0	0	0	0	0
81+		0	0	0	0	0	0	0	0	0	0	0	0	0	0

12.8 Summary

The DMRB Summary Tables are included as Appendix 12.2.

In total there are 3281 residential properties within the Core Area. The overall significance of impact for these properties are summarised in Tables 12.15(a) and 12.15(b) for the Year of Opening and Design Years, respectively.

Table 12.15(a) Summary of Significance of Impact at Residential Properties for the Year of Opening

Category of significance of impact	Number at Ground Floor	Number at First floor
Slight Adverse	1833	1648
No Change	1179	1358
Slight Beneficial	269	275

Table 12.15(b) Summary of Significance of Impact at Residential Properties for the Design Year

Category of significance of impact	Number at Ground Floor	Number at First floor
Slight Adverse	2515	2494
No Change	677	713
Slight Beneficial	89	74

Overall, for the Core Network, there are no properties at which the predicted significance of impact is greater than “slight adverse” and, as such, noise mitigation is not required.

For the Wider Network the Scheme shows very clear benefits for 20 people out of a total of 566 people (number of properties multiplied by 2.36) that will experience a reduction in noise annoyance.

Regulation 3 of the Noise Insulation (Scotland) Regulations 1975 confers a duty on road authorities to offer insulation to eligible residential properties affected by noise from a new road or additional carriageway, where the use of the road causes, or is expected to cause the relevant noise level to exceed the prevailing noise level by at least 1 dB (A) and is not less than the specific level (68 dB $L_{A10(18hr)}$. A count of (potentially) eligible domestic properties has been carried out and it has been determined that there are (potentially) of the order of 61 properties that may be deemed eligible in terms of NISR in the Design Year. Each of these properties has an absolute noise level greater than $L_{A10(18hr)}$ 65dB (65dB(A) is used as a proxy for the 68dB(A) because of the different calculation methodology required under the NISR) and the difference between Do-Something and

Do-Minimum is 1dB or more. Indeed, for these properties the difference between the Do-Something and Do-Minimum noise levels in the Design Year is predicted to be 1dB.

A list of properties that may be eligible will be drawn up in advance of the construction stage. Prevailing noise levels will be measured prior to construction for these properties in accordance with the 1975 Regulations. Within 12 months of the opening of the road, further measurements will be undertaken to determine eligibility under the Regulations. The Regulations also require that eligibility for noise insulation is reviewed at defined intervals (5, 10 and 15 years) after the road is opened. The statutory noise insulation assessments will be undertaken by Scottish Government representatives.

Under the requirements of DMRB, all properties that experience a change in noise level of 1 dB(A) or more must be classified into ambient noise level bands of below 50 dB(A), 50 to <60 dB(A), 60 to <70 dB(A) and ≥70 dB(A). It is estimated that there are 353 residential properties located in the study area that are predicted to experience a change in noise level of this nature for the Do-Minimum Scenario and there are 1323 residential properties in the Do-Something scenario. In addition, it is estimated that approximately 3281 properties will experience an increase in potential noise nuisance for the Do-Something Scheme and 3273 properties for the Do-Minimum Scheme.

Outwith the core area there are 17 properties within 50m of a road where that road has a predicted noise increase of 1dB, or more, and 223 properties that lie within 50m of a road with a predicted decrease in noise of at least 1dB.

It should be appreciated that there are no residential properties with a significance of impact that is greater than “Slight Adverse”. This implies that there are no residential properties where the increase in noise level, due to the M8/M73/M74 Network Improvements, results in an assessed noise level that exceeds 1dB. Moreover, although the noise assessment shows that there are 2515 residential properties where the Significance of Impact is “Slight Adverse” in the Design Year the average increase in noise level for these properties is approximately 0.2dB. This small increase in the absolute noise level is not surprising when it is considered that the M8/M73/M74 Network Improvements simply consist of the widening of existing Motorway roads. Since, with the addition of an extra lane, the relative change in the distance between the source and receiver will, in general, be very small the noise impact will be very small indeed: remember that the increase in noise level is equal to 10 times the logarithm to the base ten of the new source to receive separation divided by old source to receiver separation. Also, there needs to be at least a twenty-five percent increase in the traffic flow for there to be a 1dB in the noise level. Therefore, there needs to be are fairly large increase in the absolute number of vehicles using a motorway in order to give a 1dB increase in noise levels.

Within the Core Network there are approximately 41 properties with 40m of the Do-Something Scheme that are predicted to be exposed to a noise level greater than or equal to 58dB $L_{A10(18hr)}$. These properties are clustered at nine different locations. At 85 Wardrie Road, which represents the most exposed group of properties (4), within 40m of the Do-Something Scheme, the 2020 Do-Something estimation of traffic vibration

nuisance (% of people bothered by vibration) is equal to 53% where as for the Do-Minimum Scenario 52% are predicted to be bothered. This compares with the current situation where 49% are predicted to be bothered. Yet it should be appreciated that these predictions are based on absolute noise levels which, because the assessment has been based on a 2-Dimensional model, is likely to prove over estimated values for estimated traffic vibration nuisance. Therefore, due to the nature of the non linear relationship between noise exposure and the percentage of people bothered, the actual change in the percentage of people bothered when comparing the existing situation with the year of opening and/or the Design Year, and the year of opening with the Design Year, is likely to be less than three, four and one percent, respectively.

12.9 References

World Health Organisation, *Community Noise* 1999/2000

Watts, G.R. (1990) TRRL Research Report 246 *Traffic Induced Vibration in Buildings*

Baughan and Martin 1981, (see DMRB text for references)

Watts, G. R. (1984), *Vibration Nuisance from Road Traffic – results of a 50 site survey*

Design Manual for Roads and Bridges (DMRB); Volume 11, Section 3, Part 7 Traffic Noise and Vibration

Calculation of Road Traffic Noise (CRTN); Department of Transport Welsh Office, 1988

Scottish Transport Appraisal Guidance (STAG)
www.scot-tag.org.uk/stag/exec.htm

13 Pedestrians, Cyclists, Equestrians and Community Effects

13.1 Introduction

The objective of this chapter is to identify the routes used by pedestrians and others together with associated community facilities, and to assess the potential effects upon these of the proposed M8/M73/M74 Network Improvements Scheme.

13.2 Methods

This chapter has been prepared in general accordance with the principles and techniques outlined in The Design Manual for Roads and Bridges (DMRB) Volume 11 (Environmental Assessment) and as set out in Chapter 4 herein (Approach and Methods). The aim of the assessment was to identify community facilities and existing and proposed non-vehicular routes used by pedestrians, cyclists, equestrians and others. An assessment was then made of potential changes to amenity value, safety and journey times, with particular emphasis placed on routes that traverse the existing M73/M74 corridor and which are thus most likely to be affected by the Scheme. Where changes due to the scheme were to the detriment of pedestrians and others, an assessment of how to mitigate these negative effects was made.

The assessment was based on a desk study of relevant plans and other published documents listed at 13.7 supplemented by a walkover survey to update and confirm site specific information. Actual counts of pedestrian/ cycle / equestrian movements were carried out across 14 crossing locations identified in the following section to help establish their baseline usage. This involved a 48 hour count between 00:00 Friday 1st June 2007 and 24:00 Saturday 2nd June 2007 and involved the setting up of video cameras at the 14 locations to record NMU movements. Results were recorded for each 15 minute period. The recorded flows were then utilised to establish the typical nature of the use of each crossing, i.e. for commuting, educational, or leisure purposes, and to assist in gauging their sensitivity to change. Consultation with the Scottish Rights of Way and Access Society (ScotWays), Sustrans, Scottish Natural Heritage, Central Scotland Forest Trust and South Lanarkshire Council (SLC) was also undertaken.

The routes designated for use by pedestrians and others and the key community facilities identified within the study area are shown in NMU Access Drawing Sheets 1 to 6 (M8MFJV/ST2/T/4001 to 4006) which form an integral part of the assessment.

13.3 Baseline Conditions

13.3.1 M8 Junction 10 to Baillieston Interchange – Figure 13.1a

As indicated by Figure 13.1a there is existing provision for pedestrian, cycle and other non-motorised forms of travel across this part of the M8 at the following locations:

1. Across Junction 10 between Westerhouse Road and Bartiebeith Road

2. Across a footbridge linking Halliburton Crescent to the south with a footpath to the north further linked to Kildermorie Road and Arniesdale

3. Across Wardie Road

4. The Jimmy Young Bridge

The communities of Easterhouse to the north and Queenslie/Barlanock to the south are potentially affected by the Scheme. These areas:

- are included within the Greater Easterhouse Social Inclusion Partnership (SIP);
- contain a very high proportion of 'no-car' households; and
- are currently severed north-south by the existing M8 alignment.

A number of key facilities exist, to which local people require access. These include:

- Queenslie Industrial Estate for employment opportunities, south-west of Junction 10.
- Easterhouse Shopping Centre for shopping and employment opportunities.
- Glasgow Fort shopping centre for shopping and employment opportunities.
- John Wheatley College for education, training and employment opportunities.
- A number of primary and secondary schools.
- A variety of Community Support Services, many of which are located in the Westerhouse Road/ John Wheatley College/ Easterhouse shopping centre area.

Of the circa 29,000 people resident in this SIP, many will be dependant on forms of travel other than the private car to access these key facilities and neighbouring communities across the M8. Many of these movements are likely to take place using crossings described above.

The Westerhouse Road/ Bartiebeith Road, junction 10 (Crossing 1) is a motorway over bridge and pedestrian surveys carried out on 1 June 2007 revealed that the bridge is heavily used particularly by pedestrians which constitute 97% of the NMU traffic. Approximately 900 people use the bridge on a weekday, and 700 on a Saturday, with numbers rising throughout the day, peaking in mid to late afternoon, with several smaller peaks; this is consistent with a range of employment and educational attractions nearby and the low car ownership rate in the area. The footway on either side of the bridge is generally wide at approximately 3m and facilitates non motorised travel. Advisory cycle lanes are in force on the carriageway for the extent of the bridge.

M8 Junction 10 NMU Provision

The footbridge from Haliburton Crescent to Kildermorie Road (Crossing 2) is also quite wide at approximately 3m and is heavily used by pedestrians, who constitute over 99% of the non motorised traffic, over 850 on a weekday and 650 on a Saturday. Flow profiles are similar to that observed at Crossing 1, which is also consistent with the nature of the area.

Haliburton Road Footbridge

The M8 overbridge at Wardie Road (Crossing 3), to a slightly lesser degree is also heavily used by pedestrians, who constitute 99% of NMU movements with nearly 600 movements being completed on a weekday and nearly 500 on a Saturday. The flow profile demonstrates clear movement peaks in a northbound direction during 08:00-09:00 hours and a southbound direction 15:00-16:00 hours consistent with travel to and from employment. There are also smaller peaks in both directions between 12:00-13:00 hours, consistent with the educational facilities in the area. Footways are also generous over the bridge at approximately 2.8m wide, slight gradients are in place however at either end.

Wardie Road Overbridge

A number of bus services also serve the area, providing access to facilities in Glasgow City Centre. Many of these bus routes use the Junction 10 crossing. In addition, planned improvements to John Wheatley College include proposals for an improved Public Transport (bus) interchange.

Further east, the Jimmy Young Bridge, M8 junction 9 (Crossing 4) is also popular, mainly with pedestrians who constitute 96% and 98% of the flow on a Friday and Saturday, respectively with approximately 700 trips and 600 trips recorded. Footways on either side are again wide at approximately 3m. Easterhouse Rail station is accessible via the Jimmy Young Bridge. Compared to the availability of buses, this facility is relatively remote for Easterhouse residents. This station is closer to the community of Swinton, which lies beyond the SIP boundary towards the Baillieston Interchange. The presence of the station appears to be replicated in the NMU survey carried out at his site with a peak southbound movement, towards the station recorded during 07:00-10:00 hours and potentially corresponding northbound, from the station peak recorded during 16:00-18:00 hours, possibly commuting movements. There also appears to be a peak that corresponds with people perhaps heading to the station in the early evening and returning later at night, perhaps social trips. Peaks on a Saturday appear to be more associated with social movements.

Jimmy Young Bridge

13.3.2 M73 Baillieston to Maryville Interchanges (M73/M74) – Figure 13.1b

As indicated by Figure 13.1b all of the non-motorised user routes from of Swinton (Rhindmuir Road) and Crosshill (Old Edinburgh Road and Bredisholm Road) to Bargeddie (Bredisholm Road), go via the Ellismuir farm accommodation bridge. Population in this area is sparse and so there is likely to be little requirement for non-motorised travel. This is reflected in the NMU surveys which recorded 49 people movements on a Friday and 40 on a Saturday. Further south, the North Calder Water crosses the M73 but there is no footpath provision alongside it available for use by pedestrians, cyclists or other users.

Ellismuir Farm Accommodation Bridge

13.3.3 Maryville Interchange (M73/M74) and M74 west –Figure 13.1c

As shown in Figure 13.1c, the nearest significant centres of population in this area around the Maryville Interchange are:

- Broomhouse, a suburb to the southeast of Glasgow;
- Calderbraes (to the east of the interchange, in North Lanarkshire); and
- Uddingston (south-east of the interchange, in South Lanarkshire).

Some residential expansion of Broomhouse is allocated within the Glasgow City Plan adjacent to the Glasgow Zoo (now closed). This community currently has access across the M74 to some recreational facilities to the south (Listed Building and recreational resources). To achieve this there is a footbridge across Hamilton Road linked to footways along Hamilton Road and the M74 overbridge. The Hamilton Road Footbridge, which is approximately 2m wide, is in poor condition and its stepped ramps do not accommodate movements by the less able. Footway provision across junction 4 is provided only on the eastern side of the overbridge; the main population and the Hamilton Road Footbridge are located to the west. Use of the M74, junction 4 overbridge is comparatively limited, with 94 people recorded using the bridge on a Friday and 50 on a Saturday. This is consistent with there being relatively few attractions to the south of the M74, primarily a sewage works and crematorium.

On a Saturday 24% of the NMU traffic at this location was equestrian (12 riders). This is the only location, bar one other, where any equestrian use was recorded.

Footbridge across Hamilton Road

M74 Overbridge

Footways run east from Broomhouse along the Hamilton Road/Glasgow Road/A74 road corridor, providing a link to Calderbraes, Birkenshaw and Uddingtson. The quality of this route varies, with footway widths of no more than 1m in places but wider around the recently constructed roundabout junction of the A74/B7001. NMU counts at this location are comparably small with 75 people on a Friday and 105 on Saturday, suggesting that this mainly a recreational route. Cyclists formed the majority of the traffic on a Friday (63%) and 45% on a Saturday.

M73/M74 Pedestrian Underpasses

This route passes beneath the M73/M74 Maryville interchange via two underpasses. Links to Uddingston are provided by M74 overbridges at the B758 Blantyre Farm Road and the B7071 Glasgow Road. The NMU surveys on the B758 confirmed previous site observations, which noted that usage of the routes between communities were relatively low, with 86 users being observed on a Friday and 88 on a Saturday, 20% and 32% respectively of whom were cyclists. While the data are limited, results suggest that this is also mainly a recreational route.

B758 Blantyre Farm Road

Use of the B7071, M74 overbridge between Calderbraes and Uddingston is slightly higher with 270 users on a Friday and 281 on a Saturday. When observing the pattern of flows it appears that there are more defined peaks in movements, with users heading southeast in the morning (08:00 – 09:00 hours) and northwest in the afternoon (16:00-17:00 hours) on a Friday. This may be associated with educational facilities in Uddingston, such as Uddingston Grammar School.

B7071 Glasgow Road

There are some employment opportunities in the Birkenshaw area as well as a school. The absence of schools in Broomhouse and its relative isolation suggests that there may be a requirement to continue to cater for pupil pedestrian travel between this area, Birkenshaw and Uddingston, although Council boundaries at the interchange imply that Broomhouse-resident children are likely to attend schools further to the northeast of Maryville Interchange in Baillieston.

There are bus services routed along the A74/Hamilton Road corridor between Uddingston, Calderbraes and Broomhouse. These will not be affected by the proposed widening of the M74 at this location.

13.3.4 M74 from Maryville Interchange to Raith (Junction 5, M74/A725) – Figures 13.1d and e

Figures 13.1d and e show the M74 (south of the B7071 Glasgow Road) as it currently passes through the communities of Uddingston (to the southwest) and Tannochside/Viewpark (to the northeast). A number of key local services have been identified, all of which are located in Uddingston, with the implication that the residents of Tannochside/Viewpark require access across the M74 to reach them (although there are likely be facilities further away from the M74 in Viewpark that also serve local needs). Access across the M74 is provided in the form of the following crossings of the M74 with associated footways:

- Old Mill Road
- National Cycle Network Route 75 between Muiredge Primary School to the west, with further railway crossings to the east towards the A721 Edinburgh Road

- Bellshill Road
- Fallside Road

The M74 Overbridge at Old Mill Road is moderately well utilised by pedestrians, more so on a Friday (726 users) than a Saturday (421 users), with cyclists comprising 3% and 5% of the flow respectively. Data reveal quite clear peaks, southbound during 8:00-9:00 hours and 15:00-16:00 hours, suggesting that route may be of importance to school children.

Old Mill Road

Surveys reveal that the National Cycle Route 75 (NCN75) underpass is moderately well used on a Friday (592 users), 9% of which are cyclists. This route has similar peaks in usage during 08:00-09:00 hours and 15:00-16:00 hours. On Saturday the route is less well used, (283 users), 10% being cyclists. Similarly this suggests that the underpass is likely to be of importance to school children.

N75 Underpass

Key local services in the immediate vicinity of the M74 include 2 primary schools and Uddingston Grammar School. There is also an area of industrial activity to the east of the M74 to which NCN75 provides access, and which may be a significant source of local employment.

Use of the M74 underpass at Bellshill Road is comparatively low at 95 users on a Friday and 56 on a Saturday, 6 % and 14% respectively being cyclists. Although numbers are too small to draw any definite conclusions there appears to be peaks in demand around commuting hours on a Friday, weekday. The profile of demand on a Saturday is less well defined.

M74, Bellhills Road Underpass

The use of the M74 Overbridge at Fallside Road is also relatively low at 85 and 75 users on a Friday and Saturday respectively, 16% of which on both days were cyclists. Peaks in flows are observed during commuting times on the weekday (07:00-08:00 and 17:00-1800 hours) but the data is too limited to draw firm conclusions as to the purpose of journeys (recreational, education or employment

Fallside Road Overbridge

Further south, Figure 13.1e shows the community of Bothwell located to the west of the M74. As well as a sizeable residential community, Bothwell includes a large hospital site and Bothwell Services (M74) is nearby. There is no significantly large population to the east of the M74 at this location, although there is Bothwell Park. The NMU surveys revealed that use of the M74 overbridge at Bothwell was relatively low on a weekday with just 17 users being observed on a Friday. Slightly higher use was observed on a Saturday suggesting it is more of a recreational route for NMU's or is used for local access, although overall numbers are still small (31 users).

Bothwell Park Overbridge

13.3.5 Raith Junction (Junction 5, M74/A725) – Figure 13.1e

Figure 13.1e shows two main routes for NMUs across the existing Junction as follows:

- Route between a footway along the A725 (north) and Orbiston Road; and
- The Clyde Walkway

Strathclyde Country Park is the one facility of importance to the nearby local communities of Bothwell, Whitehill and Orbiston within reasonable walking distances to and across the Junction. The Park offers a number of leisure activities including water sports, playing fields, a hotel, public house and an amusement park.

NMU access across the Junction is currently the only formal means of access between:

- The communities of Orbiston and Bothwell (to the west)
- Sections of the Clyde Walkway

Both the communities of Bothwell and Orbiston enjoy high levels of car ownership suggesting relatively little dependence on non-motorised means of travel for access to key services. Areas of Whitehill are subject to relatively low levels of car ownership, suggesting that a significant amount of the local population could depend on non-motorised forms of transport to access facilities across the Junction.

The route across the Junction is often narrow and immediately adjacent to heavy flows of fast moving vehicles. These features create a route across the Junction that is difficult to negotiate and unattractive to users.

To the east of the Junction a footway continues between the A725 Bellshill Road and Strathclyde Country Park and then along Hamilton Road to provide access to the residential area of Orbiston between Hamilton Road and Motherwell Road. To the west of the Junction a footway also continues along the A725 to link into the footway network of Bothwell, north of the A725.

The Clyde Walkway is a long-distance path along the River Clyde which connects various communities and facilities from Glasgow Centre out through the south-east of the conurbation to Motherwell, Lanark and beyond. The route runs through the Hamilton Low Parks (also known locally as Raith Haugh) SSSI between the A725 at Bothwell and the M74 (Junction 5). It is designated to continue across the Junction and then through Strathclyde Country Park parallel and west of the M74. Clyde Walkway access across the Junction shares the same unsatisfactory route infrastructure described above. This section of the walkway is a significant diversion away from the banks of the Clyde which the route normally follows elsewhere. Also, although the walkway is designated to pass across the Junction, there is no clear means of achieving this to the extent that the current Clyde Walkway is effectively severed as a continuous route for non-motorised travellers in this area.

The Clyde Walkway route through Strathclyde Country Park is also proposed for designation by SUSTRANS as part of Route 74 of the National Cycle Network. This proposed route continues along the Strathclyde Country Park access road approach to the Raith Junction where it would join the current route provision across the Junction. NCN Route 74 is proposed to continue through Bothwell along Laighlands Road, off the A725 south of Raith. A number of short paths within Strathclyde Country Park are also available in the vicinity of the hotel on the approach to Strathclyde Loch.

Previous site observations suggested that existing NMU demand along these routes is low, and that this includes some cycling and equestrian activity. The low level of use is consistent with the lack of major community facilities in the area with any significant travel-generation characteristics. It is also consistent with the difficulties imposed on movement across the Junction noted above, which suggests that some non-motorised

travel to the facilities in Strathclyde Country Park, between the communities of Bothwell and Orbiston, and in particular, the low car ownership area of Whitehill along the Clyde Walkway, is suppressed. This was further confirmed by the surveys which only observed 49 users over 24 hour period on a Friday, and 78 on a Saturday, which suggests that this is more of a recreational route for pedestrians and cyclists.

Bus stops are provided on the A725 (south) adjacent to Bothwell, providing bus access (with a further short walk) to Strathclyde Country Park for people from Hamilton (including Whitehill) and Orbiston/Bellshill) travelling on existing services along the A725.

13.3.6 M74 between Raith (Junction 5, M74/A725) to Hamilton (Junction 6, M74/A723) – Figure 13.1f

Figure 13.1f shows the M74 along this corridor between Junctions 5 (Raith) and 6 (Hamilton). The scheme at this location involves widening of the southbound carriageway. There are no known proposals for changes to the configuration of Junction 6 itself so baseline conditions here have not been examined.

There is a network of footpaths either side of the M74, the major element of which is the continuation of the Clyde Walkway south through Strathclyde Country Park continuing from the Raith Junction to the north (as described above). To the east of the M74, the Clyde Walkway connects to a network of paths and tracks within Clyde Park and North Haugh at the southern end of Strathclyde Loch. The Clyde Walkway continues south under the Clyde Bridge crossing of the A723.

To the west of the M74 another network of paths and tracks exist, linked to Strathclyde Country Park Golf Course and Playing Fields. There is a single connection across the M74 which links Strathclyde Country Park east and west of the M74, provided in the form of:

- A footbridge across the River Clyde
- An underpass beneath the M74

Apart from the crossing facilities across Raith described above, this is currently the only NMU connection across the M74 allowing access across all parts of the Country Park.

The use of the M74 underpass at this location to and from Strathclyde Country Park is relatively high at this location, with 522 users being observed on a Friday and 568 on a Saturday. Use of the underpass appears to vary throughout the day and suggests that the route is more popular with recreational users. The route is also reasonably well used by cyclists who formed 21% and 23% of traffic respectively on the two survey days.

River Clyde Footbridge

M74 Underpass at Strathclyde Country Park

Beyond the Country Park to the east are the communities of Braedale/ Airbles, with Strathclyde Hospital further east. To the west of the M74 and Strathclyde Country Park is Hamilton Town Centre. The affected M74 crossing does not appear to provide the most direct route for access between these areas either side of the M74.

13.3.7 Summary

The preceding sections presented an assessment of the base line situation for non-motorised travel along sections of the M8/M74/M73 corridors which are affected by the proposed scheme. The assessment establishes to what degree these pedestrian and cyclists routes are sensitive to change with regards to status, current levels of use and their importance to communities as a means of providing access to key facilities. This is summarised by Table 13.1.

Table 13.1 Baseline Non Motorised User Network – Sensitivities to Change

Sensitivity	Area/Route	Comment	Sheet
High	Jimmy Young Bridge	This serves as a direct link between the Easterhouse and Swinton Communities and the Easterhouse Train Station, within a defined Social Inclusion Partnership area. The bridge is well used and the alternative involves a significant diversion.	1
Medium	M8 Junction 10 Overbridge	These bridges are also within the SIP area and are well used, however alternatives exist.	1
	Halliburton Road Footbridge		
	Wardie Road Overbridge		
	Maryville Interchange Underpass	The underpass is of local importance connecting the community of Broomhouse to other communities east of the M73 but is subject to low levels of use. Bus services are also in operation via the underpass.	3
	B7071 Glasgow Road Overbridge	The bridge of local importance connecting the communities of Calderbraes and Uddingston is subject to moderate levels of use.	3
	Old Mill Road Overbridge	The bridge is of local importance and connects the communities of Birkenshaws/ Calderbraes Tannochside to Uddingston, south of the M74 and Uddingston Train Station and Uddingston Grammar School. The bridge is subject to high levels of use.	4
	NCN 75, M74 Underpass	Route of national and local importance and is subject to high level of use.	4
	River Clyde footbridge and M74 Underpass	These crossings are of local importance and are subject to high levels of recreational use.	6
Low	Ellismuir Farm Accommodation Bridge	The bridge is of local importance for recreational uses but is subject to low levels of use.	2
	M74 Junction 4 Overbridge	The bridge is of local importance connecting Broomhouse. to the facilities South of the M74 but is subject to low levels of use.	3
	B785 Blantyre Farm Road Overbridge	This bridge is of local importance connecting the communities of Uddingston and Calderbraes but is subject to low levels of use.	3

Sensitivity	Area/Route	Comment	Sheet
	Bellshill Road, M74 Underbridge	These bridges are of local importance, connecting communities severed by the M74 to employment areas and is subject to low levels of use.	4
	Fallside Road, M74 Overbridge		
	Bothwell Park Road	These bridges are discussed in more detail in a separate specific Environmental Statement	
	M74 Junction 5, Raith		

Table 13.1 indicates that most of the routes affected by the existing M8/ M73/ M74 motorways are of low or medium sensitivity to change with the exception of the Jimmy Young Bridge. This bridge is considered highly sensitive to change due to its location, degree of use by pedestrians and cyclists, and lack of reasonable alternatives for people to cross the M8 in the area.

13.4 Scheme Impacts and Mitigation

Chapter 3 describes the proposed scheme and Figures 13.1a-f show the scheme in conjunction with the routes used by pedestrians and others non motorised users, such as cyclists and equestrians, along with the key community facilities in the area. In determining the effects of the proposed scheme, an assessment needs to be made of the number of pedestrians and others likely to experience changed journey times, potential impacts on safety and amenity, and any predicted changes to community severance.

In general the proposed scheme involves on-line widening within the existing road boundary. The impacts of the scheme once completed (operational phase) on existing non-motorised user crossings and access routes are therefore generally low and not significant. No pedestrian, cycle or equestrian routes will be lost as a result of the scheme, and existing routes will be retained.

During the construction phase of the scheme, temporary disruption to some crossing points can be expected as carriageway widening work (and hence widening of underpasses or overbridges) takes place. This may include temporary diversions which will add to journey times for users while the construction at a particular crossing location is completed. The impact of such temporary disruption is generally likely to be slight adverse, with the potential for moderate adverse at certain times and locations.

13.4.1 M8 Junction 10 to Baillieston Interchange – Figure 13.1a

The proposed scheme in the area will see on line widening of the M8 and will not permanently affect the status of either the M74, junction 10 overbridge, the footbridge between Halliburton Crescent and Bartiebeith Road, the M74 overbridge at Wardie Road and the Jimmy Young Bridge, M74 junction 9. Although the proposals will have no lasting impact on these routes warranting mitigation it is apparent having recorded the use of these bridges that the construction phases of the scheme will need to be staged in order to ensure minimal disruption.

In the context of existing severance and social exclusion apparent in the Greater Easterhouse area, it is essential that any proposed changes to the M8 configuration in this area maintain existing provision for non-motorised forms of travel.

13.4.2 M73 Baillieston to Maryville Interchanges (M73/M74) – Figure 13.1b

The proposed scheme will have minimal impact, with the Ellismuir Farm accommodation bridge being retained. No mitigation is therefore required. Taking into account the existing low level of use, it is envisaged that temporary disruption during the construction phase will also have a limited and temporary impact on non motorised users.

13.4.3 Maryville Interchange (M73/M74) and M74 west – Figure 13.1c

The proposed scheme does not affect the M74, Junction 4 overbridge. No mitigation is therefore required. Low levels of use were recorded during survey and it considered that the construction phase of the scheme will have only a limited and temporary impact. Similarly the NMU crossings underneath the M73 at the Maryville Interchange, and the B758 Blantyre Farm Road, M74 overbridge, are also unlikely to be affected by the proposed scheme.

The footway network between Broomhouse, Calderbraes, and Uddingston around the interchange is also unlikely to be significantly affected by the proposed scheme although work will need to be phased in order to keep disruption to a minimum during the construction period.

The B7071 Glasgow Road crossing will be retained and therefore no additional mitigation measures are required at this location. The construction phase of the scheme will have to be phased or managed to minimise disruption to people using this crossing point as far as practicable.

Although levels of use of the route from Broomhouse across Hamilton Road and the M74 west of the interchange are small at present it is anticipated that this could change under plans within City Plan allocation and this may in the future (and not as part of the M8/M73/M74 proposals) involve upgrading of the Hamilton Road footbridge and relocation of the footway on the east side of the junction 4 overbridge bridge, in line with pedestrian desire lines to the west side of the bridge.

13.4.4 M74 from Maryville Interchange to Raith Junction (Junction 5, M74/A725) – Figures 13.1d and e

The proposed scheme will involve on line widening of the M74 which will have limited impact as the existing crossing points at Old Mill Road, the NCN route 75 underbridge, Bellshill Road and Fallside Road are all to be retained on their existing alignments. In general, effects of the ‘on-line’ widening proposed on this section of motorway are not expected to be require additional mitigation measures. It is envisaged that the construction phases can be staged or managed to ensure that impact to Non Motorised Users during construction at these locations is minimised as far as practicable.

13.4.5 Raith Junction (Junction 5, M74/A725) – Figure 13.1e

The proposed upgrade of the Junction and the slight realignment of the Bothwellpark Road Bridge over the M74 are part of a separate DMRB Stage 3 assessment and access provision for non-motorised users is discussed in detail in the Environmental Statement for the Raith scheme (MFJV 2007). It is however considered that proposals for online widening on the M74 will present no lasting impact on Non Motorised Users.

13.4.6 M74 between Raith (Junction 5, M74/A725) and Hamilton (Junction 6, M74/A723) – Figure 13.1f

The on-line widening of the M74 southbound will see the existing River Clyde footbridge being retained and the slight extension of the existing pedestrian underpass below the M74, on an identical alignment, between the segments of Strathclyde Country Park east and south side of the M74. No specific mitigation is required, although as this route is popular for recreational use, the construction phase will need to be staged or managed to ensure that impact to Non Motorised Users during construction at these locations is minimised as far as practicable.

13.5 Residual Impacts

The proposed scheme will have no long term impact requiring specific mitigation for pedestrians, cyclists or equestrians. Residual impacts of the scheme are assessed to be negligible.

13.6 References

Highways Agency, The Scottish Executive Development Department, The National Assembly of Wales and The Department of the Environment for Northern Ireland *The Design Manual for Roads and Bridges Volume 11 Environmental Assessment* (1993, amended and updated 1998/1999/2000/2001/2003)

Greater Easterhouse Partnership Strategy (2003 -2006).

M74 Junction 5, Raith. Stage 3 Part 1: Environmental Statement. MFJV March 2006.

14 Vehicle Travellers

14.1 Introduction

This chapter sets out the assessment undertaken to determine the potential effects of the M8/M73/M74 Network Improvements scheme on the quality of driving conditions and experience for vehicle travellers. In this respect, the potential change to views from the road and effects of the scheme on driver stress are examined.

'View from the road' is defined as the extent to which travellers, including drivers, are exposed to the different types and quality of scenery through which a route passes.

