

HKIE Technical Seminar,  
Jointly organized by Environmental Division, YMC and AMC

**Representative River Regeneration Project,  
Part 1 - the Hong Kong Cases**

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**Abstract of Talk**

Regenerate rivers or water discharge channels inside congested built-up area is a hot topic world-wide. After long years of development in such urban environment, rivers or water channels, almost without exception, are getting heavily polluted and deteriorated both in water quality, visual appearance and disrupting seriously the urban fabric of the city. This obviously becomes a scar in a modern city.

In view of this, many governments are trying great efforts to improve the situation for “rivers” in a very poor condition. The technicality and involvement of works are a challenging task for such projects. It involves many complex issues, such as how to arrive at a perfect planning and integrate it into the existing urban fabric, to stop the continual flowing-in of pollutants, carry out the decontamination process, diversion of existing facilities and relocation of inhabitants being interrupted. Finally, it comes the carrying out of the regeneration work majority of which are of civil engineering nature.

In this seminar the Speaker present some representative project cases both in Hong Kong (Kai Tak River) and mainland China that he followed and studied during the last 15 years and show actions in regenerating these “rivers”. The upgrading of the urban environment will also be highlighted.

**Rivers refer to in this talk can be categorized into:**

- Natural rivers
- Rivers being urbanized and run inside inhabited zones  
e.g. Shanghai – Huangpu River, Guangzhou – Pearl River  
Bangkok – Chao Phraya River,  
Ho Chi Minh City – Saigon River  
Paris – Seine River, London – River Thames
- Urban channel/nullah
- Canal and waterway

**Basic steps to clean up an urbanized river with heavy human-impacts:**

- Divert the flowing-in of polluted water (new drain to replace the old system, provision of treatment plant)
- Construct the new drain to replace the old system
- Cleanse up the river
  - vacate/clear up the nearby structures (illegal, unauthorized, polluting or un-appropriate facilities)
  - cleansing up the river-bed
  - improve the water quality by draining-in of treated/cleaner water from other fresh sources.
- Upgrade the nearby environment
  - re-align the river bank
  - provision of green and landscaping space
  - seam the river vicinity into the urban fabric



River regeneration in a long run can be integrated as part of the overall Master Planning of a city

### River Water - Our Invaluable Asset

In Hong Kong, there are hundreds of rivers, streams and open nullahs. They are finite resources having different beneficial uses: such as supply to reservoirs, irrigation, preservation of aquatic life, recreation and passage of storm water to the sea. The EPD has a comprehensive river water quality monitoring programme in Hong Kong since 1986, which covers 82 stations at 30 main rivers and streams running through urban areas. The monitoring involves conducting field measurements and collecting water samples for laboratory analyses of over 40 physico-chemical and biological parameters, including organics, nutrients, metals and E. coli bacteria, serving the following purposes:

- evaluate the pollution status of river waters;
- monitor long-term changes in water quality;
- provide a scientific basis for planning water pollution control strategies; and
- assess the compliance with the key statutory Water Quality Objectives (WQOs).



### Existing Sewage Treatment Facilities in Hong Kong

#### Harbour Area Treatment Scheme Stage 2A

#### Pillar Point Sewage Treatment Works

#### Stonecutters Island Sewage Treatment Works

#### Stanley Sewage Treatment Works

#### Sham Tseng Sewage Treatment Works

#### Siu Ho Wan Sewage Treatment Works

#### Shatin Sewage Treatment Works

#### Tai Po Sewage Treatment Works

#### Shek Wu Hui Sewage Treatment Works

#### Yuen Long Sewage Treatment Works

#### Sai Kung Sewage Treatment Works

#### Small Sewage Treatment Facilities on Lantau Island and Outlying Islands

### Water Quality Index (WQI) for Rivers

In addition to the WQOs, a Water Quality Index (WQI), based on assessment on the level of dissolved oxygen, 5-day Biochemical Oxygen Demand and ammonia-nitrogen, is used to indicate the general health of rivers. These parameters are relevant to conserving the primary beneficial use for maintenance of aquatic life, and are collectively used to gauge the extent of organic pollution in a river. The WQI classifies river water quality into 5 categories according to the level of organic pollution. In recent years, most rivers in Hong Kong are within the "Fair" to "Excellent" range and no river was graded "Very Bad" since 2012.

