



C510 – Whitechapel and Liverpool Street Station Tunnels

Instrumentation and Monitoring Close Out Report

Block 17 Liverpool Street

CRL Document Number: C510-BBM-C2-RGN-C101-50227

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:
1.0	14/11/2016	[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:

		Crossrail Review and Acceptance Decal	
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	
[REDACTED]			Date: 15/12/16
Institute Crossrail approval of design, details, calculations.			

Document Revision History		
Revision	Date	Purpose
1.0	06/10/2016	For approval

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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 17 of Crossrails'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.

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 17 Location

Figure 1 shows the Liverpool St general location plan, C510 tunnel construction and where Block 17 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).

Thames critical assets are located on Finsbury Pavement within Block 17, including a 16in cast iron and 450mm ductile iron water mains and the London Bridge Sewer City Road branch. Other utilities within Block 17 include cast iron and plastic gas mains, a brick sewer, as well as cast iron and ductile iron water mains. The location and details of these assets can be found in 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.

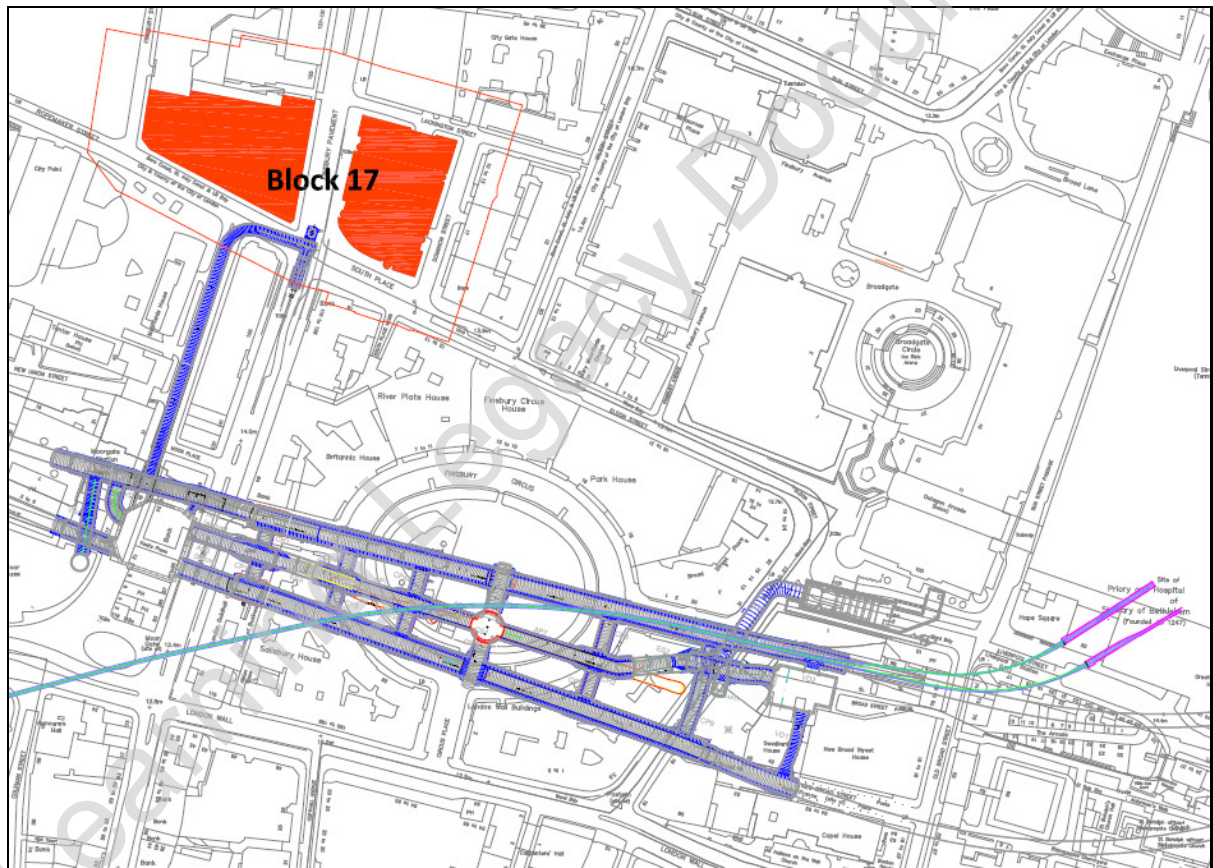


Figure 1- Liverpool St General Location Plan - including Block 17 monitoring area

3.2 Block 17 Description

Block 17 is located between Dominion St and Finsbury St. The Block is occupied by Arbuthnot House, Finsbury Court and Marks and Spencer at 70 Finsbury Pavement. Block 17 contains the following types of monitoring sensors:

- Road Studs (LP) - manual monitoring
- Building (BREs)- manual monitoring

Each monitoring assets details are listed within the Decommissioning Status Tracker (*Table 2*) and further relevant information can be sourced from the installation reports.

