

**CATALOGUE OF
HONG KONG TUNNELS
(Up to February 2016)**

**Mainland East Division
Geotechnical Engineering Office
Civil Engineering and Development Department**

FOREWORD

This document contains a catalogue of existing tunnels and tunnels currently under construction in Hong Kong. It is based on a literature review of published information as well as information obtained from various government departments, the MTR Corporation, the former Kowloon Canton Railway Corporation, the Airport Authority Hong Kong, Hongkong Electric Company Limited, CLP Power Hong Kong Limited, and The Hong Kong and China Gas Company Limited. This catalogue is a live document that will be updated from time to time as further information becomes available.

The main purpose of the catalogue is to disseminate available information on tunnels. A few significant cable duct and gas pipe crossings constructed using tunnelling methods such as horizontal directional drilling and pipe jacking have also been included. It is hoped that this catalogue and, in particular, the associated references, will prove to be a useful source of information for civil and geotechnical engineers when planning, investigating, designing and constructing new tunnel projects.

Staff from the Mainland East Division of this Office compiled the catalogue. Apart from other GEO colleagues, the project clients and the works agents, members of the Hong Kong Institution of Engineers Geotechnical Division Working Group on Cavern and Tunnel Engineering and other individuals have also provided useful information. All contributions are gratefully acknowledged.

The user of this catalogue is entirely responsible for verifying the accuracy and relevance of the information presented. If any information in this catalogue is found to be inaccurate or out-of-date, please contact the Chief Geotechnical Engineer/Mainland East of the Geotechnical Engineering Office, Civil Engineering and Development Department, 101 Princess Margaret Road, Ho Man Tin, Kowloon, Hong Kong.

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| Project Title | Year of Completion | Length Details | Cross Section Details | Method of Construction | Geology and Groundwater | References |
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| Table 1 : Road Tunnels | | | | | | |
| Route 1 – First Lion Rock Tunnel (dual 2-lane road, carrying 3 water mains) | 1967 | 1.4 km | 9.0 m span max. x 9.2 m high internally horseshoe shaped | Drill & blast, with a five-drill jumbo, steel girder roof supports near the Kowloon Portal, concrete lining | Granite, with a maximum overburden of 258 m, fault breccias (fractured rocks, mylonites and gouge) up to 6 m wide (possibly associated with the injection of the Maryknoll ring dyke), minor water inflow, air temperature in tunnel 61-78 degrees F | Payne (1962), Davis (1963), Payne (1963), Phillips (1990) |
| Route 1 – Cross Harbour Tunnel (dual 2-lane, the first immersed tube tunnel in HK) | 1972 | 1.9 km (twin tubes) | Twin circular section of approx. 10.5 m dia. connected with transverse steel diaphragms | Immersed tube (steel tube with reinforced concrete lining) | Tunnel section under the sea supported by a screed of crushed stone on the seabed and protected by a backfilled blanket of coarse stone | Asian Building & Construction (1976), Pratt (1987), Yang et al (2006) |
| Route 1 – Second Lion Rock Tunnel (dual 2-lane road, carrying 2 water mains) | 1978 | 1.4 km | 9.0 m span max. x 9.5 m high internally horseshoe shaped | Drill & blast, concrete lining | Similar to first Lion Rock Tunnel | Phillips (1990) |
| Route 1 – Aberdeen Tunnel (dual 2-lane) | 1982 | 1.9 km (twin tubes) | 10.0 m span x 11.0 m high horseshoe shaped | Drill & blast (<i>pilot tunnel constructed</i>), lining 0.61 m thick min. | 1.55 km weathered to fresh granite; 250 m volcanic rock including 50 m weathered quartz monzonite; groundwater problems near the ground surface at portal area | Chappell & Tonge (1975; 1976), Twist & Tonge (1979), Cochrane (1984) |
| Route 5 – Kai Tak Tunnel (dual 2-lane) | 1982 | 1.25 km | 27.7 m x 14.6 m reinforced concrete box sections | Cut & cover | Reclaimed land, with old seawall, groundwater level similar to tide level in the harbour | Tunnels & Tunnelling (1972) |
| Route 2 – Eastern Harbour Crossing Tunnel (the only cross-harbour tunnel with road and rail, dual 2-lane road, 2 MTR tracks) (first concrete immersed tube tunnel in HK) | 1989 | 2.25 km (1.86 km of immersed tube tunnel (15 nos of segments) and 0.39 km of cut & cover approach tunnels) | 35.45 m x 9.75 m high box sections | Immersed tube (concrete) | Tunnel sections on alluvial deposits or sand fill within a dredged trench in the seabed | Matson (1987), Taylor (1990), Yang et al (2006) |
| Route 7 – Tseung Kwan O Tunnel (formerly known as Junk Bay Tunnel, dual 2-lane) | 1990 | 0.9 km (twin tunnels) | 10.85 m span x 7.59 m high horseshoe shaped twin tube | 700 m drill & blast, 200 m cut & cover | Strong to very strong volcanic tuff with close to widely spaced joint, water head to tunnel 30-60 m | Matson (1984), Matson & Robinson (1984) |

| Project Title | Year of Completion | Length Details | Cross Section Details | Method of Construction | Geology and Groundwater | References |
|---|--------------------|---|--|---|--|---|
| Route 9 – Shing Mun Tunnel (dual 2-lane) | 1990 | 2.6 km (twin tunnels) | 10 m span x 7.8 m high oval shaped | Drill & blast | Grades I-V fine- to coarse-grained granite | Highways Department (1987), Bergfors & Coates (1990), Larkin (1990), Torpey & Larkin (1990), Torpey & Hawley (1991) |
| Route 2 – Tate's Cairn Tunnel (dual 2-lane, the longest twin tube road tunnel in HK) | 1991 | 4 km tunnel (0.54 km & 0.38 km north & south ventilation adits respectively) (twin tunnels) | 11 m span x 8.5 m high horseshoe shaped twin tube tunnel | Drill & blast | Medium- to coarse-grained granite, intrusive feldspar porphyries with faults, generally none to minor water inflow, cumulative flow at portals of about 480 l/min. | Martin (1989), World Tunnelling (1989), Matson & Porter (1990), McFeat-Smith et al (1999) |
| Airport Authority Hong Kong Vehicular Tunnels | 1996 | 0.7 km for east tunnel and 0.7 km for west tunnel | Rectangular triple tube tunnel (two tubes for vehicles, one for utilities), overall dimensions 25-26 m wide x 8 m high | Cut & cover, cast in situ reinforced concrete, tunnel crown at approximately 2.5 m below ground level. | Reclaimed land comprising mainly fill of granitic origin, some areas in rockfill, groundwater at about 5 m below ground level | |
| Route 3 – Cheung Tsing Tunnel (formerly known as Cheung Ching Tunnel, the first dual 3-lane highway tunnel in HK) | 1997 | 1.6 km (twin tunnels) | 17 m span x 10 m high horseshoe shaped twin tube tunnel and rectangular cut & cover end sections | 1.5 km twin tube tunnel by drill & blast (<i>first time full-face blasting for a 3-lane road tunnel in HK</i>), with two end sections of cut & cover reinforced concrete tunnel at both portals | Approx. 300 m of grade II volcanics near the west portal, medium- to fine-grained grades I-IV granite for the remaining bore, with no or minor water inflow | Tunnels & Tunnelling (1994), Wong (1994), McFeat-Smith (1996), McFeat-Smith et al (1999) |
| Route 3 – Western Harbour Crossing Tunnel (dual 3-lane) | 1997 | 1.95 km comprising 1.34 km immersed tube tunnel (12 nos of segments) and 0.61 km cut & cover approach tunnels | 33.4 m x 8.02 m high box sections | Immersed tube (concrete) | Tunnel sections on alluvial deposits or sand fill within a dredged trench in the seabed | Silva et al (1998), Yang et al (2006) |
| Route 3 Country Park Section – Tai Lam Tunnel (dual 3-lane) | 1998 | 3.8 km tunnel (0.9 km ventilation adits) (twin tunnels) | 15.2 m span x 10.4 m high twin tube tunnel, 14.1 m span x 9.9 m high adits | Drill & blast, computer-controlled drilling jumbos used for the first time in HK (Central Diaphragm Wall Method for soft ground excavation at north portal), only limited groundwater control carried out | Grades I-IV fine-grained granite (50m grade V granite at north portal), encountered 20m faults (Ho Pui Reservoir Fault and Sham Tseng Fault) with highest water inflow of 400 l/min. | Endicott et al (2000), Sjostrom (2004), GEO (2007) |

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|---|---------------------------|---|--|---|---|--|
| Discovery Bay Tunnel (privately developed and operated) | 2000 | 0.6 km | 14 m span x 10 m high | Drill & blast | Granite | |
| Ma On Shan Underpass (Trunk Road T7 Project) | 2004 | 0.2 km (twin tunnels) | 12 m/16 m span x 10 m high | Drill & blast | Weak, altered and metamorphosed mudstone/siltstone, grades 1-III granite, natural stream courses above tunnel | Yang et al (2003), Ho & Li (2006) |
| Route 8 – Eagle’s Nest Tunnel (dual 3-lane) | 2007 | 2.1 km (twin tunnels) | 17 m/19 m span x 11m high | Drill & blast | Grades I-V granite, rhyolite dykes | Green et al (2006), Leung et al (2006), Lo & Cheuk (2006) |
| Route 8 – Sha Tin Heights Tunnel (dual 3-lane) | 2007 | 0.9 km (twin tunnels) | 17 m widened to 19 m x 11 m high horseshoe-shaped tunnel | Drill & blast | Granite, with occasional basalt dykes | Murfitt & Siu (2006a & b), Murfitt et al (2006a & b), GEO (2007) |
| Route 8 – Nam Wan Tunnel (dual 3-lane) | 2007 | 1.25 km (twin tunnels) | 16 m span x 10 m high | Drill & blast | Grades I-V granite, grades I-IV rhyolite | |
| Central-Wan Chai Bypass and Island Eastern Corridor Link | Construction in progress* | 3.7 km (single tunnel) | 45m span x 14m high | Cut and cover with pipe piles wall and diaphragm wall | Mainly granite, groundwater level similar to tide level in the harbour | |
| Hong Kong-Zhuhai-Macao Bridge (HZMB) - Hong Kong Link Road | Construction in progress* | 1.2 km (twin tunnels) | 20 m span x 13 m high (16 m span x 10 m high) | Sub-horizontal pipe piles, Cut and cover and Non-blasting method (e.g. mechanical excavation) | Fine to medium-grained granite | Quanke et al (2011), Olsen et al (2011) |
| Tuen Mun - Chek Lap Kok Link | Construction in progress* | 4.81 km (bored tunnels) 0.67km (cut and cover) | 12.4 m - 15.6 m dia. | TBM tunnelling Cut and cover | Subsea tunnel through marine clay, alluvium, CDG and M/SDG | |
| Liantang / Heung Yuen Wai Cross-boundary Check Point and Associated Connecting Roads in Hong Kong | Construction in progress* | 2 twin tunnels namely Lung Shan and Cheung Shan tunnels with total length of about 5.6 km | 14 m & 17 m dia. | EPB TBM (14 m dia.) and Drill & blast (17 m dia.) | Volcanic rock, Groundwater table at various depths | |

