# V11 Tongwell Street Extension and Marston Vale Line Bridge crossing Feasibility Report

Milton Keynes Council

Project number: 60664040
RP01

3rd September 2021

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## Quality information

| Prepared by | Checked by | Verified by | Approved by |
|---|---|---|---|
| Gideon Lowes<br>Principal Engineer | Structures: Robin Welsford | Lyn Clark | Gideon Lowes |
| Highways: Donald McKenzie, Hannah McHugh | Highways: John Forshaw | | |
| Geotechnical: Milagros Guerrero Espino | Geotechnical: Charles Bull | | |
| Ecology: Laura Cooper-Smith, Alan Bull | Ecology: Max Wade | | |
| Noise: Suzanne Scott | Noise: Andy Pagett | | |

## Revision History

| Revision | Revision date | Details | Authorized | Name | Position |
|---|---|---|---|---|---|
| 0 | First Issue | Revision 1 | GTL | Gideon Lowes | Project Manager |
| | | | | | |
| | | | | | |
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## Distribution List

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## Prepared for:

Milton Keynes Council

## Prepared by:

Gideon Lowes
Principal Engineer
E: gideon.lowes@aecom.com

AECOM Infrastructure & Environment UK Limited
AECOM House
200 Harpur Centre, Horne Lane
Bedford MK40 1TS
United Kingdom

T: +44(0)1234 349641
aecom.com

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# Introduction

## Overview

1.1 AECOM have been commissioned by Milton Keynes Council (MKC) to provide engineering advice to investigate the feasibility of extending V11 Tongwell Street southward from Elgar Grove/Britten Grove roundabout across the Marston Vale Line (MVL) railway to a development area to the south.

1.2 MKC are currently in the pre-planning stage for the development of land of the southern edge of Milton Keynes know as South East Milton Keynes Strategic Urban Extension (SEMK SUE). This development area requires consideration of opportunities or limitations that may exist for enhancement or extension of the existing highway network. One particular area of interest is a corridor of land set aside by the original town planners within Browns Wood and Old Farm Park residential estates to provide the possibility of the V11 Tongwell Street grid road being extended southwards to more directly access the development land to the south via a new highway bridge over the MVL railway.

1.3 The East West Rail scheme will re-establish a rail link between Cambridge and Oxford. As well as being a key part of plans to create a science arc between the cities and surrounding areas, the scheme is to promote economic, business and housing growth along the corridor served by it. Whilst the early development of the scheme was undertaken by Network Rail, to enable its further development to focus more keenly on the scheme's specific and unique objectives, East West Rail limited has been established to be its promoter. The proposed scheme involves the upgrading of the MVL railway. It is assumed that this will see the existing number of tracks maintained but increased passenger journeys made principally via increased frequencies of trains. At the same time electrification within the design life of the V11 scheme is highly likely, as well as the introduction of new rolling stock, increasing headroom requirements for any crossing of the railway well above those that may have been envisaged by the town planners. The proposed East West Rail scheme includes a combined pedestrian and cycle bridge in the location of the V11 extension only (i.e. no vehicular access across the railway is proposed), and has recently been under consultation with the outcomes not yet known.

1.4 This feasibility study will consider the engineering required to create a dual carriageway from Browns Wood roundabout (where the V11 Tongwell dual carriageway section meets Bletcham Way) into the SEMK SUE. The dual carriageway will continue the Redway NMU connections into the SEMK SUE across the MVL railway, and allow for future provision of Mass Rapid Transit (MRT) lanes by converting the nearside lanes of the carriageway to MRT lanes.

## Location

1.5 The location of the proposed scheme runs from Browns Wood and Old Farm Park in South East Milton Keynes across the MVL railway and into the proposed development area to the south of the railway as shown in Figures 1-1 and 1-2. Figure 1-1, highlights the location of these existing residential estates in relation to local and national infrastructure including the M1, A421 and railway, as well as the area available to the south of this and the railway towards Woburn Sands and Bow Brickhill, whilst Figure 1-2 shows a more detailed existing street plan to the north of the railway taken from the Milton Keynes Atlas.

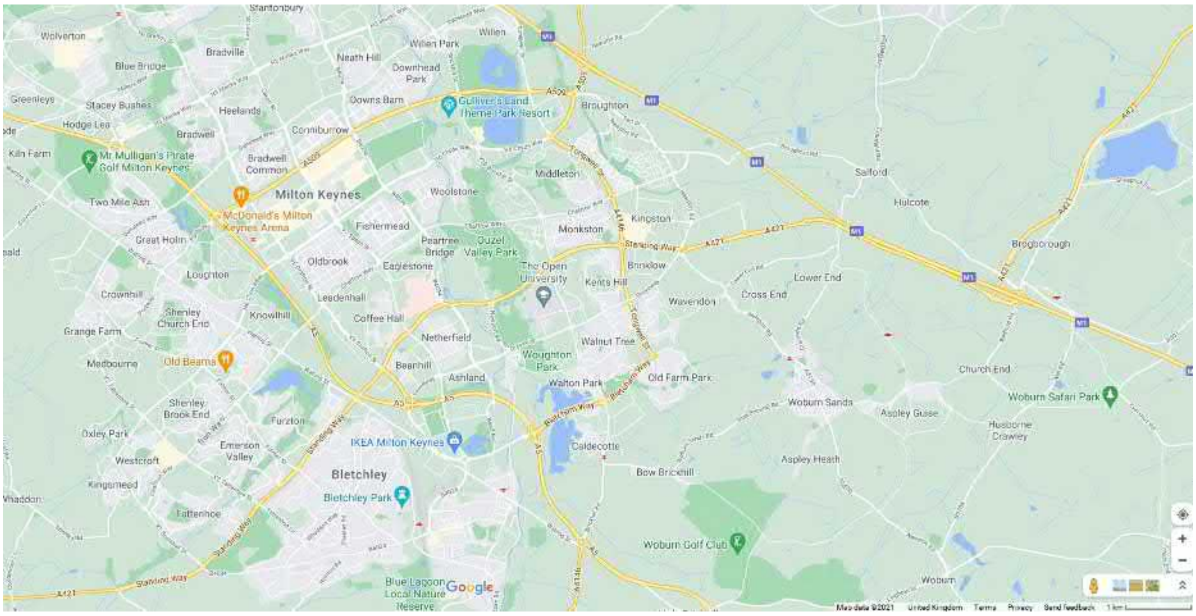



**Figure 1-1 – Location Plan**

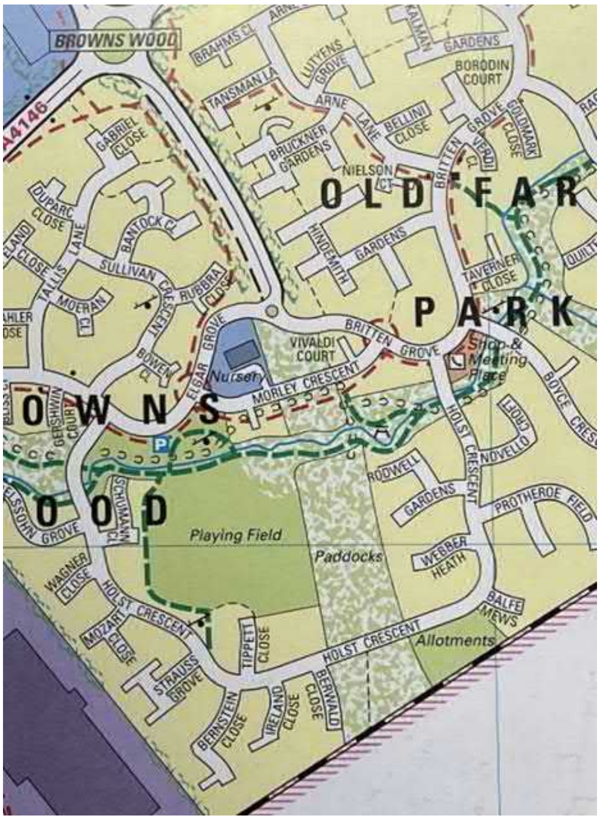



**Figure 1-2 – Extract from Milton Keynes Atlas**

1.6 Figure 1-3 includes an extract from the SEMK SUE Development Framework 1301MC Draft consultation showing the planned extension of the V11 grid road across the railway and into a new roundabout to the south, as well as other new roads that would be proposed as part of the SEMK SUE scheme. The southern limit of this feasibility study has been agreed to be either to the north of this proposed roundabout just prior to the start of the approach and departure flares to the roundabout, or to where existing ground level can be met, whichever occurs sooner.

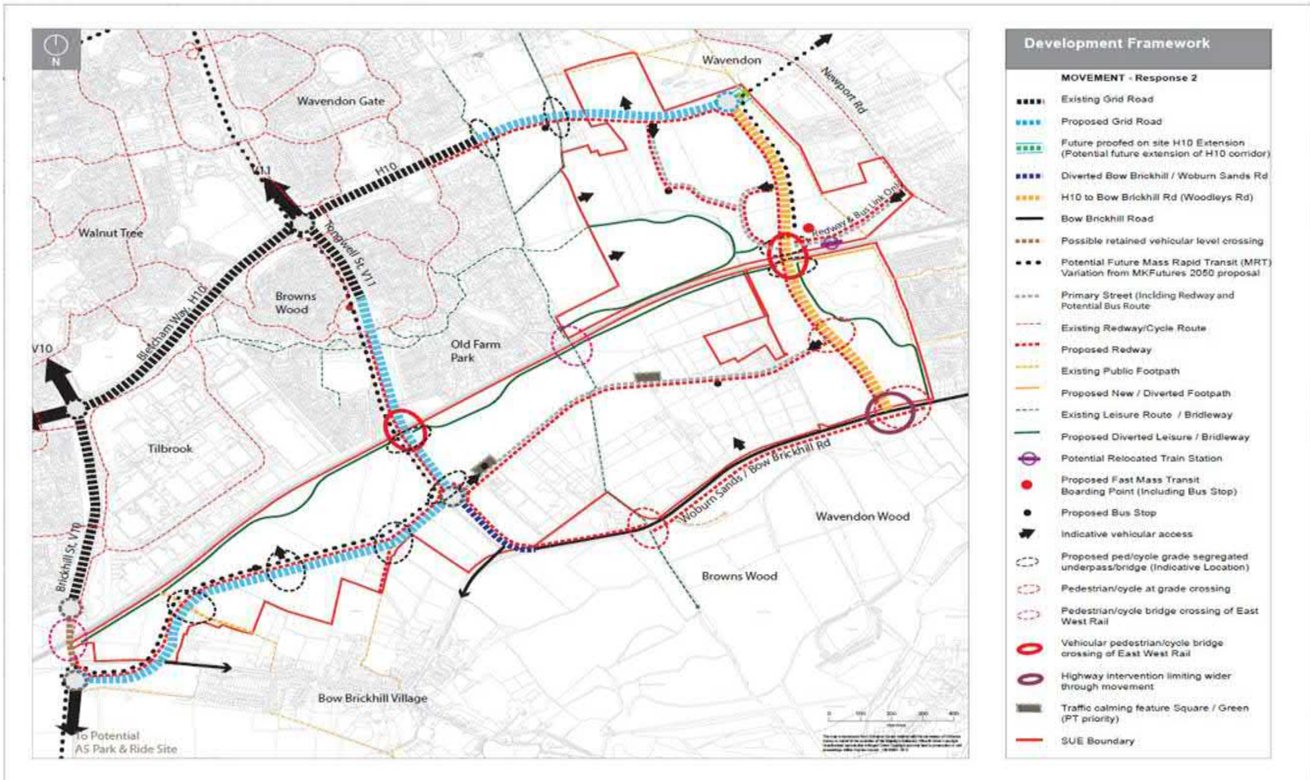



**Figure 1-3 – Extract from the SEMK SUE Development Framework 1301MC Draft consultation**

# Existing Locality

1.7 The existing environment to the north of the railway includes a strategic future Transport Corridor (CT8) between the Browns Wood residential estate to the west and the Old Farm Park estate to the east, which was included in earlier Town Planning with the view to potentially developing the existing V11 Tongwell Street South towards, and it is assumed over the MVL railway.

1.8 The Transport Corridor is currently held under a 999-year lease by the Milton Keynes Parks Trust (MKPT). MKC as the Landlord/freeholder can use any of the land at any time for a transport scheme, subject to giving the Parks Trust as tenant formal written notice. The minimum notice period is 28 days.

1.9 There are various conditions and caveats in the lease that place contractual obligations on MKC to obtain MKPT's approval over the treatment of landscape on adjacent land that remains under MKPT control and in relation to new landscaping associated with any new road scheme layout that will be passed back to MKPT for future maintenance following completion.

1.10 The legal mechanism of the Transport Corridor leases was established by the Milton Keynes Development Corporation (MKDC) as a way to maintain the city's landscaped grid roads – making MKPT as tenant responsible for the structural landscaping within the network but also enabling the Highway Authority as landlord (and successor in title to MKDC) to use the reserve areas for future road schemes, if they were ever needed. This gives MKPT legal rights over the grid road corridors in the way they function as green landscaped corridors as well as transport routes. Accordingly, the Trust must be consulted and involved in the process of designing the new road scheme. Since this information has only very recently come to the attention of AECOM no such consultation has yet taken place, but it will clearly be important that MKPT are consulted at the outset of any preliminary design stage that may follow this feasibility study.

1.11 The Transport Corridor presently takes the form of an area of Paddocks to the immediate north of the railway where the base of embankment would need to be widest in order that the road may cross the railway. Within 200 m north of the railway lies Holst Crescent, a relatively long single carriageway road that curves north into both Browns Wood and Old Farm Park as it moves away from the paddocks. Around 300 m north of the railway the paddocks meet a bridleway and watercourse (Caldecotte Brook) in close proximity to each other and then an extended gyratory system featuring Morley Crescent, Britten Grove and Elgar Grove; the latter two of which meet in a three arm roundabout at the southern end of Tongwell Street approximately 500 m north of the railway. Beyond the roundabout the existing environment is characterised by wide verges along Tongwell street, particularly the northbound verge, which give way to lines of semi-mature trees offering intermittent screening to the residential areas beyond.

1.12 As well as the residential areas to the east and west of the corridor to the north of the railway, there are a number of local community facilities to the immediate west, including Busy Bees Nursery, Browns Wood Playground, Browns Wood Sports Ground and a BMX (Pump) Track.

1.13 To the south of the railway the existing environment comprises arable farmland.

1.14 The existing ground levels of the site generally fall from the southern roundabout and continues to fall over the railway, save for a localised low level embankment upon which the railway is built, to a low point at Caldecotte Brook. From here ground levels rise again towards Browns Wood roundabout.

1.15 The proximity of Holst Crescent to the railway makes it immediately apparent that a significant height embankment will occur to accommodate the proposed extension of the V11 if the railway is to be crossed by a road underbridge / railway overbridge. This part of Holst Crescent can be accessed from either Browns Wood to the West or Old Farm Park to the east and hence it was not immediately obvious whether the benefits of maintaining this section of Holst Crescent would outweigh the costs. For this reason it was agreed that the scope of the study should include two Options at Holst Crescent as follows:

Option A: Holst Crescent to be maintained with either an at-grade junction with the V11 or an additional underpass structure supporting the V11 over Holst Crescent.

Option B: Holst Crescent stopped up either side of the works with turning areas provided at suitable locations adjacent to the new embankment.

1.16 Figure 1-4 includes key features in the locality to the north of the railway in plan, with further photographic detail of the same included in Figures 1-5 to 1-12 which were taken during AECOM's recent site visit in August 2021.


**Figure 1-4 – Existing Constraints**


**Figure 1-5 – Existing Tongwell Street**

**Figure 1-6 – Roundabout at Tongwell St/Britten Grove Roundabout**


**Figure 1-7 – 'Busy Bees' Nursery – Off Morley Crescent**

**Figure 1-8 – Northern Network Rail Boundary line and gate leading to pedestrian crossing of Marston Vale Line**


**Figure 1-9 – Track taken from inside railway boundary on north side, looking south at Marston Vale Line**

**Figure 1-10 – Water course (Caldecotte Brook) with Bridleway crossing – Approximately 1.5m wide**

**Figure 1-11 – Shed and fence adjacent to ‘Morley Crescent’ carriageway**


**Figure 1-12 – Shed and fence adjacent to 'Holst Crescent' carriageway**

# 2. Proposed Works

## Key Design Standards

2.1 The table below presents a list of design standards used in the production of the engineering solution for V11 Tongwell Extension.

| Document Title | Document Source |
|---|---|
| Design Manual for Roads and Bridges (DMRB) (as current on 1st July 2021) | https://www.standardsforhighways.co.uk/dmrb/ |
| Highway Design Guide for developers | Milton Keynes Council |
| Redway Design Manual Consultation Draft | Milton Keynes Council |

## Key Design Assumptions

2.2 The following sections present details of Key Design Assumptions and Risks identified during the preparation of this V11 Tongwell Extension Feasibility Report.

## Highway Assumptions

2.3 Drainage proposals will need to be developed at any subsequent preliminary design stage. At this stage it is assumed a suitable outfall can be identified and utilised and proposals can be developed to the acceptability of the water authority.

2.4 Due to the proposed 40mph speed limit, it is assumed that a safety barrier is not required in the dual carriageway central reserve. It is noted that a safety barrier has not been provided on nearby grid roads which have a higher speed limit. DMRB CD 377 Requirements for Road Restraint Systems requires a safety barrier for only those dual carriageways with speed limits of 50mph and above, where the central reserve is less than 10m wide. It is anticipated that a risk assessment will be carried out during preliminary design to determine if a central reserve barrier is required.

2.5 Proposals to locally divert walking/Redway/bridleway routes as set out in the remainder of this report are assumed to be acceptable.

2.6 Headroom clearances identified under 'Structures Assumptions' are acceptable in terms of the development of the highway alignment.

2.7 Available ground survey information is based on a LIDAR survey. It has limitations as features such as carriageway edges, fences and boundary lines are not shown on the survey, however it is assumed to be adequate for developing this feasibility study.

2.8 It has been assumed the road alignment is developed to meet desirable standards even although there may be scope for considering relaxations/departures.

## Structures Assumptions

2.9 Whilst East West Rail is an independent company appointed to develop the MVL railway and as such it could set its own standards to be used in the development, design and operation of that railway, because it will in effect form an integral part of the Network Rail traditional rail network it is assumed that East West Rail will choose to fully adopt and apply Network Rail standards. We thus assume that the bridge over the MVL railway will be designed to Network Rail and the Design Manual for Road and Bridges standards.

2.10 The structural supports will need to be located outside the railway boundary fence line. The location of the railway fence line has been assumed based on satellite imagery with a 0.5m allowance for error in this value.

2.11 A headroom of 6.2m has been considered above the MVL railway in accordance with East West Rail NR15 Planning Drawings Route Sections 2D, 2E and Stations.

2.12 A headroom of 3.7m has been considered for the bridleway underpass in accordance with DMRB requirements for equestrian users without dismounting.

2.13 A minimum allowance of 125mm has been included for carriageway surfacing.

## Current Known Risks

2.14 Accurate topographic information will be required to take the design forward in future stages. A budget cost estimate will be provided to MKC around the time of submission of this report.

2.15 No Geotechnical Ground Investigation has been commissioned around the location of structural foundations. Rather preliminary foundation designs have been based on assumed soil parameters from the nearest historic boreholes available as discussed in Section 5 of this report. Ground Investigations will be required for future design stages and may present a risk of increase in the cost of foundations, as well as having the potential to reduce costs. However, an appropriate cost allowance has been made in terms of risk and optimism bias to account for this, and other aspects in which the level of design development is currently low as discussed in Section 8.

2.16 No ecological, noise or other environmental surveys or stakeholder consultations, including consideration of potential stakeholder objections have been commissioned. When these are undertaken they may well impose further constraints on the design, over and above those imposed by engineering considerations such as cross section and headroom and other spatial constraints considered thus far.

## Health, Safety and Welfare Risks

2.17 As well as the above project risks, key risks to health, safety and welfare, considered appropriate to the feasibility stage design are discussed in this report along with the way in which they may potentially be mitigated. 'Safety in design risk' registers have been prepared by the Highways and Structures teams to assist with risk identification and mitigation and are available upon request.

# 3. Highways

## Introduction

3.1 Milton Keynes Council aspiration to develop land to the south of the Marston Vale Line (MVL) railway requires upgrade and extension of the V11 Tongwell Street within the area Brown's Wood and Old Farm Park residential estates. A corridor of land for the proposed roadworks (Transport Corridor CT8) has been set aside by the original town planners. This transport corridor runs southwards from Elgar Grove Roundabout crossing Morley Crescent and Holst Crescent and through the MVL railway, as shown in Figure 3-4.

3.2 This Feasibility Study investigates and reports on possible options for a proposed dual carriageway road alignment, from Browns Wood Roundabout to the location of a proposed SEMK SUE development roundabout (to be designed by others) south of the MVL railway.

## Highway Design Parameters

3.3 For the initial investigation into possible road alignments for upgrade and extension of V11 Tongwell Road the parameters were set out as follows:

3.4 As the proposed road will be a Primary Distributor Grid Road, the road design is based on current good practice as contained within the Design Manual for Roads and Bridges as directed by the Milton Keynes Highway Design Guide for Developers.

3.5 In accordance with the initially agreed brief, the highway alignment was developed on the basis of a speed limit of 60mph (equating to a design speed of 100kph). 100kph dictates the use of long horizontal and vertical curves and the considerable extent of the required embankment works either side of the railway crossing quickly became evident. A meeting was held between AECOM and MKC on 2 August 2021 to discuss AECOM's concerns in this respect, and in the interest of mitigating the height of the embankments, it was agreed to develop the highway alignment on the basis of a reduced speed limit of 40mph (70-kph design speed)

3.6 The speed limit for the new road alignment is 40mph which translates to a Design Speed of 70kph[1]. The mainline alignment has been developed to desirable standards applicable to a 70kph design speed as indicated in Figure 3-1.

3.7 It is acknowledged within the DMRB, that with the designer's discretion, relaxations to design standards can be applied. Relaxations have not been used within the proposed road alignments for this feasibility study.

3.8 From DMRB CD109, the desirable maximum longitudinal gradient of the proposed road alignment is 4% and a maximum superelevation of 5% (in urban areas) which will be applied to any proposal.

| **Design speed kph** | 120 | 100 | 85 | 70 | 60 | 50 | V2/R |
|---|---|---|---|---|---|---|---|
| **Stopping sight distance (metres)** | | | | | | | |
| Desirable minimum | 295 | 215 | 160 | 120 | 90 | 70 | - |
| One step below desirable minimum | 215 | 160 | 120 | 90 | 70 | 50 | - |
| **Horizontal curvature (metres)** | | | | | | | |
| Minimum R* with adverse camber and without transitions | 2880 | 2040 | 1440 | 1020 | 720 | 520 | 5 |
| Minimum R* with superelevation of 2.5% | 2040 | 1440 | 1020 | 720 | 510 | 360 | 7.07 |
| Minimum R* with superelevation of 3.5% | 1440 | 1020 | 720 | 510 | 360 | 255 | 10 |
| Desirable minimum R (superelevation 5%) | 1020 | 720 | 510 | 360 | 255 | 180 | 14.14 |
| One step below desirable Minimum R (superelevation 7%) | 720 | 510 | 360 | 255 | 180 | 127 | 20 |
| Two steps below desirable minimum radius (superelevation 7%) | 510 | 360 | 255 | 180 | 127 | 90 | 28.28 |
| **Vertical curvature** | | | | | | | |
| Desirable minimum* crest K value | 182 | 100 | 55 | 30 | 17 | 10 | - |
| One step below desirable min crest K value | 100 | 55 | 30 | 17 | 10 | 6.5 | - |
| Desirable minimum sag K value | 37 | 26 | 20 | 20 | 13 | 9 | - |

**Figure 3-1: DMRB CD109 'Highway Link Design' – Table 2.10 Design Speed Parameters**

[1] DMRB CD109 Highway Link Design, Table 2.5 - Urban roads speed limit/design speed relationship

# Typical Carriageway Cross Section

3.9 The proposed grid road extension is to have the facility to be readily converted to use by a Mass Rapid Transport (MRT) in future. As such 3.5m wide MRT lanes must be accommodated within the scheme in both directions, northbound and southbound, at some point in the future. For the purposes of this study it is assumed that this may be readily achieved by initially providing an urban all-purpose dual carriageway (D2UAP), with 2 no. 3.65m wide running lanes, a 1m minimum verge width, in accordance with DMRB CD 127 Figure 2.1.1N1g. It is anticipated that the nearside lanes will then become MRT lanes in the future, with an additional 0.15m wide margin then available between MRT lanes and the offside lane for remaining vehicular traffic. The typical cross section, agreed with MKC, can be seen in Figure 3-2.

3.10 Feasibility of providing new Redways from Browns Wood roundabout to Elgar Grove and Britten Grove was considered. However due to the existing Redway network in this area, part of which runs parallel with Tongwell Street, it was determined that new Redways would be appropriate for the section of the works from Holst Crescent to the SEMK roundabout. The proposed Redways will connect to the existing Redway network south of Holst Crescent, thus providing facilities for pedestrians and cyclists over the entire length of the scheme.

3.11 In sections without Redways, where a Road Restraint System (RRS) is required, this will be accommodated within the verge which will be suitably widened to 1.2m in order to allow for the necessary setback and working width of the RRS.

3.12 In accordance with the scope of works, all earthwork slopes are assumed to be a gradient of 1 in 3 for the purposes of this feasibility study.

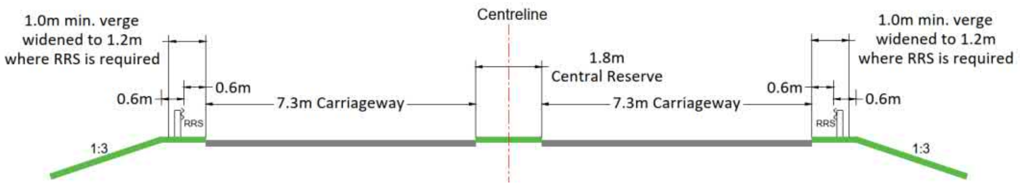



**Figure 3-2: Highway Typical Cross Section**

3.13 New Redways are required south of Morley Crescent and will be provided adjacent to each carriageway with a 1m wide segregation verge. A RRS will be provided within this segregation to provide a further level of protection to non-motorised users, rather than at the back of the verge on the outside of the Redway as shown in Figure 3-3. It is assumed the consequent positioning of the Redway adjacent to the Road Restraint System is acceptable, even though strictly speaking the working width behind the barrier encroaches within the Redway.

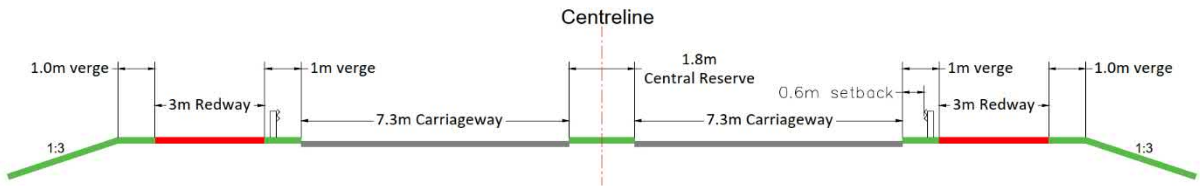



**Figure 3-3: Highway Typical Cross Section with Redway**

3.14 Over the proposed bridge the outer verges will generally be removed although the inner verges will continue across the structure, albeit hardened where there is insufficient cover to establish growth of grass. Thus the total minimum verge width including Redway is generally reduced from 5m between structures to 4m at structures. The one exception to this general rule is for Holst Crescent Underpass where the substantial ground cover to the buried structure means that it is more appropriate for the typical highway cross section with 5m wide verges to cross the structure.

# Railway Clearance Height

3.15 For the purpose of this report, Railway clearance is defined as being the difference in level between the centrelines of the running surfaces of the railway and the road above.

3.16 The critical point of the scheme which has significant influence on the proposed road alignment is the crossing of the MVL railway. The railway is due to be electrified in the future as part of the East West Rail project which will require installation of Overhead Line Equipment (OLE), as such the minimum required clearance over the proposed OLE needs to be satisfied by the proposed overbridge and associated road alignment designs. To determine an effective road alignment to meet these requirements for this feasibility study, the railway clearance from the highest rail to the road level was established as 7.8m, the breakdown of this height is shown in Table 3-1.

**Table 3-1: Minimum Road Clearance over Railway**

| Element | Height / Depth (m) | Comments |
|---|---|---|
| Clearance from highest track to bridge soffit | 6.200 | Required minimum height to bridge soffit to allow enough clearance over the proposed OLE. Taken from agreed East West Rail NR15 Planning Drawings, Route Sections 2D, 2E and Stations. |
| Steel beam supporting bridge deck | 0.850 | Refer to Structures Chapter for further information. |
| Bridge deck slab | 0.250 | Refer to Structures Chapter for further information. |
| Allowance for road superelevation | 0.180 | The road is superelevated across the railway bridge hence the low point of the road, southbound east channel, is critical in terms of OLE clearance. As such an allowance for this is required to be added to the road alignment centreline level. |
| Allowance for longitudinal gradient of railway | 0.200 | The railway rises from west to east hence an allowance is required at the road centreline to account for this. |
| Pavement | 0.125 | Allowance for binder course, wearing course and bridge deck waterproofing. |
| **TOTAL** | **7.8m** | Clearance from highest rail to road centreline. |

**Note:** Clearance above is to road centreline, critical point of clearance is east side of structure

## Transport Corridor

3.17 The limits of the Transport Corridor are shown on Figure 3-4. Ideally the footprint of the scheme including earthworks and any maintenance access requirements should not exceed these limits.

## Existing Ground Levels

3.18 The ground model used for the design of the road alignment was a LIDAR model containing a 1m grid obtained from the Environment Agency online survey archive through the DEFRA Data Services Platform website. This ground model does not contain any feature lines such as kerb lines, fence lines etc. as would be obtained from a topographical survey. As such the proposed road alignment centreline will tie into ground level where appropriate. Further information will be required to confirm the particulars of junctions and carriageway tie-ins for development of the design should it be taken forward.

3.19 Milton Keynes Council provided a 3D topographical survey in CAD format (29495_T_REV 03D.dwg) for the area south of the railway. This survey was compared to the obtained LIDAR data for the purpose of assessing the accuracy of the ground model. This resulted in there being very little difference between the two ground surface models (<100mm) which gives a good level of confidence in use of the LIDAR data for the ground model and any subsequent assessments of road alignment against existing ground level.

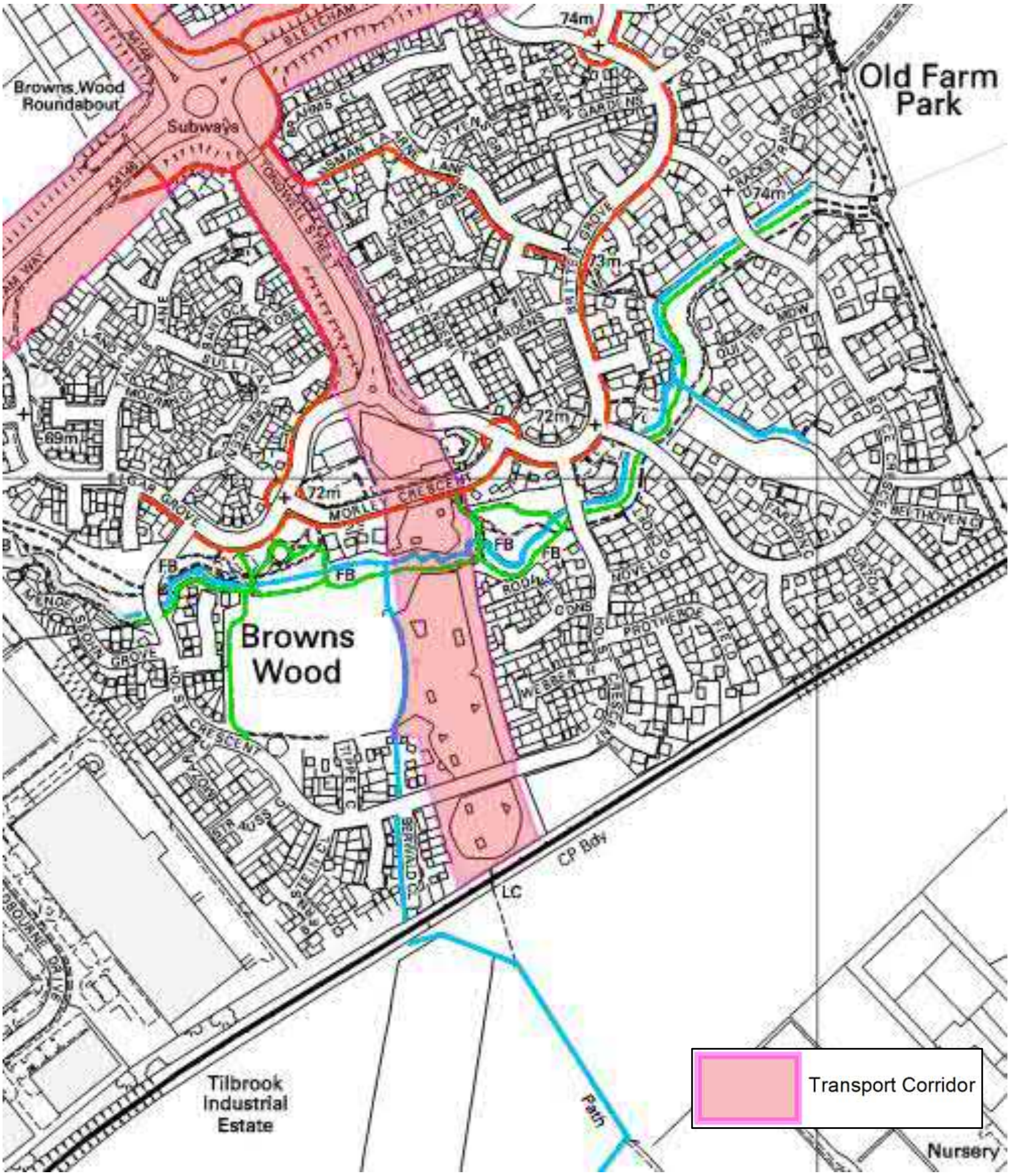



**Figure 3-4: Transport Corridor**

# SEMK Development

3.20 A high-level outline of the proposed SEMK development south of the railway has been provided by Milton Keynes Council. This shows an indicative location of the development roundabout which the road extension scheme will tie into. For the purposes of this assessment it is assumed that the proposed road alignment centreline will tie in to ground level at the north of the proposed roundabout location, see Figure 3-5.