Block 17 Installation Report References:

- Monitoring Installation Report LIV-LP-17- Finsbury Pavement
CRL Document Number: C510-BBM-C2-RGN-C101-50116
- Monitoring Installation Report LIV-LB-17- Liverpool Street
CRL Document Number: C510-BBM-C2-RGN-C101-50158

The Settlement Contour Drawing (C122-OVE-C2-DDA-CR001_Z-21313) predicts the Block 17 area to experience approximately 1-10mm of settlement.

4 Construction Programme Influencing Block 17

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 17, 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 this area (orange outline) and the tunnel constructions. Tunnel advance start and finish dates will be used in assessment of the monitoring data.

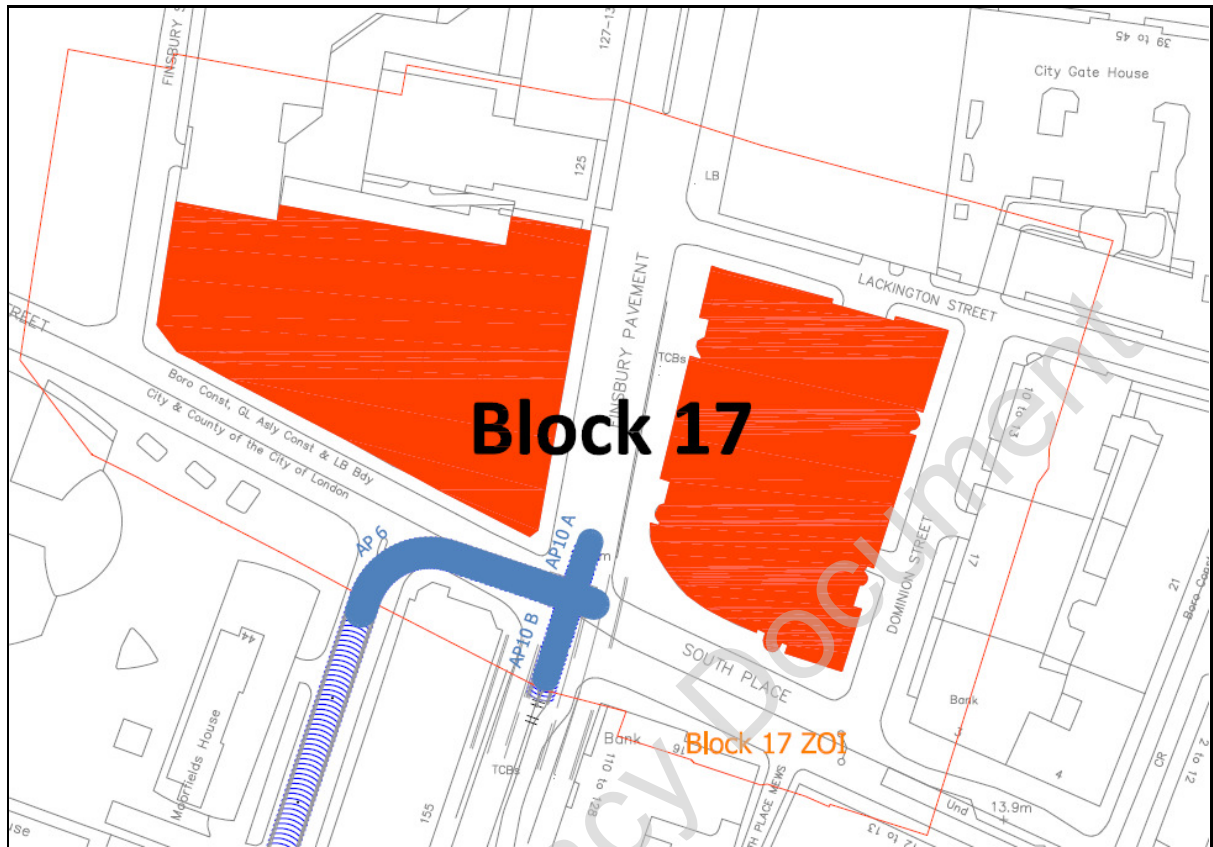


Figure 2 - Block 17 Active ZOI Constructions

Figure 2 shows the Block 17 ZOI and the tunnel constructions that occurred within its boundary. The construction advances within the ZOI that have the potential to affect Block 17 are listed and summarised in Table 1.

