OXFORDSHIRE
STRATEGIC RAIL FREIGHT INTERCHANGE

DCO Submission

Environmental Statement

Chapter 11: Ground Conditions
Appendix 11.10: Jurassic Rock Exposure Technical Note

Document 6.11J
Rev P03

On behalf of
Oxfordshire Railfreight Limited

Prepared by BWB Consulting Ltd
October 2026

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OxSRFI: Jurassic Rock Exposure Technical Note
October 2026

Project Name:	Oxfordshire Strategic Rail Freight Interchange
Project No:	NTH2479
Revision:	P03
Reference:	OXSRFI-BWB-ZZ-XX-RP-YE-00014_GeoSSSI
Author:	[redacted]
Approver:	[redacted]

Oxfordshire Railfreight Limited (The Client) are promoting a Strategic Rail Freight Interchange (SRFI) on land east of the former Upper Heyford Air Base, south of the Chiltern Main Line, and southwest of Junction 10 of the M40 motorway.

The Order Limits partially fall within an area designated as a Site of Special Scientific Interest (SSSI) designated due to geological interest in its exposures of Jurassic rocks and has biological interest associated with limestone grassland, scrub, ancient woodland and wetland habitats.

This Technical Note relates to the geological interest of the SSSI unit and not biological interest.

Geological Importance

Jurassic limestones are renowned for their abundant and well-preserved fossils. These can include marine creatures like ammonites, belemnites, bivalves, and marine reptiles (ichthyosaurs, plesiosaurs). The nearby Ardley Trackways is also a local SSSI where dinosaur footprints were discovered. SSSIs are designated where these fossil assemblages are particularly rich, diverse, or provide crucial insights into past life, environments, and evolutionary processes. Jurassic limestone rock faces are designated as SSSIs because they represent some of the "best examples" of this geological formation, providing critical insights into Earth's history, and serving as important sites for research and education.

The exposed rock faces often display clear stratigraphic sequences, showing layers of rock laid down over millions of years. This allows geologists to study the sequence of events, changes in sea level, and depositional environments during the Jurassic period. Sites are chosen for their representativeness of particular formations or for exhibiting unique sedimentological features (e.g. ooliths indicating warm, shallow seas).

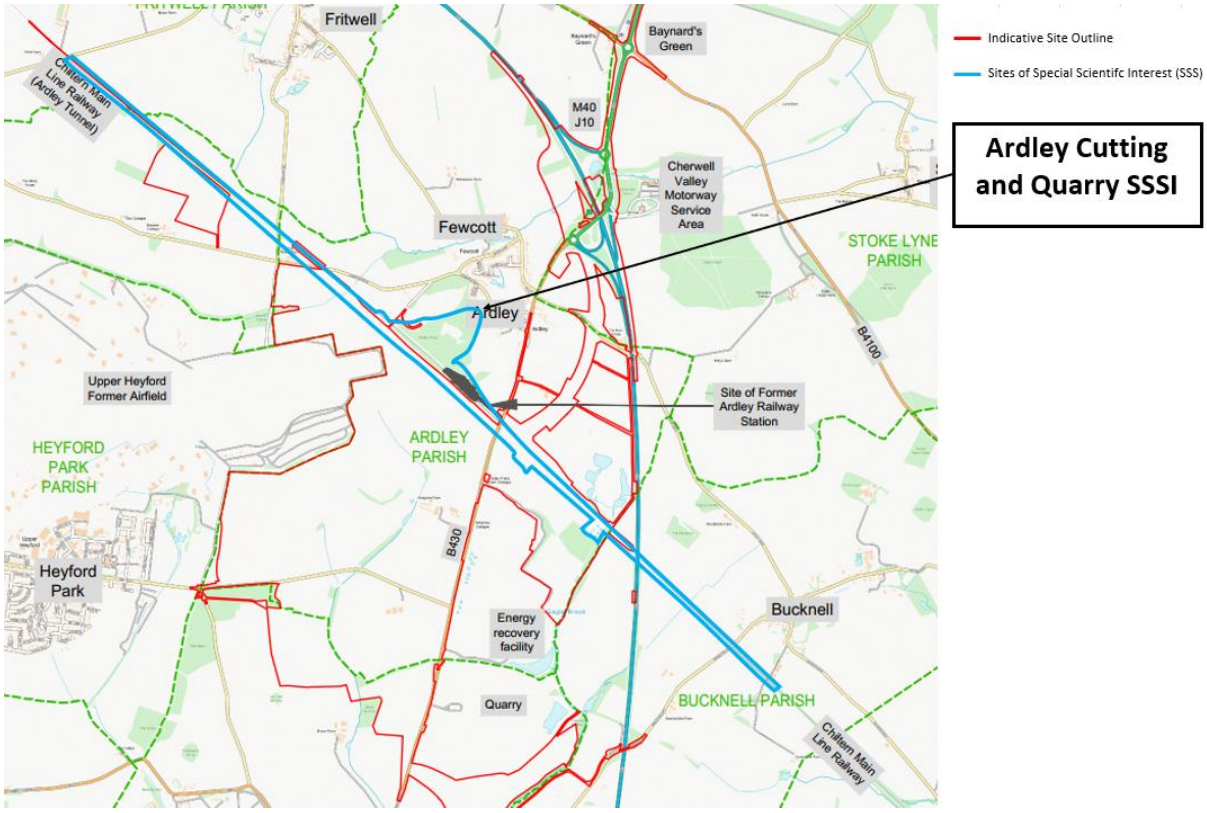
The site is 40.13 ha in area and has been a SSSI since 1988. The Natural England citation with regard to Earth Heritage states:

