2 The birmingham CITY Centre Extension Scheme

2.1 INTRODUCTION

This chapter of the ES sets out the objectives of the scheme and also describes:

- the main features of light rail transit (LRT) schemes;
- the potential benefits of LRT schemes such as Midland Metro;
- the proposed route and design of the proposed scheme;
- the way in which the scheme will be constructed and operated; and
- the main alternatives that have been considered.

2.2 FEATURES OF LIGHT RAIL TRANSIT SYSTEMS

2.2.1 What is Light Rail?

The exact origination of the term “light rail” is unclear. However, it was reportedly first used in the 1960s in order to avoid the American terms “trolley” and “streetcar” or the British “tram” and “tramway”.

There are a number of definitions of light rail systems in existence. However, “light rail” commonly refers to electric railway systems constructed during the 1970s or later. They are characterised by an “ability to operate single or multiple cars [trains] along exclusive rights-of-way at ground level, on aerial structures, in subways or in streets, able to board and discharge passengers at station platforms or at street, track, or car-floor level and normally powered by overhead electrical wires”.

1.2.2 Key Characteristics of Light Rail Schemes

The development of LRT systems in Europe and the USA began in the latter half of the last century, principally in response to the advance of the private car and the consequent increase in congestion and car ownership within cities. There was, as a result, a need for a change in the function of public transport, such that it could offer the ability to:

- travel distances longer than buses and traditional tramways, but shorter than heavy railways;
- deliver public transport services on a regional rather than an urban scale; and
• compete with the private car on a door-to-door basis in terms of comfort and speed.

The term “light” implies a number of characteristics, including less demanding construction parameters leading to reduced costs and construction time, lighter vehicles than those used on conventional rail schemes and structures with steeper gradients and sharper curves, with more flexibility for integration with the urban environment.

The maximum speed of light rail vehicles is usually around 95 km/hr (59 mph) while “heavy”, or conventional, trains normally can operate up to speeds of around 200 km/hr (or 125 mph). Light rail speeds are variable due to restrictions imposed by Her Majesty’s Railway Inspectorate (HMRI) or as a consequence of the characteristics of the streets in which they operate. However, in general terms the average speed is lower than that of heavy rail.

Light rail vehicles can operate as single or multiple units, carrying up to around 250 passengers. The number of cars in any one unit is limited by a number of factors, including station platform length, highway design and the manoeuvrability of the vehicle.

There are over 400 light rail and tramway systems in 50 countries worldwide. Since the 1950s and 1960s, many tramway systems in several countries (including Germany, Switzerland and Belgium) have been modernised and upgraded to light rail systems. In a number of other countries, where tramways have disappeared completely from cities and towns, completely new systems have been developed. This has been the case in North America, in the Asia-Pacific region and in certain European countries such as the UK and France. Over 100 such systems are currently being planned worldwide.

Light rail systems have demonstrated that they can reduce dependence on the use of the private car in urban environments and overall they have a number of benefits, which are outlined below.

• **Capacity.** Systems have a relatively high capacity and are capable of carrying between 3,000 and 11,000 passengers per hour per direction. This is equivalent to around 2,300 to 8,500 cars per hour, assuming occupancy of 1.3 persons per vehicle. Put simply, “the higher capacity of the light rail vehicle can reduce road congestion for a given traffic flow and an attractive and reliable light rail service can reduce car usage and so reduce congestion further.” The Midland Metro Line 1 performs very well in terms of capacity, being able to carry 15,000 passengers per hour.

• **Speed and regularity.** Light rail can attain reliable service speeds and is capable of accelerating quickly. With effective design features such as segregated rights-of-way and priority at crossings and traffic lights (which make light rail congestion-free), vehicles are able to achieve average speeds of between 20 and 30 km/hr in pedestrian areas and city centre streets, and speeds of around 40 to 70 km/hr on other street-running sections, thus ensuring short journey times. This compares to average speeds of around 43 to 51 km/hr for cars on urban roads.
• **Reliability.** As a congestion-free system, light rail is a “turn up and go” system being both regular and reliable. In addition, light rail systems can continue to operate during adverse weather conditions.

• **Environmental benefits.** Notwithstanding any short term environmental impacts that may occur during construction, light rail systems have a number of environmental benefits. There are no emissions at street level and modern traction equipment with regenerative braking allows considerable energy saving. Light rail schemes are also a relatively quiet transport mode. Noise and vibration impacts can be further mitigated with good design and maintenance of tracks and vehicles.

• **Comfort and accessibility.** Vehicles with a well maintained track and good suspension can ensure a smooth ride. The combination of low-floor vehicles with gapless boarding points offers more efficient accessibility for all categories of passengers, including wheelchair users and people with prams or pushchairs.

• **Safety.** Light rail has a relatively good safety record in the UK and all systems are required to conform to rigorous HMRI requirements. The total number of injuries reported by operators during the period 1 April 2000 to 31 March 2001 was 126, which is equal to around 0.1 casualties per billion passenger kilometres. In 2000 1,665 car drivers and passengers were killed on Britain’s roads, and there were 3,409 road accident casualties in total. This equates to approximately 2.8 deaths per billion passenger kilometres. In the case of light rail, having both priority at traffic lights and segregated rights-of-way can assist in reducing risks of accidents with road traffic. Safety for passengers can also be enhanced with appropriate design of stations or stops.

• **Flexibility.** Light rail can negotiate relatively tight curves and steep gradients and can operate at ground level, underground or elevated. It can operate within traffic and can run at high speeds when segregated from other traffic. It can access narrow historic centres and can also run on conventional railway track.

• **Affordability.** Light rail is one of the cheapest and best value forms of quality mass transit.

• **Contributions towards a positive city image.** Light rail can be aesthetically pleasing, giving a positive image to a city. In the view of the International Association of Public Transport (UITP), it “contributes positively to the social dimension of a city, improves the quality of life and makes it more liveable”.

• **Regeneration.** Light rail schemes can contribute to both the modernisation and regeneration of urban centres as well as to the development of new areas.

### 1.3 **THE NEED FOR THE SCHEME**
Light rail provision is a key policy objective for the West Midlands, identified as the most appropriate solution to meeting the high level of identified travel demand and capable of making a “step change” required to sustain the economic future of the region. The provision of a LRT system was first identified in the transportation strategy of the WMPTA and Centro in 1986 as a solution to the existing and future transportation problems of the conurbation of Birmingham. It also forms an integral part of WMPTA and Centro’s 20 year Public Transport Strategy for the West Midlands and is supported in the West Midlands Multi-modal Study and draft Regional Planning Guidance for the West Midlands. Further policy support is also provided in the adopted and Second Deposit Birmingham Unitary Development Plan.

The proposed Birmingham City Centre Extension scheme will provide a clean, attractive quick and regular public transport link to the city centre, with interchange at New Street Station and Snow Hill Station, further supporting the integrated transport system within Birmingham and promoting access between commercial, residential and leisure uses in the central area.

In addition to providing direct access to the main shopping and business areas in the city centre, it is envisaged that the scheme will support and stimulate the growth of the commercial, residential and leisure uses along Broad Street, Five Ways and Hagley Road. In particular, the alignment is fully integrated with proposed development sites, including:

- the Martineau Galleries development, a major retail and office scheme;
- Colmore Square;
- the Snow Hill development, a mixed use scheme on land adjacent to Snow Hill Railway Station which is currently used for car parking; and
- Arena Central, located on the former Central TV Site, Broad Street.

Developers have worked in collaboration with Centro to integrate the alignment into their proposals. Financial contributions under Section 106 of the Town and Country Planning Act 1990 have also been secured by BCC to cover certain capital costs and further contributions from these sources are anticipated. These are set out in the funding statement that accompanies the Order application.

1.4 OBJECTIVES OF THE SCHEME

The primary objectives of the West Midlands 2000 Local Transport Plan (LTP) are:

- to ensure that the transport system underpins the economic revitalisation of the West Midlands Metropolitan area;
- to ensure that transport contributes towards social inclusion by increasing accessibility for everyone;
• to move towards a more sustainable pattern of development and growth;
• to improve safety and health for all; and
• to integrate all forms of transport with each other, with other land uses and with other policies and priorities.

A core element of the LTP is to develop a multi-modal, integrated ‘turn up and go’ public transport network, referred to as Network West Midlands. This is identified as the means by which many of the LTP objectives will be met. The proposed Birmingham City Centre Extension scheme is highlighted in the LTP as a key component of this network, in addition to an extension from Wednesbury to Brierley Hill (see Section 1.7).

The Network West Midlands public transport network proposals have been developed further in the 20 Year Public Transport Strategy. The overriding objective of the strategy is to increase the use of public transport, through partnership, to improve the economic, environmental and social well being of the West Midlands. The strategy identifies specific local networks as being critical in supporting the strategic public transport network. Network West Midlands identifies the Midland Metro Line 1 extensions as part of the public transport solution for the area in appropriate locations where forecast demand is high and generally substantially more than 2,000 passengers per AM peak.

