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BRB (Residuary) Ltd
Major Works Programme 2009/2012

VAR9/2602 ASSESSMENT PROGRAMME

BD21 ASSESSMENT AND INSPECTION REPORT

Red Barn Overbridge, Rushbury, Shropshire

BRIDGE REF: BUI/26

January 2010

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Document control sheet BPP 04 F8

Client: BRB (Residuary) Ltd
Project: Major Works Programme 2009/2012 Job No: B12360AH – BUI/26
Document Title: VAR9/2602 Assessment Programme
BD21 Assessment and Inspection
BUI/26

	Originator	Checked by	Reviewed by	Approved by
ORIGINAL Form AA	[redacted]			
DATE 6 November 2009				
Document Status: Form AA				

REVISION Form BA	NAME	NAME	NAME	NAME
	[redacted]			
DATE 27 January 2010				
Document Status: Form BA				

REVISION	NAME	NAME	NAME	NAME
DATE	SIGNATURE	SIGNATURE	SIGNATURE	SIGNATURE
Document Status				

REVISION	NAME	NAME	NAME	NAME
DATE	SIGNATURE	SIGNATURE	SIGNATURE	SIGNATURE
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1 General Description and Structural Details

1.1 Introduction

Jacobs was appointed by BRB(R) to conduct the site survey at BUI/26 in sufficient detail to provide data for BD21 assessment work.

Structural Soils Ltd excavated two trial pits on the centre line of the road, one at the mid-span and the other one over the north abutment to expose the top flange of the centre girder.

1.2 Location and General Description

Bridge BUI/26 carries a public bridleway, also used for field access, over the track bed of the former Buildwas to Marsh railway at Rushbury in Shropshire.

The bridleway is unpaved. The bridge deck itself is concrete with no additional surfacing. Overall width between the parapets is about 5.43m (Photo 3 & 4).

The OS grid reference is SO 513 912.

The bridge was constructed in 1867. Pre-cast concrete jack arches appear to have replaced the original brick jack arches circa 1960.

1.3 Construction type

The structure is a square, single span overbridge. The clear span is 7.58m (24' – 10") (photo 1).

The bridge comprises of three internal longitudinally spanning cast iron girders, spaced at 4' - 4¼" (1.327m) centres and two cast iron edge girders (Photo 6). Pre-cast concrete arches span between the bottom flanges of the girders to form the bridge deck.

The internal girders have an overall depth of 21" (533mm) at mid span and 16" (406mm) at supports. The edge girders have an overall depth of 20" (508mm) throughout.

Three tie bars fix the edge girders to the internal girders at mid-span and quarter-span.

The abutments and wingwalls are constructed from random size stones irregularly coursed.

The parapets are corrugated steel sheeting with cast apexes on top. The parapets are supported by masonry pilasters at the ends and two stiffeners along the span. The stiffeners are connected to the top flange of the edge girders and the outer face of the corrugated steel parapet.

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2 Existing Information Search

2.1 Services Search

Documentation obtained by Structural Soils Ltd is included in Appendix B.

2.2 SI Results

Trial pits were excavated as part of the survey and were located at the mid-span and the north abutment over the centre girder.

Data on the trial pit and a description of the investigation is included in Appendix C.

2.3 Existing Drawings

There is one bridge drawing available showing deck section, elevation and plan of the bridge. The drawing shows the bridge in its original form with brick jack arches. The bridge deck was reconstructed with pre-cast concrete arches and the girders may have been re-bedded at the same time accounting for minor dimensional differences.

3 Structure Condition

3.1 General

The survey and inspection for BD21 assessment were undertaken on Monday 24 August 2009. There were heavy showers with sunny intervals and temperature was about 20°C.

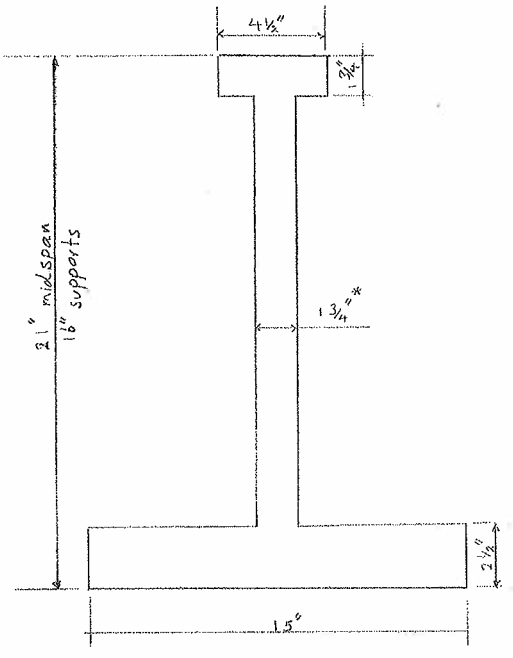
It was possible to park on the road at the bridge. There is no regular traffic use. Access to the formation was gained through the field access track at the north west side of the bridge.

3.2 Main superstructure

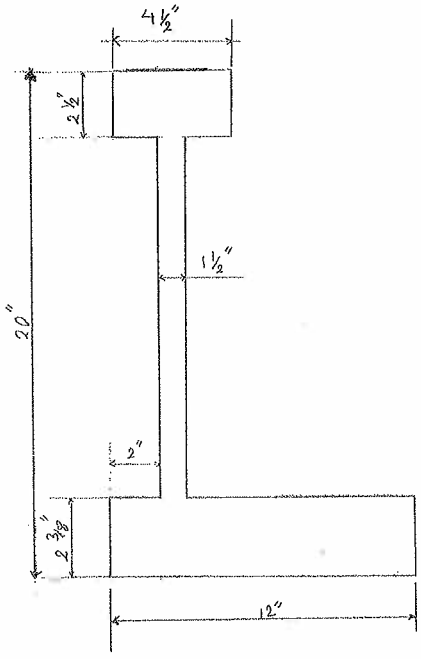
3.2.1 Longitudinal girders

The edge girders are generally in satisfactory condition with no significant section loss; though they have some calcareous staining to the inside leg of the bottom flanges (Photos 5&6).

The internal girders are in similar condition. They show no section loss throughout the bottom flanges, with only some calcareous staining and small stalactites (Photo 6).



Internal girders



Edge girders

3.2.2 Precast concrete arches

The precast concrete arches area in good condition with no major defects (Photo 6).

3.2.3 Tie bars

The tie bars in the west bay are in satisfactory condition with minor surface corrosion (Photo 6).

The tie bars in the centre bays have significant corrosion and section loss. The residual diameter of their corroded section is about ¾".

The tie bars in the east bay have severe section loss due to corrosion. The first tie bar from the north is corroded and broken. The residual diameter of the other two tie bars is about ½" (Photo 7).

3.3 Abutments

The abutments are constructed from random size stones irregularly coursed.

The south abutment is in satisfactory condition. There is a crack starting from the east bedding stone stretching diagonally towards the quoin stone at ground level. There is a sapling growing about 1m down from the bedding stone at the east corner. Mortar filling is generally good, except at the east quoin stones where there is a significant mortar loss (photo 9).

The north abutment is also in satisfactory condition. Mortar filling is generally in good condition, except the east corner where there is some moderate mortar loss. One of the bedding stones under the first internal girder from the east appears to be spalled (photo 8).

3.4 Wingwalls

The wingwalls are constructed from random size stones irregularly coursed.

The north east wingwall is obscured by vegetation. From what can be seen, it appears to be in satisfactory condition (photo 11).

The north west wingwall is generally in satisfactory condition. There is some mortar loss in the abutment corner.

The south east wingwall has some vegetation growing on the corner next to the abutment and also on the pilaster. There is some mortar loss in the lower courses (Photo 12).

The south west wing wall is in good condition. There is some mortar loss in the top corner next to the abutment (photo 13).

3.5 Parapets

The parapets have surface corrosion throughout, but there is no significant section loss.

3.6 Formation

The formation is reverting to natural vegetation. There is an infrequently used unofficial footpath going under the bridge to the east. (Photo 1).

3.7 Road surface

The bridge is on an unmade track used for access to the fields (Photos 3 & 4). The bridge deck itself is concrete which is showing some signs of surface deterioration and shallow rooted vegetation has taken hold. Road surface condition is rated as "poor" for BD21 bridge specific live loading.

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4 Assessment to BD21

4.1 Structural Parts checked to BD21

The following parts of the bridge were checked to BD21:

- Internal girders: Bending in tension, bending in compression, shear
- Edge girders: Bending in tension, bending in compression, shear
- Jack arches

4.2 Methodology

BD21 vehicle loading was applied to the internal girders using the simple distribution methods outlined in Chapter 2 of BA 16/97. As the concrete surface occupies the entire width of the bridge, the carriageway loading was also applied to the edge girders using the same method. No checks for accidental vehicle loading were deemed necessary as carriageway loading applies on all girders.

The embedment of the internal cast iron girders in concrete permits an increase in the section modulus for live load by D/d in accordance with BD21/01 Clauses 7.12 to 7.15.

The assessment was based on the current condition of the structure as determined by the inspection. Specific allowance for recorded section losses was made to the appropriate component of the relevant elements.

Determination of the adequacy of the jack arches was based upon the empirical method described in Bridgeguard 3 Current Information Sheet No 22 (Pro-forma for the empirical assessment of brick, masonry and concrete jack arches and associated ties), though the pre-cast concrete jack arches need special consideration.

The substructure was assessed qualitatively.

4.3 Results

Element: **Internal girders**

Span = 7.71m

26 tonne loading K factors for various road surface and HGV flow combinations:

	HGV Flow		
Road Surface	High (H)	Med. (M)	Low (L)
Good (g)	0.79	0.77	0.75
Poor (p)	0.89	0.87	**0.85**

18 tonne loading K factors for various road surface and HGV flow combinations:

	HGV Flow		
Road Surface	High (H)	Med. (M)	Low (L)
Good (g)	0.64	0.62	0.59
Poor (p)	0.73	0.71	**0.64**

C = Available live load capacity / Live load capacity required for Adjusted HA loading and relates directly to the K factors in Figures 5.2 to 5.7 of BD21/01.

C > K = 0.64 for 18 tonne loading (Lg) Low HGV flow, poor road condition.

Action	Location	Dead load effect	HA adjusted LL effect	Assessed live load resistance	C factor	Live load rating
Bending (tension)	Mid-span	105.9 kN.m	291.2 kN.m	200.1 kN.m	0.687	**18 tonnes**
Shear	Support	54.9 kN	151.8 kN.m	420.9 kN	2.77	40 tonnes

Element: **Edge girders**

	HGV Flow		
Road Surface	High (H)	Med. (M)	Low (L)
Good (g)	0.64	0.62	0.59
Poor (p)	0.73	0.71	**0.64**

7.5 tonne loading K factors for various road surface and HGV flow combinations:

	HGV Flow		
Road Surface	High (H)	Med. (M)	Low (L)
Good (g)	0.35	0.34	0.33
Poor (p)	0.40	0.38	**0.37**

Group 1 FE loading K factors for all combinations: **0.49**
Group 2 FE loading K factors for all combinations: **0.25**

Action	Location	Dead load effect	HA adjusted LL effect	Assessed live load resistance	C factor	Live load rating
Bending (tension)	Mid-span	69.7 kN.m	247.9 kN.m	137.7 kN.m	0.555	**7.5 tonnes Grp. 1FE**
Shear	Support	36.0 kN	128.0 kN	448.6 kN	3.5	40 tonnes

C > K = 0.37 for 7.5 tonne loading (Lg) Low HGV flow, poor road condition.
C > K = 0.49 for Group 1 fire engine loading.

Element: **Jack arches and tie rods**

The pre-cast concrete jack arch units are considered to be adequate for full local wheel effects although they do not conveniently fit with the criteria required in the Bridgeguard CIS No.22 empirical method of assessment. The combination of the arch unit and infill concrete should give adequate resistance.

The tie bars in the west bay are satisfactory. They are just about compliant for full 40 tonne loading but quite acceptable for the restricted capacity of the principal girders. Those in the east bay are badly corroded and one is fractured and need to be replaced. They are non-compliant in their current state though it is noted that vehicles do not normally track on this part of the deck.

Element: **Substructure**

The abutments show no signs of structural distress. By qualitative assessment, they are rated at 40 tonnes Assessment Live Loading.

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5 Conclusions and Recommendations

The carriageway width and hence the number of notional lanes on the bridge is subject to interpretation. The width between the parapets is 5.49m which would indicate two notional lanes, but the width is further restricted between the pilasters giving an effective with less than 5m and hence single lane loading. Given the very limited use of the bridge by vehicles and the encroachment of vegetation leading to a single vehicle track in the centre of the bridge, it appeared reasonable to adopt single lane loading.

The capacity of the bridge is limited by the edge girders to 7.5 tonnes, but practically 18 tonnes can be achieved in its current pattern of use, as this is the capacity of the three central girders. To formalise the assessment at 18 tonnes it would be necessary to install kerbs or other barriers to limit the carriageway loading position. In this instance accidental vehicle loading would have to be considered on the verges and again would be limited by the capacity of the edge girders.

The tie bars in the east edge bay of the bridge are corroded and the 7.5 tonne limit is dependent on these tie bars being replaced. The tie bars on the west edge of the bridge are adequate for maximum AW vehicle loading.

Any repairs or strengthening of the bridge needs to consider the very limited use made of the bridge by vehicles; not more than occasional field access by agricultural equipment.

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Appendix A - Photographs

1. East elevation

2. West elevation

3. Road over bridge looking north

4. Road over bridge looking south

5. West edge girder and parapet

6. Bridge deck soffit

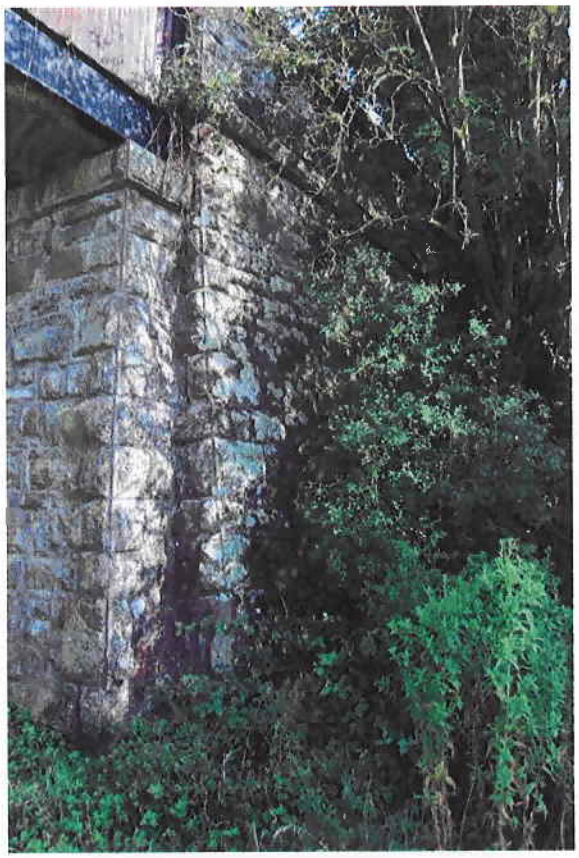
7. Precast concrete arches and broken tie bar in the east bay

8. North abutment

9. South abutment

10. North west wingwall

11. South east wingwall



12. South west wingwall

13. Trial Pit at mid-span over the centre girder

14. Trial pit at north abutment over the centre girder

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Appendix B - Services Search

National One Call

powered by PlanToDig.com

Response Summary

enquiries@national-one-call.co.uk
Tel: 0844 800 9957 Fax: 0845 280 2040

Enquiry Number	**EQ/UVSJD484**	Service	**Retriever**
Location of Enquiry	**at Grid Refs 351353 291257 Sth of Rushbury Rd and East of Darby Lane, Sth of Rushbury, Shropshire, SY6 7**		

