

## C510 – Whitechapel and Liverpool Street Station Tunnels

### Instrumentation and Monitoring Close Out Report Block 16 Liverpool Street

CRL Document Number: C510-BBM-C2-RGN-C101-50237

Supplier Document Number: N/A

Contract MDL reference: C13.014

#### 1. Contractor Document Submittal History:

Revision:	Date:	Prepared by:	Checked by:	Approved by:	Reason for Issue:
3.0	25/10/2017	[Redacted]	[Redacted]	[Redacted]	For Acceptance

#### 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"/>
					<input type="checkbox"/>

#### 3. Acceptance by Crossrail:

		<b>Crossrail Review and Acceptance Decal</b>	
This decal is to be used for submitted documents requiring acceptance by Crossrail.			
<input checked="" type="checkbox"/>	Code 1.	Accepted. Work May Proceed	
<input type="checkbox"/>	Code 2.	Not Accepted. Revise and resubmit. Work may proceed subject to incorporation of changes indicated	
<input type="checkbox"/>	Code 3.	Not Accepted. Revise and resubmit. Work may not proceed	
<input type="checkbox"/>	Code 4.	Received for information only. Decal is not issued	
[Redacted Signature]			Date: 09/11/17
Crossrail approval of design, details, calculations,			

Document Revision History		
Revision	Date	Purpose
1.0	15/02/2017	For approval
2.0	21/06/2017	For approval
3.0	31/10/2017	For approval

## TABLE OF CONTENTS

<b>1</b>	<b>Purpose of Close out Report .....</b>	<b>4</b>
<b>2</b>	<b>Scope of Monitoring Assessment for Close Out .....</b>	<b>5</b>
<b>3</b>	<b>Close Out Report Block Description and Location Plan .....</b>	<b>6</b>
3.1	<b>Block 16 Location .....</b>	<b>6</b>
3.2	<b>Block 16 Description.....</b>	<b>7</b>
<b>4</b>	<b>Construction Programme Influencing Block 16 .....</b>	<b>8</b>
4.1	<b>Tunnel Advances Affecting Block 16 .....</b>	<b>10</b>
<b>5</b>	<b>Monitoring Assessment of Block 16 .....</b>	<b>11</b>
5.1	<b>Time Graphs Monitoring Full History and Construction Durations .....</b>	<b>12</b>
5.2	<b>Block 16 Decommissioning Status Tracker .....</b>	<b>15</b>
5.3	<b>Supplementary Evidence for Decommissioning.....</b>	<b>18</b>
5.4	<b>Monitoring sensor Location Plan and Decommissioning Status .....</b>	<b>19</b>
<b>6</b>	<b>Decommissioning Recommendations .....</b>	<b>22</b>
<b>7</b>	<b>Appendix 1 (Graphs, Tables and Figures of Rev.1) .....</b>	<b>23</b>
<b>8</b>	<b>Appendix 2 (Graphs, Tables and Figures of Rev.2) .....</b>	<b>34</b>

Learning Legacy Document

## Tables and Figures

<i>Figure 1- Liverpool St General Location Plan - including Block 16 monitoring area .....</i>	6
<i>Figure 2 - Block 16 ZOI Constructions.....</i>	9
<i>Figure 3- Block 16 Monitoring Not Considered for Decommissioning in Revision 1.....</i>	11
<i>Figure 4- Blomfield Street Site Hoarding.....</i>	18
<i>Figure 5- LB &amp; LC Monitoring Sensor Settlement Status and Location Plan .....</i>	20
<i>Figure 6- LP Monitoring Sensor Settlement Status and Location Plan.....</i>	21
<i>Graph 1- All Remaining Block 16 BREs &amp; Invar Scales (LB &amp; LC) Manual Monitoring History in Relation to Construction .....</i>	13
<i>Graph 2- All Remaining Block 16 Road Studs (LP) Manual Monitoring History in Relation to Construction ..</i>	14
<i>Table 1- Tunnel Advances Affecting Block 16.....</i>	10
<i>Table 2- Block 16 Decommissioning Status Tracker .....</i>	17

Learning Legacy Document

(From General Document Template ref: BBMV-Form-S9-04 rev 5.0)

## 1 Purpose of Close out Report

Materials and Workmanship Specification - Instrumentation and Monitoring (C122-OVE-Z4-RSP-CR001-00007), section KX10.2114 specifies the requirement for a close out report prior to the decommissioning of monitoring sensors and instruments. It is therefore, the purpose of this close out report to gain acceptance to decommission identified monitoring sensors in Block 16 of Crossrail's C510 Liverpool St. Acceptance to decommission sensors will result in ceasing measurements, stopping the reporting and removing sensors.

To gain approval to decommission instrumentation and monitoring, the monitoring data will be analysed to demonstrate settlement does not breach specified rates after the minimum monitoring period is complete.

This revision of the close out report (revision 3) proposes to decommission all remaining sensors not agreed in revision 2. The summary table, associated graphs and figures for sensors agreed to be decommissioned in revision 1 and 2 are provided in appendix 1 and 2, respectively.

**N.B.** Monitoring sensors refers to all monitoring points; which includes BREs, road studs, extensometers, inclinometers, tilt meters, crack meters, retros (survey stickers) and prisms. Please note this is not an exhaustive list and does not include monitoring systems/equipment, such as communication boxes.

## 2 Scope of Monitoring Assessment for Close Out

Specification KX10.4103 of document C122-OVE-Z4-RSP-CR001-00007 states that to establish approval for decommissioning, the contractor is to produce a close out report which summarises the observations in correlation with the construction activities. The report is to demonstrate monitoring has reached acceptable settlement rates; whether to the specified rate, or where no rate is specified trigger values are evaluated against potential residual risks. I&M schedule C122-OVE-C2-DDJ-CR001-Z-31511 specifies the acceptable settlement rates with the requirements to monitor at different construction phases, and duration for completion. To summarise the I&M schedule states that the manual monitoring decommissioning specified rate is 2mm per year, following 16 months post construction monitoring (4 months step down and quarterly measurements for a minimum of 12 months long term monitoring). The I&M schedule does not identify the need for long term automated monitoring or specify a settlement rate requirement, it only states that monitoring must continue for 6 months post construction. At the 6 month juncture, agreement must be sought from the project manager to decommission automated monitoring programmes through a close out report or agreeing to cease the works with the project manager. In most cases decommissioning will be possible, as the residual risk will be captured through the remaining long term manual monitoring.

Contrary to the Specification for Instrumentation and Monitoring (C122-OVE-Z4-RSP-CR001-00007), the Project Managers Instruction (PMI) C510-PMI-01102 replaces long term monitoring with satellite interferometry (InSAR) for the areas agreed by the project manager. If long term monitoring responsibilities are removed from BBMV and covered by satellite interferometry, the specified settlement criteria may not be met by BBMV. If this occurs, reference to the agreement will be provided to state BBMV are no longer responsible for the sensors and consequently decommissioning acceptance will be proposed.

In some cases it may be agreed with the project manager to cease monitoring prior to meeting the specified rates. The close out report will be revised to incorporate these agreements prior to decommissioning. Due to multiple influencers and large construction monitoring zones, it may be prudent to submit successive document revisions for close out reports, where the specification is not met or the minimum post construction monitoring has not been achieved.

### 3 Close Out Report Block Description and Location Plan

#### 3.1 Block 16 Location

Figure 1 shows the Liverpool St general location plan, C510 tunnel construction and where Block 16 is situated. Detailed location plans can be found within the installation reports and photomontages as listed in Section 3.2. Each monitoring sensor's location is shown within the assessment plans (Section 5.4).

A Thames Water 8 inch cast iron water main is located on Old Broad Street within close proximity to Block 16. Other utilities include plastic gas mains, brick sewers and numerous water mains. Location and details of these critical assets can be found in the Instrumentation and Monitoring Plan: Liverpool Street Station Ground Movement and Asset Protection C122-OVE-C2-RGN-C101-50013 or the relevant C122 prepared Damage Assessment Reports.

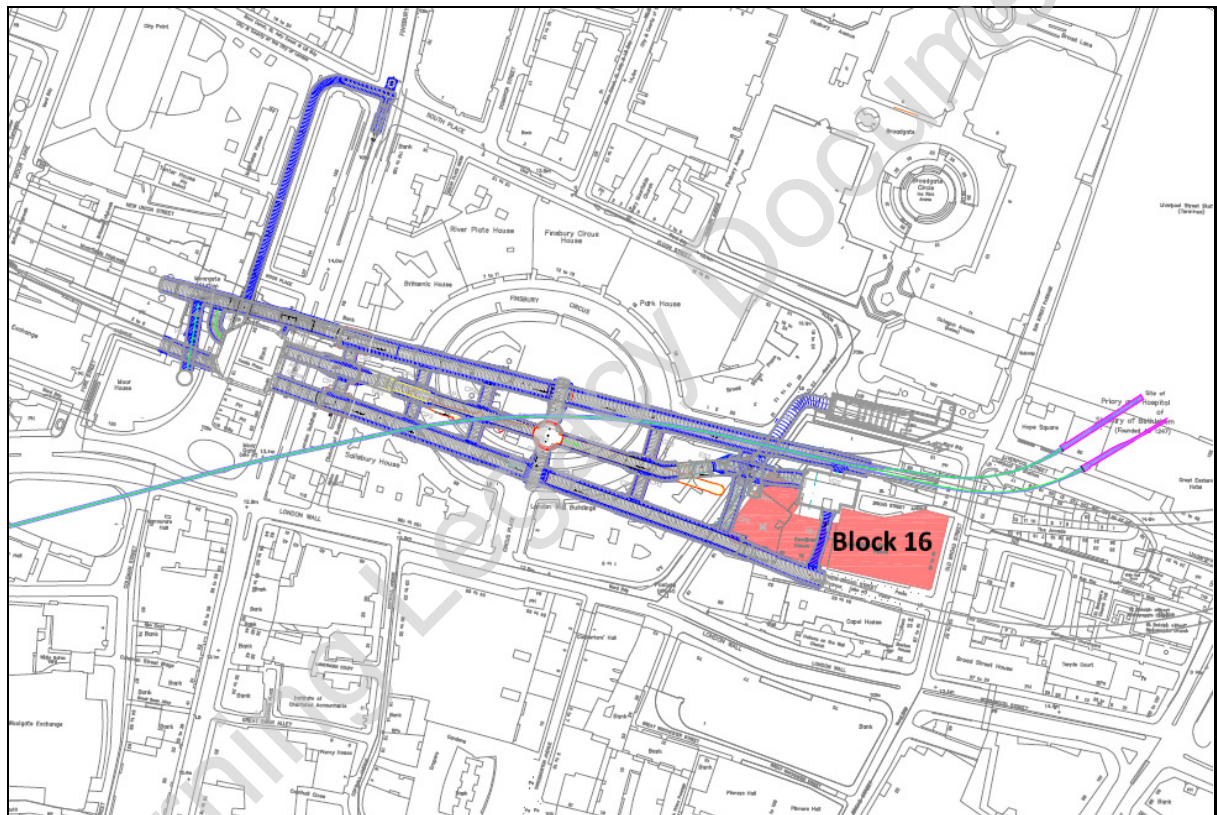


Figure 1- Liverpool St General Location Plan - including Block 16 monitoring area

### 3.2 Block 16 Description

Block 16 is located between Blomfield St and Old Broad St. The block occupies County House, New Broad Street House and Swedbank House. Block 16 contains the following types of monitoring sensors:

- Building (BREs)- manual monitoring
- Road Studs (LP) - manual monitoring
- Tiltmeters (TB)- automated monitoring
- 3D Geodetic Prism Monitoring (RP) – automated monitoring
- Water Settlement Cell- Electronic (SH)- automated monitoring
- Invar Scale (LC)- manual monitoring
- Crackmeters (CK)- manual monitoring

Each monitoring assets details are listed within the Decommissioning Status Tracker and further relevant information can be sourced from the following reports.

Block 16 Report References:

- Installation Report- New Broad Street House (Block 16), Liverpool Street  
CRL Document Number: C510-BBM-C2-RGN-C101-50015
- Monitoring Installation Report Internal LIV-LP-16- Blomfield Street  
CRL Document Number: C510-BBM-C2-RGN-C101-50141
- Monitoring Installation Report- LIV- LB- 16 – Liverpool Street  
CRL Document Number: C510-BBM-G-RGN-C101-50005
- Monitoring Installation Report LIV- All Block- Crack Meters- Liverpool St  
CRL Document Number: C510-BBM-G-RGN-C101-50224

The Settlement Contour Drawing (C122-OVE-C2-DDA-CR001\_Z-21313) predicts the Block 16 area to experience approximately 10-110mm of settlement.

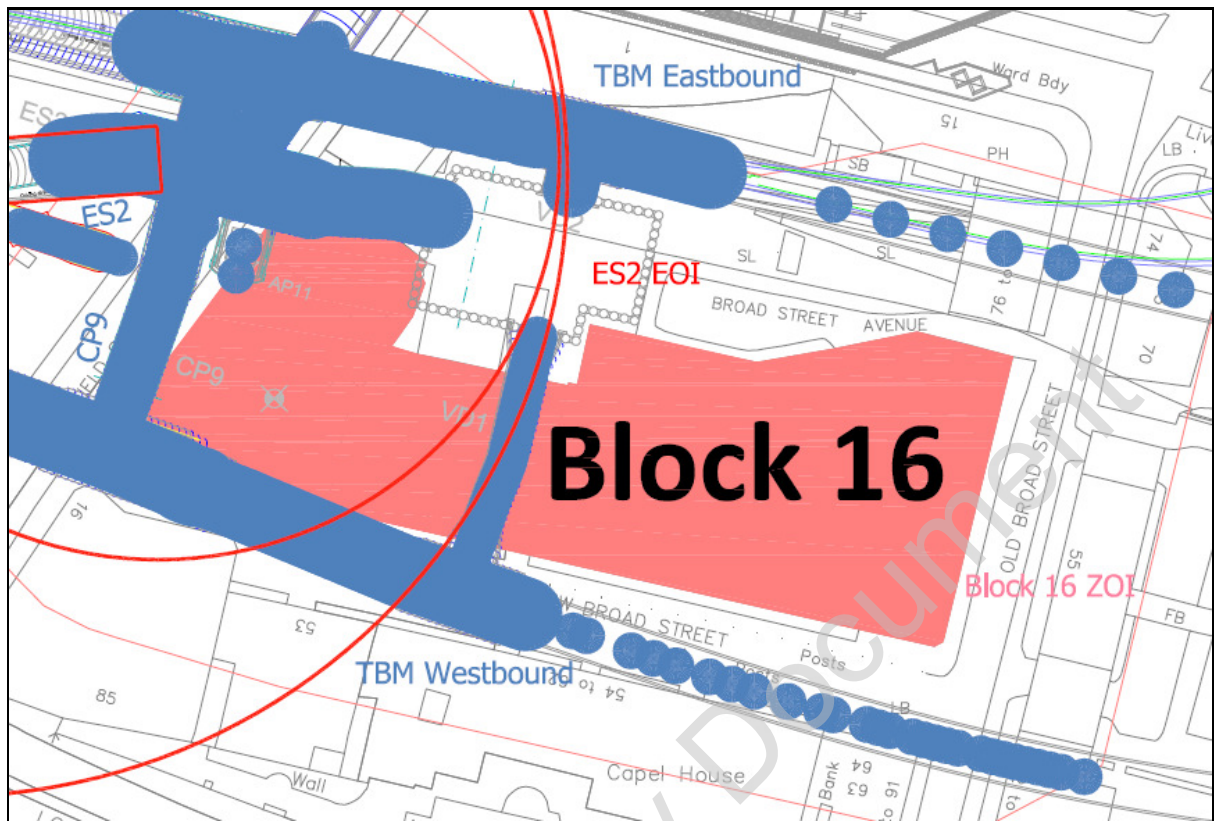
## 4 Construction Programme Influencing Block 16

Extent of Influence (EOI) monitoring areas were established to record ground movements in relation to Crossrail construction. The EOI purpose is to ensure all assets and areas are adequately monitored for movement during construction, this is achieved by controlling when and how often monitoring occurs. The Asset Protection Instrument and Monitoring (I&M) Schedules (C122 –OVE-C2-DDJ-CR001\_Z-31511) states the extent of influence (EOI) of an active tunnel is 2 x depth from the active tunnel face. The EOI is used to determine when monitoring sensors are no longer influenced by construction and can be considered for decommissioning.

The original specification received amendments to manual monitoring frequency within the EOI through several PMIs, with the latest PMI (C510-PMI-01103) establishing an Active ZOI (Zone of Influence) as 2 x tunnel diameter from the active tunnel face projected to the surface. The Active ZOI changed the rates of monitoring frequency, it did not replace EOI. The EOI is used to determine when a monitoring sensor is eligible for decommissioning. Whereas, active ZOI is used to analyse manual monitoring movement against construction.

To identify the tunnels that had the potential to significantly affect Block 16, a ZOI area was established by giving each monitoring sensor a radius of 2.0 x tunnel diameter. This area was then used to determine all the mining advances that occurred within its boundary, *Figure 2* shows the ZOI boundary (pink outline) and the tunnel constructions. Tunnel advance start and finish dates will be used in assessment of the monitoring data.





**Figure 2 - Block 16 ZOI Constructions**

**N.B.** ES2 EOI is represented in *Figure 2* to show the area of Block 16 that is within its boundary.

*Figure 2* shows the Block 16 ZOI and the tunnel advances that occurred within its boundary. The construction advances within the ZOI that have the potential to affect Block 16 are listed and summarised in *Table 1*. Further evidence for construction dates can be seen in *Table 2* which lists the latest tunnel advances for each point.

As the ES2 safe stop was completed on the 24<sup>th</sup> of November 2016, post construction monitoring had not been completed for a portion of Block 16 that was within the ES2 EOI during revision 1. Revision 2 did not propose all sensors to be decommissioned as they had not met the trend requirements. Post construction monitoring has been completed for Block 16, therefore the remaining sensors can now be considered for decommissioning. Further evidence for Block 16 sensors decommissioning status can be found in the decommissioning tracker.

**N.B.** It should be noted that C502 and C503 works may have affected Block 16. Reference should be made to C502 and C503 close out reports for construction dates.

(From General Document Template ref: BBMV-Form-S9-04 rev 5.0)

#### 4.1 Tunnel Advances Affecting Block 16

The information presented in *Table 1* is used in the monitoring graphs (Section 5.1), to show the ground movements in relation to construction. Construction advances will vary depending on the sensor type as the location of the sensors will vary.

Tunnel Advances Start & Ends for Graphs					
Tunnel Code	Tunnel Reference	Primary Layer Type	Start Date	End Date	ZONE
ES2- Safe Stop	ES2	Enlargement	20/11/2016	24/11/2016	EOI
ES2-Enlargement	ES2	Enlargement	03/10/2016	07/11/2016	ZOI
CH3-Enlargement	CH3	Enlargement	21/08/2016	28/08/2016	ZOI
AP11-Enlargement	AP11	Enlargement	06/08/2016	14/08/2016	ZOI
AP12-Enlargement	AP12	Enlargement	04/08/2016	04/08/2016	ZOI
AP2-Enlargement	AP2	Enlargement	28/06/2016	07/06/2016	ZOI
AP2-Pilot	AP2	Pilot	25/04/2016	12/05/2016	ZOI
ES2-Pilot	ES2	Pilot	14/02/2016	24/04/2016	ZOI
TBM-West-RC-Pilot	TBM-West-RC	Pilot	07/03/2015	12/03/2015	G305
TBM-East-RC-Pilot	TBM-East-RC	Pilot	25/01/2015	31/01/2015	G305
CP10-Enlargement	CP10	Enlargement	15/08/2014	17/08/2014	ZOI
CP9-Enlargement	CP9	Enlargement	08/08/2014	23/08/2014	ZOI
CP9-Pilot	CP9	Pilot	17/07/2014	23/07/2014	ZOI
CP10-Pilot	CP10	Pilot	15/07/2014	16/07/2014	ZOI
VD1-Enlargement	VD1	Enlargement	28/05/2014	08/06/2014	ZOI
VD2-Enlargement	VD2	Enlargement	17/05/2014	17/05/2014	ZOI
RCW-Enlargement	RCW	Enlargement	14/04/2014	07/05/2014	ZOI
PTW-East-Enlargement	PTW-East	Enlargement	25/03/2014	14/04/2014	ZOI
RCE-Enlargement	RCE	Enlargement	31/01/2014	05/03/2014	ZOI
PTE-East-Enlargement	PTE-East	Enlargement	19/01/2014	30/01/2014	ZOI
RCW-Pilot	RCW	Pilot	18/10/2013	28/10/2013	ZOI
PTW-East-Pilot	PTW-East	Pilot	06/10/2013	18/10/2013	ZOI
RCE-Pilot	RCE	Pilot	09/09/2013	26/09/2013	ZOI
PTE-East-Pilot	PTE-East	Pilot	01/09/2013	09/09/2013	ZOI
AP1a-Enlargement	AP1a	Enlargement	04/08/2013	14/08/2013	ZOI
AP1b-Enlargement	AP1b	Enlargement	13/07/2013	04/08/2013	ZOI
AP1a-Pilot	AP1a	Pilot	19/05/2013	07/06/2013	ZOI
AP1b-Pilot	AP1b	Pilot	27/03/2013	18/05/2013	ZOI
GAD2-Pilot	GAD2	Pilot	07/03/2012	09/03/2012	ZOI

**Table 1- Tunnel Advances Affecting Block 16**

##### Heading Index:

AP – Access Passage

CH - Chamber

CP - Cross Passage

ES – Escalator

GAD – Grout Adit

LCE - Launch Chamber East

LCW – Launch Chamber West

PTE – Platform Tunnel East

PTW – Platform Tunnel West

RCE – Reception Chamber East

RCW – Reception Chamber West

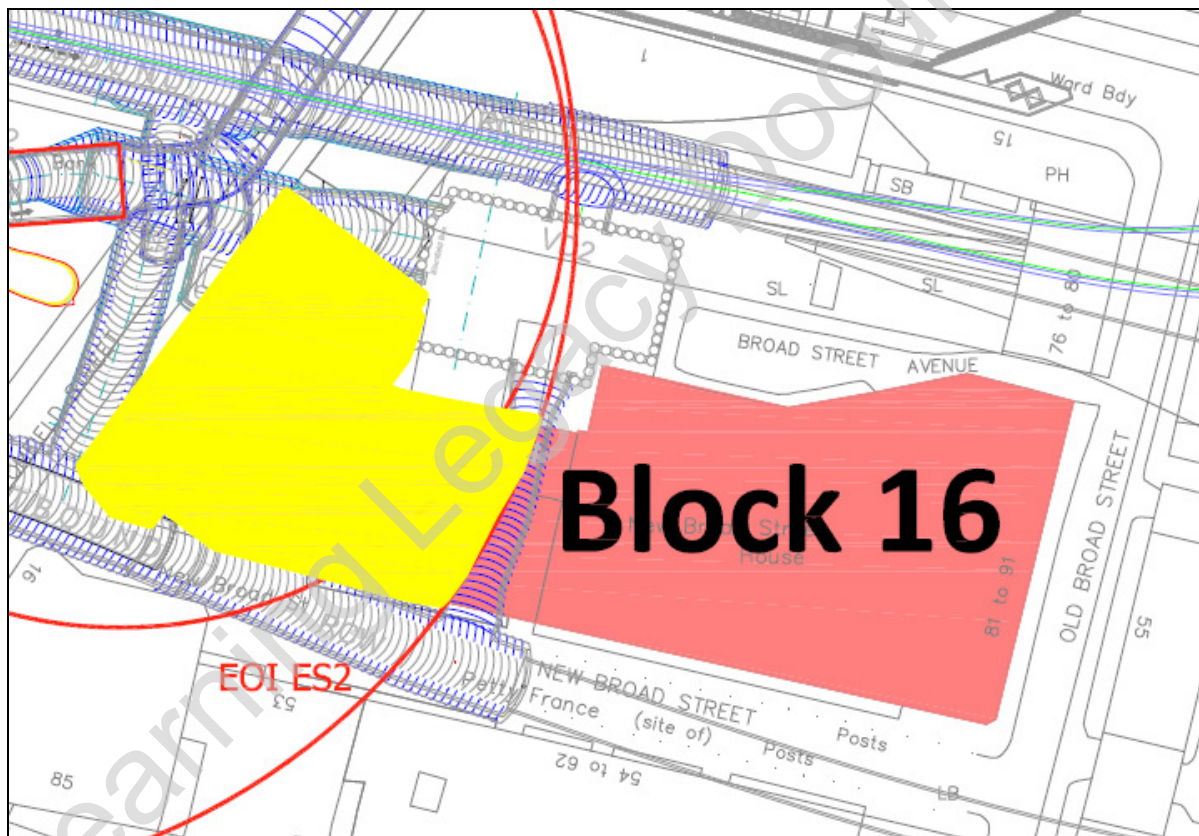
TBM – Tunnel Boring Machine

VD – Ventilation Drive

## 5 Monitoring Assessment of Block 16

Evidence for decommissioning each monitoring sensor is shown through graphs, tables and plans. Each element of assessment compliments the other and is used together to determine acceptance of decommissioning. *Table 2* highlights the monitoring sensors to be considered for decommissioning and provides supporting evidence for the decision. In some cases supplementary evidence is required to prove stability or provide reasoning for decommissioning.