The existing Line 1 of the Midland Metro runs from Wolverhampton to Birmingham city centre, terminating at Snow Hill Station. This route serves the business quarter reasonably well and the main shopping areas are located within walking distance to the station. However, it does not penetrate the main retail, civic and leisure uses in the city centre. The ability of Midland Metro Line 1 to interchange with bus, rail and taxi services will be improved by the extension scheme. In addition, visitors to Birmingham arriving at New Street Station may use the Birmingham City Centre Extension to reach the International Conference Centre and National Indoor Arena complex, and the business area at Five Ways and Hagley Road. The Birmingham City Centre Extension scheme will also allow greater movement between the business and retail quarters and link the greater convention centre quarter with major transport interchanges and commercial, retail and leisure activities in the city centre. In particular, construction of this route is critical to the development of the Midland Metro network enabling a further extension of Midland Metro along Hagley Road and onto Halesowen Town Centre and also routes to Birmingham Airport, Chelmsley Wood, Bartley Green and Great Barr.

A description of the Midland Metro network, which includes the existing Line 1 and proposed future routes is provided in Figure 2.1.
The Birmingham City Centre Extension scheme will help to address the key objectives outlined in the LTP, as described above, by:

- improving accessibility to the heart of the city as part of a package of pedestrian and environmental enhancements to the city centre;
- providing full integration with the proposed new “Bus Mall” enabling improved interchange of bus services, bus priority and associated traffic management works;
- improving access to existing and major new developments in the city centre, in particular by linking the Broad Street/Hagley Road corridor to New Street Railway Station and Snow Hill Railway Station; and
- providing integration with main line rail services at New Street and Snow Hill stations.

The other broad requirements of the Birmingham City Centre Extension scheme are:

- to be a key ingredient of the continued economic and environmental regeneration of the region;
- to ease the effects of congestion especially in the urban centres served by the Metro and on relevant radial routes to those centres;
- to assist social inclusion through improved accessibility, especially for those without access to a car;
- to meet passenger requirements by providing a fully accessible, comfortable, attractive, safe and secure public transport environment;
- to provide fully accessible, safe, secure, attractive, clean and well-maintained tram stops; and
- to be designed and constructed with full regard to the continuing vitality and quality of life of the people and businesses and to contribute to urban renaissance.

It is also envisaged that the scheme will build on the success of Midland Metro Line 1, where already more than 15% of journeys made on the Metro were previously made by car, and offer new journey and employment opportunities and increased patronage on Line 1. It will also action policies set out in Birmingham’s Unitary Development Plan adding further transport choices in the city centre and improving accessibility to commercial, retail, leisure and residential quarters.

2.5 ROUTE DESCRIPTION

2.5.1 Introduction
The proposed scheme runs for approximately 3.2 km from the existing Line 1 where it crosses Henrietta Street, via Snow Hill and New Street Stations, to Five Ways and the Edgbaston area, terminating on Hagley Road. The scheme forms part of wider proposals to reduce levels of road traffic in the city centre and to improve the environment for pedestrians and cyclists. The scheme will facilitate the removal of the existing Midland Metro Line 1 terminus at Snow Hill Railway Station, to allow conversion of the station from light rail use back to heavy rail use, although these works are not included in the TW Order for the Birmingham City Centre Extension scheme. To replace this new stops are proposed at St Chad’s (with coach station interchange), and at the Snow Hill development site (provisional stop) located adjacent to Snow Hill Railway Station and Bull Street.

The proposed scheme is illustrated in Figures 2.2a to 2.2d and described below.

Fig 2.2a

Fig 2.2b

Fig 2.2c

Fig 2.2d

To facilitate the description of the Birmingham City Centre Extension scheme, the proposed route has been divided into a number of sections, as follows:

• Snow Hill Viaduct to Bull Street;

• Bull Street to Stephenson Place via Corporation Street;

• Stephenson Place to Victoria Square via Stephenson Street and Pinfold Street;

• Victoria Square to Broad Street via Paradise Circus Queensway; and

• Broad Street to Hagley Road, via Five Ways.

Where practicable, potential environmental impacts are also described by route sections, later in the ES.

2.5.2 Snow Hill Viaduct to Bull Street

The proposed alignment will tie in to the existing Midland Metro Line 1 track east of the St Paul’s tram stop and north west of Snow Hill Railway Station. At this point the scheme will utilise the existing rail corridor.

St Chad’s stop will be constructed on the existing railway viaduct at Livery Street/Lionel Street. This will require internal and external alterations to the existing railway viaduct arches, including the installation of a lift and staircase to the outside of the viaduct and the provision of pedestrian access to Livery Street through the existing arches. The St Chad’s stop will form part of a multi-modal interchange,
enabling direct interchange with heavy rail services at Snow Hill Railway Station and with new National Express Coach Station services on Livery Street (see *Figure 5.1* and *Section 5.2.2*).

Immediately north of Snow Hill Station, the route leaves the existing rail corridor and continues to the east of the station on a new viaduct located on land currently used for car parking (refer to *Plate 2.1*). The existing bridge spanning Great Charles Street Queensway (refer to *Plate 2.2*) will be partially demolished and replaced with a new over-bridge structure.

A further mixed use development is proposed by Railtrack Developments Ltd on land adjacent to Snow Hill Railway Station, the Snow Hill Development site. This development accommodates the proposed alignment and future provision for a stop (Snow Hill Queensway stop). Outline planning permission for this development has recently been granted by BCC.

The location of this Snow Hill Development site and other proposed development sites adjacent to the scheme are illustrated in *Figure 5.1*.

The alignment continues on street on Colmore Circus Queensway (refer to *Plate 2.3*). The existing carriageway will be extended to the east to enable the construction of a segregated alignment to its eastern side (on the western side of the Wesleyan building).

### 2.5.3 Bull Street to Stephenson Place via Corporation Street

The route then continues on-street along Bull Street, before turning south west onto Corporation Street (refer to *Plate 2.4*, *Plate 2.5* and *Plate 2.6*). A proposed stop is located on Bull Street adjacent to the Minories shopping arcade and Temple Court. Access to the Friends Meeting House on Bull Street will be maintained during the operation of the proposed scheme. A proposed stop is also located on Corporation Street, adjacent to Fore Street, providing access to City Plaza.

### 2.5.4 Stephenson Place to Victoria Square via Stephenson Street and Pinfold Street

From Corporation Street the proposed alignment crosses New Street onto Stephenson Place and turns west onto Stephenson Street. Works to the surface of the highway will be required in this area to reduce the gradient for the scheme. In addition, due to the proximity of the tram alignment to the walkway serving the Pallasades Shopping Centre (refer to *Plate 2.7* and *Plate 2.8*), it will be necessary to attach a glazed screen to the New Street/Pallasades ramp walkway and at first floor level on the Stephenson Street balcony to prevent public access to the overhead line equipment (OHLE).

Due to the minimal clearance between the swept path and buildings on Stephenson Place, pedestrian access will be restricted on the western side of Stephenson Place.
during the operation of the scheme. Furthermore, the clearance between the swept path and buildings on the corner of Stephenson Street will be reduced to a width of around 1.7 m. Given the current level of pedestrian movement in this area, and the fact that the number of pedestrians in this area may increase in the future if plans to re-model New Street Station are progressed by Network Rail, BCC have indicated that 1.7 m is an insufficient footway width for this location. As a result, Centro are seeking powers in the TW Order to widen the footway on the western corner of Stephenson Place, which will require works to a listed building currently occupied by Waterstone’s booksellers. This would include the provision of a walkway through the lower ground floor frontage section of the store, which is understood to be a modern addition to the building. The impact of this work on cultural heritage is described in Section 6.7.

A proposed stop is located on Stephenson Street, which provides interchange with New Street Station.

From Stephenson Street (see Plate 2.9) the route follows Pinfold Street (see Plate 2.10) to Victoria Square (refer to Plates 2.11 and 2.12). Re-levelling works will also be required on Pinfold Street. Where the pavement is lowered, internal changes to the thresholds of buildings that are accessed via Pinfold Street will be required. This will affect properties on Ethel Street (numbers 1 to 17) and 88 New Street, which is currently occupied by Habitat. Low retaining walls will also be constructed adjacent to the building facades of Victoria House, 80 New Street and 50 Pinfold Street as the surface of the pavement will have to be lowered locally here. Although these works are minor in nature, all three buildings are Grade II Listed and as a result, Listed Building Consent will be required to carry out these works. In addition, due to the distance between the corner of Victoria House on Pinfold Street and the proposed alignment, pedestrian movement will be prevented in this area through physical measures such as deterrent paving.

2.5.5 Victoria Square to Broad Street via Paradise Circus Queensway

In order to accommodate the proposed alignment through Victoria Square it will be necessary to carry out works to the existing hard and soft landscaping. This will include changes to ground levels and the construction of small retaining walls and steps in some areas.