The last completed C510 construction which had the potential to affect Block 17 within its ZOI was the PRM Lift Enlargement, which was completed on the 9th of October 2015. As there is no further C510 construction that has the potential to affect Block 17, it is proposed to decommission all monitoring sensors.

4.1.1 Tunnel Advances Affecting Block 17

The information presented in *Table 1* is used in the monitoring graph (Section 5.1), to show the ground movements in relation to construction.

TUNNEL ADVANCES STARTS & ENDS FOR GRAPHS							
Tunnel Code	Tunnel Reference	Primary Layer Type	Start Date	End Date	Start Advance	End Advance	Zone
PRM Lift-Enlargement	PRM Lift	Enlargement	09/08/2015	09/10/2015	1	100	ZOI
AP10b-Enlargement	AP10b	Enlargement	21/07/2015	29/07/2015	1	16	ZOI
AP10a-Enlargement	AP10a	Enlargement	14/07/2015	20/07/2015	1	10	ZOI
AP6-1-Enlargement	AP6-1	Enlargement	09/07/2014	18/05/2015	115	172	ZOI

Table 1- Tunnel Advances Affecting Block 17

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 17

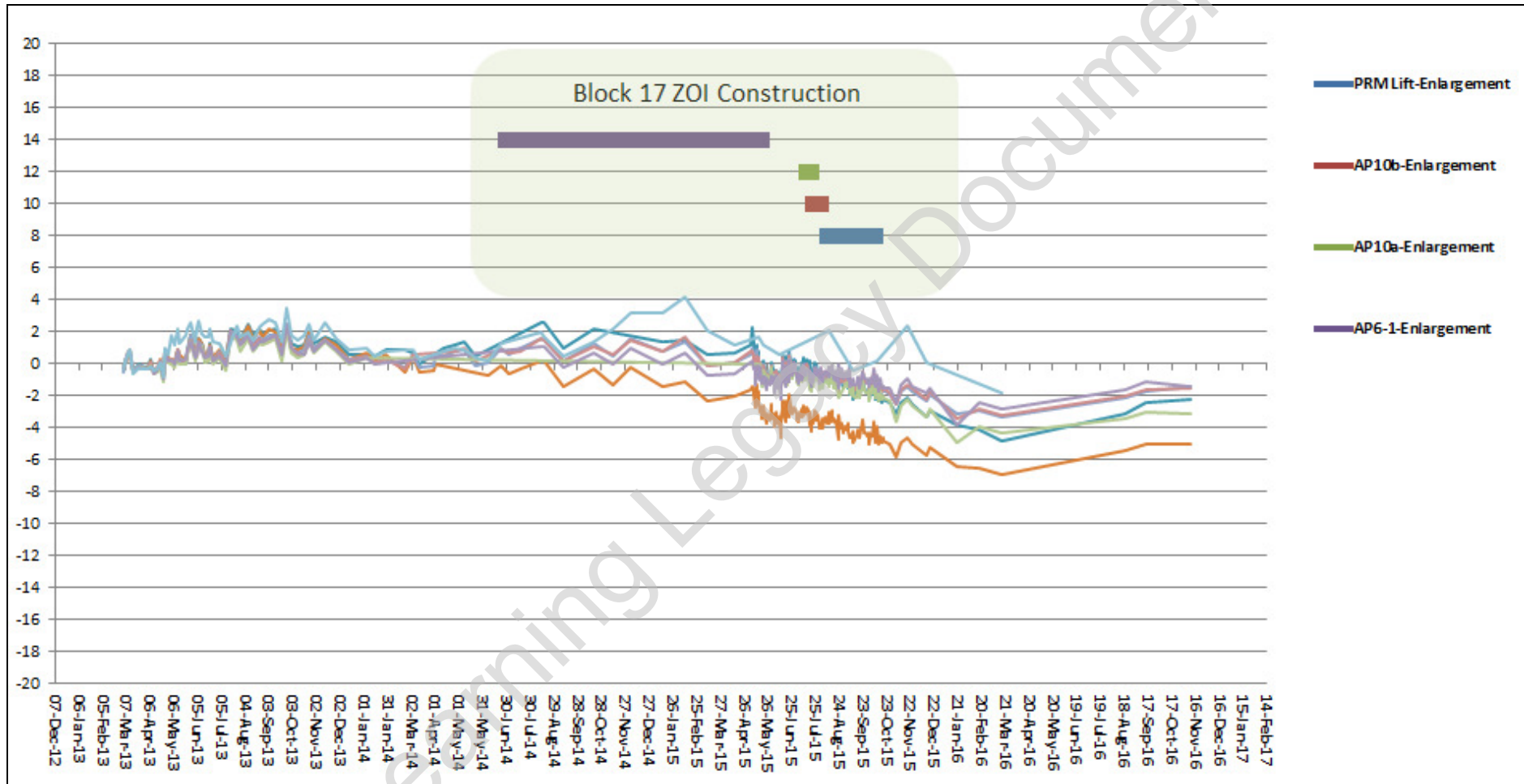
Evidence for decommissioning each monitoring sensor is shown through a graph, table (*Table 2*) and a plan. Each element of assessment compliments the other and is used together to determine acceptance of decommissioning. *Table 2* highlights the monitoring sensors to be considered for decommissioning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