> *"the railway cutting and southernmost quarry together constitute one of southern England's key sites for Mid Jurassic strata. It has exposures range from the Chipping Norton Formation to the White Limestone Formation and therefore the entire local Bathonian is represented with the exception of the Forest Marble".*

Geological SSSIs can provide invaluable outdoor laboratories for scientific research, allowing geologists, and palaeontologists to study natural processes, collect data, and understand long-term environmental change. These sites may also serve as an excellent educational resource for students and the public, promoting an understanding and appreciation of geology, fossils, and biodiversity.

The location of the above SSSI units is indicated on the below plan.

Figure 1: Location Plan



Ground Conditions

British Geological Survey (BGS) mapping for the site indicates that the site is predominantly underlain by White Limestone Formation (comprising limestone, wackestone, packstone, grainstone and mudstone), with superficial deposits absent. The entire site area is underlain by Sedimentary Bedrock formed during the Jurassic Period. The White Limestone Formation is sub-divided into the Bladon Member, the Ardley Member and the Shipton Member:

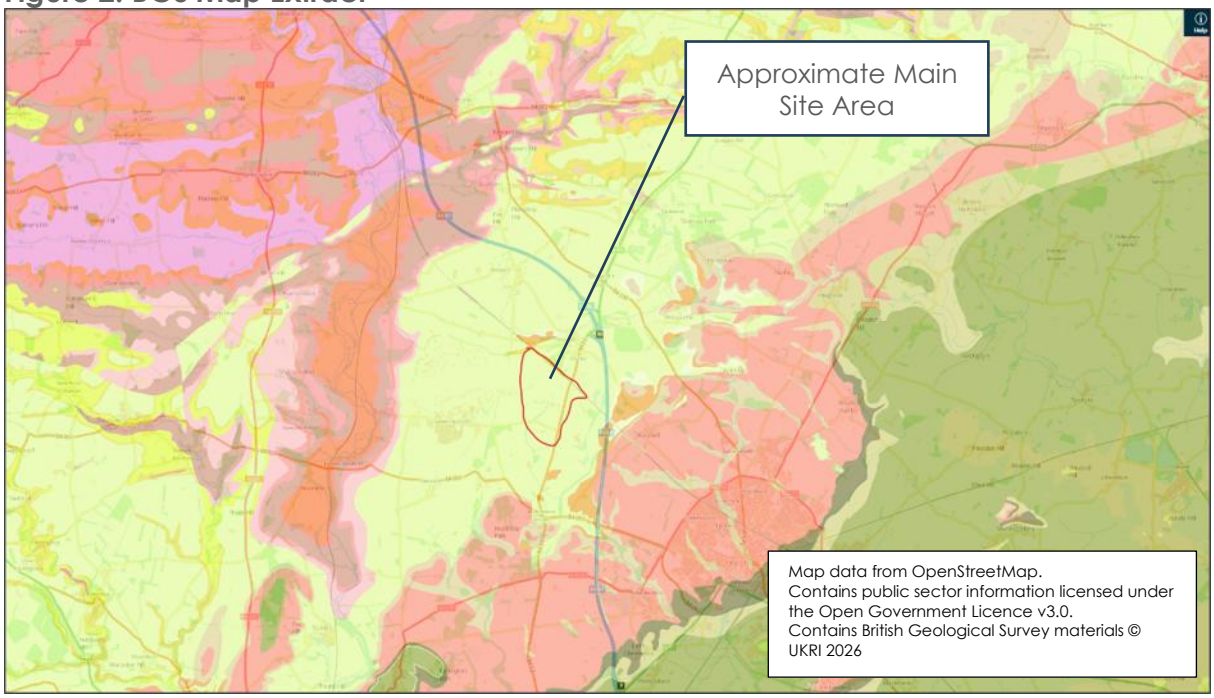
- The Bladon Member: comprises a green and grey clay/mudstone, which is commonly lignitic.
- The Ardley Member: comprising a pale grey to off-white or yellowish limestone, peloidal wackestones and packstones with common ooidal and shell fragmental grainstones, and recrystallised limestone with beds of argillaceous limestone, sandy limestone, marl and mudstone or clay at some levels.
- The Shipton Member: comprising pale grey to off-white or yellowish limestone, peloidal wackestone and packstone with subordinate ooidal and shell fragmental grainstone, and recrystallised limestone with beds of argillaceous limestone, marl and mudstone or clay.