The alignment retains a minimum of 3.3 m for unobstructed pedestrian movement between the swept path and the Diana Princess of Wales memorial wall. In order to create this pedestrian route, levels in Victoria Square need to be modified through the construction of a new retaining wall (to a height of around 550 mm) and steps incorporating a handrail. All finished materials used will be complimentary to the conservation area. Curved steps will also be provided at either end of the retaining wall, adjacent to the junction with New Street and the Town Hall. Existing steps, which run parallel to the Diana Princess of Wales memorial wall, will also be realigned as part of the works.
The ‘Iron Man’ sculpture will be relocated to a site adjacent to the Town Hall (refer to Plate 2.11) as illustrated in Figure F1.1 in Appendix F and in agreement with BCC.

From Victoria Square, the route turns west onto Paradise Street (refer to Plate 2.13), with a proposed stop located close to the Town Hall. The Town Hall is a Grade I listed building, which is currently undergoing major refurbishment works and improvements. The Snow Hill bound platform of the stop adjacent to the Town Hall will be at the same level as the Town Hall, however, a retaining wall and steps will be required adjacent to the Five Ways bound platform, in order to accommodate the difference in levels between the stop and the pavement on Paradise Street. As the Town Hall is a Grade I listed building, the detailed design of this stop will be subject to agreement with BCC in conjunction with English Heritage.

Paradise Subway will be infilled as part of the proposed scheme. From Paradise Street the alignment crosses Suffolk Street Queensway (refer to Plate 2.14) via a new bridge structure. This will require the realignment of slip roads serving Suffolk Street Queensway and the construction of new retaining walls and parapets. The new bridge will also enable a footbridge across Queensway to Alpha Tower (refer to Plate 2.15) with access to the proposed Arena Central development (see Section 5.2.2). Although Centro are seeking powers to construct this bridge under the TW Order, its construction will be subject to financial contributions from the developer of Arena Central. Cyclists will be required to dismount in order to cross the new bridge. On the western side of Queensway, the alignment turns north and then west onto Broad Street. Additional retaining structures will be required in this area to create new walkways.

2.5.6 Broad Street to Hagley Road, via Five Ways

The proposed alignment continues on Broad Street (see Plate 2.16, Plate 2.17, Plate 2.18 and Plate 2.19) within the existing highway, with stops at Centenary Square (Plate 2.17), Brindleyplace, Five Ways and Edgbaston. The stop at Centenary Square will require the removal of a short stretch of the pedestrian area in front of the Registry Office (see Plate 2.16). The route continues along Broad Street on street, with a stop at Five Ways underpass (see Plates 2.20 and 2.21). Upon leaving the underpass the route crosses Hagley Road and runs to the south of the highway from Edgbaston Shopping Centre to 54 Hagley Road (see Plate 2.22) (ie between Francis Road and Plough and Harrow Road) where the scheme terminates (Plate 2.23).

2.6 SYSTEM SPECIFICATION

2.6.1 Vehicles

It is envisaged that the light rail vehicles will be 35 m in length and no more than 2.65 m wide and articulated. Power will be transmitted to vehicles via an overhead line system from a substation constructed at Five Ways (see Section 2.6.2 below) supplemented by existing Line 1 substations. Headspan wires can be suspended between poles or shared lighting columns located either between the tracks or along the edge of the track, or suspended from buildings.
Throughout the city centre, vehicles will not exceed a speed of 48 kph (30 mph) and speeds are likely to be lower in many areas due to the volume of pedestrians and the curvature of the track around some corners.

The vehicles will have capacities of approximately 70 seated and 130 standing and there will be low floor access from platforms to provide for mobility-impaired passengers. In total it is anticipated that there will be six additional vehicles to supplement those already in use on Line 1, in operation on the Birmingham City Centre Extension scheme.

2.6.2 Power Supply and Infrastructure

Vehicles will be powered by 750 dc volt overhead electric lines, via current drawn from a substation located at Five Ways which is fed to trams through contact wires and returned to the substation through the running rails.

There will normally be a minimum clearance of 5.8 m between contact wires and the highway surface, with a lesser clearance of 5.2 m in areas accessible by the public, but not by vehicles. At the Five Ways underpass the clearance will be around 4.8 m and a vehicle headroom restriction will be imposed. Headspan wires will be supported by building fixings or by poles. Where appropriate, and with any necessary consent of the owner and BCC, headspan wires will be fixed to buildings in order to minimise the use of poles. The live contact wire is then hung from the headspan wire.

Centro will seek to use building fixings on all buildings, including listed buildings, located adjacent to the route with the exception of the Town Hall. The use of building fixings in preference to poles to reduce visual impact has also been recommended by the Commission for Architecture and the Built Environment (CABE) \(^{\text{v}}\) and has been incorporated into the Design Guidelines created for Midland Metro (refer to Appendix F). Where possible, shared poles (eg for lighting, signage, traffic signals and/or overhead line equipment) will also be used to minimise visual impact. The diameter of poles will be up to 400 mm. The need for support and, therefore, poles will be greatest on bends in the alignment to maintain a curve in the overhead wires.

A substation will be required to power the system, which will be approximately 5 m by 17 m in size and 4 m in height. It is proposed, if possible, to integrate the substation into the design of the entrance to the stop at Five Ways, subject to approval with BCC.

Ducts for control and communications cables required for CCTV coverage and contact with the tram drivers and passengers will be laid on one or both sides of the track. Ducted feeder power cables may also be required to ensure that the voltage of the contact wire is sufficient to power the tram.

Platform equipment boxes will be mounted on or close to the stop platforms and tram signal heads will be installed to control tram movement. Every effort will be made in the detailed design of the scheme to reduce unnecessary visual clutter and it may be possible to find alternative locations for this equipment. Electrical signal cabinet boxes will also be installed at Colmore Circus and along Broad Street to ensure that
the movement of the tram at junctions is synchronised with that of other road users. Wherever possible visual clutter will be minimised by integrating signage and signals, subject to HMRI approval.

2.6.3 Service Characteristics

It is envisaged that the proposed scheme would operate seven days a week, between the hours of 0630 to 2330 as detailed below:

- 0700 to 1900 Monday to Saturday – every six minutes; and
- 0630 to 0700 and 1900 to 2330 Monday to Saturday and at all times on Sunday – every 10 minutes.

Since the scheme is not totally segregated from road traffic, time delays may be introduced during busy periods and at signalled junctions. Vehicles will have priority over road traffic at junctions. Therefore, where trams from both directions wish to cross a road junction, a small delay may be encountered. Consequently, the frequency of operations described above is the expected separation of services. The estimated journey time from Snow Hill to Edgbaston is around 13 minutes.

2.6.4 Stops

As described above in Section 2.5, a total of nine tram stops (10 with the provisional stop at Snow Hill Queensway) will be constructed along the proposed route, in the following locations:

- **St Chad’s**: the stop will be located on the existing viaduct adjacent to Great Charles Street Queensway at Livery Street/Lionel Street, and will consist of two side platforms. The stop would serve the proposed new National Express Coach Station on land off Lionel Street and associated development and link with Snow Hill Railway Station. Access to the stop will be via stairs and a lift. Internal and external alterations to the existing railway viaduct and arches will be necessary to accommodate these facilities.

- **Snow Hill Queensway**: provisional stop for which powers will be sought as part of the TW Order. Financial contributions will be required from the developer to cover the capital cost of stop construction. The detailed location of the stop will be subject to a condition of any outline planning consent for the development. A new over-bridge will be constructed at Great Charles Street Queensway in addition to a new viaduct alongside Snow Hill Station to bring the tram tracks to existing levels at Colmore Circus. The provisional stop would be located on the new viaduct.

- **Bull Street**: this stop would consist of an island platform and would serve the business/retail uses in this location. Complementary landscaping works including new paving, street furniture and tree planting will also be provided.
• **Corporation Street:** this stop is located to the south east of the Cherry Street/Union Street junction, and would consist of staggered side platforms. The stop would serve the retail and residential uses on Corporation Street. Complementary landscaping works including new paving, street furniture and tree planting will also be provided.

• **Stephenson Street:** this stop would consist of two side platforms and provide interchange with New Street Station. Complementary landscaping works including new paving and street furniture will also be provided adjacent to this stop.

• **Victoria Square:** this stop is located in the vicinity of the Town Hall serving Victoria Square, the Town Hall, the Central Library, Chamberlain Square, Civic Buildings and New Street. Complementary landscaping works including new paving, street furniture and tree planting will also be provided adjacent to this stop.

• **Centenary Square:** this stop consists of an island platform and would serve the business and leisure uses on Centenary Square including the International Convention Centre, Mailbox, Repertory Theatre and the proposed Arena Central development. Bus laybys are also located in this area, enabling bus interchange at this stop.