Status: Affected

Organisation	**Response**
Severn Trent Plc	water

Status: Not Affected

Organisation	**Response**
Affiniti - Kingston Communications	Please find attached details of your recent plant enquiry. Kingston Communications network is not affected by the proposed works at the location specified on the notice. This is valid for 3 months from date of receipt
Dwr Cymru Welsh Water	Not our supply area
E S Pipelines Ltd	7 July 2009 Reference: EQ/UVSJD484 Dear Sir/Madam, Thank you for your recent plant enquiry at: Sth of Rushbury Rd and East of Darby Lane, Sth of Rushbury, Shropshire, I can confirm that ESP Gas Group Ltd has no gas or electricity apparatus in the vicinity of this site address and will not be affected by your proposed works. ESP are continually laying new gas and electricity networks and this notification is valid for 90 days from the date of this letter. If your proposed works start after this period of time, please re-submit your enquiry. Important Notice Please be advised that any enquiries for ESP Connections Ltd, formerly known as British Gas Connections Ltd, should be sent directly to us at the address shown above Yours faithfully, [redacted] erations Manager
Energetics	can confirm Ene[redacted] have any plant located at the address in question Thanks [redacted]
Fibrespan Ltd	With regard to your enquiry below, I can confirm that FibreSpan Ltd. does NOT have any plant affected by your proposed works. Kind regards, [redacted]
Fujitsu - Orange pcs	Location SOUTH OF RUSHBURY ROAD AND EAST OF DARBY LANE, SOUTH OF RUSHBURY Dated 18-JUL-09 With reference to your enquiry regarding the above noted location, we are unaware of any ORANGE PCS plant or services supported by Fujitsu in the area indicated in your enquiry. We bring your attention to the fact that whilst we try to ensure the information we provide is accurate, the information is provided Without Prejudice and Fujitsu accepts no liability for claims arising from any inaccuracy, omissions or errors contained herein. Fujitsu responds to plant enquiries for Orange PCS. As we are moving towards a fully electronic database we urge our customers to request plant enquiries by email which will result in a higher level of service and cost saving. Please note that Fujitsu does not deal with plant enquiries for Hutchinson Network Services (GEO) or Global Crossing and have no forwarding details. If you require any further information, please do not hesitate to contact me. Plant Protection Administrator Fujitsu Telecommunications Europe Ltd
Gamma Telecom	Having examined my records, I can confirm that Gamma Telecom has no owned apparatus within the area of your enquiry below:- Regards Ray Gamma Telecom Plant Records
Gas Transportation Co	Site Ref: EQ/UVSJD484 Date: 15 July 2009 Re: Sth of Rushbury Rd and East of Darby Lane, Sth of Rushbury, Shropshire. Thank you for your enquiry concerning apparatus in the vicinity of your proposed work. GTC/ENC can confirm that we have no apparatus in the vicinity but please note that other Gas Transporters/Electricity Distributors may have and that you should ensure that all transporters/ distributors have been consulted. All future plant enquiries must contain accurate Easting and Northing references to enable us to process your enquiry efficiently. Yours sincerely GTC
Interoute - Netsphere 24 Ltd	we are unaware of any Interoute plant
Spectrum Interactive plc	In response to your query regarding the reference above, Spectrum Interactive (formerly New World Payphones) our initial thoughts are we have No telephone kiosk onsite at present. Our plant is above ground, and should not affect any underground works, should you come across a telephone kiosk and it's not a BT one then it will be one of ours. If you have any further queries please do not hesitate to contact me on 01442 205538 Melanie Mulvanerty Logistics and Delivery Administrator Spectrum Interactive plc 01442 205534

THUS plc	We are unaware of any Thus plant in the vicinity of your proposed works. Thanks [redacted] Streetworks Noticing Officer
Verizon Business	Verizon Business is a licensed Statutory Undertaker. We have reviewed your plans and have determined that Verizon Business (Formally known as MCI WorldCom, MFS) has no apparatus in the areas concerned. If you have any further queries please do not hesitate to call. Yours faithfully [redacted] Plant Protection Officer
Virgin Media (NTL:Telewest)	virgin media and viatel plant should not be affected by your proposed works
Vtesse Networks Ltd	Your Ref EQ/EEHBY820 EQ/MVQD0283 EQ/MIJEW231 EQ/IMXE0056 EQ/WNVRL555 EQ/MIRHY134 EQ/FCNEB812 EQ/GWFCU088 EQ/NWVFG285 EQ/RPIXI360 EQ/UVSJD484 EQ/EHOKO832 Our Ref 0709/324 0709/325 0709/326 0709/327 0709/328 0709/329 0709/330 0709/331 0709/332 0709/333 0709/334 0709/335 I confirm that Vtesse Networks do not have any plant in the area of your enquiry. Regards Amanda Pearson

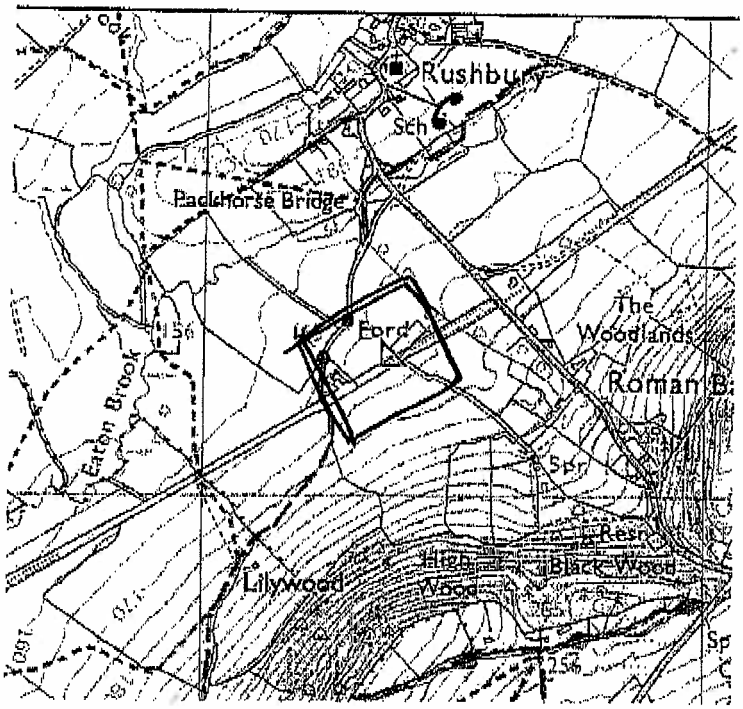
SECTION 2 STRUCTURE 2

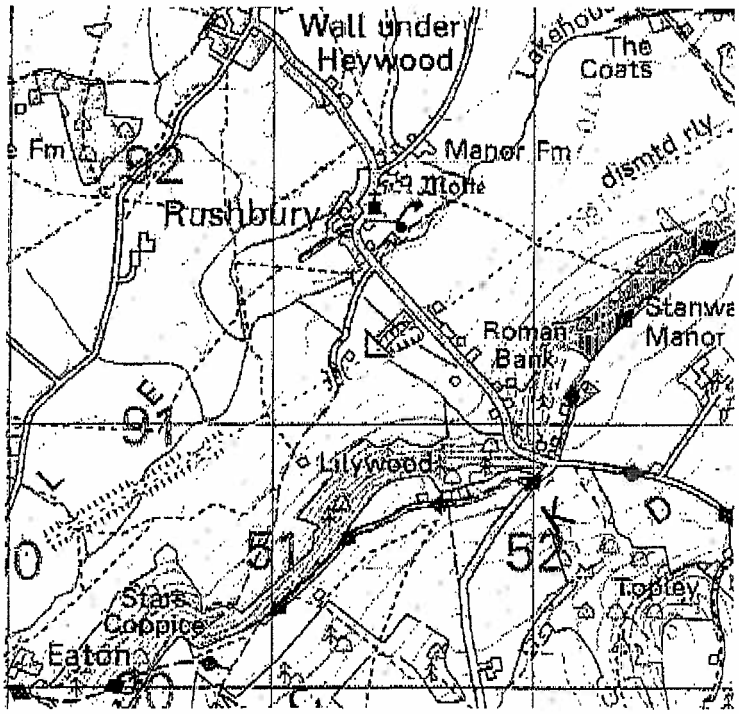
East of Darby Lane

Sth of Rushbury at 357353, 291257.

BUI/26 – SO513912

EQ/UVSJD484





Search Results

Thank you for your enquiry: LS-090707-VD-545-UME

Subject always to our standard terms and conditions, this enquiry result is valid for 28 days only from the date of enquiry and is based on the confirmed information you entered. If the location of the work changes then a further enquiry must be made. Should the work not be undertaken within 28 days of the enquiry then a further enquiry must be made.

ENQUIRER DETAILS
Name: Mr McMaster
Company: PlanToDig
Email: brian.mcmaster@national-one-call.co.uk

ENQUIRY DETAILS
Your reference: EQ/UVSJD484 - Sth of Rushbury Rd, Shropshire
Your location: 351312 291340
Confirmed location: OS grid reference (351300 291325)
Estimated start date: 20-07-2009
Type of work: Excavations Non Utility - Private services
Distance covered: 250 metres

NOT IN THE ZONE OF INTEREST

BP Exploration Purbeck Southampton Pipeline	**Mainline Pipelines Limited**
BPA	**Manchester Jetline Limited**
Centrica Energy	**Marchwood Power Ltd (Gas Pipeline)**
ConocoPhillips (UK) Ltd	**NPower CHP Pipelines**
ConocoPhillips Ltd Humber Refinery	**National Grid (National Gas and Electricity Transmission Networks)**
Coryton Energy Co Ltd (Gas Pipeline)	**Premier Transmission Ltd (SNIP)**
E-on UK Plc (Gas Pipelines Only)	**Sabic UK Petrochemicals**
Esso Petroleum Company Limited	**Scottish Power Generation Ltd**
Geo Networks Limited	**Shell UK Ltd**
Government Pipelines & Storage System	**Total**
Ineos	**Wingas Storage UK Ltd**

Thank you for your enquiry, there is no further action necessary.

Please note that the Linesearch.org system only contains information on National Grid - (National Gas and Electricity Transmission Networks) This does not include National Grid's or others local high pressure (above 7 bar) gas pipelines and lower pressure gas pipelines. Details of who to contact for National Grid's distribution assets, including their local high pressure pipelines, can be found via http://www.nationalgrid.com/uk/LandandDevelopment/DDC/GasElectricNW

For other energy network operators' contact details see http://2008.energynetworks.org/

Please quote the Linesearch enquiry reference number in *all* correspondence

NON AFFECTED PLANT ENQUIRY

KCOM Group Plc
Network Engineering Centre
Vulcan Street
Hull
HU6 7PS

Tel: 01482 603479

Kingston Communications network is not affected by the proposed works at the location specified below. This is valid for 3 months from date of receipt. For further info please call 01482 603479.

Please send all future enquiries to the postal address above or alternatively they can be e-mailed to highwaysadmin@kcom.com

Kingston Notice Number - 90857 Kingston Planner: JS

Undertaker Name - National One Call

Your Reference No : EQ/UVSJD484

Location : SOUTH OF RUSHBURY ROAD AND EAST OF DARBY LANE, SOUTH OF RUSHBURY, SHROPSHIRE

PLANCAST

Working with
netsphere 24
Carrier Network Solutions
On behalf of
interoute

The Old Haybarn
Rosebery Mews
Mentmore
Buckinghamshire
LU7 0UE
Tel: +44 (0)1525 630017
Fax:+44 (0)1525 630018
e-mail: plantenquiries@netsphere24.co.uk

[redacted]

8 July 2009

Our Ref: PC/39905/PE2877
Your Ref: EQ/UVSJD484

Dear Sir/Madam,

RE: Interoute Communications Ltd Preliminary Enquiry Scheme (C2)
at Grid Refs 351353 291254 South of Rushbury Rd and East of Darby Lane, South of Rushbury, Shropshire SY6 7 (351312 291340

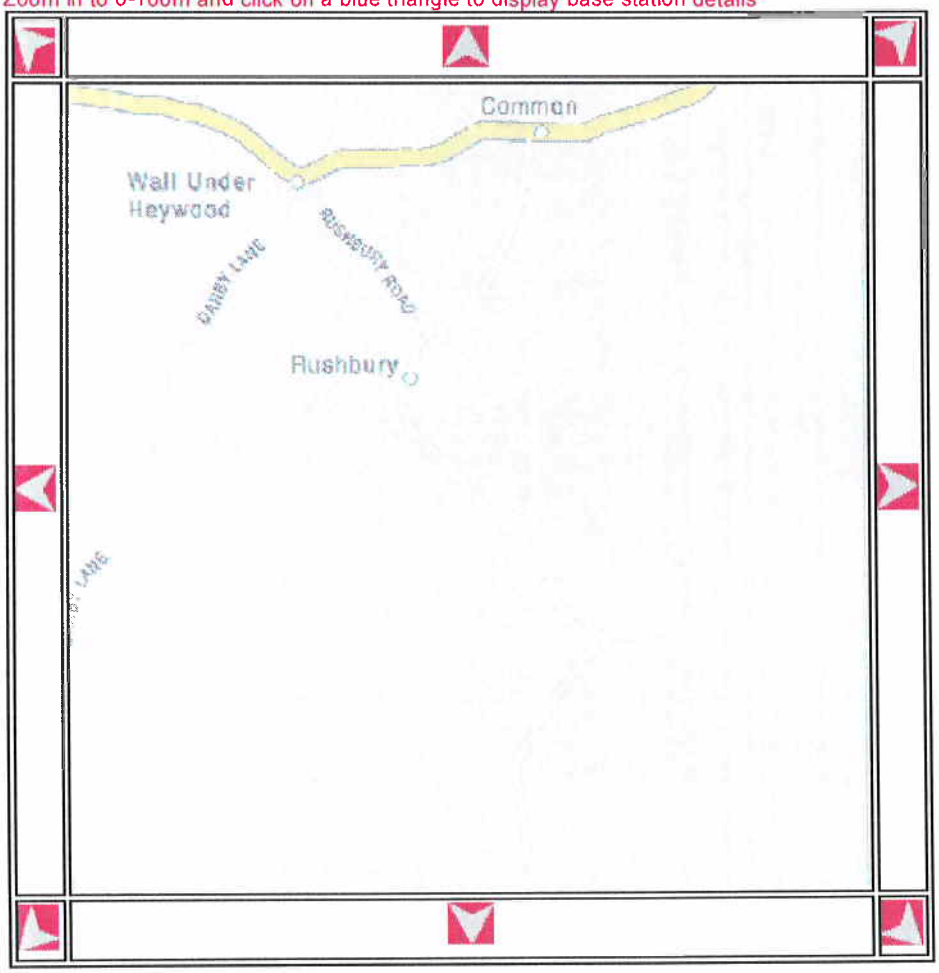
With reference to your enquiry regarding the above site, please note that we are unaware of any Interoute Communications Ltd plant. We would like to bring to your attention that whilst we try to ensure the information we provide is accurate, the information is provided without prejudice and both Netsphere24 Limited and Plancast Limited accept no liability for claims arising from any inaccuracy, omissions or errors contained herein.

Should you require any further information, please do not hesitate to contact us.

Yours faithfully

[redacted]
Planning & Design

Zoom in to 0-100m and click on a blue triangle to display base station details



Map Scale (metres):
0 ——— 500

Enter details to search for a location within the UK or click here for tips on searching.

- (•) Postcode
- ( ) Street Name
- ( ) Town/City

SEARCH

Click map to :

- ( ) Zoom In
- (•) Zoom Out
- ( ) Re-Centre

Key

▲ Base Station

PRINT

Base stations displayed in this square	
Single operator GSM technology	0
Single operator UMTS technology	0
Single operator TETRA technology	0
Shared base stations with more than one operator or more than one technology	0

Taylor Roger

From: retriever@national-one-call.co.uk
Sent: 07 July 2009 12:02
To: Taylor Roger
Subject: Dwr Cymru Welsh Water - EQ/UVSJD484

National One Call Enquiry EQ/UVSJD484

Documents / Responses Requested from

Dwr Cymru Welsh Water

Requests are made for the following documents.

Click the document to see the Plan	*Use this section only for marking up to fax /Email*	
Document	***Affected***	***Action Taken / Required / Comments***
Water / Drainage Plan	*Yes / No*	

Click here to see the marked-up plan

If you prefer, you can print this form, mark it up and fax it back to us on 0845 280 2040 If you are faxing this form to us and are not affected, simply highlight 'No'. If you are affected, tell us what action you have taken, or that we should take to obtain the document and if there is a charge made for you providing the document.

Required Date	20/07/2009	**Response Deadline 19/07/2009**
Enquirer	**Structural Soils Ltd**	
Contact	Retriever from National One Call	
Email address	retriever@national-one-call.co.uk Click this address to respond by email.	
Postal Address	National One Call, 1 Mill Place, Mill Road Industrial Estate, Linlithgow Bridge, West Lothian, EH49 7TL	
Phone	0844 800 9957	**Fax 0845 280 2040**
Work Intention	Works Intended	
Created Date	07/07/2009	
Notice given	13 Days (9 Workdays)	
Location Address	**at Grid Refs 351353 291257 Sth of Rushbury Rd and East of Darby Lane, Sth of Rushbury, Shropshire, SY6 7**	
Site Description	site at Grid Refs 351353,291257 - Sth of Rushbury and East of Darby Lane	
Comments	Structure BUI/26 over dismantled railway	
Approximate OS Centre Point	SO 51312 91340 : Easting 351312 , Northing 291340	
Bounding Box	351502,291173 to 351121,291507	

Click here to see the marked-up plan

THIS SITE IS OUT OF OUR AREA CONTACT SEVERN TRENT WATER

- 7 JUL 2009

INSTALCOM LTD

CIVILS AND CABLING INSTALLATION SPECIALIST

Instalcom House, Manor Way, Herts, WD6 1QH

Telephone: 0208 731 4600 Fax: 0208 731 4601 Email: plantenquiries@instalcom.co.uk

16th July, 2009

Dear Sir/Madam

Your Ref EQ/UVSJD484. Sth of Rushbury Rd & East of Darby Lane, Shropshire
Our Ref: E7/09 – 0675

With reference to your enquiry regarding the above noted locations, I can confirm that GLOGAL CROSSING (UK) LTD, GLOBAL CROSSING PEC and FIBRENET UK LTD networks **DO NOT** have any apparatus within the immediate proximity of your proposed works.

