

CHRIS FORD – APPENDICES TO PROOF OF EVIDENCE

The Network Rail (Old Oak Common Great Western Mainline Track Access) Order

Appendices to Proof of Evidence

CONTENTS

CF1 – Old Oak Common Lineside Logistics Compound Strategy (1152270-NWR-STR-DEL-000001 P01 issue 20220720)

CF2 – Best Practice Design Guide for Network Rail Infrastructure Access Points (CS075481)

CF1

Access Points at Old Oak Common Station

Document Number: 152270-NWR-STR-DEL-000001

Version: P01



Western
Route

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1. Introduction

The proposed HS2 station on the site of the historic Old Oak Common (OOC) depot removes two access points for Road Rail Vehicles and one pedestrian access. The project also introduces a significant volume of assets which will be critical for Crossrail service, GWML service and operation of the station going forwards. Suitable and sufficient access has been identified as a requirement and needs consideration at an early stage to ensure enough space is provided.

This document only considers the final state. Interim access will need to be provided during construction stages which will need be agreed elsewhere in line with the AMP.

Relevant requirements below:

Requirement ID	Req't Source	Requirement	Owner	Req't Type	Priority	Acceptance Criteria	Rationale
RR-COCS-61	NR Sponsor	Safe access shall be provided as far as reasonably practicable to new, changed and renewed assets such that they can be readily maintained without disruption to the operational railway. Existing access shall be maintained, where practicable, or a suitable replacement access arrangement shall be identified and agreed. The Project shall undertake an appropriate risk assessment, with mitigations and a communication record, to identify where additional PPE or access equipment to undertake maintenance is necessary. This shall be incorporated into and accepted through the Health and safety file / Operations and Maintenance documents.	Client Rep (NR Sponsor) PDR (NR DPE) Contract or's Engineering Manager [CEM]	CSM-RA; CDM; (PIED/ SdD); Performance	High	NR agreed Maintenance Strategy. Design General arrangement or local arrangement drawing showing location of equipment to be maintained and the safe access to it. Health and safety file accepted. Operations and Maintenance documents accepted.	The location of the project is strategically critical to the operation and performance of the GWML (GWR), Elizabeth Line (Crossrail), Heathrow Express services, with higher than the national performance targets and significantly restricted maintenance access.

Requirement ID	Req't Source	Requirement	Owner	Req't Type	Priority	Acceptance Criteria	Rationale
RR-COCS-83	NR Sponsor	The project shall undertake Reliability, Availability and Maintenance analysis to demonstrate the project's ability to meet client and route reliability and performance requirements. The project shall ensure that scheme design, component construction and maintenance access meet the required service and performance levels. The project team shall ensure that any new assets which are designed and installed as part of this project meet the reliability targets set out in Section 3.3. The project team shall ensure that new assets can be maintained / monitored from a position of safety, without the requirement for a line blockage, OHLE isolation or working at height.	NR Sponsor; DRAM; Local Maintenance Delivery Unit(s)	CDM; CSM-RA and Performance	High	Design Submissions and associated Maintenance Strategy for the OOC GWML station, for acceptance, shall confirm access for maintenance is protected, including evidence of engagement with Route and Local Maintenance and NR station facilities (i.e. from Reading station) teams as appropriate. Acceptance of new assets by the route at project hand back.	Lessons learnt from other NR major station locations highlight how maintenance and operations of stations is poorly considered during design development, leading to safety and escalation cost issues.

Requirement ID	Req't Source	Requirement	Owner	Req't Type	Priority	Acceptance Criteria	Rationale
RR-COCS-86	NR Sponsor; HS2-RQM-00000152	24 hour Access to the lineside and operational infrastructure for local NR Maintenance and Ops organisations shall be provided during all stages of construction. The project shall not adversely affect NR's ability to physically access Network Rail Infrastructure.	DRAM; Local Maintenance Delivery Unit(s)	Safety and Performance	High	Construction phasing plan, Maintenance Strategy.	

Requirement ID	Req't Source	Requirement	Owner	Req't Type	Priority	Acceptance Criteria	Rationale
RR- OOC- 89	CR- OOC- 0050	Lineside access points for classic infrastructure, both vehicular and pedestrian (with steps where necessary) shall be retained or replaced with a suitable alternative (matching all existing facilities from the replaced access as a minimum) that is agreed with NR. New, revised and existing access points shall be reviewed against the Project design, recognising which access points may be used for which maintenance activities, where existing or changed maintenance possession limits are and how protection may be established, or how revised maintenance may impact on the provided Train Service Specification. All new vehicular access points shall provide hard standing parking spaces for vehicles where practicable. All new vehicular access points shall also be evaluated for potential use as Road / Rail on-track points (RRAPs) for RRVs and shall identify the potential for material and equipment access and storage, where practicable.	NR Sponsor: NR Ops: DRAM; Local Maintenance Delivery Unit(s)	Safety and Performance	High	Design submission and maintenance strategy for acceptance, shall demonstrate adequate access points are provided, whether temporary or permanent, for future inspection, examination and maintenance, including site safety arrangements and asset changes with any special needs or features. The location of any new access point shall be agreed with the local MDU. NR Project team shall coordinate with HS2.	Maintenance Strategy (GRIP deliverable) and requested by the Senior Maintenance Interface Manager as part of the AMP process. If there is any requirement to increase the maintenance access points beyond the current number this shall be agreed with HS2 Ltd through the change control procedure. NR/L2/RMVP/0200 applies Note, NR currently has another project evaluating lineside access arrangements in the Paddington – Reading (P2R) area, which shall be included as an interfacing Project.

2. Logistics compound and RRAP sizing requirements

A logistics compound will need to be provided at all new access points on the relief lines. An example of a 'good' compound is 'North Pole' access at Barlby Road.

Requirements:

It is anticipated that this RRAP area will need to provide:

- A secure compound.
- Level access, for 5m, on the approach to the railway.
- Allow a swept envelope of "HG Rigid Vehicle" from the 1983 Standard British Design Library to access the railway.

The logistics compound will need to provide:

- Room for 8 Transit vans.
- Laydown area which is 5m wide by 35m. The laydown area should enable a 30m SG switch to be delivered and then lifted and transported to Track.
- Suitable lighting at a high level, e.g., typical streetlight.
- Should ideally be located adjacent to the RRAP as any distance between this and RRAP would interfere with productivity and have a possible impact upon rostering.

3. Relief Line Access

3.1. Access to the East

An access point is required to the East of OOC Station to allow access to the railway whilst OOC is functioning as a terminus for trains from the West.

Other RRAPS accessing the relief lines in this scenario include:

- Kensal (AGONY) – Restricted access due to depot moves which may need to continue in this situation.
- Marcon & Bus depot – Possibly restricted access due to depot moves which may need to be maintained.
- North East RRAP – Restricted to allow access onto the Up-Relief Line only.

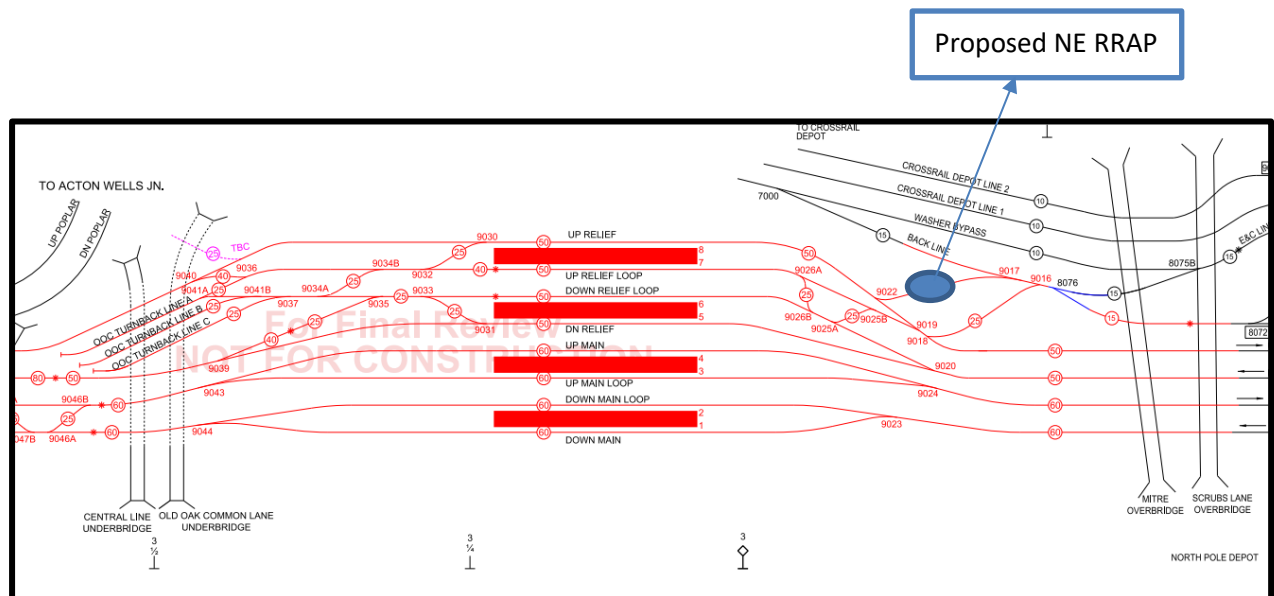


Figure 1: Proposed NE RRAP Location



It is anticipated that a RRAP should be provided due to the possible restrictions on other RRAPs available within a block between OOC and Paddington high level, and the relative ease with which this could be accommodated compared to a RRAP to the West.

The area is severely constrained due to proximity of end of platform signal and depot access. A sensible assumption for RRAP location is shown below, this restricts this report to a single option. This would only be for Platform 8 track.

3.2. Access to the West

An access point is required to the West of OOC Station, this is likely to be the most critical access point. All of these allow access to the relief lines. Most of these options offer enhanced benefit vs the Eastern access as they can be used whilst Crossrail trains turnback at OOC. This is not true for option 1B which would require the turnbacks to be taken out of use as well.

There are significant challenges to overcome for this access point regarding the Adjacent Site development, access through WSP Urban Realm design, provision of Chiltern platforms and future two tracking of the Chiltern lines.

Other RRAPS accessing the relief lines in the scenario of a block to the west of OOC (Exclusive) include:

Acton Yard – This has significant restrictions as the infrastructure is owned by a third party.

There are several pedestrian access points, via ladders, in Acton Cutting.

The access in this area, to the West of OOC Station, is exceedingly poor.

3.2.1. Option 1A - Off OOC lane Bridge into Feeder station site

A new road ramp can be placed off Old Oak Common Lane towards the north east side of the new Up Relief line. A RRAP can be placed over the Up-Relief Line and the Turnback Siding 1. There is also space for a large size compound to be placed in this area.

Risks:

- Possible complexity with Chiltern Lines reconnection.
- Complexity with interface with OOC road lowering and the raised footpath.
- Clearance of vehicles using the RRAP to structures in the area.

Result:

- This has been discounted by the road design progressed by HS2.



Figure 3: Sketch of Location of RRAP and Compound off OOC Lane Bridge

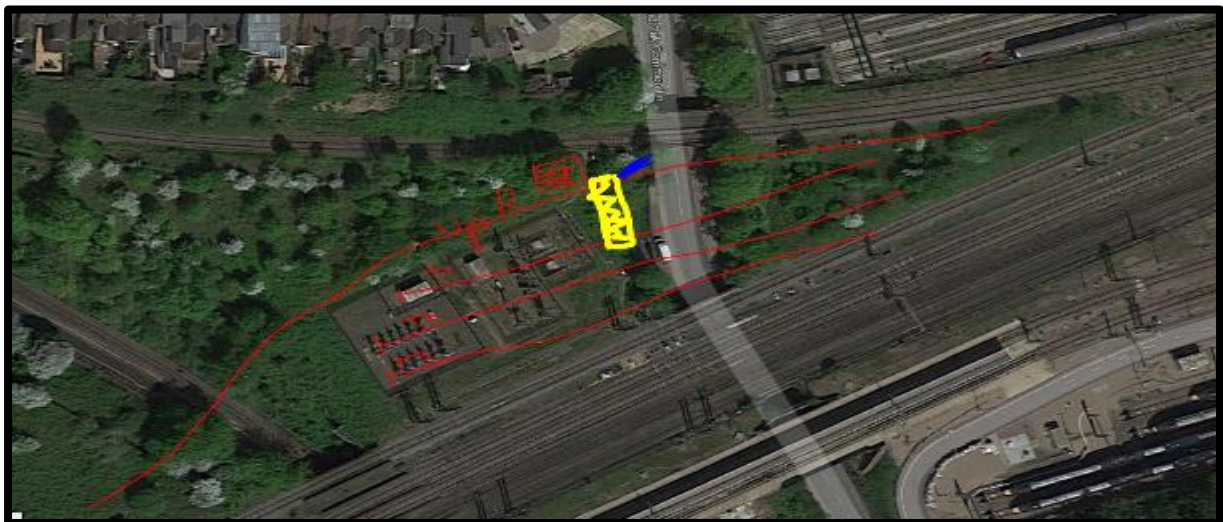


Figure 4: Satellite Photo of Location of RRAP and Compound off OOC Lane Bridge

3.2.2. Option 1B – Off OOC lane Bridge into Feeder station site – Turnback siding 3 slued North

This option is like 1A, with the slight modification to move Turnback siding 3 further north and allow for a road to be connected from OOC lane bridge between the Turnback's and the Down Relief lines. This would require the currently proposed continuous deck to have a large void.

A RRAP can then be put on the Turnback Sidings for maintenance access.

Risks:

- May be precluded due to void in bridge deck clashing with temporary slews required for construction of the station.
- Not usable if turning back trains in the turnback.

Result:

- This has been discounted by the road design progressed by HS2.



Figure 5: Location of RRAP off OOC Lane Bridge, Turnback Siding slued North

3.2.3. Option 2A – Acton East overbridge access to Relief lines

On-track vehicles can gain access off Westway A40, and through an industrial estate where a new overbridge will be built over the Up/Down Poplar lines and down into the space between the AWL and MLN1 lines. A RRAP can then be placed on the Up and Down Relief lines. There is also space here for a compound.



Figure 6: Route to Acton East Overbridge

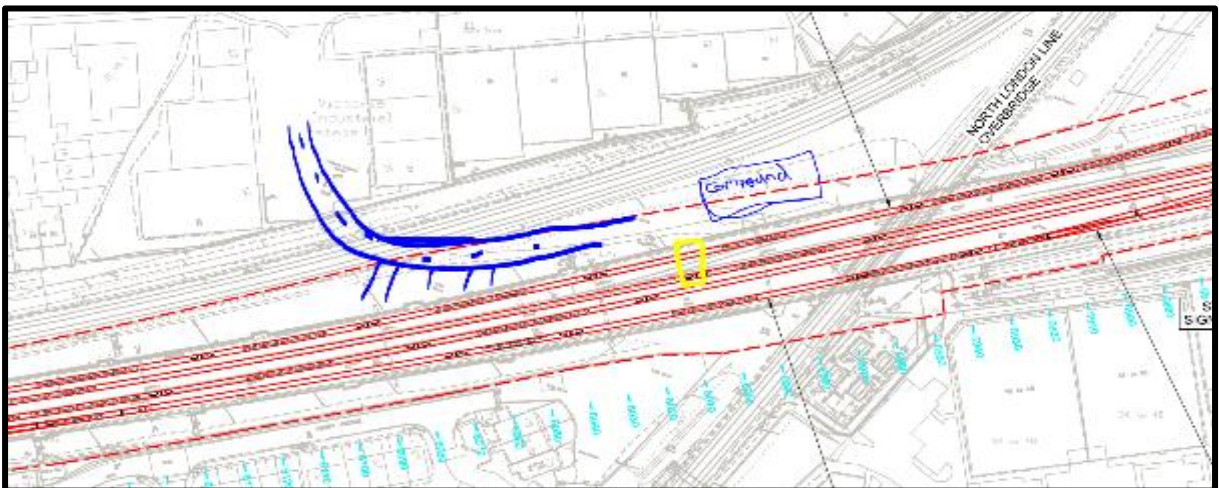


Figure 7: Acton East Overbridge to RRAP Location

Risks:

- Significant space and cost to install the bridge.
- Risks associated with another overbridge.
- Restrictions around future crossovers in Acton cutting.

Result:

- This has been discounted by the extreme level difference and insufficient space to resolve.

3.2.4. Option 2B – RRAP over Poplar Lines and Relief Lines

This option is like option 2A, but rather than an Overbridge, 2 RRAPs are installed. One on the Poplar lines and the other on the Up/DN Relief lines. Still space for a compound.

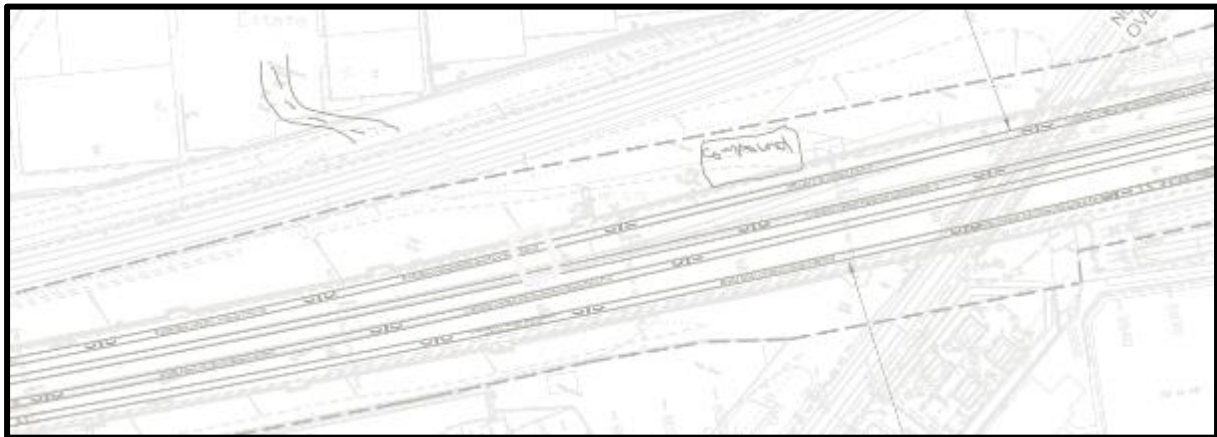


Figure 8: RRAP over Poplar and Relief Lines

Risks:

- The North London Line Bridge is in this area, so structural clearances will need to be checked against all the RRV vehicles that will use the RRAP.
- Clearance between RRV's and line side structures.
- Using the RRAP means the Poplars can't be used whilst the Reliefs are in possession. Prior agreement will have to be made with the TOC's/FOC's to use the line during relief line possession to west of GWML station. How frequently are the Poplar lines used?
- The AWL Poplar Lines are handed back early, at 0100 on Monday to allow Freight running. This option would therefore be severely restricted.
- Restrictions around future crossovers in Acton cutting.

Result:

- This has been discounted by the extreme level difference and insufficient space to resolve.

3.2.5. Option 3A – North London Line abutment access

Access can be gained from the A40 to Victoria road, where a new road can be constructed through the field area behind Travelodge and the industrial building to the abutment of the North London Line

bridge. The new road will continue through the abutment, requiring significant modification, and carry on into the area between the North London Line Bridge and the Central Line Bridge. The Up-Relief line will be in this area, so the RRAP can be placed on the Up Relief or both the Up Relief and Turnback lines.



