

		C310 THAMES TUNNEL REPORT			
EMPLOYER	CROSSRAIL	eB NO	C310-HTM-C-RGN-CR148-50024	Rev	2.0
TITLE	Monitoring Close-Out Reports relating to Tunnelling Works North Embankment River Thames - North Woolwich Portal (excl. Store Rd)				

ORIGINATOR COMPANY NAME	Hochtief Murphy JV
-------------------------	--------------------

CMDL: C09.006

REVISION	DOCUMENT APPROVAL / REVISION RECORD DETAILS	DATE
1.0	Issued for acceptance	10/02/2015
2.0	DRS comments incorporated, Issued for CRL acceptance	17/04/2015

Stakeholder (.....) review required? Yes ... No ...

This document has been reviewed by in the capacity of for coordination, compliance, integration, and acceptance as a safe system of work, output, control, sequence. This document is acceptable for transmittal to for no objection to the works being executed as described.

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Review by Stakeholder (if required):

Stakeholder organization	Job Title	Name	Signature	Date	Acceptance

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REVIEWED BY: HMJV Construction Manager Print: _____ Sign: _____ Date: 17/04/2015	APPROVED BY: HMJV Project Director Print: _____ Sign: _____ Date: 17/04/2015

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EMPLOYER	CROSSRAIL	eB NO	C310-HTM-C-RGN-CR148-50024	Rev	2.0
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1.0 INTRODUCTION

The purpose of this report is to compile the individual Close-out reports which summarise the monitoring data from the instrumentation within a monitoring area or of an asset and relates it to the construction activities which have produced any observed movement changes.

The data that is presented within the body the individual Close-out report is summarised in a cover sheet. This forms the basis for which the associated monitoring instrumentation is to be decommissioned. The values, comments and conclusions presented in the cover sheet of the individual Close-out report are derived from the monitoring data attached to the individual close-out report.

The content of the Close-out reports complies with what is required as per C122 – M&W Specification KX10 – Instrumentation & Monitoring C122-OVE-Z4-RSP-CR001-00007 Rev.7.0.

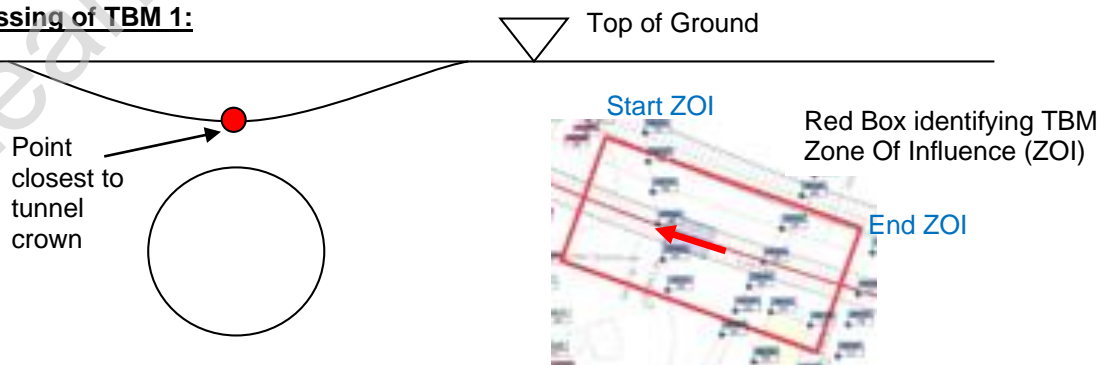
Each individual Close-out report contains


- a cover summary sheet
- monitoring point location plan (Note: A number of plan views show the red line visualising the tunnel centre line following the frame around the printed area and crossing randomly the plan view. That issue couldn't rectified and needs to be ignored. In the following appendices that random crossing was discovered: app.74, app. 75, app. 76, app. 77, app. 78, app. 79, app. 80, app.81, app.82, app. 83, app.84, app. 85, app. 86, app. 87, app. 88, app.89, app. 90, app. 91, app.92, app.95, app. 96, app. 105, app. 106, app. 107, app. 109, app.110, app. 111 and app. 112)
- Settlement-time plot and/or monitoring data spreadsheets (Note: A number of settlement time plots show a line joining the end and start of the data plots. That issues occurs randomly by creating the plots and couldn't rectified, therefore please ignore that line. In the following appendices that issue was discovered: app. 82, app. 83, app. 84, app. 87, app. 89, app 91, app. 95, app. 96, app. 97, app. 98.)

The Cover summary sheet entails:

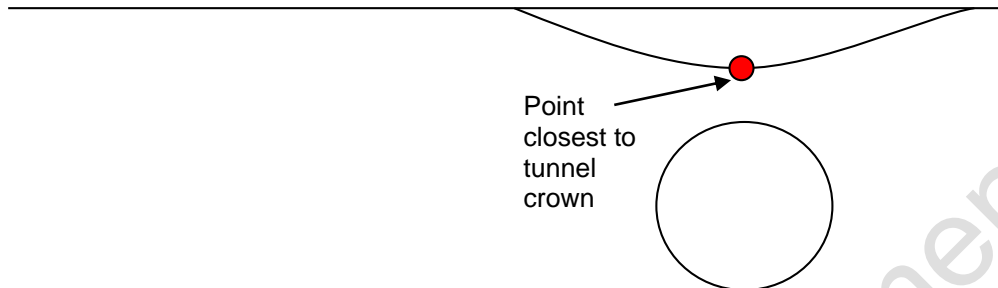
- Information on location of Monitoring area and/or asset
- Reference C310 I&M drawing
- Relevant chainage
- Sensor type
- Trigger value
- Selected critical monitoring points following the logic illustrated below:

Passing of TBM 1:



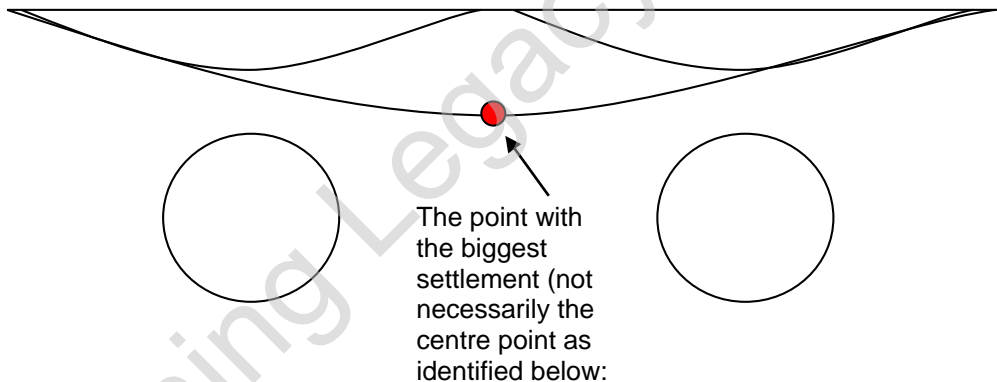
		C310 THAMES TUNNEL REPORT			
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Passing of TBM 2:




- Start and end date of relevant construction activity (other than TBM-Drive), where applicable.
- Long-term: The monitoring point with the greatest confirmed value of vertical movement of the corresponding monitoring asset.

After Passage of TBM 1 and TBM 2



- Note on possible residual risks
- Supporting comments and conclusions

All close-out reports identified in the appendices form part of this report.

 HOCHTIEF MURPHY Joint Venture		C310 THAMES TUNNEL REPORT			
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2.0 REFERENCE DOCUMENTS

MPCGM C310-HTM-Z-STP-CR148-50058 Rev.14.0

MPCGM NWP C310-HTM-Z-STP-CR146-50002 Rev. 4.0

HMJV I&M Drawings:

C310-HTM-C-DWG-CR148_PT005-50010 Rev. 9.0


C310-HTM-C-DWG-CR146_ST004-70001 Rev. 7.0

C310-HTM-C-DWG-CR146_ST004-70002 Rev. 6.0

C310-HTM-C-DWG-CR146_ST004-70003 Rev. 12.0

M&W Specification KX10 – Instrumentation & Monitoring / C122-OVE-Z4-RSP-CR001-00007 Rev. 7.0

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3.0 APPENDICES

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Appendix 78	Old Station Museum – TM
Appendix 79	Old Station Museum, Listed Wall
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Appendix 81	CS CP 16
Appendix 82	Geotechnical Cross Section 3
Appendix 83	CS TRM
Appendix 84	TRM Car park
Appendix 85	Siding Apartments 1-16 – HLC
Appendix 86	Siding Apartments 1-16 - TM
Appendix 87	Siding Apartments 17-74 - HLC
Appendix 88	Siding Apartments 17-74 – TM
Appendix 89	Albert Road Building 171-209 – HLC
Appendix 90	Albert Road Building 171-209 – TM
Appendix 91	Albert Road Building 211-217 – HLC
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Appendix 93	TW Pumping Station – HLC
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Appendix 96	CS 26 - Old Station 2 - CH 89120
Appendix 97	CS 27 - Old Station 3 - CH 89075
Appendix 98	CS 28 - Pumping station - CH 89055
Appendix 105	Albert Road "2"
Appendix 106	CS 31 - Store Road Sewer West - CH 89000
Appendix 107	CS 32 - Factory Road 1 - CH 88970
Appendix 108	Factory Road Extensometer / SD
Appendix 109	Geotechnical Cross Section 4
Appendix 110	CS 33 - Factory Road 2 - CH 88935
Appendix 111	CS 34 - Factory Road 3 - CH 88900
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		C310 THAMES TUNNEL REPORT			
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APPENDIX 00

Overall Register / Close out report


Learning Legacy Document

Close Out report: processing status

last update: 07/02/2015

	No.	Name of Report	Installation Type	Passing with TBM 1	Passing with TBM 2	
Plumstead Portal	1	White Hard Depot Building	Hydrostatic Levelling Cell	destressing of ground anchors - approx. Mar 2015 removal of last props - Feb. 2015		
	2	White Hard Depot Building	Tiltmeter			
	3	APB posts	Levelling Studs			
Tunnel Drive T1 / Westbound & T2 / Eastbound	4	CS1 - Crane Platform / Headwall	Levelling Studs	10.01.2013	20.05.2013	
	5	CS2 - Crane Platform / Headwall	Levelling Studs	18.01.2013	24.05.2013	
	6	White Hard Road Bridge	Hydrostatic Levelling Cell	21.-25.01.2013	25.-27.05.2013	
	7	White Hard Road Bridge	Tiltmeter	21.-25.01.2013	25.-27.05.2013	
	8	White Hard Road	Levelling Studs	23.-25.01.2013	26.-27.05.2013	
	9	Cathedral Substation - HLC	Hydrostatic Levelling Cell	26.-28.01.2013	28.-29.05.2013	
	10	Cathedral Substation - TM	Tiltmeter	26.-28.01.2013	28.-29.05.2013	
	11	Cathedral Substation - Lev.St.	Levelling Studs	26.-28.01.2013	28.-29.05.2013	
	12	CS1 - Old Coalyard	Levelling Studs	30.01.2013	30.05.2013	
	13	CS2 - Old Coalyard	Levelling Studs	03.02.2013	09.06.2013	
	14	CS3 - Old Coalyard	Levelling Studs	25.02.2013	12.06.2013	
	15	CS4 - Old Coalyard	Levelling Studs	02.03.2013	16.06.2013	
	16	APB Sidings - Old Coalyard	Levelling Studs	30.01.-09.03.2013	30.05.-18.06.2013	
	17	Cross Passage 19	Levelling Studs	Excavation Nov.-Dec.2013		
	18	Geotechnical Cross Section 1	Levelling Studs	09.03.2013	18.06.2013	
	19	Southern Outfall Sewer 1	Levelling Studs	12.03.2013	18.06.2013	
	20	Southern Outfall Sewer 2	Levelling Studs	13.03.2013	19.06.2013	
	21	Southern Outfall Sewer 3	Levelling Studs	15.03.2013	21.06.2013	
	22	Southern Outfall Sewer Pumping Station	Levelling Studs	13.03.2013	20.06.2013	
	23	Southern Outfall Sewer Extensometer	Extensometer	17.03.2013	20.06.2013	
	24	CS 5 - Petment Crescent Bridge - Lev.St.	Levelling Studs	24.03.2013	28.6.2013	
	25	Petment Crescent Bridge - HLC	Hydrostatic Levelling Cell	24.-25.03.2013	28.-29.06.2013	
	26	Royal Mail	Hydrostatic Levelling Cell	27.-29.03.2013	30.06.-02.07.2013	
	27	Mc Donald	Hydrostatic Levelling Cell	26.-27.03.2013	30.06.-01.07.2013	
	28	CS6 - Bus Garage	Levelling Studs	29.03.2013	02.07.2013	
	29	Bus Garage	Hydrostatic Levelling Cell	01.-05.04.2013	05.-09.07.2013	
	30	Bus Garage	Tiltmeter	01.-05.04.2013	05.-09.07.2013	
	31	CS7 - Petment Cresent + Subway	Levelling Studs	05.-07.04.2013	09.-11.07.2013	
	32	SOS Plumstead Road South	Levelling Studs	05.04.-02.05.2013	10.07.-01.08.2013	
	33	SOS Plumstead Road North	Levelling Studs	16.04.-07.05.2013	17.07.-07.08.2013	
	34	SOS Plumstead Road Extensometer	Extensometer	20.04.-06.05.2013	20.07.-04.08.2013	
	35	Cross Passage 18	Levelling Studs	Excavation Jan.-Feb.2014		
	36	Gateway Business center	Levelling Studs	07.-16.04.2013	13.07.-17.07.2013	
	37	CS8 - Signature Industries	Levelling Studs	19.04.2013	19.07.2013	
	38	Signatute Industries	Levelling Studs	20.-26.04.2013	20.-24.07.2013	
	39	Geotechnical Cross Section 2	Levelling Studs	28.04.2013	28.07.2013	
	40	CS9 - Wall Marshgate Path	Levelling Studs	28.04.2013	28.07.2013	
	41	Wall Middle Gate House	Levelling Studs	30.04.2013	30.07.2013	
	42	Wall Plumstead Road	Levelling Studs	28.04.-06.05.2013	28.07.-05.08.2013	
	43	Middle Gate House	Hydrostatic Levelling Cell	01.-02.05.2013	30.-31.07.2013	
	44	Middle Gate House	Tiltmeter	01.-02.05.2013	30.-31.07.2013	
	45	DLR Down line Tunnel	Hydrostatic Levelling Cell	01.05.2013	30.07.2013	
	46	DLR Up line Tunnel	Hydrostatic Levelling Cell	02.05.2013	31.07.2013	
	47	CS10 - Footpath MGH to Plumstead Road	Levelling Studs	03.05.2013	01.08.2013	
	48	CS11 - I/O Center	Levelling Studs	05.05.2013	03.08.2013	
	49	I/O Center Building	Levelling Studs	05.-11.05.2013	02.-09.08.2013	
	50	I/O Center Car Park	Levelling Studs	08.-12.05.2013	07.-10.08.2013	
	51	CS12 - Cornwallis Road	Levelling Studs	12.05.2013	10.08.2013	
	52	CS13 - 1200 BH Sewer WSB	Levelling Studs	12.05.2013	10.08.2013	
	Woolwich Station Box	removal of last props - approx. Mar. 2015				

Tunnel Drive T3 / Westbound & T4 / Eastbound	53	Building 11	Hydrostatic Levelling Cell	WSB- removal of last props in Western Box: approx. Mar. 2015		
				13.-17.09.2013	04.-09.02.2014	
	54	CS 15 - BH Hoarding	Levelling Studs	18.09.2013	10.02.2014	
	55	Verbrueggens House	Levelling Studs	22.-23.09.2013	11.-12.02.2014	
	56	CS 16 - Footpath Royal Arsenal	Levelling Studs	23.09.2013	12.02.2014	
	57	CS 17 - Footpath Royal Arsenal	Levelling Studs	25.09.2013	16.02.2014	
	58	Main Guard House	Hydrostatic Levelling Cell	28.09.-01.10.2013	17.-18.02.2014	
	59	Main Guard House	Tiltmeter	28.09.-01.10.2013	17.-18.02.2014	
	60	Royal Brass Foundry	Hydrostatic Levelling Cell	27.-29.09.2013	16.-17.02.2014	
	61	Royal Brass Foundry	Tiltmeter	27.-29.09.2013	16.-17.02.2014	
	62	CS Royal Arsenal Listed Wall	Levelling Studs	02.10.2013	21.02.2014	
	63	CS 18 - Warren lane	Levelling Studs	03.10.2013	22.02.2014	
	64	Hotel Warren lane	Levelling Studs	07.-23.10.2013	23.02.-05.03.2014	
	65	CS 19 - Warren lane Carpark	Levelling Studs	26.10.2013	08.03.2014	
	66	CS 20 - Warren lane Carpark	Levelling Studs	27.10.2013	09.03.2014	
	67	CS 21 - Warren lane Carpark	Levelling Studs	29.10.2013	11.03.2014	
	68	CS 22 - Warren lane roundabout	Levelling Studs	31.10.2013	11.03.2014	
	69	Warren lane Carpark EB	Levelling Studs	26.-31.10.2013	08.-13.03.2014	
	70	Warren lane Carpark WB	Levelling Studs	26.-31.10.2013	08.-13.03.2014	
	71	Extensometer Warren lane Carpark	Extensometer	26.-31.10.2013	08.-13.03.2014	
	72	CS 23 - southside retaining wall footpath	Levelling Studs	06.11.2013	16.03.2014	
	73	Southside retaining wall	Prisms	06.11.2013	17.03.2014	
	74	Northside retaining wall	Prisms	11.12.2013	13.04.2014	
	75	Northside Flood Wall	Hydrostatic Levelling Cell	10.-11.12.2013	13.-15.04.2014	
	76	CS Pier Road	Levelling Studs	12.12.2013	17.04.2014	
	77	Old Station Museum	Hydrostatic Levelling Cell	12.-14.12.2013	17.-19.04.2014	
	78	Old Station Museum	Tiltmeter	12.-14.12.2013	17.-19.04.2014	
	79	Old Station Museum, Listed Wall	Hydrostatic Levelling Cell	18.12.2013-09.01.2014	21.-25.04.2014	
	80	CS 24 - CP 16 - CH 89210	Levelling Studs	17.12.2013	21.04.2014	
	81	CS CP 16	Levelling Studs	Excavation Jun.-Jul.2014		
	82	Geotechnical Cross Section 3	Levelling Studs	07.01.2014	23.04.2014	
	83	CS TRM	Levelling Studs	07.01.2014	23.04.2014	
	84	TRM Carpark	Levelling Studs	09.01.-15.01.2014	24.-30.04.2014	
	85	Siding Apartments 1-16	Hydrostatic Levelling Cell	14.12.2013-06.01.2014	19.-21.04.2014	
	86	Siding Apartments 1-16	Tiltmeter	14.12.2013-06.01.2014	19.-21.04.2014	
	87	Siding Apartments 17-74	Hydrostatic Levelling Cell	06.-11.01.2014	22.-26.04.2014	
	88	Siding Apartments 17-74	Tiltmeter	06.-11.01.2014	22.-26.04.2014	
	89	Albert Road Building 171-209	Hydrostatic Levelling Cell	12.-14.01.2014	26.-29.04.2014	
	90	Albert Road Building 171-209	Tiltmeter	12.-14.01.2014	26.-29.04.2014	
	91	Albert Road Building 211-217	Hydrostatic Levelling Cell	15.-16.01.2014	29.-30.04.2014	
	92	Albert Road Building 211-217	Tiltmeter	15.-16.01.2014	29.-30.04.2014	
	93	TW Pumping Station	Hydrostatic Levelling Cell	16.-17.01.2014	30.04.-01.05.2014	
	94	TW Pumping Station	Tiltmeter	16.-17.01.2014	30.04.-01.05.2014	
	95	CS 25 - Old Station 1 - CH 89155	Levelling Studs	09.01.2014	25.04.2014	
	96	CS 26 - Old Station 2 - CH 89120	Levelling Studs	10.01.2014	26.04.2014	
	97	CS 27 - Old Station 3 - CH 89075	Levelling Studs	11.01.2014	28.04.2014	
	98	CS 28 - Pumping station - CH 89055	Levelling Studs	14.01.2014	29.04.2014	
	99	CS 29 - Store Road Sewer	Levelling Studs	16.01.2014	30.04.2014	
	100	Store Road Sewer - SAA	SAA	16.01.2014	01.05.2014	
	101	Store Road Sewer - SG	Strain Gauges	16.01.2014	01.05.2014	
	102	Store Road Sewer - FO SG	FO-Strain Gauges	16.01.2014	01.05.2014	
	103	Store Road Sewer - Extensometer	Extensometer	17.01.2014	02.05.2014	
	104	CS 30 - Store Road Sewer CL - CH 89025	Levelling Studs	16.01.2014	01.05.2014	
	105	Albert Road "2"	Levelling Studs	14.-31.01.2014	28.04.-17.05.2015	
	106	CS 31 - Store Road Sewer West - CH 89000	Levelling Studs	18.01.2014	02.05.2014	
	107	CS 32 - Factory Road 1 - CH 88970	Levelling Studs	19.01.2014	03.05.2014	
	108	Factory Road Extensometer / SD	Extensometer	19.-25.01.2014	03.-10.05.2014	
	109	Geotechnical Cross Section 4	Levelling Studs	19.01.2014	01.-03.05.2014	
	110	CS 33 - Factory Road 2 - CH 88935	Levelling Studs	21.01.2014	04.05.2014	
	111	CS 34 - Factory Road 3 - CH 88900	Levelling Studs	23.01.2014	06.05.2014	
	112	CS 35 - Factory Road 4 - CH 88870	Levelling Studs	25.01.2014	08.05.2014	
	North Woolwich Portal	113	CS Headwall	Levelling Studs	remoaval of last props - approx. Feb. 2015	
		114	Albert Road "1"	Levelling Studs		
		115	Factory Road	Levelling Studs		
		116	CS Headwall	Levelling Studs		
		117	Crane Slab	Levelling Studs		
		118	Extensometer Portal NWP - RDS	Extensometer		

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APPENDICES 01 - 73

Used in Document no.C310-HTM-C-RGN-CR148-50022

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APPENDIX 74
Northside retaining wall

Learning Legacy Document

monitoring asset

Retaining Wall River Thames

reference monitoring drawing:

C310-HTM-C-DWG-CR146-ST004-70003

name of monitoring section:

Northside retaining wall

sensor type:

prisms

chainage:

89290

point no.:

3004 1561 - 3004 1569

trigger values:
[mm]

green: N/A

amber: N/A

red: N/A

reference document for trigger values:

Management Plan for Control of Ground Movement

EB-no.:

C310-HTM-Z-STP-CR148-50058

Appendix:

Section 5.3.16

monitoring data

	date		max. value	point no.	comments
baseline	26/11/13		0.00		
TBM 1	start ZOI	09/12/13	0.00	3004 1564	
	end ZOI	15/12/13	-3.00	3004 1564	breached not any trigger value
TBM 2	start ZOI	12/04/14	-3.00	3004 1567	
	end ZOI	17/04/14	0.00	3004 1567	breached not any trigger value
longterm	21/11/14		2.00	3004 1567	
Evaluation of any potential residual risks			<input checked="" type="checkbox"/>	No residual risk since the Works have been completed by HMJV	
			<input type="checkbox"/>	Yes, residual risk (see comment below)	

summary / comments

The values of the prisms show the horizontal deflection of the retaining walls, no trigger values for horizontal deflection specified.

For monitoring of vertical displacement more accurate sensors were installed (HLC - Appendix 75). Under consideration of temperature differences, the surrounding ground condition and the achievable accuracy of the measurement (accuracy of measurement +/- 2mm), HMJV has no concern to cease the monitoring.

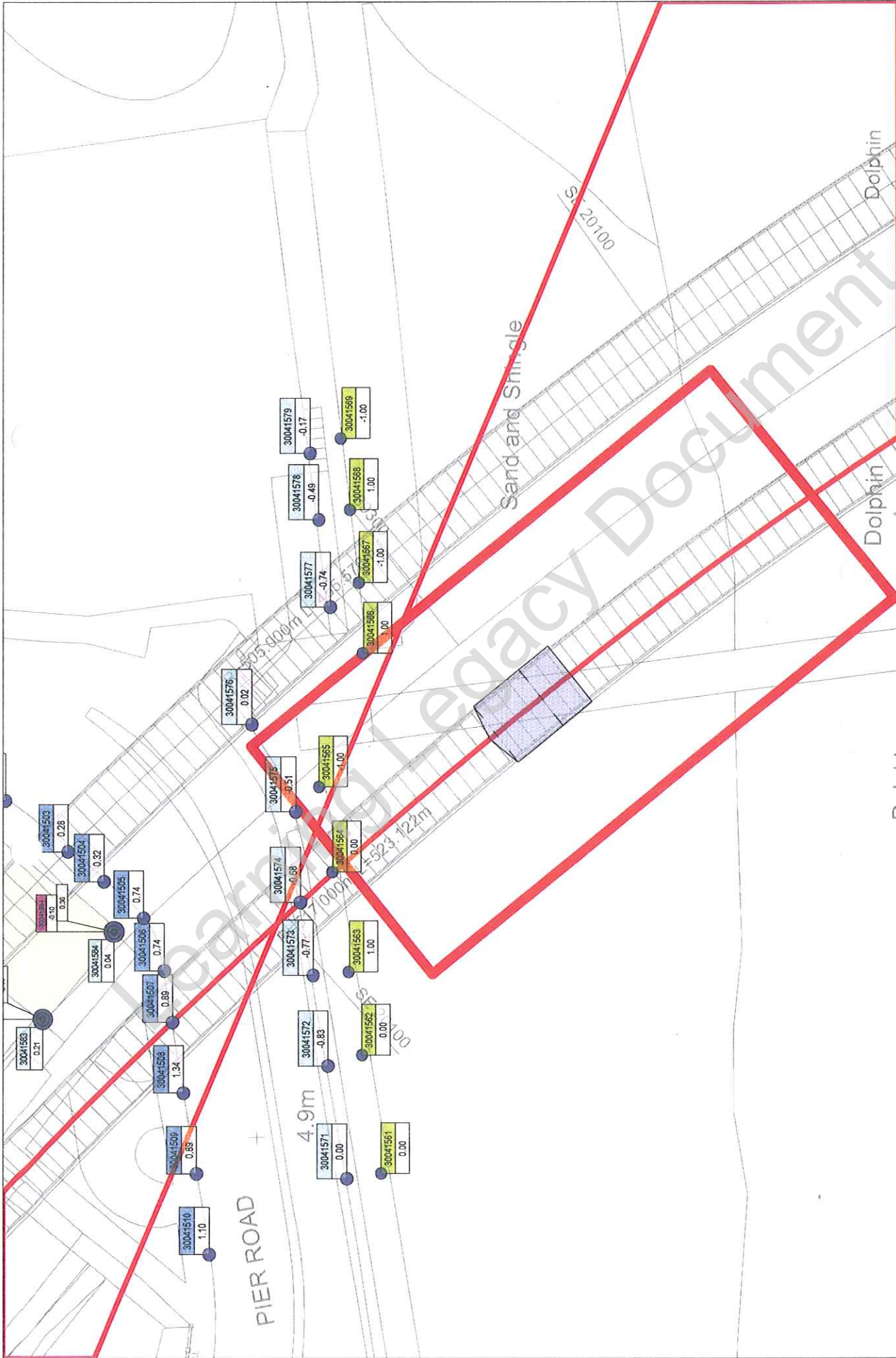
The rate of change in the monitoring data is less than the required standards as per the specifications and drawings.

date / signature: 14/04/2015

print name:

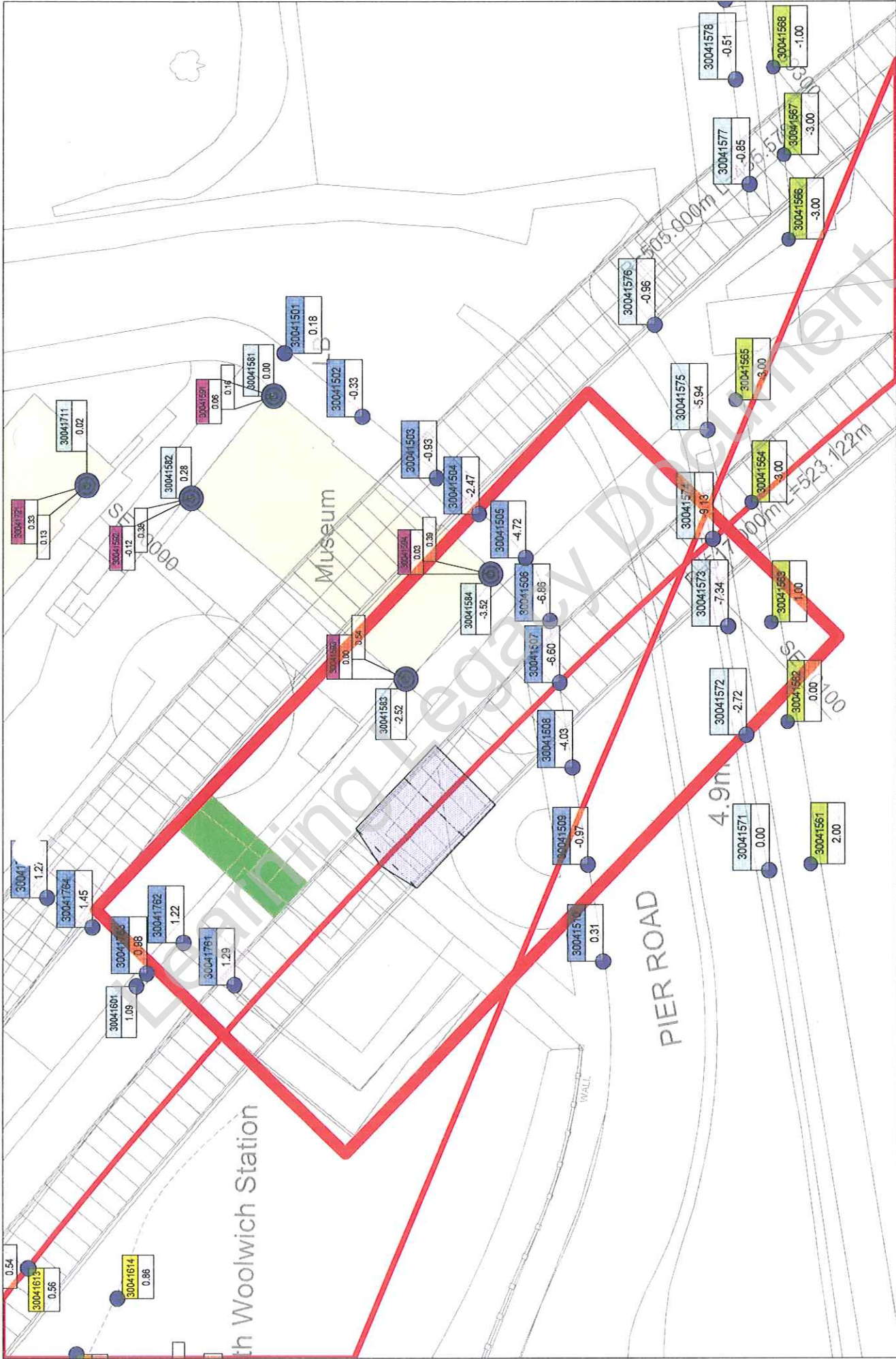
HMJV project role:

Monitoring & Survey engineer



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: TBM drive WB
 current values: 09.12.2013 18:05

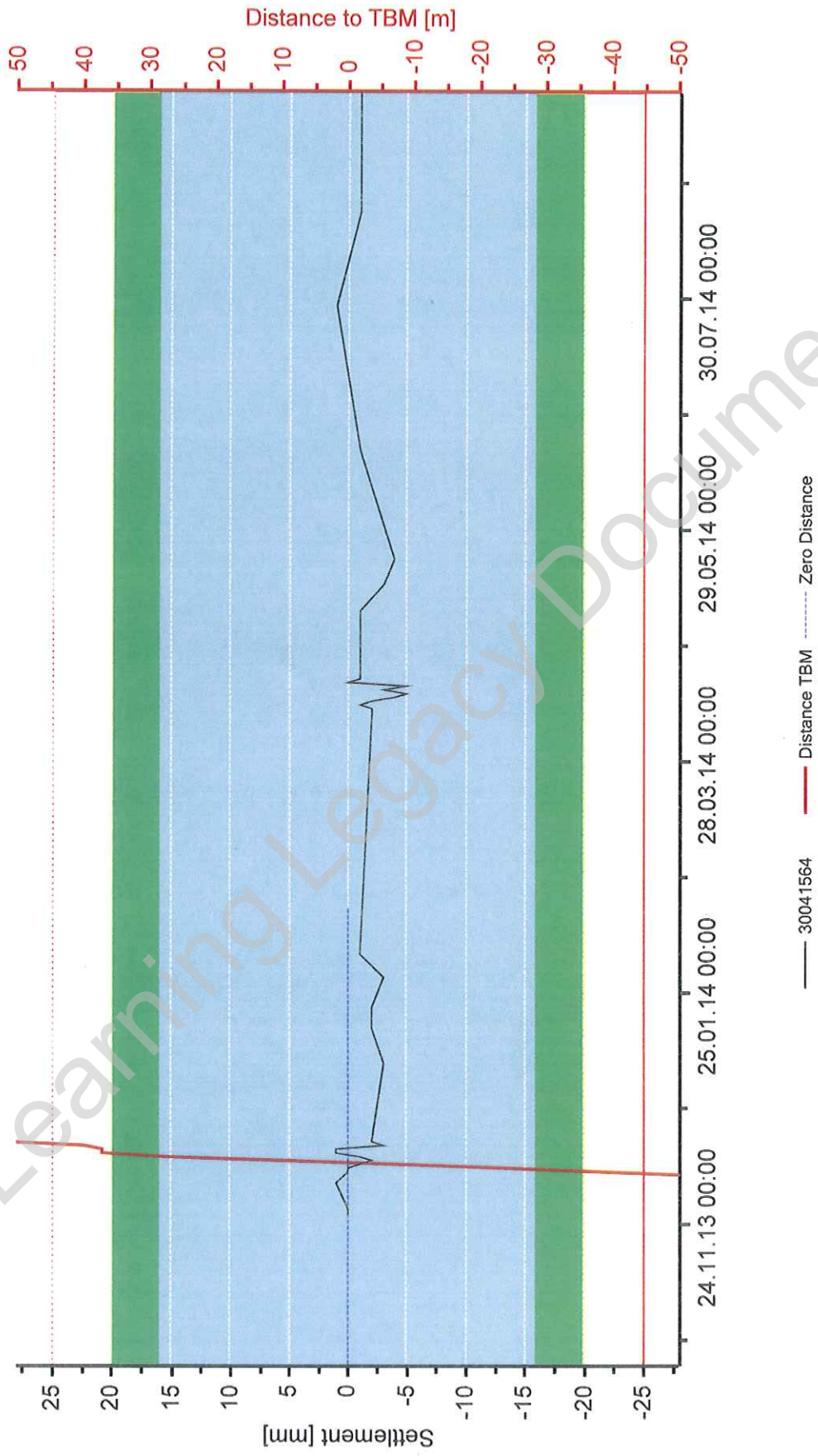




Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: TBM drive WB
 current values: 15.12.2013 17:10

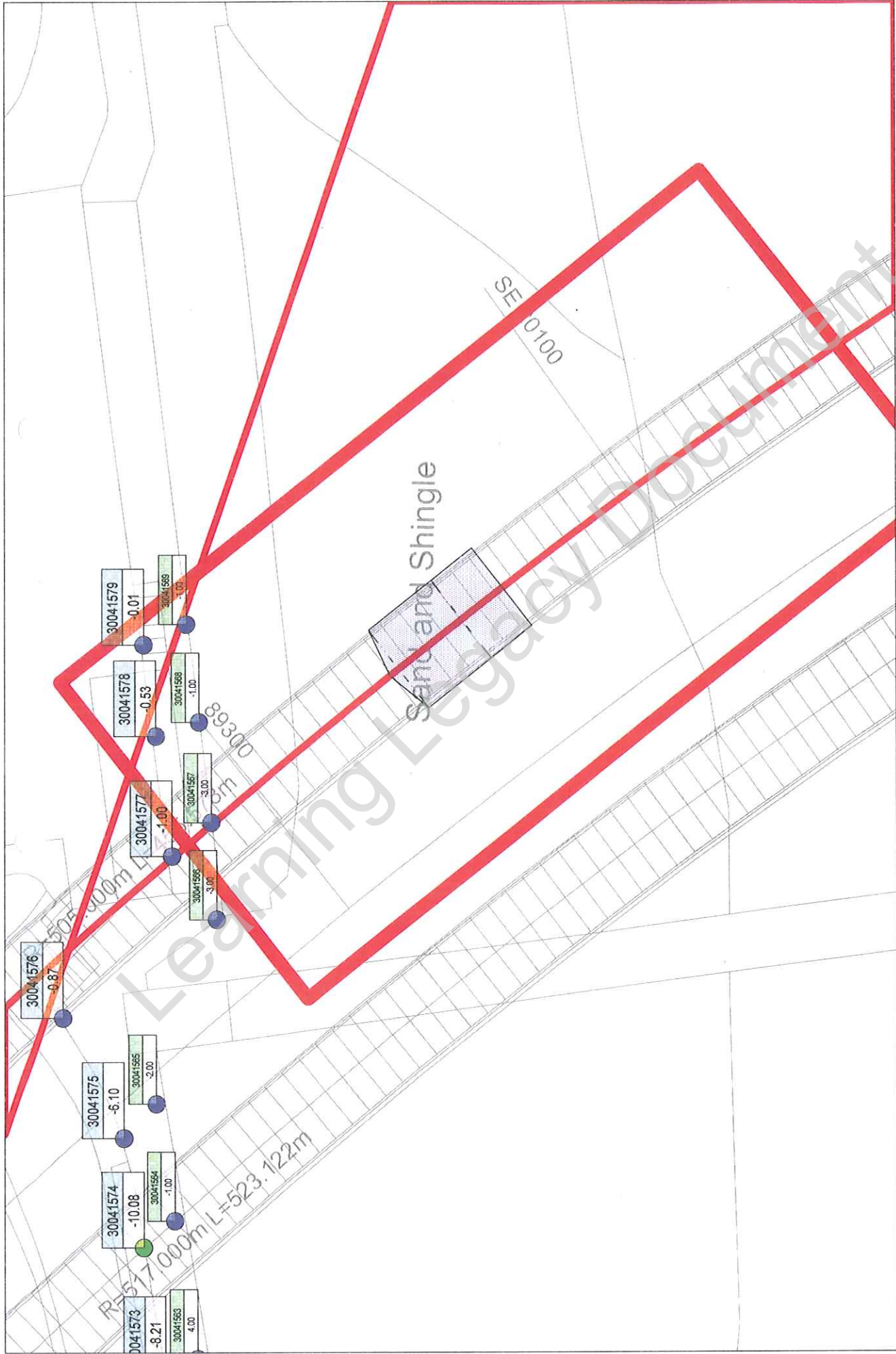


Point: 30041564



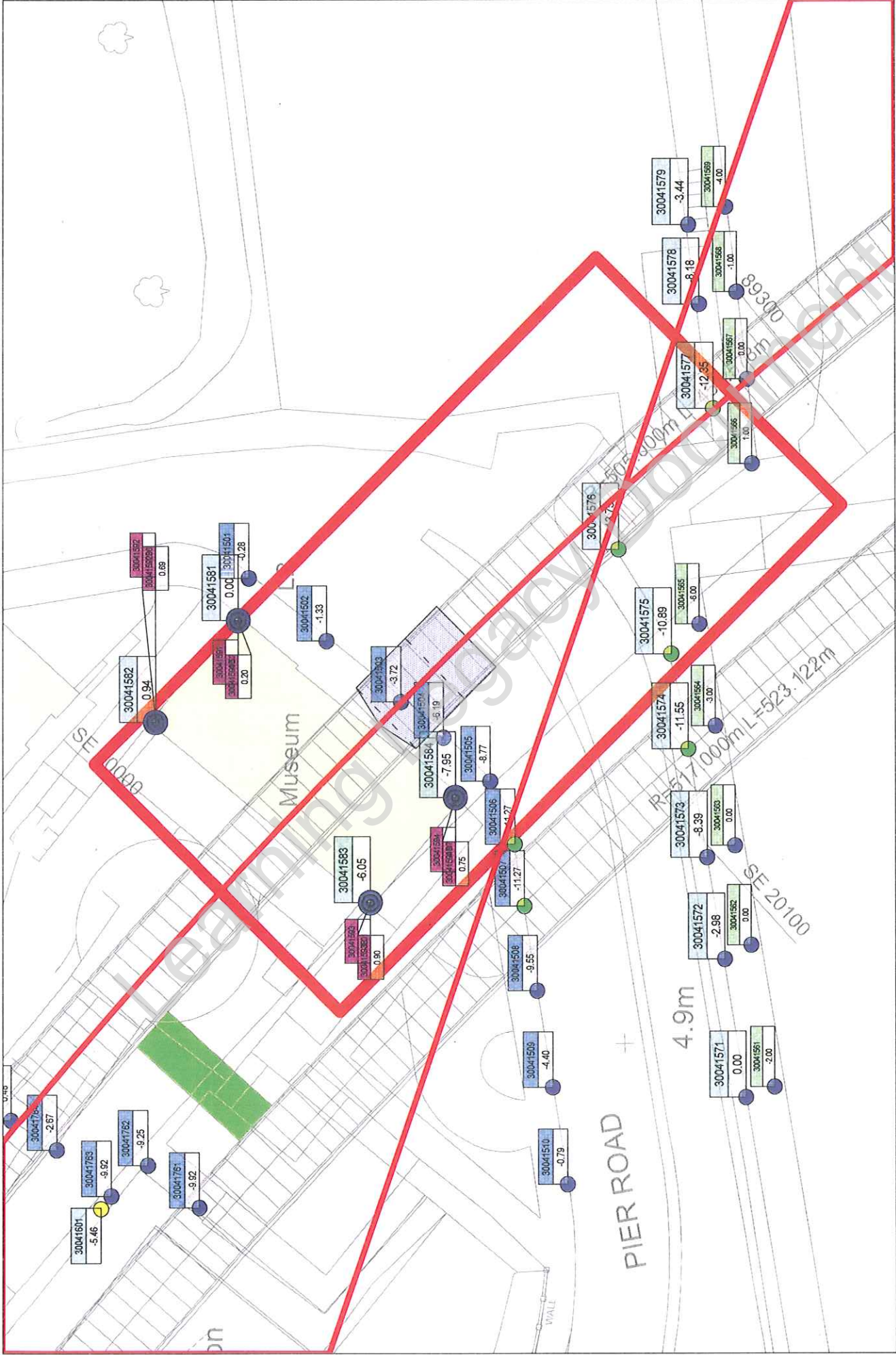
Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: WB Tunnel - Northside retaining walls 17.10.2013 - 23.09.2014
date: 18.01.2015 15:28 current values: 18.01.2015 15:15





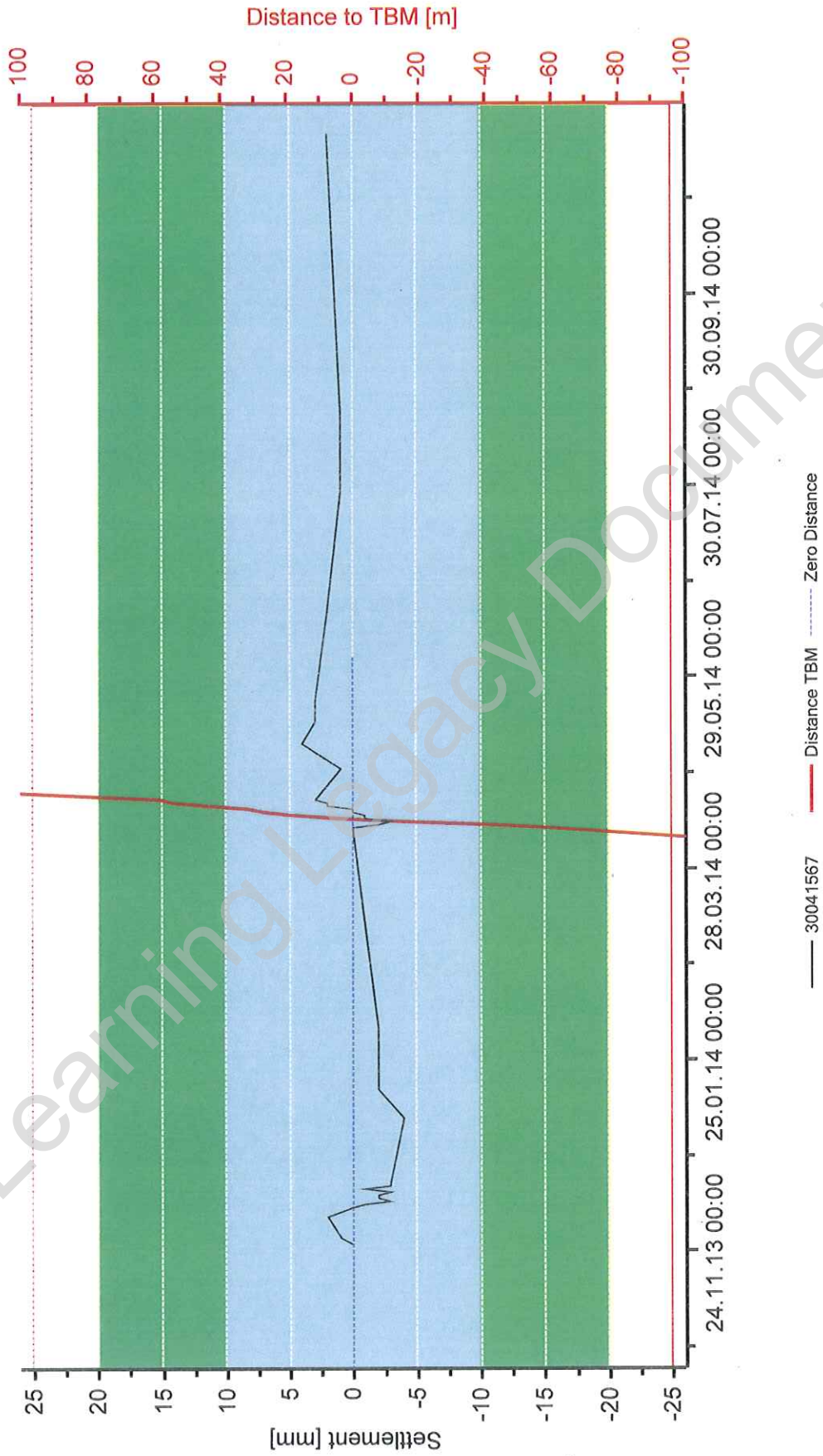
Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: C310 EB tunnel drive; NWP: portal excavation, construction base slab
 current values: 12.04.2014 09:00





Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: C310 EB tunnel drive; NWP: portal excavation, construction base slab
 current values: 17.04.2014 09:00

Point: 30041567



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: EB Tunnel - Northside Retaining walls - 17.10.2013 - 21.11.2014
date: 18.01.2015 16:32 current values: 18.01.2015 16:15



monitoring table



Joint Venture

project: C310 Thames Tunnel

structure: Northside Retaining Wall (Prisms)

Note: if deviation is negative value, retaining wall is leaning towards the River Thames

No. of reading	baseline	1. following		2. following		3. following		4. following		5. following		6. following							
		date	ref. line offset	deviation from last/baseline	date	ref. line offset	deviation from last/baseline	date	ref. line offset	deviation from last/baseline	date	ref. line offset	deviation from last/baseline						
	26/11/13																		
No.	reference line offset																		
30041561	-2.053	-2.051	2	2	-2.054	-3	-1	-2.051	3	2	-2.053	-2	0	-2.053	0	0	-2.054	-1	-1
30041562	-2.094	-2.093	1	1	-2.095	-2	-1	-2.093	2	1	-2.094	-1	0	-2.095	-1	-1	-2.095	0	-1
30041563	-2.136	-2.134	2	2	-2.136	-2	0	-2.134	2	2	-2.135	-1	1	-2.136	-1	0	-2.136	0	0
30041564	-2.147	-2.147	0	0	-2.146	1	1	-2.147	-1	0	-2.147	0	0	-2.148	-1	-1	-2.149	-1	-2
30041565	-2.221	-2.221	0	0	-2.221	0	0	-2.222	-1	-1	-2.222	-1	-1	-2.222	0	-1	-2.223	-1	-2
30041566	-2.605	-2.603	2	2	-2.602	1	3	-2.604	-2	1	-2.604	0	1	-2.606	-2	-1	-2.607	-1	-2
30041567	-3.099	-3.098	1	1	-3.097	1	2	-3.099	-2	0	-3.100	-1	-1	-3.102	-2	-3	-3.101	1	-2
30041568	-3.102	-3.099	3	3	-3.099	0	3	-3.100	-1	2	-3.101	-1	1	-3.102	-1	0	-3.102	0	0
30041569	-3.077	-3.076	1	1	-3.078	-2	-1	-3.077	1	0	-3.078	-1	-1	-3.078	0	-1	-3.078	0	-1

Document

monitoring table



Joint Venture

project: C310 Thames Tunnel

structure: Northside Retaining Wall (Prisms)

Note: if deviation is negative value, retaining wall is leaning towards the River Thames

No. of reading	7. following		8. following		9. following		10. following		11. following		12. following				
	baseline	date	elevation	deviation from last/ baseline	ref. line offset	deviation from last/baseline	ref. line offset	deviation from last/baseline	ref. line offset	deviation from last/baseline	ref. line offset	deviation from last/baseline			
No.	reference line offset	26/11/13	12/12/2013	13/12/2013	14/12/2013	15/12/2013	16/12/2013	16/12/2013	06/01/2014						
30041561	-2.053	-2.054	0	-1	-2.053	0	0	-2.051	2	-2.054	-3	-1	-2.053	1	0
30041562	-2.094	-2.095	0	-1	-2.093	2	1	-2.094	-1	-2.094	0	0	-2.093	1	1
30041563	-2.136	-2.134	2	2	-2.134	0	2	-2.135	-1	-2.135	0	1	-2.135	0	1
30041564	-2.147	-2.148	1	-1	-2.146	2	1	-2.150	-4	-2.149	1	-2	-2.150	-1	-3
30041565	-2.221	-2.222	1	-1	-2.223	-1	-2	-2.224	-2	-2.224	0	-3	-2.227	-3	-6
30041566	-2.605	-2.605	2	0	-2.608	-3	-3	-2.608	-2	-2.607	1	-2	-2.609	-2	-4
30041567	-3.099	-3.101	0	-2	-3.102	-1	-3	-3.102	-2	-3.102	0	-3	-3.103	-1	-4
30041568	-3.102	-3.102	0	0	-3.103	-1	-1	-3.103	-1	-3.102	1	0	-3.105	-3	-3
30041569	-3.077	-3.078	0	-1	-3.078	1	-1	-3.079	-1	-3.079	0	-2	-3.081	-2	-4

Document

monitoring table



Joint Venture

project: C310 Thames Tunnel

structure: Northside Retaining Wall (Prisms)

Note: if deviation is negative value, retaining wall is leaning towards the River Thames

No. of reading	baseline	13. following		14. following		15. following		16. following		17. following		18. following			
		reference line offset	elevation	ref. line offset	deviation from last/baseline	ref. line offset	deviation from last/baseline	ref. line offset	deviation from last/baseline	ref. line offset	deviation from last/baseline	ref. line offset	deviation from last/baseline		
date	28/11/13	15/01/2014	21/01/2014	29/01/2014	04/02/2014	13/03/2014	10/04/2014								
30041561	-2.053		-2.054	-1	-2.053	1	0	-2.052	1	1	-2.054	-2	-2.055	-1	-2
30041562	-2.094	-2.093	-2.093	0	-2.094	-1	0	-2.093	1	1	-2.094	-1	-2.095	-1	-1
30041563	-2.136	-2.134	-2.134	0	-2.134	0	2	-2.134	0	2	-2.134	0	-2.136	-2	0
30041564	-2.147	-2.149	-2.149	0	-2.150	-1	-3	-2.148	2	-1	-2.149	-1	-2.149	0	-2
30041565	-2.221	-2.224	-2.226	-2	-2.226	0	-5	-2.224	2	-3	-2.223	1	-2.225	-2	-4
30041566	-2.605	-2.606	-2.605	1	-2.604	1	1	-2.604	0	1	-2.604	0	-2.605	-1	0
30041567	-3.099	-3.101	-3.101	0	-3.101	0	-2	-3.101	0	-2	-3.100	1	-3.099	1	0
30041568	-3.102	-3.102	-3.102	0	-3.100	2	2	-3.102	-2	0	-3.101	1	-3.102	-1	0
30041569	-3.077	-3.078	-3.079	-1	-3.078	1	-1	-3.078	0	-1	-3.078	0	-3.079	-1	-2

monitoring table



Joint Venture

project: C310 Thames Tunnel

structure: Northside Retaining Wall (Prisms)

Note: if deviation is negative value, retaining wall is leaning towards the River Thames

No. of reading	19. following		20. following		21. following		22. following		23. following		24. following				
	baseline	date	reference line offset	elevation	ref. line offset	deviation from last/ baseline	ref. line offset	deviation from last/ baseline	ref. line offset	deviation from last/ baseline	ref. line offset	deviation from last/ baseline			
30041561	-2.053	26/11/13	-2.054	-1	-2.051	3	-2.051	0	-2.055	-4	-2.056	-1	-2.055	1	-2
30041562	-2.094		-2.095	-1	-2.091	4	-2.092	-1	-2.095	-3	-2.095	0	-2.094	1	0
30041563	-2.136		-2.136	0	-2.132	4	-2.133	-1	-2.136	-3	-2.137	-1	-2.136	1	0
30041564	-2.147		-2.149	0	-2.148	1	-2.149	-1	-2.151	-2	-2.152	-1	-2.150	2	-3
30041565	-2.221		-2.225	0	-2.223	2	-2.224	-1	-2.228	-4	-2.229	-1	-2.227	2	-6
30041566	-2.605		-2.607	-2	-2.608	-1	-2.604	4	-2.605	-1	-2.604	1	-2.604	0	1
30041567	-3.099		-3.101	-2	-3.102	-1	-3.100	2	-3.100	0	-3.099	1	-3.099	0	0
30041568	-3.102		-3.103	-1	-3.103	0	-3.101	2	-3.103	-2	-3.103	0	-3.103	0	-1
30041569	-3.077		-3.081	-2	-3.078	3	-3.077	1	-3.081	-4	-3.081	0	-3.081	0	-4

Document

monitoring table



Joint Venture


project: C310 Thames Tunnel

structure: Northside Retaining Wall (Prisms)

Note: if deviation is negative value, retaining the wall is leaning towards the River Thames

No. of reading	baseline	31. following		32. following		33. following		34. following		35. following	
		date	elevation	deviation from last/ baseline	ref. line offset	deviation from last/baseline	ref. line offset	deviation from last/baseline	ref. line offset	deviation from last/baseline	ref. line offset
	26/11/13	21/05/2014	19/06/2014	28/07/2014	22/08/2014	21/11/2014					
	reference line offset										
30041561	-2.053	-2.057	-1	-4	-2.053	4	0	1	-2.052	0	1
30041562	-2.094	-2.096	0	-2	-2.093	3	1	0	-2.093	0	1
30041563	-2.136	-2.138	-2	-2	-2.135	3	1	2	-2.134	-1	2
30041564	-2.147	-2.151	-1	-4	-2.148	3	-1	2	-2.148	-2	-1
30041565	-2.221	-2.227	-2	-6	-2.223	4	-2	3	-2.222	-2	-1
30041566	-2.605	-2.601	-2	4	-2.600	1	5	-1	-2.602	-1	3
30041567	-3.099	-3.096	0	3	-3.097	-1	2	-1	-3.098	0	1
30041568	-3.102	-3.101	0	1	-3.100	1	2	-1	-3.100	1	2
30041569	-3.077	-3.080	0	-3	-3.077	3	0	-2	-3.078	1	-1

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 HOCHTIEF MURPHY Joint Venture		C310 THAMES TUNNEL REPORT			
EMPLOYER	CROSSRAIL	eB NO	C310-HTM-C-RGN-CR148-50024	Rev	2.0
TITLE	Monitoring Close-Out Reports relating to Tunnelling Works North Embankment River Thames - North Woolwich Portal (excl. Store Rd)				

APPENDIX 75
Northside Flood Wall

Learning Legacy Document

monitoring asset	Floodwall River Thames		
reference monitoring drawing:	C310-HTM-C-DWG-CR146-ST004-70003		
name of monitoring section:	Northside Floodwall River Thames		
sensor type:	hydrostatic levelling cell (hlc)		
chainage:	89280	point no.:	3004 1571 - 3004 1579
trigger values: [mm]	green: +14 -14	amber: +18 -18	red: +22 -22
reference document for trigger values:	Management Plan for Control of Ground Movement		
EB-no.:	C310-HTM-Z-STP-CR148-50058		
Section:	5.3.16		

monitoring data

	date		max. value	point no.	comments
baseline	17/10/13		0.00		
TBM 1	start ZOI	10/12/13	-0.90	3004 1574	
	end ZOI	15/12/13	-9.13	3004 1574	breached not any trigger value
TBM 2	start ZOI	12/04/14	-1.00	3004 1577	
	end ZOI	17/04/14	-12.43	3004 1577	breached not any trigger value
longterm	22/05/14	-11.45	3004 1577	System has been destroyed approx. 1 month after passing of TBM 2.	
Evaluation of any potential residual risks	<input checked="" type="checkbox"/>		No residual risk since the Works have been completed by HMJV		
	<input type="checkbox"/>		Yes, residual risk (see comment below)		

summary / comments

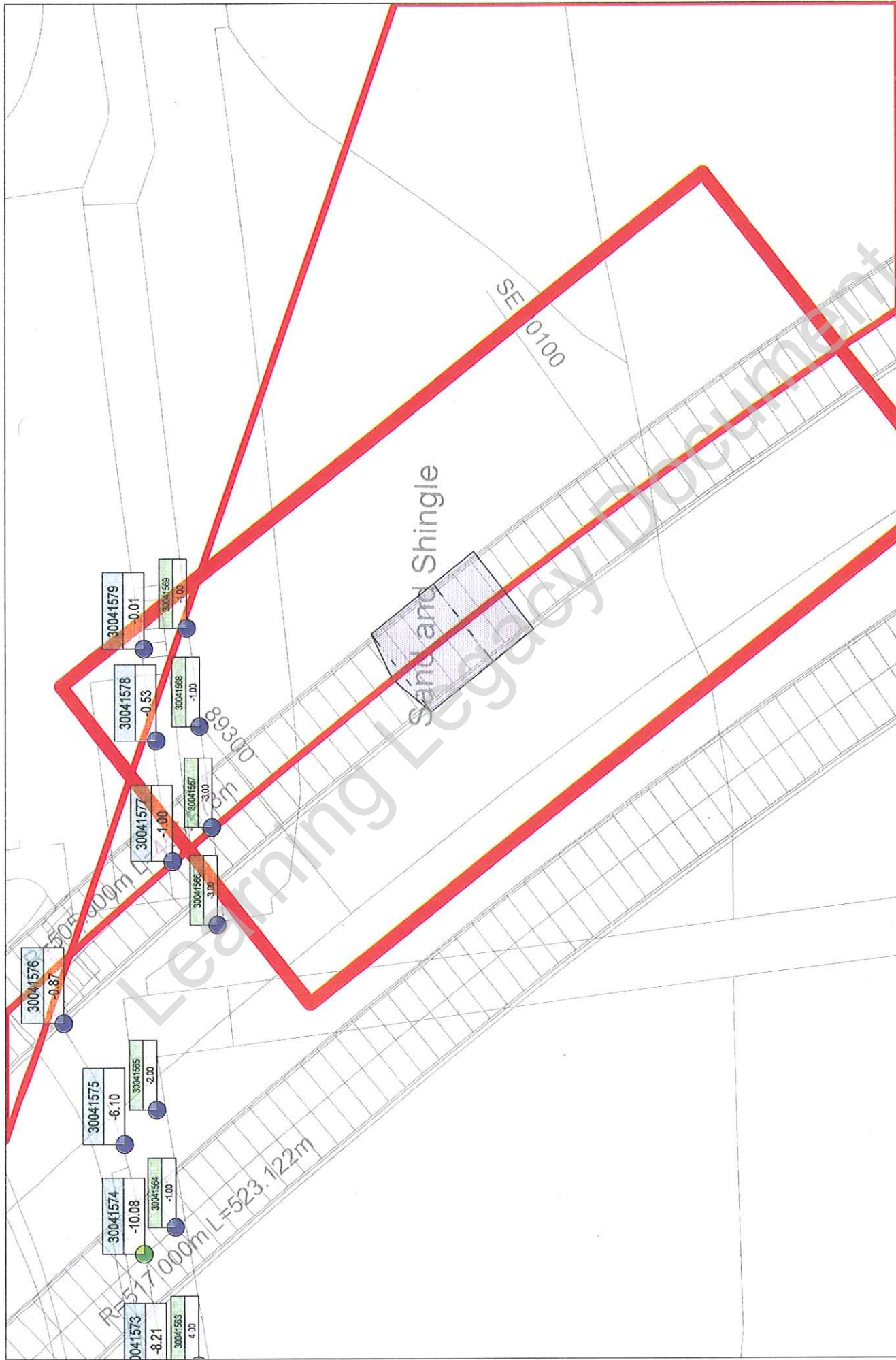
The system has been damaged/destroyed 2 times.
 1st: damaged on: 11/01/2014 reinstallation done for 2nd drive: 18/03/2014
 It was agreed in CTC-meeting to reinstall the system shortly before arrival of TBM 2.
 2nd: damaged on: 22/05/2014
 approx. 1month after TBM 2 passed this area, the system has been damaged a 2nd time.
 It was agreed in the CTC, to decommission the system.
 Under consideration of temperature differences and the achievable accuracy of the system, HMJV has no concern to cease the monitoring.
 The rate of change in the monitoring data is less than the required standards as per the specifications and drawings up to the time when the instrumentations have been damaged/destroyed.

date / signature: 14/04/15

print name:

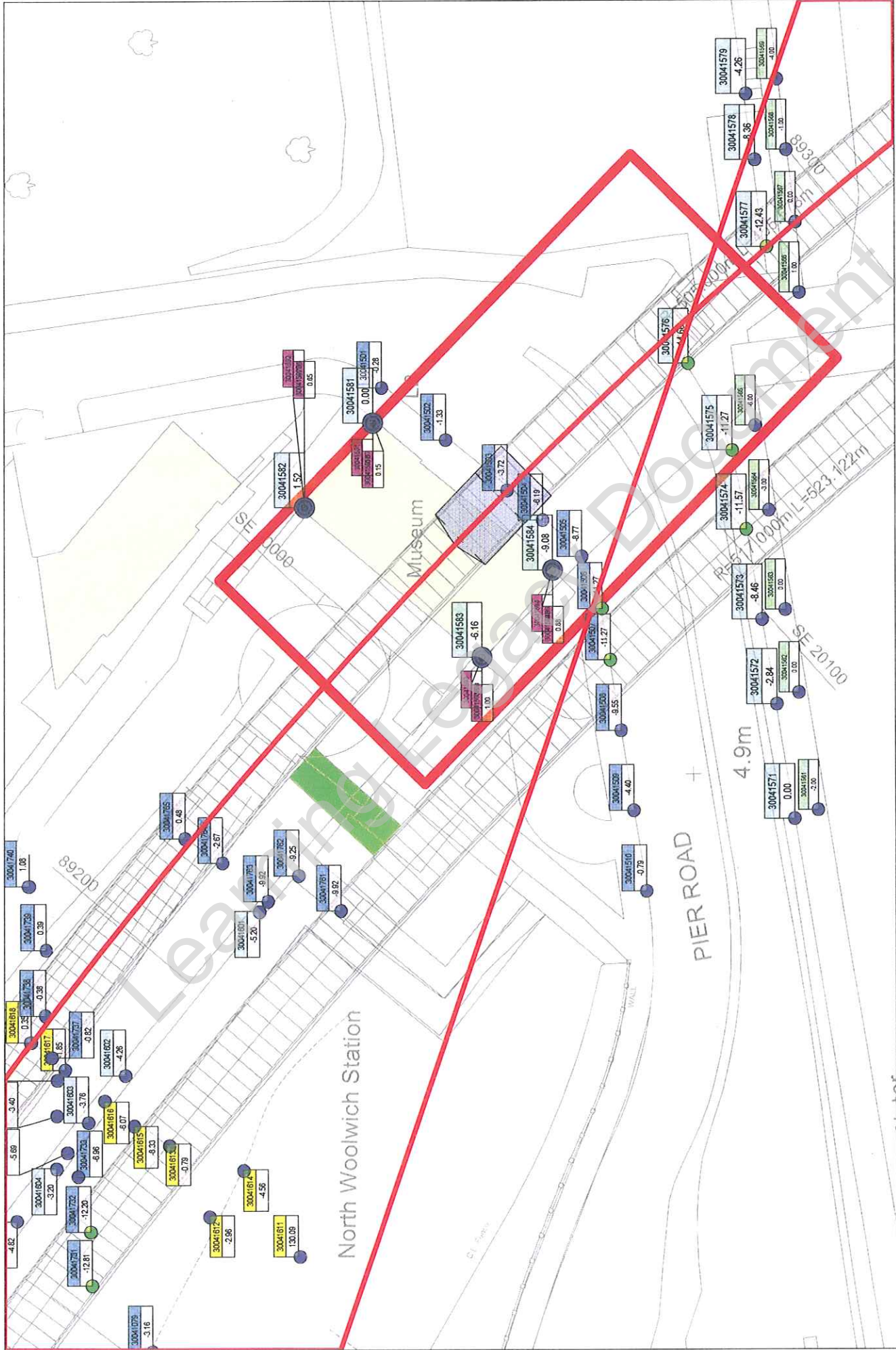
HMJV project role:

Monitoring & Survey Engineer

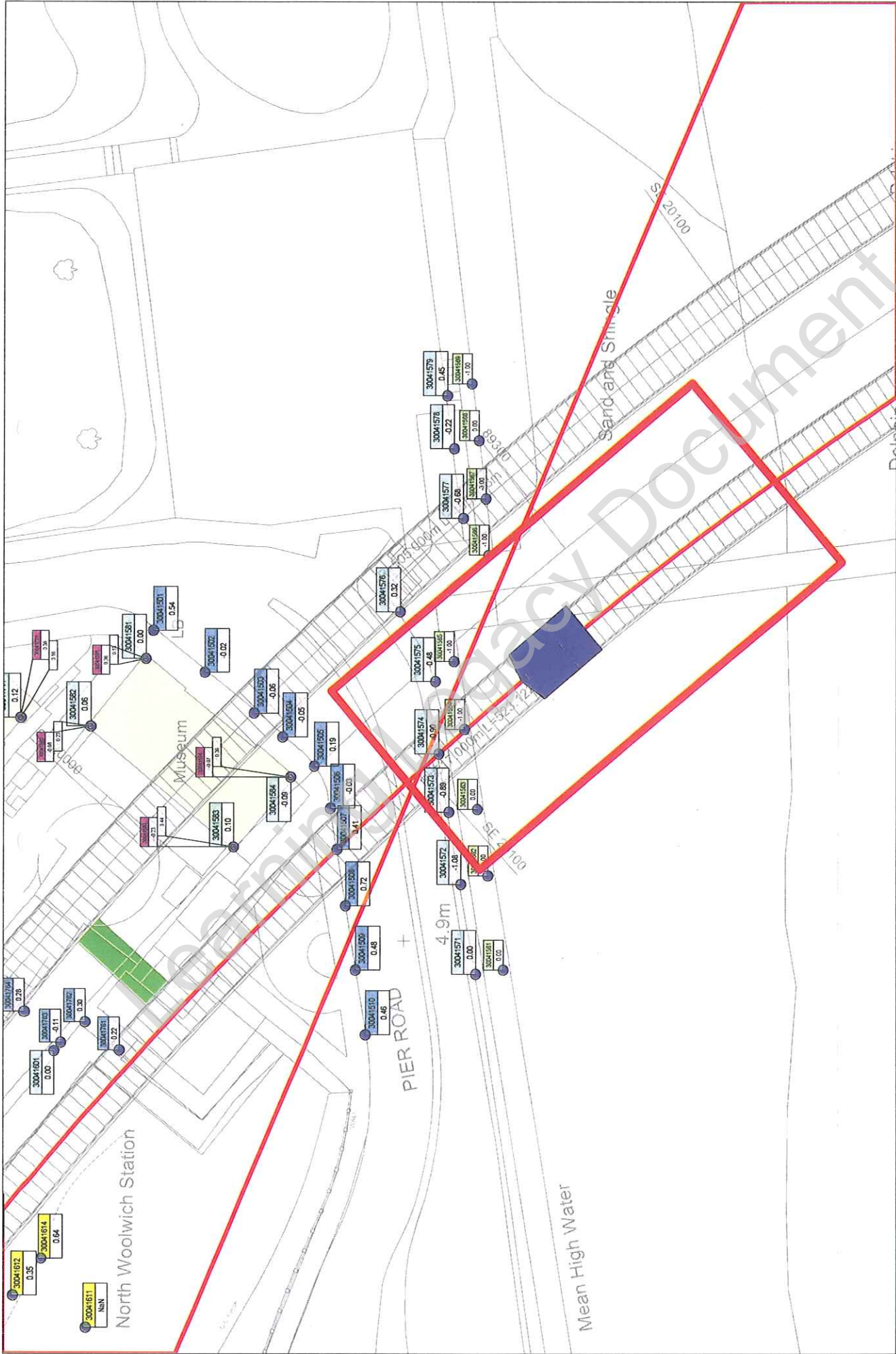


Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: C310 EB tunnel drive; NWP: portal excavation, construction base slab
 current values: 12.04.2014 09:00



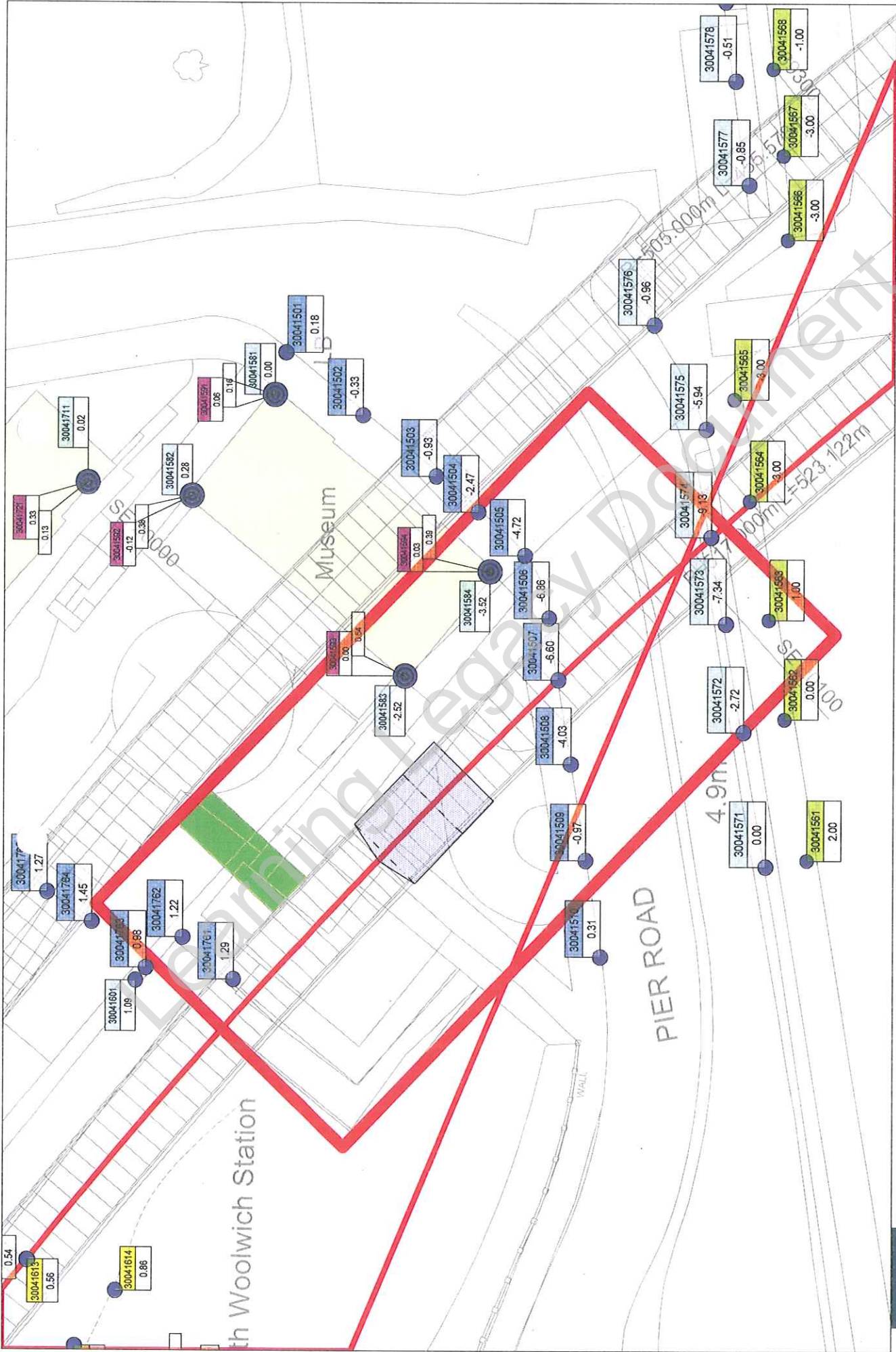


Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: C310 EB tunnel drive; NWP: portal excavation, construction base slab
 current values: 17.04.2014 19:08



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: portal excavation, construction base slab and capping beam
 current values: 10.12.2013 09:00





Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: TBM drive WB
 current values: 15.12.2013 17:10



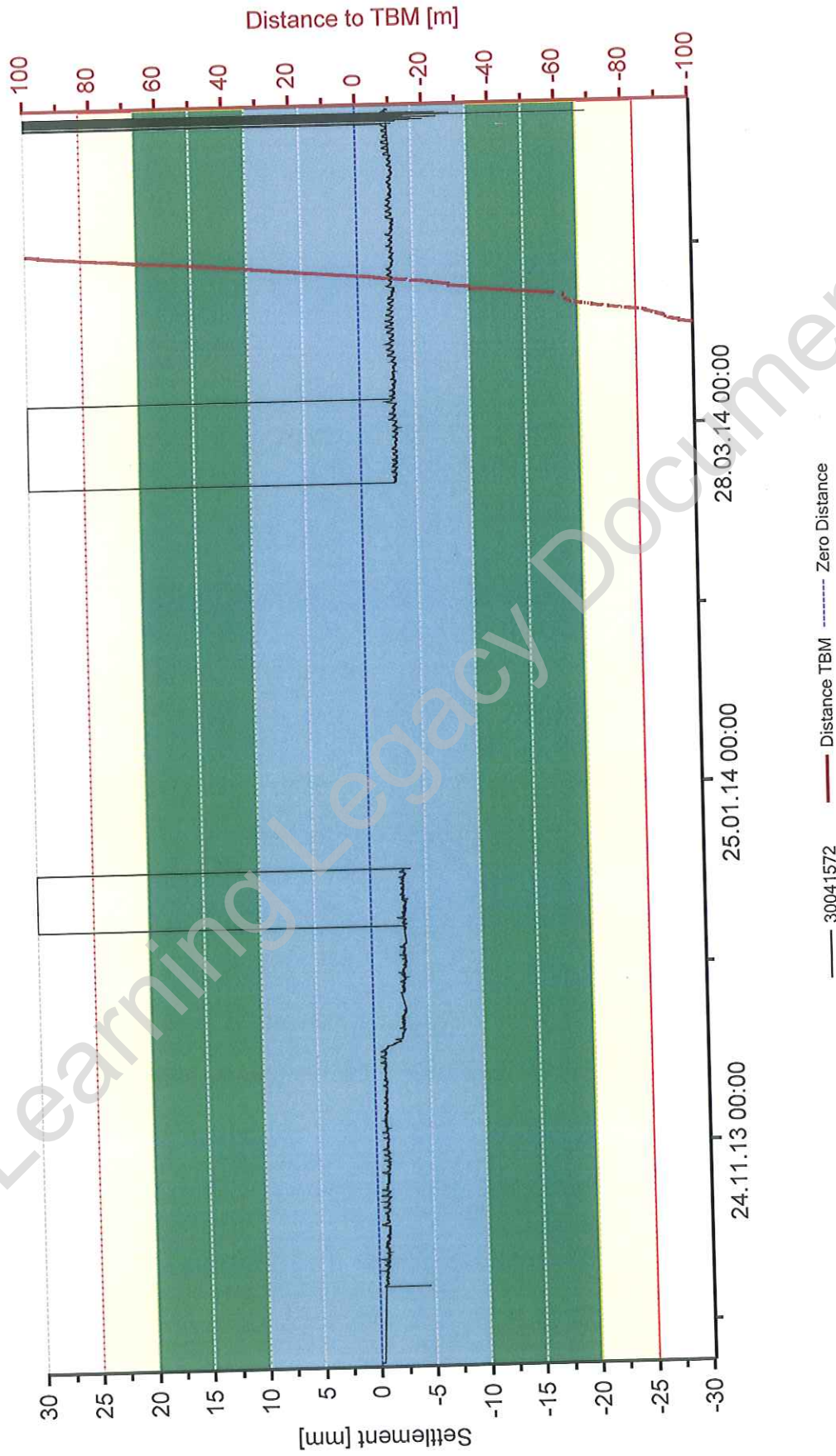
Profile: Measurement Point 30041571



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 Close Out Report: EB Tunnel - HLC Northside Floodwall River Thames - 17.10.2013 - 22.05.2014
 date: 14.04.2015 14:20 current values: 14.04.2015 14:05



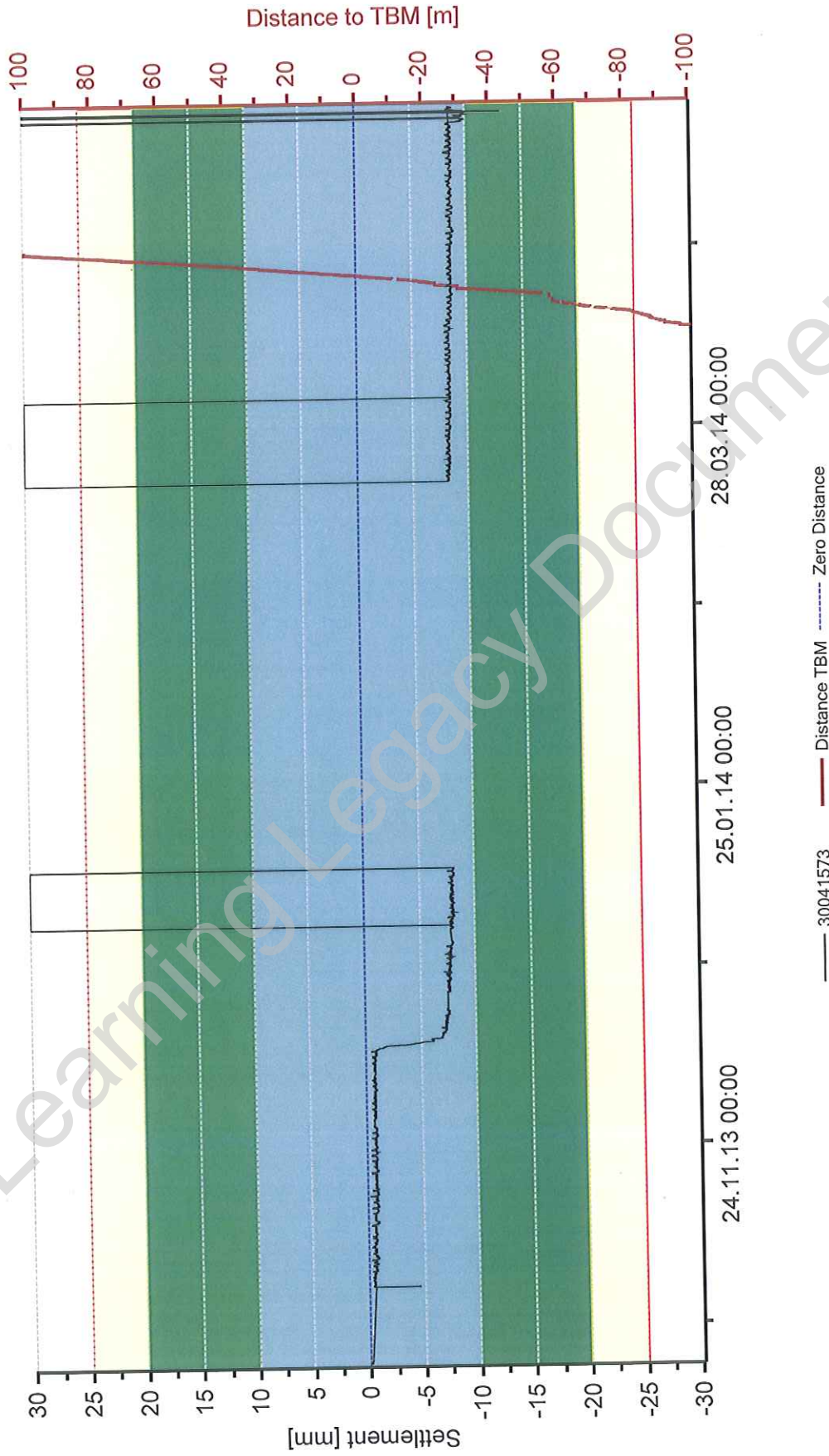
Profile: Measurement Point 30041572



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: EB Tunnel - HLC Northside Floodwall River Thames - 17.10.2013 - 22.05.2014
date: 14.04.2015 14:22 current values: 14.04.2015 14:05



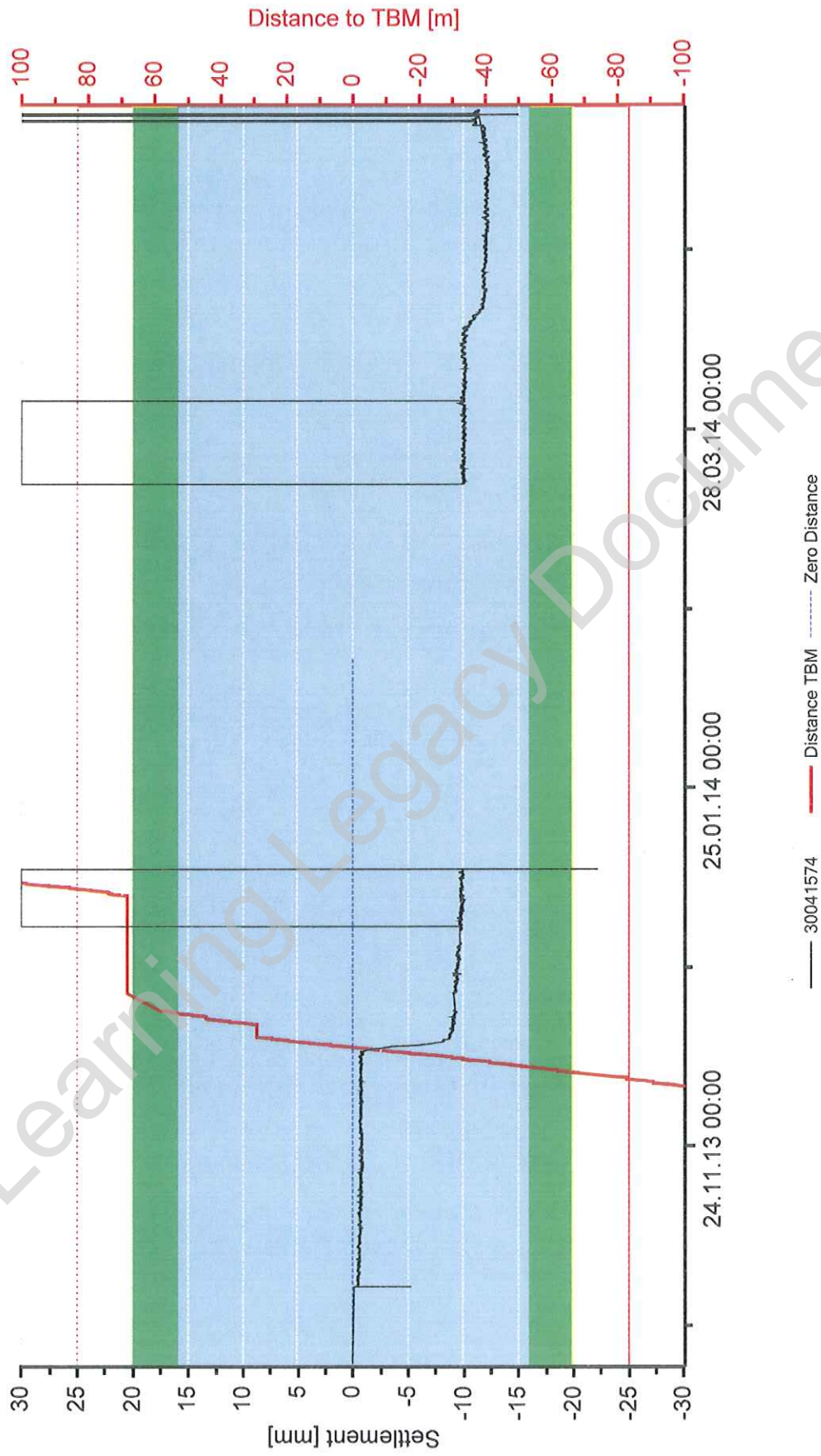
Profile: Measurement Point 30041573



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: EB Tunnel - HLC Northside Floodwall River Thames - 17.10.2013 - 22.05.2014
date: 14.04.2015 14:24 current values: 14.04.2015 14:05



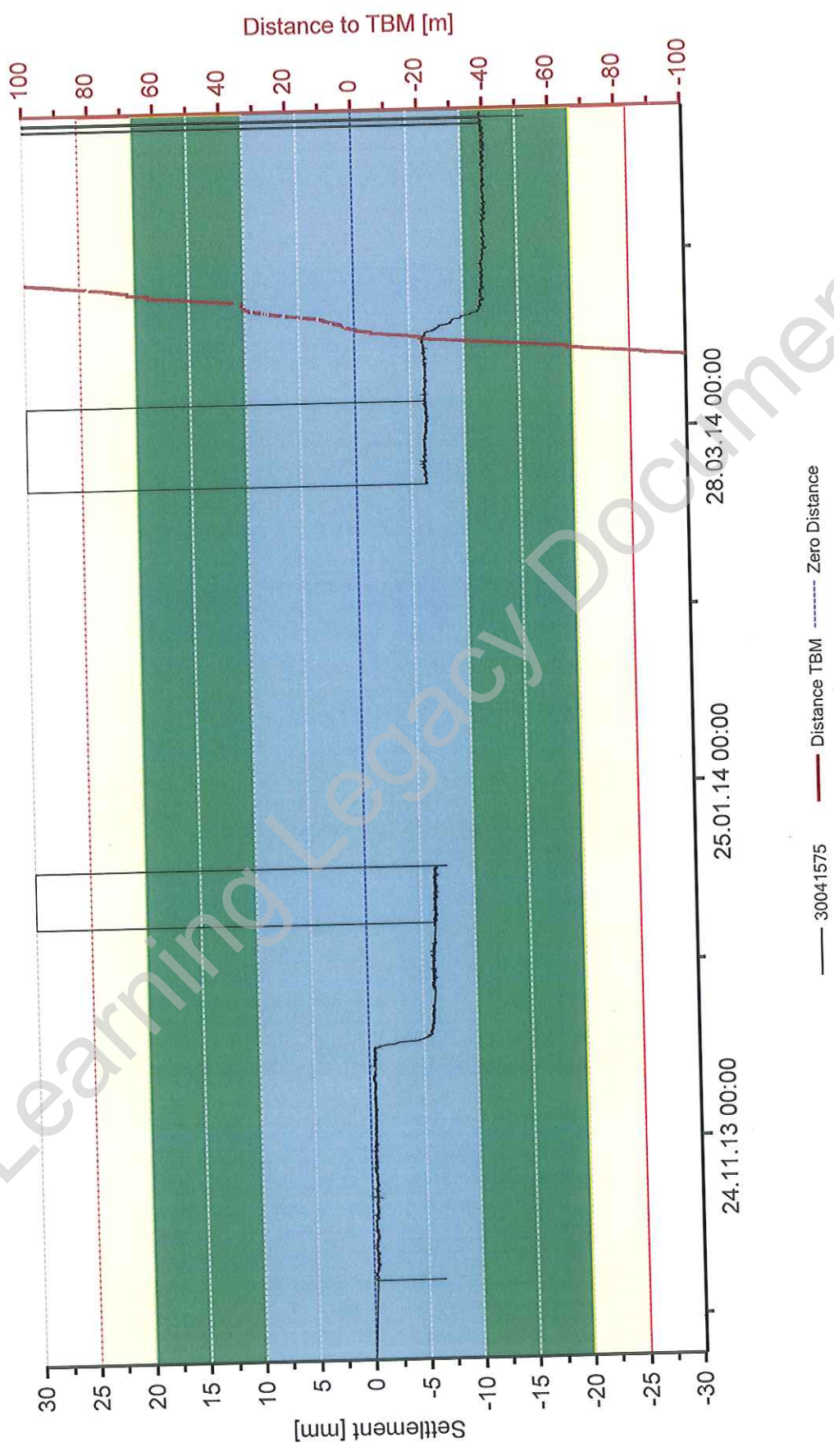
Point: 30041574



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: WB Tunnel - HLC Northside Floodwall River Thames - 17.10.2013 - 22.05.2014
Date: 17.11.2014 11:10 Current Values: 17.11.2014 10:51



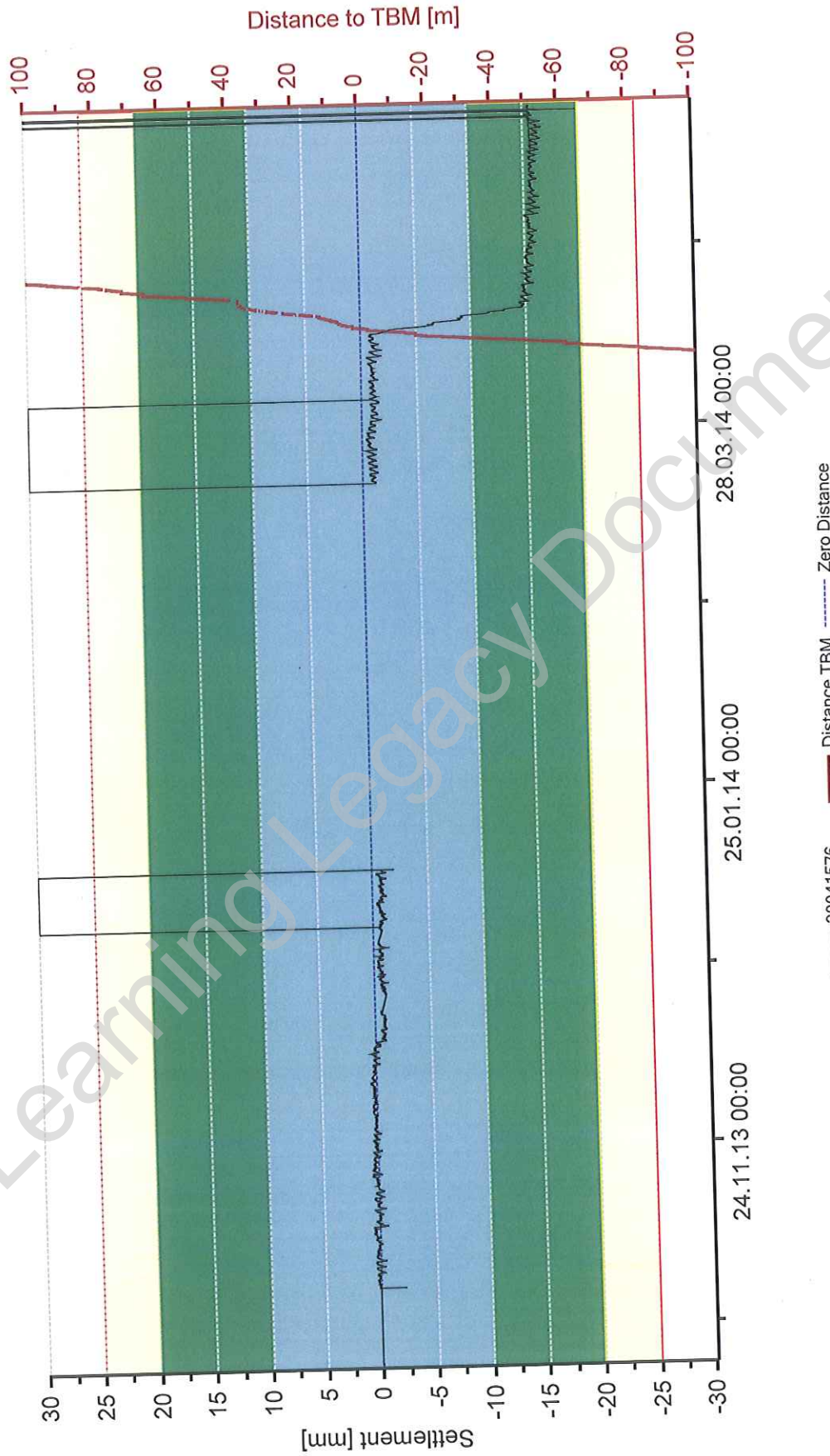
Profile: Measurement Point 30041575



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 Close Out Report: EB Tunnel - HLC Northside Floodwall River Thames - 17.10.2013 - 22.05.2014
 date: 14.04.2015 14:26 current values: 14.04.2015 14:05



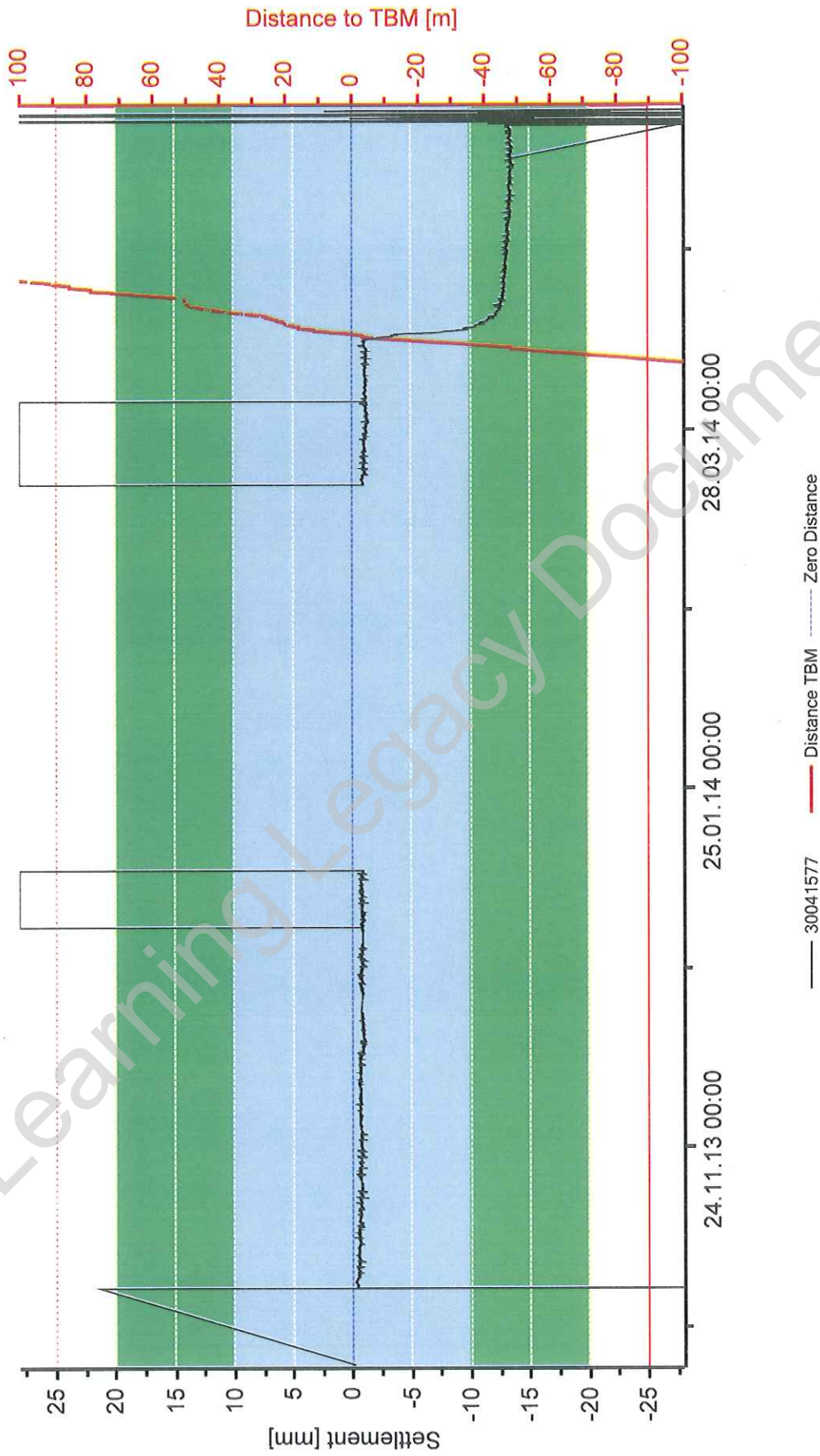
Profile: Measurement Point 30041576



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: EB Tunnel - HLC Northside Floodwall River Thames - 17.10.2013 - 22.05.2014
date: 14.04.2015 14:28 current values: 14.04.2015 14:05



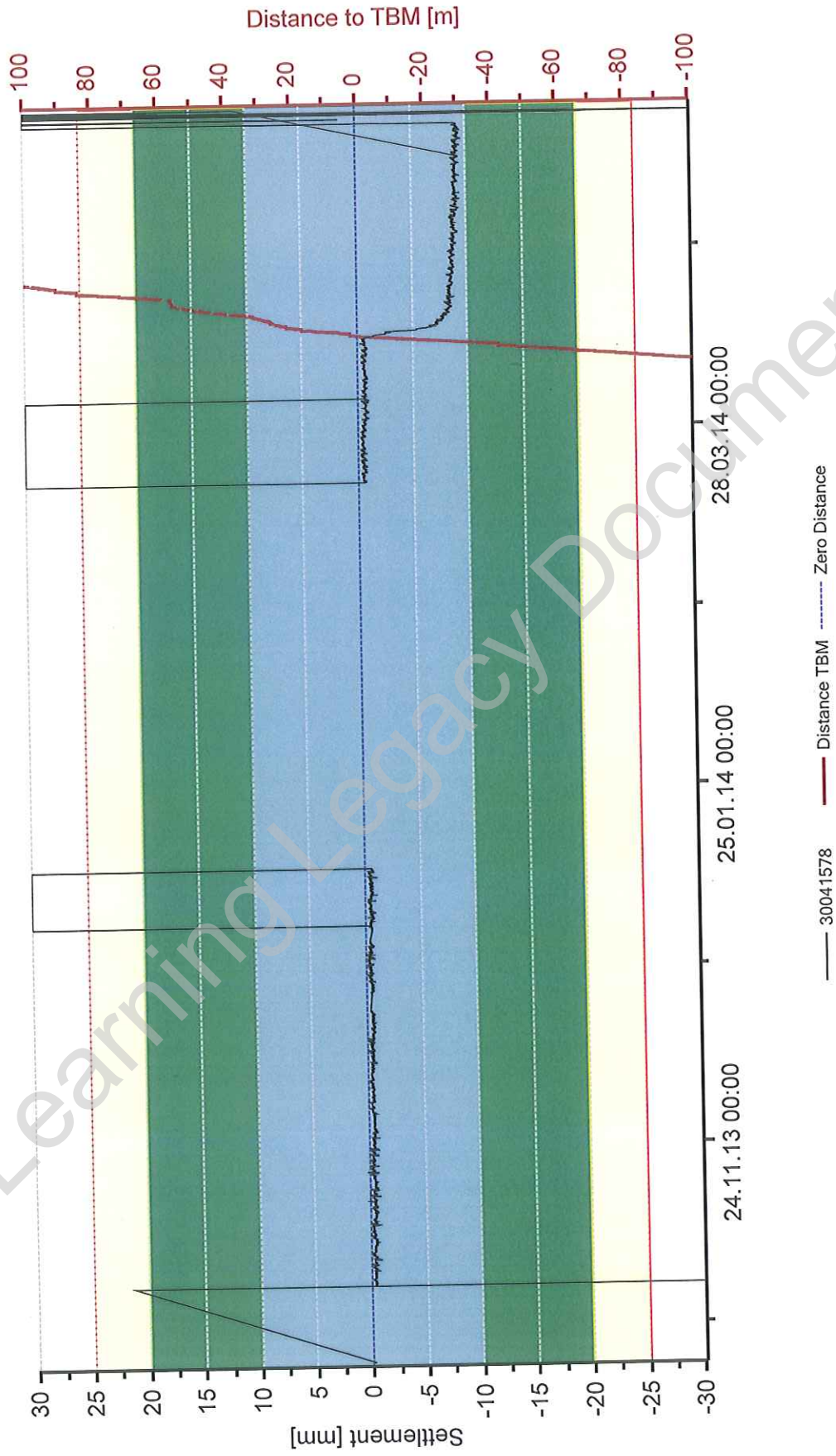
Point: 30041577



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: EB Tunnel - HLC Northside Floodwall River Thames - 17.10.2013 - 22.05.2014
date: 17.11.2014 11:17 current values: 17.11.2014 11:06



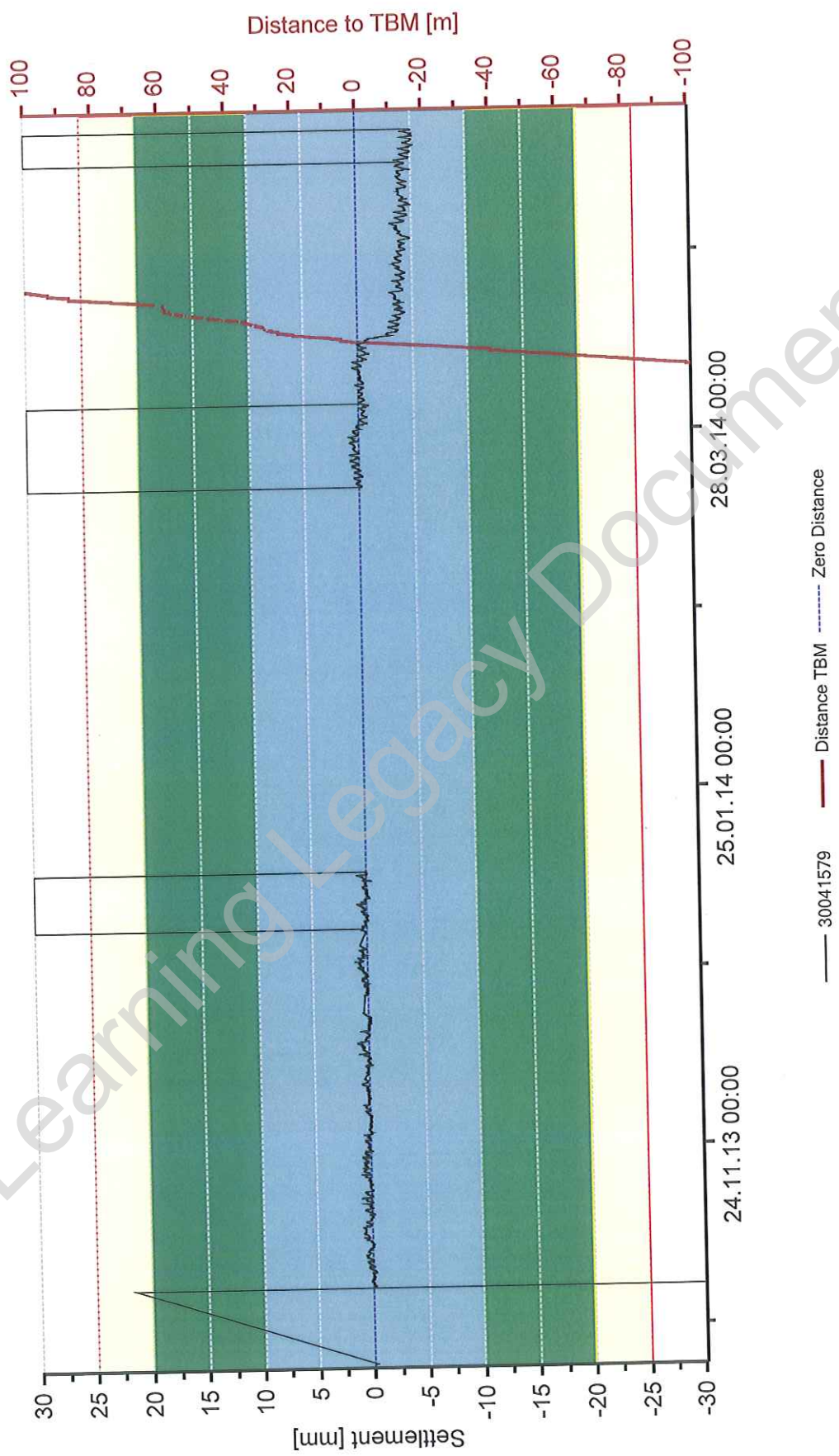
Profile: Measurement Point 30041578



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: EB Tunnel - HLC Northside Floodwall River Thames - 17.10.2013 - 22.05.2014
date: 14.04.2015 14:29 current values: 14.04.2015 14:05



Profile: Measurement Point 30041579



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 Close Out Report: EB Tunnel - HLC Northside Floodwall River Thames - 17.10.2013 - 22.05.2014
 date: 14.04.2015 14:31 current values: 14.04.2015 14:05



 HOCHTIEF MURPHY Joint Venture		C310 THAMES TUNNEL REPORT			
EMPLOYER	CROSSRAIL	eB NO	C310-HTM-C-RGN-CR148-50024	Rev	2.0
TITLE	Monitoring Close-Out Reports relating to Tunnelling Works North Embankment River Thames - North Woolwich Portal (excl. Store Rd)				

APPENDIX 76
CS Pier Road

Learning Legacy Document

monitoring asset	Services underneath Pier Road		
reference monitoring drawing:	- C310-HTM-C-DWG-CR146-ST004-70003		
name of monitoring section:	CS Pier Road		
sensor type:	manual levelling studs		
chainage:	89260	point no.:	3004 1501 - 3004 1510
trigger values: [mm]	green: +16 -16	amber: +20 -20	red: +25 -25
reference document for trigger values:	Management Plan for Control of Ground Movement		
EB-no.:	C310-HTM-Z-STP-CR148-50058		
Appendix:	AAA		

monitoring data

	date		max. value	point no.	comments
baseline	01/10/13		0.00		
TBM 1	start ZOI	10/12/13	0.41	3004 1507	
	end ZOI	17/12/13	-8.41	3004 1507	breached not any trigger value
TBM 2	start ZOI	14/04/14	-1.70	3004 1503	
	end ZOI	21/04/14	-15.54	3004 1503	breached not any trigger value
longterm		19/03/15	-19.18	3004 1504	breached green trigger value, reported to SRG, no further action required
Evaluation of any potential residual risks			<input checked="" type="checkbox"/>	No residual risk since the Works have been completed by HMJV	
			<input type="checkbox"/>	Yes, residual risk (see comment below)	

summary / comments

The maximum deflection ratio is 1:8530 (3004 1506 - 3004 1507 - 3004 1508) - no TW trigger breached (TW alert value 1:1000).

Under consideration of temperature differences, the surrounding ground condition and the achievable accuracy of the measurement, HMJV has no concern to cease the monitoring.

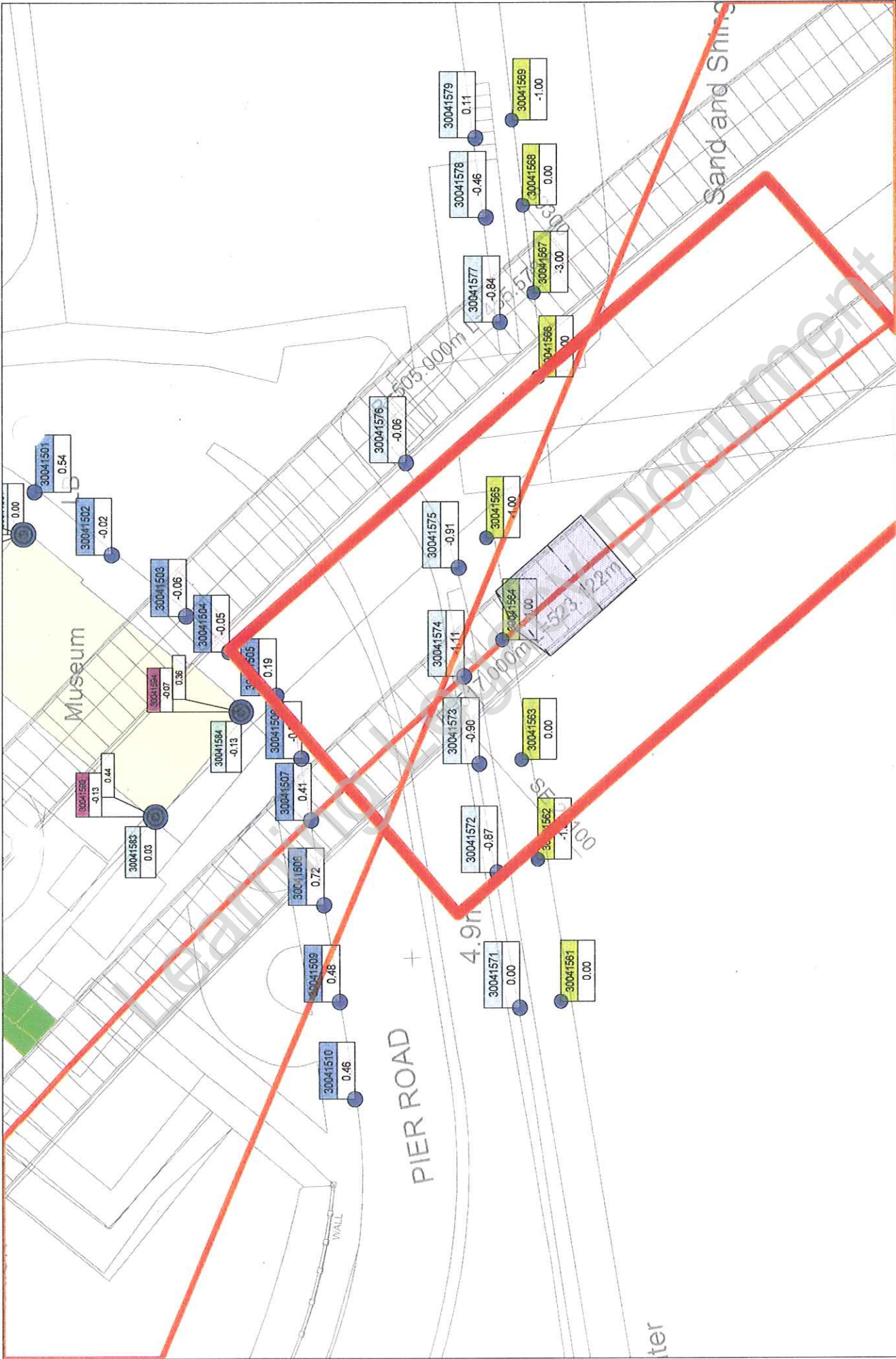
The rate of change in the monitoring data is less than the required standards as per the specifications and drawings.

date / signature: 14/04/15

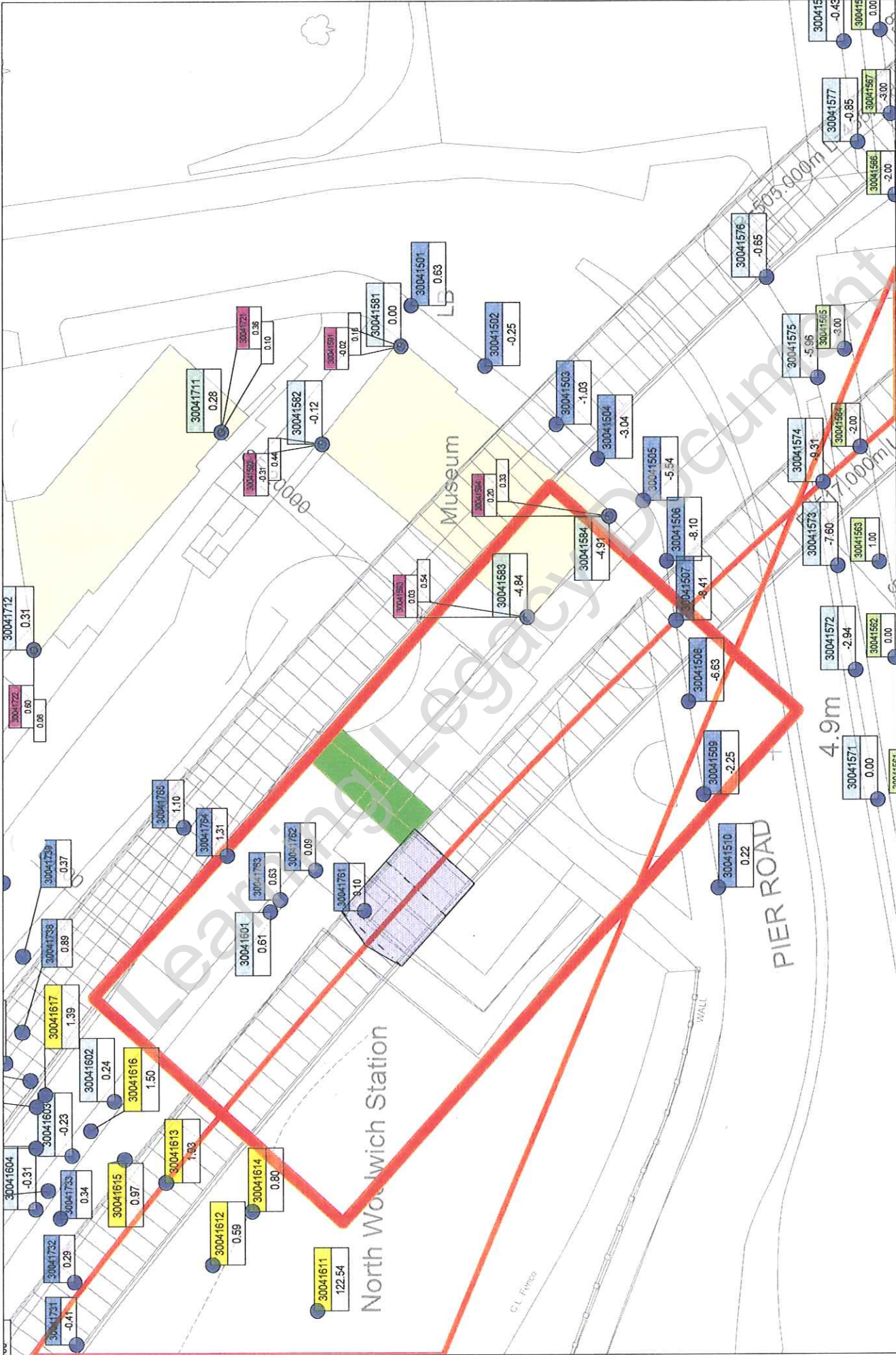
print name:

HMJV project role:

Monitoring & Survey engineer



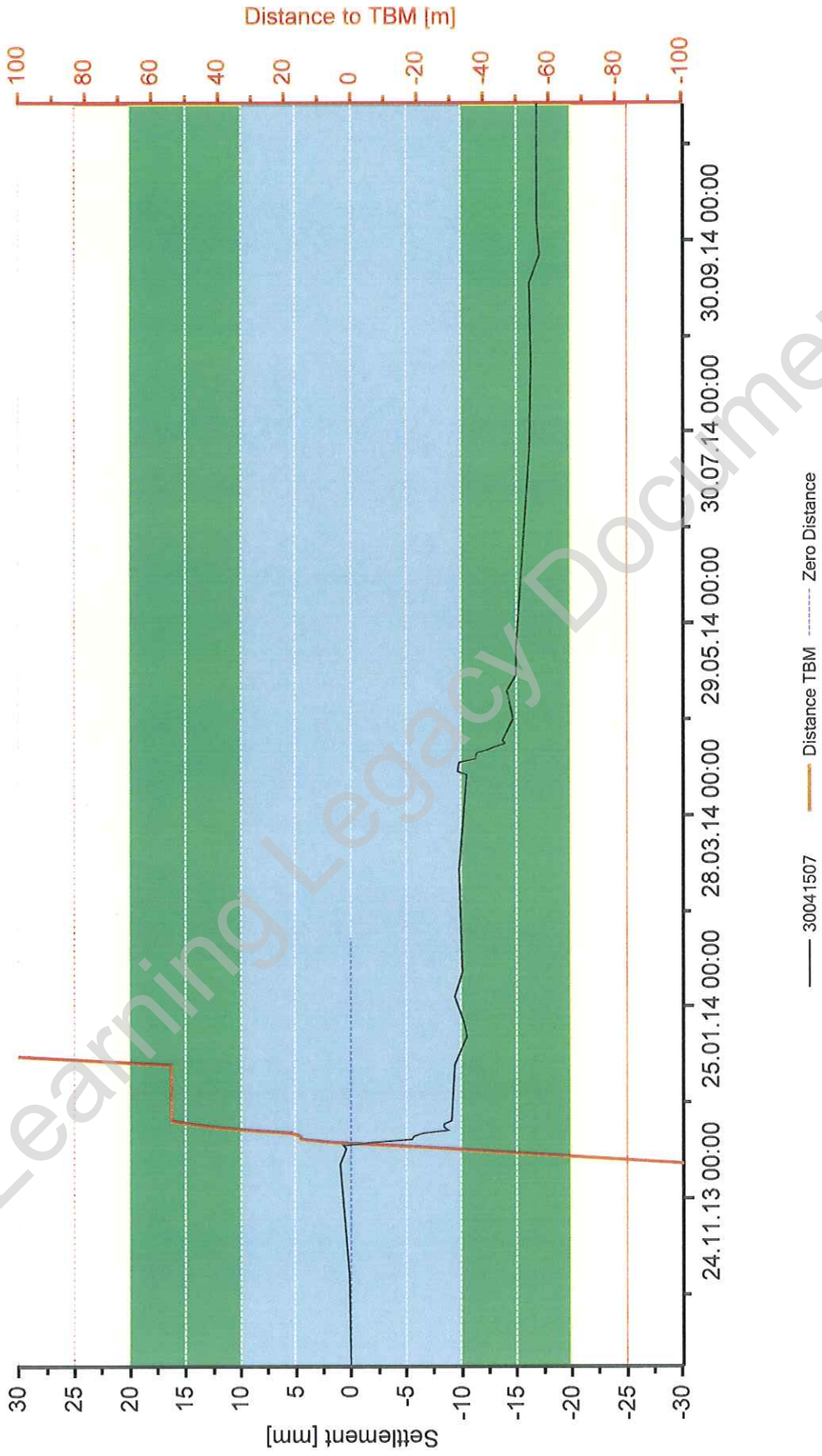
Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: TBM drive WB
 current values: 10.12.2013 17:49



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: portal excavation, construction base slab and capping beam
 current values: 17.12.2013 09:00



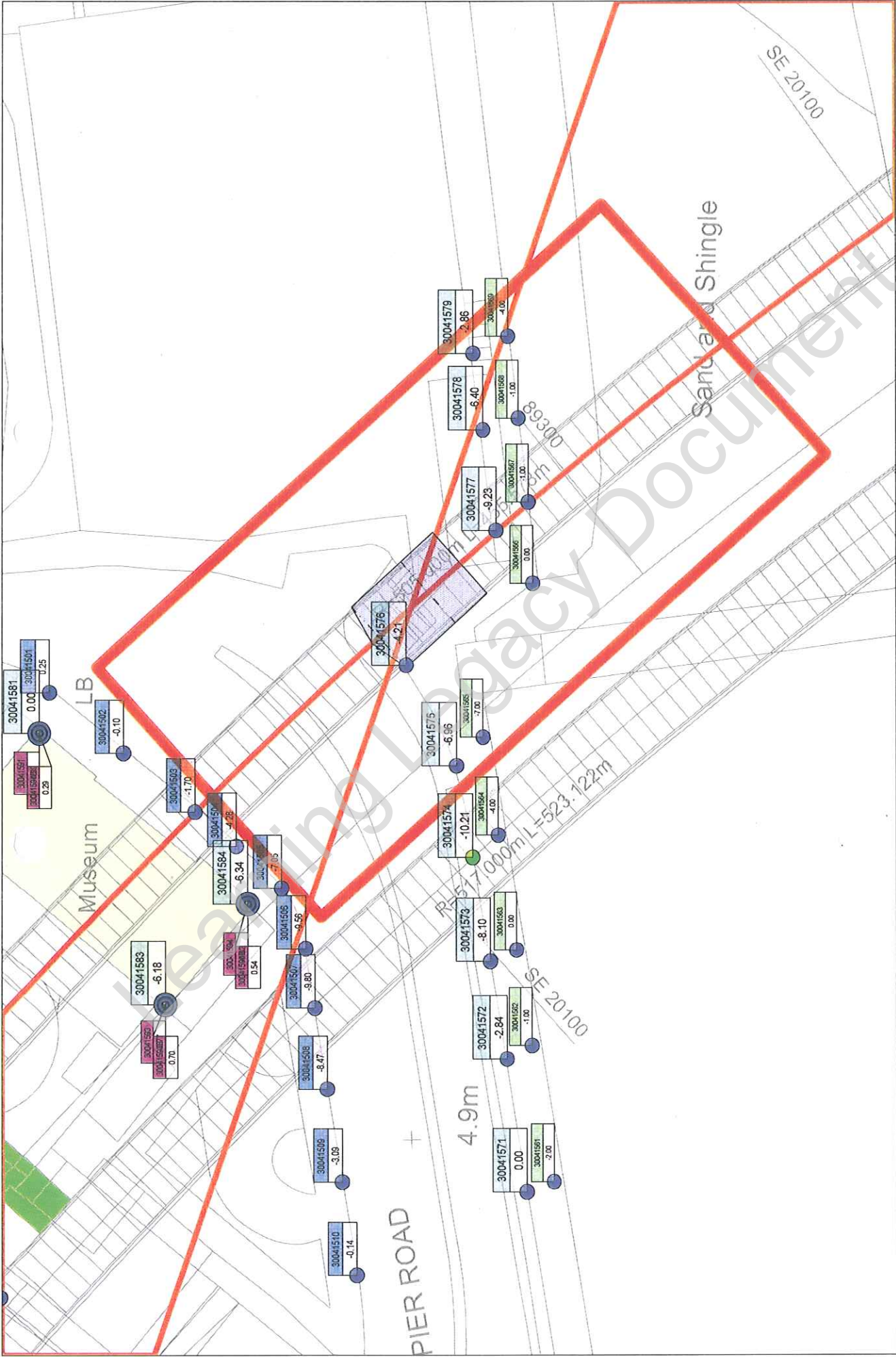
Point: 30041507



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal

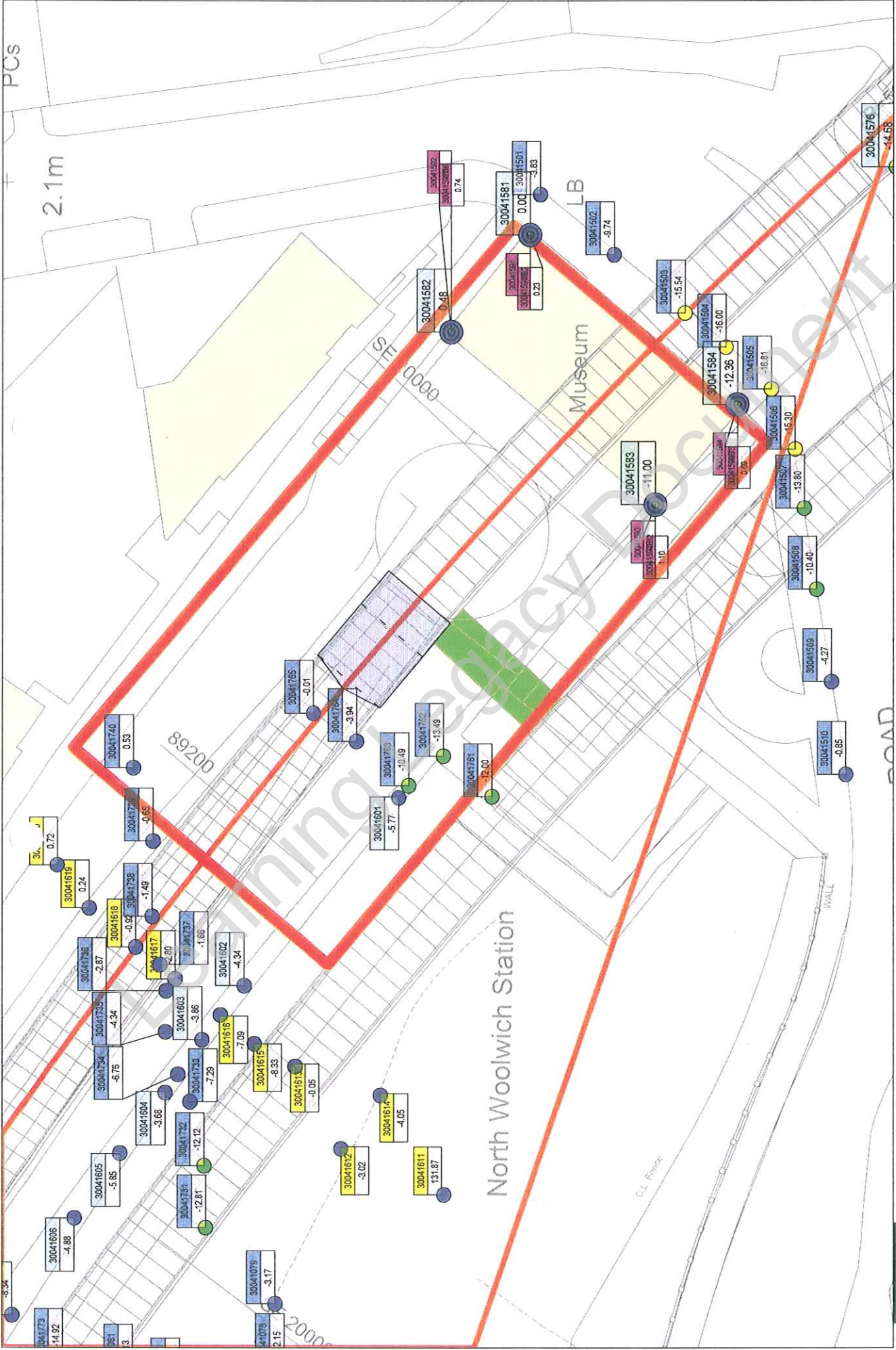
Close Out Report: WB Tunnel - CS Pier Road - 01.10.2013 - 13.11.2014

Date: 18.11.2014 10:45 Current Values: 18.11.2014 10:29



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: C310 EB tunnel drive; NWP: portal excavation, construction base slab
 current values: 14.04.2014 09:20

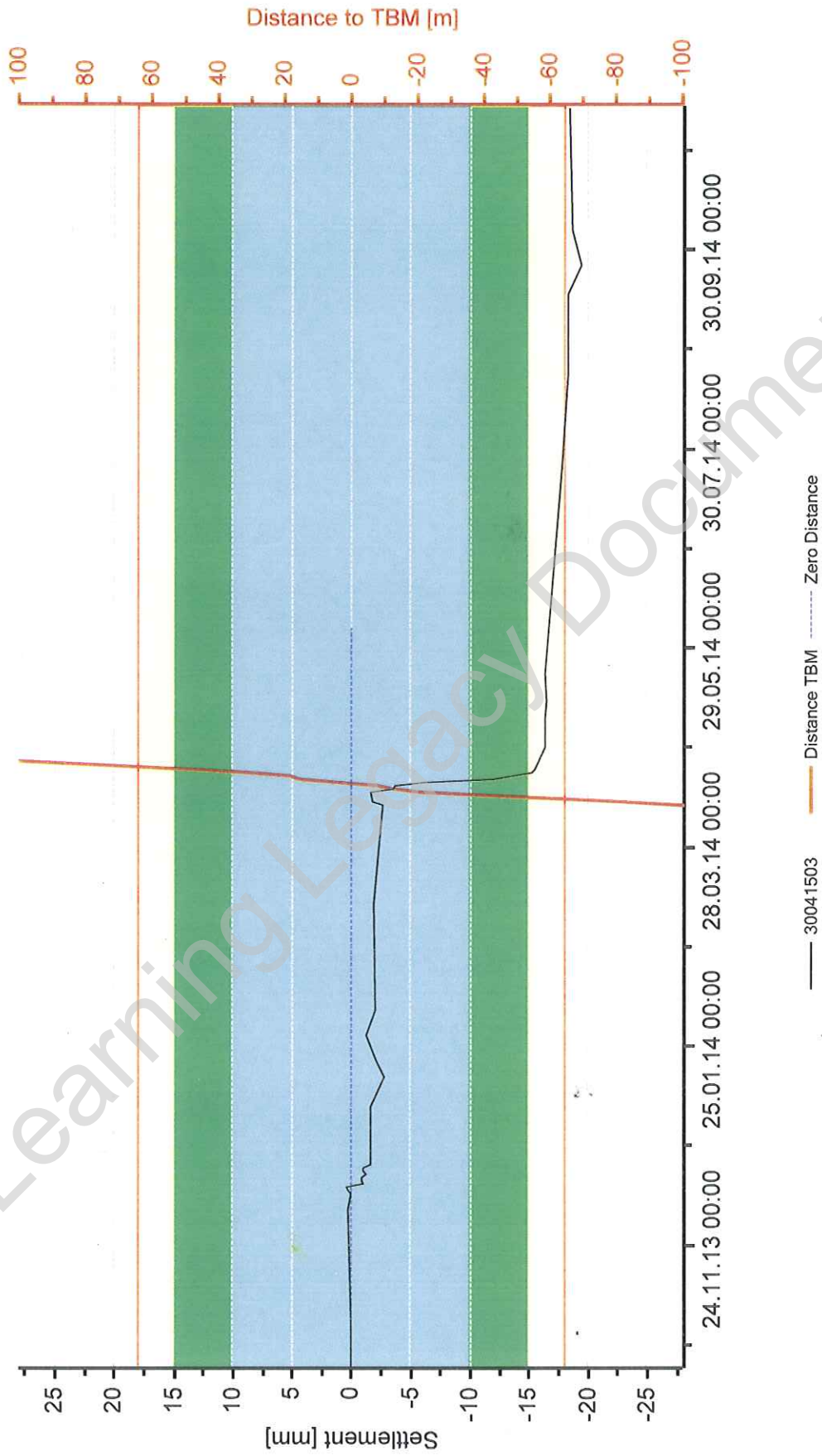




Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: C310 EB tunnel drive; NWP: portal excavation, construction base slab
 current values: 21.04.2014 09:00



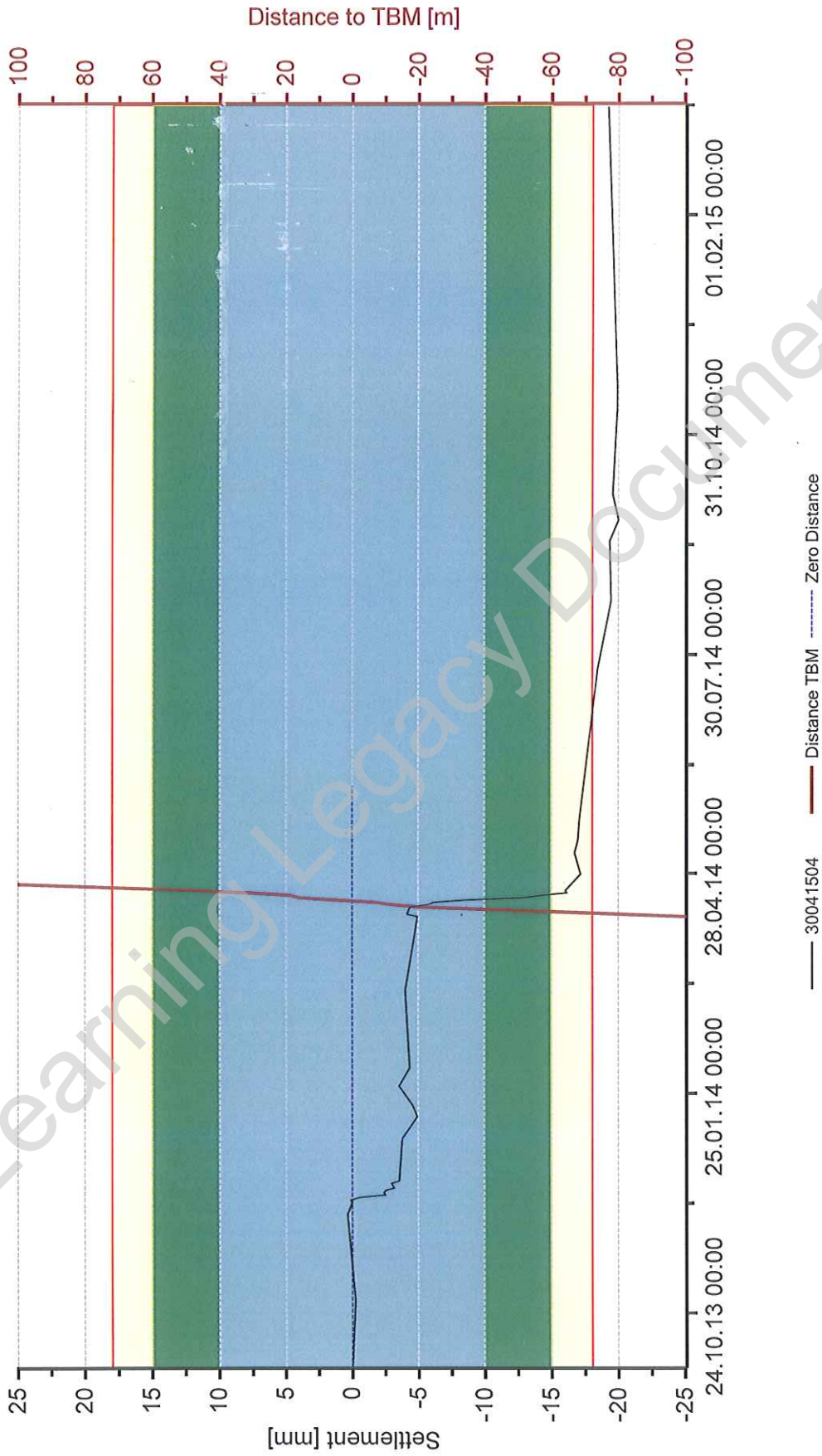
Point: 30041503



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: EB Tunnel - CS Pier Road - 01.10.2013 - 13.11.2014
date: 17.11.2014 11:42 current values: 17.11.2014 11:21



Profile: Measurement Point 30041504



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal

Close Out Report: EB Tunnel - CS Pier Road - 01.10.2013 - 19.03.2015

date: 09.04.2015 09:14 current values: 09.04.2015 08:03



monitoring table



Joint Venture

project: C310 Thames Tunnel

structure: Cross section Pier road

No. of reading	baseline		1. following		2. following		3. following		4. following		5. following		6. following						
	date	elevation	30/10/2013	deviation from last/baseline	05/12/2013	elevation	deviation from last/baseline	10/12/2013	elevation	deviation from last/baseline	11/12/2013	elevation	deviation from last/baseline	12/12/2013	elevation	deviation from last/baseline	13/12/2013		
30041501	1/10/13	103.924	0	0	103.925	1	1	103.925	0	1	103.925	0	1	103.925	0	1	103.924	-1	0
30041502		104.158	0	0	104.158	0	0	104.158	0	0	104.158	0	0	104.158	0	0	104.157	-1	-1
30041503		104.390	0	0	104.390	0	0	104.390	0	0	104.390	0	0	104.390	0	0	104.389	-1	-1
30041504		104.505	0	0	104.505	0	0	104.505	0	0	104.505	0	0	104.504	-1	-1	104.502	-2	-3
30041505		104.622	0	0	104.623	1	1	104.622	-1	0	104.622	0	0	104.620	-2	-2	104.618	-3	-4
30041506		104.697	0	0	104.698	1	1	104.697	-1	0	104.698	1	0	104.694	-3	-3	104.691	-4	-6
30041507		104.783	0	0	104.784	1	1	104.784	0	0	104.784	0	1	104.781	-3	-2	104.778	-4	-6
30041508		104.857	0	0	104.859	1	1	104.858	-1	1	104.858	0	1	104.857	-1	0	104.854	-3	-3
30041509		104.800	0	0	104.801	1	1	104.800	0	0	104.801	0	1	104.801	0	1	104.799	-2	-1
30041510		104.829	0	0	104.830	1	1	104.830	-1	0	104.829	0	0	104.830	1	1	104.829	-1	0

monitoring table



Joint Venture

project: C310 Thames Tunnel

structure: Cross section Pier road

No. of reading	baseline date	7. following 14/12/2013		8. following 15/12/2013		9. following 16/12/2013		10. following 17/12/2013		11. following 18/12/2013		12. following 19/12/2013	
		elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline
30041501	103.924	103.924	0	103.924	0	103.924	0	103.925	0	103.925	0	103.924	0
30041502	104.158	104.158	0	104.158	0	104.158	0	104.158	0	104.158	0	104.157	-1
30041503	104.390	104.389	-1	104.389	0	104.388	-1	104.389	0	104.389	0	104.388	-1
30041504	104.505	104.502	-2	104.502	0	104.502	-1	104.502	0	104.502	0	104.501	-1
30041505	104.622	104.617	-5	104.617	0	104.616	-1	104.616	0	104.616	0	104.616	-1
30041506	104.697	104.691	-6	104.690	-1	104.689	-1	104.689	0	104.689	0	104.688	-1
30041507	104.783	104.778	-5	104.777	-1	104.775	-2	104.775	0	104.775	0	104.774	-1
30041508	104.857	104.854	-3	104.853	-1	104.851	-3	104.851	0	104.851	0	104.850	-1
30041509	104.800	104.799	-1	104.799	0	104.797	-1	104.798	0	104.798	0	104.797	-1
30041510	104.829	104.829	0	104.829	0	104.829	-1	104.829	0	104.829	0	104.829	0

monitoring table



Joint Venture

project: C310 Thames Tunnel

structure: Cross section Pier road

No. of reading	baseline	13. following		14. following		15. following		16. following		17. following		18. following	
		elevation	deviation from last/ baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline
date	1/10/13	06/01/2014		15/01/2014		20/01/2014		28/01/2014		05/02/2014		10/03/2014	
30041501	103.924	103.925	0	103.923	-1	103.924	1	103.925	0	103.925	0	103.924	0
30041502	104.158	104.157	0	104.156	-1	104.157	1	104.158	1	104.157	-1	104.158	1
30041503	104.390	104.388	0	104.387	-1	104.388	1	104.389	1	104.388	-1	104.388	0
30041504	104.505	104.501	0	104.500	-1	104.500	0	104.501	1	104.500	-1	104.501	0
30041505	104.622	104.615	0	104.614	-1	104.615	0	104.616	1	104.615	-1	104.615	0
30041506	104.697	104.688	0	104.687	-1	104.687	1	104.688	1	104.687	-1	104.687	0
30041507	104.783	104.774	0	104.773	-1	104.773	0	104.774	1	104.773	-1	104.774	0
30041508	104.857	104.850	0	104.848	-1	104.849	1	104.850	1	104.849	-1	104.849	0
30041509	104.800	104.797	0	104.796	-1	104.796	0	104.797	1	104.796	-1	104.796	0
30041510	104.829	104.829	0	104.827	-2	104.828	1	104.829	1	104.828	-1	104.829	1

monitoring table



Joint Venture

project: C310 Thames Tunnel

structure: Cross section Pier road

No. of reading	baseline	19. following		20. following		21. following		22. following		23. following		24. following	
		elevation	deviation from last/ baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline
date	1/10/13	10/04/2014		11/04/2014		14/04/2014		15/04/2014		16/04/2014		17/04/2014	
30041501	103.924	103.924	0	103.924	0	103.924	0	103.923	-1	103.924	0	103.924	0
30041502	104.158	104.158	0	104.158	1	104.158	0	104.157	-1	104.157	0	104.155	-2
30041503	104.390	104.387	-1	104.388	1	104.388	0	104.386	-2	104.386	0	104.384	-2
30041504	104.505	104.500	-1	104.501	1	104.500	0	104.499	-1	104.499	-1	104.496	-2
30041505	104.622	104.614	0	104.615	1	104.615	0	104.613	-2	104.613	0	104.611	-2
30041506	104.697	104.687	-1	104.688	1	104.687	0	104.686	-1	104.686	0	104.685	-1
30041507	104.783	104.773	-1	104.774	1	104.774	0	104.772	-2	104.772	0	104.772	0
30041508	104.857	104.848	-1	104.849	1	104.849	0	104.848	-1	104.848	0	104.848	0
30041509	104.800	104.796	-1	104.797	1	104.797	0	104.795	-2	104.795	0	104.796	0
30041510	104.829	104.828	-1	104.829	1	104.829	0	104.827	-2	104.828	1	104.829	0

monitoring table



Joint Venture

Project: C310 Thames Tunnel

structure: Cross section Pier road

No. of reading	baseline	25. following		26. following		27. following		28. following		29. following		30. following		
		date	elevation	deviation from last/ baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline
		1/10/13												
				18/04/2014		19/04/2014		20/04/2014		21/04/2014		28/04/2014		07/05/2014
No.	elevation		elevation	deviation from last/ baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline
30041501	103.924		103.922	-2	103.921	-1	103.920	-1	103.920	0	103.920	-1	103.920	0
30041502	104.158		104.151	-4	104.150	-1	104.148	-2	104.148	0	104.148	-1	104.148	0
30041503	104.390		104.378	-6	104.376	-2	104.374	-2	104.374	0	104.373	-1	104.373	0
30041504	104.505		104.492	-4	104.490	-1	104.489	-2	104.489	0	104.488	-1	104.488	0
30041505	104.622		104.607	-4	104.606	-1	104.605	-2	104.605	0	104.604	-1	104.605	1
30041506	104.697		104.683	-2	104.682	-1	104.682	-1	104.682	0	104.681	-1	104.681	0
30041507	104.783		104.771	-1	104.770	-1	104.769	-1	104.770	0	104.769	-1	104.769	1
30041508	104.857		104.848	-1	104.847	-1	104.846	0	104.847	0	104.846	-1	104.846	0
30041509	104.800		104.796	0	104.795	0	104.795	0	104.796	1	104.794	-1	104.795	1
30041510	104.829		104.828	0	104.828	-1	104.828	0	104.828	0	104.827	-1	104.828	0

monitoring table



Joint Venture

project: C310 Thames Tunnel

structure: Cross section Pier road

No. of reading	baseline		31. following		32. following		33. following		34. following		35. following		36. following	
	date	elevation	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline
	1/10/13													
30041501		103.924	103.920	0	103.920	0	103.919	0	103.918	-1	103.919	0	103.918	0
30041502		104.158	104.147	0	104.147	0	104.148	0	104.147	-1	104.146	-1	104.146	0
30041503		104.390	104.373	0	104.373	0	104.373	0	104.372	-1	104.371	-1	104.371	0
30041504		104.505	104.488	0	104.488	0	104.488	0	104.486	-2	104.485	-1	104.485	0
30041505		104.622	104.604	-1	104.604	0	104.604	1	104.603	-2	104.602	-1	104.602	0
30041506		104.697	104.680	0	104.680	0	104.681	1	104.680	-2	104.679	-1	104.679	0
30041507		104.783	104.768	-1	104.768	0	104.769	1	104.767	-2	104.767	0	104.767	0
30041508		104.857	104.846	-1	104.846	0	104.846	0	104.845	-1	104.844	-1	104.844	0
30041509		104.800	104.794	-1	104.794	0	104.795	0	104.793	-2	104.793	0	104.793	0
30041510		104.829	104.827	0	104.827	0	104.828	0	104.826	-2	104.821	-5	104.826	5

monitoring table




Joint Venture

project: C310 Thames Tunnel

structure: Cross section Pier road

No. of reading	baseline		37. following		38. following		39. following		40. following		elevation	deviation from last/baseline	elevation	deviation from last/baseline	
	date	elevation	elevation	deviation from last/ baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline					
	1/10/13														
30041501		103.924	103.918	-1	103.919	1	-6	103.919	0	-6	103.919	0	-5		
30041502		104.158	104.145	-1	104.146	1	-13	104.146	0	-13	104.146	0	-12		
30041503		104.390	104.370	-1	104.371	1	-19	104.371	0	-18	104.372	1	-18		
30041504		104.505	104.485	-1	104.485	1	-20	104.485	0	-20	104.486	1	-19		
30041505		104.622	104.601	-1	104.602	1	-19	104.602	0	-19	104.603	0	-19		
30041506		104.697	104.678	-1	104.679	1	-19	104.679	1	-18	104.679	0	-18		
30041507		104.783	104.766	-1	104.766	0	-17	104.766	0	-17	104.767	1	-16		
30041508		104.857	104.844	-1	104.844	0	-13	104.844	1	-13	104.845	1	-12		
30041509		104.800	104.792	0	104.793	0	-7	104.792	0	-8	104.793	1	-6		
30041510		104.829	104.825	-1	104.826	0	-3	104.825	0	-4	104.827	2	-2		

		C310 THAMES TUNNEL REPORT			
EMPLOYER	CROSSRAIL	eB NO	C310-HTM-C-RGN-CR148-50024	Rev	2.0
TITLE	Monitoring Close-Out Reports relating to Tunnelling Works North Embankment River Thames - North Woolwich Portal (excl. Store Rd)				

APPENDIX 77

Old Station Museum – HLC

Learning Legacy Document

monitoring asset	Old Station Museum		
reference monitoring drawing:	C310-HTM-C-DWG-CR146-ST004-70003		
name of monitoring section:	Old Station Museum		
sensor type:	hydrostatic levelling cell (hlc)		
chainage:	89250	point no.:	3004 1581 - 3004 1584
trigger values: [mm]	green: +16 -16	amber: +20 -20	red: +25 -25
reference document for trigger values:	Management Plan for Control of Ground Movement		
EB-no.:	C310-HTM-Z-STP-CR148-50058		
Appendix:	AAA		

monitoring data

	date	max. value	point no.	comments
baseline	17/10/13	0.00		
TBM 1	start ZOI	10/12/13	-0.13 0.03	3004 1584 3004 1583
		end ZOI	18/12/13	-5.00 -4.94
TBM 2	start ZOI	15/04/14	-6.53 -6.21 0.10	3004 1584 3004 1583 3004 1582
		end ZOI	22/04/14	-12.44 -10.86 0.61
longterm	19/06/14	-12.52 -11.20 0.33	3004 1584 3004 1583 3004 1582	System decommissioned approx. 2 month after passing of TBM 2.

Evaluation of any potential residual risks	<input checked="" type="checkbox"/>	No residual risk since the Works have been completed by HMJV
	<input type="checkbox"/>	Yes, residual risk (see comment below)

summary / comments

approx. 2month after TBM 2 passed this area, the system has been decommissioned due to the fact, that the owner wanted to sell the building. It was agreed in the CTC.
Under consideration of temperature differences and the achievable accuracy of the system HMJV has no concern to cease the monitoring.
The rate of change in the monitoring data is less than the required standards as per the specifications and drawings up to the time when the instrumentations have been damaged/destroyed.