5.1 Time Graphs Monitoring Full History and Construction Durations

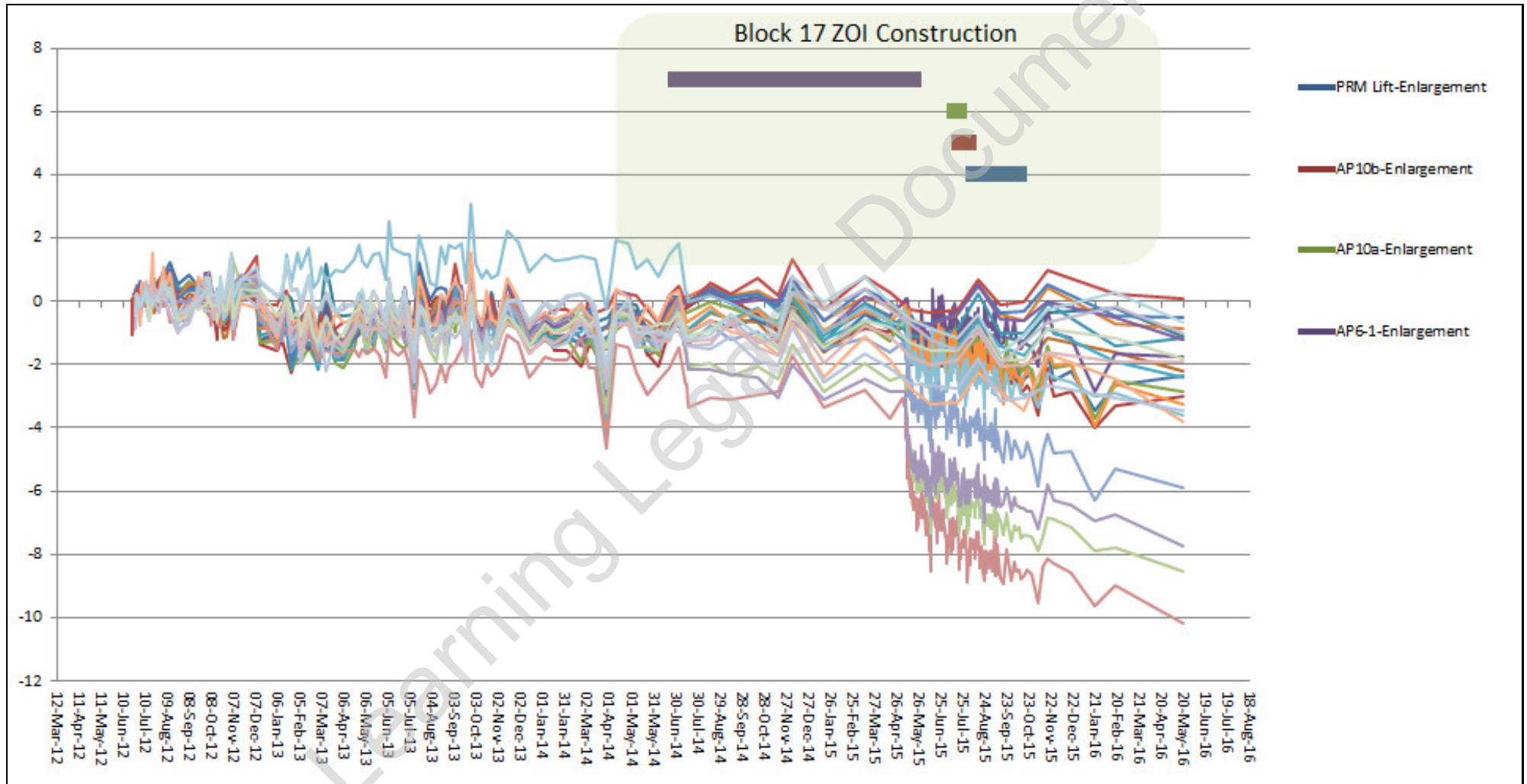
To assess the movement of Block 17 monitoring sensors; each monitoring sensor data type is displayed in a line graph, with a gantt chart (bar) representing the construction identified in Section 4:

- *Graph 1* –All Block 17 Road Studs (LP) Manual Monitoring History in Relation to Construction
- *Graph 2* –All Block 17 BREs (LB) Manual Monitoring History in Relation to Construction

Graph 1 - All Block 17 Road Studs (LP) Manual Monitoring History in Relation to Construction



Graph 2 - All Block 17 BREs (LB) Manual Monitoring History in Relation to Construction



5.2 Block 17 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 latest 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 17. 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 17 Decommissioning Status Tracker

10/11/2016



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 Day Calculation Period	180 Day	180 Day Calculation Period	365 Days	365 Day Calculation Period			
C510-LP13701	Block 117	S11701	External	Manual	LP	Road Stud	Finsbury Pavement	LIV_PRM Lift Enlargement Adv-100	09/10/2015	10/11/2016	4.15	239	4.15	239	0.29	366	10.11.2016	Met 2mm per annum specification	Proposed
C510-LP13702	Block 117	S11701	External	Manual	LP	Road Stud	Finsbury Pavement	LIV_PRM Lift Enlargement Adv-100	09/10/2015	10/11/2016	3.20	239	3.20	239	0.15	366	10.11.2016	Met 2mm per annum specification	Proposed
C510-LP13703	Block 117	S11701	External	Manual	LP	Road Stud	Finsbury Pavement	LIV_PRM Lift Enlargement Adv-100	09/10/2015	10/11/2016	2.97	239	2.97	239	0.33	366	10.11.2016	Met 2mm per annum specification	Proposed
C510-LP13704	Block 117	S11701	External	Manual	LP	Road Stud	Finsbury Pavement	LIV_PRM Lift Enlargement Adv-100	09/10/2015	10/11/2016	2.72	239	2.72	239	0.15	366	10.11.2016	Met 2mm per annum specification	Proposed
C510-LP13705	Block 117	S11701	External	Manual	LP	Road Stud	Finsbury Pavement	LIV_PRM Lift Enlargement Adv-100	09/10/2015	10/11/2016	2.07	239	2.07	239	-0.36	366	10.11.2016	Met 2mm per annum specification	Proposed
C510-LP13706	Block 117	S11701	External	Manual	LP	Road Stud	Finsbury Pavement	LIV_PRM Lift Enlargement Adv-100	09/10/2015	10/11/2016	2.48	239	2.48	239	0.29	366	10.11.2016	Met 2mm per annum specification	Proposed
C510-LP13707	Block 117	S11701	External	Manual	LP	Road Stud	Finsbury Pavement	LIV_PRM Lift Enlargement Adv-100	09/10/2015	16/03/2016	-11.21	120	-3.56	187	-2.51	372	10.03.2016	Road Stud gone- No survey since 16/03/2016	Proposed
C510-LB11701	Block 117	S11701	External	Manual	LB	BRE	70 Finsbury Pavement	LIV_PRM Lift Enlargement Adv-100	09/10/2015	18/05/2016	-1.53	183	-1.53	183	1.09	369	14.06.2016	CTC 14.06.2016 Confirmed monitoring to be replaced by InSAR.	Proposed
C510-LB11702	Block 117	S11701	External	Manual	LB	BRE	70 Finsbury Pavement	LIV_PRM Lift Enlargement Adv-100	09/10/2015	18/05/2016	-2.10	183	-2.10	183	-0.30	369	14.06.2016	CTC 14.06.2016 Confirmed monitoring to be replaced by InSAR.	Proposed
