Cabinet
Background Papers

Date: **Thursday 27 May 2021**

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Briefing Note – Wealdstone Selective Licensing Renewal

Part 3 of the Housing Act 2004 allows Local Authorities to introduce a Selective Licensing Scheme if certain conditions are met for the area. The Department for Communities and Local Government "Selective Licensing in the Private Rented Sector" Guide for Local Authorities states that the area must have one or more of the following conditions being experienced in order for a selective licensing designation to be made:

i. low housing demand (not applicable in Wealdstone),
ii. significant and persistent problem caused by anti-social behaviour (ASB),
iii. poor property conditions,
iv. high levels of migration,
v. high level of deprivation
vi. high levels of crime

Since June 2016, the Council has sought to licence all rented accommodation in the designated area to ensure they are all subject to conditions specific to ensuring safety, addressing the issues found in the area (e.g. waste disposal condition aimed at reducing fly tipping) and carrying out inspections to ensure the premises are fit for habitation and safe.

To give a context as to the number of properties licensed in this period, the 2013 census of Wealdstone showed there were 1045 rented premises in the ward. Since 2016, 774 (74%) rented premises have been licensed under the Selective Licensing Scheme, and 331 (31%) Houses in Multiple Occupation (HMO) under appropriate scheme for those premises. In total 1105 premises have been licensed. This is 60 (5%) more premises than were captured in the original census, and is a result of premises changing use as well as some premises moving from a selective licence requirement (e.g. a single family rented property) to a HMO requirement (e.g. multiple households moving in).

The 2019 vitality profile[1] does shows a clear reduction of these areas with fly tipping clearly reduced in Edgware (Selective Licensing introduced in 2015) and Wealdstone (2016) and it is in this area in particular that further attention will be given.

The evidence does show that Wealdstone is getting better in the areas that Selective Licensing directly impacts. But it also shows that, combined with the deprivation and ASB aspects, there is still more work to be done. And it is likely that this is more around those premises that have remained under the radar and now need to be tackled directly. Over the last 5 years, there have been 126 reports of premises that should be subject to selective licensing in Wealdstone, with 101 of these in the last 2 years as awareness increases including the register of licensed premises on the Council's website.

It should also be noted that fly tipping has reduced on council (public) land but does not take into account the issues still faced on private or orphaned land. An example is the service road stretching behind Costa Coffee to Mir Supermarket, which continues to be plagued by waste from both the rented flats above the premises and others but unfortunately the land is orphaned (no owner). It is these areas that Selective must do more now to address.

Assessing the consultation comments, the main criticism from landlords in particular is the view that such a scheme is put in place as a money making process. It is understood though how, particularly for landlords, another fee is see as a burden though its impact is limited (£550 per 5 years in the main, £110 per year, less than £10 per month).

[1] environment (harrow.gov.uk)

Additionally, comments centred on more to be done with tenants, who are perceived as the "culprits" of a lot of issues. But by working with landlords, a lot of this can be addressed through clear ASB action plans and tenancy agreements.

In an ideal world licensing of this nature would not be needed, but as can be seen it has led to improvements and consistency of approach that the next 5 years will build upon. While the Council understands the burdens landlords are faced with, such a scheme has led to improvements and a standardised playing field for all. By targeting those that have gone under the radar previously, through use of intelligence and complaints, further improvements will be seen

Briefing Note – Town Centre PSPO Cabinet Report

Harrow Council is committed to improving the environment, maintaining low crime and improving community safety. Directly relating to this commitment is the Councils action to address anti-social behaviour and related complaints in its main urban centre.

On 1st February 2021, the Borough Wide Public Spaces Protection Order was renewed which included controls around alcohol consumption in public places as well as urinating, defecating and spitting. But the town centre faces specific issues that were addressed through consultation and included

- Amplification of music and voice
- Financial Agreements (people trying to get visitors to sign up to them)
- Placing of tables, chairs, stands and other fixings / furniture on the street (not associated with a business, which is covered under other licensing)
- Feeding of birds and vermin
- Distribution of leaflets
- Illegal street trading (not associated with a business which is covered under other licensing)
- Begging
- Wheeled vehicles

Consultation was not a tick box exercise, and taking into account concerns of negative impact on the homeless if begging was targeted, as well as concerns over the use of scooters and bikes amongst the young, the aspect of begging and wheeled vehicles was removed from the final PSPO proposed.

The main issues raised with amplification was concern that this would stop good busking taking place in the town centre. This is addressed by the fact a busking pilot is in place for this area to ensure busking continues, with permitted amplification, but in a controlled way. The proposed PSPO does not seek to stop busking or free speech but stop the war of sound from various parties using amplification to preach, play music or to carry out other activities.

As with any enforcement discretion is key, and will be enforced sensibly. Failure to comply with a PSPO is an offence and can lead to a summary conviction and fine not exceeding level 3 on the standard scale. All enforcement officers as well as Police are authorised to take action under it.

The PSPO will be in place for a maximum 3 years as per the law, but will be reviewed to ensure it is effective in its approach in tackling issues that affect businesses and the public,

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Wealdstone Footbridge and Cycleway

Feasibility Technical Note

Harrow Council

Document Reference: WEALDSTONE FOOTBRIDGE AND CYCLEWAY

Revision: PO3

18 May 2020

Notice

This document and its contents have been prepared and are intended solely as information for Harrow Council and use in relation to basis of design.

This document has 43 pages including the cover.

Document history

Revision	Purpose description	Originated	Checked	Reviewed	Authorised	Date
P03	For Review	PCF	CB	CB	CC	18/05/20
P02	For Review	PCF	CB	CB	CC	15/04/20
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Client signoff

Client	Harrow Council
Project	Wealdstone Footbridge and Cycleway
Job number	5140544
Doc number	Wealdstone Footbridge and Cycleway Report
Client signature Date	

Contents

1. Introduction

This technical note presents the methodology to determine the bridge location, type, layout and width of the Wealdstone Footbridge and Cycleway Bridge crossing, including both footpaths and cycleways. This note also includes information on recommended gradients for the access ramps and deck.

This proposal is for a bridge that will connect public highway roads on either side of the railway (Tudor Road with Hailsham Drive). Two different bridge alignment options that have potential to be located in this area are as shown on Section 1.1 below.

The proposed development in the Kodak site (on the south-western side of the railway lines) is overlaid to show potential conflict with proposed construction works.

1.1. Proposed Structure Plans

Two proposed structure Plans have been developed. The first, Plan A, includes ramps for cyclists and pedestrians. The second, Plan B, presents only stairs for pedestrians reducing construction impact on either side of the bridge (with options showing lifts with some sized to allow pushed cycles).

The Plan A layout shows two bridge spans of approximately 40m each on three supports that will go over Tudor Road, the Barratt Way industrial site access road and the railway. Ramps and stairs will need to be located at the northern end in the Whitefriars school playing fields and in the development site at the southern end. The proposed "figure of 8" shape of the southern ramp is indicative and allows the developer to maintain to the extent possible the original plan arrangement for the building layout, reducing the impact with the proposed Kodak development plan. Figure 1-1.1 shows the proposed structural Plan A for which there are three options of width, Options 1, 2 and 3.

The Plan B layout of footbridge span(s) and approaches covers Options 4 to 10 inclusive in this report.

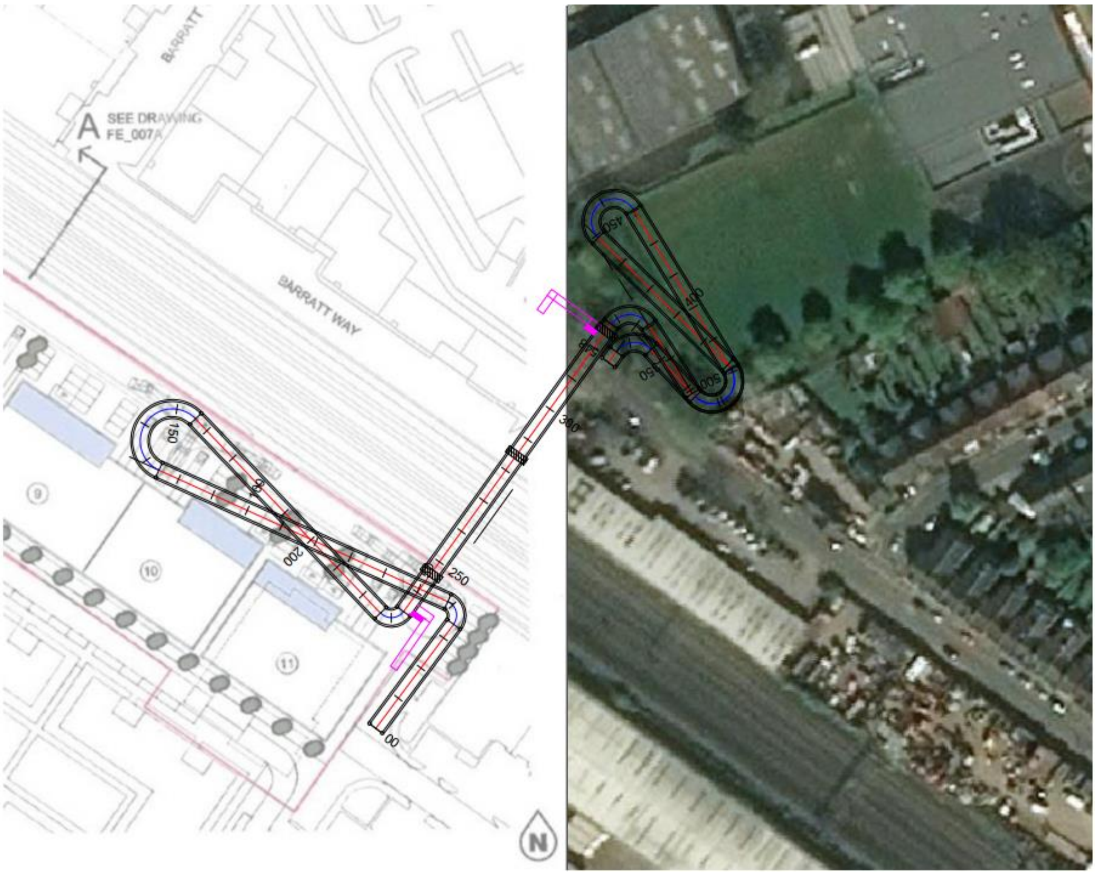

Figure 1-1.1 – Proposed Structural Plan A – Walkway/Cycleway

The access to the southern ramp of the bridge will be from Hailsham Drive, while the access to the northern side will be from Tudor Road. For the Plan A alignment three walkway arrangements have been considered with different deck width:

- Option 1 Shared-Use Walkway/Cycleway– 4m internal width (5m width overall) crossing;
- Option 2 Kerb-Separated Walkway/Cycleway– 5.7m internal width (6.7m width overall) crossing;
- Option 3 Kerb-Separated Walkway/Cycleway – 5m internal width (6.0m wide overall) crossing.

Structure Plan B alignment shows a pedestrian bridge crossing the railway only. The bridge span is approximately 40m supported on each end on abutments. Stairs will be located on the Barratt Way industrial site at the northern and on the Kodak development site at the southern. Figure 1-1.2 shows the proposed structure Plan B.

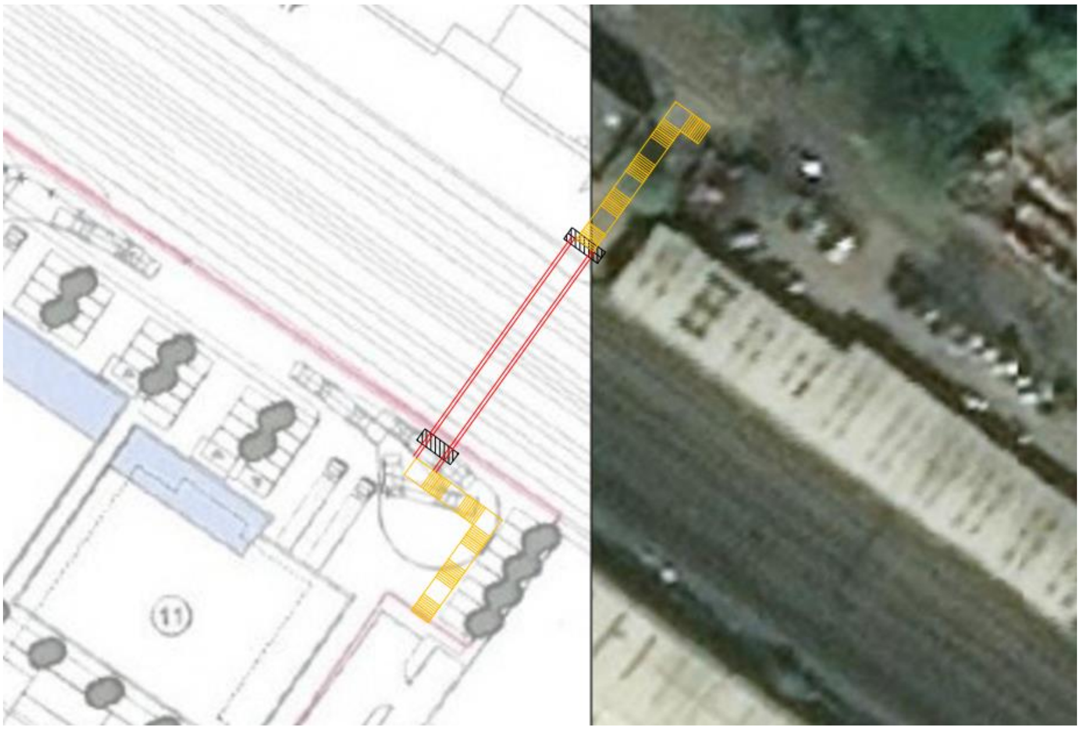

Figure 1-1.2 – Proposed Structural Plan B – Walkway Only

For Structure Plan B alignment shown above in Figure 1-1.2, five walkway only arrangements (ie no combined cycleway) all with a 3m internal width footbridge structure (4m width overall) with stairs but no ramps, have been considered. Options 5 and 7 (with lifts) will permit use by cyclists but only when the cycles are pushed across the footbridge:

- Option 4 – 1-span footbridge with lifts (latter to accommodate pedestrians only).