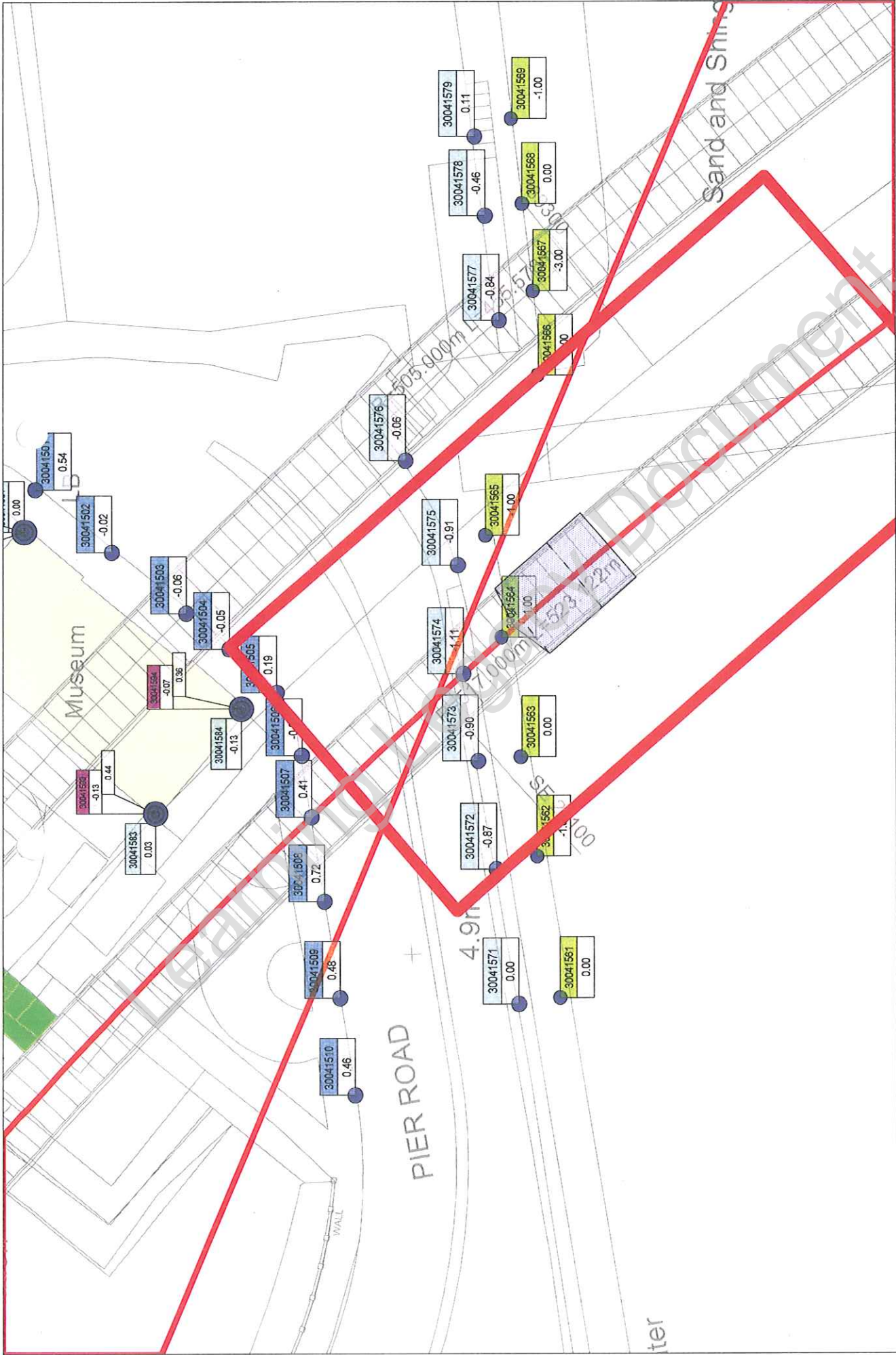
date / signature:

14/01/15

print name:

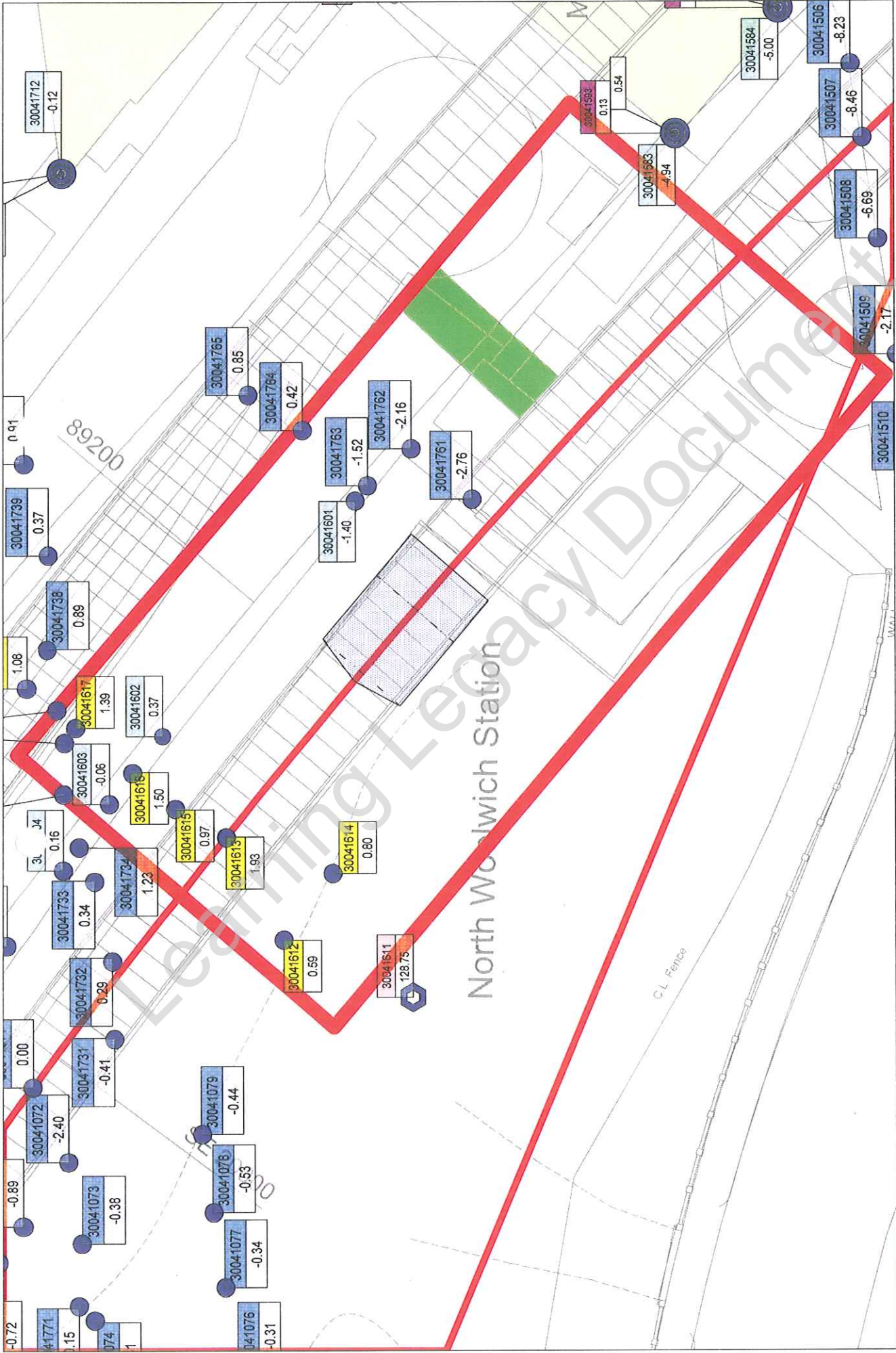
HMJV project role:

Monitoring & Survey Engineer



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: TBM drive WB
 current values: 10.12.2013 17:49





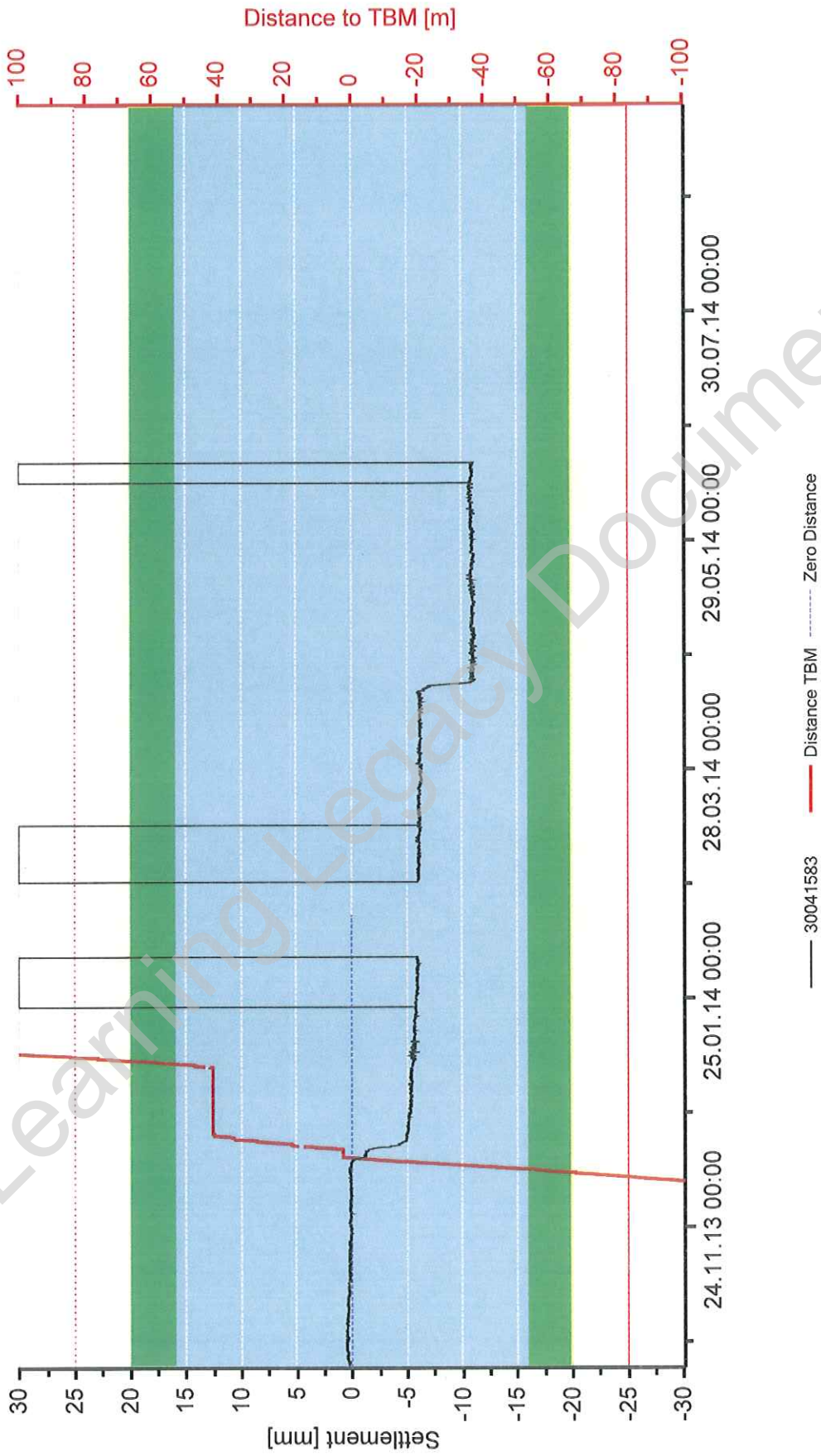
Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal

working activities: TBM drive WB

current values: 18.12.2013 17:46



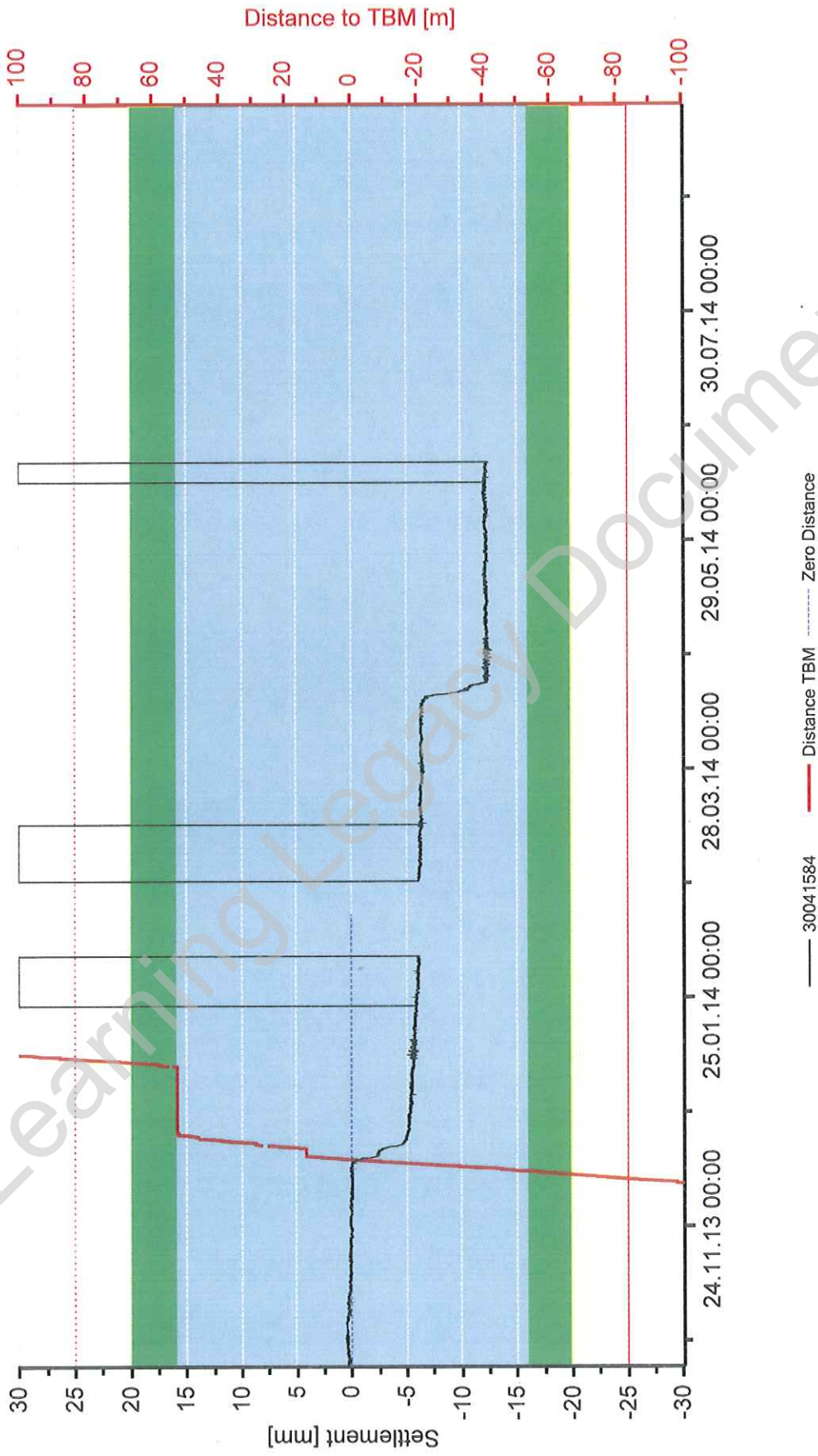
Point: 30041583



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: WB Tunnel - Old Station Museum - 17.10.2013 - 23.09.2014
Date: 18.11.2014 10:52 Current Values: 18.11.2014 10:42

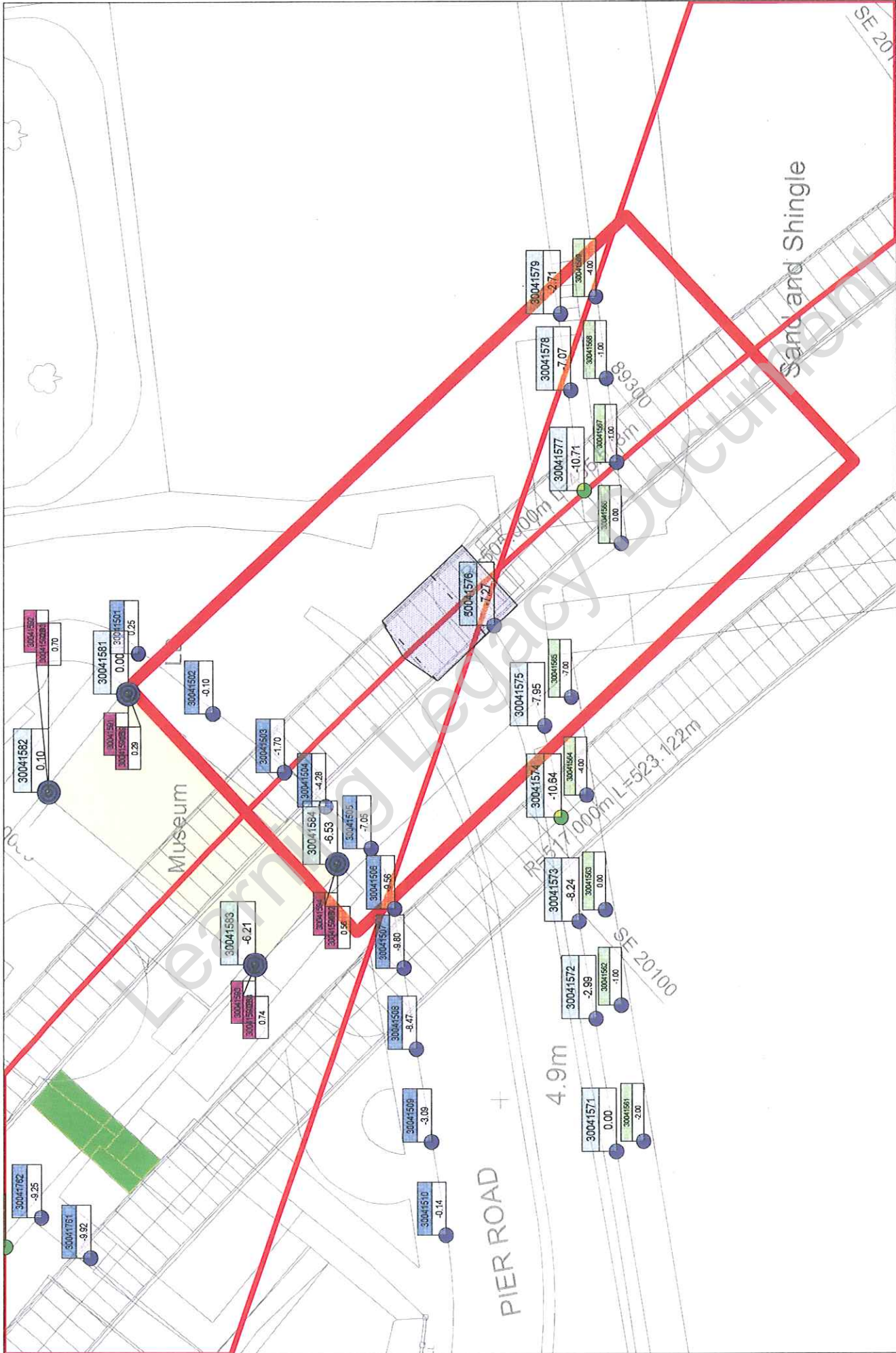


Point: 30041584



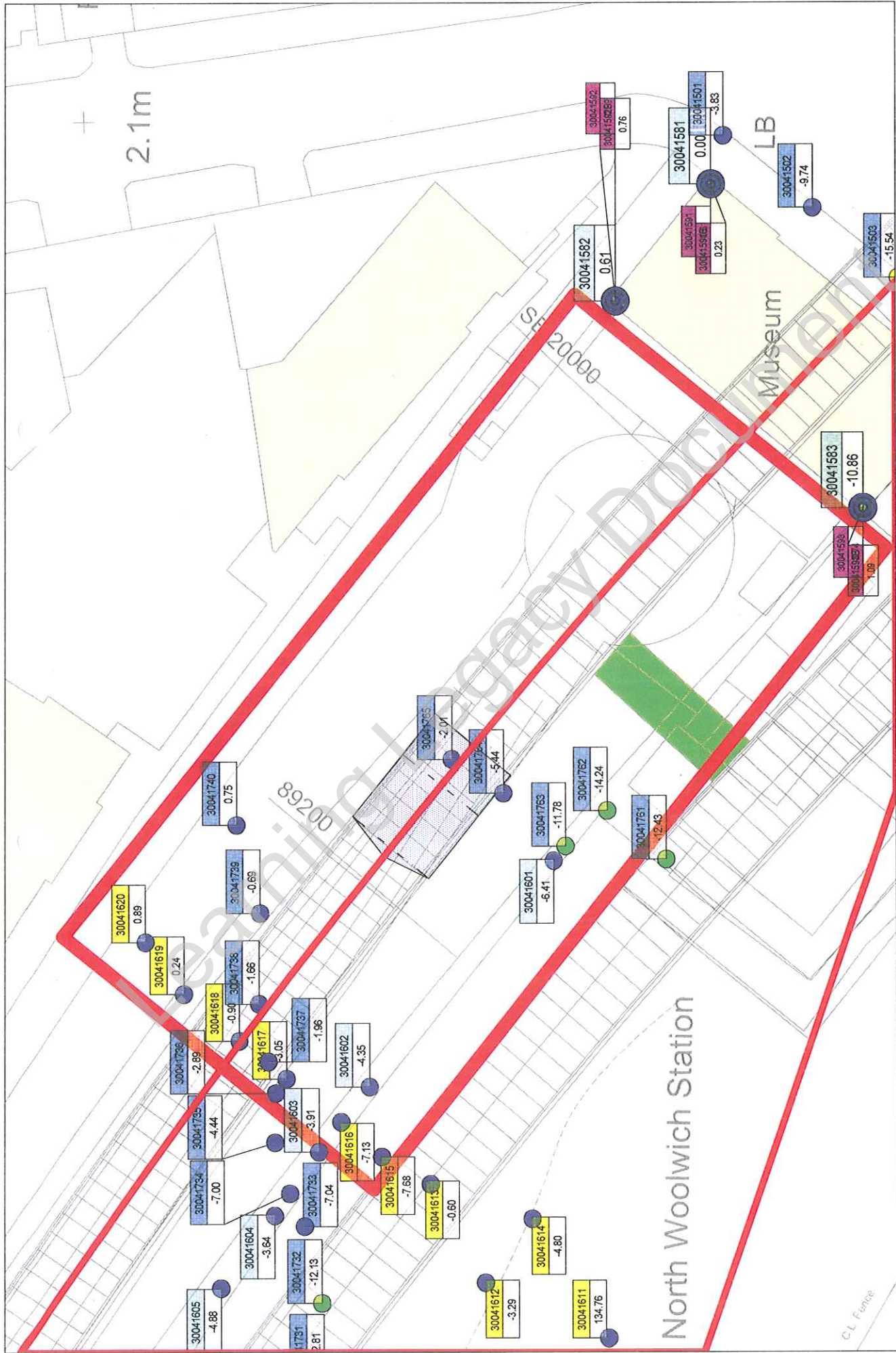
Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: WB Tunnel - Old Station Museum - 17.10.2013 - 23.09.2014
Date: 18.11.2014 10:50 Current Values: 18.11.2014 10:29





Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: C310 EB tunnel drive; NWP: portal excavation, construction base slab
 current values: 15.04.2014 08:18

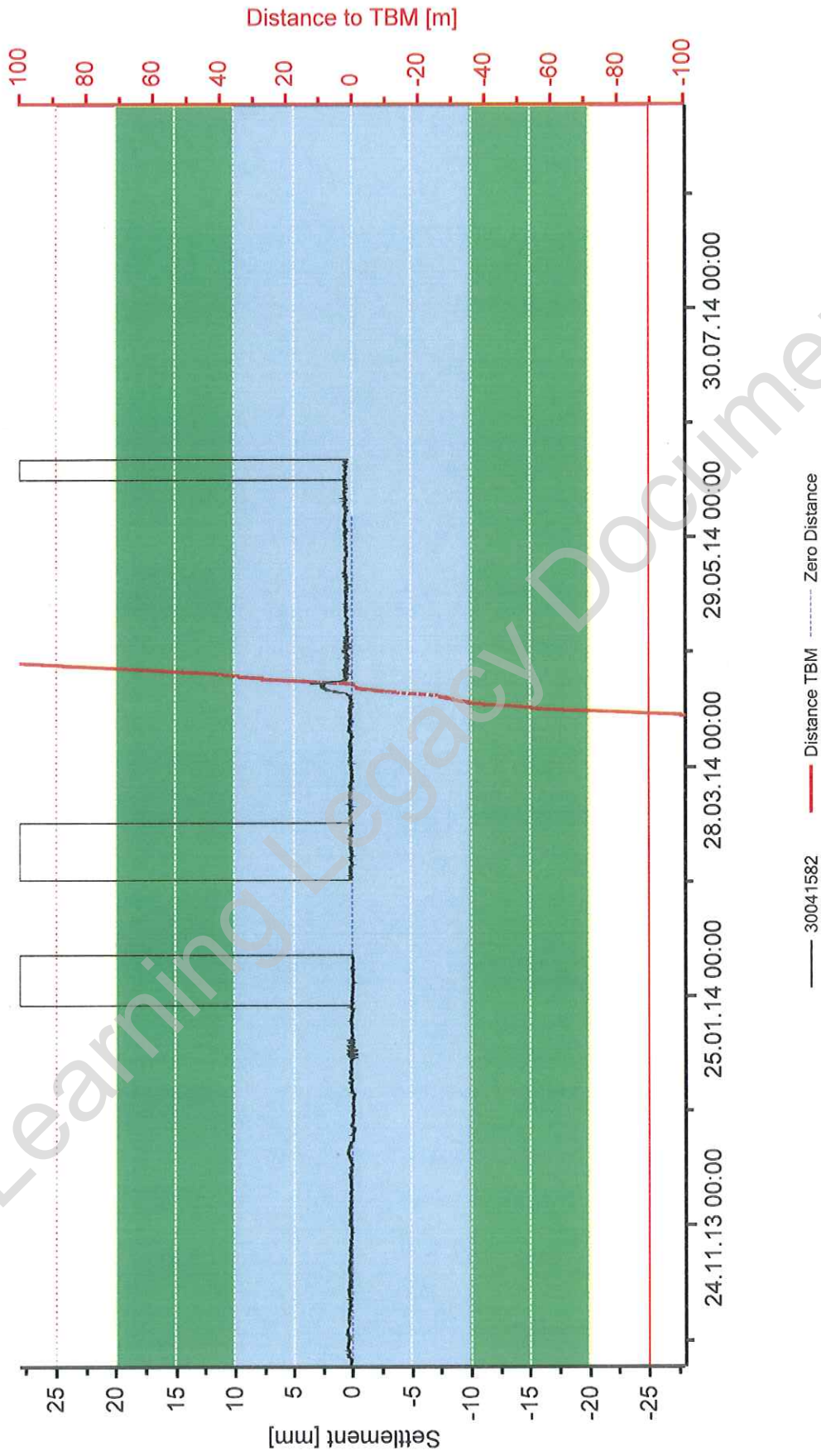




Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: C310 EB tunnel drive; NWP: portal excavation, construction base slab
 current values: 22.04.2014 09:00



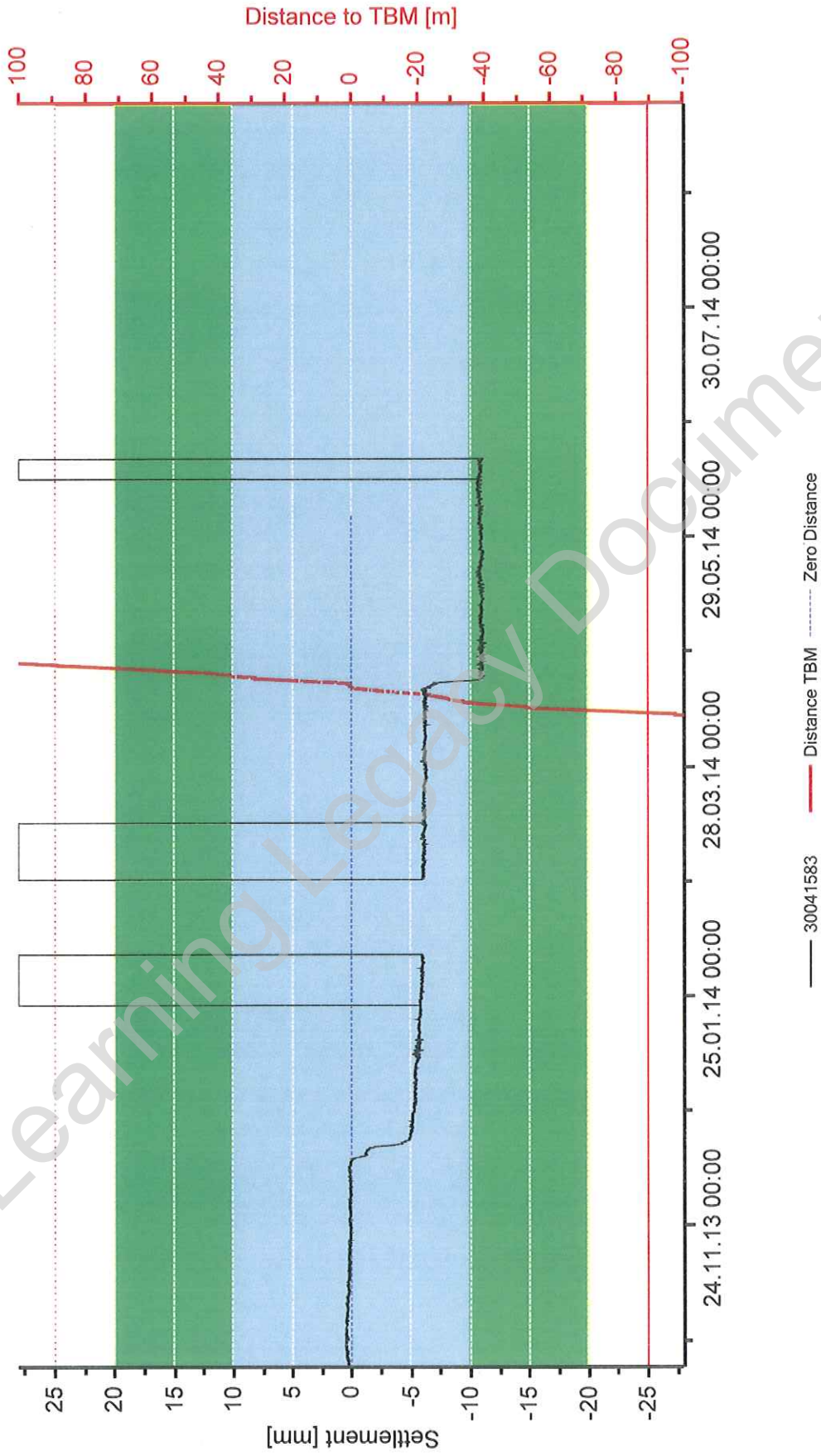
Point: 30041582



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: EB Tunnel - Old Station Museum - 17.10.2013 - 23.09.2014
date: 17.11.2014 11:57 current values: 17.11.2014 11:36



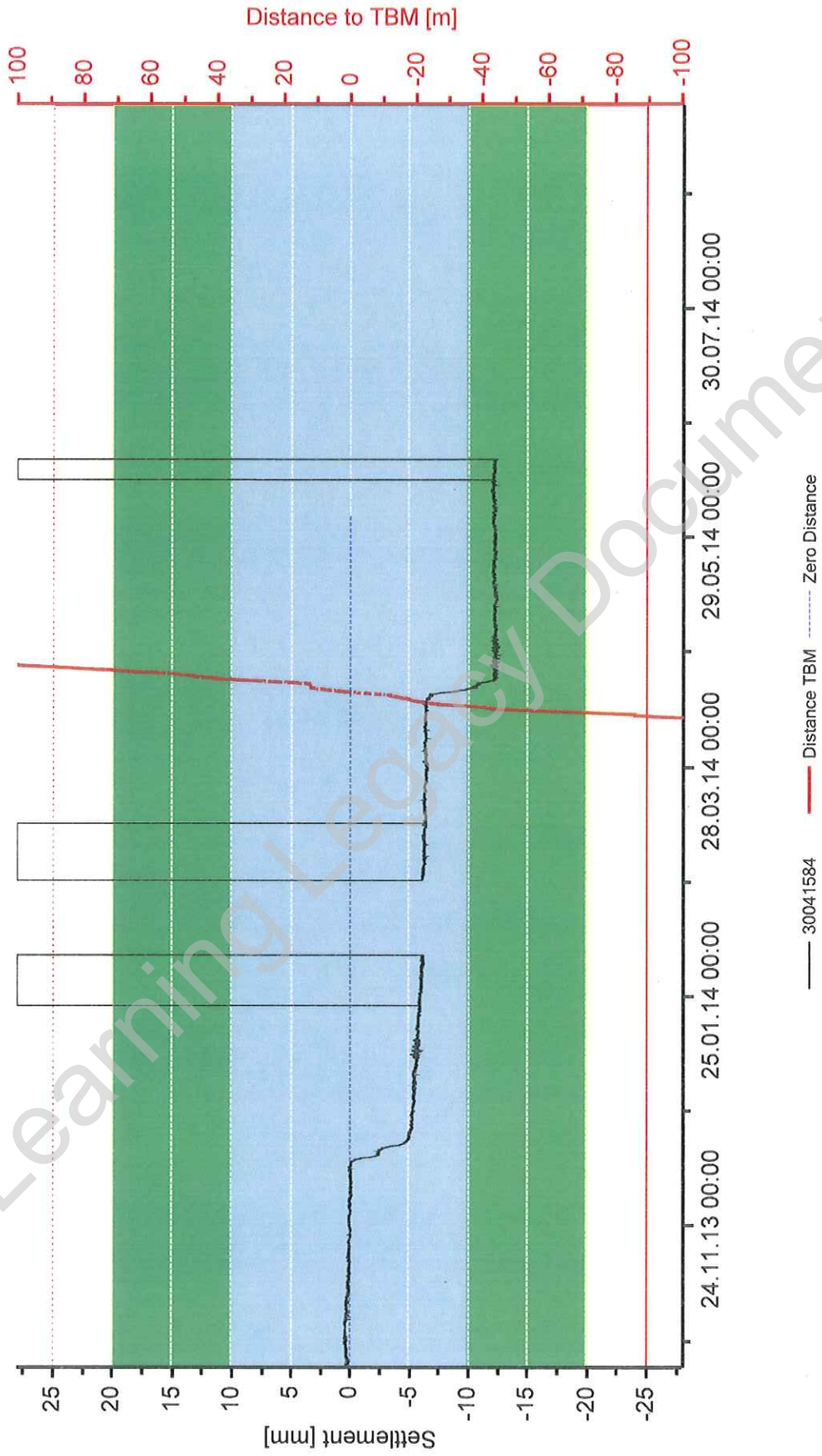
Point: 30041583



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: EB Tunnel - Old Station Museum - 17.10.2013 - 23.09.2014
date: 17.11.2014 12:00 current values: 17.11.2014 11:51



Point: 30041584



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: EB Tunnel - Old Station Museum - 17.10.2013 - 23.09.2014
date: 17.11.2014 12:03 current values: 17.11.2014 11:51




Profile: Measurement Point 30041581



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 Close Out Report: EB Tunnel - Old Station Museum - 17.10.2013 - 23.09.2014
 date: 14.04.2015 14:37 current values: 14.04.2015 14:05



 HOCHTIEF MURPHY Joint Venture		C310 THAMES TUNNEL REPORT			
EMPLOYER	CROSSRAIL	eB NO	C310-HTM-C-RGN-CR148-50024	Rev	2.0
TITLE	Monitoring Close-Out Reports relating to Tunnelling Works North Embankment River Thames - North Woolwich Portal (excl. Store Rd)				

APPENDIX 78

Old Station Museum – TM

Learning Legacy Document

monitoring asset

Old Station Museum

reference monitoring drawing:

C310-HTM-C-DWG-CR146-ST004-70003

name of monitoring section:

Old Station Museum

sensor type:

tiltmeter

chainage:

89250

point no.:

3004 1591 - 3004 1594

trigger values:
[mm]

green: N/A

amber: N/A

red: N/A

reference document for trigger values:

Management Plan for Control of Ground Movement

EB-no.:

C310-HTM-Z-STP-CR148-50058

Appendix:

AAA

monitoring data

	date		max. value	point no.	comments
baseline	17/10/13		0.00		
TBM 1	start ZOI	10/12/13	-0.13 0.03	3004 1584 3004 1583	
	end ZOI	18/12/13	-5.00 -4.94	3004 1584 3004 1583	breached not any trigger value
TBM 2	start ZOI	15/04/14	-6.53 -6.21 0.10	3004 1584 3004 1583 3004 1582	
	end ZOI	22/04/14	-12.44 -10.86 0.61	3004 1584 3004 1583 3004 1582	breached not any trigger value
longterm	19/06/14	-12.52 -11.20 0.33	3004 1584 3004 1583 3004 1582		System decommissioned approx. 2 month after passing of TBM 2.

Evaluation of any potential residual risks



No residual risk
since the Works have been completed by HMJV



Yes, residual risk
(see comment below)

summary / comments

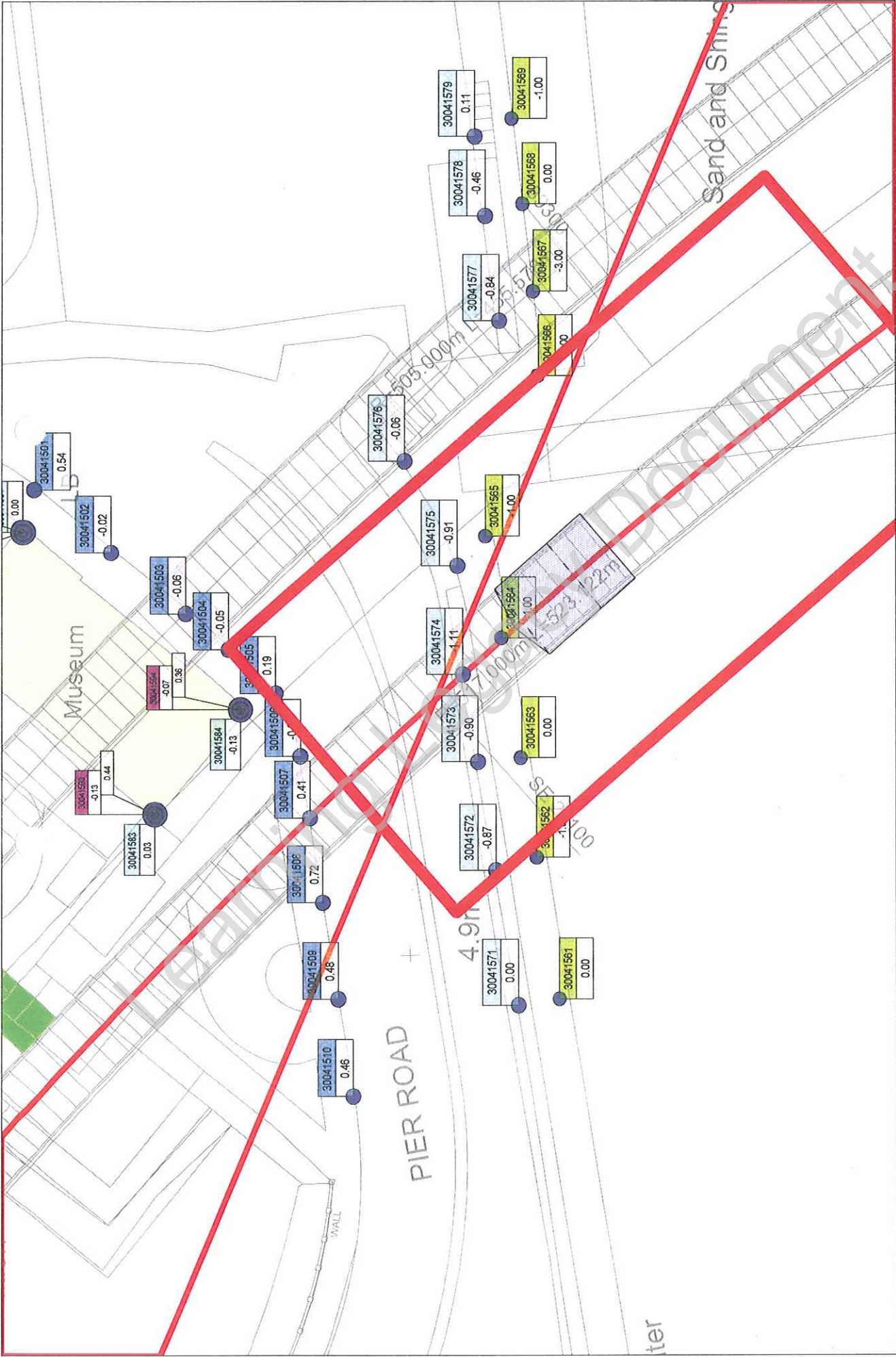
No trigger values for horizontal displacement specified.
approx. 2month after TBM 2 passed this area, the system has been decommissioned due to the fact, that the owner wanted to sell the building.
It was agreed in the CTC.
Under consideration of temperature differences and the achievable accuracy of the system HMJV has no concern to cease the monitoring.
The rate of change in the monitoring data is less than the required standards as per the specifications and drawings up to the time when the instrumentations have been damaged/destroyed.

date / signature: 14/04/15

print name:

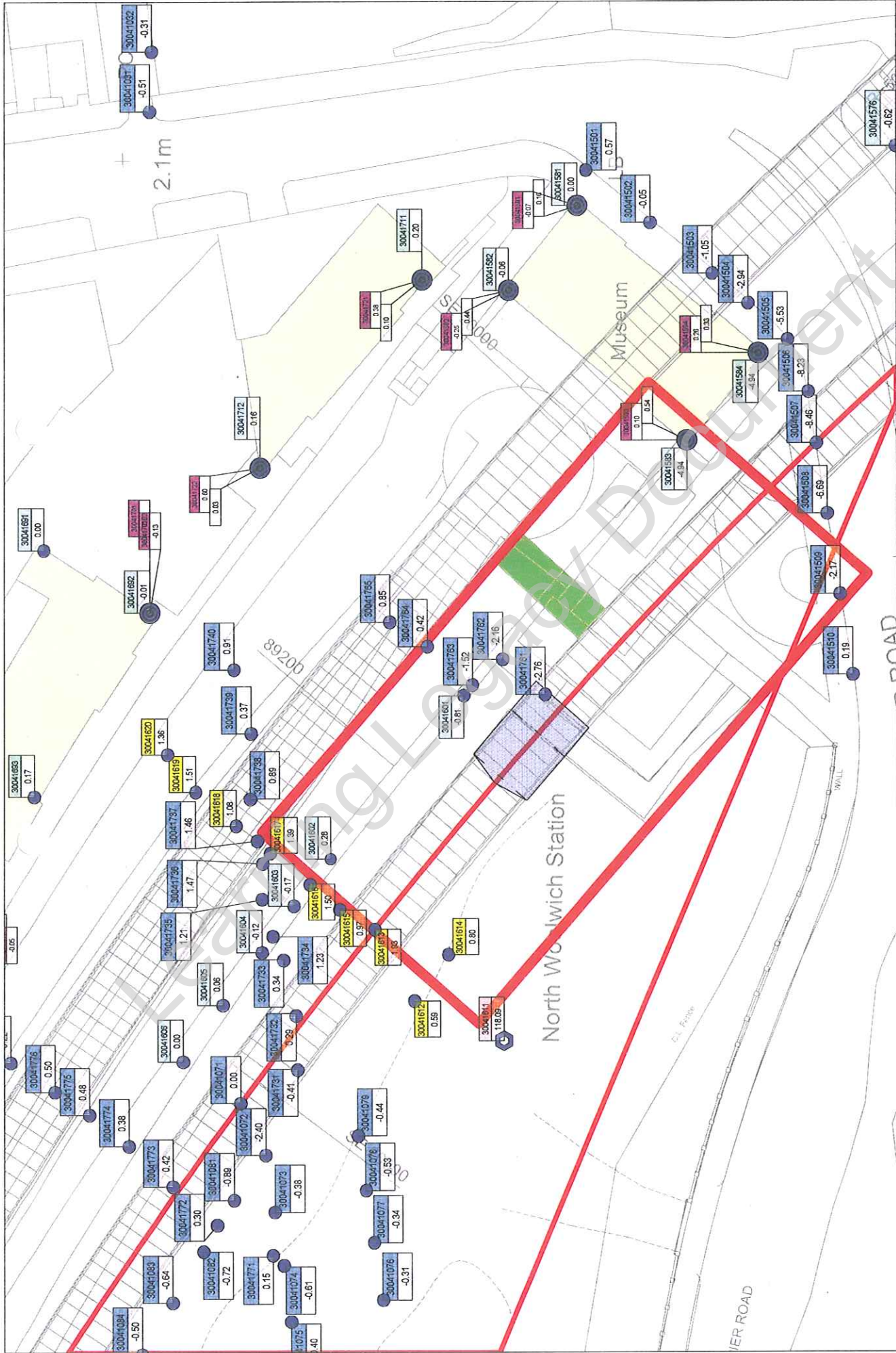
HMJV project role:

Monitoring & Survey Engineer



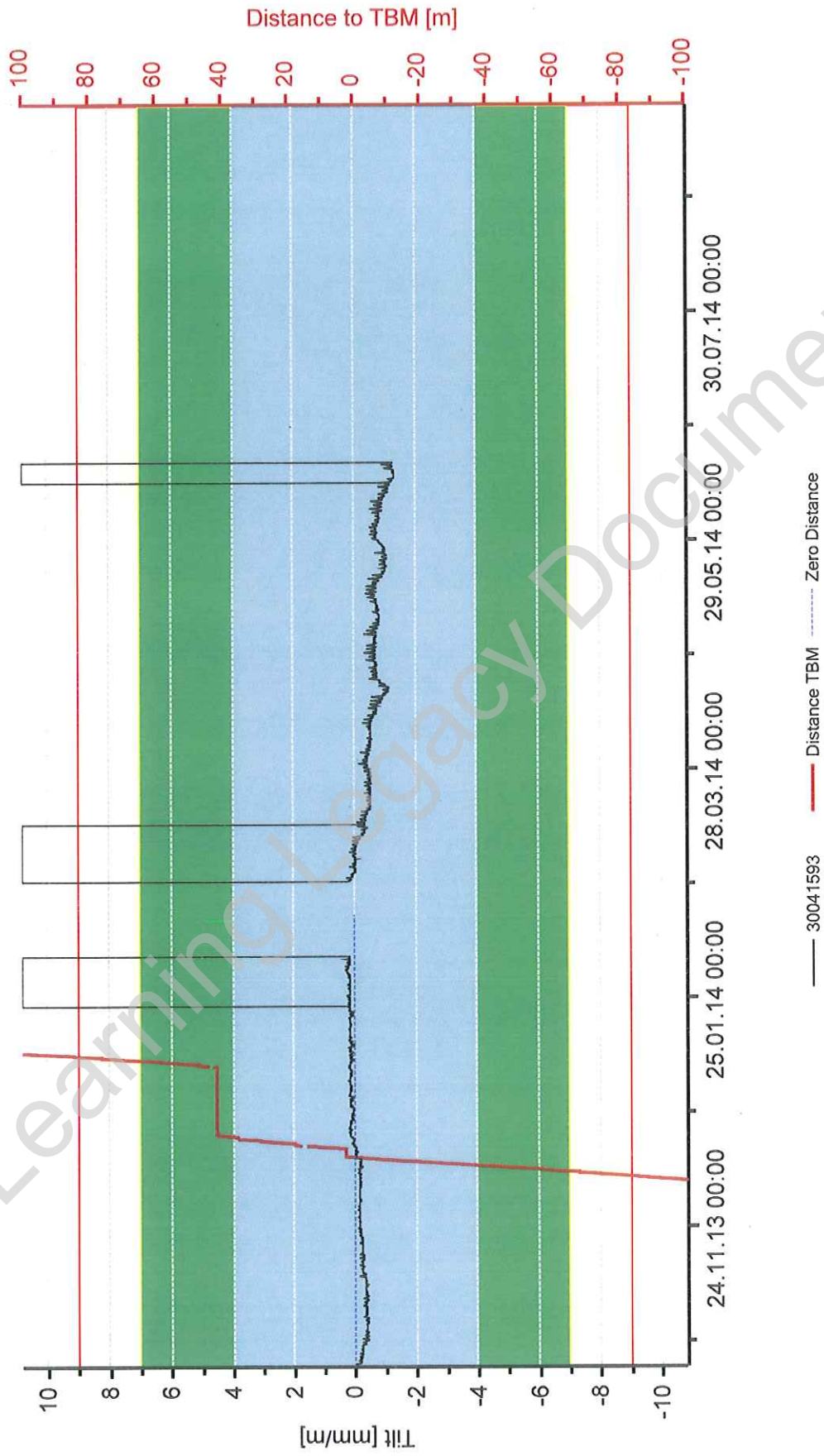
Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: TBM drive WB
 current values: 10.12.2013 17:49





Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: TBM drive WB
 current values: 18.12.2013 09:00

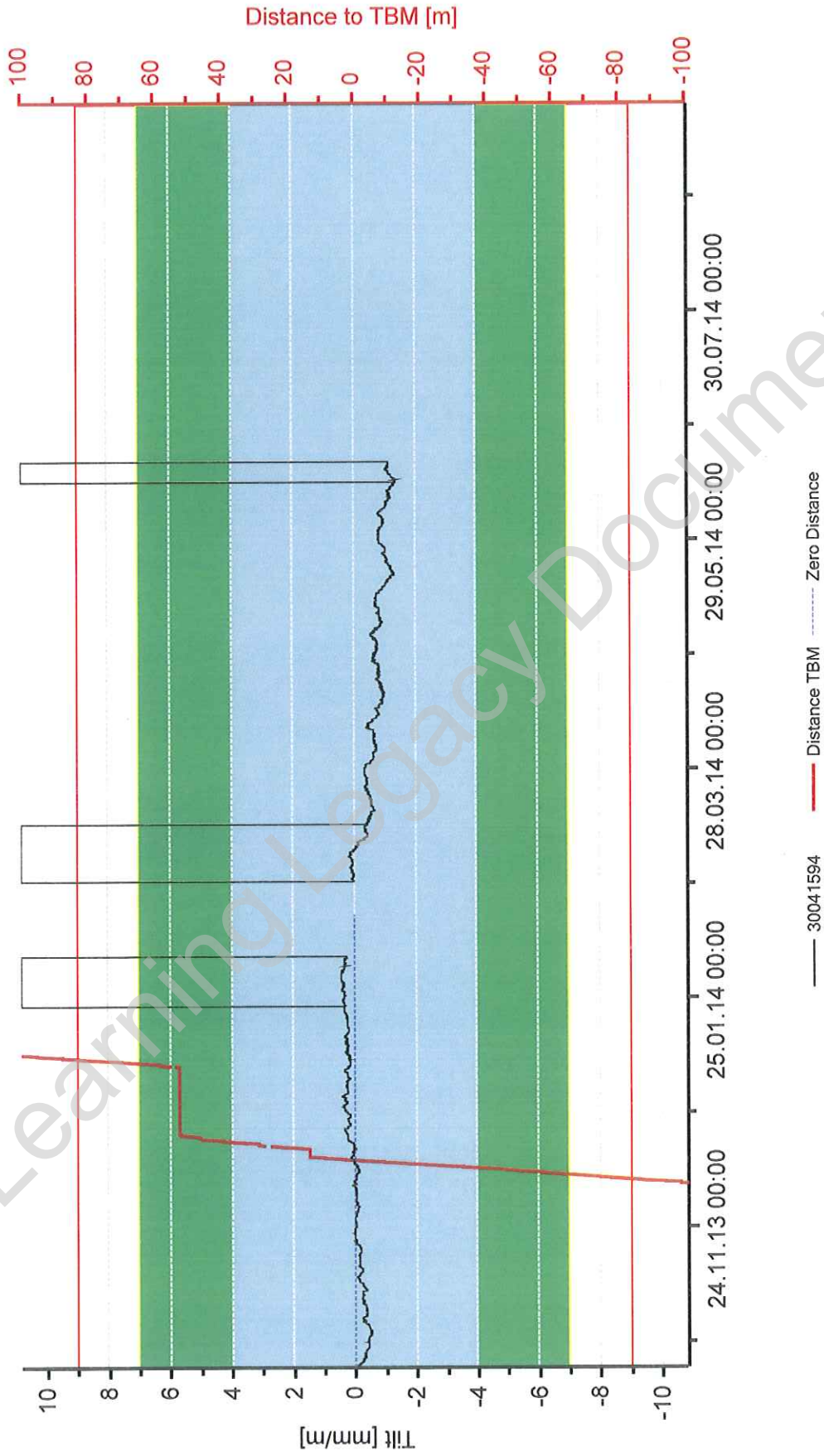
Point: 30041593



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: WB Tunnel - Old Station Museum - 17.10.2013 - 23.09.2014
Date: 18.11.2014 10:58 Current Values: 18.11.2014 10:44

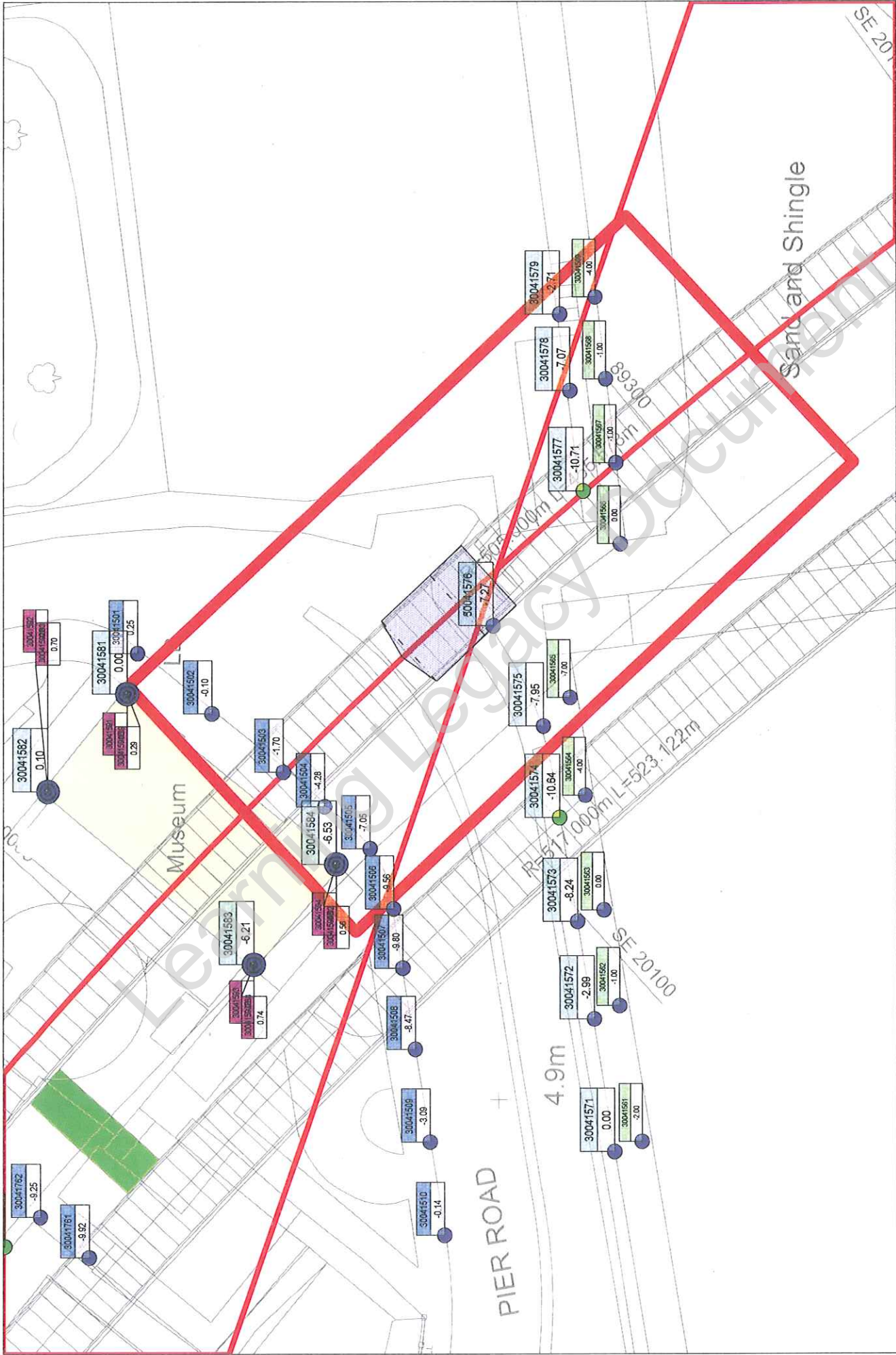


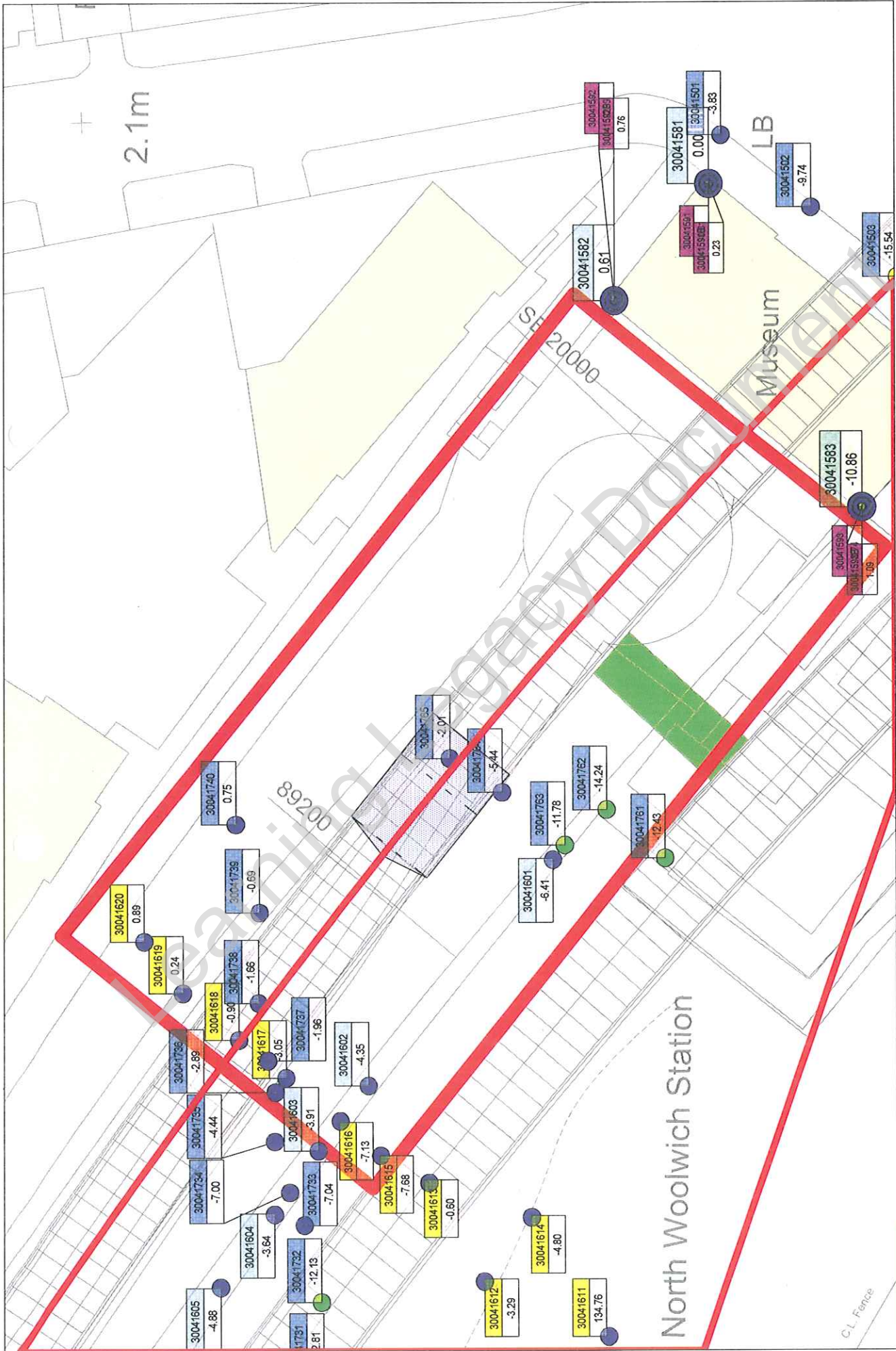
Point: 30041594



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: WB Tunnel - Old Station Museum - 17.10.2013 - 23.09.2014
Date: 18.11.2014 11:01 Current Values: 18.11.2014 10:44



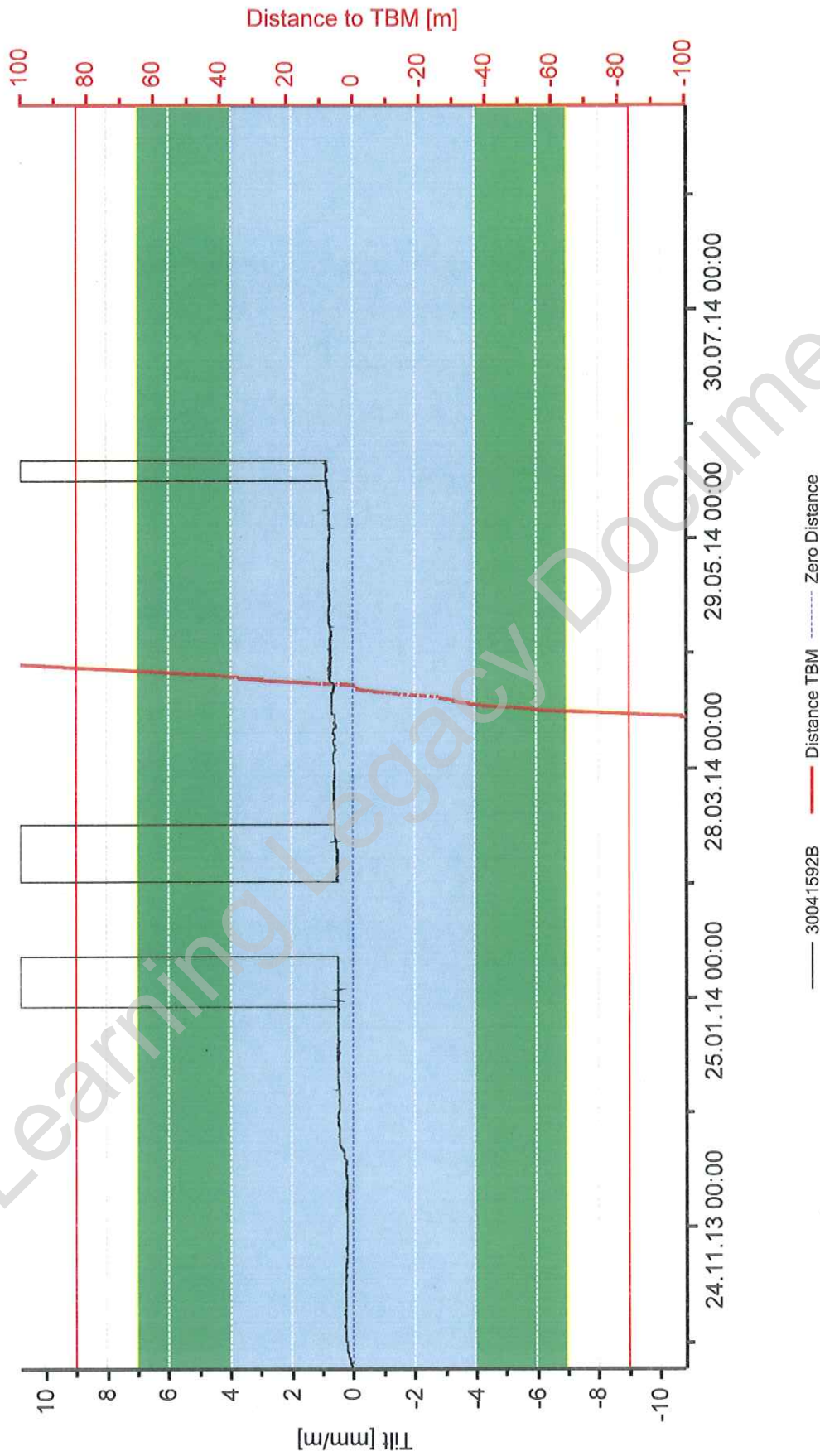




Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: C310 EB tunnel drive; NWP: portal excavation, construction base slab
 current values: 22.04.2014 09:00



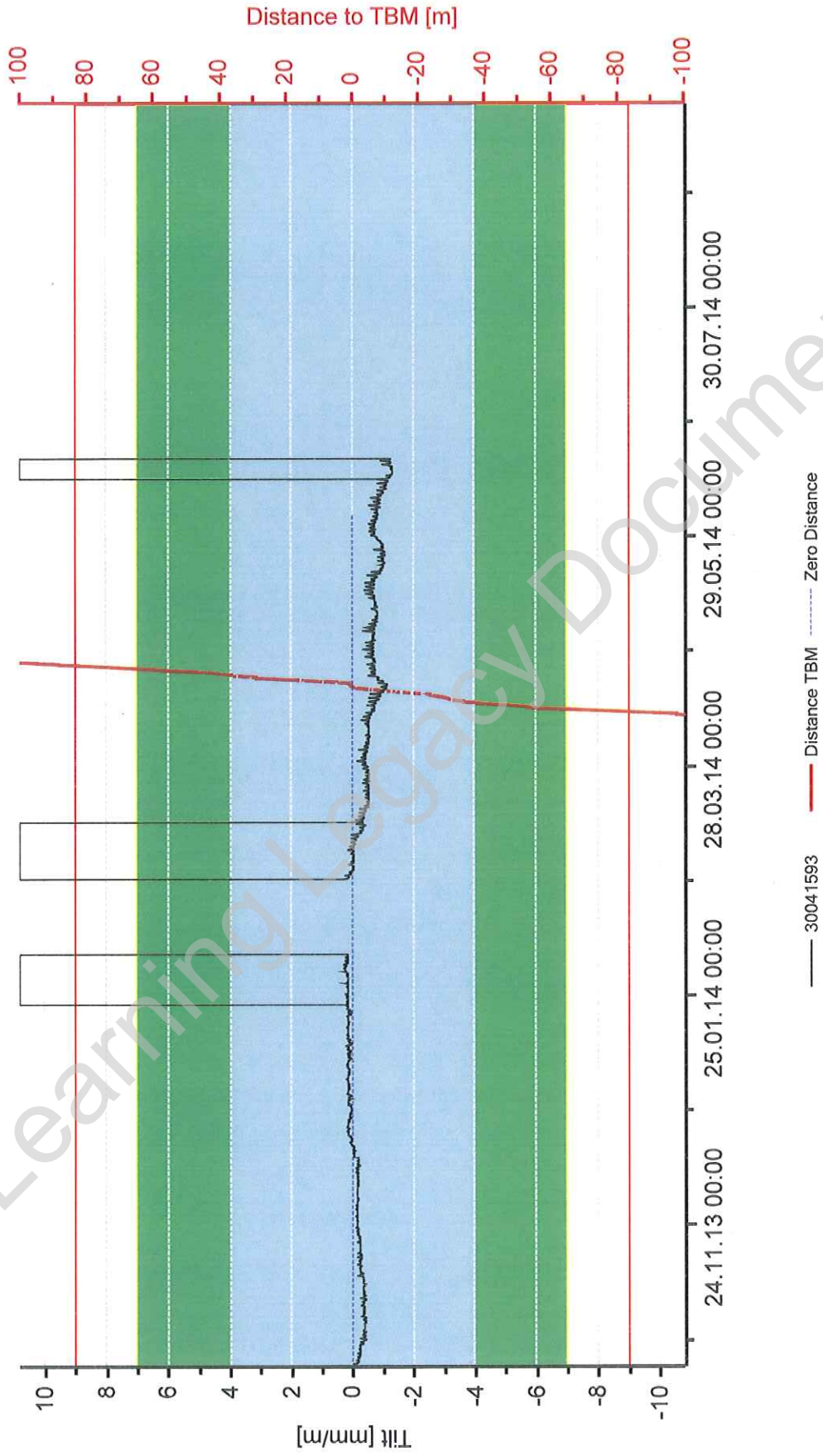
Point: 30041592B



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: EB Tunnel - Old Station Museum - 17.10.2013 - 23.09.2014
date: 18.11.2014 11:05 current values: 18.11.2014 10:44



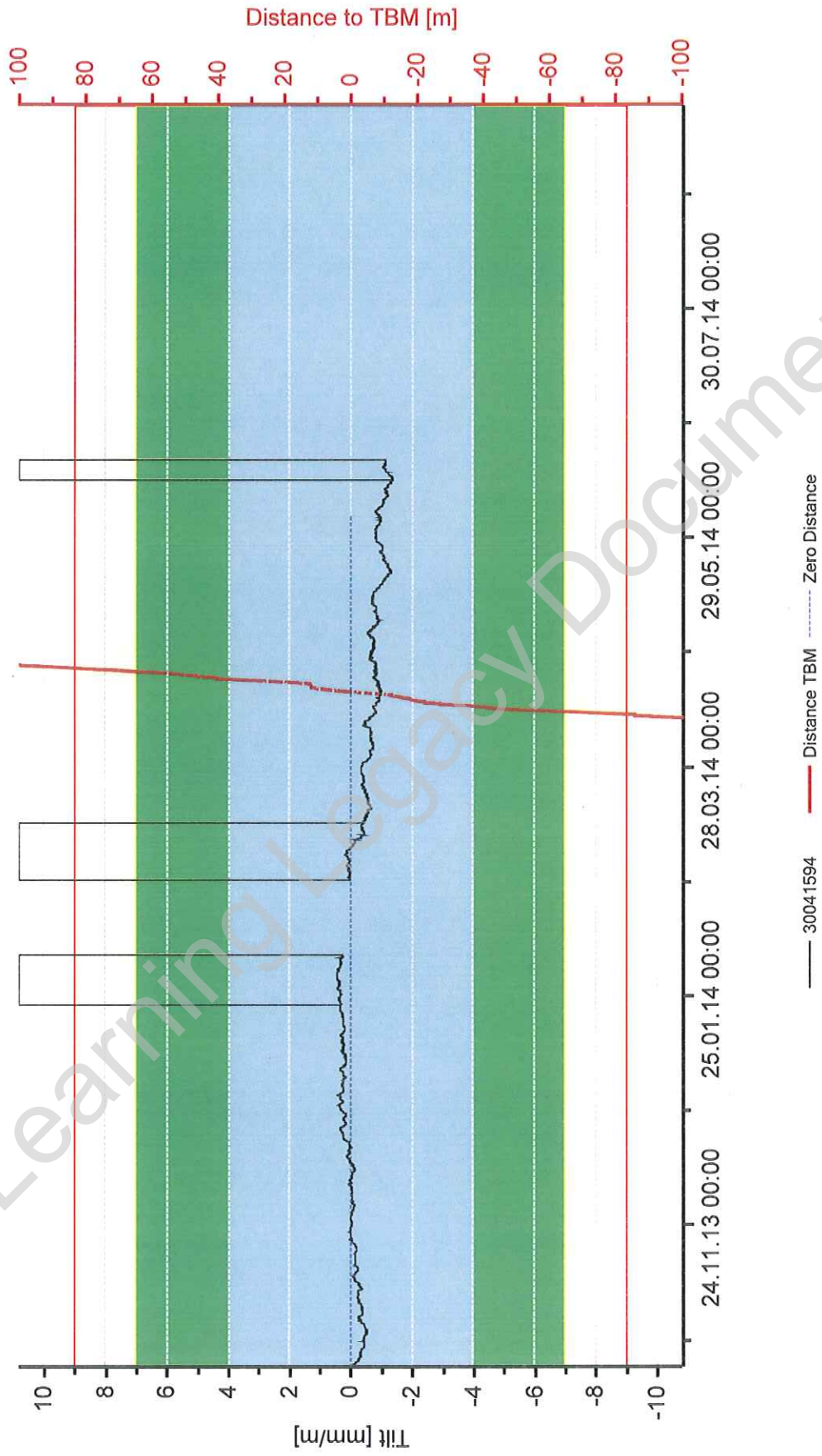
Point: 30041593



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: EB Tunnel - Old Station Museum - 17.10.2013 - 23.09.2014
date: 18.11.2014 11:10 current values: 18.11.2014 10:59



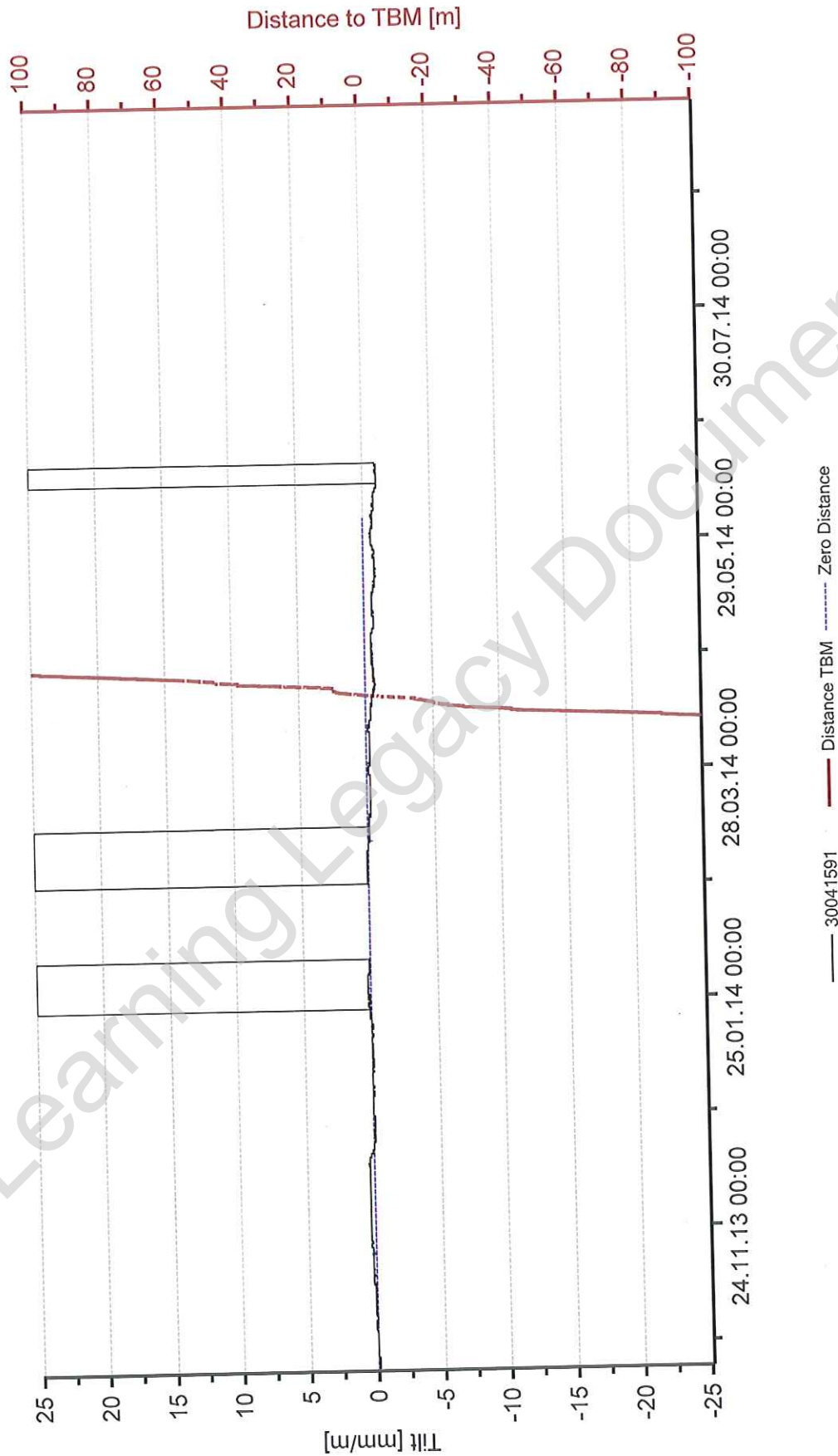
Point: 30041594



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: EB Tunnel - Old Station Museum - 17.10.2013 - 23.09.2014
date: 18.11.2014 11:12 current values: 18.11.2014 10:59




Profile: Measurement Point 30041591



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 Close Out Report: EB Tunnel - Old Station Museum - 17.10.2013 - 23.09.2014
 date: 15.04.2015 09:07 current values: 15.04.2015 08:43



		C310 THAMES TUNNEL REPORT			
EMPLOYER	CROSSRAIL	eB NO	C310-HTM-C-RGN-CR148-50024	Rev	2.0
TITLE	Monitoring Close-Out Reports relating to Tunnelling Works North Embankment River Thames - North Woolwich Portal (excl. Store Rd)				

APPENDIX 79

Old Station Museum, Listed Wall

Learning Legacy Document

monitoring asset	Area Old Station Museum - listed Wall		
reference monitoring drawing:	C310-HTM-C-DWG-CR146-ST004-70003		
name of monitoring section:	listed wall museum		
sensor type:	hydrostatic levelling cell (hlc)		
chainage:	89210-89170	point no.:	3004 1601 - 3004 1606
trigger values: [mm]	green: +16 -16	amber: +20 -20	red: +25 -25
reference document for trigger values:	Management Plan for Control of Ground Movement		
EB-no.:	C310-HTM-Z-STP-CR148-50058		
Appendix:	AAA		

monitoring data

	date	max. value	point no.	comments
baseline	17/10/13	0.00		
TBM 1	start ZOI	15/12/13	1.09	3004 1601
		07/01/14	0.49	3004 1606
	end ZOI	08/01/14	-5.18	3004 1601
		11/01/14	-5.91	3004 1606
breached not any trigger value				
TBM 2	start ZOI	20/04/14	-5.17	3004 1601
		23/04/14	-4.88	3004 1606
	end ZOI	24/04/14	-7.18	3004 1601
		26/04/14	-6.92	3004 1606
breached not any trigger value				
longterm	18/11/14	-8.23	3004 1603	

Evaluation of any potential residual risks	<input checked="" type="checkbox"/>	No residual risk since the Works have been completed by HMJV
	<input type="checkbox"/>	Yes, residual risk (see comment below)

summary / comments

Under consideration of temperature differences and the achievable accuracy of the system HMJV has no concern to cease the monitoring.
The rate of change in the monitoring data is less than the required standards as per the specifications and drawings.

date / signature:

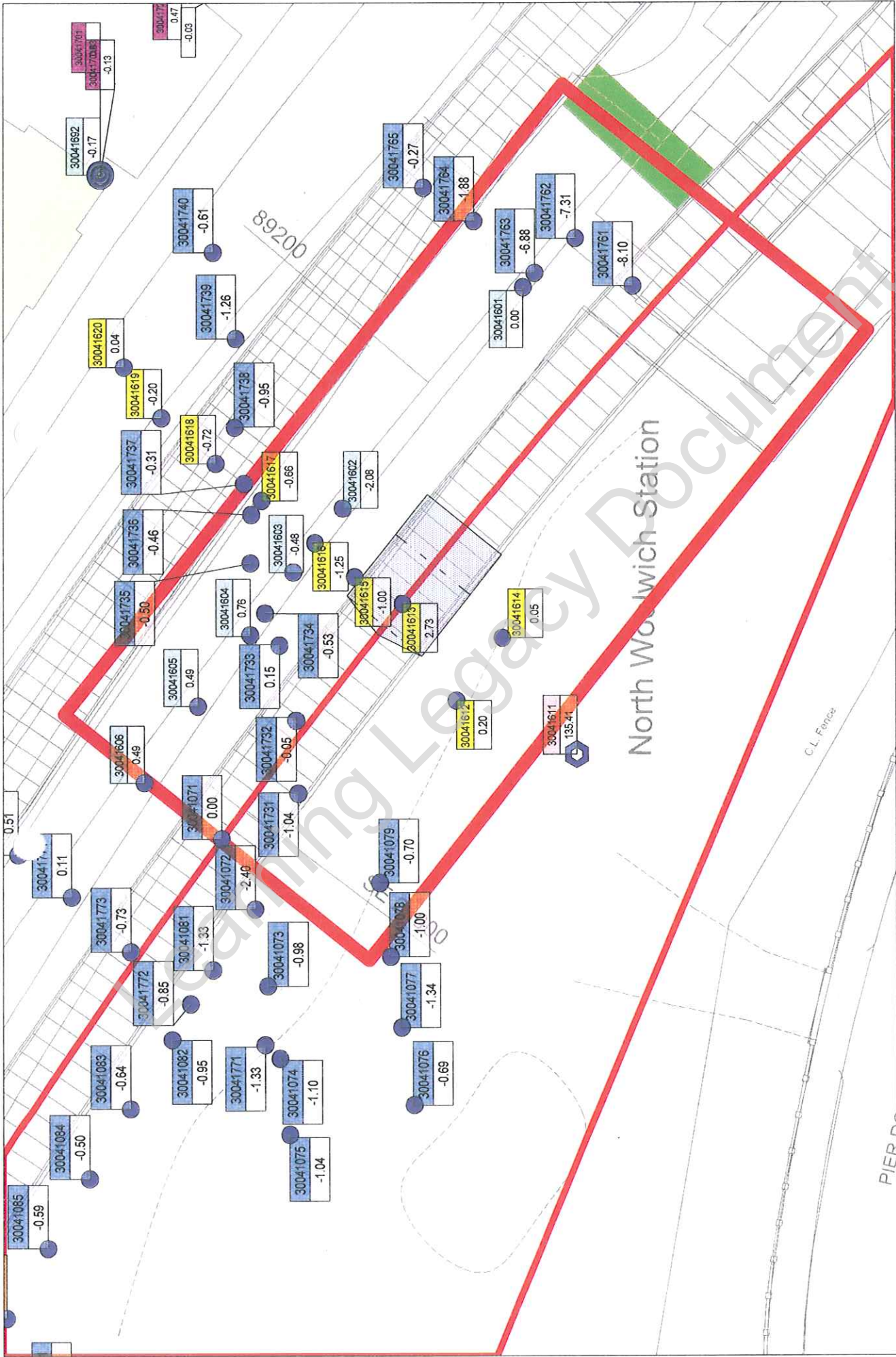
19/01/15

print name:



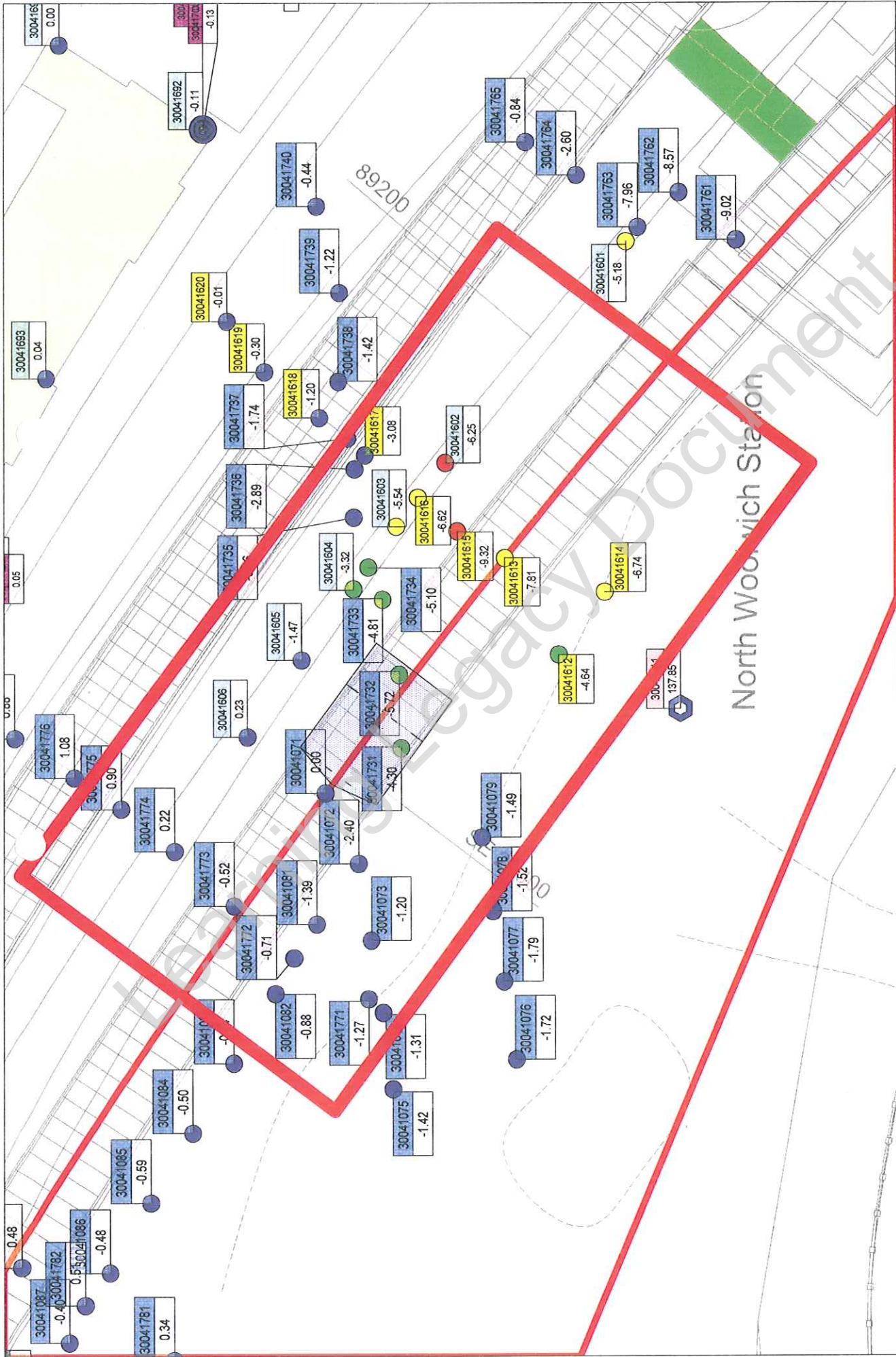
HMJV project role:

Monitoring & Survey Engineer



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: TBM drive WB
 current values: 07.01.2014 17:24

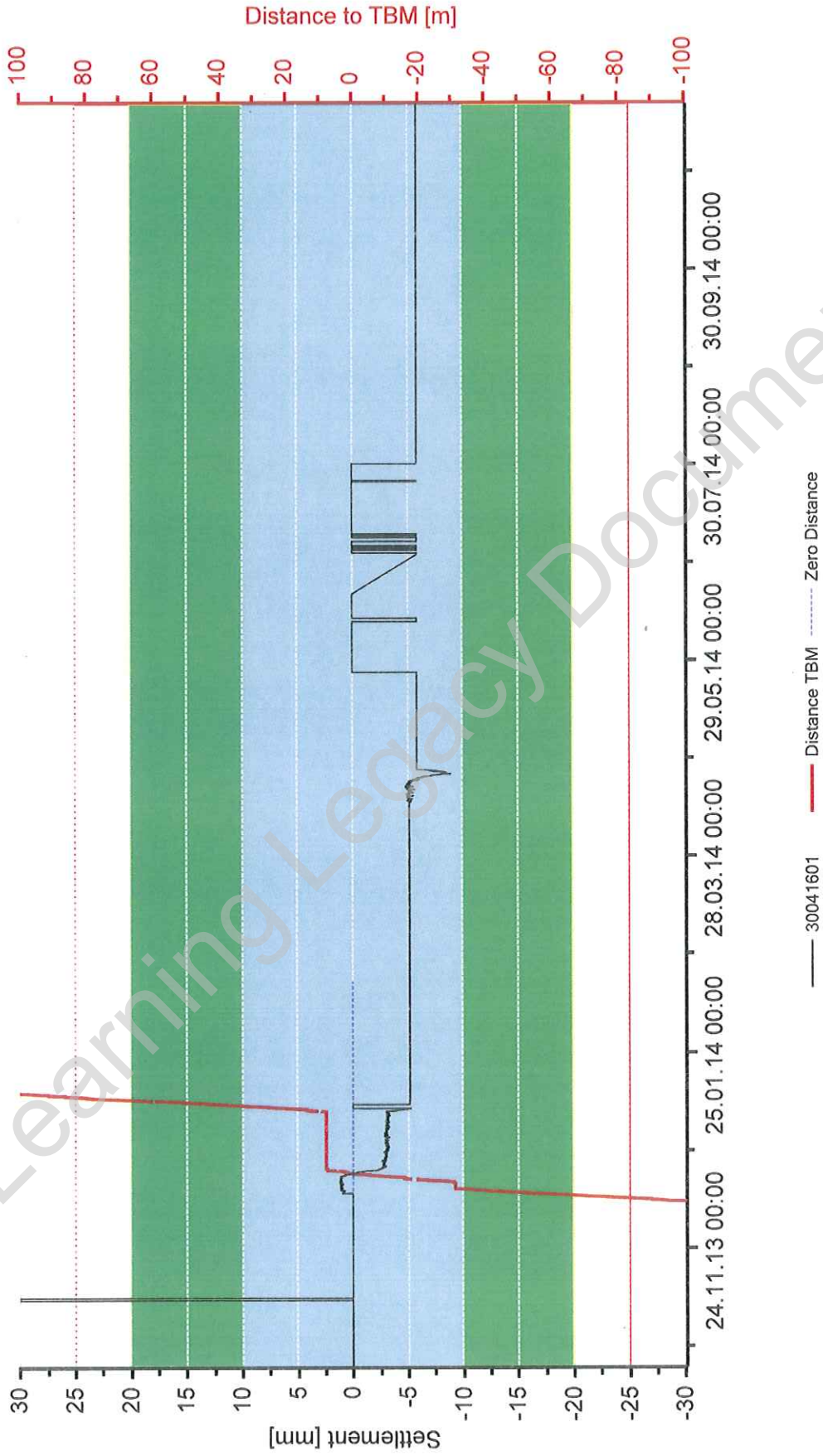




Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: TBM drive WB
 current values: 08.01.2014 17:43



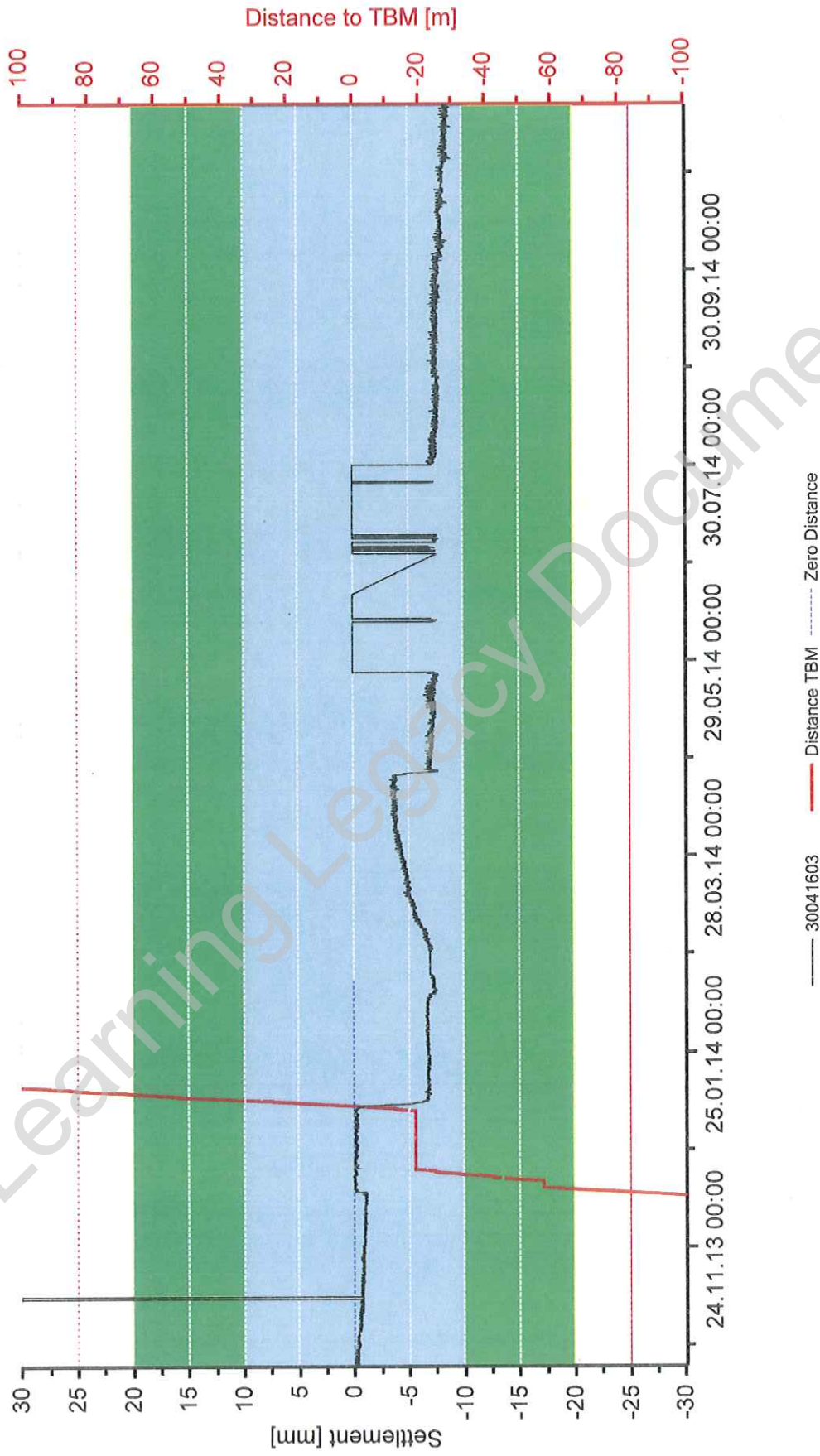
Point: 30041601



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: WB Tunnel - listed Wall museum - 17.10.2013 - 21.11.2014
Date: 20.01.2015 09:27 Current Values: 20.01.2015 09:19



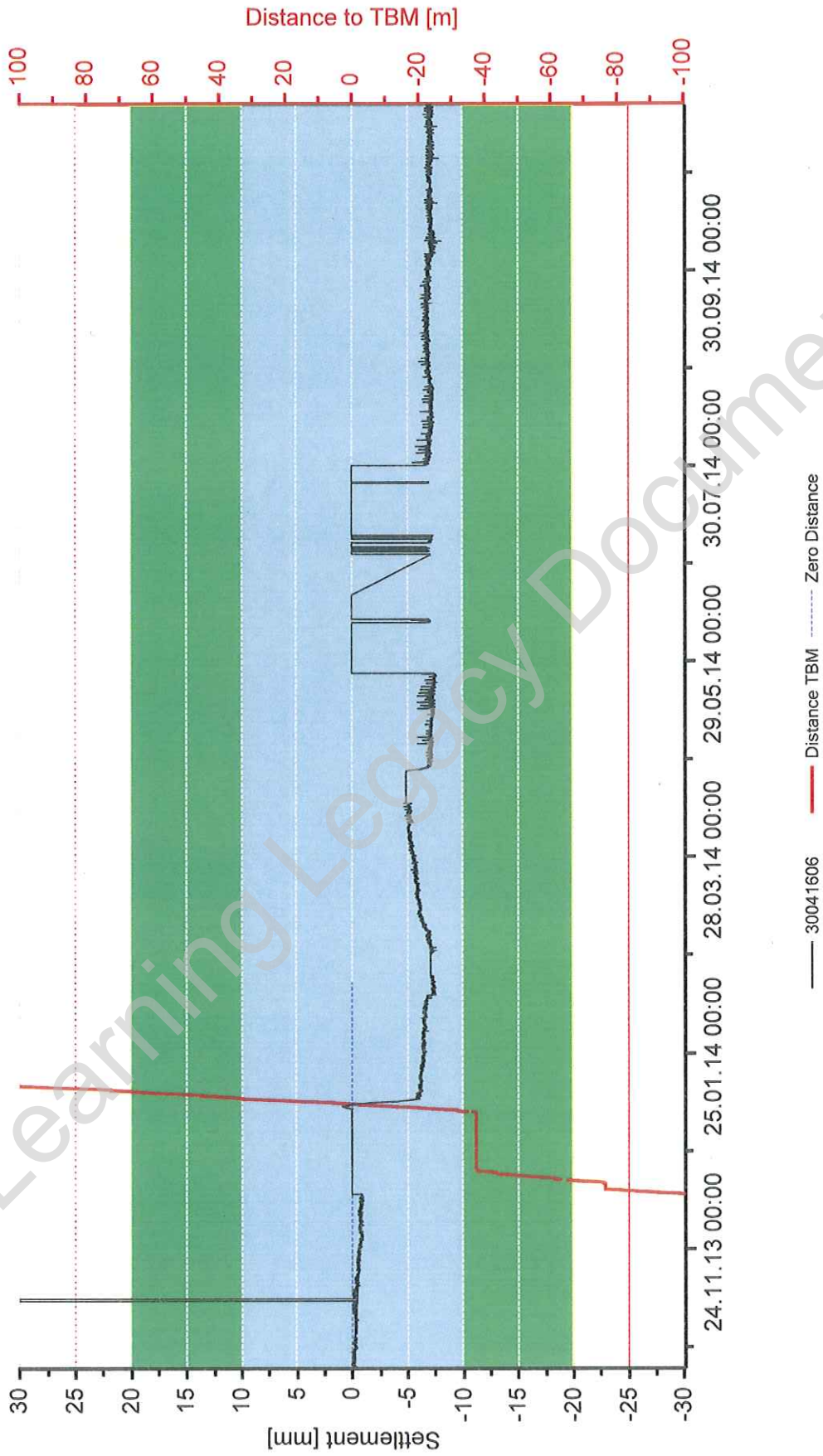
Point: 30041603



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: WB Tunnel - listed Wall museum - 17.10.2013 - 21.11.2014
Date: 20.01.2015 09:32 Current Values: 20.01.2015 09:23

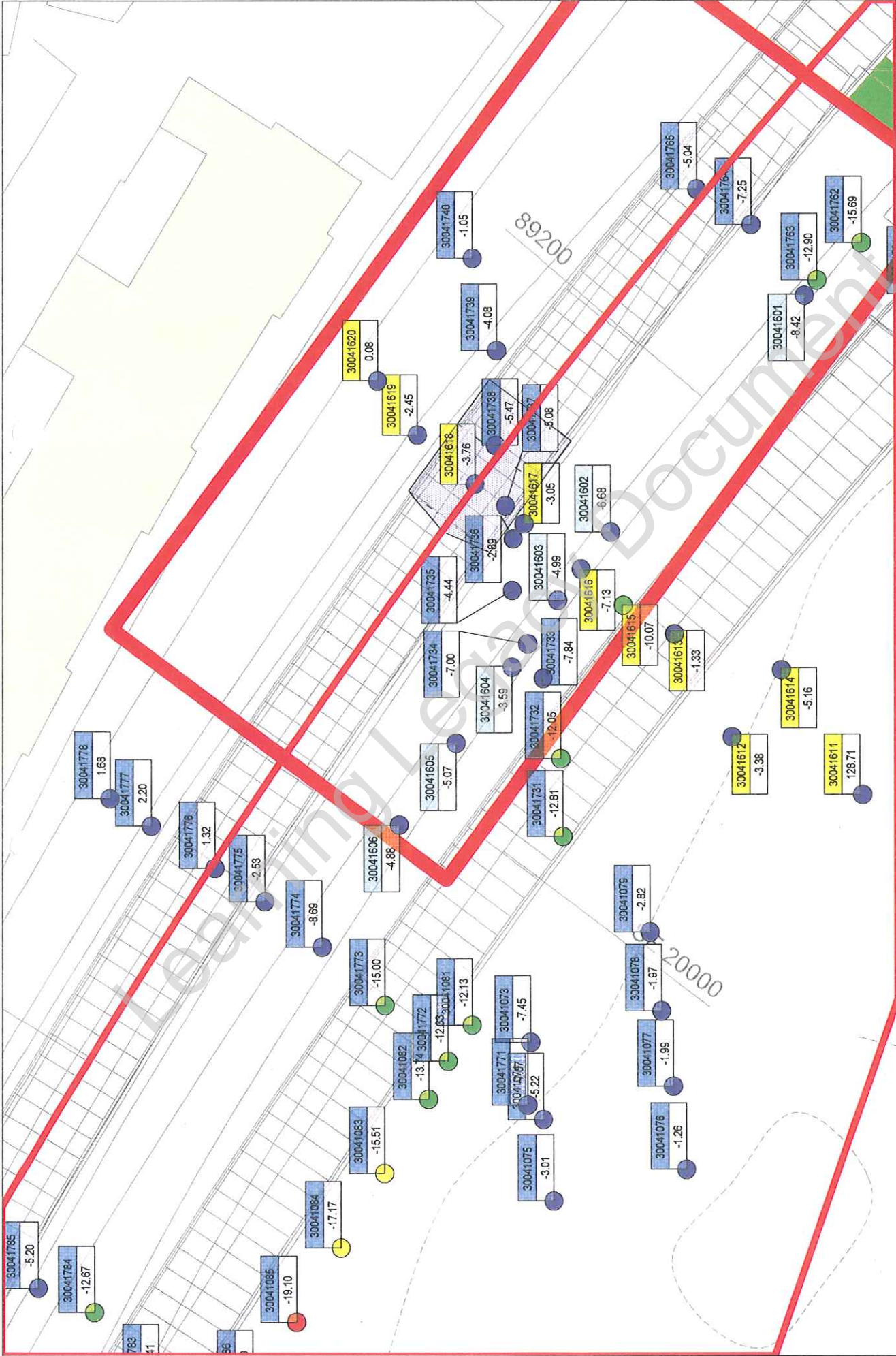


Point: 30041606



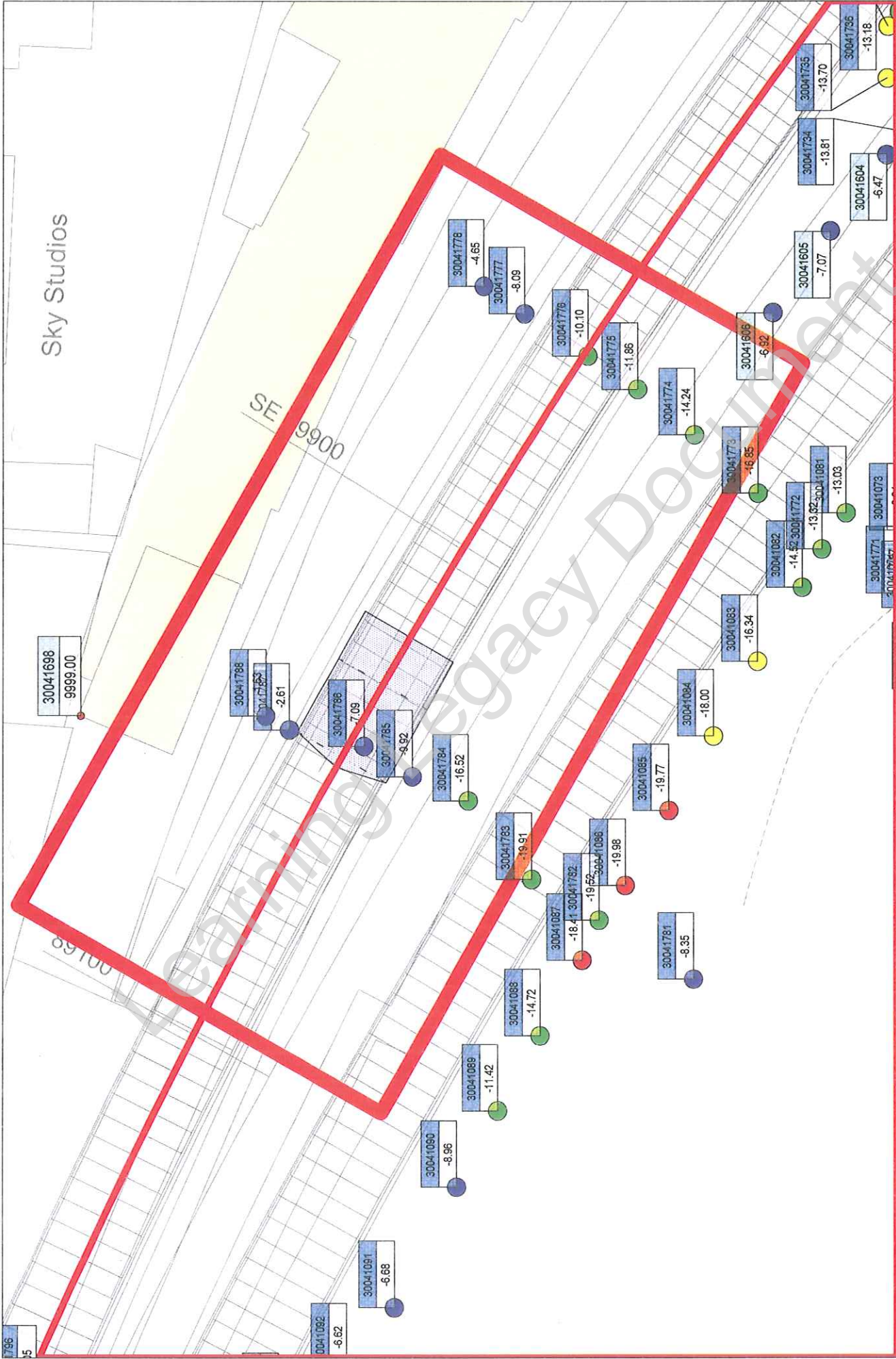
Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: WB Tunnel - listed Wall museum - 17.10.2013 - 21.11.2014
Date: 20.01.2015 09:36 Current Values: 20.01.2015 09:23





Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: C310 EB tunnel drive; NWP: portal excavation, construction base slab
 current values: 23.04.2014 12:00

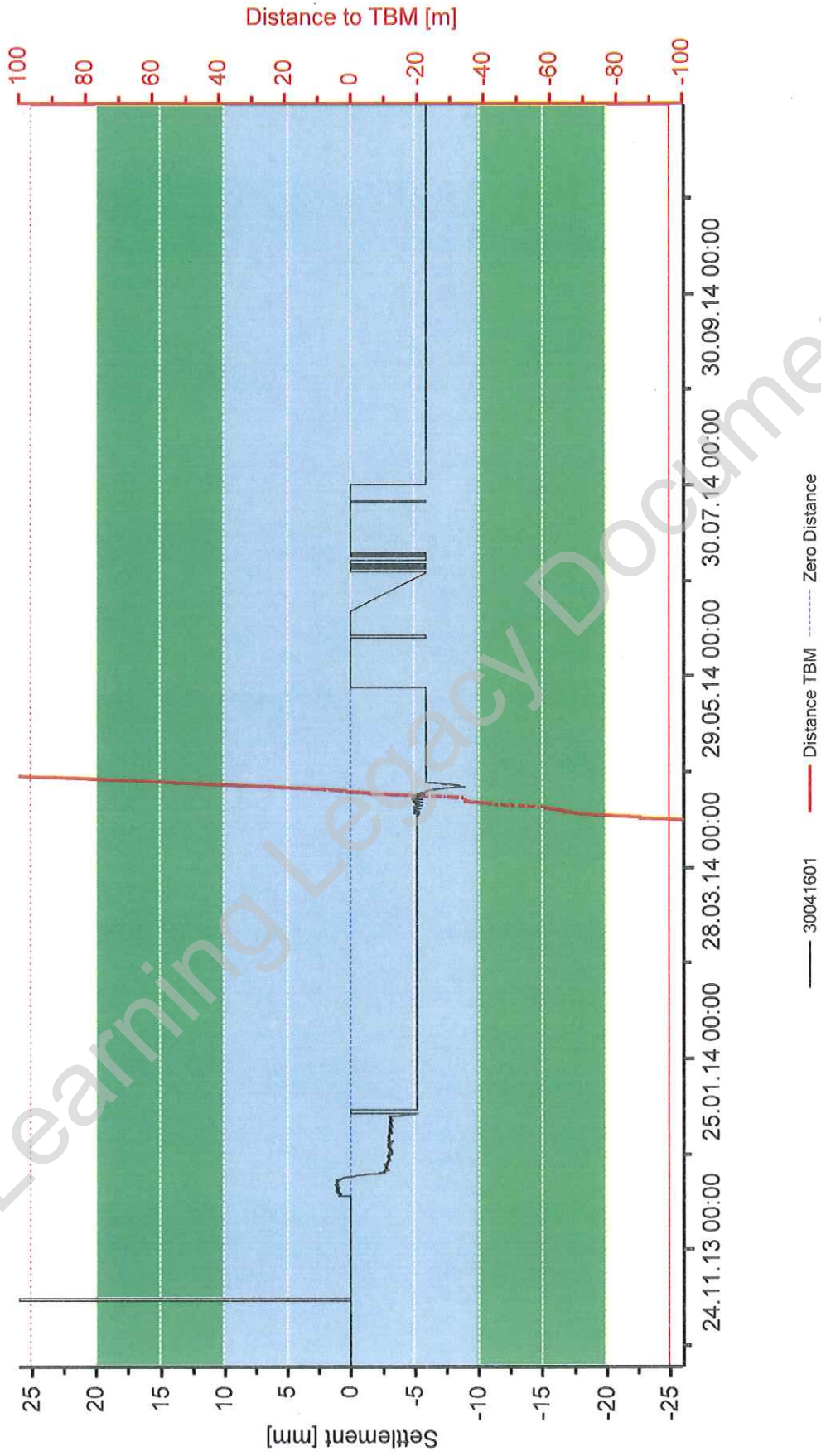




Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: C310 EB tunnel drive; NWP: portal excavation, construction base slab
 current values: 26.04.2014 09:01



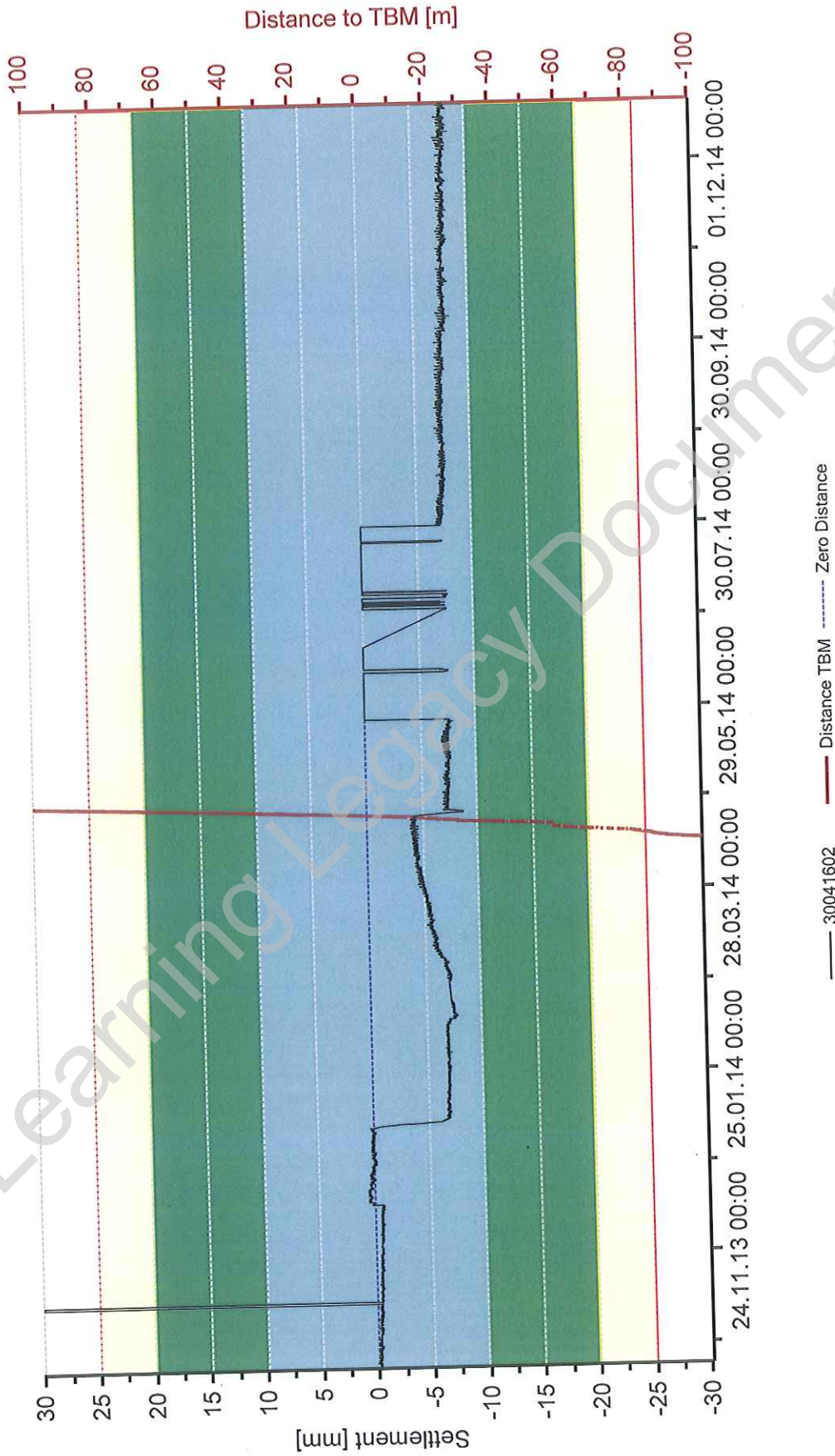
Point: 30041601



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: EB Tunnel - listed wall museum - 17.10.2013 - 21.11.2014
date: 18.01.2015 17:12 current values: 18.01.2015 17:00



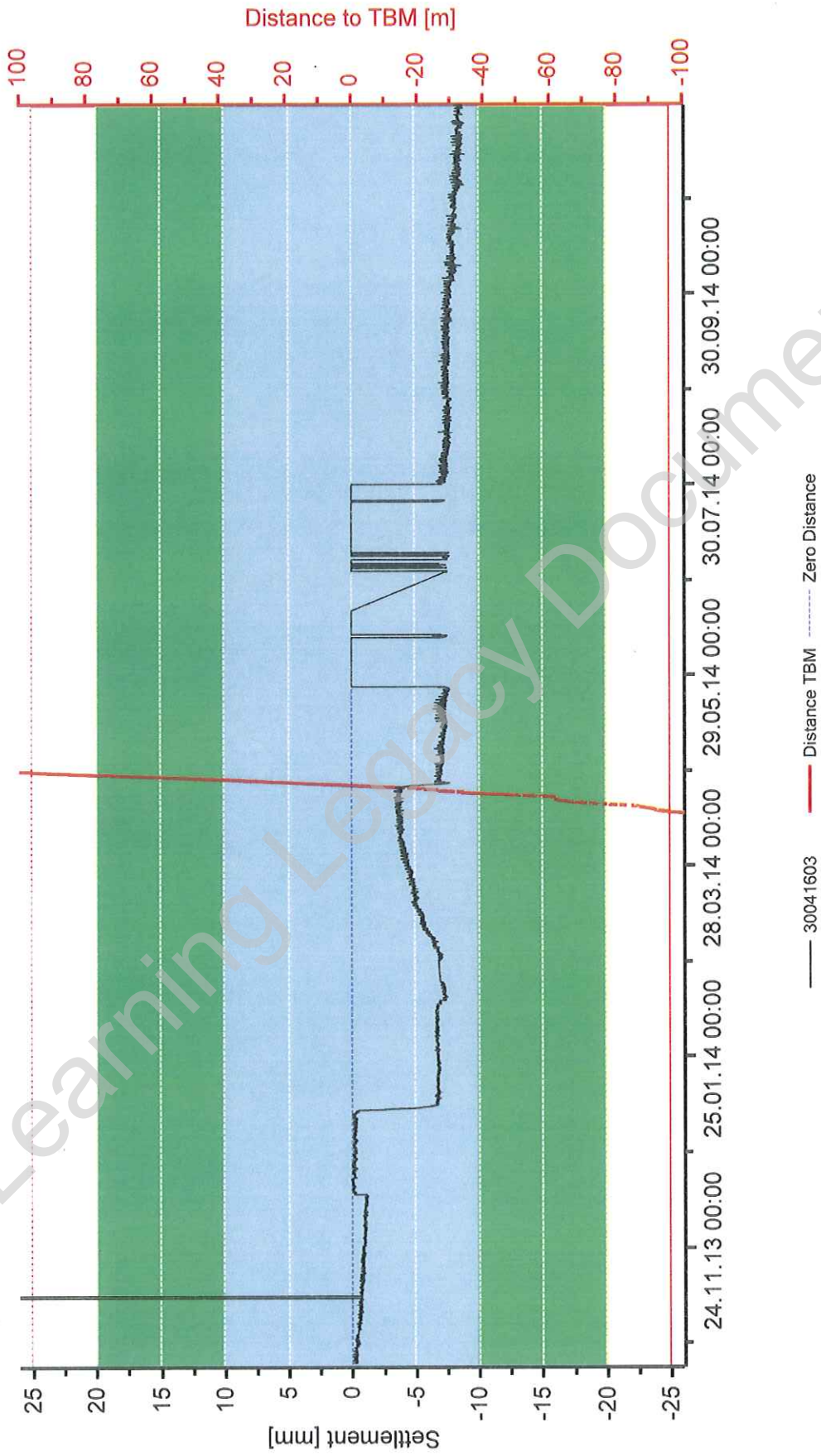
Profile: Measurement Point 30041602



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 Close Out Report: EB Tunnel - Listed Wall Museum - 17.10.2013 - 21.11.2014
 date: 14.04.2015 14:42 current values: 14.04.2015 14:05



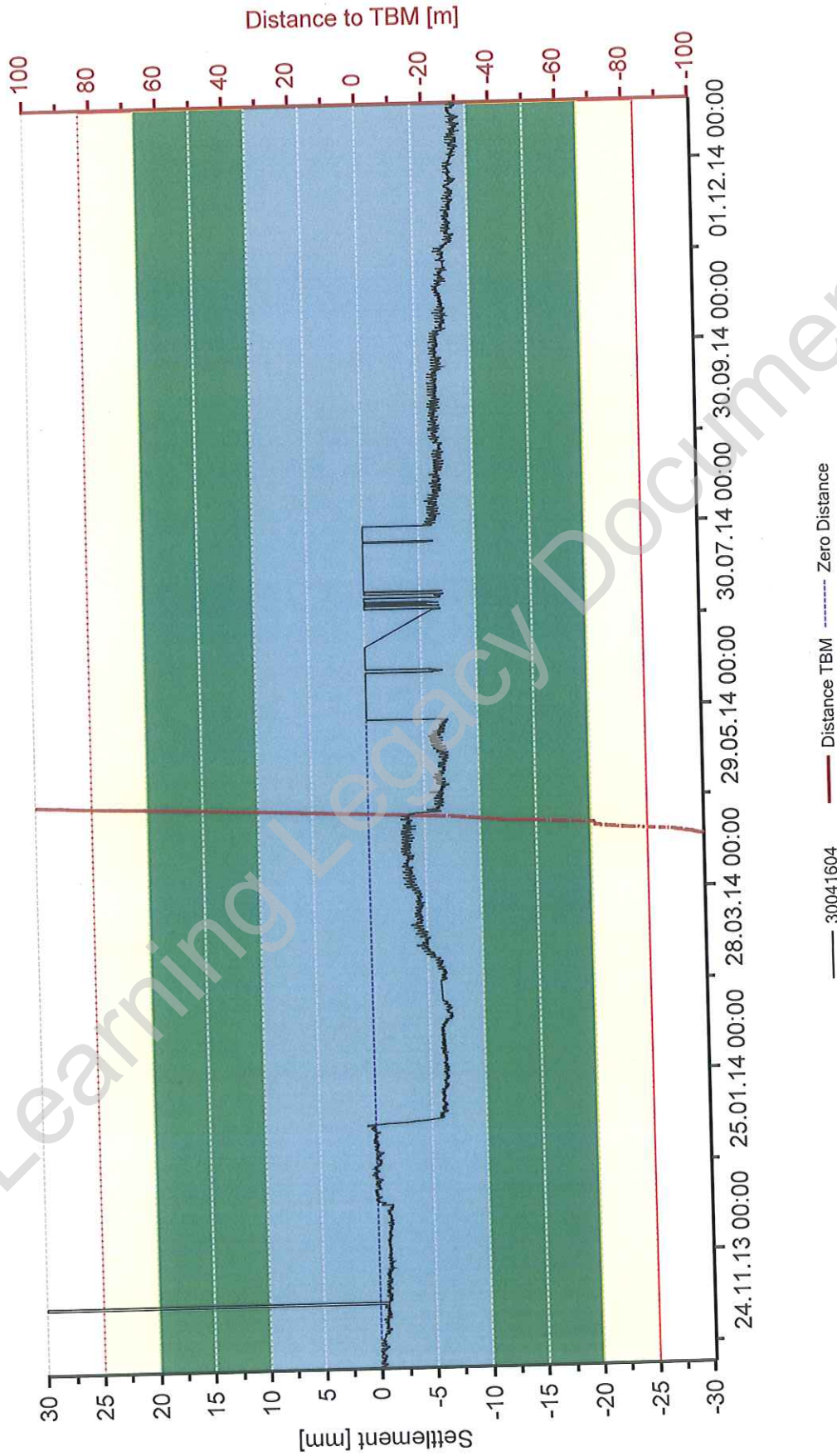
Point: 30041603



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: EB Tunnel - listed wall museum - 17.10.2013 - 21.11.2014
date: 18.01.2015 17:28 current values: 18.01.2015 17:15



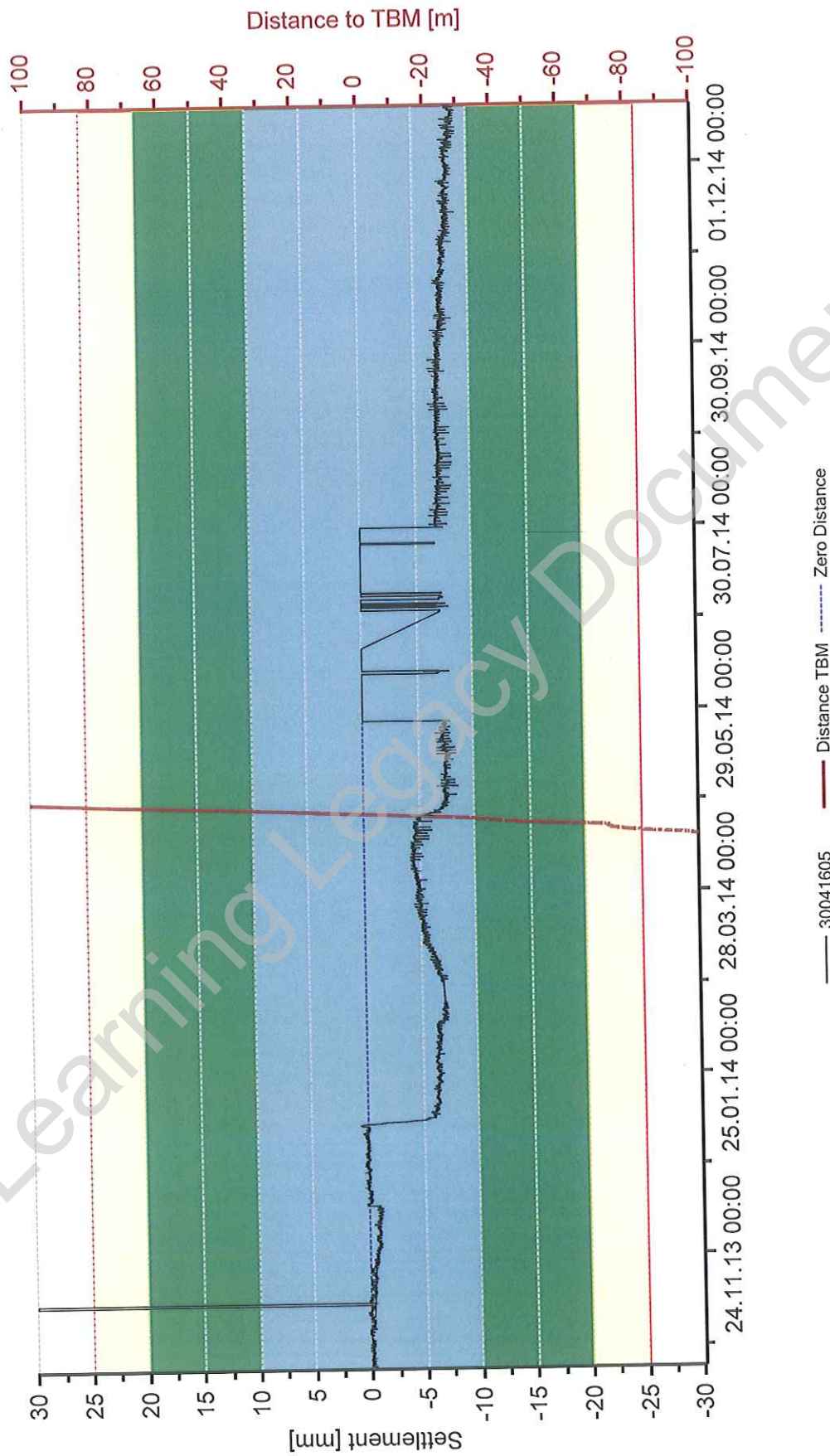
Profile: Measurement Point 30041604



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 Close Out Report: EB Tunnel - Listed Wall Museum - 17.10.2013 - 21.11.2014
 date: 14.04.2015 14:44 current values: 14.04.2015 14:05



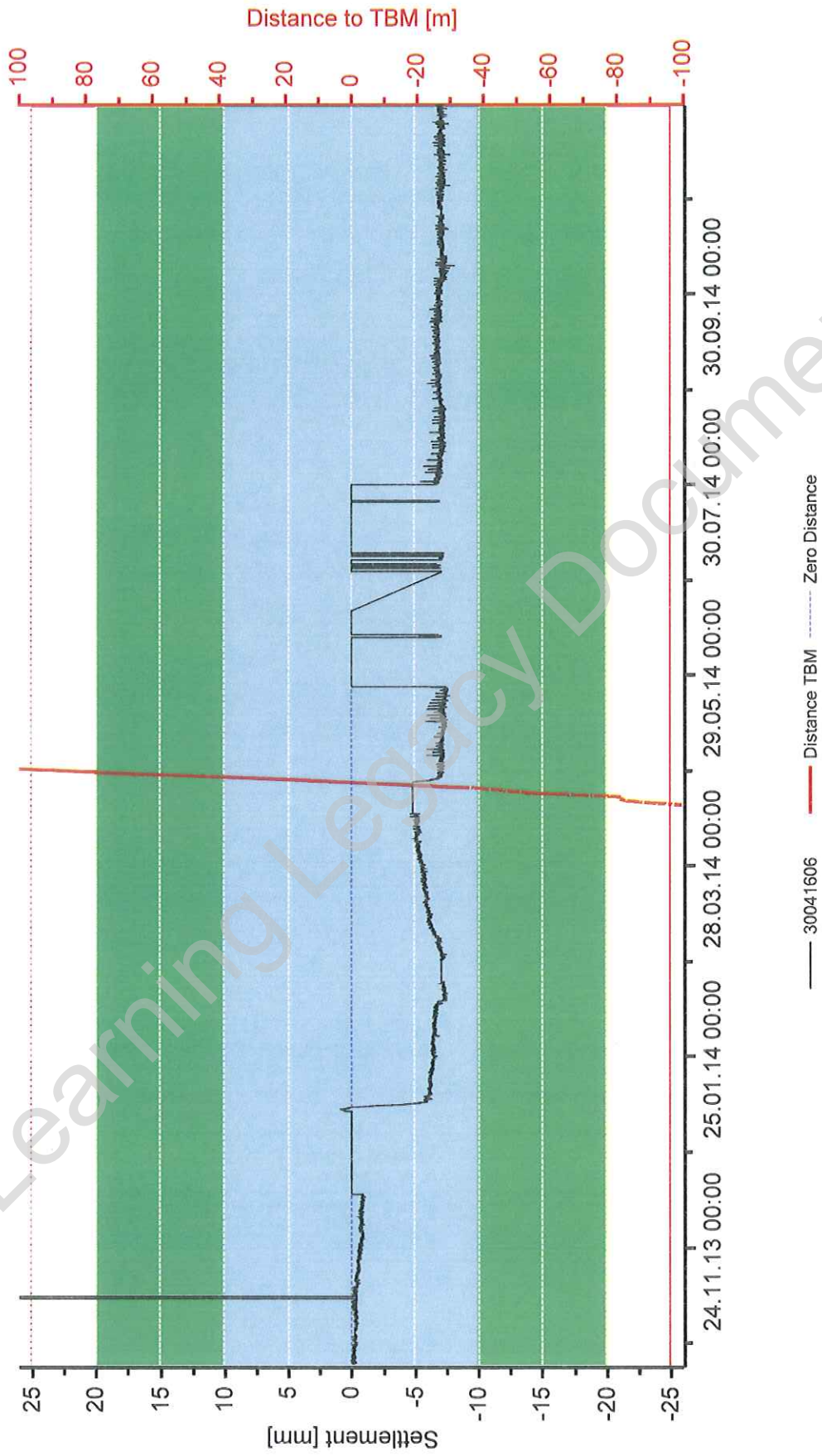
Profile: Measurement Point 30041605



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 Close Out Report: EB Tunnel - Listed Wall Museum - 17.10.2013 - 21.11.2014
 date: 14.04.2015 14:46 current values: 14.04.2015 14:05



Point: 30041606



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: EB Tunnel - listed wall museum - 17.10.2013 - 21.11.2014
date: 18.01.2015 17:22 current values: 18.01.2015 17:15



 HOCHTIEF MURPHY Joint Venture		C310 THAMES TUNNEL REPORT			
EMPLOYER	CROSSRAIL	eB NO	C310-HTM-C-RGN-CR148-50024	Rev	2.0
TITLE	Monitoring Close-Out Reports relating to Tunnelling Works North Embankment River Thames - North Woolwich Portal (excl. Store Rd)				

APPENDIX 80
CS 24 - CP 16 - CH 89210

Learning Legacy Document

monitoring asset

Area Old Station Museum

reference monitoring drawing:

C310-HTM-C-DWG-CR146-ST004-70003

name of monitoring section:

CS 24 - CP 16

sensor type:

manual levelling studs

chainage:

89210

point no.:

3004 1761 - 3004 1765

trigger values:

[mm]

green: +16
-16

amber: +20
-20

red: +25
-25

reference document for trigger values:

Management Plan for Control of Ground Movement

EB-no.:

C310-HTM-Z-STP-CR148-50058

Appendix:

AAA

monitoring data

	date		max. value	point no.	comments
baseline	14/11/13		0.00		
TBM 1	start ZOI	15/12/13	1.29	3004 1761	
	end ZOI	08/01/14	-8.10	3004 1761	breached not any trigger value
TBM 2	start ZOI	20/04/14	-0.15	3004 1765	
	end ZOI	23/04/14	-5.04	3004 1765	breached not any trigger value
longterm	21/11/14	-18.52	3004 1762	breached green trigger value reported to SRG, no further action required	

Evaluation of any potential residual risks



No residual risk
since the Works have been completed by HMJV



Yes, residual risk
(see comment below)

summary / comments

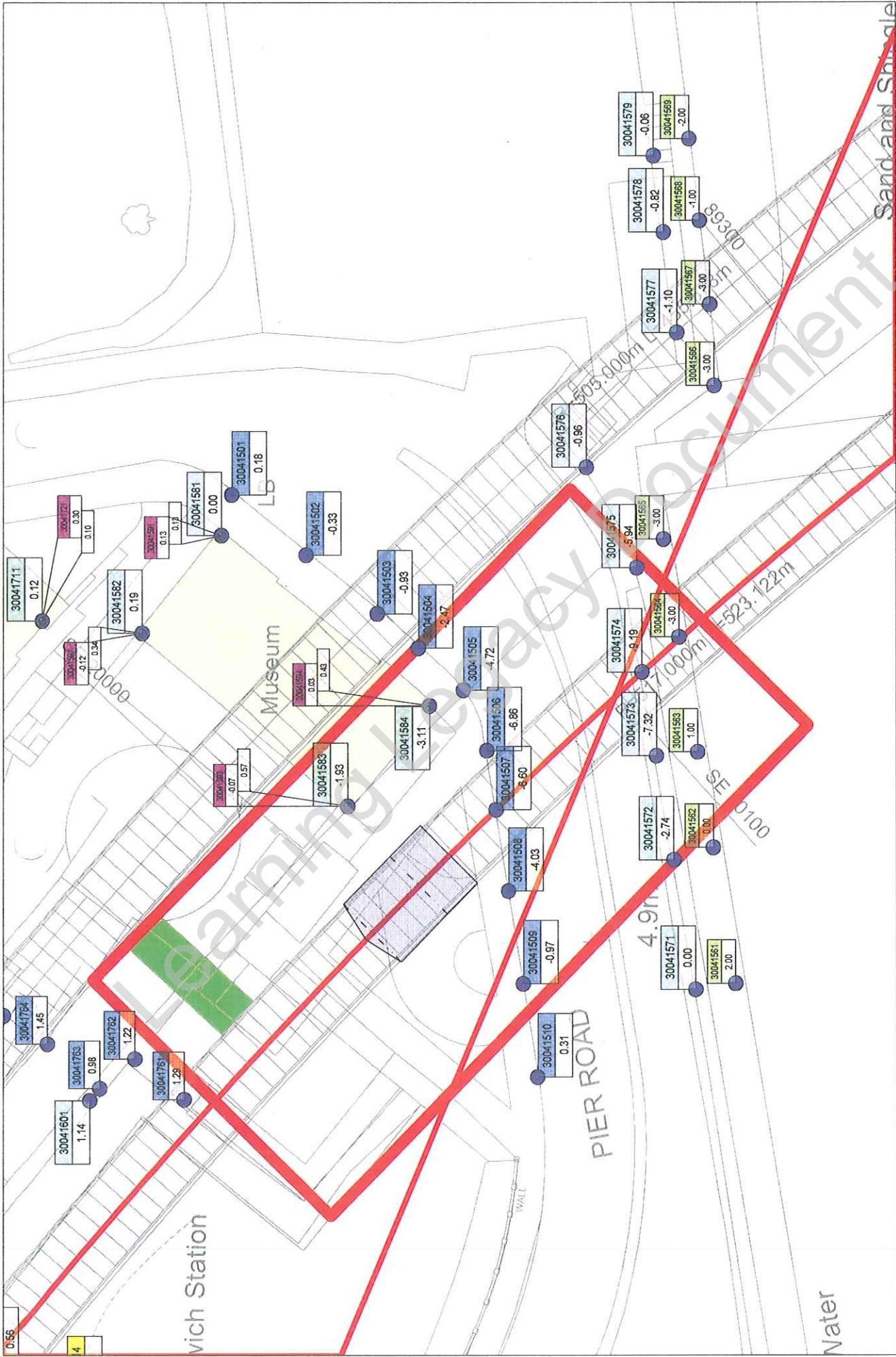
Under consideration of temperature differences, the surrounding ground condition and the achievable accuracy of the measurement, HMJV has no concern to cease the monitoring.
The rate of change in the monitoring data is less than the required standards as per the specifications and drawings.

date / signature: 17/04/15

print name:

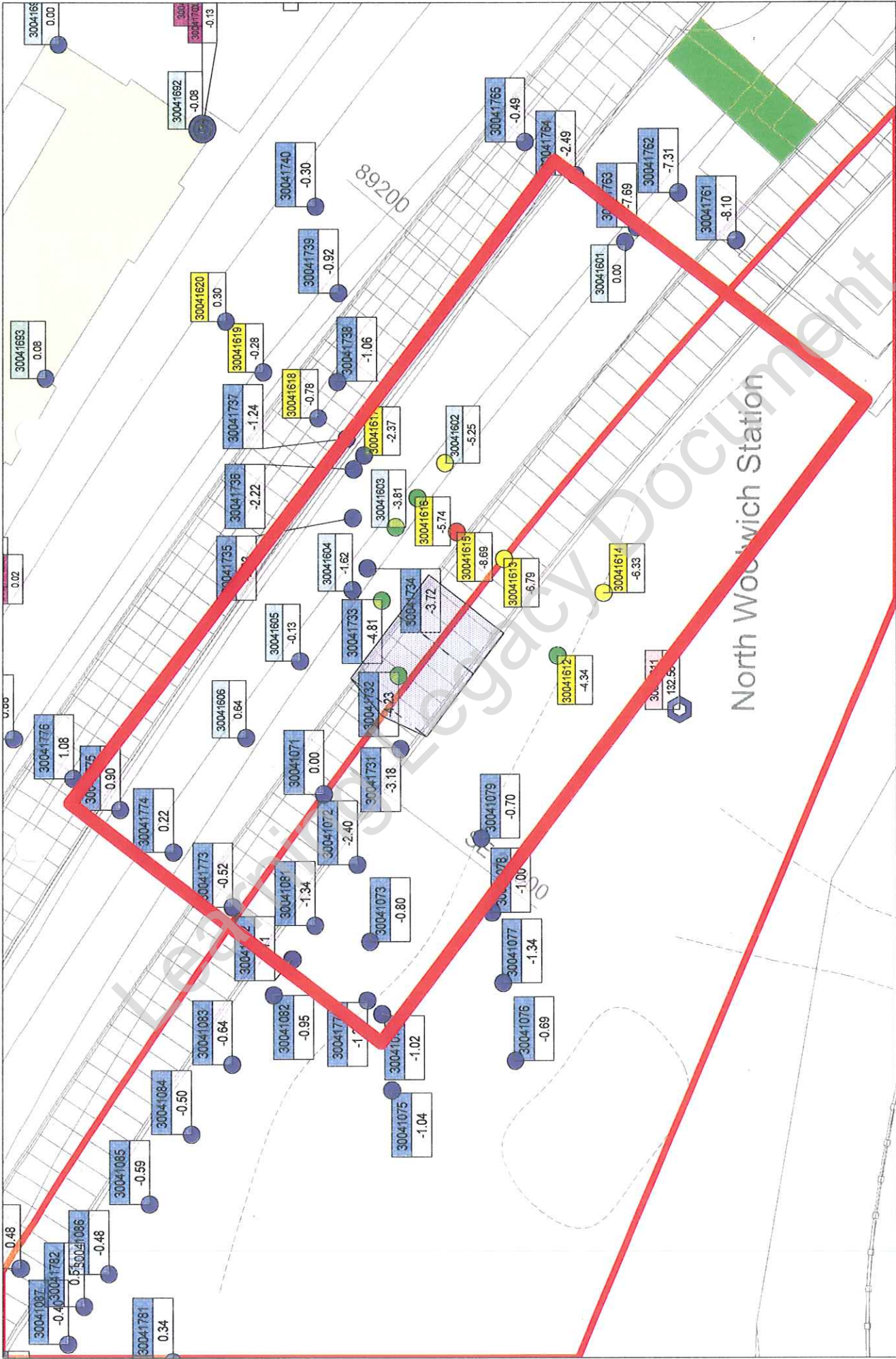
HMJV project role:

Monitoring & Survey engineer



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: portal excavation, construction base slab and capping beam
 current values: 15.12.2013 09:00

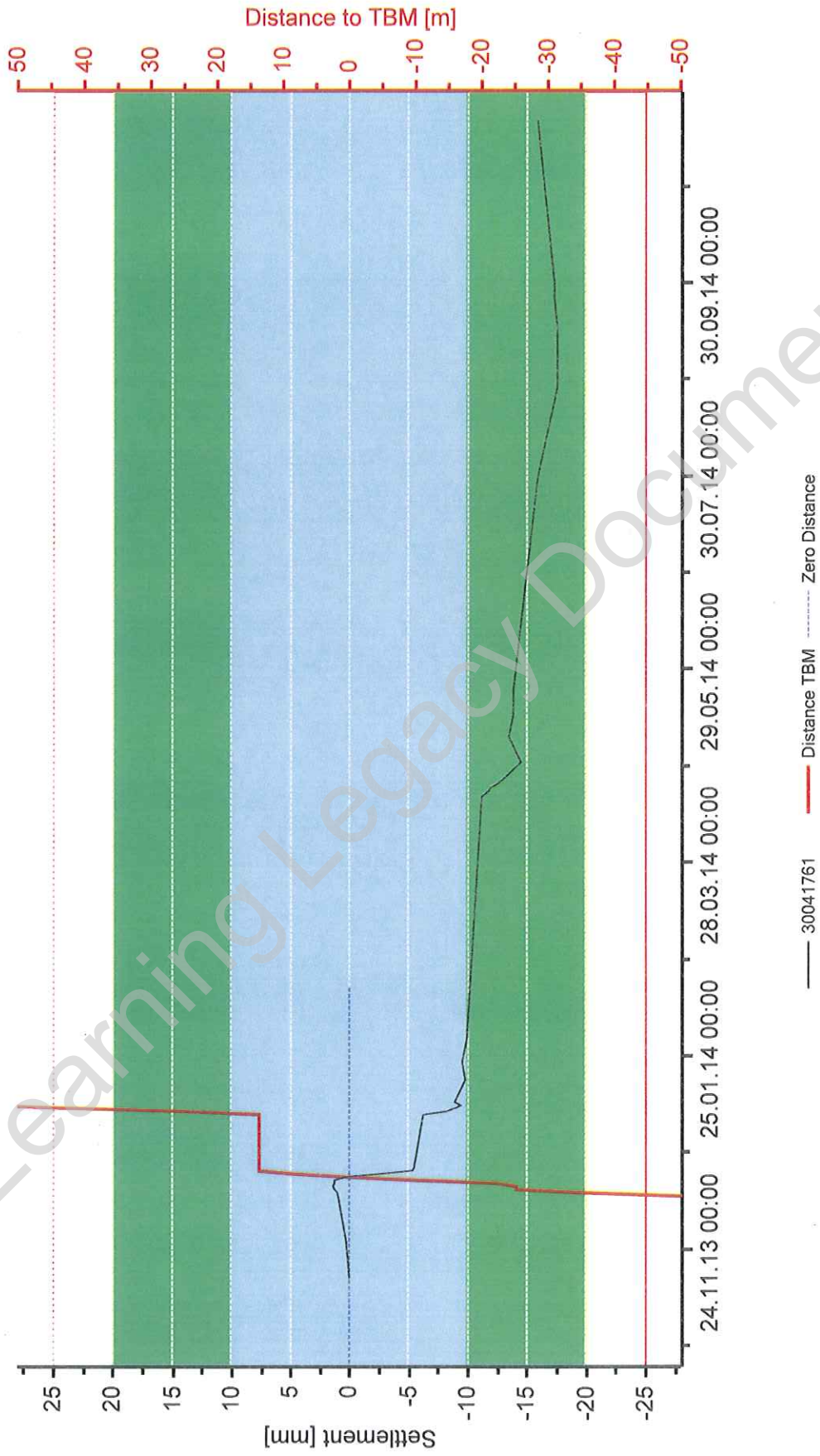




Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: TBM drive WB
 current values: 08.01.2014 09:00



Point: 30041761

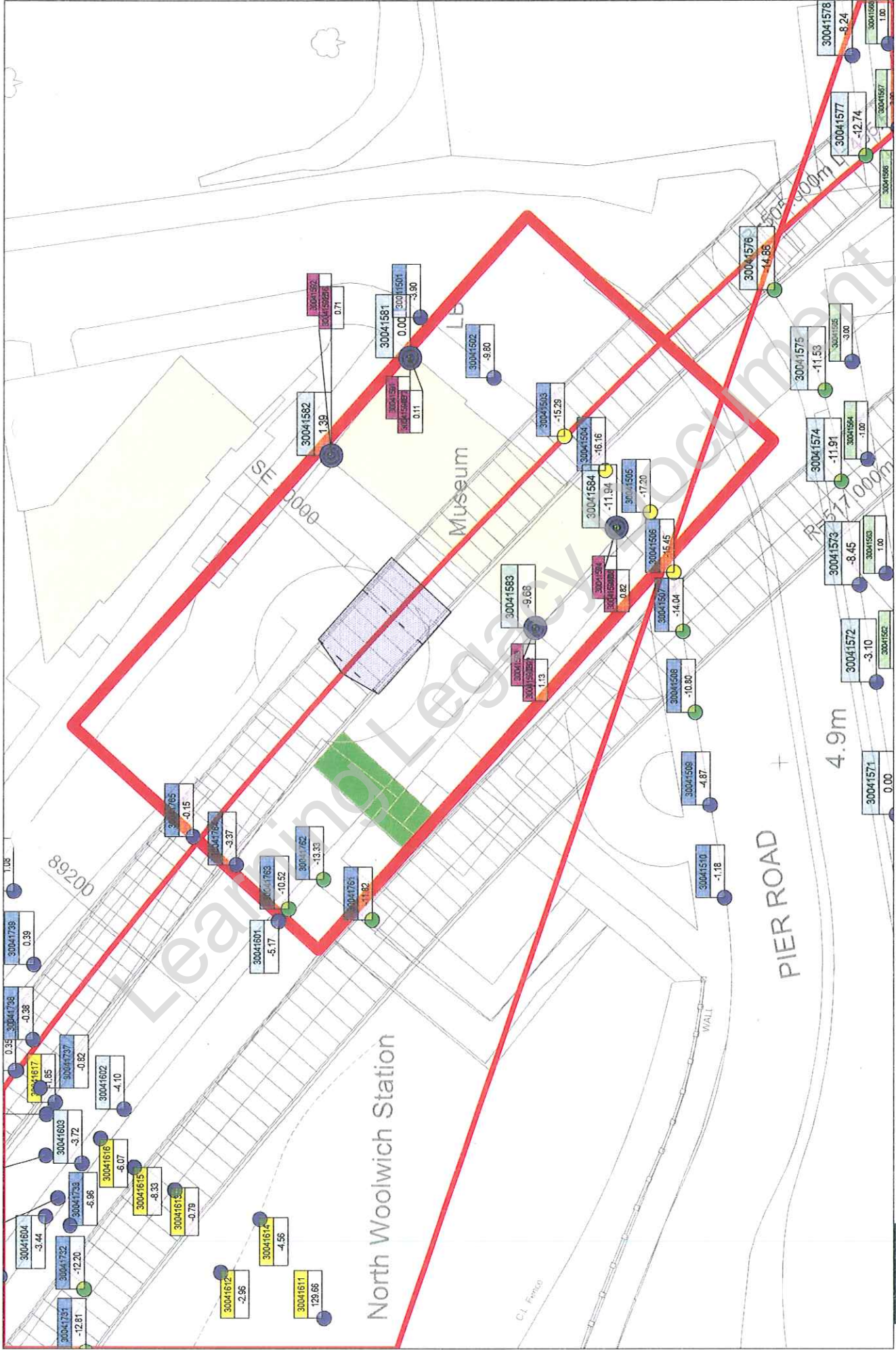


Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal

Close Out Report: WB Tunnel - CS24-CP16 17.10.2013 - 23.09.2014

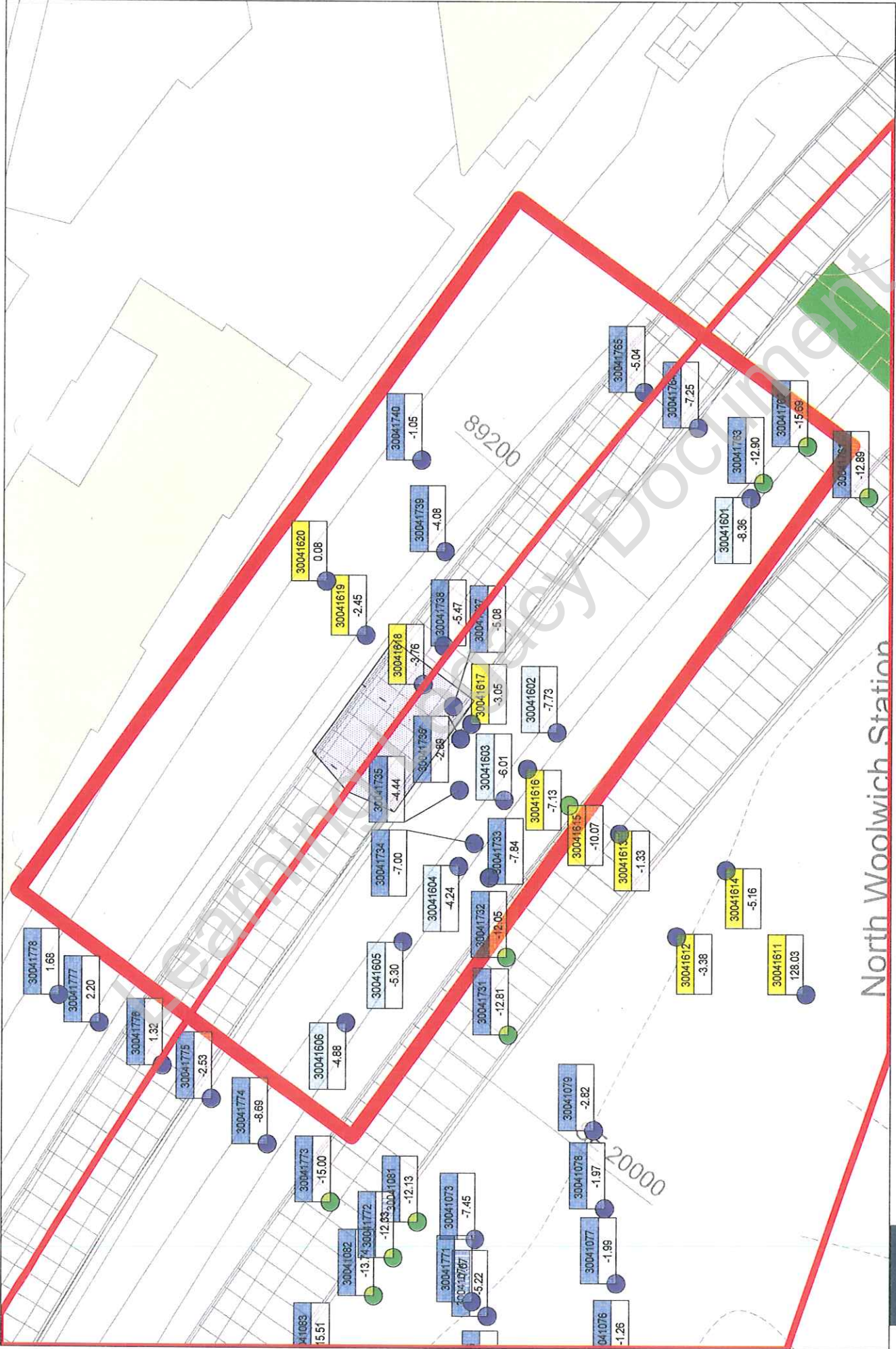
date: 18.01.2015 15:40 current values: 18.01.2015 15:30





Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: C310 EB tunnel drive; NWP: portal excavation, construction base slab
 current values: 20.04.2014 09:00

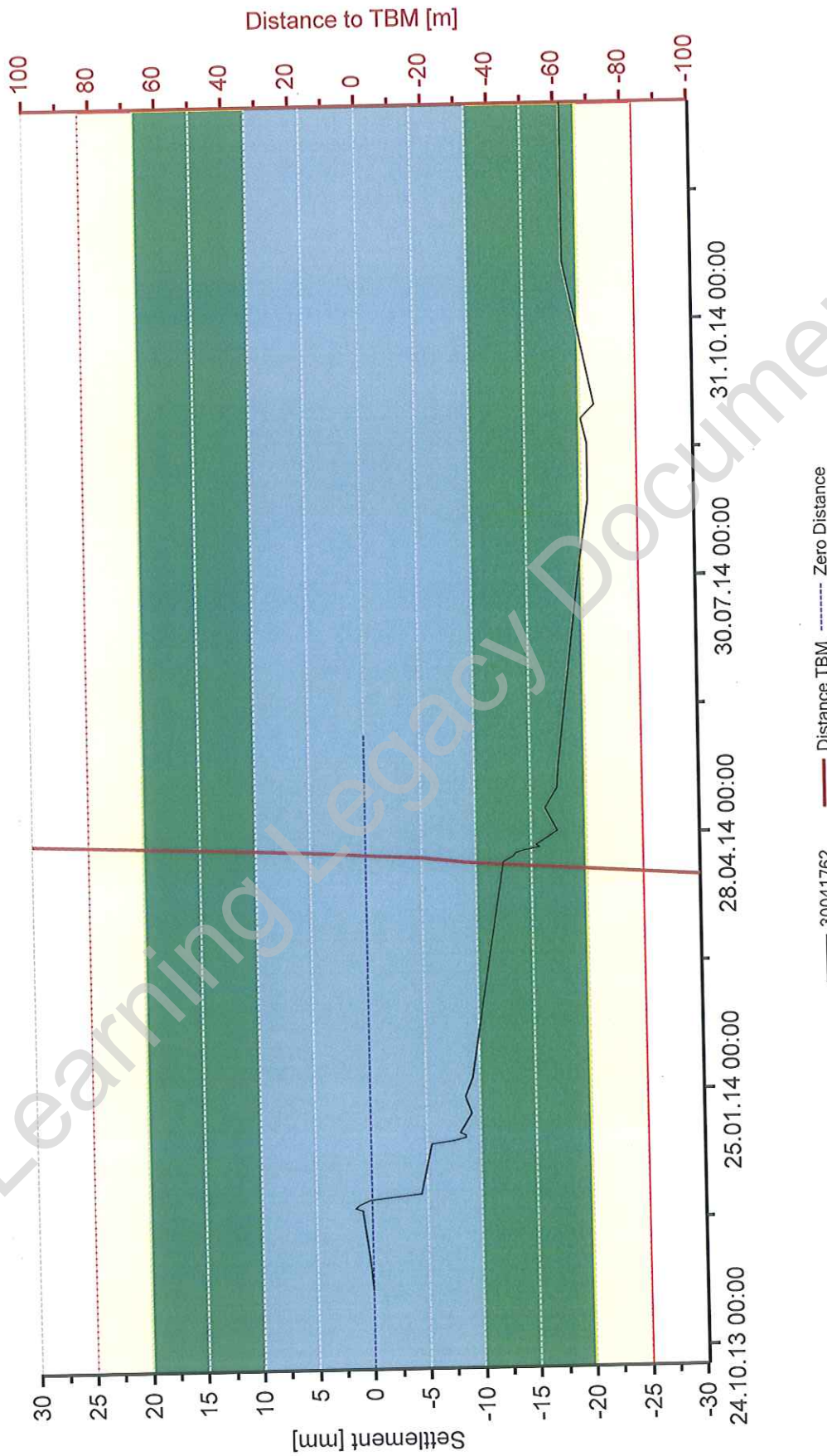




Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: C310 EB tunnel drive; NWP: portal excavation, construction base slab
 current values: 23.04.2014 17:47



Profile: Measurement Point 30041762



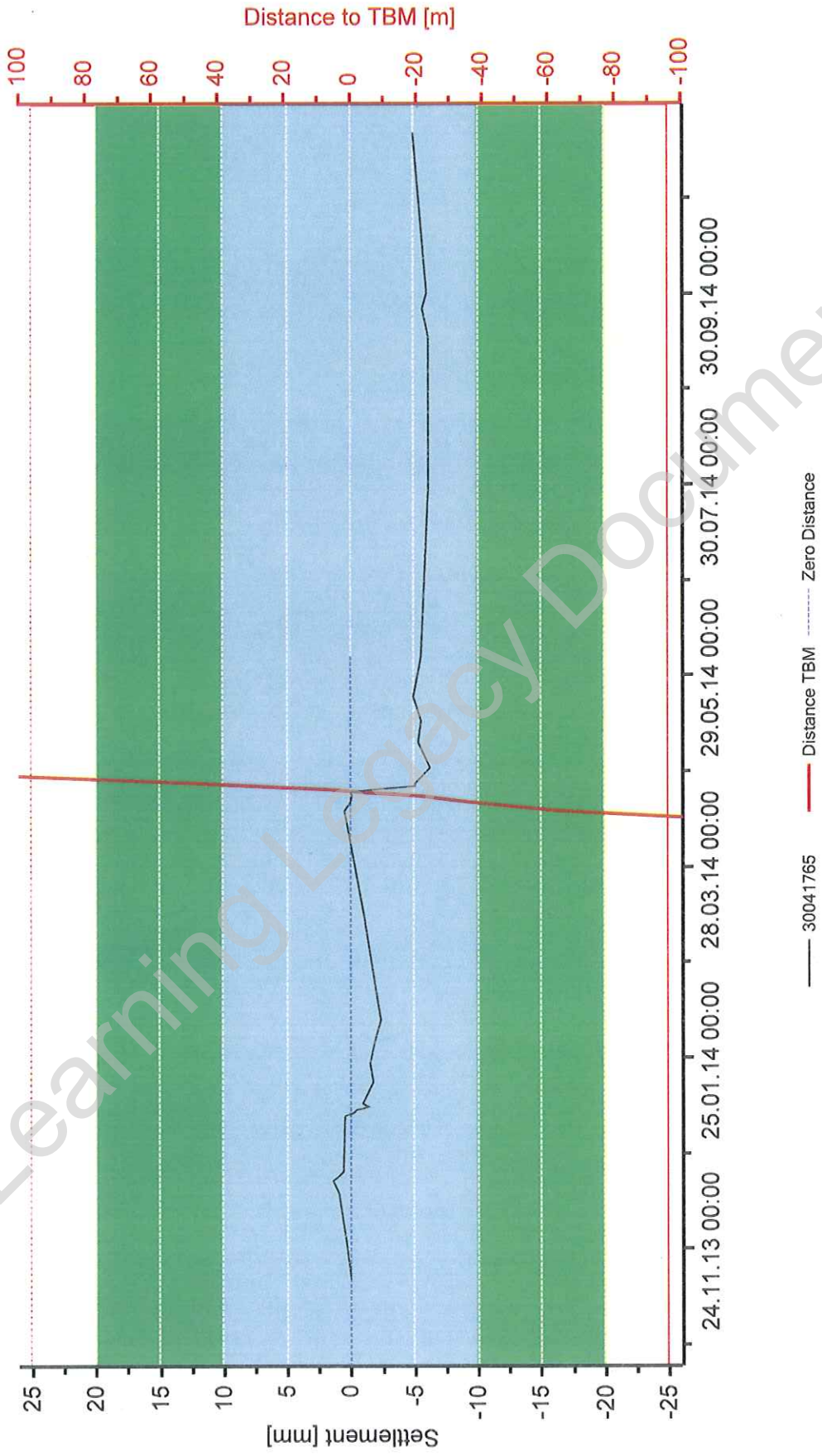
Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal

Close Out Report: EB Tunnel - CS24-CP16 - 17.10.2013 - 21.11.2014

date: 14.04.2015 14:56 current values: 14.04.2015 14:05



Point: 30041765



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal

Close Out Report: EB Tunnel - CS24-CP16 - 17.10.2013 - 21.11.2014

date: 18.01.2015 16:45 current values: 18.01.2015 16:30



monitoring table



Joint Venture

project: C310 Thames Tunnel

structure: CS24 CP16

No. of reading	baseline		1. following		2. following		3. following		4. following		5. following		6. following	
	date	elevation	26/11/2013	deviation from last/baseline	12/12/2013	deviation from last/baseline	13/12/2013	deviation from last/baseline	14/12/2013	deviation from last/baseline	15/12/2013	deviation from last/baseline	16/12/2013	deviation from last/baseline
30041761	14/11/13	104.499	104.499	0	104.500	1	104.500	0	104.500	0	104.500	0	104.500	0
30041762		104.496	104.496	0	104.496	0	104.496	0	104.497	1	104.497	0	104.496	-1
30041763		104.322	104.321	0	104.322	1	104.322	0	104.323	0	104.323	0	104.322	0
30041764		104.378	104.378	0	104.379	1	104.379	0	104.379	0	104.379	0	104.379	0
30041765		103.143	103.143	0	103.144	1	103.144	0	103.144	0	103.144	0	103.144	0

Legacy Document

monitoring table



Joint Venture

project: C310 Thames Tunnel

structure: CS24 CP16

No. of reading	baseline		7. following		8. following		9. following		10. following		11. following		12. following	
	date	elevation	date	deviation from last/ baseline	date	deviation from last/baseline	date	deviation from last/baseline	date	deviation from last/baseline	date	deviation from last/baseline	date	deviation from last/baseline
	14/11/13		17/12/2013		18/12/2013		19/12/2013		20/12/2013		06/01/2014		07/01/2014	
No.	elevation		elevation	deviation from last/ baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline
30041761	104.499		104.499	-1	104.496	-3	104.494	-3	104.494	0	104.493	-1	104.491	-2
30041762	104.496		104.496	-1	104.493	-2	104.491	-2	104.491	0	104.490	-1	104.488	-2
30041763	104.322		104.322	0	104.320	-2	104.318	-2	104.318	0	104.317	-1	104.315	-3
30041764	104.378		104.379	0	104.378	-1	104.378	-1	104.377	0	104.377	0	104.376	-1
30041765	103.143		103.144	0	103.144	0	103.143	0	103.143	0	103.143	0	103.142	-1
														0

Engineering Legacy Document

monitoring table



Joint Venture

project: C310 Thames Tunnel
structure: CS24 CP16

No. of reading	baseline		13. following		14. following		15. following		16. following		17. following		18. following	
	date	elevation	date	deviation from last/ baseline	date	deviation from last/baseline	date	deviation from last/baseline	date	deviation from last/baseline	date	deviation from last/baseline	date	deviation from last/baseline
	14/11/13		08/01/2014		08/01/2014		09/01/2014		10/01/2014		17/01/2014		23/01/2014	
No.		elevation		deviation from last/ baseline		deviation from last/baseline		deviation from last/baseline		deviation from last/baseline		deviation from last/baseline		deviation from last/baseline
30041761		104.499			104.490	-1	104.490	0	104.490	0	104.489	-1	104.489	0
30041762		104.496			104.487	-1	104.487	0	104.488	1	104.486	-1	104.487	1
30041763		104.322		-8	104.314	0	104.313	-1	104.314	0	104.312	-1	104.313	0
30041764		104.378		-2	104.375	0	104.375	-1	104.375	1	104.374	-1	104.374	0
30041765		103.143		0	103.142	0	103.141	-1	103.142	0	103.141	-1	103.141	0

Legacy Document

monitoring table



Joint Venture

project: C310 Thames Tunnel

structure: CS24 CP16

No. of reading	baseline		25. following		26. following		27. following		28. following		29. following		30. following			
	date	elevation	elevation	deviation from last/ baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline		
	14/11/13															
														07/05/2014		
30041761		104.499	104.487	0	-12	104.486	0	-13	104.486	0	-13	104.485	-1	104.486	1	-13
30041762		104.496	104.482	0	-13	104.480	-1	-16	104.480	0	-15	104.478	-2	104.479	1	-16
30041763		104.322	104.311	0	-10	104.309	-1	-13	104.308	-1	-14	104.307	-1	104.308	1	-14
30041764		104.378	104.374	-1	-4	104.370	-2	-7	104.370	-1	-8	104.369	-1	104.370	1	-8
30041765		103.143	103.143	0	0	103.138	-3	-5	103.138	0	-5	103.136	-1	103.137	1	-5

Legacy Document

monitoring table



Joint Venture

project: C310 Thames Tunnel

structure: CS24 CP16

No. of reading	baseline		31. following		32. following		33. following		34. following		35. following		36. following	
	date	elevation	14/05/2014	deviation from last/ baseline	22/05/2014	deviation from last/baseline	04/06/2014	deviation from last/baseline	17/06/2014	deviation from last/baseline	29/07/2014	deviation from last/baseline	27/08/2014	deviation from last/baseline
		elevation	elevation	deviation from last/ baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline
30041761		104.499	104.485	0 -14	104.485	0 -14			104.484	-1 -15	104.483	-1 -16	104.481	-2 -18
30041762		104.496	104.478	-1 -17	104.478	0 -17			104.478	0 -18	104.476	-2 -20	104.475	-1 -21
30041763		104.322	104.308	0 -14	104.307	-1 -14	104.307	0 -15	104.306	-1 -15	104.303	-4 -19	104.304	1 -18
30041764		104.378	104.370	0 -8	104.370	0 -8	104.369	-1 -9	104.369	0 -8	104.369	-1 -9	104.367	-1 -10
30041765		103.143	103.137	0 -6	103.138	1 -5	103.137	-1 -6	103.137	0 -6	103.136	0 -6	103.136	0 -6

Legacy Document

monitoring table




Joint Venture

project: C310 Thames Tunnel

structure: CS24-CP16

No. of reading	baseline		37. following		38. following		39. following		40. following			
	date	elevation	14/11/13	16/09/2014	25/09/2014	30/09/2014	21/11/2014	elevation	deviation from last/baseline	elevation	deviation from last/baseline	
No.	elevation		elevation	deviation from last/ baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline
30041761	104.499		104.482	0 -17	104.482	0 -17	104.482	0 -17	104.483	1 -16		
30041762	104.496		104.475	0 -20	104.474	-1 -21	104.475	1 -20	104.477	2 -19		
30041763	104.322		104.305	1 -17	104.304	0 -17	104.305	0 -17	104.305	1 -16		
30041764	104.378		104.368	0 -10	104.367	0 -10	104.368	1 -10	104.369	1 -9		
30041765	103.143		103.137	1 -6	103.137	0 -6	103.137	0 -6	103.138	1 -5		

Legacy Document

		C310 THAMES TUNNEL REPORT			
EMPLOYER	CROSSRAIL	eB NO	C310-HTM-C-RGN-CR148-50024	Rev	2.0
TITLE	Monitoring Close-Out Reports relating to Tunnelling Works North Embankment River Thames - North Woolwich Portal (excl. Store Rd)				

