

Project Bradford

Potential Shaft Probing Works– 12/01/21

Project Manager: *Gavin Clifford*

Project Engineer: Oliver Partington

Revision	Date	Comment
P00	12.01.21	First Issue
C01	02.03.21	Issue

Document Number: BRA-CSL-ZZ-ZZ-RP-X-00904

Uniclass Code: PM_60_60_70

Overview

Works commenced on site on 16 November 2020. To date 3no voided/Soft locations have been encountered.

- BS-13 from 4.0m BGL to 26.0m BGL
- BK-09 soft from AoD to 30.0m BGL
- BY-11 Soft from AoD to 19.0m where ground became hard

Following the conversations with BAM it was agreed to complete the 7.0m grid around each location where possible. Where the locations lay outside the target treatment area additional bores were drilled to prove rock head. A number of inclined bores were drilled from a safe distance to further explore the positions. These inclined bores were set out 7.0m away from the target location and targeted the positions 500mm either side. Up to 4no inclined bores were drilled, 2no at 24 degrees and 2no at 19 degrees. Below are the findings of the works carried out at each position.

- BK09

Bore Hole Ref	Rock Head Encountered (mBGL)	Comments
BK09	30.0m	Cased to 30m and soft from 18m onwards and pulled off to wait for further instructions possible shaft.
BK07	13.5m	Vertical
BK11	16.0m	Vertical
BH11	16.0m	Vertical
BH09	14.0m	Vertical
BM07	15.0	Vertical
BM09	14.0m	Vertical
BK09 500m off set 7.0m (Left)	16.0m	Overburden – 0.0m - 13.0m Soft - 13.0m – 16.0m Rock - 16.0m+ (Inclined at 24 degrees)
BK09 500m off set 7.0m (Right)	16.0m	Overburden – 0.0m - 13.0m Soft - 13.0m – 16.0m Rock - 16.0m+ (Inclined at 24 degrees)
BK09 500m off set 7.0m (Left)	18.0m	Overburden – 0.0m - 13.0m Soft - 13.0m – 18.0m Rock - 18.0m+ (Inclined at 19 degrees)
BK09 500m off set 7.0m (Right)	19.5m	Overburden – 0.0m - 13.0m Soft - 13.0m – 19.5m Rock - 19.5m+ (Inclined at 19 degrees)

- BS13

Bore Hole Ref	Rock Head Encountered (mBGL)	Comments
BS13	28.0m	Very soft from 4m to 26m possible shaft.
BU11	14.0m	Vertical
BS11	14.5m	Vertical
BS15	13.5m	Vertical
BP13	14.5m	Vertical
BP15	13.5m	Vertical
BU13	14.0m	Vertical
BS13A- 500m off set 7.0m (Left)	18.0m	Overburden – 0.0m - 15.5m Soft - 15.5m – 18.0m Rock - 18.0m+ (Inclined at 24 degrees)
BS13B - 500m off set 7.0m (Right)	18.0m	Overburden – 0.0m - 15.5m Soft - 15.5m – 18.0m Rock - 18.0m+ (Inclined at 24 degrees)
BS13A - 500m off set 7.0m (Left)	15.0m	Overburden – 0.0m – 15.0m Rock - 15.0m – 22.0m Rock – 22.0+ (Inclined at 19 degrees)
BS13B - 500m off set 7.0m (Right)	15.0m	Overburden – 0.0m – 15.0m Rock - 15.0m – 18.0m Soft - 18.0m – 22.0m Rock – 22.0+ (Inclined at 19 degrees)

- BY11

Bore Hole Ref	Rock Head Encountered (mBGL)	Comments
BY11	19.0m	Nothing until 19m possible shaft.
BY09	14.0m	Vertical
BY13	12.5m	Vertical
CA11	15.0m	Vertical
CA09	12.00m	Vertical

Observations

From the drilling the following can be observed.

BK-09

- Localised vertical holes confirm rock head indicating a change in ground conditions for BK-09.
- FWR return observed when drilling BK-09 suggesting soft ground or back filled.
- Inclined drilling indicates that it is possibly a shaft.

BS-13

- Localised vertical holes confirm rock head indicating a change in ground conditions for BS-13.
- FWR return observed when drilling BS-013 suggesting soft ground or back filled.
- Inclined drilling indicates that it is possibly a shaft.

BY11

- Localised vertical holes confirm rock head indicating a change in ground conditions for BY-11.
- FWR return observed when drilling BY-11 suggesting soft ground or back filled.

22D990 - Drilling Record - Rev 2

Page 1

Cementation

SKANSKA

Contract Name

Project Bradford

Search File Number:

Contract Number

22D990

File Number

BK-09

General Information

Design Area Type

A

Driller

Billy Rooney

Rig Number

C6 - A57096

Start Date

2020-11-24

Finish Date

2020-11-24

Drilling Log

Design Area

A

BH Reference

BH19/02A

Rock Head Depth

Expected Casing

Expected Depth

Type of Strata	Specific Strata (if able to identify)	Water Returns	Fractured / Unfractured?	Depth to Top	Depth
Cased	/	FWR		0.0	30.0
	/		☐ Yes ☐ No	30.0	
	/		☐ Yes ☐ No		
	/		☐ Yes ☐ No		
	/		☐ Yes ☐ No		
	/		☐ Yes ☐ No		
	/		☐ Yes ☐ No		
	/		☐ Yes ☐ No		
	/		☐ Yes ☐ No		
	/		☐ Yes ☐ No		
	/		☐ Yes ☐ No		
	/		☐ Yes ☐ No		
	/		☐ Yes ☐ No		
	/		☐ Yes ☐ No		

Productivity

	Hours	Comments/Details
Breakdowns	0	
Obstructions	0	
Standing	0	

Other Details

Underground Services / Gas, Water emissions / Voids or
Suspended Workings / Settlement of Ground Heave?

☒ Yes ☐ No

If yes then insert details below....

Cased to 30m and soft from 18m onwards and pulled of to await for further instructions possible shaft

22D990 - Drilling Record - Rev 1 Page 1

Cementation
SKANSKA

Contract Name Project Bradford Search Pile Number:

Contract Number 22D990 Pile Number BS-13

General Information

Design Area Type B Driller Colin Trower Rig Number C6 - A57097

Drilling Log

Design Area B BH Reference BH19/05 Rock Head Depth 26.00 Expected Casing Expected Depth

Type of Strata	Specific Strata (if able to identify)	Water Returns	Fractured / Unfractured?	Depth to Top	Depth
Cased		FWR		0.0	26.0
Mudstone		FWR	☐ Yes ☒ No	26.0	37.0
			☐ Yes ☐ No	37.0	
			☐ Yes ☐ No		
			☐ Yes ☐ No		
			☐ Yes ☐ No		
			☐ Yes ☐ No		
			☐ Yes ☐ No		
			☐ Yes ☐ No		
			☐ Yes ☐ No		
			☐ Yes ☐ No		
			☐ Yes ☐ No		
			☐ Yes ☐ No		
			☐ Yes ☐ No		

Productivity

Breakdowns Hours Comments/Details

0

Obstructions 0

Standing 0

Other Details

Underground Services / Gas, Water emissions / Voids or Suspended Workings / Settlement of Ground Heave? ☒ Yes ☐ No

If yes then insert details below....

Very soft from 4m to 26m possible shaft.

22D990 - Drilling Record - Rev 6 Page 1

Cementation SKANSKA	Contract Name	Project Bradford	Search File Number:		File Number
	Contract Number	22D990			BY-11

General Information

Design Area	B	Driller	John Drummond	Spannerman	William Hamilton	Rig	C6 XP – A57217
Start Date	2021-01-12		Finish Date	2021-01-12			

Drilling Log

Design Area	BH Reference	Rock Head Depth	Expected Casing	Expected Depth
B	BH19/05	19.00		49.00

Type of Strata	Specific Strata (if able to identify)	Water Returns	Fractured?	Depth to Top	Depth
Cased	/	FWR		0.0	20.0
	/		☐ Yes ☐ No	20.0	
	/		☐ Yes ☐ No		
	/		☐ Yes ☐ No		
	/		☐ Yes ☐ No		
	/		☐ Yes ☐ No		
	/		☐ Yes ☐ No		
	/		☐ Yes ☐ No		
	/		☐ Yes ☐ No		
	/		☐ Yes ☐ No		
	/		☐ Yes ☐ No		
	/		☐ Yes ☐ No		
	/		☐ Yes ☐ No		
	/		☐ Yes ☐ No		
	/		☐ Yes ☐ No		
	/		☐ Yes ☐ No		
	/		☐ Yes ☐ No		

Productivity

	Hours	Comments/Details
Breakdowns	0	
Obstructions	0	
Standing	0	

Other Details

Underground Services / Gas, Water emissions / Voids or Suspected Workings / Settlement of Ground Heave? ☒ Yes ☐ No

If yes then insert details below....

Nothing till 19m possible shaft pulled off put barriers round

Co-op Live (Project Bradford)

BK-09 Grouting – Report

Revision	Date	Comment
P00	18.02.21	First Issue
C01	03.03.21	Issue
C02	04.03.21	Issue

Document Number: BRA-CSL-ZZ-ZZ-RP-X-00902

Uniclass Code: PM_60_60_70

Project Manager: *Gavin Clifford*

Project Engineer: Oliver Partington

1.0 INTRODUCTION

Following the completion of the investigation works a change in ground conditions was found approximately 1.0m wide running East to West which was less than 0.5m running North to South. It was concluded that this position was to be grouted before a further decision could be made on the requirement of a cap. A summary of the initial investigation is located within appendix A (BRA-CSL-ZZ-ZZ-RP-X-00904) and the following bailey bridge works within appendix B. All positions undertaken on the bailey bridge were proved 6.0m into rockhead.

The objectives of these grouting works were to:

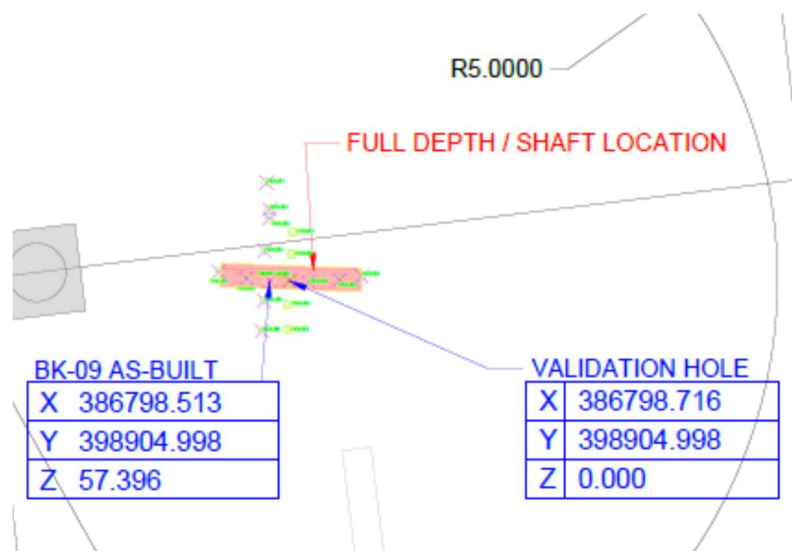
- Fill any voids present using pressure grouting techniques to mitigate the impact to the pile design.

1.1 VALIDATION METHODOLOGY

The following methodology was agreed and undertaken.

- Drill a grouting bore down to rock head on original BK-09
- Commence grouting in ascending stages (2.0m)
- Each position to be pressure grouted using 1.5psi per meter overburden (minimum) or if grout seen surfacing.
- Grout curing period 24hrs
- Drill validation bore in center and repeat operation to confirm that position of sufficiently grouted.

Following a review of the drilling information (Appendix B). The original position BK-09 was to be grouted. This was undertaken over 3 days. It was observed over this period that a significant grout quantity was injected. Due to this high grout take the decision was taken to drill a validation bore to validate the treatment.



1.2 PROGRESS

The position has been grouted and validated by using ascending stage grouting techniques applying a validating pressure at each 2.0m stage over the length of the bore. Rock head was variable at 42m and 38m BGL.

A summary of the grouting operation is out lined below.

BK-09 Grout Hole (11/02/21) MBGL	Volume Injected (Ltr)	Comments
42.0	6300	Pressure 63psi (Stage Complete)
40.0	8400	TBC

Total Injected – 14.7m3

BK-09 Grout Hole (12/02/21) MBGL	Volume Injected (Ltr)	Comments
40.0	200	Pressure 60psi (Stage Complete)
38.0	10300	TBC

Total Injected 10.5m3

BK-09 Grout Hole (15/02/21) MBGL	Volume Injected (Ltr)	Comments
38.0	-	Pressure 57psi (Stage Complete)
36.0	-	Pressure 54psi (Stage Complete)
34.0	-	Pressure 51psi (Stage Complete)
32.0	-	Pressure 48psi (Stage Complete)
30.0	2500	Pressure 45psi (Stage Complete)
28.0	500	Pressure 42psi (Stage Complete)
26.0	500	Pressure 39psi (Stage Complete)
24.0	300	Pressure 36psi (Stage Complete)
22.0	300	Pressure 33psi (Stage Complete)
20.0	500	Pressure 30psi (Stage Complete)
18.0	300	Pressure 27psi (Stage Complete)
16.0	300	Pressure 24psi (Stage Complete)
14.0	300	Pressure 21psi (Stage Complete)
12.0	200	Pressure 18psi (Stage Complete)
10.0	200	Pressure 15psi (Stage Complete)
8.0	200	Pressure 12psi (Stage Complete)
6.0	200	Pressure 9psi (Stage Complete)

Total Injected 6.3m3

Validation Bore – Drilled at midpoint between east and west of low rock head encountered

BK-09 Grout Hole (16/02/21) MBGL	Volume Injected (Ltr)	Comments
42.0	-	Rock
40.0	-	Rock
38.0	-	Rock
36.0	150	Pressure 54psi (Stage Complete)
34.0	150	Pressure 51psi (Stage Complete)
32.0	100	Pressure 48psi (Stage Complete)
30.0	100	Pressure 45psi (Stage Complete)
28.0	100	Pressure 42psi (Stage Complete)
26.0	100	Pressure 39psi (Stage Complete)
24.0	100	Pressure 36psi (Stage Complete)
22.0	100	Pressure 33psi (Stage Complete)
20.0	100	Pressure 30psi (Stage Complete)
18.0	100	Pressure 27psi (Stage Complete)
16.0		Surface – validation complete

Note: All positions held for 5mins without drop in pressure.

Total Injected – 1.1m3

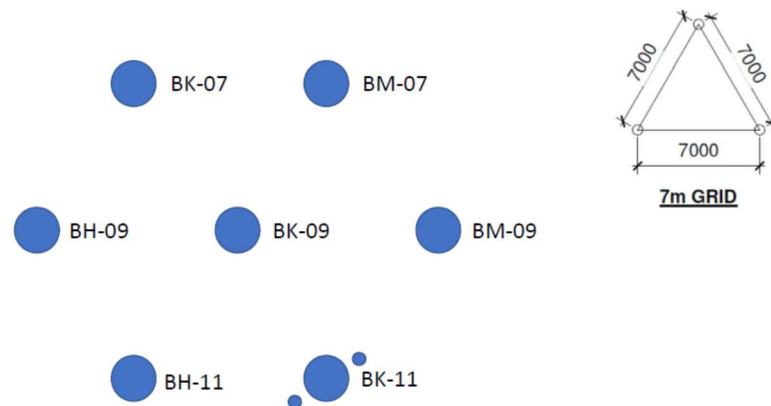
Total Injected for works – 32.6m3

The shaft has been validated by using ascending stage grouting techniques applying a validating pressure at each 2.0m stage over the length of the bore. It is now CSL's opinion that this location is most likely to be a Vent Shaft for the historical mine workings.

The grouting works were undertaken from the 11/02/21 and were completed on the 16/02/21.