In revision 1 of Block 16 close out report, not all monitoring sensors were able to be considered for decommissioning as they were within the EOI of ES2 (yellow highlight). As post construction monitoring has now been completed for the entirety of Block 16, revision 2 allowed for decommissioning of all sensors. However not all sensors had met trends requirements in revision 2. Revision 3 is dealing with all sensors not proposed in revision 2



**Figure 3- Block 16 Monitoring Not Considered for Decommissioning in Revision 1**

**N.B.** The highlighted yellow area was not considered for decommissioning in Revision 1

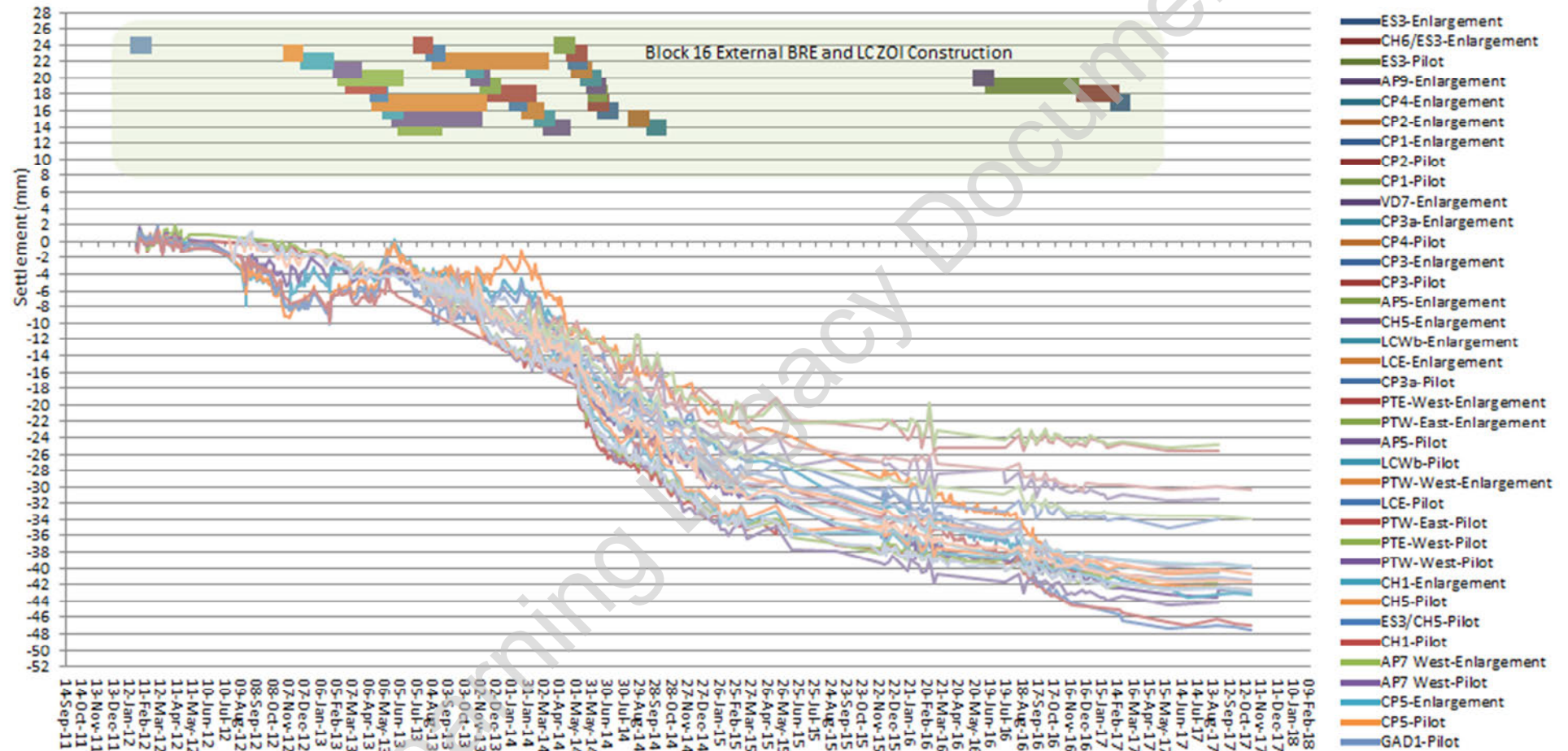
## 5.1 Time Graphs Monitoring Full History and Construction Durations

To assess the movement of Block 16 monitoring sensors; each monitoring sensor data type is displayed in a line graph, with a gantt chart (bar) representing the construction identified in Section 4:

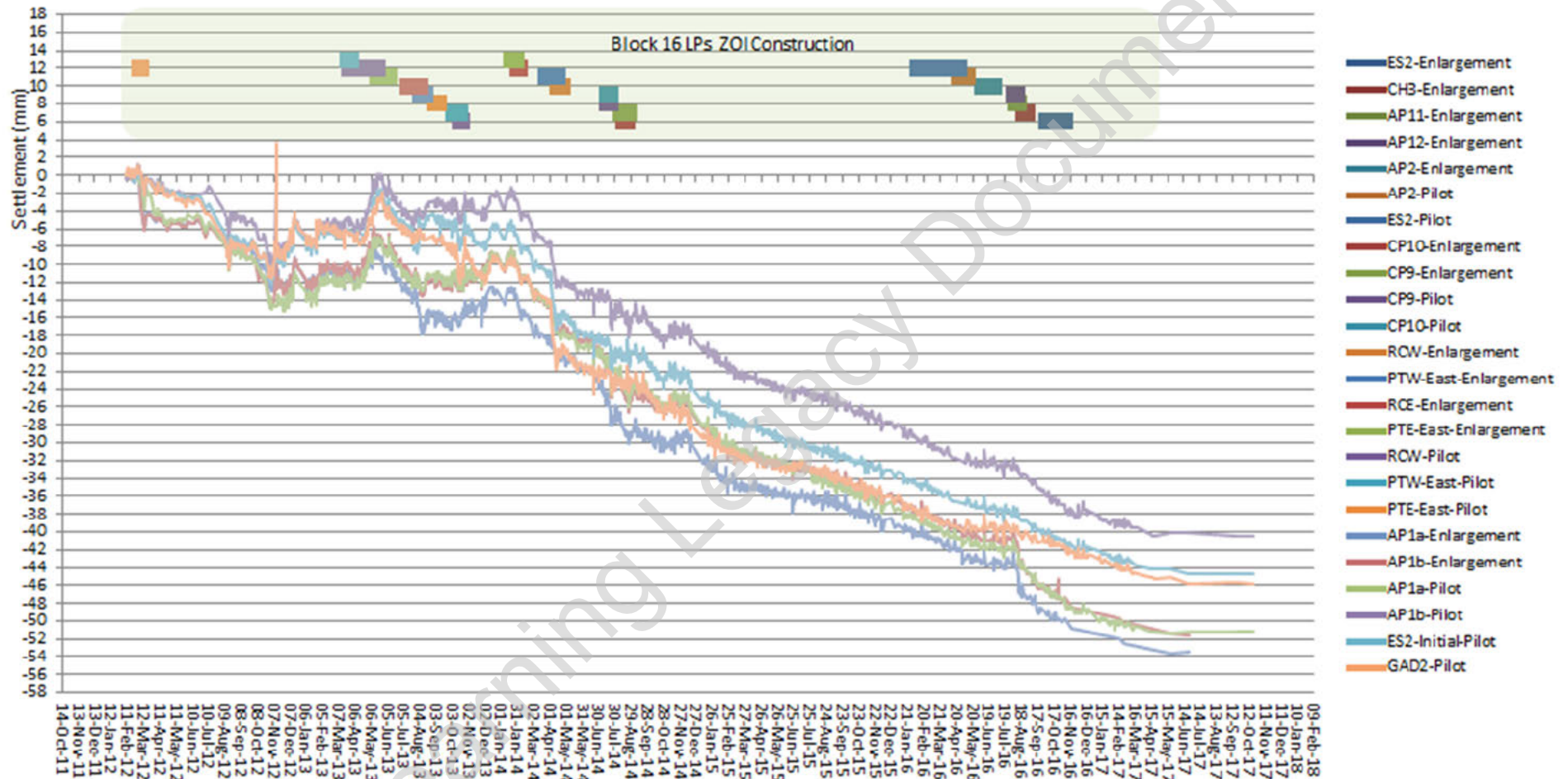
- Graph 1- All Remaining Block 16 BREs & Invar Scales (LB & LC) Manual Monitoring History in Relation to Construction
- Graph 2- All Remaining Block 16 Road Studs (LP) Manual Monitoring History in Relation to Construction

Learning Legacy Document

**Graph 1- All Remaining Block 16 BREs & Invar Scales (LB & LC) Manual Monitoring History in Relation to Construction**



**Graph 2- All Remaining Block 16 Road Studs (LP) Manual Monitoring History in Relation to Construction**



## 5.2 Block 16 Decommissioning Status Tracker

The decommissioning tracker identifies (*Table 2*) each monitoring sensor and provides the critical information to enable decommissioning assessment for each sensor. The initial fields shown in the tracker are descriptors of the monitoring sensor, whilst the remaining fields are the assessment for decommissioning. The purpose of the tracker is to provide Crossrail reviewers with sufficient information in conjunction with construction movement graphs and plots, to accept BBMV's proposal to decommission sensors on an individual basis.

Detailed explanation of the tracker column headers:

### Tracker Column Header – Last Construction Date and Traffic Lights

For each sensor the EOI parameter is used to determine the last completed construction advance that had the potential to cause settlement. All construction tunnel advances that had the potential to affect a sensor through its EOI are listed for each sensor, from the list the latest advance is used as a construction completion indicator. A traffic light system is used to highlight when a sensor has surpassed defined monitoring time frames; 4 months (120 days), 6 months (180 days) and 16 months (480 days).

**N.B.** Each monitoring sensor's last affecting primary construction heading and advance number's completion date has been listed within the Decommissioning Status Tracker. The last construction heading listed, is not the closest to the monitoring sensor, but the last completed within the 2 x diameter radius.

### Tracker Column Header – 120, 180 & 365 Days Average Settlement Trend

There are three average settlement trends, which tie into the defined monitoring time frames; 120, 180 and 365 days. The calculation used to determine the trend is the same for all three periods. It is a slope calculation (explained below) of the defined period, multiplied over one year. The trend is calculated from the latest reading and includes all readings within the defined period, which is averaged and then multiplied over 1 year. If there is no initial reading for the time frame date, the calculation will continue back to include the next available date. This is an important consideration when assessing the trend and to assist the reviewers, the time frame used within the calculation is included within the decommissioning tracker status table. Defined monitoring time frames:

- The 120 day average rate is used to show the completion of manual monitoring step down period, this is the minimum period of monitoring prior to InSAR taking monitoring responsibility.
- The 180 day average rate is the minimum monitoring period after construction for automated sensors.
- The 365 day average trend is a calculation to determine annual settlement rates using measurements taken across a full year. This measurement period is therefore the desired duration to be used to assess whether long term settlement meets the 2mm per annum specification.

### Slope calculation Settlement Trend:

**Description** – The settlement trend calculates the slope of the linear regression line through data points in known\_y's and known\_x's. The slope is the vertical distance divided by the horizontal distance between any two points on the line, which is the rate of change along the regression line.

### Calculation

$$b = \frac{\sum (x - \bar{x})(y - \bar{y})}{\sum (x - \bar{x})^2}$$

Example - If the calculated trend for a 6 month period is 1.5mm, it is multiplied into 365 days, to equal a projected settlement trend of 3mm over 1 year.

### Tracker Column Header – ERP Ceased date

ERP and CTC meetings have identified project efficiencies, by ceasing manual monitoring programmes early, or prior to reaching 2mm/yr. InSAR may have taken responsibility of monitoring or the perceived risk may be low enough to warrant ceasing the monitoring. In these situations the cease date is provided, along with a comment explaining the reasoning. Monitoring that has been ceased still requires approval to decommission and will be identified within the decommissioning status tracker as proposed to decommission.

### Tracker Column Header – Decommissioning Status

The status is the decommissioning situation for each sensor within Block 16. The different statuses are as follows:

- Outstanding - Monitoring sensor has not met the close out requirements and approval to decommission will be sought in subsequent revisions of this close out report.
- Proposed - the sensor is proposed to be decommissioned. Crossrail to accept the sensor can be decommissioned.
- Agreed – Agreed to decommission through previous revision of the close out report. No further reporting or monitoring has taken place.
- Complete - Monitoring sensor has been removed and evidence gathered during decommissioning.

**N.B.** When monitoring sensors have not met the requirements, it may still be appropriate to decommission. In this scenario supplementary evidence will be provided to explain the reasoning for decommissioning.



Table 2 - Block 16 Decommissioning Status Tracker LB & LC & LP

25/10/2017

< 2.0 mm GREEN    < 3.5 mm AMBER    > 3.5 mm RED

C510 Sensor Name	Block	Section	Int / Ext	Measurement Type	Sensor Type	Sensor Description	Asset/Location	EOI Last Primary Layer Construction	Last Construction Date	Latest Surveyed Date	AVERAGE SETTLEMENT TREND						Ceased Date	General Comment	Decommissioning Status
											120 Day Calculation Period	180 Day Calculation Period	365 Day Calculation Period	120 Day Calculation Period	180 Day Calculation Period	365 Day Calculation Period			
C510-LB11638	Block 116	S11601	Internal	Manual	LB	BRE	County House	LIV_CP9_Enlargement_Adv-32	23/08/2014	21/08/2017	-0.97	181	-0.97	181	-3.01	368		Stable 9 month trend	Proposed
C510-LB11639	Block 116	S11601	Internal	Manual	LB	BRE	County House	LIV_CP9_Enlargement_Adv-32	23/08/2014	21/08/2017	-1.37	181	-1.37	181	-3.31	368		Stable 6 month trend	Proposed
C510-LB11640	Block 116	S11601	Internal	Manual	LB	BRE	County House	LIV_AP11_Enlargement_Adv-25	14/08/2016	21/08/2017	-1.38	181	-1.38	181	-2.55	368			Proposed
C510-LB11641	Block 116	S11601	Internal	Manual	LB	BRE	County House	LIV_AP11_Enlargement_Adv-25	14/08/2016	21/08/2017	-1.37	181	-1.37	181	-2.53	368		Stable 9 month trend	Proposed
C510-LB11642	Block 116	S11601	Internal	Manual	LB	BRE	County House	LIV_AP11_Enlargement_Adv-25	14/08/2016	21/08/2017	-0.35	181	-0.35	181	-2.22	368			Proposed
C510-LB11643	Block 116	S11601	Internal	Manual	LB	BRE	County House	LIV_CH3_Enlargement_Adv-11	28/08/2016	21/08/2017	-2.20	181	-2.20	181	-1.45	368		<2mm per annum specification met	Proposed
C510-LB11644	Block 116	S11601	Internal	Manual	LB	BRE	County House	LIV_CH3_Enlargement_Adv-11	28/08/2016	21/08/2017	-0.58	181	-0.58	181	-1.21	368			Proposed
C510-LB11645	Block 116	S11601	Internal	Manual	LB	BRE	County House	LIV_CH3_Enlargement_Adv-11	28/08/2016	21/08/2017	-0.78	181	-0.78	181	-2.23	368			Proposed
C510-LB11646	Block 116	S11602	Internal	Manual	LB	BRE	County House	LIV_AP11_Enlargement_Adv-25	14/08/2016	20/10/2017	-0.65	154	-1.20	241	-2.66	368		Stable 9 month trend	Proposed
C510-LB11647	Block 116	S11602	Internal	Manual	LB	BRE	County House	LIV_CH3_Enlargement_Adv-11	28/08/2016	20/10/2017	-1.05	154	-1.39	241	-2.29	368			Proposed
C510-LB11648	Block 116	S11602	Internal	Manual	LB	BRE	County House	LIV_CH3_Enlargement_Adv-11	28/08/2016	20/10/2017	-0.36	154	-0.54	241	-2.34	368			Proposed
C510-LB11649	Block 116	S11602	Internal	Manual	LB	BRE	County House	LIV_CH3_Enlargement_Adv-11	28/08/2016	20/10/2017	0.35	154	-0.47	241	-0.69	368			Proposed
C510-LB11650	Block 116	S11602	Internal	Manual	LB	BRE	County House	LIV_CH3_Enlargement_Adv-11	28/08/2016	20/10/2017	-0.65	154	-0.78	241	-1.17	368		<2mm per annum specification met	Proposed
C510-LB11651	Block 116	S11602	Internal	Manual	LB	BRE	County House	LIV_CH3_Enlargement_Adv-11	28/08/2016	20/10/2017	-0.33	154	-0.90	241	-1.67	368			Proposed
C510-LB11652	Block 116	S11602	Internal	Manual	LB	BRE	County House	LIV_AP11_Enlargement_Adv-25	14/08/2016	20/10/2017	-0.72	154	-0.90	241	-1.77	368			Proposed
C510-LB11623	Block 116	S11603.2	External	Manual	LB	BRE	Swed Bank House	LIV_TBM-West-RC_Pilot_Adv-4008	12/03/2015	18/08/2017	-1.44	178	-0.97	197	-0.68	507		CTC agreed 09/10/2017. See email correspondence from JK	Agreed
C510-LB11624	Block 116	S11603.2	External	Manual	LB	BRE	Swed Bank House	LIV_TBM-West-RC_Pilot_Adv-4008	12/03/2015	18/08/2017	-1.02	178	-0.62	197	-0.50	507			Agreed
C510-LB11625	Block 116	S11603.2	External	Manual	LB	BRE	County House	LIV_VD1_Enlargement_Adv-23	04/06/2014	18/08/2017	-0.41	158	-1.07	186	-2.15	410		Stable 9 month trend	Proposed
C510-LB11626	Block 116	S11603.2	External	Manual	LB	BRE	County House	LIV_CP9_Enlargement_Adv-32	23/08/2014	18/08/2017	-0.68	158	-1.47	186	-3.00	373		Stable 6 month trend	Proposed
C510-LB11627	Block 116	S11603.2	External	Manual	LB	BRE	County House	LIV_AP11_Enlargement_Adv-25	14/08/2016	20/10/2017	0.67	154	-0.51	241	-2.78	366		Stable 9 month trend	Proposed
C510-LC11601	Block 116	S11603.2	External	Manual	LC	Invar Scale	County House	LIV_AP11_Enlargement_Adv-25	14/08/2016	20/10/2017	0.28	154	-1.01	241	-2.27	366			Proposed
C510-LC11602	Block 116	S11603.2	External	Manual	LC	Invar Scale	County House	LIV_CP9_Enlargement_Adv-32	23/08/2014	20/10/2017	0.36	154	-0.90	241	-1.61	366		<2mm per annum specification met	Proposed
C510-LC11603	Block 116	S11603.2	External	Manual	LC	Invar Scale	Swed Bank House	LIV_VD1_Enlargement_Adv-28	05/06/2014	18/08/2017	-1.22	178	-1.23	197	-1.73	499		CTC agreed 09/10/2017. See email correspondence from JK	Agreed
C510-LB11628	Block 116	S11603.8-S11604	External	Manual	LB	BRE	County House	LIV_CH3_Enlargement_Adv-11	28/08/2016	20/10/2017	-0.55	154	-1.18	182	-4.55	365			Proposed
C510-LB11629	Block 116	S11604	External	Manual	LB	BRE	County House	LIV_ES2_Invert_Adv-8	07/11/2016	20/10/2017	-1.03	154	-1.03	182	-4.59	365		Stable 6 month trend	Proposed
C510-LB11630	Block 116	S11604	External	Manual	LB	BRE	County House	LIV_ES2_Invert_Adv-8	07/11/2016	20/10/2017	-0.31	154	-1.19	241	-4.45	365			Proposed
C510-LB11631	Block 116	S11604	External	Manual	LB	BRE	County House	LIV_ES2_Invert_Adv-8	07/11/2016	20/10/2017	-0.51	154	-1.82	241	-3.29	372			Proposed
C510-LP11604	Block 116	S11601	External	Manual	LP	Road Stud	Bloomfield St	LIV_ES2_Invert_Adv-8	07/11/2016	22/06/2017	#N/A		#N/A		#N/A			Sensor destroyed as surface was altered. See photo in Supplementary Evidence.	Proposed
C510-LP11605	Block 116	S11601	External	Manual	LP	Road Stud	Bloomfield St	LIV_ES2_Invert_Adv-8	07/11/2016	22/06/2017	#N/A		#N/A		#N/A				Proposed
C510-LP11606	Block 116	S11601	External	Manual	LP	Road Stud	Bloomfield St	LIV_ES2_Invert_Adv-8	07/11/2016	20/10/2017	0.08	154	-0.07	182	-5.16	365			Proposed
C510-LP11607	Block 116	S11601	External	Manual	LP	Road Stud	Bloomfield St	LIV_ES2_Invert_Adv-8	07/11/2016	20/10/2017	-1.12	154	-0.59	182	-4.75	365		Stable 6 month trend	Proposed
C510-LP11608	Block 116	S11601	External	Manual	LP	Road Stud	Bloomfield St	LIV_CH3_Enlargement_Adv-11	28/08/2016	20/10/2017	-1.25	154	-1.26	182	-5.11	365			Proposed
C510-LP11609	Block 116	S11601	External	Manual	LP	Road Stud	Bloomfield St	LIV_CP9_Enlargement_Adv-32	23/08/2014	20/10/2017	-1.05	154	-1.07	182	-5.68	365			Proposed

Learning Legal

### 5.3 Supplementary Evidence for Decommissioning

In some cases supplementary evidence will be provided to support the decommissioning evidence.

