

**STRUCTURAL DESIGN OF A STEEL PLATE COVER TO A
CULVERT AT HOLLINGWORTH ROAD,
LITTLEBOROUGH.**

Project ref: YZ074
Issue: 04
Date: 10/02/2026
Prepared by: Henry Byfield
Engineer
BEng | AaPS

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REV.	Revision description	Date
01	First issue	17/04/2024
02	Second issue to capture loads acting on the crown of the pipe & reference guidance from the Standard Conditions for Works Adjacent to Pipelines 90048	21/05/2024
03	Compressible material added to underside of steel plate protection.	10/10/2024
04	Calculations and design philosophy updated. Site construction phase culvert protection verification supported by before & after condition surveys.	10/02/2026

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   	Project LITTLEBOROUGH CULVERT COVER STEEL PLATE DESIGN			Job No. YZ074
	Drawing Reference	Calculations by HB	Checked by SB	Calc Sheet No. 2
	Unit			Date 10/02/26

Table of Contents

1. BACKGROUND & DESIGN PHILOSOPHY 3

2. ASSUMPTIONS 5

3. LOAD CATEGORIES..... 6

 3.1. LOAD TYPES: 6

 3.2. LOAD COMBINATIONS 6

4. PERMANENT LOADINGS & DESIGN CHECKS..... 7

5. TEMPORARY LOADINGS & DESIGN CHECKS 9

 5.1. ISOMETRIC VIEWS 12

 5.2. FINITE ELEMENT ANALYSIS..... 13

6. SUMMARY OF CULVERT DRAINAGE SURVEYS..... 14

7. SUMMARY..... 24

8. ANNEX A – EASTWOODS CE DESIGN STATEMENT 25

1. BACKGROUND & DESIGN PHILOSOPHY

Rev 4

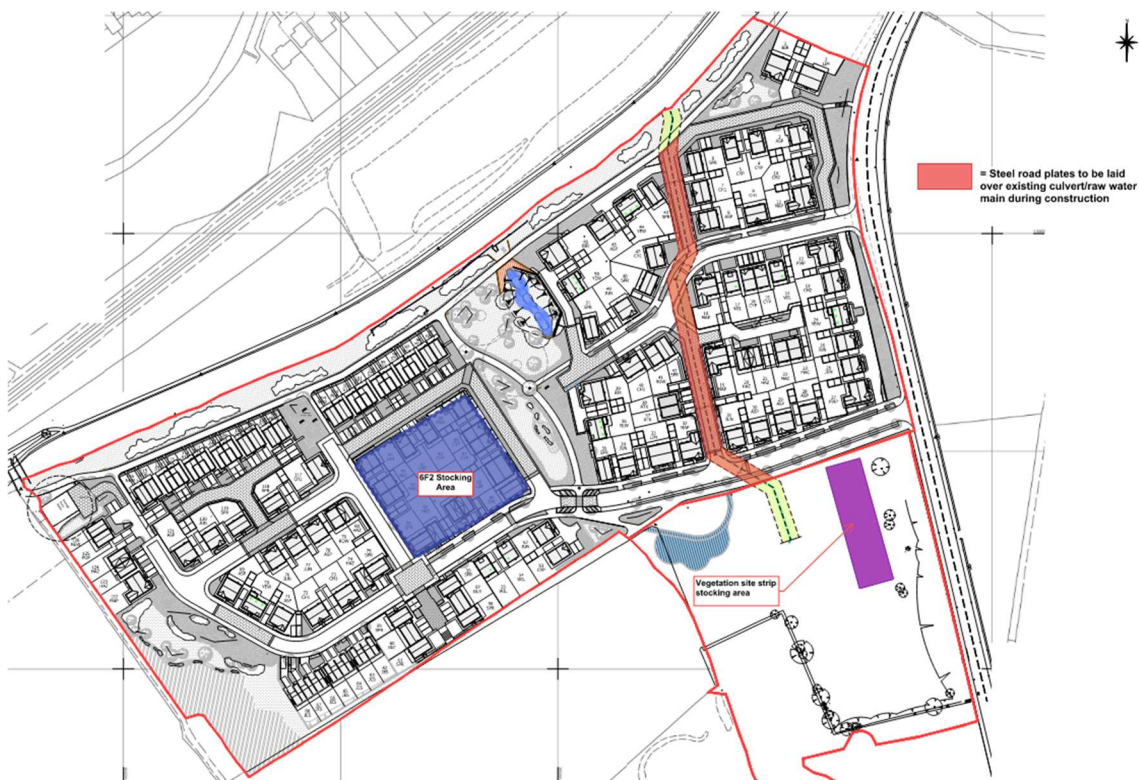
An existing water main culvert lies within the site boundary (highlighted below in yellow / orange semi-transparent outline). Planning condition 6 for the development highlights the need for the water main to be protected from damage. Mitigation / protective measure are designed within this report by utilizing a steel protective plate with a compressible material underneath over the culvert in areas of vehicle traffic / foreseen surcharge loads in the temporary case. The protective plate is later removed once the construction phase is finished, and suitable cover is placed above the culvert to dissipate any loads at the surface for the permanent load case.

Temporary Case:

- The temporary case (site construction phase) is to be verified by calculation AND / OR before and after drainage survey reports.

The following calculations show that the steel plate is designed to bridge over both the culvert and the granular surround and redistribute loads to suitable strata either side of the pipe. A layer of compressible material between the steel plate and the granular pipe surround is to be installed. The compressible material allows the steel plate to deflect along the 900mm length spanning over the culvert & granular pipe surround. The loads will path to suitable supporting bearing strata either side. The interface between the granular pipe surround and the natural strata is considered a line of fault. Loads will dissipate down through the natural firm clay soil strata. Ultimately, loads acting on the crown of the pipe will be negligible (from the self-weight of granular backfill) and will fall well within the 8.5kN/m^2 limit set out by clause 4.1.3. of the Standard Conditions for Works Adjacent to Pipelines.

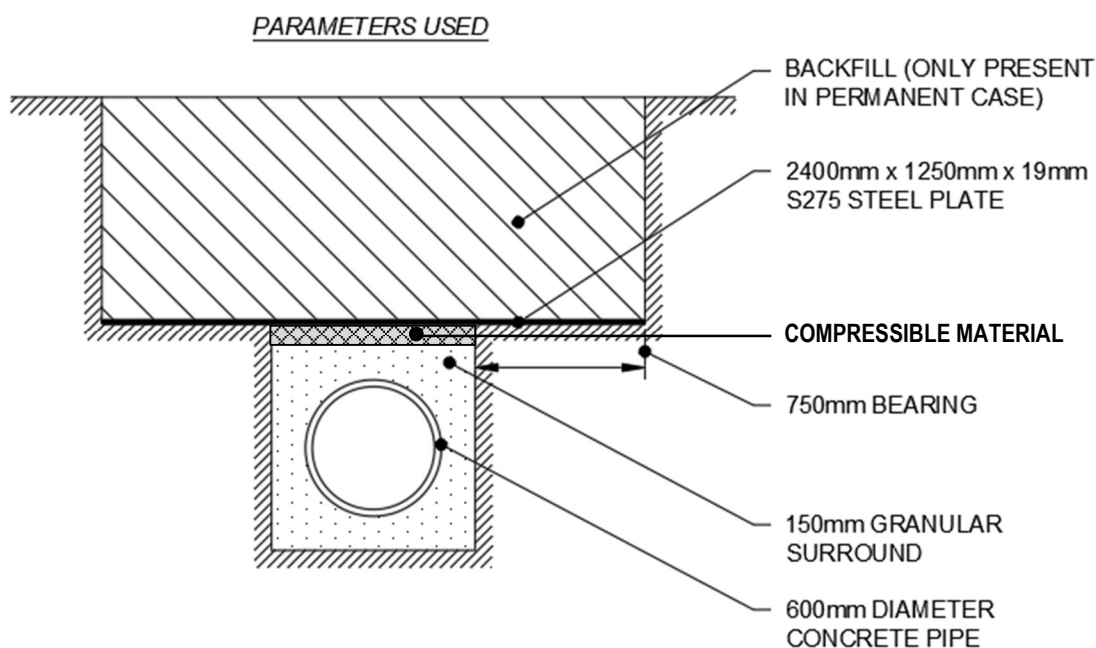
The steel plate is designed to withstand the above loading arrangement, as shown by the following calculations where the steel plate capacity is reviewed in FEA.