APPENDIX A – Summary of Initial Probing

Summary of Initial Probing



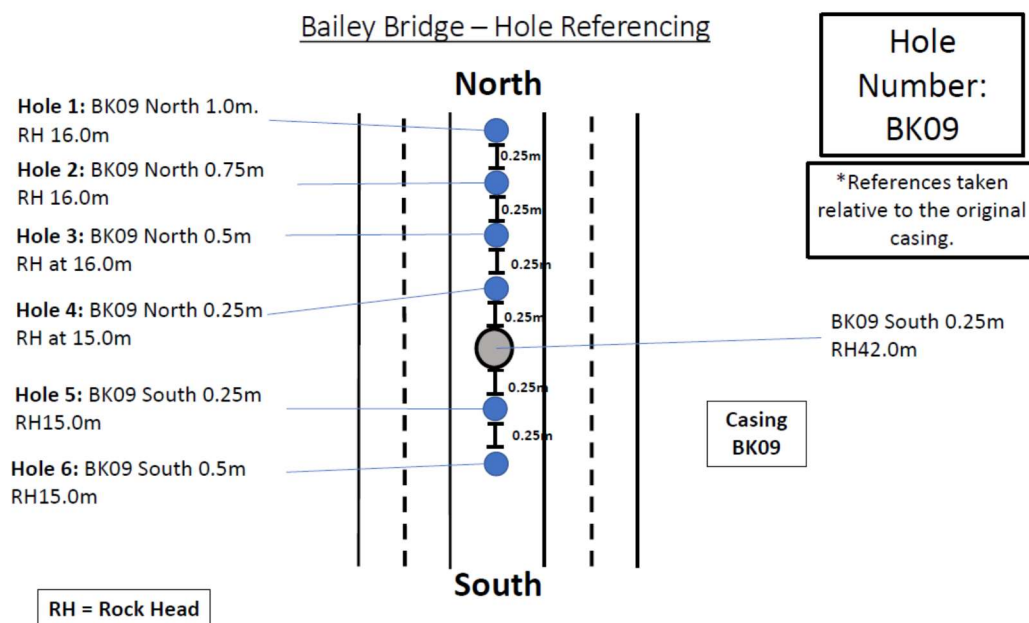
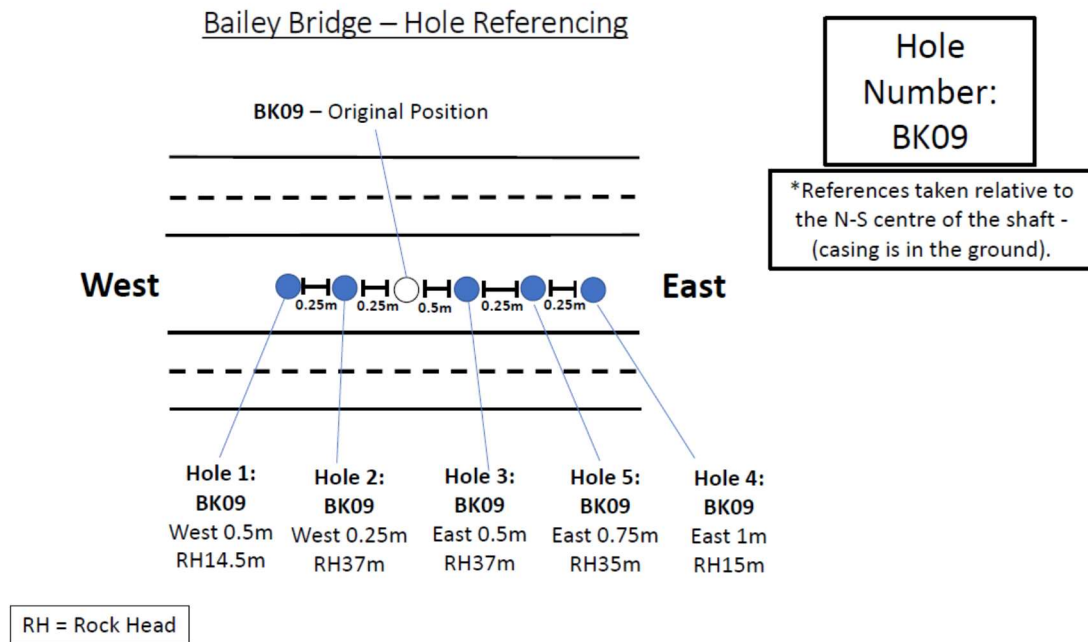
BK-11 – Starting Position of 4no inclined bores

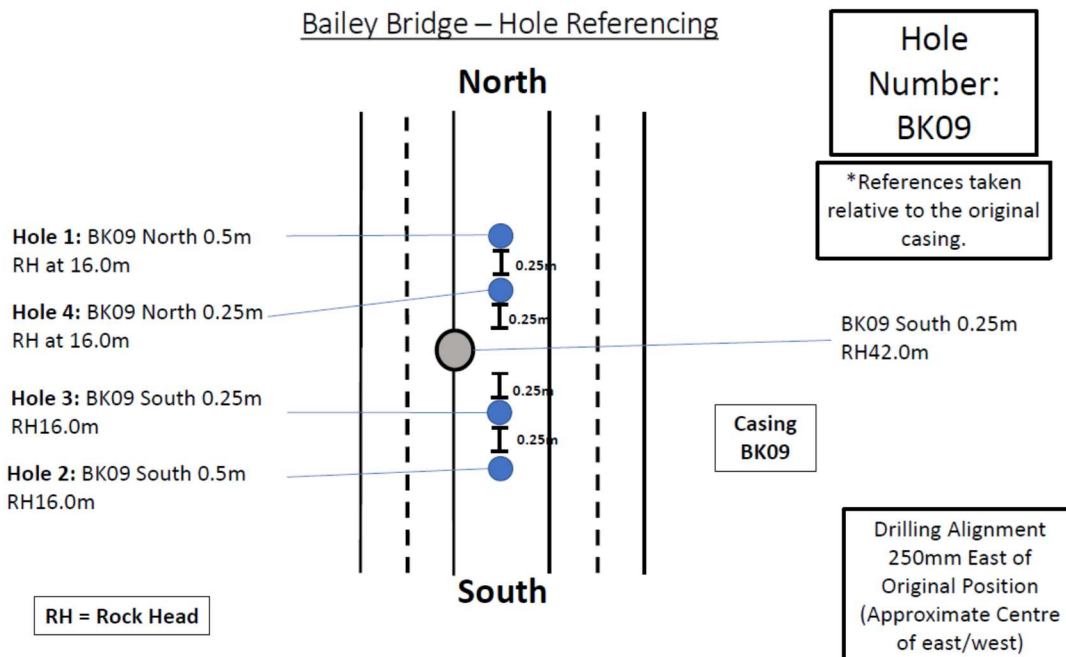
Note: All position proved 1.0m into rockhead

- BK09

Bore Hole Ref	Rock Head Encountered (mBGL)	Comments
BK09	30.0m	Cased to 30m and soft from 18m onwards and pulled off to wait for further instructions possible shaft.
BK07	13.5m	Vertical
BK11	16.0m	Vertical
BH11	16.0m	Vertical
BH09	14.0m	Vertical
BM07	15.0	Vertical
BM09	14.0m	Vertical
BK09 500m off set 7.0m (Left)	16.0m	Overburden – 0.0m - 13.0m Soft - 13.0m – 16.0m Rock - 16.0m+ (Inclined at 24 degrees)
BK09 500m off set 7.0m (Right)	16.0m	Overburden – 0.0m - 13.0m Soft - 13.0m – 16.0m Rock - 16.0m+ (Inclined at 24 degrees)
BK09 500m off set 7.0m (Left)	18.0m	Overburden – 0.0m - 13.0m Soft - 13.0m – 18.0m Rock - 18.0m+ (Inclined at 19 degrees)
BK09 500m off set 7.0m (Right)	19.5m	Overburden – 0.0m - 13.0m Soft - 13.0m – 19.5m Rock - 19.5m+ (Inclined at 19 degrees)

APPENDIX B – Investigation Information



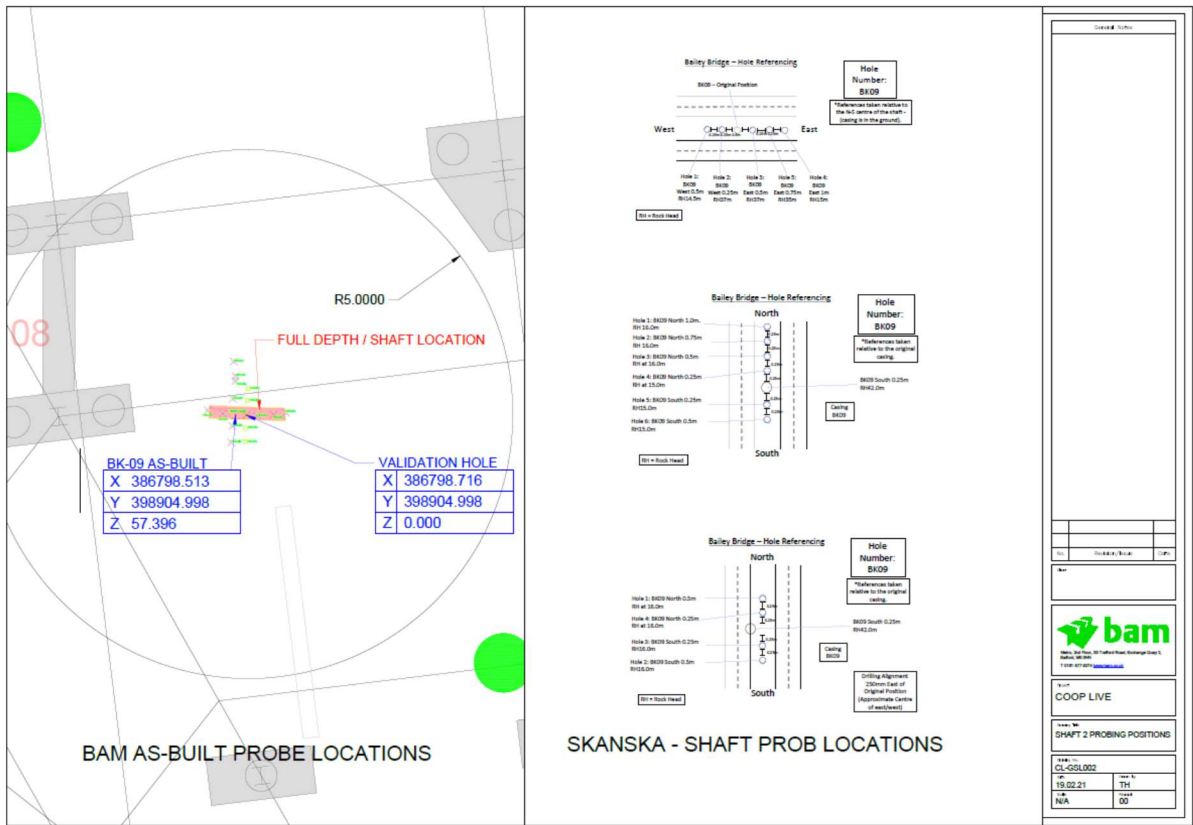


BK09 – Probe Summary

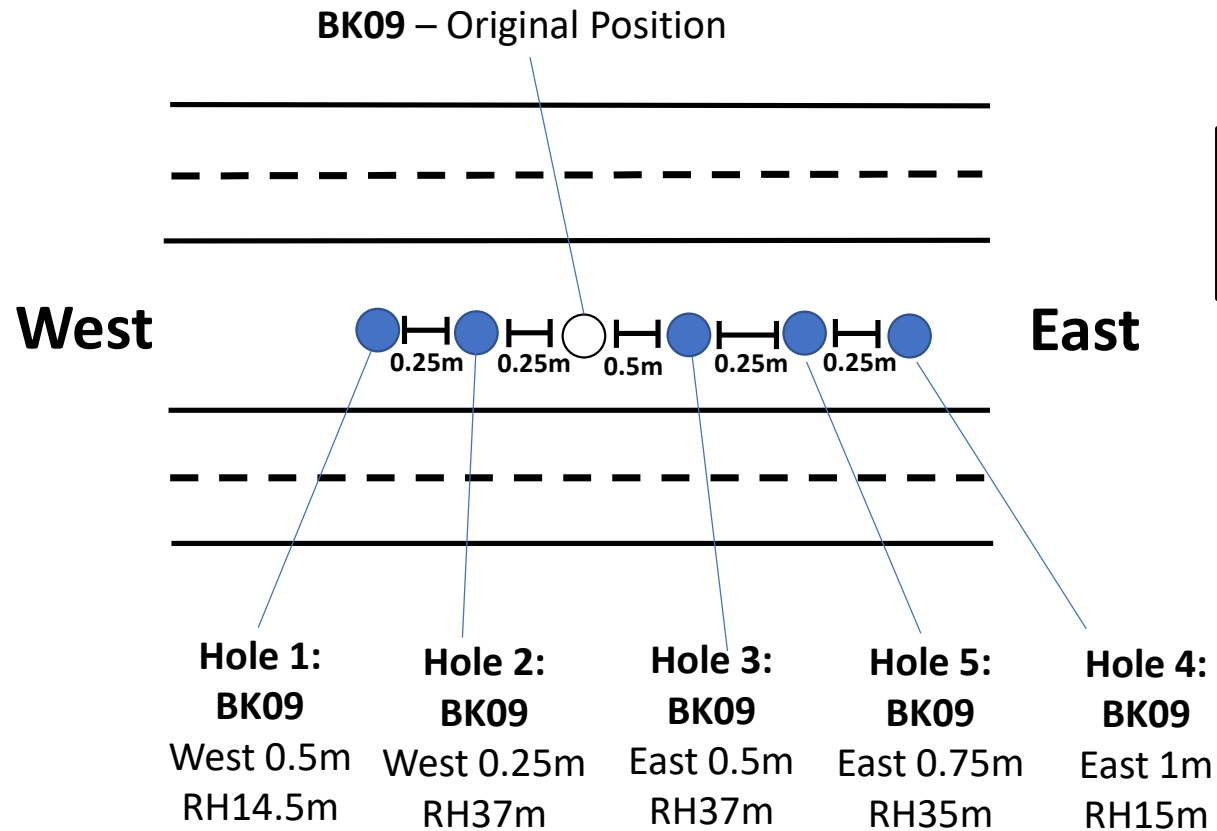
No. of Holes	Hole Reference	Bailey Bridge Orientation	Rock Head Depth (m)	Inside Shaft Yes/No	Comments
1	BK09 West 0.5m	W-E	RH 14.5m	No	N/A
2	BK09 West 0.25m	W-E	RH 37.0m	Yes	N/A
3	BK09 Original		RH 42.0m	Yes	N/A
4	BK09 East 0.5m	W-E	RH 37.0m	Yes	N/A
5	BK09 East 0.75m	W-E	RH 35.0m	Yes	N/A
6	BK09 East 1.0m	W-E	RH 15.0m	No	N/A
7	BK09 North 1.0m	N-S	RH 16.0m	No	N/A
8	BK09 North 0.75m	N-S	RH 16.0m	No	N/A
9	BK09 North 0.5m	N-S	RH 16.0m	No	N/A
10	BK09 North 0.25m	N-S	RH 15.0m	No	N/A
11	BK09 South 0.25m	N-S	RH 15.0m	No	N/A
12	BK09 South 0.5m	N-S	RH 15.0m	No	N/A
13	BK09 North 0.5m	N-S (2)	RH 16.0m	No	N/A
14	BK09 North 0.25m	N-S(2)	RH 16.0m	No	N/A
15	BK09 South 0.25m	N-S(2)	RH 16.0m	No	N/A
16	BK09 South 0.5m	N-S(2)	RH 16.0m	No	N/A

Note - All positions proven 6.0m into rock head.