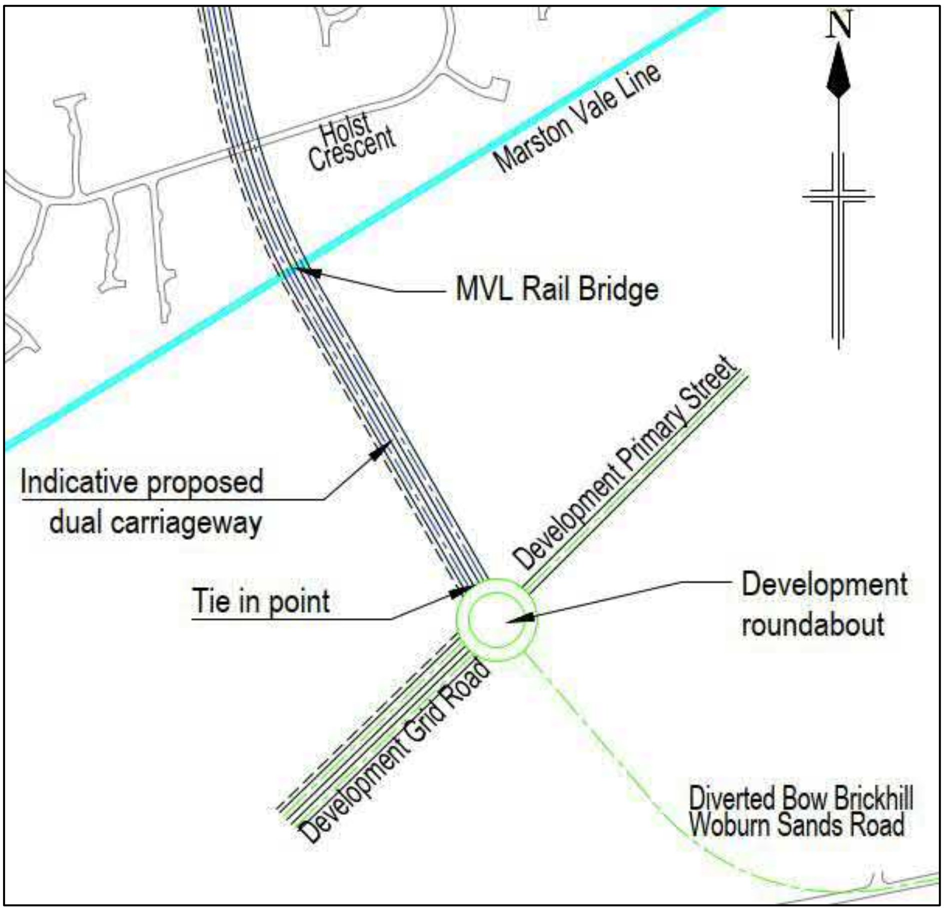



**Figure 3-5: SEMK Development south of MVL Railway**

# Proposed Road Alignment Assessment

3.21 As referred to earlier in this section, initial considerations for a road alignment with 100kph design speed was quickly superseded by a design utilising a lesser design speed of 70kph in an attempt to reduce the impact associated with the proposed embankment heights. Details of these considerations are summarised below.

## Initial Considerations

3.22 As outlined previously under the heading Highway Design Parameters, a 100kph design speed alignment was produced, however was not taken forward due to extensive earthworks and scheme footprint. The extent of the earthworks, some of which encroached the Transport Corridor boundary, can be seen in Figure 3-6.

3.23 The 100kph road alignment prepared for initial review and its associated details are briefly summarised below and can be seen in the road profile in Figure 3-10.

### Browns Wood Roundabout to Elgar Grove/Britten Grove Roundabout

3.24 From Browns Wood Roundabout to Elgar Grove Roundabout the alignment generally follows the line and level of Tongwell Street (Chainage 0/000 to 0/300).

### Elgar Grove/Britten Grove Roundabout over MVL Bridge to south tie-in

3.25 The right-hand horizontal curve of 820m continues south to Chainage 0/400, beyond Britten Grove, it then continues straight before a entering a left-hand curve of 720m radius, the desirable minimum value for the design speed. With this radius a superelevation of 5% is required (the maximum of urban roads), which continues over the bridge deck. South of the bridge the horizontal geometry becomes a straight up to the tie-in point with the SEMK development roundabout. Consequently, there are generally no issues in terms of design standards with regards horizontal alignment with a 100kph design speed.

3.26 The vertical alignment begins to rise at a gradient of 2.85% from Elgar Grove southwards over Morley Crescent and Caldecotte Brook. The alignment is approximately 6m above Morley Crescent, as the existing ground level falls southwards while the road alignment rises in this area.

3.27 From Caldecotte Brook the road alignment continues to rise into a crest curve of K=100 (10,000m vertical radius), the desirable minimum value which peaks over the MVL bridge. Due to the high design speed and associated large vertical curves required the proposed crest curve has a length of 486m in order to meet the clearance requirements of 7.8m over the railway. The existing ground rises as well as the proposed road level as it heads south from Caldecotte Brook, with a proposed embankment height of over 10m above existing ground level at Holst Crescent. This vertical curve continues on to meet a straight section with a longitudinal gradient of 2% as the alignment heads down to the tie-in point at the SEMK roundabout.

3.28 There isn't any scope to relax the radius of the vertical curve over the MVL bridge below desirable minimum standards (K=100). DMRB CD 109, paragraph 2.13 states that relaxations below desirable minimum for vertical curvature shall not be used on immediate approach to junctions. This length is defined as a function of the design speed and for 100kph extends from the junction over the MVL bridge. Any reduction would be defined as a departure and is not permitted.

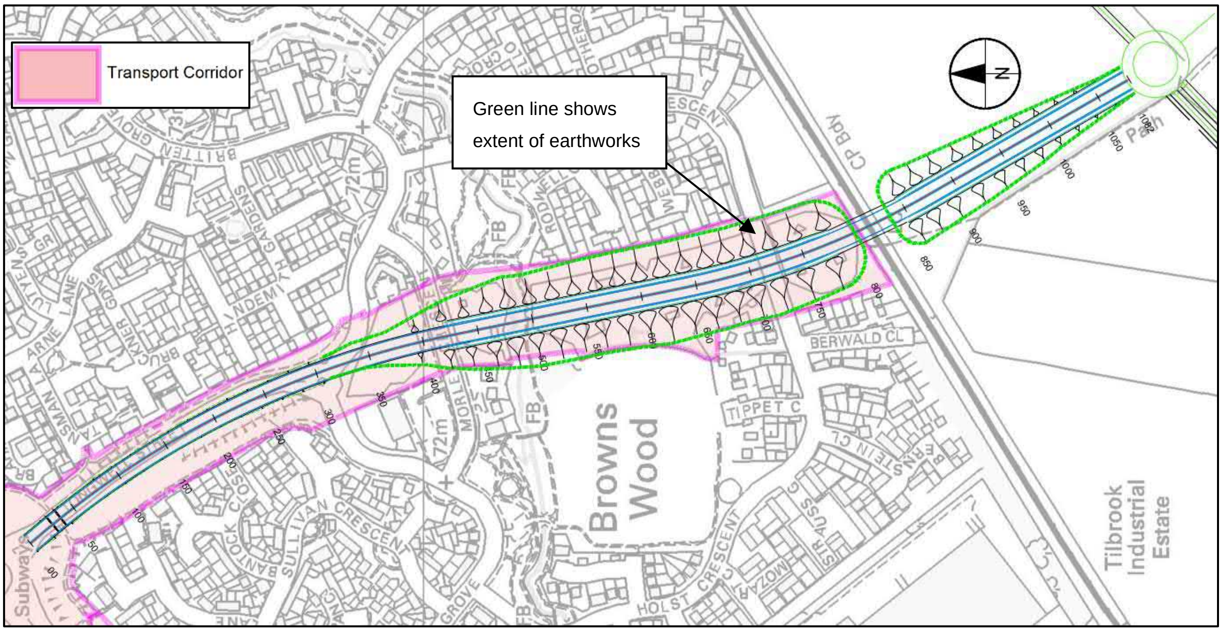



**Figure 3-6: 100kph Alignment Plan**

## 70kph, Preferred Design Speed Alignment

3.29 Following a meeting with Milton Keynes Council on 2 August 2021 it was agreed a design speed of 70kph (40mph speed limit) should be adopted for the proposed road alignment and is considered further in the remainder of this report.

3.30 With the reduction in design speed from the initial 100kph, proposed road levels and therefore embankment heights immediately north of the MVL railway are reduced by approximately 2.5m. This also decreases the scheme footprint which is now contained within the transport corridor, as shown in Figure 3-7.

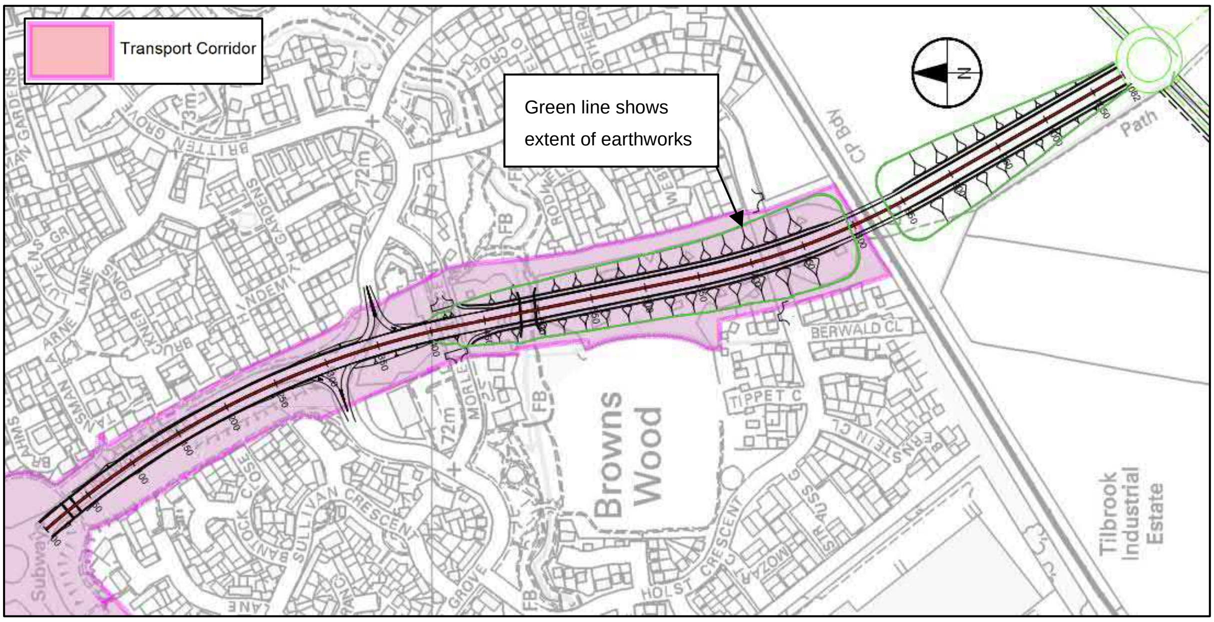



Figure 3-7: 70kph Alignment Plan

3.31 The alignment meets desirable minimum design standards for the design speed of 70kph with no relaxations or Departures from Standards required. The 70kph road alignment and associated are summarised below and can be seen in Plan and Profile drawing 60664040-ACM-HML-V11_ML_000_Z-DR-CH-1001, in Appendix A. The road profile is shown in Figure 3-9Figure 3-8: Road Profile- Preferred 70kph Design Speed (40mph).

## Browns Wood Roundabout to Elgar Grove/Britten Grove Roundabout

3.32 From Browns Wood Roundabout to Elgar Grove Roundabout the alignment generally follows the line and level of Tongwell Street (Chainage 0/000 to 0/300). The existing single Tongwell Street carriageway would be converted into the proposed southbound carriageway of the proposed dual carriageway, to aid construction and traffic management. The majority of new works in this area will be to the west of the existing Tongwell Street for construction of the northbound carriageway and extension of the existing Redway underpass, south of Browns Wood Roundabout.

3.33 This right-hand curve of the alignment through this section has a radius of 820m, greater than the desirable minimum of 720m. Further survey information of the existing road features would be required for preliminary design in order for the proposed southbound carriageway to effectively tie-in to existing levels of Tongwell Street.

3.34 The road cross section at this section is that shown in Figure 3-2, dual carriageway without Redway. It is anticipated that non-motorised users will make use of the existing Redway network in this area therefore Redways adjacent to the carriageways in this section are not required.

## Elgar Grove/Britten Grove Roundabout over MVL Bridge to south tie-in

3.35 The right-hand horizontal curve of 820m continues south to Chainage 0/400, beyond Britten Grove, it then continues straight before a entering a left-hand curve of 720m radius, the desirable minimum value for the design speed. With this radius a superelevation of 2.5% is required which continues over the proposed MVL bridge deck. This superelevation establishes the critical point for bridge clearance over the future railway OLE is the east side of the structure where the cross section of the road is at its lowest point, particularly when considering that the railway rises longitudinally from west to east.

3.36 South of the MVL bridge the road horizontal geometry is straight up to the tie-in point with the SEMK development roundabout. Consequently, there are no issues in terms of design standards with regards horizontal alignment for a 70kph design speed.

3.37 The vertical alignment begins to fall via a small crest curve (K=30, the desirable minimum) and a gradient of 1.26% from Elgar Grove southwards into a small cutting through Britten Grove before rising into a section of fill over Morley Crescent and Caldecotte Brook, to allow for construction of a combined Redway and bridleway underpass. The alignment is approximately 2.0m above Morley Crescent, as the existing ground level falls southwards towards Caldecotte Brook.

3.38 From Caldecotte Brook the road alignment continues to rise reaching a gradient of 4% (the desirable maximum) before a crest curve of K=30 (3000m vertical radius), the desirable minimum value which peaks south of the MVL bridge. The road then continues down at a gradient of 2.7% before a tie in with the existing ground level at 2% gradient at the location of the SEMK development roundabout. The highest point of the vertical alignment is south of the MVL bridge ensuring that the road level is decreasing as it heads northwards over the bridge to ensure embankment heights on the north are minimised.

3.39 This alignment meets the railway clearance requirement of 7.8m at the MVL bridge. The existing ground rises as it heads south from Caldecotte Brook, which gives a proposed road height of approximately 8.5m above existing ground level at Holst Crescent. The proposed cross section at this point is shown in Figure 3-8.

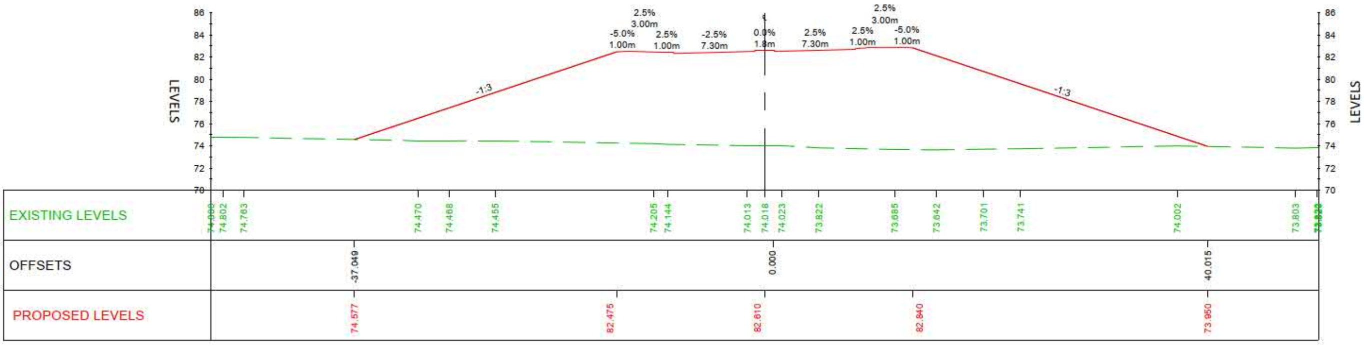
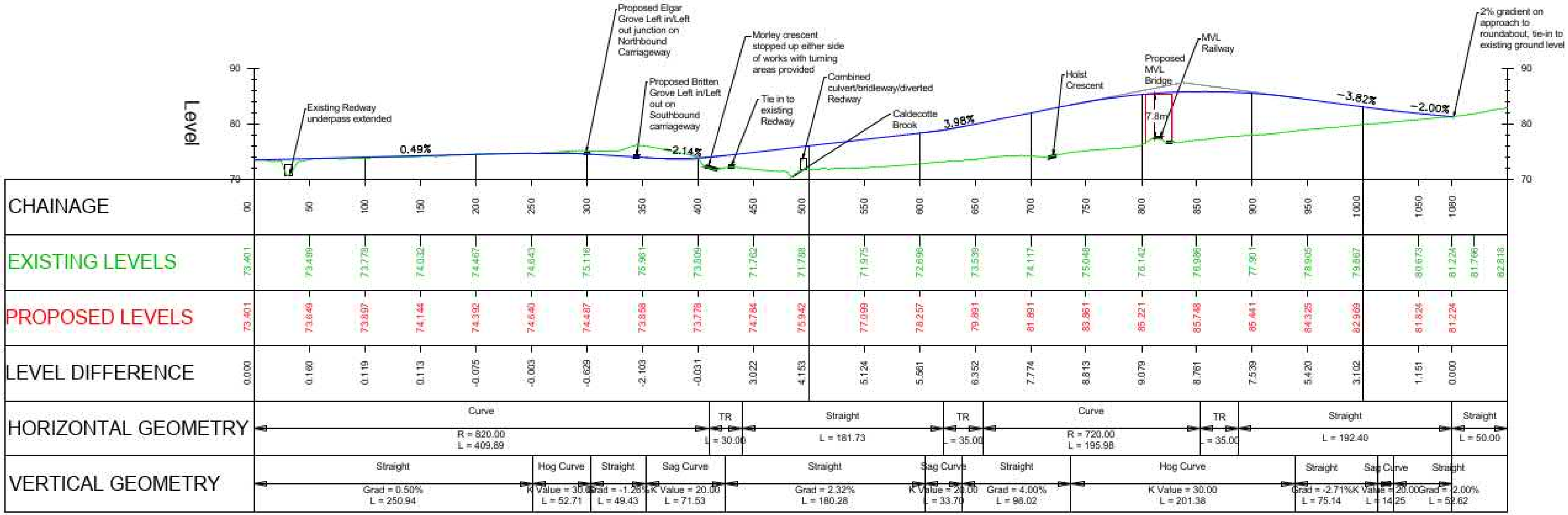
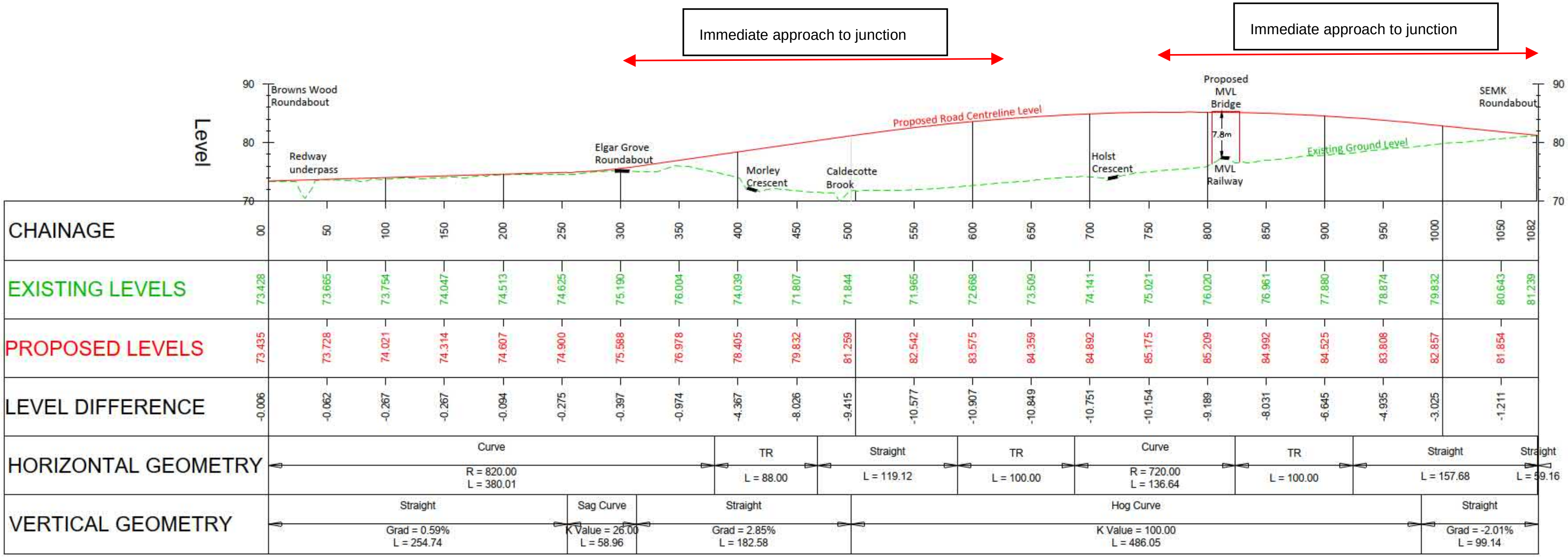



Figure 3-8: Cross Section at Holst Crescent




Note: Vertical scale is 5 times greater than horizontal

**Figure 3-8: Road Profile- Preferred 70kph Design Speed (40mph)**




Note: Vertical scale is 5 times greater than horizontal

**Figure 3-9: Road Profile- 100kph Design Speed (60mph) – NOT TAKEN FORWARD**

## Elgar Grove / Britten Grove

3.40 The existing roundabout at Elgar Grove and Britten Grove will be replaced by two left in/left out junctions, one on each carriageway. This is for increased road safety as roundabouts are not considered acceptable at intermediate junctions on grid roads. It is anticipated that these will be the only junctions on the new road between Browns Wood Roundabout and the SEMK development roundabout, the indicative junction layouts can be seen in Drawing 60664040-ACM-HML-V11_ML_000_Z-DR-CH-1002 in Appendix A.

## Morley Crescent

3.41 Morley Crescent is proposed to be stopped up either side of the works, severing the east / west link of the road with turning areas provided at suitable locations adjacent to the limits of the new works. Access on to the proposed road would be via the nearby left in / left out junctions at Elgar Grove and Britten Grove.

3.42 Consequently, vehicles located in the local area west of the proposed works wishing to travel southbound would require using the left in / left out junction at Elgar Grove and access the northbound carriageway and turning at Browns Wood Roundabout. Similarly, vehicles located on the east side of works wishing to travel northbound would require using the left in / left out junction at Britten Grove and access the southbound carriageway and turning at the SEMK development roundabout.

## Holst Crescent

3.43 As the proposed alignment passes high on an embankment over Holst Crescent, there are two possible options for the road at this location listed below (these are shown on drawing 60664040-ACM-HML-V11_ML_000_Z-DR-CH-1002 in Appendix A:

> Option A: Due to the high embankment over Holst Crescent it is impractical to consider an at grade junction at this location, as such an underpass at Holst Crescent could be constructed through the embankments in order to maintain the east / west link through the proposed works. The underpass would maintain the Holst Crescent link across the Transport Corridor allowing vehicles to access the proposed left in / left out junctions at Elgar Grove and Britten Grove. This would allow direct access to the proposed southbound and northbound carriageways and may be preferable to detouring via Browns Wood or the new SEMK development roundabouts.
>
> Option B: Holst Crescent stopped up either side of the works with turning areas provided at suitable locations adjacent to the new works.

# Redways and Non-Motorised Users

3.44 There is currently an extensive network of Redways in the area from Morley Crescent north to Browns Wood Roundabout. These are situated east and west of the proposed scheme with two crossings through the transport corridor, situated south of Morley Crescent and under Tongwell Street just south of Browns Wood Roundabout. Consequently, it was decided that new Redways in the area north of Morley Crescent were not required. The existing Redway Network in the vicinity of the scheme can be seen in Figure 3-10.

3.45 The existing Redway south of Morley Crescent will be severed by the works. However, the east / west link will be maintained through diversion of Redway users on to an existing bridleway south of Caldecotte Brook. This combined Redway and bridleway route crosses the scheme via a proposed underpass. Due to the proximity of Caldecotte Brook, it is assumed that this will be combined with a culverted section of the watercourse as this will achieve a more open aspect solution enhancing appeal to equestrian and other NMUs, as well as fauna.

3.46 The severed section of the existing Redway south of Morley Crescent will be regraded on both sides of the scheme to tie into the proposed Redways provided adjacent to both proposed carriageways, which run from the connections south of Morley Crescent to the SEMK development roundabout. Consequently, a Redway network will be provided over the length of the scheme.

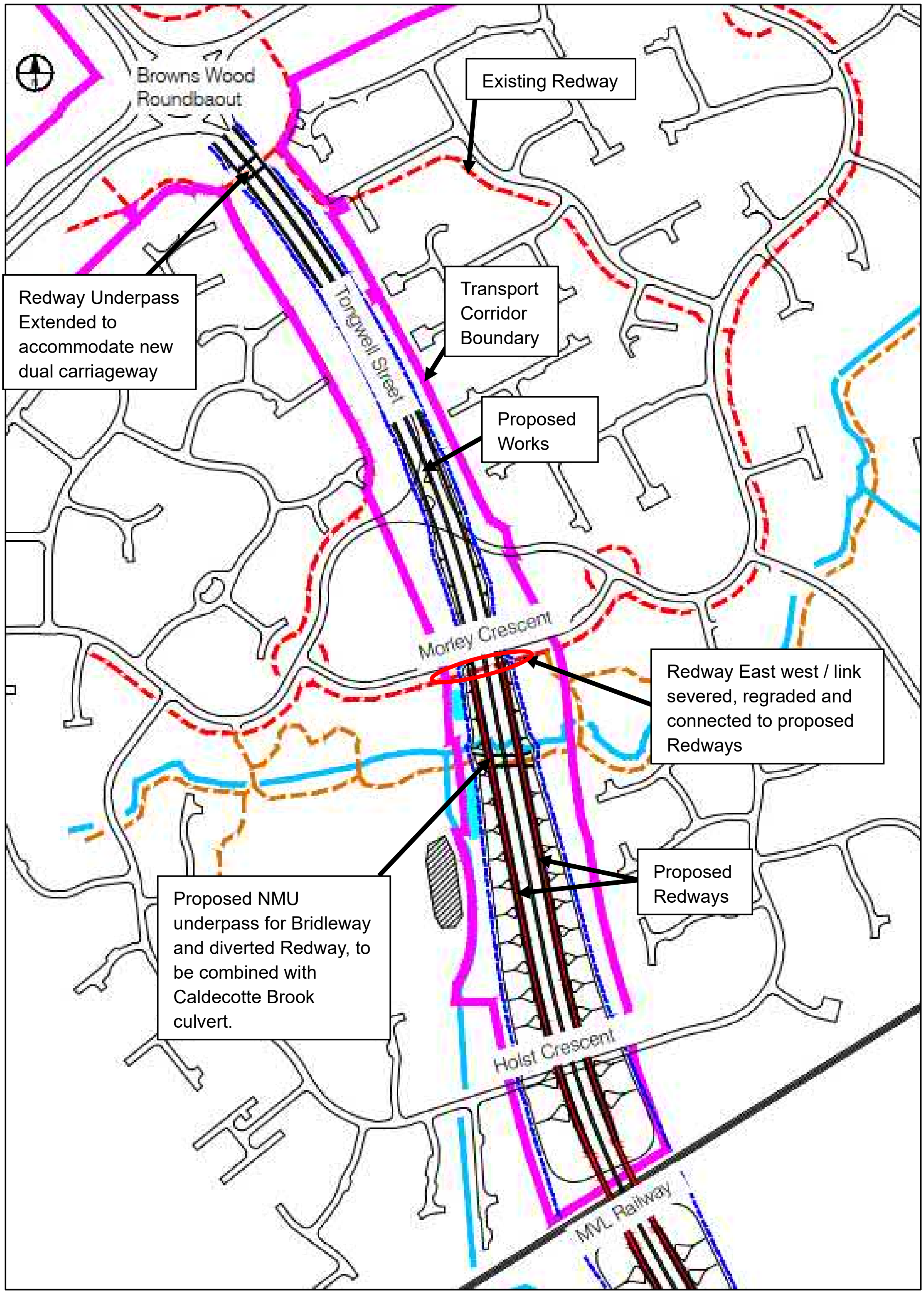



**Figure 3-10: NMU Networks**

# Maintenance

3.47 For this assessment of the proposed works it assumed that a maintenance strip of 3m wide will be required adjacent to the extent of earthworks slopes. Maintenance requirements of the road and its associated features and elements are considered at a wider level at this stage in accordance with CDM 2015 requirements, with the anticipation that these will be reviewed and developed when the scheme design progresses.

# Drainage

3.48 At this stage a drainage design has not been developed in any detail however it is assumed that drainage for the proposed dual carriageway will be provided by gullies and a carrier drain. Earthworks drainage will be provided by filter drains.

3.49 The new road alignment passes over Caldecotte Brook watercourse. The water course will need to be culverted over this length.

3.50 Possible drainage treatment areas have been identified adjacent to Caldecotte Brook, these are shown on drawing 60664040-ACM-HML-V11_ML_000_Z-DR-CH-1001, in Appendix A.

3.51 Initial findings from the study highlight that a section of existing watercourse south of the MVL railway may need to be diverted.

# Utilities

3.52 C2 enquiries were sent out on 13 August 2021. Returns have been received from all of the Utility providers contacted with the exception of Colt Technology Services who had not submitted a response at the time of finalising this report. In addition, the return from Thames Water indicated apparatus within the scheme extents but it was not possible to correlate the accompanying plans with the scheme and a number of them included a road marked as the M11 so would appear to be an erroneous return. Thames Water and Colt have been contacted again to resolve these uncertainties.

3.53 Of the remaining Utility providers, the following declared having apparatus that would be highly likely to affect the scheme as follows:

i. BT showed apparatus running across the Tongwell Street carriageway to the immediate south of Browns Wood Roundabout and then continuing south along the east verge. This is likely to require local diversion or protection to construct the new northbound carriageway and verge at the junction with Browns Wood roundabout. (The route of this service beyond here to the south is unclear due to an incomplete return from BT, who have therefore been contacted again for clarification.) It should also be clarified with BT if their apparatus includes Fibre Optic cables or more traditional wire cables as the work required in diverting them will be considerably more involved if they are Fibre Optic.

ii. City Fibre declared apparatus in the north verge of Holst Crescent, which would likely require temporary protection and/ or temporary diversion during construction of the new underpass under Option A, and improved protection possibly via robust split-ducting under the high embankment of Option B should such an approach be acceptable to City Fibre. However, City Fibre may alternatively require the development of a diversion that would not involve their service being buried under some 8 m of embankment and being inaccessible for some 80 m of its length.

iii. GTC recorded an existing low pressure gas main in the north verge of Morley Crescent which will run under a lower section of embankment under both Option A and Option B and therefore may require improved protection or diversion.

iv. Anglian Water declared a 180 mm MDPE/ PE 80 Potable Water Main in the north verge of Holst Crescent which would likely require temporary protection and/ or temporary diversion during construction of the new underpass under Option A, and improved protection possibly via protective sleeving under the high embankment of Option B should such an approach be acceptable to Anglian Water. However, Anglian Water may alternatively require the development of a diversion that would not involve their service being buried under some 8 m of embankment and being inaccessible for some 80 m of its length.