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| Table 2 : Railway Tunnels (including associated underground facilities) – MTRC (including ex-KCRC) Tunnels | | | | | | |
| KCR Beacon Hill Tunnel (First) (single lane tunnel of standard gauge) | 1910 | 2.2 km | 5.2 m int. width x 5.8 m high above rail level horseshoe shaped | Drill & blast, using gelatine and electric fuse firing, brick lining (portals and lining 30 m from the face at either end were built of granite in ashlar work), up to 427 m below ground surface | Granite, quartz felsite, felsite and diorite, water inflow up to 2,700 l/min. | Eves (1908, 1911) |
| Modified Initial System Tunnels MTRC Contract 103: Cross-Harbour Tunnel | 1980 | 1.4 km | Immersed tube | Immersed tube | Fill, marine deposits, alluvium, grades I-V granite, with corestone | Yang et al (2006) |
| Modified Initial System Tunnels MTRC Contract 106: Central & Admiralty | 1980 | 0.8 km | - | Cut & cover stations using diaphragm walling | Fill, marine deposits, alluvium, grades I-V granite, with corestone | Haswell & Umney (1978), Edwards et al (1980) |
| Modified Initial System Tunnels MTRC Contract 107: Mong Kok to Yau Ma Tei & Prince Edward to Mong Kok | 1980 | 0.8 km | 4.9-5.0 m ID SGI & PCC, 11.6m crossover chambers | Bored tunnels under compressed air with precast concrete segmental lining | Fill, marine deposits, alluvium, grades I-V granite, with corestone | Endicott (1980), Haswell et al (1980), McIntosh et al (1980) |
| Modified Initial System Tunnels MTRC Contract 108: Yau Ma Tei to Jordan & Jordon to TST | 1980 | 1.2 km | 4.9-5.0 m ID SGI & PCC, 11.6 m crossover chambers | – bored tunnels – bored tunnels under compressed air with precast concrete segmental and in situ lining | Fill, marine deposits, alluvium, grades I-V granite, with corestone | Endicott (1980), Haswell et al (1980), McIntosh et al (1980) |
| Modified Initial System Tunnels MTRC Contract 109: Central to Admiralty and connections to Immersed tube at each side of harbour | 1980 | 1.0 km | 4.9-5.0 m ID SGI & PCC, 11.6 m crossover chambers | – cut & cover – bored tunnels – bored tunnels under compressed air with precast concrete segmental and in situ lining | Fill, marine deposits, alluvium, grades I-V granite, with corestone | Endicott (1980), Haswell et al (1980), McIntosh et al (1980) |

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|---|--------------------|----------------|---|---|--|--|
| Modified Initial System Tunnels MTRC Contract 101: Prince Edward to Yau Ma Tei | 1980 | 1.4 km | 4.9-5.0 m ID SGI & PCC, 11.6 m crossover chambers | Cut & cover stations using: secant piling, sheet piling, packed-in-place piling | Fill, marine deposits, alluvium, grades I-V granite, with corestones | Haswell & Umney (1978), Edwards et al (1980), Endicott (1980), Haswell et al (1980), McIntosh et al (1980) |
| Modified Initial System Tunnels MTRC Contract 102: Jordon & TST | 1980 | 0.6 km | - | Cut & cover stations using packed-in-place piles | Fill, marine deposits, alluvium, grades I-V granite, with corestones | Haswell & Umney (1978), Edwards et al (1980), Endicott (1980), Haswell et al (1980), McIntosh et al (1980) |
| Modified Initial System Tunnels MTRC Contract 201: Lok Fu to Wong Tai Sin an Wong Tai Sin to Diamond Hill | 1980 | 1.5 km | 4.9-5.0 m ID SGI & PCC, 11.6 m crossover chambers | Bored tunnels in free and compressed air with precast concrete lining. Station by cut & cover using soldier piles | Fill, marine deposits, alluvium, grades I-V granite, with corestone | Haswell & Umney (1978), Edwards et al (1980), Endicott (1980), Haswell et al (1980), McIntosh et al (1980) |
| Modified Initial System Tunnels Contract 202: Prince Edward to Shek Kip Mei | 1980 | 0.7 km | 4.9-5.0 m ID SGI & PCC, 11.6 m crossover chambers | Cut & cover tunnels plus bored tunnels with precast and in situ concrete lining. Station by cut & cover using soldier piles | Fill, marine deposits, alluvium, grades I-V granite, with corestone | Haswell & Umney (1978), Edwards et al (1980), Endicott (1980), Haswell et al (1980), McIntosh et al (1980) |
| Modified Initial System Tunnels MTRC Contract 203: Shek Kip Mei to Kowloon Tong and Kowloon Tong to Lok Fu | 1980 | 1.7 km | 4.9-5.0 m ID SGI & PCC, 11.6 m crossover chambers | Bored tunnel with in situ concrete lining | Fill, marine deposits, alluvium, grades I-V granite, with corestone | Haswell & Umney (1978), Edwards et al (1980), Endicott (1980), Haswell et al (1980), McIntosh et al (1980) |
| Modified Initial System Tunnels MTRC Contract 205: Kowloon Tong | 1980 | 0.3 km | Station box | Station by cut & cover using diaphragm walling and soldier piles | Fill, marine deposits, alluvium, grades I-V granite, with corestone | Haswell & Umney (1978), Edwards et al (1980), Endicott (1980), Haswell et al (1980), McIntosh et al (1980) |
| Modified Initial System Tunnels MTRC Contract 206: Choi Hung | 1980 | 0.4 km | Station box | Station by cut & cover using king piles | Fill, marine deposits, alluvium, grades I-V granite, with corestone | Haswell & Umney (1978), Edwards et al (1980), Endicott (1980), Haswell et al (1980), McIntosh et al (1980) |
| Modified Initial System Tunnels MTRC Contract 207: Diamond Hill | 1980 | 0.3 km | Station box | Station by cut & cover using king piles | Fill, marine deposits, alluvium, grades I-V granite, with corestone | Haswell & Umney (1978), Edwards et al (1980), Endicott (1980), Haswell et al (1980), McIntosh et al (1980) |

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|---|--------------------|----------------|---|---|--|--|
| Modified Initial System Tunnels MTRC Contract 208: Choi Hung to Kowloon Bay | 1980 | 0.7 km | 4.9-5.0 m ID SGI & PCC, 11.6 m crossover chambers | Bored tunnels with SGI and in situ lining | Fill, marine deposits, alluvium, grades I-V granite, with corestone | Haswell & Umney (1978), Edwards et al (1980), Endicott (1980), Haswell et al (1980), McIntosh et al (1980) |
| Modified Initial System Tunnels MTRC Contract 209: Diamond Hill to Choi Hung | 1980 | 0.7 km | 4.9-5.9 m ID SGI and in situ | Cut & cover tunnel with sheet piles | Fill, marine deposits, alluvium, grades I-V granite, with corestone | Haswell & Umney (1978), Edwards et al (1980), Endicott (1980), Haswell et al (1980), McIntosh et al (1980) |
| KCR Beacon Hill Tunnel (Second) (30-40m to the side of the first KCR Beacon Hill Tunnel) | 1981 | 2.3 km | 11.1 m span x 9.0 m high horseshoe shaped | Drill & blast, pilot method adopted (two side pilot tunnels of 3 m x 4 m were excavated, and fitted with steel arches and reinforced concrete walls up to 300-500 mm thick which later became part of the lining)Messer Method used to place steel ribs (being jacked forward in stages in soft ground at the faces before excavation), rock bolts used extensively | As above,with fractured zones and water inflow in places | Parrott (1980) |
| Tsuen Wan Extension Tunnels MTRC Contract 301: Prince Edward to Cheung Sha Wan | 1982 | 1.7 km | 5.1-6.4 m ID SGI & PCC, 11.6 m crossover chambers | Tunnels: bored under compressed air with SGI and precast concrete segments hand-excavated within open shield, cut & cover. Underground stations using cut & cover via: pack-in-piling, diaphragm walling, sheet piling, secant piling | Fill, marine deposits, alluvium, grades I-V granite, with corestones | Cater et al (1984) MTRC as-built drawings |
| Tsuen Wan Extension Tunnels MTRC Contract 302: Cheung Sha Wan to Mei Foo | 1982 | 2.1 km | 5.1-6.4 m ID SGI & PCC, 11.6 m crossover chambers | Tunnels: bored under compressed air with SGI and precast concrete segments hand-excavated within open shield, cut & cover. Underground stations using cut & cover via: pack-in-piling, diaphragm walling, sheet piling, secant piling | Fill, marine deposits, alluvium, grades I-V granite, with corestones | Cater et al (1984) MTRC as-built drawings |

| Project Title | Year of Completion | Length Details | Cross Section Details | Method of Construction | Geology and Groundwater | References |
|---|--------------------|----------------|---|--|--|---|
| Tsuen Wan Extension Tunnels MTRC Contract 303: Mei Foo to Lai King | 1982 | 1.4 km | 5.1-6.4 m ID SGI & PCC, 11.6 m crossover chambers | Tunnels: bored under compressed air with SGI and precast concrete segments hand-excavated within open shield, cut & cover. Underground stations using cut & cover via: pack-in-piling, diaphragm walling, sheet piling, secant piling | Fill, marine deposits, alluvium, grades I-V granite, with corestones | Cater et al (1984) MTRC as-built drawings |
| Tsuen Wan Extension Tunnels MTRC Contract 305: Kwai Hing to Tsuen Wan | 1982 | 1.6 km | 5.1-6.4 m ID SGI & PCC, 11.6 m crossover chambers | Tunnels: bored under compressed air with SGI and precast concrete segments hand-excavated within open shield, cut & cover. Underground stations using cut & cover via: pack-in-piling, diaphragm walling, sheet piling, secant piling | Fill, marine deposits, alluvium, grades I-V granite, with corestones | Cater et al (1984) MTRC as-built drawings |
| Tsuen Wan Extension Tunnels MTRC Contract 307 & 308: Tsuen Wan and Tsuen Wan Depot | 1982 | 0.3 km | 5.1-6.4 m ID SGI & PCC, 11.6 m crossover chambers | Tunnels: bored under compressed air with SGI and precast concrete segments hand-excavated within open shield, cut & cover. Underground stations using cut & cover via: pack-in-piling, diaphragm walling, sheet piling, secant piling | Fill, marine deposits, alluvium, grades I-V granite, with corestones | Cater et al (1984) MTRC as-built drawings |
| Island Line Tunnels Contract 401: Sheung Wan | 1986 | 0.04 km | | Cut & cover using diaphragm walling | Fill, marine deposits, alluvium, grades I-IV granite, with corestones, below old jetties and seawalls, near to many old buildings on timber piles (in one contract it was necessary to remove lower ends of piles) | Caiden et al (1986), Thorley et al (1986), Sharp et al (1986), GEO (2007) |

