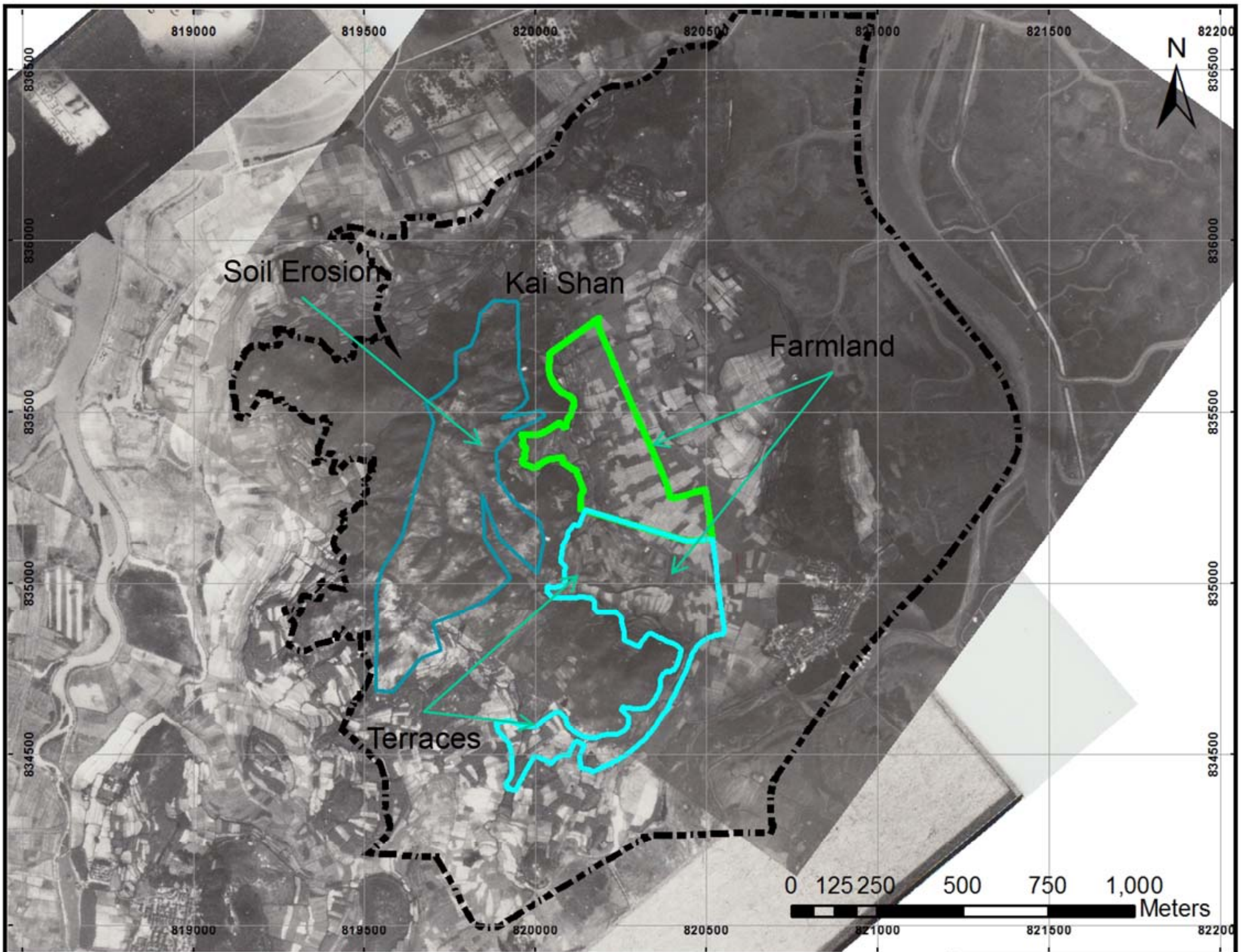
Appendix A

Aerial Photograph Interpretation



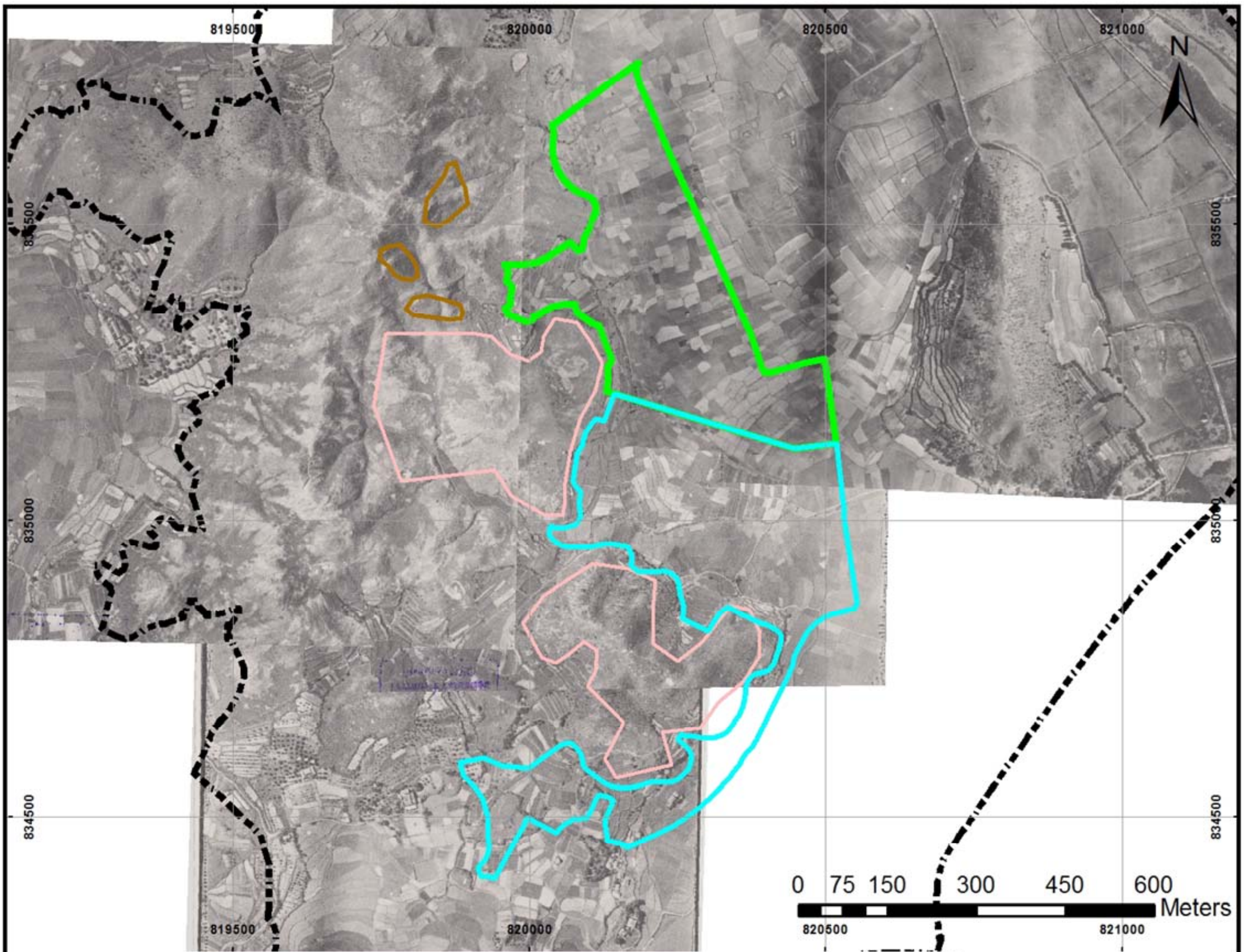
Year 1924

- Farmland and terraces on the flat land surrounding the foot hills occupied the Public Housing (PH) Site and Yuen Long Industrial Estate Extension (YLIEE).
- No man-made structures were identified.
- A small number of graves were identified at the foot hills adjacent to the proposed development site.
- Sparse vegetation was observed across the natural terrain to the west of the PH Site and YLIEE.
- Soil erosion was observed mainly on the hill top.

Legend

- Study Area
- YLIEE Site
- PH Site
- Soil Erosion
- Farmland/Terrace Boundary

Job Title Agreement No. CB20120293 Planning and Engineering Study for the Public Housing Site and Yuen Long Industrial Estate Extension at Wang Chau	Figure Title **Aerial Photo Interpretation** (Sheet 1 of 8)	ARUP Ove Arup & Partners Hong Kong Limited Scale N.T.S. Drn. ELCF Date 09/2012 Chd. AN Approved SWM Job No. 226464 Figure No. A1



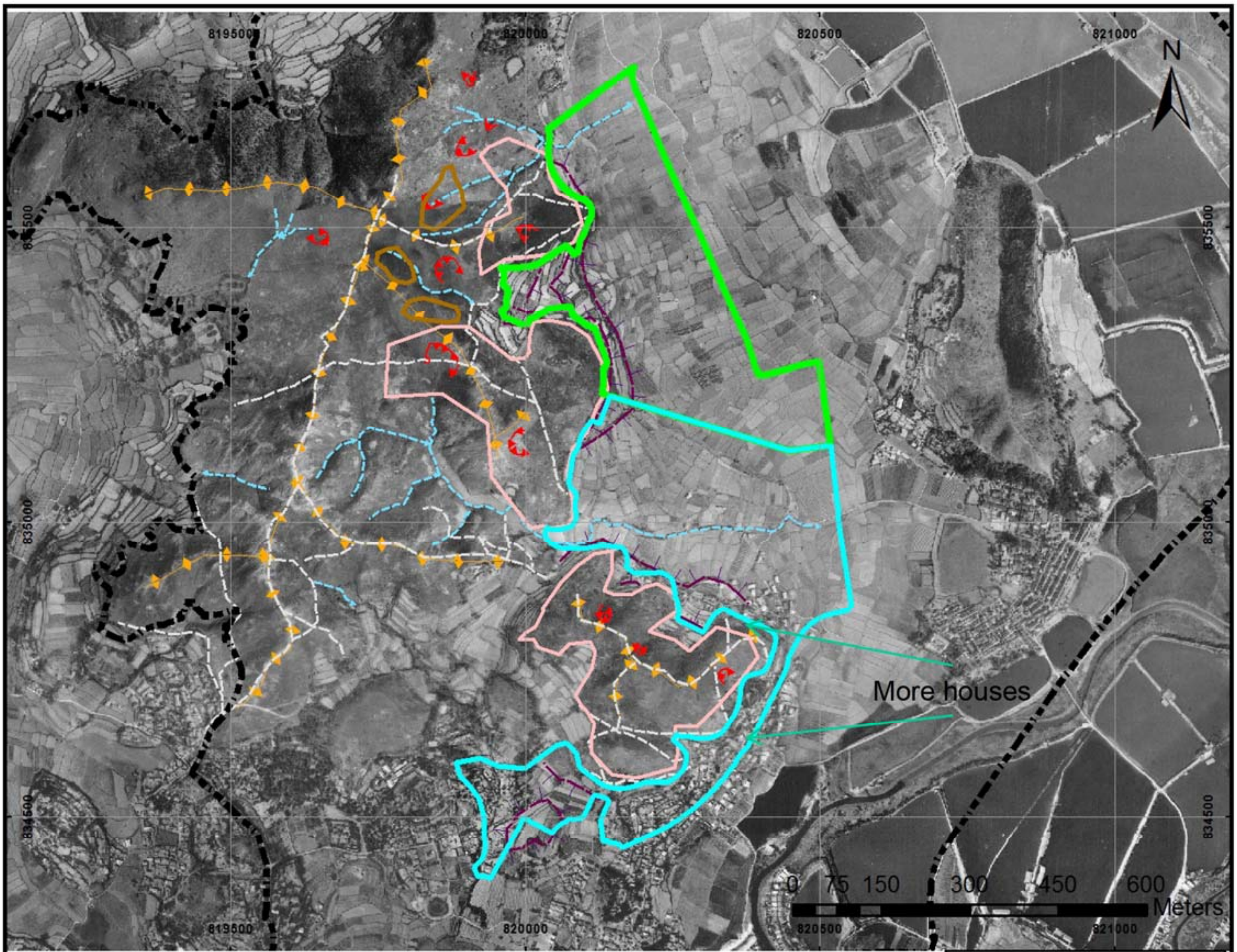
Year 1949

- Additional graves were observed in the area to the west of proposed development.
- Further small trees and vegetation can be observed within the natural terrain area to the west of the proposed PH Site and YLIEE.
- Further rock outcrops and boulders were observed in the natural terrain to the west of proposed development sites.
- No other significant changes were observed.

Legend

- Study Area
- YLIEE Site
- PH Site
- Rock Outcrop/ Boulders
- Grave Area

Job Title	Figure Title	ARUP Ove Arup & Partners Hong Kong Limited
Agreement No. CB20120293 Planning and Engineering Study for the Public Housing Site and Yuen Long Industrial Estate Extension at Wang Chau	**Aerial Photo Interpretation** (Sheet 2 of 8)	Scale N.T.S. Drn. ELCF Date 09/2012 Chd. AN Approved SWM Job No. 226464 Figure No. A2



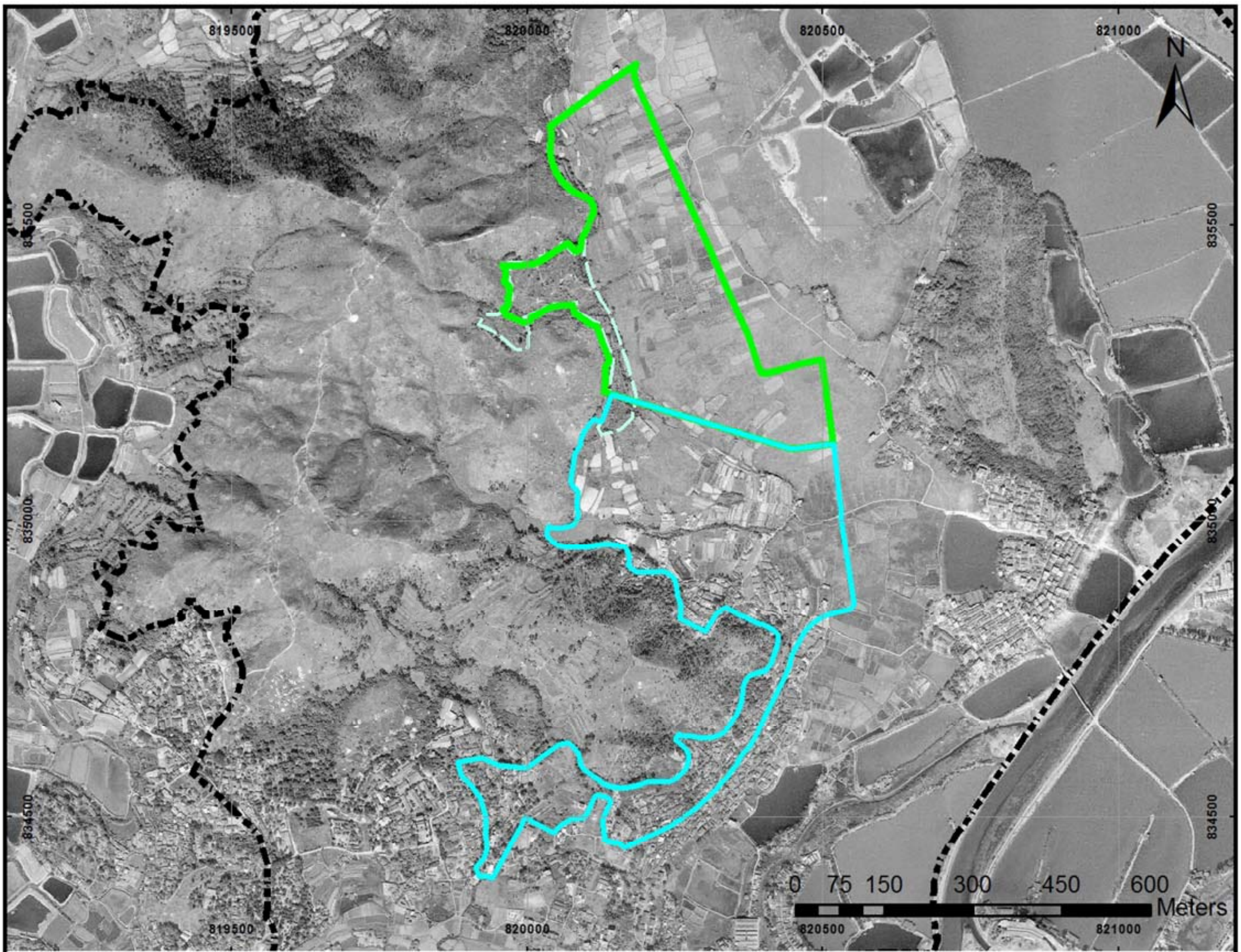
Year 1963

- The majority of the land within the PH and YLIEE sites and adjacent areas was still used for agricultural purposes. However, more low-rise houses were observed, especially concentrated in the southern portion of the PH site. Low-rise structures were observed within the agricultural area.
- Natural incised drainage lines were observed predominantly in the central sites and northern portions of the natural terrain hillside orientated towards the PH and YLIEE sites. These drainage line converge forming two drainage lines, one passing through the PH site, and one passing through the YLIEE site. Most of the drainage lines identified were NE to SW trending with some minor drainage lines trending NW to SE.
- No recent landslide scars were observed but morphological depressions were noted in the hills to the West of the PH and YLIEE sites, which may be related to previous landslide activities.
- Rock outcrops and boulders were observed along the major drainage lines and spurlines suggesting shallow rockhead level in these areas.
- More graves were mainly distributed over the small hills and foot slope.
- Footpaths were mainly observed along the ridgelines and along the foot hills.
- No other significant changes were observed

Legend

- Study Area
- YLIEE Site
- PH Site
- Drainage line
- Spurline
- Convex Break
- Terrace
- Footpaths
- Rock Outcrop/ Boulders
- Grave Area

Job Title Agreement No. CB20120293 Planning and Engineering Study for the Public Housing Site and Yuen Long Industrial Estate Extension at Wang Chau	Figure Title **Aerial Photo Interpretation** (Sheet 3 of 8)	ARUP Ove Arup & Partners Hong Kong Limited Scale N.T.S. Drn. ELCF Date 09/2012 Chd. AN Approved SWM Job No. 226464 Figure No. A3



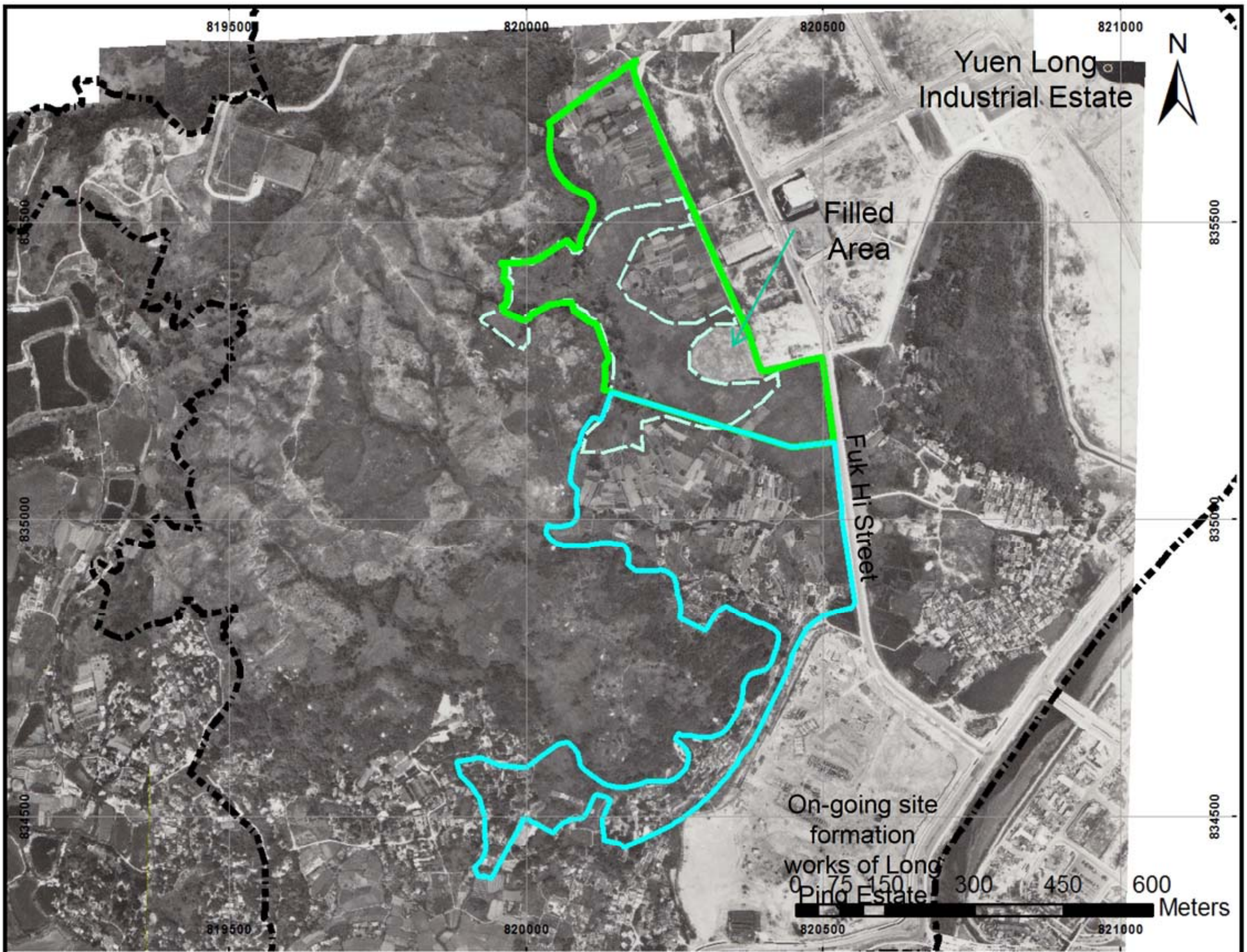
Year 1973

- A significant portion of farmland and terraces at foot hills remained active within the YLIEE.
- More houses were observed in the southern portion of the proposed PH Site.
- More vegetation was observed to the west of the PH Site.
- No other significant changes were observed.

