



Work Area: SMM
Work Type: I&M
Originator Company: GEOCISA UK

# C435 Farringdon Main Station

CRL Lead reviewer: [Redacted]
Eve Herrington

## Monitoring Close-Out Report: Automated Total Station ATS 17 and 3D Targets read by ATS 17.

**CRL Document Number: C435-BFK-C2-RGN-M123-51622**

Supplier Document Number: N/A

Contract MDL reference C13.012

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1.0	12-04-2016	[Redacted]	[Redacted]	[Redacted]	For acceptance
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### 2a. Stakeholder Review Required? YES NO

Stakeholder submission required: LU  RfL  Purpose of submission: For no objection   
 NR  LO  For information   
 DLR  Other: \_\_\_\_\_

This document has been reviewed by the following individual for coordination, compliance, integration and acceptance and is acceptable for transmission to the above stakeholder for the above stated purpose.

Sign: \_\_\_\_\_ Role: \_\_\_\_\_ Name: \_\_\_\_\_ Date: \_\_\_\_\_

Sign: \_\_\_\_\_ Role: \_\_\_\_\_ Name: \_\_\_\_\_ Date: \_\_\_\_\_

### 2b. Review by Stakeholder (if required):

Stakeholder Organisation	Job Title	Name	Signature	Date	Acceptance
					<input type="checkbox"/>
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					<input type="checkbox"/>

compliance with their contractual obligations and does not constitute as or materials developed or selected by the designer/supplier.

### 3. Acceptance by Crossrail:

[Redacted]  
 15/10/2016  
 [Redacted]

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## A. INTRODUCTION

In line with the C122 – M&W Specification KX10 – Instrumentation & Monitoring C122-OVE-Z4-RSP-CR001-00007, this close out report aims to address the following points in relation to the instrumentation defined in Section B.

- Identify movements observed by the relevant instruments;
- Relate these movements to construction activities, where applicable.
- Identify trigger breaches that may have occurred.
- Demonstrate that the rate of change of the data is either in line with the required rate or such that residual risks are minimal.
- Identify any such residual risks should there be considered to be any.

Based on the above points, this close out report will provide justification for the decommissioning of the instruments.

## B. INSTRUMENTS

### B.1 Description of the Instruments

This Close-Out Report relates the prisms read by ATS17. See Table 1 below with the details of the prisms read by ATS17.

Sensor	Location	Easting (m)	Northing (m)	Elevation (mATD)
C435-RP01701	THE SMOKERY	82078.7694	36538.9682	125.6399
C435-RP01702	THE SMOKERY	82077.8231	36533.0945	125.6398
C435-RP01703	THE SMOKERY	82077.6735	36532.9644	121.6679
C435-RP01705	THE SMOKERY	82082.3551	36521.2024	125.6394
C435-RP01706	THE SMOKERY	82081.1883	36528.0939	125.6377
C435-RP01707	2-3 COWCROSS ST	82126.6187	36545.6467	119.3482
C435-RP01709	2-3 COWCROSS ST	82126.1874	36546.3632	119.3626
C435-RP01710	35-37 GREENHILL'S RENTS	82099.9404	36525.4168	118.7971
C435-RP01711	2-3 COWCROSS ST	82126.0038	36546.7308	124.8265
C435-RP01712	35-37 GREENHILL'S RENTS	82107.1217	36530.9262	119.0925
C435-RP01714	THE SMOKERY	82083.4399	36521.6763	125.6335
C435-RP01715	THE SMOKERY	82089.4222	36525.544	119.315
C435-RP01716	THE SMOKERY	82088.44	36525.05	125.6356
C435-RP01717	THE SMOKERY	82095.3232	36529.5507	118.6674
C435-RP01718	THE SMOKERY	82095.14	36529.56	125.6424
C435-RP01719	THE SMOKERY	82092.48	36533.64	125.6286
C435-RP01726	77a CHARTERHOUSE ST	82103.5486	36507.2303	120.5384
C435-RP01727	77a CHARTERHOUSE ST	82104.6156	36507.2221	130.1951
C435-RP01729	77a CHARTERHOUSE ST	82089.8046	36508.1762	121.6032
C435-RP01730	77a CHARTERHOUSE ST	82089.7711	36508.1883	130.145
C435-RP01731	79-83 CHARTERHOUSE ST	82091.6811	36503.6626	116.9337
C435-RP01732	79-83 CHARTERHOUSE ST	82091.6629	36503.6903	120.1437

Sensor	Location	Easting (m)	Northing (m)	Elevation (mATD)
C435-RP01733	79-83 CHARTERHOUSE ST	82091.6565	36503.6581	130.094
C435-RP01734	79-83 CHARTERHOUSE ST	82090.0227	36506.936	118.4738
C435-RP01743	35-37 GREENHILL'S RENTS	82106.9421	36530.7953	129.2779
C435-RP01744	35-37 GREENHILL'S RENTS	82100.0263	36525.5158	129.2606
C435-RP01745	35-37 GREENHILL'S RENTS	82100.9988	36523.5264	121.6799
C435-RP01746	35-37 GREENHILL'S RENTS	82100.9917	36523.4864	131.6304
C435-RP01747	35-37 GREENHILL'S RENTS	82103.93	36519.2964	121.6851
C435-RP01748	35-37 GREENHILL'S RENTS	82103.8715	36519.347	131.633
C435-RP01749	35-37 GREENHILL'S RENTS	82100.345	36521.3753	119.672
C435-RP01750	79-83 CHARTERHOUSE ST	82105.8027	36511.2727	119.5971
C435-RP01751	79-83 CHARTERHOUSE ST	82111.3289	36513.2585	121.793
C435-RP01752	79-83 CHARTERHOUSE ST	82111.2261	36513.2127	127.0471
C435-RP01753	79-83 CHARTERHOUSE ST	82103.7308	36509.4103	120.0533
C435-RP01754	79-83 CHARTERHOUSE ST	82103.7094	36509.4161	127.0565
C435-RP01735	2-3 COWCROSS ST	82136.1461	36555.5623	124.1426
C435-RP01736	87 CHARTERHOUSE ST	82126.5847	36512.7678	130.9952
C435-RP01737	87 CHARTERHOUSE ST	82127.8321	36510.5594	130.9083
C435-RP01738	87 CHARTERHOUSE ST	82127.1851	36514.7302	131.9168
C435-RP01739	87 CHARTERHOUSE ST	82129.2989	36516.2603	132.0045
C435-RP01740	79-83 CHARTERHOUSE ST	82122.5336	36502.4001	128.7239
C435-RP01741	79-83 CHARTERHOUSE ST	82114.5082	36507.9495	128.1325
C435-RP01742	79-83 CHARTERHOUSE ST	82111.8593	36513.1414	128.1208

Table 1: Details of the prisms read by AST17.

The prisms read by ATS 17 installed on 11 Greenhill's Rent are shown in the following documents:

Drawings:

- C435-BFK-C2-DWG-M123-50045. 3D Targets Installed for Farringdon Station.

Installation Reports:

- C435-BFK-C2-RGN-M123-51047 Installation Report: Automated Total Station Installation at 11Greenhill's Rent (ATS 17)
- C435-BFK-C2-RGN-M123-50006 Installation Report of 3D Targets read by ATS 17
- C435-BFK-C2-RGN-M123-50064 Installation Report of 3D Targets installed on Roof



## B.2 Location of the Instruments

Prisms associated with ATS17 are located on the plan below highlighted in yellow.

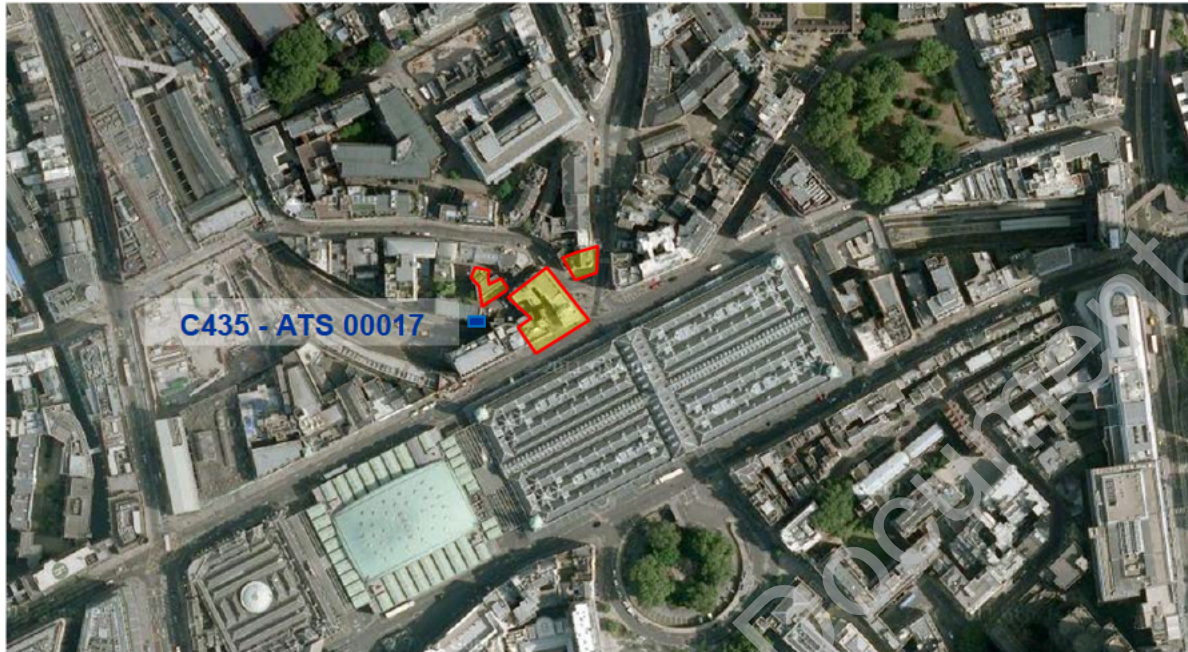


Figure 1 – Plan showing the Location prisms read by ATS17.