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|--|--------------------|----------------|------------------------|--|--|---|
| Island Line Tunnels Contract 402: Sheung Wan & overrun tunnels | 1986 | 0.8 km | 5.3-8.9 m ID SGI & PCC | Tunnels: bored tunnel using compressed air, Station: diaphragm walling | Fill, marine deposits, alluvium, grades I-IV granite, with corestones, below old jetties and seawalls, near to many old buildings on timber piles (in one contract it was necessary to remove lower ends of piles) | Caiden et al (1986), Thorley et al (1986), Sharp et al (1986), GEO (2007) |
| Island Line Tunnels Contract 403: Sheung Wan to Admiralty | 1986 | 1.3 km | 5.3-7.6 m ID SGI & PCC | Tunnels: bored tunnel using compressed air using segmental lining, Station: diaphragm walling | Fill, marine deposits, alluvium, grades I-IV granite, with corestones, below old jetties and seawalls, near to many old buildings on timber piles (in one contract it was necessary to remove lower ends of piles) | Caiden et al (1986), Thorley et al (1986), Sharp et al (1986), GEO (2007) |
| Island Line Tunnels Contract 404: Admiralty to Causeway Bay | 1986 | 2 km | 5.1-7.6 m ID SGI & PCC | Tunnels: bored tunnel using compressed air using segmental lining, Station: diaphragm walling | Fill, marine deposits, alluvium, grades I-IV granite, with corestones, below old jetties and seawalls, near to many old buildings on timber piles (in one contract it was necessary to remove lower ends of piles) | Caiden et al (1986), Thorley et al (1986), Sharp et al (1986), GEO (2007) |
| Island Line Tunnels Contract 405: Causeway Bay to Tin Hau | 1986 | 2 km | 5.3-7.6 m ID SGI & PCC | Tunnels: bored tunnel using compressed air using segmental and cast in situ lining, Station: diaphragm and caisson walling | Fill, marine deposits, alluvium, grades I-IV granite, with corestones, below old jetties and seawalls, near to many old buildings on timber piles (in one contract it was necessary to remove lower ends of piles) | Caiden et al (1986), Thorley et al (1986), Sharp et al (1986), GEO (2007) |
| Island Line Tunnels Contract 406: Tin Hau to North Point | 1986 | 1.3 km | 5.1-7.6 m ID in situ | Tunnels: bored tunnel and cast in situ lining, Station: bored tunnel | Fill, marine deposits, alluvium, grades I-IV granite, with corestones, below old jetties and seawalls, near to many old buildings on timber piles (in one contract it was necessary to remove lower ends of piles) | Caiden et al (1986), Thorley et al (1986), Sharp et al (1986), GEO (2007) |

| Project Title | Year of Completion | Length Details | Cross Section Details | Method of Construction | Geology and Groundwater | References |
|---|--------------------|----------------|---|---|--|---|
| Island Line Tunnels Contract 407: North Point to Tai Koo | 1986 | 1.8 km | 5.1-7.6 m ID in situ | Tunnels: bored tunnel and cast in situ lining, Station: cut & cover & bored | Fill, marine deposits, alluvium, grades I-IV granite, with corestones, below old jetties and seawalls, near to many old buildings on timber piles (in one contract it was necessary to remove lower ends of piles) | Caiden et al (1986), Thorley et al (1986), Sharp et al (1986), GEO (2007) |
| Island Line Tunnels Contract 408: Tai Koo to Sai Wan Ho | 1986 | 0.9 km | 5.1-7.6 m ID in situ | Tunnels: bored tunnel and cast in situ lining, Station: bored cavern | Fill, marine deposits, alluvium, grades I-IV granite, with corestones, below old jetties and seawalls, near to many old buildings on timber piles (in one contract it was necessary to remove lower ends of piles) | Caiden et al (1986), Thorley et al (1986), Sharp et al (1986), GEO (2007) |
| Island Line Tunnels Contract 409: Sai Wan Ho to Shau Kei Wan | 1986 | 0.5 km | 5.1-7.6 m ID in situ | Cut & cover using bored piles and hand-dug caissons | Fill, marine deposits, alluvium, grades I-IV granite, with corestones, below old jetties and seawalls, near to many old buildings on timber piles (in one contract it was necessary to remove lower ends of piles) | Caiden et al (1986), Thorley et al (1986), Sharp et al (1986), GEO (2007) |
| Island Line Tunnels Contract 410: Shau Kei Wan to Heng Fa Chuen | 1986 | 0.8 km | 5.1-7.6 m ID in situ | Tunnels: bored tunnel and cast in situ lining | Fill, marine deposits, alluvium, grades I-IV granite, with corestones, below old jetties and seawalls, near to many old buildings on timber piles (in one contract it was necessary to remove lower ends of piles) | Caiden et al (1986), Thorley et al (1986), Sharp et al (1986), GEO (2007) |
| Island Line Tunnels Contract 414: Sai Wan Ho to Shau Kei Wan | 1986 | 1.0 km | 5.1-7.6 m ID in situ | Tunnels: bored tunnel and cast in situ lining, Station: diaphragm walling | Fill, marine deposits, alluvium, grades I-IV granite, with corestones, below old jetties and seawalls, near to many old buildings on timber piles (in one contract it was necessary to remove lower ends of piles) | Caiden et al (1986), Thorley et al (1986), Sharp et al (1986), GEO (2007) |
| Island Line Tunnels Eastern Harbour Crossing & Approach Tunnels (Contracts C1, C2 & C3) | 1989 | 3.6 km | 5.1-7.6 m ID arch rail / road immersed tube | Drill & blast, Immersed tube | | Yang et al (2006) |

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|--|--------------------|----------------|--|--|--|--|
| Island Line Tunnels Queensway Tunnel (Admiralty to Pacific Place) | 1990 | 53 m | 8.3 m dia. horseshoe shaped | Drill & blast section from south sides and north side of Queensway via shafts sunk on footpath. Ribs and laggings main form of support together with shotcreteing and spot bolting | | |
| Island Line Tunnels Quarry Bay Improvement Works | 1997 | Not available | | Robbins vertical raise-borer and hand-excavation for passenger adits and staircases and chemical expansion grouts | Grades I-II granite | Law & Keller (1999) |
| Lantau and Airport Railway Tunnels Contract No. 508: Lai King Tunnels | 1998 | 0.9 km | 5.4 m int. width horseshoe shaped, 10-12 m wide x 6 m high box structure, 12.4 m wide x 7.7 m high | Drill & blast, cast in situ lining, Cut & cover | Grades I-IV granite, rhyolite, tuff | Hardingham et al (1998), Morris et al (1992) |
| Lantau and Airport Railway Tunnels Contract No. 512: Tsing Yi Tunnels | 1998 | 1.66 km | Horseshoe | Drill & blast, shotcrete with rockbolts and steel arches and cast in situ lining | Grades I-IV volcanic rock with granodiorite dyke | Züblin (2007) |
| Lantau and Airport Railway Tunnels Contract No. 514: East Lantau Tunnels | 1998 | 1.0 km | Horseshoe | Drill & blast, shotcrete with rockbolts and steel arches and cast in situ lining | Grades I-IV granite, rhyolite, tuff | |
| Lantau and Airport Railway Tunnels Contract No. 501A: Central Subway | 1998 | 265 m | 90 m ² box section | Pedestrian cut & cover tunnels | Reclaimed land | Atkins (2007), Bayliss (1998) |
| Lantau and Airport Railway Tunnels Contract No. 502: Immersed Tube | 1998 | 1.3 km | 125 m x 12 m x 8 m | Twin bore immersed tube | | Yang et al (2006) |
| Lantau and Airport Railway Tunnels Contract No. 503B & 504: Cut & cover sections | 1998 | 500 m; 950 m | | 4 cellular cut & cover cast in situ box tunnel | Reclaimed land | |

| Project Title | Year of Completion | Length Details | Cross Section Details | Method of Construction | Geology and Groundwater | References |
|---|--------------------|---|---|---|--|--|
| Quarry Bay Congestion Relief Tunnels | 2001 | Two 2.2 km twin running tunnels, two 0.3 km platform tunnels, cross-over cavern and 70m deep shafts | 6.2 m dia. running tunnels, 10 m span platform tunnels, 20 m span crossover cavern at Fortress Hill | Two hard rock Robbins TBMs, drill & blast for platform, crossover and niches and hand-excavation for passenger adits and turnout chamber. Shotcrete and rock bolts, chemical expansion grouts and non-explosive method (Sunburst, which involves use of small cartridges containing explosives and gas) for splitting the rock at vibration-sensitive areas | Grades I-III granite | Tam (1998), Cooper et al (2001), Tam (2001), Yang et al (2005), GEO (2007) |
| Tseung Kwan O Extension – Black Hill Tunnels | 2002 | 8.0 km | 6.3 m dia. | Drill & blast, shotcrete, steel ribs to support weak zones, unreinforced cast in situ lining 250 mm thick min., small sections of cut & cover (four single lane tunnels, from Yau Tong to Tiu Keng Leng) | Granite, some volcanic tuff, maximum depth of 180 m below ground level | Tunnels & Tunnelling International (1999; 2002) |
| Tseung Kwan O Extension – Pak Shing Kok Tunnels | 2002 | 6.4 km | 6.3 m dia. Tunnels, 23 m span x 10 m high cavern | Drill & blast, shotcrete, steel ribs, rockbolts, unreinforced cast in situ lining 250 mm thick min. | Strong volcanic tuff, highly fractured, low rock cover at fault zone, with highest water head above tunnel of 30 m | Tunnels & Tunnelling International (1999), Lo et al (2001a), GEO (2007) |
| Tseung Kwan O Extension – Lam Tin to Eastern Harbour Crossing Tunnels | 2002 | 1.2 km | 6.3 m dia. | Drill & blast, Cut & cover for approach tunnels | Granite, Fill, marine clay, alluvium grades III-V tuff, 30 m from seawall in marine clay | Ho et al (2001), Pan et al (2001), Hill et al (2002), Wightman & Cheung (2002) |