'Driver stress' relates to three main components, namely frustration, fear of potential accidents and uncertainty relating to the route being followed. The level of stress incurred by a driver may be affected by many factors, including variations in skill, experience and knowledge of the roadway amongst others. Frustration may occur due to the driver's inability to drive at a particular desired speed consistent in terms of the general standard of the road, whilst the level of uncertainty may be raised by lack of route knowledge, the likelihood of pedestrians and poor signage/sight.

14.2 Methods

14.2.1 Baseline Methods

Information regarding existing baseline conditions was gathered through a desk-based review of available data, specifically OS map data and site visits.

14.2.2 Impact Assessment Methods

This assessment has been carried out using the guidelines set out in DMRB Volume 11, Section 3, Part 9.

Possible effects upon vehicle travellers are considered in terms of the route corridor landscape and visual value, and the magnitude of impact.

Corridor Value

The value, or status, of the corridor through which the route passes, is detailed in Table 14.1 below. With regard to views from the road, a number of aspects need to be considered in determining sensitivity including: the types of scenery and landscape; the extent of traveller's views; the quality of the landscape; and the presence of features of particular interest or prominence.

Table 14.1 – Definition of Corridor Value

Value or Sensitivity	Criteria
High	The traveller experiences extensive views of a high quality landscape, area of unique landscape character or prominent features of particular interest.
Medium	The traveller is exposed to partial/intermittent views of a high quality landscape (or extensive views of a moderate quality landscape), area of unique/distinctive landscape character or features of interest.
Low	The traveller is exposed to views of an area of low quality landscape/unremarkable or degraded landscape character or has heavily restricted views/no view of the surrounding landscape regardless of quality.

Impact Magnitude

The severity, or magnitude, of impact was assessed independently of the site value and assigned to one of the categories listed within Table 14.2 below.

Table 14.2 – Impact Magnitude Criteria

Criteria	Definition
Major Positive or Negative	A major alteration in views from the road or in driver stress such that the driving experience is significantly affected.
Moderate Positive or Negative	An alteration in views from the road or in driver stress such that the driving experience would be diminished or enhanced - but to a minor degree.
Slight Positive or Negative	Minimal alteration in views from the road or in driver stress such that there would be a measurable change but this would not significantly affect the driving experience either positively or negatively.
Negligible	Very little appreciable change in views from the road or in driver stress and not considered to have any noticeable effect on the driving experience.

14.3 Baseline Conditions

The study area is centred on lengths of the existing motorway network of the M8, M73 and M74.

14.3.1 Views from the Road

The existing M8, west of Baillieston Interchange, passes through a varied landscape of steep sided valleys cut deeply into plateau farmlands, fragmented agriculture within the wider valley floodplains and gently undulating hills of varying local value. The corridor in which the road lies has been designated in the North Lanarkshire Local Plan as an 'important wildlife / landscape corridor'. A full description of the landscape character and quality is contained in Chapter 11 Landscape Effects. The road lies predominantly at or near ground level without dramatic changes in height.

Overall views along the M8 route corridor are mainly of intermittent residential areas and fragmented open space. The landscape is interspersed with widespread evidence of current industrial activity and open sites.

Continuing south onto the M73 at the Baillieston Interchange the route passes through farmland and also forms part of North Lanarkshire's 'wildlife / landscape corridor'. Overall views are of farmland and residential built form. The route passes through a valley with intermittent level changes accommodated by bridges, embankments and cuttings.

At Maryville Interchange, travelling west along the M74, the landscape is of low landscape value. Views to the north of the M74 are of elevated ground and fragmented woodland. South of the M74 there are views of an elevated, partly reclaimed landfill site and the edge of the Daldowie sewerage works screened by a low level fence. Travelling south along the M74 views from the road are well screened with intermittent views of Motherwell and Strathclyde Country Park, then towards Hamilton Services, views become more open.

Easterhouse to Baillieston Interchange *(Figures 11.1a-b and 11.2a-b)*

Heading east, driver views from the M8 are divided between the built up industrial land and fragmented open space to the north and south, and farmland to the east. Intermittent views of Easterhouse and Queenslie are visible through partial screening along both sides of the M8. The slight gradient in land and planted features to the north of the M8 help screen Easterhouse from the road (Photo Viewpoints 1 – 4).

Baillieston Interchange to Maryville *(Figures 11.1b-c and 11.2b-c)*

Between Baillieston and Maryville, there are open views across farmland / grazing land, woodland and estate planting. Beyond these views, the fringe of built up residential areas of Calderbraes and Baillieston are visible (Figures 11.8-11.11 and 11.15: Photo Viewpoints 5 – 8 & 12).

Maryville to Broomhouse *(Figures 11.1c and 11.2c)*

The Maryville and Broomhouse area is mostly made up of reclaimed land which has been partially reinstated with planting on the northern side of the carriageway. There are open views from the road to the east and west. Further to the south of Maryville the area is dominated by a sewerage works screened by a low level fence which is partially visible from the road, as shown on Figures 11.12 -11.16: Photo Viewpoints 9 – 13.

Maryville to Bothwell *(Figures 11.1c-e and 11.2c-e)*

Travelling from Maryville to Bothwell views to the north are mostly screened by planting and changes in level along the route. Views further south are more open and the residential area of Bothwell can be seen from the road, as shown on Figures 11.17 – 11.26: Photo Viewpoints 14 – 23. The landscape in this area is mostly unclassified residential areas with some medium quality landscape to the north of the M74.

Bothwell to Hamilton *(Figures 11.1e-f and 11.2e-f)*

Landscape quality in this area is mostly high value with small areas of medium and low quality. Travelling south after Bothwell Services, there are intermittent views towards Motherwell and Strathclyde Country Park where there are openings in the planting and the land falls away from the M74. Generally all other views east and west are well screened and only very partial glimpses of the landscape are available through the planting. After Raith Junction views are well screened by planting up until the Hamilton Services Area where views become more open, as shown on Figures 11.27 – 11.30: Photo Viewpoints 24 – 28.

14.3.2 Driver Stress

The combination of functions fulfilled by the M8, M73 and M74 compounds the problems of accommodating high levels of local, regional and long distance traffic with sub-standard road layouts and junction configurations.

There are many different types of vehicle travellers on the roads including, commuters and commercial vehicles such as HGV drivers. On the existing motorway network frustration is experienced by drivers of vehicles slowed down by HGV drivers, who may be overtaking one another. This frustration is caused by drivers not being able to travel at their desired speed.

The volume of HGV drivers on the road may lead to fear of potential accidents by other vehicle travellers. A large number of HGVs can be intimidating and stressful for drivers.

Based on the guidance provided in the DMRB Volume 11, Section 3, Part 9, Chapter 4, the combination of high traffic volumes and speeds along the existing roads is anticipated to relate to a High level of driver stress.

14.4 Predicted Impacts

14.4.1 Views from the Road

A summary of the impacts of views from the road are set out below, divided into route sections as for the baseline description for ease of reference. Associated visual effects are covered in greater detail in Chapter 11 Landscape Effects.

At identified points along the route, the widening of the existing carriageway will cause a significant loss of vegetation and tree planting. Points where this loss of planting is likely to occur and driver's views altered will be referred to in the text below and can be seen in the associated view points.

Easterhouse to Baillieston Interchange *(Figures 11.1a-b and 11.2a-b)*

The north side of the existing eastbound carriageway will be widened to provide an additional running lane, which will be introduced on the existing hard shoulder. This would affect the existing earthworks profile and the existing embankment may be steepened or an earth retaining solution devised. Where this occurs the loss of mature roadside vegetation at Viewpoint 1 (Wardie Road) will open views up towards Easterhouse. Further loss of mature vegetation will occur where slope steepening takes place at the Easterhouse Road crossing (Easterhouse Road Bridge) (Figures 11.4 – 11.7: Photo Viewpoints 1 – 4). The magnitude of impact of the Scheme along this section is therefore considered to be Slight Negative (long term).

Baillieston Interchange to Maryville *(Figures 11.1b-c and 11.2b-c)*

The M73 widens on line between the Baillieston Interchange and Maryville with the provision of an additional running lane in each direction utilising the existing hard shoulder. Over the North Calder Water Bridge the existing hard shoulder is also utilised for the additional running lane, therefore this section of road will be left with no hard shoulder.

Views from the road will be similar to existing for this section of road apart from the introduction of SUDS (Sustainable Urban Drainage Systems). SUDS are described in detail in Chapter 15 Water Quality and Drainage and are comprised of source controls such as filter drains and swales as well as site controls such as detention basins. With regards to views from the roads it is the detention basins that will have an impact. These are provided for attenuation and treatment of road runoff, prior to discharge into the watercourse. They are designed to retain water for a prolonged period during and after storm events. Shallow sided slopes provide a gradual transition from ground level to the base of the structure and ecological value and diversity can be promoted through micro-wetland areas in the base of the basins.

Road widening will remove some vegetation which lines the side of the road to the east and west of the M73 and which currently screens views of high value landscape to the west and views onto the settlement of Calderbraes to the east. Although the effects of this will be slight there may be opening up of views onto high value landscape.

The first of the proposed SUDS ponds relevant to this area will be found on the eastern side of the M73, located within medium quality landscape. This can be seen from the road and will comprise a retention pond as described above. The second SUDS facility within this area is located on the western side of the M73; this pond is smaller than the first and will involve the removal of existing vegetation. A third SUDS facility is proposed further south, located north of Glasgow Road and this pond will also involve the removal of existing vegetation opening up views somewhat to the west of the M73 onto high value landscape.

The magnitude is considered to be Slight Positive (long term) in that views onto high value landscape may be opened up and views of more interest created. Where appropriate the ponds will be screened with planting.

Maryville to Broomhouse *(Figures 11.1c and 11.2c)*

The M74 on this section will be widened on line and will consist of an additional running lane in both directions. The M74 off slip to Daldowie junction is retained and will increase from 1 to 2 lanes. The flow of traffic to the M73 (N) from the M74 will be modified, comprising of a new 2 lane on slip. For M74(N) Traffic the existing M73 diverge slip to Daldowie junction will remain unaltered. However, the existing 2 lanes from the M73 (S) with the 2 lanes from the M74(W) join as a 2 lane gain providing 4 lanes of motorway.

The changes to the Daldowie Junction will have some impact on views from the road, although these changes are within the boundary of the M74 and will not change views onto the surrounding landscape.

Slight variations may occur where alternative screening is put in place to obscure views of the sewerage treatment works at Daldowie. This is likely to result in improved screening of unwanted views of the sewerage works and low quality landscape as well as the possibility of planting where none exists at present.

Some loss of vegetation will occur where slope steepening takes place at the existing bridge at Maryville Junction, seen in Figures 11.12 and 11.13: Photo Viewpoints 9 and 10. This will have a very limited effect on views from the road. The magnitude of impact of the Scheme on this section is therefore considered to be Slight Positive (long term).

Maryville to Bothwell *(Figures 11.1c-e and 11.2c-e)*

A proposed SUDS facility is located on the south of the M74 off Junction 4 which may slightly affect views from the road for north bound traffic although changes in the view will be negligible.

The north and southbound carriageways of the existing M74 between Maryville and Junction, 5 Raith will be widened. Views from the road at Maryville interchange will remain the same as at present. Travelling towards Bothwell, significant areas of vegetation are likely to be removed along the route which will create more open views into Kylepark and Calderbraes. Loss of vegetation further east of Calderbraes will have

no significant effect on changes to views from the road (Figures 11.17 – 11.26: Photo Viewpoints 14 – 23). Further south towards Uddingston further vegetation will be lost, opening views slightly, to the area on both sides of the M74. The magnitude of impact of the Scheme on this section of the scheme is therefore considered to be Slight Negative (long term).

Bothwell to Hamilton *(Figures 11.1e-f and 11.2e-f)*

This section of the strategy will widen the southbound carriageway of the existing M74 between Junctions 5 Raith and Junction 6 Hamilton. Views will be very similar to existing, although at Junction 6 some loss of vegetation will create slightly more open views from the road into the Hamilton Service Area (Figure 11.27 – 11.30: Photo Viewpoints 24 – 28). The magnitude of impact of the Scheme on this section is therefore considered to be Negligible.

Table 14.3 Summary of Impacts on Views from the Road

Stage	Summary of Impacts on Views from the Road
Easterhouse to Baillieston Interchange	**Slight negative impact within a medium value landscape –** loss of existing vegetation will open up vies to the residential area of Easterhouse.
Baillieston Interchange to Maryville	**Slight positive impact within a medium value landscape –** views will be opened up onto high value landscape and SUDS Ponds will add interest to views from the road.
Maryville to Broomhouse	**Slight positive within a low value landscape –** alternative screening will be put in place to screen low quality landscape including the Daldowie sewerage treatment works.
Maryville to Bothwell	**Slight negative within a medium value landscape –** loss of existing vegetation will open up views on to residential areas and some medium value land.
Bothwell to Hamilton	**Negligible effects within a mostly high value landscape –** some loss of vegetation will occur although views will be very similar to existing.

14.4.2 Driver Stress

During the construction phase of the development driver stress may increase for a temporary period where localised traffic management is set in place through working areas. Traffic management may cause slower traffic flows, increase driver uncertainty with regard to journey times, and heightened fears of vehicle break-down or accidents.

Once construction is complete the proposed development will result in the provision of additional motorway lanes, thereby relieving congestion and driver stress by reducing fear of potential accidents and relieving frustration.

The proposal to have three and in some places four lanes will allow more people to travel at their desired speeds due to a reduction in congestion and more space on the road. This will decrease uncertainty over journey times and again reduce fear of potential accidents and intimidation from other vehicle travellers.

Discontinuous hard shoulders will be proposed to avoid major alteration to bridges on the M8 Junction 10 to the Baillieston Interchange. Over the M73 North Calder Water Bridge, the hard shoulder is also discontinuous. This will avoid increased driver stress throughout construction as there will be less disruption to the road network and views from the road but may cause slight increased stress long term for some inexperienced drivers due to the absence of a hard shoulder on some stretches.

The overall effect of the Scheme upon driver stress is likely to be beneficial compared to the existing situation and is assessed as Moderate.

Mitigation Strategy

Mitigation of the potential impacts on driver views is also discussed in Chapter 11 Landscape, and may include:

- Appropriate and sensitive bridge design where new watercourse crossings are proposed – to create a visual feature that makes a positive contribution to local views;
- The use of embankments and cuttings will be kept to a minimum where possible, and will be sensitively designed to ensure the final appearance minimises visual impacts where possible;
- Appropriate seeding/planting of earthworks to reflect surrounding landscape character and vegetation pattern;
- Planting of hedgerows, and roadside vegetation and the establishment of tree screens where appropriate; and
- Replacement tree planting due to the required land take for the scheme.

Driver stress will also be ameliorated by appropriate design, landscaping and planting along the motorways, along with suitable road layouts, lighting and signage designed to improve confidence in route selection and decision making at junctions.

The scheme will improve journey times and will reduce driver stress and frustration on the M8, M73 and M74.

14.5 Residual Impacts

Whilst the gradual re-establishment of vegetation will reduce scarring impacts, the network improvements will have permanent effects in relation to driver views where the

height of roads is elevated. The Scheme will result in a positive impact on driver stress by addressing the current and anticipated future congestion and difficulties arising from the mixing of local and through traffic.

14.6 Reference

Design Manual for Roads and Bridges Volume 11 Environmental Assessment (1993, amended and updated 2003),

15 Road Drainage and the Water Environment

15.1 Introduction

This Chapter describes the existing hydrology, drainage and surface water environment at and around the proposed scheme and identifies potential impacts arising from the road network improvements under consideration, and outlines various approaches for managing the quantity and quality of surface water runoff during construction and operation of the proposed network improvements.

The potential affect on groundwater resources is addressed in this Chapter and is also discussed in Chapter 16, Geology and Soils. The earlier Stage 2 assessment (Option Appraisal) concluded that the rock strata present beneath the site contains a locally important aquifer and that the hydrogeology can be classified as 'medium sensitivity'. That assessment also concluded that whilst the road network improvements might affect locally identified perched groundwater it is unlikely that there would be any significant impact on groundwater sensitive areas. The current scheme proposals anticipate that because all potentially contaminated runoff from the proposed road will be routed through surface water drainage systems any risk of contamination of the underlying aquifer is minimised and the resulting impact on groundwater resource will remain 'negligible'.

Development activities on any catchment should be placed in the context of the catchment and its existing ecological and hydrological properties prior to undertaking the work. Unmanaged runoff from developments can have serious adverse effects that may degrade both the ecological, hydrological and water quality of watercourses. Historically, developments have resulted in reduction of water quality and in some cases resulted in habitat loss for wildlife and reduced the ability of the water environment to function naturally.

15.2 Regulatory Controls

The Scottish Environment Protection Agency (SEPA) is the environmental regulator responsible for protecting the water environment in Scotland. They have statutory powers and duties for the protection and monitoring of the quality of the water environment. The water environment is defined in law (Section 3, WEWS Act 2003) and is essentially all waters, either above or below ground. Exclusions include the drinking water supply pipe system, the sewerage network and artificially created systems for the treatment of pollutants.

The Water Framework Directive (WFD) through the Water Environment and Water Services (Scotland) Act 2003 provides regulatory controls over a wide range of activities in order to protect and improve Scotland's water environment. The Act outlines SEPA's duties to:

- protect and improve the water environment;
- promote efficient and sustainable water use;
- have regard to the social and economic impacts of exercising its functions;

- act in the best way to contribute to the achievement of sustainable development;
- promote sustainable flood management;
- co-ordinate the delivery of its functions with others;
- ensure progressive reduction of pollution of groundwater; and,
- contribute to mitigating effects of floods and droughts.

The formal water environment regulatory controls were then introduced in the Controlled Activities Regulations (CARs), which came into effect on the 1st April 2006. SEPA employs a risk-based approach to the implementation of the CARs. This is reflected in the varying levels of authorisation required: from compliance with a set of General Binding Rules for low risk activities, to a Complex Licence with site-specific conditions where multiple activities, or linked activities across a number of sites, are proposed.

The CARs and more general SEPA guidance have been used as drivers to inform the design process in relation to the water environment within the M8/M73/M74 Network Improvements Scheme. Potential impacts have been considered in terms of the authorisation hierarchy adopted by the Regulations to ensure that compliance with General Binding Rules is achieved where possible. Where impacts cannot be designed-out, alternative options are investigated to demonstrate the value of the accepted solution in terms of minimising environmental impact. Mitigation proposals have then been developed which counter the negative effects of the development and promote the best practicable environmental solution.

SEPA also has a duty under the Environment Act 1995 to offer advice to local authorities with regards to risk of flooding although it has limited statutory powers in this respect.

15.2.1 Motorway Development

Stage 3 assessment considers the Scheme in the context of the existing surface water environment.

In this Chapter, the following have been considered for the Scheme:

Do nothing: no improvement scheme takes place, and existing drainage and hydrological patterns remain unaltered other than as a result of natural change or other development activities in the area. There are no mitigation measures.

Do something: this involves an improvement scheme for the area. In this scenario, drainage, hydrology and water quality impacts for the road improvements have been assessed for the following two conditions:

Network improvements WITHOUT drainage mitigation: this involves construction of additional lanes and associated motorway slip roads with no provision for mitigation measures for surface water quality and quantity. This identifies the level of impacts under worst case conditions.

Network improvements WITH drainage mitigation: this involves construction of additional lanes and associated motorway slip roads with provision for mitigation measures for managing surface water quality and quantity. This identifies the level of residual impacts.

15.3 Assessment Methodology

15.3.1 Guidance Documents

The water quality and drainage assessment has been carried out in accordance with the Design Manual for Roads and Bridges (DMRB), (2006); Volume 11; Environmental Assessment, Section 3; Environmental Assessment Techniques, Part 10 (HA 216/06); Road Drainage and the Water Environment.

Surface water pollution prevention and mitigation measures have been developed based on discussions with SEPA and on current good practice guidance for road drainage including:

- DMRB (2006); Volume 4; Geotechnics and Drainage, Section 2; Drainage, Part 1, HA 103/06, Vegetative Treatment Systems for Highway Runoff.
- Sustainable Urban Drainage Systems (SUDS) as set out in CIRIA Report C697 (2007) “The SUDS Manual”.
- Guidance contained within the SEPA publications entitled: “Watercourses in the Community” and “Ponds, Pools and Lochans” was used.
- CIRIA (1997) Report 142: “Control of Pollution from Highway Drainage Discharges”

New culverts would normally conform to the design Guidance: ‘River Crossings and Migratory Fish’’ – A Consultation Paper produced by the Scottish Executive (April 2000) and also to CIRIA Report 168: Culvert Design Guide (1997). New culverts would also be designed to encourage free passage of associated wildlife. However, no new culverts will be constructed under this scheme and all existing culverts are being retained without alteration.

15.3.2 Baseline Identification

Baseline conditions were identified through desk studies and site walk-over investigations. These included consultations with statutory consultees such as South Lanarkshire Council (SLC), North Lanarkshire Council (NLC), Glasgow City Council (GCC) and SEPA, along with a review of relevant data and published material relating to the local and wider hydrological environment. The data collected and sources of information are listed in Table 15.1.

Table 15.1 Sources of Information for Hydrology and Surface Water Quality

Topic	Source of Information
Climate	
Rainfall	Flood Estimation Handbook CD ROM -Version 2.0 The Centre for Ecology and Hydrology, Wallingford
Surface Waters	
Water Quality	Historical water quality sampling, 2004, SEPA Discharge & Sewerage, 2004, SEPA
Hydrological Regimes	Recorded flow data, 2004, SEPA
Drainage System Records	SLC, NLC, GCC, Scottish Water

Consultations

Consultations with NLC and SLC were undertaken and summarised as follows:

NLC - Consultation with NLC identified a number of aspects relating to hydrology and drainage. These included:

- Maintaining the status quo situation, if the surface areas of the existing roads do not change.
- Flood risk assessment and drainage impact assessment in relation to proposed new carriageways.
- Prevention of adverse effects on the watercourses from the new carriageways' drainage outfalls and introduction of a rate of limited discharge at the outfalls.
- Provision of attenuation storage at the new carriageways outfalls.

NLC made references to the requirements of the Water Framework Directive (WFD) and the Controlled Activities Regulations (CAR), and the need to meet their requirements in relation to works to the existing watercourses or on the floodplain.

Consultations with NLC, SLC and GCC were also carried out to obtain the records of the existing drainage systems of the motorways. It was established that in early 2001 all the available information was sent to Scottish Executive which was then passed on to their current road maintenance contractors (Amey Infrastructure Services (AIS)) responsible for the area. No information was available from NLC or SLC directly; information originally created in their name was received from AIS where available.

GCC provided information in connection with the existing M8 motorway drainage between M8/J10 and M8/J9. This information was in the form of as-built drawings detailing pipe lengths, sizes and manhole locations.

SEPA - Consultation with SEPA provided the information as listed in Table 15.1. In connection with works to existing watercourses they made references to SEPA's publication entitled 'Ponds, Pools and Lochans' which provides advice on how to maximise the ecological and amenity potential of urban watercourses, particularly regarding SUDS. SEPA also referred to River Restoration Centre works and techniques. SEPA discourage culverting of the watercourses, however, if culverting is required design should be in accordance with best practice, which permits the passage of fish and other aquatic fauna under normal conditions. SEPA requires the free passage of fish at all times.

15.3.3 Impact Assessment Criteria

Potential impact on the water environment is assessed, based on a product of the importance of the receiving watercourse and the magnitude of the impacts. While DMRB utilises a classification scheme for England and Wales based on the River Ecosystem classification, in Scotland SEPA employ a class grading from A1 to D, Table 15.2 provides a cross-reference for the classification schemes available in both regions, and highlights the identical assessment parameters and requirements. The criteria which are used to assess the importance of surface water features and the magnitude of the impact are defined in Tables 15.3 and 15.4. The significance of the predicted impact is then defined using a combination of the magnitude and importance as described in Table 15.5.

Table 15.2 Comparison of Water Quality Classification: DMRB vs SEPA

DMRB (HA216/06 - Table 2.1)		SEPA (Annex 1)		Assessment Parameters Common to DMRB & SEPA		
RQO	GQA Grade	Class	Description	Dissolved Oxygen (% Saturation) (10%ile)	Biochemical Oxygen Demand (mg/l) (90%ile)	Ammonia (mg/l) (90%ile)
RE1	A	A1	Excellent	>80	<2.5	<0.25
RE2	B	A2	Good	>70	<4.0	<0.6
RE3	C	B	Fair	>60	<6.0	<1.3
RE4	D	C	Poor	>50	<8.0	<2.5
RE5	E	D	Seriously Polluted	>20	<15.0	<9.0
	F			<20	>15.0	>9.0

Table 15.3 Estimating the Importance of Water Environment Attributes

Importance	Criteria	Typical Examples	
Very High	Attribute has a high quality and rarity on regional or national scale	**Surface Water:**	EC Designated Salmonid / Cyprinid fishery
			RQO River Ecosystem Class RE1
			Site protected under EU or UK wildlife legislation (SAC, SPA, SSSI, Ramsar site)
		Groundwater:	Major aquifer providing a regionally important resource or supporting site protected under wildlife legislation SPZ I*
		Flood Risk:	Floodplain or defence protecting more than 100 residential properties from flooding
High	Attribute has a high quality and rarity on local scale	**Surface Water:**	Major Cyprinid fishery
			RQO River Ecosystem Class RE2
			Species protected under EU or UK wildlife legislation (SAC, SPA, SSSI, Ramsar site)
		Groundwater:	Major aquifer providing a locally important resource or supporting river ecosystem SPZ II*
		Flood Risk:	Floodplain or defence protecting between 1 and 100 residential properties or industrial premises from flooding
Medium	Attribute has a medium quality and rarity on a local scale	**Surface Water:**	RQO River Ecosystem Class RE3 or RE4
		Groundwater:	Aquifer providing water for agricultural or industrial use with limited connection to surface water SPZ III*
		Flood Risk:	Floodplain or defence protecting 10 or fewer industrial premises from flooding
Low	Attribute has a low quality on a local scale	**Surface Water:**	RQO River Ecosystem Class RE5
		Groundwater:	Non-aquifer
		Flood Risk:	Floodplain with limited constraints and a low probability of flooding of residential and industrial properties

* Source Protection Zones - An area designated around a groundwater source, the maximum extent of which is the catchment area for the source and within which the processes and activities that can occur within that area are limited by environmental agencies.

Table 15.4 Estimating the Magnitude of an Impact on an Attribute

Magnitude	Criteria	Typical Example	
Major Adverse	Results in loss of attribute and/or quality and integrity of the attribute	**Surface Water:**	Potential high risk in Method A (Annex I) and potential failure of Total Zinc and Dissolved Copper in Method B.
			Calculated risk of pollution from an accidental spillage >2% annually (Method D Annex I)
			Loss or extensive change to a fishery
			Loss or extensive change to a Nature Conservation Site
		Groundwater:	Loss of an aquifer
			Potential high risk in Method C (Annex I) of pollution to groundwater from routine runoff - risk score >250
			Calculated risk of pollution from an accidental spillage >2% annually (Method D Annex I)
		Flood Risk:	Increase in peak flood level (1% annual probability) >100mm (Methods E & F Annex I)
Moderate Adverse	Results in effect on integrity of attribute, or loss of part of attribute	**Surface Water:**	Potential high risk in Method A (Annex I) and *either* potential failure of Total Zinc *or* Dissolved Copper in Method B.
			Calculated risk of pollution from an accidental spillage >1% annually and <2% annually (Method D Annex I)
			Partial loss in productivity of a fishery
		Groundwater:	Partial loss or change to an aquifer
			Potential medium risk in Method C (Annex I) of pollution to groundwater from routine runoff - risk score 150-250
			Calculated risk of pollution from an accidental spillage >1% annually and <2% annually (Method D Annex I)
		Flood Risk:	Increase in peak flood level (1% annual probability) >50mm (Methods E & F Annex I)
Minor Adverse	Results in some measurable change in attributes quality or vulnerability	**Surface Water:**	Potential high risk in Method A (Annex I) and no change in Total Zinc and Dissolved Copper in Method B.
			Calculated risk of pollution from an accidental spillage >0.5% annually and <1% annually (Method D Annex I)
		Groundwater:	Potential low risk in Method C (Annex I) of pollution to groundwater from routine runoff - risk score <150

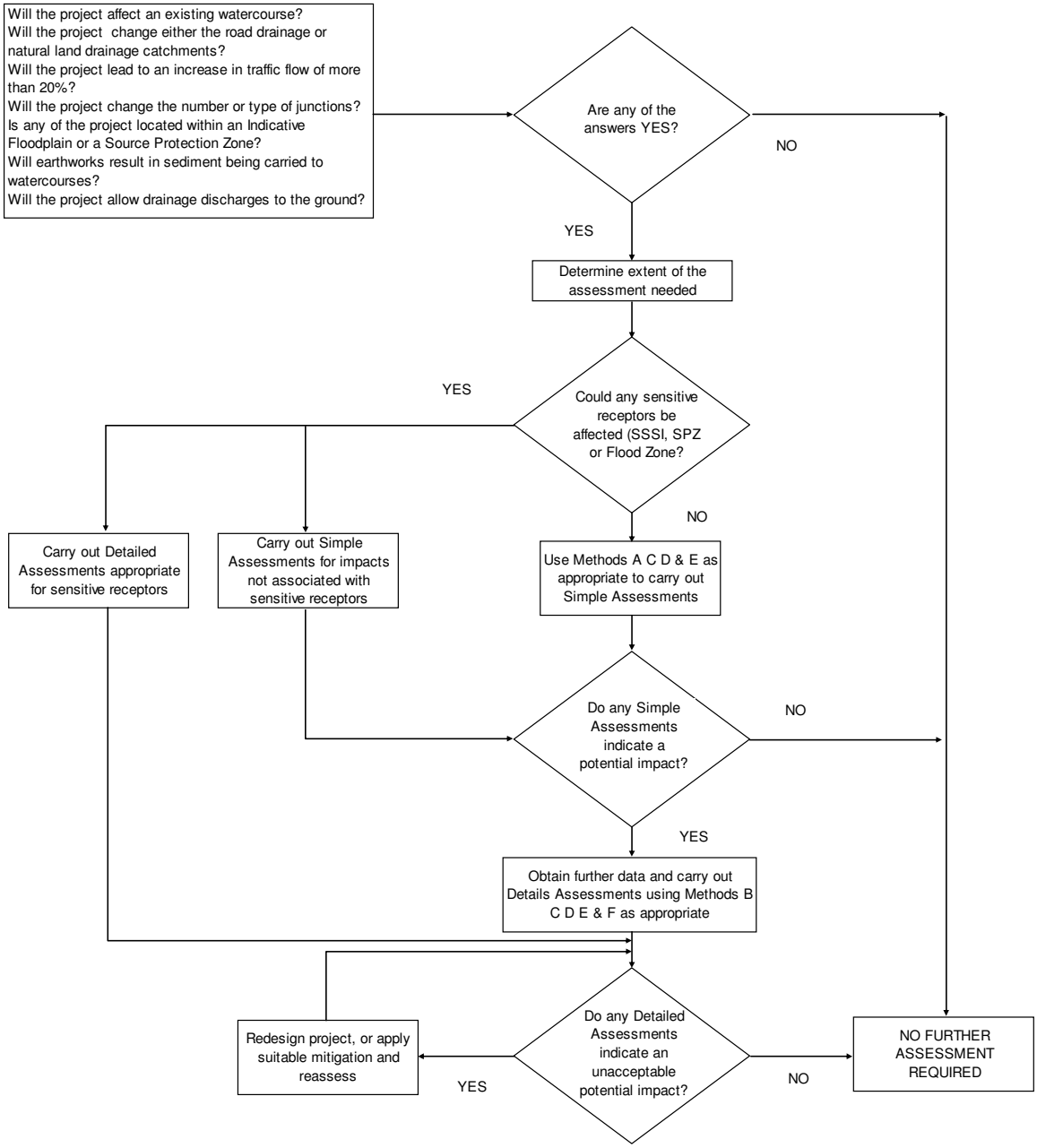
Magnitude	Criteria	Typical Example	
			Calculated risk of pollution from an accidental spillage >0.5% annually and <1% annually (Method D Annex I)
		Flood Risk:	Increase in peak flood level (1% annual probability) >10mm (Methods E & F Annex I)
Negligible	Results in effect on attribute, but of insufficient magnitude to affect the use or integrity	The proposed scheme is unlikely to affect the integrity of the water environment	
		Surface Water:	Low risk in Method A (Annex I) and risk of pollution from an accidental spillage <0.5% annually (Method D Annex I)
		Groundwater:	No measurable impact on aquifer and risk of pollution from an accidental spillage <0.5% annually (Method D Annex I)
		Flood Risk:	Negligible change in peak flood level (1% annual probability) < ± 10mm (Methods E & F Annex I)
Minor Beneficial	Results in some beneficial effect on attribute or a reduced risk of negative effect occurring	**Surface Water:**	Calculated reduction in existing spillage risk by 50% or more (when existing spillage risk is <1% annually) (Method D Annex I)
		Groundwater:	Calculated reduction in existing spillage risk by 50% or more to an aquifer (when existing spillage risk is <1% annually) (Method D Annex I)
		Flood Risk:	Reduction in peak flood level (1% annual probability) >10mm (Methods E & F Annex I)
Moderate Beneficial	Results in moderate improvement of attribute quality	**Surface Water:**	Calculated reduction in existing spillage risk by 50% or more (when existing spillage risk is <1% annually) (Method D Annex I)
		Groundwater:	Calculated reduction in existing spillage risk by 50% or more to an aquifer (when existing spillage risk is <1% annually) (Method D Annex I)
		Flood Risk:	Reduction in peak flood level (1% annual probability) >50mm (Methods E & F Annex I)
Major Beneficial	Results in major improvement of attribute quality	**Surface Water:**	Removal of existing polluting discharge, or removing the likelihood of polluting discharges occurring to a watercourse
		Groundwater:	Removal of existing polluting discharge to an aquifer or removing the likelihood of polluting discharges occurring to an aquifer
			Recharge of an aquifer
		Flood Risk:	Reduction in peak flood level (1% annual probability) >100mm (Methods E & F Annex I)

Table 15.5 Criteria to Assess the Significance of the Potential Impacts

IMPORTANCE OF ATTRIBUTE					
	Very High	Neutral	Moderate / Large	Large / Very Large	Very Large
	High	Neutral	Slight / Moderate	Moderate / Large	Large / Very Large
	Medium	Neutral	Slight / Moderate	Moderate	Large
	Low	Neutral	Neutral	Slight	Slight / Moderate
		Negligible	**Minor**	**Moderate**	**Major**
		MAGNITUDE OF IMPACT			

15.3.4 Impact Assessment Procedure

The procedure implemented is that detailed in HA216/06 (DMRB 11.3.10) and is summarised in the following flow-chart.