APPENDIX C – Grouting Positions



Bailey Bridge – Hole Referencing

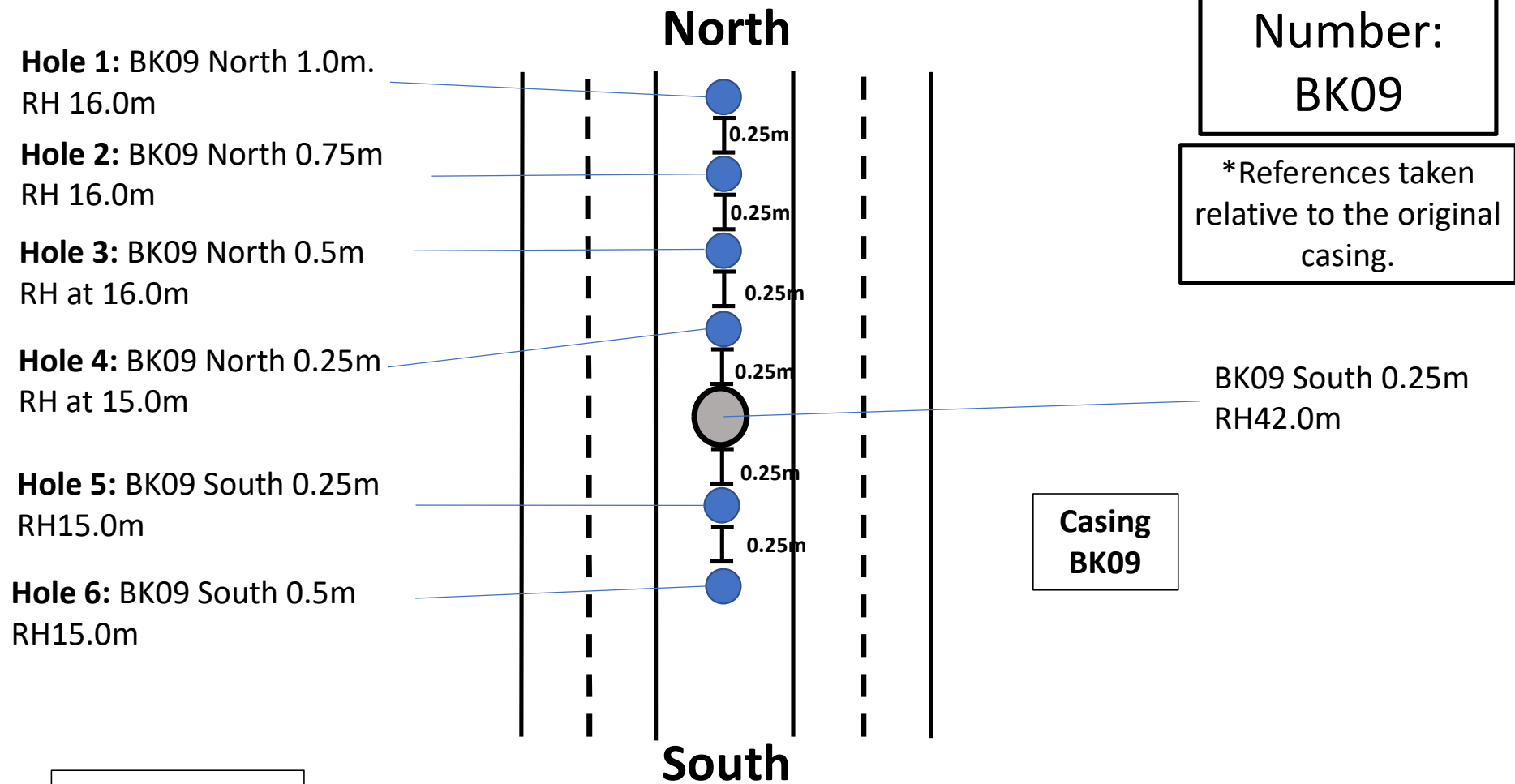


Hole
Number:
BK09

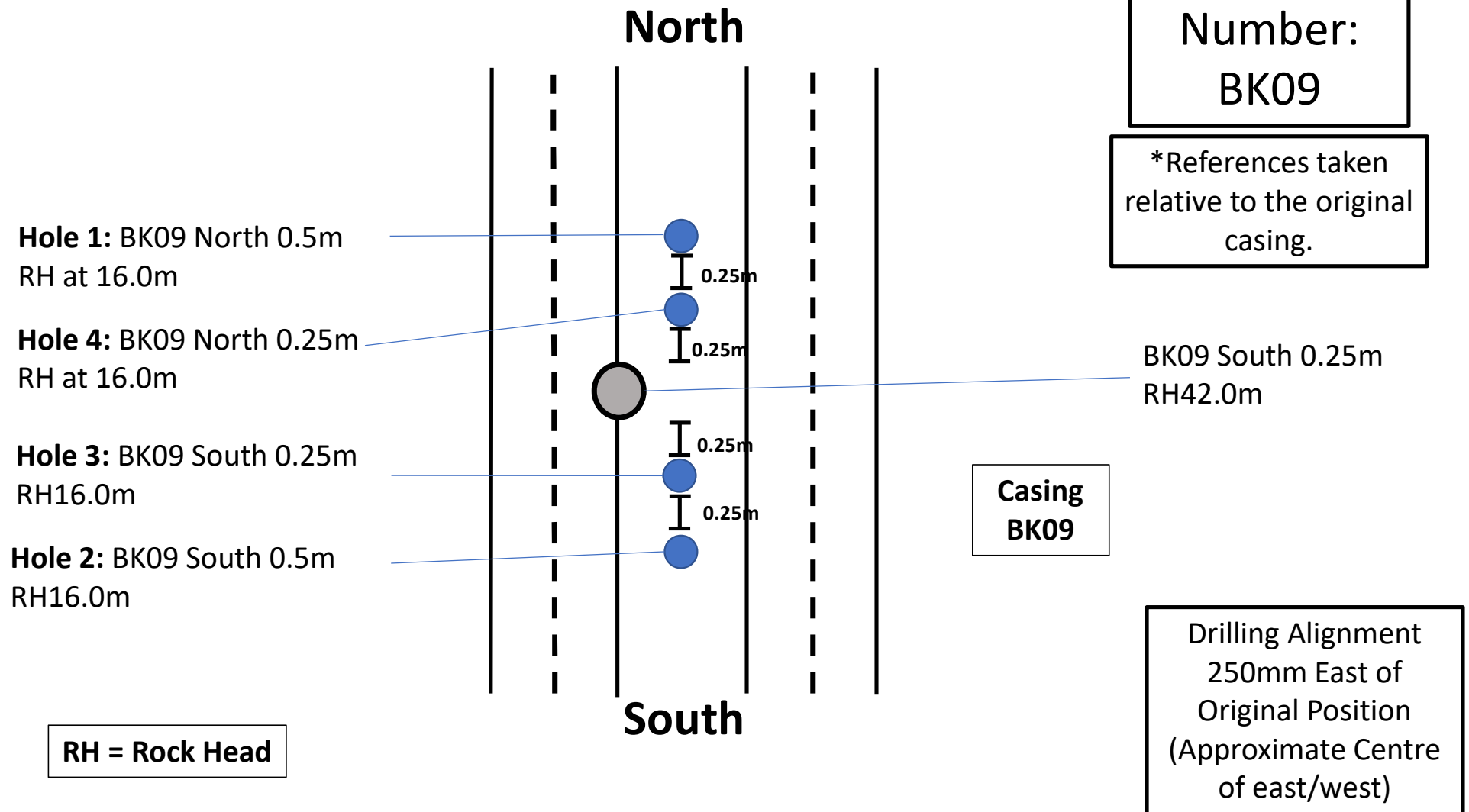
*References taken relative to
the N-S centre of the shaft -
(casing is in the ground).

RH = Rock Head

Bailey Bridge – Hole Referencing



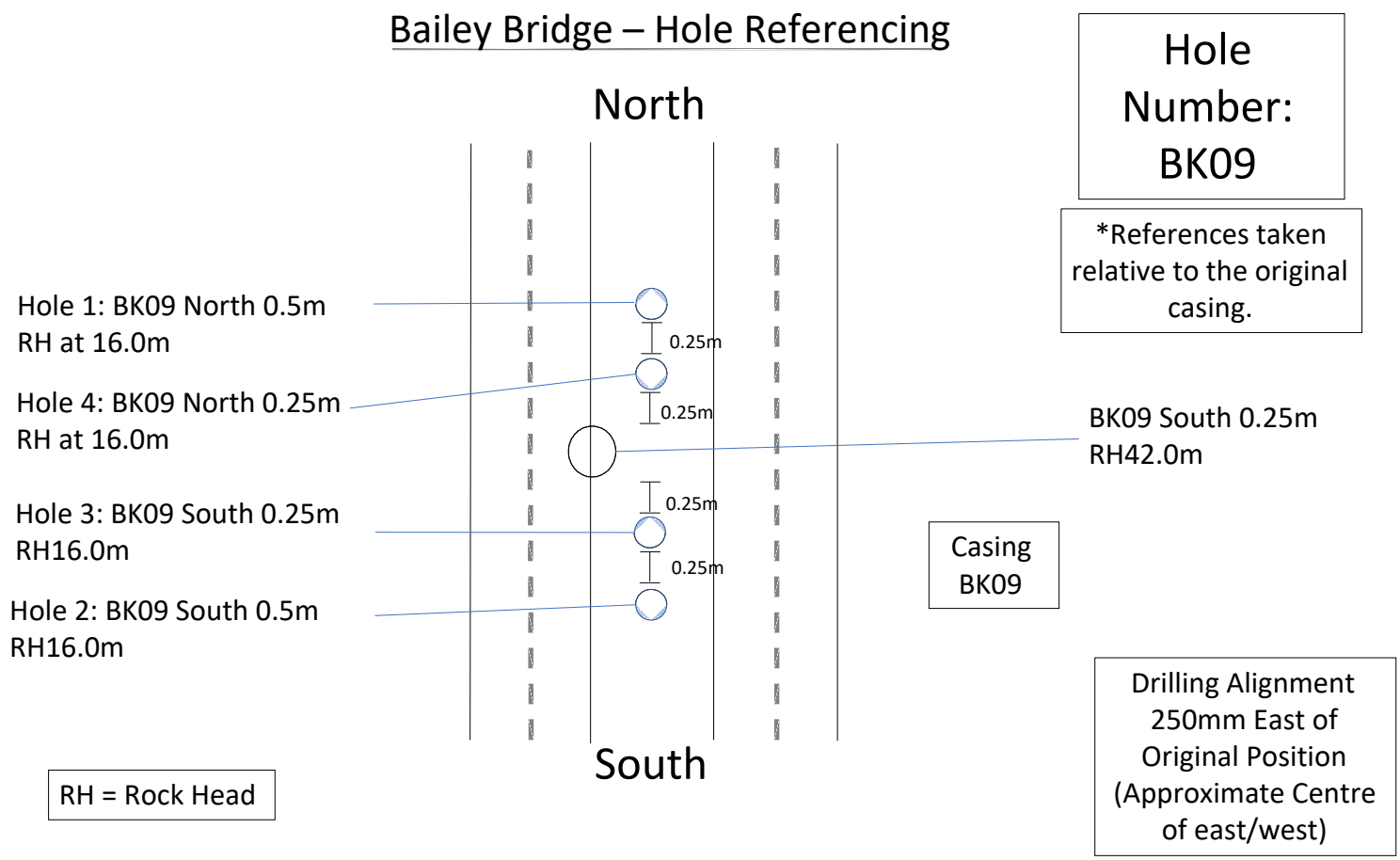
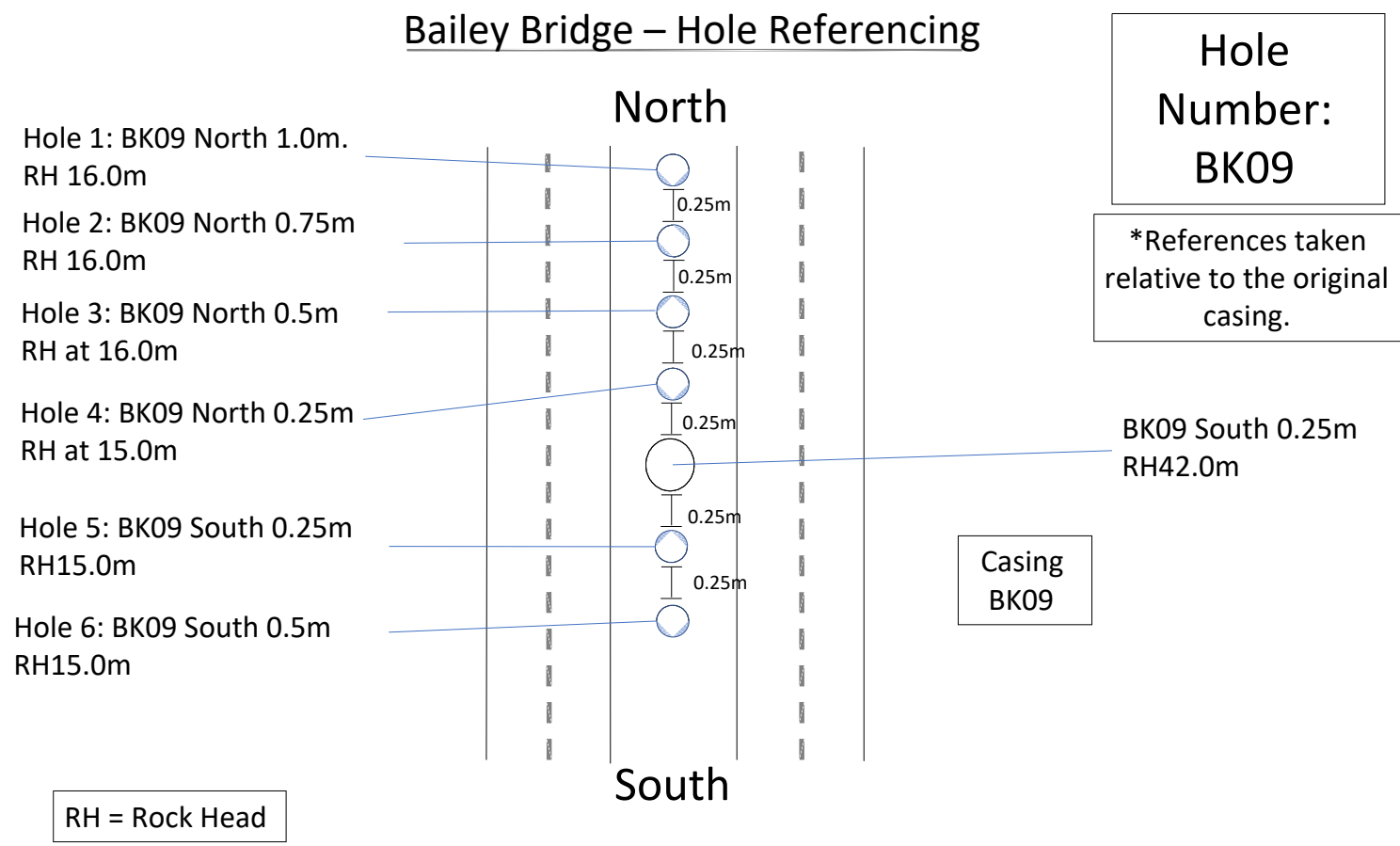
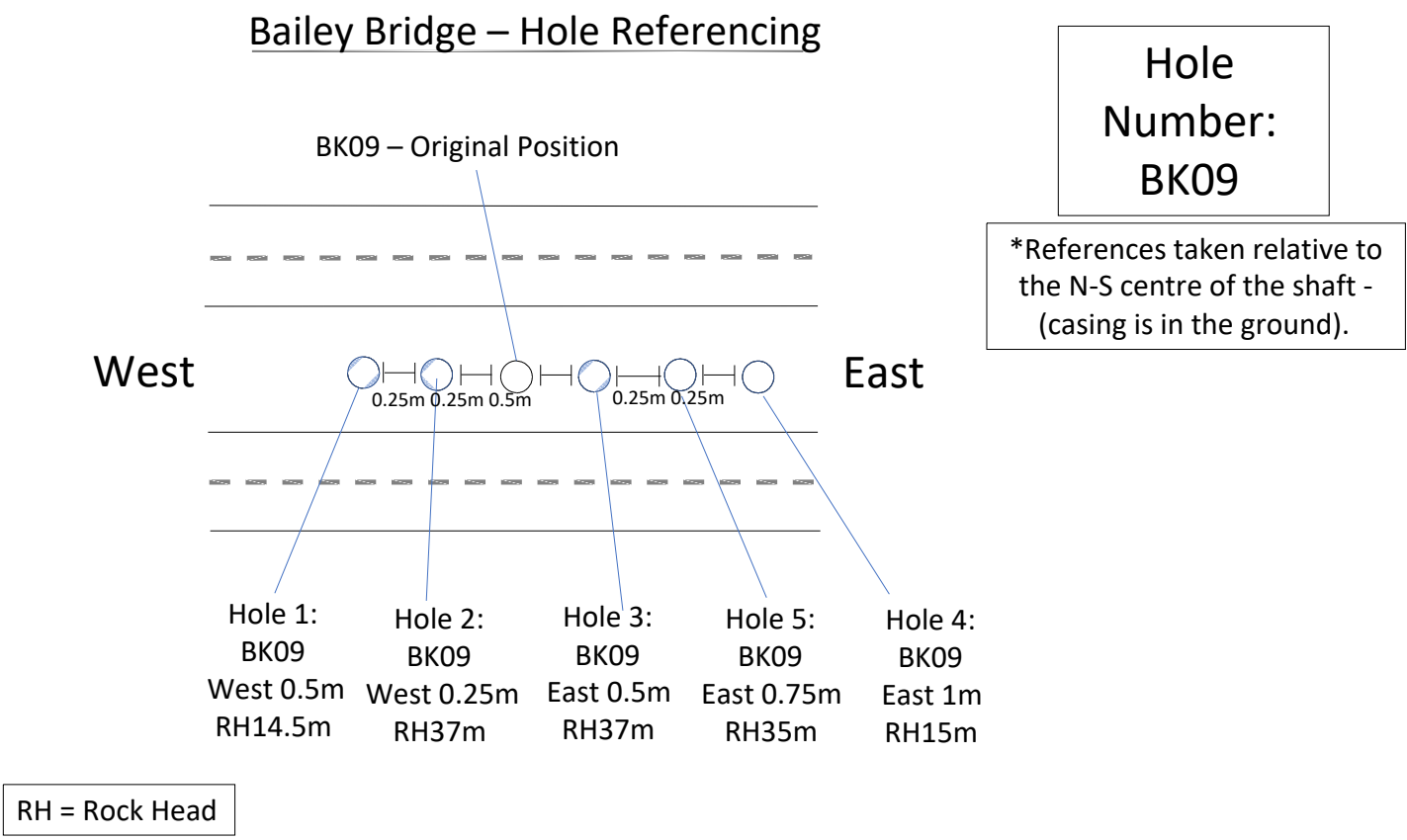
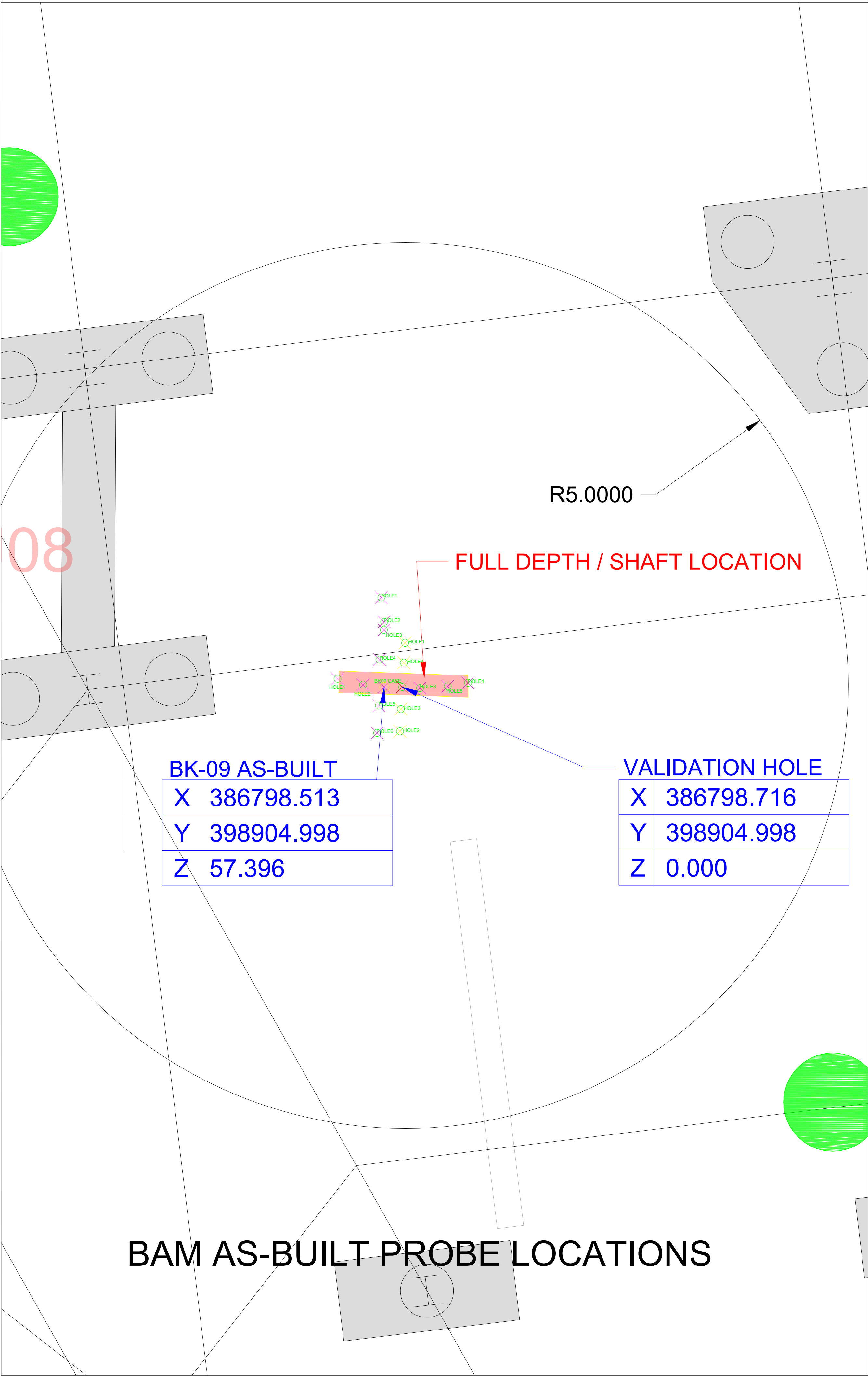
Bailey Bridge – Hole Referencing