Instalcom responds to plant enquiries for GLOGAL CROSSING (UK) LTD, GLOBAL CROSSING PEC and FIBRENET UK LTD simultaneously and therefore you only need send one copy of a plant enquiry to cover all of these companies. As we are moving towards a fully electronic database we urge our customers to request plant enquiries by email which will result in a higher level of service, please forward future plant enquiries to **plantenquiries@instalcom.co.uk**

If you require any further information, please do not hesitate to contact me.

Plant Protection Administrator.

Instalcom Limited
Instalcom House,
Manor Way,
Borehamwood,
WD6 1QH

E mail:- plantenquiries@instalcom.co.uk
Phone:- 020 8731 4600
Fax:- 020 8731 4601

www.instalcom.co.uk

[redacted]

[redacted]
National One Call

1 Mill Place
Mill Road Industrial Estate
Linlithgow Bridge
West Lothian

EH49 7TL

Virgin Media
National Plant Enquiries Team
Scimitar Park
Courtauld Road
Courtauld Road
Basildon
Essex
SS13 1ND

Tel: 0870 888 3116 Opt 2
Fax: 01268 468557

Drawing Ref:	13557 21/07/2009
Plant Enquiry	VM/PLE/013557
Your Letter Date	07/07/2009
Your Ref:	EQ/UVSJD484
Date:	21/07/2009

Dear Sir / Madam,

Enquiry Location: **South of Rushbury Road and East of Darby Lane**
Shropshire
SY6

Thank you for your enquiry regarding work at the above location.

Virgin Media and Viatel plant should not be affected by your proposed work and no strategic additions to our existing network are envisaged in the immediate future.

Should your request be in relation to a New Development and you require an estimate to be prepared for Virgin Media to service your proposed development, please submit this request for costs along with site drawings (scale 1:500) to:

New Developments
Virgin Media
1 Dove Wynd
Strathclyde Business Park
Bellshill
ML4 3AL

This information is only valid on the date of issue. If your start date is 3 months or more from the date of
this letter, please re-apply for updated information.

Yours faithfully,

National Plant Enquiries Team
email: plant.enquiries.team@virginmedia.co.uk

717092
DD

Gordon, Dominique

From: retriever@national-one-call.co.uk
Sent: 07 July 2009 12:02
To: National Plant Enquiry's
Subject: Cable & Wireless - EQ/UVSJD484
Follow Up Flag: Follow up
Flag Status: Red

National One Call Enquiry EQ/UVSJD484

Documents / Responses Requested from

Cable & Wireless

Requests are made for the following documents.

Click the document to see the Plan	*Use this section only for marking up to fax /Email*	
Document	***Affected***	***Action Taken / Required / Comments***
Telecoms. Plan	*Yes / No*	

Click here to see the marked-up plan

If you prefer, you can print this form, mark it up and fax it back to us on 0845 280 2040
If you are faxing this form to us and are not affected, simply highlight 'No'. If you are affected, tell us what action you have taken, or that we should take to obtain the document and if there is a charge made for you providing the document.

NEW ROADS & STREET WORKS ACT - 1991
PLANT ENQUIRY
CABLE & WIRELESS PLANT IS
NOT AFFECTED

Required Date	20/07/2009	**Response Deadline** 20/07/2009	TEL: 01454 66 3300 FAX: 01454 66 3330
Enquirer	**Structural Soils Ltd**		
Contact	Retriever from National One Call		
Email address	retriever@national-one-call.co.uk Click this address to respond by email.		
Postal Address	National One Call, 1 Mill Place, Mill Road Industrial Estate, Linlithgow Bridge, West Lothian, EH49 7TL		
Phone	0844 800 9957	**Fax 0845 280 2040**	
Work Intention	Works Intended		
Created Date	07/07/2009		
Notice given	13 Days (9 Workdays)		
Location Address	**at Grid Refs 351353 291257 Sth of Rushbury and East of Darby Lane, Sth of Rushbury, Shropshire, SY6 7**		
Site Description	site at Grid Refs 351353,291257 - Sth of Rushbury and East of Darby Lane		
Comments	Structure BUI/26 over dismantled railway		
Approximate OS Centre Point	SO 51312 91340 : Easting 351312 , Northing 291340		
Bounding Box	351502,291173 to 351121,291507		

NEW ROADS & STREET WORKS ACT - 1991
PLANT ENQUIRY
CABLE & WIRELESS PLANT IS
NOT AFFECTED
TEL: 01454 66 3300 FAX: 01454 66 3330

Click here to see the marked-up plan

Our Ref: H/03/171540
Your Ref: EQ/UVSJD484
14 July 2009

WALES&WEST UTILITIES

Wales & West House
Spooner Close
Celtic Springs
Coedkernew
Newport NP10 8FZ

Tŷ Wales & West
Spooner Close
Celtic Springs
Coedcernyw
Casnewydd NP10 8FZ

T. 029 2027 8500
F. 0870 1450076
www.wwutilities.co.uk

National One Call
1 Mill Place
Mill Road Industrial Estate
Linlithgow Bridge
West Lothian
EH49 7TL

Dear Sir/Madam,

Re: EXCHANGE OF INFORMATION

Wales and West Utilities acknowledge receipt of your notice on 07/07/2009 advising us of the proposals for

Rushbury Rd and East of Darby Lane

According to our mains records Wales and West Utilities has no apparatus in the area of your enquiry. However Gas pipes owned by other GT's and also privately owned may be present in this area. Information with regard to such pipes should be obtained from the owners.

Safe digging practices, in accordance with HS(G)47, must be used to verify and establish the actual position of mains, pipes, services and other apparatus on site before any mechanical plant is used. It is your responsibility to ensure that this information is provided to all persons (either direct labour or contractors) working for you on or near gas apparatus.

If you have any further enquires please contact me on the number below.

Yours faithfully,

[redacted]

Admin. Assistant
Network Records
02920 278845

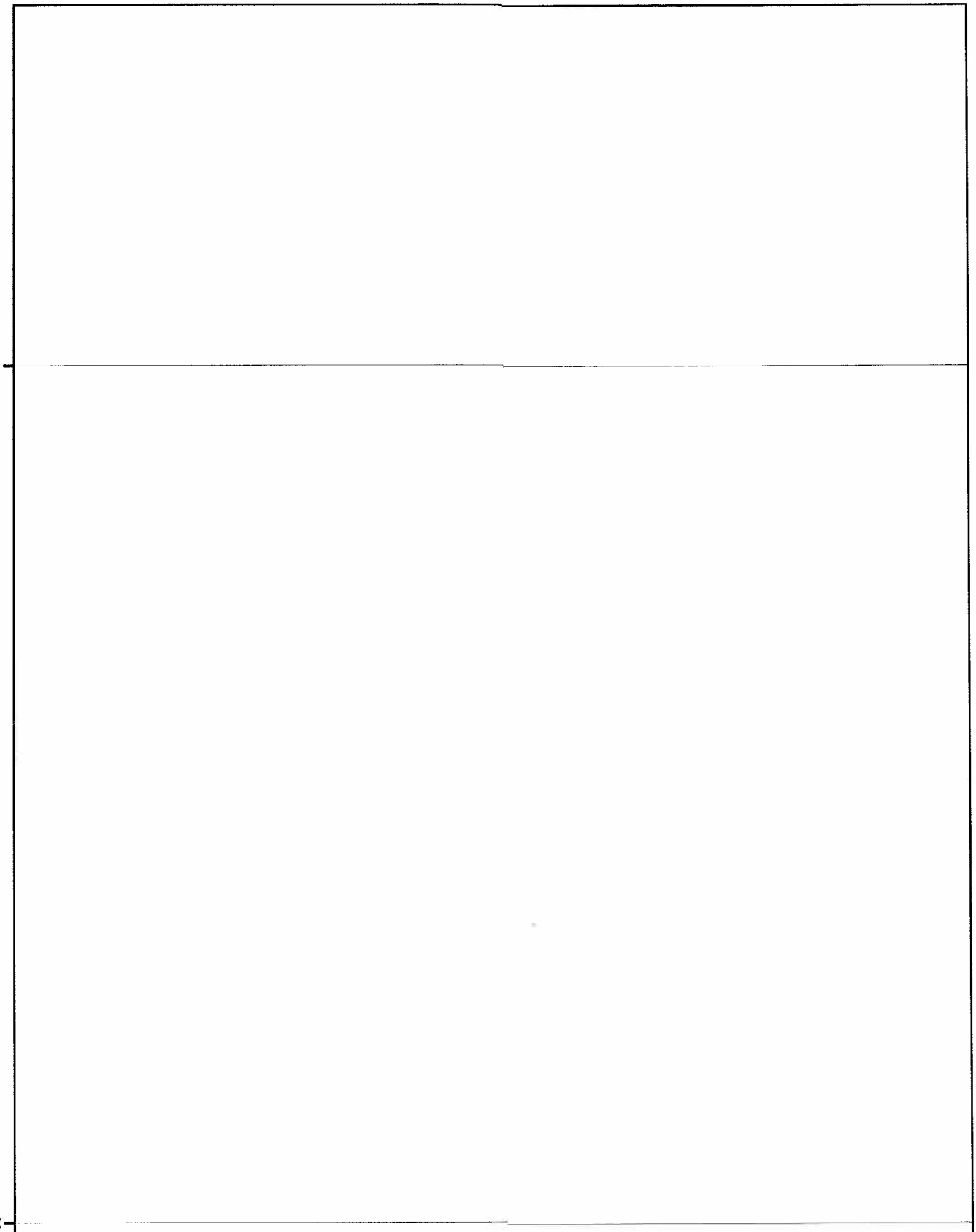
24 hour gas escape number
Rhif 24 awr os bydd nwy yn gollwng

0800 111 999*

*calls will be recorded and may be monitored
caiff galwadau eu recordio a gellir eu monitro

NP/v.21-Mar2003

Wales & West Utilities Limited
Registered Office:
Wales & West House, Spooner Close, Coedkernew, Newport NP10 8FZ
Registered in England and Wales: No. 5046791



PROJECT ID: 0

SCALE: 1:1,250

USER ID: [redacted]

DATE: 14/07/2009

PROJECT PLAN

GRID REFERENCE:
Easting : 351312 Northing . 291340

Low Pressure

Medium Pressure

0 12.5 25 50 Met

(GT). Gas pipes
relevant owners.
nnections,etc. are
tribution Network,
establish the
is information
not be referred

Some examples of Plant Items:

Valve

Depth of Cover

Syphon

Diameter Change

Wales and West Utilities Ltd GIS

This plan is reproduced from or based on the OS survey map by Wales & West Utilities, with the sanction of the controller of HM Stationery Office. Crown Copyright Reserved.

Our Ref: WM/18.07.09/ag058/77406

Your Ref: EQ/UVSJD484

Date: 18 July 2009

, .
National One Call
1 Mill Place
Mill Road Industrial Estate
Linlithgow Bridge
West Lothian
Glasgow, EH49 7TL.

Dear Sir / Madam,

Re: Proposed Works Enquiry South Of Rushbury Rd And East Of Darby Lanerushbury, Shropshire, SY6

National Grid acknowledges receipt of your notice of your intention to carry out work at the above location.

IMPORTANT NOTE: This response is for the Gas Distribution Network ONLY. You MUST also obtaininformation local Electricity Distribution Networks and the National Transmission Gas and Electricity Networks. Please refer to the enclosed "Work Safely in the Vicinity.." leaflet or on www.nationalgrid.com

According to our records National Grid has no gas mains in the area of your enquiry.

Gas pipes owned by other Gas Transporters and also privately owned may be present in this area. Information with regard to such pipes should be obtained from the owners.

If you have any further enquires please contact the Telephone number below.

Yours faithfully,

[redacted]

openreach
a BT Group business

BT

Our Ref: /NNHC/2006

Your Ref:

Date: As Post Mark

National Notice Handling Centre
PP 3WW18, Telecom House,
Trinity Street,
Hanley,
Stoke-on-Trent,
ST1 5ND.

Freephone: 0800 800865

Freephone 0800 800 865

Dear Customer,

NR & SW ACT 1991 – PROPOSED WORKS AT:

Prior to commencement of work: for free onsite guidance and accurate up to date location of BT plant please contact our Plant Protection Service by the following methods
Tele 0800 9173993
Fax 01332 578650
Email Dial before you dig DBYD@openreach.co.uk
Visit the website www.dialbeforeyoudig.com

Thank you for your letter of describing the above proposals.

Enclosed are copies of our drawing marked up to show the approximate locations of BT apparatus which is present in the immediate vicinity of your works. It is intended for general guidance only. No guarantee is given of its accuracy.

It should not be relied upon in the event of excavations or other works made near to British Telecommunications plc apparatus which may exist at various depths and may deviate from the marked route.

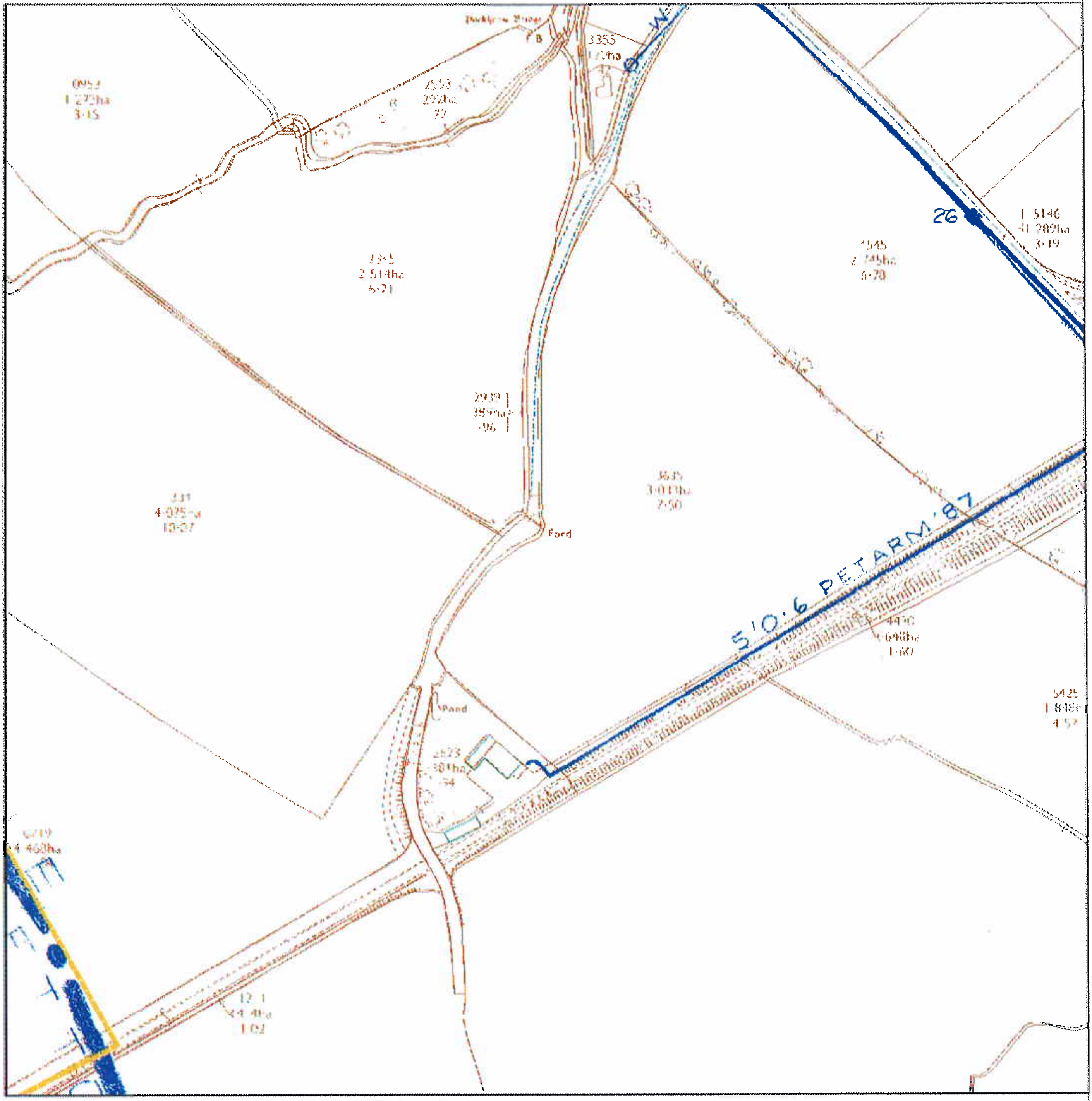
To avoid damage it is recommended that mechanical excavators or borers are not used within 600mm of British Telecommunications plc plant. If scaffolding is erected, please ensure that our equipment is not enclosed, blocked, covered or otherwise obstructed by the scaffolding.