WQI		Condition of River Water
3.0 – 4.5	Blue	Excellent
4.6 – 7.5	Green	Good
7.6 – 10.5	Yellow	Fair
10.6 – 13.5	Orange	Bad
13.6 – 15.0	Black	Very Bad



Parameter	Unit	Kai Tak Nullah		
		KN1	KN2	KN3
Dissolved oxygen	mg/L	6.6 (5.1 – 7.5)	7.0 (6.3 – 7.7)	7.2 (7.1 – 8.0)
pH		7.1 (6.9 – 7.6)	7.3 (7.0 – 7.6)	7.3 (7.1 – 7.7)
Suspended solids	mg/L	4 (3 – 32)	8 (3 – 24)	6 (4 – 19)
5-day Biochemical Oxygen Demand	mg/L	4 (<1 – 6)	3 (2 – 6)	4 (2 – 8)
Chemical Oxygen Demand	mg/L	26 (18 – 40)	28 (23 – 34)	29 (23 – 39)
Oil & grease	mg/L	<0.5 (<0.5 – <0.5)	<0.5 (<0.5 – <0.5)	<0.5 (<0.5 – <0.5)
Faecal coliforms	cfu/100mL	180,000 (15,000 – 2,800,000)	84,000 (15,000 – 340,000)	140,000 (41,000 – 540,000)
E. coli	cfu/100mL	85,000 (8,000 – 880,000)	35,000 (6,000 – 120,000)	56,000 (11,000 – 240,000)
Ammonia-nitrogen	mg/L	0.74 (0.33 – 2.80)	0.49 (0.10 – 1.60)	0.48 (0.13 – 1.50)
Nitrate-nitrogen	mg/L	4.65 (2.30 – 6.10)	4.90 (3.90 – 5.50)	5.00 (4.60 – 5.20)
Total Kjeldahl nitrogen	mg/L	1.60 (1.20 – 3.40)	1.30 (0.76 – 2.10)	1.40 (0.96 – 2.20)
Ortho-phosphate	mg/L	1.30 (0.48 – 1.70)	1.30 (0.58 – 1.60)	1.30 (0.69 – 1.60)
Total phosphorus	mg/L	1.40 (0.57 – 1.70)	1.40 (0.67 – 1.70)	1.30 (0.61 – 1.70)
Total sulphide	mg/L	<0.02 (<0.02 – 0.12)	<0.02 (<0.02 – <0.02)	<0.02 (<0.02 – 0.05)
Aluminium	µg/L	<50 (<50 – 390)	<50 (<50 – 330)	<50 (<50 – 320)
Cadmium	µg/L	<0.1 (<0.1 – 0.3)	<0.1 (<0.1 – 0.1)	0.1 (<0.1 – 0.2)
Chromium	µg/L	1 (<1 – 2)	<1 (<1 – 1)	<1 (<1 – 2)
Copper	µg/L	8 (4 – 23)	9 (5 – 21)	9 (4 – 22)
Lead	µg/L	<1 (<1 – 4)	<1 (<1 – 2)	<1 (<1 – 2)
Zinc	µg/L	40 (30 – 60)	40 (30 – 80)	40 (30 – 170)
Flow	L/s	NM	NM	NM

