

An MND Statutory Board
Our ref: APPBCA-2022-02

01 March 2022

Dear Sir/Madam

SUBMISSION OF SITE INVESTIGATION (SI) DATA IN STANDARDISED ELECTRONIC FORMAT TO COMPLY WITH THE IMPLEMENTATION OF NEW STRATIGRAPHIC FRAMEWORK

Objective

1. This circular is to inform the industry on adopting the geological unit name as established in the new stratigraphic framework of Singapore while submitting SI data both in borehole logs and standardised electronic format protocol AGS(SG).

Background

2. BCA has introduced a new publication for the geology of Singapore on 1st of October 2021 to launch the new stratigraphic framework, which consists of a 1:50,000 scale geological map including a memoir. In this publication, new geological units have been introduced and previous named units of DSTA (2009) Geology of Singapore have been re-classified in accordance with the guidelines of International Commission on Stratigraphy (ICS). Refer to Annex A showing comparison between the current units (DSTA, 2009) and new units of BCA, 2021. The sale and product info of this new publication can be accessed via: <https://go.gov.sg/bundled-geomap-geomemoir>

Requirement for Submission of SI Data in the AGS(SG) Electronic Format

3. We wish to inform the industry that the submission of SI data in the AGS(SG) electronic format based on the new stratigraphic framework will be a requirement **with effect from 1st October 2022 for all SI works carried out**. Examples highlighting on the representation of new geological unit name in borehole log are shown in Annex B. The addendum of the new abbreviations (codes) is presented in the latest edition of 'Guidelines for Electronic Transfer of Site Investigation Data', which can be downloaded from: <https://www1.bca.gov.sg/docs/default-source/docs-corp-regulatory/building-control/electronic-transfer-si-data.pdf>

Circulation and Enquiries

4. Please disseminate the contents of this circular to your members. If you need any clarification, you may contact officer Lau Sze Ghiong (Ms.), email: LAU_sze_ghiong@bca.gov.sg

Yours faithfully



ER. Kiefer Chiam Sing Lih
DIRECTOR
BUILDING ENGINEERING GROUP
For COMMISSIONER OF BUILDING CONTROL
BUILDING AND CONSTRUCTION AUTHORITY

ANNEX A: NEW GEOLOGICAL UNITS IN COMPARISON WITH DSTA (2009)

BCA, 2021			DSTA, 2009		
Group/Centre	Formation/Pluton	Member	Member/Facies	Formation/Undesignated	
Kallang Group	Tekong Formation		Littoral Member	Kallang Formation	
	Semakau Formation		Reef Member		
	Rochor Clay Formation		Marine Member		
	Tanjong Rhu Clay Formation	Marina South Member			
	Kranji Formation		Transitional Member		
	Jalan Besar Formation		Alluvial Member		
	Bedok Formation			Huat Choe Formation *	
	Fort Canning Formation			Old Alluvium	
	Bukit Batok Formation **			Fort Canning Boulder Bed	
Sentosa Group	Kusu Formation		Tengah Facies	Jurong Formation	
	Buona Vista Formation		St John Facies		
	Fort Siloso Formation		Rimau Facies		
	Tanjong Rimbau Formation		Pandan Facies		
Jurong Group	Boon Lay Formation	Clementi Member	Ayer Chawan Facies		
	Pandan Formation	Kent Ridge Member	Jong Facies		
	Pulau Ayer Chawan Formation	Nanyang Member	Queenstown Facies		
	Tuas Formation				
	Pengerang Formation				Palaeozoic Volcanics
	Sajahat Formation				Sajahat Formation
	Singapore Basalt-andesite Dyke-swarm			Dyke rocks	
Bukit Timah Centre	Pulau Sekudu Quartz-monzonite Pluton			Bukit Timah Granite	
	Simpang Granite Pluton				
	Pulau Ubin Granite Pluton				
	Dairy Farm Granite-microgranite Pluton			Gombak Norite	
	Gombak Gabbro-granite Pluton				
	Choa Chu Kang Granodiorite-tonalite Pluton				

* Considered to be weathered tuff belonging to Jurong Group ** Not previously Identified In Singapore

Direct correlation between BCA and DSTA units	Broadly equivalent, either one BCA unit to many DSTA units or many BCA units to one DSTA unit	No equivalency
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ANNEX B: EXAMPLES SHOWING BOREHOLE LOG (OF SI REPORT) IN THE USE OF NEW GEOLOGICAL UNITS WHILE DESCRIBING SOIL AND ROCK PROPERTIES

