Project Name	Croxley Rail Link, Stage 1	Exploratory Hole Log	Hole ID.
Project No.	TB7219		BH102
Engineer	Arup		
Employer	Taylor Woodrow Construction Ltd		Header Page 1

Ground Level 154.34m TD Coordinates 59309.77 X, 51246.03 Y Local Grid

Date Started 14/10/2013 Date Completed 29/10/2013 Inclination Vertical

Top	Base	Type	Date Started	Date Ended	Crew	Section Logged By	Core Barrel	Core Bit	Equipment	Shoring / Support	Remarks
0.00	1.20	IP	14/10/2013	14/10/2013	PC	CM			Hand Tools		
1.20	12.20	CP	15/10/2013	15/10/2013	CC	CM			Dando 3000		
12.20	45.00	RC	21/10/2013	29/10/2013	CD	SK	SWF	TC/PCD	Hands England		

CABLE PERCUSSION DETAILS

Hard Strata Depth from	Hard Strata Depth to	Chiselling Start time hhmm	Chiselling Duration hhmm	Remarks

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Casing depth at strike time	Casing depth to seal flow
15/10/2013		4.70	4.70	NR	NR	NR

HOLE DIAMETER / CASING

Hole diameter	Depth of hole	Casing diameter	Depth of casing
200	12.20	200	12.20
150	17.00	150	17.00
146	45.00		

ROTARY FLUSH DETAILS

From depth	To depth	Flush type	Flush return %	Flush colour
12.20	12.40	Water	50	White/Brown
12.40	14.90	Water	0	NA
14.90	15.40	Water	50	White/Brown
15.40	15.90	Water	0	NA
15.90	16.90	Water	50	White
16.90	45.00	Water	0	NA

DYNAMIC SAMPLING

Top	Base	Diameter	Time hhmmss	Recovery %

INSTALLATION DETAILS

Distance from G.L.	ID	Type	Response zone Top	Response zone Base
3.50	01	SP	1.00	3.50

PIPE CONSTRUCTION

ID	Pipe Top	Pipe Base	Dia. of pipe	Type of pipe
01	0.00	1.00	50	Plain
01	1.00	3.40	50	Slotted

BACKFILL DETAILS

Top of section	Base of section	Material	Remarks
0.00	0.50	Concrete	
0.50	1.00	Bentonite	
1.00	3.50	Gravel backfill	
3.50	45.00	Bentonite	

NOTES: All depths in metres, all diameters in millimetres.
Water strike rise time in minutes, hard strata time in hhmm
For details of abbreviations, see key

Log Print Date And Time: 09/09/2014 08:45:44

SOIL ENGINEERING

Part of the Bachy Soletanche group

Project Name Croxley Rail Link, Stage 1 Project No. TB7219 Engineer Arup Employer Taylor Woodrow Construction Ltd		Exploratory Hole Log	Hole ID. BH102 Header Page 2

Ground Level 154.34m TD Coordinates 59309.77 X, 51246.03 Y Local Grid

Date Started 14/10/2013 Date Completed 29/10/2013 Inclination Vertical

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
14/10/2013	0730	0.00	0.00	DRY	Start of Hole
14/10/2013	1800	1.20	0.00	DRY	End of IP
15/10/2013	0730	1.20	0.00	DRY	Start of CP
15/10/2013	1800	12.20	12.20	4.60	End of CP
21/10/2013	0730	12.20	12.20	3.06	Start of RC
21/10/2013	1800	12.40	12.20	0.00	End of Shift
22/10/2013	0730	12.40	12.20	2.94	Start of Shift
22/10/2013	1800	15.90	15.90	3.10	End of Shift
24/10/2013	0730	15.90	15.90	0.30	Start of Shift
24/10/2013	1800	29.30	17.00	2.97	End of Shift
25/10/2013	0730	29.30	17.00	1.10	Start of Shift
25/10/2013	1200	36.00	17.00	2.78	End of Shift
28/10/2013	0730	36.00	17.00	2.46	Start of Shift
28/10/2013	1800	45.00	17.00	3.14	End of RC
29/10/2013	0730	45.00	17.00	1.26	Installation
29/10/2013	1730	0.00	0.00	0.00	End of Hole

SPT DETAILS

Depth	Type	Incremental blow count / penetration in mm	Hammer No.	Energy ratio %	Casing depth	Water depth
2.50	SPT	N=17 (3,4,4,4,5,4)	AR356	75	2.50	DRY
3.50	SPT	N=13 (2,3,3,3,4,3)	AR356	75	3.50	DRY
4.70	SPT	N=12 (1,1,2,3,5,2)	AR356	75	4.70	4.50
7.50	SPT	N=1 (0,1,0,0,1,0)	AR356	75	7.50	6.90
9.50	SPT	N=10 (1,2,3,2,3,2)	AR356	75	9.50	6.60
12.80	SPT	N=10 (1,2,4,2,2,2)	51	70	12.20	2.96
14.90	SPT	N=10 (2,3,2,2,4,2)	51	70	14.90	2.74
16.90	SPT(C)	N=18 (1,3,3,4,9,2)	51	70	15.90	0.42
33.80	SPT(C)	65/300mm (15,10/13,17,8,21,19)	51	70	17.00	2.78
38.50	SPT	N=27 (3,7,6,11,4,6)	51	70	17.00	2.10

DEPTH RELATED REMARKS

Top Depth	Base Depth	Remarks

GENERAL NOTES

1. Casing moving down the borehole during coring runs from 16.40m to 17.90m.

* Seating blows only.

NOTES: All depths in metres, all diameters in millimetres.
For details of abbreviations, see key

Log Print Date And Time: 09/09/2014 08:45:59

SOIL engineering
Part of the Bachy Soletanche group

Project Name	Croxley Rail Link, Stage 1	Exploratory Hole Log	Hole ID.
Project No.	TB7219		BH102
Engineer	Arup		
Employer	Taylor Woodrow Construction Ltd		Sheet 1 of 9

Ground Level	154.34m TD	Coordinates	59309.77 X, 51246.03 Y Local Grid
Hole Type	IP+CP+RC	Inclination	Vertical

Description of Strata	Legend	Depth (Thickness)	Datum Level	Sampling Details	Dia.	Blow Count And Sample Recovery TCR / SCR / RQD / IF	In Situ Test Details	Install-ation
MADE GROUND: Black tarmacadam.		0.10	154.24					
MADE GROUND: Grey silty sandy gravel. Gravel sized fragments are angular fine to coarse. Sand sized fragments are fine to coarse.		0.20	154.14					
MADE GROUND: Grey sandy gravel and cobbles.Gravel and cobble sized fragments are subangular to subrounded fine to coarse of flint, brick and concrete. With an oily odour. Sand sized fragments are fine to coarse.		(0.20) 0.40	153.94	ES 1 0.30 B 2 0.30				
Firm brown slightly sandy gravelly silty clay. Gravel is subangular to subrounded fine to coarse of flint. Sand sized fragments are fine to medium. (RIVER TERRACE DEPOSIT)				B 3 0.60-1.00 ES 4 1.00 D 5 1.50 U 6 1.50-1.95 D 7 2.00 B 8 2.00-2.50	100	46 Blows, 89% Recovery		
Medium dense brown and cream very silty gravel. Gravel is subangular to subrounded fine to coarse of weak low density chalk and occasional flint. (RIVER TERRACE DEPOSIT) at 2.50m driller noted slight smell of diesel		(2.10) 2.50	151.84	ES 10 2.50 B 11 2.50-3.00 D 9 2.50 D 12 3.00 D 13 3.00			SPT N=17 2.50 2.95	
Medium dense brown silty sandy GRAVEL. Gravel is subangular to subrounded fine to coarse of flint. Sand is fine to coarse. (RIVER TERRACE DEPOSIT)		(1.00) 3.50	150.84	ES 14 3.50 B 15 3.50-4.00			SPT N=13 3.50 3.95	
Cream CHALK. Recovered as slightly gravelly SILT. Gravel is subangular to subrounded fine to coarse of weak medium density chalk and occasional flint. (WHITE CHALK SUBGROUP)		(0.50) 4.00	150.34	D 16 4.00 B 17 4.20-4.70 UF 4.50-4.70 D 18 4.70 B 19 4.70-5.20	100	23 Blows, 0% Recovery	SPT N=12 4.70 5.15	

NOTES: All depths in metres, all diameters in millimetres.
See header sheet for details of boring, progress and water.
For details of abbreviations, see key

Log Print Date And Time: 09/09/2014 08:46:14

Project Name	Croxley Rail Link, Stage 1	Exploratory Hole Log	Hole ID.
Project No.	TB7219		BH102
Engineer	Arup		
Employer	Taylor Woodrow Construction Ltd		Sheet 2 of 9

Ground Level	154.34m TD	Coordinates	59309.77 X, 51246.03 Y Local Grid
Hole Type	IP+CP+RC	Inclination	Vertical