Vistry Group Bovis Homes Linden HOMES Vistry Partnerships		Project LITTLEBOROUGH CULVERT COVER STEEL PLATE DESIGN		Job No. YZ074	
		Drawing Reference	Calculations by HB	Checked by SB	Calc Sheet No. 4
		Unit			Date 10/02/26
	In addition to the steel plate calculations, a before & after culvert drainage camera survey will be undertaken to monitor culvert defects and ensure site construction works have not structurally impacted the existing culvert The results of these surveys will be appended to this report. The permanent (end-use) case is to be verified by the project design engineer – Eastwoods CE. A design statement for the permanent case is appended to this report.				

2. ASSUMPTIONS

The pipe should be bedded and surrounded in appropriate material in the normal way, as shown below:



In all cases, backfilling should be carried out in accordance with BS EN 1610:2015, clause 11.

Assumptions:

- Concrete pipe of diameter: 600mm.
- Width of granular surround to pipe: 150mm.
- Plate spans a gap of: 900mm.
- Steel grade of plate: S275.
- Plate dimensions: 2400mm x 1250mm x 19mm.
- Compressible material installed between granular surround and underside of steel plate

NOTE: The steel plate and compressible material are to be removed once the temporary case (construction phase) is complete & cover to the pipe is to be placed.

Design Codes:

- BS EN 1991-2:2023 - Actions on Structures
- NA to BS EN 1991-2:2003 - Actions on Structures
- BS 9295:2020 - Guide to the structural design of buried pipes
- Standard Conditions for Works Adjacent to Pipelines 90048

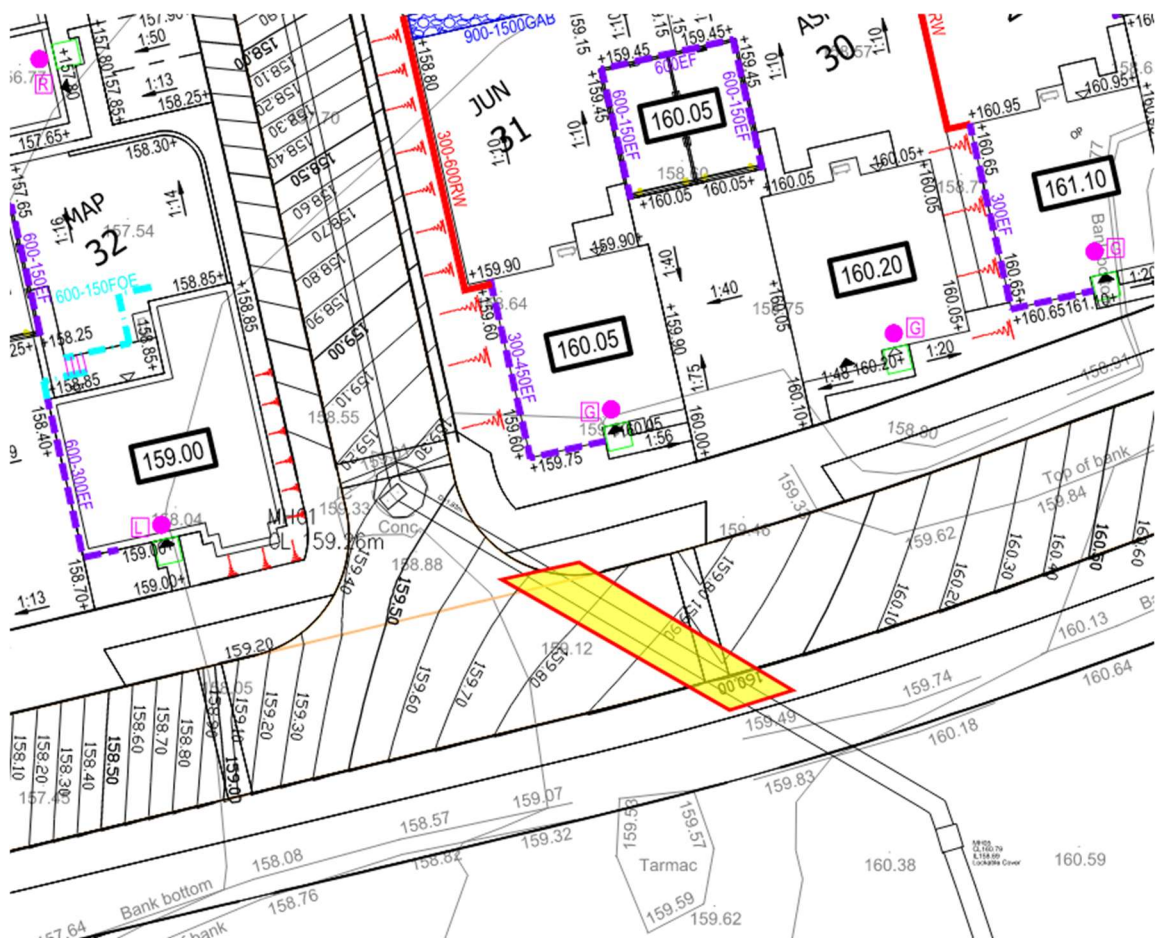
Vistry Group Bovis Homes Linden HOMES Vistry Partnerships	Project LITTLEBOROUGH CULVERT COVER STEEL PLATE DESIGN			Job No. YZ074
	Drawing Reference	Calculations by HB	Checked by SB	Calc Sheet No. 6
	Unit			Date 10/02/26
	3. LOAD CATEGORIES 3.1. LOAD TYPES: Dead loads: Self-weight of plate (accounted for by FEA software): (D1) Live Loads: Vehicle loading (to be determined): (L1) 3.2. LOAD COMBINATIONS: Serviceability Limit State - SLS: 1.00 D1 + 1.00 L1 Ultimate Limit State - ULS: 1.35 D1 + 1.50 L1			

4. PERMANENT LOADINGS & DESIGN CHECKS

Rev 4

'Appendix A – Eastwoods CE Design Statement' Verifies the permanent / end-use case. As Vistry's design engineer, Eastwoods take responsibility for the civil engineering proposals, but this excludes the temporary works design for culvert protection. However, a cursory loading check has been carried out below to determine the utilization / safety factor within the design.

Minimum cover to culvert:



Pavement Build-Up:

Asphalt: 40 mm (surface) + 60 mm (binder) + 75 mm (base) = 175 mm bound

Type 1 sub-base: 150 mm unbound

Capping: 325 mm unbound

Total pavement thickness = 650 mm *(spread loads at 2:1)*

Subgrade clay starts at 650 mm below surface.

Target depth = 1,200 mm → 1.2 m – 0.65 m = 0.55 m into clay. *(spread loads at 1:1)*

Wheel load - Use 50 kN ($\approx$ 5 tonne wheel) for residential road with refuse truck (conservative).

Tyre contact area = 300 mm $\times$ 300 mm

Spread through layers:

1) After 650 mm of 2:1 spread

Extra width = $2 \times 0.65 \text{ m} = 1.3 \text{ m}$ $\times$ 0.65 m = 1.3 m $\times$ 0.65 m = 1.3 m each side

Patch width $\approx$ 0.3 m + 2.6 m = 2.9 m

Patch length $\approx$ 0.3 m + 2.6 m = 2.9 m

Area $\approx$ 8.4 m²

2) After further 550 mm of 1:1 spread

Extra width = $1 \times 0.55 \text{ m} = 0.55 \text{ m}$ $\times$ 0.55 m = 0.55 m $\times$ 0.55 m = 0.55 m each side

Patch width $\approx$ 2.9 m + 1.1 m = 4.0 m

Patch length $\approx$ 2.9 m + 1.1 m = 4.0 m

Area $\approx$ 16 m²

Stress at Pipe Crown:

Stress = $50 / 16 = 3.1 \text{ kN/m}^2$ (SLS)

$1.50 \times 3.1 = 4.65 \text{ kN/m}^2$ (ULS)

4.65 kN/m² < 8.50 kN/m², Therefore PASS (55% Utl.)

(8.50 kN/m² limit is given in United Utilities 'standard conditions for works adjacent to pipelines' – Ref. 90048 Issue 3.1).

Compared to soil overburden (1.2m $\times$ 18kN/m³ $\approx$ 22 kN/m²) – Traffic loads only make up $\sim$ 15% extra.

PASS

5. TEMPORARY LOADINGS & DESIGN CHECKS

Most onerously loaded plant operating on site (temporary case).

Circa 40-ton haulage truck (Moxy) such as a Volvo A35G.