Water quality for Kai Tak Nullah, 2010 monitoring data

BOD5  
Biochemical oxygen demand with a 5-day cycle

faecal coliforms 糞大腸菌群

E coli 大腸桿菌

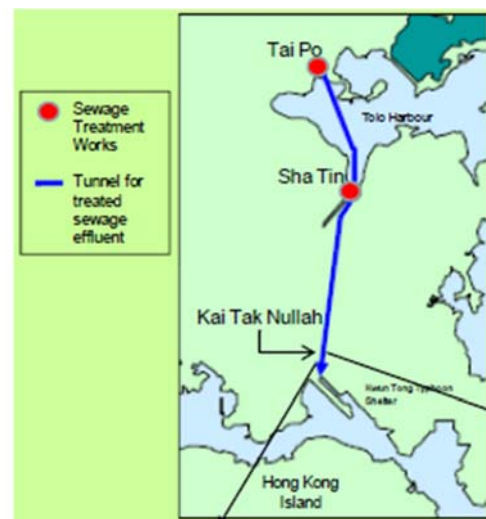
Dissolved oxygen	mg/L
pH	
Suspended solids	mg/L
BOD <sub>5</sub>	mg/L
COD	mg/L
Oil & grease	mg/L
E. coli	cfu/100mL
Faecal coliforms	cfu/100mL
Ammonia-nitrogen	mg/L
Nitrate-nitrogen	mg/L
Total Kjeldahl nitrogen	mg/L
Ortho-phosphate	mg/L
Total phosphorus	mg/L
Sulphide	mg/L
Aluminium	µg/L
Cadmium	µg/L
Chromium	µg/L
Copper	µg/L
Lead	µg/L
Zinc	µg/L
Flow	L/s

Chemical constituents to be measured under HK's water quality monitoring system

Watercourse	pH	5-Day Biochemical Oxygen Demand	Chemical Oxygen Demand	Dissolved Oxygen	Suspended Solids	Overall Compliance
<b>Eastern New Territories</b>						
Shing Mun River	89%	91%	98%	98%	100%	95%
Lam Tsuen River	99%	82%	95%	99%	100%	95%
Tai Po River	100%	100%	100%	100%	100%	100%
Tai Po Kau Stream	100%	100%	100%	100%	100%	100%
Shan Liu Stream	100%	92%	100%	100%	100%	98%
Tung Tze Stream	100%	92%	92%	100%	100%	97%
Ho Chung River	96%	96%	100%	100%	100%	98%
Sha Kok Mei Stream	100%	100%	100%	100%	100%	100%
Tai Chung Hau Stream	100%	100%	100%	100%	100%	100%
Tseng Lan Shue Stream	100%	61%	97%	97%	100%	91%
<b>Northwestern New Territories</b>						
River Indus	100%	50%	86%	81%	67%	77%
River Beas	97%	50%	86%	94%	100%	86%
River Ganges	100%	56%	61%	92%	67%	75%
Yuen Long Creek	100%	0%	21%	69%	25%	43%
Kam Tin River	100%	8%	38%	67%	50%	53%
Tin Shui Wai Nullah	63%	63%	88%	100%	50%	73%
Fairview Park Nullah	100%	8%	50%	83%	0%	48%
Ha Pak Nai Stream	100%	100%	100%	100%	100%	100%
Tai Shui Hang Stream	100%	100%	100%	100%	100%	100%
Pak Nai Stream	100%	100%	100%	100%	100%	100%
Sheung Pak Nai Stream	100%	100%	100%	100%	100%	100%
Ngau Hom Sha Stream	100%	100%	100%	100%	100%	100%
Tsang Kok Stream	100%	100%	100%	100%	100%	100%
<b>Lantau Island</b>						
Mui Wo River	97%	100%	100%	100%	100%	99%
Tung Chung River	97%	75%	100%	100%	100%	94%
<b>Southwestern New Territories &amp; Kowloon</b>						
Tuen Mun River	99%	71%	92%	92%	100%	91%
Pai Min Kok Stream	100%	75%	100%	100%	100%	95%
Kau Wa Keng Stream	100%	75%	100%	100%	100%	95%
Sam Dip Tam Stream	100%	100%	100%	100%	100%	100%
Kai Tak Nullah	Not applicable					
<b>Average Compliance (All monitoring stations)</b>	<b>98%</b>	<b>77%</b>	<b>90%</b>	<b>90%</b>	<b>88%</b>	<b>90%</b>

Compliance with water quality objectives for Hong Kong rivers (2010 example)

Improvement of water quality for Kai Tak Nullan



### Tolo Harbour Effluent Export Scheme (THEES)

THEES helps to solve the pollution problem in Tolo Harbour in the 80's by conveying the treated effluent from Tai Po and Shatin STWs to Victoria Harbour (Kwun Tong Typhoon Shelter) via a long tunnel and Kai Tak Nullah. The water quality in the nullah has seen marked improvement. The *E. coli* and BOD<sub>5</sub> level of the nullah has reduced by 80% and 75% respectively from 1999 to 2009.