BK09 – Probe Summary

No. of Holes	Hole Reference	Bailey Bridge Orientation	Rock Head Depth (m)	Inside Shaft Yes/No	Comments
1	BK09 West 0.5m	W-E	RH 14.5m	No	N/A
2	BK09 West 0.25m	W-E	RH 37.0m	Yes	N/A
3	BK09 Original		RH 42.0m	Yes	N/A
4	BK09 East 0.5m	W-E	RH 37.0m	Yes	N/A
5	BK09 East 0.75m	W-E	RH 35.0m	Yes	N/A
6	BK09 East 1.0m	W-E	RH 15.0m	No	N/A
7	BK09 North 1.0m	N-S	RH 16.0m	No	N/A
8	BK09 North 0.75m	N-S	RH 16.0m	No	N/A
9	BK09 North 0.5m	N-S	RH 16.0m	No	N/A
10	BK09 North 0.25m	N-S	RH 15.0m	No	N/A
11	BK09 South 0.25m	N-S	RH 15.0m	No	N/A
12	BK09 South 0.5m	N-S	RH 15.0m	No	N/A
13	BK09 North 0.5m	N-S (2)	RH 16.0m	No	N/A
14	BK09 North 0.25m	N-S(2)	RH 16.0m	No	N/A
15	BK09 South 0.25m	N-S(2)	RH 16.0m	No	N/A
16	BK09 South 0.5m	N-S(2)	RH 16.0m	No	N/A

Note – All positions proven 6.0m into rock head



SKANSKA - SHAFT PROB LOCATIONS

General Notes

No.	Revision/Issue	Date

Client

Metro, 2nd Floor, 33 Trafford Road, Exchange Quay 2, Salford, M5 3NN
T 0161 877 9274 www.bam.co.uk

Project

COOP LIVE

Drawing Title

SHAFT 2 PROBING POSITIONS

Drawing No.

CL-GSL002

Date

19.02.21

Scale

N/A

Drawn by

TH

Revision

00

Cementation

SKANSKA

Co-op Live (Project Bradford)

BS-13 Grouting – Report

Revision	Date	Comment
P00	08.12.21	First Issue
C01	02.03.21	Issue
C02	04.03.21	Issue

Document Number: BRA-CSL-ZZ-ZZ-RP-X-00901

Uniclass Code: PM_60_60_70

Project Manager: *Gavin Clifford*

Project Engineer: Oliver Partington

1.0 INTRODUCTION

Following the completion of the investigation works from the baily bridge it was established that a 2.0m x 1.0m shaft was present. A review meeting was held on the 01/02/21 where it was concluded that the shaft was to be grouted before a further decision could be made on the requirement of a cap. A summary of the initial investigation is located within appendix A (BRA-CSL-ZZ-ZZ-RP-X-00904) and the following bailey bridge works within appendix B. All position were proved 1.0m into rockhead.

The objectives of these grouting works were to:

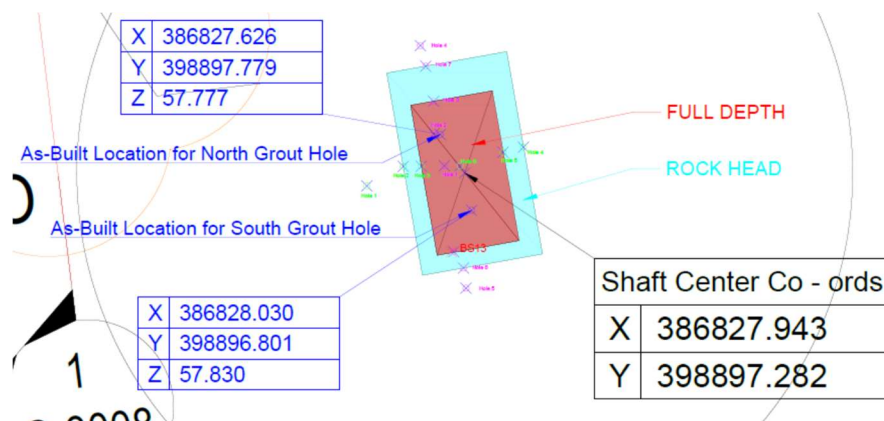
- Fill any voids present within the shaft using pressure grouting techniques to mitigate the impact to the pile design.

1.1 VALIDATION METHODOLOGY

The following methodology was agreed and undertaken.

- Drill grouting bores down to rock head
- Commence grouting in ascending stages (2.0m)
- Each position to be pressure grouted using 1.5psi per meter overburden (minimum) or if grout seen surfacing.
- Grout curing period 24hrs
- Drill validation bore and repeat operation to confirm that position of sufficiently grouted.

Following a review of the drilling information (Appendix B) two number grouting positions were selected. One located in the north and one in the south (Appendix C). Following grouting a central bore was drilled to validate the works.



1.2 PROGRESS

The shaft has been grouted and validated by using ascending stage grouting techniques applying a validating pressure at each 2.0m stage over the length of the bore. Rock head was established at 28m BGL.

A summary of the validation operation is out lined below.

North Grout Hole (02/02/21)	Volume Injected (Ltr)	Comments
28.0m	500	Pressure 42psi (Stage Complete)
26.0m	2000	Pressure 42psi (Stage Complete)
24.0m	500	Pressure 42psi (Stage Complete)

Total Injected – 3.0m3

South Grout Hole (02/02/21)	Volume Injected (Ltr)	Comments
28.0m	500	Pressure 42psi (Stage Complete)
26.0m	500	Surfaced
24.0m	1300	Pressure 42psi (Stage Complete)

Total Injected 2.3m3

During the grouting on the 02/02/21 grout was seen surfacing from the previously drilled bores. Due to this observation the bores were drilled back down to depth the following day and the process repeated. This was to allow the grout above to cure and ensure that the shaft was being sufficiently grouted.

North Grout Hole (03/02/21)	Volume Injected (Ltr)	Comments
28.0m	0	Pressure 42psi (Stage Complete)
26.0m	300	Pressure 42psi (Stage Complete)
24.0m	200	Pressure 42psi (Stage Complete)
22.0m	200	Pressure 40psi (Stage Complete)
20.0m	100	Pressure 40psi (Stage Complete)
18.0m	200	Pressure 40psi (Stage Complete)
16.0m	200	Pressure 30psi (Stage Complete)
14.0m	100	Pressure 30psi (Stage Complete)
12.0m	200	Pressure 30psi (Stage Complete)
10.0m		Surfaced
8.0m		Surfaced – Works Complete

Total Injected – 1.5m3

South Grout Hole (03/02/21)	Volume Injected (Ltr)	Comments
28.0m	100	Pressure 42psi (Stage Complete)
26.0m	300	Pressure 40psi (Stage Complete)
24.0m	100	Pressure 40psi (Stage Complete)
22.0m	-	Pressure 40psi (Stage Complete)
20.0m	100	Pressure 30psi (Stage Complete)
18.0m	100	Pressure 30psi (Stage Complete)
16.0m	100	Pressure 30psi (Stage Complete)
14.0m	100	Pressure 30psi (Stage Complete)
12.0m	100	Pressure 30psi (Stage Complete)
10.0m	200	Pressure 30psi (Stage Complete)
8.0m	200	Pressure 30psi (Stage Complete)
		Surfaced – Works Complete

Total Injected – 1.4m3

Validation Bore

Central Validation Bore (04/02/21)	Volume Injected (Ltr)	Comments
28.0m	200	Pressure 42psi (Stage Complete)
26.0m	50	Pressure 39psi (Stage Complete)
24.0m	100	Pressure 36psi (Stage Complete)
22.0m	50	Pressure 33psi (Stage Complete)
20.0m	50	Pressure 30psi (Stage Complete)
18.0m	50	Pressure 27psi (Stage Complete)
16.0m	50	Pressure 24psi (Stage Complete)
14.0m	50	Pressure 21psi (Stage Complete)
12.0m	50	Pressure 18psi (Stage Complete)
10.0m		15 psi - Surfaced – Works Complete

Note: All positions held for 5mins without drop in pressure.

Total Injected – 0.65m3

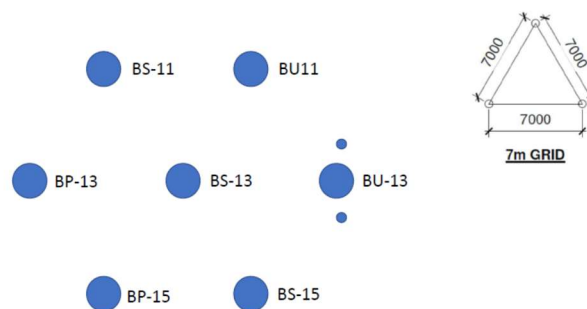
Total Injected for works – 8.85m3

The shaft has been validated by using ascending stage grouting techniques applying a validating pressure at each 2.0m stage over the length of the bore. All investigation probing positions have been grouted.

The works were undertaken from the 28/01/21 and were completed on the 05/02/21.

