A-squared Studio

14-19 Tottenham Mews

Monitoring Specification – Thames Water Assets

June 2023

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Project Number	2743
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Document Name	Monitoring Specification – Thames Water Assets

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1. Overview

A-squared Studio Engineers Ltd (A-squared) has been appointed by Mark & Partners Ltd to provide a strategy and specification for the monitoring works associated with the Thames Water Utilities Limited (Thames Water) assets within and surrounding the proposed 14-19 Tottenham Mews development, London.

Further details regarding the site and the proposed development can be found in Section 2.

Thames Water Utilities Limited may rely on the content and findings presented in this document.

1.1. Specification Roles

Client & Principal Contractor	Glenman Construction Ltd
Monitoring Contractor / Contractor	TBC
Designer	Mark & Partners Ltd

1.2. Purpose and Objectives

This specification details the strategy for the Thames Water asset monitoring required for the development works.

A specialist Contractor will be appointed to support the safeguarding of surrounding assets and will be responsible for the implementation of the monitoring, management of the monitoring data, attending monitoring meetings and providing factual reports as defined within this specification.

The primary objectives of the monitoring scope of works are to:

- Confirm that the movements at the target points are in line with the predicted ground movements during each key works phase within the zone of influence of the development.
- Provide all relevant asset holders with assurances that the works are progressing in a manner that safeguards their assets from damage and ensuring on-going safe operation, in conjunction with the responsibilities defined in the Monitoring Action Plan (MAP) or Emergency Preparedness Plan (EPP).
- Ensure any potential significant or unexpected movement is identified at an early stage to allow appropriate mitigation measures to be implemented.
- Provide evidence, which may be used to determine the cause of any potential damage to the third-party assets and to support the design of any remedial works.

2. Scheme Details

2.1. Overview

The development site is located at 14-19 Tottenham Mews, W1T 4AA in the London Borough of Camden, as shown in Figure 2.1.

The site is located at approximate National Grid reference of 529323E, 181799N and the site covers an area of approximately 0.05ha.

The site is currently occupied by the NHS Tottenham Mew Resource Centre and consists of a 2-storey office building at ground level. The existing building is believed to be timber framed. The building is currently vacant and the site is relatively flat across the footprint at circa 26.2mOD.

Further technical details of the scheme and impact on the adjacent Thames Water assets are provided in the A-squared Ground Movement Assessment report: 2743-A2S-XX-XX-RP-Y-0001-00.

