2. Existing Conditions

2.1 Introduction

2.1.1 This section of the report provides a description of the existing A77 within the limits of the A77 Maybole Bypass Study Area and the land to the north of Maybole encompassed by each of the three bypass corridors.

2.1.2 The A77 Route Action Plan[2] (RAP) contained a detailed assessment of the geometric standards along the A77, including the length of the trunk road within the study area of this assessment.

2.2 Description of Locality and Topography

2.2.1 The topography of the study area is generally undulating, reflecting the morainic nature of the local geology with slopes ranging from shallow to steep. Immediately to the west and north of Maybole are Gallow Hill and Kirklandhill respectively which range in elevation from approximately 85m AOD to 145m Above Ordnance Datum (AOD). Moving to the north-east of Maybole two further unnamed hills are present which range in elevation from approximately 75m AOD to 120m AOD.

2.2.2 The landscape of the study area is dominated by open agricultural grassland with only minor areas of woodland present. Several minor streams flow through the study area generally towards the south-east.

2.2.3 Residential areas of Maybole are located to the south of the western half of the study area and isolated dwellings are present at a number of other locations. The study area is intersected by several local roads and the north-eastern portion is flanked on the south-western side by the Ayr to Stranraer railway line.

2.3 Engineering Conditions

Geometry and Cross Section

2.3.1 Travelling northbound from the southern extents of the study area, the A77 is signed as being National Speed Limit and the geometric standards and carriageway cross section at this point appear appropriate for the 100kph Design Speed associated with a road of this nature.

2.3.2 After a large radius right hand bend, the route enters Maybole and the speed limit is reduced to 30mph just prior to the first property, ‘Alva’, on the left and the access to ‘Broomknowes Cottage’ on the right.

2.3.3 The route then becomes known as Kirkoswald Road and passes the school ‘Carrick Academy’ on the left before crossing over the Stranraer/Glasgow railway line. Part time Variable Message Signs (VMS) reduce the speed limit to 20mph in the vicinity of the school accesses.

[2] A77 Route Action Plan – South Ayrshire Council and Dumfries and Galloway Council, October 1997

2.3.4 At the northern end of the railway bridge, the route swings to the left before turning sharply to the right on a tight bend with a radius of less than 60 metres. This bend is immediately followed by a tighter left hand bend with radius of approximately 40 metres and continues, becoming Whitehall Road. Throughout this section the trunk road maintains a carriageway cross section of 7.3 metres or greater.

2.3.5 The route now follows Whitehall Road for approximately 350 metres with carriageway widths generally 7.3 metres or greater before entering the High Street at the crossroads with School Vennel and John Knox Street.

2.3.6 On becoming the High Street, the carriageway width quickly reduces to less than 5 metres and narrow footpaths (<1.2m) are present at either side of the carriageway. A pelican crossing is also present.

2.3.7 A reverse curve negotiates the historic building of Maybole Castle which dates from 1560. Carriageway widths at this location are 5 metres or less causing vehicles to slow in order to pass safely.

2.3.8 Following this section of constricted alignment, the route widens for a short length to over 7.3 metres, up to the junction with the B7023 Culzean Road on the left. North of this junction the A77 once again narrows to 5 metres or less and continues as Cassillis Road / McDowall Terrace for approximately 450 metres to the junction with Kirkmichael Road on the right.

2.3.9 From here, the trunk road widens to approximately 7 metres and continues beyond the semi-rural environment on a right hand bend of approximately 90 metres radius. Passing the property of 'Lyonpark' on the right, the route once again enters the surrounding rural environment and reverts to the National Speed Limit.

2.3.10 The A77 then extends north of the town on a large radii left hand bend compliant with design standards for a 100Akph design speed. This is followed by a short straight section in the vicinity of the property 'Drumellan', before once more turning to the left on a large radius bend towards the property of 'Nether Culzean'.

2.3.11 At this property, the route turns to the right on a large radius bend, then swings again to the left by the properties of 'Smithston Cottages' on a radius of approximately 240 metres which is below desirable minimum for a road of 100kph Design Speed.

Side Roads and Private Accesses

2.3.12 Commencing to the south of Maybole and travelling northwards through the town centre, the following side roads have a junction with the A77. These are Major/Minor Priority Junctions.

