

Birmingham Eastside Extension

Transport and Works Act 1992

The Transport and Works
(Applications and Objections Procedure)
(England and Wales) Rules 2006

Environmental Statement Volume 3 Non-Technical Summary



WEST MIDLANDS
COMBINED AUTHORITY



Birmingham Eastside Extension

ES Volume 3: Non-Technical Summary (NTS)

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West Midlands Combined Authority

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1 Introduction

1.1 Background

- 1.1.1 The Midland Metro light rail network serves the West Midlands and has been operating between Birmingham City Centre and Wolverhampton City Centre since May 1999. Since 1999 there have been a number of proposed extensions to the network and the West Midlands Combined Authority (WMCA) now proposes to develop an extension from Bull Street/Corporation Street to High Street Deritend in south east Birmingham. The proposed extension is approximately 1.9km in length, with 1.7km of tramway and 0.2km of road and is known as the Birmingham Eastside Extension (BEE). The drawing MMD-300207-ED00-DRA-0000-0101 – Existing and Proposed Metro Routes in Appendix A shows the location of the BEE in relation to the Midland Metro.
- 1.1.2 The WMCA (referred to as the Promoter) is applying to the Secretary of State for Transport for an order under the Transport and Works Act 1992 for the necessary permissions for the construction, maintenance and operation of the BEE.
- 1.1.3 The Promoter was established in June 2016 as the statutory successor to the West Midlands Integrated Transport Authority and the West Midlands Passenger Transport Executive ('Centro'). Transport for West Midlands (TfWM) is the 'executive' body of the WMCA responsible for transport in the West Midlands.
- 1.1.4 The development of the BEE will maximise interchange opportunities with existing railway stations and will connect the proposed High Speed 2 (HS2) Curzon Street Station with the wider Birmingham City Centre area. This BEE will facilitate the growth of the Eastside and Digbeth areas by providing new public transport links with key population, education and employment centres and provide opportunities for a reduction in the use of cars.

1.2 Environmental Impact Assessment (EIA)

- 1.2.1 As part of the Transport and Works Act Order (TWAO) process, an Environmental Impact Assessment (EIA) is required to be carried out. EIA is a process that identifies the likely significant environmental effects (both adverse and beneficial) of a proposed development during both the construction and operation phases. It ensures that the importance of these environmental effects, and the opportunity for reducing any adverse effects, are properly considered as part of the design process and are understood by the public, the relevant decision-making authorities, statutory authorities and other interested parties.
- 1.2.2 EIA assists in decision making so that environmental factors can be considered alongside economic and social factors. EIA also helps project developers to prevent, reduce and offset adverse environmental effects. The results of the EIA are presented in the Environmental Statement (ES).

EIA scope and methodology

- 1.2.3 An EIA has been carried out based on the legislative requirements set out in the European Union EIA Directive 85/337/EEC and the Transport and Works (Applications and Objections Procedure) (England and Wales) Rules 2006. This legislative process allows a request for a formal opinion from the Secretary of State for Transport as to the list of environmental topics that should be considered in an EIA. In January 2016, the Secretary of State for Transport provided a formal decision ('Scoping Opinion') which confirms the list of topics that should be considered in the EIA. A summary of the environmental topics that have been included (shown by a ✓) / excluded (shown by a ✖) in this EIA is provided in Table 1.1 below. The methods applied have followed relevant guidelines and reflect best practice.

Table 1.1: Environmental topics agreed by the Secretary of State for Transport for inclusion in the ES

Environmental topic	Construction impacts ✓/✖	Operational impacts ✓/✖
Land Use and Land Take	✓	✓
Climate Change Resilience	✓	✓
Traffic and Transport	✓ - No consideration of hazardous loads	✓ - No consideration of hazardous loads
Noise and Vibration	✓	✓
Air Quality	✓	✓
Greenhouse Gases	✓	✓
Townscape and Visual Amenity	✓	✓
Historic Environment	✓	✓
Soils, Geology and Contaminated Land	✓	✖
Water Resources and Land Drainage	✓ - No consideration of the potential impact on local canal network	✓ - No consideration of the potential impact on local canal network
Ecology	✓ - Only consideration of the potential impact on bats	✓ - Only consideration of the potential impact on bats
Socio-economic	✓	✓
Electromagnetic Fields	✓ - No consideration of the potential impact on the BEE of third-party equipment	✓ - No consideration of the potential impact on the BEE of third-party equipment
Inclusion (✓) / Exclusion (✖)		

Other developments considered within the EIA

- 1.2.4 In order for an assessment of the environmental impacts of the BEE to be carried out it was necessary to consider other developments in the vicinity that may impact upon the environment or subsequently be impacted upon by BEE. Within the BEE EIA there are two categories of development that have been considered; developments in the future environmental baseline and other committed developments which will inform the assessment of cumulative effects.

Developments in the future environmental baseline

- 1.2.5 As the BEE construction is not currently anticipated to commence until 2020 (see project timetable in Section 1.1.5), the environmental baseline against which any impacts of BEE have been assessed considered the anticipated future state of the environment in 2020.
- 1.2.6 The developments in the future baseline that are considered within the BEE EIA have been agreed with Birmingham City Council (BCC) and are listed below:
- HS2 Curzon Street Station - will be in its construction phase when the BEE starts construction; and
 - Masshouse (residential development) - will be completed when the BEE starts construction.

Committed developments

- 1.2.7 Committed developments are development proposals that have either been granted planning permission or are likely to be granted planning permission in the reasonably foreseeable future. The committed developments that are considered within the BEE EIA in assessing cumulative impacts are all mixed-use developments that have been agreed with BCC and are listed below:
- Exchange Square (Phase 1);
 - Exchange Square (Phase 2);
 - Bull Ring Trading Estate;
 - Beorma Quarter; and
 - Smithfield.

EIA consultation

- 1.2.8 Consultation has been undertaken throughout the BEE development process providing opportunities for others including the general public to influence and inform the proposals.
- 1.2.9 This has included ongoing liaison with officers of BCC, HS2, discussions with statutory consultees (for example, the Environment Agency, Severn Trent Water) and consultation with stakeholders that are potentially likely to be directly affected by the BEE.
- 1.2.10 Consultation with the general public commenced in February 2014 when two route options were presented for the section of the BEE route to the west of HS2 Curzon Street Station. Following this event a second public consultation event was held in October 2014 on the eastern section of the BEE route i.e. from HS2 Curzon Street Station to the terminus, with two route options being presented. Both events were held over a three to four week period and enabled the Promoter to understand the degree of support for the various route options.
- 1.2.11 Where feasible, the information obtained during the consultation process has been taken into consideration within the ES.

1.3 Further Information

- 1.3.1 The Promoters application for the Order is accompanied by a number of documents, amongst them an ES. The ES comprises three volumes:
- Volume 1 – Main Statement;
 - Volume 2 – Technical Appendices: these will include technical reports and figures that have been referred to in Volume 1 - Main Statement; and
 - Volume 3 - Non-Technical Summary (NTS).

- 1.3.2 This document is Volume 3 – NTS however, the full three-volume ES may be accessed online at the Promoter's website: <https://westmidlandscombinedauthority.org.uk/>

- 1.3.3 The ES along with all of the TWAO application documentation may also be viewed at the following location:

The Library of Birmingham:
Centenary Square
Broad Street
Birmingham
B1 2ND

Opening hours:
Monday to Tuesday: 11:00-19:00; and
Wednesday to Saturday: 11:00-17:00.

To purchase a hardcopy of the ES NTS or the complete three-volume ES, please contact Customer Services at the following location:

Customer Services
Midland Metro Alliance
One Victoria Square
Birmingham
B1 1BD

- 1.3.4 To purchase a hardcopy of the ES NTS or the complete three-volume ES, please contact the Midland Metro Alliance at the following location:

Customer Services
Midland Metro Alliance
7th Floor
One Victoria Square
Birmingham
B1 1BD

2 The BEE

2.1 The Scheme Boundary and Surrounding Area

- 2.1.1 The Scheme Boundary (i.e. the TWAO application area within which the BEE will be located) is situated in the east of Birmingham City Centre, to the east of New Street Station through the Digbeth and the Eastside areas. The drawings MMD-300207-HS30-DRA-0000-1001 – Scheme Boundary and MMD-300207-HS30-DRA-0000-1002 – Scheme Boundary given in Appendix A show the extent of the Scheme Boundary.
- 2.1.2 This area comprises of a mixture of land uses that have strong connections to industry and commerce with an urban character made up of warehouses and other commercial buildings, some of which have been converted to alternative uses including small studio offices, arts spaces and apartments.
- 2.1.3 BCC has longstanding plans for further investment and regeneration of Digbeth and Eastside areas, which is reflected in various BCC planning policies. Its plans involve maximising the benefits arising from improved connectivity and investment in HS2 and associated commercial, retail and residential developments.

2.2 Planning Context

- 2.2.1 National, regional and local planning and other policies relevant to the EIA for the BEE have been identified. These policies were reviewed to assess compliance of the BEE with all regulations. Chapter 4 within ES Volume 1 Main Statement provides commentary on how the BEE aligns and is consistent with all relevant policies.

2.3 BEE Route

- 2.3.1 The BEE involves the construction and operation of 1.9km with some 1.7km of tramway and 0.2km of road. The tram will run both on existing roads and through pedestrianised areas. The route alignment is shown in drawings in Appendix A MMD-300207-HS29-DRA-0000-0010 to MMD-300207-HS29-DRA-0000-0017.
- 2.3.2 The BEE route commences at the junction with BCCE at the junction of Bull Street and Corporation Street running southeast along Bull Street. The route then crosses the southern end of Dale End and runs into New Meeting Street via an area of land that is currently occupied by buildings on Kings Parade, Dale End which will need to be demolished.
- 2.3.3 The route then continues northeast along Albert Street, where there will be a tram stop, crosses Moor Street Queensway and continues as segregated track just in front of the Hotel LaTour and along Park Street passing the edge of Eastside City Park. The route then turns south across a grassed area, and then into New Canal Street to connect with the proposed HS2 Curzon Street Station where there will be a second tram stop. The route then joins the existing highway as a shared track with other road traffic running south along New Canal

Street with a tram stop just north of Bordesley Street and then continues into Meriden Street as a shared track. The route then turns eastwards onto Digbeth and then High Street Deritend where the tram will be segregated from other traffic. From here, the BEE will run in the centre of the carriageway and terminate on High Street Deritend at a stop located between Rea Street and Floodgate Street. The track will be constructed as far as the junction with Heath Mill Lane to allow for a tram turnback and lay over facility. Associated highway works will continue as far as just past the junction with Adderley Street.

2.4 BEE Elements

Tram stops

2.4.1 There will be four tram stops at the following locations:

- Albert Street;
- New Canal Street;
- Meriden Street; and
- High Street Deritend (terminus).

Trams, overhead line equipment and catenary-free operation

2.4.2 The trams will be 33 metres in length and some 2.7 metres wide. On the majority of the BEE route, the trams will be powered by batteries located on the tram roofs and not using overhead line equipment (OLE). This is known as catenary-free operation. The tram batteries are recharged by OLE along other sections of the route. As catenary-free sections do not require OLE there is no need for infrastructure works associated with attaching overhead lines to free-standing poles or buildings. This will limit the environmental impact on architecturally and historically sensitive conservation areas.

2.4.3 The BEE will comprise the following sections:

- the section from the junction at Bull Street and Corporation Street to the Albert Street tram stop would use OLE;
- the section from the Albert Street tram stop to the High Street Deritend terminus would be catenary-free; and
- the section from the High Street Deritend terminus to the tram turnback and layover facility would use OLE.

Segregated and shared track

2.4.4 The BEE trams will run on both segregated and shared track. Segregated track is where the trams are separated from all other road traffic, shared track is where trams operate on a section of track alongside either general traffic or specific types of traffic, for example only buses.

Power supply

- 2.4.5 An underground electrical chamber will be located on the corner of Bull Street and Corporation Street. An electricity substation will be located to the east of Meriden Street, south of the Meriden Street tram stop and cabinets containing electrical equipment will be required at various locations along the BEE route.

Lighting, drainage, utilities and services

- 1.1.5 During detailed design of the BEE, lighting will be reviewed and will be provided as required to suit the urban design requirements and to ensure current highway lighting standards are met. Amendments to the existing drainage system will be required to provide highway and tram track drainage. Generally this will consist of standard highway drainage features such as gullies or combined kerb drainage. To prevent flooding in the area between Moor Street Queensway and Fazeley Street, an underground flood water storage tank will be provided. Before the main construction works start, any existing services such as electricity, gas and water will be diverted away from the route of the BEE.

Highway works

- 2.3.14 The tram tracks will be installed alongside standard highway construction activities. Highway works will include realignment of existing kerb lines and junction arrangements including associated earthworks and resurfacing to highways and footways. Modifications to existing traffic signals and installation of new signals will also be required.

2.5 Mitigation measures

Design process

As part of the BEE design development, environmental mitigation measures that will be taken to avoid or reduce any adverse environmental effects have been incorporated into the BEE design. These mitigation measures are considered as part of the BEE scheme. For example the use of catenary-free system for approximately 70% of the BEE route which has been incorporated into the scheme provides environmental mitigation.

Urban Design Strategy

- 2.5.1 An Urban Design Strategy has been developed for the BEE, the principles of which have been agreed with BCC. The key design principles include:
- a simplification of paving with the use of grassed surface within the tram tracks outside Hotel LaTour;

- surface materials associated with the HS2 Curzon Street Station development to be integrated with the BEE urban design;
- careful locating of infrastructure associated with the BEE i.e. transformers, cabinets and other electrical equipment with combined OLE poles and lighting columns to reduce street clutter (e.g. unnecessary signage, advertising, railings, furniture);
- a temporary park (temporary until future development proposals come forward) to be constructed on the corner of Dale End and Albert Street on land left vacant by building demolition required to construct the BEE; and
- tree planting where feasible along the route.

Code of Construction Practice (CoCP)

- 2.5.2 In addition, mitigation measures relating to the construction phase are set out in the Code of Construction Practice (CoCP). The CoCP outlines the construction principles that the construction contractor will adhere to so to ensure that any potential environmental effects arising from construction works will be appropriately controlled and managed.

2.6 Project Timetable

- 2.6.1 An indicative timetable for the BEE is provided in Table 2.1 below. It is assumed that construction of the BEE will take up to two years. The BEE is anticipated to be operational in 2022.