Figure 2.1 Site boundary and surrounding features

Figure 2.2 Thames Water assets on adjacent streets – Watermains

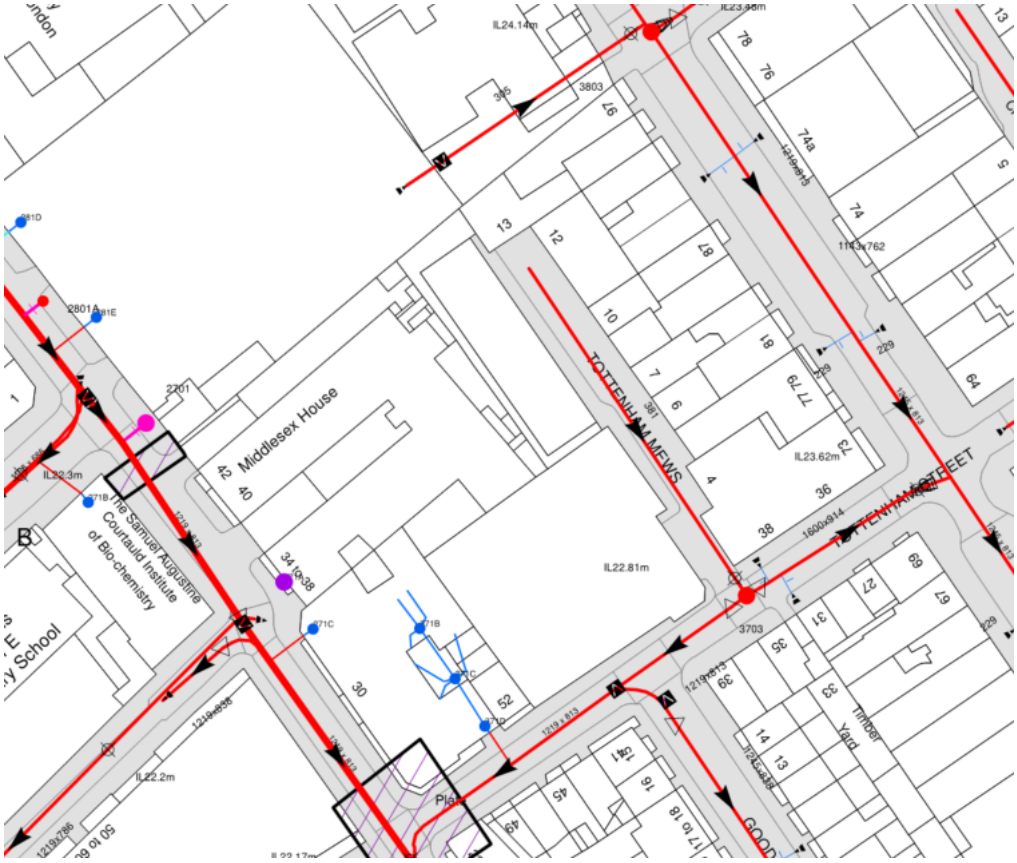

Figure 2.3 Thames Water assets on adjacent streets - Sewer

2.2. Interface with Thames Water Assets

The proposed buildings are being constructed adjacent to various Thames Water assets in the area, which are present within the zone of influence of the proposed development.

3. Summary of Monitoring Requirements

3.1. General

The aim of the monitoring works is to measure ground movements that may arise in the vicinity of the proposed development works and verify that they do not exceed predictions from the Thames Water Ground Movement Assessment Report prepared by A-squared, dated May 2023. The outline scope of the Monitoring Contractor's works and services is listed below. This is the minimum scope required as part of the performance specified works – the Monitoring Contractor shall supplement the scope accordingly in order to meet the technical requirements detailed in the specification.

- Design, supply, installation, commissioning, calibration, testing, operation, cleaning, maintenance, decommissioning and removal of monitoring infrastructure (in its entirety).
- Survey monitoring of the target points presented in Appendix A, as required.
- Vibration monitoring of Thames Water sewer as identified in the MAP.
- Factual reporting of the results, analysis and interpretation of the results.
- Survey of the current condition of relevant pavements and/or other monitoring target points.
- Liaison with the Client, the Designer and other interested parties, as required.
- Submission of documentation detailed within this specification.
- Attend monitoring meetings as defined in Section 7.6.

- Produce Factual Monitoring Reports and Final Monitoring Reports as defined in Section 7.6.
- Comply with the MAP/EPP produced for the relevant third-party assets. The Contractor will be required to produce final monitoring equipment location plans for approval.

These activities shall occur in line with the substructure and superstructure programme. The current outline programme at the time of issue of this specification is summarised in Section 5.2.

The Monitoring Contractor is to liaise with the Designer to confirm any changes to the construction programme and identify the impact of such changes to their programme of works and costs.

Monitoring data shall be forwarded in a digital format within 24 hours of completion of each survey. Trigger alerts will be implemented by the Monitoring Contractor in accordance with the MAP/EPP. Arrangements shall be made for relevant asset holders to have access to the monitoring data.

The MAP/EPP will be prepared to outline the action points and intervention levels required in case of significant movement and will describe the actions to be taken in the event of movement exceeding trigger levels. The trigger levels and interventions will be agreed between the Designer and with the appropriate asset holders.

The MAP/EPP will be reviewed by the Designer and approved by the relevant asset holders prior to works commencing and further to any subsequent document revisions.

3.2. Condition Surveys

Condition surveys will be undertaken by the Monitoring Contractor at the locations of the monitoring studs.

These condition surveys shall be managed by the Monitoring Contractor and instructed by the Client. The condition survey should comprise the following:

- Visual inspection of the surrounding pavements and/or hardstanding, including photographic records.
- Recording of any anomalies/existing distress. Records should include photographic evidence, nature and dimensions of the anomalies, and plan drawings showing their locations.

4. Project Team Responsibilities

4.1. Monitoring Contractor Responsibilities

The Contractor shall:

- Obtain all permissions and possessions within timescales required for the installation of monitoring points to achieve the scheme programme.
- Use appropriately qualified engineers, as required by the relevant third parties, to undertake the works.
- Provide method statements, risk assessments and fixing details etc. as required by any relevant third parties.
- Attend Emergency Review Panel meetings as required.
- Be responsible for providing monitoring data information within 24 hours in the agreed format.
- Be responsible for responding to trigger alerts during the works and confirming if such an alert is genuine.