Procedure for Assessment of Potential Impacts to the Water Environment (DMRB HA 216/06)

15.4 Baseline Conditions

15.4.1 Site Description and Topography

The M8/M73/M74 Network Improvements area of interest lies to the east of Glasgow and takes in sections of three major transport routes and a number of local roads that link to the aforementioned routes. The routes in question are (Figure 15.1);

- The M8/J8 (Baillieston) to M8/J10;
- The M73/J1 (Maryville) to M73/J2 (Baillieston); and,
- The M74 between 2km west of M74/J3 and M74/J6 (Hamilton).

The topography in the scheme area is dominated by two watercourses; the River Clyde and the North Calder Water. Topographic features of these two watercourses are dominated by the sloping hillsides that convey surface water to either of these watercourses. In general, topographic elevations range from 1.62mAOD adjacent to the River Clyde to 187.54mAOD at East Kilbride.

15.4.2 Site Hydrological Location

The Scheme falls within the catchment area of the River Clyde. It also falls within the major and minor tributaries of the River Clyde, the North Calder Water, Tollcross Burn, Battle Burn and Pow Burn. Strathclyde Loch is a major hydrological feature north of the M74 between Raith (M74/J5) and Hamilton (M74/J6). The loch was constructed during the early 1970's and covers an area of approximately 87ha. It was built on the floodplain of the River Clyde at the confluence of the Clyde and the South Calder Water. Figure 15.1 shows the above watercourses.

No water abstractions were identified within 500m of the scheme as part of the geotechnical desk study undertaken in 2004-05. Additionally no known fisheries are located within 500m of the scheme.

15.4.3 Rainfall

According to the FEH CD-ROM, the annual average rainfall for the location is 1170mm.

15.4.4 Existing Surface Water Features

The following watercourses and water bodies are situated within or near the scheme area. They are listed below and shown on Figure 15.1.

- River Clyde
- North Calder Water
- Tollcross Burn
- Battle Burn
- Pow Burn / Myers Burn

- Unnamed Burn
- Cadzow Burn
- Strathclyde Loch
- Laighland and Bothwell Park Ponds

The River Clyde

The River Clyde is one of the major rivers in Scotland and drains large parts of central and southern Scotland and is a designated salmonid fishery. The River Clyde rises in the Lowther Hills area, with Daer Reservoir is situated on the upper reach in the Lowther Hills. Initially it flows in a north and north-easterly direction and then turns in a north-westerly direction towards Glasgow. The catchment area of the River Clyde as far downstream as Daldowie is about 1903km^2. Daldowie is identified as the downstream boundary of the study area and is the location of a SEPA river flow gauging station (River Clyde at Daldowie, Station 84013). The catchment consists of upland moorland and arable lowland with urban areas located on the lower part of the catchment. The River Clyde is designated as a SSSI and Special Protection Area for Birds (SPA) further downstream.

The North Calder Water

The North Calder Water is a major tributary of the River Clyde with a total catchment area of about 130km^2. It is a designated salmonid fishery. The North Calder Water rises in the Black Loch area to the north east of Airdrie, an area which is characterised by predominately rural land use. It flows into the Hillend Reservoir before it continues in west and south-westerly directions towards Airdrie and passes through the eastern and southern boundary of the town. It then flows along the eastern and southern boundaries of Coatbridge and meanders in a westerly direction in the valley between Coatbridge and Uddingston, then in the valley between the eastern part of Glasgow and Uddingston. Immediately southeast of Baillieston Junction (M8/J8) the North Calder Water receives outfall from the Baillieston Surface Water Sewer (BSWS). The BSWS derives its flow from developments in Lochwood to the northwest of Baillieston Junction. It joins the River Clyde at Maryville. The North Calder Water flows in a natural channel with winding meanders, pools and shoals. The channel bed consists of stones with gravel shoals and riffle and some boulders. The slopes of channel banks vary and are generally covered with dense brush, shrubs and trees.

Tollcross Burn

Tollcross Burn is a minor tributary of the River Clyde with a total catchment area of about 35.6km^2. It rises in the Glenboig area to the north of the M8/M73 at Baillieston Junction and flows in south westerly direction in open and culverted channels through Glasgow and joins the River Clyde at Dalbeth.

Battle Burn

Battle Burn is a minor tributary of the River Clyde with a total catchment area of about 5.5km^2. It rises in the Mount Vernon area and it flows in southerly direction in open and culverted channels through Glasgow and joins the River Clyde at Carmyle.

Myers Burn / Pow Burn

Pow Burn is a minor tributary of the River Clyde with a total catchment area of about 5.5km^2. It rises in Bothwell Park area to the north of M74 east of Maryville Junction (M74/J4) and flows in north westerly direction along the M74 before it crosses the motorway and continues in south westerly direction and joins the River Clyde north of Kylepark.

Unnamed Burn (the Burn)

The unnamed Burn (here referred to as the Burn) is a minor tributary of the River Clyde with a total catchment area of about 1.04km^2.

The natural catchment drainage paths of the Burn have been altered over the years by housing development and construction of the local road network. The Burn rises to the west of the existing A725 trunk road and town of Orbiston. It flows in south-westerly direction and passes under the railway line connecting Uddingston and Motherwell. It then passes through an existing pond (northeast of Raith junction) west of the A725 and continues to flow parallel to the A725 in a south-westerly direction towards Raith, crossing the M74 motorway to the north of the junction. It then flows in a southerly direction before it passes beneath the A725 to the south-west of the junction. The Burn then continues south towards the River Clyde and discharges into the existing Site of Special Scientific Interest (SSSI) south of the junction. There is no apparent overflow route from the pond into the River Clyde. However, it is envisaged that sub-surface hydraulic connectivity is achieved between the pond and the watercourse.

In sections, the Burn is heavily modified, reducing its ecological value. No evidence of fish was found during the ecological surveys of the watercourse. The ecological status of the Burn is discussed further in Chapter 10.

Cadzow Burn

The Cadzow Burn is a minor tributary of the River Clyde with a total catchment area of approximately 7.74km^2.

The Cadzow Burn rises to the southwest of Laighstonehall and Meikle Earnock before flowing in a north easterly direction before entering the urbanised areas of Hamilton to the south of the M8. The Burn passes through numerous culverts and is crossed by several bridges for both pedestrian and vehicular access before emerging into a heavily modified channel flowing through Hamilton Palace grounds. From here the Cadzow Burn enters a culvert beneath the M8 and discharges into the River Clyde adjacent to the southern extent of Strathclyde Loch.

Strathclyde Loch

Strathclyde Loch is a significant water body adjacent to the existing Scheme and is located to the south east of the M74/J5 (Raith) covering an area of about 87ha. The loch was constructed during early 1970's. Current usage includes recreation and sporting facilities. It is built on the floodplain of the River Clyde at the confluence with the South Calder Water.

Strathclyde Loch forms part of the Strathclyde Country Park development, which is in itself part of a Site of Interest for Nature Conservation (SINCs); more specifically North Lanarkshire SINC 75/1a. The wetlands/ponds within the SINCs are important habitat features supporting a range of bird species and contributing to the reasons for designation of these sites. Strathclyde Loch discharges to the River Clyde around 300m upstream of the bridge carrying the M74 over the River Clyde.

Laighland and Bothwell Park Ponds

The ponds are extensively colonised by tall herb fen and swamp habitat and are therefore smaller in area than suggested on the most recent OS maps.

Laighland / Bothwell Park Wetlands are also designated SINCs. Chapter 10 (Ecology) describes the SINCs in more detail.

The locations of the ponds are as follows:

- The large water body in the SSSI designated area between the River Clyde and the existing M74/J5 (Raith) (NGR 714, 578);
- The pond to the west of M74/J5 (Raith) (NGR 710, 584);
- Ponds lying within an elongated area of wetland. The site is isolated from the rest of the SINC by the M74 as the ponds are located to the north west of the M74/J5 (Raith), west of the motorway (NGR 711, 588) and (NGR 712, 586);
- The area of wetland and wet woodland that forms the largest part of the SINC to the north east of the M74/J5 (Raith), west of A725 trunk road (NGR 716, 589);and,
- The elongated area of wetland to the north of the M74/J5 (Raith) and south of Bothwell Park Wood (NGR 714, 591).

All of the water bodies other than the pond at NGR 714 578 drain via the Burn to the pond, and ultimately to the River Clyde as described above.

15.4.5 Surface Water Quantity

Calculated Flow

Flood flow calculations are carried out in accordance with FEH methods. The river flow gauging stations on the River Clyde at Daldowie and on North Calder Water at Calderpark are situated at NS672 616 and NS681 625 respectively. Two pooling groups containing gauged catchments from the FEH database similar to the catchment of the River Clyde at Daldowie and North Calder Water at Calderpark were created. The estimated median annual maximum flood (Q_{med}), i.e. the flood which is exceeded once

every two years on average, was calculated. The calculated growth curve was applied to the estimated Qmed of the River Clyde catchment at Daldowie and North Calder Water at Calderpark to calculate the 1 in 100 year and 1 in 200 year peak flows.

Average 95 percentile flow for the River Clyde at Daldowie was obtained from the Hydrological data UK, Hydrometric Register and Statistics 1996-2000 published by Centre for Ecology and Hydrology-British Geological Survey at Wallingford.

The estimated flows in the River Clyde and the North Calder Water are summarised in Table 15.6.

Table 15.6 Estimated Flows in the River Clyde and North Calder Water

Name of the Site	Low Flow (Q_{95}) (m^3/sec)	Median Flow 2Year $(Qmed)_{s,adj}$ (m^3/sec)	100Year Peak Flows (m^3/sec)	200Year Peak Flows (m^3/sec)
River Clyde at Blairston	7.74	383	896	1031
River Clyde at Daldowie	9.76	391	993	1141
North Calder Water at Calderpark	0.54	40	104	121

Fairhurst-Halcrow JV, Hydrodynamic Modelling Report 2005

Existing Floodplain and Flooding

Initial investigation of flood risk focussed on the 2nd Generation SEPA Indicative Flood Maps (http://www.sepa.org.uk/flooding/mapping/). These maps have been developed to give an indication of whether a general area, not individual properties or specific locations, may be affected by flooding. Initial comparison of the proposed Scheme to the aforementioned Flood Maps indicated that the proposed works are outwith the functional floodplain of the North Calder Water, the Cadzow Burn, the Battle Burn, the Tollcross Burn, the Burn and the environmentally sensitive areas. Therefore, it was determined that the focus of analysis would be the River Clyde.

The SEPA Flood Map for the River Clyde in the vicinity of the Scheme indicates that the area south of Maryville has the possibility of being flooded from both the river and the sea. The same can be said for the land north and south of the M74 between Raith (M74/J5) and Hamilton (M74/J6). The net effect being a recommendation to undertake a more detailed investigation along this reach of the River Clyde.

The original hydraulic model of the River Clyde was developed in 1988 to determine the likely effects of the termination of dredging operations in the watercourse. The model extended from Greenock to Daldowie over a length of some 45km. The River Clyde model was extended to Blairston gauging station at Bothwell in 1995 as part of an investigation into flooding between Bothwell and Glasgow City Centre.

In October 1996, Babtie Group was commissioned by South Lanarkshire Council to carry out flood investigations on the River Clyde and its tributaries. Phase III of this study, reported on in September 1997, involved the extension of the existing hydraulic model beyond the original upstream limit at Blairston, to 1km upstream of the Clyde confluence with the Avon Water. The hydraulic model was then used to investigate the flooding mechanisms at Hamilton Palace Grounds with a view to determining possible flood alleviation measures required to protect a proposed development.

The original River Clyde model was constructed using Babtie in-house software, FLOODTIDE, whilst topographic and structure information was collated from a variety of sources.

In 1999, Babtie Group was commissioned by Glasgow City Council to convert the FLOODTIDE model in to ISIS, an industry-standard software package, and review the findings of previous modelling studies. This involved reassessing the original hydrology in terms of making use of updated gauged information and confirming original flows using Flood Estimation Handbook methodology. A walking inspection between Strathclyde Loch and Glasgow City Centre was also carried out to identify any changes in channel and floodplain topography and recalibration of the transferred model was undertaken. Predicted flood envelopes were produced for the 1 in 5 and 1 in 100 year events. They also predicted the flood levels at various locations on the River Clyde including the river reach along Strathclyde Loch for various flood return periods, as shown in Table 15.7.

Although the 1999 study concentrated on the modelled stretch within GCC boundaries, the entire Clyde model between Strathclyde Loch and Greenock was converted to ISIS.

The Halcrow Fairhurst Joint Venture was commissioned by Glasgow City Council in 2003 to investigate flood mechanisms and alleviation options in the River Clyde within the local authority boundaries. However, the Clyde catchment as a whole was considered to ensure solutions which could benefit other local authorities were not discounted. The existing ISIS model of the Clyde was updated as far upstream as Blairston gauging station and an updated hydrological analysis was carried out including derivation of flows at Blairston.

The latest flood study, in 2006, of the River Clyde in the vicinity of Raith was carried out by Halcrow who were commissioned by South Lanarkshire Council to carry out a high level flood mapping exercise on the Clyde. The model developed was designed to inform SLC's strategic response to flooding and, as such, is too coarse to provide flood levels for design purposes. In this respect, the model is similar in scope to the SEPA indicative flood map which was developed to provide a strategic overview of flood risk in Scotland and to inform the need for more detailed assessment at specific locations. As such the levels from the 1997 issued Babtie Report, validated by comparison to the later Halcrow (2005) report, have been used as the basis of assessment for the Scheme.

Table 15.7 Predicted Flood Levels (Babtie Flood Study)

Location	Return Periods (year)					
	1 in 5	1 in 10	1 in 25	1 in 50	1 in 100	1 in 200
	Predicted Flood level (mAOD)					
North Haugh	22.89	23.22	23.71	23.97	24.18	24.72
Hamilton Low Parks	21.76	22.11	22.68	23.02	23.40	24.18
Raith Haugh	21.76	22.11	22.67	22.97	23.39	24.12
Bothwell Bridge	21.40	21.71	22.22	22.52	22.89	23.57

Babtie, Flood Study 1997

The flood envelopes derived from Flood Study report produced by Babtie, 1997 confirm the extent of the River Clyde floodplain between the M74 and Strathclyde Loch. Figure 15.2, shows the extent of the 1 in 200 year flood inundation at this location.

Further flood study for the River Clyde was carried out by Consultants Halcrow-Fairhurst Joint Venture in 2005. As part of a Hydrodynamic Modelling study, the flood inundation map of the area between Blairston Gauging station and the Railway Bridge near Hamilton was produced showing the predicted flood envelopes for the River Clyde. The flood envelopes confirm the extent of the River Clyde floodplain to the south of the M74 between M74/J2 and M74/J4 (Maryville). Figure 15.3 shows the extent of the 1 in 200 year flood inundation to the south of Maryville Junction. It shows that the existing junction is not at risk of flooding during 1 in 200 year flood event. Table 15.8 shows predicted flood levels in the River Clyde at Daldowie gauging station situated to the south of M74/J2 and M74/J4.

Table 15.8 Predicted Flood Levels (Halcrow/Fairhurst Modelling Report)

Location	Return Periods (year)					
	1 in 5	1 in 10	1 in 25	1 in 50	1 in 100	1 in 200
	Predicted Flood level (mAOD)					
River Clyde at Daldowie	-	11.72	12.21	12.62	13.04	13.53

Halcrow- Fairhurst JV, Hydrodynamic Modelling Report 2005

15.4.6 Surface Water Quality

Under the Water Framework Directive WFD, which encompasses all surface and ground waters, there is a requirement that natural water features in the vicinity of the proposed scheme will reach good ecological status by 2015. This is a departure from the traditional methods of measuring water quality using chemical parameters. Under the WFD, the status of water will be assessed using a range of parameters, which include chemical, ecological, physical and hydrological measures, which will be used to give a holistic assessment of ecological health.

Water Quality Classification

The River Water Quality Classification used by SEPA is based on a five point scale and includes all rivers with a catchment area of 10km^2 or more and specific smaller rivers where known pollution problems exist. This is called the "classification network". The classification network is divided into river stretches at confluences and pollution pressures. Every stretch is assigned a monitoring point where chemical and/or ecological surveys are taken and the aesthetic appearance recorded. The quality or "class" of a length of river is calculated from the monitoring point results.

No water quality data exist under the "classification network" for the small watercourses in the vicinity of M74/J5 as their catchment areas are less than the required 10km^2. However, the land south of M74/J5, between the A725 and the M74, is a Site of Special Scientific Interest (SSSI) – Hamilton Low Parks (NGR 714, 578).

Environmental Quality Standard

The Environmental Quality Standards (EQS), produced by SEPA, are benchmark criteria against which fresh and marine water quality can be assessed. These are principally ecological standards, specified for a range of parameters at levels required to protect aquatic life.

In the assessment of the impact of road runoff on the water environment, zinc and soluble copper are used as indicator metals to represent the potential for contamination. For total zinc and soluble copper, the EQSs for freshwater vary with water hardness, as hardness affects the solubility of metals. The relevant statutory EQS for the protection of freshwater aquatic life in Scotland, provided by SEPA, are given in Table 15.9.

Table 15.9 Environmental Quality Standards for the Protection of Freshwater Life

Parameter	Hardness	EQS
Copper (dissolved Annual Average (AA))	1-10 mg/l $CaCO_3$	1 µg/l
	10-50 mg/l $CaCO_3$	6 µg/l
	50-100mg/l $CaCO_3$	10 µg/l
	100-300 mg/l $CaCO_3$	28 µg/l
Zinc (total AA)	0-50 mg/l $CaCO_3$	8 µg/l
	50-100 mg/l $CaCO_3$	50 µg/l
	100-150 mg/l $CaCO_3$	75 µg/l
	150-200 mg/l $CaCO_3$	75 µg/l
	200-250 mg/l $CaCO_3$	75 µg/l
	>250 mg/l $CaCO_3$	125 µg/l

Source: SEPA, Technical Guidance Manual for Licensing Discharges to Water, Annex G, 2004

Historical Water Quality

Information on the historical water quality was obtained from SEPA's Harmonised Monitoring Scheme which commenced in 1974. The only data available for the River Clyde was obtained at the Glasgow Green monitoring station located west and downstream of the Scheme route corridor, for the period 1975 to 2003. The North Calder Water information was obtained from the Calderpark gauging station which is located north west of the Maryville Interchange by Glasgow Zoo, for the period 1974 to 2003. The summary of historical water quality results is illustrated in Table 15.10.

Table 15.10 Historical Water Quality of the North Calder Water and River Clyde

Determinant	North Calder Water at Calderpark (1975-2003)	River Clyde at Glasgow Green (1974-2003)
pH (pH Units)	7.7	7.5
Suspended Solids	22.9	14.9
Alkalinity	141.5	85.7
BOD (mg/l)	10.5	5.6
Ammonia (free)	0.005	0.07
Nitrate (max)	8.87	5.34
Nitrate (min)	0.3	0.05
Hardness	197.4	128.6
Chloride	57.9	63
Electrical conductivity (µs/cm)	575.3	473.7
Copper	0.006	0.006
Zinc	0.035	0.026
N.B. Results are expressed in mg/l unless stated and are average values over the time period stated.		

The harmonised data record for the River Clyde demonstrates a reduction in levels of copper, chromium, nickel, lead, cadmium and zinc since 1975 which indicates an improvement in water quality. Biological oxygen demand (BOD) also improved between 1975 and 1988; however, more recent data was not available to confirm if this improvement was maintained. There has been no significant change in the pH, nitrate or nitrite levels.

The harmonised data record for the North Calder Water at Calderpark contains several gaps; however, it demonstrates a reduction in levels of zinc, lead, copper, chromium, cadmium, orthophosphate, nitrate, nitrite and ammoniacal nitrogen since 1975. An improvement in BOD was noted between 1975 and 1989. However, further data was not available to confirm if this improvement was maintained.

Comparison of mean levels of each of the determinants against their respective Environmental Quality Standard (EQS) is favourable when using mean determinant level from the last 2 years of data. All recorded determinants for both the North Calder Water and River Clyde are recorded at levels below their respective EQS for 2002 and 2003 (Table 15.11).

Table 15.11 Recent Historical Water Quality of the North Calder Water and River Clyde

Determinant	North Calder Water at Calderpark for the Period 2002-2005			River Clyde at Glasgow Green for the Period 2002-2005		
	Average	95-Percentile	Compliance with EQS	Average	95th Percentile	Compliance with EQS
pH	8.01	8.40	100%	7.63	7.92	100%
Suspended Solids	18.50	97.75	88%	12.93	45.00	90%
Alkalinity	143.16	214.56	-	85.85	124.54	-
BOD (mg/l)	-	-	-	-	-	-
Ammonia (free)	0.01	0.01	100%	0.01	0.02	93%
Nitrate (max)	2.24	-	-	3.63	-	-
Nitrate (min)	0.38	-	-	0.68	-	-
Hardness	199.69	277.95	100%	130.33	222.20	100%
Chloride	53.39	105.05	98%	60.00	250.00	93%
Electrical conductivity (µs/cm)	534.54	665.30	100%	429.35	1082.95	100%
Copper	0.006	0.011	97%	0.004	0.009	100%
Zinc	0.020	0.045	97%	0.014	0.032	99%
N.B. Results are expressed in mg/l unless stated and are average values over the time period stated.						

In general, over the last 40 years water quality is likely to have improved due to stricter controls over discharging waste waters to surface waters, improvements in industrial efficiency, reduction in acidity of rainwater, reduced industrial activity and better water management.

Current Water Quality

Current water quality data (2006) from SEPA's "classification network" contains information for both the North Calder Water and River Clyde. The North Calder Water data was obtained from the Calderpark Gauging Station and the River Clyde data from Uddingston Bridge, Strathclyde Park Footbridge and Cambuslang Bridge. Where recorded water quality data was unobtainable, the grade attributed to a particular watercourse was derived from the receiving watercourse immediately downstream. The watercourses are graded as follows: A1 – Excellent, A2 – Good, B – Fair, C – Poor, D – Seriously polluted or U – Unclassified. The water quality results found both rivers to be of Class B (Fair) quality. The specific classifications are illustrated in Table 15.12. Values stated are the lowest value attributed to a river reach length.

Table 15.12 River Water Quality Classification (2006 Data) (Figure 15.4)

Determinant	River Clyde at Uddingston Bridge	River Clyde at Strathclyde Park Footbridge	River Clyde at Cambuslang Bridge	North Calder Water at Calderpark
Overall	B	A2	B	B
Biology	B	A2	B	B
Chemistry	B	A2	B	B
Aesthetics	A1	A1	A2	A2
Nutrients	B	A2	B	B
Biology – Laboratory analysed	B	A2	B	B
Biology – Bankside	-	-	-	-
pH	A1	A1	A1	A1
Iron	A1	-	A1	A1
Ammonia	B	A2	A2	A2
BOD	A2	A2	B	B
Dissolved Oxygen (% Saturation)	A2	A1	B	A1
Toxic Substances	-	-	-	-
Sampling Year	2006	2006	2006	2006

The land south of Raith Junction (M74/J5), between the A725 and M74, is a Site of Special Scientific Interest (SSSI) – Hamilton Low Parks. The SSSI covers 107.6ha and has a specific biological designation referring to the flora and fauna located within the site boundary.

The area has been designated a SSSI since 31st January 1986 and is classified as a biological SSSI as its habitats support breeding bird species of national importance. Furthermore, the site also attracts significant numbers of wintering wetland birds. Most importantly, woodland that lies on the south bank of the River Clyde contains one of the largest heronries in Scotland. The ecological interest of the SSSI and other wetlands in the vicinity of the Junction is discussed further in Chapter 10 (Ecology).

The water environment within the SSSI can be considered relatively stable because the Wildlife and Countryside Act 1981 requires SNH to be notified of any "Potentially Damaging Operations" which are proposed in the vicinity of the site, and therefore offers protection against changes in land management. However, it is likely that some of the local road network discharges via the Burn and the wetland within the SSSI, although no

outfalls have been identified. This will be an historic discharge and is likely to have been in place before the SSSI designation was assigned.

The ecological interest of the SSSI and other wetlands in the vicinity of the alignment are discussed further in Chapter 10 (Ecology).

Strathclyde Loch is a very large, man-made body of water located approximately 500m south east of Raith Junction (M74/J5) and south east of the above SSSI. The loch derives its water supply from the South Calder Water which has an overall water quality classification of B (Fair).

Contamination

A preliminary desk study investigation of the Scheme route, including existing M74/J1 to M74/J5, existing M73 Maryville Interchange (M74/J4) to Baillieston Interchange (M8/J8) and the existing M8/J10 to M8/J8, identified several potentially contaminating land uses in the route corridor (Figure 15.4). However, there are few instances of these potentially contaminated sites in the vicinity of the watercourses identified above.

Potentially influential past land uses in the vicinity of the River Clyde within the route corridor are:

- Historic Slag Heap located east of Kenmuir south of the M74 (A on Figure 15.4);
- Daldowie Sludge Treatment Centre located south of the M74 west of Junction 3 (B); and,
- Greenoakhill Landfill located north of the M74 west of Junction 3 (C).

Potentially influential past land uses in the vicinity of the North Calder Water within the route corridor are:

- Former Calderbank Colliery north west of M8/J6 (EuroCentral) (D); and,
- Early 20th Century Railway north west of M73/J1 (Maryville) (E).

Potentially influential past land uses in the vicinity of the Hamilton Low Parks SSSI and Strathclyde Loch are:

- Disused quarry present within Hamilton Low Parks area (F);
- Branch Railway to the north west of M74/J5 (Raith) (crosses through the catchment of the SSSI) (G); and,
- Works identified to the north of the SSSI may impact the tributaries draining into the SSSI (H).

Such potentially contaminated land may impact on surface waters by migration of organic and inorganic contaminants such as metals, hydrocarbons, pesticides, volatile or semi volatile organic compounds and PCBs, via groundwater flow. These potential contamination issues will be dealt with within the framework of the contaminated land

legislation. The Environmental Protection Act 1990, Part IIA Contaminated Land (Section 57 of the Environmental Act 1995) (SE/2006/44) and the Contaminated Land Regulations 1999 provide a basis on which to determine the risks and liabilities presented by a contaminated site. Contaminated Land is defined within Annex 3, Chapter A part 1 – Scope of Chapter and in all those sections mentioned as:

"Any land which appears to the local authority in whose area it is situated to be in such a condition, by reason of substances in it, on or under the land that-

(a) – Significant harm is being caused or there is significant possibility of such harm being caused; or,

(b) – Significant pollution of the water environment is being caused or there is a significant possibility of such pollution being caused."

The current ground investigation was scoped to obtain preliminary geotechnical information and not to address contamination issues; however, potential impacts on controlled waters will be addressed at the detailed design stage under guidance and directives contained in the document stated above (SE/2006/44).

15.4.7 Importance of Surface Water Features and Areas

The importance of the surface water features in the vicinity of the proposed scheme has been determined as follows using the criteria in Table 15.2 and Table 15.3. Their importance is influenced by associated sites of ecological importance, with which they are closely connected, the aesthetic value of the feature, its chemical attributes, the value of the feature to the local economy, and amenity value.

River Clyde

According to SEPA River Classification 1996-2004 the River Clyde length south of Maryville junction and at Bothwell Bridge is classified as Class 'B' (fair quality), this equates to an RQO grade of RE3 and a GQA grade of C. The River Clyde is classed as high importance with respect to the habitat attribute,

North Calder Water

According to SEPA River Classification 1996-2004 the North Calder Water at Calder Park gauging station is classified as Class 'B' (fair quality) and is thus equates to an RQO grade of RE3 and a GQA grade of C. The North Calder Water is classified as medium importance with respect to all attributes potentially impacted by the proposed scheme.

Tollcross Burn

No classification has been attributed to the water in the Tollcross Burn. In the absence of specific classifications being available, it is prudent to apply the classification from the receiving watercourse. The burn runs through Glasgow and discharges into the River Clyde and is therefore considered to be of medium importance.

Battle Burn

Again, no classification has been attributed to the water in the Battle Burn. In the absence of specific classifications being available, it is prudent to apply the classification from the receiving watercourse. The burn runs through Glasgow and discharges into the River Clyde and is therefore considered to be of medium importance.

Pow Burn / Myers Burn

No classification has been attributed to the water in the Pow Burn. In the absence of specific classifications being available, it is prudent to apply the classification from the receiving watercourse. However as it discharges into the River Clyde as described above it should be classified equally as Class 'B' (fair quality), this equates to an RQO grade of RE3 and a GQA grade of C. The Pow Burn / Myers Burn is classified as medium to high for attributes potentially impacted by the proposed scheme.

Unnamed Burn ('The Burn')

No classification has been attributed to the water in the Burn. However, the Burn discharges into an area of wetland located in the existing SSSI and is thus (as a conservative approach) considered to be of high importance.

The Burn channel itself shows evidence of modification through historic land management practices and is therefore considered as high importance.

Cadzow Burn

No classification has been attributed to the water in the Pow Burn. In the absence of specific classifications being available, it is prudent to apply the classification from the receiving watercourse. However as it discharges into the River Clyde as described above it should be classified equally as Class 'B' (fair quality), this equates to an RQO grade of RE3 and a GQA grade of C.

The Cadzow Burn is classified as medium importance with respect to all attributes potentially impacted by the proposed scheme.

Site of Special Scientific Interest (SSSI)

Raith Haugh/Hamilton Low Parks SSSI is located to the south of Raith Junction (M74/J5). It is a biological SSSI covering an area of about 107.6ha (Figure 15.2). Chapter 10 (Ecology) describes the SSSI in more detail. The part of the SSSI lying north of the River Clyde includes a wetland area that forms part of the mosaic of habitats for which the site is designated, and is important for the ornithological interest of the SSSI.

Strathclyde Loch and Sites of Importance for Nature Conservation (SINC)

A number of SINCs exist within the vicinity of the Scheme. Those most closely associated with water features include the SINCs along the North Calder Water (but not including the watercourse itself) and those at Raith junction. Only the Raith junction SINCs are given consideration here, as they have greatest potential to be hydrologically linked to the motorway network.

Laighland/Bothwell Park Wetlands SINC is situated to the north of the junction and comprises 3 sub-sites. The wetlands/ponds within the SINCs are important habitat features supporting a range of bird species and contributing to the reasons for designation of these sites. These are:

- Laighland Wetland 1 (NS716, 589 - 4ha), an area of wetland and wet woodland that forms the largest part of the SINC and is adjacent to the A725;
- Laighland Wetland 2 (NS714, 590 - 2.5ha), an elongated area of wetland that runs north from the M74 to the southern edge of Bothwell Park Wood; and
- Laighland Wetland 3 (NS712, 587 – 2.5ha), an elongated area of wetland, including two areas of open water, that lies along the southern edge of the M74 embankment in the Laighland area. The site is isolated from the rest of the SINC by the M74.