In the event of BT apparatus being in the area of works we recommend that your plant/vehicle crossing is either resited, or apply for a budget estimate by submitting detailed plans to the above address, these will be forwarded to the appropriate department for their comments.

Please ensure you quote our reference on any future correspondence.

Yours faithfully,

Maps by email Plant Information Reply



IMPORTANT WARNING

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

DIAL BEFORE YOU DIG

FOR PROFESSIONAL ON SITE ASSISTANCE PRIOR TO COMMENCEMENT OF EXCAVATION WORKS

ADVANCE NOTICE REQUIRED
(Office hours: Monday-Friday 08.00 to 17.00)

Tel: 0800 9173993
E-mail: dbyd@openreach.co.uk
Website: www.dialbeforeyoudig.com

KEY TO BT SYMBOLS

Symbol	Meaning	Symbol	Meaning
——	UNDERGROUND PLANT	○	POLE
A/C, D/W or W	OVERHEAD PLANT	☒	CABINET
■	JOINT BOX	□	BURIED JOINT
OR	DISTRIBUTION POINT	J	JOINTING POST
OR 72	MANHOLE	- - - - - -	PROPOSED U/G
— · — · —	DP BOUNDARY	A/C, D/W or W	PROPOSED O/H
OR	OTHER BT BOUNDARY		PROPOSED BOX

Other proposed plant is shown using dashed lines. BT symbols not listed above may be disregarded. Existing BT plant may not be recorded. Information valid at the time of preparation.

openreach
a BT Group business
BT

BT ref: SUY13010X

Map reference (centre): SO5130091325

Issued: 07/07/09 13:09:57

e·on | Central Networks

Central Networks
Toll End Road
Tipton
West Midlands
United Kingdom
DY4 0HH
central-networks.co.uk

Bureau Services
T 02476 186 502
F 0121 522 6176
AIMBureauServices
@central-networks.co.uk

National One Call

1 Mill Place
Mill Road Industrial Estate
Linlithgow Bridge
West Lothian
EH29 7TL

Your Ref: EQ/UVSJD484

Our Ref: W0709/53395

Date: 09/07/2009

Dear Sir/Madam,

Location: South of Rushbury Road

Further to your request dated 07/07/2009 we enclose a copy of our Composite Mains Record(s) showing our plant in the vicinity of the above location.

Please note that cable positions are approximate only, a cable locator and/or careful use of hand tools should be used to verify the exact locations of all cables, including service cables. The cost of rectifying any damage will be charged. The information included on this plan should not be referred to beyond 3 months from the date printed on the plan.

You should ensure that your activities are carried out in accordance with Health and Safety legislation. Should your works be within the vicinity of any Underground/Overhead equipment we would request that it be carried out in accordance with our guidelines as laid down within the attached **'GUIDANCE'** document.

Damage to underground cables and contact with overhead lines can cause fatal or severe injury. In the event of any cable damage or contact with an overhead line, please keep people clear and immediately telephone 0800 0152059. This will enable us to take action to control risks to people, limit the effects of damage and consequent cost of repair.

If you require further information relating to any legal rights which the Company may have over this land please contact the Wayleave Department on the telephone number stated on the **'GUIDANCE'** document.

Central Networks East plc
No 2366923

Central Networks West plc
No 3600574

Central Networks Services Limited
No 3600545

Registered in England and Wales

Registered Office:
Westwood Way
Westwood Business Park
Coventry, CV4 8LG

e·on | Central Networks

If you have requested additional information a copy of your letter will have been forwarded to the following person/department:

Department: _____

Telephone:

Should you require any further information, please contact AIM Bureau Services.

We note that you have agreed to pay for paper copies of our records and our invoice will be sent to you in due course.

Yours faithfully

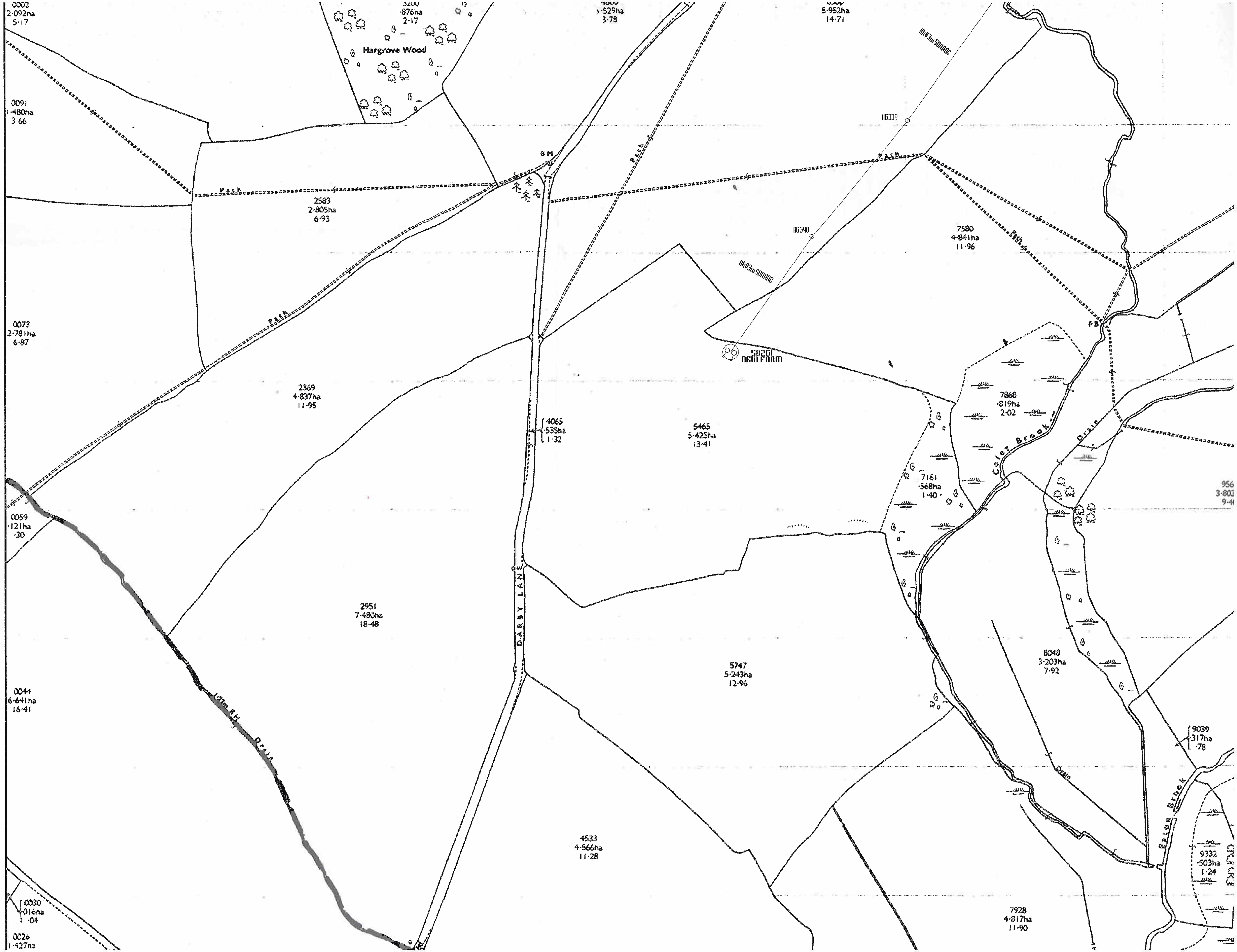
[redacted]

CENTRAL NETWORKS DATA SERVICES

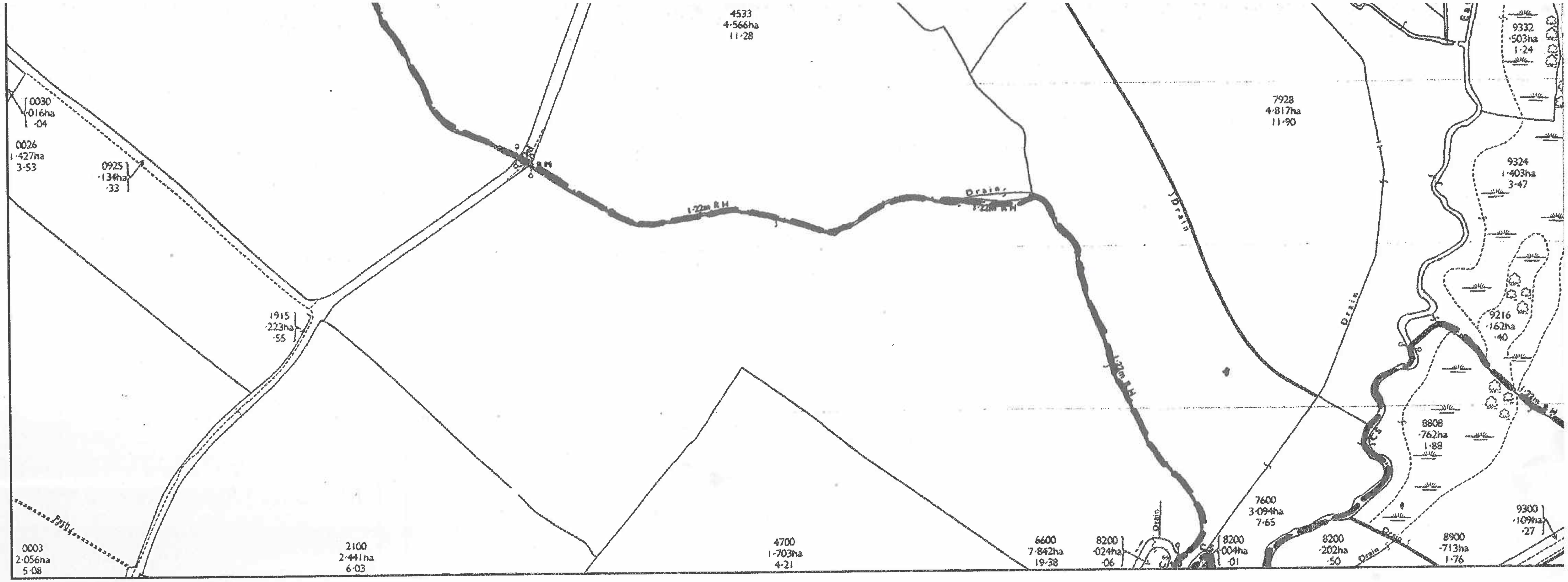
Enclosures:

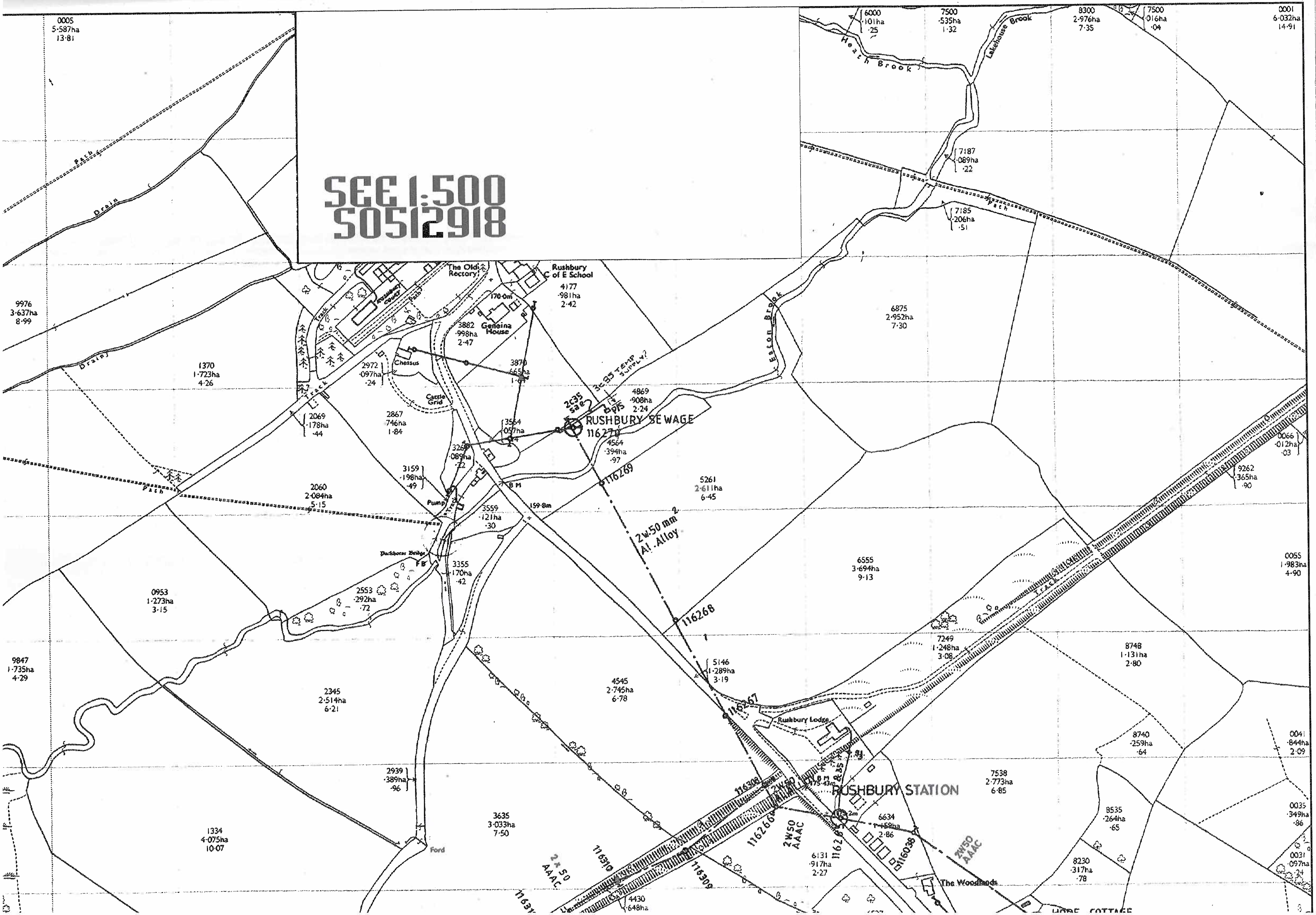
- **Guidance** documents
- Requested Drawings

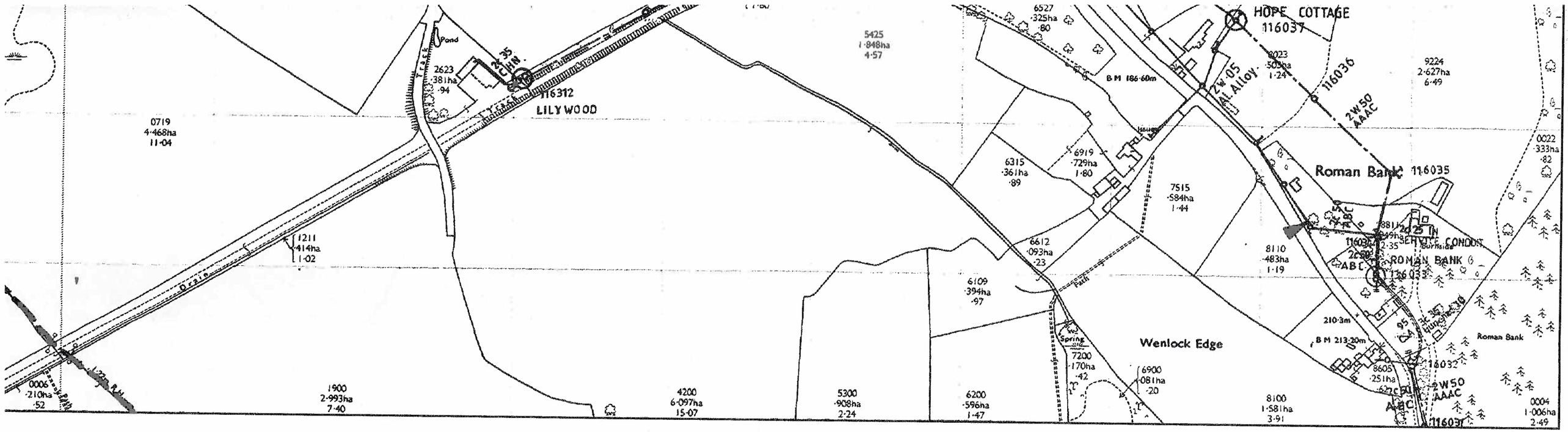
Please refer to enclosed information before carrying out any work



0002
2·092ha
5·17
·876ha
2·17
Hargrove Wood
1·529ha
3·78
5·952ha
14·71
0091
1·480ha
3·66
Path
BM
2583
2·805ha
6·93
7580
4·841ha
11·96
0073
2·781ha
6·87
2369
4·837ha
11·95
4065
·535ha
1·32
5465
5·425ha
13·41
5826
NEW FARM
7868
·819ha
2·02
Coley Brook
Drain
FB
7161
·568ha
1·40
0059
·121ha
·30
2951
7·480ha
18·48
DARBY LANE
5747
5·243ha
12·96
8048
3·203ha
7·92
0044
6·641ha
16·41
Drain
9039
·317ha
·78
Eaton Brook
9332
·503ha
1·24
4533
4·566ha
11·28
0030
·016ha
·04
0026
1·427ha
7928
4·817ha
11·90