#### **Roadstuds (LP) Manual Monitoring- Blomfield St**

**Includes:** C510-LP11604-05

#### **Reasons to propose decommissioning**

LP11604-05 have not been measured since 22/06/2017. The road studs have been destroyed and access has been blocked by another contractor's site hoarding on Blomfield St. *Figure 4* shows the site hoarding on Blomfield St. Ground was changed when the blue hoarding was installed so road studs cannot be replaced. It is therefore proposed to decommission C510-LP11604-05.



**Figure 4- Blomfield Street Site Hoarding**

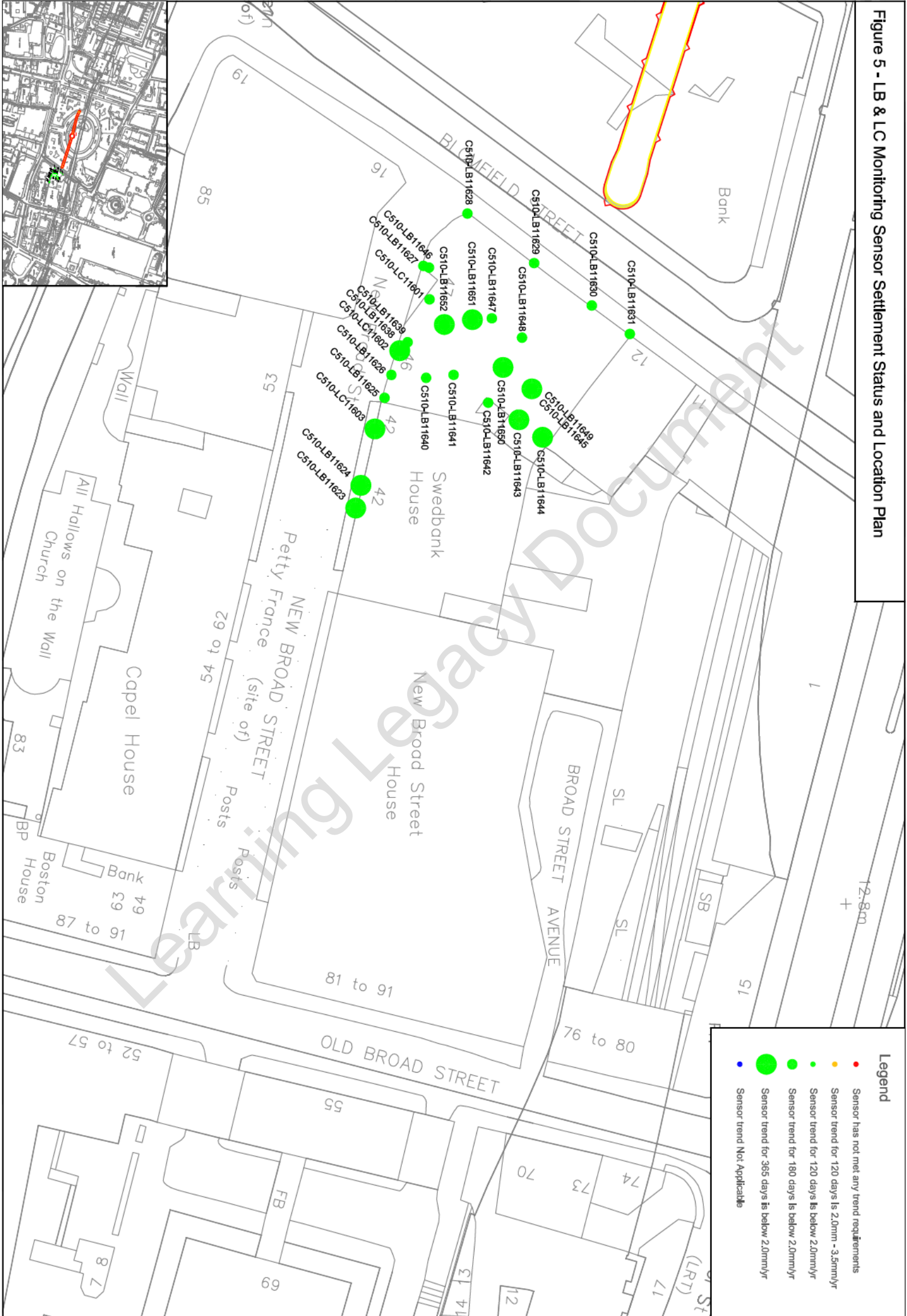
#### 5.4 Monitoring sensor Location Plan and Decommissioning Status

The following plots provide a visual representation of all Block 16 monitoring sensors with a colour circle that defines its settlement status. A green circle represents when a trend is below 2mm/yr and the larger the circle the greater the trend period. When a trend has not been met, a small red circle will represent the monitoring sensor.

- *Figure 5- LB & LC Monitoring Sensor Settlement Status and Location Plan*
- *Figure 6- LP Monitoring Sensor Settlement Status and Location Plan*

Learning Legacy Document

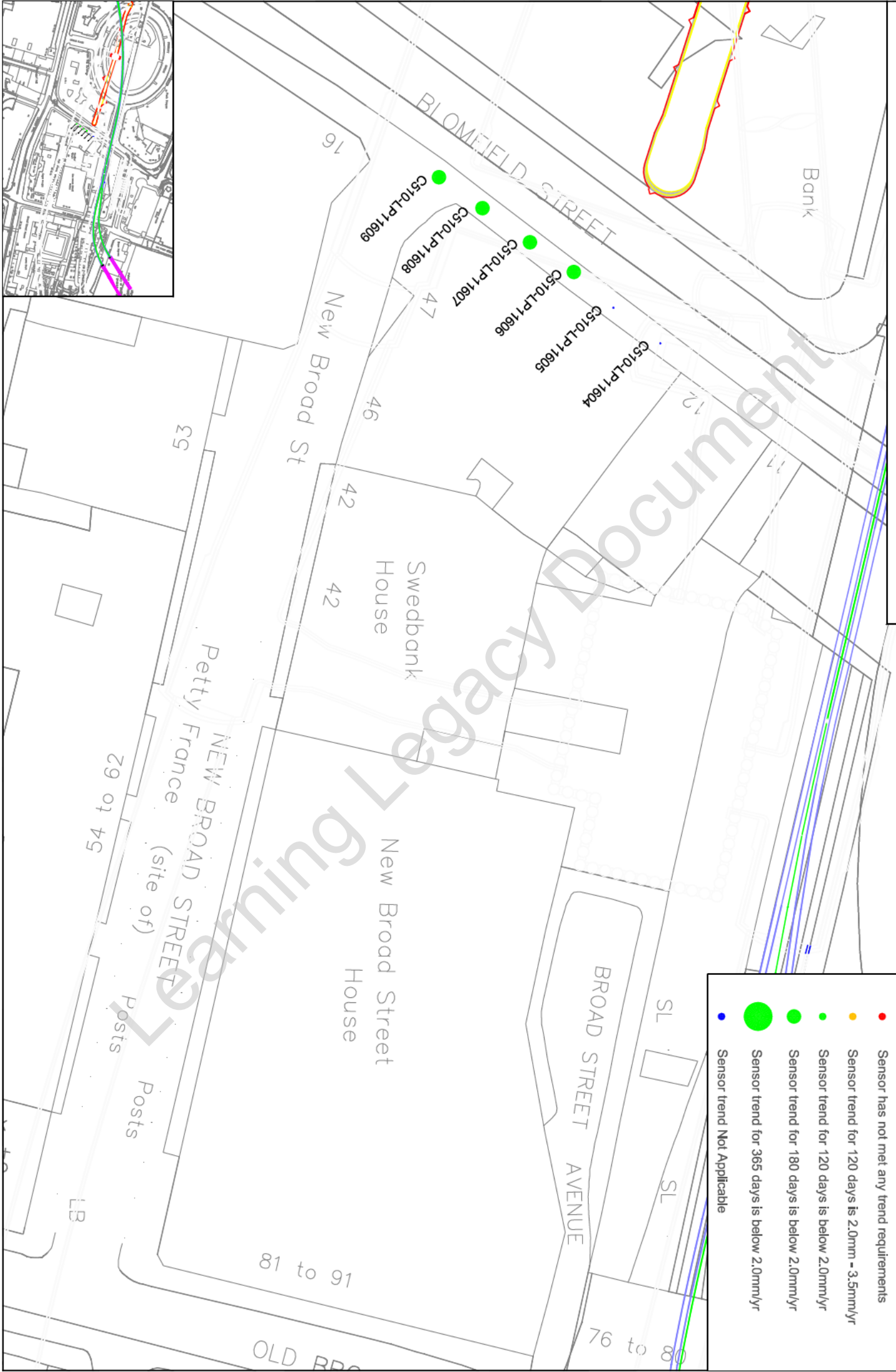
Figure 5 - LB & LC Monitoring Sensor Settlement Status and Location Plan



**Legend**

- Sensor has not met any trend requirements
- Sensor trend for 120 days is 2.0mm - 3.5mm/yr
- Sensor trend for 120 days is below 2.0mm/yr
- Sensor trend for 180 days is below 2.0mm/yr
- Sensor trend for 365 days is below 2.0mm/yr
- Sensor trend Not Applicable

Figure 6-LP Monitoring Sensor Decommissioning Status and Location Plan



**Legend**

- Sensor has not met any trend requirements
- Sensor trend for 120 days is 2.0mm - 3.5mm/yr
- Sensor trend for 120 days is below 2.0mm/yr
- Sensor trend for 180 days is below 2.0mm/yr
- Sensor trend for 365 days is below 2.0mm/yr
- Sensor trend Not Applicable

## 6 Decommissioning Recommendations

Revision 3 of Block 16 close out report requests all of the remaining monitoring sensors to be decommissioned.

**N.B.** When required, decommissioning and re-instatement evidence will be collected during the removal of monitoring sensors, which will be included within the final report.

Learning Legacy Document

---

## 7 Appendix 1 (Graphs, Tables and Figures of Rev.1)

Appendix 1 includes the Graphs, Tables and Figures that were used as evidence to agree decommissioning in Revision 1 of Block 16 Close out Report.

Learning Legacy Document

Table 2 - Block 16 Decommissioning Status Tracker SH & TB



C510 Sensor Name	Block	Section	Int / Ext	Measurement Type	Sensor Type	Sensor Description	Asset/Location	EOI Last Primary Layer Construction	Last Construction Date	Latest Surveyed Date	AVERAGE SETTLEMENT TREND						Ceased Date	General Comment	Decommissioning Status
											120 Days	120 Day Calculation Period	180 Days	180 Day Calculation Period	365 Days	365 Day Calculation Period			
C510-SH011601	Block 116	S11601	Internal	Automated	SH	Settlement Cell-Electronic	Swedbank House	LIV_TBM-West-RC_Pilot_Adv-4008	12/03/2015	07/03/2016	-2.15	120	-4.27	180	-1.16	366	No data following renovations 20.05.2016. CTC agreed to cease 07/06/2016.	Agreed	
C510-SH011602	Block 116	S11601	Internal	Automated	SH	Settlement Cell-Electronic	Swedbank House	LIV_TBM-West-RC_Pilot_Adv-4008	12/03/2015	07/03/2016	-2.21	120	-4.07	180	-0.68	366	No data following renovations 20.05.2016. CTC agreed to cease 07/06/2016.	Agreed	
C510-SH011603	Block 116	S11601	Internal	Automated	SH	Settlement Cell-Electronic	Swedbank House	LIV_TBM-West-RC_Pilot_Adv-4008	12/03/2015	07/03/2016	0.09	120	-2.49	180	0.29	366	No data following renovations 20.05.2016. CTC agreed to cease 07/06/2016.	Agreed	
C510-SH011604	Block 116	S11601	Internal	Automated	SH	Settlement Cell-Electronic	Swedbank House	LIV_TBM-West-RC_Pilot_Adv-4008	12/03/2015	07/03/2016	-0.01	120	-2.70	180	-0.02	366	No data following renovations 20.05.2016. CTC agreed to cease 07/06/2016.	Agreed	
C510-SH011611	Block 116	S11602	Internal	Automated	SH	Settlement Cell-Electronic	Swedbank House	LIV_TBM-West-RC_Pilot_Adv-4008	12/03/2015	07/03/2016	-0.05	120	-2.75	180	0.00	366	No data following renovations 20.05.2016. CTC agreed to cease 07/06/2016.	Agreed	
C510-SH011612	Block 116	S11602	Internal	Automated	SH	Settlement Cell-Electronic	Swedbank House	LIV_VD1_Enlargement_Adv-41	08/06/2014	07/03/2016	1.68	120	-1.80	180	0.84	366	No data following renovations 20.05.2016. CTC agreed to cease 07/06/2016.	Agreed	
C510-SH011613	Block 116	S11602	Internal	Automated	SH	Settlement Cell-Electronic	Swedbank House	LIV_VD1_Enlargement_Adv-41	08/06/2014	07/03/2016	1.53	120	-0.45	180	4.97	366	No data following renovations 20.05.2016. CTC agreed to cease 07/06/2016.	Agreed	
C510-SH011614	Block 116	S11602	Internal	Automated	SH	Settlement Cell-Electronic	Swedbank House	LIV_VD1_Enlargement_Adv-41	08/06/2014	07/03/2016	1.44	120	-2.62	180	-2.01	366	No data following renovations 20.05.2016. CTC agreed to cease 07/06/2016.	Agreed	
C510-SH011615	Block 116	S11602	Internal	Automated	SH	Settlement Cell-Electronic	Swedbank House	LIV_TBM-West-RC_Pilot_Adv-4008	12/03/2015	07/03/2016	1.82	120	-2.51	180	-1.90	366	No data following renovations 20.05.2016. CTC agreed to cease 07/06/2016.	Agreed	
C510-SH011616	Block 116	S11602	Internal	Automated	SH	Settlement Cell-Electronic	Swedbank House	LIV_VD1_Enlargement_Adv-41	08/06/2014	07/03/2016	1.71	120	-1.09	180	2.96	366	No data following renovations 20.05.2016. CTC agreed to cease 07/06/2016.	Agreed	
C510-SH011617	Block 116	S11602	Internal	Automated	SH	Settlement Cell-Electronic	Swedbank House	LIV_VD1_Enlargement_Adv-41	08/06/2014	07/03/2016	0.01	120	-2.33	180	0.56	366	No data following renovations 20.05.2016. CTC agreed to cease 07/06/2016.	Agreed	
C510-SH011618	Block 116	S11602	Internal	Automated	SH	Settlement Cell-Electronic	Swedbank House	LIV_TBM-West-RC_Pilot_Adv-4008	12/03/2015	07/03/2016	1.44	120	-1.98	180	0.74	366	No data following renovations 20.05.2016. CTC agreed to cease 07/06/2016.	Agreed	
C510-SH011619	Block 116	S11602	Internal	Automated	SH	Settlement Cell-Electronic	Swedbank House	LIV_AP11_Enlargement_Adv-25	14/08/2016	07/03/2016	-0.03	120	-2.76	180	0.24	366	No data following renovations 20.05.2016. CTC agreed to cease 07/06/2016.	Agreed	
C510-SH011620	Block 116	S11602	Internal	Automated	SH	Settlement Cell-Electronic	Swedbank House	LIV_AP11_Enlargement_Adv-25	14/08/2016	07/03/2016	-0.02	120	-2.60	180	1.01	366	No data following renovations 20.05.2016. CTC agreed to cease 07/06/2016.	Agreed	
C510-SH011621	Block 116	S11602	Internal	Automated	SH	Settlement Cell-Electronic	Swedbank House	LIV_VD1_Enlargement_Adv-41	08/06/2014	07/03/2016	-2.95	120	-5.44	180	0.50	366	No data following renovations 20.05.2016. CTC agreed to cease 07/06/2016.	Agreed	
C510-SH011622	Block 116	S11602	Internal	Automated	SH	Settlement Cell-Electronic	Swedbank House	LIV_AP11_Enlargement_Adv-25	14/08/2016	07/03/2016	-1.72	120	-4.44	180	0.67	366	No data following renovations 20.05.2016. CTC agreed to cease 07/06/2016.	Agreed	
C510-SH011631	Block 116	S11603	External	Automated	SH	Settlement Cell-Electronic	Swedbank House	LIV_VD1_Enlargement_Adv-26	05/06/2014	09/09/2016	-20.24	120	-5.61	180	8.92	366	Power Box Damaged+ Supplementary Evidence	Agreed	
C510-SH011632	Block 116	S11603	External	Automated	SH	Settlement Cell-Electronic	Swedbank House	LIV_VD1_Enlargement_Adv-28	05/06/2014	09/09/2016	-4.88	120	-12.94	180	-6.24	366	Power Box Damaged+ Supplementary Evidence	Agreed	
C510-SH011633	Block 116	S11603	External	Automated	SH	Settlement Cell-Electronic	Swedbank House	LIV_TBM-West-RC_Pilot_Adv-4008	12/03/2015	09/09/2016	-6.49	120	-12.86	180	-5.29	366	Power Box Damaged+ Supplementary Evidence	Agreed	
C510-SH011634	Block 116	S11603	External	Automated	SH	Settlement Cell-Electronic	Swedbank House	LIV_TBM-West-RC_Pilot_Adv-4008	12/03/2015	09/09/2016	1.30	120	-7.15	180	-3.67	366	Power Box Damaged+ Supplementary Evidence	Agreed	
C510-SH011635	Block 116	S11603	External	Automated	SH	Settlement Cell-Electronic	Swedbank House	LIV_TBM-West-RC_Pilot_Adv-4008	12/03/2015	09/09/2016	1.35	120	-7.15	180	-3.43	366	Power Box Damaged+ Supplementary Evidence	Agreed	
C510-SH011636	Block 116	S11603	External	Automated	SH	Settlement Cell-Electronic	Swedbank House	LIV_TBM-West-RC_Pilot_Adv-4008	12/03/2015	09/09/2016	2.25	120	-5.87	180	-3.08	366	Power Box Damaged+ Supplementary Evidence	Agreed	
C510-SH011641	Block 116	S11604	Internal	Automated	SH	Settlement Cell-Electronic	County House	LIV_AP11_Enlargement_Adv-25	14/08/2016	16/02/2017	9.68	120	8.21	180	7.17	366	Within ES2 EOI	Outstanding	
C510-SH011642	Block 116	S11604	Internal	Automated	SH	Settlement Cell-Electronic	County House	LIV_CH3_Enlargement_Adv-11	28/08/2016	16/02/2017	10.17	120	7.86	180	7.88	366	Within ES2 EOI	Outstanding	
C510-SH011643	Block 116	S11604	Internal	Automated	SH	Settlement Cell-Electronic	County House	LIV_CH3_Enlargement_Adv-11	28/08/2016	16/02/2017	3.05	120	1.99	180	4.45	366	Within ES2 EOI	Outstanding	
C510-SH011644	Block 116	S11604	Internal	Automated	SH	Settlement Cell-Electronic	County House	LIV_CH3_Enlargement_Adv-11	28/08/2016	16/02/2017	2.47	120	3.84	180	5.22	366	Within ES2 EOI	Outstanding	
C510-SH011645	Block 116	S11604	Internal	Automated	SH	Settlement Cell-Electronic	County House	LIV_CH3_Enlargement_Adv-11	28/08/2016	16/02/2017	4.25	120	4.79	180	5.74	366	Within ES2 EOI	Outstanding	
C510-SH011646	Block 116	S11604	Internal	Automated	SH	Settlement Cell-Electronic	County House	LIV_AP11_Enlargement_Adv-25	14/08/2016	16/02/2017	2.11	120	2.67	180	4.60	366	Within ES2 EOI	Outstanding	
C510-SH011647	Block 116	S11604	Internal	Automated	SH	Settlement Cell-Electronic	County House	LIV_AP11_Enlargement_Adv-25	14/08/2016	16/02/2017	3.28	120	1.87	180	3.55	366	Within ES2 EOI	Outstanding	
C510-SH011651	Block 116	S11605	Internal	Automated	SH	Settlement Cell-Electronic	County House	LIV_AP11_Enlargement_Adv-25	14/08/2016	16/02/2017	2.22	120	2.72	180	4.60	366	Within ES2 EOI	Outstanding	
C510-SH011652	Block 116	S11605	Internal	Automated	SH	Settlement Cell-Electronic	County House	LIV_AP11_Enlargement_Adv-25	14/08/2016	16/02/2017	4.04	120	4.06	180	4.34	366	Within ES2 EOI	Outstanding	
C510-SH011653	Block 116	S11605	Internal	Automated	SH	Settlement Cell-Electronic	County House	LIV_AP11_Enlargement_Adv-25	14/08/2016	16/02/2017	9.46	120	10.71	180	7.97	366	Within ES2 EOI	Outstanding	
C510-SH011654	Block 116	S11605	Internal	Automated	SH	Settlement Cell-Electronic	County House	LIV_AP11_Enlargement_Adv-25	14/08/2016	16/02/2017	4.39	120	3.38	180	3.73	366	Within ES2 EOI	Outstanding	
C510-SH011655	Block 116	S11605	Internal	Automated	SH	Settlement Cell-Electronic	County House	LIV_CP9_Enlargement_Adv-32	23/08/2014	16/02/2017	1.12	120	1.28	180	1.91	366	Within ES2 EOI	Outstanding	
C510-SH011661	Block 116	S11606	Internal	Automated	SH	Settlement Cell-Electronic	County House	LIV_CH3_Enlargement_Adv-11	28/08/2016	16/02/2017	1.13	120	1.00	180	2.52	366	Within ES2 EOI	Outstanding	
C510-SH011662	Block 116	S11606	Internal	Automated	SH	Settlement Cell-Electronic	County House	LIV_CH3_Enlargement_Adv-11	28/08/2016	16/02/2017	0.83	120	-0.16	180	0.07	366	Within ES2 EOI	Outstanding	
C510-SH011663	Block 116	S11606	Internal	Automated	SH	Settlement Cell-Electronic	County House	LIV_AP11_Enlargement_Adv-25	14/08/2016	16/02/2017	1.08	120	2.14	180	3.94	366	Within ES2 EOI	Outstanding	
C510-SH011664	Block 116	S11606	Internal	Automated	SH	Settlement Cell-Electronic	County House	LIV_CH3_Enlargement_Adv-11	28/08/2016	16/02/2017	2.54	120	3.11	180	4.47	366	Within ES2 EOI	Outstanding	
C510-SH011665	Block 116	S11606	Internal	Automated	SH	Settlement Cell-Electronic	County House	LIV_CH3_Enlargement_Adv-11	28/08/2016	16/02/2017	4.23	120	4.91	180	4.67	366	Within ES2 EOI	Outstanding	
C510-SH011666	Block 116	S11606	Internal	Automated	SH	Settlement Cell-Electronic	County House	LIV_CH3_Enlargement_Adv-11	28/08/2016	16/02/2017	4.25	120	4.87	180	5.53	366	Within ES2 EOI	Outstanding	
C510-TB11601A	Block 116	N/A	Internal	Automated	TB	Tiltmeter-Biaxial	New Broad St House	LIV_VD1_Enlargement_Adv-41	08/06/2014	08/03/2016	-0.20	120	-0.27	180	-0.04	365	No data following renovations 20.05.2016. CTC agreed to cease 07/06/2016 (values are tilt mm/m)	Agreed	
C510-TB11601B	Block 116	N/A	Internal	Automated	TB	Tiltmeter-Biaxial	New Broad St House	LIV_VD1_Enlargement_Adv-41	08/06/2014	08/03/2016	-0.14	120	-0.20	180	0.11	365	No data following renovations 20.05.2016. CTC agreed to cease 07/06/2016 (values are tilt mm/m)	Agreed	
C510-TB11602A	Block 116	N/A	Internal	Automated	TB	Tiltmeter-Biaxial	New Broad St House	LIV_AP11_Enlargement_Adv-25	14/08/2016	08/03/2016	-0.05	120	-0.01	180	0.19	365	No data following renovations 20.05.2016. CTC agreed to cease 07/06/2016 (values are tilt mm/m)	Agreed	
C510-TB11602B	Block 116	N/A	Internal	Automated	TB	Tiltmeter-Biaxial	New Broad St House	LIV_AP11_Enlargement_Adv-25	14/08/2016	08/03/2016	0.93	120	0.23	180	0.08	365	No data following renovations 20.05.2016. CTC agreed to cease 07/06/2016 (values are tilt mm/m)	Agreed	
C510-TB11603A	Block 116	N/A	Internal	Automated	TB	Tiltmeter-Biaxial	New Broad St House	LIV_TBM-West-RC_Pilot_Adv-4008	12/03/2015	11/09/2016	0.91	120	-1.32	180	-0.70	365	Power Box Damaged+ Supplementary Evidence- Agreed to decommission (values are tilt mm/m)	Agreed	
C510-TB11603B	Block 116	N/A	Internal	Automated	TB	Tiltmeter-Biaxial	New Broad St House	LIV_TBM-West-RC_Pilot_Adv-4008	12/03/2015	11/09/2016	1.86	120	-2.47	180	-1.34	365	Power Box Damaged+ Supplementary Evidence- Agreed to decommission (values are tilt mm/m)	Agreed	
C510-TB11604A	Block 116	N/A	Internal	Automated	TB	Tiltmeter-Biaxial	New Broad St House	LIV_TBM-West-RC_Pilot_Adv-4008	12/03/2015	08/03/2016	0.23	120	0.07	180	0.13	365	No data following renovations 20.05.2016. CTC agreed to cease 07/06/2016 (values are tilt mm/m)	Agreed	
C510-TB11604B	Block 116	N/A	Internal	Automated	TB	Tiltmeter-Biaxial	New Broad St House	LIV_TBM-West-RC_Pilot_Adv-4008	12/03/2015	08/03/2016	-0.08	120	0.04	180	-0.15	365	No data following renovations 20.05.2016. CTC agreed to cease 07/06/2016 (values are tilt mm/m)	Agreed	
C510-TB11605A	Block 116	N/A	Internal	Automated	TB	Tiltmeter-Biaxial	New Broad St House	LIV_TBM-West-RC_Pilot_Adv-4008	12/03/2015	11/09/2016	0.00	120	-0.02	180	0.13	365	Power Box Damaged+ Supplementary Evidence- Agreed to decommission (values are tilt mm/m)	Agreed	
C510-TB11605B	Block 116	N/A	Internal	Automated	TB	Tiltmeter-Biaxial	Swedbank House	LIV_TBM-West-RC_Pilot_Adv-4008	12/03/2015	11/09/2016	-0.04	120	-0.06	180	0.23	365	Power Box Damaged+ Supplementary Evidence- Agreed to decommission (values are tilt mm/m)	Agreed	
C510-TB11611A	Block 116	11601	External	Automated	TB	Tiltmeter-Biaxial	Swedbank North Façade	LIV_VD1_Enlargement_Adv-41	08/06/2014	08/03/2016	0.06	120	0.02	180	-1.34	365	No data following renovations 20.05.2016. CTC agreed to cease 07/06/2016 (values are tilt mm/m)	Agreed	
C510-TB11611B	Block 116	11601	External	Automated	TB	Tiltmeter-Biaxial	Swedbank North Façade	LIV_VD1_Enlargement_Adv-41	08/06/2014	08/03/2016	0.91	120	0.99	180	-0.50	365	No data following renovations 20.05.2016. CTC agreed to cease 07/06/2016 (values are tilt mm/m)	Agreed	