Legend

- Study Area
- YLIEE Site
- PH Site
- Abandoned Farmland

Job Title Agreement No. CB20120293 Planning and Engineering Study for the Public Housing Site and Yuen Long Industrial Estate Extension at Wang Chau	Figure Title **Aerial Photo Interpretation** (Sheet 5 of 8)	ARUP **Ove Arup & Partners Hong Kong Limited** Scale N.T.S. Drn. ELCF Date 09/2012 Chd. AN Approved SWM Job No. 226464 Figure No. A4



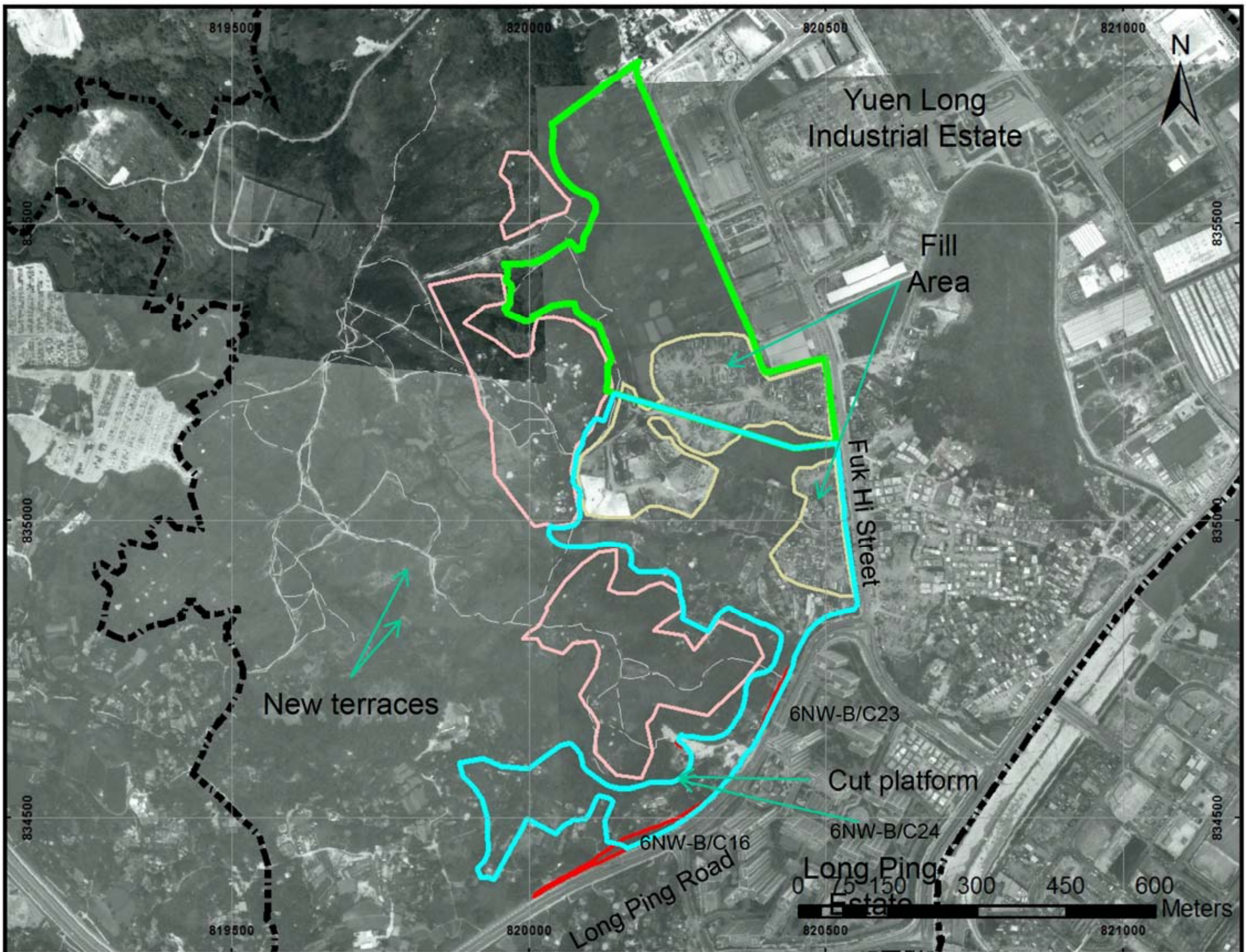
Year 1984

- A significant portion of farmland and terraces in the foot hills appear to have been abandoned.
- Part of the southern portion of the YLIEE has been filled.
- Due to the site formation work to the east of the PH Site, some of the houses were cleared.
- The Yuen Long Industrial Estate was being constructed and Fuk Hi Street was formed within the east of the YLIEE.
- No other significant changes were observed.

Legend

- Study Area
- YLIEE Site
- PH Site
- Abandoned Farmland

Job Title	Figure Title	ARUP Ove Arup & Partners Hong Kong Limited
Agreement No. CB20120293 Planning and Engineering Study for the Public Housing Site and Yuen Long Industrial Estate Extension at Wang Chau	**Aerial Photo Interpretation** (Sheet 5 of 8)	Scale N.T.S. Drn. ELCF Date 09/2012 Chd. AN Approved SWM Job No. 226464 Figure No. A5



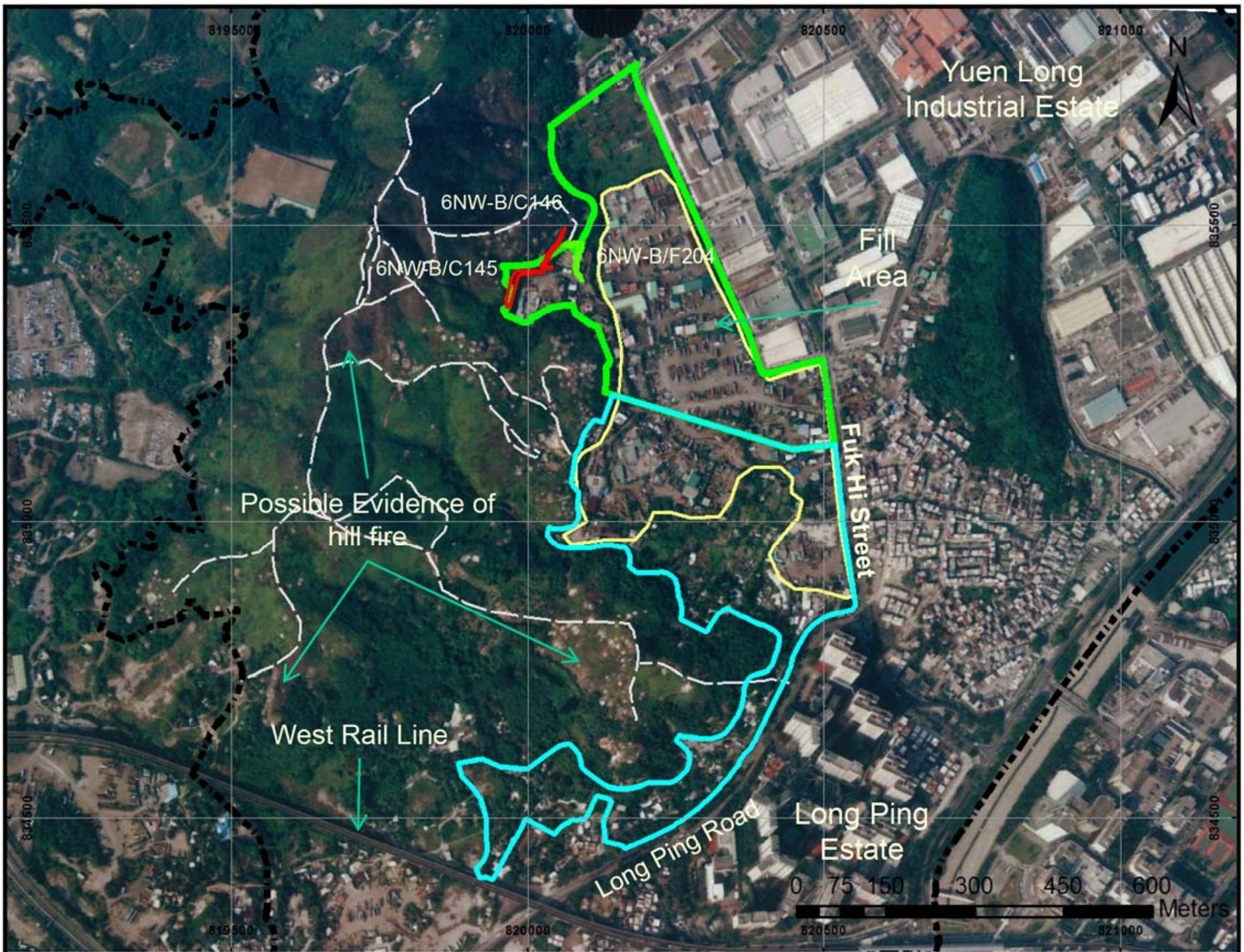
Year 1994

- In the northern portion of the PH Site and southern portion of the YLIEE, a significant portion of agricultural land was filled and converted into container storage areas.
- More low-rise houses were observed to the east of the PH Site.
- To the southeast of the PH Site, site formation work was completed and Long Ping Estate and Long Ping Road were built. The associated cut slopes 6NW-B/C16 and 6NW-B/C23 were observed.
- Man-made feature 6NW-B/C24 and a cut platform were observed in the southern portion of the PH Site.
- Construction of the Yuen Long Industrial Estate had been completed.
- Fewer houses were observed in the southern portion of the PH Site.
- Two areas of new terrace and some new graves were observed in the natural terrain to the west of the PH Site.
- More dense vegetation cover was observed to the west of the PH Site.
- Foot paths were more extensively formed on the natural terrain.
- No other significant changes were observed.

Legend

- Study Area
- YLIEE Site
- PH Site
- Cut Slope
- Grave Area
- Fill Area
- Footpath

Job Title	Figure Title	ARUP Ove Arup & Partners Hong Kong Limited
Agreement No. CB20120293 Planning and Engineering Study for the Public Housing Site and Yuen Long Industrial Estate Extension at Wang Chau	**Aerial Photo Interpretation** (Sheet 6 of 8)	Scale N.T.S. Drn. ELCF Date 09/2012 Chd. AN Approved SWM Job No. 226464 Figure No. A6



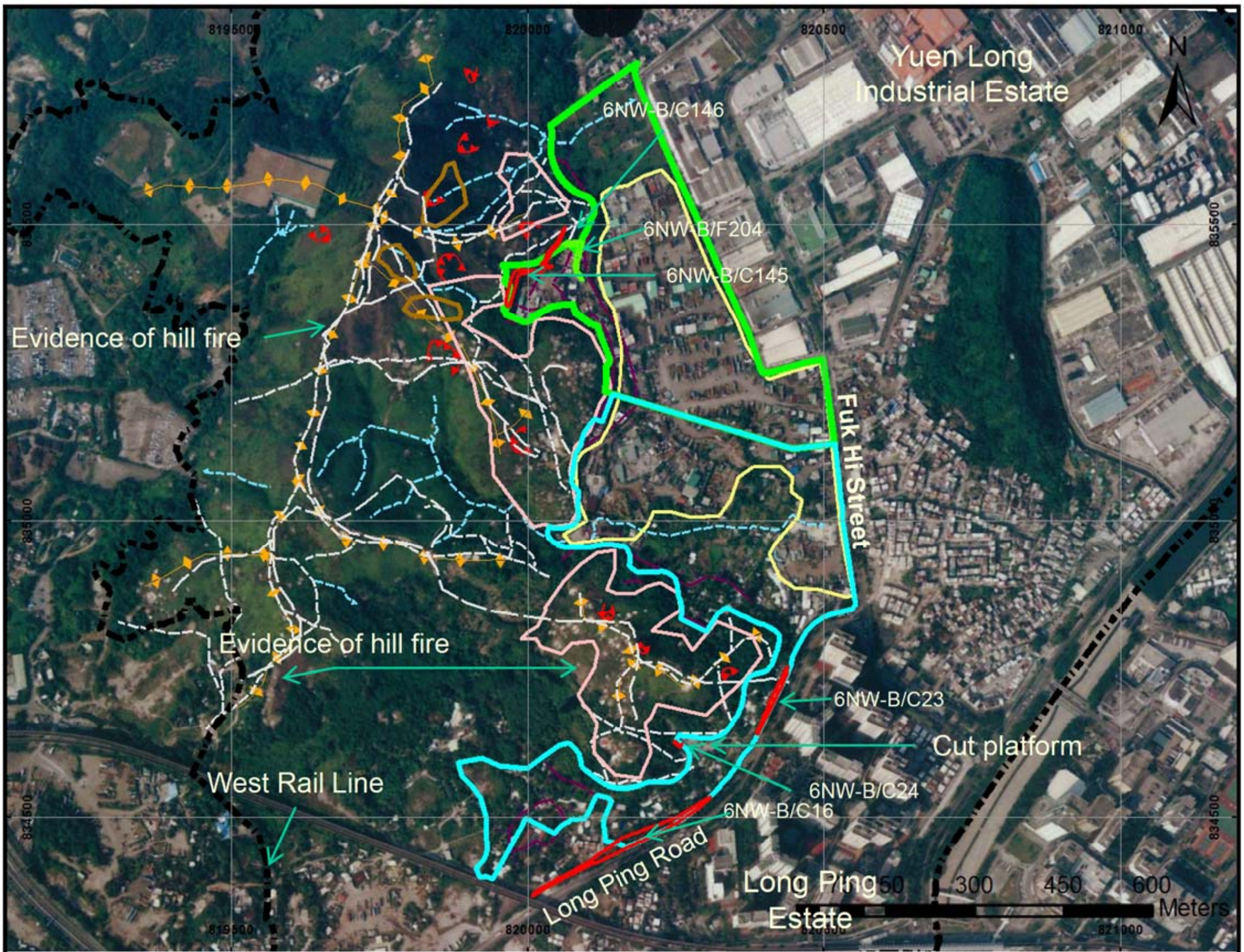
Year 2010

- More agricultural land was filled and container storage area became the major land use within the PH Site and YLIEE.
- Man made features 6NW-B/F204, 6NW-B/C145, 6NW-B/C146 were built by 2010.
- The West Rail Line was observed adjacent to the south of the PH Site.
- More graves were observed throughout the natural terrain.
- Those areas near graves were poorly vegetated which was possibly caused by hill fire.
- Generally more dense vegetation cover was observed to the west of the PH Site.
- No other significant changes were observed.

Legend

- Study Area
- YLIEE Site
- PH Site
- Cut Slope
- Fill Slope
- Fill Area

Job Title	Figure Title	ARUP Ove Arup & Partners Hong Kong Limited
Agreement No. CB20120293 Planning and Engineering Study for the Public Housing Site and Yuen Long Industrial Estate Extension at Wang Chau	**Aerial Photo Interpretation** (Sheet 7 of 8)	Scale N.T.S. Drn. ELCF Date 09/2012 Chd. AN Approved SWM Job No. 226464 Figure No. A7



Summary

- The PH Site and YLIEE were largely composed of agricultural land prior to 1973. In the past 20 years, most of the agricultural areas were filled and became a container storage area in the northern portion of the PH Site and the YLIEE. The southern portion of the PH Site was mainly residential areas from the 1960s until present.
- Yuen Long Industrial Estate and Fuk Hi Street were built by 1984. More residential areas and Long Ping Road were observed to the east and northeastern portion of the PH Site. The West Rail Line was built by 2010.
- Man-made features 6NW-B/C16, 6NW-B/C23, 6NW-B/C24, 6NW-B/C145, 6NW-B/C146 and 6NW-B/F204 were formed by 2010.
- Graves were observed to the west of the PH Site and YLIEE. Prior to 1963 the grave area was relatively small compared to present. In the past 20 years, more concrete based graves were observed in the hills. Evidence of hill fire near those graves was observed.
- No recent landslide scars have been observed but morphological depressions were noted.
- Incised drainage lines starting within the natural terrain with flow towards the PH Site and YLIEE.
- Streams were observed across the northern portion and middle part of proposed development sites in 1960s.

Legend

- Study Area
- YLIEE Site
- PH Site
- Drainage line
- Spurline
- Convex Break
- Terrace
- Footpaths
- Cut Slope
- Fill Slope
- Fill Area
- Grave Area
- Rock Outcrop/ Boulders

Job Title	Figure Title	ARUP Ove Arup & Partners Hong Kong Limited
Agreement No. CB20120293 Planning and Engineering Study for the Public Housing Site and Yuen Long Industrial Estate Extension at Wang Chau	**Aerial Photo Interpretation** (Sheet 8 of 8)	Scale N.T.S. Drn. ELCF Date 09/2012 Chd. AN Approved SWM Job No. 226464 Figure No. A8

Appendix B

Summary of Available GIU Field and Laboratory Testing Data

Summary of Existing GI Record from GIU

Table B1 List of Archival Ground Investigation and Laboratory Testing Data

GIU Ref.	Year	Report Title	No. of GI Record	Associated Laboratory Testing GIU Ref.
3225	1981	Yuen Long Development Packages 6 & 8 Site Investigation Report	1	-
5107	1981	Long Pin Estate	4	5108-5110
5936	1981	Long Ping Estate - Phase III Development Volume I - Drillhole Logs Site Investigation Report	6	-
9488	1982	Yuen Long Standard Factories Piling to Foundations Site Investigation Report	2	-
9490	1987	Standard Factories on Yuen Long Industrial Estates Final Report	10	-
9501	1983	Long Ping Estate Site Investigation for Phase I Development	2	-
11809	1989	Tin Shui Wai East Access and Long Ping Estate Link Site Investigation Report	7	-
13091	1989	Y.L.T.L. 313 S.C.S.S.5, Yuen Long, N.T.	11	-
17547	1993	Y.L.T.L. 313 S.A. SS2 Fuk Hi Street, Yuen Long.	8	17538
26993	1996	School Improvement Programme - Phase II, Package 2 School: P42II - YL Long Ping Estate, Tung Koon Primary School, Long Ping Estate, Yune Long. Ground Investigation Report. Volume 4.	4	-
28528	1997	greement No. TS-200 KCRC West Rail Project Western Section Geotechnical Data Report Appendix B1 Phase 1 Final Ground Investigation Data Report Vol. 1	1	-
28536	1997	Agreement No. TS-200 KCRC West Rail Project Western Section Geotechnical Data Report Appendix B2 Phase 2 Final Ground Investigation Data Report Vol. 1	1	28544-28552
35413	1998	Agreement No. DD-200 KCRC West Rail Project Yuen Long Section Geotechnical Data Report - Appendix A1 Final Ground Investigation Data Report (Phase I) Volume A1	4	35501-35530
55076	1998	KCRC West Rail Project Western Section Agreement No. TS-200 Geotechnical Data Report Phase 3 Final Ground Investigation Data Report Volume 1 of 7	1	-
55967	2010	Landslip Prevention & Mitigation Programme, Ground Investigation for Pilot Seismic Microzonation Study in North-west New Territories Yuen Long & Tuen Mun Districts Volume 1 of 3	2	-