Table 2.1: Indicative timetable for BEE delivery

Activity	Target period
BEE TWAO application submission	2016
Secretary of State's decision (anticipated)	2017/2018
Discharge of BEE TWAO planning conditions	2018 onwards
BEE construction	2020 to 2021
BEE commissioning, testing, operational	2022

2.7 BEE Construction

- 2.7.1 BEE construction is due to commence in 2020 and last for approximately 24 months.
- 2.7.2 An indicative construction strategy for the BEE has been developed at Chapter 6 of Volume 1 Main Statement, which provides the principles, but not the details, of the construction works that will be carried out by the construction contractor. Key activities include:
- preliminary works such as the diversion of public utilities and roads;
 - excavation of material to a depth of around 1m along the majority of the track alignment;
 - installation of track drainage;
 - installation of tram rails on a reinforced concrete base slab;

- clipping, welding, bonding of rails to the concrete track foundations;
- placing of road surfacing around the tram rails;
- installation of trams stops;
- excavation of foundations for, and installation of the substation;
- providing new kerbs and base supports for OLE poles;
- attachment of OLE to building fixings and poles; and
- landscaping.

2.7.3 Alterations to the existing highway will also be required in some areas to accommodate the BEE. These alterations will include widening of roads, closure of pedestrian access points to lower level shop on Bull Street and minor traffic flow alterations.

Building demolition

2.7.4 Demolition of a number of properties at the following locations will be required for the development of the BEE:

- 1-7 Kings Parade, Dale End which is occupied by TSB, MS Cosmetics, Pound Palace, The Money Shop, Cash Generator and McDonalds; and
- The former South and City College, Fusion Centre, High Street Deritend.

Construction hours

2.7.5 Construction hours are assumed to be 0700-1900 during weekdays and 0700-1300 on Saturdays where necessary. Some night-time working will be required to reduce unnecessary disruption to road users during day-time hours. Any work outside of the standard hours will be agreed in advance with BCC.

Construction compounds

2.7.6 It is proposed that there will be three main temporary construction compounds. These compounds will be positioned for easy access to the main areas of work and to minimise the number of traffic movements associated with the construction phase.

2.8 BEE Operation

2.8.1 It is expected that the BEE infrastructure will be regularly maintained/repared and remain operational for at least 60 years.

2.8.2 The operational hours of the BEE are assumed to be:

- Monday to Wednesday inclusive from 06:00 to 01:00; and
- Thursday to Sunday inclusive from 06.00 to 03.00.

- 2.8.3 The frequency of trams during the above operational hours are assumed to be:
- 10 trams per hour between 06:00-19:59; and
 - four trams per hour after 20:00.

3 Need and Alternatives

3.1 The Need for BEE

- 1.1.6 The introduction of HS2 to Birmingham and the proposed development of Eastside and Digbeth will stimulate new travel demand for the area, a trend that is set to increase in the future. To realise the full potential for future economic growth within these areas, high quality public transport services providing connections between Digbeth, Eastside, the proposed HS2 Curzon Street Station, Birmingham City Centre, and the surrounding area are required. The current public transport network does not achieve this and BEE aims to provide the transport solution. Similarly, the current transport network does not provide a sufficient cross city link to and from Digbeth for the significant population centres north of Birmingham and in the Black Country.
- 1.1.7 The poor connectivity between Eastside and the rest of the city centre, including key strategic city centre rail interchanges, is a barrier to growth for that area. If people are to work, live and visit Eastside and Digbeth, the rest of the city and region needs to be easily accessible by public transport. Without extending the Midland Metro, there is a risk that HS2 and the area's development will not fulfil the full geographical extent of the economic benefits anticipated. The BEE is therefore needed to fulfil the full potential of the economic benefits.

3.2 Alternatives

- 3.2.1 A range of alternatives were considered in the BEE design process:
- alternative technology;
 - alternative routes; and
 - BEE design (including components); and

Alternative technology

- 3.2.2 Alternative transport technologies to link Birmingham New Street Station and HS2 Curzon Street Station have been reviewed. These included an automated people mover (cable-hauled), cable car, dedicated taxi or shuttle bus, direct heavy rail link, monorail, personal rapid transit and traveller. There are significant challenges in constructing these technologies and they will also cause visual, noise and vibration impacts and property loss. Therefore, the Promoter considered that the tram was the most appropriate scheme in this location.

Alternative routes

Bull Street to New Canal Street initial route options

- 3.2.3 An extensive Bull Street to New Canal Street route selection exercise was carried out to establish an optimum route linking BCCE with HS2 Curzon Street Station, see Table 3.1. As part of this exercise a broad level environmental analysis of the seven route options identified was undertaken.

Table 3.1: Summary of Bull Street to New Canal Street route options initially considered.

Option	Description
Option 1	This option would run from Bull Street to High Street, Carrs Lane, Moor Street Queensway, Park Street and Curzon Street in the vicinity of HS2 Curzon Street Station.
Option 2	This option would run along the southern edge of the Martineau Galleries re development and on Albert Street. It would then follow Moor Street Queensway towards Curzon Street in the vicinity of HS2 Curzon Street Station, similar to Option 1.
Option 3	This option would start at the Bull Street/Corporation Street junction and run through the Martineau Galleries Phase 2 redevelopment. It would then run on Moor Street Queensway before terminating at the Millennium Point opposite HS2 Curzon Street Station.
Option 4	This option would start at Bull Street and run through the northern part of the Martineau Galleries redevelopment. It would then follow Priory Queensway, Masshouse Lane and Park Street before terminating at Millennium Point opposite HS2 Curzon Street Station.
Option 5	Option 5 would run in front of the Wesleyan Building. It would then turn towards Priory Queensway to follow a route similar to Option 4.
Option 6	This option would start at New Street/Corporation Street, continuing along New Street and High Street before either joining Option 1 into Carrs Lane or continuing on to pass through the proposed Martineau Galleries Phase 2 re-development.
Option 7	Option 7 is comprised of an eastbound track along the line of Option 2 and a westbound track along the line of Option 1.

3.2.4 Further work on all the options in Table 3.2, resulted in a preference for Option 1 (along Bull Street – High Street – Carrs Lane) and Option 2 (along Bull Street - Albert Street/New Meeting Street). Route Option 1 and 2 were subsequently presented at public consultation where Option 2 was identified as the preferred route.

3.2.5 In summary, the main reasons for the choice of Option 2 was that it will deliver lower costs, faster journey times, less potential for journey delays and fewer impacts on the local highway and bus networks. In terms of environmental issues that were taken into account, Option 2 was judged to only have minor negative effects on noise and townscape, whereas Option 1 was judged to have minor negative environmental impacts that included noise and geo-environmental issues.

New Canal Street to terminus route options

3.2.6 Based on the publication of plans relating to HS2 Curzon Street Station and consultation with BCC and other organisations, it was considered that a Fazeley Street option and a High Street Deritend option were feasible, see Table 3.2.

Table 3.2: Route options from New Canal Street to terminus

Option	Description
Fazeley Street	The route would run along Fazeley Street from the junction with New Canal Street. It would turn onto Liverpool Street, where a stop would be located close to the junction with Great Barr Street and Heath Mill Lane. The route would continue into Adderley Street where it would terminate.
High Street Deritend	The route would run southwards along New Canal Street before running onto Meriden Street and turning left onto High Street Deritend. The route would operate along the centre of High Street Deritend, with a stop located close to the junction with Milk Street serving Digbeth Coach Station and the Custard Factory. The route would continue into Adderley Street where it would terminate.

Following public consultation the High Street Deritend route was identified as the preferred route due to its proximity to a number of specific locations in the Eastside of Birmingham and the route choice being a stimulus for economic regeneration. A tram stop was also added at Meriden Street to support the regeneration of the Curzon street area.

Alternative design

3.2.7 The design, including location of the BEE components, has changed during the EIA process as a result of consultation with stakeholders to improve the design and minimise environmental effects as illustrated by the following design considerations:

- moving a tram stop from a location outside Hotel LaTour to Albert Street in to better serve the proposed HS2 station and future developments in the immediate vicinity of Albert Street;
- moving the BEE terminus from Adderley Street to High Street Deritend, in order to avoid additional land acquisition in Adderley Street and property demolition;
- advanced archaeological watching brief to be undertaken during the ground investigation (GI) at EIA stage, in order to avoid/minimise any potential for negative impacts on buried archaeology and minimise delays to the construction programme;
- no OLE fixings are proposed on listed buildings, in order to avoid any potential for impact on the heritage assets and their settings, this was possible as poles can be accommodated within the route corridor;
- Meriden Street tram stop platforms have been moved north of the junction with Bordesley Street in order to avoid the need for demolishing buildings on Meriden Street;
- the number of construction compounds initially being considered has been reduced from seven to three, in order to reduce any potential for negative environmental effects;
- the BEE alignment along High Street Deritend has been amended with the provision of a central reserve between the opposing tram tracks, in order to provide a safer environment for all road users (pedestrians, tram users, vehicles). In addition, at the eastern end of the BEE route, a kerbed area has been formed to allow for tram overrun to be accommodated;

- the location of the substation has been moved from its original location on Meriden Street, north of Bordesley Viaduct to south of the viaduct so as to avoid the need to demolish any buildings on Meriden Street; and
- advance warning to the tram operator and the public on visual display boards via tannoy to be provided at High Street Deritend tram stop in case of disruption to tram services.

4 Summary of EIA Findings

4.1 Land Use and Land Take

- 4.1.1 The BEE does have some temporary land uses during the construction phase for example for the temporary use of the three construction compounds. This temporary use of land during the construction phase is not considered to be significant.
- 4.1.2 The operation of the BEE will result in the loss of some existing retail and commercial floorspace, albeit this is limited to a small number of locations where it is not possible to accommodate the alignment of the tramway without affecting third party land. These locations and the land take stated in brackets in square metres include the corner of Corporation Street and Bull Street (258m²); the corner of Albert Street and Bull Street (1507m²); the temporary surface car park land (1035m²); an area of open space (6690m²), New Canal Street (664m²), commercial land 96-98 Coventry Street (2701m²) and the Corner of Meriden Street and High Street Deritend (1578m²).
- 4.1.3 The optioneering exercise undertaken during the design of the scheme has sought to avoid and minimise, where possible the need to take third party land and associated demolition of buildings and structures. However, The BEE does lead to some effects on land take. The extent of this permanent land take is considered to have a moderate adverse effect that is considered to be significant.

4.2 Climate Resilience

- 4.2.1 As part of the EIA, a Climate Change Risk Assessment (CCRA) was undertaken. The CCRA evaluated the various BEE design components and identified measures within the design that would assist in adapting to climate change and as such contribute towards the climate resilience of the BEE.
- 4.2.2 The findings of the CCRA provide an assessment of the expected performance of the BEE under current climate conditions and projected future climate change.
- 4.2.3 The CCRA considered a range of climatic factors; high and low temperature extremes, precipitation extremes (including heavy and prolonged rainfall, thunderstorms, lightning and hail, fog, and snow), strong winds and strong sunshine. All of these have the potential to do harm to the BEE infrastructure with potential consequences including deterioration in infrastructure, increased maintenance, increase disruption to users affecting journey time and increased risk to users and staff. Each of these climate risks has been examined against the BEE design to assess its climate resilience.
- 4.2.4 The results of the CCRA have identified that there are some climatic factors that are considered to be high risk to the BEE; high and low temperature extremes, thunderstorms and lightning, and strong winds. However the assessment of the BEE design components has identified that the majority of the components also have a high level of climate resilience.

There are three areas of medium resilience; heavy rainfall impacting on the tram alignment, strong winds impacting on the tram alignment, and strong winds impacting on the tram vehicles.

- 4.2.5 It is considered that no additional climate change adaptation measures are required over and above those already incorporated within the BEE design.

4.3 Traffic and Transport

- 4.3.1 The traffic and transport assessment considers the potential impact of the BEE upon the local road network, the public transport network, pedestrians, cyclists and road safety.
- 4.3.2 Within the vicinity of the BEE there are a high number of pedestrian footways and a variety of pedestrian crossings at key locations.
- 4.3.3 There is a large public transport network in the vicinity of the BEE; Moor Street Queensway is one of six bus interchanges in Birmingham City Centre and High Street Deritend is a major route for buses with over 100 buses per hour using the route in peak periods. Birmingham Coach Station is also located on High Street Deritend.
- 4.3.4 During construction the low levels of predicted construction traffic associated with each stage of the construction process will not cause excessive change in the average amount or composition of traffic. The introduction of low levels of additional construction traffic within the study is also not anticipated to have a detrimental impact on road safety or to have the potential to contribute to higher levels of collisions.
- 4.3.5 The provision of temporary pedestrian facilities including footways and formalised crossings will ensure that no excessive delay for pedestrians will be introduced. The small amount of additional traffic will also not contribute to changes in the pedestrian experience in the vicinity of the BEE.
- 4.3.6 Changes in traffic flow as a result of the BEE construction process are not anticipated to have an adverse or beneficial impact on local roads within the area in relation to pedestrian's experience of fear and intimidation.
- 4.3.7 There are no likely significant adverse or beneficial temporary effects on any receptors within the study area during the construction of the BEE.
- 4.3.8 There will be an increase in driver delay on Heath Mill Lane / Liverpool Street and High Street Deritend, east of Alcester Street. This is considered to be a moderate adverse significant effect.
- 4.3.9 There will be a number of significant beneficial effects on pedestrians at locations including Dale End, Moor Street Queensway, Fazeley Street, New Canal Street, High Street Deritend,

Milk Street and Heath Mill Lane. These significant beneficial effects are due to a reduction in the average amount of traffic along these sections of the BEE route which will reduce the levels of fear and intimidation or perception of severance which is currently experienced by pedestrians on these roads.

4.4 Noise and Vibration

- 4.4.1 Noise impacts are likely to arise due to construction activities at sensitive receptors immediately adjacent to the BEE route during some stages of the works. This is mainly associated with excavation of the carriageway for track formation, the installation of rails and road surface works. It is considered that the noise effects during construction will be mitigated by the construction contractor who will use good on site practice for the control of noise including best practicable means and the adoption and implementation of the CoCP. Therefore, noise effects from the construction work are not considered to be significant.
- 4.4.2 No significant adverse effects are anticipated for noise and vibration associated with the operation of the trams or tram infrastructure.
- 4.4.3 An indirect effect of the operation of BBE will result in changes in traffic flow (volumes, speeds and proportion of Heavy Goods Vehicles) that will lead to adverse impacts to sensitive receptors away from the BEE scheme. Some of the receptors are predicted to experience a significant adverse effect. These indirect effects are likely to arise from changes to the road network as a result of other proposed developments including HS2 that are included in the traffic model.

4.5 Air Quality

- 4.5.1 An air quality assessment has been carried out for the construction and operational phases of the BEE. The assessment has involved a desk based study and a six month air quality monitoring survey undertaken between November 2015 and June 2016 to measure existing concentrations of nitrogen dioxide (NO₂) in the vicinity of the BEE.
- 4.5.2 The assessment has identified that some construction activities are likely to generate dust which has the potential to cause annoyance (e.g. discolouration of surfaces) at nearby locations if uncontrolled. However, with the incorporation of good construction practices as outlined within the CoCP, no significant temporary air quality effects are expected to occur during construction of the BEE.
- 4.5.3 The air quality effects of the operation of the BEE have been assessed at number of locations in the vicinity of the BEE using computer simulation which has been verified against the air quality monitoring survey data.