Following consideration by LB Harrow the initial outline Option 4 (Fig 1-1.2) was enhanced to give more detailed consideration based on a series of further options as listed below:

- Option 5 – 1-span footbridge with lifts (latter to accommodate ped's and cycles)
- Option 6 – 1-span footbridge without lifts
- Option 7 – 2-span footbridge with lifts (latter to accommodate ped's and cycles)
- Option 8 – 2-span footbridge without lifts
- Option 9 – 2-span footbridge with lifts (latter to accommodate ped's and cycles)
- Option 10 – 1-span footbridge without lifts

Paired Options 5 and 6 both have the same location/arrangement of staircases in plan.

Similarly, paired Options 7 and 8 both have the same locations/arrangements of staircases in plan; see drawings in Appendix B for details.

Each of the above four options will need to consider the swept path for longer articulated vehicles, below the north end of the footbridge, travelling from Barrett Way into Tudor Road; see insets on Drg's for Options 7 and 8 in Appendix B.

Options 9 and 10 have been added in response to a recent meeting between LB Harrow and the developer to minimise any effects on the Kodak development site; these also consider the swept path for various vehicles below the north and south ends of the footbridge and give consideration to the retaining structure within the Kodak development; see insets on Drg's for Options 9 and 10 added in Appendix B.

1.2. Proposed Vertical Profile

The proposed vertical alignment for the initial ramped Options 1-3 is shown in the Figure 1-2.1 and the for the Stepped Option 4 in Figure 1-2.2 respectively for Structure Plan A and Structure Plan B layout.

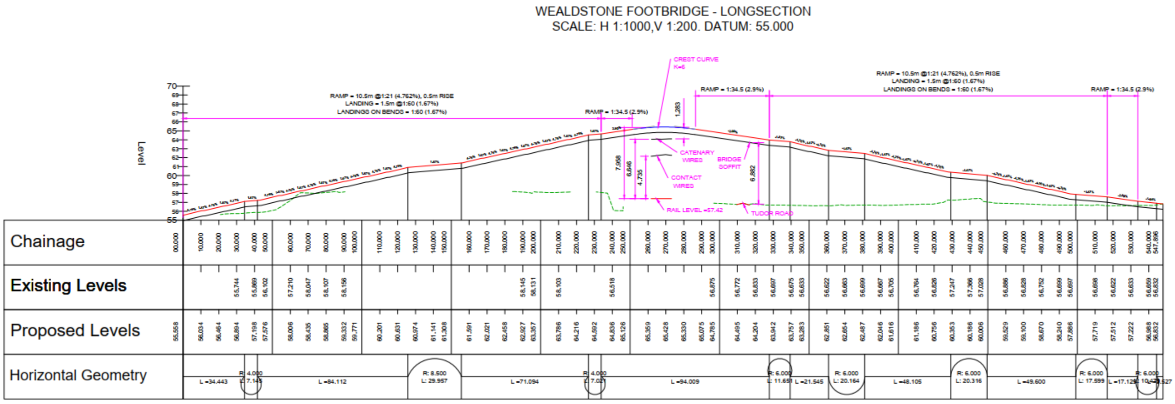

Figure 1-1.1 – Proposed Structure Plan A Vertical Profile - Walkway/Cycleway

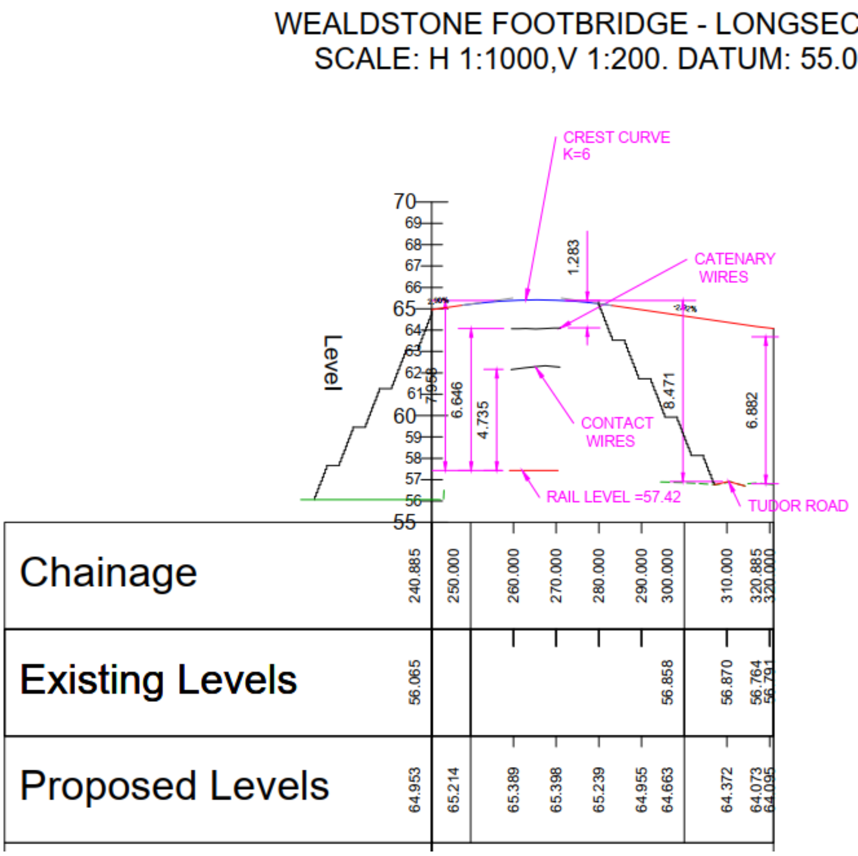

Figure 1-2.2 – Proposed Structure Plan B Vertical Profile - Walkway

Both profiles show that the required clearances have been respected.

The geometrical parameters assumed to obtain the vertical profile have been discussed in detail in the Section 3.

2. Bridge Form

Several types of structures have been considered (i) Steel Truss (ii) Others discussed in section 2.5.

The pedestrian and cycle bridge has been proposed to cross the West Coast main line railway, London Overground lines and the Barratt Way industrial site connecting Hailsham Drive Road on the south side and Tudor Road on the north side.

Options 1, 2 and 3 make provision for combined use by pedestrians and cyclists over whole structure.

Options 1, 2, 3 and 4 have sub-options with and without lifts which are intended for pedestrian use only.

In Options 4, 5 and 6 the pedestrian footbridge will be crossing only the West Coast main line and London Overground railway lines.

In Options 7 and 8 a second span will be provided at the south end to cross over an access track (which will serve a proposed building) from one end of Hailsham Drive.

Options 5, 7 and 9 make provision for bigger lifts which can accommodate cycles, which would then have to be pushed across the footbridge.

In addition, Options 9 and 10 also acknowledge the need to re-align the existing access track at the south end (which will serve a proposed building) from Hailsham Drive and the requirement to extend an existing retaining wall.

2.1. Land

The bridge will be connecting two public highways and passing over land in private ownership.

For Plan A Options 1, 2 and 3 with 2 x 40m long main spans, the north bridge support, the stairs, ramp and lift will be constructed on the Whitefriars school land owned by Harrow Council. The Council's planning department will need to be engaged to agree on the land needed to construct the bridge access facilities.

The access to the north side of the bridge will be directly from Tudor Road.

For Plan B, the 40m long Option 4 pedestrian bridge, the 35m long single span Options 5 and 6, the 57m long two span Options 7 and 8, the 35m long single span over the railway (with an associated 22m long span parallel to the railway on the south side) for Option 9 and a 35m long single span for Option 10 each have only stairs (with or without a lift at each end) minimising the impact on the Kodak development and eliminating the impact with Whitefriars school land. There will be more land to be acquired on the Barratt Way industrial site to locate the stairs.

The 80m overall length Plan A cyclist/pedestrian bridge Options 1, 2 and 3 will require a central support on Barratt Way Industrial site. This site is in private ownership and negotiation will be required to acquire the land to construct the central pier and to maintain the new structures. The central bridge support will be located to have minimal impact on the functionality of the site.

The Council intention would be to purchase the land but allow the industrial site continued access and parking rights over the land in perpetuity so that there is no impact on their current operational arrangements. The south bridge support and access facilities will be constructed in the Kodak development site

The Kodak development site has planning approval for residential and commercial units. The site is being developed as individual areas. Area D3, shown in the below Figure 2-1.1, bounds the railway line in the location of the proposed bridge and will be for industrial units.

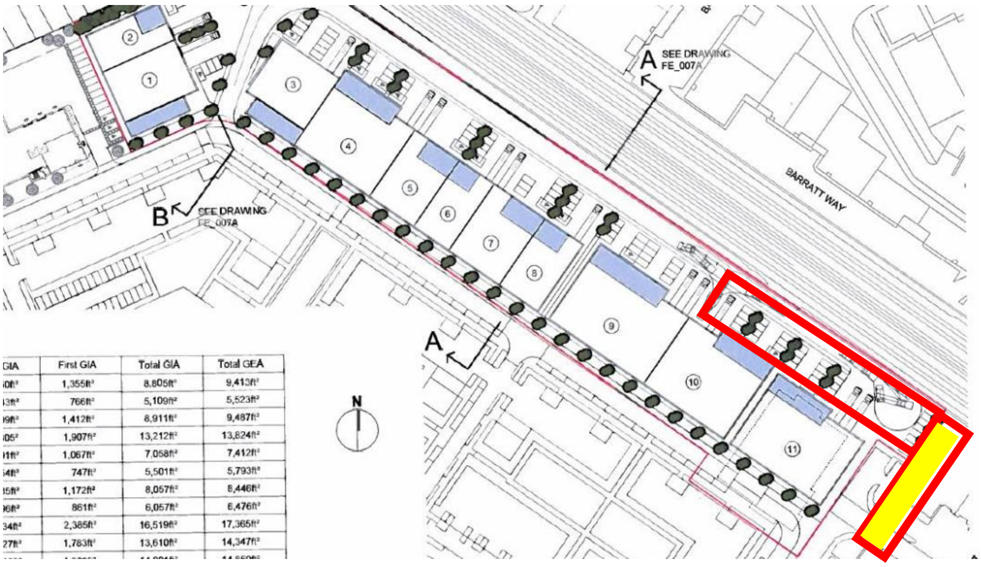

Figure 2-1.1 – Layout for site D3 development plan

The rectangular areas outlined in red in the Figure 2-1.1 show the proposed location for the Plan A ramps (Options 1-3), while the yellow area shows the approximate location of stairs proposed for Plan B (Option 4).

Enhancement of stairs Option 4

Following initial consideration by LB Harrow followed by LB Harrow's discussions with the Kodak developer the initial outline Option 4 (Fig 1-1.2) has been developed into a series of enhanced stair options, Options 5-10, included in Appendix B, to determine a configuration of the stairs access that can best accommodate the footbridge in the Kodak development plan.

The pedestrian and cycle access to the bridge will be from Hailsham Drive for each of the options.

2.2. Survey Information

A preliminary survey has been carried out providing all the required levels and information to locate the ramps and the bridge respecting the road/rail clearances.

The survey has confirmed that the railway sits on an embankment and the rail levels are approximately 2m above the existing ground level on the south side (Kodak development side) and 1m above the road level on the north side (Tudor Road) leading to longer ramps and stairs to accommodate this difference in levels.

The main levels obtained from the survey are listed below:

- Existing ground levels at the north side of the crossing (Kodak Development) – vary from **55.5m to 58.3m**
- Hailsham Drive level – **55.60** m.
- Existing rail levels vary from **57.42m to 57.34m**
- Highest level of the OLE (Overhead line equipment) at the bridge location **64.3m**
- Barratt Way road level – **57.0m**
- Barratt Way Industrial Estate top of roof **64.9m**
- Existing ground level at the south side of the crossing (Whitefriars school) **56.6m**
- Distance between Barratt Way Industrial Estate and Afford Motors – **10.7m**

2.3. Clearances and Headroom

The height clearance over Tudor Road will be 5.8m in accordance with DMRB TD27/05 recommendations. See Section 4 for further details. The minimum 5.8m clearance is retained over the Barratt Way industrial site.

Clearance from overhead electrification lines above the railway will be as specified by Network Rail. For this feasibility study the following clearance recommendations have been respected:

1. A minimum 600mm vertical clearance has been provided to any part of the OLE for the new bridge soffit level. See Section 5 for further details.
2. A minimum 2000mm horizontal clearance has been provided to any part of the gantry (including to OHLE apparatus) to allow a safe construction and maintenance of both bridge and gantry. See Section 5 for further details.
3. A 4.5m lateral clearance from existing near running rail edge to the north and south supports (bridge abutments) has been maintained.

The minimum headroom for cyclists and pedestrians over the ramps and inside the enclosure of the bridge will be 2400mm in accordance with DMRB standards.

Further information on the site clearances are provided in the Section 4.

2.4. Steel Truss Option

This option consists of a Warren truss bridge that can be used for both pedestrian and cyclist/pedestrian alignments.

The Plan A alignment (Options 1-3) will be spanning 80m over the railway and Tudor Road. The bridge will have two spans of 40m each, simply-supported to facilitate the construction over the railway.

The supports at either side of the railway will be located maintaining a minimum distance of 4.5m from the existing near running rail edge. The central support will be located in the Barratt Industrial site in a way to reduce the impact on the functionality of the industrial site.

