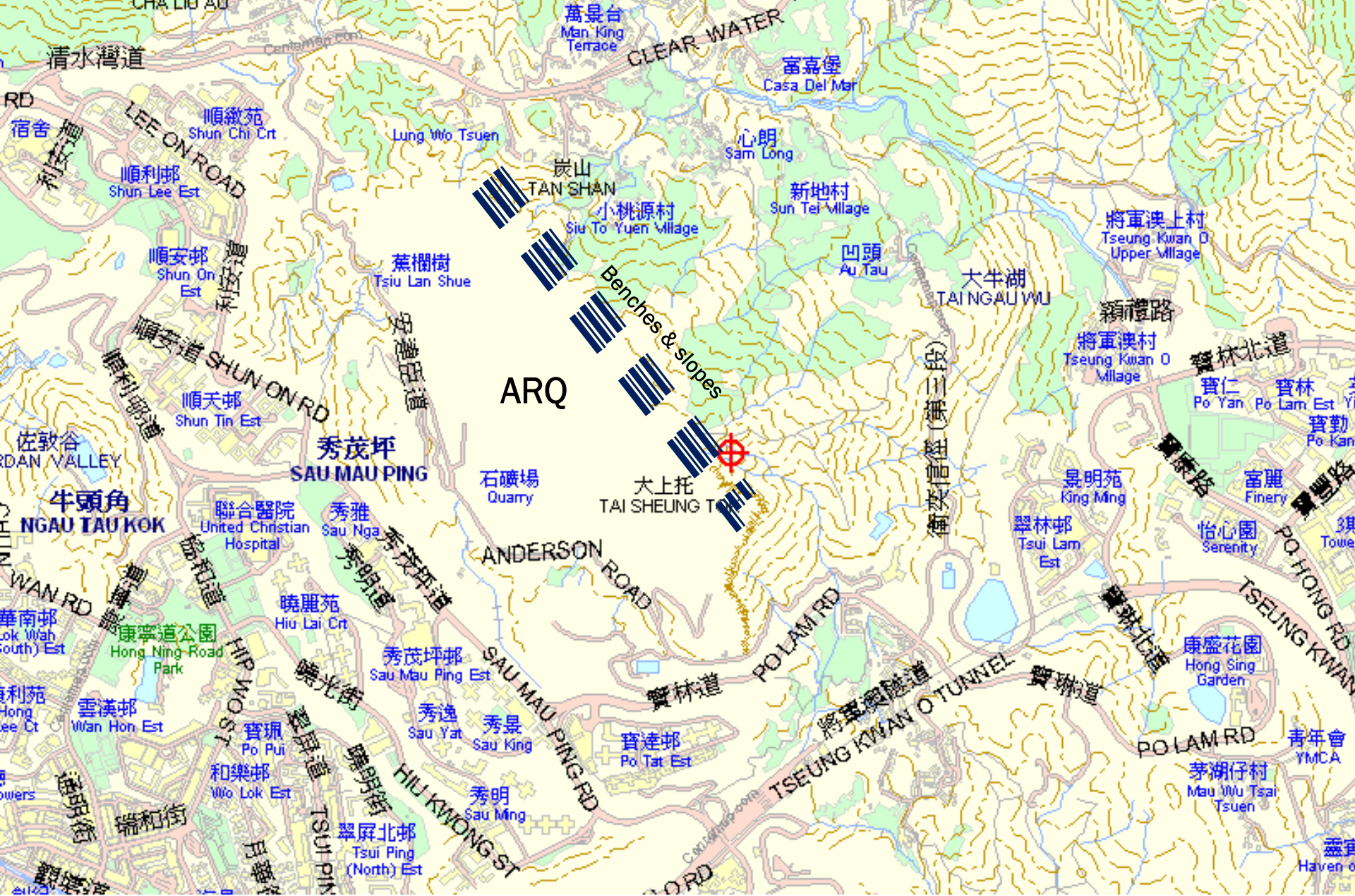


Geological Society of Hong Kong – Professional Branch

Site Visit - 30 January 2010

A CLOSE ENCOUNTER OF
VOLCANIC TUFF/GRANITE CONTACT
AT ANDERSON ROAD QUARRY

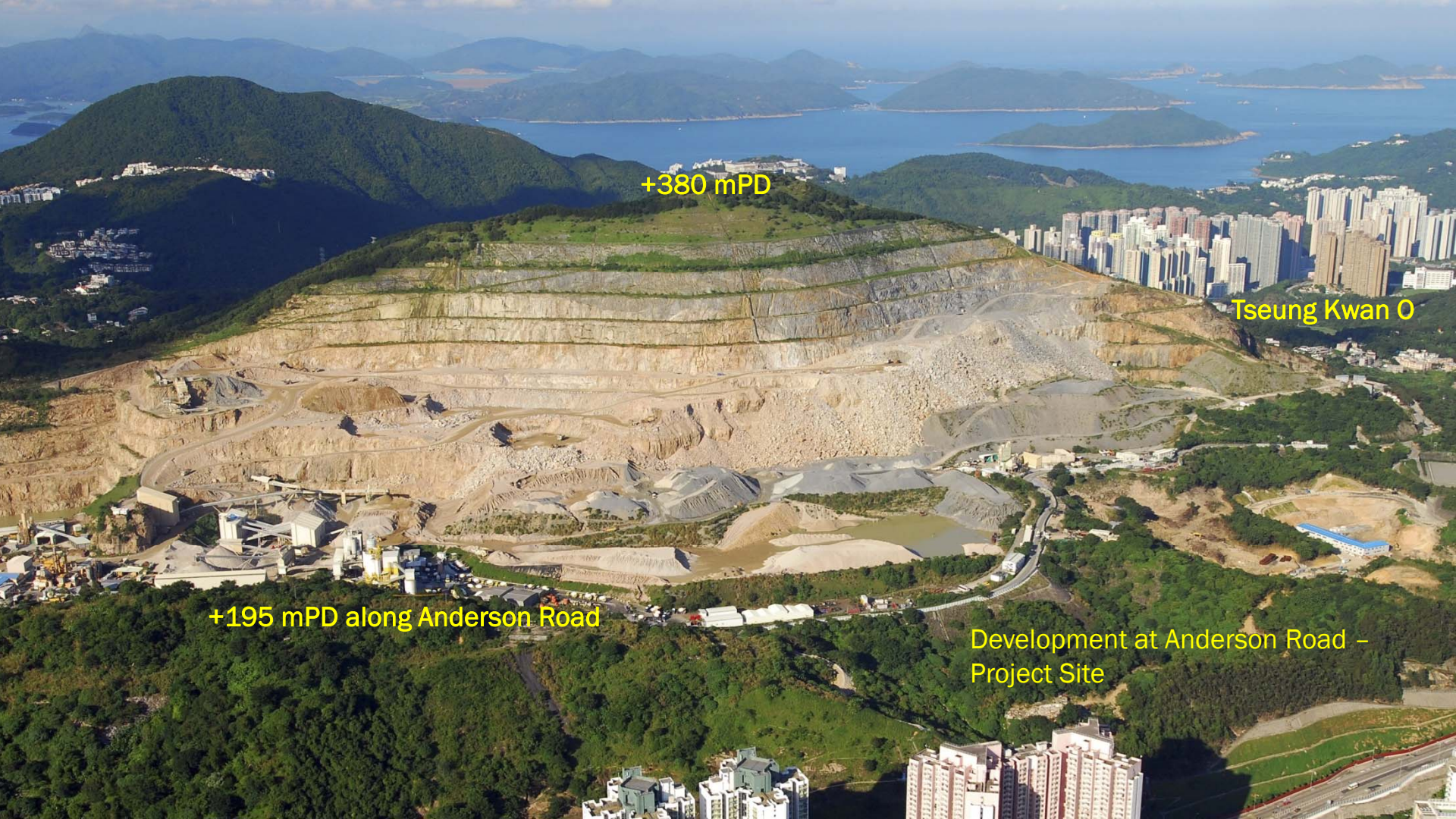
Guided by Sam Ho & Lawrence Lee



Location of ARQ Site at Eastern Kowloon

BACKGROUND OF ARQ

- ✘ Operating since 1956 at SW slopes of Tai Sheung Tok hill at Kowloon peninsula (Ka Wah & Pioneer)
- ✘ Rock reserve – 54 million tonnes, annually production about 3.5 million tonnes
- ✘ Area - 86 hectares (future platform 40 hectares)
- ✘ Contract up to Jun 2016 (KWP Quarry Co. Ltd)
- ✘ Final landform: 7 benches max., (200m high slope)
65° rock slope at 20m intervals
Green cover to blend in with natural environment



+380 mPD

Tseung Kwan O

+195 mPD along Anderson Road

Development at Anderson Road -
Project Site

Aerial View of Anderson Road Quarry
安達臣道石礦場



Tai Sheung Tok (大上托)