Description of Strata	Legend	Depth (Thickness)	Datum Level	Sampling Details	Dia.	Blow Count And Sample Recovery TCR	SCR	RQD	IF	In Situ Test Details	Install-ation
Cream CHALK. Recovered as slightly gravelly SILT. Gravel is subangular to subrounded fine to coarse of weak medium density chalk and occasional flint. (WHITE CHALK SUBGROUP)				U 20 6.00-6.45	100	32 Blows, 56% Recovery					
		(4.50)		D 21 6.50 B 22 6.50-7.50							
				D 23 7.50 B 24 7.50-8.00						SPT N=1 7.50	
										7.95	
Cream CHALK. Recovered as silty gravel and cobbles. Gravel and cobbles are subrounded to subangular fine to coarse of weak medium density chalk.		8.50	145.84	D 25 8.50							
				UF 9.00-9.50 B 26 9.00-9.50	100	20 Blows, 0% Recovery					
				D 27 9.50 B 28 9.50-10.00						SPT N=10 9.50	
										9.95	

NOTES: All depths in metres, all diameters in millimetres.
See header sheet for details of boring, progress and water.
For details of abbreviations, see key

Log Print Date And Time: 09/09/2014 08:46:16

Project Name	Croxley Rail Link, Stage 1	Exploratory Hole Log	Hole ID.
Project No.	TB7219		BH102
Engineer	Arup		
Employer	Taylor Woodrow Construction Ltd		Sheet 3 of 9

Ground Level	154.34m TD	Coordinates	59309.77 X, 51246.03 Y Local Grid
Hole Type	IP+CP+RC	Inclination	Vertical

Description of Strata	Legend	Depth (Thickness)	Datum Level	Sampling Details	Sampling Dia.	Blow Count And Sample Recovery TCR	SCR	RQD	IF	In Situ Test Details	Install-ation
Cream CHALK. Recovered as silty gravel and cobbles. Gravel and cobbles are subrounded to subangular fine to coarse of weak medium density chalk.		(3.70)									
at 10.50m slight brown/orange staining				D 29 10.50							
				U 30 11.00-11.45	100	39 Blows, 100% Recovery					
				D 31 11.50							
				D 32 12.00							
Structureless CHALK. Composed of stiff cream very gravelly SILT. Clasts are subangular to subrounded fine to coarse extremely weak to very weak low density white chalk with occasional iron staining. Abundant subangular coarse gravel sized fragments of rinded (<1-3mm) flint. ((WHITE CHALK SUBGROUP, Grade Dm)		12.20	142.14	12.20 12.40	107	100	20	0			
from 12.40m to 12.66m recovered as subangular cobbles of flint (full diameter core 12.55m to 12.65m)				12.40 12.80	107	65	0	0			
from 12.66m to 12.80m assumed zone of core loss										SPT N=10 12.80	
				12.80 13.40	107	47	0	0		13.25	
from 13.40m to 13.50m recovered as angular to subangular coarse gravel sized fragments of rinded (1-3mm) flint											
from 13.50m to 14.40m assumed zone of core loss		(2.77)		13.40 14.40	107	10	0	0	NA		
from 14.40m to 14.48m 1 No subangular to subrounded cobble sized fragment of rinded (<1mm) flint											
from 14.54m to 14.60m 1 No subangular coarse gravel sized fragment of weak to medium strong medium density white stained occasionally stained brown chalk				14.40 14.90	107	40	16	0			
from 14.60m to 14.90m assumed zone of core loss										SPT N=10 14.90	
		14.97	139.37								

NOTES: All depths in metres, all diameters in millimetres.
See header sheet for details of boring, progress and water.
For details of abbreviations, see key

Log Print Date And Time: 09/09/2014 08:46:17

SOIL engineering

Project Name	Croxley Rail Link, Stage 1	Exploratory Hole Log	Hole ID.
Project No.	TB7219		BH102
Engineer	Arup		
Employer	Taylor Woodrow Construction Ltd		Sheet 4 of 9

Ground Level	154.34m TD	Coordinates	59309.77 X, 51246.03 Y Local Grid
Hole Type	IP+CP+RC	Inclination	Vertical

Description of Strata	Legend	Depth (Thickness)	Datum Level	Sampling Details	Sampling Dia.	Blow Count And Sample Recovery TCR	SCR	RQD	IF	In Situ Test Details	Install-ation
12.20m - 14.97m : Remaining Detail : 14.90m - 14.97m : from 14.90m to 14.97m 1 No subangular cobble sized fragment of rinded (1mm) flint (full diameter core)		(0.38)		14.90 15.40	107	70	8	0		15.35	
14.97m - 15.35m : Structureless CHALK. Composed of slightly silty slightly sandy angular to subangular fine to coarse GRAVEL. Clasts are very weak to weak cream chalk with frequent reddish orange staining (up to medium gravel sized). Occasional subangular to subrounded fine to medium gravel sized fragments of rinded and partially rinded (<1mm) flints. (SEAFORD / NEWHAVEN CHALK FORMATION, Grade Dc)		15.35	138.99								
Assumed zone of core loss.		15.50	138.84	15.40 15.90	107	20	0	0			
Recovered as: Black angular to subrounded fine to coarse GRAVEL sized fragments of black flints occasionally rinded (<3mm). (WHITE CHALK SUBGROUP) from 16.00m to 16.40m assumed zone of core loss		(0.90)		15.90 16.40	107	20	0	0			
Very weak to weak low to medium density white with occasional fine to medium gravel sized patches of orange staining CHALK. Discontinuities are horizontal to subvertical (0-88 degrees) extremely closely to medium spaced (NI/80/230) planar and stepped open and infilled (<1/2/3) with frequent black specks and occasional orangish brown staining. Occasional angular to subangular fine to coarse gravel sized fragments of black flints and rinded flints. Rare thin to thick interlaminations of grey marls. (WHITE CHALK SUBGROUP, Grade B3)		16.40	137.94	16.40 16.90	107	24	0	0		SPT(C) N=18 16.90	
from 16.40m to 16.52m flints are abundant. Chalk is recovered as extremely weak from 16.52m to 16.90m assumed zone of core loss from 16.90m to 17.10m flints are abundant. Recovered as silty subangular to subrounded fine to coarse gravel. Gravel is extremely weak to very weak low density chalk from 17.45m to 17.50m undulating smooth possibly drilling induced discontinuity from 17.50m to 17.90m assumed zone of core loss				16.90 17.90	107	40	10	0		17.35	
from 17.90m to 17.95m recovered as non intact core (slightly silty angular to subangular fine to coarse gravel) from 18.13m to 18.23m 1 No subvertical (80 degrees) discontinuity planar open <1mm with occasional to frequent black specks from 18.23m to 18.40m and 18.70m to 19.05m recovered as non intact core (slightly silty angular to subangular fine to coarse gravel. Gravel is very weak medium density chalk)				17.90 18.90	107	100	80	33			
from 19.10m to 19.35m very closely to closely spaced thin to thick interlaminations of wispy grey marls from 19.35m to 19.55m recovered as non intact core (angular fine to coarse gravel. Gravel is very weak medium density chalk) from 19.50m silty from 19.57m to 19.61m 30 degrees very thin bed angular to subangular medium to coarse gravel sized fragments of rinded flint from 19.61m to 19.79m 1 No subvertical clean tight				18.90 20.30	107	96	34	16			

NOTES: All depths in metres, all diameters in millimetres.
See header sheet for details of boring, progress and water.
For details of abbreviations, see key

Log Print Date And Time: 09/09/2014 08:46:19

Project Name	Croxley Rail Link, Stage 1	Exploratory Hole Log	Hole ID.
Project No.	TB7219		BH102
Engineer	Arup		
Employer	Taylor Woodrow Construction Ltd		Sheet 5 of 9

Ground Level	154.34m TD	Coordinates	59309.77 X, 51246.03 Y Local Grid
Hole Type	IP+CP+RC	Inclination	Vertical

Description of Strata	Legend	Depth (Thickness)	Datum Level	Sampling Details	Sampling Dia.	Blow Count And Sample Recovery TCR	SCR	RQD	IF	In Situ Test Details	Install-ation
Remaining Detail : 19.61m - 19.79m : (probably drilling/flint induced) discontinuity Detail 19.79m - 20.25m : from 19.79m to 20.25m recovered as non intact core (slightly silty angular to subangular fine to coarse gravel. Gravel is very medium density chalk) from 20.25m to 20.30m assumed zone of core loss from 20.30m to 20.40m recovered as non intact core (slightly silty angular to subrounded fine to coarse gravel. Gravel is very weak to weak medium density chalk) from 20.75m to 20.90m abundant medium gravel sized patches of orange staining				20.30 21.80	107	100	67	47			
from 21.15m to 21.60m recovered as non intact core (slightly sandy angular to subangular fine to coarse gravel. Gravel is very weak to weak medium density white chalk) (possibly flint/drilling induced) at 21.60m and 21.65m 2 No horizontal planar rough discontinuities (probably drilling induced) from 21.80m to 21.86m recovered as non intact core (slightly silty angular to subrounded fine to coarse gravel. Gravel is very weak low to medium density white chalk) from 22.10m to 22.17m recovered as non intact core (slightly silty subangular to subrounded fine to coarse gravel. Gravel is very weak medium density white chalk) from 22.17m to 22.35m flints are abundant. Recovered as very gravelly silt (flint induced). Gravel is angular to subangular fine to medium of extremely weak to very weak low density white chalk from 22.50m to 22.80m 1 No planar smooth open (1mm) clay smeared with occasional black specks on discontinuity surface				21.80 23.30	107	97	52	0			
from 23.10m to 23.25m recovered as non intact core (angular fine to coarse gravel. Gravel is weak medium density white chalk) from 23.47m to 24.00m recovered as non intact core (slightly sandy angular fine to coarse gravel. Gravel is weak medium density white chalk. Occasional angular to subangular fine to coarse black flint) at 24.37m frequent fine to medium gravel sized patches of orange staining from 24.65m to 24.80m recovered as non intact core (angular to subrounded fine to coarse gravel. Gravel is very weak medium density white chalk)				23.30 24.80	107	100	53	0			