BOD5  
Biochemical oxygen demand with a 5-day cycle

## Reconstruction, improvement and rehabilitation of the Kai Tak Nullah

Existing Kai Tak River is about 2.4 km long. The river running along Choi Hung Road from Po Kong Village Road, through Tung Tau Estate, Prince Edward Road East, Kai Tak Development area and finally connects to Victoria Harbour.

However, the drainage capacity of Kai Tak River was inadequate to meet the current flood protection standard. Severe flooding have occurred at Choi Hung Road and affected Wong Tai Sin and San Po Kong area under heavy rainstorm. In order to improve the drainage capacity of the river and mitigate flooding risk of the area, Drainage Services Department is carrying out improvements works for the Upstream and Midstream of Kai Tak River.

In a long run the project will improve the overall environmental quality of the Kai Tak Nullah and the urban fabric nearby. The final target includes the control of [dust, odour, noise, water quality, sewerage system, waste management, land contamination, cultural heritage, landscape and visual elements](#) etc.

### Project Title

### Reconstruction and Rehabilitation of Kai Tak Nullah from Po Kong Village Road to Tung Kwong Road - Remaining Works

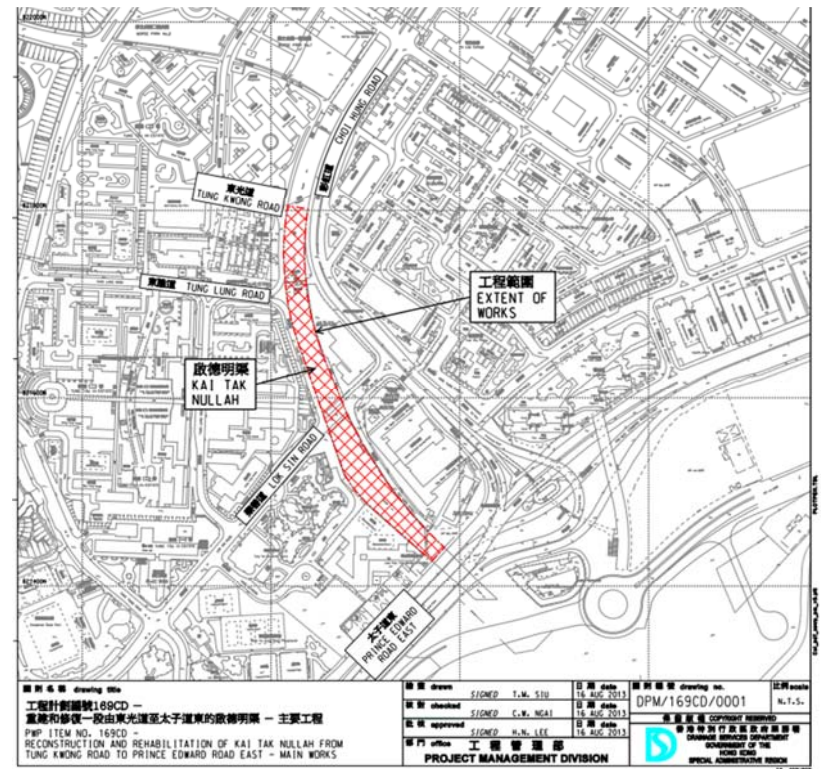
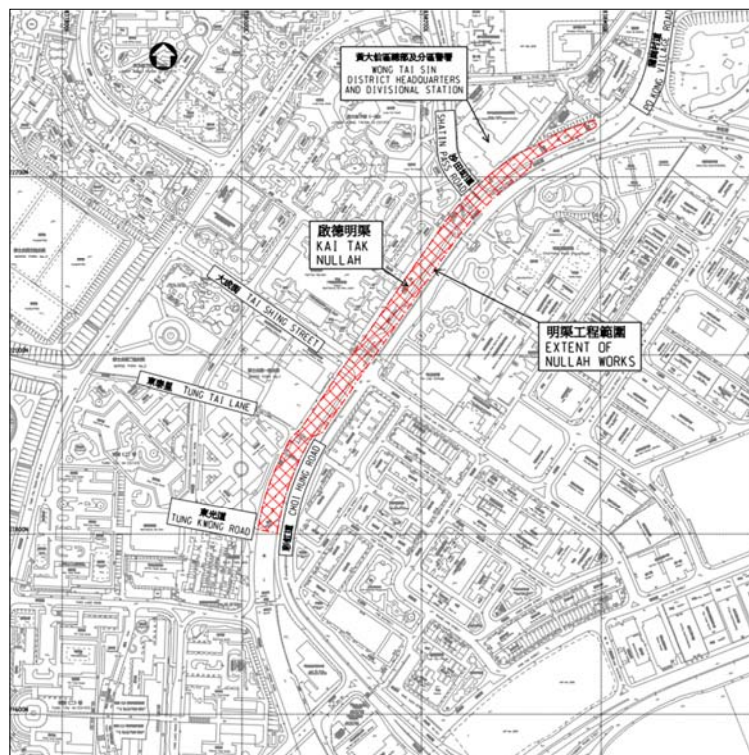
<b>Project Scope</b>	The project includes reconstruction, improvement and rehabilitation of section of about 600m long Kai Tak Nullah from ..... <a href="#">More</a>
<b>Major Improvements and Benefits</b>	Improve the drainage capacity and rehabilitate the section of Kai Tak Nullah from Po Kong Village Road to Tung Kwong Road
<b>Consultants</b>	AECOM Consulting Services Limited
<b>Contractors</b>	DC/2011/04 - Leader - Sunnic Joint Venture
<b>Contract No.</b>	DC/2011/04
<b>Project Commencement Date</b>	31 October 2011
<b>Project Completion Date</b>	End 2017
<b>Approved Project estimate</b>	About \$1,600 million
<b>Controlling Division</b>	Project Management Division
<b>Type</b>	Flood Prevention