APPENDIX 81

CS CP 16

Learning Legacy Document

monitoring asset	Surface at Cross Passage 16		
reference monitoring drawing:	C310-HTM-C-DWG-CR146-ST004-70003		
name of monitoring section:	XP 16		
sensor type:	manual levelling studs		
chainage:	91040	point no.:	3004 2001 - 3004 2012
trigger values: [mm]	green: +16 -16	amber: +20 -20	red: +25 -25
reference document for trigger values:	Management Plan for Control of Ground Movement		
EB-no.:	C310-HTM-Z-STP-CR148-50058		
Appendix:			

monitoring data

	date	max. value	point no.	comments
baseline	14/05/14	0.00		
TBM 1	Manual levelling studs were not installed at the time of underpassing with TBM 1+2 the area of XP18			
TBM 2				
XP works	07/06/14	-1.17 -1.16	3004 2005 3004 2010	start excavation
	16/09/14	-3.88 -5.28	3004 2005 3004 2010	inner lining finished
longterm	22/01/15	-2.93 -3.45	3004 2005 3004 2010	last reading breached not any trigger value
Evaluation of any potential residual risks	<input checked="" type="checkbox"/>	No residual risk since the Works have been completed by HMJV		
	<input type="checkbox"/>	Yes, residual risk (see comment below)		

summary / comments

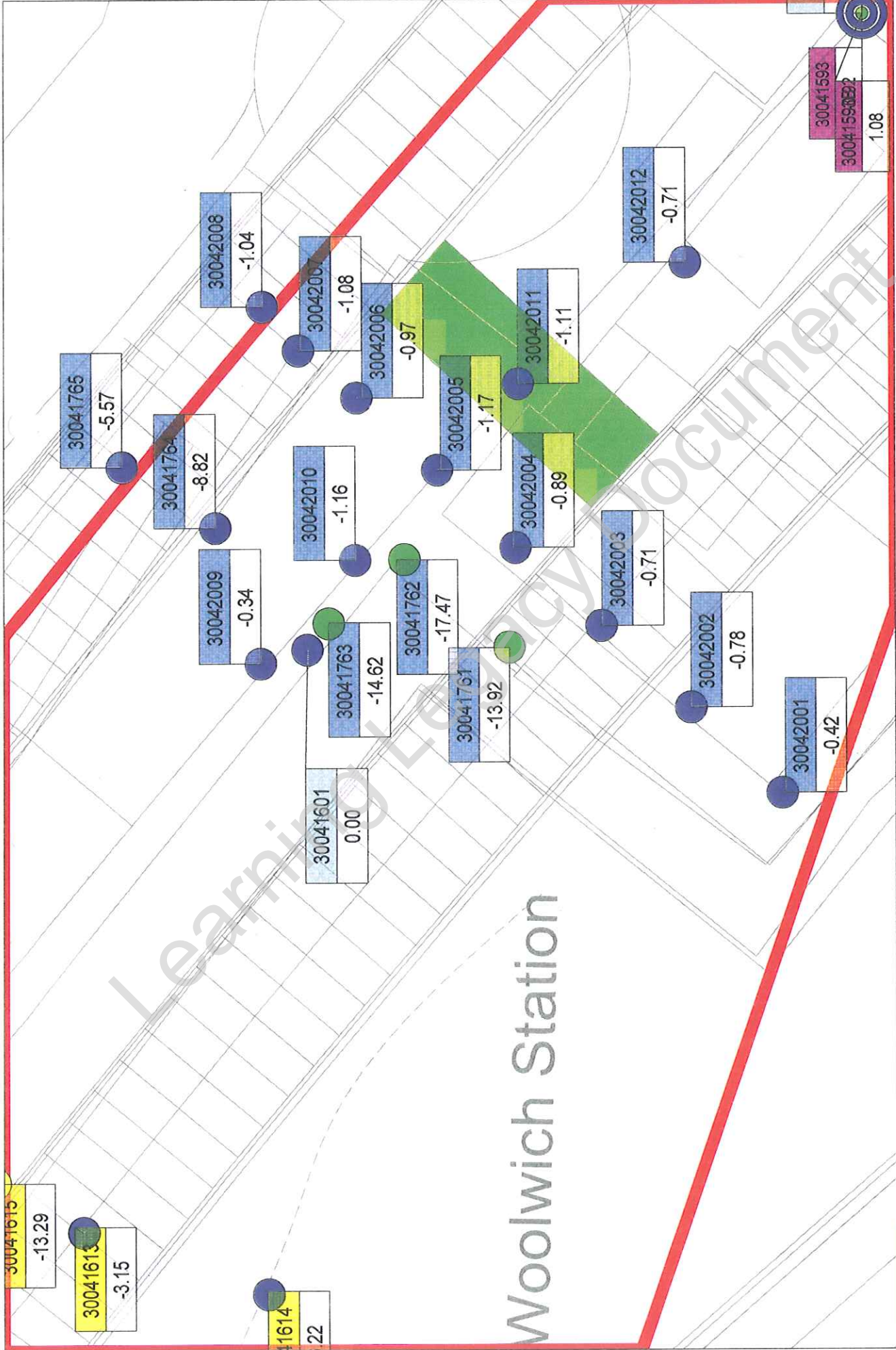
Under consideration of temperature differences, the surrounding ground condition and the achievable accuracy of the measurement, HMJV has no concern to cease the monitoring.
The rate of change in the monitoring data is less than the required standards as per the specifications and drawings.

date / signature: 14/04/2015

print name:

HMJV project role:

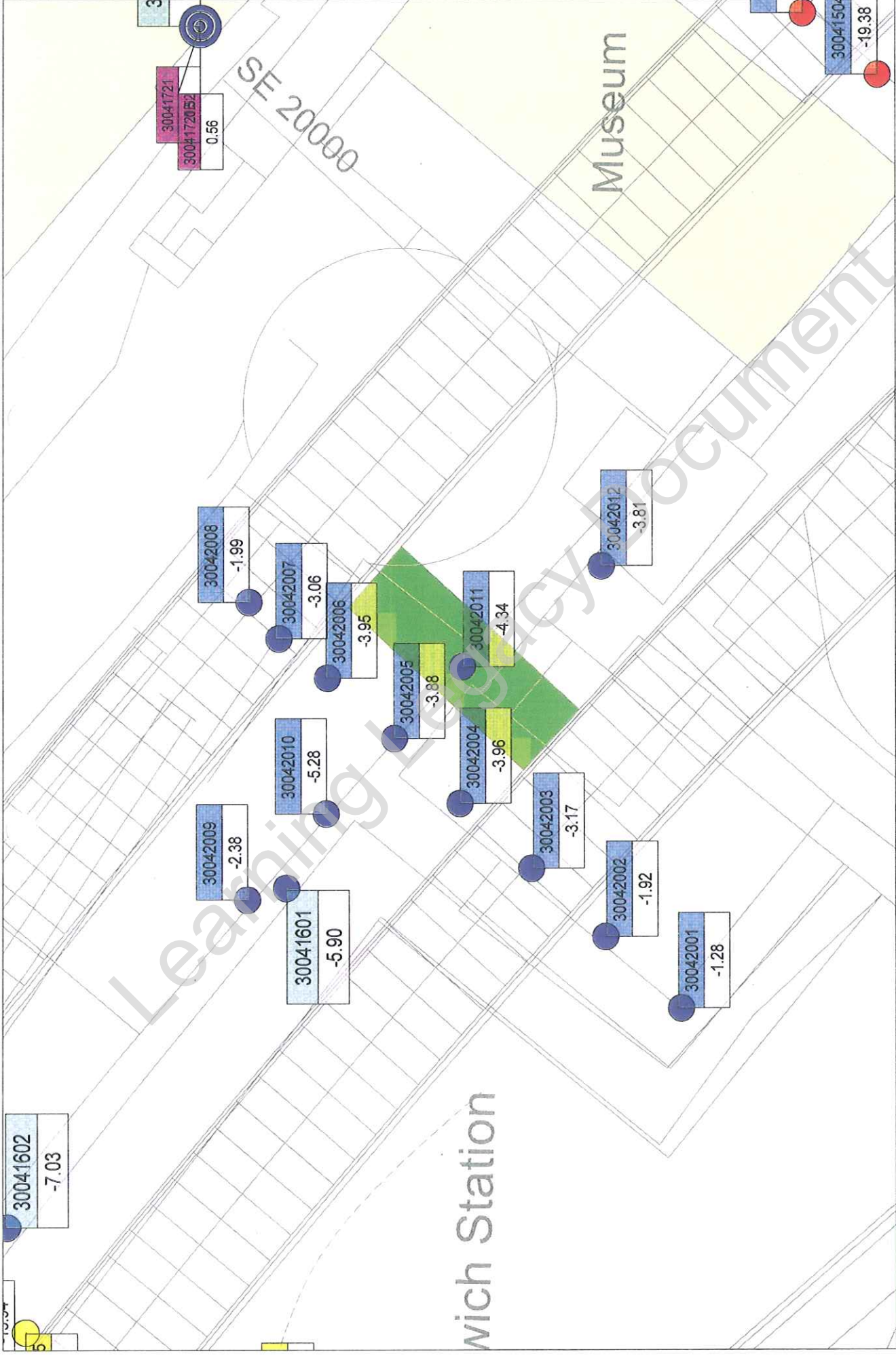
Monitoring & Survey engineer



Woolwich Station

Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 Working activities: portal excavation, construction base slab and capping beam
 current values: 08.06.2014 08:57

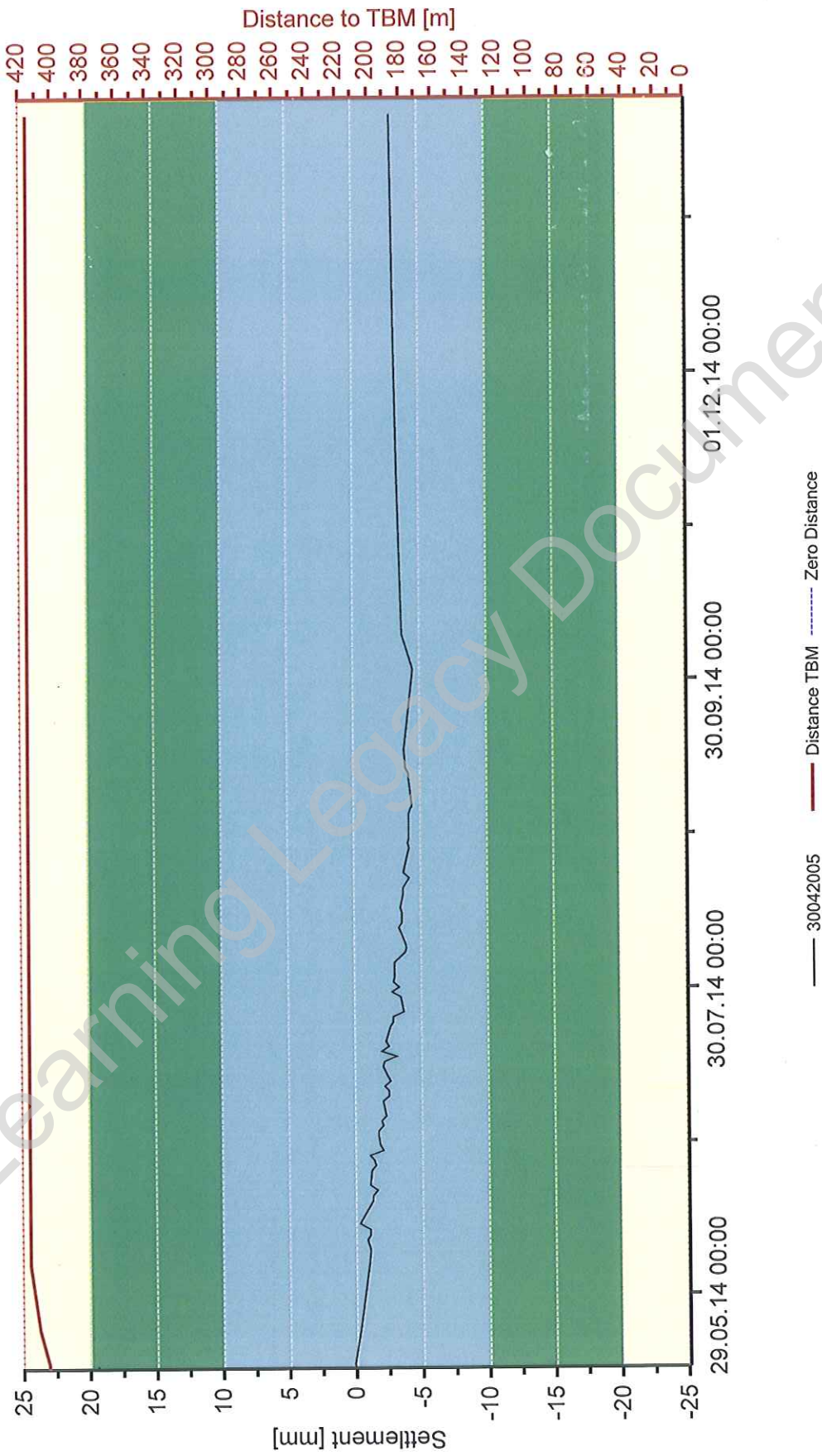




Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: C310 EB tunnel drive; NWP: portal excavation, construction base slab
 current values: 16.09.2014 15:08



Point: 30042005



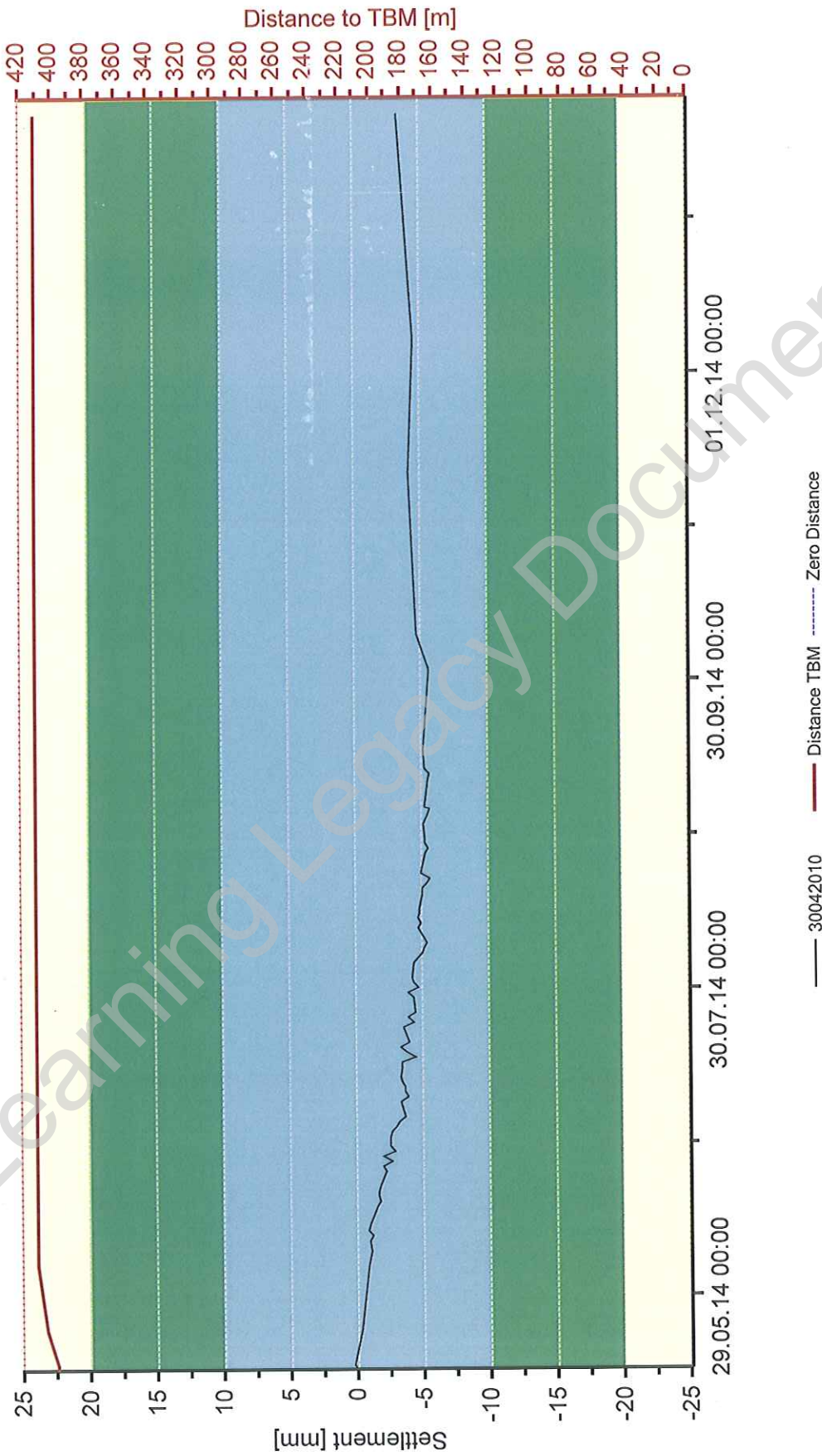
Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal

Close Out Report: CS CP 16 - 14.05.2014 - 22.01.2015

date: 03.02.2015 09:06 current values: 03.02.2015 08:45



Point: 30042010



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal

Close Out Report: CS CP 16 - 14.05.2014 - 22.01.2015

date: 03.02.2015 09:08 current values: 03.02.2015 08:45



monitoring table



Joint Venture

project: C310 Thames Tunnel

structure: CP.16

No. of reading	baseline		1. following		2. following		3. following		4. following		5. following		6. following		
	date	elevation	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	
	14/5/14														
				15/05/2014		22/05/2014		04/06/2014		07/06/2014		09/06/2014		10/06/2014	
30042001	104.368	104.368	0	104.368	0	104.368	0	104.368	0	104.368	0	104.369	1	104.367	-2
30042002	104.392	104.392	0	104.392	0	104.392	0	104.391	-1	104.391	0	104.391	0	104.392	0
30042003	104.399	104.399	0	104.398	0	104.398	0	104.398	0	104.398	0	104.398	0	104.398	0
30042004	104.394	104.394	0	104.394	0	104.394	0	104.394	-1	104.393	0	104.394	0	104.393	0
30042005	104.265	104.265	0	104.264	0	104.264	-1	104.263	-1	104.263	-1	104.264	0	104.263	0
30042006	104.306	104.306	0	104.306	-1	104.306	-1	104.305	-1	104.305	0	104.305	0	104.305	0
30042007	103.240	103.240	0	103.239	-1	103.239	-1	103.239	0	103.239	0	103.239	0	103.239	-1
30042008	103.245	103.245	0	103.245	-1	103.245	-1	103.244	-1	103.244	-1	103.245	1	103.245	0
30042009	104.154	104.154	0	104.154	0	104.154	-1	104.154	0	104.154	0	104.154	0	104.153	0
30042010	104.247	104.247	0	104.246	-1	104.246	-1	104.245	-1	104.245	0	104.246	0	104.245	0
30042011	104.327	104.327	0	104.326	0	104.326	0	104.326	-1	104.325	-1	104.326	0	104.326	0
30042012	104.481	104.482	0	104.481	-1	104.481	0	104.481	0	104.481	0	104.481	0	104.480	0

monitoring table



Joint Venture

project: C310 Thames Tunnel

structure: CP 16

No. of reading	19. following		20. following		21. following		22. following		23. following		24. following		
	baseline	14/5/14	27/06/2014	28/06/2014	30/06/2014	01/07/2014	02/07/2014	03/07/2014	02/07/2014	03/07/2014	02/07/2014	03/07/2014	
Point No.	elevation	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline
30042001	104.368	104.367	-1	104.367	0	-1	104.367	0	-1	104.367	0	104.367	0
30042002	104.392	104.391	-1	104.391	0	-1	104.391	0	-1	104.391	0	104.391	0
30042003	104.399	104.397	-1	104.397	0	-1	104.397	0	-1	104.397	0	104.397	0
30042004	104.394	104.392	-1	104.393	0	-2	104.393	0	-2	104.393	0	104.392	0
30042005	104.265	104.262	-1	104.263	0	-2	104.263	0	-2	104.263	0	104.263	0
30042006	104.306	104.304	-1	104.304	0	-2	104.304	0	-2	104.304	0	104.304	0
30042007	103.240	103.238	-1	103.237	-1	-3	103.239	1	-2	103.238	0	103.238	0
30042008	103.245	103.244	-1	103.243	-1	-2	103.244	1	-1	103.244	0	103.244	0
30042009	104.154	104.153	-1	104.153	0	-1	104.153	0	-1	104.153	0	104.153	0
30042010	104.247	104.244	-1	104.244	0	-3	104.244	0	-3	104.244	0	104.243	0
30042011	104.327	104.325	-1	104.324	0	-2	104.325	1	-2	104.325	0	104.324	0
30042012	104.481	104.478	-1	104.479	1	-3	104.479	0	-3	104.479	0	104.479	0

monitoring table



Joint Venture

project: C310 Thames Tunnel

structure: CP 16

No. of reading	25. following		26. following		27. following		28. following		29. following		30. following		
	baseline	04/07/2014	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	
date	14/5/14											11/07/2014	
Point No.	elevation	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline
30042001	104.368	104.367	0	-1	104.367	0	-1	104.367	0	-1	104.367	0	-1
30042002	104.392	104.391	0	-1	104.391	0	-1	104.391	0	-1	104.390	0	-2
30042003	104.399	104.397	0	-2	104.397	0	-2	104.397	1	-2	104.397	0	-2
30042004	104.394	104.392	0	-2	104.392	0	-2	104.392	0	-2	104.392	0	-2
30042005	104.265	104.262	0	-2	104.262	0	-2	104.262	0	-3	104.262	0	-3
30042006	104.306	104.304	0	-2	104.304	0	-2	104.304	0	-3	104.304	0	-3
30042007	103.240	103.237	-1	-3	103.238	1	-2	103.238	0	-3	103.238	0	-3
30042008	103.245	103.243	0	-2	103.244	0	-2	103.244	0	-2	103.244	0	-2
30042009	104.154	104.153	-1	-2	104.153	0	-1	104.153	0	-1	104.153	0	-1
30042010	104.247	104.243	0	-4	104.243	0	-3	104.243	0	-4	104.243	0	-4
30042011	104.327	104.324	0	-2	104.324	0	-2	104.324	0	-2	104.324	0	-2
30042012	104.481	104.478	0	-3	104.479	1	-3	104.478	-1	-3	104.478	0	-3

monitoring table



Joint Venture

project: C310 Thames Tunnel

structure: CP 16

No. of reading	baseline		31. following		32. following		33. following		34. following		35. following		36. following			
	14/5/14	elevation	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline		
date	14/5/14			12/07/2014		14/07/2014		15/07/2014		16/07/2014		17/07/2014		18/07/2014		
30042001	104.368	104.367	0	-1	104.368	0	0	104.367	0	-1	104.367	0	-1	104.367	0	-1
30042002	104.392	104.390	0	-2	104.391	1	-1	104.391	0	-1	104.391	0	-1	104.391	0	-1
30042003	104.399	104.397	0	-2	104.397	0	-1	104.397	0	-2	104.396	-1	-2	104.397	0	-2
30042004	104.394	104.392	0	-2	104.393	0	-2	104.392	-1	-3	104.391	-1	-3	104.392	0	-2
30042005	104.265	104.262	0	-3	104.262	0	-2	104.262	0	-2	104.261	-1	-3	104.263	1	-2
30042006	104.306	104.304	0	-3	104.304	0	-2	104.304	0	-2	104.303	0	-3	104.303	0	-3
30042007	103.240	103.237	0	-3	103.238	1	-2	103.238	0	-2	103.238	0	-3	103.238	0	-3
30042008	103.245	103.243	0	-2	103.244	0	-2	103.244	0	-2	103.243	0	-2	103.244	0	-1
30042009	104.154	104.153	0	-1	104.153	1	-1	104.153	-1	-1	104.153	0	-2	104.153	0	-1
30042010	104.247	104.243	0	-3	104.243	0	-4	104.243	0	-3	104.242	-1	-5	104.243	0	-3
30042011	104.327	104.324	0	-3	104.325	1	-2	104.324	-1	-2	104.323	-1	-3	104.324	0	-3
30042012	104.481	104.479	0	-3	104.479	0	-3	104.479	0	-3	104.478	-1	-3	104.479	0	-3

monitoring table



Joint Venture

project: C310 Thames Tunnel

structure: CP 16

No. of reading	baseline		37. following		38. following		39. following		40. following		41. following		42. following										
	14/5/14	elevation	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline									
date	14/5/14				19/07/2014			22/07/2014			23/07/2014			24/07/2014			25/07/2014			28/07/2014			
30042001	104.368	104.366	104.367	0	-2	104.367	0	-1	104.367	0	-1	104.366	0	-2	104.366	0	-2	104.366	0	-2	104.366	0	-2
30042002	104.392	104.390	104.391	1	-2	104.391	1	-1	104.391	-1	-2	104.391	0	-2	104.390	-1	-2	104.390	0	-2	104.390	0	-2
30042003	104.399	104.397	104.397	0	-2	104.397	0	-2	104.397	-1	-2	104.397	0	-2	104.396	-1	-3	104.396	0	-2	104.396	0	-2
30042004	104.394	104.392	104.392	0	-3	104.392	0	-3	104.392	0	-3	104.392	0	-3	104.391	-1	-3	104.392	0	-3	104.392	0	-3
30042005	104.265	104.262	104.262	0	-2	104.262	0	-3	104.262	0	-3	104.262	0	-3	104.262	0	-3	104.262	0	-3	104.261	0	-4
30042006	104.306	104.303	104.303	0	-3	104.303	0	-3	104.303	0	-3	104.303	0	-3	104.304	0	-3	104.303	0	-3	104.303	0	-3
30042007	103.240	103.238	103.238	0	-3	103.238	0	-3	103.238	0	-3	103.238	0	-3	103.238	0	-3	103.237	0	-3	103.237	0	-3
30042008	103.245	103.243	103.244	1	-2	103.244	1	-1	103.244	-1	-2	103.244	0	-2	103.244	0	-2	103.243	0	-2	103.243	0	-2
30042009	104.154	104.152	104.153	0	-2	104.153	0	-2	104.153	0	-2	104.152	0	-2	104.152	0	-2	104.152	0	-2	104.152	0	-2
30042010	104.247	104.242	104.243	1	-4	104.243	1	-4	104.242	-1	-4	104.242	0	-4	104.242	-1	-5	104.242	0	-4	104.242	0	-4
30042011	104.327	104.323	104.324	1	-3	104.324	1	-3	104.324	0	-3	104.324	0	-3	104.323	0	-3	104.323	0	-3	104.323	0	-3
30042012	104.481	104.479	104.479	0	-3	104.479	0	-2	104.479	-1	-3	104.478	0	-3	104.478	0	-3	104.478	0	-3	104.478	0	-3

monitoring table

project: C310 Thames Tunnel

structure: CP 16

No. of reading	43. following		44. following		45. following		46. following		47. following		48. following					
	baseline	29/07/2014	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline				
date	14/5/14											06/08/2014				
30042001	104.368	104.367	1	-1	104.366	-1	-2	104.367	0	-1	104.367	0	-1	104.366	0	-2
30042002	104.392	104.391	1	-1	104.390	-1	-2	104.391	0	-2	104.391	0	-1	104.390	0	-2
30042003	104.399	104.397	1	-2	104.397	0	-2	104.397	0	-2	104.397	0	-2	104.396	-1	-3
30042004	104.394	104.392	0	-3	104.391	-1	-3	104.392	0	-3	104.392	0	-3	104.391	-1	-4
30042005	104.265	104.262	1	-3	104.261	-1	-3	104.262	0	-3	104.262	0	-3	104.261	-1	-4
30042006	104.306	104.303	0	-3	104.303	0	-3	104.303	0	-3	104.303	0	-3	104.302	-1	-4
30042007	103.240	103.238	1	-2	103.237	-1	-3	103.238	1	-3	103.238	0	-2	103.237	-1	-3
30042008	103.245	103.243	0	-2	103.243	0	-2	103.244	0	-2	103.244	0	-1	103.243	-1	-2
30042009	104.154	104.152	1	-2	104.152	0	-2	104.152	0	-2	104.152	0	-1	104.152	-1	-3
30042010	104.247	104.243	0	-4	104.242	-1	-5	104.242	0	-4	104.242	0	-4	104.241	-1	-5
30042011	104.327	104.324	0	-3	104.323	0	-3	104.323	0	-3	104.323	0	-3	104.322	-1	-4
30042012	104.481	104.478	0	-3	104.478	0	-3	104.478	0	-3	104.478	0	-3	104.477	-1	-4

monitoring table



Joint Venture

project: C310 Thames Tunnel

structure: CP 16

No. of reading	baseline		55. following		56. following		57. following		58. following		59. following		60. following		
	date	elevation	14/5/14	15/08/2014	18/08/2014	19/08/2014	20/08/2014	21/08/2014	22/08/2014	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline
30042001			104.368	104.367	104.367	104.367	104.367	104.367	104.367	104.367	0	104.366	0	104.367	0
30042002			104.392	104.390	104.390	104.390	104.390	104.390	104.390	104.390	0	104.390	0	104.390	0
30042003			104.399	104.396	104.396	104.396	104.396	104.396	104.396	104.396	0	104.396	0	104.396	1
30042004			104.394	104.391	104.391	104.391	104.391	104.391	104.391	104.391	0	104.390	0	104.391	0
30042005			104.265	104.261	104.261	104.261	104.261	104.261	104.261	104.261	0	104.260	0	104.261	0
30042006			104.306	104.303	104.303	104.303	104.303	104.303	104.303	104.303	0	104.302	0	104.303	0
30042007			103.240	103.238	103.238	103.238	103.238	103.238	103.238	103.238	0	103.237	-1	103.238	0
30042008			103.245	103.244	103.244	103.244	103.244	103.244	103.244	103.244	0	103.243	-1	103.244	1
30042009			104.154	104.152	104.152	104.152	104.152	104.152	104.152	104.152	0	104.151	-1	104.152	1
30042010			104.247	104.242	104.241	104.241	104.241	104.241	104.241	104.241	0	104.241	0	104.242	1
30042011			104.327	104.323	104.322	104.322	104.322	104.322	104.322	104.322	0	104.322	0	104.322	1
30042012			104.481	104.478	104.478	104.478	104.478	104.478	104.478	104.478	0	104.477	0	104.478	0

monitoring table



Joint Venture

project: C310 Thames Tunnel

structure: CP 16

No. of reading	baseline		61. following		62. following		63. following		64. following		65. following		66. following				
	date	elevation	26/08/2014	deviation from last/ baseline	27/08/2014	elevation	deviation from last/ baseline	28/08/2014	elevation	deviation from last/ baseline	29/08/2014	elevation	deviation from last/ baseline	01/09/2014	elevation	deviation from last/ baseline	03/09/2014
30042001	14/5/14	104.368	104.367	0	-1	104.366	0	-2	104.367	0	-1	104.367	0	-1	104.366	0	-2
30042002		104.392	104.390	0	-2	104.390	0	-3	104.390	0	-2	104.390	0	-2	104.390	0	-2
30042003		104.399	104.396	0	-3	104.395	0	-3	104.396	1	-3	104.396	0	-3	104.396	0	-3
30042004		104.394	104.390	0	-4	104.390	0	-4	104.390	0	-4	104.390	0	-4	104.390	0	-4
30042005		104.265	104.261	0	-4	104.260	0	-4	104.261	0	-4	104.260	0	-4	104.260	0	-4
30042006		104.306	104.302	0	-4	104.302	0	-4	104.302	0	-4	104.302	0	-4	104.302	0	-4
30042007		103.240	103.237	0	-3	103.237	0	-3	103.237	0	-3	103.237	0	-3	103.237	0	-3
30042008		103.245	103.243	0	-2	103.243	0	-2	103.244	0	-2	103.243	-1	-2	103.243	0	-2
30042009		104.154	104.152	0	-2	104.152	0	-3	104.152	0	-2	104.152	0	-3	104.151	0	-3
30042010		104.247	104.241	0	-5	104.241	0	-6	104.241	0	-5	104.241	0	-5	104.241	0	-6
30042011		104.327	104.322	0	-4	104.322	0	-5	104.322	0	-4	104.322	0	-5	104.322	0	-5
30042012		104.481	104.478	0	-4	104.478	0	-4	104.478	0	-4	104.478	0	-4	104.478	0	-4

monitoring table



Joint Venture

project: C310 Thames Tunnel

structure: CP 16

No. of reading	baseline		67. following		68. following		69. following		70. following		71. following		72. following	
	date	elevation	date	deviation from last/ baseline	date	deviation from last/ baseline	date	deviation from last/ baseline	date	deviation from last/ baseline	date	deviation from last/ baseline	date	deviation from last/ baseline
	14/5/14		04/09/2014		05/09/2014		09/09/2014		10/09/2014		11/09/2014		12/09/2014	
Point No.	elevation		elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline
30042001	104.368		104.367	0 -1	104.367	0 -1	104.367	0 -1	104.367	0 -1	104.367	0 -1	104.367	0 -1
30042002	104.392		104.390	0 -2	104.390	0 -2	104.390	0 -2	104.390	0 -2	104.390	0 -2	104.390	0 -2
30042003	104.399		104.396	0 -3	104.396	0 -3	104.396	0 -3	104.396	0 -3	104.395	0 -3	104.396	0 -3
30042004	104.394		104.390	0 -4	104.390	0 -4	104.390	0 -4	104.390	0 -4	104.390	0 -4	104.390	0 -4
30042005	104.265		104.260	0 -4	104.260	0 -4	104.261	0 -4	104.260	0 -4	104.260	0 -4	104.261	0 -4
30042006	104.306		104.302	0 -4	104.302	0 -4	104.302	0 -4	104.302	0 -4	104.302	0 -5	104.302	0 -4
30042007	103.240		103.237	0 -3	103.237	0 -3	103.237	0 -3	103.237	0 -4	103.237	0 -3	103.237	0 -4
30042008	103.245		103.243	0 -2	103.243	0 -2	103.244	0 -2	103.243	-1 -2	103.243	0 -2	103.243	0 -2
30042009	104.154		104.151	0 -3	104.152	0 -3	104.152	0 -2	104.152	0 -2	104.152	0 -3	104.151	0 -3
30042010	104.247		104.241	0 -6	104.241	0 -5	104.241	0 -5	104.241	0 -6	104.241	0 -6	104.241	0 -5
30042011	104.327		104.322	0 -5	104.322	0 -4	104.322	0 -5	104.322	0 -4	104.322	0 -5	104.322	0 -5
30042012	104.481		104.478	0 -4	104.478	0 -4	104.478	0 -4	104.478	0 -4	104.478	0 -4	104.478	0 -4

monitoring table



Joint Venture

project: **C310 Thames Tunnel**

structure: **CP 16**

No. of reading	73. following		74. following		75. following		76. following		77. following		78. following					
	baseline	16/09/2014	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline				
date	14/5/14	16/09/2014	25/09/2014	02/10/2014	09/10/2014	16/10/2014	11/11/2014									
Point No.	elevation	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline			
30042001	104.368	104.367	0	-1	104.366	0	-2	104.368	1	0	104.367	0	-1	104.36822	1	0
30042002	104.392	104.390	0	-2	104.390	0	-2	104.391	0	-2	104.390	0	-2	104.39121	1	-1
30042003	104.399	104.396	0	-3	104.396	0	-3	104.396	1	-2	104.396	0	-3	104.39648	0	-2
30042004	104.394	104.390	0	-4	104.390	0	-4	104.391	1	-3	104.390	-1	-4	104.39175	1	-3
30042005	104.265	104.261	0	-4	104.260	0	-4	104.261	1	-4	104.260	0	-4	104.26121	1	-3
30042006	104.306	104.302	0	-4	104.302	0	-5	104.302	1	-4	104.302	0	-4	104.30302	1	-3
30042007	103.240	103.237	1	-3	103.237	0	-3	103.238	1	-3	103.237	0	-3	103.23871	1	-2
30042008	103.245	103.243	0	-2	103.243	0	-2	103.245	1	-1	103.244	-1	-1	103.24498	1	0
30042009	104.154	104.152	0	-2	104.152	0	-3	104.153	1	-2	104.152	0	-2	104.15324	1	-1
30042010	104.247	104.241	0	-5	104.241	-1	-6	104.242	1	-5	104.242	0	-5	104.24241	1	-4
30042011	104.327	104.322	0	-4	104.322	-1	-5	104.322	1	-4	104.322	0	-5	104.32366	2	-3
30042012	104.481	104.478	0	-4	104.478	0	-4	104.478	0	-3	104.479	1	-3	104.48066	2	-1

monitoring table



Joint Venture

project: C310 Thames Tunnel

structure: CP 16

No. of reading	baseline		79. following		80. following		81. following		82. following		83. following		84. following	
	date	elevation	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline
	14/5/14													
				08/12/2014		22/01/2015								
Point No.		elevation	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline
30042001		104.368	104.368	0	104.369	1	104.369	1						
30042002		104.392	104.391	0	104.392	1	104.392	0						
30042003		104.399	104.396	0	104.397	1	104.397	-2						
30042004		104.394	104.391	-1	104.392	1	104.392	-3						
30042005		104.265	104.261	0	104.262	0	104.262	-3						
30042006		104.306	104.303	0	104.303	0	104.303	-3						
30042007		103.240	103.239	0	103.238	-1	103.238	-2						
30042008		103.245	103.245	0	103.245	1	103.245	0						
30042009		104.154	104.153	0	104.153	0	104.153	-1						
30042010		104.247	104.242	0	104.243	1	104.243	-3						
30042011		104.327	104.323	-1	104.324	1	104.324	-2						
30042012		104.481	104.480	-1	104.481	1	104.481	0						

		C310 THAMES TUNNEL REPORT			
EMPLOYER	CROSSRAIL	eB NO	C310-HTM-C-RGN-CR148-50024	Rev	2.0
TITLE	Monitoring Close-Out Reports relating to Tunnelling Works North Embankment River Thames - North Woolwich Portal (excl. Store Rd)				

APPENDIX 82
Geotechnical Cross Section 3

Learning Legacy Document

monitoring asset	Area		
reference monitoring drawing:	C310-HTM-C-DWG-CR146-ST004-70003		
name of monitoring section:	Geotechnical Cross Section 3		
sensor type:	manual levelling studs piezometer, inclinometer and extensometer		
chainage:	89190	point no.:	3004 1611 - 3004 1620
trigger values: [mm]	green: +16 -16	amber: +20 -20	red: +25 -25
reference document for trigger values:	Management Plan for Control of Ground Movement		
EB-no.:	C310-HTM-Z-STP-CR148-50058		
Appendix:	AAA		

monitoring data

	date	max. value surface level	point no.	comments
baseline	14/11/13	0.00		
TBM 1	start ZOI	18/11/13	0.97	3004 1615
	end ZOI	09/01/14	-10.81	3004 1615
TBM 2	start ZOI	22/04/14	-0.90	3004 1618
	end ZOI	25/04/14	-10.52	3004 1618
longterm	21/11/14	-15.67	3004 1616	
Evaluation of any potential residual risks	<input checked="" type="checkbox"/>	No residual risk since the Works have been completed by HMJV		
	<input type="checkbox"/>	Yes, residual risk (see comment below)		

summary / comments

The Geotechnical Cross Section 3 depends out of 2no. extensometer (3004 1613 and 3004 1614), 1no inclinometer (3004 1612) and 1 no piezometer (3004 1611) - on every loction of the in-ground instruments is also a precise levelling surface point and in addition there are another 6 precise levelling points (3004 1615 - 3004 1620) insatelled, which complete this Geotechnical Cross Section.

The accuracy of the extensometer readings of approx. 2mm causes the fluctuation of the measured values.

The inclinometer tube were since the 14/02/14 not usable any more.

During re-instatment works in that area, the piezometer was damaged and no readings could be taken after the 24/05/2014.

Under consideration of temperatur differences, the surrounding ground condition and the achievable accuracy of the measurement, HMJV has no concern to cease the monitoring.

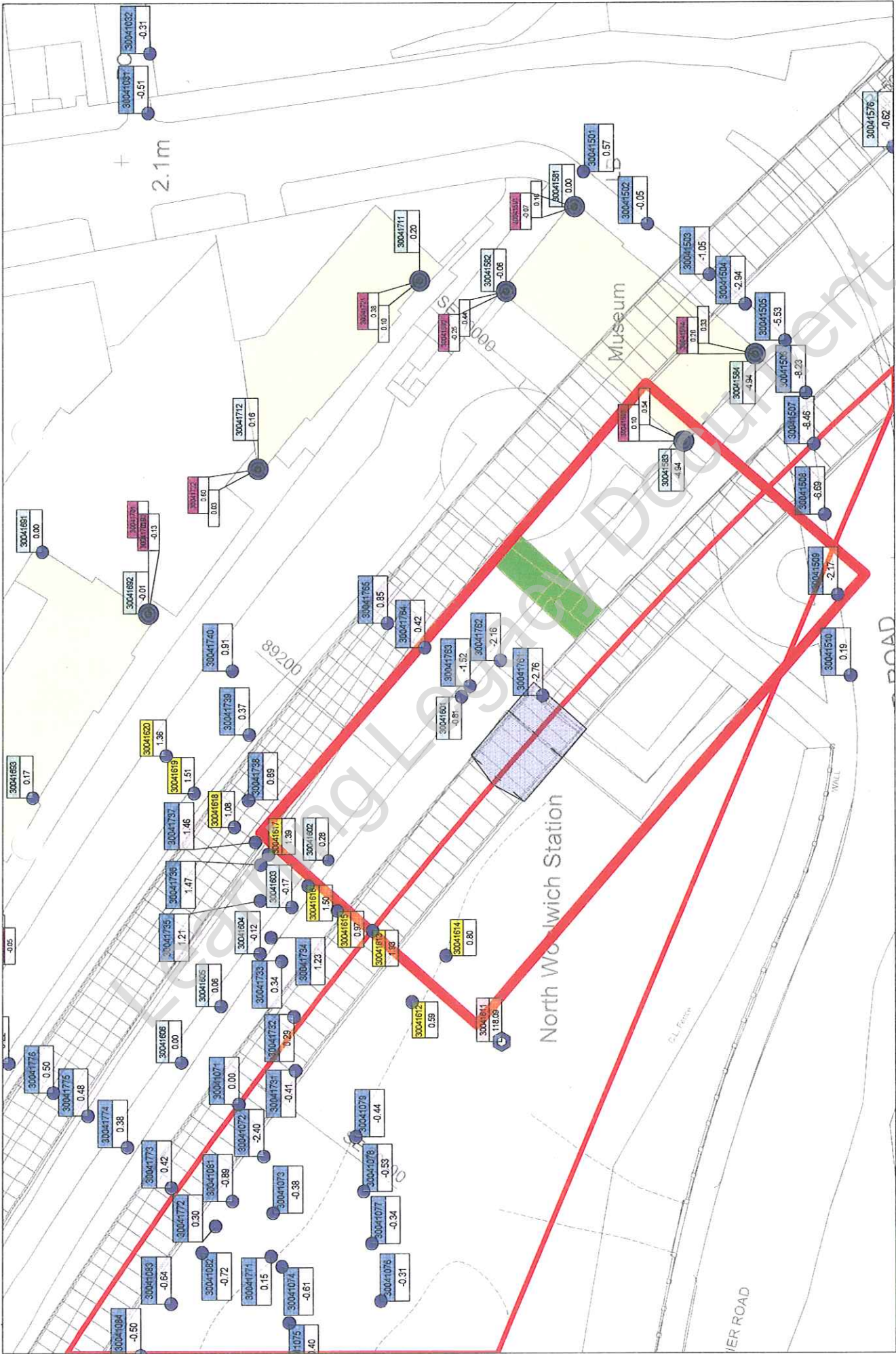
The rate of change in the monitoring data is less than the required standards as per the specifications and drawings.

date / signature: 14/04/15

print name:

HMJV project role:

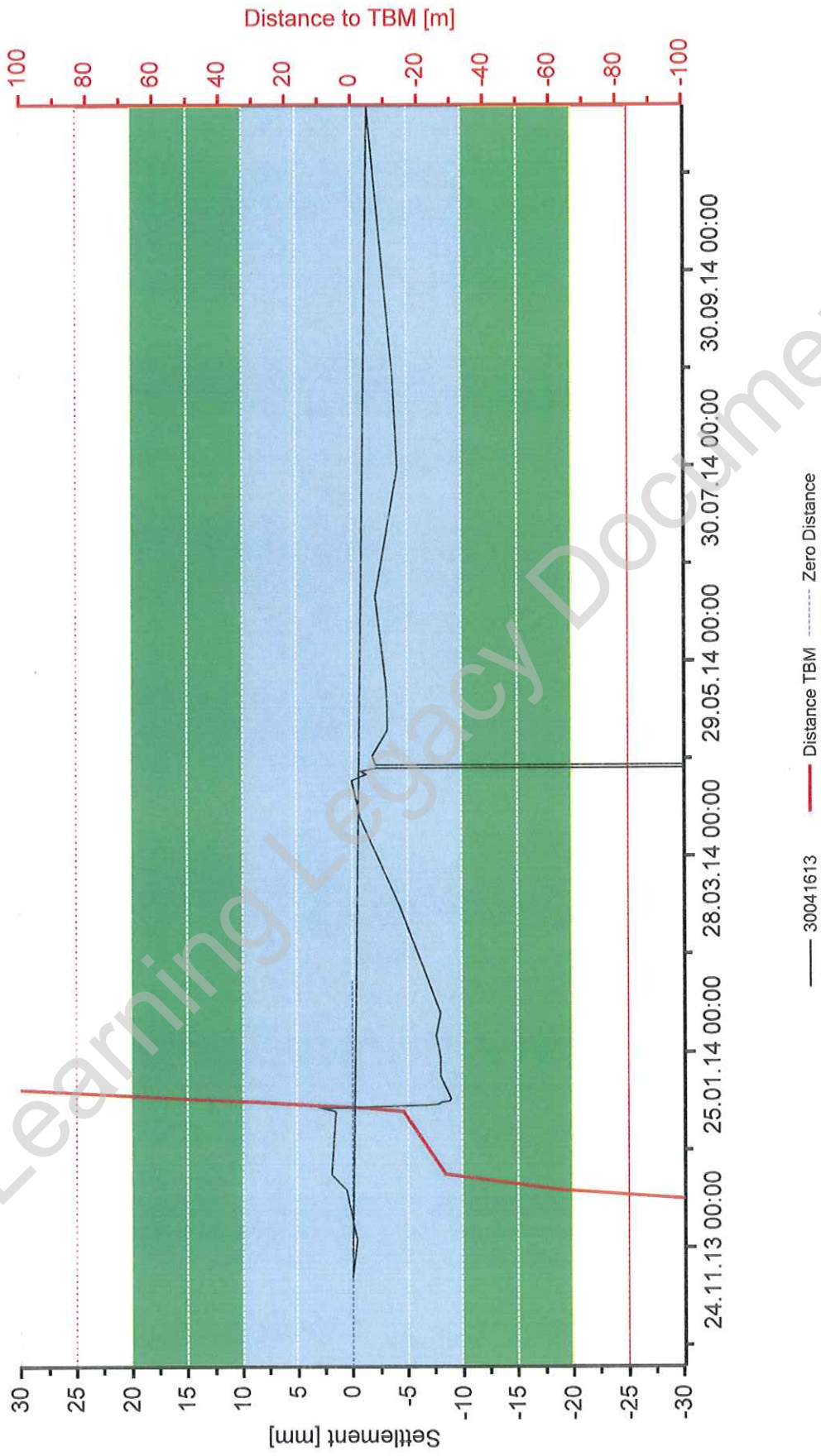
Monitoring & Survey engineer



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: TBM drive WB
 current values: 18.12.2013 09:00



Point: 30041613

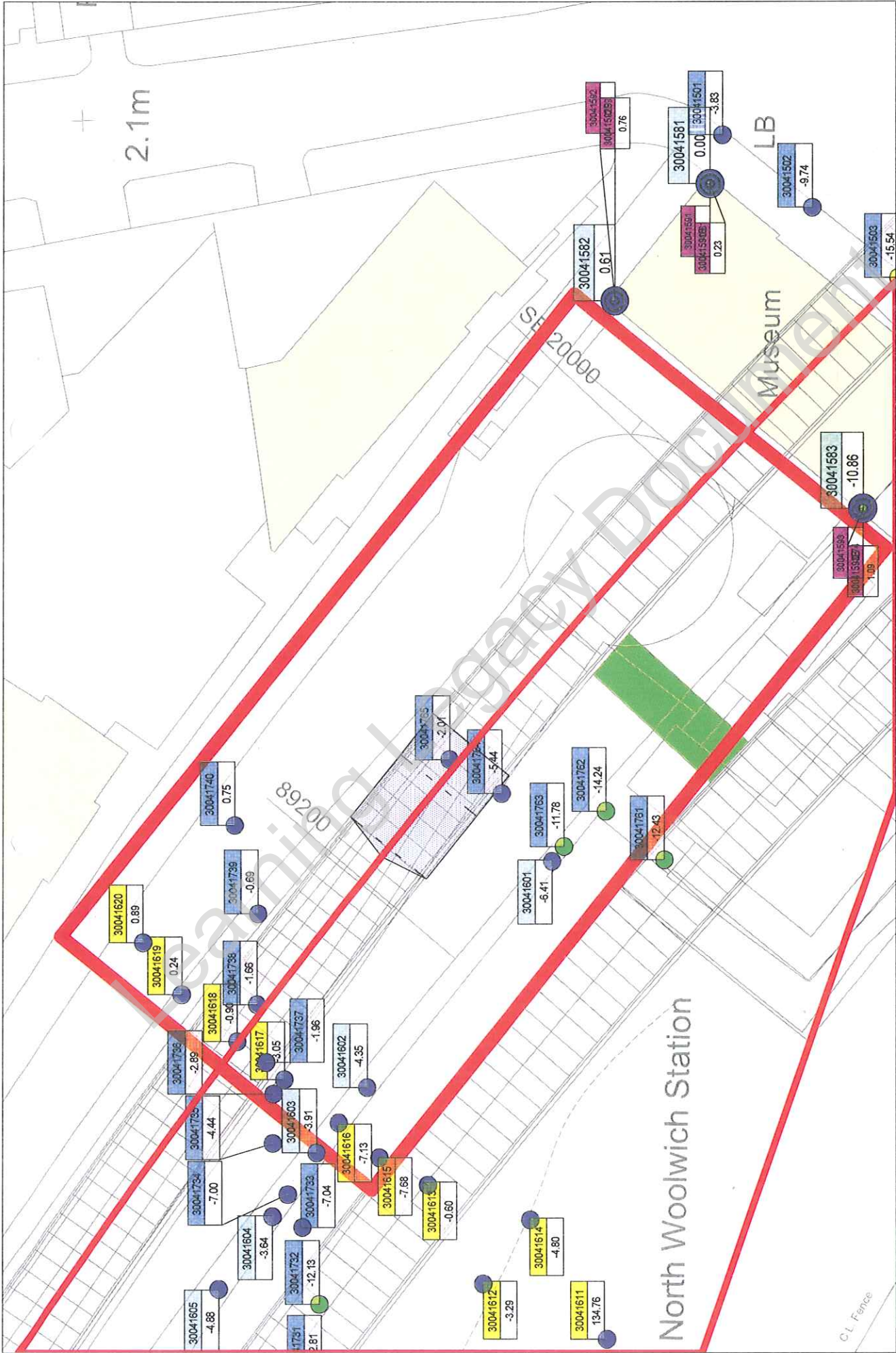


Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal

Close Out Report: WB Tunnel - GCS 3 - 17.10.2013 - 21.11.2014

Date: 20.01.2015 09:16 Current Values: 20.01.2015 09:08

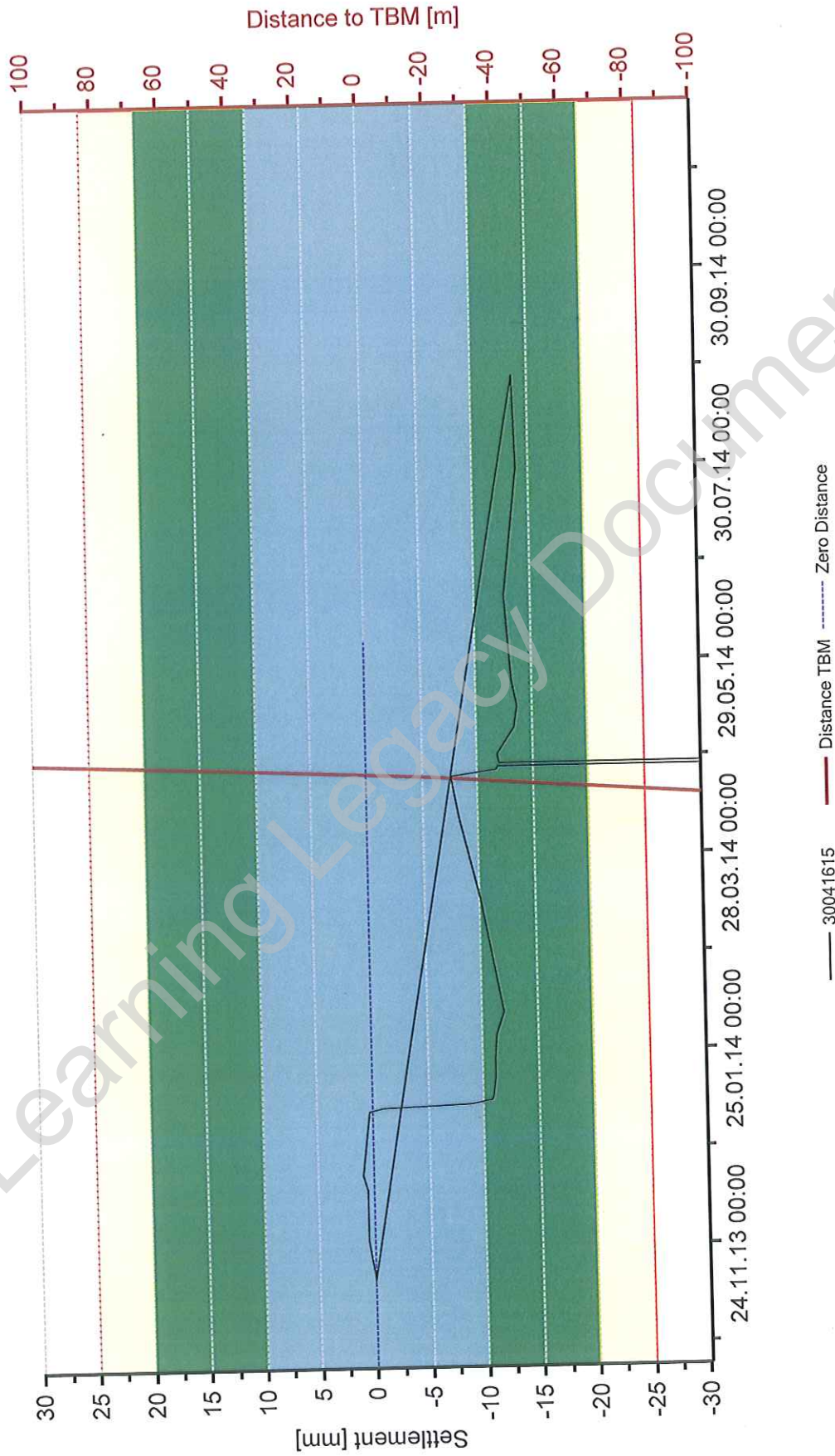




Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: C310 EB tunnel drive; NWP: portal excavation, construction base slab
 current values: 22.04.2014 09:00



Profile: Measurement Point 30041615



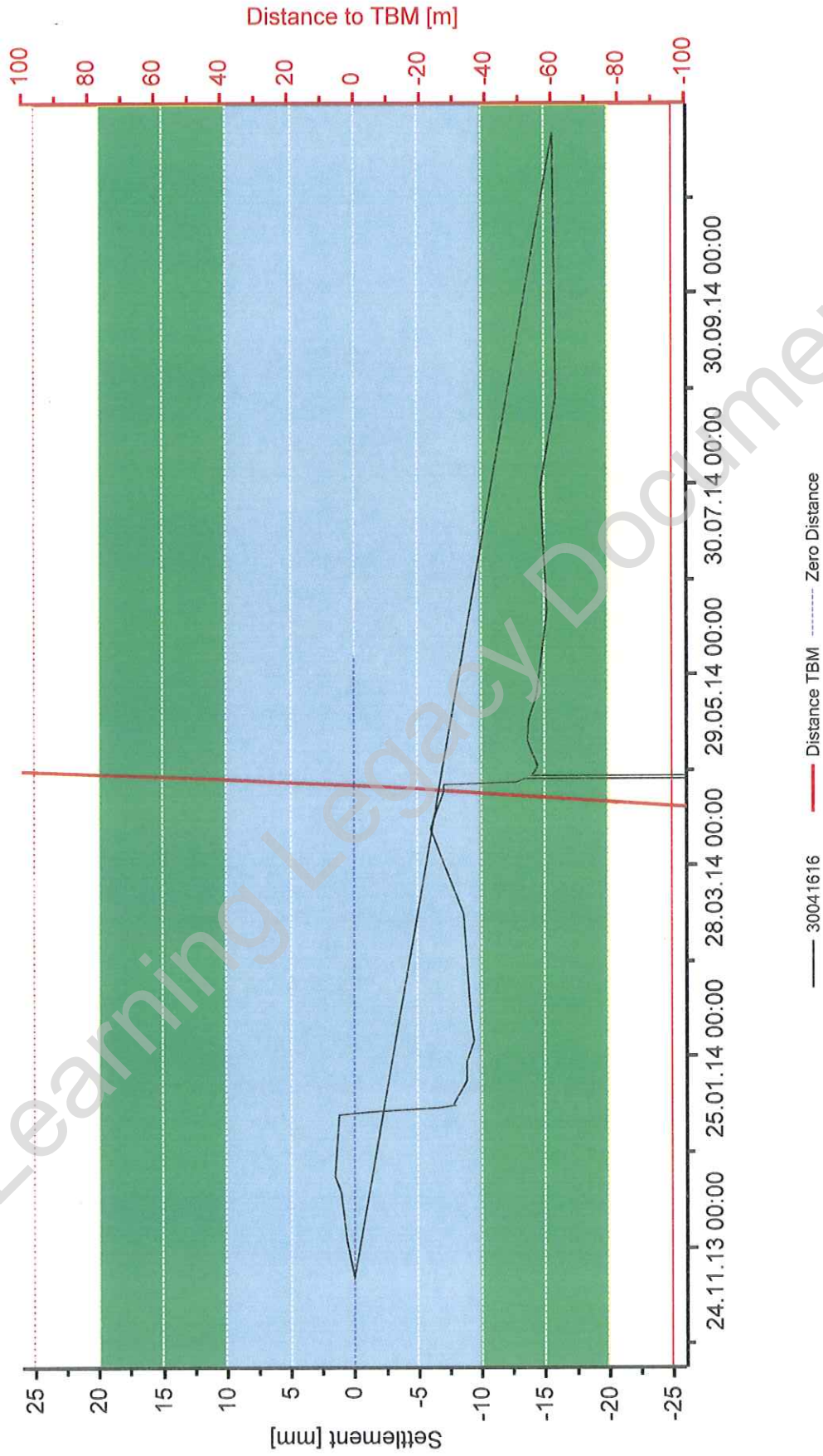
Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal

Close Out Report: EB Tunnel - GCS 3 - 17.10.2013 - 21.11.2014

date: 14.04.2015 15:29 current values: 14.04.2015 14:05



Point: 30041616



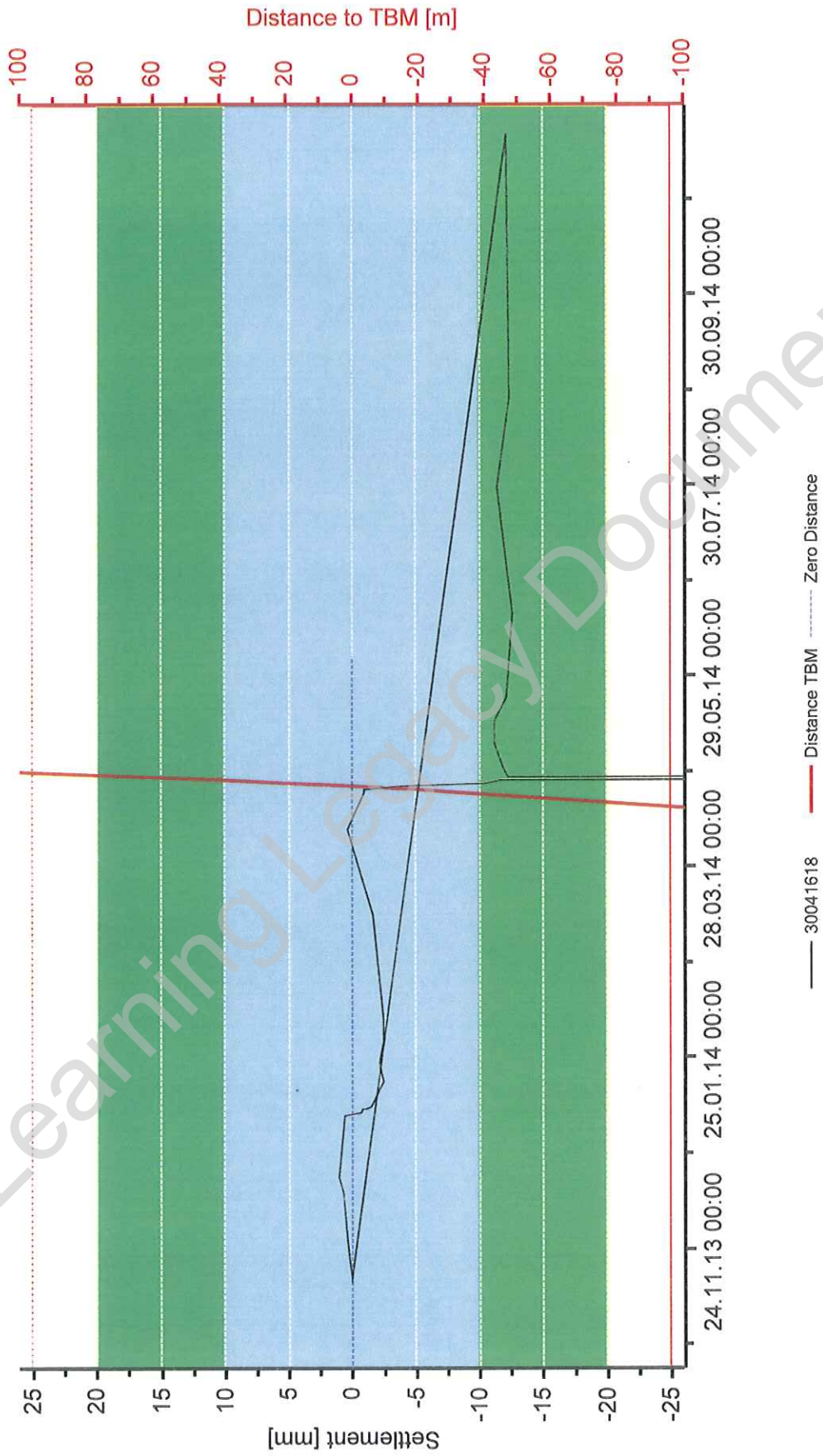
Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal

Close Out Report: EB Tunnel - listed wall museum - 17.10.2013 - 21.11.2014

date: 19.01.2015 12:14 current values: 19.01.2015 11:58



Point: 30041618



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: EB Tunnel - listed wall museum - 17.10.2013 - 21.11.2014
date: 18.01.2015 17:33 current values: 18.01.2015 17:15



monitoring table



Joint Venture

project: C310 Thames Tunnel

structure: GCS3

No. of reading	baseline		1. following		2. following		3. following		4. following		5. following		6. following					
	date	elevation	date	elevation	date	elevation	date	elevation	date	elevation	date	elevation	date	elevation				
No.																		
30041611																		
30041612	14/11/13	103.076	26/11/2013	103.077	0	0	12/12/2013	103.076	0	1	06/01/2014	103.076	0	0	08/01/2014	103.072	-5	-4
30041613		103.357		103.357	0	0		103.358	1	2		103.360	1	3		103.351	-10	-7
30041614		103.487		103.487	1	1		103.487	0	1		103.487	0	0		103.480	-6	-6
30041615		103.573		103.573	1	1		103.573	0	1		103.572	-1	-1		103.564	-8	-9
30041616		103.890		103.890	1	1		103.891	1	1		103.889	-2	-1		103.884	-4	-6
30041617		103.891		103.892	1	1		103.893	0	1		103.891	-1	-1		103.889	-2	-2
30041618		102.692		102.693	0	0		102.694	0	1		102.692	-1	-1		102.692	0	-1
30041619		102.723		102.723	1	1		102.724	0	2		102.722	-2	0		102.722	0	0
30041620		103.772		103.772	0	0		103.773	0	1		103.772	0	0		103.772	0	0
30041613(1)		99.262		99.262	0	0		99.263	1	1		99.263	0	-1		99.251	-10	-11
30041613(2)		95.265		95.265	0	0		95.266	1	1		95.266	0	-1		95.258	-6	-7
30041613(3)		92.263		92.263	0	0		92.264	0	1		92.264	-1	-1		92.248	-14	-15
30041614(1)		97.392		97.393	1	1		97.393	0	1		97.393	-1	-1		97.386	-6	-7
30041614(2)		92.392		92.392	1	1		92.392	0	0		92.392	0	0		92.387	-5	-5
30041614(3)		87.412		87.413	1	1		87.413	0	1		87.413	0	1		87.408	-6	-4

monitoring table



Joint Venture

project: C310 Thames Tunnel

structure: GCS3

No. of reading	baseline		7. following		8. following		9. following		10. following		11. following		12. following		
	date	elevation	deviation from last/ baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	date	deviation from last/baseline
30041611															
30041612		103.076	0	103.071	-1	-6	103.070	0	-6	103.070	0	-6	103.070	0	-7
30041613		103.357	-1	103.349	0	-8	103.349	-1	-9	103.348	0	-9	103.349	1	-8
30041614		103.487	0	103.480	0	-7	103.479	0	-7	103.479	0	-8	103.479	0	-8
30041615		103.573	-1	103.562	-1	-10	103.562	0	-11	103.562	0	-11	103.562	0	-11
30041616		103.890	-1	103.882	-1	-8	103.882	0	-8	103.882	0	-8	103.881	-1	-9
30041617		103.891	-1	103.888	-1	-4	103.888	0	-4	103.888	0	-4	103.887	-1	-4
30041618		102.692	0	102.691	0	-2	102.691	0	-2	102.691	0	-2	102.690	-1	-2
30041619		102.723	0	102.722	0	0	102.722	0	-1	102.722	0	0	102.721	-1	-1
30041620		103.772	0	103.771	0	0	103.771	0	0	103.772	0	0	103.771	-1	-1
30041613(1)		99.262	-1	99.250	0	-13	99.249	-1	-13	99.249	0	-14	99.249	0	-13
30041613(2)		95.265	-8	95.249	-1	-16	95.249	0	-16	95.249	0	-16	95.248	0	-17
30041613(3)		92.263	-1	92.247	-1	-17	92.253	6	-10	92.246	-7	-17	92.246	0	-17
30041614(1)		97.392	-1	97.385	0	-8	97.385	0	-8	97.384	0	-8	97.384	0	-8
30041614(2)		92.392	0	92.386	0	-6	92.386	0	-6	92.385	0	-6	92.392	7	1
30041614(3)		87.412	-1	87.407	-1	-4	87.408	0	-4	87.408	0	-4	87.408	0	-4

monitoring table



Joint Venture

project: C310 Thames Tunnel

structure: GCS3

No. of reading	baseline		19. following		20. following		21. following		22. following		23. following		24. following	
	date	elevation	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline
	14/11/13													07/05/2014
30041611														
30041612		103.076	103.073	0 -3	103.073	0 -4	103.072	0 -4	103.073	0 -4	103.073	0 -4	103.071	-1 -5
30041613		103.357	103.356	-1 -1	103.357	0 -1	103.355	-1 -2	103.356	0 -2	103.356	0 -2	103.354	-1 -3
30041614		103.487	103.481	0 -5	103.482	1 -4	103.481	-1 -5	103.481	0 -6	103.481	0 -5	103.480	-1 -7
30041615		103.573	103.563	-2 -10	103.561	-2 -12	103.561	0 -12	103.561	0 -12	103.561	0 -12	103.559	-2 -13
30041616		103.890	103.883	0 -7	103.877	-6 -13	103.876	-1 -14	103.876	-1 -14	103.875	0 -14	103.876	1 -14
30041617		103.891	103.888	0 -3	103.880	-3 -4	103.879	-1 -13	103.878	0 -13	103.878	-1 -13	103.879	1 -12
30041618		102.692	102.689	-3 -4	102.682	-7 -11	102.681	-1 -12	102.680	-1 -12	102.680	0 -12	102.681	1 -11
30041619		102.723	102.720	-3 -2	102.715	-5 -8	102.714	-1 -8	102.713	-1 -9	102.714	0 -9	102.714	1 -8
30041620		103.772	103.772	-1 0	103.769	-3 -3	103.768	0 -3	103.768	0 -4	103.768	0 -4	103.768	0 -3
30041613(1)		99.262	99.252	0 -10	99.253	1 -10	99.251	-1 -11	99.251	0 -11	99.252	0 -11	99.250	-1 -12
30041613(2)		95.265	95.250	0 -15	95.251	1 -14	95.250	-1 -15	95.250	0 -15	95.251	0 -14	95.249	-1 -16
30041613(3)		92.263	92.247	-1 -16	92.248	1 -15	92.247	-1 -16	92.247	0 -16	92.248	0 -15	92.246	-1 -17
30041614(1)		97.392	97.386	0 -6	97.387	1 -5	97.386	-1 -6	97.386	0 -7	97.386	1 -6	97.385	-1 -7
30041614(2)		92.392	92.387	0 -4	92.389	1 -3	92.387	-1 -4	92.387	0 -4	92.388	1 -4	92.387	-1 -5
30041614(3)		87.412	87.408	0 -4	87.409	1 -3	87.408	-2 -4	87.409	1 -3	87.408	-1 -4	87.407	-1 -5

monitoring table



Joint Venture

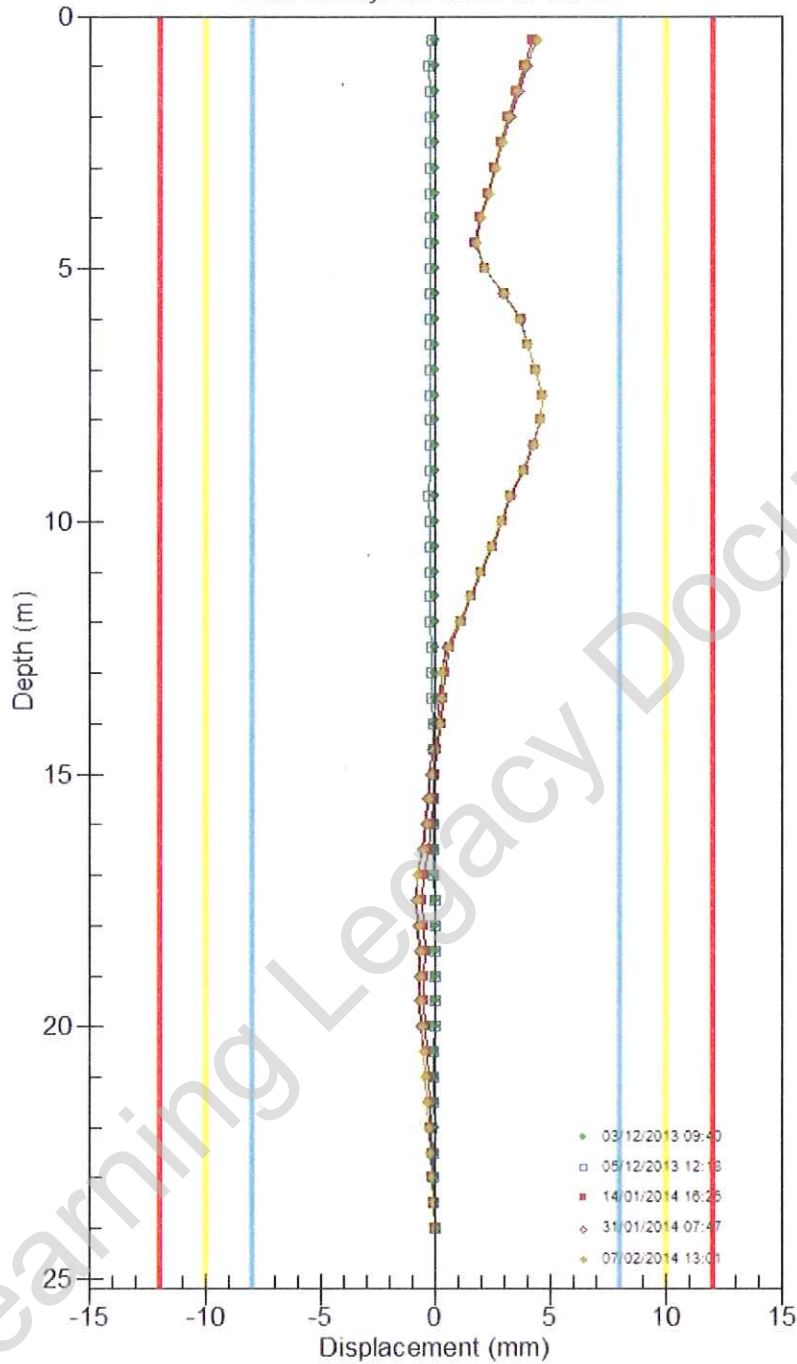
project: C310 Thames Tunnel

structure: GCS3

No. of reading	baseline		25. following		26. following		27. following		28. following		29. following		30. following	
	date	elevation	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline
	14/11/13													21/11/2014
No.		elevation	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline
30041611														
30041612		103.076	103.071	0 -5	103.071	0 -5	103.072	1 -4	103.071	-1 -5	103.071	covered	103.071	0 -5
30041613		103.357	103.354	0 -3	103.354	0 -3	103.355	1 -2	103.353	-2 -4	103.354	0 -4	103.356	2 -1
30041614		103.487	103.480	0 -7	103.480	0 -6	103.480	0 -6	103.479	-1 -7	103.479	0 -7	103.481	1 -6
30041615		103.573	103.559	0 -14	103.559	0 -13	103.560	1 -13	103.559	-1 -14	103.559	0 -14	destroyed	
30041616		103.890	103.876	0 -14	103.875	-1 -14	103.875	-1 -15	103.875	1 -15	103.874	-1 -16	103.874	0 -16
30041617		103.891	103.878	-1 -13	103.878	0 -13	103.877	-1 -14	103.878	1 -13	103.877	-1 -15	103.878	1 -14
30041618		102.692	102.681	0 -11	102.680	-1 -12	102.680	0 -13	102.681	1 -11	102.680	-1 -12	102.680	0 -12
30041619		102.723	102.714	0 -8	102.714	0 -8	102.713	-1 -9	102.715	2 -7	102.714	-1 -9	102.714	1 -8
30041620		103.772	103.769	1 -2	103.768	-1 -3	103.768	-1 -4	103.769	1 -3	103.767	-2 -4	103.768	1 -4
30041613(1)		99.262	99.250	0 -12	99.250	0 -12	99.251	1 -11	99.250	-1 -13	99.250	0 -13	99.249	-1 -14
30041613(2)		95.265	95.249	0 -16	95.250	1 -15	95.251	1 -14	95.251	0 -14	95.251	1 -14	95.250	-1 -15
30041613(3)		92.263	92.246	0 -17	92.247	1 -16	92.248	1 -15	92.247	-1 -16	92.248	1 -16	92.247	-1 -16
30041614(1)		97.392	97.385	0 -7	97.386	0 -7	97.386	1 -6	97.386	0 -6	97.387	0 -6	97.388	1 -5
30041614(2)		92.392	92.387	0 -5	92.388	1 -4	92.388	1 -4	92.388	0 -4	92.388	0 -3	92.390	1 -2
30041614(3)		87.412	87.408	0 -4	87.409	1 -3	87.409	0 -3	87.409	0 -3	87.409	0 -3	87.410	1 -2

nwp:gcs3.1 - A Axis Cumulative

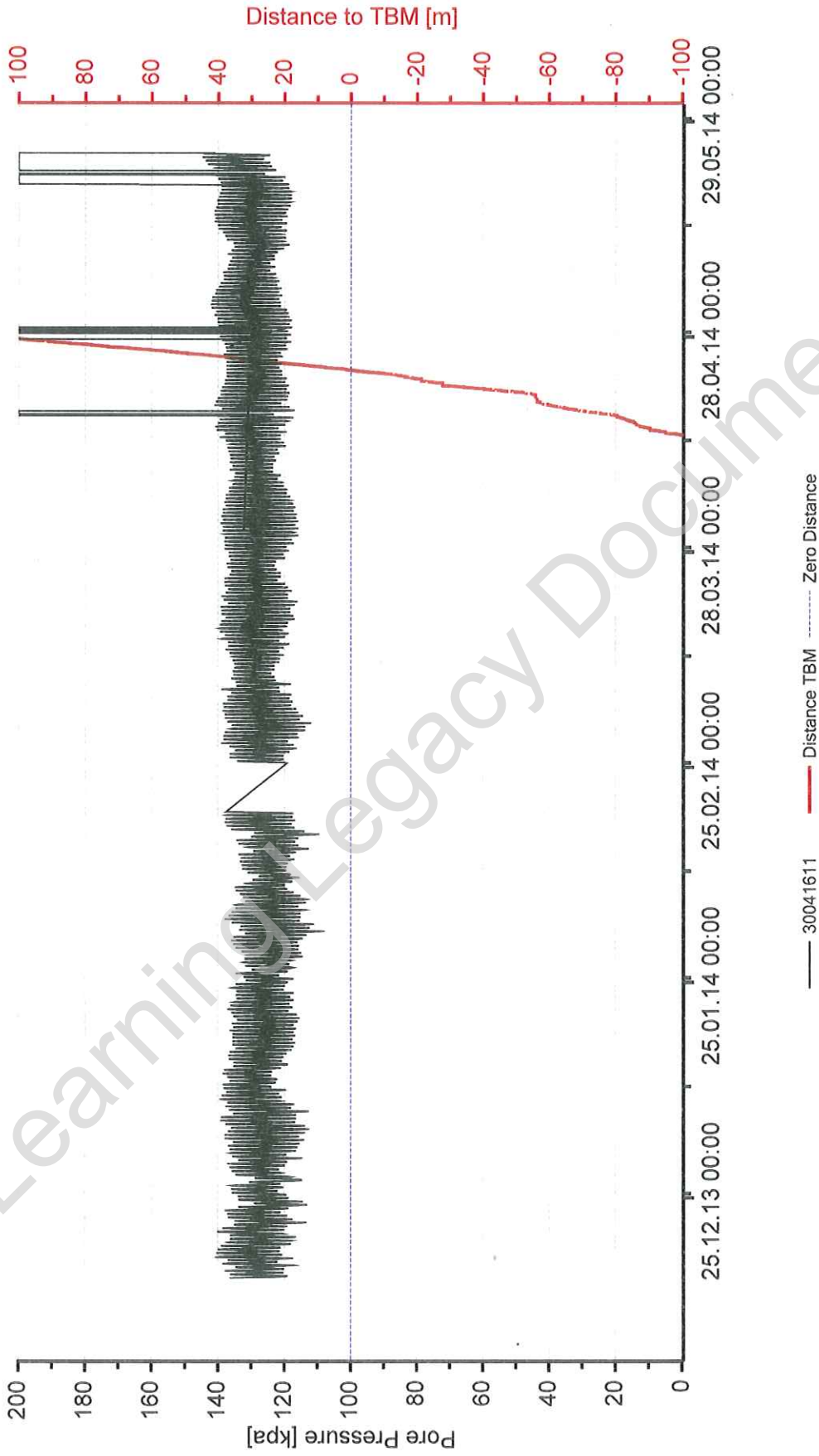
Initial survey: 03/12/2013 09:40



PROJECT: C310 Thames Tunnel
SITE: GCS 3
INSTALLATION: Point no. 3004 1612
COMPANY: HMJV
CLIENT: Crossrail

NOTE: Manual Inclinator
Geotechnical Cross Section No. 3
location next to Westbound Tunnel
Direction of displacement: perpendicular to tunnel alignment
positive value - deviation towards tunnel centre line

Point: 30041611



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal

Close Out Report: GCS 3 - Piezometer

date: 20.01.2015 17:11 current values: 20.01.2015 13:28



 HOCHTIEF MURPHY Joint Venture		C310 THAMES TUNNEL REPORT			
EMPLOYER	CROSSRAIL	eB NO	C310-HTM-C-RGN-CR148-50024	Rev	2.0
TITLE	Monitoring Close-Out Reports relating to Tunnelling Works North Embankment River Thames - North Woolwich Portal (excl. Store Rd)				

APPENDIX 83

CS TRM

Learning Legacy Document

monitoring asset

TW Twin Rising Main

reference monitoring drawing:

C310-HTM-C-DWG-CR146-ST004-70003

name of monitoring section:

CS Twin Rising Main

sensor type:

manual levelling studs

chainage:

89190

point no.:

3004 1731 - 3004 1740

trigger values:

[mm]

green: +16
-16

amber: +20
-20

red: +25
-25

reference document for trigger values:

Management Plan for Control of Ground Movement

EB-no.:

C310-HTM-Z-STP-CR148-50058

Appendix:

AAA

monitoring data

	date		max. value	point no.	comments
baseline	14/11/13		0.00		
TBM 1	start ZOI	06/01/14	-0.05	30041732	
	end ZOI	10/01/14	-12.92	3004 1732	breached not any trigger value
TBM 2	start ZOI	21/04/14	-1.49	3004 1738	
	end ZOI	25/04/14	-10.51	3004 1738	breached not any trigger value
longterm	21/11/14		-16.11	3004 1734	breached green trigger value, reported to SRG , no further action required
Evaluation of any potential residual risks			<input checked="" type="checkbox"/>	No residual risk since the Works have been completed by HMJV	
			<input type="checkbox"/>	Yes, residual risk (see comment below)	

summary / comments

The maximum deflection ratio is 1:3350 (3004 1732 - 3004 1733 - 3004 1734) - no trigger breached (TW alert value 1:1000).

Under consideration of temperature differences, the surrounding ground condition and the achievable accuracy of the measurement, HMJV has no concern to cease the monitoring.

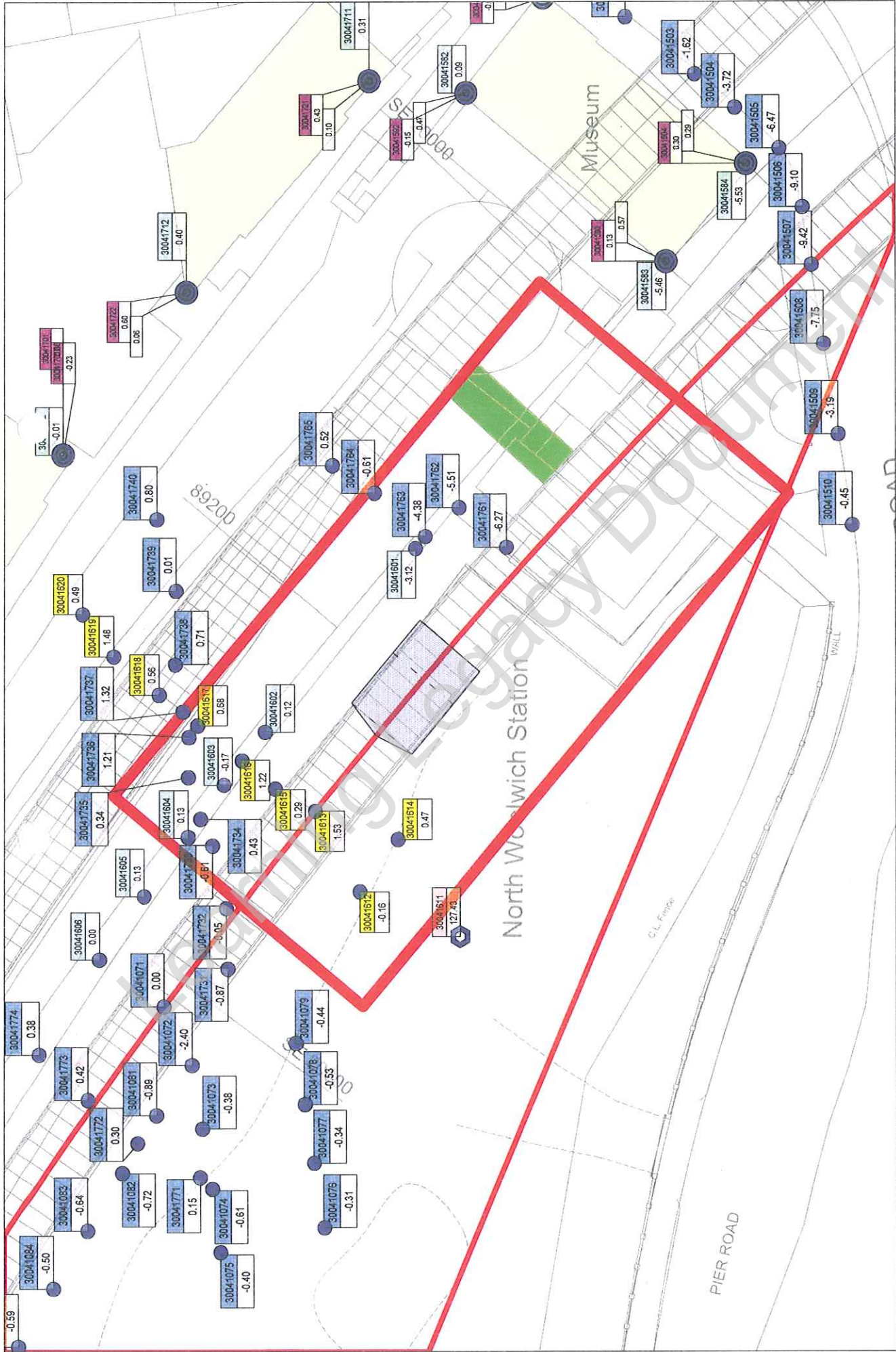
The rate of change in the monitoring data is less than the required standards as per the specifications and drawings.

date / signature: 14/04/15

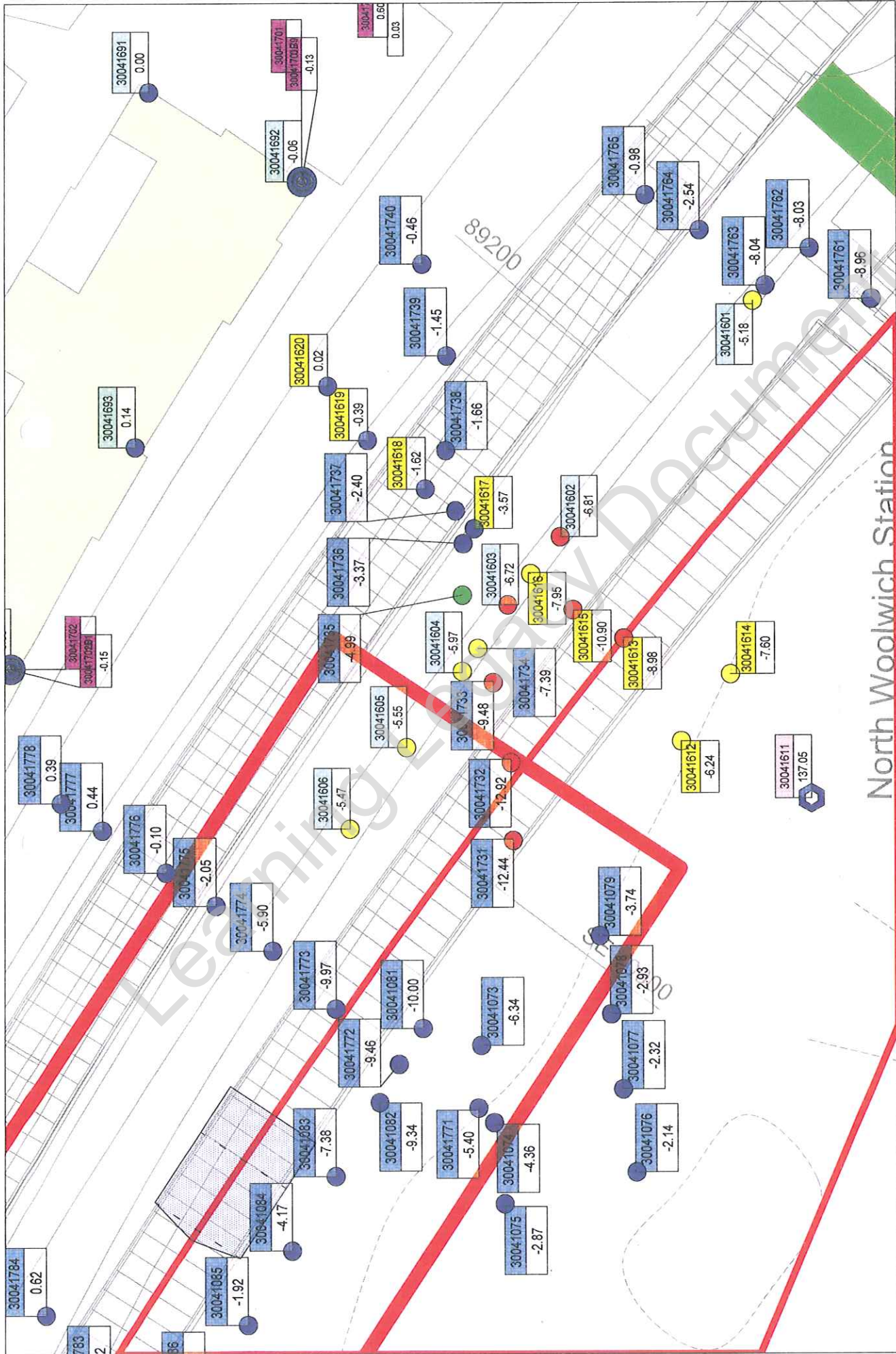
print name:

HMJV project role:

Monitoring & Survey engineer



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: TBM drive WB
 current values: 06.01.2014 15:00

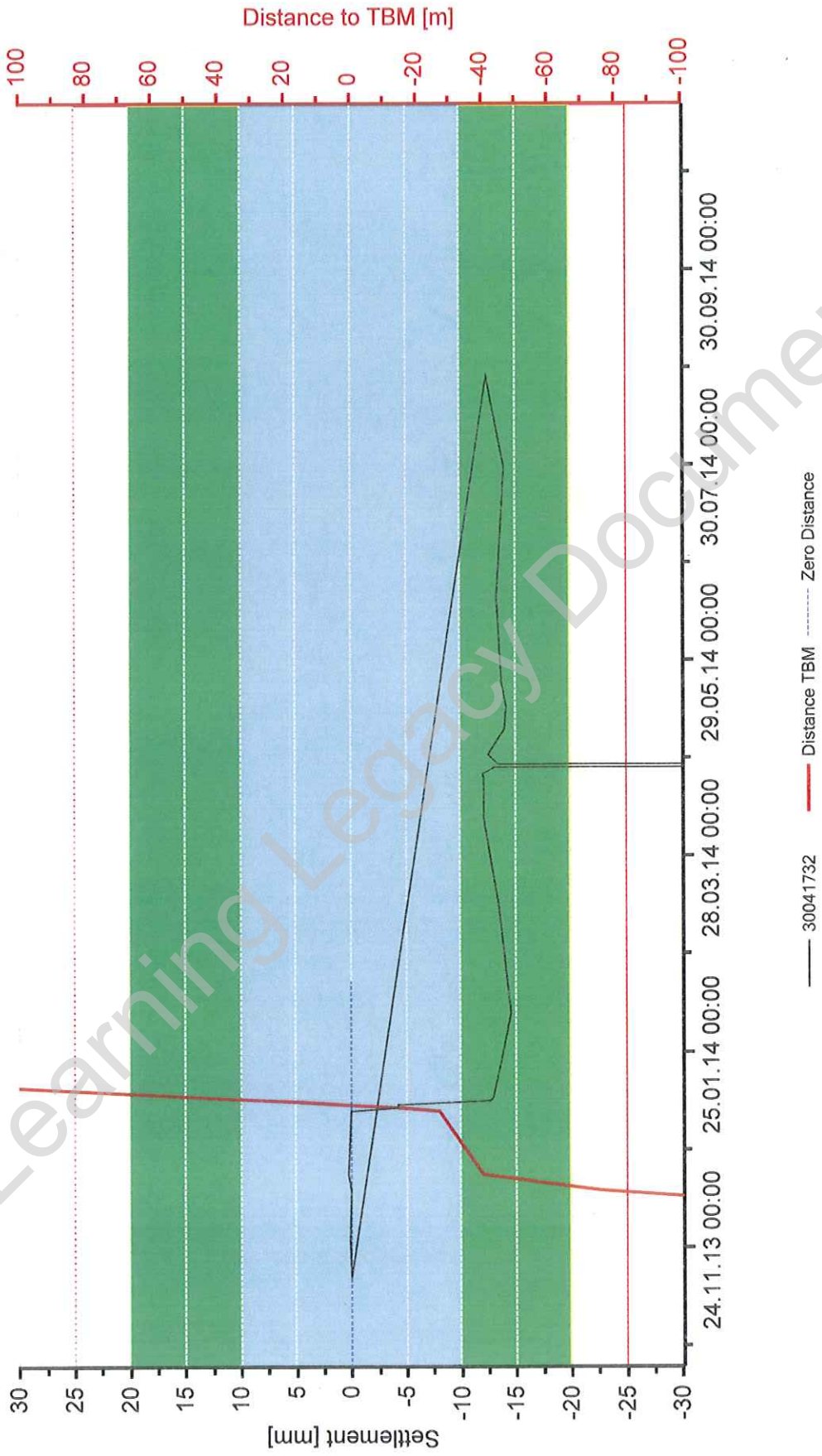


Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal

working activities: TBM drive WB

current values: 10.01.2014 09:23

Point: 30041732

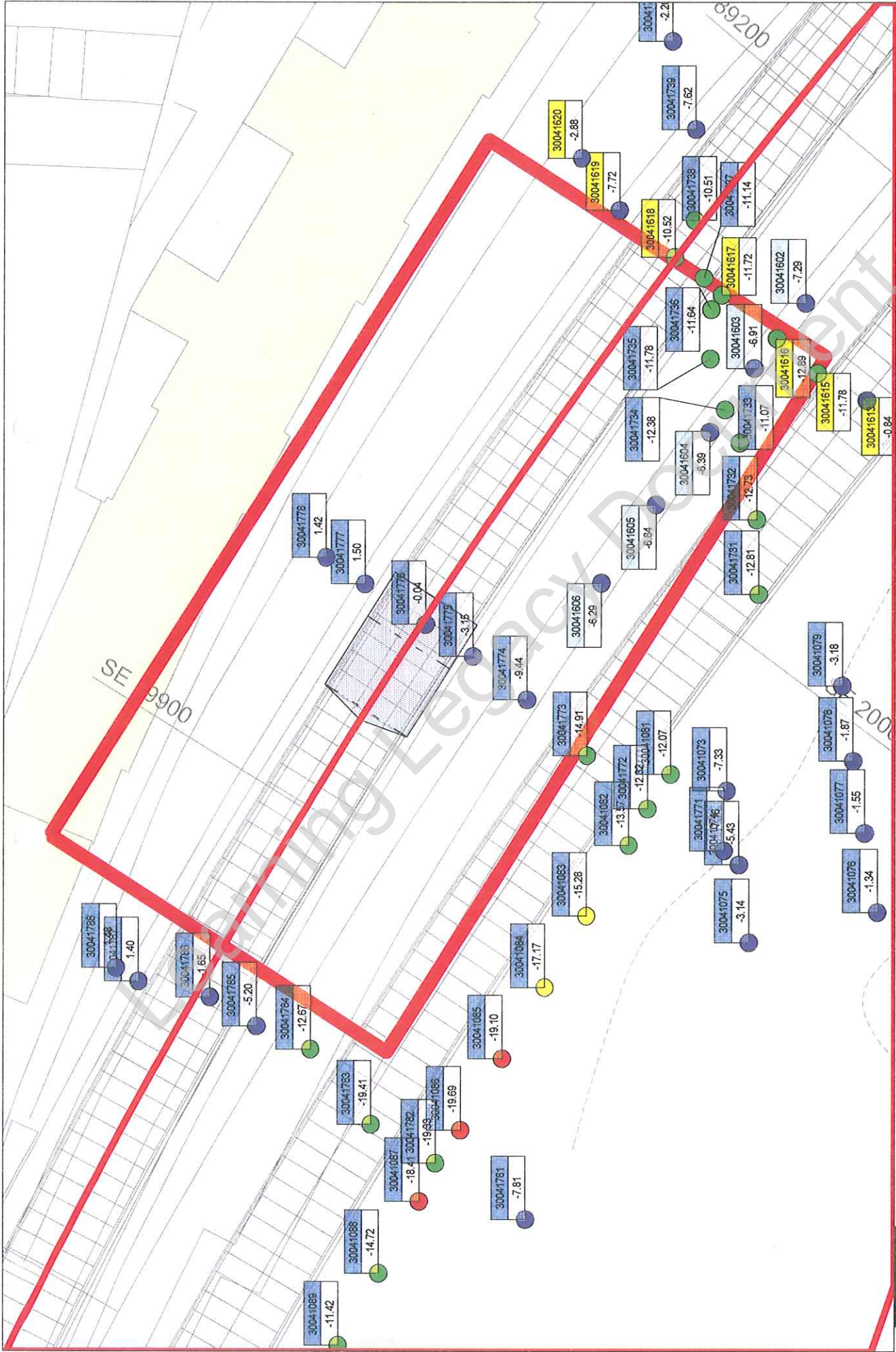


Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal

Close Out Report: WB Tunnel - CS TRM - 17.10.2013 - 21.11.2014

Date: 20.01.2015 09:46 Current Values: 20.01.2015 09:23

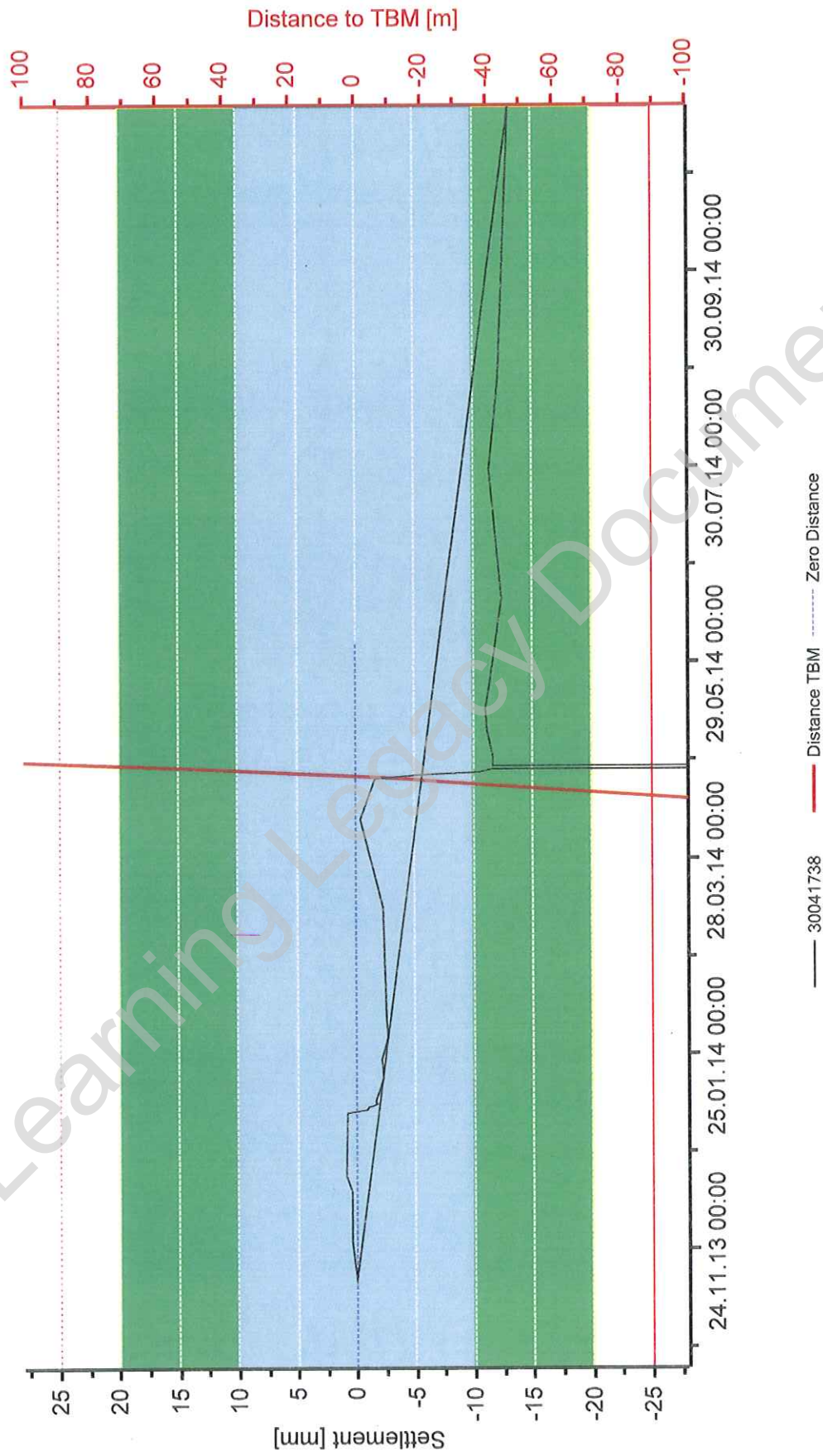




Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: C310 EB tunnel drive; NWP: portal excavation, construction base slab
 current values: 25.04.2014 06:44



Point: 30041738



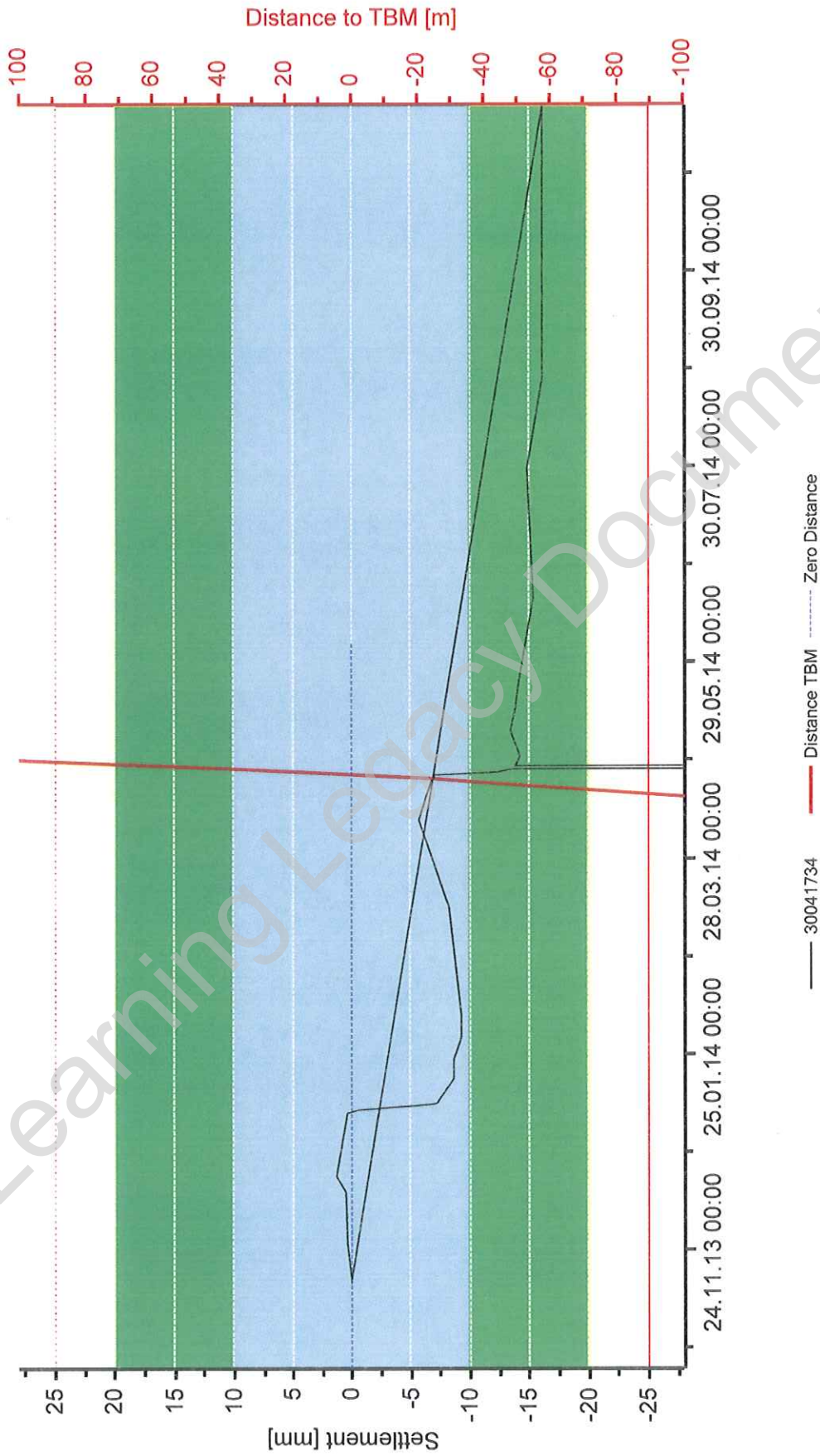
Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal

Close Out Report: EB Tunnel - CSTRM - 17.10.2013 - 21.11.2014

date: 20.01.2015 10:09 current values: 20.01.2015 09:39



Point: 30041734



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal

Close Out Report: EB Tunnel - CSTRM - 17.10.2013 - 21.11.2014

date: 20.01.2015 10:14 current values: 20.01.2015 09:39



monitoring table



Joint Venture

project: C310 Thames Tunnel

structure: Twin Raising Mains Cross section

No. of reading	baseline		1. following		2. following		3. following		4. following		5. following		6. following				
	date	elevation	26/11/2013	deviation from last/baseline	12/12/2013	deviation from last/baseline	17/12/2013	deviation from last/baseline	06/01/2014	deviation from last/baseline	07/01/2014	deviation from last/baseline	08/01/2014	deviation from last/baseline			
30041731	102.585	102.584	0	0	102.584	0	0	0	102.584	0	-1	102.584	0	-1	102.582	-2	-3
30041732	102.546	102.546	0	0	102.546	0	0	0	102.546	0	0	flooded			102.542	-4	-4
30041733	102.595	102.595	0	0	102.595	0	0	0	102.594	-1	-1	102.595	1	0	102.590	-5	-5
30041734	103.776	103.776	0	0	103.777	1	1	1	103.776	-1	0	103.775	-1	-1	103.772	-3	-4
30041735	103.784	103.784	0	0	103.784	0	1	1	103.784	-1	0	103.783	-1	-1	103.781	-2	-3
30041736	103.873	103.873	0	0	103.874	1	1	1	103.874	0	1	103.872	-2	0	103.871	-2	-2
30041737	102.761	102.762	1	1	102.762	0	1	1	102.762	0	1	102.760	-2	0	102.759	-1	-1
30041738	102.758	102.759	0	0	102.759	0	1	1	102.759	0	1	102.757	-2	-1	102.757	0	-1
30041739	102.768	102.768	0	0	102.768	0	0	0	102.768	0	0	102.767	-1	-1	102.767	0	-1
30041740	103.867	103.868	0	0	103.868	0	1	1	103.868	0	1	103.867	-1	-1	103.867	0	0

monitoring table



Joint Venture

project: C310 Thames Tunnel

structure: Twin Raising Mains Cross section

No. of reading	7. following		8. following		9. following		10. following		11. following		12. following								
	baseline	14/11/13	elevation	deviation from last/ baseline	08/01/2014	elevation	deviation from last/ baseline	09/01/2014	elevation	deviation from last/ baseline	10/01/2014	elevation	deviation from last/ baseline						
No.	elevation	14/11/13	elevation	deviation from last/ baseline	08/01/2014	elevation	deviation from last/ baseline	09/01/2014	elevation	deviation from last/ baseline	10/01/2014	elevation	deviation from last/ baseline						
30041731	102.585		102.581	-4	102.575	-6	-10	102.573	-2	-11	102.572	-1	-12	102.571	-1	-13	102.572	0	-13
30041732	102.546		102.540	-6	102.535	-5	-11	102.533	-2	-13	102.533	0	-13				102.532	-1	-14
30041733	102.595				102.586	-3	-8	102.586	-1	-9	102.585	0	-9	102.585	-1	-10	102.584	0	-10
30041734	103.776		103.770	-1	103.769	-2	-7	103.768	0	-7	103.768	0	-7	103.767	-1	-9			
30041735	103.784		103.780	-1	103.779	-1	-5	103.779	0	-5	103.779	0	-5	103.778	-1	-6			
30041736	103.873		103.870	-1	103.869	-1	-3	103.869	0	-3	103.869	0	-3	103.868	-1	-4			
30041737	102.761		102.759	-1	102.758	0	-2	102.759	0	-2	102.758	0	-2	102.758	-1	-3			
30041738	102.758		102.757	0	102.757	0	-2	102.757	0	-2	102.757	0	-2	102.756	-1	-2			
30041739	102.768		102.767	0	102.766	0	-2	102.766	0	-2	102.767	0	-1	102.766	-1	-2			
30041740	103.867		103.867	0	103.866	-1	-1	103.866	0	-1	103.867	0	0	103.866	-1	-1			

monitoring table



Joint Venture

project: C310 Thames Tunnel

structure: Twin Raising Mains Cross section

No. of reading	baseline		13. following		14. following		15. following		16. following		17. following		18. following	
	date	elevation	date	deviation from last/ baseline	date	deviation from last/baseline	date	deviation from last/baseline	date	deviation from last/baseline	date	deviation from last/baseline	date	deviation from last/baseline
	14/11/13		23/01/2014		30/01/2014		06/02/2014		12/03/2014		09/04/2014		21/04/2014	
No.	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline
30041731	102.585	0	102.572	-13	102.571	0	102.571	-1	102.572	1	102.572	1	102.572	1
30041732	102.546	0	102.532	-14	102.531	-1	102.531	-1	102.533	1	102.534	1	102.534	0
30041733	102.595	0	102.584	-10	102.584	0	102.584	0	102.586	2	102.588	2	102.587	0
30041734	103.776	0	103.767	-9	103.766	-1	103.766	0	103.767	1	103.770	3	103.769	-1
30041735	103.784	0	103.778	-6	103.777	-1	103.777	0	103.778	1	103.780	2	103.779	-1
30041736	103.873	0	103.869	-4	103.868	-1	103.868	0	103.869	1	103.871	2	103.870	-1
30041737	102.761	0	102.758	-3	102.757	0	102.757	0	102.758	1	102.760	2	102.759	-1
30041738	102.758	0	102.756	-2	102.756	0	102.756	0	102.756	0	102.758	2	102.757	-1
30041739	102.768	0	102.766	-2	102.766	0	102.766	0	102.766	1	102.768	2	102.767	-1
30041740	103.867	0	103.866	-1	103.865	-1	103.866	0	103.867	1	103.868	2	103.868	-1

Carbis Bay Document

monitoring table



Joint Venture

project: C310 Thames Tunnel

structure: Twin Raising Mains Cross section

No. of reading	19. following		20. following		21. following		22. following		23. following		24. following				
	baseline	14/11/13	elevation	deviation from last/ baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline			
date		22/04/2014	23/04/2014	24/04/2014	25/04/2014	26/04/2014	29/04/2014								
No.	elevation	elevation	deviation from last/ baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline		
30041731	102.585	102.534	destroyed	102.533	destroyed	102.533	destroyed	102.533	destroyed	102.533	destroyed	102.533	destroyed		
30041732	102.546	102.534	-12	102.534	0	-12	102.533	0	-13	102.533	0	-13	1	-13	
30041733	102.595	102.588	-7	102.587	-1	-8	102.584	-3	-11	102.583	-1	-12	102.583	0	-12
30041734	103.776	103.769	-7	103.769	0	-7	103.763	-5	-12	103.762	-1	-14	103.761	0	-14
30041735	103.784	103.779	-4	103.779	0	-4	103.772	-7	-12	103.771	-1	-13	103.770	0	-14
30041736	103.873	103.870	-3	103.870	0	-3	103.861	-9	-12	103.860	-1	-13	103.859	0	-13
30041737	102.761	102.759	-2	102.756	-3	-5	102.750	-6	-11	102.749	-1	-12	102.748	0	-12
30041738	102.758	102.757	-2	102.753	-4	-5	102.748	-5	-11	102.747	-1	-12	102.747	0	-12
30041739	102.768	102.767	-1	102.764	-3	-4	102.760	-4	-8	102.760	-1	-8	102.759	0	-9
30041740	103.867	103.868	0	103.866	-2	-1	103.865	-1	-2	103.865	0	-3	103.864	0	-3

Copyrighted Document

monitoring table



Joint Venture

project: C310 Thames Tunnel

structure: Twin Raising Mains Cross section

No. of reading	25. following		26. following		27. following		28. following		29. following		30. following	
	baseline	07/05/2014	14/05/2014	22/05/2014	18/06/2014	29/07/2014	27/08/2014					
Date	14/11/13											
No.	elevation	deviation from last/ baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline
	30041731	102.585	destroyed	destroyed	destroyed	destroyed	destroyed	destroyed	destroyed	destroyed	destroyed	destroyed
30041732	102.546	102.532 -1	102.532 0	102.532 0	102.533 0	102.532 0	102.532 0	102.532 -1	102.532 -1	102.532 -1	102.534 2	-12
30041733	102.595	102.582 -1	102.581 0	102.581 0	102.581 0	102.581 0	102.581 0	102.579 -2	102.579 -2	102.580 1	102.580 1	-15
30041734	103.776	103.762 1	103.762 0	103.761 0	103.761 0	103.761 0	103.760 -1	103.760 -1	103.761 0	103.759 -1	103.759 -1	-16
30041735	103.784	103.771 1	103.771 0	103.770 0	103.770 0	103.770 0	103.769 -1	103.769 -1	103.770 1	103.769 -1	103.769 -1	-15
30041736	103.873	103.860 1	103.860 0	103.860 0	103.860 0	103.860 0	103.859 -1	103.859 -1	103.859 1	103.858 -1	103.858 -1	-15
30041737	102.761	102.749 1	102.749 0	102.748 -1	102.748 -1	102.748 -1	102.747 -1	102.747 -1	102.748 1	102.747 -1	102.747 -1	-13
30041738	102.758	102.747 1	102.747 0	102.747 0	102.747 0	102.747 0	102.746 -1	102.746 -1	102.747 1	102.746 -1	102.746 -1	-12
30041739	102.768	102.760 1	102.760 0	102.760 0	102.760 -1	102.760 -1	102.759 -1	102.759 -1	102.761 2	102.759 -1	102.759 -1	-9
30041740	103.867	103.865 1	103.865 0	103.865 0	103.865 0	103.865 0	103.864 -1	103.864 -1	103.864 0	103.863 -1	103.863 -1	-5

 HOCHTIEF MURPHY Joint Venture		C310 THAMES TUNNEL REPORT			
EMPLOYER	CROSSRAIL	eB NO	C310-HTM-C-RGN-CR148-50024	Rev	2.0
TITLE	Monitoring Close-Out Reports relating to Tunnelling Works North Embankment River Thames - North Woolwich Portal (excl. Store Rd)				

APPENDIX 84
TRM Carpark

Learning Legacy Document

monitoring asset	TW Twin Rising Main		
reference monitoring drawing:	C310-HTM-C-DWG-CR146-ST004-70003		
name of monitoring section:	Twin Rising Main - Carpark HMJV		
sensor type:	manual levelling studs		
chainage:	89190-89050	point no.:	3004 1071 - 3004 1100
trigger values: [mm]	green: +16 -16	amber: +20 -20	red: +25 -25
reference document for trigger values:	Management Plan for Control of Ground Movement		
EB-no.:	C310-HTM-Z-STP-CR148-50058		
Appendix:	AAA		

monitoring data

	date	max. value	point no.	comments
baseline	25/11/13	0.00		
TBM 1	start ZOI	07/01/14	-1.33	3004 1081
		14/01/14	-1.93	3004 1097
	end ZOI	11/01/14	-12.59	3004 1081
		16/01/14	-6.36	3004 1097
breached not any trigger value				
TBM 2	start ZOI	23/04/14	-12.13	3004 1081
		28/04/14	-9.08	3004 1097
	end ZOI	26/04/14	-13.03	3004 1081
		30/04/14	-9.91	3004 1097
breached not any trigger value				
longterm	21/11/14	-24.15	3004 1086	breached amber trigger value deflection ratio calculated, no trigger exceeded

Evaluation of any potential residual risks

No residual risk
since the Works have been completed by HMJV

Yes, residual risk
(see comment below)

summary / comments

The maximum deflection ratio is 1:2358 (3004 1085 - 3004 1086 - 3004 1087) - no trigger breached (TW alert value 1:1000).

Under consideration of temperature differences, the surrounding ground condition and the achievable accuracy of the measurement, HMJV has no concern to cease the monitoring.

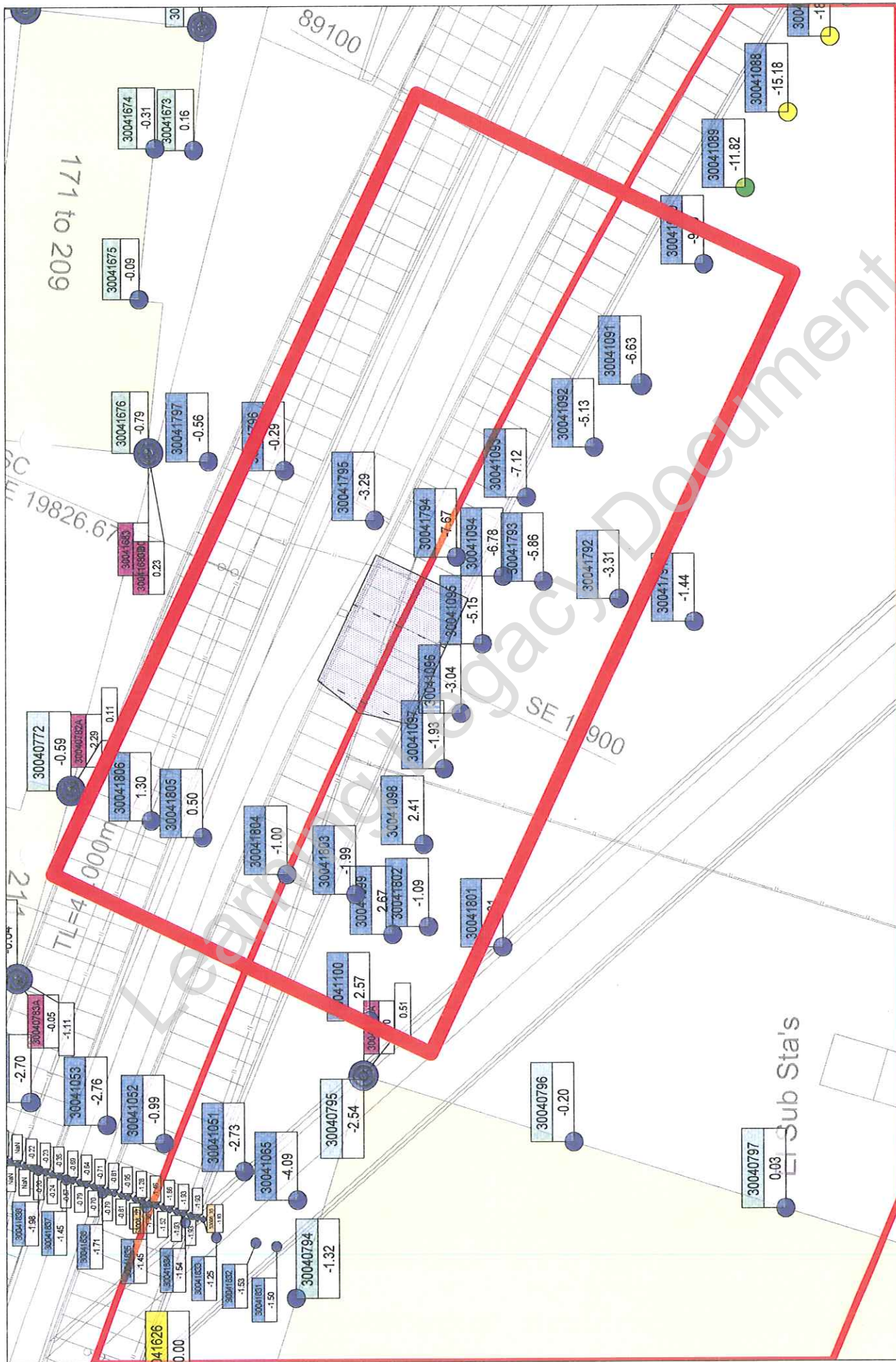
The rate of change in the monitoring data is less than the required standards as per the specifications and drawings.

date / signature: 14/04/15

print name:

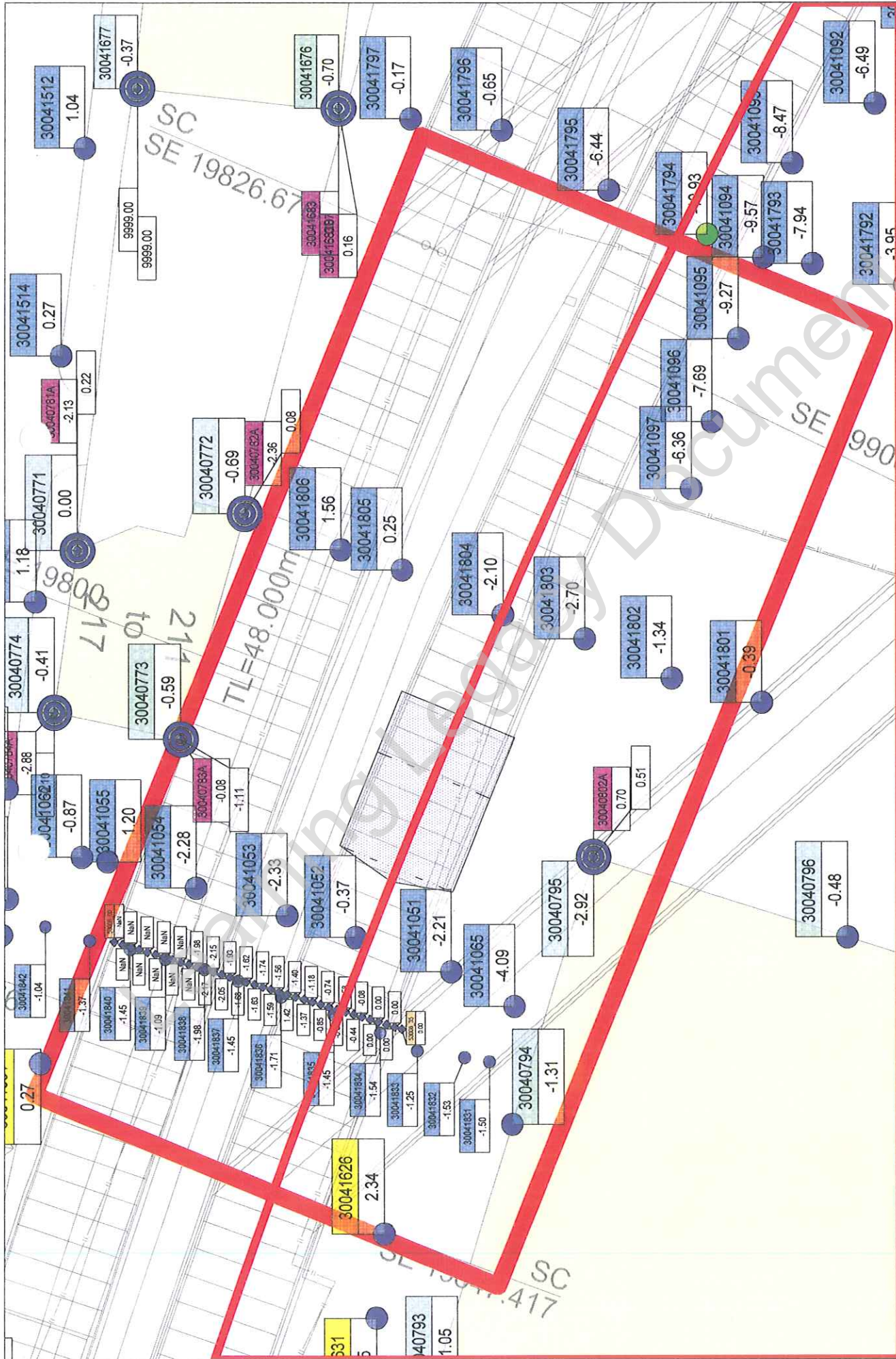
HMJV project role:

Monitoring & Survey engineer

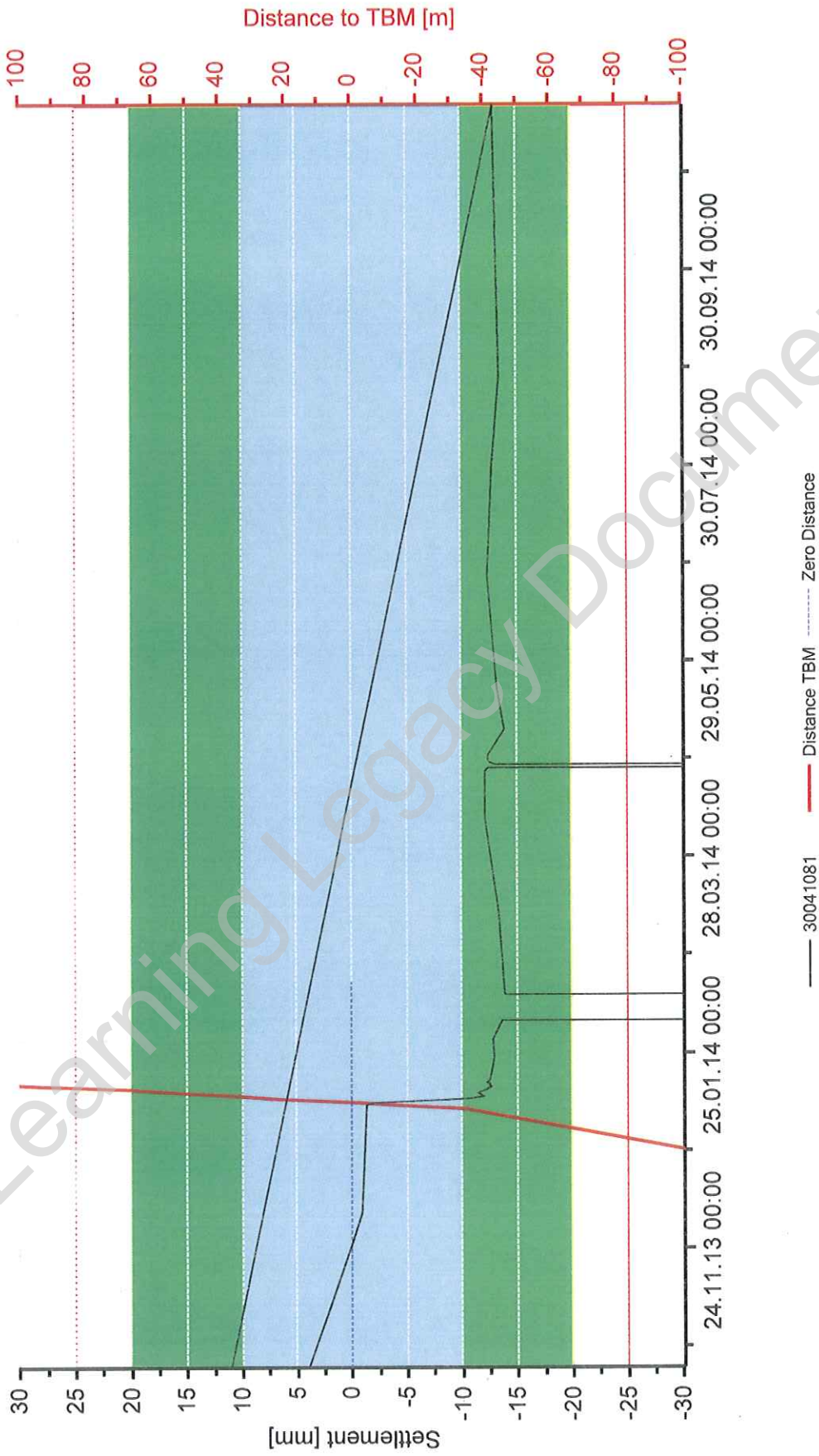


Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: TBM drive WB
 current values: 14.01.2014 16:00





Point: 30041081



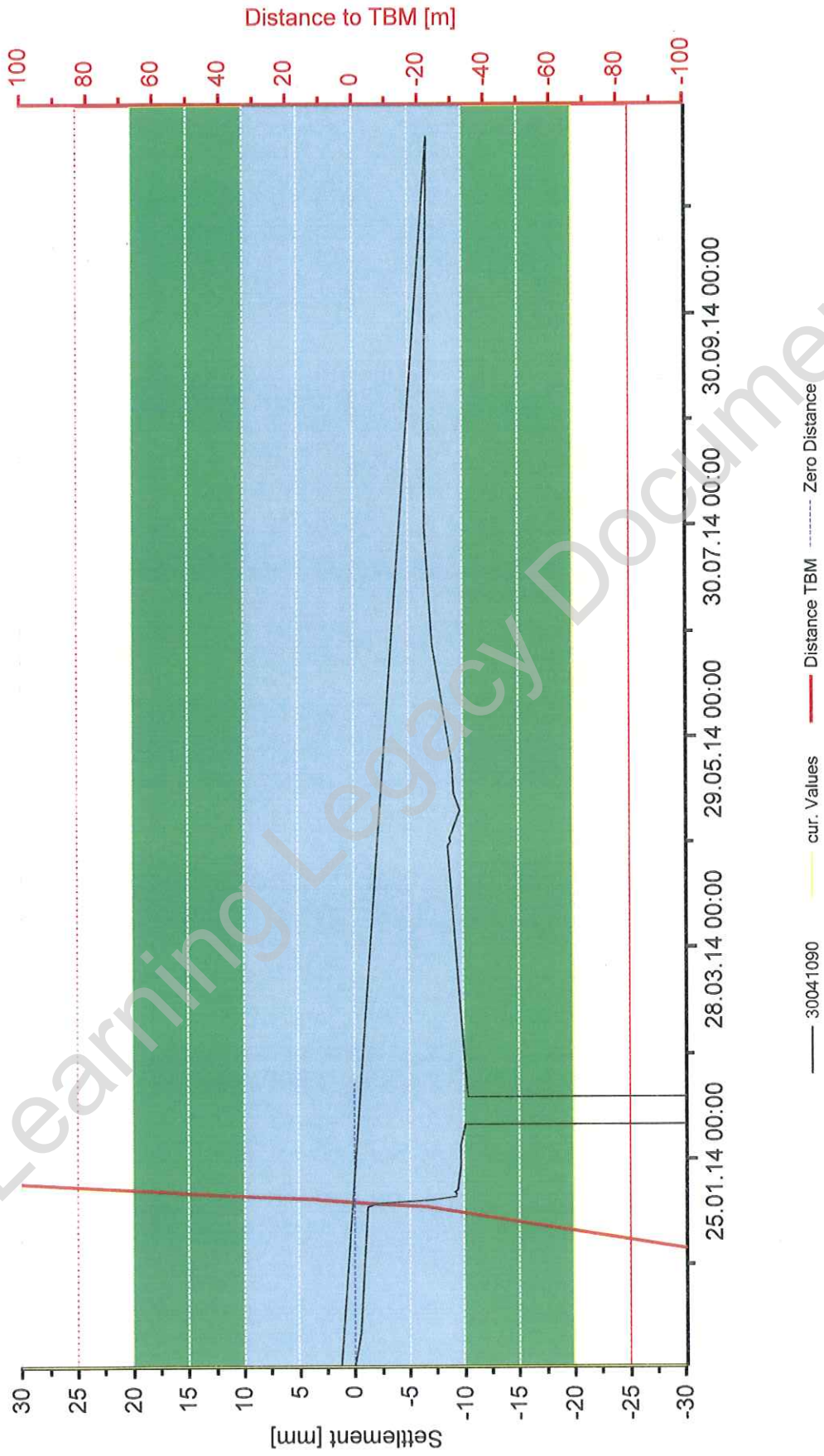
Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal

Close Out Report: WB Tunnel - TRM Carpark - 17.10.2013 - 21.11.2014

Date: 20.01.2015 12:08 Current Values: 20.01.2015 11:53



Point: 30041090



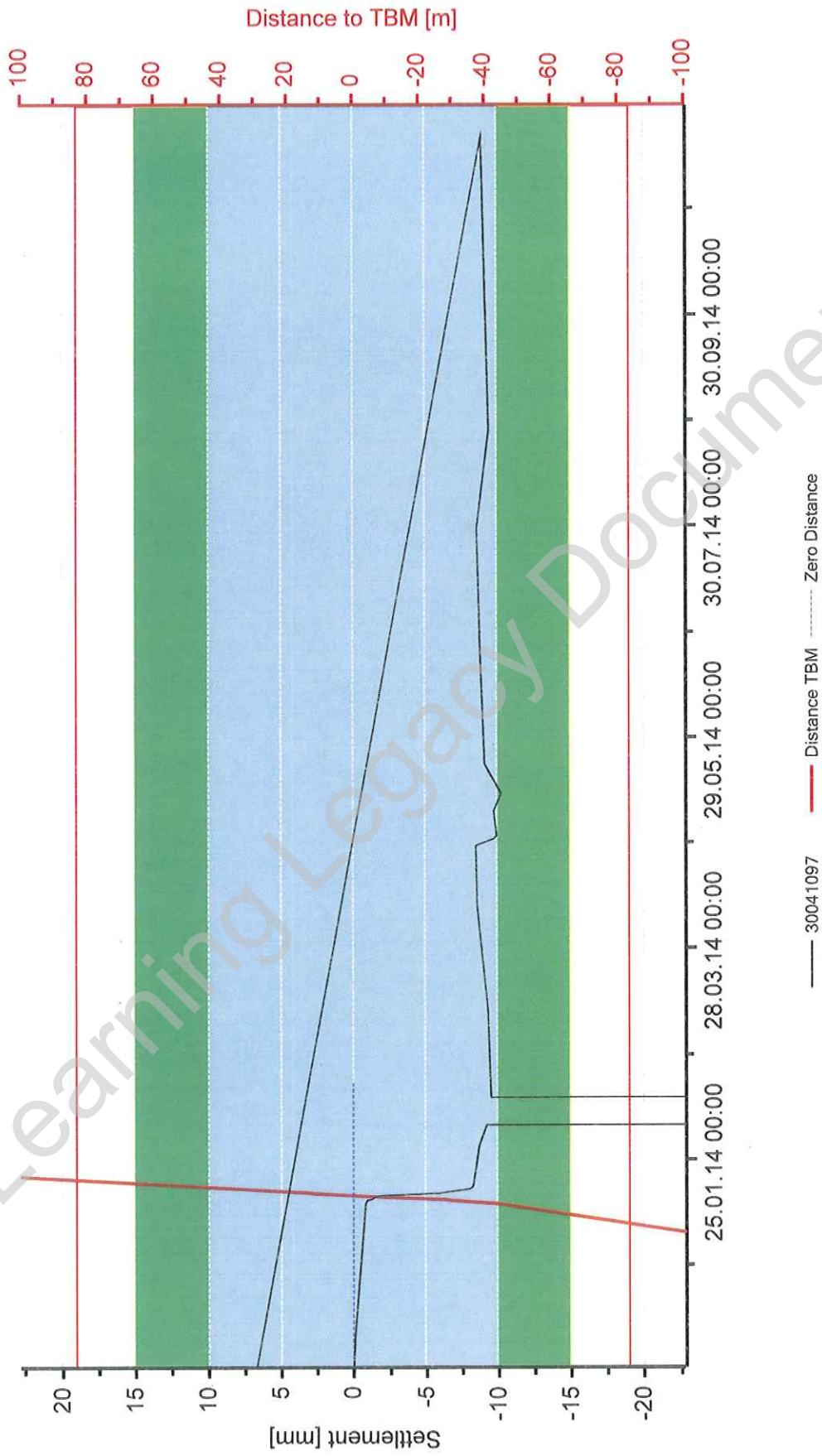
Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal

Close Out Report: WB Tunnel - TRM Carpark - 17.10.2013 - 21.11.2014

Date: 20.01.2015 12:11 Current Values: 20.01.2015 11:53



Point: 30041097

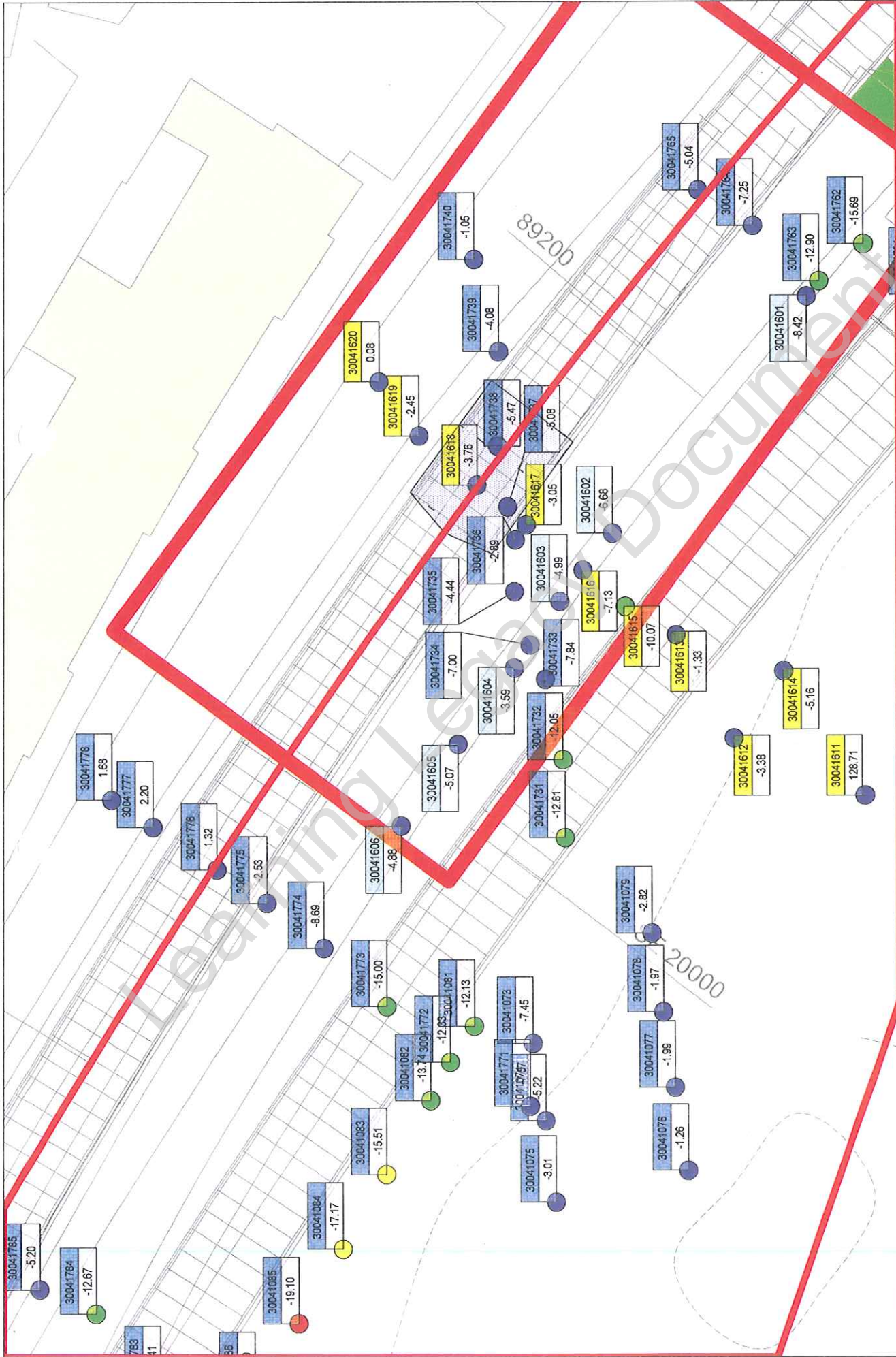


Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal

Close Out Report: WB Tunnel - TRM Carpark - 17.10.2013 - 21.11.2014

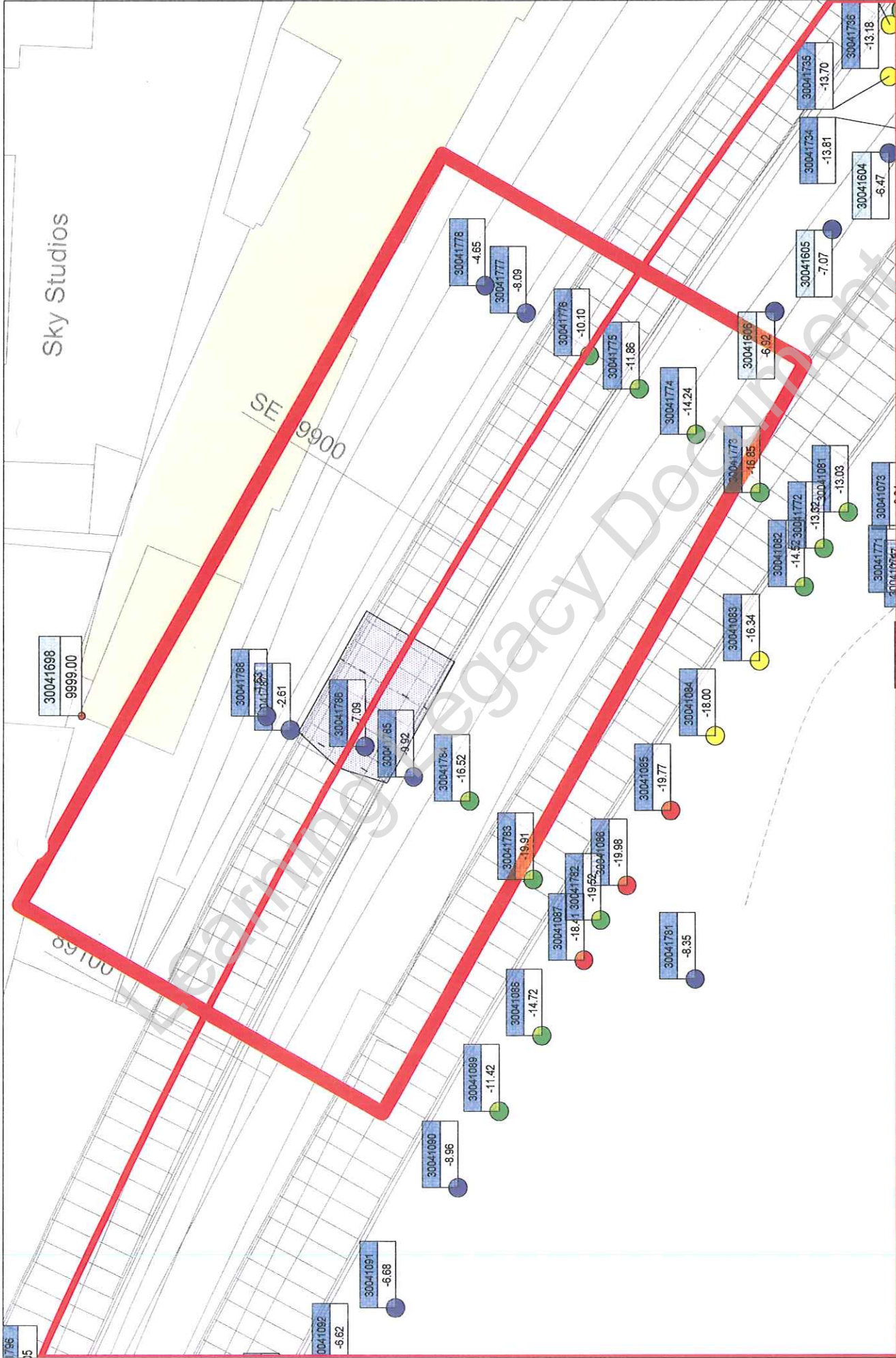
Date: 20.01.2015 12:14 Current Values: 20.01.2015 12:06





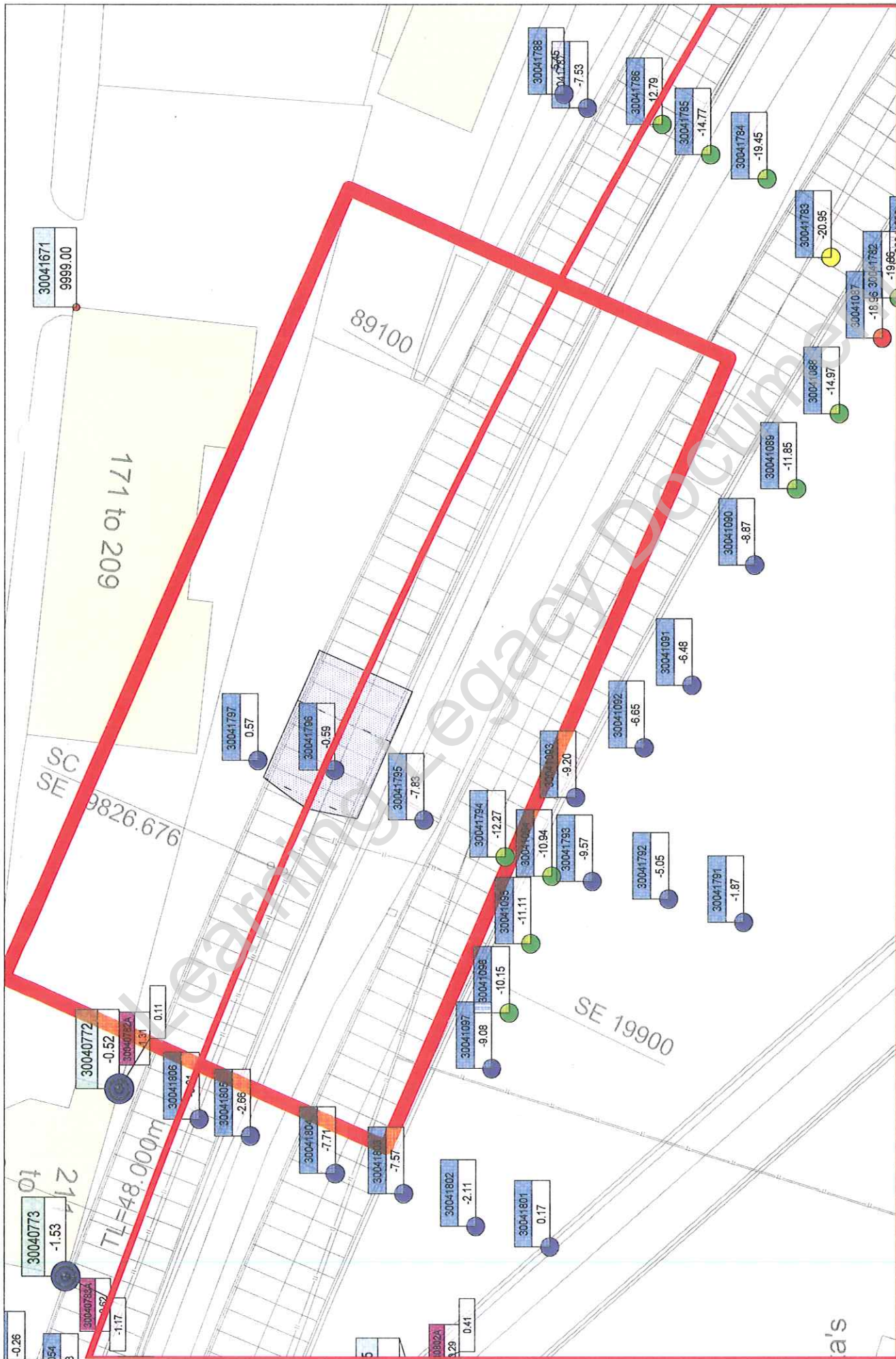
Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: C310 EB tunnel drive; NWP: portal excavation, construction base slab
 current values: 23.04.2014 12:00





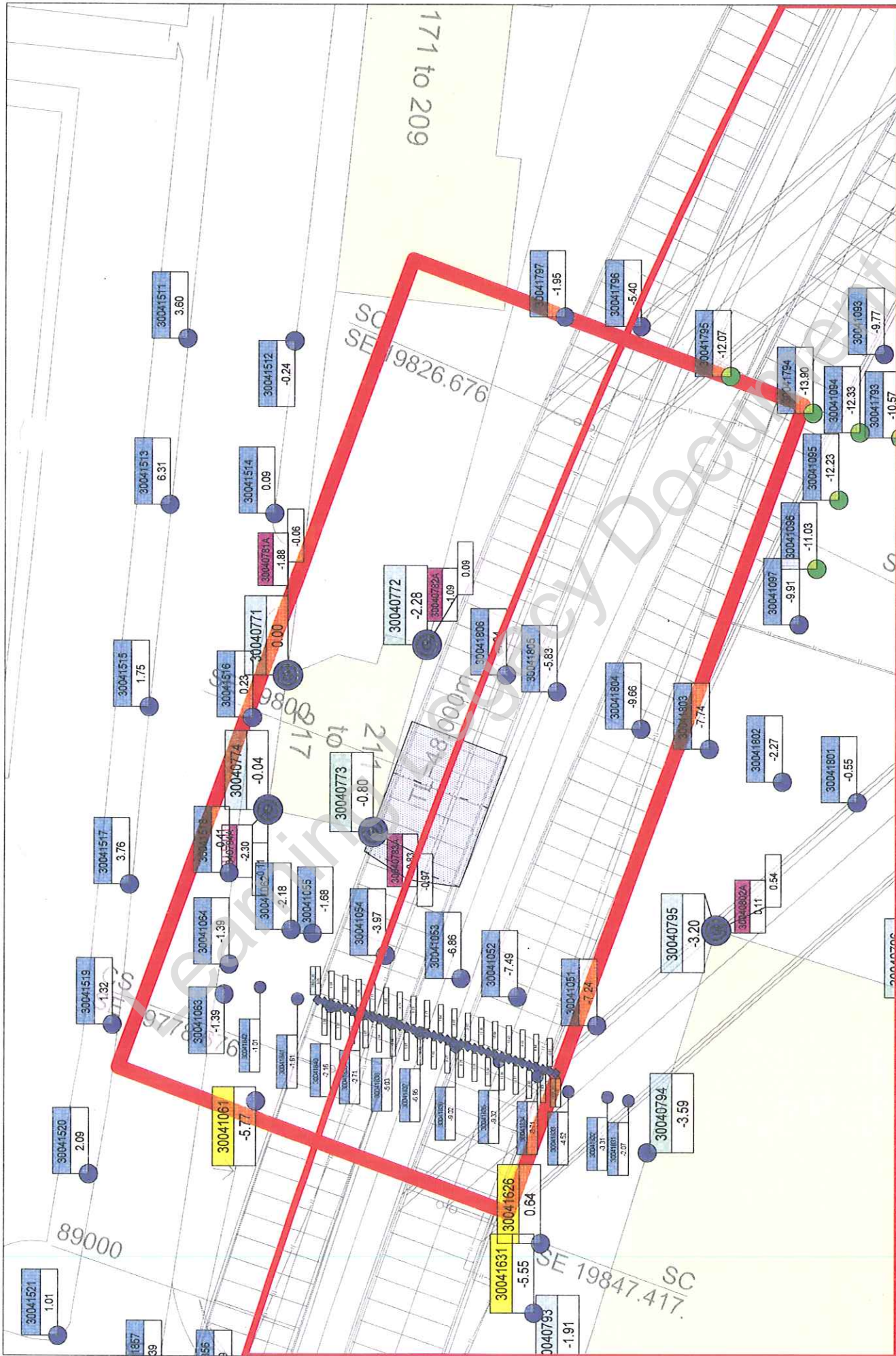
Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: C310 EB tunnel drive; NWP: portal excavation, construction base slab
 current values: 26.04.2014 09:01





Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: C310 EB tunnel drive; NWP: portal excavation, construction base slab
 current values: 28.04.2014 13:52



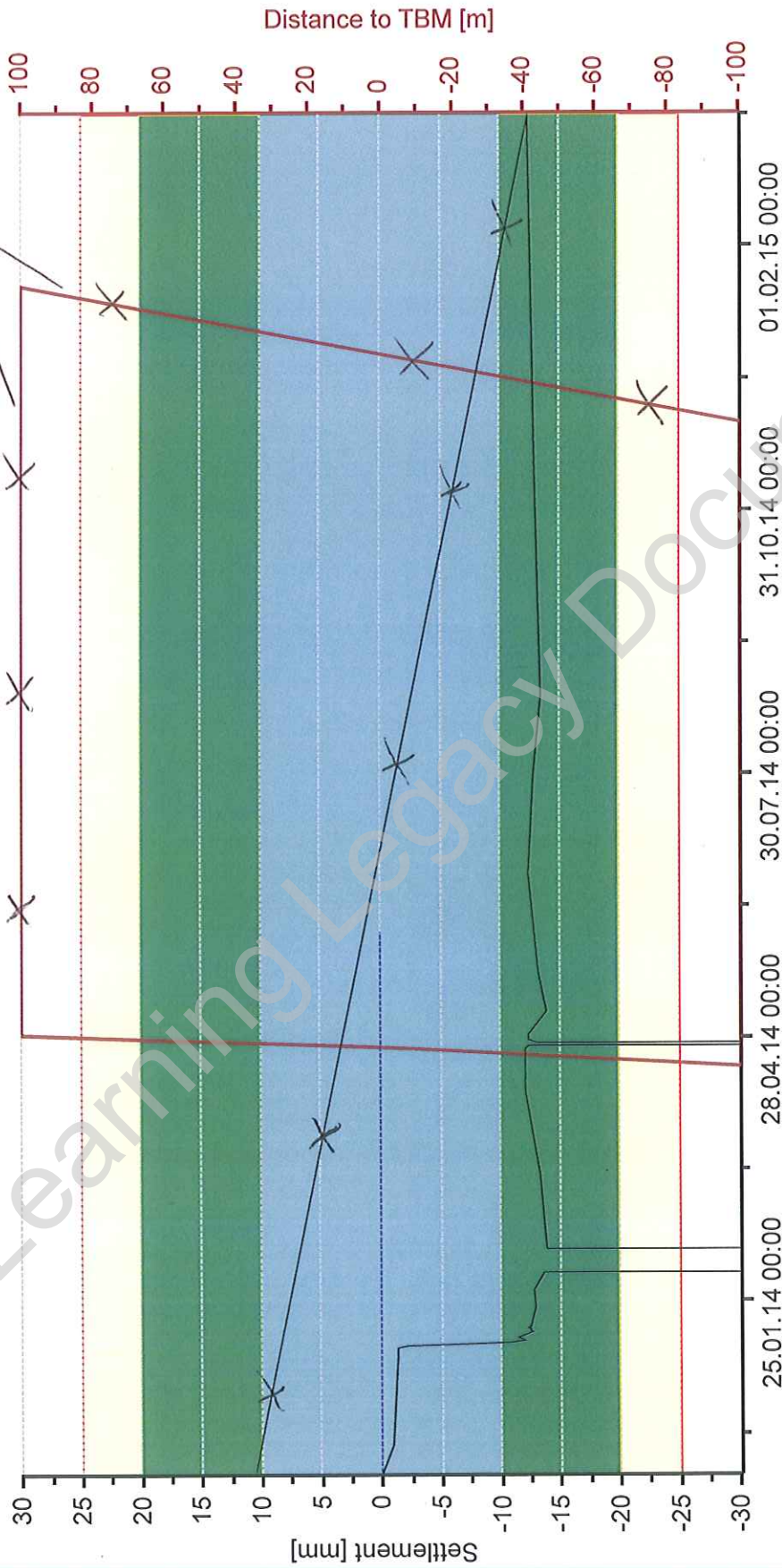


Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: C310 EB tunnel drive; NWP: portal excavation, construction base slab
 current values: 30.04.2014 09:00



Profile: Measurement Point 30041081

Line to be ignored

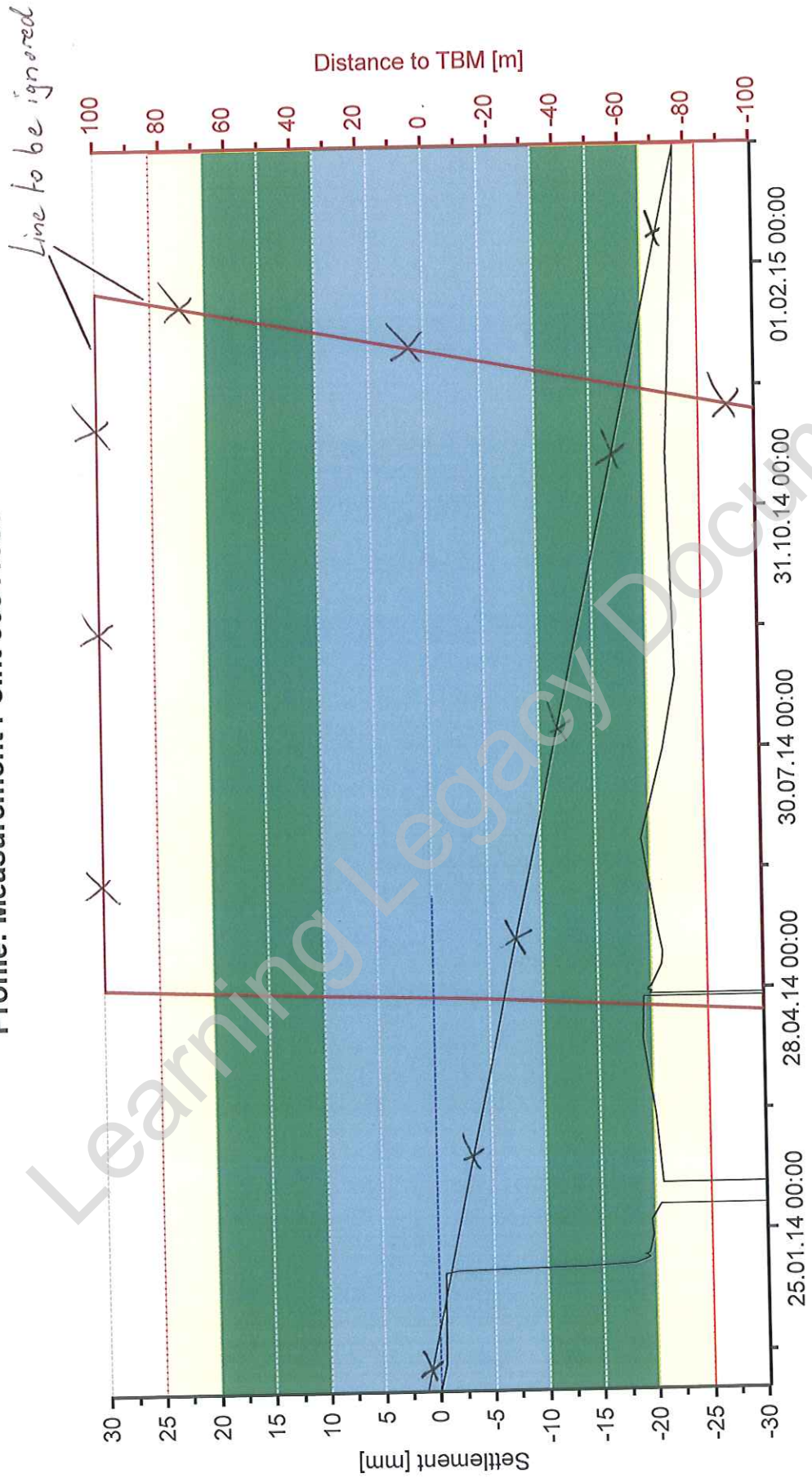


— 30041081 — Distance TBM - - - - - Zero Distance

Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 Close Out Report: EB Tunnel - TRM Carpark - 25.11.2013 - 19.03.2015
 date: 14.04.2015 15:40 current values: 14.04.2015 14:05



Profile: Measurement Point 30041085



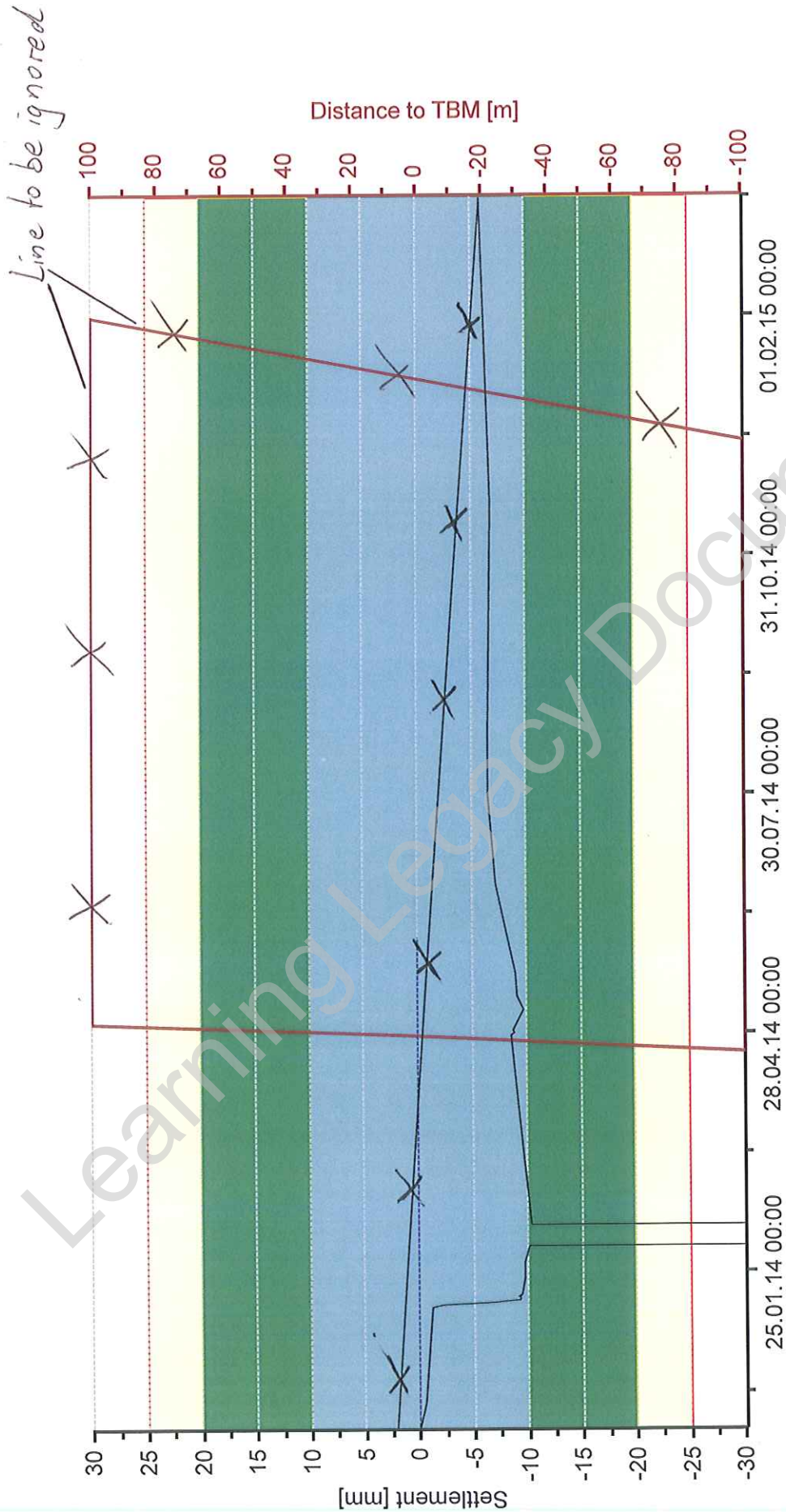
Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal

Close Out Report: EB Tunnel - TRM Carpark - 25.11.2013 - 19.03.2015

date: 14.04.2015 15:42 current values: 14.04.2015 14:05



Profile: Measurement Point 30041090



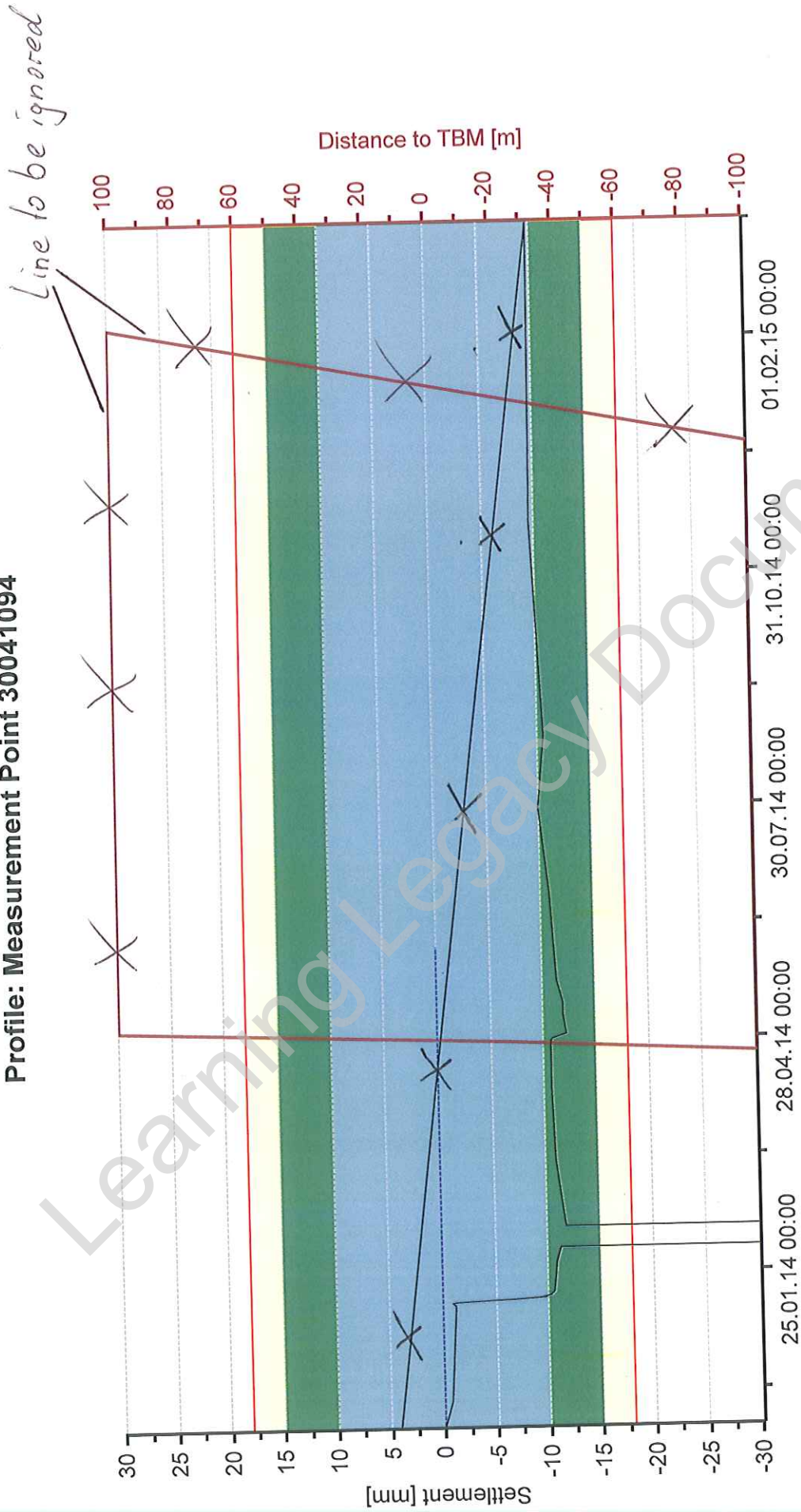
Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal

Close Out Report: EB Tunnel - TRM Carpark - 25.11.2013 - 19.03.2015

date: 14.04.2015 15:45 current values: 14.04.2015 14:05



Profile: Measurement Point 30041094



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal

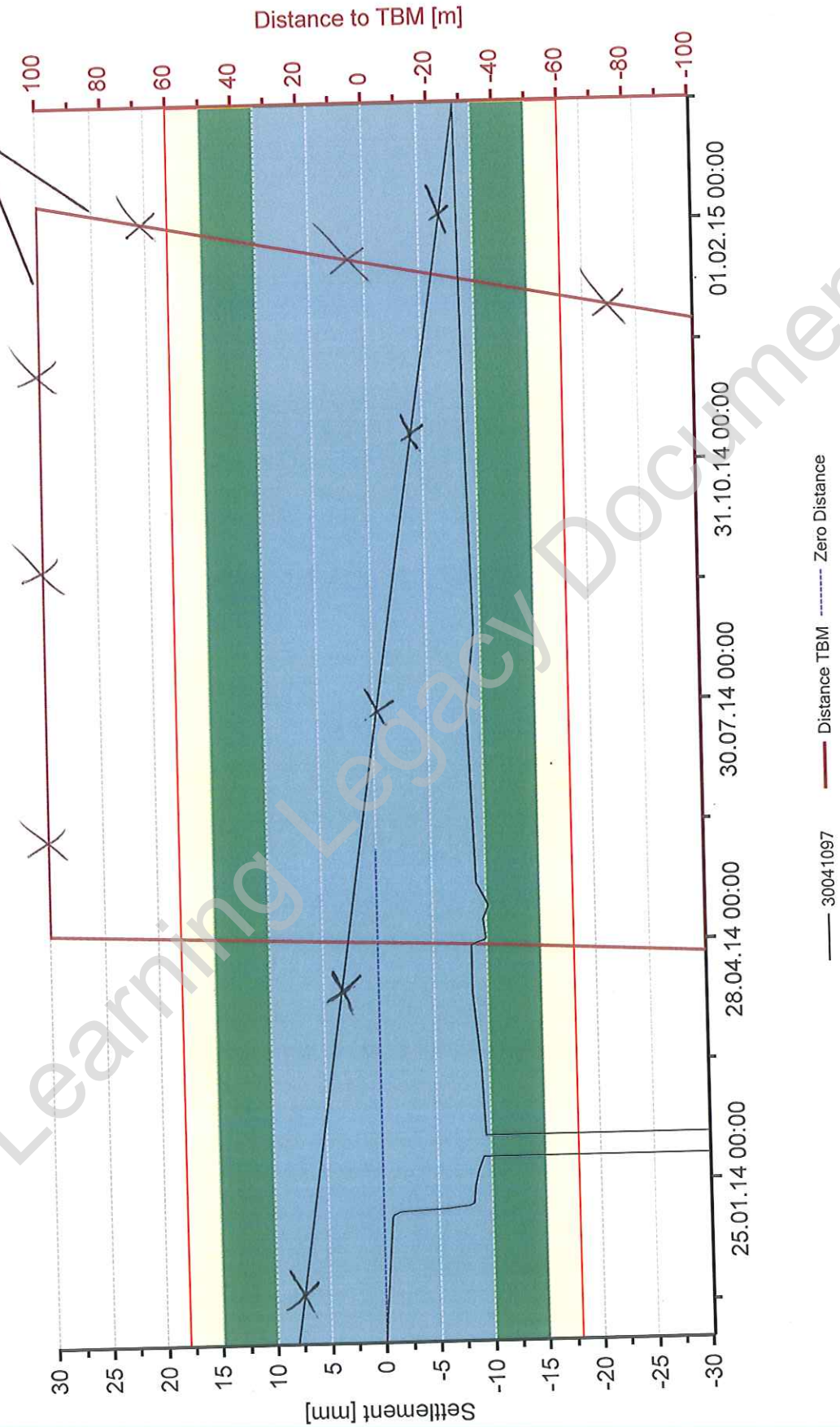
Close Out Report: EB Tunnel - TRM Carpark - 25.11.2013 - 19.03.2015

date: 14.04.2015 15:47 current values: 14.04.2015 14:05



Profile: Measurement Point 30041097

Line to be ignored



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 Close Out Report: EB Tunnel - TRM Carpark - 25.11.2013 - 19.03.2015
 date: 14.04.2015 15:49 current values: 14.04.2015 14:05




monitoring table



Joint Venture

project: C310 Thames Tunnel
structure: Twin Raising Mains CarPark

No. of reading	baseline	19. following		20. following		21. following		22. following		23. following		24. following	
		elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline
date	25/11/13	17/01/2014	23/01/2014	29/01/2014	04/02/2014	12/02/2014	10/03/2014						
No.													
30041071	destroyed	destroyed	destroyed	destroyed	destroyed	destroyed	destroyed						
30041072	destroyed												
30041073	103.187		103.179 -1	103.179 0	103.178 -1	103.178 0	103.179 1	103.178 0	103.178 -1	103.178 0	103.178 0	103.179 1	103.178 0
30041074	103.180		103.174 -1	103.174 0	103.173 -1	103.173 0	103.174 1	103.173 0	103.173 -1	103.173 0	103.173 0	103.174 1	103.173 0
30041075	103.160		103.156 0	103.156 0	103.156 -1	103.156 0	103.156 1	103.156 0	103.156 -1	103.156 0	103.156 0	103.156 1	103.156 0
30041076	103.243		103.241 0	103.241 0	103.240 -1	103.240 0	103.241 1	103.240 0	103.240 -1	103.240 0	103.240 0	103.241 1	103.240 0
30041077	103.269		103.266 0	103.266 0	103.265 -1	103.265 0	103.266 1	103.265 0	103.265 -1	103.265 0	103.265 0	103.266 1	103.265 0
30041078	103.285		103.282 0	103.282 0	103.281 -1	103.281 0	103.282 1	103.281 0	103.281 -1	103.281 0	103.281 0	103.282 1	103.281 0
30041079	103.312		103.308 0	103.308 0	103.307 -1	103.307 0	103.308 1	103.307 0	103.307 -1	103.307 0	103.307 0	103.308 1	103.307 0
30041080	destroyed	destroyed	destroyed	destroyed	destroyed	destroyed	destroyed						
30041081	103.157		103.144 0	103.144 0	103.143 -1	103.143 0	103.144 1	103.143 0	103.143 -1	103.143 0	103.143 0	103.144 1	103.143 0
30041082	103.102		103.087 -1	103.088 0	103.087 -1	103.087 0	103.087 1	103.087 0	103.087 -1	103.087 0	103.087 0	103.087 1	103.087 0
30041083	103.042		103.025 0	103.025 0	103.024 -1	103.024 0	103.025 1	103.024 0	103.024 -1	103.024 0	103.024 0	103.025 1	103.024 0
30041084	102.994		102.975 -1	102.976 0	102.975 -1	102.976 0	102.975 1	102.974 -1	102.974 -1	102.974 -1	102.974 -1	102.975 1	102.974 -1
30041085	102.941		102.921 0	102.921 0	102.920 -1	102.920 0	102.921 1	102.920 -1	102.920 -1	102.920 0	102.920 0	102.921 1	102.920 0
30041086	102.887		102.867 0	102.867 0	102.866 -1	102.866 0	102.867 1	102.866 -1	102.866 -1	102.866 0	102.866 0	102.866 1	102.866 0
30041087	102.834		102.815 0	102.815 0	102.814 -1	102.814 0	102.815 1	102.814 -1	102.814 -1	102.814 0	102.814 0	102.815 1	102.814 0
30041088	102.749		102.733 0	102.733 0	102.733 -1	102.733 0	102.733 1	102.733 -1	102.733 -1	102.732 0	102.733 0	102.733 1	102.732 0
30041089	102.671		102.659 0	102.659 0	102.659 -1	102.659 0	102.659 1	102.659 -1	102.659 -1	102.659 0	102.659 0	102.659 1	102.659 0
30041090	102.599		102.579 0	102.579 0	102.578 0	102.578 0	102.579 1	102.578 0	102.578 0	102.578 0	102.578 0	102.579 1	102.578 0
30041091	102.512		102.504 0	102.504 0	102.504 0	102.504 0	102.504 1	102.504 0	102.504 0	102.504 0	102.504 0	102.504 1	102.504 0
30041092	102.420		102.412 -2	102.413 1	102.413 0	102.413 0	102.413 1	102.413 0	102.413 -1	102.413 0	102.413 0	102.413 1	102.413 0
30041093	102.490		102.480 0	102.481 0	102.480 0	102.480 0	102.480 1	102.480 0	102.480 0	102.480 0	102.480 0	102.480 1	102.480 0
30041094	102.903		102.892 0	102.892 0	102.891 0	102.891 0	102.892 1	102.891 0	102.891 0	102.891 0	102.891 0	102.892 1	102.891 0
30041095	102.887		102.877 0	102.877 0	102.876 0	102.876 0	102.877 1	102.876 -1	102.876 -1	102.876 0	102.876 0	102.876 1	102.876 0
30041096	102.852		102.843 0	102.843 0	102.842 0	102.842 0	102.843 1	102.842 -1	102.842 -1	102.842 0	102.842 0	102.842 1	102.842 0
30041097	102.845		102.836 0	102.836 0	102.836 0	102.836 0	102.836 1	102.836 0	102.836 -1	102.835 0	102.835 0	102.835 1	102.835 0
30041098	destroyed	destroyed	destroyed	destroyed	destroyed	destroyed	destroyed						
30041099	destroyed	destroyed	destroyed	destroyed	destroyed	destroyed	destroyed						
30041100	destroyed	destroyed	destroyed	destroyed	destroyed	destroyed	destroyed						

		C310 THAMES TUNNEL REPORT			
EMPLOYER	CROSSRAIL	eB NO	C310-HTM-C-RGN-CR148-50024	Rev	2.0
TITLE	Monitoring Close-Out Reports relating to Tunnelling Works North Embankment River Thames - North Woolwich Portal (excl. Store Rd)				

APPENDIX 85
Siding Apartments 1-16 – HLC

Learning Legacy Document

monitoring asset

Building Sidings Apartments 1-16

reference monitoring drawing:

C310-HTM-C-DWG-CR146-ST004-70003

name of monitoring section:

Siding Apartments 1-16

sensor type:

hydrostatic levelling cell (hlc)

chainage:

89250-89220

point no.:

3004 1711 - 3004 1712

trigger values:

[mm]

green: +16
-16

amber: +20
-20

red: +25
-25

reference document for trigger values:

Management Plan for Control of Ground Movement

EB-no.:

C310-HTM-Z-STP-CR148-50058

Appendix:

AAA

monitoring data

	date		max. value	point no.	comments
baseline	21/11/13		0.00		
TBM 1	start ZOI	12/12/13	0.11 0.11	3004 1711 3004 1712	
	end ZOI	09/01/14	-0.03 0.07	3004 1711 3004 1712	breached not any trigger value
TBM 2	start ZOI	15/04/14	-0.15 -0.07	3004 1711 3004 1712	
	end ZOI	23/04/14	-0.27 -0.19	3004 1711 3004 1712	breached not any trigger value
longterm	18/11/14		0.06 0.29	3004 1711 3004 1712	

Evaluation of any potential residual risks



No residual risk

since the Works have been completed by HMJV



Yes, residual risk

(see comment below)

summary / comments

Under consideration of temperature differences and the achievable accuracy of the system HMJV has no concern to cease the monitoring.
The rate of change in the monitoring data is less than the required standards as per the specifications and drawings.