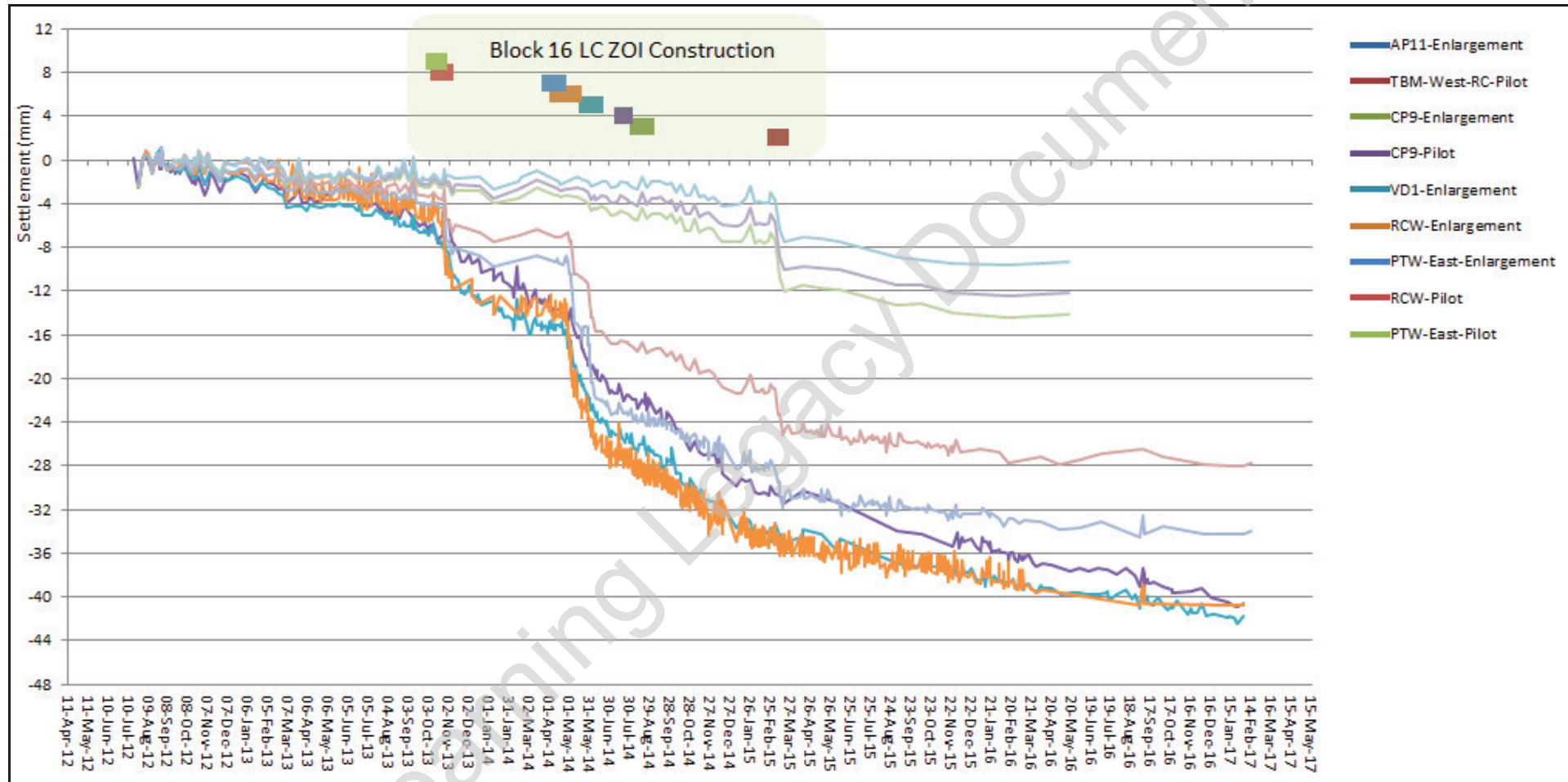
**Table 3 - Block 16 Decommissioning Status Tracker LB + LC + LP**

**< 2.0 mm GREEN < 3.5 mm AMBER > 3.5 mm RED**  
 AVERAGE SETTLEMENT TREND

C510 Sensor Name	Block	Section	Int / Ext	Measurement Type	Sensor Type	Sensor Description	Asset/Location	EOI Last Primary Layer Construction	Last Construction Date	Latest Surveyed Date	AVERAGE SETTLEMENT TREND							Ceased Date	General Comment	Decommissioning Status		
											120 Day	120 Days	120 Day Calculation Period	180 Day	180 Days	180 Day Calculation Period	365 Day				365 Days	365 Day Calculation Period
C510-LB11601	Block 116	S11601	External	Manual	LB	BRE	New Broad St House	LIV_TBM-East-RC_Pilot_Adv-3909	31/01/2015	17/02/2016		-2.83	168		-4.39	252		-1.54	366	14.06.2016	CTC 14.06.2016 Confirmed monitoring to be replaced by InSAR.	Proposed
C510-LB11602	Block 116	S11601	External	Manual	LB	BRE	New Broad St House	LIV_TBM-East-RC_Pilot_Adv-3909	31/01/2015	17/02/2016		-3.70	168		-4.09	252		-1.57	366	14.06.2016	CTC 14.06.2016 Confirmed monitoring to be replaced by InSAR.	Proposed
C510-LB11603	Block 116	S11601	External	Manual	LB	BRE	New Broad St House	LIV_TBM-East-RC_Pilot_Adv-3909	31/01/2015	17/02/2016		-2.83	168		-3.57	252		-1.63	366	14.06.2016	CTC 14.06.2016 Confirmed monitoring to be replaced by InSAR.	Proposed
C510-LB11604	Block 116	S11601	External	Manual	LB	BRE	New Broad St House	LIV_TBM-East-RC_Pilot_Adv-3895	27/01/2015	15/05/2016		0.85	172		-0.97	256		-2.62	368	14.06.2016	CTC 14.06.2016 Confirmed monitoring to be replaced by InSAR.	Proposed
C510-LB11605	Block 116	S11601	External	Manual	LB	BRE	New Broad St House	LIV_TBM-East-RC_Pilot_Adv-3895	27/01/2015	15/05/2016		-0.64	172		-1.49	256		-2.56	368	14.06.2016	CTC 14.06.2016 Confirmed monitoring to be replaced by InSAR.	Proposed
C510-LB11606	Block 116	S11601	External	Manual	LB	BRE	New Broad St House	LIV_TBM-East-RC_Pilot_Adv-3895	27/01/2015	15/05/2016		-0.21	172		-0.60	256		-2.16	368	14.06.2016	CTC 14.06.2016 Confirmed monitoring to be replaced by InSAR.	Proposed
C510-LB11607	Block 116	S11601	External	Manual	LB	BRE	New Broad St House	LIV_TBM-East-RC_Pilot_Adv-3895	27/01/2015	15/05/2016		-0.22	172		-0.22	256		-1.93	368	14.06.2016	CTC 14.06.2016 Confirmed monitoring to be replaced by InSAR.	Proposed
C510-LB11608	Block 116	S11601	External	Manual	LB	BRE	New Broad St House	LIV_TBM-East-RC_Pilot_Adv-3895	27/01/2015	15/05/2016		-0.84	172		-1.96	256		-2.23	368	14.06.2016	CTC 14.06.2016 Confirmed monitoring to be replaced by InSAR.	Proposed
C510-LB11609	Block 116	S11601;S11602	External	Manual	LB	BRE	New Broad St House	LIV_TBM-East-RC_Pilot_Adv-3890	27/01/2015	15/05/2016		-0.39	172		-1.48	256		-2.34	368	14.06.2016	CTC 14.06.2016 Confirmed monitoring to be replaced by InSAR.	Proposed
C510-LB11610	Block 116	S11602	External	Manual	LB	BRE	New Broad St House	LIV_TBM-East-RC_Pilot_Adv-3885	26/01/2015	15/05/2016		-0.40	172		-1.19	256		-2.18	368	14.06.2016	CTC 14.06.2016 Confirmed monitoring to be replaced by InSAR.	Proposed
C510-LB11611	Block 116	S11602	External	Manual	LB	BRE	New Broad St House	LIV_TBM-East-RC_Pilot_Adv-3885	26/01/2015	15/05/2016		-0.85	172		-1.92	256		-2.81	368	14.06.2016	CTC 14.06.2016 Confirmed monitoring to be replaced by InSAR.	Proposed
C510-LB11612	Block 116	S11602	External	Manual	LB	BRE	New Broad St House	LIV_TBM-East-RC_Pilot_Adv-3885	26/01/2015	15/05/2016		-0.42	172		-1.92	256		-2.70	368	14.06.2016	CTC 14.06.2016 Confirmed monitoring to be replaced by InSAR.	Proposed
C510-LB11613	Block 116	S11602	External	Manual	LB	BRE	New Broad St House	LIV_TBM-West-RC_Pilot_Adv-3980	06/03/2015	15/05/2016		-0.21	172		-1.15	256		-2.38	368	14.06.2016	CTC 14.06.2016 Confirmed monitoring to be replaced by InSAR.	Proposed
C510-LB11614	Block 116	S11602	External	Manual	LB	BRE	New Broad St House	LIV_TBM-West-RC_Pilot_Adv-3987	07/03/2015	15/05/2016		-0.40	172		-1.48	256		-2.52	368	14.06.2016	CTC 14.06.2016 Confirmed monitoring to be replaced by InSAR.	Proposed
C510-LB11615	Block 116	S11602	External	Manual	LB	BRE	New Broad St House	LIV_TBM-West-RC_Pilot_Adv-3989	08/03/2015	15/05/2016		-0.21	172		-1.23	256		-2.34	368	14.06.2016	CTC 14.06.2016 Confirmed monitoring to be replaced by InSAR.	Proposed
C510-LB11616	Block 116	S11603.1	External	Manual	LB	BRE	New Broad St House	LIV_TBM-West-RC_Pilot_Adv-3991	07/03/2015	15/05/2016		-0.19	172		-1.02	256		-2.29	368	14.06.2016	CTC 14.06.2016 Confirmed monitoring to be replaced by InSAR.	Proposed
C510-LB11617	Block 116	S11603.1	External	Manual	LB	BRE	New Broad St House	LIV_TBM-West-RC_Pilot_Adv-3993	07/03/2015	15/05/2016		0.01	172		-1.23	256		-2.38	368	14.06.2016	CTC 14.06.2016 Confirmed monitoring to be replaced by InSAR.	Proposed
C510-LB11618	Block 116	S11603.1	External	Manual	LB	BRE	New Broad St House	LIV_TBM-West-RC_Pilot_Adv-3996	07/03/2015	15/05/2016		-0.84	172		-1.28	256		-2.48	368	14.06.2016	CTC 14.06.2016 Confirmed monitoring to be replaced by InSAR.	Proposed
C510-LB11619	Block 116	S11603.1	External	Manual	LB	BRE	New Broad St House	LIV_TBM-West-RC_Pilot_Adv-4001	08/03/2015	15/05/2016		-1.25	172		-1.41	256		-2.65	368	14.06.2016	CTC 14.06.2016 Confirmed monitoring to be replaced by InSAR.	Proposed
C510-LB11620	Block 116	S11603.1	External	Manual	LB	BRE	New Broad St House	LIV_TBM-West-RC_Pilot_Adv-4006	12/03/2015	15/05/2016		-0.40	172		-1.01	256		-2.52	368	14.06.2016	CTC 14.06.2016 Confirmed monitoring to be replaced by InSAR.	Proposed
C510-LB11621	Block 116	S11603.1	External	Manual	LB	BRE	New Broad St House	LIV_TBM-West-RC_Pilot_Adv-4008	12/03/2015	15/05/2016		-3.62	167		-2.62	184		-2.12	366	14.06.2016	CTC 14.06.2016 Confirmed monitoring to be replaced by InSAR.	Proposed
C510-LB11622	Block 116	S11603.1	External	Manual	LB	BRE	New Broad St House	LIV_TBM-West-RC_Pilot_Adv-4008	12/03/2015	15/05/2016		-4.28	167		-2.83	184		-2.25	366	14.06.2016	CTC 14.06.2016 Confirmed monitoring to be replaced by InSAR.	Proposed
C510-LB11623	Block 116	S11603.2	External	Manual	LB	BRE	Swed Bank House	LIV_TBM-West-RC_Pilot_Adv-4008	12/03/2015	21/02/2017		-0.28	167		-0.52	329		-1.44	369		Within ES2 EOI- Review in rev 2	Outstanding
C510-LB11624	Block 116	S11603.2	External	Manual	LB	BRE	Swed Bank House	LIV_TBM-West-RC_Pilot_Adv-4008	12/03/2015	21/02/2017		-0.28	167		-0.52	329		-1.74	369		Within ES2 EOI- Review in rev 2	Outstanding
C510-LB11625	Block 116	S11603.2	External	Manual	LB	BRE	County House	LIV_VD1_Enlargement_Adv-23	04/06/2014	21/02/2017		-2.77	140		-2.49	232		-2.14	369		Within ES2 EOI- Review in rev 2	Outstanding
C510-LB11626	Block 116	S11603.2	External	Manual	LB	BRE	County House	LIV_CP9_Enlargement_Adv-32	23/08/2014	21/02/2017		-2.95	125		-3.95	181		-2.60	369		Within ES2 EOI- Review in rev 2	Outstanding
C510-LB11627	Block 116	S11603.2	External	Manual	LB	BRE	County House	LIV_AP11_Enlargement_Adv-25	14/08/2016	21/02/2017		-5.69	125		-6.09	181		-4.95	369		Within ES2 EOI- Review in rev 2	Outstanding
C510-LB11628	Block 116	S11603.8;S11604	External	Manual	LB	BRE	County House	LIV_CH3_Enlargement_Adv-11	28/08/2016	21/02/2017		-5.98	124		-6.93	181		-7.70	369		Within ES2 EOI- Review in rev 2	Outstanding
C510-LB11629	Block 116	S11604	External	Manual	LB	BRE	County House	LIV_ES2_Invert_Adv-8	07/11/2016	21/02/2017		-8.25	124		-12.66	183		-11.54	369		Within ES2 EOI- Review in rev 2	Outstanding
C510-LB11630	Block 116	S11604	External	Manual	LB	BRE	County House	LIV_ES2_Invert_Adv-8	07/11/2016	21/02/2017		-8.63	124		-12.42	183		-15.34	369		Within ES2 EOI- Review in rev 2	Outstanding
C510-LB11631	Block 116	S11604	External	Manual	LB	BRE	County House	LIV_ES2_Invert_Adv-8	07/11/2016	21/02/2017		-5.25	131		-9.07	183		-11.61	369		Within ES2 EOI- Review in rev 2	Outstanding
C510-LB11632	Block 116	S11601	Internal	Manual	LB	BRE	Swed Bank House	LIV_VD1_Enlargement_Adv-28	05/06/2014	07/09/2016		-3.55	182		-3.55	182		-3.32	365		Within ES2 EOI- Review in rev 2	Outstanding
C510-LB11633	Block 116	S11601;S11602	Internal	Manual	LB	BRE	Swed Bank House	LIV_VD1_Enlargement_Adv-41	08/06/2014	09/03/2016		-4.65	187		-4.65	187		-2.44	370		Within ES2 EOI- Review in rev 2	Outstanding
C510-LB11634	Block 116	S11601	Internal	Manual	LB	BRE	Swed Bank House	LIV_TBM-West-RC_Pilot_Adv-4008	12/03/2015	31/08/2016		-2.71	175		-3.41	182		-2.41	447		Within ES2 EOI- Review in rev 2	Outstanding
C510-LB11635	Block 116	S11601	Internal	Manual	LB	BRE	Swed Bank House	LIV_VD1_Enlargement_Adv-41	08/06/2014	09/03/2016		-4.42	187		-4.42	187		-2.27	370		Within ES2 EOI- Review in rev 2	Outstanding
C510-LB11636	Block 116	S11601	Internal	Manual	LB	BRE	Swed Bank House	LIV_TBM-West-RC_Pilot_Adv-4008	12/03/2015	09/03/2016		-4.11	187		-4.11	187		-1.96	370		Within ES2 EOI- Review in rev 2	Outstanding
C510-LB11637	Block 116	S11601	Internal	Manual	LB	BRE	Swed Bank House	LIV_VD1_Enlargement_Adv-41	08/06/2014	31/08/2016		-0.83	175		-0.28	182		-1.42	447		Within ES2 EOI- Review in rev 2	Outstanding
C510-LB11638	Block 116	S11601	Internal	Manual	LB	BRE	County House	LIV_CP9_Enlargement_Adv-32	23/08/2014	21/02/2017		-3.61	127		-4.69	187		-3.67	370		Within ES2 EOI- Review in rev 2	Outstanding
C510-LB11639	Block 116	S11601	Internal	Manual	LB	BRE	County House	LIV_CP9_Enlargement_Adv-32	23/08/2014	21/02/2017		-4.77	127		-4.55	187		-3.36	370		Within ES2 EOI- Review in rev 2	Outstanding
C510-LB11640	Block 116	S11601	Internal	Manual	LB	BRE	County House	LIV_AP11_Enlargement_Adv-25	14/08/2016	21/02/2017		-4.12	127		-3.42	187		-2.61	370		Within ES2 EOI- Review in rev 2	Outstanding
C510-LB11641	Block 116	S11601	Internal	Manual	LB	BRE	County House	LIV_AP11_Enlargement_Adv-25	14/08/2016	21/02/2017		-3.97	127		-3.21	187		-3.06	370		Within ES2 EOI- Review in rev 2	Outstanding
C510-LB11642	Block 116	S11601	Internal	Manual	LB	BRE	County House	LIV_AP11_Enlargement_Adv-25	14/08/2016	21/02/2017		-3.06	127		-3.01	187		-2.68	370		Within ES2 EOI- Review in rev 2	Outstanding
C510-LB11643	Block 116	S11601	Internal	Manual	LB	BRE	County House	LIV_CH3_Enlargement_Adv-11	28/08/2016	21/02/2017		-1.37	127		-1.03	187		-1.02	370		Within ES2 EOI- Review in rev 2	Outstanding
C510-LB11644	Block 116	S11601	Internal	Manual	LB	BRE	County House	LIV_CH3_Enlargement_Adv-11	28/08/2016	21/02/2017		-2.36	127		-1.28	187		-1.79	370		Within ES2 EOI- Review in rev 2	Outstanding
C510-LB11645	Block 116	S11601	Internal	Manual	LB	BRE	County House	LIV_CH3_Enlargement_Adv-11	28/08/2016	21/02/2017		-3.79	127		-3.05	187		-3.17	370		Within ES2 EOI- Review in rev 2	Outstanding
C510-LB11646	Block 116	S11602	Internal	Manual	LB	BRE	County House															