4.2. Designer Responsibilities

The Designer shall:

- Review the condition surveys prior to monitoring equipment installation so any additional monitoring requirements can be identified.

- Act as the point of contact for the Contractor with third parties.
- Attend Emergency Review Panel meetings and recommend modifications to the construction sequence, temporary works etc. as required.
- Confirm reference datum and the global grid to third parties as required.
- Review the monitoring data forwarded by the Contractor to ensure that it is in accordance with the third-party requirements.

4.3. Client Responsibilities

The Client shall be responsible for:

- Attending Emergency Review Panel meetings and instructing any contingency measures agreed within the Emergency Review Panel (ERP) meetings.
- Providing topographic plans to the Contractor of all assets with structural monitoring for production of target location plans which are required for inclusion within the MAP.
- Facilitate and arrange all Condition Surveys prior to monitoring equipment installation so any additional monitoring required can be identified.
- Instruct additional monitoring surveys if required by the Designer in accordance with the MAP.
- Assisting the Contractor with the liaison / agreement for the installation of monitoring equipment and targets.

4.4. Principal Contractor Responsibilities

The Principal Contractor shall be responsible for providing the Monitoring Contractor and Designer with a programme of the proposed construction activities for the following 7 days on a weekly basis so any movements recorded can be related to the works on site.

The Principal Contractor shall be responsible for the implementation of the MAP / EPP for the scheme, which include details such as contingency measures and monitoring trigger limits for adoption during the monitoring period. This element of scope should be coordinated with the full project design team – including any requirements for Ground Movement Assessment revision and / or amendments.

The Principal Contractor shall report and implement agreed contingency measures. These will comprise mitigation actions such as propping, shoring, strapping, structural repairs etc. to be agreed with the asset holder and all other relevant parties once the nature of the damage is apparent.

4.5. Third Party Responsibilities

Any relevant third parties shall be consulted by the Client / Contractor to agree:

- Attendance at any monitoring meetings or emergency review panel meetings, as relevant or necessary.

5. Monitoring Contract

5.1. General

The works described in this specification comprise monitoring associated with the development of the site.

5.2. Programme

Table 1 shows the number and frequency of visits during the construction of the substructure and superstructures of the three new building blocks. The substructure construction programme is currently unknown but will be updated once a construction programme is available, and baseline monitoring should be undertaken at least 1 week before this date.

Table 1 Monitoring programme during various construction stages

Stage	Stage length	Frequency of visits	Number of visits
Baseline monitoring period	Minimum 1 week prior to commencement of demolition works	-	1
Demolition	TBC	Weekly	TBC
Substructure construction	115 days	Weekly	23
Superstructure construction	120 days	Weekly up to 70% completion Every two weeks until 100% completion	TBC
Post-construction	TBC	Every two weeks until stable readings	TBC

The Monitoring Contractor shall note any time overlap in substructure and superstructure works when costing the monitoring period / number of visits required.

It should be noted these periods may vary as the project develops / construction proceeds. The Monitoring Contractor shall liaise with the Principal Contractor to confirm any changes to the above programme.

5.3. Works Planning

The Monitoring Contractor shall:

- Provide a programme of installation and commissioning to the Designer and Client. The programme shall include key milestones required for obtaining access to all assets.
- Prepare all relevant Health and Safety documents relating to equipment installation, monitoring, maintenance, and decommissioning of the system.
- Submit Method Statements, Work / Asset Package Plans, Risk Assessments, fixing details, and all supporting information to all asset holders within sufficient timescales to gain approval.
- Liaise with the Designer, Client, and Thames Water to agree the permits required to enable installation of all the monitoring equipment within the required timescales.
- Liaise with Client, Project Manager, and Designer in accordance with the CDM regulations 2015 to discuss / agree CDM responsibilities and provide the necessary documentation.
- Comply with all third parties' requirements (in particular Thames Water).
- Be responsible for the installation of the monitoring equipment, the reading of the targets, and instruments.
- Agree access to the structures and installation of all the monitoring equipment with the relevant third party, the Designer and the Client.
- Locate all services prior to works and ensure their operation is not affected by the installation works and operation of the monitoring system.