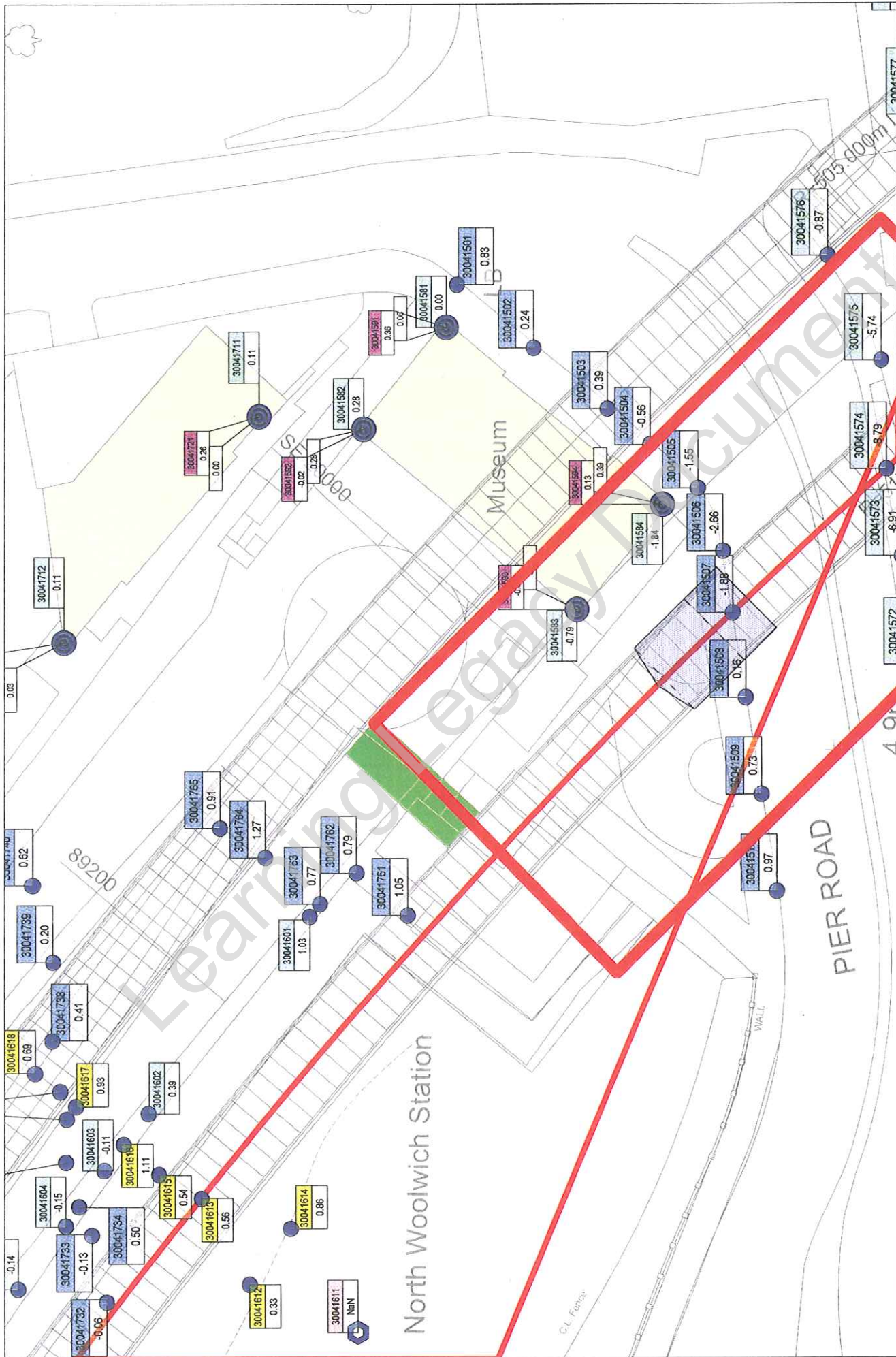
date / signature:

02/02/2015

print name:

HMJV project role:

Monitoring & Survey Engineer

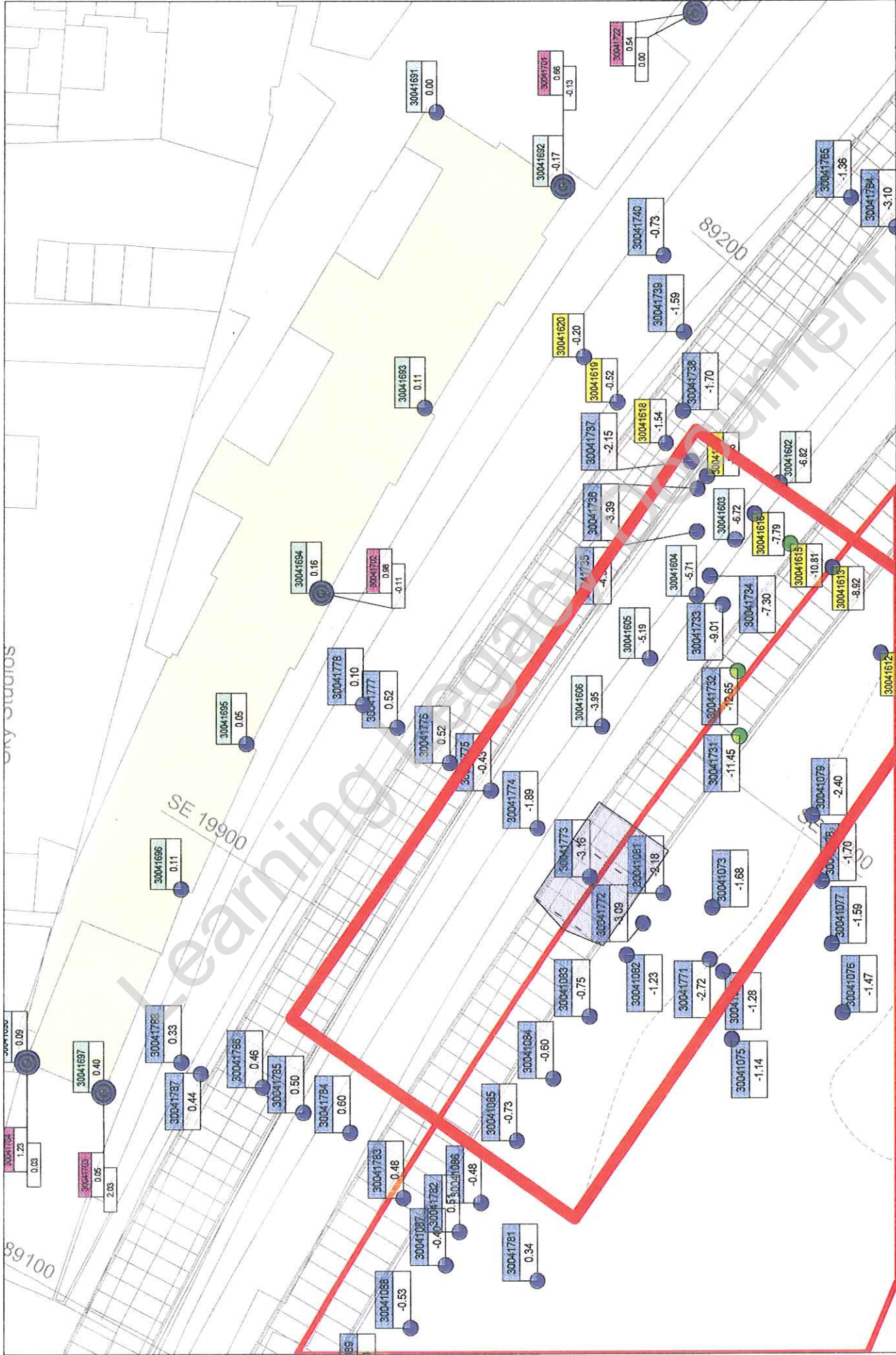


Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal

working activities: WB TBM Tunneldrive

Date: 12.12.2013 17:59





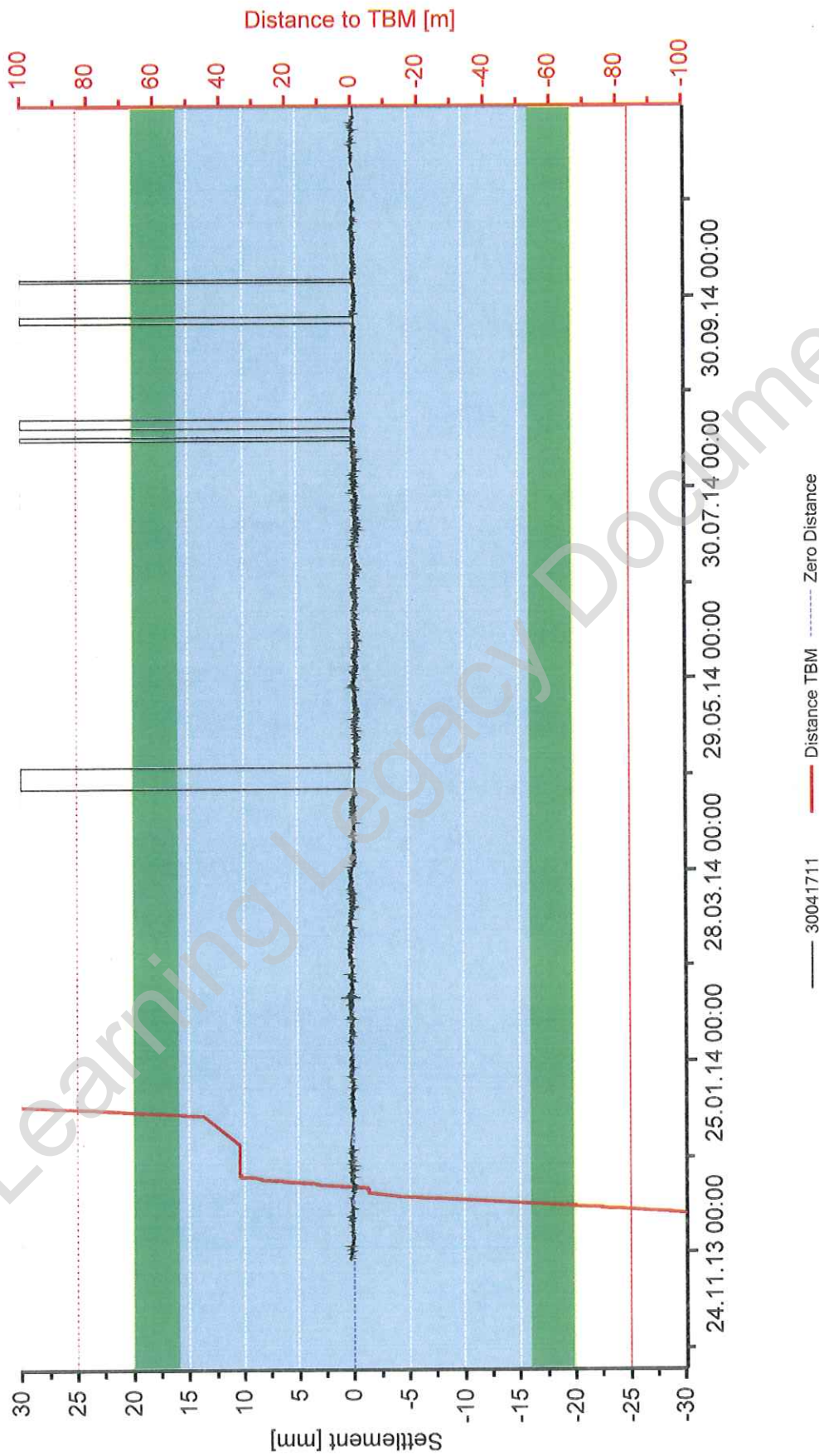
Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal

working activities: WB TBM Tunneldrive

Date: 09.01.2014 17:59



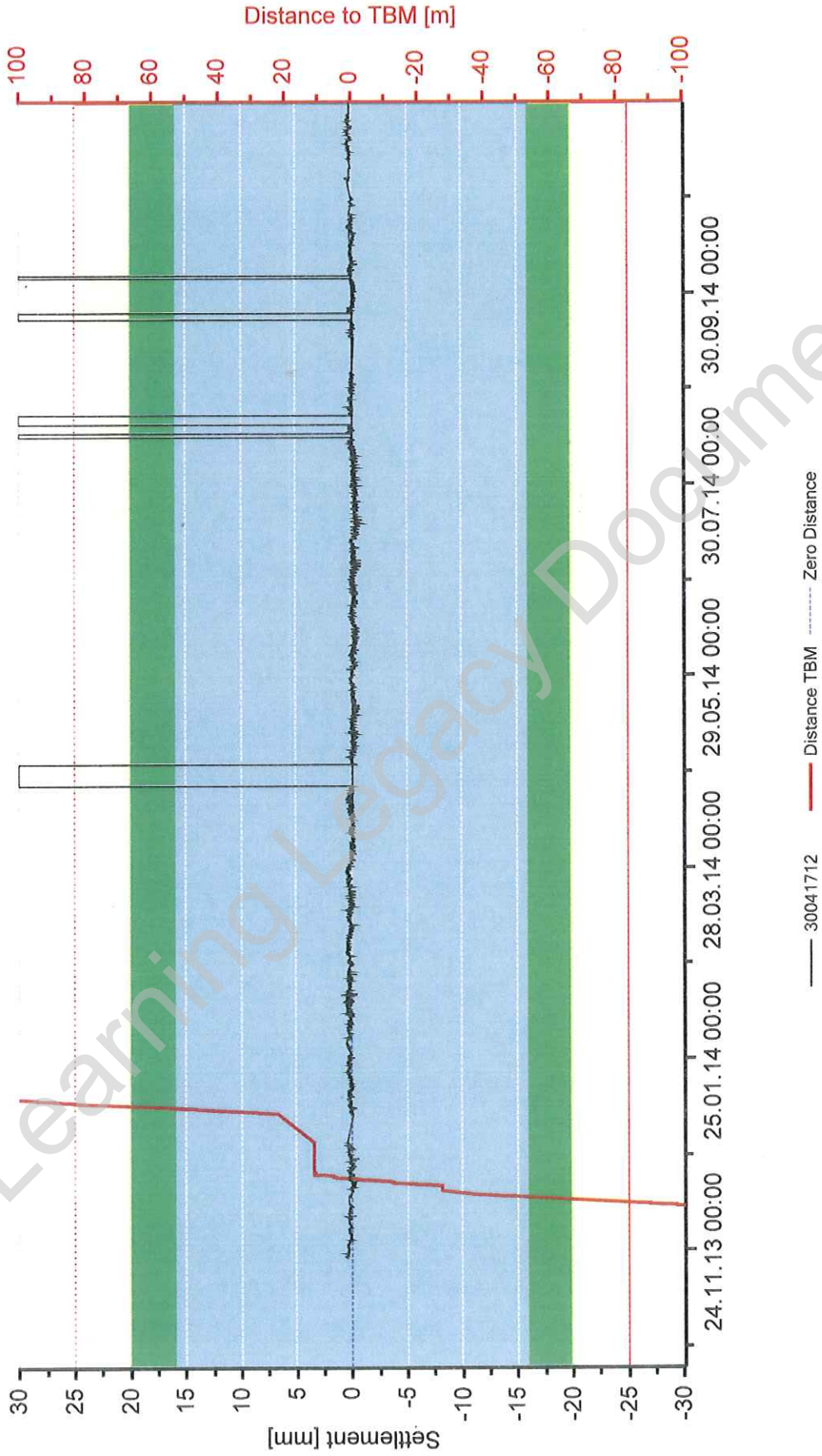
Point: 30041711



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: WB Tunnel - Siding Apartments 1-16 - 17.10.2013 - 21.11.2014
Date: 20.01.2015 12:45 Current Values: 20.01.2015 12:39

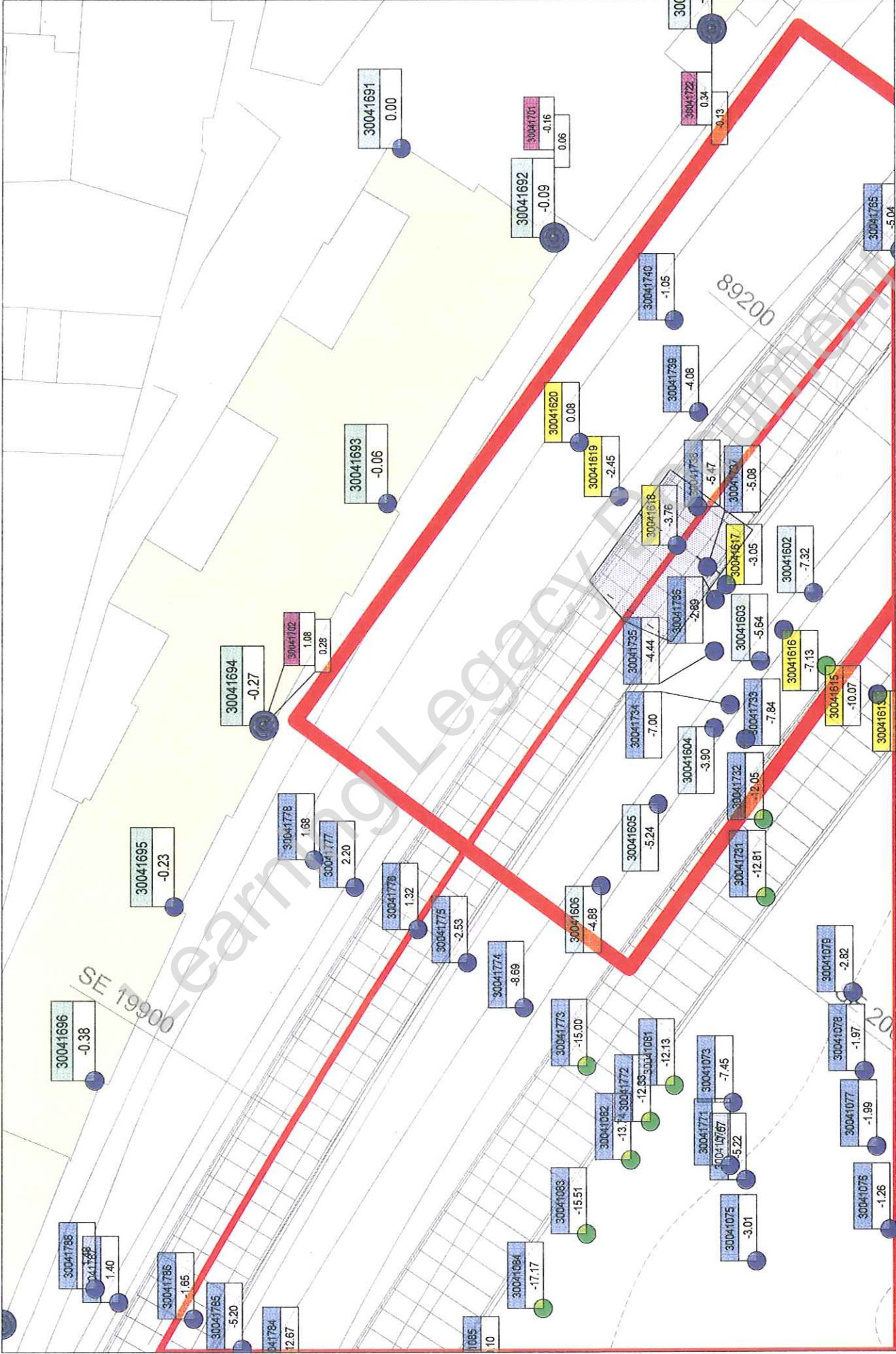


Point: 30041712



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: WB Tunnel - Siding Apartments 1-16 - 17.10.2013 - 21.11.2014
Date: 20.01.2015 12:47 Current Values: 20.01.2015 12:39





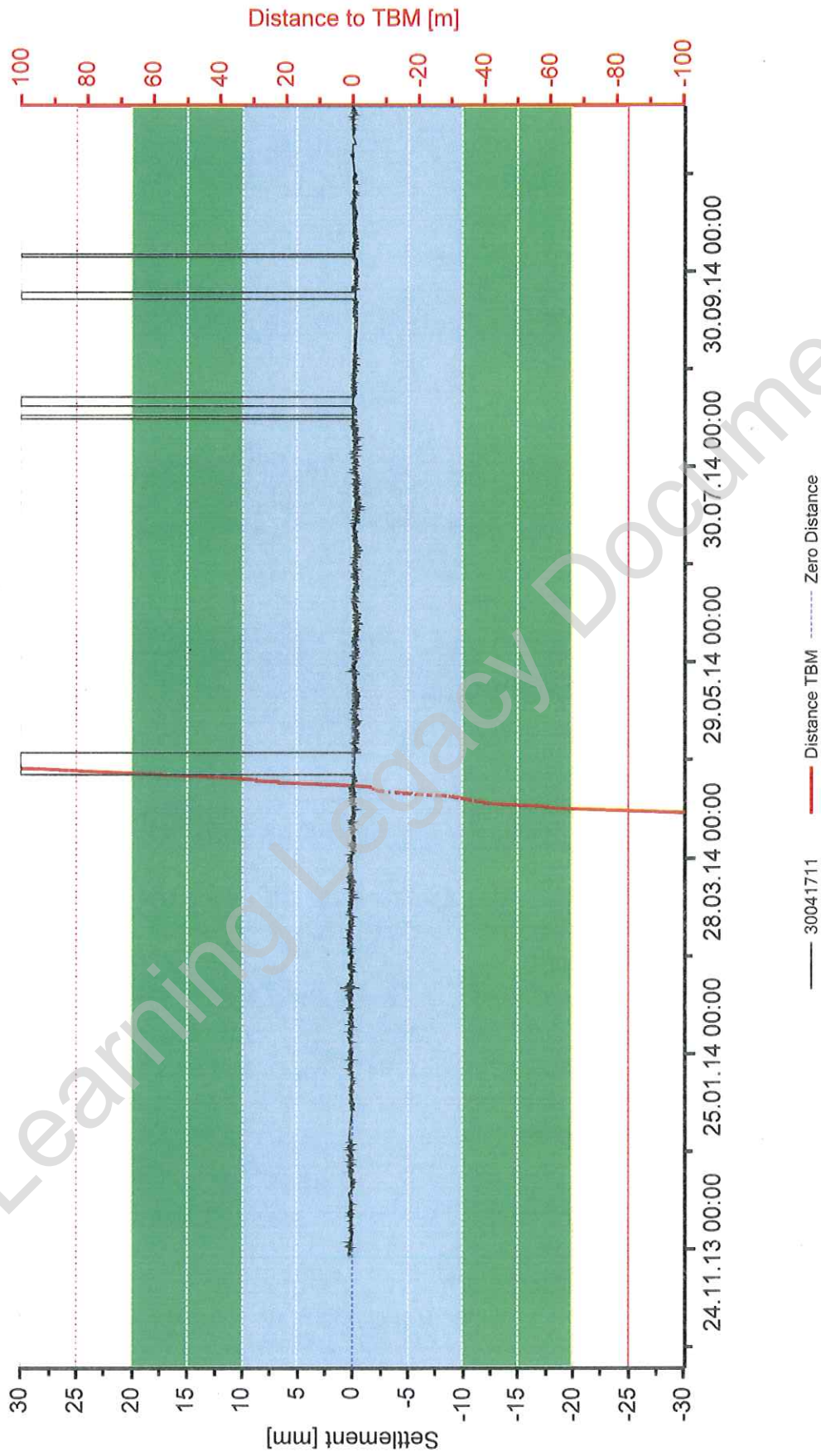
Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal

Working activities: EB TBM Tunneldrive

current values: 23.04.2014 14:59



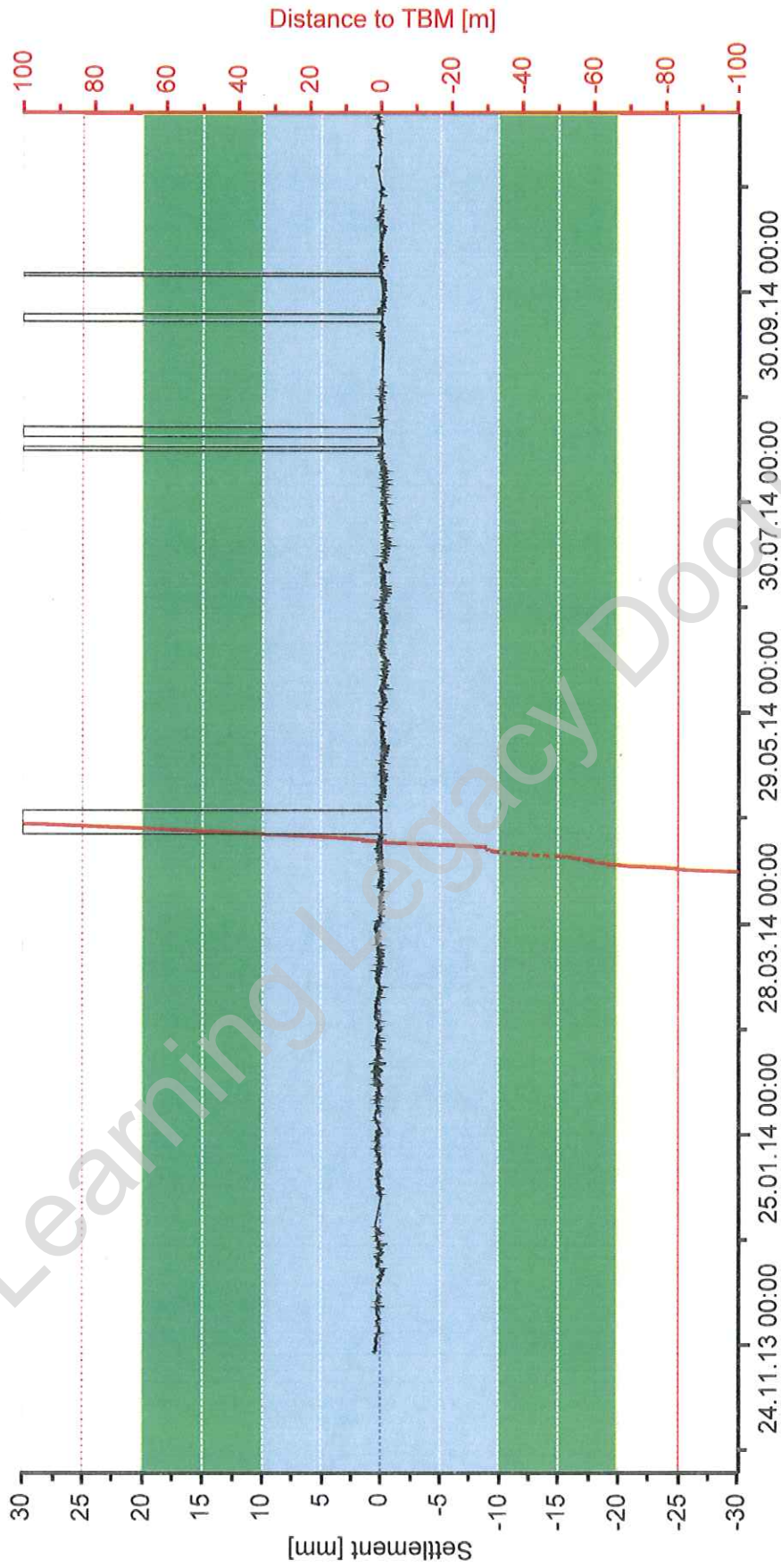
Point: 30041711



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: EB Tunnel - Siding Apartments - 17.10.2013 - 21.11.2014
date: 20.01.2015 16:53 current values: 20.01.2015 13:28




Point: 30041712



— 30041712 — Distance TBM - - - - - Zero Distance

Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: EB Tunnel - Siding Apartments - 17.10.2013 - 21.11.2014
date: 20.01.2015 16:55 current values: 20.01.2015 13:28



 HOCHTIEF MURPHY Joint Venture		C310 THAMES TUNNEL REPORT			
EMPLOYER	CROSSRAIL	eB NO	C310-HTM-C-RGN-CR148-50024	Rev	2.0
TITLE	Monitoring Close-Out Reports relating to Tunnelling Works North Embankment River Thames - North Woolwich Portal (excl. Store Rd)				

APPENDIX 86

Siding Apartments 1-16 – TM

Learning Legacy Document

monitoring asset	Building Sidings Apartments 1-16		
reference monitoring drawing:	C310-HTM-C-DWG-CR146-ST004-70003		
name of monitoring section:	Sidings Apartments 1-16		
sensor type:	tiltmeter		
chainage:	89250-89220	point no.:	3004 1721 - 3004 1722
trigger values: [mm]	green: +16 -16	amber: +20 -20	red: +25 -25
reference document for trigger values:	Management Plan for Control of Ground Movement		
EB-no.:	C310-HTM-Z-STP-CR148-50058		
Appendix:	AAA		

monitoring data

	date		max. value	point no.	comments
baseline	21/11/13		0.00		
TBM 1	start ZOI	12/12/13	0.26	3004 1721	
			0.51	3004 1722	
	end ZOI	09/01/14	0.46	3004 1721	breached not any trigger value
			0.54	3004 1722	
TBM 2	start ZOI	15/04/14	0.46	3004 1721	
			0.28	3004 1722	
	end ZOI	23/04/14	0.46	3004 1721	breached not any trigger value
			0.34	3004 1722	
longterm		18/11/14	0.56	3004 1721	
			0.61	3004 1722	

Evaluation of any potential residual risks	<input checked="" type="checkbox"/>	No residual risk since the Works have been completed by HMJV
	<input type="checkbox"/>	Yes, residual risk (see comment below)

summary / comments

Under consideration of temperature differences and the achievable accuracy of the system, HMJV has no concern to cease the monitoring.
The rate of change in the monitoring data is less than the required standards as per the specifications and drawings.

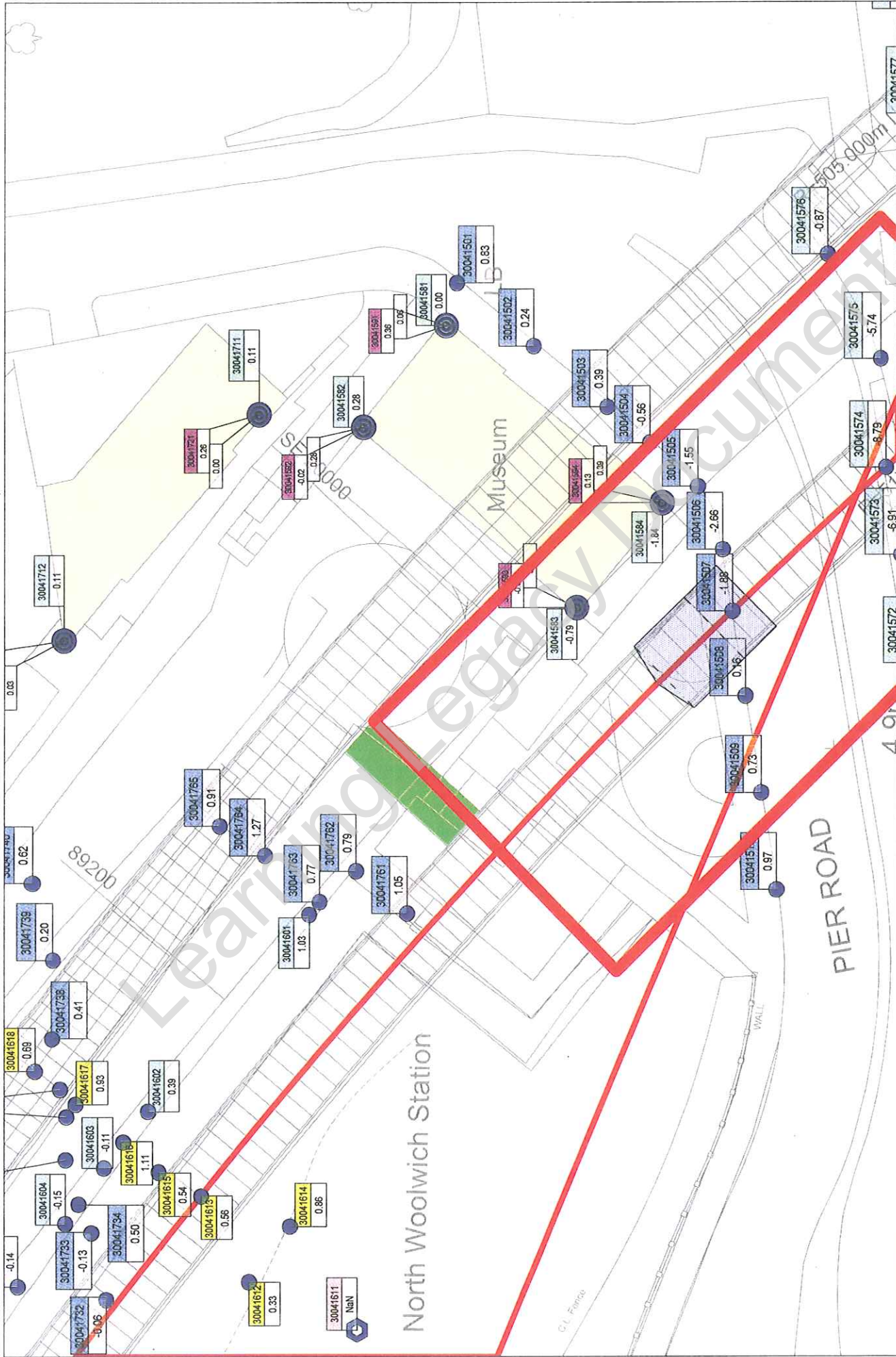
date / signature:

02/02/15

print name:

HMJV project role:

Monitoring & Survey Engineer

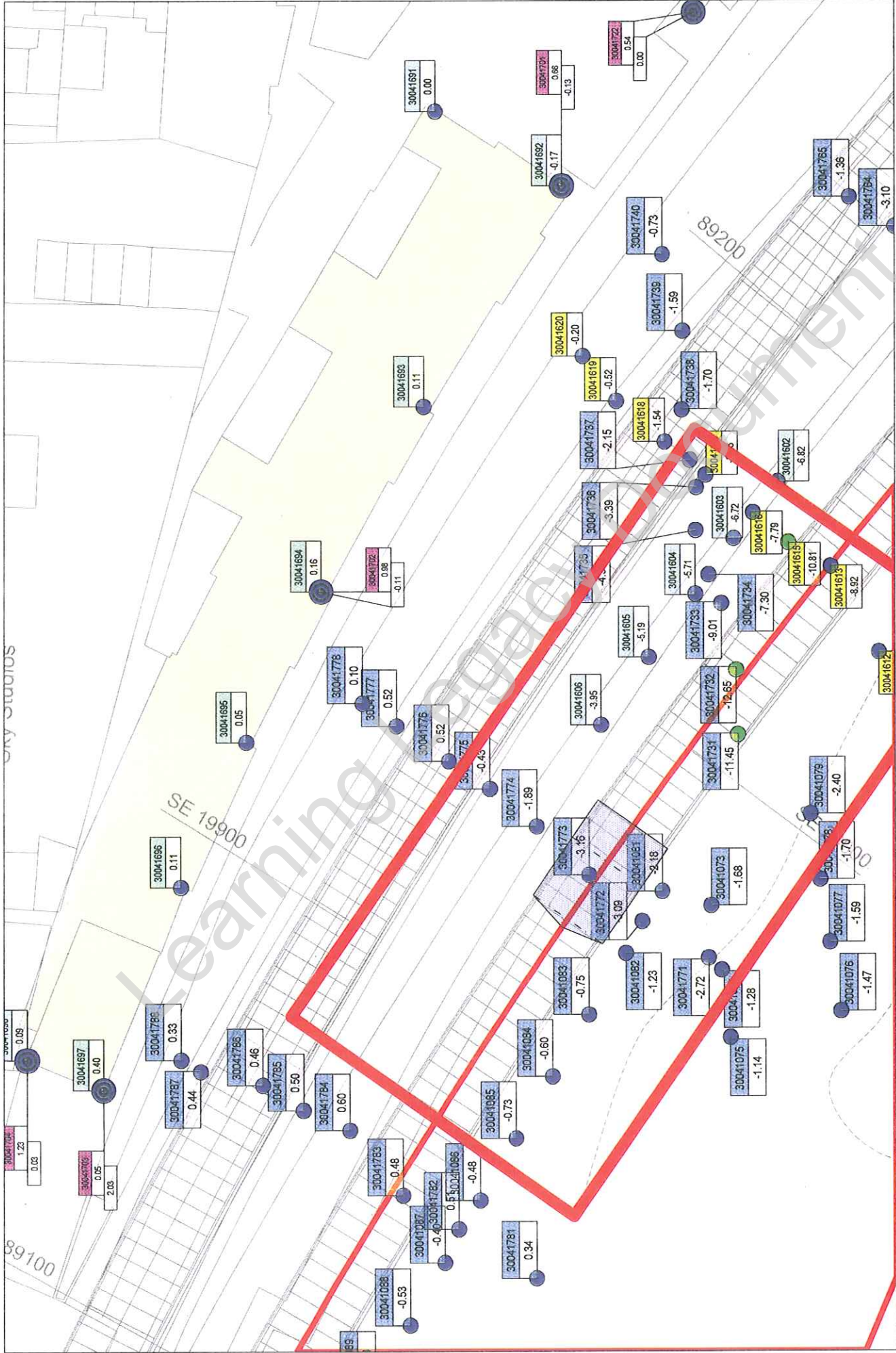


Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal

working activities: WB TBM Tunneldrive

Date: 12.12.2013 17:59

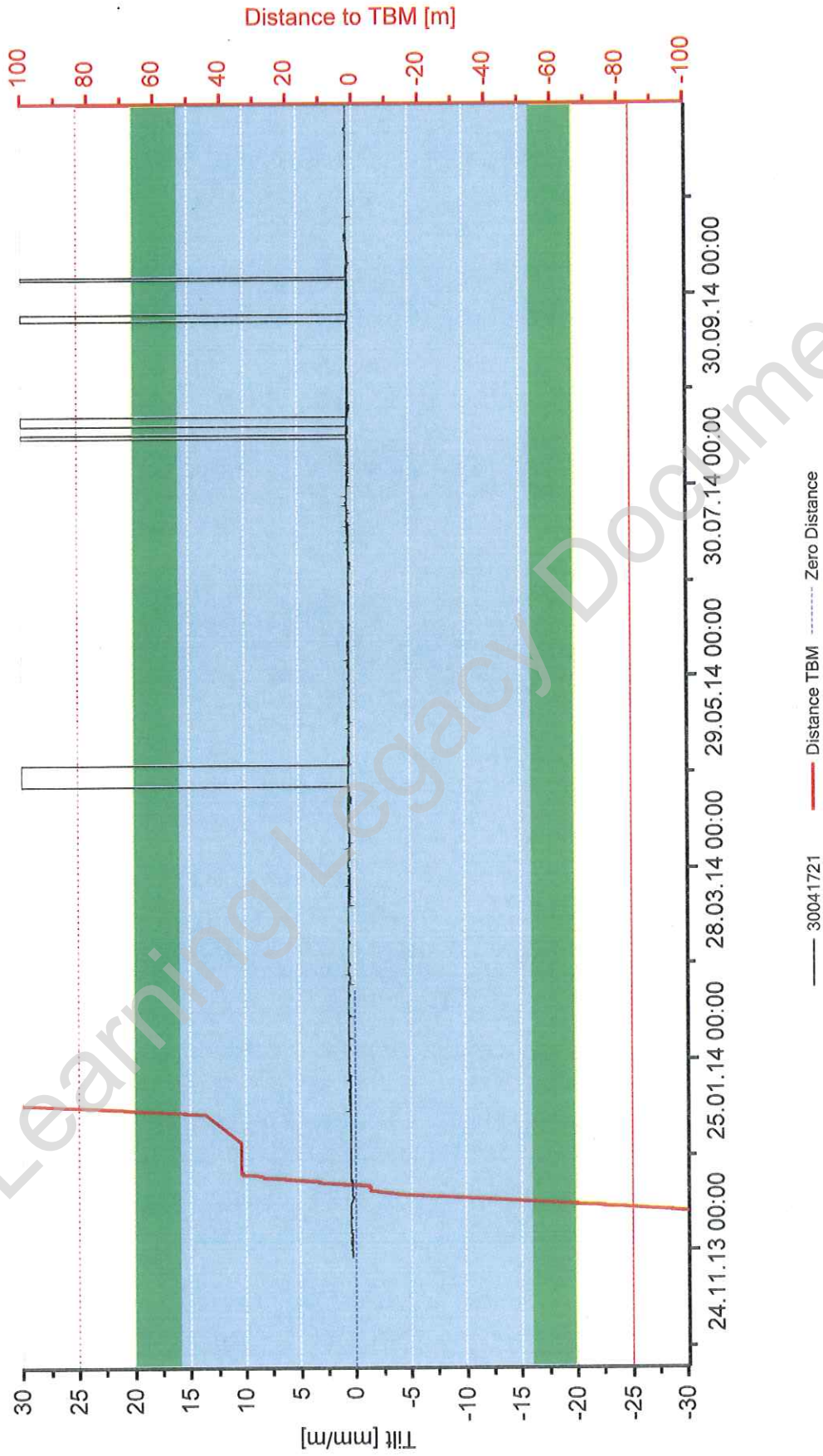




Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: WB TBM Tunneldrive
 Date: 09.01.2014 17:59



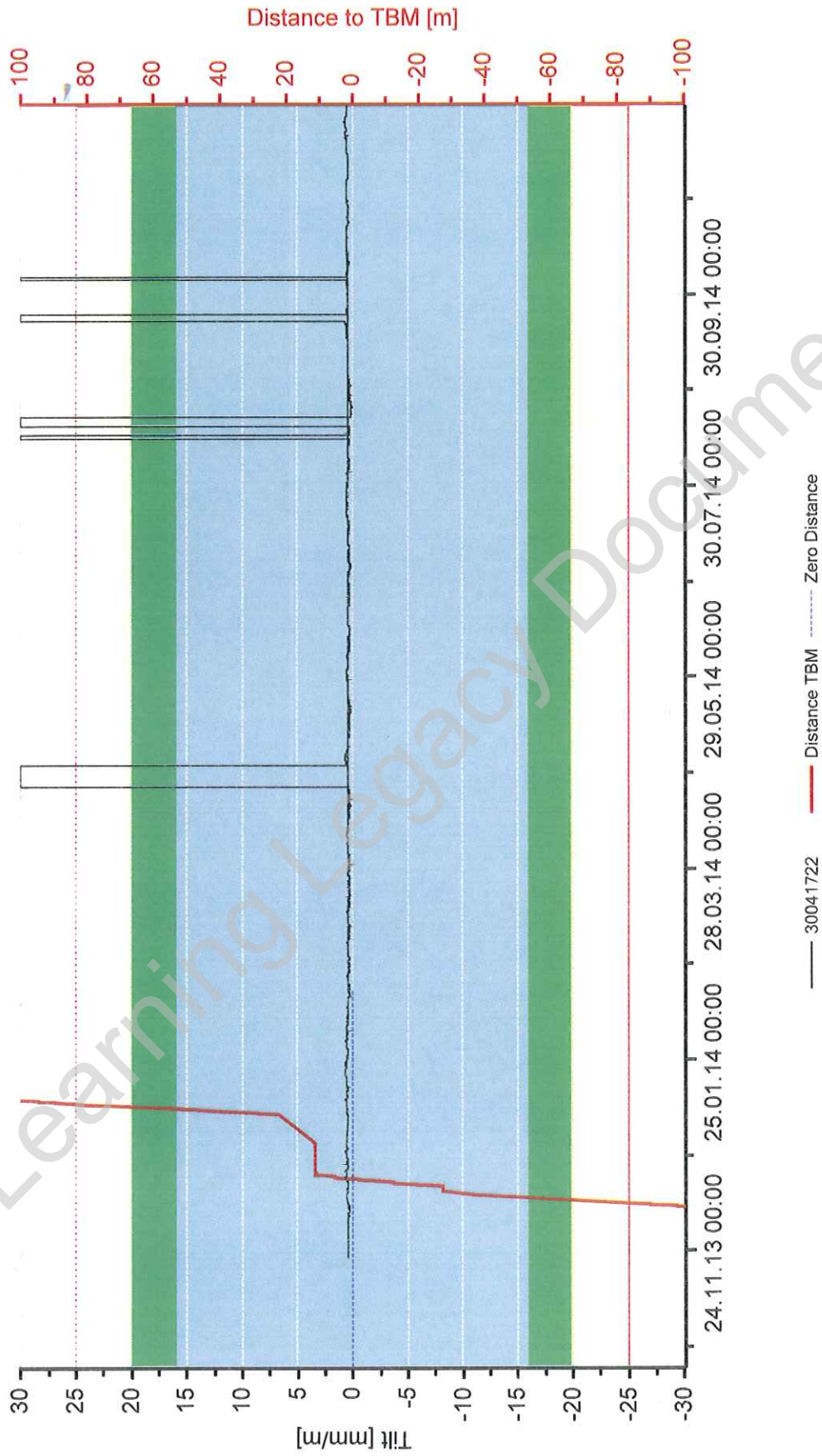
Point: 30041721



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: WB Tunnel - Siding Apartments 1-16 - 17.10.2013 - 21.11.2014
Date: 20.01.2015 12:53 Current Values: 20.01.2015 12:39

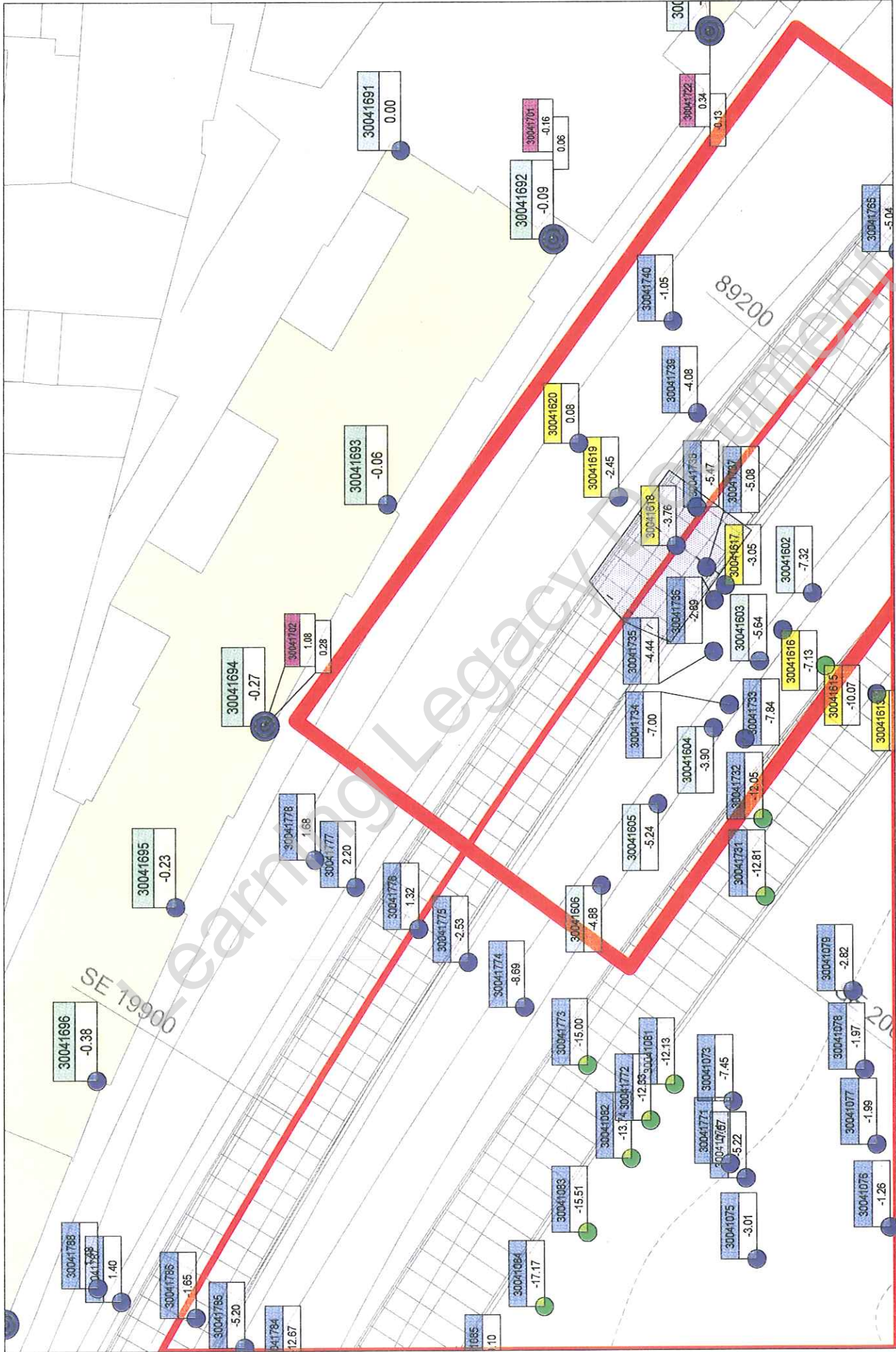


Point: 30041722



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: WB Tunnel - Siding Apartments 1-16 - 17.10.2013 - 21.11.2014
Date: 20.01.2015 12:57 Current Values: 20.01.2015 12:39





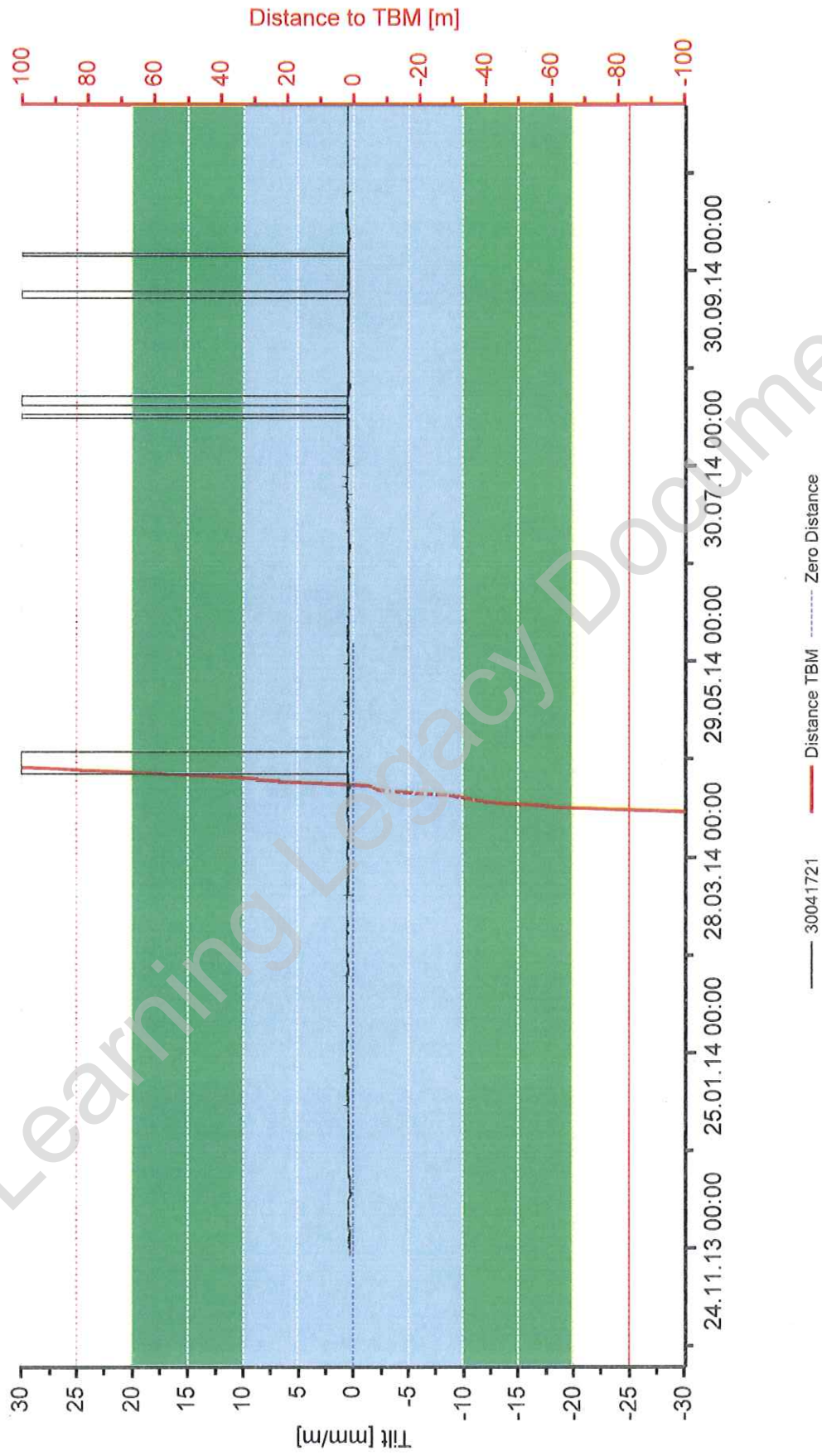
Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal

Working activities: EB TBM Tunneldrive

current values: 23.04.2014 14:59



Point: 30041721

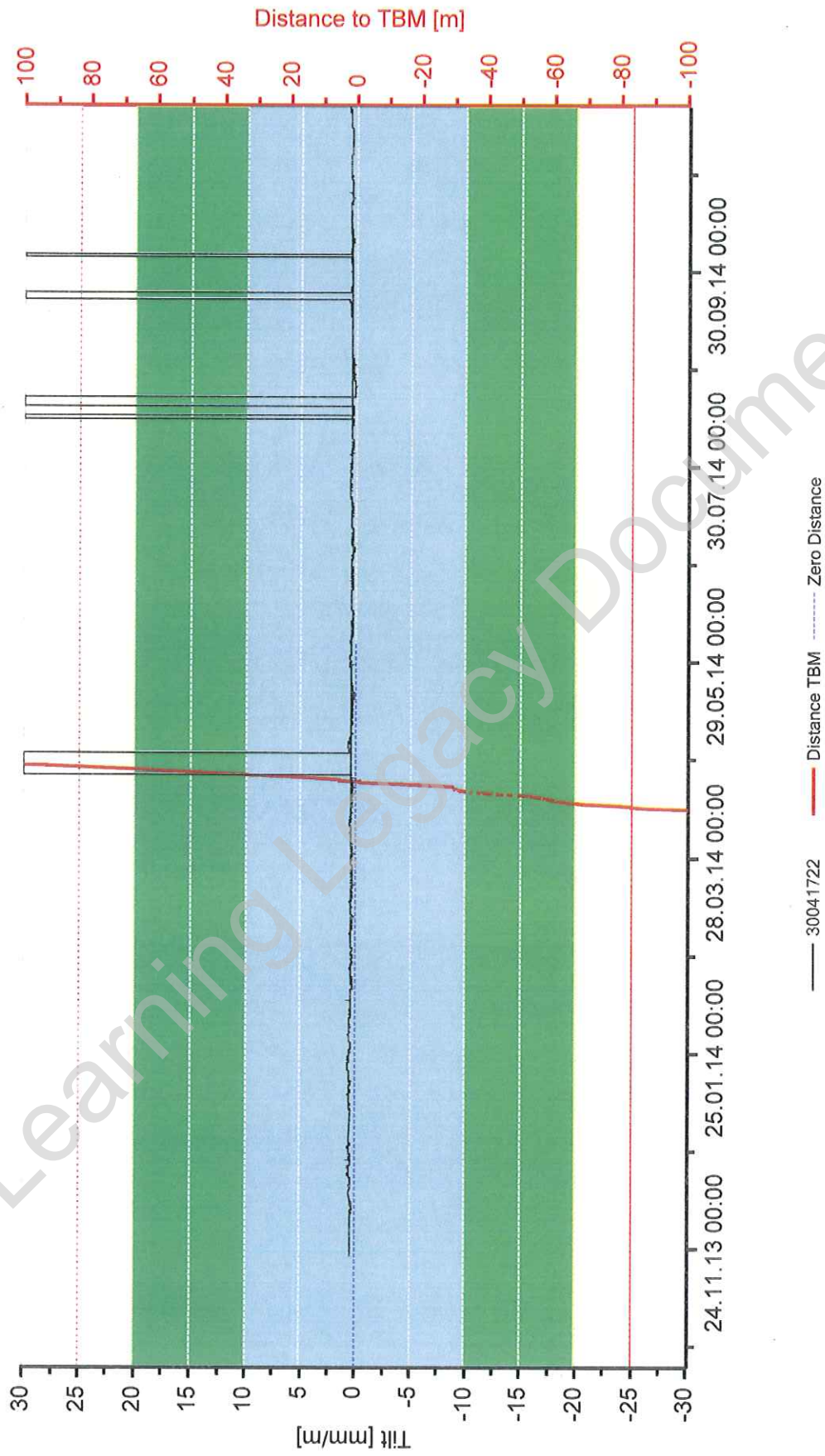


Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal

Close Out Report: EB Tunnel - Siding Apartments - 17.10.2013 - 21.11.2014


date: 20.01.2015 16:57 current values: 20.01.2015 13:28

Point: 30041722



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: EB Tunnel - Siding Apartments - 17.10.2013 - 21.11.2014
date: 20.01.2015 17:04 current values: 20.01.2015 13:28



 HOCHTIEF MURPHY Joint Venture		C310 THAMES TUNNEL REPORT			
EMPLOYER	CROSSRAIL	eB NO	C310-HTM-C-RGN-CR148-50024	Rev	2.0
TITLE	Monitoring Close-Out Reports relating to Tunnelling Works North Embankment River Thames - North Woolwich Portal (excl. Store Rd)				

APPENDIX 87

Siding Apartments 17-74 – HLC

Learning Legacy Document

monitoring asset

Building Siding Apartments 17-74

reference monitoring drawing:

C310-HTM-C-DWG-CR146-ST004-70003

name of monitoring section:

Sidings Apartments 17-74

sensor type:

hydrostatic levelling cell (hlc)

chainage:

89220-89120

point no.:

3004 1691 - 3004 1698

trigger values:
[mm]

green: +16
-16

amber: +20
-20

red: +25
-25

reference document for trigger values:

Management Plan for Control of Ground Movement

EB-no.:

C310-HTM-Z-STP-CR148-50058

Appendix:

AAA

monitoring data

	date	max. value	point no.	comments
baseline	21/11/13	0.00		
TBM 1	start ZOI	20/12/13	-0.11	3004 1692
		20/12/13	-0.14	3004 1695
		09/01/14	0.40	3004 1697
	end ZOI	09/01/14	-0.17	3004 1692
		14/01/14	0.05	3004 1695
		14/01/14	0.59	3004 1697
TBM 2	start ZOI	20/04/14	-0.02	3004 1692
		23/04/14	-0.23	3004 1695
		23/04/14	-0.16	3004 1697
	end ZOI	30/04/14	-0.30	3004 1692
		30/04/14	-1.45	3004 1695
		30/04/14	-1.14	3004 1697
longterm	18/11/14	-0.20	3004 1692	
		-1.79	3004 1695	
		-0.49	3004 1697	

Evaluation of any potential residual risks



No residual risk

since the Works have been completed by HMJV



Yes, residual risk

(see comment below)

summary / comments

Under consideration of temperature differences and the achievable accuracy of the system, HMJV has no concern to cease the monitoring.

The rate of change in the monitoring data is less than the required standards as per the specifications and drawings.

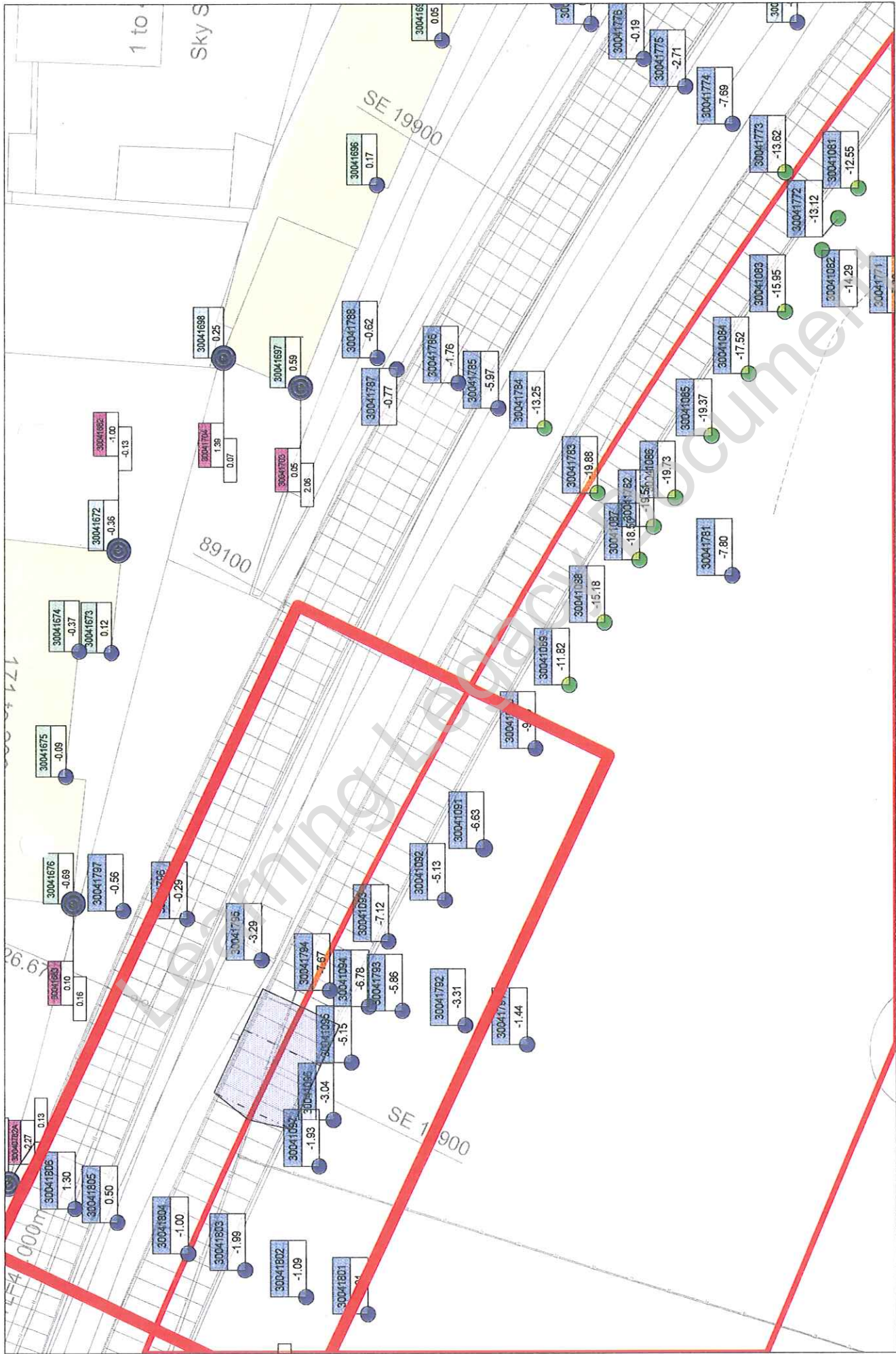
date / signature:

02/02/2015

print name:

HMJV project role:

Monitoring & Survey Engineer



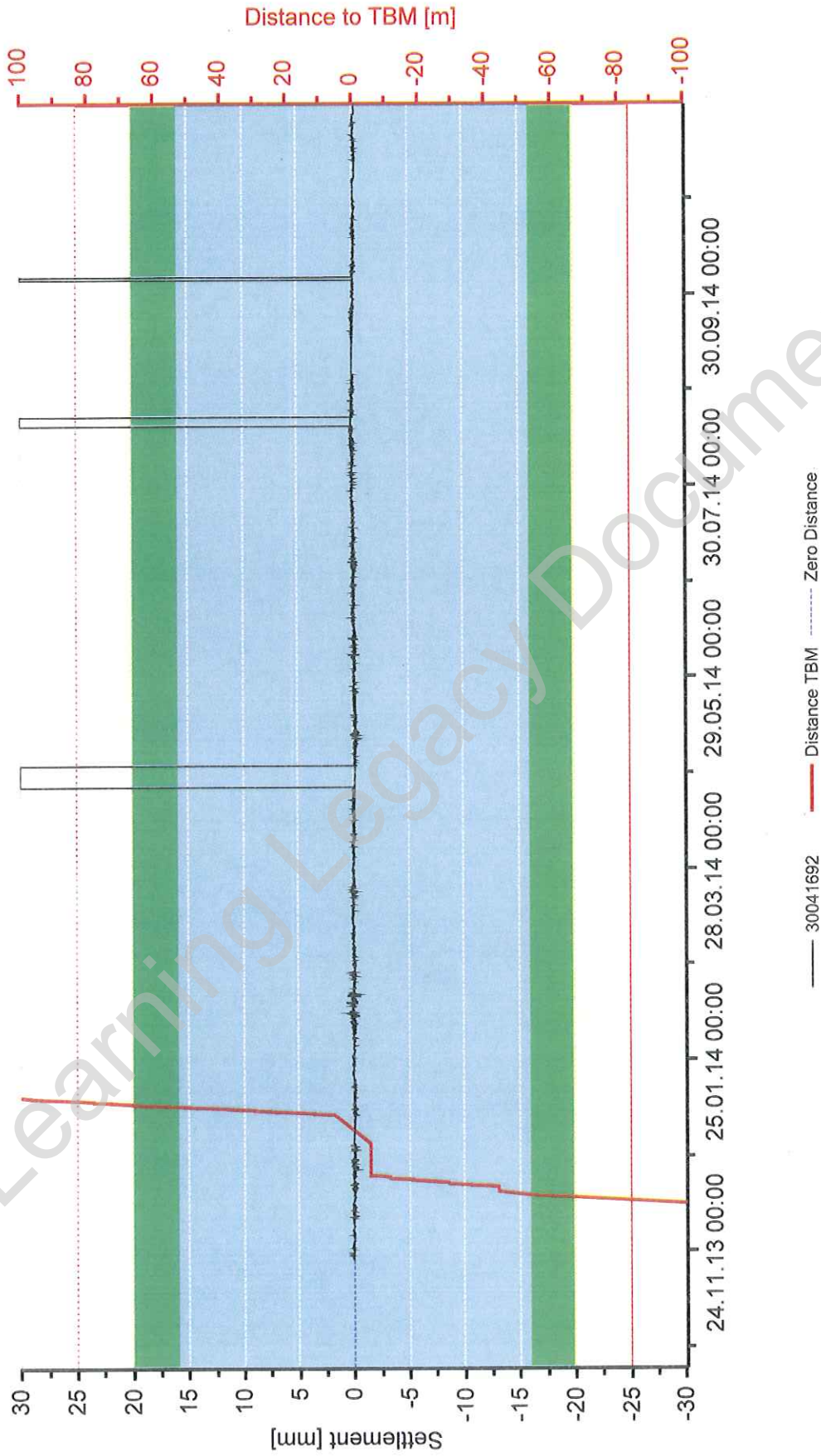
Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal

working activities: WB TBM Tunneldrive

Date: 14.01.2014 17:57



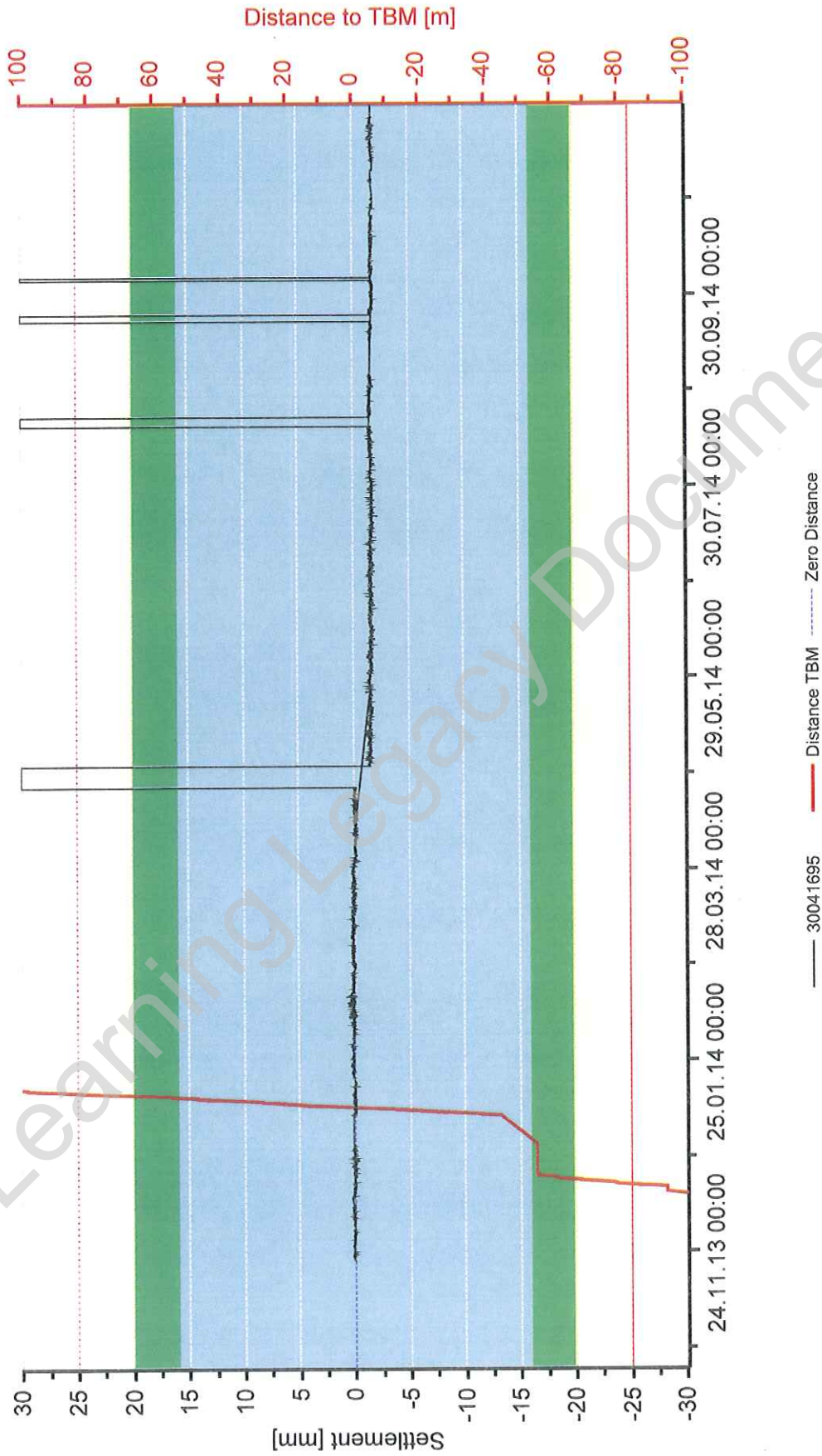
Point: 30041692



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: WB Tunnel - Siding Apartments 17-74 - 17.10.2013 - 21.11.2014
Date: 20.01.2015 12:58 Current Values: 20.01.2015 12:39



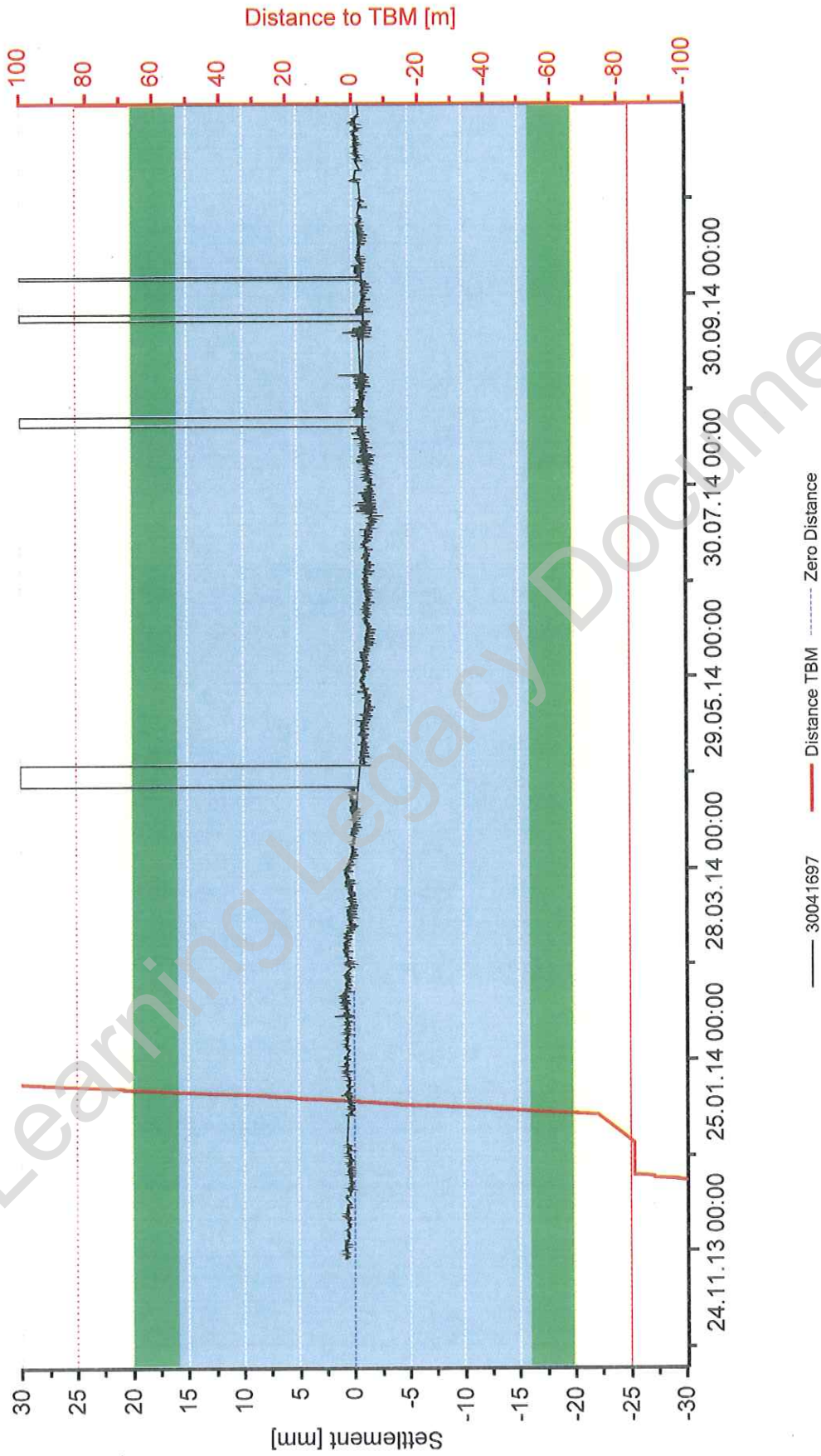
Point: 30041695



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: WB Tunnel - Siding Apartments 17-74 - 17.10.2013 - 21.11.2014
Date: 20.01.2015 13:00 Current Values: 20.01.2015 12:52

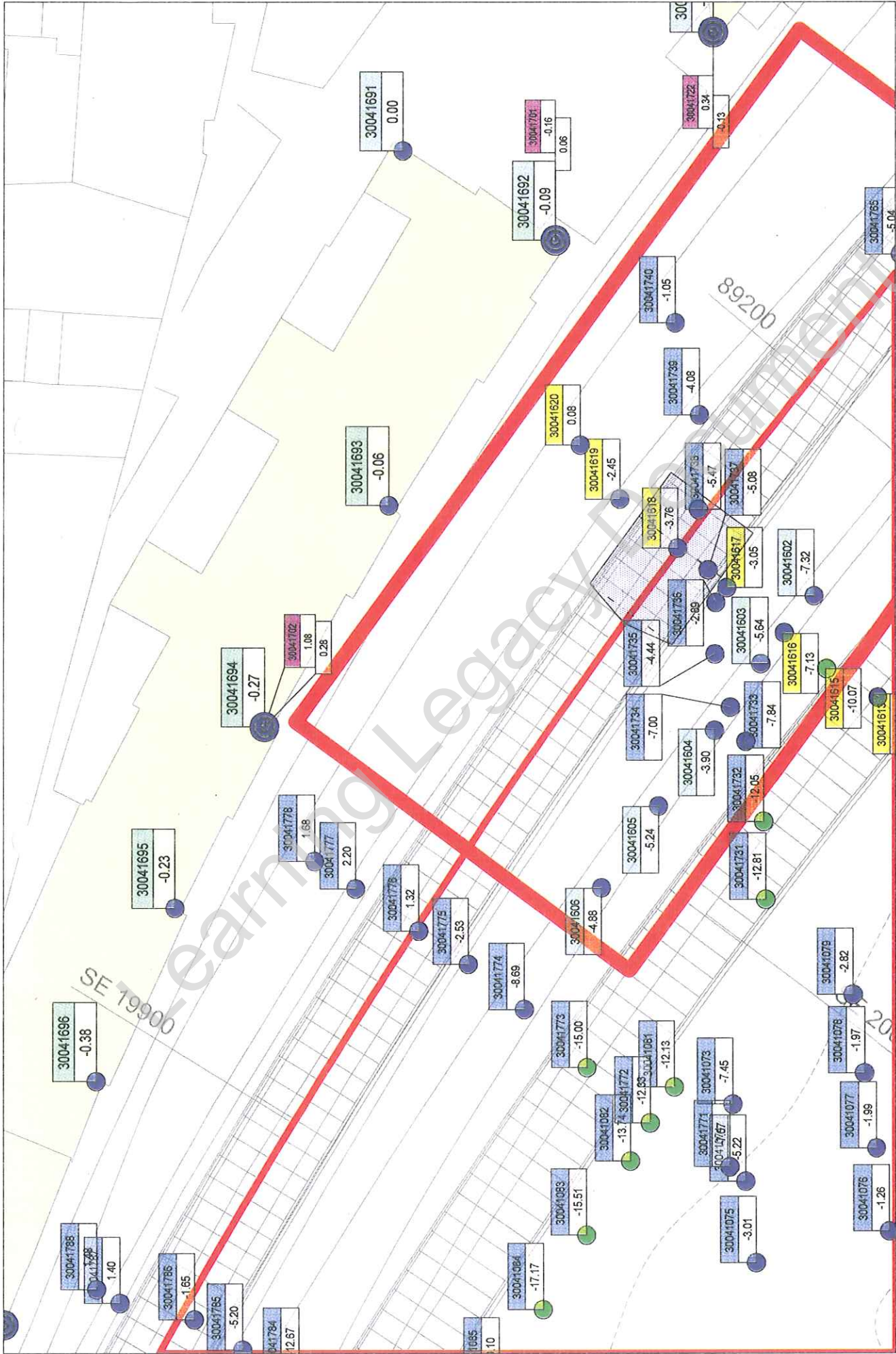


Point: 30041697



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: WB Tunnel - Siding Apartments 17-74 - 17.10.2013 - 21.11.2014
Date: 20.01.2015 13:02 Current Values: 20.01.2015 12:52



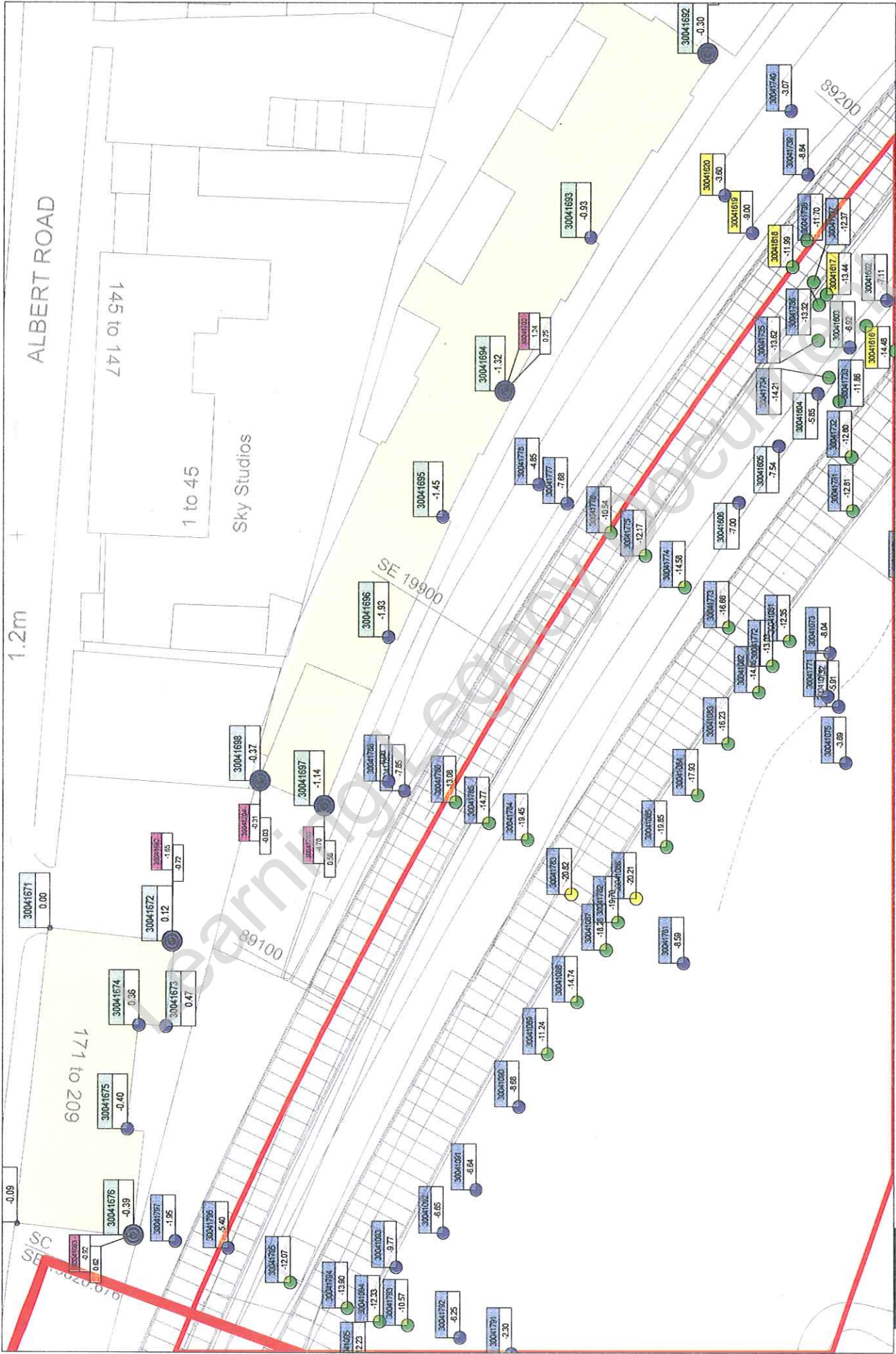


Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal

Working activities: EB TBM Tunneldrive

current values: 23.04.2014 14:59





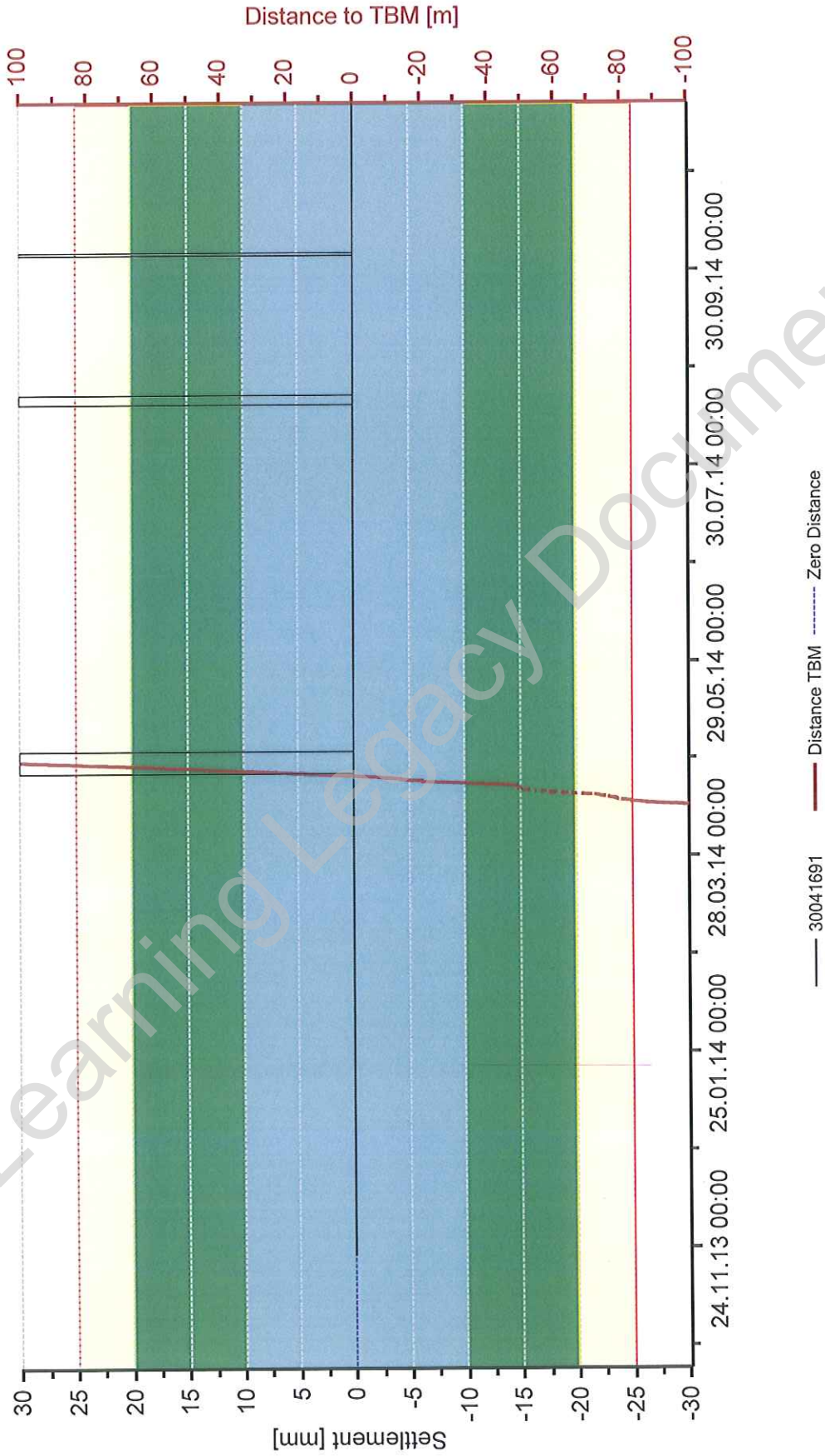
Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal

Working activities: EB TBM Tunneldrive

current values: 30.04.2014 17:59



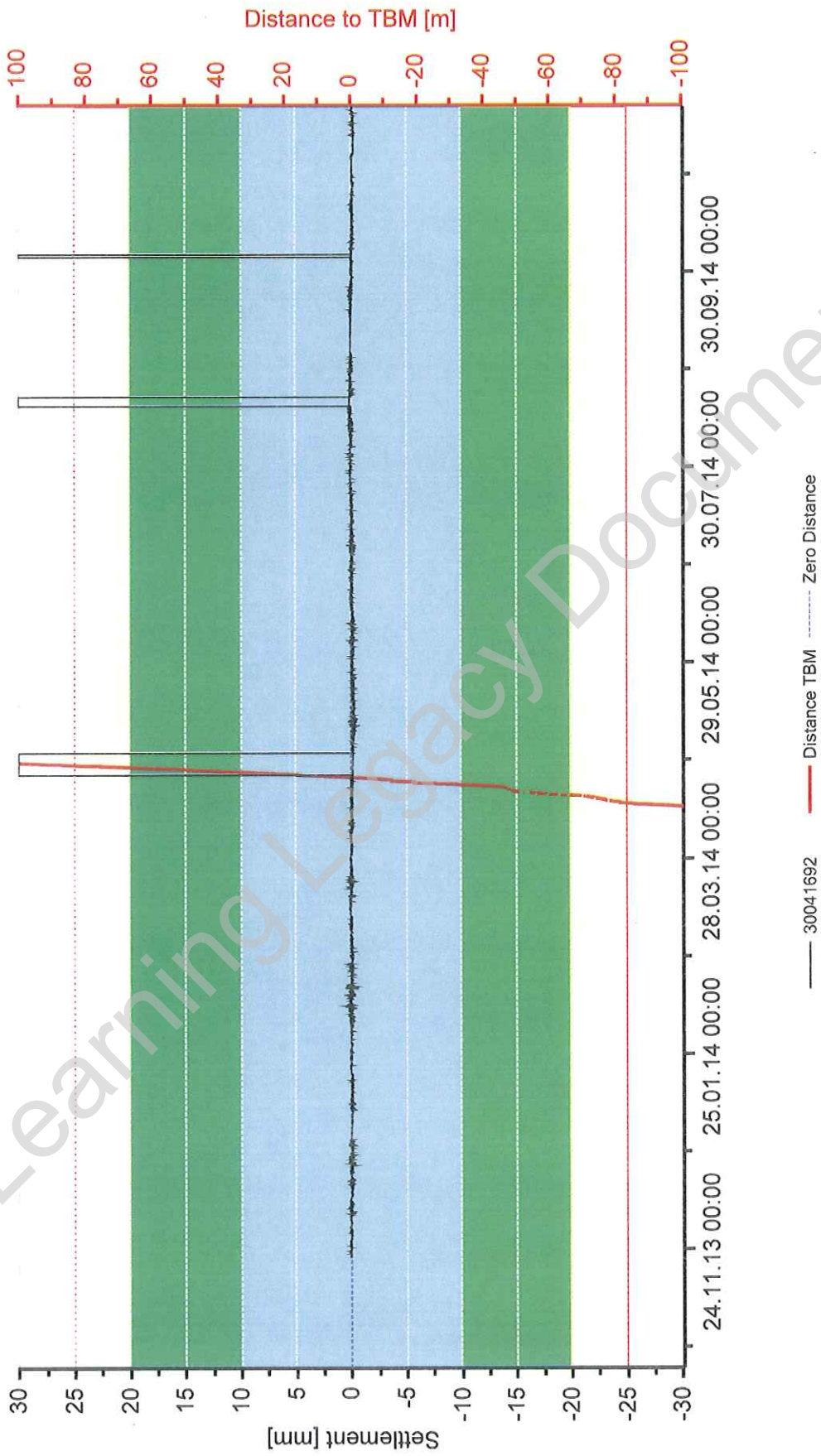
Profile: Measurement Point 30041691



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 Close Out Report: EB Tunnel - Siding Appartments - 17.10.2013 - 21.11.2014
 date: 14.04.2015 15:53 current values: 14.04.2015 14:05



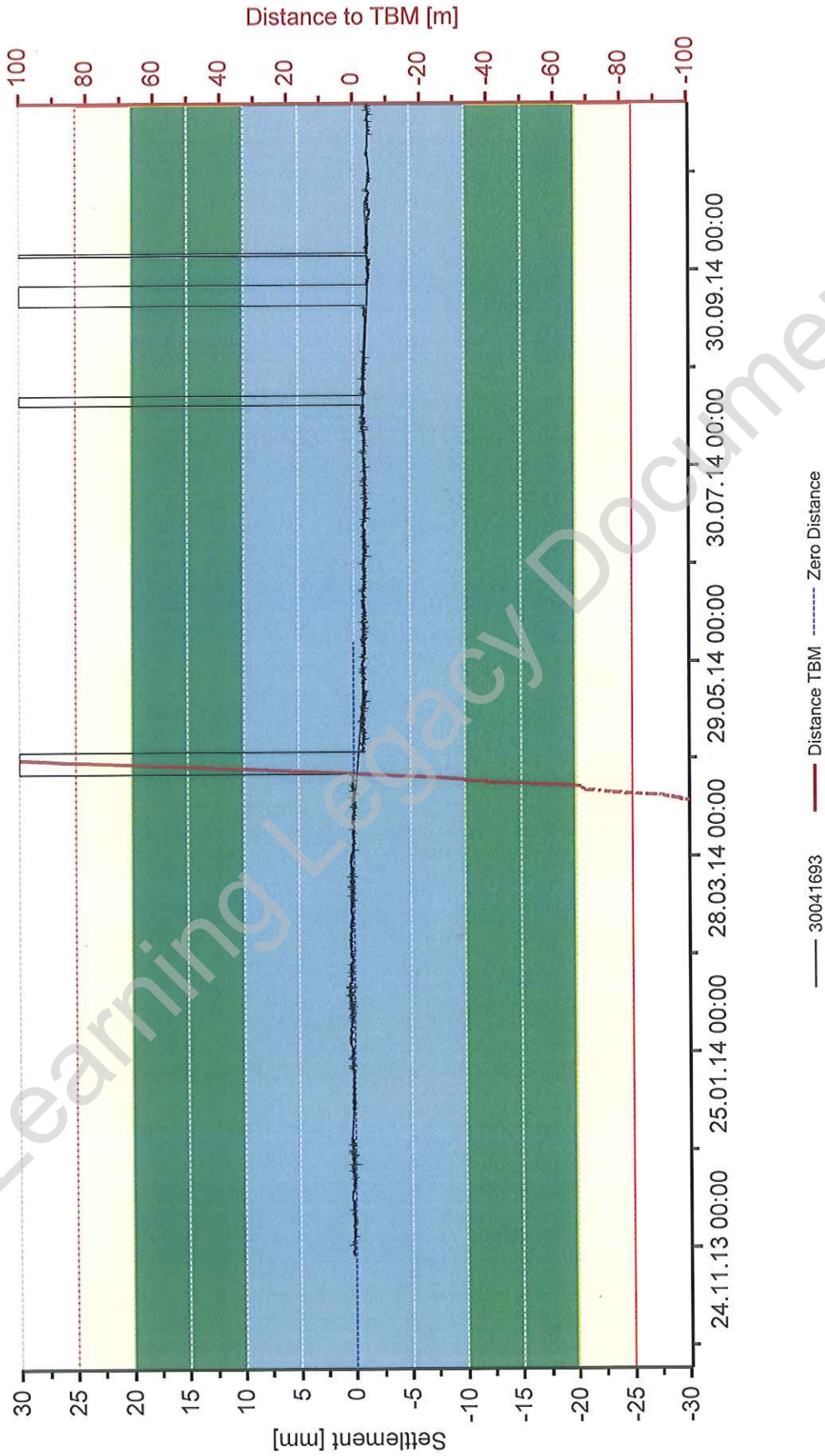
Point: 30041692



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: EB Tunnel - Siding Apartments - 17.10.2013 - 21.11.2014
date: 20.01.2015 16:47 current values: 20.01.2015 13:28



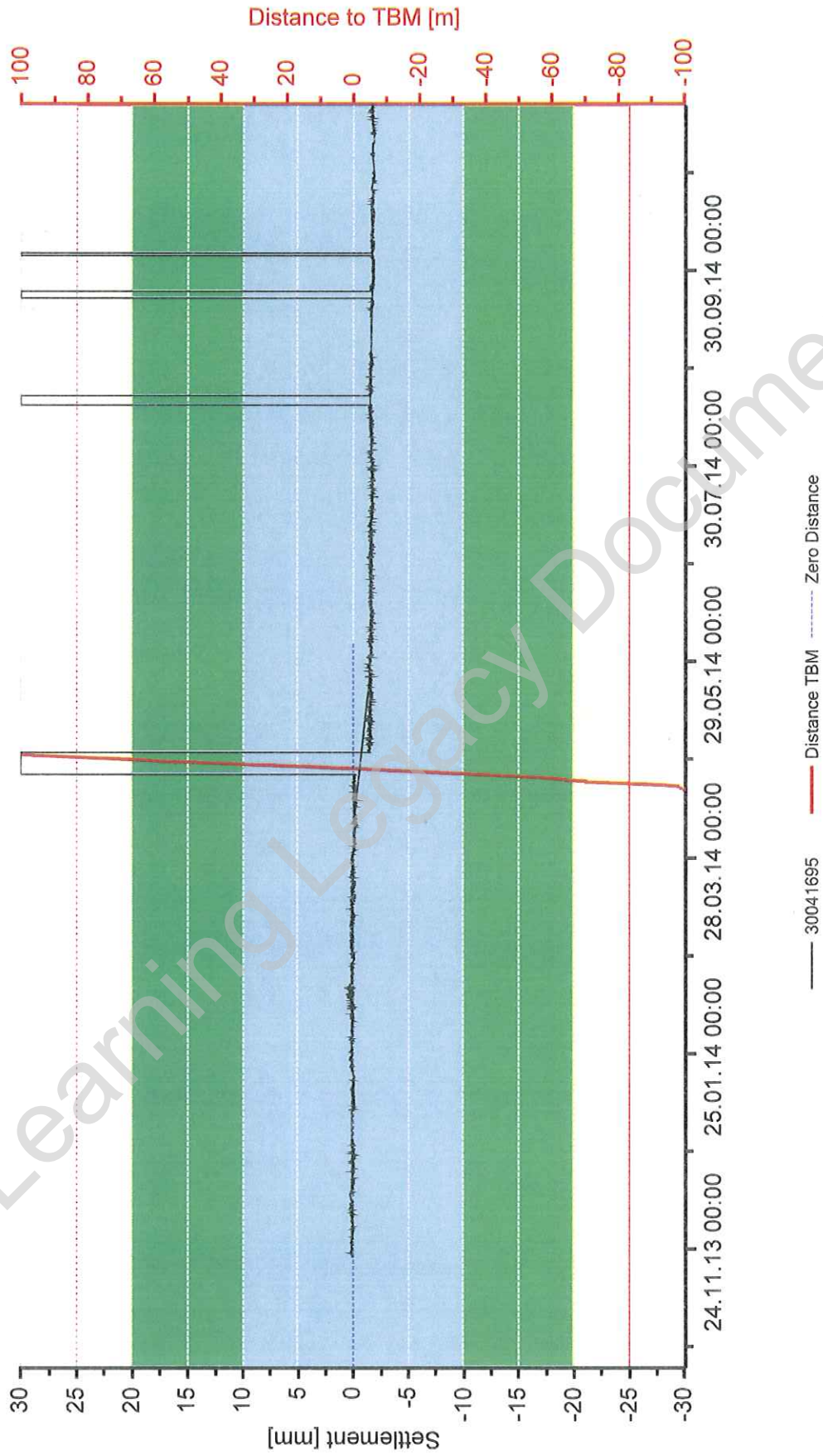
Profile: Measurement Point 30041693



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 Close Out Report: EB Tunnel - Siding Appartments - 17.10.2013 - 21.11.2014
 date: 14.04.2015 15:55 current values: 14.04.2015 14:05



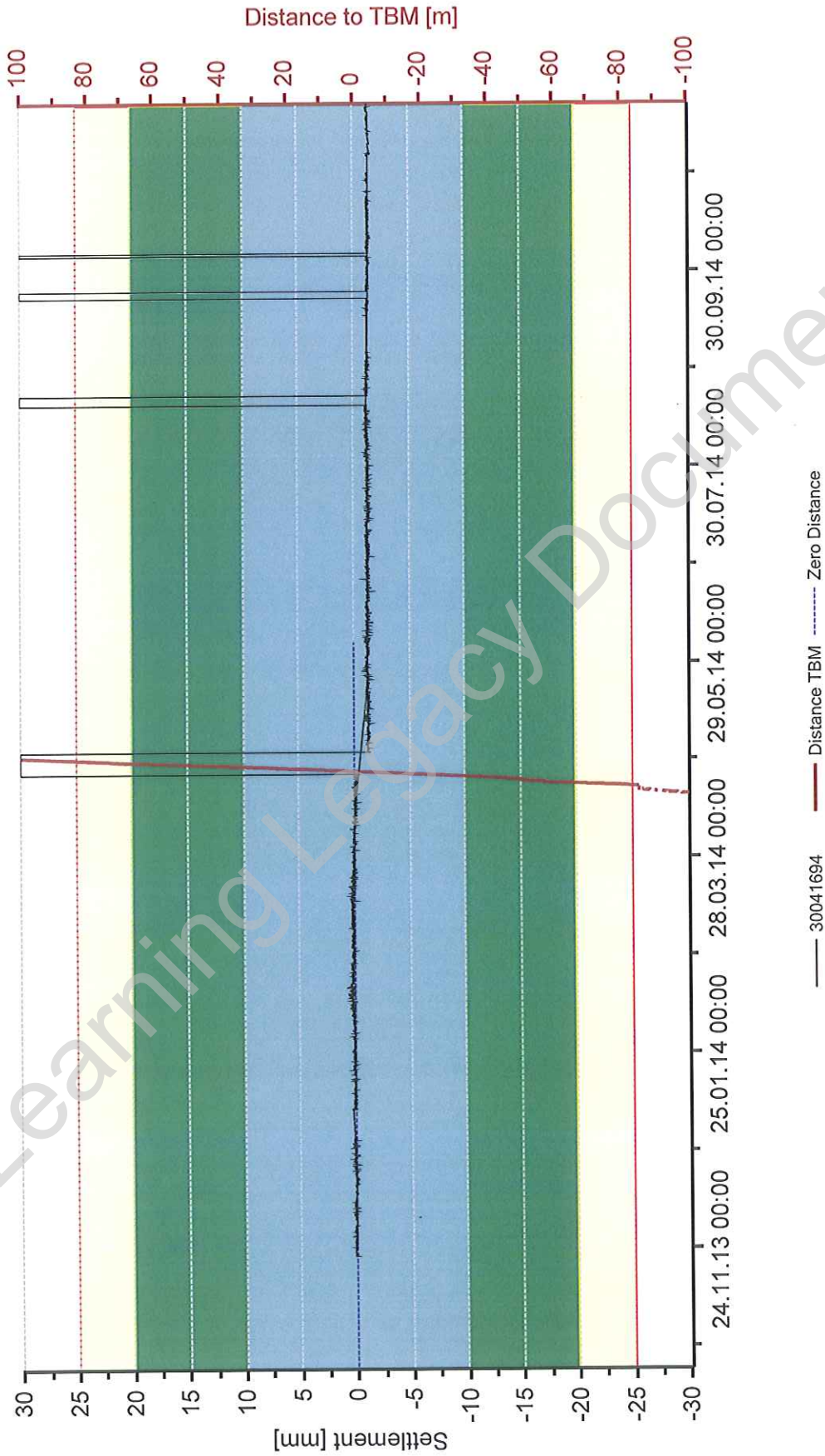
Point: 30041695



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: EB Tunnel - Siding Apartments - 17.10.2013 - 21.11.2014
date: 20.01.2015 16:45 current values: 20.01.2015 13:28



Profile: Measurement Point 30041694



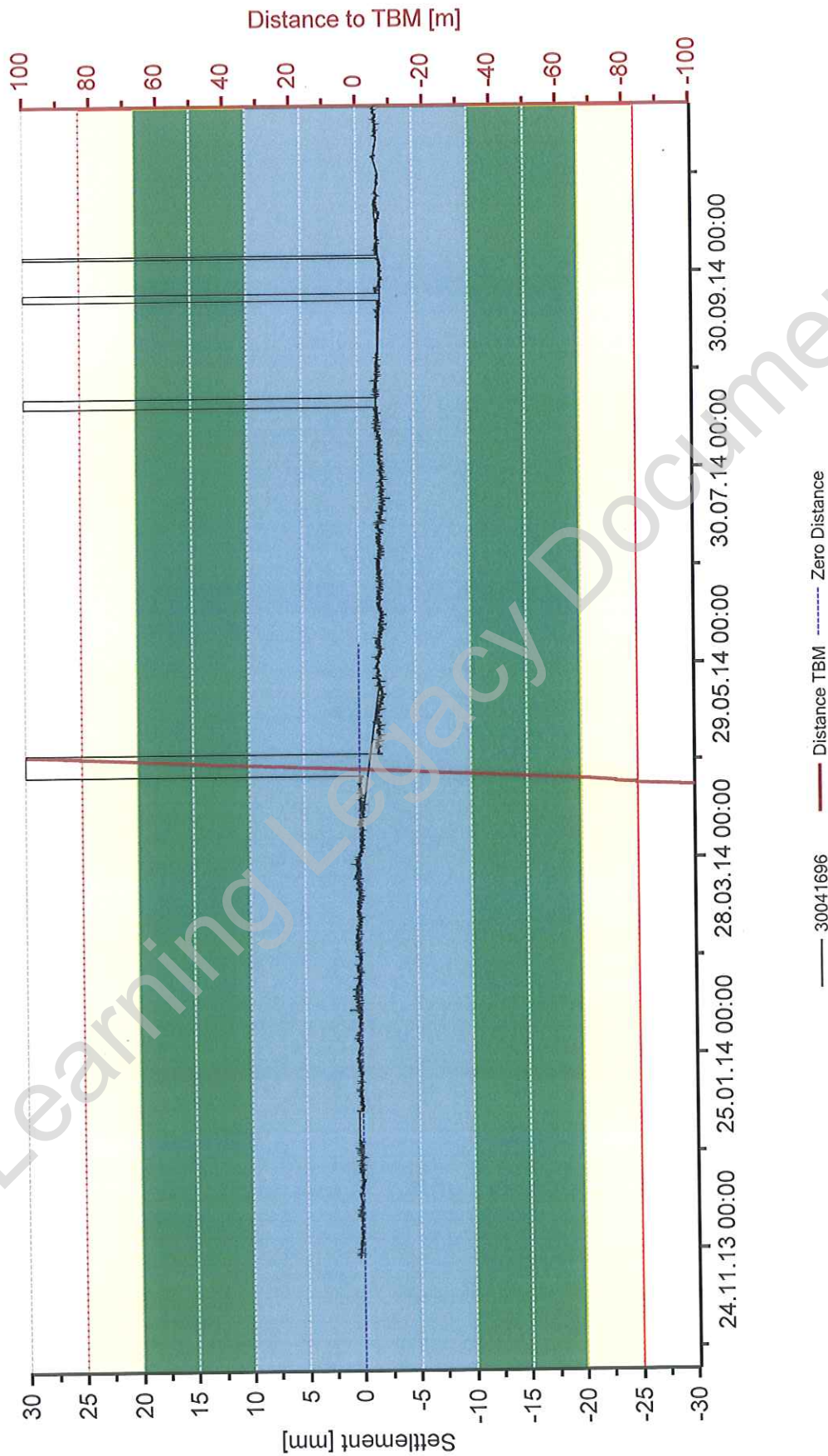
Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal

Close Out Report: EB Tunnel - Siding Appartments - 17.10.2013 - 21.11.2014

date: 14.04.2015 15:59 current values: 14.04.2015 14:05

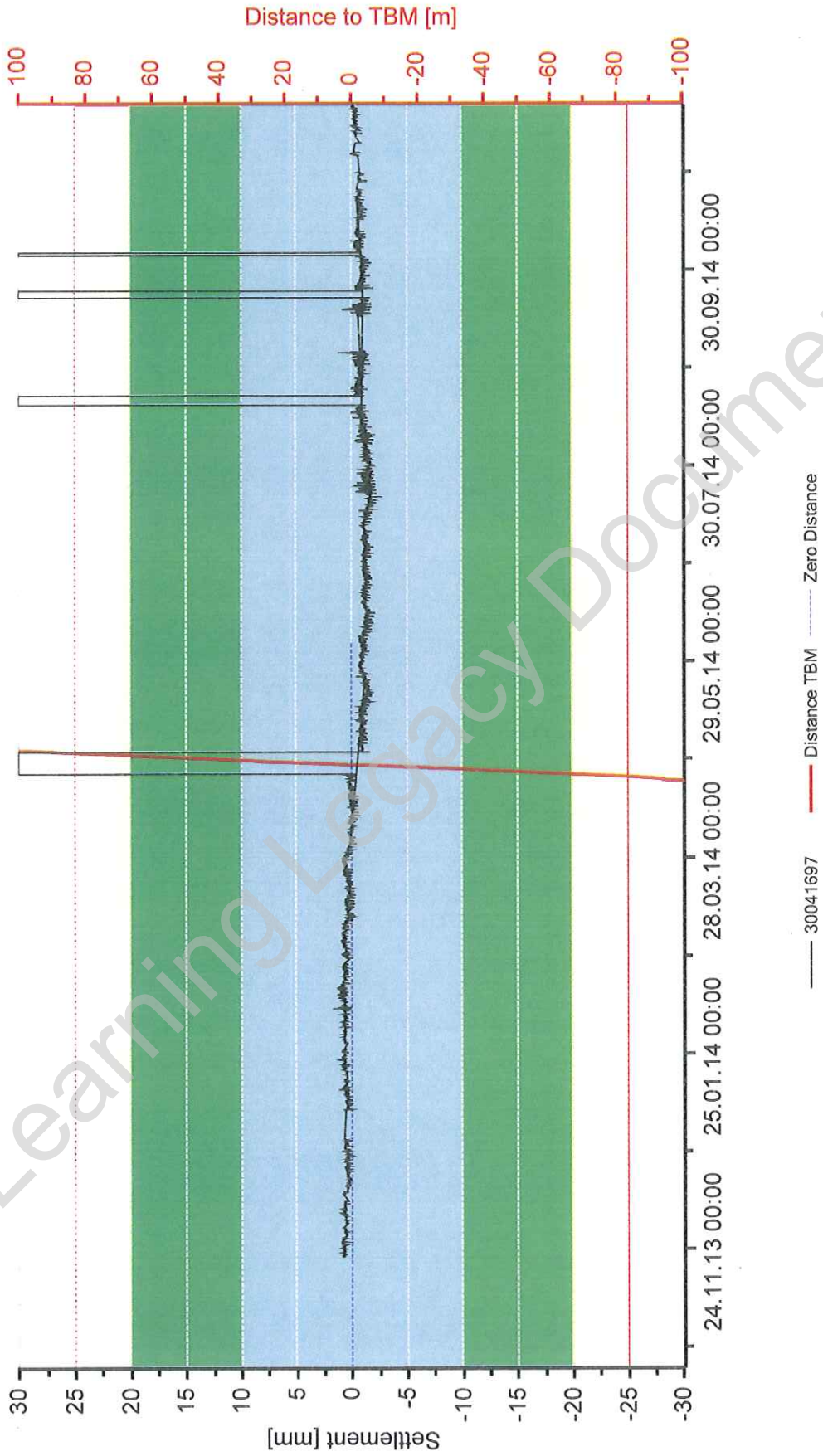


Profile: Measurement Point 30041696



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 Close Out Report: EB Tunnel - Siding Appartments - 17.10.2013 - 21.11.2014
 date: 14.04.2015 16:08 current values: 14.04.2015 14:05

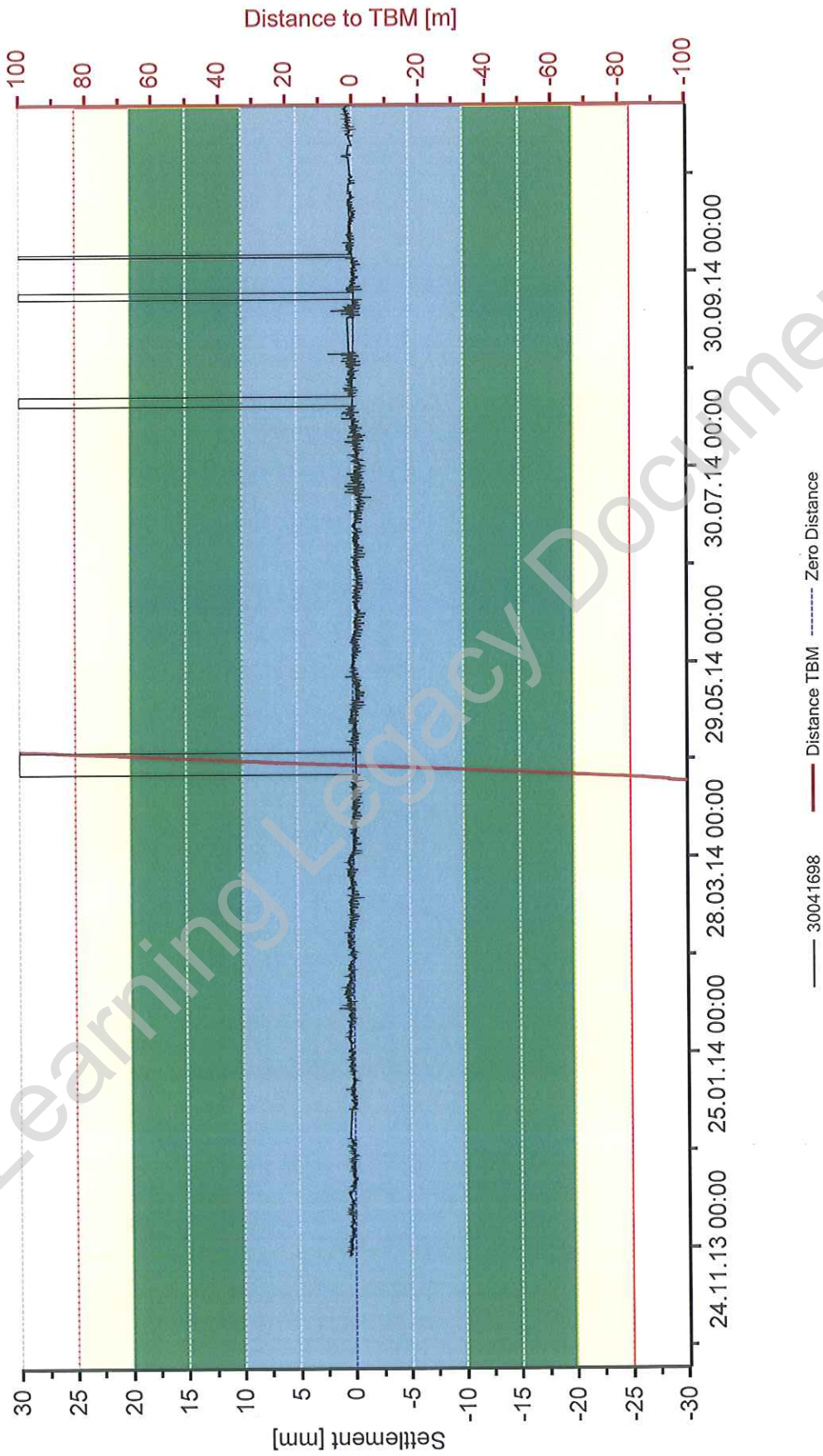
Point: 30041697



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: EB Tunnel - Siding Apartments - 17.10.2013 - 21.11.2014
date: 20.01.2015 16:43 current values: 20.01.2015 13:28



Profile: Measurement Point 30041698



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal

Close Out Report: EB Tunnel - Siding Appartments - 17.10.2013 - 21.11.2014

date: 14.04.2015 16:13 current values: 14.04.2015 14:05



 HOCHTIEF MURPHY Joint Venture		C310 THAMES TUNNEL REPORT			
EMPLOYER	CROSSRAIL	eB NO	C310-HTM-C-RGN-CR148-50024	Rev	2.0
TITLE	Monitoring Close-Out Reports relating to Tunnelling Works North Embankment River Thames - North Woolwich Portal (excl. Store Rd)				

APPENDIX 88

Siding Apartments 17-74 – TM

Learning Legacy Document

monitoring asset

Building Siding Apartments 17-74

reference monitoring drawing:

C310-HTM-C-DWG-CR146-ST004-70003

name of monitoring section:

Siding Apartments 17-74

sensor type:

tiltmeter

chainage:

89220-89120

point no.:

3004 1701 - 3004 1705

trigger values:
[mm]

green: N/A

amber: N/A

red: N/A

reference document for trigger values:

Management Plan for Control of Ground Movement

EB-no.:

C310-HTM-Z-STP-CR148-50058

Appendix:

AAA

monitoring data

	date	max. value	point no.	comments
baseline	21/11/13	0.00		
TBM 1	start ZOI	20/12/13	0.52	3004 1701
		20/12/13	0.72	3004 1702
		09/01/14	0.05	3004 1703
	end ZOI	09/01/14	0.66	3004 1701
		14/01/14	0.75	3004 1702
		14/01/14	0.05	3004 1703
TBM 2	start ZOI	20/04/14	-0.07	3004 1701
		23/04/14	1.08	3004 1702
		23/04/14	-4.57	3004 1703
	end ZOI	30/04/14	-0.30	3004 1701
		30/04/14	1.24	3004 1702
		30/04/14	-4.7	3004 1703
longterm	18/11/14	0.95	3004 1701	breached not any trigger value
		-3.50	3004 1702	
		-3.16	3004 1703	
Evaluation of any potential residual risks	<input checked="" type="checkbox"/>	No residual risk since the Works have been completed by HMJV		
	<input type="checkbox"/>	Yes, residual risk (see comment below)		

summary / comments

Under consideration of temperature differences and the achievable accuracy of the system, HMJV has no concern to cease the monitoring.

The rate of change in the monitoring data is less than the required standards as per the specifications and drawings.

No trigger values for tilt specified.