Item	Soil Description																																																																																																																																
1.0	<p>Example of borehole log (current practice):</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td colspan="2">Location: TUAS (STUDY AREA A)</td> <td colspan="2">TEST RESULTS (DETAILED TEST RESULTS REPORTED ELSEWHERE)</td> <td>SPT N-VALUE ●</td> <td>SPT N-Value (N/mm) or Fracture Index (FI, per m)</td> <td>BS SOIL / ISO ROCK CLASSIFICATION</td> <td>GEOLOGICAL CLASSIFICATION</td> <td>ELEVATION (m)</td> <td>DEPTH (m)</td> <td>SYMBOLS</td> <td>GRAPHIC LOG</td> <td>THICKNESS (m)</td> <td>WEATHERING GRADE</td> <td>ROCK STRENGTH</td> <td>BOREHOLE NO. BH1A5</td> </tr> <tr> <td colspan="2"></td> <td colspan="2"></td> <td></td> <td>NORTHING <input type="text"/></td> </tr> <tr> <td colspan="2"></td> <td colspan="2"></td> <td></td> <td>EASTING <input type="text"/></td> </tr> <tr> <td colspan="2"></td> <td colspan="2"></td> <td></td> <td>ELEVATION <input type="text"/></td> </tr> <tr> <td colspan="15"></td> <td style="text-align: center;">DESCRIPTION</td> </tr> <tr> <td colspan="15"></td> <td> Very Loose Light Yellowish Brown (2.5Y 6/3) Clayey SAND Fine to medium grained. With traces of fine grained gravels. [KALLANG FORMATION] <p style="text-align: right;"><u>Note:</u> Refer to Item 1.1a</p> </td> </tr> <tr> <td colspan="15"></td> <td> Stiff Light Reddish Brown (2.5YR 6/4) CLAY With traces of organic matter. [KALLANG FORMATION] <p style="text-align: right;"><u>Note:</u> Refer to Item 1.1b</p> </td> </tr> <tr> <td colspan="15"></td> <td> Very Soft Grey (5Y 5/1) CLAY With traces of organic matter. [KALLANG FORMATION] <p style="text-align: right;"><u>Note:</u> Refer to Item 1.1c</p> </td> </tr> </table>	Location: TUAS (STUDY AREA A)		TEST RESULTS (DETAILED TEST RESULTS REPORTED ELSEWHERE)		SPT N-VALUE ●	SPT N-Value (N/mm) or Fracture Index (FI, per m)	BS SOIL / ISO ROCK CLASSIFICATION	GEOLOGICAL CLASSIFICATION	ELEVATION (m)	DEPTH (m)	SYMBOLS	GRAPHIC LOG	THICKNESS (m)	WEATHERING GRADE	ROCK STRENGTH	BOREHOLE NO. BH1A5																NORTHING <input type="text"/>																EASTING <input type="text"/>																ELEVATION <input type="text"/>																DESCRIPTION																Very Loose Light Yellowish Brown (2.5Y 6/3) Clayey SAND Fine to medium grained. With traces of fine grained gravels. [KALLANG FORMATION] <p style="text-align: right;"><u>Note:</u> Refer to Item 1.1a</p>																Stiff Light Reddish Brown (2.5YR 6/4) CLAY With traces of organic matter. [KALLANG FORMATION] <p style="text-align: right;"><u>Note:</u> Refer to Item 1.1b</p>																Very Soft Grey (5Y 5/1) CLAY With traces of organic matter. [KALLANG FORMATION] <p style="text-align: right;"><u>Note:</u> Refer to Item 1.1c</p>
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Example of soil description (to include additional features and name of new geological unit):																																																																																																																																	
1.1a	Very loose, light yellowish brown (2.5Y 6/3), clayey SAND, fine to medium grained (subrounded) with traces of fine-grained gravels. [KALLANG GROUP; Jalan Besar Formation]																																																																																																																																
1.1b	Stiff, light reddish brown (2.5YR 6/4), streaked/mottled , CLAY with traces of organic matter. [KALLANG GROUP; Jalan Besar Formation]																																																																																																																																
1.1c	Very soft, grey (5Y 5/1), CLAY with traces of organic matter. [KALLANG GROUP; Tanjong Rhu Clay Formation]																																																																																																																																