C510-LB11703	Block 117	S11701	External	Manual	LB	BRE	70 Finsbury Pavement	LIV_PRM Lift Enlargement Adv-100	09/10/2015	18/05/2016	0.60	152	-0.84	183	-2.06	366	14.06.2016	CTC 14.06.2016 Confirmed monitoring to be replaced by InSAR.	Proposed
C510-LB11704	Block 117	S11701	External	Manual	LB	BRE	70 Finsbury Pavement	LIV_PRM Lift Enlargement Adv-100	09/10/2015	18/05/2016	0.50	152	-1.14	183	-2.30	366	14.06.2016	CTC 14.06.2016 Confirmed monitoring to be replaced by InSAR.	Proposed
C510-LB11705	Block 117	S11701	External	Manual	LB	BRE	70 Finsbury Pavement	LIV_PRM Lift Enlargement Adv-100	09/10/2015	18/05/2016	-0.73	152	-2.29	183	-1.43	366	14.06.2016	CTC 14.06.2016 Confirmed monitoring to be replaced by InSAR.	Proposed
C510-LB11706	Block 117	S11701	External	Manual	LB	BRE	70 Finsbury Pavement	LIV_PRM Lift Enlargement Adv-100	09/10/2015	18/05/2016	-0.11	152	-2.27	183	-0.78	366	14.06.2016	CTC 14.06.2016 Confirmed monitoring to be replaced by InSAR.	Proposed
C510-LB11707	Block 117	S11701	External	Manual	LB	BRE	70 Finsbury Pavement	LIV_PRM Lift Enlargement Adv-100	09/10/2015	18/05/2016	-2.20	183	-2.20	183	-0.31	369	14.06.2016	CTC 14.06.2016 Confirmed monitoring to be replaced by InSAR.	Proposed
C510-LB11708	Block 117	S11701	External	Manual	LB	BRE	70 Finsbury Pavement	LIV_PRM Lift Enlargement Adv-100	09/10/2015	18/05/2016	-2.67	183	-2.67	183	-0.30	369	14.06.2016	CTC 14.06.2016 Confirmed monitoring to be replaced by InSAR.	Proposed
C510-LB11709	Block 117	S11701	External	Manual	LB	BRE	70 Finsbury Pavement	LIV_PRM Lift Enlargement Adv-100	09/10/2015	18/05/2016	-2.05	183	-2.05	183	0.12	369	14.06.2016	CTC 14.06.2016 Confirmed monitoring to be replaced by InSAR.	Proposed
C510-LB11710	Block 117	S11701	External	Manual	LB	BRE	70 Finsbury Pavement	LIV_PRM Lift Enlargement Adv-100	09/10/2015	18/05/2016	-1.77	183	-1.77	183	0.53	369	14.06.2016	CTC 14.06.2016 Confirmed monitoring to be replaced by InSAR.	Proposed
C510-LB11712	Block 117	S11702	External	Manual	LB	BRE	Finsbury Court	LIV_PRM Lift Enlargement Adv-100	09/10/2015	18/05/2016	-2.35	183	-2.35	183	0.45	369	14.06.2016	CTC 14.06.2016 Confirmed monitoring to be replaced by InSAR.	Proposed
C510-LB11713	Block 117	S11702	External	Manual	LB	BRE	Finsbury Court	LIV_PRM Lift Enlargement Adv-100	09/10/2015	18/05/2016	-3.06	183	-3.06	183	-0.95	369	14.06.2016	CTC 14.06.2016 Confirmed monitoring to be replaced by InSAR.	Proposed
C510-LB11714	Block 117	S11702	External	Manual	LB	BRE	Finsbury Court	LIV_PRM Lift Enlargement Adv-100	09/10/2015	18/05/2016	-1.76	152	-3.06	183	-1.88	366	14.06.2016	CTC 14.06.2016 Confirmed monitoring to be replaced by InSAR.	Proposed
