

**32-33 TORRINGTON SQUARE
MONITORING**

**Monitoring Report
SES-10215-MR01**

Date of survey completion: 21st May 2018

Executive Summary

Instrumentation Installed

Targets, precise Level points have been installed at key locations on site.

Instrumentation:

Total Station:	Leica TS30 Motorised Total Station Angular Standard Deviation $\pm 0.5''$ arc Distance Standard Deviation $\pm 0.5\text{mm}+1\text{ppm}$ Absolute accuracy of horizontal readings: $\pm 2\text{mm}$
Level:	Leica DNA03 Precision Digital Level Leica GPCL2 Invar Bar Coded Staff Standard Deviation 0.4mm for a 1km double-run

Summary of Results

Targets on Front Elevation of The Warburg Institute

Targets are showing negligible horizontal movement.
Targets are showing negligible vertical movement.

Targets on Side Elevation of The Warburg Institute

Targets are showing negligible horizontal movement.
Targets are showing negligible vertical movement.

Targets on Rear Elevation of The Warburg Institute

Targets are showing negligible horizontal movement.
Targets are showing negligible vertical movement.

Targets on Staircase

Targets are showing negligible horizontal movement.
Targets are showing negligible vertical movement.

Targets on back garden of No. 31 Torrington Square

Targets are showing negligible horizontal movement.
Targets are showing negligible vertical movement.

Targets on back garden of No. 32 Torrington Square

Targets are showing negligible horizontal movement.
Targets are showing negligible vertical movement.

Targets on Rear Elevation of No. 32 Torrington Square

Targets are showing negligible horizontal movement.
Targets are showing negligible vertical movement.

Targets on Side Elevation of No. 32 Torrington Square

Targets are showing negligible horizontal movement.
Targets are showing negligible vertical movement.

Executive Summary

Targets on Front Elevation of No. 32 Torrington Square

Targets are showing negligible horizontal movement.

Targets are showing negligible vertical movement.

Targets on Front Elevation of No. 31 Torrington Square

Targets are showing negligible horizontal movement.

Targets are showing negligible vertical movement.

Targets on Heating Tunnel

Targets are showing negligible horizontal movement.

Targets are showing negligible vertical movement.

Precise Level Points along courtyard

Precise level points are showing negligible movement.

Precise Level Points on Front Elevation of The Warburg Institute

Precise level points are showing negligible movement.

Precise Level Points on Side Elevation of The Warburg Institute

Precise level points are showing negligible movement.

Precise Level Points on Rear Elevation of The Warburg Institute

Precise level points are showing negligible movement.

Precise Level Points on Side Elevation of No. 32 Torrington Square

Precise level points are showing negligible movement.

Precise Level Points on Front Elevation of No. 32 Torrington Square

Precise level points are showing negligible movement.

Precise Level Points on Front Elevation of No. 31 Torrington Square

Precise level points are showing negligible movement.

Precise Level Points on Staircase

Precise level points are showing negligible movement.

Survey Schedule and Notes

Report No.	Quote / PCP Number	Quote Item Number	Date(s)	Type of Survey	Survey Description	Weather	Surveyor(s)
MIR	2222-SMrevA	1.2.1	02-04/05/18	Installation	Installation of Monitoring 3D Reflective Targets	Showers, 12°C	P. Le
	2222-SMrevA	1.2.2	08, 09, 11/05/18	Installation	Installation of Precise Level Points	Sunny, 25°C	
	2222-SMrevA	1.2.3	10, 11, 15, 17/05/18	Base Readings	Control establishment. Base readings of 3D Reflective Targets and Precise Level Points	Partly Sunny, 17°C	
1	2222-SMrevA	1.3.1	21/05/18	Targ+Lev	Monitoring Survey of 3D Reflective Targets and Precise Level Points	Partly Sunny, 20°C	P. Le

Absolute accuracy of readings: ±2mm

A positive value in the dE column, denotes positive movement in the Eastings coordinate plane and vice versa.

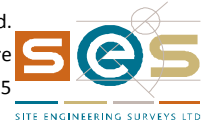
A positive value in the dN column, denotes positive movement in the Northings coordinate plane and vice versa.

A positive value in the dElev column, denotes heave and vice versa

Site Engineering Surveys Ltd.