The White Limestone formation was laid down during the Jurassic era between 165 and 168 million years ago and is a sedimentary rock that forms from the accumulation of the remains of marine organisms, such as coral and shells, and the precipitation of calcium carbonate from water. Limestone is known for its fossil content.

The presence of limestone is not rare; indeed, vast areas of the surrounding region are directly underlain by limestone bedrock of the White Limestone Formation. However, there are limited continuously exposed rock faces presenting the whole geological sequence, hence its designation as a SSSI. The pale yellow/green on the below image taken from the BGS mapping viewing portal shows the extents of the White Limestone Formation. As can be seen from the

below image, this formation extends across a much greater area than either the site (roughly outlined in red) or the adjoining SSSI.

Figure 2: BGS Map Extract



Current Condition

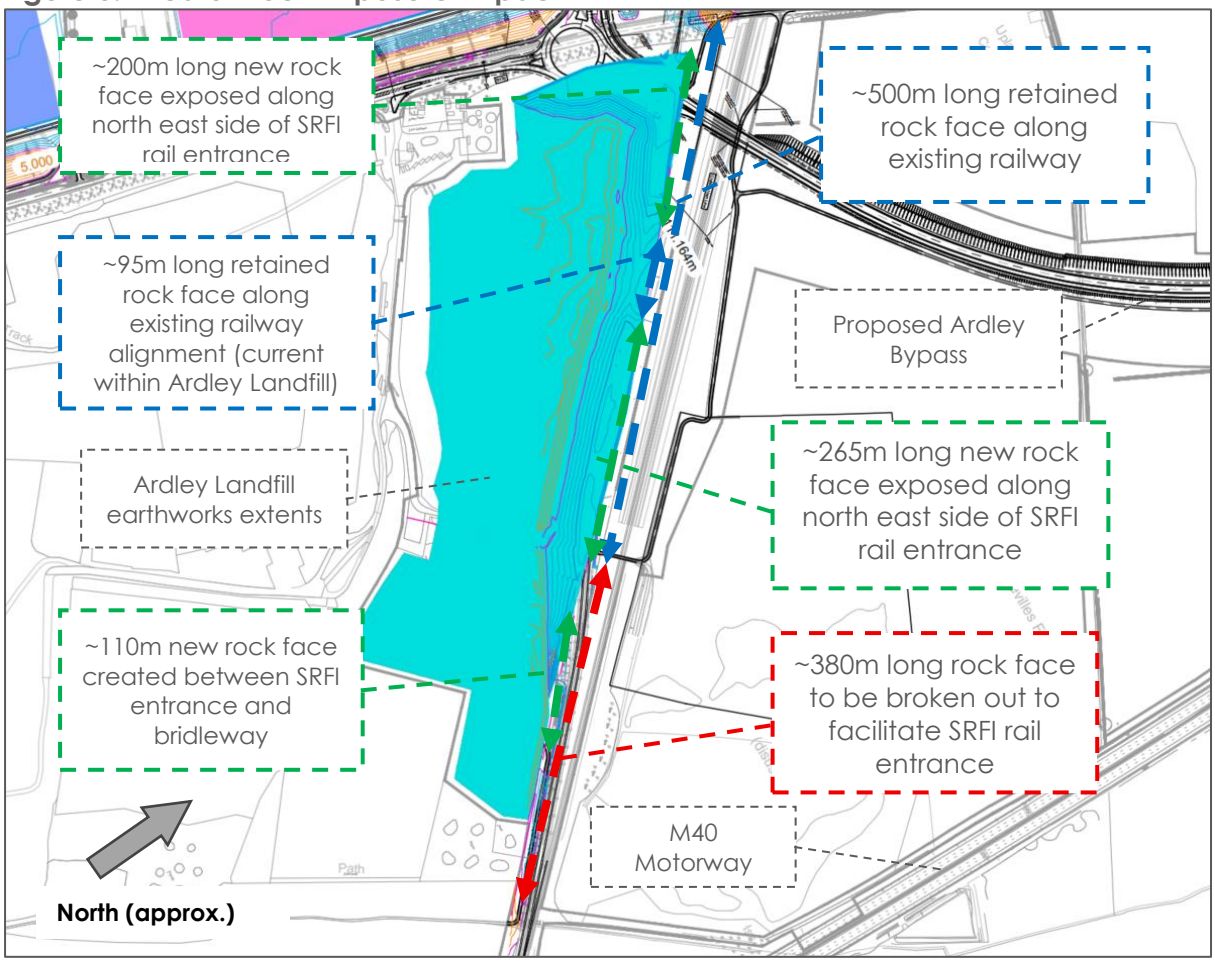
There are two key areas of the Geological Ardley Cutting and Quarry SSSI that will be effected by the Proposed Development:

A small south west facing rock face within the northern part of Ardley Landfill, adjacent to Chiltern Railway.		This rock exposure comprises a circa 3m high rock face associated with an area of either signficiant subsidence, or incomplete landfill, at Ardley Landfill. Below the crumbling and partially vegetated rock face was a pond which prevents easy human access to all but the ends of the rock face.
Areas of the north east facing rock face along Chiltern Railway where connections are proposed into and out of the proposed SRFI.		The railway cuttings south east end where it falls within the site is circa 8m deep. The lower section of the embankment is a partially vegetated rock face set at approximately 70 degrees and around 4m high. The upper portion is also approximately 4m, set at approximately 45 degrees and wholly vegetated. Moving north west, the rock face becomes smaller and shllower and is not present north west of the B430. There is no public access to any section of the railway cutting with it being an active railway.