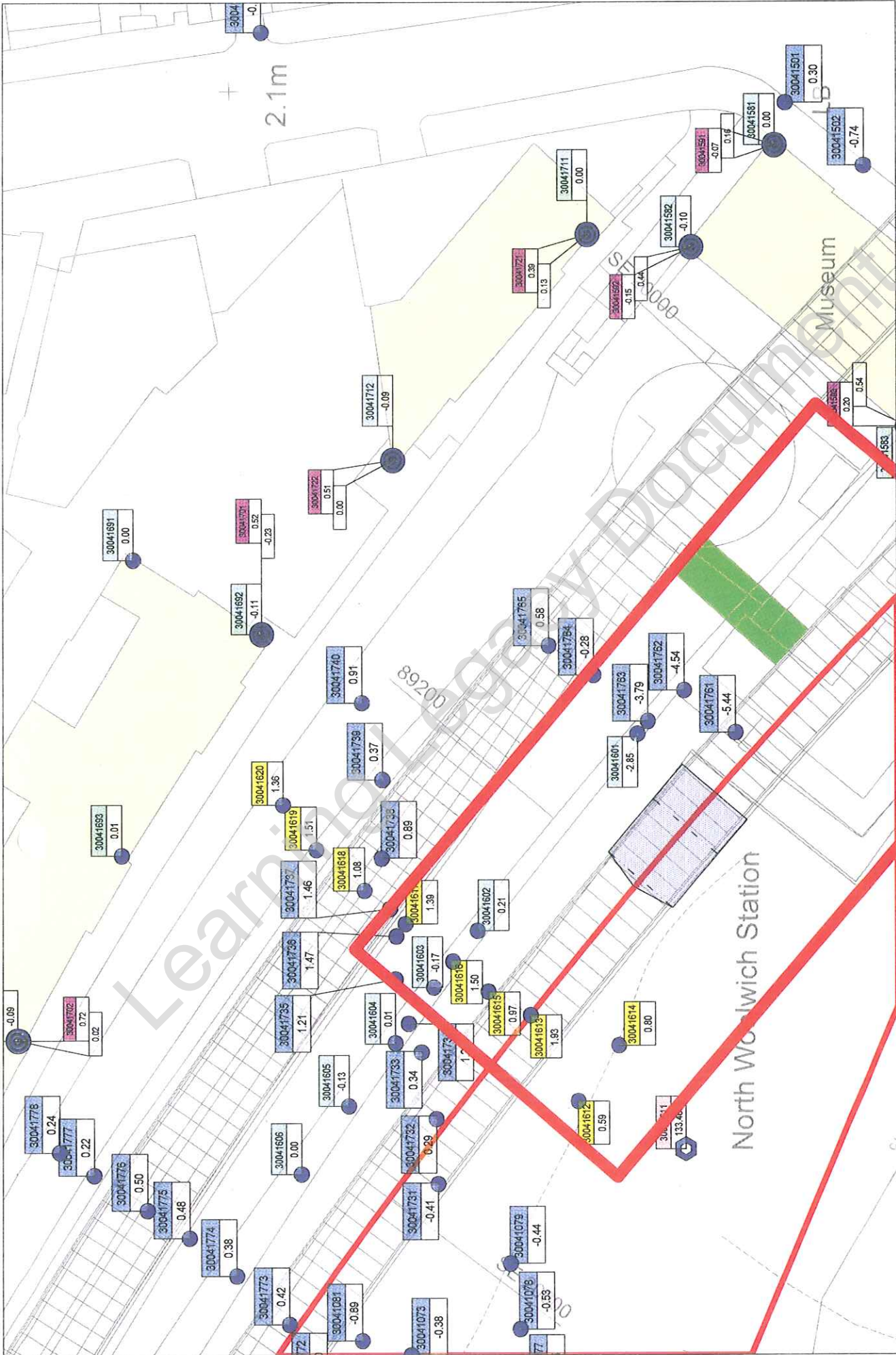
date / signature:

14/04/15

print name:

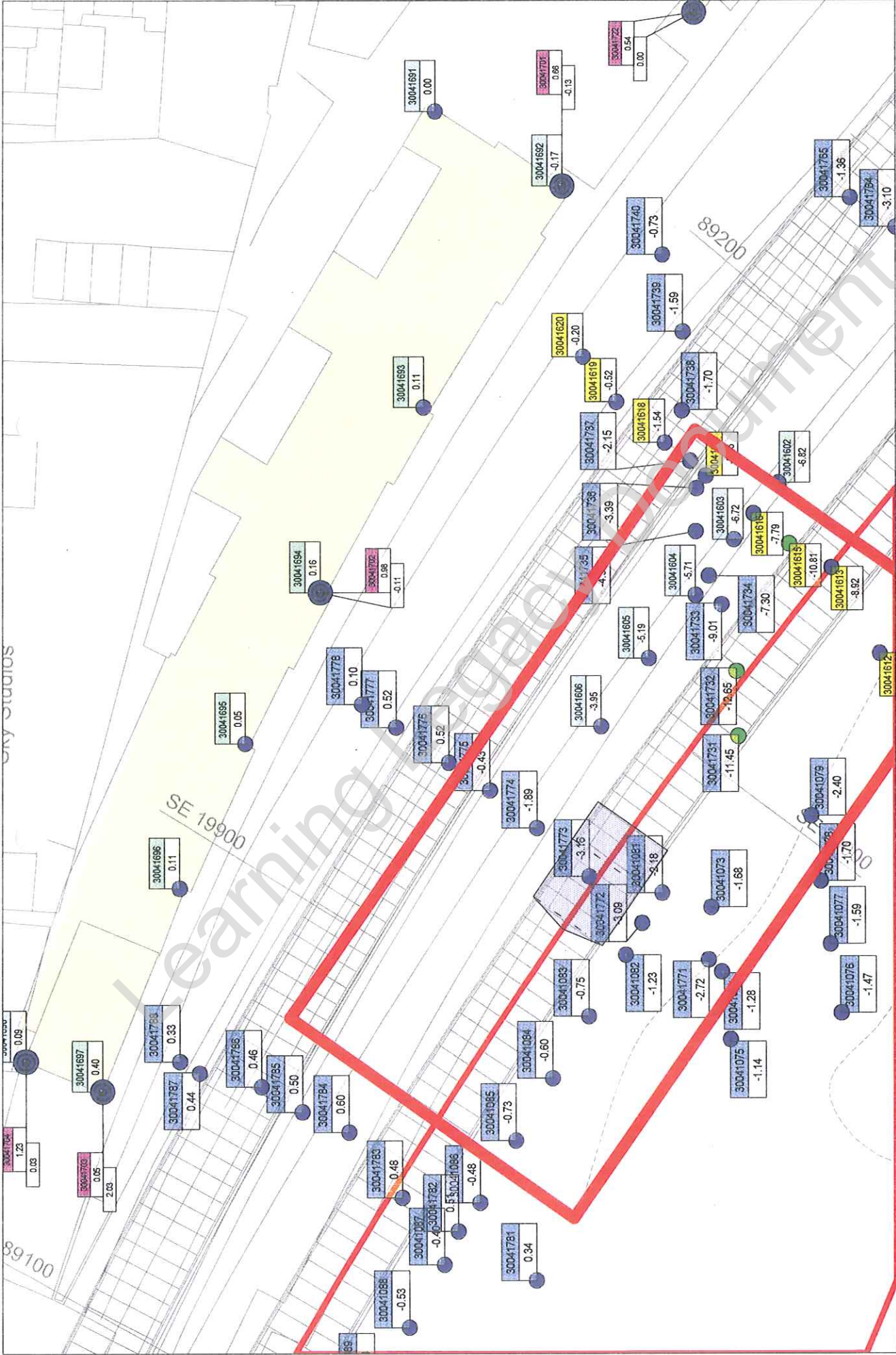
HMJV project role:

Monitoring & Survey Engineer



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: WB TBM Tunneldrive
 Date: 20.12.2013 17:57



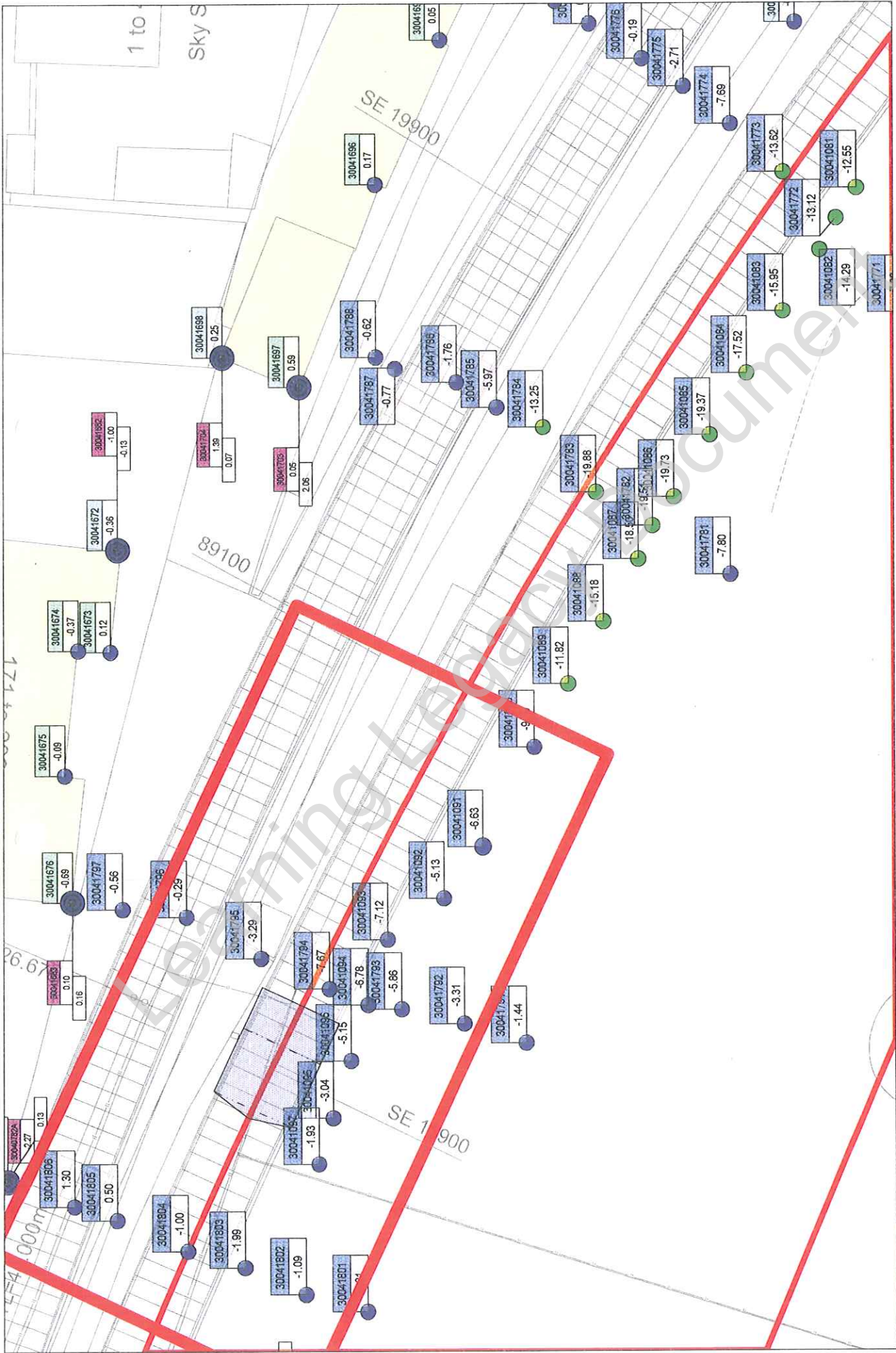


Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal

working activities: WB TBM Tunneldrive

Date: 09.01.2014 17:59





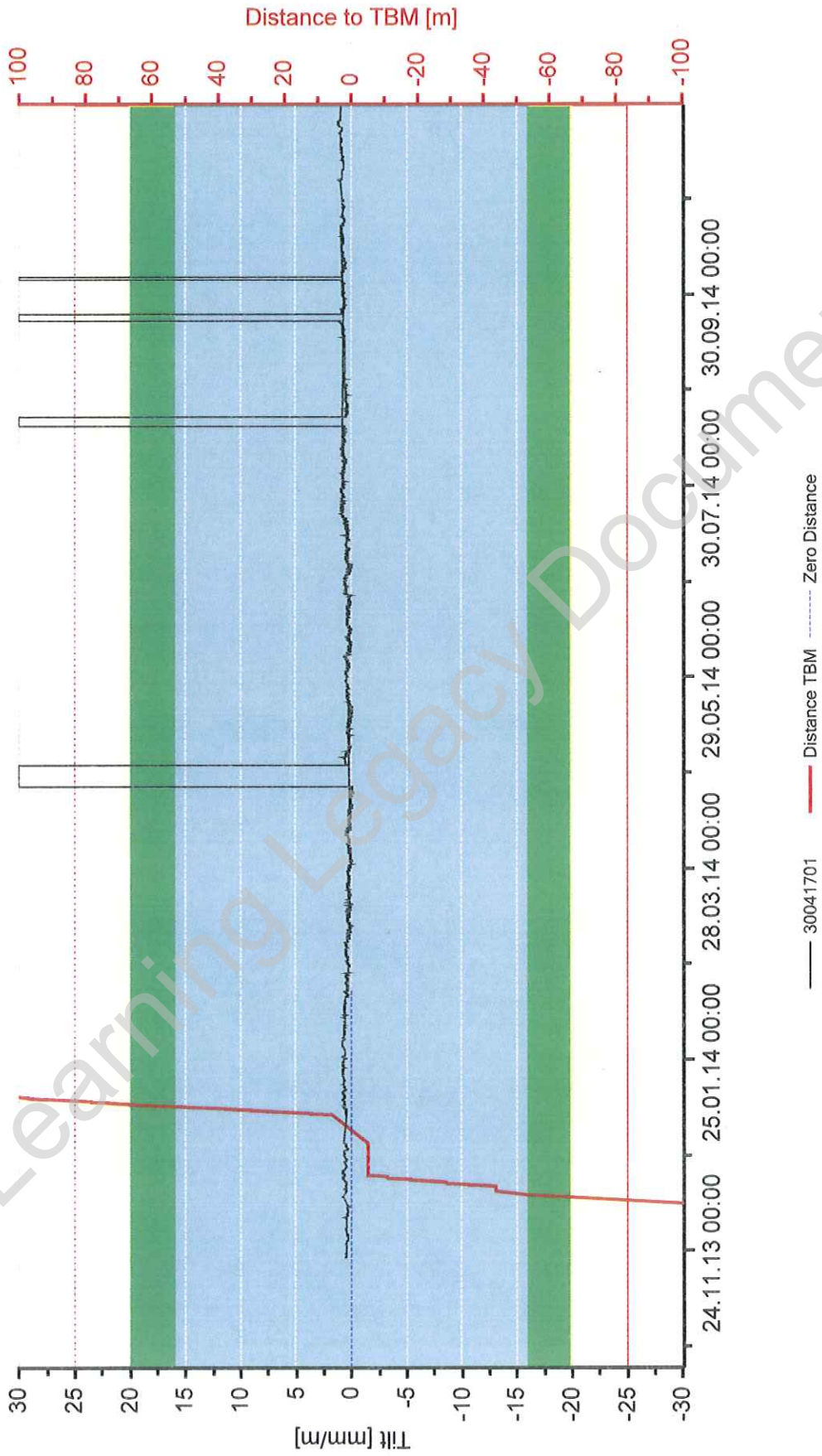
Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal

working activities: WB TBM Tunneldrive

Date: 14.01.2014 17:57



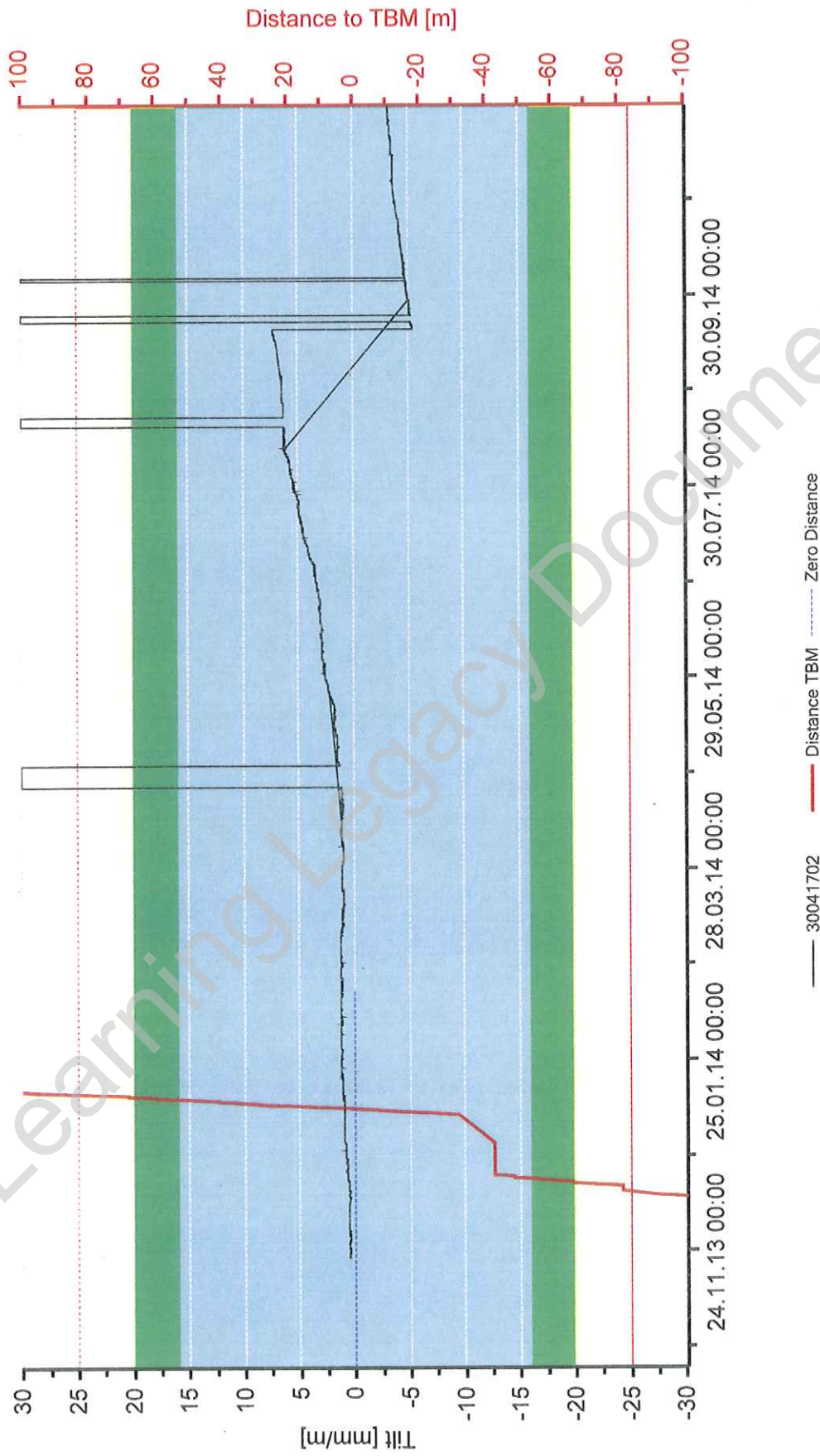
Point: 30041701



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: WB Tunnel - Siding Apartments 17-74 - 17.10.2013 - 21.11.2014
Date: 20.01.2015 13:04 Current Values: 20.01.2015 12:52



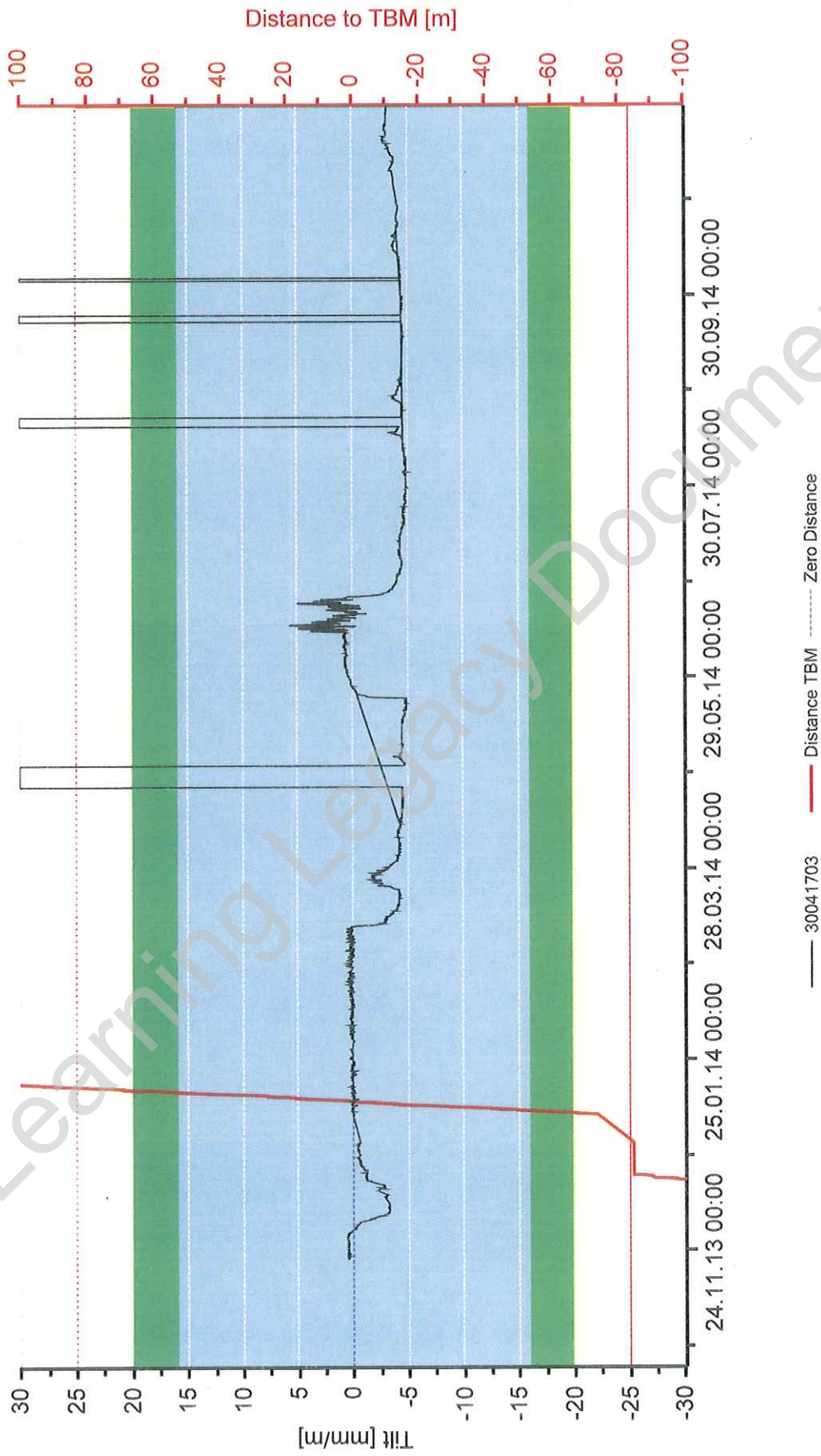
Point: 30041702



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: WB Tunnel - Siding Apartments 17-74 - 17.10.2013 - 21.11.2014
Date: 20.01.2015 13:06 Current Values: 20.01.2015 12:52

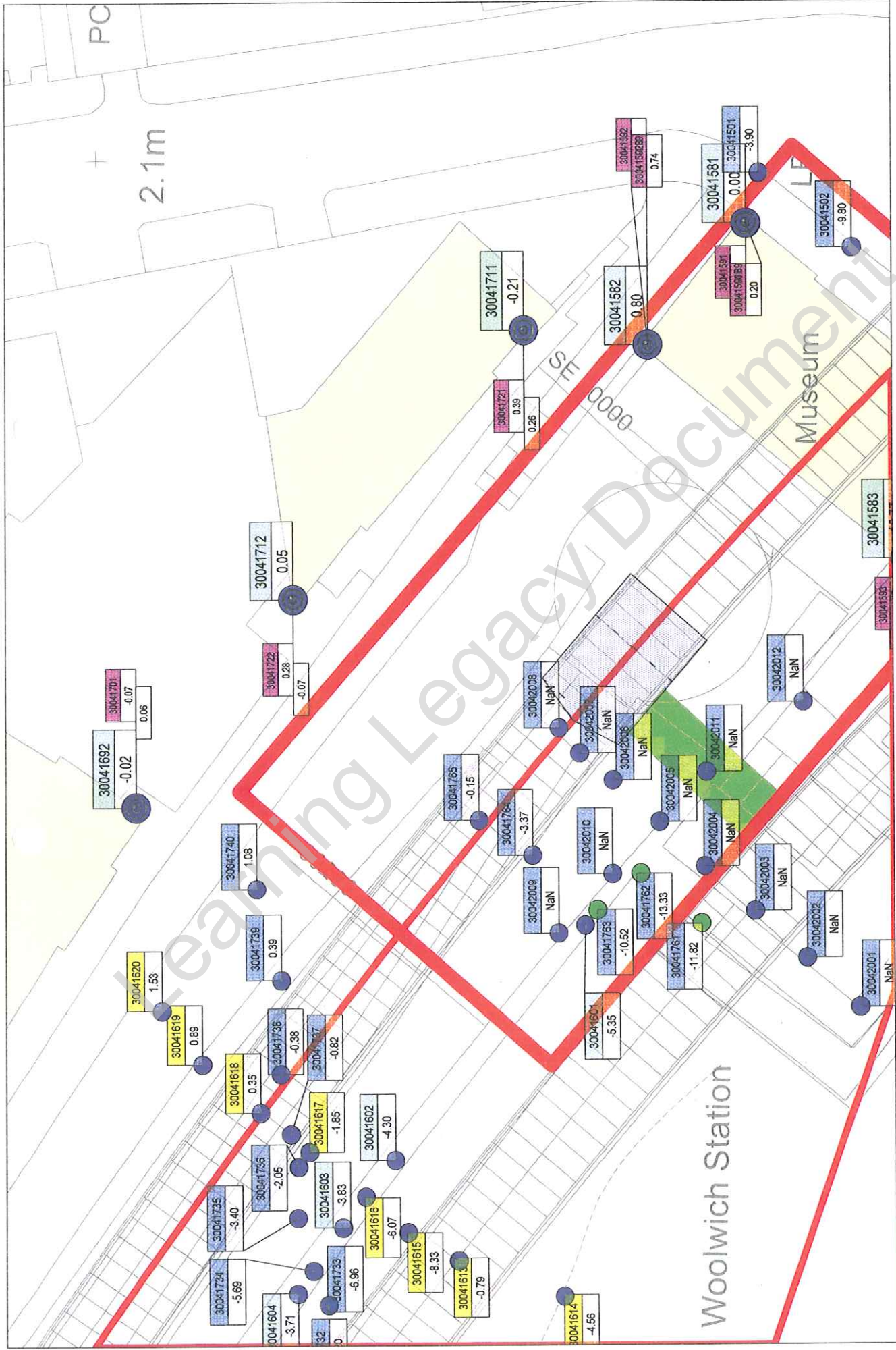


Point: 30041703



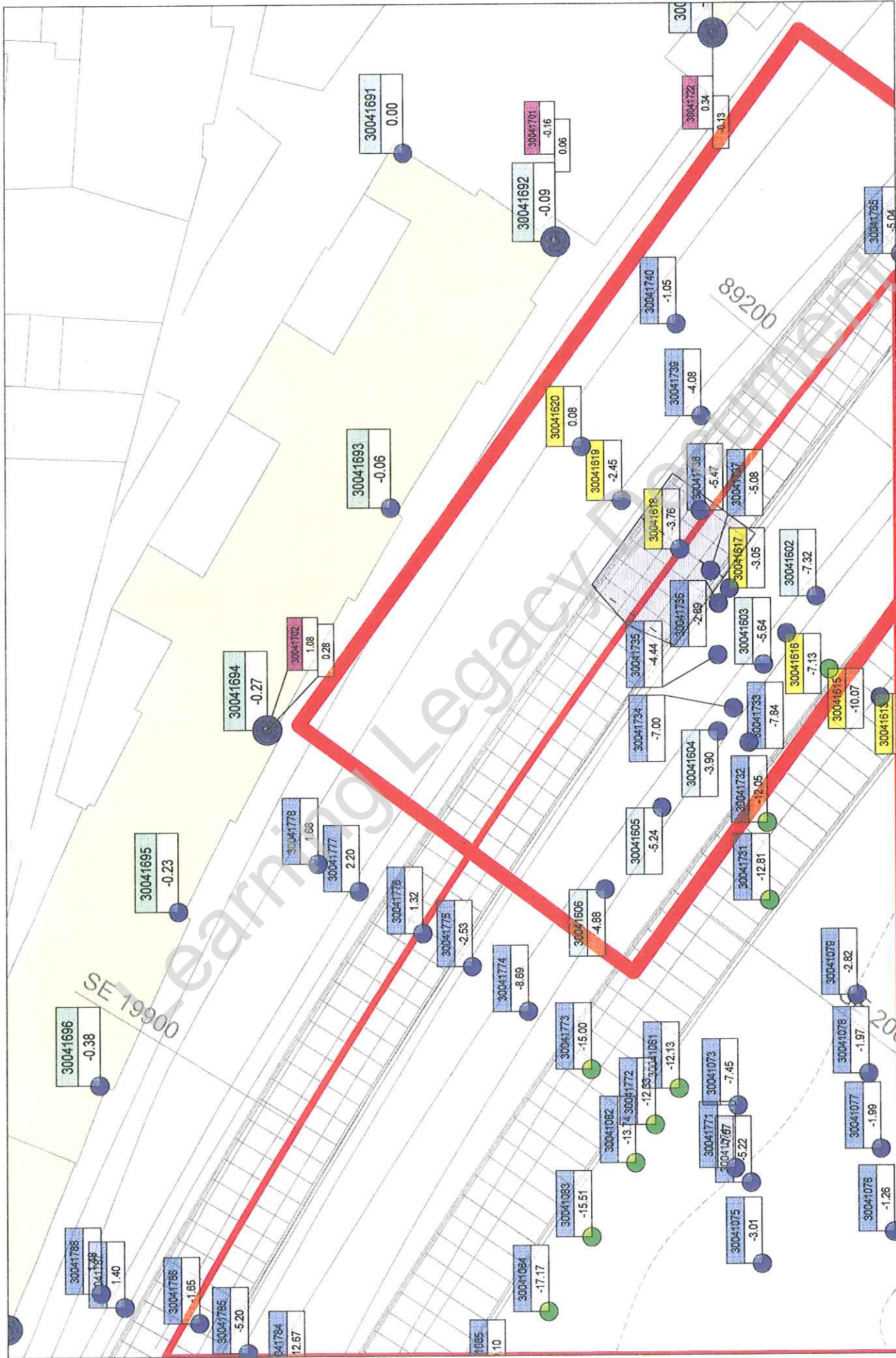
Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: WB Tunnel - Siding Apartments 17-74 - 17.10.2013 - 21.11.2014
Date: 20.01.2015 13:09 Current Values: 20.01.2015 12:52





Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 Working activities: EB TBM Tunneldrive
 current values: 20.04.2014 17:59



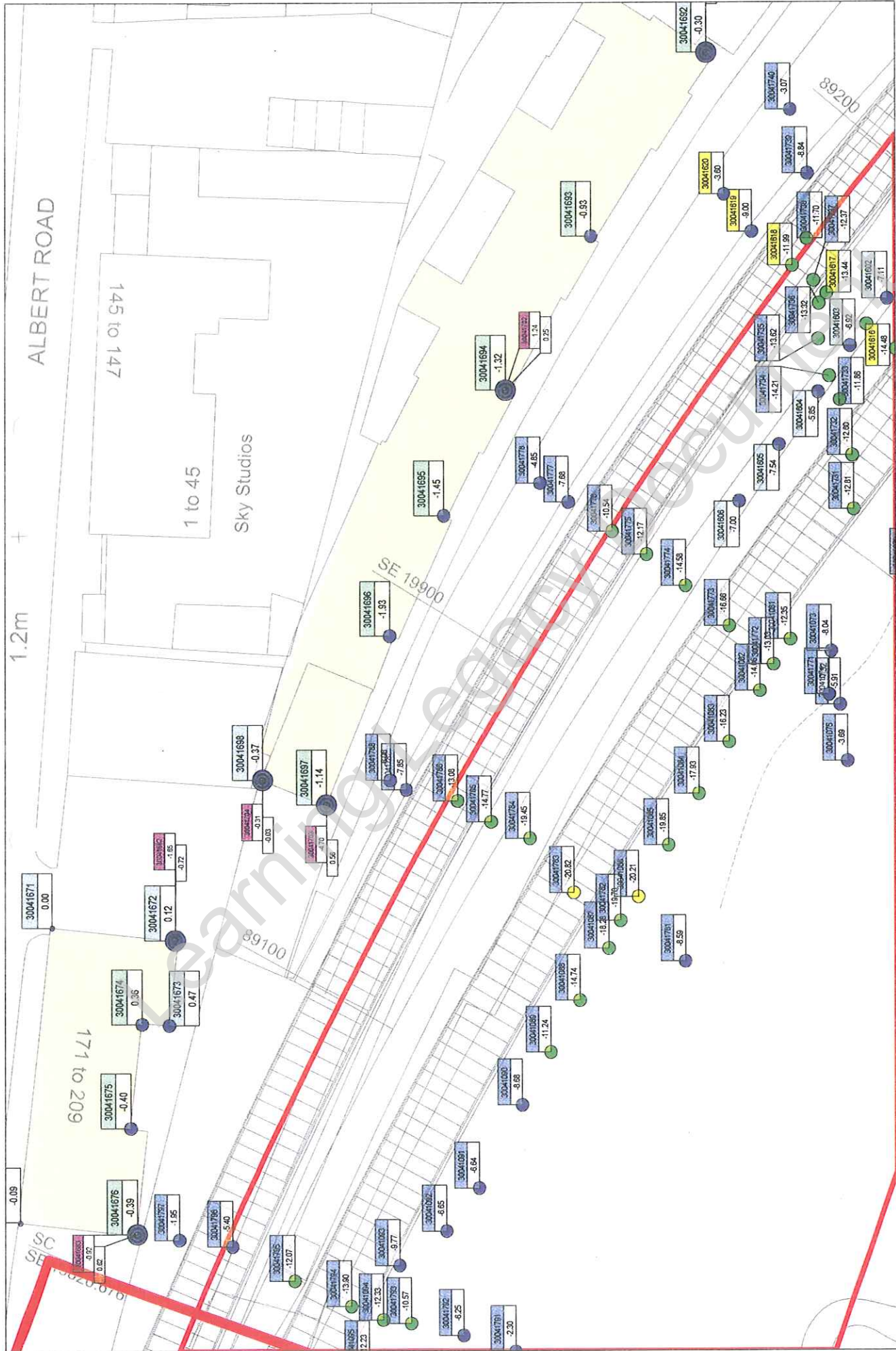


Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal

Working activities: EB TBM Tunneldrive

current values: 23.04.2014 14:59





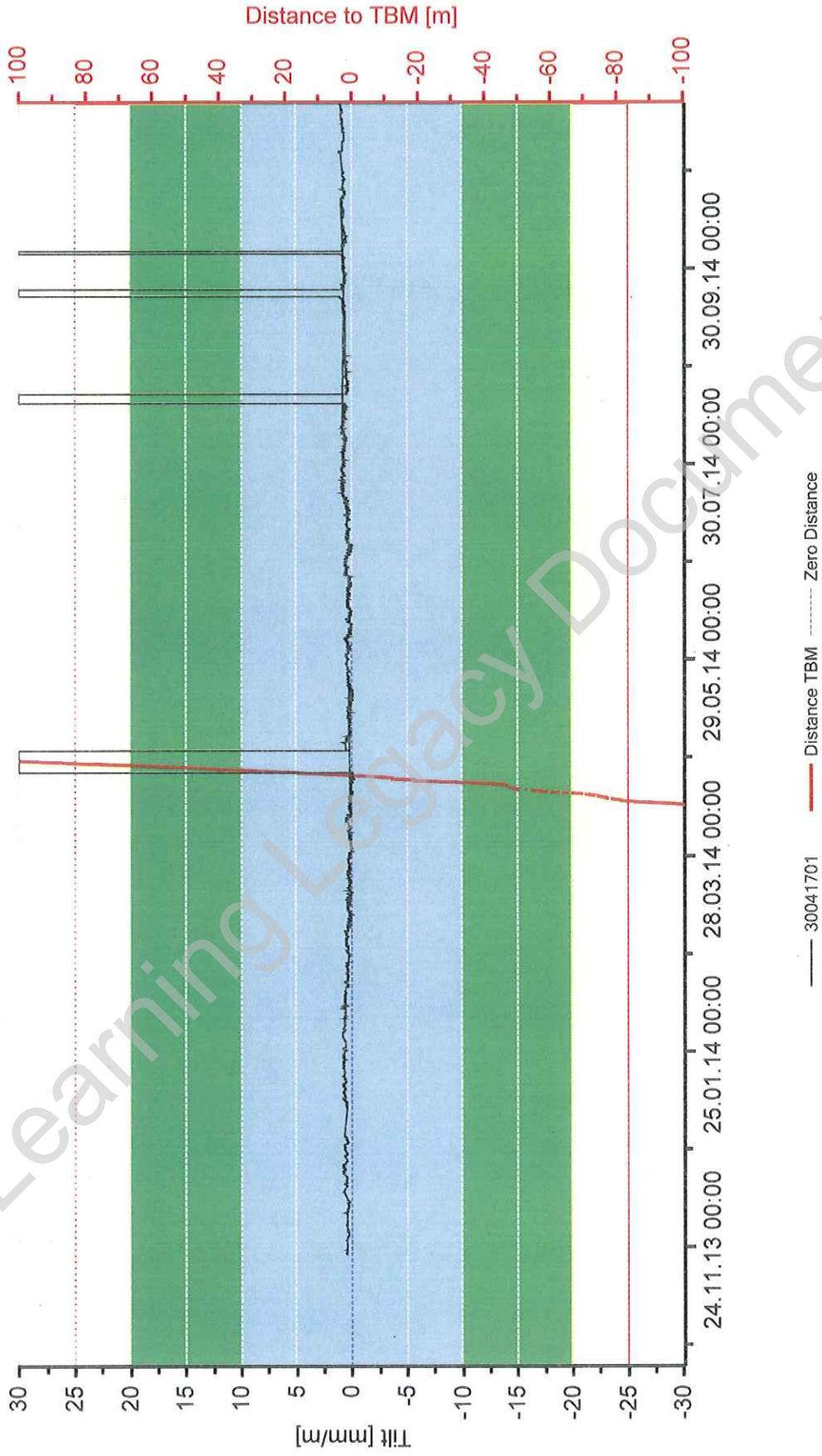
Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal

Working activities: EB TBM Tunneldrive

current values: 30.04.2014 17:59



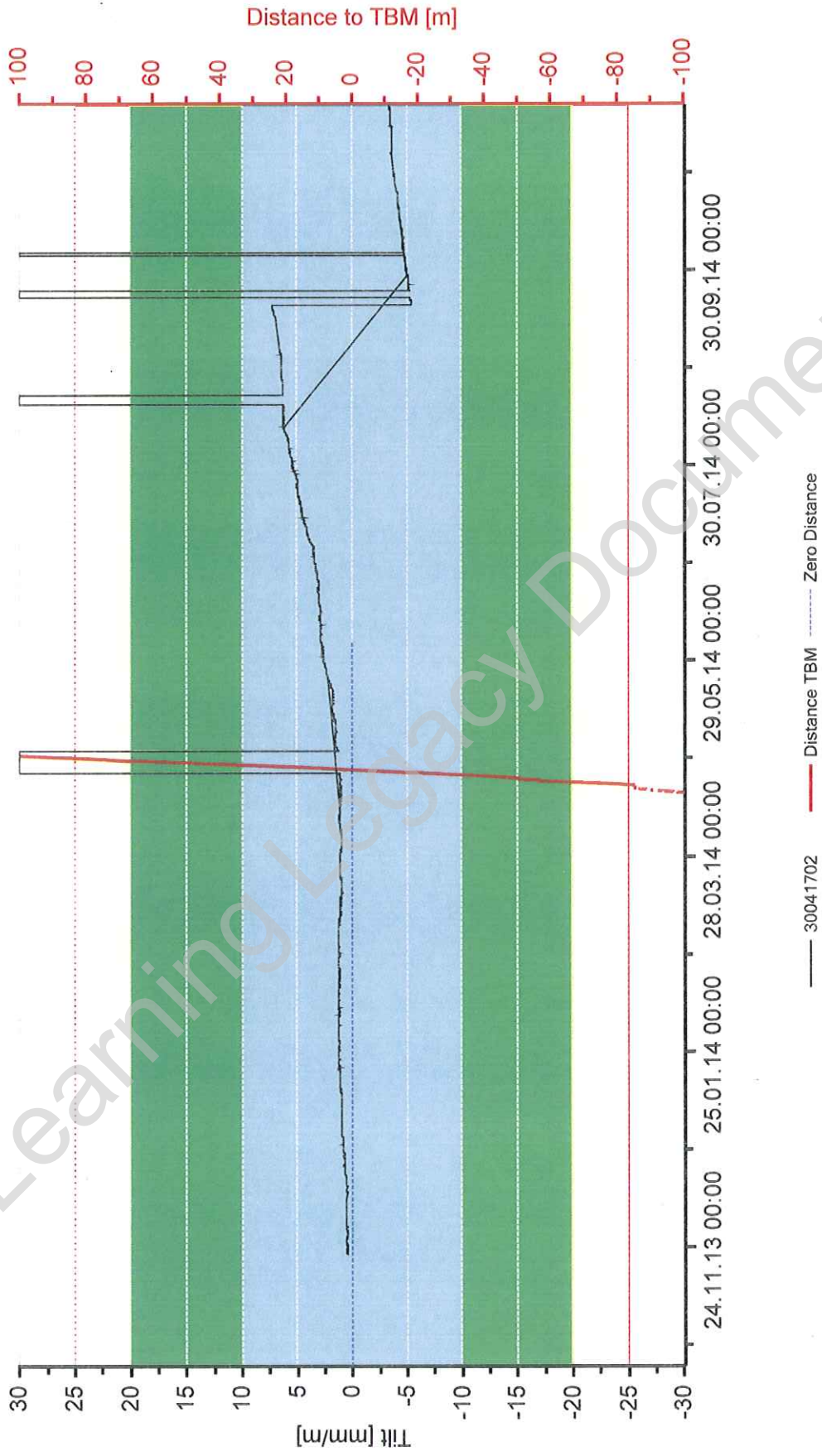
Point: 30041701



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: EB Tunnel - Siding Apartments - 17.10.2013 - 21.11.2014
date: 20.01.2015 16:52 current values: 20.01.2015 13:28



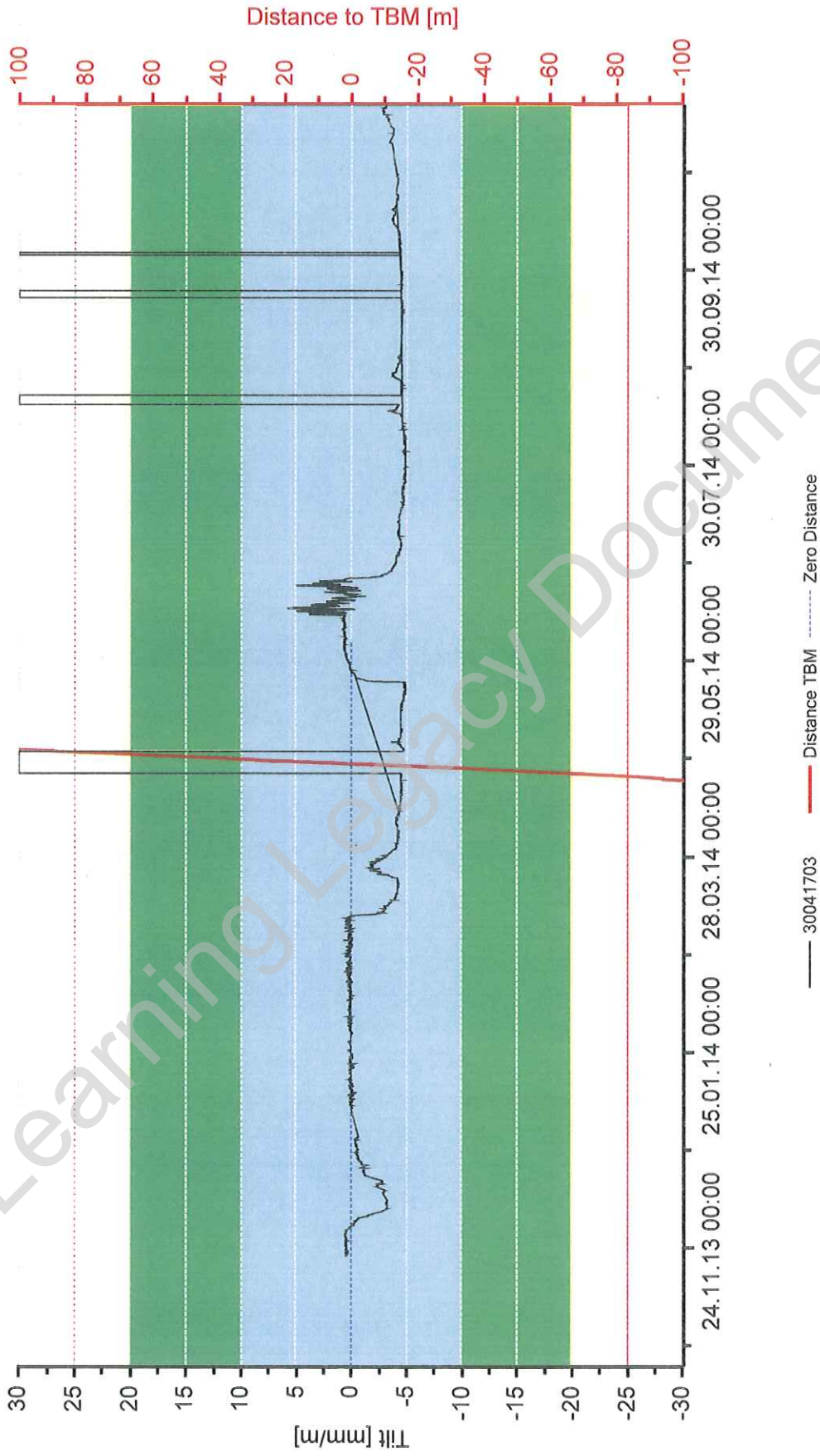
Point: 30041702



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: EB Tunnel - Siding Apartments - 17.10.2013 - 21.11.2014
date: 20.01.2015 16:50 current values: 20.01.2015 13:28



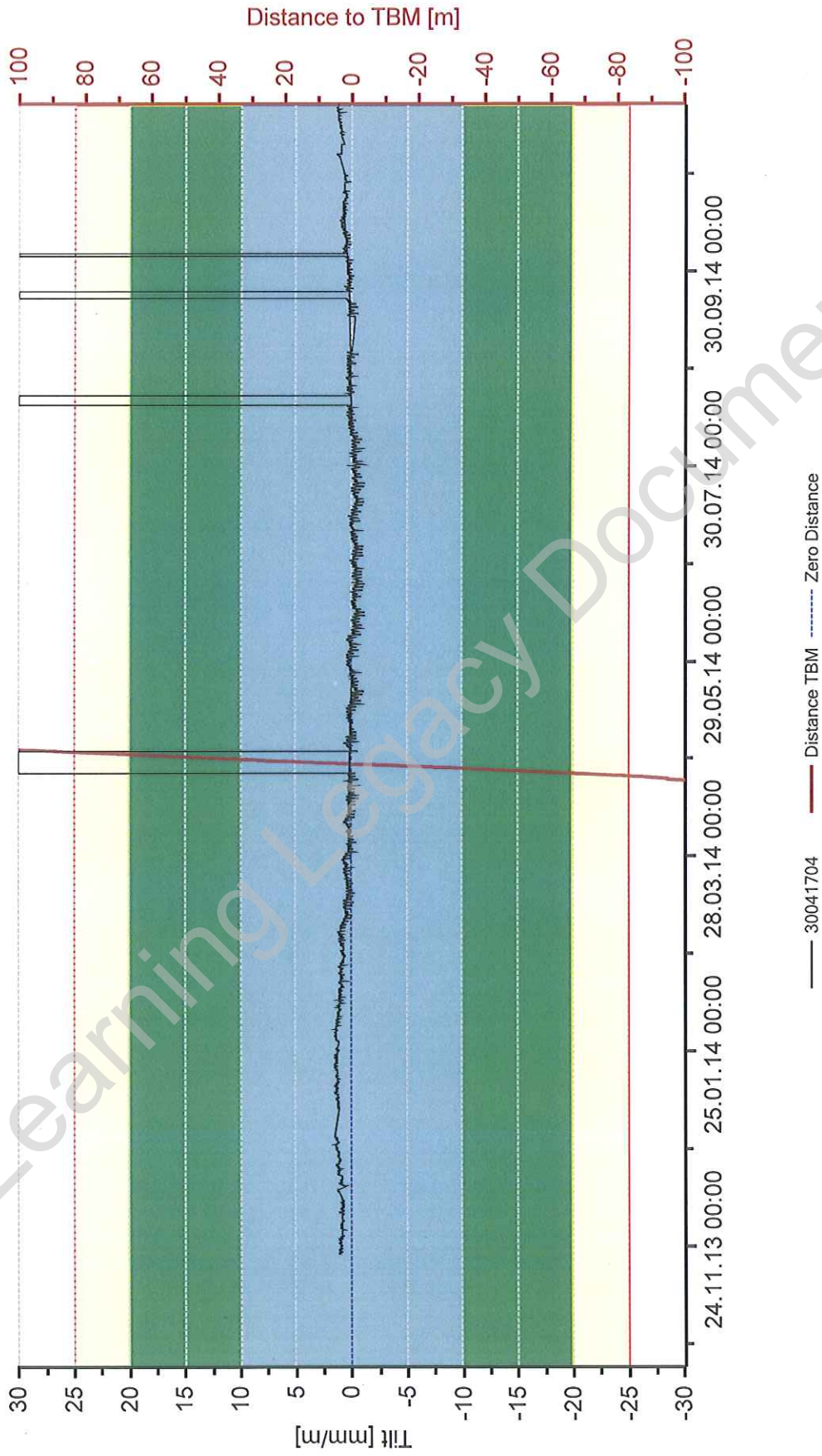
Point: 30041703



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: EB Tunnel - Siding Apartments - 17.10.2013 - 21.11.2014
date: 20.01.2015 16:48 current values: 20.01.2015 13:28




Profile: Measurement Point 30041704



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 Close Out Report: EB Tunnel - Siding Appartments - 17.10.2013 - 21.11.2014
 date: 14.04.2015 16:16 current values: 14.04.2015 14:05



 HOCHTIEF MURPHY Joint Venture		C310 THAMES TUNNEL REPORT			
EMPLOYER	CROSSRAIL	eB NO	C310-HTM-C-RGN-CR148-50024	Rev	2.0
TITLE	Monitoring Close-Out Reports relating to Tunnelling Works North Embankment River Thames - North Woolwich Portal (excl. Store Rd)				

APPENDIX 89

Albert Road Building 171-209 – HLC

Learning Legacy Document

monitoring asset

Building Albert Road 171-209

reference monitoring drawing:

C310-HTM-C-DWG-CR146-ST004-70003

name of monitoring section:

Building Albert Road 171-209

sensor type:

hydrostatic levelling cell (hlc)

chainage:

89100-89070

point no.:

3004 1671 - 3004 1677

trigger values:

[mm]

green: +12
-12

amber: +15
-15

red: +18
-18

reference document for trigger values:

Management Plan for Control of Ground Movement

EB-no.:

C310-HTM-Z-STP-CR148-50058

Appendix:

AAA

monitoring data

	date		max. value	point no.	comments
baseline	21/11/13		0.00		
TBM 1	start ZOI	11/01/14	-0.30 -0.73	3004 1672 3004 1676	
	end ZOI	16/01/14	-0.22 -0.97	3004 1672 3004 1676	breached not any trigger value
TBM 2	start ZOI	26/04/14		3004 1672 3004 1676	no values available between 23/04/14-29/04/14
	end ZOI	30/04/14	0.12 -0.39	3004 1672 3004 1676	breached not any trigger value
longterm	18/11/14		-0.80 -1.19	3004 1672 3004 1676	

Evaluation of any potential residual risks



No residual risk

since the Works have been completed by HMJV



Yes, residual risk

(see comment below)

summary / comments

Under consideration of temperature differences and the achievable accuracy of the system, HMJV has no concern to cease the monitoring.
The rate of change in the monitoring data is less than the required standards as per the specifications and drawings.

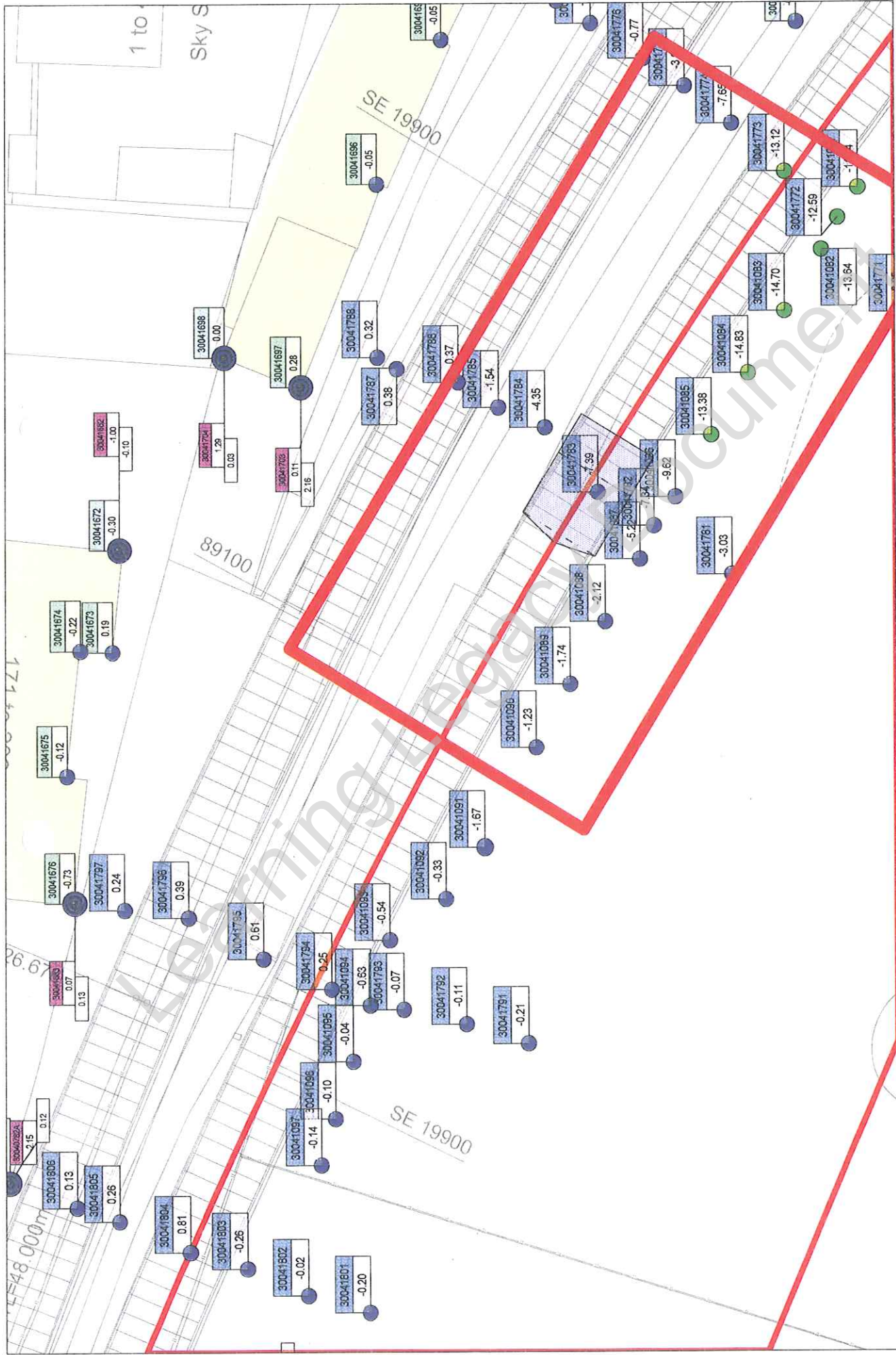
date / signature:

02/02/2015

print name:

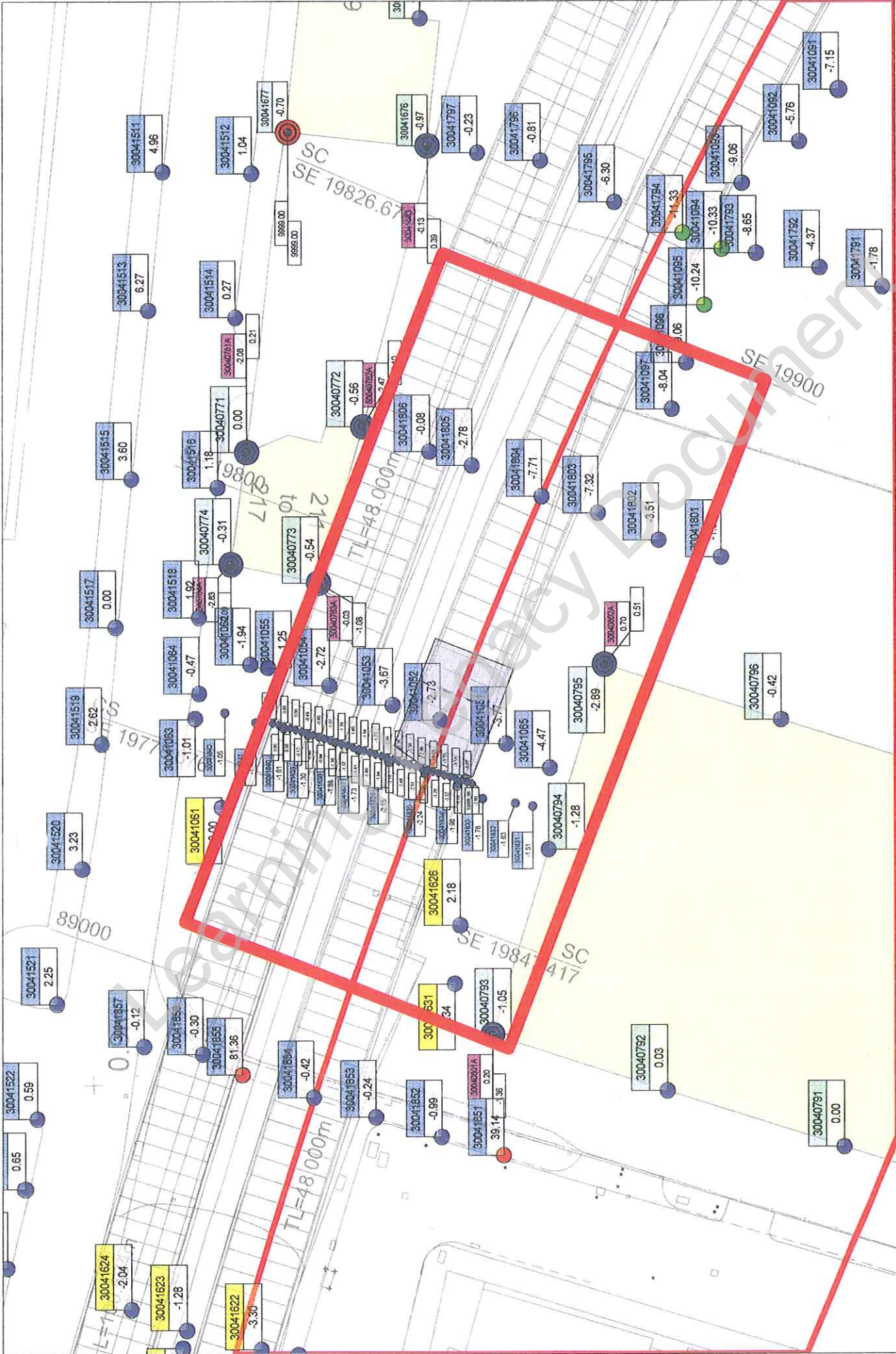
HMJV project role:

Monitoring & Survey Engineer



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
working activities: WB TBM Tunneldrive
Date: 11.01.2014 17:59

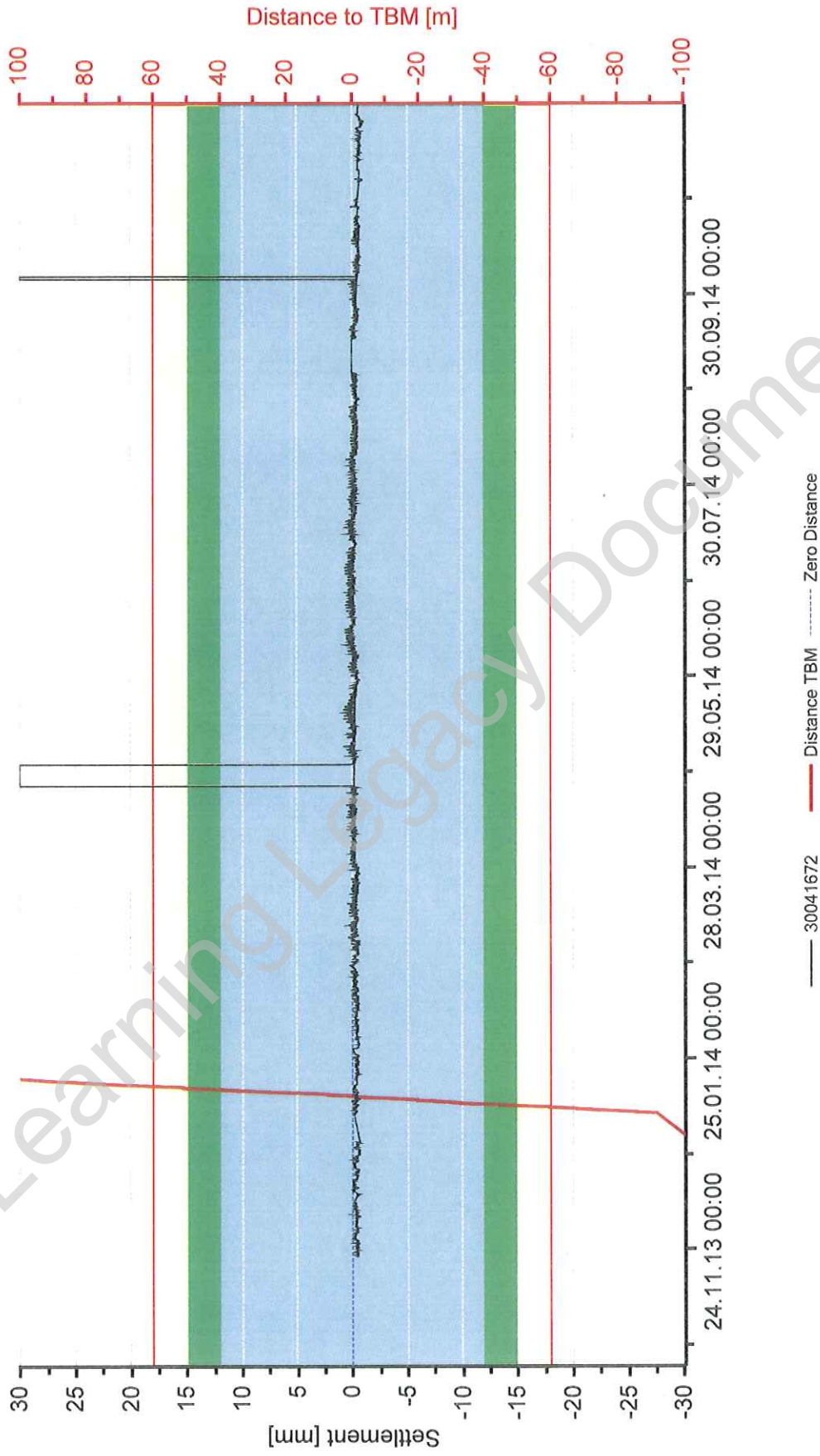




Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: WB TBM Tunneldrive
 Date: 16.01.2014 17:56



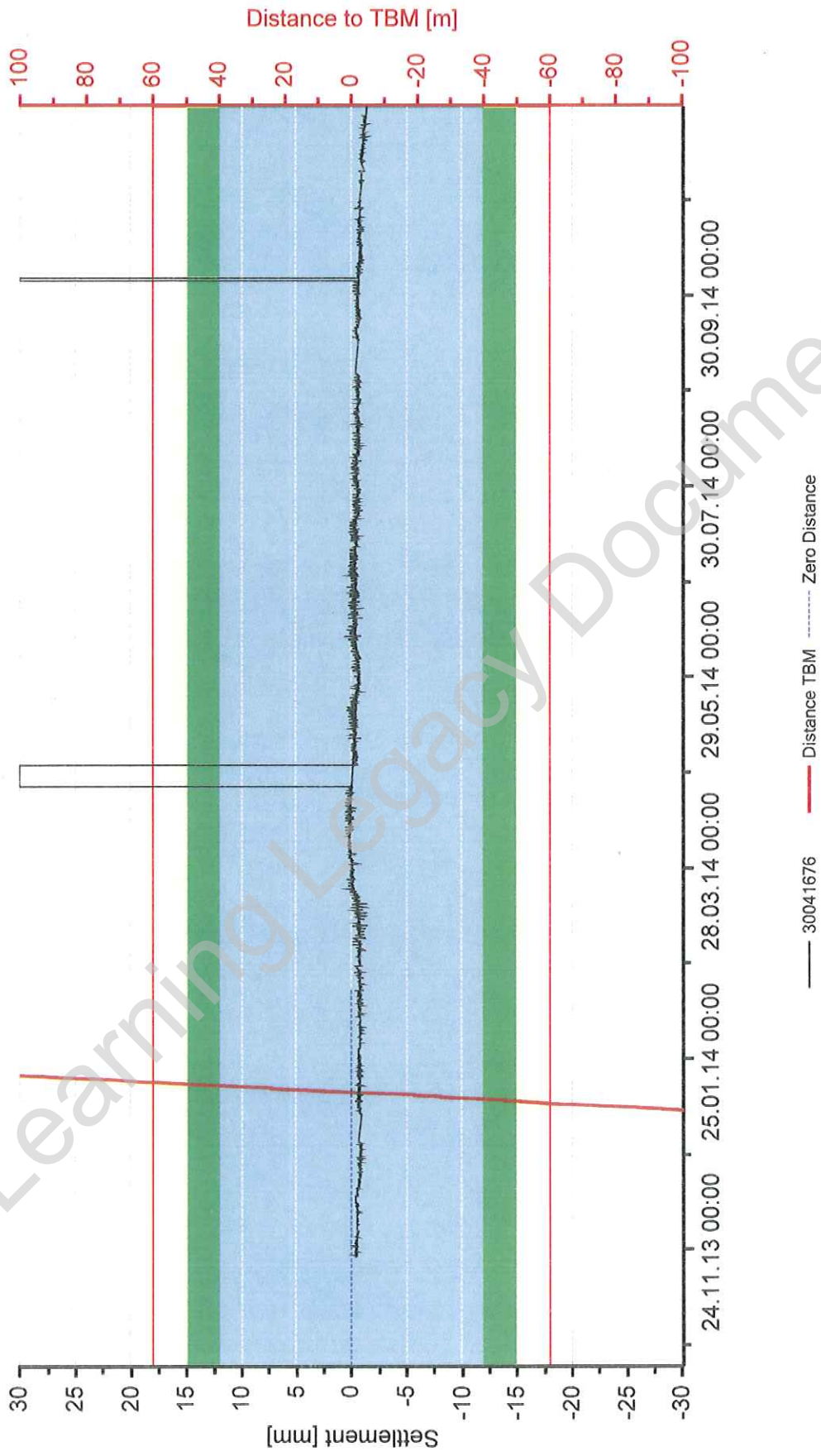
Point: 30041672



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: WB Tunnel - Building Albert Road 171-209 - 17.10.2013 - 21.11.2014
Date: 20.01.2015 13:12 Current Values: 20.01.2015 12:52

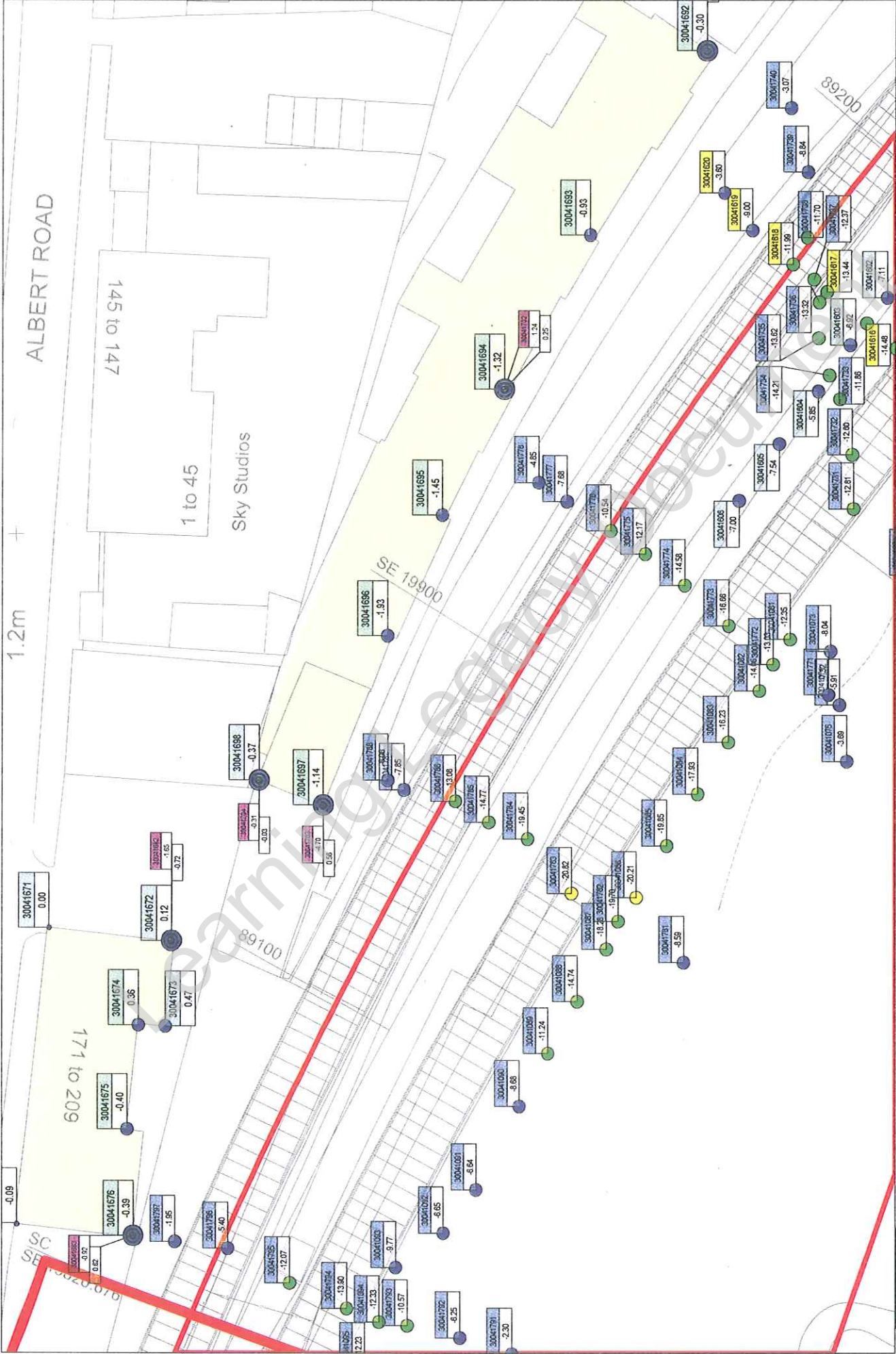


Point: 30041676



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: WB Tunnel - Building Albert Road 171-209 - 17.10.2013 - 21.11.2014
Date: 20.01.2015 13:14 Current Values: 20.01.2015 12:52

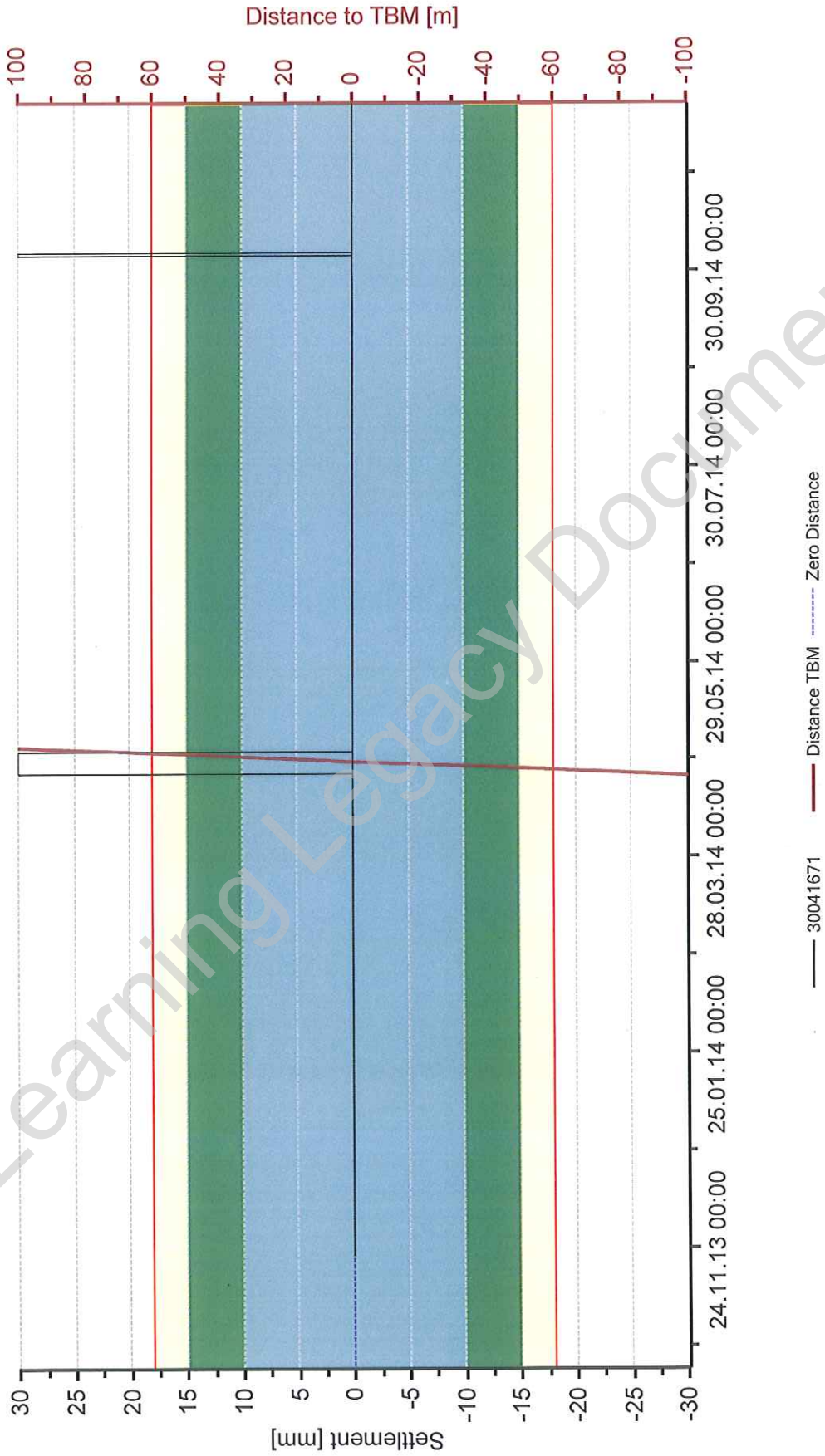




Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 Working activities: EB TBM Tunneldrive
 current values: 30.04.2014 17:59



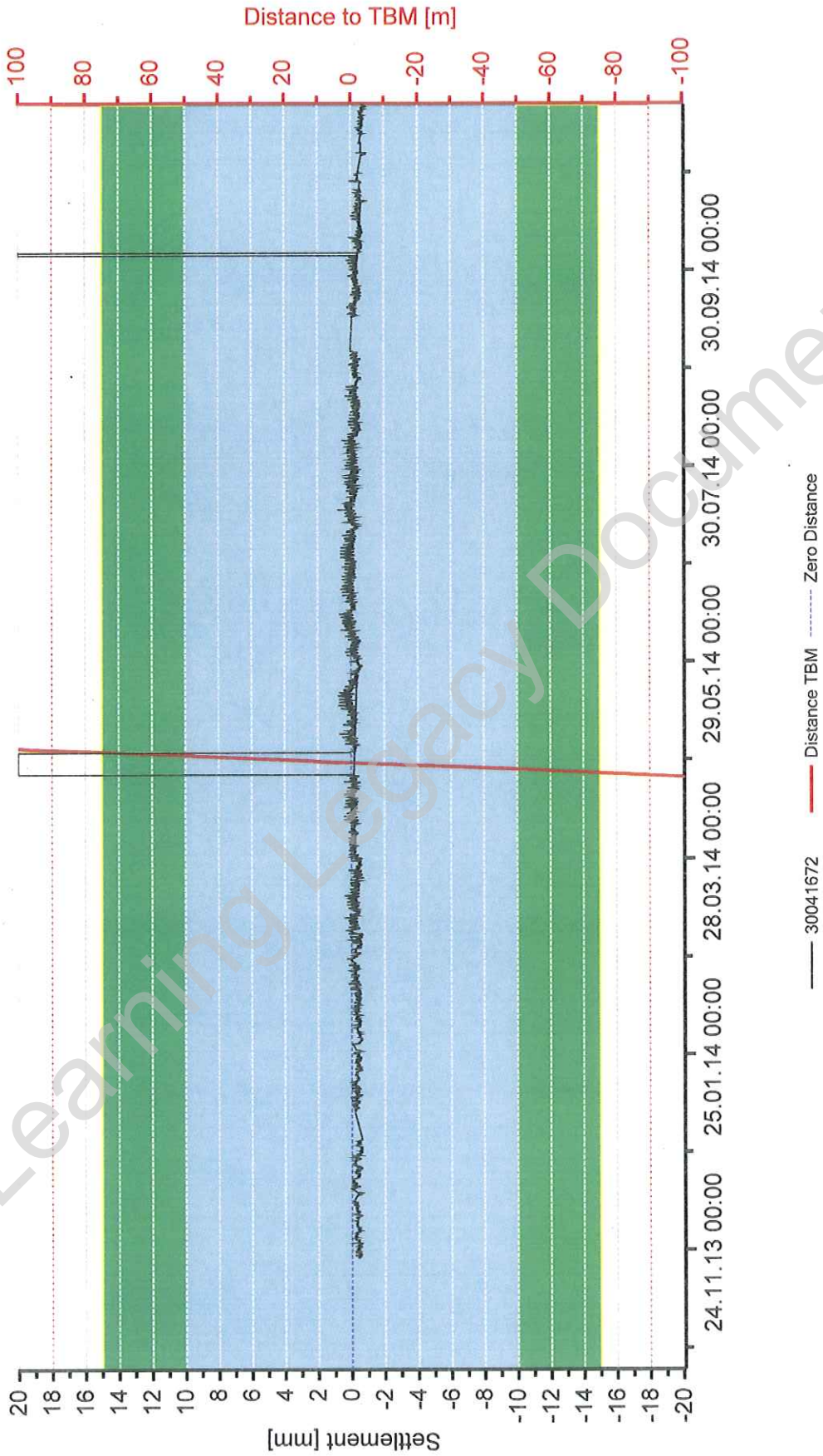
Profile: Measurement Point 30041671



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 Close Out Report: EB Tunnel - Building Albert Road 171-209 - 17.10.2013 - 21.11.2014
 date: 14.04.2015 16:21 current values: 14.04.2015 14:05



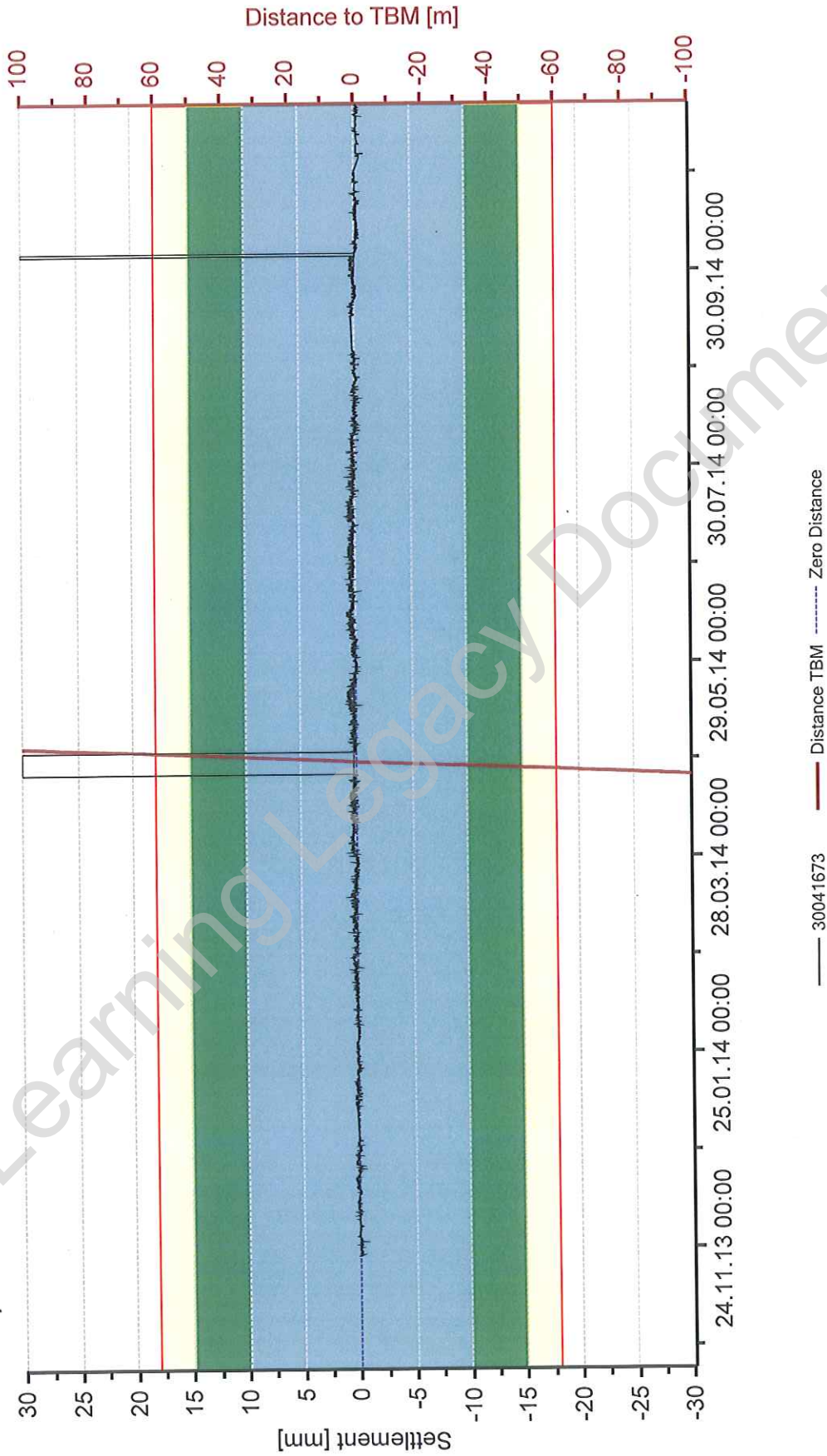
Point: 30041672



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: EB Tunnel - Building Albert Road - 17.10.2013 - 21.11.2014
date: 20.01.2015 16:36 current values: 20.01.2015 13:28



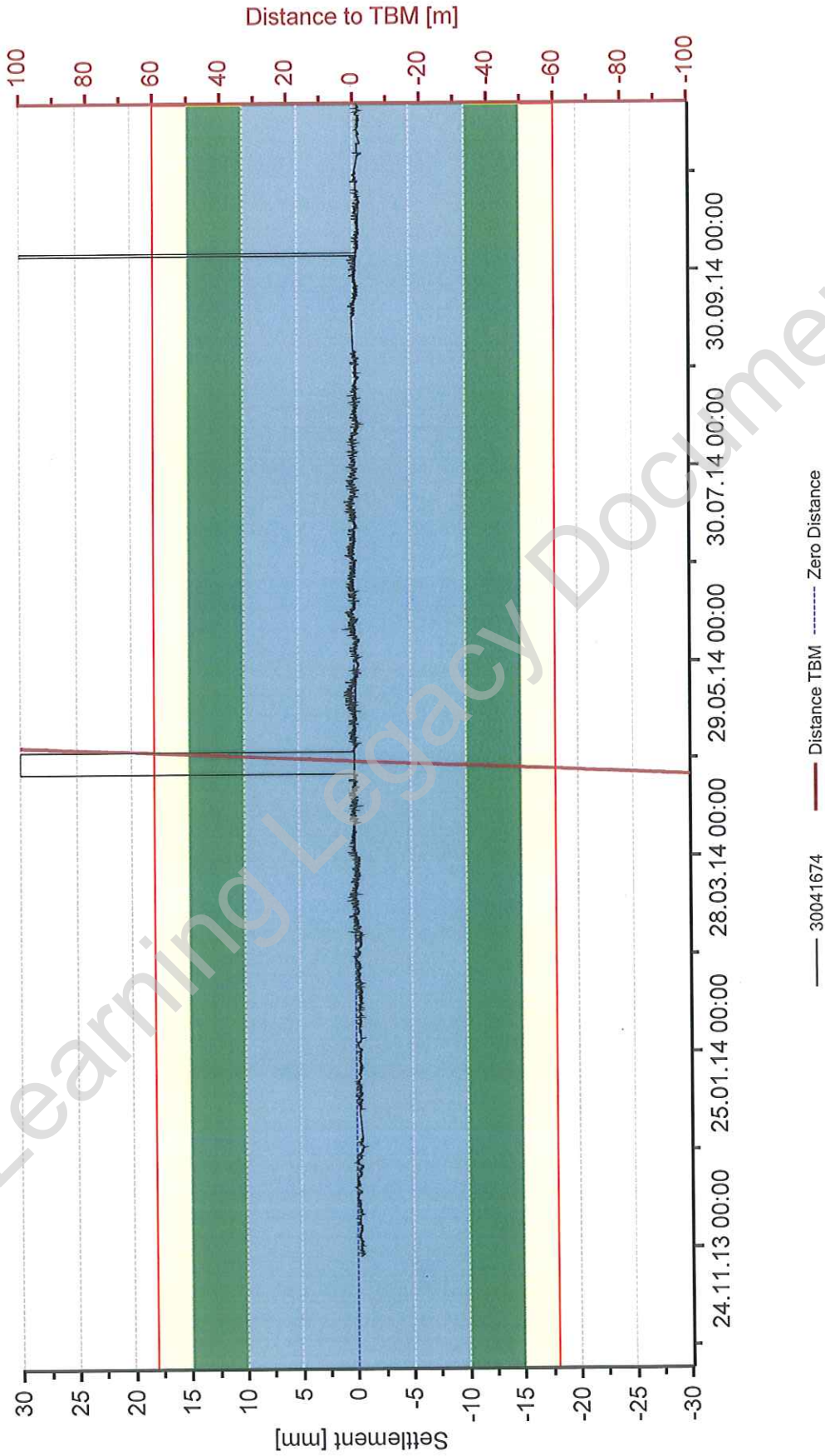
Profile: Measurement Point 30041673



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 Close Out Report: EB Tunnel - Building Albert Road 171-209 - 17.10.2013 - 21.11.2014
 date: 14.04.2015 16:24 current values: 14.04.2015 14:05



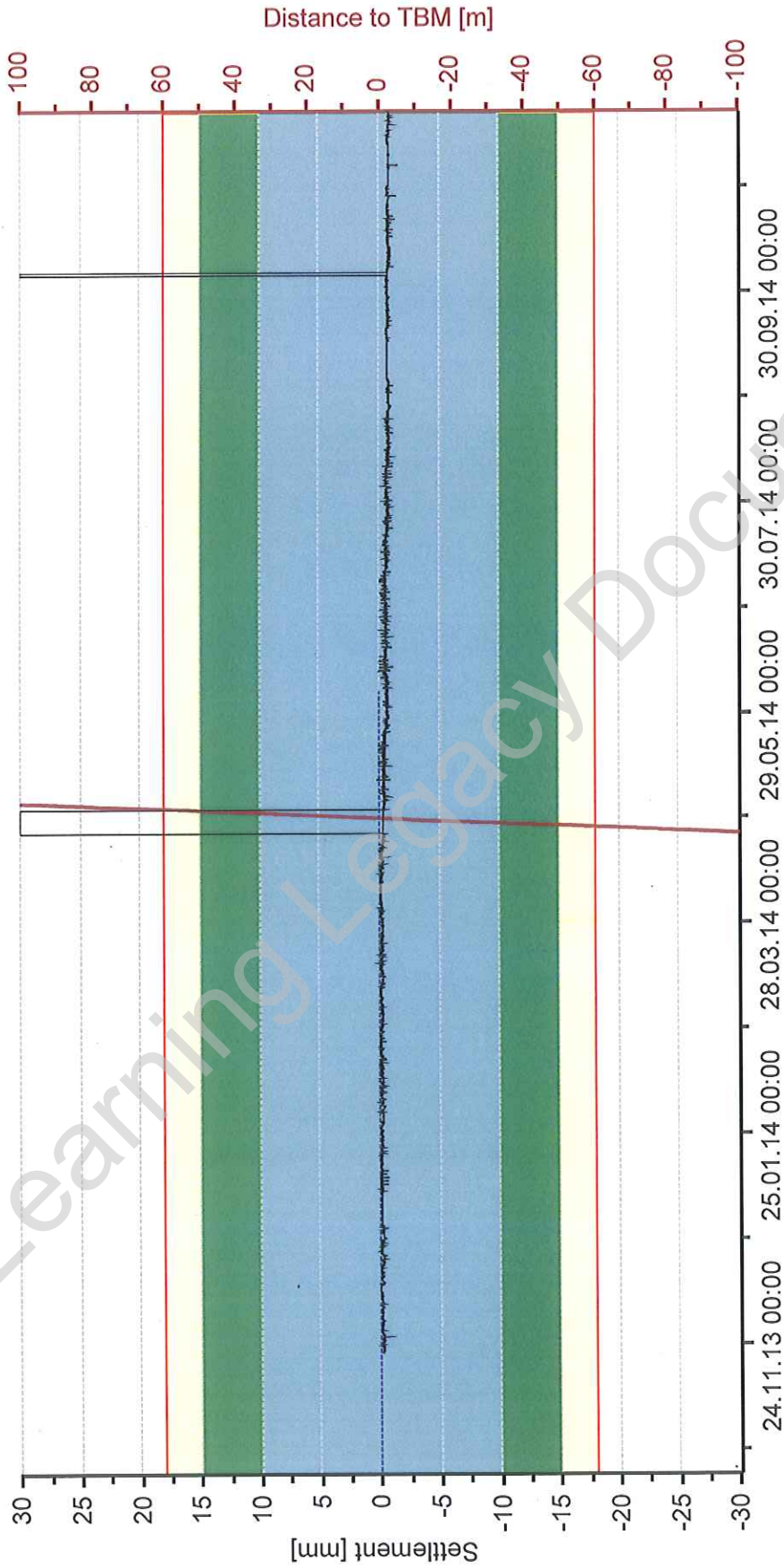
Profile: Measurement Point 30041674



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 Close Out Report: EB Tunnel - Building Albert Road 171-209 - 17.10.2013 - 21.11.2014
 date: 14.04.2015 16:26 current values: 14.04.2015 14:05



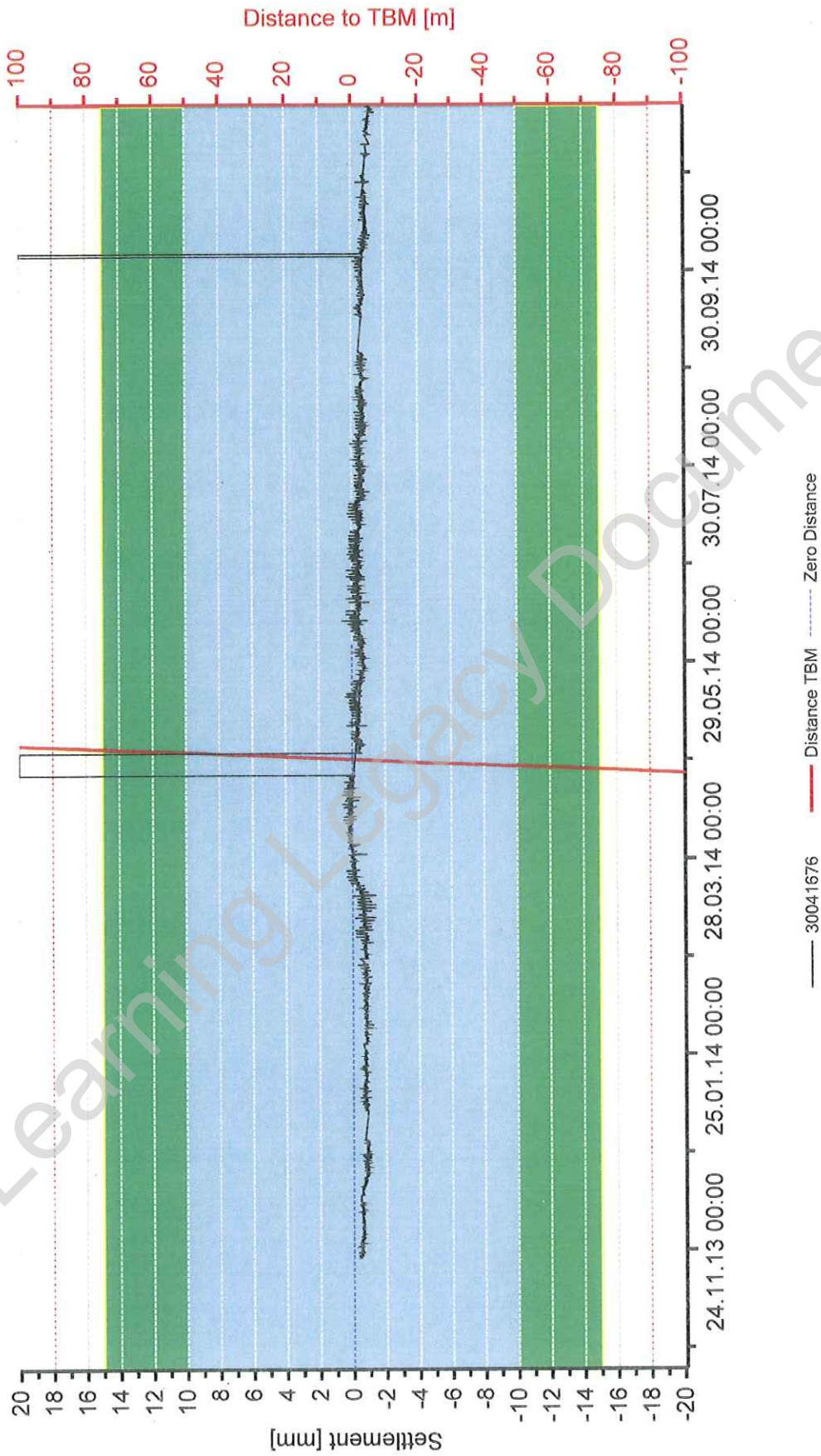
Profile: Measurement Point 30041675



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 Close Out Report: EB Tunnel - Building Albert Road 171-209 - 17.10.2013 - 21.11.2014
 date: 14.04.2015 16:28 current values: 14.04.2015 14:05



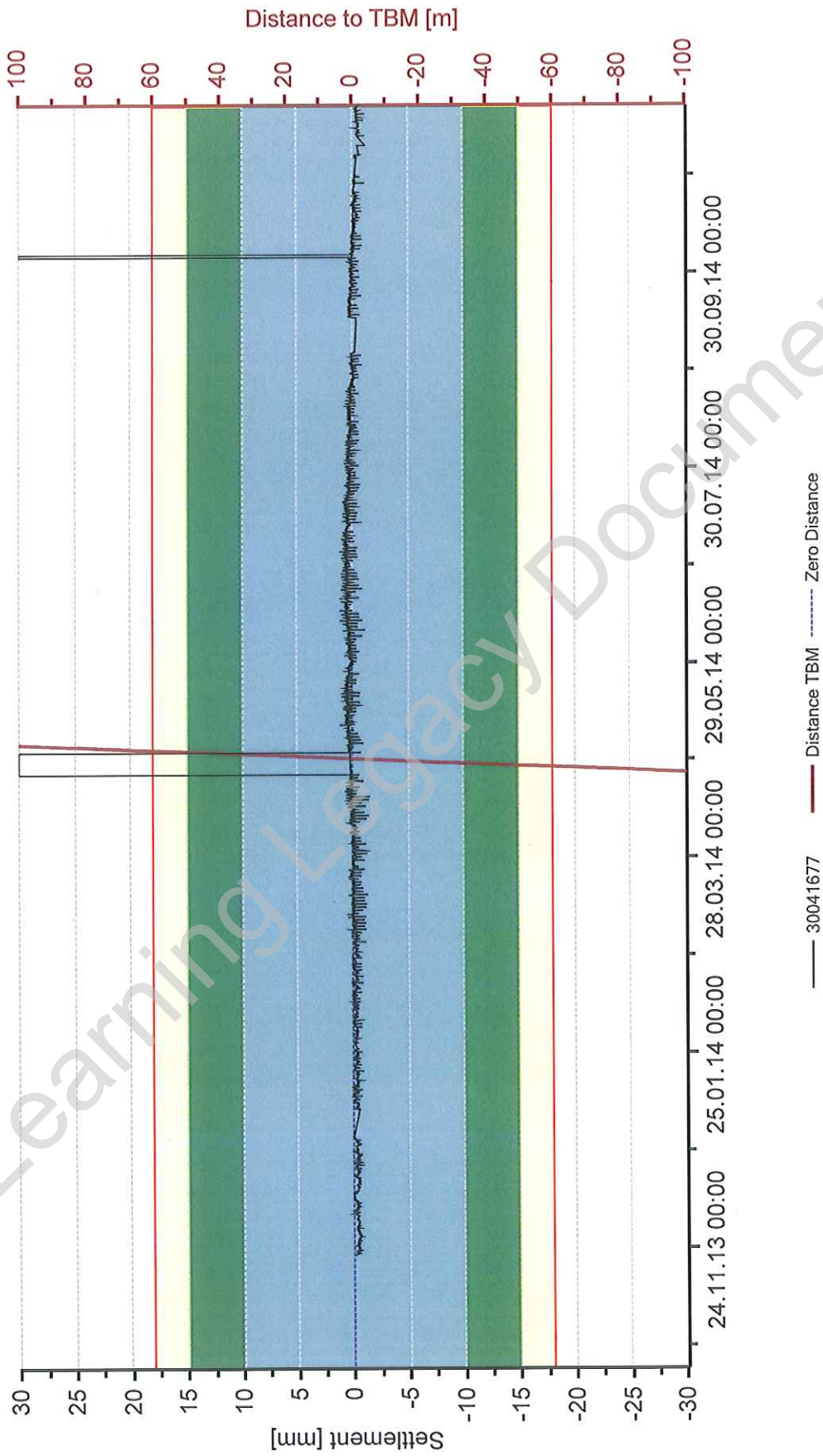
Point: 30041676



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: EB Tunnel - Building Albert Road - 17.10.2013 - 21.11.2014
date: 20.01.2015 16:34 current values: 20.01.2015 13:28




Profile: Measurement Point 30041677



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 Close Out Report: EB Tunnel - Building Albert Road 171-209 - 17.10.2013 - 21.11.2014
 date: 14.04.2015 16:30 current values: 14.04.2015 14:05



 HOCHTIEF MURPHY Joint Venture		C310 THAMES TUNNEL REPORT			
EMPLOYER	CROSSRAIL	eB NO	C310-HTM-C-RGN-CR148-50024	Rev	2.0
TITLE	Monitoring Close-Out Reports relating to Tunnelling Works North Embankment River Thames - North Woolwich Portal (excl. Store Rd)				

APPENDIX 90

Albert Road Building 171-209 – TM

Learning Legacy Document

monitoring asset	Building Albert Road 171-209		
reference monitoring drawing:	C310-HTM-C-DWG-CR146-ST004-70003		
name of monitoring section:	Building Albert Road 171-209		
sensor type:	tiltmeter		
chainage:	89100-89070	point no.:	3004 1681 - 3004 1684
trigger values: [mm]	green: N/A	amber: N/A	red: N/A
reference document for trigger values:	Management Plan for Control of Ground Movement		
EB-no.:	C310-HTM-Z-STP-CR148-50058		
Appendix:	AAA		

monitoring data

	date	max. value	point no.	comments
baseline	21/11/13	0.00		
TBM 1	start ZOI	11/01/14	-1.00 0.07	3004 1682 3004 1683
	end ZOI	16/01/14	-1.10 -0.13	3004 1682 3004 1683
TBM 2	start ZOI	26/04/14		3004 1682 3004 1683
	end ZOI	30/04/14	-1.65 -0.92	3004 1682 3004 1683
longterm	18/11/14	-0.70 -0.56	3004 1682 3004 1683	

Evaluation of any potential residual risks

- No residual risk**
since the Works have been completed by HMJV
- Yes, residual risk**
(see comment below)

summary / comments

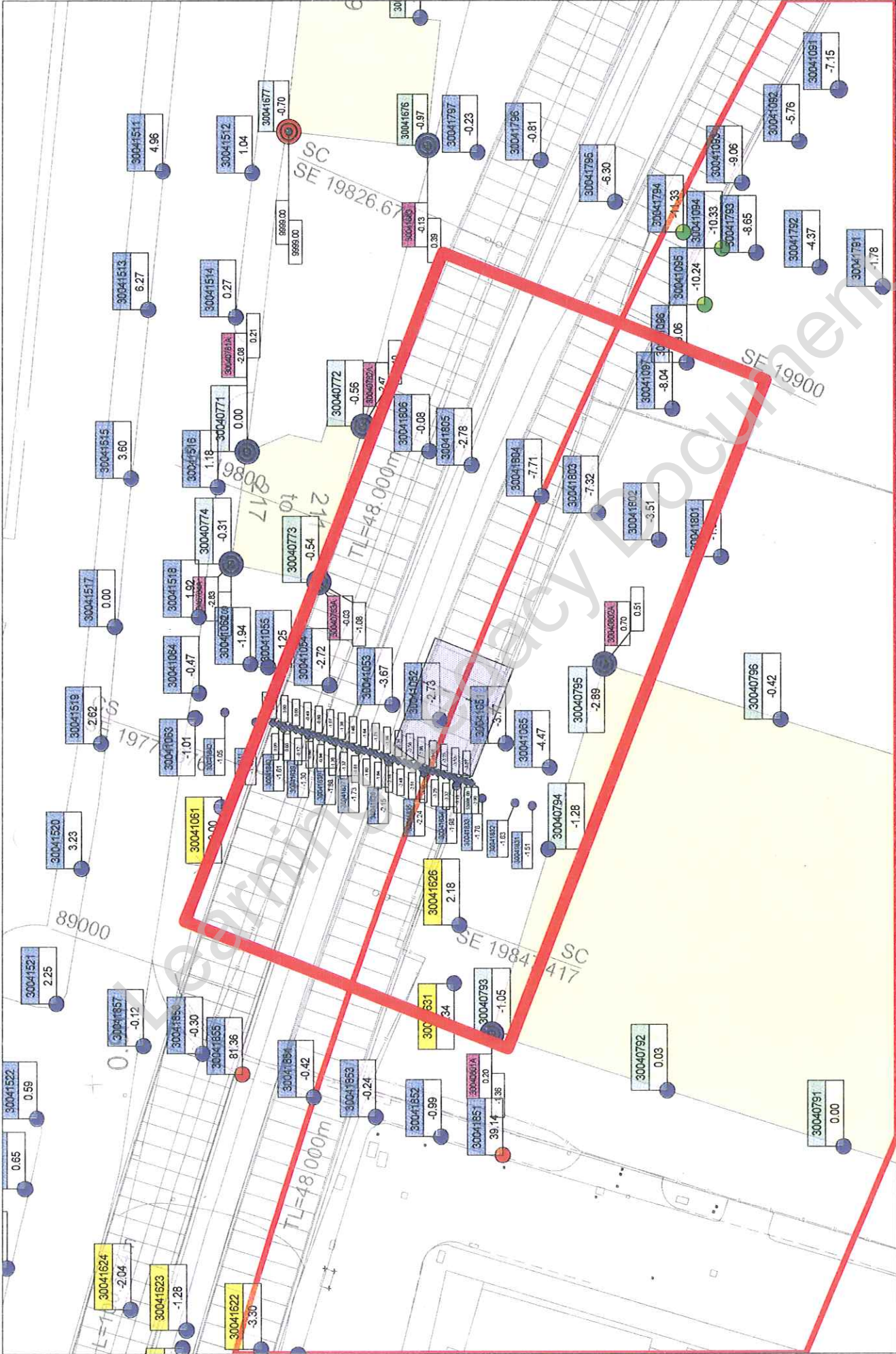
For the sensors 30041681 and 30041684 it was agreed not to install due to the fact only to be placed in a not safe position on the building and located on the far side of the building with no expected tunnelling influence.
 No trigger values for tilt specified.
 Under consideration of temperature differences and the achievable accuracy of the system, HMJV has no concern to cease the monitoring.
 The rate of change in the monitoring data is less than the required standards as per the specifications and drawings.

date / signature: 14/04/15

print name:

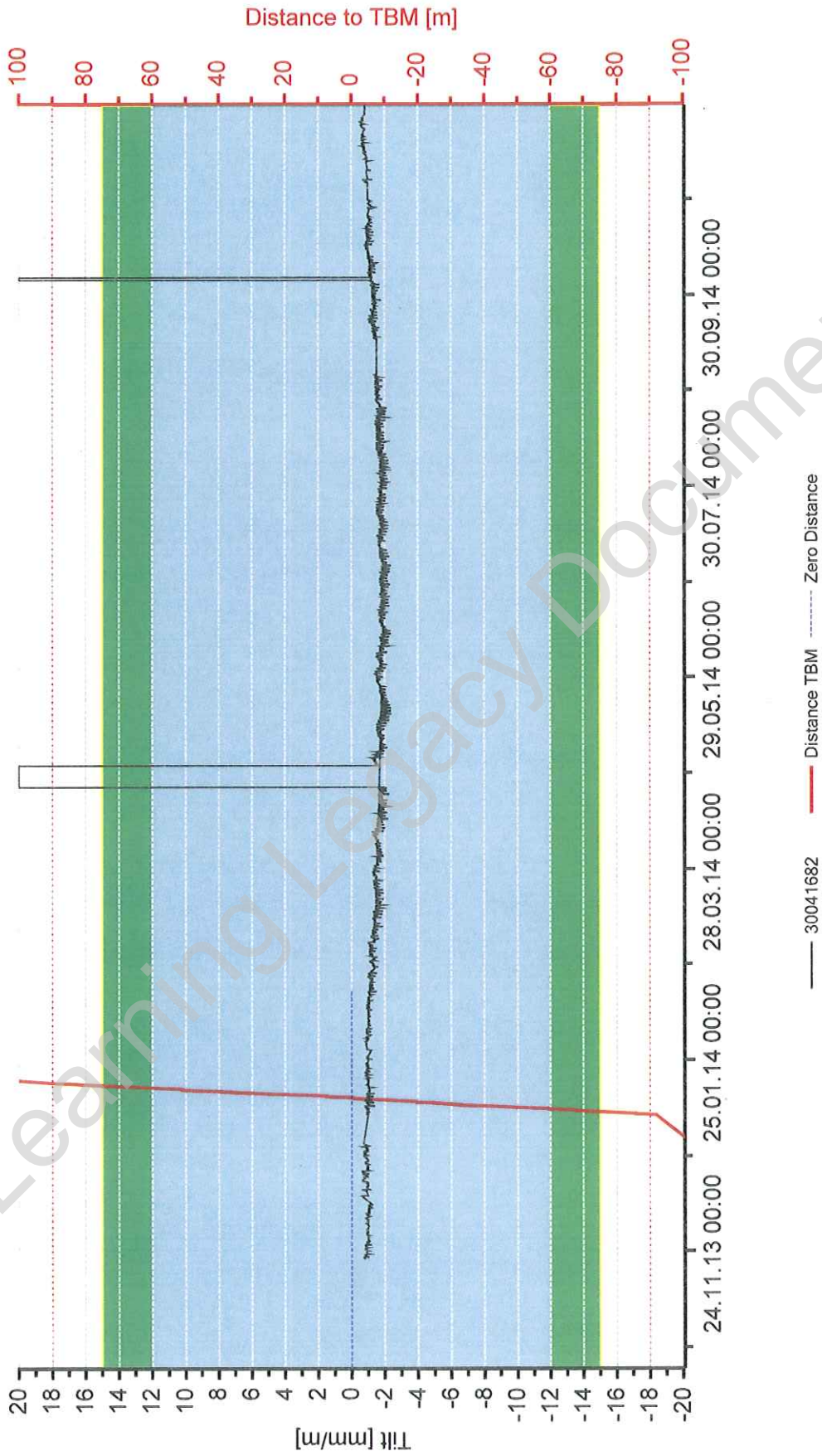
HMJV project role:

Monitoring & Survey Engineer



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: WB TBM Tunneldrive
 Date: 16.01.2014 17:56

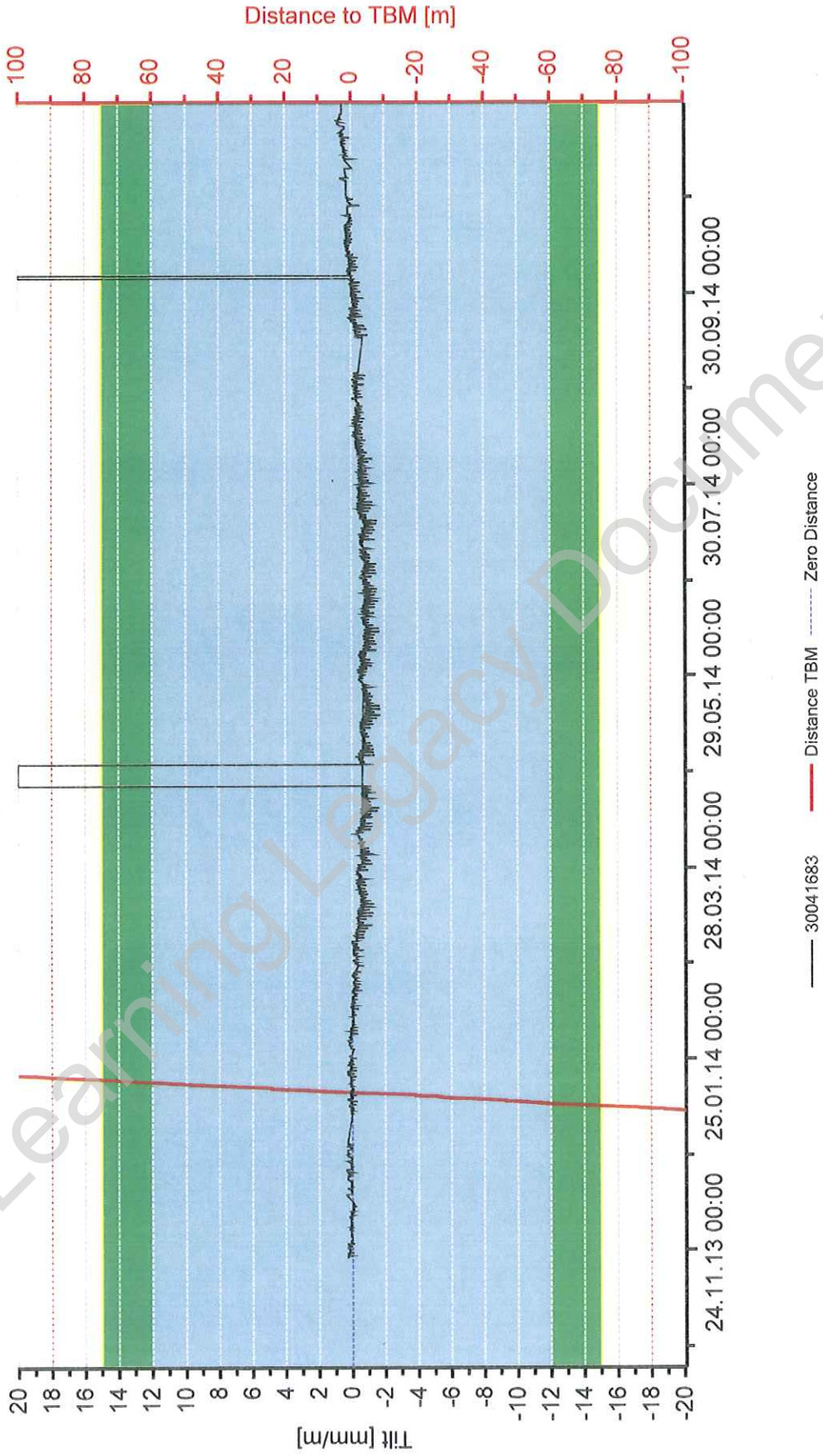
Point: 30041682



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: WB Tunnel - Building albert Road 171-209 - 17.10.2013 - 21.11.2014
Date: 20.01.2015 13:18 Current Values: 20.01.2015 13:07

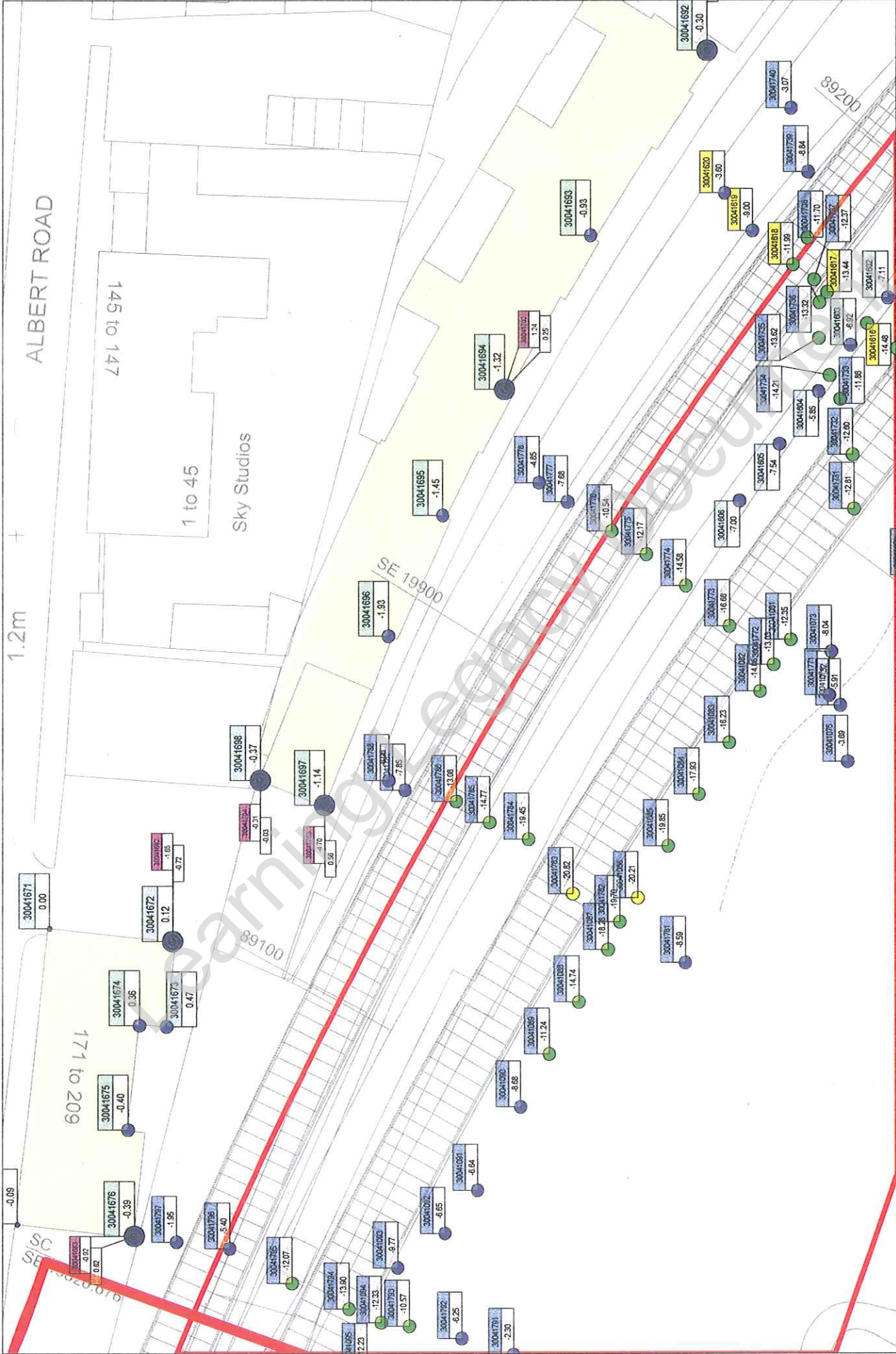


Point: 30041683



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: WB Tunnel - Building albert Road 171-209 - 17.10.2013 - 21.11.2014
Date: 20.01.2015 13:19 Current Values: 20.01.2015 13:07

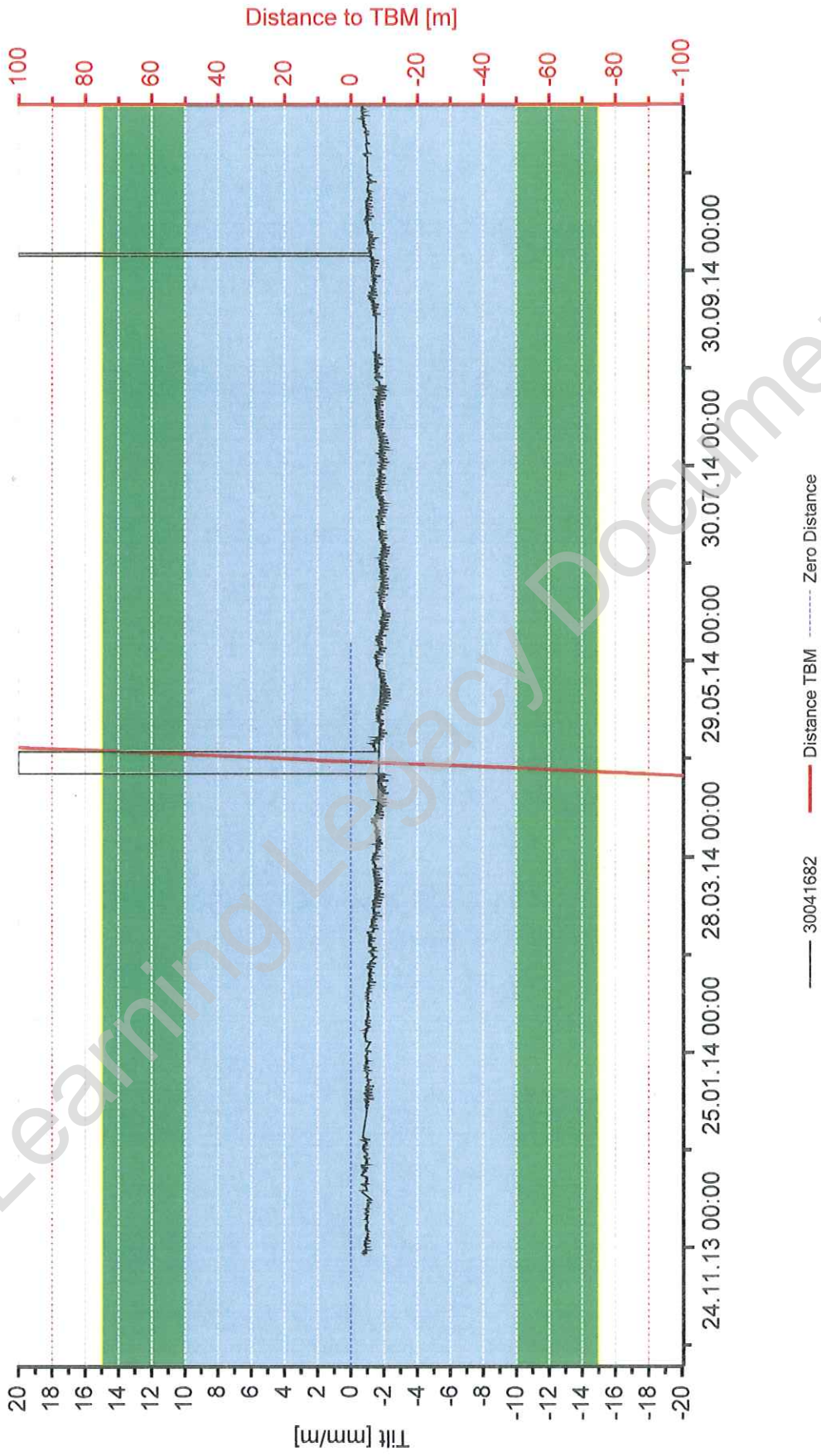




Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 Working activities: EB TBM Tunneldrive
 current values: 30.04.2014 17:59



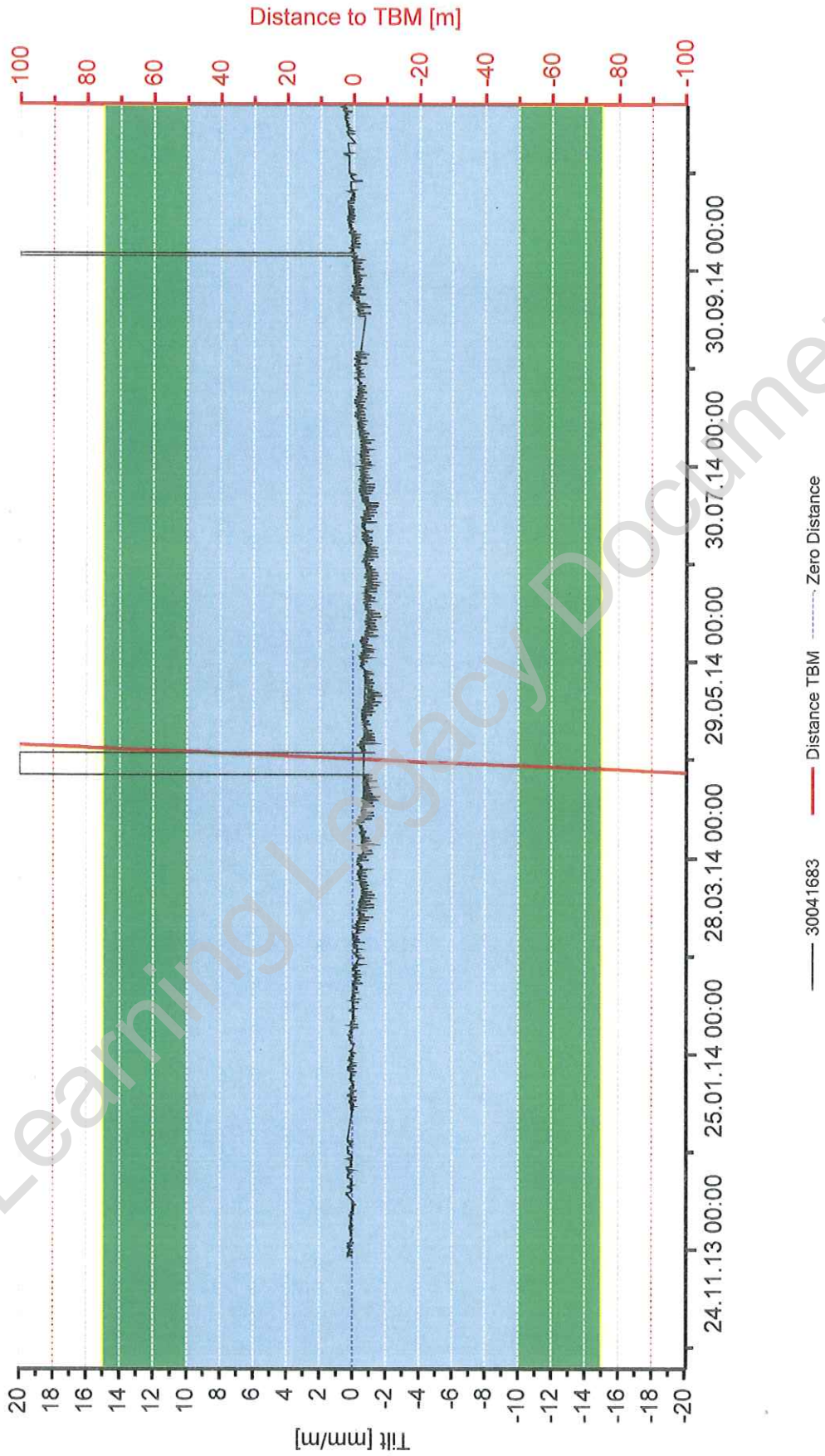
Point: 30041682



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: EB Tunnel - Building Albert Road - 17.10.2013 - 21.11.2014
date: 20.01.2015 16:40 current values: 20.01.2015 13:28



Point: 30041683



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: EB Tunnel - Building Albert Road - 17.10.2013 - 21.11.2014
date: 20.01.2015 16:38 current values: 20.01.2015 13:28



 HOCHTIEF MURPHY Joint Venture		C310 THAMES TUNNEL REPORT			
EMPLOYER	CROSSRAIL	eB NO	C310-HTM-C-RGN-CR148-50024	Rev	2.0
TITLE	Monitoring Close-Out Reports relating to Tunnelling Works North Embankment River Thames - North Woolwich Portal (excl. Store Rd)				

APPENDIX 91

Albert Road Building 211-217 – HLC

Learning Legacy Document

monitoring asset	Building Albert Road 211-217		
reference monitoring drawing:	C310-HTM-C-DWG-CR146-ST004-70003		
name of monitoring section:	Building Albert Road 211-217		
sensor type:	hydrostatic levelling cell (hlc)		
chainage:	89040	point no.:	3004 0771 - 3004 0774
trigger values: [mm]	green: +12 -12	amber: +15 -15	red: +18 -18
reference document for trigger values:	Management Plan for Control of Ground Movement		
EB-no.:	C310-HTM-Z-STP-CR148-50058		
Appendix:	AAA		

monitoring data

	date	max. value	point no.	comments
baseline	27/02/13	0.00		
TBM 1	start ZOI	14/01/14	-0.69	3004 0772
		15/01/14	-0.70	3004 0773
	end ZOI	17/01/14	-0.79	3004 0772
		18/01/14	-0.61	3004 0773
breached not any trigger value				
TBM 2	start ZOI	28/04/14	-0.49	3004 0772
		29/04/14	-1.13	3004 0773
	end ZOI	01/05/14	-2.53	3004 0772
		02/05/14	-1.84	3004 0773
breached not any trigger value				
longterm		18/11/14	-2.25	3004 0772
		02/10/14	-2.50	3004 0773

Evaluation of any potential residual risks



No residual risk
since the Works have been completed by HMJV



Yes, residual risk
(see comment below)

summary / comments

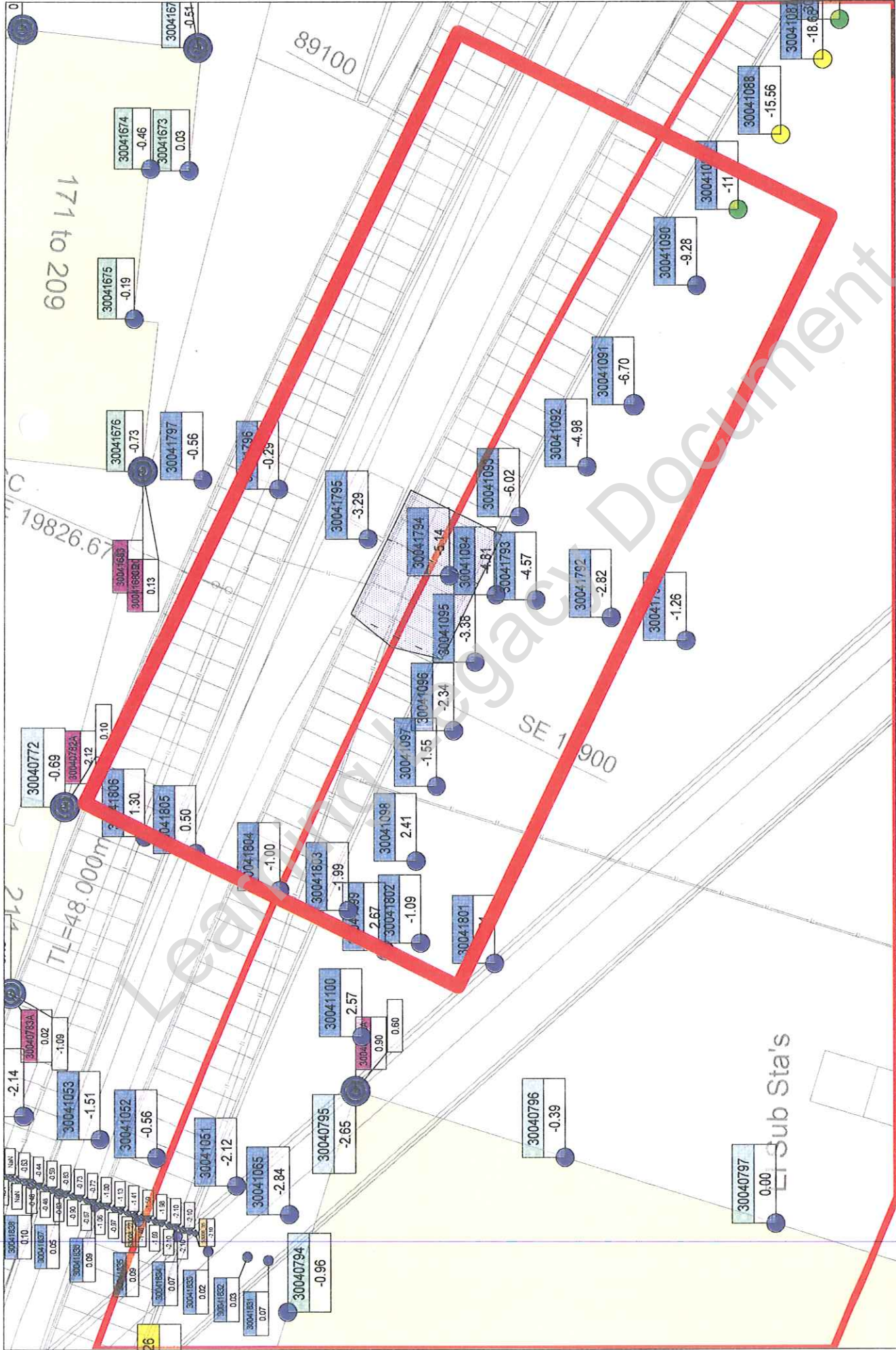
The sensor no. 3004 0773 was damaged on 02/10/14 and is was agreed not to replace it due to the fact that no trend was shown during the last 5 month.
Under consideration of temperature differences and the achievable accuracy of the system, HMJV has no concern to cease the monitoring.
The rate of change in the monitoring data is less than the required standards as per the specifications and drawings.

date / signature: 14/04/15

print name:

HMJV project role:

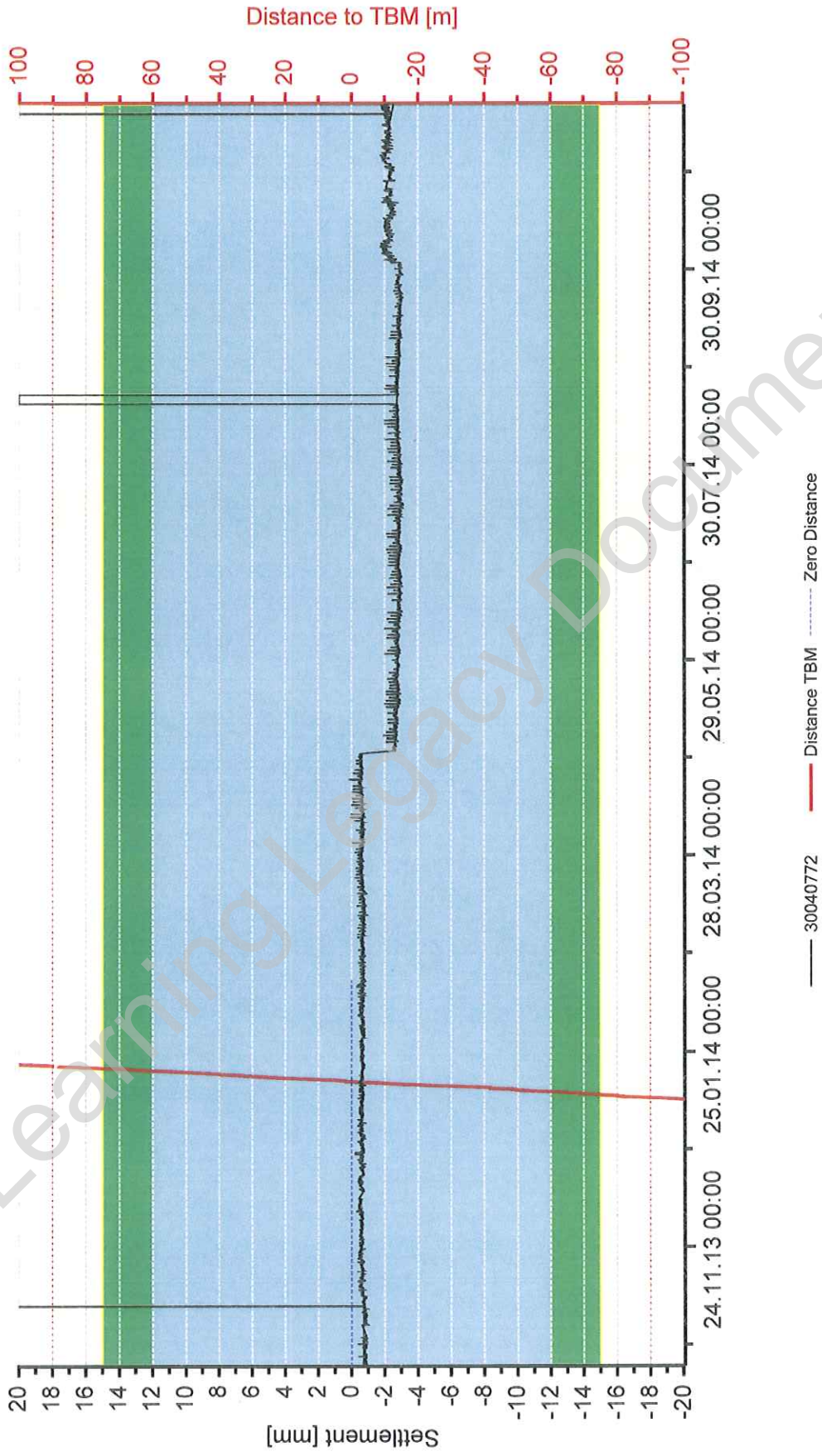
Monitoring & Survey Engineer



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: TBM drive WB
 current values: 14.01.2014 09:00



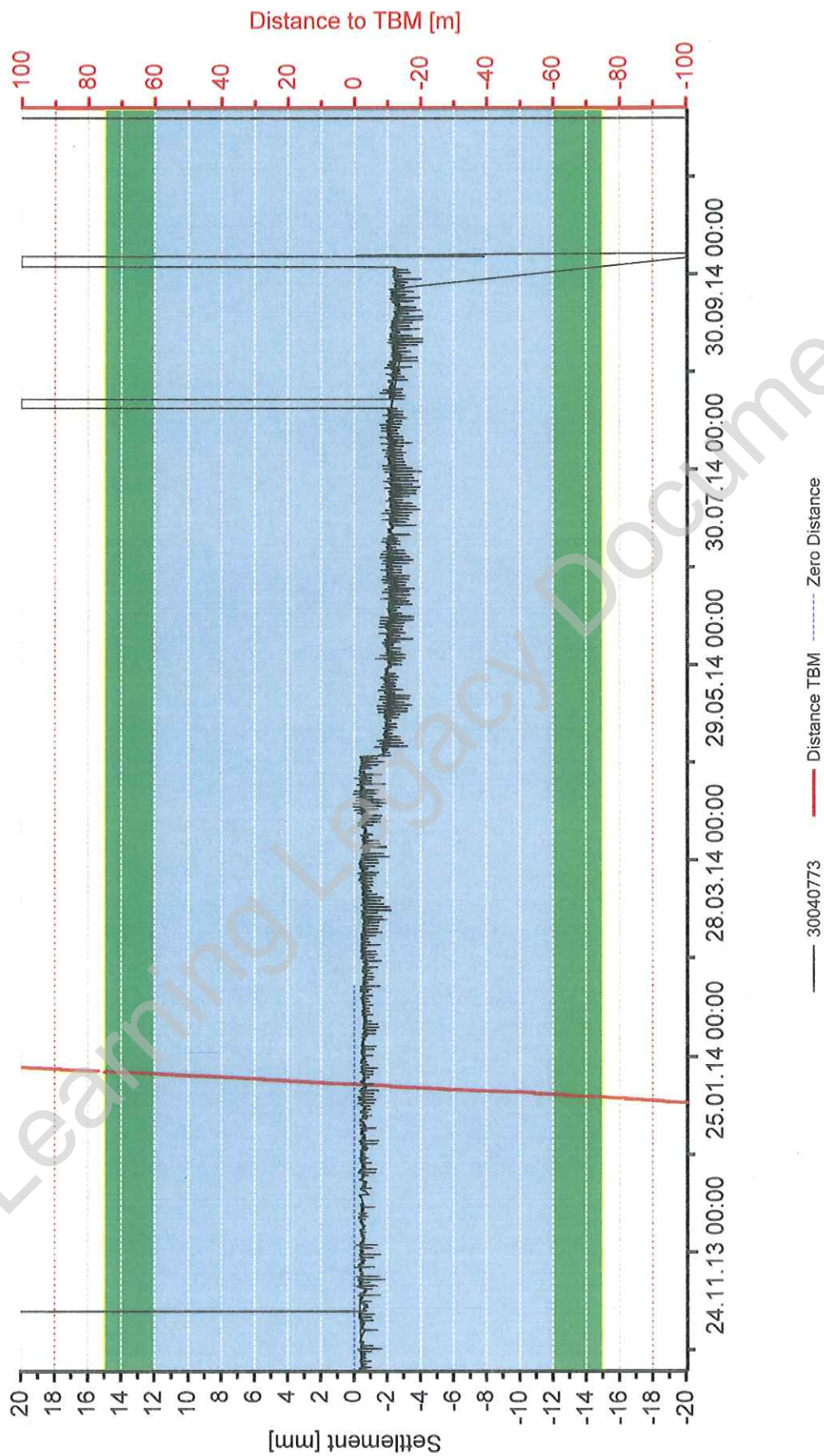
Point: 30040772



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: WB Tunnel - Building albert Road 211-217 - 17.10.2013 - 21.11.2014
Date: 20.01.2015 13:22 Current Values: 20.01.2015 13:07

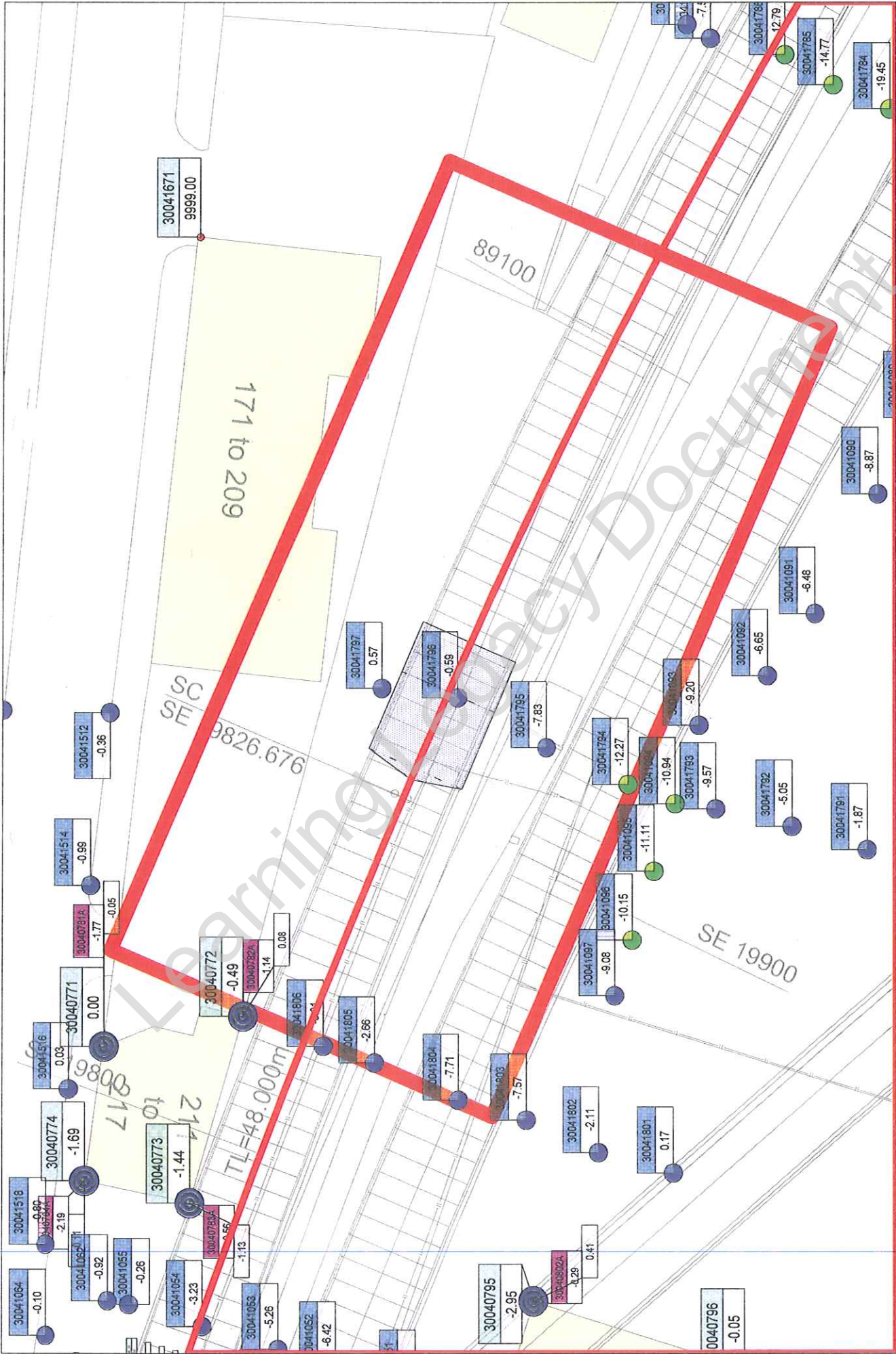


Point: 30040773



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: WB Tunnel - Building Albert Road 211-217 - 17.10.2013 - 21.11.2014
Date: 20.01.2015 13:25 Current Values: 20.01.2015 13:07

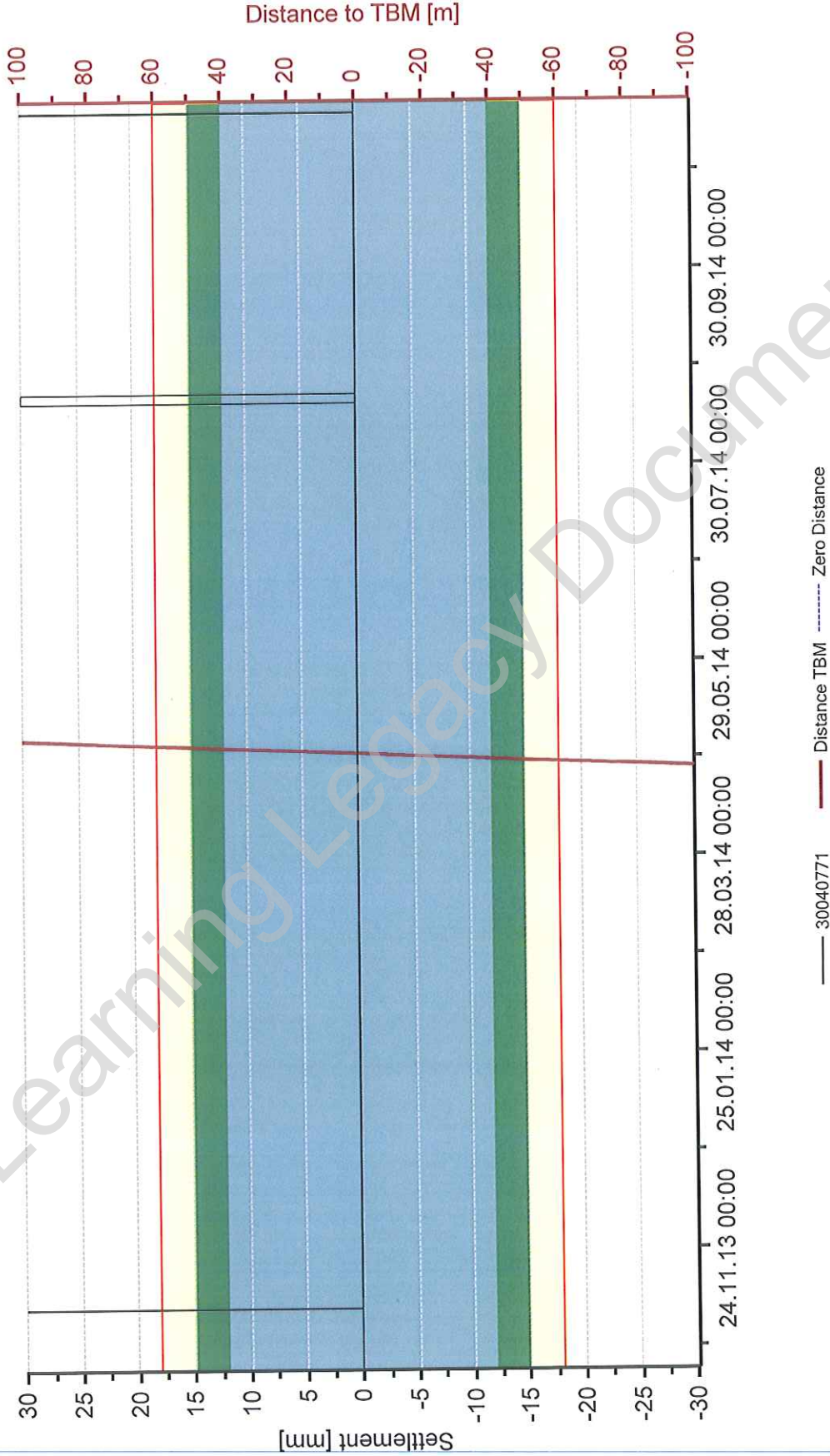




Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: C310 EB tunnel drive; NWP: portal excavation, construction base slab
 current values: 28.04.2014 17:52

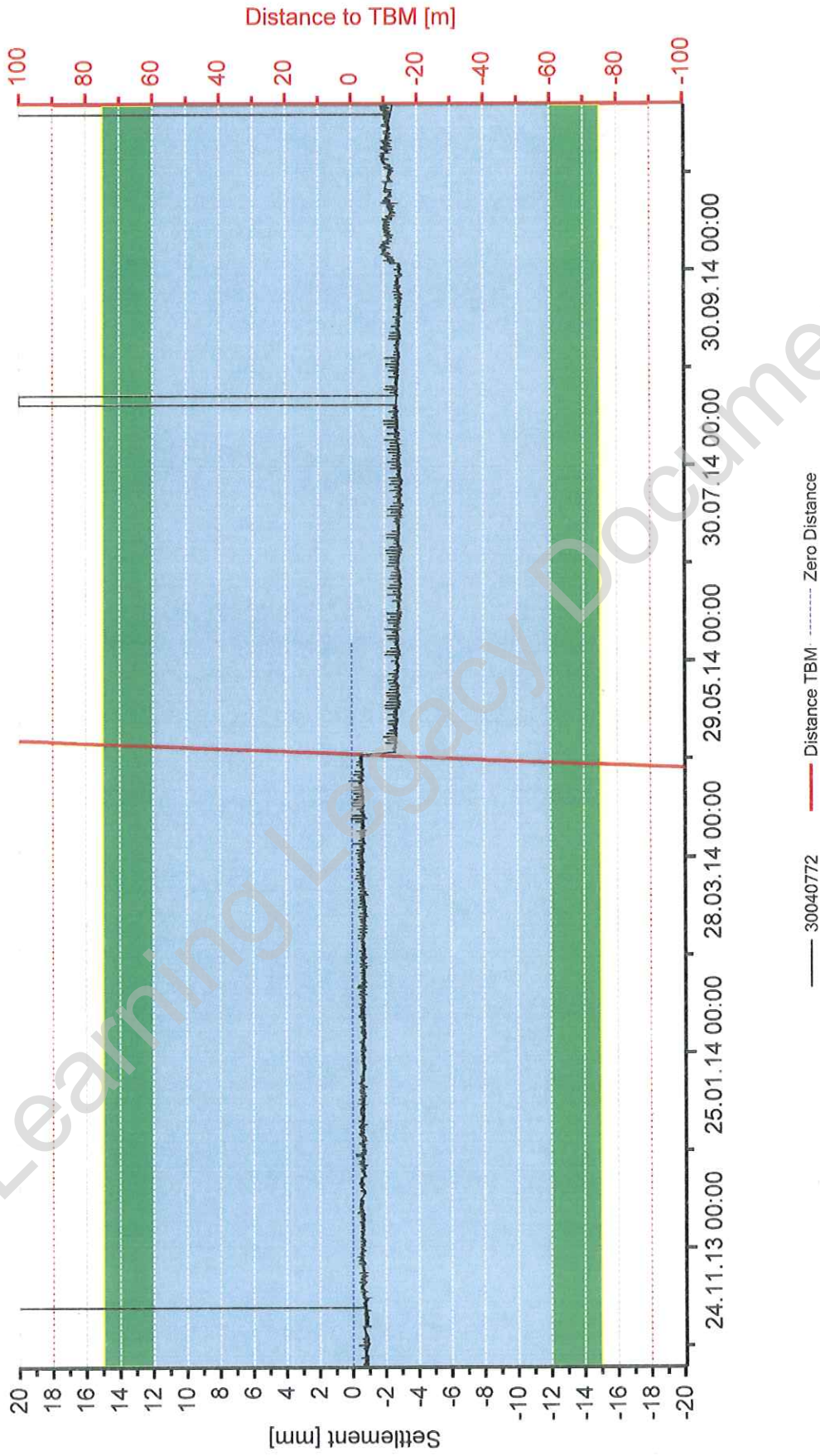


Profile: Measurement Point 30040771



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 Close Out Report: EB Tunnel - Building Albert Road 211-217 - 17.10.2013 - 21.11.2014
 date: 14.04.2015 16:40 current values: 14.04.2015 14:05

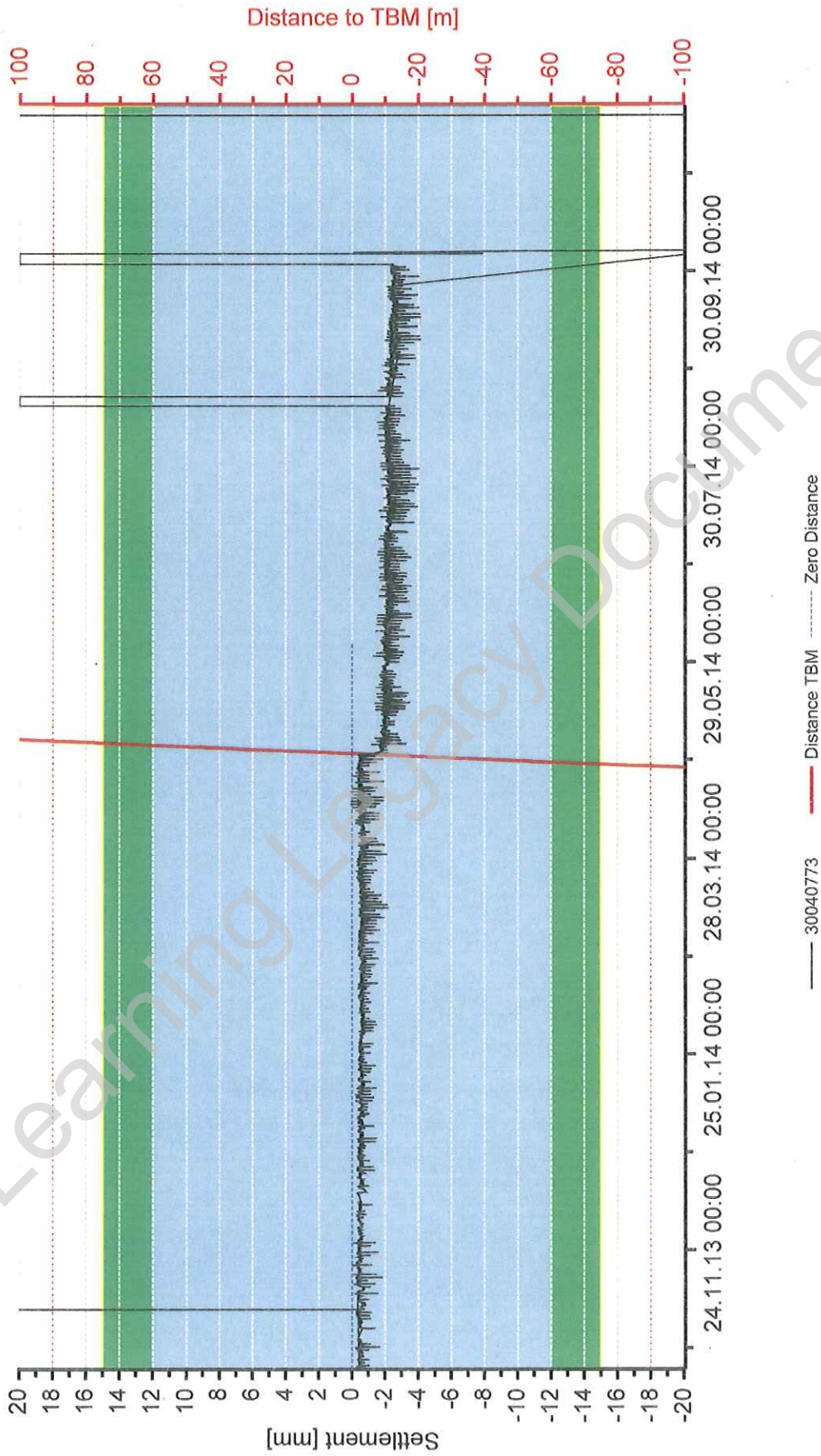
Point: 30040772



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: EB Tunnel - Building Albert Road - 17.10.2013 - 21.11.2014
date: 20.01.2015 16:22 current values: 20.01.2015 13:28



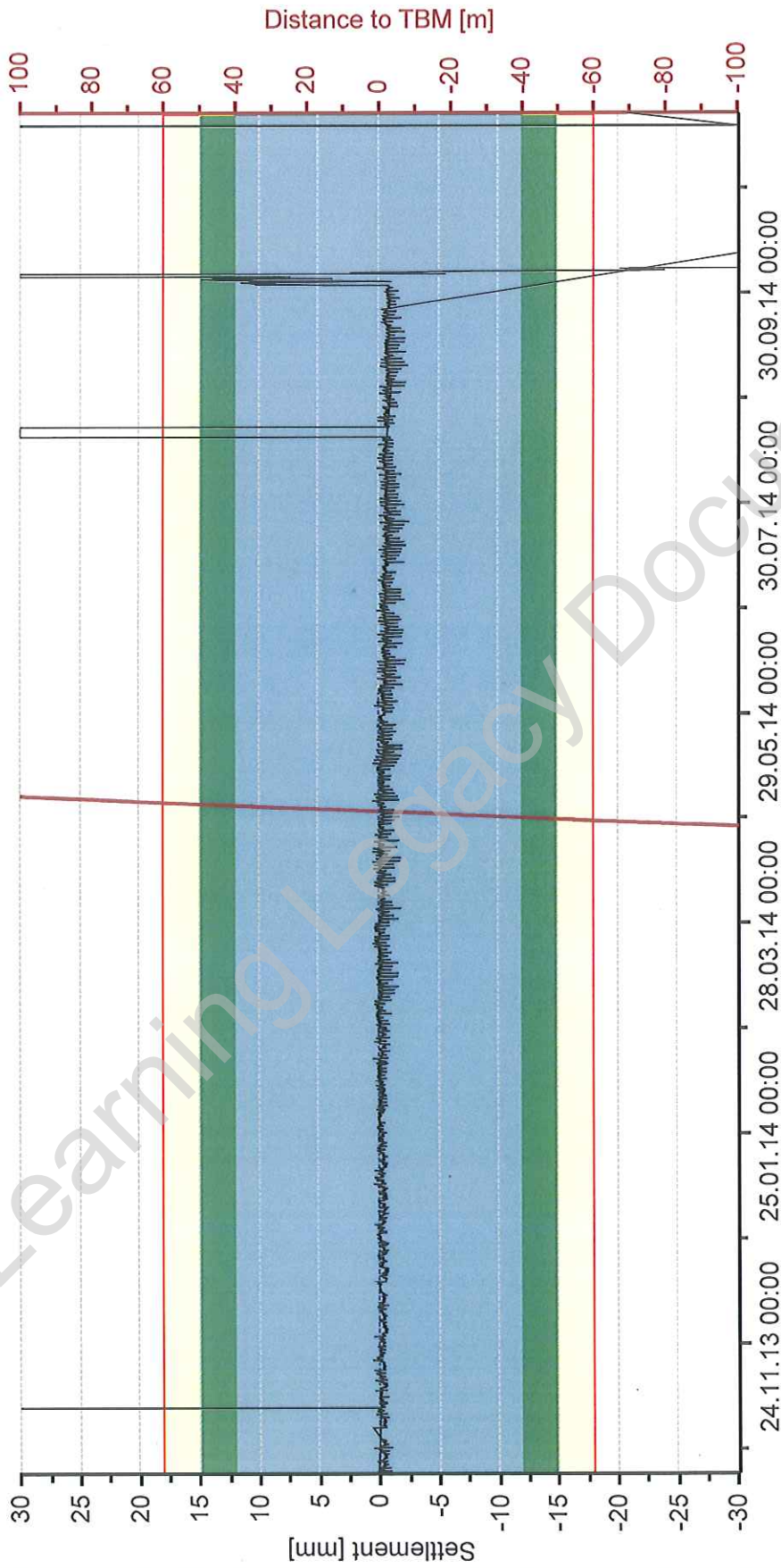
Point: 30040773



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: EB Tunnel - Building Albert Road - 17.10.2013 - 21.11.2014
date: 20.01.2015 16:24 current values: 20.01.2015 13:28



Profile: Measurement Point 30040774



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 Close Out Report: EB Tunnel - Building Albert Road 211-217 - 17.10.2013 - 21.11.2014
 date: 14.04.2015 16:42 current values: 14.04.2015 14:05



		C310 THAMES TUNNEL REPORT			
EMPLOYER	CROSSRAIL	eB NO	C310-HTM-C-RGN-CR148-50024	Rev	2.0
TITLE	Monitoring Close-Out Reports relating to Tunnelling Works North Embankment River Thames - North Woolwich Portal (excl. Store Rd)				

APPENDIX 92

Albert Road Building 211-217 – TM

Learning Legacy Document

monitoring asset	Building Albert Road 211-217		
reference monitoring drawing:	C310-HTM-C-DWG-CR146-ST004-70003		
name of monitoring section:	Building Albert Road 211-217		
sensor type:	tiltmeter		
chainage:	89040	point no.:	3004 0781 - 3004 0784
trigger values: [mm]	green: N/A	amber: N/A	red: N/A
reference document for trigger values:	Management Plan for Control of Ground Movement		
EB-no.:	C310-HTM-Z-STP-CR148-50058		
Appendix:	AAA		

monitoring data

	date	max. value	point no.	comments
baseline	08/03/13	0.00		
TBM 1	start ZOI	14/01/14	-2.12	3004 0782A
	end ZOI	17/01/14	-2.34	3004 0782A breached not any trigger value
TBM 2	start ZOI	28/04/14	-1.14	3004 0782A
	end ZOI	01/05/14	-0.97	3004 0782A breached not any trigger value
longterm	18/11/14	-3.18	3004 0782A	

Evaluation of any potential residual risks	<input checked="" type="checkbox"/>	No residual risk since the Works have been completed by HMJV
	<input type="checkbox"/>	Yes, residual risk (see comment below)

summary / comments

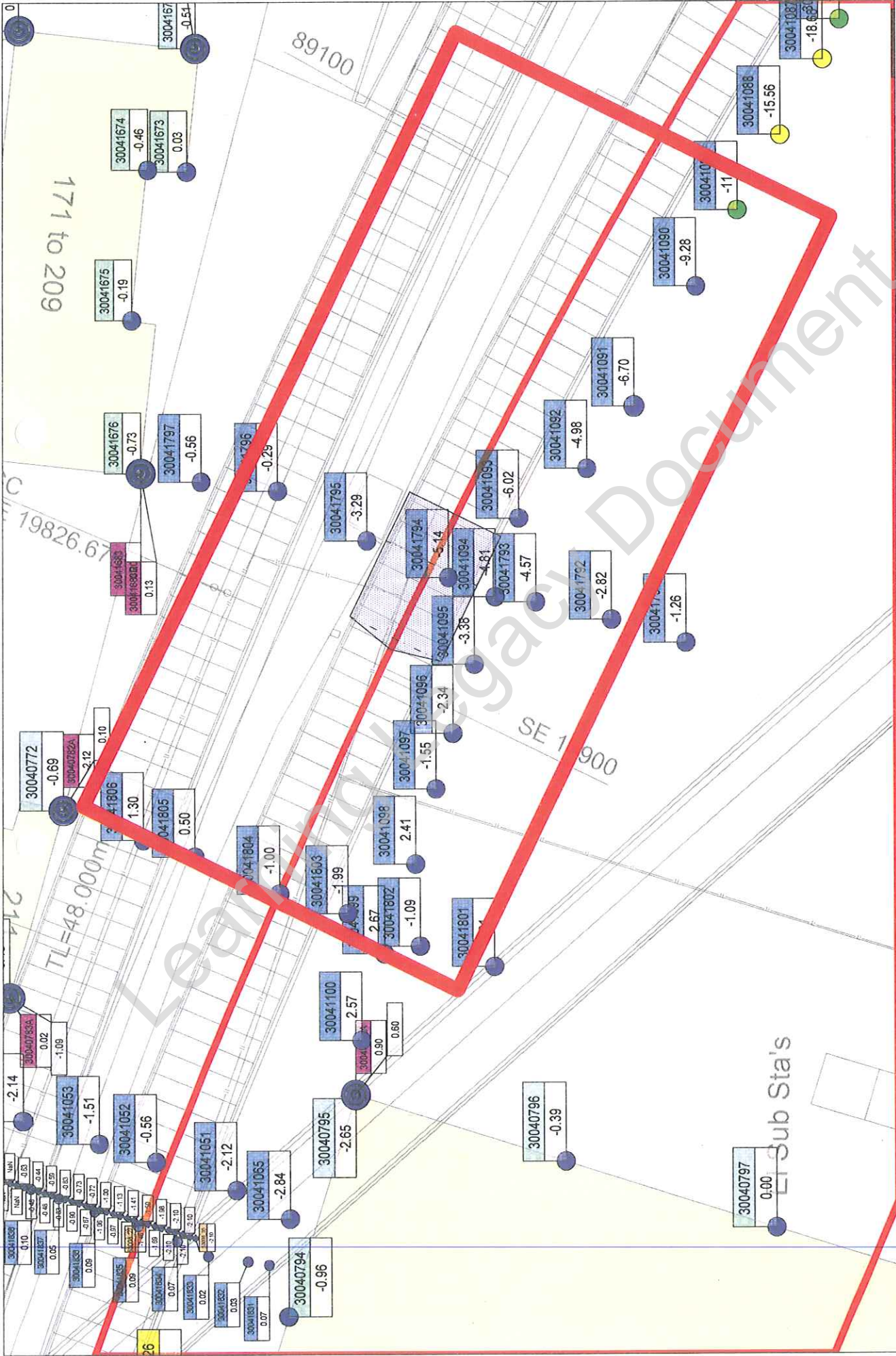
Under consideration of temperature differences and the achievable accuracy of the system, HMJV has no concern to cease the monitoring.
 The rate of change in the monitoring data is less than the required standards as per the specifications and drawings.
 No trigger values for tilt specified.

date / signature: 14/04/15

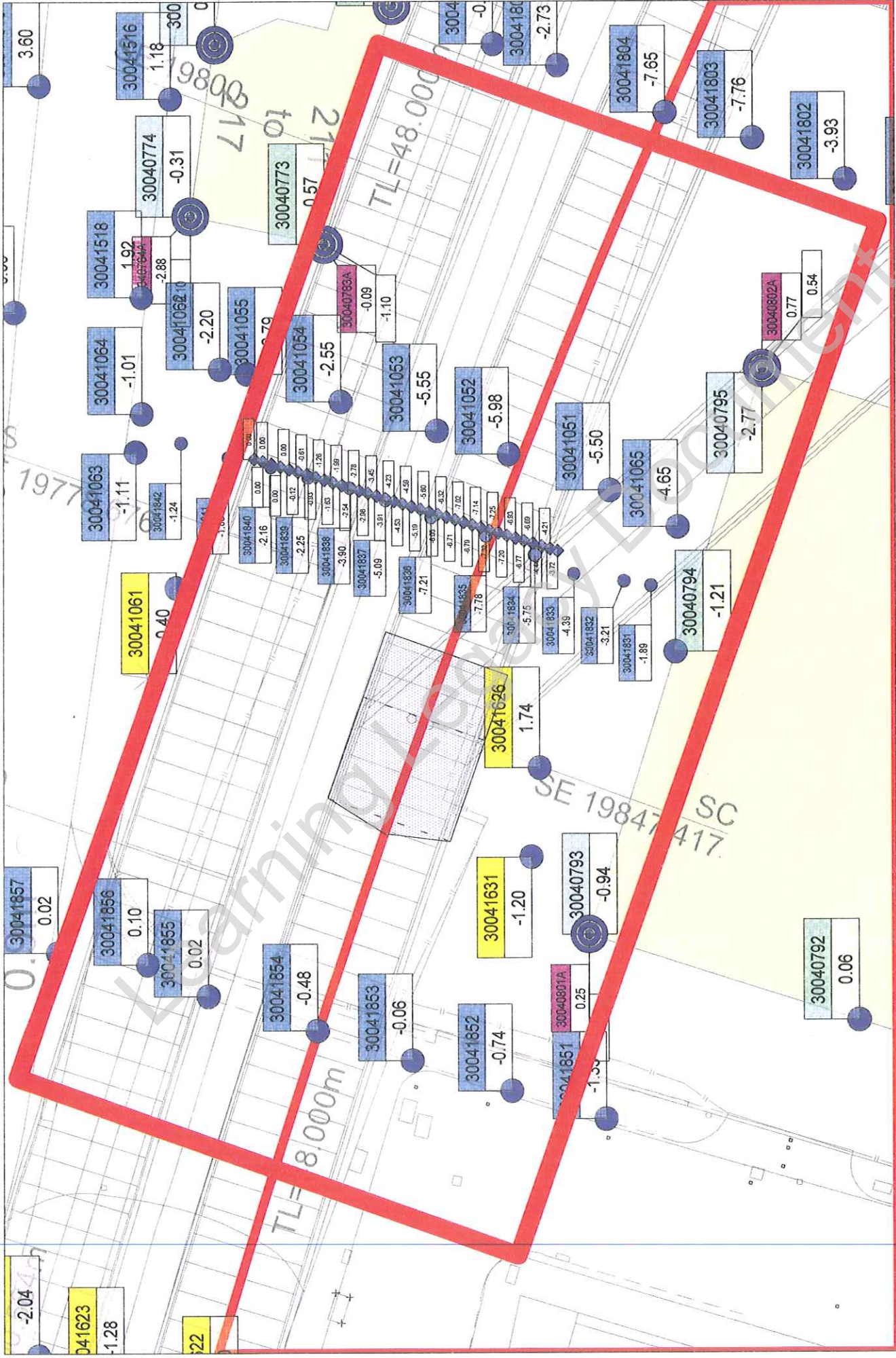
print name:

HMJV project role:

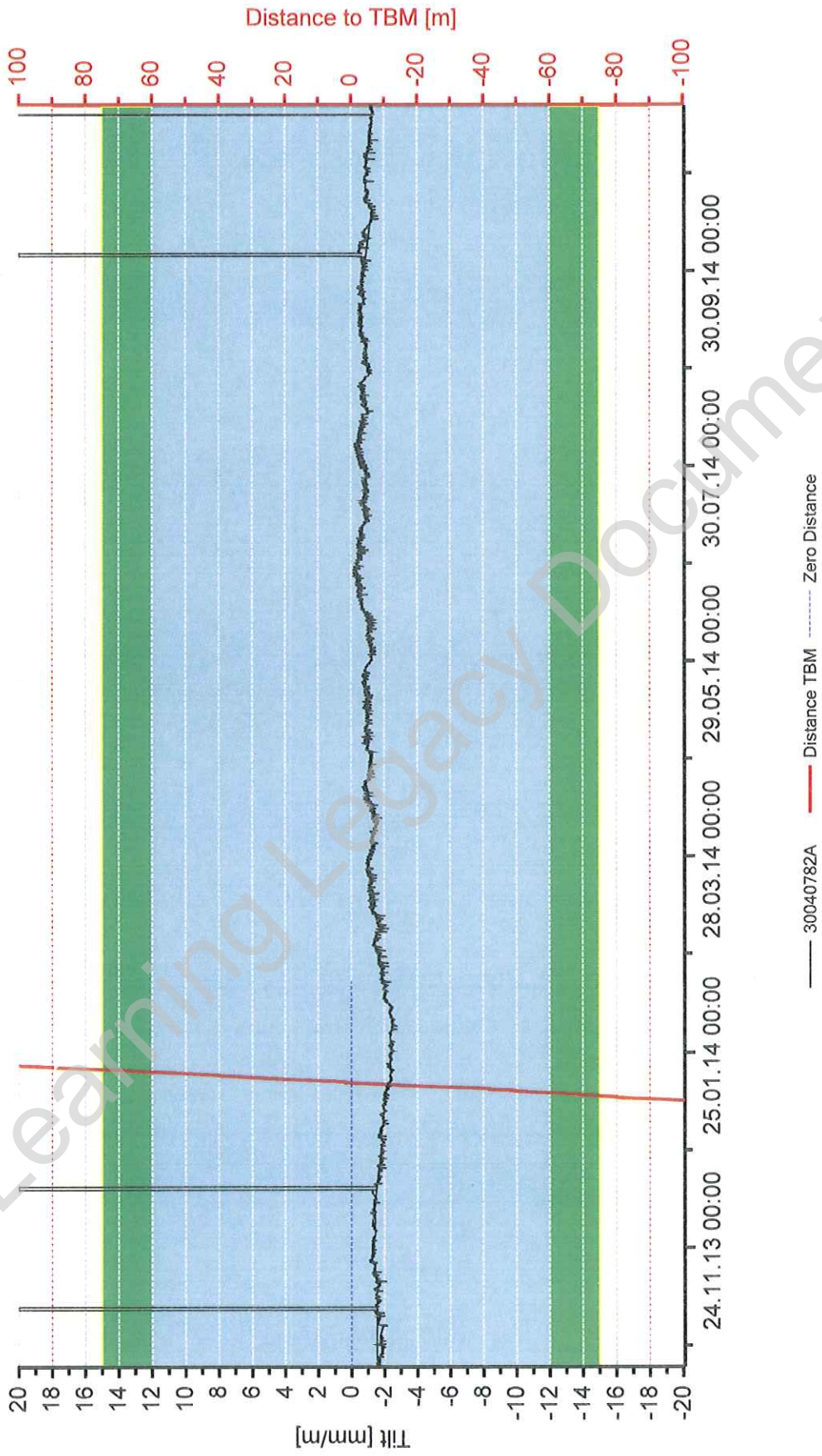
Monitoring & Survey Engineer



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: TBM drive WB
 current values: 14.01.2014 09:00



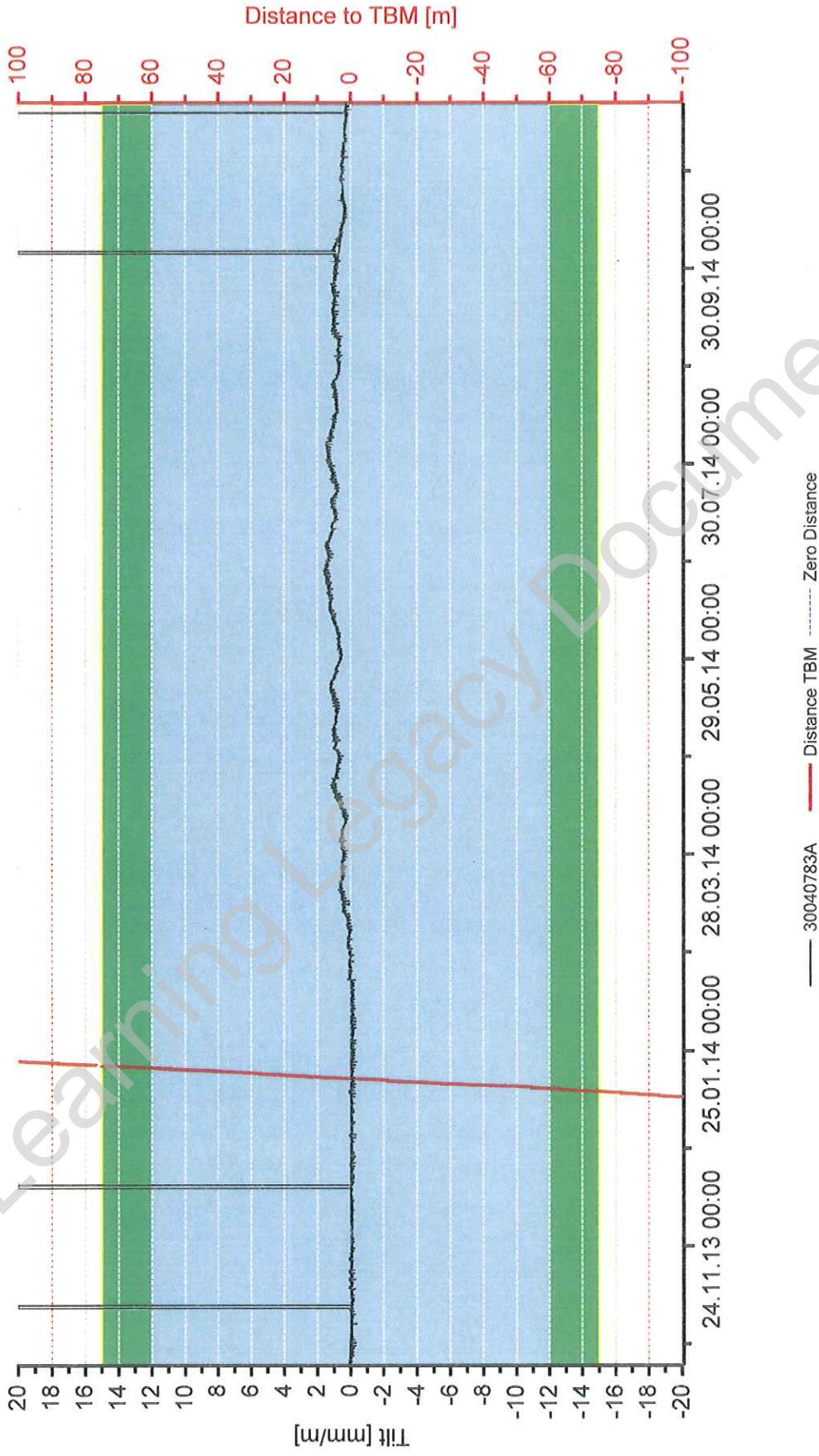
Point: 30040782A



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: WB Tunnel - Building albert Road 211-217 - 17.10.2013 - 21.11.2014
Date: 20.01.2015 13:29 Current Values: 20.01.2015 13:07