Item	Rock Description																																
2.0	<p><u>Example of borehole log (current practice):</u></p> <table border="1"> <tr> <td colspan="2">Location: SIMPANG AND SELETAR (STUDY AREA C)</td> <td rowspan="4">BS SOIL / ISO ROCK CLASSIFICATION</td> <td rowspan="4">GEOLOGICAL CLASSIFICATION</td> <td rowspan="4">ELEVATION (m)</td> <td rowspan="4">DEPTH (m)</td> <td rowspan="4">SYMBOLS</td> <td rowspan="4">GRAPHIC LOG</td> <td rowspan="4">THICKNESS (m)</td> <td rowspan="4">WEATHERING GRADE</td> <td rowspan="4">ROCK STRENGTH</td> <td>BOREHOLE NO. BH1C2</td> </tr> <tr> <td colspan="2">TEST RESULTS (DETAILED TEST RESULTS REPORTED ELSEWHERE)</td> <td>NORTHING <input type="text"/></td> </tr> <tr> <td colspan="2">● SPT N-VALUE</td> <td>EASTING <input type="text"/></td> </tr> <tr> <td colspan="2">SPT N-Value (N/mm) or Fracture Index (FI, per m)</td> <td>ELEVATION <input type="text"/></td> </tr> <tr> <td>TCR=100% SCR=11% RQD=11%</td> <td></td> <td>FI = N</td> <td></td> <td></td> <td>40.00 41 41.00 42 42.00 43 43.00 44 44.00 45 45.00</td> <td>CR-4 CR-5 CR-6 CR-7 CR-8</td> <td></td> <td></td> <td></td> <td> <p>Strong to Very Strong Light Greenish Grey (5GY 8/1) spotted with Greyish Black (N2) GRANITE Slightly weathered. Rock consists of Quartz (1-3 mm dia.); Orthoclase (1-5 mm dia.); Biotite (1-3 mm dia.). Discontinuities are very closely to closely spaced. Joint surfaces are undulating rough. Apertures are partly open to open. Three sets of joints; J1=15-30 deg J2=30-35 deg J3=60-75 deg. From 64.00 to 64.30m: Core loss [BUKIT TIMAH GRANITE]</p> <p><u>Note:</u> Refer to Item 2.1</p> </td> </tr> </table>	Location: SIMPANG AND SELETAR (STUDY AREA C)		BS SOIL / ISO ROCK CLASSIFICATION	GEOLOGICAL CLASSIFICATION	ELEVATION (m)	DEPTH (m)	SYMBOLS	GRAPHIC LOG	THICKNESS (m)	WEATHERING GRADE	ROCK STRENGTH	BOREHOLE NO. BH1C2	TEST RESULTS (DETAILED TEST RESULTS REPORTED ELSEWHERE)		NORTHING <input type="text"/>	● SPT N-VALUE		EASTING <input type="text"/>	SPT N-Value (N/mm) or Fracture Index (FI, per m)		ELEVATION <input type="text"/>	TCR=100% SCR=11% RQD=11%		FI = N			40.00 41 41.00 42 42.00 43 43.00 44 44.00 45 45.00	CR-4 CR-5 CR-6 CR-7 CR-8				<p>Strong to Very Strong Light Greenish Grey (5GY 8/1) spotted with Greyish Black (N2) GRANITE Slightly weathered. Rock consists of Quartz (1-3 mm dia.); Orthoclase (1-5 mm dia.); Biotite (1-3 mm dia.). Discontinuities are very closely to closely spaced. Joint surfaces are undulating rough. Apertures are partly open to open. Three sets of joints; J1=15-30 deg J2=30-35 deg J3=60-75 deg. From 64.00 to 64.30m: Core loss [BUKIT TIMAH GRANITE]</p> <p><u>Note:</u> Refer to Item 2.1</p>
Location: SIMPANG AND SELETAR (STUDY AREA C)		BS SOIL / ISO ROCK CLASSIFICATION	GEOLOGICAL CLASSIFICATION										ELEVATION (m)	DEPTH (m)	SYMBOLS	GRAPHIC LOG	THICKNESS (m)	WEATHERING GRADE	ROCK STRENGTH	BOREHOLE NO. BH1C2													
TEST RESULTS (DETAILED TEST RESULTS REPORTED ELSEWHERE)																				NORTHING <input type="text"/>													
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TCR=100% SCR=11% RQD=11%		FI = N			40.00 41 41.00 42 42.00 43 43.00 44 44.00 45 45.00	CR-4 CR-5 CR-6 CR-7 CR-8				<p>Strong to Very Strong Light Greenish Grey (5GY 8/1) spotted with Greyish Black (N2) GRANITE Slightly weathered. Rock consists of Quartz (1-3 mm dia.); Orthoclase (1-5 mm dia.); Biotite (1-3 mm dia.). Discontinuities are very closely to closely spaced. Joint surfaces are undulating rough. Apertures are partly open to open. Three sets of joints; J1=15-30 deg J2=30-35 deg J3=60-75 deg. From 64.00 to 64.30m: Core loss [BUKIT TIMAH GRANITE]</p> <p><u>Note:</u> Refer to Item 2.1</p>																							
2.1	<p><u>Example of rock description (to include additional features and name of new geological unit):</u></p> <p>Strong to very strong, light greenish grey (5GY 8/1) spotted with greyish black (N2), <i>equigranular, coarse-grained</i> GRANITE, slightly weathered, rock consists of quartz (1-3 mm dia.), orthoclase (1-5 mm dia.), biotite (1-3 mm dia.), mafic minerals ~15%, <i>weak/subtle magmatic lineation, slight discolouration of minerals (along discontinuities)</i>, discontinuities are very closely to closely spaced, joint surfaces are undulating rough, apertures are partly open to open, three sets of joints; J1= 15-30 deg, J2= 30-35 deg, J3= 60-75 deg, from 64.00 to 64.30m: core loss. [BUKIT TIMAH CENTRE; Simpang Granite Pluton]</p>																																