+380 mPD

SE

NW

Topography of ARQ

Sau Mau Ping Estate

Current benches and final rock faces



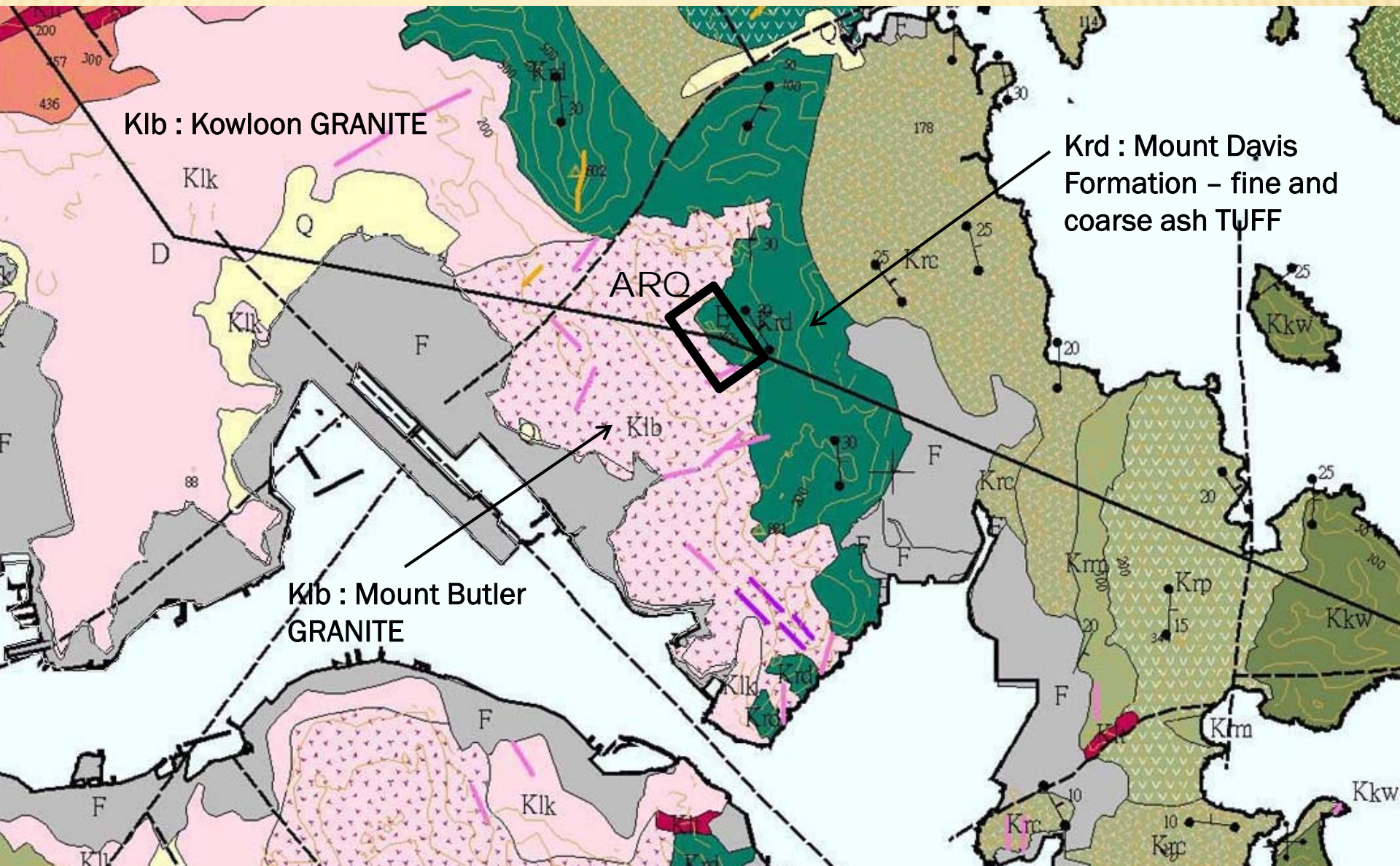
65° rock slope at 20m intervals

GEOLOGY OF ARQ – ROCK TYPES

- ✘ Early Cretaceous Repulse Bay Volcanic Group – Mount Davis Formation (Krd) - coarse ash crystal tuff and eutaxitic fine ash vitric tuff (143 million years ago)
- ✘ Early Cretaceous Mount Butler Granite (Klb) – equigranular fine to medium-grained granite (136 million years ago)
- ✘ Pegmatite patches, aplite, feldspar porphyry, greisenised granite

GEOLOGICAL UNITS OF HONG KONG				
Age	Formation/Group	Lithology	Distribution	Related units
Q		Unconsolidated sediments, alluvium, colluvium		
E ₁	Ping Chau Fm. 平洲組	Dolomitic siltstone, siltstone	Ping Chau	
	Kat O Fm. 高洲組	Breccia	Kat O, Lau Fau Shan, Ap Chau	Tai Ping Wan Gr.
K ₀	Port Island Fm. 赤洲組	Reddish sandstone, conglomerate	Port Island, Mira Bay	
	Pat Sin Leng Fm. 八仙樓組	Reddish siltstone	Pat Sin Leng, Bride's Pool	
K ₁	Kau Sai Chau Volcanic Group 狗頭洲組	Fine ash, rhyolite, welded tuff	Clearwater Bay, Kau Sai Chau, High Island Reservoir, Ninpin Is.	High Island Fm. Clear Water Bay Fm.
	Repulse Bay Volcanic Group 淡水灣群	Eutaxitic tuff, fine ash tuff, rhyolite	Lantau Is., Cheung Sheung, Sai Kung, Hong Kong Is.	Mang Kung Uk Fm. Long Harbour Fm. Ngo Mei Chau Fm. Ap Lei Chau Fm.