NOTES: All depths in metres, all diameters in millimetres.
See header sheet for details of boring, progress and water.
For details of abbreviations, see key

Log Print Date And Time: 09/09/2014 08:46:21

SOIL engineering
Part of the Bachy Soletanche Group

Project Name	Croxley Rail Link, Stage 1	Exploratory Hole Log	Hole ID.
Project No.	TB7219		BH102
Engineer	Arup		
Employer	Taylor Woodrow Construction Ltd		Sheet 6 of 9

Ground Level	154.34m TD	Coordinates	59309.77 X, 51246.03 Y Local Grid
Hole Type	IP+CP+RC	Inclination	Vertical

Description of Strata	Legend	Depth (Thickness)	Datum Level	Sampling Details	Sampling Dia.	Blow Count And Sample Recovery TCR	SCR	RQD	IF	In Situ Test Details	Install-ation
Remaining Detail : 24.80m - 25.05m : from 24.80m to 25.05m recovered as non intact core (gravelly silt. Frequent angular fine to coarse gravel sized fragments of black flint. (Flint induced). Gravel is subangular to subrounded fine to medium extremely weak to very weak low to medium density white chalk) from 25.05m to 25.40m 1 No subvertical (80 degrees) planar rough closed clean discontinuity (probably drilling induced) from 25.45m to 25.63m 1 No 60 degrees planar rough open (<1mm) with occasional to frequent black specks on discontinuity surface from 25.65m to 25.77m 2 No 55 degrees planar rough open (<1mm) with occasional orange staining and occasional black specks on discontinuity surfaces from 25.80m to 26.50m recovered as non intact core (subangular to subrounded fine to coarse gravel and subrounded cobbles. Gravel and cobbles are very weak medium density white chalk)				24.80 26.30	107	100	61	0		
from 26.65m to 26.70m 1 No coarse gravel sized patch of orange staining from 26.70m to 29.00m chalk is cream from 26.90m to 27.25m discontinuities are randomly orientated (subhorizontal/45/60/80) extremely closely spaced planar open (<1mm) clean (possibly drilling induced). Occasional medium gravel sized patches of orange staining and occasional thin streaks (1-2mm thick) of orangish brown staining from 27.35m to 27.65m recovered as non intact core (soft gravelly silt. Gravel is subangular to subrounded fine to coarse extremely weak to very weak low density cream chalk. Rare angular to subangular fine to coarse gravel sized fragments of partially rinded flint) from 27.65m to 27.80m assumed zone of core loss from 27.74m to 27.80m 1 No subangular to subrounded cobble sized fragment of horned rinded (1mm) flint				26.30 27.80	107	90	42	0		
from 27.80m to 27.90m recovered as non intact core (slightly silty angular to subrounded fine to coarse gravel. Gravel is very weak low to medium density cream chalk. Rare angular fine to medium gravel sized fragments of partially rinded flint (1mm)) from 27.93m to 28.67m discontinuities are 60-75 degrees very closely to closely spaced planar smooth open (<1mm) with occasional to frequent black specks on discontinuity surfaces at 28.67m thin band (2-3mm thick) of partially rinded (<1mm) flint from 28.75m to 29.35m recovered as non intact core (slightly sandy angular fine to coarse gravel. Gravel is very weak low to medium density white chalk. Rare angular medium gravel sized fragments of black flint and partially rinded (<1mm) flint)				27.80 29.30	107	98	57	0		
from 29.35m with very closely to closely spaced thin to thick interlaminations and occasional wispy (1mm) of grey marls											

NOTES: All depths in metres, all diameters in millimetres.
See header sheet for details of boring, progress and water.
For details of abbreviations, see key

Log Print Date And Time: 09/09/2014 08:46:22

Project Name	Croxley Rail Link, Stage 1	Exploratory Hole Log	Hole ID.
Project No.	TB7219		BH102
Engineer	Arup		
Employer	Taylor Woodrow Construction Ltd		Sheet 7 of 9

Ground Level	154.34m TD	Coordinates	59309.77 X, 51246.03 Y Local Grid
Hole Type	IP+CP+RC	Inclination	Vertical

Description of Strata	Legend	Depth (Thickness)	Datum Level	Sampling Details	Sampling Dia.	Blow Count And Sample Recovery TCR	SCR	RQD	IF	In Situ Test Details	Install-ation
Remaining Detail : 29.85m - 29.95m : from 29.85m to 29.95m recovered as non intact core (angular to subangular fine to coarse gravel. Gravel is very weak medium density white chalk)				29.30 30.80	107	100	57	9			
Detail 29.95m - 30.10m : from 29.95m to 30.10m 3 No subangular to subrounded coarse gravel sized fragments of rinded (<1mm) flint											
from 30.10m to 30.75m recovered as non intact core (angular to subangular fine to coarse gravel and occasional cobbles of very weak low to medium density chalk). (Recovered non intact due to 2 No 80 degrees planar rough discontinuities with occasional to frequent black specks on discontinuity surfaces/flint above). Occasional light grey staining at 30.50m occasional thin streaks (<1-2mm) of dark orange staining		(28.60)							NI 80 230		
from 30.75m to 31.40m recovered as non intact core (slightly silty subangular to subrounded gravel. Gravel is extremely weak to very weak low to medium density white chalk. Rare angular to subangular fine to coarse gravel sized fragments of black flints and partially rinded flints)											
at 31.25m 1 No coarse gravel sized shell fossil											
from 31.40m to 32.30m assumed zone of core loss				30.80 32.30	107	40	13	0			
from 32.30m to 32.63m recovered as non intact core (subangular to subrounded fine to coarse gravel of white occasionally stained light orangish brown strong high density chalk. Occasional subangular medium to coarse gravel sized fragments of partially rinded (<1mm) flint) (possible phosphate content)											
from 32.63m to 32.70m 1 No subangular cobble sized fragment of rinded (1mm) flint				32.30 33.30	107	46	0	0			
from 32.70m to 32.76m recovered as non intact core (subangular to subrounded fine to coarse gravel. Gravel is weak to medium strong medium to high density occasional to frequent of tabular (10mm) rinded (<1mm) and subrounded gravel sized fragments. Possible 10mm thick bed of light grey marl)											
from 32.76m to 33.30m assumed zone of core loss											
from 33.30m to 33.62m recovered as non intact core (very silty angular to subrounded fine to coarse gravel. Gravel is very weak to weak medium density white chalk. Rare angular to subangular fine to coarse gravel sized fragments of black flint and partially rinded (1mm) flint)											
from 33.62m to 33.80m assumed zone of core loss											
from 33.80m to 34.13m recovered as non intact core (silty angular to subrounded fine to coarse gravel. Gravel is very weak to weak medium density white chalk. Abundant angular to subangular fine to coarse gravel sized fragments of black flint and rinded (<1mm) flint)				33.30 34.50	107	64	0	0		SPT(C) 65/300mm 33.80 34.19	
from 34.13m to 34.20m subangular to subrounded cobble sized fragments of rinded (<1mm) flint											
from 34.20m to 34.50m assumed zone of core loss											
from 34.50m to 34.70m recovered as non intact core (slightly sandy angular to subrounded fine to coarse gravel. Gravel is very weak to weak medium density white chalk. Occasional angular to subangular coarse gravel sized fragments of partially rinded (<1mm))											
from 34.70m to 35.50m very closely spaced thin to thick											

NOTES: All depths in metres, all diameters in millimetres.
See header sheet for details of boring, progress and water.
For details of abbreviations, see key

Log Print Date And Time: 09/09/2014 08:46:24

Project Name	Croxley Rail Link, Stage 1	Exploratory Hole Log	Hole ID.
Project No.	TB7219		BH102
Engineer	Arup		
Employer	Taylor Woodrow Construction Ltd		Sheet 8 of 9

Ground Level	154.34m TD	Coordinates	59309.77 X, 51246.03 Y Local Grid
Hole Type	IP+CP+RC	Inclination	Vertical