- 4.5.4 The results of the computer simulations identify that annual mean NO₂ concentrations are expected to improve or experience a negligible change at the majority of locations assessed. While there are some areas which are predicted to experience an increase in changes in NO₂ concentrations these changes are not considered to be significant. Changes in dust concentrations as a result of the BEE are considered to be 'negligible' at all assessed locations and the resultant concentrations are predicted to be below the relevant air quality objectives and these changes are not considered to be significant.

4.6 Greenhouse Gases

- 4.6.1 The potential impact of the BEE on greenhouse gases (GHG) emissions will occur through the use of construction materials building the BEE, through energy use when the BEE is operational and through subsequent changes to other methods of transport when the BEE is operational. There are six main GHG: carbon dioxide (CO₂), methane, nitrous oxide, perfluorocarbons, hydrofluorocarbons and sulphur hexafluoride. Any GHG emissions from the BEE will primarily relate to CO₂.
- 4.6.2 The construction activities will lead to emissions of GHG. However, the CoCP will include a number of measures that will minimise the emissions from construction plant and construction traffic as far as possible. Some of the measures included will also take into account possible reuse of construction materials, thereby further reducing potential emissions.
- 4.6.3 Although an indirect source of emissions, the use of materials for construction is predicted to be the largest contributor to construction impacts. Some measures to reduce material use have already been included in the BEE design. Further consideration will be given to the use of sustainable materials during subsequent design phases. Given the level of the emissions associated with construction, they are not considered to lead to a significant impact compared with other emissions sources considered in the assessment over the lifetime of BEE.
- 4.6.4 The BEE will lead to an increase in emissions of GHG due to its use of energy from the powering the trams and associated infrastructure. The changes in emissions associated with the BEE are very small in the context of existing emissions from the transport network in Birmingham and are not considered to be significant.

4.7 Townscape and Visual

- 4.7.1 A townscape and visual impact assessment has been carried out for the construction and operational phases of the BEE. The townscape assessment is concerned with the physical changes in the character of the townscape whilst the visual assessment focuses on the changes to people's views.

Townscape

- 4.7.2 There are three townscape character areas (TCA) identified within the vicinity of the BEE route: the City Core TCA, Eastside TCA and Digbeth TCA. The TCA are discrete areas that have distinct characteristics and are based on BCC planning policy.
- 4.7.3 Overall, the City Core and Digbeth TCA can accommodate the type of change proposed without key characteristics being fundamentally altered. Construction of the HS2 Curzon Street Station will be taking place between 2017 and 2026 adjacent to construction of the BEE where it passes through the Eastside TCA, which will lower the TCA susceptibility to change.
- 4.7.4 During the construction phase there will be temporary moderate adverse significant effects on the City Core TCA and the Digbeth TCA but these effects will affect a relatively small proportion of the overall TCA. The construction activities associated with the HS2 Curzon Street Station development will temporarily reduce the sensitivity of the Eastside TCA and consequently the BEE will result in a temporary minor adverse non-significant effect.
- 4.7.5 In the operation phase of the BEE, the introduction of a high quality and consistent approach to paving and street furniture and a reduction in street clutter will enhance townscape character and therefore result in a permanent minor beneficial effect on the City Core TCA and Digbeth TCA. The loss of trees, the introduction of trams and the increased presence of buses in the Eastside TCA will result in a permanent minor adverse effect on the Eastside TCA. Neither of these effects are significant.

Visual amenity

- 4.7.6 The visual effects of the BEE were assessed from 18 viewpoints within the vicinity of the BEE route- these viewpoints were agreed with BCC.
- 4.7.7 Due to the dense urban environment lining the BEE route, most visual receptors identified are in very close proximity to the construction works. Receptors (i.e. people) in Moor Street Queensway, Eastside City Park, on the mainline to Birmingham New Street Railway Station and in New Canal Street will see the BEE construction works in the context of the adjacent large scale HS2 Curzon Street Station construction site.
- 4.7.8 It is predicted that the BEE will result in temporary significant adverse effects on the following visual receptors during construction: pedestrians and users of Bull Street shops and restaurants, guests at Hotel LaTour and residents along New Canal Street, and those in upper floors above shops along High Street Deritend. There will also be significant adverse temporary visual effects from New Canal Street (within Warwick Bar (Bordesley) Conservation Area) and looking east and west from Digbeth, Deritend and Bordesley High Streets Conservation Area.

4.7.9 There will be no significant impacts on visual receptors during the first year of the BEE operation. The majority of the receptors will have minor beneficial or negligible effects. There will be minor adverse effects during operation on pedestrians and road users of Moor Street Queensway, users of Eastside City Park, guests at Hotel LaTour and residents in the Hive apartments along Park Street and occupiers in other parts of the Masshouse development.

4.7.10 After five years of the BEE operation, there will be no change in the assessment of views apart from guests at Hotel LaTour (the impact will then become minor beneficial), users of Eastside City Park and residents in the Hive apartments along Park Street and occupiers in other parts of the Masshouse development (the impacts will then become negligible).

4.8 Historic Environment

4.8.1 The assessment identified that within a 200m study area from the centre of the BEE tram alignment, that there are 31 listed buildings and 58 locally listed buildings.

4.8.2 The BEE will pass through two conservation areas; Warwick Bar Conservation Area, designated due to its historic canal side setting, and Digbeth, Deritend and Bordesley High Street Conservation Area, designated for its remnants of medieval settlement. The BEE also passes through Digbeth and Deritend Area of Archaeological Significance where there is a high potential for 12th Century remains.

4.8.3 There is likely to be buried archaeology in the vicinity of the BEE relating to medieval settlements in the High Street Deritend area and post-medieval industrial activity in the Park Street and High Street Deritend area.

4.8.4 The assessment has identified that New Canal Street and Meriden Street are the most sensitive areas to construction activities as both streets have a relatively quiet industrial setting with canals and railway heritage including the 19th Century railway viaduct.

4.8.5 It is anticipated that temporary construction activities close to the fronts of the listed and the locally listed buildings within both the Warwick Bar and the Digbeth/Deritend Conservation Areas will have a likely significant adverse effect upon their late Victorian/Edwardian industrial setting.

4.8.6 During the course of construction it is anticipated that there will be significant major adverse effects on the buried archaeology in the area. Specifically, in the burial ground at Park Street Gardens and St John's Chapel on High Street Deritend. However, the exact impact will not be known until additional archaeological surveys are carried out prior to construction. The draft TWAO makes provision for controls on the excavations of buried remains.

4.8.7 The assessment has concluded that there are no likely significant adverse effects from the operation of the BEE on the historic environment. The BEE will only affect an approximate 2% of the total conservation area impacting along New Canal Street and Meriden Street.

- 4.8.8 Although not significant, there are operational impacts which are likely to be beneficial to the conservation areas. These include improved pedestrian connections allowing for better connectivity between Birmingham City Centre and these historic areas, a reduction in the number of vehicles and a reduction in the amount of street clutter (i.e. removal of redundant poles and signage) which will enhance and restore the industrial feel and setting of the conservation areas.

4.9 Soils, Geology and Contaminated Land

- 4.9.1 The Scoping Opinion has stated that the assessment of the construction and operational effects on soils and geology can be scoped out (i.e. excluded) and as such, the assessment has only focused on the issues of contaminated land or groundwater.
- 4.9.2 Historically, the assessment study area included a greater proportion of industry than currently exists. A number of historic sites have been identified as potential contributors of industrial pollution including metal production works, plastic processing works and a waste processing plant. Other historic land use includes metal working, timber yards, gas works and canal wharves. Current potentially polluting industrial activities include car dealerships, electric goods manufacturing and garage services.
- 4.9.3 Ground investigation, including soil, leachate (liquids that contains dissolved pollutants) and groundwater testing, has been undertaken along the BEE route in 2016. The results of this ground investigation will enable the preparation of a remediation strategy, in order to ensure appropriate management of contaminated land, where present, during the BEE construction.
- 4.9.4 The embedded mitigation measures detailed in the CoCP include the appropriate removal, storage and reuse of soil and the correct storage and disposal, as necessary, of potentially contaminated soils, fuels, chemicals and waste. Measures will be in place in case any contaminative substances are encountered and relevant specialists will be required to carry out further assessment. An emergency action plan will also be prepared and implemented in the event of a potential leak or spillage occurring.
- 4.9.5 The implementation of the embedded mitigation related to ground investigation and the CoCP will result in no likely significant contamination effects from the BEE construction or operation on the soils, geology, groundwater or surface water.

4.10 Land Drainage and Water Resources

- 4.10.1 The potential impacts on land drainage (surface water runoff and combined sewers) and water resources (rivers, canals and groundwater) during construction and operation of the BEE have been assessed through a desk based assessment and following a site visit. A Flood Risk Assessment (FRA) has also been carried out.

- 4.10.2 The FRA has identified that the majority of the BEE is within Flood Zone 1 - the area of lowest flood risk. The section of the BEE that runs through some sections of High Street Deritend are located in Flood Zone 2 and 3 - the area with a medium and highest flood risk, respectively. The main source of flood risk is from the River Rea which crosses under the BEE, in a culvert running under High Street Deritend.
- 4.10.3 This section of the BEE within the higher risk flood area will stop operating during flood events and a warning system will be provided for advising tram users of the potential flood situation.
- 4.10.4 The potential land drainage construction impacts include localised flooding due to over discharge of construction surface water runoff; accidental spillage or leakage of pollution substances into the sewers or drains. The potential operational impacts include increased surface water flood risk around Park Street Gardens due to an increase in paved area associated with the BEE route crossing the parkland.
- 4.10.5 Appropriate mitigation measures including implementing good site practices during construction and scheduled monitoring and cleaning of sewers and drains to avoid the build-up of silt during the operational stage. Subject to these mitigation measures, the significance of the impacts to land drainage in the vicinity of the BEE will be reduced to not significant.
- 4.10.6 The potential construction impacts on the River Rea are localised flooding due to siltation and accidental spillage or leakage of polluting substances. The Digbeth Branch Canal is located a sufficient enough distance that it is not expected that the BEE would cause any significant effect on this watercourse. The potential construction impacts on ground water include potential discharge of contaminated surface water directly to the ground with polluting substances or surface water containing increased loads of suspended solids. During the construction stage, mitigation measures including a sedimentation tank used to remove sediments from the construction works runoff will reduce likely significant effects to surface watercourses and ground water to not significant.
- 4.10.7 There is no negative impact to the surface watercourses or groundwater during the operational stage. In contrast, the development of the BEE will create flood storage in the form of an underground storage tank near High Street Deritend. This is considered as a positive impact to the surrounding area both upstream and downstream of the River Rea.

4.11 Ecology and Biodiversity

- 4.11.1 The potential effects of the BEE on ecology and biodiversity during construction and operation have been assessed following a desk-based study and site visits.
- 4.11.2 Four sites of local ecological importance are located within 100m of the BEE alignment. All four are Sites of Local Importance for Nature Conservation and are designated for their canal habitat.

- 4.11.3 An ecological survey of the BEE was undertaken in March 2015 and updated in June 2016. The habitats recorded are all common; amenity grassland, buildings, hardstanding, introduced shrub, parkland scattered trees, scattered shrub and running water, and have either a low or negligible ecological value.
- 4.11.4 Based on previous ecological studies along with information in the Scoping Opinion and subsequent consultation with BCC, the ecological assessment has been confined to only the assessment of the potential impact on bats in the vicinity of the BEE.
- 4.11.5 Overall the BEE study area has a very low ecological value, to the point where the loss of habitats due to the development of the BEE is not likely to have a significant effect on ecology including bats during either construction or operation. In addition, the proposed landscape planting has the potential to slightly increase biodiversity within the Scheme Boundary but not to the point that it is significant.

4.12 Socio-Economics

During the construction of BEE, there will be significant permanent effects arising from the loss of land used for employment that is the retail businesses at Kings Parade. There will also be the permanent loss of land used by a car parking business on Meriden Street to allow development of a substation that is considered to be significant.

There will be jobs created and the BEE will contribute to the economic growth in Birmingham. It is expected that some 30 jobs will be created during the construction phase. During operation several key significant beneficial effects are predicted. Some 110 to 230 jobs will be created as a result of the operation of the BEE scheme. This will result in approximately £4.7m to £9.5m in GVA growth in the local area.

BEE will provide better public transport connections to Digbeth and Eastside from Birmingham City Centre, and from Eastside into Birmingham City Centre and west of the centre towards Five Ways and also north towards West Bromwich and Wolverhampton. This has the potential to encourage the economic development and regeneration of the area by improving accessibility to these areas and also to HS2 Curzon Street Station, national and local rail stations and also Birmingham Coach Station. As a result, there will be improved access to employment opportunities, good and services through improved public transport provision between the City Centre, Digbeth and the proposed HS2 site. This beneficial effect is considered to be significant.

4.13 Electromagnetic Fields

- 4.13.1 A desk study has been carried out to assess the potential for effects of electric and magnetic fields arising from the BEE.

- 4.13.2 Electric and magnetic fields are produced wherever electricity is used. Electromagnetic fields (EMF) cause interference with electronic equipment and, if high levels are present, may have short-term effects on human health including blurred vision and dizziness.
- 4.13.3 Any potential electromagnetic issues on the BEE will be mitigated by complying with the requirements of the EU Electromagnetic Compatibility (EMC) Directive, so that equipment installed on the BEE will not suffer electromagnetic interference within the local environment.
- 4.13.4 No likely significant electromagnetic compatibility effects are expected along the route of the BEE and the adjacent environment during either the construction or operational phase.

5 Summary of Environmental Effects

- 5.1.1 An assessment of the BEE has been completed for each of the environmental topics. The EIA process is undertaken with the purpose of identifying effects resulting from the BEE which are considered to be 'significant' despite inclusion of the proposed mitigation measures. The likely significant environmental effects arising from the BEE during both the construction and operation stages are summarised in Table 5.1.

Table 5.1: Significant effects of the BEE

Environmental topic	Significant effects identified	
	Construction phase	Operational phase
Land Use and Land Take	No	Yes (adverse)
Climate Resilience	No	No
Traffic and Transport	No	Yes (beneficial and adverse)
Noise and Vibration	No	Yes (adverse)
Air Quality	No	No
Greenhouse Gases	No	No
Townscape and Visual Amenity	Yes (adverse)	No
Historic Environment	Yes (adverse)	No
Soils, Geology and Contaminated Land	No	No
Land Drainage and Water Resources	No	No
Ecology and Biodiversity	No	No
Socio-economic	Yes (adverse)	Yes (beneficial)
Electromagnetic Fields	No	No

- 5.1.2 Table 5.1 shows that potentially significant adverse effects are related to:

- Traffic and Transport - during the BEE operation;
- Noise and Vibration – indirect effects during the BEE operation;
- Townscape and Visual Amenity- during the BEE construction;
- Socio-economics; during construction; and
- Historic Environment- during the BEE construction.