### Project Title

### Reconstruction and Rehabilitation of Kai Tak Nullah from Tung Kwong Road to Prince Edward Road East - main works

<b>Project Scope</b>	The project includes reconstruction and rehabilitation of a section of about 500m long Kai Tak Nullah from Tung Kwong Road to Prince ..... <a href="#">More</a>
<b>Major Improvements and Benefits</b>	Improve the drainage capacity and rehabilitate the section of Kai Tak Nullah from Tung Kwong Road to Prince Edward Road East
<b>Consultants</b>	Atkins China Limited
<b>Contractors</b>	DC/2013/03 - China Road and Bridge Corporation
<b>Contract No.</b>	DC/2013/03
<b>Project Commencement Date</b>	30 December 2013
<b>Project Completion Date</b>	End 2017
<b>Approved Project estimate</b>	About \$1,200 million
<b>Controlling Division</b>	Project Management Division
<b>Type</b>	Flood Prevention





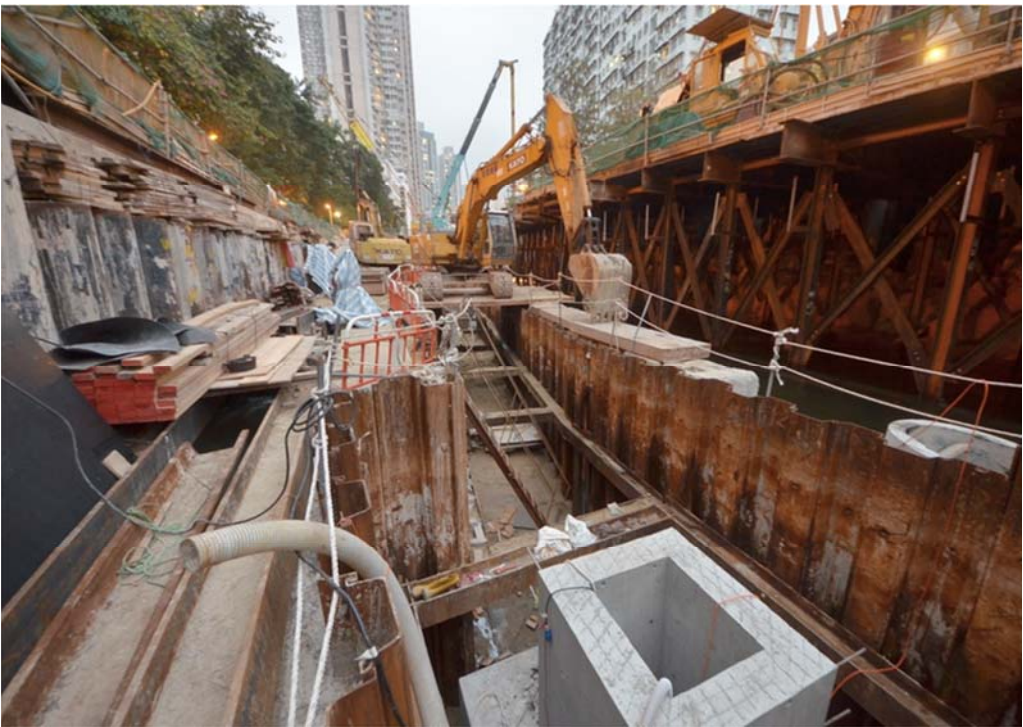
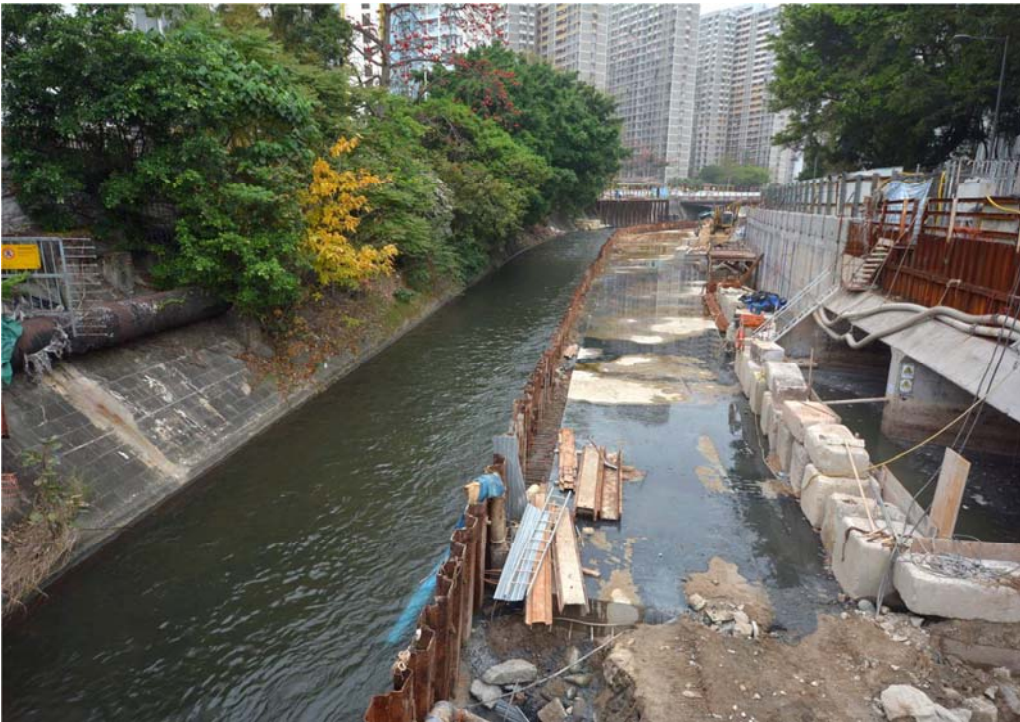
Kai Tak Nullah at Wong Tai Sin and San Po Kong as in 2008