Description of Strata	Legend	Depth (Thickness)	Datum Level	Sampling Details	Sampling Dia.	Blow Count And Sample Recovery TCR	SCR	RQD	IF	In Situ Test Details	Install-ation
Remaining Detail : 34.70m - 35.50m : interlaminations of light grey marls Detail 34.90m - 35.00m : from 34.90m to 35.00m and 35.37m to 35.50m recovered as non intact core (angular fine to coarse gravel. Gravel is very weak to weak medium density white chalk and very weak grey marls) from 35.50m to 36.35m recovered as non intact core (slightly sandy angular to subangular fine to coarse gravel. Gravel is very weak to weak low to medium density white chalk and occasionally very weak light grey marl. Rare angular medium to coarse gravel sized fragments of partially rinded (1mm) flint)				34.50 36.00	107	98	47	0		
from 36.10m to 36.15m recovered as silty from 36.35m to 36.65m very closely spaced thin interlaminations (<2mm) of wispy light grey marls from 36.45m to 36.65m recovered as non intact core (subangular fine to medium gravel. Gravel is very weak to weak low to medium density chalk and light grey marls) from 36.65m to 37.00m assumed zone of core loss				36.00 37.00	107	65	21	0		
from 37.00m to 37.40m recovered as slightly silty slightly sandy subangular to subrounded fine to coarse gravel. Gravel is very weak to weak low to medium density white chalk from 37.40m to 37.55m recovered as non intact core (subangular to subrounded medium to coarse gravel. Gravel is weak to medium strong medium to high density white chalk occasional orange staining and rare black specks) from 37.55m to 37.60m 1 No very thin bed of angular to subangular coarse gravel sized fragments of partially rinded flint from 37.60m to 38.00m assumed zone of core loss				37.00 38.00	107	70	0	0		
from 38.00m to 38.10m recovered as non intact core (slightly sandy subangular to subrounded fine to coarse gravel. Gravel is very weak low medium density chalk) from 38.10m to 38.47m 1 No curviplanar stepped open (<1mm) stained grey and occasionally light orange discontinuity				38.00 38.50	107	100	74	0		
from 38.47m to 38.70m recovered as non intact core (slightly silty slightly sandy angular to subangular fine to coarse gravel. Gravel is very weak low density white occasionally stained grey chalk) from 38.70m to 39.05m recovered as non intact core (slightly sandy subangular to subrounded fine to coarse (predominantly coarse) gravel with occasional cobbles. Gravel (and cobbles) to very weak low to medium density white occasionally stained grey chalk) from 39.05m to 39.50m assumed zone of core loss				38.50 39.50	107	45	27	0		SPT N=27 38.50 38.95
from 39.50m to 39.65m recovered as non intact core (angular to subangular fine to coarse gravel. Gravel is very weak low to medium density white occasionally stained light grey and orange chalk) from 39.65m to 39.75m subangular to subrounded cobble of rinded (1mm) flint				39.50 40.00	107	100	44	0		

NOTES: All depths in metres, all diameters in millimetres.
See header sheet for details of boring, progress and water.
For details of abbreviations, see key

Log Print Date And Time: 09/09/2014 08:46:25

SOIL ENGINEERING
Part of the Bachy Soletanche Group

Project Name	Croxley Rail Link, Stage 1	Exploratory Hole Log	Hole ID.
Project No.	TB7219		BH102
Engineer	Arup		
Employer	Taylor Woodrow Construction Ltd		Sheet 9 of 9

Ground Level	154.34m TD	Coordinates	59309.77 X, 51246.03 Y Local Grid
Hole Type	IP+CP+RC	Inclination	Vertical

Description of Strata	Legend	Depth (Thickness)	Datum Level	Sampling Details	Sampling Dia.	Blow Count And Sample Recovery TCR	SCR	RQD	IF	In Situ Test Details	Install-ation
Remaining Detail : 39.75m - 40.56m : from 39.75m to 40.56m recovered as non intact core (slightly sandy angular to subrounded fine to coarse gravel. Gravel is very weak low density white chalk occasional orange and grey staining and striated marls)				40.00 41.00	107	96	63	0			
from 40.56m to 40.71m 1 No thin bed of very weak grey marl from 40.60m to 40.68m marl weathered to a firm to stiff clay with occasional to frequent medium gravel sized pockets of orangish brown staining											
from 41.17m to 41.20m, 41.30m to 41.40m and 41.56m to 41.64m recovered as non intact core (slightly sandy subangular to subrounded fine to coarse gravel. Gravel is very weak low to medium density white occasionally stained grey chalk)				41.00 42.50	107	89	59	26			
from 42.34m to 42.50m assumed zone of core loss											
from 43.14m to 43.26m 1 No 45 degrees planar smooth tight clean discontinuity (probably drilling induced)				42.50 44.00	107	100	73	23			
from 43.80m to 44.00m recovered as non intact core (slightly sandy angular to subrounded fine to coarse gravel. Gravel is extremely weak to weak low to medium density white chalk and occasional light grey marls) from 44.00m to 44.40m recovered as non intact core (clayey (completely weathered marls) slightly sandy slightly silty angular to subrounded gravel. Gravel is extremely weak to very weak low to medium density white chalk and occasional light grey marls)				44.00 45.00	107	100	42	0			
from 44.75m to 45.00m recovered as non intact core (slightly sandy angular to subangular fine to coarse											

NOTES: All depths in metres, all diameters in millimetres.
See header sheet for details of boring, progress and water.
For details of abbreviations, see key

Log Print Date And Time: 09/09/2014 08:46:28

Project Name	Croxley Rail Link, Stage 1	Exploratory Hole Log	Hole ID.
Project No.	TB7219		BH102
Engineer	Arup		
Employer	Taylor Woodrow Construction Ltd		Sheet 9+ of 9

Ground Level	154.34m TD	Coordinates	59309.77 X, 51246.03 Y Local Grid
Hole Type	IP+CP+RC	Inclination	Vertical

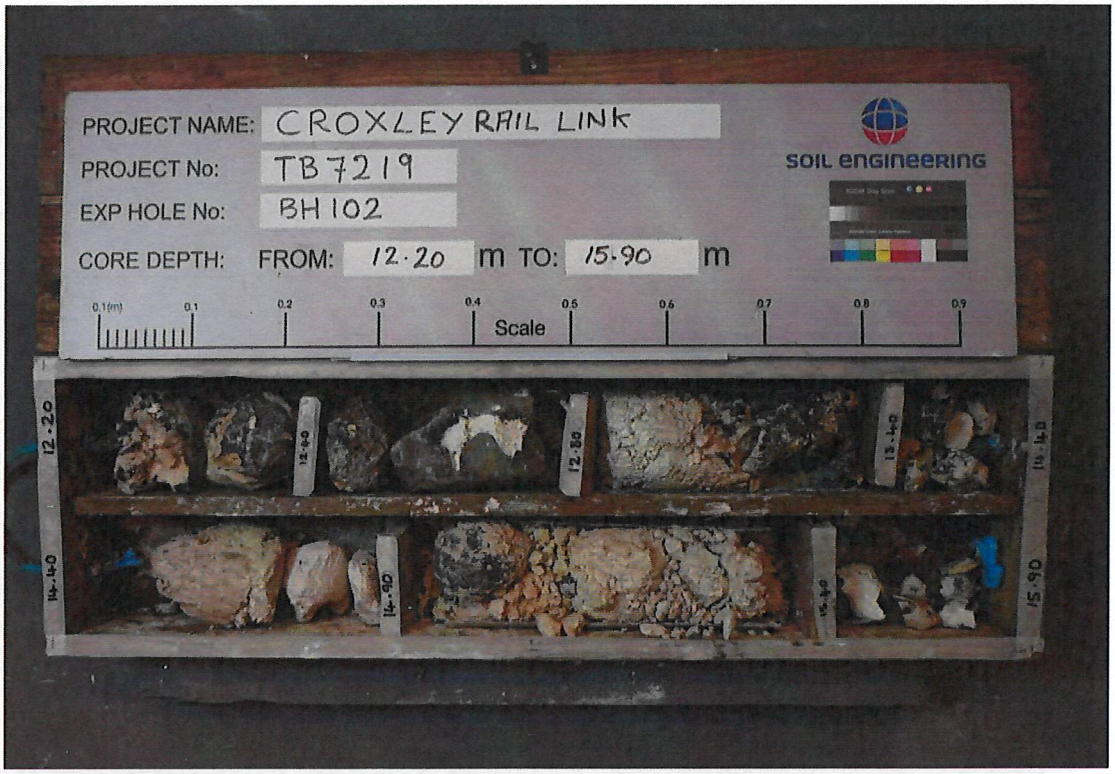
Description of Strata	Legend	Depth (Thickness)	Datum Level	Sampling		Blow Count And Sample Recovery				In Situ Test Details	Install-ation
				Details	Dia.	TCR	SCR	RQD	IF		
Remaining Detail : 44.75m - 45.00m : gravel. Gravel is very weak low to medium density white chalk and occasional light grey marls)		45.00	109.34								
Exploratory hole complete at 45.00 m.											