North Lanarkshire SINC 75/1a lies within the southeast part of the survey area. The northern edge of the SINC at Strathclyde Country Park comprises Strathclyde Loch (which is artificial and managed for recreation and sport), its shoreline and a man-made island.

The SINCs are classified as having very high importance to reflect their environmentally protected status, However, Strathclyde Loch is not classified with respect to importance since there is no impact presented by the proposed scheme.

15.4.8 Existing Sewerage and Road Discharges

Sewerage Discharges

Information regarding consent to discharge in the scheme area was provided by SEPA. This indicated existing discharge consent into the River Clyde. There are three significant discharges at this location which are (Figure 15.4):

- A combined storm overflow at Bothwell Bridge (WPC/W/8758);
- A discharge of treated sewage effluent from Hamilton Sewerage Treatment Works (WPC/W/13909); and
- A discharge of treated sewage effluent from Daldowie Sewerage Treatment Works.

Existing Road Drainage

The existing road drainage is via road gullies, carrier drains, filter drains and channel drains. As-built drainage drawings of the M8 dated 1977 show that the runoff from the motorway between M8/J10 and M8/J9 drains into the Baillieston Surface Water Sewer (BSWS) to the south west of the M8/J9. A note on the drawing at the point of discharge into the BSWS indicates that drainage upstream of this location is the responsibility of Scottish Executive.

Along its route, BSWS collects runoff from a housing development sewer to the south west of Baillieston junction before discharging into a small tributary of the North Calder Water south east of the M8/J8 (Baillieston). Immediately upstream of the above housing development, an overflow incorporated in BSWS discharges into the Tollcross Burn.

Drainage Site Investigation – May 2005

In the absence of as-built drainage drawings and information for the entire Scheme area, a walk-over survey was carried out in the vicinity of the watercourses adjacent to the M73 south of M73/J2 (Baillieston) and M74 in the Uddingston area in May 2005 to identify possible surface water outfalls from the two motorways. This survey formed part of the feasibility study into existing surface water outfalls to investigate the opportunity of re-use and development under the carriageway widening proposal. Specific investigation areas are detailed on Figure 15.4.

Patterson's Quarry (No.1 on Figure 15.4)

The land owned by Patterson's Quarry lies both to the north and south of the M74 between M74/J2 and M74/J3. This area was of particular interest as it holds the shortest path from the motorway to the River Clyde and could potentially be the route of a surface water outfall from this section of the M74.

The land to the north of the motorway is a live quarry with evidence on site to suggest that it is a former landfill site for domestic refuse. Currently, groundwater pumped from the quarry pit is discharged into settlement lagoons on the south side of the motorway where particulate material is settled out before the water is discharged directly into the River Clyde. Along the boundary of the site adjacent to the motorway there were areas of saturated ground suggesting that drainage in this area is poor. The site manager of Patterson's Quarry had no knowledge of any surface water sewers on this site that collect runoff from the motorway.

The land to the south of the motorway is also a live quarry, with the two sites being connected by an underpass running beneath the M74. What is believed to be two surface water manholes were identified on the beyond the road corridor, adjacent to the hard shoulder. No surface water outfalls were observed at this site.

Roundknowe Farm (No.2 on Figure 15.4)

No surface water outfalls were observed at Roundknowe Farm, although a large diameter (approximately 1200mm) cast iron pipeline was noted crossing the watercourse adjacent to the downstream side of the bridge at Roundknowe Road, which may possibly convey foul water to Daldowie Sewerage Treatment Works.

M73 Viaduct from Woodhead Farm (No.3 on Figure 15.4)

The observations beneath the M73 viaduct were made from the south bank of the North Calder Water. From this position it could be seen that there were a number of manholes protruding from the ground in a line thought to be heading towards a large concrete

chamber directly below the bridge deck. An above ground pipeline of around 800mm diameter emerged from this chamber and ran in a westerly direction parallel to the watercourse. This pipeline was visible for a further 50m or so before disappearing.

On the south bank only one manhole was found which was thought to be part of the surface water drainage from the M73.

North Calder Water from Newlands Farm (No.4 on Figure 15.4)

Observations were made from the south bank of the North Calder Water at a distance upstream of the M73 viaduct. The ground rises in the upstream direction with the bank becoming steeper as it approaches the watercourse. From the top of the bank there were no visible outfalls apart from what appeared to be a small bore pipe discharging water down the south bank to the watercourse.

North Calder Water from Greyfriars Farm (No.5 on Figure 15.4)

From a position on the east bank of the North Calder Water to the south of the M74/J4 (Maryville), a large diameter outfall pipe (approximately 750mm) with a concrete headwall and partially blocked trash screen was observed. The indication was that outfall was part of surface runoff drainage system serving the M74/J4 (Maryville).

Pow Burn at Kylepark (No.6 on Figure 15.4)

The Pow Burn is a minor tributary of the River Clyde. The burn is culverted in a number of locations; it passes through residential areas with a number of small foot bridges along its course. There were no obvious outfalls from the M74 identified, indicating that the burn does not receive surface runoff from the motorway.

Myers Burn from Old Mill Road (No.7 on Figure 15.4)

From information on various maps it is believed that Myers Burn is the upstream reach of the Pow Burn, before it passes under the M74. It was not possible to make out Myers Burn from Old Mill Road due to the high density of the vegetation in that area, but the topography and information from maps indicated that there was a stream in that location. No motorway outfalls into Myers Burn were observed due to the high density of vegetation.

Drainage Investigation - March 2006

Following initial site investigation further information was obtained from AIS which is currently the road maintenance contractor responsible for the area.

M74/J4 (Maryville) to M74/J5 (Raith)

From the drainage investigation report for between M74/J4 and M74/J5 it was noted that the surface runoff for the M74 discharges into two separate systems; those pipes that outfall into the basin located to the north east of Raith (M74/J5) adjacent to the

northbound carriageway (No.8 on Figure 15.4), and pipes that outfall intermittently into Pow Burn (Myers Burn) running parallel to the southbound carriageway with no attenuation (No.9 on Figure 15.4).

AIS Archive Documents

Also received from AIS was a series of documents referring to the infilling and subsequent diversion of the Forth & Clyde Canal between M8/J12 (Riddrie) and M8/J8 (Baillieston). While the documents mentioned the construction of new sections of motorway there was no reference to the associated drainage system. The bulk of the documents received focus on either the installation (including the reasoning for it) or the maintenance of the double-pipe system for the piping of the Forth & Clyde Canal.

Plans of the pipe system and manholes were incorporated into schematics of Scheme options to assess the proximity to the proposed road systems; the issue being whether the expansion of the road system will impinge on the pipes or manholes. The canal pipeline crosses beneath the existing between M8/J8 (Baillieston) and M8/J9 (Figure 15.4).

Outfalls for the section of motorway between M8/J8 (Baillieston) and M8/J10 have been initially estimated from plans produced in 1977 regarding the construction of the aforementioned motorway.

15.5 Predicted Impacts

15.5.1 General

This section describes predicted impacts and effects without the incorporation of mitigation measures. The assessment has been carried out in accordance with DMRB, (2006); Volume 11; Environmental Assessment, Section 3; Environmental Assessment Techniques, Part 10; Road Drainage and the Water Environment. Drainage design will adopt current Highway Agency and Transport Scotland standards and aim to achieve water quality objectives now mandatory in the UK as a result of the WFD. Water quality and drainage impacts may be direct or indirect, temporary or long-term, and can occur during the construction phase (which is discussed further in Chapter 9; Disruption Due to Construction) and operation of the scheme. They may relate to:

- Road surface runoff;
- Accidental spillage on the road;
- Flooding;
- Groundwater flows (groundwater is addressed in Chapter 16); and,
- Impacts of new structures within water bodies, watercourses and floodplains.

According to DMRB, the impact of routine road runoff can be assessed using the concentrations of dissolved copper and total zinc in receiving waters as indicators. These metals have been used as indicators of the level of impact as they are generally indicative

of the levels of other metals of concern along with PAH loads. Copper is included for its toxicity and is indicative of changes in water chemistry.

The assessment method takes into account water quality and Environmental Quality Standards (EQS) for the Protection of all Freshwater Life relating to the receiving watercourses. As previously indicated, EQS are principally ecological standards, specified for a range of parameters at levels required to protect aquatic life.

EQS for freshwater can vary with water hardness, as hardness affects the solubility of metals. The relevant EQS for the protection of freshwater aquatic life provided by SEPA are given in Table 15.9.

Assessment requires data on the upstream concentrations of dissolved copper and total zinc in each watercourse, an indication of receiving water hardness, an estimate of the road surface area to be drained to each outfall, the run-off coefficient of the road scheme, traffic flow data and the 95th percentile flow (Q_{95}) of the receiving watercourse. In the absence of flow data to calculate Q_{95}, the Q_{95} was estimated as described above and shown in Table 15.11.

The impact of road runoff on the water environment is assessed through the calculation of pollutant loadings in runoff and the number of vehicles predicted to use the road. HA216/06 Method A requires the comparison of daily traffic figures to the ratio of water volume in the receiving watercourse versus the volume of runoff from the road. This is undertaken through the application of a design rainfall event to a road carrying a predicted number of vehicles. The traffic model estimates the Annual Average Daily Traffic; the number of vehicles and the proportion of those vehicles that are classed as heavy goods vehicles. Should a predefined limit be breached, based on the River Ecosystem classification for the receiving watercourse, then more detailed assessment methodologies are required. During the detailed assessment HA216/06 allows for the calculation of zinc and copper levels based on the projected traffic levels along various sections of the proposed road for use as part of the Method B Assessment.

Baseline conditions are created through the utilisation of the 2004 traffic model incorporating none of the road schemes identified as being implemented in the 2020 model (this includes Raith and the M8 Baillieston to Newhouse). The addition of 2004 traffic levels allows for the assessment of the traffic influence on pollutant loadings in the receiving watercourses. The removal of this influence when considering 2020 traffic levels means that traffic is not double counted and that the proposed scheme alone is being assessed against the base water quality levels. .

The annual average daily traffic figures are for the design year 2020 assuming low traffic growth rates. Details of the calculations are given in Appendix 15.1. The results are presented and discussed for each network in Section 15.6.2.

Impacts During Construction

Once construction commences the runoff from the construction site may result in pollution of the watercourse downstream of the works. This could be in the form of high silt

loadings in the surface water runoff. Fine particles will remain in suspension and the heavier material would settle out on the bed of the river.

There are potential adverse impacts associated with the various activities or events specifically associated with the construction phase, such as:

- The risk associated with general site clearance, this could arise from stripping vegetation and topsoil from the working area leaving exposed ground surfaces susceptible to erosion;
- The risk associated with high silt loadings, this could arise from construction traffic movements over exposed wet temporary haul roads, thereby disturbing exposed ground and releasing silt into the surface water runoff;
- Untreated, large stockpiles of topsoil on site can slough off into watercourses during rainfall, thereby creating pollution; and,
- Accidental spillage of fuel and oils from the engineering plant and machinery and concrete liquors contaminating the nearby watercourses.

The early establishment of temporary drainage facilities will reduce the risk of pollution problems during construction. In addition, construction operations should adopt best working practices. Guidance on surface water protection during development is provided by SEPA in the form of Pollution Prevention Guidelines (PPG). These notes provide a basis for the assessment of impacts and the design of surface water treatment, in addition to consultation with the local SEPA Environmental Protection Team. Relevant PPGs include:

- PPG 1: General Guide to the Prevention of Water Pollution;
- PPG 2: Above Ground Oil Storage Tanks;
- PPG 5: Works in, near or liable to affect watercourses; and,
- PPG 6: Working at Construction and Demolition Sites.

Further measures should be taken during the construction period to ensure that the Contractor gives due consideration to the recommendations contained within the above guidelines. Design recommendations are also required for proper pollution mitigation with regards to the type of facilities required and the methodology adopted.

Construction impacts are fully discussed in Chapter 9, Disruption Due to Construction.

Impacts During Operation

Road Surface Runoff

The Construction Industry Research and Information Association (CIRIA) Report R142 describes road surface runoff as a complex matrix of inter-related substances. It divides pollutants from highway drainage discharges into the following six categories:

Sediments – 'Sediment is simply defined as material that settles to the bottom of a liquid'

Hydrocarbons – 'In the report the term hydrocarbons is used to mean organic compounds containing only carbon and hydrogen, particularly the petrochemical derived group which includes petrol, fuel, oils, lubricating oils and hydraulic fluids'.

Metals – 'The above report indicates that the majority of studies on metals in highway runoff have concentrated on lead, cadmium, copper, zinc and iron'.

Salt and nutrients – 'Salt and nutrients are defined as those generally neutral materials that occur as soluble compounds and have a direct polluting effect upon vegetable matter either by reducing or extinguishing conditions conducive to propagation or by accelerating growth to the detriment of the balance of the environment'.

Microbial – 'Microbial activity is mainly associated with the particulate material derived from the decay of organic matter or finely divided solids that harbour bacteria or viruses. Significant microbial populations are transported with wind blown soils'.

Others – 'Substances which do not readily fit into the other classes. Examples of these materials are pesticides and herbicides'.

High concentrations of pollutants can accumulate during prolonged dry spells or drought, and are then released by rainfall and consequently impact on water quality due to low flows in the watercourses at this time.

DMRB Volume 11 recommends initial assessment of the concentrations of dissolved copper and total zinc in receiving waters in order to assess the impact of road runoff and to determine whether mitigation is needed. As part of the detailed design process it is recommended that a wider assessment be undertaken with regard to water quality and pollutant loadings such that proposed SuDS arrangements can be refined.

The Scheme lies within the catchment area of the River Clyde. As a result, there is potential risk of pollution from the collective effects of the motorway surface runoff, its junctions and associated extension of the local road network outfalls within the catchment. The pollution may be more pronounced in the small tributaries because of the small flows in the tributaries which offer little or no dilution.

Location of Proposed Outfalls

Walk over survey of the existing drainage and outfalls could not establish the exact location of every outfall. More detailed site investigation undertaken with AIS has provided an indication of the existing drainage outfall locations (Figure 15.4). This allows the determination of the suitability of the existing outfall locations for SUDS facilities.

M8 – Proposed motorway widening between M8/J10 and M8/J8 (Baillieston) will drain into the existing BSWS west of M8/J9 and from there into the North Calder Water;

M73 – Proposed motorway widening will drain into existing outfalls; and,

M74 – Proposed motorway widening will drain into existing outfalls.

It is anticipated that SUDS attenuation and treatment facilities will be provided at the existing outfall locations in line with CIRIA C697.

Capacity Constraints

Further consultation with Scottish Water will be required in connection with the capacity of the existing BSWS which drains surface runoff between M8/J10 and M8/J8 (Baillieston) into the North Calder Water. In the event of increased runoff being generated by the proposed Scheme, and being discharged into the BSWS, it may be necessary to attenuate runoff to existing discharge levels such that the capacity of the BSWS is not exceeded.

Accidental Spillage on the Road (Post-Construction Permanent Works)

CIRIA Report R142 states that spillages resulting from individual accidents are potentially the most serious source of contaminants associated with highways. Accidental spillages can range from minor losses of fuel from vehicles to major losses from fractured tanker vehicles, but their effects can be serious because of the unpredictable nature of materials involved.

The report explains that the liquids which are carried in large quantities present a high potential for serious pollution following accidental spillage including:

- Petrol, diesel fuel, oils, other liquid hydrocarbons and chemicals;
- Acids and caustic solutions;
- Toxic wastes;
- Inert slurries;
- Sewage sludge; and,
- Products that can cause high biological loadings e.g. sugar and dairy products.

A risk assessment of a serious spillage causing pollution has been undertaken according to DMRB (Vol11). Detailed calculations are provided in Appendix 15.1. The method is based on a number of assumptions, such as emergency services response times and runoff coefficients, to provide an estimate of the risk. Predicted traffic flows are based on the 2020 Scenario 2 (Low Growth), 24 Hr AADT (7 day) flows. It is assumed that the emergency services would take less than 20 minutes to respond.

The probability of a serious spillage event occurring on each length of road served by a single drainage network was estimated based on Table D.1 in DMRB Volume 11 (page A1/12). The type of road was assumed to be motorway with and without junction (serious accidental spillages per billion HGV km/yr = 0.46 and 0.36 respectively), motorway slip roads (serious accidental spillages per billion HGV km/yr = 0.43) and all purpose urban

within 100m of slip roads, side roads and roundabouts (serious accidental spillages per million HGV km/yr = 0.36, 1.81 and 5.35 respectively). The proposed roads' dimensions in each category were calculated from the option layout drawings.

The assessment includes a calculation of the risk of a pollution incident for discharge to two categories of watercourses. According to DMRB, these are 'aquifers and sensitive watercourses', and 'all other receiving waters'. This risk is measured against acceptable thresholds for each category, predicted spillage risks of greater than 1 in 100 years for aquifers and sensitive watercourses with the threshold being derived from consultation with SEPA and 1 in 100 years for all other receiving watercourses. For the purposes of this assessment, the River Clyde comes under the category of 'all other receiving watercourses'.

A summary of the spillage risk assessment and comparison with threshold limits are provided for each section of the proposed scheme draining to a particular outfall.

Flooding and Drainage Impact Assessment

Initial assessments show that the road widening associated with M8, M73 and M74 does not impinge on the floodplain of the North Calder Water and The River Clyde during 1 in 200 year flood return period. Hence, at these locations there are no floodplain storage losses as the result of the new road development. This is achieved through engineering design such that widening is achieved above the level of the 1 in 200 year flood level and therefore outwith the functional floodplain (see Figure 15.11).

The uncontrolled discharge of surface runoff from the road development proposals draining to existing watercourses during storm events has the potential to cause localised flooding and increase the risk of flooding downstream with consequential damage and disturbance to residential and commercial properties as well as to natural features.

It is anticipated that the additional lanes would increase the road surface runoff which, without mitigation measures, such as flood storage and attenuation, could result in a significant flood impact during heavy rainfall events.

In order to compare the likely impact on flooding, the peak flows for 1 in 2 year 'greenfield' runoff and 1 in 2 year and 1 in 5 year peak highway discharges were estimated for each road drainage outfall. These are presented for each option in Section 15.6.2.

In relation to BSWS, Scottish Water will require a hydraulic assessment of their network in this area to assess the impact of additional runoff from the road development into the BSWS.

Effects on Watercourse Quality

Surface runoff without mitigation would cause serious pollution to the North Calder Water and the River Clyde downstream of the proposed highway outfalls; resulting in potential

long term effects on aquatic fauna and fishery. The uncontrolled discharge of surface runoff during construction may affect the biota of watercourses due to the deposition of suspended solids and formation of a sediment layer on the watercourse bed. Sediments which coat the natural substrate of a watercourse can smother flora and fauna including fish eggs laid in the gravels. Once these sediment layers are formed they are not readily displaced by spates and may form compacted layers on the bed of the stream. This will alter the nature of the substrate from a sandy stony environment to a sediment crust which can significantly affect habitats, and thus the type of flora and fauna within the watercourse, over extended periods of time.

15.6 Scheme Scenarios

15.6.1 Do-nothing

As described in Section 15.2.1, Do-nothing involves no new scheme and existing drainage and hydrological patterns remain unaltered other than as a result of natural change or other development activities in the area, and there are no mitigation measures.

However, over time the catchment would be subject to the potential effects of other types of developments and associated drainage management systems. The effect of climate change will increase the flood frequency and hence the risk of flooding. The continued discharge of contaminated surface water runoff does not support environmental legislation such as the Water Environment and Water Services (Scotland) Act 2003 (WEWS) which aims to improve the quality of Scotland's watercourses over time. Thus the do nothing option results in a gradual deterioration of environmental standards.

15.6.2 Do-something

As described in Section 15.2.1, the Do-something options involve improvements either WITH or WITHOUT mitigation. 'WITHOUT mitigation' would not include any provisions for mitigation measures for road surface runoff quality and quantity. This identifies the level of impacts under worst-case conditions.

WITHOUT Drainage Mitigation Measures

Network 1

Network 1 comprises the surface water drainage system for the M8 from Junction 8 to Junction 10.

Network 2

Network 2 comprises the surface water drainage system for the M73 northbound and M73 southbound south of M73/J2 (Baillieston Junction) from its crossing over the railway to the crossing over the North Calder Water.

Network 3

Network 3 comprises the surface water drainage system for the M73 northbound and M73 southbound from where the motorway enters a cutting south of the crossing over the North Calder Water to M73/J1 (Maryville).

Network 4

Network 4 comprises the surface water drainage system for the M74 northbound and M74 southbound from 2km west of M74/J3 to the point at which the M74 crosses the North Calder Water west of M74/J4 (Maryville).

Network 5

Network 5 comprises the surface water drainage system for the M74 northbound on slip from the M73 southbound at M74/J4.

Network 6

Network 6 comprises the surface water drainage system for the M74 northbound and M74 southbound from the point at which the M74 crosses the railway east of M74/J4 to M74/J4.

Network 7

Network 7 comprises the surface water drainage system for the M74 northbound and southbound from where the M74 crosses the railway east of M74/J4 to Bellshill Road.

Network 8

Network 8 comprises the surface water drainage system for the M74 northbound and southbound from Bellshill Road to M74/J5 (Raith).

Network 9

Network 9 comprises the surface water drainage system for the M74 southbound from the crossing over the River Clyde north west of M74/J6 and M74/J6 (Hamilton). The M74 northbound for this length of motorway is unaltered with respect to the M8/M73/M74 Network Improvements Scheme. The two carriageways are distinct in their drainage networks; therefore no proposed drainage system for the northbound carriageway has been developed.

Network 10

Network 10 comprises the surface water drainage system for the M74 southbound from M74/J5 southeast to the crossing over the River Clyde.

Network 11

Network 11 comprises the surface water drainage system for the M74 southbound within M74/J5 (Raith). The drainage system in this location will feed into the SuDS facility designed as part of the M74/J5 (Raith) upgrade). The M74 northbound and southbound for this length of motorway is unaltered with respect to the M8/M73/M74 Network Improvements Scheme. The two carriageways are distinct in their drainage networks; therefore no proposed drainage system for the northbound carriageway has been suggested.

Network 12

Network 12 comprises the surface water drainage system for the M73 northbound and M73 southbound from the crossing over the North Calder Water south to where the M73 enters the cutting.

Network 13

Network 13 comprises the surface water drainage system for the Queenslie Industrial Estate south of the M8 and west of M8/J10. From investigation of as-built drawings of the surface water drainage system for the M8 in this area it was noted that Queenslie Industrial Estate surface water is fed into the motorway drainage system and from there is conveyed to the Baillieston Surface Water Sewer.

Table 15.13 shows the road length and area for M8/J10 to M8/J8, M73/J1 to M73/J2 and west of M74/J3 to M74/J6 and compares the 1 in 2 year 'greenfield' runoff of the catchment with the runoff from the road paved area during 1 in 2 year flow and 1 in 5 year peak flows at theoretical outfall locations. Natural 'greenfield' runoff figures for individual outfalls were derived from the product of the area of road surface drained as part of the catchment 'greenfield' runoff figure. This in itself was calculated through the application of the methods listed in Table 15.19 and is in line with the SuDS methodology and Water Framework Directive objectives.

Table 15.13 Surface Runoff at the Proposed Outfall Locations

Outfall	Road Drainage Length (m)	Road Drainage Area (ha)	1 in 2 year Greenfield Runoff (l/s)	1 in 2 year Peak Road Runoff (l/s)	1 in 5 year Peak Road Runoff (l/s)
Network 1	1843	11.84	14.64	148.83	184.25
Network 2	1661	3.5	5.34	54.35	67.29
Network 3	1349	4.97	6.09	61.89	76.62
Network 4	2765	17.6	3.02	30.69	37.99
Network 5	421	1.22	15.46	157.19	194.60

Outfall	Road Drainage Length (m)	Road Drainage Area (ha)	1 in 2 year Greenfield Runoff (l/s)	1 in 2 year Peak Road Runoff (l/s)	1 in 5 year Peak Road Runoff (l/s)
Network 6	2736	9.57	15.70	159.69	197.70
Network 7	1204	3.05	5.07	51.51	63.76
Network 8	3150	10.12	12.91	131.29	162.53
Network 9	1680	3.87	13.98	142.15	175.98
Network 10	115	0.26	1.39	14.14	17.50
Network 11	ACCOMMODATED WITHIN THE RAITH SCHEME				
Network 12	260	1.17	1.17	11.85	14.67
Network 13	NOT ASSESSED – PUBLIC SEWER REALIGNMENT				

Table 15.14 below indicates the results from DMRB HA216/06 Method A assessment of the proposed drainage networks.

Table 15.14 DMRB HA 216/06 Assessment Results

Network	River Class	AADT	Dilution	Level of Risk
1	RE 3	242,954	32.63	Low
2	RE 3	121,956	170.35	Low
3	RE 3	140,340	160.99	Low
4	RE 3	121,434	22.03	Low
5	RE 3	50,889	712.18	Low
6	RE 2	137,292	1,016.34	Low
7	RE 3	137,292	6.43	High
8	RE 2	541,808	581.17	Low
9	RE 2	67,701	1,955.80	Low
10	RE 2	67,701	28,564.76	Low
11	ACCOMMODATED WITHIN THE RAITH SCHEME			
12	RE 3	105,377	830.08	Low
13	NOT ASSESSED - PUBLIC SEWER REALIGNMENT			

Method A concludes that only Network 7 requires a Detailed Assessment in line with DMRB HA216/06.

Table 15.15 below shows the impact of the total zinc and dissolved copper on the watercourse for Network 7 such that mitigation requirements be implemented and assessed.

Table 15.15 Predicted Impact of Total Zinc and Dissolved Copper on the Receiving Watercourses WITHOUT Mitigation

Outfall Location	Sensitivity	Parameter	EQS (µg/l)	Upstream Conc. (µg/l)	Downstream Conc. (µg/l)	Increase (µg/l)	Magnitude+	Significance
Network 7	Medium	Copper	28	3.72	24.07	20.35	Minor Adverse	Slight
		Zinc	75	14.01	99.01	85.00	Minor Adverse	Moderate

Table 15.16 Summary of Impact

Outfall Location	Impact
Network 7	Moderate significance

Table 15.17 Summary of Spillage Risk Assessment, WITHOUT Mitigation

Watercourse Category	Feature/ Outfalls	Threshold of Acceptability (1 in Years)	Calculation for Spillage Risk (1 in Years)	Within acceptable limits?
All other receiving watercourses	Network 1	1 in 100	1 in 1941	Yes
All other receiving watercourses	Network 2	1 in 100	1 in 2827	Yes
All other receiving watercourses	Network 3	1 in 100	1 in 1798	Yes
All other receiving watercourses	Network 4	1 in 100	1 in 1217	Yes
All other receiving watercourses	Network 5	1 in 100	1 in 9514	Yes
All other receiving watercourses	Network 6	1 in 100	1 in 815	Yes
All other receiving watercourses	Network 7	1 in 100	1 in 1883	Yes
All other receiving watercourses	Network 8	1 in 100	1 in 689	Yes
All other receiving watercourses	Network 9	1 in 100	1 in 1239	Yes
All other receiving watercourses	Network 10	1 in 100	1 in 18102	Yes
All other receiving watercourses	Network 11	ACCOMMODATED WITHIN THE RAITH SCHEME		
All other receiving watercourses	Network 12	1 in 100	1 in 20594	Yes
All other receiving watercourses	Network 13	NOT ASSESSED – PUBLIC SEWER REALIGNMENT		

WITH Drainage Mitigation Measures

Drainage Mitigation Applicable

The drainage design would be in accordance with the DMRB, Volume 4a; design would adopt current road drainage design standards including Sustainable Urban Drainage Systems (SUDS), addressing the three principal objectives of SUDS, including:

- Amenity and wildlife, to integrate with overall habitat and environmental strategies;
- Water quantity, to control the effects of road runoff on the receiving watercourses and therefore mitigate the downstream flood risk;
- Water quality, to protect the downstream from point source, diffuse and accidental contamination; and,

Flood protection and river engineering will be applied to mitigate flood risk posed by any proposed new crossings or culverts and through the use of erosion protection to minimise the damage to the bed and banks of the receiving watercourse. However, the development footprint is outwith the functional floodplain and does not impinge on any existing culverts or crossings such that the water environment is impacted. Erosion protection design will be carried out in line with the following guidance:

- River Restoration Centre (1999) Manual of River Restoration Techniques
- Fisher, K. & Ramsbottom, D. (2001) River Diversions: A Design Guide
- Escarameia, M. (1998) River and Channel Revetments: A Design Manual

Surface Water Management Train Proposal

During Construction
Settling facilities would be provided for runoff discharge from the construction site to intercept mobilised particles into the watercourses. During construction works there is a potential risk of high volumes of runoff from heavy rainfall. Measures would be provided for safe routes to direct the runoff towards an area for storage with overflow into the nearest watercourse.

Crossing of the watercourse either by fording or culverting would be avoided. Where this is not possible, temporary bridge crossing would be provided for the North Calder Water. Working within the watercourse or on its banks will be avoided to protect in-stream and bankside habitats.

Permanent Road Drainage
Within the Scheme boundary, the existing motorway drainage would be replaced by a new drainage system. This new drainage system would incorporate SuDS facilities in line with CIRIA C697.

The 'management train approach' would be central to the proposed highway surface water drainage strategy. The main objective is the treatment and control of runoff as near to the source as possible protecting downstream habitats. Table 3.3 in CIRIA C697 states that for highways the number of treatment train components required is a minimum of three.

The objective of the mitigation measures outlined below is to convey surface water run-off from the road surface to a receiving watercourse without detrimental effect on water quality and associated ecosystems. Mitigation measures include those that aim to prevent, reduce or offset potential effects.

Mitigation measures to reduce the risk of adverse impacts comprise solutions, which would be aimed at the source of the impact. The risk of causing deterioration in water quality can be reduced by using SUDS. This includes the choice of route location and road alignment to avoid impacts. For example the avoidance of important/sensitive water features where possible.

The SUDS facilities at the outfalls would include an oil interceptor, a spillage containment unit (defence against accidental spillage of harmful liquid such as chemical etc. on the road) and a forebay basin with 20% of the volume of the basin to provide for settlement of coarse silts. The basin would provide attenuation with additional volume of 1 x V_t for further improvement of water quality. Table 15.18 shows the general arrangement of SUDS facilities at the outfalls which may vary depending on the location.

Further investigation indicated that the 'ideal' SuDS treatment train was not viable in certain locations; a lack of available space for networks 1, 4, 7, 9 and 10 meant that larger above ground attenuation features such as extended detention basins and ponds were not feasible. In these situations swales have been proposed along with additional design elements such that attenuation and treatment potential is maximised for the available space.

Table 15.18 Surface Water Management Train

Treatment Level	SUD Technique
Management and Prevention	Good Housekeeping
Source Control	Swales Catchpits Filter drains Road Gullies
Site Controls	Oil Interceptors Spillage containments Silt forebays Extended Detention Basins Wet pools

Swales
Road swales will be used along the bottom of the road embankments and, prior to the road drainage entering a watercourse, have significant pollutant removal potential. Swales are low-lying vegetated channels that drain water evenly off impermeable areas. Rainwater runs in sheets through the vegetation alongside the swale, which slows and filters the flow. They are designed to convey water, but can also provide the benefits of infiltration, detention and treatment of runoff. Incorporation of check dams or pools can slow flows, increase attenuation and promote deposition of suspended solids.

Catchpits
Catchpits consist of manholes with shallow depth (about 200mm) sumps. They are designed to trap sediments and other debris and retain a proportion of the suspended solids present in the runoff and settle out hydrocarbons and metals. Catchpits will be located at regular spacing, not more than 100m, with longer intervals in exceptional circumstances along the filter drains and at the junctions of carrier drains.

Filter Drains
Filter drains will be used along the length of the proposed road including approach roads at the junctions. Filter drains consist of a perforated pipe laid in a trench backfilled with gravel and will be constructed along the terrestrial part of the road. Filter drains will be used to convey road surface runoff to the discharge point and to filter out pollutants including suspended solids, hydrocarbons, iron, copper and zinc. They will also provide attenuation of flows by reducing the velocity of the runoff. Piped carrier drains are required in some locations to transfer discharge from filter drains to ditches. There will not be any provision for filter drains on the bridge decks of structures across the North Calder Water as this is not technically feasible. It is anticipated that combined gullies/kerb/channel drains, specifically designed for use in bridge decks will be used.