OPERATING WEIGHT UNLOADED

			A35G		A40G	
Tires			26.5R25*		29.5R25**	
Front	kg	lb	15,700	34,613	16,100	35,494
Rear	kg	lb	13,600	29,983	14,600	32,187
Total	kg	lb	29,300	64,595	30,700	67,682
Payload	kg	lb	34,500	76,059	39,000	85,980

Operating weight includes all fluids and operator

*) A35G with tires 775/65R25, add 200 kg (440 lb)/axle

**) A40G with tires 875/65R25, add 300 kg (660 lb)/axle

TOTAL WEIGHT

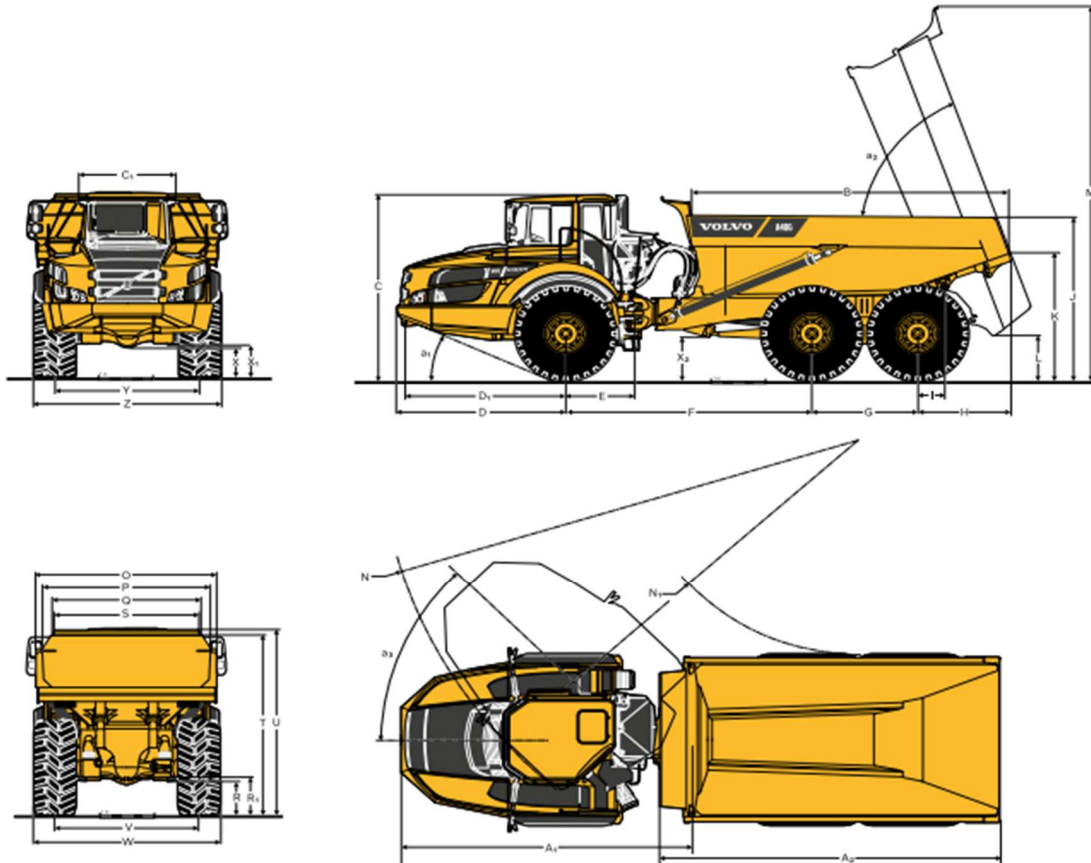
			A35G		A40G	
Tires			26.5R25*		29.5R25**	
Front	kg	lb	19,200	42,329	20,450	45,084
Rear	kg	lb	44,600	98,326	49,250	108,578
Total	kg	lb	63,800	140,655	69,700	153,662

*) A35G with tires 775/65R25, add 200 kg (440 lb)/axle

**) A40G with tires 875/65R25, add 300 kg (660 lb)/axle

GROUND PRESSURE

			A35G		A40G		A35G		A40G	
Tires			26.5R25		29.5R25		775/65R25		875/65R25	
Unloaded										
Front	kPa	psi	132	19.1	111	16.1	115	16.7	98	14.2
Rear	kPa	psi	54	7.8	47	6.8	48	7	42	6.1
Loaded										
Front	kPa	psi	158	22.9	139	20.2	138	20	121	17.5
Rear	kPa	psi	183	26.5	167	24.2	160	23.2	146	21.2



DIMENSIONS

Pos	Unit		A35G		A40G	
A	mm	ft in	11,180	36'8"	11,263	36'11"
A ₁	mm	ft in	5,476	18'	5,476	18'
A ₂	mm	ft in	6,241	20'6"	6,404	21'0"
B	mm	ft in	5,568	18'3"	5,844	19'2"
C	mm	ft in	3,547	11'8"	3,599	11'10"
C ₁	mm	ft in	1,772	5'10"	1,772	5'10"
D	mm	ft in	3,100	10'2"	3,100	10'2"
D ₁	mm	ft in	2,942	9'8"	2,942	9'8"
E	mm	ft in	1,277	4'2"	1,277	4'2"
F	mm	ft in	4,578	15'0"	4,518	14'10"
G	mm	ft in	1,820	6'	1,940	6'4"
H	mm	ft in	1,683	5'6"	1,706	5'7"
I	mm	ft in	650	2'2"	495	1'7"
J	mm	ft in	3,014	9'11"	3,132	10'3"
K	mm	ft in	2,304	7'7"	2,435	8'
L	mm	ft in	890	2'11"	822	2'8"
M	mm	ft in	7,236	23'9"	7,265	23'10"
N	mm	ft in	8,866	29'1"	8,957	29'5"
N ₁	mm	ft in	4,416	14'6"	4,327	14'2"
O	mm	ft in	3,216	10'7"	3,430	11'3"

DIMENSIONS

Pos	Unit		A35G		A40G	
P	mm	ft in	2,902	9'6"	3,118	10'3"
Q	mm	ft in	2,553	8'5"	2,820	9'3"
R	mm	ft in	564	1'10"	613	2'0"
R ₁	mm	ft in	652	2'2"	701	2'4"
S	mm	ft in	2,423	7'11"	2,651	8'8"
T	mm	ft in	3,382	11'1"	3,427	11'3"
U	mm	ft in	3,498	11'6"	3,546	11'8"
V	mm	ft in	2,534	8'4"	2,636	8'8"
W	mm	ft in	3,221	10'7"	3,403	11'2"
X	mm	ft in	500	1'8"	553	1'10"
X ₁	mm	ft in	592	1'11"	645	2'1"
X ₂	mm	ft in	738	2'5"	788	2'7"
Y	mm	ft in	2,534	8'4"	2,636	8'8"
Z	mm	ft in	3,221	10'7"	3,403	11'2"
a ₁	°		23.6		24.3	
a ₂	°		72		70	
a ₃	°		45		45	

A35G: Unloaded machine with 26.5R25

A40G: Unloaded machine with 29.5R25

$$\text{Tire width} = W - V = 3221 - 2534 = 687\text{mm}$$

$$\text{Axle load} = 44600 / 2 = 22300\text{kg} (x9.81/1000) = 218 \text{ kN}$$

BS EN
1991-2:
6.3.1

load model 1, which considers Concentrated and uniformly distributed loads, which cover most of the effects of the traffic of lorries and cars. This model should be used for global and local verifications.

BS EN
1991-2
6.3.2(5)

- Each axle of the tandem system should be taken into account with two identical wheels, the load per wheel being therefore equal to $0,5 \alpha Q \times Q_k$.
- The contact surface of each wheel should be taken as square and of side 0,40 m (see Figure 6.2).

In this case the tire width is known to be 0.687m. Using engineering judgement we will assume the same square contact patch.

NA BS EN
1991-2
NA.2.16.1.
3

This square contact area philosophy is further backed up in load model 3 of the National Annex, where: 'the wheel loads of all three SV models should be uniformly distributed over a square contact area as shown in figure NA.1'.

There should be an additional Dynamic Amplification Factor (DAF) applied to account for dynamic effects such as the impact or vibration caused by moving loads.