3.54 In addition to the above, the following Utility Providers declared having apparatus within the extent or immediate vicinity of the scheme, but may or may not be found to have an impact on the scheme following further investigation:

i. Vodafone showed an underground service route running along the west verge of the V11 to the north of Browns Wood roundabout, and then along the north verge of Bletcham Way to the west of Browns Wood roundabout. Therefore, although this service impacts the roundabout it is unlikely to impact the scheme.

ii. Network Rail recorded copper cable signalling apparatus running along the line of the MVL. The declared search area extended beyond the railway boundary and so there is a possibility that this will impact the scheme. However, provided that in practice the signalling cabling is contained within the cess or embankment of the railway within the railway boundary, and appropriate temporary works are carried out when constructing the MVL bridge foundations as described in Section 4, it is unlikely that this signalling cable would significantly impact the scheme.

iii. Anglian Water declared 750 mm surface water drainage and foul sewer drainage in the east verge of Tongwell Street south of Browns Wood roundabout. Any works would be minimal provided there is not a requirement to significantly upgrade the existing Tongwell Street North verge.

3.55 Selected C2 returns, including plans of services that may be affected are included in Appendix C. It should be noted that these cannot be relied upon for accurate location of services, but only to give an indication. The full C2 returns which include some of the special requirements of the Utilities providers are available from AECOM upon client request.

3.56 As the V11 extension would be providing access to development areas to the south and given the wide verges and Redways adjacent to the carriageways, its route provides an opportunity to carry crucial services to the new development area in an effective way. Should the scheme be progressed further, then at the next stage early consultation with the developer(s) and associated Utility providers is recommended to establish what services would need to be carried.

# Street Lighting

3.57 For the purposes of this feasibility study street lighting has been assumed to be required for each carriageway situated within the verges. A column spacing of 35m has been assumed at this stage.

# Alternative Rail Crossing

3.59 This feasibility study focusses on a proposed road alignment incorporating a bridge spanning the MVL Railway. For means of contrast, an alternative proposed centreline road alignment was produced with the proposed road crossing underneath the railway.

3.60 To produce this alternative alignment the same tie in points were used as for the overbridge alignment as well as the same design speed of 70kph. For clearance requirements under the railway the following was assumed:

**Table 3-2: Minimum Road Depth under Railway**

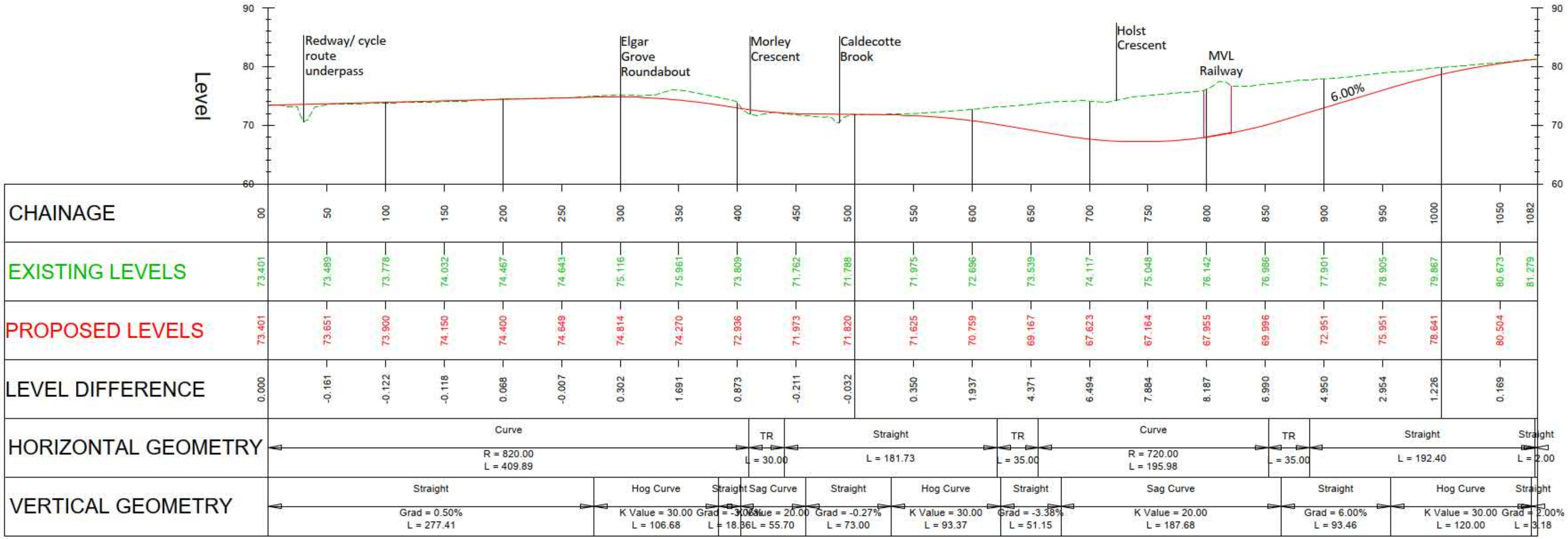
| Element | Height / Depth (m) | Comments |
|---|---|---|
| Absolute minimum cover below existing ground level | 1.00 | Under toe of the small embankment supporting the railway. |
| Minimum cover below current top of rail | 1.50 | Subject to further investigation this may increase to 2.5m. |
| Box depth in a single span | 1.60 | Note that it may be necessary to introduce dividing walls to satisfy Network Rail’s deflection requirements. |

| Element | Height / Depth (m) | Comments |
|---|---|---|
| Road clearance envelope | 5.35 | This include 5.3m headroom[2] at new structures + a working sag allowance |
| **TOTAL** | **7.95** | Note that a minimum ground cover of 1m meets the criteria of minimum 1.5m below top of rail. |

3.61 Given the criteria above, a clearance height for the road below the railway of 7.95m was used to produce an initial alignment. The alternative alignment can be seen in Figure 3-11.

3.62 This alternative alignment has various impacts which differ in significance from that of the scheme with a bridge crossing the railway in terms of environment and construction. These would need to be evaluated in any potential development of this alternative. In general terms it is likely that bridge costs would be increased, but environmental impact would be reduced. Drainage would also need consideration and a permanent pumping system would be required. In terms of vertical road alignment, the key issue to note is the need for a steeper longitudinal gradient south of the railway. Due to the rising ground level south of the railway, a longitudinal road gradient of 6% is required to tie-in at the SEMK development roundabout. A 6% gradient is greater than the desirable maximum of 4% and would require a relaxation.

[2] DMRB CD 127 Cross Sections and Headrooms - Table 4.1




Note: Vertical scale is 5 times greater than horizontal

**Figure 3-11: Road Profile- Alternative Railway Crossing**

# Structures

## Introduction

4.1 To facilitate the proposed extension of the V11 Tongwelll street from Browns Wood roundabout to the land south of the MVL railway, multiple structures will be required. The obstacles crossed include Morley Crescent and associated Redway, a Bridleway and watercourse, Holst Crescent (under Option A) and MVL railway. Additionally an existing underpass on the south arm of Browns Wood roundabout will require alteration to accommodate a wider carriageway.

4.2 The preferred structural solutions for accommodating each of the above are described below, starting from the railway crossing and working north towards Browns Wood roundabout.

## Marston Vale Line Railway Bridge Solution

4.3 The feasibility stage solution described below has been chosen to best meet the currently perceived needs of the scheme, particularly in terms of minimising the level difference between the railway and road surface above (the Railway Clearance), and in doing so assisting with minimising the height of the adjacent embankment to the north. Consideration has also been given to minimising the impact on the operational railway in the permanent works and in the maintenance of the bridge, as well as addressing other stakeholder needs.

4.4 As described in Section 3, there are key challenges presented in terms of minimising the height of the embankment to the north of the railway, even with the proposed reduced design speed to 40 mph. In order to further assist with controlling the height of the embankment, a decision was made early on to target minimising the construction depth of the bridge superstructure without compromising its structural performance, most particularly in terms of deflection under live load.

4.5 As well as minimising bridge construction depth it will be important to minimise impact on the operational railway, both from the construction of the bridge and its ongoing maintenance, especially when considering the planned increased use of the MVL under the East West Rail scheme. For this reason, a decision was taken to keep all supports, as well as the plan footprint of their foundations, clear of the existing railway boundary.

4.6 Appendix B includes feasibility stage General Arrangement drawings for the structure, which the following structural rationale should be read in conjunction with.

4.7 Spread foundations have been assumed at this point, which are likely to be viable, subject to a positive outcome from the scheme specific Ground Investigation that would be required in due course. However, as discussed in Section 5, it may prove necessary to excavate to circa 3m below existing ground level to found the piers on the underlying Oxford Clay bearing strata which sits below the Head deposits that would be unsuitable for direct founding of the bridge. Use of a mass concrete or granular bedding layer between the upper surface of the Oxford Clay and the underside of the bridge's reinforced concrete spread footing could be used under these circumstances to acceptably transfer loads from the spread footing to the founding material at minimum cost. (This depth of excavation will not be required for the bankseats as dispersal through the embankment below will reduce applied bearing pressures on the head deposits to an acceptable level.)

4.8 In order to avoid segregation of communities that might otherwise be severed by the construction of the new road, it has been agreed to provide pedestrian access to the north of the bridge, outside but close to the railway boundary, with a nominal minimum width of 2m. To mitigate environmental segregation, a wildlife corridor is to be provided to the south of the bridge with a nominal minimum width of 3m. As described in Section 5, foundation size (measured in the longitudinal direction of the V11 road) is expected to be in the order of 4m. It is desirable to keep the piers reasonably close to the railway boundary to limit the span of the main bridge over the railway and thereby also limit the bridge's construction depth for the reasons described in paragraph 4.4 above. To do this would require vertical temporary support to the excavation for the pier foundations, such as vertical sheet piling, in order to avoid undermining the railway boundary and embankment. To make sufficient space for this, and provide a route for running maintenance vehicles, including mobile elevated working platforms, an increased width of 3m is proposed between the piers and the railway boundary on each side of the railway. These widths may simultaneously accommodate the pedestrian route and wildlife corridor (which given the low and infrequent nature of maintenance activities on the bridge is assumed not to present any significant conflict and therefore to be acceptable).

4.9 The above arrangement suggests a main span in the order of 27m between pier centrelines. Open side spans are proposed in a three-span solution (rather than a single span solution with full frame abutments) for the following reasons:

i. Integral construction is proposed to minimise maintenance liabilities by removing a need for bearings and expansion joints, both of which would require routine replacement throughout the working life of the bridge. With open side spans the substantial earth pressures generated by expansion and contraction of the bridge superstructure caused by temperature changes are limited to the comparably modest height of a shallow bank seat at the top of each approach embankment. As well as reducing the substructure material quantities, this also consequently reduces bending effects at the integral connections between the superstructure and substructure, which in turn limits the construction depth.

ii. Construction of a pier instead of a full frame abutment adjacent to the railway will reduce the amount of construction required close to the railway boundary and therefore the amount of work required to be undertaken in railway possessions, thereby having a positive impact on costs and health and safety. Construction durations could be further reduced, and health and safety further enhanced, by forming the piers from concrete units that are fabricated off-site and then erected on site, possibly structurally connected to each other and the spread footing foundations by post-tensioning.

iii. Compared to full frame abutments in a single span solution which would require the embankment to continue to the railway boundary, this approach will reduce loss of light, both as a consequence of its open side spans, which will allow some light to pass through, and as a consequence of the reduced embankment height that accompanies the reduced construction depth achieved as described in point i above.

4.10 A structural construction depth in the order of 1.1m is expected to be viable. The superstructure would comprise 10 No. 0.85m deep weathering steel girders in a multi-girder arrangement connected to a 0.25m thick reinforced concrete deck slab in a composite manner via shear connectors. Weathering steel is proposed to minimise maintenance by negating a need for routine repainting above the operational railway which would bring significant cost and safety implications.

4.11 Railway possessions during construction would be required for

- some of the construction works on the piers
- lifting in of the main girders (in braced pairs)
- placement of permanent formwork units above the main girder braced pairs
- erection of proprietary cantilever and edge beam formwork/ falsework units
- erection of the parapets.

In general, the approach taken would be to assess the safety impact of any construction works on the operational railway and plan for possessions where the risk of conflict between the workforce and the operational railway without a possession was found to be significant. This would typically include any situations where the railway embankment may be undermined or where construction materials or plant could fall into the railway; either vertically from above or by falling sideways. For the works on the piers large formwork and falsework lifts as well as large height concrete pours could present such a risk, and so consideration may be given to constructing the piers in a series of limited height ‘lifts’ similar to slip forming so as to minimise possessions. Such an approach is understood to have been used successfully on the construction of the new A14 bridge over the East Coast Mainline railway. Alternatively, they could be formed from modular concrete units precast off-site and connected together and to the spread footing foundations using post-tensioning as is understood to be favoured for HS2.

4.12 It is important that conflict is avoided between any new Overhead Line Electrification (OLE) apparatus, such as stanchions supporting the catenary wires, for the MVL improvement and the proposed bridge site is avoided. The presence of such apparatus within the bridge footprint may significantly impact the bridge design and severely hamper construction activities. If the bridge and embankment scheme is taken forward, then in the next stage measures should be implemented to ensure that East West Rail’s OLE design is developed cognisant of the potential intention to construct this bridge and avoid its likely footprint.

4.13 It also needs to be recognised that, assuming East West Rail follow the same procedures that Network Rail do, in order to achieve their consent, the emerging design of the bridge would need to be the subject of a Signal Sighting Survey. Whilst such a survey would not be overly costly, experience has shown that there are a limited number of practitioners with suitable credentials to complete these exercises; so they can become constraints to programmes.

# Holst Crescent Underpass

4.14 The next structure heading north from the railway would exist only under Option A; Holst Crescent Underpass which would carry the V11 dual carriageway extension over the existing Holst Crescent alignment.

4.15 The highway cross section over the structure would be similar to that over the railway, whilst the cross section under it would accord with the standard for a local distributor road and feature a 6.75m wide carriageway with 2 x 2m wide raised verges/ footways.

4.16 In accordance with CD 127 a minimum headroom of 5.3m (+ sag curve compensation) would be required over the carriageway and the adjacent verges. This headroom is substantially less than the level difference between Holst Crescent and the V11 extension above. A buried structure can thus be provided with fill material placed above it, the cover of which would be substantially greater than 0.6 m deep. A single clear span of 10.75 m is able to accommodate the Holst Crescent cross section. The implication of this limited span and significant ground cover is to notably limit the differential thermal expansion and contraction of the deck slab relative to the supports. This has substantial design benefits when considering a low maintenance integral solution, most notably in keeping the backfill pressures under temperature expansion relatively low thereby also limiting the bending effects in the integral structure arising from both these temperature induced earth pressures and the deformations themselves caused by temperature changes . This is reflected within the simplified design rules for maximum earth pressures in PD 6694-1:2011 which may be used for buried structures with an expansion length of less than 7.5m (this typically being half the distance between outer faces of opposing abutments).

4.17 For the above reason a single span portal frame structure is proposed for Holst Crescent Underpass as shown on the drawing in Appendix B.

4.18 A portal frame is preferrable to a box structure as its construction would minimise disruption to the existing Holst Crescent carriageway. The span and height of the structure is likely to be slightly too large to facilitate the use of precast reinforced concrete units; as they would be too large and heavy to be readily transported from an off-site precast yard to site. At the same time the span of the superstructure is not sufficient to warrant the use of structural steelwork or precast pretensioned concrete deck beams in the deck, although if for some reason it was considered highly desirable to minimise temporary closures of Holst Crescent during construction, then pretensioned concrete deck beams could be used. However, it is anticipated that Holst Crescent could be temporarily stopped up during the construction of the superstructure, which would enable the construction of an insitu reinforced concrete deck slab as has been shown on the drawing option in Appendix B.

4.19 Use of wingwalls parallel to the V11 above, will provide the most open aspect to the approach to the structure portal ends, and is thus currently assumed in this option, although an alternative with 45 degree splay wingwalls could easily be developed at preliminary design stage if preferred following stakeholder consultation. If it becomes desirable to soften the appearance of the wingwalls, the use of reinforced earth retaining walls with concrete block or vegetated block facings, or the use of stone filled gabions could be considered. Although this may increase construction costs such increases would generally be tolerable when compared against the overall scheme costs.

4.20 It is noted that the cross section shown on the Option B drawing for Holst Crescent includes minimum 2m wide footways within raised verges either side of the carriageway, and this complies with the requirements for a local distributor road given in Section 3.12 of the Milton Keynes Council ‘Highway Design Guide for developers’ the existing verges inclusive of footways on Holst Crescent are somewhat wider, featuring as they do wide grassed and tree-lined verges between the edge of the carriageway and the footway. Continuing such a width through the structure would present poor value for money. A soft verge under the structure would not be effective as grass would not grow. In addition a nominally level hardened verge/ footway any wider than 2m may encourage anti-social parking and should therefore be avoided. Rather the grassed portion of the verge would be tapered in, in a similar manner to that provided where nearby Bletcham Way crosses Wadesmill Lane as shown in Figure 4-1 below. If the view is taken that the resulting structure cross section is too narrow then 1.5m wide hardened 1:3 revetment / slopes could be introduced at the backs of the footways in a similar manner to that shown in Figure 4-1, although the cost of doing so would likely amount to a six figure sum increase in scheme costs.


**Figure 4-1 – Verge tapering at structure following typical example at Wadesmill Lane beneath Bletcham way**

# Bridleway, Morley Crescent Redway and Caldecotte Brook Underpass

4.21 As shown in Figure 3-10 to the South of Morley Crescent lie an East West Redway, Caldecotte Brook and a bridleway all in relatively close proximity. As the scheme will inevitably require a significant import of fill to form embankments of sufficient height to cross the railway and because of the limited width of the available transport corridor, it is not desirable to create grade separation at the location of the Redway by lifting the proposed V11 extension significantly above existing ground level. However, by locally aligning the Redway and the bridleway they could be accommodated in a single Underpass situated at the approximate location of the existing bridleway which may then enable all NMUs to cross the V11. This combined Underpass could have a typical Milton Keynes layout, but with wide verges of 1m width either side of a 3m wide NMU routes being replaced in this instance by a 5m width for a segregated bridleway and Redway. (Note that if combination of equestrian users and cycles is considered acceptable to MKC it may be prudent to consult the Horse Society on the same and gain their views on required width, as CD 143 does not explicitly set out recommended widths under such circumstances.) This would typically be bordered by 1:3 (vertical: horizontal) inclined revetments to provide an open aspect.

4.22 Such an open aspect in a combined structure would help to allow more natural light to enter the structure, and if combined with relatively straight approaches would also benefit personal security. The open aspect may also benefit the crossing of the Caledecotte Brook (relative to a conventional culvert or pipe crossing) if it was combined into the same underpass structure, albeit with a dividing wall and equestrian parapet as shown in the structural cross section sketch in Figure 4-2 below. Provision of a natural stream bed in the base of the channel would mitigate the inevitable adverse impact that having a hard and smooth bed to the watercourse would have and encourage the passage of freshwater fauna and flora. Additionally, mammal ledges and bat boxes could be placed above the inclined revetment if desired to encourage the passage of terrestrial fauna and thus reduce adverse ecological impacts. However, any decision to accommodate bat boxes should be weighed up against the restriction this may place on the future maintenance of the structure.

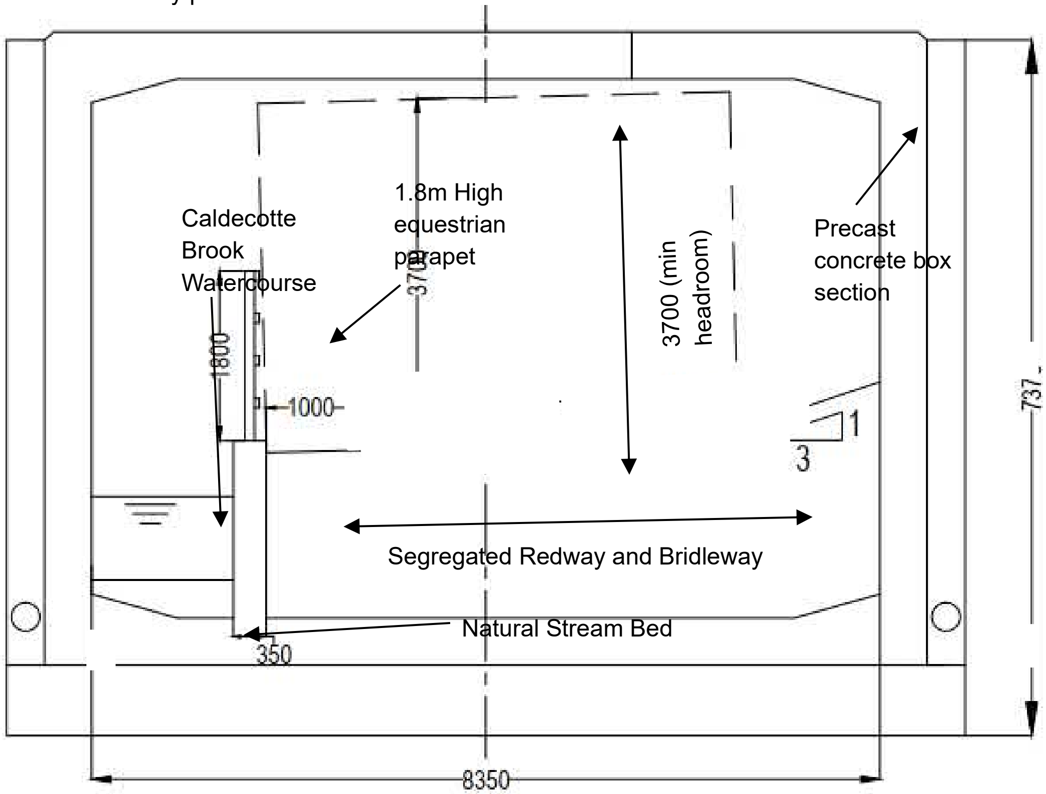



**Figure 4-2 – Bridleway, Morley Crescent Redway and Caldecotte Brook Underpass**

# Browns Wood Roundabout South Subway extension

4.23 The existing South Subway that supports the current V11 single carriageway to the south of Browns Wood roundabout is shown in Figure 4-3 below. As can be seen, this features a similar cross section to that proposed for the Bridleway, Redway and Caldecotte Brook Underpass, and is to the arrangement that is common throughout Milton Keynes; with an open aspect encouraging regular NMU usage.

**Figure 4-3 – Existing Browns Wood Roundabout South Subway**

4.24 It is known that in the construction of some of the Redway underpasses beneath key grid roads in Milton Keynes, buried couplers were included just behind the edge face of the deck slab. These were provided to facilitate a potential later widening of the structure by the construction of an extension to the deck slab. It is assumed that this structure does not include such provisions.

4.25 It would be proposed that this cross section be largely duplicated by placing a new structure to the immediate west of the existing. That would then carry the existing carriageway which would be converted to become the southbound carriageway of the then dualled V11 as already described in Section 3, whilst the new structure would carry the northbound carriageway.

4.26 However, the existing structure would appear to feature an articulated deck slab supported by bearings at each abutment, imposing some inherent maintenance liabilities associated with the bearings and expansion joints. The proposed new additional structure would eliminate these liabilities by featuring an integral connection between abutments and deck in a portal frame arrangement.

4.27 It is assumed that it would be preferrable to limit closures of the Redway beneath the proposed structure to planned night-times only, since the alternative routes would involve travelling several hundred metres further and so could increase risk to NMUs by encouraging at grade crossing of the existing V11 carriageway during construction. Consequently, the use of precast concrete deck beams, which could be made composite with an insitu infill or deck slab, would be preferrable for the superstructure construction.

4.28 There would appear to be sufficient space within the transport corridor to construct the new structure at least 2m away from the edge of the existing such that differential displacements between new and existing structures will not be an issue. A horizontal grid, slab mesh or plate in accordance with clause 4.51 of CD 377 (which would present a significant maintenance liability) would then not be required (as would be the case if the lateral gap between structures was between 100mm and 2m), and more light may enter the structures creating a more pleasant aspect. However, this would need to be confirmed at Preliminary Design stage through design of the highway connection between the new northbound carriageway and the Browns Wood Roundabout. If it proved that the structures needed to be brought closer together then it is recommended that they be brought to within 100 mm of each other as recommended by clause 4.50 of CD 377, thereby again avoiding a need to provide a horizontal grid, slab mesh or plate. However, the existing and new structure should not be structurally connected and the existing parapet (but not the supporting edge beam) on what would become the inner face of the existing structure should be removed.

## Retaining Walls

4.29 As it is possible to position the proposed V11 embankment within the Transport Corridor it is not presently envisaged that any retaining walls of significant size or length would be required to deliver the scheme, other than wingwalls at the corners of the structures as already described above.

4.30 Should small walls be required to accommodate local features along the scheme close to the toe of the embankment, they could be formed from gabions or modular concrete blocks.

## General Structures considerations

4.31 Spare ducts should be included in the verges both under and over structures in order to minimise further disruption, particularly to the MVL railway bridge. In the event that large services need to be carried over the railway then it would likely be most appropriate to split the service provision into multiple ducted lines in order that this does not drive up construction depth. Alternatively, the large service could pass under the railway via a directionally drilled or thrust bored conduit installed by the service provider or the developer of the site to be served by the service. Early consultation with Utility providers is recommended as experience shows that standard or preferred Utility provider arrangements at bridges can prove unacceptable to transport infrastructure asset owners (e.g. having a large service slung between steel girders over the railway although spatially desirable may be unacceptable to Network Rail as it implies a risk of disruption to the railway).

# Geotechnical

## Introduction

5.1 A review of the available geotechnical information has been undertaken to inform the requirements for the structure foundations.

## Geology

5.2 Consultation of the British Geological Survey (BGS) mapping indicates that the site is underlain by a varying thickness of Head Deposits, which in turn overlie the Oxford Clay.

5.3 Head Deposits are described by the BGS as “Poorly sorted and poorly stratified, angular rock debris and/or clayey hillwash and soil creep, mantling a hillslope and deposited by solifluction and gelifluction processes. Solifluction is the slow viscous downslope flow of waterlogged soil and other unsorted and unsaturated superficial deposits. The term gelifluction is restricted to the slow flow of fluidized superficial deposits during the thawing of seasonally frozen ground. The flow is initiated by meltwater from thawing ice lenses. Polymict deposit: comprises gravel, sand and clay depending on upslope source and distance from source. Locally the deposit can contain lenses of silt, clay or peat and organic material.”

5.4 The underlying Oxford Clay is described by the BGS as “Silicate-mudstone, grey, generally smooth to slightly silty, with sporadic beds of argillaceous limestone nodules. Over most of the outcrop it comprises a tripartite succession consisting of Lower (Peterborough Member), Middle (Stewartby Member) and Upper (Weymouth Member). The Peterborough member is mainly brownish-grey, silicate-mudstone, which is organic-rich ("bituminous"), with subordinate beds of pale to medium grey, blocky mudstone. The Stewartby Member is mainly pale to medium grey, smooth to slightly silty, blocky silicate-mudstone, with subordinate beds of silty mudstone rich in shell-debris. The Weymouth Member is mainly pale grey, calcareous, smooth, blocky mudstone.

# Ground Conditions

5.5 Borehole records were consulted from the BGS GeoIndex Onshore. These were undertaken in the mid 1980s and suggested the stratigraphical sequence across the site.

5.6 No other geotechnical information was available from these boreholes, as no Standard Penetration Tests (SPT) were undertaken in the boreholes.

# Groundwater

5.7 Groundwater was encountered in the boreholes around Caldecotte Brook, having seeped in when the borehole was left open overnight. It was also struck within the Head Deposits, approximately midway along the proposed route. No subsequent monitoring information has been found.

# Earthworks

5.8 Given the need to import fill to construct the embankment, the proposed 1V:3H slopes are considered appropriate for the likely fill that may be obtained from local off-site sources.

# Structure Foundations

5.9 Information from the historical boreholes undertaken closest to the Marston Vale Line has identified an idealised stratigraphical sequence comprising the following.

5.10 Head Deposits were identified to between 1.0m and 1.8m deep, which appear to reduce in thickness from north to south. Below this is the Weathered Oxford Clay. This is present as a layer of soft to firm laminated CLAY, often with a stiffer crust. This is generally present to around 2.8m deep. Below 2.8m is the firm becoming stiff Oxford Clay, which is predominantly where we would recommend that the structure is founded.

5.11 We have made a conservative estimate on the “allowable” bearing capacity of the material, based on a standard determination of bearing capacity using factors of safety and not partial factors in accordance with Eurocode 7, of 200 $kN/m^2$ at 3m depth. Above this the softened Head material and the softer, weathered Oxford Clay would only have a value of around 100 $kN/m^2$.

5.12 Based on the estimated initial loading, we anticipate that the foundation would be somewhere between 2.5m (dead load only) and 4.0m wide (dead load and live load) at 3.0m depth. Should this be considered to be excessive, the adoption of piles may be considered.

# Opportunities

5.13 Given the lack of data available to confirm the shear strengths of the material, there would be the opportunity to undertake a ground investigation to investigate the soil conditions and properties to confirm, and possibly reduce, the depth and nature of the foundation required to support the bridge.

5.14 There would also be the opportunity to include investigation of the chemical aggressivity of the soil, particularly given that Oxford Clay is known to contain pyrite and is likely to require the adoption of sulphate-resisting cement.

5.15 The investigation would also be able to investigate the nature of the ground below the embankment and the depth of any water that may be encountered across the site.

5.16 The construction of the embankments for the scheme will require the importation and placement of a considerable amount of fill material; of the order of 200,000 tonnes. There is the potential that another project or development in the Milton Keynes area will be generating not dissimilar quantities of material potentially suitable as this fill but be having to send it from site as waste. Coordination between such sites and developments and this project, particularly with respect to timing, may provide the opportunity to use the surplus from those other sites and developments as all or part of the needed imported fill for this project.

## Risks

5.17 The risks associated with this scheme are that the investigation indicates that the use of spread foundations would not be feasible at the site and that piled foundations may be required.

5.18 Other risks include the lack of relevant geotechnical data may lead to false assumptions regarding other parts of the scheme. The lack of contamination data will require testing to be undertaken, which may result in areas that require remedial works being identified.

# 6. Environment

## Introduction

6.1 As described in Section 1, much of the land within the Transport Corridor to the immediate north of the railway is presently used as horse paddocks, which are let out by the MKPT under short term licences. This use is long standing and it is understood that the paddocks were set up and have been used continuously in this way since the MK Development Corporation days more than 30 years ago. Any road extension through the land here will inevitably mean a loss in paddock availability, which should be considered in how the road scheme is mitigated if a decision is made to pursue the scheme further through a preliminary design phase.

6.2 Irrespective of MKC's legal rights to acquire the existing Transport Corridor at relatively short notice, the loss of green space between Browns Wood and Old Farm Park is likely to be detrimental to the local community, and potentially significantly so without careful mitigation may well lead to considerable local objection to the scheme. Although the primary driver of this report is to investigate the engineering feasibility of a highway and bridging scheme with a view to the wider benefits this may provide to Milton Keynes in facilitating an effective SEMK SUE, high level comment on the likely environmental impacts in terms of Ecology and Noise impacts which are perceived to be significant have been sought by AECOM's respective specialist teams and are included below.

## Ecology

6.3 A high level ecological desk study was undertaken in August 2021, utilising online resources including the Department for Environmental Food and Rural Affairs' (Defra's) Multi-Agency Geographic Information for the Countryside (MAGIC) to identify the location of sites statutorily designated for their biodiversity value and species presence (where recorded) up to a 2 kilometre radius from the proposed scheme boundary.

6.4 MAGIC was also used to identify areas in the vicinity of the proposed scheme which have been granted a protected species license by Natural England (NE), pertaining to known development, in the recent past. European Protected Species (EPS) licenses are licences that have been issued, often as part of proposed developments, to permit the lawful disturbance of a given protected species. Additional information specific to Great Crested Newt (GCN), such as survey class licence returns and pond survey data between 2017-2019 were also available from MAGIC and were reviewed.

6.5 Whilst the high-level desk study, included below, presents information on ecological receptors (such as designated sites, protected and/ or notable habitats and species) and scheduled invasive non-native species found using online resources in August 2021, a Preliminary Ecological Appraisal (PEA) will need to be undertaken during any subsequent preliminary design stage. This PEA will comprise of a more detailed desk study, obtaining information on non-statutorily designated sites and species and habitat records from the local biological records centre; a Phase 1 habitat survey; and protected species scoping survey. The PEA will determine whether protected and/or scheduled species and notable habitats and species are likely to be present within the proposed scheme extent and impacted upon by the proposed scheme. Following this PEA, the need for Phase 2 protected species surveys would be identified and these data would inform mitigation measures to be incorporated into any future design stages.

6.6 Whilst it is anticipated that all works will be within the proposed scheme boundary as shown in this report, due to the current status of design this cannot be completely confirmed at this stage. Further assessment may be needed during future design stages if the works go beyond the boundaries of the proposed scheme as shown in this report to ensure that any required mitigation is identified and appropriate.

# Desk Study -Statutorily designated Sites

6.7 No sites statutorily designated for nature conservation were identified within 2km of the proposed scheme.

6.8 The proposed scheme is located within the Risk Zone of Wavendon Heath Ponds Site of Special Scientific Interest (SSSI) (approximately 2.9km south-east). Given the distance between this SSSI and the proposed scheme, there will be no direct impact on habitats within the SSSI and there are unlikely to be indirect impacts on this SSSI.

# Desk Study - Habitats

6.9 Defra's MAGIC application was used to identify whether any priority habitats have been recorded within the vicinity of the proposed scheme which may be at risk of destruction from clearance works.

6.10 The majority of habitat located within the transport corridor appears to be amenity grassland, used for paddocks and as recreational grounds. Areas within the transport corridor also include mown verges. None of these habitats are priority habitats.