Figure 9: Route to North London Line Abutment RRAP Location

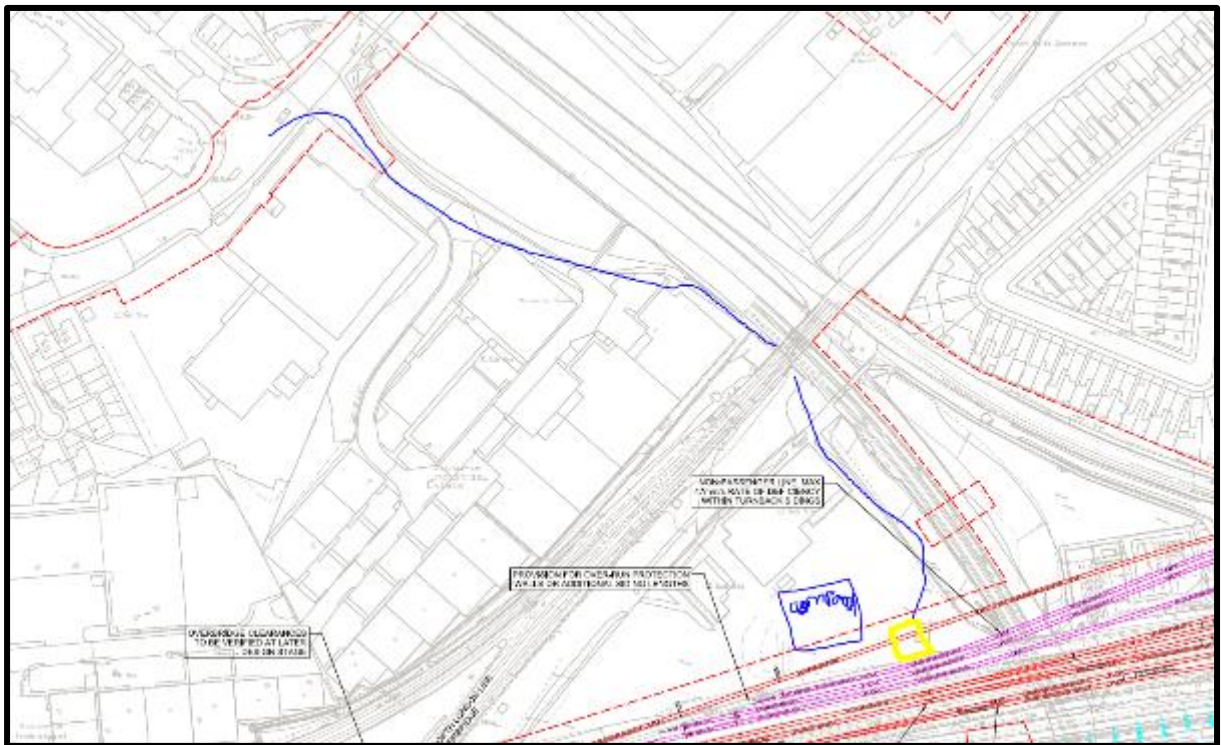


Figure 10: North London Line Abutment RRAP Location

3.2.6. Option 3B - North London Line abutment access

Like option 3A but with a new overbridge built from the South West of Central Line to North East of the Central Line, with a new road continuing South to the area between Old Oak Common Lane Bridge and the Central Line bridge. RRAP in same position as in 3A. There is space for a compound in this area.

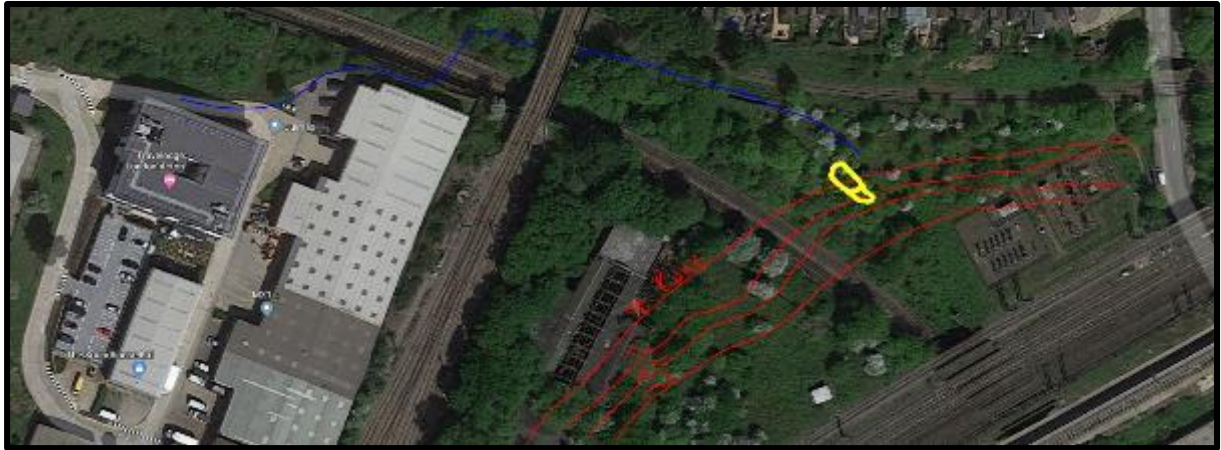


Figure 11: North London Line Abutment RRAP Location

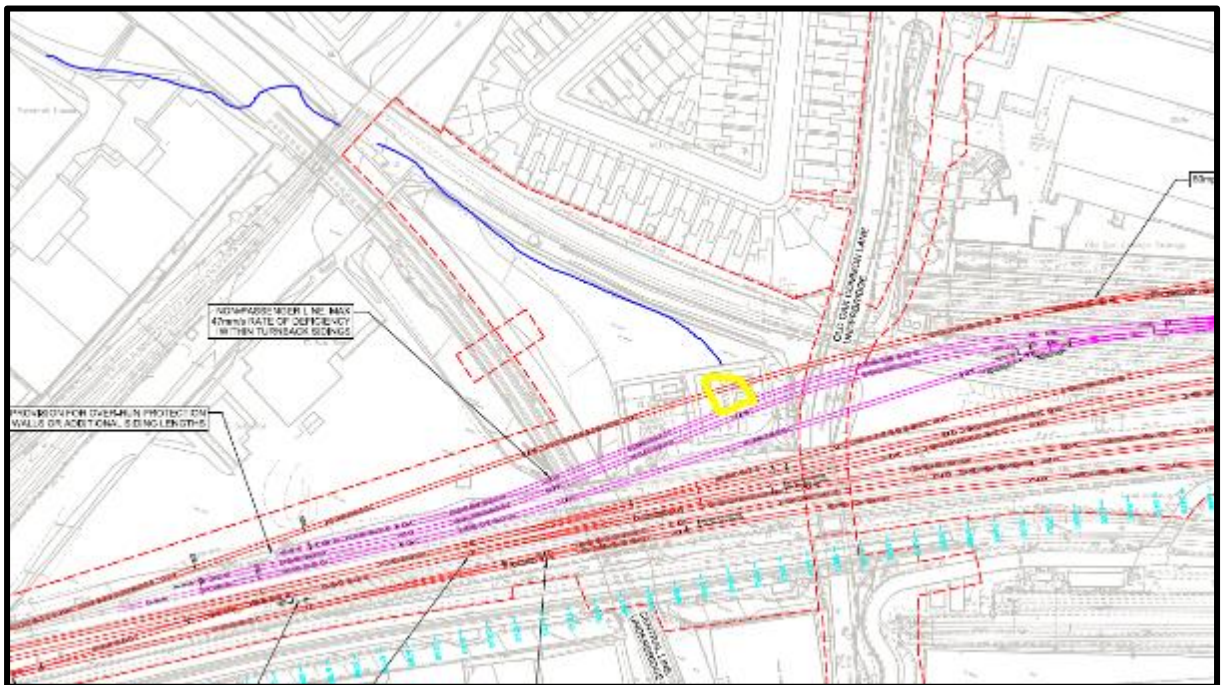


Figure 12: North London Line Abutment RRAP Location

Risks:

- Constructing a bridge over the operational Central line, adequate protection will need to be in place to ensure safety of the line is not compromised due to the works.
- Protection of the central line once the new bridge is operational.
- Clearance of RRV's going under the bridges.

General Risks/Hazards:

- New path to the station will need security from the public.

3.2.7. Option 4A – Access off Chase Lane and provision of an access Road parallel to the ANL

The Access point would be off Chase Lane which would drop down to the ANL level.

An access road would be created parallel to the ANL, crossing at some points to place it in between the Central Line and ANL. This would require a block of the ANL if operational in the future or provision of a level crossing.

This would take the access road down to the Feeder station site where a site compound could be established and a RRAP provided onto Up Relief.

Risks:

- Requires a block of the ANL or level crossing
- May preclude two tracking the ANL
- Long access road which will require future maintenance, construction, lighting?



Figure 13: Chase Lane RRAP Location

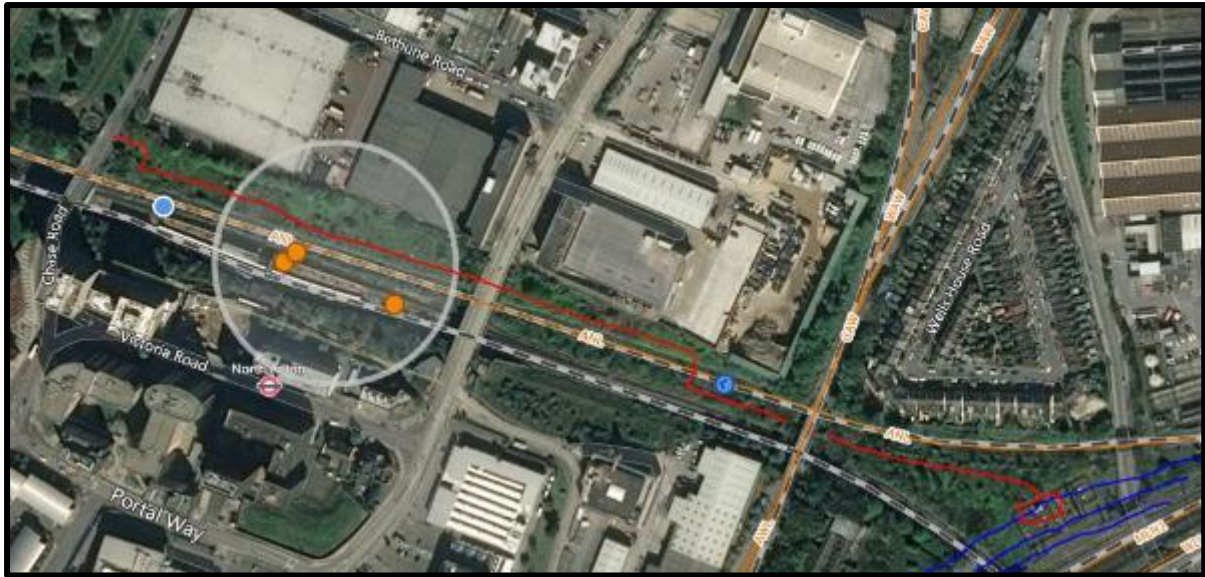


Figure 14: Chase Lane RRAP Location

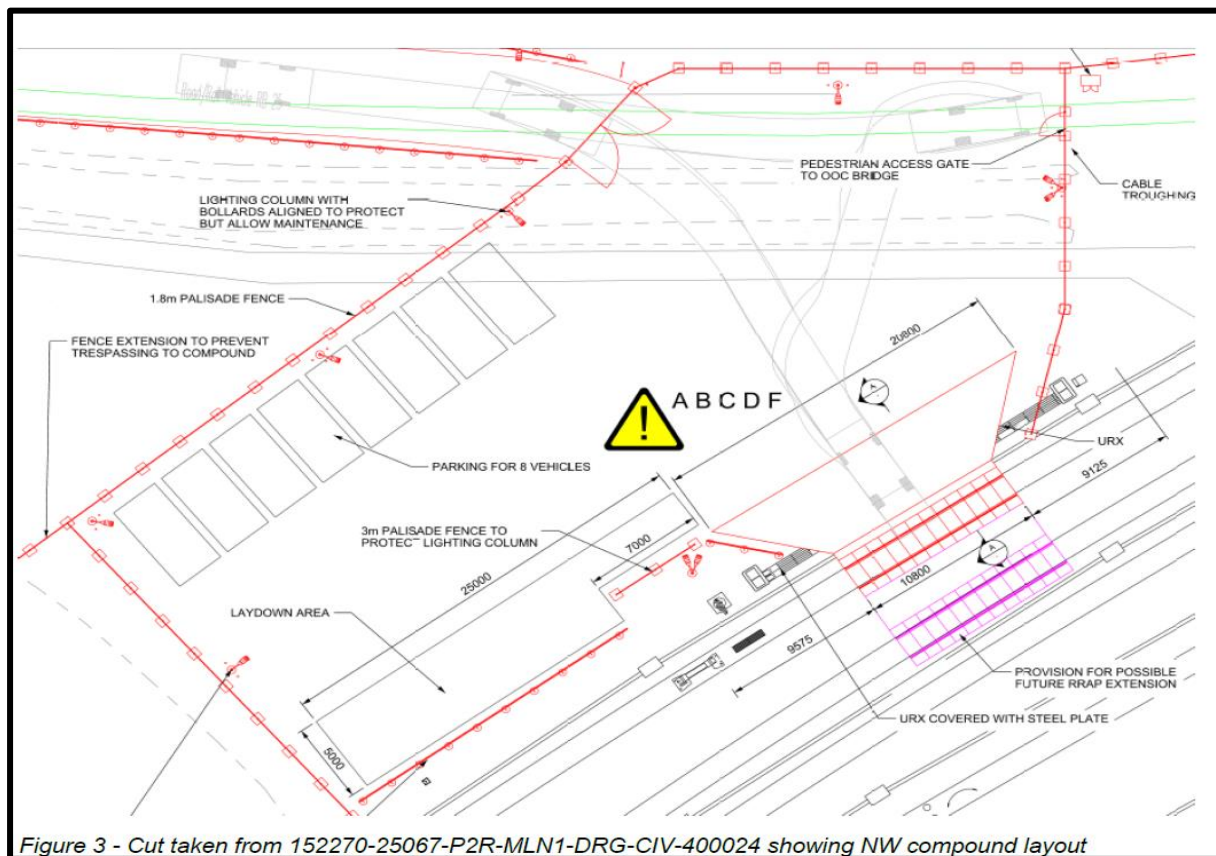


Figure 3 - Cut taken from 152270-25067-P2R-MLN1-DRG-CIV-400024 showing NW compound layout

Figure 15: Chase Lane RRAP Plan

3.2.8. Option 4B– Access off Victoria Rd and provision of an access Road parallel to the ANL

This follows the same principles as Option 4A, however the access is Via Victoria Road. This has the advantage of a shorter access road on railway land, but the disadvantage of the access being on a busier road with a greater level difference.



Figure 16: Victoria Road RRAP Location

3.2.9. Option 4C– Access from Victoria Rd Crossover Box / HS2 Maintenance Area

The access point would be from the Victoria Road Crossover Box / HS2 maintenance area.

This access point would be utilised for a range of deliveries, specifically those of the ATFS requirements. Access to this point from the main A40 route not impaired by weight or height restrictions.

The inclusions of the vehicle movements required to deliver the railway systems project into the HS2 traffic management plan will be necessary to ensure an integrated approach to deliveries is achieved. This will prevent an excess of vehicular traffic using the local road network.



Figure 17: Victoria Road Site Access Route

Crossover Box / HS2 Maintenance Area

3.2.10. Option 5

Option 5 involved access off Old Oak Common lane, through the ASD (exact location to be determined by Urban Realm Designer). A rough sketch of this is shown below. 5A, 5B and 5C are then options which have the same access to the rail corridor but different locations for the RRAP and possible Logistics compound.

Result:

- Non-preferred due to security issues associated with the station and preclusion of future Chiltern Line platform.