C510-LB11715	Block 117	S11702	External	Manual	LB	BRE	Finsbury Court	LIV_PRM Lift Enlargement Adv-100	09/10/2015	18/05/2016	-1.72	152	-2.91	183	-3.26	366	14.06.2016	CTC 14.06.2016 Confirmed monitoring to be replaced by InSAR.	Proposed
C510-LB11716	Block 117	S11702	External	Manual	LB	BRE	Finsbury Court	LIV_PRM Lift Enlargement Adv-100	09/10/2015	18/05/2016	-3.22	152	-3.88	183	-4.15	366	14.06.2016	CTC 14.06.2016 Confirmed monitoring to be replaced by InSAR.	Proposed
C510-LB11717	Block 117	S11702	External	Manual	LB	BRE	Finsbury Court	LIV_PRM Lift Enlargement Adv-100	09/10/2015	18/05/2016	-2.89	152	-3.39	183	-3.54	366	14.06.2016	CTC 14.06.2016 Confirmed monitoring to be replaced by InSAR.	Proposed
C510-LB11718	Block 117	S11702	External	Manual	LB	BRE	Finsbury Court	LIV_PRM Lift Enlargement Adv-100	09/10/2015	18/05/2016	-2.97	152	-3.35	183	-2.56	366	14.06.2016	CTC 14.06.2016 Confirmed monitoring to be replaced by InSAR.	Proposed
C510-LB11719	Block 117	S11702	External	Manual	LB	BRE	Arbuthnot House	LIV_PRM Lift Enlargement Adv-100	09/10/2015	18/05/2016	-2.40	152	-2.58	183	-1.65	366	14.06.2016	CTC 14.06.2016 Confirmed monitoring to be replaced by InSAR.	Proposed
C510-LB11720	Block 117	S11702	External	Manual	LB	BRE	Arbuthnot House	LIV_PRM Lift Enlargement Adv-100	09/10/2015	18/05/2016	-4.19	183	-4.19	183	-0.28	369	14.06.2016	CTC 14.06.2016 Confirmed monitoring to be replaced by InSAR.	Proposed
C510-LB11721	Block 117	S11702	External	Manual	LB	BRE	Arbuthnot House	LIV_PRM Lift Enlargement Adv-100	09/10/2015	18/05/2016	-1.60	183	-1.60	183	-0.88	369	14.06.2016	CTC 14.06.2016 Confirmed monitoring to be replaced by InSAR.	Proposed
C510-LB11722	Block 117	S11702	External	Manual	LB	BRE	Arbuthnot House	LIV_PRM Lift Enlargement Adv-100	09/10/2015	18/05/2016	-0.51	183	-0.51	183	-0.14	369	14.06.2016	CTC 14.06.2016 Confirmed monitoring to be replaced by InSAR.	Proposed
C510-LB11723	Block 117	S11702	External	Manual	LB	BRE	Arbuthnot House	LIV_PRM Lift Enlargement Adv-100	09/10/2015	18/05/2016	-1.87	183	-1.87	183	-0.13	369	14.06.2016	CTC 14.06.2016 Confirmed monitoring to be replaced by InSAR.	Proposed
C510-LB11724	Block 117	S11702	External	Manual	LB	BRE	Arbuthnot House	LIV_AP6-1 Enlargement Adv-154	10/05/2015	18/05/2016	-0.67	183	-0.67	183	0.50	369	14.06.2016	CTC 14.06.2016 Confirmed monitoring to be replaced by InSAR.	Proposed
C510-LB11725	Block 117	S11702	External	Manual	LB	BRE	Arbuthnot House	LIV_AP6-1 Enlargement Adv-150	09/05/2015	18/05/2016	-0.81	183	-0.81	183	0.64	369	14.06.2016	CTC 14.06.2016 Confirmed monitoring to be replaced by InSAR.	Proposed