- Preserve and protect all equipment, infrastructure, and services present within the third-party assets during the Principal Contractor's work.
- Ensure that the Monitoring Contractor's activities / equipment do not interfere with the normal operation of the third-party assets during the Principal Contractor's work. Any incidents during installation, which cause damage to the third-party assets, shall be raised to the third party, Designer, and the Client immediately.
- Provide the Designer a pre-installation condition survey. This shall comprise a photographic and written record of the condition at the location of all the equipment.
- Ensure the monitoring system is performing to acceptable accuracies during the commissioning of the system. If monitoring readings from the manual monitoring are found to differ significantly during the commissioning period an additional three readings shall be taken and all equipment shall be checked.

5.4. Maintenance

The Monitoring Contractor shall:

- Rectify any faults, damage, or knocks to the entire monitoring instrumentation system for the duration of the contract and provide replacement for the lost instrumentation.
- Allow for the appropriate protection to any monitoring equipment which may be knocked / affected by works on site or accidentally damaged by the public, site users, maintenance workers, or vehicular traffic. The locations shall be agreed with the Client, the Designer, and the relevant third party (Thames Water).
- Collect data from the monitoring instruments and maintain the monitoring system (monitoring prisms and equipment, importation of manual surveys into the database, maintenance of manual monitoring targets). The Monitoring Contractor shall allow for suitable maintenance of the system during its proposed life span. This will include all equipment maintenance and equipment relocation, as required, to ensure the on-going operation of the system.
- Ensure all the targets are cleaned on a suitable frequency to ensure accurate surveying throughout the contract.

5.5. Monitoring System

The minimum system requirements are discussed in each section of the specification. The Monitoring Contractor may only vary the system subject to agreement with the Designer, the Client, and the relevant asset owner.

The Monitoring Contractor shall confirm the manual monitoring approach for approval by the Designer, Client and relevant third party. Manual monitoring readings shall be undertaken by the same personnel. Should there be a need to change personnel, duplicate readings shall be taken on the same instrument at the same time by the out-going person and their replacement to ensure consistency in approach and quality of the readings.

The Monitoring Contractor shall provide CAD files of the as-built locations of all monitoring equipment.

Sufficient stable datum points will be chosen and agreed with the Designer which shall be located outside of the zone of influence and shall be a sufficient distance to ensure fitness for purpose for the duration of the works. The redundancy and reliability of the monitoring system along with robustness of alternative or duplicate backup systems shall be demonstrated by the Monitoring Contractor. The global reference datums type, construction, location, and number shall be agreed with the Designer.

The Monitoring Contractor will adopt the project global grid which will be provided by the Designer. Local monitoring grids will be required to be translated relevant to the global grid on an asset-by-asset basis to facilitate deformation analysis along key axis or planes and to make movement interpretation easier. The grid adopted shall be clear on all MAP monitoring location plan drawings. The local grid shall be agreed with the Designer. The Monitoring Contractor shall provide the Designer with the details of the

calculations undertaken to translate the recorded movements from the global grid to the local monitoring grid on an asset-by-asset basis.

5.6. Monitoring Equipment

The equipment required in each area to be monitored is specified in the relevant section of the specification.

The Monitoring Contractor shall:

- Ensure equipment and materials will be installed, calibrated, and tested in accordance with the manufacturer's specification and to manufacturer's instructions.
- Supply and maintain all necessary equipment (including total station, targets / prisms, etc).
- Ensure all equipment and staff comply with the asset holders' / representatives' specific requirements.
- Ensure all equipment is manufactured by companies with proven experience and all equipment, brackets etc. to provide robust, corrosion and vibration resistant instrumentation for the physical environment and duration of the monitoring.
- Ensure that the equipment supplied is robust and be adequately protected against levels of interference and environmental conditions expected on a construction site, in public areas or within operational buildings.
- Ensure sufficient backup equipment is available, such that if any mechanical failure occurs to any equipment it can be replaced within 24 hours. Critical equipment will include the reference datum points.
- Allow for all maintenance required for the monitoring system.
- The Contractor shall decommission all the monitoring equipment upon completion of the works or at identified and agreed stage of works, unless otherwise stated in the contract.

5.7. Monitoring Meetings

The Monitoring Contractor will be required to attend monitoring meetings and to provide factual reports as defined in Section 8.3.