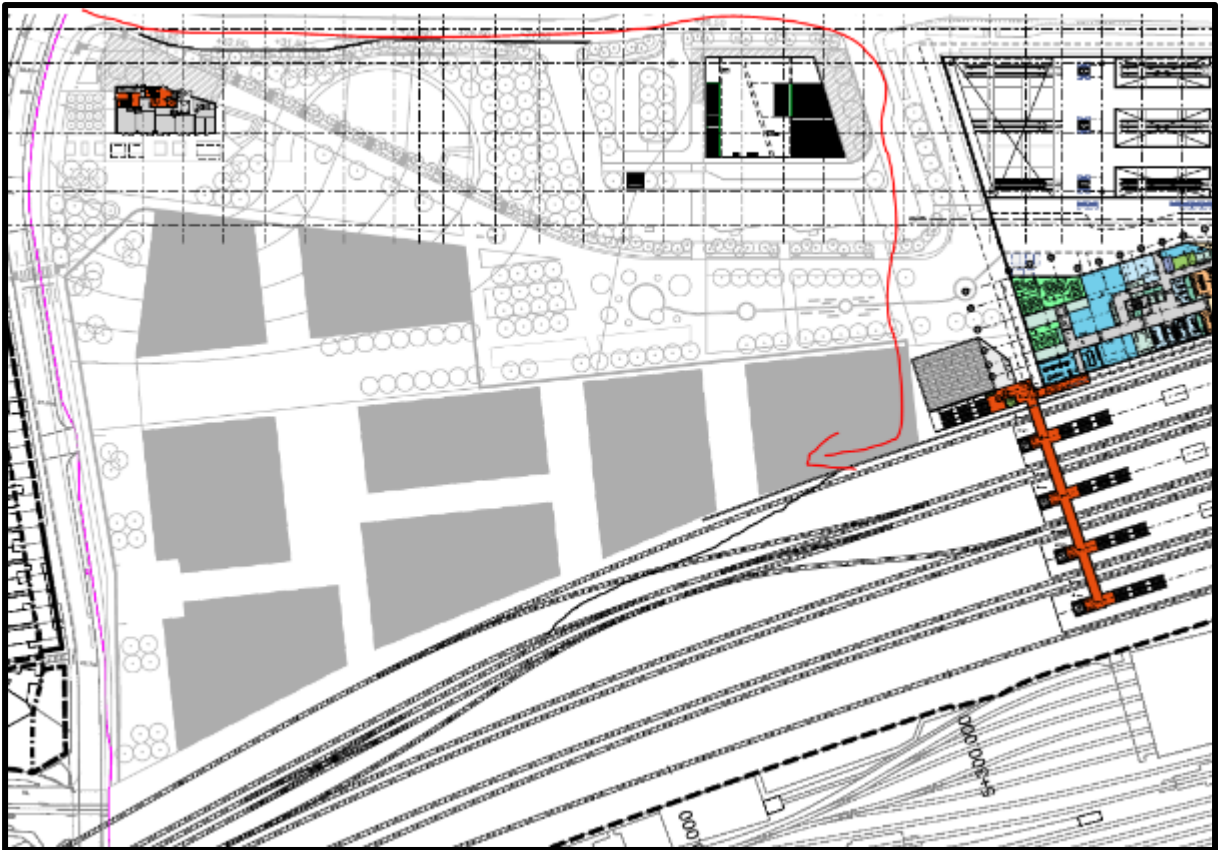


Figure 18: Route 1 to ASD RRAP

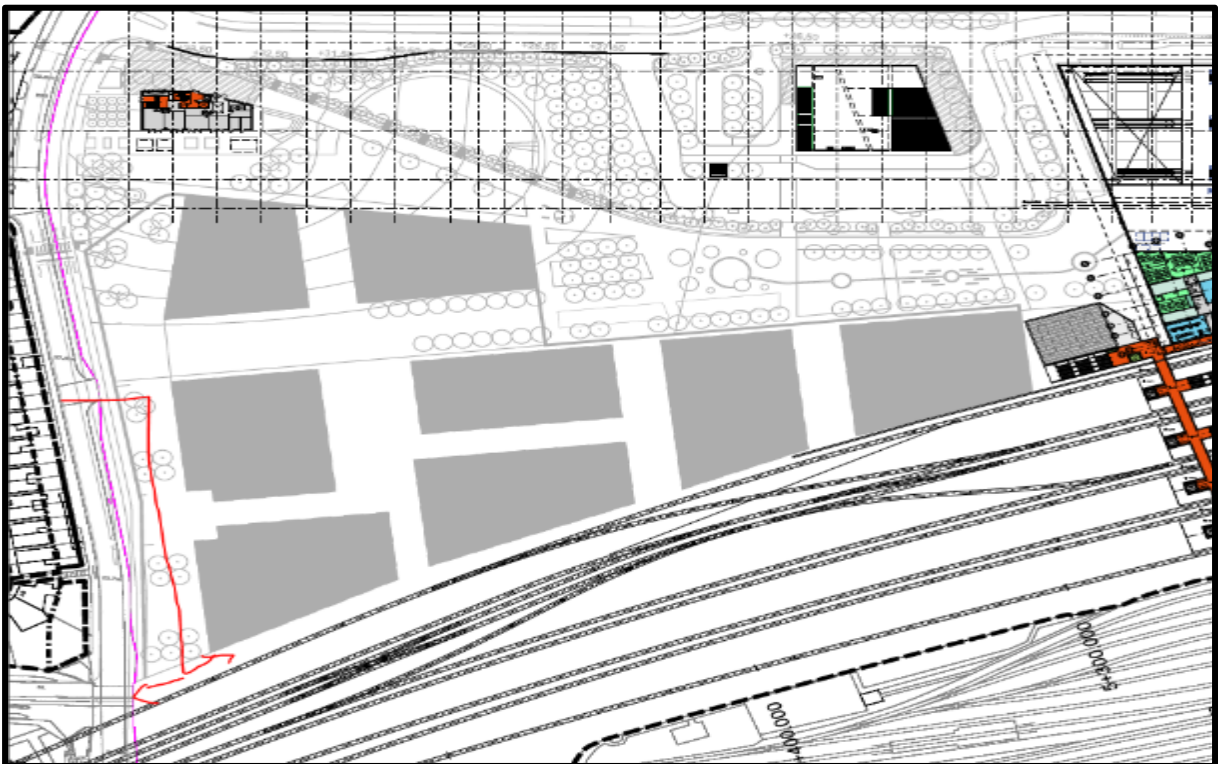


Figure 19: Route 2 to ASD RRAP

3.2.10.1. Option 5A – RRAP in ‘Guts’ of Scissors

RRAP to be provided on the Up Relief in the guts of the scissors.

Risk:

- Possibly hard to isolate and may be issues with possession limits, unless signalling controls can be introduced.
- This will complicate the Chiltern connection and would require a block of ANL to access.

Result:

- Non-preferred due to security issues associated with the station and preclusion of future Chiltern Line platform.

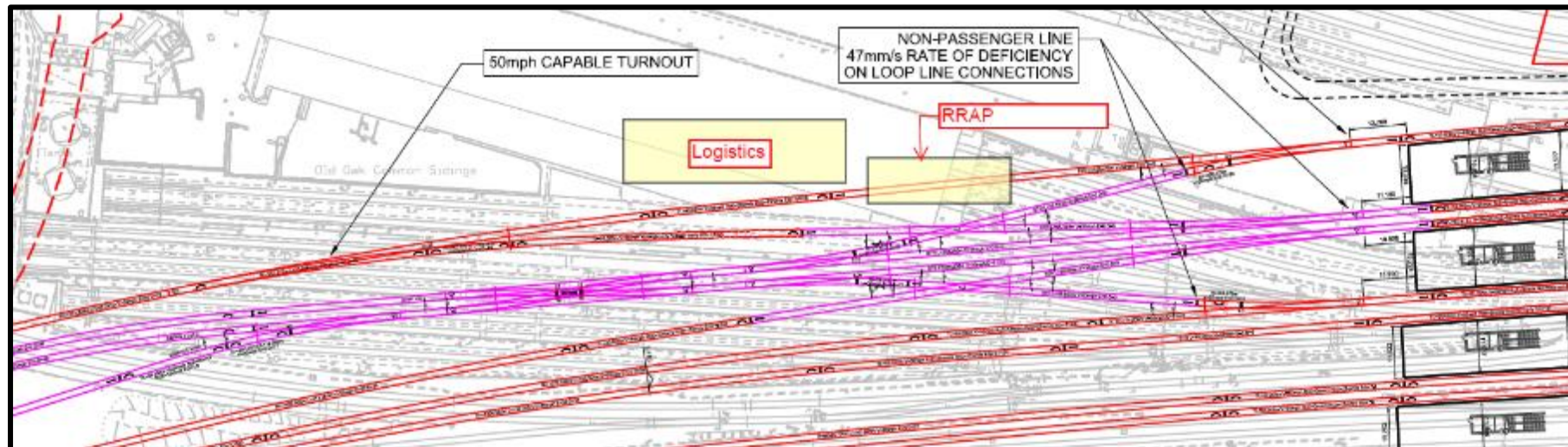


Figure 20: RRAP in Scissors

3.2.10.2. Option 5B – RRAP to Country of Up Relief to Platform 7 turnout

RRAP to be provided to the country of the turnout connecting the Up Relief to Platform 7. This offers an easier and more useful location for the RRAP compared to Option 5A.

Risk:

- Possible clash with UTX chambers and interface with OOC Lane.
- Longer distance for access to be provided through ASD.
- This would likely preclude or complicate the Chiltern Platforms. Block of ANL would be required for access.

Result:

- Non-preferred due to security issues associated with the station and preclusion of future Chiltern Line platform.



Figure 21: RRAP to Country of Up Relief to Platform 7

3.2.10.3. Option 5C – RRAP in Feeder station site, with access across OOC Ln bridge.

OOC Lane bridge would need to be widened to allow vehicular access to the North of the Up Relief. The RRAP and logistics compound would then be in the Feeder Station site.

Risk:

- This would likely preclude Chiltern platforms or at minimum require a block of ANL for access.

Result:

- Non-preferred due to security issues associated with the station and preclusion of future Chiltern Line platform.

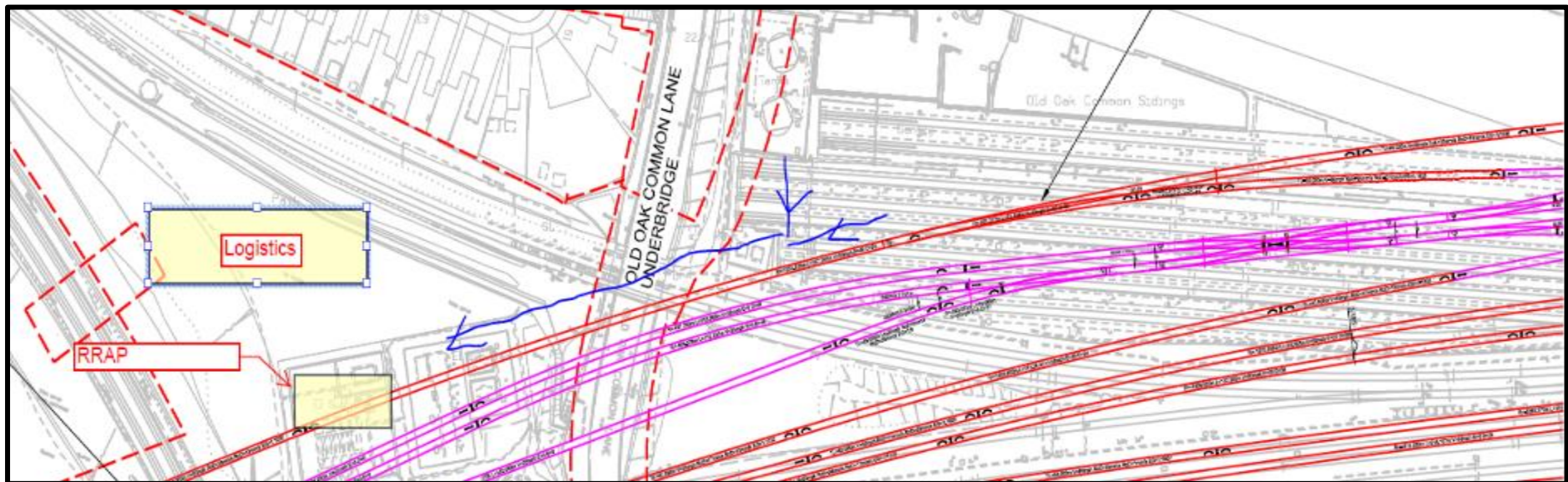


Figure 22: RRAP in Feeder Station Site

3.2.11. Option 6

Option 6 is based around accessing the rail corridor via the proposed Utilities UTX diversion chambers and associated embankments.

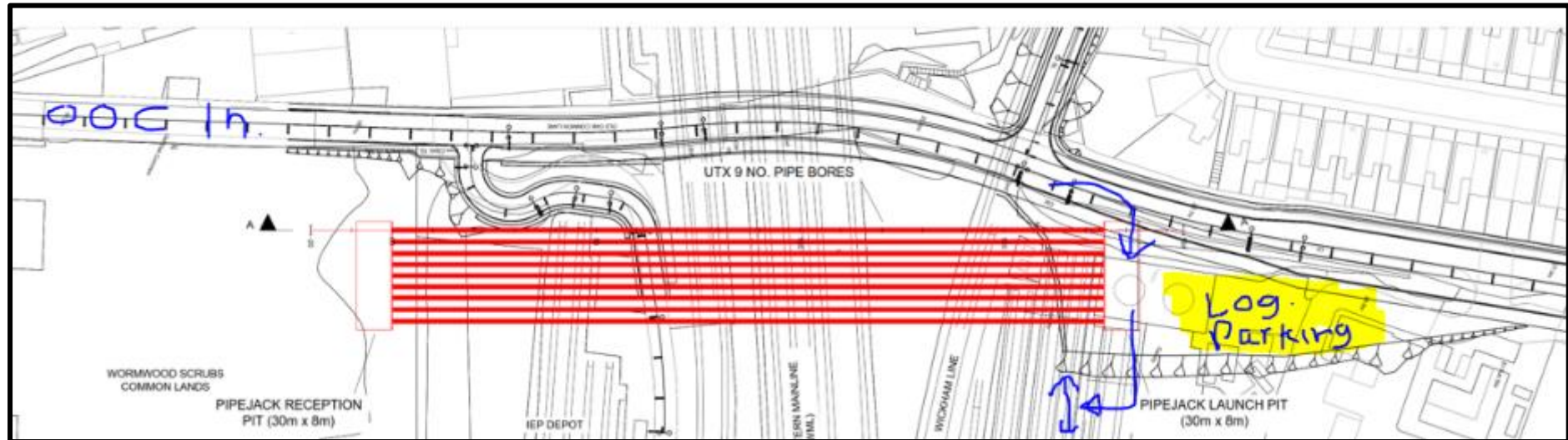


Figure 23: RRAP through proposed UTX Diversion

The level area adjacent to the UTX chamber could be used for parking and logistics.

6A, 6B and 6C are as per Option 5A, 5B and 5C above in terms of RRAP location.

Risk:

- All options pose serious constraints on Chiltern connection / platform and would require a block of the ANL line to access.
- Consideration of the grade of embankment would need to be considered.

3.3. Relief Lines recommendation

The proposed location for the Eastern Access should be provided to HS2 Ltd to assess the impact on their urban realm and box construction. This could be significant.

The proposed locations for the Western access should be assessed for feasibility and processed in line with iELC. The Western access has a possible significant interface with the proposed operational concept if the turnback lines are planned to be in use whilst there is a relief line block to the West of the station which may preclude some options.

It is advised that OOC Station is treated as a pedestrian access to the mainlines for inspections and fault response. Logistics and storage should be provided in the wide ways off the ends of platforms. Access should be via end of platform bridges and suitable stairs / ramps off the ends of the platforms. Signalling Lock Out Devices should be provided. Parking space for 2 Transit vans should be allowed for a suitable distance away from the End of Platform bridges to enable transportation of heavy maintenance kit, ideally via the lifts / stairs provided for emergency escape in the Cess of the Up Relief, outside the fence line. This will prove invaluable on mid-week nights.

Note: The Relief lines will be functional after 2023, so opportunities to install these solutions in advance would be beneficial.

Option	Does HS2 Project have the land to install the mitigation	Does HS2 have the powers to install the mitigation	Who is best placed to design (off track)	Who is best placed to install (Off track)
East	TBC – Yes?	Yes	HS2 Ltd	HS2 Ltd
West 1A	Yes	Yes	HS2 Ltd and NR	HS2 Ltd and NR
West 1B	Yes	Yes	HS2 Ltd and NR	HS2 Ltd and NR
West 2A	No – Third party agreements outside of project area	No	NR	NR
West 2B	No – Third party agreements outside of project area	No	NR	NR
West 3A	No – Third party agreements outside of project area	No	NR	NR
West 3B	No – Third party agreements outside of project area	No	NR	NR
West 4A	No – Third party agreements	Yes	NR	NR

	outside of project area			
West 4B	No – Third party agreements outside of project area	Yes	NR	NR
West 5A	Yes	Yes	HS2 Ltd	HS2 Ltd
West 5B	Yes	Yes	HS2 Ltd	HS2 Ltd
West 5C	Yes	Yes	HS2 Ltd	HS2 Ltd and NR
West 6A	Yes	Yes	HS2 Ltd	HS2 Ltd
West 6B	Yes	Yes	HS2 Ltd	HS2 Ltd
West 6C	Yes	Yes	HS2 Ltd	HS2 Ltd and NR

The options that are to be progressed are as follows:

- Option 4A – Access off Chase Lane and provision of an access Road parallel to the ANL
- Option 4B– Access off Victoria Rd and provision of an access Road parallel to the ANL
- Option 4C– Access from Victoria Rd Crossover Box / HS2 Maintenance Area

4. Main Line Access

The project does not affect the boundary fence adjacent to the Down Main.

The current mainline access points are shown schematically below and are unaltered as part of the project.

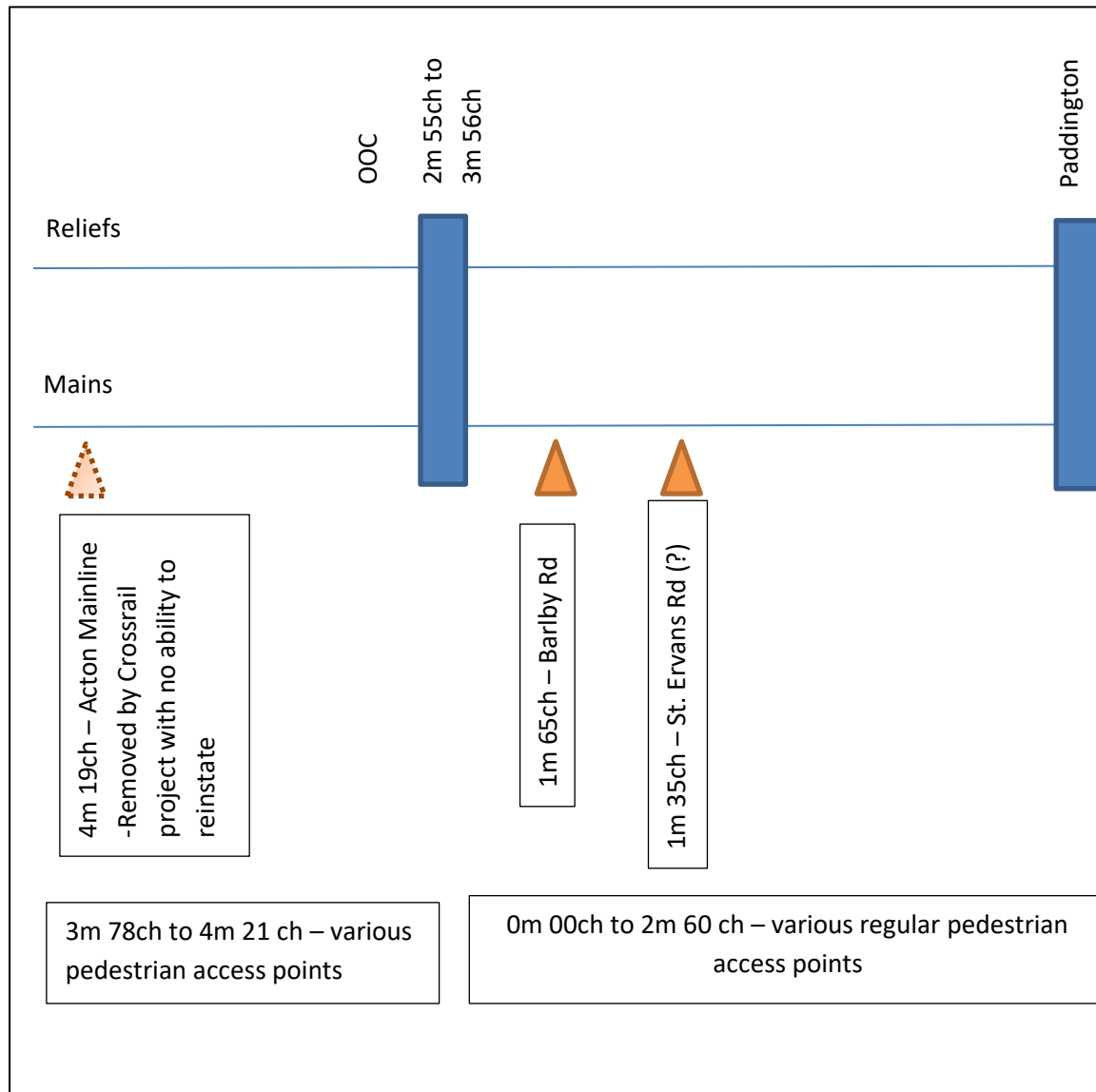


Figure 24: Schematic of Mainline Access Points

Generally, it is expected that the mainlines will only be subject to either a complete block from the West to Paddington, or a block from the West to OOC, except for North Pole depot access.

The increase in assets on the mainlines is currently proposed to be 4No. Turnouts and 2No. Crossovers with associated OLE and signalling infrastructure.

4.1. Access to the East

There is no reduction in access to the East of OOC Station.

The existing RRAP and access at Barlby road is ~90ch away from the Eastern Throat of OOC. It is therefore close enough to reach the assets. This RRAP has a large logistics area associated with it.