Table B2 Summary of Available Borehole Data

GIU Ref. /	GI Station No.	Easting	Northing	Ground Level (mPD)	Hole Depth (m)	Base of Hole (mPD)	Vertical/ Inclined Hole	Depth to base of unit (mbgl) Fill	COLL/ DFD	PD/MD /ED	All	VI	V/IV	Engineering Rockhead (mbgl)	Level of base of unit (mPD) Fill Base	Colluvium Base	PD/MD/ ED Base	Alluvium Base	V Base	Engineering Rockhead level (mPD)
3225	03225/B7	820513.90	834819.40	2.80	34.00	-31.20	Vertical	4.50			8.00				-1.70			-5.20		
5107	05107/H1	820541.97	834761.14	3.48	49.00	-45.52	Vertical	2.50			10.00		26.00	30.50	0.98			-6.52	-22.52	-27.02
5107	05107/H14	820302.91	834452.39	2.63	60.00	-57.37	Vertical	3.00			4.50		52.50		-0.37			-1.87	-49.87	
5107	05107/H4	820468.22	834683.56	2.70	60.00	-57.30	Vertical						46.00						-43.30	
5107	05107/H7	820450.79	834590.34	2.70	28.60	-25.90	Vertical	0.50			7.00		22.00		2.20			-4.30	-19.30	
5936	05936/B6/1	820370.18	834512.71	2.94	67.64	-64.70	Vertical	2.00					55.90		0.94				-52.96	
5936	05936/B6/2	820385.43	834503.14	1.54	55.05	-53.51	Vertical	3.00			3.00		48.00	61.87	-1.46			-1.46	-46.46	-60.33
5936	05936/B6/3	820407.38	834506.45	1.37	29.76	-28.39	Vertical	4.50			4.50		29.30	49.80	-3.13			-3.13	-27.93	-48.43
5936	05936/B6/4	820420.82	834514.83	1.10	28.69	-27.59	Vertical				4.30							-3.20		
5936	05936/B6/5	820398.10	834499.18	1.73	53.68	-51.95	Vertical				2.50		45.00	48.66				-0.77	-43.27	-46.93
5936	05936/B6/6	820397.57	834487.87	1.28	43.11	-41.83	Vertical				5.50							-4.22		
9488	09488/BH-2	820442.33	835541.07	4.81	55.90	-51.09	Vertical	2.00			12.50		55.30		2.81			-7.69	-50.49	
9488	09488/BH-3	820426.26	835533.36	4.76	48.70	-43.94	Vertical	2.00		5.00	15.00		48.00		2.76		-0.24	-10.24	-43.24	
9490	09490/BH-1	820396.00	835307.00	4.27	37.45	-33.18	Vertical	1.50			14.50		32.30		2.77			-10.23	-28.03	
9490	09490/BH-10	820483.00	835285.00	5.04	34.00	-28.96	Vertical	2.00			13.50		28.65		3.04			-8.46	-23.61	
9490	09490/BH-2	820429.00	835322.00	4.57	49.35	-44.78	Vertical				12.50		44.30					-7.93	-39.73	
9490	09490/BH-3	820464.00	835338.00	4.60	43.50	-38.90	Vertical	1.50			12.00		38.50		3.10			-7.40	-33.90	
9490	09490/BH-4	820397.00	835286.00	4.30	63.28	-58.98	Vertical	1.50			12.00		58.20		2.80			-7.70	-53.90	
9490	09490/BH-5	820423.00	835297.00	4.46	49.90	-45.44	Vertical	1.50			15.00		44.70		2.96			-10.54	-40.24	
9490	09490/BH-6	820451.00	835307.00	4.53	48.06	-43.53	Vertical	2.00			13.50		42.70		2.53			-8.97	-38.17	
9490	09490/BH-7	820479.00	835314.00	4.51	63.30	-58.79	Vertical	1.50			12.00		58.20		3.01			-7.49	-53.69	
9490	09490/BH-8	820409.00	835270.00	4.47	74.00	-69.53	Vertical	1.50			13.00		69.00		2.97			-8.53	-64.53	
9490	09490/BH-9	820445.00	835277.00	4.56	60.60	-56.04	Vertical	3.00			6.00		53.40		1.56			-1.44	-48.84	
9501	09501/CC/11	820428.75	834563.40	1.90	44.52	-42.62	Vertical				4.50		36.26					-2.60	-34.36	
9501	09501/CC/8	820437.85	834579.13	2.51	51.19	-48.68	Vertical				7.50		46.60					-4.99	-44.09	
11809	11809/LR10	820180.05	834478.89	17.27	30.20	-12.93	Vertical													
11809	11809/LR11	819962.87	834322.02	8.21	21.00	-12.79	Vertical				3.00							5.21		
11809	11809/LR12	819230.54	834315.18	4.00	24.80	-20.80	Vertical			2.50	6.20		22.00				1.50	-2.20	-18.00	
11809	11809/LR13	820261.87	834506.43	9.56	20.00	-10.44	Vertical													
11809	11809/LR7	820164.16	834395.68	12.64	30.35	-17.71	Vertical													
11809	11809/LR8	820156.08	834417.41	14.67	20.30	-5.63	Vertical													
11809	11809/LR9	820181.63	834432.97	14.13	25.50	-11.37	Vertical						20.30						-6.17	
13091	13091/1	820396.93	835505.55	5.61	62.37	-56.76	Vertical			9.50	11.00		47.10	51.15			-3.89	-5.39	-41.49	-45.54
13091	13091/10	820337.13	835524.48	5.38	25.45	-20.07	Vertical	4.00			9.50				1.38			-4.12		
13091	13091/11	820307.11	835511.90	5.46	25.45	-19.99	Vertical	2.00			9.50				3.46			-4.04		
13091	13091/2	820383.35	835485.19	5.29	25.45	-20.16	Vertical	3.50		6.00	11.50				1.79		-0.71	-6.21		
13091	13091/3	820349.07	835470.42	5.27	25.45	-20.18	Vertical	3.50			9.50				1.77			-4.23		
13091	13091/4	820319.77	835458.08	5.19	25.50	-20.31	Vertical	1.60		4.00	11.00				3.59		1.19	-5.81		
13091	13091/5	820387.48	835539.87	5.80	65.80	-60.00	Vertical	3.50		6.00	11.00		50.30	50.30	2.30		-0.20	-5.20	-44.50	-44.50
13091	13091/6	820371.90	835511.39	5.36	82.25	-76.89	Vertical	3.50			9.00		67.10	67.10	1.86			-3.64	-61.74	-61.74
13091	13091/7	820339.90	835498.55	5.29	25.45	-20.16	Vertical	2.00			9.50				3.29			-4.21		
13091	13091/8	820312.36	835483.98	5.19	25.45	-20.26	Vertical	2.50			10.00				2.69			-4.81		
13091	13091/9	820361.40	835535.28	5.73	25.45	-19.72	Vertical	4.00			11.00				1.73			-5.27		
17547	17547/BH15	820215.85	835700.25	4.38	100.01	-95.63	Vertical	1.00		4.50	9.00		84.28	84.82	3.38		-0.12	-4.62	-79.90	-80.44
17547	17547/BH16	820202.45	835766.83	4.26	36.48	-32.22	Vertical	2.50			8.50		20.00	20	1.76			-4.24	-15.74	-15.74
17547	17547/BH17	820249.25	835715.05	4.46	50.23	-45.77	Vertical	2.50			8.50		35.21	35.21	1.96			-4.04	-30.75	-30.75
17547	17547/BH18	820215.15	835784.50	4.28	46.50	-42.22	Vertical	2.00			10.00		27.00	31.4	2.28			-5.72	-22.72	-27.12
17547	17547/BH19	820255.08	835752.35	4.09	43.34	-39.25	Vertical	4.00			10.00		28.00	28	0.09			-5.91	-23.91	-23.91
17547	17547/BH20	820264.85	835779.54	4.16	91.28	-87.12	Vertical	2.50	34.00	4.50	8.50		51.00	71.20	1.66	-29.84	-0.34	-4.34	-46.84	-67.04
17547	17547/BH21	820245.25	835803.48	4.34	44.00	-39.66	Vertical	2.50		4.50	8.50		28.85	28.85	1.84		-0.16	-4.16	-24.51	-24.51
17547	17547/BH27	820303.78	835737.85	4.41	56.45	-52.04	Vertical	4.00	38.00	4.50	8.50			41.00	0.41	-33.59	-0.09	-4.09		-36.59
26993	26993/P42II_BH1	820503.89	834678.98	5.10	42.85	-37.75	Vertical	3.80			13.80		21.63	21.63	1.30			-8.70	-16.53	-16.53
26993	26993/P42II_BH2	820521.08	834671.39	5.10	70.04	-64.94	Vertical	3.70			11.70		52.98	52.98	1.40			-6.60	-47.88	-47.88
26993	26993/P42II_BH3	820515.91	834704.63	5.09	42.88	-37.79	Vertical	5.80			9.80		24.90	24.90	-0.71			-4.71	-19.81	-19.81
26993	26993/P42II_BH4	820533.11	834696.17	5.09	55.21	-50.12	Vertical	3.80			8.50		32.37	25.77	1.29			-3.41	-27.28	-20.68
28528	28528/TS200/DHPZ/004	820024.34	834342.23	9.03	45.60	-36.57	Vertical	1.20				6.00	35.22	40.00	7.83				-26.19	-30.97
28536	28536/TS200/DH/042	819886.17	834394.02	8.82	43.26	-34.44	Vertical	4.50		7.00	5.60		37.76		4.32			3.22	-28.94	
35413	35413/DD200/DH/070	819840.07	834418.01	9.70	68.44	-58.74	Vertical		3.10		11.10		58.20	58.20		6.60		-1.40	-48.50	-48.50
35413	35413/DD200/DH/071	819875.06	834404.04	8.70	71.48	-62.78	Vertical	0.50			7.70		50.30	50.30	8.20			1.00	-41.60	-41.60
35413	35413/DD200/DH/072	819915.05	834389.07	9.05	42.29	-33.24	Vertical		1.00		3.70		30.94	35.04		8.05		5.35	-21.89	-25.99
35413	35413/DD200/DH/073	819950.02	834375.08	8.66	42.35	-33.69	Vertical		1.50		5.70		30.45	35.20		7.16		2.96	-21.79	-26.54
55076	55076/TS200/DHPZ/186	819983.34	834357.91	9.26	38.40	-29.14	Vertical					4.00	31.30	31.30					-22.04	-22.04
55967	55967/BH41	820154.63	835247.23	11.85	24.90	-13.05	Vertical	1.50				4.60	21.80		10.35				-9.95	
55967	55967/BH42	820208.96	835782.70	4.08	32.92	-28.84	Vertical	1.50			9.70		23.90	23.90	2.58			-5.62	-19.82	-19.82

Notes: Requirement for Engineering Rockhead is 5m of continuous non-calcarous rock of grade 3 or better with at least 85% core recovery per core-run. Where rockhead is to be determined in calcareous rock, requirements are marble class I or II (as per Chan 1994) with 20m of continuous rock and at least 85% core recovery per core-run. Where marble is encountered but not proven to 20m, values are highlighted in yellow.

Table B3 Summary of Available Soil Classification Data

												Paticle Size Distribution				
Hole ID	Depth	Sample Type	Geology	Natural Moisture Content	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Bulk Density	Dry Density	Particle Density	Clay (%)	Silt (%)	Sand (%)	Gravel (%)	Cobble & Boulder (%)
05107/H14	2	P	FILL	45	56	31	25	0.556				22	44	33		
05107/H14	5.5	U	V(Si)	25	63	34	29	-0.317				15	75	9	1	0
05107/H14	15.5	M	V(Si)	43	69	35	34	0.226								
05107/H14	36.5	M	V(Si)	9	35	24	11	-1.409				1	26	35		
05107/H14	36.5	M	V(Si)	10	42	30	12	-1.65				1	51	33		
05107/H4	4.5	M	V(Si)	35	46	27	19	0.395				9	74	16	1	0
05107/H4	17	M	V(Sa)	35								7	59	32		
05107/H4	27	M	V(Si)	15	36	25	11	-0.9				3	50	46	1	0
05107/H7	7.55	U	V(Si)	47	47	25	22	1.005				10	84	6	0	0
17547/BH15	5	M	ALL	40	49	25	24	0.629	1.84	1.31	2.761	46	46	8	0	0
17547/BH15	11	M	V(MSi)	18	50	30	20	-0.61	2.21	1.87	2.815	4	16	10	70	0
17547/BH17	11	M	V(M)	44	59	42	17	0.135	1.8	1.25	2.8	10	57	29	4	0
17547/BH17	17	M	V(M)	34	53	31	22	0.145	1.94	1.45	2.86	6	67	27	0	0
17547/BH18	1	M	FILL	17	37	29	8	-1.55	2.1	1.8	2.642	8	35	25	32	0
17547/BH20	3	M	MD	33	28	17	11	1.418	1.93	1.45	2.764	15	43	41	1	0
17547/BH20	7	M	ALL	18	24	12	12	0.475	2.16	1.83	2.715	20	18	38	24	0
17547/BH20	25	M	DFD	56		NP			1.7	1.09	2.817	7	49	39	5	0
17547/BH21	3	M	MD	36	33	16	17	1.147	1.84	1.36	2.626	23	57	20	0	0
17547/BH21	5	M	ALL	16		NP			2.2	1.89	2.74	23	60	17	0	0
17547/BH21	9	M	V(MSi)	71	54	27	27	1.622	1.59	0.93	2.751	59	24	17	0	0
28536/TS200/DH/042	2.5	M	FILL	45	88	29	59	0.271	1.75	1.2						
28536/TS200/DH/042	4.5	M	ALL	20												
28536/TS200/DH/042	5.28	M	ALL									5	14	79	2	0
28536/TS200/DH/042	8.5	M	V(MSi)	13					2.19	1.93						
28536/TS200/DH/042	13.28	M	V(MSi)									3	36	47	14	0
28536/TS200/DH/042	16.5	M	V(MSi)	14												
28536/TS200/DH/042	17.28	M	V(MSi)									2	28	59	11	0
28536/TS200/DH/042	22.5	M	V(MSi)	18					2.08	1.76						
35413/DD200/DH/071	6.8	M	ALL											48		
35413/DD200/DH/071	20.2	M	V(MSi)									16	28	34	22	0
35413/DD200/DH/071	20.3	M	V(MSi)	22												
35413/DD200/DH/072	2	M	ALL						2.06	1.7						
35413/DD200/DH/072	2.2	M	ALL									24	25	50	1	0
35413/DD200/DH/072	2.3	M	ALL	23												
35413/DD200/DH/072	6	M	V(MSi)						2.17	1.94						
35413/DD200/DH/072	6.2	M	V(MSi)									1	71	26	2	0
35413/DD200/DH/072	6.3	M	V(MSi)	15												
35413/DD200/DH/072	15	M	V(MSi)						1.88	1.42						
35413/DD200/DH/072	15.2	M	V(MSi)									3	65	20	12	0
35413/DD200/DH/072	15.3	M	V(MSi)	27												

Table B4 Summary of Available Triaxial Testing Data

Hole	Depth	Sample Type	Geology	Test Type	Initial Moisture Content (%)	Bulk Density (Mg/m3)	Dry Density (Mg/m3)	Axial Strain (%)	Corrected Deviator Stress (kN/m2)	Pore Water Pressure at Start (kN/m2)	Pore Water Pressure at Failure (kN/m2)
05107/H14	2	P	FILL-z	UU				22.6	15.54		
05107/H14	5.5	U	V(Si)-z	CU				7.48	146.64	52	80
05107/H14	15.5	M	V(Si)-z	UU				6.16	67.71		
17547/BH15	5	M	ALL-c	CUM	40.1	1.835	1.31	3.87	221.3	100	245
17547/BH15	5	M	ALL-c	CUM	40.1	1.835	1.31	3.91	122.6	100	174
17547/BH15	5	M	ALL-c	CUM	40.1	1.835	1.31	5.04	64.3	100	142
17547/BH15	11	M	V(MSi)-z	CUM	17.8	2.207	1.873	3.13	390.6	100	277
17547/BH15	11	M	V(MSi)-z	CUM	17.8	2.207	1.873	3.54	211.2	100	190
17547/BH15	11	M	V(MSi)-z	CUM	17.8	2.207	1.873	4.48	128.4	100	147
17547/BH17	11	M	V(M)-z	CUM	44.3	1.802	1.249	4.22	334.5	100	286
17547/BH17	11	M	V(M)-z	CUM	44.3	1.802	1.249	4.97	222	100	202
17547/BH17	11	M	V(M)-z	CUM	44.3	1.802	1.249	5.49	110.3	100	158
17547/BH17	17	M	V(M)-z	CUM	34.2	1.939	1.446	3.65	66	100	145
17547/BH17	17	M	V(M)-z	CUM	34.2	1.939	1.446	4.76	150.4	100	193
17547/BH17	17	M	V(M)-z	CUM	34.2	1.939	1.446	9.69	281.1	100	292
17547/BH18	1	M	FILL-z	CUM	15.7	2.118	1.831	1.18	166.2	200	207
17547/BH18	1	M	FILL-z	CUM	15.7	2.118	1.831	1.63	285.1	200	210
17547/BH18	1	M	FILL-z	CUM	15.7	2.118	1.831	1.64	87.3	200	207
17547/BH20	3	M	MD-c	CUM	32.6	1.927	1.453	4.09	61.7	100	128
17547/BH20	3	M	MD-c	CUM	32.6	1.927	1.453	5.59	175.9	100	161
17547/BH20	3	M	MD-c	CUM	32.6	1.927	1.453	5.86	114	100	145
17547/BH20	7	M	ALL-s	CUM	17.7	2.157	1.833	2.52	359.2	100	156
17547/BH20	7	M	ALL-s	CUM	17.7	2.157	1.833	3.23	207.1	100	154
17547/BH20	7	M	ALL-s	CUM	17.7	2.157	1.833	4.36	154.3	100	154
17547/BH20	25	M	DFD-z	CUM	56.1	1.703	1.09	0.87	174	100	221
17547/BH20	25	M	DFD-z	CUM	56.1	1.703	1.09	1.4	135.6	100	178
17547/BH20	25	M	DFD-z	CUM	56.1	1.703	1.09	1.58	247.9	100	271
17547/BH21	3	M	MD-c	CUM	35.5	1.84	1.358	4.29	117.8	100	187
17547/BH21	3	M	MD-c	CUM	35.5	1.84	1.358	5.28	74.7	100	143
17547/BH21	3	M	MD-c	CUM	35.5	1.84	1.358	7.9	44.9	100	124
17547/BH21	5	M	ALL-s	CUM	16.3	2.2	1.891	2.47	1000.7	100	58
17547/BH21	5	M	ALL-s	CUM	16.3	2.2	1.891	3.09	310.9	100	87
17547/BH21	5	M	ALL-s	CUM	16.3	2.2	1.891	3.14	639.4	100	40
17547/BH21	9	M	V(MSi)-z	CUM	70.8	1.593	0.933	4.53	207.9	100	236
17547/BH21	9	M	V(MSi)-z	CUM	70.8	1.593	0.933	5.36	137.8	100	175
17547/BH21	9	M	V(MSi)-z	CUM	70.8	1.593	0.933	5.74	77.8	100	149
28536/TS200/DH/042	3.28	M	FILL-c	UU	45	1.75	1.2	3	46		
28536/TS200/DH/042	9.28	M	V(MSi)-z	UU	13	2.19	1.93	3	477		
28536/TS200/DH/042	23.28	M	V(MSi)-z	UU	18	2.08	1.76	3	213		
35413/DD200/DH/071	20.4	M	V(MSi)-z	CU	30	1.869	1.437	7.37	254.6	200	218
35413/DD200/DH/071	20.6	M	V(MSi)-z	CU	25.7	1.893	1.506	5.56	336.7	200	280
35413/DD200/DH/071	20.8	M	V(MSi)-z	CU	34.1	1.814	1.353	4.49	411.9	200	363
35413/DD200/DH/072	2.4	M	ALL-c/z	CU	20.5	2.068	1.716	14.52	85.1	200	186
35413/DD200/DH/072	2.6	M	ALL-c/z	CU	22.2	2.038	1.668	13.52	81.1	200	192
35413/DD200/DH/072	2.8	M	ALL-c/z	CU	21.2	2.054	1.695	15.35	152	200	194
35413/DD200/DH/072	6.4	M	V(MSi)-z	CU	11.9	2.217	1.982	8.52	252	200	194
35413/DD200/DH/072	6.6	M	V(MSi)-z	CU	13.1	2.207	1.95	4.56	246.2	200	215
35413/DD200/DH/072	6.8	M	V(MSi)-z	CU	11.1	2.242	2.018	6.01	784.8	200	187
35413/DD200/DH/072	15.4	M	V(MSi)-z	CU	26.8	1.934	1.525	6.15	122.2	200	225
35413/DD200/DH/072	15.6	M	V(MSi)-z	CU	22.2	1.928	1.578	11.96	248.4	200	225
35413/DD200/DH/072	15.8	M	V(MSi)-z	CU	24.7	1.941	1.551	7.32	791.6	200	298