Development Impacts

Any development works north west of the B430 will not impact on the Geological designation of the SSSI as no rock exposures exists in these areas. The areas that will be affected by rock exposure impact, both removal and creation, are presented on Figure 3 below.

Figure 3: Area of Rock Exposure Impact



In total, the following changes will be made to rock exposures as a result of the Development:

- Approximately 595m of rock face will be retained.
- Approximately 380m of rock face will be lost.
- Approximately 575m of rock face will be created.
- **Net creation of 185m of rock face.**

The existing rock faces only expose circa 4m depth of limestone sequence rockface which are currently poorly maintained and vegetated. The new rock faces are all also in the White Limestone Formation with no significant faulting or geological changes mapped between existing and new proposed locations. The new rock faces will be on rail alignments approximately at grade with the existing Chiltern Main Line rail alignment and so the new rock exposure would at least directly replace the stratigraphic sequence of the rock face but also provides opportunity for enhancement to current conditions.

It's understood that the SSSI is designated because the full stratigraphical sequence of the limestone is exposed. It is important to note that this is not the case for the exposures that will need to be removed as part of the OxSRFI works. The full thickness of the White Limestone Formation, from the Bladon Member through the Ardley Member to the Shipton Member, is

approximately 20-30 m. The existing limestone rock sequence exposures are generally less than 4m high and therefore do not expose the entire stratigraphic thickness of the formation.

Geological Cross Sections appended as **Drawing 1 and 2**, provide the ground profile between the existing railway alignment and the landfill, indicating the relative positions of the existing and proposed rock exposures. The existing railway runs at an elevation of between 109 and 111m above Ordnance Datum (AOD) with the proposed new railway sidings, and therefore new rock faces exposed, from the same elevations of between circa 109 and 111m AOD. The new exposures would be between 6 and 7m in height, which would be greater than existing exposures if the full height is left exposed. The majority of the rock faces would be between 20 and 30m west of the existing exposures.

Given that the rail alignment is approximate to the base of the landfill/ former quarry which terminated on underlying mudstone (of the Rutland Formation), the exposures are associated with the deepest part of the White Limestone Formation, which is the Shipton Member, and the geology considered to be the richest in geological interest (such as potential fossils). The cross sections demonstrate that the same sequence would be lost and added as a result of the proposed work. Additionally, no identified stratigraphic horizons are expected to be permanently lost.

The proposals would result in a net increase in exposed rock face length and exposed White Limestone Formation., illustrated in
Figure 3 and **Figure 4**.