Barlby Rd accesses onto North Pole Line B. Due to the location hindering the access between North Pole depot and Paddington Barlby Rd has restricted access times. Mid-week access is granted on an 8- week rotation, it appears that regular Sunday access is in the EAS.

If a new RRAP could be installed to the West of Ladbroke Grove, then access to the Main Lines would be significantly improved. Any access would require negotiation with the operators of North Pole Depot. It is anticipated that an access point could be provided to the West of Mitre Bridge or to the West of the E&C line bridge if agreement could be reached with Hitachi.



Figure 25: North Pole East Access

4.2. Access to the West

4.2.1. Option 1

There was a RRAP at Acton Mainline Station which has been removed. It is currently under investigation for relocation 200 yards West at Horn Lane (Jewson Builders Yard) 4m 27ch, placing it approximately 54ch from the Western throat of OOC.

The SW RRAP will be located within a new compound adjacent to the Jewson warehouse's yard in Acton. The compound and RRAP will be accessed from Horn Lane (A4000). Vehicles accessing the new RRAP from the Horn Lane entrance to Jewson's Yard will be required to travel through the yard and around the back of the main Jewson building to reach the site.

The RRAP shall access both the Up Main and Down Main lines. The length of the RRAP in its permanent form shall be 10.8m. During the construction phase, however, the RRAP shall be 16.2m long to allow articulated RRVs, like SRS PKR750 vehicle, to access the track. The existing OLE structures and head span J/07/01 within the vicinity of the proposed RRAP will need to be moved at least 10m away from the RRAP end. The Western edge of the RRAP is to be exactly 10m from the head span structure. Based on the available data, existing troughs adjacent to the track along the Jewson's Yard boundary will need to be moved into a URX under the access to the RRAP.

The existing boundary fence needs to be modified to allow for placing a new concrete approach slab to the RRAP, and Jewson's material storage adjacent to the track will need to be removed to allow access. A sliding security gate has been proposed in front of the RRAP. However, if an access gate can be inserted where shown in Figure 27, a low height Armco barrier can be installed adjacent to the rail. This will help with lifting materials from the compound onto the track during RRV shifts. If not, the fence will need to remain at 1.8m high and removed when required, with a gate across the RRAP.

The limits are within the regular possession limits.



Figure 26: Proposed SW Jewson's RRAP

The current design adopts a two-stage approach to the RRAP, the Temporary Stage is for construction and will include a larger storage and laydown area as detailed in Figure 27. This will maximise the benefit of the access. The Permanent Stage show in Figure 28, shows a reduced compound and adjusted access gate arrangement.

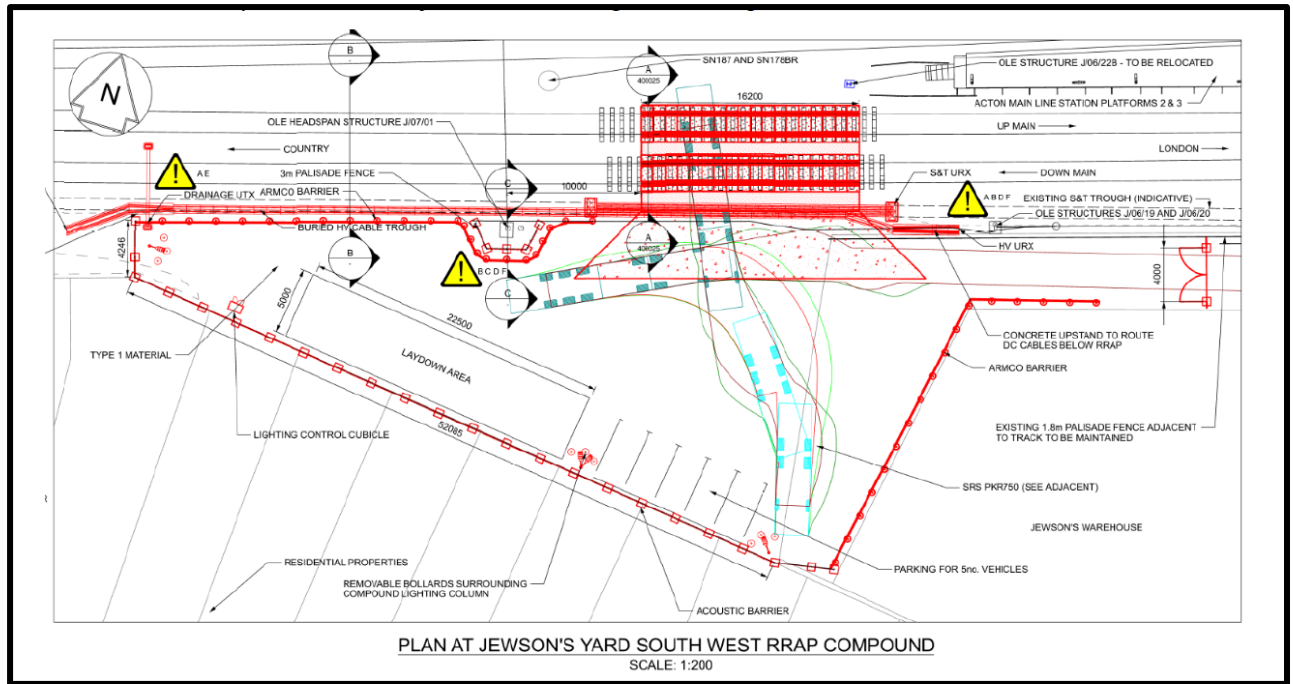


Figure 27: Temporary Stage of Jewson Acton SW RRAP

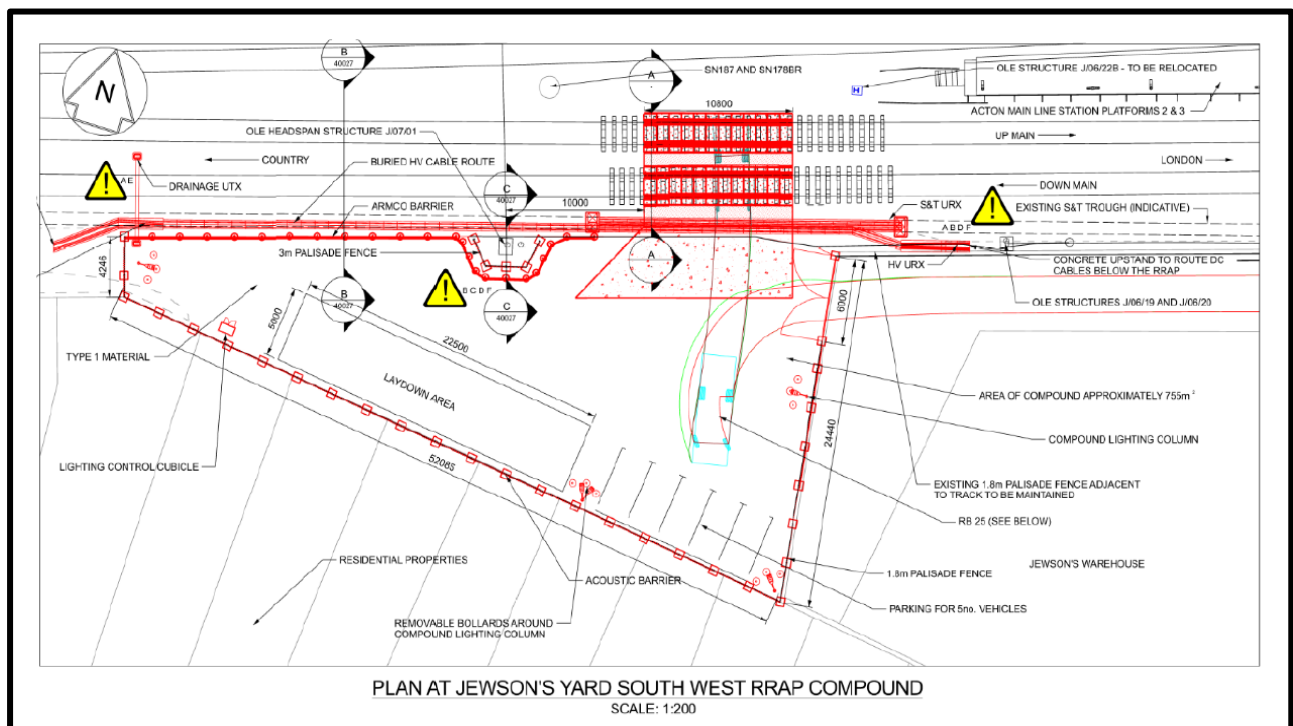


Figure 28: Permanent Stage of Jewson Acton SW RRAP

4.2.2. Option 2

An access point could be installed at North Pole depot, accessed off Old Oak Common Lane. This would require buy-in from Hitachi.

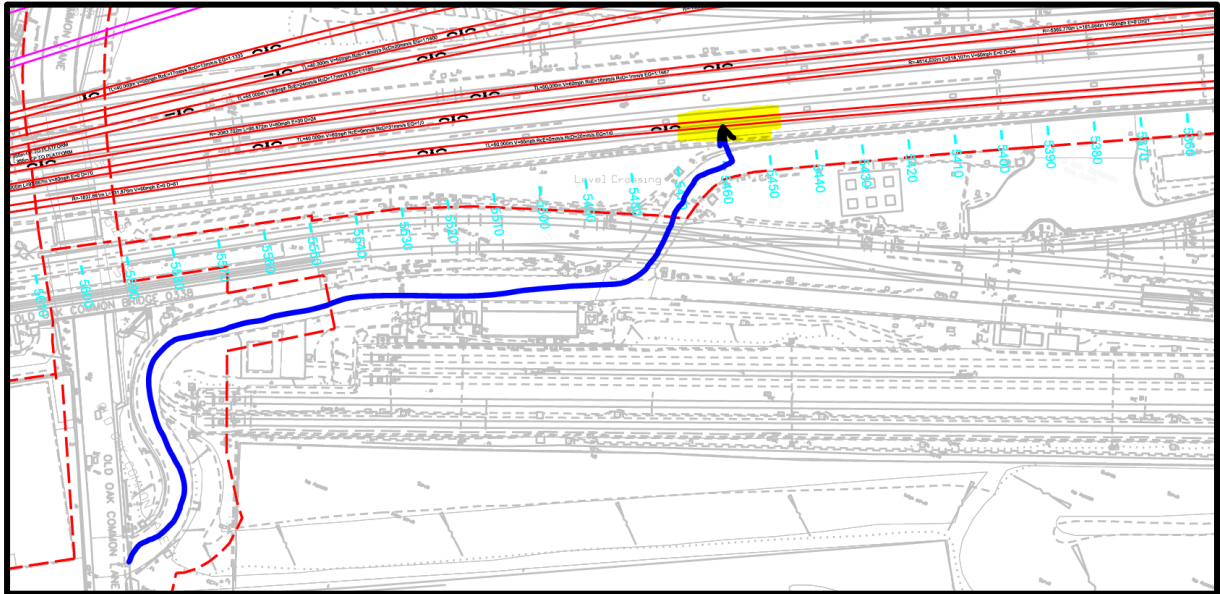


Figure 29: North Pole Depot RRAP

Risk:

- Hitachi interface
- Limited space for logistics area
- Curved approach road may limit long wheelbase deliveries
- Can the depot roads be blocked to allow traversing across the depot level crossing?

4.2.3. Other Areas

Areas from Acton West Junction to the future OOC Station have not been selected due to various reasons shown below. Options in this section are in 2.1 and 2.2.

North Pole Depot: This is the main ccess from OOC station to the North London Line. (Figure 30)



Figure 30: North Pole Depot RRAP

From North London Line to Acton Mainline: There is a significant level difference with any possibility of resolving the level difference reliant upon purchase and demolition of large numbers of residential buildings. (Figure 31)

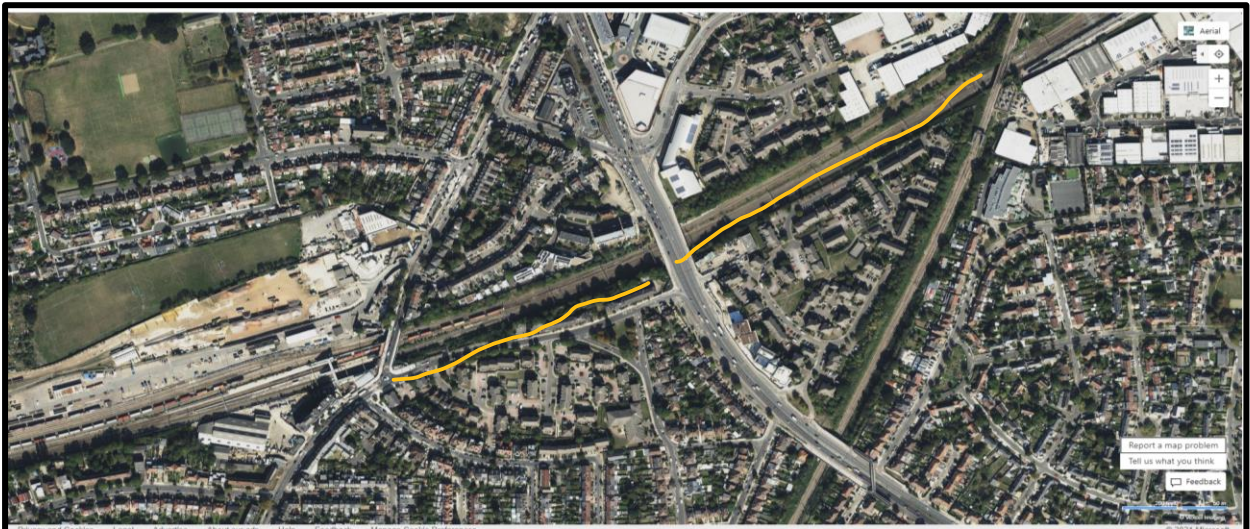


Figure 31: North London Line to Acton Mainline

Jewson to Acton West Junction: There is a large level difference with residential properties alongside. Anything further west of this is on the western side of Acton West Junction and therefore not suitable to possession regimes. (Figure 32)

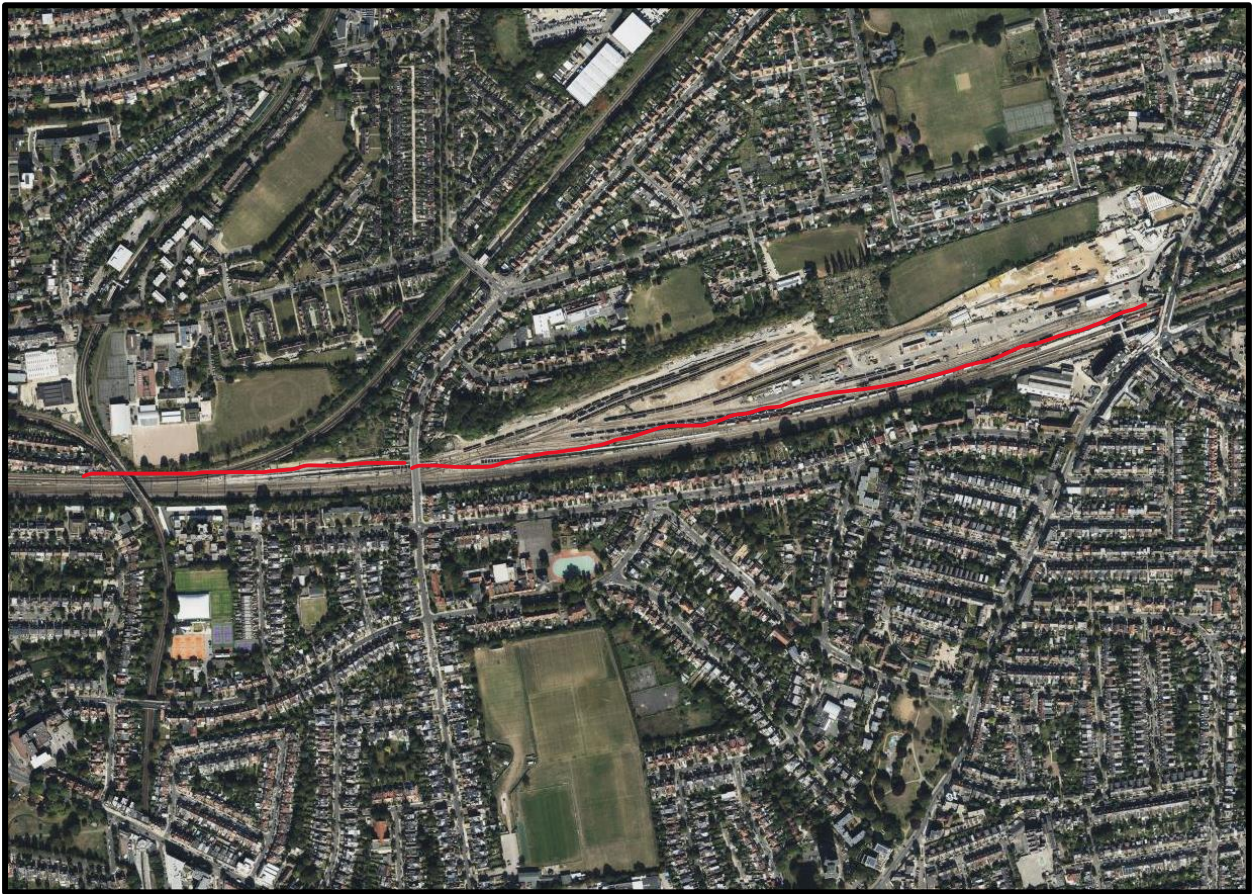


Figure 32: Jewson to Acton West Junction

4.3. Mainlines recommendation

It is assumed that most of the access opportunities will allow access from a reinstated Acton Mainline RRAP. This RRAP should be reinstated in the new location.

In the event of OOC acting as a terminus with trains turning back to and from the West Acton Mainline RRAP would not be available. In this situation Barlby Rd RRAP would need to be used. Although Barlby Road is regularly unavailable to routine mid-week access, it is likely that this would be available in any access treating OOC as a terminus from the West.

It is advised that OOC Station is treated as a pedestrian access to the mainlines for inspection and fault response. However, if the RRAPs providing access from the cess, options shown above, cannot be created a pedestrian access point with adjacent parking will be required to facilitate routine maintenance access involving heavier equipment.

Logistics and storage should be provided in the wide ways off the ends of platforms. Access should be via end of platform bridges and suitable stairs / ramps off the ends of the platforms. Signalling Lock Out Devices should be provided. Parking space for 2No. Transit vans should be allowed for a suitable distance away from the End of Platform bridges to enable transportation of heavy maintenance kit, ideally via the lifts / stairs provided for emergency escape in the Cess of the Up Relief, outside the fence line. This will prove invaluable on mid-week nights.

CF2

Network Rail Infrastructure Access Points

Best Practice Design Guide

Network Rail Ltd

CS075481



Quality Management

Job No	CS075481	Doc No.	BPDG/1.0
Title	Network Rail Infrastructure Access Points – Best Practice Design Guide		
Client	Network Rail		
File reference	X:\075481 - Network Rail Access Points		
Date	March 2015		
Prepared by	S Chambers	Signature (for file)	
Checked by	L Carr	Signature (for file)	
Authorised by	J Sheridan	Signature (for file)	

Change Control

Issue No	Description	Originator	Issue date
1.0	Issued for approval	S. Chambers	08/05/2015

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Appendix A	– Access Point Categorisation Table
Appendix B	– Access Point Generic Layouts
Appendix C	– Standard Details
Appendix D	– Specifications & Product Literature

1. Introduction

1.1 Appointment

- 1.1.1 Capita Property and Infrastructure Ltd (“Capita”) was commissioned by Network Rail (Ltd) to undertake a Best Practice Design Guide for the Infrastructure Access Points project.