Table B5 Summary of Available Consolidation Testing Data

Hole	Depth	Geology	Initial Moisture Content	Final Moisture Content	Initial Bulk Density	Initial Dry Density	Test Number	Stress Applied	Initial Void Ratio	Final Void Ratio	Coefficent of Volume Compressibility	Coefficient of Consolidation
05107/H14	2	FILL-z	44.94	32.6	1.676	1.156	1	50.893	1.284	1.12	1.46	3.102348
05107/H14	2	FILL-z	44.94	32.6	1.676	1.156	2	100.4	1.12	1.031	0.84	1.353924
05107/H14	2	FILL-z	44.94	32.6	1.676	1.156	3	199.41	1.031	0.916	0.572	1.35708
05107/H14	2	FILL-z	44.94	32.6	1.676	1.156	4	397.42	0.916	0.801	0.203	1.407576
05107/H14	2	FILL-z	44.94	32.6	1.676	1.156	5	793.46	0.801	0.677	0.175	1.38864
05107/H14	2	FILL-z	44.94	32.6	1.676	1.156	6	397.42	0.677	0.687		
05107/H14	2	FILL-z	44.94	32.6	1.676	1.156	7	199.41	0.687	0.705		
05107/H14	2	FILL-z	44.94	32.6	1.676	1.156	8	50.893	0.705	0.743		
05107/H14	2	FILL-z	44.94	32.6	1.676	1.156	9	1.388	0.743	0.857		
05107/H14	5.5	V(Si)-z	42.05	40.63	1.623	1.143	1	50.984	1.383	1.252	1.11	74.166
05107/H14	5.5	V(Si)-z	42.05	40.63	1.623	1.143	2	100.68	1.252	1.184	0.601	63.12
05107/H14	5.5	V(Si)-z	42.05	40.63	1.623	1.143	3	199.92	1.184	1.1104	0.372	71.3256
05107/H14	5.5	V(Si)-z	42.05	40.63	1.623	1.143	4	399.17	1.1104	1	0.248	53.652
05107/H14	5.5	V(Si)-z	42.05	40.63	1.623	1.143	5	797.1	1	0.871	0.162	54.5988
05107/H14	5.5	V(Si)-z	42.05	40.63	1.623	1.143	6	399.17	0.871	0.884		
05107/H14	5.5	V(Si)-z	42.05	40.63	1.623	1.143	7	199.92	0.884	0.906		
05107/H14	5.5	V(Si)-z	42.05	40.63	1.623	1.143	8	50.984	0.906	0.962		
05107/H14	5.5	V(Si)-z	42.05	40.63	1.623	1.143	9	1.246	0.962	1.091		
05107/H14	15.5	V(Si)-z	41	41.44	1.78	1.262	1	51.184	1.199	1.173	0.241	198.5124
05107/H14	15.5	V(Si)-z	41	41.44	1.78	1.262	2	100.97	1.173	1.154	0.174	93.102
05107/H14	15.5	V(Si)-z	41	41.44	1.78	1.262	3	200.55	1.154	1.127	0.124	83.3184
05107/H14	15.5	V(Si)-z	41	41.44	1.78	1.262	4	399.69	1.127	1.085	0.0988	88.368
05107/H14	15.5	V(Si)-z	41	41.44	1.78	1.262	5	798	1.085	1.004	0.0985	71.6412
05107/H14	15.5	V(Si)-z	41	41.44	1.78	1.262	6	399.69	1.004	1.018		
05107/H14	15.5	V(Si)-z	41	41.44	1.78	1.262	7	200.55	1.018	1.04		
05107/H14	15.5	V(Si)-z	41	41.44	1.78	1.262	8	51.184	1.04	1.08		
05107/H14	15.5	V(Si)-z	41	41.44	1.78	1.262	9	1.396	1.08	1.135		
05107/H4	4.5	V(Si)-z	27.07	26	1.958	1.541	1	50.893	0.846	0.815	0.339	104.148
05107/H4	4.5	V(Si)-z	27.07	26	1.958	1.541	2	100.4	0.815	0.793	0.246	83.9496
05107/H4	4.5	V(Si)-z	27.07	26	1.958	1.541	3	199.41	0.793	0.76	0.185	77.0064
05107/H4	4.5	V(Si)-z	27.07	26	1.958	1.541	4	397.42	0.76	0.717	0.124	85.5276
05107/H4	4.5	V(Si)-z	27.07	26	1.958	1.541	5	793.46	0.717	0.657	0.0885	69.432
05107/H4	4.5	V(Si)-z	27.07	26	1.958	1.541	6	397.42	0.657	0.666		
05107/H4	4.5	V(Si)-z	27.07	26	1.958	1.541	7	199.41	0.666	0.678		
05107/H4	4.5	V(Si)-z	27.07	26	1.958	1.541	8	50.893	0.678	0.707		
05107/H4	4.5	V(Si)-z	27.07	26	1.958	1.541	9	1.388	0.707	0.759		
05107/H4	17	V(Sa)-s	21.74	27.98	1.852	1.405	1	50.893	0.877	0.766	1.19	99.7296
05107/H4	17	V(Sa)-s	21.74	27.98	1.852	1.405	2	100.4	0.766	0.735	0.352	83.634
05107/H4	17	V(Sa)-s	21.74	27.98	1.852	1.405	3	199.41	0.735	0.696	0.229	91.2084
05107/H4	17	V(Sa)-s	21.74	27.98	1.852	1.405	4	397.42	0.696	0.649	0.142	106.6728
05107/H4	17	V(Sa)-s	21.74	27.98	1.852	1.405	5	793.46	0.649	0.586	0.0963	103.5168
05107/H4	17	V(Sa)-s	21.74	27.98	1.852	1.405	6	397.42	0.586	0.594		
05107/H4	17	V(Sa)-s	21.74	27.98	1.852	1.405	7	199.41	0.594	0.605		
05107/H4	17	V(Sa)-s	21.74	27.98	1.852	1.405	8	50.893	0.605	0.633		
05107/H4	17	V(Sa)-s	21.74	27.98	1.852	1.405	9	1.388	0.633	0.727		
05107/H7	7.55	V(Si)-z	47.63	44.86	1.653	1.119	1	51.117	1.432	1.382	0.407	221.2
05107/H7	7.55	V(Si)-z	47.63	44.86	1.653	1.119	2	100.94	1.382	1.346	0.309	284.4
05107/H7	7.55	V(Si)-z	47.63	44.86	1.653	1.119	3	200.44	1.346	1.288	0.246	282.504
05107/H7	7.55	V(Si)-z	47.63	44.86	1.653	1.119	4	400.21	1.288	1.183	0.23	230.68
05107/H7	7.55	V(Si)-z	47.63	44.86	1.653	1.119	5	799.19	1.183	1.016	0.191	125.136
05107/H7	7.55	V(Si)-z	47.63	44.86	1.653	1.119	6	400.21	1.016	1.031		
05107/H7	7.55	V(Si)-z	47.63	44.86	1.653	1.119	7	200.44	1.031	1.053		
05107/H7	7.55	V(Si)-z	47.63	44.86	1.653	1.119	8	51.117	1.053	1.107		
05107/H7	7.55	V(Si)-z	47.63	44.86	1.653	1.119	9	1.249	1.107	1.224		
17547/BH15	5	ALL-c	29	25.7	1.793	1.39	1	50	0.9867	0.9232	0.64	1.42
17547/BH15	5	ALL-c	29	25.7	1.793	1.39	2	100	0.9232	0.8948	0.3	1.2
17547/BH15	5	ALL-c	29	25.7	1.793	1.39	3	200	0.8948	0.8477	0.25	1.3
17547/BH15	5	ALL-c	29	25.7	1.793	1.39	4	400	0.8477	0.7872	0.16	1.52
17547/BH15	5	ALL-c	29	25.7	1.793	1.39	5	800	0.7872	0.7084	0.11	1.88
17547/BH17	17	V(M)-z	32.8	26.2	1.849	1.392	1	50	1.0541	0.9761	0.76	103.76
17547/BH17	17	V(M)-z	32.8	26.2	1.849	1.392	2	100	0.9761	0.9448	0.32	294.63
17547/BH17	17	V(M)-z	32.8	26.2	1.849	1.392	3	200	0.9448	0.8995	0.23	377.63
17547/BH17	17	V(M)-z	32.8	26.2	1.849	1.392	4	400	0.8995	0.8373	0.16	76.46
17547/BH17	17	V(M)-z	32.8	26.2	1.849	1.392	5	800	0.8373	0.7491	0.12	60.37
17547/BH20	3	MD-c	24.6	22	1.965	1.577	1	50	0.7532	0.6998	0.61	34.11
17547/BH20	3	MD-c	24.6	22	1.965	1.577	2	100	0.6998	0.6824	0.2	66.78
17547/BH20	3	MD-c	24.6	22	1.965	1.577	3	200	0.6824	0.6626	0.12	69.58
17547/BH20	3	MD-c	24.6	22	1.965	1.577	4	400	0.6626	0.6372	0.076	86.52
17547/BH20	3	MD-c	24.6	22	1.965	1.577	5	800	0.6372	0.6079	0.045	100.42
17547/BH21	3	MD-c	24.9	20.7	1.642	1.315	1	50	0.9965	0.8653	1.3	3.66
17547/BH21	3	MD-c	24.9	20.7	1.642	1.315	2	100	0.8653	0.807	0.63	2.17
17547/BH21	3	MD-c	24.9	20.7	1.642	1.315	3	200	0.807	0.7187	0.49	1.9
17547/BH21	3	MD-c	24.9	20.7	1.642	1.315	4	400	0.7187	0.6341	0.25	3.67

Table B5 Summary of Available Consolidation Testing Data

Hole	Depth	Geology	Initial Moisture Content	Final Moisture Content	Initial Bulk Density	Initial Dry Density	Test Number	Stress Applied	Initial Void Ratio	Final Void Ratio	Coefficent of Volume Compressibility	Coefficient of Consolidation
05107/H14	2	FILL-z	44.94	32.6	1.676	1.156	1	50.893	1.284	1.12	1.46	3.102348
17547/BH21	3	MD-c	24.9	20.7	1.642	1.315	5	800	0.6341	0.5427	0.14	3.56
17547/BH21	9	V(MSi)-z	46.8	39.1	1.395	0.95	1	50	1.8942	1.6396	1.8	1.81
17547/BH21	9	V(MSi)-z	46.8	39.1	1.395	0.95	2	100	1.6396	1.5406	0.75	1.58
17547/BH21	9	V(MSi)-z	46.8	39.1	1.395	0.95	3	200	1.5406	1.4056	0.53	2.26
17547/BH21	9	V(MSi)-z	46.8	39.1	1.395	0.95	4	400	1.4056	1.2548	0.31	3.56
17547/BH21	9	V(MSi)-z	46.8	39.1	1.395	0.95	5	800	1.2548	1.0757	0.2	2.58

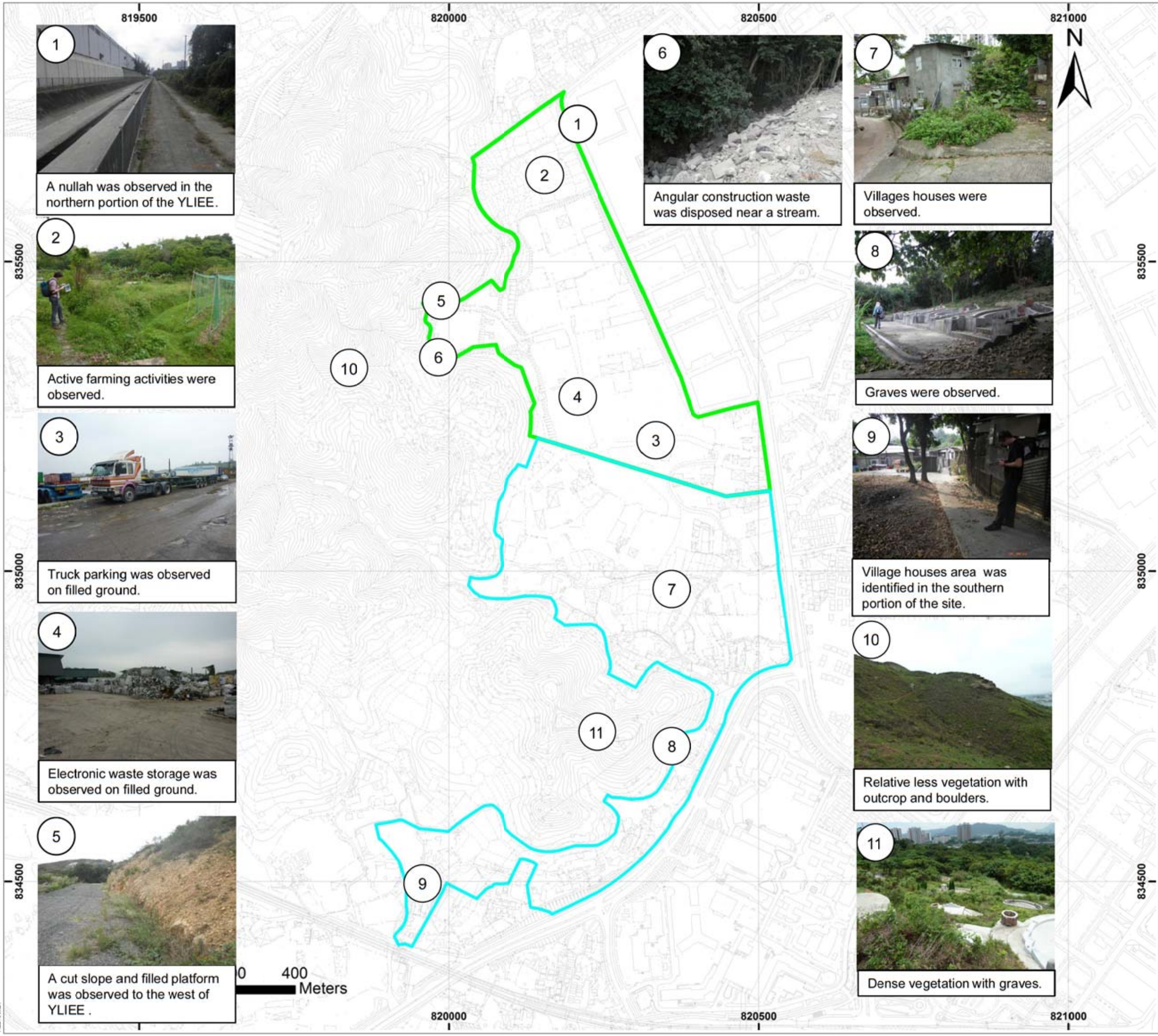
Table B6 Summary of Groundwater Monitoring Data for Wang Chau

Hole	Site located or relevant	Instrument type	Ground Level (mPD)	Duration of Monitoring	Piezometer Tip Level (mPD)	Geology at tip	Minimum GWL (mbgl)	Maximum GWL (mbgl)	Minimum GWL (mPD)	Maximum GWL (mPD)
09490/BH-10	YLIEE	SPIE	5.04	7 days	-28.46	II(M)	4.50	4.81	0.23	0.54
09490/BH-2	YLIEE	SP	4.57	7 days	-44.73	II(M)	4.25	4.31	0.26	0.32
09490/BH-3	YLIEE	SPIE	4.60	7 days	-33.90	II(M)-g/cb	4.45	4.51	0.09	0.15
09490/BH-4	YLIEE	SPIE	4.30	7 days	-38.50	IV/II(M)-b	4.20	4.46	-0.16	0.10
09490/BH-9	YLIEE	SP	4.56	7 days	-48.84	III(M)-b	4.30	7.45	-2.89	0.26
11809/LR10	PH	SPIE	17.27	7 days	2.57	IV/III(Si)	8.02	9.01	8.26	9.25
11809/LR11	PH	SPIE	8.21	7 days	-1.87	V(Si)-z	2.14	2.34	5.87	6.07
11809/LR7	PH	SP	12.64	7 days	-2.46	V/IV(Si)-z	10.65	10.81	1.83	1.99
11809/LR8	PH	SPIE	14.67	7 days	8.47	IV(Sa)-g	DRY	DRY	DRY	DRY
11809/LR9	PH	SPIE	14.13	7 days	5.06	IV(Sa)	8.30	8.62	5.51	5.83
26993/P42II_BH1	PH	SPIE	5.10	7 days	-9.40	V(MSi)-z	3.41	3.49	1.61	1.69
28528/TS200/DHPZ/004	PH	SPIE	9.03	8 days	-17.22	V(MSi)-z	2.56	2.73	6.30	6.47
55076/TS200/DHPZ/186	PH	SPIE	9.26	7 days	-23.74	III/II(MSi)	2.15	2.30	6.96	7.11

Notes: SP- Standpipe; SPIE- Standpipe Piezometer

Appendix C

Site Reconnaissance Records



Legend

- Public Housing (PH) Site
- Yuen Long Industrial Estate Extension (YLIEE) Site
- ① Photo Location

Rev	Description	By	Date
0	Draft Report	ELCF	August 2013

Consultant

ARUP

Project title

Agreement No. CB20120293
Planning and Engineering Study for the Public Housing Site and Yuen Long Industrial Estate Extension at Wang Chau

Drawing title

Geotechnical Feasibility and Site Formation Assessment
Site Reconnaissance

Drawing no. Appendix C1 Rev. 0

Drawn ELCF | Date August 2013 | Checked JH | Approved ST

Scale 1:6000 (A3) | Status For Issue

HONG KONG HOUSING AUTHORITY

USER :
FILE NAME :

Appendix D

Ground Investigation Report

D1 Ground Investigation Report

1.1 The proposed site specific ground investigation has been postponed due to difficulties gaining access for the proposed works. As a result, no project specific ground investigation data is currently available. The Ground Investigation will be updated to include all ground investigation data once the GI has been completed and the factual report is available.

Appendix E

Laboratory Testing Report

E1 Laboratory Testing Report

1.1 As the proposed site specific ground investigation has been postponed due to difficulties with land access, no site specific laboratory testing data is currently available. The Laboratory Testing Report will be updated to include all laboratory testing data once the laboratory testing has been completed and the factual report is available.

Appendix F

Geophysical Survey Interpretation

INTERPRETATION OF GRAVITY DATA TO EVALUATE DISTRIBUTION OF ROCKHEAD

Yuen Long Industrial Estate Extension and Public Housing sites, Wang Chau, Yuen Long

1 PRELIMINARY DETAILS

1.1 Instruction to Cosine Ltd

Following initial enquiry by Arup, Cosine Ltd submitted a proposal E00612/fc/101212 on 13th March 2013 to interpret existing gravity data in the Wang Chau area. The proposal was accepted on 15th March 2013 (Arup ref 226464/L065/1L/1t) and the work was scheduled to be conducted under the terms of Arup sub-consultancy agreement 228105/MIW/JR/003MIW of 1st Oct 2012. The request to proceed was issued 01st August 2013.

1.2 Objectives

The purpose of the project was to interpret existing gravity data to investigate :

- the variation in rockhead surface, with reference to available drillholes for control
- faults / structural lineations, geological features that may present geotechnical hazard
- locally contrasting lithologies eg., marble that may be apparent through locally 'positive' anomaly components due to relatively high rock density

within and around the Yuen Long Industrial Estate Extension (YLIEE) and Public Housing (PH) sites, in support of the GI programme. The project specific GI programme is currently subject to restricted access.

It should be noted that for the purposes of this report, the geophysical rockhead is defined as that horizon which would represent the top of Grade III or better rock where all layers of Grade IV rock and above have been theoretically combined and re-expressed as a single overlying saprolitic thickness, regardless of the degree of interlayering. This is not necessarily the same as 'Engineering Rockhead' which is often defined as per the conditions for Category 1 (c), as set out in Table 2.1 of the Buildings Department Code of Practice for Foundations. As these conditions relate to core recovery over a specific length of core run, it is not possible to define an Engineering Rockhead from gravity survey data.

1.3 Gravity data source

A gravity survey of Yuen Long was conducted for the Hong Kong Geological Survey (GEO) in 1988 by EGS Ltd, with 1361 data points. The survey covered the whole of Yuen Long including Wang Chau with an average data spacing of 100m and peripheral data at increased spacing. The data distribution in relation to the YLIEE and PH sites is shown by Figure 1.

Permission to use those archived gravity data for this application was obtained from GEO by Arup.

1.4 Drillhole data source

Archived drillhole log data in pdf format were supplied by Arup. Those data included an extensive compilation of drillholes in the Tin Shui Wai, Long Pin, Wang Chau and Yuen Long area.

A description of the anticipated ground conditions is provided in Section 6 of the TR3 Geotechnical Feasibility and Site Formation Assessment Report.

2 INTERPRETATION PROCEDURE

2.1 Summary

Interpretation has been completed in the following sequence :

a) Preparation of the measured gravity data for interpretation by re-reduction, applying an appropriate rock density that minimises the correlation between the reduced data and the terrain.
b) Definition of the smooth background component of the gravity data (the regional gravity anomaly) that can be attributed to the whole unweathered rock section that includes Grade III and better rock, plus deep crustal components and including the isostatic gravity effect. This regional gravity component has been defined with reference to the drillhole sections across the Tin Shui Wai – Wang Chau – Long Pin - Yuen Long area and the gravity data interpolated to the drillhole locations.
c) Subtraction of the smoothed regional gravity anomaly from the whole measured gravity data points by interpolation, to eliminate the influence of the whole unweathered rock section and crustal geology. The negative residual component (the residual anomaly) can be theoretically attributed to the mass deficiency of the soil material (Grades IV/V rock / saprolitic soil and superficial deposits) overlying the Grade III or better rock.
d) Development of a 3-D depth model of the combined superficial saprolitic section overlying the Grade III or better rock by computed iterative inversion of the residual gravity data, applying a density contrast that optimises the correlation between the model and the drillhole data.

2.2 Reference datum

The gravity data were re-expressed to the WGS84 gravity ellipsoid datum to generate the fundamental gravity anomaly.

Hong Kong Principal Datum has been adopted as the topographic reference datum throughout the interpretation process. Gravity data have been reduced to this topographic datum and the output depth model has therefore also adopted this datum as its upper constraint.

2.3 Drillhole data for interpretation control

Rockhead depths, lithologies of Grade III rock and locations have been extracted from the logs of 368 drillholes selected from the drillhole archive files (1.4) and the data used to constrain the interpretation process. The complete drillhole database far exceeded 368 drillholes. Drillholes which had been archived as clusters or individually, generally within 300m of the site periphery and which had encountered Grade III rock, were selected preferentially regardless of lithology. Outlying drill holes and drillholes where the Grade III rock or better was reasonably expected at shallow depth were also selected within the boundary of gravity data coverage to provide control for the definition of the regional gravity anomaly. Drillholes that were positioned outside the area of gravity data coverage were not included by the analyses.

2.4 Data preparation

Data had been archived with a density of 2600 $kg.m^{-3}$ (2.6 $gm.cc^{-1}$) assigned to the Bouguer Correction and to the Terrain Correction, consistent with all other archived Hong Kong gravity data at that time. The mean rockmass (Grade I to III) density in Hong Kong is approximately 2620 $kg.m^{-3}$.

Data have been plotted and reviewed for obvious discrepancies and errors. A significant inverse correlation between topography and terrain corrected (Bouguer) gravity anomaly was noted over the elevated terrain west of the Wang Chau sites, which implied that the density adopted for initial data reduction, 2600 $kg.m^{-3}$, was significantly too high for the local elevated terrain. The density assigned to the Bouguer correction and to the Terrain Correction was therefore progressively reduced to 2200 $kg.m^{-3}$ at which value the correlation was effectively eliminated. The derived density value is significantly lower than the mean density for Hong Kong hard rock which tends to imply that there is a significantly thick cover of weathered section at least over parts of the hills adjacent to the site.

All data were re-reduced and re-terrain corrected at 2200 $kg.m^{-3}$. The re-reduced data effectively express the gravity anomaly on HK Principal Datum which has been adopted as the datum for the modelling process. The density of soils between Ground Level and HKPD over the wider low lying areas is estimated to be approximately 1600-1900 $kg.m^{-3}$. The difference incurred by imposing the value of 2200 $kg.m^{-3}$ for the data reduction process through that depth interval over the flat lying areas is very small and uniform, and has been wholly accommodated by the modelling process.