Graph 6- All Block 16 Invar Scales (LC) Manual Monitoring History in Relation to Construction



Graph 7- CK 11601 Crackmeter (CK) Manual Monitoring History in Relation to Construction

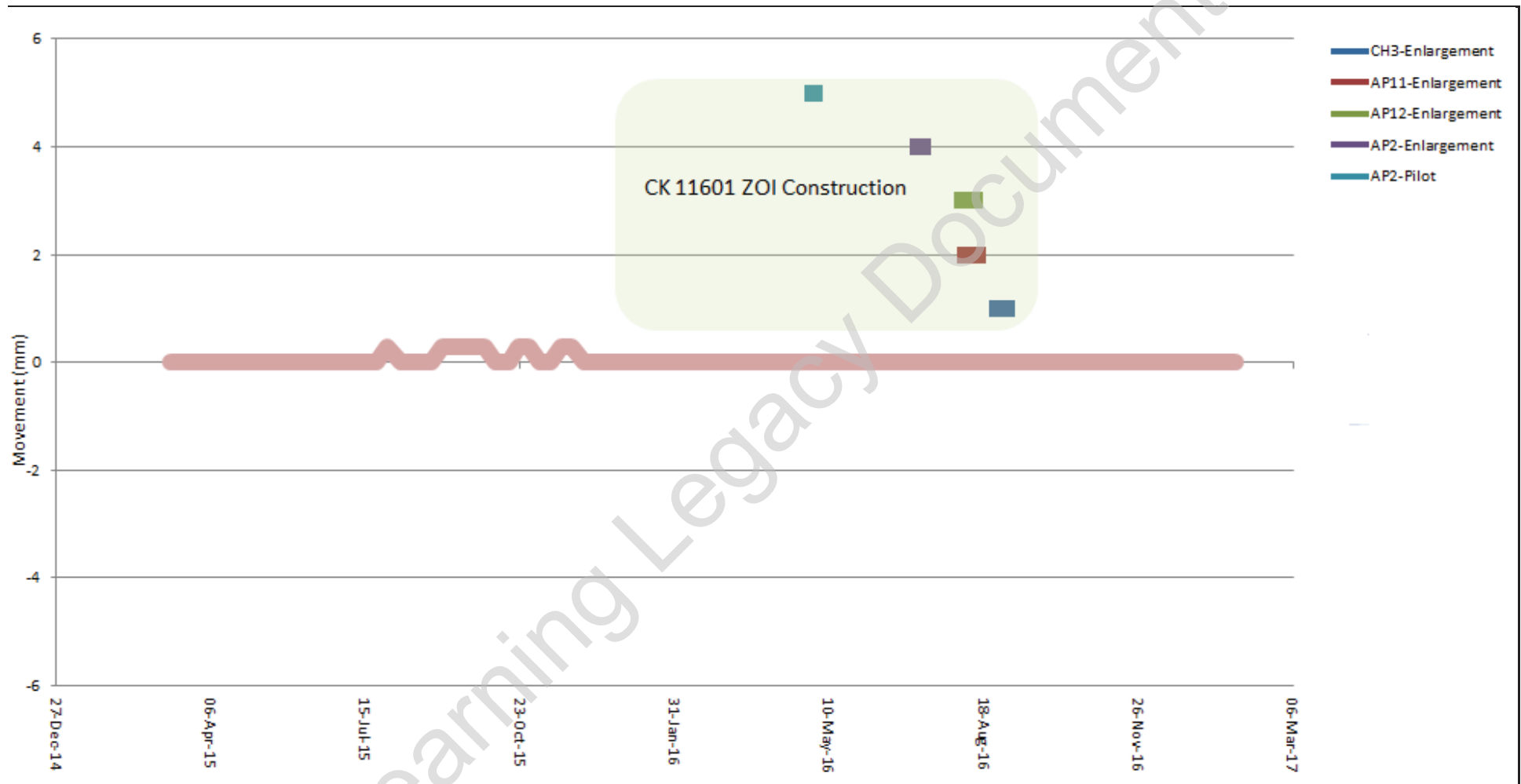


Figure 5- LB Monitoring Sensor Decommissioning Status and Location Plan

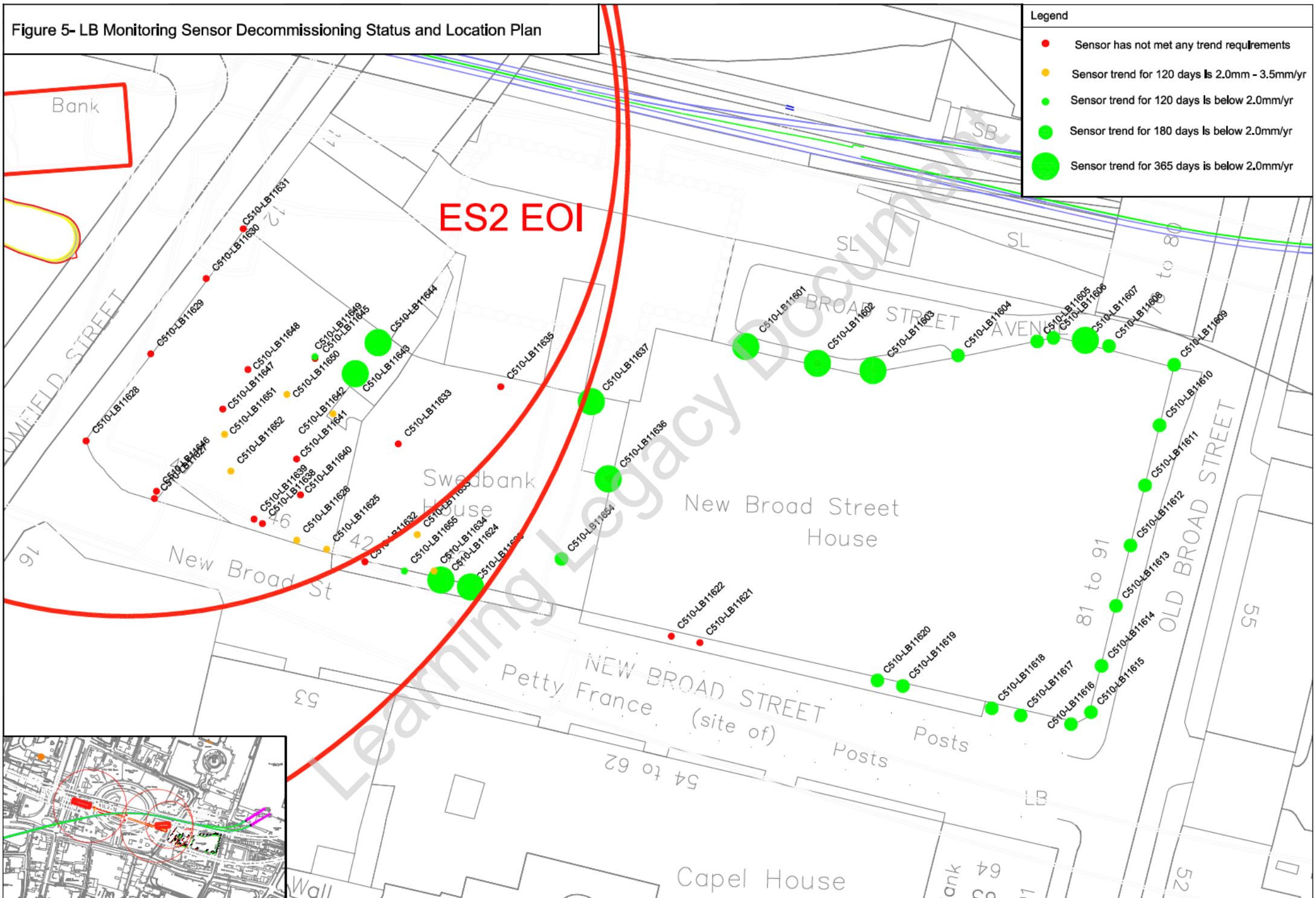


Figure 7- TB Monitoring Sensor Decommissioning Status and Location Plan

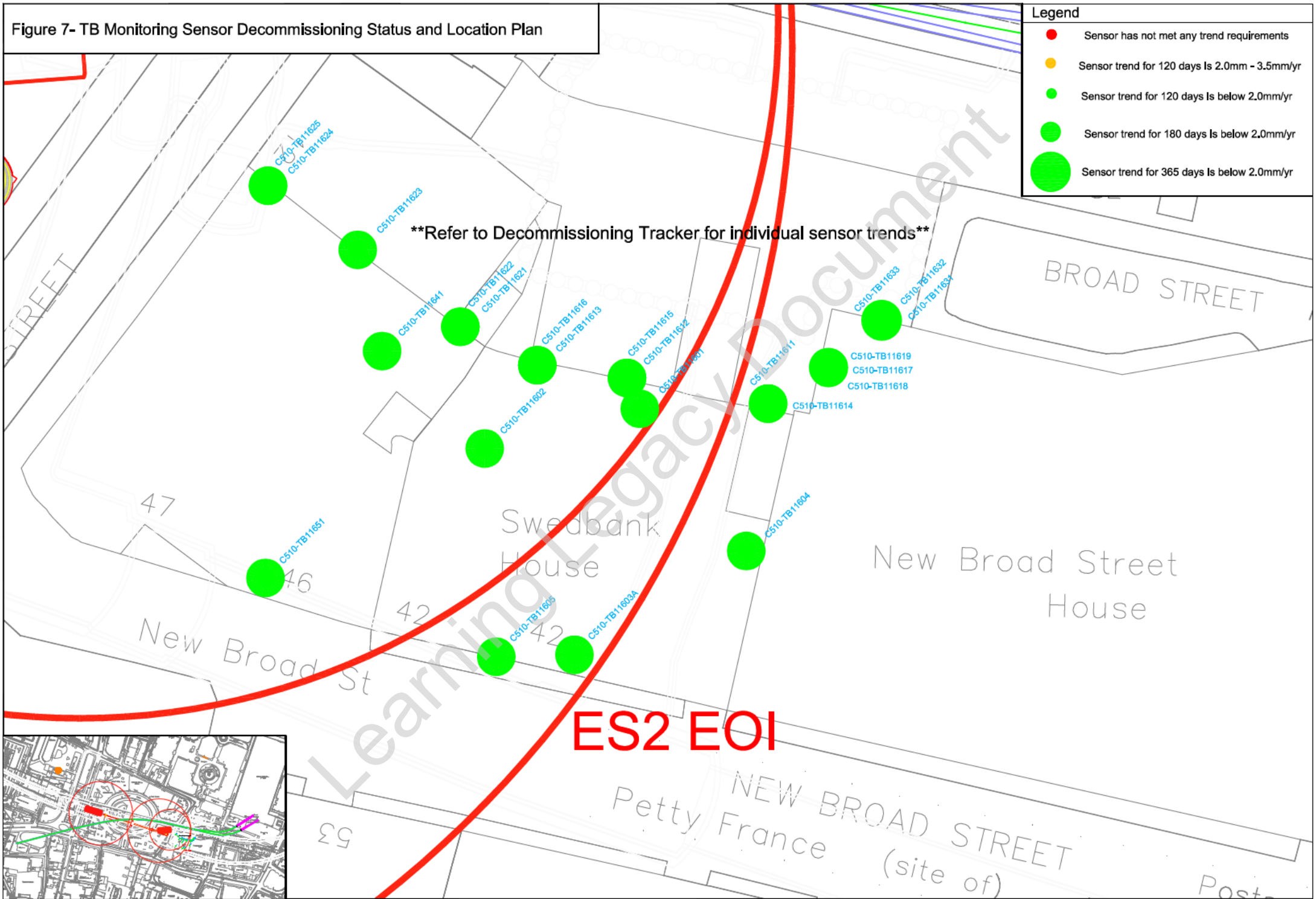


Figure 8- RP Monitoring Sensor Decommissioning Status and Location Plan

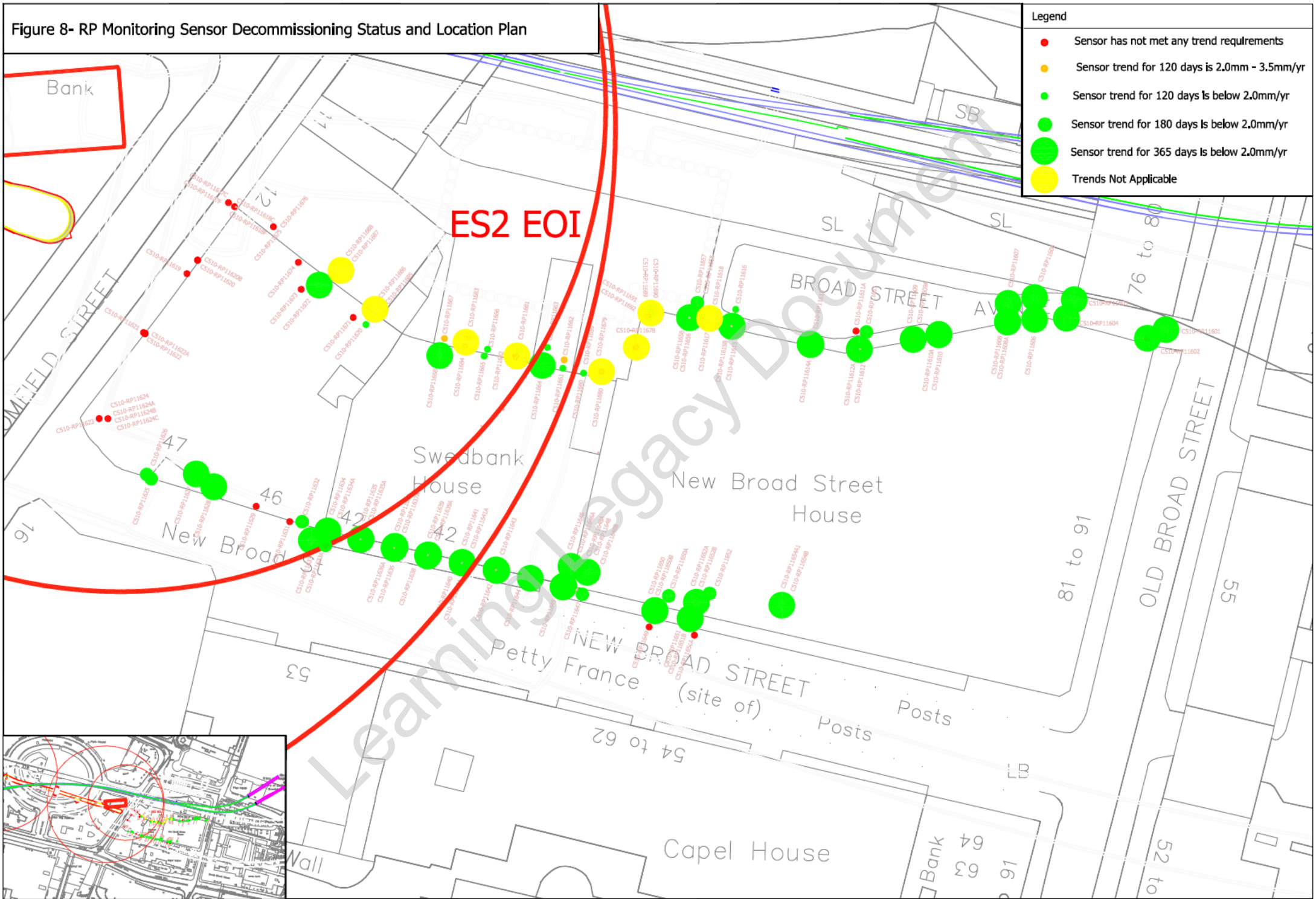


Figure 9- SH Monitoring Sensor Decommissioning Status and Location Plan

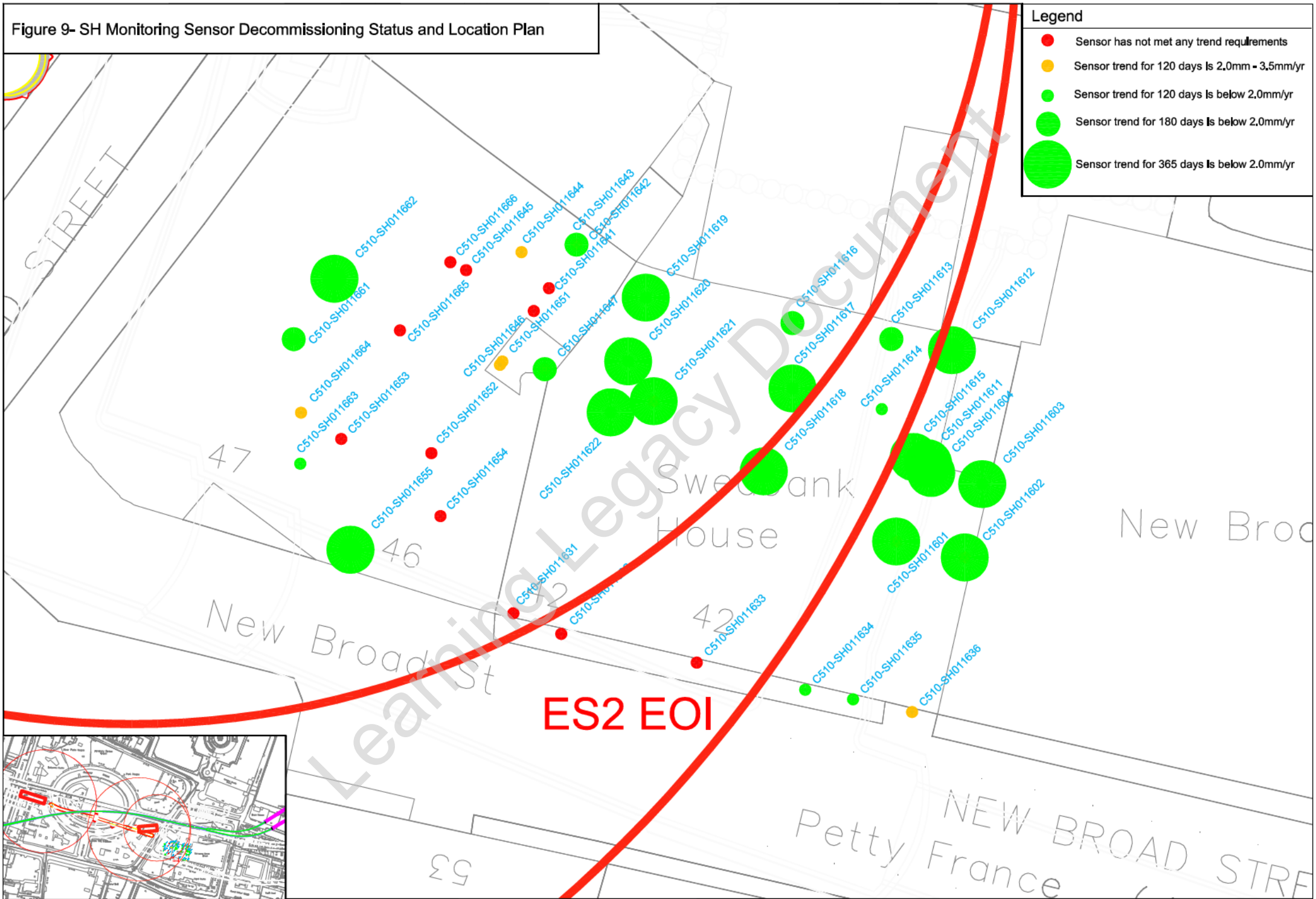
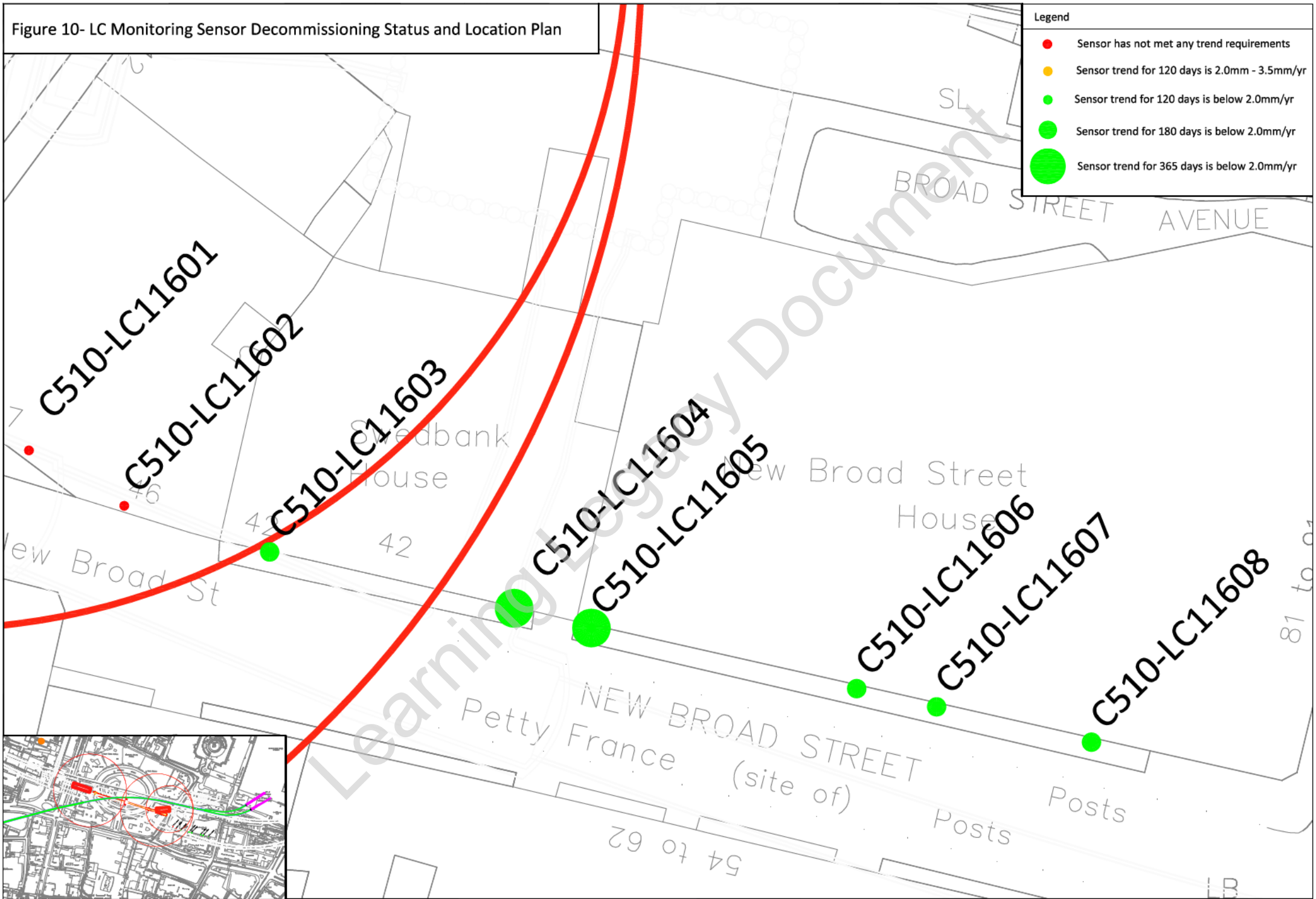




Figure 10- LC Monitoring Sensor Decommissioning Status and Location Plan



---

## 8 Appendix 2 (Graphs, Tables and Figures of Rev.2)

Appendix 2 includes the Graphs, Tables and Figures that were used as evidence to agree decommissioning in Revision 2 of Block 16 Close out Report.