**Trees and Hedgerows**

6.11 Aerial photography identified that mature trees and hedgerows are present within and adjacent to the proposed scheme including along the railway corridor and therefore trees and hedgerows may be directly, or indirectly, impacted by the works.

6.12 Hedgerows are a habitat of principal importance which is afforded some protection under the Hedgerow Regulations 1997. Trees and hedgerows have the potential to support priority and/or notable species, such as roosting bats and breeding birds and are important for many species, often providing the connectivity to facilitate dispersal and commuting for bats, Badger *Meles meles* and Great Crested Newt *Triturus cristatus*. Many small bird species also nest in hedgerows.

**Running Water**

6.13 Running water is a habitat of principal importance and may support protected species including Otter *Lutra lutra*, Water Vole *Arvicola amphibius* and fish.

6.14 Aerial photography identified that Caldecotte Brook runs through the middle of the proposed scheme, and is potentially connected to Caldecotte Lake to the west of the proposed scheme, which drains into the River Ouzel. It is possible that works will impact the watercourse due to the creation of a culvert. Changes in hydrology and pollution may also impact upon ecological processes within the watercourse and its downstream catchment. Excessive vibration directly over the watercourse may have adverse impacts on species, e.g. fish and their spawning activity and the ability to take refuge from potential predators.

6.15 If any works associated with the proposed scheme are within 8m of any running water, then consent may be required from the Environment Agency and, or Local Planning Authority.

**Standing water**

6.16 Standing water, including ponds, are habitats of principal importance.

6.17 A review of ordinance survey (OS) mapping identified four ponds within 500m of the proposed scheme. Such areas may support protected species, such as Great Crested Newt. Three of the ponds are separated from the proposed scheme by main roads and buildings which would act as a barrier to dispersal of Great Crested Newt from these ponds to the proposed scheme. However, one pond is located adjacent to Caldecotte Brook downstream of the proposed development. This pond has the potential to be indirectly impacted by the proposed scheme in terms of either hydrology, e.g. flooding, and changes in water quality. This could impact upon any protected species using this water body.

**Buildings and Structures**

6.18 Aerial photography identified that there are two small buildings within the proposed scheme which could be affected by the works. These buildings could support roosting bats or breeding birds.

# Desk Study - Species

6.19 The proposed scheme has the potential to impact a number of terrestrial habitats identified from aerial photography of the proposed scheme including, hedgerows, grassland and running water (as identified above) which can support protected species including: Great Crested Newt, breeding birds, badgers, bats, fish, otters, reptiles and water voles. Further information of species at risk, and recommended actions based on the ecological receptors identified can be found in Table 6-1.

6.20 The desk study, using MAGIC, identified seven EPS licenses for Great Crested Newt and bats that were active within 2km of the proposed scheme between 2009 and 2021, none of which are now active.

6.21 A total of 45 Great Crested Newt Species Licence Returns (between 2014 and 2017) have been identified within 2km of the proposed scheme, all with Great Crested Newt confirmed as present. Great Crested Newt are a highly mobile species, known to typically range up to 500m from breeding ponds. As a precaution and without any information stating otherwise, it is assumed that ponds within 500m of the proposed scheme could support breeding populations of Great Crested Newt and so there is a risk of presence within habitats which may be cleared.

## Recommendations

6.22 The proposed scheme has the potential to impact upon protected habitats and species, however the presence, or absence, of such would need to be confirmed through ecological surveys and a formal desk study. Furthermore, an arboricultural impact assessment will be required.

6.23 The requirement for further ecology surveys is presented in Table 6-1 and is based on the information obtained with the high-level desk study included within this feasibility report and using professional judgement. However, the need for these surveys, or otherwise, will be confirmed following the PEA and the surveys presented in Table 6-1 therefore are for indicative use only to inform programme.

**Table 6-1: Ecological Features Potentially at Risk, Further Recommendations and Survey Timings**

| Ecological Feature | Main Drivers | Potential Requirements for further survey | Study Area | Survey Timings |
|---|---|---|---|---|
| Aquatic scoping surveys | Wildlife and Countryside Act (WCA) 1981 (as amended), NERC Act | A check of the potential for water bodies and watercourses to support protected or notable species (such as fish) and inform further survey work | Water bodies and watercourses within 500m of the proposed scheme | Any time of year |
| Priority Habitats, including hedgerows | WCA 1981 (as amended), NERC Act, Hedgerow Regulations (1997) | Phase 2 botanical survey and hedgerow survey | Within proposed scheme boundary, up to 50m | May-September |
| Invasive non-native species | WCA 1981 (as amended), NERC Act Invasive Alien species (Enforcement and Permitting) Order 2019 | Detailed survey if any such species noted or suspected of being present on the proposed development | Within the proposed scheme, a zone of 50 m around it, plus upstream in the Caldecotte | May to August |

| | | | | |
|---|---|---|---|---|
| | | | Brook and its catchment | |
| Terrestrial and aquatic invertebrates | WCA 1981 (as amended), NERC Act | Detailed survey if any such species noted or suspected of being present on the proposed development | Within the proposed scheme, a zone of 50 m around it, plus upstream in the Caldecotte Brook and its catchment | May to September |
| Great Crested Newt | Protected under the EC Habitats Directive and the WCA 1981 (as amended). UK species of principal importance under the NERC Act. | Habitat Suitability Index (HSI) survey which will determine whether presence/absence surveys to be carried out on waterbodies (scoped in) within 500m of the proposed scheme.<br><br>Ecological Clerk of Works (ECoW) supervision for vegetation clearance. | All waterbodies within 500m of the proposed scheme where potential for impacts on Great Crested Newt have been identified. | HSI survey – any time of year<br>Presence / absence surveys to be undertaken between March and June inclusive. |
| Reptiles | Protected under the WCA 1981 (as amended) | Surveys of suitable reptile habitat (such as grassland) to confirm presence or absence | Within proposed scheme boundary | March-September inclusive. |
| Breeding Birds | Protected under the WCA 1981 (as amended). Some species are specially protected and listed under Schedule 1 (WCA). | Surveys to confirm the presence, or absence of protected or notable species | Within proposed scheme boundary | March to August, inclusive |
| Bats | Protected under the EC Habitats Directive and the WCA 1981 (as amended). UK species of principal importance. | Identification of suitable mature trees and structures, including a preliminary roost assessment (PRA) which determines if further survey | Entire extent of the proposed scheme where mature trees and structures will be | PRA can be undertaken at any time of year.<br>Further bat surveys between May and September inclusive |

| | | | | |
|---|---|---|---|---|
| | | required. Only possible with safe access.<br><br>Bat Emergence/Re-Entry Surveys. | affected by the works. Further survey work is dependant on PRAs. | |
| Badgers | Protection of Badger Act, 1992 | Survey to identify and class all badger setts on site. | All hedgerows, scrub and woodland within 50m of the proposed scheme | Any time of year but February to March is preferable. |
| Otter | Protected under the EC Habitats Directive and the WCA 1981 (as amended). UK species of principal importance. | Walkover of Caldecotte Brook to determine habitat suitability. Further surveys necessary to determine likely presence or absence.<br>No waterbody can be ruled out for otter from just a desk study, site visits are imperative. | Caldecotte Brook and 100m either side of the works. | Any time of year, but March to August is preferable |
| Water Vole | Protected under the WCA 1981 (as amended). UK species of principal importance. | Walkover of Caldecotte Brook to determine habitat suitability. Further surveys necessary to determine likely presence or absence. Waterbodies suitable for Water Vole should be located within 5km of the scheme for mitigation purposes. Water Vole may require on site mitigation. | Caldecotte Brook and 100m either side of the works. | April to September |

# Noise and Vibration

6.24 A qualitative review of the potential for significant adverse noise and vibration effects due to the Scheme has been completed. This has been based on readily available online mapping datasets, information on the proposed Scheme, and publicly available information on the East West Rail scheme3.

6.25 The key national policy is set out in the National Planning Policy Framework4 (NPPF). The NPPF states that planning policies and decisions should:

> *"a) mitigate and reduce to a minimum, potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason*."

6.26 With regard to 'adverse impacts' and 'significant adverse impacts', the NPPF refers to the Noise Policy Statement for England (NPSE). The NPSE sets out the governments noise policy aims:

> *"Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:*
> - *avoid significant adverse impacts on health and quality of life;*
> - *mitigate and minimise adverse impacts on health and quality of life; and*
> - *where possible, contribute to the improvement of health and quality of life."*

6.27 Therefore, any future planning application for the proposed Scheme must demonstrate compliance with these aims. With regard to the context of 'sustainable development', factors including engineering practicality, cost versus benefit, other potential impacts such as landscape and visual, ecological considerations and public consultation responses can be considered when making decisions on mitigation measures.

# Noise/ Visual Impact

6.28 Annual average weekday traffic (AAWT) flows on the V11 Tongwell Street Extension & Marston Vale Line Bridge Crossing Scheme are anticipated to be in the region of 15,000, with approximately 5% HGVs and a speed of around 40 mph. The northern section of the Scheme from the A4146 to Elgar Grove, follows the alignment of the existing V11 Tongwelll Street grid road, which forms an access into the surrounding housing area. The Scheme then cuts through an area of open space rising up on embankment of around 7.8 m to cross over the Marston Vale Line (MVL) before terminating at a junction with a proposed new road within the South East Milton Keynes Strategic Urban Extension (SEMK SUE). The corridor of land corridor of land between Elgar Grove and the MVL was set aside by the original town planners to provide for the possibility of the V11 Tongwell Street grid road being extended southwards.

6.29 Between the A4146 and the MVL the surrounding land use is predominantly residential. The Busy Bees nursery is also adjacent to the Scheme off Morley Crescent. To the south of Morley Crescent the Browns Wood playground and sports ground is located to the west of the Scheme. An area of allotments is located immediately to the north of the MVL. South of the MVL is currently open agricultural land.

6.30 Road traffic noise is likely to be dominant noise source in the area with some contribution from the MVL. A Noise Important Area (NIA) (Reference 14607) has been identified by Defra5 on the A4146 at the north end of the Scheme as part of the mapping of noise levels from major roads. Milton Keynes Council is responsible for investigated and mitigating road traffic noise in this NIA.

6.31 As part of the East West Rail scheme environmental assessment, short term baseline noise monitoring was completed at a location on Berwald Close north of the MVL. The monitored levels in this location were very low at 37 dB $L_{Aeq,18h}$ during the day and 33 dB $L_{Aeq,8h}$ at night. However it is noted that the monitoring duration was short, and there is the potential that this sample did not include any train passbys on the adjacent MVL. The predicted impact of the East West Rail scheme in this location is reported as a negligible (0.1 to 2.9 dB) or minor (3.0 to 4.9 dB) increase in railway noise at night. Towards the north end

[3] https://www.networkrail.co.uk/running-the-railway/railway-upgrade-plan/key-projects/east-west-rail/bicester-to-bletchley-milton-keynes/
[4] Ministry of Housing, Communities and Local Government (2021) National Planning Policy Framework.
[5] http://www.extrium.co.uk/noiseviewer.html

of the Scheme on Tongwell Street closer to the A4146, ambient noise levels are likely to be rather higher, with daytime levels in the range 55 to 55.9 dB $L_{Aeq,16h}$ reported on the England Noise and Air Quality Viewer[5].

6.32 Given the close proximity of sensitive receptors to the Scheme there is a high potential for significant adverse construction noise effects. Some works involving vibratory rollers e.g. to compact the ground, are also likely, and piling may be required at the new bridge over the MVL, therefore, there is also a potential for significant construction vibration effects. It is likely that the majority of the works can be completed during the day, however some night works are likely to be required, such as at the new bridge over the MVL. Mitigation measures such as the choice of low noise/vibration construction methods/plant and the use of solid site hoarding would minimise impacts during construction, however, the risk of construction residual significant adverse effects remains high.

6.33 Similarly, there is a high potential for significant adverse operational traffic noise effects due to the Scheme, as noise sensitive receptors are located in very close proximity to the new road and existing ambient noise levels away from the A4146 are low. Mitigation in the form of noise barriers and/or bunds / false cuttings is potentially feasible, though engineering practicalities and landscape/visual impacts would need to be considered. The use of low noise surfacing is also a possibility which would provide some benefit. However, the proposed speed of 40 mph (64 km/hr) is below the 75 km/hr cut-off for assuming a benefit from low noise surfacing adopted in the standard UK assessment methodology for road schemes set out in the Design Manual for Roads and Bridges (DMRB[6]). The risk of operational residual significant adverse effects therefore remains high. There is potential for the closest residential properties to qualify for additional insulation/ventilation under the Noise Insulation Regulations[7].

6.34 The operation of the new road is likely to result in changes in traffic flows on other surrounding roads, although until traffic modelling of the Scheme is completed it is not possible to determine if any such changes will result in significant effects (adverse or beneficial).

6.35 As part of a future planning application for the Scheme a noise and vibration assessment would be required as part of the Scheme Environmental Impact Assessment. The assessment would include baseline noise monitoring in the area, construction noise and vibration predictions based on information/assumptions on the nature of the works provided by a contractor, and operational traffic noise predictions. Such an assessment would follow the requirements of the noise and vibration section of DMRB. The inclusion of a bus-based Mass Rapid Transit (MRT) system on the Scheme would also need to be included in a future noise impact assessment of the Scheme.

## Opportunities/ Mitigation

6.36 Consideration of the proximity of adjacent noise sensitive receptors in the final alignment of the new road would be beneficial, though given the constraints of the available corridor of land opportunities to maximise the distance to receptors are limited. Some potential mitigation may be possible through the choice of 3D alignment and the use of false cuttings / bunds, though again the available land is a potential constraint. Replacing the proposed embankment/bridge over the MVL with an underpass would potentially significantly reduce the operational noise impacts of this section of the Scheme as the road would be in a cutting on the approaches to the MVL.

## Further Environmental Considerations

6.37 Specialist input into Visual Impact, Air Quality and other potential environmental aspects have not yet been sought as part of this current commission. However, it would be appropriate to seek such input early on in any subsequent preliminary design phase.

6.38 In the absence of such specialist input it is assumed that visual impact would be both significant and adverse to those residential properties to the immediate north of the railway on Holst Crescent and the cul-de-sac streets accessed via Holst Crescent. Mitigation could take the form of additional tree planting and environmental barriers along the embankment lines, but any screening of traffic could also have an impact in terms of loss of light and as such this aspect would require careful consideration in any subsequent design development.

[6] https://www.standardsforhighways.co.uk/dmrb/search/cc8cfcf7-c235-4052-8d32-d5398796b364
[7] Noise Insulation Regulations 1975 (as amended 1988).

6.39 It is assumed that wider air quality would not be significantly impacted by the scheme and may even be benefitted by reducing congestion on the routes relieved, particularly when the MRT is brought into service. However, local air quality would be adversely impacted and so again a specialist assessment and consideration of mitigation measures would require attention during any subsequent design development.

# 7. Constructability

## Introduction

7.1 The proposed construction sequence for the MVL railway bridge will be:

1. Establish safety screens adjacent to railway boundary.
2. Install temporary sheet piling.
3. Excavate approximately 3m below existing ground level to meet competent bearing stratum (likely Oxford clay).
4. Backfill excavation with granular layer or mass concrete up to underside of pier foundation.
5. Construct reinforced concrete pier foundations.
6. Construct approach embankments up to abutment founding level (may be carried out concurrently with steps 2 to 5).
7. Construct reinforced concrete abutments and piers up to temporary bearing level.
8. Lift and install steel girders in pairs (under full railway possessions for span above railway) and place on temporary bearings. Girder pairs to be lifted with intermediate bracing, and permanent formwork panels in place and edge beam cantilever falsework attached.
9. Install remaining permanent formwork.
10. Pressure test soffit integrity with water under possession to ensure that no material including slurry may be lost when constructing the deck, including concrete pouring
11. Place reinforcement for and cast reinforced concrete deck slab
12. Place reinforcement for and cast reinforced concrete deck cantilevers and edge beams
13. Place reinforcement for and cast reinforced concrete end diaphragms
14. Backfill to finish levels behind abutments
15. Complete remaining works (e.g. install parapets, waterproofing, drainage and surfacing).

7.2 Construction of the remaining structures will follow a similar but simpler bottom up form of construction. Section 4 includes comments on some of the specific considerations for those structures, the most notable of which concern whether it is necessary to minimise closures of existing NMU routes or Holst Crescent during construction. Precast concrete beams may be used in the design of the deck slab where this proves necessary and in general terms the more that can be precast off-site the more opportunity there is to expedite the overall construction programme on site and minimise health and safety risk.

# 8. Cost

8.1 Outline costs have been calculated for both Option A (Holst Crescent maintained by means of Holst Crescent Crossing Bridge) and Option B (Holst Crescent stopped up with turnaround facilities installed).

8.2 In each case the capital costs are feasibility stage budget estimates developed on the basis of material quantity take-offs and unit rates derived on the basis of Spons Civil Engineering Price Book. For the structures components the 2018 version of the Price Book was used but an inflationary factor of 11.2% was used to convert those rates into 2025 rates (the assumed year of construction as discussed in Section 9 by assuming that the average rate of construction price inflation between 2018 and 2021 would be maintained until 2025). A risk allowance of 20% was also assumed to account for the relatively early stage of design.

8.3 Explicit calculation of the costs for MVL railway crossing was carried out based on take-off of quantities from the drawings included in Appendix A. This was then used to calculate a basic cost per unit plan area of bridge of circa £3200 per square metre (including risk but excluding optimism bias as described in paragraph 8/9), which was found to align with general recent experience of bridge construction. For the remainder of the bridges the approach was taken to use the same basic unit rate per square metre and multiply that by the respective area of the bridge. In each case the width was taken as the width between outside faces of parapet edge beams and the length as the length that would be generated in a structure with open side spans similar to the MVL railway crossing, which can be determined according to the following formula:

8.4 Length (for costing using rate per square metre) = Main span length (to support centres) + equivalent side spans based on level difference between V11 and obstacle crossed multiplied by 1:3 slope grade = Main span length + 2 x 3 x (Headroom + Deck thickness + 125 mm surfacing)

8.5 For the railway bridge consideration was given to adding an additional cost premium to allow for possessions of the railway, planning of the same and other safeguarding requirements for the railway and those that may otherwise come into conflict with it, to the requirements of East West rail was added in. The premium would have been assumed to be £200,000 based on recent experience of similar projects. In addition carrying out the construction itself within the limitations of the requirements of the railway will inevitably require a portion of the work to be carried out during short, overnight possessions which will increase cost further, so a further supplementary premium of 20% on capital costs was also considered in addition to this. However, as discussed in Section 8.8 below, by instead assuming an Optimism bias for the railway bridge of 66% as may be the case for a typical rail project, rather than the 44% used for the remainder of the scheme, it was found that a slightly greater increase to the cost estimate resulted, and hence this was considered suitably robust in itself without also allowing this additional 20% + £200,000.

8.6 Lifecycle maintenance costs have been included based on the following assumed maintenance cycles over the measurement period of 60 years and baselined to the assumed year of construction of 2025, with future costs discounted using a discounting rate of 3.5% for the first 30 years and then 3.0% for the next 20 years as per the requirements of HM Treasury Green Book. The lifecycle maintenance regime assumed is included in Table 8-1 below.

| Element | Maintenance Frequency, Traffic Management Approach and Works duration | Comments |
|---|---|---|
| Bridges - Waterproofing replacement | 35 years – Lane closures with 24 hour working – 28 days | Assumed period based on average industry practice. |
| Bridges - Local resurfacing and Joint replacement | 10 years – Lane closures with 24 hour working – 5 days | Although bridges are to be integral and thus joints are likely to be a combination of buried joints and bridge expansion joints only, still assumed to be required at this frequency to address settlement issues which occur as a consequence of strain-ratchetting of backfill under the effects of annual thermal expansion and contraction. |
| Bridges – Silane (or other approved hydrophobic pore lining impregnant application) | 11 years – Night-time lane closures – 15 nights | Assumed to be required only for concrete surfaces with XD3 exposure to BS 8500, which for the purpose of this scheme will be assumed to be limited to the upper and outer surfaces of the Parapet Edge beams only. The maintenance interval of 11 years was obtained from a 2006 draft version of BD 36 and making the assumption that the concrete will be equivalent to an historic high quality concrete with 50mm cover. This approach is likely conservative as |

| | | |
|---|---|---|
| | | modern concrete to BS 8500 is likely to outperform even historic standards and it could be argued that a 15 year interval between applications is more reasonable. |
| Bridges – Parapet Maintenance or repair | 25 years – Night-time lane closure – 3 nights. | Assume that on average a major parapet repair will be required due to significant impact on each side of the bridge once every 25 years on average. |
| Bridges – Routine Maintenance | 1 year – Daytime lane closure – 1 day | For the low maintenance, integral bridges considered, assumed to be limited to rodding of back of wall drainage and combined kerb and deck drainage units, removal of weeds and debris from verges and parapet mesh. |
| Bridges – Principal Inspections | 6 years, including in the base year of 2025 in the form of a Pre-Opening Principal Inspection - Night time lane closures – 2 Nights | Conservative assumption which may be reduced for some structures using a risk based approach to as infrequently as 12 yearly. |
| Bridges – General Inspections | 2 years apart from in a year where a Principal Inspection is carried out (i.e. in Years 2, 4, 8, 10, 14, 16, 20 etc) – Daytime lane closures – 1 day | |
| Highways - Pavement | Pavement is design for 40 years design life although within this period significant maintenance can be expected dependant on traffic flows. | It is assumed works with be required at 15 years interval starting with resurfacing and progressively more substantial works in subsequent cycles. |
| Highways - routine | Other aspects of highway infrastructure will need regular inspection and maintenance/replacement as required. These include barrier, signing, lighting, drainage, grass cutting. | |
| Highways – Winter maintenance | Annual | |

**Table 8-1 – Assumed Lifecycle Maintenance Regime**

8.7 Road user delays have been calculated by assuming typical duration periods for highway schemes and assuming a 5 km diversion for closures and 1km lane closures where only lane closures are required.

8.8 A risk allowance of 20% has been added on all calculated costs in line with typical risk allowances for schemes at this stage of development, as well as an Optimism bias allowance of 44% for the majority of the scheme based on the average rates normally recommended for roads schemes as examples of standard civil engineering projects. However, for the MVL railway bridge this was increased to 66% to as recommended for a normal rail scheme as an example of a non-standard civil engineering scheme.

8.9 Table 8-2 summarises the cost estimate for Option A and Table 8-3 for Option B, with a break down between Structures and Highways cost as requested. Further subdivision between the cost of the MVL railway crossing and the other bridges is also provided.

| Cost Component | Highways | MVL railway crossing structure | Other Structures | Total |
|---|---|---|---|---|
| Capital Cost | £12.1 million | £9.1 million | £6.8 million | £28.0 million |
| Lifecycle Maintenance Cost | £3.2 million | £1.1 million | £1.5 million | £5.8 million |
| Whole Life Cost | £15.3 million | £10.2 million | £8.3 million | £33.8 million |

**Table 8-2 – Option A costs**

| Cost Component | Highways | MVL railway crossing structure | Other Structures | Total |
|---|---|---|---|---|
| Capital Cost | £12.3 million | £9.1 million | £2.6 million | £24.0 million |
| Lifecycle Maintenance Cost | £3.2 million | £1.1 million | £0.6 million | £4.9 million |
| Whole Life Cost | £15.5 million | £10.2 million | £3.2 million | £28.9 million |

**Table 8-3 – Option B costs**

8.10 Should a decision be made to progress the scheme to a Preliminary Design phase, then costs should be revisited in further detail by (or in consultation with) a specialist costing team, and weighed up against the benefits of the scheme to provide a Cost-Benefit analysis with a view to demonstrating that the net benefits of the scheme support its further progress.

# 9. Next Steps

## Conclusion and decision on whether to proceed with bridging solution, or investigate alternative underpass option further instead

9.1 The proposed scheme considered within the scope of this feasibility study is fundamentally feasible from an engineering perspective. This study has demonstrated how, with a 40 mph design speed, the V11 Tongwell Streeet could be extended across the railway by means of a relatively conventional 3 span steel and concrete integral bridge, and keep within the available Transport Corridor to the north using a 1:3 earth embankment, without need for significant lengths of retaining walls..

9.2 However, whilst the potential for the protected land corridor to be used as a highway link has been stated since its establishment, it is not clear that such a link was ever envisaged to require such a high embankment as this feasibility study has determined is required. That requirement together with consideration of how close the embankment will be to existing housing together with the manner in which it will segregate the Browns Wood and Old Farm Park residential estates as well as its removal of the open space it currently affords as either widened verges, parkland or paddocks, must be a cause for concern. It is assumed that MKC will want to carefully reflect on the implications of the feasibility stage engineering design presented in this report before taking a decision on whether to progress an embankment and bridging solution through preliminary design.

9.3 Should a decision be made to proceed further then environmental impact should be considered in more detail including the ecological and noise assessment work outlined in Section 6, as well as the impact of community severance, air quality, visual impact and landscaping. This could be carried out in parallel with some further development of the bridging solution, and consideration of appropriate mitigation, before progressing to a phase of careful stakeholder consultation on the preliminary design. A minimum of 6 months would be recommended for this phase.

9.4 An alternative to progressing with the over-bridging solution would be to investigate the feasibility of the alternative possibility of passing under the railway, that was briefly introduced at the end of Section 3 further. This could be carried out by means of an extension to this feasibility study. The under-bridging solution for this would likely need to feature a reinforced concrete box structure constructed to the side of the railway and then jacked below the railway using hydraulic ram jacks, in order to minimise disruption to the railway. Such a solution would likely be several million pounds more costly and would require the involvement of more specialists contractors/subconstractors. In addition there would be a need to pump water out of the cutting, although whether this would involve significant quantities of ground water has not yet been investigated. However, some reduction of earthworks costs as the scheme would likely be a net exporter rather than importer, would be likely and may go some way towards offsetting the higher bridging and pumping costs. Any increased cost associated with the underpass/cutting option would need to be viewed in balance with the clear environmental impacts associated with the embankment option.

9.5 It is therefore suggested that MKC should first consider whether they wish the feasibility study to be extended to look at a cutting and underpass solution further.

9.6 Irrespective of the solution to be progressed, provided preliminary design of at least one solution to extending the V11 along the Transport Corridor is required, then Topographical survey of the area north of the railway to, and including Browns Wood Roundabout to verify feature lines including boundaries, carriageway limits etc will be required. AECOM will provide a price for carrying this out.

# Information required for Preliminary Design of Bridging solution

9.7 Should a decision be made to proceed with Preliminary Design of the bridging solution then further design and development will be required to establish suitable geometries and tie-ins for the junctions between the V11 extension and the existing side roads at Elgar Grove and Britten grove. Extents of Regrading of existing Redways will be required to be confirmed for their tie-ins to proposed new Redways. Finalising these designs will be subject to receipt of topographical surveys of the pertinent areas.

9.8 A survey of the railway confirming rail levels and boundary through the proposed overbridge would be required.

9.9 Utility diversions and installations, as well as any temporary protection requirements would need to be developed along with associated (C3) budget estimates.

9.10 Confirmation of SEMK Development details for the tie-in of the proposed road would be required.

9.11 Proposed traffic analysis with AADT and AAWT would be required.

9.12 Early consultation with the developer(s) and associated Utility providers would be recommended to establish what, if any, services may be most acceptably carried along the V11 extension to service the new developments to the South.

9.13 Confirmation of any small structures and storage facilities to be removed within the Transport Corridor.

# Outline programme for Preliminary Design, Detailed Design and Construction of the scheme

9.14 It is important to understand the mechanism MKC will use to establish planning approval/consent for this scheme. The remainder of this section assumes that an effective planning process is available that can address any stakeholder objections in a reasonable timeframe. On this basis reasonably pessimistic and optimistic programme timeframes are described below. Should an effective planning process not be available, this could well drastically increase these timeframes.

9.15 Assuming initially that a decision is quickly made by MKC to progress a bridging solution then a preliminary design phase of at least 6 months would be required, assumed to start in October 2021. However, in order that the Preliminary Design may be suitably robust and include a reasonable period for informal stakeholder consultation (including both local residents and East West Rail) and planning and completion of all ecological surveys (as set out in Table 6-1), as well as a Ground Investigation, completion by the end of August 2022 may be more appropriate.

9.16 Assuming that MKC wished to progress formal consultation following informal consultation carried out during the Preliminary Design Phase, Detailed Design should take no more than 6 months including approvals. For the purpose of this report AECOM have assumed a formal consultation period of 6 months, although on this aspect MKC's internal rules and strategy could well dictate a longer or shorter period.

9.17 A targeted, well planned construction phase could be completed in as little as 12 months, particularly if Early Contractor Involvement was included in the Preliminary and Detailed Design phase, and the start of this phase was in late spring so as to capitalise on relatively benign summer weather for constructing foundations and earthworks. However, an 18 month period should be more cautiously assumed.

9.18 Putting together each of the above phases, an optimistic and streamlined approach may permit opening of the V11 extension in 2024, whilst a pessimistic and more phased approach may lead to opening as late as 2025. See Table 9-1.

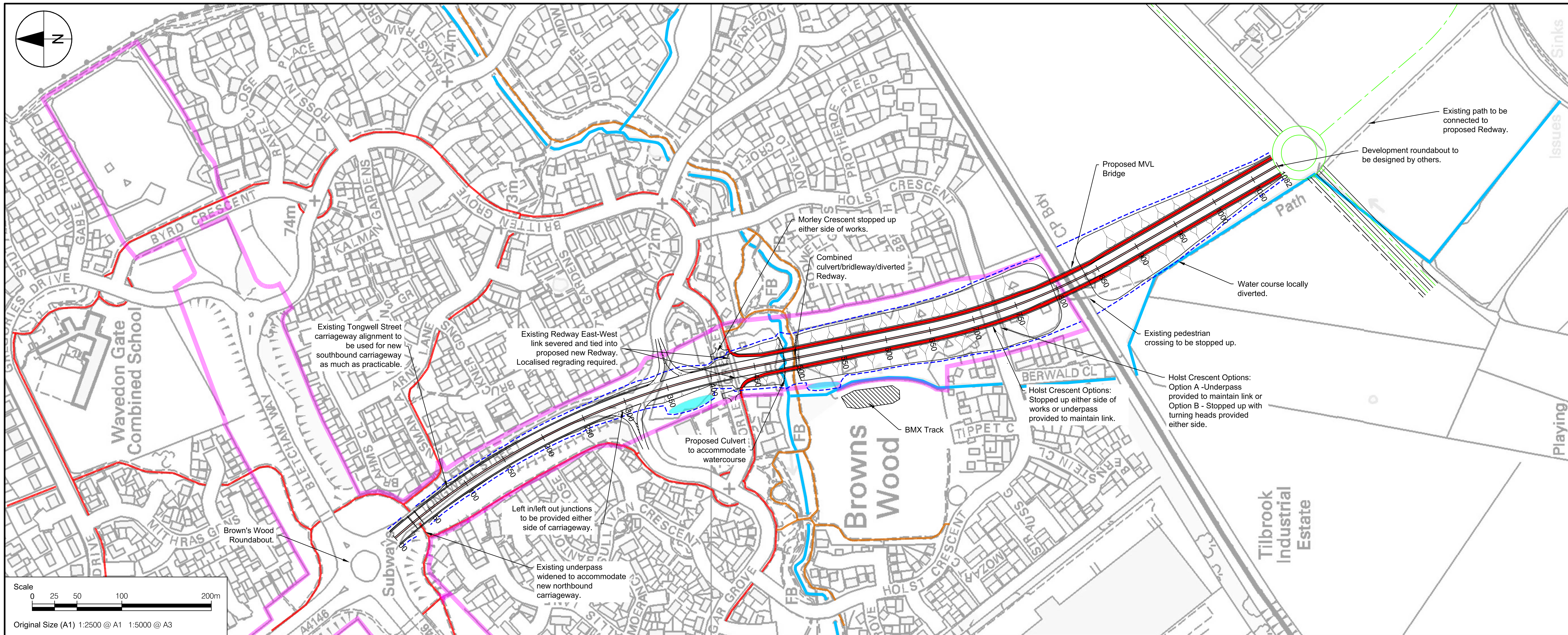
| Phase | Optimistic and Streamlined Programme with minimal consultation – High risk/ fast delivery | Pessimistic and Staged Programme with more consultation – Lower risk/ slower delivery | Comments |
|---|---|---|---|
| Preliminary Design | Autumn 2021 to Spring 2022 | Autumn 2021 to Autumn 2022 | In Staged Programme all surveys may be carried out in advance of detailed design |
| Detailed Design | Autumn 2022 to Spring 2023 | Summer 2023 to Spring 2024 | Preceded by Formal Consultation in Staged Programme |
| Construction | Spring 2023 to Spring 2024 | Spring 2024 to Autumn 2025 | |

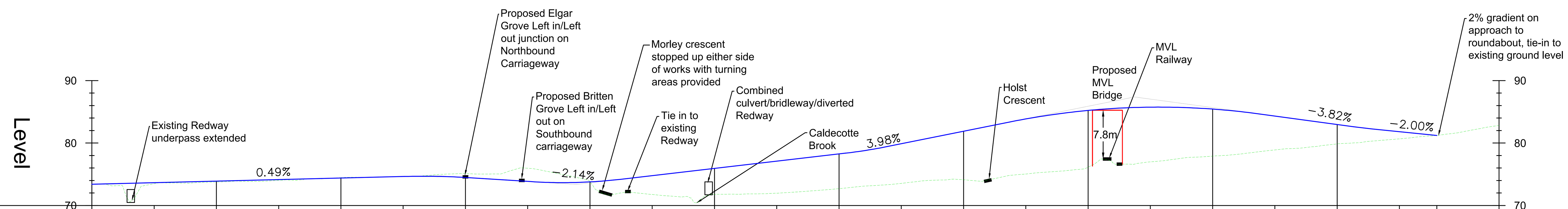
**Table 9-1 – Programme for subsequent Design phases and Construction**

9.19 If a decision is alternatively made to progress a feasibility study of a solution to pass under the railway then a further 6 weeks for feasibility would be appropriate, as well as another later 6 weeks to progress early consultations with East West Rail, and a further 3 months for a more complex coordinated detailed design programme (requiring designers of the permanent structure as well as the box jacking arrangement to progress their inputs in a coordinated manner) adding perhaps a further 6 months to the overall programme.