4533
4·566ha
11·28
0030
·016ha
·04
0026
1·427ha
3·53
0925
·134ha
·33
1·22m R H
Drain
1·22m R H
7928
4·817ha
11·90
9332
·503ha
1·24
9324
1·403ha
3·47
Drain
Drain
1915
·223ha
·55
9216
·162ha
·40
1·22m R H
8808
·762ha
1·88
Path
7600
3·094ha
7·65
9300
·109ha
·27
0003
2·056ha
5·08
2100
2·441ha
6·03
4700
1·703ha
4·21
6600
7·842ha
19·38
8200
·024ha
·06
8200
·004ha
·01
8200
·202ha
·50
8900
·713ha
1·76
Drain
Drain


SEE 1:500
SO512918
RUSHBURY SEWAGE
116270
116269
2W 50 mm
Al. Alloy
116268
116267
RUSHBURY STATION
2W50 AAAC
2 x 50 AAAC
116266
116265
116308
116309
116310
116038
The Old Rectory
Rushbury C of E School
Geneina House
Chessus
Cattle Grid
Pump
Packhorse Bridge
FB
Ford
Rushbury Lodge
The Woodlands
Heath Brook
Lakehouse Brook
Eaton Brook
Drain
Path
Track
BM
170·0m
159·8m
2C35 TEMP SUPPLY
2C35 SAE
0005
5·587ha
13·81
9976
3·637ha
8·99
1370
1·723ha
4·26
2069
·178ha
·44
2867
·746ha
1·84
2972
·097ha
·24
3882
·998ha
2·47
4177
·981ha
2·42
4869
·908ha
2·24
4564
·394ha
·97
3564
·057ha
3159
·198ha
·49
3559
·121ha
·30
3355
·170ha
·42
2060
2·084ha
5·15
0953
1·273ha
3·15
2553
·292ha
·72
9847
1·735ha
4·29
2345
2·514ha
6·21
2939
·389ha
·96
1334
4·075ha
10·07
3635
3·033ha
7·50
4545
2·745ha
6·78
5146
1·289ha
3·19
5261
2·611ha
6·45
6555
3·694ha
9·13
6875
2·952ha
7·30
7249
1·248ha
3·08
6000
·101ha
·25
7500
·535ha
1·32
8300
2·976ha
7·35
7500
·016ha
·04
0001
6·032ha
14·91
7187
·089ha
·22
7185
·206ha
·51
0066
·012ha
·03
9262
·365ha
·90
0055
1·983ha
4·90
8748
1·131ha
2·80
8740
·259ha
·64
0041
·844ha
2·09
7538
2·773ha
6·85
8535
·264ha
·65
0035
·349ha
·86
6634
·159ha
2·86
6131
·917ha
2·27
8230
·317ha
·78
0031
·097ha
·24
4430
·648ha



BOUNDARY
SEVERN / NORTHERN

SO4892	SO5092	SO5092	
SO4891	SO5091	SO5091	
SO4890	SO5090	SO5290	SO 5 0

91

e·on | Central Networks

Central Networks
Central Networks Data Services
Bureau Services
Toll End Road, Tipton
West Midlands DY4 0HH
T 02476 186502
F 0121 522 6176

DRAWING No.	SCALE	1:2500
SO510913	DATE	09/07/2009
	PREP. BY	wpb so 5091
ORDNANCE REF.:		

LEGEND

VOLTAGE/ITEM	UNDERGROUND CABLES		OVERHEAD CABLES	
	EXISTING	PROPOSED	EXISTING	PROPOSED
132 kV.				
66 33 kV.				
11 kV/6.6 kV				
240 415 VOLT				
PILOT TELEPHONE				
CONDUITS				
MAJOR CON LINES				
SERVICES				

COMPASS

IMPORTANT NOTE

CABLE DEPTHS ARE NORMALLY BETWEEN 0.4 AND 1.5 METRES. THOSE MARKED * HAVE BEEN LAID AFTER 1.10.88 GENERALLY AS FOLLOWS

LV INCLUDING SERVICES	0.4 - 0.6 METRES
HV	0.5 - 0.9 METRES
ALL ROAD CROSSINGS	0.6 - 1.0 METRES
33-66-132kV	0.9 - 1.5 METRES

ANY DEPTHS SHOWN ON THIS PLAN ARE SPECIFIC TO THAT POINT, AT THE DATE INDICATED OR TIME OF INSTALLATION TO THE BEST OF OUR KNOWLEDGE AND BELIEF.
NOTE THERE MAY BE WIDE VARIATIONS FROM NORMAL OR EVEN INDICATED DEPTHS FOR VARIOUS REASONS E.G CHANGED SURFACE LEVELS AND UNDERGROUND OBSTRUCTIONS. THEREFORE ALL CABLES IN THE VICINITY OF WORKS MUST BE CAREFULLY LOCATED ON SITE.
GUIDANCE FOR SAFE WORKING PROCEDURES IS CONTAINED IN HEALTH AND SAFETY EXECUTIVE GUIDANCE, BOOKLET HSG47 AVAILABLE FROM HSE BOOKS
NO LIABILITY IS ACCEPTED BY CENTRAL NETWORKS FOR ANY ERROR IN OR OMISSION FROM THE PLAN WHETHER DUE TO NEGLIGENCE OR OTHERWISE THIS SHALL NOT AFFECT LIABILITY FOR DEATH OR PERSONAL INJURY RESULTING FROM NEGLIGENCE.

V4.2 WRG 05/06/07

Severn Trent Water

SEVERN TRENT WATER Ltd
Waterworks Road
Edgbaston
Birmingham
B16 9DD

Tel 0845 601 6616
Fax 0121 452 3569

Direct Line **0845 601 6616**
Contact Plan to Dig
Our Ref RMC38578

Apparatus Location Enquiry

Further to your enquiry re: 6 sites All Saints Street B18 Mythe Road GL20 Klondyke Road LE14 Bristol Road GL1 Bushbury Road SY6 and Langton Road LE16

Enclosed is a copy of the plan(s) showing the approximate positions of the public water mains and/or public sewers situated within the vicinity of the land/property which is the subject of your enquiry.

The Records Management Centre can only provide plans of the location of the Company's underground assets. Therefore service pipes and drains are the responsibility of the property owner and should be anticipated during any excavation.

Please also find enclosed a copy of Severn Trent Water's General Conditions and Precautions for your information.

A VAT receipt is attached herewith together with your enquiry documentation. (Please ensure that VAT receipts are forwarded to your finance department where appropriate).

Records Management Centre

- Distribution Main
- Trunk Main (local/primary)
- Strategic Main
- Fire Supply Main
- Fire Main
- Non-Domestic Customer Service Pipe
- Domestic Customer Service Pipe
- Abandoned Main
- Elevated Main
- Aqueduct
- Duct
- Cable, Earthing
- Cable, Optical Fibre/Instrumentation
- Cable, Low Voltage
- Cable, High Voltage
- Cable, Other

- Pumping Facility
- Booster Facility
- Potable Water Storage
- Water Tower
- Well / Borehole
- Intake
- Water Treatment Works / Chamber
- Draw-off Tower
- Bowser Point
- Water Facility Connection
- Quality Sample Point

- Water Isolation Valve (Closed)
- Water Isolation Valve (Open)
- Water Isolation Valve (Partially Open)
- Water Air Valve
- Pressure Reducing Valve
- Pressure Sustaining Valve
- Non-Return Valve
- Float Valve
- Hydrant (Single/Double)
- Washout (Single/Double)
- Bulk Meter
- Water Hatch Box
- Pressure Tapping
- Insertion Flow Meter Point
- Water Chemical Injection Point
- Motive Water Point

- Change In Characteristic
- Marker Post
- Cable Junction
- Anode
- Boundary Box
- Stop tap
- Cross Piece
- Strainer
- Listening Post
- Revenue Meter
- Housing, Building
- Housing, Kiosk
- Housing, Other
- Pipe Support Structure
- Open Pipe
- Discharge
- End Cap
- SSSI Area
- Access Right
- Pre-1937 Properties

MATERIALS

AC - ASBESTOS CEMENT
AK - ALKATHENE
C - CONCRETE
CI - CAST IRON
CU - COPPER
DI - DUCTILE IRON
GF - GLASS FIBRE
GRC - GLASS REINFORCED CONCRETE
GRP - GLASS REINFORCED PLASTIC
HDPE - HIGH DENSITY POLY
HPPE - HIGH PERFORMANCE POLY
LDPE - LOW DENSITY POLY
LEAD - LEAD
MDP - MEDIUM DENSITY POLY
E
O - OTHER
PC - PRE-STRESSED CONCRETE
PF - PITCH FIBRE
PP - POLY PROPYLENE
PSC - PLASTIC STEEL COMPOSITE
PVC - POLY VINYL CHLORIDE
RPM - REINFORCED PLASTIC MATRIX
SI - SPUN IRON
SST - STAINLESS STEEL
ST - STEEL
UPVC - UNPLASTICISED PVC

LINING

BI - BITUMEN
CL - CEMENT
PL - PLASTIC
RL - RESIN
O - OTHER

N
W E
S

Severn Trent Water

Severn Trent Water Limited
Waterworks Road
Edgbaston
Birmingham
B16 9DD
Telephone: 0845 601 6616

WATER MAINS RECORD

O/S Map scale: 1:2500

Date of issue: 14.07.09

This map is centred upon:
O / S Grid reference:

x : 351305

y : 291395

Do not scale off drawing:

Disclaimer:

1. This plan and any information supplied with it is furnished as a general guide, is only valid at the date of issue and no warranty as to its correctness is given or implied. In particular this plan and any information shown on it must not be relied upon in the event of any development or works (including but not limited to excavations) in the vicinity of SEVERN TRENT WATER assets or for the purposes of determining the suitability of a point of connection to the sewerage or distribution systems.

2.

3. Document users other than SEVERN TRENT WATER business users are advised that this document is provided for reference purpose only and no further copies should be made from it.

JACOBS

Appendix C - Trial Pit Log

STRUCTURAL SOILS

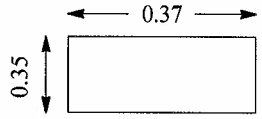
TRIAL PIT LOG

Contract:	Client:	Trialpit:
BE4 BD21 Bridges	**Jacobs**	**BUI/26 TP01**

Contract Ref:	Date:	Ground Level (m):	Co-ordinates:	Sheet:
761191	**24.08.09**	**---**	**---**	**1** of **1**

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
						MADE GROUND: Concrete.	0.18	
						Trial pit terminated at 0.18m depth on cast iron main girder encased in concrete.		

Plan (Not to Scale)



General Remarks

1. Trial hole carried out in centre of north abutment
2. Service plans checked and position CAT scanned prior to excavation
3. No groundwater encountered during excavation
4. Trial hole backfilled and reinstated to the local authority specification

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Logged By:	Checked By:
Hand dug	**Hand tools**	**MPickering**	**MD**

STRUCTURAL_SOILS_GINT_LIBRARY.GLB!TRIAL PIT LOG - STANDARD | 761191 - BE4 BD21 BRIDGES.GPJ - v8_02 | 01/09/09 - 10:51.
Structural Soils Ltd, Branch Office - Castleford: The Potteries, Pottery Street, Castleford, West Yorkshire, WF10 1NJ. Tel: 01977-552255, Fax: 01977-552299, Web: www.soils.co.uk, Email:north@soils.co.uk.

STRUCTURAL SOILS

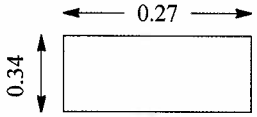
TRIAL PIT LOG

Contract:	Client:	Trialpit:
BE4 BD21 Bridges	**Jacobs**	**BUI/26 TP02**

Contract Ref:	Date:	Ground Level (m):	Co-ordinates:	Sheet:
761191	**24.08.09**	**---**	**---**	**1** of **1**

Samples and In-situ Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Depth	No	Type	Results					
						MADE GROUND: Concrete.	0.10	
						Trial pit terminated at 0.10m depth on cast iron main girder encased in concrete.		

Plan (Not to Scale)



General Remarks

1. Trial hole carried out in centre of bridge deck
2. Service plans checked and position CAT scanned prior to excavation
3. No groundwater encountered during excavation
4. Trial hole backfilled and reinstated to the local authority specification

All dimensions in metres | Scale: **1:25**

Method Used:	Plant Used:	Logged By:	Checked By:
Hand dug	**Hand tools**	**MPickering**	**MD**

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Appendix D - Form AA

FORM 'AA' (BRIDGES) **GC/TP0356**

Appendix: 4

ELR/ Bridge No BUI/26 Issue: 1

Revision: B (Nov 2000)

APPROVAL IN PRINCIPLE FOR ASSESSMENT

Bridge/Line Name: **Red Barn, Rushbury / Buildwas to Marsh**

ELR/Bridge No. **BUI/26**

Brief Description of Existing Bridge:

(a) Span Arrangement

The structure is a square, single span overbridge. The clear span is 7.58m (24' – 10").

(b) Superstructure Type

The bridge comprises of three internal longitudinally spanning cast iron girders, spaced at about 1.358m (4' – 5½") centres and two cast iron edge girders. Pre-cast concrete arches span between the bottom flanges of the girders and these are covered in concrete to form the bridge deck. The internal girders have an overall depth of 21" (533mm) at mid span and 16" (406mm) at supports. The edge girders have an overall depth of 20" (508mm) throughout.

(c) Substructure Type

The abutments and wingwalls are masonry gravity type structures constructed from random size stones irregularly coursed.

(d) Planned highway works/modifications at this site

None

(e) Road designation class and whether classed as a heavy load route

The bridge carries a public bridleway also used for field access. The bridleway is unpaved. The bridge deck itself is concrete with no additional surfacing. The heaviest vehicles ever likely to use the bridge are farm tractors and trailers. HGV use is low (L) and road surface condition is considered to be poor (p).

(f) Any other requirements

None.

FORM 'AA' (BRIDGES) **GC/TP0356**

Appendix: 4

ELR/ Bridge No BUI/26 Issue: 1

Revision: B (Nov 2000)

APPROVAL IN PRINCIPLE FOR ASSESSMENT

Assessment Criteria

(a) Loadings and Speed

Dimensions and condition obtained from site measurements and reference to historic data. (See Jacobs report "VAR9-2602 Assessment Programme – BD21Assessment and Inspection Report – Bridge Ref.: BUI/26"). Assessment live loading obtained from and applied in accordance with BD21/01, assuming low HGV flow and poor road condition. The bridge is assessed for up to 40/44 tonne live loading, with reduced loading being determined where this capacity is not reached.

(b) Codes to be used

BD21/01 - "The Assessment of Highway Bridges and Structures"

(c) Proposed Method of Structural Analysis

BD21 vehicle loading will be applied to the internal girders using the simple distribution methods outlined in Chapter 2 of BA 16/97. As the concrete surface occupies the entire width of the bridge the carriageway loading will also be applied to the edge girders using the same method.

The embedment of the internal cast iron girders in concrete will permit an increase in the section modulus for live load by D/d in accordance with BD21/01 Clauses 7.12 to 7.15.

The assessment will be based on the current condition of the structure as determined by the inspection. Specific allowance for any recorded section losses will be made to the appropriate component of the relevant elements.

Determination of the adequacy of the jack arches will be based upon the empirical method described in Bridgeguard 3 Current Information Sheet No 22 (Pro-forma for the empirical assessment of brick, masonry and concrete jack arches and associated ties.)

The substructure will be assessed qualitatively.

FORM 'AA' (BRIDGES)

GC/TP0356
Appendix: 4
Issue: 1
Revision: B (Nov 2000)

ELR/ Bridge No BUI/26

APPROVAL IN PRINCIPLE FOR ASSESSMENT

Senior Civil Engineer's Comments

None

Proposed Category for Independent Check 1

Superstructure 1

Substructure

Name of Checker suggested if Cat 2 or 3

Category 1

The above assessment, with amendmer

Signe

Title

Date 26/11/2009

Category 2 and 3

The above assessment, with amendments shown, is approved in principle:

Signed

Title

Date

Signed

Title

Date

JACOBS

Appendix E - Form BA

FORM 'BA' (BRIDGES)

GC/TP0356
Appendix: 4
Issue: 1
Revision: A (Dec 2005)

ELR/ Bridge No BUI/26

CERTIFICATION FOR ASSESSMENT CHECK

Assessment Group: **Jacobs Engineering UK Ltd**

Bridge/Line Name: **Red Barn Overbridge / Buildwas to Marsh**

Category of Check: **1**

ELR/ Bridge No: **BUI/26**

We certify that reasonable professional skill and care have been used in the assessment of the above structure with a view to securing that:

(1) It has been assessed in accordance with the Approval in Principle as recorded on Form AA approved on 26 November 2009.