## C. MOVEMENTS

### C.1 Movements Resulting from Construction Activities

#### C.1.1 Relevant Crossrail (BFK) Works

The construction activities affecting these instruments are outlined in the Table 2 below:

ACTIVITY	START DATE	END DATE
WB TBM passage	22/08/2013	09/10/2013
SCL-PTW enlargement	10/06/2014	27/08/2014
EB TBM passage	10/01/2014	24/01/2014
SCL-PTE enlargement	06/07/2014	06/02/2015
SCL-CP4	17/09/2014	23/10/2014

Table 2 –Constructions activities associated to ATS17.

#### C.1.2 Resulting Movements

To analyse the result for the prisms buildings will be looked at individually.

- 77a Charterhouse St.
- 79-83 Charterhouse St.
- 87 Charterhouse St.
- The Smokery.
- 35-37 Greenhill's Rent.
- 2-3 Cowcross St.

### 1. 77a Charterhouse St

Monitoring data for these prisms is presented in Appendix B.

- WB TBM caused maximum 4mm of settlement from 25-09-2013 to 26-09-2013.
- EB TBM caused maximum 2mm of settlement from 13-01-2014 to 14-01-2014.
- Residual settlement caused maximum 5-6mm.
- Compensation grouting from Moorgate Shaft 3 caused maximum 5-6mm of heave from 01-07-2014 to 13-07-2014.
- The combination between PTW and PTE works caused maximum 15-17mm of settlement from 22-6-2014 to 09-09-2014.
- Compensation grouting caused maximum 2-3mm of heave from 30-08-2014 to 13-09-2014.
- CP4 construction caused maximum 4-5mm of settlement from 17-09-2014 to 16-10-2014.
- Residual settlement caused 2-3mm.
- Compensation grouting caused maximum 3-4mm of heave from 04-01-2015 to 01-02-2015.
- Maximum Longitudinal displacement -8mm.
- Maximum Transversal displacement 16mm.
- Maximum settlement captured at the end of the works -26mm.

### 2. 79-83 Charterhouse St:

Monitoring data for these prisms is presented in Appendix B.

- WB TBM caused maximum 5-6mm of settlement from 25-09-2013 to 26-09-2013.
- No movements caused by the EB TBM.
- Compensation grouting from Moorgate Shaft 3 caused maximum 2-3mm of heave from 12-07-2014 to 17-07-2014.
- The combination between PTE and PTW caused maximum 14-16mm of settlement from 22-06-2014 to 09-09-2014.
- Compensation grouting caused maximum 2mm of heave from 04-09-2014 to 14-09-2014.
- CP4 construction caused maximum 3-4mm of settlement from 17-09-2014 to 16-10-2014.
- Compensation grouting caused maximum 3-4mm of heave from 08-01-2015 to 31-01-2015.
- Maximum Longitudinal displacement 12mm.
- Maximum Transversal displacement 14mm.
- Maximum settlement captured at the end of the works -30mm.

### 3. 87 Charterhouse St:

Monitoring data for these prisms is presented in Appendix B.

- TaM's installation from Moorgate Shaft 1 caused maximum 4-5mm of heave from 18-08-2013 to 27-08-2013.
- WB TBM caused maximum 4mm of settlement from 25-09-2013 to 26-09-2013.
- Residual settlement caused 2mm.
- No movements caused by the EB TBM.
- Compensation grouting from Moorgate Shaft 1 caused maximum 2-3mm of heave from 08-07-2014 to 22-07-2014.
- The combination between PTW and PTE caused maximum 14-15mm of settlement from 23-07-2014 to 09-09-2014.
- Compensation grouting caused maximum 4-5mm from 03-09-2014 to 18-09-2014.
- CP4 works caused maximum 5-6mm of settlement from 17-09-2014 to 16-10-2014.
- Maximum Longitudinal displacement -8mm.
- Maximum Transversal displacement -8mm.
- Maximum settlement captured at the end of the works -29mm.

4. The Smokery:

Monitoring data for these prisms is presented in Appendix B.

- WB TBM caused maximum 2mm of settlement from 22-08-2013 to 24-08-2013.
- EB TBM caused maximum 3-4mm of settlement from 13-01-2014 to 15-01-2014.
- Residual settlement caused 4-5mm.
- The combination between PTW and PTE caused maximum 20-22mm of settlement from 22-06-2014 to 09-09-2014.
- CP4 caused maximum 2-3mm of settlement from 17-09-2014 to 16-10-2014.
- Maximum Longitudinal displacement 16mm.
- Maximum Transversal displacement 15mm.
- Maximum settlement captured at the end of the works -30mm.

5. 35-37 Greenhill's Rent:

Monitoring data for these prisms is presented in Appendix B.

- TaM's installations from Moorgate Shaft 3 caused maximum 2-3mm of heave settlement from 23-07-2013 to 04-09-2013.
- WB TBM caused maximum 2mm of settlement from 25-09-2013 to 26-09-2013.
- EB TBM caused maximum 2-3mm of settlement from 13-01-2014 to 14-01-2014.
- Residual settlement caused 5-6mm.
- Compensation grouting from Moorgate Shaft 3 caused maximum 6-7mm of heave from 04-07-2014 to 13-07-2014.
- The combination between PTW and PTE caused maximum 14-16mm of settlement from 22-06-2014 to 09-09-2014.
- Compensation grouting caused maximum 5-6mm of heave from 06-09-2014 to 14-09-2014.
- CP4 construction works caused maximum 8-10mm of settlement from 17-09-2014 to 16-10-2014.
- Maximum Longitudinal displacement -6mm.
- Maximum Transversal displacement -9mm.
- Maximum settlement captured at the end of the works -30mm.

6. 2-3 Cowcross St:

Monitoring data for these prisms is presented in Appendix B.

- TaM's installations from Moorgate Shaft 1 caused maximum 2-3mm of heave from 27-08-2013 to 14-01-2014.
- No movements caused by the WB TBM.
- EB TBM caused maximum 4-5mm of settlement from 13-01-2014 to 14-01-2014.
- Residual settlement caused 4-5mm.
- Compensation grouting from Moorgate Shaft 1 caused maximum 7-8mm of heave from 06-08-2014 to 17-08-2014.
- The combination between PTW and PTE caused maximum 13-14mm of settlement from 22-06-2014 to 12-10-2014.
- CP4 construction works caused 4-5mm of settlement from 17-09-2014 to 16-10-2014.
- Maximum Longitudinal displacement -12mm.
- Maximum Transversal displacement 18mm.
- Maximum settlement captured at the end of the works -24mm.



## C.2 Trigger Breaches

The Instrumentation and Monitoring Plan: Farringdon Station Ground Movement and Asset Protection C122-OVE-C2-RGN-M123-50013 outlines the triggers associated with the works.

In this case, buildings which are within Moorgate Spur Shafts No.1 or No.3 ZOI, trigger values associated to are:

- DEFAULT ALERT (in any direction): 10mm

On the other hand, triggers associated to monitoring installed in The Smokery building outside compensation grouting area are as follow:

- DEFAULT ALERT (in any direction): 10mm
- GREEN: 24mm settlement
- AMBER: 30mm settlement
- RED: 38mm settlement

The Table 3 below shows the 10mm default alerts and the triggers breached:

MONITORING GROUP (Location)	POINT ID	TYPE	DIRECTION	DATE OF LAST READING	LAST READING VALUE (mm)	TRIGGER LEVEL	
						WORST HISTORICAL STATUS	CURRENT STATUS
THE SMOKERY	C435-RP01701	AUTOMATIC RP	Settlement	12/06/2015 11:00	-30.6	Amber	Amber
	C435-RP01702	AUTOMATIC RP	Settlement	20/04/2015 12:00	-22.5	Default Alert	Default Alert
	C435-RP01703	AUTOMATIC RP	Settlement	03/06/2013 06:00	0.7	Clear	Clear
	C435-RP01705	AUTOMATIC RP	Settlement	28/09/2015 12:00	-13.6	Default Alert	Default Alert
	C435-RP01706	AUTOMATIC RP	Settlement	28/09/2015 12:00	-19.1	Default Alert	Default Alert
1 COWCROSS STREET	C435-RP01707	AUTOMATIC RP	Settlement	28/09/2015 12:00	-23.5	Default Alert	Default Alert
2 COWCROSS STREET	C435-RP01709	AUTOMATIC RP	Settlement	28/09/2015 12:00	-23.7	Default Alert	Default Alert
35-37 GREENHILL'S RENTS	C435-RP01710	AUTOMATIC RP	Settlement	28/09/2015 12:00	-26.8	Default Alert	Default Alert
2 COWCROSS STREET	C435-RP01711	AUTOMATIC RP	Settlement	28/09/2015 12:00	-18.2	Default Alert	Default Alert
35-37 GREENHILL'S RENTS	C435-RP01712	AUTOMATIC RP	Settlement	28/09/2015 12:00	-28.5	Default Alert	Default Alert
THE SMOKERY	C435-RP01714	AUTOMATIC RP	Settlement	28/09/2015 12:00	-14.6	Default Alert	Default Alert
	C435-RP01715	AUTOMATIC RP	Settlement	28/09/2015 12:00	-18.4	Default Alert	Default Alert
	C435-RP01716	AUTOMATIC RP	Settlement	28/09/2015 12:00	-17.5	Default Alert	Default Alert
	C435-RP01717	AUTOMATIC RP	Settlement	28/09/2015 12:00	-21.3	Default Alert	Default Alert
	C435-RP01718	AUTOMATIC RP	Settlement	28/09/2015 12:00	-21.1	Default Alert	Default Alert
	C435-RP01719	AUTOMATIC RP	Settlement	28/09/2015 12:00	-25.2	Green	Green
77a CHARTERHOUSE STREET	C435-RP01726	AUTOMATIC RP	Settlement	28/09/2015 13:00	-25.6	Default Alert	Default Alert
	C435-RP01727	AUTOMATIC RP	Settlement	28/09/2015 13:00	-26	Default Alert	Default Alert
	C435-RP01729	AUTOMATIC RP	Settlement	28/09/2015 13:00	-23.3	Default Alert	Default Alert
	C435-RP01730	AUTOMATIC RP	Settlement	28/09/2015 13:00	-22.9	Default Alert	Default Alert
79-83 CHARTERHOUSE STREET	C435-RP01731	AUTOMATIC RP	Settlement	28/09/2015 13:00	-18.9	Default Alert	Default Alert
	C435-RP01732	AUTOMATIC RP	Settlement	28/09/2015 13:00	-18.5	Default Alert	Default Alert
	C435-RP01733	AUTOMATIC RP	Settlement	28/09/2015 13:00	-18	Default Alert	Default Alert
2 COWCROSS STREET	C435-RP01734	AUTOMATIC RP	Settlement	28/09/2015 13:00	-22.3	Default Alert	Default Alert
	C435-RP01735	AUTOMATIC RP	Settlement	28/09/2015 12:00	-15.8	Default Alert	Default Alert
	C435-RP01736	AUTOMATIC RP	Settlement	28/09/2015 12:00	-24.7	Default Alert	Default Alert
87 CHARTERHOUSE STREET	C435-RP01737	AUTOMATIC RP	Settlement	28/09/2015 13:00	-24.2	Default Alert	Default Alert
	C435-RP01738	AUTOMATIC RP	Settlement	28/09/2015 12:00	-26.5	Default Alert	Default Alert
	C435-RP01739	AUTOMATIC RP	Settlement	28/09/2015 12:00	-26.8	Default Alert	Default Alert
79-83 CHARTERHOUSE STREET	C435-RP01740	AUTOMATIC RP	Settlement	28/09/2015 13:00	-18.8	Default Alert	Default Alert
	C435-RP01741	AUTOMATIC RP	Settlement	28/09/2015 13:00	-25.3	Default Alert	Default Alert
35-37 GREENHILL'S RENTS	C435-RP01742	AUTOMATIC RP	Settlement	28/09/2015 13:00	-30.2	Default Alert	Default Alert
	C435-RP01743	AUTOMATIC RP	Settlement	28/09/2015 12:00	-28.5	Default Alert	Default Alert
	C435-RP01744	AUTOMATIC RP	Settlement	28/09/2015 12:00	-27	Default Alert	Default Alert
87 CHARTERHOUSE STREET	C435-RP01745	AUTOMATIC RP	Settlement	28/09/2015 12:00	-26.5	Default Alert	Default Alert
	C435-RP01746	AUTOMATIC RP	Settlement	28/09/2015 12:00	-25.9	Default Alert	Default Alert
	C435-RP01747	AUTOMATIC RP	Settlement	28/09/2015 12:00	-24.8	Default Alert	Default Alert
	C435-RP01748	AUTOMATIC RP	Settlement	28/09/2015 12:00	-25.3	Default Alert	Default Alert
	C435-RP01749	AUTOMATIC RP	Settlement	28/09/2015 12:00	-25.8	Default Alert	Default Alert
78-83 CHARTERHOUSE STREET	C435-RP01750	AUTOMATIC RP	Settlement	28/09/2015 13:00	-29.8	Default Alert	Default Alert
	C435-RP01751	AUTOMATIC RP	Settlement	28/09/2015 13:00	-30.4	Default Alert	Default Alert
	C435-RP01752	AUTOMATIC RP	Settlement	28/09/2015 13:00	-30	Default Alert	Default Alert
	C435-RP01753	AUTOMATIC RP	Settlement	28/09/2015 13:00	-28.9	Default Alert	Default Alert
	C435-RP01754	AUTOMATIC RP	Settlement	28/09/2015 13:00	-28.4	Default Alert	Default Alert

Table 3 – Default Alerts and Triggers breached by the prisms read by ATS17

## C.3 Significant issues with the Instrumentation

Prism C435-RP01703 installed on The Smokery western facade was covered by vegetation from 03/06/2013 onwards.

Prism C435-RP01704 to be located on The Smokery façade was never installed as result of the lack of line of sight from any ATS.



#### **C.4 Residual Risks**

The rate of settlement for all instrumentation within this report has been analysed and in all cases the rate is less than 2mm/year.

#### **D. CONCLUSIONS**

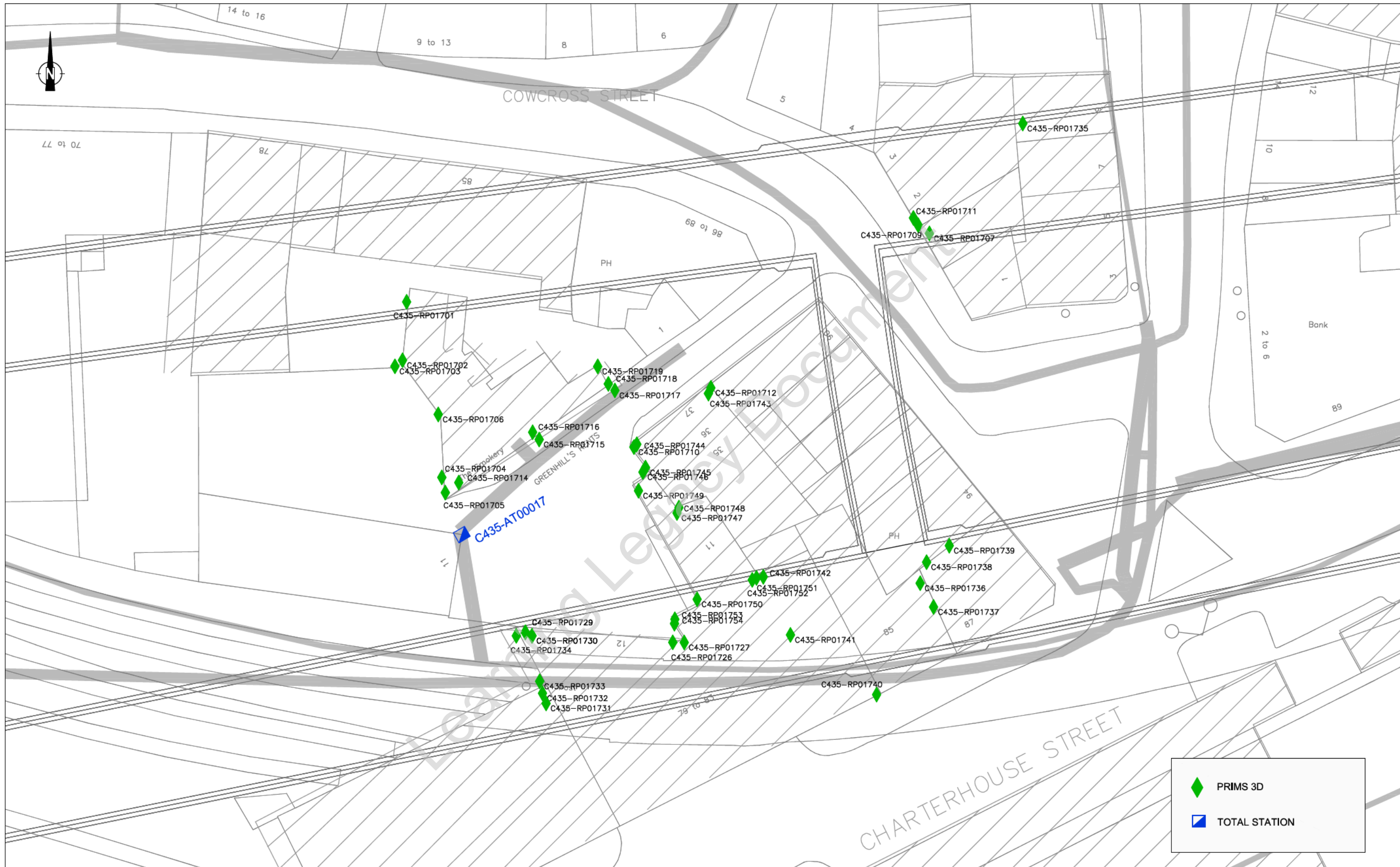
Monitoring showing stability. No residual risks remain. Long term monitoring to be completed by Crossrail.

As per C435-PMI-00549 the Long Term Monitoring has been ceased in this area and subsequently all monitoring associated is no longer done by BFK. The last measurement carried out for these devices on 28/09/2015.

Learning Legacy Document

APPENDIX A: DRAWINGS

Learning Legacy Document



Notes:



**GEOCISA UK**

C/ Los Llanos de Jerez 10-12  
28823- MADRID  
www.geocisa.com



Contract : C435 I&M FARRINGDON

Originator : GEOCISA

Location : CROSSRAIL GENERAL

Title :

3D PRIMS ATS17

By :

Chk :

App :

Auth :

**GEOCISA**

Scale : @ A3

Drg No : C435-BFK-C2-RGN-M123-50062-IR-RP-ATS17

Rev :

Sult :

\$Pby\$

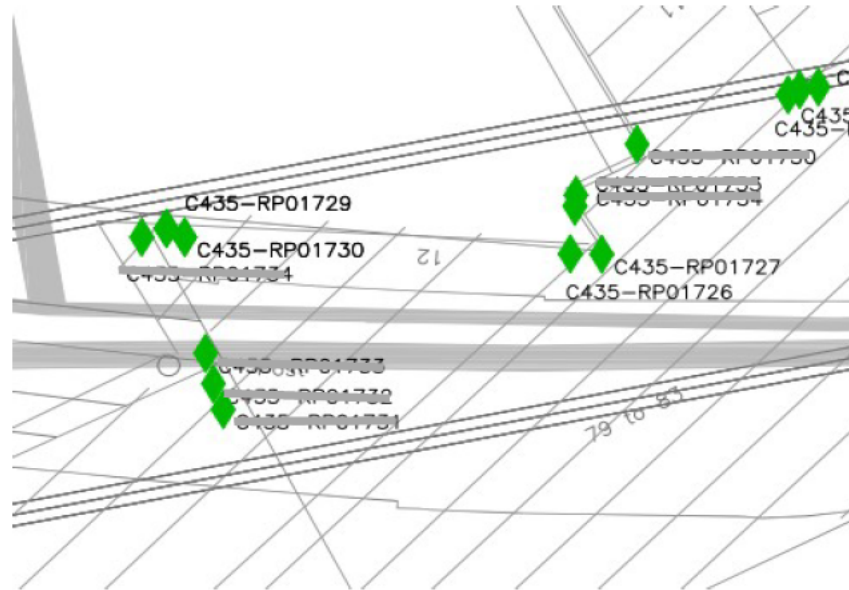
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APPENDIX B: GRAPHS