- 5.1.3 Table 5.1 also shows there are likely to be significant beneficial effects which are related to:

- Traffic and Transport- during the BEE operation; and
- Socio-economics – during operation.

Appendices

A.	Appendix A - Drawings	27
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A. Appendix A - Drawings

MMD-300207-ED00-DRA-0000-0101 – Existing and Proposed Metro Routes

MMD-300207-HS30-DRA-0000-1001 – Scheme Boundary (Sheet 1 of 2)

MMD-300207-HS30-DRA-0000-1002 – Scheme Boundary (Sheet 2 of 2)

MMD-300207-HS29-DRA-0000-0010 – Key Plan

MMD-300207-HS29-DRA-0000-0011 – Route Layout (Sheet 1 of 7)

MMD-300207-HS29-DRA-0000-0012 – Route Layout (Sheet 2 of 7)

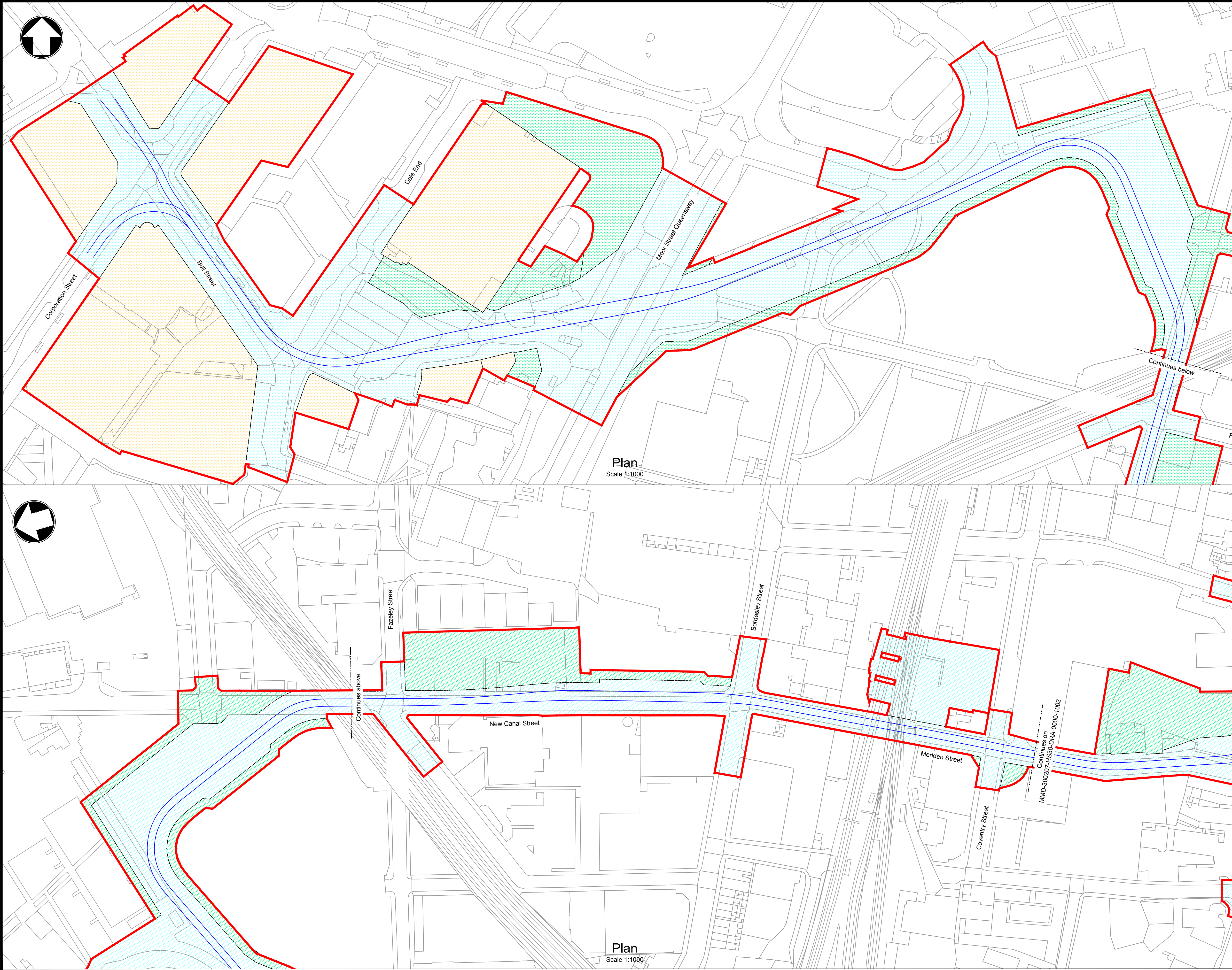
MMD-300207-HS29-DRA-0000-0013 – Route Layout (Sheet 3 of 7)

MMD-300207-HS29-DRA-0000-0014 – Route Layout (Sheet 4 of 7)

MMD-300207-HS29-DRA-0000-0015 – Route Layout (Sheet 5 of 7)

MMD-300207-HS29-DRA-0000-0016 – Route Layout (Sheet 6 of 7)

MMD-300207-HS29-DRA-0000-0017 – Route Layout (Sheet 7 of 7)



- Notes
1. All dimensions are in metres unless otherwise stated.
 2. Do not scale any items or information from this drawing.

Key to symbols

Key to Plan:

- Limit of Deviation and of Land to be Acquired or Used
- Limit of Land to be Used Temporarily
- Limit of Land with Rights to Attach Equipment to Buildings
- Tramway Centrelines
- Scheme Boundary

Reference drawings

P1	19.09.16	EQ	First Issue.	CS	GL
Rev	Date	Drawn	Description	Ch'k'd	App'd

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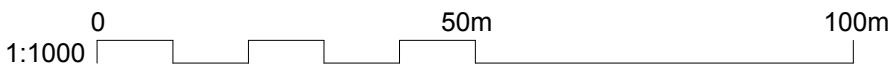
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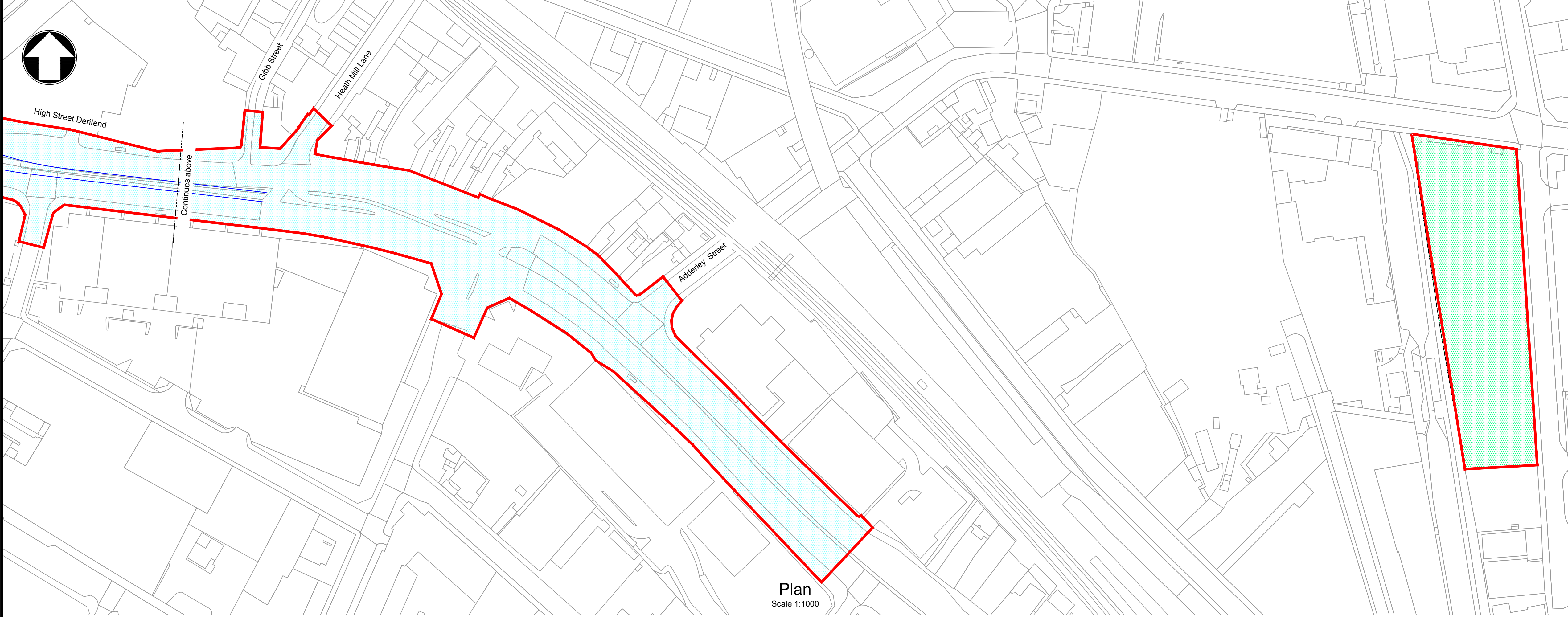
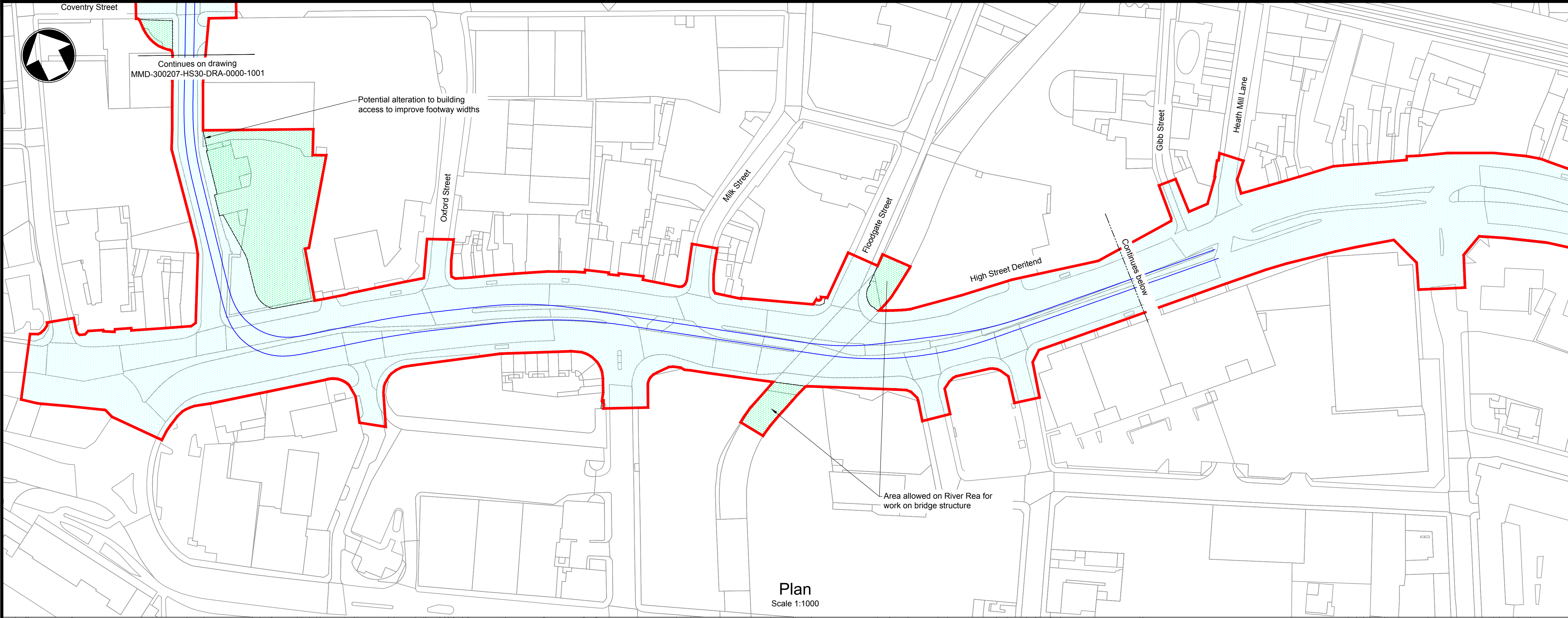
**centro**
transforming public transport

Client
Centro
Centro House
16 Summer Lane
Birmingham
B19 3SD

Title
Midland Metro Phase 2
Birmingham Eastside Extension
Scheme Boundary
(Sheet 1 of 2)

Designed	E.Quarshie	Eng check	C.Searson
Drawn	E.Quarshie	Coordination	C.Searson
Dwg check	A.Griffiths	Approved	G.Last
Scale at A1	1:1000	Status	PRE
Drawing Number	MMD-300207-HS30-DRA-0000-1001	Rev	P1





Notes

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Key to Plan:

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- Tramway Centrelines
- Scheme Boundary

Reference drawings

P1	19.09.16	EQ	First Issue.	CS	GL
Rev	Date	Drawn	Description	Ch'k'd	App'd

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Title

Midland Metro Phase 2
Birmingham Eastside Extension
Scheme Boundary
(Sheet 2 of 2)

Designed	E.Quarshie	Eng check	C.Searson
Drawn	E.Quarshie	Coordination	C.Searson
Dwg check	A.Griffiths	Approved	G.Last