NOTES: All depths in metres, all diameters in millimetres.
See header sheet for details of boring, progress and water.
For details of abbreviations, see key

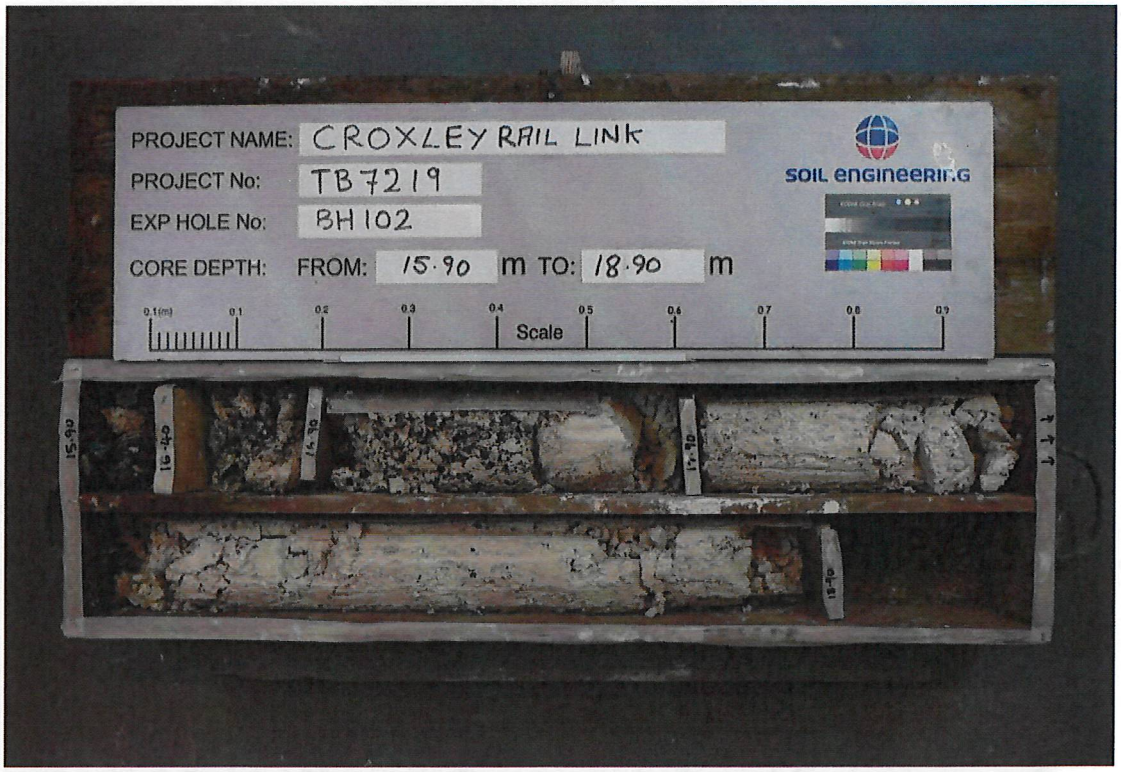
Log Print Date And Time: 09/09/2014 08:46:29

SOIL ENGINEERING
Part of the Bachy Soletanche Group

Project Name	Croxley Rail Link, Stage 1	**Photographic Record**	Hole ID
Project No.	TB7219		BH102
Engineer	Ove Arup and Partners		Plate No.
Employer	Vinci Construction UK Limited		01



Box 1



Box 2

Photographed by	Date photographed	BH102_12.20 to 15.90m	SOIL ENGINEERING
	27/11/2014	BH102_15.90 to 18.90m	
Form No. SE-SDP-F-005	IssueNo.RevisionNo 2.04	Issue Date 05/11/2012	Part of the Bachy Soletanche Group

Project Name	Croxley Rail Link, Stage 1	**Photographic Record**	Hole ID
Project No.	TB7219		BH102
Engineer	Ove Arup and Partners		Plate No.
Employer	Vinci Construction UK Limited		02

Box 3

Box 4

Photographed by	Date photographed	BH102_18.90 to 20.90m	SOIL ENGINEERING
	27/11/2014	BH102_20.90 to 22.80m	
Form No. SE-SDP-F-005	IssueNo.RevisionNo 2.04	Issue Date 05/11/2012	Part of the Bachy Soletanche Group

Project Name	Croxley Rail Link, Stage 1	**Photographic Record**	Hole ID
Project No.	TB7219		BH102
Engineer	Ove Arup and Partners		Plate No.
Employer	Vinci Construction UK Limited		03

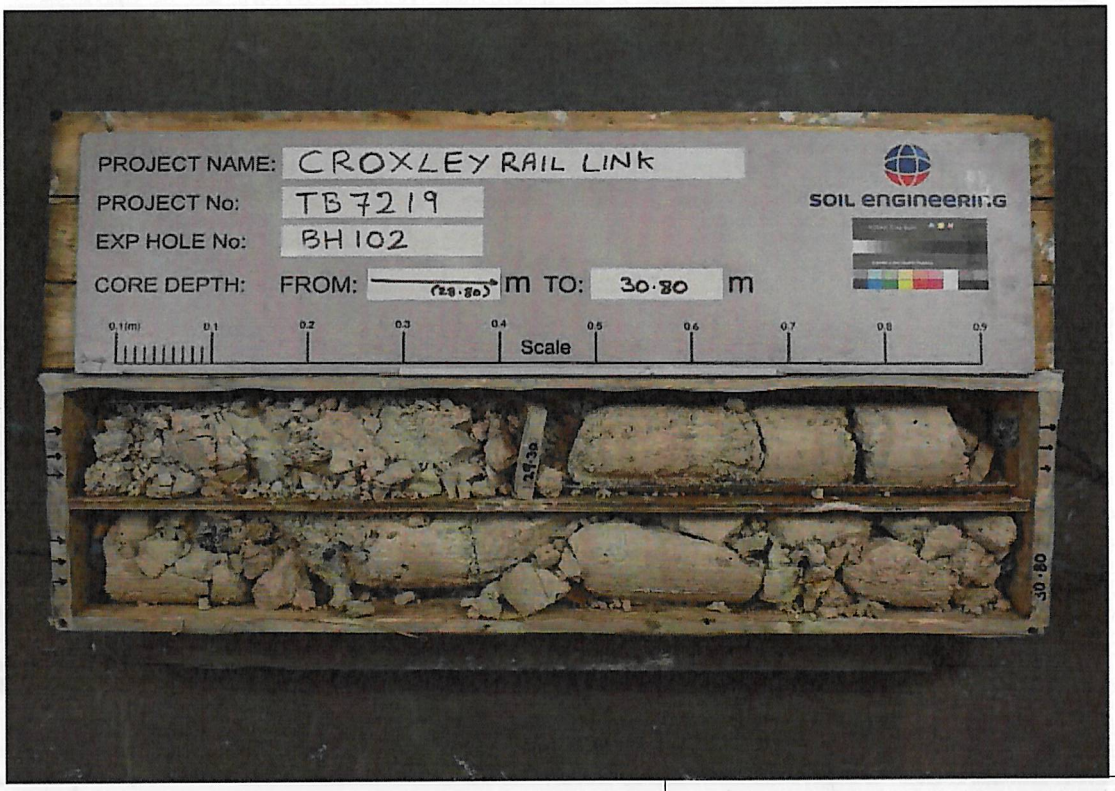
Box 5

Box 6

Photographed by	Date photographed	BH102_22.80 to 24.80m	SOIL ENGINEERING
	27/11/2014	BH102_24.80 to 26.80m	
Form No. SE-SDP-F-005	IssueNo.RevisionNo 2.04	Issue Date 05/11/2012	Part of the Bachy Soletanche Group

Project Name	Croxley Rail Link, Stage 1	**Photographic Record**	Hole ID
Project No.	TB7219		BH102
Engineer	Ove Arup and Partners		Plate No.
Employer	Vinci Construction UK Limited		04