32-33 Torrington Square

Job no. 10215



3D Position Monitoring

Point	Date of base readings	Average Base readings			Target Readings			Diff to base (mm)		
		Easting	Northing	Level	21/05/18					
					Easting	Northing	Level	dE	dN	dElev
Targets on Front Elevation of The Warburg Institute										
201	04/05/18	515.460	312.267	19.458	515.461	312.267	19.457	1	0	0
202	04/05/18	515.434	312.323	15.535	515.435	312.323	15.535	1	0	0
203	04/05/18	515.411	312.224	11.556	515.411	312.224	11.556	0	0	0
204	04/05/18	515.121	304.761	18.913	515.122	304.761	18.913	0	0	0
205	04/05/18	515.126	304.854	15.647	515.127	304.854	15.647	0	0	0
206	04/05/18	515.132	304.796	11.944	515.133	304.796	11.944	1	0	0
Targets on Side Elevation of The Warburg Institute										
207	04/05/18	520.607	304.266	17.161	520.607	304.266	17.161	0	0	0
208	04/05/18	520.408	304.269	14.146	520.408	304.269	14.147	0	0	0
209	04/05/18	520.369	304.274	11.015	520.369	304.274	11.015	0	0	0
210	04/05/18	525.513	304.152	18.053	525.513	304.152	18.053	0	0	0
211	04/05/18	525.512	304.154	15.024	525.512	304.154	15.024	0	0	0
212	04/05/18	525.501	304.157	10.712	525.501	304.157	10.712	0	0	0
Targets on Rear Elevation of The Warburg Institute										
213	04/05/18	525.600	309.001	19.410	525.600	309.001	19.410	0	0	0
214	04/05/18	525.602	309.021	16.662	525.603	309.020	16.662	0	0	0
215	04/05/18	525.611	309.370	10.468	525.609	309.371	10.468	-2	1	0

Absolute accuracy of readings: ±2mm

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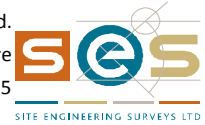
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3D Position Monitoring

Point	Date of base readings	Average Base readings			Target Readings			Diff to base (mm)		
		Easting	Northing	Level	21/05/18					
					Easting	Northing	Level	dE	dN	dElev

Targets on Staircase

216	04/05/18	526.630	304.479	18.167	526.630	304.479	18.167	0	0	0
217	04/05/18	526.637	304.511	15.301	526.636	304.511	15.301	0	0	0
218	04/05/18	526.642	304.490	10.893	526.641	304.490	10.893	0	0	0
219	04/05/18	529.668	304.440	17.914	529.667	304.440	17.914	0	0	0
220	04/05/18	530.462	304.445	14.594	530.462	304.445	14.594	0	0	0
221	04/05/18	530.464	304.424	10.483	530.464	304.424	10.483	-1	0	0
222	04/05/18	526.678	306.912	18.349	526.678	306.912	18.349	0	0	0
223	04/05/18	526.679	306.960	15.330	526.678	306.960	15.330	0	0	0
224	04/05/18	526.692	306.951	10.921	526.692	306.951	10.921	-1	0	0
225	04/05/18	529.716	306.897	17.946	529.716	306.897	17.946	0	0	0
226	04/05/18	530.509	306.878	14.573	530.509	306.878	14.573	0	0	0
227	04/05/18	530.518	306.877	10.398	530.518	306.877	10.398	0	0	0

Targets on back garden of No. 31 Torrington Square

228	04/05/18	535.556	284.820	11.483	535.556	284.820	11.483	0	0	0
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Targets on back garden of No. 32 Torrington Square

229	04/05/18	535.369	290.927	11.473	535.369	290.928	11.473	0	0	0
230	04/05/18	535.383	290.797	9.635	535.383	290.797	9.635	0	0	0
231	04/05/18	535.457	296.376	11.474	535.456	296.376	11.474	0	0	0
232	04/05/18	535.455	296.367	9.482	535.455	296.366	9.483	0	0	0

Absolute accuracy of readings: ±2mm

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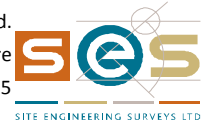
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32-33 Torrington Square

Job no. 10215



3D Position Monitoring

Point	Date of base readings	Average Base readings			Target Readings			Diff to base (mm)		
		Easting	Northing	Level	21/05/18					
					Easting	Northing	Level	dE	dN	dElev