Item	Rock Description											
3.0	Example of borehole log (current practice):											
Location: TUAS (STUDY AREA A)		BS SOIL / ISO ROCK CLASSIFICATION		GEOLOGICAL CLASSIFICATION		ELEVATION (m)		DEPTH (m)		SYMBOLS GRAPHIC LOG THICKNESS (m) WEATHERING GRADE ROCK STRENGTH		BOREHOLE NO. BH1A5
TEST RESULTS (DETAILED TEST RESULTS REPORTED ELSEWHERE)												● SPT N-VALUE SPT N-Value (N / mm) or Fracture Index (FI, per m)
TCR=100% SCR=71% RQD=65% TCR=100% SCR=74% RQD=74% TCR=100% SCR=92% RQD=85% TCR=100% SCR=91% RQD=83% TCR=100%				SI	S(II)	-37.76	41 42 43 44 45 46 47 48	CR-10 CR-11 CR-12 CR-13	6.00 II IV	Medium Strong Dark Grey (N3) SILTSTONE Slightly weathered. Discontinuities are very closely to closely spaced. Joint surfaces are undulating rough and occasionally smooth slickensided. Joint one set J1=10-20 deg. Thinly to thickly laminated with tuff. Dip of bedding: 20 deg. Vertical fractures are prominent from 36.4 to 41.0m. From 37.60 to 37.70 m: Core loss. From 37.40 to 37.60; 38.20 to 37.55m; 39.90 to 40.00m and 40.50 to 40.70m: Disintegrated. From 49.50 m to 50.20 m: Medium bedded with tuffaceous sandstone. Water loss was observed from 36.00m to 41.00m. [JURONG FORMATION; Ayer Chawan Facies] Medium strong to Strong Dark Grey (N3) SILTSTONE Fresh. Closely to medium spaced discontinuities. Thinly laminated to thinly bedded with tuff. Dip of bedding 20 deg from 49.50 to 50.20m. Medium bedded with tuffaceous SANDSTONE. Water loss was observed. [JURONG FORMATION; Ayer Chawan Facies]		
											Note: Refer to Item 3.1a Note: Refer to Item 3.1b	

Example of rock description (to include additional features and name of new geological unit):

3.1a	Medium Strong, Dark Grey (N3), SILTSTONE, Slightly weathered. Discontinuities are very closely to closely spaced. Joint surfaces are undulating rough and occasionally smooth slickensided. Joint one set J1=10-20 deg. Thinly to thickly laminated with tuff. Dip of bedding: 20 deg. Minor folds/soft sediment structures (of distorted features) from ~41.0 (bottom) to ~39.0m (top). Vertical fractures are prominent from 36.4 to 41.0m. From 37.60 to 37.70 m: Core loss. From 37.40 to 37.60; 38.20 to 37.55m; 39.90 to 40.00m and 40.50 to 40.70m: Disintegrated. From 49.50 m to 50.20 m: Medium bedded with tuffaceous sandstone (sand grains are subangular). Water loss was observed from 36.00m to 41.00m. [JURONG GROUP; Pulau Ayer Chawan Formation]
3.1b	Medium strong to Strong, Dark Grey (N3), SILTSTONE, Fresh. Closely to medium spaced discontinuities. Thinly laminated to thinly bedded with tuff. Parallel lamination/bedding. Dip of bedding 20 deg from 49.50 to 50.20m. Medium bedded with tuffaceous SANDSTONE (sand grains typically are subangular to subrounded). Soft sediment structures from ~42.8 (bottom) to ~42.2m (top). Normal graded bedding from ~44.7 (bottom) to ~44.5m (top). Water loss was observed. [JURONG GROUP; Pulau Ayer Chawan Formation]