APPENDIX A – Summary of Initial Probing

Summary of Initial Probing



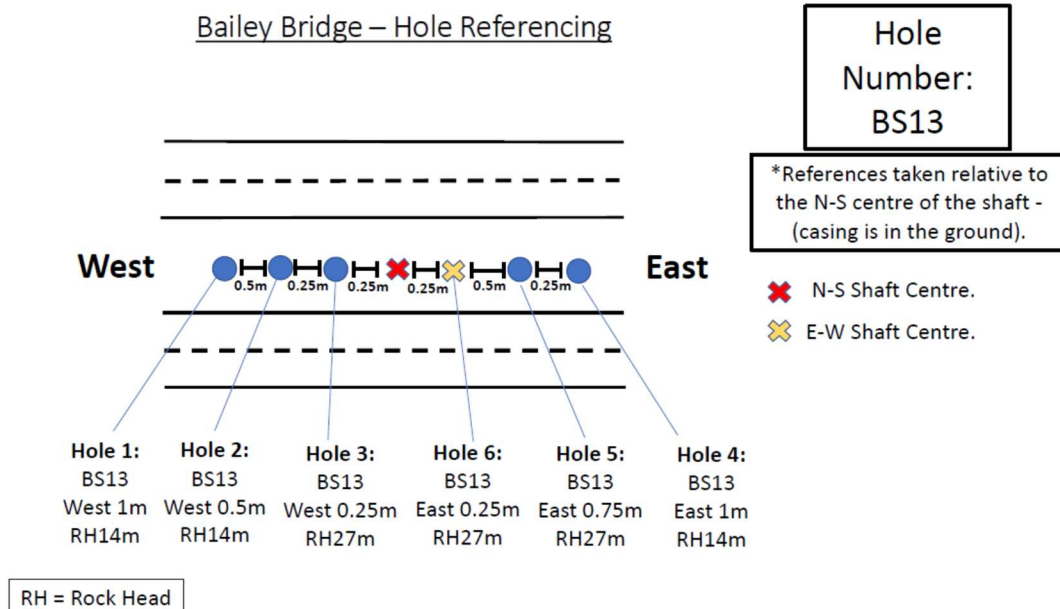
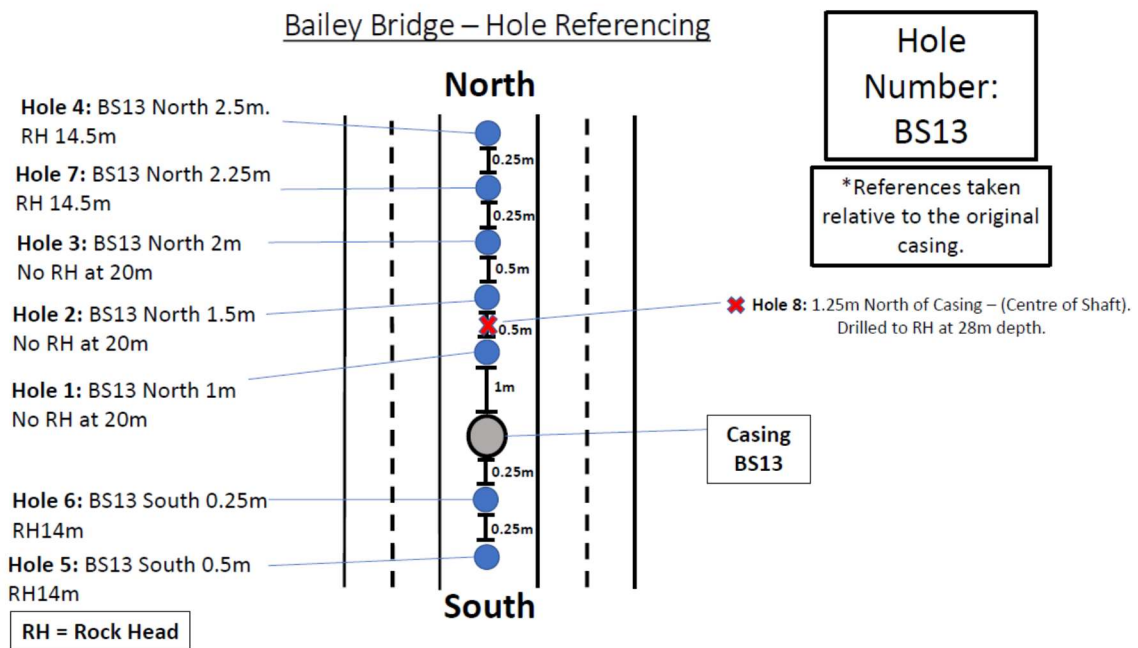
BU-13 – Starting Position of 4no inclined bores

Note: All position proved 1.0m into rockhead

- BS13

Bore Hole Ref	Rock Head Encountered (mBGL)	Comments
BS13	28.0m	Very soft from 4m to 26m possible shaft.
BU11	14.0m	Vertical
BS11	14.5m	Vertical
BS15	13.5m	Vertical
BP13	14.5m	Vertical
BP15	13.5m	Vertical
BU13	14.0m	Vertical
BS13A- 500m off set 7.0m (Left)	18.0m	Overburden – 0.0m - 15.5m Soft - 15.5m – 18.0m Rock - 18.0m+ (Inclined at 24 degrees)
BS13B - 500m off set 7.0m (Right)	18.0m	Overburden – 0.0m - 15.5m Soft - 15.5m – 18.0m Rock - 18.0m+ (Inclined at 24 degrees)
BS13A - 500m off set 7.0m (Left)	15.0m	Overburden – 0.0m – 15.0m Rock - 15.0m – 22.0m Rock – 22.0+ (Inclined at 19 degrees)
BS13B - 500m off set 7.0m (Right)	15.0m	Overburden – 0.0m – 15.0m Rock - 15.0m – 18.0m Soft - 18.0m – 22.0m Rock – 22.0+ (Inclined at 19 degrees)

APPENDIX B - Investigation Information

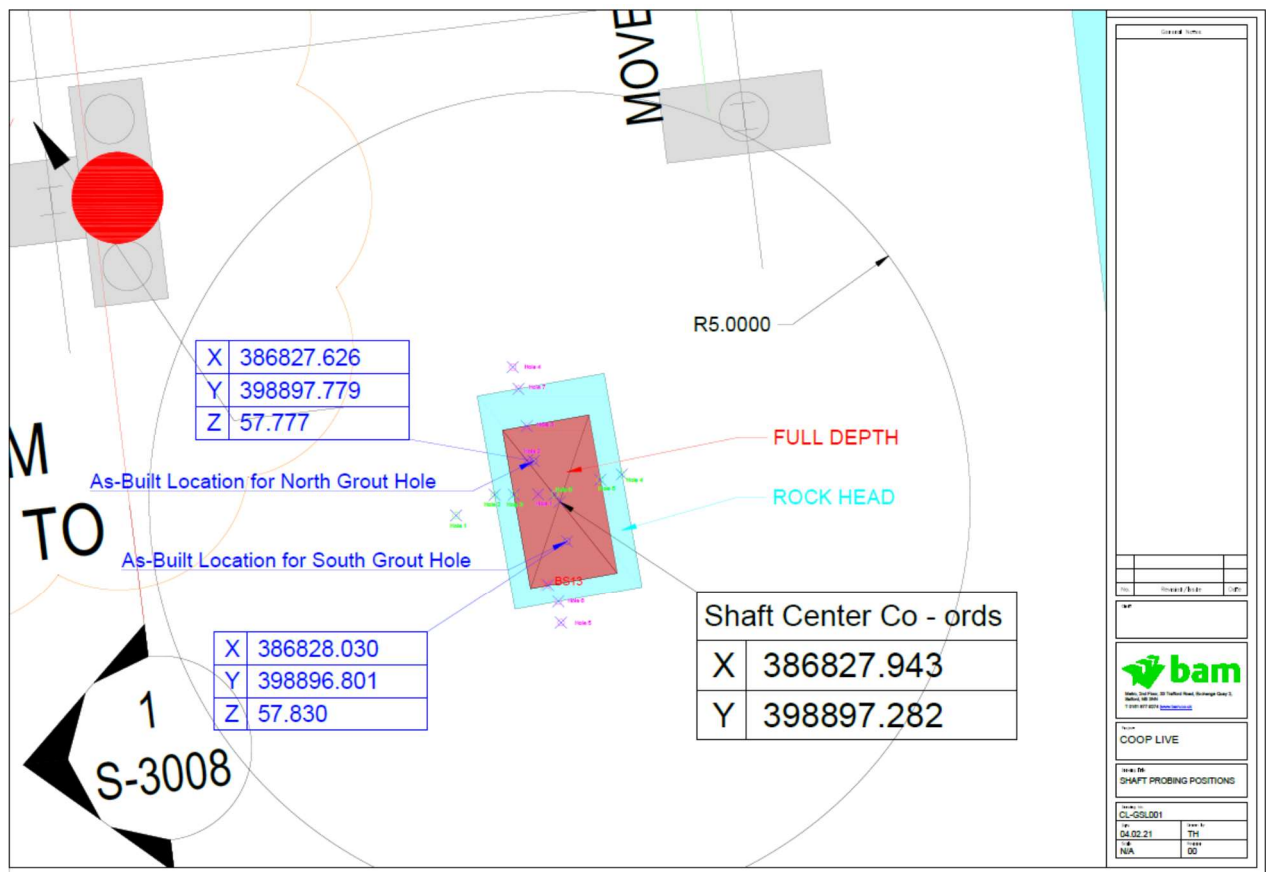


BS13 – Probe Summary

No. of Holes	Hole Reference	Bailey Bridge Orientation	Rock Head Depth (m)	Inside Shaft Yes/No	Comments
1	BS13 North 1m	N-S	No RH at 20m	Yes	Same as Hole 2.
2	BS13 North 1.25m (Centre of Shaft)	N-S	RH 27m	No	Slight resistance from PPL - 4m, then soft from 4m-27m. No resistance encountered at 25.5m as in Hole 12.
3	BS13 North 1.5m	N-S	No RH at 20m	Yes	Same as Hole 2.
4	BS13 North 2m	N-S	No RH at 20m	Yes	Same as Hole 2.
5	BS13 North 2.25m	N-S	14.5m	No	N/A
6	BS13 North 2.5m	N-S	14.5m	No	N/A
7	BS13 South 0.25m	N-S	14m	No	N/A
8	BS13 South 0.5m	N-S	14m	No	N/A
9	BS13 West 0.25m	E-W	27m	Yes	N/A
10	BS13 West 0.5m	E-W	14m	No	N/A
11	BS13 West 0.75m	E-W	14m	No	N/A
12	BS13 East 0.25m (Centre of Shaft)	E-W	27m	Yes	From 4-6m a slight resistance was encountered, which required spinning the casing to get through. From 6-16m the ground offered little - no resistance and casings were pushed down through the shaft. From 25m-25.5m the top hammer was required to get through - potentially a boulder at the base of the shaft. 25.5m-27m returned to soft.
13	BS13 East 0.75m	E-W	27m	Yes	Same as Hole 12.
14	BS13 East 1m	E-W	14m	No	N/A

Note - All positions proven 1.0m into rock head.

APPENDIX C – Grouting Positions



Bailey Bridge – Hole Referencing

Hole 4: BS13 North 2.5m.
RH 14.5m

Hole 7: BS13 North 2.25m
RH 14.5m

Hole 3: BS13 North 2m
No RH at 20m

Hole 2: BS13 North 1.5m
No RH at 20m

Hole 1: BS13 North 1m
No RH at 20m

Hole 6: BS13 South 0.25m
RH14m

Hole 5: BS13 South 0.5m
RH14m

RH = Rock Head

North

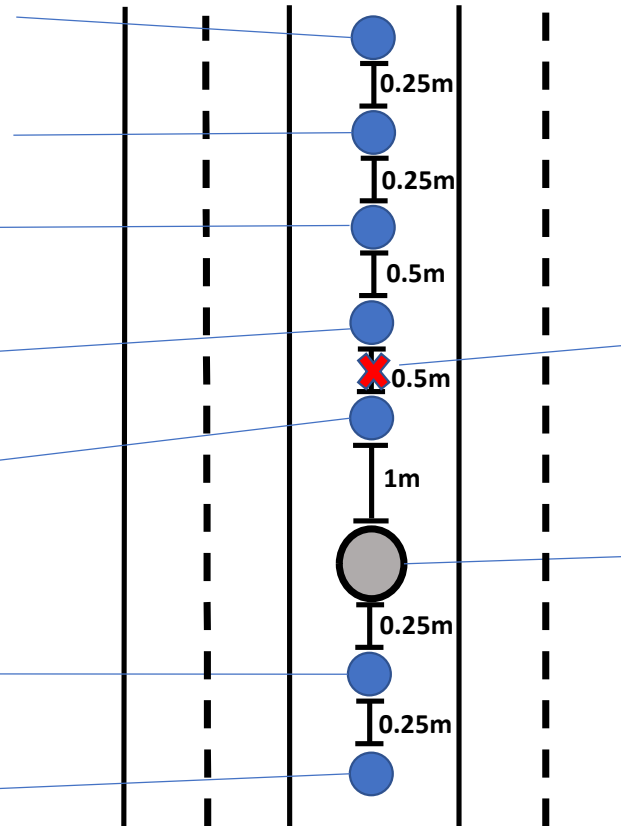
South

**Hole
Number:
BS13**

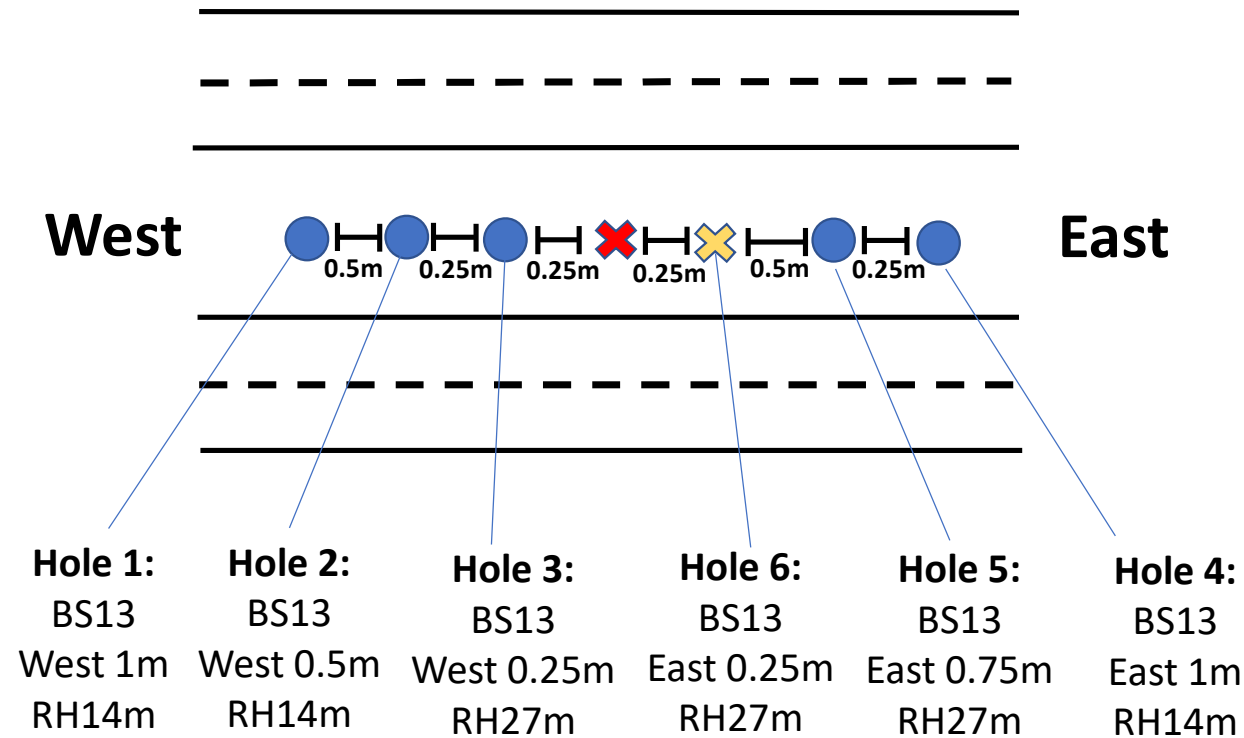
*References taken
relative to the original
casing.

✗ **Hole 8:** 1.25m North of Casing – (Centre of Shaft).
Drilled to RH at 28m depth.

**Casing
BS13**



Bailey Bridge – Hole Referencing



Hole
Number:
BS13

*References taken relative to
the N-S centre of the shaft -
(casing is in the ground).

✖ N-S Shaft Centre.