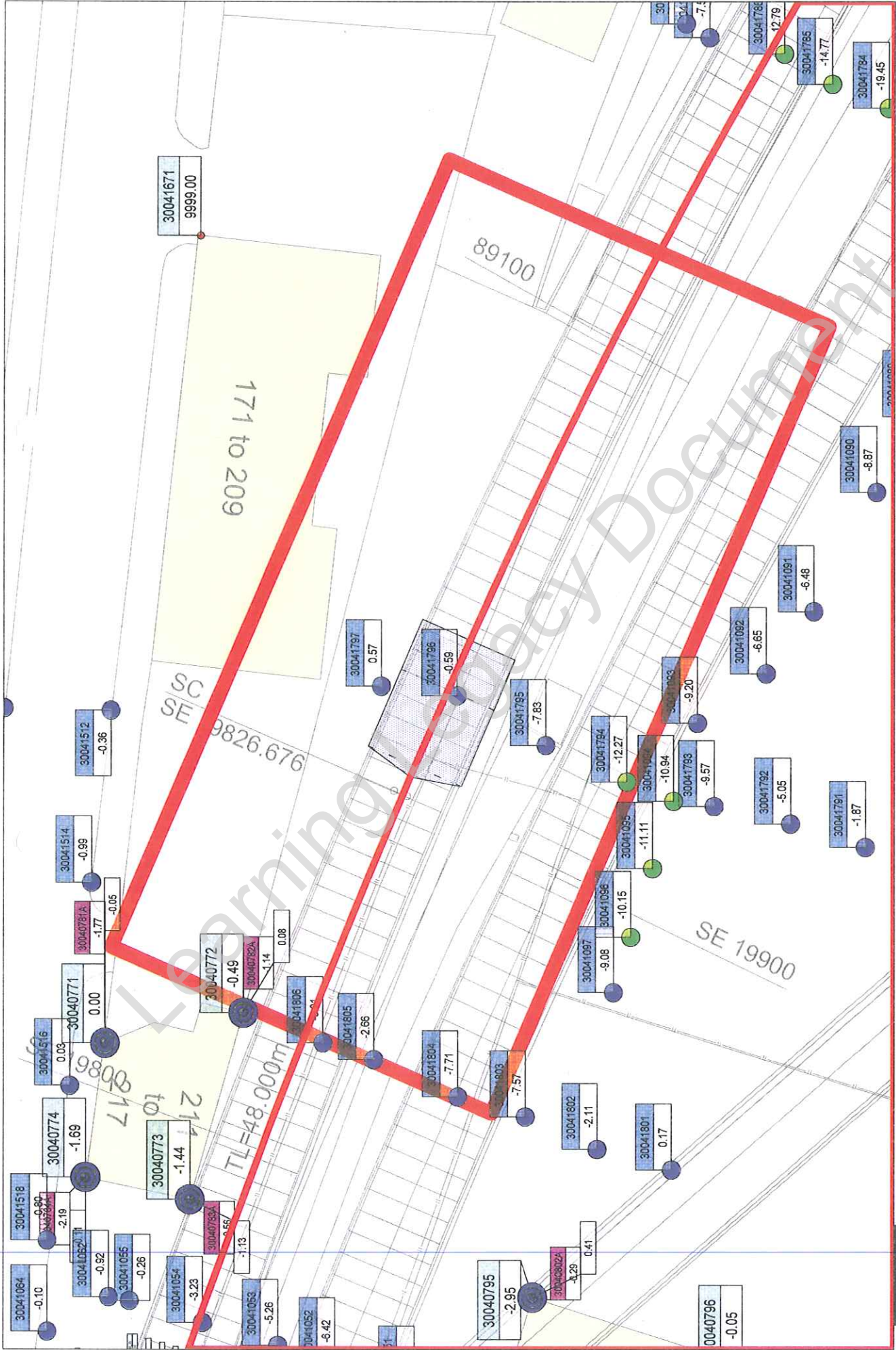


Point: 30040783A



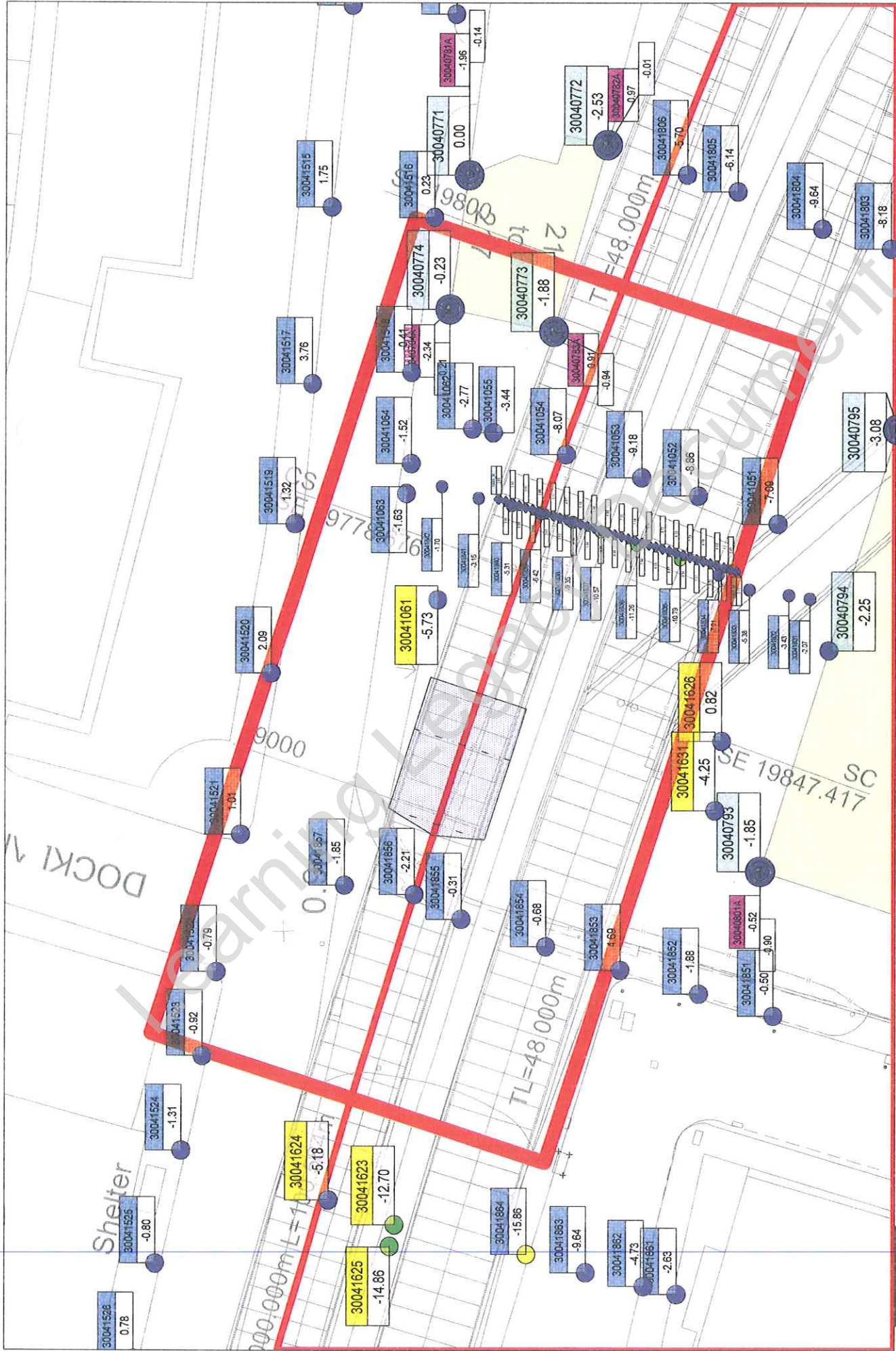
Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: WB Tunnel - Building Albert Road 211-217 - 17.10.2013 - 21.11.2014
Date: 20.01.2015 13:33 Current Values: 20.01.2015 13:28



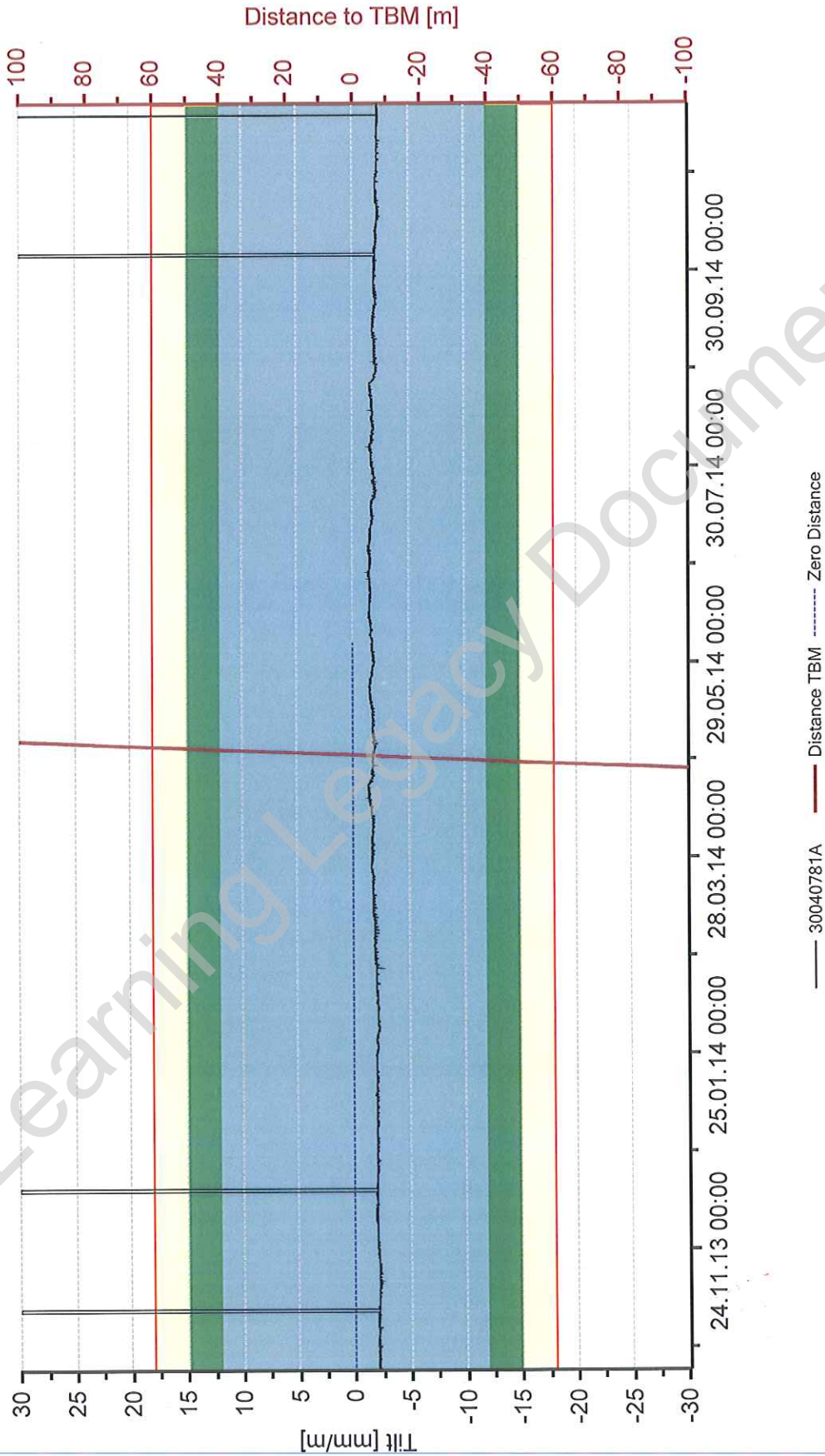


Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: C310 EB tunnel drive; NWP: portal excavation, construction base slab
 current values: 28.04.2014 17:52





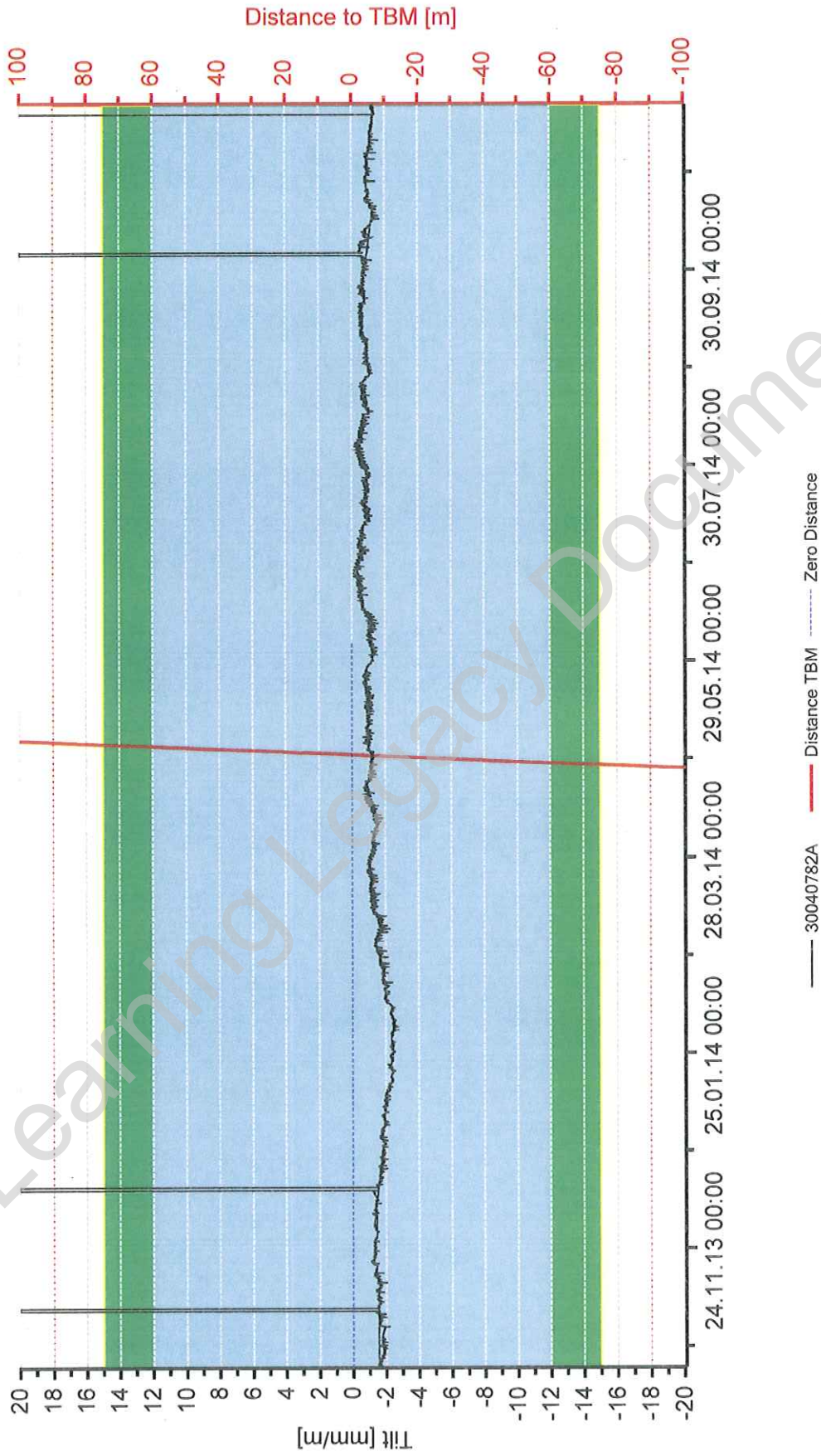
Profile: Measurement Point 30040781A



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 Close Out Report: EB Tunnel - Building Albert Road 211-217 - 17.10.2013 - 21.11.2014
 date: 14.04.2015 16:48 current values: 14.04.2015 14:05



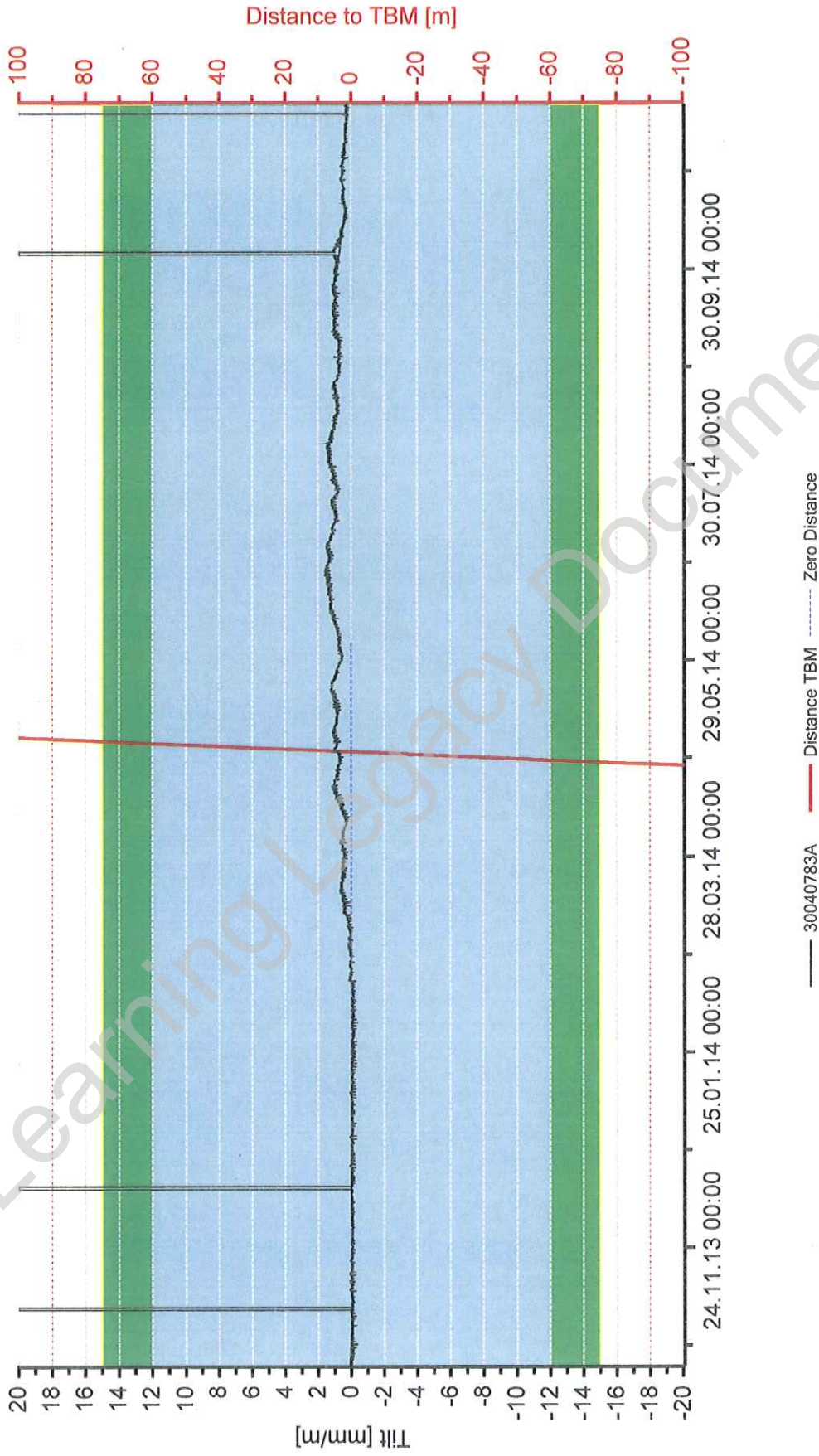
Point: 30040782A



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: EB Tunnel - Building Albert Road - 17.10.2013 - 21.11.2014
date: 20.01.2015 16:30 current values: 20.01.2015 13:28



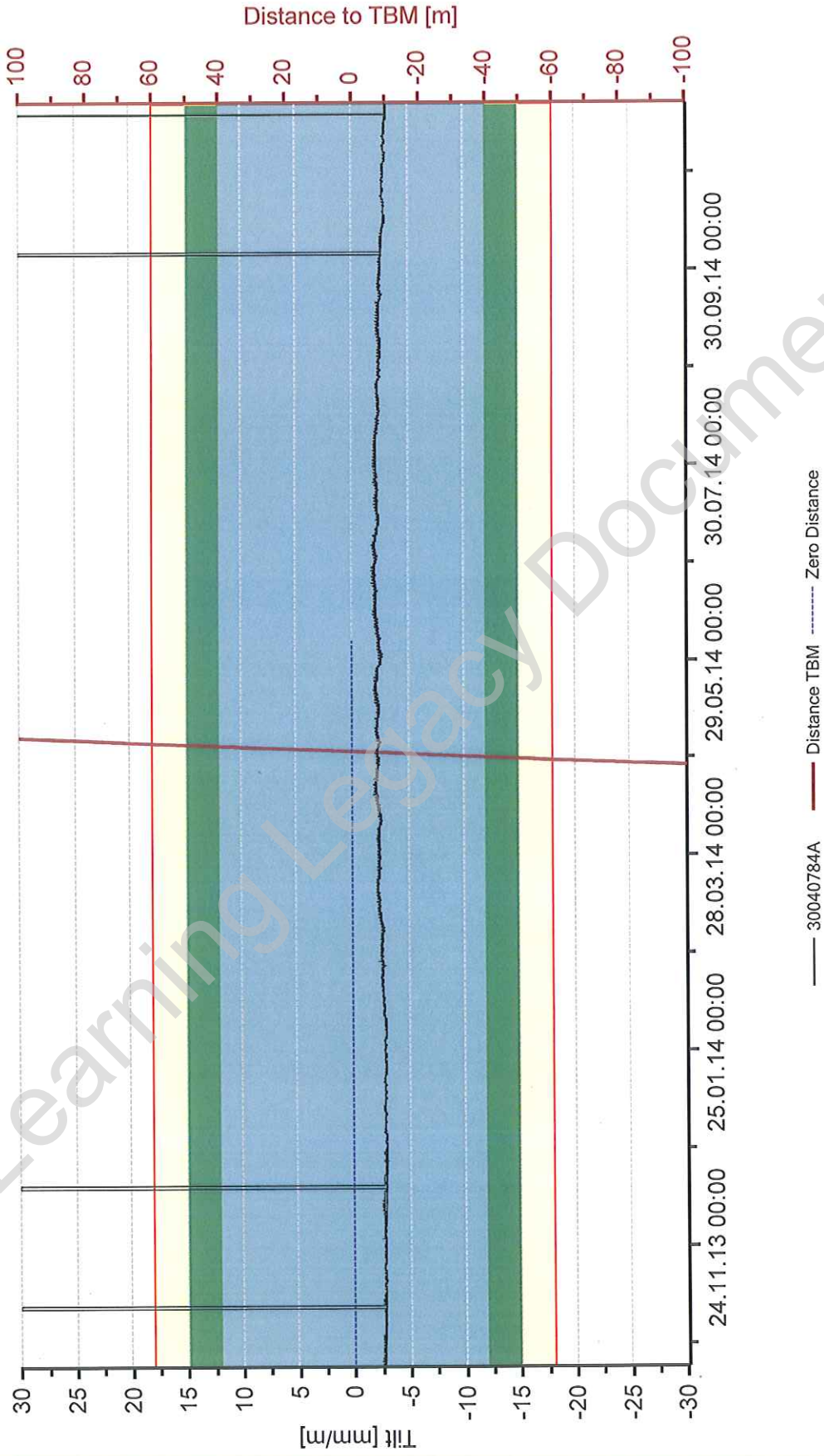
Point: 30040783A



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: EB Tunnel - Building Albert Road - 17.10.2013 - 21.11.2014
date: 20.01.2015 16:32 current values: 20.01.2015 13:28



Profile: Measurement Point 30040784A



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 Close Out Report: EB Tunnel - Building Albert Road 211-217 - 17.10.2013 - 21.11.2014
 date: 14.04.2015 16:49 current values: 14.04.2015 14:05



		C310 THAMES TUNNEL REPORT			
EMPLOYER	CROSSRAIL	eB NO	C310-HTM-C-RGN-CR148-50024	Rev	2.0
TITLE	Monitoring Close-Out Reports relating to Tunnelling Works North Embankment River Thames - North Woolwich Portal (excl. Store Rd)				

APPENDIX 93
TW Pumping Station – HLC

Learning Legacy Document

monitoring asset	TW Pumping Station		
reference monitoring drawing:	C310-HTM-C-DWG-CR146-ST004-70003		
name of monitoring section:	TW Pumping Station		
sensor type:	hydrostatic levelling cell (hlc)		
chainage:	89040	point no.:	3004 0791 - 3004 0799
trigger values: [mm]	green: +12 -12	amber: +15 -15	red: +18 -18
reference document for trigger values:	Management Plan for Control of Ground Movement		
EB-no.:	C310-HTM-Z-STP-CR148-50058		
Appendix:	AAA		

monitoring data

	date	max. value	point no.	comments
baseline	08/03/13	0.00		
TBM 1	start ZOI	14/01/14	-2.54	3004 0795
		15/01/14	-0.81	3004 0793
	end ZOI	19/01/14	-2.82	3004 0795
		20/01/14	-0.92	3004 0793
breached not any trigger value				
TBM 2	start ZOI	29/04/14	-3.14	3004 0795
		30/04/14	-1.91	3004 0793
	end ZOI	02/05/14	-2.80	3004 0795
		03/05/14	-1.54	3004 0793
breached not any trigger value				
longterm	18/11/14	-1.91 -0.39	3004 0795 3004 0793	

Evaluation of any potential residual risks



No residual risk
since the Works have been completed by HMJV



Yes, residual risk
(see comment below)

summary / comments

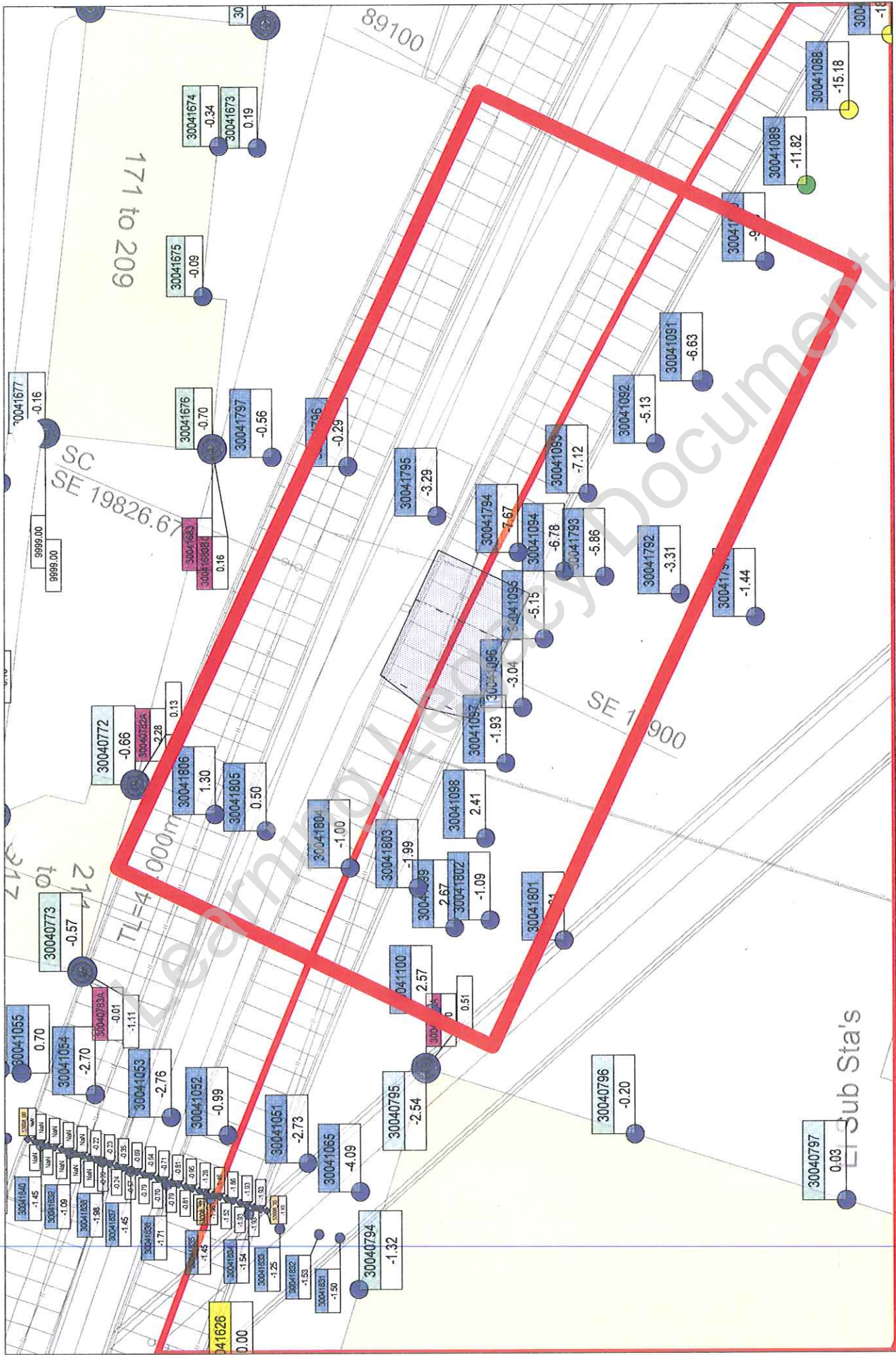
Under consideration of temperature differences and the achievable accuracy of the system, HMJV has no concern to cease the monitoring.
The rate of change in the monitoring data is less than the required standards as per the specifications and drawings.

date / signature: 14/04/15

print name:

HMJV project role:

Monitoring & Survey Engineer



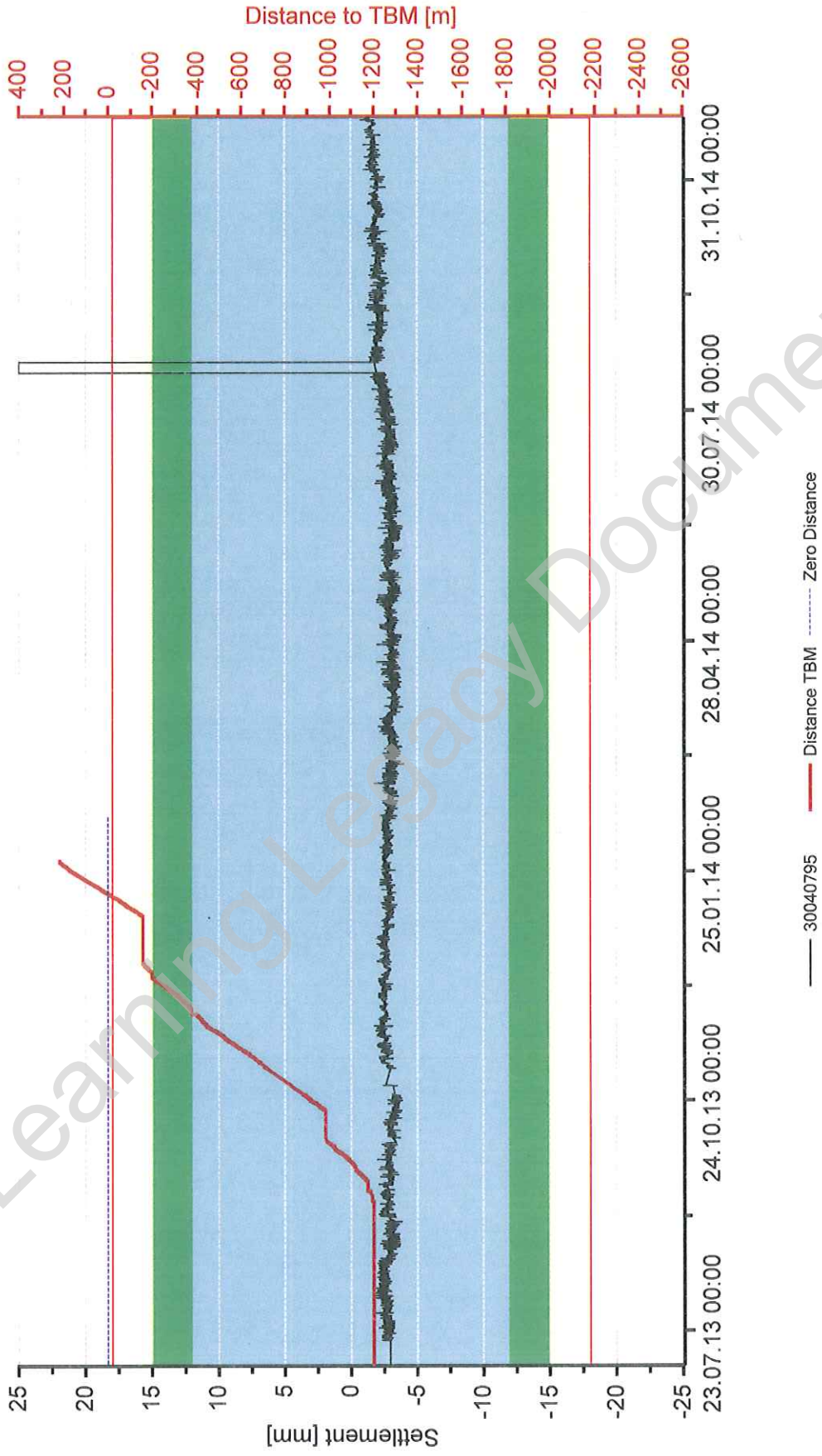
Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal

working activities: TBM drive WB

current values: 14.01.2014 17:37

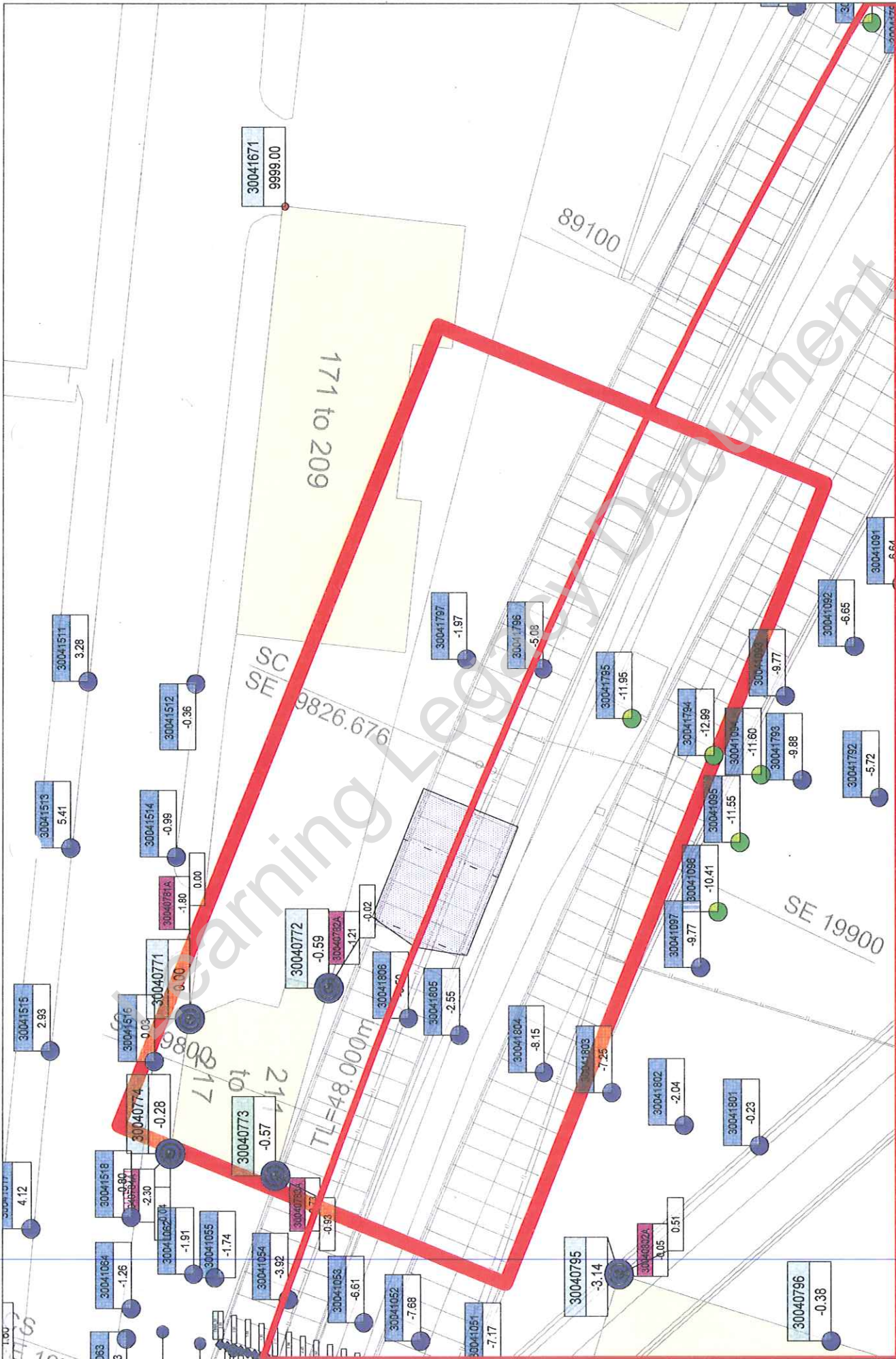


Point: 30040795



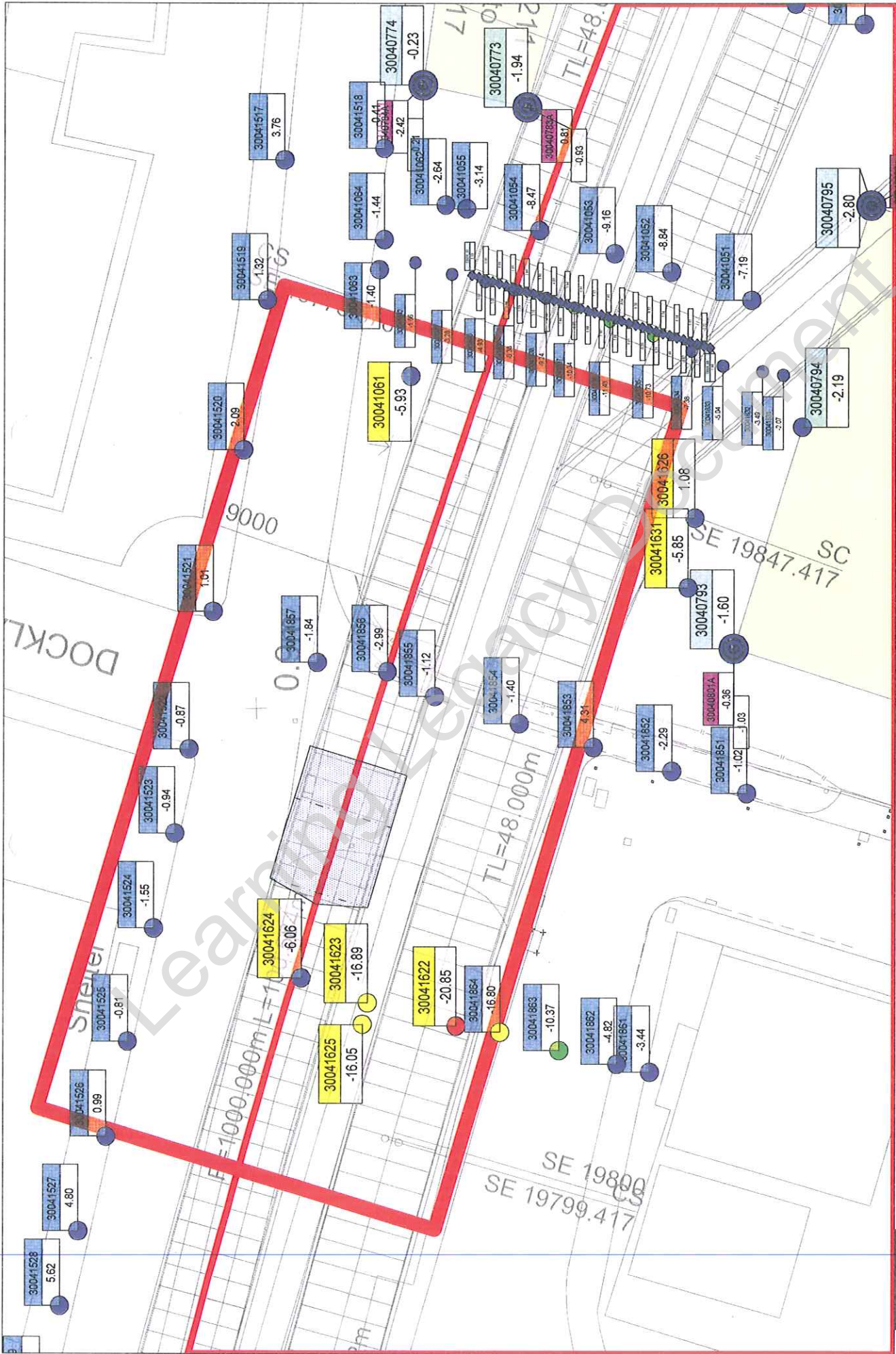
Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: WB Tunnel- TW Pumping station - 17.10.2013 - 21.11.2014
Date: 22.01.2015 10:06 Current Values: 22.01.2015 09:52



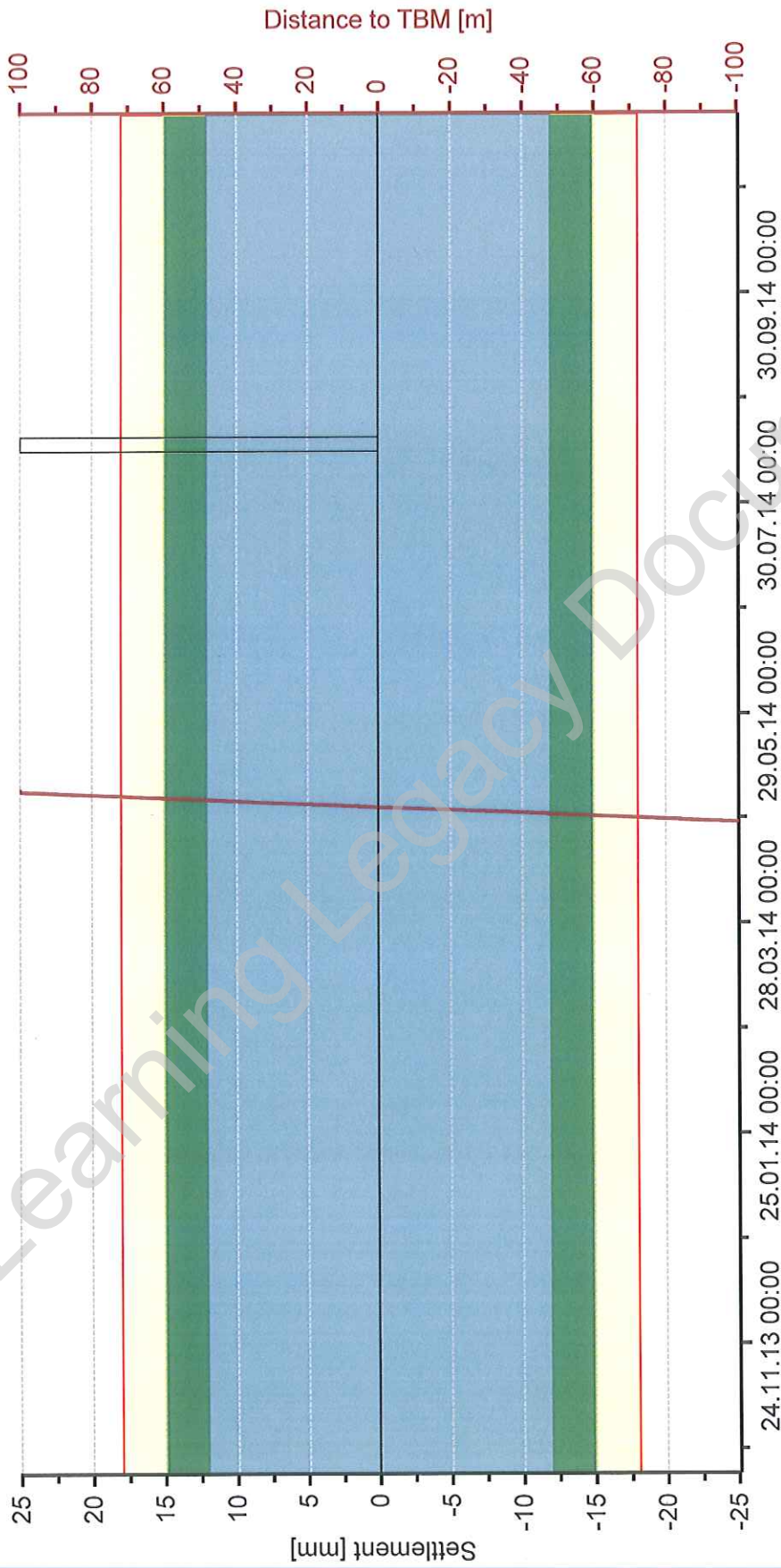


Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: C310 EB tunnel drive; NWP: portal excavation, construction base slab
 current values: 29.04.2014 09:57



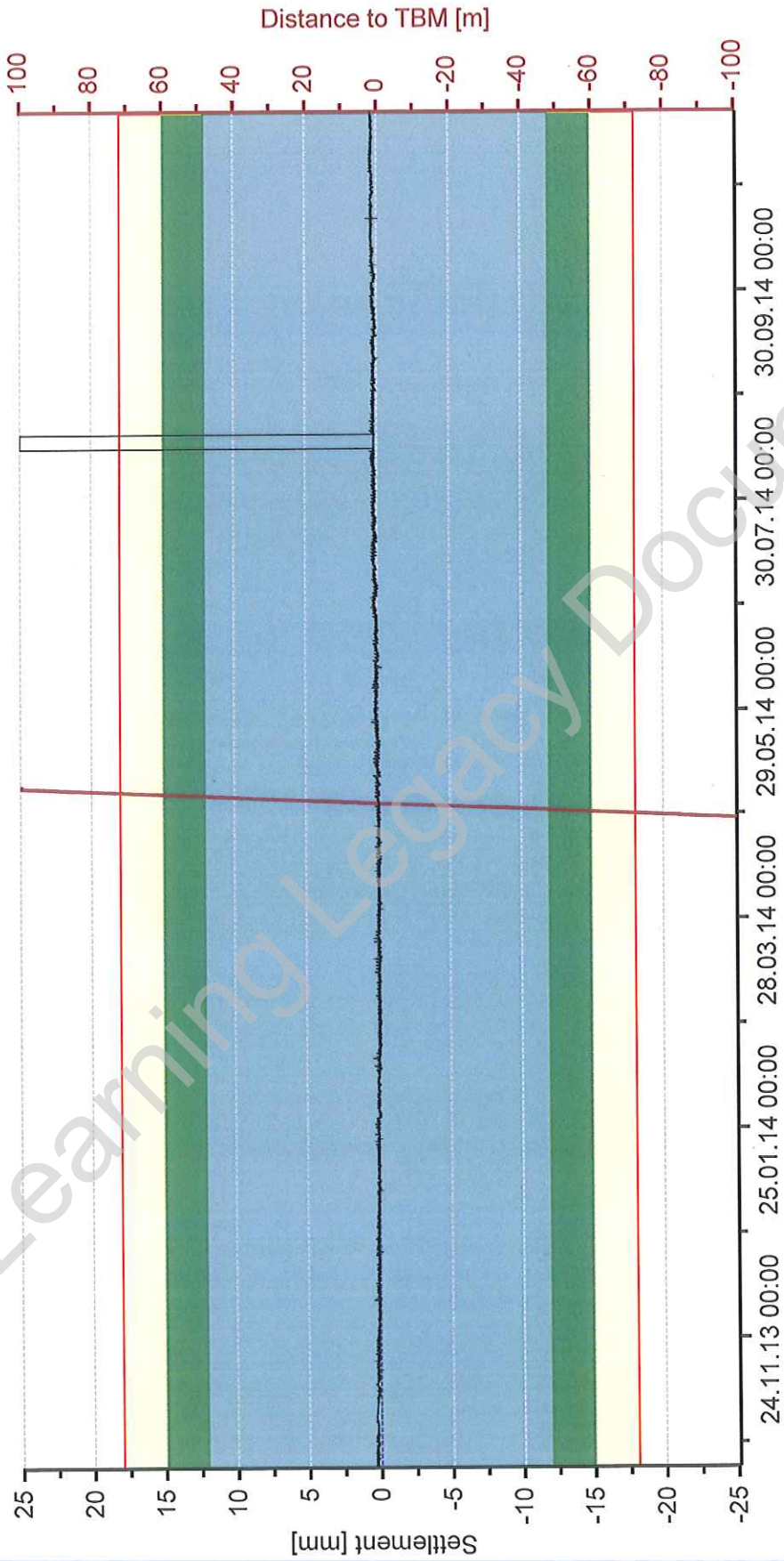


Profile: Measurement Point 30040791



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 Close Out Report: EB Tunnel - TW Pumping Station - 17.10.2013 - 21.11.2014
 date: 14.04.2015 17:39 current values: 14.04.2015 14:05

Profile: Measurement Point 30040792

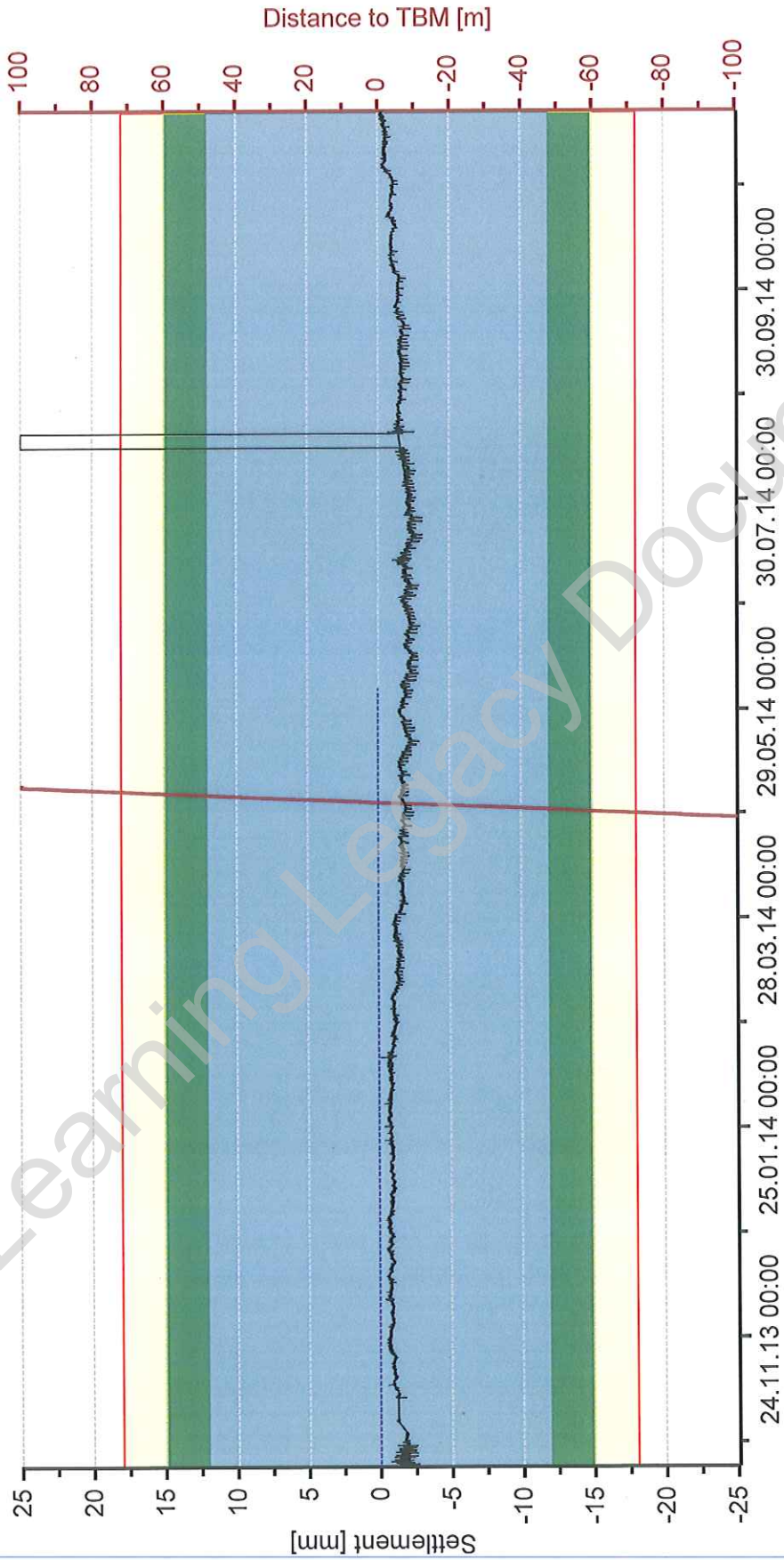


— 30040792 — Distance TBM - - - - - Zero Distance

Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 Close Out Report: EB Tunnel - TW Pumping Station - 17.10.2013 - 21.11.2014
 date: 14.04.2015 17:46 current values: 14.04.2015 14:05



Profile: Measurement Point 30040793

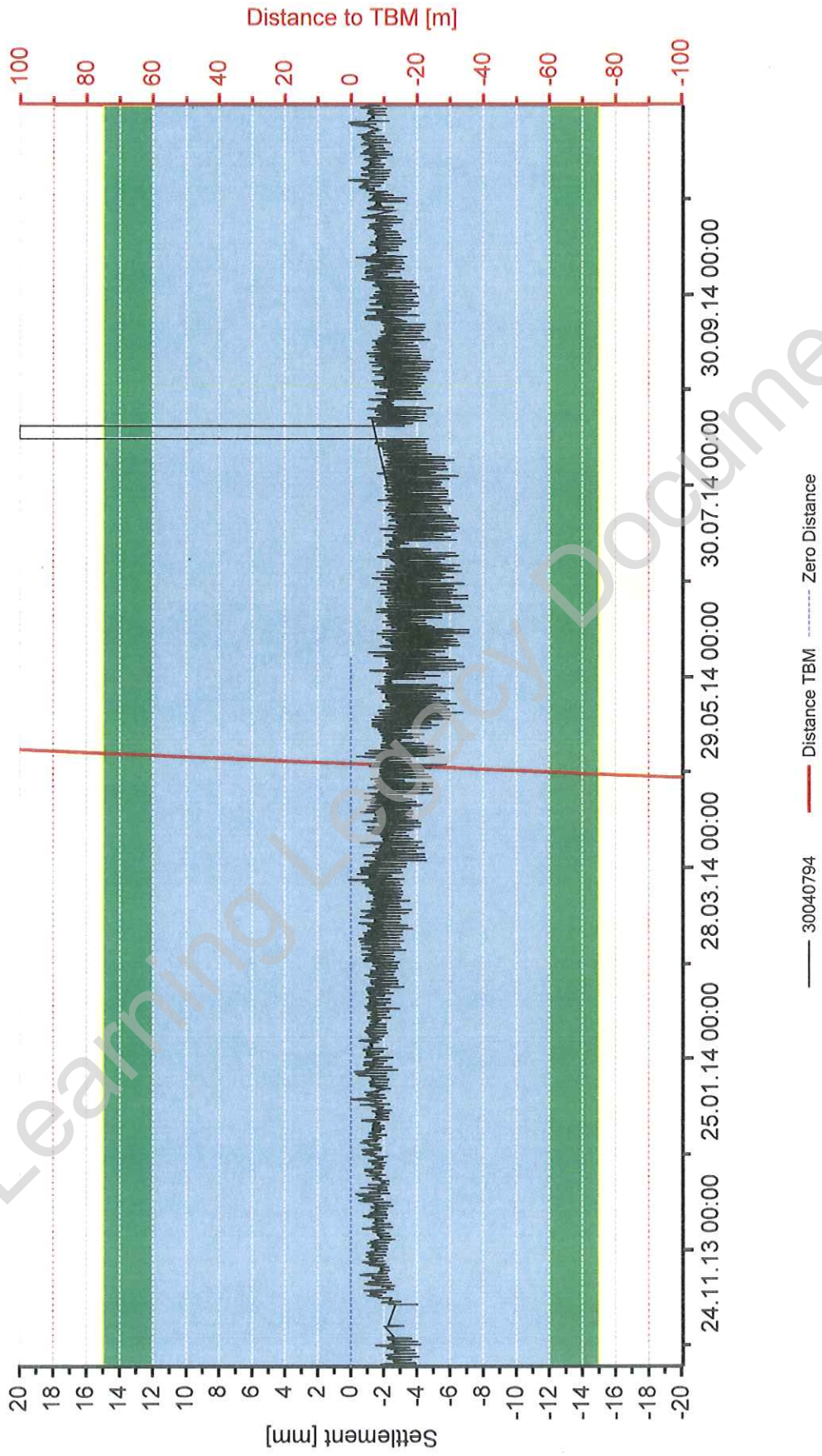


— 30040793 - - - - - Distance TBM Zero Distance

Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 Close Out Report: EB Tunnel - TW Pumping Station - 17.10.2013 - 21.11.2014
 date: 14.04.2015 17:49 current values: 14.04.2015 14:05



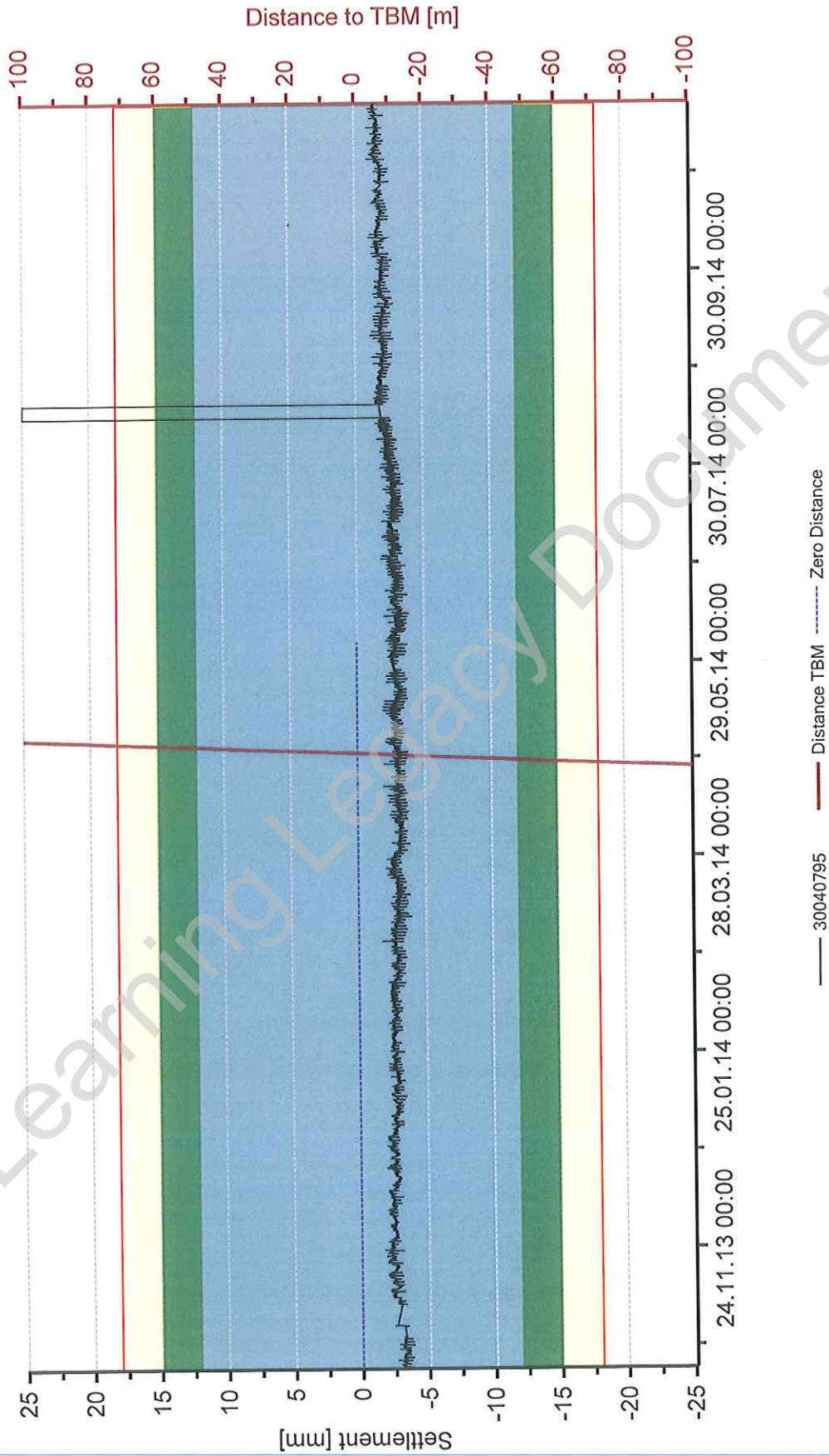
Point: 30040794



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: EB Tunnel - TW Pumping station - 17.10.2013 - 21.11.2014
date: 20.01.2015 16:12 current values: 20.01.2015 13:28

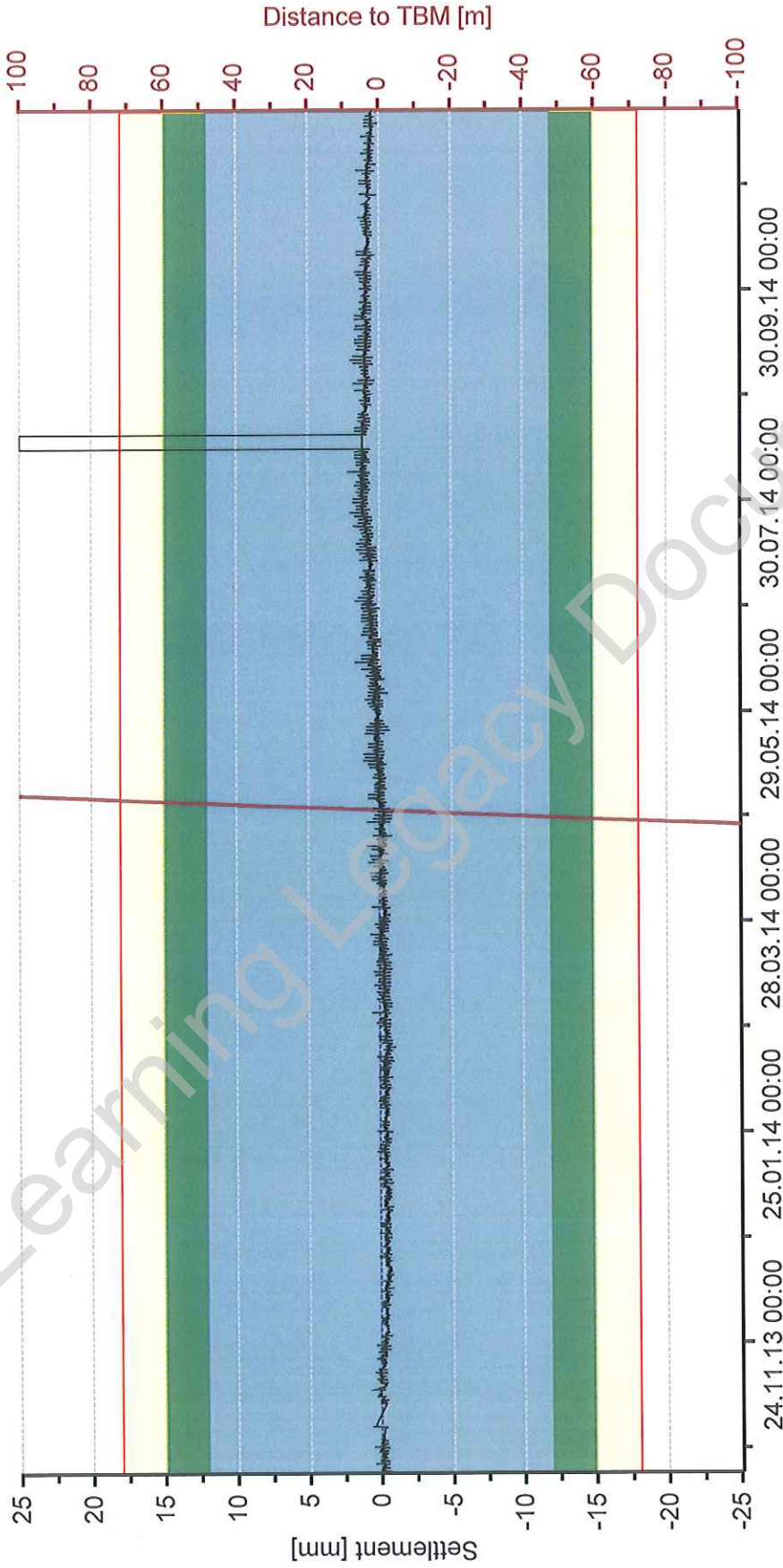


Profile: Measurement Point 30040795



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 Close Out Report: EB Tunnel - TW Pumping Station - 17.10.2013 - 21.11.2014
 date: 14.04.2015 17:37 current values: 14.04.2015 14:05

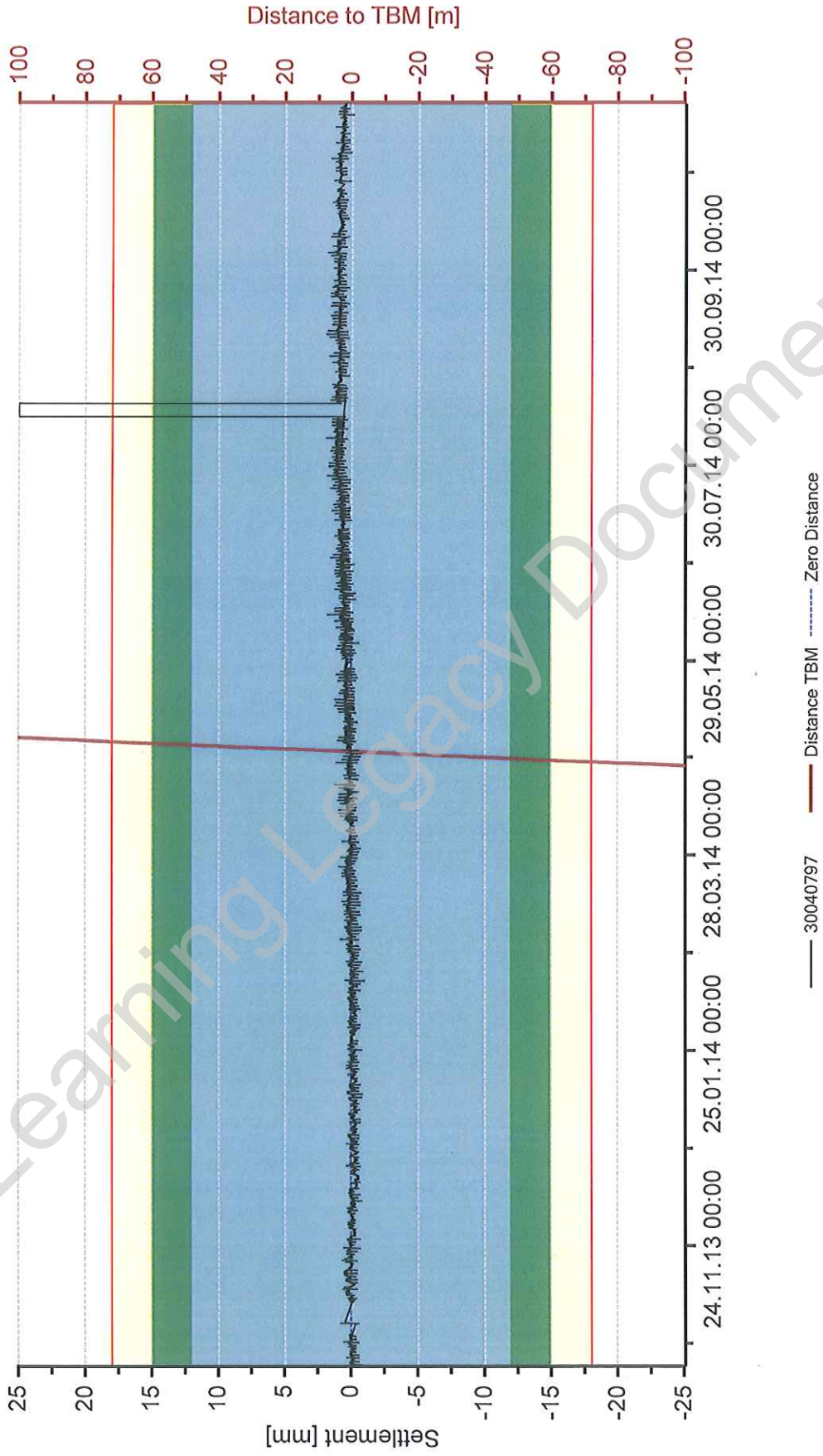
Profile: Measurement Point 30040796



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: EB Tunnel - TW Pumping Station - 17.10.2013 - 21.11.2014
date: 14.04.2015 17:52 current values: 14.04.2015 14:05




Profile: Measurement Point 30040797



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 Close Out Report: EB Tunnel - TW Pumping Station - 17.10.2013 - 21.11.2014
 date: 14.04.2015 18:05 current values: 14.04.2015 14:05



 HOCHTIEF MURPHY Joint Venture		C310 THAMES TUNNEL REPORT			
EMPLOYER	CROSSRAIL	eB NO	C310-HTM-C-RGN-CR148-50024	Rev	2.0
TITLE	Monitoring Close-Out Reports relating to Tunnelling Works North Embankment River Thames - North Woolwich Portal (excl. Store Rd)				

APPENDIX 94
TW Pumping Station – TM

Learning Legacy Document

monitoring asset	TW Pumping Station		
reference monitoring drawing:	C310-HTM-C-DWG-CR146-ST004-70003		
name of monitoring section:	TW Pumping Station		
sensor type:	tiltmeter		
chainage:	89040	point no.:	3004 0801 - 3004 0802
trigger values: [mm]	green: N/A	amber: N/A	red: N/A
reference document for trigger values:	Management Plan for Control of Ground Movement		
EB-no.:	C310-HTM-Z-STP-CR148-50058		
Appendix:	AAA		

monitoring data

	date	max. value	point no.	comments
baseline	08/03/13	0.00		
TBM 1	start ZOI	14/01/14	0.90	3004 0802A
	end ZOI	19/01/14	0.77	3005 0802A breached not any trigger value
TBM 2	start ZOI	29/04/14	-0.05	3006 0802A
	end ZOI	02/05/14	0.15	3007 0802A breached not any trigger value
longterm	18/11/14	0.64	3008 0802A	

Evaluation of any potential residual risks	<input checked="" type="checkbox"/>	No residual risk since the Works have been completed by HMJV
	<input type="checkbox"/>	Yes, residual risk (see comment below)

summary / comments

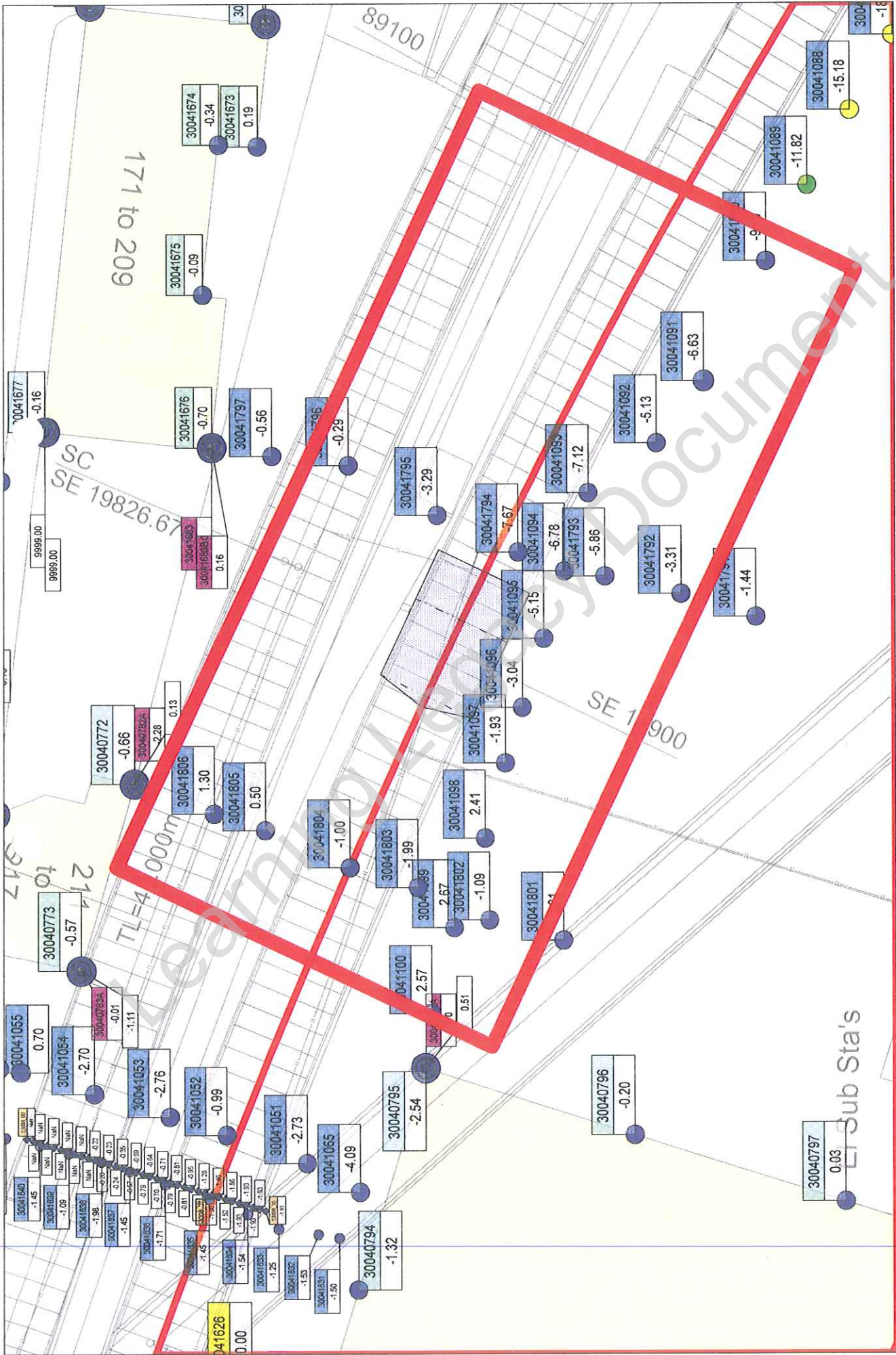
Under consideration of temperature differences and the achievable accuracy of the system, HMJV has no concern to cease the monitoring.
 The rate of change in the monitoring data is less than the required standards as per the specifications and drawings.
 No trigger values for tilt specified.

date / signature: 14/04/15

print name:

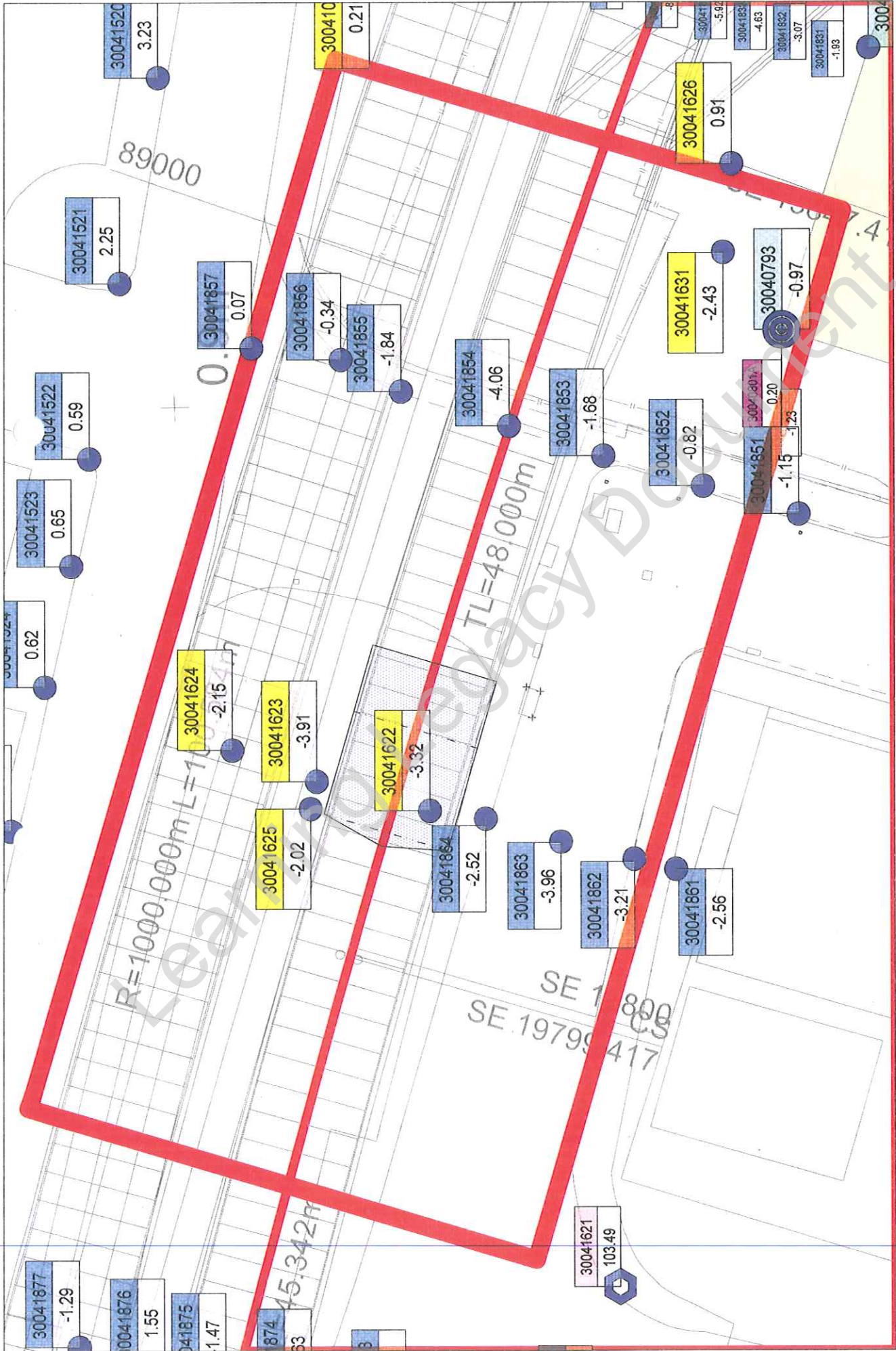
HMJV project role:

Monitoring & Survey Engineer



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: TBM drive WB
 current values: 14.01.2014 17:37

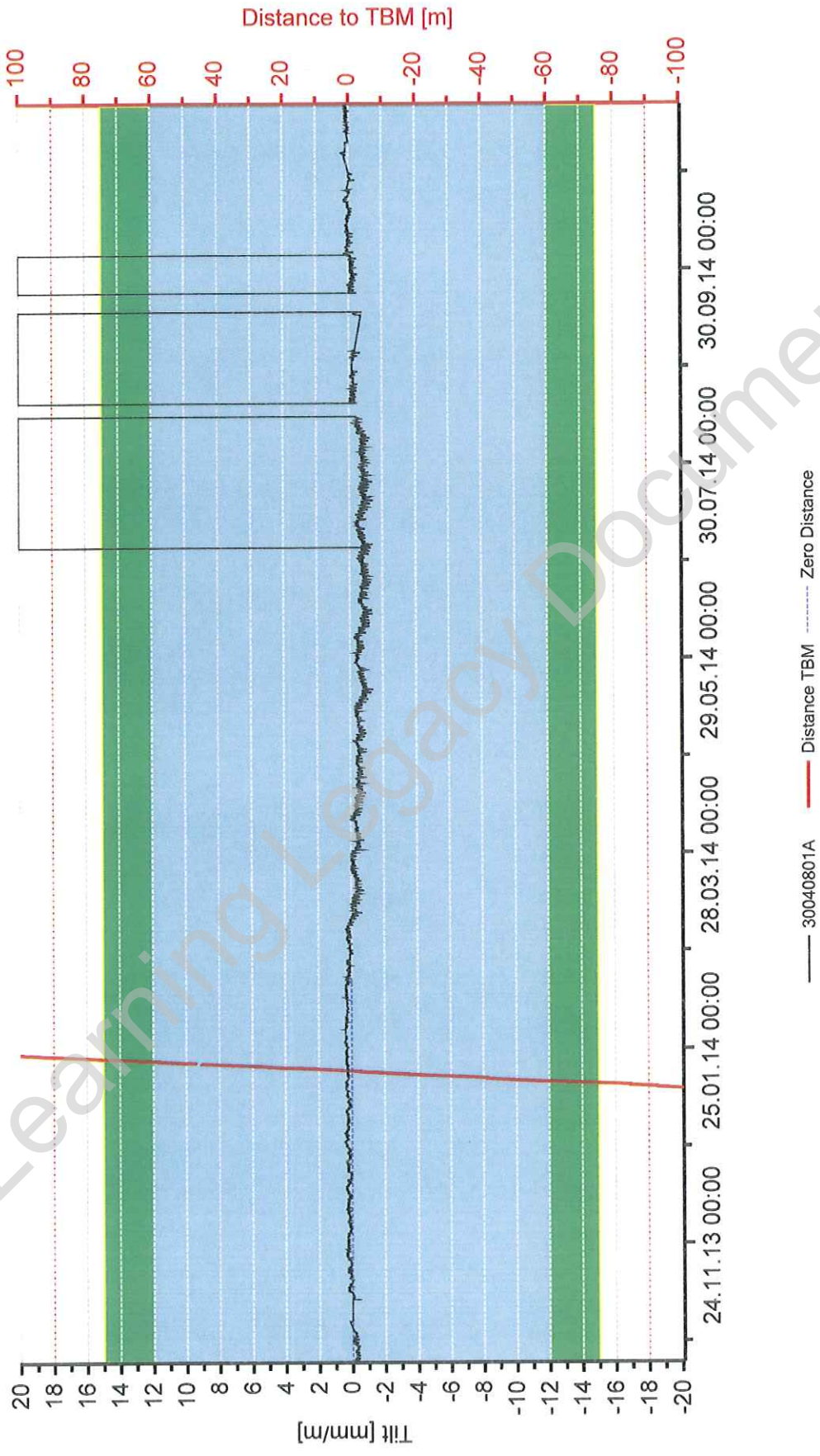




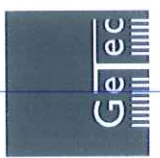
Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: TBM drive WB
 current values: 19.01.2014 18:06



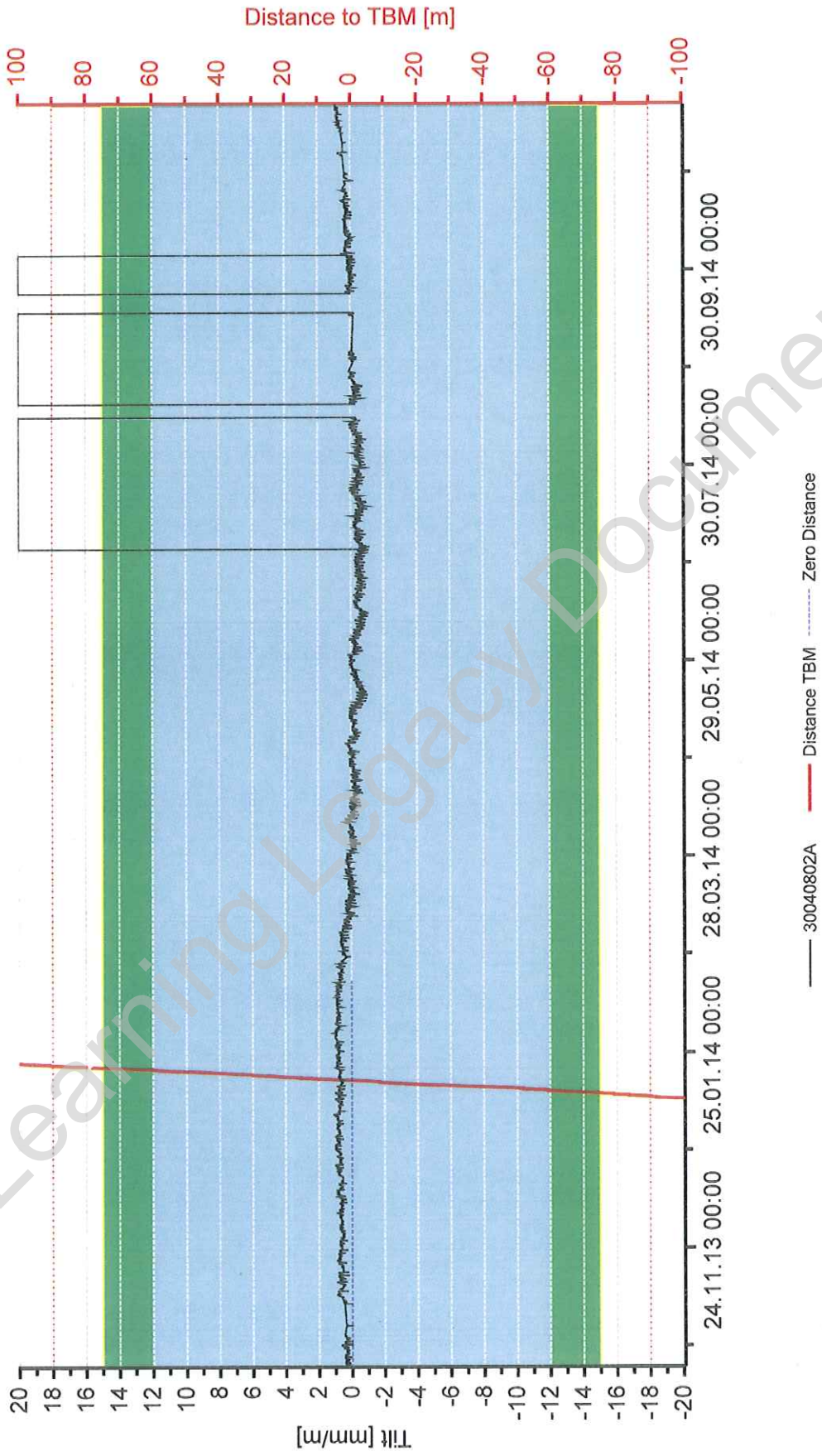
Point: 30040801A



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: WB Tunnel - TW Pumping station - 17.10.2013 - 21.11.2014
Date: 20.01.2015 14:23 Current Values: 20.01.2015 13:28

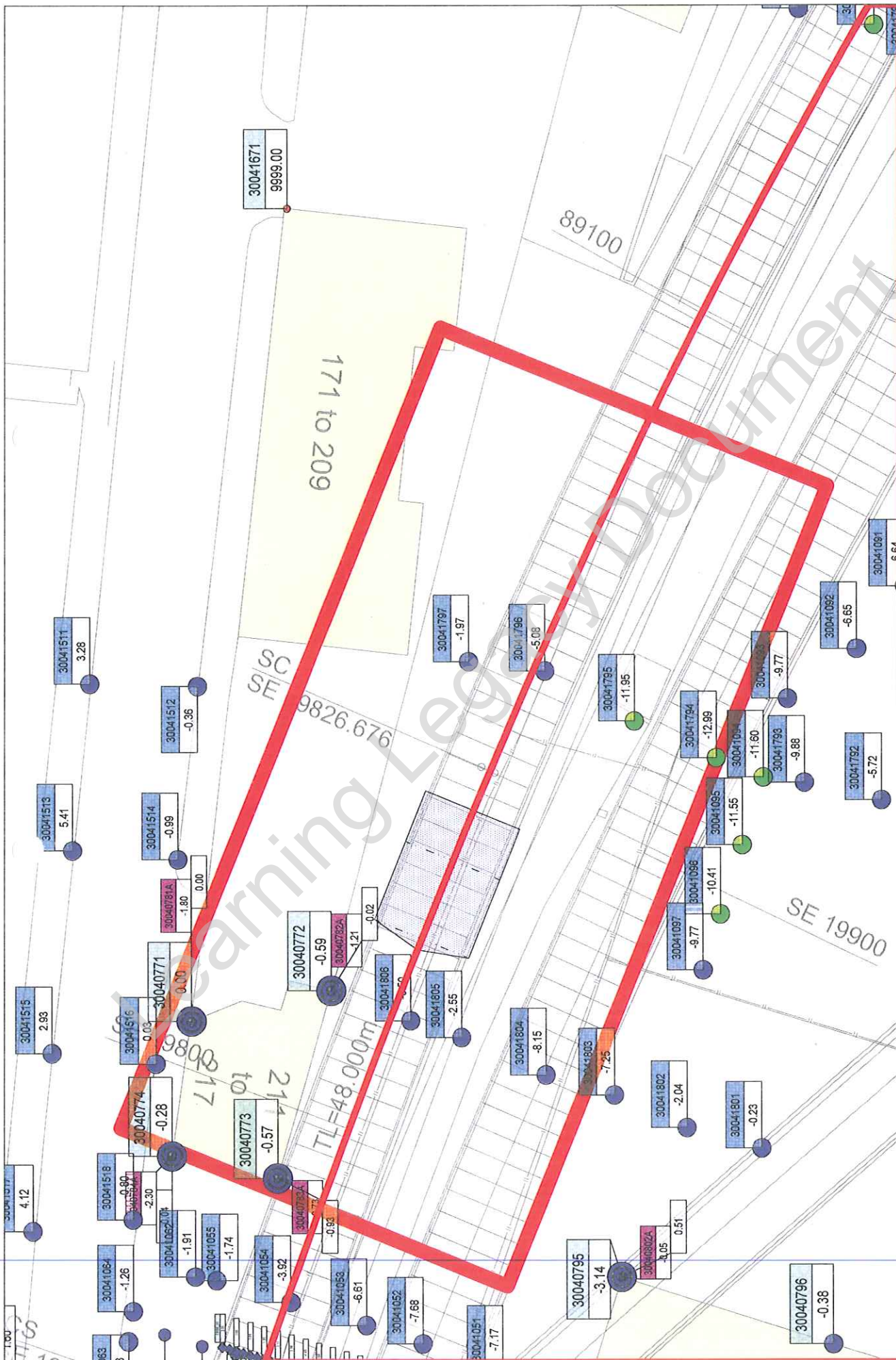


Point: 30040802A

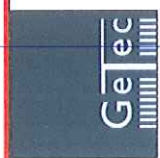


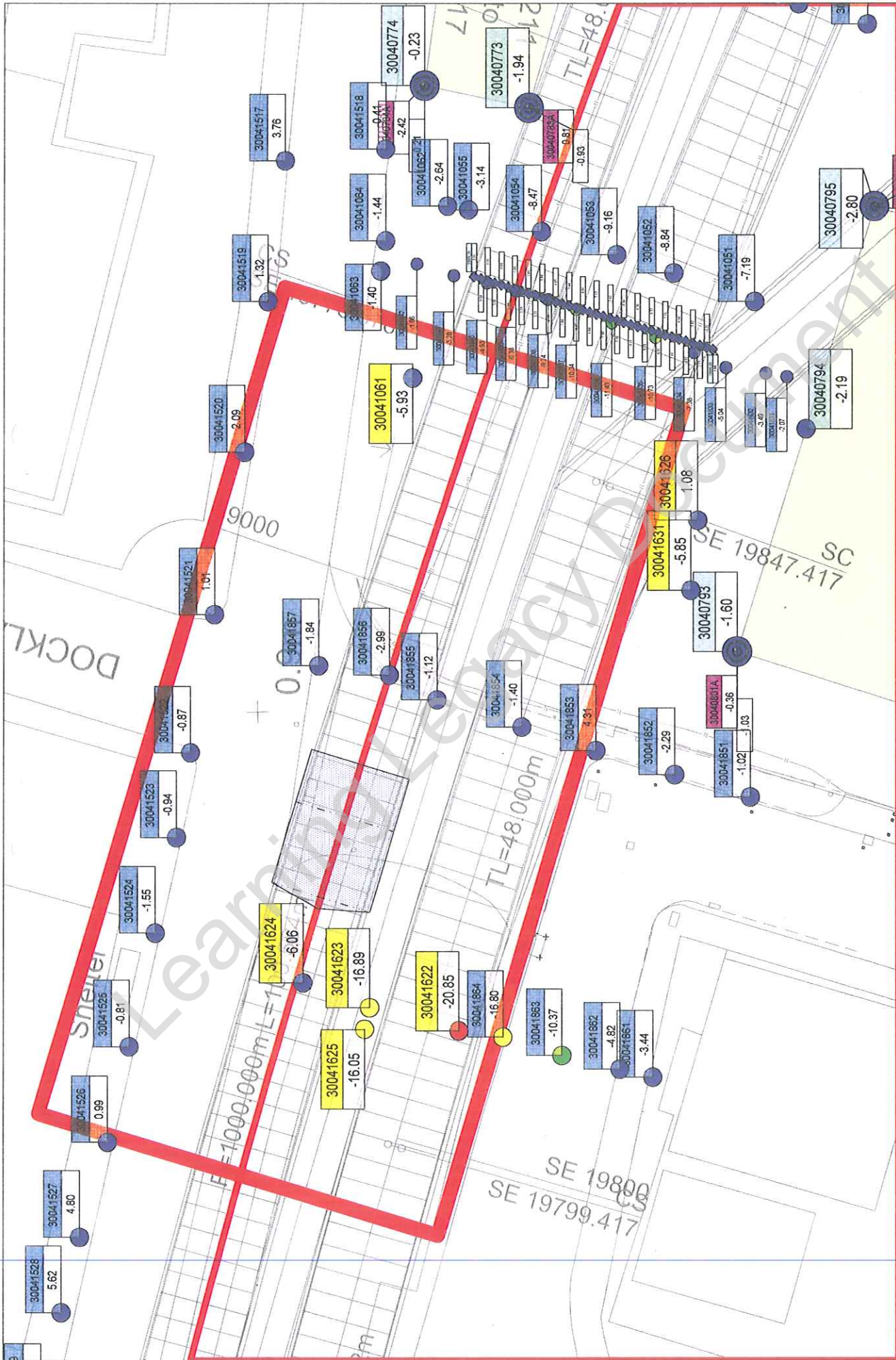
Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: WB Tunnel - TW Pumping station - 17.10.2013 - 21.11.2014
Date: 20.01.2015 14:21 Current Values: 20.01.2015 13:28



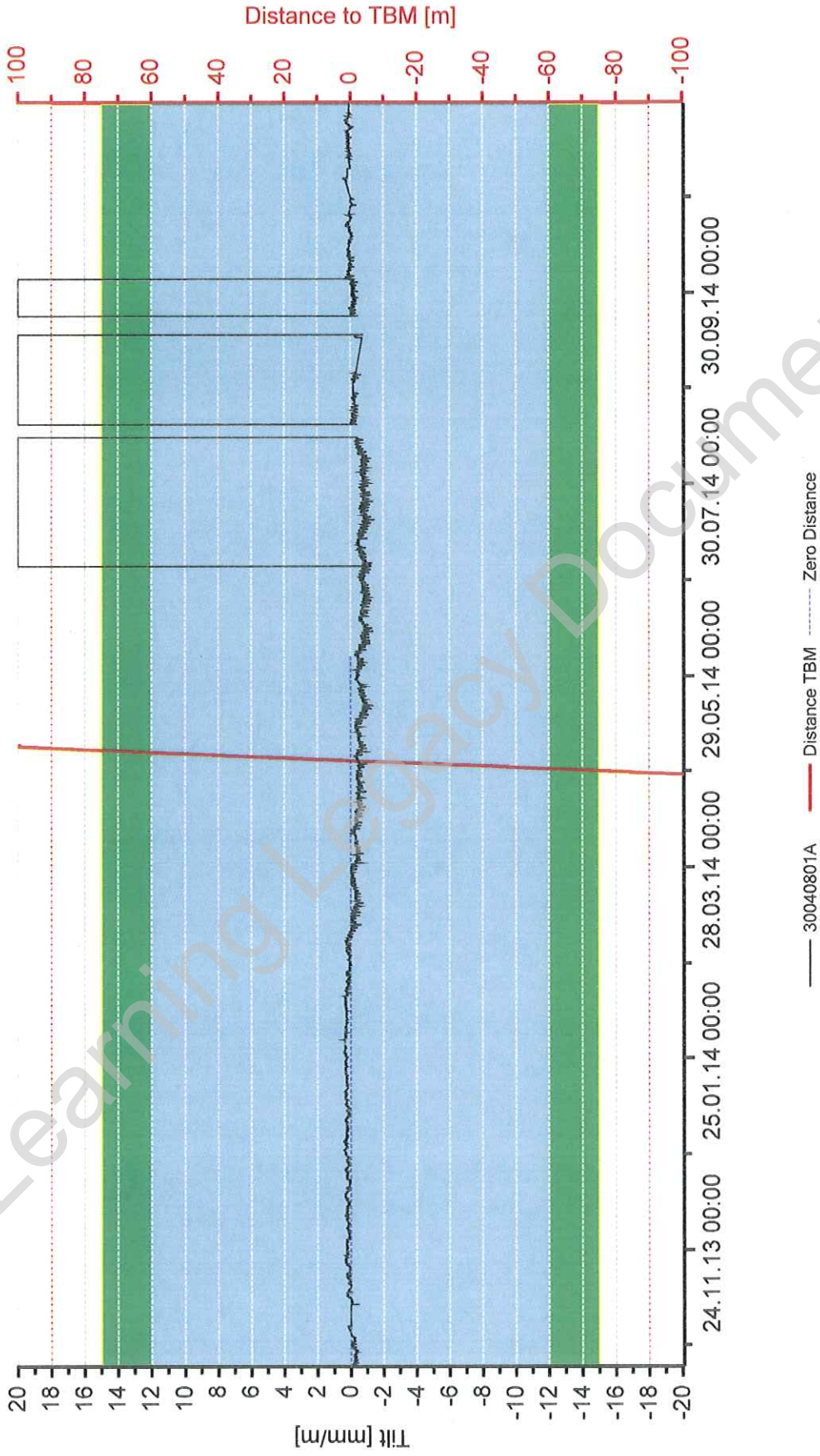


Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: C310 EB tunnel drive; NWP: portal excavation, construction base slab
 current values: 29.04.2014 09:57





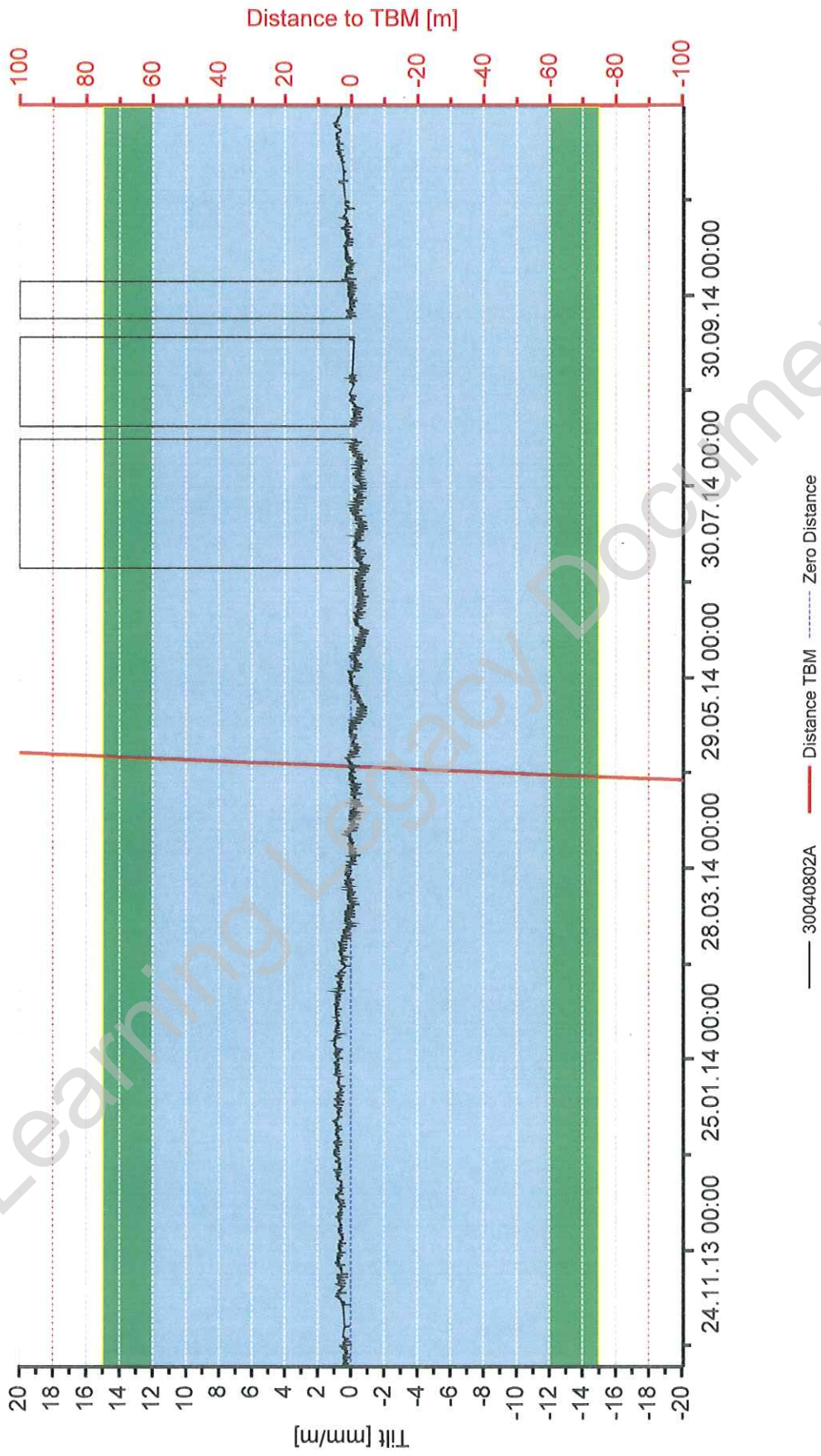
Point: 30040801A



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: EB Tunnel - TW Pumping station - 17.10.2013 - 21.11.2014
date: 20.01.2015 16:17 current values: 20.01.2015 13:28




Point: 30040802A



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: EB Tunnel - TW Pumping station - 17.10.2013 - 21.11.2014
date: 20.01.2015 16:19 current values: 20.01.2015 13:28



		C310 THAMES TUNNEL REPORT			
EMPLOYER	CROSSRAIL	eB NO	C310-HTM-C-RGN-CR148-50024	Rev	2.0
TITLE	Monitoring Close-Out Reports relating to Tunnelling Works North Embankment River Thames - North Woolwich Portal (excl. Store Rd)				

APPENDIX 95

CS 25 - Old Station 1 - CH 89155

Learning Legacy Document

monitoring asset	Old Station Museum		
reference monitoring drawing:	C310-HTM-C-DWG-CR146-ST004-70003		
name of monitoring section:	CS 25 Old Station 1 - Ch89155		
sensor type:	manual levelling studs		
chainage:	89155	point no.:	3004 1771 - 3004 1778
trigger values: [mm]	green: +16 -16	amber: +20 -20	red: +25 -25
reference document for trigger values:	Management Plan for Control of Ground Movement		
EB-no.:	C310-HTM-Z-STP-CR148-50058		
Appendix:	AAA		

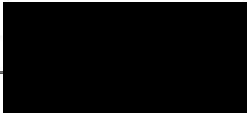
monitoring data

	date	max. value	point no.	comments	
baseline	14/11/13	0.00			
TBM 1	start ZOI	08/01/14	-0.52	3004 1773	
	end ZOI	12/01/14	-12.90	3004 1773	breached not any trigger value
TBM 2	start ZOI	23/04/14	1.32	3004 1776	
	end ZOI	26/04/14	-10.10	3004 1776	breached not any trigger value
longterm	21/11/14	-17.73	304 1774	breached green trigger value	
Evaluation of any potential residual risks	<input checked="" type="checkbox"/>	No residual risk since the Works have been completed by HMJV			
	<input type="checkbox"/>	Yes, residual risk (see comment below)			

summary / comments

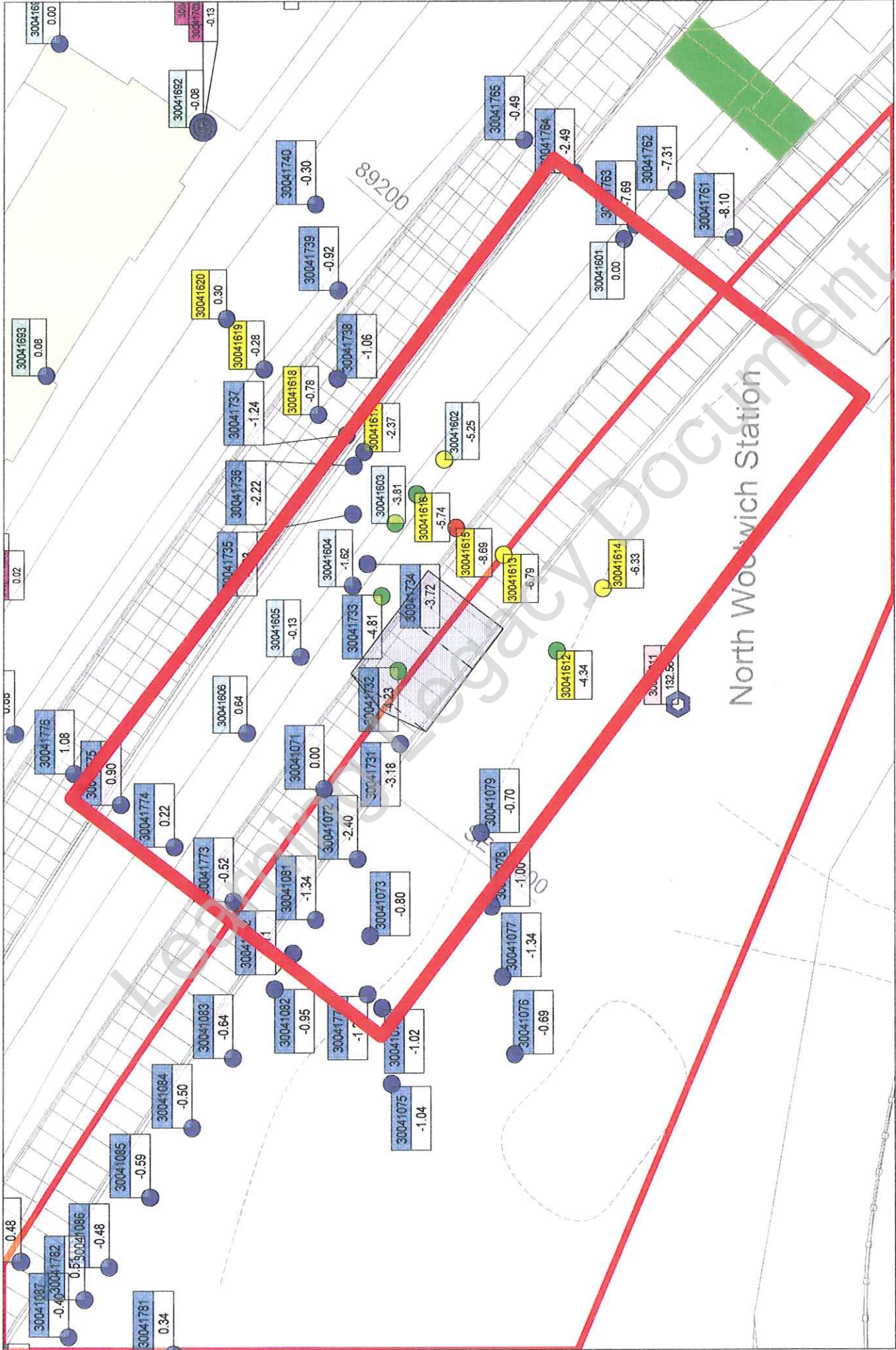
Under consideration of temperature differences, the surrounding ground condition and the achievable accuracy of the measurement, HMJV has no concern to cease the monitoring.
The rate of change in the monitoring data is less than the required standards as per the specifications and drawings.

date / signature: 19/11/2015

print name: 

HMJV project role:

Monitoring & Survey engineer

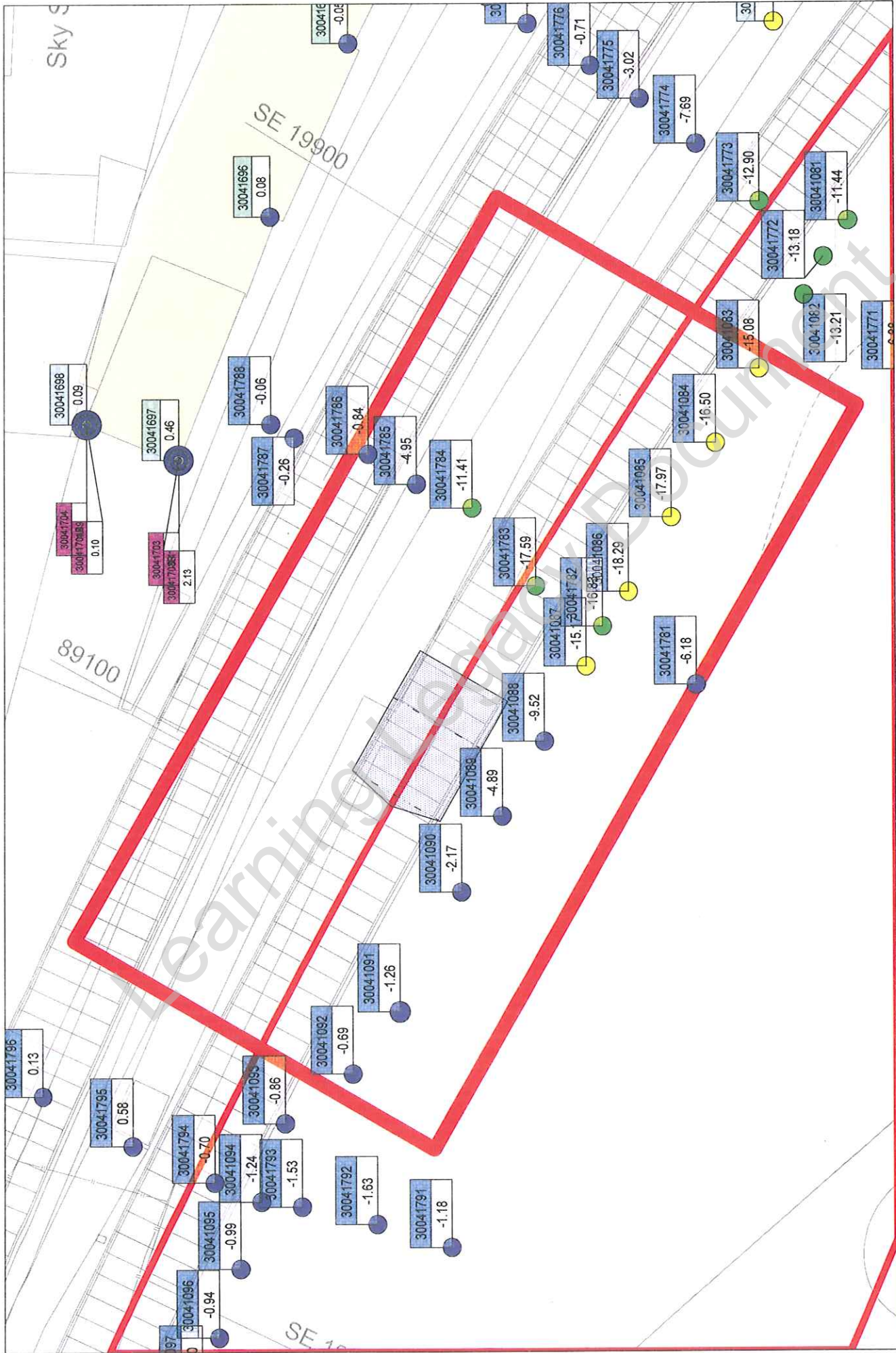


Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal

working activities: TBM drive WB

current values: 08.01.2014 09:00





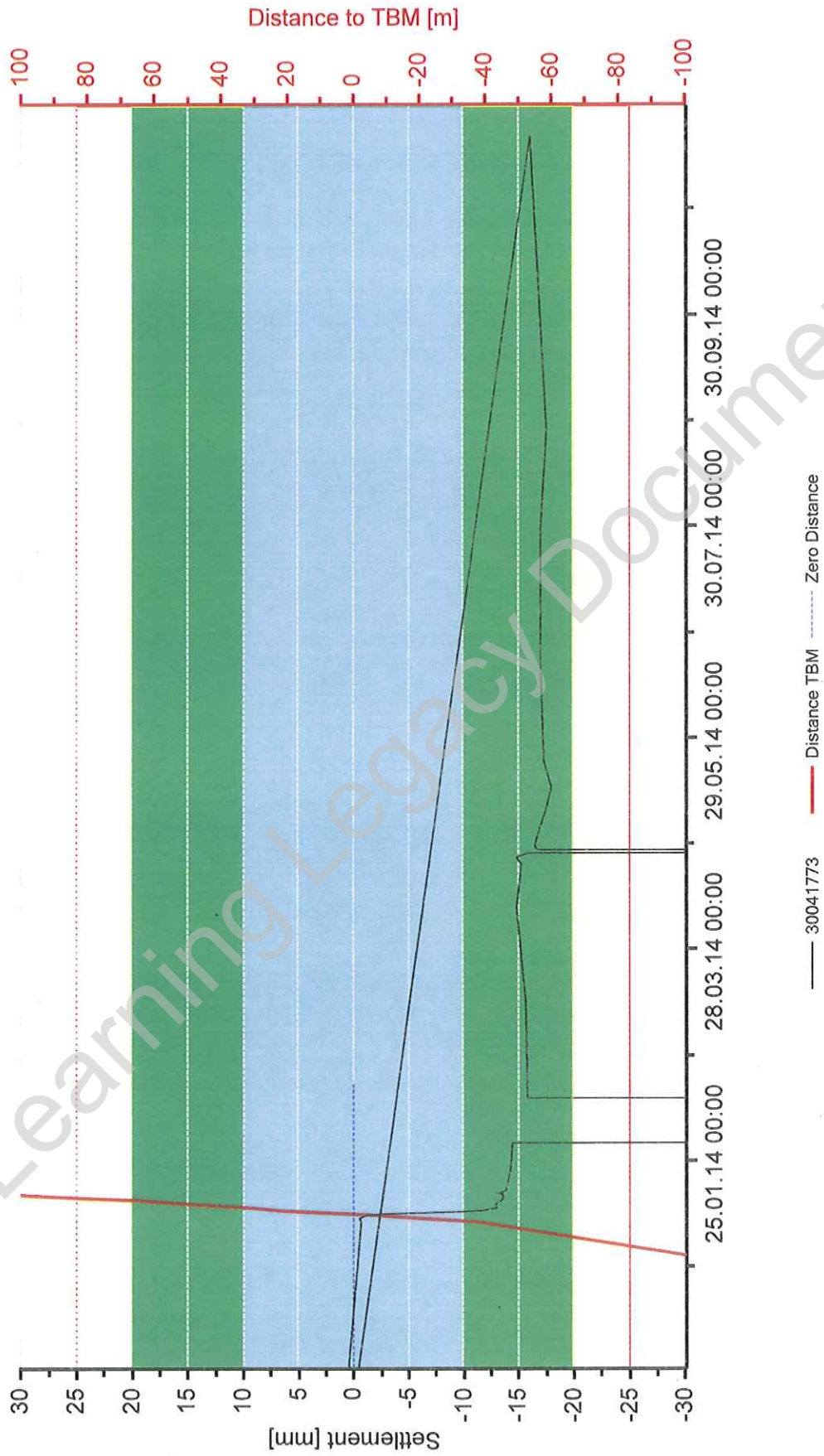
Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal

working activities: TBM drive WB

current values: 12.01.2014 09:00

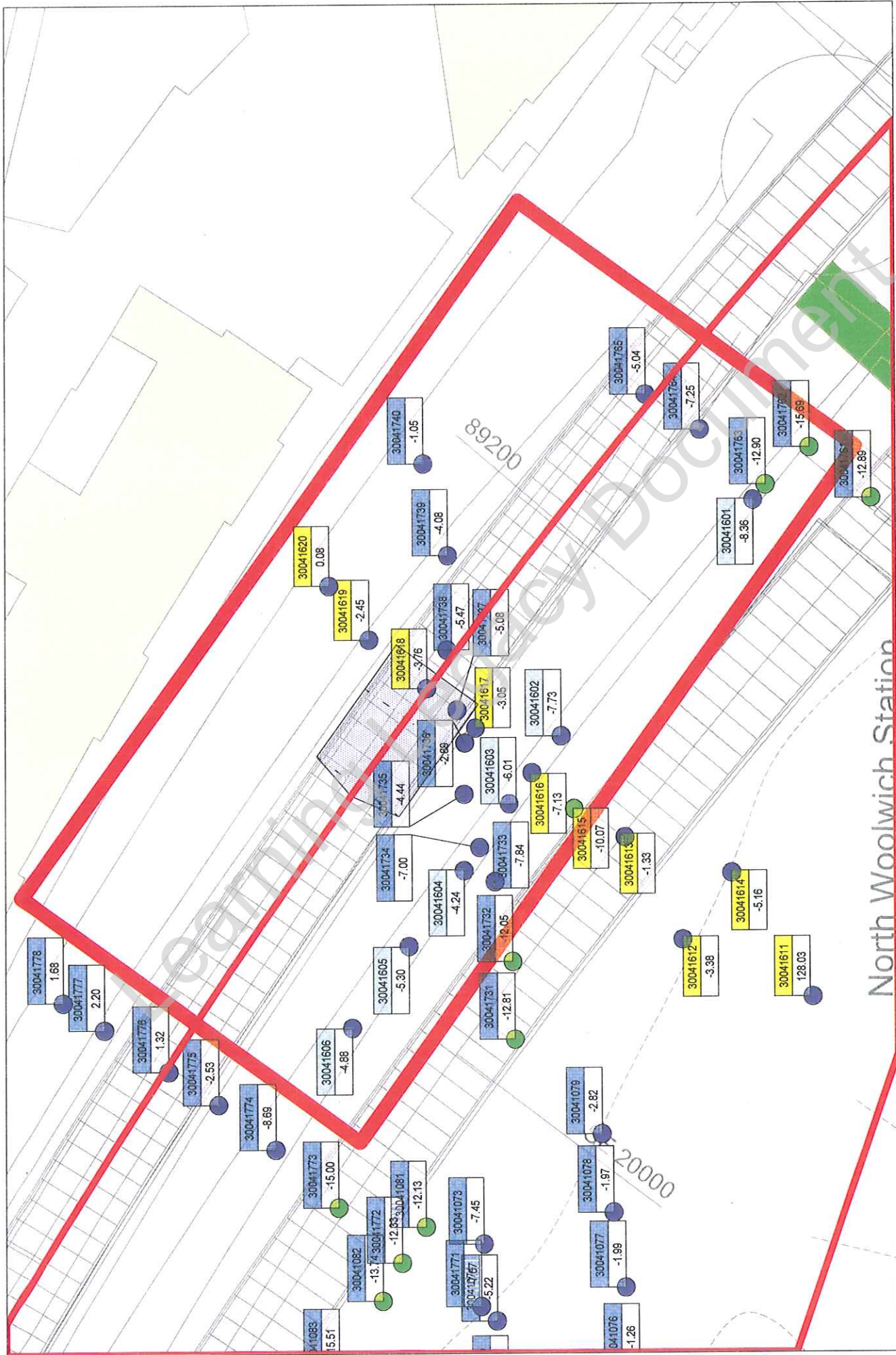


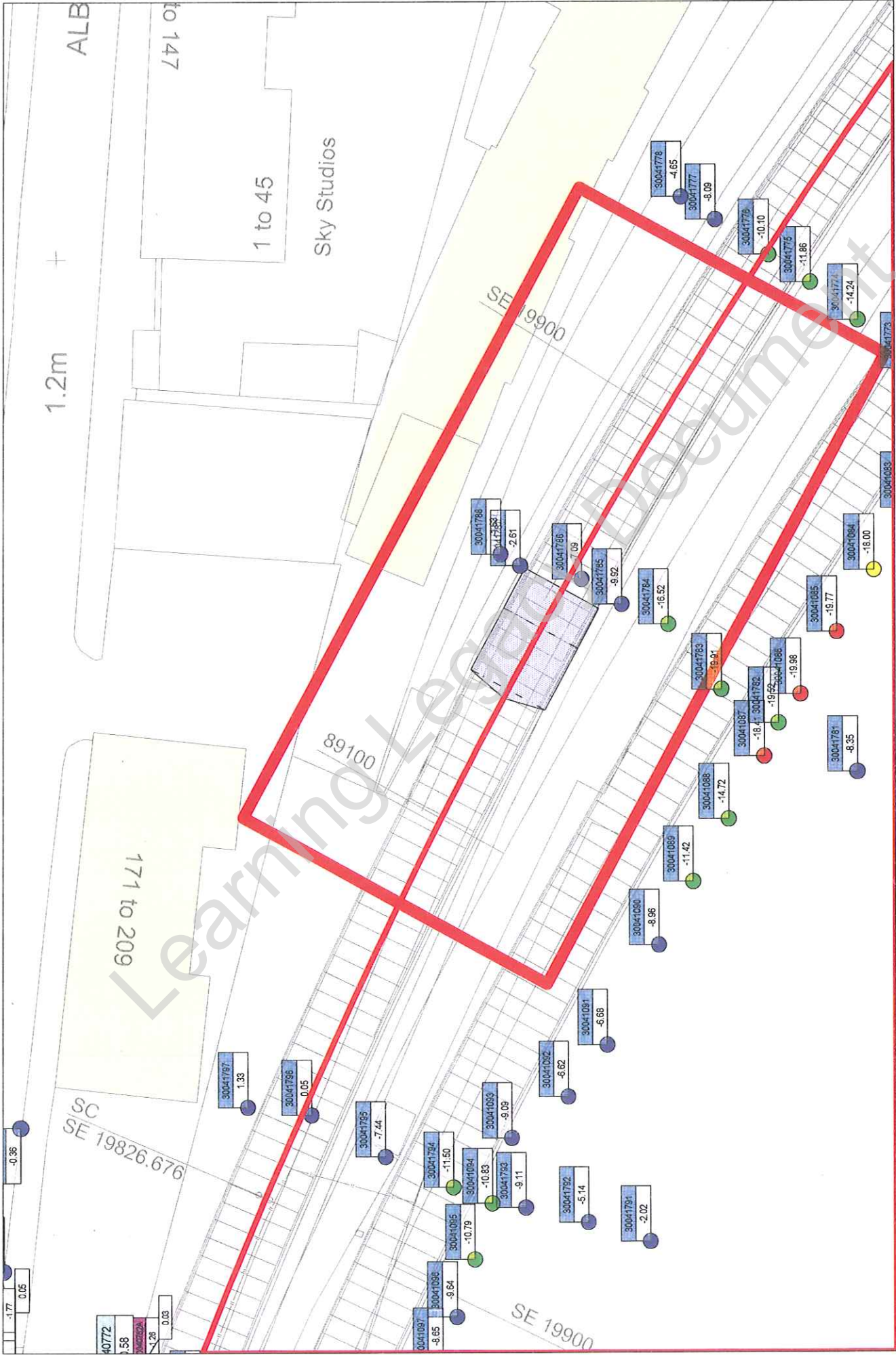
Point: 30041773



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: WB Tunnel - CS25 Old station 1 - 17.10.2013 - 21.11.2014
Date: 20.01.2015 12:34 Current Values: 20.01.2015 12:22

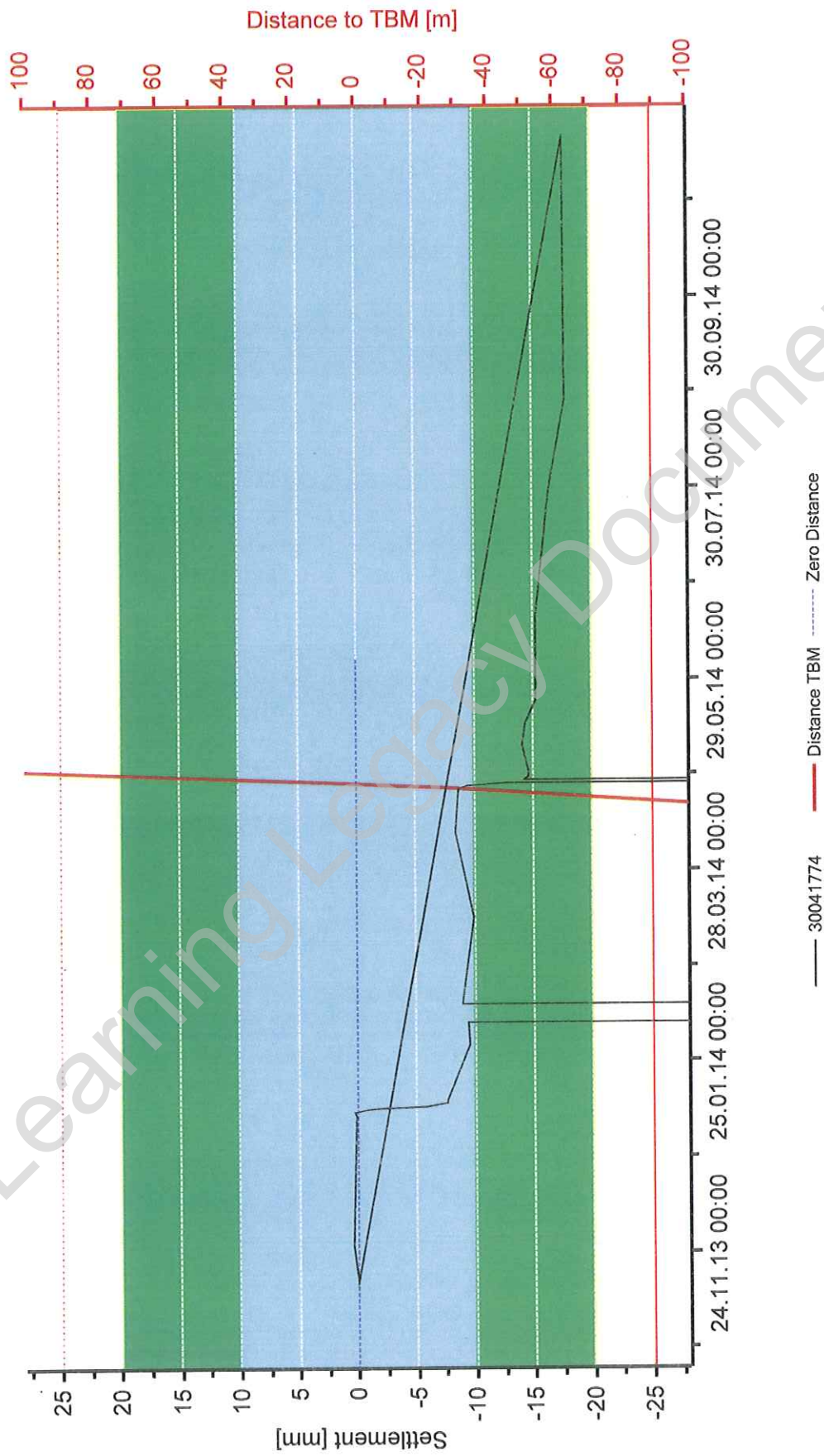






Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: C310 EB tunnel drive; NWP: portal excavation, construction base slab
 current values: 26.04.2014 17:59

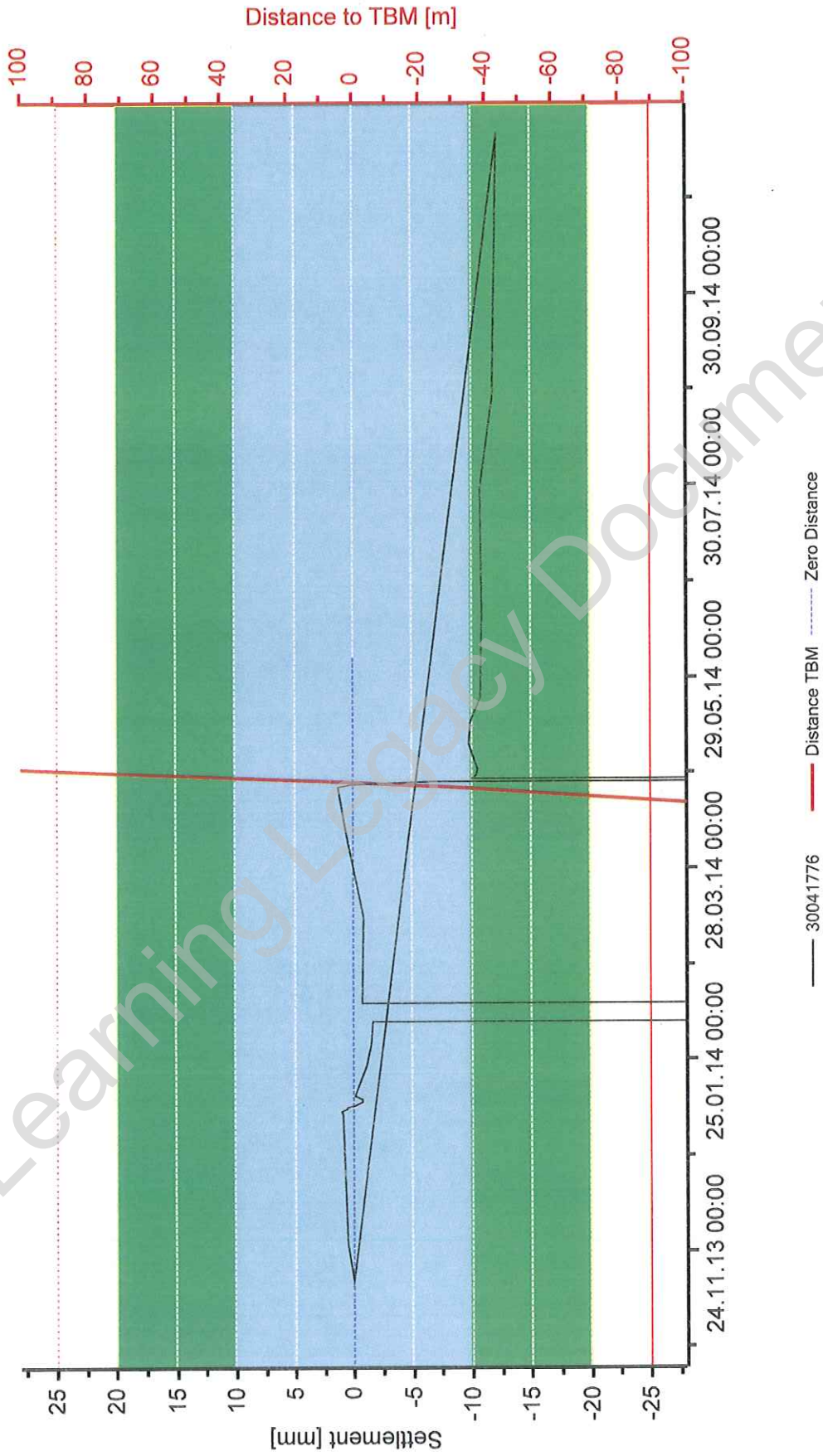
Point: 30041774



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: EB Tunnel - CS 25 Old Station 1 - 17.10.2013 - 21.11.2014
date: 20.01.2015 11:38 current values: 20.01.2015 11:21



Point: 30041776



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: EB Tunnel - CS 25 Old Station 1 - 17.10.2013 - 21.11.2014
date: 20.01.2015 11:36 current values: 20.01.2015 11:21



monitoring table



Joint Venture

project: C310 Thames Tunnel
structure: CS25 Old Station 1

No. of reading	baseline	1. following		2. following		3. following		4. following		5. following		6. following		
		date	elevation	deviation from last/baseline	date	elevation	deviation from last/baseline	date	elevation	deviation from last/baseline	date	elevation	deviation from last/baseline	
		14/11/13			07/01/2014			08/01/2014			09/01/2014		10/01/2014	
No.	elevation		elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline
30041771	103.177		103.178	0	103.176	-1	103.176	0	103.176	0	103.175	-1	103.172	-3
30041772	103.129		103.129	0	103.128	-1	103.127	-1	103.126	-1	103.126	-2	103.119	-6
30041773	103.120		103.120	0	103.119	-1	103.118	-1	103.116	-1	103.116	-2	103.110	-7
30041774	103.575		103.576	0	103.575	0	103.574	-1	103.574	-1	103.573	-1	103.569	-4
30041775	103.622		103.623	0	103.623	0	103.622	-1	103.622	0	103.622	0	103.620	-2
30041776	102.502		102.503	1	102.503	0	102.503	-1	102.503	0	102.503	0	102.502	-1
30041777	102.514		102.514	0	102.515	0	102.514	-1	102.514	0	102.515	0	102.514	0
30041778	103.507		103.507	0	103.507	0	103.507	0	103.507	0	103.507	0	103.507	0

Document

monitoring table



Joint Venture

project: C310 Thames Tunnel
structure: CS25 Old Station 1

No. of reading	baseline	7. following		8. following		9. following		10. following		11. following		12. following					
		date	elevation	deviation from last/ baseline	date	elevation	deviation from last/baseline	date	elevation	deviation from last/baseline	date	elevation	deviation from last/baseline				
		14/11/13			11/01/2014			12/01/2014			13/01/2014			14/01/2014			
No.	elevation																
30041771	103.177		103.172	0	-6	103.171	-1	-7	103.171	0	-7	103.171	0	-7	103.170	0	-7
30041772	103.129		103.117	-2	-11	103.116	-1	-13	103.115	-1	-13	103.116	0	-13	103.115	0	-13
30041773	103.120		103.108	-2	-12	103.106	-1	-13	103.107	0	-13	103.106	0	-13	103.106	0	-14
30041774	103.575					103.568	-2	-8	103.568	0	-8						
30041775	103.622					103.619	-1	-3	103.619	0	-3	103.619	0	-3			
30041776	102.502					102.501	-1	-1	102.501	0	-1	102.502	1	0			
30041777	102.514					102.514	-1	0	102.514	0	0	102.514	1	0			
30041778	103.507					103.507	0	0	103.508	1	1	103.507	-1	0			

Copyright Document

monitoring table



Joint Venture

project: C310 Thames Tunnel
structure: CS25 Old Station 1

No. of reading	baseline		13. following		14. following		15. following		16. following		17. following		18. following	
	date		14/01/2014		15/01/2014		15/01/2014		16/01/2014		23/01/2014		30/01/2014	
No.	elevation		elevation	deviation from last/ baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline
30041771	103.177		103.170	0 -7	103.171	0 -7	103.171	0 -7	103.170	-1 -8	103.170	-1 -8	103.170	0 -7
30041772	103.129		103.116	0 -13	103.116	0 -13	103.116	0 -13	103.116	0 -13	103.115	-1 -14	103.115	0 -13
30041773	103.120		103.106	0 -14	103.106	0 -13	103.106	0 -13	103.106	-1 -14	103.105	0 -14	103.105	0 -15
30041774	103.575										103.567	-1 -9	103.566	-1 -10
30041775	103.622										103.619	-1 -4	103.618	-1 -4
30041776	102.502										102.501	-1 -1	102.501	0 -1
30041777	102.514										102.514	-1 0	102.513	0 -1
30041778	103.507										103.507	-1 0	103.506	0 -1

Engineering Legacy Document

monitoring table



Joint Venture

project: C310 Thames Tunnel

structure: CS25 Old Station 1

No. of reading	baseline	19. following		20. following		21. following		22. following		23. following		24. following	
		date	elevation	deviation from last/ baseline	date	elevation	deviation from last/ baseline	date	elevation	deviation from last/ baseline	date	elevation	deviation from last/ baseline
	14/11/13				12/02/2014			12/03/2014	09/04/2014	22/04/2014	23/04/2014		
No.	elevation	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline
30041771	103.177	103.169	-1	103.169	0	103.169	-8	103.170	1	103.170	0	103.170	0
30041772	103.129	103.115	-1	103.114	0	103.115	-14	103.116	1	103.116	0	103.116	1
30041773	103.120			103.104	-1	103.104	-16	103.105	1	103.104	0	103.105	0
30041774	103.575	103.566	0	103.566	0	103.565	-1	103.567	2			103.567	0
30041775	103.622	103.618	0	103.619	1	103.618	0	103.620	2			103.620	0
30041776	102.502	102.500	0	102.501	1	102.501	-1	102.503	1			102.503	1
30041777	102.514	102.514	0	102.514	0	102.514	0	102.516	2			102.516	0
30041778	103.507	103.506	0	103.507	1	103.507	0	103.509	2			103.509	0

Accuracy Document

monitoring table



Joint Venture

project: C310 Thames Tunnel

structure: CS25 Old Station 1

No. of reading	baseline		25. following		26. following		27. following		28. following		29. following		30. following	
	date	elevation	elevation	deviation from last/ baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline
	14/11/13													
														07/05/2014
30041771		103.177	103.170	0 -7	103.170	0 -7	103.170	-1 -8	103.170	0 -7	103.170	0 -7	103.169	-1 -8
30041772		103.129	103.116	0 -12	103.116	0 -13	103.115	-1 -13	103.116	0 -13	103.116	0 -13	103.115	-1 -14
30041773		103.120	103.105	0 -15	103.104	-1 -16	103.103	-1 -17	103.103	0 -17	103.103	0 -17	103.102	-1 -17
30041774		103.575	103.566	-1 -9	103.563	-3 -13	103.561	-2 -14	103.561	0 -15	103.561	0 -15	103.561	0 -14
30041775		103.622	103.619	-1 -3	103.613	-6 -9	103.610	-3 -12	103.610	0 -12	103.610	0 -12	103.610	0 -12
30041776		102.502	102.502	-1 0	102.496	-6 -7	102.492	-4 -10	102.492	0 -10	102.492	0 -11	102.492	1 -10
30041777		102.514	102.516	-1 1	102.510	-6 -4	102.506	-4 -8	102.506	0 -8	102.506	0 -8	102.507	1 -7
30041778		103.507	103.508	0 1	103.505	-3 -2	103.502	-3 -5	103.502	0 -5	103.502	0 -5	103.503	1 -4

monitoring table



Joint Venture

project: C310 Thames Tunnel

structure: CS25 Old Station 1

No. of reading	baseline		31. following		32. following		33. following		34. following		35. following		36. following	
	date	elevation	elevation	deviation from last/ baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline
	14/11/13													
30041771		103.177	103.169	0 -9	103.170	0 -8	103.169	-1 -8	103.168	-1 -9	103.168	-1 -9	103.168	0 -9
30041772		103.129	103.115	0 -14	103.116	0 -13	103.115	0 -13	103.115	0 -14	103.115	0 -14	103.115	1 -13
30041773		103.120	103.102	-1 -18	103.103	0 -17	103.103	0 -17	103.102	-1 -18	103.102	-1 -18	103.103	1 -16
30041774		103.575	103.561	0 -14	103.560	0 -15	103.559	-1 -16	103.558	-1 -18	103.558	-1 -18	103.558	0 -18
30041775		103.622	103.610	0 -12	103.610	0 -12	103.609	0 -13	103.608	-1 -14	103.608	-1 -14	103.609	0 -14
30041776		102.502	102.492	0 -10	102.491	0 -11	102.491	0 -11	102.491	0 -11	102.490	-1 -12	102.490	0 -12
30041777		102.514	102.507	0 -7	102.506	0 -9	102.507	1 -7	102.505	-1 -9	102.505	-1 -9	102.505	0 -9
30041778		103.507	103.503	0 -4	103.502	-1 -5	103.502	1 -5	103.502	1 -5	103.501	-1 -6	103.502	0 -5

Copyright Document

		C310 THAMES TUNNEL REPORT			
EMPLOYER	CROSSRAIL	eB NO	C310-HTM-C-RGN-CR148-50024	Rev	2.0
TITLE	Monitoring Close-Out Reports relating to Tunnelling Works North Embankment River Thames - North Woolwich Portal (excl. Store Rd)				

APPENDIX 96

CS 26 - Old Station 2 - CH 89120

Learning Legacy Document

monitoring asset	Old Station Museum		
reference monitoring drawing:	C310-HTM-C-DWG-CR146-ST004-70003		
name of monitoring section:	CS 26 Old Station 2 - Ch89120		
sensor type:	manual levelling studs		
chainage:	89120	point no.:	3004 1781 - 3004 1788
trigger values: [mm]	green: +16 -16	amber: +20 -20	red: +25 -25
reference document for trigger values:	Management Plan for Control of Ground Movement		
EB-no.:	C310-HTM-Z-STP-CR148-50058		
Appendix:	AAA		

monitoring data

	date	max. value	point no.	comments	
baseline	14/11/13	0.00			
TBM 1	start ZOI	09/01/14	0.48	3004 1783	
	end ZOI	13/01/14	-19.32	3004 1783	breached green trigger value
TBM 2	start ZOI	25/04/14	-1.65	3004 1786	
	end ZOI	27/04/14	-12.43	3004 1786	breached not any trigger value
longterm	21/11/14	-21.04	3004 1783	breached amber trigger value	
Evaluation of any potential residual risks	<input checked="" type="checkbox"/>	No residual risk since the Works have been completed by HMJV			
	<input type="checkbox"/>	Yes, residual risk (see comment below)			

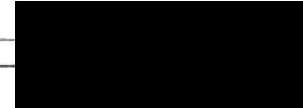
summary / comments

Under consideration of temperature differences, the surrounding ground condition and the achievable accuracy of the measurement, HMJV has no concern to cease the monitoring.
The rate of change in the monitoring data is less than the required standards as per the specifications and drawings.

date / signature:

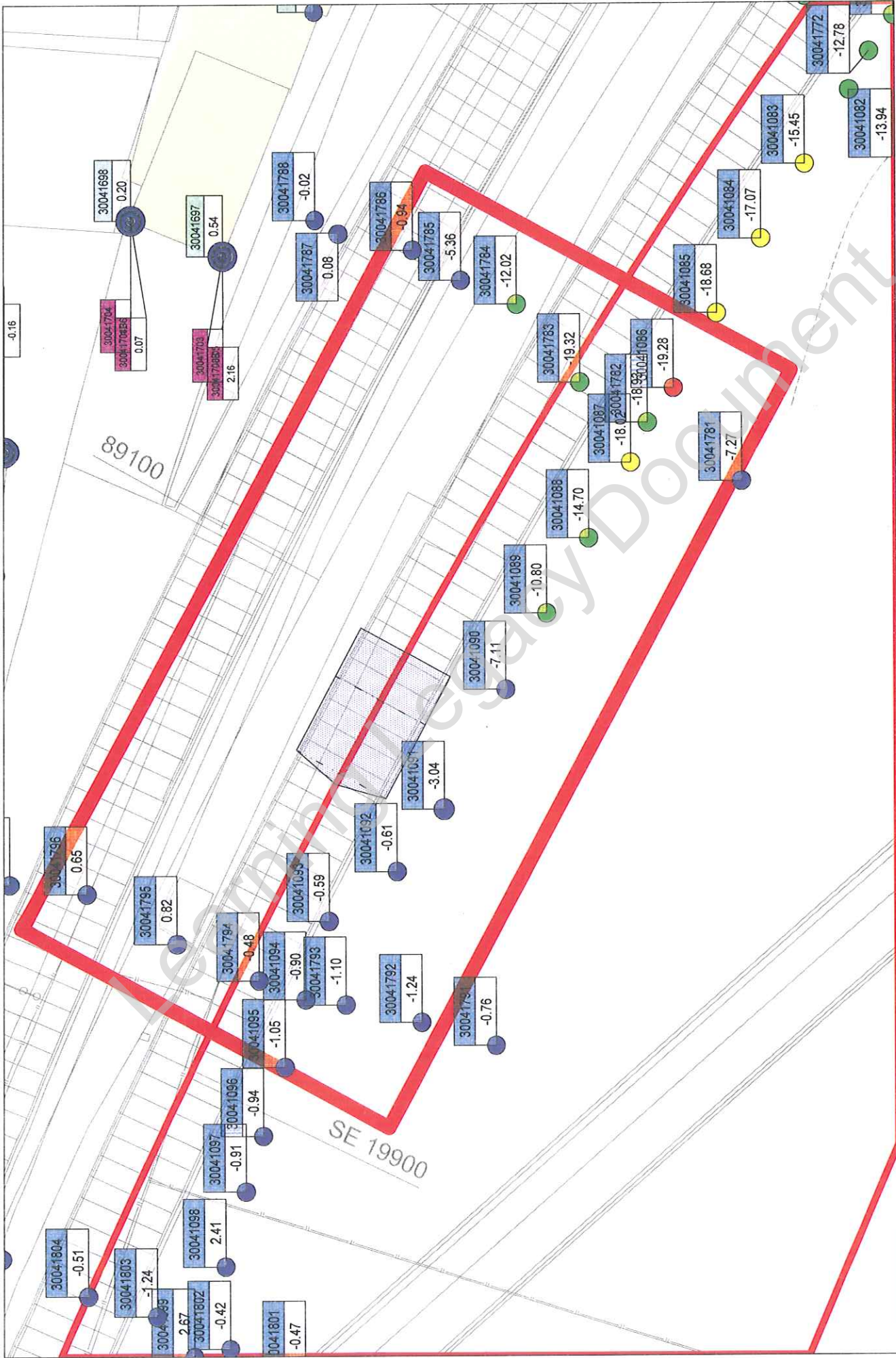
19/01/2015

print name:

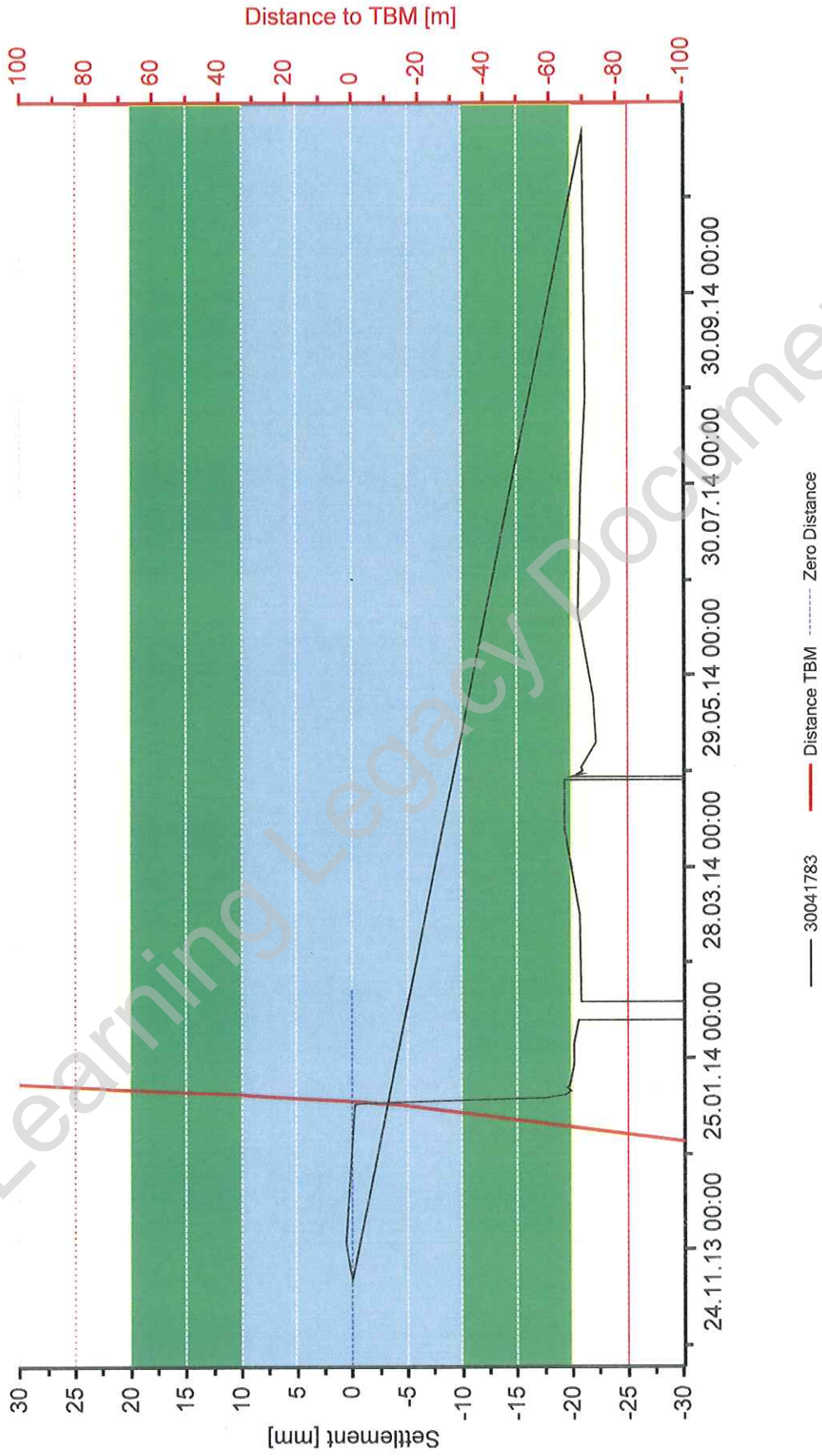


HMJV project role:

Monitoring & Survey engineer



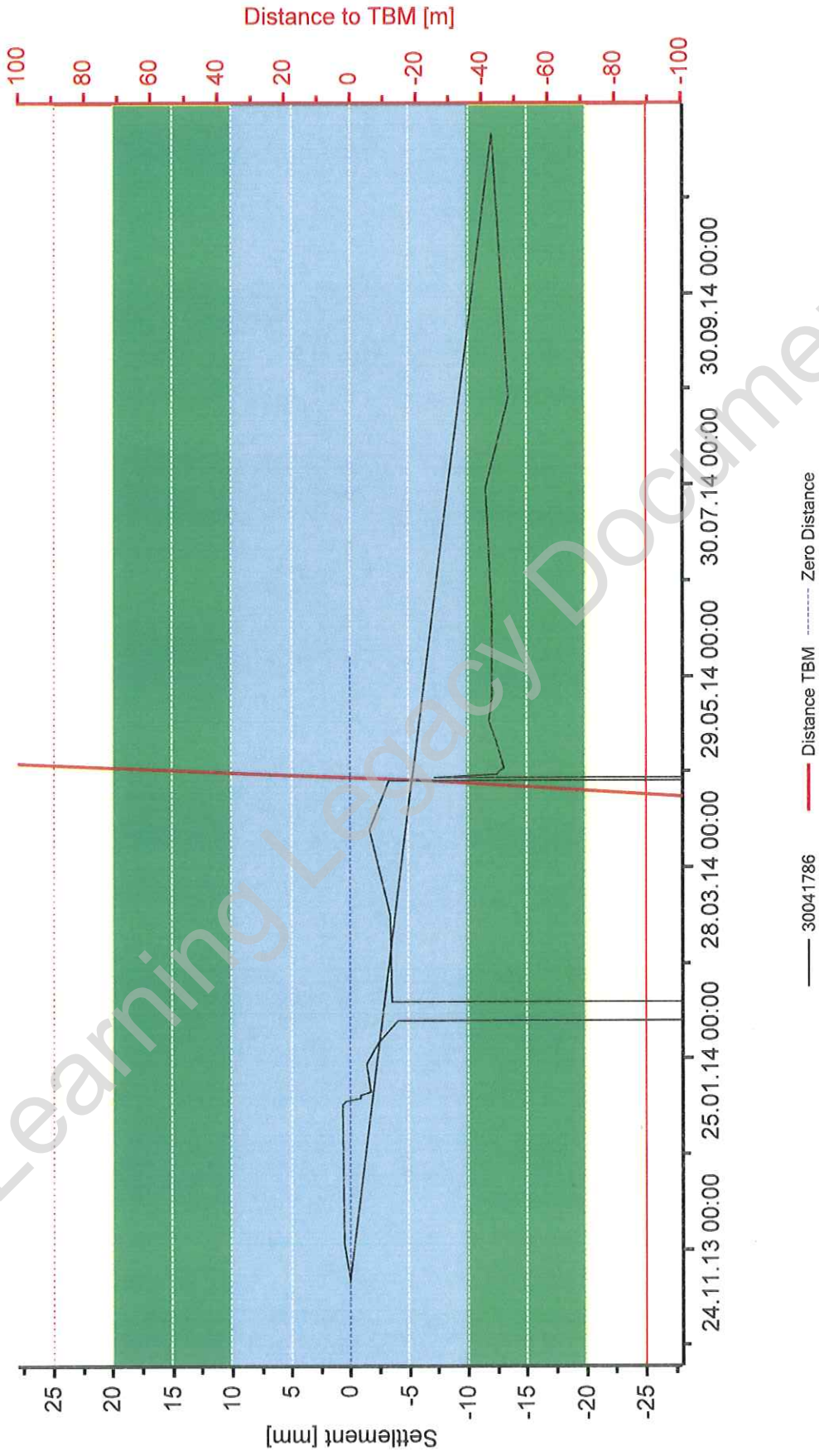
Point: 30041783



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: WB Tunnel - CS26 Old station 2 - 17.10.2013 - 21.11.2014
Date: 20.01.2015 12:37 Current Values: 20.01.2015 12:22



Point: 30041786



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: EB Tunnel - CS 26 Old Station 2 - 17.10.2013 - 21.11.2014
date: 20.01.2015 11:41 current values: 20.01.2015 11:21



monitoring table



Joint Venture

project: C310 Thames Tunnel

structure: CS26 Old Station 2

No. of reading	baseline	1. following		2. following		3. following		4. following		5. following		6. following						
		date	elevation	deviation from last/baseline	date	elevation	deviation from last/baseline	date	elevation	deviation from last/baseline	date	elevation	deviation from last/baseline					
	14/11/13																	
		10/01/2014																
		11/01/2014																
		12/01/2014																
		13/01/2014																
30041781	102.884	102.885	0	0	102.884	-1	0	102.884	0	-1	102.881	-2	-3	102.878	-3	102.877	-1	-7
30041782	102.858	102.858	1	1	102.857	-1	-1	102.857	-1	-1	102.851	-6	-7	102.841	-9	102.839	-2	-19
30041783	102.838	102.838	0	0	102.838	-1	0	102.837	-1	-1	102.831	-6	-7	102.820	-10	102.819	-2	-19
30041784	103.336	103.337	1	1	103.337	0	1				103.332	-5	-4	103.325	-7	103.324	-1	-12
30041785	103.347	103.348	1	1	103.348	0	1				103.345	-2	-2	103.342	-3	103.342	0	-5
30041786	102.201	102.202	0	0	102.202	0	1				102.202	0	0	102.200	-1	102.200	0	-1
30041787	102.231	102.232	0	0	102.232	0	0				102.232	0	0	102.231	-1	102.231	0	0
30041788	103.321	103.322	0	0	103.322	0	0				103.322	0	0	103.321	0	103.321	0	0

Drafting Legacy Document

monitoring table

project: C310 Thames Tunnel

structure: CS26 Old Station 2

Joint Venture



No. of reading	baseline		7. following		8. following		9. following		10. following		11. following		12. following			
	14/11/13	elevation	13/01/2014	deviation from last/ baseline	14/01/2014	deviation from last/baseline	14/01/2014	deviation from last/baseline	15/01/2014	deviation from last/baseline	15/01/2014	deviation from last/baseline	16/01/2014	deviation from last/baseline		
30041781	102.884	102.877	0	-7	102.877	0	-8	102.877	0	-8	102.877	0	-8	102.877	0	-8
30041782	102.858	102.839	0	-19	102.838	0	-20	102.838	0	-20	102.838	0	-20	102.838	0	-20
30041783	102.838	102.818	0	-20	102.818	0	-20	102.818	0	-20	102.818	0	-20	102.818	0	-20
30041784	103.336				103.323	-1	-13									
30041785	103.347				103.341	-1	-6									
30041786	102.201				102.200	-1	-2									
30041787	102.231				102.231	-1	-1									
30041788	103.321				103.321	-1	-1									

Legacy Document

monitoring table



Joint Venture

project: C310 Thames Tunnel

structure: CS26 Old Station 2

No. of reading date	baseline 14/11/13		13. following 23/01/2014		14. following 30/01/2014		15. following 06/02/2014		16. following 12/02/2014		17. following 12/03/2014		18. following 09/04/2014	
	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline
30041781	102.884	-1	102.876	-8	102.877	0	102.876	0	102.876	0	102.876	0	102.877	1
30041782	102.858	0	102.838	-20	102.838	0	102.837	-1	102.837	0	102.838	1	102.839	1
30041783	102.898	0	102.818	-20	102.817	0	102.817	0	102.817	0	102.817	0	102.819	1
30041784	103.336	0	103.323	-13	103.322	-1	103.322	0	103.322	0	103.322	0	103.324	2
30041785	103.347	0	103.341	-6	103.340	-1	103.340	0	103.340	0	103.340	0	103.342	2
30041786	102.201	0	102.200	-1	102.199	-1	102.197	-2	102.198	1	102.198	0	102.200	2
30041787	102.231	0	102.231	0	102.229	-2	102.230	2	102.231	0	102.231	0	102.233	2
30041788	103.321	0	103.321	0	103.320	-1	103.320	0	103.321	1	103.321	0	103.323	2

Confidentiality Document

monitoring table



Joint Venture

project: C310 Thames Tunnel

structure: OS26 Old Station 2

No. of reading date	baseline		31. following		deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	
	elevation	date	elevation	date												
	102.884	14/11/13	102.876	21/11/2014	-8											
30041781	102.884		102.876		1											
30041782	102.858		102.838		1											
30041783	102.838		102.817		0											
30041784	103.336		103.315		1											
30041785	103.347		103.332		1											
30041786	102.201		102.189		1											
30041787	102.231		102.224		1											
30041788	103.321		103.316		1											