5.8. Data Acquisition and Reporting

- The MAP will outline the action points and intervention levels required and describe the actions to be taken in the event of movements exceeding trigger levels.
- The MAP and trigger levels will be agreed with the Contractor and the asset holder prior to works commencing on site. The trigger threshold may need to be reviewed by the Designer further to completion of initial rounds of monitoring and with agreement from the Contractor and relevant third parties.
- The monitoring information prepared by the Contractor will provide notification by a suitable method of any readings greater than or equal to the MAP levels once forwarded to the Designer. Trigger levels will be provided to the Contractor by the Designer.
- The Contractor shall review within the reporting timescales defined in the MAP any trigger alerts issued and confirm if they are due to genuine movements or equipment error or interference. The Contractor shall provide photographic and video information, where available, to aid initial reporting of either a trigger alert investigation or due to restrictions in optical survey lines of sight.
- Graphical displays / trigger alerts within the digital format spreadsheets shall be updated as soon as practicable after readings are taken to allow sufficient notification of the trigger levels.
- The Contractor will review all results post survey during the works and highlight any increasing or decreasing trends in the monitoring data to the Designer.
- A summary of current construction activities shall be included by the Contractor in the Monitoring Report to allow for the influence of any construction activities on the monitored infrastructure to be assessed.
- The Contractor will undertake the data calculations and translations as required by the MAP / EPP.
- The Contractor will be required to support the implementation of the MAP / EPP during construction.

5.9. Disclosure of Data

The Monitoring Contractor shall not disclose or publish any instrumentation data to third parties without authorisation from the Client.

5.10. Monitoring System Decommissioning

A report will be issued by the Monitoring Contractor to the Designer, Principal Contractor, and to the relevant asset holder to enable decommissioning of the monitoring system on an asset by asset basis and / or project stages. The report will be issued once steady data has been obtained. Once the relevant asset holder / representative has confirmed that the monitoring system can be decommissioned the Designer / Client will instruct the Monitoring Contractor to decommission the relevant part of the monitoring system. The Monitoring Contractor shall confirm that decommissioning of any given component of the monitoring system will not have an adverse effect on the function of the remainder of the system.

6. Target Points Monitoring

6.1. General

Target points are to be positioned at key locations adjacent to the proposed development site. These will require precise monitoring of vertical movements. This monitoring is required to measure general ground movements surrounding the site as an indirect, but representative, means of reviewing the impact of the construction works on the Thames Water assets.

6.2. Monitoring Strategy

The change in the vertical movements of the targets versus time is required. The Monitoring Contractor shall refer to Table 1 regarding the monitoring frequency allowance.

Hilti nails or similar shall be used to carry out precise levelling and movement monitoring of the target points around the site. The pins should be located in the ground at the approximate locations shown in Figure 6.1.

The targets shall be robustly attached and adequately protected to prevent damage, displacement, or vandalism. Any targets damaged during the works shall be replaced by the Monitoring Contractor.