Figure 4: Rock Exposure Impact and SSSI Extents

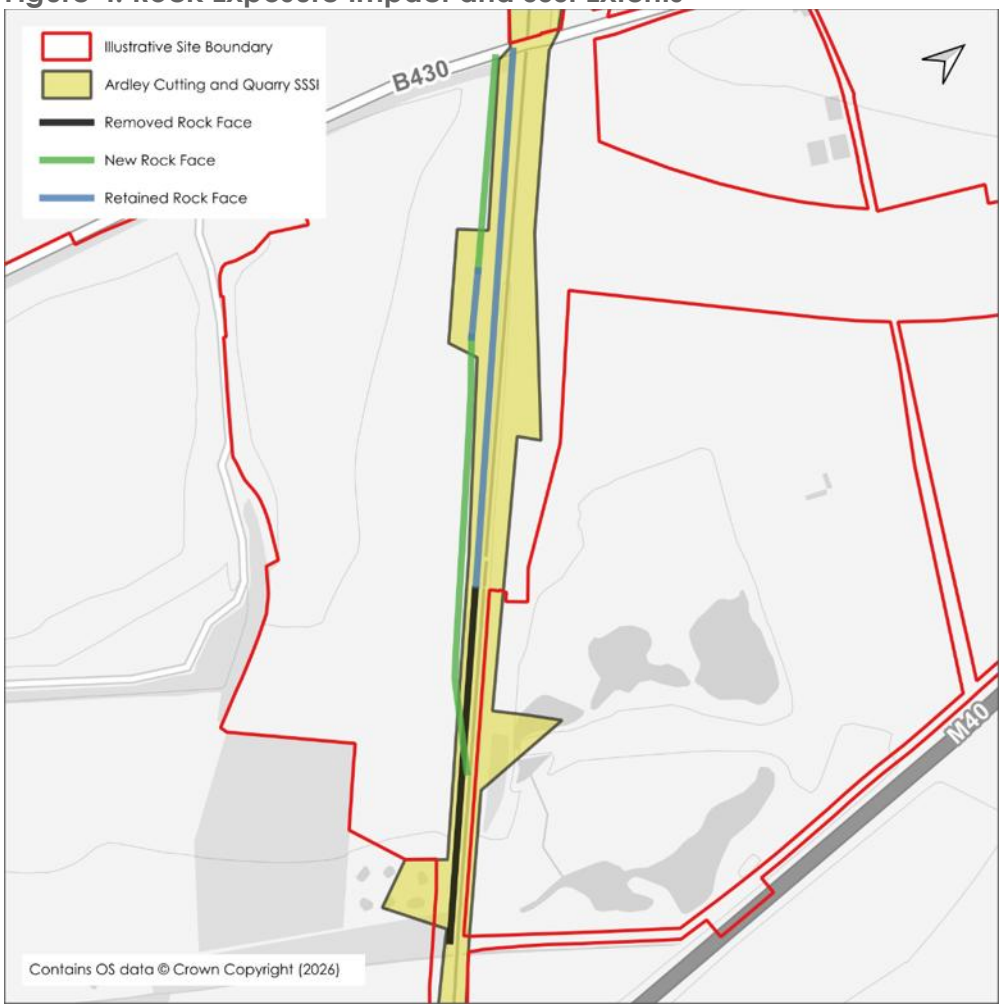


Figure 4 above presents where the existing and new rock exposures would fall within the current SSSI designated area. Given that the current SSSI boundary is constrained to the area of rock faces, it is not possible to create new exposures within the SSSI boundary, albeit the new exposure would only require a small amendment to the existing SSSI boundary should Natural England wish to expand the designation to incorporate any new features.

New Rock Face Exposure Design

The exact detail for the new rock exposures along new rail alignment are not currently advanced and are subject to detailed design to ensure that they are left safe and geotechnically stable. However, the design of the exposure will take account of the guidance provided by Natural England General Publication NE789.

Summary

The new rock faces created as part of the OxSRFI works would expose the same White Limestone Formation succession that is currently visible within the rock faces that will be removed from the Ardley Cutting SSSI as part of the wider proposed works. The design intent is that replacement exposures of new rock faces will provide exposure of the same full stratigraphic interval currently exposed within the removed rock faces, such that the stratigraphic succession remains observable. The lateral extent of continuous rock face exposure affected would be reduced in some locations but replaced by newly created rock faces exposing the same geological sequence. The replacement rock faces are through the same rock sequence and of a similar, or greater, height.

At this stage, full details of how the rockface will be left is subject to detailed design. However, the overall scientific integrity of the new exposures will be created and managed through mitigation and maintenance aligned with NE guidance on rock faces in railway cuttings (Natural England General Publication NE789 Geoconservation: principles and practice).

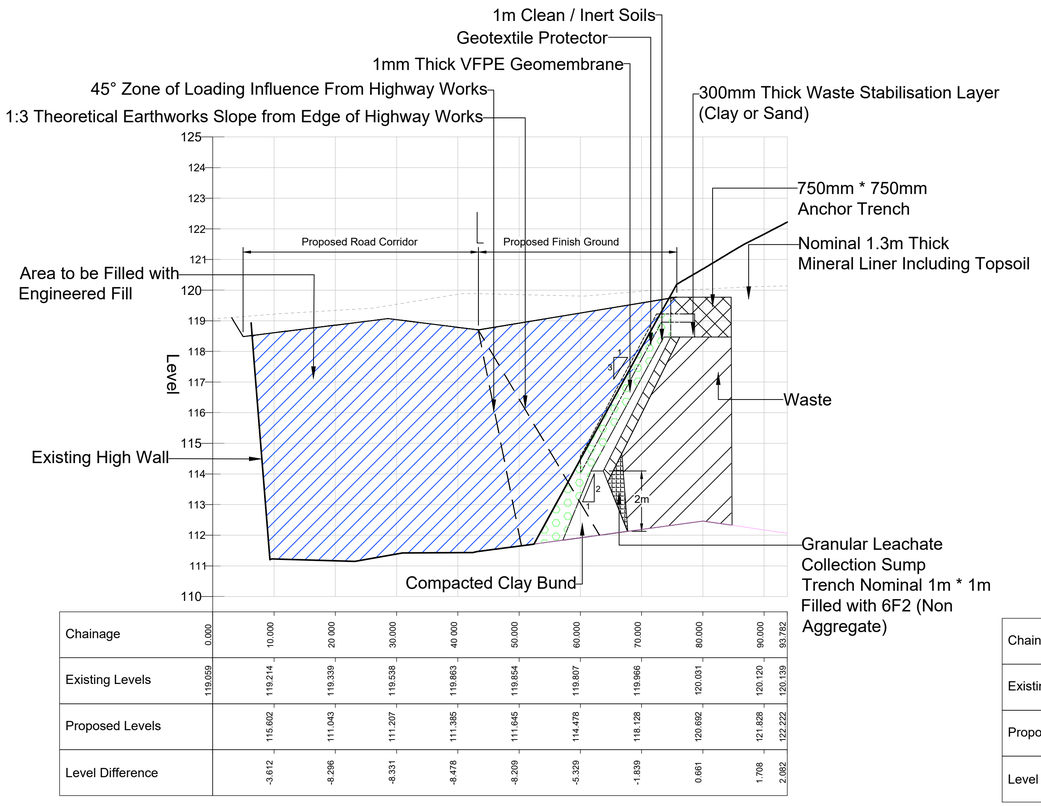
.