The bridge access facilities, ramps, stairs and lifts will be located to reduce impact on the existing structures and future development on either side of the railway.

The Plan B alignment (Option 4) and the additional options that have evolved since that (Options 5-10) will either span 40m over the railway only or have an additional span over the access from the end of Hailsham Drive.

2.4.1. Bridge Superstructure

The span of the bridge will be a steel Warren truss. The top and bottom chords of the truss will be following the proposed longitudinal alignment.

The below figure shows a typical 40m Warren truss crossing a railway that could be used for the Plan B alignment options.

Figure 2 - 4.1.1 – Typical Warren Truss crossing a Railway

The same type of truss can be used for the two x 40m span cyclist and pedestrian bridge in the Plan A options.

The total construction height of the bridge will be 4000mm. A span length/height ratio equal to 10 will guarantee the required vertical stiffness to transfer the vertical loads to the bridge supports.

The top and bottom chords of the trusses will be Square Hollow Section (SHS) and the diagonals will be Rectangular Hollow Section (RHS).

The bridge will be designed to accommodate a service vehicle in accordance with clause NA.2.38 of the UK national annex to BS EN 1991-2. To accommodate the above requirements the bridge deck will be 10mm steel plate with transversal stiffeners spaced at 600mm. Conservatively the overall steel deck depth, including the bottom chord, has been assumed to be 600mm. The proposed bridge deck will provide adequate transversal stiffness to transfer the longitudinal and transversal loads to the bridge supports.

The truss bridge configuration will work with any of the proposed cross section widths described in Section 3:

- Option 1 Shared-Use Walkway/Cycleway– 4m wide crossing (5.00 m total width of the bridge);
- Option 2 Kerb-Separated Walkway/Cycleway– 5.7m wide crossing (6.70 m total width of the bridge);
- Option 3 Kerb-Separated Walkway/Cycleway – 5m wide crossing (6.00 m total width of the bridge);
- Options 4 to 10 inclusive Walkway – 3m wide crossing (4.00 m total width of the bridge).

A pedestrian parapet of 1.8m will be provided on the sides of the bridge to be compliant with Network Rail standards. Handrails will be provided on the inside faces of the parapets on stairs and ramps.

Full enclosure, to the sides and the roof of the walkway/cycleway, will be required to provide greater protection over the railway lines and to discourage the throwing of objects from the bridge onto the railway lines.

The drainage requirements to prevent surface water run-off above the road / railway will be achieved with an upstand of 50mm from the surface of the walkway / cycleway.

2.4.2. Bearing arrangement

The 40m truss will be supported on 4 mechanical bearings allowing thermal longitudinal and transversal movements.

The design and specification of the structural bearings will be carried out in accordance with BS EN 1337. Mechanical bearings will be proposed for this type of bridge.

2.4.3. Bridge and Ramp Substructures

A steel frame structure will be used to support the bridge and the ramps. A typical support is shown in the following figure. It is recognised this may need to be reduced in extent to mitigate incursion in to private land forming part of Barret Way.

Figure 2-4.3.1 – Typical steel frame support used for pedestrian/cyclist bridge crossing a railway

The bridge abutment and central support foundation will typically consist of 4 piles, while the ramp supports will have 2 piles.

2.5. Other structure options

Different types of truss such as Vierendeel and Pratt can be used having the same geometrical dimensions as the Warren truss described in the previous section. The following two figures show these different types of truss.

Figure 2-5.1 - Typical Pratt Truss crossing a Railway

Figure 2-5.2 - Typical Vierendeel Truss crossing a Railway

Different bridge structural types have been analysed for this feasibility study:

a. two 40m span composite steel-concrete deck – total construction depth 1.5m
b. two 40m span steel beams with a steel deck
c. two 40m span concrete precast box beams
d. two 40m span half-through bridge girder with steel or concrete deck

Although the above options are feasible, they have been rejected mainly due to aesthetic requirements and achieving permissible clearance.

Changing the bridge type would mean raising the bridge deck level to accommodate the higher construction depth of options a, b and c compared to the proposed truss, increasing the overall cost of the ramps.

3. Ramps, Stairs and Lifts

3.1. Inclusive Design

3.1.1. Introduction:

The client has duties under the Equality Act and as such the design team cannot make decisions that pertain to equalities but can afford the client opportunities to engage with their equalities team and to undertake consultation with people covered by the Equality Act. If instructed, Atkins could assist the client in undertaking any necessary consultation and evaluation, but the final equalities-based decision would rest with the client.

In order to advise the client, we have referred to Sections 9.1, 9.2, 9.3, 9.4 and 9.5 of BS83300-2:2018 and Section 10.5 of BS 8300-2:2018, which should be used to guide the detailing of ramps, stairs, lifts and bridges.

Our general inclusive design observations and recommendations are that:

- A long bridge link poses a risk of individuals encountering antisocial behaviour and threats against their person. As such the following should be considered:
  - Means of providing as much natural surveillance as possible in any form possible,
  - Means of providing a sense of visibility from and onto the bridge walkway (such as weld-mesh, rather than solid enclosure, to prevent objects or people falling onto the tracks or roadways).

- Cyclists should be separated out from pedestrians in such an installation if cyclists are not to dismount. Not providing clear separation (especially on bridges) puts people with mobility, visual and hearing impairments at a significant disadvantage to the extent that some will avoid such environments for fear of injury. This is an extremely contentious issue for many disabled people. Consequently, we would advise that:
  - If separation was provided, then it is suggested that a visually contrasting 100mm "kerb" be provided to denote separation and that the pedestrian and cycle surfaces have visually different appearances.
  - If cyclists are to cross the bridge and no separation from pedestrians were provided, then it is advised that cyclists should be required to dismount.
  - If partial segregation was to be provided, meaning making use of white lines, then it would offer little reassurance to pedestrians and clarity as to where safety from collision may be found, especially for people with visual impairment. A white line will often be insufficient, even if raised as pedestrians will often struggle to take in any marks indicating which side to, they are to walk.

With regards to a footbridge only option our specific observations are:

- A footbridge only option could be seen as discriminatory within an urban environment, when connecting two urban areas. This would need to be evaluated and be subject to consultation with people covered by the Equality Act.

- We would advise that this could lead to you the client having to:
  - commission an audit and review alternative pedestrian routes (that people with mobility impairments would otherwise have to take), with a view to upgrading these routes and make improvements;
  - or having to provide lifts at either end and providing enhanced security provision; described in the Security section below.

However, since a bridge is being proposed to shorten the distance and the shortest alternative route is approximately 0.6 miles from this proposed footbridge, then it seems doubtful that an alternative route would suffice and doubtful that lifts would not be necessary from an equality perspective.

If lifts were provided, then they would need to be sized to accommodate a variety of mobility modes.

We would advise that the bridge deck would be for pedestrians only, that in general wheeled traffic, such as cycles, should not be permitted other than disabled people using wheelchairs or cycles as mobility aids. Cyclists who are able to walk however could be permitted to use the lifts, provide that they walk over the bridge with their cycles.

Dependent on how attractive the new route remains to people using cycles and scooters under this option, it carries risk that, if it is implemented, some cycling and scootering will occur irrespectively. In this event it can in practice become a challenge to achieve a balance between controlling cycling and scootering without preventing access by users of larger cycles as mobility aids, in ways which could be seen as discriminatory.

Given that the bridge could be a lot more reliant on the availability of lifts, we would suggest that some form of mixed-use opportunity, with some retail provision, could afford a "perception of ownership" and "natural surveillance" for the lifts, whilst realizing development and/or revenue value, if appropriately designed and managed.

3.2. Ramps

When designing ramps, the following considerations need to be taken in account:

- Stairs should also be provided as an alternative route.
- Gradients should be gentler than 1 in 20 (5%) as handrails needn't be provided on both sides, such as one the side separating pedestrians from cyclists.
- 100mm side upstands are required on the sides adjoining the structure.
- Landings should tonally contrast with the ramp sections.
- Landings should be every 0.5m rise if the gradient is gentler than 1 in 20% (5%). If the gradient is not steeper than 1 in 30 (approx. 3%) a level resting place adjacent to the route may be provided as an exception.
- Where there is a change of direction then there should be a level landing with adequate cross falls of no greater than 1 in 50 (2%) to allow drainage. As such ramps should not bend. Bending ramps would twist the ramp surface and the combination of twist and bend makes it harder for disabled people to negotiate the change in levels.
- Ramps should also contrast with structures/guarding etc to the side, and handrails should contrast with side elements too. Where there is kerb separation with cyclists then this should contrast too and the cycle route ought to be visually distinct.
- If the above inclusive design advice, regarding providing separation or requiring cyclists to dismount, were not implemented then care should be taken to discourage cyclist moving at speed and bends should be designed to discourage travelling at speed. However, this is unlikely to provide reassurance to pedestrians and is unlikely to be perceived as inclusive as pedestrians would still feel vulnerable to collisions.

The following figure shows the typical steel ramps that can be used for this crossing bridge.

Figure 3-2.1 – Typical steel ramp arrangement

3.3. Stairs

When designing stairs, the following considerations need to be taken in account:

- Set goings at 350mm intervals and risers between 150mm and 180mm;
- Provide no more than 20 risers between landings;
- Provide no more than 36 overall risers in a flight without changing direction (or elongating a landing by more than twice its width).

- The surface width of a stair, between enclosing walls, strings, balustrades or upstands, should be not less than 1200 mm, and the width between handrails should be not less than 1000 mm.
- Where the width between handrails exceeds 2000mm, the stair should be divided into two or more channels by a handrail to ensure that all users have access to a handrail.

The following figure shows the typical steel stairs arrangement.

Figure 3-3.1 – Typical steel stairs arrangement

3.4. Lifts

Lifts are often necessary where the overall rise of a ramp sequence is over 2m, however:

- It needs to be borne in mind that unsupervised external urban realm lifts that have no “perceived ownership” nor “natural surveillance” present a significant risk of attracting anti-social behaviour ranging from being used as toilets through to violent acts against individuals.
- Nevertheless, it is advised that lifts provision should still be considered and evaluated:
    - If lifts are provided, we would suggest that, the bridge formed a link between development opportunities either side of the bridge and utilized internalized lifts. Some form of mixed-use opportunity with retail could afford the “perception of ownership” and “natural surveillance” whilst realizing development value and/or revenue if appropriately designed and managed
    - However, if “perception of ownership” and “natural surveillance” cannot be achieved it is not unusual for lifts to not to be included when traversing over rail and road infrastructure, otherwise they often become a liability and maintenance challenge.
    - Even so, the decision whether to provide lifts should be the client’s decision best achieved through them including their equalities team and ensuring that people covered by the Equality Act are consulted.

- If lifts were to be provided then through lifts would be advantageous as would lift sizes that accommodate larger wheelchairs, mobility buggies and cycles, as wheel as people accompanying wheelchair users. This would exceed minimum lift size.

Where this is not appropriate or possible to provide lifts then:

- Space for future lift provision, should a later decision be made to provide lifts.
- BS8300-1:2018 advises that provision be made for:
  - Rest areas, including seating.
  - Shelter from inclement weather whilst using a bridge.
  - Help and call points that connect to local management services if assistance is required.

3.5. Security

The primary means of providing a sense of security should always be through exploring means of providing a “perception of ownership” and “natural surveillance.”

Whether or not “perception of ownership” or “natural surveillance” is possible, BS8300-1:2018 advises that provision be made for:

- security cameras;
- avoidance of shadows and potential hidden locations;
- clear views from one side of the route to the other;
- materials and barriers that enhance rather than block sight lines;
- suitable lux levels to ensure good visibility appropriate to the area.

3.6. Lighting

Lighting should not be placed at low level or placed within people’s field of view but directed onto paths.

- 100 lux be provided (preferable 200 lux on stairs)
- Any LED’s need to be chosen should be:
  - Specified with high quality controls and colour output.
  - At the warm end of the spectrum, preferably with phosphor lenses,
  - Not left uncovered so that individual LED’s can be seen,
- Be diffused to reduce adverse neurological implications

3.7. Change of Direction

With regards to cycle track ramp alignment, a key source is CD 195 “Designing for cycle traffic" (Highways England, 2019). This sets out the relationships of ramp gradient to design speed, then to minimum horizontal radii for ramp links or to safe stopping distance to determine safe length of ramps between turns, where the radii may be less than the minimum for links at a given design speed.

Table E/3.16. of CD195 sets gradients for design speeds: less than 3% (design speed of 30kph, absolute minimum 20kph), 3% or greater (design speed of 40kph, absolute minimum 40kph). Table E/3.18. sets design speeds for minimum safe stopping distance (SSD): 40kph (minimum SSD of 47m), 30kph (minimum SSD of 31m), 20kph (minimum SSD of 17m). Table E/3.20 sets design speeds for minimum horizontal radii: 40kph (minimum radii of 57m); 30kph (minimum radii of 32m), 20kph (minimum radii of 14m).

LCDS adds (section 4.5.8) that a minimum external radius of 4m should be applied at intersections where cyclists may not need to stop. It is considered that this may equally apply to the ramp turns. In conclusion a 4.0m radius can be used if the minimum SSD ramp length is compliant with the E/3.18

Summary Minimum Radius: 4.00m

4. Geometric Considerations

4.1. Vertical Clearance Constraints

4.1.1. Vertical Clearance of Railway

Desired minimum height to soffit of structure (New Construction) is **5.10m**[1]

Contact wire heights above rail level are:

- Normal[2] = 4.7m
- Minimum[2] = 4.165m
- Level Crossings (Normal Route)[3] = 5.8m
- Level Crossings (High Load Route) = 6.75m
- Actual surveyed clearance = 4.735m

See section 5 for “Overhead Line Considerations”

4.1.2. Vertical Clearance over Roadway (Tudor Road)

Bridge Structure Required Headroom:

New Construction Headroom (Pedestrian Bridge) = 5.7 + S where S = 0.08 max. for Sag Curve Compensation[4] + structural deflections estimated as 0.015m.