- Ladyland Road / Coral Glen (Skewed Crossroads);
- Wellington Street / The Croft (Crossroads);
- Carrick Street;
- Welltrees Street;
- School Vennel / John Knox Street (Crossroads);
- Crosne Street;
- Castle Street;
- Kirkwynd;
- Culzean Road (B7023) & Barns Road (B7024) / St Cuthbert's Street & St Cuthbert's Road (B7023) (Crossroads);
- Kirkland Street;
- Redbrae;
- Kirkmichael Road;
- Lover's Lane;
- Un-named road to B7045 (passing Myremill Cottage); and
- B742.

2.3.13 Out with the town centre, there are also a number of private accesses onto the A77 – to the south of Maybole the following properties are accessible from the A77:

- Cultezeoun – access via northbound carriageway
- Broomknowes – access via southbound carriageway
- Broomknowes Cottage – access via southbound carriageway

2.3.14 North of the town centre the following properties have direct access to the A77:

- Lyonston – access via northbound carriageway
- Lyonpark – access via southbound carriageway
- Drumellan Cottage – access via southbound carriageway
- Drumellan – access via southbound carriageway
- Myremill Cottage – access via southbound carriageway
- Nether Culzean – access via northbound carriageway
- High Smithston Cottages – access via southbound carriageway
- High Smithston – access via southbound carriageway
- Laigh Smithston – access via southbound carriageway

Water Courses

2.3.15 Travelling through the study area from south to north, the following watercourses pass under the existing A77 in culverts through embankment:

- Parish Mains Burn;
- Un-named Burn at Nether Culzean;
- Black Glen Burn; and
- Smithston Burn.

2.3.16 There are four minor water courses in the land to the north of Maybole that would be crossed or are close to the proposed route options.

- An unnamed burn issues from a spring close to Cultezeoun Farm approximately 500m to the west of Maybole and crosses under the existing A77 via a culvert of approximately 1000mm diameter near to Broomknowes Farm. This burn is a tributary of the Water of Girvan.
- There is a minor watercourse to the east of Ladycross Wood, which was dry at the time of the site survey in June 2006 but was flowing in January 2007. This watercourse flows below ground for several hundred meters before issuing to the north of the railway line approximately 700m to the east of Maybole. The burn is then culverted beneath the existing A77.
- An unnamed burn issues adjacent to the railway track bed close to Nether Culzean farm. This may also be a seasonal stream with periods without flow during dry summer months.
- Another small watercourse, the Brockloch Burn, runs to the north of the 'Blue' route option and receives overflow from the small loch at Laigh Grange. A section of Brockloch Burn is culverted for up to 100m between the loch and Laigh Grange Bridge. This burn was flowing in June 2006 and is therefore considered to flow all year round.

2.3.17 These last three watercourses all form part of the tributary network of the River Doon.

Surface Water

2.3.18 The existing A77 does not currently incorporate a SUDS scheme to accommodate the treatment of roadside surface waters and is drained via a series of channel and side entry gullies. There are no apparent drainage issues at present.

Lay-Bys

2.3.19 Along the length of the A77 within the study area, several lay-bys have been identified. Initial inspection indicates that these are similar to a Type B lay-by, with the exclusion of a footway, as detailed in TA 69 of the DMRB. Travelling from south to north through the study area, approximate locations of lay-bys are as follows:

- A77 Southbound, approximately 400 metres south of the access to 'Broomknowes';
- A77 Northbound, approximately 150 metres north of the access to 'Broomknowes'; and
- A77 Southbound, approximately 190 metres north of the access to 'Myremill Cottage' and 'Myremill'.

Structures

2.3.20 Transport Scotland Trunk Road Bridges Database (TRBDB) was reviewed for information relating to the location and condition of any structures on the A77 within the study area.

Table 2.1 and Drawing No 5028091/20/P/01/003 (Appendix A) provide details and locations of these existing structures.