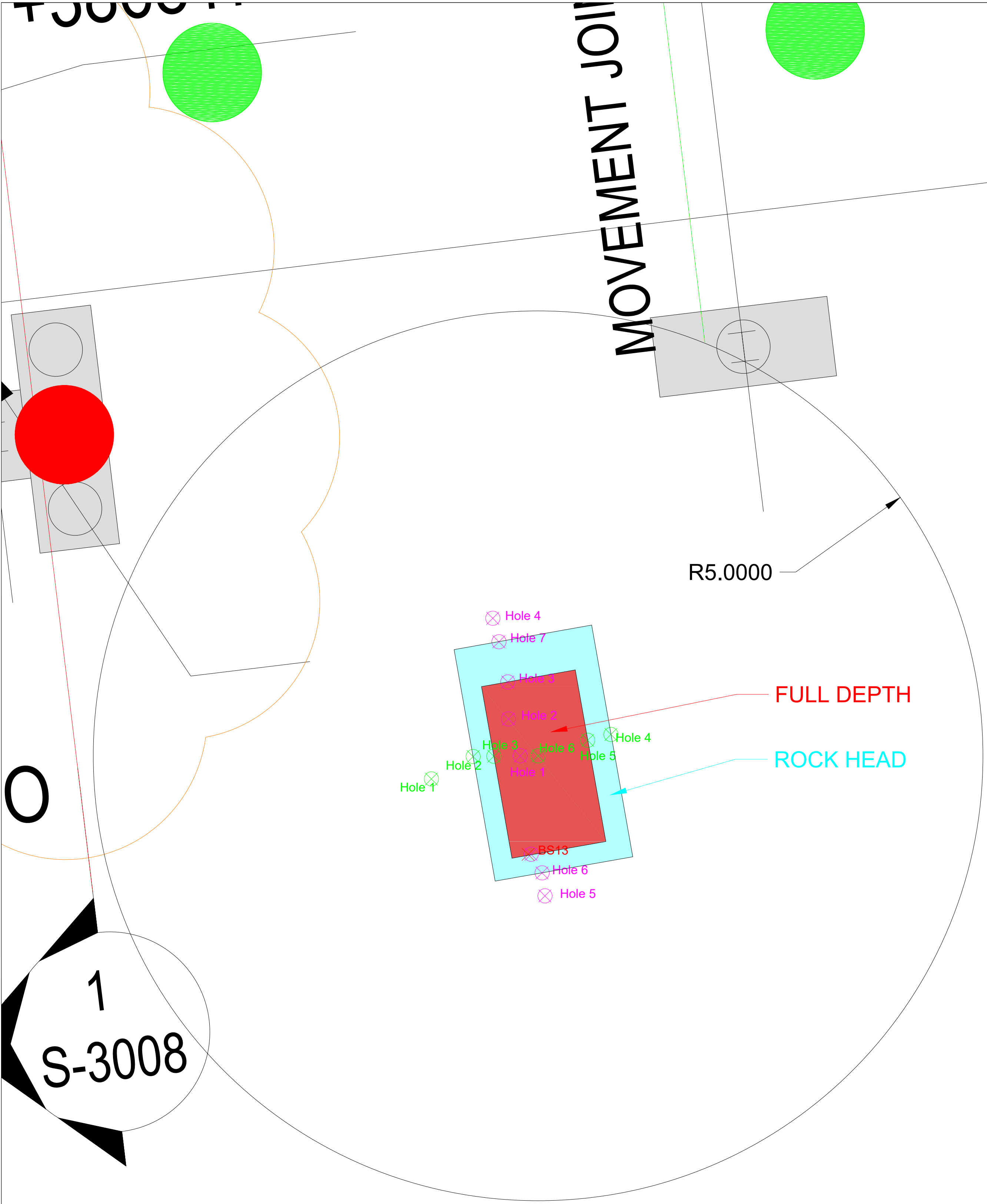
✖ E-W Shaft Centre.

RH = Rock Head

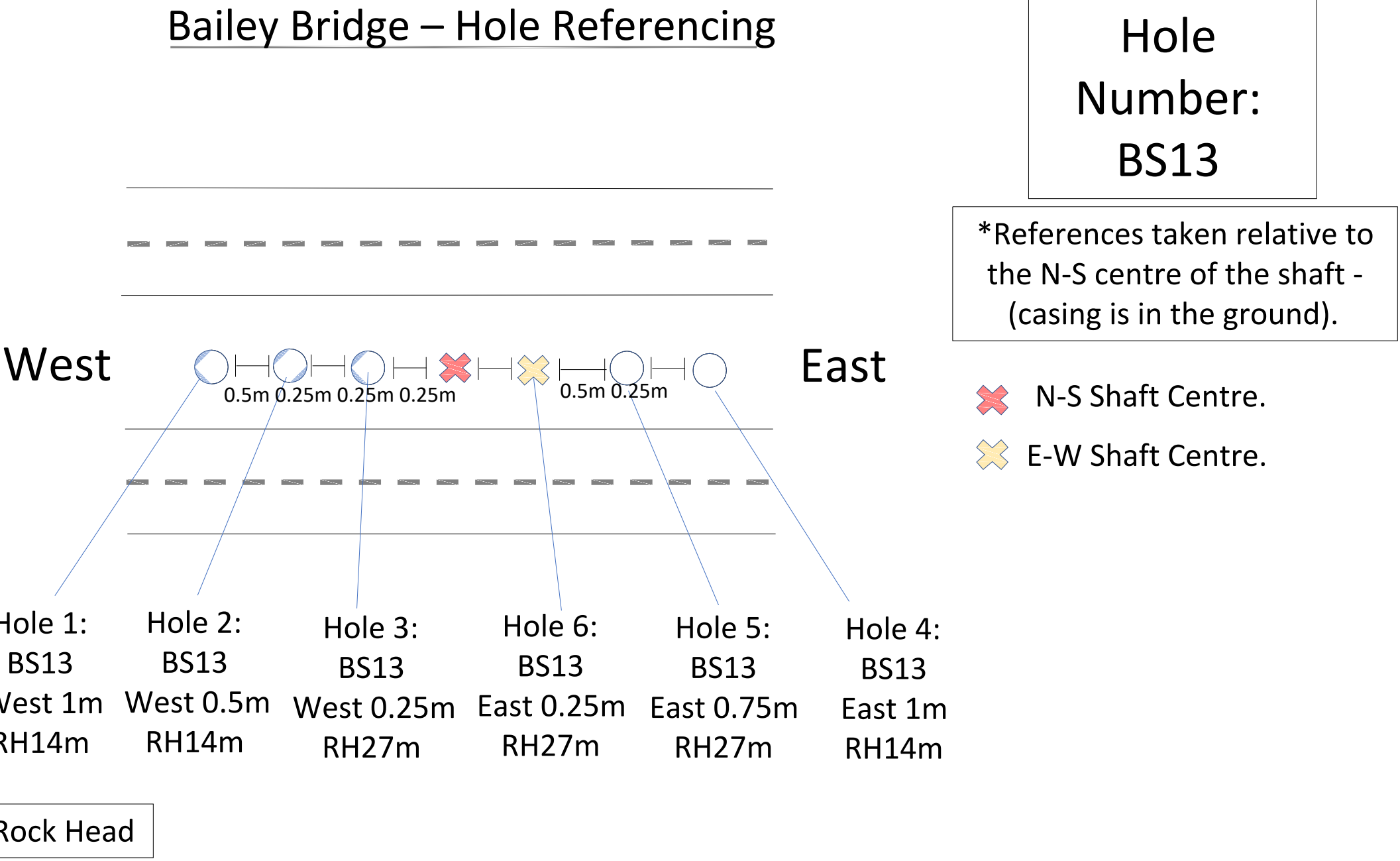
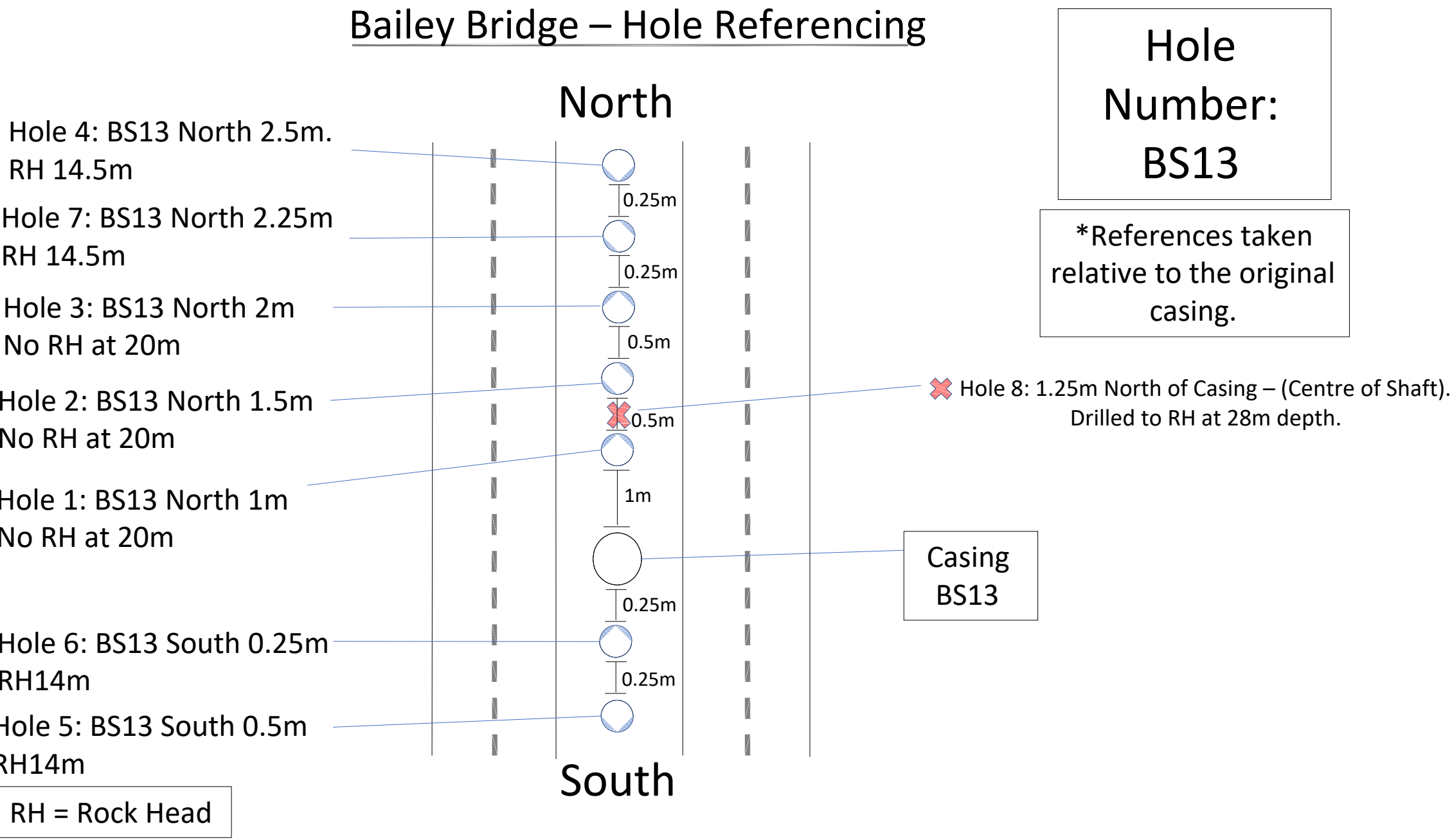
BS13 – Probe Summary

No. of Holes	Hole Reference	Bailey Bridge Orientation	Rock Head Depth (m)	Inside Shaft Yes/No	Comments
1	BS13 North 1m	N-S	No RH at 20m	Yes	Same as Hole 2.
2	BS13 North 1.25m (Centre of Shaft)	N-S	RH 27m	No	Slight resistance from PPL - 4m, then soft from 4m-27m. No resistance encountered at 25.5m as in Hole 12.
3	BS13 North 1.5m	N-S	No RH at 20m	Yes	Same as Hole 2.
4	BS13 North 2m	N-S	No RH at 20m	Yes	Same as Hole 2.
5	BS13 North 2.25m	N-S	14.5m	No	N/A
6	BS13 North 2.5m	N-S	14.5m	No	N/A
7	BS13 South 0.25m	N-S	14m	No	N/A
8	BS13 South 0.5m	N-S	14m	No	N/A
9	BS13 West 0.25m	E-W	27m	Yes	N/A
10	BS13 West 0.5m	E-W	14m	No	N/A
11	BS13 West 0.75m	E-W	14m	No	N/A
12	BS13 East 0.25m (Centre of Shaft)	E-W	27m	Yes	From 4-6m a slight resistance was encountered, which required spinning the casing to get through. From 6-16m the ground offered little - no resistance and casings were pushed down through the shaft. From 25m-25.5m the top hammer was required to get through - potentially a boulder at the base of the shaft. 25.5m-27m returned to soft.
13	BS13 East 0.75m	E-W	27m	Yes	Same as Hole 12.
14	BS13 East 1m	E-W	14m	No	N/A

Note – All positions proven 1.0m into rock head



BAM AS-BUILT PROBE LOCATIONS



SKANSKA - SHAFT PROB LOCATIONS

General Notes

No.	Revision/Issue	Date

Client

bam

Metro, 2nd Floor, 33 Trafford Road, Exchange Quay 2, Salford, M5 3NN
T 0161 877 9274 www.bam.co.uk

Project
COOP LIVE

Drawing Title
SHAFT PROBING POSITIONS

Drawing No.
CL-GSL001

Date	Drawn by
01.02.21	TH

Scale	Revision
N/A	00

Co-op Live (Project Bradford)

BY-11 Grouting – Report

Revision	Date	Comment
P00	26.02.21	First Issue
C01	03.03.21	Issue
C02	04.03.21	Revised

Document Number: BRA-CSL-ZZ-ZZ-RP-X-00900

Uniclass Code: PM_60_60_70

Project Manager: *Gavin Clifford*

Project Engineer: Oliver Partington

1.0 INTRODUCTION

Following the completion of the investigation works a change in ground conditions was found approximately 2.25m wide running East to West which was less than 1.25m running North to South. It was concluded that this position was to be grouted before a further decision could be made on the requirement of a cap. A summary of the initial investigation is located within appendix A (BRA-CSL-ZZ-ZZ-RP-X-00904) and the following bailey bridge works within appendix B. All positions undertaken on the bailey bridge were proved 6.0m into rockhead.

The objectives of these grouting works were to:

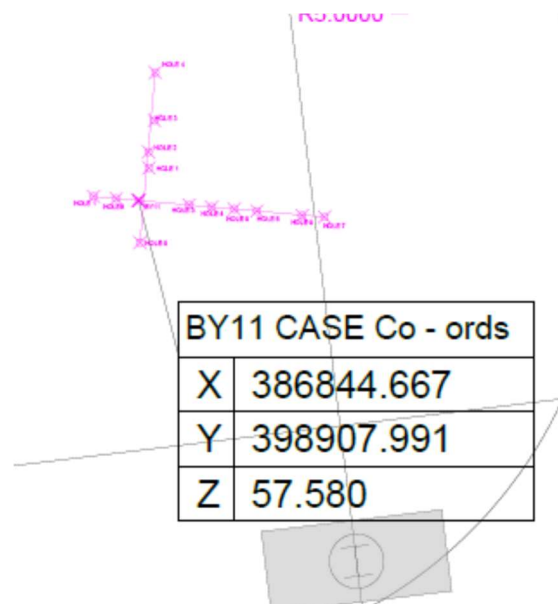
- Fill any voids present using pressure grouting techniques to mitigate the impact to the pile design.

1.1 VALIDATION METHODOLOGY

The following methodology was agreed and undertaken.

- Drill a grouting bore down to rock head on original BY-11
- Continue full depth to ensure seams at depth are treated
- Once seams are complete commence grouting cased stages
- Grouting in ascending stages (2.0m) from rock head
- Each position to be pressure grouted using 1.5psi per meter overburden (minimum) or if grout seen surfacing
- No additional validation bores required

Following a review of the drilling information (Appendix B). The original position BY-11 was to be grouted full depth in line with the grouting philosophy document.



1.2 PROGRESS

The position has been grouted and validated by using ascending stage grouting techniques applying a validating pressure at each 2.0m stage over the length of the bore. Rock head was encountered at 19.5m BGL.

A summary of the drilling operation is out lined below.

BY-11 – RH at 19.5m BGL

- 0.0m - 21m cased
- 21.0m – 27m Mudstone/soft
- 27.0m – 42m Hard – Part water Return
- Grout Injected at depth 100ltrs

A summary of the grouting operation is out lined below.

BY-11 Grout Hole (19/02/21) MBGL	Volume Injected (Ltr)	Comments
21.0	100	Pressure 33psi (Stage Complete)
20.0	300	Pressure 30psi (Stage Complete)
18.0	300	Pressure 27psi (Stage Complete)
16.0	300	Pressure 24psi (Stage Complete)
14.0	-	Grout loss into overburden (works complete)

Total Injected – 0.9m3

Note: All positions held for 5mins without drop in pressure.