• **Brindleyplace:** this stop would consist of two side platforms and serve the business and leisure uses on Broad Street and Brindleyplace. Complementary landscaping works including new paving, street furniture and tree planting will also be provided adjacent to this stop.

• **Five Ways:** this stop is located in the underpass at Five Ways roundabout. The stop would consist of a two sided platform and serve the business and leisure uses adjacent to Five Ways Roundabout including the multiplex cinema on Broad Street and a major mixed use scheme, Broadway Plaza, which is currently under construction. Stair and lift facilities will be provided to access the stop. Complementary landscaping works including new paving, street furniture and tree planting will be provided adjacent to this stop. The sub-station building may also be integrated in to the design of the stop entrance.

• **Edgbaston:** this stop is located adjacent to 54 Hagley Road and would consist of an island platform. This stop would serve the business uses on Hagley Road. Complementary landscaping works including new paving, street furniture and tree planting will be provided adjacent to this stop.

All infrastructure will be designed to comply with the Disability Discrimination Act 1995 and provided to the quality standard equivalent or greater than that used on Midland Metro Line 1. Design guidelines have been prepared for the proposed scheme, which sets out the principles of good design that the Concessionaire for the scheme will be required to implement. Stops will be restricted to a length of around 30 m and will be approximately 350 mm above carriageway level. Low level boarding to the platforms will allow easy access and facilitate integration into the existing streetscape.
Stops will consist of either a single island platform with a double canopy or two side platforms each with its own canopy. The shelters will consist of a glazed canopy and side screens, and lighting will be provided on the underside of the canopies if required and along the rest of the platform. Passenger information systems at the stops will provide up to date Metro travel information. Stops may also contain a ticket machine, seating and signage, in addition to closed circuit television (CCTV), where this is required. CCTV is already provided in much of the city centre by BCC. Where this coverage does not extend to stops on the proposed Birmingham City Centre Extension scheme, additional CCTV facilities will be provided.

New surfacing will be introduced as part of the complementary measures of the project, to ensure that the design of hard landscaping works improves the visual quality of the street. Variations to the design of stops may be necessary due to local townscape character and this will be dealt with as detailed matters as part of any subsequent planning approvals. Design Guidelines created for Midland Metro set out the general design principles, which should be taken into account during the detailed design of the scheme. A copy is provided in Appendix F. In addition, indicative designs of Metro stops and other infrastructure associated with the alignment are provided in Appendix F.

2.6.5 Depot Facility

The proposed Birmingham City Centre Extension scheme (and the proposed Wednesbury to Brierley Hill scheme) will utilise the existing depot facilities at Wednesbury, which currently serve Midland Metro Line 1. However, in order to accommodate the stabling, cleaning and maintenance of the additional vehicles associated with both extensions, it will be necessary to carry out works to the existing depot. This comprises the following:

- installation of three new stabling roads and connections;
- construction of an additional cleaning slab;
- provision of tram roof access to the central maintenance bay;
- provision of a new control room (to serve all three lines);
- provision of a new train crew messing facility; and
- an extension to the existing site stores.

These facilities can be provided within the extent of the existing boundary and as a result, these works do not form part of the TW Order application for the proposed Birmingham City Centre Extension scheme. However, the construction works required to provide these facilities and the use of the depot during the operation of the scheme may give rise to environmental impacts. These have been considered as part of the EIA and are reported in this ES as secondary environmental effects of the proposed Birmingham City Centre Extension scheme.
2.7 TRAFFIC MANAGEMENT

Alterations to traffic flow within the city centre are proposed to help achieve BCC’s wider aims of improving traffic circulation and improving conditions for pedestrians and cyclists. It should also offer less congested streets for Midland Metro to operate on.

A significant element of these alterations is as a consequence of BCC’s proposed city centre highway works, which include the implementation of the ‘Bus Mall’, which forms part of the Local Transport Plan. The design of the Birmingham City Centre Extension scheme alignment and the preparation/implementation of the Bus Mall scheme have been co-ordinated in order to provide an integrated public transport system in the city centre. Priority signalling and real time information (which provides information on the tram arrival times) will also help to make the Midland Metro a more attractive transport option.

Traffic has already been removed from the south eastern section of Colmore Circus Queensway, with the remainder of Colmore Circus Queensway to become two-way, enabling access to properties on Colmore Row to be maintained. However, buses and taxis are expected to be displaced from the upper (north eastern) part of Bull Street as a direct consequence of Midland Metro.

The section of Corporation Street between Bull Street and New Street will be closed to all traffic except Metro and for access. Both Stephenson Place and Stephenson Street will be closed to vehicular traffic, except for access to off-street areas, on-street loading at restricted times, the taxi bay in Stephenson Street for the Burlington Hotel and access to the Burlington Hotel and the Britannia Hotel (via New Street), up to the junction with Lower Temple Street. Pinfold Street will be closed to all vehicular traffic from Stephenson Street to New Street, in addition to Paradise Street and the link between Hill Street and Paradise Street will be severed. City bound traffic will also be prevented from using three sections of Broad Street, as described below:

- Sheepcote Street to a street unofficially known as Oozell’s Way;
- Granville Street to Berkley Street; and
- Gas Street to Paradise Circus Queensway.

City bound traffic (with the exception of the Metro, buses, taxis and service vehicles) will therefore, be diverted via the Ring Road and Bath Row. Height restrictions will operate at the Five Ways underpass, preventing access by buses and HGVs.

A description of the proposed traffic measures (most of which are part of BCC’s traffic management strategy) and their impacts on road users, pedestrians and cyclists is provided in Section 6.3 and 7.3.

2.8 CONSTRUCTION

2.8.1 Principal Construction Activities
Once all the necessary powers and approvals have been obtained for the Birmingham City Centre Extension scheme, Centro will select a Concessionaire to design, build, operate and maintain the scheme.

Construction is expected to last for approximately three years (including advance diversion of utilities which is expected to last for around 12 to 20 months) and will involve a number of key activities, as follows:

- diversion of utilities;
- partial demolition of the existing bridge deck over the northbound carriageway of Great Charles Street Queensway to the west of Chad’s Circus Queensway;
- removal of existing infilled beams at Colmore Circus Queensway;
- bridge construction and/or works to existing bridges over the southbound carriageway of Great Charles Street Queensway through the Snow Hill development site and at Suffolk Street Queensway;
- works to existing railway viaducts at Lionel Street to enable construction of the St Chad’s stop;
- construction of a new viaduct adjacent to Snow Hill Station;
- construction of retaining walls adjacent to the Alpha Tower at the eastern end of Broad Street;
- piling works associated with viaduct construction at Snow Hill and bridge construction at Great Charles Street Queensway and Suffolk Street Queensway;
- earthworks;
- provision of track drainage and alterations to existing highway drainage;
- track laying along the route;
- realignment and reinstatement of highways and footpaths
- removal of steps, retaining walls, trees and street furniture at Victoria Square and works to replace and modify steps, new retaining walls, tree planting and lighting;
- modifications to highway signalling;
- accommodation works (eg works required to boundary walls or frontages to accommodate the tram alignment);
• construction of over-head line electrification (OHLE) poles and building fixings and possible relocation of existing street-lighting;

• re-paving works;

• installation of tram signalling and electrical equipment;

• construction of a substation;

• installation of stops;

• landscaping works; and

• commissioning and testing of the system.

The construction methods for each of these activities are described below in Section 2.8.3 and the programming and phasing of construction works described in Section 2.8.4.

The construction methods described are based upon experience of similar projects and hence, should be considered as indicative only at this stage in the project. The final method of working, including the phasing and programming of works, will be determined by the Concessionaire.

2.8.2 Working Hours

Normal working hours during construction will be 0700 to 1900 hours Monday to Friday and 0700 to 1300 hours on Saturday. Quiet work (eg plant maintenance) may take place outside these hours including Sundays, although this will need to be agreed with BCC prior to works taking place. In addition, certain works may be required outside of the normal working hours. For example, where works to the highway are required, these may be carried out outside of 0700 to 1900 hours, in order to avoid peak traffic and to minimise the effects of the works on road users and on pedestrians in city centre areas. Night-time working may also be required in some areas and this will be agreed with BCC prior to works taking place, and will be subject to the noise control measures outlined in the draft Code of Construction Practice for the project, a copy of which is provided in Appendix D. It may also be necessary to close or divert sections of the highway where work is required outside normal working hours. At this stage of the project, it is expected that out of hours working will be required as part of the following activities:

• Great Charles Queensway during bridge works;

• Suffolk Street Queensway during bridge works;
• works to the existing viaducts at Lionel Street associated with construction of the St Chad’s stop, due to the need to carry out works adjacent to an operational railway;

• works to Statutory Undertakers’ equipment where it is necessary to minimise disruption to users;

• construction of the substation at Five Ways;

• works requiring vehicle accesses to be temporarily blocked; and

• initial testing and commissioning works.