Targets on Rear Elevation of No. 32 Torrington Square

233	04/05/18	529.166	290.701	16.136	529.166	290.701	16.136	0	0	0
234	04/05/18	529.161	290.700	13.973	529.161	290.700	13.973	0	0	0
235	04/05/18	529.205	293.076	16.097	529.205	293.075	16.097	-1	-1	0
236	04/05/18	529.206	293.089	13.722	529.204	293.088	13.723	-2	-1	0
237	04/05/18	524.917	293.273	21.612	524.917	293.273	21.612	-1	0	0
238	04/05/18	524.908	293.307	18.566	524.907	293.307	18.566	0	0	0
239	04/05/18	524.942	294.721	21.677	524.941	294.720	21.678	-1	0	0
240	04/05/18	524.940	294.743	18.579	524.940	294.743	18.579	-1	0	0
241	04/05/18	524.932	294.161	14.392	524.932	294.161	14.392	0	0	0
242	04/05/18	524.965	296.822	21.627	524.965	296.822	21.627	0	0	0
243	04/05/18	524.965	296.801	18.565	524.964	296.801	18.566	-1	0	0

Targets on Side Elevation of No. 32 Torrington Square

244	04/05/18	521.462	297.063	18.957	521.462	297.063	18.957	0	0	0
245	04/05/18	521.566	297.043	15.945	521.566	297.043	15.946	-1	0	0
246	04/05/18	521.591	297.024	12.581	521.590	297.024	12.582	0	0	0
247	04/05/18	515.809	297.213	19.556	515.809	297.213	19.556	0	0	0
248	04/05/18	515.740	297.198	15.776	515.740	297.197	15.776	0	0	0
249	04/05/18	515.692	297.181	12.685	515.692	297.181	12.685	0	0	0

Absolute accuracy of readings: ±2mm

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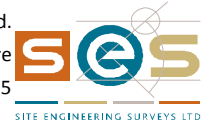
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A positive value in the dElev column, denotes heave and vice versa

Site Engineering Surveys Ltd.

32-33 Torrington Square

Job no. 10215



3D Position Monitoring

Point	Date of base readings	Average Base readings			Target Readings			Diff to base (mm)		
		Easting	Northing	Level	21/05/18					
					Easting	Northing	Level	dE	dN	dElev

Targets on Front Elevation of No. 32 Torrington Square

265	04/05/18	513.955	296.690	22.500	513.956	296.690	22.500	0	0	0
250	15/05/18	513.981	296.649	18.591	513.982	296.648	18.591	1	-1	0
251	15/05/18	513.986	296.694	16.542	513.987	296.694	16.542	0	0	0
252	15/05/18	513.970	296.684	14.150	513.970	296.683	14.150	1	0	0
266	04/05/18	513.818	293.332	22.522	513.819	293.332	22.522	0	0	0
253	15/05/18	513.912	293.142	18.604	513.913	293.142	18.604	0	0	0
254	15/05/18	513.897	293.252	16.485	513.898	293.251	16.485	1	-1	0
255	15/05/18	513.902	293.001	14.257	513.902	293.001	14.257	0	0	0

Targets on Front Elevation of No. 31 Torrington Square

256	04/05/18	513.839	290.257	20.774	513.839	290.257	20.774	1	0	0
257	04/05/18	513.833	290.239	17.719	513.833	290.239	17.719	0	0	0
258	04/05/18	513.811	290.209	14.841	513.811	290.209	14.841	1	0	0
259	04/05/18	513.785	287.788	20.598	513.786	287.788	20.598	1	0	0
260	04/05/18	513.761	287.756	17.761	513.762	287.757	17.761	1	0	0
261	04/05/18	513.745	287.788	14.813	513.746	287.788	14.813	1	0	0
262	04/05/18	513.696	284.941	20.730	513.697	284.942	20.730	0	0	0
263	04/05/18	513.700	285.000	17.724	513.701	285.001	17.724	1	1	0
264	04/05/18	513.745	284.748	14.678	513.746	284.749	14.678	1	1	0

Absolute accuracy of readings: ±2mm

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A positive value in the dElev column, denotes heave and vice versa

Site Engineering Surveys Ltd.