Use **5.80m** for Bridge Structure headroom.

4.1.3. Headroom for Pedestrians

Minimum Headroom inside enclosure or under overhead ramp (Pedestrian and Cyclist)[5]: 2.4m

4.2. Footway/cycleway space requirements

No current pedestrian or cyclist flow data is available and so minimum width cannot be calculated. However, depending on the degree of existing severance caused by the railway and the quality of nearby rail crossings, even a small bridge can have a big impact, causing pedestrians and cyclists to re-route to it. It is therefore prudent to allow additional capacity for this possibility.

Bridges are rarely replaced within 60 years making it prudent to provide capacity for long term demand. LCDS advises to consider likely growth in cyclist numbers due to network improvements and making a new link locally, recommending that new pedestrian/cycle bridges in urban areas should be built with at least 4 metres’ clear width[4], providing for a medium level of demand.

[1] *NR/L3/TRK/2049 Module 07 Gauging Table 1 – Minimum Soffit Heights for Standard Structure Gauge*
[2] *GL/RT/1210 Part 3 Mechanical Requirements 3.1*
[3] *GL/RT/1210 Part 3 Table 3*
[4] *Design Manual for Roads and Bridges Vol. 6 Section 1*
[5] *Design Manual for Roads and Bridges Vol. 2 Section 2*

LCDS[4] notes that it is important to note that flows may not be the principal determinant of appropriate infrastructure type. In all cases, the potential impact on more vulnerable users must be taken into account in decisions about separation. The proximity of schools, accommodation for older people, hospitals, health centres and facilities for disabled people can have a significant influence on the composition of pedestrian flows. It may highlight the need for cycle slowing measures or avoiding shared use. Recently issued guidance from Transport for the West Midlands[4] echoes this, advising that greater segregation should also be considered when planning routes that will attract large numbers of inexperienced cyclists, such as access to schools.

4.2.1. Shared-Use: Footway/cycleway requirements

Risk of collision with cyclists is an extremely contentious issue for many disabled people. Not providing clear separation (especially on bridges) puts disabled people at a significant disadvantage to the extent that some will avoid such environments for fear of injury. Partial segregation by use of white lines generally offers little reassurance to disabled pedestrians and clarity as to where safety from collision may be found. In consideration of these issues, this note discusses the option of a kerb-separated footway and cycleway both in relation minimum space required by the relevant design standards, and also in the context of available space limited to a maximum 5.00m to avoid impacting on existing adjacent structures.

4.2.2. Kerb-Separated: Footway space requirements

Highways England *BD 29/17*, states that the minimum clear width of the bridge footway shall not be less than 2.00m[6]. Therefore, understanding that neither a Capacity Analysis nor a Comfort Level Assessment has been performed, assuming provision is made for medium levels of demand[7], it is recommended that a 2.00m clear footpath width be provided. This is further discussed in Section 4,

Summary footpath clear width:	**2.00m minimum required**

4.2.3. Kerb-Separated: Cycleway space requirements

Sustrans[8] suggests a minimum width of 3.00m for two cyclists, preferably 4.00m or more. Studies carried out by Atkins for the TfL Cycle Programme Team and The Royal Parks developed a number of scenarios varying from one to three cyclists (side by side) with different levels of passing distance. In line with guidelines presented in the LCDS and Sustrans[9], two scenarios have been subsequently identified (Figure 4.2.1). The dimensions illustrated in Figure 4.2.1 were taken from two Atkins reports as well as LCDS[10].

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[6] *Highways England (2017) BD 29/17 - Design Manual for Roads and Bridges, Vol 2, Section 2, pp6/1. Sustrans (2015) Design Manual Chapter 8: Bridge and Other Structures (Draft), pp11 also states that the footway width should be at least 2.00m wide. Design Manual for Roads and Bridges Vol. 6 Section 1.*
[7] Transport for London (2014) *London Cycling Design Standards, Chapter 4, p65.*
[8] Sustrans (2015) *Sustrans Design Manual Chapter 8: Bridges and Other Structures,* p11-12.
[9] Transport for London (2014) *London Cycling Design Standards, Chapter 2, p52 and* Sustrans (2015) *Design Manual Chapter 8: Bridge and Other Structures.*
[10] Atkins (2009) *Cycling, Walking and Accessibility: Off-highway Design Research for Transport for London* and Atkins (2006) *Kensington Gardens Studio Walk.* Both studies adopted information provided by DfT - Department for Transport (2008) *Cycle Infrastructure Design, Local Transport Note 2/98*. Transport for London (2014) *London Cycling Design Standards, Chapter 3, p7-9.*

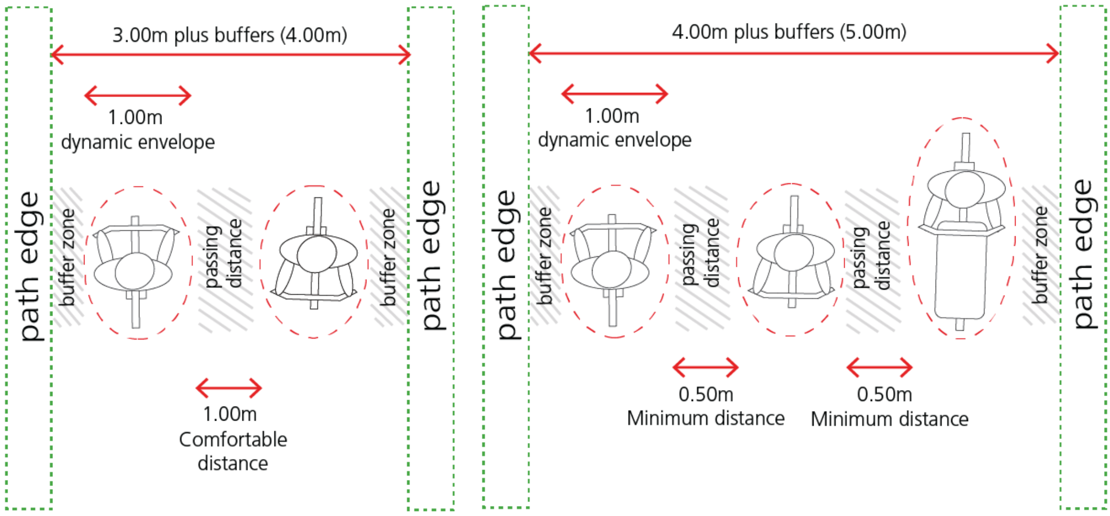

Figure 4-2.3.1 - Widths of Cycle infrastructure: Scenario A (minimum required): 2 cyclists (left) and Scenario B (recommended): 3 cyclists (right) (not to scale)

A key element in deciding whether the crossing should cater for two cyclists at a time (Scenario A) or three cyclists side by side (Scenario B) is very much determined by the character of the cycleway.

To that end, following LCDS and Sustrans guidelines and assuming provision is made for medium levels of demand, a width of 3.00m would adequately meet the aspirations of the local community. In the context of a 5.00m maximum available space, a reduction in the width of the cycleway space to 2.30m to avoid impact on adjacent structures would be in line with 2,00m minimum width recommended by LCDS where demand is low and provides some margin for additional width required by users of wider cycles on the ramps and at the turns. However, this provision would not meet the minimum width for medium demand, where the likelihood of users of wider cycles requiring to pass each other is increased. Depending on demand, a 2.30m cycleway space may not be suitable for all people and may exclude some potential users and/or have safety concerns.

As LTN 1/12 advises, where room is limited, any plan to segregate a route needs careful consideration. In general, narrower routes might be best left unsegregated, especially where splitting the route would reduce the widths available for pedestrians or cyclists to near their minimum values. A balance needs to be struck between possible benefits of segregating users and the disadvantages of reducing the space available to both groups.

The output of the cycleway width is further discussed in Section 4.3: Overall deck width.

Summary cycleway clear width:	**3.00m minimum required (excludes buffers)**

4.2.4. Buffers requirements

Buffers (a clear space between pedestrians and cyclists and any physical element such as parapets) are required for safety and comfort reasons. The Pedestrian Comfort Guidance states that *'if the footway was not busy, people tend to walk along the centre of the footway leaving a generous buffer between themselves and the building edge and kerb. However, if the footway is busy, people keep at least 0.20m between the building edge or kerb and their position'*[11].

Provision for further study of likely pedestrian usage should be performed to consider the need for the 0.2m buffer.

[11] Transport for London (2014) *London Cycling Design Standards, Chapter 4, p54.*
[11] Transport for London (2010) *Pedestrian Comfort Guidance for London*, p26. Fruin (Pedestrian Planning and Design, p66), also mentions the need for a personal comfort zone.

In the case of cyclists, a similar guidance applies to consider the need for buffers, differing in that it is the edge conditions rather than the level of demand that determines the buffer width. Where the edge condition is a low upstand up to 150mm height (e.g. a kerb) the required buffer is 200mm. Where it is a vertical feature above 0.60m (e.g. a parapet) the required buffer is 0.50m; however, the clear distance between the cyclist and the parapet is recommended to be 0.50m[12].

Summary buffers:	**0.20m between footway and cycleway** **0.50m between cycleway and parapet**

The impact of the dimensioning of the buffers to the overall crossing deck width is summarised in the next section.

4.3. Deck overall width

Based on the information from Section 4.2, the diagrams below summarise the deck overall width for the following options:

- Option 1: Shared-Use Footway/Cycleway– 4m wide crossing (3.00 m footway/cycleway + 0.5m buffers on either side);
- Option 2: Kerb-Separated Footway /Cycleway– 5.7m wide crossing (2.00 m footway + 3.00 m cycleway + 0.5m buffers on cyclist side +0.2m separation kerb);
- Option 3: Kerb-Separated Footway/Cycleway – 5m wide crossing (2.00 m footway + 2.30 m cycleway + 0.5m buffers on cyclist side +0.2m separation kerb);
- Option 4: Footway – 3m wide crossing (2.6 m footway + 0.20m buffers on either side).

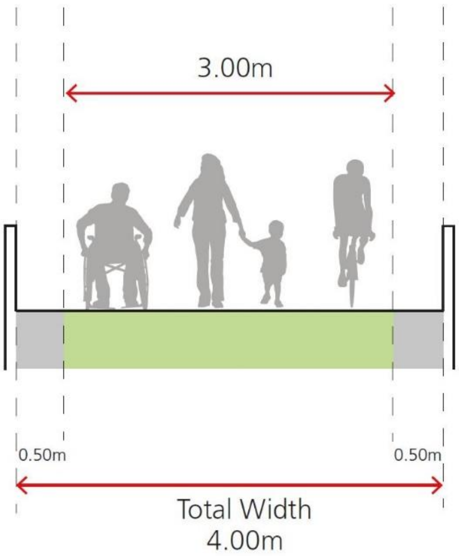

Figure 4-3.1 – Option 1: Shared-Use Footway/Cycleway– 4m total width

[12] Transport for London (2014) *London Cycling Design Standards, Chapter 4, p65;* Sustrans (2015) *Sustrans Design Manual Chapter 8: Bridges and Other Structures*, p11 and Atkins (2009) *Cycling, Walking and Accessibility*, p47.
[13] Department for Transport (2012) *Shared Use Routes for Pedestrians and Cyclists*, p43.

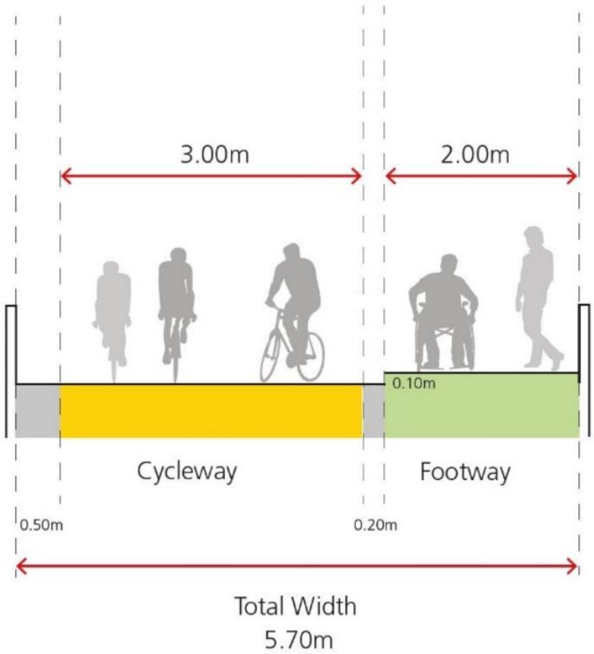

Figure 4-3.2 – Option 2: Kerb-Separated Footway /Cycleway– 5.7m total width

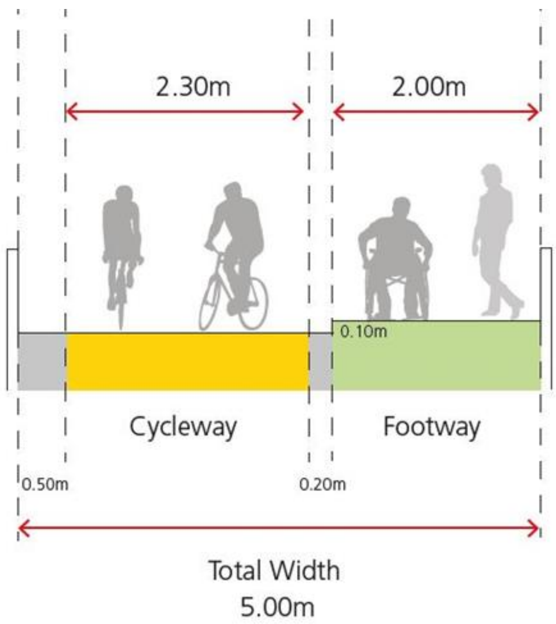

Figure 4-3.3 – Option 3: Kerb-Separated Footway /Cycleway– 5.0 m total width

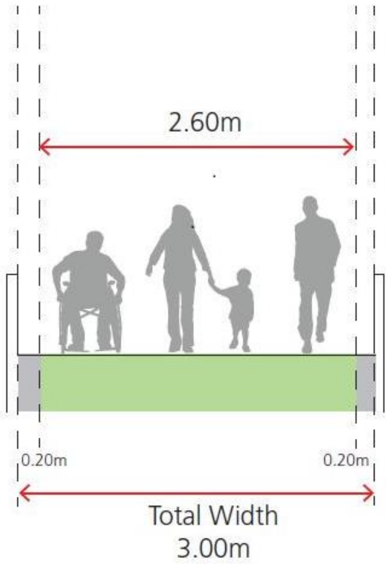

Figure 4-3.4 – Option 4: Footway – 3m total width

Summary deck internal width:	**Option 1: Shared Use: 4.00m** **Option 2: Kerb-Separated: 5.70m** **Option 3: Kerb-Separated: 5.00m** **Option 4: Footway Only: 3.00m**

4.4. Considerations for gradients

For pedestrians, ramps as defined in BS8300 are between 1 in 12 (2m max length) and 1 in 20 (10m length). Shallower than 1 in 20 classifies as a gradient but landings are required for every 500mm rise. A slope of 1 in 21 or shallower means that handrails are not essential on both sides of the pedestrian route.