J ₂	Lantau Volcanic Group 大嶼山群	Vitric tuff, volcanoclastic sediments	Lantau Is., Lai Chi Chong	Lai Chi Chong Fm.
J ₁	Tsuen Wan Volcanic Group 荃灣群	Daotic tuff, ash tuff	Yuen Long, Sheung Shui, Shatin, Tai Po	Sai Lau Kong Fm. Tai Mo Shan Fm. Shing Mun Fm. Yim Tin Tsai Fm.
	Tuen Mun Fm. 屯門組	Andesites, tuff, volcanic breccia	Tuen Mun, Tin Shui Wai	
J ₀	Tai O Fm. 大潭組	Greyish siltstone, graphitic sandstone	Tai O	
	Tolo Channel Fm. 赤門海峽組	Siltstone, sandstone, mudstone	Fung Wong Wai, Nai Chung, Sham Chung	
P	Tolo Harbour Fm. 大埔海組	Black siltstone, sandstone, mudstone	Ma Shi Chau, Chinese University	Center Is. Fm. Tung Chung Fm.
C ₁	Lok Ma Chau Fm. 窩馬洲組	Quartzite, metaconglomerate, phyllite	Lo Wu, Lok Ma Chau	San Tin Group
	Yuen Long Fm. 元朗組	Marble, dolomite	Ma On Shan, Yuen Long	
D	Bluff Head Fm. 雷竹角組	Siltstone, quartz conglomerate, red sandstone	Ma On Shan, Bluff Head, Harbour Is.	Ma On Shan Fm.
Age(m.y.)	Intrusive Rocks	Lithology	Distribution	
140	Lion Rock Suite 獅子山岩套	Medium and fine-grained granite, quartz monzonite	Kowloon, Hong Kong Is., Po Toi Is.	
144-142	Cheung Chau Suite 長洲岩套	Quartz monzonite, rhyodacite porphyry dykes	Cheung Chau, Lantau Is.	
148-146	Kwai Chung Suite 葵涌岩套	Coarse-grained granite, rhyolite dykes	Lantau Is., Shatin, Lamma Is.	
165-160	Lamma Suite 南丫島岩套	Medium to fine-grained monzogranite, granodiorite	Tai Lam, Tsing Shan, Lantau Is., Tai Mo Shan, Lamma Is., Soko Is.	