Learning Legacy Document

 HOCHTIEF MURPHY Joint Venture		C310 THAMES TUNNEL REPORT			
EMPLOYER	CROSSRAIL	eB NO	C310-HTM-C-RGN-CR148-50024	Rev	2.0
TITLE	Monitoring Close-Out Reports relating to Tunnelling Works North Embankment River Thames - North Woolwich Portal (excl. Store Rd)				

APPENDIX 97

CS 27 - Old Station 3 - CH 89075

Learning Legacy Document

monitoring asset	Old Station Museum		
reference monitoring drawing:	C310-HTM-C-DWG-CR146-ST004-70003		
name of monitoring section:	CS 27 Old Station 3 - Ch89075		
sensor type:	manual levelling studs		
chainage:	89075	point no.:	3004 1791 - 3004 1797
trigger values: [mm]	green: +12 -12	amber: +15 -15	red: +18 -18
reference document for trigger values:	Management Plan for Control of Ground Movement		
EB-no.:	C310-HTM-Z-STP-CR148-50058		
Appendix:	AAA		

monitoring data

	date		max. value	point no.	comments
baseline	17/11/13		0.00		
TBM 1	start ZOI	12/01/14	0.70	3004 1794	
	end ZOI	16/01/14	-10.93	3005 1794	breached not any trigger value
TBM 2	start ZOI	27/04/14	0.13	3006 1796	
	end ZOI	30/04/14	-5.40	3007 1796	breached not any trigger value
longterm	21/11/14		-11.21	3008 1794	

Evaluation of any potential residual risks	<input checked="" type="checkbox"/>	No residual risk since the Works have been completed by HMJV
	<input type="checkbox"/>	Yes, residual risk (see comment below)

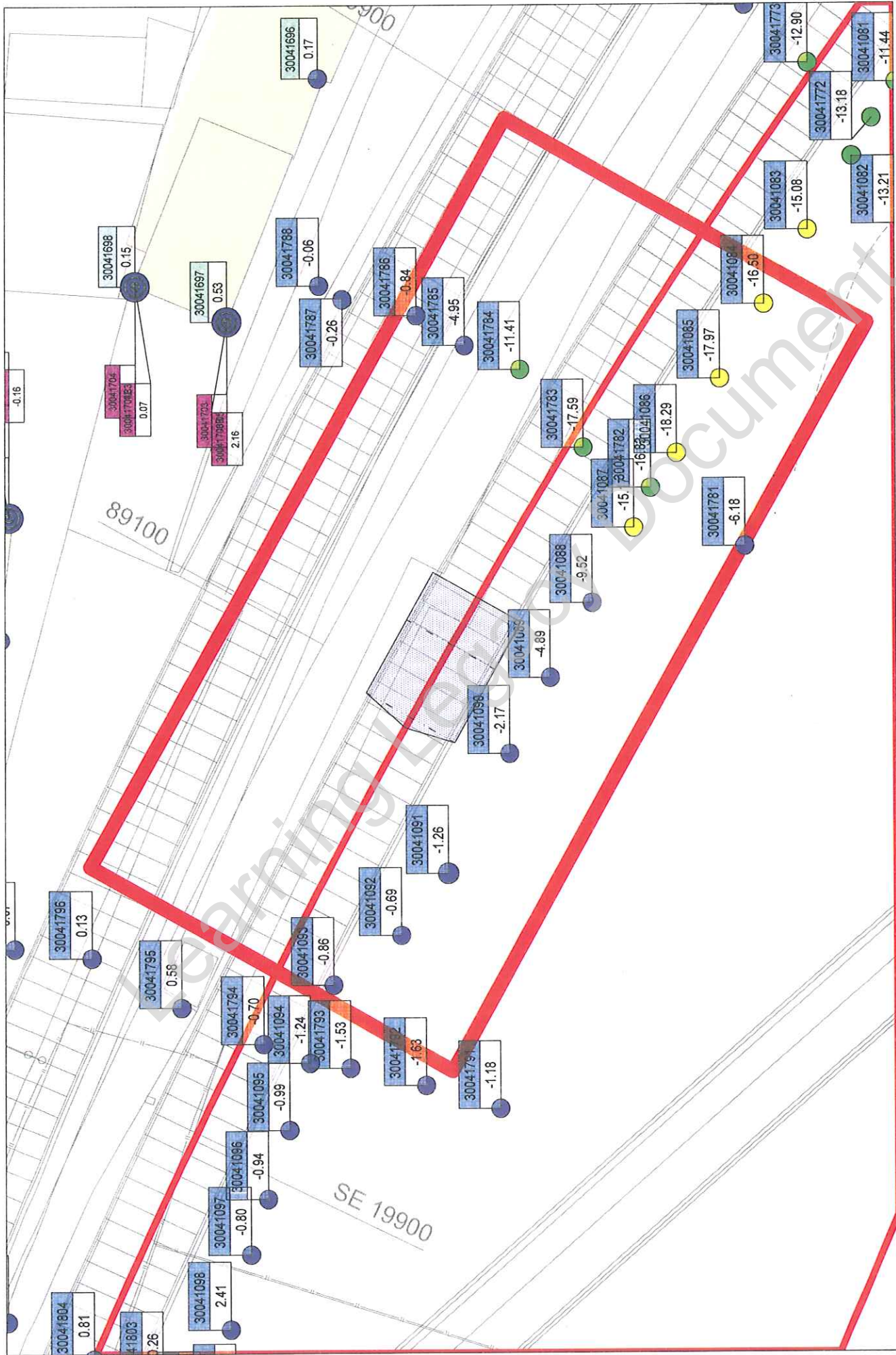
summary / comments

Under consideration of temperature differences, the surrounding ground condition and the achievable accuracy of the measurement, HMJV has no concern to cease the monitoring.
The rate of change in the monitoring data is less than the required standards as per the specifications and drawings.

date / signature: 19/01/2015

print name: 

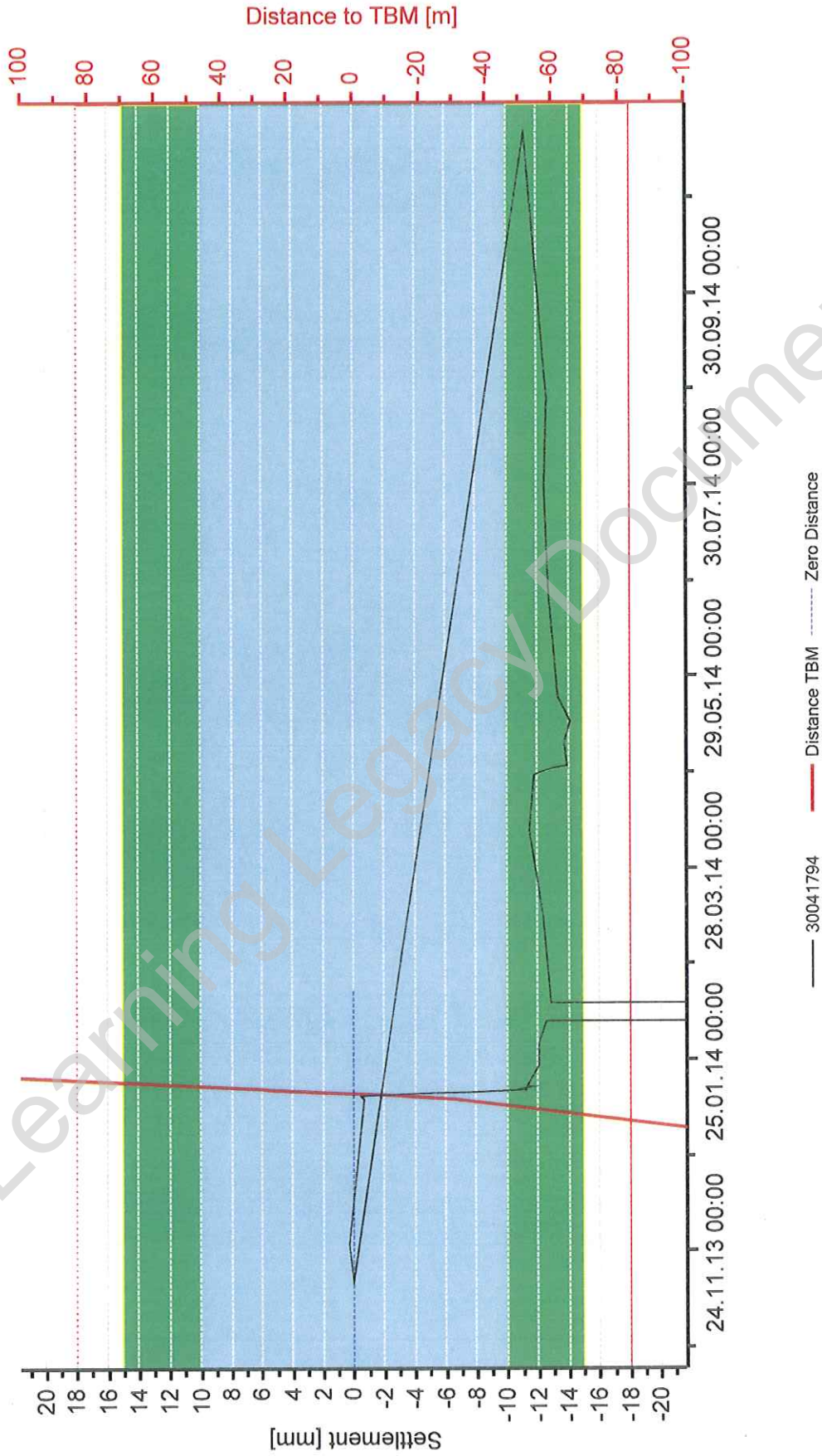
HMJV project role: Monitoring & Survey engineer



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: TBM drive WB
 current values: 12.01.2014 17:05



Point: 30041794

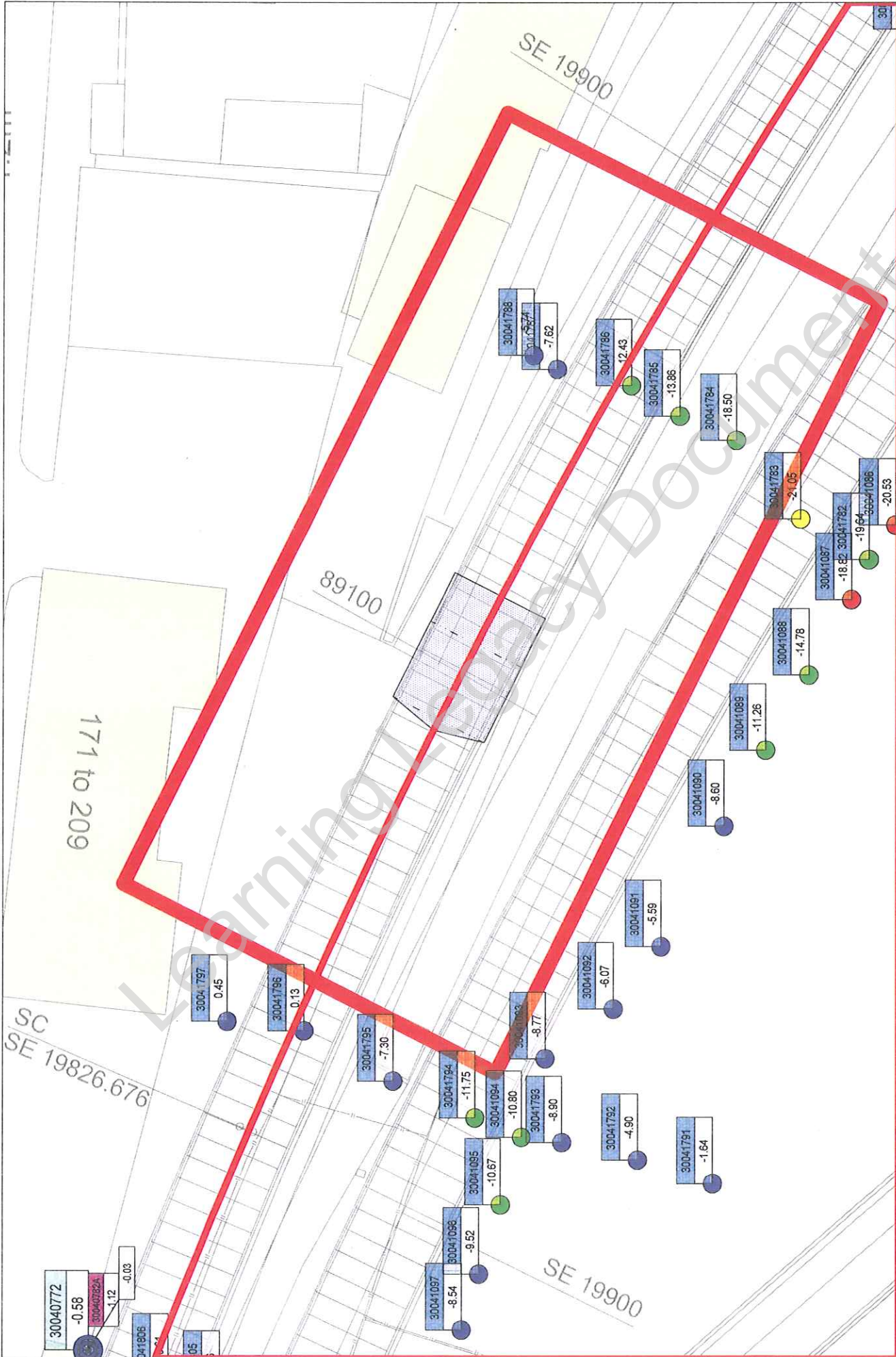


Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal

Close Out Report: WB Tunnel - CS27 Old station 3 - 17.10.2013 - 21.11.2014

Date: 20.01.2015 12:40 Current Values: 20.01.2015 12:22

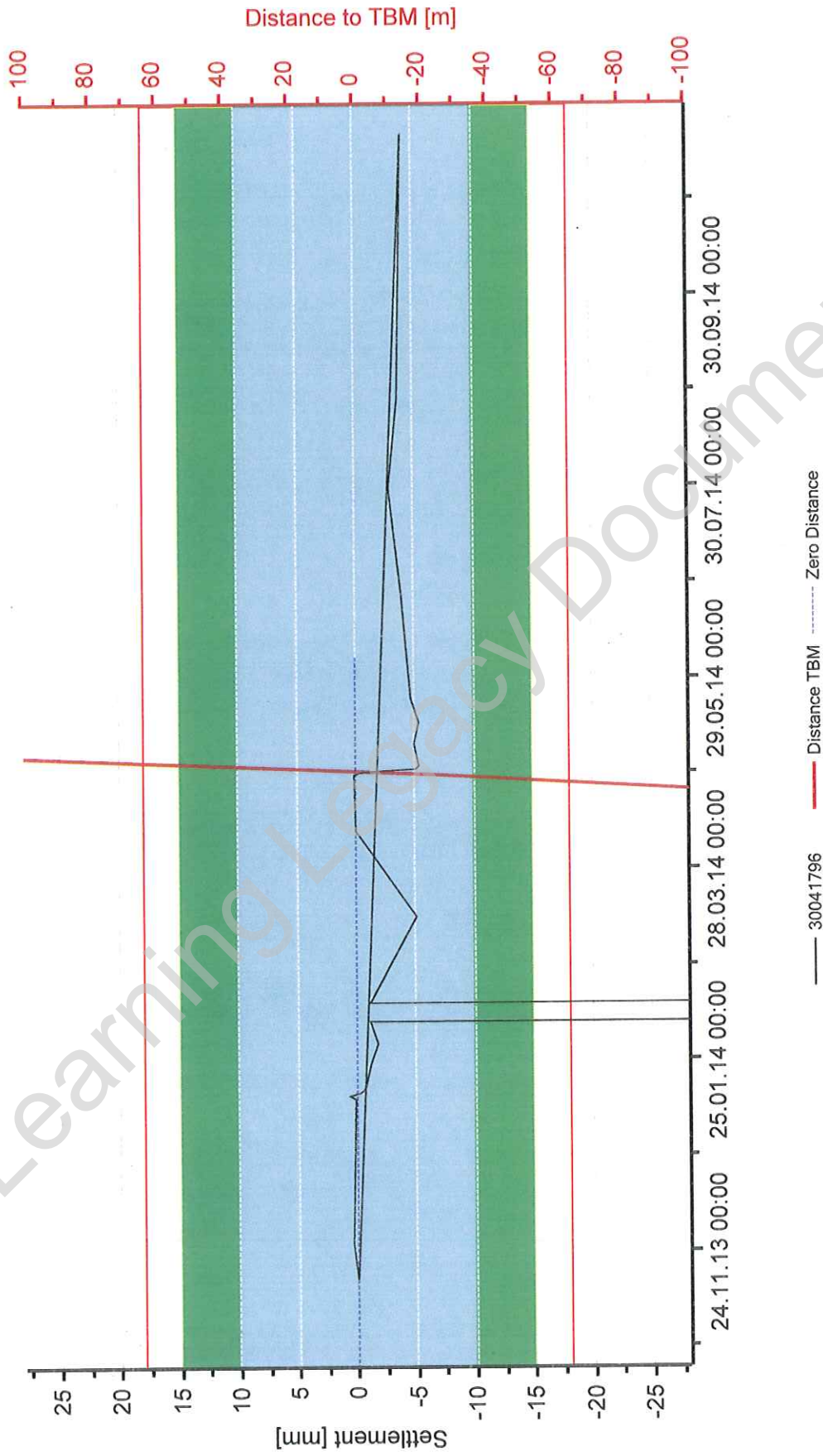




Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: C310 EB tunnel drive, NWP: portal excavation, construction base slab
 current values: 27.04.2014 09:00



Point: 30041796



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: EB Tunnel - CS 27 Old Station 3 - 17.10.2013 - 21.11.2014
date: 20.01.2015 11:43 current values: 20.01.2015 11:21



monitoring table



Joint Venture

project: C310 Thames Tunnel

structure: CS27 Old Station 3

No. of reading	baseline		1. following		2. following		3. following		4. following		5. following		6. following		
	date	elevation	date	elevation	date	elevation	date	elevation	date	elevation	date	elevation	date	elevation	
No.		elevation	deviation from last/baseline		elevation	deviation from last/baseline		elevation	deviation from last/baseline		elevation	deviation from last/baseline		elevation	deviation from last/baseline
30041791	14/11/13	102.878	0	26/11/2013	102.877	-1	12/01/2014	102.877	0	13/01/2014	102.877	0	13/01/2014	102.876	-1
30041792		102.874	0		102.872	-2		102.873	0		102.872	-1		102.871	-3
30041793		102.891	0		102.889	-1		102.890	0		102.889	0		102.886	-3
30041794		102.869	0		102.868	-1		102.868	0		102.868	0		102.864	-4
30041795		102.119	1		102.119	0		102.120	0					102.115	-4
30041796		101.947	0		101.947	0		101.948	1					101.947	-1
30041797		101.942	0		101.942	0		101.943	0					101.942	-1

Knowledge Document

monitoring table



Joint Venture

project: C310 Thames Tunnel

structure: CS27 Old Station 3

No. of reading date	13. following 06/02/2014		14. following 12/02/2014		15. following 12/03/2014		16. following 09/04/2014		17. following 27/04/2014		18. following 28/04/2014				
	baseline 14/11/13	elevation	deviation from last/ baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline		
30041791	102.878	102.875	-1	102.875	0	-3	102.876	1	-2	102.876	0	-2	102.876	0	-2
30041792	102.874	102.868	-1	102.868	-1	-6	102.868	1	-5	102.869	0	-5	102.869	0	-5
30041793	102.891	102.881	-1	102.881	-1	-10	102.881	1	-10	102.882	1	-9	102.881	-1	-10
30041794	102.869	102.856	-1	102.856	0	-13	102.857	0	-12	102.857	1	-11	102.857	0	-12
30041795	102.119	102.111	1	102.112	0	-7	102.111	-1	-8	102.111	1	-7	102.111	0	-7
30041796	101.947	101.946	1	101.946	0	-1	101.942	-4	-5	101.947	5	0	101.947	0	0
30041797	101.942	101.942	0	101.942	0	0	101.945	3	3	101.944	-2	1	101.943	-1	0

monitoring table



Joint Venture

project: C310 Thames Tunnel

structure: CS27 Old Station 3

No. of reading	baseline	19. following		20. following		21. following		22. following		23. following		24. following	
		elevation	deviation from last/ baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline
date	14/11/13	29/04/2014		30/04/2014		07/05/2014		14/05/2014		22/05/2014		28/05/2014	
30041791	102.878	102.876	0	102.875	0	102.875	0	102.876	0	102.877	1	102.876	0
30041792	102.874	102.868	-1	102.868	-1	102.868	1	102.868	0	102.869	1	102.869	0
30041793	102.891	102.881	0	102.880	-1	102.881	0	102.881	0	102.881	1	102.882	1
30041794	102.869	102.856	-1	102.855	-1	102.855	0	102.855	0	102.856	1	102.856	0
30041795	102.119	102.107	-4	102.107	0	102.107	1	102.107	-1	102.107	0	102.107	0
30041796	101.947	101.942	-4	101.942	0	101.942	0	101.942	0	101.942	1	101.941	-1
30041797	101.942	101.941	-3	101.941	0	101.940	0	101.941	1	101.941	0	101.939	-1

Knowledge Document

monitoring table




Joint Venture

project: C310 Thames Tunnel

structure: CS27 Old Station 3

No. of reading	baseline		25. following		26. following		27. following		28. following		
	date	elevation	date	elevation	date	elevation	date	elevation	date	elevation	
No.	date	elevation	deviation from last/ baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline
30041791	14/11/13	102.878	2	102.878	-1	102.877	-1	102.876	-1	102.876	0
30041792		102.874	2	102.871	0	102.871	-3	102.870	-1	102.870	0
30041793		102.891	0	102.882	0	102.883	-9	102.882	-1	102.884	1
30041794		102.869	0	102.856	0	102.856	-13	102.856	0	102.858	1
30041795		102.119	0	102.107	0	102.108	-12	102.109	1	102.110	1
30041796		101.947	2	101.943	2	101.944	-4	101.943	-1	101.943	0
30041797		101.942	2	101.942	2	101.942	0	101.942	0	101.943	1

Knowledge Document

 HOCHTIEF MURPHY Joint Venture		C310 THAMES TUNNEL REPORT			
EMPLOYER	CROSSRAIL	eB NO	C310-HTM-C-RGN-CR148-50024	Rev	2.0
TITLE	Monitoring Close-Out Reports relating to Tunnelling Works North Embankment River Thames - North Woolwich Portal (excl. Store Rd)				

APPENDIX 98

CS 28 - Pumping station - CH 89055

Learning Legacy Document

monitoring asset	TW Pumping Station		
reference monitoring drawing:	C310-HTM-C-DWG-CR146-ST004-70003		
name of monitoring section:	CS 28 Pumping Station		
sensor type:	manual levelling studs		
chainage:	89055	point no.:	3004 1801 - 3004 1806
trigger values: [mm]	green: +12 -12	amber: +15 -15	red: +18 -18
reference document for trigger values:	Management Plan for Control of Ground Movement		
EB-no.:	C310-HTM-Z-STP-CR148-50058		
Appendix:	AAA		

monitoring data

	date		max. value	point no.	comments
baseline	14/11/13		0.00		
TBM 1	start ZOI	14/01/14	-1.00	3004 1804	
	end ZOI	17/01/14	-7.65	3005 1804	breached not any trigger value
TBM 2	start ZOI	28/04/14	-0.01	3006 1806	
	end ZOI	01/05/14	-5.70	3007 1806	breached not any trigger value
longterm	21/11/14		-5.50	3008 1804	

Evaluation of any potential residual risks	<input checked="" type="checkbox"/>	No residual risk since the Works have been completed by HMJV
	<input type="checkbox"/>	Yes, residual risk (see comment below)

summary / comments

Under consideration of temperature differences, the surrounding ground condition and the achievable accuracy of the measurement, HMJV has no concern to cease the monitoring.
The rate of change in the monitoring data is less than the required standards as per the specifications and drawings.

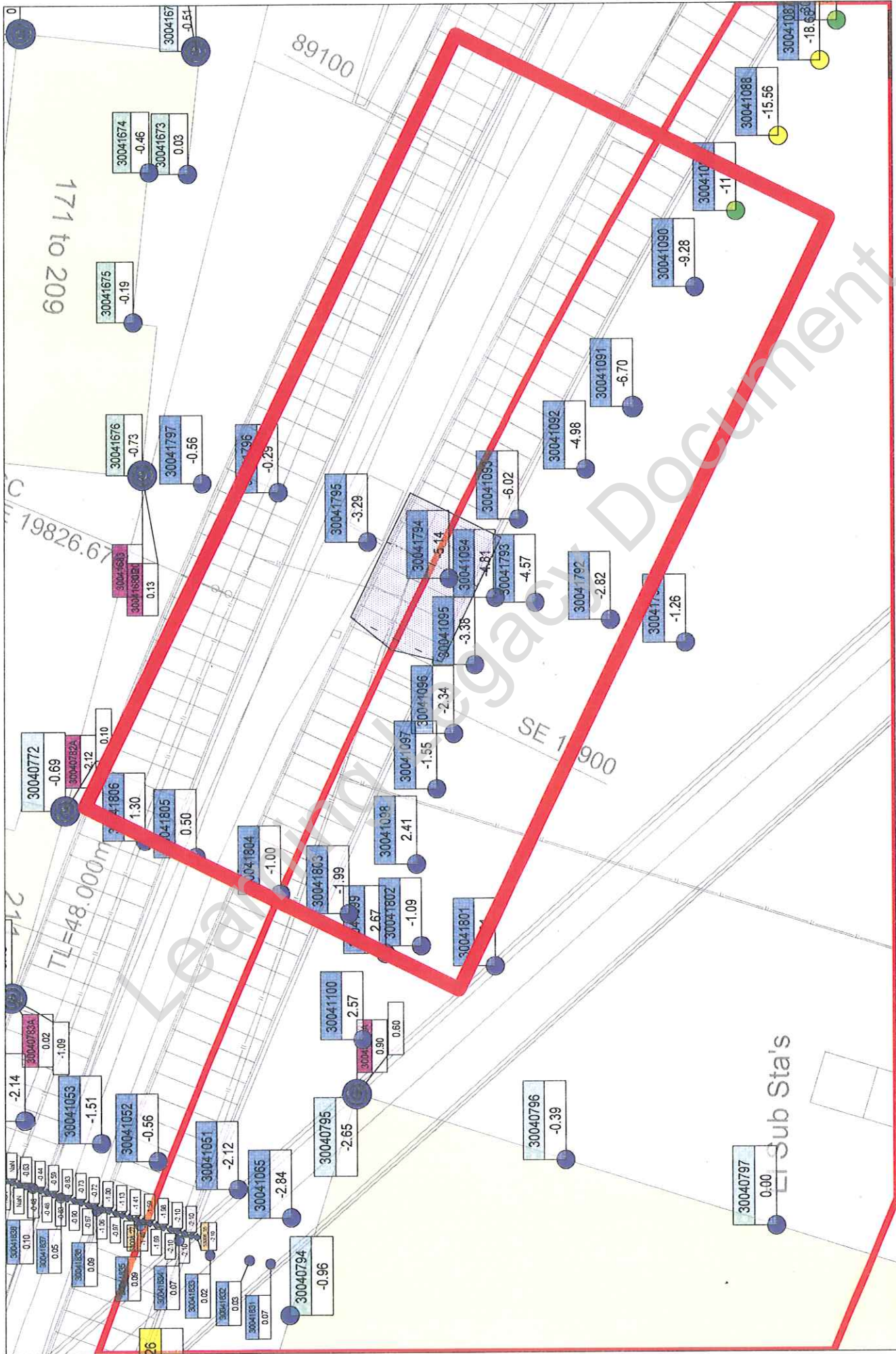
date / signature:

19/11/2015

print name:

HMJV project role:

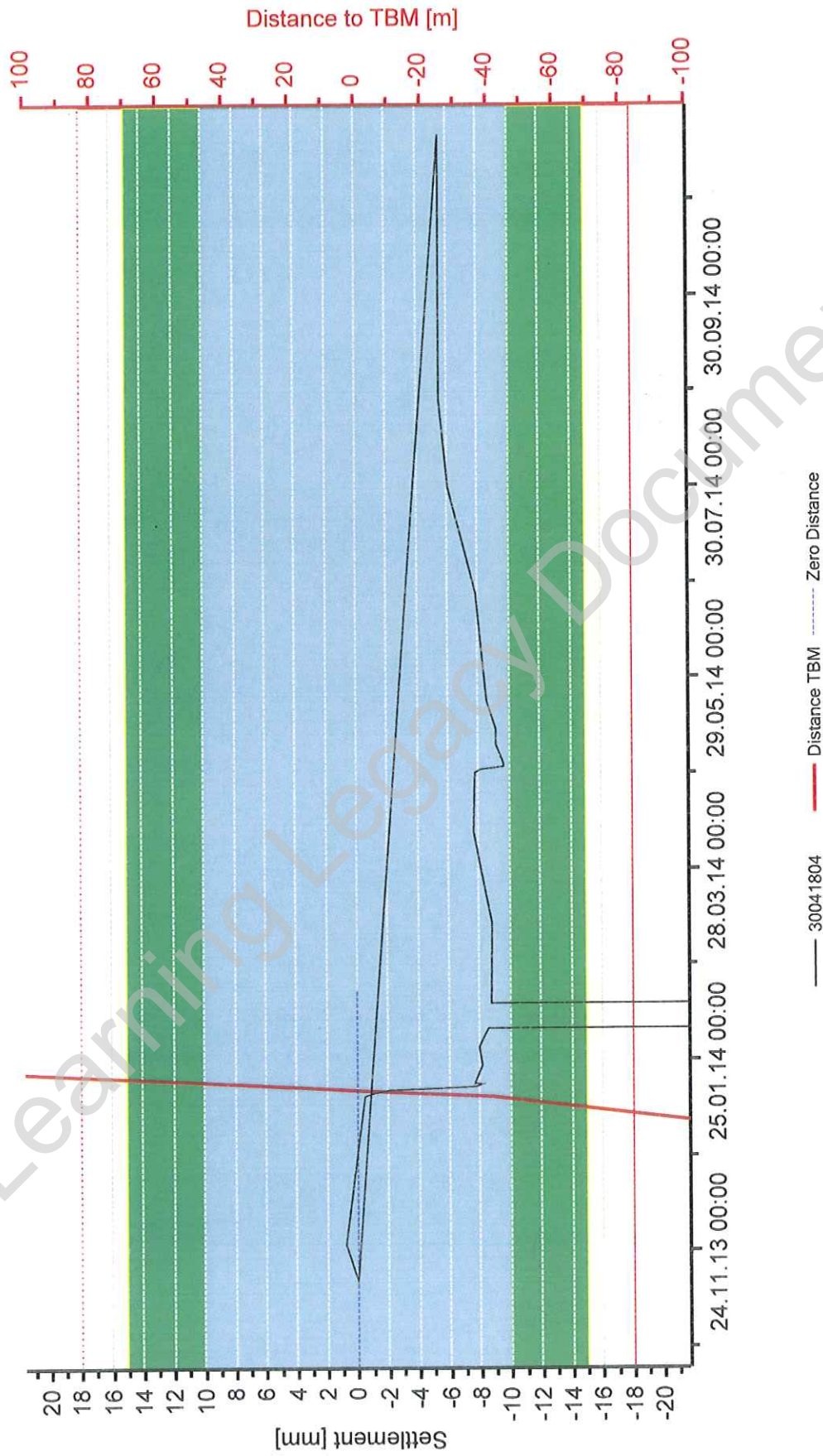
Monitoring & Survey engineer



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: TBM drive WB
 current values: 14.01.2014 09:00

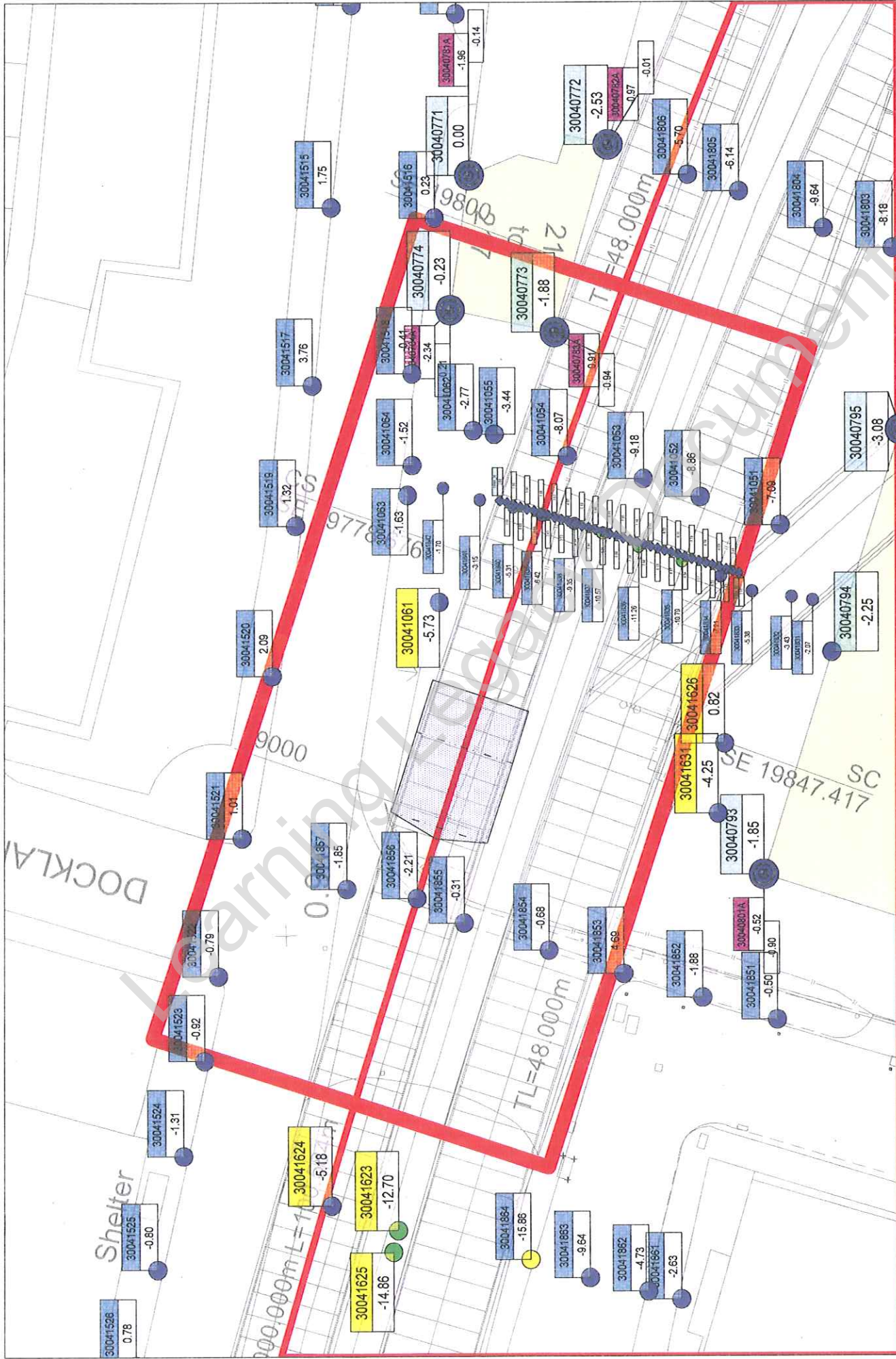


Point: 30041804



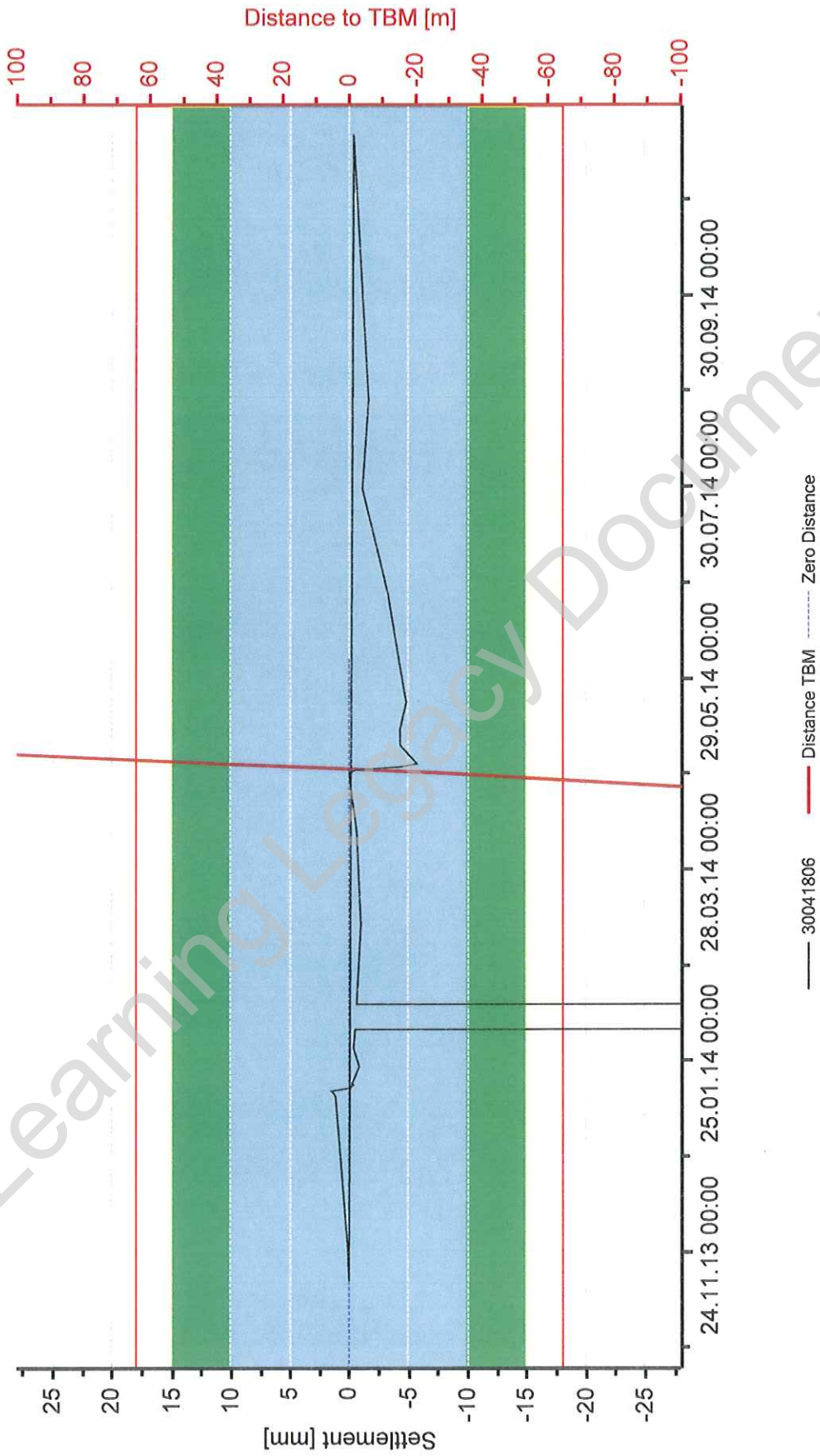
Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: WB Tunnel - CS28 Pumping station - 17.10.2013 - 21.11.2014
Date: 20.01.2015 12:42 Current Values: 20.01.2015 12:22





Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: C310 EB tunnel drive; NWP: portal excavation, construction base slab
 current values: 01.05.2014 18:32

Point: 30041806



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: EB Tunnel - CS 28 Pumping station - 17.10.2013 - 21.11.2014
date: 20.01.2015 11:47 current values: 20.01.2015 11:21



monitoring table



Joint Venture

project: C310 Thames Tunnel

structure: CS28 Pumping Station

No. of reading	baseline		1. following		2. following		3. following		4. following		5. following		6. following	
	date	14/1/13	26/11/2013	13/01/2014	14/01/2014	15/01/2014	16/01/2014	16/01/2014	16/01/2014	16/01/2014	elevation	deviation from last/baseline	elevation	deviation from last/baseline
No.	elevation	elevation	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline
30041801	101.388	101.388	101.388	0	101.388	0	101.387	-1	101.388	0	101.387	-1	101.387	0
30041802	101.383	101.383	101.382	0	101.382	0	101.382	-1	101.382	0	101.380	-2	101.379	0
30041803	101.566	101.566	101.565	-1	101.564	-1	101.564	-1	101.564	-1	101.560	-4	101.559	0
30041804	101.951	101.952	101.951	-1	101.950	0	101.950	-1	101.949	-1	101.944	-5	101.943	-1
30041805	101.722	101.723	101.723	1	101.723	0	101.723	0	101.723	0	101.720	-3	101.720	0
30041806	101.616	101.616	101.617	1	101.617	0	101.617	0	101.618	2	101.616	-2	101.616	0

monitoring table



Joint Venture

project: C310 Thames Tunnel

structure: CS28 Pumping Station

No. of reading	7. following		8. following		9. following		10. following		11. following		12. following		
	baseline	17/01/2014	17/01/2014	23/01/2014	29/01/2014	04/02/2014	12/02/2014						
date	14/1/13	17/01/2014	17/01/2014	23/01/2014	29/01/2014	04/02/2014	12/02/2014						
No.	elevation	elevation	deviation from last/ baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline		
		30041801	101.388	101.386	-1	-2	101.387	0	-2	101.386	-1	-2	101.386
30041802	101.383	101.379	-1	-4	101.379	0	-4	101.379	0	-4	101.379	0	-4
30041803	101.566	101.559	0	-8	101.559	0	-8	101.559	0	-8	101.558	-1	-8
30041804	101.951	101.943	0	-8	101.943	0	-8	101.943	0	-8	101.943	-1	-9
30041805	101.722	101.719	0	-3	101.720	0	-3	101.719	0	-3	101.719	0	-3
30041806	101.616	101.616	0	0	101.616	0	0	101.616	1	0	101.615	0	-1

monitoring table



Joint Venture

project: C310 Thames Tunnel

structure: CS28 Pumping Station

No. of reading	baseline		13. following		14. following		15. following		16. following		17. following		18. following	
	date	14/1/13	10/03/2014	09/04/2014	28/04/2014	29/04/2014	30/04/2014	01/05/2014						
No.	elevation	elevation	deviation from last/ baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	
														elevation
30041801	101.388	101.387	1	101.388	1	-1	101.388	1	0	101.388	0	101.388	0	0
30041802	101.383	101.380	1	101.381	1	-2	101.381	0	-2	101.381	0	101.381	0	-2
30041803	101.566	101.558	0	101.559	1	-7	101.559	0	-8	101.559	0	101.559	0	-8
30041804	101.951	101.942	0	101.943	1	-8	101.943	0	-8	101.943	0	101.941	-2	-10
30041805	101.722	101.719	0	101.720	1	-2	101.720	0	-3	101.720	0	101.717	-3	-6
30041806	101.616	101.615	0	101.615	0	-1	101.616	1	-0.01	101.615	0	101.612	-4	-6

monitoring table



Joint Venture

project: C310 Thames Tunnel

structure: CS28 Pumping Station

No. of reading date	baseline 14/11/13	25. following 27/08/2014		26. following 29/09/2014		27. following 21/11/2014					
		elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline
30041801	101.388	101.393	0	5	destroyed						
30041802	101.383	101.383	0	1	destroyed	due to reinstatement works					
30041803	101.566	101.561	0	-5	destroyed	due to reinstatement works					
30041804	101.951	101.946	1	-5		due to reinstatement works	101.946	0	-5		
30041805	101.722	101.720	0	-2			101.720	0	-2		
30041806	101.616	101.614	-1	-2			101.616	1	0		

Legacy Document

 HOCHTIEF MURPHY Joint Venture		C310 THAMES TUNNEL REPORT			
EMPLOYER	CROSSRAIL	eB NO	C310-HTM-C-RGN-CR148-50024	Rev	2.0
TITLE	Monitoring Close-Out Reports relating to Tunnelling Works North Embankment River Thames - North Woolwich Portal (excl. Store Rd)				

APPENDIX 105

Albert Road "2"

Learning Legacy Document

monitoring asset

Albert Road

reference monitoring drawing:

C310-HTM-C-DWG-CR146-ST004-70003

name of monitoring section:

Albert Road - 2

sensor type:

manual levelling studs

chainage:

89070-88820

point no.:

3004 1511 - 3004 1541

trigger values:
[mm]

green: +12
-12

amber: +15
-15

red: +18
-18

reference document for trigger values:

Management Plan for Control of Ground Movement

EB-no.:

C310-HTM-Z-STP-CR148-50058

Appendix:

AAA

monitoring data

	date	max. value	point no.	comments
baseline	01/10/13	0.00		
TBM 1	start ZOI	12/01/14	0.00	3004 1511
		16/01/14	0.65	30041523
		20/01/14	0.76	30041537
		24/01/14	0.50	30041540
	end ZOI	31/01/14	4.69	3004 1511
		31/01/14	-0.39	30041523
		31/01/14	0.59	30041537
		31/01/14	1.07	30041540
breached not any trigger value				
TBM 2	start ZOI	27/04/14	3.28	3004 1511
		01/05/14	-0.92	30041523
		05/05/14	-0.62	30041537
		09/05/14	-3.56	30041540
	end ZOI	01/05/14	3.60	3004 1511
		05/05/14	-1.06	30041523
		19/05/14	-0.29	30041537
		19/05/14	-6.08	30041540
breached not any trigger value				
longterm	13/11/14	1.23	30041523	
		3.01	30041537	
		2.57	30041540	

Evaluation of any potential residual risks



No residual risk since the Works have been completed by HMJV



Yes, residual risk (see comment below)

summary / comments

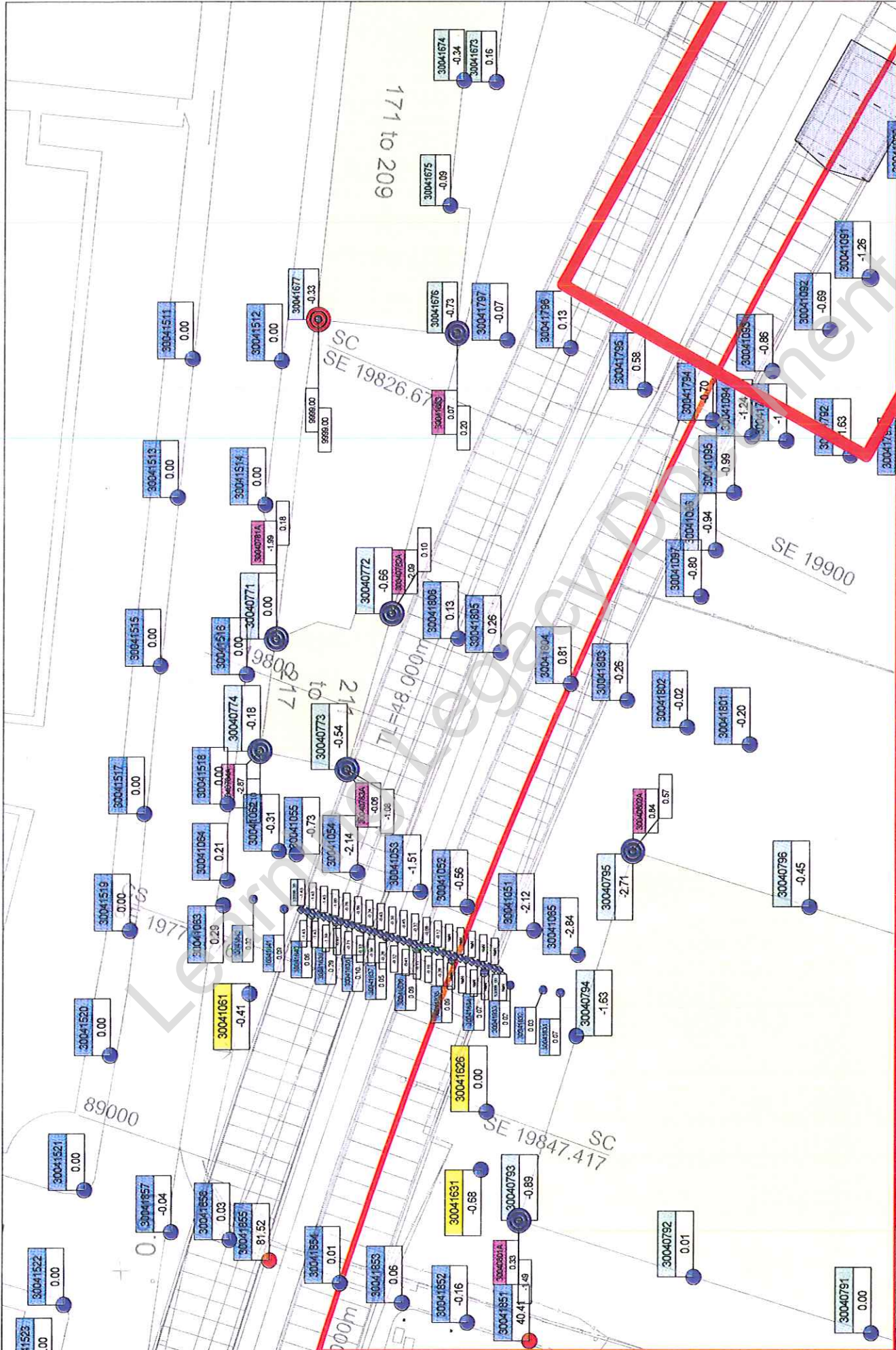
Due to reinstatement works of the curbstones on Albert Road, Point nos. 30041511-30041521 were destroyed on 02/05/2014.
Under consideration of temperature differences, the surrounding ground condition and the achievable accuracy of the measurement, HMJV has no concern to cease the monitoring.
The rate of change in the monitoring data is less than the required standards as per the specifications and drawings.

date / signature: 02/02/2015

print name:

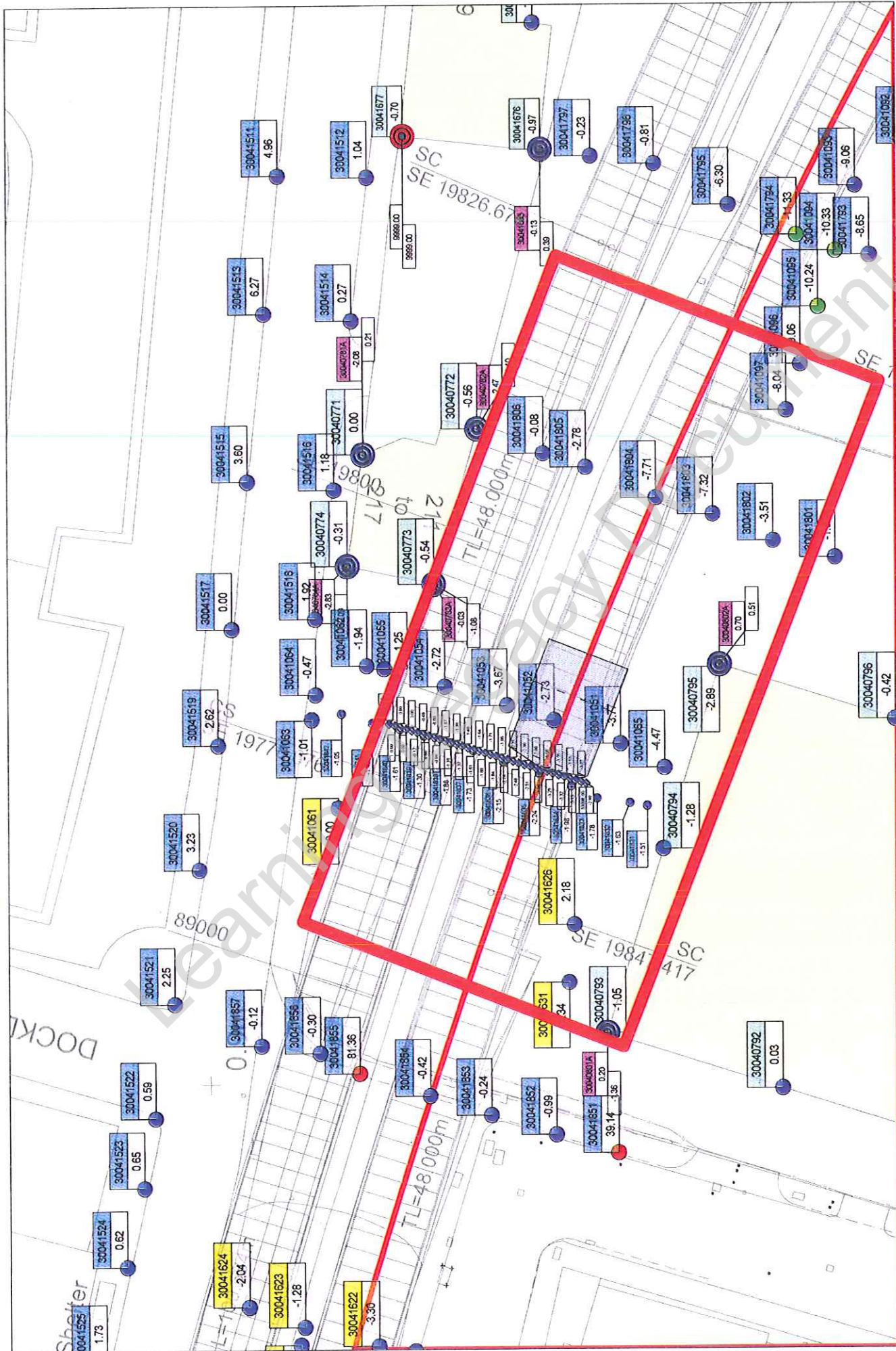
HMJV project role:

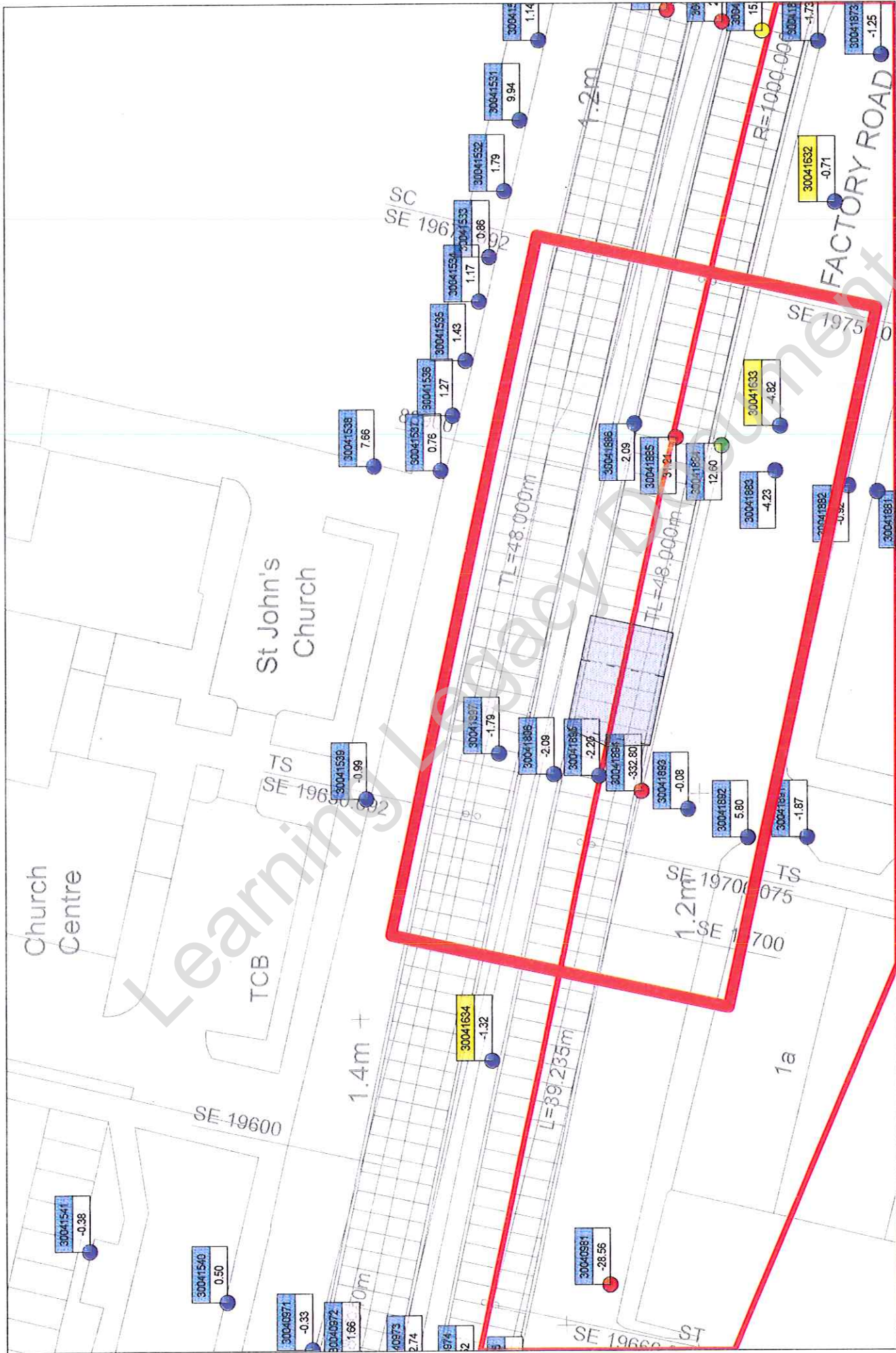
Monitoring & Survey engineer



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: WB TBM Tunneldrive
 Date: 12.01.2014 17:59



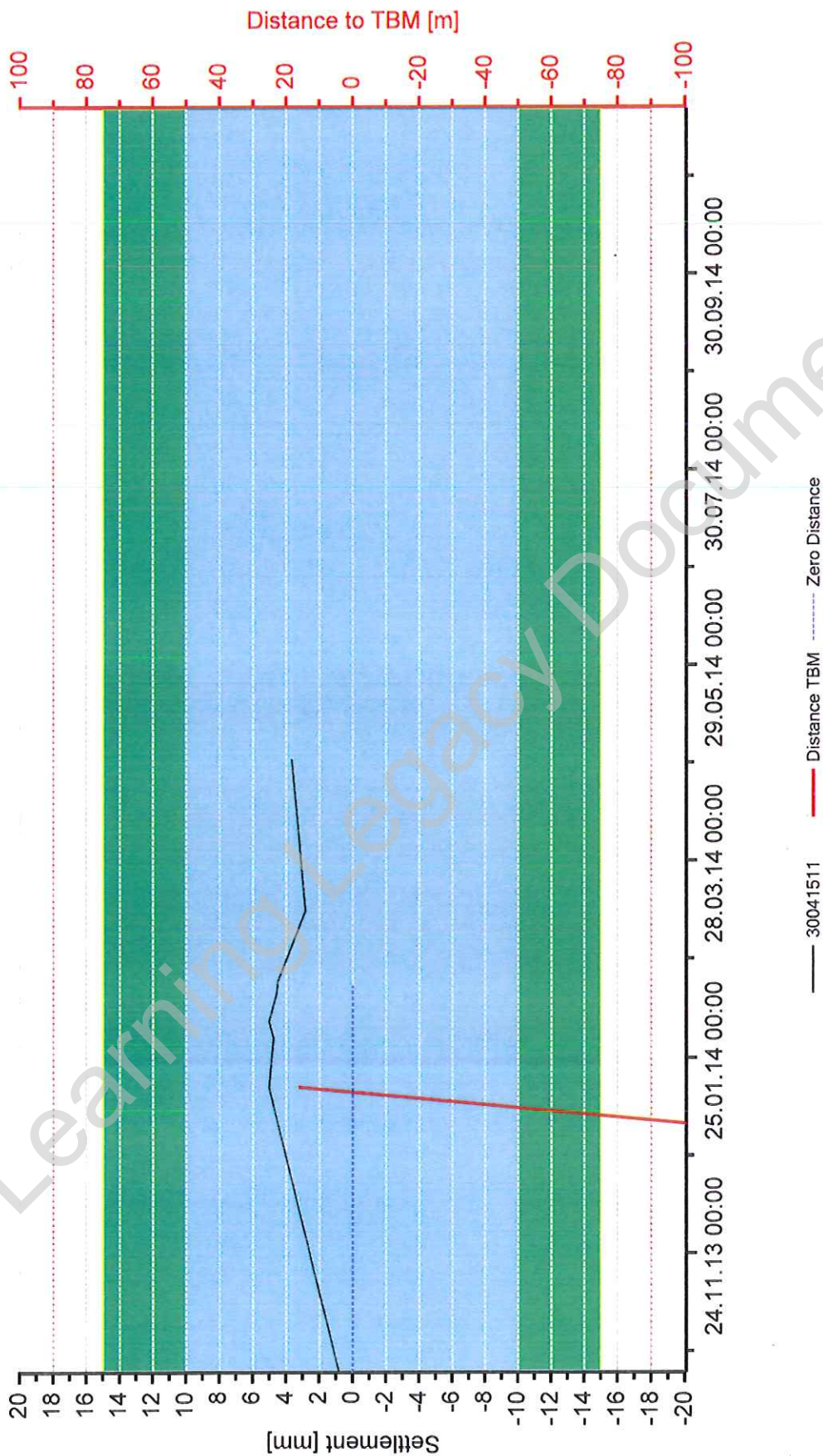




Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: WB TBM Tunneldrive
 Date: 24.01.2014 17:59



Point: 30041511



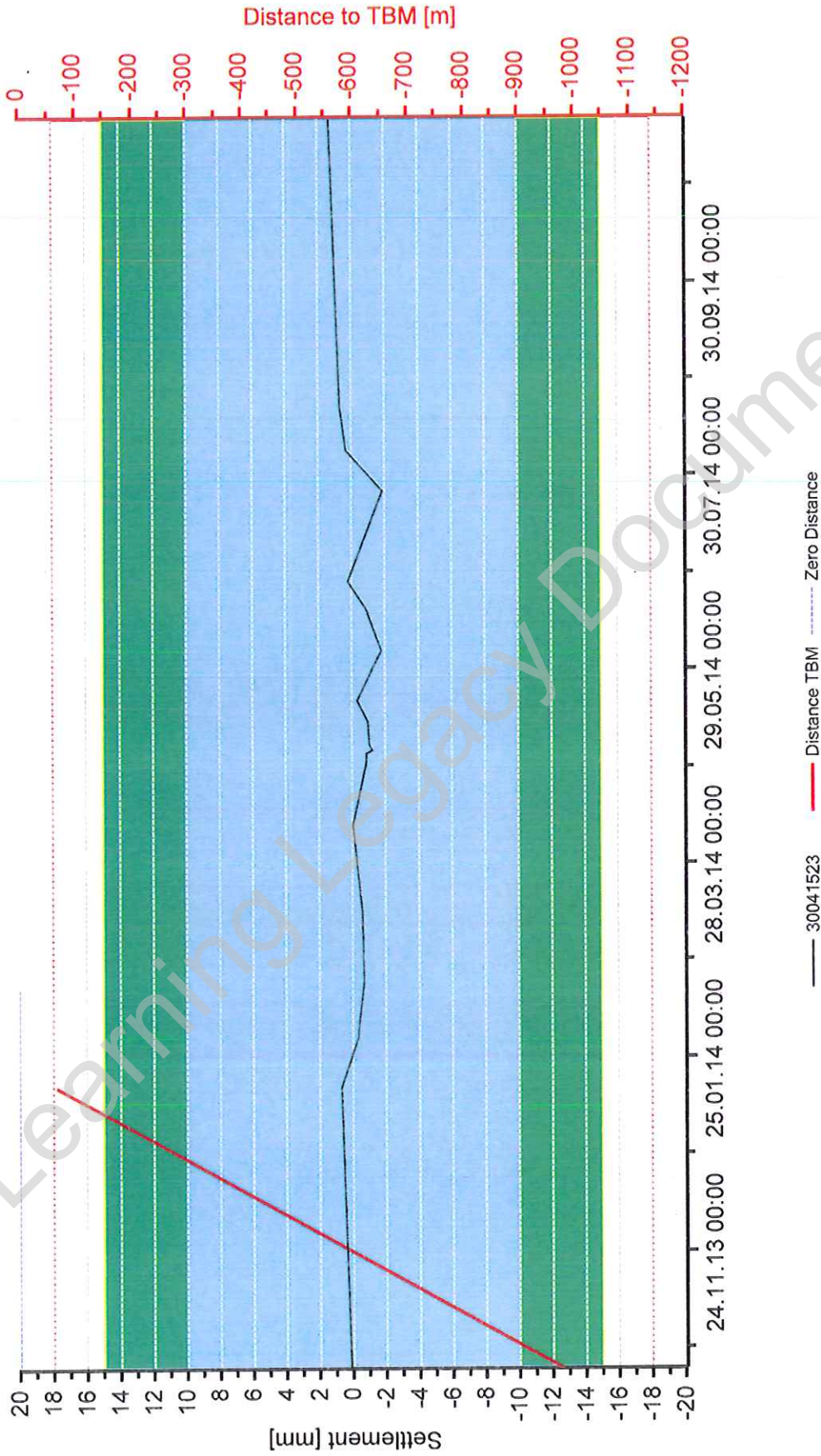
Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal

Close Out Report: WB Tunnel - Albert Road 2 - 17.10.2013 - 21.11.2014

Date: 21.01.2015 09:31 Current Values: 21.01.2015 09:21



Point: 30041523



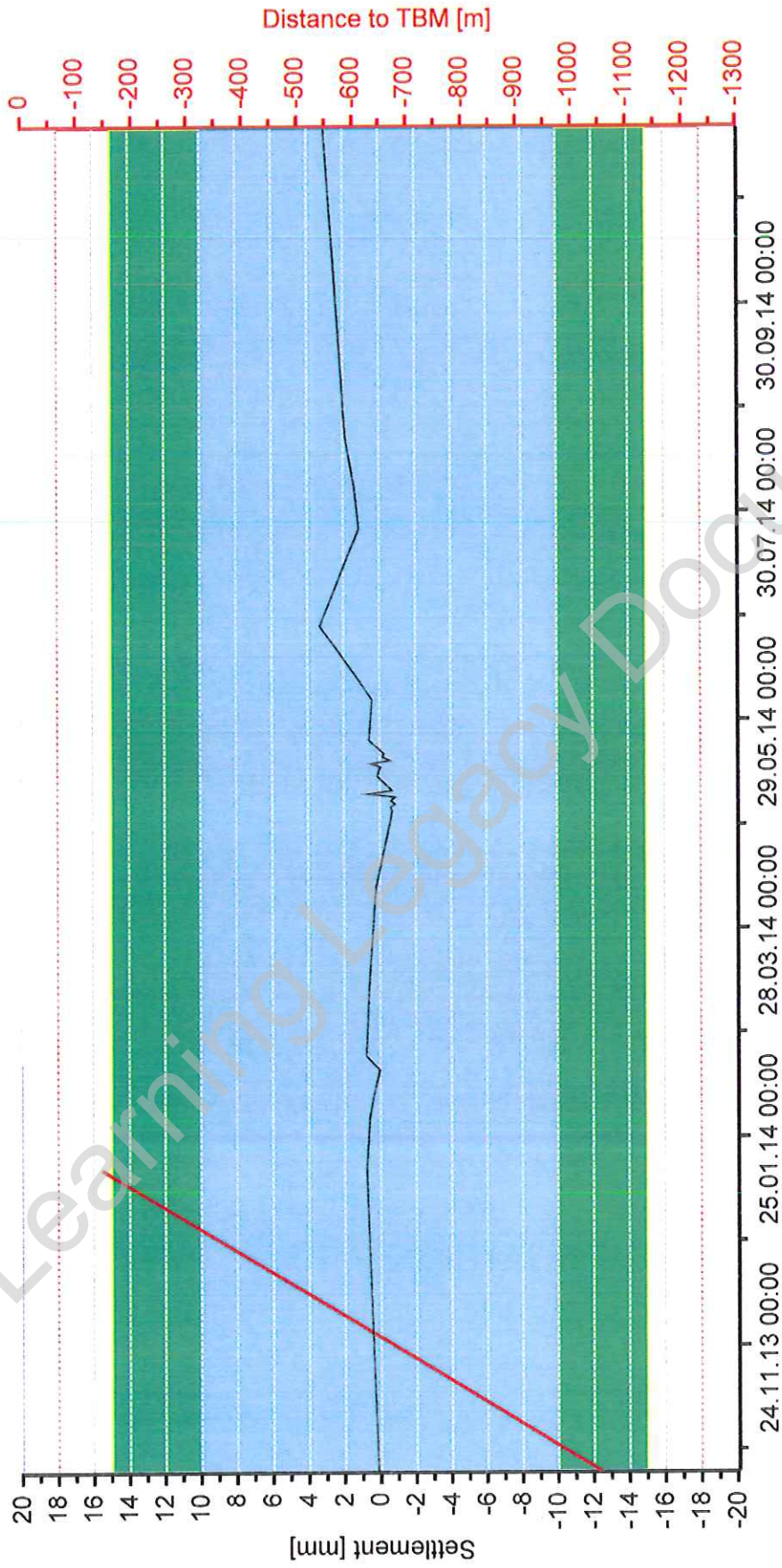
Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal

Close Out Report: WB Tunnel - Albert Road 2 - 17.10.2013 - 21.11.2014

Date: 21.01.2015 09:35 Current Values: 21.01.2015 09:21



Point: 30041537



— 30041537 — Distance TBM - - - - - Zero Distance

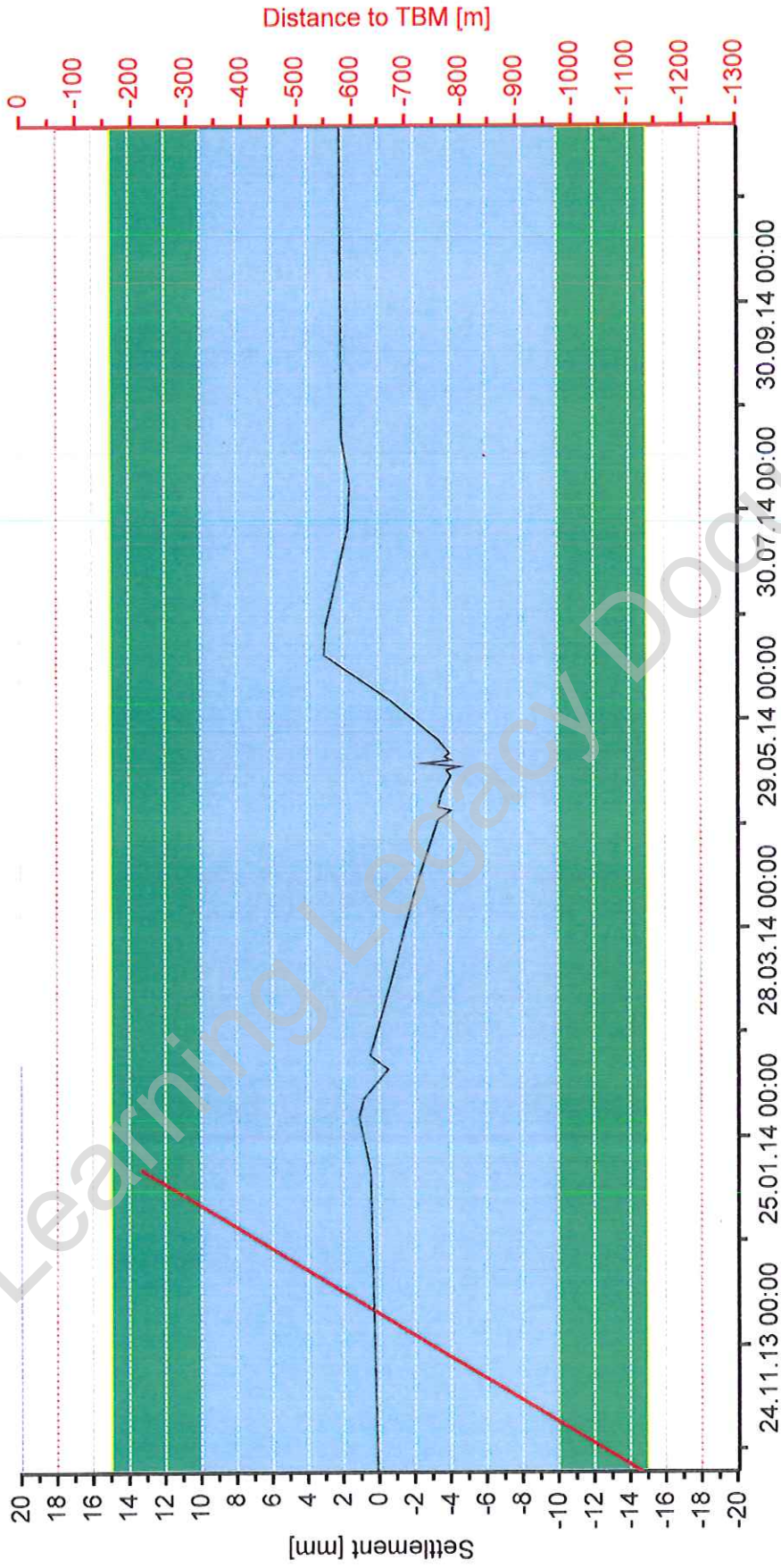
Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal

Close Out Report: WB Tunnel - Albert Road 2 - 17.10.2013 - 21.11.2014

Date: 21.01.2015 09:39 Current Values: 21.01.2015 09:21



Point: 30041540

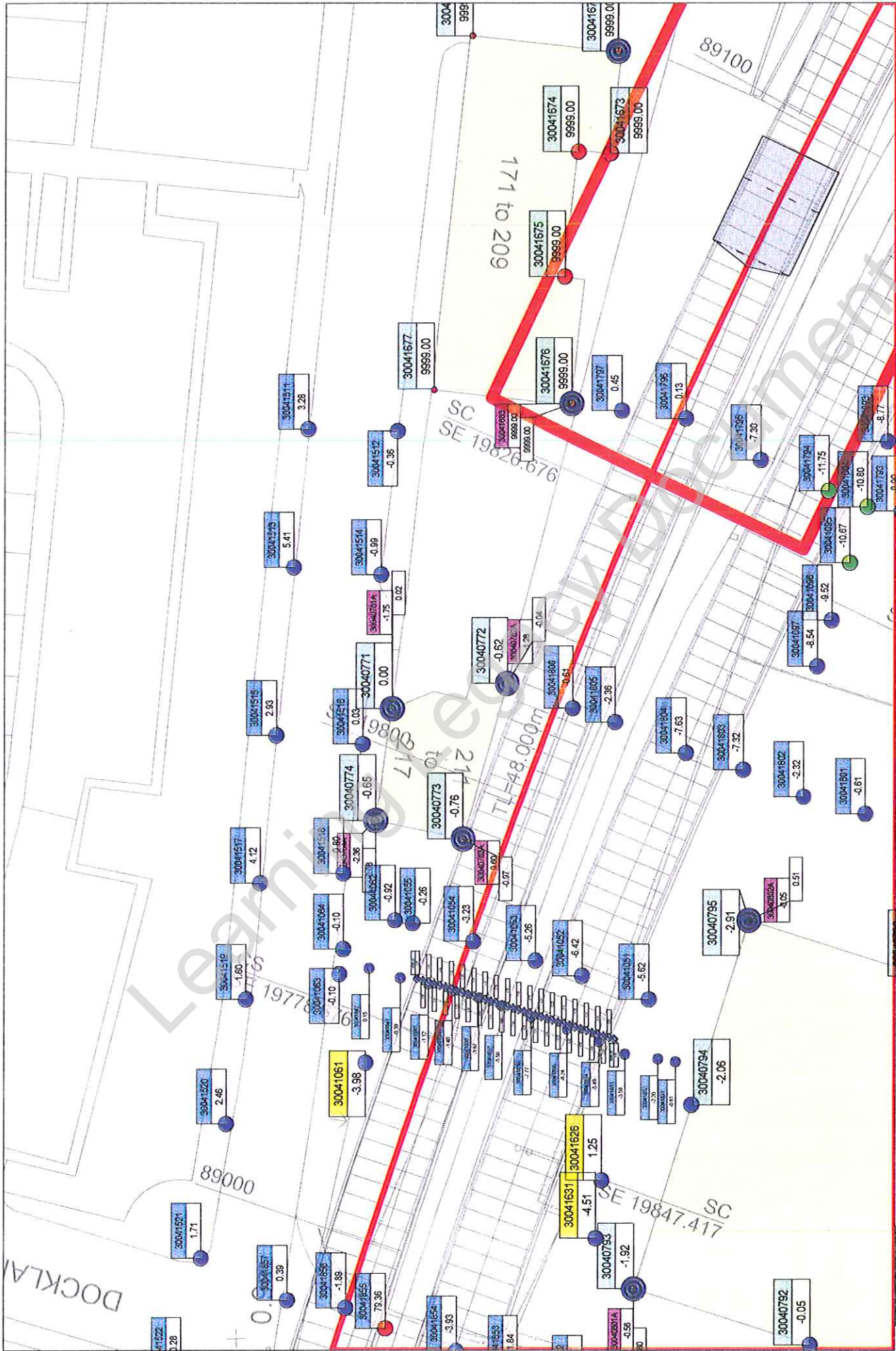


Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal

Close Out Report: WB Tunnel - Albert Road 2 - 17.10.2013 - 21.11.2014

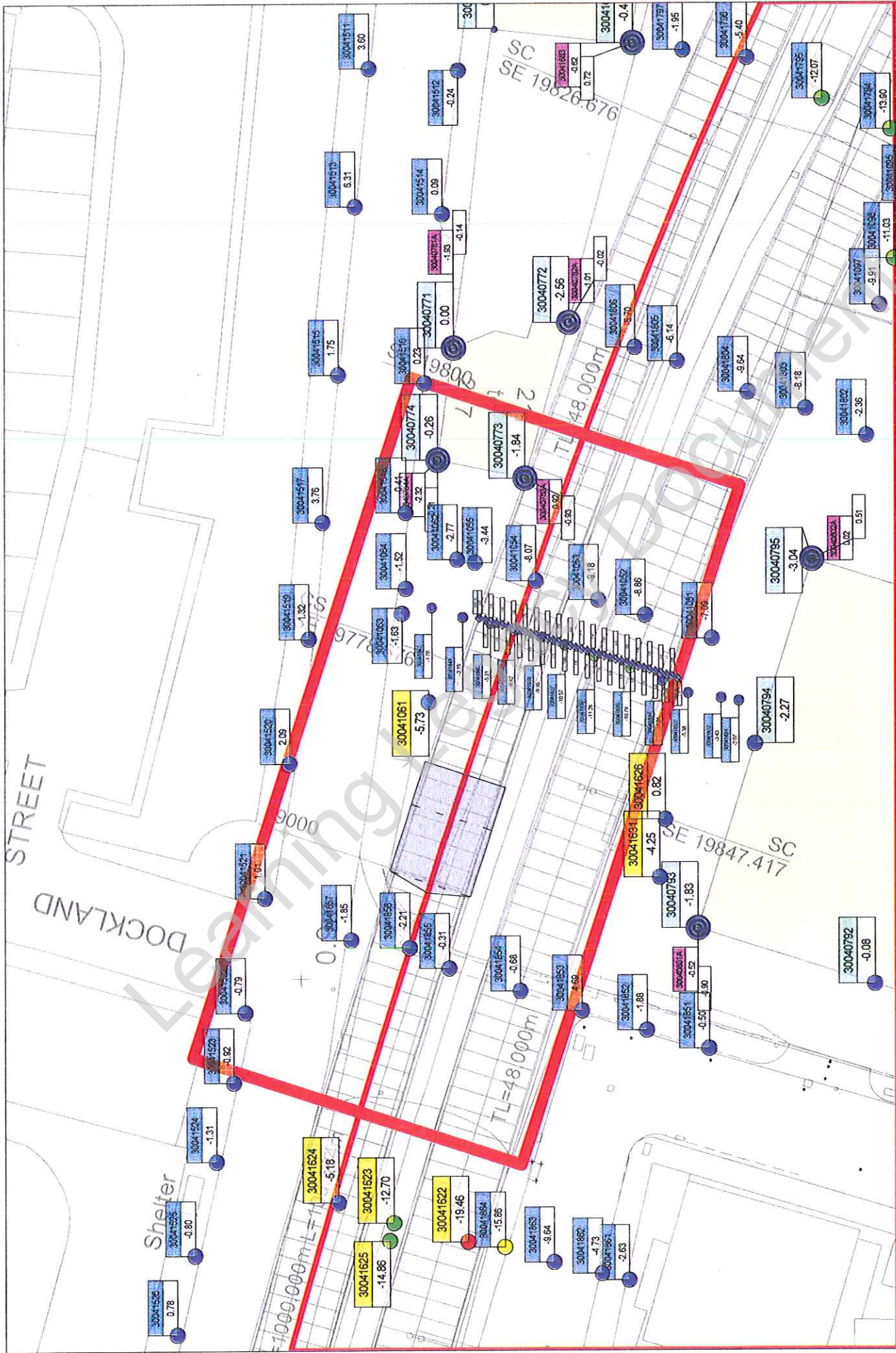
Date: 21.01.2015 09:41 Current Values: 21.01.2015 09:39





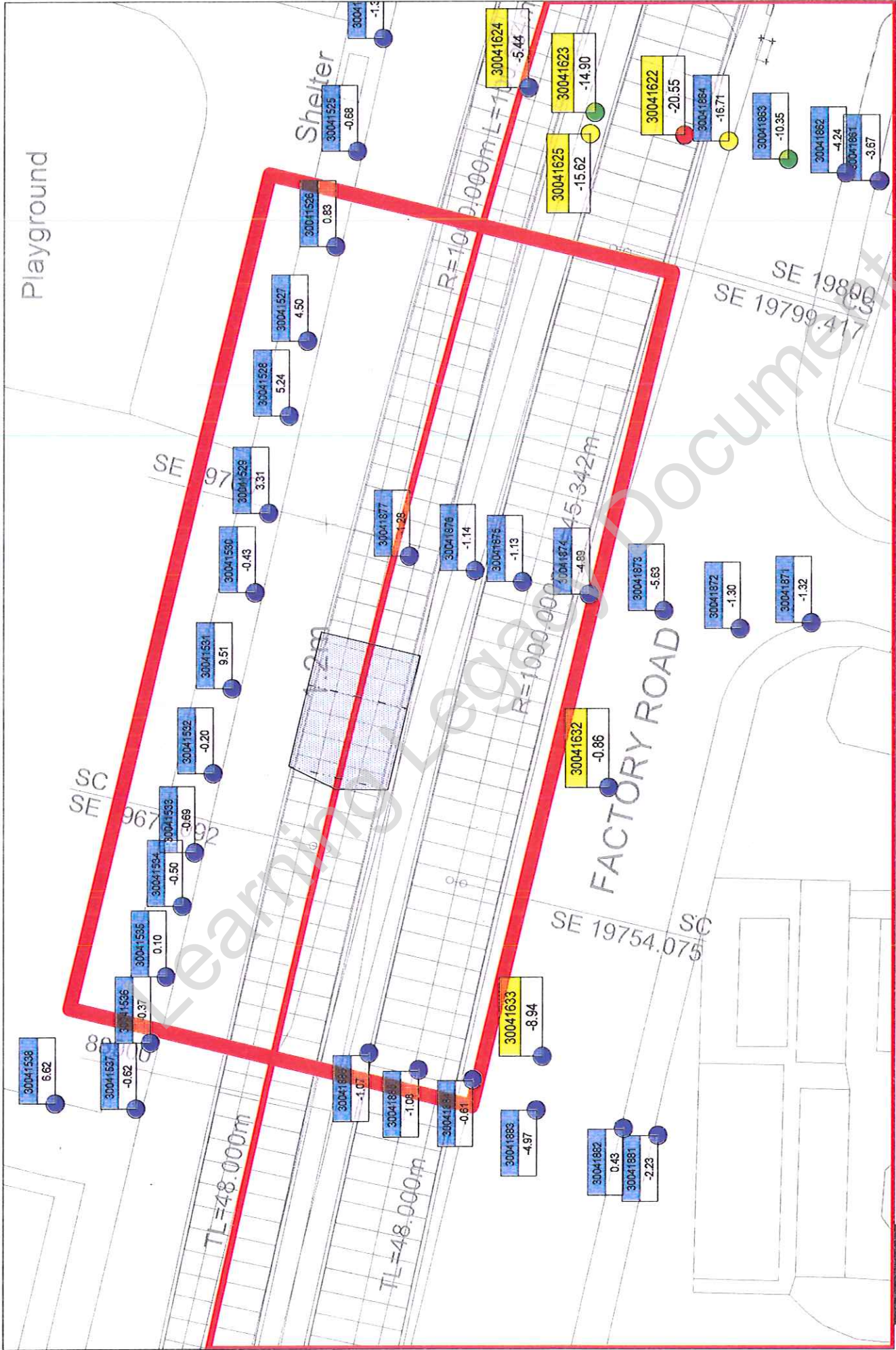
Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 Working activities: EB TBM Tunneldrive
 current values: 27.04.2014 17:59





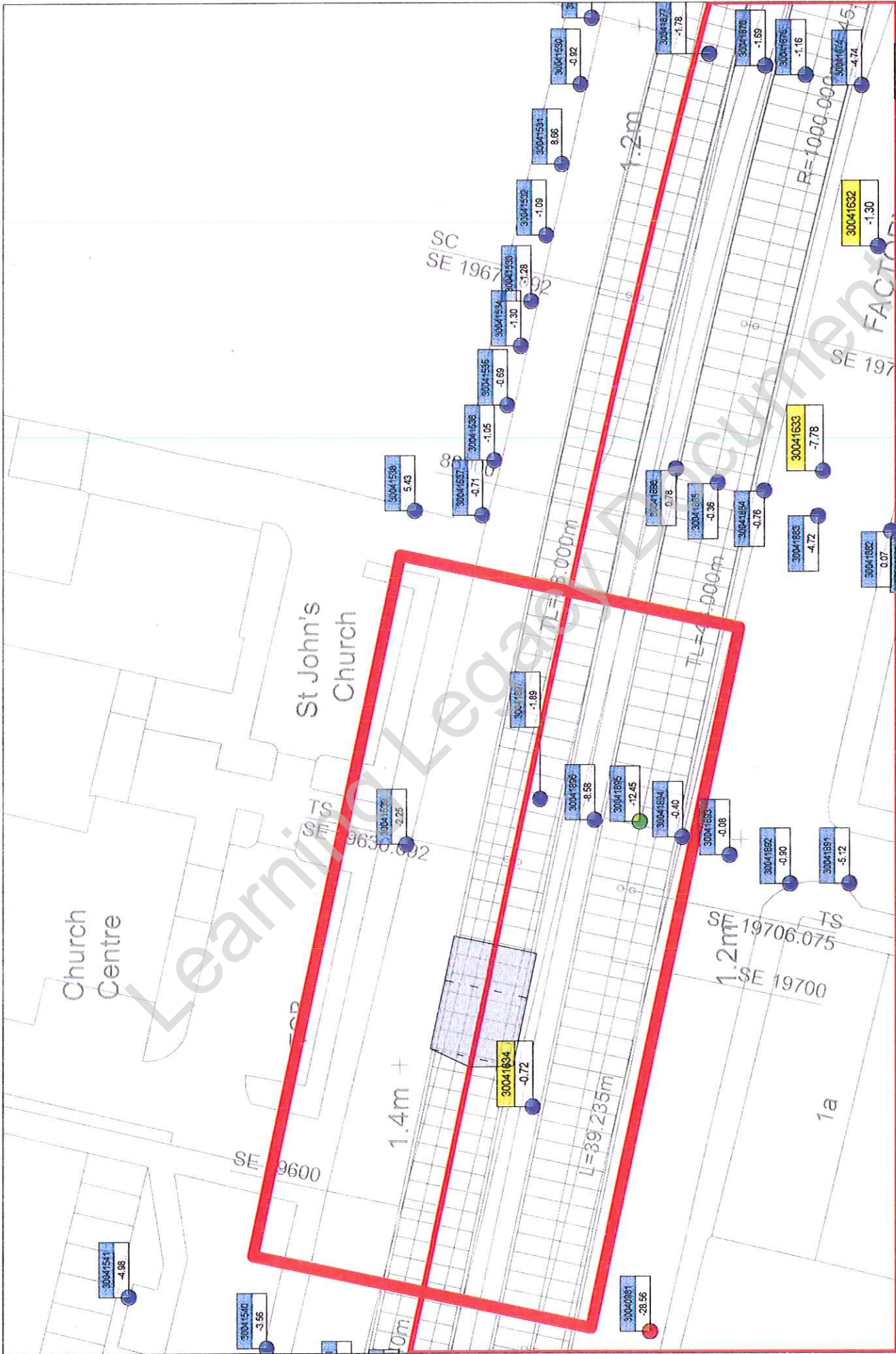
Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 Working activities: EB TBM Tunneldrive
 current values: 01.05.2014 17:59





Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: C310 EB tunnel drive; NWP: portal excavation, construction base slab
 current values: 05.05.2014 09:00

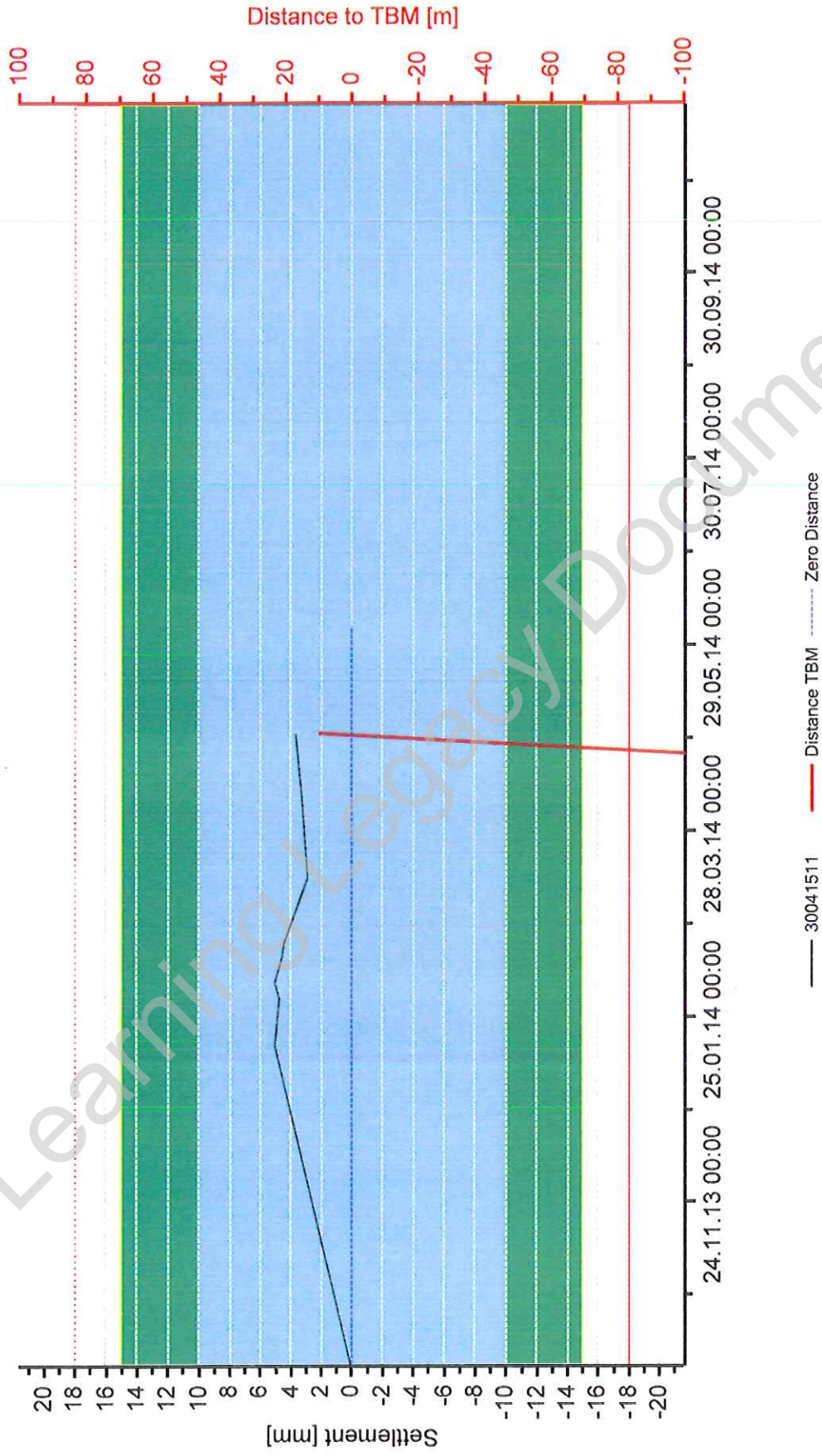




Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 Working activities: EB TBM Tunneldrive
 current values: 09.05.2014 17:59



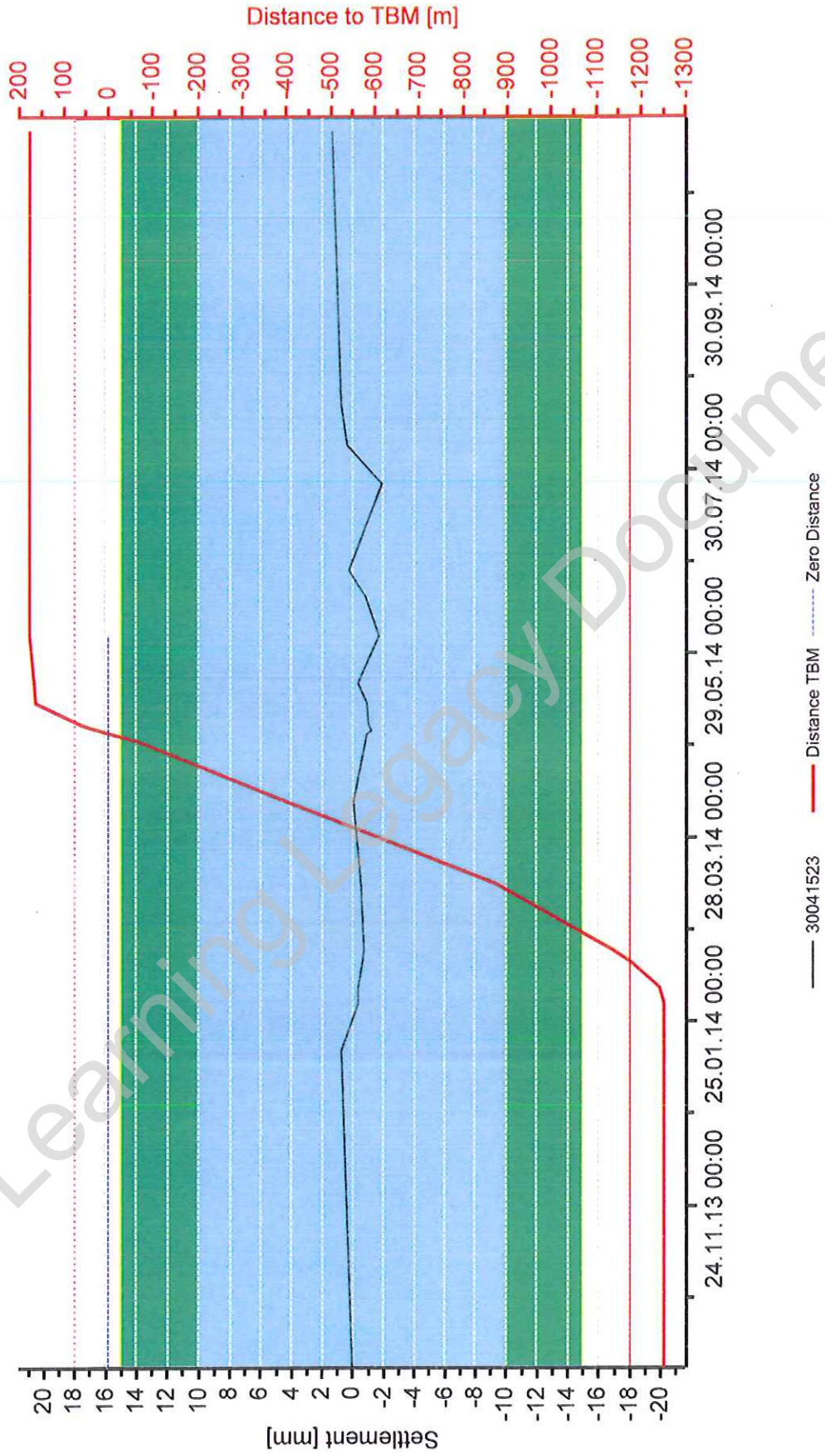
Point: 30041511



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: EB-Tunnel - Albert Road 2 17.10.2013 - 21.11.2014
date: 21.01.2015 10:30 current values: 21.01.2015 07:50



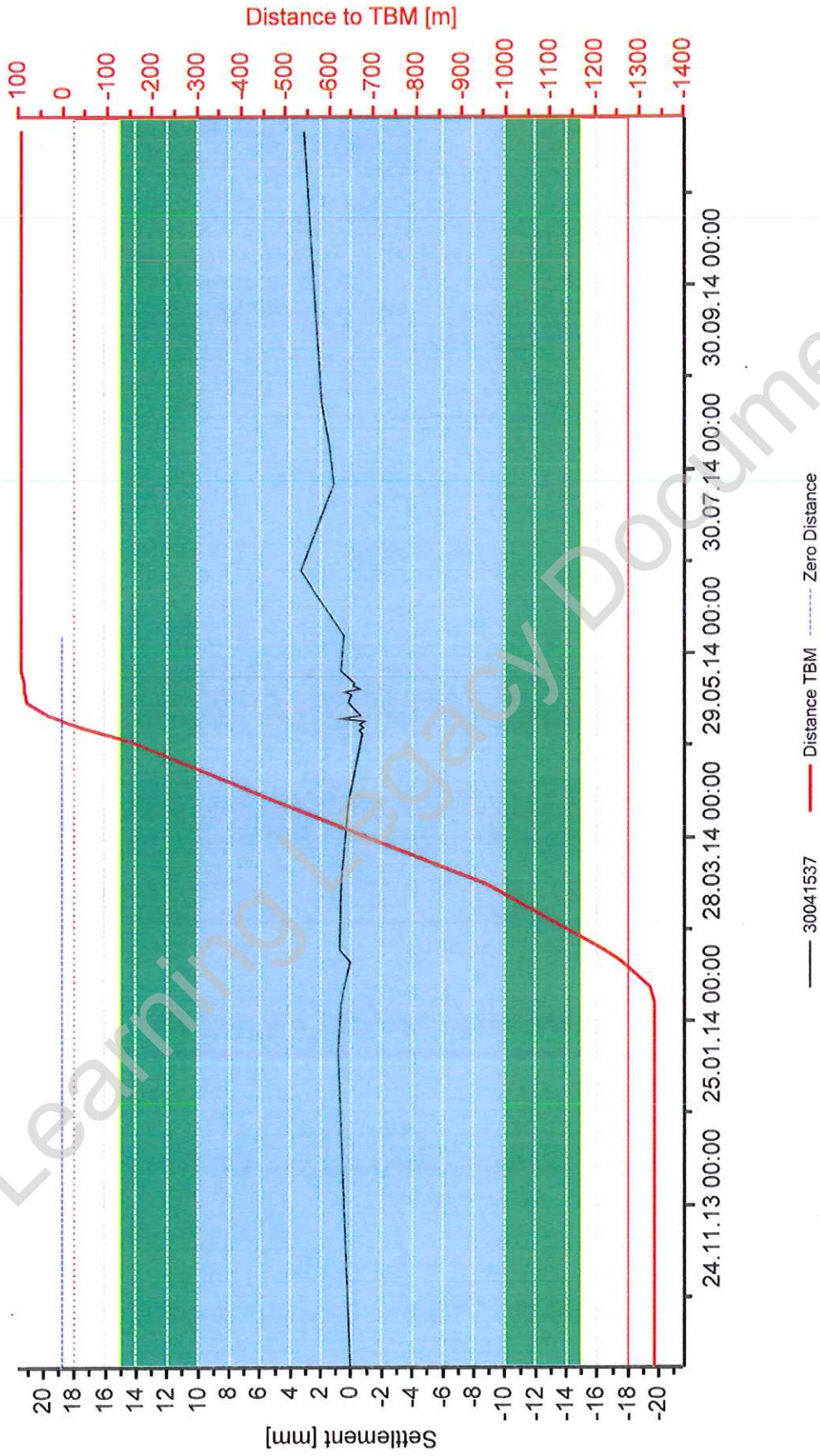
Point: 30041523



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: EB-Tunnel - Albert Road 2 17.10.2013 - 21.11.2014
date: 21.01.2015 10:42 current values: 21.01.2015 10:21



Point: 30041537



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: EB-Tunnel - Albert Road 2 17.10.2013 - 21.11.2014
date: 21.01.2015 10:44 current values: 21.01.2015 10:21



monitoring table



Joint Venture

project: C310 Thames Tunnel

structure: TW Albert Road (Fernhill Street - Dockland Street)

No. of reading date	1. following 15/01/2014		2. following 23/01/2014		3. following 31/01/2014		4. following 05/02/2014		5. following 14/02/2014		6. following 18/02/2014							
	baseline elevation	deviation from last/ baseline elevation	baseline elevation	deviation from last/ baseline elevation	baseline elevation	deviation from last/ baseline elevation	baseline elevation	deviation from last/ baseline elevation	baseline elevation	deviation from last/ baseline elevation	baseline elevation	deviation from last/ baseline elevation						
30041511	100.938	100.943	5	100.942	-1	4	100.942	0	5	100.943	1	5	100.942	-1	5	100.942	0	4
30041512	101.037	101.038	1	101.037	-1	0	101.037	0	0	101.036	-1	-1	101.037	0	0	101.036	-1	-1
30041513	100.915	100.922	6	100.921	-1	6	100.922	1	6	100.922	1	7	100.921	0	6	100.921	0	6
30041514	101.016	101.016	0	101.015	-1	0	101.015	0	0	101.016	0	0	101.015	-1	-1	101.015	0	-1
30041515	100.816	100.819	4	100.819	-1	3	100.819	0	3	100.819	0	3	100.819	0	3	100.819	0	3
30041516	101.025	101.027	1	101.026	-1	0	101.026	0	0	101.026	0	0	101.025	-1	0	101.025	-1	0
30041517	100.721	covered		100.725	4	4	100.725	0	4	100.725	0	4	100.725	0	4	100.725	0	4
30041518	100.985	100.987	2	100.986	-1	1	100.986	0	1	100.986	0	1	100.986	0	1	100.985	-1	0
30041519	100.832	100.835	3	100.834	-1	2	100.834	0	2	100.835	1	3	100.834	0	2	100.834	0	2
30041520	100.814	100.818	3	100.817	-1	3	100.817	0	3	100.817	0	3	100.817	0	3	100.817	0	2
30041521	100.954	100.956	2	100.955	-1	2	100.955	0	2	100.956	0	2	100.955	0	2	100.955	0	1
30041522	101.137	101.137	1	101.137	-1	0	101.137	0	0	101.137	0	0	101.137	0	0	101.136	0	-1
30041523	101.071	101.072	1	101.071	-1	0	101.070	0	0	101.070	0	0	101.070	0	-1	101.070	0	-1
30041524	101.001	101.001	1	101.001	-1	0	101.000	0	0	101.001	0	0	101.000	0	-1	101.000	0	-1
30041525	101.011	101.013	2	101.012	-1	1	101.012	0	1	101.012	0	1	101.012	0	1	101.012	0	1
30041526	100.910	100.914	4	100.913	-1	3	100.913	0	3	100.913	0	3	100.913	-1	2	100.913	0	3
30041527	100.935	100.942	7	100.942	-1	6	100.942	0	7	100.942	0	6	100.941	0	6	100.942	1	7
30041528	101.002	101.008	6	101.008	0	6	101.008	0	7	101.009	0	7	101.009	0	7	101.009	1	7
30041529	101.078	101.082	4	101.082	0	3	101.082	0	4	101.082	0	3	101.082	0	3	101.083	1	4
30041530	101.177	101.179	1	101.178	0	1	101.178	0	1	101.178	0	1	101.178	0	1	101.179	1	1
30041531	101.150	101.160	10	101.160	0	10	101.161	2	12	101.161	1	11	101.160	0	11	101.161	0	11
30041532	101.212	101.214	2	101.213	-1	1	101.214	2	3	101.213	-1	2	101.213	0	2	101.214	0	2
30041533	101.258	101.259	1	101.259	0	1	101.260	1	1	101.259	0	1	101.259	0	1	101.260	1	1
30041534	101.287	101.288	1	101.288	-1	1	101.288	1	1	101.288	0	1	101.288	-1	0	101.288	1	1
30041535	101.247	101.249	1	101.249	0	1	101.249	0	1	101.249	0	1	101.249	0	1	101.249	0	1
30041536	101.272	101.273	1	101.273	-1	1	101.273	0	1	101.272	-1	0	101.273	0	1	101.273	1	1
30041537	101.301	101.302	1	101.302	0	1	101.302	0	1	101.302	0	0	101.301	0	0	101.302	1	1
30041538	101.179	101.187	8	101.187	0	7	101.187	0	8	101.187	0	8	101.187	-1	7	101.187	0	8
30041539	101.487	101.486	-1	101.486	0	-1	101.486	0	-1	101.486	0	-1	101.485	-1	-2	101.486	1	-1
30041540	101.592	101.592	1	101.592	0	0	101.593	1	1	101.592	0	1	101.591	-1	-1	101.592	1	0
30041541	101.782	101.781	0	101.781	0	-1	101.782	1	0	101.782	1	0	101.782	-1	-1	101.781	1	-1

monitoring table



Joint Venture

project: C310 Thames Tunnel

structure: TW Albert Road (Fernhill Street - Dockland Street)

No. of reading	7. following		8. following		9. following		10. following		11. following		12. following		
	baseline	12/03/2014	09/04/2014	29/04/2014	02/05/2014	30/05/2014	04/05/2014						
Point No.	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	
30041511	100.938	100.941	-2	3	100.941	0	4	Covered	Covered	Covered	Covered		
30041512	101.037	101.035	-1	1	101.037	0	0	Covered	Covered	Covered	Covered		
30041513	100.915	100.920	-1	5	100.921	1	6	Covered	Covered	Covered	Covered		
30041514	101.016	101.014	-1	-2	101.015	1	0	Covered	Covered	Covered	Covered		
30041515	100.816	100.817	-1	2	100.819	1	3	Covered	Covered	Covered	Covered		
30041516	101.025	101.025	-1	-1	101.026	1	0	Covered	Covered	Covered	Covered		
30041517	100.721	100.724	0	3	100.725	1	4	Destroyed	Destroyed	Destroyed	Destroyed		
30041518	100.995	100.984	-1	0	100.984	0	0	Covered	Covered	Covered	Covered		
30041519	100.832	100.834	0	2	100.834	0	2	Destroyed	Destroyed	Destroyed	Destroyed		
30041520	100.814	100.816	0	2	100.817	0	2	Destroyed	Destroyed	Destroyed	Destroyed		
30041521	100.954	100.955	0	1	100.955	0	2	Destroyed	Destroyed	Destroyed	Destroyed		
30041522	101.137	101.136	0	-1	101.136	1	-1	Destroyed	Destroyed	Destroyed	Destroyed		
30041523	101.071	101.070	0	-1	101.071	1	0	101.136	0	-1	101.135	0	-1
30041524	101.001	101.000	0	-1	101.000	0	-1	101.070	0	-1	101.070	0	-1
30041525	101.011	101.011	-1	0	101.011	0	0	100.999	0	-2	100.999	0	-2
30041526	100.910	100.912	-1	2	100.912	0	2	101.010	0	-1	101.010	0	-1
30041527	100.935	100.941	-1	6	100.941	-1	5	100.911	0	1	100.911	0	0
30041528	101.002	101.009	0	7	101.009	0	7	100.940	0	5	100.940	0	4
30041529	101.078	101.083	0	4	101.083	0	4	101.008	0	6	101.007	-1	5
30041530	101.177	101.179	0	1	101.178	0	1	101.082	0	3	101.081	-1	2
30041531	101.150	101.161	0	11	101.160	0	11	101.177	0	0	101.177	0	-1
30041532	101.212	101.213	0	2	101.213	0	1	101.159	-1	10	101.159	0	9
30041533	101.258	101.259	-1	1	101.259	0	1	101.212	0	0	101.212	-1	0
30041534	101.287	101.288	0	1	101.288	0	1	101.258	0	0	101.258	0	0
30041535	101.247	101.248	0	1	101.248	0	1	101.287	0	0	101.286	0	-1
30041536	101.272	101.273	0	1	101.273	0	0	101.287	0	0	101.286	0	-1
30041537	101.301	101.302	0	1	101.302	0	0	101.247	0	0	101.247	0	0
30041538	101.179	101.187	0	8	101.186	-1	7	101.272	0	0	101.272	0	0
30041539	101.487	101.486	0	-1	101.486	0	-1	101.301	-1	-1	101.301	0	-1
30041540	101.592	101.591	-1	-1	101.589	-1	-2	101.186	0	6	101.186	0	6
30041541	101.782	101.780	-1	-1	101.779	-2	-3	101.485	-1	-2	101.485	0	-2
								101.587	-1	-4	101.588	1	-3
								101.776	-1	-6	101.777	0	-5

monitoring table



Joint Venture

Project: C310 Thames Tunnel

structure: TW Albert Road (Fernhill Street - Dockland Street)

No. of reading	19. following		20. following		21. following		22. following		23. following		24. following			
	baseline	17/07/13	elevation	18/05/2014	deviation from last/ baseline	elevation	17/05/2014	deviation from last/ baseline	elevation	18/05/2014	deviation from last/ baseline	elevation	23/05/2014	
Point No.	elevation	15/05/2014	deviation from last/ baseline	elevation	18/05/2014	deviation from last/ baseline	elevation	18/05/2014	deviation from last/ baseline	elevation	19/05/2014	deviation from last/ baseline	elevation	
30041511	100.938	Covered	Covered	100.938	Covered	Covered	100.938	Covered	100.938	Covered	100.938	Covered	100.938	
30041512	101.037	Covered	Covered	101.037	Covered	Covered	101.037	Covered	101.037	Covered	101.037	Covered	101.037	
30041513	100.915	Covered	Covered	100.915	Covered	Covered	100.915	Covered	100.915	Covered	100.915	Covered	100.915	
30041514	101.016	Covered	Covered	101.016	Covered	Covered	101.016	Covered	101.016	Covered	101.016	Covered	101.016	
30041515	100.816	Covered	Covered	100.816	Covered	Covered	100.816	Covered	100.816	Covered	100.816	Covered	100.816	
30041516	101.025	Covered	Covered	101.025	Covered	Covered	101.025	Covered	101.025	Covered	101.025	Covered	101.025	
30041517	100.721	Destroyed	Destroyed	100.721	Destroyed	Destroyed	100.721	Destroyed	100.721	Destroyed	100.721	Destroyed	100.721	
30041518	100.985	Covered	Covered	100.985	Covered	Covered	100.985	Covered	100.985	Covered	100.985	Covered	100.985	
30041519	100.832	Destroyed	Destroyed	100.832	Destroyed	Destroyed	100.832	Destroyed	100.832	Destroyed	100.832	Destroyed	100.832	
30041520	100.814	Destroyed	Destroyed	100.814	Destroyed	Destroyed	100.814	Destroyed	100.814	Destroyed	100.814	Destroyed	100.814	
30041521	100.954	Destroyed	Destroyed	100.954	Destroyed	Destroyed	100.954	Destroyed	100.954	Destroyed	100.954	Destroyed	100.954	
30041522	101.137			101.137			101.137		101.137		101.137		101.137	
30041523	101.071			101.071			101.071		101.071		101.071		101.071	
30041524	101.001			101.001			101.001		101.001		101.001		101.001	
30041525	101.011			101.011			101.011		101.011		101.011		101.011	
30041526	100.910	0	1	100.910	0	1	100.910	0	1	100.910	0	2	100.910	
30041527	100.935	0	5	100.935	0	5	100.935	0	5	100.935	0	5	100.935	
30041528	101.002			101.002			101.002		101.002		101.002		101.002	
30041529	101.078			101.078			101.078		101.078		101.078		101.078	
30041530	101.177			101.177			101.177		101.177		101.177		101.177	
30041531	101.150			101.150			101.150		101.150		101.150		101.150	
30041532	101.212			101.212			101.212		101.212		101.212		101.212	
30041533	101.258			101.258			101.258		101.258		101.258		101.258	
30041534	101.287			101.287			101.287		101.287		101.287		101.287	
30041535	101.247			101.247			101.247		101.247		101.247		101.247	
30041536	101.272			101.272			101.272		101.272		101.272		101.272	
30041537	101.301	0	0	101.301	1	0	101.301	0	0	101.301	0	0	101.301	
30041538	101.179			101.179	101.186	0	7	101.185	-1	6	101.185	0	6	101.185
30041539	101.487	101.485	-1	-1	101.487	2	0	101.486	-1	-1	101.486	0	-1	101.486
30041540	101.592	101.587	-1	-5	101.589	2	-3	101.587	0	-4	101.588	0	-4	101.588
30041541	101.782	101.776	-1	-6	101.777	2	-5	101.776	0	-6	101.776	0	-6	101.776

monitoring table



Joint Venture

project: C310 Thames Tunnel

structure: TW Albert Road (Fernhill Street - Dockland Street)

No. of reading	25. following		26. following		27. following		28. following		29. following		30. following								
	baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline						
date	1/10/13			04/06/2014	17/06/2014	26/06/2014	25/07/2014	07/08/2014	21/08/2014										
30041511	100.938			Destroyed		Destroyed		Destroyed		Destroyed		Destroyed							
30041512	101.037	101.036	-1	Destroyed		Destroyed		Destroyed		Destroyed		Destroyed							
30041513	100.915			Destroyed		Destroyed		Destroyed		Destroyed		Destroyed							
30041514	101.016	101.014	-2	Destroyed		Destroyed		Destroyed		Destroyed		Destroyed							
30041515	100.816			Destroyed		Destroyed		Destroyed		Destroyed		Destroyed							
30041516	101.025	101.024	-1	Destroyed		Destroyed		Destroyed		Destroyed		Destroyed							
30041517	100.721			Destroyed		Destroyed		Destroyed		Destroyed		Destroyed							
30041518	100.985	100.985	0	Destroyed		Destroyed		Destroyed		Destroyed		Destroyed							
30041519	100.832			Destroyed		Destroyed		Destroyed		Destroyed		Destroyed							
30041520	100.814			Destroyed		Destroyed		Destroyed		Destroyed		Destroyed							
30041521	100.954			Destroyed		Destroyed		Destroyed		Destroyed		Destroyed							
30041522	101.137	101.135	-2	101.136	1	0	101.137	1	1	101.136	-2	-1	101.138	2	1	101.139	1	2	
30041523	101.071	101.069	-1	101.070	1	-1	101.071	1	0	101.069	-2	-2	101.072	2	0	101.072	0	1	
30041524	101.001	100.999	-1	101.001	1	0	101.002	1	1	101.001	-1	0	101.003	2	2	101.003	0	2	
30041525	101.011	101.010	-1	101.011	1	0	101.013	2	2	-101.014	1	3	101.014	0	4	-101.014	0	3	
30041526	100.910	100.910	-2	0	100.911	1	1	100.910	-1	0	100.913	3	3	100.913	3	3	100.911	-2	1
30041527	100.935	100.938	-2	3	100.935	-3	-1	100.930	-5	-6	100.941	11	5	100.935	-3	0	100.933	-2	-2
30041528	101.002	101.007	-1	5	101.007	0	5	101.006	-1	4	101.010	4	6	101.006	-1	5	101.005	-1	3
30041529	101.078	101.081	-1	3	101.083	1	4	101.083	0	4	-101.084	1	5	101.082	0	3	101.082	0	3
30041530	101.177	101.177	0	-1	101.179	2	1	101.179	1	2	101.178	-2	0	101.177	0	0	101.178	1	1
30041531	101.150	101.159	0	9	101.160	1	10	101.159	0	9	101.160	1	10	101.156	-3	6	101.156	0	6
30041532	101.212	101.212	0	0	101.213	1	2	101.214	1	3	101.213	-1	1	101.212	0	0	101.213	1	1
30041533	101.258	101.259	0	0	101.260	1	2	101.261	1	3	101.259	-2	1	101.259	1	1	-101.260	1	2
30041534	101.287	101.288	1	0	101.290	2	2	101.290	1	3	101.289	-2	2	101.288	1	1	101.289	1	2
30041535	101.247	101.248	1	1	101.250	2	3	101.251	1	4	101.250	-2	2	101.249	2	2	101.250	1	3
30041536	101.272	101.273	1	1	101.275	1	2	101.275	1	3	101.274	-2	2	101.274	2	2	101.274	0	2
30041537	101.301	101.302	0	0	101.304	2	2	101.305	1	3	101.303	-2	1	101.303	0	1	101.303	0	2
30041538	101.179	101.186	1	7	101.186	0	6	101.184	-1	5	101.188	3	8	101.182	-6	2	101.181	-1	2
30041539	101.487	101.484	-2	-3	101.487	4	1	101.487	0	0	101.484	-3	-3	101.482	-2	-5	101.480	-2	-7
30041540	101.592	101.591	3	-1	101.595	4	3	101.594	-1	3	101.593	-1	2	101.593	-1	2	101.594	0	2
30041541	101.782	101.780	3	-2	-101.785	5	3	101.785	0	3	-101.784	-2	2	101.783	-2	2	101.785	1	3

monitoring table



Joint Venture

project: C310 Thames Tunnel

structure: TW Albert Road (Fernhill Street - Dockland Street)

No. of reading date	baseline 1/10/13	31. following 13/11/2014		32. following		33. following		34. following		35. following		36. following	
		elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline
30041511	100.938	Destroyed											
30041512	101.037	Destroyed											
30041513	100.915	Destroyed											
30041514	101.016	Destroyed											
30041515	100.816	Destroyed											
30041516	101.025	Destroyed											
30041517	100.721	Destroyed											
30041518	100.985	Destroyed											
30041519	100.832	Destroyed											
30041520	100.814	Destroyed											
30041521	100.954	Destroyed											
30041522	101.137	Destroyed											
30041523	101.071	101.072	1	1									
30041524	101.001	101.004	1	3									
30041525	101.011	101.014	0	3									
30041526	100.910	100.912	-1	2									
30041527	100.935	100.934	-1	-1									
30041528	101.002	101.005	0	3									
30041529	101.078	101.083	1	4									
30041530	101.177	101.179	1	2									
30041531	101.150	101.155	0	6									
30041532	101.212	101.214	0	2									
30041533	101.258	101.261	1	2									
30041534	101.287	101.291	2	3									
30041535	101.247	Destroyed											
30041536	101.272	101.276	1	4									
30041537	101.301	101.304	1	3									
30041538	101.179	101.183	1	4									
30041539	101.487	101.481	-1	-5									
30041540	101.592	101.594	0	2									
30041541	101.782	101.784	0	3									

		C310 THAMES TUNNEL REPORT			
EMPLOYER	CROSSRAIL	eB NO	C310-HTM-C-RGN-CR148-50024	Rev	2.0
TITLE	Monitoring Close-Out Reports relating to Tunnelling Works North Embankment River Thames - North Woolwich Portal (excl. Store Rd)				

APPENDIX 106

CS 31 - Store Road Sewer West - CH 89000

Learning Legacy Document

monitoring asset	TW Store Road Sewer		
reference monitoring drawing:	C310-HTM-C-DWG-CR146-ST004-70003		
name of monitoring section:	CS 31 Store Road Sewer West		
sensor type:	manual levelling studs		
chainage:	89000	point no.:	3004 1851 - 3004 1857
trigger values: [mm]	green: +12 -12	amber: +15 -15	red: +18 -18
reference document for trigger values:	Management Plan for Control of Ground Movement		
EB-no.:	C310-HTM-Z-STP-CR148-50058		
Appendix:	AAA		

monitoring data

	date		max. value	point no.	comments
baseline	16/12/13		0.00		
TBM 1	start ZOI	17/01/14	-0.48	3004 1854	
	end ZOI	20/01/14	-4.35	3004 1854	breached not any trigger value
TBM 2	start ZOI	30/04/14	-2.92	3004 1856	
	end ZOI	03/05/14	-4.16	3004 1856	breached not any trigger value
longterm	21/11/14		-2.87	3004 1856	
Evaluation of any potential residual risks			<input checked="" type="checkbox"/>	No residual risk since the Works have been completed by HMJV	
			<input type="checkbox"/>	Yes, residual risk (see comment below)	

summary / comments

Under consideration of temperature differences, the surrounding ground condition and the achievable accuracy of the measurement, HMJV has no concern to cease the monitoring.
The rate of change in the monitoring data is less than the required standards as per the specifications and drawings.

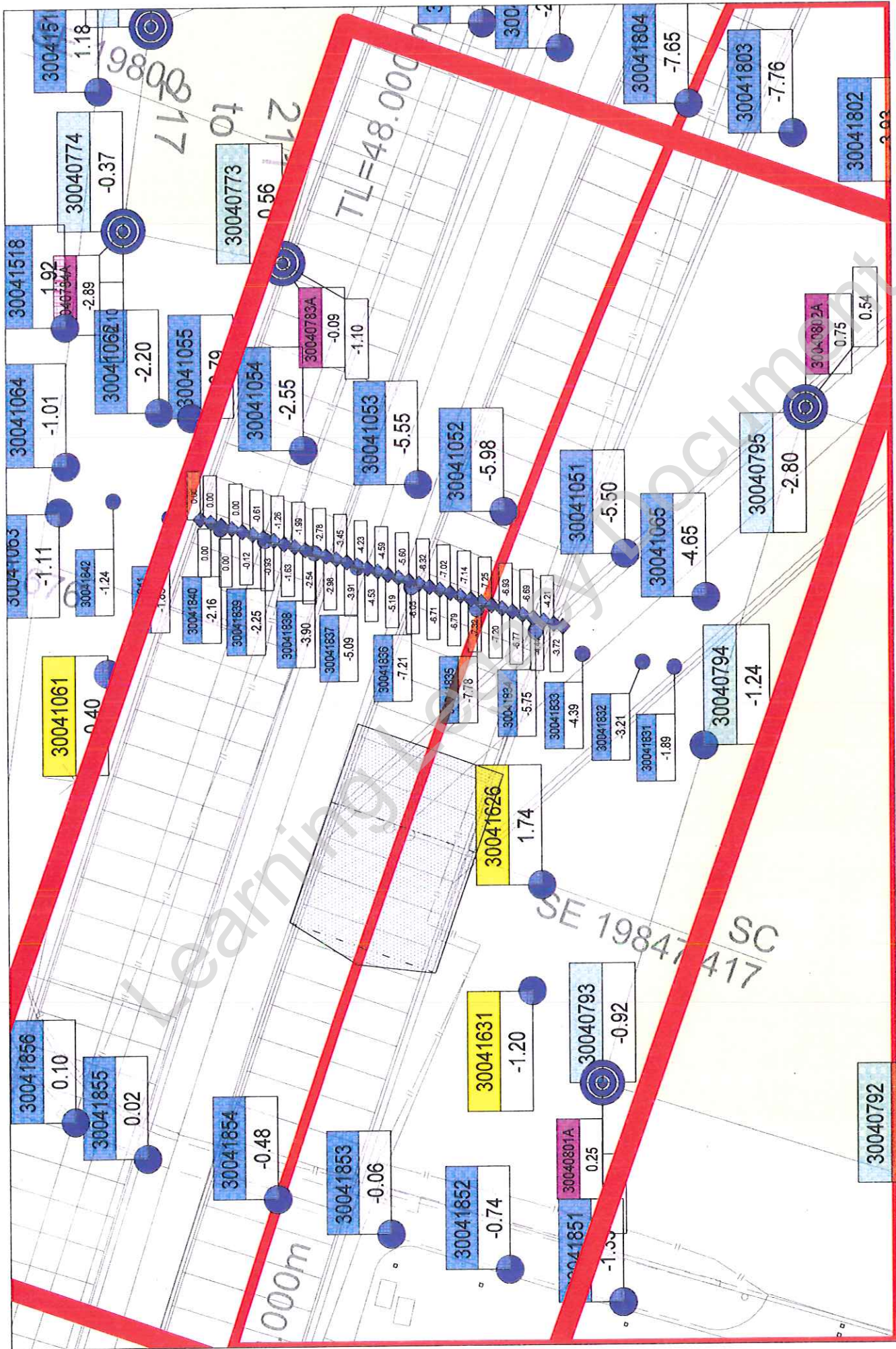
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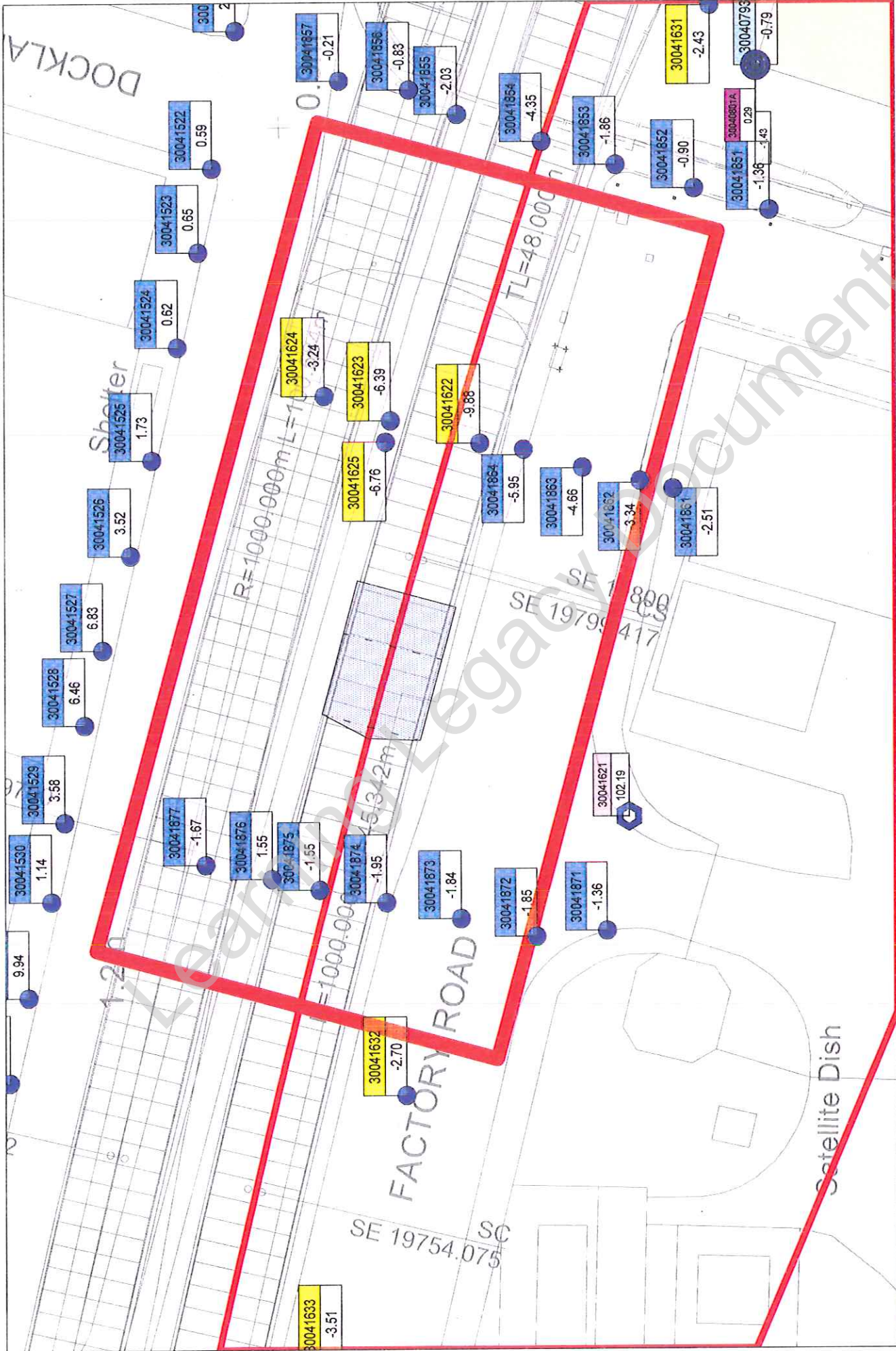
02/02/2015

print name:

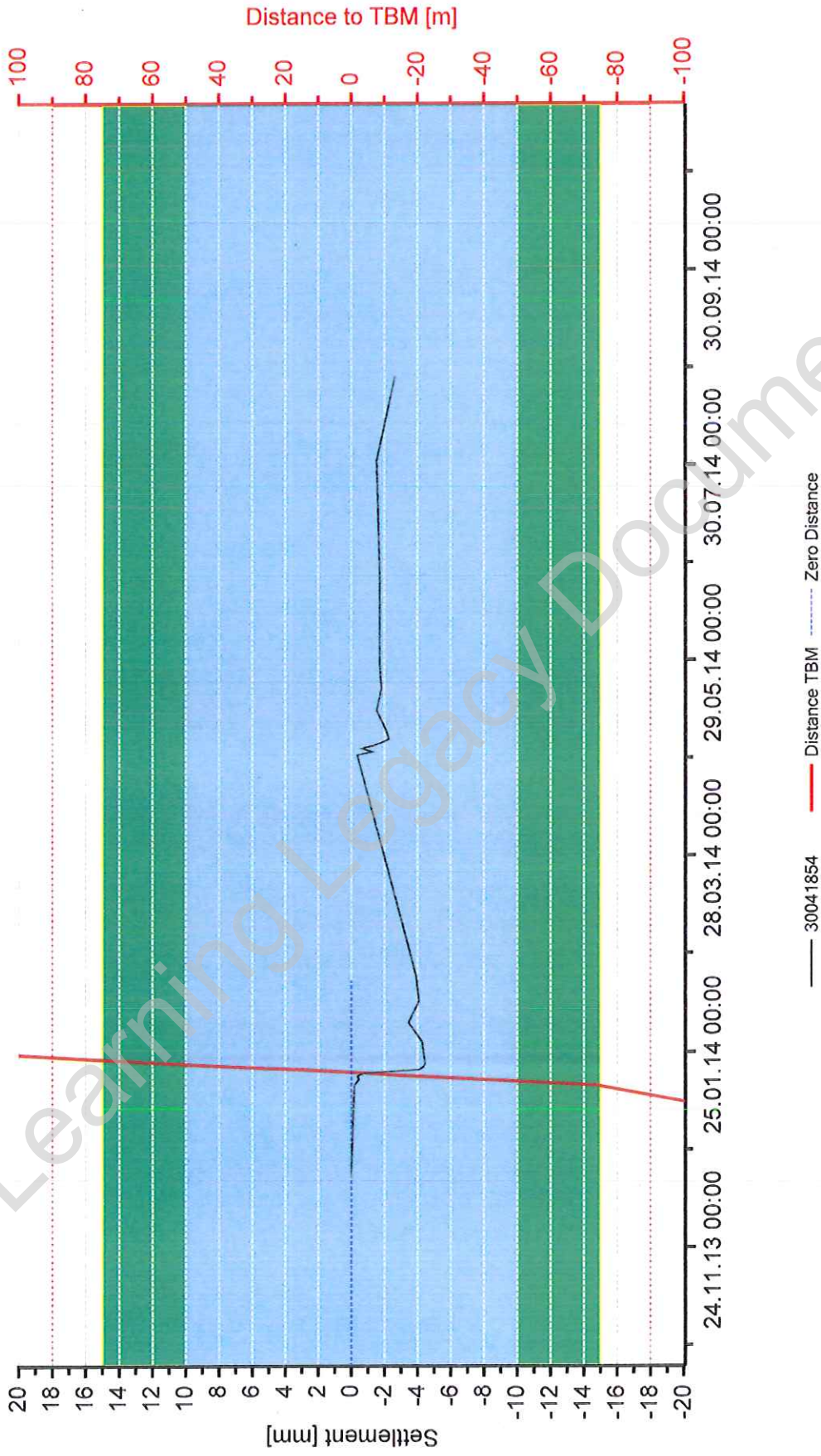
HMJV project role:

Monitoring & Survey engineer



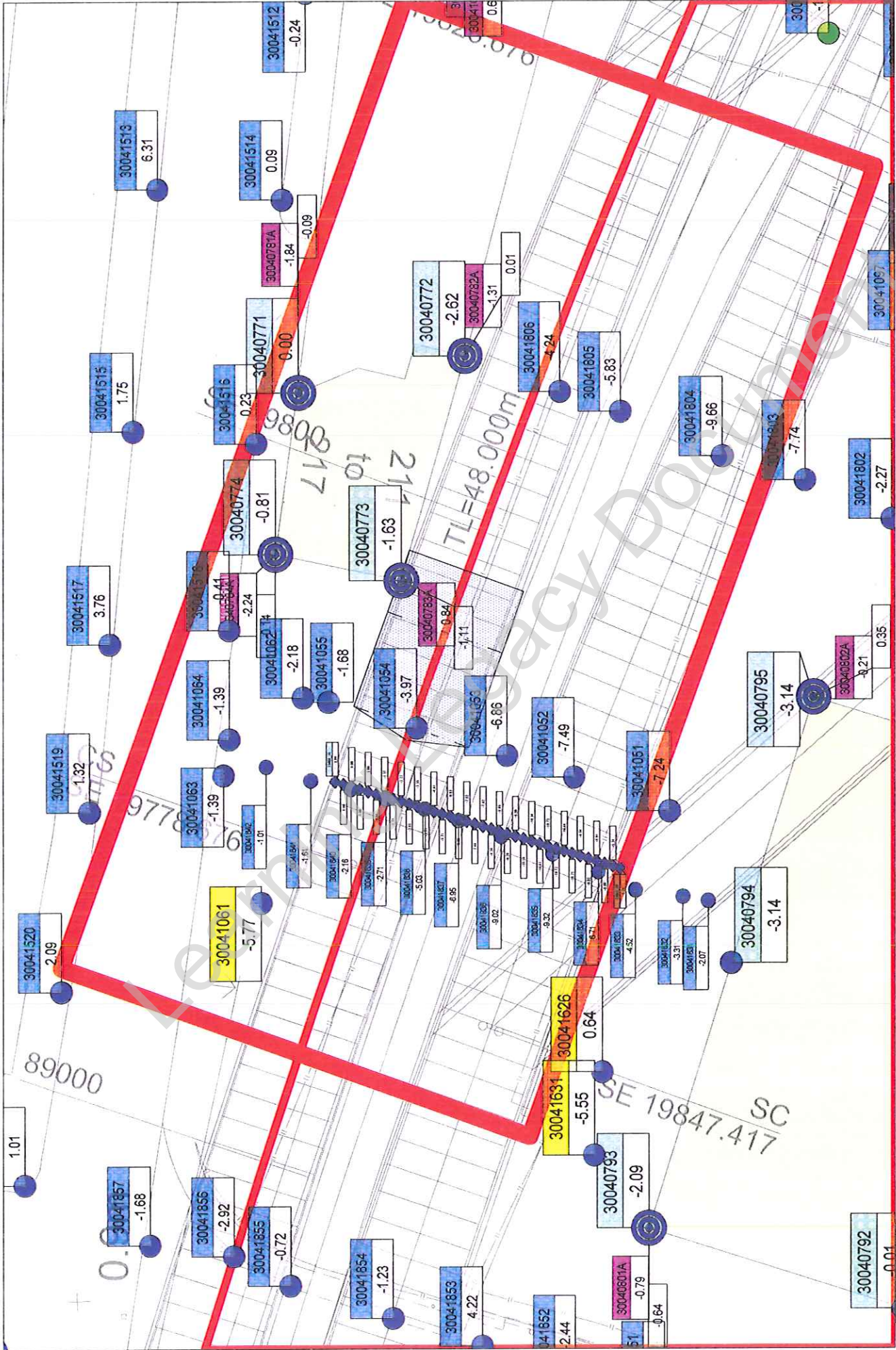


Point: 30041854



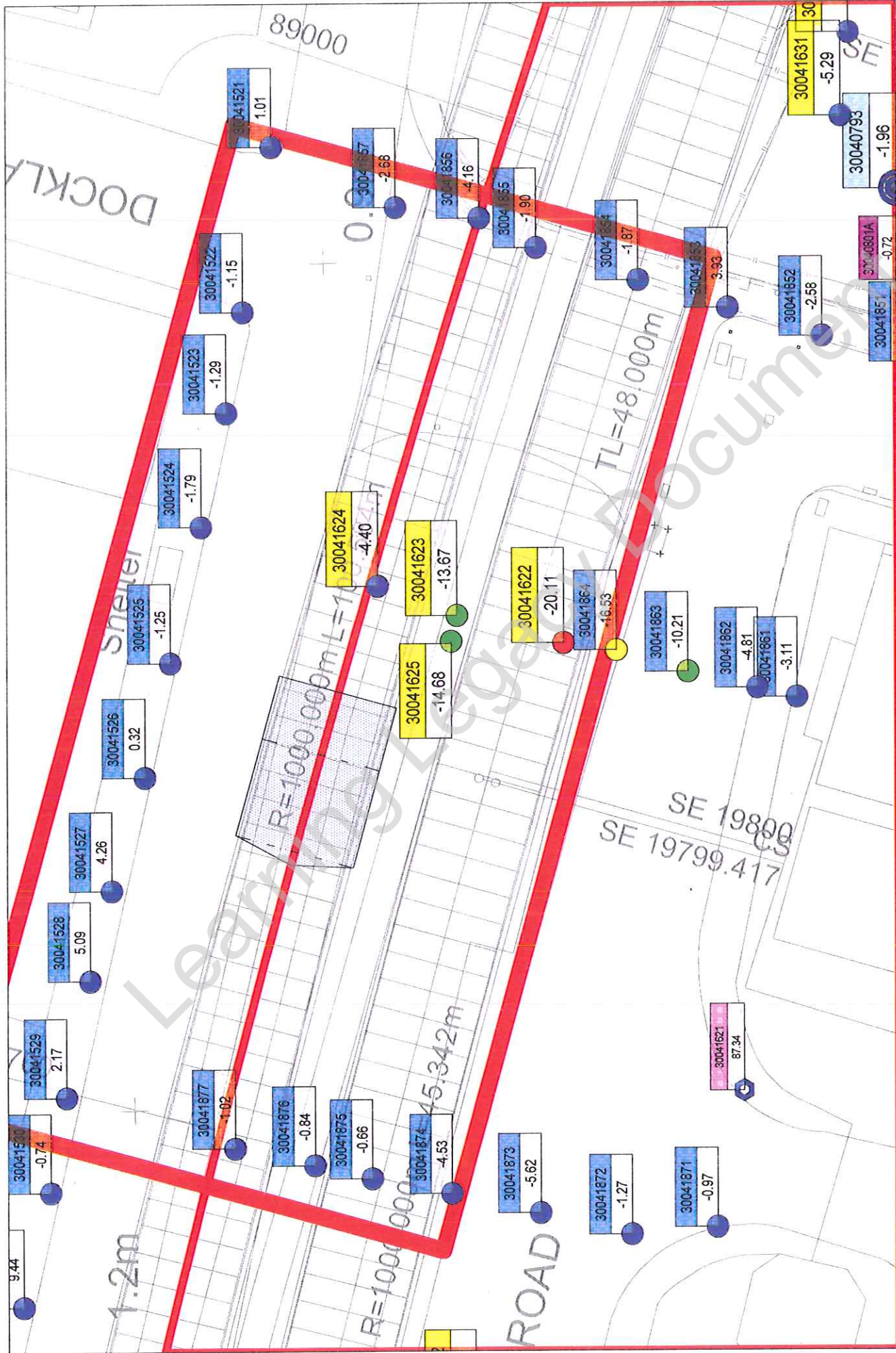
Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: WB Tunnel - CS 31 Store Road sewer West - 17.10.2013 - 21.11.2014
Date: 20.01.2015 13:57 Current Values: 20.01.2015 13:28





Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: C310 EB tunnel drive; NWP: portal excavation, construction base slab
 current values: 30.04.2014 17:43

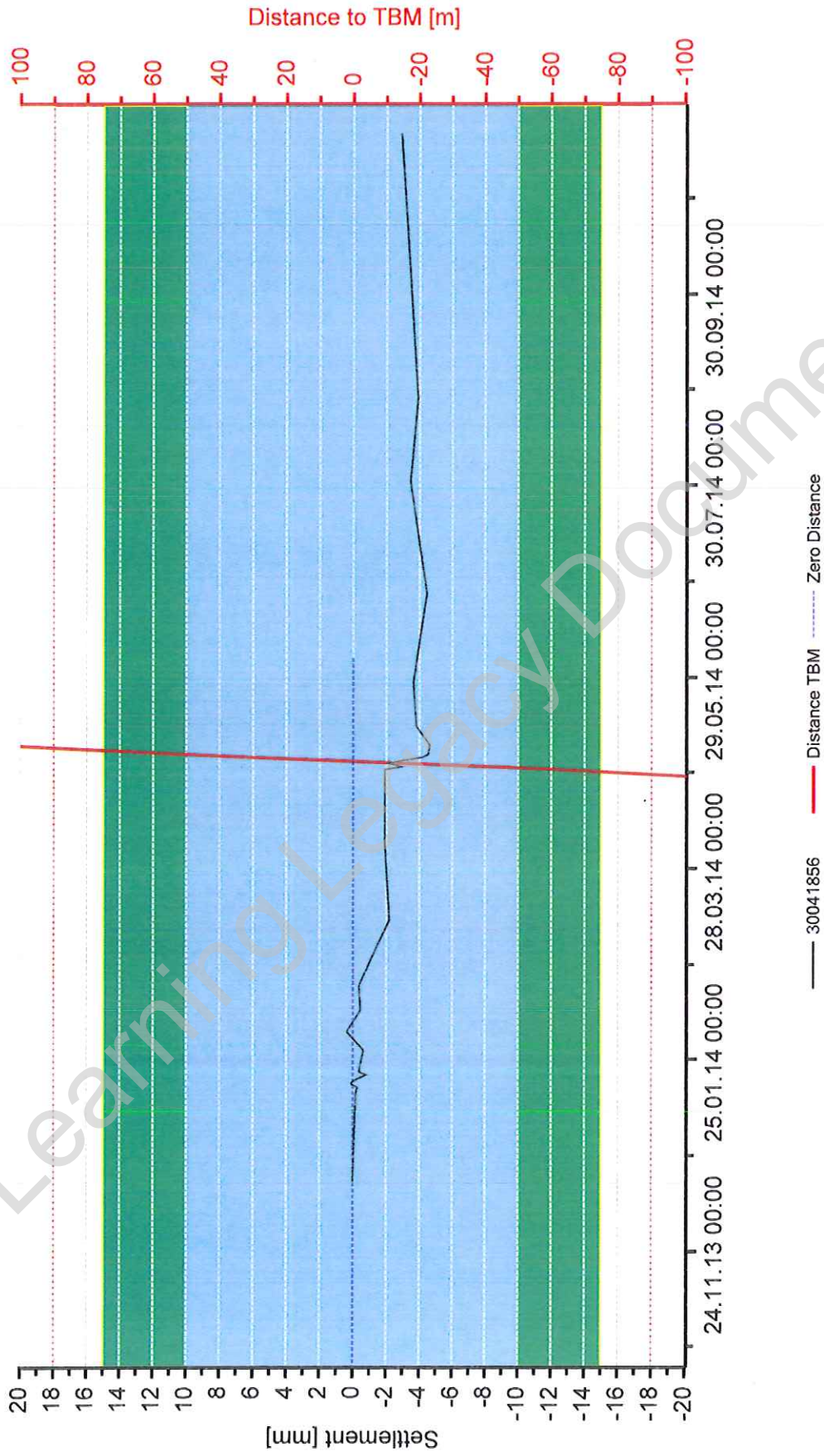




Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: C310 EB tunnel drive; NWP: portal excavation, construction base slab
 current values: 03.05.2014 19:00



Point: 30041856



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: EB Tunnel - CS 31 Store road Sewer West - 17.10.2013 - 21.11.2014
date: 20.01.2015 11:52 current values: 20.01.2015 11:21



monitoring table




Joint Venture

project: C310 Thames Tunnel
structure: CS 31 Store Road

No. of reading	baseline	19. following		20. following		21. following		22. following		23. following		24. following	
		elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline
date	16/12/13	02/05/2014		03/05/2014		04/05/2014		07/05/2014		13/05/2014		20/05/2014	
No.	elevation	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline	elevation	deviation from last/ baseline
30041851	101.069	101.028	-1 -2	101.028	0 -1	101.028	0 -1	101.028	0 -1	101.029	0 -1	101.026	-2 -3
30041852	101.166	101.164	0 -2	101.164	0 -3	101.164	0 -2	101.164	0 -2	101.164	0 -2	101.164	0 -2
30041853	101.177	101.181	0 4	101.181	0 4	101.180	0 4	101.180	0 4	101.181	1 4	101.181	0 4
30041854	101.130	101.129	-1 -1	101.128	0 -2	101.128	0 -2	101.128	0 -2	101.128	1 -2	101.128	0 -2
30041855	101.104	101.021	-1 -1	101.021	-1 -2	101.020	-1 -3	101.020	1 -2	101.021	0 -2	101.021	0 -2
30041856	101.092	101.089	-1 -3	101.088	-1 -4	101.087	0 -5	101.087	0 -5	101.088	1 -4	101.088	0 -4
30041857	100.938	100.936	0 -2	100.936	-1 -3	100.935	0 -3	100.936	0 -3	100.936	0 -3	100.936	0 -2

Learning Technology Document

 HOCHTIEF MURPHY Joint Venture		C310 THAMES TUNNEL REPORT			
EMPLOYER	CROSSRAIL	eB NO	C310-HTM-C-RGN-CR148-50024	Rev	2.0
TITLE	Monitoring Close-Out Reports relating to Tunnelling Works North Embankment River Thames - North Woolwich Portal (excl. Store Rd)				

APPENDIX 107

CS 32 - Factory Road 1 - CH 88970

Learning Legacy Document

monitoring asset	Area Factory Road		
reference monitoring drawing:	C310-HTM-C-DWG-CR146-ST004-70003		
name of monitoring section:	CS 32 Factory Road 1 - Ch88970		
sensor type:	manual levelling studs		
chainage:	88970	point no.:	3004 1861 - 3004 1864
trigger values: [mm]	green: +12 -12	amber: +15 -15	red: +18 -18
reference document for trigger values:	Management Plan for Control of Ground Movement		
EB-no.:	C310-HTM-Z-STP-CR148-50058		
Appendix:	AAA		

monitoring data

	date	max. value	point no.	comments	
baseline	16/12/13	0.00			
TBM 1	start ZOI	18/01/14	-2.40	3004 1864	
	end ZOI	21/01/14	-6.19	3004 1864	breached not any trigger value
TBM 2	start ZOI	01/05/14	-15.88	3004 1864	breached amber trigger value, reported and reviewed during SRG and CTC no further action required
	end ZOI	04/05/14	-16.03	3004 1864	breached amber trigger value, reported and reviewed during SRG and CTC no further action required
longterm	21/11/14	-16.13	3004 1864	breached amber trigger value, reported and reviewed during SRG and CTC no further action required	

Evaluation of any potential residual risks



No residual risk
since the Works have been completed by HMJV



Yes, residual risk
(see comment below)

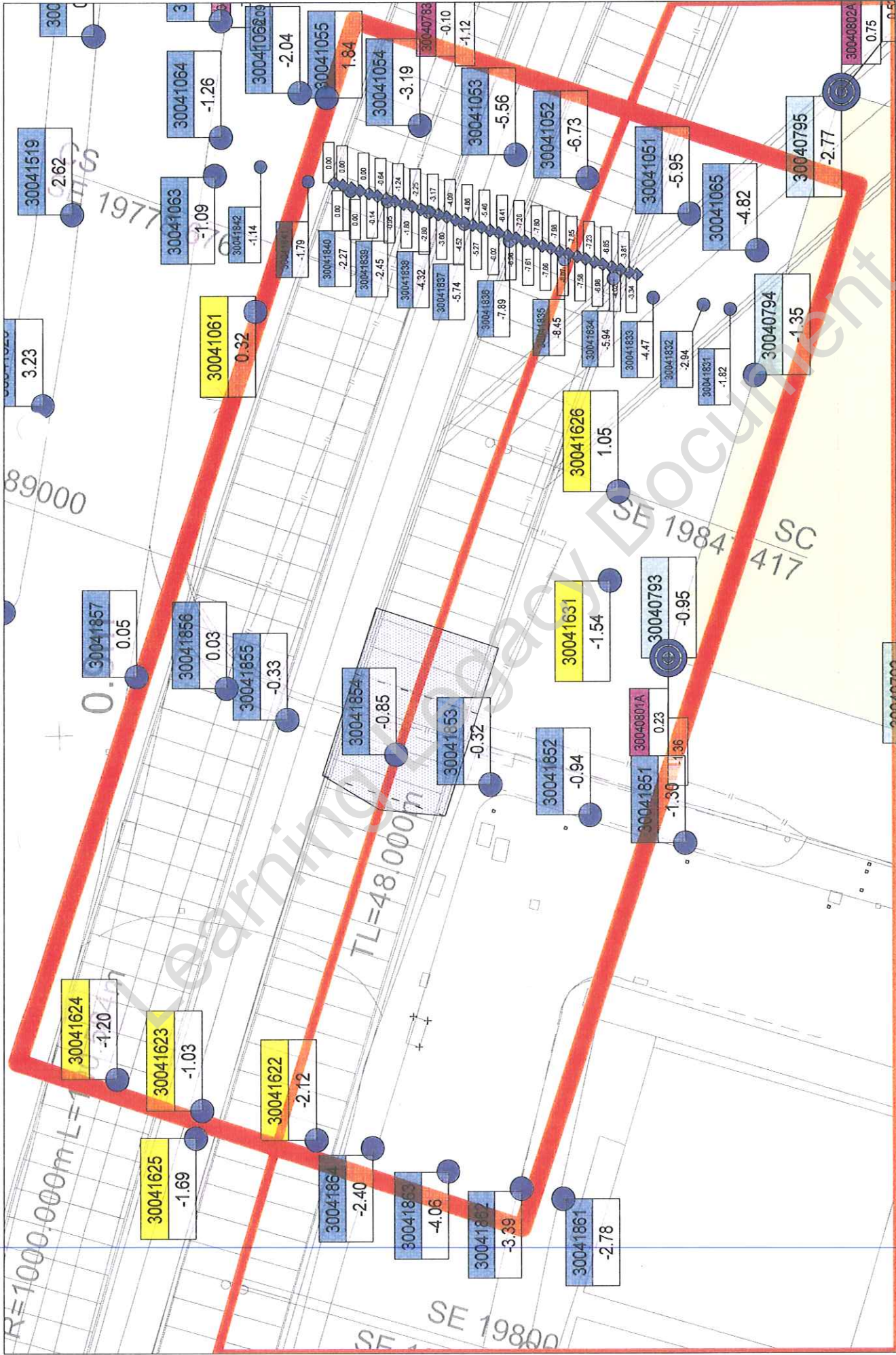
summary / comments

Under consideration of temperature differences, the surrounding ground condition and the achievable accuracy of the measurement, HMJV has no concern to cease the monitoring.
The rate of change in the monitoring data is less than the required standards as per the specifications and drawings.