Learning Legacy

5.3 Supplementary Evidence for Decommissioning

Revision 1 of Block 17 close out report does not require supplementary evidence.

5.4 Monitoring sensor Location Plan and Decommissioning Status

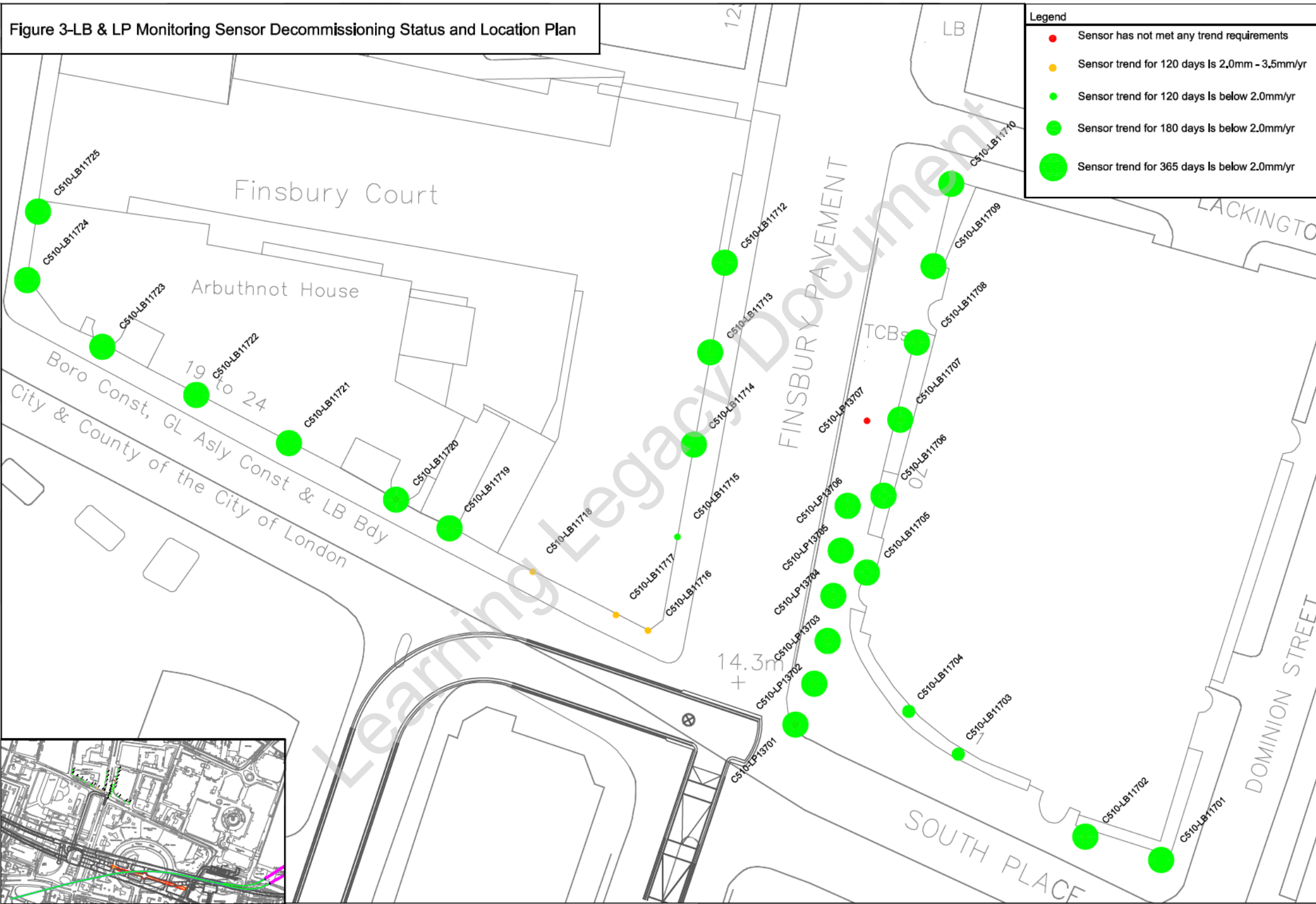
The following plots provide a visual representation of all Block 17 monitoring sensors with a colour circle that defines its settlement status. A green circle represents when a trend is below 2mm/yr and the larger the circle the greater the trend period. When a trend has not been met, a small red circle will represent the monitoring sensor. There is one plan for Block 17 LP monitoring sensors.

- *Figure 3 – LB & LP Monitoring Sensor Settlement Status and Location Plan*

Learning Legacy Document

Figure 3-LB & 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



6 Decommissioning Recommendations

Through the monitoring assessment process in Section 5, it is purposed that all Block 17 sensors are to be decommissioned. *Table 2- Decommissioning Tracker* lists all Block 17 monitoring sensor's decommissioning status and the supporting evidence. As it was confirmed by Crossrail that INSAR has sufficient coverage to take over the manual monitoring of the Block 17 BREs and the road studs have not shown any significant movement for the past 365 days, it is proposed to decommission all Block 17 monitoring sensors.

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