1.2 Background

- 1.3 Access points on the infrastructure vary enormously depending upon line category, purpose and location (urban / suburban). The vast majority of Network Rail's access points have not been formally designed, rather they have evolved over a century and a half with predominantly only manual maintenance. Historically, health and safety was not at the forefront and the interface between railway maintenance vehicles, plant delivery, trains and pedestrians has not been a priority.
- 1.3.1 With the emphasis changing towards mechanised maintenance using heavy Road Rail Vehicle (RRV) machines, specialist RRVs for transporting personnel and heavy materials directly from maintenance depots to worksites, a need has arisen to standardise access points starting with those capable of Heavy Goods Vehicles (HGVs) delivery of plant and materials. Newly designed access points must retain the capacity to enable traditional style maintenance and renewal techniques whilst providing provision for modern vehicles and practices.
- 1.3.2 This Best Practice Design Guide specifies what is considered ‘Best Practice’ for the design of access points with the capability for HGV deliveries and for on and off-tracking heavy RRVs by means of a Road Rail Access Point (RRAP).
- 1.3.3 For detailed information on sustainable solutions this Design Guide should be read in conjunction with the following document:
- LNW Access Improvements Sustainability Appraisal by Capita on behalf of Network Rail Ltd. Reference CS/068368/SA/1.00. March 2014.

- 1.3.4 The sustainability appraisal identifies which of the design solutions for the LNW Access Improvement project provide the lowest whole life costs whilst also being the most sustainable, over a 25 year design life. The access point components considered are; steps, handrails, gates/fences, footway edgings, footway fill, rolled stone road, asphalt road, concrete road, and kerbs.
- 1.3.5 The proposed infrastructure will have a design life of 25 years, unless stated otherwise:
- Modular Buildings: 25 years
 - Palisade Fence & Gates: 25 years
 - Steel/GRP tread staircase: 50+ years
 - Electronic equipment and devices: 10-15 years
 - Lighting Installation (column mounted): 20-25 years
 - Electrical installation including wiring distribution boards and accessories: 25–30 years

1.4 Objectives

- 1.4.1 The purpose of the best practice guide is to identify the relevant design criteria for Network Rail RRV Access Points, which provide the required level of facilities defined by the categorisation of the Access Point.
- 1.4.2 In order to determine the relevant design criteria, the category of Access Point will be defined (e.g. from pedestrian to heavy plant), along with the minimum requirements for each. A classification matrix is included in Appendix A.
- 1.4.3 This guidance will apply the principles agreed with Network Rail to facilitate an approved design for delivery and implementation of New or Refurbished Road Rail Access Points nationwide on Network Rail's infrastructure.
- 1.4.4 It will also provide developers, contractors, suppliers, designers and key stakeholders with a consistent approach and direction on Network Rail's requirements for these facilities.

1.5 Abbreviations & Definitions

- 1.5.1 The table below provides abbreviations for terms used in this document:

Table 1 - Abbreviations & Terms

3rd Rail	Third Rail
AC	Alternating Current
AFC	Approved for Construction
BGS	British Geology Society

BS	British Standard
CAD	Computer Aided Design
CCTV	Closed-Circuit Television
CEM	Contractors Engineering Manager
CEN	European Committee for Standardisation – based in Brussels and complements CENELEC
CIP	Competent Independent Person
COSS	Controller of Site Safety
CR	Change Request
CRE	Contractors Responsible Engineer
DC	Direct Current
DNO	Distribution Network Operator (previously known as Regional Electricity Company – REC)
DPE	Designated Project Engineer
ELR	Engineers Line Reference
EQPT	Equipment
FRP	Fibre Reinforced Plastic
GB	Great Britain
GFRP	Glass Fibre Reinforced Plastic
GRP	Glass Reinforced Plastic
GRIP	Guide to Rail Investment Process
HABD	Hot Axle Bearing Detectors
HAZOP	HAZard and OPerability study
HGV	Heavy Goods Vehicle
HMRI	Her Majesty's Railway Inspectorate
ICE	Institution of Civil Engineers
LCC	Life Cycle Cost
LED	Light Emitting Diode
LV	Low Voltage
NR	Network Rail
OLE	Overhead Line Equipment
O&M	Operation & Maintenance
OTM	On-Track Machine
OTP	On-Track Plant
PADS	Parts and Drawing System Database
PCD	Pitch Circle Diameter
PDD	Project Definition Document
PDS	Project Design Specification
PPE	Personal Protective Equipment
PTS	Personnel Track Safety (certificate)
RAM	Route Asset Manager
REC	Regional Electricity Company
ROGS	Railways and Other Guided Transport Systems (Safety) Regulations
RRV	Road Rail Vehicle
RRAP	Road Rail Access Point
RSSB	Railway Safety and Standards Board

SA	Sustainability Assessment
SIC	Safety in Construction
SIU	Safety in Use
SPM	Scheme Project Manager
S&T	Signalling & Telecommunications
SUDS	Sustainable Urban Drainage Systems
TOC's	Train Operating Companies
WLCC	Whole Life Cycle Costing
UK	United Kingdom
URX	Under Road (Public Highway) Crossing
UTX	Under Track Crossing
V&V	Validation & Verification

1.5.2 Access Point

1.5.3 In the context of this guide, Access Point means: Area from Network Rail's boundary, including the route from the public highway, up to and including the on/off tracking point. This guide also includes pedestrian access points.

1.5.4 Cross Tracking

1.5.5 The process of transferring on-track plant from one track to another by off and on tracking.

1.5.6 RRAP (Road Rail Access Point)

1.5.7 A designated pre-planned and suitable location for on/off and cross tracking on-track plant.

1.5.8 On Tracking

1.5.9 On tracking is the process of placing on-track plant on the track.

1.5.10 Off Tracking

1.5.11 Off tracking is the process of removing on-track plant from the track

1.5.12 RRV (Road Rail Vehicles)

1.5.13 A vehicle that can travel on the ground under its own power and also travel on rail by virtue of a rail wheel system under its own power system. Such vehicles are not allowed to operate, work or travel on rail outside of possessions.

1.6 Interpretation for Sustainability and Safety Assessment Tables

1.6.1 Following the LCC, SA, SIC and SIU a weighted pointing system will be applied in order to categorize the preferred infrastructure solutions as defined below:

Weighted Pointing System

Assessment	Score	
LCC	Design solution with the lowest LCC	1
	Design solution with the second lowest LCC	2
	Design solution with the second highest LCC	3
	Design solution with the highest LCC	4
SA	Most sustainable solution	1
	Second highest sustainable solution	2
	Second to last sustainable solution	3
	Least sustainable solution	4
SIC	Design solution with the lowest safety in construction	1
	Design solution with the second lowest safety in construction	2
	Design solution with the second highest safety in construction	3
	Design solution with the highest safety in construction	4
SIU	Design solution with the lowest safety in use	1
	Design solution with the second lowest safety in use	2
	Design solution with the second highest safety in use	3
	Design solution with the highest safety in use	4
LCC + SA + SIC + SIU scores =	The design solution with the lowest points should be the preferred design solution	

2. Planning & Design Strategy

2.1 General

2.1.1 The guidance is applicable to all new & upgraded Network Rail vehicular access points. Each access point, new or upgraded will need to be assessed individually to determine categorisation.

2.1.2 Access Points can be wide ranging in terms of location, size, history, access to main road, proximity to track, proximity to residential housing etc. In order to develop a Planning & Design strategy for an access point there are a number of factors that need to be considered such as:

- Topography;
- Track geometry and infrastructure;
- Environmental issues;
- Planning;
- Land agreements;
- Geotechnical considerations;
- Social issues;
- Whole life costing.

2.2 Topography

2.2.1 Careful consideration is required of the site topography for locations of the access point to ensure a level surface of suitable size can be achieved for safe unloading of plant and materials. New and existing Network Rail access points will vary in size and layout.

2.3 Track Geometry and Infrastructure

2.3.1 Careful consideration for siting new access points is to be considered with respect to the existing track and infrastructure. The design is to take in to account all operational lineside equipment e.g. OLE, 3rd Rail, cabinets, track, gantries, signals, drainage etc.

2.4 Environmental Issues

2.4.1 The impact on the environment is to be taken into account when siting a new access point. An environmental report is recommended to investigate any potential environmental issues and risks which could arise with the new proposal.

2.5 Planning

- 2.5.1 Planning searches and consultations are recommended when siting access points. Due to the size of the access points planned, several issues could arise with the local authority such as new roads and housing developments. The local planning authority will need to be informed if existing kerb lines require modification for dropped kerbing, also access points with larger compounds and permanent buildings are to be notified.
- 2.5.2 Network Rail's Asset Protection department have dedicated teams to provide advice to the public and developers who are planning activities on or near the railway. The teams deal with a multitude of issues including neighbouring construction sites, utility works, bridge works, domestic maintenance, new road schemes, inspections and surveys, and works within the designated precautionary area of level crossings.

2.6 Land Agreements

- 2.6.1 All new access points are to be sited on Network Rail owned land. Careful consideration with respect to the lineside neighbours is necessary. A clear understanding of land ownership is required to avoid accidents with RRV plant and other 3rd party equipment within proximity of the access point / road. For example a Network Rail marlin map should be provided to indicate the location of the access point from the road / property to the rail.

2.7 Geotechnical Considerations

- 2.7.1 The existing geology of the area is to be considered during the design and when siting new access points. A Geotechnical Desktop appraisal is to be undertaken to confirm anticipated ground conditions and verify if further investigations are required. Intrusive investigations such as trial holes and boreholes will be required for roads and buildings. The appraisal will also identify if a site is at risk of flooding.

2.8 Social Issues

- 2.8.1 The majority of rail possessions for maintenance and engineering works occur during the night and at weekends. Network Rail staff and contractors are to respect the privacy, sensitivity and property of residents.
- 2.8.2 Network Rail are advised to notify local authorities and other community representatives such as Members of Parliament and local councillors for engineering works at the relevant access point and surrounding area.
- 2.8.3 Design considerations should be considered such as positioning lighting and generators away from residential properties and using silenced equipment where practicable.

2.9 Whole Life Costing

- 2.9.1 BS ISO Buildings and Constructed Assets – Service Life Planning – Part 5: Life Cycle Costing: 15686-5:2008, provides the following definitions:

Definitions	
Whole Life Costing (WLC)	This is a methodology for the systematic economic consideration of all whole life costs and benefits over a period of analysis, as defined in the agreed scope.
	An economic assessment considering all agreed projected significant and relevant cost flows over a period of analysis expressed in monetary value. The projected costs are those needed to achieve defined levels of performance, including reliability, safety and availability.

- 2.9.2 Whole life-cycle costing (WLCC) is rapidly becoming the standard method for the long-term cost appraisal of buildings and civil infrastructure projects.
- 2.9.3 With clients demanding projects that demonstrate value for money over the long term, WLCC is increasingly becoming an essential tool for those involved in the design, construction, operation and risk analysis of construction projects.
- 2.9.4 We recommend that a WLCC approach should be adopted to understand the broad parameters of any access point design in order to determine the most cost effective value solution in terms of design, quality and construction.
- 2.9.5 For example whilst a “Type 1 road surface” may be economically viable, the same approach may not be true for longer access roads so another approach e.g. Asphalt road surface with kerbing should be considered and evaluated as though the capital cost may be high this benefits from a longer life and less maintenance, and therefore a lower ‘Whole Life Cost’.

3. Categorisation Matrix

3.1 General

3.1.1 Categorisation for new and existing access points has been undertaken and separated into 5 types, from pedestrian access to large RRV access, which are discussed below.

3.1.2 Refer to Appendix A for the Categorisation Table with full list of requirements for each category.

3.2 Class 1

3.2.1 Pedestrian access point – Access gate, located in the boundary fence with padlock / slide bar. No vehicle parking, access from public highway / 3rd party land, used for access to track for patrolling.

3.3 Class 2

3.3.1 Pedestrian access point – Access gate, located in the boundary fence with padlock / slide bar. Vehicle parking for car / van available on Network Rail land, used for access to track for patrolling and light maintenance.

3.4 Class 3

3.4.1 OTP/OTM (small) RRAP consists of RRV access, 6m vehicle access gate, located in the boundary fence with padlock / slide bar, dedicated parking space for car / van along with limited storage space for materials. Used for RRV access light / maintenance works.

3.5 Class 4

3.5.1 OTP/OTM (medium) RRAP consists of RRV access, min 6m vehicle access gate & fenced compound, padlock / slide bar. Dedicated access for parking (cars / vans) / temporary accommodation / material storage / turning area for HGV and RRV.

3.6 Class 5

3.6.1 OTP/OTM (large) RRAP consists of RRV access – min 6m vehicle access gate & fenced compound, padlock / slide bar. Dedicated access for parking (cars/vans) / permanent accommodation / material storage / turning area for heavy good vehicles and rail plant / lighting / CCTV / drainage / welfare / permanent power supply.

4. Security Categorisation

4.1 General

- 4.1.1 With the risk of theft, trespass and vandalism on the railway infrastructure a review has been undertaken to categorise three anti theft levels for the access points to prevent criminal activity resulting in financial loss to Network Rail and contractors.
- 4.1.2 The level of security will be determined by a number of factors and should be confirmed during the outline design (GRIP 3) stage of development. Below are the standard security levels to be considered when designing access points:

4.2 Level 1 – Anti Trespass

- 4.2.1 Basic level of security, this would include standard Network Rail 1.8m high palisade fencing and gates to prevent access by members of the public.

4.3 Level 2 – Enhanced

- 4.3.1 Enhanced level of security, this would include same deterrents as basic level, but would also include permanent switchable lighting of compound areas.

4.4 Level 3 – High

- 4.4.1 High Security would include same deterrents as Enhanced but would also require CCTV coverage of the compound / entrance & permanent buildings. The palisade fencing and gates would also be upgraded to 'Security' (SP) as defined in BS 1722: Part 12. This will be 3.0m High Palisade fencing with anti burrow sill.

5. General Design Requirements

5.1 General

- 5.1.1 Potential solutions for the proposed infrastructure should be designed to provide safe access and operations at Road Rail Access Points. This should include but not be limited to, segregation of pedestrians / vehicles in compound areas along with consideration of the access route from the public highway to the compound.
- 5.1.2 The designer should consider emerging technology when considering each element of the design, for example LED lighting along walkways or 'StarPath' (aggregate material which stores energy (UV rays) and releases at night to provide low level glow along route).
- 5.1.3 The design scope shall identify the general design requirements including:
- Civil and structural design requirements
 - Standardisation of design
 - RRAP Layout
 - Fencing
 - Access gates – pedestrian & vehicle access
 - Vehicle barriers and railings
 - Surface treatment – access track / compound
 - Vehicle turning facilities
 - Accommodation buildings & storage facilities
 - Access of highway to access point
 - Parking
 - Signage
 - Lighting – permanent & temporary
 - CCTV
 - Power supply (permanent & temporary)
 - Drainage
 - Hand railing
 - Stairwells
 - Topography survey
 - Environmental assessment
 - Site investigation
 - Existing / historical site conditions

5.2 Civil and Structural Design Requirements

- 5.2.1 Prior to completion of any designs the Design Consultant / Designer shall make sure that they have met the requirements of NR/L2/INI/02009 Engineering Management for Projects and submitted the relevant documentation for review and acceptance as required by the standard.
- 5.2.2 The designs for the access points shall be in accordance with the requirements of NR/L2/CIV/003 Engineering Assurance of Building and Civil Engineering Works.
- 5.2.3 The civil and structural design elements of the new and existing sites shall include but not be limited to the following:
- Geotechnical assessment where applicable;
 - Duct routes and chambers;
 - Civil and structural works design; and
 - Building works design.
- 5.2.4 The Designer shall take into account any site specific design requirements captured on the Pre-Construction Information Pack provided by NR.
- 5.2.5 The checking of all access point designs shall be in accordance with the check category as described in NR/L2/CIV/003 and documentation referred to therein.
- 5.2.6 Generic access point layouts are provided in Appendix B.

5.3 Standardisation of Design

- 5.3.1 The infrastructure required to create access points provides an ideal scenario for standardising design and selection of components. A set of standard details has been included in Appendix C of this guide. These should be considered for use on all sites where appropriate.
- 5.3.2 Sustainable design solutions are also to be considered e.g. Truckpave and GRP/FRP products. For details refer to LNW Access Improvements Sustainability Appraisal (2014). The document contains information, regarding access steps, handrails, roads and kerbing etc.
- 5.3.3 Standardisation will provide several benefits for the design / construction of access points:
- Better product quality, reliability, and improved whole life costs;
 - Mass production of components reducing costs e.g. palisade fencing;
 - Availability of parts for replacement and maintenance;
 - Less time and effort required to construct;
 - Reduction in cost and maintenance;
 - Standard matting and concrete apron sizes;
 - Standard accommodation units (modular); and

- Standard fencing / gate sizes.

5.3.4 Where reasonably practicable the designers shall make use of standard / generic details, forms F002 and F003 (Form B) submission. This should be discussed / agreed with Network Rail at the beginning of GRIP 4 stage.

5.4 Road Rail Access Point (RRAP)

5.4.1 Wherever possible, locate the RRAP on straight and level track.

5.4.2 RRAP points should not be located:

- On curves of 200m radius or less where continuous check rails are installed;
- High ballast shoulder areas;
- Over rail adjustments switches;
- Over rail joints;
- Where OLE is less than 4165mm and where non level road surface can bring any part of the on track plant within 600mm of OLE – as stated in the plant manual;
- Rail welds;
- Over treadles;
- Within 20m of a platform ramp;
- Over Hot Axle Bearing Detectors (HABDs); and
- Where guard rails or lateral resistance end plates are present.

5.4.3 Risk Assessed Locations

5.4.4 Unless a risk assessment demonstrates that it is safe to do so, RRAPs should not be located

- Less than 20m from any switch and crossing unit;
- Less than 20m from an underbridge or tunnel where there are vertical or lateral restrictions that could restrict vehicle manoeuvrability;
- Where infrastructure assets such as signalling equipment and lineside structures are located which could restrict vehicle manoeuvrability;
- Next to or over under track crossings;
- Within trespass and vandalism hotspots; and
- Where road access is hazardous (e.g. access is directly from a dual-carriageway, busy roads and areas of limited road visibility).

5.4.5 Assessment of 3rd parties

5.4.6 An assessment shall be undertaken into the effect of a RRAP on lineside neighbours and, wherever possible, they should not be located next to or within:

- Sites of Special Scientific Interest (SSSIs);
- Conservation areas;
- Adjacent to hospitals;
- Residential areas;
- Power Stations; and
- Schools.