NA BS EN
1991-2
NA.2

Table NA.2 — Dynamic Amplification Factors for the SV and SOV vehicles

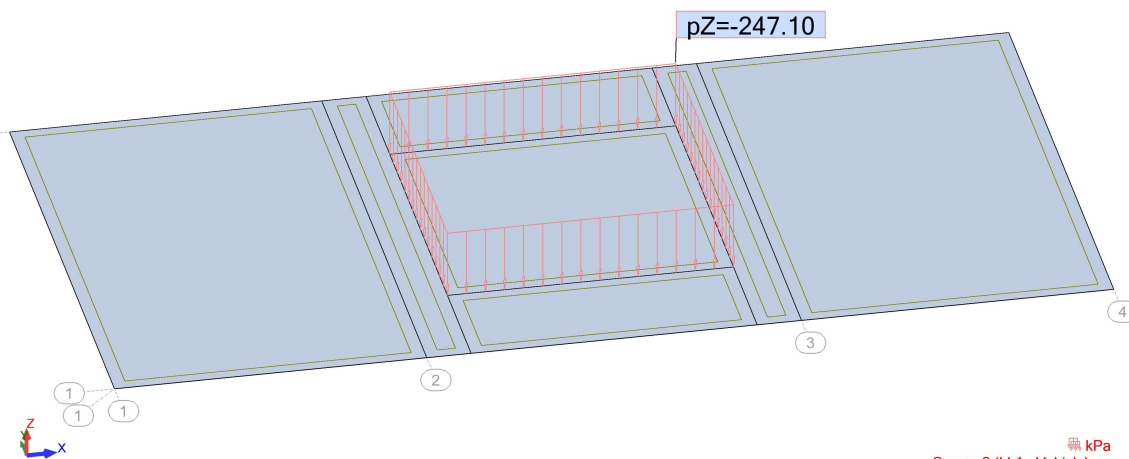
Basic axle load	DAF
100 kN	1,20
130 kN	1,16
165 kN	1,12
180 kN	1,10
225 kN	1,07

$$\text{Basic axle load} = 44600 / 2 \times 9.81 / 1000 = 218 \text{ kN}, \quad \text{Use DAF} = 1.07.$$

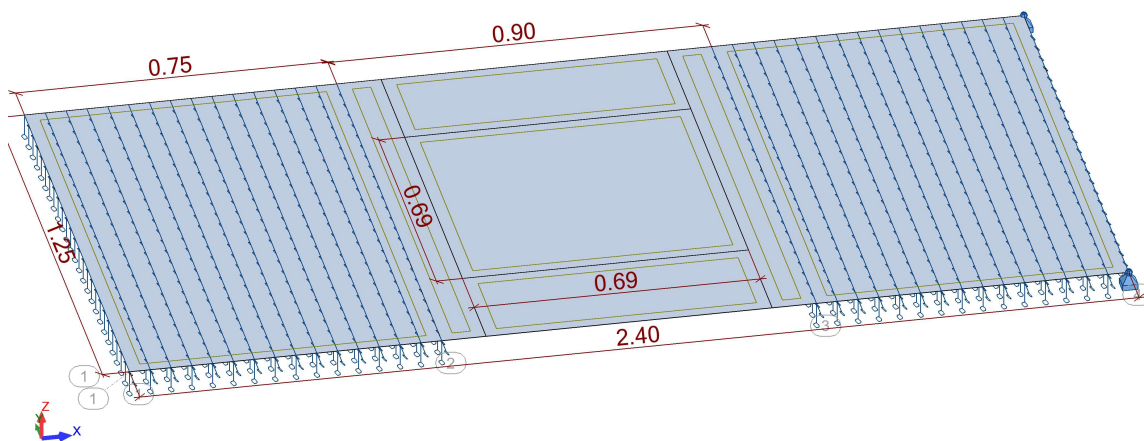
$$\text{load per wheel} = 0,5 \alpha Q \times Q_k.$$

Vistry Group Bovis Homes  Linden HOMES Vistry  Partnerships		Project LITTLEBOROUGH CULVERT COVER STEEL PLATE DESIGN		Job No. YZ074	
		Drawing Reference	Calculations by HB	Checked by SB	Calc Sheet No. 11
		Unit			Date 10/02/26
	Where: $\alpha_Q = DAF = 1.07$ $Q_k = 218 \text{ kN}$ Load per wheel = $0.5 \times 1.07 \times 218 = 116.63 \text{ kN (SLS)}$ Area of tire contact on the plate = $0.687\text{m} \times 0.687\text{m}$ Area load acting on this contact patch = $116.63 / (0.687 \times 0.687) = 247.1 \text{ kN/m}^2$				

5.1. ISOMETRIC VIEWS

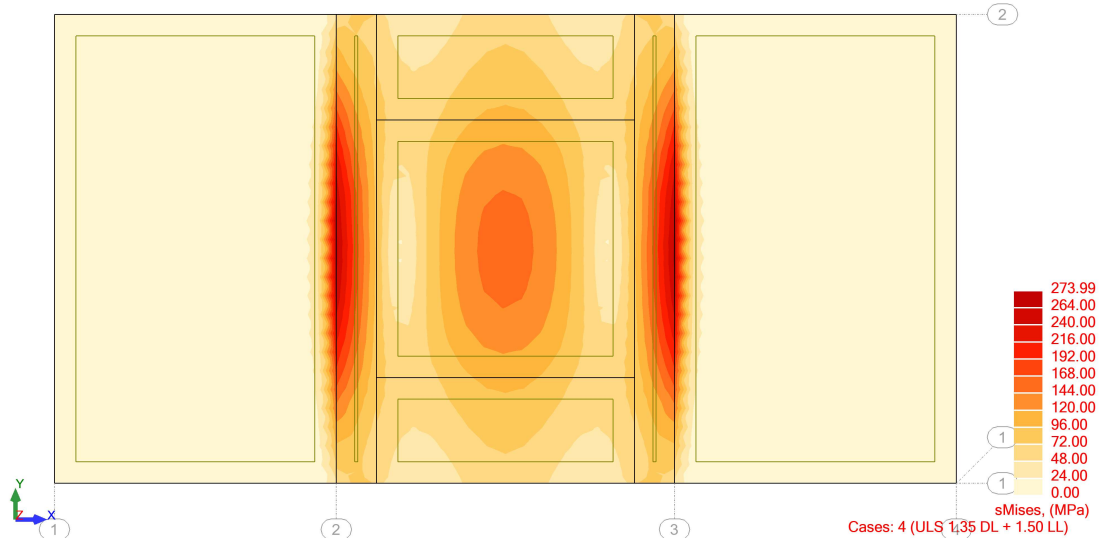


Isometric View showing vehicle live loading on the modelled steel plate.

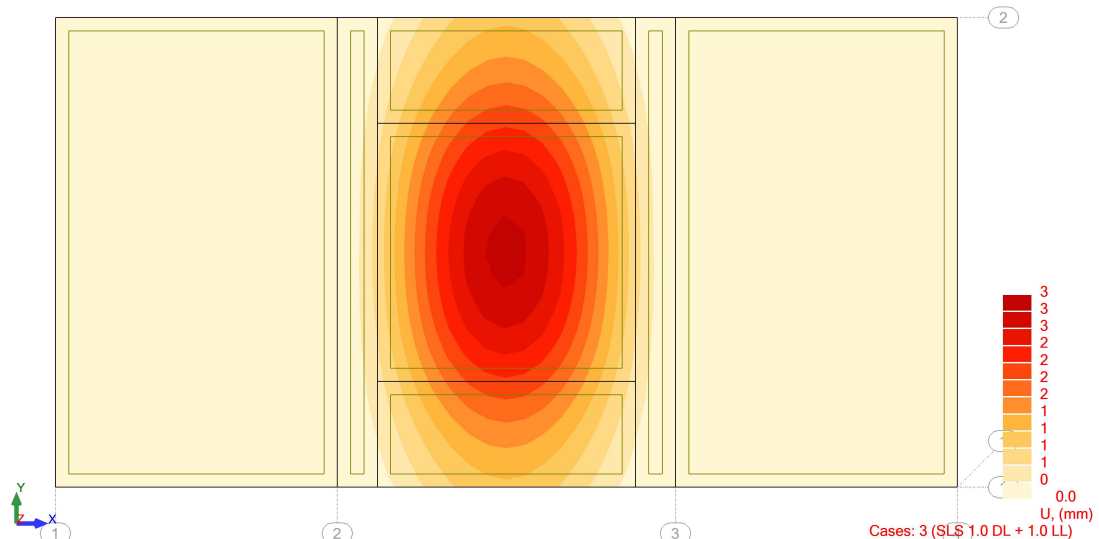


Isometric View showing plate dimensions and support conditions.