Scale at A1	Status	Rev
1:1000	PRE	P1

Drawing Number

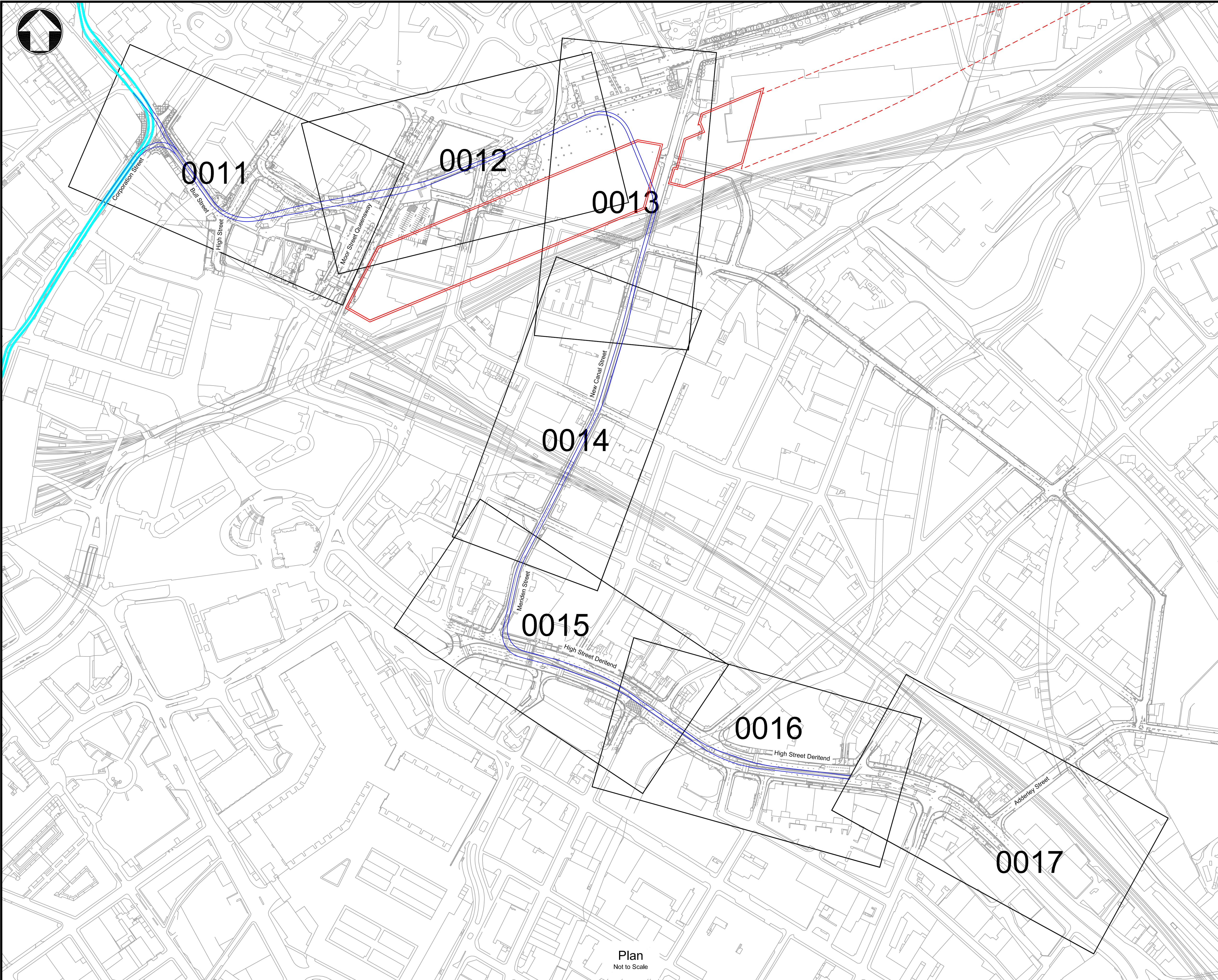
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0 50m 100m
1:1000



- Notes
1. All dimensions are in metres unless otherwise stated.
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- Key to symbols
- Indicative BEE Route
 - Indicative BCCE Route
 - HS2 Station Building outline (indicative only)
 - - - HS2 Viaduct outline (indicative only)

Reference drawings

MMD-300207-HS29-DRA-0000-0011 - Route Layout (Sheet 1 of 7)
MMD-300207-HS29-DRA-0000-0012 - Route Layout (Sheet 2 of 7)
MMD-300207-HS29-DRA-0000-0013 - Route Layout (Sheet 3 of 7)
MMD-300207-HS29-DRA-0000-0014 - Route Layout (Sheet 4 of 7)
MMD-300207-HS29-DRA-0000-0015 - Route Layout (Sheet 5 of 7)
MMD-300207-HS29-DRA-0000-0016 - Route Layout (Sheet 6 of 7)
MMD-300207-HS29-DRA-0000-0017 - Route Layout (Sheet 7 of 7)

P3	15/09/2016	JK	Revised Alignment.	CMS	GJL
P2	29/04/2016	EQ	Revised Alignment.	CMS	GJL
P1	16/09/2015	JK	First Issue.	CMS	GJL
Rev	Date	Drawn	Description	Ch'k'd	App'd



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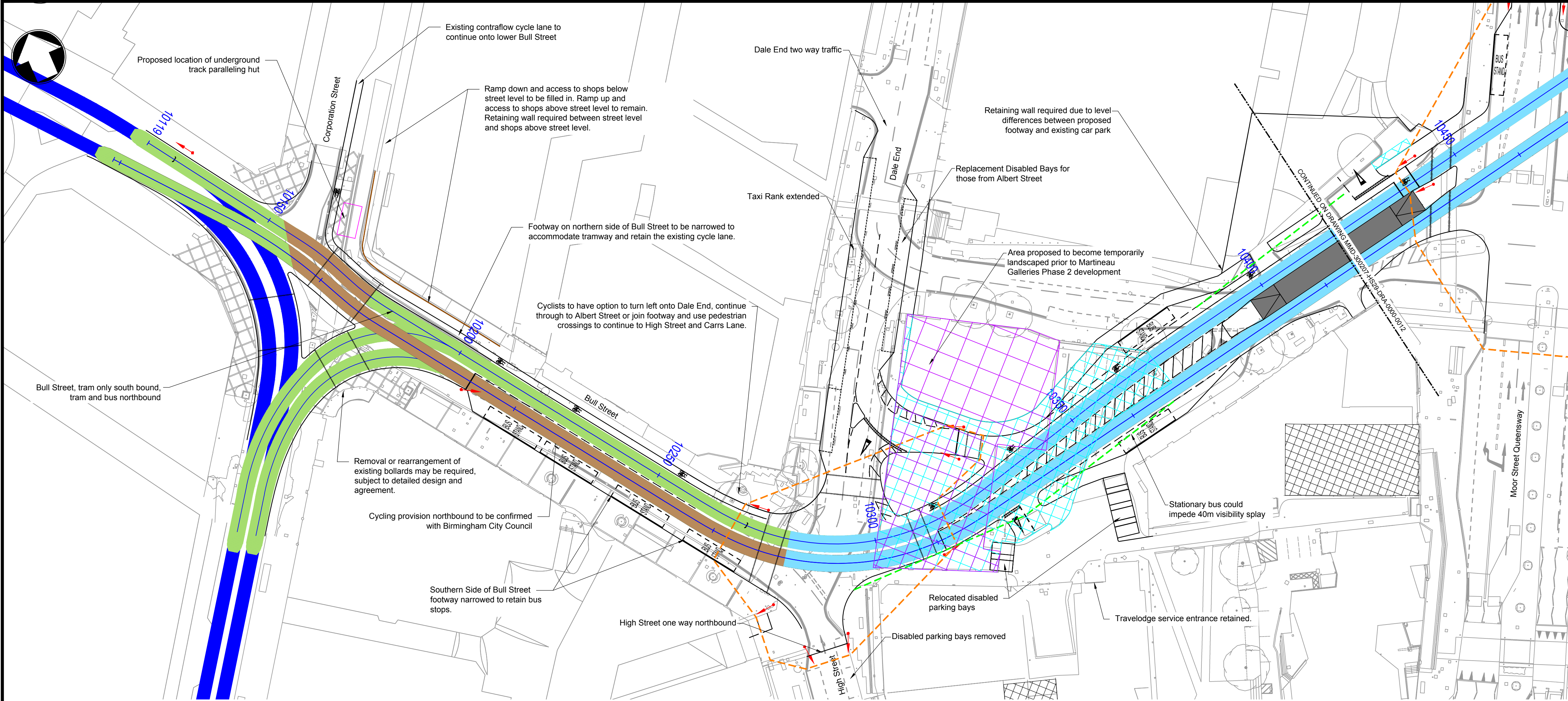


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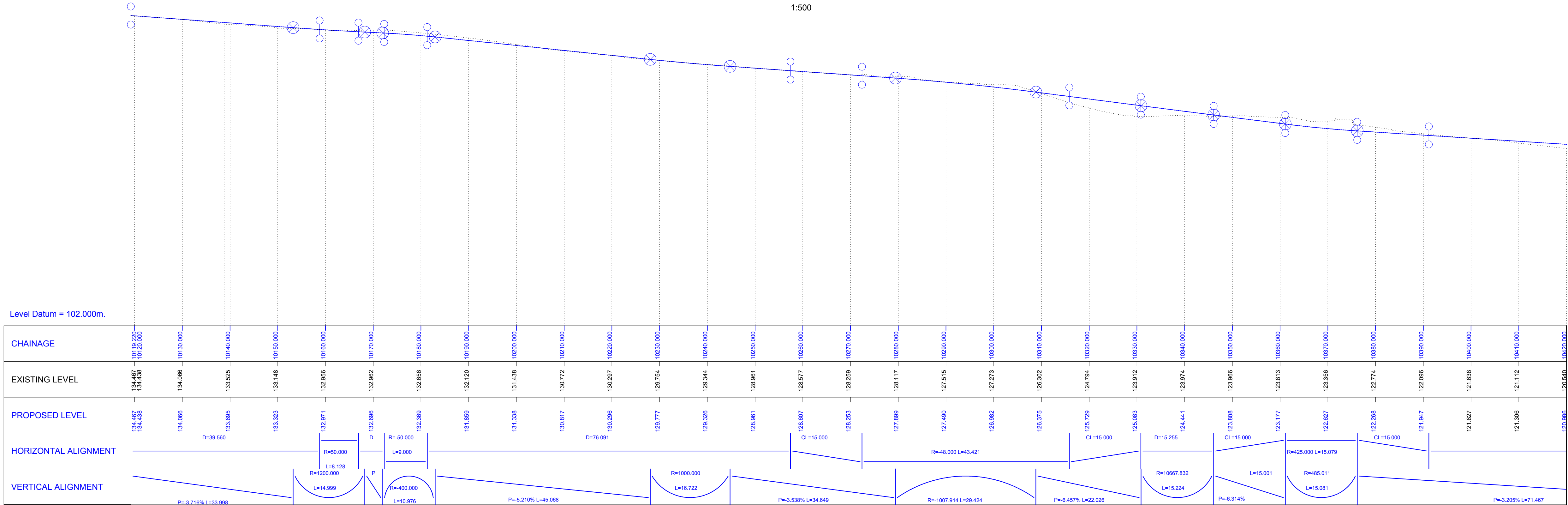
Title
Midland Metro Phase 2
Birmingham Eastside Extension
Route Layout
Key Plan

Designed	E.Quarshie	Eng check	C. Searson
Drawn	E.Quarshie	Coordination	C. Searson
Dwg check	A. Griffiths	Approved	G. Last
Scale at A1	Status	Rev	
As Shown	PRE	P3	

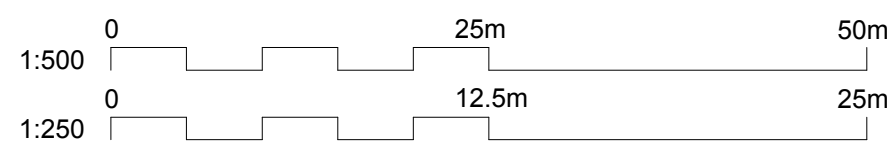
Drawing Number
MMD-300207-HS29-DRA-0000-0010



Plan
1:500



Long Section
Chainage 10119 to 10420
Scale - H = 1:500, V = 1:250



- Notes
- All dimensions are in metres unless otherwise stated.
 - Do not scale any items or information from this drawing.
 - Service locations not considered during design.
 - The Developed Kinematic Envelope (DKE) of the tram is based upon the updated Generic Tram DKE Model for 'Type A Vehicles'. Refer to Mott MacDonald Ltd report reference MMD-300207-SL02-DOC-0001.
 - Footway and platform widths are subject to modeling.
 - Electrical equipment (LV, lighting, OLE and associated cabinets) to be confirmed. Land take shown for possible locations of cabinets required at each tram stop.

- Key to symbols
- Key to Plan:
- Proposed Tramway Centreline
 - Birmingham City Centre Extension
 - Shared Track
 - Segregated Track
 - Shared trams and buses
 - Edge of Kerb
 - Land Take
 - Buildings to be Demolished
 - Primary Signal Head and 4m Pole
 - Proposed Road Markings
 - Proposed Tram Stop
 - HS2 Station Building Outline (Indicative Only)
 - Existing Bridge
 - Proposed Retaining Wall
 - Junction Intervisibility
 - Junction visibility splays
 - Listed Buildings
 - Proposed Planting
- Key to Long Section:
- Existing Level
 - Proposed Level
 - Horizontal Tangent Point
 - Vertical Tangent Point

- Reference drawings
- MMD-300207-HS29-DRA-0000-0010 - Route Layout - Key Plan
MMD-300207-HS29-DRA-0000-0012 - Route Layout (Sheet 2 of 7)
MMD-300207-HS29-DRA-0000-0013 - Route Layout (Sheet 3 of 7)
MMD-300207-HS29-DRA-0000-0014 - Route Layout (Sheet 4 of 7)
MMD-300207-HS29-DRA-0000-0015 - Route Layout (Sheet 5 of 7)
MMD-300207-HS29-DRA-0000-0016 - Route Layout (Sheet 6 of 7)
MMD-300207-HS29-DRA-0000-0017 - Route Layout (Sheet 7 of 7)

P4	15/09/2016	JK	Updated Long Section.	CMS	GJL
P3	18/08/2016	JK	Revised Highway Alignment.	CMS	GJL
P2	04/05/2016	EQ	Revised Alignment.	CMS	GJL
P1	16/09/2015	JK	First Issue.	CMS	KC
Rev	Date	Drawn	Description	Ch'k'd	App'd