2.5 Development of the background regional gravity anomaly

The reduced gravity data (total gravity anomaly) can be effectively attributed to the whole geological distribution below topographic datum. The interpretation of the data required the component due to the near surface low density section of interest (the residual gravity anomaly) to be isolated reliably from the total gravity anomaly. This has been achieved through definition of a 'regional' anomaly component that is essentially the gravity signature of a total hard rock section to HKPD plus all crustal geological components.

To derive that 'regional' component, the relative mass deficiency of section overlying Grade III rock at each borehole location has been calculated and effectively compensated at the higher mean density of hard rock.

The computed regional anomaly values were plotted at each drillhole location, contoured smoothly over the whole data area to generate the 'regional' anomaly attributable to a total rockmass section and expressed on a regular 25m grid.

2.6 Development of the residual gravity anomaly

The defined smooth regional anomaly grid was interpolated to each gravity data point and subtracted from the reduced measured gravity anomaly value to define the negative residual gravity anomaly that, by definition, is attributable to the distribution of the relatively mass deficient (low density) unconsolidated and highly weathered section over the whole area. The relationship is expressed as :

Residual component = Total reduced (measured) anomaly - Regional component

The whole process was computed on a 25m regular grid covering the whole data extent.

2.7 Data edit

At this stage the residual data were examined for discrepancies that were clearly beyond the scope of near surface geological variations and that could be attributed to the influence of surface artefacts or data error. If retained in the interpretation process, those data points would induce severe local distortion of the 3-D depth model. Seven data points were removed from the total of 1361.

2.8 Development of the rockhead surface by 3-D inverse modelling

Residual data for the whole Yuen Long area were interpolated to a regular grid with 25m node interval to support interpretation by iterative inverse 3-D modelling.

The 3-D modelling process generates a grid of thicknesses representing the combined superficial and saprolitic soil section overlying Grade III or better rock, for which the final computed theoretical gravity response matches the gridded residual gravity data closely. The computed process is iterative, the model being adjusted by automatic feedback to progressively converge the theoretical gravity response with the gridded residual gravity data.

The model adopts the negative mean density contrast of the soil section against the underlying Grade III or better rock and the upper surface of the model is HK Principal Datum. For the purposes of modelling, the greatest density contrast within the rock section occurs between Grade III or better rock and Grade IV rock and above.

The final mean density contrast adopted for the model, -800 $kg.m^{-3}$, was determined through a process of correlation between successive output models and adjacent drillholes. In particular, the emphasis was placed upon those drillholes that encountered marble although the comparison was extended to all rocktypes.

Expressed from HK Principal Datum, the thickness of the model is numerically equivalent to the depth of the geophysical rockhead surface. Where weathered rock, Grade IV/V and above, is interlayered with Grade III or better rock, the model theoretically integrates the whole discontinuous section of saprolitic material to a single overlying thickness such that the rockhead horizon is represented as a simple division between saprolitic soils above and Grade III and better rock below. In areas of complex ground this may not coincide with the Engineering Rockhead for foundation design and some discrepancies may occur as a result, beyond the normal level of errors of the process. Engineering Rockhead for foundation design can only be determined from drillholes. In those complex areas, theoretically the elevation of the geophysical rockhead would tend to be above the Engineering Rockhead and conversely, where borehole correlation is available, significant discrepancies may be read as a measure of the degree of geological complexity.

For the purposes of modelling, the rockhead level has been automatically constrained to the HKPD in those places where the residual gravity anomaly indicates rock elevations are in fact above HKPD. This may be seen in the output model in areas of hilly terrain adjacent to the site where the returned thicknesses of the superficial and saprolitic section are indicated to be 0m.

The fundamental limitations of the assumptions of the modelling process and their potential impact upon the results are discussed in Section 3.3

3 RESULTS

3.1 The output model

The output grid model in effect defines geophysical rockhead level. It has been plotted and contoured smoothly in Figures 2 and 3. There is a general correlation between the model and the known rockhead variations from drillholes and from the areas of elevated terrain (truncated at HKPD) across the whole Yuen Long area. A reasonable degree of confidence is therefore attached to the form of the model.

Possible geological faults or fracture zones and troughs of deeper weathering have been identified from the model and are shown in Figure 2. Possible faults and fracture zones are recognised in the model as : -

- linear steps or narrow steep zones in the rockhead model surface that, despite small amplitudes in some cases, persist over at least three gravity data points and therefore are consistently supported.
- consistent lateral offsets of rockhead elevations across a linear alignment.
- patterns of elevated or depressed rockhead that persist generally across large parts of the data coverage with distinct linear boundaries.

These features are generated in the model by the automatic inversion process and therefore fundamentally are expressed by the gravity data.

Some of these features are evident within or crossing the site boundary and they are identified in Figure 3 as dashed lines. These features should be regarded as locations where there is an increased probability of fault conditions within the Grade III and better rock *at rockhead level*. The positional accuracy of those implied structural lineaments is limited by the 100m sampling spacing of the data and the 25m grid node interval of the model.

Drillholes have been plotted on the model to review the distribution of lithologies of Grade III or better rock in relation to the implied geological structure. They are discriminated as marble, undifferentiated metasediments, undifferentiated intrusive igneous rocks and volcanic clastics (Tuffs, Breccias etc).

In most cases, the lithology encountered at rockhead level has been plotted. In the case of marble however, it has also been recognised preferentially where it occurs substantially but not necessarily exclusively within the drillhole section, to highlight the potential for karstic solution. In fact in many cases, the drillhole sections were noted to encounter alternating layers of marble and metasediments.

Although no definite exclusive correlation can be observed between lithology and rockhead level, there is a tendency for marble to associate with the deepest rockhead areas of the wider Yuen Long area including apparent 'troughs' of deeper weathering. The lithological correlation is discussed further in Section 3.5

3.2 Definition of rockhead

The gravity model essentially describes a distinct horizon between Grade III or better rock and the overlying saprolitic (Grade IV / V rock) and superficial soils. In practice this ideal horizon is not always observed, rather the transition is often a variable thick zone of interleaved Grade III and Grade IV/V rock. In that case the gravity model expresses a conceptual horizon which represents the summation of all soil material resting upon the summation of all Grade III or better rock. The rockhead defined by the gravity model therefore may tend to be represented at a higher elevation than the Engineering Rockhead used for foundation design.

The response of the model to karst conditions will result similarly in a relatively elevated rockhead representation where the solution conditions occur at the upper surface of the marble. But where the karst conditions lie at any depth beneath the Engineering Rockhead, the model rockhead will tend to be comparatively depressed, subject of course to all other sources of normal interpretational error including the gravity data sampling interval.

3.3 Inherent limitations of the model

The model is subject to several inherent limitations beyond the normal level of interpretational inaccuracy.

- The model rockhead may not coincide with Engineering Rockhead (for foundation design) in zones of complex ground. In fact the scatter against known Engineering Rockhead data from drilling can be used as a measure to project likely degree of geotechnical complexity.
- The model has adopted a uniform density contrast of -800 $kg.m^{-3}$ between the Grade III or better rock and the overlying saprolitic and superficial soils to optimise the overall correlation between the model and the drillhole rockhead levels. In reality it is probable that the mean density contrast decreases with depth and with increasing thickness of saprolite. The assumption is likely to have resulted in under-evaluation of the depth to Grade III rock in the deeper areas where there is a significant thickness of saprolite. From observation of the borehole logs the condition is expected to apply mostly in areas of deep metasedimentary rocks rather than areas of deep marble.
- Data points are distributed at approximately 100m spacing. That distribution ultimately controls the degree of detail that the model can support. The model was developed on a 25m regular grid to allow it to represent sharp features such as fault controlled rockhead levels as clearly as possible but inevitably structural features in the model will have incurred a degree of smoothing which limits the spatial resolution and also masks or relaxes features with small amplitude.
- The definition of the regional gravity anomaly and hence residual gravity anomaly data (sections 2.5 and 2.6), from which the model was directly developed, was achieved across the site by extrapolation from drillholes outside the boundary and dominantly to the east. The absence of drillhole data within the site or immediately to the west of the site will have restricted the local fine definition of the residual anomaly slightly and hence also the local accuracy of the model. However the site is

narrow and therefore the restriction may have had minor influence upon the indicated depths of model depths within the site but not upon the structural form. For example the subcrop trace of the known metasediments at HKPD depicted by the model (Figure 3) around the western boundary of the site appears to be reasonably coincidental within the accuracy available from the 100m spaced data. In fact improved drillhole coverage within the site would not have significant impact upon the results without being accompanied by a significant reduction of the gravity data spacing.

- As a passive geophysical method of ground investigation that is subject to the (density) contrast of geological masses rather than signal energy input, there is fundamentally no limitation upon the depth of investigation by the gravity method. However, the resolution available to the model decreases with increasing depth such that in areas of deep rockhead the overall structural form can be resolved but the detail of an uneven rockhead may not be readily distinguished.

3.4 Prediction of rockhead levels from the gravity model

The viability of the gravity grid depth model has been tested by comparison with the point depth definition afforded by drillholes around the periphery of the site. There is at this site a significant degree of scatter between the two data sets, some of which can be attributed to the limitations of the model identified in the previous section. The roughness of true rockhead in relation to data spacing must also be a contributory factor.

A correlation coefficient of approximately 0.85 is returned for the whole Yuen Long model compared with the drillhole depths, whereas the line of regression between those data sets implies an overall equality of depths. The discrepancy between the model and the marble rockhead, which returned the optimum comparison amongst the lithological types, has been expressed as a fraction of the indicated model depth. The distribution of that ratio may be applied to the model to determine the reliability of the indicated depths.

The analysis indicated that 68 percent of drillhole depths are within +/- 0.4 of the indicated model depth and 35 percent are within +/-0.2 of the indicated model depth. Applied to the model over the YLIEE and PH sites, the implication is that the maximum statistically predictable error on the deepest part of the model (~ 40 metres) will be +/- 16 metres. At lesser depths the predictable error will be proportionately less.

The degree of scatter between the model and the rockhead levels from drillholes is large in comparison with many other sites in Hong Kong and, beyond the inherent normal errors of the gravity modelling process, it suggests a roughness at the top of Grade III rock surface (rockhead) in relation to the 100m gravity data spacing.

3.5 Recognition of lithological types from the gravity model

The gravity interpretation cannot discriminate specific lithological types and small density variations between rock types will be accommodated as variations of the to Grade III rock in the depth model.

The possibility of correlation between lithology and depth that could occur as a consequence of differential weathering has been investigated by review of the archive drillhole data. Any degree of correlation that can be reasonably demonstrated could potentially be extended to the model and used to express a probability of lithological identity.

To avoid or minimise the sampling bias that would be incurred through drillholes locally clustered in small sites, the whole area has been expressed on a 25m interval grid. Those grid cells containing drillholes that encountered Grade III or better rock have been flagged according to the presence of marble, the presence of rock types other than marble, and the averaged rockhead level. The comparisons of those equally weighted grid cell areas in terms of the frequency of occurrence of the lithology group against averaged depth are shown in Figures 4a and 4b. Figure 4a expresses the comparison between the marble group and the group of other rock types for the wider Yuen Long district covered by Figure 2. Figure 4b expresses the comparison between the marble group and the group of other rock types for the area including the YLIEE and PH Sites covered by Figure 3. The lithological groups flagged in any one area cell were not mutually exclusive.

Figure 4a suggests that, with the exception of the shallowest examples to 10-15m below HKPD, where marbles are largely not encountered, there is no systematic distinction between the depth distributions of marbles and of other rock types for depths to approximately 60m below HKPD. At rockhead depths increasing beyond 80m the plots tend to suggest that marble has been encountered more frequently than other rock types.

Figure 4b which is confined to the area around the Yuen Long Industrial Estate Extension (YLIEE) and the Public Housing (PH) site (Figure 2) shows again that with the exception of the shallowest part of the section, there is no systematic distinction between the depth distributions of marbles and of other rock types for all depths encountered by the drillholes.

In fact the frequency distributions for marble and for other rock types are largely coincident.

It is therefore concluded that the gravity model, as an expression of depth to Grade III or better rock, cannot offer an unequivocal discrimination of lithological type. On this basis, except in the close vicinity of the metasediments subcrop around the western site boundary, the probabilities of the occurrence of marble and of the presence of other rock types within the site area are effectively equal.

Whereas the distribution and precision of these gravity data are inappropriate for resolving individual solution cavities, the mass deficiency of larger zones of karst development would appear in the model results as a depression of rockhead. Investigation of karst conditions normally requires the distribution of marble rockhead level to be known as a prerequisite, and for the gravity data to be suitably close spaced and recorded with a high precision.

3.6 Overall structural form of the model

The overall structural form of the model (Figure 2) is generally consistent with the known rock outcrops / subcrops of the Wang Chau area and in the south with the known structurally delineated distribution of marble in the Yuen Long town area. The general structural form of the model is therefore considered to be reasonably reliable.

3.7 Recognition of structural faults and fracture zones.

The gravity model may provide useful information on probable or possible faults and fracture zones, subject to the resolution available from the gravity data distribution. Those structural features may be recognised where they have resulted in a linear and persistent step or trough in the rockhead surface, with an amplitude that is sufficient to be defined by the model. As a general criterion, to avoid spurious conclusions due to small data errors and ground surface influences, the rockhead step would ideally persist through at least three gravity data points, ie., in this case approximately 300m, to support a minimum level of confidence.

The model fundamentally represents a grid surface of the top of Grade III or better rock and hence below rockhead level, it cannot resolve fault structure, especially where the fault is inclined. Referral to the GI logs in general will not yield confirmation unless the drill hole is closely coincidental with the rockhead intersection of the fault structure.

Vertical or steeply inclined lateral density contrasts within the Grade III or better rock may also yield a similar result where the lithological boundary appears in the output gravity model as a rockhead step. Such contrasts can occur between the marble and the metasediments but the lateral persistence of the juxtaposition is likely to be limited in this structurally complex environment.

For this site, several small but persistent linear steps of top of Grade III rock are implied by the model and these tend to be aligned mutually sub-parallel and perpendicular, with associated lateral offsets of the shallow subcrop in some cases. These rockhead steps are interpreted as expressions of possible faulted zones and are shown as dashed lines on Figures 2 and 3 accordingly, reflecting a level of uncertainty. Some of these interpreted structures extend across or are marginal to the YLIEE and PH sites where they should be regarded as zones of increased probability of fault conditions. The accuracy of definition for these possible fault zones is subject to the survey data spacing.

4 DISCUSSION AND CONCLUSION

4.1 YLIEE site (Figure 3)

The northwestern half and western margin of the YLIEE site is reasonably expected to include metasediments, by association with the adjacent outcrop, with depths generally not significantly greater than 25m below HKPD. The model indicates a moderately steep top of Grade III or better rock, dipping away to the southeast from the subcrop of the metasediments, and levelling out at a depth of 25-30m. This rock surface profile is laterally persistent to the north-northeast, possibly attributable to a minor fault zone, and it separates this sector from the southeastern part of the site where top of rock is predicted to be greater with depths exceeding 40 metres on the eastern site boundary. This southeastern sector is subdivided by a northwesterly trending lineament, also attributed here to a minor fault zone with an implied rockhead step of approximately 5 to 10 metres down to the northeast. Marble may be present in this deeper eastern zone, at least to the east of the northeasterly trending rockhead lineament, by association with the closely adjacent drillhole results. Analysis of the drillhole rockhead distribution for the area around the site (Figure 4b) shows that the depths of the model cannot be taken as a guide to the lithology even on a basis of probability.

4.2 PH site (Figure 3)

Rock depths below HKPD in the northern half of the PH site are indicated by the model to vary between 10 metres closely adjacent to the western boundary increasing locally to 45 metres adjacent to the eastern boundary. Analysis of the drillhole rockhead distribution around the site (Figure 4a) implies that lithological correlations on the basis of depth are not supported and therefore strictly, lithological projections for this site cannot be made.

Over most of this area, the depths are projected to be less than 35 metres below HKPD.

The narrow southern extension of the PH site follows the known subcrop of the shallow metasediments at HKPD and depths in this sector are generally predicted to be less than 15 metres with the exception of the southernmost tip. A narrow rockhead trough along the southeastern boundary of this extension is ascribed to a minor northeasterly fault or fracture zone that appears to have offset the subcrop of the metasediments. Fault breccias and gravels may be encountered within this narrow zone.

4.3 General appraisal of the model

The objectives of the project outlined in Section 1.2 have been met as far as the data can reasonably support.

The model is closely consistent with the known subcrop of the locally elevated terrain and, allowing for the inherent limitations of the process, is overall consistent with the drillhole data distributed around the periphery of the sites. A reasonable level of confidence is therefore attached to the general structural form of the model and the uncertainty upon indicated depths to rock has been quantified as far as possible.

The depth interpretation process is subject to intrinsic numerical levels of error as a result of the accuracy of the reduced data and of the assigned mean density contrast of the model. In this instance, the first of these factors may introduce an uncertainty of approximately +/- 2 metres on the depths of the model, whereas the assigned mean density will yield an error on the modelled depths that is approximately proportional to the degree of density discrepancy. As such a discrepancy of +/- 10 percent on the mean density contrast may impose a further error on the modelled depths of up to +/- 4.5 metres across the sites.

The degree of scatter in the correlated rockhead data has been examined so that the total degree of uncertainty of depths to Grade III or better rock that are implied by the model across the sites can be gauged. Accordingly, the analyses indicate that depths to Grade III rock exceeding 50 metres are unlikely, and that over most of the site area the depths will be 35 metres or less.

Increased probability of fault conditions has been attached to persistent, linear and narrow zones of steep gradient described by the model at the top of Grade III rock. Those implied linear step-like features defined in the top surface of Grade III rock are arranged mutually sub-parallel and perpendicular, further supporting the probable identity as geological faults.

Section 2.4 of this report indicated that an assigned rock density of 2200 $kg.m^{-3}$ was required to minimise the correlation between the highest points of the adjacent elevated terrain and the reduced gravity anomaly. That derived density value is significantly lower than the average rock density for Hong Kong (2620 $kg.m^{-3}$) and it points to a significantly thick cover of weathered rock. Although the terrain is not unduly steep and the correlation was observed at the points of highest elevation remote from the Sites, the implied weathered condition should be borne in mind in the event that the slopes are cut near to the margins of the sites.