| Project Title | Year of Completion | Length Details | Cross Section Details | Method of Construction | Geology and Groundwater | References |
|---|--------------------|--------------------------|---|--|---|--|
| West Rail Tunnels (ex-KCRC) Tai Lam Tunnel (single tube, twin/triple track tunnel with centre partition wall) | 2003 | (a) 5.5 km; (b) 0.36 km | (a) 14-19 m wide x 9-11 m high horseshoe shaped; (b) 14.5 m x 8.8 m twin cell box | Drill & blast, dowels and sprayed concrete temporary support, probing ahead when approaching the faults and pre-grouting, permanent unreinforced concrete lining predominantly 300-500 mm thick, with waterproofing membrane, incorporating drainage measures to collect and drain groundwater. Crushers together with a conveyor belt, which advanced with the blast face was used for mucking out – first of its kind in the world to have such a long (up to 3.5 km) conveyor belt system. Cut & cover at portals | Volcanic tuff, intrusive granite, granodiorite, dacite, basalt dyke, rhyolite dyke, two major fault zones 1-8 m wide (Ho Pui Reservoir Fault and Sham Tseng Fault) with water inflow from probe holes of 240-400 l/min. at fault zone | Lo et al (2001b), Gould et al (2002), GEO (2007) |
| West Rail Tunnels (ex-KCRC) Kwai Tsing Tunnels (Tsing Tsuen Tunnel) | 2003 | 3.6 km | 8.75 m dia. twin tube tunnel | 1.8 km EPB TBM (first use of open & closed compressed air mode EPB TBM in HK), 120 m cut & cover | Residual soils, marine deposits, alluvium and reclamation fill | |
| West Rail Tunnels (ex-KCRC) (Ha Kwai Chung Tunnel) | 2003 | 1.7 km | 13 m wide x 9 m high | 1.7 km drill & blast, up to 180 m below ground surface | Loose marine sands/soft marine clays, granular alluvial deposits, granodiorite, granite with intrusions of rhyolite, basalt and quartz monzonite | Stenning et al (2001) |
| Disneyland Resort Line (Tai Yam Teng Tunnels) | 2004 | (a) 0.12 km; (b) 0.75 km | (a) 6.6 m x 6.1 m box section; (b) 6.1 m span x 6 m high horseshoe shaped | (a) Cut & cover; (b) Drill & blast | Grades I-III porphyritic rhyolite, grades I-IV granite, grades I-IV volcanic tuff | Salisbury et al (2006) |

| Project Title | Year of Completion | Length Details | Cross Section Details | Method of Construction | Geology and Groundwater | References |
|--|--------------------|----------------------|---|--|--|--|
| West Rail Tunnels (ex-KCRC) Tsim Sha Tsui Extension Tunnels (ex-KCRC), Signal Hill Tunnel (pedestrian subway) | 2005 | 1 km | 12 m wide x 9.5 m high | Cut & cover with pipe pile wall supported by struts, working less than 0.5 m above Cross Harbour Tunnel, tunnel runs parallel to and just 10 m from Victoria Harbour at 18 m deep at the closet location. | Fill, marine deposits, alluvial deposits, grades I-V granite | Ng et al (2004) |
| West Rail Tunnels (ex-KCRC) Signal Hill Tunnel (pedestrian subway) | 2005 | 945 m | 8.8 m wide x 6-8.5 m high horseshoe shaped | 843 m cut & cover and 102 m drill & blast | Fill, marine deposits, alluvial deposits, grades I-V granite | Ng et al (2004) |
| West Rail Tunnels (ex-KCRC) Lok Ma Chau Spurline Tunnels (ex-KCRC) | 2007 | (a) 3.2 km; (b) 2 km | (a) 8.75 m dia. twin tube tunnel; (b) 20 m wide x 10 m high | (a) Mixshield EPB TBM; (b) Cut & cover, (Ground freezing used for the construction of 5 m span cross passages below Long Valley) | Superficial deposits, grades I-V tuff, Fill, alluvial deposits, grade V tuff, with groundwater at 2-3 m below ground level | Storry et al (2006a), Storry et al (2006b), Martin, O. et al (2005a, b). |
| West Rail Tunnels (ex-KCRC) Queensway Subway | 2007 | 0.35 km | 7.15 m span widened to 17 m span x 11 m high (in rock) | Drill & blast, probing ahead and pre-grouting for groundwater control as required (generally single-stage grouting with micro-fine cement); shotcrete, lattice girders, pre-support canopy and face reinforcement as temporary support for weak zones (mined in free air). Permanent cast in situ concrete or shotcrete lining | Grades II-V granite, groundwater at about 10 m above tunnel crown level | Desaintpaul & Askew (2006) |
| Kowloon Southern Link (ex-KCRC) KDC 200 (Jordon Road via Canton Road to Salisbury Road) | 2008 | 1.2 km | 8 m dia. twin tube | Mixshield slurry TBM | Superficial deposits, grades I-V granite with groundwater at about +2.5 mPD | Lee et al (2008), Wong et al (2008), Frew et al (2009), Tam & Howley (2009), Taylor (2009) |
| Kowloon Southern Link (ex-KCRC) KDB 300 (Jordon Road to Yau Ma Tei ventilation building) | 2008 | 0.85 km | 12.8 m wide x 8.5 m high reinforced concrete box, excavation to approx. -15 mPD | Cut and cover | | Lee et al (2008), Wong et al (2008), Frew et al (2009), Tam & Howley (2009), Taylor (2009) |

| Project Title | Year of Completion | Length Details | Cross Section Details | Method of Construction | Geology and Groundwater | References |
|--|---------------------------|---|--|--|---|--|
| Kowloon Southern Link (ex-KCRC) KDB 400 (Yau Ma Tei ventilation building to Nam Cheong overrun tunnel) | 2008 | 1.06 km | 12.8 m wide x 8.5 m high reinforced concrete box, excavation to approx. - 15 mPD | Cut and cover | | Lee et al (2008), Wong et al (2008), Frew et al (2009), Tam & Howley (2009), Taylor (2009) |
| West Island Line | 2014 | 3.3 km, plus 3 stations (2 caverns and passenger/ ventilation adits networking) | 6.5 m span (tunnels); 5.5 m - 8 m span (adits); and 22 m span (caverns) | Drill and blast, cut & cover station, Mined tunnelling with pre-support canopy, steel ribs and lattice girders and ground freezing | Fill, marine deposits, alluvium, colluvium, Granite and Tuffs, corestones; water inflows in places through fracture zones | Ground Engineering (2011), New Civil Engineering International (2011), Bolton (2011a), Bolton (2011c), Polycarpe et al (2012), Tsang et al (2012), Baribault et al (2012), Hamill et al (2013), Shimizu et al (2014) |
| South Island Line (East) | Construction in progress* | 4.9 km tunnel | 12 m - 19 m span, 6.5 m - 12 m span (tunnels) and 22 m span (cavern) | Drill and blast; cut & cover station, underpinning with temporary rock pillars; mined tunnelling with pre-support canopy, steel ribs and lattice girders | Granite and volcanic tuff with localized Monzonite. The alignment intersects a number of fault zones | Tam (2012a), Bolton (2011a), Steele & Mackay (2013), Steele et al (2013) |
| Kwun Tong Line Extension | Construction in progress* | 2.6 km | 5.2 m - 14.2 m span (tunnels) and 20.2 m (cavern) | Drill and blast, cut and cover and Mined tunnelling | Granitic rock, groundwater table at various depths | |
| Express Rail Link: Guangzhou-Shenzhen-Hong Kong | Construction in progress* | 26.0 km (Hong Kong section) | 8.7 m - 9 m dia. twin tunnels and 30 m cut and cover section | Drill & blast, cut and cover, Slurry TBM and EPB TBM tunnelling | Soft ground, mixed ground and hard rock with different weathering grades; fault zone encountered; groundwater table at various depths | Bolton (2011a), Bolton (2011b), Chan & Li (2012), So et al (2013a), So et al (2013b), Koungelis & Lyall (2013), Leung et al (2013), Pollak et al (2013) |
| Shatin To Central Link | Construction in progress* | 17 km (Tai Wai to Hung Hom section – 11 km, Cross Harbour section – 6 km) | 6-7 m span for Tai Wai to Hung Hom, and 7-8 m span for Cross Harbour | Drill and blast, cut and cover, TBM and Mined tunnelling. Cross Harbour tunnel to be immersed tube | Fill, marine deposits, alluvium and Grades II-V granite | Bolton (2011a), Bolton (2011d) |

| Project Title | Year of Completion | Length Details | Cross Section Details | Method of Construction | Geology and Groundwater | References |
|--|--------------------|----------------|-----------------------|---|-------------------------|---|
| Table 3 :Water Supply Tunnels | | | | | | |
| Pok Fu Lam Tunnel | 1877 | 0.08 km | 1.5 m dia. | | | |
| Tai Tam Tunnel (Tai Tam to Wong Nai Chung) | 1887 | 2.2 km | 1.5 m dia. | Drill & blast (dynamite), unlined | Granite | Surveyor General (1884; 1885), Davis (1963) |
| Shing Mun Tunnels (North Conduit and South Conduit, Shing Mun to Shek Lei Pui) | 1926 | 2.0 km | 2.74 m dia. | Drill & blast, concrete lined or unlined | Granite | Davis (1963), Woodward (1935) |
| Tai Tam Tuk East Tunnel | 1934 | 0.03 km | 4.3 m dia. | | | |
| Mount Parker Lower Catchwater Tunnel | 1934 | 0.17 km | 2.7 m dia. | | | |
| Tai Po Road WTW Raw Water Inlet Pipe Tunnel | 1956 | 0.11 km | 2.34 m dia. | Drill & blast | | |
| Tai Lam Chung Tunnels (Tai Lam Chung to Chai Wan Kok to Tsing Lung Tau) | 1957-1974 | 24.45 km | 1.75-5.35 m dia. | Drill & blast, up to 350 m approx. below ground surface | Granite, granodiorite | Davis (1963) |
| Tai Po Road S/R Outlet Pipe Tunnel | 1958 | 0.26 km | 2.34 m dia. | Drill & blast | | |
| Tunnel for Shek Pik Trunk Main | 1962 | 0.12 km | 2.7 m dia. | | | |
| Shek Pik Scheme Water Tunnels Tunnel A | 1963 | 483 m | 2.4 m dia. | Drill & blast, concrete lined or unlined | Granite, rhyolites | Davis (1963) |