5.2. FINITE ELEMENT ANALYSIS



$273.99 \text{ N/mm}^2 < 275 \text{ N/mm}^2$, Therefore PASS
Stresses are within allowable limits.



Consider an allowable deflection = span / 200 for a short spanning structural element with no brittle finishes = $900 / 200 = 4.5 \text{ mm}$

$3 \text{ mm} < 4.5 \text{ mm}$, Therefore PASS
Deflections are within allowable limits.

3mm of deflection should be able to occur without exhausting the limits of the compressible material to ensure no imposed load on the steel plate is distributed to the granular pipe surround underneath. Thus, redistributing loads away from acting on the crown of pipe.

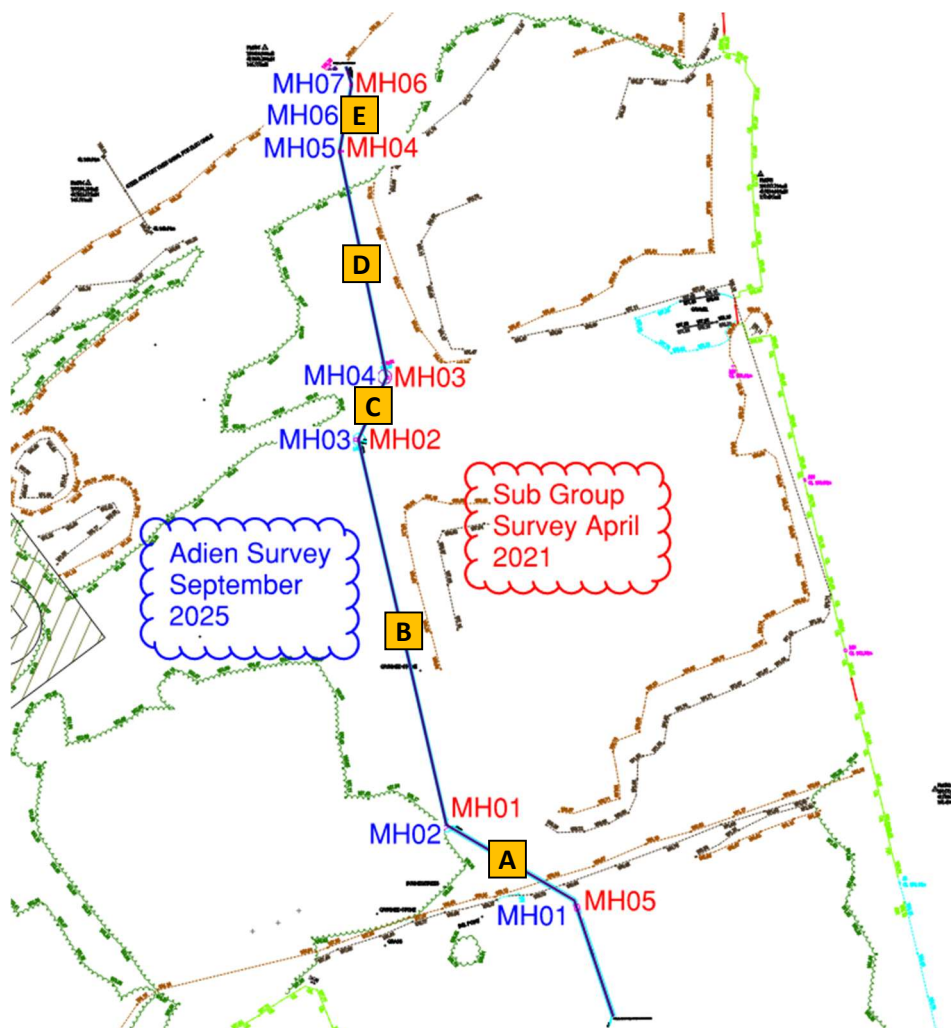
6. SUMMARY OF CULVERT DRAINAGE SURVEYS

Prior to starting construction works on site, a survey of the culvert was carried out by Sub Group in April of 2021. Steel protective plates have since been installed over the culvert to protect the existing infrastructure from damage during the bulk earthworks. The plates were removed once levels were brought up to proposed levels with sufficient cover to the crown of the culvert. Eastwoods CE are responsible for the engineering design & have confirmed the suitability of the final design in this regard – see appended email correspondence.

A second September 2025 survey has now been done after the completion of the bulk earthworks, roads, sewers and plots within proximity of the culvert.

The report findings show that the condition of the culvert within the extents shown below have not worsened. No issues were flagged during Adien's recent survey.

The below markup shows the survey extents of the culvert. The node references differ between reports so have been labelled as sections A through E for ease of comparison within this report, and tabulated on the following pages side by side.



Project LITTLEBOROUGH CULVERT COVER STEEL PLATE DESIGN			Job No. YZ074
Drawing Reference	Calculations by HB	Checked by SB	Calc Sheet No. 15
Unit			Date 10/02/26

Section A

2021 Sub Group survey

		SUB GROUP LTD DONCASTER Tel: 01302 880537 joe.walshaw@sub-group.co.uk	
Section Inspection - 27/04/2021 - 05X			
Section 4	Inspection 1	Date 27/04/21	Time 10:34
Operator JW	Vehicle VAN1	Camera 235	Preset Length Not Specified
Client's Job Ref Not Specified	Weather Dry	Pre Cleaned 0	PLR 05X
Legal Status Not Specified	Alternative ID Not Specified		
Town or Village: Road: Location: Surface Type:	Littleborough Hollingworth Rd Fields Culverted watercourse	Inspection Direction: Inspected Length: Total Length: Joint Length:	Upstream Node: Upstream Pipe Depth: Downstream Node: Downstream Pipe Depth:
Use: Type of Pipe: Flow Control: Year Constructed: Inspection Purpose:	Culverted watercourse Not Specified Associated with future capital scheme including Drainage Area Planning	Pipe Shape: Dia/Height: Pipe Material: Lining: Lining Material:	Circular 600 mm Concrete No Lining No Lining
Comments: Recommendations:			
Scale: 1:257	Position [m]	Code	Observation
Depth: m			
01	0.00	GO	General observation: HEAVY FAST FLOW
	0.00	ST	Start of survey
	0.00	MH	Manhole: 01
	0.00	WL	Water level, 20% of sewer height
	29.70	MH	Manhole: 05
	29.70	FH	Finish survey
05			
Depth: m			
Construction Features		Miscellaneous Features	
Structural Defects		Service & Operational Observations	
STR No. Def	STR Peak	STR Mean	STR Total
0	0.0	0.0	0.0
STR Grade	SER No. Def	SER Peak	SER Mean
1.0	0	0.0	0.0
SER Total	SER Grade		
0.0	1.0		

HOLLINGWORTH RD, LITTLEBOROUGH

2025 Adien Survey

		ADIEN MILLFIELD IND EST, DONCASTER	
Section Inspection - 11/11/2025 - 01X			
Item No. 7	Insp. No. 1	Date 11/11/25	Time 9:40
Operator JW	Vehicle Not Specified	Camera Not Specified	Preset Length Not Specified
Client's Job Ref Not Specified	Weather No Rain Or Snow	Pre Cleaned No	PLR 01X
Legal Status Not Specified	Alternative ID Not Specified		
Town or Village: Road: Location: Surface Type:	Littleborough Hollingworth Rd Footway Culverted watercourse	Inspection Direction: Inspected Length: Total Length: Joint Length:	Upstream Node: Upstream Pipe Depth: Downstream Node: Downstream Pipe Depth:
Use: Type of Pipe: Flow Control: Year Constructed: Inspection Purpose:	Culverted watercourse Gravity drain/sewer No flow control Not Specified Routine inspection	Pipe Shape: Dia/Height: Material: Lining Type: Lining Material:	Circular 600 mm Concrete No Lining No Lining
Comments: Recommendations:			
Scale: 1:270	Position [m]	Code	Observation
Depth: m			
02	0.00	MH	Start node, manhole, reference: 02
	0.00	WL	Water level, 5% of the vertical dimension
	31.10	MHF	Finish node, manhole, reference: 01
01			
Depth: m			
Construction Features		Miscellaneous Features	
Structural Defects		Service & Operational Observations	
STR No. Def	STR Peak	STR Mean	STR Total
0	0.0	0.0	0.0
STR Grade	SER No. Def	SER Peak	SER Mean
1.0	0	0.0	0.0
SER Total	SER Grade		
0.0	1.0		

LITTLEBOROUGH HOLLINGWORTH RD

Project

LITTLEBOROUGH CULVERT COVER STEEL PLATE DESIGN

Job No.