(Mainly after GEO publications)



Geological Setting of ARO Site



Front View of ARQ Rock Cut Slopes

The image shows a close-up view of a rock face. The central and largest portion is a light-colored, fine to medium-grained granite with a speckled texture. To the right, there is a distinct, darker, and more crystalline area identified as a pegmatite patch. The surrounding area consists of broken rock fragments and smaller pieces of the same granite material. The overall appearance is that of a natural rock outcrop in a field setting.

Fine to medium grained granite & a pegmatite patch (Mount Butler granite)



coarse ash crystal tuff
& fine ash vitric tuff

Feldsparphyric rhyolite

INTERESTING GEOLOGICAL FEATURES

- × Granite intrusion – field evidence
- × Dykes, sills and veins
- × Contact relations
- × Stopping

- a. Chilled margins in granite
- b. Baked contact (contact metamorphism of wall rock)
- c. Discordant contacts
- d. Rotated fragments of wall rock within pluton
- e. Xenoliths within pluton (rare inclusions)
- f. Dilational offset of pre-existing layers by a tabular intrusion
- g. Stopping or roof rock (passive intrusion)

Gently inclined joints

coarse ash crystal tuff
& fine ash vitric tuff

Granitic
sills



granitic intrusion in volcanic tuff in
form of sills

granite
intrusion

Extension: magma moved into fractures or
voids formed by extension of the country rock in
response to regional tensional stress.

Pegmatite vein in coarse ash crystal tuff (Mount Davis Formation)

Chilled margin ?



Eutaxitic foliation: a welding structure formed when hot pumice is fused, compressed and consequently oriented in volcanic tuff. It was extremely hot during deposition – welding.