9.20 In any event, as the new highway will involve a crossing of the MVL, be that either over or under the line, securing the early, full and binding involvement of East West Rail will be essential to the successful development and implementation of the project. In equivalent situations where the railway is under Network Rail's jurisdiction, their input cannot be obtained until a BAPA agreement is in place between the outside party promoting the railway crossing and Network Rail. It is thus important that at an early stage such a BAPA agreement (or whatever equivalent East West Rail might use) is developed and agreed between MKC and East West Rail.

# Appendix A - Highways Drawings




| CHAINAGE | 00 | 50 | 100 | 150 | 200 | 250 | 300 | 350 | 400 | 450 | 500 | 550 | 600 | 650 | 700 | 750 | 800 | 850 | 900 | 950 | 1000 | 1050 | 1080 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EXISTING LEVELS | 73.401 | 73.489 | 73.778 | 74.032 | 74.467 | 74.643 | 75.116 | 75.961 | 73.809 | 71.762 | 71.788 | 71.975 | 72.696 | 73.539 | 74.117 | 75.048 | 76.142 | 76.986 | 77.901 | 78.905 | 79.867 | 80.673 | 81.224 | 81.766 | 82.818 |
| PROPOSED LEVELS | 73.401 | 73.649 | 73.897 | 74.144 | 74.392 | 74.640 | 74.487 | 73.858 | 73.778 | 74.784 | 75.942 | 77.099 | 78.257 | 79.891 | 81.891 | 83.861 | 85.221 | 85.748 | 85.441 | 84.325 | 82.969 | 81.824 | 81.224 | | |
| LEVEL DIFFERENCE | 0.000 | 0.160 | 0.119 | 0.113 | -0.075 | -0.003 | -0.629 | -2.103 | -0.031 | 3.022 | 4.153 | 5.124 | 5.561 | 6.352 | 7.774 | 8.813 | 9.079 | 8.761 | 7.539 | 5.420 | 3.102 | 1.151 | 0.000 | | |

| HORIZONTAL GEOMETRY | Curve | TR | Straight | TR | Curve | TR | Straight | Straight |
|---|---|---|---|---|---|---|---|---|
| | R = 820.00 L = 409.89 | L = 30.00 | L = 181.73 | L = 35.00 | R = 720.00 L = 195.98 | L = 35.00 | L = 192.40 | L = 50.00 |

| VERTICAL GEOMETRY | Straight | Hog Curve | Straight | Sag Curve | Straight | Sag Curve | Straight | Hog Curve | Straight | Sag Curve | Straight |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Grad = 0.50% L = 250.94 | K Value = 30.00 L = 52.71 | Grad = -1.26% L = 49.43 | K Value = 20.00 L = 71.53 | Grad = 2.32% L = 180.28 | K Value = 20.00 L = 33.70 | Grad = 4.00% L = 98.02 | K Value = 30.00 L = 201.38 | Grad = -2.71% L = 75.14 | K Value = 20.00 L = 14.25 | Grad = -2.00% L = 52.62 |

# V11 LONGITUDINAL SECTION CHAINAGE 0 TO 1082

0 10m 20m 40m
0 50m 100m 200m
SCALE 1:2500 H SCALE 1:500 V

AECOM

**PROJECT**

V11 TONGWELL STREET EXTENSION AND MARSTON VALE LINE RAILWAY BRIDGE CROSSING FEASIBILITY STUDY

**CLIENT**

MILTON KEYNES COUNCIL

Milton Keynes Council
Synergy Park, Chesney Wold, Bleak Hall
MK6 1LY

**CONSULTANT**

AECOM Ltd.
AECOM House, Harpur Center, Horne Lane,
Bedford, MK40 1TS
Tel: 01234 349641
www.aecom.com

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1. LACK OF COORDINATION WITH THE EAST/WEST RAILWAY DEVELOPMENT PROJECT.
2. UNKNOWN UTILITIES

**NOTES**

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5. ALL EARTHWORKS SLOPE GRADIENTS ARE 1:3, UNLESS STATED OTHERWISE.

**LEGEND**

- Water course
- Existing Redway
- Proposed Redway
- Existing leisure route/ bridleway
- Transport Corridor Limits
- Proposed Vertical Design Level
- Existing Ground Level
- Works Boundary
- Possible locations for drainage treatment areas

**ISSUE/REVISION**

| I/R | DATE | DESCRIPTION |
|---|---|---|
| P01 | 26/08/2021 | FEASIBILITY REPORT |

**PROJECT NUMBER**

60664040

**SHEET TITLE**

PLAN AND PROFILE

**SHEET NUMBER**

60664040-ACM-HML-V11_Z-DR-CH-1001



ISO A1 594mm x 841mm
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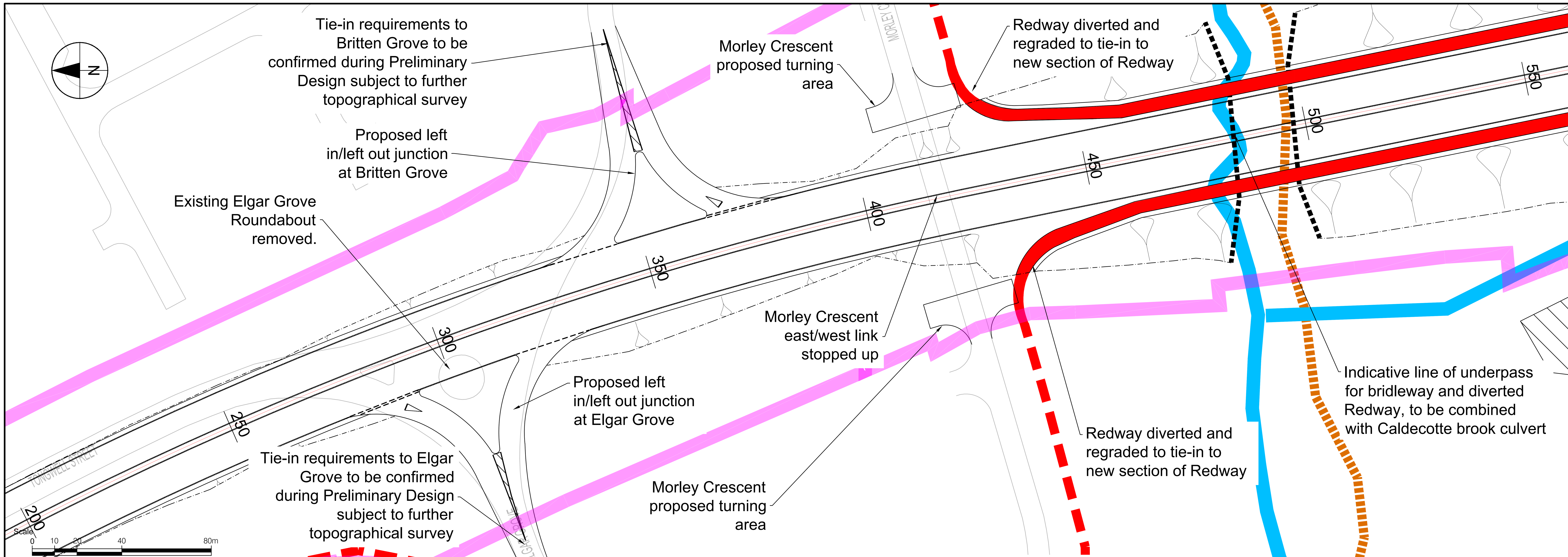
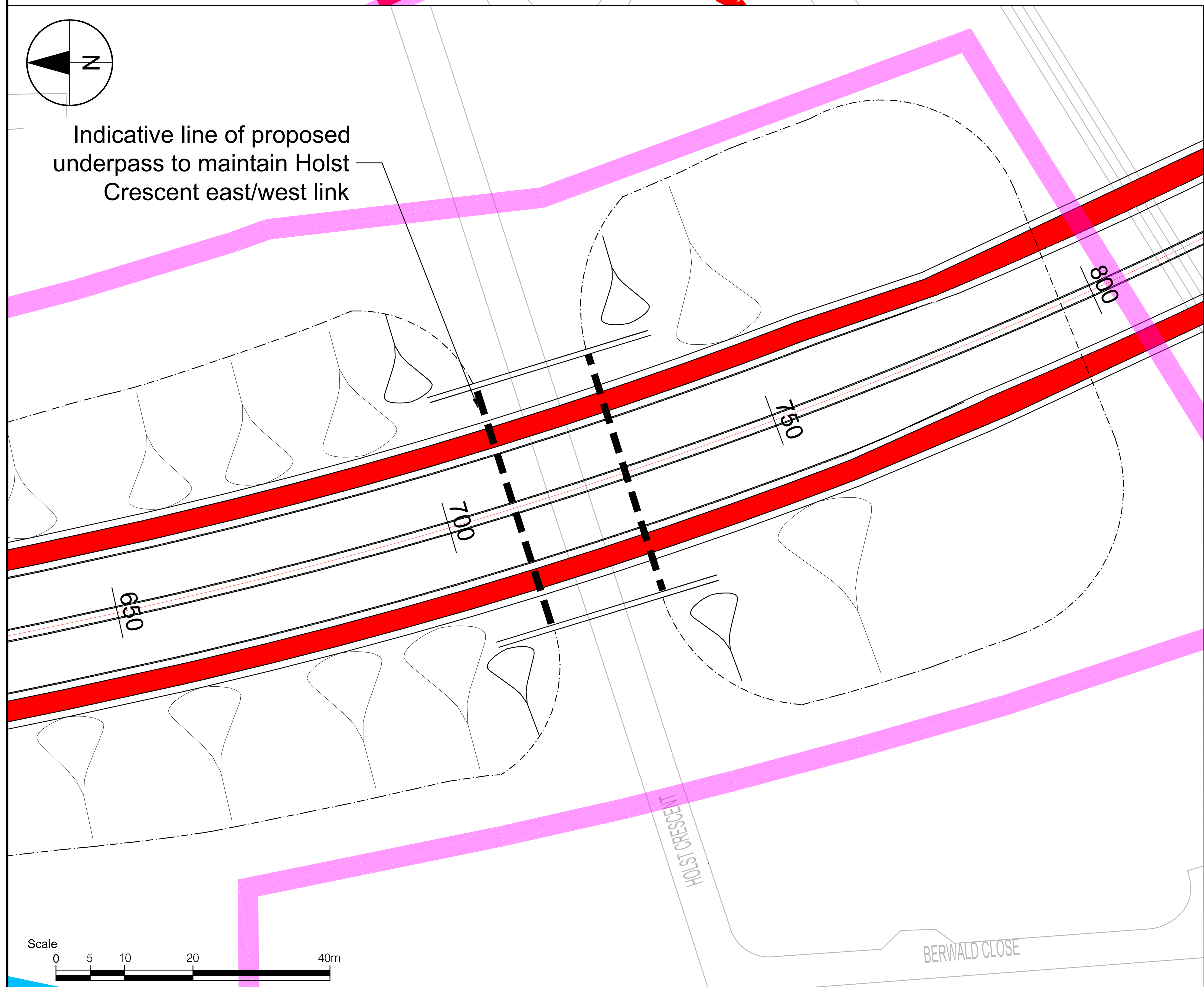
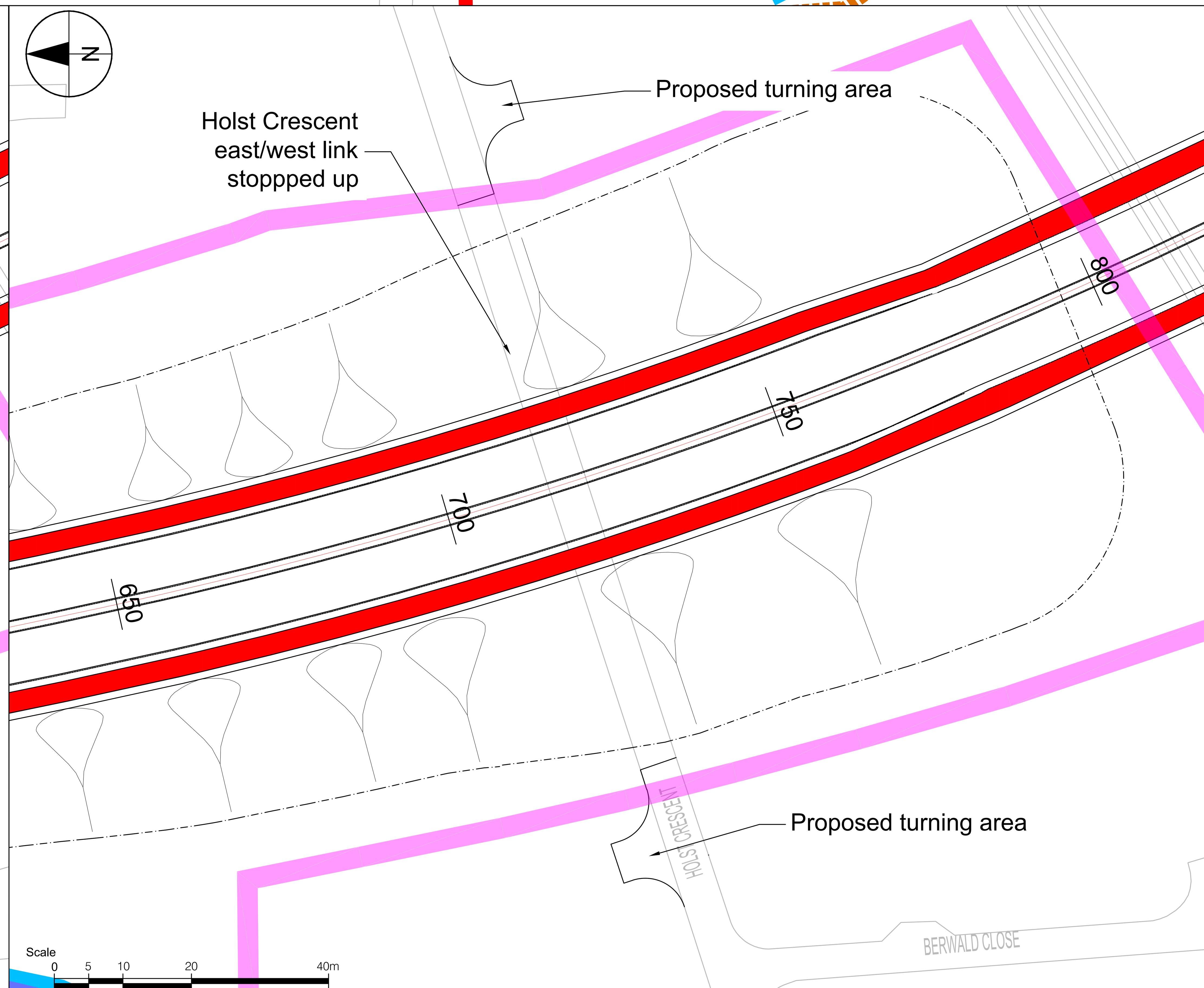



LEFT IN / LEFT OUT JUNCTIONS AND REDWAY CONNECTION PROPOSALS




OPTION A: HOLST CRESCENT UNDERPASS




OPTION B: HOLST CRESCENT TURNING AREAS

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**PROJECT**

*V11 TONGWELL STREET EXTENSION AND MARSTON VALE LINE RAILWAY BRIDGE CROSSING FEASIBILITY STUDY*

**CLIENT**

MILTON KEYNES COUNCIL

Milton Keynes Council
Synergy Park, Chesney Wold, Bleak Hall
MK6 1LY

**CONSULTANT**

AECOM Ltd.
AECOM House, Harpur Center, Horne Lane,
Bedford, MK40 1TS
Tel: 01234 349641
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LEGEND

- Water course
- Existing Redway
- Proposed Redway
- Existing leisure route/ bridleway
- Transport Corridor Limits

**ISSUE/REVISION**

| I/R | DATE | DESCRIPTION |
|---|---|---|
| P01 | 30/08/2021 | FEASIBILITY REPORT |

**PROJECT NUMBER**

60664040

**SHEET TITLE**

JUNCTION PROPOSALS
& REDWAY CONNECTIONS

**SHEET NUMBER**

60664040-ACM-HML-V11_Z-DR-CH-1002



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Checked: DM
Designer: HM
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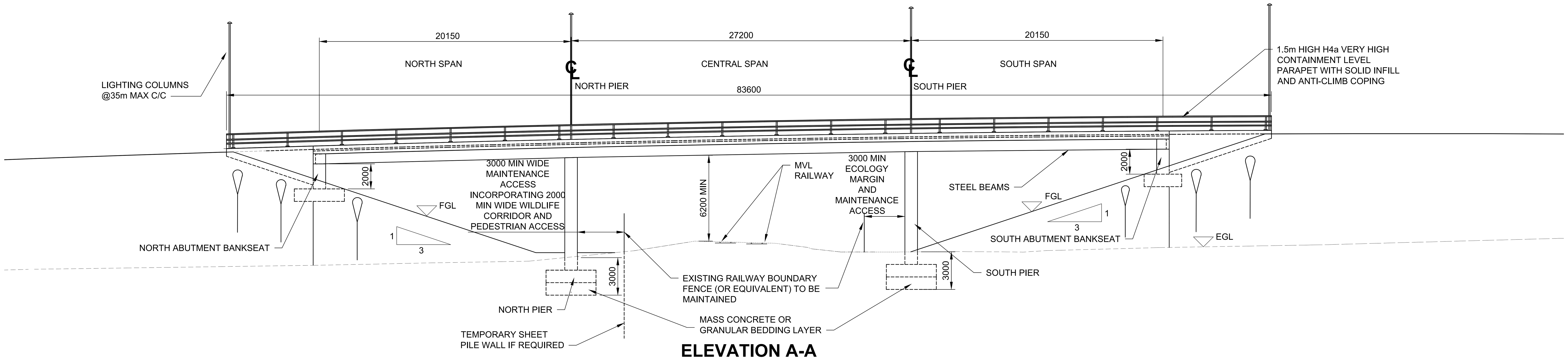
# Appendix B - Structures Drawings

Project Management Initials: Designer: FK Checked: MDH Approved: RW ISO A1 594mm x 841m

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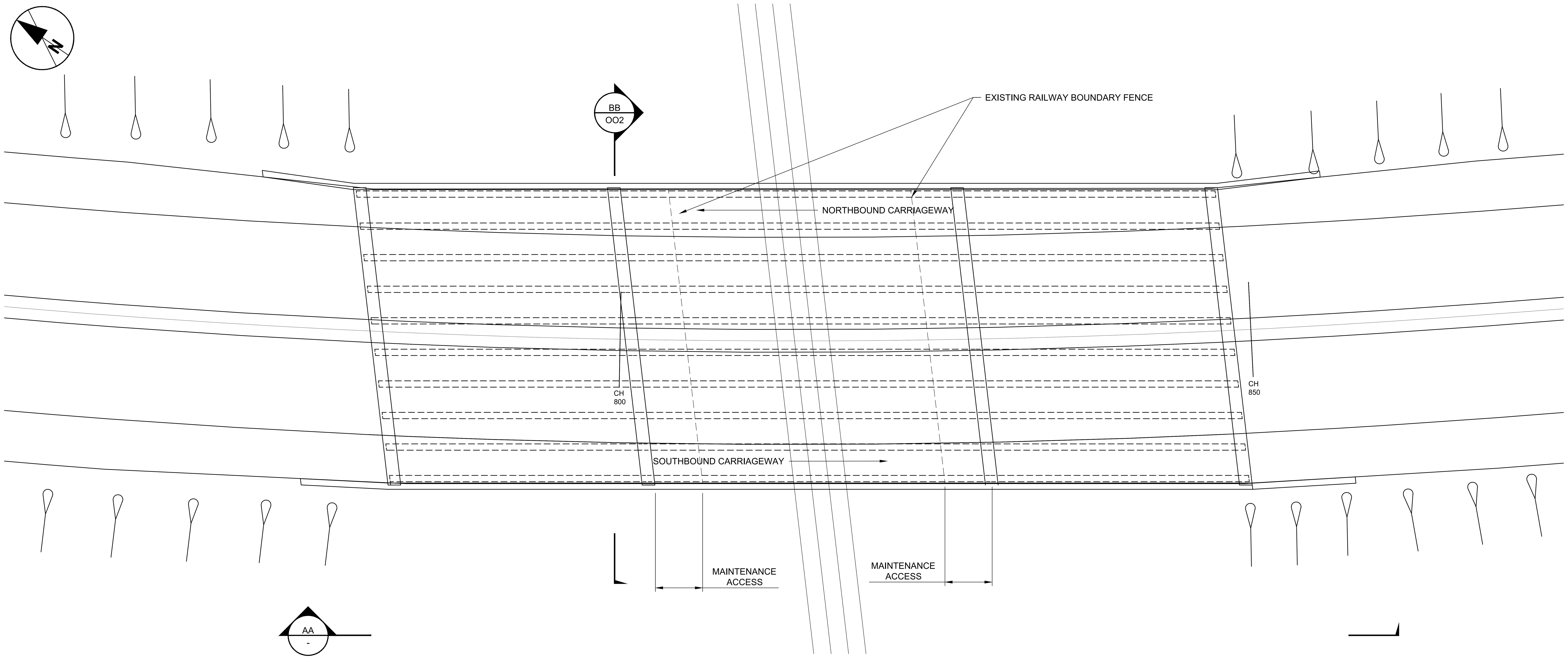


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**PROJECT**

*V11 TONGWELL STREET EXTENSION AND MARSTON VALE LINE RAILWAY BRIDGE CROSSING FEASIBILITY STUDY*

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Milton Keynes Council
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1.WORKING IN PROXIMITY OF LIVE RAILWAY
2.RISK OF FALLS FROM HEIGHT
3.RISK OF UNCHARTERED SERVICES IN EXCAVATIONS
4.DEEP EXCAVATIONS

NOTES

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| I/R | DATE | DESCRIPTION |
|---|---|---|
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**PROJECT NUMBER**

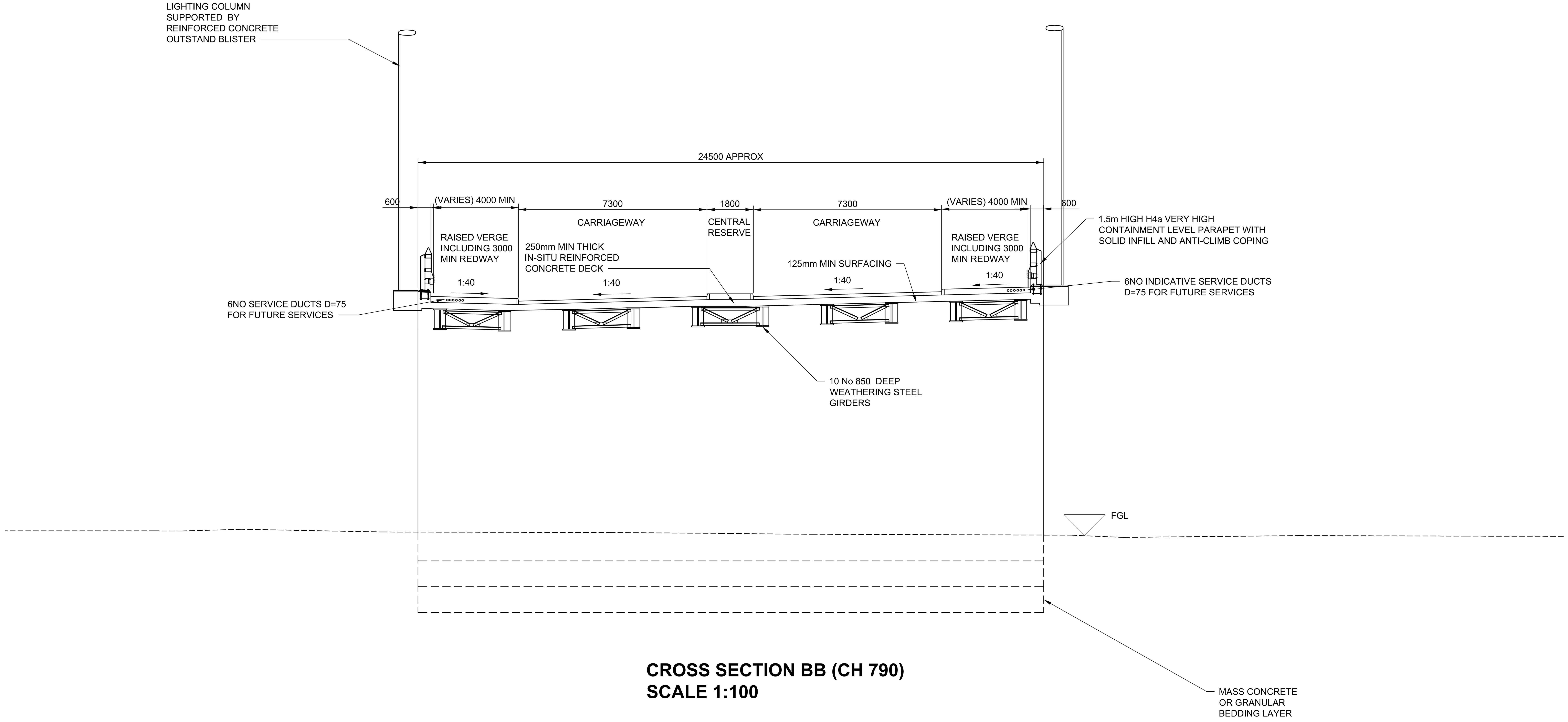
60664040

**SHEET TITLE**

MARSTON VALE LINE RAILWAY BRIDGE GENERAL ARRANGEMENT
SHEET 1 OF 2

**SHEET NUMBER**

60664040/DWG/MVLR/001




**CROSS SECTION BB (CH 790)**
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AECOM

**PROJECT**

*V11 TONGWELL STREET EXTENSION AND MARSTON VALE LINE RAILWAY BRIDGE CROSSING FEASIBILITY STUDY*

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MILTON KEYNES COUNCIL

Milton Keynes Council
Synergy Park, Chesney Wold, Bleak Hall
MK6 1LY

**CONSULTANT**

AECOM Ltd.
AECOM House, Harpur Center, Horne Lane,
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**ISSUE/REVISION**

| I/R | DATE | DESCRIPTION |
|---|---|---|
| | | |

**PROJECT NUMBER**

60664040

**SHEET TITLE**

MARSTON VALE LINE RAILWAY BRIDGE
GENERAL ARRANGEMENT
SHEET 2 OF 2

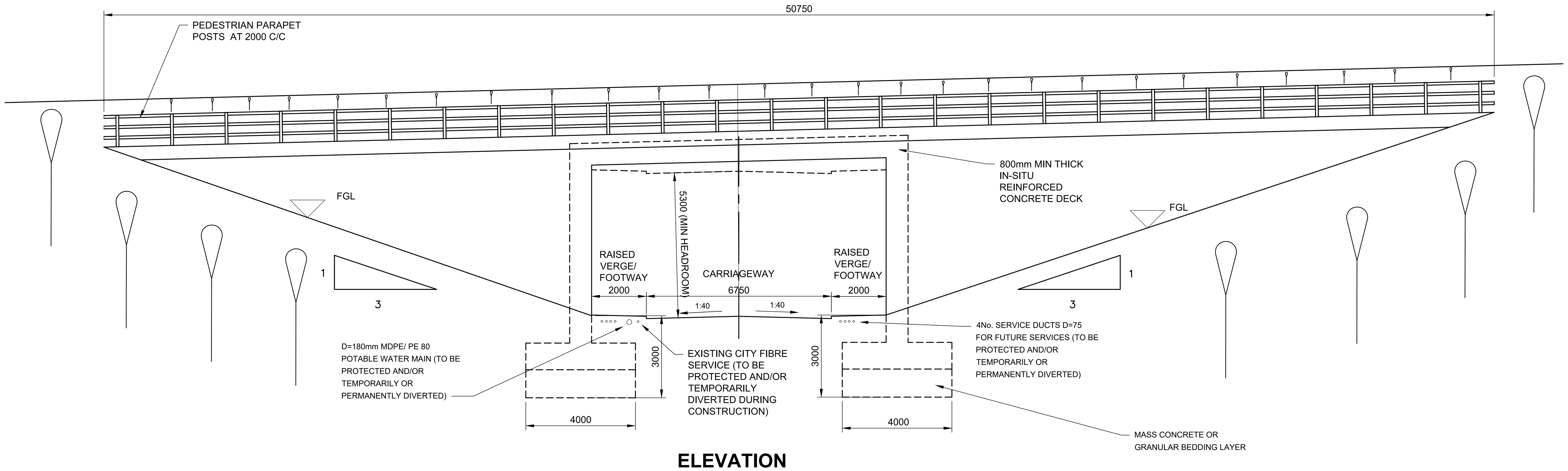
**SHEET NUMBER**

60664040/DWG/MVLR/002

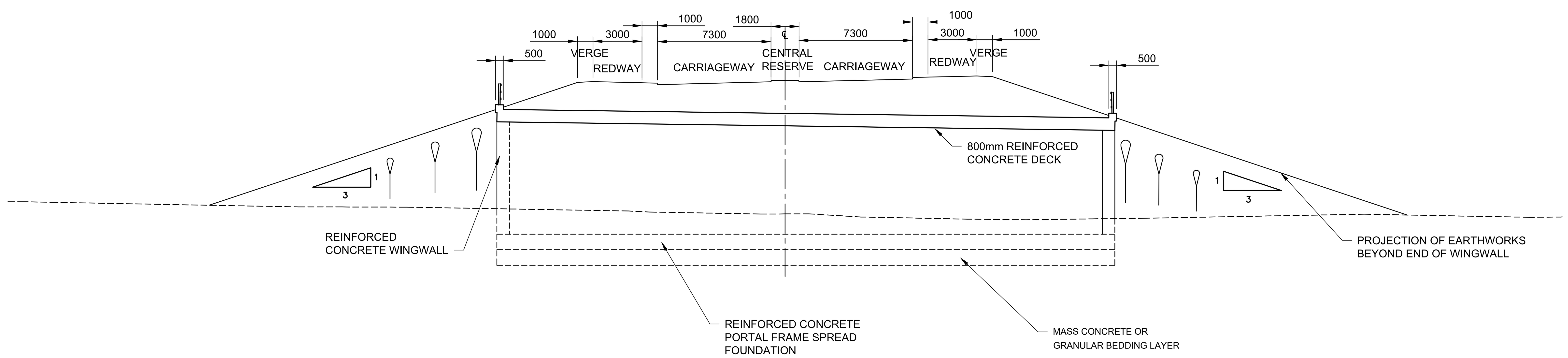


Project Management Initials: Designer: FK Checked: MDH Approved: RW ISO A1 594mm x 841mm

Last saved by: FLORENTIA.KARIOU(2021-09-02) Last Plotted: 2021-09-02
Filename: C:\USERS\FLORENTIA.KARIOU\DOCUMENTS\V11 EXTENSION\DRW PDFS\60664040_DWG_MVLR_0002NEW.DWG




**ELEVATION**
**SCALE 1:100**




**CROSS-SECTION (CH 717.975)**
**SCALE 1:200**

ISO A1 594mm x 841m
Approved: RW
Checked: MDH
Designer: FK
Project Management Initials:

Last saved by: FLORENTIA.KARIOU(2021-09-02) Last Plotted: 2021-09-02
Filename: \\NA.AECOMNET.COM\LFS\EMEA\GLASGOW-UKGLG2\DCS\PROJECTS\CI\60664040_MILTON_KEYNES_V11_EXTN\900_CAD_GIS\950_STRUCTURES\DRAWINGS STRUCTURES\60664040_DWG_HCU_0001.DWG

AECOM

**PROJECT**

*V11 TONGWELL STREET EXTENSION AND MARSTON VALE LINE RAILWAY BRIDGE CROSSING FEASIBILITY STUDY*

**CLIENT**

MILTON KEYNES
COUNCIL

Milton Keynes Council
Synergy Park, Chesney Wold, Bleak Hall
MK6 1LY

**CONSULTANT**

AECOM Ltd.
AECOM House, Harpur Center, Horne Lane,
Bedford, MK40 1TS
Tel: 01234 349641
www.aecom.com

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION BOX

IT IS ASSUMED THAT ALL WORKS ON THIS DRAWING WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR WORKING, WHERE APPORIATE, TO AN APPROPRIATE METHOD STATEMENT.