Therefore, from a pedestrian point of view a landing should be every 0.5m rise If the gradient is gentler than 1 in 20 (5%) then the landings don't have to be every 10m measured horizontally. If the gradient is not steeper than 1 in 30 (approx. 3%) a level resting place adjacent to the route may be provided as an exception.

Where there is a change of direction then there should be a level landing with adequate cross falls of no greater than 1 in 50 (2%) to allow drainage.

Proposed gradients:

- On Approach Ramps deploy a 1:21 gradient with landings at every 0.5m rise for pedestrians and cyclist, with:
    - Landings and gradients of distinct tonal colour difference;
    - handrails on one side of the pedestrian surface (but not above the roadway nor railway);
    - landings that should usually be no less than the width of the gradient serving the pedestrians and no less than 1.5m
- On main bridge over railway deploy a 1:34 gradient with:
    - a level resting place adjacent to the gradient;
    - any landings that are provided are of distinct tonal colour difference to the gradients;

- handrails on one side of the pedestrian surface (but not above the roadway nor railway);

The following gradients are recommended for this facility. See Appendix for additional information “Gradients”.

Summary gradient for cyclists	**Maximum accepted 5% with a maximum of 100m of ramp run.**

Summary gradient for all pedestrians including mobility impaired users	**With Landings: 4.76% (1:21) with a maximum of 10.5m of ramp with level landings of 1.5m width provided between sections for every 0.5m rise.** **Without Landings: 2.9% (1.34.5)** **Landings on rest areas 1.7% (1:60)**

5. Overhead Line Considerations

5.1. Existing Condition

The proposed bridge is to be installed over the West Coast Mainline (WCML) and London Overground railways. The tracks are electrified: -

- WCML at 25kV AC system
- London Overground 750V DC

The OLE in the area is a mixture of UK1 and Mk1 equipment. The OLE is supported from portal structures that span the 4 WCML tracks.

Figure 5-1.1: Photograph showing the OLE system

5.2. Impact on the OLE

The photograph below shows the approximate position of the proposed crossing.

Figure 5-2.1: Photograph showing the approximate location of the proposed bridge

The following options have been considered as part of this feasibility study.

5.2.1. No OLE Modifications

To avoid any modifications to the OLE the underside of the bridge deck will need to be positioned clear of the OLE wires.

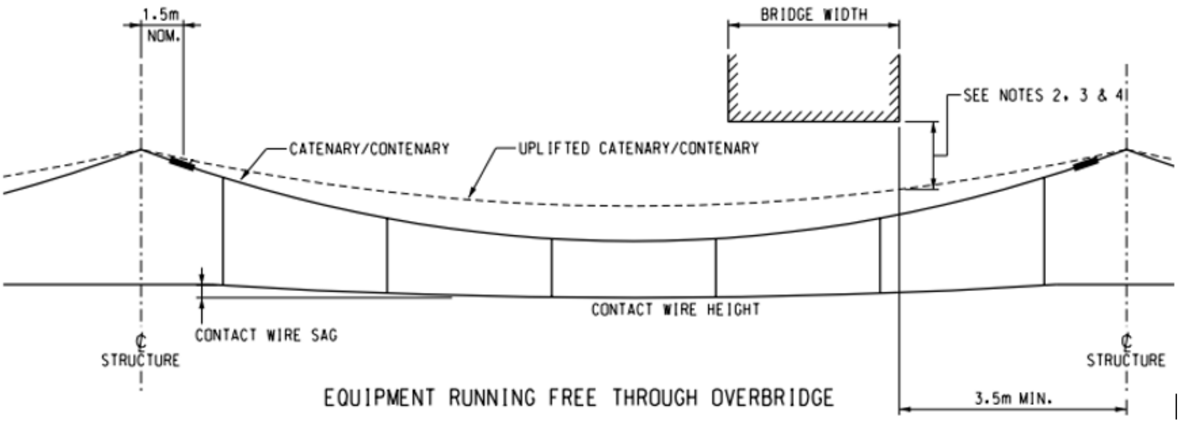

Figure 5.2.1.1: Along Track Profile of The OLE System

From the initial survey, the catenary wire (top wire on the photo above) is approximately 6.7m from the rail. To determine an approximate height of the bridge soffit the following factors will need to be considered: -

Catenary Wire (Top OLE Wire)	6.70m
Electrical Clearance	0.60m
Bridge Installation Tolerance	0.10m
TOTAL	**7.40m**

The above will need to be reviewed at the next stage.

The offset of bridge from the OLE structure and supports should be a minimum of 2.0m. This will allow access for the Network Rail OLE Maintenance teams to the OLE structure and supports. This will need to be reviewed and agreed with Network Rail.

5.2.2. Modifications to the OLE

To reduce the soffit height from the railway, modifications would be required to the OLE system. This would involve cutting the catenary wire and running this below the boom of the OLE structure.

The sketch below shows how the OLE could be modified. The existing catenary supports over the boom are shown in green and modified supports are shown in red. The OLE contact wire would also need to be lowered.

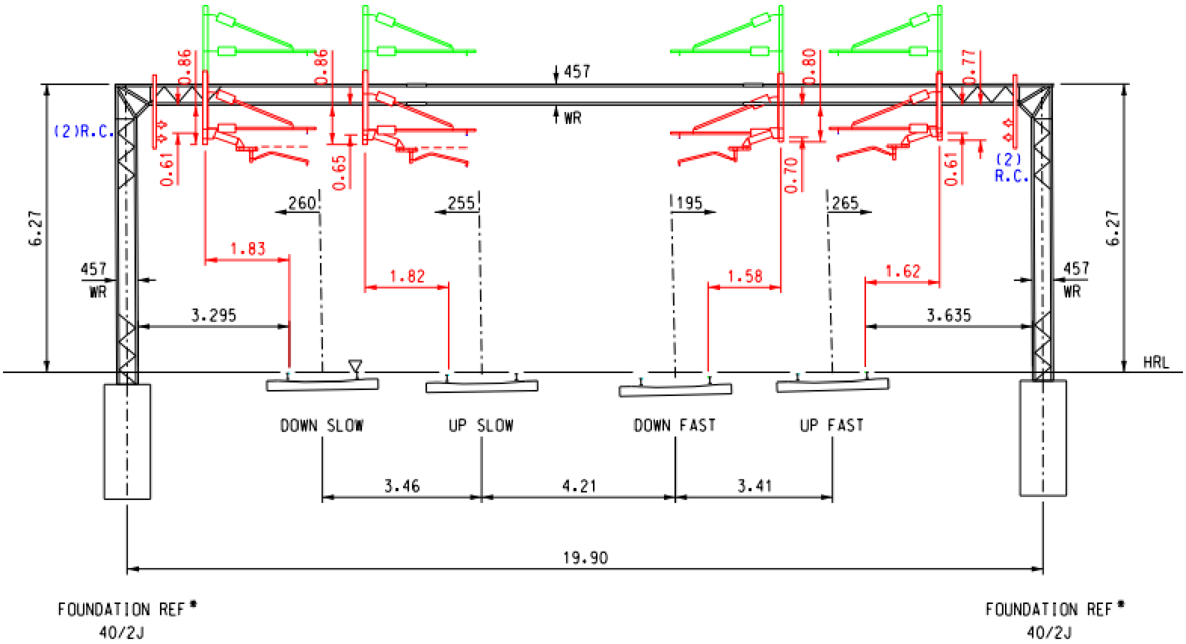

Figure 5-2.2.1: Indicative Sketch showing how the OLE System Below the Boom.

Lowering the OLE system would create a significant amount of OLE construction works. The contact wire would need to be graded onwards from the revised height at the footbridge location. This grading would need to be done over a number of OLE structures on both sides of the footbridge. This could be up to 5 structures either side, before the contact wire height could return to its original level.

NOTE: the cost of lowering the OLE would be significant. We believe that the footbridge can be set at the correct level to avoid it and so no cost has been allowed for it.

Lowering the OLE catenary and contact wire would be dependent upon both the span length (distance along track between adjacent OLE structures) and the System depth (vertical distance between the catenary wire and contact wire). If the span length is too long and/or the system depth too small the catenary wire will fall below the contact wire. To overcome this issue a new OLE structure would be required.

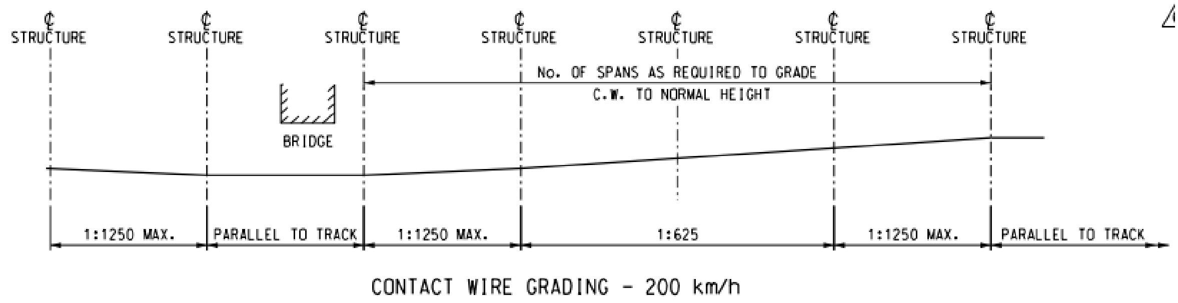

Figure 5-2.2.2: Indicative Sketch showing the contact wire grading requirements

Looking at the photographs it would appear that this area is being upgraded to include the Auto Transformer. This is a wire that runs in each of the two cesses (areas on the outside of all the tracks). This will need to be lowered, similar to the catenary wire to clear the bridge. As this cable is live at 25kV in the cess it should be a minimum of 5.20m above the adjacent rail in order to provide safe electrical clearances for staff walking in the cess. If this minimum height cannot be achieved the Auto Feeder will need to be terminated and then cabled in troughing route under the bridge. This will require new OLE structures.

NOTE: the cost of lowering the Auto Transformer wires could be significant and no cost has been allowed for it in this report.

The OLE record drawings will need to be reviewed to understand the impact and limitations of the OLE infrastructure.

5.3. Earthing and Bonding

As the footbridge will be spanning the electrified lines it will need to be bonded to the WCML traction return rail.

An earthing and bonding strategy will need to be developed to ensure that the traction return bonding interface will not impact on any utilities or services is compliant.

Consideration will need to be given to the bonding requirements with respect to the bonding requirements for the London DC electrified lines

5.4. Additional Considerations

The following will need to be considered at the next stage.

- To inspect and maintain the new bridge a possession and isolation of the railway will be required.
- OLE Height and Stagger survey will be required at the next stage, approximate length of survey required will be 1km either side of the proposed footbridge location.
- OLE record drawings to be reviewed to understand the OLE infrastructure in the area of the new footbridge.
- Review the footbridge design to identify high level impact on the OLE infrastructure.

Summary clearances	**Distance Rail to soffit of bridge superstructure 7.4m.** **Offset of bridge from the OLE structure and supports should be a minimum of 2.0m**

6. Construction

6.1. Construction Costs

6.1.1. Estimate Summary

Based on the information detailed elsewhere within this report, initial feasibility estimates have been prepared by Faithful+Gould Ltd. (F+G), a member of the SNC-Lavalin Group.

Estimates have been produced initially for structures incorporating two main spans and ramped approaches. These have been prepared for three alternative deck widths and pedestrian/cycle user arrangements, namely:

- Option 1 - 5.0m wide (overall) shared not separated
- Option 2 - 6.7m wide (overall) kerb-separated
- Option 3 - 6.0m wide (overall) kerb-separated

All of these options have been estimated on the basis of a Steel Truss structure being adopted and lifts being provided at each side of the structure.

The estimates are summarised in the Table below.