Table 2.1 – Existing Structures

TRBDB Reference	Structure Name	Type	Approximate Dimensions	Amey/TRBDB Comments
A77 230 C86	Mains Culvert	T100 Corrugated Steel Culvert	1.2m diameter 25m long	
A77 230 C92	Parish Mains Culvert	T100 Corrugated Steel Culvert	1.2m diameter 32m long	
A77 240	Kirkoswald Road Rail	Reinforced Concrete Rail Underbridge	Single Span = 13.3m Skew = 54° Max H'room = 5.1m	From the 2nd Stage Risk Ranking & Assessment of Road Rail Bridges report by Amey / Fairhurst (October 2003) the initial risk ranking was 89 due to approach containment and parapet resilience. The structure carries an average of 3,500 veh/day. Recommended that OBB safety barriers are erected on the southwestern approach, 45m long, at an approx cost of £5k. Structure is in reasonably good condition. Cracking and leaching on wing walls not deteriorated significantly and should be monitored through future general inspections.
A77 240 W1	Kirkoswald Road Wall	Masonry Retaining Wall	Height 2.4m Length 50m	Structure generally in good condition, pointing loss and one vertical crack toward centre of wall both due to plant and tree growth. Damage to safety fence required urgent remedial work.

TRBDB Reference	Structure Name	Type	Approximate Dimensions	Amey/TRBDB Comments
A77 240 W2	Coral Glen Wall	Insitu reinforced concrete cantilever	Min Height = 0.25m Max Height = 1.95m Length 27m	Structure is in fair condition with few defects. Recommended crack at base of column is resin injected to prevent ingress of water. Condition of footpath materials should be monitored to ensure no deterioration due to tilting of wall.
A77 250	Laigh Smithston Rail O/B	Masonry Arch Rail Overbridge	Headroom Unknown	
A77 260	Smithston	Masonry Arch, filled spandrel overbridge	Single Span = 3.3m Width = 14m Min H'room = 1.3m	Structure is in fair condition, recommendation is to repair concrete soffit and stone work of spandrel, arching and intrados is monitored.

Safety Fencing

2.3.21 Through the town of Maybole, safety fencing is not evident due to the urban nature of the route.

2.3.22 At the southern end of the study area Open Box Beam (OBB) safety fencing is located in both the northbound and southbound verges of the A77 where it crosses Parish Mains Burn on embankment. North of the town centre, open box beam safety fencing is provided on the southbound verge of the A77 north of Smithston Bridge, passing through the bridge and extending to the south of Smithston Bridge. There is also open box beam safety fencing in the northbound verge of the trunk road north of Smithston Bridge to safeguard vehicles from the adjacent watercourse.

Road Pavement Construction

2.3.23 Atkins obtained pavement condition data from the Scottish Executive Trunk Road Network Management Division (TRNMD) which contained the following information:

- Pavement Construction;
- Raw Deflectograph Deflections;
- Rut Depths;
- Texture Depths;
- Longitudinal Profile;
- SCRIM Coefficients; and
- SCRIM Investigatory Levels and Deficiencies.

2.3.24 The A77, within the study area, is a single carriageway road approximately 8.6km in length. The pavement is shown to be of fully flexible construction throughout the length of the route.

2.3.25 The findings contained here are based on a desk study of routine survey data. No site specific detailed investigations have been undertaken.

2.3.26 The condition category definitions are given in Table 2.2.

Table 2.2 – Definition of Condition Categories

Category	Definition
1	**Sound** – no visible deterioration
2	**Some Deterioration -** lower level of concern. The deterioration is not serious and more detailed (project level) investigations are not needed unless extending over long lengths, or several parameters are at this category at isolated positions
3	**Moderate Deterioration –** warning level of concern. The deterioration is becoming serious and needs to be investigated. Priorities for more detailed (project level) investigations depends on the extent and values of the condition parameters.
4	**Severe Deterioration -** intervention level of concern. This condition should not occur very frequently on the motorway and all purpose trunk road network as earlier maintenance should have prevented this state from being reached. At this level of deterioration more detailed (project level) investigations should be carried out on the deteriorated lengths at the earliest opportunity and action taken if, and as, appropriate.

2.3.27 A significant length of Category 2 or 3 texture is present in both the northbound and southbound lanes throughout Maybole town centre and from Nether Culzean to Hogg's Corner, indicating some deterioration. The remainder of the route has Category 1 texture depth.

2.3.28 The results of the SCRIM survey show that the route is generally within allowable parameters for SCRIM. However the measured skid resistance is at or below the default investigatory levels in isolated areas between 'Carrick Academy', 'Lyonston Farm Cottages' and approximately 110m south of the junction of A77, and between 'High Smithston' and the access to 'Knoweholm'. Rutting does not appear to be a significant problem along this route.