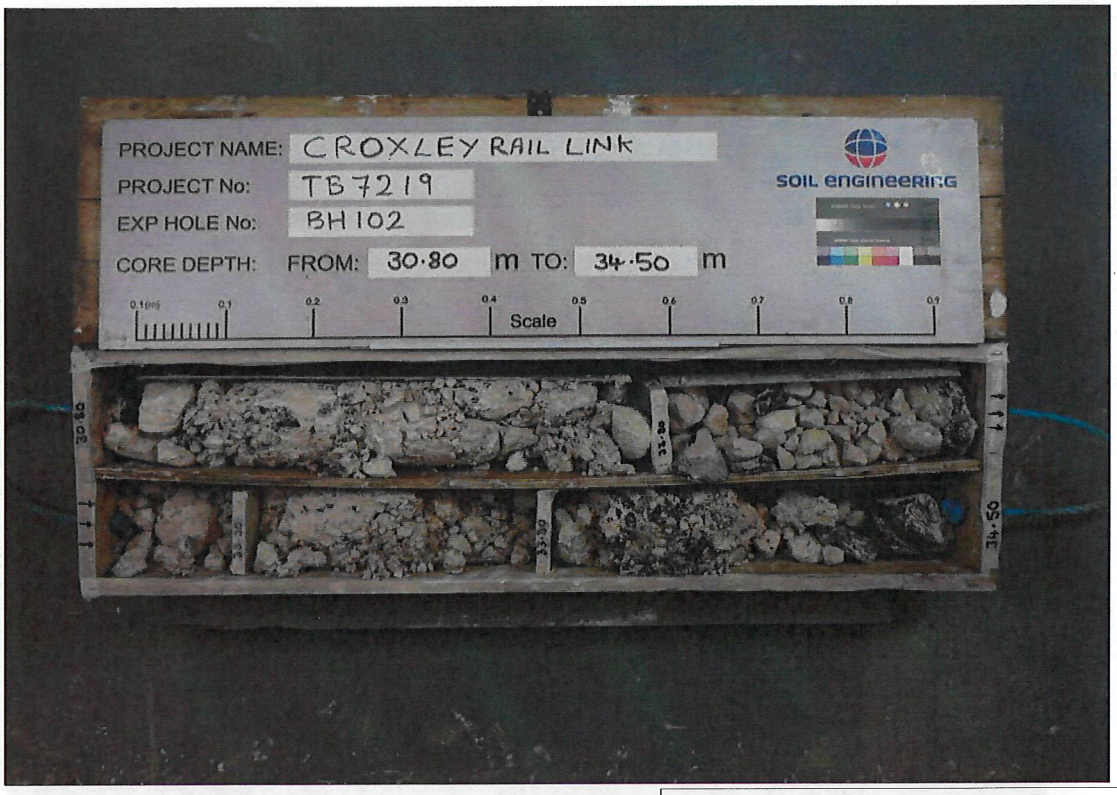
Box 7



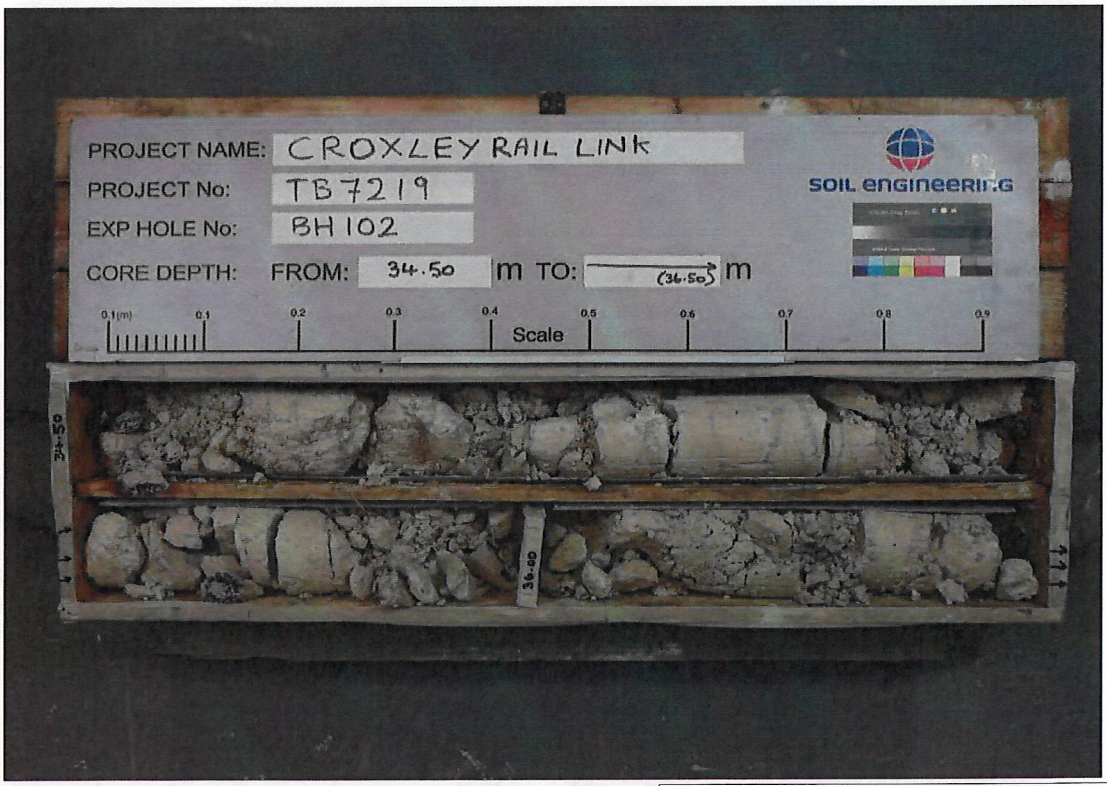
Box 8

Photographed by	Date photographed	BH102_26.80 to 28.80m	SOIL ENGINEERING
	27/11/2013	BH102_28.80 to 30.80m	
Form No. SE-SDP-F-005	IssueNo.RevisionNo 2.04	Issue Date 05/11/2012	Part of the Bachy Soletanche Group

Project Name	Croxley Rail Link, Stage 1	**Photographic Record**	Hole ID
Project No.	TB7219		BH102
Engineer	Ove Arup and Partners		Plate No.
Employer	Vinci Construction UK Limited		05



Box 9



Box 10

Photographed by	Date photographed	BH102_30.80 to 34.50m	SOIL ENGINEERING
	27/11/2013	BH102_34.50 to 36.50m	
Form No. SE-SDP-F-005	IssueNo.RevisionNo 2.04	Issue Date 05/11/2012	Part of the Bachy Soletanche Group

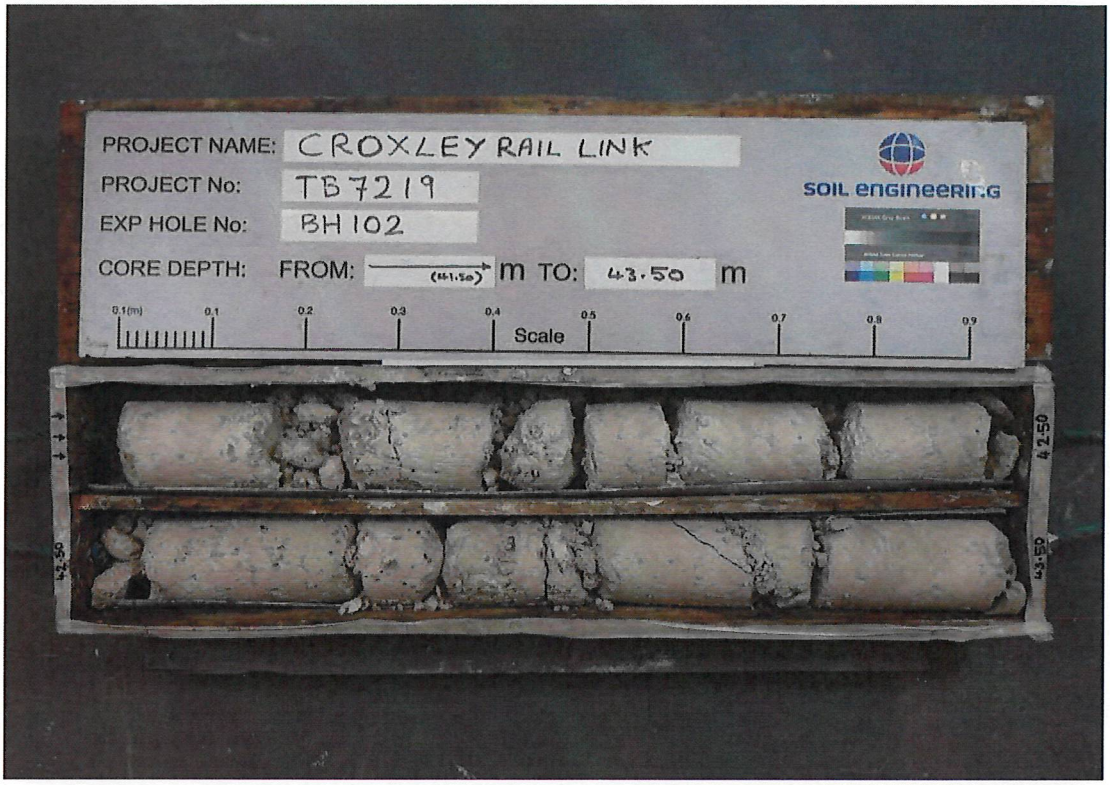
Project Name	Croxley Rail Link, Stage 1	**Photographic Record**	Hole ID
Project No.	TB7219		BH102
Engineer	Ove Arup and Partners		Plate No.
Employer	Vinci Construction UK Limited		06