(2) It has been checked for compliance with the following principal British Standards, Codes of Practice, BRB (Residuary) Limited technical notes and Assessment standards:

BD 21/01 - "The Assessment of Highway Bridges and Structures"

BD 16/97 - "The Assessment of Highway Bridges and Structures"

List any departures from the above and additional methods or criteria adopted, with reference and justification for their acceptance.

None

Category 1

[redacted]

Date

29/1/10 Assessor

29/1/10 Assessment Checker

28-2-10 Authorised signatory of the firm of Consulting Engineers to whom Assessor/Checker is responsible.

FORM 'BA' (BRIDGES)

GC/TP0356
Appendix: 4
Issue: 1
Revision: A (Dec 2005)

ELR/ Bridge No BUI/26

CERTIFICATION FOR ASSESSMENT CHECK

Category 2 and 3 (Note: Category 1 check must also be signed)

(a) Assessment

Name	Signature	Date	
			Assessor
			Assessment Checker
			Authorised signatory of the firm of Consulting Engineers to whom Assessor/Checker is responsible.

(b) Check

Name	Signature	Date	
			Assessor
			Assessment Checker
			Authorised signatory of the firm of consulting engineers to whom Assessor/Checker is responsible.

This Certificate is accepted [redacted] 2/2010

FORM 'BAA' (BRIDGES)

GC/TP0356
Appendix: 4
Issue: 1
Revision: A (Dec 2005)

ELR/ Bridge No BUI/26

CERTIFICATION FOR ASSESSMENT CHECK

Notification of Assessment Check

Assessment Group	Jacobs Engineering UK Ltd
Bridge Name/Road No.	Red Barn Overbridge / bridleway
Line Name	Buildwas to Marsh
ELR Code/Structure No.	BUI/26

The above bridge has been assessed and checked in accordance with Standards which are listed on the appended Form BA. A summary of the results of the assessment in terms of capacity and restrictions is as follows:-

STATEMENT OF CAPACITY

Edge girders:	7.5 tonnes ALL, Group 1 fire engines
Internal girders	18 tonnes ALL
Abutments (qualitative assessment)	>18 tonnes ALL
Jack arches and west side tie bars	Full AW loading
East side tie bars	No live load capacity

Recommended Loading Restrictions

7.5 tonnes ALL and Group 1 fire engines subject to the tie bars in the outer arch east being replaced.

Description of Structural Deficiencies and Recommended Strengthening

Capacity of the bridge is limited by the edge girders. The assessment assumed that carriageway loading can be applied over the width of the bridge because it is a continuous concrete slab with no kerbs and the verges are only a manifestation of vegetation encroachment rather than a stop point for carriageway surfacing. In practice, the few vehicles that use the bridge track towards the centre; therefore 18 tonnes capacity may be achieved.

The tie bars in the east bay need to be replaced.

Some repointing work is recommended on the abutment quoins. Vegetation on the abutments and wingwalls, including a sapling establishing on the south abutment, needs to be cleared

FORM 'BAA' (BRIDGES)

GC/TP0356
Appendix: 4
Issue: 1
Revision: A (Dec 2005)

ELR/ Bridge No BUI/26

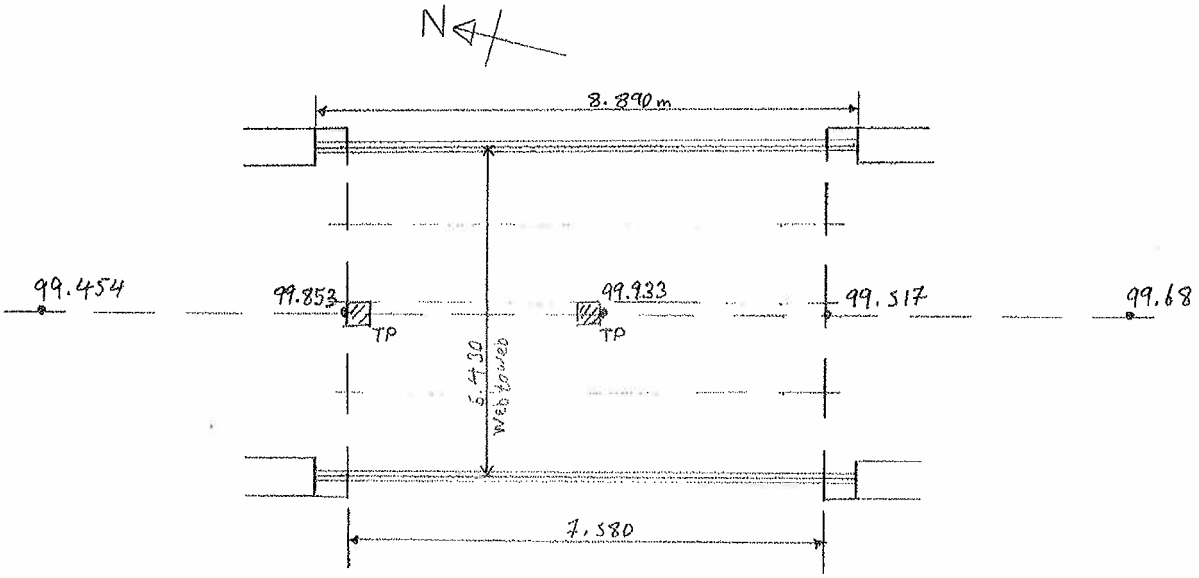
CERTIFICATION FOR ASSESSMENT CHECK

[redacted]

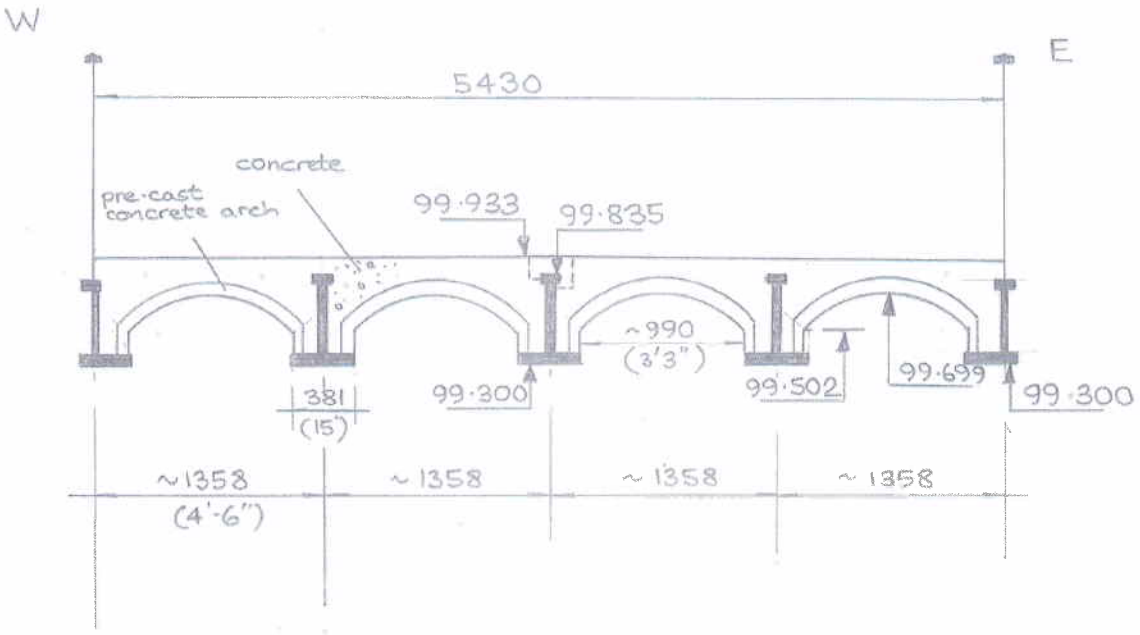
Date	
29/1/10	Assessor
29/1/10	Assessment Checker
26.2.10	Authorised signatory of the firm of Consulting Engineers to whom Assessor/Checker is responsible.

This Certificate is accepted [redacted] (25/2/2010)

Appendix F - Calculations



Plan



Section

CALCULATION COVER SHEET

Jacobs
Reading

Project Title:	BRB (Residuary) Ltd - Major Works 2009/2012	Calc. No.:	180
Job No:	B12360AH	File:	R16
Project Manager	[redacted]	Subject:	**BUI/26**
Designer			Red Barn Overbridge, Rushbury, Shropshire
Project Group	31400		BD21 Assessments

	Total Sheets	Made by	Date	Checked by	Date	Reviewed by	Date		
Original		[redacted]	Jan-10	[redacted]	Jan-10				
Rev									
Rev									
Rev									
Rev									
Rev									

Superseded by Calculation No. Date

For design criteria, refer to Approval in Principle (Form AA) document

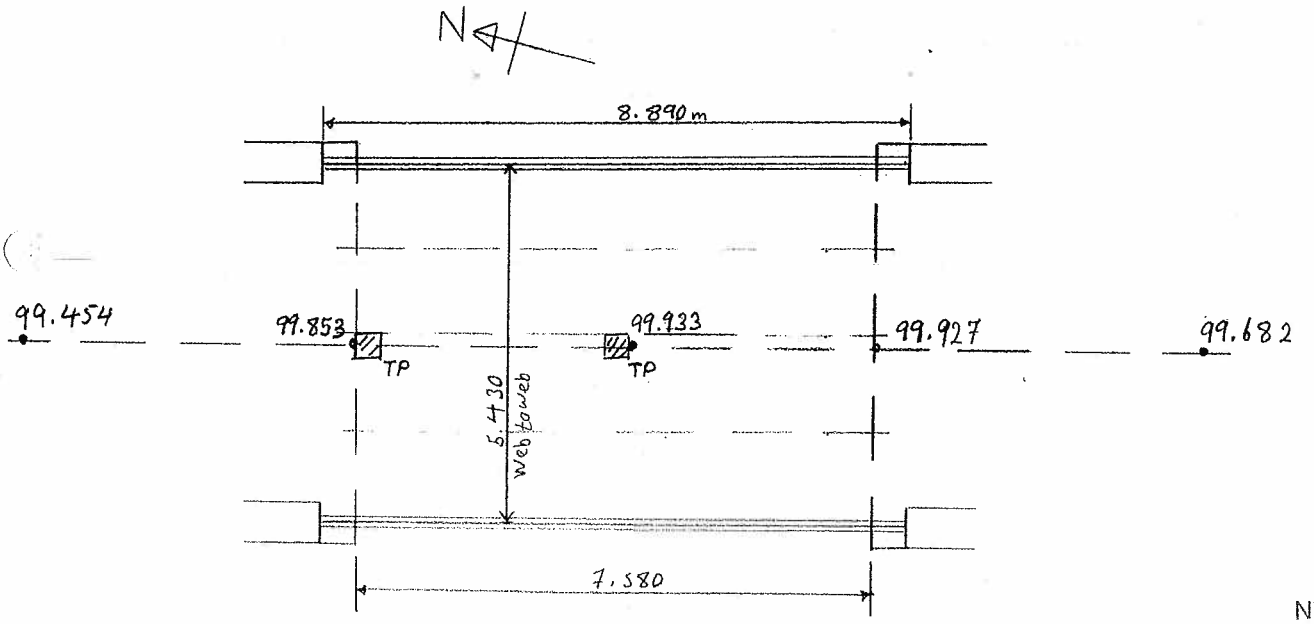
CALCULATION SHEET

JACOBS

Project Title: BRB(R) Ltd - Major Works Programme 2009-2012			Sheet No: 1
Subject: BUI/26			Calc No: 180
Job No: B12360AH			File: R16
Made B [redacted]	Date: 01/10	Revised By:	Date:
Checked By: [redacted]	Date: 1/10	Checked By:	Date:

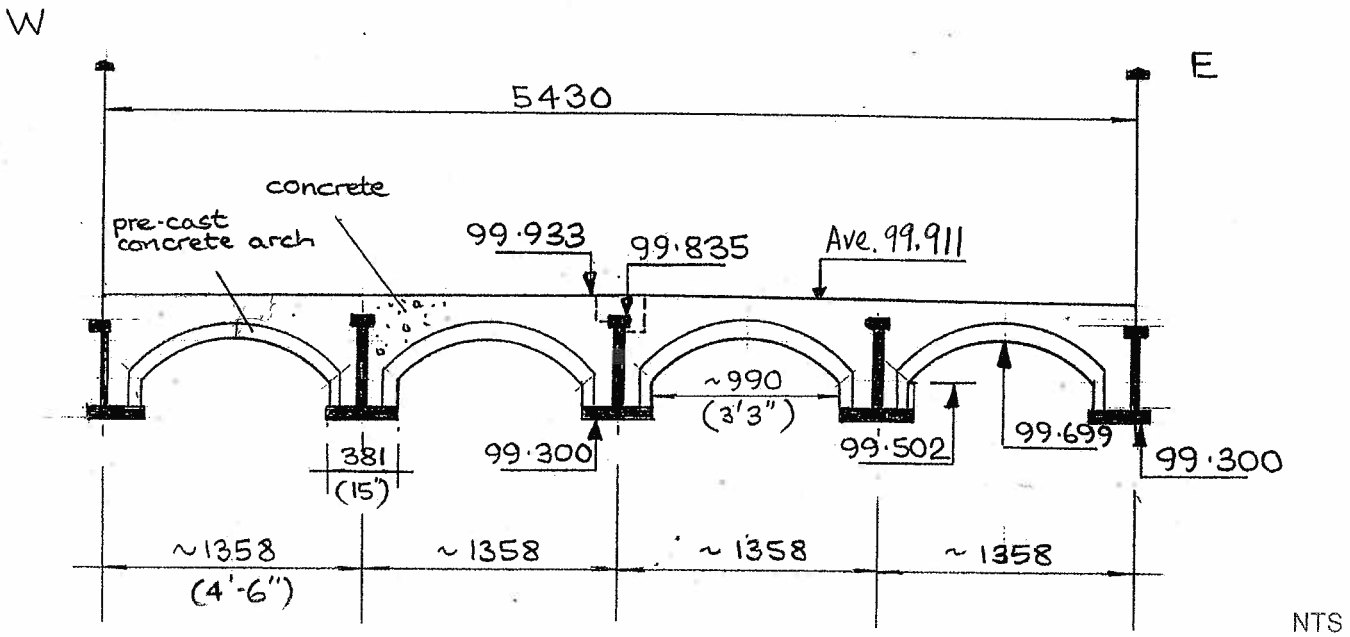
BD21 assessment of BUI/26

Site survey by Jacobs – August 2009:



NTS

Bridge plan



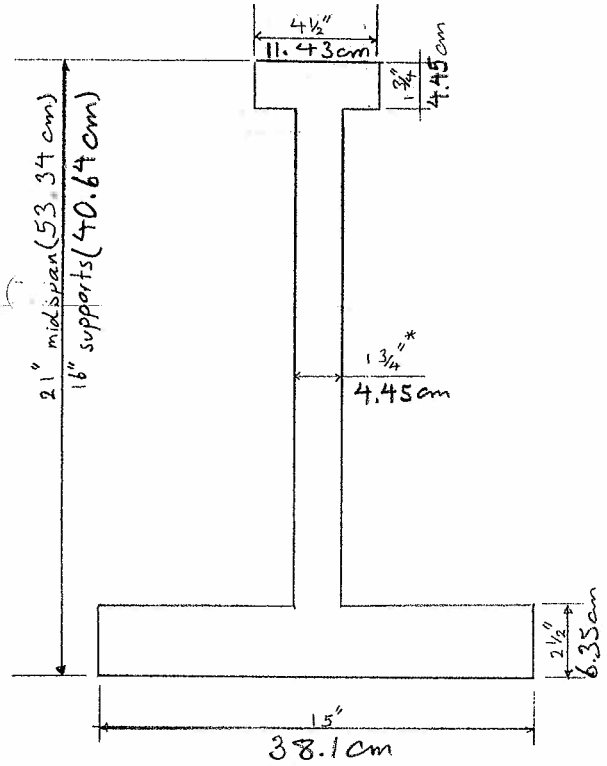
NTS

Deck cross-section

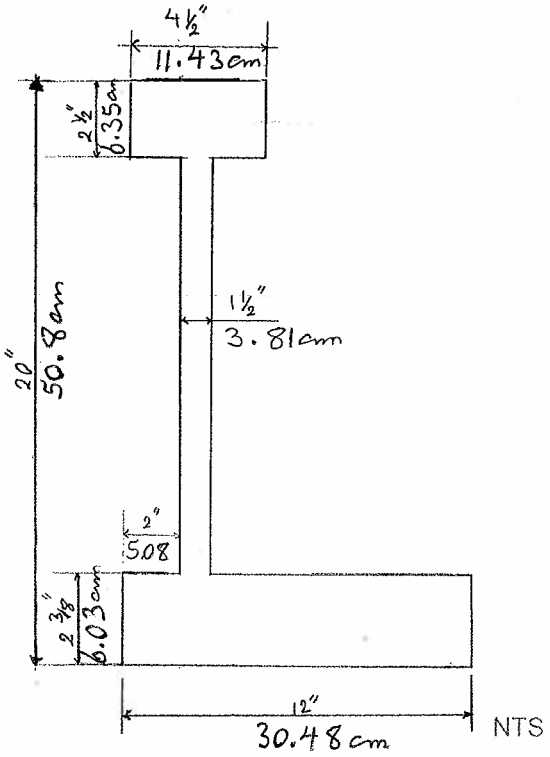
CALCULATION SHEET

JACOBS

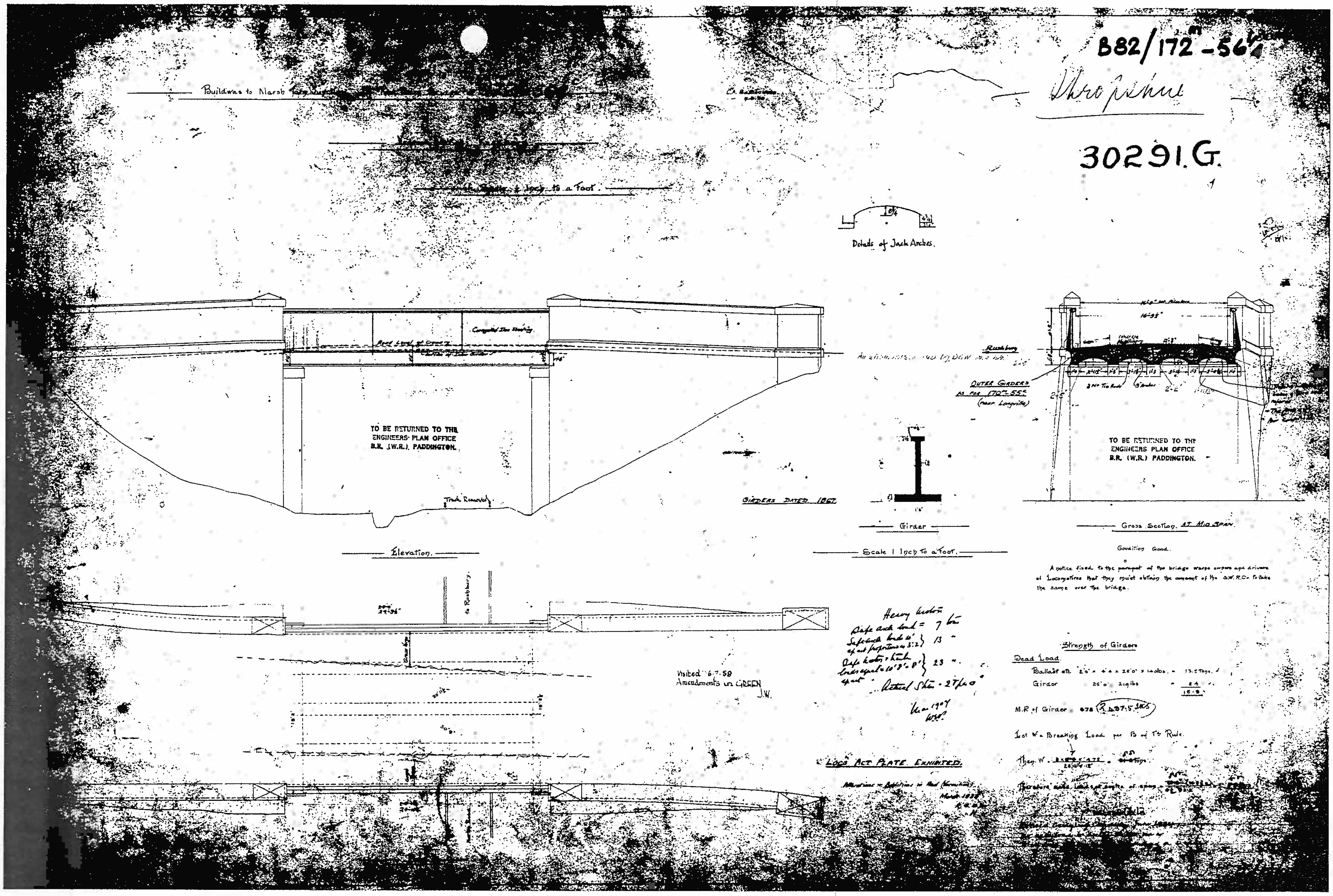
Project Title: BRB(R) Ltd - Major Works Programme 2009-2012			Sheet No: 2
Subject: BUI/26			Calc No: 180
Job No: B12360AH			File: R16
Made By: ME	Date: 01/10	Revised By:	Date:
Checked By: [redacted]	Date: 1/10	Checked By:	Date:



Internal girders



Edge girders


B82/172-56
Shropshire
30291.G.
Details of Jack Arches.
Elevation.
TO BE RETURNED TO THE ENGINEERS' PLAN OFFICE B.R. (W.R.) PADDINGTON.
Rushbury
OUTER GIRDERS
GIRDERS DATED 1867
Girder
Scale 1 Inch to a Foot.
Cross Section. AT MID SPAN.
TO BE RETURNED TO THE ENGINEERS PLAN OFFICE B.R. (W.R.) PADDINGTON.
Condition Good.
A notice fixed to the parapet of the bridge warns owners and drivers of Locomotives that they must obtain the consent of the G.W.R.Co. to take the same over the bridge.
Visited 6.7.58
Amendments in GREEN
J.W.
LOCO ACT PLATE EXHIBITED.
Strength of Girders
Dead Load.
Ballast etc 2'0" x 4'4 x 25'0" x 140lbs. = 13.5 Tons.
Girder 25'0" 219lbs = 2.4
15.9
M.R of Girder
Let W = Breaking Load per B of T's Rule.

CALCULATION SHEET

JACOBS

Project Title: BRB(R) Ltd - Major Works Programme 2009-2012			Sheet No: 4
Subject: BUI/26			Calc No: 180
Job No: B12360AH			File: R16
Made By: [redacted]	Date: 01-10	Revised By:	Date:
Checked [redacted]	Date: 1/10	Checked By:	Date:

Girders section properties:

Internal girders (mid-span):

Element	Dimension b(cm)	Dimension d(cm)	Area	y from top	Ay	A(y-y1)^2	I=bd^3/12
Top flange	**11.43**	**4.445**	50.8	**2.223**	112.92	56313.61	83.65
Web	**4.445**	**42.545**	189.1	**25.718**	4863.50	18153.47	28525.69
Bottom flange	**38.10**	**6.350**	241.9	**50.165**	12136.67	51924.00	812.95
NET AREA			481.9		17113.09		
GROSS AREA			481.9				
Depth to Neutral Axis y1		35.52					
					Sum	126391.07	29422.29

Ixx= 155813.37
Ztop= 4387.24
Zbot= 8741.33

Internal girders (supports):

Element	Dimension b(cm)	Dimension d(cm)	Area	y from top	Ay	A(y-y1)^2	I=bd^3/12
Top flange	**11.43**	**4.445**	50.8	**2.223**	112.92	32751.82	83.65
Web	**4.445**	**29.845**	132.7	**19.368**	2569.31	9017.79	9847.03
Bottom flange	**38.10**	**6.350**	241.9	**37.465**	9064.09	23486.16	812.95
NET AREA			425.4		11746.32		
GROSS AREA			425.4				
Depth to Neutral Axis y1		27.61					
					Sum	65255.78	10743.63

Ixx= 75999.41
Ztop= 2752.38
Zbot= 5833.66

CALCULATION SHEET

JACOBS

Project Title: BRB(R) Ltd - Major Works Programme 2009-2012		Sheet No: 5
Subject: BUI/26		Calc No: 180
Job No: B12360AH		File: R16
Made By: M [redacted] 10	Revised By:	Date:
Checked B [redacted] /10	Checked By:	Date:

Edge Gir [redacted]

Element	Dimension b(cm)	Dimension d(cm)	Area	y from top	Ay	A(y-y1)^2	I=bd^3/12
Top flange	**11.430**	**6.350**	72.6	**3.175**	230.44	58934.43	243.89
Web	**3.810**	**38.418**	146.4	**25.559**	3741.05	5467.25	18002.43
Bottom flange	**30.480**	**6.033**	183.9	**47.784**	8786.03	47740.25	557.60
NET AREA			402.8		12757.52		
GROSS AREA			402.8				
Depth to Neutral Axis y1		31.67					
					Sum	112141.93	18803.92

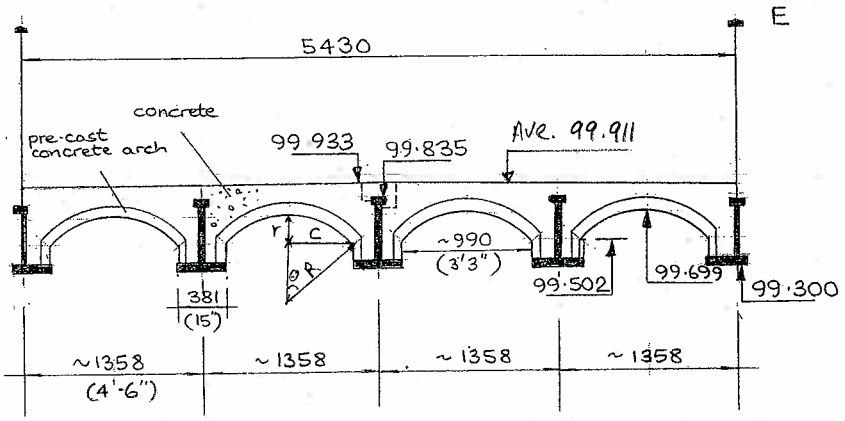
Ixx= 130945.85
Ztop= 4134.65
Zbot= 6845.19

CALCULATION SHEET

JACOBS

Project Title. BRB(R) Ltd - Major Works Programme 2009-2012			Sheet No: 6
Subject: BUI / 26			Calc No: 180
Job No: B12360AH			File: R16
Made By [redacted]	Date: 01/10	Revised By:	Date:
Checked	Date: 1/10	Checked By:	Date:

Internal girders (Dead loads)



$C = 990/2 = 495$ mm

$r = (99.699 - 99.502) \times 1000 = 197$ mm

$R = \frac{c^2 + r^2}{2r} = 720$ mm

$\theta = \sin^{-1}(c/R) = 43.4°$

Area of sector $= \frac{2\theta}{360} \pi R^2 = 392674$ mm^2

Area of triangle $= 2 \times c(R-r)/2 = 258885$ mm^2

Area of segment $= 392674 - 258885 = 133789$ mm^2

P.1 Ave. Road level $= (99.853 + 2 \times 99.933 + 99.927)/4 = 99.911$

Fill area above arch springing $= 1.358 \times (99.911 - 99.502) - 133789 \times 10^{-6} = 0.422$ m^2

P.4 Fill area above top of bottom flang $= 0.381 \times \left[99.502 - 99.300 - \frac{6.35}{100}\right] = 0.053$ m^2

Total fill area $= 0.475$ m^2

P.4 Area of girder $= (481.9 + 425.4)/2 \times 1.1 \times 10^{-4} = 00499$ m^2

↳ fillet...

CALCULATION SHEET

JACOBS

Project Title: BRB(R) Ltd - Major Works Programme 2009-2012			Sheet No: 7
Subject: BUI / 26			Calc No: 180
Job No: B12360AH			File: R16
Made By: [redacted]	Date: 01/10	Revised By:	Date:
Checked [redacted]	Date: 1/10	Checked By:	Date:

BD 21/01 Table 4.1

wt. of fill and arch barrel :

$= 2300 \times 0.475 = 1093$ kg/m

wt of girder $= 7200 \times 0.0499 = 359$ kg/m

Total factored dead load $= 1.0 \times 1093 + 1.0 \times 359$

$= 1452$ kg/m $= 14.24$ kN.m

Effective span:

clear span = 7.580

cl. 6.5

$\therefore$ Effective span $= 7.580\text{m} + 2 \times \left(\frac{1}{3} \times \frac{1}{2} \times \frac{16'' \times 25.4}{1000}\right)$ (sandstone blocks)

$= 7.715$ m (Internal girders)

Effective span $= 7.580 + 2 \times \left(\frac{1}{3} \times \frac{1}{2} \times \frac{20'' \times 25.4}{1000}\right)$

$= 7.749$ m (Edge girder)

CALCULATION SHEET

JACOBS

Project Title: BRB(R) Ltd - Major Works Programme 2009-2012			Sheet No: 8
Subject: BUI / 26			Calc No: 180
Job No: B12360AH			File: R16
Made By: [redacted]	Date: 01/10	Revised By:	Date:
Checked [redacted]	Date: 1/10.	Checked By:	Date:

Dead load effects (Internal girders)

Dead load bending moment at mid-span

P.7 $= wL^2/8 = 14.24 \times 7.715^2/8 = 105.9$ kN.m

Dead load shear at supports

$= wL/2 = 14.24 \times 7.715/2 = 54.9$ kN.

Dead load stress (bending):

P.4 $\sigma_t = \frac{M}{Z_b} = \frac{105.9 \times 10^6}{8741.33 \times 10^3} = 12.11$ N/mm² (tension)

$\sigma_c = \frac{M}{Z_t} = \frac{105.9 \times 10^6}{4387.24 \times 10^3} = 24.14$ N/mm² (compression)

Dead load stress (shear):

P.2 web area $= (16'' \times 1\tfrac{3}{4}'') \times 25.4^2 = 18065$ mm²

$\sigma = \frac{54.9 \times 10^3}{18065} = 3.04$ N/mm²

CALCULATION SHEET

JACOBS

Project Title: BRB(R) Ltd - Major Works Programme 2009-2012			Sheet No: 9
Subject: BUI / 26			Calc No: 180
Job No: B12360AH			File: R16
Made By [redacted]	ate: 01/10	Revised By:	Date:
Checked [redacted]	ate: 1/10	Checked By:	Date:

Live load (internal girders):

Parapet spacing = 5.430

P.1 clear carriageway < 5.0m (restricted by width between stone pilasters)

BD 21/01 Table 5.1 ∴ No of notional lanes = 1

girders spacing = 1.358m , Effective span = 7.715m

BA 16/97 Table 2/2(a) Use BA16/97 distribution chart for internal girders

$k_L = 0.49$

BA 21/01 cl. 5.18 HA load = $336\left(\frac{1}{L}\right)^{0.67} = 85.5$ kN/m

HA KEL = 120 kN

5.23 Adjustment factor = $3.65/2.5 = 1.46$

Table 3.1 $f_L = 1.0$

HA adjusted live load moment

$$= \left[\frac{85.5 \times 7.715^2}{8} + \frac{120 \times 7.715}{4}\right] \times \frac{0.49}{1.46} \times 1.0 = \underline{291.2 \text{ kN.m}}$$

HA adjusted live load shear:

BA 16/97 cl. 2.8 $S_L = k_L \cdot Su + 0.5\, Sk$

$$S_L = \left(\frac{85.5 \times 7.715}{2 \times 1.46}\right) \times 0.49 + 0.5 \times \left(\frac{120}{1.46}\right) = \underline{151.8 \text{ kN}}$$

CALCULATION SHEET

JACOBS

Project Title: BRB(R) Ltd - Major Works Programme 2009-2012			Sheet No: 10
Subject: BUI / 26			Calc No: 180
Job No: B12360AH			File: R16
Made By: [redacted]	Date: 01/10	Revised By:	Date:
Checked [redacted]	Date: 1/10	Checked By:	Date:

BD 21/01

Reduction factor "K" for "low" HGV use and "poor" road condition (fig 5.4)

K = 0.87 (40 tonnes)

∴ live load effects:

M = 291.2 x 0.87 = 253.3 kN.m

V = 151.8 x 0.87 = 132.1 kN

BD 21/01 cl. 7.13

Section modulus may be increased for live load stress by factor of D/d

d = 21" x 25.4 = 533 mm ✓ (at mid span)

P. 6

D = (99.933 - 99.300) x 1000 = 633 mm

cl. 7.14

D/d = 1.188 < 2.0 ✓

Live load stress (bending - 40t)

$$\sigma_t = \frac{M}{Z_b} = \frac{253.3 \times 10^6}{1.188 \times 8741.33 \times 10^3} = 24.4 \text{ N/mm}^2 \text{ (tension)}$$ ✓

$$\sigma_c = \frac{M}{Z_t} = \frac{253.3 \times 10^6}{1.188 \times 4387.24 \times 10^3} = 48.6 \text{ N/mm}^2 \text{ (compression)}$$ ✓

Live load stress (shear - 40t)

P. 8

$$\delta = \frac{132.1 \times 10^3}{18065} = 7.312 \text{ N/mm}^2$$ ✓

CALCULATION SHEET

JACOBS

Project Title: BRB(R) Ltd - Major Works Programme 2009-2012			Sheet No: 11
Subject: BUI / 26			Calc No: 180
Job No: B12360AH			File: R16
Made By [redacted]	Date: 01/10	Revised By:	Date:
Checked [redacted]	Date: 1/10	Checked By:	Date:

Max permissible live load tensile stress

BD 21/01 4.10, P.8

$f_L = 24.6 - 0.44 f_d = 24.6 - 0.44 \times 12.11 = 19.27^{*}$ N/mm²

$f_L = 19.6 - 0.76 f_d = 19.6 - 0.76 \times 12.11 = 10.39$ N/mm²

$\Rightarrow f_L = 19.27$ N/mm² $\not>$ 24.4 N/mm²

∴ Internal girders are not adequate for 40 tonnes loading.