Learning Legacy Document

Table 2 - Block 16 Decommissioning Status Tracker

28/06/2017



AVERAGE SETTLEMENT TRENDS

C50 Sensor Name	Block	Section	Int / Ext	Measurement Type	Sensor Type	Sensor Description	Asset Location	ZOI Last Primary Layer Construction	Last Construction Date	Latest Surveyed Date	Settlement (mm)					Ceased Date	General Comment	Decommissioning Status
											120 Days	120 Day Calculation Period	180 Days	180 Day Calculation Period	365 Days			
C50-LB1623	Block 116	S1603.2	External	Manual	LB	BRE	Swed Bank House	LIV_TBM-West-RC_Pilot_Adv-4008	12/03/2015	19/05/2017	-0.39	254	-0.39	254	-0.54	416	Manual Monitoring specification not met- Reasses in Rev 3	Outstanding
C50-LB1624	Block 116	S1603.2	External	Manual	LB	BRE	Swed Bank House	LIV_TBM-West-RC_Pilot_Adv-4008	12/03/2015	19/05/2017	-0.39	254	-0.39	254	-0.48	416	Manual Monitoring specification not met- Reasses in Rev 3	Outstanding
C50-LB1625	Block 116	S1603.2	External	Manual	LB	BRE	County House	LIV_VD1_Enlargement_Adv-23	04/06/2014	19/05/2017	-2.89	123	-2.73	227	-2.30	381	Manual Monitoring specification not met- Reasses in Rev 3	Outstanding
C50-LB1626	Block 116	S1603.2	External	Manual	LB	BRE	County House	LIV_CP9_Enlargement_Adv-32	23/08/2014	19/05/2017	-1.76	123	-3.13	185	-3.13	366	Manual Monitoring specification not met- Reasses in Rev 3	Outstanding
C50-LB1627	Block 116	S1603.2	External	Manual	LB	BRE	County House	LIV_AP11_Enlargement_Adv-25	14/08/2016	19/05/2017	-3.74	121	-4.93	184	-5.45	366	Manual Monitoring specification not met- Reasses in Rev 3	Outstanding
C50-LB1628	Block 116	S1603.8.S1604	External	Manual	LB	BRE	County House	LIV_CH3_Enlargement_Adv-11	28/08/2016	22/06/2017	-5.56	121	-6.22	190	-7.37	366	Manual Monitoring specification not met- Reasses in Rev 3	Outstanding
C50-LB1629	Block 116	S1604	External	Manual	LB	BRE	County House	LIV_ES2_Invert_Adv-8	07/11/2016	22/06/2017	-4.01	121	-4.86	206	-11.70	366	Manual Monitoring specification not met- Reasses in Rev 3	Outstanding
C50-LB1630	Block 116	S1604	External	Manual	LB	BRE	County House	LIV_ES2_Invert_Adv-8	07/11/2016	22/06/2017	-2.68	121	-5.20	217	-14.61	366	Manual Monitoring specification not met- Reasses in Rev 3	Outstanding
C50-LB1631	Block 116	S1604	External	Manual	LB	BRE	County House	LIV_ES2_Invert_Adv-8	07/11/2016	22/06/2017	-4.55	121	-4.20	217	-10.54	366	Manual Monitoring specification not met- Reasses in Rev 3	Outstanding
C50-LB1632	Block 116	S1601	Internal	Manual	LB	BRE	Swed Bank House	LIV_VD1_Enlargement_Adv-28	05/06/2014	07/09/2016	N/A	N/A	N/A	N/A	N/A	Access no longer due to internal refurbishment- Agreed to cease Monitoring in CTC meeting 07/06/2016	Proposed	
C50-LB1633	Block 116	S1601.S1602	Internal	Manual	LB	BRE	Swed Bank House	LIV_VD1_Enlargement_Adv-41	08/06/2014	09/03/2016	N/A	N/A	N/A	N/A	N/A	Access no longer due to internal refurbishment- Agreed to cease Monitoring in CTC meeting 07/06/2017	Proposed	
C50-LB1634	Block 116	S1601	Internal	Manual	LB	BRE	Swed Bank House	LIV_TBM-West-RC_Pilot_Adv-4008	12/03/2015	31/08/2016	N/A	N/A	N/A	N/A	N/A	Access no longer due to internal refurbishment- Agreed to cease Monitoring in CTC meeting 07/06/2018	Proposed	
C50-LB1635	Block 116	S1601	Internal	Manual	LB	BRE	Swed Bank House	LIV_VD1_Enlargement_Adv-41	08/06/2014	09/03/2016	N/A	N/A	N/A	N/A	N/A	Access no longer due to internal refurbishment- Agreed to cease Monitoring in CTC meeting 07/06/2019	Proposed	
C50-LB1636	Block 116	S1601	Internal	Manual	LB	BRE	Swed Bank House	LIV_TBM-West-RC_Pilot_Adv-4008	12/03/2015	09/03/2016	N/A	N/A	N/A	N/A	N/A	Access no longer due to internal refurbishment- Agreed to cease Monitoring in CTC meeting 07/06/2020	Proposed	
C50-LB1637	Block 116	S1601	Internal	Manual	LB	BRE	Swed Bank House	LIV_VD1_Enlargement_Adv-41	08/06/2014	31/08/2016	N/A	N/A	N/A	N/A	N/A	Access no longer due to internal refurbishment- Agreed to cease Monitoring in CTC meeting 07/06/2021	Proposed	
C50-LB1638	Block 116	S1601	Internal	Manual	LB	BRE	County House	LIV_CP9_Enlargement_Adv-32	23/08/2014	19/05/2017	-1.72	121	-2.25	184	-3.65	436	Manual Monitoring specification not met- Reasses in Rev 3	Outstanding
C50-LB1639	Block 116	S1601	Internal	Manual	LB	BRE	County House	LIV_CP9_Enlargement_Adv-32	23/08/2014	19/05/2017	-2.49	121	-3.30	184	-3.78	436	Manual Monitoring specification not met- Reasses in Rev 3	Outstanding
C50-LB1640	Block 116	S1601	Internal	Manual	LB	BRE	County House	LIV_AP11_Enlargement_Adv-25	14/08/2016	19/05/2017	-1.86	121	-2.56	184	-2.76	436	Manual Monitoring specification not met- Reasses in Rev 3	Outstanding
C50-LB1641	Block 116	S1601	Internal	Manual	LB	BRE	County House	LIV_AP11_Enlargement_Adv-25	14/08/2016	19/05/2017	-2.35	121	-3.01	184	-2.97	436	Manual Monitoring specification not met- Reasses in Rev 3	Outstanding
C50-LB1642	Block 116	S1601	Internal	Manual	LB	BRE	County House	LIV_AP11_Enlargement_Adv-25	14/08/2016	19/05/2017	-3.56	121	-2.86	184	-2.61	436	Manual Monitoring specification not met- Reasses in Rev 3	Outstanding
C50-LB1643	Block 116	S1601	Internal	Manual	LB	BRE	County House	LIV_CH3_Enlargement_Adv-11	28/08/2016	19/05/2017	-2.35	121	-1.95	184	-0.43	436	Manual Monitoring specification not met- Reasses in Rev 3	Outstanding
C50-LB1644	Block 116	S1601	Internal	Manual	LB	BRE	County House	LIV_CH3_Enlargement_Adv-11	28/08/2016	19/05/2017	-1.81	121	-1.80	184	-1.52	436	Manual Monitoring specification not met- Reasses in Rev 3	Outstanding
C50-LB1645	Block 116	S1601	Internal	Manual	LB	BRE	County House	LIV_CH3_Enlargement_Adv-11	28/08/2016	19/05/2017	-1.70	121	-2.32	184	-3.34	436	Manual Monitoring specification not met- Reasses in Rev 3	Outstanding
C50-LB1646	Block 116	S1602	Internal	Manual	LB	BRE	County House	LIV_AP11_Enlargement_Adv-25	14/08/2016	19/05/2017	-3.08	121	-3.77	184	-5.46	436	Manual Monitoring specification not met- Reasses in Rev 3	Outstanding
C50-LB1647	Block 116	S1602	Internal	Manual	LB	BRE	County House	LIV_CH3_Enlargement_Adv-11	28/08/2016	19/05/2017	-3.35	121	-2.58	184	-6.05	436	Manual Monitoring specification not met- Reasses in Rev 3	Outstanding
C50-LB1648	Block 116	S1602	Internal	Manual	LB	BRE	County House	LIV_CH3_Enlargement_Adv-11	28/08/2016	19/05/2017	-2.72	121	-3.42	184	-8.15	436	Manual Monitoring specification not met- Reasses in Rev 3	Outstanding
C50-LB1649	Block 116	S1602	Internal	Manual	LB	BRE	County House	LIV_CH3_Enlargement_Adv-11	28/08/2016	19/05/2017	-2.05	121	-0.77	184	-3.08	436	Manual Monitoring specification not met- Reasses in Rev 3	Outstanding
C50-LB1650	Block 116	S1602	Internal	Manual	LB	BRE	County House	LIV_CH3_Enlargement_Adv-11	28/08/2016	19/05/2017	-1.69	121	-0.96	184	-3.72	436	Manual Monitoring specification not met- Reasses in Rev 3	Outstanding
C50-LB1651	Block 116	S1602	Internal	Manual	LB	BRE	County House	LIV_CH3_Enlargement_Adv-11	28/08/2016	19/05/2017	-2.92	121	-2.19	184	-4.71	443	Manual Monitoring specification not met- Reasses in Rev 3	Outstanding
C50-LB1652	Block 116	S1602	Internal	Manual	LB	BRE	County House	LIV_AP11_Enlargement_Adv-25	14/08/2016	19/05/2017	-2.27	121	-2.15	184	-4.52	436	Manual Monitoring specification not met- Reasses in Rev 3	Outstanding
C50-LB1653	Block 116	S1602	Internal	Manual	LB	BRE	Swed Bank House	LIV_TBM-West-RC_Pilot_Adv-4008	12/03/2015	31/08/2016	N/A	N/A	N/A	N/A	N/A	Access no longer due to internal refurbishment- Agreed to cease Monitoring in CTC meeting 07/06/2019	Proposed	
C50-LB1654	Block 116	S1603	Internal	Manual	LB	BRE	Swed Bank House	LIV_TBM-West-RC_Pilot_Adv-4008	12/03/2015	31/08/2016	N/A	N/A	N/A	N/A	N/A	Access no longer due to internal refurbishment- Agreed to cease Monitoring in CTC meeting 07/06/2020	Proposed	
C50-LB1655	Block 116	S1600	External	Manual	LB	BRE	Swed Bank House	LIV_TBM-West-RC_Pilot_Adv-4008	12/03/2015	31/08/2016	N/A	N/A	N/A	N/A	N/A	Access no longer due to internal refurbishment- Agreed to cease Monitoring in CTC meeting 07/06/2021	Proposed	
C50-LC1601	Block 116	S1603.2	External	Manual	LC	Invert Scale	Swed Bank House	LIV_AP11_Enlargement_Adv-25	14/08/2016	19/05/2017	-3.01	123	-4.62	185	-5.15	366	Manual Monitoring specification not met- Reasses in Rev 3	Outstanding
C50-LC1602	Block 116	S1603.2	External	Manual	LC	Invert Scale	Swed Bank House	LIV_CP9_Enlargement_Adv-32	23/08/2014	19/05/2017	-2.08	121	-2.75	184	-3.97	366	Manual Monitoring specification not met- Reasses in Rev 3	Outstanding
C50-LC1603	Block 116	S1603.2	External	Manual	LC	Invert Scale	Swed Bank House	LIV_VD1_Enlargement_Adv-28	05/06/2014	19/05/2017	-2.46	123	-1.16	254	-1.96	408	Manual Monitoring specification not met- Reasses in Rev 3	Outstanding
C50-LP1601	Block 116	S1601	External	Manual	LP	Road Stud	Bloomfield St	LIV_ES2_Invert_Adv-8	07/11/2016	26/11/2012	N/A	N/A	N/A	N/A	N/A	Sensor destroyed- Unable to monitor	Proposed	
C50-LP1602	Block 116	S1601	External	Manual	LP	Road Stud	Bloomfield St	LIV_ES2_Invert_Adv-8	07/11/2016	26/11/2012	N/A	N/A	N/A	N/A	N/A	Sensor destroyed- Unable to monitor	Proposed	
C50-LP1603	Block 116	S1601	External	Manual	LP	Road Stud	Bloomfield St	LIV_ES2_Invert_Adv-8	07/11/2016	26/11/2012	N/A	N/A	N/A	N/A	N/A	Sensor destroyed- Unable to monitor	Proposed	
C50-LP1604	Block 116	S1601	External	Manual	LP	Road Stud	Bloomfield St	LIV_ES2_Invert_Adv-8	07/11/2016	22/06/2017	-3.83	121	-4.80	217	-13.92	368	Manual monitoring specification not met- Reasses in Rev 3	Outstanding
C50-LP1605	Block 116	S1601	External	Manual	LP	Road Stud	Bloomfield St	LIV_ES2_Invert_Adv-8	07/11/2016	22/06/2017	-4.35	121	-5.48	217	-14.52	368	Manual monitoring specification not met- Reasses in Rev 3	Outstanding
C50-LP1606	Block 116	S1601	External	Manual	LP	Road Stud	Bloomfield St	LIV_ES2_Invert_Adv-8	07/11/2016	22/06/2017	-3.40	121	-4.41	183	-13.12	368	Manual monitoring specification not met- Reasses in Rev 3	Outstanding
C50-LP1607	Block 116	S1601	External	Manual	LP	Road Stud	Bloomfield St	LIV_ES2_Invert_Adv-8	07/11/2016	22/06/2017	-4.45	121	-4.93	183	-10.59	368	Manual monitoring specification not met- Reasses in Rev 3	Outstanding
C50-LP1608	Block 116	S1601	External	Manual	LP	Road Stud	Bloomfield St	LIV_CH3_Enlargement_Adv-11	28/08/2016	22/06/2017	-4.85	121	-5.85	183	-8.74	368	Manual monitoring specification not met- Reasses in Rev 3	Outstanding
C50-LP1609	Block 116	S1601	External	Manual	LP	Road Stud	Bloomfield St	LIV_CP9_Enlargement_Adv-32	23/08/2014	22/06/2017	-5.54	121	-6.79	183	-7.20	368	Manual monitoring specification not met- Reasses in Rev 3	Outstanding
C50-RP1075H	Block 116	N/A	External	Automated	RP	3D Geodetic prism	Swedbank House	LIV_CH3_Enlargement_Adv-9	27/08/2016	08/06/2015	N/A	N/A	N/A	N/A	N/A	Prisms were installed for temporary works- No longer producing data and no more grouting in the area	Proposed	
C50-RP1075L	Block 116	N/A	External	Automated	RP	3D Geodetic prism	Swedbank House	LIV_AP11_Enlargement_Adv-25	14/08/2016	11/07/2015	N/A	N/A	N/A	N/A	N/A	Prisms were installed for temporary works- No longer producing data and no more grouting in the area	Proposed	
C50-RP1076H	Block 116	N/A	External	Automated	RP	3D Geodetic prism	Swedbank House	LIV_AP11_Enlargement_Adv-25	14/08/2016	01/07/2015	N/A	N/A	N/A	N/A	N/A	Prisms were installed for temporary works- No longer producing data and no more grouting in the area	Proposed	
C50-RP1076L	Block 116	N/A	External	Automated	RP	3D Geodetic prism	Swedbank House	LIV_AP11_Enlargement_Adv-25	14/08/2016	09/06/2015	N/A	N/A	N/A	N/A	N/A	Prisms were installed for temporary works- No longer producing data and no more grouting in the area	Proposed	
C50-RP1077H	Block 116	N/A	External	Automated	RP	3D Geodetic prism	Swedbank House	LIV_VD1_Enlargement_Adv-41	08/06/2014	09/06/2015	N/A	N/A	N/A	N/A	N/A	Prisms were installed for temporary works- No longer producing data and no more grouting in the area	Proposed	
C50-RP1077L	Block 116	N/A	External	Automated	RP	3D Geodetic prism	Swedbank House	LIV_VD1_Enlargement_Adv-41	08/06/2014	09/06/2015	N/A	N/A	N/A	N/A	N/A	Prisms were installed for temporary works- No longer producing data and no more grouting in the area	Proposed	
C50-RP1078H	Block 116	N/A	External	Automated	RP	3D Geodetic prism	Swedbank House	LIV_VD1_Enlargement_Adv-41	08/06/2014	09/06/2015	N/A	N/A	N/A	N/A	N/A	Prisms were installed for temporary works- No longer producing data and no more grouting in the area	Proposed	
C50-RP1078L	Block 116	N/A	External	Automated	RP	3D Geodetic prism	Swedbank House	LIV_VD1_Enlargement_Adv-41	08/06/2014	09/06/2015	N/A	N/A	N/A	N/A	N/A	Prisms were installed for temporary works- No longer producing data and no more grouting in the area	Proposed	
C50-RP1177C	Block 116	N/A	External	Automated	RP	3D Geodetic prism	New Broad Street House	LIV_ES2_Invert_Adv-8	07/11/2016	16/06/2017	-3.42	120	-4.8	180	-6.32	365	6 Months post construction monitoring specification complete- Agreed to decommission the grouting adit	Proposed
C50-RP1177D	Block 116	N/A	External	Automated	RP	3D Geodetic prism	New Broad Street House	LIV_ES2_Invert_Adv-8	07/11/2016	16/06/2017	-3.43	120	-4.51	180	-6.39	365	6 Months post construction monitoring specification complete- Agreed to decommission the grouting adit	Proposed
C50-RP1178C	Block 116	N/A	External	Automated	RP	3D Geodetic prism	New Broad Street House	LIV_ES2_Invert_Adv-8	07/11/2016	16/06/2017	-1.82	120	-2.67	180	-6.22	365	6 Months post construction monitoring specification complete- Agreed to decommission the grouting adit	Proposed
C50-RP1178D	Block 116	N/A	External	Automated	RP	3D Geodetic prism	New Broad Street House	LIV_ES2_Invert_Adv-8	07/11/2016	16/06/2017	-1.68	120	-2.65	180				

Table 2 - Block 16 Decommissioning Status Tracker

28/06/2017

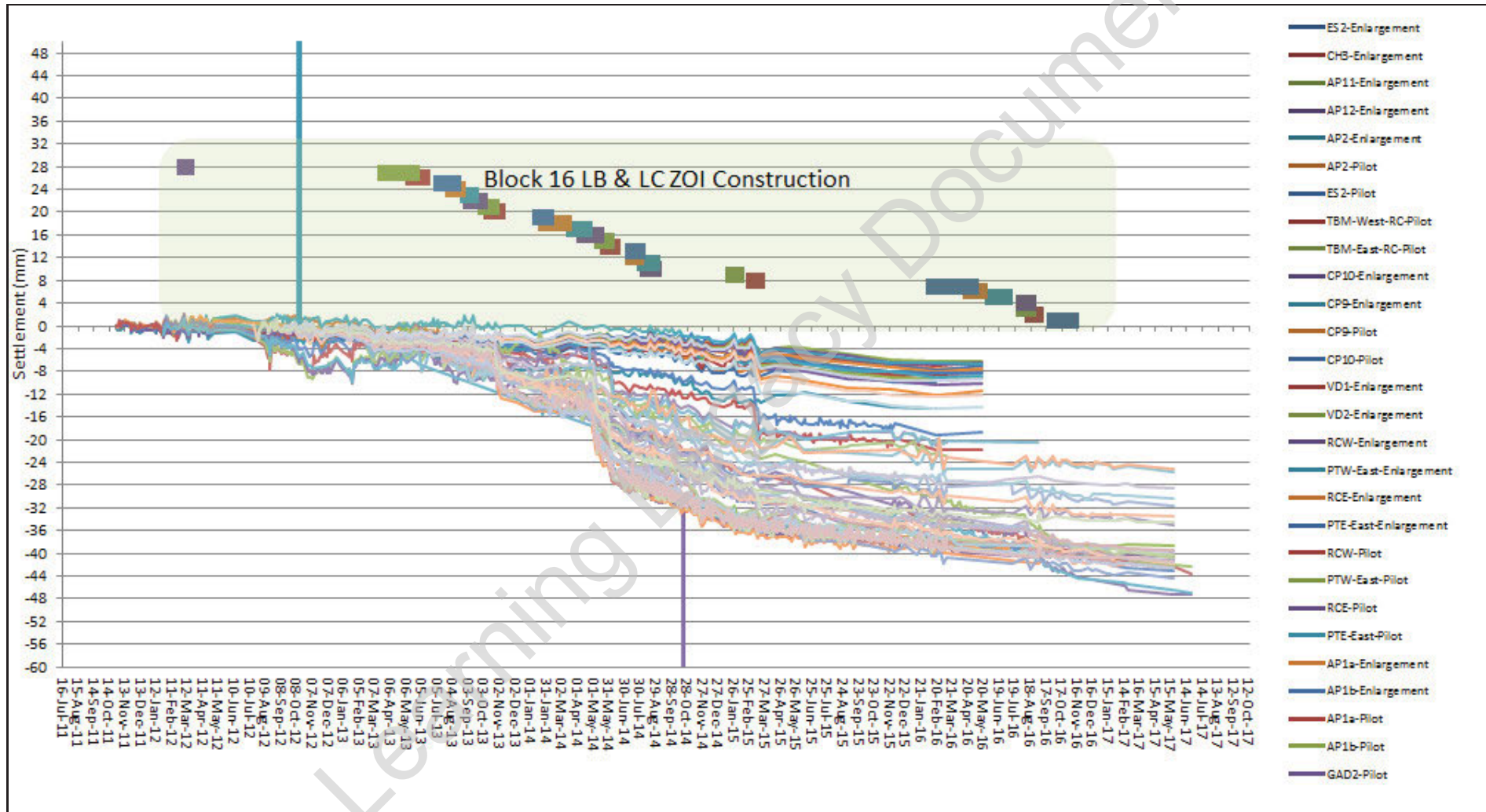
< 2.0 mm GREEN	< 3.5 mm AMBER	> 3.5 mm RED
----------------	----------------	--------------