| Project Title | Year of Completion | Length Details | Cross Section Details | Method of Construction | Geology and Groundwater | References |
|---|--------------------|---|--|--|---|--|
| Shek Pik Scheme Water Tunnels Tunnel B | 1963 | 1.24 km | 3.7 m dia. | Drill & blast, concrete lined or unlined | Granite, rhyolites | Davis (1963) |
| Shek Pik Scheme Water Tunnels Tunnel C | 1963 | 1.59 km | 3.7 m & 5.3 m dia.; 3.8 m & 5.3 m dia. | Drill & blast, concrete lined or unlined | Granite, rhyolites | Davis (1963) |
| Shek Pik Scheme Water Tunnels Tunnel D | 1963 | 1.85 km | 1.5 m dia. | Drill & blast, concrete lined or unlined | Granite, rhyolites | Davis (1963) |
| Shek Pik Scheme Water Tunnels Supply Tunnel (1) | 1963 | 7.64 km | 5.2 m dia. | Drill & blast, concrete lined or unlined | Granite, rhyolites | Davis (1963) |
| Shek Pik Scheme Water Tunnels Supply Tunnel (2) | 1963 | 1.45 km | 1.5 m dia. | Drill & blast, concrete lined or unlined | Granite, rhyolites | Davis (1963) |
| Shek Pik Scheme Water Tunnels Diversion Tunnel | 1963 | 559 m | 1.5 m dia. | Drill & blast, concrete lined or unlined | Granite, rhyolites | Davis (1963) |
| Tung Chung Tunnel | 1963 | 7.2 km | 4.0-4.6 m dia. | Drill & blast, concrete lined or unlined | | |
| Plover Clove Stage I Tunnels (Tai Po to Pai Tau Hang) | 1965-1971 | 20.2 km main tunnel, plus branch and access tunnels | 1.75-6.7 m dia. | Drill & blast, concrete lined or unlined | Granite, fine-grained rhyolitic tuff | Davis (1963), Garrod (1966) |
| Plover Clove Stage II Tunnels | 1967 | 18.2 km main tunnel, plus branch and access tunnels | 2.59-9.14 m dia. | Drill & blast, (first reported use of NATM in HK), concrete lined or unlined | Fine-grained rhyolitic tuff, with severe weathering in some areas | Davis (1963), Ford & Elliot (1965) |
| Aberdeen East Catchwater Tunnel | 1969 | 0.12 km | 1.98 m dia. | Drill & blast, concrete lined | | |
| High Island Water Tunnels | 1976 | 40 km, plus 10 shafts | 2.29-4.27 m dia. | Drill & blast, sprayed concrete or steel rib temporary support, unlined, sprayed or cast in situ concrete permanent lining, up to 500 m below ground surface | Granite, rhyolites | Tunnels & Tunnelling (1971), Don et al (1973), Vail et al (1976) |

| Project Title | Year of Completion | Length Details | Cross Section Details | Method of Construction | Geology and Groundwater | References |
|--|--------------------|---|-----------------------|--|--|--|
| Sai Kung Tunnel | 1982 | 0.85 km | 2.5-2.8 m dia. | | | |
| Tai Po Tau to Shatin Aqueduct Tunnel | 1983 | 2.25 km tunnel (in 3 sections) | 2.7-3.3 m dia. | Drill & blast, sprayed concrete or steel rib, and rock bolts as temporary support, steel, sprayed or cast in situ concrete permanent lining or unlined | | |
| Top Hill to Lamb Hill, Ma Mei Ha to Nam Chung Tunnel | 1983 | 5.3 km | 3.3 m dia. | Drill & blast, concrete lined or unlined | | |
| Kornhill Tunnel | 1983 | 0.19 km | 3.0 m dia. | | | |
| Tsing Tam/Yau Kom Tau Tunnel | 1985 | 5.2 km | 2.5-3.45 m dia. | Drill & blast, concrete lined or unlined | | |
| Western Aqueduct Tunnels (Increase of Water Supply from China, Stage I Muk Wu/Au Tau/Tai Lam Chung Aqueduct) | 1986 | 13.8 km | 2.6-3.4 m dia. | Drill & blast, concrete lined, steel lined or unlined | Granites, granodiorites, sedimentary rock, coarse ash tuffs, generally none to moderate water inflows, high inflow in shear zone in volcanic rocks and at fractured zones or open joints connecting the tunnels with a local reservoir | McFeat-Smith (1982), McFeat-Smith et al (1999) |
| Ngau Tam Mei Aqueduct Tunnel | 1986 | 0.39 km | 2.6 m dia. | Drill & blast, steel lined | | |
| Plover Cove Reservoir Harbour Island Raw Water Pumping Station Intake Tunnel | 1987 | 0.775 km intake tunnel, 30 m and 70 m deep shafts | 2.75-3.2 m dia. | Drill & blast | Coarse ash tuff, rhyolites, sandstones, siltstones, quartzite | McMeekan & Yue (1987) |

| Project Title | Year of Completion | Length Details | Cross Section Details | Method of Construction | Geology and Groundwater | References |
|---|--------------------|-------------------------------|-----------------------|---|---|--|
| Tolo Harbour Aqueduct Scheme Plover Cove Sai O to Pak Kong Water Tunnel | 1988 | 5.4 km | 2.7-3.0 m dia. | Drill & blast, sprayed or cast in situ concrete with mesh reinforcement and rock bolts as temporary and permanent support, concrete lined, steel lined or unlined, up to 370 m below ground surface | Similar to above | McMeekan & Yue (1987) |
| Ngau Tam Mei/Tai Po Tau Aqueduct | 1988 | 6.1 km | 2.5-3.1 m dia. | Drill & blast, concrete lined, steel lined or unlined | | |
| Pak Kong/Ho Chung, Ho Chung/Tseung Kwan O Tunnel | 1989 | 6 km | 2.0 m dia. | Drill & blast, steel lined | Granites, volcanics, generally none to minor water inflow, very high initial inflows (3,600 l/min) at granite/volcanic interface reducing to 50% | McFeat-Smith (1998), McFeat-Smith et al (1999) |
| Tai Po Tau No 4 Raw Water Pumping Station Tunnels | 1992 | 0.3 km (4 sections), 2 shafts | 3.6-6.0 m dia. | 160 m of existing 3.6 m dia. tunnel enlarged to up to 6 m dia., concrete lined | | |
| Siu Ho Wan to Silvermine Bay Aqueduct Tunnel | 1996 | 7 km | 2.7-3.56 m dia. | Open TBM, concrete lined, steel lined or unlined | Granite with rhyolite dyke swarm, several zones of initially high water inflows at open joints, with cumulative outflow of 2,400 l/min reducing with time | McFeat Smith et al (1999) |
| Western Aqueduct Supply Tunnel to Siu Ho Wan Treatment Works | 1996 | 0.2 km | 3 m dia. | Drill & blast, concrete lined or steel lined | Under the dam at Tai Lam Chung Reservoir | |

| Project Title | Year of Completion | Length Details | Cross Section Details | Method of Construction | Geology and Groundwater | References |
|--|--------------------|--|--|---|---|--|
| Tai Po to Butterfly Valley Fresh Water Tunnel (Tai Po Treatment Works Raw and Treated Water Aqueducts) | 2001 | 14 km raw water tunnel, treated water tunnel and short tunnels, 2 shafts, 2x107 m (pipe jacking), 1.2 km raw water tunnel, 1.2 km treated water tunnel | 2.7-4.9 m dia 3.1 m dia. 2.7 m dia 3.8 m dia. | Two hard rock TBMs (greatest depth below ground surface in HK – up to 600 m), steel ribs and laggings as temporary support where weak/fractured rock was encountered, difficulties installing permanent lining due to very high water pressures, two pipe jacked mini-tunnels, two drill & blast drives Water main tunnel by pipe jacking; Raw water tunnel – steel rigs and lagging, drill & blast Treated water tunnel – 2 TBMs and drill & blast | Granodiorite, fine ash tuff, tuff-breccia, tuffite, granite, seven major faults and over 20 minor faults, low to moderate inflows in granite, extremely high inflows in volcanics up to 14,940 l/min, water temperature 34-36 °C, high radon levels | McFeat-Smith (1998), World Tunnelling (1999), Arnold (1999), Sjostrom (2004) |
| Butterfly Valley Primary Service Reservoir | 2001 | Outlet: 295m Inlet: 210m | 5.67-9.3m | Mechanical excavation Drill and blast | Granite | |
| Tan Kwai Tseun Tunnel | 2002 | 0.18 km | 2.8 m high x 4.8 m wide | | | |
| Ma Wan Water Main | 2003 | 1.36 km | 0.82 m dia. drillhole, 0.45 m dia. water pipe within 0.61 m dia. steel casing coated with fusion-bonded epoxy coating, with HDPE duct inside | Horizontal directional drilling (HDD) (first use of horizontal directional drilling in hard rock in HK), use of pilot drillholes of 0.33 m and 0.7 m diameter, enlarging to 0.82 m in diameter, 76 m below sea level, 38 m rock cover except in fault zones | Granite, volcanic tuff | Tam (2000), Loneragan & Lukas (2003) |
| Gloucester Road Water Main | 2003 | 0.019 km | 1.0 m dia. with 1.4 m dia. steel sleeve | Open shield pipe jacking with manual excavation | Fill with cobbles and boulders, seawall blocks, marine and alluvial deposits, groundwater about 2.6 m below ground level | Swann et al (2003) |