YZ074

Drawing Reference

Calculations by
HB

Checked by
SB

Calc Sheet No.

16

Unit

Date

10/02/26

Section A

2021 Sub Group survey

2025 Adien Survey

SUB GROUP LTD
DONCASTER
Tel. 01302 880537
joe.walshaw@sub-group.co.uk

Section Rehab - 27/04/2021 - 05X

Section	Inspection	Date	Time	Client's Job Ref	Weather	Pre Cleaned	PLR
4	1	27/04/21	10:34	Not Specified	Dry	0	05X
Operator	Vehicle	Camera	Preset Length	Legal Status	Alternative ID		
JW	VAN1	235	Not Specified	Not Specified	Not Specified		

Town or Village: Littleborough

Road: Hollingworth Rd

Location: Fields

Surface Type:

Inspection Direction: Upstream

Inspected Length: 29.70 m

Total Length: 29.70 m

Joint Length: 0.00 m

Upstream Node: 05

Upstream Pipe Depth: 0

Downstream Node: 01

Downstream Pipe Depth: 0

Comments:

Recommendations:

Scale: 1:217

Position [m]

Code

Observation

MPEG

Photo

Grade

Depth: m

01

0.00

0.00

0.00

0.00

29.70

29.70

05

Depth: m

GO General observation: HEAVY FAST FLOW 00:00:00

ST Start of survey 00:02:39

MH Manhole: 01 00:02:39

WL Water level, 20% of sewer height 00:02:39

MH Manhole: 05 00:03:01

FH Finish survey 00:03:02

HOLLINGWORTH RD, LITTLEBOROUGH

Project LITTLEBOROUGH CULVERT COVER STEEL PLATE DESIGN			Job No. YZ074
Drawing Reference	Calculations by HB	Checked by SB	Calc Sheet No. 17
Unit			Date 10/02/26

Section B

2021 Sub Group survey



SUB GROUP LTD
, DONCASTER
Tel. 01302 880537
joe.walshaw@sub-group.co.uk

Section Inspection - 27/04/2021 - 01X

Section	Inspection	Date	Time	Client's Job Ref	Weather	Pre Cleaned	PLR
1	1	27/04/21	9:49	Not Specified	Dry	0	01X
Operator	Vehicle	Camera	Preset Length	Legal Status	Alternative ID		
JW	VAN1	235	Not Specified	Not Specified	Not Specified		

Town or Village:	Littleborough	Inspection Direction:	Downstream	Upstream Node:	01
Road:	Hollingworth Rd	Inspected Length:	82.50 m	Upstream Pipe Depth:	
Location:	Fields	Total Length:	82.50 m	Downstream Node:	02
Surface Type:		Joint Length:	0.00 m	Downstream Pipe Depth:	
Use:	Culverted watercourse				
Type of Pipe:					
Flow Control:					
Year Constructed:	Not Specified				
Inspection Purpose:	Associated with future capital scheme including Drainage Area Planning				
Comments:					
Recommendations:					

Scale:	1:712	Position [m]	Code	Observation	MPEG	Photo	Grade
Depth: m							
01							
		0.00	GO	General observation: HEAVY FAST FLOW	00:00:00		
		0.00	ST	Start of survey	00:02:19		
		0.00	MH	Manhole: 01	00:02:19		
		0.00	WL	Water level, 20% of sewer height	00:02:19		
		82.50	MH	Manhole: 02	00:04:09		
		82.50	FH	Finish survey	00:04:09		
02							
Depth: m							

Construction Features				Miscellaneous Features				
Structural Defects				Service & Operational Observations				
STR No. Def	STR Peak	STR Mean	STR Total	STR Grade	SER No. Def	SER Peak	SER Mean	SER Total
0	0.0	0.0	0.0	1.0	0	0.0	0.0	0.0
								1.0

HOLLINGWORTH RD, LITTLEBOROUGH

2025 Adien Survey



ADIEN
MILLFIELD IND EST, DONCASTER

Section Inspection - 06/11/2025 - 02X

Item No.	Insp. No.	Date	Time	Client's Job Ref	Weather	Pre Cleaned	PLR
2	1	06/11/25	19:14	Not Specified	No Rain Or Snow	No	02X
Operator	Vehicle	Camera	Preset Length	Legal Status	Alternative ID		
JW	Not Specified	Not Specified	Not Specified	Not Specified	Not Specified		

Town or Village:	Littleborough	Inspection Direction:	Downstream	Upstream Node:	02
Road:	Hollingworth Rd	Inspected Length:	43.90 m	Upstream Pipe Depth:	
Location:	Footway	Total Length:	43.90 m	Downstream Node:	03
Surface Type:		Joint Length:		Downstream Pipe Depth:	
Use:	Surface water				
Type of Pipe:	Gravity drain/sewer				
Flow Control:	No flow control				
Year Constructed:	Not Specified				
Inspection Purpose:	Routine inspection				
Comments:					
Recommendations:					

Scale:	1:381	Position [m]	Code	Observation	MPEG	Photo	Grade
Depth: m							
02							
		0.00	MH	Start node, manhole, reference: 02			
		0.00	WL	Water level, 15% of the vertical dimension			
		43.90	MHF	Finish node, manhole, reference: 03			
03							
Depth: m							

Construction Features				Miscellaneous Features				
Structural Defects				Service & Operational Observations				
STR No. Def	STR Peak	STR Mean	STR Total	STR Grade	SER No. Def	SER Peak	SER Mean	SER Total
0	0.0	0.0	0.0	1.0	0	0.0	0.0	0.0
								1.0

LITTLEBOROUGH HOLLINGWORTH RD

Project LITTLEBOROUGH CULVERT COVER STEEL PLATE DESIGN			Job No. YZ074
Drawing Reference	Calculations by HB	Checked by SB	Calc Sheet No. 18
Unit			Date 10/02/26

Section B

2021 Sub Group survey



SUB GROUP LTD
, DONCASTER
Tel. 01302 880537
joe.walshaw@sub-group.co.uk

Section Rehab - 27/04/2021 - 01X

Section	Inspection	Date	Time	Client's Job Ref	Weather	Pre Cleaned	PLR
1	1	27/04/21	9:49	Not Specified	Dry	0	01X
Operator	Vehicle	Camera	Preset Length	Legal Status	Alternative ID		
JW	VAN1	235	Not Specified	Not Specified	Not Specified		

Town or Village: Littleborough
Road: Hollingworth Rd
Location: Fields
Surface Type:

Inspection Direction: Downstream
Inspected Length: 82.50 m
Total Length: 82.50 m
Joint Length: 0.00 m

Upstream Node: 01
Upstream Pipe Depth: 0
Downstream Node: 02
Downstream Pipe Depth: 0

Comments:
Recommendations:

Scale: 1:603 **Position [m]** **Code** **Observation** **MPEG** **Photo** **Grade**

Depth: m
01

0.00
0.00
0.00
0.00

GO
ST
MH
WL

General observation: HEAVY FAST FLOW
Start of survey
Manhole: 01
Water level, 20% of sewer height

00:00:00
00:02:19
00:02:19
00:02:19

Depth: m
02

82.50
82.50

MH
FH

Manhole: 02
Finish survey

00:04:09
00:04:09

Depth: m

HOLLINGWORTH RD, LITTLEBOROUGH

2

2025 Adien Survey



ADIEN
MILLFIELD IND EST, DONCASTER

Section Inspection - 06/11/2025 - 02X

Item No.	Insp. No.	Date	Time	Client's Job Ref	Weather	Pre Cleaned	PLR
3	1	06/11/25	19:20	Not Specified	No Rain Or Snow	No	02X
Operator	Vehicle	Camera	Preset Length	Legal Status	Alternative ID		
JW	Not Specified	Not Specified	Not Specified	Not Specified	Not Specified		

Town or Village: Littleborough
Road: Hollingworth Rd
Location: Footway
Surface Type:

Inspection Direction: Downstream
Inspected Length: 84.40 m
Total Length: 84.40 m
Joint Length:

Upstream Node: 02
Upstream Pipe Depth:
Downstream Node: 03
Downstream Pipe Depth:

Use: Culverted watercourse
Type of Pipe: Gravity drain/sewer
Flow Control: No flow control
Year Constructed: Not Specified
Inspection Purpose: Routine inspection

Pipe Shape: Circular
Dia/Height: 600 mm
Material: Concrete
Lining Type: No Lining
Lining Material: No Lining

Comments:
Recommendations:

Scale: 1:731 **Position [m]** **Code** **Observation** **MPEG** **Photo** **Grade**

Depth: m
02

0.00
0.00

MH
WL

Start node, manhole, reference: 02
Water level, 10% of the vertical dimension

Depth: m
03

84.40

MHF

Finish node, manhole, reference: 03

Depth: m

LITTLEBOROUGH HOLLINGWORTH RD

2

Project

LITTLEBOROUGH CULVERT COVER STEEL PLATE DESIGN

Job No.