Road Gullies
Road gully pots will be used at the kerbed sections of the roads such as junctions. Gully pots function in a similar manner to catchpits and consist of an inlet grill at road level, a pot and an outlet pipe. The pot extends below the level of the outlet pipe. Road gullies and carrier drain systems would filter out pollutants such as zinc, copper, iron, lead, suspended solids and hydrocarbons.

Oil or Chemical Containment
In order to eliminate the risk of oil or chemical spillage from collisions or accidents involving transport tankers reaching the watercourse, storage containment with a maximum volume of 20m^3 will be introduced at the road outfalls. This could be in the form of a long lined swale or a storage feature. During an emergency event the outlet would be blocked while the surface of the road is washed and drained. The spillage would then be pumped into a tanker for safe transportation and disposal.

SuDS Facilities
SuDS facilities will be provided for attenuation and treatment of the road runoff, prior to discharge into the watercourse.

SuDS facilities are designed to retain water for a prolonged period during and after storm events, providing conditions for settlement of suspended solids and other pollutants in a sediment forebay and attenuation of stormwater runoff. SuDS facilities have significant pollutant removal potential through the incorporation of a permanent pool.

Maximum depths during extreme storm events will be up to 3.0m. Shallow sided slopes provide a gradual transition from ground level to the base of the structure with a low flow channel conveying normal flows and also provide a safety margin such that pedestrians will not fall directly into the water contained within the SuDS facility. Ecological value and diversity can be promoted through micro-wetland areas in the base of the basins.

Erosion Protection
Where required, erosion protection measures will be used to minimise damage to the banks and bed of receiving watercourses at the outfalls from the extended detention basins. Soft engineering techniques will be introduced to minimise the environmental impacts.

Mitigation of Surface Runoff Quantity Impacts

The uncontrolled discharge of surface runoff from road drainage to existing watercourses during storm events has the potential to cause localised flooding and increased risk of flooding downstream with consequential damage and disturbance to residential and commercial properties.

During consultation with NLC and SLC, 1 in 2 year ‘greenfield’ ‘allowable’ discharge was recommended. In addition NLC suggested 1 in 200 year storage volume with a safe route towards the watercourse or a safe area for overflow and in emergency conditions.

The ‘allowable’ discharge rate for the North Calder Water Catchment and River Clyde catchment were estimated using various empirical methods (Table 15.19) as well as recorded flow data. This rate was then used to estimate the ‘greenfield’ runoff for the proposed highway and the required attenuation storage volume. The lower the value of runoff, the greater the attenuation required.

For the preliminary designs, peak discharge rates were limited to that of the 1 in 2 year ‘greenfield’ runoff. In accordance with DMRB (HA216/06) the attenuation basins will be designed to cater for a 1 in 100 flood event. Further attenuation would be provided in the designed freeboard to accommodate a 1 in 200 flood event. Overflow structures will be incorporated into the attenuation design to allow discharge for extreme events and emergency situations. Overland flow routes will be provided for more extreme events allowing safe discharge of the runoff towards the watercourse.

Tables 15.19 and 15.20 show the associated methods and calculated 1 in 2 year ‘greenfield’ runoff rates for the North Calder Water catchment and the River Clyde catchments at Daldowie.

Table 15.19 Methods of Calculation for 1 in 2 year Greenfield runoff for the North Calder Water Catchment

Method	Formula	Greenfield Runoff (l/sec/ha)
Poots and Cochrane	$I = 0.0136\ (AREA)^{0.866}(RSMD)^{1.413}\cdot(SOIL)^{1.521}$	2.45
FSSR No6 Institute of Hydrology	$I = 0.00066\ (AREA)^{0.92}(SAAR)^{1.22}(SOIL)^{2.0}$	3.64
Report No124, Institute of Hydrology	$I = 0.00108(AREA)^{0.89}(SAAR)^{1.17}(SOIL)^{2.17}$	3.19
Modified Rational Method	$Q_p = 3.61 \bullet C_v \bullet i \bullet A$	3.51
FEH QMED	$QMED_{rural}=1.172(AREA)^{AE}(SAAR/1000)^{1.560}(FARL)^{2.642}(SPRHOST/100)^{1.211}(0.0198)^{RESHOST}$	3.36
FEH transfer method using recorded data for North Calder Water	-	2.70

Comparing the above results, 2 year 'greenfield' runoff rate (2.7 l/sec/ha) from FEH transfer method and recorded data for North Calder Water was used to estimate the required volume of detention basins at each highway outfalls.

Table 15.20 Methods of Calculation for 1 in 2 year Greenfield runoff for the River Clyde at Daldowie

Method	Formula	Greenfield Runoff (l/sec/ha)
Poots and Cochrane	$I = 0.0136\ (AREA)^{0.866}(RSMD)^{1.413}\cdot(SOIL)^{1.521}$	2.10
FSSR No6 Institute of Hydrology	$I = 0.00066\ (AREA)^{0.92}(SAAR)^{1.22}(SOIL)^{2.0}$	4.35
Report No124, Institute of Hydrology	$I = 0.00108(AREA)^{0.89}(SAAR)^{1.17}(SOIL)^{2.17}$	3.55
Modified Rational Method	$Q_p = 3.61 \bullet C_v \bullet i \bullet A$	3.97
FEH QMED	$QMED_{rural}=1.172(AREA)^{AE}(SAAR/1000)^{1.560}(FARL)^{2.642}(SPRHOST/100)^{1.211}(0.0198)^{RESHOST}$	1.97
FEH transfer method using recorded data for River Clyde	-	2.28

Mitigation of Surface Runoff Quality Impacts

The SUDS features proposed for the highway accord with CIRIA Report C697 and will include:

- Source controls, as the first level of treatment, i.e. filter drains, swales to provide a means of slowing the runoff rate and treatment of the surface water by filtration (if acceptable), settlement and biodegradation;

- Site controls, providing up to three levels of treatment of treatment, where required, i.e. ponds and swales.

Where possible the SuDS proposals will use source control methods to provide localised attenuation and treatment of surface water runoff from the road prior to discharge into the watercourses. SuDS facilities will be used for the control and treatment of runoff from roads. These will be designed to retain water for a prolonged period during and after storm events, providing conditions for settlement of suspended solids and other pollutants and attenuation of storm water runoff.

Figure 15.5 – Figure 15.10 show the theoretical location for SUDS facilities at the outfalls.

Network 1

Network 1 comprises the surface water drainage system for the M8 from Junction 8 to Junction 10. The formation of the road within a cutting and bounded by heavily urbanised land has resulted in the lack of a suitable site being identified for large scale above ground facilities. The proposed solution is to use a combination of surface and subsurface facilities to provide a degree of attenuation prior to discharge into the Baillieston Surface Water Sewer; these structures would be filter drains leading to enhanced swales with check dams and oversized pipes or tank sewers prior to discharge. Oil interceptors will be incorporated into the treatment train such that serious spillages can be mitigated.

Network 2

Network 2 comprises the surface water drainage system for the M73 northbound and M73 southbound south of M73/J2 (Baillieston Junction) from its crossing over the railway to the crossing over the North Calder Water. Treatment and attenuation would be provided in the form of filter drains, a sedimentation forebay, a permanent wet pool and attenuation volume prior to discharge to the North Calder Water. Control structures will be incorporated such that serious spillages can be mitigated.

Network 3

Network 3 comprises the surface water drainage system for the M73 northbound and M73 southbound from where the motorway enters a cutting south of the crossing over the North Calder Water to M73/J1 (Maryville). Treatment and attenuation would be provided in the form of filter drains, a sedimentation forebay, a permanent wet pool and attenuation

volume prior to discharge to the North Calder Water. Control structures will be incorporated such that serious spillages can be mitigated.

Network 4

Network 4 comprises the surface water drainage system for the M74 northbound and M74 southbound from 2km west of M74/J3 to the point at which the M74 crosses the North Calder Water west of M74/J4 (Maryville). The proposed solution is to use a combination of surface and subsurface facilities to provide a degree of attenuation prior to discharge into the North Calder Water; these structures would be filter drains leading to enhanced swales with check dams and oversized pipes or tank sewers prior to discharge. Oil interceptors will be incorporated into the treatment train such that serious spillages can be mitigated.

Network 5

Network 5 comprises the surface water drainage system for the M74 northbound on slip from the M73 southbound at M74/J4. Treatment and attenuation would be provided in the form of filter drains, a sedimentation forebay, a permanent wet pool and attenuation volume prior to discharge to the North Calder Water. Control structures will be incorporated such that serious spillages can be mitigated.

Network 6

Network 6 comprises the surface water drainage system for the M74 northbound and M74 southbound from the point at which the M74 crosses the railway east of M74/J4 to M74/J4. Treatment and attenuation would be provided in the form of filter drains, a sedimentation forebay, a permanent wet pool and attenuation volume prior to discharge to the local receiving watercourse. Control structures will be incorporated such that serious spillages can be mitigated.

Network 7

Network 7 comprises the surface water drainage system for the M74 northbound and southbound from where the M74 crosses the railway east of M74/J4 to Bellshill Road. The proposed solution is to use a combination of surface and subsurface facilities to provide a degree of attenuation prior to discharge into the receiving watercourse; these structures would be filter drains leading to enhanced swales with check dams and oversized pipes or tank sewers prior to discharge. Oil interceptors will be incorporated into the treatment train such that serious spillages can be mitigated.

Network 8

Network 8 comprises the surface water drainage system for the M74 northbound and southbound from Bellshill Road to M74/J5 (Raith). Assessment has been made on the capacity of the SuDS facilities present at Raith; the conclusion being that sufficient

capacity is available to accommodate the discharge from the proposed drainage scheme in this area.

Network 9

Network 9 comprises the surface water drainage system for the M74 southbound from the crossing over the River Clyde north west of M74/J6 and M74/J6 (Hamilton). The M74 northbound for this length of motorway is unaltered with respect to the M8/M73/M74 Network Improvements Scheme. The two carriageways are distinct in their drainage networks; therefore no proposed drainage system for the northbound carriageway has been suggested.

Due to the context of this outfall location (on an embankment, adjacent to the functional floodplain of the river Clyde which is classified as a SSSI), the proposed solution is to use a combination of surface and subsurface facilities to provide a degree of attenuation prior to discharge into the receiving watercourse; these structures would be filter drains leading to enhanced swales with check dams and oversized pipes or tank sewers prior to discharge. Oil interceptors will be incorporated into the treatment train such that serious spillages can be mitigated. This allows for optimum usage of land available for SuDS while minimising the impact on the protected landscape in the immediate vicinity.

Network 10

Network 10 comprises the surface water drainage system for the M74 southbound from M74/J5 southeast to the crossing over the River Clyde. This network is adjacent to the functional floodplain of the River Clyde and is bounded by local watercourses. Topographic effects and the aforementioned features mean that the proposed solution is to use a combination of surface and subsurface facilities to provide a degree of attenuation prior to discharge into the receiving watercourse; these structures would be filter drains leading to enhanced swales with check dams and oversized pipes or tank sewers prior to discharge. Oil interceptors will be incorporated into the treatment train such that serious spillages can be mitigated.

Network 11

Network 11 comprises the surface water drainage system for the M74 southbound within M74/J5 (Raith). Due to its size, the drainage system in this location will feed into the SuDS facility design as part of the M74/J5 (Raith) upgrade. The M74 northbound and southbound for this length of motorway is unaltered with respect to the M8/M73/M74 Network Improvements Scheme. The two carriageways are distinct in their drainage networks; therefore no proposed drainage system for the northbound carriageway has been suggested.

Network 12

Network 12 comprises the surface water drainage system for the M73 northbound and M73 southbound from the crossing over the North Calder Water south to where the M73

enters the cutting. Treatment and attenuation would be provided in the form of filter drains, a sedimentation forebay, a permanent wet pool and attenuation volume prior to discharge to the local receiving watercourse. Control structures will be incorporated such that serious spillages can be mitigated.

Network 13

Network 13 comprises the surface water drainage system for the Queenslie Industrial Estate south of the M8 and west of Baillieston Junction (M8/J10). From investigation of as-built drawings of the surface water drainage system for the M8 in this area it was noted that Queenslie Industrial Estate surface water is fed into the motorway drainage system. It is proposed to isolate the water from Queenslie Industrial Estate and relay it directly to the Baillieston Surface Water Sewer as in the existing scheme. No SuDS facility has been planned for Network 13.

Table 15.21 shows details of site controls at the proposed outfall locations.

Table 15.21 Details of Site Controls

Outfall Location	Highway Drainage Length (m)	Highway Drainage Area (ha)	Impervious Fraction (%)	Volume of Forebay (m^3)	100yr Attenuation Storage (m^3)	Treatment Volume V_t (m^3)	Allowable 2yr Greenfield Discharge (l/s)	100yr Flood Average Surface Area (m^2)
Network 1	1730	11.84	87.12	-	-	-	13.59	-
Network 2	1033	3.5	83.03	365	1445	380	9.17	1520
Network 3	1273	4.97	84.46	578	2265	624	14.18	2110
Network 4	3621	17.6	85.50	-	-	-	22.41	-
Network 5	400	1.22	81.00	130	520	141	3.30	740
Network 6	2640	9.57	83.33	1000	3910	1088	25.84	3300
Network 7	1167	3.05	84.74	-	-	-	0.58	-
Network 8	3200	10.12	85.81	-	-	-	24.93	-
Network 9	1660	3.87	83.01	-	-	-	21.37	-
Network 10	106	0.26	84.48	-	-	-	7.12	-
Network 11	ACCOMMODATED WITHIN THE RAITH SCHEME							
Network 12	250	1.17	91.40	140	550	325	3.35	780
Network 13	NOT ASSESSED – PUBLIC SEWER REALIGNMENT							
Network 14	251	0.28	68.6	-	-	-	0.79	-

15.6.3 Residual Impacts

The application of SUDS to the design of the drainage system will reduce the concentrations of pollutants and suspended solids entering the watercourses as outlined in Section 15.6.2. The predicted residual impacts on water quality with the mitigation measures in place are given in Table 15.22 and the calculations are shown in Appendix 15.1. Since Network 7 was the only proposed drainage network to provide a result from Method A stipulating Detailed Assessment, only Network 7 is presented in Table 15.22.

Table 15.22 Predicted Impact of Total Zinc and Dissolved Copper on the Receiving Watercourses WITH Mitigation

Outfall Location	Sensitivity	Parameter	EQS (µg/l)	Upstream Conc. (µg/l)	Downstream Conc. (µg/l)	Increase (µg/l)	Magnitude+	Significance
Network 7	Medium	Copper	28	3.72	6.13	2.41	Negligible	Neutral
		Zinc	75	14.01	24.28	10.27	Negligible	Neutral

Table 15.22 shows that with the proposed mitigation measures, the predicted concentrations of dissolved copper and total zinc would be reduced to nil compared to those without the effect of mitigation.

The impacts are summarised in Table 15.23.

Table 15.23 Summary of Impact WITH Mitigation

Outfall Location	Impact
Network 7	Neutral significance

The risk of a serious pollution incident is given in Table 15.24.

Table 15.24 Summary of Spillage Risk Assessment, WITH Mitigation

Watercourse Category	Feature/ Outfalls	Threshold of Acceptability (1 in Years)	Calculation for Spillage Risk (1 in Years)	Within Acceptable Limits?
All other receiving watercourses	Network 1	1 in 100	1 in 16,176	Yes
All other receiving watercourses	Network 2	1 in 100	1 in 31,411	Yes
All other receiving watercourses	Network 3	1 in 100	1 in 19,979	Yes
All other receiving watercourses	Network 4	1 in 100	1 in 13,519	Yes
All other receiving watercourses	Network 5	1 in 100	1 in 105,708	Yes

Watercourse Category	Feature/ Outfalls	Threshold of Acceptability (1 in Years)	Calculation for Spillage Risk (1 in Years)	Within Acceptable Limits?
All other receiving watercourses	Network 6	1 in 100	1 in 9,059	Yes
All other receiving watercourses	Network 7	1 in 100	1 in 10,463	Yes
All other receiving watercourses	Network 8	1 in 100	1 in 7,656	Yes
All other receiving watercourses	Network 9	1 in 100	1 in 13,768	Yes
All other receiving watercourses	Network 10	1 in 100	1 in 150,847	Yes
All other receiving watercourses	Network 11	ACCOMMODATED WITHIN THE RAITH SCHEME		
All other receiving watercourses	Network 12	1 in 100	1 in 228,827	Yes
All other receiving watercourses	Network 13	NOT ASSESSED – PUBLIC SEWER REALIGNMENT		

The cumulative risk of a serious pollution incident occurring has been assessed on a reach length basis. Five reaches has been identified for analysis, the results are presented in Table 15.25. As noted, assessment of the total reach of the River Clyde affected by the proposed scheme indicates that the probability calculated cumulatively for all reaches affected by the proposed scheme is in excess of the 1% threshold stipulated by DMRB Method D as being acceptable and does not specifically require the addition of mitigation measures. For comparison, however, the application of mitigation measures results in a situation for each reach far in excess of what is required by DMRB.

Table 15.25 Cumulative Risk of a Serious Pollution Incident

Receiving Watercourse	Contributing Drainage Networks	Probability of Serious Pollution Incident	
		Without Mitigation	With Mitigation
River Clyde	8 / 9 / 10	1 in 432 years	1 in 4,764 years
Myers Burn / Pow Burn	7	1 in 1,883 years	1 in 10,463 years
River Clyde	6 / 7 / 8 / 9 / 10	1 in 246 years	1 in 2,405 years
North Calder Water	1 / 2 / 3 / 4 / 5 / 12	1 in 417 years	1 in 4,320 years
River Clyde	1 / 2 / 3 / 4 / 5 / 6 / 7 / 8 / 9 / 10 / 12	1 in 155 years	1 in 1,545 years

15.7 Summary and Conclusion in Relation to Surface Runoff Impacts

The evaluation made here is limited to the effect of the physical impact of the proposed road widening on the floodplains of the River Clyde and the North Calder Water and surface runoff quantity and quality.

15.7.1 Physical Impact on the Existing Floodplains

The predicted 1 in 200 year flood return period water level in the existing conditions would impinge on the existing M74 southbound embankment. The predicted water level for this flood event is 24.18mAOD. The proposed widening of the southbound carriageway would not affect the floodplain of the River Clyde between the M74 and the Strathclyde Loch since widening is achieved through local reprofiling of the existing embankment above the level of the 1 in 200year flood event; reprofiling works are to be undertaken at elevations greater than 27mAOD. The proposed scheme allows for the conversion of existing hard shoulder and verge into running land and hard shoulder (see Figure 15.11).

The creation of SuDS facilities within the road corridor, where feasible, has served to mitigate the impact on existing land use (Chapter 8). Where SuDS are proposed outwith the trunk road corridor, they are located such that actively used agricultural land is not impacted and that only fallow / scrub ground is utilised.

15.7.2 Water Quality and Quantity

In terms of quality, the analysis shows that, with the exception of Network 7 discharging to the Myers Burn / Pow Burn, the discharge of road runoff without mitigation will have a minor adverse impact on the quality of the water. Potential impacts on the water quality of the North Calder Water and the River Clyde are assessed as low risk. The introduction of SUDS surface runoff mitigation will further reduce the level of impact and will reduce cumulative effects on the water quality, and is required to satisfy regulatory requirements (i.e. Controlled Activity Regulations). The result is a slight / moderate beneficial significance with respect to impacting the water environment for a number of attributes (contaminated runoff and runoff volumes), and neutral significance of other impacts previously classified as minor adverse significance. The spillage risk assessment and threshold of acceptability for category of ‘All other receiving watercourses’ without mitigation are within the threshold of acceptability of 1% for all strategies.

In terms of quantity, the analysis shows that the discharge of road runoff into both the North Calder Water and River Clyde would require mitigation to ‘greenfield’ runoff to avoid increase in the risk of flooding downstream. Despite physical constraints applied to mitigation measures proposed, both DMRB and regulatory requirements are satisfied. In some locations identified for placement of SuDS facilities, the primary option of a sedimentation forebay, an attenuation volume and a treatment volume have been omitted due to space constraints. In these situations, alternative SuDS facilities have been selected; filter drains, swales and oil interceptors. The incorporation of these items into the DMRB assessment procedure has resulted in a satisfactory effect on the water quality and quantity being discharged into the receiving watercourse. This occurs on Networks 1, 4, 7, 9 and 10.

With respect to the scheme as a whole, the existing trunk road does not contain any identifiable surface runoff attenuation or treatment structures. Since the proposed scheme is a modification of the existing trunk road, and that the proposed SuDS facilities are applied to the trunk road within the scheme as a whole (and not just to the additional areas), it should be emphasised that the proposals are beneficial. This is pertinent with

respect to the Water Framework Directive's aim of obtaining 'Good Status' in watercourses by 2015. This has further implications when considering water based industries in the area.

Initial geotechnical Desk Studies stated that there were no fisheries or drinking water abstraction locations within 500m of the scheme. Given that the proposed scheme involves the creation of attenuation and treatment structures where originally there were none the impact on runoff quantity has been deemed negligible / beneficial. This correlates with Section 10.6 that states the impact on the water habitats is likely to be imperceptible during the operation phase of the scheme.

A summary of the potential impacts of the development on the water environment can be found in Table 15.26.

Table 15.26 Summary of Impacts on Water Environment

Feature	Attribute	Quality	Importance	Magnitude (Without Mitigation)	Mitigation	Magnitude (With Mitigation)	Significance	
River Clyde	Water Quality - Contaminated Runoff	Class RE3 (SEPA Grade B)	Medium	Minor Adverse	Gullies and catchpits trap sediments and other debris whilst retaining a proportion of suspended solids. Sedimentation forebay provides conditions for settlement of suspended solids. SuDS facility provides treatment of the road runoff prior to discharge into the River Clyde.	Minor Beneficial	Slight / Moderate	Beneficial
	Water Quantity - Increased Runoff		Low	Minor Adverse	Flow balancing capacity of the SuDS facility provides attenuation of road runoff prior to discharge to the watercourse. As the existing junction ultimately drains to the burn without attenuation, the effect of the proposals will be positive	Minor Beneficial	Neutral	/ Beneficial
	Water Quantity - Reduced Flows		Low	Negligible	Flow will be reduced only marginally due to the low proportion of the road area relative to the natural catchment. Existing road drainage flows do not contribute to baseflow.	Negligible	Neutral	/ Negligible

Feature	Attribute	Quality	Importance	Magnitude (Without Mitigation)	Mitigation	Magnitude (With Mitigation)	Significance	
					conditions. The removal of the existing road runoff reduces the pollutant potential and the dilution capacity of the watercourse is less critical			
	Floodplain - Storage			No Impact	No works are proposed within the functional floodplain	No Impact		No Impact
	Development Footprint - Habitat		High	No Impact	Proposed SuDS could provide new habitat niche	No Impact		No Impact
North Calder Water	Water Quality - Contaminated Runoff	Class RE3 (SEPA Grade B)	Medium	Minor Adverse	Gullies and catchpits trap sediments and other debris whilst retaining a proportion of suspended solids. Sedimentation forebay provides conditions for settlement of suspended solids. SuDS facility provides treatment of the road runoff prior to discharge into the North Calder Water.	Minor Beneficial	Slight / Moderate	/ Beneficial
	Water Quantity - Increased Runoff		Medium	Minor Adverse	Flow balancing capacity of the SuDS facility provides attenuation of road runoff prior to discharge to the watercourse. As the	Minor Beneficial	Slight / Moderate	/ Beneficial

Feature	Attribute	Quality	Importance	Magnitude (Without Mitigation)	Mitigation	Magnitude (With Mitigation)	Significance	
					existing junction ultimately drains to the burn without attenuation, the effect of the proposals will be positive			
	Water Quantity - Reduced Flows		Medium	Negligible	Flow will be reduced only marginally due to the low proportion of the road area relative to the natural catchment. Existing road drainage flows do not contribute to baseflow conditions. The removal of the existing road runoff reduces the pollutant potential and the dilution capacity of the watercourse is less critical.	Negligible	Neutral	/ Negligible
	Floodplain - Storage			No Impact	No works are proposed within the functional floodplain	No Impact		No Impact
	Development Footprint - Habitat			No Impact	No works are proposed within the functional floodplain	No Impact		No Impact

Feature	Attribute	Quality	Importance	Magnitude (Without Mitigation)	Mitigation	Magnitude (With Mitigation)	Significance	
Cadzow Burn	Water Quality - Contaminated Runoff	Class RE3 (SEPA Grade B)	Medium	Minor Beneficial	Gullies and catchpits trap sediments and other debris whilst retaining a proportion of suspended solids. Sedimentation forebay provides conditions for settlement of suspended solids. SuDS facility provides treatment of the road runoff prior to discharge into the River Clyde, not the Cadzow Burn.	Minor Beneficial	Slight / Moderate	/ Beneficial
	Water Quantity - Increased Runoff		Medium	Negligible	Flow balancing capacity of the SuDS facility provides attenuation of road runoff prior to discharge to the River Clyde, not the Cadzow Burn. As the existing junction ultimately drains to the burn without attenuation, the effect of the proposals will be positive	Negligible	Neutral	/ Negligible
	Water Quantity - Reduced Flows		Medium	Negligible	Flow will be reduced only marginally due to the low proportion of the road area relative to the natural catchment. Existing road drainage flows do not contribute to baseflow	Negligible	Neutral	/ Negligible

Feature	Attribute	Quality	Importance	Magnitude (Without Mitigation)	Mitigation	Magnitude (With Mitigation)	Significance	
					conditions. The removal of the existing road runoff reduces the pollutant potential and the dilution capacity of the watercourse is less critical.			
	Floodplain - Storage			No Impact	No works are proposed within the functional floodplain	No Impact		No Impact
	Development Footprint - Habitat			No Impact	No works are proposed within the functional floodplain	No Impact		No Impact
Tollcross Burn	Water Quality - Contaminated Runoff	Class RE3 (SEPA Grade B)	Medium	No Impact	No discharges are proposed for the Tollcross Burn from the proposed scheme	No Impact		No Impact
	Water Quantity - Increased Runoff			No Impact	No discharges are proposed for the Tollcross Burn from the proposed scheme	No Impact		No Impact
	Water Quantity - Reduced Flows			No Impact	No discharges are proposed for the Tollcross Burn from the proposed scheme	No Impact		No Impact
	Floodplain - Storage			No Impact	No works are proposed within the functional floodplain	No Impact		No Impact
	Development Footprint - Habitat			No Impact	No works are proposed within the functional floodplain	No Impact		No Impact

Feature	Attribute	Quality	Importance	Magnitude (Without Mitigation)	Mitigation	Magnitude (With Mitigation)	Significance	
Battle Burn	Water Quality - Contaminated Runoff	Class RE3 (SEPA Grade B)	Medium	No Impact	No discharges are proposed for the Battle Burn from the proposed scheme	No Impact		No Impact
	Water Quantity - Increased Runoff			No Impact	No discharges are proposed for the Battle Burn from the proposed scheme	No Impact		No Impact
	Water Quantity - Reduced Flows			No Impact	No discharges are proposed for the Battle Burn from the proposed scheme	No Impact		No Impact
	Floodplain - Storage			No Impact	No works are proposed within the functional floodplain	No Impact		No Impact
	Development Footprint - Habitat			No Impact	No works are proposed within the functional floodplain	No Impact		No Impact
Myers Burn / Pow Burn	Water Quality - Contaminated Runoff	Class RE3 (SEPA Grade B)	Medium	Minor Adverse	Gullies and catchpits trap sediments and other debris whilst retaining a proportion of suspended solids. Sedimentation forebay provides conditions for settlement of suspended solids. SuDS facility provides treatment of the road runoff prior to discharge into the watercourse.	Minor Beneficial	Slight / Moderate	/ Beneficial

Feature	Attribute	Quality	Importance	Magnitude (Without Mitigation)	Mitigation	Magnitude (With Mitigation)	Significance	
	Water Quantity - Increased Runoff		Medium	Minor Adverse	Flow balancing capacity of the SuDS facility provides attenuation of road runoff prior to discharge to the watercourse. As the existing junction ultimately drains to the burn without attenuation, the effect of the proposals will be positive	Minor Beneficial	Slight / Moderate	/ Beneficial
	Water Quantity - Reduced Flows		High	No Impact	Flow will be reduced only marginally due to the low proportion of the road area relative to the natural catchment. Existing road drainage flows do not contribute to baseflow conditions. The removal of the existing road runoff reduces the pollutant potential and the dilution capacity of the watercourse is less critical.	No Impact		No Impact
	Floodplain - Storage		High	No Impact	Proposed SuDS will increase floodplain storage available	Negligible		No Impact
	Development Footprint - Habitat		High	Negligible	Proposed SuDS could provide new habitat niche	Minor Beneficial	Slight / Moderate	/ Beneficial

Feature	Attribute	Quality	Importance	Magnitude (Without Mitigation)	Mitigation	Magnitude (With Mitigation)	Significance	
The Burn	Water Quality - Contaminated Runoff		High	Minor Adverse	Runoff from the road will be intercepted, conveyed to a SuDS facility and will be discharged into the River Clyde. No discharges to The Burn are proposed	Minor Beneficial	Slight / Moderate	/ Beneficial
	Water Quantity - Increased Runoff			No Impact	No discharges are proposed for The Burn from the proposed scheme	No Impact		No Impact
	Water Quantity - Reduced Flows			Negligible	No discharges are proposed for The Burn from the proposed scheme	Negligible		/ Negligible
	Floodplain - Storage			No Impact	No works are proposed within the functional floodplain	No Impact		No Impact
	Development Footprint - Habitat			No Impact	No works are proposed within the functional floodplain	No Impact		No Impact
SSSIs / SINCs	Water Quality - Contaminated Runoff	Class RE1 (SEPA Grade A1)	Very High	Minor Adverse	Runoff from the road will be intercepted, conveyed to a SuDS facility and will be discharged into the River Clyde. No discharges to environmentally protected are proposed	Minor Beneficial	Moderate / Large	/ Beneficial

Feature	Attribute	Quality	Importance	Magnitude (Without Mitigation)	Mitigation	Magnitude (With Mitigation)	Significance	
	Water Quantity - Increased Runoff		Very High	Negligible	Flow will be reduced only marginally due to the low proportion of the road area relative to the natural catchment. Existing road drainage flows do not contribute to baseflow conditions. The removal of the existing road runoff reduces the pollutant potential and the dilution capacity of the watercourse is less critical.	Negligible	Neutral	/ Negligible
	Water Quantity - Reduced Flows		Very High	Negligible	Flow will be reduced only marginally due to the low proportion of the road area relative to the natural catchment. Existing road drainage flows do not contribute to baseflow conditions. The removal of the existing road runoff reduces the pollutant potential and the dilution capacity of the watercourse is less critical.	Negligible	Neutral	/ Negligible
	Floodplain - Storage			No Impact	No works are proposed within the functional floodplain	No Impact		No Impact
	Development			No Impact	No works are proposed	No Impact		No Impact

Feature	Attribute	Quality	Importance	Magnitude (Without Mitigation)	Mitigation	Magnitude (With Mitigation)	Significance	
	Footprint - Habitat				within the functional floodplain			
Strathclyde Loch	Water Quality - Contaminated Runoff	Class RE3 (SEPA Grade B)		No Impact	Runoff from the road will be intercepted, conveyed to a SuDS facility and will be discharged into the River Clyde. No discharges to Strathclyde Loch are proposed	No Impact		No Impact
	Water Quantity - Increased Runoff			No Impact	No existing discharges have been identified. No discharges to Strathclyde Loch are proposed	No Impact		No Impact
	Water Quantity - Reduced Flows			No Impact	No existing discharges have been identified. No discharges to Strathclyde Loch are proposed	No Impact		No Impact
	Floodplain - Storage			No Impact	No works are proposed within the functional floodplain	No Impact		No Impact
	Development Footprint - Habitat			No Impact	No works are proposed within the functional floodplain	No Impact		No Impact

15.8 References

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16 Geology and Soils

16.1 Introduction

This chapter outlines the assessment undertaken to determine the potential impacts on geology and soils of the proposed scheme during operation. Potential impacts upon geology and soils during the construction phase are considered in Chapter 9 – Disruption Due to Construction.

Road schemes have the potential to impact upon the geology and soils of an area through direct and indirect impacts on sites of importance or scientific interest, loss or sterilisation of mineral deposits or soil resources, disturbance of contaminated land or surcharging of ground which may accelerate erosion and subsidence.

This chapter does not discuss the value of the soil resources in terms of agriculture or other potential land uses as this has already been covered in Chapter 8 – Land Use.

16.1.1 Baseline Methods

A desk-based study supported by Preliminary Investigation (Phase 5) of the proposed route corridor was undertaken for the Stage 2 Assessment of alternative scheme strategies (MFJV 2007). The data gathered formed the basis for the design of the currently ongoing detailed ground investigation (Phase 6) and a ground model is currently being prepared to incorporate all relevant data. The ground model allows manipulation of the historic ground investigation information and facilitates interpretation of the data. Relevant information such as laboratory test results and known areas of potential contamination may also be superimposed. By interpreting the model, it is possible to predict the prevailing soil types present beneath the proposed scheme alignment and to establish the broad engineering properties of each soil horizon.