| Project Title | Year of Completion | Length Details | Cross Section Details | Method of Construction | Geology and Groundwater | References |
|---|--------------------|----------------|-----------------------|---|--|--------------------|
| Underground Service Reservoir behind The University of Hong Kong Proposed Centennial Campus | 2009 | 0.2 km | 8m to 15m | Sub-horizontal pipe piles (for the first 20m access tunnel) and NATM (for the rock caverns) | The caverns were built in metasandstone and granite. Metasandstone: RQD 30-70%; UCS 20 to 65 MPa; locally damp condition and minor inflow were observed Granite: RQD 75-80%; UCS above 20MPa; the rock was dry | Mackay et al(2009) |

| Project Title | Year of Completion | Length Details | Cross Section Details | Method of Construction | Geology and Groundwater | References |
|--|--------------------|---|---|---|--|--|
| Table 4 : Drainage and Sewage Tunnels | | | | | | |
| Seymour Road/Robinson Road Drainage Tunnel (private) | 1975 | 80 m | 1.5 m wide x 2.0 m high horseshoe shaped tunnel | | | |
| Tseung Kwan O Sewer Tunnel | 1986 | 1.82 km | 2.4 m dia. | Drill & blast, shotcrete, dowels, steel sets with laggings, concrete permanent lining | Lapilli tuff, rhyolite, fault, shear zones | |
| Fanling South Trunk Sewer Tunnel | 1989 | 0.37 km | 1.35 m ID (6-14 m below ground level) | Pipe jacked (3 m long 125 mm thick precast reinforced concrete pipes) slurry shield TBM (cutters with tungsten carbide bits), electromagnetic flowmeter for slurry (first sewer tunnel constructed using pipe jacked slurry shield TBM in HK) | Alluvial deposits, grades III-V volcanics with boulders, groundwater up to 7 m above tunnel soffit level | McFeat-Smith & Woods (1990), McFeat-Smith & Herath (1994) |
| NWNT Sewerage Tunnel | 1992 | 9.1 km, (3.1 km 1.8 m dia. marine outfall pipeline) | 3.0 m dia. | Drill & blast, two-boom jumbo, concrete lining (longest tunnel in HK at the time) | Granite, no to minor water inflow | Construction & Contract News (1992), McFeat-Smith et al (1999) |
| East Kowloon Sewer Tunnel | 1993 | 0.1 km | 1.95 m ID (9-11 m below ground) | Pipe jacked slurry shield TBM, with man access to tunnel face through machine chamber for removal of boulders | Fill with boulders, alluvial deposits, groundwater 3 m below ground level | McFeat-Smith (1994), McFeat-Smith & Herath (1994) |

| Project Title | Year of Completion | Length Details | Cross Section Details | Method of Construction | Geology and Groundwater | References |
|--|--------------------|---|---|--|--|---|
| Hong Kong University of Science & Technology Sewerage Tunnel | 1993 | 1.5 km | | Drill & blast | Volcanic rocks, generally none to minor water inflows, but with high inflow (2,800 l/min) at fracture zones, reducing to 50% in one month and by 80% ultimately | McFeat-Smith et al (1999) |
| Stanley Sewerage Treatment Cavern | 1994 | 130 m | 17 m wide x 17 m high | Drill & blast | Massive granite with widely spaced joints and 10 m wide fault zone | Oswell et al (1993), Chan & Ng (2006) |
| Stanley, Tai Tam & Redhill Sewage Tunnel | 1994 | 0.75 km | 1.9 m x 2.1 m high horseshoe shaped | Drill & blast | | |
| Tolo Harbour Effluent Export Scheme Tunnel | 1996 | 7.5 km, 18 m deep shaft at Diamond Hill | 3.56 m dia. (2.5 m ID) | Double shield hard rock TBM (first hard rock TBM drive by HKSAR Government), water proof lining inside precast concrete segmental lining, tunnel crosses about 12 m below Tate's Cairn Tunnel and about 4 m above water supply tunnel from High Island Reservoir, steel lining provided to the latter tunnel | Fine- to coarse-grained granite occasionally intersected by porphyritic rhyolite (100-200 m grades III-V rock), syenite and dolerite dykes, granodiorite, with no to minor water inflow and occasional initial high inflow at fractured zones or open joints cumulating to 2,400 l/min | Morris et al (1992), McFeat-Smith (1998), McFeat-Smith et al (1999) |
| Island West (Mount Davis, SG (1963)) Refuse Transfer Station | 1997 | (a) 66 m; (b)160 m | (a) 28 m wide x 12 m high (tripping hall); (b)12.5 m wide x 7 m high (compactor hall) | Drill & blast | Volcanic tuff of generally, good rock quality with a few fracture zones | Chan & Ng (2006) |

| Project Title | Year of Completion | Length Details | Cross Section Details | Method of Construction | Geology and Groundwater | References |
|---|--------------------|----------------|-----------------------------------|--|--|--|
| Central, Western and Wanchai West Trunk Sewer Tunnels | 2000 | 5.0 km | 1.05-1.8 m dia. (up to 18 m deep) | Pipe jacked slurry shield TBM, free air/compressed air hand shield | Mixed ground in reclaimed area (fill, marine deposits and alluvium, with boulders and armour rock), groundwater about 2-4 m below ground level | Mok (2002) |
| HATS Stage 1 Tunnels (Strategic Sewage Disposal Scheme) | 2001 | 4.8 km | 3.2 m dia. | Tunnel AB: open hard rock TBM | Volcanic tuff, granite, fault | McFeat-Smith et al (1999), Chui & Tai (2001), Grandori et al (2001), McLearie et al (2001), Pakianathan et al (2002), Tai & Ho, (2002), Pakianathan et al (2004), Sjostrom (2004), GEO (2007), Maxwell & Kite (2012) |
| HATS Stage 1 Tunnels (Strategic Sewage Disposal Scheme) | 2001 | 5.3 km | 4.23 m dia. | Tunnel C: open hard rock TBM | Volcanic tuff, granite, rhyolite, fault | McFeat-Smith et al (1999), Chui & Tai (2001), Grandori et al (2001), McLearie et al (2001), Pakianathan et al (2002), Tai & Ho, (2002), Pakianathan et al (2004), Sjostrom (2004), GEO (2007), Maxwell & Kite (2012) |
| HATS Stage 1 Tunnels (Strategic Sewage Disposal Scheme) | 2001 | 3.6 km | 3.4 m dia. | Tunnel D: open hard rock TBM | Granite | McFeat-Smith et al (1999), Chui & Tai (2001), Grandori et al (2001), McLearie et al (2001), Pakianathan et al (2002), Tai & Ho, (2002), Pakianathan et al (2004), Sjostrom (2004), GEO (2007), Maxwell & Kite (2012) |

| Project Title | Year of Completion | Length Details | Cross Section Details | Method of Construction | Geology and Groundwater | References |
|---|--------------------|----------------|-----------------------|------------------------------|---------------------------------|--|
| HATS Stage 1 Tunnels (Strategic Sewage Disposal Scheme) | 2001 | 5.5 km | 4.3 m dia. | Tunnel E: open hard rock TBM | Granite | McFeat-Smith et al (1999), Chui & Tai (2001), Grandori et al (2001), McLearie et al (2001), Pakianathan et al (2002), Tai & Ho, (2002), Pakianathan et al (2004), Sjostrom (2004), GEO (2007), Maxwell & Kite (2012) |
| HATS Stage 1 Tunnels (Strategic Sewage Disposal Scheme) | 2001 | 3.6 km | 3.35 m dia. | Tunnel F: open hard rock TBM | Granite, rhyolite dykes, faults | McFeat-Smith et al (1999), Chui & Tai (2001), Grandori et al (2001), McLearie et al (2001), Pakianathan et al (2002), Tai & Ho, (2002), Pakianathan et al (2004), Sjostrom (2004), GEO (2007), Maxwell & Kite (2012) |
| HATS Stage 1 Tunnels (Strategic Sewage Disposal Scheme) | 2001 | 0.8 km | 3.0 m dia. | Tunnel G: drill & blast | Granite | McFeat-Smith et al (1999), Chui & Tai (2001), Grandori et al (2001), McLearie et al (2001), Pakianathan et al (2002), Tai & Ho, (2002), Pakianathan et al (2004), Sjostrom (2004), GEO (2007), Maxwell & Kite (2012) |

| Project Title | Year of Completion | Length Details | Cross Section Details | Method of Construction | Geology and Groundwater | References |
|--|--------------------|--|--|---|---|--|
| HATS Stage 1 Tunnels (Strategic Sewage Disposal Scheme) | 2001 | 1.7 km | 5.64 m dia., (finished diameter ranging from 1.2 m to 5.0 m) | Outfall tunnel: open hard rock TBM Pre-grouting using OPC, some UFC and MFC In situ concrete lining for tunnels A, B, C, F & G, precast (75-145 m below sea level, unprecedented in HK)Ground freezing used around the eye of a 1.8 m dia. pipe jacked tunnel between two shafts at Kwun Tong (75-145 m below sea level, unprecedented in HK) | Granite, (Predominantly hard volcanic tuff or granite, with fault zones and zones of deep weathering at isolated locations; water inflow through rock joints and other discontinuities under pressure of up to 15 bars) | McFeat-Smith et al (1999), Chui & Tai (2001), Grandori et al (2001), McLearie et al (2001), Pakianathan et al (2002), Tai & Ho, (2002), Pakianathan et al (2004), Sjostrom (2004), GEO (2007), Maxwell & Kite (2012) |
| West Kowloon Drainage Improvement Stage 2 Phase 2 – Kai Tak Transfer Scheme Tunnel | 2004 | 1.5 km tunnel, 6 shafts (up to 9.5 m dia.), 450 m long 4.8 m x 2.5 m box culvert | 4.4 m ID | 5.17 m dia. mixshield slurry TBM (610 mm x 356 mm single cutters, 4 twin cutters for rock and 50 soft ground scraps), precast concrete segmental lining, two-part EPDM and hydrophilic strip inset gasket, up to 30 m below ground surface (first use of large diameter slurry TBM in HK) The TBM was turned 90 degrees through a shaft. A 90 m tunnel section was constructed using NATM | Fill, alluvial deposits (some with peat), grades II-V granite with corestones, a section with a highly weathered fault and a basalt dyke, very shallow cover (<0.75 tunnel dia.) at a location approaching a shaft, maximum hydrostatic head of 140kPa at crown level, compressed air “bubble” behind top of cutterhead for TBM maintenance | Salisbury & Hake (2004), Chu & Wong (2009) |
| Wan Chai East and North Point Trunk Sewer Tunnels | 2005 | 3.8 km | 0.6-1.8 m ID. (0.78-2.15 m outer dia.), 27 temporary shafts | Four pipe jacked slurry shield TBMs with rock cutters, precast reinforced concrete pipes, 3.9-18 m below ground level, compressed air chamber for replacement of cutters (404 m long S-curve section is the first time achieved in HK) | Fill with cobbles and boulders, old seawalls, disused piles, marine and alluvial deposits, grades II-V granite with corestones, groundwater about 2-4 m below ground level | Mok (2006), Wang et al (2006), Wong (2006) |