THIS DRAWING IS TO BE USED FOR THE PURPOSE OF ISSUE THAT IT WAS ISSUED FOR AND IS SUBJECT TO AMENDMENT.

EXCEPTIONAL RISKS RELATING TO THE WORKS ASSOCIATED WITH THIS DRAWING ARE IDENTIFIED BELOW.

1.WORKING IN PROXIMITY OF LIVE HIGHWAY
2.RISK OF FALLS FROM HEIGHT
3.RISK OF UNCHARTERED SERVICES IN EXCAVATIONS
4.DEEP EXCAVATIONS

NOTES
1. DO NOT SCALE FROM THIS DRAWING.
2. ALL DIMENSIONS ARE GIVEN IN MILLIMETRES UNLESS NOTED OTHERWISE.
3. ALL LEVELS, CHAINAGES AND COORDINATES IN METRES UNLESS NOTED OTHERWISE. ALL LEVELS ARE A.O.D. UNLESS NOTED OTHERWISE.
4. THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT STRUCTURES, EARTHWORKS AND HIGHWAYS DRAWINGS.

**ISSUE/REVISION**

| I/R | DATE | DESCRIPTION |
| --- | --- | --- |
| | | |



**PROJECT NUMBER**

60664040

**SHEET TITLE**

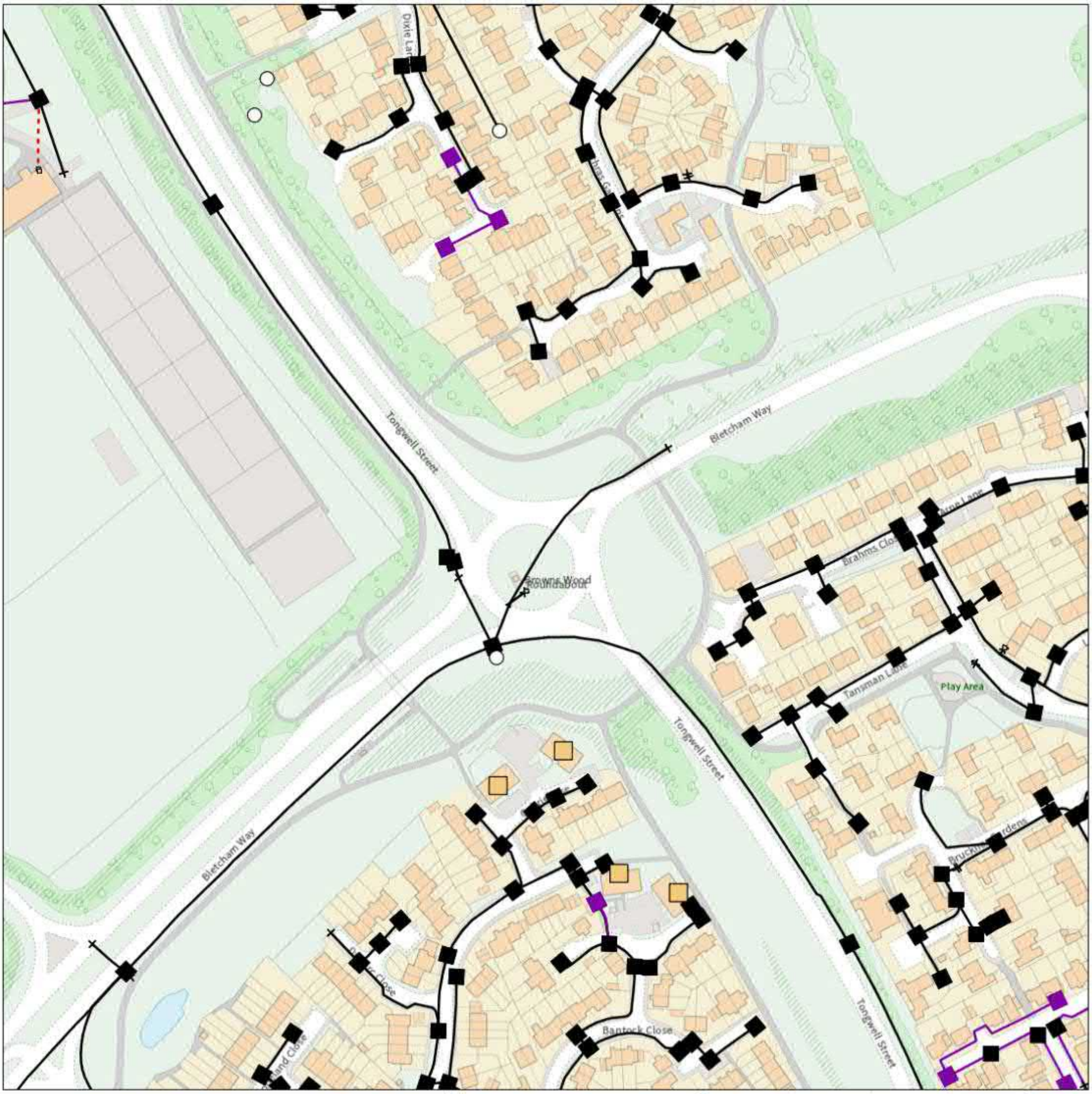
HOLST CRESCENT UNDERPASS GENERAL ARRANGEMENT
SHEET 1 OF 1

**SHEET NUMBER**

60664040/DWG/HCU/0001

# Appendix C - Selected correspondence from C2 returns

# Maps by email Plant Information Reply




## IMPORTANT WARNING

Information regarding the location of BT apparatus is given for your assistance and is intended for general guidance only. No guarantee is given of its accuracy.It should not be relied upon in the event of excavations or other works being made near to BT apparatus which may exist at various depths and may deviate from the marked route.

openreach

## CLICK BEFORE YOU DIG

FOR PROFESSIONAL FREE ON SITE ASSISTANCE PRIOR TO COMMENCEMENT OF EXCAVATION WORKS INCLUDING LOCATE AND MARKING SERVICE

email cbyd@openreach.co.uk

ADVANCE NOTICE REQUIRED
(Office hours: Monday - Friday 08.00 to 17.00)
www.openreach.co.uk/cbyd

### Accidents happen

If you do damage any Openreach equipment please let us know by calling 0800 023 2023 (opt 1 + opt 1) and we can get it fixed ASAP



**KEY TO BT SYMBOLS**

| | Planned | Live |
|---|---|---|
| PCP | | |
| Pole | | |
| Box | | |
| Manhole | | |
| Cabinet | | |

| | | | |
|---|---|---|---|
| Change Of State | + | Hatchings | |
| Split Coupling | × | Built | |
| Duct Tee | ▲ | Planned | |
| Building | | Inferred | |
| Kiosk | Ⓚ | Duct | |

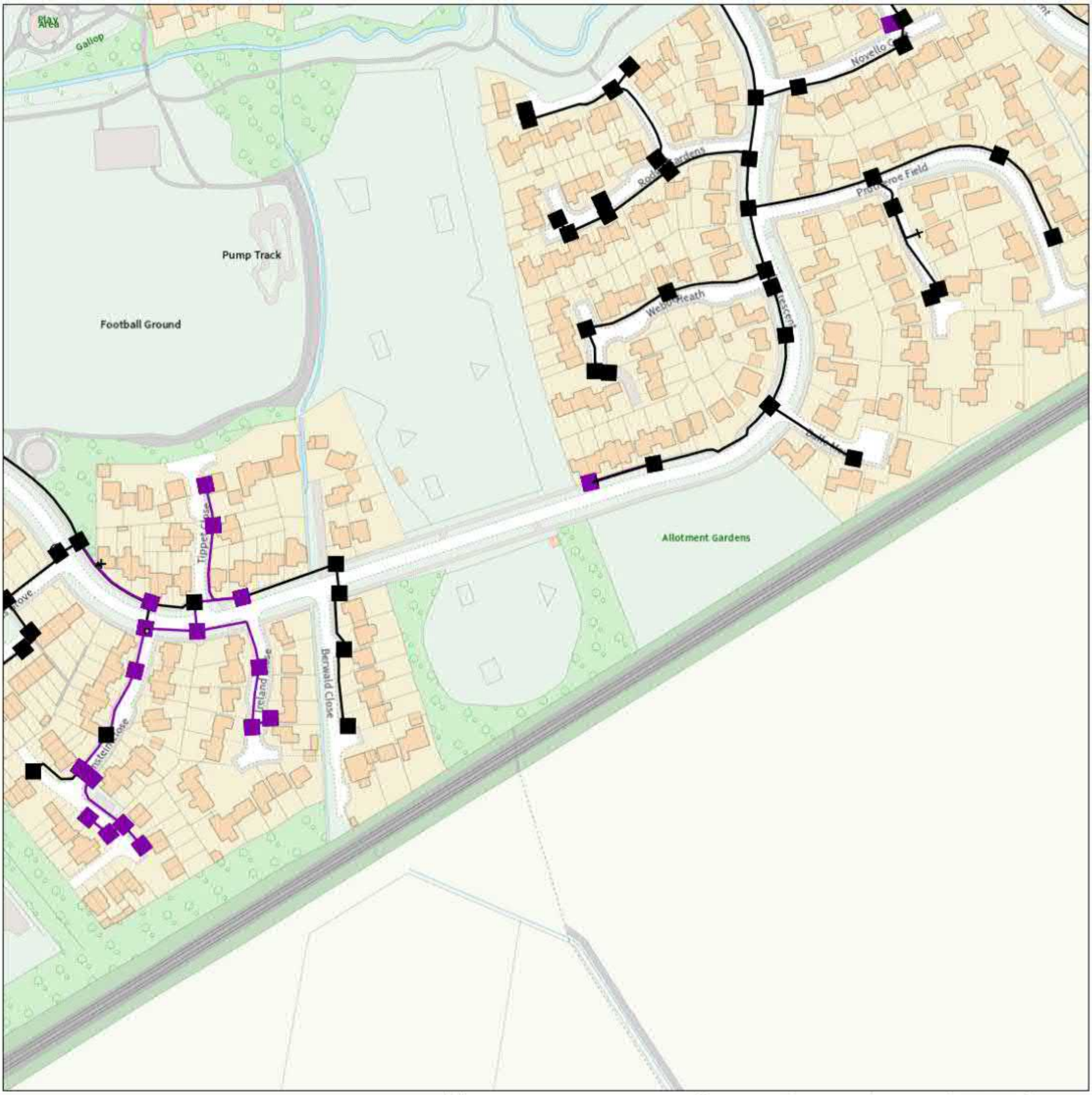
Other proposed plant is shown using dashed lines.
BT Symbols not listed above may be disregarded.
Existing BT Plant may not be recorded.
Information valid at time of preparation. Maps are only valid for 90 days after the date of publication.

| | Pending Add | In Place | Pending Remove | Not In Use |
|---|---|---|---|---|
| Power Cable | | | | |
| Power Duct | | | | N/A |

BT Ref : LFP02558Q
Map Reference : (centre) SP9037436394
Easting/Northing : (centre) 490374,236394
Issued : 25/08/2021 14:55:16

WARNING: IF PLANNED WORKS FALL INSIDE HATCHED AREA IT IS ESSENTIAL BEFORE PROCEEDING THAT YOU CONTACT THE NATIONAL NOTICE HANDLING CENTRE. PLEASE SEND E-MAIL TO: nnhc@openreach.co.uk

# Maps by email Plant Information Reply




## IMPORTANT WARNING

Information regarding the location of BT apparatus is given for your assistance and is intended for general guidance only. No guarantee is given of its accuracy.It should not be relied upon in the event of excavations or other works being made near to BT apparatus which may exist at various depths and may deviate from the marked route.

openreach

**CLICK BEFORE YOU DIG**

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email **cbyd@openreach.co.uk**

ADVANCE NOTICE REQUIRED
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**Accidents happen**

If you do damage any Openreach equipment please let us know by calling 0800 023 2023 (opt 1 + opt 1) and we can get it fixed ASAP



| KEY TO BT SYMBOLS | Planned | Live | | | | |
|---|---|---|---|---|---|---|
| | | | Change Of State | + | Hatchings | |
| | | | Split Coupling | × | Built | |
| PCP | | | Duct Tee | ▲ | Planned | |
| Pole | | | Building | | Inferred | |
| Box | | | Kiosk | Ⓚ | Duct | |
| Manhole | | | | | | |
| Cabinet | | | | | | |

Other proposed plant is shown using dashed lines.
BT Symbols not listed above may be disregarded.
Existing BT Plant may not be recorded.
Information valid at time of preparation. Maps are only valid for 90 days after the date of publication.

| | Pending Add | In Place | Pending Remove | Not In Use |
|---|---|---|---|---|
| Power Cable | | | | |
| Power Duct | | | | N/A |

BT Ref : MDV02554M
Map Reference : (centre) SP9067935683
Easting/Northing : (centre) 490679,235683
Issued : 25/08/2021 14:55:49

**WARNING: IF PLANNED WORKS FALL INSIDE HATCHED AREA IT IS ESSENTIAL BEFORE PROCEEDING THAT YOU CONTACT THE NATIONAL NOTICE HANDLING CENTRE. PLEASE SEND E-MAIL TO: nnhc@openreach.co.uk**


bitmap_layout select_raster

# LEGEND

| | |
|---|---|
| ■ | EXISTING PLANT |
| — | EXISTING PLANT |

bitmap_layout select_raster

Head Office
CityFibre Holdings Ltd
15 Bedford Street,
London,
WC2E 9HE

Tel: 0845 293 0774
Web: www.cityfibre.com

Asset Office
CityFibre Holdings Ltd,
Rutherford House,
Birchwood,
Warrington,
WA3 6ZH

Email: asset.team@cityfibre.com



Project

Plant Enquiry

Drawing

Existing Plant

Drawn by:

smallworld

Date: 19/08/2021

Drawing No.

CFH_EP_000001

Revision

001

Scale: 1:2500

A4

0m 20m 40m 60m 80m 100m

N


bitmap_layout select_raster

# LEGEND

■ EXISTING PLANT

— EXISTING PLANT

bitmap_layout select_raster

Head Office
CityFibre Holdings Ltd
15 Bedford Street,
London,
WC2E 9HE

Tel: 0845 293 0774
Web: www.cityfibre.com

Asset Office
CityFibre Holdings Ltd,
Rutherford House,
Birchwood,
Warrington,
WA3 6ZH

Email: asset.team@cityfibre.com



Project

Plant Enquiry

Drawing

Existing Plant

Drawn by:

smallworld

Date: 19/08/2021

Drawing No.

CFH_EP_000001

Revision

001

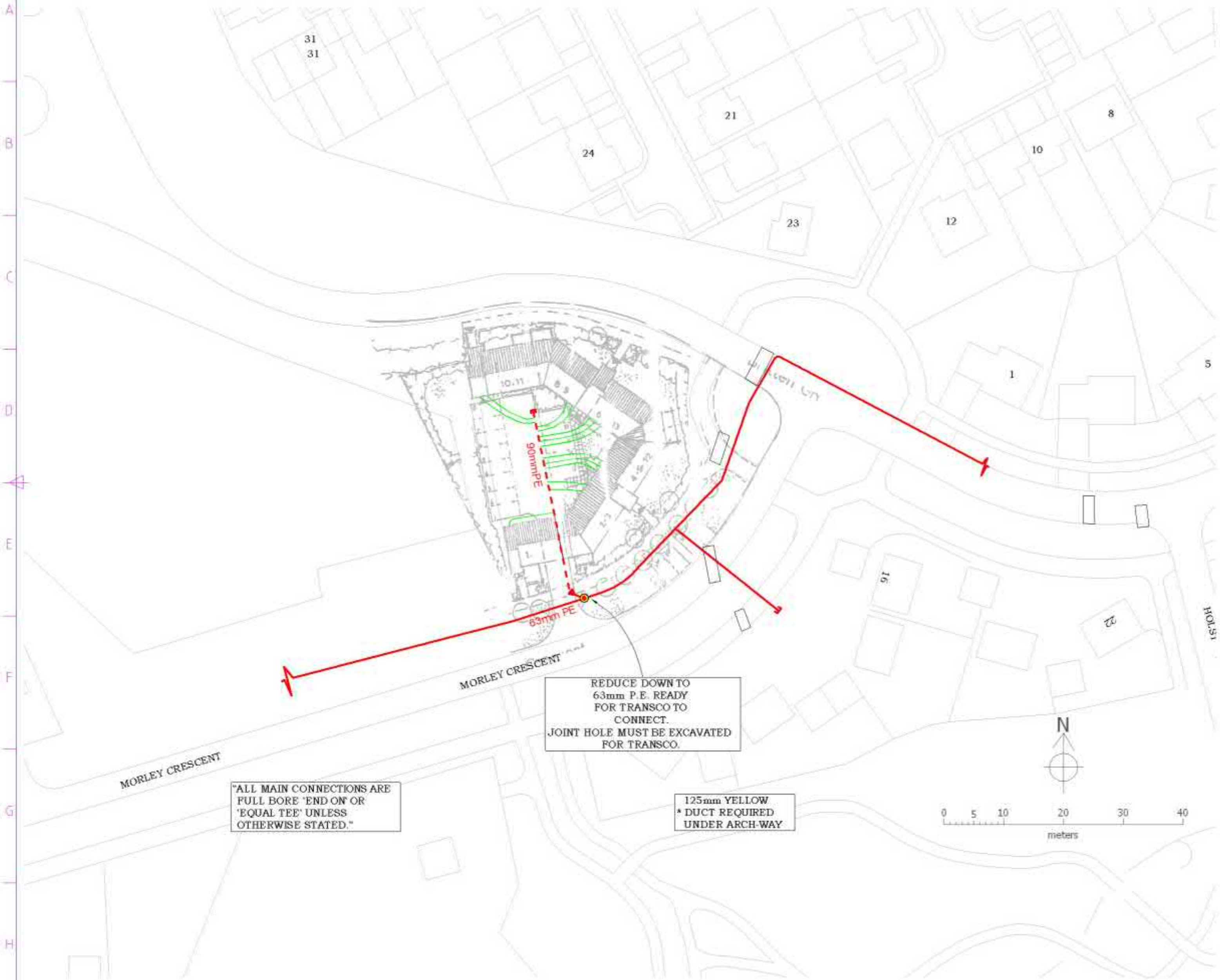
Scale: 1:2500

A4

0m 20m 40m 60m 80m 100m

N

| Rev | Revision Note | Date | By |
|---|---|---|---|
| 1 | Original drawing | 04/09/08 | Fade |




Minimum Proximity to Properties - Pe Mains

| O.D. (mm) | Material Pe Grade | MOP < 75 mbar | MOP > 75 mbar ≤ 2 bar | MOP > 2bar ≤ 4 bar |
|---|---|---|---|---|
| | | Minimum Proximity (m) | | |
| ≤ 140 | Pe 80 SDR 26 | 0.25 | 3 | |
| | Pe 80 SDR 17.6 | 0.25 | 3 | |
| | Pe 80 SDR 11 | 0.25 | 3 | 5 |
| 150 to 250 | Pe 80 SDR 26 | 1 | 3 | |
| | Pe 80 SDR 17.6 | 1 | 3 | |
| | Pe 80 SDR 11 | 1 | 3 | 5 |
| 315 | Pe 80 SDR 26 | 1 | 3 | |
| | Pe 80 SDR 17.6 | 1 | 3 | |
| | Pe 80 SDR 11 | 1 | 3 | 5 |

This gas network design has been carried out by :

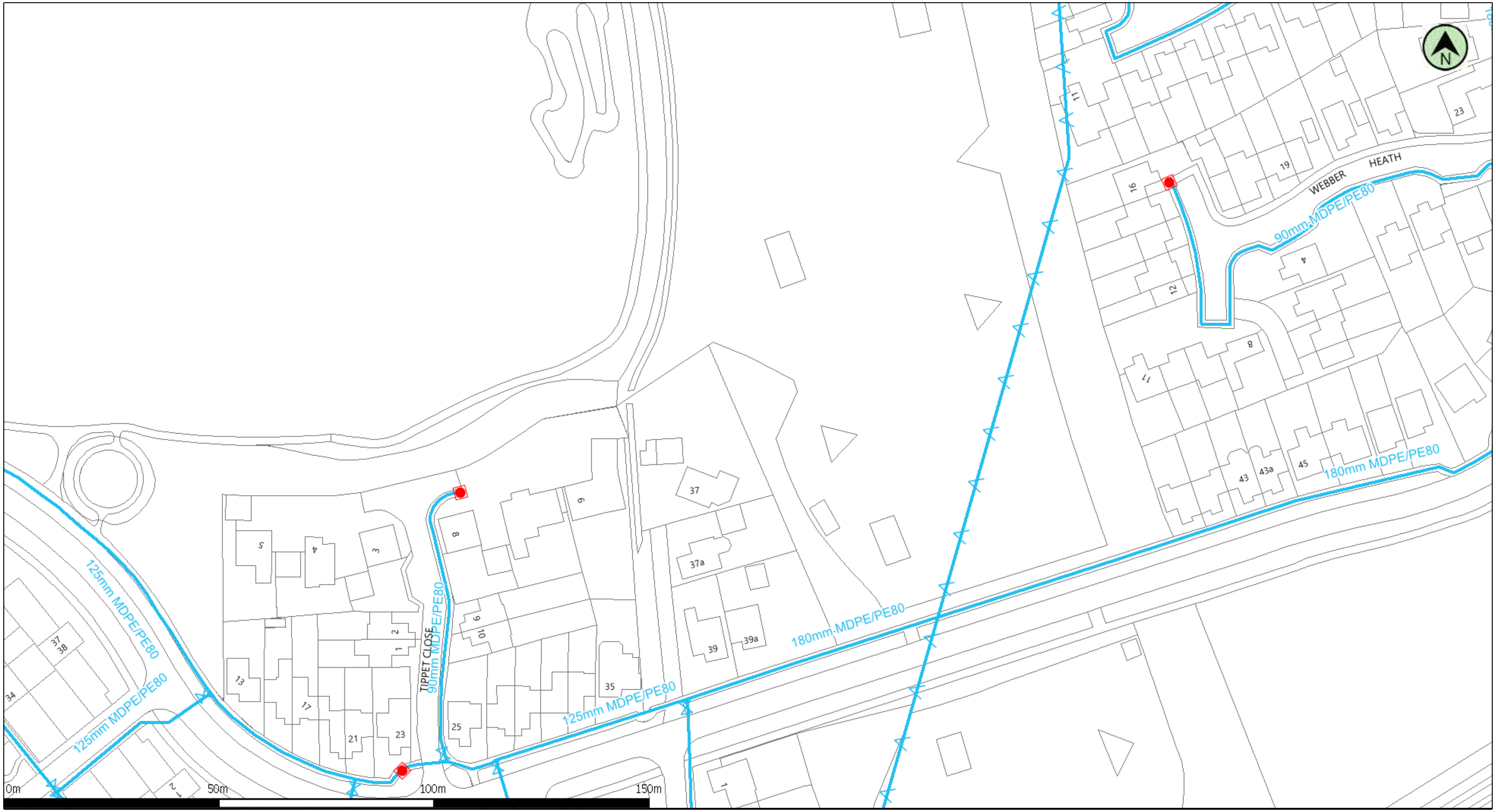

Neal Herbert IEng MIGEM
Engineering Manager
The Gas Transportation Company Ltd
Woolpit Business Park
Bury St Edmunds
Suffolk
IP30 9UP
Tel : 01359 240363
Fax : 01359 244398
www.gtc-uk.co.uk


GIRS Reg. No: IUP 2000015/0017/001F

All pipe and fittings used on this design are to be in accordance with PL2/E, L12/E and F7/E



Drawing Scale : 1:500
O.S.REF :
Network Number : N0001693-1
Project Number :
Drawing Number : N0001693-1_R1-0
Date : 04-09-2008
Developer : UIP CCM (Scotland) Ltd.
Location : Home Farm, Glasgow, Lanarkshire G63
Designed By :
Drawn By: Fade
Checked By:
SHEET SIZE A2




 Date: 13/08/21 Scale: 1:1250 Map Centre: 490595,235742 Data updated: 31/07/21 Our Ref: 622377 - 1 Clean Water Plan A4

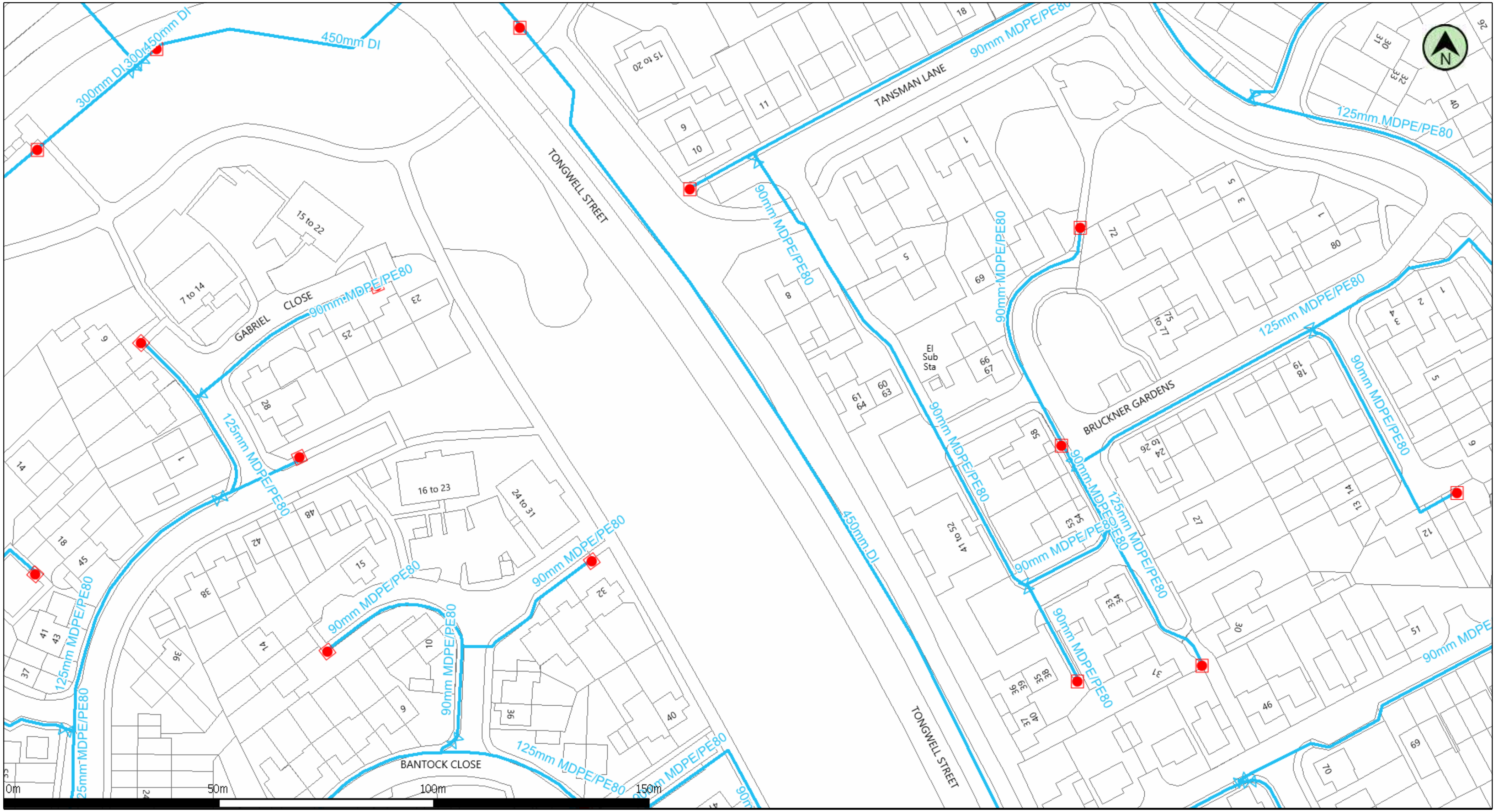


| | | | |
|---|---|---|---|
| Potable Water | | Fitting | |
| Raw Water | RAW | | |
| Decommissioned Water | | Hydrant | |

zoe.mccubbreyedwards@aecom.com

MKC Tongwell St

love every drop
anglianwater




 Date: 13/08/21 Scale: 1:1250 Map Centre: 490482,236257 Data updated: 31/07/21 Our Ref: 622377 - 2 Clean Water Plan A4



| | | | |
|---|---|---|---|
| Potable Water | | Fitting | |
| Raw Water | RAW | | |
| Decommissioned Water | | Hydrant | |

zoe.mccubbreyedwards@aecom.com

MKC Tongwell St

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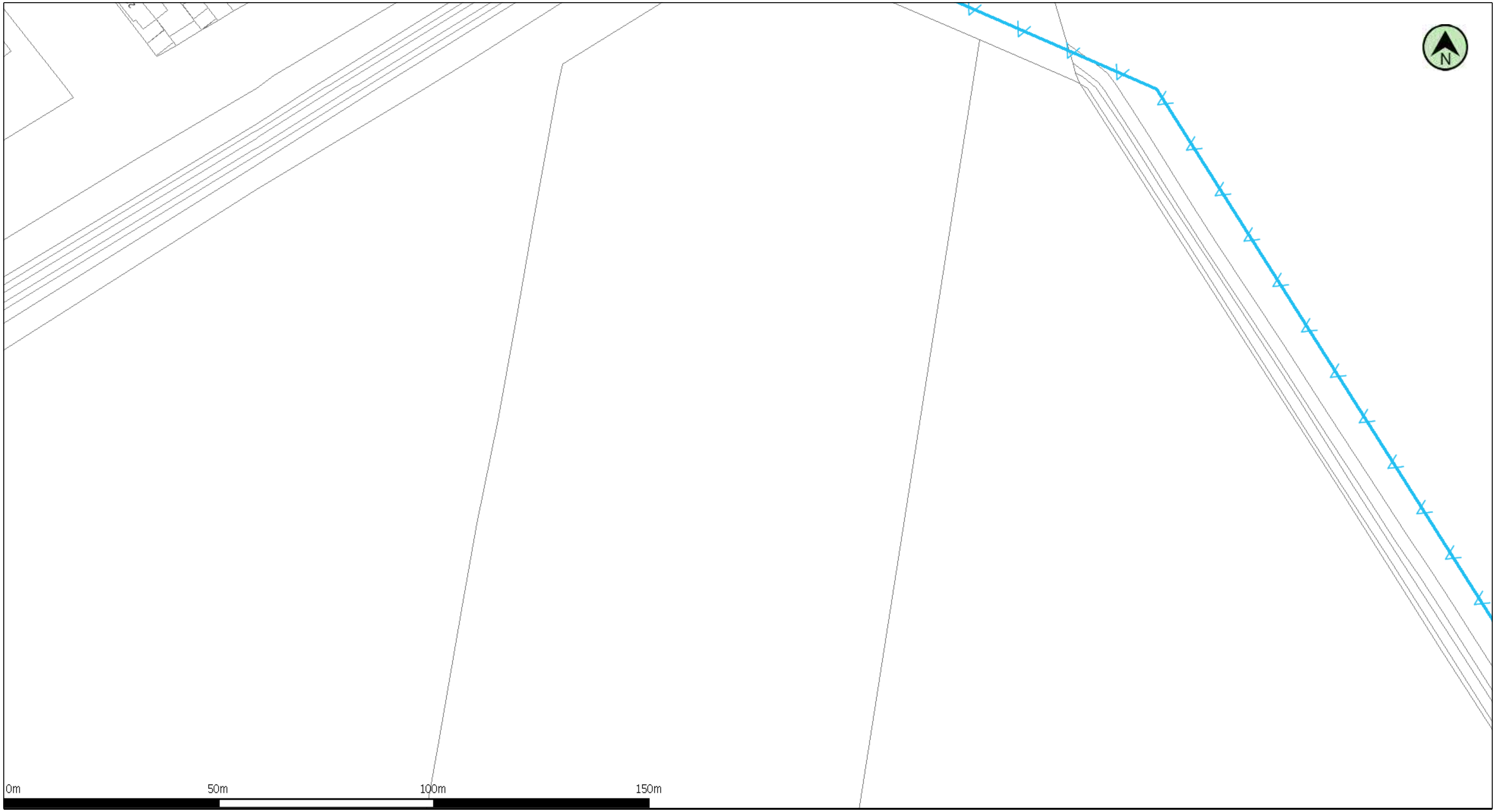





Date: 13/08/21 | Scale: 1:1250 | Map Centre: 490614,235426 | Data updated: 31/07/21 | Our Ref: 622377 - 3 | Clean Water Plan A4

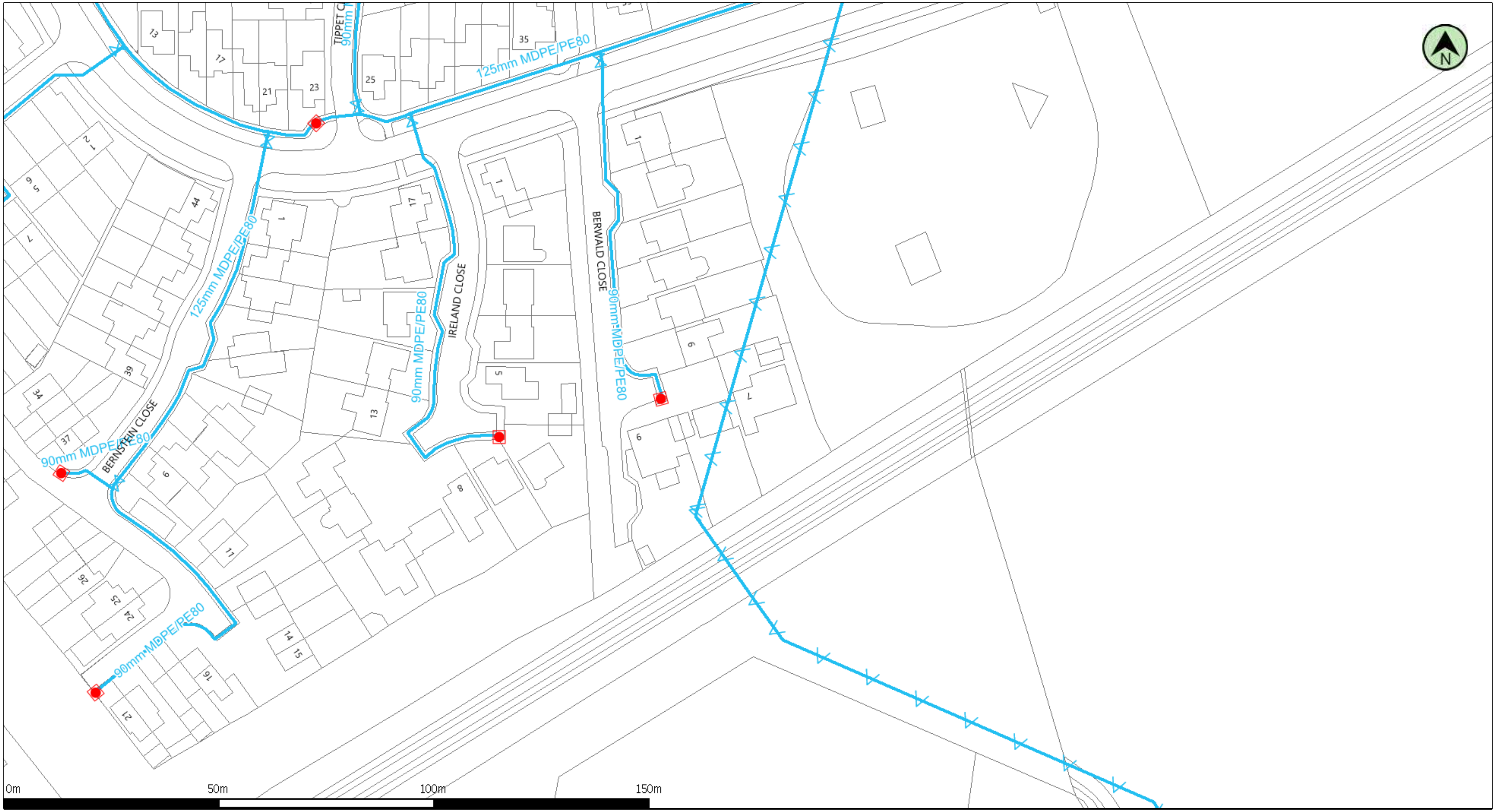
This plan is provided by Anglian Water pursuant its obligations under the Water Industry Act 1991 sections 198 or 199. It must be used in conjunction with any search results attached. The information on this plan is based on data currently recorded but position must be regarded as approximate. Service pipes, private sewers and drains are generally not shown. Users of this map are strongly advised to commission their own survey of the area shown on the plan before carrying out any works. The actual position of all apparatus MUST be established by trial holes. No liability whatsoever, including liability for negligence, is accepted by Anglian Water for any error or inaccuracy or omission, including the failure to accurately record, or record at all, the location of any water main, discharge pipe, sewer or disposal main or any item of apparatus. This information is valid for the date printed. This plan is produced by Anglian Water Services Limited (c) Crown copyright and database rights 2021 Ordnance Survey 100022432.This map is to be used for the purposes of viewing the location of Anglian Water plant only. Any other uses of the map data or further copies is not permitted. This notice is not intended to exclude or restrict liability for death or personal injury resulting from negligence.