Table 6.1.1 – Estimate Summary – Options 1-3 (including lifts)

	Group Element / Package			Option 1 – 5.0m wide (overall) shared not separated - With lifts	Option 2 – 6.7m wide (overall) kerb-separated - With lifts	Option 3 – 6m wide (overall) kerb-separated - With lifts
				£k	£k	£k
1.01	Railway Control Systems			5	5	5
1.02	Train Power Systems			10	10	10
1.03	Electric Power and Plant			982	982	982
1.04	Permanent Way / Track			0	0	0
1.05	Telecommunication Systems			318	318	318
1.06	Buildings and Property			25	25	25
1.07	Civil Engineering			5885	7132	6748
1.08	Enabling Works			170	170	170
1.09	Rolling Stock			0	0	0
	Base construction		**£k**	**7,395**	**8,642**	**8,258**
2.01	Preliminaries		25%	1,849	2,161	2,065
2.02	Contractor Overheads and Profit		12.5%	1,155	1,350	1,290
	Indirect construction			**3,004**	**3,511**	**3,355**
	CONSTRUCTION COST (C)			**10,399**	**12,153**	**11,613**
3.01	Project Design Team Fees		10%	1,040	1,215	1,161
3.02	Project Management Team Fees		10%	1,040	1,215	1,161
3.03	Other Project Development (excluding Land Cost and compensation costs)			108	108	108
3.04	Land cost			2,208	2,208	2,208
3.05	Compensation Cost			Excluded	Excluded	Excluded
	Employer Indirect			**4,396**	**4,747**	**4,639**
	POINT ESTIMATE Construction + Development Cost (E)			**14,795**	**16,900**	**16,252**
4.01	Risk / Uncertainty		40%	5,918	6,760	6,501
	Expected Final Cost excluding inflation (F)			**20,713**	**23,660**	**22,753**
5.01	Inflation		Excluded			
	EXPECTED FINAL COST - EFC TOTAL COST LIMIT (H)		**£k**	**20,713**	**23,660**	**22,753**

Alternative estimates have also been produced should lifts not be required and these estimates are also tabled below.

Table 6.1.2 – Estimate Summary – Options 1-3 (excluding lifts)

	Group Element / Package			Option 1 – 5.0m wide (overall) shared not separated - No lifts	Option 2 – 6.7m wide (overall) kerb-separated - No lifts	Option 3 – 6m wide (overall) kerb-separated - No lifts
				£k	£k	£k
1.01	Railway Control Systems			5	5	5
1.02	Train Power Systems			10	10	10
1.03	Electric Power and Plant			272	272	272
1.04	Permanent Way / Track			0	0	0
1.05	Telecommunication Systems			278	278	278
1.06	Buildings and Property			25	25	25
1.07	Civil Engineering			5870	7117	6734
1.08	Enabling Works			170	170	170
1.09	Rolling Stock			0	0	0
	Base construction		**£k**	**6,631**	**7,877**	**7,494**
2.01	Preliminaries		25%	1,658	1,969	1,874
2.02	Contractor Overheads and Profit		12.5%	1,036	1,231	1,171
	Indirect construction			**2,694**	**3,200**	**3,045**
	CONSTRUCTION COST (C)			**9,324**	**11,078**	**10,539**
3.01	Project Design Team Fees		10%	932	1,108	1,054
3.02	Project Management Team Fees		10%	932	1,108	1,054
3.03	Other Project Development (excluding Land Cost and compensation costs)			108	108	108
3.04	Land cost			2,208	2,208	2,208
3.05	Compensation Cost			Excluded	Excluded	Excluded
	Employer Indirect			**4,181**	**4,532**	**4,424**
	POINT ESTIMATE Construction + Development Cost (E)			**13,505**	**15,609**	**14,963**
4.01	Risk / Uncertainty		40%	5,402	6,244	5,985
	Expected Final Cost excluding inflation (F)			**18,907**	**21,853**	**20,948**
5.01	Inflation		Excluded			
	EXPECTED FINAL COST - EFC TOTAL COST LIMIT (H)		**£k**	**18,907**	**21,853**	**20,948**

Further estimates have been produced for an option comprising of a Footway crossing with only stairs and not ramps, namely:

- Option 4 - 3m pedestrian only crossing (4m wide structure)

Sub-options have been considered with and without the provision of lifts and these are tabulated below.

Table 6.1.3 – Estimate Summary – Option 4 (including and excluding lifts)

	Group Element / Package			Option 4 – 3m pedestrian only crossing (4m wide structure) - With lifts	Option 4 – 3m pedestrian only crossing (4m wide structure) - Without lifts
				£k	£k
1.01	Railway Control Systems			5	5
1.02	Train Power Systems			10	10
1.03	Electric Power and Plant			842	133
1.04	Permanent Way / Track			0	0
1.05	Telecommunication Systems			176	136
1.06	Buildings and Property			0	0
1.07	Civil Engineering			1048	1009
1.08	Enabling Works			71	68
1.09	Rolling Stock			0	0
	Base construction		£k	2,152	1,360
2.01	Preliminaries		25%	538	340
2.02	Contractor Overheads and Profit		12.5%	336	212
	Indirect construction			874	552
	CONSTRUCTION COST (C)			3,027	1,912
3.01	Project Design Team Fees		10%	303	191
3.02	Project Management Team Fees		10%	303	191
3.03	Other Project Development (excluding Land Cost and compensation costs)			108	108
3.04	Land cost			319	263
3.05	Compensation Cost			Excluded	Excluded
	Employer Indirect			1,032	753
	POINT ESTIMATE Construction + Development Cost (E)			4,059	2,665
4.01	Risk / Uncertainty		40%	1,623	1,066
	Expected Final Cost excluding inflation (F)			5,682	3,731
5.01	Inflation		Excluded		
	EXPECTED FINAL COST - EFC TOTAL COST LIMIT (H)		£k	5,682	3,731

Further estimates have been produced in April 2020 for four further options (5 to 8) comprising of a Footway crossing with only stairs/lifts and not ramps, namely:

- Option 5 – 40m single span 3m pedestrian only crossing (4m wide structure) with lifts
- Option 6 - 40m single span 3m pedestrian only crossing (4m wide structure) without lifts
- Option 7 - 57m twin span 3m pedestrian only crossing (4m wide structure) with lifts
- Option 8 - 57m twin span 3m pedestrian only crossing (4m wide structure) without lifts

These have been prepared on the same principles as those for Options 1 to 4 and are tabulated below.

Table 6.1.4 – Estimate Summary – Options 5 to 8.

	Group Element / Package			Option 5 – 40m single span 3m pedestrian only crossing (4m wide structure)with lifts	Option 6 - 40m single span 3m pedestrian only crossing (4m wide structure) without lifts	Option 7 - 57m twin span 3m pedestrian only crossing (4m wide structure) with lifts	Option 8 - 57m twin span 3m pedestrian only crossing (4m wide structure) without lifts
				£k	£k	£k	£k
1.01	Railway Control Systems			5	5	5	5
1.02	Train Power Systems			10	10	10	10
1.03	Electric Power and Plant			1095	104	1073	110
1.04	Permanent Way / Track			0	0	0	0
1.05	Telecommunication Systems			191	139	185	146
1.06	Buildings and Property			0	0	0	0
1.07	Civil Engineering			1094	1048	1549	1523
1.08	Enabling Works			56	55	70	70
1.09	Rolling Stock			0	0	0	0
	Base construction		**£k**	**2,451**	**1,360**	**2,893**	**1,864**
2.01	Preliminaries		25%	613	340	723	466
2.02	Contractor Overheads and Profit		12.5%	383	213	452	291
	Indirect construction			**996**	**553**	**1,175**	**757**
	CONSTRUCTION COST (C)			**3,447**	**1,913**	**4,068**	**2,622**
3.01	Project Design Team Fees		10%	345	191	407	262
3.02	Project Management Team Fees		10%	345	191	407	262
3.03	Other Project Development (excluding Land Cost and compensation costs)			108	108	108	108
3.04	Land cost			200	156	100	100
3.05	Compensation Cost			Excluded	Excluded	Excluded	Excluded
	Employer Indirect			**997**	**646**	**1,022**	**732**
	POINT ESTIMATE Construction + Development Cost (E)			**4,444**	**2,559**	**5,090**	**3,354**
4.01	Risk / Uncertainty		40%	1,778	1,024	2,036	1,342
	Expected Final Cost excluding inflation (F)			**6,222**	**3,583**	**7,125**	**4,696**
5.01	Inflation		Excluded				
	EXPECTED FINAL COST - EFC TOTAL COST LIMIT (H)		**£k**	**6,222**	**3,583**	**7,125**	**4,696**

Further estimates have been produced in May 2020 for two further alignment options (9 and 10) comprising of a Footway crossing with only stairs/lifts and not ramps, namely:

- Option 9 – 57m twin span pedestrian crossing 3m wide (4m wide structure) with lifts
- Option 10 - 35m single span pedestrian crossing 3m wide (4m wide structure) No lifts

It should be noted that these options both now include amendments to the access road and associated retaining wall at the south west end of the footbridge that would be required to facilitate these alignments.

These estimates have been prepared on the same principles as those for Options 1 to 8 and are tabulated below.

Table 6.1.5 – Estimate Summary – Options 9 and 10

	Group Element / Package			Option 9 – 57m twin span pedestrian crossing 3m wide (4m wide structure) with lifts	Option 10 – 35m single span pedestrian crossing 3m wide (4m wide structure) No lifts
				£k	£k
1.01	Railway Control Systems			5	5
1.02	Train Power Systems			10	10
1.03	Electric Power and Plant			1073	103
1.04	Permanent Way / Track			0	0
1.05	Telecommunication Systems			183	138
1.06	Buildings and Property			0	0
1.07	Civil Engineering			1646	1238
1.08	Enabling Works			79	78
1.09	Rolling Stock			0	0
	Base construction		**£k**	**2,996**	**1,572**
2.01	Preliminaries		25%	749	393
2.02	Contractor Overheads and Profit		12.5%	468	246
	Indirect construction			**1,217**	**638**
	CONSTRUCTION COST (C)			**4,213**	**2,210**
3.01	Project Design Team Fees		10%	421	221
3.02	Project Management Team Fees		10%	421	221
3.03	Other Project Development (excluding Land Cost and compensation costs)			108	108
3.04	Land cost			206	156
3.05	Compensation Cost			Excluded	Excluded
	Employer Indirect			**1,156**	**706**
	POINT ESTIMATE Construction + Development Cost (E)			**5,369**	**2,916**
4.01	Risk / Uncertainty		40%	2,148	1,166
	Expected Final Cost excluding inflation (F)			**7,517**	**4,082**
5.01	Inflation		Excluded		
	EXPECTED FINAL COST - EFC TOTAL COST LIMIT (H)		**£k**	**7,517**	**4,082**

The sections below describe the approach that has been taken in respect of preparation of the cost estimate. Whilst the level of design information provided does not facilitate detailed or complete measurements to be generated for all works, we have however reviewed all elements of the scope of works and believe that the estimate is robust and complete in terms of covering all of the physical works required, whether by a specific estimate having been prepared for those works, or by the inclusion of provisional assessments of the likely cost for those elements which are currently less well defined.

6.1.2. Methodology

The estimates have been prepared and presented under the overall structure of Network Rail's RMM1 Method of Measurement. This has been done at Group Element level.

Where possible the estimates have been approached on the basis of applying unit rates to either measured quantities of physical works or where deemed more appropriate, to an assessment of the resources (Labour/Plant/Materials) required to expedite the works. The general approach adopted in respect of the compilation and application of rates to the measured quantities has been to utilise rates and historical cost data from F+G's internal cost database. This has been derived from similar UK Railway Projects or other relevant projects with which we have had a commercial engagement. Where tendered information has been used, to reflect a robust cost, rates etc. contained within a number of the tender returns have been reviewed and not just those of the lowest tender.

Market intelligence either researched during previous workstreams on past projects or obtained specifically for the purposes of this estimate has also been utilised.

Where necessary adjustment has been made to rates for inflation/deflation and/or to exclude any allowance for overheads and profit which has been accounted for separately at Summary level within this estimate.

High level items where the scope is not confirmed are based on top down asset level benchmarks, whereas whenever firmer assumptions can be made from the supporting data provided, a quantified rate approach has been adopted.

High level price checks were carried out on the overall estimate as part of the review process by reference to benchmarking sources where possible/practical or by more detailed interrogation of the rates used, and the sourcing and normalisation of rates from multiple sources if necessary.

The scope of works that form the basis of the estimates are at an extremely early stage of development but reflect as far as possible the particular characteristics of the structure in terms of its location and construction form.

Estimates are inclusive of Contractor's indirect costs (Preliminaries and Overheads & Profit) as well as Employer's indirect costs (Project management, Design and Other costs). These are calculated as a percentage uplift on base construction cost and total construction cost respectively.

Clients Project management and Design development costs are calculated as a percentage uplift on base construction cost and total construction cost respectively.

The percentages used have generally been derived and applied in line with the following typical benchmarks for Network Rail. Those identified for Bridges have been adopted.

We have however reduced the allowance for Contractors Overheads and profit to 12.5% as we believe that is more reflective of current tender trends.

Indirect Work % Selection	2.01 Preliminaries	2.02 Overheads and Profit	3.01 Design Team Fees	3.02 Project Team Fees	Contingency - Allowance
Asset					
Signalling	30%	15%	30%	10%	5%
AC/DC Electrification	20%	15%	10%	10%	5%
Permanent way	30%	15%	15%	10%	5%
Telecoms	20%	15%	15%	10%	5%
Level Crossings	20%	15%	15%	10%	5%
Tunnels	25%	15%	10%	10%	5%
Property projects	30%	15%	20%	10%	5%
Bridges	25%	15%	10%	10%	5%
General Civils	25%	15%	10%	10%	5%

In the absence of any formal risk assessment or modelling having been undertaken, an allowance has been made for Risk & Contingency based on a 40% uplift in line with industry/Network Rail guidelines for this stage of scheme development. No allowance has been made for Optimism bias which it is assumed would be factored in if necessary, as part of the business case reviews.

Allowances have been made within the estimate for land purchase costs for both landing sites but these should be regarded as being for comparison purposes and indicative only as both the exact footprint of land required and the land values specific to this location have not been fully defined or established at this time.

6.1.3. Key Assumptions

The following key assumptions have been made in preparing the estimate.