32-33 Torrington Square

Job no. 10215



Point	Date of base readings	Average Base readings			Target Readings			Diff to base (mm)		
		Easting	Northing	Level	Easting	Northing	Level	21/05/18		
								dE	dN	dElev
Targets on Heating Tunnel										
114	15/05/18	511.079	295.654	9.701	511.079	295.653	9.700	0	-1	-1
115	15/05/18	512.070	295.486	8.437	512.070	295.486	8.437	0	0	-1
116	15/05/18	509.279	295.930	9.424	509.280	295.930	9.424	1	0	0
117	15/05/18	508.847	296.036	7.905	508.847	296.036	7.905	0	0	0
118	15/05/18	506.347	296.876	8.966	506.347	296.876	8.966	0	0	0
119	15/05/18	507.339	296.759	6.969	507.339	296.759	6.969	0	0	0
120	15/05/18	503.972	296.967	9.551	503.972	296.967	9.551	1	0	0
121	15/05/18	504.162	297.123	6.820	504.162	297.123	6.820	0	0	0

Notes: A positive difference denotes heave and vice versa

Precise Levels

Point	Type	Date of base readings	Average	Level	Diff (mm)
				21/05/18	

Precise Level Points along Torrington Square

101	Stud	10/05/18	10.1537	10.1541	0.4
102	Stud	10/05/18	10.1406	10.1411	0.5
103	Stud	10/05/18	10.2904	10.2906	0.2
104	Stud	10/05/18	10.3225	10.3227	0.2
105	Stud	10/05/18	10.3768	10.3770	0.2
106	Stud	10/05/18	10.3685	10.3684	-0.1
107	Stud	10/05/18	10.4464	10.4465	0.1
108	Stud	10/05/18	10.4890	10.4888	-0.2

Precise Level Points along courtyard

109	Stud	10/05/18	7.3923	7.3924	0.1
110	Stud	10/05/18	7.4089	7.4092	0.2
111	Stud	10/05/18	7.3493	7.3499	0.5
112	Stud	10/05/18	7.3331	7.3336	0.5
113	Stud	10/05/18	7.3241	7.3246	0.5

Precise Level Points on Front Elevation of The Warburg Institute

301	Barcode	17/05/18	11.3331	11.3333	0.2
302	Barcode	17/05/18	11.5600	11.5600	0.0

Precise Level Points on Side Elevation of The Warburg Institute

303	Barcode	17/05/18	10.5505	10.5502	-0.3
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Precise Level Points on Rear Elevation of The Warburg Institute

304	Barcode	10/05/18	7.5766	7.5768	0.2
305	Barcode	10/05/18	7.4026	7.4028	0.2

Precise Level Points on Side Elevation of No. 32 Torrington Square

306	Barcode	10/05/18	11.6650	11.6648	-0.2
307	Barcode	10/05/18	11.6995	11.6995	0.0

Precise Level Points on Front Elevation of No. 32 Torrington Square

308	Barcode	17/05/18	11.7717	11.7717	0.0
309	Barcode	17/05/18	11.3719	11.3714	-0.4

Notes: A positive difference denotes heave and vice versa

Precise Levels

Point	Type	Date of base readings	Average	Level	Diff (mm)
				21/05/18	

Precise Level Points on Front Elevation of No. 31 Torrington Square

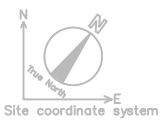
310	Barcode	10/05/18	11.2639	11.2639	0.1
311	Barcode	10/05/18	11.5500	11.5502	0.2
312	Barcode	10/05/18	11.3591	11.3595	0.3