| Project Title | Year of Completion | Length Details | Cross Section Details | Method of Construction | Geology and Groundwater | References |
|---|--------------------|--|---------------------------|--|--|--|
| Stormwater Drain by the Hong Kong Airport Authority | 2006 | 42.9 m | 1.75 m dia. concrete pipe | Pile jacking | Fill material comprising coarse gravel, cobbles and boulders; the measured groundwater level is about 5.5 m below ground level | |
| Harbour Area Treatment Scheme Stage 2A - Upgrading of the Stonecutters Island Sewage Treatment Works and the Preliminary Treatment Works - Interconnection Tunnel | 2012 | 0.251 km | 4.0 m dia. tunnel | TBM | <p>The interconnection tunnel is underlying soil stratum of alluvium, marine deposit and fill and is embedded in alluvium and completely decomposed granite soil, where marine deposit and alluvium were encountered from CH. 0 to CH. 220 and CDG from CH. 221 to CH. 236.</p> <p>GWL varied from +1.07mPD to +2.69mPD, mainly related to the tidal effect.</p> | Endicott & Tattersall (2010), Tam (2011), Tai et al (2011), Cunningham et al (2012b), Leung et al (2012), Tsang et al (2012a), Tsang et al (2012b), Liu et al (2012), Cheung et al (2012), Chan et al (2012b), Garshol et al (2012a), Kwan et al (2012), Mui et al (2012a), Seit et al (2012), Tang et al (2012), Garshol et al (2014) |
| Lai Chi Kok Transfer Scheme | 2012 | 1.2 km main tunnel plus 2.5 km branch tunnel and 270 m of connecting adits, total of 3.97 km | 4.9 m dia. | Slurry TBM with permanent tunnel lining for tunnels: Drill & blast for adits | Grades I-III granite at branch tunnel and grades I-IV granite at main tunnel; groundwater varies from 1 to 2 m below ground level along the main tunnel and 0.5 to 35 m below ground along the branch tunnel | Ip et al (2009), Endicott et al (2012), Wong, E.K.L. (2012), Kan et al (2013) |

| Project Title | Year of Completion | Length Details | Cross Section Details | Method of Construction | Geology and Groundwater | References |
|---|--------------------|--|--|---|--|---|
| Tsuen Wan Drainage Tunnel | 2013 | 5.1 km plus 80 m connecting adit | 6.5 m dia. | TBM for main tunnel and mechanical excavation for adits. Precast segmental lining by Design & Build contractor (URS/Scott Wilson) | Mainly granodiorite and coarse ash crystal tuff | Ciamei & Grandori (2011), Perlo et al (2012) |
| Hong Kong West Drainage Tunnel | 2013 | 10.5 km plus 7.9 km of adits, total of 18.4 km | Tunnel 6.25 m & 7.25 m dia., adits in horse-shoe shape with max. 2.5 m & 3.75m width | TBM for tunnel Drill & blast for adits | Mainly through granite/volcanic bedrock of HK Island with rock cover generally more than 100 m for main tunnel and more than 50m for adits ; groundwater expected at intersections with major faults | Tam (2012b), Evans et al (2012) |
| Harbour Area Treatment Scheme Stage 2A (Conveyance System) – Aberdeen to Ap Lei Chau | 2014 | Tunnels: Q 1.32 km | Twin circular 0.6 m dia. pipes | Two horizontal directional drill holes | Predominantly volcanic fine vitric tuff, with quartz monzonite intrusion associated with the major Aberdeen fault; groundwater similar to tide level in the harbour | Endicott & Tattersall (2010), Tam (2011), Tai et al (2011), Cunningham et al (2012a), Cunningham et al (2012b), Endicott, et al (2012), Tattersall et al (2012), Garshol et al (2012), Chan et al (2012), Mui et al (2012a), Mui et al (2012b), Indelicato, A. (2012) |
| Harbour Area Treatment Scheme Stage 2A – Construction of Sewage Conveyance System from Aberdeen to Sai Ying Pun | 2014 | Tunnels: M 3.7 km, N 1.2 km, P 2.6 km | To accommodate oval pipes from 1m x 1.9 m to 1.26 m x 2.16 m | Drill & blast | Mainly granite and tuff, groundwater level at various depths | Endicott & Tattersall (2010), Tam (2011), Tai et al (2011), Cunningham et al (2012a), Cunningham et al (2012b), Endicott, et al (2012), Tattersall et al (2012), Garshol et al (2012), Chan et al (2012), Mui et al (2012a), Mui et al (2012b), Indelicato, A. (2012) |

| Project Title | Year of Completion | Length Details | Cross Section Details | Method of Construction | Geology and Groundwater | References |
|--|--------------------|---------------------------------------|--|------------------------|---|--|
| Harbour Area Treatment Scheme Stage 2A – Construction of Sewage Conveyance System from North Point to Stonecutters Island | 2014 | Tunnels: J 3.2 km, K 4.3 km, L 4.6 km | Excavated dia. from 3.9 m to 5.5 m to accommodate oval pipes from 1m x 2 m to 2 m x 3.6 m and circular 3 m dia. pipe | Drill & blast | Mainly granite, groundwater level similar to tide level in the harbour | Endicott & Tattersall (2010), Tam (2011), Tai et al (2011), Cunningham et al (2012a), Cunningham et al (2012b), Endicott, et al (2012), Tattersall et al (2012), Garshol et al (2012), Chan et al (2012), Mui et al (2012a), Mui et al (2012b), Indelicato, A. (2012) |
| Harbour Area Treatment Scheme Stage 2A - Upgrading of the Stonecutters Island Sewage Treatment Works and the Preliminary Treatment Works – Effluent Tunnel | 2016 | 0.88 km | 8.5 m tunnel | Drill and Blast | <p>The site is underlain by reclamation fill which overlies beach sand and marine sand of Hang Hau Formation. Saprolite of completely decomposed medium- to coarse-grained Granite is present above the bedrock. The underlying bedrock generally comprises strong to moderately strong, slightly to moderately decomposed medium- to coarse-grained Granite. The invert level of Effluent Tunnel varies from 92.8 m to 94.5 m below ground, which has a minimum 30 m thick bedrock cover.</p> <p>GWL varied from +0.33mPD to +2.46mPD and +1.23mPD to +5.03mPD at Riser Shaft and Drop Shaft respectively.</p> | Endicott & Tattersall (2010), Tam (2011), Tai et al (2011), Cunningham et al (2012b), Leung et al (2012), Tsang et al (2012a), Tsang et al (2012b), Liu et al (2012), Cheung et al (2012), Chan et al (2012b), Garshol et al (2012a), Kwan et al (2012), Mui et al (2012a), Seit et al (2012), Tang et al (2012), Garshol et al (2014) |

| Project Title | Year of Completion | Length Details | Cross Section Details | Method of Construction | Geology and Groundwater | References |
|--|--|--|-----------------------------------|---|--|--|
| Table 5 : Cable and Other Tunnels | | | | | | |
| Disused Tunnels (94 such tunnels known as of January 2006, 62, 21 & 11 in Hong Kong Island, Kowloon & New Territories & outlying islands respectively) | Air raid protection tunnels built during the Second World War, other tunnels built before or during the Japanese occupation of Hong Kong | Various | Various, sufficient for man-entry | Generally hand dug with minimal support. (Bunkers at Shouson Hill leased to a company as wine cellars, one network at Lei Yue Mun being used as part of the Hong Kong Museum of Coastal Defence, one network at Sai Ying Pun being used by the Hongkong Electric Co. Ltd for routing electric cables) | Various | GEO (2006) |
| Mining tunnels at: Lin Ma Hang, Needle Hill, Lin Fa Shan, Ma On Shan, West Brother Island, ShaLo Wan Mines | 1915-1981 | 0.9 km, 3.4km, 2.3km, 23.5km, extensive, 0.3km | 2.3-2.4 m dia. | Hand excavation picks and chisels) and drill & blast | Various, at West Brother Island the mine workings had reached 90 m below sea level by 1964, with serious water inflow problems encountered (West Brother Island was flattened in the mid-1990's for a navigation facility for the Chek Lap Kok Airport) | Davis (1963), Roberts & Strange (1991), Strange & Woods (1991), Williams (1991), Woods & Langford (1991) |
| Hongkong Bank Seawater Tunnel (private tunnel built within Government land under a short term tenancy) | 1985 | 0.37 km | 7.0 m dia. | Drill & blast, probing ahead and pre-grouting (fan grouting and localised fissured grouting), rock bolts and shotcrete, 0.5 m cast in situ concrete lining after completion of tunnel excavation | Tunnel up to 75 m below ground, minimum rock cover of 10 m, mainly grade II granite with weak seams encountered, water inflow up to 540 l/min., drawdown up to 25 m at 100 m west of tunnel alignment, resulting in large settlements (up to 100 mm) and building damage | Cowland & Thorley (1985), Archer & Knight 1986), Troughton et al (1991), GEO (2007) |
| Crossings for seawater cooling pipes at Harcourt Road and Queensway (private) | 1988 | 27 m (Harcourt Road crossing) | 6 m wide x 2.5 m high | Horizontal mini-piles to form tunnel wall structure, pre-grouting (tube-à-manchette) prior to excavation | Reclaimed land, grade V granite | Owen & Tam (1989) |