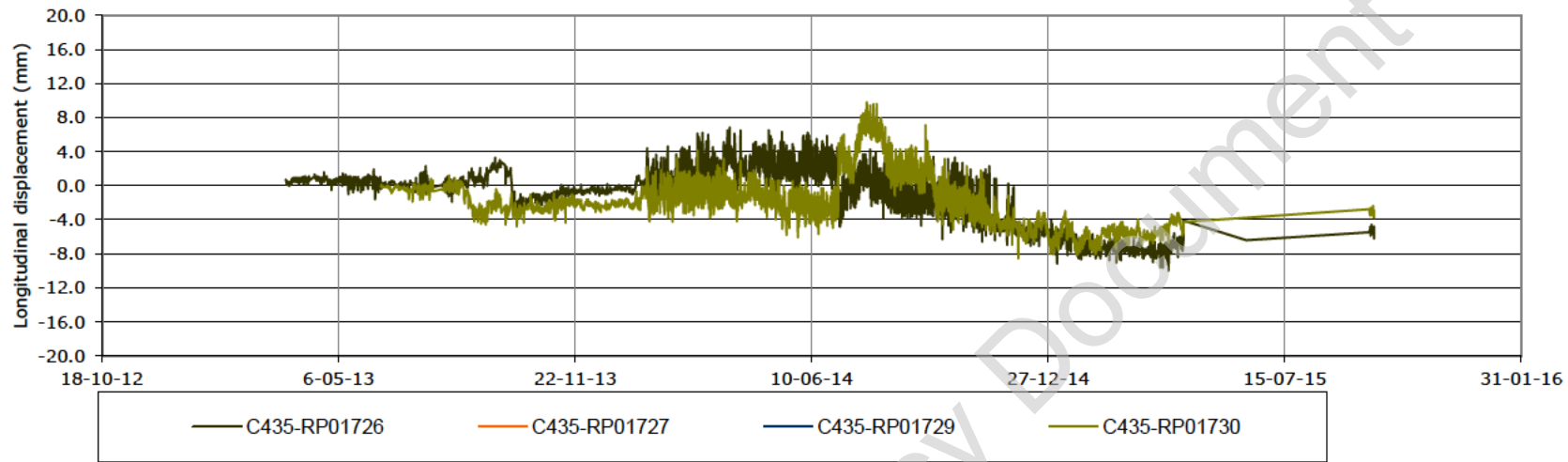
Learning Legacy Document



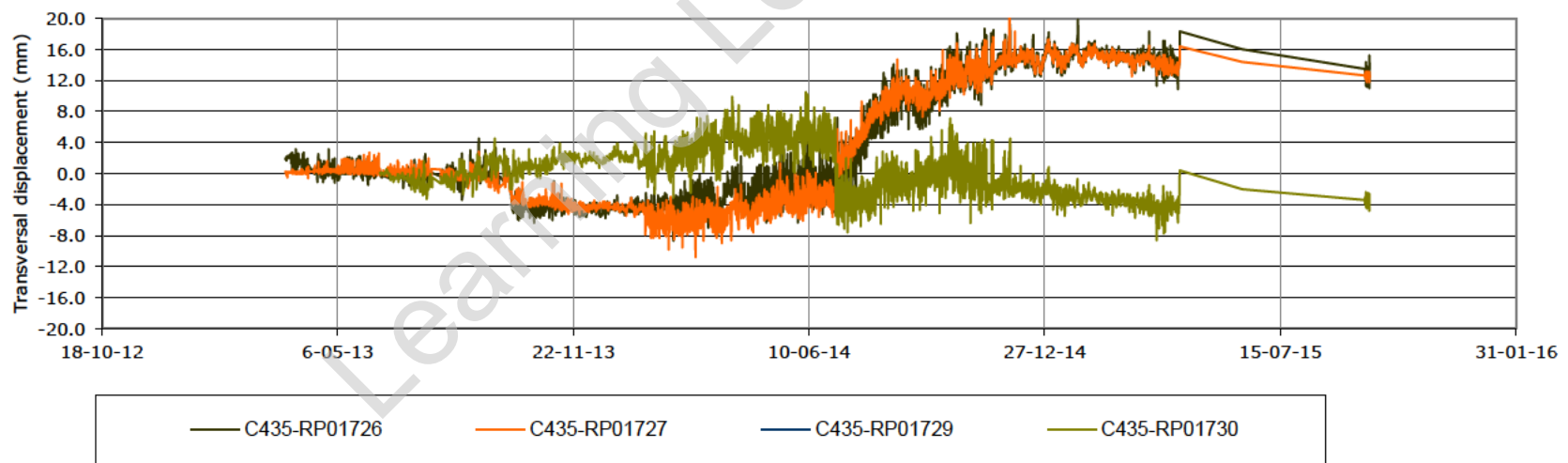
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 AREA Farringdon Station  
 DEVICE 3D Target



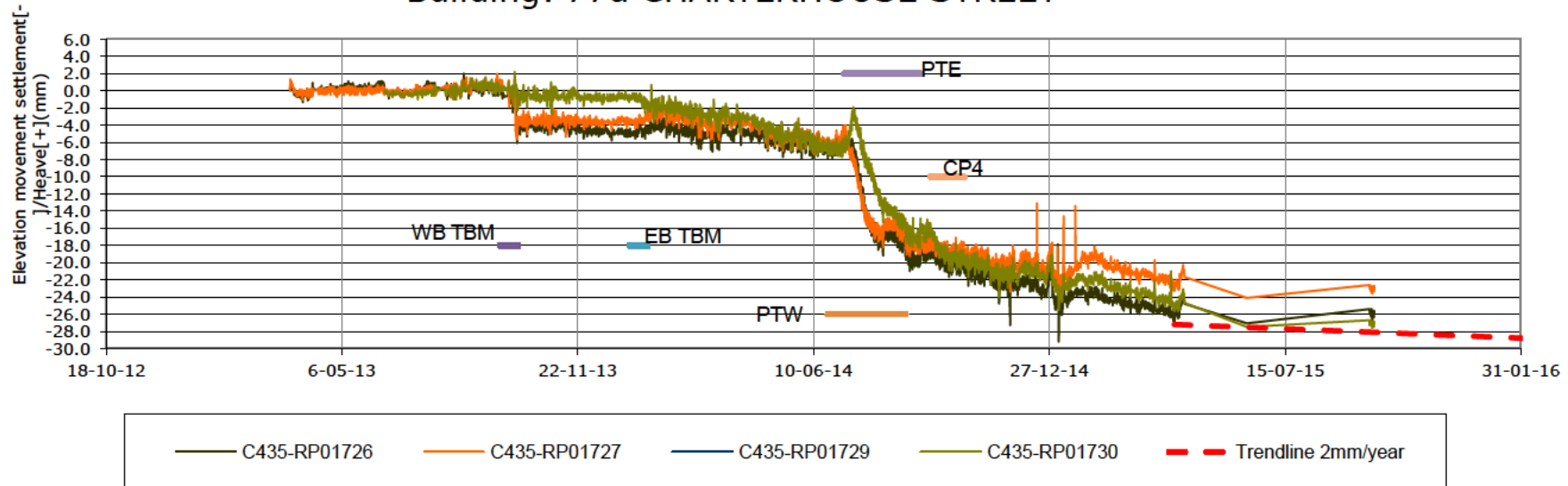
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Building: 77a CHARTERHOUSE STREET