16.1.2 Impact Assessment Methods

Guidance Documents

The impact of the proposed road scheme on the geology and soils of the area has been considered in accordance with the Design Manual for Roads and Bridges (DMRB), (1998); Volume 11; Environmental Assessment, Section 3; Environmental Assessment Techniques, Part 11; Geology and Soils.

Impact Assessment Criteria

In order to determine the impact that the scheme would have on sites of geological significance, a hierarchy of importance and magnitude has been devised for sites and impacts respectively. Significant geological sites may be classified into those of national importance/value, regional importance/value and those not considered worthy of protection (refer to Table 16.1). The magnitude of the impact may be determined by predicting the extent of the change in baseline condition resulting from route

development, refer to Table 16.2. Each potential impact is assessed in order to establish its overall significance by drawing a comparison of the magnitude of impact against the importance/value of the affected site as shown in Table 16.3.

Table 16.1 Criteria to Assess the Geology and Groundwater Sensitivity

Sensitivity	Criteria
High	Areas containing geological or geomorphological features considered to be of a national interest, for example, Sites of Special Scientific Interest. Designated sites of nature conservation importance dependent on groundwater. Presence of extensive areas of economically important minerals valuable as a national resource.
Medium	Areas containing geological features of designated regional importance, for example geological SSSI, Regionally Important Geological Sites (RIGS), considered worthy of protection for their educational, research, historic or aesthetic importance. Exploitation of local groundwater is not extensive and/or local areas of nature conservation known to be sensitive to groundwater impacts. Presence of areas of economically important minerals of regional value.
Low	Geological features not currently protected and not considered worthy of protection. Poor groundwater quality and/or very low permeabilities make exploitation of the aquifer(s) unfeasible. Changes to groundwater not expected to impact on local ecology. Absence of mineral areas or minimal areas of local economical value only.

Table 16.2 Criteria to Assess the Magnitude of the Predicted Impact on Geology and Groundwater

Magnitude of Impact	Criteria
Major	Partial (greater than 50%) or total loss of a geological site, or where there would be complete severance of a site such as to affect the value of the site. Major permanent or long term change to groundwater quality or available yield. Existing resource use is irreparably impacted upon. Changes to quality or water table level will impact upon local ecology.
Moderate	Loss of part (between approximately 15% to 50%) of a geological site, major severance, major effects to the setting, or disturbance such that the value of the site would be affected, but not to a major degree. Changes to the local groundwater regime are predicted to impact slightly on resource use but not rule out any existing supplies. Minor impacts on local ecology may result.
Slight	Minimal effect on the geological site (up to 15%) or a medium effect on its setting, or where there would be a minor severance or disturbance such that the value of the site would not be affected. Changes to groundwater quality, levels or yields do not represent a risk to existing resource use or ecology.
Negligible	Very slight change from baseline condition. Change hardly discernible, approximating to a 'no change' condition.

Table 16.3 Criteria to Assess the Significance of the Predicted Impact on Geology and Groundwater

Magnitude	Sensitivity		
	High	Medium	Low
Major	Major	Major - Moderate	Moderate
Moderate	Major - Moderate	Moderate - Slight	Slight
Slight	Moderate	Slight	Slight
Negligible	Negligible	Negligible	Negligible

16.2 Baseline Conditions

16.2.1 Topography and Geomorphology

The Stage 2 Environmental Impact Assessment Report identified no topographical or geomorphological features within the survey corridor that were considered worthy of protection.

Since the production of the Stage 2 Report the Preliminary Ground Investigation (Phase 5) has been has been completed and a Main Investigation stage (Phase 6) is still in progress. This has provided a significant volume of data that is being incorporated into the ground model and is being used to define more accurately the ground conditions generally. However, during this process no sites of geomorphological interest have been identified.

Topographical and geomorphological resources are therefore concluded to be of low sensitivity.

16.2.2 Geology

Drift Geology

The information obtained to date has enabled the ground model to be developed and has resulted in mostly minor modifications to the interpreted soil profile.

The thickness of the drift deposit is variable but is known to be in excess of 20m thick beneath the M74 close to Raith Junction. Glacial till is widespread beneath the route but fairly variable soil conditions have been proved covering the Till at a number of locations. Beneath the M73, a significant thickness of sand and gravel is present, overlying the glacial till. Beneath the M74, the superficial soils are highly variable and generally comprises sand and soft clay, underlain by Glacial Till in places, and directly over lying bedrock in others. Granular deposits appear to be dense around Daldowie area and looser between Raith and Hamilton. Much of these deposits are likely to be representative of alluvium deposited by the adjacent River Clyde, although in some areas

they are likely to be glacial origin. Made ground has also been identified widely within the study area. Although this is mainly a thin superficial layer, generally less than 2m thick, it has been recorded to be up to 7.5m thick beneath the M74 at the site of a former quarry near Uddingston. In addition, thick deposits of placed material exist in association with existing infrastructure, for example up to 9m of embankment construction on the M74 west of Maryville Interchange.

Solid Geology

A number of rotary boreholes were drilled during the Phase 5 ground investigations and further drilling under Phase 6 continues. These have generally confirmed the assessment of solid geology that was produced at Stage 2. Results of these operations confirm the variability in rockhead profile. Bedrock was encountered at its shallowest at less than 2m depth around Baillieston Interchange but is known to exceed 20m depth beneath the M74 close to Raith Junction.

No sensitive sites associated with solid geology have been identified within the survey corridor and this baseline condition is therefore considered to be low sensitivity.

16.2.3 Ground Surface Stability

Prior to completion of the Phase 5 and Phase 6 Ground Investigations it was anticipated that parts of the study area would be underlain by abandoned mineworkings. Such workings were known to exist beneath the M8, the M73 and the M74 west of Maryville Interchange. Initial studies indicated that there were likely to be workings within 30m of rockhead which could affect surface stability. The current Ground Investigations to explore the mining conditions beneath the site are yet to be commenced.

In terms of the value of a site for development, stable ground is of extreme importance and for the purposes of this assessment ground stability continues to be termed high value and sensitivity.

16.2.4 Hydrogeology/Groundwater

The Stage 2 Environmental Impact Assessment Report recorded the hydrogeology of the area to be of medium sensitivity. Since the production of that report several water monitoring stations have been installed across the site. Monitoring is continuing and it is too early to draw any firm conclusions, however, initial data suggest sub-surface water is present variably at less than 1m depth and greater than 10m depth. In many shallow boreholes no groundwater has been observed. The BGS Hydrogeological Map of Scotland indicates that the rocks of the Carboniferous period present beneath the site are a locally important aquifer. Based on the foregoing, the sensitivity of the hydrogeology of the area remains unchanged from the Stage 2 assessment, at medium sensitivity.

16.2.5 Sensitive Land Uses/Designated Sites

Environmentally sensitive sites are considered in Chapter 10 – Ecology and Nature Conservation. There are no geologically sensitive sites within the study corridor and this baseline condition therefore is classified as low.

16.2.6 Contamination

Desk Study work on the extent and nature of potential contamination along the route has identified landfill sites, numerous mineral railway lines and several historical “works”.

Qualitative risk assessments have been carried out for each of the identified sites of potential contamination and initial results suggest that there may be a risk of local contamination of soils and controlled waters (groundwater and surface water) at a small number of locations. Each of the sites identified by the desk study will therefore be investigated during the Phase 6 investigation by intrusive methods and a series of chemical laboratory tests undertaken on recovered soil samples.

Those sites where contaminated soils are confirmed will be potentially of regional significance and may, for the purposes of this assessment, be classed as medium sensitivity.

16.2.7 Loss of Economic Deposits

No economically important drift material has been identified, with the possible exception of the granular deposits beneath the western end of the M74 where these have been worked previously adjacent to the route. However, the original construction of the M74 has already sterilised this resource beneath the route having been permitted under an earlier planning consent. The resource immediately adjacent to the route has already been worked. This baseline condition is therefore classified as low sensitivity.

Detailed study of the mineral position beneath the study corridor indicates that several coal seams have been mined in this area at shallow depths to over 600m depth below ground level. It is considered that an economic quantity of coal remains beneath the footprint of the scheme. As this resource is considered to be of regional importance the loss of economic deposits may be classified as medium sensitivity.

16.2.8 Summary of Baseline Conditions

Table 16.4 Summary of Baseline Conditions

Baseline Condition		Sensitivity of Geological Interest
Topography and Geomorphology		Low
Geology	Drift Geology	Low
	Solid Geology	Low
Ground Surface Stability		High
Hydrogeology / Groundwater		Medium
Sensitive Land Uses / Designated Sites		Low
Contamination		Medium
Loss of Economic Deposits		Medium

16.3 Predicted Impacts

16.3.1 General

This section discusses the potential impacts on baseline geology and soil conditions that may result from the proposed scheme without any mitigation measures. Only those geological conditions that have been identified as being of a greater than "low" sensitivity within Section 16.2 have been considered in the following section. The potential impact has been assessed for two possible scenarios, described below:

- Do-nothing Scenario

  Under the conditions of a "do-nothing" scenario, i.e. the proposed scheme did not go ahead, baseline conditions would only be affected by the occurrence of natural geological processes over time and would therefore remain largely unchanged.

- Development of the proposed Scheme

  Under development of the proposed scheme there a number of possible impacts and these are each discussed in turn in the following sections.

16.3.2 Ground Surface Stability

The collapse of abandoned workings is usually a result of deterioration of mine supports or mine roof material. Where this occurs at shallow depth the void created by original mine workings may migrate upwards to the surface and cause instability at ground level. This may occur with or without surface construction. However, ground instability would

significantly affect the value of the site for road development and as a significant proportion of the route might be found to be at risk of shallow mineworking collapse the magnitude of this impact may be considered major.

Reference to Table 16.3 indicates that the significance of route development on potential ground instability is major.

16.3.3 Hydrogeology / Groundwater

Groundwater levels can naturally vary both locally and regionally due to seasonal, short term and long term climatic variations. The impact of a do-nothing scenario would be negligible.

The establishment of the proposed road would be likely to have an impact on hydrogeology only where groundwater is located at shallow depths or close to formation level.

Assumed perched groundwater has frequently been encountered at shallow levels and may be close to formation level particularly in areas of cuttings. Perched groundwater can easily be addressed using standard filter or slope drainage systems and whilst these will adequately protect the carriageway, the underlying groundwater aquifer will be unaffected.

No groundwater sensitive sites have been identified within influencing distance of the proposed motorway widening and it is therefore anticipated that the scheme would have a negligible impact on groundwater.

Table 16.3 would therefore indicate that the significance of route development on hydrogeology and groundwater is negligible.

16.3.4 Contamination

Contaminants are suspected in the soil at a number of locations and a qualitative risk assessment will be carried out for each of these sites. In most cases, under the conditions of a do-nothing scenario, the presence of contamination in the soil is not of concern as the contaminants are expected to be immobile and unable to impact on any receptor. However some contaminants can be leachable and could therefore be mobilised by infiltrating surface water transferring to the underlying aquifer. Under a do nothing scenario, therefore, groundwater at some locations may be at risk from leachable contaminants and this impact is considered to be moderate.

Following establishment of the proposed motorway widening hard cover (new sections of road) will occupy previously soft ground. This will reduce surface water infiltration and will therefore reduce the risk of contaminants being mobilised beneath the carriageway. It is considered that in this way the impact on groundwater will be reduced from moderate to slight.

The construction of the scheme will introduce a potential impact on construction and maintenance workers as they may come into contact with the contaminated material. This impact is considered to be moderate.

The significance of route development on contamination is therefore assessed to be moderate to slight.

16.3.5 Loss of Economic Deposits

Despite extensive coal extraction beneath the scheme corridor, significant quantities of coal are anticipated to remain. This has been confirmed by intrusive investigation as part of the Phases 5 and 6 Ground Investigation. However the presence of the existing motorways and adjacent development would restrict opencast operations to any currently undeveloped areas, and given that a large proportion of the deposit has been historically extracted it is considered unlikely that deep mining of the residual coal would be financially viable in the foreseeable future. The impact of a do-nothing scenario on the potential development of opencast coaling operations is therefore negligible.

The proposed scheme involves widening of the existing motorway carriageway and junction rearrangement. It is thought that the additional area that might be affected by future mining following development of one of the options would be extremely small and the magnitude of the impact may therefore be classed as negligible.

The presence of sand and gravel that was anticipated during desk study has been confirmed by the intrusive investigation works and this type of material can be of significant economical importance. However it is considered that the additional area of sand and gravel that would become sterilised on completion of any of the proposed development strategies would be insignificant. The magnitude of the impact may therefore be classed as negligible.

16.3.6 Summary of Significance of Predicted Impacts without Mitigation

Table 16.5 Summary of Significance of Predicted Impacts Without Mitigation

Baseline Condition	Sensitivity of Geological Interest	Magnitude of Impact	Significance of Impact
Ground Surface Stability	High	Major	Major
Hydrogeology / Groundwater	Medium	Negligible	Negligible
Contamination	Medium	Groundwater - Slight	Slight
		Humans - Moderate	Moderate - Slight
Loss of Economic Deposits	Medium	Negligible	Negligible

16.4 Mitigation

16.4.1 Do-nothing Scenario

Under the conditions of a "do-nothing" scenario, mitigation measures would be unnecessary except in the unlikely case of contamination or of mining related concerns.

16.4.2 Development of the proposed Scheme

At this stage the only significant impacts that have been identified in relation to geology and soils is potential ground surface instability due to mine workings collapse, disturbance of contaminated ground and the loss of economic coal deposits. Mitigation measures to address each of these impacts are discussed in the following sections.

16.4.3 Ground Surface Stability

Potentially unstable ground is anticipated along the route. The most practical mitigation measure is consolidation of workings by grouting. This involves the drilling of a grid of closely spaced boreholes into the mineworking void. Grout is placed down each drilled hole, commencing down the dip of the inclined seam and around the perimeter of the zone. This forms a curtain/perimeter wall and creates a barrier preventing grout material from escaping from the proposed grout zone.

16.4.4 Contamination

Current waste management regulations and sustainability objectives and guidance encourage the retention on site of all materials, even those that are contaminated. The impact of mobilising contamination and potentially bringing contaminants into contact with controlled waters or humans can be mitigated by remediation, encapsulation, or the introduction of clean cover and hydraulic break layers. However in each case the identified sources of contamination and the groundwater receptor extend far beyond the boundaries of the proposed construction corridor. It is therefore impractical to attempt to address this contamination risk by treating soils within the proposed construction area. Furthermore it has been demonstrated that establishment of the proposed road will reduce the risk of contaminated soils impacting on groundwater. It is unlikely that construction of the road will increase contamination exposure and remediation may therefore not be necessary. Discussions with appropriate regulatory authorities are currently ongoing with respect to this.

The risk to construction and maintenance workers from mobilisation of and exposure to contaminants may be reduced to acceptable levels by ensuring appropriate personal protective clothing and equipment is adopted and standard health and safety procedures are followed.

Provided that potentially contaminated material is excavated and handled in a responsible manner to prevent migration to other receptors, the risks and associated impacts can be reduced to acceptable levels.

16.4.5 Loss of Economic Deposits

Transport Scotland is unlikely to be able to actively market the remaining mineral reserves beneath the site.

16.5 Residual Impacts

With appropriate mitigation measures adopted during the design, construction and operation of the scheme, potential effects associated with the collapse of old mine workings and the disturbance of contaminated ground will be reduced so as not to pose significant risks to the development, site workers or the general public.

Consolidation of mineworkings by grouting creates a relatively impermeable zone which may be located beneath the groundwater table. This is likely to alter groundwater flow paths by closing off a preferential pathway through workings. It also blocks an area which may previously have been filled with potentially contaminated minewater. As the grouted zone is relatively small in terms of the regional groundwater aquifer and the greater interconnected system of mineworkings the impact of filling this void space is considered to be negligible.

16.6 References

Design Manual for Roads and Bridges Volume 11 Environmental Assessment (1993, amended and updated 2003), The Highways Agency, The Scottish Executive Development Department, The National Assembly of Wales and The Department of the Environment for Northern Ireland.

M8 Baillieston to Newhouse and Associated Improvements, Contract 2 Ground Investigation, Phase 5 Associated Network Improvements, Preliminary Factual Data, December 2005

British Geological Survey Maps

British Geological Survey	NS 66 SE	Drift / Solid and Environmental	1:10,560
British Geological Survey	NS 66 SW	Drift / Solid and Environmental	1:10,560
British Geological Survey	NS 76 SW	Drift / Solid and Environmental	1:10,000
British Geological Survey	NS 75 NW	Drift / Solid and Environmental	1:10,000
British Geological Survey	Hydrogeological Map of Scotland		1:625,000

Mining Records

Coal Authority Report, Coal Mining Report - A Corridor of M74 from Junction 1 at Fullarton to Junction 5 at the Raith Interchange. Ref: 00006093-05, March 2005

Coal Authority Report, Coal Mining Report – M8 at Junction 10. Ref: 00006094-05, March 2005

Coal Authority Report, Coal Mining Report – M8 Baillieston to Newhouse Enhancements, Southern Area. Ref: 00017419-05, June 2005

Coal Authority Report, Coal Mining Report – M8 Baillieston to Newhouse Enhancements, Northern Area. Ref: 00017420-05, June 2005

W A Fairhurst & Partners, Preliminary Geological Long-Section, M8/M73/M74 Network Improvements.

W A Fairhurst & Partners, Basis of Design Statements – Preliminary Qualitative Contamination Risk Assessments Rev 0

17 Policy and Plans

17.1 Introduction

This chapter provides an overview and appraisal of the strategic and local planning context of the proposed Scheme. The chapter sets out the Strategic Policies and their implications for each of the areas where route corridor improvements are to be undertaken, looking at current guidance in the form of National Planning Policy Guidelines (NPPG) and Scottish Planning Policy (SPP), before addressing the relevant structure and local plan policies and the context these set for the corridor improvements and consequential works.

17.2 National and Scottish Planning Policy

The following section examines the current planning policies relating to the proposed corridor improvement areas. National, strategic and local planning policies, where applicable, have each been examined and are discussed below.

17.2.1 The National Planning Framework for Scotland

The National Planning Framework for Scotland is a planning document that analyses the underlying trends in Scotland's territorial development, the key drivers of change and the challenges. It is one of the factors taken into account in decisions on policy and spending priorities as well as providing a context for development plans and planning decisions.

The Framework sets the strategic context for the scheme. The transport policy is based on supporting the promotion of economic growth, promoting social inclusion and accessibility, while ensuring that the development of transport is sustainable and minimises the environmental impact of travel.

The scheme fits in with the National Planning policy's targeted improvements of the motorway and trunk road network by tackling some of the critical congestion spots. This issue is highlighted further in the "Key Issues and Drivers for Change" section, which identifies that in parts of urban Scotland, the trunk road network and public transport systems require investment to address problems of congestion and unreliability to match Scotland's needs and potential.

17.2.2 National Planning Policy Guidelines, NPPG and SPP

National Planning Policy Guidelines (NPPG) and Scottish Planning Policies (SPP) are prepared by the Scottish Executive and provide a statement of Government policy on land use and other planning related issues, which are considered to be of national importance. These statements of Government policy may, where appropriate, be material considerations that should be taken into account in the development control process. At present much of the relevant guidance is under review, and for this reason each of the existing and consultation documents are outlined and reviewed. These maybe be subject to change as a number are presently under review. The purpose of this section is to provide a comprehensive evaluation of the policies and how they relate to

the scheme. Quotes are included from the documents where it is felt supportive evidence is required.

The relevant planning guidance (NPPG and SPP) to this policy review include:

- SPP 1 The Planning System;
- SPP2 Economic Development;
- SPP 7 Planning and Flooding;
- SPP 17 Planning for Transport;
- SPP 21 Green Belts;
- NPPG 5 Archaeology and Planning;
- NPPG 14 Natural Heritage; and
- NPPG 18 Planning and the Historic Environment;

17.2.3 SPP 1 The Planning System

SPP 1 provides an overview of the land use planning system in Scotland. It sets out the key principles and the Scottish Executive's priorities for the system to guide policy formulation and decision making towards the wider goal of sustainable development. The policy mainly provides overall guidance to local authorities on producing development plans and setting objectives when deciding on development proposals. Those objectives relating to the scheme are:

Sustainable development:

- promoting regeneration and the full and appropriate use of land, buildings and infrastructure;
- promoting the use of previously developed land and minimising greenfield development;
- encouraging energy efficiency through the layout and design of development;

The proposed scheme is a positive response to these objectives because it will assist in:

- improving accessibility to established regeneration sites and proposed sites;
- maximising the efficiency of the road network;

Economic Competitiveness:

- ensuring that land for employment is well placed in relation to the transport network and the labour force; and
- supporting steps to achieve the Framework for Economic Development including the provision of infrastructure and raw materials;

The proposed scheme is a positive response to these objectives because it will assist in providing a positive response to the Framework for Economic Development.

The section on Integrated Transport provides support for greater efficiency in the existing transport network; paragraph 20 states:

"The planning system is important in delivering the Executive's commitment to a more sustainable, effective, integrated transport system. Integration of land use and transport is not just an end in itself. It is essential for the economy of Scotland that the labour force has easy access to places of employment and those raw materials, components and finished products can be transported efficiently."

SPP 1 under 'Integrated Transport' states ways in which more sustainable travel patterns can be achieved, and this includes:

- promoting an efficient transport network for the movement of freight and goods distribution, including where possible use of rail and water;
- identifying priorities for investment in transport infrastructure and safeguarding land for longer term possibilities;

The scheme will assist in promoting a more efficient transport network for freight and goods distribution.

17.2.4 SPP 2 Economic Development

SPP 2 Economic Development was issued in November 2002 replacing NPPG2 on Business and Industry. This guideline sets out existing government policy on economic development.

In accordance with SPP 2, local planning authorities are required to have regard to the following objectives:

- ensure existing business locations are able to meet the anticipated changes in the economy and provide choice for a diverse range of economic development;
- provide special sites, particularly those of National significance and those which support the knowledge based economy;
- respond positively to firm proposals for corporate headquarters;
- support existing and new businesses;
- provide for small towns and rural areas;
- secure and support the delivery of sites for economic development in sustainable locations by identifying key locations that are highly accessible by public transport;
- promote the re-use of previously developed sites in sustainable locations and meet the requirements of particular sectors; and,
- work with the enterprise networks to provide a framework that links key business locations more closely with public transport and other development activity.

In relation to the above, the scheme is in general compliance with these objectives as a facilitator of development, improving accessibility for business and industry..

17.2.5 SPP 7 Planning and Flooding

This SPP is aimed at helping all the parties to consider flooding issues properly, especially in the light of climate change predictions, and so prevent additional land and development being put at risk from flooding.

The central purpose of this particular SPP is to prevent further development or construction which would have a significant probability of being affected by flooding or which would increase the probability of flooding elsewhere.

The key objectives of the guidance are:

- new development should not take place if it would be at significant risk of flooding from any source or would materially increase the probability of flooding elsewhere. SEPA have issued planning authorities with indicative flood risk maps;
- the storage capacity of functional floodplains should be safeguarded, and works to elevate the level of a site by land-raising should not lead to a loss of flood water storage capacity;
- developers and planning authorities to deal very seriously with flooding, to take an informed approach to decision making and err on the side of caution where flood risk is an issue;
- developers have properly had regard to the probability of flooding and the associated risks;
- where built up areas already benefit from flood defences, redevelopment of brownfield sites should be acceptable but Greenfield proposals will extend the area of built development at risk and should preferably be considered in the light of alternatives through the development plan process;
- generally, drainage will be a material consideration and the means of draining a development should be assessed;
- sustainable drainage will be required whenever practicable and watercourses should not be culverted; and,
- flood prevention and alleviation measures should respect the wider environmental concerns and appropriate engineering solutions recognise the context provided by the development plan.

The policy in this SPP is based on the following principles:

- developers and planning authorities must give consideration to the possibility of flooding from all sources;
- new development should be free from significant flood risk from any source (see paragraph 40);

- in areas characterised as 'medium to high' flood risk for watercourse and coastal flooding (see paragraph 34 and the Risk Framework) new development should be focussed on built up areas and all development must be safeguarded from the risk of flooding;
- new development should not:
    - materially increase the probability of flooding elsewhere;
    - add to the area of land which requires protection by flood prevention measures;
    - affect the ability of the functional flood plain (see Glossary) to attenuate the effects of flooding by storing flood water;
    - interfere detrimentally with the flow of water in the flood plain;
    - compromise major options for future shoreline or river management.

For coastal and watercourse flooding a Risk Framework characterises areas for planning purposes by their annual probability of flooding and gives the planning response:

- little or no risk area (less than 0.1% (1:1000)) – no general constraints;
- low to medium risk area (0.1% to 0.5% (1:1000 to 1:200) – suitable for most development but not essential civil infrastructure; and
- medium to high risk area (0.5% (1:200)) or greater – in built up areas with flood prevention measures most brownfield development should be acceptable except for essential civil infrastructure; undeveloped and sparsely developed areas are generally not suited for most development.

In relation to the above, the scheme is in general compliance with these objectives, as outlined below:

- the construction areas are generally free from significant flood risk;
- full account has been taken of potential flood impacts of the scheme and SEPA indicative flood risk maps analysed;
- flood plain impact will be minimal and impact on water course flood plains has been fully assessed;
- a precautionary approach has been taken on areas of potential flood risk in all of the corridor improvement areas.
- drainage from the scheme will be a fundamental part of the detailed design and will be fully accounted for in final design proposals; and,
- sustainable drainage systems (SUDS) will be used where practical in the final design of the scheme.

17.2.6 SPP 17 Planning for Transport

SPP 17 Planning for Transport replaces the earlier NPPG 9 Provision of Roadside Facilities on Motorways and Other Trunk Roads in Scotland, NPPG 17 Transport and Planning and SPP 17 Planning Maximum Parking Standards Addendum to NPPG 17. At the time of publication it was intended that accompanying guidance Planning Advice Note 57 Transport and Planning, should be updated.

SPP 17 sets out the national focus on transport, namely the delivery of transport projects and the positive role land use and transport planning takes in supporting and building upon the Scottish Executive's transport delivery agenda. SPP 17 states that:

"The overall vision is of a Scotland where the economy can flourish and communities can function without significant environmental and social problems arising from car dependency, traffic congestion and pollution."

The overall vision for transport relates to The Scottish Executive "Partnership for a Better Scotland (2003)" which has four aims:

- growing the economy;
- delivering excellence in public services;
- supporting strong communities; and
- developing an ambitious and confident Scotland.

SPP 17 is based on supporting these aims through integration of land use, economic development, environmental issues and transport planning. Its key objectives are:

- to meet European and UK commitments and targets on greenhouse gases and local air quality;
- to maintain and enhance the natural and built environment, through avoiding or mitigating adverse environmental impacts, minimizing environmental intrusion and retaining, improving and enhancing areas for biodiversity;
- to maintain and enhance the quality of urban life, particularly the vitality and viability of urban centres;
- to reinforce the rural economy and way of life; and
- to ensure that the impact of development proposals on transport networks does not compromise their safety or efficiency.

It goes on to state how the planning system is a key mechanism for integration through supporting a pattern of development, those objectives relating to the scheme are:

- supporting economic growth and regeneration;
- taking account of identified population and land use changes in improving accessibility to public services, including health services jointly planned; and

- contributing to effective management of motorised travel, within a context of sustainable transport objectives.

In the section on Major Strategic Projects the policy provides supportive statements to the scheme, where it states:

"Maintaining and improving transport infrastructure has an important role to play in growing Scotland's economy. Congestion has a major impact on the economy and environment of Scotland." (Paragraph 15)

The scheme will assist in relieving congestion and contribute to the economic development objectives by improving the network's efficiency

17.2.7 SPP 21 Green Belts

SPP 21 sets out the objectives of green belt policy and the way in which it should be used and enforced. The key objectives of green belt policy are:

- to direct planned growth to the most appropriate locations and support regeneration;
- to protect and enhance the character, landscape setting and identity of towns and cities; and
- to protect and give access to open space within and around towns and cities, as part of the wider structure of green space.

As a result, there is a strong presumption against inappropriate development in the green belt. The scheme will fall under the heading in the SPP of proposals for non-conforming uses which states:

"Where a proposed use would not normally be consistent with green belt designation, exceptionally it may still be considered appropriate, either as a national priority or to meet an established need, and only if no other suitable site is available."

The scheme can be viewed as being a national priority and would therefore be meeting an established need. In addition, the majority of the scheme lies within the existing road boundary.

17.2.8 NPPG 5 Archaeology and Planning

NPPG 5 sets out the Government's planning policy on how archaeological remains and discoveries should be handled through the development planning and management systems, including the weight apportioned to them in planning decisions and the use of associated planning conditions. The ultimate objective of NPPG 5 is to secure the best possible treatment of the archaeological heritage indicating ways of preserving our archaeological resources while at the same time accommodating the need for development.

NPPG 5 states that because of their extent, certain activities such road development, may have particularly significant consequences for archaeological remains. This is reflected in the principle adopted by government departments of direct funding necessary archaeological investigations from project costs, for example in trunk road schemes.

In relation to the Scheme, the principles of NPPG 5 have been taken into account in the assessment of the preferred scheme. Discussions have been undertaken with Historic Scotland to ensure appropriate consideration of the cultural heritage resource is progressed, as have consultations with the West of Scotland Archaeology Service regarding the nature of cultural heritage resources in the vicinity of the Scheme.

17.2.9 NPPG 14 Natural Heritage

This NPPG provides guidance on how the Government's policies for the conservation and enhancement of Scotland's natural heritage should be reflected in land use planning. This:

- sets out national planning policy considerations in relation to Scotland's natural heritage;
- summarises the main statutory obligations in relation to the conservation of natural heritage;
- explains, as part of a wider framework for conservation and development, how natural heritage objectives should be reflected in development plans;
- describes the role of the planning system in safeguarding sites of national and international importance;
- provides guidance on the approach to be adopted in relation to local and non-statutory designations; and
- draws attention to the importance of safeguarding and enhancing natural heritage beyond the confines of designated areas.

The NPPG takes the view that the scale, siting and design of new development should take full account of landscape characteristics and the potential impact on the local environment. Particular care is needed in considering new development proposals situated at the edge of settlements or in areas of open countryside.

In summary, the scheme will minimise environmental effects of road construction and operation through restricting development to the existing road corridor as far as possible, ensuring that natural heritage is protected and mitigating adverse impacts where necessary.

17.2.10 NPPG 18 Planning and the Historic Environment

NPPG 18 deals primarily with listed buildings, conservation areas, world heritage sites, historic gardens, designed landscapes and other historic settings. It complements NPPG 5 on Archaeology and Planning, which sets out the role of the planning system in protecting ancient monuments and archaeological sites and landscapes.

Central to the Government's approach is the need to secure preservation of these valued features whilst accommodating and remaining responsive to emerging present day needs.

In relation to NPPG 18, the scheme is in general compliance with these objectives and will have no adverse effect on designated features, listed buildings, conservation areas, historic gardens and designated landscapes.

17.3 Glasgow and the Clyde Valley Joint Structure Plan

The strategic vision for the development of Glasgow and the Clyde Valley Joint Structure Plan area is to achieve a radical change in the competitive position and quality of life and environment of Glasgow and the Clyde Valley.

The key aims of the Structure Plan are identified as:

- to increase economic competitiveness;
- to promote greater social inclusion and integration;
- to sustain and enhance the natural and built environment; and
- to encourage integration between land uses and transportation.

The Glasgow and Clyde Valley Joint Structure Plan 2006 sets out an agenda for sustained growth as a basis for a 20-year planning and development strategy for Glasgow and the Clyde Valley. The over-arching goal of the Structure Plan is to promote the balanced and sustainable development of the area by:

- setting the land use framework for sustainable development;
- encouraging economic, social and environmental regeneration; and
- maintaining and enhancing the quality he natural heritage and built environment;

The plan promotes a Corridor of Growth which links up the major centres of employment and services to all communities, and in particular the Priority Areas (Table 2). This is to be achieved through means of:

- promoting key renewal opportunities within or related to the Corridor;
- enhancing key centres of business, education and commerce within the Corridor;
- improvements to public transport access along, across and into the Corridor;
- completion of the road and rail network serving the Corridor;
- safeguarding and expansion of international transport terminals within the Corridor;
- safeguarding and enhancement of environmental resources along the Corridor, by the creation of the Green Network and protection of the Green Belt; and

- use and enhancement of the established infrastructure, particularly water services, to serve development needs within the Corridor;

17.4 Local Planning Context

The scheme falls within three local authorities: North Lanarkshire, South Lanarkshire and Glasgow City, each of whom has a different local plan(s) and in turn policies which have direct relevance to the proposed works. The relevant local plans are:

- Hamilton District Local Plan (August 2000).
- Southern Area Local Plan (Finalised Draft Modified June 2001).
- Monklands District Local Plan (1991).
- Northern Corridor Local Plan (February 2003)
- North Lanarkshire Local Plan (Consultation Draft 2007).
- Glasgow City Plan (August 2003).
- Glasgow City Plan 2 (Finalised Draft May 2007).