2.8.3 Construction Activities and Plant

Before the main work of installing the scheme infrastructure can start, preliminary works such as the diversion of public utilities and roads will need to take place. Utilities diversions will be required throughout the route and will involve digging new trenches for water pipes, sewers, electricity and communications cables and gas pipes.

Certain public utilities running within the swept path of the track will need to be relocated to minimise future disruption to Midland Metro services during their maintenance and in the event of failure. However, it may not be necessary or possible to relocate all apparatus on street-running sections of the tram, due to the restricted space on footpaths, verges or car parking bays. Where this is the case, it may be necessary to lower and protect the services from damage caused by vibration or increased load resulting from the operation of Midland Metro. Diversion of utilities in advance of the main construction works may take place in order to minimise the construction time for the scheme. The relocation of Post Office pillar boxes and public telephone boxes may also be required.

At this stage in the project, the condition of subgrade material located below the surface in areas where track will be laid is not known. However, it is expected that excavation of material to a depth of around 0.5 m to 1.2 m will be required along the majority of the track alignment. Once excavation works have been completed, track drainage will be installed. The type of drainage required will vary depending on the position of the track and the foundation of the track. In areas of poor soil, engineering fill or ‘capping material’ may be needed to provide a firm foundation for the track. This will be compacted using vibratory rollers prior to the positioning of reinforcement mesh used in the construction of a reinforced concrete base slab. The base slab is then cast by pouring concrete onto the reinforcement mesh, which will provide the foundation for the rails.

The rails are then clipped to the top of the base slab, levelled into position and continuously welded together. The rails will be pre-encapsulated with a rubber-like polymer, to enable bonding between the rail and concrete slab. This polymer also assists in reducing vibration and stray current from the proposed scheme. A second layer of concrete is then poured around the rails to a level that allows for road
surfacing to be placed. Road surfacing is then laid around the rails. New kerbs, parking bays and base supports for OHLE poles may be constructed concurrently, where there is enough space to construct the concrete base slab.

Alterations to the existing highway will also be required in some areas to accommodate the scheme. This will include:

- major intersection works;
- minor traffic flow alterations;
- widening of roads;
- closure of pedestrian subways;
- realignment of footways;
- re-arrangement of lane layouts;
- limiting of traffic movements at intersections;
- repairing and surfacing works; and
- removal and installation of pedestrian crossings.

These works may entail the demolition of structures, excavation of soil and/or pavement, relaying of a formation base and/or casting of a reinforced concrete slab as described above, and resurfacing with asphalt. Existing road markings will be removed and new markings added.

Powers to close the existing pedestrian subway at Hagley Road have been included in the TW Order application at the request of Calthorpe Estates. However, financial contributions form a source external to the scheme will be required to implement the closure if required. Potential major property redevelopments in the vicinity may afford such a funding opportunity. In addition, a new pedestrian crossing will be provided by BCC at the western end of the terminus on Hagley Road. The provision of this crossing does not form part of the TW Order application for the proposed Extension scheme.

Powers to extend Easy Row pedestrian subway have also been included in the Order application, to be carried out in agreement with BCC.

Track construction will be followed by OHLE installation. The approximate spacing between OHLE fixings and/or poles is between 20 m and 30 m depending on the speed and gradient of the track. Additional supports may be needed at highway junctions and closer spacing of poles or fixings will be required on bends. The number of poles can be reduced by suspending the contact wires from building fixings and this can be particularly advantageous where space is limited in the city centre. Although the fixings and/or poles may be erected during track construction, the
contact wires will not be suspended until the end of the works. Where possible, building fixings will be used to minimise visual clutter in sensitive townscape areas and narrow streets. Shared poles will also be used wherever possible as discussed in Section 2.6.2 above.

A summary of the plant that will be used in undertaking the construction activities described above is given below in Box 2.1.

<table>
<thead>
<tr>
<th></th>
<th>Summary of Main Construction Plant</th>
</tr>
</thead>
<tbody>
<tr>
<td>•</td>
<td>earth moving plant;</td>
</tr>
<tr>
<td>•</td>
<td>earth compaction plant;</td>
</tr>
<tr>
<td>•</td>
<td>lorry mounted concrete pump;</td>
</tr>
<tr>
<td>•</td>
<td>road planer;</td>
</tr>
<tr>
<td>•</td>
<td>cherry-pickers;</td>
</tr>
<tr>
<td>•</td>
<td>vibratory rollers;</td>
</tr>
<tr>
<td>•</td>
<td>sheet pile drivers;</td>
</tr>
<tr>
<td>•</td>
<td>bored piling rig;</td>
</tr>
<tr>
<td>•</td>
<td>mobile cranes;</td>
</tr>
<tr>
<td>•</td>
<td>delivery lorries;</td>
</tr>
<tr>
<td>•</td>
<td>track laying equipment;</td>
</tr>
<tr>
<td>•</td>
<td>compressors;</td>
</tr>
<tr>
<td>•</td>
<td>generators;</td>
</tr>
<tr>
<td>•</td>
<td>pneumatic drills;</td>
</tr>
<tr>
<td>•</td>
<td>brick-cutters;</td>
</tr>
<tr>
<td>•</td>
<td>hand held power tools.</td>
</tr>
</tbody>
</table>

2.8.4 Programming and Phasing

General

It is envisaged that construction of the scheme will commence in early 2006 with the first service operating in late 2008. The scheme will be divided into eight work stages during construction as described below.
Work Stages

The use of these work stages has been developed in order to minimise traffic impacts during construction, and is considered to be a feasible method for constructing the scheme based on experience of other projects. However, the final choice of construction method and phasing will be developed by the Concessionaire. A description of each of these indicative work stages is provided below in Table 2.1 and illustrated in Figures 2.3a to 2.3d.
Table 0.1 Indicative Construction Work Stages

<table>
<thead>
<tr>
<th>Work Stage</th>
<th>Approximate Duration (months)</th>
<th>Description of Main Works</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1 to 12</td>
<td><em>St Chad’s to Colmore Circus Queensway</em></td>
</tr>
</tbody>
</table>

This stage is split into two stages, with Stage 1A including works from St Chad’s to Great Charles Street Queensway and Stage 1B from Great Charles Street Queensway to Colmore Circus, as described below.

**1A** 2 to 11 This work stage will include the following construction activities:

- Twin track over the existing viaduct including turn-back siding.
- Stop at St Chad’s on the existing viaduct.
- Cross-overs between St Paul’s stop and the tie-in point for the extension, and between the proposed extension track with the existing single track into Snow Hill terminus.
- Access from Livery Street through the existing viaduct with a lift and stairs to the St Chad’s stop.
- Partial replacement of the existing bridge span over Great Charles Street Queensway northbound.
- New span over Great Charles Street Queensway southbound.

**1B** 2 to 12 Continuing work will include the following:

- Construction of a supporting structure taking the tram through the existing Snow Hill at-grade car park in the form of a reinforced concrete viaduct with an access road serving 1 to 3 Colmore Row (to be finalised).
- Installation of a mesh screen to all levels of the adjacent multi-storey car park.
- Creation of a means of access to 1 to 3 Colmore Row car park.

*Colmore Circus Queensway to Bull Street*

Work Stage 2 is divided into two stages, with Stage 2A including works through Colmore Circus Queensway and Stage 2B from Colmore Circus Queensway to Bull Street, as described below.

**2A** 2 to 13 This work stage will include the following:

- Construction of a twin track tramway across Colmore Circus Queensway.
- Realignment of Colmore Row and Colmore Circus Queensway.
- Removal of existing bridge deck beams within Colmore Circus Queensway.
<table>
<thead>
<tr>
<th>Work Stage</th>
<th>Approximate Duration (months)</th>
<th>Description of Main Works</th>
</tr>
</thead>
<tbody>
<tr>
<td>2B</td>
<td>2 to 11</td>
<td>Continuing work will include the following:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Construction of a twin track tramway from Colmore Circus Queensway to Bull Street.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Provision of a centre island stop at Bull Street.</td>
</tr>
<tr>
<td>3</td>
<td>2 to 15</td>
<td>Bull Street to Paradise Circus Queensway</td>
</tr>
<tr>
<td></td>
<td></td>
<td>This stage involves the construction from Bull Street to Paradise Circus Queensway, to include the following:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Construction of a twin track tramway from Bull Street to Paradise Circus Queensway via Corporation Street, Stephenson Place, Stephenson Street, Pinfold Street and Victoria Square.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Changes to the Bull Street and Corporation Street junction to accommodate the tramway and bus mall.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Construction of a new stop at Corporation Street to comprise staggered side platforms.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Construction of a track crossover in Corporation Street.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Installation of a screen to both the Pallasades Shopping Centre ramp and the upper level to the Pallasades along Stephenson Street.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Closure of the footway on the eastern side of Stephenson Place.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Closure of the toilets beneath Pallasades ramp.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Creation of a walkway through the corner of 80 New Street (currently occupied by Waterstone’s) at the junction of Stephenson Place and Stephenson Street.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Construction of a new stop in Stephenson Street comprising of side platforms.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Adjustments to the landscaping in Victoria Square.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Construction of a new stop near to the Town Hall in Victoria Square.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Construction of small retaining walls to the south of the Victoria Square stop.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Closure of Pinfold Street and Paradise Street to all traffic except trams.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Traffic and tram signal control at the intersection of Stephenson Street and Stephenson Place.</td>
</tr>
<tr>
<td>4</td>
<td>2 to 12</td>
<td>Paradise Circus Queensway and Suffolk Street Queensway</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The complexity of this Work Stage results in two sub stages. Stage 4A includes the bridge over Suffolk Street Queensway and Work Stage 4B includes work at either side of the crossing.</td>
</tr>
<tr>
<td>Work Stage</td>
<td>Approximate Duration (months)</td>
<td>Description of Main Works</td>
</tr>
<tr>
<td>------------</td>
<td>-----------------------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>4A</td>
<td>2 to 4</td>
<td>This work stage will include the following construction activities:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4B</td>
<td>2 to 12</td>
<td>Based on the current alignment the work comprises:</td>
</tr>
</tbody>
</table>