* Assessed live load resistance (tension)

$= 19.27 \times (8741.33 \times 1.188) \times 10^3/10^6 = \underline{200.1}$ kN/m

Fig 5.4 & P.9 For 26 tonnes loading: $k = 0.85 \Rightarrow M = 291.2 \times 0.85 = 247.5 \not< 200.1$

∴ Internal girders are not adequate for 26 tonnes loading.

Fig 5.4 P9. 18 tonnes loading $k = 0.67$

$M = 291.2 \times 0.67 = 195.1$ kN.m < 200.1 kN.m ∴ OK

Fig 5.4 P.9 Group 1 FE loading: $k = 0.49$

$\therefore M = 291.2 \times 0.49 = 142.7$ kN.m < 188.4 kN.m ∴ OK

∴ Internal girders are adequate for 18t loading in tensile bending

CALCULATION SHEET

JACOBS

Project Title: BRB(R) Ltd - Major Works Programme 2009-2012			Sheet No: 12
Subject: BUI / 26			Calc No: 180
Job No: B12360AH			File: R16
Made By: [redacted]	Date: 01/10	Revised By:	Date:
Checked [redacted]	Date: 1/10	Checked By:	Date:

Permissible stress (compression)

P.8

$$\begin{cases} f_L = -43.9 + 0.79\, f_d = -43.9 + 0.79(-24.14) = -62.97\ N/mm^2 \\ f_L = -81.3 + 3.15\, f_d = -81.3 + 3.19(-24.14) = -158.3\ N/mm^2 \\ f_d + f_L < 154\ N/mm^2 \end{cases}$$

P 10 ∴ Permissible live load stress = $154 - 24.97 = 129.0\ N/mm^2 > 48.6$ "ok in 40^t comp."

P 11,12 ∴ Internal girders are adequate for 18 tonnes loading in bending.

Shear check:

BD 21/01 4.11 & P8 Permissible shear stress = $24.6 - 0.44 f_d = 24.6 - 0.44 \times 3.04$

P.10 $= 23.3^{*}\ kN > 7.312\ N/mm^2$ ok

$7.312 + 3.04 = 10.35 < 42\ N/mm^2$

∴ Internal girders are adequate for 40 tonnes loading in shear

P.8 * Assessed live load shear = $23.3 \times 18065/1000 = 420.9\ kN$

CALCULATION SHEET

JACOBS

Project Title: BRB(R) Ltd - Major Works Programme 2009-2012			Sheet No: 13
Subject: BUI / 26			Calc No: 180
Job No: B12360AH			File: R16
Made By: [redacted]	Date: 01/10	Revised By:	Date:
Checked [redacted]	Date: 1/10	Checked By:	Date:

Edge girder (dead load)

wt of corrugated steel parapet (7mm Assumed thickness)

$= 7850\ kg/m^3 \times 1.34\ m \times 0.007 \times 1.1 = 81\ kg/m$

↳ Apex, connections

P.5 wt. of edge girder $= 7200 \times (402.8 \times 10^{-4}) \times 1.1 = 319\ kg/m$

P.7 wt. of fill $= 1093/2 = 547\ kg/m$

Total factored dead load $= 81 + 319 + 547 = 947\ kg/m$

$= 9.29\ kN/m$ ✓

CALCULATION SHEET

JACOBS

Project Title: BRB(R) Ltd - Major Works Programme 2009-2012			Sheet No: 14
Subject: BUI / 26			Calc No: 180
Job No: B12360AH			File: R16
Made By: [redacted]	Date: 01/10	Revised By:	Date:
Checked B[redacted]	Date: 1/10	Checked By:	Date:

Dead load effects (Edge girders)

Dead load bending moment at mid-span

P. 13.7 $= \frac{wL^2}{8} = 9.29 \times 7.749^2/8 = 69.73\ kN.m$

Dead load shear at supports

$= wL/2 = 9.29 \times 7.749/2 = 36.0\ kN$

Dead load stress (bending):

P.5 $\sigma_t = \frac{M}{Z_b} = \frac{69.73 \times 10^6}{6845.19 \times 10^3} = 10.19\ N/mm^2$ (tension)

$\sigma_c = \frac{M}{Z_t} = \frac{69.73 \times 10^6}{4134.65 \times 10^3} = 16.86\ N/mm^2$ (compression)

Dead load stress (shear):

P.2 Web area $= (20 \times 1.5'') \times 25.4^2 = 19355\ mm^2$

$\sigma = \frac{36.0 \times 10^3}{19355} = 1.86\ N/mm^2$

CALCULATION SHEET

JACOBS

Project Title: BRB(R) Ltd - Major Works Programme 2009-2012			Sheet No: 15
Subject: BUI / 26			Calc No: 180
Job No: B12360AH			File: R16
Made By [redacted]	Date: 01/10	Revised By:	Date:
Checked [redacted]	Date: 1/10	Checked By:	Date:

Live load (Edge girder)

$L = 7.75\,m$

BA 21/01 cl. 5.18, P.7

HA load $= 336\left(\frac{1}{L}\right)^{0.67} = 85.22\ kN/m$ / 2.5m lane

HA KEL $= 120\ kN$ / 2.5m lane

5.23 $AF = 3.65/2.5 = 1.46$ $\gamma_{f_L} = 1.0$

P.1 Girder spacing $= 1.358\,m$

BA 16/97 Table 2/3 (a) Lateral distribution factor $= 0.415$

HA adjusted live load moment

$$= \left[\frac{85.22 \times 7.749^2}{8} + \frac{120 \times 7.749}{4}\right] \times \frac{0.415}{1.46} \times 1.0 = \underline{247.9\ kN.m}$$

HA adjusted live load shear

$$= \left[\frac{85.22 \times 7.749}{2} + 120\right] \times \frac{0.415}{1.46} \times 1.0 = \underline{128.0\ kN}$$

P.10 $k = 0.87$ (40 tonne)

∴ Live load effects:

$M = 247.9 \times 0.87 = 215.7$ kN.m

$V = 128.0 \times 0.87 = 111.4$ kN

Live load stress in bending (40 tonne)

$$\sigma_t = \frac{M}{Z_b} = \frac{215.7 \times 10^6}{6845.19 \times 10^3} = 31.51 \ N/mm^2 \ (\text{tension})$$

$$\sigma_c = \frac{M}{Z_t} = \frac{215.7 \times 10^6}{4134.65 \times 10^3} = 52.17 \ N/mm^2 \ (\text{compression})$$

Live load stress in shear (40 tonne)

P.14 $$\sigma = \frac{111.4 \times 10^3}{19355} = 5.76 \ N/mm^2$$

Max permissible live load tensile stress:

P.14 $f_L = 24.6 - 0.44 f_d = 24.6 - 0.44 \times 10.19 = 20.12^{*} \ N/mm^2 \not> 31.51 \ N/mm^2$

∴ Edge girders are not adequate for 40^t loading.

* Assessed live load moment resistance $= 20.12 \times 6845.19 / 10^3 = \underline{137.7 \text{ kN.m}}$

Table 5.4 $k = 0.67$ (18 tonnes)

P.15 $M = 247.9 \times 0.67 = 166.1$ kN.m $\not<$ 137.7 kN.m Fail for 18^t loading

Table 5.4 $k = 0.49$ (Group 1 FE)

$M = 247.9 \times 0.49 = 121.5$ kN.m $<$ 137.7 kN.m "Ok for Group 1 FE"

Table 5.4 $k = 0.38$ (7.5 tonnes) $\Rightarrow M = 247.9 \times 0.38 = \underline{94.2} < 137.7$ kN.m Ok for 7.5^t loading

CALCULATION SHEET

JACOBS

Project Title: BRB(R) Ltd - Major Works Programme 2009-2012			Sheet No: 17
Subject: BUI / 26			Calc No: 180
Job No: B12360AH			File: R16
Made By: [redacted]	Date: 01/10	Revised By:	Date:
Checked [redacted]	Date: 1/10.	Checked By:	Date:

Max. permissible live load compression stress:

BD21/01 CL. 4.10 & P.14

$f_L = -43.9 + 0.79 f_d = -43.9 + 0.79 \times (-16.86) = 57.22 \ N/mm^2$

$f_L = -81.3 + 3.15 f_d = -81.3 + 3.15 \times (-16.86) = -134.41 \ N/mm^2$

$f_L + f_d < 154 \qquad 134.1 + 16.86 = 150.96 < 154$

P.16 $\therefore f_L = 134.41 > 52.17 \ N/mm^2$ $\therefore$ ok for 40^t loading

$\therefore$ Edge girders are adequate for "Group 1 FE" in bending (Limited by tensile stress)

shear check:

BD21/01 4.11, P.14

Permissible shear stress $= 24.6 - 0.44 q_d = 24.6 - 0.44 \times 1.86$

P.16 $= 23.18^* \ N/mm^2 > 5.76 \ N/mm^2$

$23.18 + 1.86 = 25.04 < 46 \ N/mm^2$ $\therefore$ ok

$\therefore$ Edge girders are adequate for 40 tonnes loading in shear

P.14 *Assessed live load shear $= 23.18 \times 19355 \times 10^{-3} = 448.6 \ kN$

PRO FORMA FOR EMPIRICAL ASSESSMENT OF BRICK, MASONRY AND CONCRETE JACK ARCHES AND ASSOCIATED TIES
(To be included with the Assessment Report Calculations)

BRIDGE NAME:	Red Barn Overbridge
RAILTRACK NO:	**BUI/26**

Assessment should include completion of all three Sections even where Section 1 has shown the bridge deck to be non-compliant.

SECTION 1 CHECKS FOR COMPLIANCE WITH 24 T CONFIGURATION REQUIREMENTS

		Compliant Yes/No
What is maximum clear span of the arch *Non-compliant if greater than 2.0m*	0.990m	Yes
Do jack arches spring from bottom flanges of beams? The pre-cast units sit on the bottom flanges of the beams, though the actual springing point is about 150mm higher *If not, non compliant*	NO	No
What is the beam spacing? What is the rise of the arch? Gross aspect ratio *Non-compliant if greater than 10*	b=1.358m r_c=0.197m b/r_c=6.9	Yes
What is the arch barrel thickness (including concrete fill above) and how is it derived ie from record drawings or site investigation? *Non-compliant if thickness less than 220*	d := 76 mm **Girders are cast in the concrete jack arches** **Min arch+fill thick=154mm**	No

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CALC No. 180
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JOB No. 312360 AH
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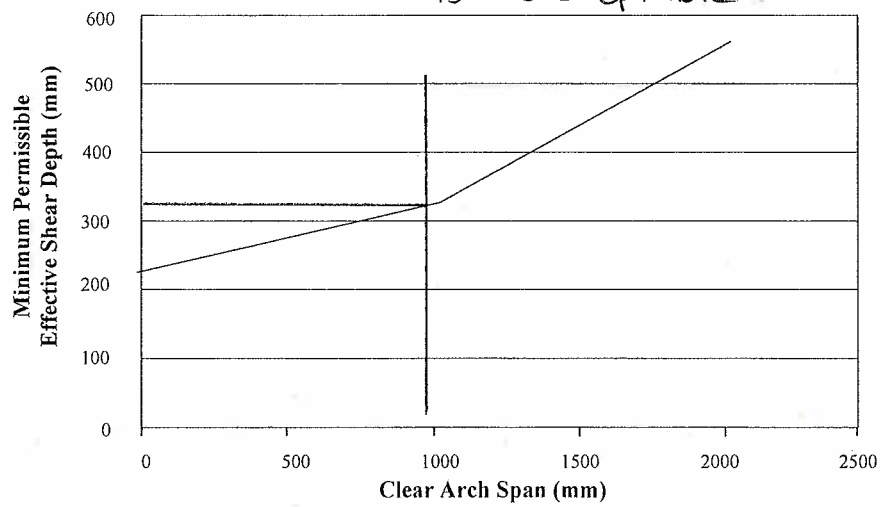
PRO FORMA FOR EMPIRICAL ASSESSMENT OF BRICK, MASONRY AND CONCRETE JACK ARCHES AND ASSOCIATED TIES
(To be included with the Assessment Report Calculations)

BRIDGE NAME:	Red Barn Overbridge
RAILTRACK NO:	**BUI/26**

Assessment should include completion of all three Sections even where Section 1 has shown the bridge deck to be non-compliant.

SECTION 2 CHECKS FOR DEFICIENCY

Type No	Deficiency	Pass/ Fail
1	What is the backing material? Is it structural? All concrete, Yes Does the structural backing extend to at least the crown level of the arch extrados? *If not, then fail (1) (4)* Yes Height of structural fill above crown $d_f := 136\ mm$ What is effective shear depth of deck? (= arch rise + barrel thickness + depth of structural fill above crown of extrados) $D_s := r_c + d + d_f$ $D_s := 212\ mm$ Is $D_s \geq$ "minimum requirements of Fig 1 " Fail if < Fig 1 All concrete construction is acceptable  *Figure 1*	Pass Fail

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2	Do jack arches span longitudinally (eg in half through girder construction) or transversely between longitudinal girders? -Transversely- For longitudinal spanning jack arches, ignore following questions on ties/lateral restraint and state N/A. Are ties provided in edge bays of transversely spanning jack arches? yes *If yes, go to 3a/3b* *If not, fail unless edge bay is 'hard' (see 5)*	pass
3a CI	What is the cross sectional area of one tie? (allowing for corrosion losses) Diameter of tie $Dia := 13\ mm$ (Corroded ties east bay) Therefore Area $A := 132.7\ mm^2$ What is number of ties per beam length? $n := 3$ What is the clear skew span? $L := 7.580\ m$ Specific area of tie $A_s := \frac{(n+1)\cdot A}{L}$ $A_s := 70.0\ \frac{mm^2}{m}$ *Non-compliant if less than 260mm²/m* What is maximum tie spacing? $S := 1.9\ m$ *Non-compliant if greater than 2.5m for cast iron*	for uncorroded ties in west bay d = 25mm A = 491 mm² n = 3 L = 7.58 A_s = 259 mm²/m OK Fail Pass
3b WI/ST	What is the cross sectional area of one tie? (allowing for corrosion losses) Diamensions of the tie $dt1 := 0\ mm$ $dt2 := 0\ mm$ Therefore Area $A := dt1 \cdot dt2$ $A = 0 \cdot m^2$ What is number of ties per beam length? $n := 0$ What is the clear skew span? $L := 0\ m$ Specific area of tie $A_s := \frac{(n+1)\cdot A}{L}$ $A_s = 0 \cdot m$ *Non-compliant if less than 260mm²/m* What is maximum tie spacing? $S := 0\ m$ *Non-compliant if greater than 3.0m for wrought iron/steel*	NA
4	Are ties located within crown of external arch? No *If so, then fail CI or possible fail for WI/steel*	Pass
5	Does external bay construction provide alternative lateral restraint? (ie not soft edge)? *If so, pass.If not, are ties provided in first Jack Arch bay? if yes,treat as 3a (or 3b). otherwise fail.*	Pass

Notes: (1) Results also in loss of D/d (composite action) for cast iron beams
(4) A trial hole should be undertaken to confirm the existence of structural backing if there is any doubt.

SHEET NO 20
CALC NO 180
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PRO FORMA FOR EMPIRICAL ASSESSMENT OF BRICK, MASONRY AND CONCRETE JACK ARCHES AND ASSOCIATED TIES
(To be included with the Assessment Report Calculations)

BRIDGE NAME:	Red Barn Overbridge
RAILTRACK NO:	**BUI/26**

Assessment should include completion of all three Sections even where Section 1 has shown the bridge deck to be non-compliant.

SECTION 3 CHECKS FOR DEFICIENCY

Type No	Defect	Empirical Assessment		Pass/ Fail
		CI Decks	WI/Steel Decks	
6	Rotation of supporting beam? No	Fail	NA	Pass
7	Horizontal displacement of supporting beam? No	Fail	NA	Pass
8	Inadequate support to springings eg corrosion of bottom flange of supporting beam over a significant length, missing bedding mortar? No	Possible Fail	NA	Pass
9	Transversely bowed bottom flange of supporting beam? No	Fail	NA	Pass
10	Cracking at crown of arch owing to spreading of springings (other than 12, 13)? No	Fail	NA	Pass
11	Distortion and any associated cracking of jack arch barrel? No	Fail	NA	Pass
12	Arch crack resulting in substructure crack? No	Fail	NA	Pass
13	Substructure crack or other distress resulting in crack to jack arch? No	Possible Fail	NA	Pass

Notes:

SHEET No 21
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FILE R16
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