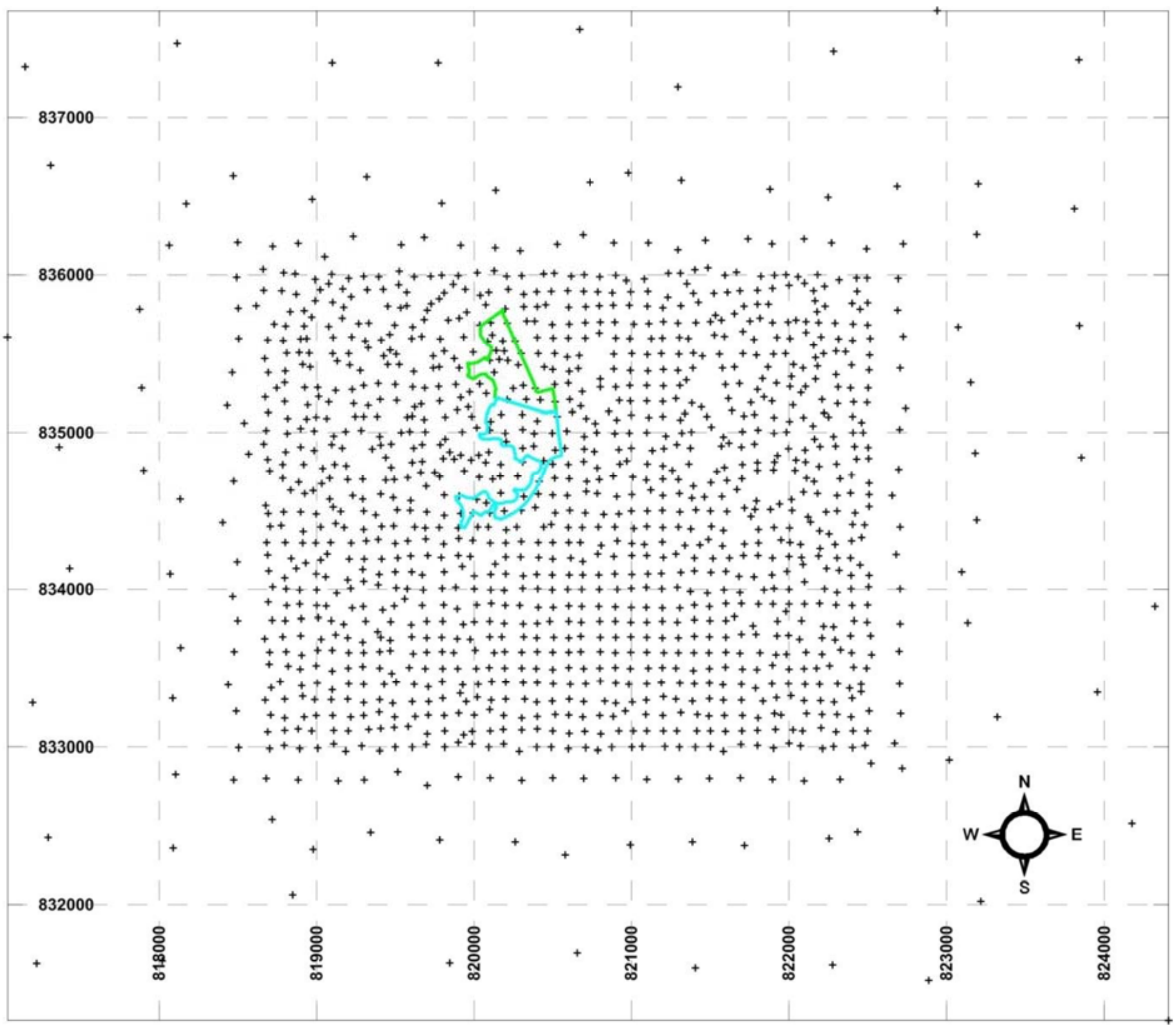


Figure 1 **Distribution of 1361 gravity data in relation to the YLIEE and PH sites**

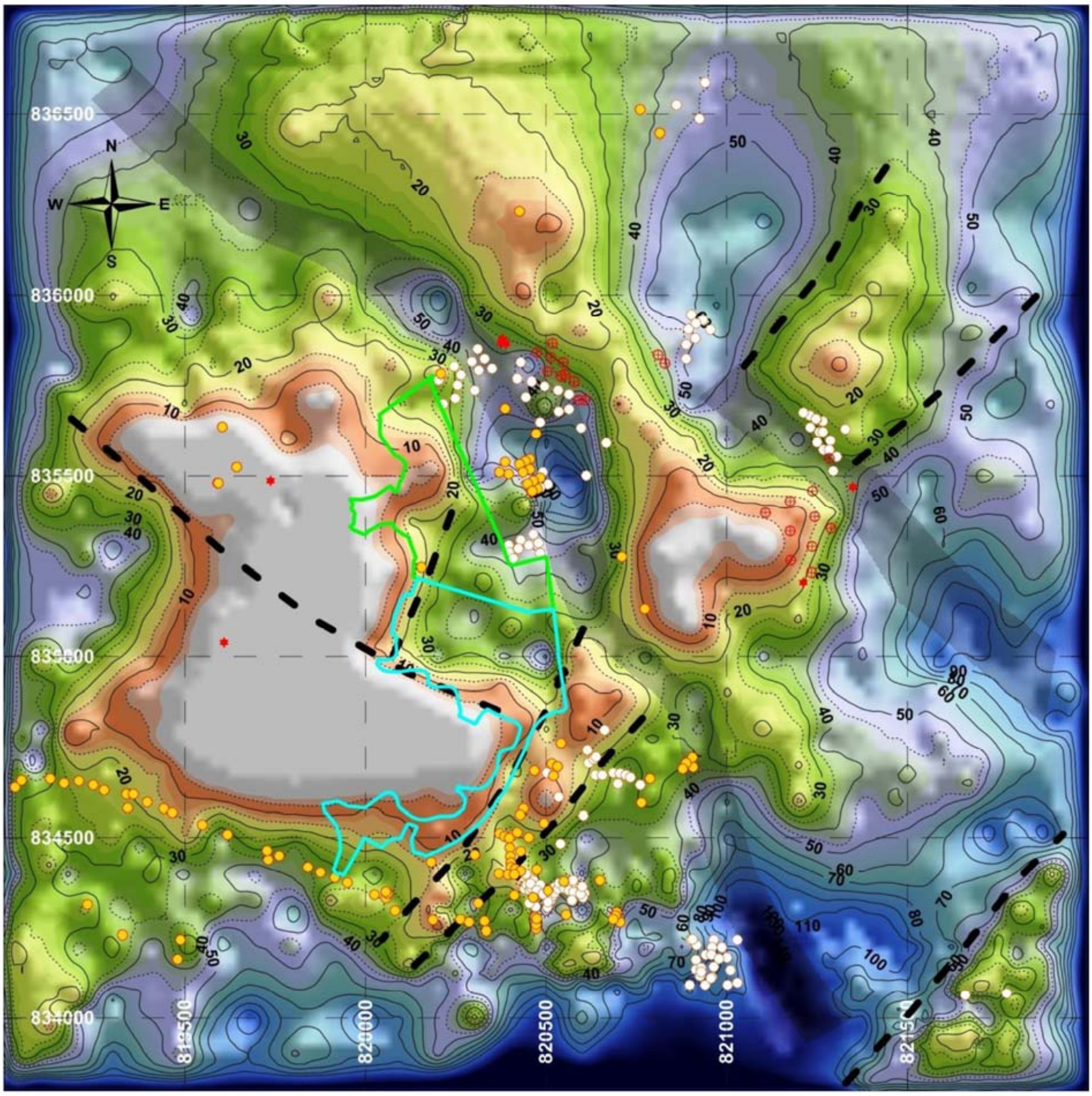


Figure 2 **Top of rockmass model for the Yuen Long area including Wang Chau by interpretation of gravity data**

Drillhole lithologies are shown as :

White – marble
Yellow – undifferentiated metasediments
Red cross circles – intrusive igneous undifferentiated
Red stars – Volcanic clastics (Tuffs, Breccias etc)

Indicated persistent linear troughs in the rock surface are shaded.

Depth contours in metres below HKPD.

YLIEE site boundary – blue PH site boundary - red

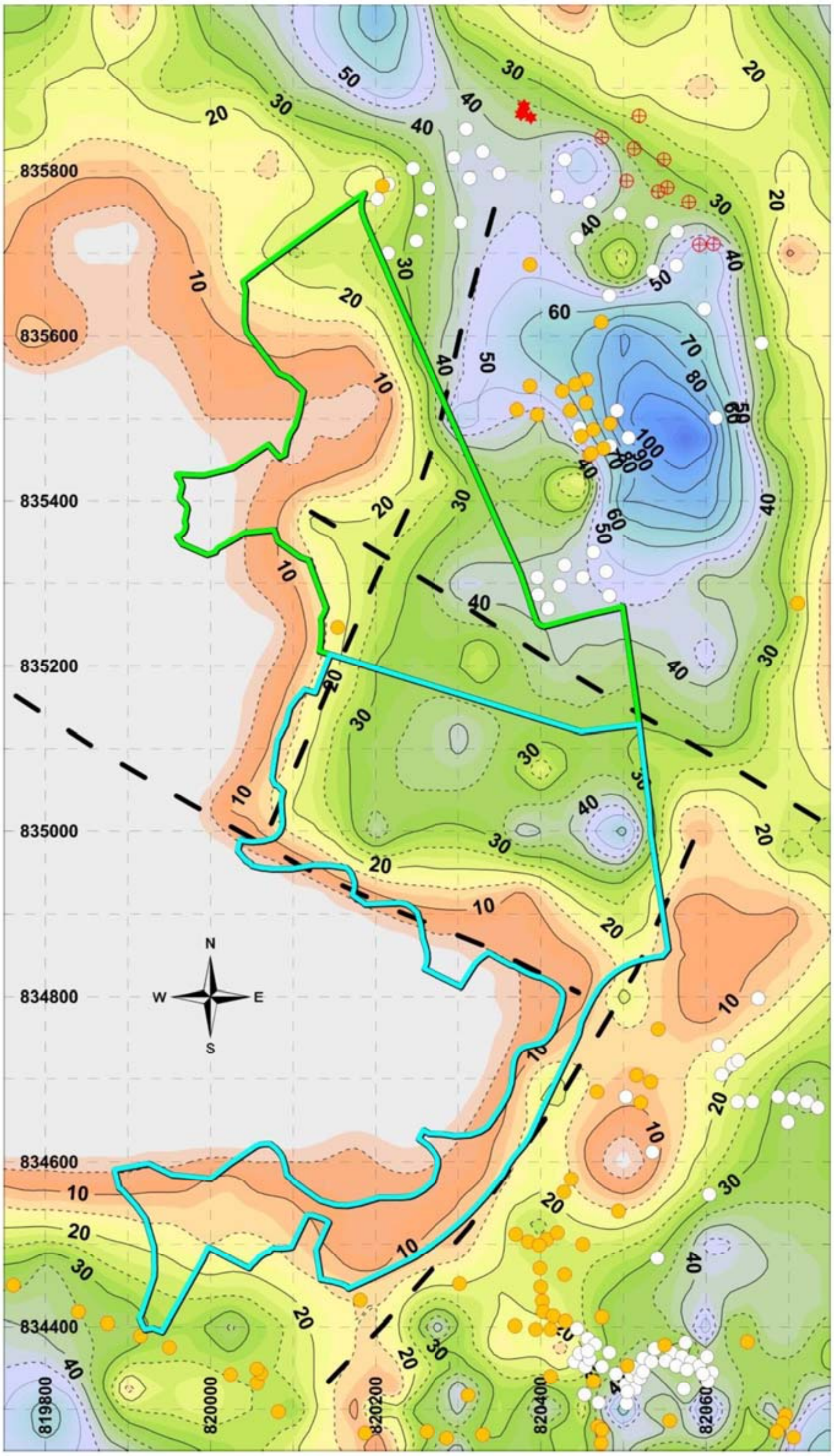


Figure 3 Detail of the top of rockmass model over the YLIEE and PH site areas

Drillhole lithologies are shown as :

White – marble ; Yellow – undifferentiated metasediments ;
Red cross circles – intrusive igneous undifferentiated ; Red stars – Volcaniclastics (Tuffs, Breccias)

Depth contours in metres below HKPD. YLIEE site boundary – blue PH site boundary - red

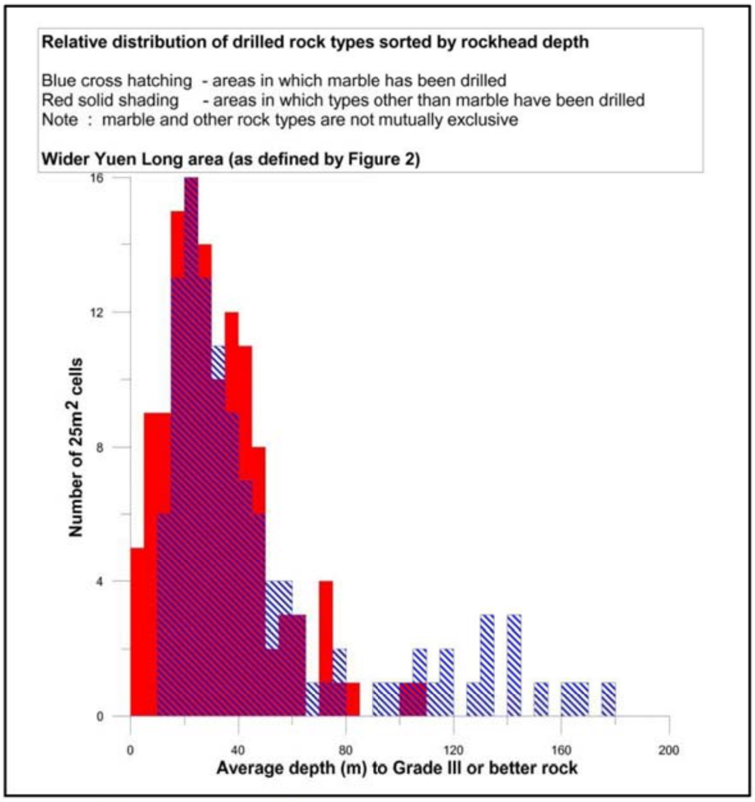


Figure 4a **Relative distributions of marble and of other rocks by rockhead depth Sample base – all drillholes shown in Figure 2, Yuen Long district**

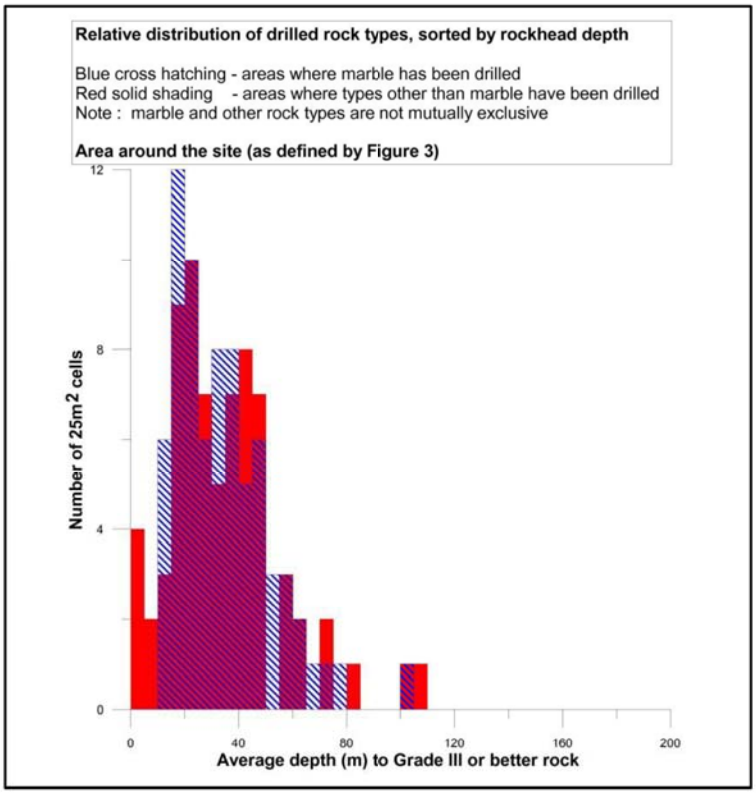


Figure 4b **Relative distributions of marble and of other rocks by rockhead depth Sample base – all drillholes shown in Figure 3, Site area**

Data source references

Gravity data

Gravity data survey of the Yuen Long district. 1988. Geotechnical Control Office (now Geotechnical Engineering Office of CEDD) Princess Margaret Road, Ho Man Tin, Kowloon

Ground Investigation logs

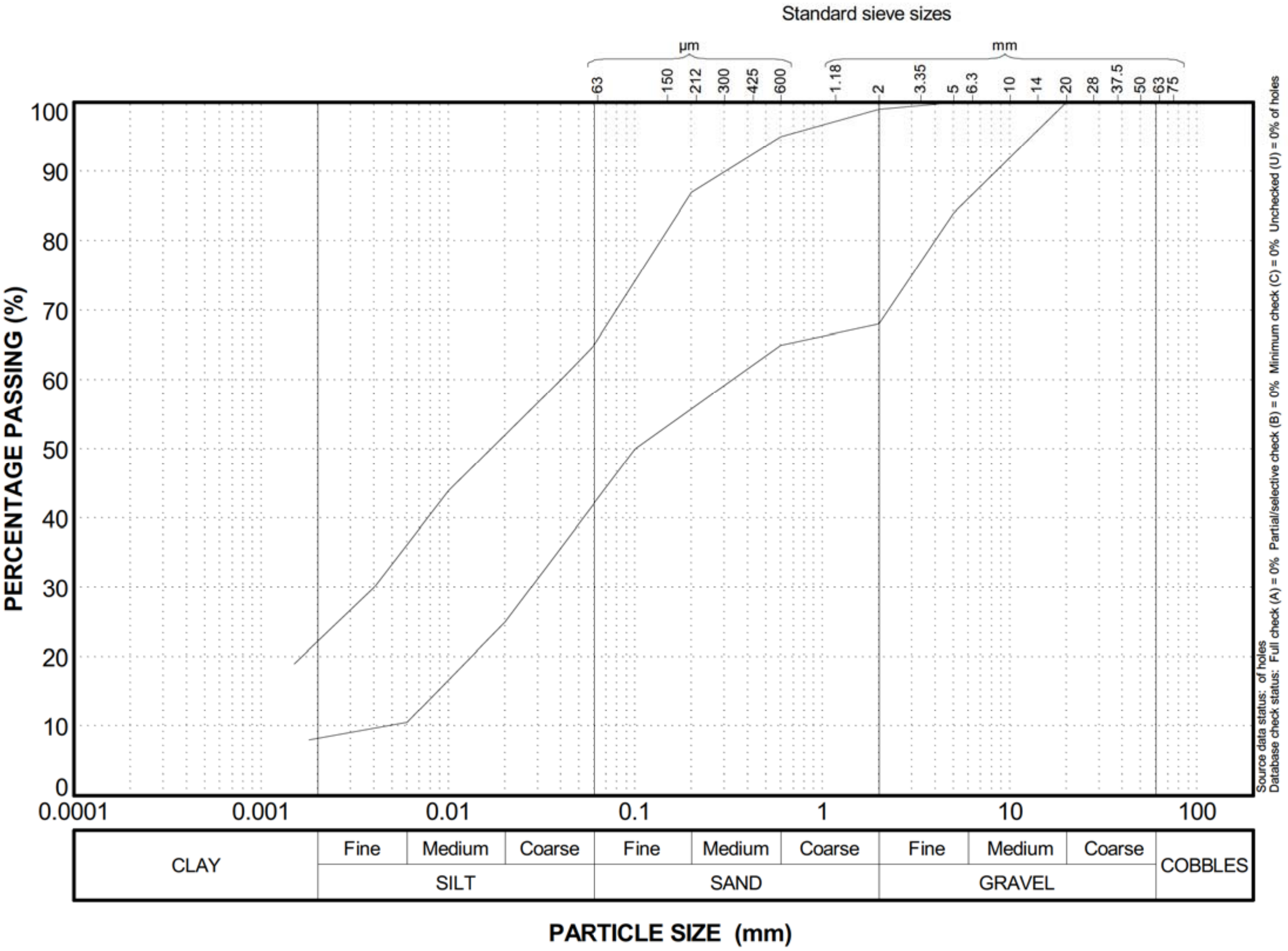
Compilation of GI logs for Tin Shui Wai, Long Pin, Wang Chau and Yuen Long area. prepared by Arup 2013 from archive data. Defined by Section 6 of the TR3 Geotechnical Feasibility and Site Formation Assessment Report.

Geological reference - Maps published by Hong Kong Geological Survey

Series HGB5A
Sheet 6-NW-A 1:5000 Tin Shui Wai Superficial Geology
Sheet 6-NW-B 1:5000 Yuen Long Superficial Geology
Series HGB5B
Sheet 6-NW-A 1:5000 Tin Shui Wai Solid Geology
Sheet 6-NW-B 1:5000 Yuen Long Solid Geology

Appendix G

Geotechnical Parameter Plots



Wang Chau P&E
Particle Size Distribution
Fill

226464

FIGURE **G1.1**

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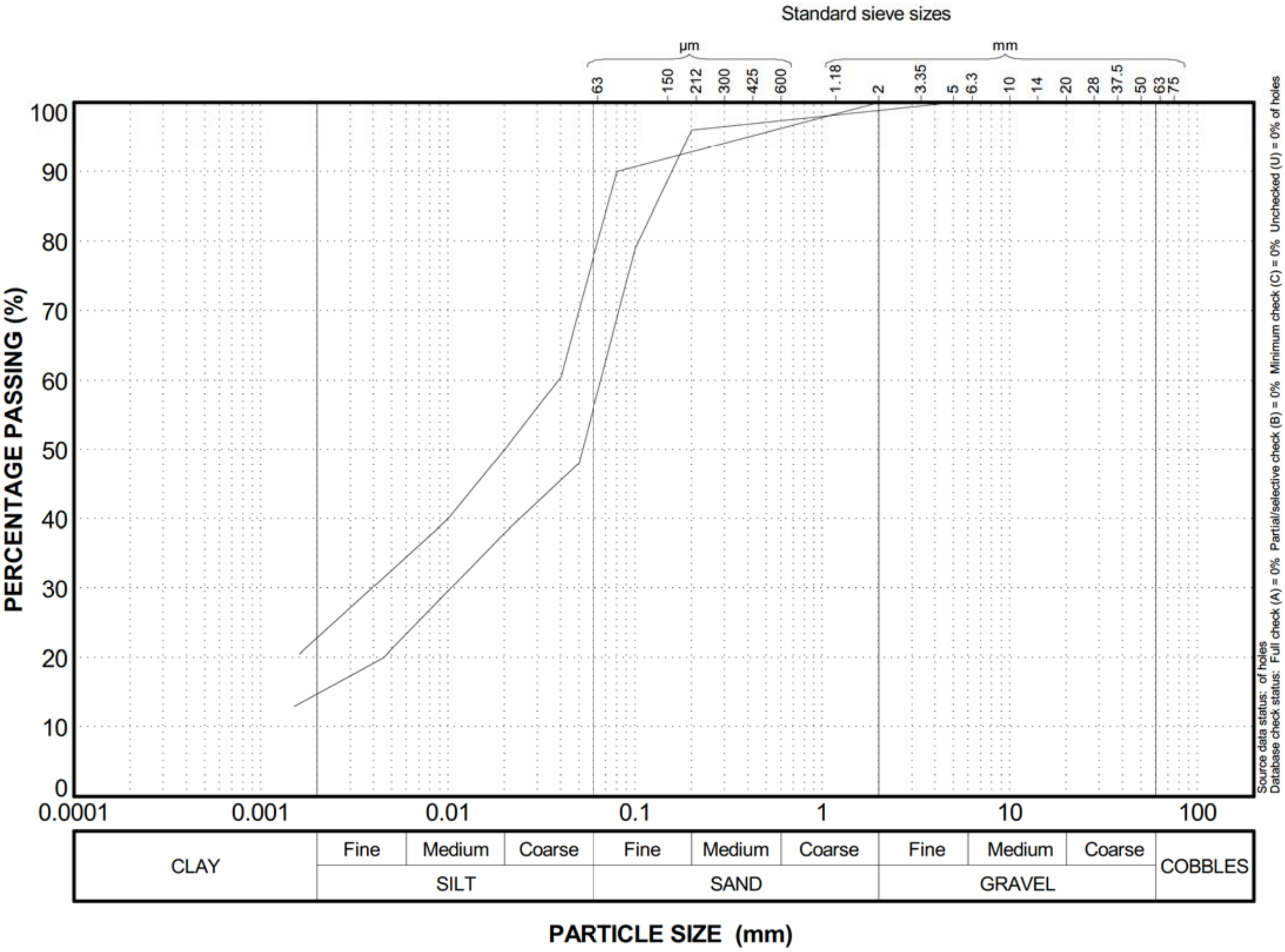