YZ074

Drawing Reference

Calculations by

HB

Checked by

SB

Calc Sheet No.

19

Unit

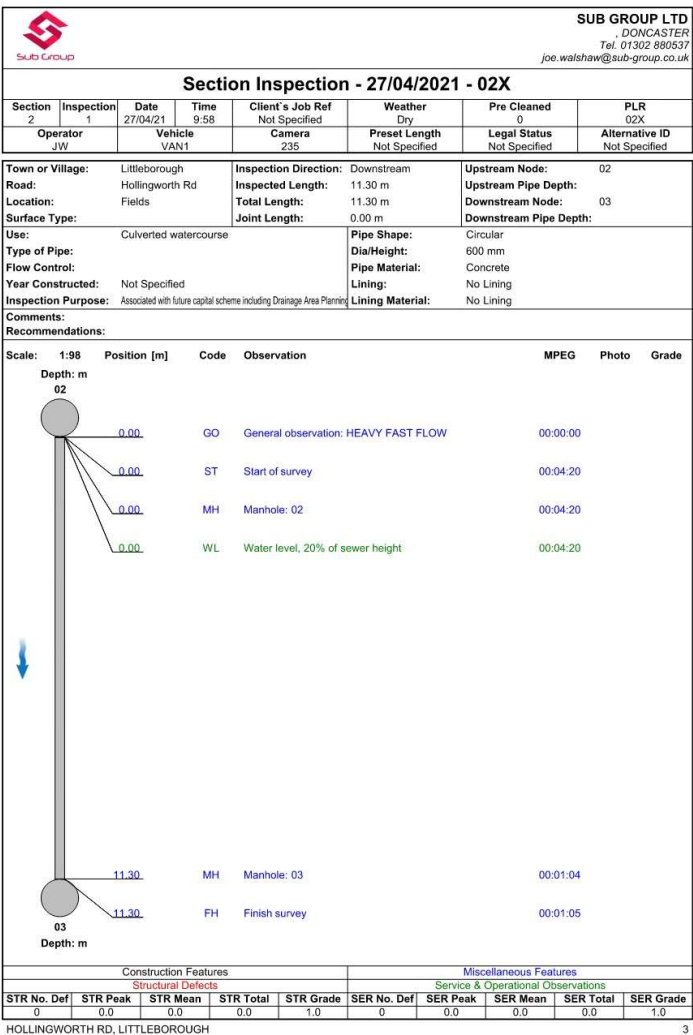
Date

10/02/26

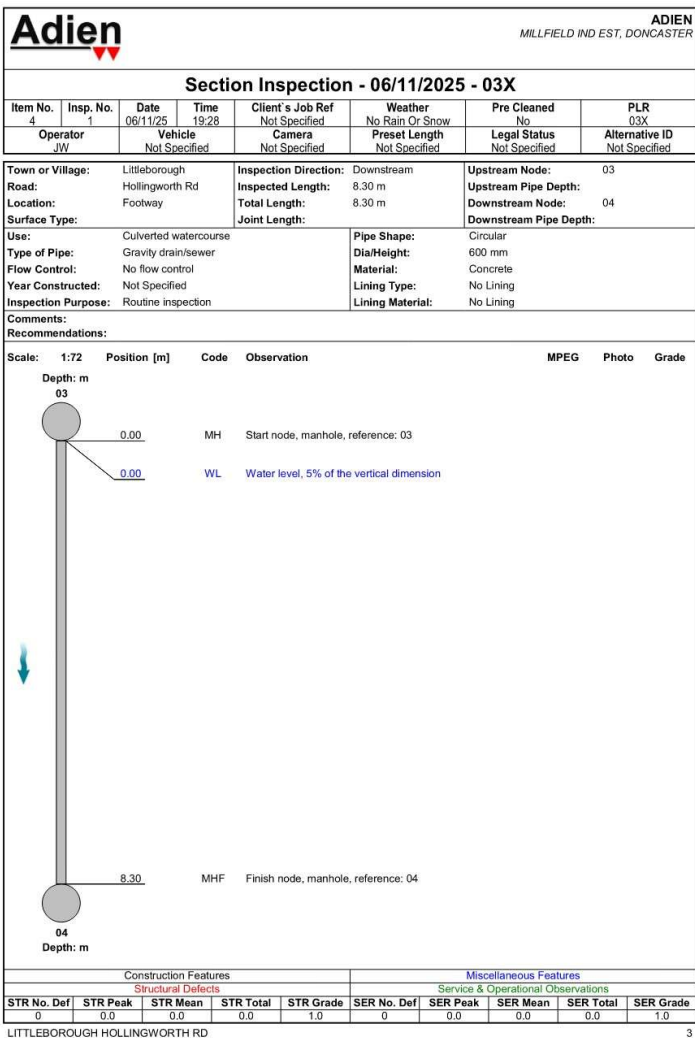
Section C

2021 Sub Group survey

2025 Adien Survey



3



3

Vistry Group



Linden
HOMES

Vistry
Partnerships

Project

LITTLEBOROUGH CULVERT COVER STEEL PLATE DESIGN

Job No.

YZ074

Drawing Reference

Calculations by
HB

Checked by
SB

Calc Sheet No.

20

Unit

Date

10/02/26

Section C

2021 Sub Group survey

2025 Adien Survey



Project LITTLEBOROUGH CULVERT COVER STEEL PLATE DESIGN			Job No. YZ074
Drawing Reference	Calculations by HB	Checked by SB	Calc Sheet No. 21
Unit			Date 10/02/26

Section D

2021 Sub Group survey



SUB GROUP LTD
, DONCASTER
Tel. 01302 880537
joe.walshaw@sub-group.co.uk

Section Inspection - 27/04/2021 - 03X

Section 3	Inspection 1	Date 27/04/21	Time 10:05	Client's Job Ref Not Specified	Weather Dry	Pre Cleaned 0	PLR 03X
Operator JW	Vehicle VAN1	Camera 235	Preset Length Not Specified	Legal Status Not Specified	Alternative ID Not Specified		

Town or Village: Littleborough
Road: Hollingworth Rd
Location: Fields
Surface Type:

Inspection Direction: Downstream
Inspected Length: 47.60 m
Total Length: 47.60 m
Joint Length: 0.00 m

Upstream Node: 03
Upstream Pipe Depth:
Downstream Node: 04
Downstream Pipe Depth:

Use: Culverted watercourse
Type of Pipe:
Flow Control:
Year Constructed: Not Specified
Inspection Purpose: Associated with future capital scheme including Drainage Area Planning

Pipe Shape: Circular
Dia/Height: 600 mm
Pipe Material: Concrete
Lining: No Lining
Lining Material: No Lining

Comments:
Recommendations:

Scale: 1:411 Position [m] Code Observation MPEG Photo Grade

Depth: m
03

0.00
0.00
0.00
0.00

GO
ST
MH
WL

General observation: HEAVY FAST FLOW
Start of survey
Manhole: 03
Water level, 20% of sewer height

00:00:00
00:01:15
00:01:15
00:01:15

47.60
47.60

MH
FH

Manhole: 04
Finish survey

00:02:29
00:02:30

04
Depth: m

Construction Features
Structural Defects

Miscellaneous Features
Service & Operational Observations

STR No. Def	STR Peak	STR Mean	STR Total	STR Grade	SER No. Def	SER Peak	SER Mean	SER Total	SER Grade
0	0.0	0.0	0.0	1.0	0	0.0	0.0	0.0	1.0

HOLLINGWORTH RD, LITTLEBOROUGH

5

2025 Adien Survey



ADIEN
MILLFIELD IND EST, DONCASTER

Section Inspection - 06/11/2025 - 04X

Item No. 5	Insp. No. 1	Date 06/11/25	Time 19:32	Client's Job Ref Not Specified	Weather No Rain Or Snow	Pre Cleaned No	PLR 04X
Operator JW	Vehicle Not Specified	Camera Not Specified	Preset Length Not Specified	Legal Status Not Specified	Alternative ID Not Specified		