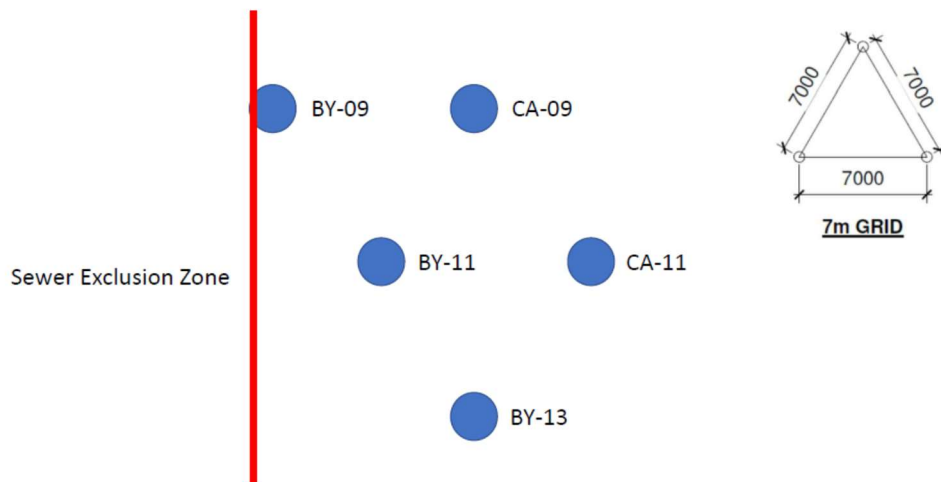
Total Injected across bore – 1.0m3

The position has been validated by using ascending stage grouting techniques applying a validating pressure at each 2.0m stage over the length of the bore.

The grouting works were undertaken from the 19/02/21 and were completed on the 19/02/21.

APPENDIX A – Summary of Initial Probing

Summary of Initial Probing

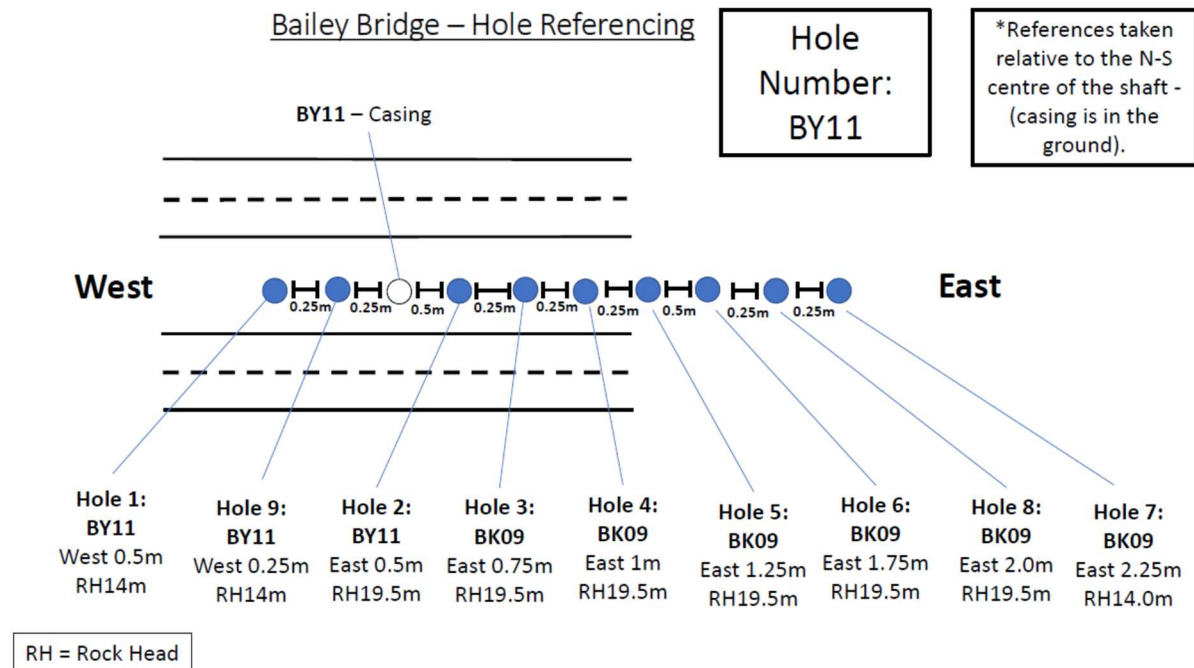
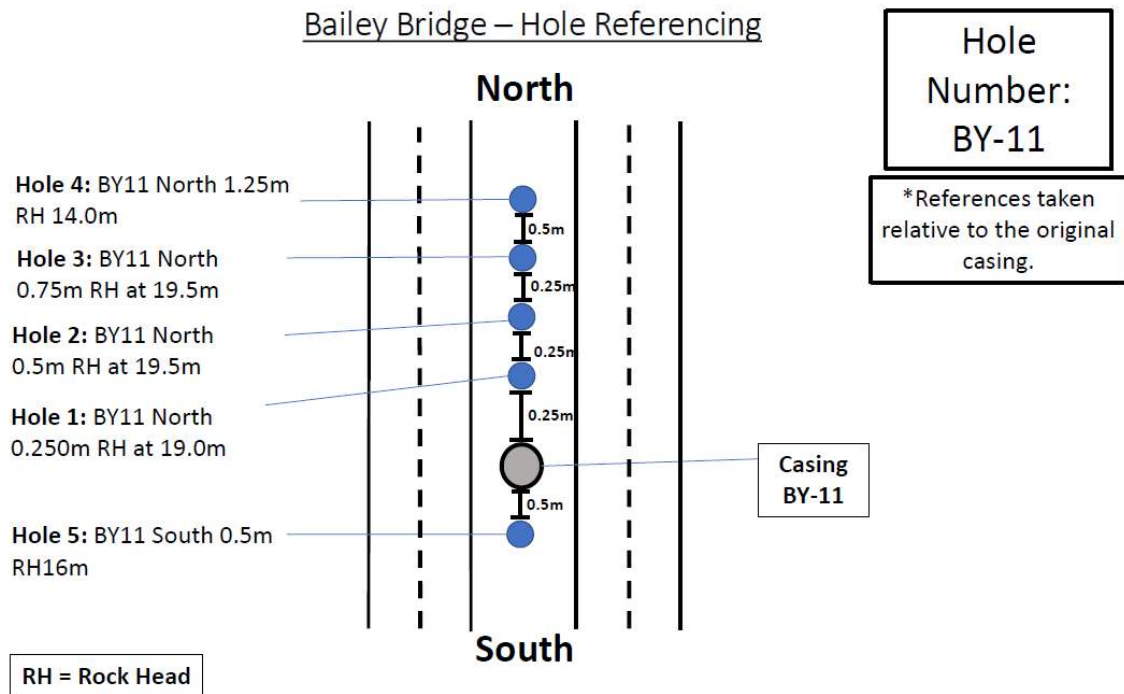


Note: All position proved 1.0m into rockhead

- BY11

Bore Hole Ref	Rock Head Encountered (mBGL)	Comments
BY11	19.0m	Nothing until 19m possible shaft.
BY09	14.0m	Vertical
BY13	12.5m	Vertical
CA11	15.0m	Vertical
CA09	12.00m	Vertical

APPENDIX B – Investigation Information

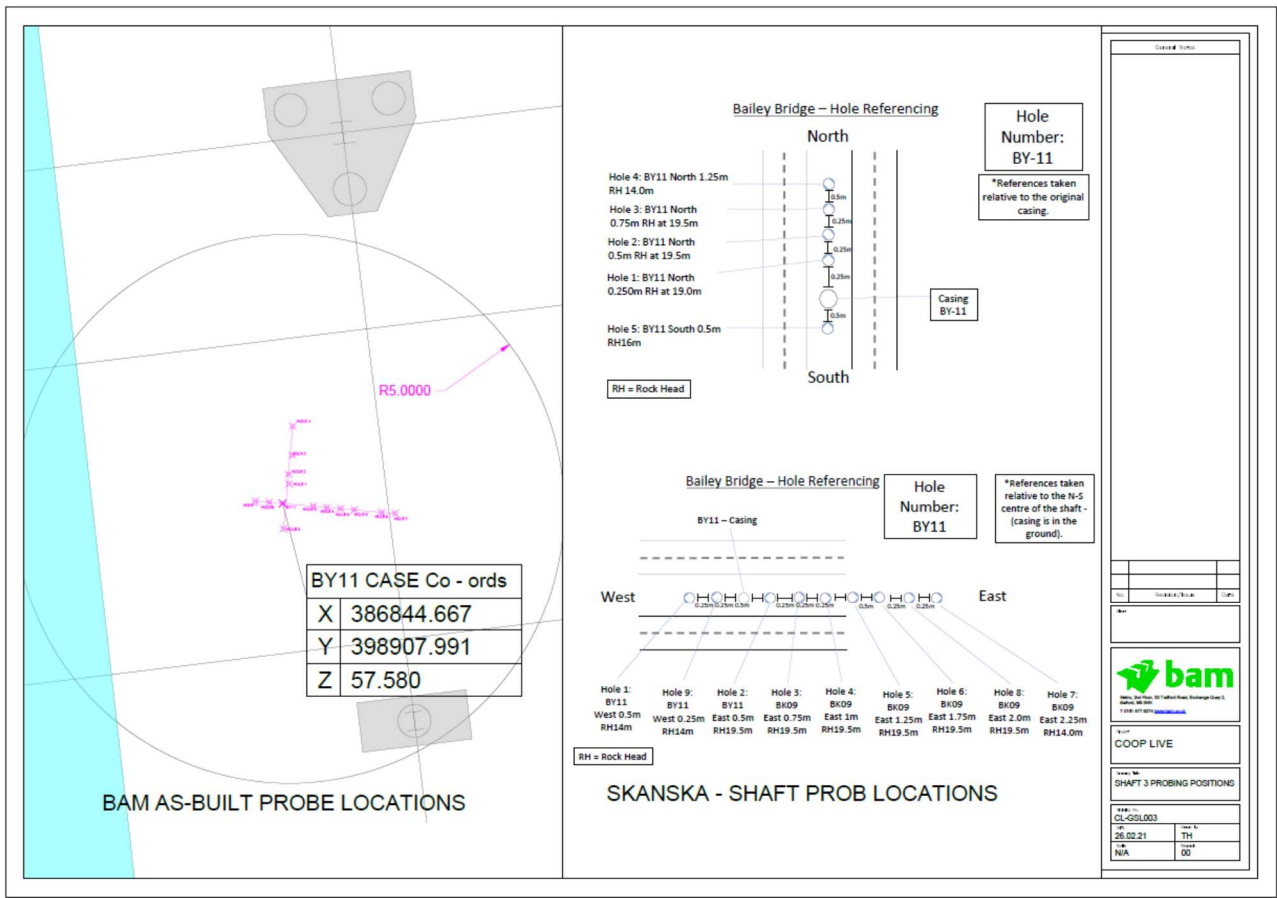


BY11 – Probe Summary

No. of Holes	Hole Reference	Bailey Bridge Orientation	Rock Head Depth (m)	Inside Yes/No	Comments
1	BY11 North 1.25m	N-S	RH at 14.0m	No	
2	BY11 North 0.75m	N-S	RH at 19.5m	Yes	
3	BY11 North 0.5m	N-S	RH at 19.5m	Yes	
4	BY11 North 0.25m	N-S	RH at 19.0m	Yes	
5	BY11 South 0.5m	N-S	RH at 16.0m	No	
6	BY11 West 0.5m	E-W	RH at 14.0m	No	
7	BY11 West 0.25m	E-W	RH at 14m	No	
8	BY11 East 0.5m	E-W	RH at 19.5m	Yes	
9	BY11 East 0.75m	E-W	RH at 19.5m	Yes	
10	BY11 East 1.0m	E-W	RH at 19.5m	Yes	
11	BY11 East 1.25m	E-W	RH at 19.5m	Yes	
12	BY11 East 1.75m	E-W	RH at 19.5m	Yes	
13	BY11 East 2.0m	E-W	RH at 19.5m	Yes	
14	BY11 East 2.25m	E-W	RH at 14m	No	

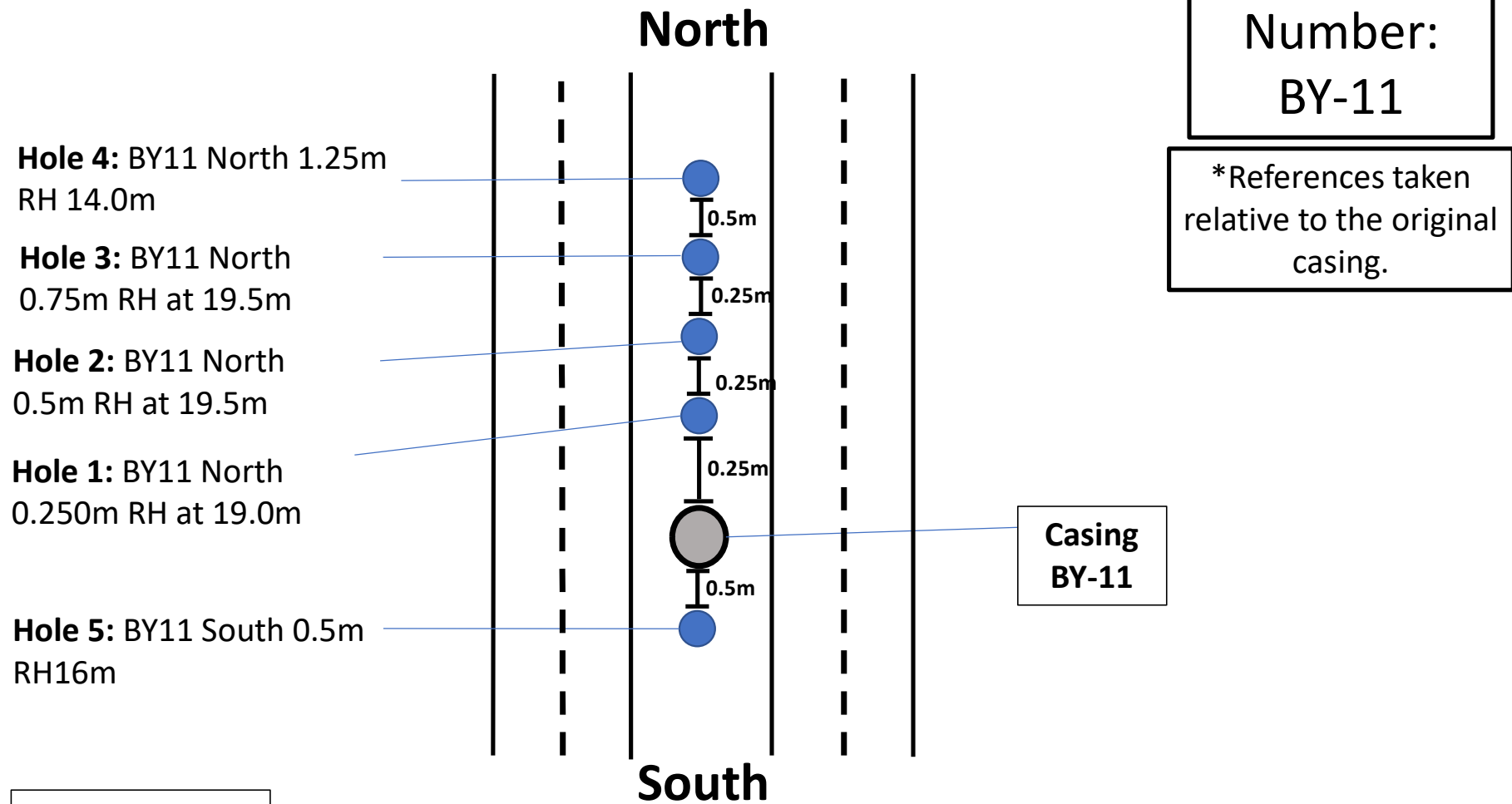
Note - All positions proven 6.0m into rock head.