- Estimates are based at 4th Quarter 2019 price levels. No allowance has been made for inflation to potential implementation dates.
- Prices are expressed in Pounds Sterling.
- The rates used reflect the assumption that the works will be carried out by experienced railway contractors and the works shall be competitively tendered.
- The estimate should be considered as having a tolerance range of +40/-20%.
- It has been assumed that both lighting and CCTV coverage will be provided to the structure, ramps and approach footpaths. It is not however clear at present as to where this would be monitored and what equipment would be required to make the connection to this location or what modifications may be needed to any existing installation. A similar situation exists in respect of the provision of CCTV and fire/passenger alarm systems within the lifts where these form part of the scope. A provisional allowance has therefore been made to allow for these connections.
- It has been assumed that the foundations to the main span supports will require piles but these will not be required to support the stair structures which will be built off a continuous RC base slab.
- It has been assumed that sufficient headroom can be achieved over Network Rail's infrastructure such that there will be no requirement to adjust any part of the Overhead Line Equipment and associated infrastructure.

6.1.4. Exclusions

We have endeavoured to provide as complete an estimate as has been practical at this stage of the scheme/design development and benchmark these costs against previous schemes. There are however a number of costs which will be very specific to the scheme and or the location of the works which it is not possible to establish or benchmark with any degree of accuracy at this stage. The following costs are therefore specifically excluded from the estimate:

- Value Added Tax or other Taxes.
- Escalation during the lead in and construction periods (i.e. all costs are therefore based at current price levels: 4Q19).
- Financing.
- TOC/FOC compensation costs and track access and operational charges associated with the provision of any Abnormal Possessions of Network Rail infrastructure.
- Legal & Parliamentary/ Governmental Fees.
- Estate, Local Planning Fees. Public Consultation Costs.
- An indicative allowance has been made for potential land purchase costs but no allowance has been made for any further Third party compensation. (e.g. for disruption to or extinguishment of business activities).
- All costs associated with developing and implementing a Network Rail Asset Protection Agreement for the scheme. (Which would include all Network Rail development, planning and management costs prior to and during the GRIP 6 Construction, test, and commissioning phase.).
- Any costs associated with lowering of OHLE equipment or Auto Transformer cables.
- The estimates are for CAPEX costs only and no allowance has been made for future operation or maintenance costs within these figures.

Summary Costs (Internal Width Between Parapets)

Option 1 – 2 spans (4m Footway/cycleway) Lifts	**£20,713,000**
Option 1 – 2 spans (4m Footway/cycleway) No Lifts	**£18,907,000**
Option 2 – 2 spans (5.7m Footway/cycleway) Lifts	**£23,660,000**
Option 2 – 2 spans (5.7m Footway/cycleway) No Lifts	**£21,853,000**
Option 3 – 2 spans (5m Footway/cycleway) Lifts	**£22,753,000**
Option 3 – 2 spans (5m Footway/cycleway) No Lifts	**£20,948,000**
Option 4 – 1 span (3m pedestrian only) Lifts	**£5,682,000**
Option 4 – 1 span (3m pedestrian only) No Lifts	**£3,731,000**
Option 5 – 1 span (3m pedestrian with walked cycles only) Lifts	**£6,222,000**
Option 6 – 1 span (3m pedestrian only) No Lifts	**£3,583,000**
Option 7 – 2 spans (3m pedestrian with walked cycles only) Lifts	**£7,125,000**
Option 8 – 2 spans (3m pedestrian only) No Lifts	**£4,696,000**
Option 9 – 2 spans (3m pedestrian with walked cycles only) Lifts	**£7,517,000**
Option 10 – 1 span (3m pedestrian only) No Lifts	**£4,082,000**

7. Overall summary

Key dimensions and measurements identified for the design development of the Wealdstone Footbridge and Cycleway or Footbridge Only are provided below:

Table 7.1 – Summary of recommendations

Bridge Location	Tudor Road to Hailsham Drive
Bridge Type	**Steel Truss**
Cost	**See Section 6**
Footway/Cycleway widths	**Option 1 Shared Use Footway/Cycleway: 4.00m (excludes buffers)** **Option 2 Kerb-Separated Footway and Cycleway: 5.00m (excludes buffers)**
Buffers	**0.50m between cycleway and parapet** **0.20m between footway and cycleway**
Deck internal width	**Option 1: Shared Use Footway/cycleway: 4.00m** **Option 2: Kerb-Separated Footway/cycleway: 5.70m** **Option 3: Kerb-Separated Footway/cycleway: 5.00m** **Option 4: Footway Only Footway/cycleway: 3.00m** **Option 5: Footway Only (pushed cycles): 3.00m** **Option 6: Footway Only: 3.00m** **Option 7: Footway Only (pushed cycles): 3.00m** **Option 8: Footway Only: 3.00m** **Option 9: Footway Only (pushed cycles): 3.00m** **Option 10: Footway Only: 3.00m**
Gradient for cyclists	**Maximum accepted 5% with a maximum of 100m of ramp run.**
Gradient for all pedestrians including mobility impaired users	**With Landings: 4.76% (1:21) with a maximum of 10.5m of ramp with level landings of 1.5m width provided between sections for every 0.5m rise.** **Without Landings: 2.9% (1.34.5)**
Minimum Radius	**4.00m**
OLE clearances	**Distance Rail to soffit of bridge superstructure 7.4m.** **Offset of bridge from the OLE structure and supports should be a minimum of 2.0m**

8. Appendix A – Standards and Gradients

Standards

The following publications form the basis for this Technical Note:

1. Highways England (2017) BD 29/17 *Design Manual for Roads and Bridges*, Vol 2, Section 2
2. Sustrans (2015) *Design Manual Chapter 8: Bridge and Other Structures*
3. Transport for London (2014) *London Cycling Design Standards*
4. Transport for London (2010) *Pedestrian Comfort Guidance for London*
5. Manual for Streets and MfS2

Additional publications were included as guidance on gradients for cyclists and pedestrians, including mobility impaired users, and other space requirements, as follows:

6. BSI Standards Publication (2018) *BS 8300 - Design of an Accessible and Inclusive Built Environment – Part 1 External Environment*
7. Department for Transport (2005) *Inclusive Mobility*
8. Department for Transport (2008) *Cycle Infrastructure Design – Local Transport Note 2/08*
9. The Highways England (2019) CD 195: Designing for cycle traffic
10. The Highways Agency (1993) *TD 36/93 Subways for Pedestrians and Pedal Cyclists*
11. Transport for London (2015) Streetscape Guidance and (2009) *Streetscape Guidance Draft*

Furthermore, there are references to the following Atkins reports:

- Atkins (2006) *Kensington Gardens Studio Walk* for The Royal Parks
- Atkins (2009) *Cycling, Walking and Accessibility: Off-highway Design Research* for Transport for London
- Atkins (2016) *Kensington Gardens: Mount Walk* for The Royal Parks
- Atkins (2016) *Hyde Park: The Broad Walk* and Rotten Row - *Pedestrians and Cyclists Monitoring Programme* for The Royal Parks
- Atkins (2017) *Rotten Row and Serpentine Road: Pedestrian and Cyclist Infrastructure Study* for The Royal Parks.

Lastly, two other guidance were used for reference to the dimensioning of personal space and cycleways width provision.

- Fruin, J. (1971) *Pedestrian Planning and Design*
- Local Transport Note 1/12 (2012) *Shared Use Routes for Pedestrians and Cyclists*

Gradients

Considerations for gradients for both cyclist access ramps, and pedestrian and mobility impaired users have been considered.

The slope and gradient of the canal crossing presents many considerations for the accessibility and usability of the route. With steep gradients, the amount of effort required to reach this minimum speed may be beyond the cyclists' ability, resulting in wobbly, slow and unpredictable cycling. These conditions result in the need for increased cycleway width provision[13].

Forecast speeds are an important factor to consider when designing a ramp or slope, as well as the length of the inclined section. Steep gradients can lead to high speeds for descending cyclists or low speeds for climbing cyclists, which can create hazards for all users of the route. Stopping distances increase significantly on downhill gradients in excess of 3%.[14]. Due to the probable need

[13] Local Transport Note 1/12 (2012) Shared Use Routes for Pedestrians and Cyclists, p40.
[14] CD195 Designing for cycle traffic, p14-15.

to turn corners, shared use is likely to be preferable to separation and sufficient widths should be provided to retain comfortable movements for all users. Noting the need to provide for growing numbers of people walking and cycling, a working minimum of 4 metres should be applied wherever possible, widening on busier sections of path or where separation of users is considered to be necessary. At intersections where cyclists may not need to stop, a minimum external radius of 4 metres should be applied.[15]

Wet conditions, debris and litter are also dangerous for cyclists climbing steep slopes, as cycling over these can easily cause slips and skids. Debris and water tend to accumulate in flat rest areas where there is not sufficient cross fall. Additionally, some types of pedal cycles are not designed to tackle steep climbs, such a single speed town bikes, tricycles and hand-cycles, and less experienced/able cyclists may not be able to tackle long, uphill sections. Advising on suitable ramp gradient is therefore not a straightforward matter, as length of ramps, existing desire lines and the directness of the route can determine the attractiveness of the route.

Other important factors to consider when designing a ramp or slope, as well its gradient, are its length and width. Steep gradients cause cyclists to involuntarily accelerate when going downhill, reaching speeds of 30-50km/h depending on the length and curvature of the slope. The route must be designed to mitigate this likelihood. High speeds can present a risk to other users, and ramps that are too steep or straight can generate a public perception about speeding cyclists[16].

Another factor to consider is enabling cyclists to maintain momentum on the approach of a steep incline. A cyclist can more easily manage a slope when moving at regular speeds immediately before the ascent, as climbs are considerably more difficult to manage when starting from a stationary position. If momentum can be maintained on the approach, the steepest gradient should be placed at the bottom of the climb to reduce effort needed to climb it[17].

At even relatively modest uphill gradients of 3% or so, the speed achieved by a cyclist could fall to the level - typically around 7mph - at which the stability of the cycle is reduced. The additional space needed by slow moving cyclists should be considered.[18]Additionally, routes with design speeds significantly below 30km/h are unlikely to be attractive to regular commuter cyclists[18] and it may be necessary to ensure there is space for those overtaking.

Where space permits, steep gradients can be mitigated by providing ramps in a zig-zag arrangement up the slope. Where this approach is adopted, it is essential that the turning points are kept as level as possible using the minimum crossfall necessary to shed water. It is especially important to avoid adverse camber at these locations[18].

Guidance on gradients for cyclists and all pedestrians including mobility impaired users

The 'complexity' of what is and is not acceptable is also reflected to mobility impaired users. However, it can be concluded from the information summarised in Table 6, for all modes, a gradient of 3% or less is ideal for all users and it is recommended by most of publications. 5% is normally referred as the maximum accepted gradient with a limited length.

The main argument for accepting steeper gradients is that, although 3% will be the ideal gradient, for difficult sites or where a need arises, such as to limit the length of a ramp, 5% can be adopted.

Table 10-1 summarises the gradient requirements for cyclists and all pedestrians including mobility impaired users. Full documents references are presented in Section 1 of this document (including the date of the publication). To facilitate, the number under 'reference' is the same as in Section 1. Page numbers are given under relevant fields.

[15] London Cycling Design Guide (2014), Chapter 7, p26; Chapter 4, p67.
[16] Sustrans Design Manual Chapter 8, Bridges and Other Structures, p10.
[17] Design Manual for Roads and Bridges: Part 8 BD 29/17 Design Criteria for Footbridges, p12/1.
[17] Design Guidance: Active Travel (Wales) Act 2013. Welsh Government. December 2014, p52.
[18] Department for Transport (2008) Local Transport Note 2/08, Cycle Infrastructure Design, p41; p44

For the purpose of the Table A, 'length' is defined as the actual (diagonal) metric distance of the ramp, also referred as going of ramp.

Reference	Design standards, codes and guidance	Gradient	
		Cyclist	Pedestrians
1	BD 29/17 - Design Criteria for Footbridges	Ramps shall not be steeper than 5% (no maximum length specified). Page: 6/1	No information.
2	Sustrans: Design Manual for Bridges and Other Structures	Recommended maximum 3%, accepted maximum 5% up to 100m; 7% up to 30m, more than 7% for short lengths (not specified). Page: 10	No information.
3	TfL - London Cycling Design Standards	Medium category peak hour cycle flows: for 2-way track 200-1,000; for partially separated and shared routes 150-300. Pages: Chapter 4/54 and Chapter 4/64 CLoS Assessment: Less 3% scores 2 (maximum rating), between 3% and 5% scores 1 and more than 5% scores 0 (no maximum length stated). *Plus*: Ramps should have a shallow gradient – generally be no greater than 5% (no maximum length specified). 8% gradient over short stretches with flat landings every 10-15 metres may be preferable to a long or convoluted 5% gradient ramp. Pages: Chapter2/8 and Chapter 7/24	No information.
5	BS 8300 Part 1	No information.	Gradients between 1:60 (1.67%) and less than 1:20 (5%) are classed as 'gently sloping'. The standard recommends provision of landings every 500mm rise. A ramp* should have the lowest practicable gradient within the range of 1:20 (5%) to 1:12 (8%) The gradient of a ramp flight in relation to its going should be not steeper than that shown in Table 3 (p40) and no individual flight of a ramp should have a going greater than 10 m or a rise of more than 500 mm. Slopes less than 1.67% do not level landings. Sections between 1.67% and less than 5% gradient need level landings for every 500mm of rise, and level landings are required every 10m for ramps of 5% gradient. Between 5% and 8% the requirement of the level landings will vary according to information presented in

Reference	Design standards, codes and guidance	Gradient	
		Cyclist	**Pedestrians**
			Table 3. Minimum 1.5m level landings required for every 0.5m rise. Pages: 39-41 Clause 9.5: Subways or bridges are likely to rise in excess of 2 m, which can make them inaccessible obstacles despite incorporating standard inclusive design features. For this reason, where practicable, conventional passenger lifts or an alternative route around the obstacle should be provided. Page 45
6	Inclusive Mobility	No information.	Recommended 2.5%, maximum accepted 5% (no maximum length specified), steeper gradients above 5% with a maximum length of 1.00m. Pages: 11-12
7	LTN 2/08 - Cycle Infrastructure Design	In general, a maximum gradient of 3% is recommended, but this can rise to 5% over a distance of up to 100 metres. Where steeper slopes are unavoidable, the limiting gradient is 7% over a distance of up to 30 metres. Page: 44	Preferred maximum 5%, with 8% as absolute maximum. Individual flights must not exceed 10 metres, and intermediate resting places should be at least 2 metres long. Page: 67
8	LTN 1/12 – Shared Use Routes for Pedestrians and Cyclists	Where gradients are steep, climbing cyclists might wobble to some extent, and descending cyclists can quickly gain speed. In both cases, additional width is helpful. Page: 40	
9	CD 195 Designing for cycle traffic	Table E/3.9. for gradients and distances: from 2% (maximum length of 150m), 3% (maximum length of 80m) and 5% (maximum length of 30m). Page: 14 Table E/3.16. for gradients and design speeds: less than 3% (design speed of 30kph, absolute minimum 20kph), 3% or greater (design speed of 40kph, absolute minimum 40kph). Page 17 Table E/3.18. for design speeds and minimum safe stopping distance (SSD): 40kph (minimum SSD of 47m), 30kph (minimum SSD of 31m), 20kph (minimum SSD of 17m). Page 18	No information.