5.4.7 *Logistic Considerations*

5.4.8 RRAP locations shall take into account the delivery logistics regarding:

- Accessing through the boundary gate from public highways;
- Access routes through minor roads;
- Height, width and weight restrictions on public highways;
- Overhead services (e.g. power lines, pipes and telephone wires).
- Overhead Cables (excluding OLE) shall be demarked with “goal posts” to warn of height restrictions;
- Seasonal or periodic road availability;
- Access rights and suitability of private roads;
- Delivery vehicle size and manoeuvrability;
- Condition of existing highway surface and verges; and
- Access through residential areas.

5.4.9 *Requirements in DC electrified line areas*

5.4.10 In DC electrified (3rd rail & 4th rail) areas:

- A permanent section gap shall be installed at the RRAP to permit unrestricted access to the track;
- Where insufficient gaps exist, lower the 3rd rail off the insulators, remove an adequate number of insulators and protect the rail from damage; and
- The RRAP shall NOT be installed without the appropriate authorisation.

5.4.11 For additional information refer to module P301 – Road Rail Access Points – Figure 5.

5.4.12 *Requirements in AC electrified line areas*

5.4.13 In overhead line electrified areas, position the RRAP such that:

- The approach to the RRAP under OLE is level where reasonably practicable;
- The minimum clearance of 4165mm is achieved; and
- The appropriate authorisation to install the RRAP has been authorised by Network Rail.

5.4.14 For additional information refer to the plant module P301 – Road Rail Access Points – Figure 8.

5.4.15 *Proprietary Rubber Matting e.g. Strail & Rosehill Rail*

5.4.16 Strail is a direct loading rubber panel system which consists of end restraints and tie rods, locking the system together as a one unit. It is a high strength and durable covering used for level crossing and RRAP. The modular system consists of individual full rubber panels, which are secured using the lock tight system.

5.4.17 Strail has the following benefits:

- Fast installation;
- Easy handling;
- Short assembly times during installations;
- Easy to maintain with minimal maintenance;
- Suitable for any rail or sleeper type; and
- Can be installed manually.

5.4.18 Proprietary systems that are product approved shall be considered where appropriate.

5.4.19 Rosehill Rail (formally Hold Fast) manufacture a similar product but with an alternative fixing system.

5.4.20 Proprietary matting is to be considered at the RRAP across the number of tracks at the chosen location.

5.4.21 Matting manufacturers indicate a typical design life to be approx 15 years for new installations. However, if there is a reduction in traffic then a longer design life of up to 25 years could be possible.

5.4.22 It may be possible to re-use and / or relocate existing decking units to avoid / mitigate potential clashes with existing NR signals / equipment. If existing mats are present then the manufacturers would require a site visit to determine if the units are compatible with the proposed.

5.4.23 For access points class 3, 4 & 5 the length of the matting and concrete apron has been assessed by the current largest plant registered to On-track, the minimum length to be used is 10m. Dependant on layout of track, equipment and size of vehicle, it may be necessary to install matting staggered along the track.



Proprietary Rubber Matting installed at RRV access point

5.4.24 Proprietary rubber matting is the preferred option for this Best Practice Design Guide. However the following alternative solutions are available:

- Timber; and
- Polysafe (Similar to Bomac).

Timber

5.4.25 This system is a direct loading system which distributes the load of plant vehicles through secured timber joists and sleepers. All exposed timber surfaces shall have an approved anti-slip coating applied.



Timber RRAP

Polysafe - Pedestrian Crossing System

- 5.4.26 The Polysafe design is a bridging system based on the Tarmac Bomac concrete panel system which is no longer manufactured. The 'Bridging' design accommodates road profile on canted track. Space sleepers in road level crossings at 600mm centres and ballast to be level with the top of sleepers. Polysafe panels are held in place by friction between rubber wedges secured against panel nib and rail web. These wedges are both internal and external and are 600mm in length. Track fastenings are visible with the crossing panels installed. The system is most used for level crossings and pedestrian walkways.



Polysafe system installed at pedestrian crossing point

- 5.4.27 The following table provides an indication of the required matting length for RRV for class 3, 4 and 5 access points.

Road Rail Access Point Matting Length	
Plant Size	Length of matting
7.5 – 17.0 tonne (Rigid)	Min 10m
17.0 tonne or greater (Articulated plant)	Min 10m

5.4.28 Concrete Apron

- 5.4.29 A reinforced concrete apron / plinth is to be installed along the length of the matting to provide a flat surface for plant vehicles to gain access to the railway line. This apron will, wherever possible, will have a splayed approach to RRAP as indicted in NR/PLANT/0200.
- 5.4.30 If existing trough routes cross the apron they are to be re-laid / modified / protected with road plates which will be determined on a site specific basis. Refer to NR/PLANT/0200 Module P301 Section 6 for the requirements of protection of cable routes.

- 5.4.31 Cable routes shall be protected such that the RRVs cannot damage them.
- 5.4.32 The approach to the rail should be of a suitable incline for the machine (normally this is approximately no steeper than 1 in 10). Refer to the manufactures guide for guidance.
- 5.4.33 The minimum distance of 1100mm from the running rail to the edge of the apron is to apply with new installations to allow clearance for High Output Ballast Cleaning Machines.
- 5.4.34 The concrete apron is to have a brush finish to increase slip resistance.
- 5.4.35 The concrete apron is to comprise a 300mm thick slab with A393 mesh installed top & bottom. The length and width shall be site specific.
- 5.4.36 The concrete shall have a compressive strength of C32/40 and be designed in accordance with BS 8500-2. Air entraining concrete mix is to be considered to prevent freeze-thaw attack.
- 5.4.37 Welfare and / or storage facilities shall be positioned such that the RRAP is kept clear at all times.



Concrete Apron installed at RRAP

5.4.38 Maintenance requirements for RRAP

- 5.4.39 Refer to NR/PLANT/0200 module P703 for inspection and maintenance requirements of RRAP.

5.4.40 RRAP upgrades

- 5.4.41 Refer to NR/PLANT/0200 module P301 section 11.2 for details.

5.5 Fencing

- 5.5.1 Steel (palisade) fencing is widely used on the railway network and that the application and maintenance is fundamentally inherent. Consequently, it is envisaged that a change to GRP/FRP fences or gates may not provide any significantly beneficial impacts.
- 5.5.2 All palisade fencing shall be designed in accordance with BS 1722-12:2006.

- 5.5.3 Steel fencing shall be designed to prevent unauthorised pedestrian access to the railway infrastructure.
- 5.5.4 A secure boundary fence shall be provided, ideally with only one point of entry and egress, to prevent illegal vehicle entry.
- 5.5.5 If damaged or vandalised Network Rail emergency / maintenance teams have replaceable fencing pales / posts readily available for repair.
- 5.5.6 1.8mm high palisade fencing is to be specified for access points in Security level 1 and 2 (Anti trespass and Enhanced).
- 5.5.7 3.0m high palisade fencing is to be specified for access points in enhanced Security Level 3 (High).
- 5.5.8 The security palisade fencing shall be fit for the intended purpose and consideration shall be given to the following:
- The line and level of the fencing;
 - The installed height of the fencing above the ground level;
 - The clearances of the fencing from other structures within and outside the fence line;
 - The position type and size of gates and where required, removable panels etc;
 - The type, grade, and key suites for security padlocks; and
 - Any special requirements regarding the avoidance of touch potential between the fence and other structures
- 5.5.9 Environmental conditions should also be considered. The fencing shall be suitable for installation outdoors at locations adjacent to railway tracks subject to the following conditions:
- The ambient air is polluted outdoors by the presence of iron dust from train brakes; and
 - The fence subject is subject to vibration caused by passing trains.
- 5.5.10 Security palisade fence shall be designed, manufactured and installed in accordance with BS 1722 – Part 12 Specification for Steel Palisade Fence.
- 5.5.11 In high security areas concrete sills or other suitable methods shall designed to prevent burrowing under the fence. Where a concrete sill is used it shall form a barrier not less than 300mm wide and shall extend at least 300mm below ground level.
- 5.5.12 All fencing within the OLE contact zone shall be equipotential bonded throughout in accordance with Network Rail Specification RT/E/S/201032 on DC electrified lines and EQH/SP/D/101 on AC electrified lines. Drilled galvanised steel lugs shall be specified and welded to the inside face of fence posts 50mm above ground level to accept bolt on earthing lugs.
- 5.5.13 Standard Details are provided in Appendix C.



Palisade Fencing Installed along Railway Boundary

5.6 Access Gates – Pedestrian & Vehicle

- 5.6.1 Galvanised steel palisade fencing is to be specified to be in accordance with BS 1722-12:2006.
- 5.6.2 For access class 1 / 2 (pedestrian) vehicle access is restricted to outside of the railway infrastructure fence without creating an obstruction to the public highway, private access, roadway or associated pedestrian footways. Where reasonably practicable, for access class 3 (car / van) adequate space shall be provided for the parking of road vehicles / material storage within the railway infrastructure fence adjacent to the RRAP.
- 5.6.3 Vehicle access points will require a minimum 6m wide palisade access gate with sliplatch locking bar to be installed at the entrance / exit of the access road, with the provision for drop bolt eyelets or similar to enable gates to be locked open when plant entering the RRAP. For security level 3 Automated Access Control System (AACS) shall be considered.
- 5.6.4 A lockable pedestrian and vehicle access gate shall be provided at the railway boundary. A pathway that is clearly distinguishable from the adjacent ground shall be constructed or maintained between the access gate and the trackside area.
- 5.6.5 Pedestrian access points require a 1.5m wide palisade gate to be installed in the boundary fence with sliplatch locking bar and padlock. The gate requires 90 degree opening and drop bolt eyelets or similar to enable gates to be locked open when plant entering the access point.
- 5.6.6 If a new pedestrian access point is required a pathway must be incorporated into the design. Pathways at pedestrian access points shall:
- Have a slip resistant surface;
 - Be free of tripping hazards;
 - Be of sufficient width to serve the intended access purpose (minimum 700mm);
 - Be provided with 1.25m high handrails where there is a risk of falling vertically from the pathway by more than 200mm; and
 - Incorporate stairways or ramps as necessary to suit the relative ground levels.

5.6.7 For pedestrian access gates that open immediately onto a trackside area, the clearance to the nearest running line shall not be less than the requirement for a Position of Safety*:

- 0 - 100mph = 1.25m
- 101 - 125mph = 2.00m

*Positions of safety from RT3170 – A Guide to Personal Track Safety

5.6.8 Standard Details are provided in Appendix C.



Palisade Vehicle & Pedestrian Access Gates

5.7 Vehicle Barriers & Railings

5.7.1 Typically the generic name for this type of corrugated steel crash barrier commonly seen throughout the UK is Armco. Armco barrier systems can be widely seen as a protective measure for people and property, both indoors and outdoors, on car parks, in warehouses, loading bays and industrial yards, factories and roadsides all over the country. Armco barrier systems are available in single row or multi row formats, with a variety of post sizes to bolt down or to cast in to concrete. Armco is a very effective and versatile barrier system with a multitude of uses.

5.7.2 Armco barriers are typically made up of galvanised corrugated steel sections fixed to steel section posts (Z and I) and can be installed along curves without affecting strength or safety.

5.7.3 Along access tracks and roads, where required a permanent safety barrier of untensioned corrugated beam construction (Armco or similar approved) shall be erected along the perimeter of any access road and along the operational track or trackside. This is required in addition to any fencing to prevent access by the public to the operational railway.

5.7.4 Where separate vehicle barriers are provided at the end of parking bays they shall not reduce the standard bay length of 4.8m long x 2.4m width for cars or 6.0m x 3.0m for vans.

- 5.7.5 If Armco (or similar approved) protective barriers are specified to protect the RRAP, lockable access gates are not required. This will be determined on a site specific basis. Utilising maximum 3m long sections of barrier.
- 5.7.6 Various heights of barrier posts can be specified so larger vehicles can see them in the rear view mirrors when if reversing.
- 5.7.7 Standard details and data sheets are provided in Appendix C and D respectively.



Armco Barrier – Bolted down to concrete surfacing

- 5.7.8 Bollards should be considered in the design to protect vulnerable areas and equipment, such as lighting and CCTV columns.

5.8 Surface Treatment – Access track / Compound Area

- 5.8.1 Collisions between moving vehicles, rail workers and moving vehicles, or the impact of a vehicle with stationary plant, vehicles or equipment can lead to physical injuries, damage and / or loss of life. Consequently, the good design of roadways and the control of traffic on-site are important factors in the prevention of RRV accidents and an important consideration in the prevention of major accident hazards on-site.
- 5.8.2 Where necessary, the depth and construction of the roadways, standing and turning areas shall be designed to accommodate the loads imposed by any normal vehicle permitted to travel on the public highway (including emergency and commercial vehicles). Particular attention shall be given to the movement of HGVs.
- 5.8.3 The road design shall take into account local ground conditions.
- 5.8.4 Surfaces of traffic routes used by either pedestrians or vehicles should be suitable for their purpose and be free of any holes, uneven or slippery surfaces that could cause accidents to vehicles or pedestrians.

- 5.8.5 A standard road width of 7.3m with an average speed of 25mph is to be designed to allow two way traffic entering the compound area. If this is not possible then a single track road with passing places are to be considered in the design.
- 5.8.6 Surface materials shall be hard wearing, low maintenance, non-slip, weather resistant, and resistant to attack from oil spillage.
- 5.8.7 Concrete and asphalt roads require suitable drainage. Refer to Section 5.16. for drainage details.
- 5.8.8 Road surfacing is to be considered in the design of the roadway to the access compounds. A cost analysis is to undertaken and a scope of work is to be produced by Network Rail for the type of roadway due to the length and increase in costs for a better hard-wearing surface.

5.8.9 Gradient

- 5.8.10 For new access roads, where possible, the maximum longitudinal gradient should be 1 in 12, and the minimum channel gradient should be 1 in 125. A crossfall or camber of 1 in 40 provides adequate drainage. If minimum gradients are not utilised, surface water tends to pond, which can be hazardous in freezing conditions.

5.8.11 Rolled Stone Access Road

- 5.8.12 The majority of the access roads on the UK rail infrastructure are well compacted stone. This material is typically crushed stone, crushed slag, concrete etc. Layers are compacted in 150mm depths and levelled by a roller or whacker plate. This is undertaken to ensure there is minimal risk of settlement once the road is open to traffic.

Advantages

- Easy to repair pot holes etc;
- An unbound surface is cheaper to install than a bound surface like bitmac or asphalt;
- A natural looking formal surface that blends in well with most landscape settings; and
- Can be constructed quickly.

Disadvantage

- High maintenance costs; particularly for re-surfacing; and
- Exploits natural resources; and
- Long installation times.



Rolled Stone Access Track within Network Rail Access Point

5.8.13 Refer to Appendix C (standard details) for typical layout.

Sustainability & Safety Assessment

Design Solution	Sustainability Score		
	LCC Score	SA Score	Total
Type 1 – natural aggregate	-	2	2
Type 1 with a mechanically stabilised layer	-	1	1

LNW Access Improvements Sustainability Appraisal (March 2014)

Design Solution	Safety Score		
	Safety in Construction (SIC)	Safety in Use (SIU)	Total
Type 1 – natural aggregate	1	1	4
Type 1 with a mechanically stabilised layer	1	1	3
LCC + SA + SIC + SIU scores =	The design solution with the lowest points should be the preferred design solution		

5.8.14 Concrete Hardstanding

5.8.15 Concrete is the ideal material for the construction of parking and working areas around buildings. It provides a hard-wearing surface which drains well at low gradients. Concrete resists spillages of diesel and other petroleum-based products. Concrete is relatively light in colour and hence concrete parking areas are easy to illuminate.

5.8.16 For access roadways expansion joints are required to allow expansion and contraction of the concrete without generating potentially damaging forces within the slab.

5.8.17 Concrete hardstanding must be drained to suitable new or existing drainage points. Refer to section 5.16. for details.

Advantages:

- Reasonably cheap construction & material costs;
- Simple to construct; and
- If well laid, concrete will provide years of maintenance free service.

Disadvantages:

- Long curing times;
- Must be properly drained to gullies or suitable drainage points;
- Laying can create health and safety risks through possible burns;
- The use of use of de-icing salts can attack the surface of the concrete; and
- Exploits natural resources.



Concrete ramp up to track level

5.8.18 Refer to Appendix C (standard details) for typical layout.

5.8.19 Concrete Hardstanding

5.8.20 Asphalt is a mixture of aggregates, binder and filler, used for constructing and maintaining all kind of roads, parking areas but also play and sport areas. Aggregates used for asphalt mixtures could be crushed rock, sand, gravel or slag. In order to bind the aggregates into a cohesive mixture a binder is used. Most commonly, bitumen is used as a binder. An average asphalt pavement consists of the road structure above the formation level which includes unbound and bituminous-bound materials. This gives the pavement the ability to distribute the loads of the traffic before it arrives at the formation level. Normally, pavements are made of different layers.

Advantages:

- Impermeable asphalt can be used from recycled (asphalt) roads, which limits the exploitation of natural resources;
- If permeable asphalt is specified it allows rainwater to soakaway to the existing sub-base. This reduces storm water run-off;

- Asphalt roads provide better traction and skid resistance for vehicles; and
- Asphalt tends to help keep roads free from ice and snow

Disadvantages:

- Laying can create health and safety risks through possible burns and toxic fumes;
- Heavy rain and other extreme weather conditions can damage asphalt, and the roads will need to be repaired frequently; and
- If permeable asphalt is specified, suitable drainage to gullies or other drainage points are required. Refer to section 5.16. for details.

5.8.21 Refer to Appendix C (standard details) for typical layout.



Asphalt Road / Surfacing

Sustainability & Safety Assessment

Design Solution	Score		
	LCC Score	SA Score	Total
Impermeable Asphalt	-	3	3
Permeable Asphalt	-	2	2
Asphalt with a mechanically stabilised layer	-	1	1

LNW Access Improvements Sustainability Appraisal (March 2014)

Design Solution	Score		
	Safety in Construction (SIC)	Safety in Use (SIU)	Total
Impermeable Asphalt	1	1	5
Permeable Asphalt	1	1	4
Asphalt with a mechanically stabilised layer	1	1	3
LCC + SA + SIC + SIU scores =	The design solution with the lowest points should be the preferred design solution		

5.8.22 Truckpave (Sustainable Solutions)

5.8.23 Manufactured from recycled plastics, Truckpave cellular paving is robust, durable and capable of withstanding all levels of traffic up to and including coaches, dustcarts and HGVs.

5.8.24 Truckpave's cells are filled with gravel, making them suitable for stabilising areas where a hard wearing surface is desirable. Truckpave are an economic, environmentally-friendly and a lightweight alternative to concrete grasscrete-type pavers.

5.8.25 Truckpave should be installed on a well-prepared, free-draining, firm and relatively-level stone sub-base (a reduced-fines Type 1 for example). As an option a Tensar Triax TX160 geogrid at the base of this layer will allow a reduction in the sub-base depth. The sub-base is overlaid with BGT100 geotextile filter / separator followed by 20mm of coarse sand as a bedding layer for the pavers.

5.8.26 Applications for Truckpave include:

- Lorry, coach and car park areas;
- Emergency fire access roads;
- HGV access roads;
- Road widening ;
- Grass verges;
- Footpaths;
- Service yards;
- Lay-bys; and
- Loading areas.