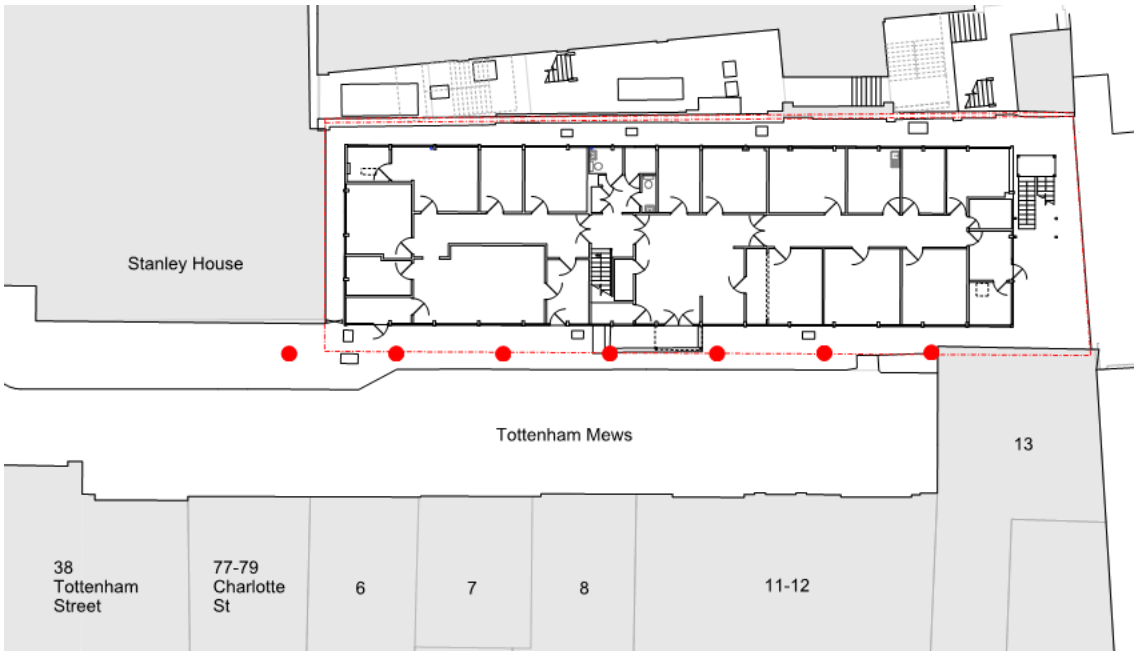

Figure 6.1 Approximate recommended locations for survey pin placement marked by red dots

6.3. Monitoring System

Monitoring of pavement and hard standing are required at the locations shown in Figure 6.1 and summarised in Table 2.

Table 2 Location summary of monitoring pins

Location	Monitoring pins
Tottenham Mews Pavement	7 no. at 5m spacing

6.4. System Requirements

The system should have an accuracy of ±1.0mm in the vertical and ±2.0mm in the horizontal directions.

The system shall have a precision of 0.5mm.

The resolution of the equipment should be approximate to the adopted accuracy and precision.

7. Vibration Monitoring

7.1. General

The number and location of the 'real-time' vibration monitoring locations will depend on the sequencing of the proposed development and the location of the piling rig and other relevant machinery at any given time in relation to the Thames Water assets. The proposed locations will be reviewed as the design develops and as the sequencing for any construction for any activities becomes more defined. Vibration monitoring is needed during the demolition of the exiting structure.

7.2. Monitoring Strategy

A minimum of one vibration device per piling/boring rig or other relevant machinery is required. The device should be located at the closest Thames Water asset as outlined in the MAP, and the indicative locations are indicated in . The vibration monitoring device(s) should be located along the assets identified, at the point in the closest proximity to any active piling/boring rigs or similar operational machinery.

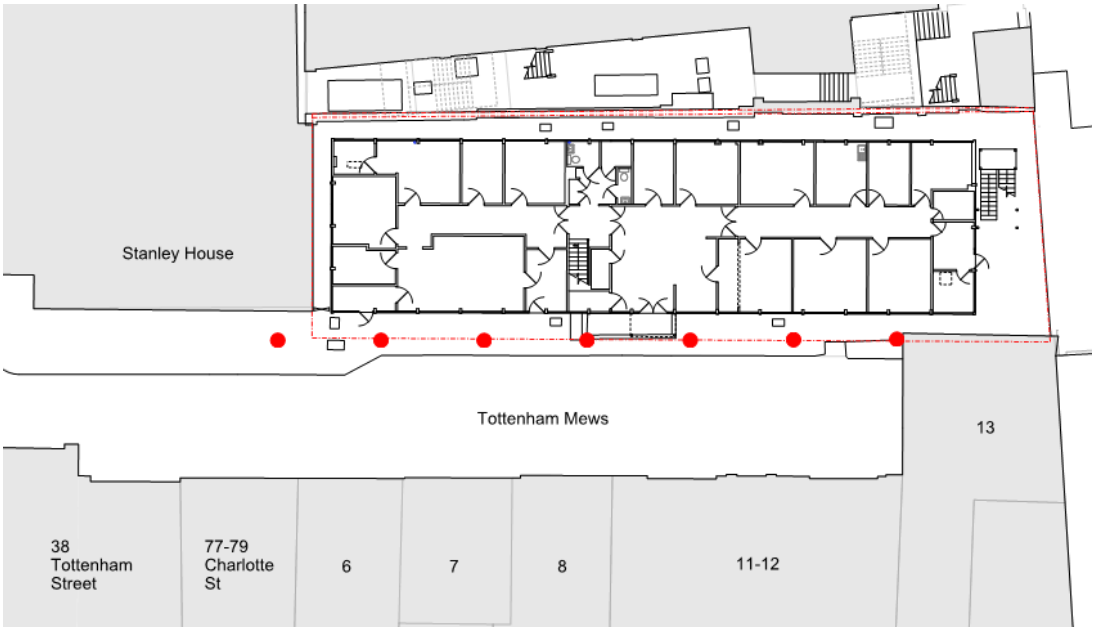

Figure 7.1 Approximate recommended monitoring locations and vibration monitoring device/s should be along the length of asset when piling/boring equipment is in use

8. Reporting

8.1. General

The Monitoring Contractor will be required to produce a Baseline Factual Monitoring Report, Factual Monitoring Reports, a Final Factual Monitoring Report for each asset and attend monitoring meetings.