Potable Water
Raw Water — RAW
Decommissioned Water
Fitting
Hydrant

zoe.mccubbreyedwards@aecom.com

MKC Tongwell St

love every drop
anglianwater






Date: 13/08/21 | Scale: 1:1250 | Map Centre: 490615,235592 | Data updated: 31/07/21 | Our Ref: 622377 - 4 | Clean Water Plan A4

This plan is provided by Anglian Water pursuant its obligations under the Water Industry Act 1991 sections 198 or 199. It must be used in conjunction with any search results attached. The information on this plan is based on data currently recorded but position must be regarded as approximate. Service pipes, private sewers and drains are generally not shown. Users of this map are strongly advised to commission their own survey of the area shown on the plan before carrying out any works. The actual position of all apparatus MUST be established by trial holes. No liability whatsoever, including liability for negligence, is accepted by Anglian Water for any error or inaccuracy or omission, including the failure to accurately record, or record at all, the location of any water main, discharge pipe, sewer or disposal main or any item of apparatus. This information is valid for the date printed. This plan is produced by Anglian Water Services Limited (c) Crown copyright and database rights 2021 Ordnance Survey 100022432.This map is to be used for the purposes of viewing the location of Anglian Water plant only. Any other uses of the map data or further copies is not permitted. This notice is not intended to exclude or restrict liability for death or personal injury resulting from negligence.

Potable Water

Raw Water — RAW

Decommissioned Water

Fitting

Hydrant

zoe.mccubbreyedwards@aecom.com

MKC Tongwell St

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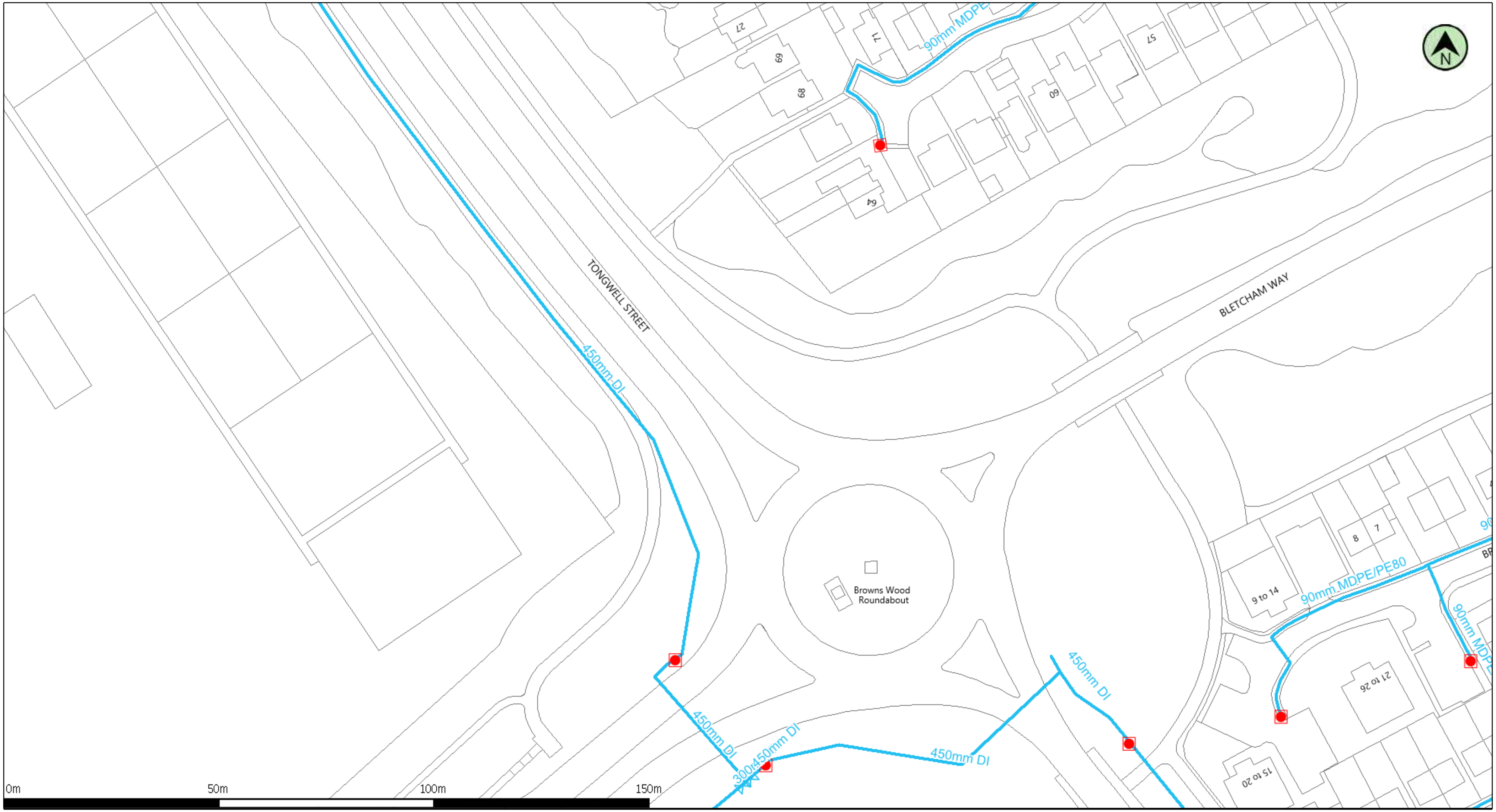


(c) Crown copyright and database rights 2021 Ordnance Survey 100022432 | Date: 13/08/21 | Scale: 1:1250 | Map Centre: 490340,236423 | Data updated: 31/07/21 | Our Ref: 622377 - 5 | Clean Water Plan A4



Potable Water
Raw Water — RAW
Decommissioned Water
Fitting
Hydrant

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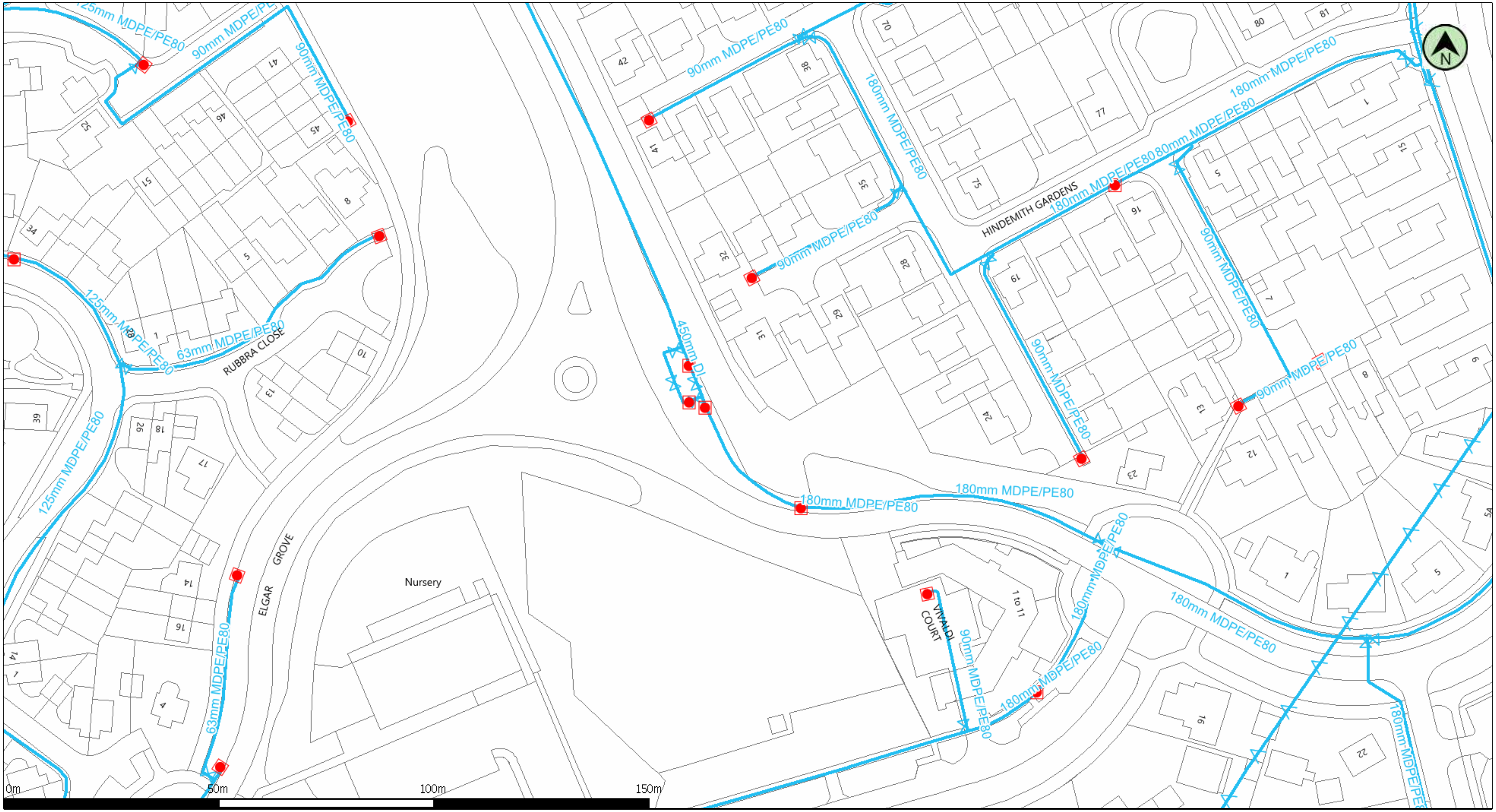


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Potable Water
Raw Water — RAW
Decommissioned Water
Fitting
Hydrant

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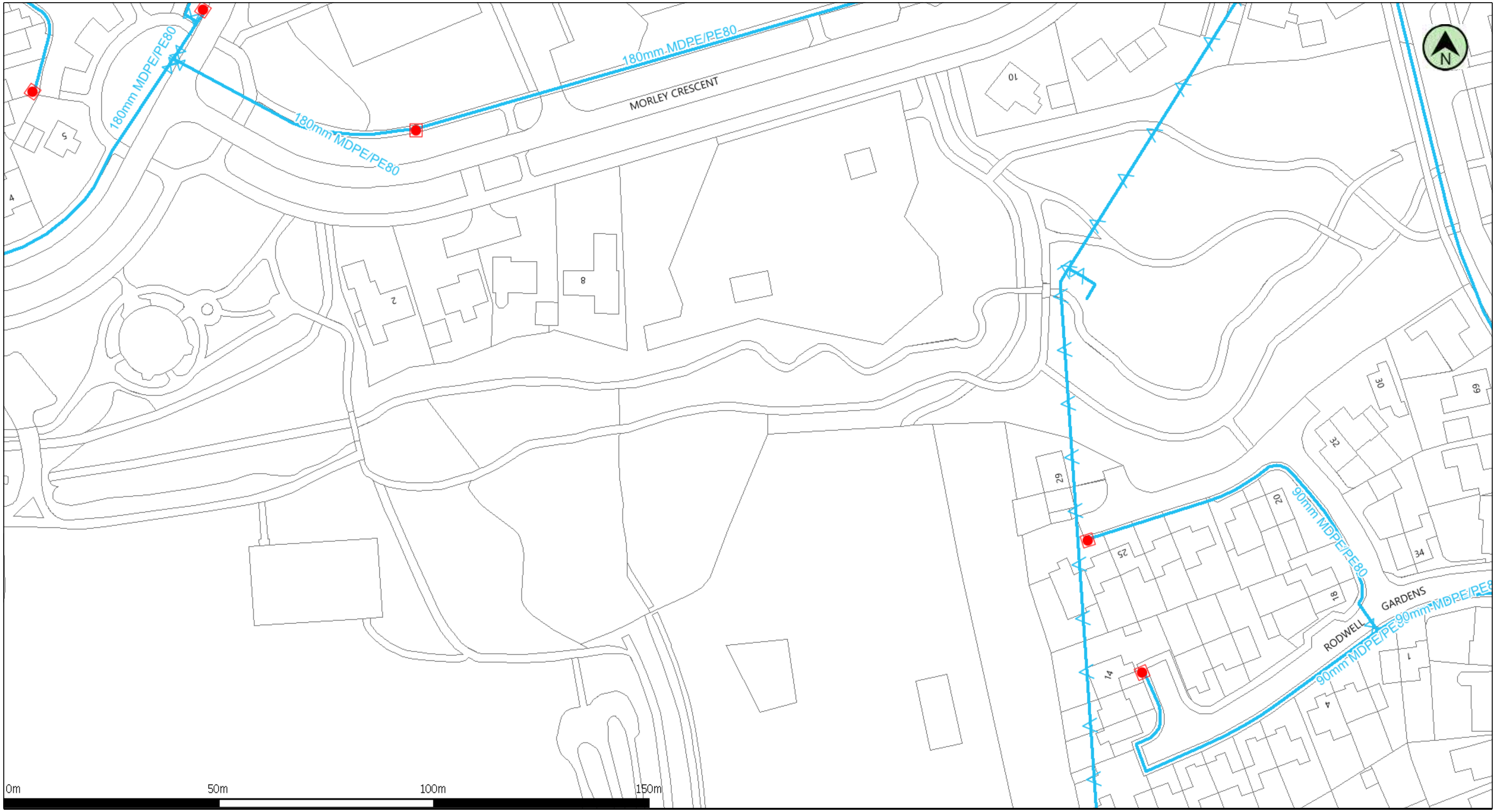


 Date: 13/08/21 Scale: 1:1250 Map Centre: 490588,235908 Data updated: 31/07/21 Our Ref: 622377 - 7 Clean Water Plan A4



| | | | |
|---|---|---|---|
| Potable Water | | Fitting | |
| Raw Water | RAW | | |
| Decommissioned Water | | Hydrant | |

zoe.mccubbreyedwards@aecom.com

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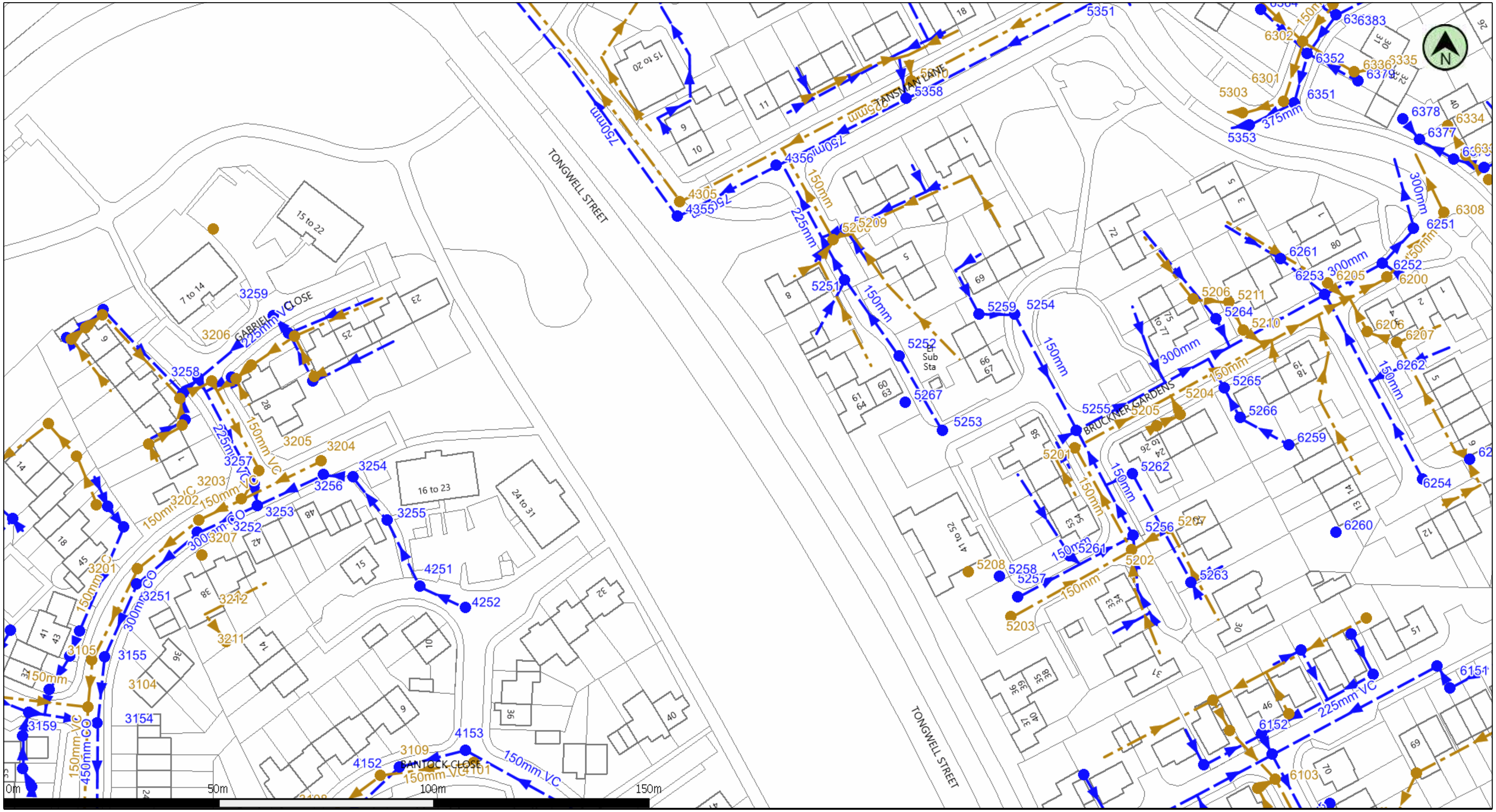





Date: 13/08/21 | Scale: 1:1250 | Map Centre: 490482,236257 | Data updated: 31/07/21 | Our Ref: 622387 - 1 | Wastewater Plan A4



Foul Sewer
Surface Sewer
Combined Sewer
Final Effluent
Rising Main*
Private Sewer*
Decommissioned Sewer*

Outfall*
Inlet*
Manhole*

Sewage Treatment Works
Public Pumping Station
Decomissioned Pumping Station

*(Colour denotes effluent type)

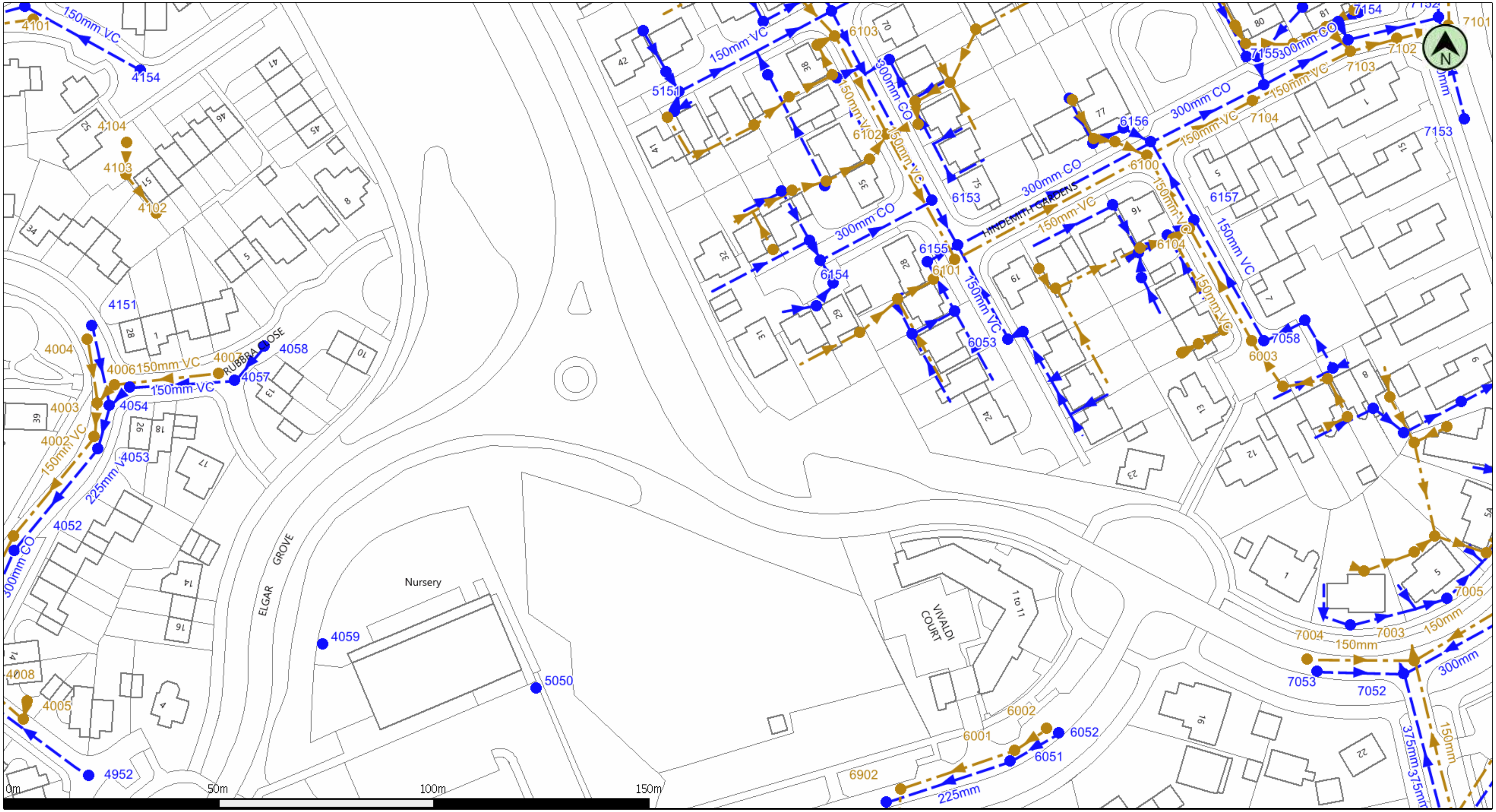
zoe.mccubbreyedwards@aecom.com

MKC Tongwell St

| Manhole Reference | Liquid Type | Cover Level | Invert Level | Depth to Invert |
|---|---|---|---|---|
| 3104 | F | 71.47 | 68.11 | 3.36 |
| 3105 | F | 71.28 | 68.271 | 3.009 |
| 3109 | F | 73.54 | 71.72 | 1.82 |
| 3201 | F | 71.22 | 68.488 | 2.732 |
| 3202 | F | 71.42 | 68.655 | 2.765 |
| 3203 | F | 71.86 | 69.15 | 2.71 |
| 3204 | F | 71.79 | 69.73 | 2.06 |
| 3205 | F | - | 69.27 | - |
| 3206 | F | - | 69.53 | - |
| 3207 | F | - | - | - |
| 3211 | F | - | - | - |
| 3212 | F | - | - | - |
| 4101 | F | 73.97 | 72.15 | 1.82 |
| 4305 | F | - | - | - |
| 5200 | F | 72.975 | 71.075 | 1.9 |
| 5201 | F | 73.675 | 72.025 | 1.65 |
| 5202 | F | 73.975 | 72.3 | 1.675 |
| 5203 | F | 74.48 | 72.75 | 1.73 |
| 5204 | F | - | - | - |
| 5205 | F | - | - | - |
| 5206 | F | - | - | - |
| 5207 | F | - | - | - |
| 5208 | F | - | - | - |
| 5209 | F | - | - | - |
| 5210 | F | - | - | - |
| 5211 | F | - | - | - |
| 5303 | F | 72.871 | 69.581 | 3.29 |
| 5310 | F | - | - | - |
| 6103 | F | 74.48 | 72.544 | 1.936 |
| 6200 | F | 73.325 | 71.384 | 1.941 |
| 6205 | F | - | - | - |
| 6206 | F | - | - | - |

| Manhole Reference | Liquid Type | Cover Level | Invert Level | Depth to Invert |
|---|---|---|---|---|
| 6207 | F | - | - | - |
| 6301 | F | 72.902 | 69.682 | 3.22 |
| 6302 | F | 73.015 | 69.875 | 3.14 |
| 6303 | F | 72.981 | 70.041 | 2.94 |
| 6308 | F | 73.45 | 71.244 | 2.206 |
| 6332 | F | - | - | - |
| 6333 | F | - | - | - |
| 6334 | F | - | - | - |
| 6335 | F | - | - | - |
| 6336 | F | - | - | - |
| 3154 | S | 71.46 | 68.751 | 2.709 |
| 3155 | S | 71.3 | 69.043 | 2.257 |
| 3159 | S | - | 69.119 | - |
| 3251 | S | 71.26 | 69.201 | 2.059 |
| 3252 | S | 71.42 | 69.335 | 2.085 |
| 3253 | S | 71.99 | 69.824 | 2.166 |
| 3254 | S | 72.04 | 70.46 | 1.58 |
| 3255 | S | 72.46 | 70.65 | 1.81 |
| 3256 | S | 71.77 | 70.29 | 1.48 |
| 3257 | S | - | 69.85 | - |
| 3258 | S | - | 70.04 | - |
| 3259 | S | - | 70.26 | - |
| 4152 | S | 73.65 | 72.23 | 1.42 |
| 4153 | S | 73.88 | 72.61 | 1.27 |
| 4251 | S | 72.8 | 71.14 | 1.66 |
| 4252 | S | 73.09 | 71.45 | 1.64 |
| 4355 | S | - | - | - |
| 4356 | S | - | - | - |
| 5251 | S | 73.1 | 71.75 | 1.35 |
| 5252 | S | 73.45 | 72.204 | 1.246 |
| 5253 | S | 73.775 | 72.4 | 1.375 |
| 5254 | S | 73.375 | 72 | 1.375 |

| Manhole Reference | Liquid Type | Cover Level | Invert Level | Depth to Invert |
|---|---|---|---|---|
| 5255 | S | 73.65 | 71.605 | 2.045 |
| 5256 | S | 73.95 | 72.6 | 1.35 |
| 5257 | S | 74.43 | 73.05 | 1.38 |
| 5258 | S | - | - | - |
| 5259 | S | - | - | - |
| 5260 | S | - | - | - |
| 5261 | S | - | - | - |
| 5262 | S | - | - | - |
| 5263 | S | - | - | - |
| 5264 | S | - | - | - |
| 5265 | S | - | - | - |
| 5266 | S | - | - | - |
| 5267 | S | - | - | - |
| 5353 | S | 72.87 | 70.38 | 2.49 |
| 5358 | S | - | - | - |
| 6151 | S | 73.874 | 72.793 | 1.081 |
| 6152 | S | 74.49 | 72.575 | 1.915 |
| 6251 | S | 73.5 | 70.843 | 2.657 |
| 6252 | S | 73.325 | 70.913 | 2.412 |
| 6253 | S | 73.225 | 71.018 | 2.207 |
| 6254 | S | 73.525 | 72.175 | 1.35 |
| 6259 | S | - | - | - |
| 6260 | S | - | - | - |
| 6261 | S | - | - | - |
| 6262 | S | - | - | - |
| 6263 | S | - | - | - |
| 6351 | S | 72.809 | 70.439 | 2.37 |
| 6352 | S | 73.038 | 70.508 | 2.53 |
| 6353 | S | 72.984 | 70.684 | 2.3 |
| 6364 | S | - | - | - |
| 6375 | S | - | - | - |
| 6376 | S | - | - | - |
| 6377 | S | - | - | - |
| 6378 | S | - | - | - |
| 6379 | S | - | - | - |






Date: 13/08/21 | Scale: 1:1250 | Map Centre: 490584,236084 | Data updated: 31/07/21 | Our Ref: 622387 - 2 | Wastewater Plan A4



Foul Sewer
Surface Sewer
Combined Sewer
Final Effluent
Rising Main*
Private Sewer*
Decommissioned Sewer*