C510 Sensor Name	Block	Section	Int / Ext	Measurement Type	Sensor Type	Sensor Description	Asset Location	ZOI Last Primary Layer Construction	Last Construction Date	Latest Surveyed Date	AVERAGE SETTLEMENT TREND					Ceased Date	General Comment	Decommissioning Status
											120 Days	120 Day Calculation Period	180 Days	180 Day Calculation Period	365 Days			
C510-SH011641	Block 116	N/A	Unknown	Automated	SH	Settlement Cell-Electronic	46 New Broad Street	LIV_AP11_Enlargement_Adv-25	14/08/2016	22/06/2017	N/A	N/A	N/A	N/A		6 Months post construction monitoring specification complete- Agreed to decommission the grouting adit- Trends unreliable due to poor network quality	Proposed	
C510-SH011642	Block 116	N/A	Unknown	Automated	SH	Settlement Cell-Electronic	46 New Broad Street	LIV_CH3_Enlargement_Adv-11	28/08/2016	22/06/2017	N/A	N/A	N/A	N/A		6 Months post construction monitoring specification complete- Agreed to decommission the grouting adit- Trends unreliable due to poor network quality	Proposed	
C510-SH011643	Block 116	N/A	Unknown	Automated	SH	Settlement Cell-Electronic	46 New Broad Street	LIV_CH3_Enlargement_Adv-11	28/08/2016	22/06/2017	3.66	120	2.11	180	1.65	366	6 Months post construction monitoring specification complete- Agreed to decommission the grouting adit	Proposed
C510-SH011644	Block 116	N/A	Unknown	Automated	SH	Settlement Cell-Electronic	46 New Broad Street	LIV_CH3_Enlargement_Adv-11	28/08/2016	22/06/2017	0.39	120	2.04	180	0.22	366	6 Months post construction monitoring specification complete- Agreed to decommission the grouting adit	Proposed
C510-SH011645	Block 116	N/A	Unknown	Automated	SH	Settlement Cell-Electronic	46 New Broad Street	LIV_CH3_Enlargement_Adv-11	28/08/2016	22/06/2017	2.37	120	1.05	180	1.96	366	6 Months post construction monitoring specification complete- Agreed to decommission the grouting adit	Proposed
C510-SH011646	Block 116	N/A	Unknown	Automated	SH	Settlement Cell-Electronic	46 New Broad Street	LIV_AP11_Enlargement_Adv-25	14/08/2016	22/06/2017	0.65	120	-0.81	180	0.10	366	6 Months post construction monitoring specification complete- Agreed to decommission the grouting adit	Proposed
C510-SH011647	Block 116	N/A	Unknown	Automated	SH	Settlement Cell-Electronic	46 New Broad Street	LIV_AP11_Enlargement_Adv-25	14/08/2016	22/06/2017	1.65	120	0.61	180	0.77	366	6 Months post construction monitoring specification complete- Agreed to decommission the grouting adit	Proposed
C510-SH011651	Block 116	N/A	Unknown	Automated	SH	Settlement Cell-Electronic	46 New Broad Street	LIV_AP11_Enlargement_Adv-25	14/08/2016	22/06/2017	0.65	120	-0.81	180	0.11	366	6 Months post construction monitoring specification complete- Agreed to decommission the grouting adit	Proposed
C510-SH011652	Block 116	N/A	Unknown	Automated	SH	Settlement Cell-Electronic	46 New Broad Street	LIV_AP11_Enlargement_Adv-25	14/08/2016	22/06/2017	-1.71	120	-2.41	180	-0.34	366	6 Months post construction monitoring specification complete- Agreed to decommission the grouting adit	Proposed
C510-SH011653	Block 116	N/A	Unknown	Automated	SH	Settlement Cell-Electronic	46 New Broad Street	LIV_AP11_Enlargement_Adv-25	14/08/2016	22/06/2017	-1.38	120	-1.52	180	2.28	366	6 Months post construction monitoring specification complete- Agreed to decommission the grouting adit	Proposed
C510-SH011654	Block 116	N/A	Unknown	Automated	SH	Settlement Cell-Electronic	46 New Broad Street	LIV_AP11_Enlargement_Adv-25	14/08/2016	22/06/2017	-2.18	120	-2.30	180	-0.49	366	6 Months post construction monitoring specification complete- Agreed to decommission the grouting adit	Proposed
C510-SH011655	Block 116	N/A	Unknown	Automated	SH	Settlement Cell-Electronic	46 New Broad Street	LIV_CP9_Enlargement_Adv-32	23/08/2014	22/06/2017	-2.40	120	-3.18	180	-1.87	366	6 Months post construction monitoring specification complete- Agreed to decommission the grouting adit	Proposed
C510-SH011661	Block 116	N/A	Unknown	Automated	SH	Settlement Cell-Electronic	46 New Broad Street	LIV_CH3_Enlargement_Adv-11	28/08/2016	22/06/2017	1.31	120	-0.32	180	-0.40	366	6 Months post construction monitoring specification complete- Agreed to decommission the grouting adit	Proposed
C510-SH011662	Block 116	N/A	Unknown	Automated	SH	Settlement Cell-Electronic	46 New Broad Street	LIV_CH3_Enlargement_Adv-11	28/08/2016	22/06/2017	1.66	120	0.12	180	-0.90	366	6 Months post construction monitoring specification complete- Agreed to decommission the grouting adit	Proposed
C510-SH011663	Block 116	N/A	Unknown	Automated	SH	Settlement Cell-Electronic	46 New Broad Street	LIV_AP11_Enlargement_Adv-25	14/08/2016	22/06/2017	0.22	120	-1.35	180	-0.53	366	6 Months post construction monitoring specification complete- Agreed to decommission the grouting adit	Proposed
C510-SH011664	Block 116	N/A	Unknown	Automated	SH	Settlement Cell-Electronic	46 New Broad Street	LIV_CH3_Enlargement_Adv-11	28/08/2016	22/06/2017	0.99	120	-0.65	180	0.24	366	6 Months post construction monitoring specification complete- Agreed to decommission the grouting adit	Proposed
C510-SH011665	Block 116	N/A	Unknown	Automated	SH	Settlement Cell-Electronic	46 New Broad Street	LIV_CH3_Enlargement_Adv-11	28/08/2016	22/06/2017	1.57	120	0.65	180	1.54	366	6 Months post construction monitoring specification complete- Agreed to decommission the grouting adit	Proposed
C510-SH011666	Block 116	N/A	Unknown	Automated	SH	Settlement Cell-Electronic	46 New Broad Street	LIV_CH3_Enlargement_Adv-11	28/08/2016	22/06/2017	2.38	120	1.04	180	1.97	366	6 Months post construction monitoring specification complete- Agreed to decommission the grouting adit	Proposed
C510-TB11621A	Block 116	N/A	Internal	Automated	TB	Tiltmeter-Biaxial	County House	LIV_AP11_Enlargement_Adv-25	14/08/2016	22/06/2017	0.07	120	0.49	180	0.13	365	6 Months post construction monitoring specification complete- Agreed to decommission the grouting adit	Proposed
C510-TB11621B	Block 116	N/A	Internal	Automated	TB	Tiltmeter-Biaxial	County House	LIV_AP11_Enlargement_Adv-25	14/08/2016	22/06/2017	-0.26	120	-0.11	180	0.24	365	6 Months post construction monitoring specification complete- Agreed to decommission the grouting adit	Proposed
C510-TB11622A	Block 116	N/A	Internal	Automated	TB	Tiltmeter-Biaxial	County House	LIV_AP11_Enlargement_Adv-25	14/08/2016	22/06/2017	0.06	120	0.13	180	0.22	365	6 Months post construction monitoring specification complete- Agreed to decommission the grouting adit	Proposed
C510-TB11622B	Block 116	N/A	Internal	Automated	TB	Tiltmeter-Biaxial	County House	LIV_AP11_Enlargement_Adv-25	14/08/2016	22/06/2017	0.15	120	-0.01	180	-0.10	365	6 Months post construction monitoring specification complete- Agreed to decommission the grouting adit	Proposed
C510-TB11623A	Block 116	N/A	Internal	Automated	TB	Tiltmeter-Biaxial	County House	LIV_CH3_Enlargement_Adv-11	28/08/2016	22/06/2017	0.20	120	0.13	180	-0.11	365	6 Months post construction monitoring specification complete- Agreed to decommission the grouting adit	Proposed
C510-TB11623B	Block 116	N/A	Internal	Automated	TB	Tiltmeter-Biaxial	County House	LIV_CH3_Enlargement_Adv-11	28/08/2016	22/06/2017	0.37	120	0.12	180	-0.17	365	6 Months post construction monitoring specification complete- Agreed to decommission the grouting adit	Proposed
C510-TB11624A	Block 116	N/A	Internal	Automated	TB	Tiltmeter-Biaxial	County House	LIV_ES2_Invert_Adv-8	07/11/2016	22/06/2017	0.42	120	0.62	180	0.05	365	6 Months post construction monitoring specification complete- Agreed to decommission the grouting adit	Proposed
C510-TB11624B	Block 116	N/A	Internal	Automated	TB	Tiltmeter-Biaxial	County House	LIV_ES2_Invert_Adv-8	07/11/2016	22/06/2017	0.40	120	0.21	180	-0.06	365	6 Months post construction monitoring specification complete- Agreed to decommission the grouting adit	Proposed
C510-TB11625A	Block 116	N/A	Internal	Automated	TB	Tiltmeter-Biaxial	County House	LIV_ES2_Invert_Adv-8	07/11/2016	22/06/2017	0.35	120	0.97	180	0.18	365	6 Months post construction monitoring specification complete- Agreed to decommission the grouting adit	Proposed
C510-TB11625B	Block 116	N/A	Internal	Automated	TB	Tiltmeter-Biaxial	County House	LIV_ES2_Invert_Adv-8	07/11/2016	22/06/2017	-0.60	120	-0.61	180	-0.44	365	6 Months post construction monitoring specification complete- Agreed to decommission the grouting adit	Proposed
C510-TB11641A	Block 116	N/A	Internal	Automated	TB	Tiltmeter-Biaxial	County House	LIV_CH3_Enlargement_Adv-11	28/08/2016	22/06/2017	0.25	120	0.26	180	0.11	365	6 Months post construction monitoring specification complete- Agreed to decommission the grouting adit	Proposed
C510-TB11641B	Block 116	N/A	Internal	Automated	TB	Tiltmeter-Biaxial	County House	LIV_CH3_Enlargement_Adv-11	28/08/2016	22/06/2017	0.54	120	0.56	180	0.21	365	6 Months post construction monitoring specification complete- Agreed to decommission the grouting adit	Proposed
C510-TB11651A	Block 116	N/A	External	Automated	TB	Tiltmeter-Biaxial	County House	LIV_CP9_Enlargement_Adv-32	23/08/2014	22/06/2017	0.11	120	0.08	180	-0.46	365	6 Months post construction monitoring specification complete- Agreed to decommission the grouting adit	Proposed
C510-TB11651B	Block 116	N/A	External	Automated	TB	Tiltmeter-Biaxial	County House	LIV_CP9_Enlargement_Adv-32	23/08/2014	22/06/2017	0.03	120	-0.01	180	0.02	365	6 Months post construction monitoring specification complete- Agreed to decommission the grouting adit	Proposed

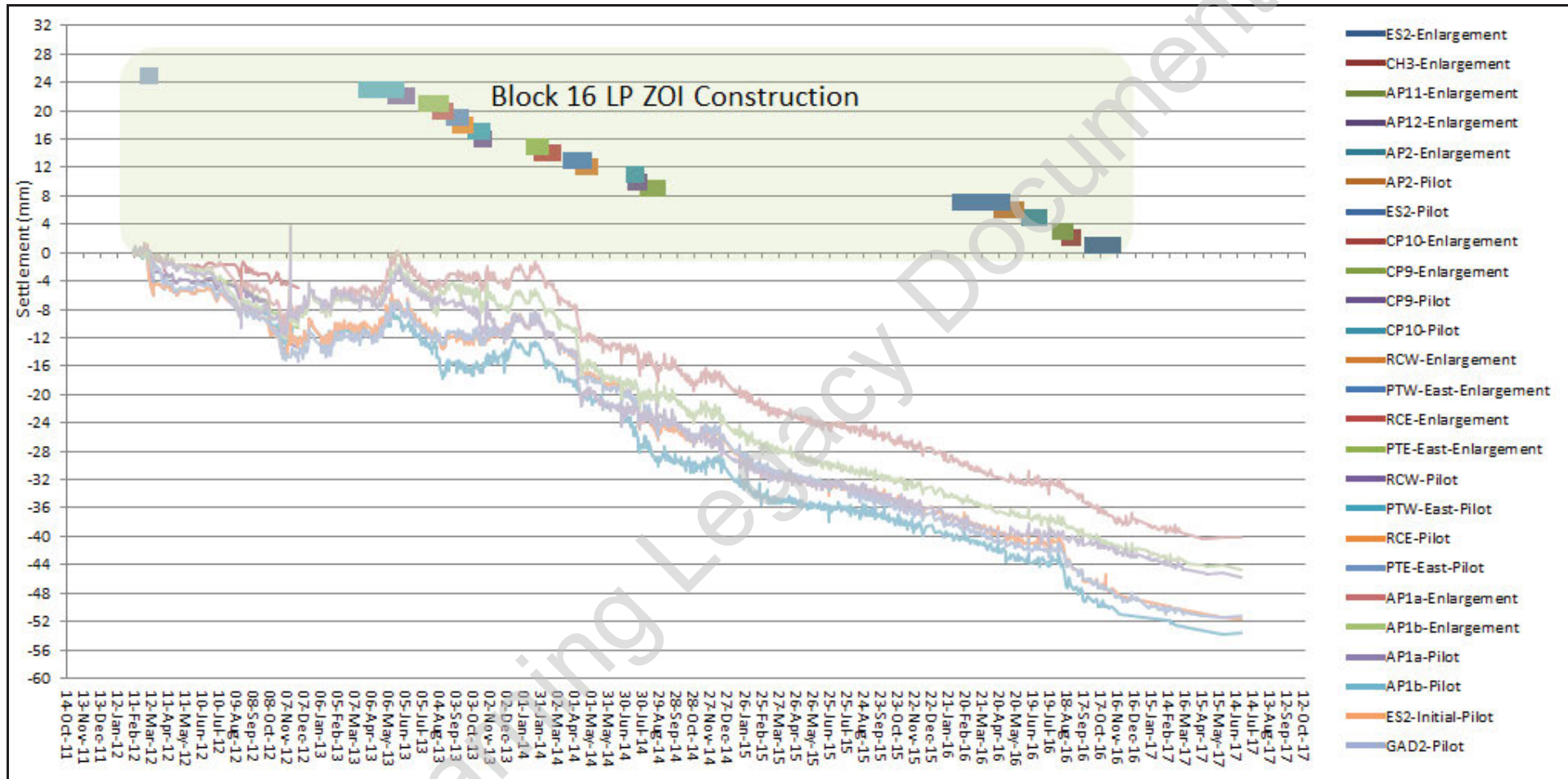
N.B. It should be noted that adjacent Crossrail works have blocked line of sight for a number of prisms- Therefore decommissioning of these sensors has been proposed



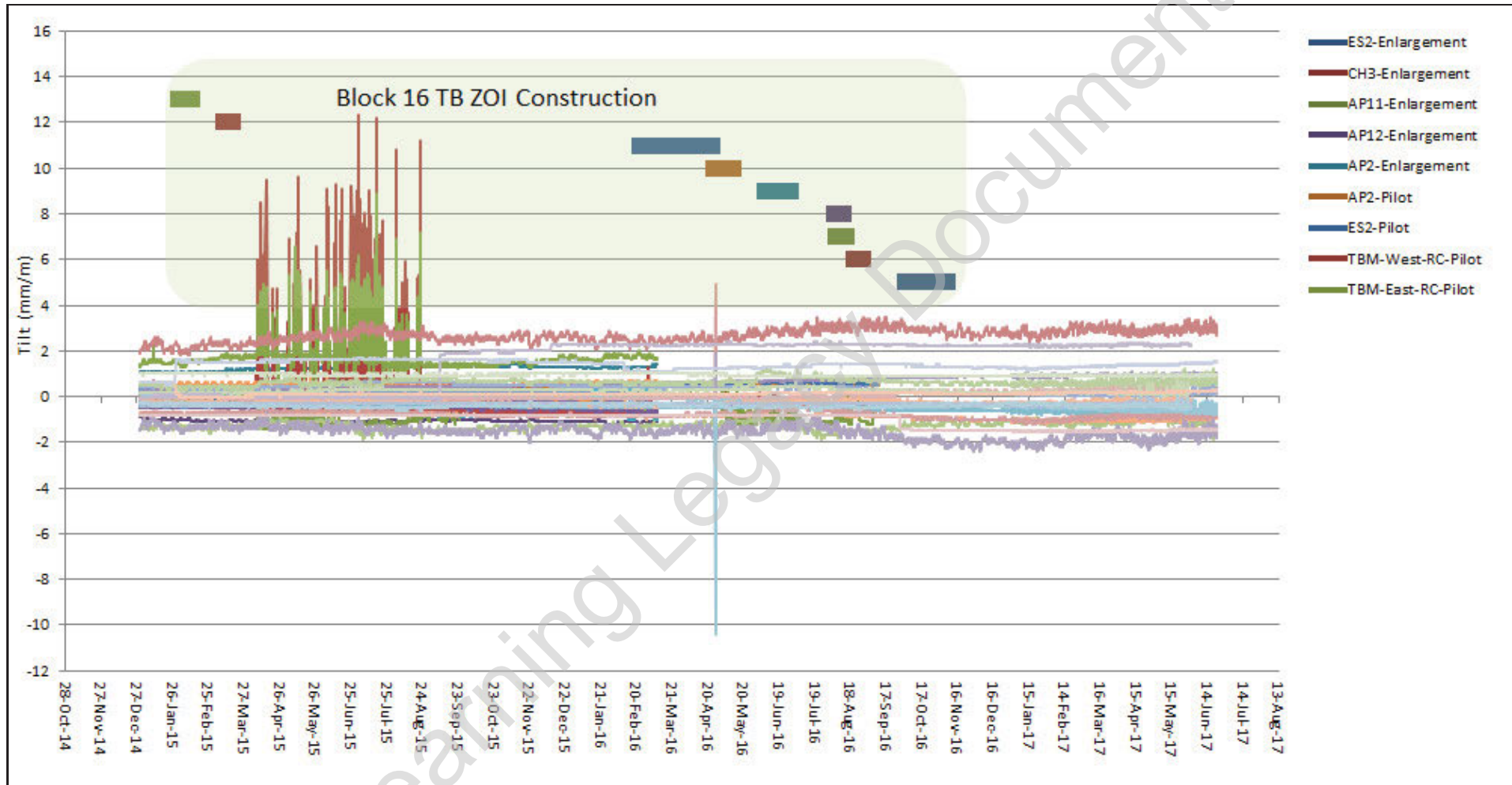
Graph 1- All Block 16 BREs & Invar Scales (LB & LC) Manual Monitoring History in Relation to Construction