APPENDIX C – Grouting Positions



8 | Page

Bailey Bridge – Hole Referencing

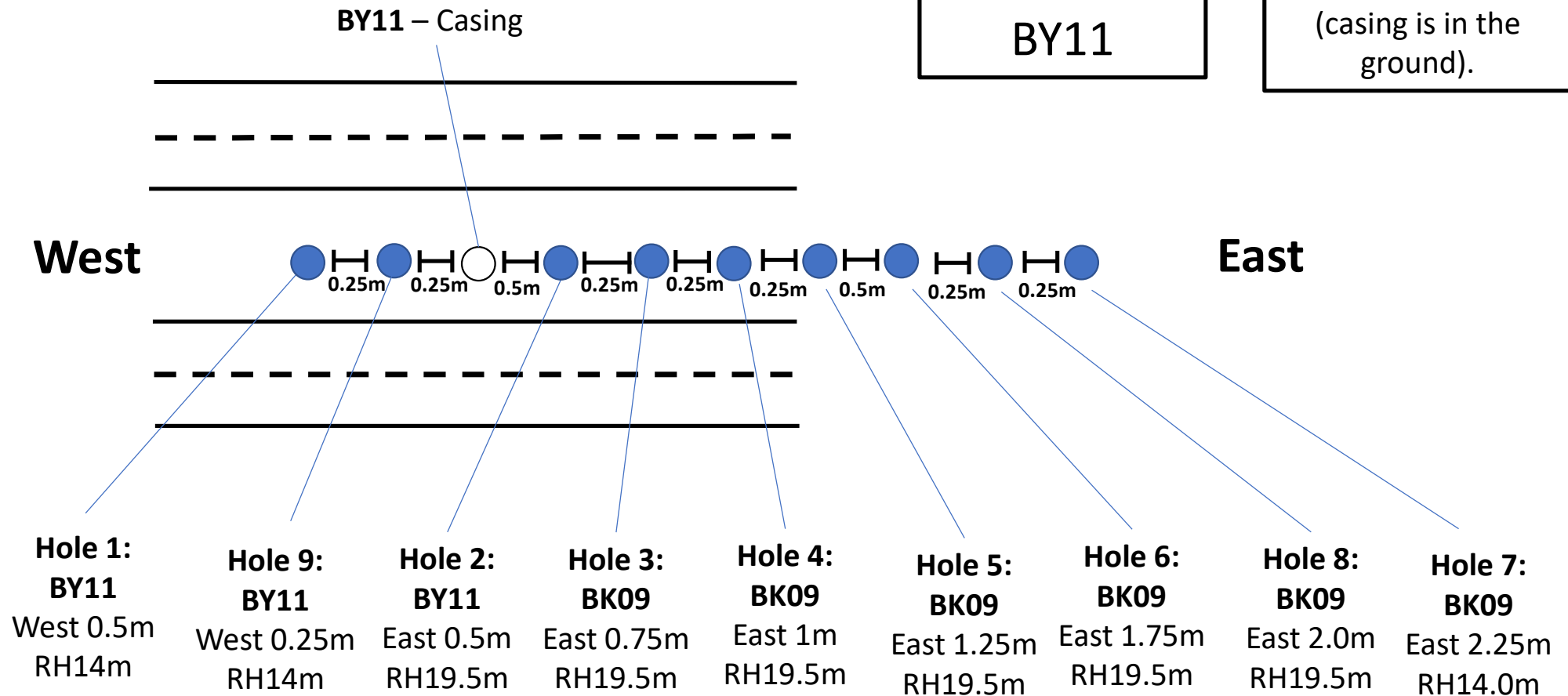


RH = Rock Head

Bailey Bridge – Hole Referencing

Hole
Number:
BY11

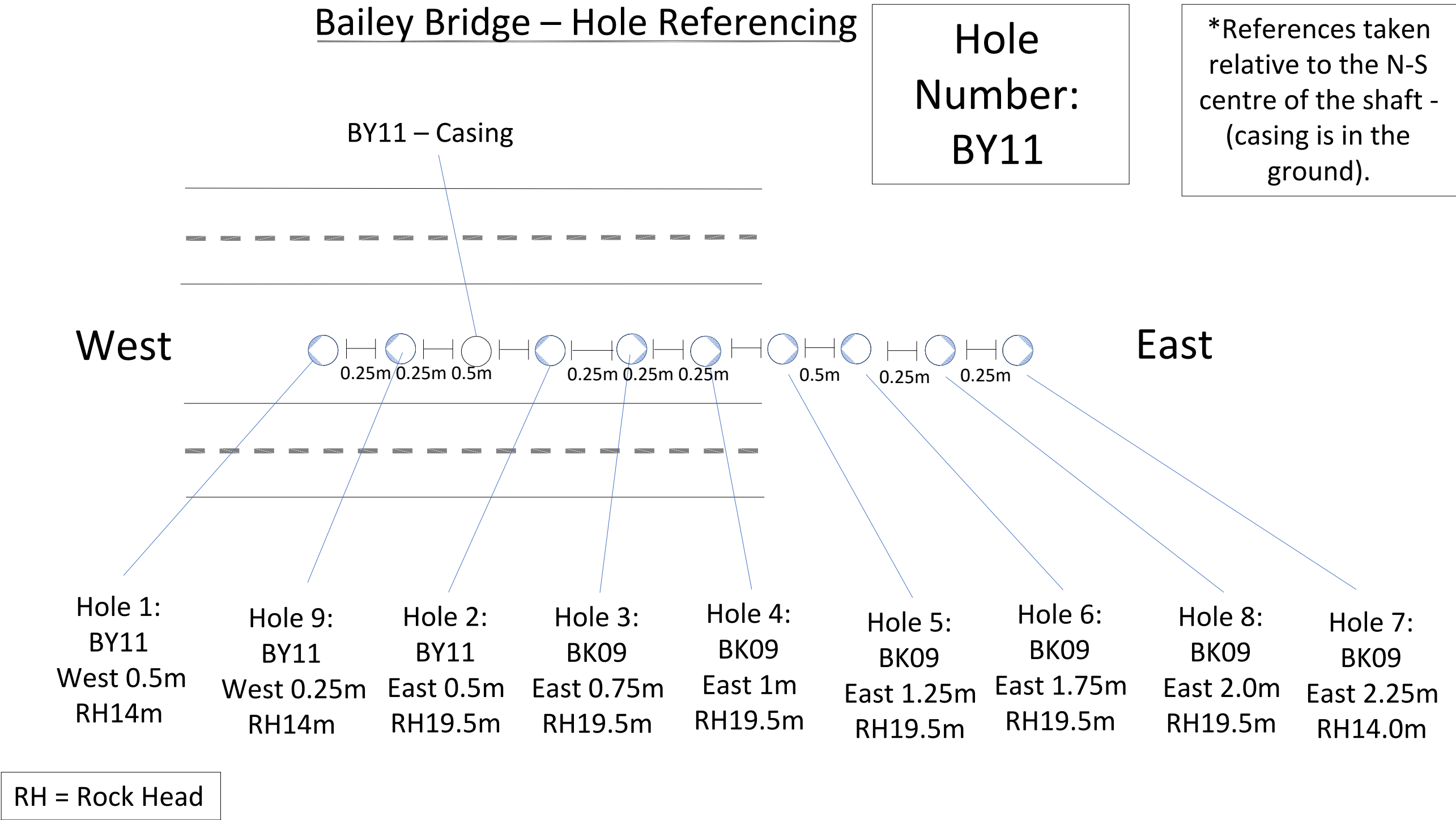
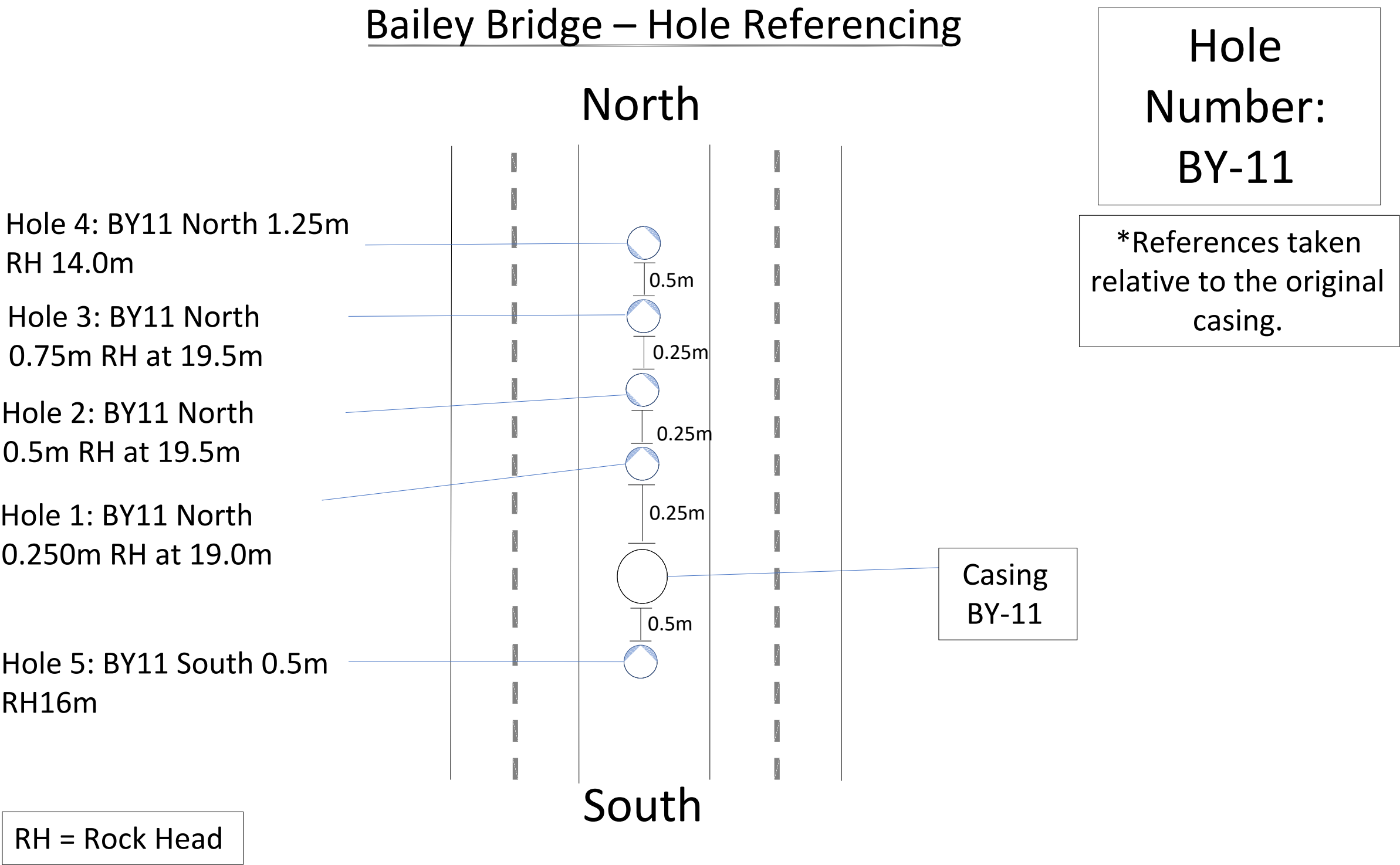
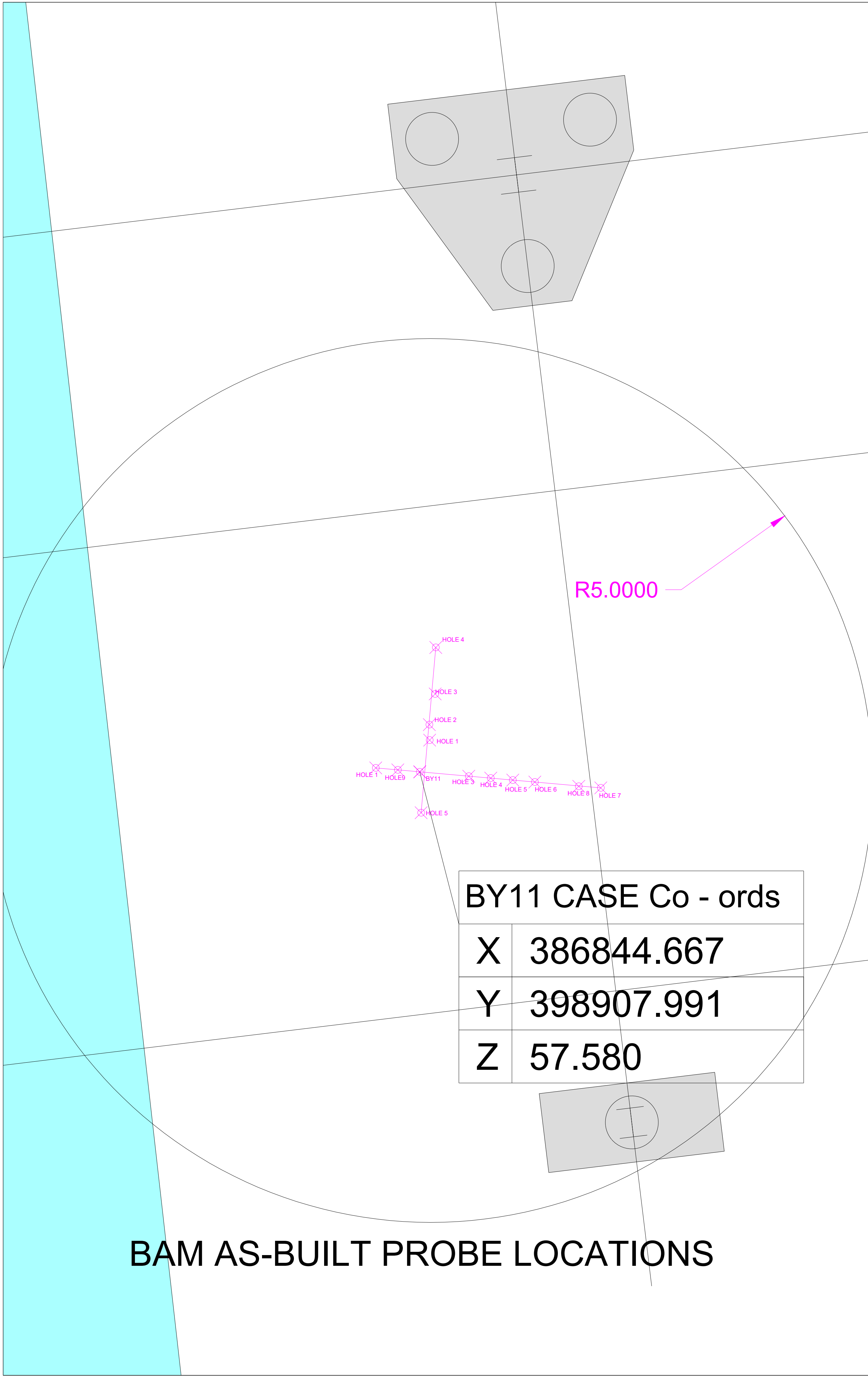
*References taken
relative to the N-S
centre of the shaft -
(casing is in the
ground).



RH = Rock Head

BY11 – Probe Summary

No. of Holes	Hole Reference	Bailey Bridge Orientation	Rock Head Depth (m)	Inside Yes/No	Comments
1	BY11 North 1.25m	N-S	RH at 14.0m	No	
2	BY11 North 0.75m	N-S	RH at 19.5m	Yes	
3	BY11 North 0.5m	N-S	RH at 19.5m	Yes	
4	BY11 North 0.25m	N-S	RH at 19.0m	Yes	
5	BY11 South 0.5m	N-S	RH at 16.0m	No	
6	BY11 West 0.5m	E-W	RH at 14.0m	No	
7	BY11 West 0.25m	E-W	RH at 14m	No	
8	BY11 East 0.5m	E-W	RH at 19.5m	Yes	
9	BY11 East 0.75m	E-W	RH at 19.5m	Yes	
10	BY11 East 1.0m	E-W	RH at 19.5m	Yes	
11	BY11 East 1.25m	E-W	RH at 19.5m	Yes	
12	BY11 East 1.75m	E-W	RH at 19.5m	Yes	
13	BY11 East 2.0m	E-W	RH at 19.5m	Yes	
14	BY11 East 2.25m	E-W	RH at 14m	No	



SKANSKA - SHAFT PROB LOCATIONS

General Notes

No.	Revision/Issue	Date

Client

Metro, 2nd Floor, 33 Trafford Road, Exchange Quay 2, Salford, M5 3NN
T 0161 877 9274 www.bam.co.uk

Project
COOP LIVE

Drawing Title
SHAFT 3 PROBING POSITIONS

Drawing No. CL-GSL003	
Date 26.02.21	Drawn by TH
Scale N/A	Revision 00