- New bridge for the twin track railway across Suffolk Street Queensway (piled foundation).

- Footbridge over Suffolk Street Queensway to the south of the tram bridge (as part of the bridge for the tram).

- Construction of twin track tramway from Paradise Circus Queensway to Suffolk Street Queensway on-slip road.

- Provision of bus lane, to incorporate a bus lay-by, from Paradise Circus Queensway to the westbound tramway.

- Construction of new traffic signals at the junction of the proposed bus and traffic lanes (west of Paradise Street) and Paradise Circus Queensway.

- Infilling of Paradise subway.

- Repositioning of the existing signal controlled pedestrian crossing.

- Realignment of Suffolk Street Queensway on-slip road and signal control at the junction with Paradise Circus Queensway.

- Construction of a twin track tramway from Suffolk Street Queensway off-slip to Broad Street on a new retained embankment.

- Demolition and rebuilding of Easy Row pedestrian subway.

- Realignment of Suffolk Street Queensway off-slip road.

- Provision of a bus lane from Suffolk Street Queensway off-slip road to the westbound tramway.

- Construction of new traffic signals at the junction of Suffolk Street Queensway off slip road and Paradise Circus Queensway.

- Realignment of the existing 'high level' footways (supported by retaining walls) on the west side of Paradise Circus Queensway and closure of the 'low level' footway.

5  
2 to 12
Paradise Circus Queensway to Broad Street

This stage along Broad Street from Paradise Circus Queensway to the un-named street between Granville Street and Sheepcote Street and includes the following construction activities:

- A twin track tramway along Broad Street from Paradise Circus Queensway to the un-named street between Granville Street and Sheepcote Street.

- A crossover at the eastern end of Broad Street.

- A new stop at Centenary Square.
<table>
<thead>
<tr>
<th>Work Stage</th>
<th>Approximate Duration (months)</th>
<th>Description of Main Works</th>
</tr>
</thead>
</table>
| 6          | 2 to 16                       | - A new stop at Brindleyplace.  
             |                               | - Amendments to highways, including signal control at the junction with Granville Street.  
             |                               | **Broad Street to the start of Five Ways underpass**  
             |                               | Work stage 6 involves the construction along Broad Street from the un-named street between Granville Street and Sheepcote Street to the Five Ways underpass, to include the following:  
             |                               | - Construction of a twin track tramway along Broad Street from the un-named street between Granville Street and Sheepcote Street and the start of Five Ways underpass.  
             |                               | - Highway amendments, including signal control at the junctions with the un-named street, Sheepcote Street and Ryland Street/Bishopgate Street.  
             |                               | **Reopening of Sheepcote Street to through traffic.**  
| 7          | 2 to 14                       | **Five Ways underpass**  
             |                               | This stage involves construction at the Five Ways underpass to include the following:  
             |                               | - A twin track tramway through the underpass at Five Ways.  
             |                               | - A new stop within the underpass having pedestrian access via steps and lifts from the central island above.  
             |                               | - Construction of a sub-station within the pedestrian area at Five-Ways junction.  
| 8          |                               | **Five Ways underpass to Hagley Road**  
             |                               | This work stage is split into two stages, with Stage 8A including works from Five Ways underpass across Hagley Road and Stage 8B involves works from the south side of Hagley Road to the terminus at No. 54, as described below.  
             | 8A 2 to 8                     | This work stage will include:  
             |                               | - Construction of a twin track tramway from Five Ways underpass across Hagley Road.  
| 8B 2 to 6  |                               | This work stage will include the following:  
             |                               | - Construction of a twin track tramway on the south side of Hagley Road.  
             |                               | - Construction of two crossovers.  
             |                               | - Realignment of the footway on Hagley Road.  
             |                               | - Construction of a terminus outside No. 54, with a central island platform.  
             |                               | **Accommodation works to the existing accesses.**  
| Other Work | 14 to 17                      | Other work to be carried out which is not included in the above work sections is described below:  
             |                               | - Amendments to the highway junctions beyond the tram alignment (Islington Row, Navigation Street and those associated with the bus  

<table>
<thead>
<tr>
<th>Work Stage</th>
<th>Approximate Duration (months)</th>
<th>Description of Main Works</th>
</tr>
</thead>
<tbody>
<tr>
<td>mall)</td>
<td>17 to 23</td>
<td>• Alterations to parking and loading arrangements outside of the tram alignment.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Overhead electrical equipment and supply.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Diversion/protection of existing services.</td>
</tr>
<tr>
<td>Other Work</td>
<td></td>
<td>• Hard and soft landscaping.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Testing and commissioning.</td>
</tr>
</tbody>
</table>

In order to progress the construction programme as quickly as possible, it will be necessary to operate some of the work stages concurrently.

Work stages 1A, 4 and 8A involve closures affecting major traffic flows. During this work Broad Street and Five Ways will be closed to traffic, with access being provided along work stage 5 (rear access is available for properties along work stage 6). The remaining work stages 1B, 2, 3 and 8B are either off the highway or only affect minor traffic flows. Work stages 6 and 7 involve almost identical road closures and traffic management measures and as a result, it is proposed to carry out these works concurrently. Work stages 1A and 4 will also be carried out concurrently as both stages require the weekend closure of the same section of the Queensway.

Work stage 4 will be carried out before work stage 5, 6 and 7 so that Broad Street is available as part of a diversion route during work stage 4. In order to minimise the overall construction programme it is also proposed to work concurrently on as many of the stages as possible and continue through the city centre during the Christmas period (ie 18 November to 12 January).

The extent of each construction work stage is illustrated in Figure 2.3 and a preliminary programme for the scheme, which has been taken from the Construction Strategy report, is described above in Table 2.1. However, at this stage in the project, the programme of works is indicative only and will be determined upon the appointment of a Concessionaire for the scheme.

It should be noted that while certain construction activities, such as piling, will generally be completed within a relatively short time at any one location before moving on to the next, general construction activity is likely to last for around eight to twelve weeks at most locations. This will include excavation works, slab formation, track-laying and finishing. Each of these activities is likely to take two to three weeks in any one location.

2.8.5 Temporary Land Requirements

Temporary worksites will be required during the construction of the scheme for the storage of plant and materials, and to accommodate the site offices. Due to the nature of the area (ie a busy city centre), locating suitable work sites of a sufficient size is
likely to be problematic. In addition, a number of sites which are currently available, are subject to development proposals and may not be available during construction of the scheme. Consequently, it may be necessary to split the main functions of the construction compounds between a number of sites. These may include:

- a general site office and staff amenity areas;
- a workshop for the maintenance of site plant and equipment;
- compounds adjacent to the sites for the major structures to facilitate access and for the storage of materials; and
- limited staff and visitor car parking.

Discussions with BCC on the location of possible work sites in the city centre are ongoing. However, a number of potential sites have been identified as being currently available. The location of each of these worksites is described below in Table 2.3 and illustrated in Figure 2.3. Each of these sites could potentially be in use throughout the construction programme. However, it should be noted that the Concessionaire may choose to use additional sites, which are not described as part of this EIA, depending on the availability of sites during construction. Any additional sites will be selected in agreement with Centro and BCC, having regard for neighbouring land uses which may be affected by construction works at the site.