Reference	Design standards, codes and guidance	Gradient	
		Cyclist	Pedestrians
		Table E/3.20 for design speeds and minimum horizontal radii: 40kph (minimum radii of 57m); 30kph (minimum radii of 32m), 20kph (minimum radii of 14m). *NOTE The minimum cycle track horizontal radii values are based on a V^2/R of 28.28 as per TD 9 Highway Link Design* Page 18	
10	TD 36/93 Subways for Pedestrians and Pedal Cyclists	Preferably shallower than 3%, normally not exceed 5%, if space is very restricted, a gradient of up to 7% may be adopted (no maximum length specified). Page: 5/1	Gradients of 5% or shallower are preferred where significant number of disabled persons or laden shoppers are expected. In other situations, gradients up to 8% is accepted and up to 10% for short lengths in exceptionally difficult sites (no maximum length specified). Page: 5/1
11	Streetscape Guidance	No information.	Optimum ramp gradient 5% (no maximum length specified). Page: 168

*Table A: Summary of recommended and maximum accepted gradients for access ramps and overall pedestrian and cycle paths for cyclists, mobility impaired and able pedestrians. All publications are listed at the beginning of this technical note. *A ramp is defined when the gradient of the slope is 5% or above, less than 5% is considered as 'gently sloping' (BS 8300-1 - Section 8.1.4).*

As previously discussed, it is a complex issue to find the right balance between accessibility, effort and convenience added the challenges of ramps when the longer the ramp, the greater the impacts of the ramp on land/property, on the environment, and on cost. It is clear the higher the gradient, the greater the effort users will have to overcome.

9. Appendix B - Drawings for Options 5, 6, 7, 8, 9 & 10

DO NOT SCALE

NOTES

1. ACCESS FOOTWAY SHOWN ADJACENT STAIRS, TO BE 1.8m WIDE, FLUSH WITH CARRIAGEWAY SURFACING. FOOTWAY WILL NEED TO BE OVER-RUN BY RIGID TRUCK DURING EGRESS MOVEMENT.
2. PROPOSALS ARE BASED ON INITIAL HEALTH AND SAFETY REVIEW AND RECOMMENDATIONS. A FURTHER HEALTH AND SAFETY REVIEW SHALL BE UNDERTAKEN AS PART OF THE DESIGN DEVELOPMENT.
3. HEALTH AND SAFETY ASPECTS RELATING TO LIFT ACCESS,LIFT ACCESS LIGHTING / ISOLATION AND OPERATION, SUBJECT TO FURTHER CONSIDERATION.
4. CONSIDERATION MAY BE GIVEN TO REDUCING THE WIDTH OF STAIRS ON NORTH APPROACH (SUBJECT TO RISK ASSESSMENT), WHICH WOULD FACILITATE INCREASED VEHICLE MOVEMENT OR INCREASE OFFSET TO ADJACENT BOUNDARY WALL.
5. EAVESMENT REQUIREMENTS FOR FOUNDATIONS AND MAINTENANCE ACCESS REQUIREMENTS TO BE DETERMINED.

KEY

- TOPOGRAPHICAL SURVEY DATA
- ORDNANCE SURVEY DATA
- FOOTBRIDGE / STEPS
- LIFTS
- FOOTWAY ACCESS TO LIFTS
- EXTENT OF LANDTAKE (0.5m FROM STRUCTURE)

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
Description: ISSUED FOR REVIEW						
S1	P1	SB	SY	CB	CC	27/02/20

Drawing Suitability: FOR REVIEW
Status: S1

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Client: Harrow COUNCIL LONDON

Project Title: WEALDSTONE FOOTBRIDGE

Drawing Title: PROPOSED ALIGNMENT OPTION 5

Drawing Number: HE5140544 - ATK - HGN - XX - SK - CH - 000001

Original Size: A1 | Scale: 1:200 | Project Ref. No: 0000000 | Sheet: 1 of 1 | Rev: P1

DRAFT

NOTES

1. PROPOSALS ARE BASED ON INITIAL HEALTH AND SAFETY REVIEW AND RECOMMENDATIONS. A FURTHER HEALTH AND SAFETY REVIEW SHALL BE UNDERTAKEN AS PART OF THE DESIGN DEVELOPMENT.
2. CONSIDERATION MAY BE GIVEN TO REDUCING THE WIDTH OF STAIRS ON NORTH APPROACH (SUBJECT TO RISK ASSESSMENT), WHICH WOULD FACILITATE INCREASED VEHICLE MOVEMENT OR INCREASE OFFSET TO ADJACENT BOUNDARY WALL.
3. EAVESMENT REQUIREMENTS FOR FOUNDATIONS AND MAINTENANCE ACCESS REQUIREMENTS TO BE DETERMINED.

KEY

- TOPOGRAPHICAL SURVEY DATA
- ORDNANCE SURVEY DATA
- FOOTBRIDGE / STEPS
- EXTENT OF LANDTAKE (0.5m FROM STRUCTURE)

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
Description: ISSUED FOR REVIEW						
S1	P1	SB	SY	CB	CC	27/02/20

Drawing Suitability: FOR REVIEW — Status: S1

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Project Title: WEALDSTONE FOOTBRIDGE

Drawing Title: PROPOSED ALIGNMENT OPTION 6

Drawing Number: HE5140544 - ATK - HGN - XX - SK - CH - 000002

Original Size: A1 | Scale: 1:200 | Project Ref. No: 0000000 | Sheet: 1 of 1 | Rev: P1

File: \\wsatkins.com\project\GBEMB\HandT\Tsol\AR\Projects\5140544 - Harrow Council transportation - Whealdstone Footbridge\30. Deliverable\32. CAD Drawings\01-WIP\SK\ HE5140544-ATK-HGN-XX-SK-CH-000002.dwg. Plotted: 05/03/2020 16:39:09 By: BELL3169

NOTES

1. PROPOSALS ARE BASED ON INITIAL HEALTH AND SAFETY REVIEW AND RECOMMENDATIONS. A FURTHER HEALTH AND SAFETY REVIEW SHALL BE UNDERTAKEN AS PART OF THE DESIGN DEVELOPMENT.
2. HEALTH AND SAFETY ASPECTS RELATING TO LIFT ACCESS,LIFT ACCESS LIGHTING / ISOLATION AND OPERATION, SUBJECT TO FURTHER CONSIDERATION.
3. CONSIDERATION MAY BE GIVEN TO REDUCING THE WIDTH OF STAIRS ON NORTH APPROACH (SUBJECT TO RISK ASSESSMENT), WHICH WOULD FACILITATE INCREASED VEHICLE MOVEMENT OR INCREASE OFFSET TO ADJACENT BOUNDARY WALL.
4. EAVESMENT REQUIREMENTS FOR FOUNDATIONS AND MAINTENANCE ACCESS REQUIREMENTS TO BE DETERMINED.

KEY

- TOPOGRAPHICAL SURVEY DATA
- ORDNANCE SURVEY DATA
- FOOTBRIDGE / STEPS
- LIFTS
- FOOTWAY ACCESS TO LIFTS
- EXTENT OF LANDTAKE (0.5m FROM STRUCTURE)

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
Description: ISSUED FOR REVIEW						
S1	P1	SB	SY	CB	CC	20/03/2020

Drawing Suitability: FOR REVIEW | Status: S1

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Client: Harrow COUNCIL LONDON

Project Title: WEALDSTONE FOOTBRIDGE

Drawing Title: PROPOSED ALIGNMENT OPTION 7

Drawing Number: HE5140544 - ATK - HGN - XX - SK - CH - 000005

Original Size: A1 | Scale: 1:200 | Project Ref. No: 0000000 | Sheet: 1 of 1 | Rev: P1

NOTES

1. PROPOSALS ARE BASED ON INITIAL HEALTH AND SAFETY REVIEW AND RECOMMENDATIONS. A FURTHER HEALTH AND SAFETY REVIEW SHALL BE UNDERTAKEN AS PART OF THE DESIGN DEVELOPMENT.
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4. EAVESMENT REQUIREMENTS FOR FOUNDATIONS AND MAINTENANCE ACCESS REQUIREMENTS TO BE DETERMINED.

KEY

- TOPOGRAPHICAL SURVEY DATA
- ORDNANCE SURVEY DATA
- FOOTBRIDGE / STEPS
- LIFTS
- FOOTWAY ACCESS TO LIFTS
- EXTENT OF LANDTAKE (0.5m FROM STRUCTURE)

Description						
Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
Description						
Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
Description						
Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
Description: ISSUED FOR REVIEW						
Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
S1	P2	SB	SY	CB	CC	24/03/20
Description: ISSUED FOR REVIEW						
Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
S1	P1	SB	SY	CB	CC	20/03/20

Drawing Suitability: FOR REVIEW — Status: S1

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Client: Harrow COUNCIL LONDON

Project Title: WEALDSTONE FOOTBRIDGE

Drawing Title: PROPOSED ALIGNMENT OPTION 8

Drawing Number: Project HE5140544 - Originator ATK - Volume HGN - Location XX - Type SK - Role CH - Number 000006

Original Size: A1 | Scale: 1:200 | Project Ref. No: 0000000 | Sheet: 1 of 1 | Rev: P2

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DO NOT SCALE

NOTES

1. PROPOSALS ARE BASED ON INITIAL HEALTH AND SAFETY REVIEW AND RECOMMENDATIONS. A FURTHER HEALTH AND SAFETY REVIEW SHALL BE UNDERTAKEN AS PART OF THE DESIGN DEVELOPMENT.
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4. EAVESMENT REQUIREMENTS FOR FOUNDATIONS AND MAINTENANCE ACCESS REQUIREMENTS TO BE DETERMINED.

KEY

- TOPOGRAPHICAL SURVEY DATA
- ORDNANCE SURVEY DATA
- FOOTBRIDGE / STEPS
- LIFTS
- FOOTWAY ACCESS TO LIFTS
- EXTENT OF LANDTAKE (0.5m FROM STRUCTURE)

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
Description:						
Description:						
Description:						
Description: ISSUED FOR REVIEW						
S1	P2	SB	SY	PF	CC	18/05/20
Description: ISSUED FOR REVIEW						
S1	P1	SB	SY	PF	CC	30/04/20

Drawing Suitability: FOR REVIEW
Status: S1

Project Title: WEALDSTONE FOOTBRIDGE

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Drawing Title: PROPOSED ALIGNMENT OPTION 9

Client: Harrow COUNCIL LONDON

Drawing Number: Project HE5140544 - Originator ATK - Volume HGN - Location XX - Type SK - Role CH - Number 000008

Original Size: A1 | Scale: 1:200 | Project Ref. No: 0000000 | Sheet: 1 of 1 | Rev: P2

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Millimetres

DO NOT SCALE

NOTES

1. PROPOSALS ARE BASED ON INITIAL HEALTH AND SAFETY REVIEW AND RECOMMENDATIONS. A FURTHER HEALTH AND SAFETY REVIEW SHALL BE UNDERTAKEN AS PART OF THE DESIGN DEVELOPMENT.
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3. EAVESMENT REQUIREMENTS FOR FOUNDATIONS AND MAINTENANCE ACCESS REQUIREMENTS TO BE DETERMINED.

KEY

- TOPOGRAPHICAL SURVEY DATA
- ORDNANCE SURVEY DATA
- FOOTBRIDGE / STEPS
- EXTENT OF LANDTAKE (0.5m FROM STRUCTURE)

Status	Revision	Drawn	Checked	Reviewed	Authorised	Issue Date
Description: ISSUED FOR REVIEW						
S1	P2	SB	SY	PF	CC	18/05/20
Description: ISSUED FOR REVIEW						
S1	P1	SB	SY	PF	CC	30/04/20

Drawing Suitability: FOR REVIEW
Status: S1

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Client: Harrow COUNCIL LONDON

Project Title: WEALDSTONE FOOTBRIDGE

Drawing Title: PROPOSED ALIGNMENT OPTION 10

Drawing Number: HE5140544 - ATK - HGN - XX - SK - CH - 000009

Original Size: A1 | Scale: 1:200 | Project Ref. No: 0000000 | Sheet: 1 of 1 | Rev: P2

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