5.8.27 The benefits of Truckpace include:

- Complies with the HSE guidance for manual handling;
- Flexible and resistant to cracking unlike concrete alternatives;
- Because of its insulating qualities, plastic achieves greatly improved volume and quality of grass compared to concrete units;
- High compressive strength;
- Environmentally friendly - manufactured from recycled plastics; and
- Has tongue and groove interlocking for additional stability.

5.8.28 Refer to Appendix C & D for Standard Detail and Product Specification.



Typical Trackpave Installation along Access Track

5.8.29 The following table has created to give an indication of the preference for road surfacing from the vehicle gate to the compound area.

Table - Road Surfacing Preference for Access Tracks & Turning Area			
Road Type	Road Surfacing	Turning Area	Kerbing & Edging Required
Surfacing preference 1	Rolled Stone (MOT)	Truckpave	No
Surfacing preference 2	Asphalt	Rolled Stone (MOT) / Truckpave	Yes
Surfacing preference 3	Concrete Hardstanding	Rolled Stone (MOT) / Truckpave	Yes

5.8.30 Kerbing & Edging

5.8.31 Kerbing to roads should be provided wherever possible to clearly define the roadway and provide a measure of protection. The kerbing length for the access track will be site specific due to the length and topography of the location. Dropped kerbing should be provided at the entrance / exits of RRV access points to enable vehicles to pull off the existing highway to the Network Rail access gate.

5.8.32 Dropped kerbs shall be used at vehicular crossing points. They should be constructed flush with the existing carriageway and shall be constructed in accordance with local authority specification drawings.

5.8.33 Pre-cast concrete kerbing is the most common on UK roads, however sustainable products such as Durakerb should be considered in the design.

5.9 Vehicle Turning Facilities

5.9.1 For access points Class 4 and 5 vehicle turning areas are required for the RRV and HGV to safely manoeuvre within the compound area.

5.9.2 It is desirable for the layout to be designed so that service vehicles do not need to reverse. The dimensions of the turning area should suit the largest RRVs.

5.9.3 The need for vehicles to reverse should be avoided where possible as reversing is a major cause of fatal accidents.

- 5.9.4 All vehicle movements within the access point compound should be supervised by competent person to minimise risk of injury to persons or damage to equipment.
- 5.9.5 If space permits a turning circle could be installed so that vehicles can turn without reversing. One-way systems can reduce the risk, especially in storage areas.
- 5.9.6 A self-draining surface is to be considered for the turning area and compound area. This will be designed on site specific basis. Refer to section 5.8. for details.
- 5.9.7 The design should also consider vertical clearances from 3rd party equipment e.g. overhead power lines.
- 5.9.8 A visual routine inspection shall take place for the management of vegetation along the access track boundary. Vegetation should be correctly managed to provide clear access to the compound and the RRAP.
- 5.9.9 The following table provides guidance for the required radius for ridged & articulated plant vehicles to turn in the compound area. The following table is based on the On-Track registered database.

Table – Recommended Turning Area Radius for RRV Plant	
Plant Size	Radius (Diameter)
7.5 – 17.0 tonne (Rigid)	15m
17.0 tonne or greater (Articulated plant)	25m

5.10 Accommodation Buildings

- 5.10.1 For access points class 4 and 5 general accommodation provisions should be provided for railway workers. These facilities should include the provision of health & welfare facilities to allow extended hours of operations.
- 5.10.2 General accommodation provisions should be considered with the following provisions for staff and visitors to the compound:
- Staff accommodation (to be in accordance with current welfare standards & NR/L3/INI/CP0036);
 - Welfare facilities;
 - First aid / rest room;
 - Wet & dry utility area including locker room; and
 - Office area complete with IT facility.
- 5.10.3 For access point class 4 temporary accommodation units are to be considered for rail staff for longer possession periods. Temporary units would require power by a generator.
- 5.10.4 Typical specification for a generic temporary accommodation unit:

External Construction:

- Steel container with side walls formed in flat panels;
- Fork pockets set in base;
- Twist lock base plates set in four corners;
- Window frames with steel shutters;
- Steel personnel doors with built in locking mechanism; and
- Hogleift lifting system.

Internal Construction:

- Lined and Insulated in GRP, panels with block insulation inserts.

Dimensions:

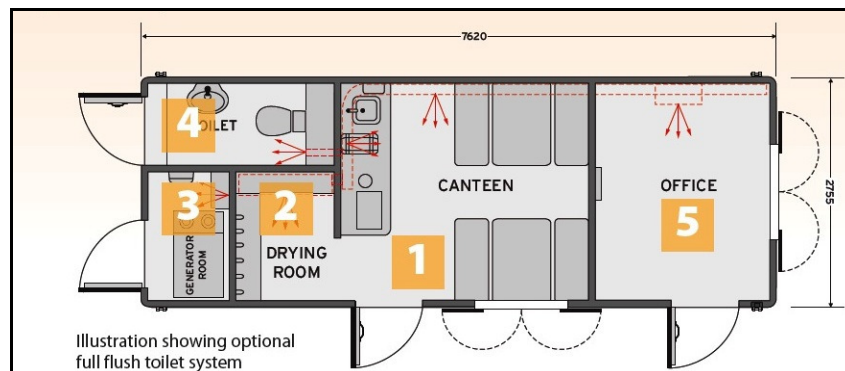
- Length: 7600mm
- Width: 2755mm
- Height: 2565mm

Weight (dry):

- Standard: 4400 kg
- With Full Flush: 4500 kg

Weights (Loaded with Fuel / Water)

- Standard: 4700 kg
- With Full Flush: 5100 kg



Plan of Anti-Vandal – Static Site Accommodation Unit

- 5.10.5 If required sheltered briefing areas are to be considered in the design for access point class 4 and 5.



Anti-Vandal Sheltered Briefing Area

5.10.6 This Anti-Vandal shelter is heavy duty and ideal for access points class 4 and 5 and can be used as a waiting and briefing area while waiting for railway possessions. These can be ideally located in compound areas near the point of access to the rail infrastructure. A fixed dimension of 3.0m or greater is to be achieved so rail personal are not classed as on or near the line.

5.10.7 Typical Specification for a generic briefing area:

- 1365mm roof width x 2480mm tip roof height
- 2-5 person capacity: 3000mm long
- 5-7 person capacity: 4305mm long
- 7-9 person capacity: 5610mm long
- Roof: 6mm dimmed polycarbonate curved
- Glazing: galvanised and powder coated steel sheet
- Seating: timber planked bench with back support as standard (steel or injected plastic seating also available).

5.10.8 For access point class 5 permanent accommodation units are to be considered for rail staff. Units would require permanent power & water supplies.

5.10.9 Modular / pre-fabricated buildings are considered to have the following benefits:

- Speed of construction is faster;
- Modular construction reduces waste and site disturbances;
- Favourable pricing with several suppliers in the market;
- Low waste;
- 100% reusable components; and
- Environmentally friendly construction process.

5.10.10 Where possible two story accommodation units should be considered with canteen / welfare facilities at ground level and office / meeting rooms located on the first floor.

5.10.11 Refer to the Network Rail Maintenance Delivery Units (MDU) best practice design guide for information and guidance of permanent office accommodation units.

5.11 Storage Facilities

5.11.1 For access points Class 4 and 5, mobile secure storage units are to be considered in the design. They are ideal for rail contactors for on-site storage and providing a safe environment for tools and equipment. Units are to be:

- Approved for use on the UK rail network;
- Built using proven techniques;
- Fully welded anti-vandal units;
- Superior security – each unit to be fitted with hidden hinges, three point locking and security locks;
- Towed to the access point for easy drop off; and
- Range from 3.6m - 6.0m long.



Typical Mobile Storage Unit

5.11.2 Refer to Appendix D for specifications and data sheets.

5.12 Access from Highway to RRV Access Point

5.12.1 An initial assessment should be undertaken to assess the impact of the design on the surrounding environment and required licenses from the relevant authorities. These may include:

- Highway Authority (Section 278 & 50);
- Environment Agency;
- Planning Applications;
- Building Regulations Applications;

- Noise / Section 61 Applications;
- Internal Drainage Board Licences;

- 5.12.2 For access points class 3, 4 and 5 new / modifications to dropped kerbing could be required for larger plant vehicles. The local authority should be contacted and the relevant licenses should be obtained prior to construction.
- 5.12.3 It is currently assumed that new / upgrade access tracks are situated on Network Rail land and will therefore not require approval by the Local Highway Authority under a section 278 agreement and that minor works such as dropped kerbs / crossings could be allowed by the Local Highway Authorities to be undertaken under a section 50 street works licence. However, this will be assessed on site specific basics.
- 5.12.4 Curves should be of sufficiently large radius to allow ridged and articulated vehicles to enter the access point. Swept path analysis is to be considered in the design due to the size of plant vehicles entering the access point.
- 5.12.5 Swept Path Analysis (SPA) is the calculation and analysis of the movement of different parts of the vehicle during a manoeuvre. At a basic level this includes calculating the path taken by each wheel during the turn and also calculating the space needed by the vehicle body during the turn. Historically these forms of calculation were carried out by hand, but in recent years, with modern software, the process has been computerised.
- 5.12.6 The software enables the modification of different vehicle sizes. This is ideal due to the size of RRVs which use Network Rail access points.
- 5.12.7 SPA benefits engineers, planners, site owners and architects with the means to assess the turning implications of a wide variety of vehicle types on road design layouts. If modifications are required to roads at new or existing points in order for the local authority and Network Rail to be confident that the design can accommodate vehicle movements, a drawing showing the SPA of vehicles can be overlaid on the proposed site layout. This would demonstrate that vehicles can manoeuvre safely and efficiently within the site.

5.13 Parking

- 5.13.1 For access point class 4 and 5 allocated car and RRV parking shall be considered in the design. Several vehicles will need designated areas allocated within the compound.
- 5.13.2 The following are standard space requirements of some typical vehicles. These may be used as a basic minimum reference values but different layouts such as parallel, herringbone and in-line, have slightly different overall space requirements and detailed layout of areas will be site specific.
- Car 2.4 metres x 4.8 metres
 - Light Vans 3.0 metres x 6.0 metres

- Rigid Vehicles 3.5 metres x 14.0 metres
- Articulated Vehicles 3.5 metres x 18.5 metres

- 5.13.3 These dimensions refer to standing space only and do not take into account: access, manoeuvring space, or space required for loading / unloading.
- 5.13.4 The design of the parking area shall provide safe, clear and convenient movement for pedestrians, and give minimal contact and conflict with rail plant.
- 5.13.5 The type & number of designated parking areas are to be site specific.

5.14 Designated Walkways for Pedestrians / Rail Personal

- 5.14.1 For access points class 4 & 5 designated walkways are to be considered in the design.
- 5.14.2 Pedestrian entrance and exit routes, as well as designated pedestrian routes to accommodation building and storage areas, should be defined and segregated from vehicular routes. Such routes shall be clearly defined with markings, colours and warning signs, and protected by a barrier or hand rail. The surface of pedestrian routes shall be of a suitable non slip material.
- 5.14.3 The walkway within the compound shall be accessible and well lit with permanent lighting. The position of access and exit points shall be clear and convenient for pedestrian use.
- 5.14.4 Pedestrian access should be discouraged at vehicle entrance and exit areas, and the design of these areas shall inhibit access by, for example, omitting footpaths.
- 5.14.5 Demarcation of pathways within the compound is to be considered in the design to provide pedestrians with a safe walking route to their intended destination and avoid operational on track vehicles within the compound area.
- 5.14.6 Compacted and bonded surfaces are the preferred form of construction, although concrete and block paving could be used where appropriate.
- 5.14.7 For additional information refer to NR/L3/CIV/160 – The Design of Car Parks for Railway Stations and Depots.



Designated pedestrian walkway to RRV access point

5.15 Signage

5.15.1 Upon entry / exit to a new or existing access point an access information board should be displayed with key information. The following identifies the key hazard, warning, safety and information that are required:

- Name of the access point;
- Mileage of the access point;
- Access reference (Network Rail) - stating the nearest line;
- Lines and direction of traffic at the location;
- OS Grid reference;
- Engineers Line Reference (ELR);
- Controlling signal box – including telephone number;
- Stop / check board stating PPE / safety equipment (safety helmet, safety boots, hi-vis clothing etc.);
- OLE / 3rd rail hazard sign;
- Site Specific hazards; and
- Nearest hospital A&E department details.

5.15.2 Additional information to be included:

- QR code – link to the hazard directory; and
- Site specific information (relevant to the area).



Typical example of Access information Signage in OLE areas



Typical example of Access information Signage in DC electrified areas

- 5.15.3 The signage shall be in accordance with Railway Group standard GI/RT7033: Guidance on Lineside Operational Signage.
- 5.15.4 The provision of signing is an integral part of the design of the access point / compound area. Signs should not be added to the design as an afterthought.
- 5.15.5 Signage shall be provided to assist track workers. Signage shall not interfere with the normal safe operation of the compound or obstruct other signs.
- 5.15.6 For both operational and security reasons, and to maximise visibility across and within the site, the height of signs shall be carefully planned. A signing hierarchy should be preserved throughout the site: safety / emergency signing should be the most visible, and information signs the next most noticeable.
- 5.15.7 Solar lighting is to be considered for signage in poor areas of visibility.

5.16 Lighting – Permanent & Temporary

- 5.16.1 Where practicable the requirement for permanent lightning will need to be considered along access roadways and compound areas up to the RRAP. Permanent & temporary lighting would be mandatory in security category 3 and 4.
- 5.16.2 The lighting levels shall be in accordance with RIS-7702-INS: Rail Industry Standard for Lighting at Stations.
- 5.16.3 The lighting design should take into account the location of deserted / isolated areas, RRAPs, roadways, walkways etc. It also should not cause significant levels of glare to road users, train drivers or signallers and others operating within the compound. It shall not interfere with the visibility of signals or the train driver's ability to distinguish the signal aspects displayed. Consideration shall be given to the need to prevent avoidable disturbance from lighting to local residents.
- 5.16.4 The general lighting should be energy efficient and designed to meet the luminance uniformity ratio of 0.4 (min) and the minimum lighting levels given in BS 5489 Part 9: Road Lighting Code of Practice for Lighting for Urban Centres and Public Amenity Areas. This should be applied in compound areas with car parking etc.
- 5.16.5 In class 5 access points the lighting shall be designed to take account of the needs of CCTV installations: the lighting shall not have a detrimental effect on the CCTV coverage but allow cameras to operate effectively under all lighting conditions and levels.
- 5.16.6 If lighting is required on new / existing buildings then fluorescent luminaries shall be installed with vandal proof diffusers and be positioned within the area so that they do not generate glare to drivers.
- 5.16.7 Lighting schemes for the illumination of new roads, parking, security areas etc. must be submitted for Network Rail prior approval. Lighting schemes could impact sighting of railway signalling; therefore, Network Rail reserves the right to have any lights screened. All schemes are to be approved by a Network Rail Signalling Engineer prior to construction.
- 5.16.8 Solar powered mobile lighting towers are to be considered in the design for access point class 4 and 5.
- 5.16.9 Specifications are provided in Appendix D.

5.17 CCTV

- 5.17.1 For enhanced security (Level 3) CCTV is to be considered for road / rail access points in areas prone to high criminal activity.

5.17.2 The design of CCTV systems shall take into account national and industry standards and guidelines. The following network rail guidance has been produced:

- NR/L2/TEL/30135: Technical Requirements for Security CCTV systems on Network Rail Infrastructure.

5.17.3 The functional and system performance requirements shall be determined following consultation with the British Transport Police.

5.17.4 The CCTV system shall, as a minimum, cover the main entrance / exit area of the access point and locations of significant risk; for example, storage areas, parking areas, amenity blocks etc.

5.17.5 The CCTV system shall provide an adequately defined image in both day and night conditions, and not be adversely affected by changing light conditions or light emissions from adjacent installations.

5.17.6 CCTV cameras shall be suitable for the full range of ambient lighting and atmospheric conditions, and shall be provided with appropriate vandal resistant housings, support brackets and fixings.



CCTV installed on a hinged pole within car park

5.18 Power Supply - Permanent & Temporary

5.18.1 For office accommodation blocks, lighting, CCTV, and general short maintenance work permanent and temporary power supplies will be required to provide Network Rail staff and contractors adequate facilities for the on-going task of maintenance on the UK rail infrastructure.

- 5.18.2 Power supplies are designed to supply equipment with particular voltages derived from a main source of electricity. They can change voltage from one type to another, provide voltages which are smoothed and free from interference, or protect the equipment and the main supply from excessive voltages or currents. The supplier of electricity is usually the local electricity company. Commonly the feed is provided by the railway organisation responsible for the fixed plant, perhaps from the traction supply. In addition, there will usually be a standby in the form of generators, batteries, or a different supply source, with appropriate switching arrangements.
- 5.18.3 Access point class 4 and 5 would require a power supply for lighting, and accommodation units. If an existing power supply is already supplying railway equipment (points heating, substation, stations etc) then power monitoring could be undertaken to determine if the existing supply could take the additional electrical load. This could provide Network Rail time and financial efficiencies.
- 5.18.4 Possible trackside supplies are to be identified at the survey by a Network Rail site engineer.

5.19 Drainage

- 5.19.1 For the upgrade of access roads / tracks and installation of new roads on the existing rail infrastructure, surface water drainage must be considered in the design scope.
- 5.19.2 Roadways, footpaths and hard standings on site should be adequately drained to prevent the build-up of standing water. If positive drainage is required this should be by gullies or drainage channels. All gratings and channel units should be of appropriate load bearing capacity for the location in which they are set. Connections for surface run-off from roads and hardstandings into drainage systems may have to include interception facilities in the case of oil or chemical contamination.
- 5.19.3 The distance from the road to the compound / RRAP will be variable (could range from 50m to 2km for example). If concrete or impermeable asphalt surfacing is specified the surface water is to be sufficiently drained to edge assists such as gulley's and carrier and filter drains. The UK road network widely uses filter drains as the ideal solution to drain roadways, car parks and compound areas. This to be considered in the design for the RRV roadway.
- 5.19.4 A filter drain is a gravel filled trench, generally with a perforated pipe at the base. Run off flows slowly through the granular material, trapping sediments and providing attenuation. Flow is then directed to a perforated pipe, which conveys run-off either back into the sewerage network or into a waterbody.
- 5.19.5 Filter drains are normally situated on the roadside verge or medium strip. Consideration of topography is important to drain road surfaces.
- 5.19.6 All Network Rail access points will differ in terms of size and shape; therefore drainage design is to be site specific.



Filter drain installed along a typical roadway.

5.19.7 The use of alternative drainage systems including Sustainable Urban Drainage Systems (SUDS) is to be considered on a site specific basis.

5.19.8 SUDS are the sustainable alternative to conventional drainage methods as they:

- Manage run off flow rates, using infiltration and the retention of storm water;
- Protect or enhance the water quality;
- Are sympathetic to the environment and the needs of the local community; and
- Provide a habitat for wildlife in urban watercourses; and encourage nature and groundwater.

5.19.9 SUDS achieve this by managing:

- Run-off close to where the rain falls;
- Potential pollution at its source protecting water resources from planting trees.

5.19.10 Storm water run-off shall be directed away from the rail track.

5.20 Hand Railing

5.20.1 For access point class 1 and 2 hand railing could be required for access points with stairwells in cutting slopes or embankments. Network Rail has 2 solutions in the current market (steel & GRP) which have a design life of 25 years.