Irregular
granitic
veins

coarse ash crystal tuff
& fine ash vitric tuff



Granitic vein and
xenolith in coarse ash
crystal tuff



STOPPING – 岩漿侵入，頂蝕作用，回採

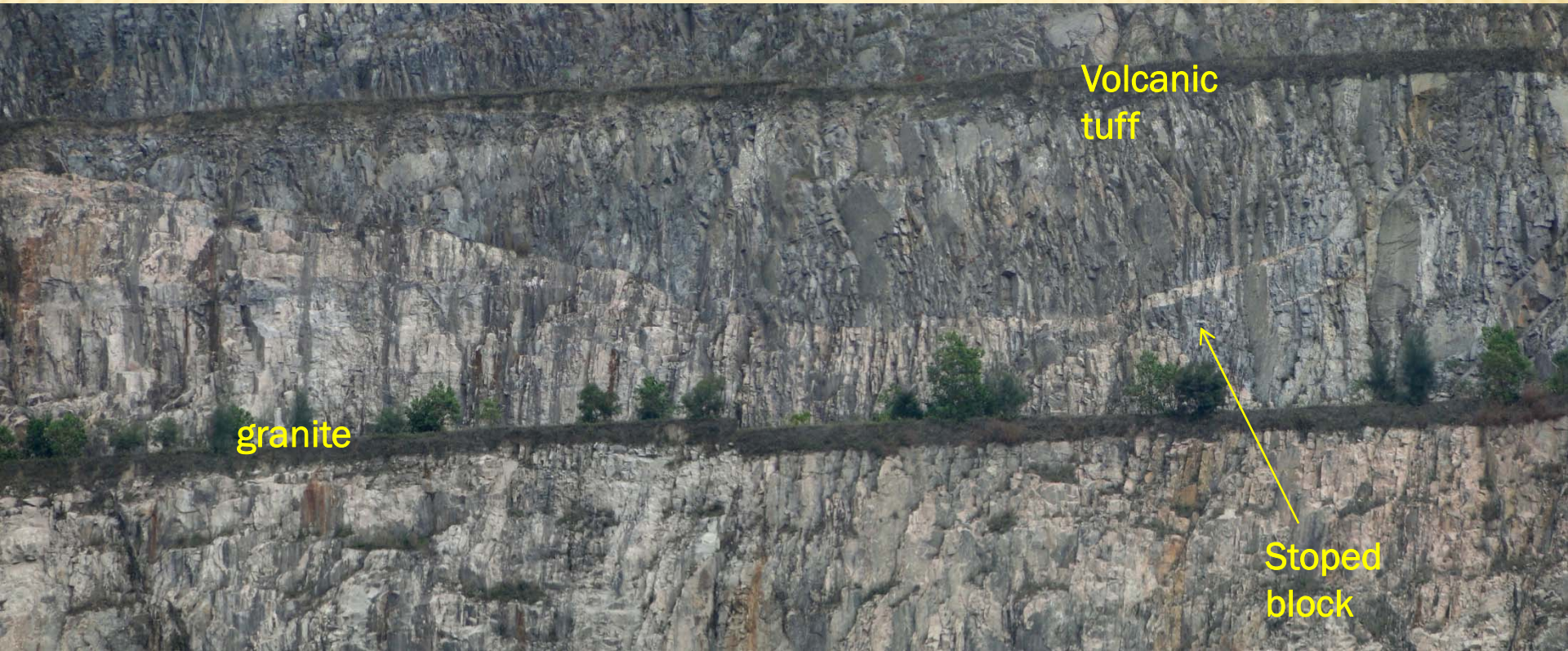
- ✘ An indication of passive intrusion of an igneous rock
- ✘ Collapse of blocks into magma chamber from sides or roof
- ✘ Magma wells up to fill “void” left by sinking blocks
- ✘ Common in shallow or intermediate depth intrusion
- ✘ No structure or foliation

Magma intrusion/ascent physical parameters:

temperature: 770 – 1,150°C

pressure: 400 – 1,000 MPa

(400,000 – 1,000,000 kPa)



Volcanic
tuff

granite

Stoped
block

A sharp and deformed interface of tuff and granite with stoped blocks

coarse ash crystal tuff
& fine ash vitric tuff

granite

granite

Stoped blocks (tuff)
within granite lopolith



Tuff

granite

Stoped blocks

Stoped blocks

granite





Have a pleasant walk !