### Table 2.3  Temporary Land Requirements

<table>
<thead>
<tr>
<th>Site</th>
<th>Location</th>
<th>Size (m²)</th>
<th>Use during Construction</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>This site is on land currently used for car parking by BCC, off Lionel Street. Access to the site would be via Lionel Street. This site is located within a mainly commercial area, although some residential flats are located on Old Snow Hill.</td>
<td>1300</td>
<td>In addition to sites 2 and 3 (see below) this site would facilitate construction works associated with Work Stage 1.</td>
</tr>
<tr>
<td>2</td>
<td>This site is currently occupied by Five Star Parking Ltd. This site is located within a mainly commercial area, although some residential flats are located on Old Snow Hill.</td>
<td>500</td>
<td>As above. This site would facilitate the demolition of the existing bridge deck over the northbound carriageway of Great Charles Street Queensway to the west of Chad’s Circus Queensway and construction of a new bridge span over the southbound carriageway of Great Charles Street Queensway. In addition to sites 1 and 2 (see above) this site would also facilitate construction works associated with Work Stage 1.</td>
</tr>
<tr>
<td>3</td>
<td>The use of this site during construction will be subject to the timing of development proposals by Railtrack Developments Ltd. This site is currently used as a car park. Commercial properties comprising mainly of offices are located to the south and east of this site. Access to the site is via Snow Hill Queensway.</td>
<td>7100</td>
<td>As for 1.</td>
</tr>
<tr>
<td>4</td>
<td>Public car park operated by BCC.</td>
<td>1200</td>
<td>This is the nearest, currently available site, for</td>
</tr>
<tr>
<td>Site</td>
<td>Location</td>
<td>Size (m²)</td>
<td>Use during Construction</td>
</tr>
<tr>
<td>------</td>
<td>----------</td>
<td>----------</td>
<td>------------------------</td>
</tr>
<tr>
<td>5</td>
<td>Private car park with access from Tennant Street. Residential dwellings are located to the south east.</td>
<td>600</td>
<td>This site would facilitate Work Stages 6 and 7.</td>
</tr>
<tr>
<td>6</td>
<td>As above.</td>
<td>800</td>
<td>As above.</td>
</tr>
<tr>
<td>7</td>
<td>Site off Bath Row. Residential properties are located to the north and west.</td>
<td>3900</td>
<td>This work site would facilitate Work Stages 7 and 8 including works associated with stop construction at Five Ways and on Hagley Road.</td>
</tr>
</tbody>
</table>

The Construction Strategy assumes that each of the carriageway within Five Ways underpass will be used for short term storage of plant and materials during the construction of Work Stage 7.

A Code of Construction Practice will govern all construction works. A description of the draft Code is provided in *Section 2.8.9* and a copy provided in *Appendix D* of this ES.

### 2.8.6 Spoil Generation

Spoil will be generated during earthworks required prior to track construction, and during the demolition of bridge structures. In total approximately 25,000 m³ of spoil will be generated during the construction of the scheme, which equates to some 2,500 HGV loads.

Although the current land uses in the area do not suggest that contaminated soil is likely to be a serious problem during construction, contaminated materials may have been used historically during the construction of the highway. Consequently, there is the potential for some of the spoil generated by the works to be contaminated (see *Section 7.9*). The Concessionaire will determine whether a site is likely to contain contaminated material prior to any works commencing. Where land is identified as being contaminated, the Concessionaire will be required to dispose of any contaminated spoil at a suitably licensed waste disposal site in accordance with the Waste Management Licensing Regulations 1994. Wherever possible, non-contaminated spoil will be reused during the construction of the scheme, used for other construction projects, or as a last resort, disposed of at a licensed waste disposal facility.

### 2.8.7 Construction Workforce

It is estimated that the combined workforce for all worksites will peak at about 400 people, although this will vary in relation to the construction programme. For instance, during highway works, the workforce will total around 160 people. During track laying and bridge construction, this will increase to around 190. Once the main construction works have been completed, the number of staff will fall to around 30 when testing and commissioning works are taking place. It is not known at this stage in the project how this workforce will be spread across the worksites described above in *Table 2.3*, although the workforce peak at any one worksite is not expected to exceed approximately 50 to 70 people.
2.8.8 Construction Traffic

Traffic will be generated by construction personnel accessing and egressing worksites and by HGVs transporting plant, materials and waste.

Construction personnel will be encouraged to use public transport to get to work. Parking in the vicinity of the site compounds is unlikely to be viable. It is envisaged that construction personnel will be required to park private vehicles at public car parks located within the city centre. Consequently, on-street car parking by the workforce is not expected to occur.

The levels of HGV traffic will vary throughout the construction period. For instance, during excavation works, 15 to 30 loads of material may be removed each day, which equates to around two to four HGV movements per hour. For off-road areas, excavation may progress more quickly giving rise to eight to 10 movements per hour, although for shorter periods than those works on the highway. During backfilling operations, movements are likely to peak at seven to 10 movements per hour, with four to eight movements at other times.

Where excavation works, backfilling and concreting (required during track laying) occur concurrently, HGV movements are expected to peak at around 10 to 20 per hour where the alignment is located on the highway, and 15 to 25 per hour in off-road areas, where works are likely to progress at a faster rate.

Further details on generated construction traffic are given in Section 7.3.

2.8.9 Code of Construction Practice

In order to minimise the impacts of construction, a draft Code of Construction Practice (CoCP) has been developed for the Birmingham City Centre Extension scheme. This is attached in Appendix D.

The draft CoCP will be advanced through discussion with BCC. It represents the level of mitigation to which Centro is committed.

The CoCP sets out the measures that will be undertaken by the Concessionaire to ensure site safety and environmental best practice. This encapsulates relevant statutory codes of practice, standards and Acts applicable to the regulation of construction practice and its effects on health and safety and the environment. The draft CoCP will be included in the contractual arrangements between Centro and its selected Concessionaire, and adherence will therefore be compulsory. It should be noted that compliance with the CoCP will not discharge the Concessionaire, or its agents, from complying with any statutory requirements in force at the time.

2.9 CONSIDERATION OF ALTERNATIVES

2.9.1 Introduction
In developing the scheme, alternatives were considered for two elements of the project: transport mode and transport route. A summary of the findings of the options appraisal process is provided below.

### 2.9.2 Transport Mode

#### Overview

Two alternative modes were considered during the development of the Birmingham City Centre Extension scheme, wire guided trolley buses and conventional buses. This appraisal of modal options was based upon the methodology outlined in the New Approach to Appraisal (NATA). The Government requires that all publicly funded investments in transport are subject to an appraisal in line with NATA, in the context of the Government’s integrated transport policy.

The assessment assumed the same route alignment for each transport mode (see Section 2.9.3 below).

#### Wire Guided Trolley Bus

A comparison of light rail transit (LRT) versus wire guided trolley bus (WGTB) was made in relation to the Government’s five assessment criteria of integration, safety, economy, accessibility and environment, in addition to cost, image and vehicle features and service reliability. A summary of the findings of this assessment is provided below:

- **Integration** – advantages of LRT over WGTB included a reduction in the need for interchange for many journeys (ie those on Line 1 into the city centre) and the provision of options for future extensions of the Midland Metro network (as illustrated in Figure 2.1).

- **Safety** – since more vehicles would be required to operate the WGTB than an LRT system a greater risk of pedestrian conflict was envisaged with WGTB.

- **Economy** – it was envisaged that both LRT and WGTB would aid the local economy and regeneration, although the LRT was considered to have a more positive image than WGTB.

- **Environment** - it was felt that an LRT system would be likely to attract a higher proportion of car users than a WGTB system, so reducing traffic congestion. Surveys of Line 1 have shown that Midland Metro is attracting a large number of motorists out of their cars. In addition, the visual impacts associated with LRT were considered to be less than for WGTB, since the latter requires double cables and longer routeing for turning circles.

- **Accessibility** – both systems can help to reduce social exclusion, although the LRT was considered to provide better access for wheelchairs.
Both systems scored equally in terms of capital cost although it was acknowledged that WGTB vehicles would be cheaper than those required for the LRT and that the WGTB could be constructed in a shorter period of time. WGTB technology is also untested in the UK in a commercial setting, whereas several LRT systems are in operation in the UK and overseas. LRT has been in operation in Birmingham since May 1999 when Midland Metro Line 1 from Wolverhampton to Birmingham Snow Hill opened. Extensions to the existing LRT will facilitate integration between the existing public transport services and other transport modes to provide the opportunity for a high quality public transport network allowing easy and straightforward interchange and increased patronage.

**Conventional Bus**

This comparison included conventional bus versus WGTB using the methodology outlined above. The findings of the assessment indicated that a WGTB system was equal to conventional buses in many ways. However, the WGTB system scored better than conventional buses in the following areas:

- an increased perception of severance associated with conventional buses and greater impact on pedestrians;
- less positive city image associated with buses;
- noise and atmospheric emissions associated with buses;
- it was considered that a WGTB would attract more car users than a conventional bus; and
- greater comfort associated with WGTB and better access for the mobility impaired.

**Summary**

Overall the use of LRT was considered to be more appropriate than WGTB or the conventional bus in the context of the Birmingham City Centre Extension scheme. This was primarily because LRT already operates in Birmingham, thus allowing extensions to the existing LRT to facilitate integration between the existing public transport services (including Line 1) and other transport modes providing a fully integrated public transport network.