Box 11

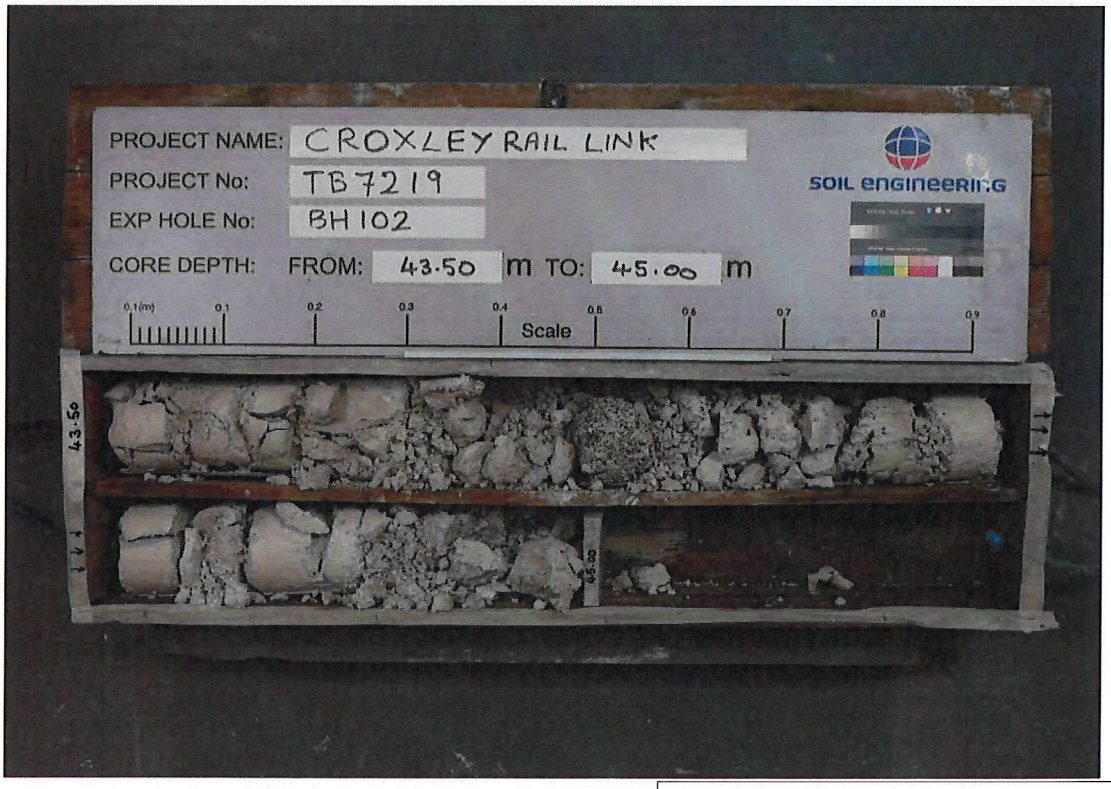
Box 12

Photographed by	Date photographed	BH102_36.50 to 39.50m	SOIL ENGINEERING
	27/11/2014	BH102_39.50 to 41.50m	
Form No. SE-SDP-F-005	IssueNo.RevisionNo 2.04	Issue Date 05/11/2012	Part of the Bachy Soletanche Group

Project Name	Croxley Rail Link, Stage 1	**Photographic Record**	Hole ID
Project No.	TB7219		BH102
Engineer	Ove Arup and Partners		Plate No.
Employer	Vinci Construction UK Limited		07

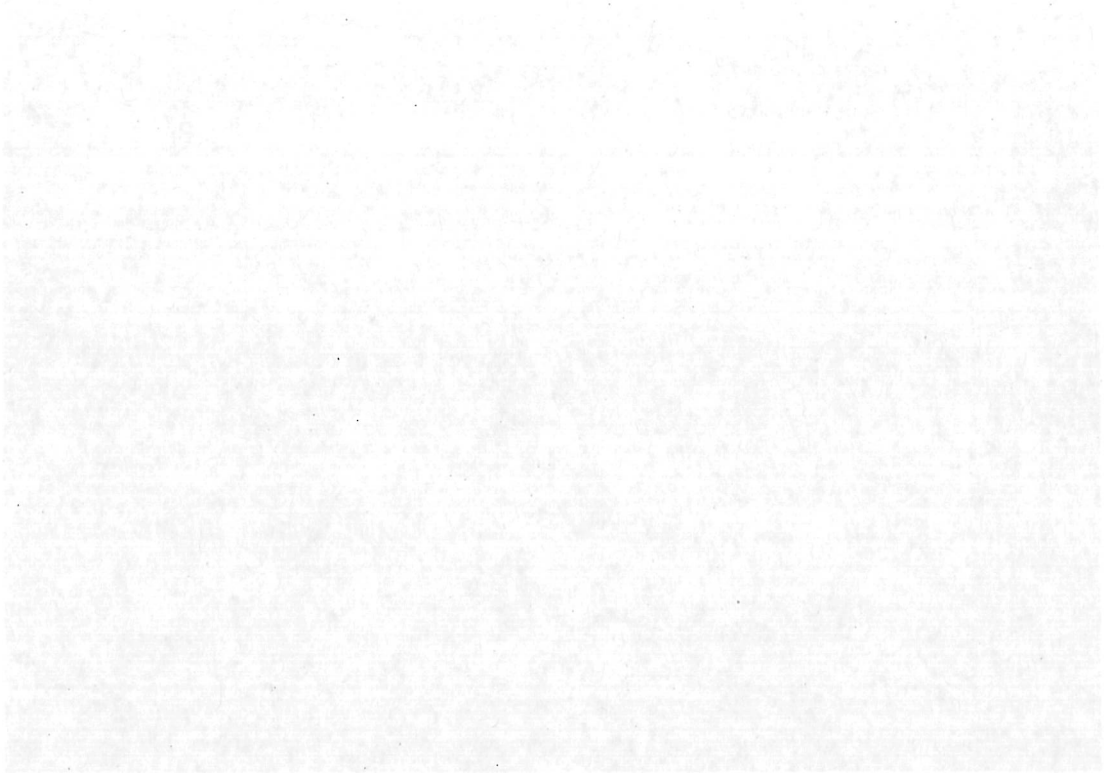


Box 13



Box 14

Photographed by	Date photographed	BH102_41.50 to 43.50m	SOIL ENGINEERING
	27/11/2014	BH102_43.50 to 45.00m	
Form No. SE-SDP-F-005	IssueNo.RevisionNo 2.04	Issue Date 05/11/2012	Part of the Bachy Soletanche Group



Project Name	Croxley Rail Link, Stage 1	Exploratory Hole Log	Hole ID.
Project No.	TB7219		RO101
Engineer	Arup		
Employer	Taylor Woodrow Construction Ltd		Header

Ground Level	154.69m TD	Coordinates	59299.87 X, 51232.58 Y Local Grid
Date Started	18/11/2013	Date Completed	26/11/2013
Inclination	Vertical		

Top	Base	Type	Date Started	Date Ended	Crew	Section Logged By	Core Barrel	Core Bit	Equipment	Shoring / Support	Remarks
0.00	1.20	IP	06/11/2013	06/11/2013	JK	IM			Hand Tools		
1.20	14.40	CP	13/11/2013	14/11/2013	DA	EC			Dando 3000		
14.40	34.75	CP	18/11/2013	26/11/2013	GC	EC			Dando 3000		

PROGRESS

Date	Time	Hole depth	Casing depth	Water depth	Remarks
06/11/2013	0730	0.00	0.00	DRY	Start of Hole
06/11/2013	1430	1.20	0.00	DRY	End of IP
13/11/2013	0730	1.20	0.00	DRY	Start of CP
13/11/2013	1900	9.90	9.90	5.10	End of Shift
14/11/2013	0730	9.90	9.90	4.50	Start of Shift
14/11/2013	1730	14.40	12.20	4.10	End of Shift
18/11/2013	0730	14.40	12.20	3.00	Start of Shift
18/11/2013	1755	20.00	20.00	5.00	End of Shift
21/11/2013	1600	20.00	20.00	NR	Start of Shift
21/11/2013	1800	20.70	20.70	4.70	End of shift
22/11/2013	0730	20.70	20.70	3.30	Start of Shift
22/11/2013	1900	28.00	27.20	3.90	End of Shift
25/11/2013	1140	28.00	27.20	2.90	Start of Shift
25/11/2013	1725	34.75	27.20	3.50	End of Hole

WATER STRIKES

Date	Time	Strike at depth	Rise to depth	Time taken to rise	Casing depth at strike time	Casing depth to seal flow
13/11/2013		5.50	5.10	20	5.50	NS

CABLE PERCUSSION DETAILS

Hard Strata Depth from	Hard Strata Depth to	Chiselling Start time hhmm	Chiselling Duration hhmm	Remarks
10.60	10.80	0845	0030	Chiselling
14.00	14.40	1130	0100	Chiselling
14.70	14.90	0925	0045	Chiselling
20.00	20.20	1605	0030	Large flint
22.70	23.00	1000	0045	Chiselling
27.20	27.40	1400	0030	Chiselling
30.50	30.85	1005	0100	Chiselling
34.00	34.20	1400	0030	Chiselling

SPT DETAILS

Depth	Type	Incremental blow count / penetration in mm	Hammer No.	Energy ratio %	Casing depth	Water depth
1.50	SPT	N=7 (3,2,2,2,2,1)	AR356	73	1.50	DRY
3.40	SPT	N=5 (1,2,2,1,1,1)	AR356	73	3.40	DRY
6.40	SPT	N=5 (1,1,1,2,1,1)	AR356	73	6.40	5.00
9.40	SPT	N=6 (2,1,1,2,1,2)	AR356	73	9.40	5.00
12.40	SPT	N=15 (3,4,4,4,4,3)	AR356	73	12.20	5.00
15.00	SPT	N=23 (3,4,4,5,7,7)	AR356	73	15.00	5.50
18.00	SPT	N=48 (8,10,11,15,12,10)	AR356	73	18.00	5.50
21.00	SPT	N=29 (4,6,6,7,7,9)	AR356	73	20.75	4.50
24.00	SPT	N=32 (5,6,6,8,8,10)	AR356	73	22.70	3.70
27.00	SPT	N=62 (7,11,14,15,13,20)	AR356	73	25.70	3.90
30.00	SPT	100/280mm (12,13/65,23,30,32,15/55)	AR356	73	27.20	3.30
33.00	SPT	N=77 (9,10,16,18,21,22)	AR356	73	27.20	3.50
34.60	SPT	100/225mm (25,0,52,48,0,0)	AR356	73	27.20	3.50

* Seating blows only.