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Wang Chau P&E
Particle Size Distribution
Marine Deposits/Estuarine Deposits

226464

FIGURE G1.2

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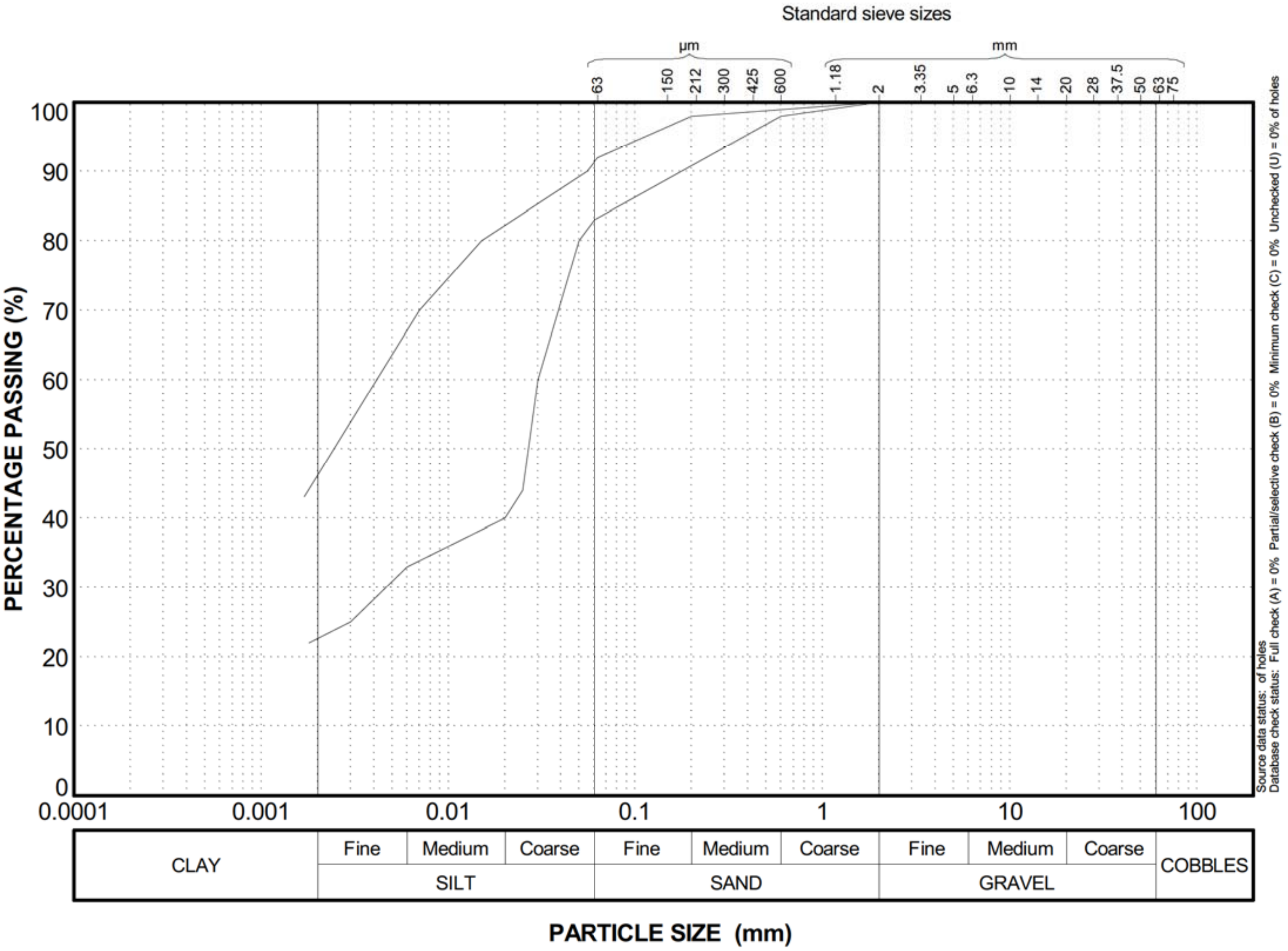

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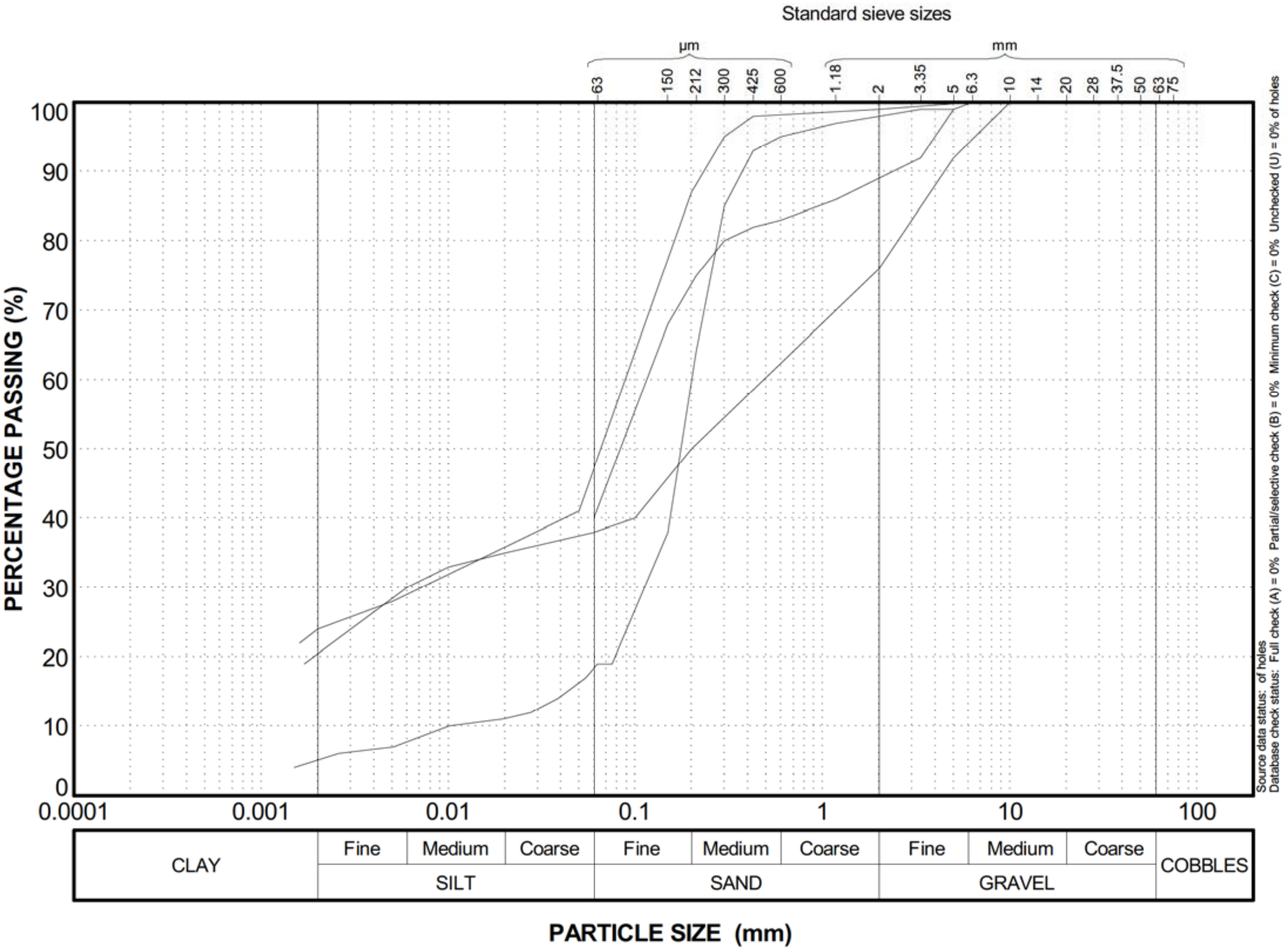
Wang Chau P&E
Particle Size Distribution
Alluvium (Clay/Silt)

226464

FIGURE G1.3



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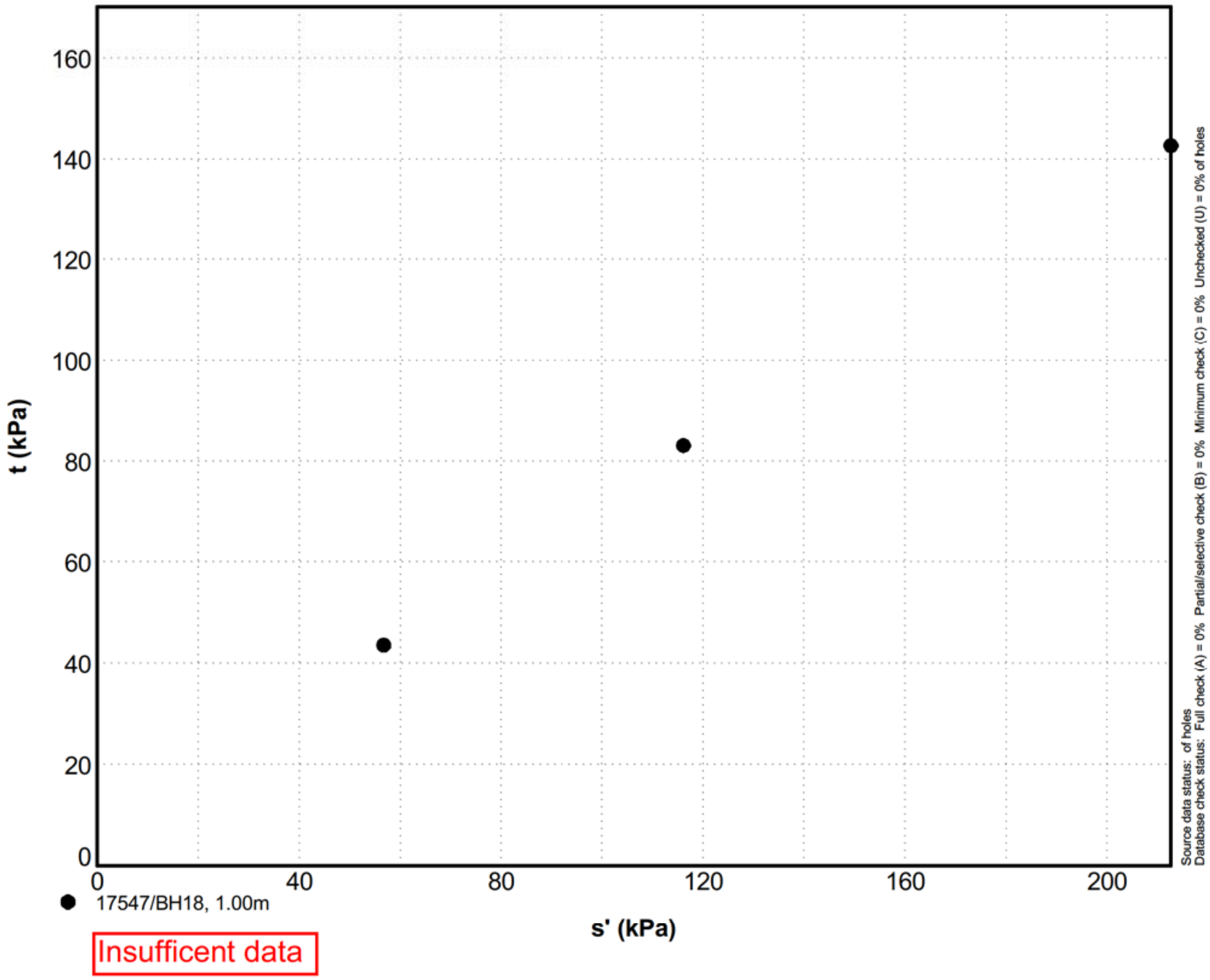
Wang Chau P&E
Particle Size Distribution
Alluvium (Sand/Gravel)

226464

FIGURE G1.4

<<DrawingFileSpec>>



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Wang Chau P&E
s'-t plot
Fill

226464

FIGURE G1.5

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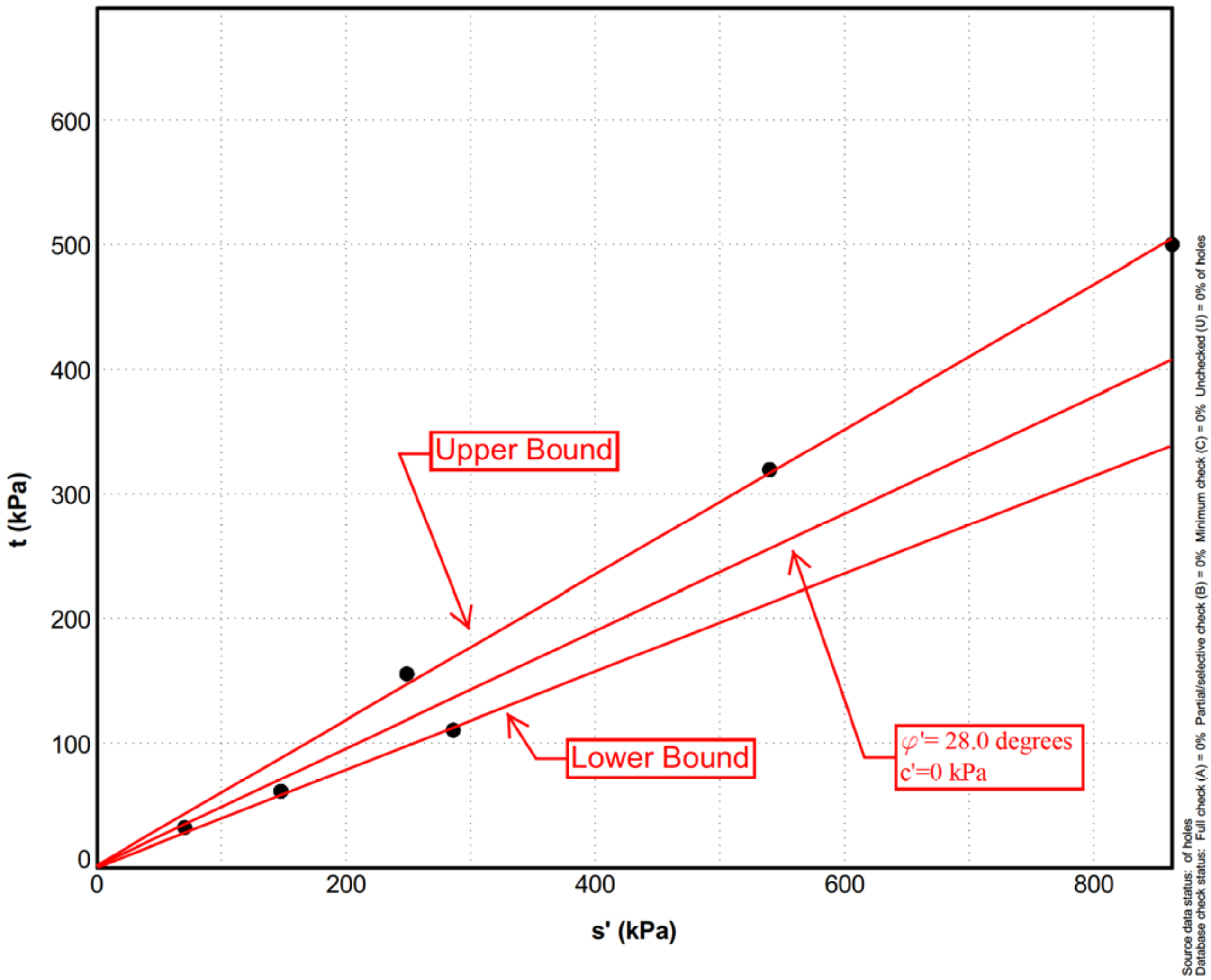
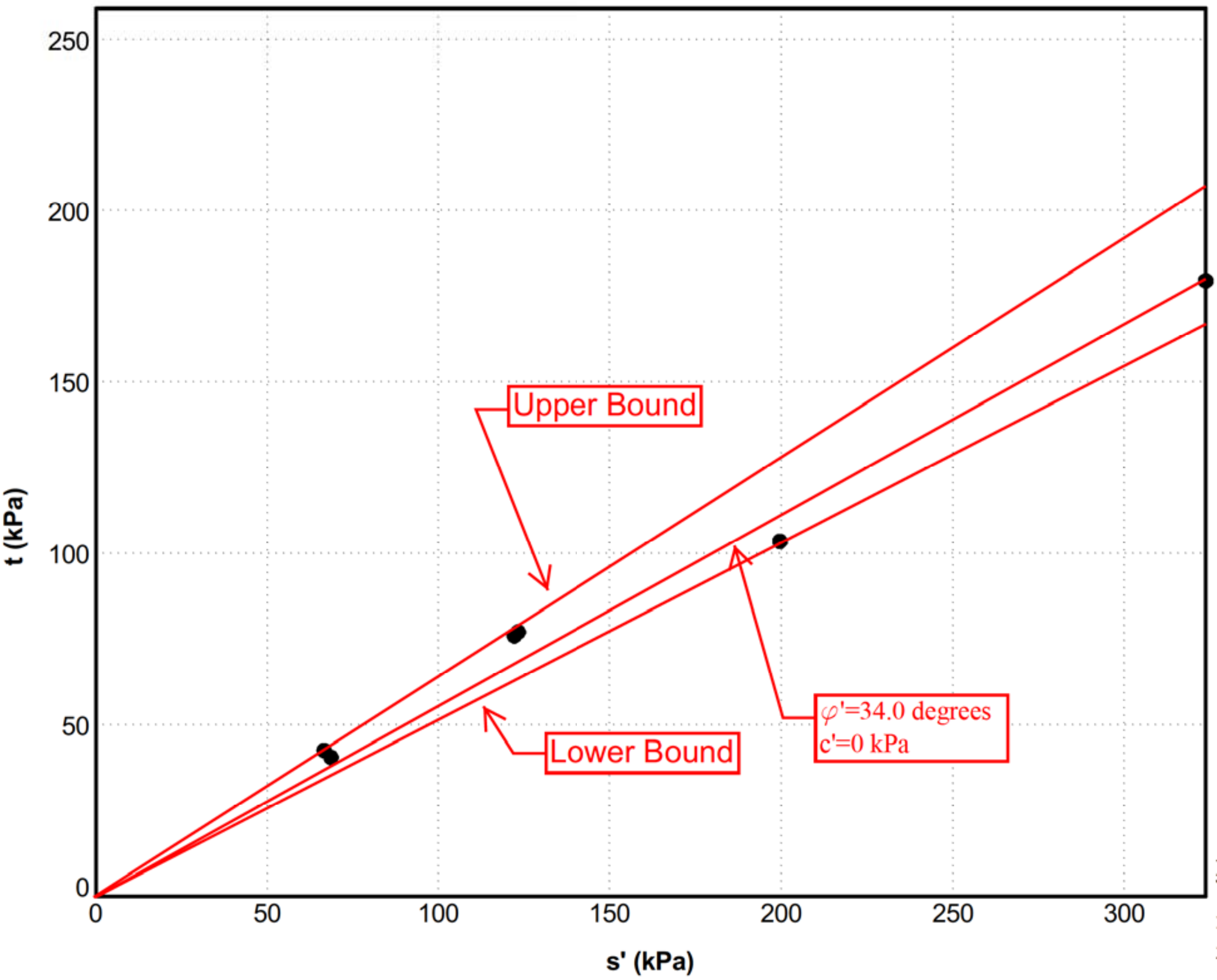


Wang Chau P&E
s'-t plot
Alluvium (Clay/Silt)

226464 FIGURE **G1.6**



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gINT output page 1 of 1. Made 21Aug13 15:19

Wang Chau P&E
s'-t plot
Alluvium (Sand/Gravel)