Where lost, it would be the full sequence; where created in most cases, it will be the full sequence, as is current, or greater. The scientific value of such sites depends substantially on the availability and quality of rock exposure. The notified geological interest relates to the exposure of the White Limestone Formation succession rather than the preservation of individual rock faces. Newly created exposures within the same stratigraphic interval would maintain opportunities for geological observation, stratigraphic study and fossil discovery. Fresh exposures are likely to provide clearer geological sections than weathered faces and therefore maintain, and potentially improve, the ability to investigate the notified geological sequence.

There is acknowledgement that a proportion of the replacement geological exposures would lie outside the current SSSI boundary, as seen in **Figure 4**. While designation status is a matter for NE, the Applicant has sought to maximise the extent of replacement exposures and ensure these retain long-term accessibility and visibility.

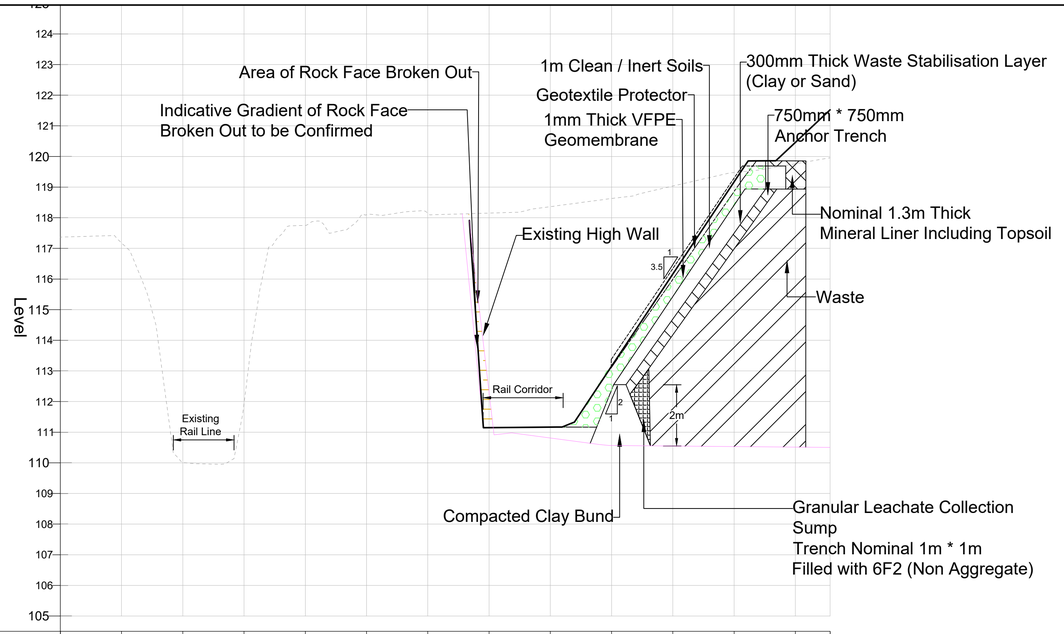
As set out above, the proposed works do not remove the underlying geological resource but alter the location and configuration of exposures through which that geology can be observed. The objective of the mitigation strategy is therefore to ensure that equivalent) sections (albeit with a net increase in terms of lengths of the notified geological succession remain exposed and available for scientific study following completion of the development.