| Project Title | Year of Completion | Length Details | Cross Section Details | Method of Construction | Geology and Groundwater | References |
|--|--------------------|---|--|---|---|---|
| HEC Wah Fu to Bowen Road Cable Tunnel | 1988 | 3.1 km | 4.4 m wide x 3.7 m high horseshoe shaped tunnel | Drill & blast, cast in situ permanent concrete lining | Mainly volcanic tuff | McFeat Smith et al (1999), HEC (2007) |
| HEC Nam Fung Road to Parker (Chaiwan Road) Cable Tunnel | 1993 | 5.7 km | 4.8 m dia. | Open hard rock TBM, with 32 single disc cutters of 483 mm in dia. and facilities for probing ahead (the first hard rock TBM drive in HK), some sections were widened by drill & blast | Fine- to medium-grained granite with 17 m wide fault zone, 120 m of weathered quartz monzonite at portal, high initial water inflows (up to 2,400 l/min.) at fracture zones or open joints | McFeat Smith et al (1985), McFeat Smith (1992), McFeat Smith (1994), McFeat-Smith (1998), McFeat-Smith et al (1999), HEC (2007) |
| The Hong Kong and China Gas Co. Ltd Braemar Hill Tunnel | 1994 | 2.6 km | 3.35 m dia. man-accessible tunnel housing a 600 mm gas pipe | Open hard rock TBM (subsequently used for SSDS tunnel between Kwun Tong and Chai Wan) | Granite, significant fracture zone trending from Tai Hang to Tai Tam Tuk, up to 80 m wide and roughly vertical, none to minor water inflow | McFeat-Smith et al (1999) |
| The Hong Kong and China Gas Co. Ltd Pipe Crossing Underneath Seawall at Ta Pang Po, North Lantau | 1995 | 0.45 km | 2 x 500 mm dia. holes housing two 300 mm dia. steel gas pipes | HDD | Up to 15 m below sea level, marine deposits | |
| Kau Shat Wan Tunnel and Audits (Mines Division Lantau Island Explosives Magazine) | 1997 | 1.42 km (comprising 1.15 km long main access tunnel and 10 nos 27 m long audits to the caverns), 20 m (caverns) | 6.5 m span (arch roof of max. height of 5.5 m with a rectangular base of 4.0 m high), 13 m wide x 6.8 m high | Drill & blast, unlined with rock bolts and shotcrete support | Medium-grained granite intruded by feldsparphyric rhyolite dykes (grade I/II) and approx. 200 m of grade IV/V rock at portals supported by reinforced concrete lining, generally high water inflow at several sheared zones or basalt dykes, covered by shotcrete | Chan & Ng (2006) |

| Project Title | Year of Completion | Length Details | Cross Section Details | Method of Construction | Geology and Groundwater | References |
|---|--------------------|---|--|--|--|--|
| Tunnels for Glory Hole Construction for Rehabilitation of Anderson Road Quarries | 1998 | 0.1 km and 0.08 km long tunnels, 3 shafts | 5.5 m and 4.6 m span x 5.5 m high (enlarged to 12.5 m high) tunnels, 76-89 m deep 2.75 m dia. Shafts | Drill & blast for tunnels, dowels and shotcrete, steel ribs for the first 20 m of one tunnel, raise boring techniques with the use of TBM for shaft construction | Grades I-II granite, shear zone encountered and grades I-II volcanic at the top 11 m of one of the shafts, no water inflow | Lam et al (2003) |
| HEC Tin Wan to Wah Fu Tunnel | 1999 | 0.8 km tunnel, 14 m deep shaft | 4.0 m wide and 3.7 m high horseshoe shaped tunnel | Drill & blast, sprayed concrete permanent lining, up to 180 m below a rock mount | Volcanic tuff, generally none to minor water inflows | |
| CLP Lantau to Ma Wan Cable Crossing | 2002 | 0.85 km | 584 mm dia. drill hole | HDD | 96 m below sea level, 40 m rock cover except in fault zones | Tam (2000), Hui et al (2002), Loneragan & Lukas (2003) |
| CLP Sham Tseng to Ma Wan Cable Crossing | 2002 | 1.3 km | 584 mm dia. drill hole | HDD | 96 m below sea level, 40 m rock cover except in fault zones | Tam (2000), Hui et al (2002), Loneragan & Lukas (2003) |
| The Hong Kong and China Gas Co. Ltd Pipe Crossing at Tai Lam Marine Police Base near Tai Lam Offtake/ Pigging Station | 2002 | 0.17 km | 550 mm dia. backreamed hole housing a 400 mm dia. PE gas pipe | HDD | Various. Granite encountered in some sections and soft clay at other sections | |
| HEC Ap Lei Chau Cable Tunnels (for Ap Lei Chau Industrial Estate Zone Substation) | 2003 | 0.42 km (twin tunnels) | 1.8 m dia. | Slurry TBM, precast concrete segmental lining, up to 100 m below mountain | Grades I-III tuff | |
| HEC Cyberport to Wah Fu Cable Tunnel | 2003 | 0.83 km | 4.0 m wide x 3.7 m high horseshoe shaped tunnel, 8 m wide x 6.15 m high joint bays | Drill & blast, plain or fibre reinforced sprayed concrete lining, rock dowels | Fine ash vitric tuff, eutaxite | |
| CLP Kwai Chung Cable Tunnel | 2005 | 1.1 km | 3.8 m dia. | Drill & blast | Grades I-III granite, average depth of 35 m | Hui et al (2002), Chan et al (2009) |

| Project Title | Year of Completion | Length Details | Cross Section Details | Method of Construction | Geology and Groundwater | References |
|--|--------------------|----------------|---|--|--|-------------------------------------|
| CLP Tuen Mun Cable Tunnel | 2005 | 0.28 km | 3.3 m dia. | Air plenum shield | Rock fill, marine deposits, grade V volcanic | |
| CLP Pui O Beach, Chi Ma Wan, Cable Crossing | 2005 | Not available | Twin 600 mm dia. boreholes with 7 x 163 mm ID ducts in borehole A, 3 x 163 mm ID ducts and 3 x 127 mm ducts in borehole B | HDD | Marine sediments, marine deposits, highly fractured grades III-V granite, grade II granite with closely spaced joints, maximum depth at -40mPD | |
| CLP Tze Wan Shan Cable Tunnel | 2005 | 0.65 km | 3.3 m dia. | Air plenum shield | Colluvium with boulders, grade V granite | Hui et al (2002), Chan et al (2009) |
| HEC Headland Road to Chung Hom Kok Road Cable Duct Crossings | 2005 | 0.27 km | 4 x 350 mm dia., with 4 nos of. 315 mm dia. cable ducts | HDD, 330 m in radius | Mainly grades II-III tuff | |
| CLP Chi Ma Wan Cable Tunnel | 2006 | 3.2 km | 3.2 m dia. | Open face hard rock TBM 13.5 m long 4.75 dia., drill & blast and steel segmental rings to form joint bays and dismantling chamber at Pui O portal | Grades I-II granite, feldsparphyric rhyolite, 4-9 m thick debris flow deposits at portals | Hui et al (2002), Chan et al (2009) |
| HEC Pak Kok Tsui Cable Tunnel | 2006 | 0.13 km | 2.5 m wide x 3.2 m high horseshoe shaped tunnel | Drill & split (both mechanical splitter and chemical expanders were used), manual excavation for soft ground, sprayed concrete lining | 50% of tunnel length in grade II fine- to medium-grained granite and 50% in grade V granite | |
| The Hong Kong and China Gas Co. Ltd Pipe Crossing Underneath Fanling Highway | 2006 | 0.04 km | 450 mm dia. casing housing a 400 mm dia. PE gas pipe | Pipe ramming. Open-ended steel casing pushed horizontally from a launch pit to a receiving pit by a pneumatic hammer. Soil inside casing removed and gas pipe inserted into casing | Generally clay with some cobbles | |

| Project Title | Year of Completion | Length Details | Cross Section Details | Method of Construction | Geology and Groundwater | References |
|---|--------------------|--|--|---|--|--------------------|
| CLP Cable Tunnel at KCRC Hung Hom Freight Yard | 2006 | 0.32 km | 3 m dia. | EPB TBM and cut & cover | Reclamation fill, marine deposits, grades I-V granite, with groundwater 2-3 m below ground surface, encountered rubble mound beneath an old seawall (for the reclamation in 1963-1967) | Wong & Wong (2012) |
| The Hong Kong and China Gas Co. Ltd Pipe Crossing Underneath Tai Wan Stream, Sai Kung | 2006 | 0.03 km | 1.1 m dia. concrete sleeve pipe housing a 750 mm dia. steel gas pipe | Pipe jacking | Mainly boulders | |
| Jordan Valley Pedestrian Tunnel | 2006 | 100 m | 5 m wide x 3.5 m high | Drill & blast | Grades I & II granite, occasional grade III | |
| HEC Lamma Power Station to Yung Shue Wan South Cable Tunnel | 2006 | 0.22 km | 2.5 m wide x 3.2 m high horseshoe shaped tunnels | Drill & split (both mechanical splitter and chemical expanders were used), mini-jumbo used, plain sprayed concrete lining | Grade II fine- to medium-grained granite | |
| CLP Cable Duct at West Kowloon Highway | 2008 | 0.2 km | 1.95 m dia. | TBM with precast concrete segmental lining | Reclaimed land in fill and marine deposits | Lam (2008) |
| CLP Cable Tunnel, Yeung Uk Road, Tsuen Wan | 2008 | 65 m | Twin section with 1.6 m & 1.2 m diameters | TBM | Fill, groundwater at about 3.5 mPD. | |
| HEC Bowen Road to Kennedy Road Cable Tunnel and Cable Duct Crossings | 2008 | 0.23 km tunnel and 0.11 km cable ducts, 2 shafts | 2.5 m wide x 2.8 m high horseshoe shaped tunnel with 14nos. of 300 mm dia. cable ducts | Drill & split for tunnel, HDD for cable ducts | Mainly grades II-III volcanic tuff, part of the tunnel is in colluvium | |

| Project Title | Year of Completion | Length Details | Cross Section Details | Method of Construction | Geology and Groundwater | References |
|--|--------------------|---------------------------------------|-----------------------|---|--|---|
| CLP Castle Peak Cable Tunnel | 2009 | 4.5 km | 4.5 m dia. | TBM, precast concrete segmental lining being considered | Grades I-II porphyritic fine- to medium-grained granite, Tuen Mun Formation comprising andesite, tuffs and sedimentary rocks such as sandstone near the Tuen Mun shaft | Chan et al (2009) |
| Ocean Park Funicular Tunnel | 2009 | 1.3 km | 6 m dia. | Drill & blast | Eutaxitic fine ash vitric tuff | Pan et al (2011) |
| Landslide Preventive Works at Po Shan Road, Mid-levels | 2009 | Twin tunnels 0.18 km and 0.26 km long | 3.5 m dia. | Retractable TBM, cast in situ concrete lining | Mainly grade II coarse to fine ash crystal tuff | Ho et al (2008), Solomon et al (2008), Lo et al (2009), Chau et al (2011), AECOM (2010), Lo et al (2010), Lo et al (2011) & Chau et al (2011) |

*Remark: Readers could visit the respective project websites for the anticipated completion dates of the on-going projects.

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