226464

FIGURE G1.7

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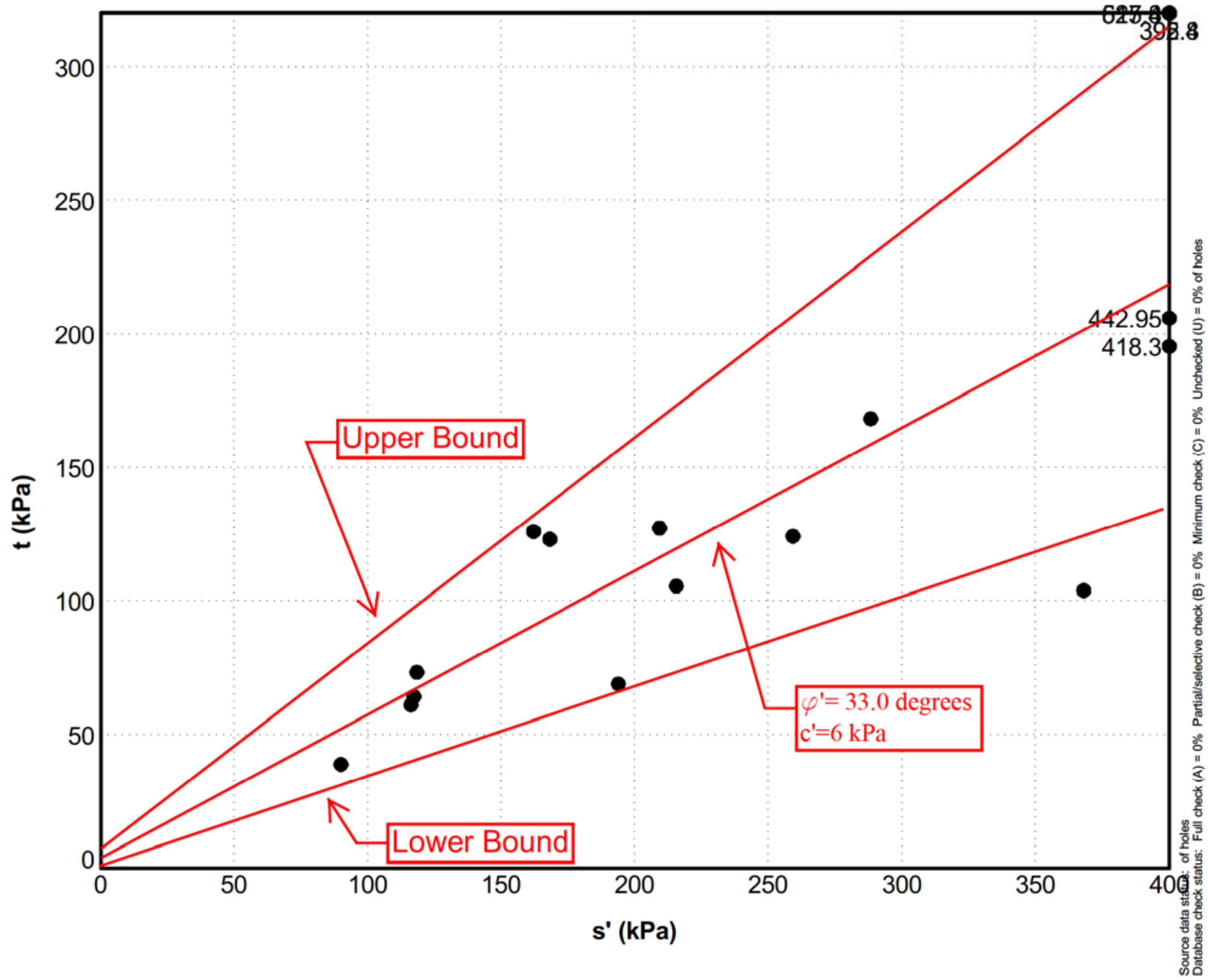

Wang Chau P&E
s'-t plot
V/IV Meta-Siltstone/Sandstone

226464

FIGURE G1.8

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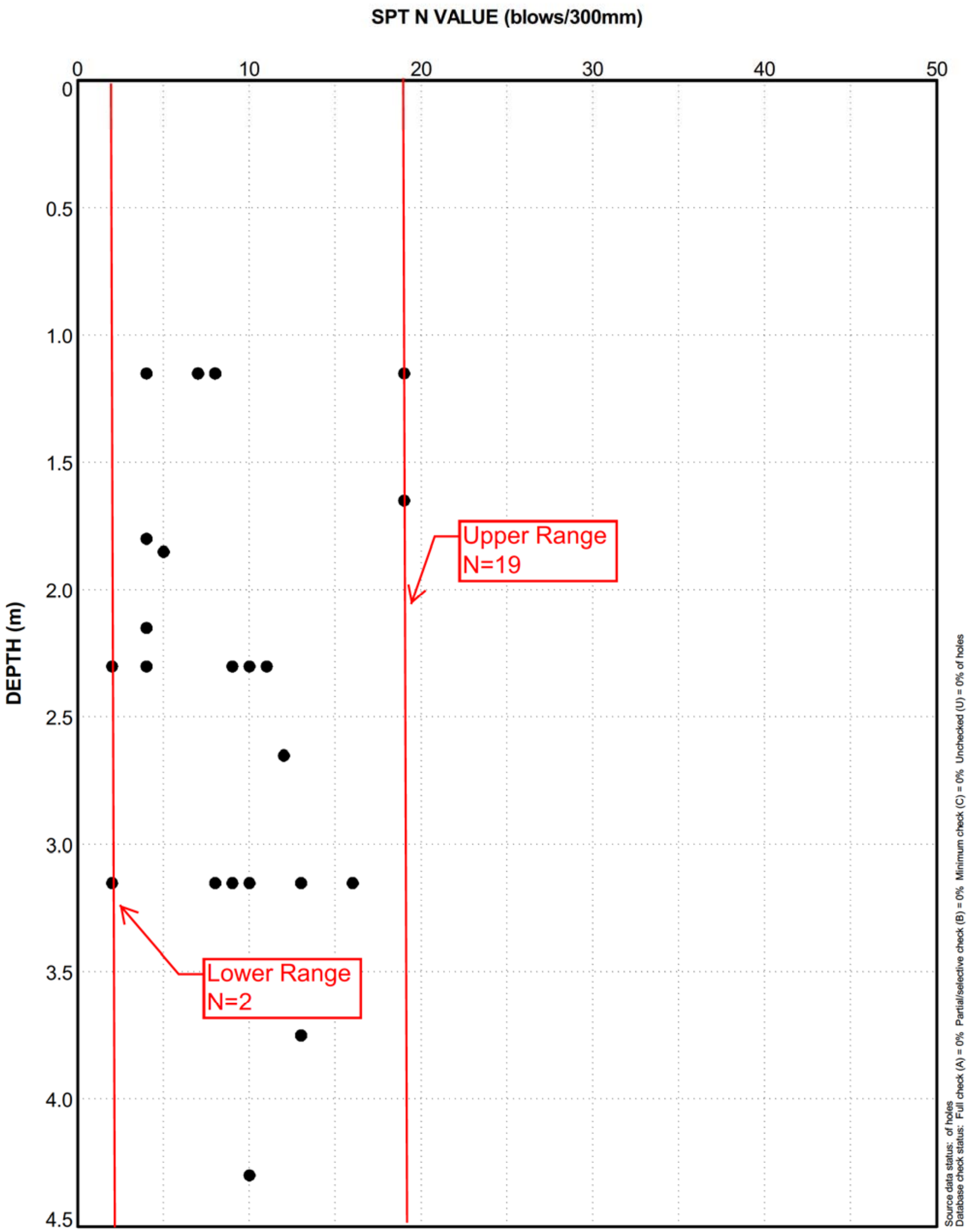

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Wang Chau P&E
Standard Penetration Test with Depth
Fill

226464

FIGURE G1.9

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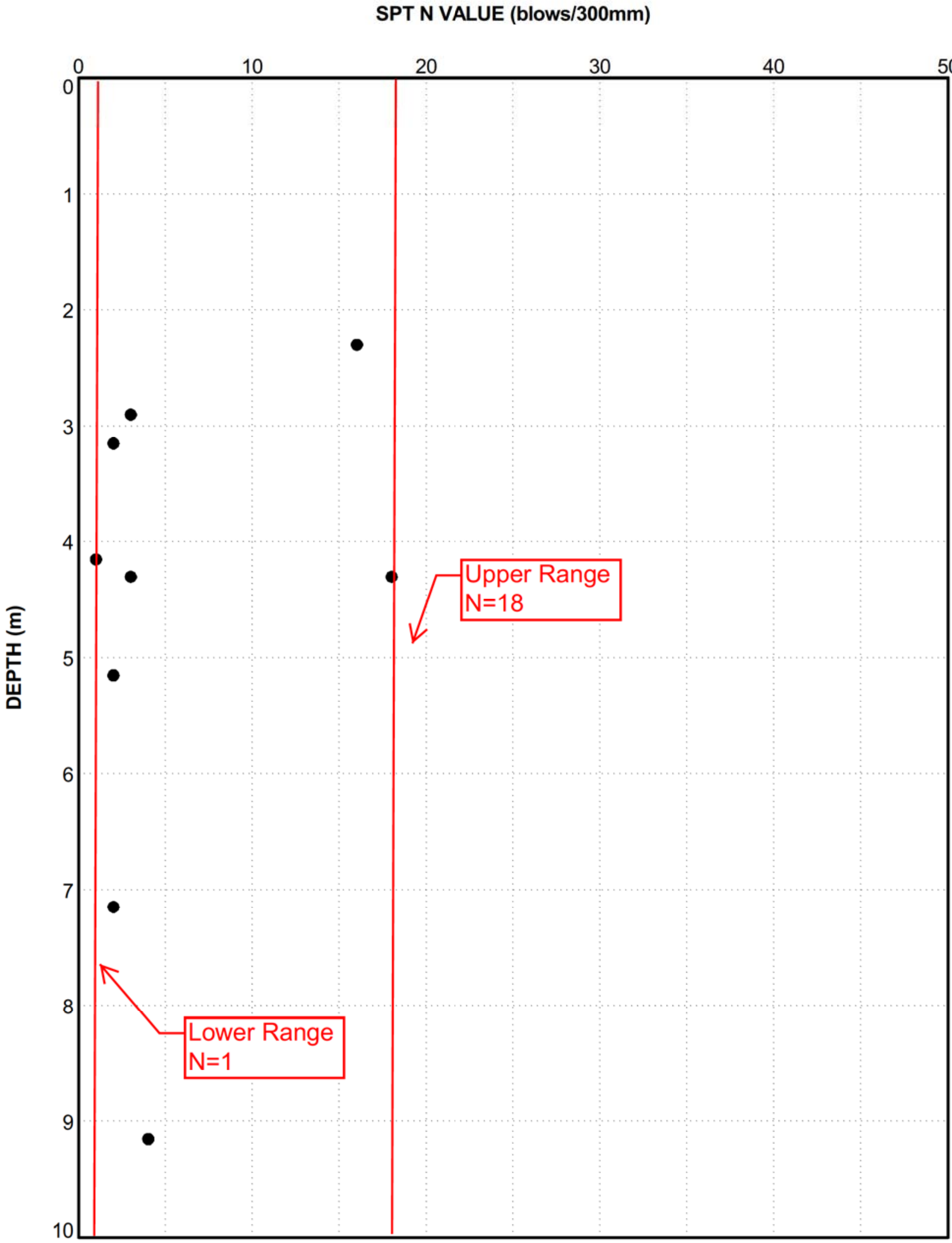

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Wang Chau P&E
Standard Penetration Test with Depth
Marine Deposits/Estuarine Deposits

226464 **FIGURE G1.10**

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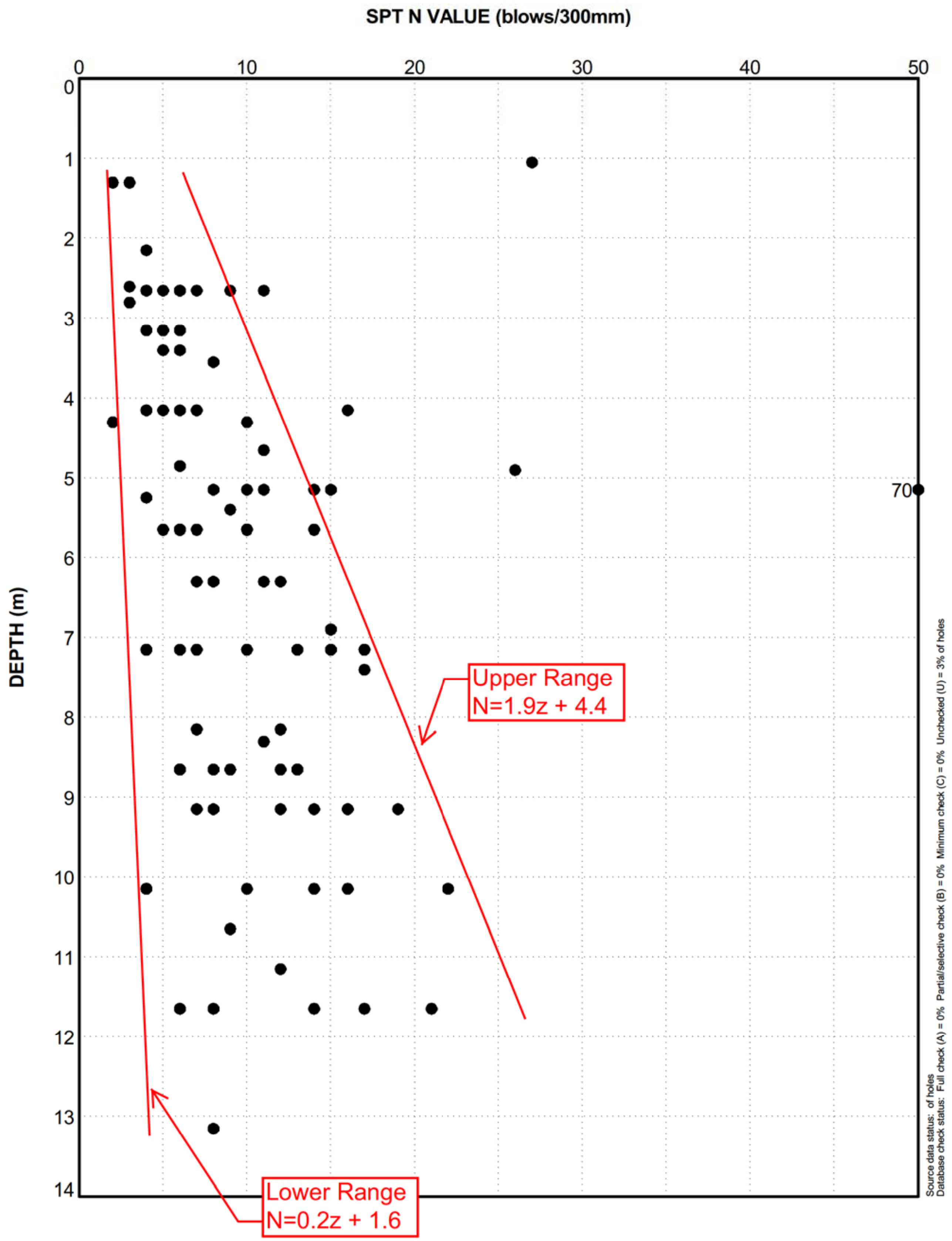

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Wang Chau P&E
Standard Penetration Test with Depth
Alluivum (Clay/Silt)

226464 **FIGURE G1.11**

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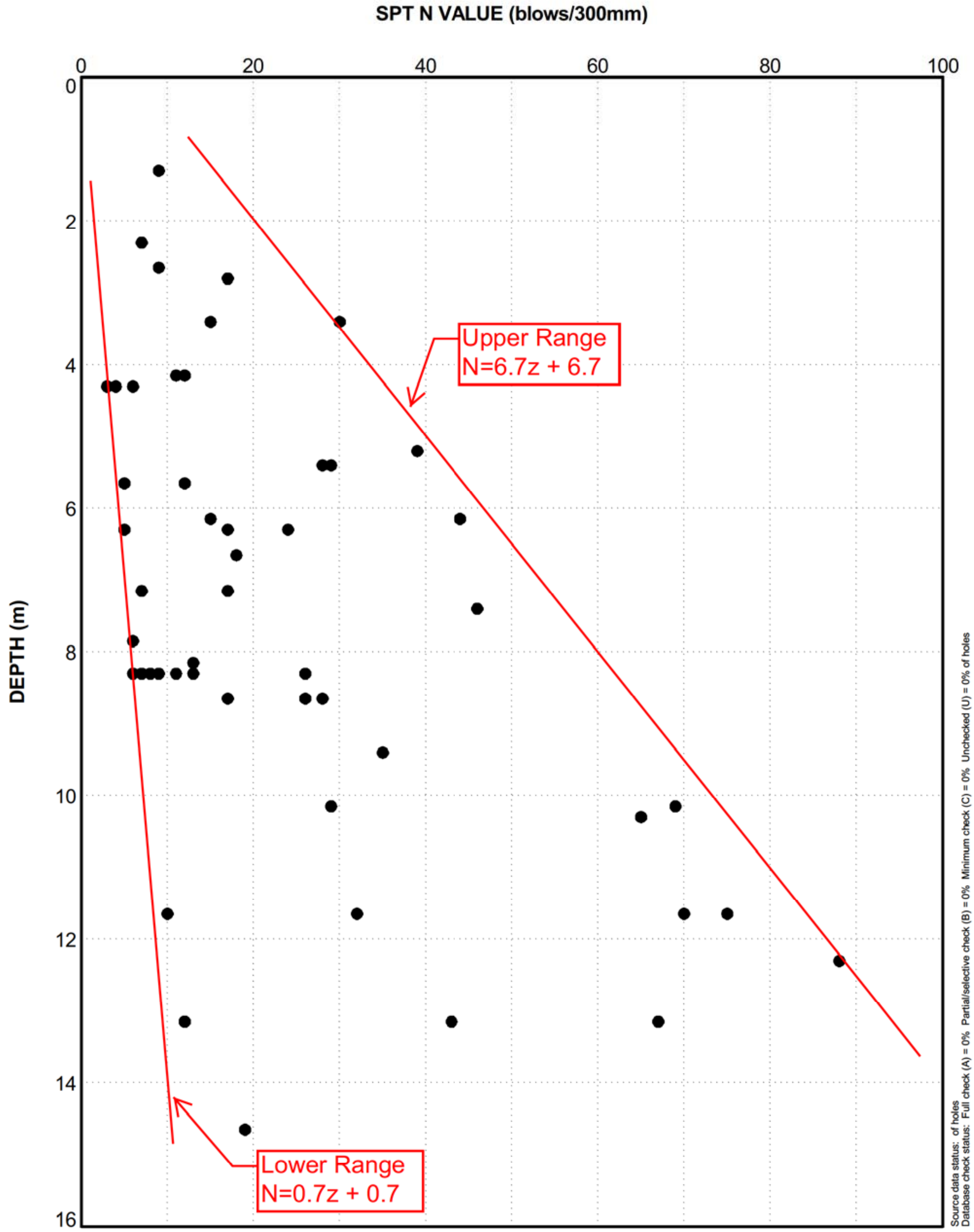

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Wang Chau P&E
Standard Penetration Test with Depth
Alluivum (Sand/Gravel)

226464

FIGURE G1.12

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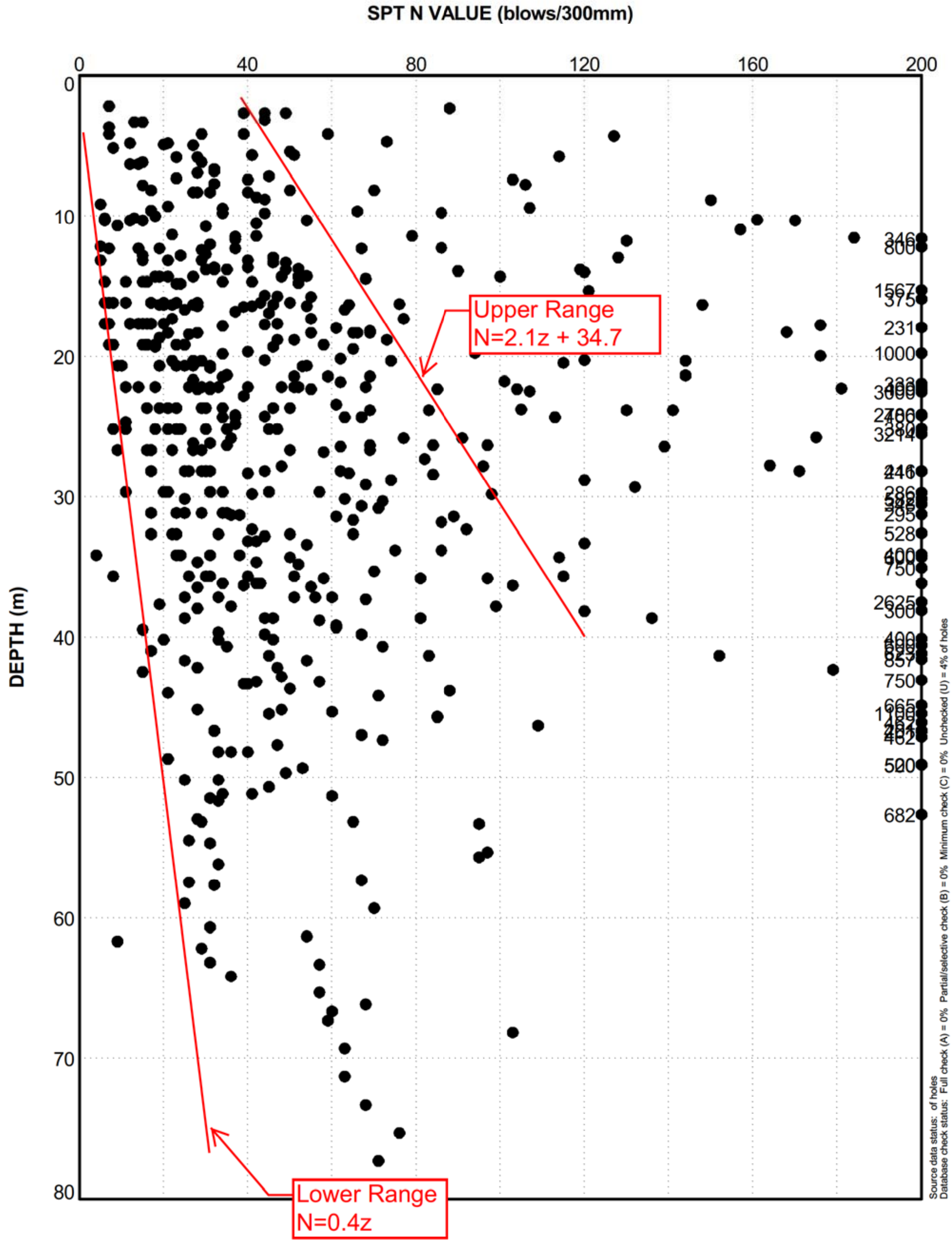

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Wang Chau P&E
Standard Penetration Test with Depth
V/IV Meta-Siltstone/Sandstone

226464

FIGURE G1.13

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