DRAWINGS



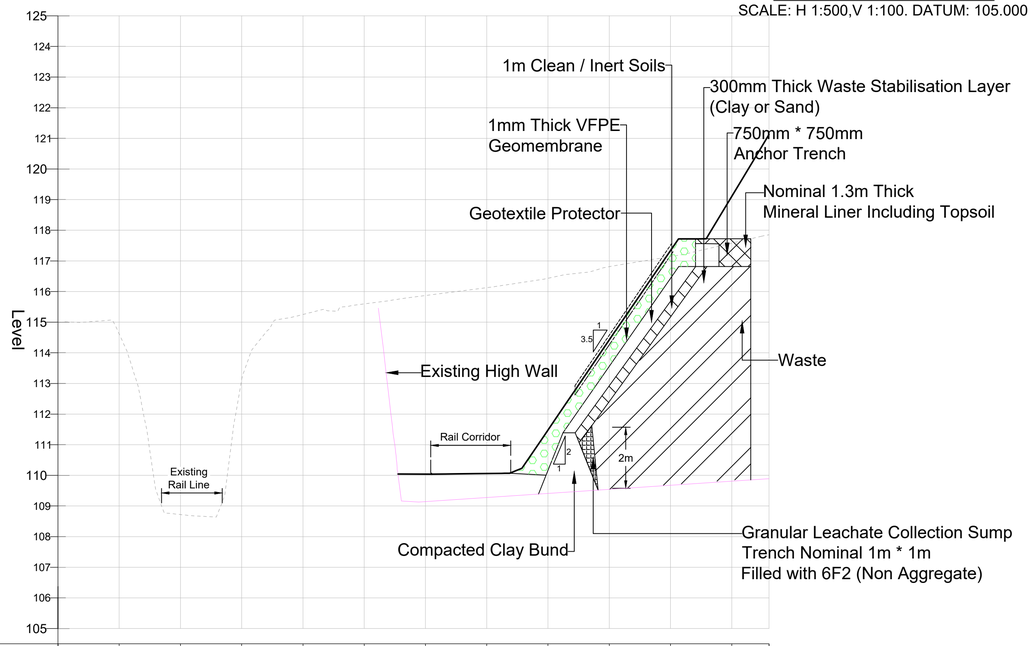
Chainage	0.000	10.000	20.000	30.000	40.000	50.000	60.000	70.000	80.000	90.000	93.782
Existing Levels	119.059	119.214	119.339	119.538	119.863	119.854	119.807	119.966	120.031	120.120	120.139
Proposed Levels		115.602	111.043	111.207	111.385	111.645	114.478	118.128	120.692	121.828	122.222
Level Difference		-3.612	-8.296	-8.331	-8.478	-8.209	-5.329	-1.839	0.661	1.708	2.082

LANDFILL 1 LONGSECTION 5:1 (1)
SCALE: H 1:500,V 1:100. DATUM: 110.000



Chainage	0.000	10.000	20.000	30.000	40.000	50.000	60.000	70.000	80.000	90.000	100.000	110.000	120.000	125.671
Existing Levels	117.388	117.180	110.009	111.933	117.750	118.095	118.147	118.152	118.362	118.629	119.035	119.478	119.762	119.957
Proposed Levels								111.149	111.166	113.154	116.162	119.171	120.458	121.523
Level Difference								-7.003	-7.196	-5.475	-2.873	-0.307	0.696	1.566

LANDFILL 2 LONGSECTION 5:1
SCALE: H 1:500,V 1:100. DATUM: 105.000



Chainage	0.000	10.000	20.000	30.000	40.000	50.000	60.000	70.000	80.000	90.000	100.000	110.000	116.080
Existing Levels	114.978	114.616	108.721	113.120	115.251	115.596	115.869	116.127	116.432	116.813	117.141	117.579	117.855
Proposed Levels							110.701	110.060	111.481	114.422	117.337	119.108	121.129
Level Difference							-5.168	-6.067	-4.951	-2.391	0.196	1.528	3.274

LANDILL 3 LONGSECTION 5:1
SCALE: H 1:500,V 1:100. DATUM: 105.000

Notes

1. Do not scale this drawing. All dimensions must be checked/ verified on site. If in doubt ask.
2. This drawing is to be read in conjunction with all relevant architects, engineers and specialists drawings and specifications.
3. All dimensions in metres unless noted otherwise. All levels in metres unless noted otherwise.
4. Any discrepancies noted on site are to be reported to the engineer immediately.

Legend

- Existing Ground Topographical Survey
- Formation Surface (Road + Rail Line)
- Engineered Fill
- Area of Rock Face Broken Out
- Clean / Inert Soils

Rev	Date	Details of issue / revision
P02	10.06.25	Updated for revised earthworks strategy
P01	25.04.25	Issue for Information

Issues & Revisions

BWB A CAF GROUP COMPANY
Birmingham [redacted]
Leeds | [redacted]
London | [redacted]
Manchester | [redacted]
Nottingham | [redacted]
www.bwbconsulting.com

Client
OXFORDSHIRE RAILFREIGHT LTD

Project Title
OxSRFI OXFORDSHIRE STRATEGIC RAIL FREIGHT INTERCHANGE

Drawing Title
LANDFILL EXCAVATION - SLOPE SECTIONS

Drawn:	[redacted]	Reviewed:	[redacted]		
BWB Ref:	NTH 2479	Date:	07.03.25	Scale@A1:	1:1000

Drawing Status
FOR INFORMATION

Project - Originator - Zone - Level - Type - Role - Number	Status	Rev
OxSRFI-BWB-HGT-ZZ-DR-CH-0630	S2	P02

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Y:\NTH\NTH2479_Oxfordshire RFI\02. Project Delivery\01. WIP\Drawings\OxSRFI-BWB-HGT-ZZ-DR-CH-0630 Landfill Excavation Slope Sections.dwg