5.20.2 For pedestrian access points which require steps, handrail would be required to provide a safety barrier from slips trips and falls. Landing areas at the bottom of steps are to be installed 3.0m from the running rail. If this cannot be achieved handrail is required to prevent track personal falling on to the operational track.

5.20.3 During the design of pedestrian walkways, hand rail shall be considered to define the limits of the path.

5.20.4 GRP is initially cheaper than steel, maintenance costs for GRP handrails at year 15 result in them having a low life cost than steel which require no maintenance over 25 years.

5.20.5 GRP / FRP

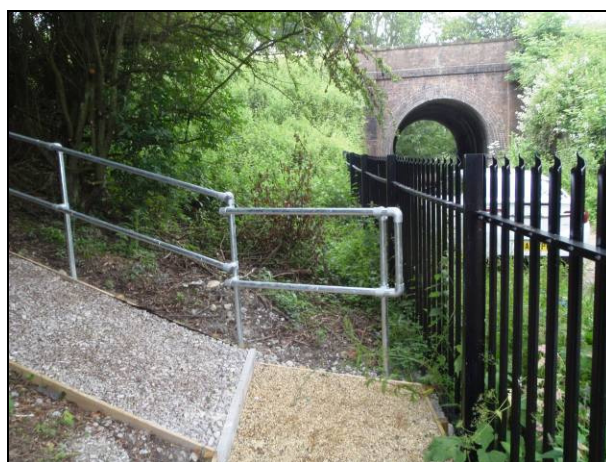
- 5.20.6 50.0mm diameter modular sections can be fixed to concrete or cast in-situ. The advantage is that GRP is very lightweight; reducing the risk of injury and it does not require traction bonding. The height of handrails shall be at least 1100 mm above the level of the adjacent walkway or cess. In this instance GRP/FRP alternatives should be considered.



GRP/FRP handrail installed at the bottom of a steps

5.20.7 Steel

- 5.20.8 Kee clamp (or similar approved) is 42.4mm diameter galvanised steel tubing, which can be fixed to concrete or cast in-situ (to concrete). The height of handrails shall be at least 1100mm above the level of the adjacent walkway or cess. Steel (Kee-clamp) typically requires little maintenance, however if the handrail is within the OLE contact zone it will require traction bonding which incurs further design works and increases the use of natural resources.



Pedestrian Ramp & Steel Handrail

Sustainability & Safety Assessment

Design Solution	Sustainability Score		
	LCC Score	SA Score	Total
Steel	1	2	3
GRP	2	1	3

LNW Access Improvements Sustainability Appraisal (March 2014)

Design Solution	Safety Score		
	Safety in Construction (SIC)	Safety in Use (SIU)	Total
Steel	2	2	7
GRP	1	1	5
LCC + SA + SIC + SIU scores =		The design solution with the lowest points should be the preferred design solution	

5.21 Steps

5.21.1 Network rail and suppliers have developed solutions for steps in cuttings / embankments. The following solutions must be considered in the design:

- GRP / FRP steps;
- Stanton Bonna; and
- Traditional brick and flag.

5.21.2 GRP / FRP

5.21.3 Complete lightweight modular channel & angle sections, treads / risers and hand rail.

5.21.4 The main benefits of GRP /FRP include:

- No traction bonding required;
- Lightweight and rapid to install;
- Can be designed for any slope angle; and
- GRP hand rail is bolted to the channel section of the stairwell.



GRP / FRP steps on a cutting slope

5.21.5 *Stanton Bonna*

5.21.6 Modular precast concrete stairwell with concrete infill with hand railing.

5.21.7 The main benefits of Stanton Bonna steps include:

- System comprise modular components that can be quickly installed saving time and money over conventional methods;
- Stairwell modules can be installed with minimal ground surface preparation and without the need for heavy plant;
- A durable system that can be used for both temporary and permanent installations;
- System can be used for slope angles between 25 – 45 degrees;
- System available with various step widths;
- Steel / GRP hand rail can be installed along side of stairwell; and
- Step infill may be type 1 stone or concrete.

5.21.8 Refer to Appendix D for specifications and data sheets.



Stanton & Bonna stairwell built on an embankment (Type 1 stone or concrete infill)

5.21.9 Traditional Brick & Flag

5.21.10 Traditionally, steps along the tracks comprised pre-cast concrete (PCC) paving slabs and brick steps. The handrail is installed along one side for protection.

5.21.11 The main benefit of traditional brick with PCC slabs steps are that typically little maintenance is required over the design life (25 years).



Brick & PCC flags – Pedestrian Access point

Sustainability & Safety Assessment

Design Solution	Sustainability Score		
	LCC Score	SA Score	Total
GRP	3	1	4
Cast in-situ Concrete	4	4	8
Stanton Bonna	1	3	4

LNW Access Improvements Sustainability Appraisal (March 2014)

Design Solution	Safety Score		
	Safety in Construction (SIC)	Safety in Use (SIU)	Total
GRP	1	1	6
Cast in-situ Concrete	3	2	13
Stanton Bonna	4	2	10
LCC + SA + SIC + SIU scores =		The design solution with the lowest points should be the preferred design solution	

5.22 Topography Survey

5.22.1 Network Rail standards have been developed to give designers a clear understanding of topographic, land, engineering and measured building techniques. The standards seek to minimise site visits by specifying that all information needed is collected in an approximate manner preventing the need for revisits.

- 5.22.2 The standards align with Network Rail's policy on sustainability to ensure sustainable policies and practices are implemented when maintaining, renewing and enhancing the railway.
- 5.22.3 The following documents provide a strategy and general introduction establishing some basic principles:
- NR/L2/TRK/3100 – Topographic, engineering, land and measured building surveying, strategy and general;
 - NR/L3/TRK/3101 – Topographic, engineering, land and measured building surveying, track;
 - NR/L3/TRK/3102 – Topographic, engineering, land and measured building surveying, Civil surveying standards (not issued);
 - NR/L3/TRK/3103 – Topographic, engineering, land and measured building surveying, survey and mapping techniques;
 - NR/L3/TRK/3104 – Topographic, engineering, land and measured building surveying, signalling survey standards;
 - NR/L3/TRK/3105 – Topographic, engineering, land and measured building surveying, overhead line electrification; and
 - NR/GN/TRK/3106 – Topographic, engineering, land and measured building surveying, commercial property surveying standards.
- 5.22.4 For new / existing / upgrades for access points a topographical survey shall be carried out for design submission.
- 5.22.5 The topographical survey is required to give the following details:
- Network Rail boundary fence lines;
 - Walls;
 - Fencing;
 - Building footprints;
 - Steps;
 - Ramps;
 - Changes in surface;
 - Footpaths, pedestrian walkways;
 - Railway running edges 20m intervals, beginning of curves (radius > 500m = 10m <500m = 5m);
 - Existing concrete aprons, matting, bollards, lighting columns;
 - Railway furniture such as boxes, cable route, ducting, switches etc;
 - Roadways, edges, back of pavements, highway boundaries of roads and tracks, changes of gradient, junctions and intersections;

- S & T equipment, point machines, telephones, treadles, location boxes, signal rodding etc.
- Catch pits, manholes, drainage, under track crossings (UTX);
- Reference features: mileposts, adjacent structures, level crossings;
- Individual mature trees (girth and average canopy extent);
- Overall extents of canopy to groups of trees / vegetation;
- Water features e.g. rivers, streams, and canals passing under or over railway tracks;
- Street furniture: transmission lines, poles, pylons, manhole inspection covers, drains, gullies, signs, lamp posts, overhead utilities crossing the railway (rural / open country areas) and service covers;
- Spot levels at 10m intervals and changes in slope profile;
- Locations and heights of OLE gantry's overhead catenary (including return conductor);
- Levels will be related to Ordnance Survey Datum; and
- Road and street names.

5.22.6 Results will be supplied in 2D and 3D AutoCAD DWG format, suitable for plotting at various drawing scales.

5.22.7 All underground service information to be requested / provided by Network Rail.

5.23 Environmental Assessment

5.23.1 The objective of an Environment Assessment is as follows:

- Identify and investigate potential environmental issues and risks which may arise during, and as a result of the site investigation and construction works; and
- Ensure that any identified issues / risks are managed effectively during design and construction.

5.23.2 When upgrading or siting new access points with buildings the following constraints should be considered:

- Local soil condition;
- Bearing capacity;
- Subsidence;
- Groundwater table;
- Underground water courses;
- Existing chemical pollutants; and
- Flood zone / plain.

5.23.3 During the site survey a description of the surrounding area, should take the following into consideration:

- Noise - local sources of noise, location, intensity and duration;
- Pollution - local sources of pollution, e.g. industry, historical land-use, motorways and other dust sources;
- Local micro-climate – wind, driving rain, flooding, frost and shading;
- Sight lines - distance from and impact on operational rail lines, junctions and signals;
- Distance from boundary, surrounding roads, viaducts, railway tracks and / or overhead power lines. Allowance should be made for zoning around buildings for future external maintenance (scaffolding or mobile platforms) without the need for road closure or track possession. Scaffolding tubes need to be at least 3m from overhead lines;
- Access for fire fighting;
- Proposed fenestration in relation to openings in adjacent structures;
- Condition of existing or adjacent property - weathering and effect of pollution, roof and eaves, lines, nature and use of adjacent properties, as well as access roads and facilities;
- Security - proximity to sensitive or military installations / areas; and
- Areas of interest or natural beauty - constraints imposed by the local planning authority to preserve plant or wild life.

5.24 Site Investigation

5.24.1 For upgraded / new access points with modular buildings (class 4) a site investigation would need to be considered in the design. The scope of the geotechnical investigation will vary according to:

- The type, indicative dimensions, mass, and weight distribution of the structure(s) to be supported;
- The availability and reliability of existing geotechnical and geological information about the site;
- The types and characteristics of the ground likely to be encountered at the site; and
- Topographical characteristics of the site concerned.

5.24.2 The hierarchy of the geotechnical investigation shall be as follows:

- Geotechnical appraisal; prior to commencing work on site a desk-based study shall be undertaken to establish expected site ground conditions and potential site hazards. This should include, but not be limited to, a review of published geological information from nearby investigations and BGS borehole records, consideration of previous uses and other non-natural influences on the site, the sensitivity of any existing structures, the overall stability, published knowledge and historical railway data, as well as local experience. Coal Authority and / or other mining reports may be required if indicated by the other desk study items. If unusual features are anticipated this should be reported to Network Rail prior to mobilisation to site. The desk study may also help determine the appropriate drilling equipment, so ensuring the requirements of this specification are met.

- Ground investigation, which comprises field investigations, laboratory testing and geological and geotechnical interpretation. The field investigation (intrusive surveys) comprises direct investigation including ground gas investigation (ground exploration and soil sampling) and indirect investigation (in-situ testing such as cone penetration testing (CPT)). The Ground Investigation shall be carried out in accordance with BS EN 1997-1, 'Geotechnical Design', the 'Specification for Ground Investigation' second edition published by the Site Investigation Steering Group, and CIRIA C665 'Assessing risks posed by hazardous ground gases to buildings'. Each investigation shall be carried out under the guidance of a Chartered Engineer or Chartered Geologist with relevant geotechnical experience.

5.24.3 Field investigations

5.24.4 The hierarchy of field investigations (intrusive surveys) undertaken shall be:

1. Trial pit / trench excavation and in-situ testing for shallow depths (maximum 1.2 m deep);
2. Driven window (or windowless) sampling and in-situ testing for deeper exploration and sampling (3-5 m deep);
3. Borehole sampling and in-situ testing at greater depths (normally 5-15 m deep), and for detailed information on material properties and groundwater conditions – primarily for modular building foundations (including pad, strip or piled foundations), and retaining structures;

5.24.5 Soil and groundwater sampling/recovery for laboratory testing may be undertaken (in any of the phases of investigation detailed above) where further detailed information may be required.

5.24.6 All intrusive investigations shall be undertaken in accordance with HSG 47.

5.24.7 Geotechnical Information and Parameters

5.24.8 As a minimum 'relevant geotechnical parameters' shall include:

- Ultimate bearing capacity of the soil at foundation level (defined as the least pressure that would cause shear failure of the soil immediately below and adjacent to the foundation);
- Grading (sieve analysis) of all soils;
- Natural and saturated moisture content of all soils;
- Moisture contents, liquid and plastic limits of clays;
- Unit weights of the soil within each stratum, noting whether saturated, moist or dry; and
- Ground aggressivity in accordance with BRE Special Digest (SD1:2005).

5.24.9 The Contractor must also consider the following 'relevant geotechnical parameters', and provide justification if any of these will not be provided:

- Undrained shear strengths of clays determined by laboratory triaxial tests on boreholes samples, and from in-situ testing;
- Effective stress parameters for all soils determined by laboratory triaxial tests on borehole samples;
- Pore water pressure log with depth; and
- Permeability of granular strata determined by in-situ permeability tests.

5.24.10 All field investigation shall be performed close to the proposed foundations and / or retaining structures. Depending upon the proposed structures, at least two exploratory holes within the footprint of the proposed foundations or structure shall be formed, especially at sites displaying irregular topography and / or stratigraphy. The depth of the investigation for shallow and piled foundations shall be in accordance with Eurocode 7.

5.24.11 Where rock is encountered the contractor shall prove that boulders or layers of cemented soils are not being mistaken for bedrock.

5.24.12 Geological records should be consulted in these circumstances. Rotary diamond core drilling should also be considered. In all cases, the contractor shall agree laboratory testing items of the site-specific investigation schedules with Network Rail and the designer. Any changes to the planned laboratory tests shall be submitted to Network Rail for approval.

5.25 Existing Site Conditions

5.25.1 No planned works shall effect the operation of the existing infrastructure or the supplies and services to signalling equipment, point heating, existing accommodation etc.

5.25.2 Due care shall be taken at the design stage to eliminate or reduce the risk of accidents in construction with buried and concealed services.

6. Applicable Design Standards

6.1.1 The following is a list of relevant rail related standards applicable to the design / construction and operation of access points which will facilitate the use of heavy RRVs. This list is not exhaustive and does not include relevant British Standards' / BS EN's / Eurocodes for which compliance will be mandatory:

- **NR/PLANT/0200/module P301** – Road Rail Access Points
- **NR/PLANT/0200/module P507** – Infrastructure Plant Operations Manual: On Track Plant
- **NR/PLANT/0200/module P703** – Infrastructure Plant Operations Manual: Road Rail Access Point Maintenance
- **COP0007** – Code of Practice for On & Off Tracking of Road Rail Vehicles
- **NR/L3/INI/CP0036** – The Provision of Welfare Facilities
- **NR/SP/OHS/069** – Lineside Facilities for Personnel Safety
- **NR/PLANT/0200** – Infrastructure Plant Manual
- **NR/L2/TRK/2102** – Design & Construction of Track
- **NR/L2/TRK/2049** – Track Design Handbook
- **NR/L3/CIV/003** - Engineering Assurance of Building & Civil Engineering Works
- **NR/L2/ELP/27239** – Maintenance Specification for Electrical Traction Distribution Equipment
- **NR/L2/TRK/4040** – Level Crossing Surface Systems
- **BS EN 50122** Railway Applications Fixed Installations
- **NR/CAT/STP/001** Catalogue of Network Rail Standards
- **NR/GN/CPR/401** Guidance on Contractual Health & Safety Requirements
- **NR/L1/INI/CP1010** – Policy on Working Safely in the Vicinity of Buried Services
- **NR/L1/INI/PM/GRIP** – Governance for Railway Investment Project (GRIP) – Policy manual
- **NR/L2/AIF/1040** – Buried Services Data Feedback
- **NR/L2/AIR/1020** – Buried Services Data Provision
- **NR/L2/CIV/003** – Engineering Assurance of Building and Civils Engineering Works
- **NR/L2/CTM/021** – Competence & Training in Track Safety
- **NR/L2/EBM/029** Network Rail Definition of Product Acceptance Requirements
- **NR/L2/ENV/015** – Contract Requirements – Environment
- **NR/L2/INI/002** – Accident and Incident reporting and Investigation
- **NR/L2/INI/02009** – Engineering Management for Projects
- **NR/L2/INI/CP0047** – Application of the Construction Design and Management Regulations to Network Rail Construction Works.
- **NR/L2/INI/CP0061** – Access Through Land Belonging to an Outside Party
- **NR/L2/INI/CP1030** – Working Safely in the Vicinity of Buried Services
- **NR/L2/INI/EDT/CP0091** - Specification for Computer Aided Design
- **NR/L2/OHS/00120** – Pre-employment, Pre-appointment and Periodic Testing for Drugs and Alcohol

- **NR/L2/OHS/005** – High Street Environment and Conditions for Work Outside Network Rail Controlled Infrastructure
- **NR/L2/OHS/018** – Supplier Requirements for the Approval of Medical Assessments and Drug and Alcohol Screening and Certification
- **NR/L2/OHS/019** – Safety of People Working On or Near the Line
- **NR/L2/OHS/020** 0 Track Visitor Permits
- **NR/L2/OHS/021** – Personal Protective Equipment and Work Wear
- **NR/L3/CIV/071** - Geotechnical Design
- **NR/L3/CIV/140** – Model Clauses for Civil Engineering Works
- **NR/L3/INI/CP0044** – Work Package Planning Process
- **NR/L3/INI/CP0046** – The Reporting and Investigation of Accidents and Incidents within Investment Projects and Asset Management Works Delivery
- **NR/L3/INV/0101** – General Requirements for the Reporting of Accidents, Incidents and Occupational Ill Health
- **NR/L3/INV/0113** – Statutory Reporting of Accidents, Incidents and Occupational Ill Health
- **NR/SP/BUS/011** - Prevention of Damage to and Danger from Surface and Buried Services
- **NR/SP/ELP/29987** - Working on or about AC Electrified Lines
- **NR/SP/ENV/007** - Project Management and the Environment
- **NR/SP/OHS/00108** - Contract Safety & Assurance Requirements
- **NR/SP/OHS/050** – Sentinel Scheme Rules

6.2 Application of Standards

6.2.1 The following are mandatory requirements:

- European and National Legislation;
- Railway Group Standards;
- Network Rail Company Standards;
- Network Rail Asset and Environment Policies;
- The requirements of this Engineering Remit; and
- The requirements of applicable temporary non-compliances pending standard change for Group and Company Standards.

6.2.2 The following are not mandatory but should be used. They become mandatory requirements if quoted in this document:

- HMRI principles and guidance;
- Network Rail guidance notes;
- British Standards;
- European Standards;
- Other: industry standards, instructions, guidance, and codes of practice that are relevant.

- 6.2.3 The applicable standards shall be reported by referring to the relevant issue of standards used and confirming the design and supporting Engineering Deliverables meets the requirements of standards.
- 6.2.4 Where documents refer to other updated or superseded standards the current version of the referenced standard shall apply.
- 6.2.5 Proposals that provide a business benefit by developing alternatives to standards should be developed as a non compliant option where the implications of the deviation to standards are explained.
- 6.2.6 Proposed deviations should be agreed before work takes places to consider them further.

Appendix A – Access Point Categorisation Table

Appendix B – Access Point Generic Layouts

Appendix C – Standard Details