ROTARY FLUSH DETAILS

From depth	To depth	Flush type	Flush return %	Flush colour

HOLE DIAMETER / CASING

Hole diameter	Depth of hole	Casing diameter	Depth of casing
200	34.75	200	27.20

DYNAMIC SAMPLING

Top	Base	Diameter	Time hhmmss	Recovery %

INSTALLATION DETAILS

Distance from G.L.	ID	Type	Response zone Top	Response zone Base

PIPE CONSTRUCTION

ID	Pipe Top	Pipe Base	Dia. of pipe	Type of pipe

BACKFILL DETAILS

Top of section	Base of section	Material	Remarks
0.00	34.75	Bentonite	

DEPTH RELATED REMARKS

Top depth	Base depth	Remarks

GENERAL NOTES

NOTES: All depths in metres, all diameters in millimetres.
Water strike rise time in minutes, hard strata time in hhmm
For details of abbreviations, see key

Unchecked — Log Print Date And Time: 09/09/2014 08:34:50

Project Name	Croxley Rail Link, Stage 1	Exploratory Hole Log	Hole ID.
Project No.	TB7219		RO101
Engineer	Arup		
Employer	Taylor Woodrow Construction Ltd		Sheet 1 of 4

Ground Level	154.69m TD	Coordinates	59299.87 X, 51232.58 Y Local Grid
Hole Type	IP+CP	Inclination	Vertical

Description of Strata	Legend	Depth (Thickness)	Datum Level	Sampling Details	Dia.	Blow Count And Sample Recovery TCR / SCR / RQD	In Situ Test Details	Install-ation
TOPSOIL.		0.10	154.59					
MADE GROUND: Brown and black slightly silty gravelly sand. Gravel sized fragments are angular to subangular fine to medium of siliceous material with frequent roots and rootlets and rare glass. Sand is fine to medium.		(0.40)		B 1 0.30 ES 2 0.40				
		0.50	154.19					
Light brown and brown fine to medium SAND. (ALLUVIUM)		(0.70)		B 3 0.70 ES 4 0.80				
Firm orangish brown slightly sandy CLAY with traces of chalk. Sand is fine. (Possibly RIVER TERRACE DEPOSIT)		1.20	153.49	D 5 1.50-1.95			SPT N=7 1.50 1.95	
		(1.00)						
Firm orangish brown slightly sandy gravelly CLAY. Gravel is dark grey and orangish brown subangular to subrounded fine to coarse of flint. With are grey subangular cobble of flint. With traces of chalk. (RIVER TERRACE DEPOSIT)		2.20	152.49					
		(1.20)		D 6 2.80				
Light yellowish cream CHALK. Recovered as slightly sandy gravelly CLAY. Gravel is cream and dark grey subangular to subrounded fine to coarse of flint and weak low density chalk. With rare subangular cobble of flint. (SEAFORD / NEWHAVEN CHALK FORMATION)		3.40	151.29	D 7 3.40 D 8 3.40-3.85			SPT N=5 3.40 3.85	
at 4.90m chalk gravel weak low to medium density				D 9 4.90				
		(4.50)						
				D 10 6.40-6.85			SPT N=5 6.40 6.85	
Cream CHALK. Recovered as slightly clayey slightly sandy GRAVEL. Gravel is cream and dark grey angular to subrounded fine to coarse of flint and medium density chalk.		7.90	146.79	D 11 7.90				
				D 12 9.40-9.85			SPT N=6 9.40 9.85	

NOTES: All depths in metres, all diameters in millimetres.
See header sheet for details of boring, progress and water.
For details of abbreviations, see key

Unchecked

Log Print Date And Time: 09/09/2014 08:35:05

SOIL engineering
Part of the Bachy Soletanche Group

Project Name	Croxley Rail Link, Stage 1	Exploratory Hole Log	Hole ID.
Project No.	TB7219		RO101
Engineer	Arup		
Employer	Taylor Woodrow Construction Ltd		Sheet 2 of 4

Ground Level	154.69m TD	Coordinates	59299.87 X, 51232.58 Y Local Grid
Hole Type	IP+CP	Inclination	Vertical

Description of Strata	Legend	Depth (Thickness)	Datum Level	Sampling Details	Sampling Dia.	Blow Count And Sample Recovery TCR	SCR	RQD	In Situ Test Details	Install-ation
Cream CHALK. Recovered as slightly clayey slightly sandy GRAVEL. Gravel is cream and dark grey angular to subrounded fine to coarse of flint and medium density chalk.				B 13 10.60-10.80						
				D 14 10.90						
at 10.90m dark cream chalk gravel weak low to medium density										
				D 15 12.40-12.85					SPT N=15 12.40 12.85	
				D 16 13.90						
at 13.90m chalk gravel weak low to medium density				B 17 14.00-14.40						
				B 18 14.70-14.90						
from 14.70m to 14.90m 1 No dark grey (with partially rinded cream cortex) subangular boulder of flint				D 19 15.00-15.45					SPT N=23 15.00 15.45	
from 15.00m to 15.50m with frequent subangular cobbles of flint				B 20 15.00-15.50						
				D 21 16.50						
from 18.00m to 18.45m light yellowish cream				D 22 18.00-18.45					SPT N=48 18.00 18.45	
from 18.00m to 18.50m chalk gravel weak low density with subangular cobbles of weak low density chalk				B 23 18.00-18.50						
				D 24 19.50						

NOTES: All depths in metres, all diameters in millimetres.
See header sheet for details of boring, progress and water.
For details of abbreviations, see key

Unchecked Log Print Date And Time: 09/09/2014 08:35:07 -

Project Name	Croxley Rail Link, Stage 1	Exploratory Hole Log	Hole ID.
Project No.	TB7219		RO101
Engineer	Arup		
Employer	Taylor Woodrow Construction Ltd		Sheet 3 of 4

Ground Level	154.69m TD	Coordinates	59299.87 X, 51232.58 Y Local Grid
Hole Type	IP+CP	Inclination	Vertical

Description of Strata	Legend	Depth (Thickness)	Datum Level	Sampling Details	Dia.	Blow Count And Sample Recovery TCR / SCR / RQD	In Situ Test Details	Install-ation
Cream CHALK. Recovered as slightly clayey slightly sandy GRAVEL. Gravel is cream and dark grey angular to subrounded fine to coarse of flint and medium density chalk.								
from 21.00m to 21.50m becoming light yellowish cream chalk gravel and cobbles of weak low density		(26.85)		D 25 21.00-21.45 B 26 21.00-21.50			SPT N=29 21.00 21.45	
				D 27 22.50				
from 24.00m to 24.50m gravel of chalk weak low density				D 28 24.00-24.45 B 29 24.00-24.50			SPT N=32 24.00 24.45	
				D 30 25.50				
from 27.00m to 27.45m with frequent subangular cobbles of flint				D 31 27.00-27.45 B 32 27.00-27.50			SPT N=62 27.00 27.45	
				D 33 28.50				

NOTES: All depths in metres, all diameters in millimetres.
See header sheet for details of boring, progress and water.
For details of abbreviations, see key

Unchecked Log Print Date And Time: 09/09/2014 08:35:08

SOIL engineering
Part of the Bachy Soletanche Group

Project Name	Croxley Rail Link, Stage 1	Exploratory Hole Log	Hole ID.
Project No.	TB7219		RO101
Engineer	Arup		
Employer	Taylor Woodrow Construction Ltd		Sheet 4 of 4

Ground Level	154.69m TD	Coordinates	59299.87 X, 51232.58 Y Local Grid
Hole Type	IP+CP	Inclination	Vertical

Description of Strata	Legend	Depth (Thickness)	Datum Level	Sampling Details	Sampling Dia.	Blow Count And Sample Recovery TCR	SCR	RQD	In Situ Test Details	Install-ation
Cream CHALK. Recovered as slightly clayey slightly sandy GRAVEL. Gravel is cream and dark grey angular to subrounded fine to coarse of flint and medium density chalk.				D 34 30.00-30.42 B 35 30.00-30.50					SPT 100/280mm 30.00 30.42	
at 30.00m occasional orange staining 2mm thick				D 36 31.50						
				D 37 33.00-33.45 B 38 33.00-33.50					SPT N=77 33.00 33.45	
at 34.50m chalk fragments are medium strong and medium density				D 39 34.50					SPT 100/225mm 34.60 34.88	
		34.75	119.94							
Exploratory hole complete at 34.75 m.										

NOTES: All depths in metres, all diameters in millimetres.
See header sheet for details of boring, progress and water.
For details of abbreviations, see key

Unchecked Log Print Date And Time: 09/09/2014 08:35:08 -

SOIL ENGINEERING
Part of the Bachy Soletanche Group