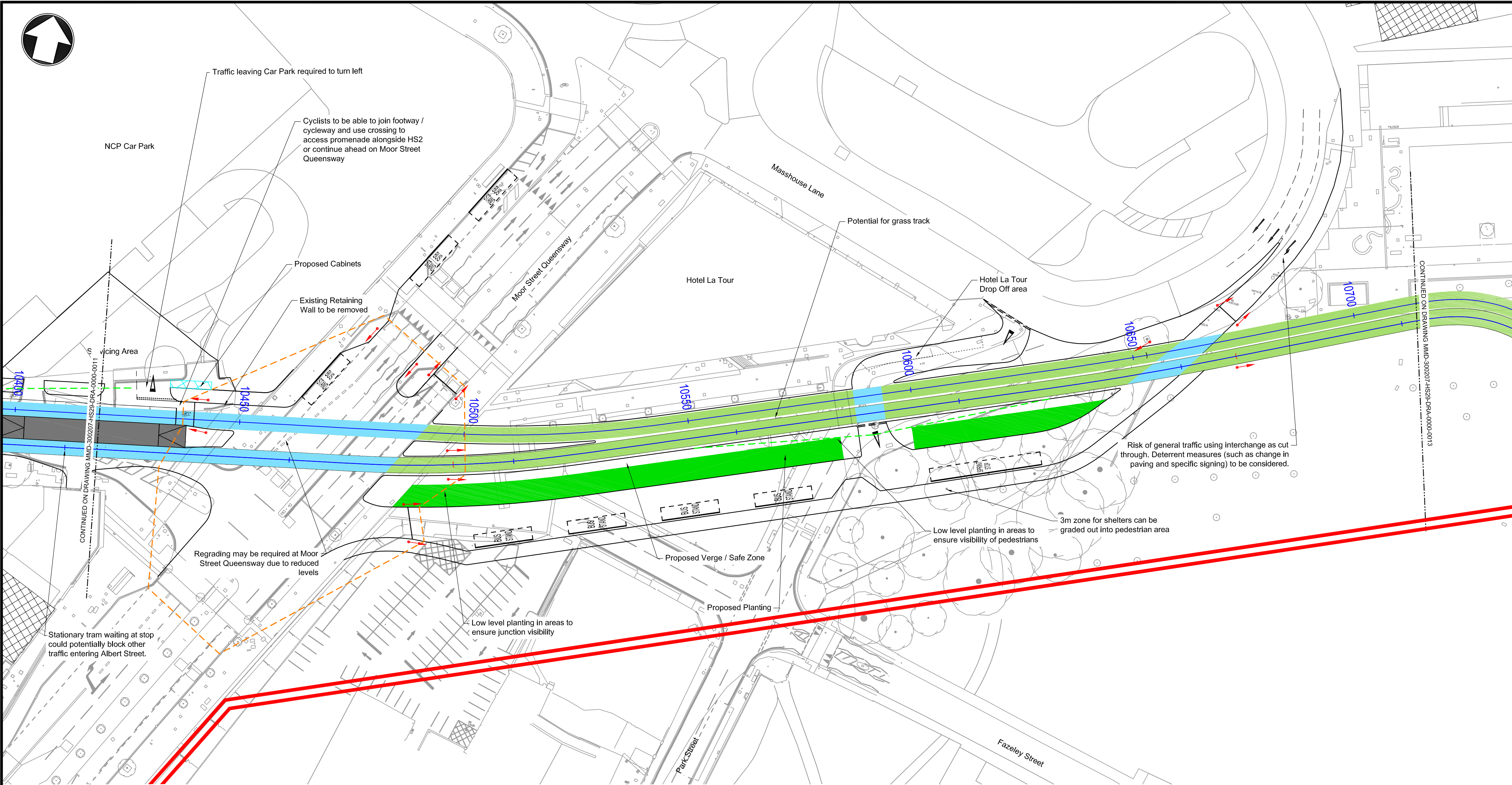
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Title
Midland Metro Phase 2
Birmingham Eastside Extension
Route Layout
(Sheet 1 of 7)

Designed	P. Duffy	Eng check	C. Seanson
Drawn	J. Kirby	Coordination	C. Seanson
Dwg check	A. Griffiths	Approved	K. Crowley
Scale at A1	Status	Rev	
As Shown	PRE	P4	
Drawing Number	MMD-300207-HS29-DRA-0000-0011		



- Notes
1. All dimensions are in metres unless otherwise stated.
 2. Do not scale any items or information from this drawing.
 3. Service locations not considered during design.
 4. The Developed Kinematic Envelope (DKE) of the tram is based upon the updated Generic Tram DKE Model for 'Type A Vehicles'. Refer to Mott MacDonald Ltd report reference MMD-300207-SL02-DOC-0001.
 5. Footway and platform widths are subject to modeling.
 6. Electrical equipment (LV, lighting, OLE and associated cabinets) to be confirmed. Land take shown for possible locations of cabinets required at each tram stop.

- Key to symbols
- Key to Plan:
- Proposed Tramway Centreline
 - Birmingham City Centre Extension
 - Shared Track
 - Segregated Track
 - Shared trams and buses
 - Edge of Kerb
 - Land Take
 - Buildings to be Demolished
 - Primary Signal Head and 4m Pole
 - Proposed Road Markings
 - Proposed Tram Stop
 - HS2 Station Building Outline (Indicative Only)
 - Existing Bridge
 - Proposed Retaining Wall
 - Junction Intervisibility
 - Junction visibility splays
 - Listed Buildings
 - Proposed Planting
- Key to Long Section:
- Existing Level
 - Proposed Level
 - Horizontal Tangent Point
 - Vertical Tangent Point

- Reference drawings
- MMD-300207-HS29-DRA-0000-0010 - Route Layout - Key Plan
 - MMD-300207-HS29-DRA-0000-0011 - Route Layout (Sheet 1 of 7)
 - MMD-300207-HS29-DRA-0000-0013 - Route Layout (Sheet 3 of 7)
 - MMD-300207-HS29-DRA-0000-0014 - Route Layout (Sheet 4 of 7)
 - MMD-300207-HS29-DRA-0000-0015 - Route Layout (Sheet 5 of 7)
 - MMD-300207-HS29-DRA-0000-0016 - Route Layout (Sheet 6 of 7)
 - MMD-300207-HS29-DRA-0000-0017 - Route Layout (Sheet 7 of 7)

P3	12/09/2016	JK	Long Section Updated.	CMS	GJL
P2	04/05/2016	EQ	Revised Alignment.	CMS	GJL
P1	16/09/2015	JK	First Issue.	CMS	KC
Rev	Date	Drawn	Description	Ch'k'd	App'd

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transforming public transport

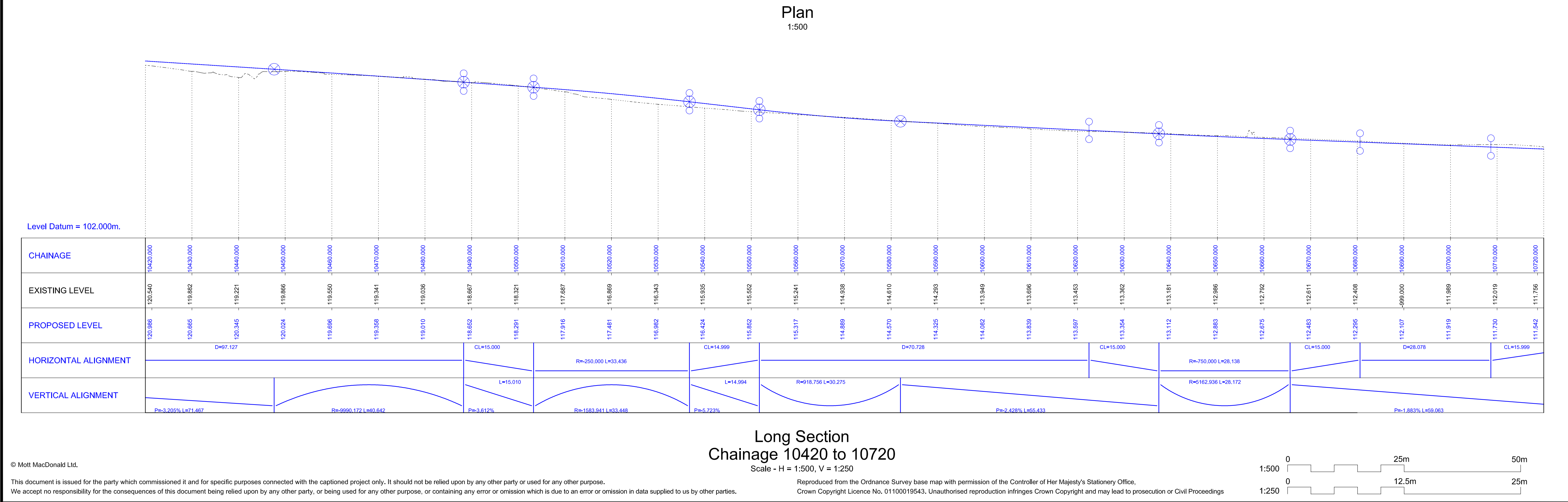
Client

Centro
Centro House
16 Summer Lane
Birmingham
B19 3SD

Title

Midland Metro Phase 2
Birmingham Eastside Extension
Route Layout
(Sheet 2 of 7)

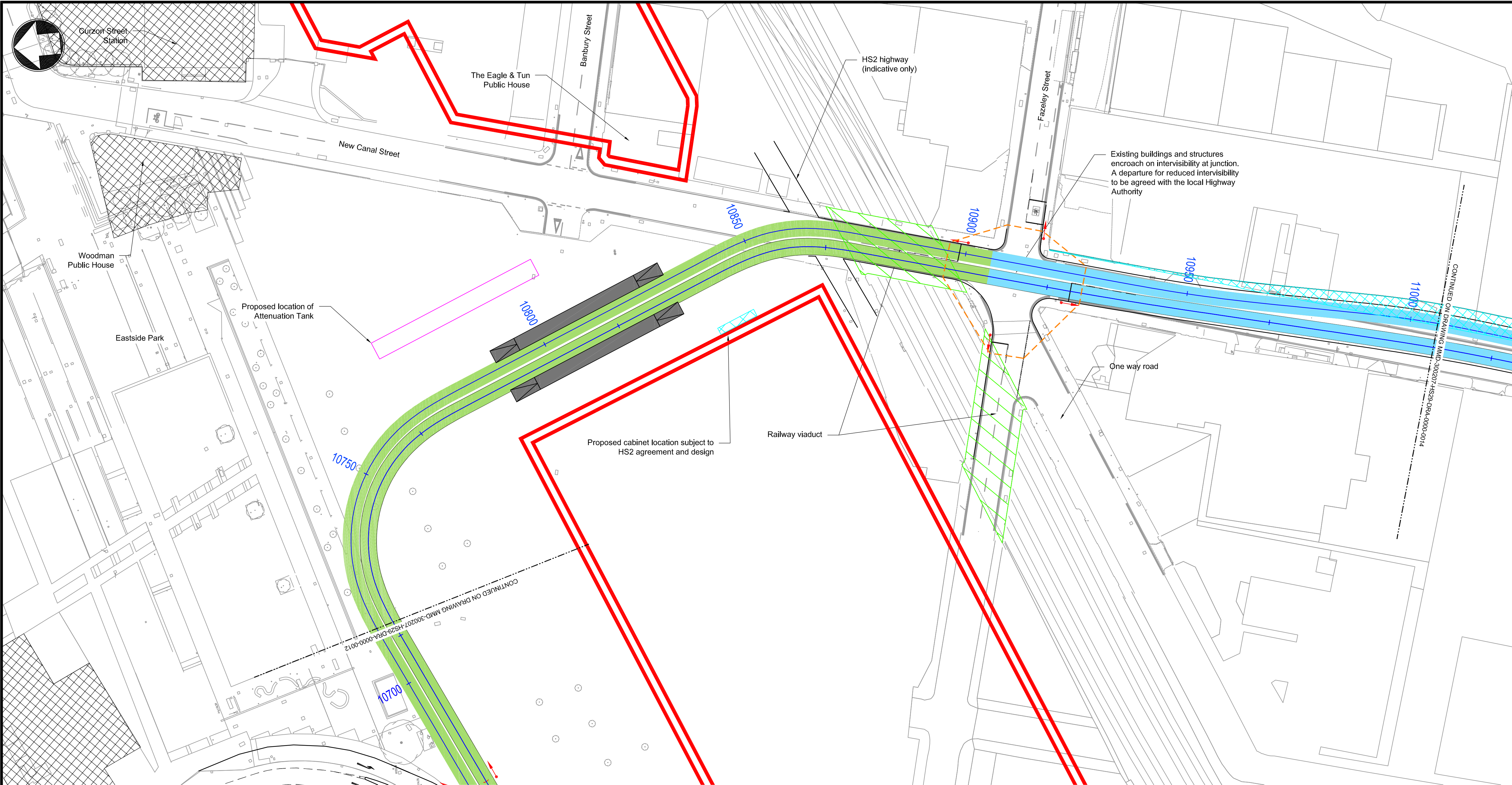
Designed	P. Duffy	Eng check	C. Searson
Drawn	J. Kirby	Coordination	C. Searson
Dwg check	A. Griffiths	Approved	K. Crowley
Scale at A1	Status	Rev	
As Shown	PRE	P3	
Drawing Number	MMD-300207-HS29-DRA-0000-0012		



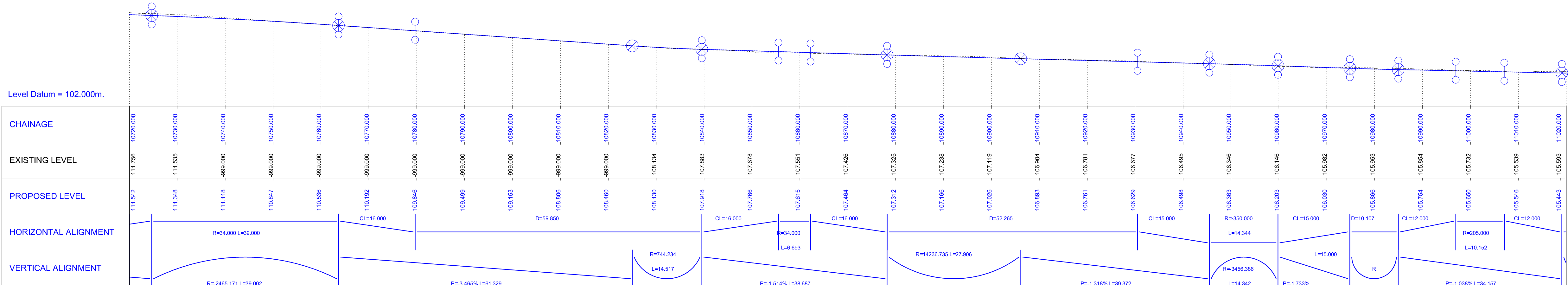
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Plan
1:500



Long Section
Chainage 10720 to 11020
Scale - H = 1:500, V = 1:250

- Notes
- All dimensions are in metres unless otherwise stated.
 - Do not scale any items or information from this drawing.
 - Service locations not considered during design.
 - The Developed Kinematic Envelope (DKE) of the tram is based upon the updated Generic Tram DKE Model for 'Type A Vehicles'. Refer to Mott MacDonald Ltd report reference MMD-300207-SLO2-DOC-0001.
 - Footway and platform widths are subject to modeling.
 - Electrical equipment (LV, lighting, OLE and associated cabinets) to be confirmed. Land take shown for possible locations of cabinets required at each tram stop.