17.4.1 Hamilton District Local Plan (South Lanarkshire Council)

The Hamilton District Plan covers the area to the south of Maryville Interchange and defined by M74 and M8. The local plan highlights the implications for key junction and route corridor improvements. These corridor improvements would have potentially positive impacts upon Hamilton, Bothwell and Uddingston in terms of enhanced accessibility and efficiency of the strategic road network.

17.4.2 Southern Area Local Plan (North Lanarkshire Council)

The Southern Area Local Plan covers the area to the north and east of Raith Junction up to the M8 (falling within North Lanarkshire).

17.4.3 Monklands District Local Plan (North Lanarkshire)

The Monklands District Local Plan 1991 was produced by the then Monklands District Council, and covers the geographical area to the east of Baillieston Interchange and the north of the M8. The plan itself is 15 years old and not aligned with the current statutory Glasgow and the Clyde Valley Joint Structure Plan . The local plan area is currently subject to review (see below) but nonetheless remains the adopted statutory land use planning guidance for this area.

The Plan includes a Chapter entitled ‘Transport and Communications’, with Section 8.2.5 on ‘Motorways and Trunk Roads’ stating:

“The travel pattern on the District’s roads is dominated by the A8/M8 running roughly east-west and the M73 running roughly north-south. Traffic volume on these major roads is increasing rapidly, with severe congestion on the A8 Shawhead Interchange. “

17.4.4 Northern Corridor Local Plan (North Lanarkshire)

The Northern Corridor Local Plan covers an 18.3 sq km area that stretches from the north east corner of Glasgow to Cumbernauld and includes the settlements of Auchinloch, Stepps, Chryston and Muirhead, Moodiesburn, Mount Ellen, Gartcosh, Mollinsburn and surrounding rural hinterland on either side of the A80 corridor.

Although this local plan area fall outwith the Scheme, the strategic implications of the scheme will have indirect impacts on the local plan area. This in particular relates to network improvements to Baillieston Interchange, which will improve accessibility to the M73.

17.4.5 North Lanarkshire Local Plan (North Lanarkshire Council)

North Lanarkshire Council's Planning Department has prepared a new, single local plan for the North Lanarkshire council area and the Consultation Draft was published in July 2007. When the plan is adopted the North Lanarkshire Local Plan will offer a 5-10 year strategy for the physical development of North Lanarkshire.

The new local plan will replace the current 11 separate plans including the Southern Area Local Plan, Northern Corridor Local Plan and the Monklands District Local Plan.

Glasgow City Plan

The Glasgow City Plan (2003) covers land west of Baillieston Interchange and North of the M74. The adopted City Plan places a focus on the importance of improving infrastructure that will aid economic development.

The Plan's Chapter on 'Infrastructure' and 'Transport' identifies as its primary aim:

"*The City Council aims to develop the City's transport infrastructure to reduce the need to travel, particularly by car, and meet the needs of residents, visitors, commerce and industry by:*

i) *creating improved conditions for economic development;*

ii) *improving links between residents and employment opportunities to promote social inclusion;*

iii) *relating transport more directly to land use; and*

iv) *increasing the integration of transport infrastructure to facilitate journeys that involve different transport modes and/or services."*

The adopted City Plan states under paragraph 6.2:

"The road network has an important influence on industrial and business development. Over the last 6 years, 70% of land developed for industry/ business uses were located adjacent or close to the strategic road network."

The City Plan chapter on the 'M8 East' covers improvements east of Baillieston Interchange. It contains the following supportive statements:

In the section 'Context' under paragraph 10.60 it is stated:

"*The area focuses on the M8 Motorway from Baillieston Interchange in the east to Junction 12 (Cumbernauld Road) in the west, and incorporates the fourteen neighbourhoods that comprise Greater Easterhouse. Within the M8 East Area of Focus there are opportunities to:*

- *establish an eastern gateway to the City;*
- *enhance the development potential if the motorway corridor;*
- *better integrate Greater Easterhouse with the rest of the City;*
- *allow Greater Easterhouse to become a more cohesive City suburb; and*
- *build on existing social, economic and investment priorities;"*

17.4.6 Glasgow City Plan 2

The Glasgow City Plan 2 (Finalised Draft, May 2007) provides an updated (albeit still in draft) policy framework context for development across the City. Once fully adopted City Plan 2 will replace the 2003 City Plan. There has been a substantial re-writing of some of the major policies and some change of emphasis of some key policies.

The 'Key Regeneration Areas' section identifies the proposed A8/M8 and associated works area as the 'M8 East Corridor' and one of a number of key growth corridors. The A8/M8 and associated road network proposals are seen to support economic development objectives in the immediate area, by virtue of acting as a catalyst for growth. This would include key employment locations at the Queenslie Industrial Estate and Glasgow Business Park.

17.5 Schedule of Policies

Table 17.1 sets out a schedule of policy objectives from the aforementioned Structure and Local Plans which relate to the proposed scheme. An indication of whether or not the proposed improvements are in compliance with these policy objectives is given.

Table 17.1 Schedule of Policy Objectives

Glasgow and Clyde Valley Joint Structure Plan		
Policy Number	**Policy Content**	**Options: Compliance with Policy**
Schedule 4 Strategic Transport Network Development Proposals - Road Schemes	"The sustainable development of Glasgow and Clyde Valley Metropolitan Area will be supported through the development of the Strategic Transportation Network as identified on Key Diagram Inset B and in Schedule 4."	The Scheme is fully compliant.
South Lanarkshire: Hamilton District Local Plan		
Policy Number	**Policy Content**	**Options: Compliance with Policy**
Policy M8	The Council will promote innovative approaches to addressing improvements to the primary road network and discourage significant highway construction. New roads will be expected to meet the overall objectives of the plan and an environmental, movement and economic assessment will be required to ensure that all possible options are fully assessed.	The Scheme is fully compliant with policy and falls within the category of improvements to the primary road network.

Policy ED2	"The Council acknowledges that the Whistleberry Corridor and South Larkhall are the prime industrial locations and will seek to promote them for major industrial locations and will seek to promote them for major industrial investment. Within the strategic context and to meet more local demands, it will further support the development for industrial purposes the site detailed below and identified on proposals map.	The Scheme will have a direct impact of improving the relationship between the M74 and M8 and. It will therefore support this policy.
Policy EN1a Greenbelt	Within the area designated as Greenbelt there will be a strong presumption against development.	The actual policy concentrates on residential development but the scheme will have to take account of the general policy. The scheme will involve loss of some green belt land.
Policy EN1b	The council will resist proposals which will result in the loss of prime agricultural land.	The Scheme has no impact on prime agricultural land.
Policy EN1c	Within areas identified as being of great landscape value, the Council will exercise particular care in assessing any proposals, even where they conform to Greenbelt policy as set out above.	No areas of great landscape value are affected by the scheme.
Policy EN25	The council recognises that the physical heritage of the district should be safeguarded and this will be taken into account when considering applications for development. The council will operate a general	The scheme will have no impact on this policy.

	presumption against development that would destroy, adversely impinge or significantly damage any heritage feature; including ancient monuments, listed buildings, conservation areas, historic gardens, designed landscapes and ancient woodlands etc.	
Policy EN7	The Council will seek timeously to protect important trees or groups of trees by using the various statutory means at its disposal, will promote and encourage the planting of trees and, where justified, insist on tree planting proposals as condition of planning consents. Particular importance is attached to the urban fringe and to villages. The most suitable species will be required in any planting scheme but in general, the Council will promote the use of deciduous species.	Tree loss will be minimised through scheme design, with loss concentrated within areas of roadside landscape planting. All works will be subject to replacement planting using native species appropriate to the area to mitigate against tree loss from roadside areas and elsewhere as required.
Policy CU3b	The Council will seek to promote the creation of urban fringe parks at the following sites: a) Kylepark (Uddingston) b) Greenhill/ Rotten Calder (Blantyre) c) Hamilton West/ Blantyre Park (in association with major development. d) Redlees (Blantyre)	The scheme will impact on this policy especially in the proposed Haughead fringe park proposal area.
Policy M1	The Council will review, on a regular basis, the operation of the transportation network and will	The scheme will contribute to the overall policy aim of improving the efficiency of the transport network.

	identify solutions to any problems that might arise. In particular, the council will seek to identify priority traffic management schemes in accordance with agreed criteria and will seek to implement these with appropriate funding from other agencies.	
Southern Area Local Plan (North Lanarkshire Council)		
Policy	**Policy Content**	**Options: Compliance with Policy**
Policy TR 1 Overcoming Access Constraints	The Council will encourage measures to overcome identified access constraints and to enable the realisation of the development proposals contained within the Local Plan.	The scheme will be supportive of the policy on the basis of improving the accessibility and functioning of the strategic road network.
Policy ENV 1 The Environment	The Council supports sustainable development by seeking to maintain and enhance the quality of the environment of the plan area through promoting the long term environmental interest and reducing, where appropriate, the damaging effects of development on this long term interest.	The scheme will help to optimise the functioning of the road network and reduce levels of congestion.
Policy ENV 5 Assessment of Environmental Impact	In determining applications for development, the council will address the likely impact on the environment.	The scheme is subject to Environmental Assessment in accordance with legislation and has considered the seven criteria set out under the policy. The scheme is therefore in general compliance with this policy.

Policy ENV 6 Green Belt	The Council will safeguard the character and function of the green belt, as defined by the Proposals Map, within which there will be a presumption against development or change of use other than that directly associated with and required for agriculture, forestry, generation of power form renewable sources, outdoor leisure and recreation, telecommunications or other appropriate rural uses.	The scheme will have an impact on the Greenbelt policy due to the potential loss of some green belt land. The scheme is however part of a network improvement of national importance.
Policy ENV9 Flooding	Where development is proposed in areas with a history of, or potential for, flooding, the Council will require a statement from the applicant showing measures to ameliorate the effects of flooding, both with the sites an din other areas where flooding is likely to be aggravated by the development. This statement will not normally be permitted where it would create or intensify an unmanageable risk of flooding.	The scheme has been subject to a flood risk assessment, examining the potential for new roads to contribute to increased flooding elsewhere, and flood risk within the immediate road network vicinity. The scheme is compliant with this policy.
Policy ENV10 Trees and Woodland Management	The council will encourage the protection and enhancement of the plan area's tree and woodland resource	The introduction of replacement planting of native species of tree and shrub appropriate to the area will mitigate unavoidable losses. The scheme in general compliance with this policy.
Policy ENV11 Protected Urban	The Council will protect and enhance those areas of urban woodland identified on the Proposals Map	No protected urban woodland will be affected by the

Woodland		scheme.
Policy ENV13 Biodiversity	The Council will seek to maintain the nature resources of the plan area by the protection of habitats, species and natural features which are vulnerable and/or specifically protected, and by a requirement to take account of the needs of wildlife where new development is proposed. The creation of new habitats will also be encouraged as part of development proposals or as stand alone projects. The council Biodiversity Action Plan and associated Habitat and Species Action Plans will form an important consideration.	The scheme has been assessed for its potential to impact upon habitats and species Proposals and measures to protect and enhance local biodiversity have been examined and included as part of mitigation. The scheme is therefore compliant with this policy.
Policy ENV 14 Nature Conservation Sites	The Council will protect and enhance the natural resources, including Sites of Importance for Nature Conservation (SINCs) and Wildlife Corridors.	The scheme falls within sections of existing motorway designated as wildlife corridor. No designated sites will be directly impacted by the scheme. Where appropriate, mitigation measures in relation to potential indirect impacts have been identified. The scheme is therefore in general compliance with this policy.
Policy ENV20 Historic Gardens and Designed Landscapes	Any development proposals which would harm the character of Historic Garden or Designed Landscapes included in the inventory of Gardens or Designed Landscapes or proposed for inclusion during the plan	No historic gardens or designated landscapes are affected by the scheme.

	period will be resisted.	
Policy ENV21 Archaeology	The Council will not normally allow development which would have an adverse impact on Scheduled Ancient Monuments, other archaeological sites and industrial archaeological resources and their settings.	The scheme will not affect any scheduled ancient monuments or other known sites of archaeological value. Historic Scotland has been consulted on any further investigations or precautionary measures required. The scheme is therefore in compliance with this policy.
Policy L4 Public Rights of Way and Access	The Council will maintain and protect the Network of Public Rights of Way and other permitted access routes. The development, promotion, and management of quality public access, will be guided by the North Lanarkshire Public Access Strategy and at least one local access forum.	The Scheme will not result in any loss of public access and is therefore in general compliance with this policy.
Glasgow City Plan (Glasgow City Council)		
Policy	**Policy Content**	**Options: Compliance with Policy**
Policy TRANS 3: Traffic Management and Traffic Calming	Major development proposals will require to consider the need for the formation, adaptation or improvement of traffic management and/or traffic calming. Submissions should take into account the following criteria (Most relevant selected): • Allocation of road space should accord with the Council's road user hierarchy for pedestrians, cyclists, public transport, freight and car/ motorcycle; • High standard of surface treatment/	The scheme is compliant with this policy in terms of improving traffic management and quality of the finished implemented project.

	landscaping; • Incorporation of pedestrian crossing facilities and other pedestrian priority facilities; • Consideration of maintenance implications and the provision of maintenance agreements.	
Policy ENV 1 Development Related to Green Belt	While there is a presumption in favour of retaining the Green Belt, the Council does recognise that situation could arise where development may be acceptable.	The scheme will have an impact on green belt land.
Policy ENV 2 Development Related to Green Space	Development on green space may be acceptable if the applicant can show, to the satisfaction of the Council, that the proposal meets at least one of the criteria listed.	The scheme will not affect defined green space.
Policy ENV 3 Flood Prevention and Land Drainage	1. Flood Attenuation Areas To ensure that flood plains remain available to act as flood attenuation areas, the Council will resist developments that: a) are located in a flood plain and/or are likely to adversely affect existing/ potential flood attenuation; and b) by their location, nature or scale, are likely to have a significant adverse effect on the risk of flooding elsewhere in the catchment. 2. Land Drainage (a) to include sustainable drainage and permeable surfacing wherever practicable;	The scheme will comply with the guidance contained in the Sustainable Urban Drainage Systems (SUDS) Design Manual. The detailed design will consider implications of flood risk, in terms of potential for the new road network to increase flooding in other areas and for flooding of road itself. This will ensure there is no significant risk. Consultation has been undertaken and will continue with SEPA, Scottish Water and SNH. The scheme therefore complies with this policy.

	and (b) in all but exceptional circumstances, to comply with guidance contained within the Sustainable Urban Drainage Systems (SUDS) Design Manual. 3. Risk To ensure that proper consideration is given to flood risk in new developments, the Council will: a) require prospective developers to undertake flood risk assessment for proposals in areas considered at risk from flooding, whatever the cause. This will require to conform (as an minimum) to the Council's guidance on undertaking a flood risk assessment. b) Consult with the Scottish Environmental Protection Agency (SEPA), Scottish Water and Scottish Natural Heritage and other planning authorities lying within each of Glasgow's river system catchment areas, and take into account their views on the risk of flooding and the potential implications arising form development proposals; and c) Have regard to categories of development and risk based on the following guidelines: (a)	
Policy ENV 5 Sites of Importance for Nature Conservation (SINC)	1. City-wide Sites There will be a presumption against any development or change of use likely to have an adverse effect on any land or water identified as being a C-SINC,	The scheme does not directly affect any designated SINCs. Potential indirect impacts on SINCs lying close to the route corridor will be identified and addressed through the assessment process and appropriate protection and mitigation measures will be set in place as part of the scheme design. Land take for the scheme has been kept to the minimum

	including the level or quality of water supply within the catchment area of wetland sites. 2. Local Sites (a) In order to conserve an integrated system of wildlife habitats, the Council will also aim to protect L-SINCs from proposals which might adversely affect them. (b) In assessing proposals affecting a L-SINC all of the following criteria must be met before a development may be looked on favourably: (i) no alternative site can be found for the proposed development; (ii) the social and economic benefits of the scheme outweigh the total or partial loss of nature conservation; and (iii) the loss can be compensated by habitat creation/site enhancement elsewhere, and where there are satisfactory arrangements to do this.	required.
Policy ENV 6 Local Nature Reserves	There will be a presumption against any development or change of use likely to have an adverse effect,	No Local Nature Reserves are affected directly by the scheme. Potential indirect impacts on LNRs lying close to

(LNR)	either directly or indirectly, on land and/or water designated as a local nature reserve.	the route corridor will be identified and addressed through the assessment process and appropriate protection and mitigation measures will be set in place as part of the scheme design.
Policy ENV 7 Corridors of Wildlife and or Landscape Importance	There will be a presumption against any development likely to have an adverse effect on the integrity or character of a Corridor of Wildlife and/or Landscape Importance. Corridors of Wildlife and Landscape Importance include the curtilage, embankments and/or cuttings of motorways, trunk roads and operational/disused railways.	The scheme will impact on this policy as the Definition of "Corridors of Wildlife and Landscape Importance" includes: "The curtilage, embankments and/or cuttings of motorways, trunk roads and operational/disused railways." Replacement planting and linking habitat creation will be an integral part of the scheme design, ensuring that the sections of affected motorway will continue to serve as wildlife corridors (as defined) in the future.
Policy ENV 8 Sites of Special Landscape Importance (SSLI)	1. There will be a presumption against any development likely to have an adverse effect on the integrity or character of a SSLI.	The scheme will not adversely impact on areas designated as SSLI.
Policy ENV 11 Tree Preservation Orders (TPO)	The Council will take into account the effect of any loss of amenity when assessing any development likely to have an adverse effect on trees, groups of trees and woodlands specified in a TPO. (c.	No locations specified in a TPO are affected by the scheme.

Policy ENV 12 Landscape Standards in New Development	1.CONTEXT To achieve a good design a new development must be integrated with its surroundings. It is important that its context, including the local green network, is recognised. Links should be made, wherever possible, to: • the green network; • the pedestrian/cycle networks; and • public transport infrastructure. 2.SITE ANALYSIS Landscape components should be surveyed and analysed in order to help achieve an integrated development. 3.LAYOUT (a) General Principles A good layout for a development will consider the location of external spaces from the outset. Developers are encouraged to employ a landscape architect early in the development process.	The scheme will be in accord with standard and best practice guidance for road design and safety and will include an appropriate landscaping strategy. Pedestrian/cycle links and public transport networks will be maintained. A detailed landscape assessment has been undertaken as scheme assessment The scheme therefore complies with this policy.
Policy HER 2 Listed Buildings (Buildings of Architectural and Historic Importance)	1. Where buildings have been listed as being of special architectural or historic interest there will be a presumption in favour of the retention of listed buildings.	There are no listed buildings or other known buildings of architectural and/or historic importance that will be directly affected by the scheme. Historic Scotland will be consulted on any further investigations that require to be undertaken.

		The scheme complies with this policy.
Policy DEV 2 Residential	The areas designated residential are the city's housing districts….in considering development proposals, the council will seek to preserve and enhance residential amenity, particularly in respect to townscape, landscape and green space provision. Proposals that would result in the loss of local green spaces (Green Space being defined as the uses specified in Policy 11: Green Space) will be considered against the criteria set out in Policy Env.2: Development Related to Greenspace.	The scheme will not impact upon i local green spaces and mitigation will be set in place to maintain local amenity.
Policy DEV 11 Greenspace	The area designated as "greenspace" are spread throughput the City, contribute to the City's greenspace network and make an important contribution to the health and wellbeing of the community. There is a presumption in favour of retaining greenspace, whether in public or private ownership. See Policy DEV 2 for local areas of amenity greenspace and Policy ENV 2 for Development	The scheme will not impact upon local green space, and mitigation will be set in place to maintain local amenity.

	related to Greenspace.	
Policy DEV 12 Green Belt	The areas designated "Green Belt" are the countryside surrounding the City's built environment Pollock Estate and Park. They form part of the City's greenspace network and are intended to prevent urban sprawl and coalescence and to maintain the visual amenity of the City. These areas will remain primarily in use for agricultural, leisure and recreation and other appropriate uses. There is a presumption in favour of retaining the green belt. See Policy ENV 1 Development Related to the Green Belt.	The scheme will have an impact on green belt land but is otherwise compliant with Policy ENV 1 under the statement "recognise that situation could arise where development may be acceptable". This similarly fits strongly with "exception part of the policy" in particular clause "(iv) The conversion and redevelopment of existing structures".
Policy DEV 13 Transport Infrastructure	The areas designated "Transport Infrastructure" is the City's network of motorways, major roads, rail corridors and main bus and railway stations that are essential to the City's function as the centre of the conurbation for residential, shopping, commercial, industry and business and entertainment activities. The council will encourage proposals that continue to support a sustainable transport network, assist the regeneration of the City and improve the quality of the environment of the transport corridors and associated facilities. Developments that would reduce the City's ability to provide effective transport infrastructure will be resisted.	The scheme is supported by this policy as it supports the creation of a sustainable transport network, assists in the regeneration of the City.

Policy SG 1 Environmental Impact Assessments	An Environmental Impact Assessment (EIA) is intended to identify the environmental effects, both positive and negative, of development proposals. It aims to prevent, reduce and offset any adverse environmental impacts. It will include any other necessary assessments. The Council will, therefore, have regard to the Regulations.	The scheme is subject to environmental assessment in accordance with The Environmental Impact Assessment (Scotland) Regulations 1999.

17.6 Conclusions

17.6.1 Compatibility with Planning Policy

The proposed scheme is in general compliance with the relevant planning policies and guidance at national, structure plan, and local plan levels, as outlined in the preceding sections of this chapter.

There will be a requirement for some mitigating works to tackle specific locations where policy conflict may occur. Detailed design of the scheme will address and mitigate such conflicts.

17.6.2 Benefits of the Development Proposals

The scheme will contribute to the improvement in the national road and transport infrastructure, and contribute to economic development and regeneration. Furthermore the proposal is compatible with policy on reducing congestion on the route network and assist in increasing competitiveness for Lanarkshire and further afield across Central Scotland.

17.7 References

Scottish Planning Policy 1- The Planning System (The Scottish Executive Development Department, November 2002)

Scottish Planning Policy 2 - Economic Development (The Scottish Executive Development Department, November 2002)

Scottish Planning Policy 7 - Planning and Flooding (The Scottish Executive Development Department, February 2004)

Scottish Planning Policy 17 - Planning for Transport (The Scottish Executive Development Department, August 2005)

National Planning Policy Guidelines 5 - Archaeology and Planning (The Scottish Office Environment Department, 1994)

National Planning Policy Guidelines 14 - Natural Heritage (The Scottish Office Development Department, 1999)

National Planning Policy Guidelines 18 - Planning and the Historic Environment (The Scottish Office Development Department, April 1999)

SDD Circular 24/1985: Development in the Countryside and Green Belts

SDD Circular 18/1987: Development Involved in Agricultural Land

Glasgow and the Clyde Valley Joint Structure Plan (2000, First & Second Alterations)

Glasgow and the Clyde Valley Joint Structure Plan (2006)

Southern Area Local Plan (North Lanarkshire Council, Final Draft Modified June 2001)

Northern Corridor Local Plan (North Lanarkshire Council, February 2003)

Monklands District Local Plan 1991- First Alteration (Monklands District Council)

Hamilton District Local Plan (South Lanarkshire Council, Adopted August 2000)

Glasgow City Plan (Glasgow City Council, August 2003)

Glasgow City Plan 2 (Glasgow City Council, Finalised Draft May 2007)

18 Environmental Impacts Table

18.1 Introduction

This chapter presents a summary of the key environmental impacts associated with the scheme.

18.2 Environmental Impacts Table

An Environmental Impacts Table (Table 18.1) has been prepared for the preferred scheme, the purpose of which is to present the predicted residual impacts associated with the conceptual design (taking account of agreed mitigation measures) in summarised form. A key to the summarised level of impact significance is provided (with the exception of landscape effects which have a specific assessment approach), but detailed assessment is provided in the relevant chapters of this document.

The table includes the following:

- description of the potential impact;
- sensitivity/value of the receptor;
- significance of impact without mitigation;
- description of any mitigation and its objective in addressing a specified impact;
- significance of the impact with mitigation in place; and
- likely duration of the impact.

The likely effects of the 'do nothing' situation, should the Scheme not be developed mainly comprises a no change situation for the existing site conditions.

The mitigation measures summarised in Table 18.1 are described in more detail in Chapters 6 – 16 (no mitigation measures are proposed for Chapter 17 Policies and Plans) and summarised in Table 19.1 Schedule of Environmental Commitments (Chapter 19).

The significance of the identified impacts is set out in detail within the relevant Chapters. This summary table provides an overview of impacts and their residual impacts with mitigation measures in place.

Key to Table 18.1

Sensitivity / value of receptor	Magnitude of Impact with mitigation			
	High (adverse or beneficial)	**Medium (adverse or beneficial)**	**Low (adverse or beneficial)**	**Negligible**
High	Significant	Significant	Not significant	Not significant
Medium	Significant	Significant	Not significant	Not significant
Low	Not significant	Not significant	Not significant	Not significant
Negligible	Not significant	Not significant	Not significant	Not significant

Table 18.1 Environmental Impacts Table

Description of Potential Impact	Sensitivity /Value of Receptor	Mitigation Measure (measures to be developed and agreed at DMRB Stage 3)	Magnitude of Impact With Mitigation	Significance of Impact With Mitigation	Duration of Impact (long, medium or short term)
AIR QUALITY					
Release of dust and particulate matter / emissions from construction vehicles and plant with reduction in air quality.	High	Possible measures during construction phase include speed limit on site access and unpaved ground. Sheeting lorries carrying dusty material off site. Locate stockpiles of dusty material away from sensitive off site locations. Regular use of water assisted dust sweeper on local roads. Cessation of all demolition, excavation and earth moving during high winds. Minimise area to be disturbed by earthmoving or excavation.	Low adverse	Not significant	Short term
	High			Not significant	Long term
CULTURAL HERITAGE					
Physical damage to/ loss of sites or remains of cultural heritage value.	Negligible	Fence sites off to prevent accidental damage. Adherence to construction method statement for siting of access roads, work compounds and working corridor.	Negligible	Not significant	None
Physical loss or damage or severance of previously unrecorded sites/remains.	Negligible	Employ appropriate construction techniques and have contingency plan in place should unrecorded remains be revealed – including contacting Historic Scotland and archaeological experts as appropriate.	Negligible	Not significant	Permanent
Disturbance due to compaction, vibration or subsidence	Negligible	No features in area likely to be affected in this way. Watching brief if required.	Negligible	Not significant	Permanent

Description of Potential Impact		Sensitivity /Value of Receptor	Mitigation Measure (measures to be developed and agreed at DMRB Stage 3)	Magnitude of Impact With Mitigation	Significance of Impact With Mitigation	Duration of Impact (long, medium or short term)
Effects on setting and amenity		Negligible	No settings considered to be affected in any noticeable way. No special measures required.	Negligible	Not significant	Temporary during construction. Permanent during operation.
Effects on unrecorded features.		Negligible	Recording of features and/or excavation if need to be removed. Trial trenching if required. Discovery of new features due excavation and earthworks, adding to archaeological knowledge of area.	Negligible	Not significant	Long-term, permanent
LAND USE						
Change in Land Use Note: Majority of required land is within existing highway boundary. Additional land take mostly from agricultural use.						
Total Land Requirement (including existing roads) (ha)	Classified Agricultural Land (ha)	Agric. Land Grades 3.2, 4.1 and 5.2 1.3ha of Prime Quality Land affected (Grade 3.1)	Restoration of access where severance occurs. Reorganisation of field boundaries to reduce fragmentation and improve viability. Opportunities for landscape enhancement.	Low – Medium adverse	Not significant	Agricultural land – permanent loss. Operational disturbance short term.
79.2	**8.5**					
Loss of Community Land		None	No publicly used land to be lost. No mitigation required.	None	Not Significant	None
Demolition of Private Property		High	No properties affected. No mitigation required.	Negligible/low adverse	Not Significant	Permanent

Description of Potential Impact	Sensitivity /Value of Receptor	Mitigation Measure (measures to be developed and agreed at DMRB Stage 3)	Magnitude of Impact With Mitigation	Significance of Impact With Mitigation	Duration of Impact (long, medium or short term)
Effect on Development Land	High	No direct land loss but environmental protection designations prejudiced. Replacement roadside planting will provide some mitigation over time. Some potential benefit to economic development opportunities.	Low adverse	Not Significant	Permanent
Effect on Development Land	High	No direct land loss but environmental protection designations prejudiced. Replacement roadside planting ultimately a mitigating influence. Some potential benefit to economic development opportunities	Low/ Medium adverse	Significant	Medium to Long Term
DISRUPTION DUE TO CONSTRUCTION					
Approximate number of properties within 100m of road line: that may be affected by construction activities: 507	High	Preparation and implementation of site working plan to avoid unnecessary disruption and annoyance.	Low adverse	Not significant	Short term
Disturbance of known/previously unrecorded cultural heritage features.	Negligible	Contractor made aware of potential for archaeological remains and requirements for dealing with any finds.	Low adverse	Negligible	N/A
Increase in dust and vehicle emissions causing nuisance to small number of sensitive receptors – impact depends on prevailing weather conditions and construction methods.	High	Contractor to adhere to best management practices and produce a method statement as part of the EMP to minimise dust and vehicle emissions. Contractor to ensure all potentially noisy construction activities are kept within the noise thresholds set by the local authority.	Low adverse	Not significant	Short term

Description of Potential Impact	Sensitivity /Value of Receptor	Mitigation Measure (measures to be developed and agreed at DMRB Stage 3)	Magnitude of Impact With Mitigation	Significance of Impact With Mitigation	Duration of Impact (long, medium or short term)
Release of surface water run-off resulting in pollution of wetlands or watercourses.	Medium - high	Adopt pollution control to reduce risk of run-off entering watercourses. Removal and disposal or treatment of silty waters. Use cut off drains to divert natural run off away from construction activities and discharge into the existing burn. Employment of SUDS.	Negligible – Low adverse	Not significant	Short term
Disruption to local traffic movements.	Medium	Traffic management controls required	medium adverse	Significant	Short term
Damage to existing road surface and verges from construction vehicles.	Low	All damaged roads and verges to be fully reinstated.	Neutral – slight adverse	Not significant	Short term
Physical impacts where modification to watercourses or infilling of ponds required.	Medium	Sensitive and careful construction techniques utilised. Work to be undertaken under control of EMP e.g. in dry conditions where possible, and where necessary the use of coffer dams or the like to divert flows in watercourses around the working area.	Low adverse	Not significant	Short term to Permanent
Disruption to wildlife, including impacts of noise, temporary floodlighting. Mammal casualties on construction site.	Low - high	Land take during construction minimised and fenced off to prevent damage to surrounding areas. All pipes capped and checked at the end of each working day for the presence of mammals. Any mammal casualties investigated.	Low adverse	Not significant	Short term

Description of Potential Impact	Sensitivity /Value of Receptor	Mitigation Measure (measures to be developed and agreed at DMRB Stage 3)	Magnitude of Impact With Mitigation	Significance of Impact With Mitigation	Duration of Impact (long, medium or short term)
Disturbance/damage to land, habitats and species due to movement and storage of construction material/plant.	Low – high (depending on location)	Area to be reinstated following scheme completion. Specific protection measures set in place via EMP to minimize disruption. Only essential works inside designated areas. Agreed mitigation and habitat reinstatement in consultation with SNH where working near to SSSI.	Low-medium adverse	Not significant -	Short term to Permanent
Visual and landscape impact of construction, site plant, temporary storage areas, earthworks, lighting and personnel.	High	Best practice to be used to ensure working areas are kept tidy and careful construction techniques utilised. Use of floodlighting to be minimised, particularly in areas close to residential properties.	Medium - low adverse	Significant	Short term
Materials balance and handling on-site and excess volume of surplus material requiring removal from site.	Medium	Appropriate disposal or re-use of surplus material. Re-cycling of earthworks material and topsoil on site for fill and landscaping purposes.	Medium adverse	Significant	Short term
Physical degradation loss of soils during construction, including compaction, erosion and inappropriate soil stripping/handling.	Low	Limit extent of working and storage areas. Erosion and sediment controls. Correct handling and storage of spoil. Re-use of excavated material where possible. Restoration of disturbed areas.	Low adverse	Not significant	Short term
Soil contamination due to accidental spillage from construction vehicles and plant, contaminants entering groundwater.	Low	Careful techniques employed. Working method statements set in place to control site working practices and avoid accidental pollution.	Low adverse	Not significant	Short term