Precise Level Points on Staircase

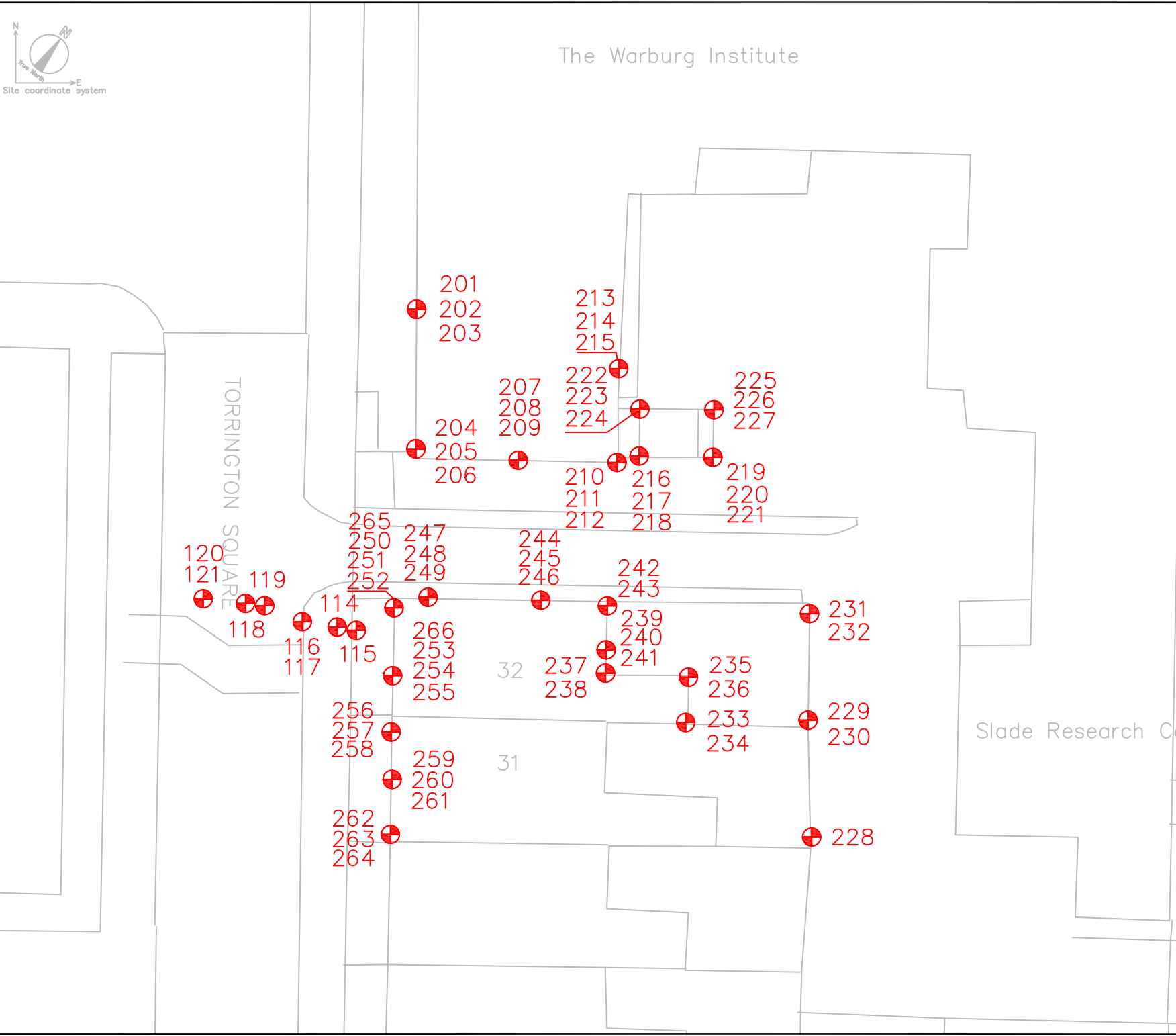
313	Barcode	17/05/18	8.4376	8.4374	-0.1
314	Barcode	17/05/18	8.4817	8.4817	-0.1
315	Barcode	17/05/18	8.5875	8.5873	-0.2
316	Barcode	17/05/18	8.5552	8.5552	0.0

Benchmarks

1001	Stud	10/05/18	9.7800	9.7800	0.0
1002	Stud	10/05/18	9.4801	9.4802	0.1
1003	Stud	10/05/18	9.8229	9.8231	0.2
1004	Stud	10/05/18	7.6630	7.6630	0.0
1005	Stud	10/05/18	7.7993	7.7996	0.2



The Warburg Institute



NOTES:

Legend:

- ⊕ Monitoring target

Coordinate system orientated to be square with elevation of Nos. 32-33 Torrington Square

Issued to client	23/05/18	IP
REVISIONS	DATE	BY

CLIENT

8 Build

PROJECT TITLE

32-33 Torrington Square

TITLE

Monitoring 3D Targets Location Plan

SURVEYED	DRAWN	CHECKED	DATE	SCALE @A3
PL	IP	-	17/05/18	NTS

S E S

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JOB No	DRAWING No	REV
10215	SES/10215/MON1	