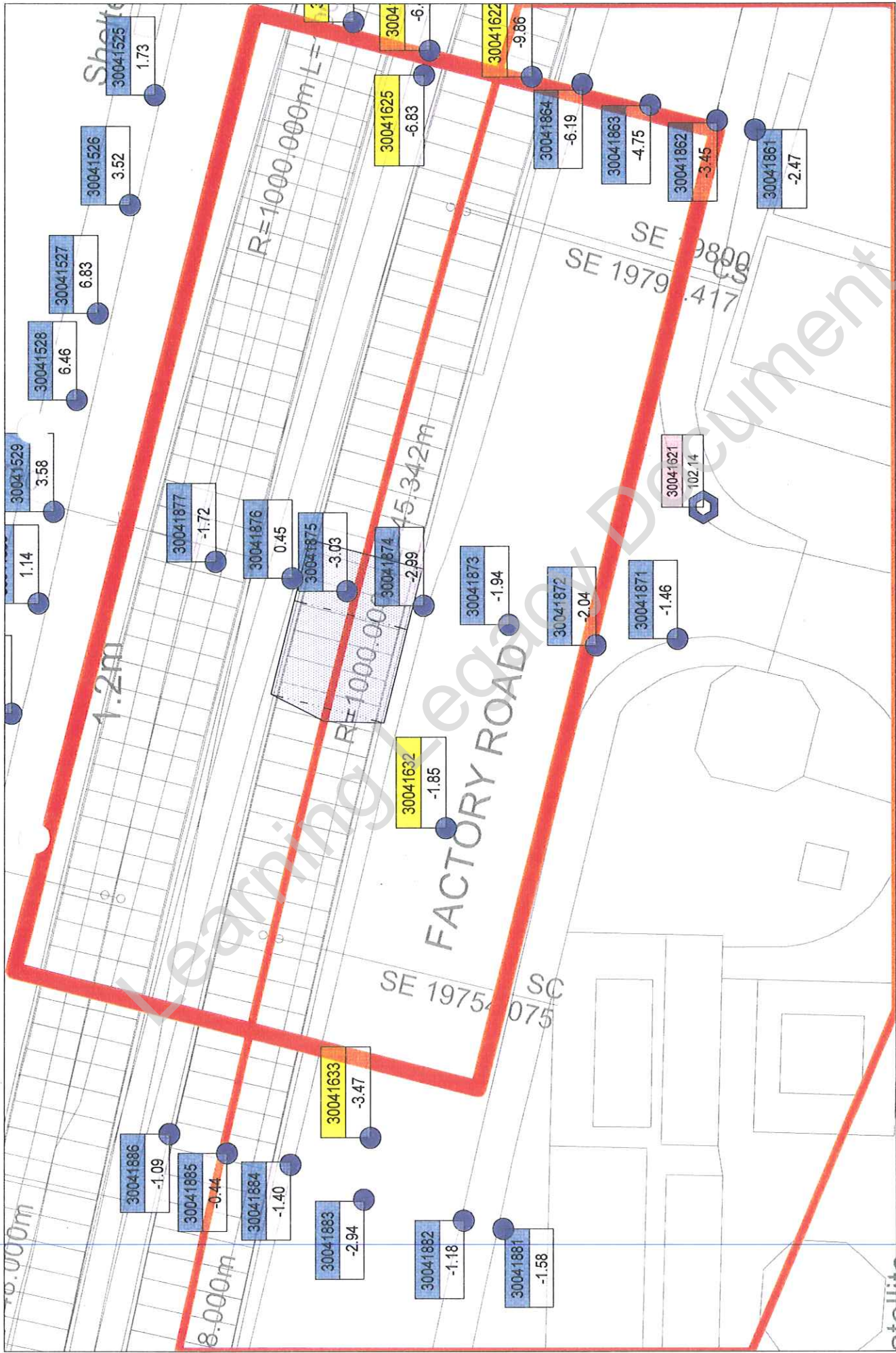
date / signature: 14/04/15

print name:

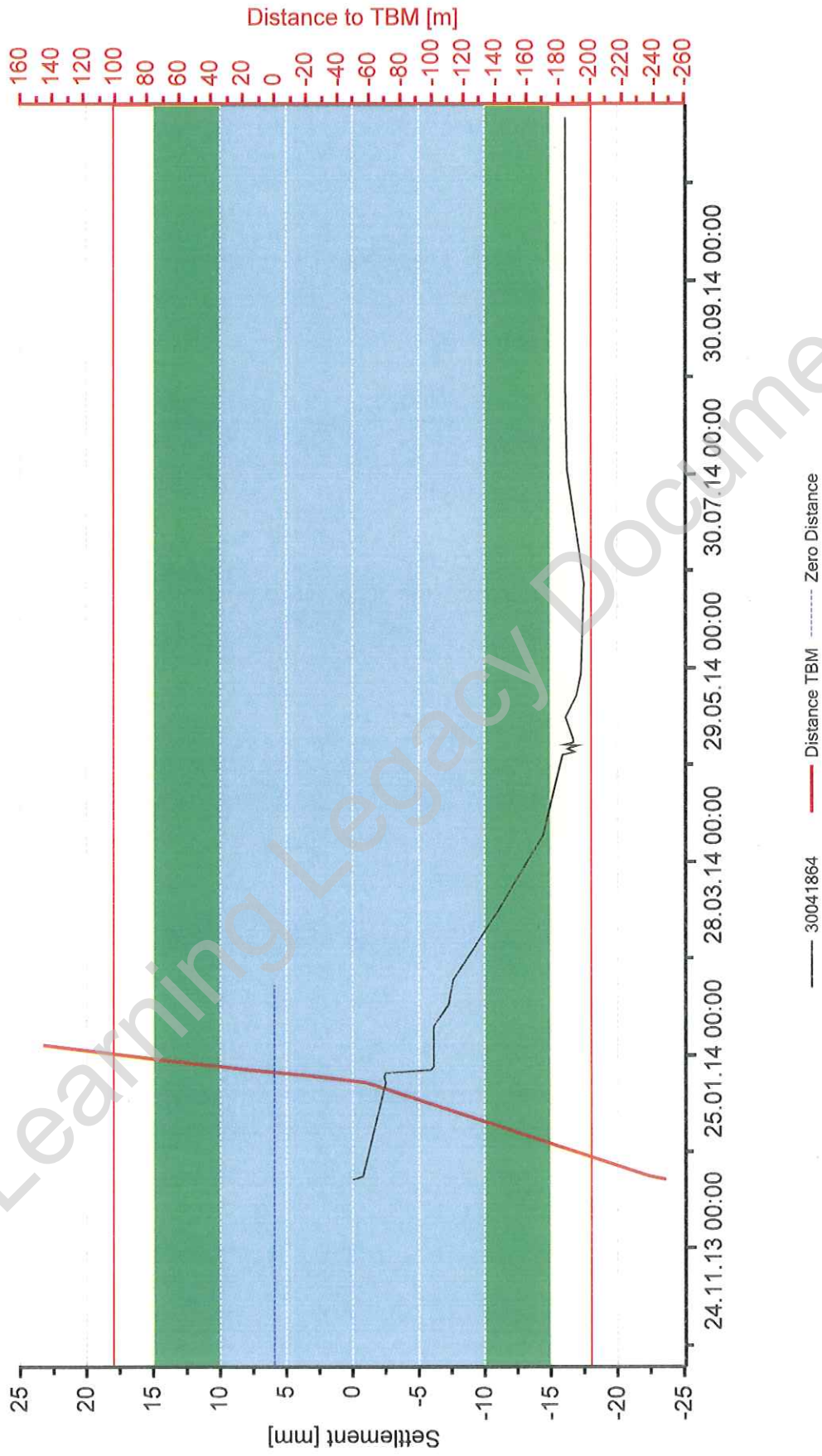
HMJV project role: Monitoring & Survey engineer



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: TBM drive WB
 current values: 18.01.2014 17:03

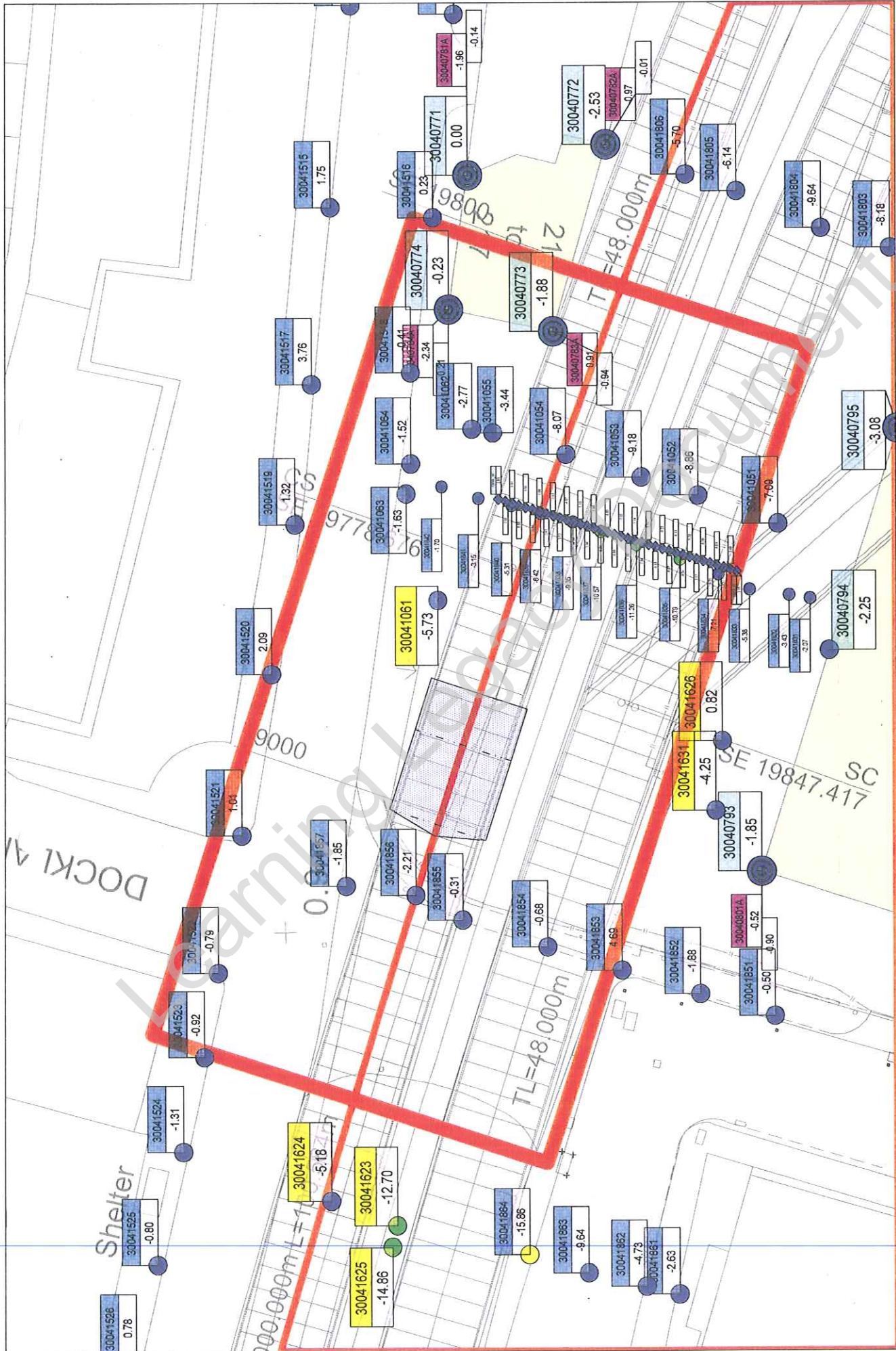


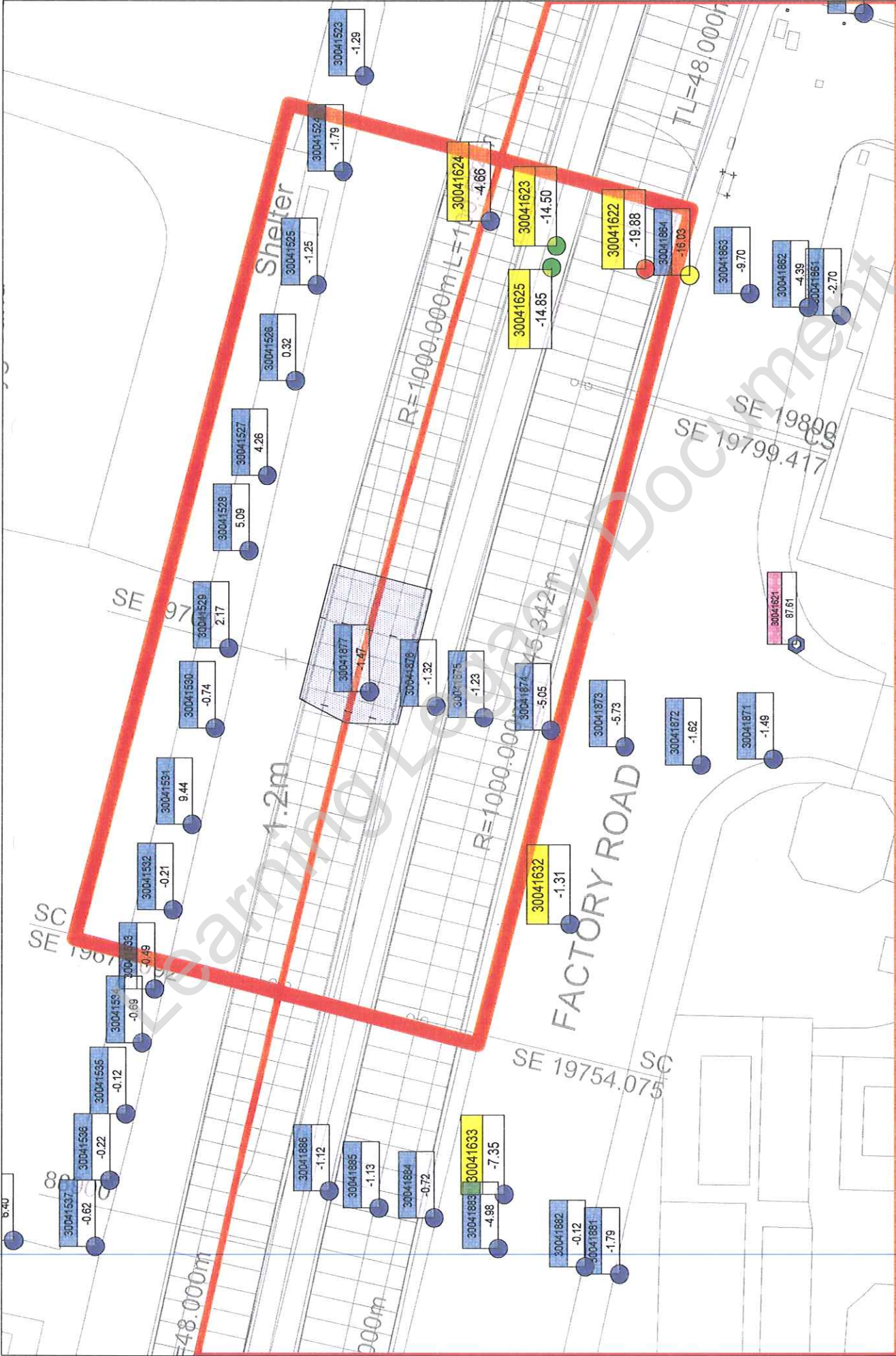
Point: 30041864



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: WB Tunnel - CS 32 Factory Road 1 - 17.10.2013 - 21.11.2014
Date: 21.01.2015 11:37 Current Values: 21.01.2015 11:22



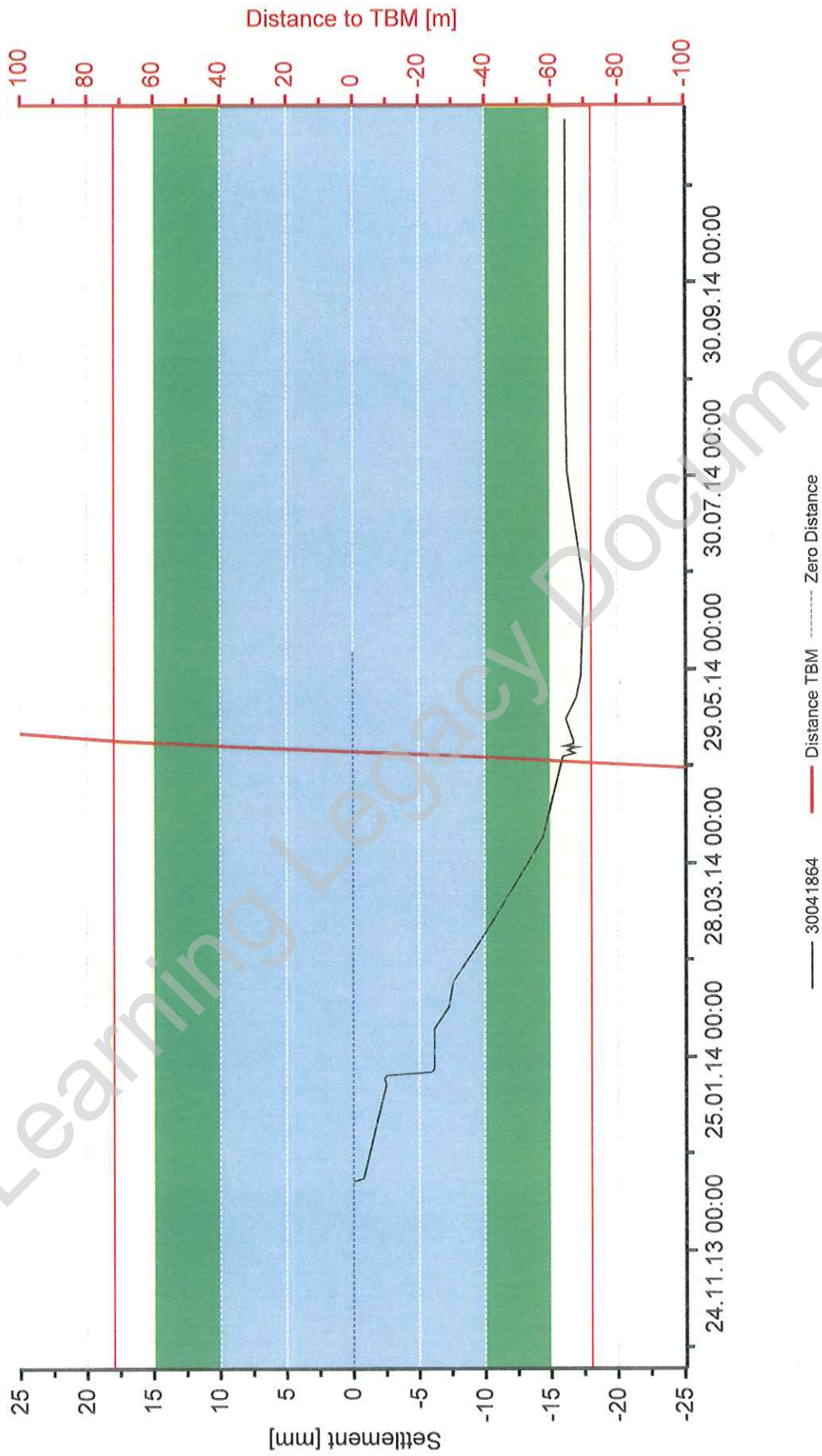




Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: C310 EB tunnel drive; NWP: portal excavation, construction base slab
 current values: 04.05.2014 16:30



Point: 30041864



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: EB-Tunnel - CS 32 Factory Road 1 - 17.10.2013 - 21.11.2014
date: 21.01.2015 11:16 current values: 21.01.2015 11:06




 HOCHTIEF MURPHY Joint Venture		C310 THAMES TUNNEL REPORT			
EMPLOYER	CROSSRAIL	eB NO	C310-HTM-C-RGN-CR148-50024	Rev	2.0
TITLE	Monitoring Close-Out Reports relating to Tunnelling Works North Embankment River Thames - North Woolwich Portal (excl. Store Rd)				

APPENDIX 108

Factory Road Extensometer / SD

Please refer to EB ref.: [C310-HTM-C-RGN-CR148-50026](#)

Learning Legacy Document

		C310 THAMES TUNNEL REPORT			
EMPLOYER	CROSSRAIL	eB NO	C310-HTM-C-RGN-CR148-50024	Rev	2.0
TITLE	Monitoring Close-Out Reports relating to Tunnelling Works North Embankment River Thames - North Woolwich Portal (excl. Store Rd)				

APPENDIX 109
Geotechnical Cross Section 4

Learning Legacy Document

monitoring asset	Area Factory Road		
reference monitoring drawing:	C310-HTM-C-DWG-CR146-ST004-70003		
name of monitoring section:	Geotechnical Cross Section 4		
sensor type:	manual levelling studs piezometer, inclinometer and extensometer		
chainage:	88970	point no.:	3004 1621 - 3004 1625
trigger values: [mm]	green: +12 -12	amber: +15 -15	red: +18 -18
reference document for trigger values:	Management Plan for Control of Ground Movement		
EB-no.:	C310-HTM-Z-STP-CR148-50058		
Appendix:	AAA		

monitoring data

	date	max. value surface level	point no.	comments
baseline	14/11/13	0.00		
TBM 1	start ZOI	18/01/14	-2.12	3004 1622
	end ZOI	21/01/14	-9.86	3004 1622
TBM 2	start ZOI	01/05/14	-12.70 -5.18	3004 1623 3004 1624
	end ZOI	05/05/14	-14.90 -5.44	3004 1623 3004 1624
longterm	21/11/14	-22.26 -18.41	3004 1622 3004 1623	breached red trigger value, reported to SRG and CTC, data reviewed, monitoring frequency increased, data stable, no further action required
Evaluation of any potential residual risks	<input checked="" type="checkbox"/>	No residual risk since the Works have been completed by HMJV		
	<input type="checkbox"/>	Yes, residual risk (see comment below)		

summary / comments

The Geotechnical Cross Section 4 depends out of 3no. extensometer (3004 1622 - 3004 1624), 1no inclinometer (3004 1625 and 3004 1626) and 1 no piezometer (3004 1621) - on every loction of the in-ground instruments is also a precise levelling surface point, excepting on the piezometer because of the position of that instrument located in Factory Road and covered with tarmac.

The accuracy of the extensometer readings of approx. 2mm causes the fluctuation of the measured values. Under consideration of temperature differences, the surrounding ground condition and the achievable accuracy of the measurement, HMJV has no concern to cease the monitoring.

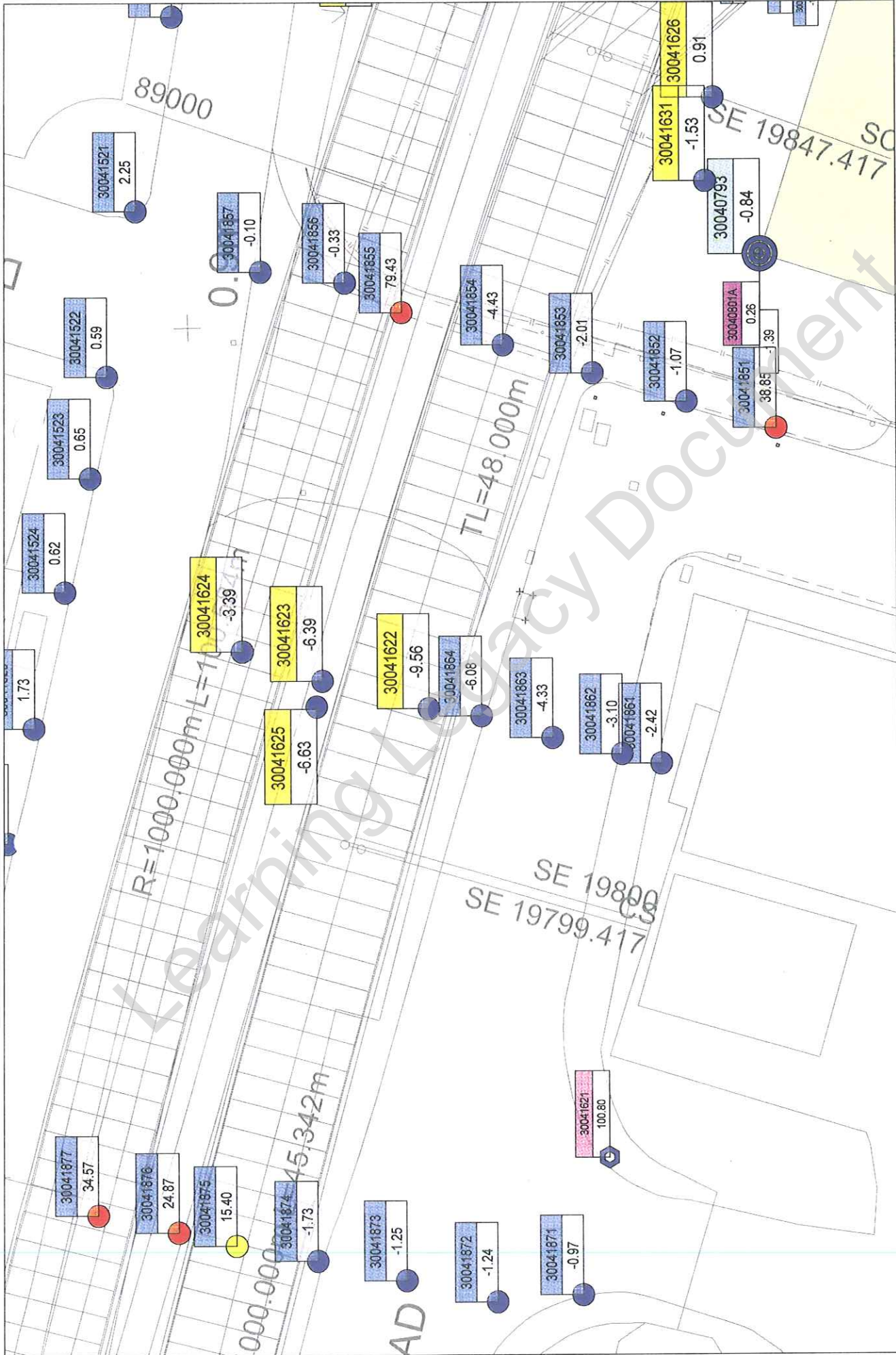
The rate of change in the monitoring data is less than the required standards as per the specifications and drawings.

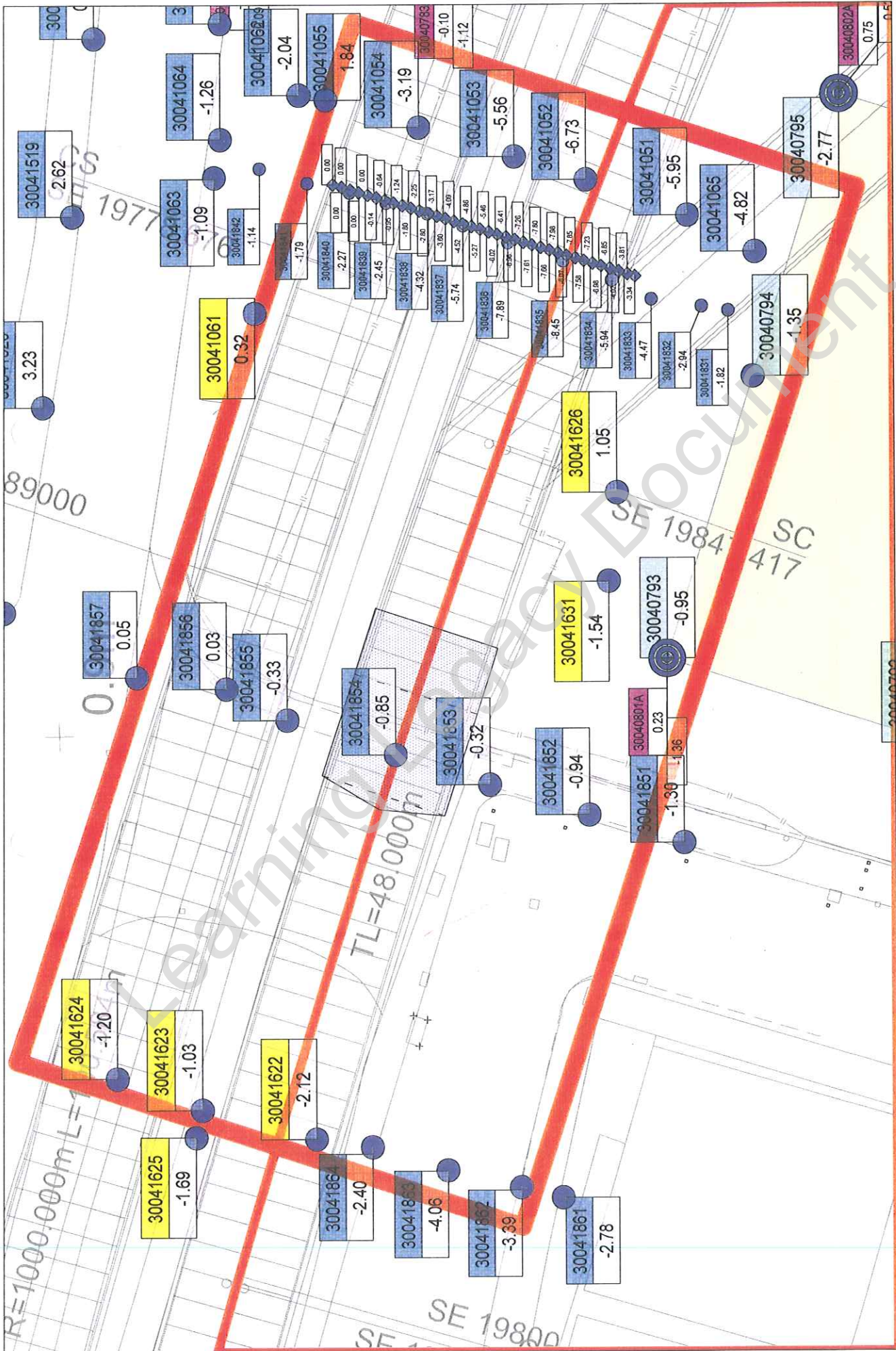
date / signature: 17/04/15

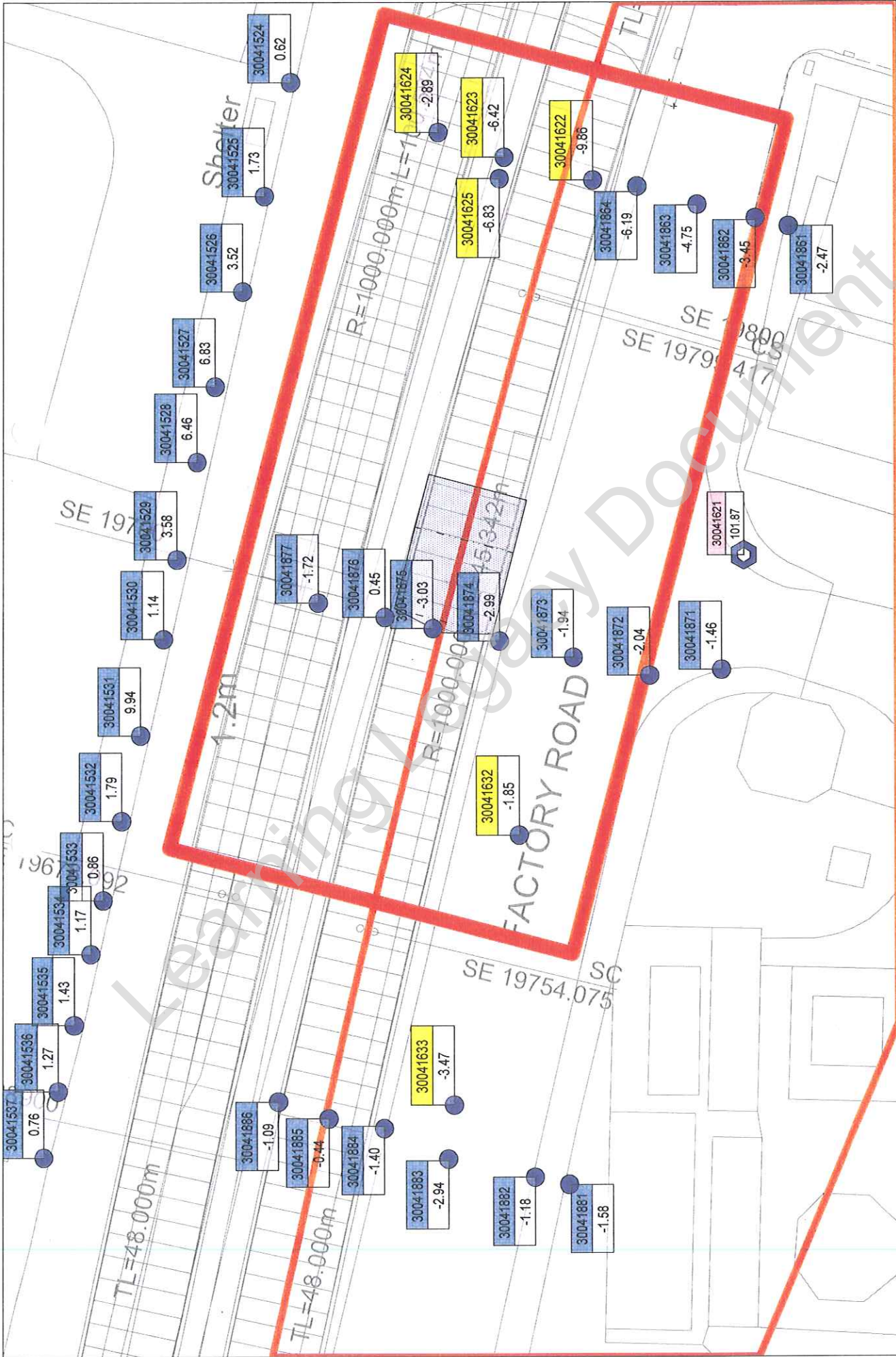
print name:

HMJV project role:

Monitoring & Survey engineer

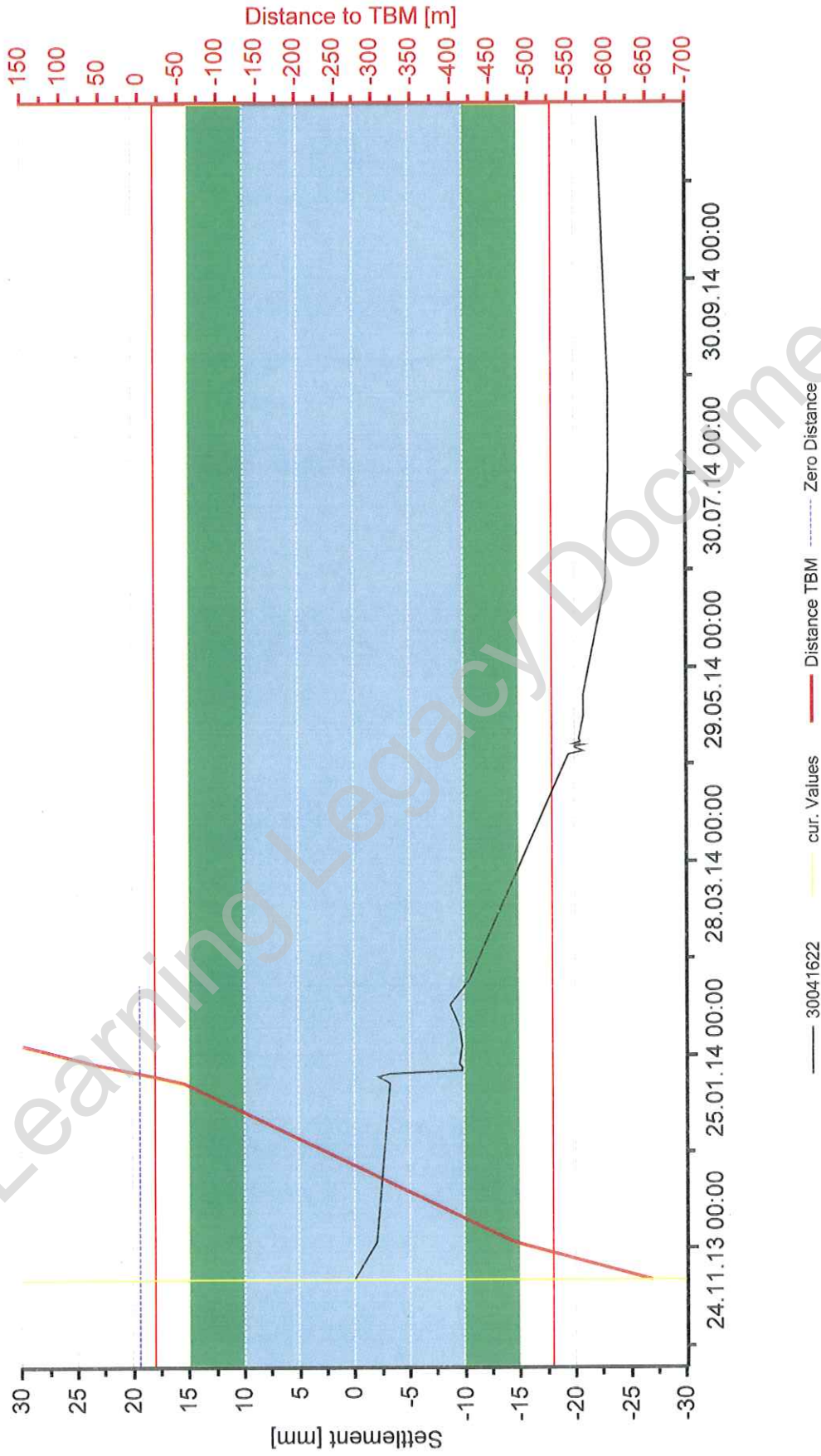






Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: TBM drive WB
 current values: 21.01.2014 09:00

Point: 30041622

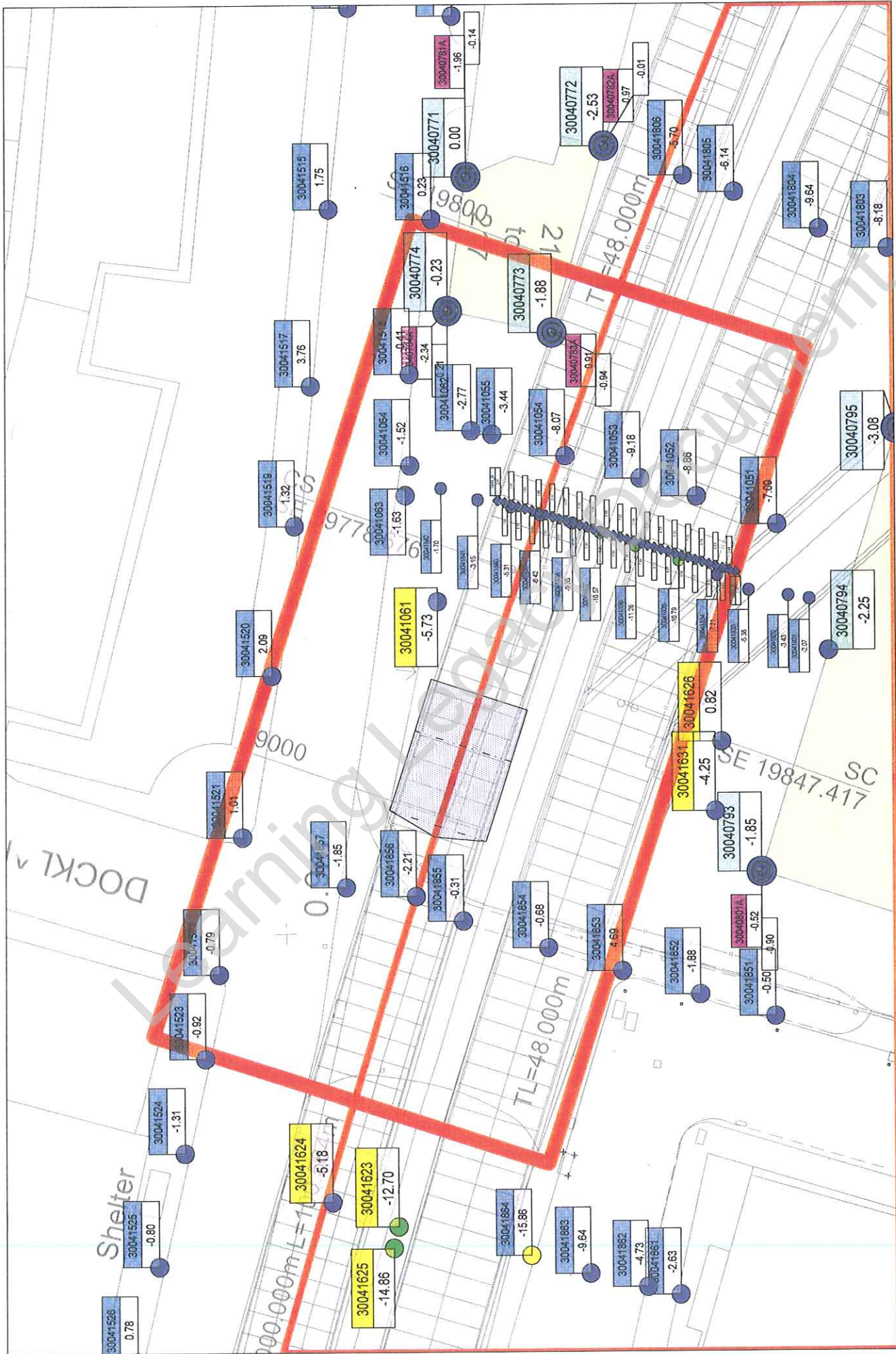


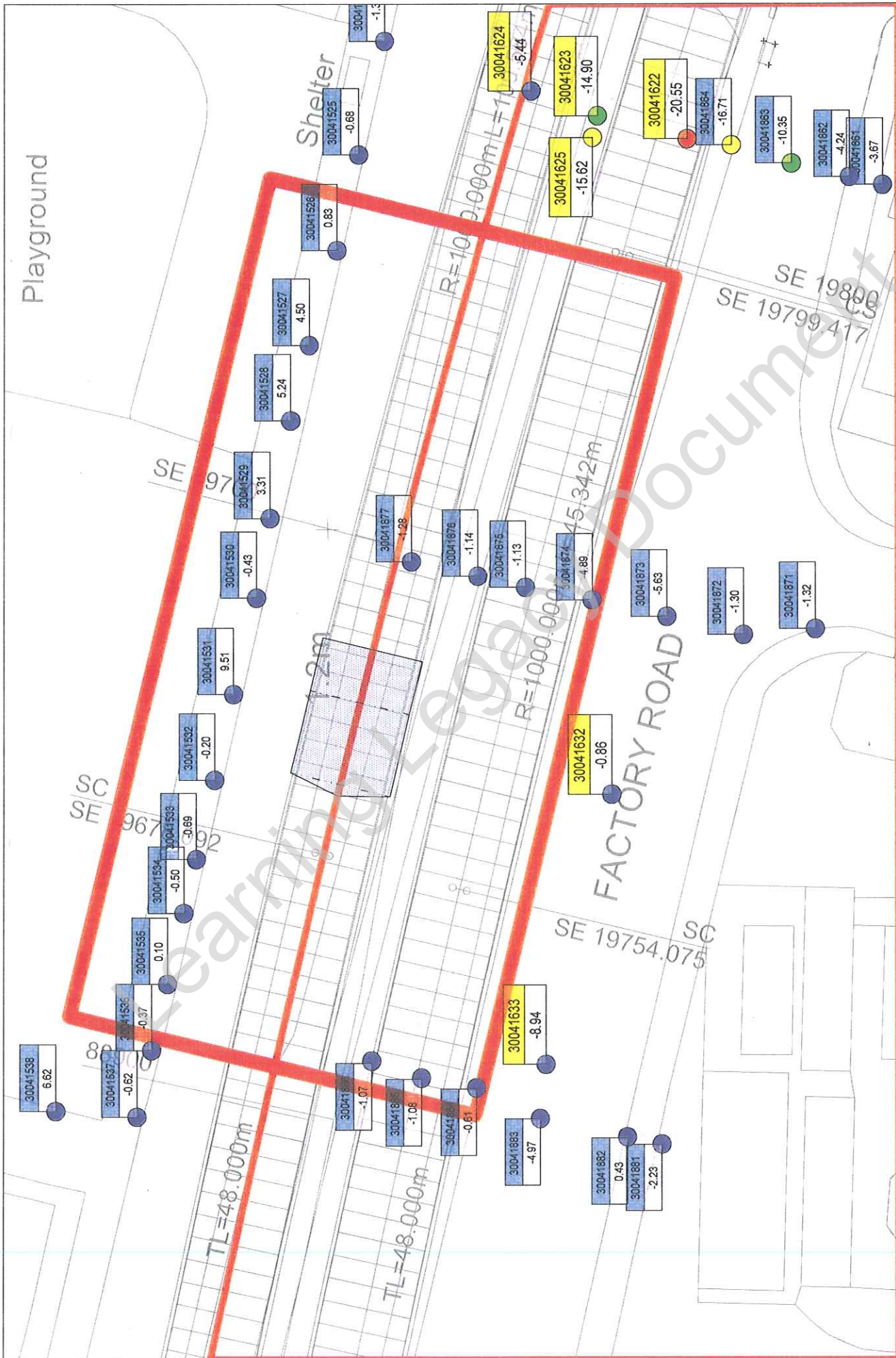
Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal

Close Out Report: WB Tunnel - GCS 4 - 17.10.2013 - 21.11.2014

Date: 21.01.2015 09:47 Current Values: 21.01.2015 09:39



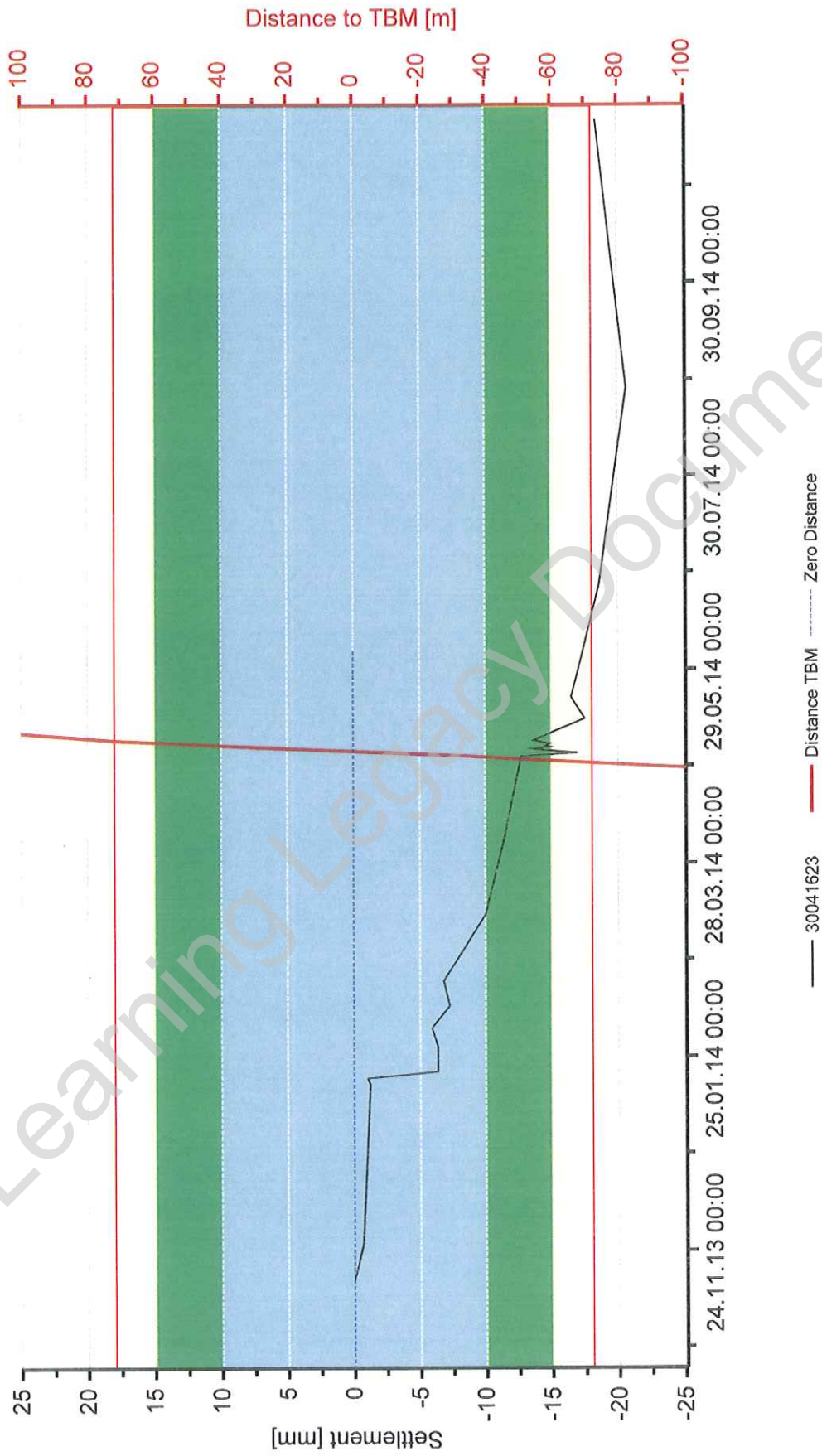




Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: C310 EB tunnel drive; NWP: portal excavation, construction base slab
 current values: 05.05.2014 09:00



Point: 30041623



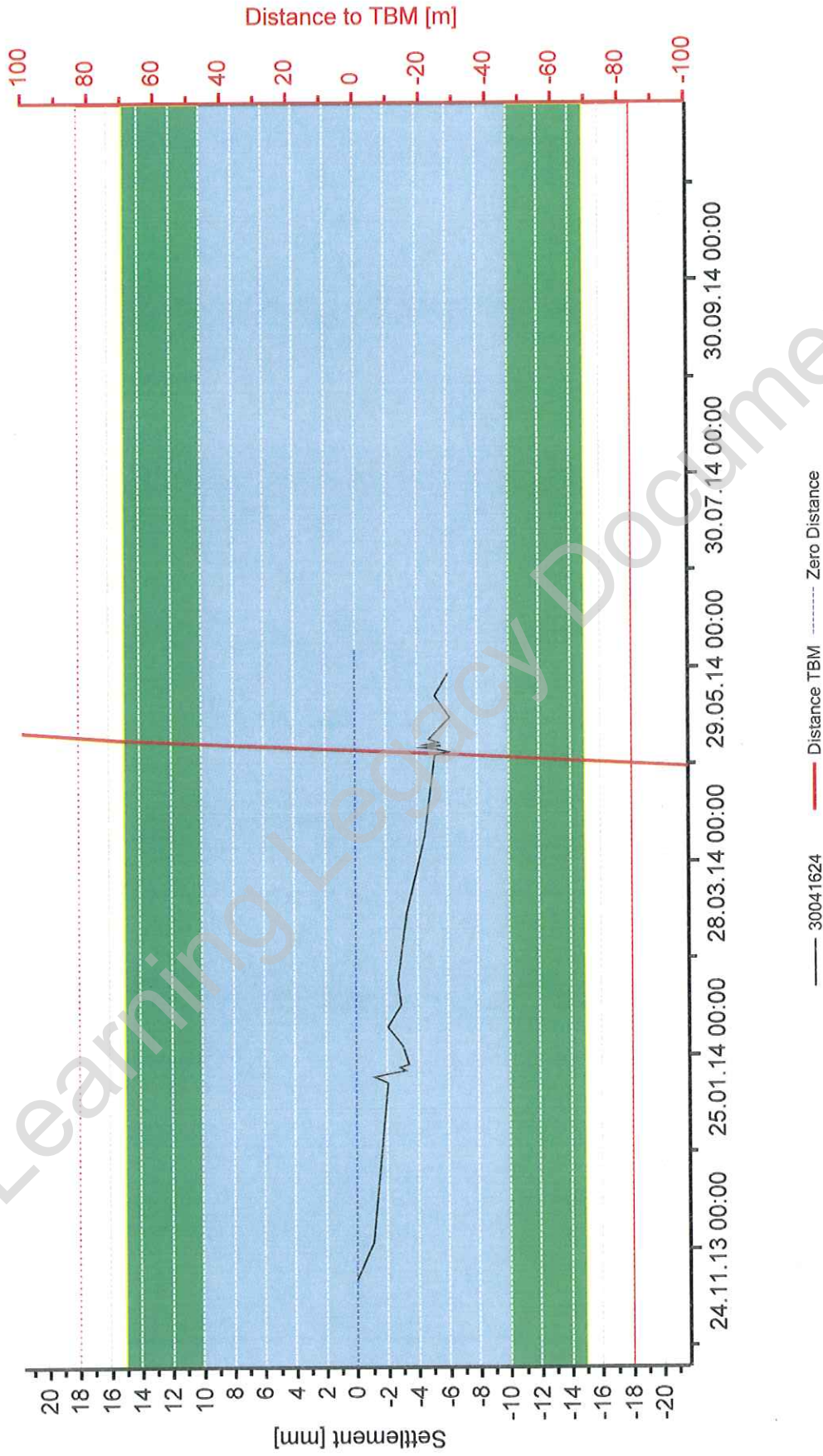
Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal

Close Out Report: EB-Tunnel - GCS 4 - 17.10.2013 - 21.11.2014

date: 21.01.2015 11:09 current values: 21.01.2015 10:21



Point: 30041624



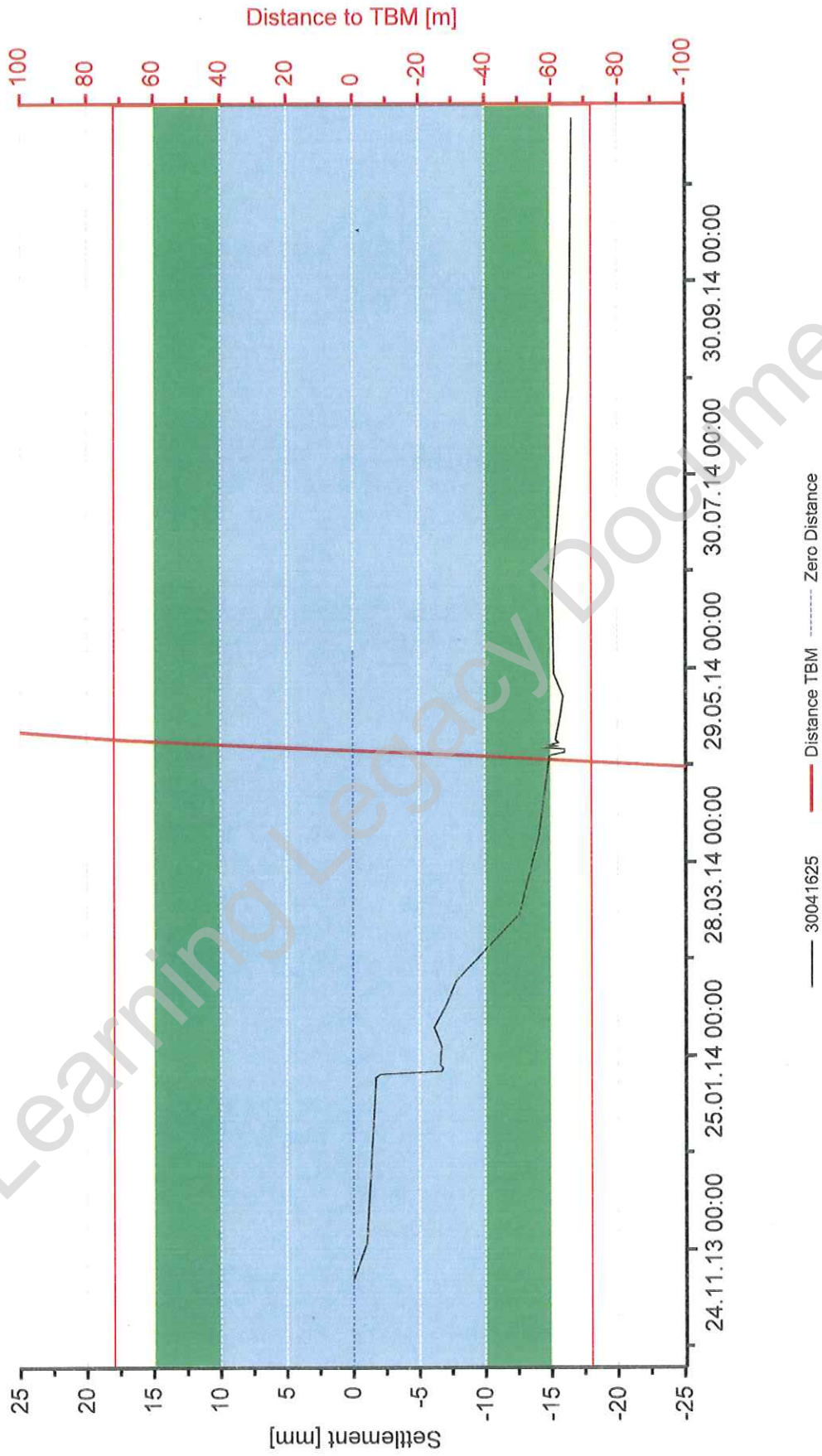
Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal

Close Out Report: EB-Tunnel - GCS 4 - 17.10.2013 - 21.11.2014

date: 21.01.2015 11:06 current values: 21.01.2015 10:21



Point: 30041625



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal

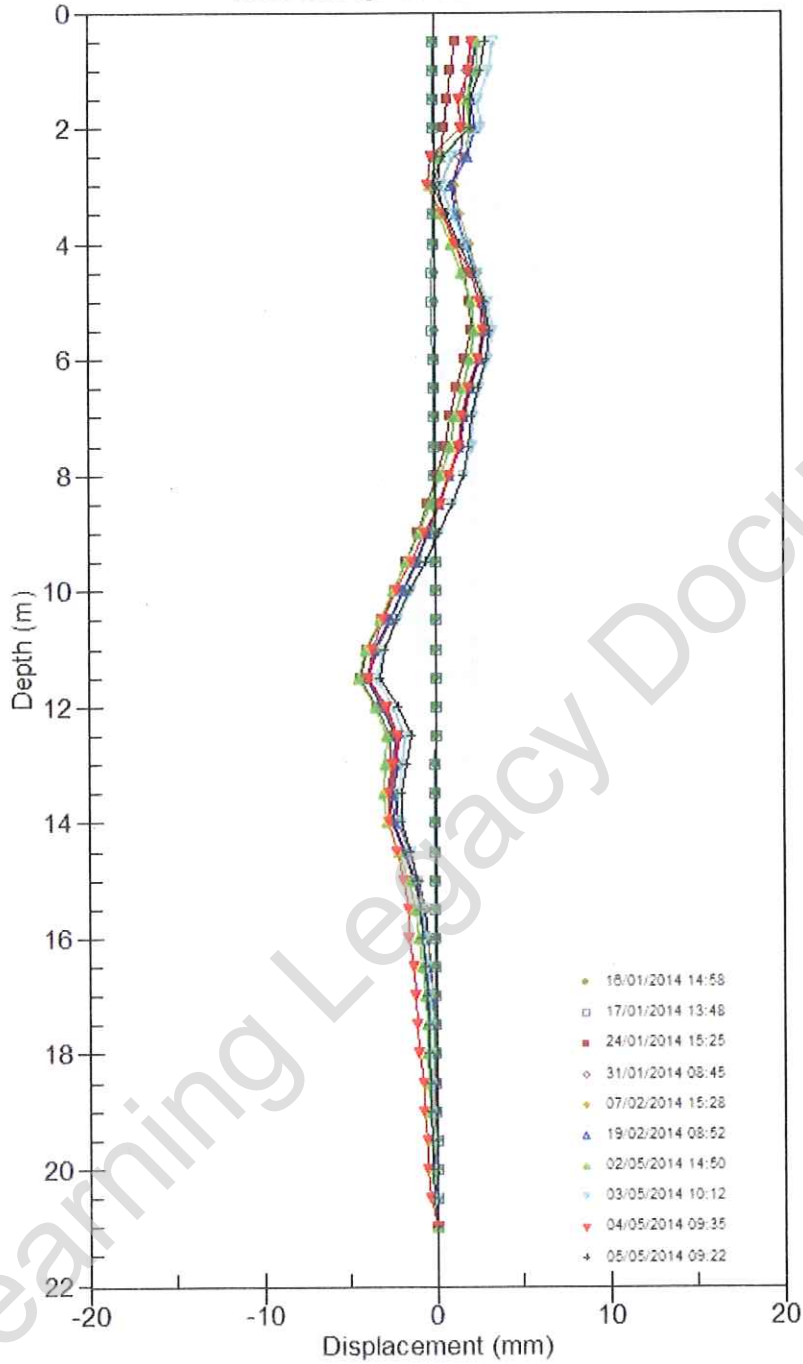
Close Out Report: EB-Tunnel - GCS 4 - 17.10.2013 - 21.11.2014

date: 21.01.2015 11:14 current values: 21.01.2015 11:06



gcs4:gcs4.2 - A Axis Cumulative

Initial survey: 16/01/2014 14:58



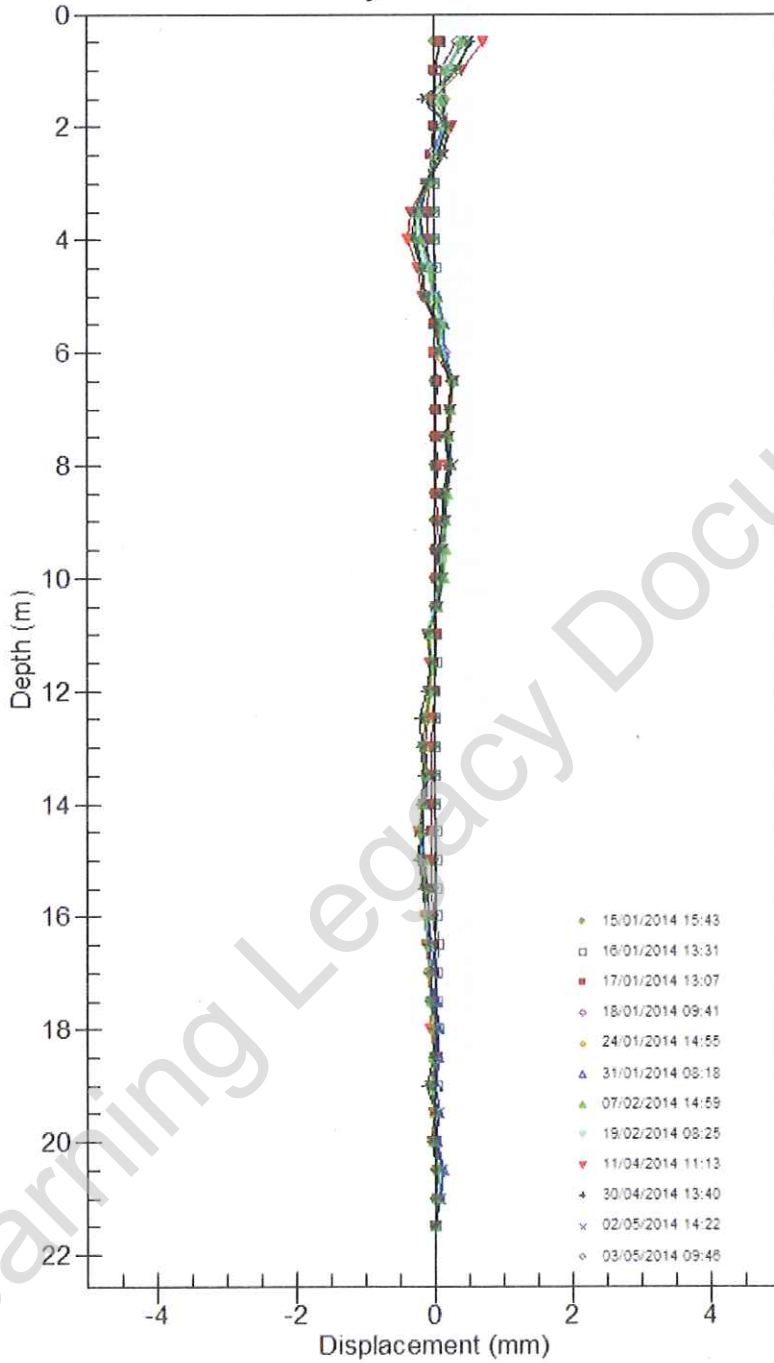
PROJECT: C310
SITE: NWP
INSTALLATION: GCS 4 - Inclinator 2
COMPANY: HMJV
CLIENT: Crossrail

NOTE: Crossrail
C310 - HMJV
Tunneldrive PP - NWP
Geotechnical Cross Section 4
Inclinometer

3004 1625

gcs4:gcs4.1 - A Axis Incremental

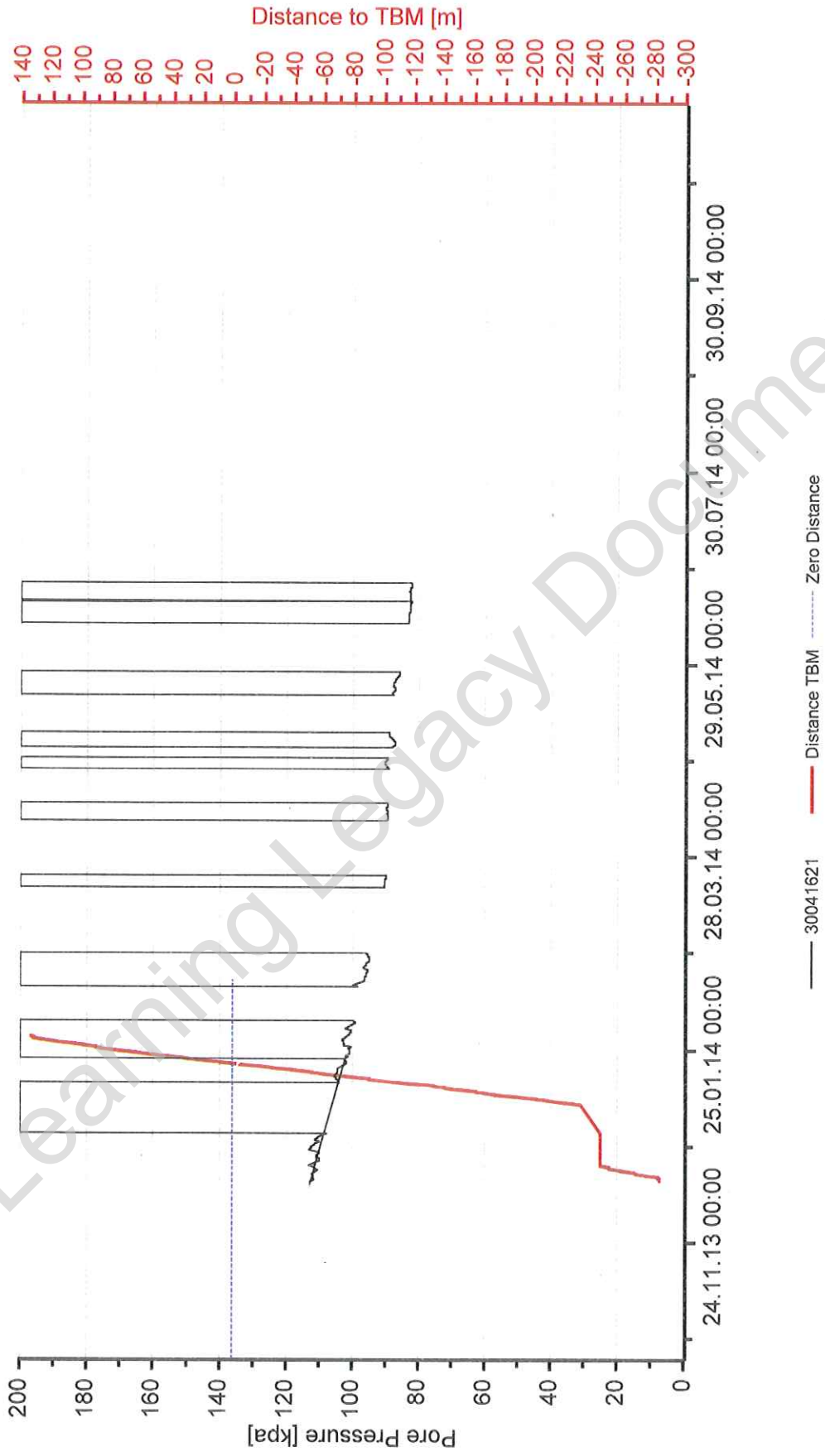
Initial survey: 15/01/2014 15:43



PROJECT: C310
SITE: NWP
INSTALLATION: GCS 4 Inclinometer 1
COMPANY: HMJV
CLIENT: Crossrail

NOTE: Crossrail
C310 - HMJV
Tunneldrive PP - NWP
Geotechnical Cross Section 4
Inclinometer
3004 1626

Point: 30041621



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal

Close Out Report: GCS 4 - Piezometer

Date: 21.01.2015 10:23 Current Values: 21.01.2015 10:06



monitoring table



Joint Venture

project: C310 Thames Tunnel

No. of reaching		1. following		2. following		3. following		4. following		5. following		6. following	
date	baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline
	14/11/13												
30041621													
30041622	101.191	101.189	-2	101.188	-1	101.188	-1	101.188	-1	101.188	-1	101.188	-1
30041623	101.440	101.439	-1	101.439	-1	101.439	-1	101.439	-1	101.439	-1	101.439	-1
30041624	101.442	101.441	-1	101.440	-1	101.440	-1	101.440	-1	101.440	-1	101.440	-1
30041625	101.610	101.609	-1	101.609	-1	101.609	-1	101.609	-1	101.609	-1	101.609	-1
30041626	100.965	100.965	0	100.967	2	100.967	2	100.967	2	100.967	2	100.967	2
30041627	N/A												
30041622(1)	98.116	98.114	-2	98.112	-2	98.112	-2	98.112	-2	98.112	-2	98.112	-2
30041622(2)	95.115	95.113	-2	95.110	-2	95.110	-2	95.110	-2	95.110	-2	95.110	-2
30041622(3)	93.113	93.111	-2	93.109	-2	93.109	-2	93.109	-2	93.109	-2	93.109	-2
30041623(1)	97.347	97.347	-1	97.347	0	97.347	0	97.347	0	97.347	0	97.347	0
30041623(2)	93.354	93.353	-1	93.351	-2	93.351	-2	93.351	-2	93.351	-2	93.351	-2
30041623(3)	90.357	90.356	-1	90.354	-2	90.354	-2	90.354	-2	90.354	-2	90.354	-2
30041624(1)	98.366	98.365	-1	98.363	-1	98.363	-1	98.363	-1	98.363	-1	98.363	-1
30041624(2)	95.363	95.362	-1	95.360	-2	95.360	-2	95.360	-2	95.360	-2	95.360	-2
30041624(3)	93.361	93.360	-1	93.359	-1	93.359	-1	93.359	-1	93.359	-1	93.359	-1

structure: GCS4

monitoring table



Joint Venture

project: C310 Thames Tunnel

No. of reading		7. following		8. following		9. following		10. following		11. following		12. following	
baseline		18/01/2014		19/01/2014		20/01/2014		21/01/2014		22/01/2014		23/01/2014	
No.	elevation	elevation	deviation from last/ baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline
30041621													
30041622	101.191	101.189	1	101.187	-1	101.181	-7	101.181	0	101.181	0	101.181	0
30041623	101.440	101.439	0	101.436	-3	101.434	-2	101.434	0	101.434	0	101.434	0
30041624	101.442	101.441	1	101.440	-1	101.438	-1	101.438	0	101.438	-1	101.438	-1
30041625	101.610	101.609	0	101.608	0	101.604	-5	101.604	0	101.604	0	101.604	0
30041626	100.965	100.966	-1	100.965	0								100.966
30041627	N/A												
30041622(1)	98.116	98.113	1	98.112	-1	98.105	-7	98.105	0	98.105	0	98.105	0
30041622(2)	95.115	95.112	1	95.110	-1	95.104	-7	95.104	0	95.104	0	95.104	0
30041622(3)	93.113	93.111	1	93.110	-1	93.105	-5	93.105	0	93.105	0	93.105	1
30041623(1)	97.347	97.347	0	97.344	-3	97.341	-3	97.341	0	97.341	0	97.341	0
30041623(2)	93.354	93.351	0	93.349	-2	93.348	-1	93.348	0	93.348	0	93.348	0
30041623(3)	90.357	90.354	0	90.351	-3	90.348	-3	90.348	0	90.349	0	90.349	0
30041624(1)	98.366	98.364	1	98.363	-1	98.363	-1	98.363	0	98.363	0	98.362	-1
30041624(2)	95.363	95.361	1	95.360	-1	95.367	7	95.367	4	95.361	-7	95.360	-1
30041624(3)	93.361	93.360	1	93.359	-1	93.366	7	93.366	5	93.360	-6	93.360	-1

monitoring table



Joint Venture

project: C310 Thames Tunnel

No. of reading		13. following		14. following		15. following		16. following		17. following		18. following	
baseline		28/01/2014		29/01/2014		03/02/2014		10/02/2014		12/02/2014		18/02/2014	
No.	elevation	elevation	deviation from last/ baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline
30041621													
30041622	101.191	101.181	0	-10	101.181	0	-10	101.182	1	-9	101.180	-2	-10
30041623	101.440	101.434	0	-6	101.434	0	-6	101.433	-1	-7	101.433	0	-7
30041624	101.442	101.439	0	-3	101.440	1	-2	101.439	-1	-3	101.439	0	-3
30041625	101.610	101.604	0	-7	101.604	1	-6	101.603	-1	-7	101.603	-1	-8
30041626	100.965				100.966	1	2				100.966	0	1
30041627	N/A												
30041622(1)	98.116	98.105	0	-11	98.105	0	-11	98.106	1	-10	98.104	-2	-12
30041622(2)	95.115	95.103	-1	-11	95.104	0	-11	95.105	1	-10	95.104	-1	-11
30041622(3)	93.113	93.105	-1	-9	93.105	0	-8	93.106	1	-7	93.105	-1	-9
30041623(1)	97.347	97.341	0	-6	97.341	0	-6	97.339	-2	-8	97.340	1	-7
30041623(2)	93.354	93.348	0	-6	93.349	0	-5	93.348	-1	-6	93.349	1	-5
30041623(3)	90.357	90.349	-1	-8	90.349	1	-7	90.349	-1	-8	90.350	2	-6
30041624(1)	98.366	98.362	0	-3	98.364	1	-2	98.362	-1	-3	98.363	1	-3
30041624(2)	95.363	95.360	0	-3	95.361	1	-2	95.360	-1	-3	95.361	1	-2
30041624(3)	93.361	93.359	0	-2	93.361	2	0	93.360	-1	-1	93.361	1	0

monitoring table



Joint Venture

project: C310 Thames Tunnel

No. of reading		19. following		20. following		21. following		22. following		23. following		24. following	
baseline		11/03/2014		07/04/2014		30/04/2014		01/05/2014		02/05/2014		03/05/2014 09:00	
No.	elevation	elevation	deviation from last/ baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline
30041621													
30041622	101.191							101.171	-9	101.170	-1	101.171	-21
30041623	101.440	101.430	-3	101.429	-2	101.427	-1	101.423	-13	101.423	-4	101.426	3
30041624	101.442	101.438	-1	101.437	-1	101.437	-1	101.436	-5	101.436	-1	101.437	1
30041625	101.610	101.598	-5	101.596	-2	101.596	-1	101.596	-15	101.594	-1	101.594	0
30041626	100.965	100.966	0	100.966	0	100.965	1	100.965	0	100.966	0	100.966	0
30041627	N/A												
30041622(1)	98.116							98.097	-8	98.097	-8	98.097	1
30041622(2)	95.115							95.101	-3	95.101	-3	95.102	1
30041622(3)	93.113							93.102	-2	93.102	-2	93.103	1
30041623(1)	97.347	97.333	-8	97.340	7			97.336	-4	97.336	-4	97.339	3
30041623(2)	93.354	93.343	-6	93.349	5			93.345	-4	93.345	-4	93.349	3
30041623(3)	90.357	90.354	4	90.351	-3			90.347	-4	90.347	-4	90.349	3
30041624(1)	98.366	98.355	-8	98.362	7			98.360	-1	98.360	-1	98.361	1
30041624(2)	95.363	95.355	-6	95.360	5			95.359	-1	95.359	-1	95.361	2
30041624(3)	93.361	93.360	-1	93.360	0			93.359	-1	93.359	-1	93.360	1

monitoring table



Joint Venture

project: C310 Thames Tunnel

No. of reading		25. following		26. following		27. following		28. following		29. following		30. following	
baseline		25. following		26. following		27. following		28. following		29. following		30. following	
date	14/11/13	03/05/2014 18:30		04/05/2014 09:00		04/05/2014 16:30		05/05/2014		06/05/2014		13/05/2014	
No.	elevation	elevation	deviation from last/ baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline
30041621													
30041622	101.191	101.171	0 -20	101.170	-1 -21	101.171	1 -20	101.170	-1 -21	101.170	0 -20	101.170	0 -21
30041623	101.440	101.426	1 -14	101.425	-1 -15	101.426	0 -14	101.425	0 -15	101.426	1 -14	101.423	-4 -18
30041624	101.442	101.437	1 -4	101.436	-1 -6	101.437	1 -5	101.436	-1 -5	101.437	1 -5	101.436	-1 -6
30041625	101.610	101.596	1 -15	101.595	-1 -15	101.596	1 -15	101.595	-1 -16	101.595	0 -15	101.595	0 -16
30041626	100.965	100.966	0 1	Covered		Covered		Covered		Covered		Covered	
30041627	N/A												
30041622(1)	98.116	98.098	1 -18	98.097	-1 -19	98.098	1 -18	98.097	-1 -19	98.097	0 -19	98.096	0 -19
30041622(2)	95.115	95.102	0 -13	95.101	-1 -14	95.102	1 -13	95.101	-1 -13	95.102	1 -13	95.101	-1 -14
30041622(3)	93.113	93.103	0 -11	93.102	-1 -11	93.103	1 -11	93.103	0 -11	93.102	-1 -11	93.102	0 -11
30041623(1)	97.347	97.340	1 -8	97.339	-1 -9	97.339	0 -9	97.338	0 -9	97.339	1 -8	97.336	-3 -12
30041623(2)	93.354	93.349	0 -5	93.348	-1 -6	93.348	1 -6	93.348	-1 -6	93.349	1 -5	93.346	-3 -8
30041623(3)	90.357	90.351	1 -6	90.349	-2 -8	90.349	0 -7	90.351	1 -6	90.350	-1 -7	90.347	-3 -9
30041624(1)	98.366	98.362	1 -4	98.361	-1 -5	98.362	1 -4	98.361	-1 -5	98.361	0 -4	98.360	-1 -6
30041624(2)	95.363	95.363	1 0	95.363	0 0	95.364	0 1	95.362	-1 -1	95.363	0 0	95.362	-1 -1
30041624(3)	93.361	93.367	6 5	93.366	0 5	93.368	2 7	93.367	-1 6	93.367	0 6	93.367	-1 5

monitoring table



Joint Venture

project: C310 Thames Tunnel

No. of reading		31. following		32. following		33. following		34. following		35. following		36. following	
date		20/05/2014		27/05/2014		28/05/2014		25/06/2014		26/06/2014		31/07/2014	
No.	elevation	elevation	deviation from last/baseline		elevation	deviation from last/baseline		elevation	deviation from last/baseline		elevation	deviation from last/baseline	
			baseline	deviation		baseline	deviation		baseline	deviation		baseline	deviation
30041621													
30041622	101.191	101.170	0	-21	101.169	0	-21	101.168	-2	-23	101.168	0	-23
30041623	101.440	101.424	1	-16	101.423	0	-17	101.422	-2	-19	Covered	Covered	Covered
30041624	101.442	101.437	1	-5	101.436	0	-6	Covered	Covered	Covered	Covered	Covered	Covered
30041625	101.610	101.595	0	-16	101.595	0	-15	101.595	0	-15	Covered	Covered	Covered
30041626	100.965	100.964	-1	0	100.968	3	3	Covered	Covered	Covered	100.969	1	4
30041627	N/A												
30041622(1)	98.116	98.097	0	-19	98.096	-1	-20	98.095	-2	-21	98.095	0	-21
30041622(2)	95.115	95.101	0	-13	95.100	-1	-14	95.099	-2	-16	95.098	-1	-16
30041622(3)	93.113	93.103	1	-10	93.101	-2	-12	93.099	-4	-14	93.099	0	-14
30041623(1)	97.347	97.338	2	-10	97.338	0	-9	97.337	-1	-11			
30041623(2)	93.354	93.347	1	-7	93.348	1	-7	93.344	-3	-10			
30041623(3)	90.357	90.347	0	-10	90.347	-1	-10	90.343	-4	-13			
30041624(1)	98.366	98.361	1	-4	98.360	-1	-6						
30041624(2)	95.363	95.363	1	0	95.361	-2	-2						
30041624(3)	93.361	93.367	1	6	93.366	-2	4						

 HOCHTIEF MURPHY Joint Venture		C310 THAMES TUNNEL REPORT			
EMPLOYER	CROSSRAIL	eB NO	C310-HTM-C-RGN-CR148-50024	Rev	2.0
TITLE	Monitoring Close-Out Reports relating to Tunnelling Works North Embankment River Thames - North Woolwich Portal (excl. Store Rd)				

APPENDIX 110

CS 33 - Factory Road 2 - CH 88935

Learning Legacy Document

monitoring asset

Area Factory Road

reference monitoring drawing:

C310-HTM-C-DWG-CR146-ST004-70003

name of monitoring section:

CS 33 Factory Road 2 - Ch88935

sensor type:

manual levelling studs

chainage:

88935

point no.:

3004 1871 - 3004 1877

trigger values:
[mm]

green: +12
-12

amber: +15
-15

red: +18
-18

reference document for trigger values:

Management Plan for Control of Ground Movement

EB-no.:

C310-HTM-Z-STP-CR148-50058

Appendix:

AAA

monitoring data

	date		max. value	point no.	comments
baseline	16/12/13		0.00		
TBM 1	start ZOI	20/01/14	-1.95 -1.55	3004 1874 3004 1875	
	end ZOI	23/01/14	-1.61 -1.93	3004 1874 3004 1875	breached not any trigger value
TBM 2	start ZOI	03/05/14	-4.53 -1.02	3004 1874 3004 1877	
	end ZOI	06/05/14	-4.71 -1.47	3004 1874 3004 1877	breached not any trigger value
longterm	21/11/14		-8.93 -5.74	3004 1873 3004 1874	
	Evaluation of any potential residual risks		<input checked="" type="checkbox"/>	No residual risk since the Works have been completed by HMJV	
			<input type="checkbox"/>	Yes, residual risk (see comment below)	

summary / comments

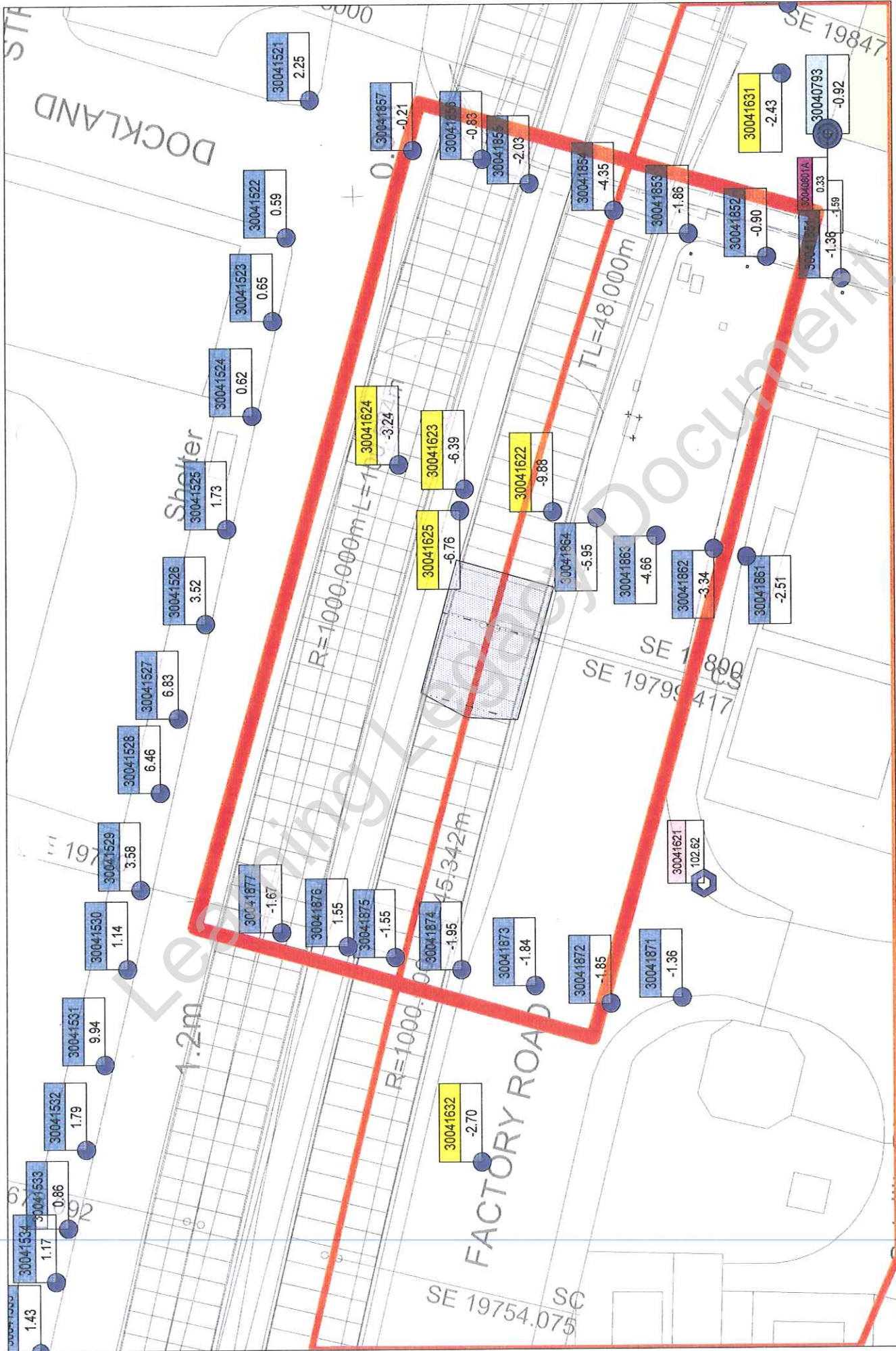
Due to different site activities some of the points were damaged/destroyed and also reinstalled. See datatable for more details.
Under consideration of temperature differences, the surrounding ground condition and the achievable accuracy of the measurement, HMJV has no concern to cease the monitoring.
The rate of change in the monitoring data is less than the required standards as per the specifications and drawings (only point 3004 1873 of the remaining points of the cross section is exceeding the 2mm change per annum).

date / signature: 14/04/15

print name:

HMJV project role:

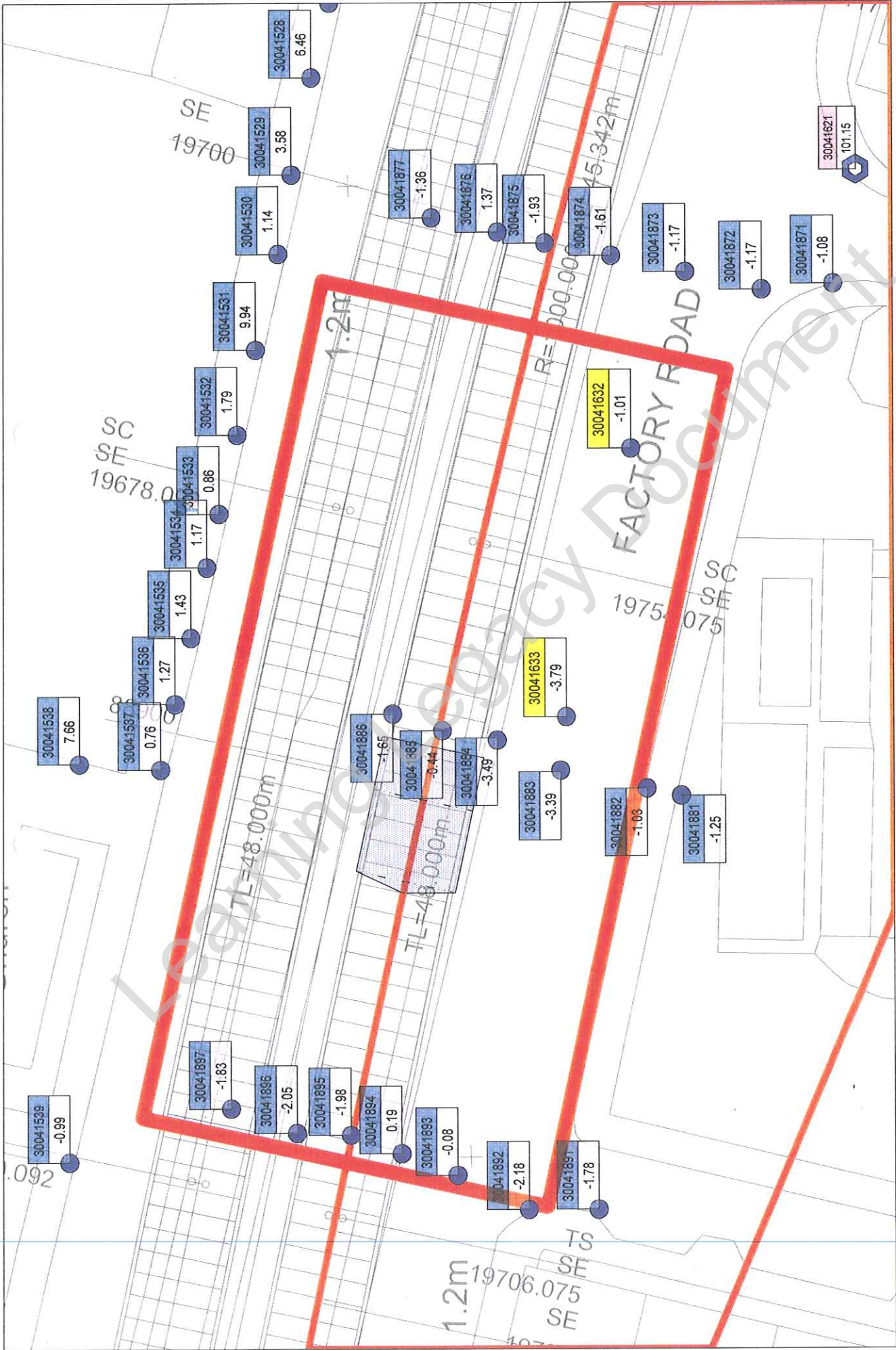
Monitoring & Survey engineer



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal

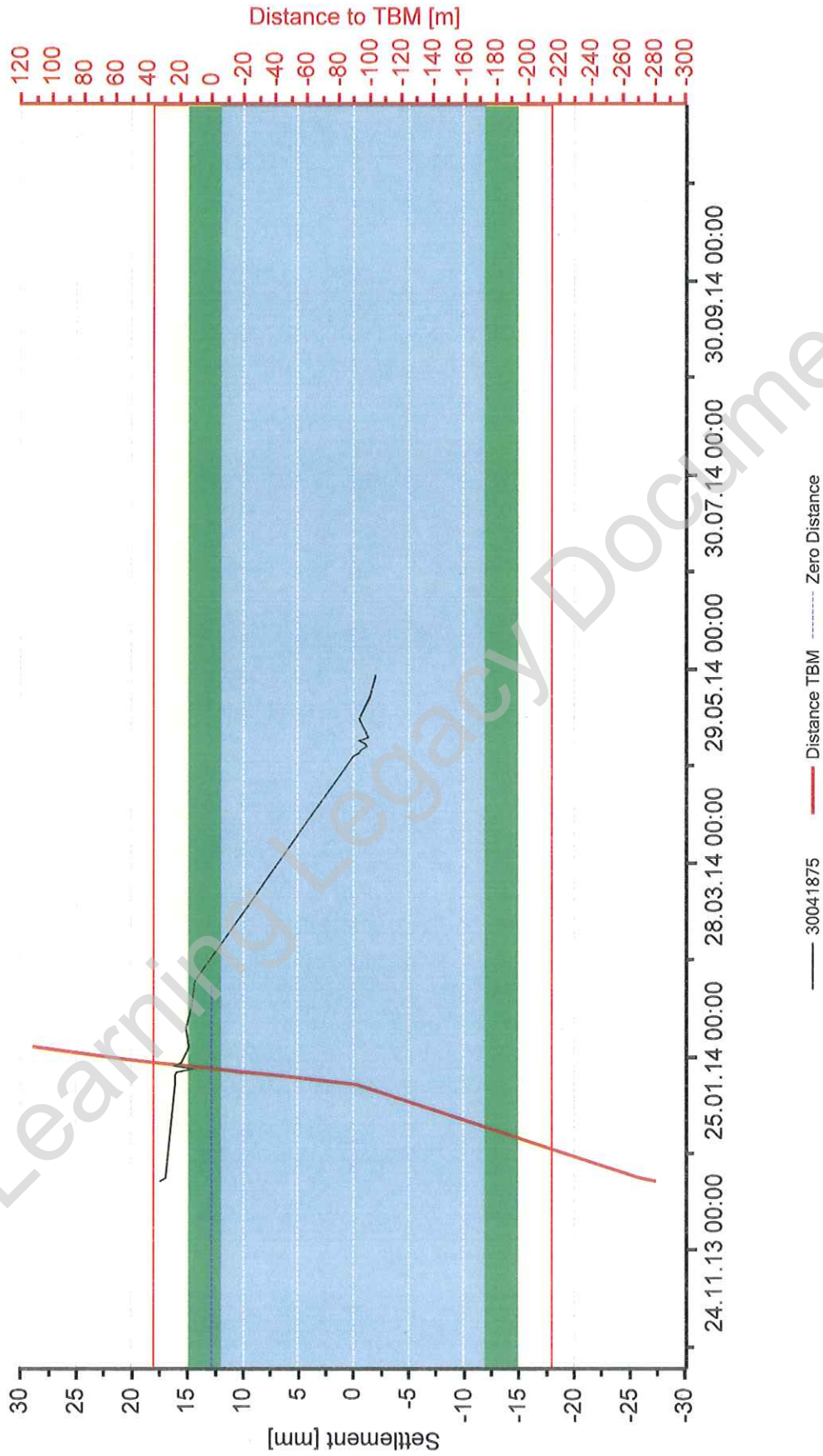
working activities: TBM drive WB

current values: 20.01.2014 09:00



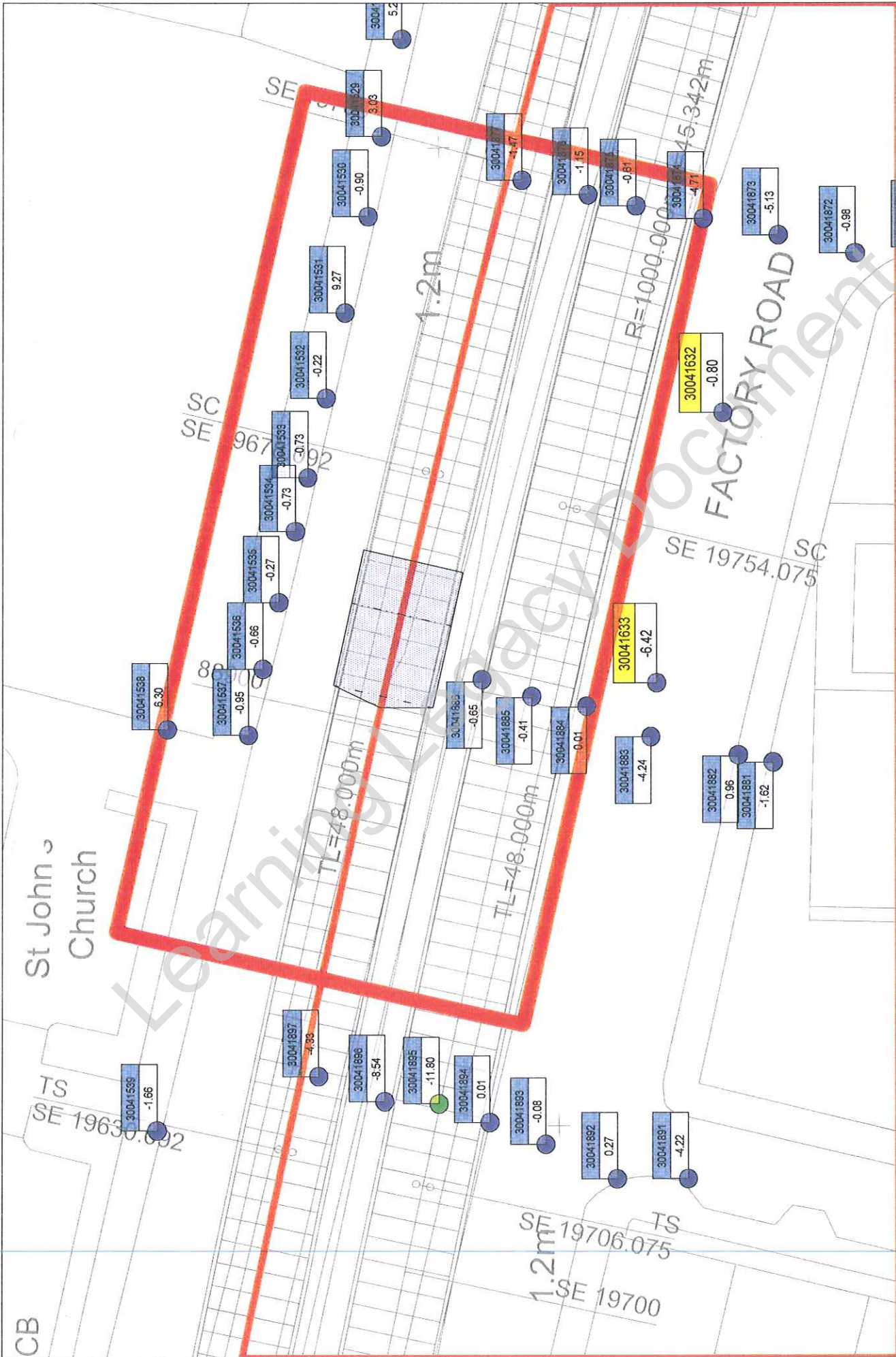
Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: TBM drive WB
 current values: 23.01.2014 19:26

Point: 30041875



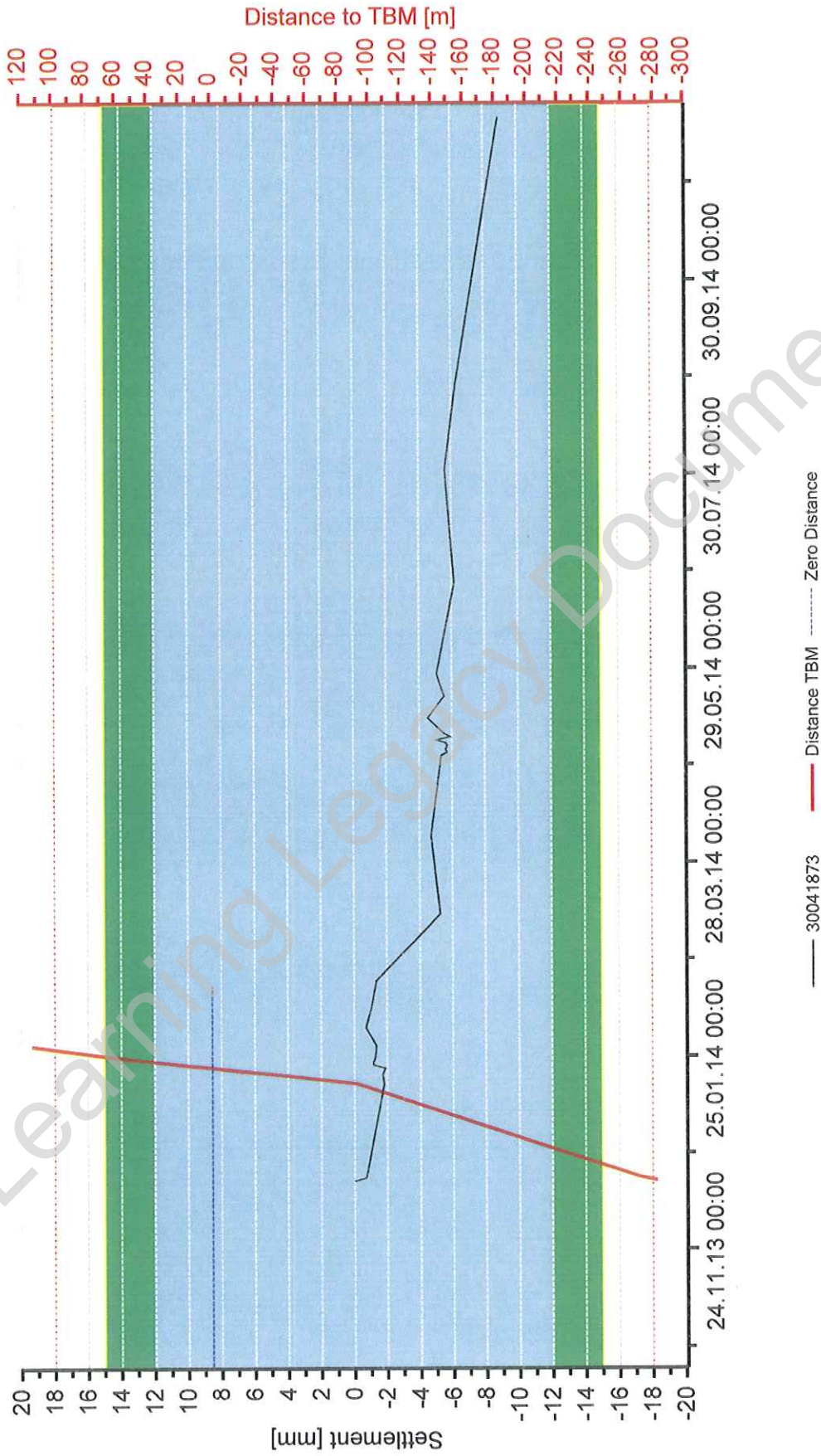
Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: WB Tunnel - CS 33 Factory Road 2 - 17.10.2013 - 21.11.2014
Date: 21.01.2015 09:49 Current Values: 21.01.2015 09:39





Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: C310 EB tunnel drive; NWP: portal excavation, construction base slab
 current values: 06.05.2014 17:20

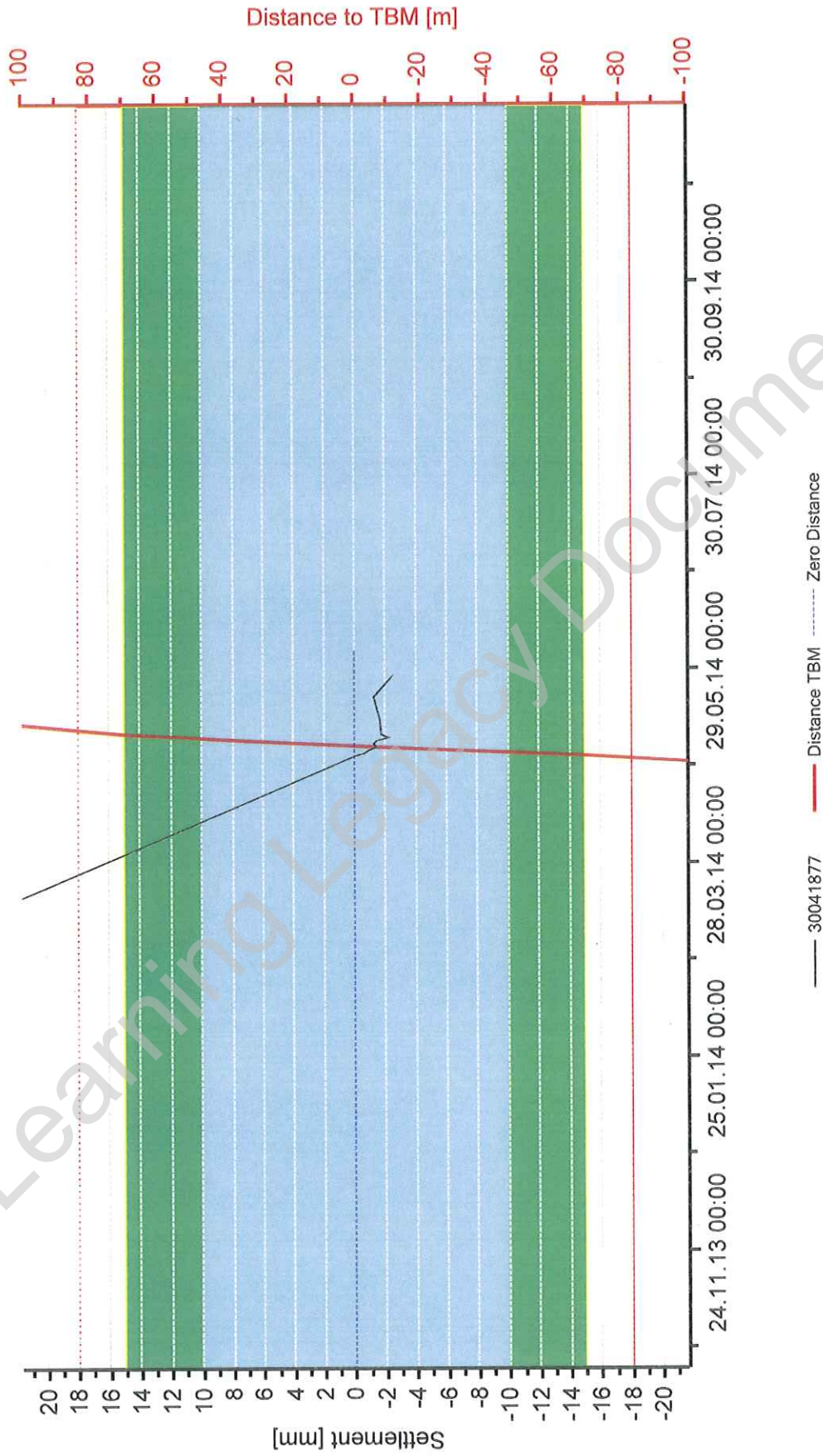
Point: 30041873



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: WB Tunnel - CS 33 Factory Road 2 - 17.10.2013 - 21.11.2014
Date: 21.01.2015 09:52 Current Values: 21.01.2015 09:39



Point: 30041877



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: EB-Tunnel - CS 33 Factory Road 2 - 17.10.2013 - 21.11.2014
date: 21.01.2015 10:58 current values: 21.01.2015 10:21



monitoring table



Joint Venture

project: C310 Thames Tunnel

structure: CS 33 Factory Road 2

No. of reacting date	baseline elevation	13. following		14. following		15. following		16. following		17. following		18. following	
		elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline
	16/12/13		11/03/2014		07/04/2014		01/05/2014		02/05/2014		03/05/2014		04/05/2014
30041871	101.417	101.417	0	101.417	0	101.416	0	101.416	101.416	-1	101.416	0	101.416
30041872	101.244	101.243	0	101.243	0	101.243	0	101.242	101.243	-1	101.243	1	101.243
30041873	101.382	101.376	-4	101.377	1	101.376	-1	101.376	101.376	-6	101.376	0	101.376
30041874	101.449	101.446	0	101.445	-1	101.445	0	Covered	101.444	0	101.444	0	101.444
30041875	101.710	Destroyed	Destroyed	Destroyed	Destroyed	101.692	New Baseline	101.691	101.691	-1	101.691	0	101.691
30041876	101.685	Destroyed	Destroyed	Destroyed	Destroyed	101.662	New Baseline	101.661	101.661	-1	101.661	0	101.661
30041877	101.677	Destroyed	Destroyed	Destroyed	Destroyed	101.641	New Baseline	101.640	101.640	-1	101.640	0	101.639
30041878													
30041879													

Document

monitoring table



Joint Venture

project: C310 Thames Tunnel

structure: CS 33 Factory Road 2

No. of reading	baseline	25. following		26. following		27. following		28. following		29. following	
		elevation	deviation from last/ baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline
date	16/12/13	27/05/2014		25/06/2014		31/07/2014		27/08/2014		21/11/2014	
30041871	101.417	101.415	0	101.414	-1	101.413	-1	101.414	0	101.415	1
30041872	101.244	101.243	0	101.242	-1	101.242	0	101.242	0	101.242	0
30041873	101.382	101.376	0	101.375	-1	101.376	1	101.375	-1	101.373	-3
30041874	101.449	101.444	1	101.443	-2	101.444	1	101.443	-1	101.443	0
30041875	101.710	101.690	-1	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
30041876	101.685	101.659	0	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
30041877	101.677	101.638	-1	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed	Destroyed
30041878											
30041879											

Copyright Document

 HOCHTIEF MURPHY Joint Venture		C310 THAMES TUNNEL REPORT			
EMPLOYER	CROSSRAIL	eB NO	C310-HTM-C-RGN-CR148-50024	Rev	2.0
TITLE	Monitoring Close-Out Reports relating to Tunnelling Works North Embankment River Thames - North Woolwich Portal (excl. Store Rd)				

APPENDIX 111

CS 34 - Factory Road 3 - CH 88900

Learning Legacy Document

monitoring asset	Area Factory Road		
reference monitoring drawing:	C310-HTM-C-DWG-CR146-ST004-70003		
name of monitoring section:	CS 34 Factory Road 3 - Ch88900		
sensor type:	manual levelling studs		
chainage:	88900	point no.:	3004 1881 - 3004 1887
trigger values: [mm]	green: +12 -12	amber: +15 -15	red: +18 -18
reference document for trigger values:	Management Plan for Control of Ground Movement		
EB-no.:	C310-HTM-Z-STP-CR148-50058		
Appendix:	AAA		

monitoring data

	date	max. value	point no.	comments	
baseline	16/12/13	0.00			
TBM 1	start ZOI	22/01/14	-1.32	3004 1886	
	end ZOI	25/01/14	-2.54	3004 1886	breached not any trigger value
TBM 2	start ZOI	05/05/14	-0.97	3004 1887	
	end ZOI	08/05/14	2.59	3004 1887	breached not any trigger value
longterm	21/11/14	-6.29	3004 1881		
Evaluation of any potential residual risks	<input checked="" type="checkbox"/>	No residual risk since the Works have been completed by HMJV			
	<input type="checkbox"/>	Yes, residual risk (see comment below)			

summary / comments

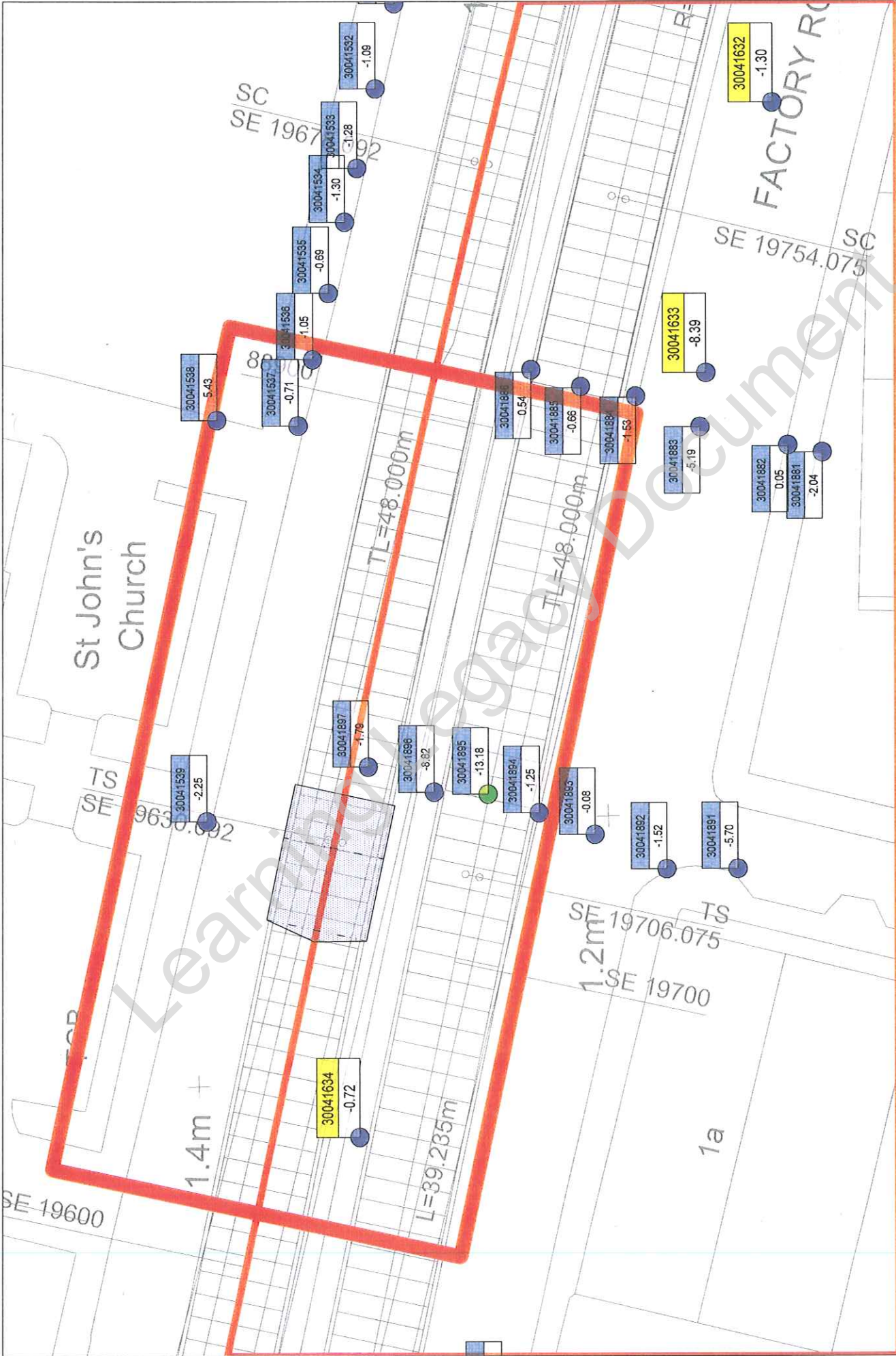
Due to different site activities some of the points were damaged/destroyed and also reinstalled. See datatable for more details.
 Under consideration of temperature differences, the surrounding ground condition and the achievable accuracy of the measurement, HMJV has no concern to cease the monitoring.
 The rate of change in the monitoring data is less than the required standards as per the specifications and drawings.

date / signature: 17/04/15

print name:

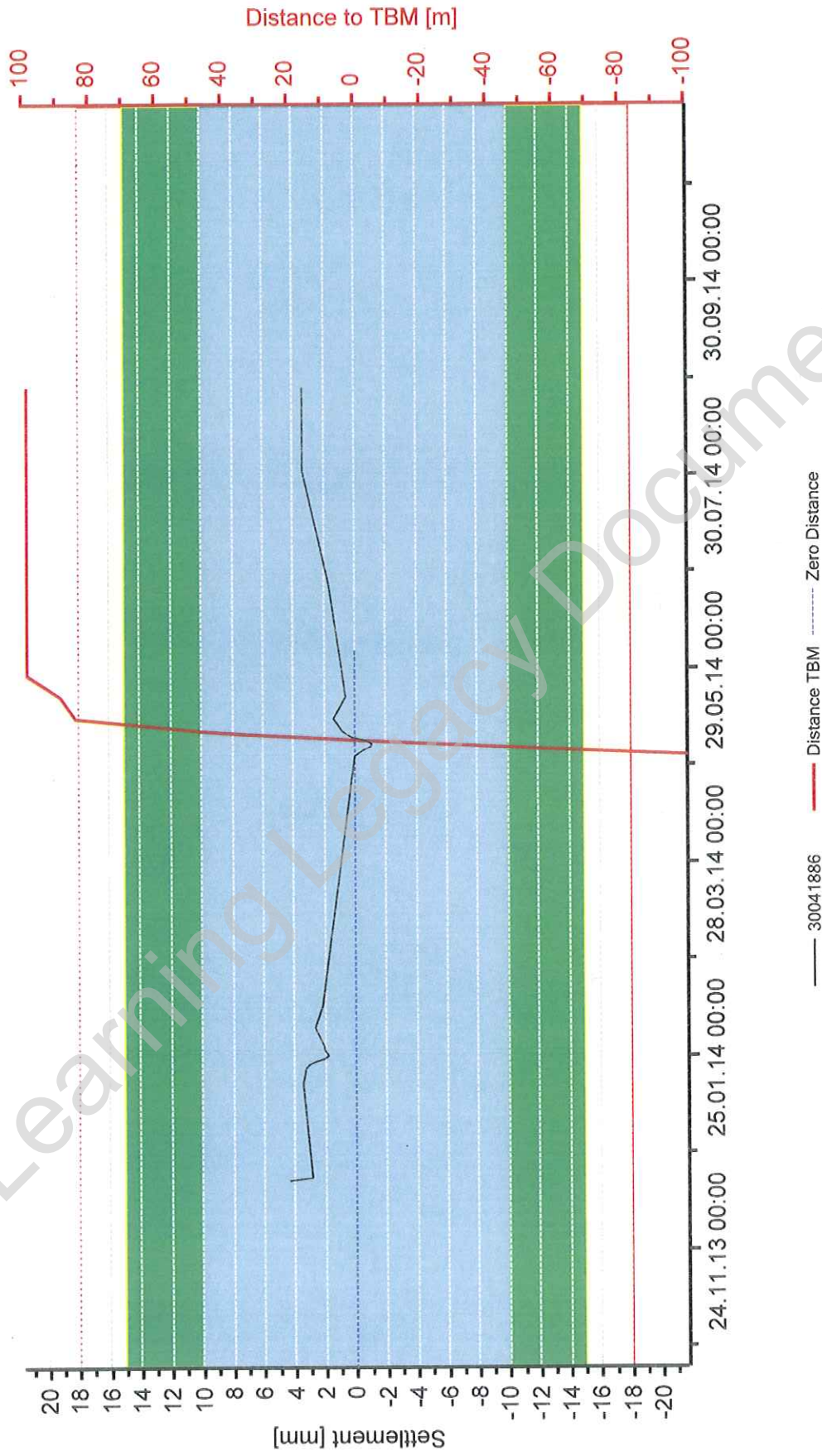
HMJV project role:

Monitoring & Survey engineer



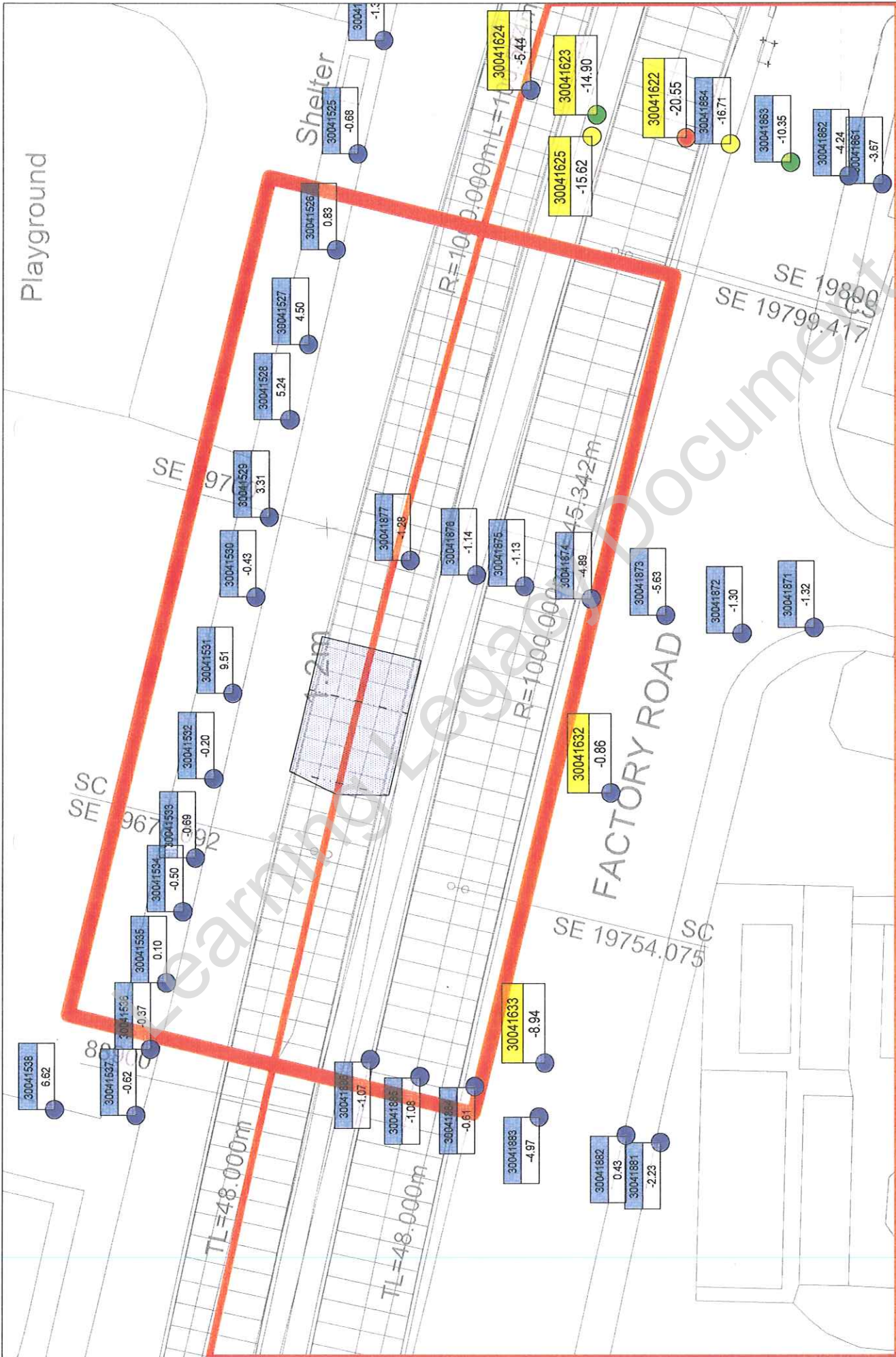
Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: C310 EB tunnel drive; NWP: portal excavation, construction base slab
 current values: 08.05.2014 18:52

Point: 30041886



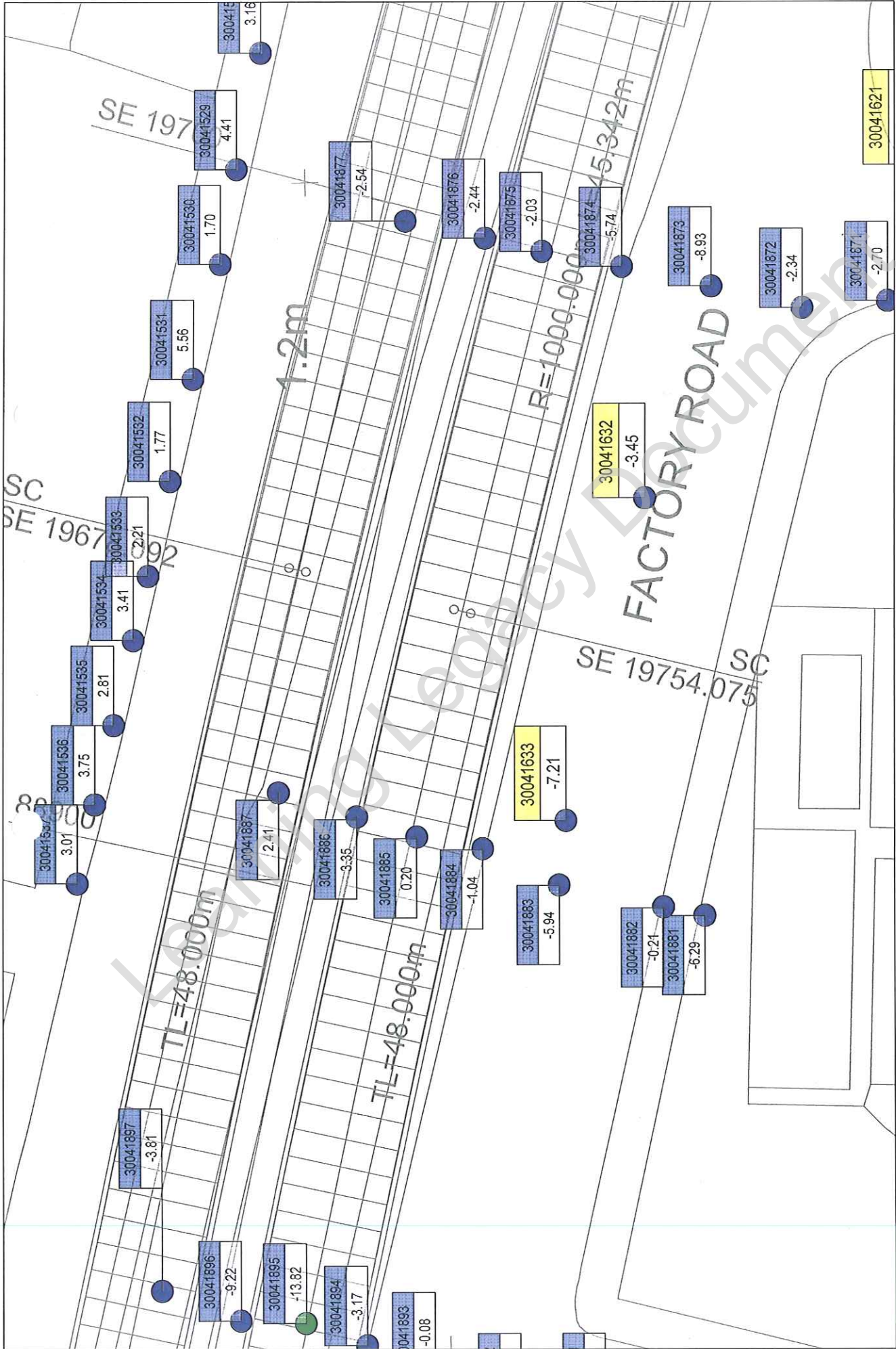
Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: EB-Tunnel - CS 34 Factory Road 3 - 17.10.2013 - 21.11.2014
date: 21.01.2015 10:53 current values: 21.01.2015 10:21



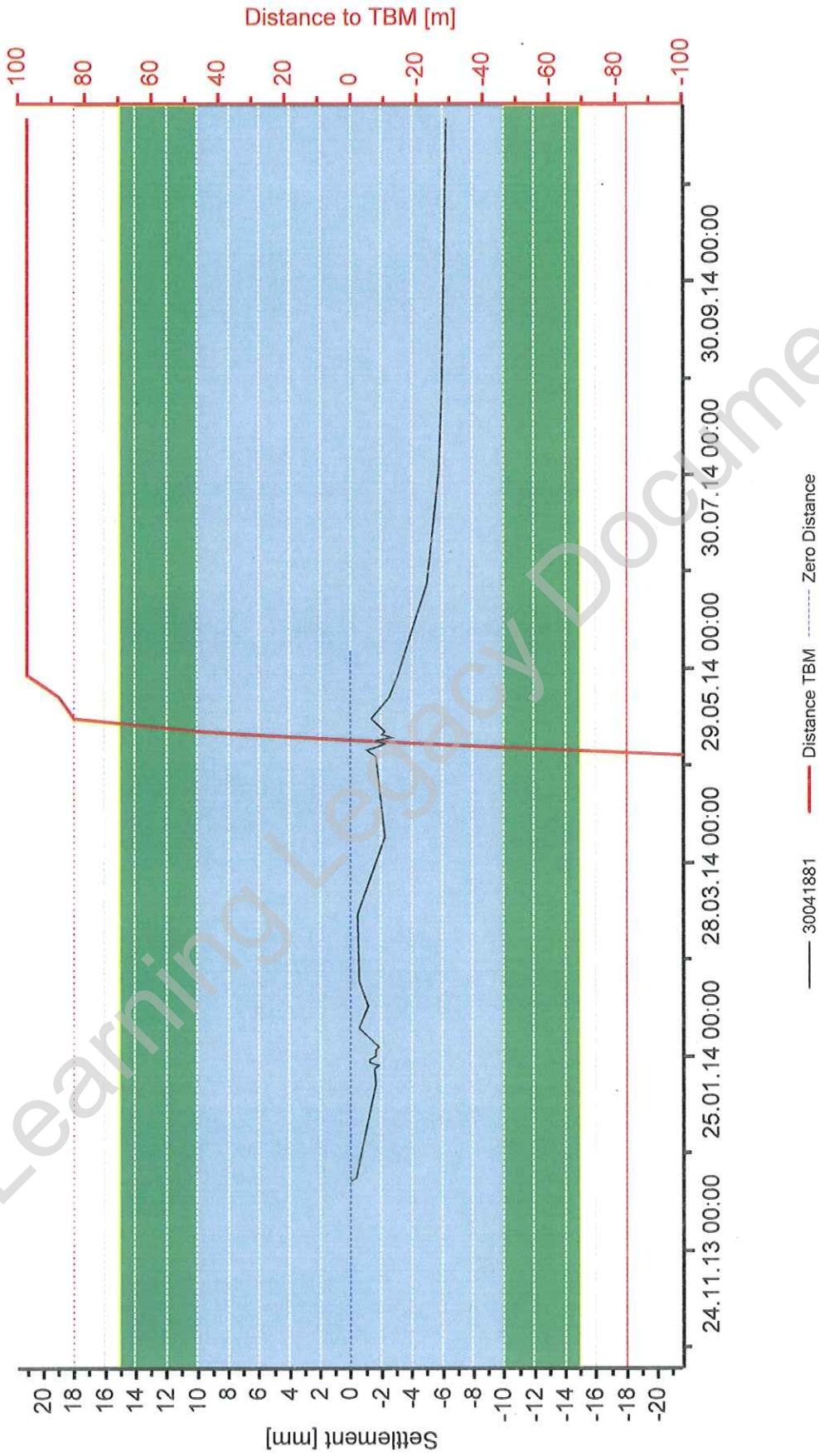


Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: C310 EB tunnel drive; NWP: portal excavation, construction base slab
 current values: 05.05.2014 09:00





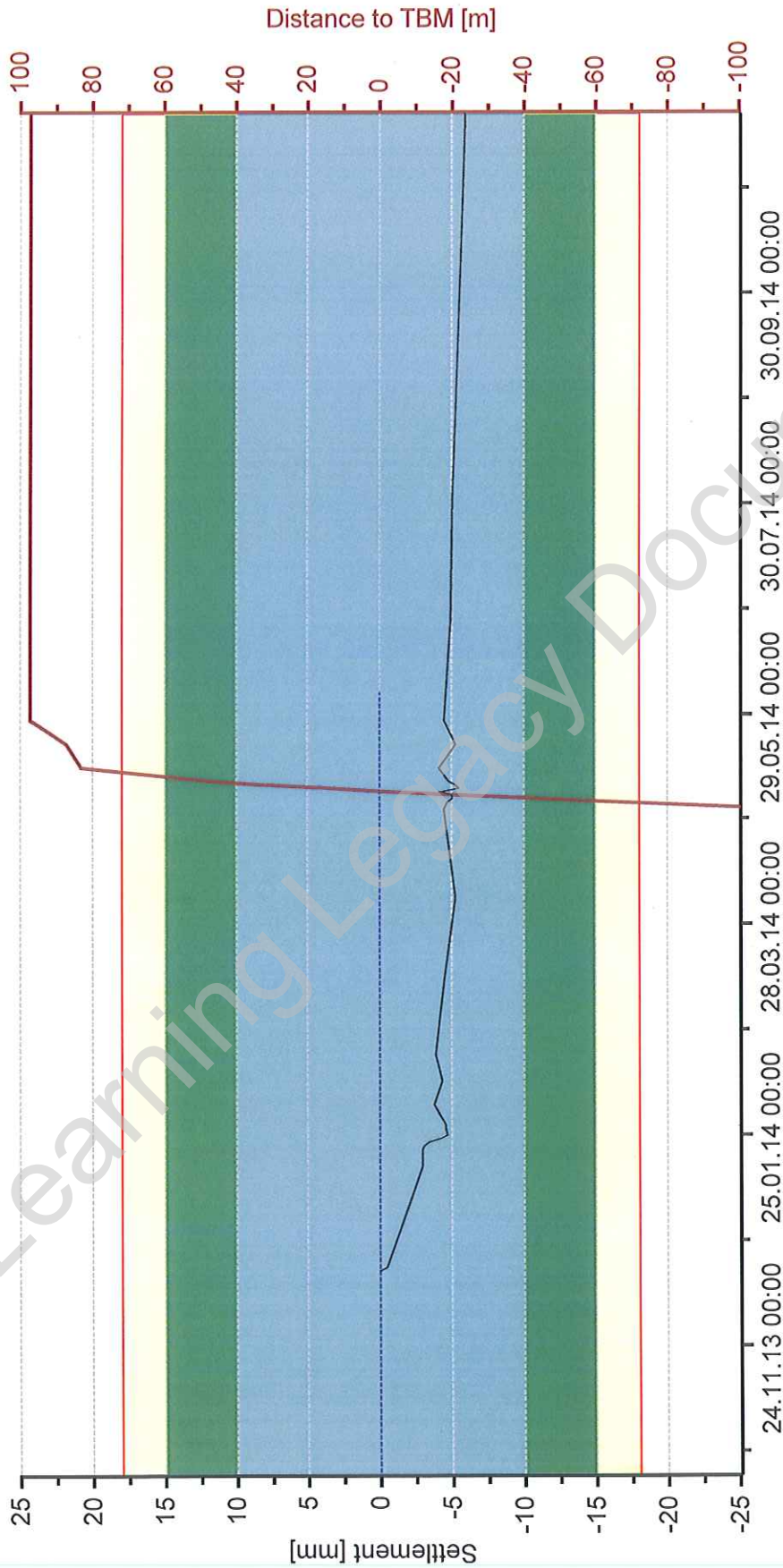
Point: 30041881



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: EB-Tunnel - CS 34 Factory Road 3 - 17.10.2013 - 21.11.2014
date: 21.01.2015 10:55 current values: 21.01.2015 10:21



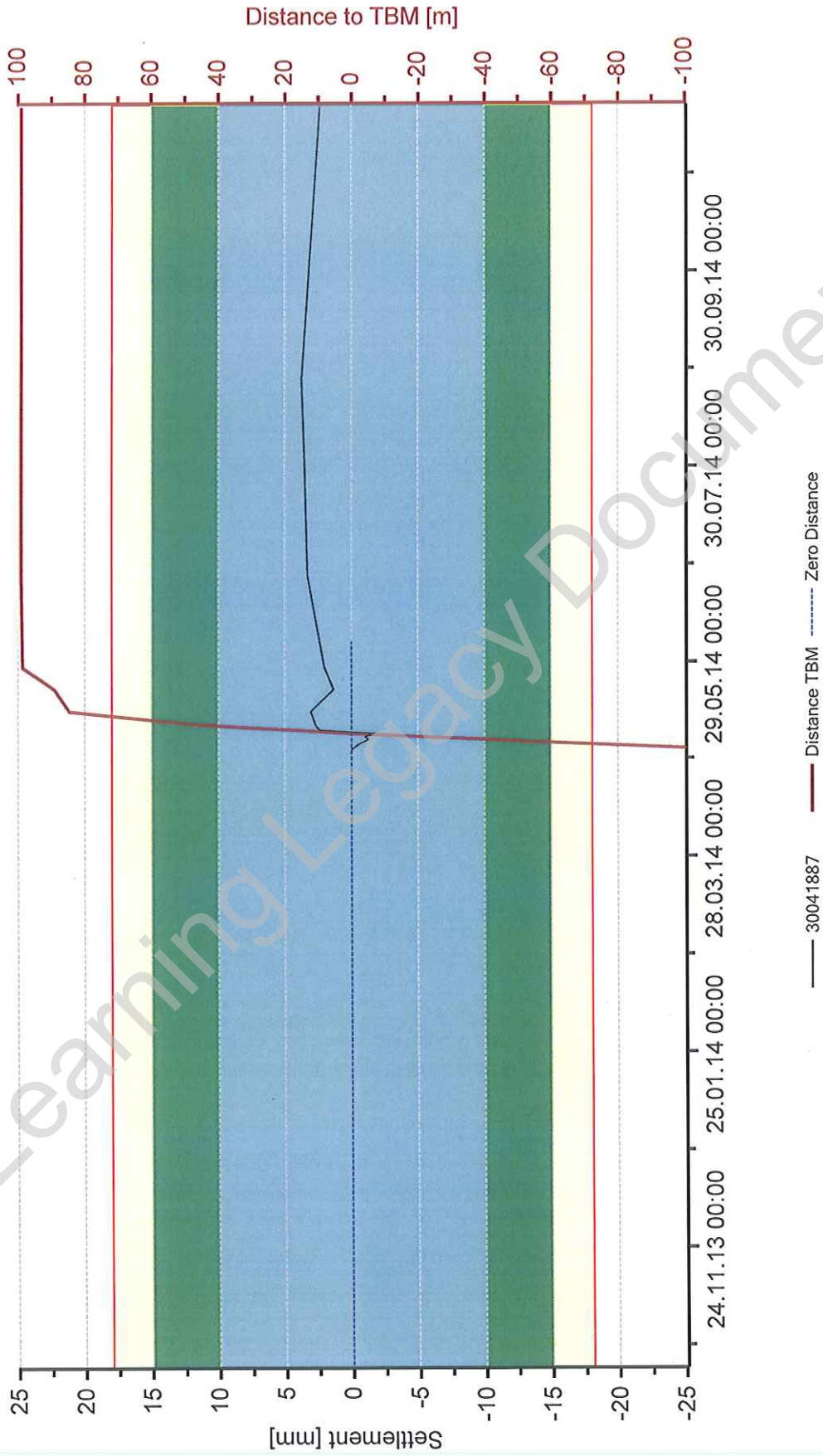
Profile: Measurement Point 30041883



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 Close Out Report: EB Tunnel - CS 34 Factory Road 3 - 17.10.2013 - 21.11.2014
 date: 15.04.2015 14:59 current values: 15.04.2015 14:13



Profile: Measurement Point 30041887



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 Close Out Report: EB Tunnel - CS 34 Factory Road 3 - 17.10.2013 - 21.11.2014
 date: 15.04.2015 14:57 current values: 15.04.2015 14:13



monitoring table



Joint Venture

project: C310 Thames Tunnel

structure: CS 34 Factory Road 3

No. of reading	baseline	7. following		8. following		9. following		10. following		11. following		12. following			
		date	elevation	deviation from last/ baseline	date	elevation	deviation from last/ baseline	date	elevation	deviation from last/ baseline	date	elevation	deviation from last/ baseline		
		16/12/13			27/01/2014		28/01/2014		03/02/2014		10/02/2014		18/02/2014		
No.	elevation														
30041881	101.511	101.509	0	-2	101.509	0	-2	101.511	1	-1	101.510	-1	101.510	1	-1
30041882	101.307	101.306	0	-1	101.306	0	-1	101.306	1	0	101.306	-1	101.306	0	-1
30041883	101.324	101.320	0	-5	101.320	0	-5	101.320	1	-4	101.320	-1	101.321	0	-4
30041884	101.248	101.243	-1	-5	101.243	0	-5	101.243	0	-4	destroyed		destroyed		
30041885	101.532	destroyed			destroyed			destroyed			destroyed		destroyed		
30041886	101.561	101.558	0	-3	101.559	0	-2	101.559	1	-2	101.559	0	destroyed		
30041887															

Learning & Safety Document

 HOCHTIEF MURPHY Joint Venture		C310 THAMES TUNNEL REPORT			
EMPLOYER	CROSSRAIL	eB NO	C310-HTM-C-RGN-CR148-50024	Rev	2.0
TITLE	Monitoring Close-Out Reports relating to Tunnelling Works North Embankment River Thames - North Woolwich Portal (excl. Store Rd)				

APPENDIX 112

CS 35 - Factory Road 4 - CH 88870

Learning Legacy Document

monitoring asset	Area Factory Road / TW Henley Road		
reference monitoring drawing:	C310-HTM-C-DWG-CR146-ST004-70003		
name of monitoring section:	CS 35 Factory Road 4 - Ch88870		
sensor type:	manual levelling studs		
chainage:	88870	point no.:	3004 1891 - 3004 1897
trigger values: [mm]	green: +12 -12	amber: +15 -15	red: +18 -18
reference document for trigger values:	Management Plan for Control of Ground Movement		
EB-no.:	C310-HTM-Z-STP-CR148-50058		
Appendix:	AAA		

monitoring data

	date	max. value	point no.	comments	
baseline	16/12/13	0.00			
TBM 1	start ZOI	23/01/14	-1.98	3004 1895	
	end ZOI	27/01/14	-7.44	3004 1895	breached not any trigger value
TBM 2	start ZOI	06/05/14	-4.33	3004 1897	
	end ZOI	11/05/14	-2.83	3004 1897	breached not any trigger value
longterm	21/11/14	-13.82	3004 1895	breached green trigger value, reported to SRG , deflection ratio calculate, no further action required	

Evaluation of any potential residual risks	<input checked="" type="checkbox"/>	No residual risk since the Works have been completed by HMJV
	<input type="checkbox"/>	Yes, residual risk (see comment below)

summary / comments

Due to different site activities some of the points were damaged/destroyed and also reinstalled. See datatable for more details. It wasn't possible to reinstall point 3004 1894.

The maximum deflection ratio was observed on 27.08.2014 with a ratio of 1:1023. (3004 1894 - 3004 1895 - 3004 1896) - no TW trigger breached (TW alert value 1:1000).

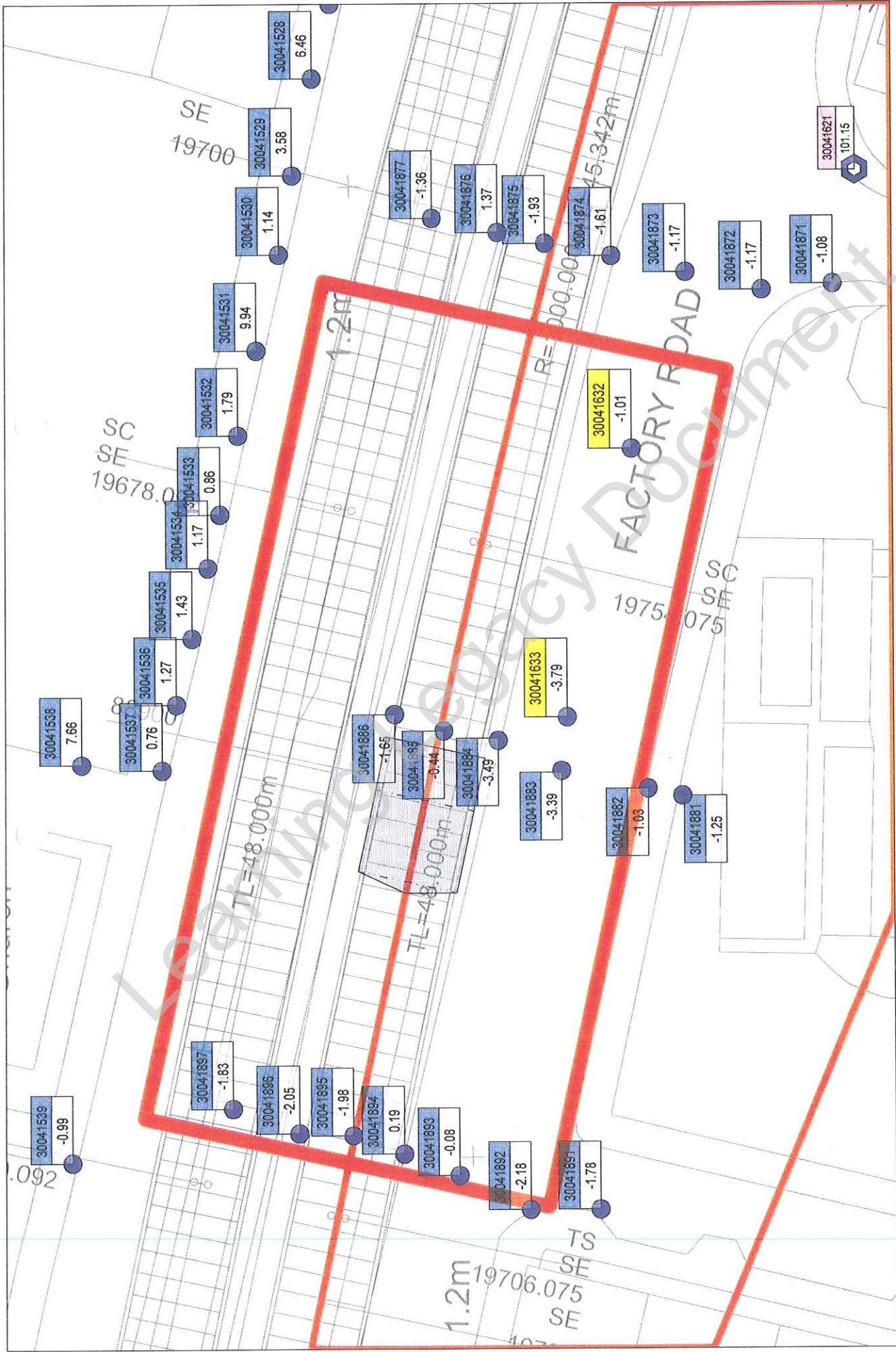
Under consideration of temperature differences, the surrounding ground condition and the achievable accuracy of the measurement, HMJV has no concern to cease the monitoring.

The rate of change in the monitoring data is less than the required standards as per the specifications and drawings.

date / signature: 14/04/15

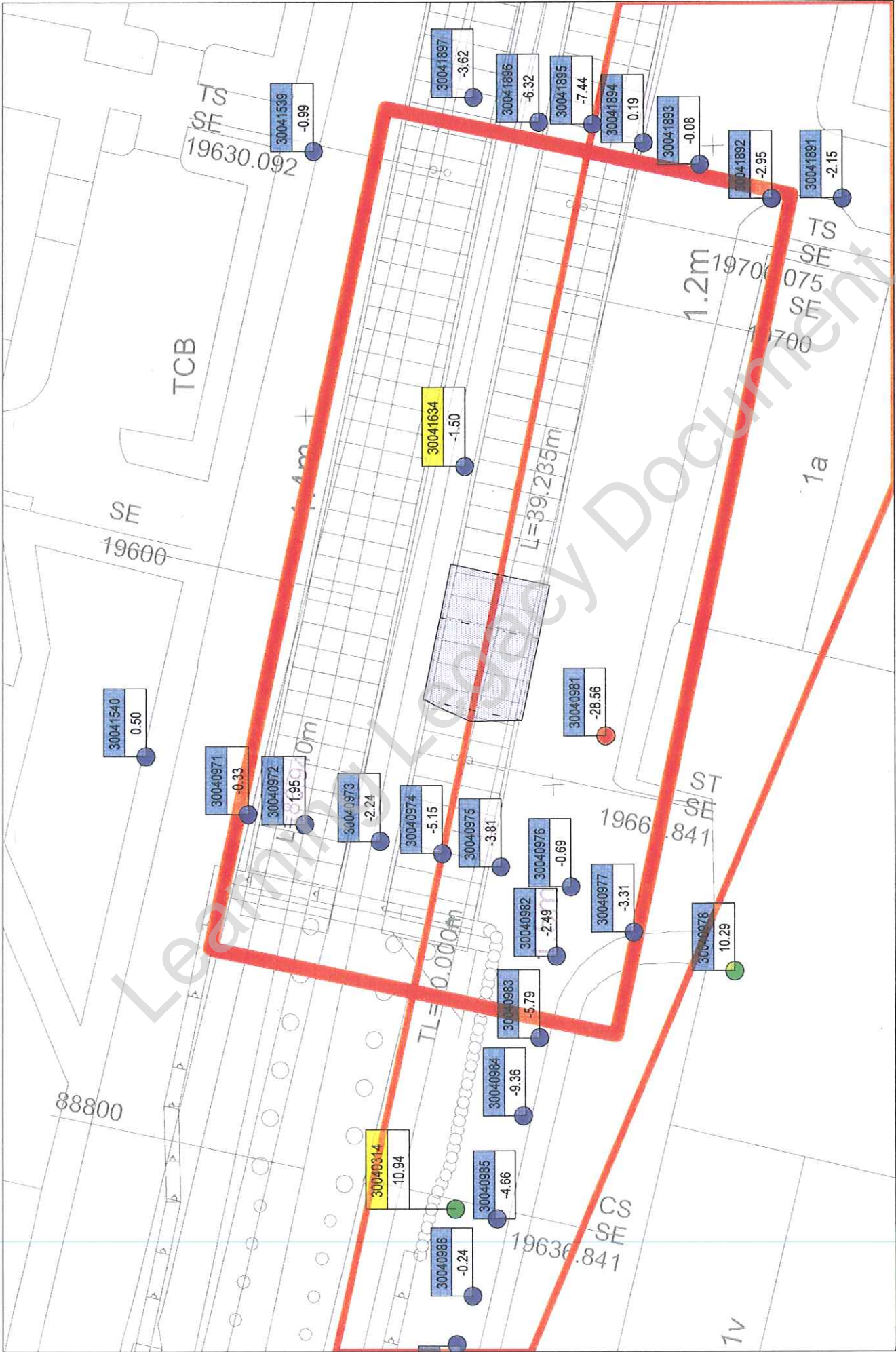
print name:

HMJV project role: Monitoring & Survey engineer



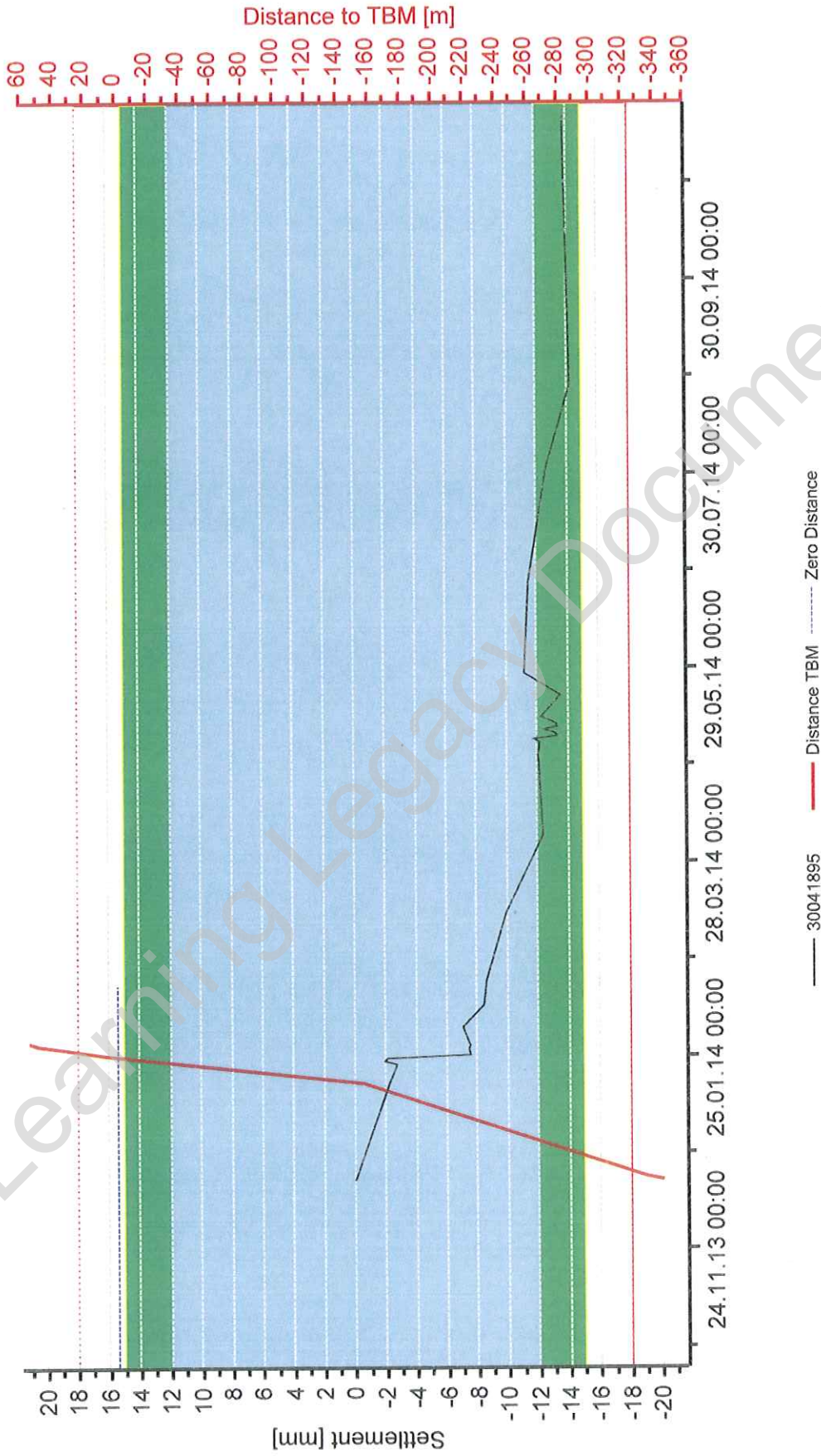
Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: TBM drive WB
 current values: 23.01.2014 19:26





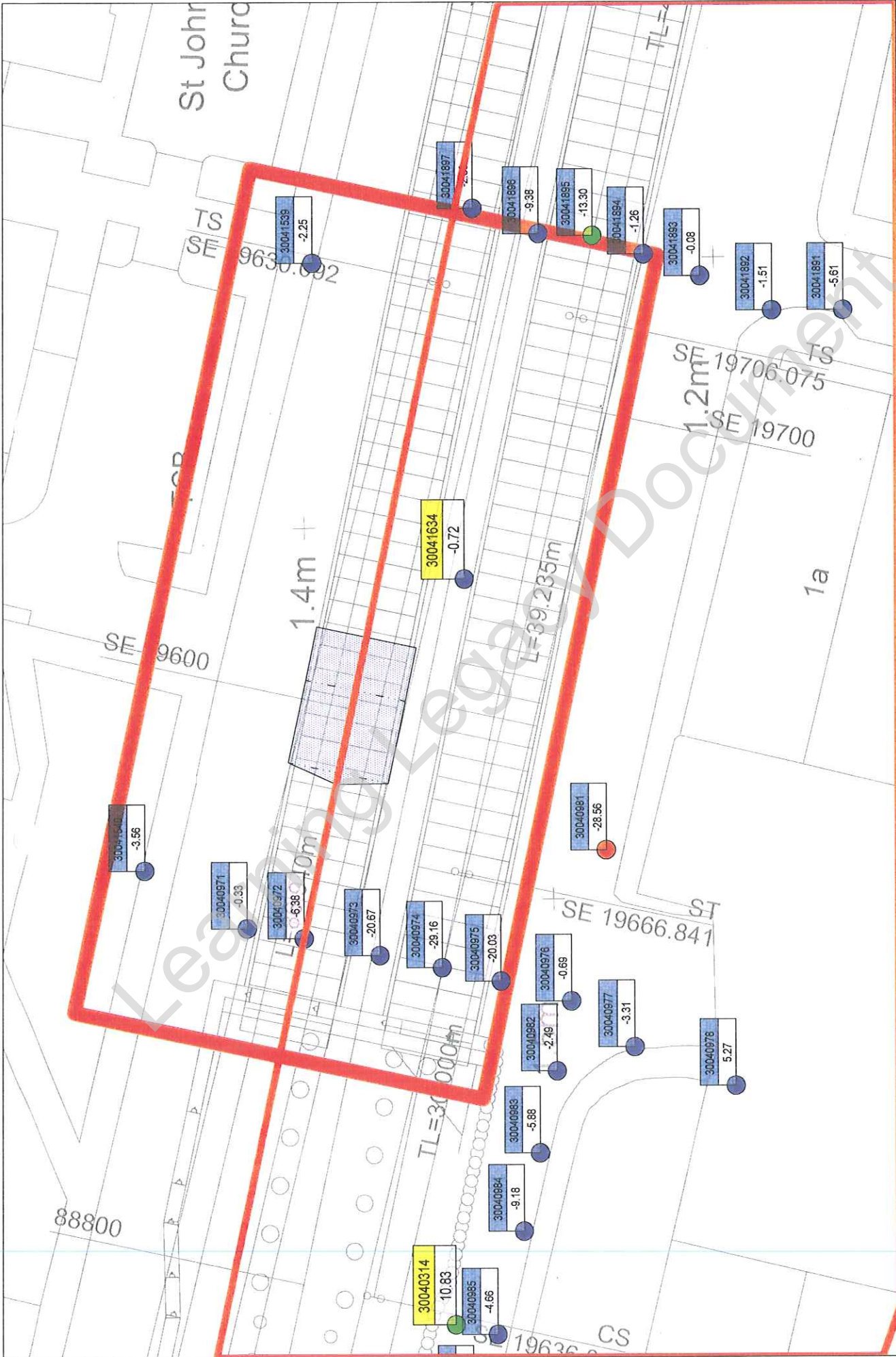
Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: TBM drive WB
 current values: 27.01.2014 15:00

Point: 30041895



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: WB Tunnel - CS 35 Factory Road 4 - 17.10.2013 - 21.11.2014
Date: 21.01.2015 10:05 Current Values: 21.01.2015 09:51

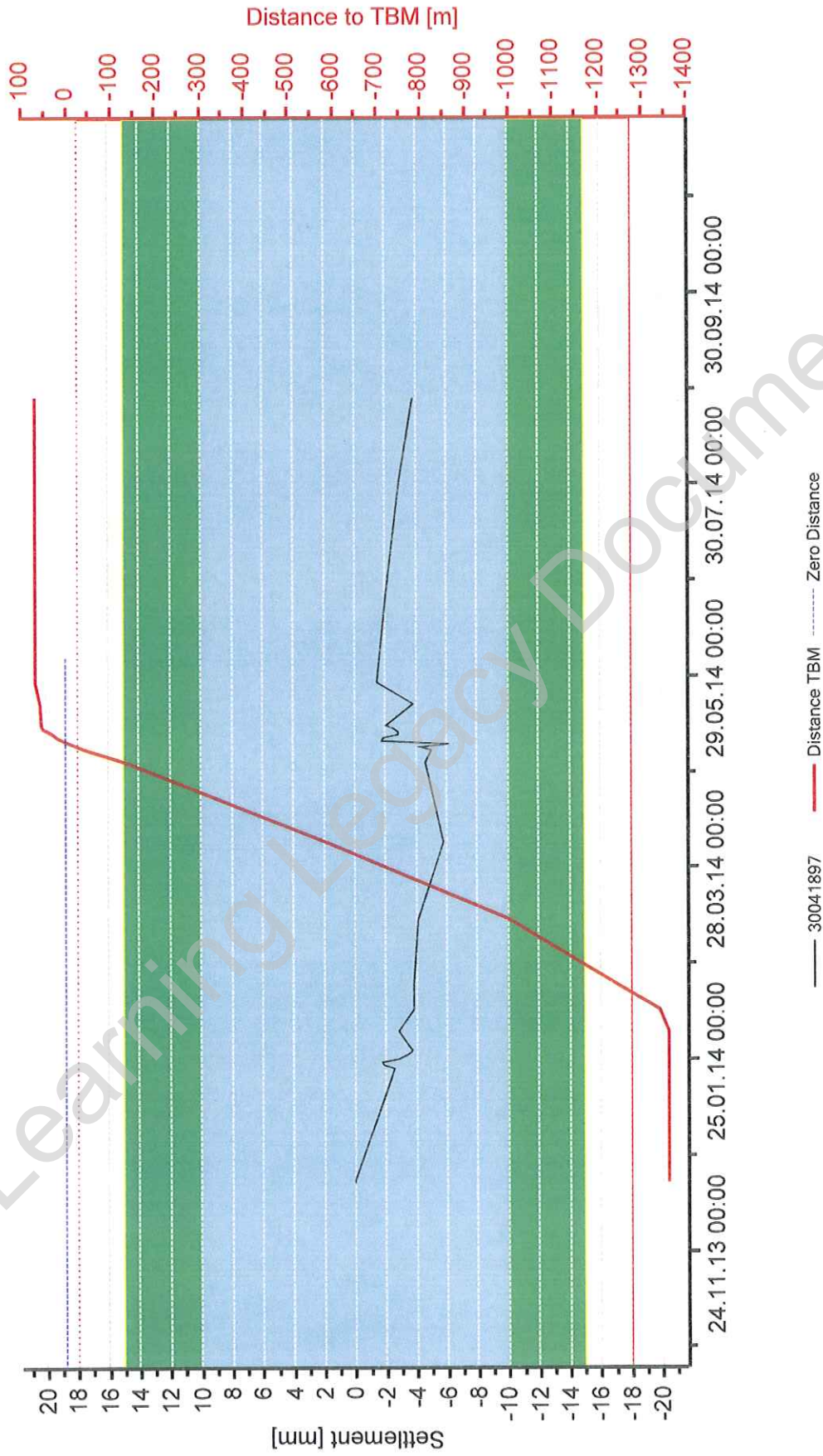




Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
 working activities: C310 EB tunnel drive; NWP: portal excavation, construction base slab
 current values: 11.05.2014 08:55



Point: 30041897



Project: C310 Thames Tunnel - Plumstead Portal to North Woolwich Portal
Close Out Report: EB-Tunnel - CS 35 Factory Road 4 - 17.10.2013 - 21.11.2014
date: 21.01.2015 10:50 current values: 21.01.2015 10:21



monitoring table



Joint Venture

project: C310 Thames Tunnel

structure: CS 35 Factory Road 4

No. of reading	baseline	19. following		20. following		21. following		22. following		23. following		24. following	
		elevation	deviation from last/ baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline
date	16/12/13	08/05/2014		09/05/2014		10/05/2014		11/05/2014		12/05/2014		13/05/2014	
30041891	101.154	101.149	0	101.149	1	101.149	-1	101.149	0	101.149	0	101.150	1
30041892	101.159	101.150	0	101.150	1	101.150	-1	101.150	0	101.150	0	101.151	0
30041893	101.203	destroyed		destroyed		destroyed		destroyed		destroyed		destroyed	
30041894	101.237	101.568	0	101.568	1	101.568	-1	101.568	0	101.568	0	101.569	1
30041895	101.940	101.927	0	101.928	1	101.927	-1	101.927	0	101.927	0	101.928	1
30041896	101.855	101.847	1	101.847	0	101.846	-1	101.846	0	101.846	0	101.847	1
30041897	101.837	101.835	4.	101.835	0	101.834	-1	101.834	0	101.834	0	101.834	1
30041898													
30041899													

Confidential Document

monitoring table



Joint Venture

project: C310 Thames Tunnel

structure: CS 35 Factory Road 4

No. of reading	baseline	25. following		26. following		27. following		28. following		29. following		30. following	
		elevation	deviation from last/ baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline	elevation	deviation from last/baseline
date	16/12/13												
		20/05/2014		27/05/2014		25/06/2014		31/07/2014		27/08/2014		21/11/2014	
30041891	101.154	101.148	-1	101.151	3	101.150	-1	101.149	-1	101.149	0	101.150	1
30041892	101.159	101.150	-1	destroyed	destroyed	101.151	0	101.150	-1	covered		destroyed	
30041893	101.203			destroyed	destroyed							destroyed	
30041894	101.237	101.568	-1	101.570	3	101.569	-2	101.567	-1	101.566	-1	101.566	-3
30041895	101.940	101.926	-1	101.929	2	101.928	0	101.927	-1	101.926	-2	101.926	-14
30041896	101.855	101.846	-1	101.848	3	101.849	0	101.848	-1	101.846	-1	101.846	-9
30041897	101.837	101.833	-2	101.835	2	101.834	-1	101.834	-1	101.833	-1	101.833	-4
30041898													
30041899													

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