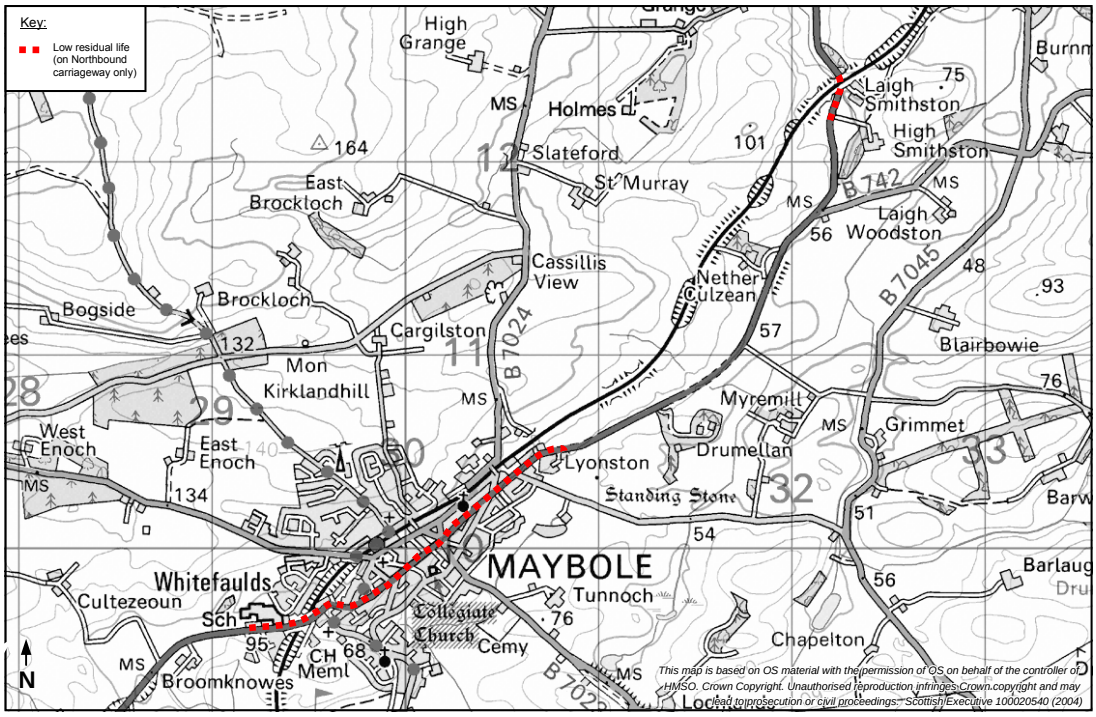
2.3.29 The ride quality is particularly poor from 'Parish Mains Bridge' to Maybole town centre and from the access to 'High Smithston' to the junction of A77 at Bankend Bridge. This is consistent across 3m, 10m and 30m longitudinal profile variances so the poor ride quality may be due to inherent characteristics of the road profile rather than an indication of potholes/settlement. A visual survey would be required to confirm the exact cause.

2.3.30 The Deflectograph data shows that a significant proportion of the pavement is exhibiting high deflections, i.e. 33% of the route shows deflections >300 microns. The deflections are variable and high in both left and right wheel paths of the northbound lane. Areas of high deflection and areas approaching critical condition, i.e. <5 years residual life are shown in Table 2.3. Areas of low residual life are also indicated in Figure 2.1.

Table 2.3 – Summary of Deflectograph Results

	Direction	Locations
High Deflections	**NB**	▪ Wellhome to Dalchomie ▪ Broomknowes to Lyonstone Farm ▪ High Smithston Bridge to High Smithston access
Low Residual Life	**NB**	▪ Carrick Academy to Lyonstone Farm ▪ High Smithston Bridge to High Smithston access