Town or Village: Littleborough
Road: Hollingworth Rd
Location: Footway
Surface Type:

Inspection Direction: Downstream
Inspected Length: 49.60 m
Total Length: 49.60 m
Joint Length:

Upstream Node: 04
Upstream Pipe Depth:
Downstream Node: 05
Downstream Pipe Depth:

Use: Culverted watercourse
Type of Pipe: Gravity drain/sewer
Flow Control: No flow control
Year Constructed: Not Specified
Inspection Purpose: Routine inspection

Pipe Shape: Circular
Dia/Height: 600 mm
Material: Concrete
Lining Type: No Lining
Lining Material: No Lining

Comments:
Recommendations:

Scale: 1:430 Position [m] Code Observation MPEG Photo Grade

Depth: m
04

0.00
0.00

MH
WL

Start node, manhole, reference: 04
Water level, 5% of the vertical dimension

49.60

MHF

Finish node, manhole, reference: 05

05
Depth: m

Construction Features
Structural Defects

Miscellaneous Features
Service & Operational Observations

STR No. Def	STR Peak	STR Mean	STR Total	STR Grade	SER No. Def	SER Peak	SER Mean	SER Total	SER Grade
0	0.0	0.0	0.0	1.0	0	0.0	0.0	0.0	1.0

LITTLEBOROUGH HOLLINGWORTH RD

4

Project

LITTLEBOROUGH CULVERT COVER STEEL PLATE DESIGN

Job No.

YZ074

Drawing Reference

Calculations by
HB

Checked by
SB

Calc Sheet No.

22

Unit

Date

10/02/26

Section D

2021 Sub Group survey

2025 Adien Survey

SUB GROUP LTD
, DONCASTER
 Tel. 01302 880537
 joe.walshaw@sub-group.co.uk

Section Rehab - 27/04/2021 - 03X

Section 3	Inspection 1	Date 27/04/21	Time 10:05	Client's Job Ref Not Specified	Weather Dry	Pre Cleaned 0	PLR 03X
Operator JW	Vehicle VAN1	Camera 235	Preset Length Not Specified	Legal Status Not Specified	Alternative ID Not Specified		

Town or Village: Littleborough	Inspection Direction: Downstream	Upstream Node: 03
Road: Hollingworth Rd	Inspected Length: 47.60 m	Upstream Pipe Depth: 0
Location: Fields	Total Length: 47.60 m	Downstream Node: 04
Surface Type:	Joint Length: 0.00 m	Downstream Pipe Depth: 0

Comments:

Recommendations:

Scale: 1:348 Position [m] Code Observation MPEG Photo Grade

Depth: m

03

04

Depth: m

GO	General observation: HEAVY FAST FLOW	00:00:00
ST	Start of survey	00:01:15
MH	Manhole: 03	00:01:15
WL	Water level, 20% of sewer height	00:01:15
MH	Manhole: 04	00:02:29
FH	Finish survey	00:02:30

HOLLINGWORTH RD, LITTLEBOROUGH



Date	10/02/26
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Section E

2025 Adien Survey

Adien

ADIENT
MILLFIELD IND EST, DONCASTER

Section Inspection - 06/11/2025 - 05X

Item No.	Insp. No.	Date	Time	Client's Job Ref	Weather	Pre Cleaned	PLR
6	1	06/11/25	19:37	Not Specified	No Rain Or Snow	No	05X
Operator		Vehicle		Camera	Preset Length	Legal Status	Alternative ID
JW		Not Specified		Not Specified	Not Specified	Not Specified	Not Specified

Town or Village:		Littleborough	Inspection Direction:		Downstream	Upstream Node:		05
Road:		Hollingworth Rd	Inspected Length:		8.00 m	Upstream Pipe Depth:		
Location:		Footway	Joint Length:		20.00 m	Downstream Node:		06
Surface Type:						Downstream Pipe Depth:		
Use:		Culverted watercourse	Pipe Shape:		Circular			
Type of Pipe:		Gravity drain/sewer	Dia/Height:		600 mm			
Flow Control:		No flow control	Material:		Concrete			
Year Constructed:		Not Specified	Lining Type:		No Lining			
Inspection Purpose:		Routine inspection	Lining Material:		No Lining			

Comments:

Recommendations:

Scale:	1:174	Position [m]	Code	Observation	MPEG	Photo	Grade
Depth: m 05 0.00 0.00 6.50 7.60 8.00 8.00 8.00 20.00 06 Depth: m							
			MH	Start node, manhole, reference: 05			
			WL	Water level, 5% of the vertical dimension			
			WL	Water level, 15% of the vertical dimension			
			WL	Water level, 30% of the vertical dimension			
			MCBR	Pipe material changes to brick at this point			
			SC	Pipe size changes, new size(s), 600mm high, 600mm wide			
			SA	Survey abandoned: WATER LEVEL			
				End of pipe			

Construction Features					Miscellaneous Features						
Structural Defects					Service & Operational Observations						
STR No.	Def	STR Peak	STR Mean	STR Total	STR Grade	SER No.	Def	SER Peak	SER Mean	SER Total	SER Grade
0	0.0	0.0	0.0	0.0	1.0	0	0.0	0.0	0.0	0.0	1.0

LITTLEBOROUGH HOLLINGWORTH RD

Vistry Group Bovis Homes Linden HOMES Vistry Partnerships		Project LITTLEBOROUGH CULVERT COVER STEEL PLATE DESIGN		Job No. YZ074	
		Drawing Reference	Calculations by HB	Checked by SB	Calc Sheet No. 24
		Unit			Date 10/02/26
7. SUMMARY All stresses and deflections are within allowable limits for the steel plate & is designed to resist the most onerous construction loads during bulk earthworks. It is noted that these calculations have been disputed by United Utilities. These calculations rely on the steel plate bridging over the culvert and gravel surround. The use of a compressible material ensures loads do not surcharge the gravel surround to the culvert. The design is based on load transfer acting downwards through the banks of natural strata either side of the culvert & not transferring laterally into the gravel surround. Should the theoretical methodology be disputed, further evidence has been gathered in the form of condition surveys to ensure the culvert has been protected from all damage. A post-earthworks culvert condition survey has been undertaken by Adien (2025) to compare to the original condition survey pre-earthworks by Sub Group (2021). It has been shown that no defects were found and the condition is the same as before. The bulk earthworks has already been completed in its entirety using the methodology set out in this report. Upon completion of the road construction, the additional cover as well as the less onerous vehicle loads will result in a less concentrated, distributed load of smaller magnitude. The final design / end-use case has been verified by our project engineers, Eastwoods CE, and appended overleaf. This report evidences that the culvert has been adequately protected and will continue to be suitably protected from damage following site completion.					

Vistry Group Bovis Homes  Linden HOMES  Vistry Partnerships 	Project LITTLEBOROUGH CULVERT COVER STEEL PLATE DESIGN			Job No. YZ074
	Drawing Reference	Calculations by HB	Checked by SB	Calc Sheet No. 25
	Unit			Date 22/12/25

8. ANNEX A – EASTWOODS CE DESIGN STATEMENT

From: Grace Holley <grace.holley@eastwoodce.com>
Sent: 13 February 2026 14:17
To: Henry Byfield; Sakhile Majola; Chris Hodge
Subject: RE: Littleborough Culvert

Categories: hollingworth road - littleborough

NOTE: Email originated outside of Vistry Group.

Hi Henry

We have been asked to comment on whether the existing culvert is suitably protected in its end case use. Our understanding is that the existing culvert is a 600dia concrete culvert and that the designs have been completed to provide a minimum 1.2m cover. We would deem 1.2m cover to be suitable for typical highway loadings assuming appropriate bed and surround has been maintained to the pipe. The existing culvert is an adoptable UU asset that was in place when the land was previously used as agricultural land and therefore will have been designed to take loading from agricultural vehicles. The anticipated vehicular loading to the culvert from the newly constructed residential development is therefore no worse than it was originally designed for. In summary, we expect that the culvert in its permanent case will be sufficiently protected for the design life of the pipe and normal traffic and loading conditions.

Kind regards,

Grace Holley
Senior Engineer

DD: 0114 399 4524
T: 0114 255 4554

Please note that I work compressed hours so may not be available on Friday afternoons.



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