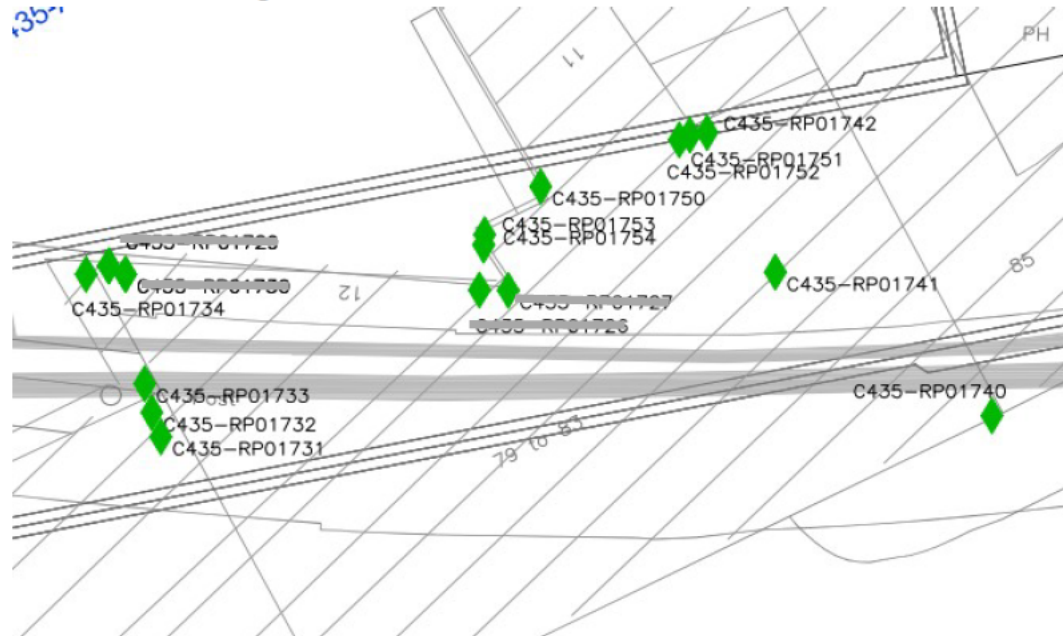


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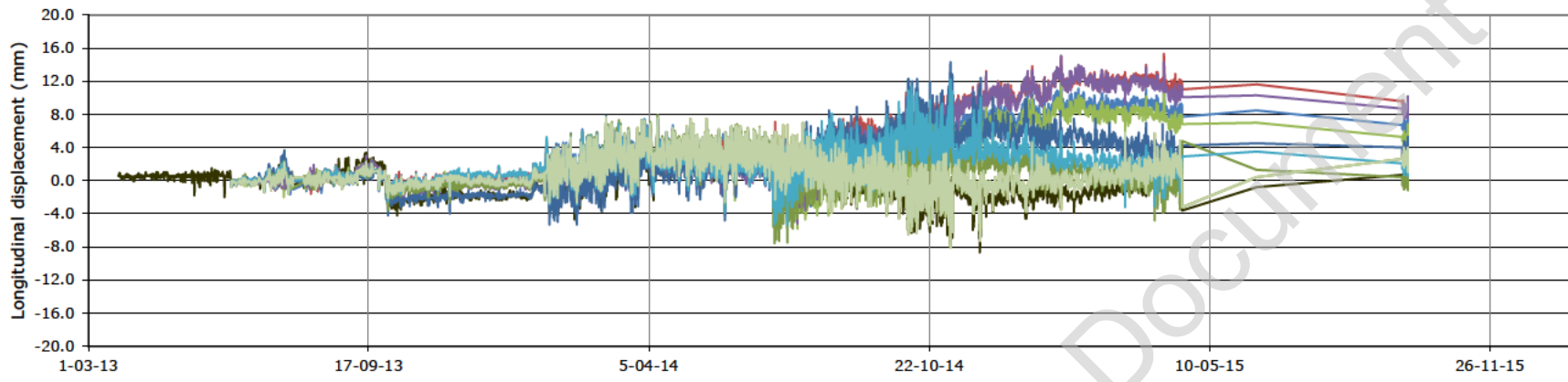


REMARKS:

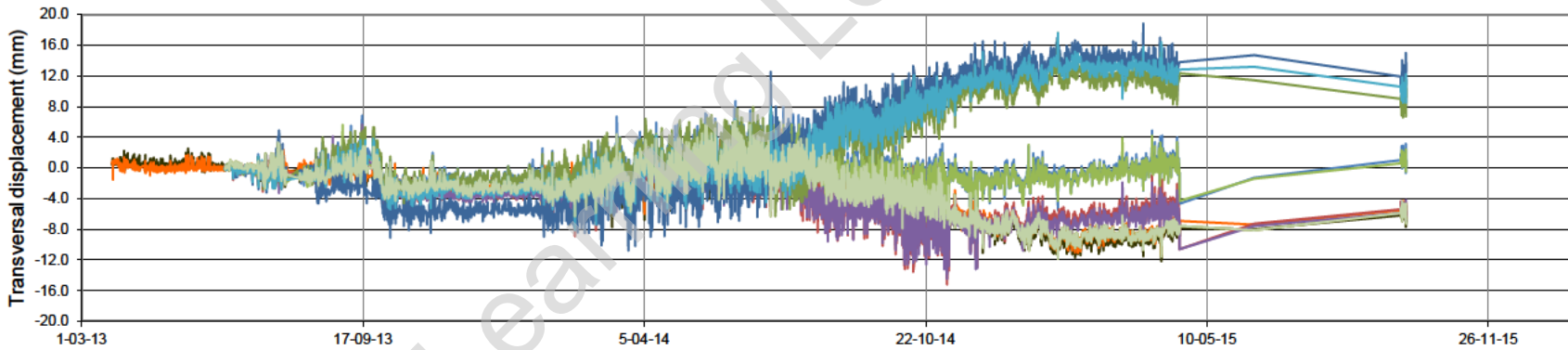
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 AREA Farringdon Station  
 DEVICE 3D Target



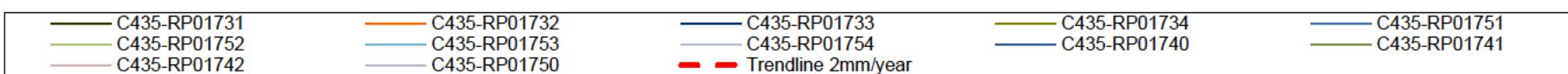
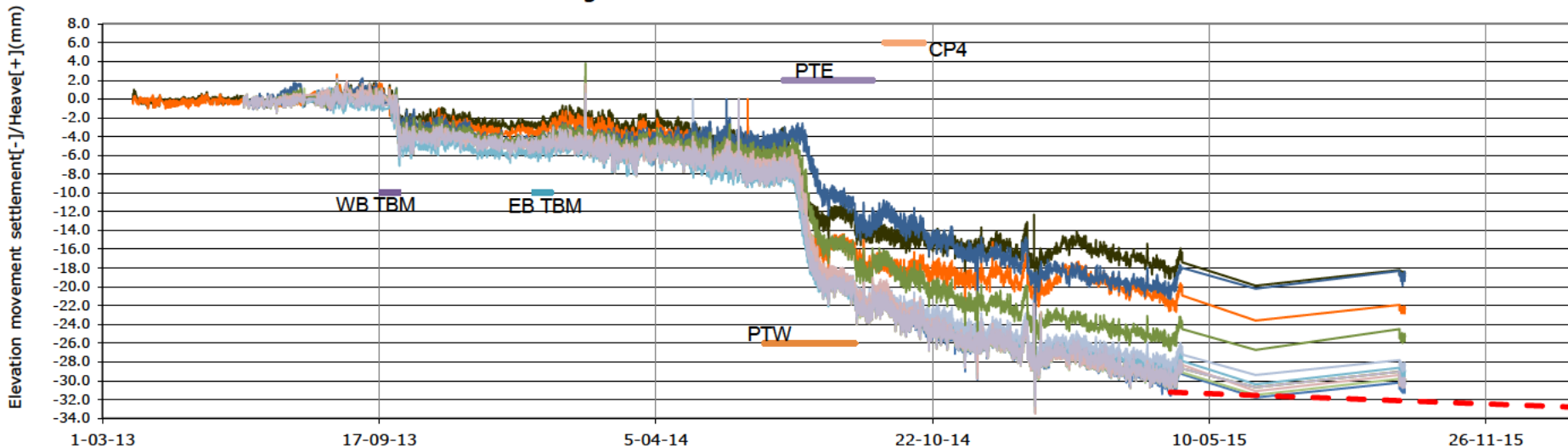
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Building: 79-83 CHARTERHOUSE STREET



Building: 79-83 CHARTERHOUSE STREET

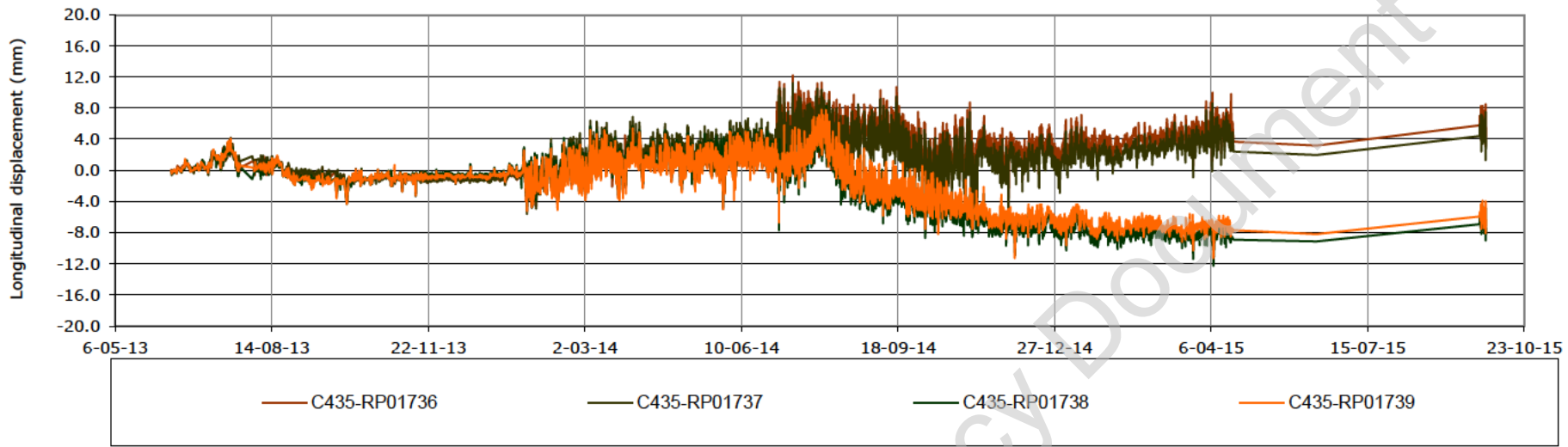


REMARKS:

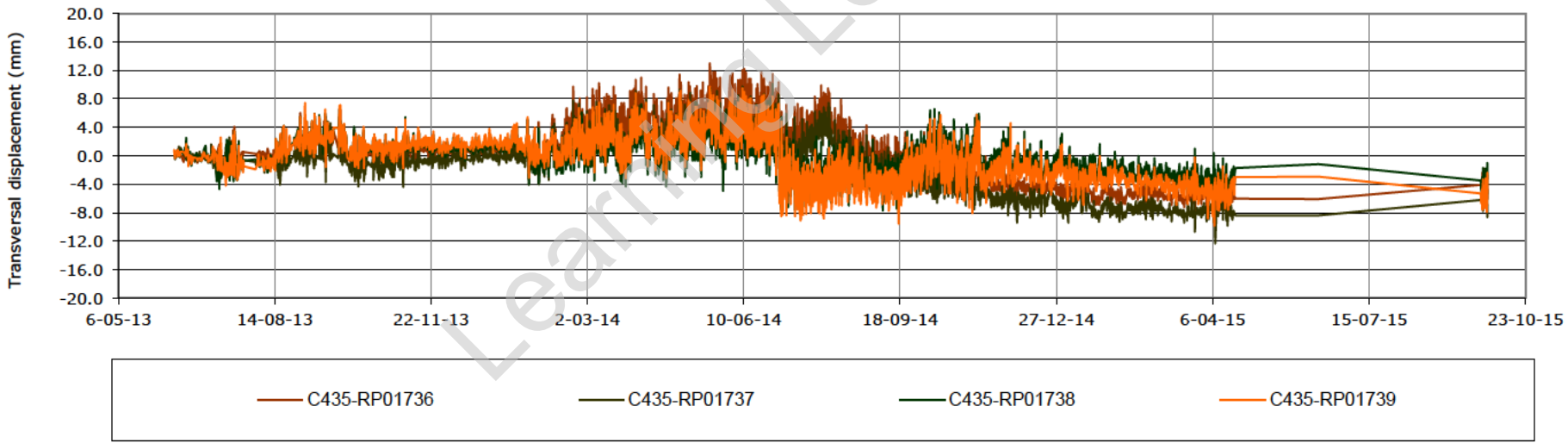
REPORT Automatic Prisms  
 AREA Farringdon Station  
 DEVICE 3D Target