Description of Potential Impact	Sensitivity /Value of Receptor	Mitigation Measure (measures to be developed and agreed at DMRB Stage 3)	Magnitude of Impact With Mitigation	Significance of Impact With Mitigation	Duration of Impact (long, medium or short term)
ECOLOGY AND NATURE CONSERVATION					
Habitat loss, disturbance, damage, fragmentation	Low	Careful siting and construction of specific scheme components. Fencing off work areas and access points. Site clearance work to follow best practice construction guidelines and method statements. Habitat reinstatement/enhancement. Native species planting to compensate for loss of grassland, scrub and woodland, as advised by a qualified landscape architect / ecologist. Creation, through planting and habitat creation, of linkage features including hedgerows.	Slight adverse	Not significant	Short term to permanent
Loss of approximately 7330m^2 designated Ancient Woodland at Daldowie	Regional/Local	Measures to be set in place by Contractor (through EMP) to preserve and protect viability of soils and for them to be re-used as part of the scheme at that location.	Moderate adverse	Significant	Permanent
Damage to Wildlife and protected species	Low – Local (European protected Species National/international)	Design of route and crossing structures to permit free passage to wildlife. Any work at watercourses likely to disturb otter will require a licence and detailed mitigation measures agreed with SNH, ensuring adequate mitigation.	Low adverse	Not significant	Short term

Description of Potential Impact	Sensitivity /Value of Receptor	Mitigation Measure (measures to be developed and agreed at DMRB Stage 3)	Magnitude of Impact With Mitigation	Significance of Impact With Mitigation	Duration of Impact (long, medium or short term)
Disturbance due to human activity, noise, dust and light'	Local/Regional	Contractual documents to require Contractor to identify and implement measures (through EMP) to reduce or avoid disturbance as far as practicable while carrying our works. Management of noise etc. also to be controlled by Local Authority. Specific measures to include avoidance of floodlighting at night near watercourses or locations near badger setts.	Low	Not Significant	Short term
Impacts and disturbance to on waterbodies and watercourses (River Clyde, North Calder Water, Strathclyde Loch and Burns) due to release of sediments and construction stage pollutants.	Low - Local	Adhere to SEPA pollution prevention guidelines and CAR legislation. Reduce movement of plant and equipment on site. Locate material storage compounds away from watercourses. Contain run off prior to treatment and/or disposal. Any disturbed watercourses reinstated in consultation with SEPA – potential enhancements considered. Implementation of SUDs to be an improvement over existing situation where no attenuation or treatment takes place.	Imperceptible/slight beneficial	Not significant	Short term

Description of Potential Impact	Sensitivity /Value of Receptor	Mitigation Measure (measures to be developed and agreed at DMRB Stage 3)	Magnitude of Impact With Mitigation	Significance of Impact With Mitigation	Duration of Impact (long, medium or short term)
LANDSCAPE/VISUAL IMPACTS					
Landscape Effects					
Changes to landcover around the new junction at Broomhouse. There will be a change to existing woodland due to structures, earthworks, and elevated roads throughout the scheme. Roadside woodland removal due to road widening and new over bridges. Some trees will need to be removed from the SUDS facilities locations.	Medium/ High	Mitigation and enhancement planting of native mixed broad-leaved woodland with particular affinity with the surroundings. New enhancement planting to assist with creating ecological links whilst addressing landscape and visual effects.	Moderate	Moderate Adverse Slight Adverse	Short term Long Term
Existing ancient woodland will be removed due to the new junction at Broomhouse and the widening and earthworks of the M74 adjacent to the new junction.	High	Ancient woodland cannot be mitigated by simply replanting so it is recommended that where there is loss of ancient woodland, careful management and regeneration of the woodland edge should ensure that self seeding of the existing stock occurs in these areas.	Substantial	Substantial Adverse Moderate Adverse	Short term Long Term

Description of Potential Impact	Sensitivity /Value of Receptor	Mitigation Measure (measures to be developed and agreed at DMRB Stage 3)	Magnitude of Impact With Mitigation	Significance of Impact With Mitigation	Duration of Impact (long, medium or short term)
Direct loss of roadside habitats during construction activities. Disturbance to existing flora and fauna adjacent to the development through operational activities. Some loss of habitats during the process of creating the SUDS facilities.	High	Enhancement and management of existing roadside flora and fauna. Protective measures to minimise disturbance to valuable habitats. Wildlife movement/ migratory requirements to link into green corridors. SUDS facilities to encourage as much habitat diversity as possible and once established will compensate for original loss of habitats. Landscaping proposals to reinstate/ enhance existing features. Landscaping to mitigate impact of proposed structures, cuttings and embankments and acoustic barriers.	Slight	Moderate Adverse Slight Adverse	Short term Long Term
Visual Effects					
There will be a significant loss in the established mature roadside planting due to the widening of the M8, which is in close proximity to the residential receptors along the southern boundary of Easterhouse. This will result in a loss of vegetation and will open up new views to the road corridor from Easterhouse. However, the mitigation measures will ensure that the views of the road are only short term.	High	Replacement and enhancement of native mixed broad- leaved woodland planting to assist in screening the road.	Moderate	Substantial Adverse No Change	Short Term Long Term

Description of Potential Impact	Sensitivity /Value of Receptor	Mitigation Measure (measures to be developed and agreed at DMRB Stage 3)	Magnitude of Impact With Mitigation	Significance of Impact With Mitigation	Duration of Impact (long, medium or short term)
The residents of Ellismuir Farm are likely to experience some adverse effects during the construction phases of this scheme from construction plant, but due to the distance and elevation of these receptors, the magnitude of visual effects will be slight.	High	Not Applicable	Slight	Moderate Adverse No Change	Short Term Long Term
The residents of Newlands Farm are likely to experience some adverse effects during the construction phases of this scheme from construction plant, but due to the distance and elevation of these receptors, the magnitude of visual effects will be slight.	High	Not Applicable	Slight	Moderate Adverse No Change	Short Term Long Term
The residents of Woodhead Farm are likely to experience some adverse effects during the construction phases of this scheme, such as the noise, vibrations, and sight of construction plant but these will be limited in duration, and the magnitude of visual effects will be slight. There may be partial views of the SUD facility below the farm but if so this will be a beneficial effect in the long term.	High	Planting around the SUDS facility will help to screen views.	Slight	Moderate Adverse Slight Beneficial	Short Term Long Term

Description of Potential Impact	Sensitivity /Value of Receptor	Mitigation Measure (measures to be developed and agreed at DMRB Stage 3)	Magnitude of Impact With Mitigation	Significance of Impact With Mitigation	Duration of Impact (long, medium or short term)
The residents of Roundknowe Lodge and Farm are likely to have clear views of the proposed SUDS facility. However, this could be a beneficial effect in the long term, as it has potential to be an attractive habitat for wildlife. The SUDS facility might remove some of the mature roadside vegetation, which could open up the views of the M74 in places.	High	Replacement and enhancement of native mixed broad-leaved woodland planting to assist in screening the road and ensure that the SUDS facility is designed in a way that creates an attractive wildlife habitat.	Moderate	Substantial Adverse Slight Beneficial	Short Term Long Term

Description of Potential Impact	Sensitivity /Value of Receptor	Mitigation Measure (measures to be developed and agreed at DMRB Stage 3)	Magnitude of Impact With Mitigation	Significance of Impact With Mitigation	Duration of Impact (long, medium or short term)
Due to the intervening land cover/form and buildings, no significant views are anticipated from most residential areas of Broomhouse and subsequently no impact. The properties along Rosebank Gardens and Hamilton Road will have more open views of the widened route due to the loss of road side vegetation through slope steepening that will be required around the on-slip Junction 3 of the M74 (see Photo Viewpoint 9) and subsequently the magnitude of effects is moderate. The Broomhouse residents will not have views of the proposed SUD facility.	High	Replacement and enhancement of native mixed broad-leaved woodland planting to assist in screening the road	Moderate	Substantial Adverse No Change	Short Term Long Term

Description of Potential Impact	Sensitivity /Value of Receptor	Mitigation Measure (measures to be developed and agreed at DMRB Stage 3)	Magnitude of Impact With Mitigation	Significance of Impact With Mitigation	Duration of Impact (long, medium or short term)
Private Place of Worship – Greyfriars Road: Depending on how much planting is removed during construction of the proposed SUDS facilities, this receptor may have partial views of the new SUDS facilities. However, if this is the case, this may be a beneficial effect in the long term. This receptor is unlikely to have anything more than partial views of the new road, due to the topography and mature planting, providing that most of the planting is retained.	Medium	Replacement and enhancement of native mixed broad-leaved woodland planting to assist in screening the road and ensure that the SUDS facilities are designed in a way that creates an attractive wildlife habitat.	Moderate	Substantial Adverse Slight Beneficial	Short Term Long Term

Description of Potential Impact	Sensitivity /Value of Receptor	Mitigation Measure (measures to be developed and agreed at DMRB Stage 3)	Magnitude of Impact With Mitigation	Significance of Impact With Mitigation	Duration of Impact (long, medium or short term)
Clydeneuk Cottage (Haughhead Bridge Tollhouse): There will be no views of the road alterations but there will be views of the new SUDS facility and the construction associated with creating them, especially in winter when the planting in front of the property loses its leaves. However, any views of the SUDS facility may be a beneficial effect in the long term, as it will create an attractive habitat for wildlife.	High	Ensure that the SUDS facility is designed in a way that creates an attractive wildlife habitat.	Moderate	Substantial Adverse Slight Beneficial	Short Term Long Term
The properties along Clydeneuk Drive experience visual effects of the widened route with minimal loss in vegetation in this location (see Photo Viewpoints 14, 15 and 32). The residential properties along the north west edge of Kyle Park will have views of the proposed SUDS facility and the construction associated with creating them. This however, in the long term, may be a beneficial effect.	High	Ensure that the SUDS facility is designed in a way that creates an attractive wildlife habitat. Replacement and enhancement of native mixed broad-leaved woodland planting to assist in screening the road	Moderate	Substantial Adverse Slight Beneficial	Short Term Long Term

Description of Potential Impact	Sensitivity /Value of Receptor	Mitigation Measure (measures to be developed and agreed at DMRB Stage 3)	Magnitude of Impact With Mitigation	Significance of Impact With Mitigation	Duration of Impact (long, medium or short term)
Calderbraes (A74) - southern edge of residential area: The widening to 4 lanes running, with hard shoulder of the route will see the re-engineering of slopes required around the Glasgow Road Bridge. The properties situated along the A74 route will experience partial views of the widened route with minimal loss of roadside planted features along the M74 (see Photo Viewpoints 17 and 18) and the associated visual effects will be of slight magnitude.	High	Replacement and enhancement of native mixed broad-leaved woodland planting to assist in screening the road.	Slight	Moderate Adverse No Change	Short Term Long Term
Isolated Dwellings (A74) – Powburn: A small area of vegetation will be lost during the road improvements but this will be minor and is not considered to result in a significant change in the view. However, there will be adverse effects from the construction process.	High	Replacement and enhancement of native mixed broad-leaved woodland planting to assist in screening the road.	Slight	Moderate Adverse No Change	Short Term Long Term

Description of Potential Impact	Sensitivity /Value of Receptor	Mitigation Measure (measures to be developed and agreed at DMRB Stage 3)	Magnitude of Impact With Mitigation	Significance of Impact With Mitigation	Duration of Impact (long, medium or short term)
Bothwell (Laighlands Road) - Houses within Local Nature Reserve: These residences will have clear views of the proposed SUDS facility and the construction process of creating them. In the long term this has the potential to be a beneficial effect as it could provide an attractive feature and habitat. Effects arising from proposed improvements to M74 Junction 5, Raith and the accommodation bridge immediately to the north of it are addressed as part of the Raith scheme assessment (MFJV 2007).	High	Ensure that the SUDS facility is designed in a way that creates an attractive wildlife habitat.	Moderate	Substantial Adverse Slight Beneficial	Short Term Long Term

Description of Potential Impact	Sensitivity /Value of Receptor	Mitigation Measure (measures to be developed and agreed at DMRB Stage 3)	Magnitude of Impact With Mitigation	Significance of Impact With Mitigation	Duration of Impact (long, medium or short term)
Bothwell (Grebe Avenue) – Residential Area: These residences will have clear views of the proposed SUD facility and the construction process of creating them. In the long term this has the potential to be a beneficial effect as it could provide an attractive feature and habitat. Effects arising from proposed improvements to M74 Junction 5, Raith and the accommodation bridge immediately to the north of it are addressed as part of the Raith scheme, assessment (MFJV2007).	High	Ensure that the SUDS facility is designed in a way that creates an attractive wildlife habitat.	Moderate	Substantial Adverse Slight Beneficial	Short Term Long Term

Description of Potential Impact	Sensitivity /Value of Receptor	Mitigation Measure (measures to be developed and agreed at DMRB Stage 3)	Magnitude of Impact With Mitigation	Significance of Impact With Mitigation	Duration of Impact (long, medium or short term)
Bothwell (Laighlands Road) – East edge of Residential Area: These residences will have clear views of the proposed SUD facility and the construction process of creating them. In the long term this has the potential to be a beneficial effect as it could provide an attractive feature and habitat. Effects arising from proposed improvements to M74 Junction 5, Raith and the accommodation bridge immediately to the north of it are addressed as part of the Raith scheme assessment (MFJV 2007).	High	Ensure that the SUDS facility is designed in a way that creates an attractive wildlife habitat.	Moderate	Substantial Adverse Slight Beneficial	Short Term Long Term
TRAFFIC NOISE AND VIBRATION					
Generated noise / vibration, during construction including earthworks, piling and movement of vehicles / plant resulting in nuisance to sensitive receptors. All strategies the same.	High	Standard good practice measures adopted during construction phase such as use of well-maintained plant. Maintenance of silencers and moving components where necessary. Noise screening if necessary. Agreement of reasonable working hours	Low – Medium adverse	Significant	Short term

Description of Potential Impact	Sensitivity /Value of Receptor	Mitigation Measure (measures to be developed and agreed at DMRB Stage 3)	Magnitude of Impact With Mitigation	Significance of Impact With Mitigation	Duration of Impact (long, medium or short term)
Increased or decreased traffic noise and vibration on existing and new roads resulting in nuisance to sensitive receptors. With the Do-minimum, 11% of the properties are within the top two noise bands, i.e. 60dB(A) and above. Strategies 3, 4 and 5 have approximately 9%, 8% and 8% of properties within the top two bands respectively. Properties will be exposed to lower noise levels with the strategies. Strategy 3 results in the lowest exposure to the greatest number of properties.	High	Mitigation not determined at this stage, although for all strategies noise mitigation is not likely to be required. Assumed that standard good practice measures will be employed and Local Authority guidelines followed.	Low beneficial	Not significant	Long term Permanent
PEDESTRIANS, CYCLISTS, EQUESTRIANS AND COMMUNITY EFFECTS					
Journey times and amenity of routes currently used by pedestrians, cyclists and other non-motorised users to access key local facilities and neighbouring communities.	M8 junction 10 to Baillieston Interchange – HIGH Remaining Scheme area – LOW	Maintain existing M8, M73 and M74 crossings, adjacent footways and footpaths. Or replace where necessary with improved infrastructure.	Medium Low	Not Significant Not Significant	Short term Short term
VEHICLE TRAVELLERS					
Increased driver stress. Reduced quality of view from the road	High	Positive impact on driver stress on both local users and users of the new motorway due to reductions in congestion and resolution of difficulties arising from the mixing of local and through traffic	Slight beneficial	Not significant	Long term

Description of Potential Impact	Sensitivity /Value of Receptor	Mitigation Measure (measures to be developed and agreed at DMRB Stage 3)	Magnitude of Impact With Mitigation	Significance of Impact With Mitigation	Duration of Impact (long, medium or short term)
Visual amenity effects such as loss of landscape elements, including trees and hedgerows.	High – low	Appropriate and sensitive design of all new structures to enhance views from the road wherever possible. Minimise height of embankments and extent of cuttings. Landscaping proposals to reinstate/ enhance existing features. Landscaping to mitigate impact of proposed structures, cuttings and embankments and acoustic barriers.	Slight – medium adverse	Slight Significant	Medium – long term
Restricted views of open landscape from existing roads due to construction of new roads, junctions, bridges and acoustic barriers.	High – low		Not Significant	Not Significant	Long term
Vehicle travellers exposed to new views of residential areas, industrial areas and open landscape.	High – low		Low adverse	Not Significant	Long term

Description of Potential Impact	Sensitivity /Value of Receptor	Mitigation Measure (measures to be developed and agreed at DMRB Stage 3)	Magnitude of Impact With Mitigation	Significance of Impact With Mitigation	Duration of Impact (long, medium or short term)
Road Drainage and the Water Environment					
Increased run-off into watercourses leading to flooding, pollution: North Calder Water, River Clyde and Strathclyde Loch	Medium	Gullies and Catchpits trap sediments and other debris and retain a proportion of the suspended solids. Filter drains convey road surface runoff to the discharge point and filter out pollutants and slow speed of flow. Swales along the bottom of the embankments remove pollutants before water enters the watercourse. Oil interceptor at the drainage outfalls defend against oil on the road being washed into the drainage system. Storage containment at drainage outfalls. Defence against accidental spillage of harmful liquid such as chemicals etc. on the road. Extended detention basins with wet pool provide attenuation and treatment of the road runoff, prior to discharge into the water course. Ecological value and diversity is promoted through micro-wetland areas in the base of the basins.	Low	Slight significance	Long term

Description of Potential Impact	Sensitivity /Value of Receptor	Mitigation Measure (measures to be developed and agreed at DMRB Stage 3)	Magnitude of Impact With Mitigation	Significance of Impact With Mitigation	Duration of Impact (long, medium or short term)
Flood events	Low	Attenuation basins to cater for a 1 in 100 flood event. Designed freeboard to accommodate a1 in 200 flood event. Overflow structures to allow discharge for extreme events and in emergency conditions. Overland flow routes for more extreme events.	Low	Not significant	Permanent
Erosion of river banks and beds	High	Erosion protection to minimise damage at outfalls from extended detention basins	Low	Not significant	Long
GEOLOGY AND SOILS					
Ground surface instability caused by collapse of abandoned mineworkings.	High	Consolidation of mineworkings by grouting.	Negligible	Not significant	Long term
Disturbance of contaminated material resulting in risk to humans, controlled waters or building materials.	Currently unknown	Controlled excavation and handling of contaminated material. Possibility of local remediation of areas of contamination.	Negligible	Not significant	Short term

19 Schedule of Environmental Commitments

19.1 Introduction

In order to ensure compliance with environmental commitments, all mitigation measures identified in the Environmental Statement necessary to protect the environment prior to, or during construction, or during operation of the proposed scheme will be incorporated in Contract documents, the Environmental Management Plan (EMP) to be drawn up by the Contractor, and specific Method Statements as appropriate. Legal and other environmental requirements will be defined (including licensing), and responsibilities and requirements established to ensure, firstly, their implementation, secondly, monitoring procedures to check their implementation and thirdly, any specific consultation requirements to ensure that mitigation measures are implemented and appropriately adhered to.

19.2 Schedule of Environmental Commitments

The purpose of the Schedule of Environmental Commitments (Table 19.1 below) is to collate and summarise mitigation measures identified throughout the Environmental Statement for ease of reference. It provides a record of commitments that the Contractor will be obliged to adhere to throughout the Contract period, although it is recognised that there may be a need to revise or supplement the commitments by agreement between the Contractor, the Scottish Executive and other interested parties. Specifically, the following are tabulated:

- location of the proposed measures;
- description of the mitigation measure;
- comments on the timing of the measures;

Figures 19.1a-h illustrate the conceptual environmental mitigation proposed as part of the scheme. Should any significant modifications to the scheme be proposed (i.e. design, construction or operational requirements), there may be additional environmental impacts arising to those identified as part of this DMRB Stage 3 EIA process. These impacts would likely require the implementation of appropriate mitigation measures. If this were the case, there would be a requirement to publish an addendum to the Environmental Statement, within which appropriate impacts and mitigation measures would be described. This addendum would include a revised Schedule of Environmental Commitments.

It should be noted that the Schedule of Environmental Commitments provides a summary of mitigation measures developed at this stage in the design process. The measures outlined in Table 19.1 are likely to require further consultation and specification by the Contractor during the development of the final design. Both operational and construction stage impacts are considered under each environmental parameter and therefore a separate Disruption due to Construction heading has not been included in the table. No specific mitigation is proposed in relation to policies and plans (Chapter 17) as this aspect is addressed in the relevant topic chapters.

Table 19.1 Schedule of Environmental Commitments

Mitigation No.	Location on Scheme	Purpose	Proposed Mitigation Measure	Timescale
Air Quality				
6.1	Throughout	Prevent dust being raised during construction phase	Locating any unpaved haul routes as far as possible from occupied residential properties.	Throughout construction period
6.2	Throughout	Prevent dust being raised during construction phase	Use of water-sprays to ensure that any unpaved routes across the site are maintained in a damp condition when in use.	Throughout construction period where appropriate
6.3	Throughout	Prevent dust being raised during construction phase	Imposition and enforcement of a 5 mph speed limit on unpaved ground.	Throughout construction period where appropriate
6.4	Throughout	Prevent dust being raised during construction phase	Sheeting of lorries carrying dusty material on and off site.	Throughout construction period where appropriate
6.5	Throughout	Prevent dust being raised during construction phase	Early sealing of open ground with vegetation.	Throughout construction period where appropriate
6.6	Throughout	Prevent dust being raised during construction phase	Locating any concrete crushing plant well away from residential areas.	Throughout construction period where appropriate
6.7	Throughout	Prevent dust being raised during construction phase	Location of stockpiles of potentially dusty material as far from sensitive locations as possible.	Throughout construction period

Table 19.1 Schedule of Environmental Commitments

Mitigation No.	Location on Scheme	Purpose	Proposed Mitigation Measure	Timescale
				where appropriate
6.8	Throughout	Prevent dust being raised during construction phase	Regular use of a water-assisted dust sweeper on local roads if necessary, to remove any material tracked out of the site.	Throughout construction period where appropriate
6.10	Throughout	Prevent dust being raised during construction phase	Regular cleaning of paved areas on-site.	Throughout construction period where appropriate
6.11	Throughout	Prevent dust being raised during construction phase	Use of a jet-spray vehicle and wheel wash for all vehicles leaving the site.	Throughout construction period where appropriate
6.12	Throughout	Prevent dust being raised during construction phase	Use of water suppression during any demolition works near to occupied residential properties.	Throughout construction period where appropriate
6.13	Throughout	Prevent dust being raised during construction phase	Use of water suppression during any cutting of stone or concrete.	Throughout construction period where appropriate
6.14	Throughout	Prevent dust mitigation measures causing watercourse contamination	Where mitigation measures rely on water, it expected that only sufficient water will be applied to damp down the material. There should not be any excess to potentially contaminate local watercourses.	Throughout construction period where appropriate
6.15	Throughout	Reduce impacts should	During all stages of the construction works there will be close	Throughout

Table 19.1 Schedule of Environmental Commitments

Mitigation No.	Location on Scheme	Purpose	Proposed Mitigation Measure	Timescale
		other mitigation measures not be fully implemented or should they temporarily break down	liaison with the local community, including the setting up of a well-publicised hotline, together with a rapid response to concerns that may arise.	construction period where appropriate
6.16	Throughout	Prevent contaminated materials becoming airborne	Any contaminated materials should be dealt with following standard procedures.	Throughout construction period where appropriate
Cultural Heritage				
7.1	Throughout	Minimise damage/disturbance to as yet unknown archaeological sites.	During site clearance and construction, the Contractor will be made aware of the possibility of unrecorded finds and careful construction techniques will be employed. If any features are uncovered by the Contractor during excavation works that may be of cultural heritage significance, works should be halted to enable Historic Scotland to determine whether any archaeological recording or removal is required.	Throughout construction period where appropriate
Land Use				
8.1	Throughout	Maintain access to agricultural/private land during construction and operation phases of	Provide temporary and permanent accommodation works.	Part of construction phase.

Table 19.1 Schedule of Environmental Commitments

Mitigation No.	Location on Scheme	Purpose	Proposed Mitigation Measure	Timescale
		scheme.		
Ecology and Nature Conservation				
10.1	Throughout	Maximise biodiversity value of new and existing habitats	Through detailed Mitigation Plan encompassing ecological and landscape measures, ranging from avoidance of sensitive areas to new planting using native species appropriate to the locality.	In advance of and during construction
10.3	Hamilton Low Parks SSSI	Protect the important habitats within the SSSI and reduce potential disturbance to birds	Ensure no encroachment into the SSSI during works, enforced through contractual documents and Environmental Management Plan (EMP).	Prior to construction
10.4	Throughout	Minimise environmental risk	Contractor required through Employer's Requirements to prepare and implement the EMP with Construction Method Statements for activities in areas of sensitivity, which will be identified both in contractual documents and in consultation with SNH.	Create in advance of site clearance and maintain /update throughout construction period
10.5	Throughout	Protection of water quality and aquatic species/habitat.	See Road Drainage and the Water Environment below.	In advance of site clearance and maintained/updated throughout construction period
10.7	Throughout	Compliance with protected species legislation: monitor	Protected species surveys, including badger, otter and bat, updated in advance of construction, to inform Contractor's final	Surveys to be updated in the correct survey

Table 19.1 Schedule of Environmental Commitments

Mitigation No.	Location on Scheme	Purpose	Proposed Mitigation Measure	Timescale
		change	design and any requirements for additional mitigation, consultation and/or licences.	season prior to the commencement of works and thereafter where appropriate
10.8	Throughout	Compliance with protected species legislation: licences for faunal species including otter, badger, bats, breeding birds	Where pre-construction surveys indicate that there will be impacts on protected species, detailed mitigation schemes will be agreed with SNH and/or the Scottish Government and appropriate licences obtained before works to disturb those species can be lawfully implemented by the Contractor.	Obtain licences in advance of works allowing sufficient time for any pre-construction mitigation requirements to be set in place.
10.9	Throughout	Protection of biodiversity resource	All working areas will be kept to a minimum, and their boundaries clearly marked at commencement of works. Sensitive habitats to be avoided when placing construction compounds, etc. using information provided in the Environmental Statement and any subsequent surveys. Areas defined in the EMP as requiring protection from accidental damage or disturbance, will be securely fenced prior to commencement of works. Fencing will be fit for purpose and be clearly visible to drivers of large construction vehicles. No materials storage will be permitted within the fenced areas.	Planned during detailed final design and implemented throughout construction period

Table 19.1 Schedule of Environmental Commitments

Mitigation No.	Location on Scheme	Purpose	Proposed Mitigation Measure	Timescale
			Topsoil will be removed and stored separately from subsoil in piles less than 2m high. Topsoil, in particular, should be stored for as short a time as possible.	
10.10	Throughout	Compliance with legislation: control and prevention of spread of invasive plant species	Checks for and control of Japanese knotweed and other invasive weed species will form part of the Employer's Requirements and EMP and will be carried out in accordance with the requirements of SEPA. Post-construction monitoring also to be identified in the EMP.	Surveyed in advance of site clearance and maintained/updated throughout construction period
10.11	Throughout	Compliance with legislation: reasonable measures to minimise impact to breeding birds (other than specially protected species, which are considered above)	Minimise the potential for damage to nests, eggs and young by removing vegetation likely to be used by breeding birds outside of the breeding season. Special measures may be required for ground-nesting species.	Throughout construction period
10.12	Ponds/ Ditches Throughout	Minimise impacts to Amphibians (and fish, where present)	Procedures for dewatering and drainage management will be agreed with SEPA and SNH and license(s) obtained if required for fish rescue.	Throughout construction period
10.13	Throughout	Minimise animal casualties through provision of safe crossing points allied with fencing to prevent access	Deer fencing, where it is to be provided, must be in place before the new road is opened. Measures will be put in place to ensure that fencing is checked and maintained as appropriate, on an ongoing basis.	Prior to commencement of operation.

Table 19.1 Schedule of Environmental Commitments

Mitigation No.	Location on Scheme	Purpose	Proposed Mitigation Measure	Timescale
		to the road at key locations.		
Landscape and Visual Impacts				
11.1	Throughout	Reduce visual intrusion during construction and operation phases as far as practicable.	Retain existing vegetation as far as practicable to provide screening during works. Contractor to limit size and extent of working and storage areas within land made available for the scheme. Time and phase works to minimise the duration of impacts at any set of visual receptors. Use fencing to define working areas. Good housekeeping of construction site and storage areas. Use temporary floodlighting only when necessary; lighting and night-time working to be in line with Local Authority requirements. Careful selection and placement of site compounds, material storage areas and spoil heaps to reduce visual intrusion and landscape impacts. Contractor to use spoil/topsoil storage bunds to create temporary screening of working areas/compounds. Early planting of trees, shrubs and grassed areas as well as new ponds and wetland creation to establish the structure of the longer-term visual and landscape mitigation.	Throughout construction period

Table 19.1 Schedule of Environmental Commitments

Mitigation No.	Location on Scheme	Purpose	Proposed Mitigation Measure	Timescale
11.2	Throughout	Screen new roads and associated junctions and earthworks and integrate scheme into the surrounding landscape	Reduce vegetation removal to the minimum necessary for the safe construction and operation of the scheme. Contractor to use the landscape/planting strategy as the minimum required for the scheme. New areas of woodland and scrub/shrub planting will help to screen new road features and integrate new earthworks into the landscape as the planting matures.	During construction phase.
Noise and Vibration				
12.1	Throughout working areas and particularly near to residential/ built-up areas	Mitigation of noise impacts on sensitive receptors (construction phase)	Noise mitigation will follow statutory guidance and requirements agreed and set in place with the Scottish Executive and relevant local authorities. These may include restrictions on workings hours, avoidance of unsocial hours where working closest to residential areas, and use of noise screening. These limits will be detailed within the Employer's Requirements and the Environmental Management Plan.	Throughout construction period

Table 19.1 Schedule of Environmental Commitments

Mitigation No.	Location on Scheme	Purpose	Proposed Mitigation Measure	Timescale
Pedestrians, Cyclists, Equestrians and Community Effects				
13.1	Throughout	Maintain public access to footpaths and cycleways during construction period, implementing temporary diversions where necessary.	Requirements to be detailed within the Employer's Requirements and the Environmental Management Plan.	Part of scheme
Vehicle Travellers				
14.1	Throughout Scheme	Reduce adverse changes to driver views and to enhance driver views of open countryside. Ameliorate driver stress	Appropriate and sensitive planting and landscape design – to make a positive contribution to local views from the road in the medium to longer term. Use earthworks design to mitigate the visual impact of new structures and to blend into the natural topography as far as practicable. Appropriate seeding/planting of earthworks to reflect surrounding vegetation. Replacement planting of trees and shrubs lost due to the required land take for the scheme.	Part of scheme

Table 19.1 Schedule of Environmental Commitments

Mitigation No.	Location on Scheme	Purpose	Proposed Mitigation Measure	Timescale
Road Drainage and the Water Environment				
15.1	Groundwater, watercourses	Prevent contamination of groundwater/surface water from construction phase or operational run-off	Lined road drainage network and SUDS basin. Route road runoff via SUDs drainage management system to outfalls.	Part of scheme. During construction of the A725 underpass
15.2	Watercourses	Maintain water quality	Gullies and catchpits to trap sediments and other debris. Pump sump to provide containment of harmful liquids such as chemicals etc. due to accidental spillage. Permanent signage to indicate the presence of Pollution Control Device (pump sump) Sedimentation forebay for settlement of suspended solids. SUDS attenuation with wet pool provides treatment of road runoff prior to discharge.	Part of scheme
15.3	Outfalls to watercourses	Erosion and bankside habitat protection	Erosion protection at outfall to minimise damage resulting from drainage discharge Minimise vegetation removal along watercourse banks. Pre-construction ecological survey to update records and ensure impacts on protected species are avoided.	Part of scheme

Table 19.1 Schedule of Environmental Commitments

Mitigation No.	Location on Scheme	Purpose	Proposed Mitigation Measure	Timescale
Geology and Soils				
16.1	All	Protect site workers and general public from risk of exposure to contaminated water or soils	Agree any necessary protective measures with the appropriate regulatory authorities in advance of work. Ensure appropriate personal protective clothing and equipment is adopted and standard health and safety procedures are followed as required.	In advance of construction activity on site and ongoing during construction phase. Ongoing during operation phase specifically for maintenance workers