- Key to symbols
- Key to Plan:
- Proposed Tramway Centrelines
 - Birmingham City Centre Extension
 - Shared Track
 - Segregated Track
 - Shared trams and buses
 - Edge of Kerb
 - Land Take
 - Buildings to be Demolished
 - Primary Signal Head and 4m Pole
 - Proposed Road Markings
 - Proposed Tram Stop
 - HS2 Station Building Outline (Indicative Only)
 - Existing Bridge
 - Proposed Retaining Wall
 - Junction Intervisibility
 - Junction visibility splays
 - Listed Buildings
 - Proposed Planting
- Key to Long Section:
- Existing Level
 - Proposed Level
 - Horizontal Tangent Point
 - Vertical Tangent Point

Reference drawings

MMD-300207-HS29-DRA-0000-0010 - Route Layout - Key Plan
MMD-300207-HS29-DRA-0000-0011 - Route Layout (Sheet 1 of 7)
MMD-300207-HS29-DRA-0000-0012 - Route Layout (Sheet 2 of 7)
MMD-300207-HS29-DRA-0000-0014 - Route Layout (Sheet 4 of 7)
MMD-300207-HS29-DRA-0000-0015 - Route Layout (Sheet 5 of 7)
MMD-300207-HS29-DRA-0000-0016 - Route Layout (Sheet 6 of 7)
MMD-300207-HS29-DRA-0000-0017 - Route Layout (Sheet 7 of 7)

P3	15/09/2016	JK	Updated Long Section.	CMS	GJL
P2	04/05/2016	EQ	Revised Alignment.	CMS	GJL
P1	16/09/2015	JK	First Issue.	CMS	KC
Rev	Date	Drawn	Description	Ch'k'd	App'd



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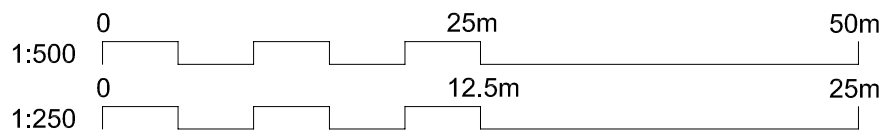


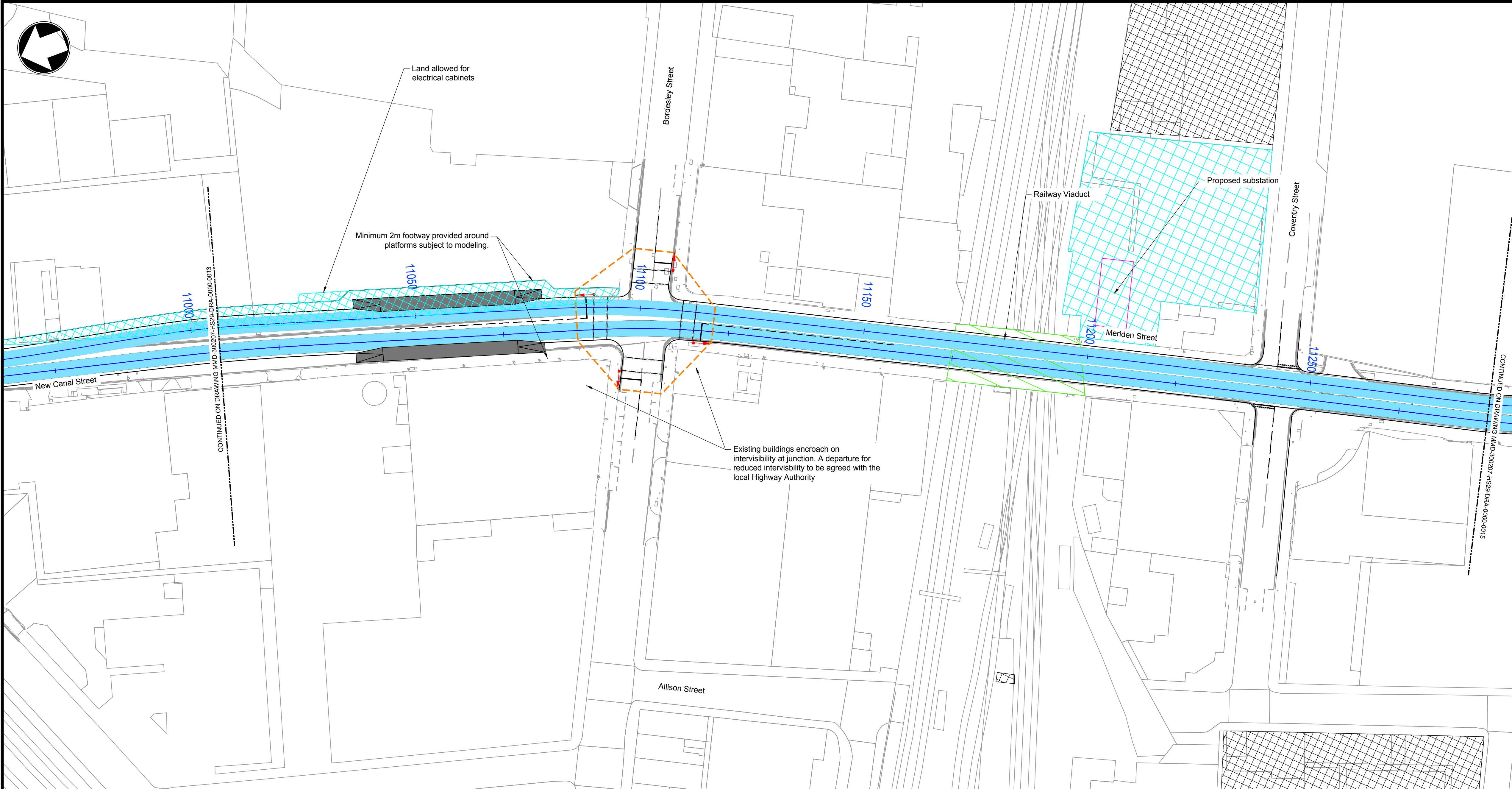
Client
Centro
Centro House
16 Summer Lane
Birmingham
B19 3SD

Title
Midland Metro Phase 2
Birmingham Eastside Extension
Route Layout
(Sheet 3 of 7)

Designed	P. Duffy	Eng check	C. Searson
Drawn	J. Kirby	Coordination	C. Searson
Dwg check	A. Griffiths	Approved	K. Crowley
Scale at A1	Status	Rev	
As Shown	PRE	P3	

Drawing Number
MMD-300207-HS29-DRA-0000-0013





- Notes
- All dimensions are in metres unless otherwise stated.
 - Do not scale any items or information from this drawing.
 - Service locations not considered during design.
 - The Developed Kinematic Envelope (DKE) of the tram is based upon the updated Generic Tram DKE Model for 'Type A Vehicles'. Refer to Mott MacDonald Ltd report reference MMD-300207-SL02-DOC-0001.
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- Key to symbols
- Key to Plan:
- Proposed Tramway Centreline
 - Birmingham City Centre Extension
 - Shared Track
 - Segregated Track
 - Shared trams and buses
 - Edge of Kerb
 - Land Take
 - Buildings to be Demolished
 - Primary Signal Head and 4m Pole
 - Proposed Road Markings
 - Proposed Tram Stop
 - HS2 Station Building Outline (Indicative Only)
 - Existing Bridge
 - Proposed Retaining Wall
 - Junction Intervisibility
 - Junction visibility splays
 - Listed Buildings
 - Proposed Planting
- Key to Long Section:
- Existing Level
 - Proposed Level
 - Horizontal Tangent Point
 - Vertical Tangent Point

Reference drawings

MMD-300207-HS29-DRA-0000-0010 - Route Layout - Key Plan
MMD-300207-HS29-DRA-0000-0011 - Route Layout (Sheet 1 of 7)
MMD-300207-HS29-DRA-0000-0012 - Route Layout (Sheet 2 of 7)
MMD-300207-HS29-DRA-0000-0013 - Route Layout (Sheet 3 of 7)
MMD-300207-HS29-DRA-0000-0015 - Route Layout (Sheet 5 of 7)
MMD-300207-HS29-DRA-0000-0016 - Route Layout (Sheet 6 of 7)
MMD-300207-HS29-DRA-0000-0017 - Route Layout (Sheet 7 of 7)

P3	18/08/2016	JK	Updated Long Section.	CMS	GJL
P2	04/05/2016	EQ	Revised Alignment.	CMS	GJL
P1	16/09/2015	JK	First Issue.	CMS	KC
Rev	Date	Drawn	Description	Ch'k'd	App'd



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Client

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Title

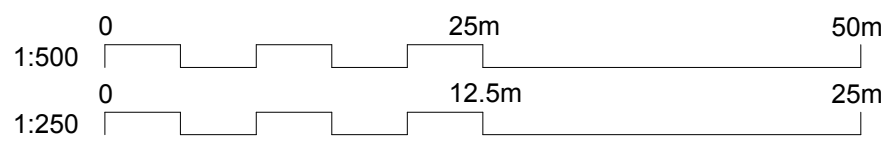
Midland Metro Phase 2
Birmingham Eastside Extension
Key Plan
(Sheet 4 of 7)

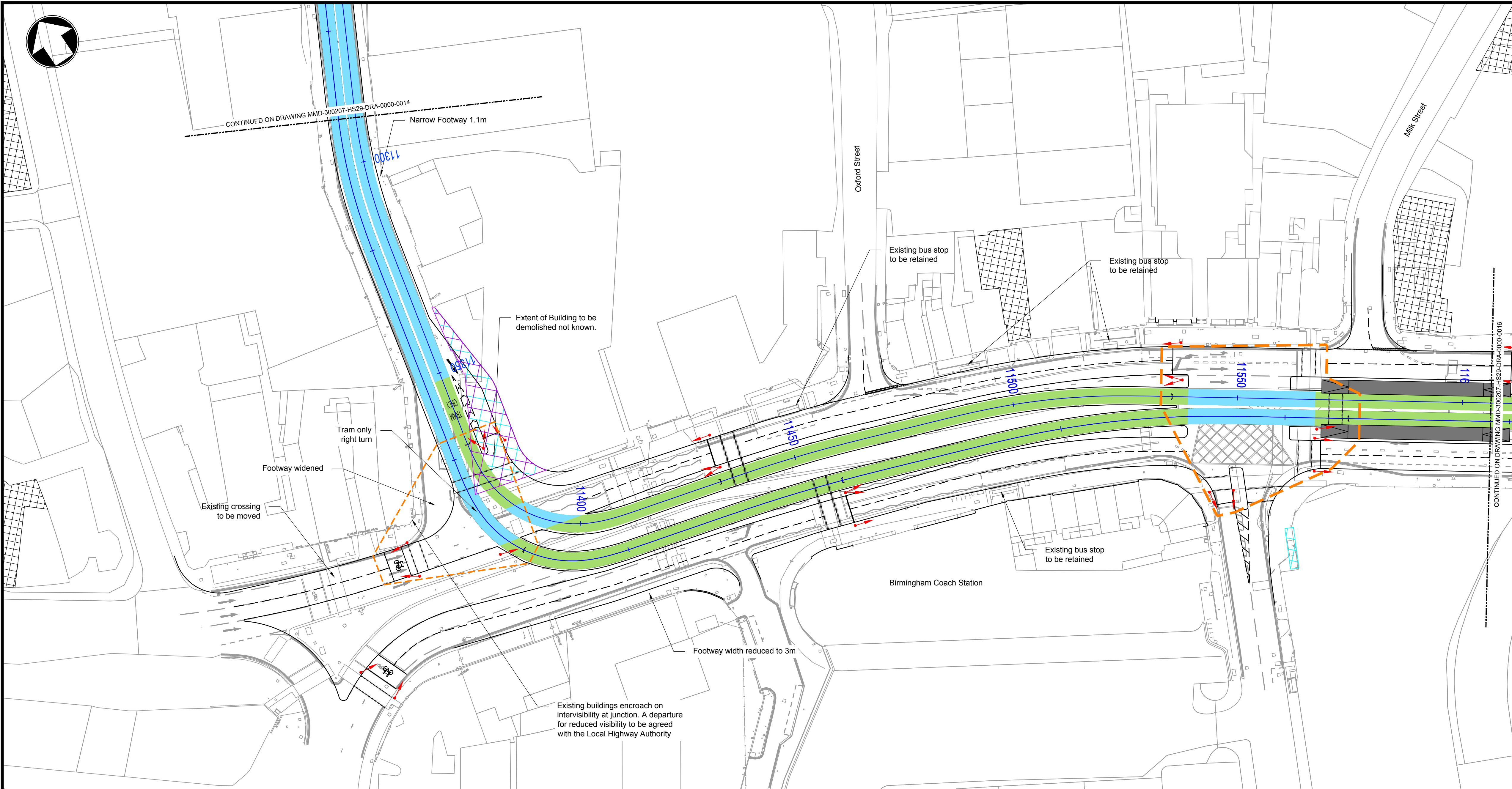
Designed	P. Duffy	Eng check	C. Searson
Drawn	J. Kirby	Coordination	C. Searson
Dwg check	A. Griffiths	Approved	K. Crowley
Scale at A1	As Shown	Status	PRE
Scale at A1	As Shown	Rev	P3

Drawing Number

MMD-300207-HS29-DRA-0000-0014

Long Section
Chainage 11020 to 11320
Scale - H = 1:500, V = 1:250





- Notes
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 - The Developed Kinematic Envelope (DKE) of the tram is based upon the updated Generic Tram DKE Model for 'Type A Vehicles'. Refer to Mott MacDonald Ltd report reference MMD-300207-SL02-DOC-0001.
 - Footway and platform widths are subject to modeling.
 - Electrical equipment (LV, lighting, OLE and associated cabinets) to be confirmed. Land take shown for possible locations of cabinets required at each tram stop.