Figure 2.1 – Pavement Condition – Areas of Low Residual Life



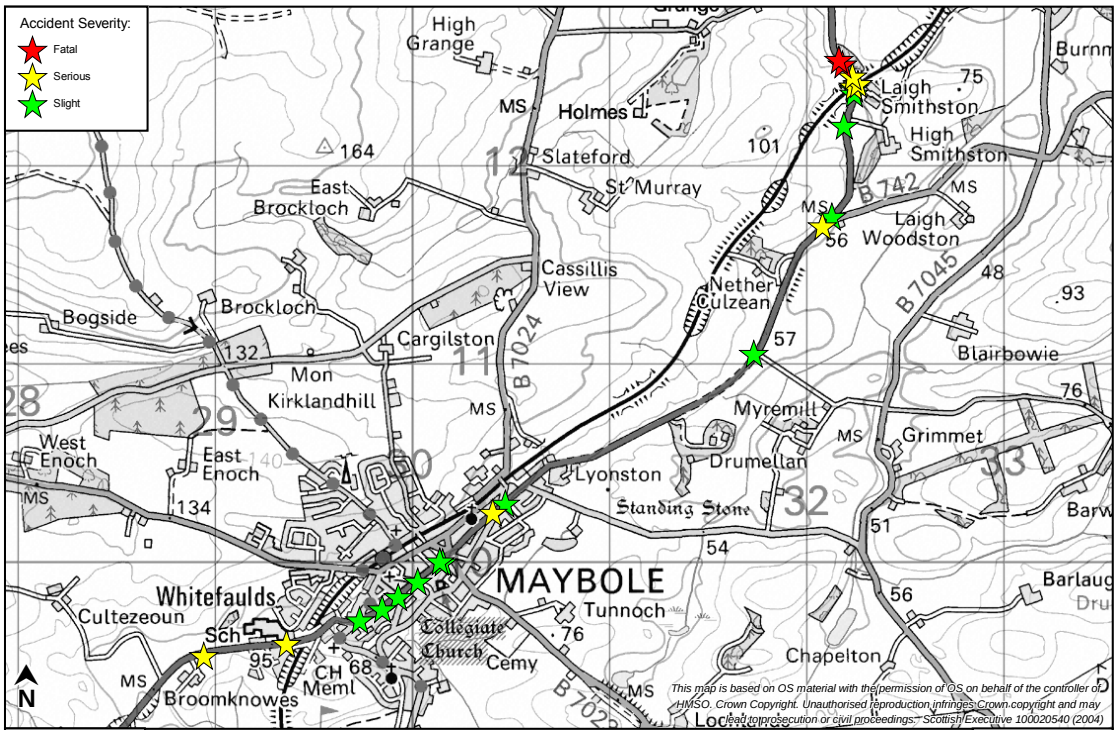
Departures from Standards and Road Geometry

2.3.31 Throughout the study area, any departures from standard are inherent in the existing alignment and would not be addressed by the proposed options which are all offline and therefore independent of existing conditions.

Safety

2.3.32 Accident data was obtained for the section of the A77 being studied for the five year period between January 1999 and December 2003 from the Scottish Executive (now Transport Scotland). The location and severity of accidents in the vicinity of Maybole is shown in Figure 2.2. For details of accident rates and comparable national averages, refer to Section 6 of this report.

Figure 2.2 – Accident Location and Severity (Jan 1999 – Dec 2003)



2.3.33 The accident rate through the town centre is lower than the comparable national average, however it is understood that there is a high 'perceived accident' risk arising from the volume of traffic passing through the historic and narrow streets. This accident risk does not appear to be fully realised (in terms of recorded accidents).

2.3.34 There is an accident cluster at Smithston Bridge which is located in the north-east of the Figure 2.2 where the railway passes over the A77 road. At this location the accident rate is considerably higher than the comparable national average. The arch shown in Figure 2.3 is the most western of the three arch structure at Smithston Railway Bridge.

2.3.35 The existing geometry on approach to, and through, the Smithston Bridge appears to be sub-standard: consisting of a right hand bend with radius of approximately 200 metres, then a left hand bend through Smithston Bridge with radius down to approximately 120 metres. There is also a 150 metre right hand radius approximately 200 metres north of Smithston Bridge.

2.3.36 The sub-standard geometry is coincident with limited forward visibility and a narrow cross section through the railway arch. This has led to a number of accidents at this location in recent times.

Figure 2.3 – Existing A77 at Smithston Bridge (northbound and southbound)

Traffic Flows

2.3.37 In the base year of 2004, there was a two-way Annual Average Daily Traffic Flow (AADT) of approximately 10,000 on the A77 to either side of Maybole town centre. Heavy goods vehicles (HGVs) make up approximately 12% of this.

2.3.38 The am and pm peak hourly flows, along with lunchtime peak hour and 12 hour flows are presented in Figure 2.4.

Figure 2.4 – Traffic Flows (2004 Base Year)