Assumed Base Of Made Ground 111.977 m
DS202 - Top Of Made Ground 118.977 m
Proposed Railway Corridor
Base Of Made Ground 110.908 m
BH01 - Top Of Made Ground 118.938 m
Base Of Made Ground 112.196 m
BH02 - Top Of Made Ground 118.846 m
DS204 - Top Of Made Ground 118.495 m
DS203 - Top Of Made Ground 119.603 m
111.164m
Base Of Made Ground 112.628 m
BH08 - Top Of Made Ground 119.428 m
DS207 - Top Of Made Ground 119.441 m
BH03 - Top Of Made Ground 116.795 m
Base Of Made Ground 109.395 m
DS205 - Top Of Made Ground 119.609 m
DS206 - Top Of Made Ground 120.900 m
DS214 - Top Of Made Ground 119.796 m
DS209 - Top Of Made Ground 117.478 m
DS210 - Top Of Made Ground 115.937 m
Proposed rail lines
BH04 - Top Of Made Ground 117.304 m
BH04A - Top Of Made Ground 117.441 m
Base Of Made Ground 109.141 m
Base Of Made Ground 110.232 m
BH09 - Top Of Made Ground 121.832 m
DS208 - Top Of Made Ground 121.742 m
DS213 - Top Of Made Ground 119.592 m
BH05 - Top Of Made Ground 115.593 m
BH05A - Top Of Made Ground 116.281 m
Base Of Made Ground 109.400 m
DS211 - Top Of Made Ground 116.360 m
DS212 - Top Of Made Ground 119.135 m
Base Of Made Ground 110.178 m
BH06 - Top Of Made Ground 118.578 m
DS215 - Top Of Made Ground 117.371 m
DS216 - Top Of Made Ground 117.593 m
Land Deposition Area
Cell A
Total Area: 68,200m²
To tie in to existing
landfill height
Bridleway to be built on
existing landfill material
Interface of bridleway
diversion and landfill to
be confirmed
DS217 - Top Of Made Ground 116.591 m
DS218 - Top Of Made Ground 114.799 m
DS218A - Top Of Made Ground 114.704 m
Base Of Made Ground 107.296 m
BH07 - Top Of Made Ground 114.396 m
DS219 - Top Of Made Ground 113.697 m
DS219A - Top Of Made Ground 113.711 m
Land Deposition Area
Cell B
Total Area: 35,000m²
Lifted by approx. 2.1m
MP 12.75
MP 12.5
Workings (dis)
Tanks
Weighbridge
Public
Recycling
Facility
Ackley Fields
Farm Cottages
Track
Pond
Silo
WB
B 430
118.9m

Notes

1. Do not scale this drawing. All dimensions must be checked/ verified on site. If in doubt ask.
2. This drawing is to be read in conjunction with all relevant architects, engineers and specialists drawings and specifications.
3. All dimensions in metres unless noted otherwise. All levels in metres unless noted otherwise.
4. Any discrepancies noted on site are to be reported to the engineer immediately.

Legend

- Cut Major Contour Cut 0.5m Interval
- Cut Minor Contour Cut 0.1m Interval
- Fill Major Contour Fill 0.5m Interval
- Fill Minor Contour Fill 0.1m Interval
- Draft Order Limits
- New Extent of Landfill
- Landfill Cells Made Ground

Isopachyte contours show the depth of cut between the existing ground level and the extent of excavation for the removal of the landfill. The extent of excavation is taken to be either:
1. The full known depth of the landfill (where this is located directly beneath the main works of highway and railway corridors), or
2. A 1m deep strip of the landfill (where this is located beneath the finished level of the embankments of the respective corridors).

Approximate volume of landfill to be removed based on the borehole information is: 170,200m^3

Note: Borehole level information is shown on the drawing.

Rev	Date	Details of issue / revision	Drw	Rev
P09	10.06.25	Volumes updated in line with new rail corridor	RP	SRH
P08	25.04.25	Section 2 direction amended	RP	SRH
P07	20.03.25	Deposition cell A extents amended	RP	SRH
P06	19.03.25	Deposition cell contours added	RP	SRH
P05	13.03.25	Volumes updated in with new carriageway	RP	SRH
P04	10.01.25	Cross sections added	JP	SRH
P03	16.10.24	Volumes updated in with new carriageway	JP	SRH
P02	07.08.24	Volumes updated in with new rail corridor	DF	SRH
P01	22.02.23	Issue for Information	MN	SRH

Issues & Revisions

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Birmingham | [redacted]
Leeds | [redacted]
London | [redacted]
Manchester | [redacted]
Nottingham | [redacted]
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Client
OXFORDSHIRE RAILFREIGHT LTD

Project Title
OxSRFI
OXFORDSHIRE
STRATEGIC RAIL FREIGHT INTERCHANGE

Drawing Title
LANDFILL EXCAVATION - ISOPACHYTE CONTOURS

Drawn:	[redacted]		Reviewed:	[redacted]	
BWB Ref:	NTH 2479	Date:	22.02.23	Scale@A1:	1:1000

Drawing Status
FOR INFORMATION

Project - Originator - Zone - Level - Type - Role - Number	Status	Rev
OxSRFI-BWB-GEN-XX-SK-CH-SK062	S2	P09

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Y:\NTH\NTH2479_Oxfordshire RFI\02. Project Delivery\01. WIP\Sketches\OxSRFI-BWB-GEN-XX-SK-CH-SK062_Landfill Excavation (Updated Rail Line).dwg