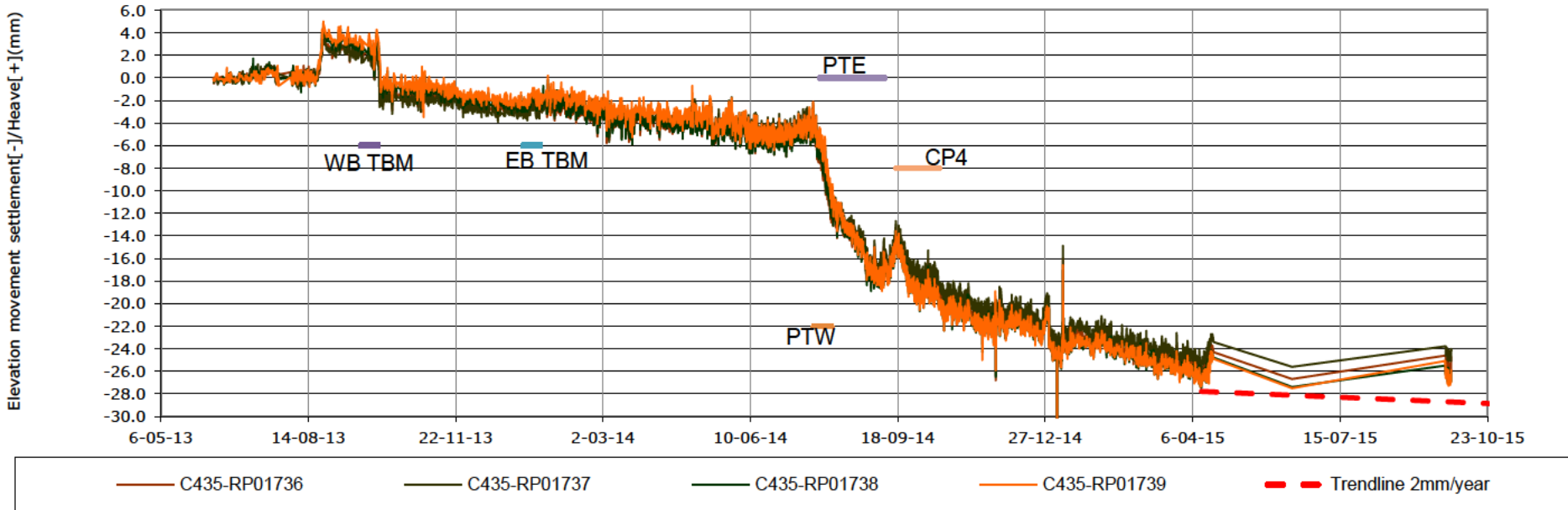
Building: 87 CHARTERHOUSE STREET ROOF



Building: 87 CHARTERHOUSE STREET ROOF



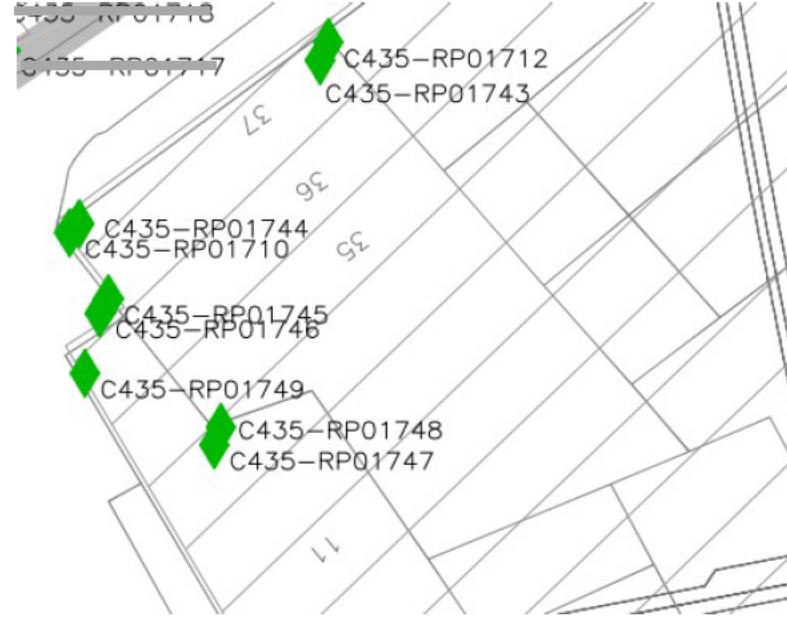
Building: 87 CHARTERHOUSE STREET ROOF



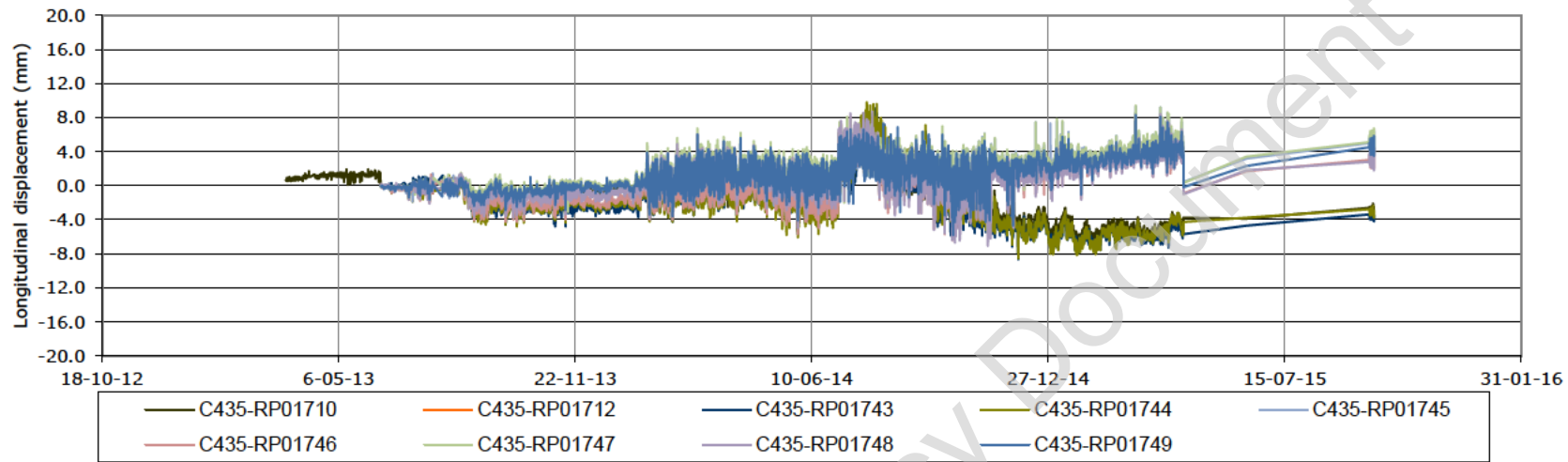
REMARKS:



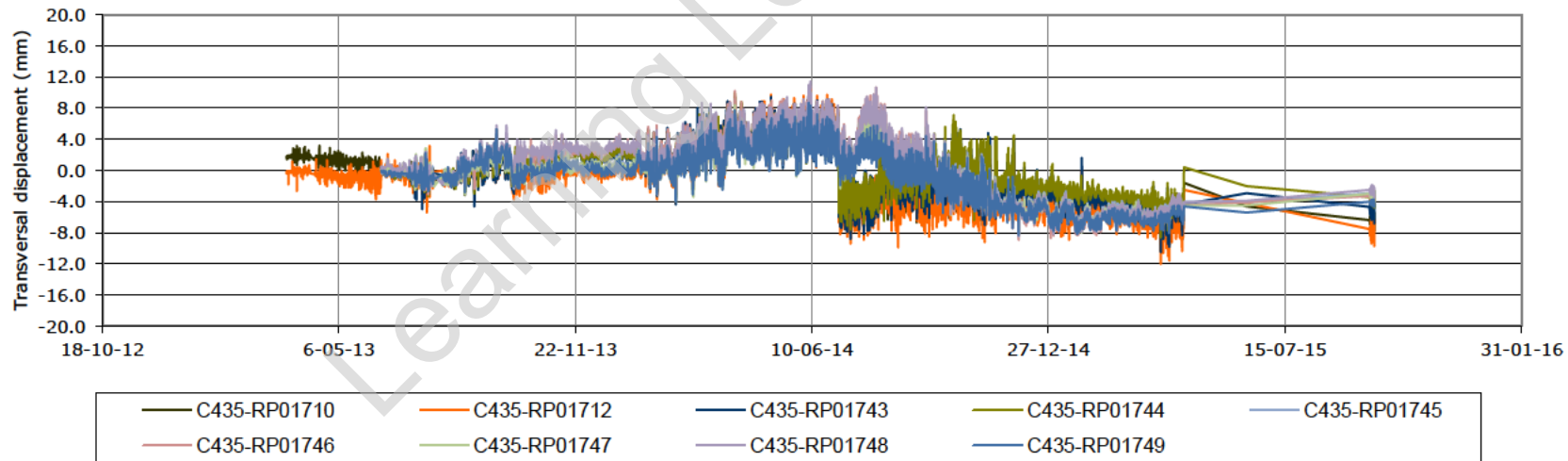
**REPORT** Automatic Prisms  
**AREA** Farringdon Station  
**DEVICE** 3D Target