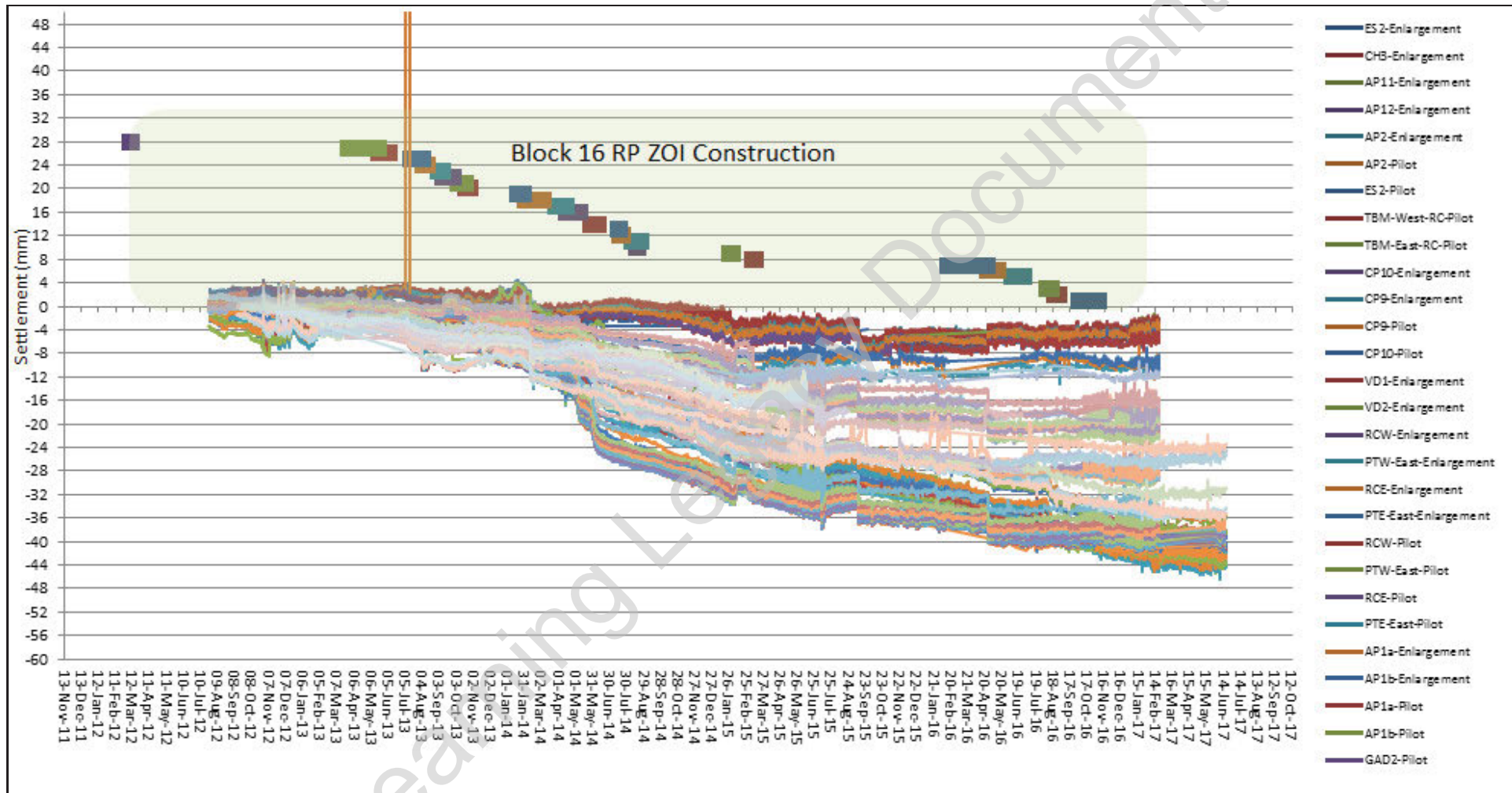
**Graph 2- All Block 16 Road Studs (LP) Manual Monitoring History in Relation to Construction**



**Graph 3- All Block 16 Tiltmeters (TB) Automated Monitoring History in Relation to Construction**



Graph 4- All Block 16 3d Geodetic Prisms (RP) Automated Monitoring History in Relation to Construction





Graph 5- All Block 16 Water Cells (SH) Automated Monitoring History in Relation to Construction

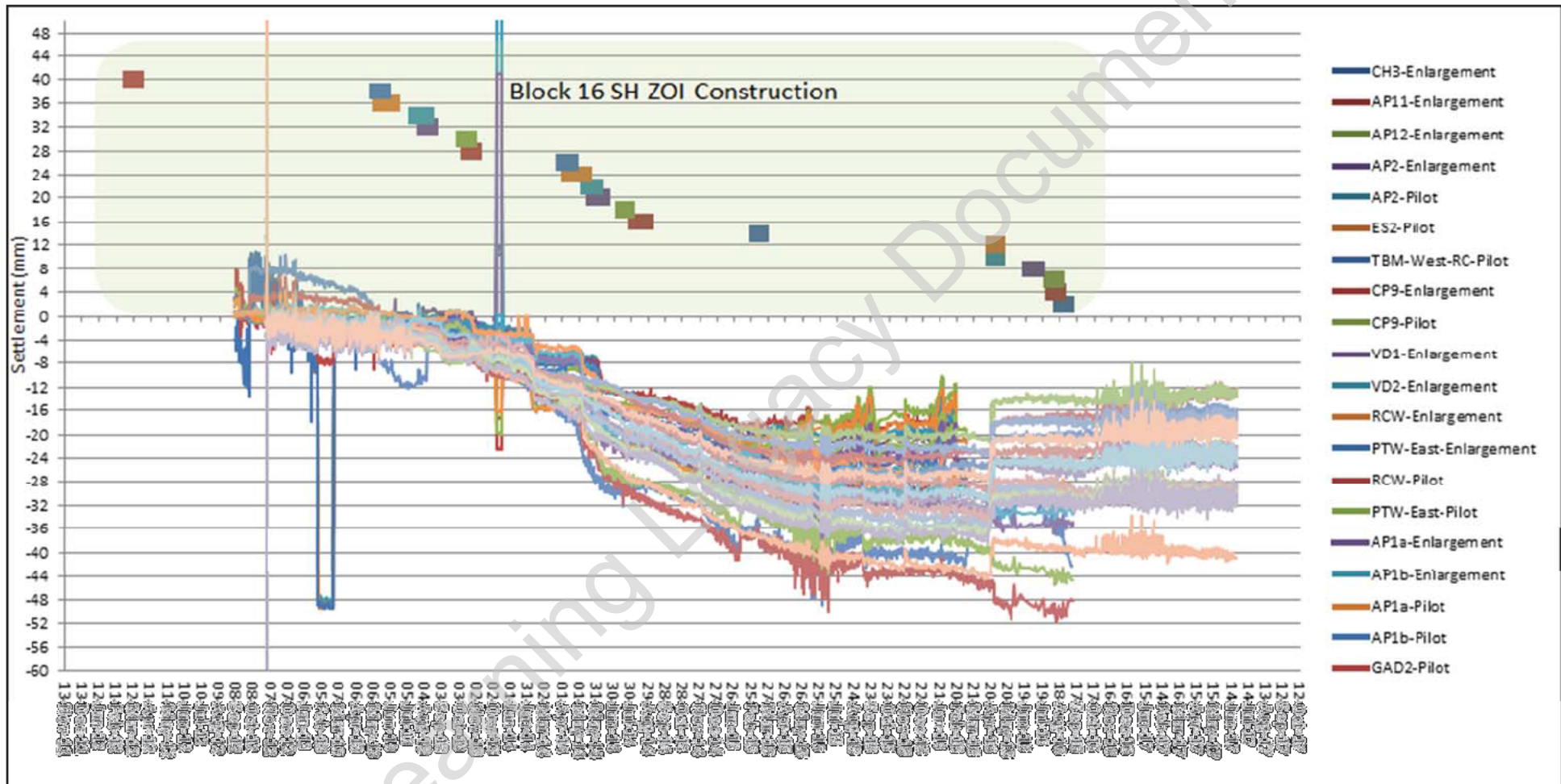


Figure 6- LB & LC Monitoring Sensor Decommissioning Status and Location Plan

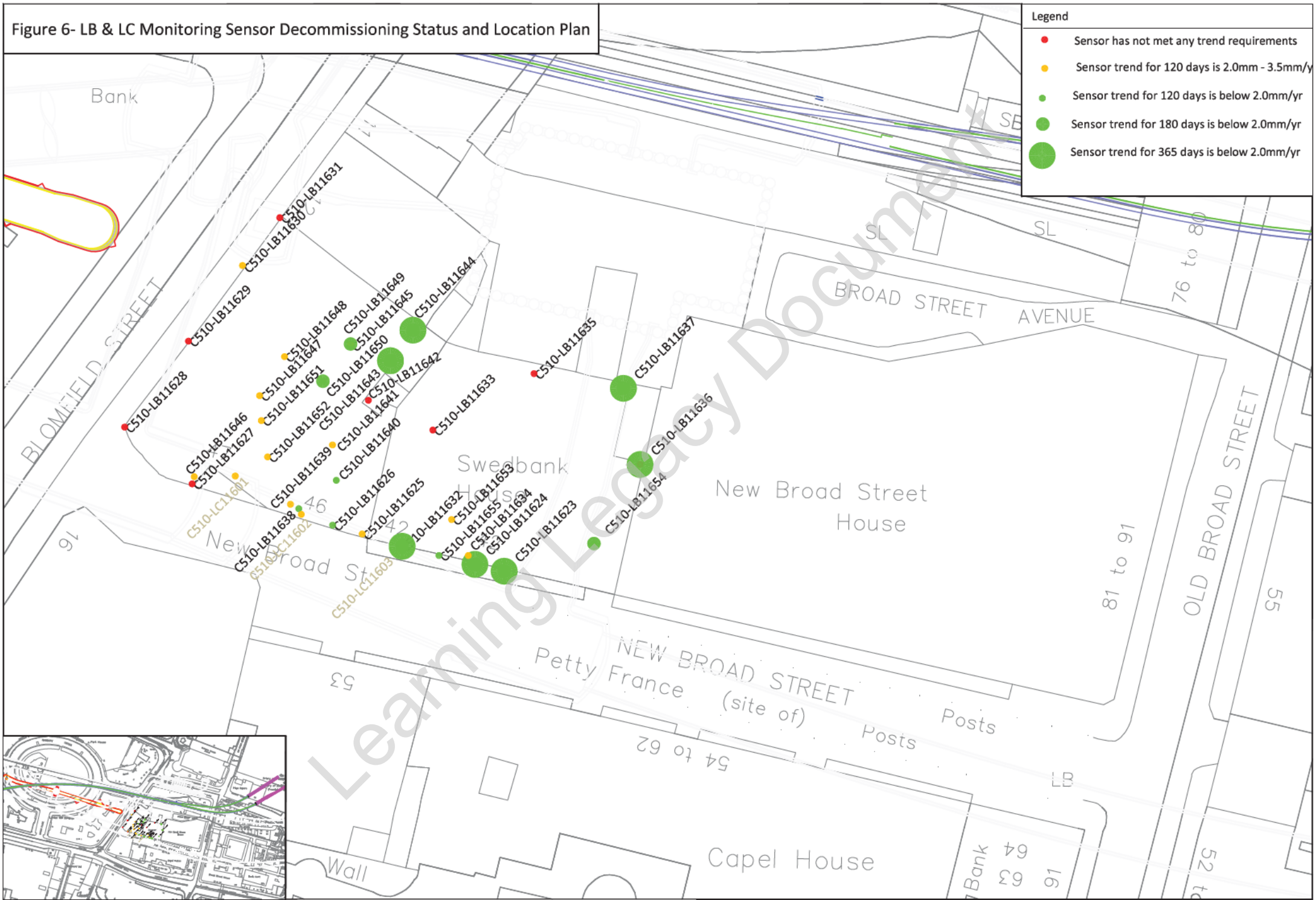


Figure 7-LP Monitoring Sensor Decommissioning Status and Location Plan

**Legend**

- Sensor has not met any trend requirements
- Sensor trend for 120 days is 2.0mm - 3.5mm/yr
- Sensor trend for 120 days is below 2.0mm/yr
- Sensor trend for 180 days is below 2.0mm/yr
- Sensor trend for 365 days is below 2.0mm/yr
- Sensor trend not applicable

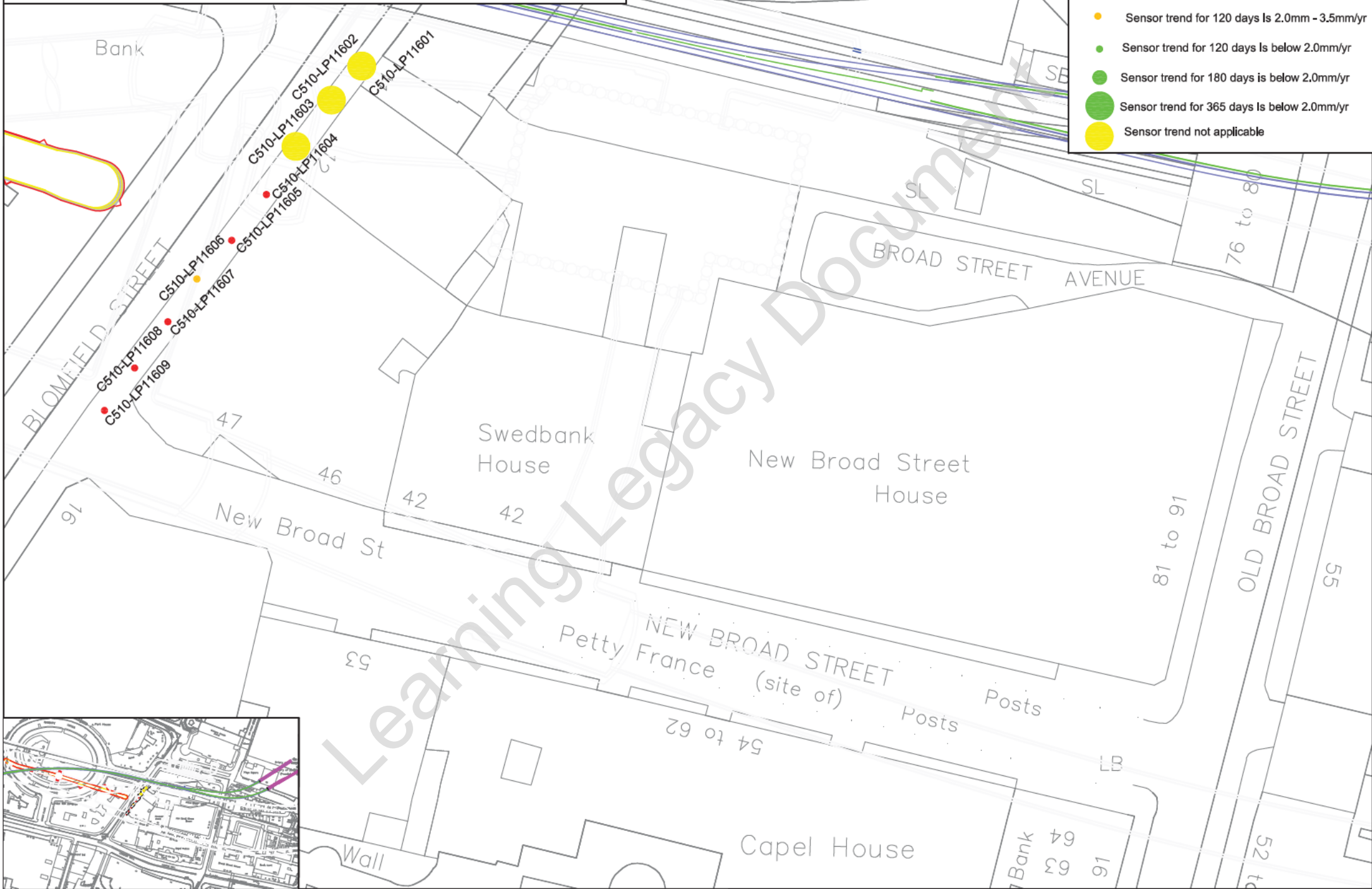


Figure 8- TB Monitoring Sensor Decommissioning Status and Location Plan

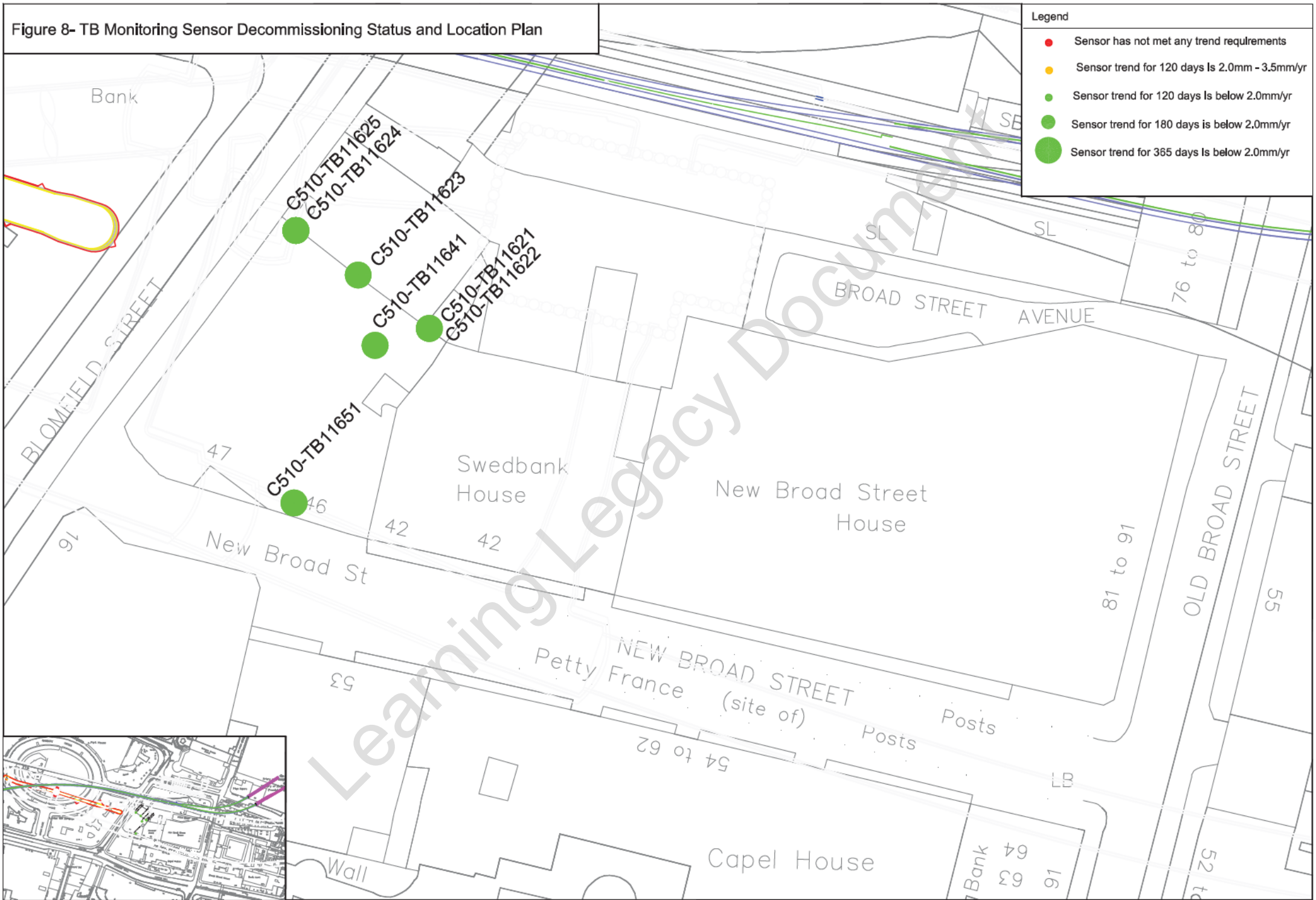


Figure 9- RP Monitoring Sensor Decommissioning Status and Location Plan

**Legend**

- Sensor has not met any trend requirements
- Sensor trend for 120 days is 2.0mm - 3.5mm/yr
- Sensor trend for 120 days is below 2.0mm/yr
- Sensor trend for 180 days is below 2.0mm/yr
- Sensor trend for 365 days is below 2.0mm/yr

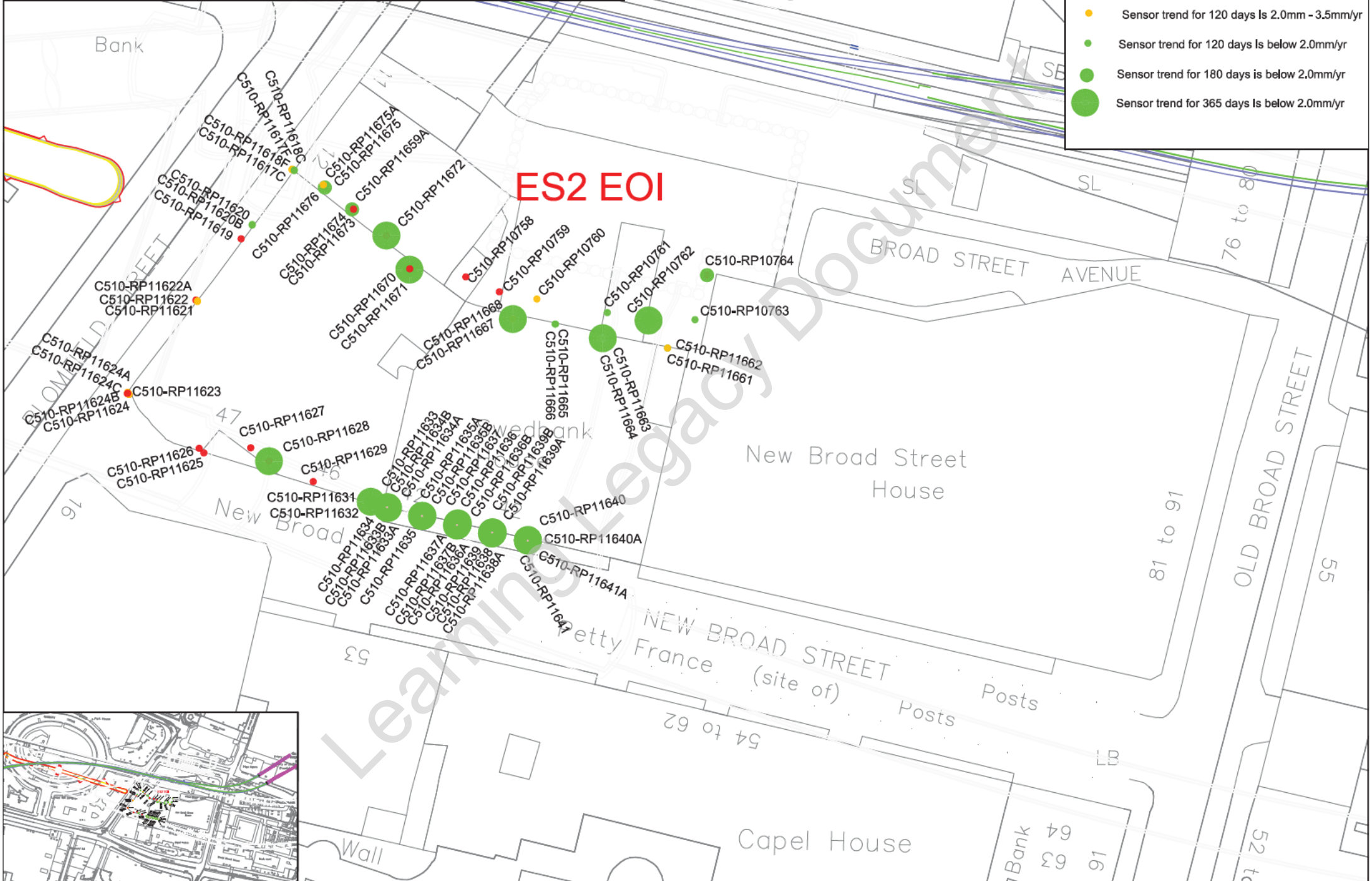


Figure 10- SH Monitoring Sensor Decommissioning Status and Location Plan

**Legend**

- Sensor has not met any trend requirements
- Sensor trend for 120 days is 2.0mm - 3.5mm/yr
- Sensor trend for 120 days is below 2.0mm/yr
- Sensor trend for 180 days is below 2.0mm/yr
- Sensor trend for 365 days is below 2.0mm/yr