Key to symbols

Key to Plan:

- Proposed Tramway Centreline
- Birmingham City Centre Extension
- Shared Track
- Segregated Track
- Shared trams and buses
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- Land Take
- Buildings to be Demolished
- Primary Signal Head and 4m Pole
- Proposed Road Markings
- Proposed Tram Stop
- HS2 Station Building Outline (Indicative Only)
- Existing Bridge
- Proposed Retaining Wall
- Junction Intervisibility
- Junction visibility splays
- Listed Buildings
- Proposed Planting

Key to Long Section:

- Existing Level
- Proposed Level
- Horizontal Tangent Point
- Vertical Tangent Point

Reference drawings

MMD-300207-HS29-DRA-0000-0010 - Route Layout - Key Plan
MMD-300207-HS29-DRA-0000-0011 - Route Layout (Sheet 1 of 7)
MMD-300207-HS29-DRA-0000-0012 - Route Layout (Sheet 2 of 7)
MMD-300207-HS29-DRA-0000-0013 - Route Layout (Sheet 3 of 7)
MMD-300207-HS29-DRA-0000-0014 - Route Layout (Sheet 4 of 7)
MMD-300207-HS29-DRA-0000-0016 - Route Layout (Sheet 6 of 7)
MMD-300207-HS29-DRA-0000-0017 - Route Layout (Sheet 7 of 7)

P3	15/09/2016	JK	Updated Long Section.	CMS	GJL
P2	04/05/2016	EQ	Revised Alignment.	CMS	GJL
P1	16/09/2015	JK	First Issue.	CMS	KC
Rev	Date	Drawn	Description	Ch'k'd	App'd



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Client

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Title

Midland Metro Phase 2
Birmingham Eastside Extension
Key Plan
(Sheet 5 of 7)

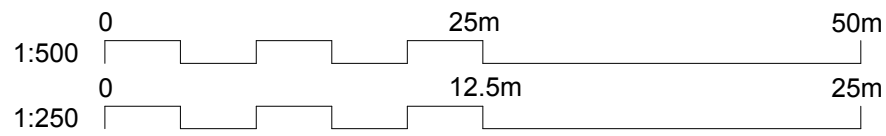
Designed	P. Duffy	Eng check	C. Searson
Drawn	J. Kirby	Coordination	C. Searson
Dwg check	A. Griffiths	Approved	K. Crowley

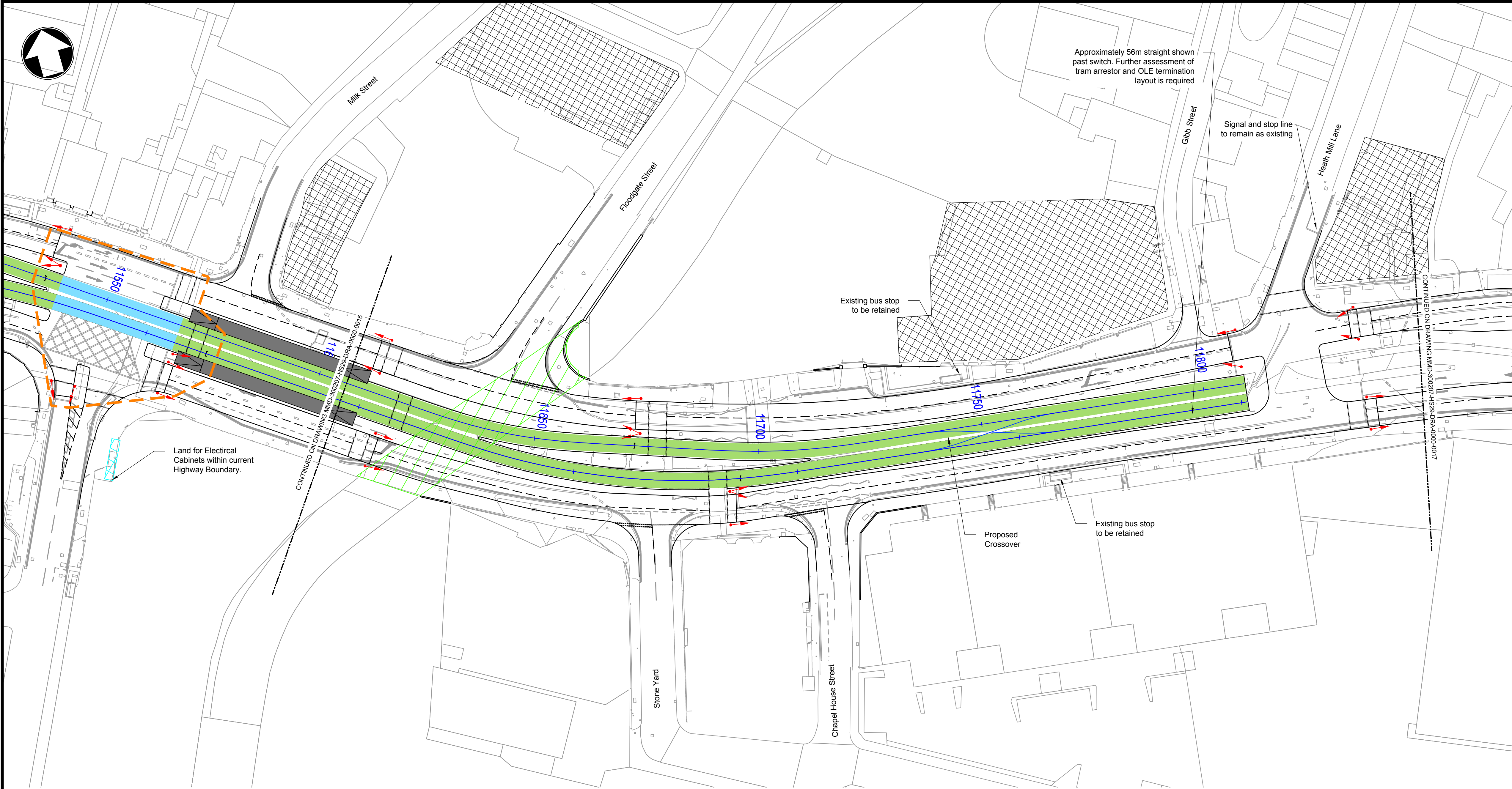
Scale at A1	Status	Rev
As Shown	PRE	P3

Drawing Number

MMD-300207-HS29-DRA-0000-0015

Long Section
Chainage 113120 to 11620
Scale - H = 1:500, V = 1:250





- Notes
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 - The Developed Kinematic Envelope (DKE) of the tram is based upon the updated Generic Tram DKE Model for 'Type A Vehicles'. Refer to Mott MacDonald Ltd report reference MMD-300207-SL02-D0C-0001.
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- Key to symbols
- Key to Plan:
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 - Junction visibility splays
 - Listed Buildings
 - Proposed Planting
- Key to Long Section:
- Existing Level
 - Proposed Level
 - Horizontal Tangent Point
 - Vertical Tangent Point

Reference drawings

MMD-300207-HS29-DRA-0000-0010 - Route Layout - Key Plan
MMD-300207-HS29-DRA-0000-0011 - Route Layout (Sheet 1 of 7)
MMD-300207-HS29-DRA-0000-0012 - Route Layout (Sheet 2 of 7)
MMD-300207-HS29-DRA-0000-0013 - Route Layout (Sheet 3 of 7)
MMD-300207-HS29-DRA-0000-0014 - Route Layout (Sheet 4 of 7)
MMD-300207-HS29-DRA-0000-0015 - Route Layout (Sheet 5 of 7)
MMD-300207-HS29-DRA-0000-0017 - Route Layout (Sheet 7 of 7)

P4	15/09/2016	JK	Updated Long Section.	CMS	GJL
P3	18/08/2016	JK	Revised Highway Alignment.	CMS	GJL
P2	04/05/2016	EQ	Revised Alignment.	CMS	GJL
P1	16/09/2015	JK	First Issue.	CMS	KC
Rev	Date	Drawn	Description	Ch'k'd	App'd



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Client

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16 Summer Lane
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B19 3SD

Title

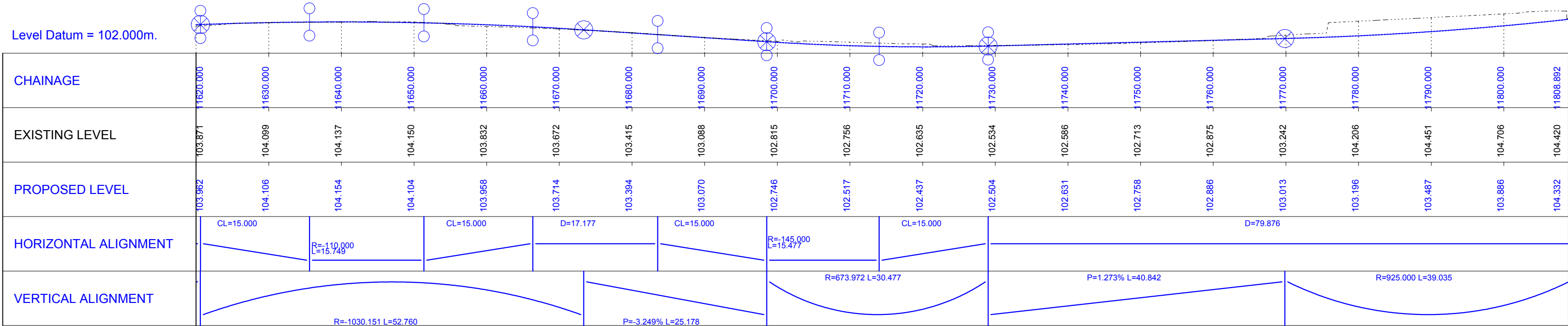
Midland Metro Phase 2
Birmingham Eastside Extension
Key Plan
(Sheet 6 of 7)

Designed	P. Duffy	Eng check	C. Searson
Drawn	J. Kirby	Coordination	C. Searson
Dwg check	M. Donovan	Approved	K. Crowley

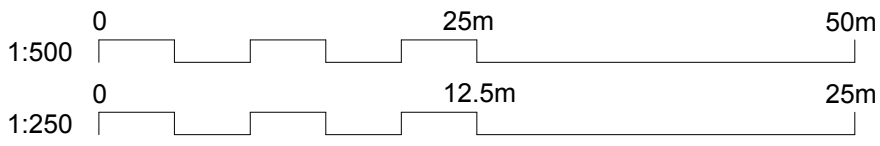
Scale at A1	Status	Rev
As Shown	PRE	P4

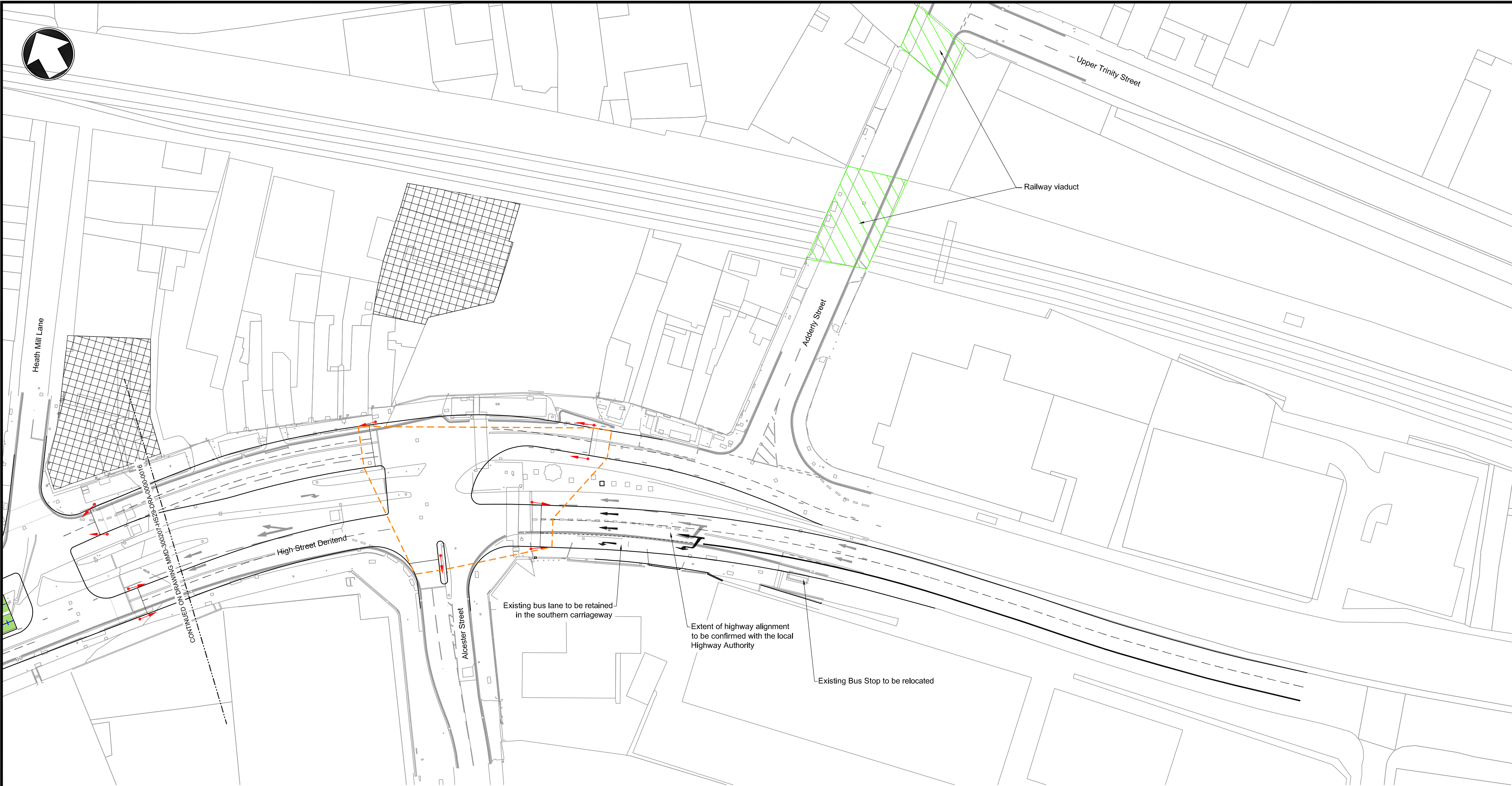
Drawing Number

MMD-300207-HS29-DRA-0000-0016



Long Section
Chainage 11620 to 11809
Scale - H = 1:500, V = 1:250





Plan
1:500

- Notes
1. All dimensions are in metres unless otherwise stated.
 2. Do not scale any items or information from this drawing.
 3. Service locations not considered during design.
 4. The Developed Kinematic Envelope (DKE) of the tram is based upon the updated Generic Tram DKE Model for 'Type A Vehicles'. Refer to Mott MacDonald Ltd report reference MMD-300207-SL02-DOC-0001.
 5. Footway and platform widths are subject to modelling.
 6. Electrical equipment to be confirmed.

Key to symbols

Key to Plan:

- Proposed Tramway Centreline
- Birmingham City Centre Extension
- Shared Track
- Segregated Track
- Shared trams and buses
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- Proposed Tram Stop
- HS2 Station Building Outline (Indicative Only)
- Existing Bridge
- Proposed Retaining Wall
- Junction Intervisibility
- Junction visibility splays
- Listed Buildings
- Proposed Planting

Key to Long Section:

- Existing Level
- Proposed Level
- Horizontal Tangent Point
- Vertical Tangent Point

Reference drawings

MMD-300207-HS29-DRA-0000-0010 - Route Layout - Key Plan
MMD-300207-HS29-DRA-0000-0011 - Route Layout (Sheet 1 of 7)
MMD-300207-HS29-DRA-0000-0012 - Route Layout (Sheet 2 of 7)
MMD-300207-HS29-DRA-0000-0013 - Route Layout (Sheet 3 of 7)
MMD-300207-HS29-DRA-0000-0014 - Route Layout (Sheet 4 of 7)
MMD-300207-HS29-DRA-0000-0015 - Route Layout (Sheet 5 of 7)
MMD-300207-HS29-DRA-0000-0016 - Route Layout (Sheet 6 of 7)

P3	15/09/2016	JK	Updated Highway Alignment.	CMS	G.J.L.
P2	03/05/2016	EQ	Revised Alignment.	CMS	G.J.L.
P1	16/09/2015	JK	First Issue.	CMS	KC
Rev	Date	Drawn	Description	Ch'k'd	App'd



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Client
Centro
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16 Summer Lane
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B19 3SD

Title
Midland Metro Phase 2
Birmingham Eastside Extension
Key Plan
(Sheet 7 of 7)

Designed	P. Duffy		Eng check	C. Searson	
Drawn	J. Kirby		Coordination	C. Searson	
Dwg check	A. Griffiths		Approved	K. Crowley	
Scale at A1	Status	Rev			
As Shown	PRE	P3			

Drawing Number
MMD-300207-HS29-DRA-0000-0017