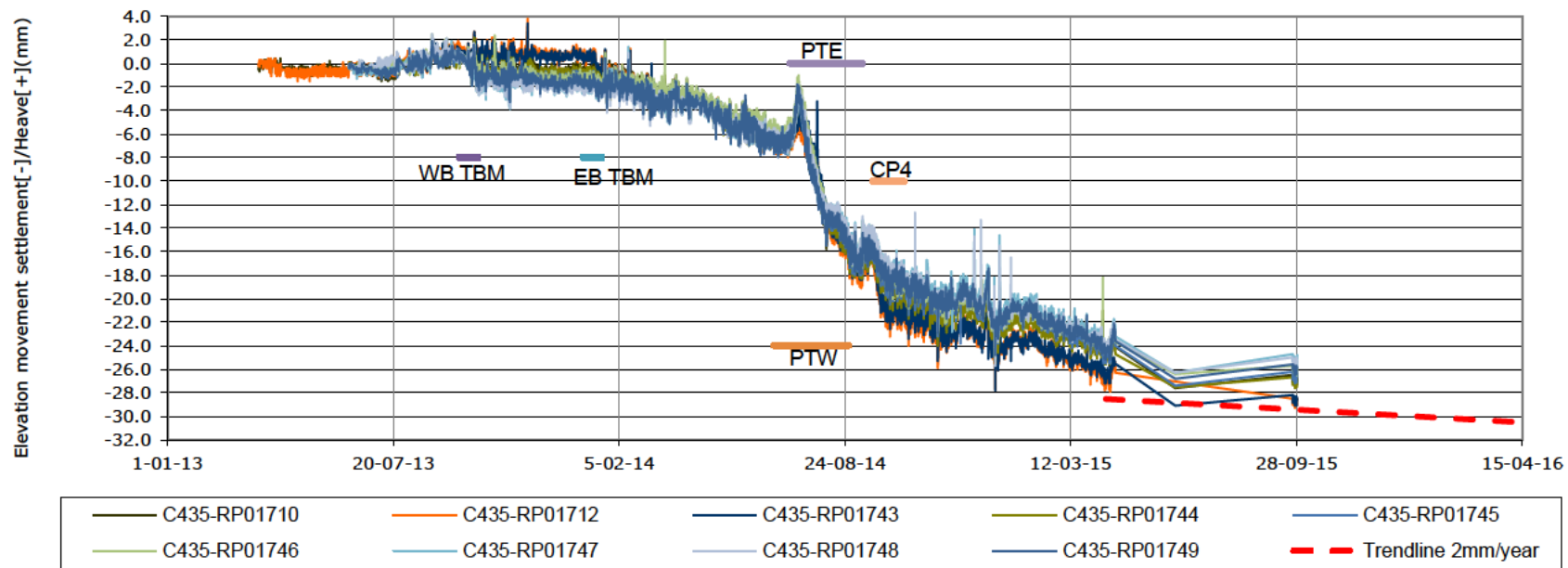
Building: 35-37 GREENHILL'S RENTS



Building: 35-37 GREENHILL'S RENTS



Building: 35-37 GREENHILL'S RENTS



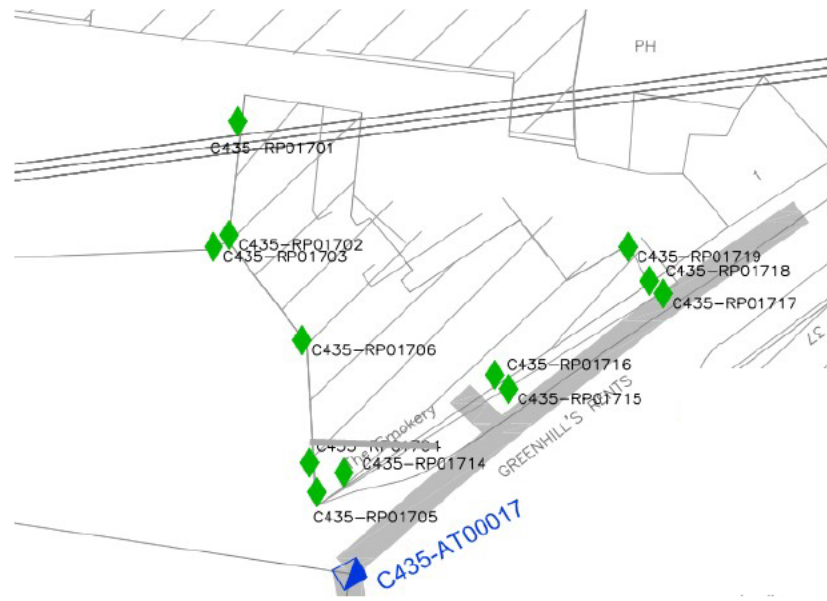
**REMARKS:**

(This area is reserved for additional remarks or observations regarding the prism data and building movement.)

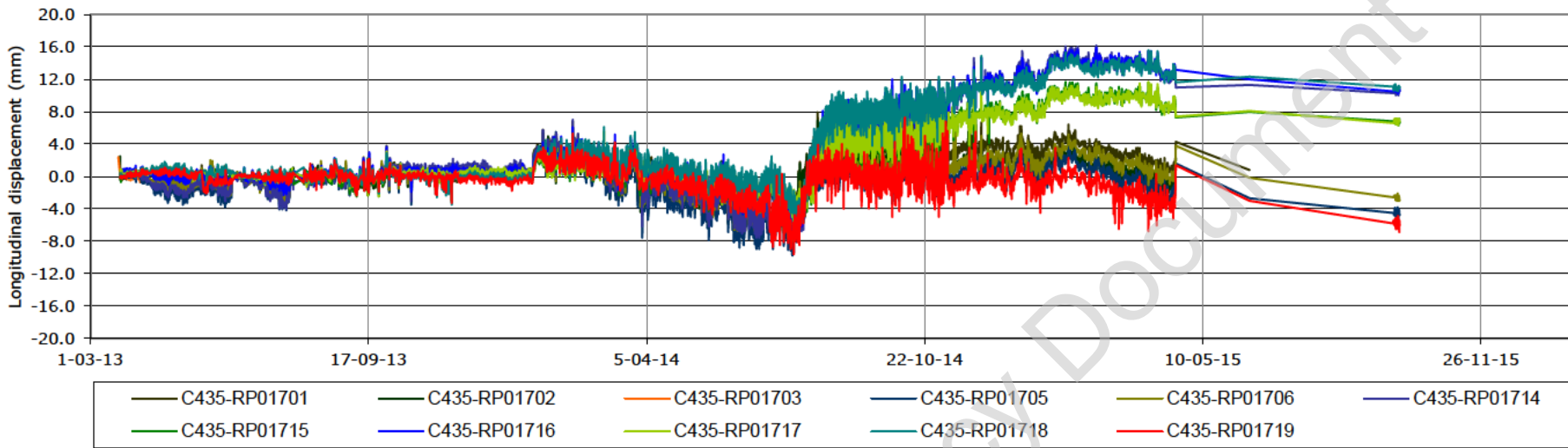




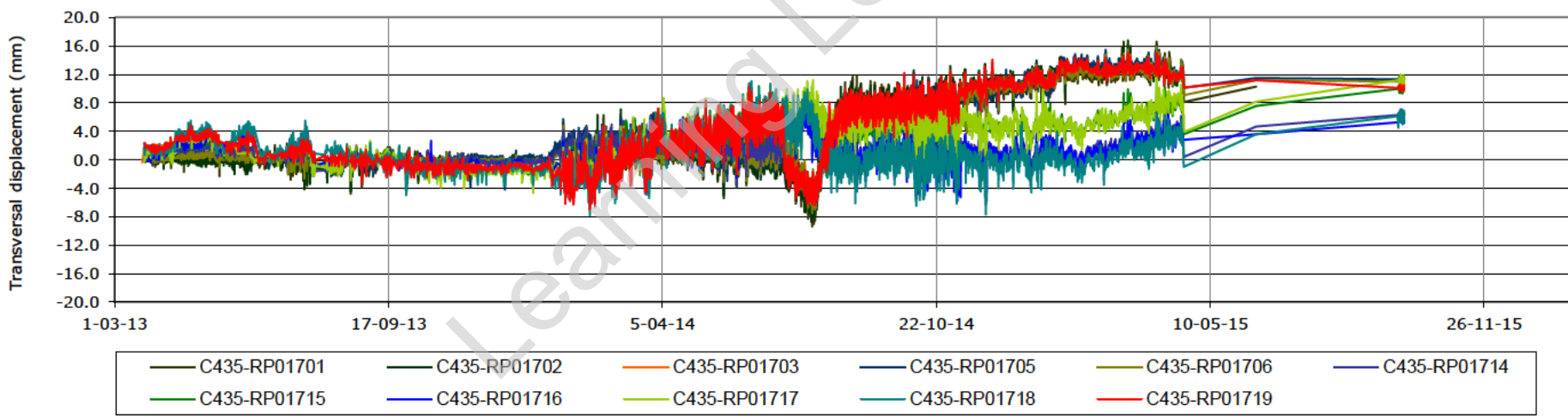
**REPORT** Automatic Prisms  
**AREA** Farringdon Station  
**DEVICE** 3D Target