Outfall*
Inlet*
Manhole*

Sewage Treatment Works
Public Pumping Station
Decomissioned Pumping Station

*(Colour denotes effluent type)

zoe.mccubbreyedwards@aecom.com

MKC Tongwell St

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anglianwater

| Manhole Reference | Liquid Type | Cover Level | Invert Level | Depth to Invert |
|---|---|---|---|---|
| 4001 | F | 73.72 | 70.72 | 3 |
| 4002 | F | 74.1 | 71.53 | 2.57 |
| 4003 | F | 74.225 | 72.024 | 2.201 |
| 4004 | F | 74.175 | 72.55 | 1.625 |
| 4005 | F | 71.79 | 69.73 | 2.06 |
| 4006 | F | 74.24 | 72.14 | 2.1 |
| 4007 | F | 74.9 | 72.81 | 2.09 |
| 4008 | F | - | - | - |
| 4101 | F | 73.97 | 72.15 | 1.82 |
| 4102 | F | - | - | - |
| 4103 | F | - | - | - |
| 4104 | F | - | - | - |
| 6001 | F | 72.35 | 69.68 | 2.67 |
| 6002 | F | 72.735 | 70.045 | 2.69 |
| 6003 | F | 74.741 | 72.88 | 1.861 |
| 6100 | F | 74.38 | 71.48 | 2.9 |
| 6101 | F | 75.057 | 71.82 | 3.237 |
| 6102 | F | 74.74 | 72.017 | 2.723 |
| 6103 | F | 74.48 | 72.544 | 1.936 |
| 6104 | F | 74.384 | 72.03 | 2.354 |
| 6902 | F | 72.025 | 69.345 | 2.68 |
| 7003 | F | 72.35 | 68.37 | 3.98 |
| 7004 | F | 72.865 | 69.925 | 2.94 |
| 7101 | F | 73.08 | 70.96 | 2.12 |
| 7102 | F | 73.3 | 71.04 | 2.26 |
| 7103 | F | 73.58 | 71.13 | 2.45 |
| 7104 | F | 74.07 | 71.29 | 2.78 |
| 4052 | S | 73.67 | 71.535 | 2.135 |
| 4053 | S | 74.04 | 72.1 | 1.94 |
| 4054 | S | 74.17 | 72.445 | 1.725 |
| 4056 | S | 74.39 | 72.72 | 1.67 |
| 4057 | S | 74.94 | 73.21 | 1.73 |

| Manhole Reference | Liquid Type | Cover Level | Invert Level | Depth to Invert |
|---|---|---|---|---|
| 4058 | S | 75.06 | 73.53 | 1.53 |
| 4059 | S | - | - | - |
| 4151 | S | 74.175 | 72.875 | 1.3 |
| 4153 | S | 73.88 | 72.61 | 1.27 |
| 4154 | S | 74.66 | 73.35 | 1.31 |
| 4952 | S | 72.68 | 71.33 | 1.35 |
| 5050 | S | - | - | - |
| 5151 | S | 74.983 | 73.452 | 1.531 |
| 6051 | S | 72.33 | 70.42 | 1.91 |
| 6052 | S | 72.83 | 70.54 | 2.29 |
| 6053 | S | 75.335 | 73.662 | 1.673 |
| 6152 | S | 74.49 | 72.575 | 1.915 |
| 6153 | S | 74.88 | 72.325 | 2.555 |
| 6154 | S | 75.33 | 73.95 | 1.38 |
| 6155 | S | 75.028 | 72.006 | 3.022 |
| 6156 | S | 74.35 | 71.86 | 2.49 |
| 6157 | S | 74.36 | 72.57 | 1.79 |
| 6952 | S | 72.05 | 70 | 2.05 |
| 7052 | S | 72.39 | 69.72 | 2.67 |
| 7053 | S | 72.83 | 70.84 | 1.99 |
| 7058 | S | 74.76 | 73.34 | 1.42 |
| 7152 | S | 73.085 | 71.445 | 1.64 |
| 7153 | S | 73.24 | 71.79 | 1.45 |
| 7154 | S | 73.52 | 71.67 | 1.85 |
| 7155 | S | 74 | 71.77 | 2.23 |
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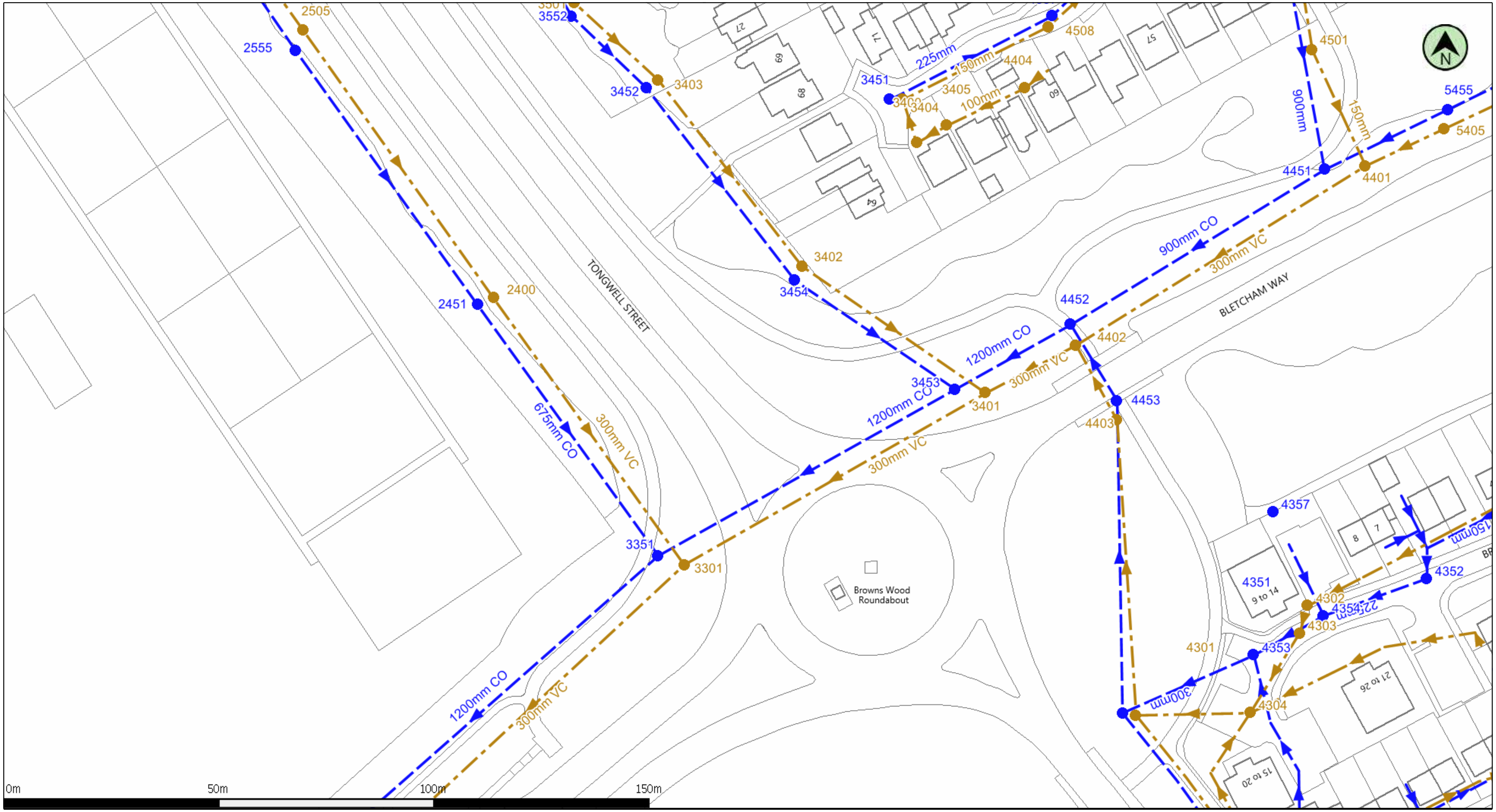


| (c) Crown copyright and database rights 2021 Ordnance Survey 100022432 | Date: 13/08/21 | Scale: 1:1250 | Map Centre: 490340,236423 | Data updated: 31/07/21 | Our Ref: 622387 - 3 | Wastewater Plan A4 |
|---|---|---|---|---|---|---|

This plan is provided by Anglian Water pursuant its obligations under the Water Industry Act 1991 sections 198 or 199. It must be used in conjunction with any search results attached. The information on this plan is based on data currently recorded but position must be regarded as approximate. Service pipes, private sewers and drains are generally not shown. Users of this map are strongly advised to commission their own survey of the area shown on the plan before carrying out any works. The actual position of all apparatus MUST be established by trial holes. No liability whatsoever, including liability for negligence, is accepted by Anglian Water for any error or inaccuracy or omission, including the failure to accurately record, or record at all, the location of any water main, discharge pipe, sewer or disposal main or any item of apparatus. This information is valid for the date printed. This plan is produced by Anglian Water Services Limited (c) Crown copyright and database rights 2021 Ordnance Survey 100022432.This map is to be used for the purposes of viewing the location of Anglian Water plant only. Any other uses of the map data or further copies is not permitted. This notice is not intended to exclude or restrict liability for death or personal injury resulting from negligence.

Foul Sewer
Surface Sewer
Combined Sewer
Final Effluent
Rising Main*
Private Sewer*
Decommissioned Sewer*

Outfall*
Inlet*
Manhole*

Sewage Treatment Works
Public Pumping Station
Decomissioned Pumping Station

*(Colour denotes effluent type)

zoe.mccubbreyedwards@aecom.com

MKC Tongwell St

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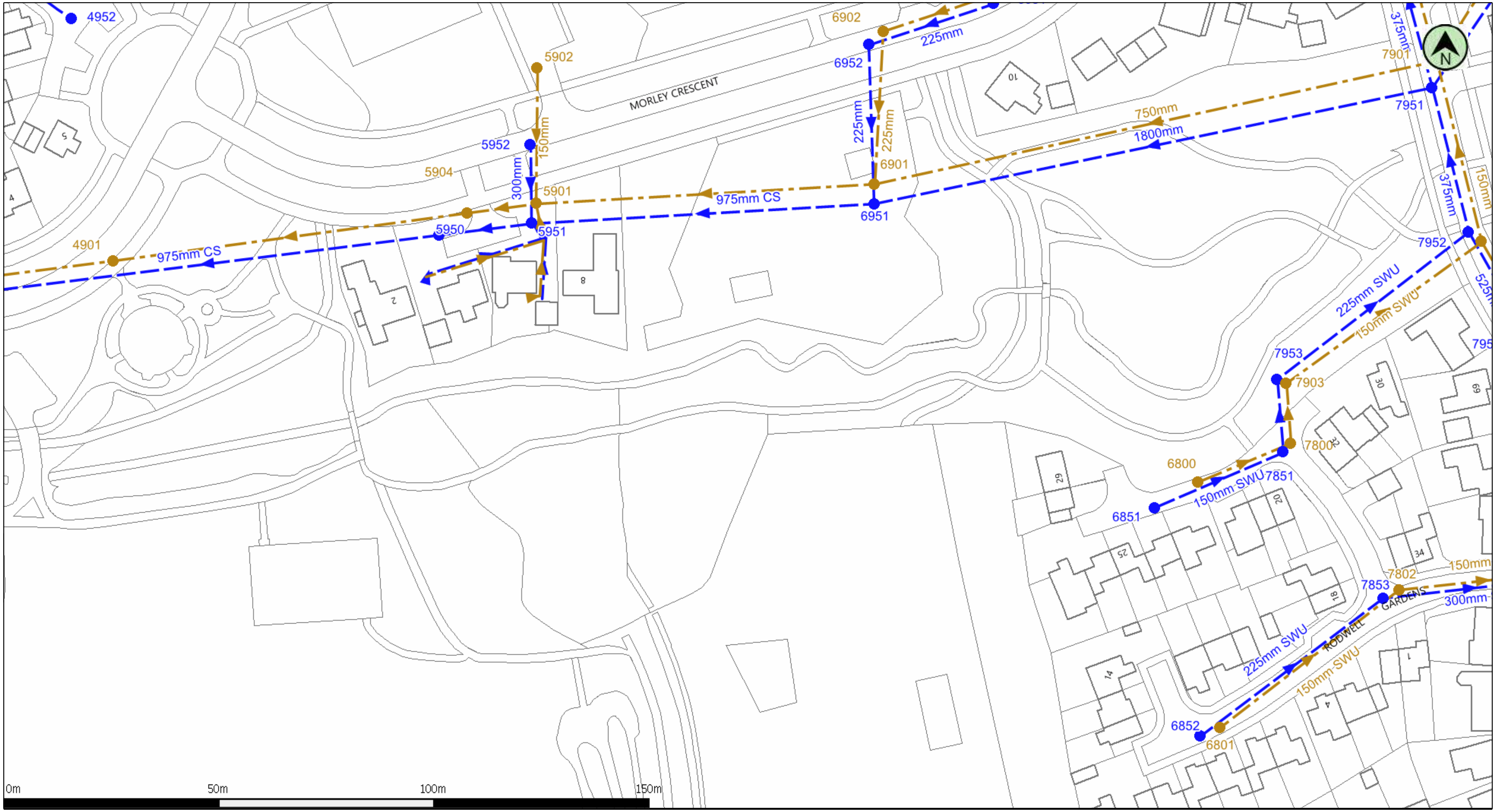
| Manhole Reference | Liquid Type | Cover Level | Invert Level | Depth to Invert |
|---|---|---|---|---|
| 2400 | F | 73.2 | 68.79 | 4.41 |
| 2505 | F | 73.4 | 70.28 | 3.12 |
| 3301 | F | 71.6 | 67.2 | 4.4 |
| 3400 | F | 74.197 | 72.447 | 1.75 |
| 3401 | F | - | - | - |
| 3402 | F | - | 72.525 | - |
| 3403 | F | - | 72.525 | - |
| 3404 | F | - | - | - |
| 3405 | F | - | - | - |
| 3501 | F | 74.6 | 72.525 | 2.075 |
| 4301 | F | 72.2 | 69.4 | 2.8 |
| 4302 | F | - | - | - |
| 4303 | F | - | - | - |
| 4304 | F | - | - | - |
| 4401 | F | 74 | 69.41 | 4.59 |
| 4402 | F | 73 | 68.25 | 4.75 |
| 4403 | F | - | - | - |
| 4404 | F | - | - | - |
| 4501 | F | 74.312 | 71.142 | 3.17 |
| 4508 | F | 74.542 | 72.167 | 2.375 |
| 5405 | F | 75.7 | 70.4 | 5.3 |
| 2451 | S | 73.2 | 69.54 | 3.66 |
| 2555 | S | 73.25 | 71.04 | 2.21 |
| 3351 | S | 71.6 | 68.6 | 3 |
| 3451 | S | 74.272 | 72.737 | 1.535 |
| 3452 | S | 76.5 | 73.8 | 2.7 |
| 3453 | S | - | - | - |
| 3454 | S | - | - | - |
| 3552 | S | 74.6 | 72.9 | 1.7 |
| 4351 | S | 72.2 | 70.2 | 2 |
| 4352 | S | - | - | - |
| 4353 | S | - | - | - |

| Manhole Reference | Liquid Type | Cover Level | Invert Level | Depth to Invert |
|---|---|---|---|---|
| 4354 | S | - | - | - |
| 4357 | S | - | - | - |
| 4451 | S | 74.5 | 70.41 | 4.09 |
| 4452 | S | 73.2 | 69.31 | 3.89 |
| 4453 | S | - | 70.2 | - |
| 4557 | S | 74.612 | 72.512 | 2.1 |
| 5455 | S | 75.9 | 71.26 | 4.64 |






Date: 13/08/21 Scale: 1:1250 Map Centre: 490588,235908 Data updated: 31/07/21 Our Ref: 622387 - 4 Wastewater Plan A4



Foul Sewer
Surface Sewer
Combined Sewer
Final Effluent
Rising Main*
Private Sewer*
Decommissioned Sewer*

Outfall*
Inlet*
Manhole*

Sewage Treatment Works
Public Pumping Station
Decomissioned Pumping Station

*(Colour denotes effluent type)

zoe.mccubbreyedwards@aecom.com

MKC Tongwell St

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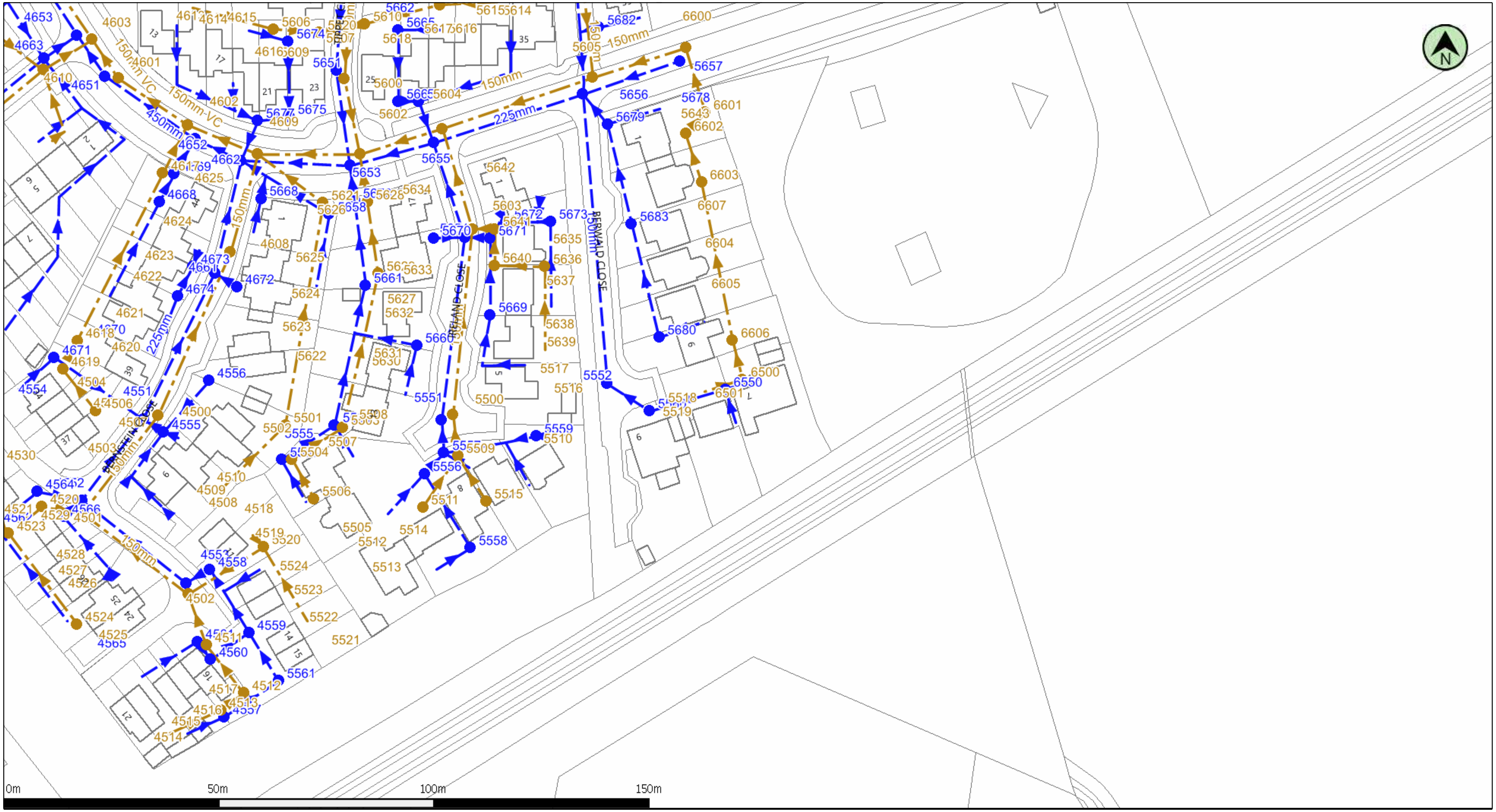
anglianwater

| Manhole Reference | Liquid Type | Cover Level | Invert Level | Depth to Invert |
|---|---|---|---|---|
| 4901 | F | - | - | - |
| 5901 | F | - | - | - |
| 5902 | F | 71.455 | 68.735 | 2.72 |
| 5904 | F | - | - | - |
| 6800 | F | 72.43 | 70.06 | 2.37 |
| 6801 | F | 73.025 | 70.945 | 2.08 |
| 6901 | F | - | - | - |
| 6902 | F | 72.025 | 69.345 | 2.68 |
| 7800 | F | 72.61 | 69.43 | 3.18 |
| 7802 | F | 73.06 | 70.42 | 2.64 |
| 7901 | F | - | - | - |
| 7902 | F | 72.93 | 68.68 | 4.25 |
| 7903 | F | 72.725 | 69.295 | 3.43 |
| 4952 | S | 72.68 | 71.33 | 1.35 |
| 5950 | S | - | - | - |
| 5951 | S | 71.26 | 66.98 | 4.28 |
| 5952 | S | 71.097 | 68.917 | 2.18 |
| 6051 | S | 72.33 | 70.42 | 1.91 |
| 6851 | S | 72.315 | 70.745 | 1.57 |
| 6852 | S | 73.085 | 71.235 | 1.85 |
| 6951 | S | 71.645 | 67.265 | 4.38 |
| 6952 | S | 72.05 | 70 | 2.05 |
| 7851 | S | 72.59 | 70.24 | 2.35 |
| 7853 | S | 73.025 | 70.915 | 2.11 |
| 7951 | S | - | - | - |
| 7952 | S | 73.025 | 69.655 | 3.37 |
| 7953 | S | 72.705 | 70.035 | 2.67 |

| Manhole Reference | Liquid Type | Cover Level | Invert Level | Depth to Invert |
|---|---|---|---|---|



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This plan is provided by Anglian Water pursuant its obligations under the Water Industry Act 1991 sections 198 or 199. It must be used in conjunction with any search results attached. The information on this plan is based on data currently recorded but position must be regarded as approximate. Service pipes, private sewers and drains are generally not shown. Users of this map are strongly advised to commission their own survey of the area shown on the plan before carrying out any works. The actual position of all apparatus MUST be established by trial holes. No liability whatsoever, including liability for negligence, is accepted by Anglian Water for any error or inaccuracy or omission, including the failure to accurately record, or record at all, the location of any water main, discharge pipe, sewer or disposal main or any item of apparatus. This information is valid for the date printed. This plan is produced by Anglian Water Services Limited (c) Crown copyright and database rights 2021 Ordnance Survey 100022432.This map is to be used for the purposes of viewing the location of Anglian Water plant only. Any other uses of the map data or further copies is not permitted. This notice is not intended to exclude or restrict liability for death or personal injury resulting from negligence.

Foul Sewer
Surface Sewer
Combined Sewer
Final Effluent
Rising Main*
Private Sewer*
Decommissioned Sewer*
Outfall*
Inlet*
Manhole*
Sewage Treatment Works
Public Pumping Station
Decomissioned Pumping Station
*(Colour denotes effluent type)

zoe.mccubbreyedwards@aecom.com

MKC Tongwell St

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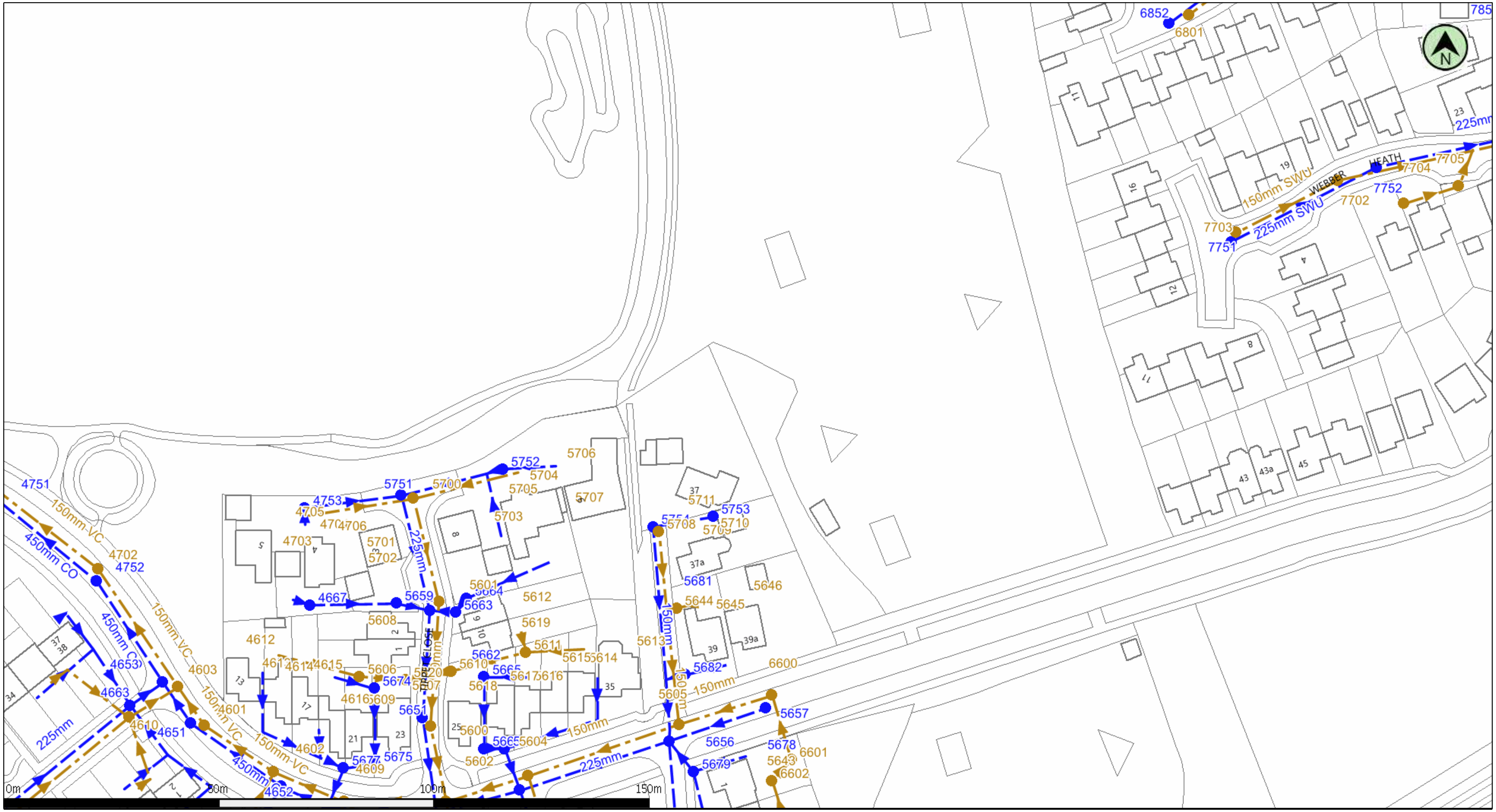
| Manhole Reference | Liquid Type | Cover Level | Invert Level | Depth to Invert |
|---|---|---|---|---|
| 4500 | F | - | - | - |
| 4501 | F | - | - | - |
| 4502 | F | - | - | - |
| 4506 | F | - | - | - |
| 4511 | F | - | - | - |
| 4512 | F | - | - | - |
| 4513 | F | - | - | - |
| 4520 | F | - | - | - |
| 4523 | F | - | - | - |
| 4524 | F | - | - | - |
| 4601 | F | 73.88 | 69.535 | 4.345 |
| 4602 | F | - | - | - |
| 4603 | F | 73.615 | 69.353 | 4.262 |
| 4608 | F | - | - | - |
| 4609 | F | - | - | - |
| 4610 | F | - | - | - |
| 4617 | F | - | - | - |
| 4618 | F | - | - | - |
| 4619 | F | - | - | - |
| 5500 | F | - | - | - |
| 5501 | F | - | - | - |
| 5503 | F | - | - | - |
| 5504 | F | - | - | - |
| 5506 | F | - | - | - |
| 5509 | F | - | - | - |
| 5511 | F | - | - | - |
| 5515 | F | - | - | - |
| 5520 | F | - | - | - |
| 5600 | F | - | - | - |
| 5602 | F | - | - | - |
| 5603 | F | - | - | - |
| 5604 | F | - | - | - |

| Manhole Reference | Liquid Type | Cover Level | Invert Level | Depth to Invert |
|---|---|---|---|---|
| 5605 | F | - | - | - |
| 5606 | F | - | - | - |
| 5610 | F | - | - | - |
| 5611 | F | - | - | - |
| 5620 | F | - | - | - |
| 5621 | F | - | - | - |
| 5628 | F | - | - | - |
| 5629 | F | - | - | - |
| 5636 | F | - | - | - |
| 5640 | F | - | - | - |
| 5641 | F | - | - | - |
| 6500 | F | - | - | - |
| 6600 | F | - | - | - |
| 6601 | F | - | - | - |
| 6602 | F | - | - | - |
| 6603 | F | - | - | - |
| 6606 | F | - | - | - |
| 4551 | S | - | - | - |
| 4552 | S | - | - | - |
| 4553 | S | - | - | - |
| 4555 | S | - | - | - |
| 4556 | S | - | - | - |
| 4557 | S | - | - | - |
| 4558 | S | - | - | - |
| 4559 | S | - | - | - |
| 4560 | S | - | - | - |
| 4561 | S | - | - | - |
| 4564 | S | - | - | - |
| 4566 | S | - | - | - |
| 4651 | S | 73.93 | 70.196 | 3.734 |
| 4652 | S | 73.926 | - | - |
| 4653 | S | 73.37 | 70.067 | 3.303 |

| Manhole Reference | Liquid Type | Cover Level | Invert Level | Depth to Invert |
|---|---|---|---|---|
| 4661 | S | - | - | - |
| 4662 | S | - | - | - |
| 4663 | S | 73.43 | 71.564 | 1.866 |
| 4668 | S | - | - | - |
| 4669 | S | - | - | - |
| 4671 | S | - | - | - |
| 4672 | S | - | - | - |
| 4673 | S | - | - | - |
| 4674 | S | - | - | - |
| 5551 | S | - | - | - |
| 5552 | S | - | - | - |
| 5553 | S | - | - | - |
| 5554 | S | - | - | - |
| 5556 | S | - | - | - |
| 5557 | S | - | - | - |
| 5558 | S | - | - | - |
| 5559 | S | - | - | - |
| 5560 | S | - | - | - |
| 5561 | S | - | - | - |
| 5651 | S | - | - | - |
| 5653 | S | - | - | - |
| 5654 | S | - | - | - |
| 5655 | S | - | - | - |
| 5656 | S | - | - | - |
| 5657 | S | - | - | - |
| 5658 | S | - | - | - |
| 5660 | S | - | - | - |
| 5661 | S | - | - | - |
| 5665 | S | - | - | - |
| 5666 | S | - | - | - |
| 5667 | S | - | - | - |
| 5668 | S | - | - | - |

| Manhole Reference | Liquid Type | Cover Level | Invert Level | Depth to Invert |
|---|---|---|---|---|
| 5669 | S | - | - | - |
| 5670 | S | - | - | - |
| 5671 | S | - | - | - |
| 5672 | S | - | - | - |
| 5673 | S | - | - | - |
| 5674 | S | - | - | - |
| 5675 | S | - | - | - |
| 5676 | S | - | - | - |
| 5677 | S | - | - | - |
| 5679 | S | - | - | - |
| 5680 | S | - | - | - |
| 5682 | S | - | - | - |
| 5683 | S | - | - | - |
| 6550 | S | - | - | - |






Date: 13/08/21 | Scale: 1:1250 | Map Centre: 490595,235742 | Data updated: 31/07/21 | Our Ref: 622387 - 6 | Wastewater Plan A4



Foul Sewer
Surface Sewer
Combined Sewer
Final Effluent
Rising Main*
Private Sewer*
Decommissioned Sewer*

Outfall*
Inlet*
Manhole*

Sewage Treatment Works
Public Pumping Station
Decomissioned Pumping Station

*(Colour denotes effluent type)

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MKC Tongwell St

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| Manhole Reference | Liquid Type | Cover Level | Invert Level | Depth to Invert |
|---|---|---|---|---|
| 4601 | F | 73.88 | 69.535 | 4.345 |
| 4602 | F | - | - | - |
| 4603 | F | 73.615 | 69.353 | 4.262 |
| 4609 | F | - | - | - |
| 4610 | F | - | - | - |
| 4702 | F | 72.77 | 68.84 | 3.93 |
| 5600 | F | - | - | - |
| 5601 | F | - | - | - |
| 5602 | F | - | - | - |
| 5604 | F | - | - | - |
| 5605 | F | - | - | - |
| 5606 | F | - | - | - |
| 5610 | F | - | - | - |
| 5611 | F | - | - | - |
| 5620 | F | - | - | - |
| 5644 | F | - | - | - |
| 5700 | F | - | - | - |
| 5708 | F | - | - | - |
| 6600 | F | - | - | - |
| 6601 | F | - | - | - |
| 6602 | F | - | - | - |
| 6801 | F | 73.025 | 70.945 | 2.08 |
| 7702 | F | 74.75 | 71.86 | 2.89 |
| 7703 | F | 74.44 | 72.29 | 2.15 |
| 7704 | F | - | - | - |
| 7705 | F | - | - | - |
| 4651 | S | 73.93 | 70.196 | 3.734 |
| 4652 | S | 73.926 | - | - |
| 4653 | S | 73.37 | 70.067 | 3.303 |
| 4662 | S | - | - | - |
| 4663 | S | 73.43 | 71.564 | 1.866 |
| 4667 | S | - | - | - |

| Manhole Reference | Liquid Type | Cover Level | Invert Level | Depth to Invert |
|---|---|---|---|---|
| 4752 | S | 72.84 | 69.527 | 3.313 |
| 4753 | S | - | - | - |
| 5651 | S | - | - | - |
| 5652 | S | - | - | - |
| 5655 | S | - | - | - |
| 5656 | S | - | - | - |
| 5657 | S | - | - | - |
| 5659 | S | - | - | - |
| 5663 | S | - | - | - |
| 5664 | S | - | - | - |
| 5665 | S | - | - | - |
| 5666 | S | - | - | - |
| 5667 | S | - | - | - |
| 5674 | S | - | - | - |
| 5675 | S | - | - | - |
| 5677 | S | - | - | - |
| 5679 | S | - | - | - |
| 5682 | S | - | - | - |
| 5751 | S | - | - | - |
| 5752 | S | - | - | - |
| 5753 | S | - | - | - |
| 5754 | S | - | - | - |
| 6852 | S | 73.085 | 71.235 | 1.85 |
| 7751 | S | 74.43 | 72.66 | 1.77 |
| 7752 | S | 74.83 | 72.21 | 2.62 |
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## Legend

- Access Chamber.Location Active Footway Chamber
- Underground Route.Route Act. - Owned
- Underground Route.Route Act. - Leased

vodafone

Vodafone Limited (No01471587) registered office is at Vodafone House, The Connection, Newbury, Berkshire, RG142FN

| | |
|---|---|
| Plot Date : 24/08/2021 | Scale : 1:1250 |

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Information with regard to such apparatus should always be obtained from Vodafone or its appointed agents.

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