The Extension scheme allows the option of future extensions to the LRT, becoming one of the first steps in a network of LRT that is modern, of high quality and provides a high speed, frequent, reliable and accessible service. By providing an extensive LRT system, integration between the different LRT lines and other public transport modes within Birmingham city centre is facilitated and is more achievable than if different transport modes are used.

**2.9.3 Route Selection**
Methodology

During 1992 to 1993, and following the construction of the existing Line 1 between Wolverhampton and Birmingham, Parliamentary approval was given for both a ‘Central Link’ from Line 1 to the city centre and for Line 2 of the Midland Metro scheme. The proposals for the Central Link involved an extension to Line 1, underground, from Snow Hill to Moor Street Station. However, due to the extensive costs involved and not being able to secure funding for the scheme, the tunnel option was abandoned.

Studies were undertaken to identify more cost effective and achievable extensions to Line 1. This included a surface running extension from line 1 at Snow Hill to the city centre and Five Ways. In determining potential street-running routes, a number of objectives were considered to assess suitable alternative alignment. These included:

- engineering feasibility;
- planning policy;
- cost/benefits;
- development proposals;
- impacts on pedestrians;
- interchange with bus and rail services; and
- areas of potential constraint (e.g. highway geometry, Railtrack structures and the need to avoid demolition of properties).

On the basis of this study, five possible alignment options were identified. Of these, options that were located adjacent to the Bull Ring development were considered to be non-viable due to the closure of the junction of High Street with St Martin’s Circus. These were subsequently refined to two main alternative routes between Snow Hill Station and Five Ways, via New Street Station, as described below:

- Option A – running through the city centre along Corporation Street, Stephenson Place and part of Stephenson Street, Pinfold Street, Broad Street and onto Five Ways.
- Option B – running through Queensway via Colmore Circus, the Old Square, The Priory, Masshouse Circus, Moor Street and St Martins/Smallbrook Queensway, Broad Street and onto Five Ways.

However, the study also recommended that a route along New Street to link Corporation Street with Victoria Square be considered.
New Street is the major east/west route for pedestrians through Birmingham city centre. In the city centre there is a need to make the best use of the limited space available and to provide an attractive physical environment, which is seen as essential to sustain the economic vitality of the city core. The introduction of greater pedestrian priority and the reduction, and in some cases, the removal of traffic for part of the day has permitted landscaping and environmental enhancement and the development of an attractive pedestrian corridor.

The initial pedestrianisation works to upper New Street have been supplemented by works to lower New Street, and as a result an average of 43,000 people traverse the route over a 12 hour period. The surrounding office and commercial buildings contribute to between 7,500 and 8,000 people per hour using New Street during the lunchtime period. This large pedestrian footfall has attracted a number of prestigious retailers to locate along New Street. In comparison, pedestrian flows along Pinfold Street average 6,314 over a 12 hour period on a weekday and on Stephenson Street the same weekday period attracts 4,130 pedestrians.

Furthermore, New Street is designated as a primary route principal pedestrian corridor in the Birmingham Unitary Development Plan (UDP) as shown on the Proposals Map. Paragraph 15.36 of the UDP states that “the creation of a more pedestrian-friendly environment is a priority. The pedestrianisation of Lower New Street and High Street is proposed as a priority measure to help reinforce the role of the Regional Shopping Centre”. The design of the proposed alignment sought to minimise the impact of the scheme on pedestrian corridors such as New Street. Additional information on pedestrian priority measures in the city centre is provided in Section 4.5 Development Planning Policy.

New Street also provides a linear pedestrian route linking the Broad Street corridor with the Bull Ring, and in the longer term the Eastside regeneration area. As a linear route the introduction of Midland Metro would remove considerable circulation space currently enjoyed by large numbers of pedestrians. The preferred routing along Pinfold Street and Stephenson Street does not accommodate similar volumes of pedestrians and is not occupied by significant numbers of retail units. In particular, Stephenson Street has a longstanding tradition of being used by high numbers of buses. For these reasons, a route along New Street was rejected by Centro and BCC.

**Selection of a Preferred Route**

Engineering feasibility and the environmental impacts of each route (Option A and Option B) were examined to inform the final route selection decision-making process and select a preferred route. The findings of this work recommended that Option A should be taken forward as the preferred option, due to the shorter journey time, better integration with the city centre and New Street Station, cost and potential for environmental improvements on Corporation Street.

In terms of engineering feasibility, Option A was favoured since it enabled more effective implementation of BCC’s Traffic Management Strategy, and in particular, is complimentary to the Bus Mall. It was also acknowledged that Option A could assist in reducing noise levels and improving public space in Corporation Street by the removal of through-traffic.
Bull Street, Corporation Street and Broad Street are designated as principal pedestrian corridor primary routes in the Birmingham UDP. As described above, paragraph 15.36 gives priority to the creation of a pedestrian-friendly environment in the city centre and that “…the proposed Metro Route will run along Corporation Street, bringing visitors into the heart of the Shopping Centre”. A range of complimentary measures has been developed with BCC to maintain and enhance the environment for pedestrians on the proposed alignment. This includes the removal of buses from Bull Street and Corporation Street and also, through traffic on section of Broad Street.

Major constraints associated with Option B were the risk of delays during the operation of the scheme as a result of traffic congestion on Hill Street at the approach to the Pallasades Shopping Centre car park and the costs associated with the reconstruction of railway structures at the Hill Street/Navigation Street junction. In addition, the construction of the scheme would be dependant on development proposals being implemented within the desired timescale.

An assessment of the potential for noise, vibration and dust impacts to occur on each of the route options also indicated that the operational noise and vibration impacts were likely to be more significant for Option B.

On completion of the feasibility work in 1998, BCC, in conjunction with Centro undertook an extensive public consultation exercise on the two proposed options. The results indicated that Option A was favoured by the respondents of the exercise since it:

- provided better accessibility in the city centre;
- had a shorter journey time;
- was cheaper to construct;
- provided better rail interchange at New Street Station;
- had a better chance of delivery; and
- facilitated improved pedestrian priority in Corporation Street, Bull Street and Stephenson Street.

This option was also supported by WMPTA and BCC Members and has been developed into the scheme being sought through the TW order.

**Route Options in Victoria Square**

In developing the scheme through Pinfold Street and Victoria Square, several minor variations in the alignment and associated works were considered. The first of these options, which required the addition of steps in front of the Diana Princess of Wales memorial wall, at the Town Hall and adjacent to the Town Hall stop in order to accommodate changes in ground levels, was considered to be unsatisfactory by HMRI
and BCC due to the distance allowed for pedestrians between the swept path and existing structures.

As a result, alternative alignment options were developed to maximise the distance between the swept path and structures such as the Diana Princess of Wales memorial wall, for pedestrian movement. In order to provide space for pedestrian movement each of the options required significant works to the existing ground levels, to the Diana Princess of Wales memorial wall and to listed buildings such as those on the corner of Pinfold Street and New Street, and Victoria House. The final option was selected in consultation with Councillors with Cabinet responsibility for transport, and with officers from BCC. It seeks a balance between the provision of sufficient space for pedestrian movement and minimum impact on existing structures such as listed buildings and hard landscaping features.

[i] Light Rail Central: The North American Light Rail Information Site (www.lightrail.com/definition.htm)


[i] HSE and Her Majesty’s Railway Inspectorate Accident Database, 1 April to 31 March 2001.


[i] International Association of Public Transport (www.uitp.com)


[i] The swept path is the area reserved for a moving tram which includes an allowance for pedestrian or road vehicle safety. The boundaries of the swept path are the closest it is safe to approach a moving tram.

[i] Headspans are wires which span from one building façade to the opposite building façade, or via poles. The electrically live contact wire is hung from the headspan. Headspan wires are normally insulated from the contact wire and therefore, are not electrically live.


[i] 21 additional vehicles will be required to operate both proposed extension schemes. Of these six are required to operate the Birmingham City Centre Extension scheme.

[i] A site located in the stabling area which can be used for internal cleaning of vehicles.


(c) Centro (June 2000) Midland Metro Future Routes Outline Business Case - Extensions to Midland Metro Line One Birmingham City Centre Tramway and Wednesbury to Brierley Hill.


(c) Centro (December 1997) Midland Metro Surface Running Study, Birmingham City Centre Engineering Evaluation.

(c) Data provided by Birmingham City Council Transport Monitoring Section, from 2001 statistics.


(c) Birmingham City Council: Joint Report of the Director of Transportation, Director of Planning and Architecture, and Director of Economic Development to the Joint Transportation and Technical Services Strategy Sub-Committee (17th February 1998) - City Centre, Street Running.

(c) Stanger (December 1997) Metro Route Option for Birmingham City centre - Environmental Study: Noise, Vibration and Dust, Stage 2 report.