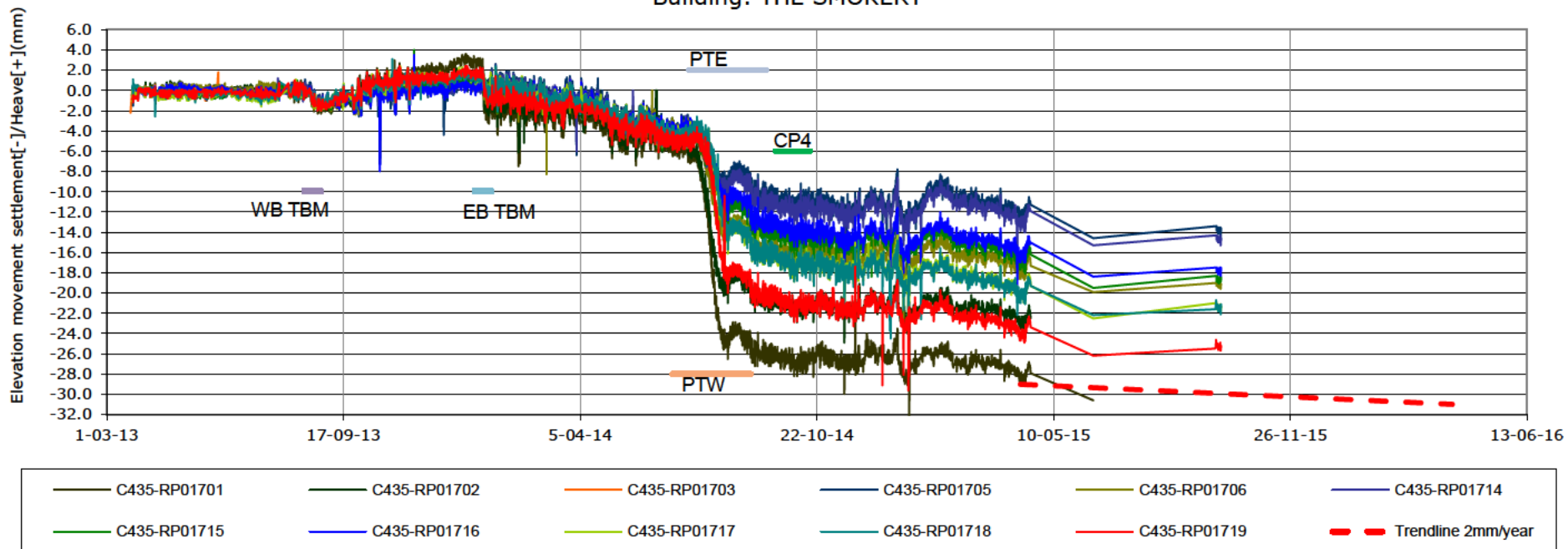
Building: THE SMOKERY



Building: THE SMOKERY



Building: THE SMOKERY



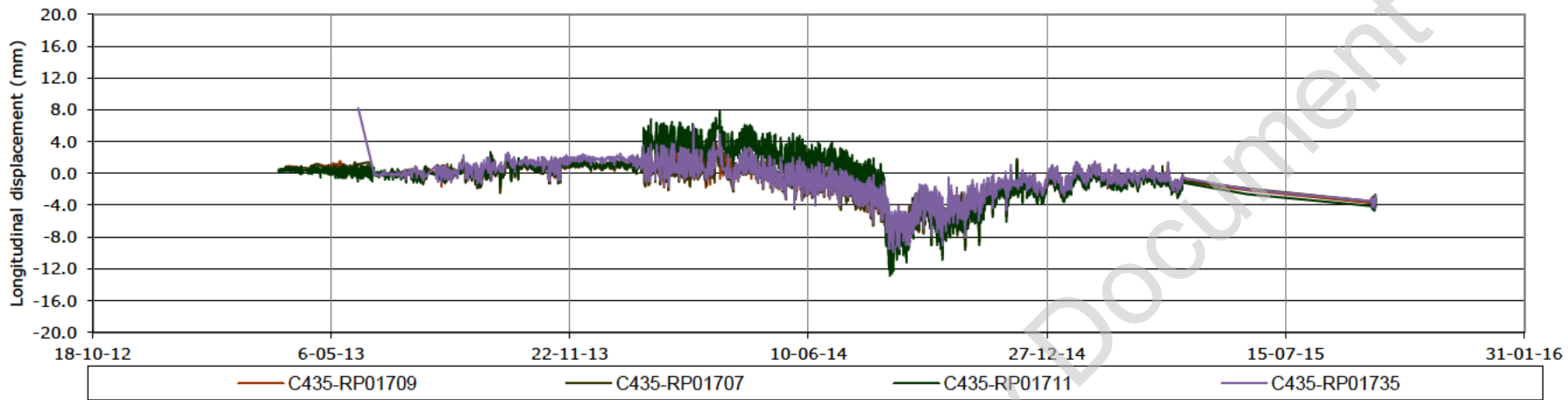
**REMARKS:**

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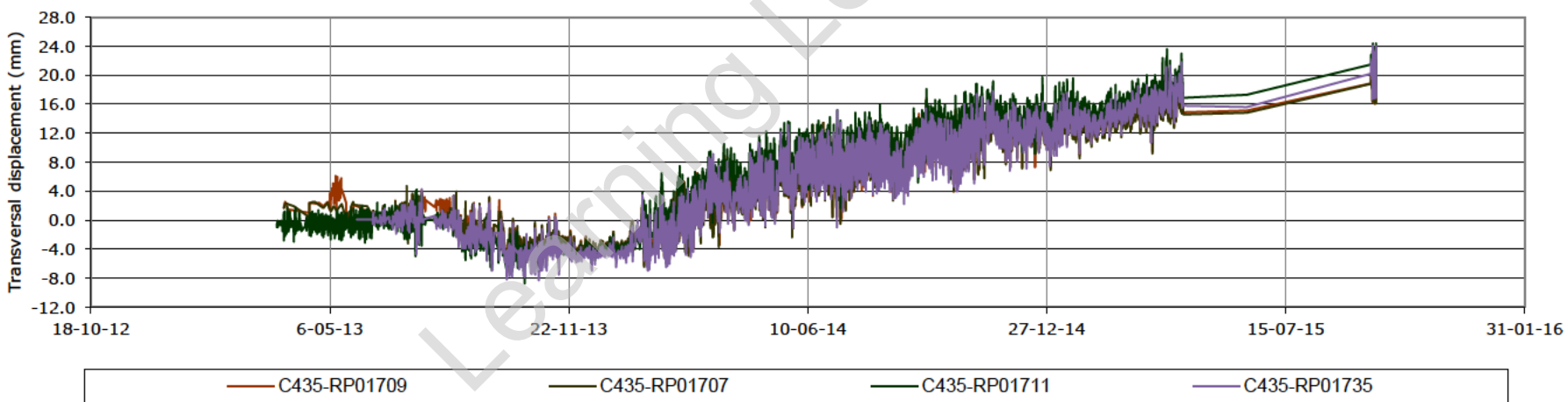
REPORT Automatic Prisms  
 AREA Farringdon Station  
 DEVICE 3D Target



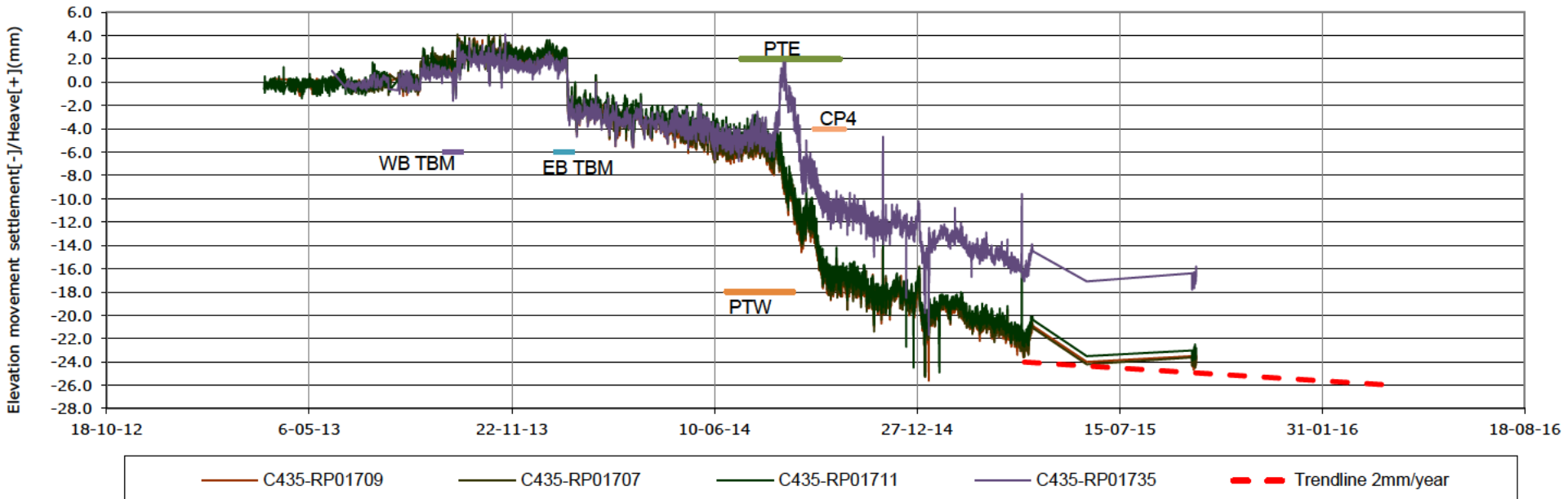
Building: 2-3 COWCROSS STREET



Building: 2-3 COWCROSS STREET



Building: 2-3 COWCROSS STREET



REMARKS:

[Empty box for remarks]

## APPENDIX C: GLOSSARY

- ATS Automatic Total Station.
- ETH Eastern Ticket Hall.
- WB Westbound.
- TBM Tunnel Boring Machine.
- EB Eastbound.
- PTW Platform Tunnel West.
- PTE Platform Tunnel East.
- CP Cross Passages.
- CH Concourse Hall.
- ZOI Zone Of Influence.
- VA Ventilation Adit.
- STE Stub Tunnel East.
- STW Stub Tunnel West.
- RTE Running Tunnel East.
- ES Escalator Shaft.
- TaM Tube a Manchette.

Learning Legacy Document