8.2. Baseline Factual Monitoring Report

The Monitoring Contractor will provide all the relevant data collected during the baseline monitoring of each monitoring pin within a concise report which will allow existing movement trends to be interpreted by the Designer. These reports shall be available for download from a remote access system. A baseline factual monitoring report will be required and will be issued by the Monitoring Contractor within 2 weeks of completion of the baseline monitoring period to the Designer. The purpose of the baseline monitoring is to confirm that the variability / accuracy of the monitoring system is acceptable and complies with the monitoring specification. Interpretive reports will be produced by the Designer to compare the predictions with the movements recorded and to review the trigger thresholds within the MAP are appropriate.

8.3. Factual Monitoring Reports

8.3.1. Provision of Monitoring Data

The Monitoring Contractor shall make interpreted monitoring data available within 24 hours of each monitoring visit, in order to enable the project team to review the data set and implement any required contingency measures (as detailed in the MAP) in a timely fashion.

8.3.2. Formal Summary Reports

Below are the general requirements:

- Reporting of construction activities.
- The Monitoring Contractor shall make formal summary reports available every two weeks, detailing the works undertaken and the movement trends recorded for each asset subject to monitoring.

- Where erroneous data is recorded and additional monitoring is undertaken, both sets of readings shall be presented. The reasons for the error shall be identified together with details of remedial works undertaken. If persistent errors are recorded, the adoption of a new base reading may be required. The Monitoring Contractor shall agree with the Designer the data correction process and reporting.
- All data shall be available in an Excel format.
- The Monitoring Contractor will confirm the location of all monitoring equipment (targets, sensors, as installed on site in the global site grid coordinates (approved by the Designer) as well as the origin and axis of all reporting grids for results output. This shall be provided on a compliant CAD model.
- In addition to reports, access to the raw data, data processing calculations, QA tests, monitoring maintenance system and collected database shall be made available to the Designer, Client, and approved stakeholders for independent audit and review of the monitoring system performance. This includes collaboration on site and at monitoring contractors processing centres.

8.4. Final Monitoring Report

A final report shall be prepared within 4 weeks of decommissioning of the monitoring for each asset. This report shall:

- Collate all of the data collected over the course of the monitoring contract.
- Include updated as built records and status of all instrumentation.
- Summarise all equipment to be removed once approval from the Designer, the Client, and third party is received.

The report shall be submitted to the Designer and the Client for approval.

8.5. Decommissioning Report

Prior to the proposed decommissioning of the monitoring of each defined asset the Designer shall submit a Decommissioning Report to the relevant asset holder / representative for approval.

8.6. Monitoring Meetings

The Contractor is not required to attend regular monitoring meetings; however, a provisional fee shall be allowed for situations where their attendance is requested/required by the Designer and/or the Client. The Contractor may be required to present their monitoring report at Monitoring Meetings. Copies of all reports are to be made available to the Designer and Client who will confirm the construction periods / programme. The report shall be available in digital format.

When required, the meetings will discuss the movements recorded relative to the trigger thresholds defined in the MAP and any increasing or decreasing movement trends.

The Contractor shall attend additional meetings (Emergency Review Panel (ERP) meetings) if genuine trigger alerts are recorded by the monitoring system to confirm the movement recorded is genuine and to discuss the monitoring regime and movements. The ERP meeting responsibilities shall be defined in the relevant MAP monitoring strategy.

Appendix A: Monitoring Survey Pin Locations

Note:

- Target position along the pavement at 5m interval.
- Image courtesy of Google Maps.

A-squared Studio	**Client** Mark & Partners Ltd	**Title** Target positions for monitoring		**Date** 17.05.2023	
	Project Name 14 – 19 Tottenham Mews	**Sheet Size** A4	**Document** 2743-A2S-XX-XX-SP-Y-0002-00	**Drawn by** QS	**Checked By** PS

Appendix B: 1mm Settlement Contour Plan

Stanley House

Middlesex House

38 Tottenham Street

77-79 Charlotte St

6

7

8

11-12

13

Tottenham Mews

0 1 5 10m

1mm contour

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