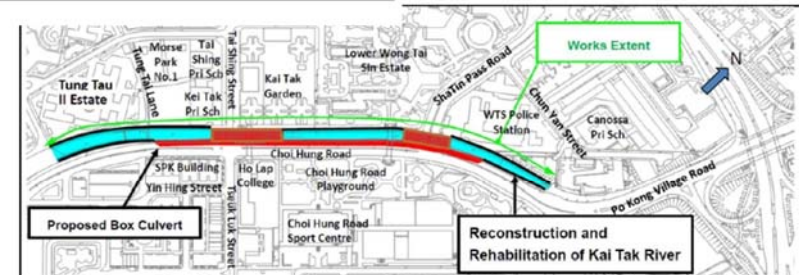
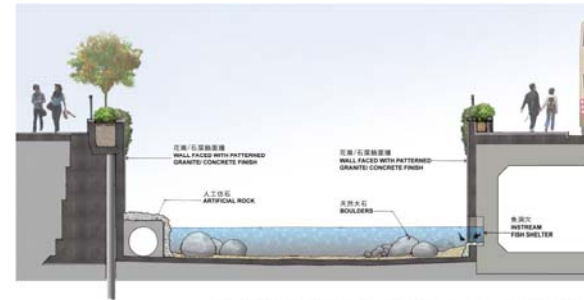
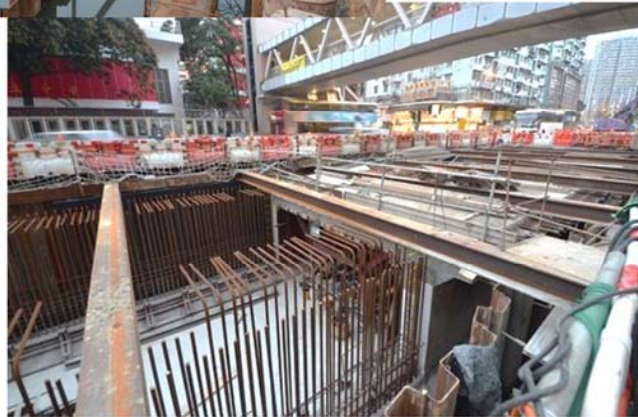
Junction at Tai Shing Street and Choi Hung Road in 2008 & 2016







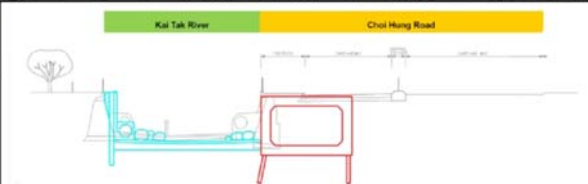




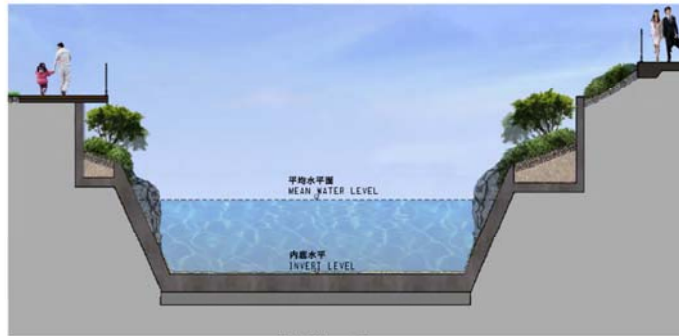
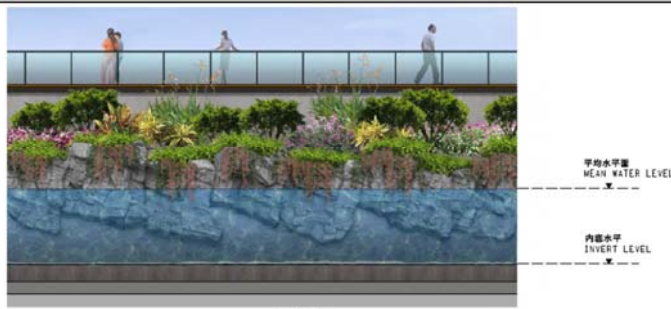
The whole project commenced on 31 October 2011, target to complete in mid of 2017

Legend:

- Construction of box culvert underground
- Junction Reconstruction
- Wall Reconstruction







圖則名稱 drawing title  
改排明渠重建及改善工程  
- 擬建排水道構想圖  
RECONSTRUCTION AND  
UPGRADING OF KAI TAK NULLAH  
- ARTIST'S IMPRESSION OF  
PROPOSED DRAINAGE CHANNEL

Provision of landscaping features (early 2017)





顧問/工程合約編號

DC/2010/03

顧問/工程合約名稱

太子道東啓德明渠改善工程

批出日期

17/08/2010

顧問/承建商

華益(林氏)建築有限公司

合約開展日期

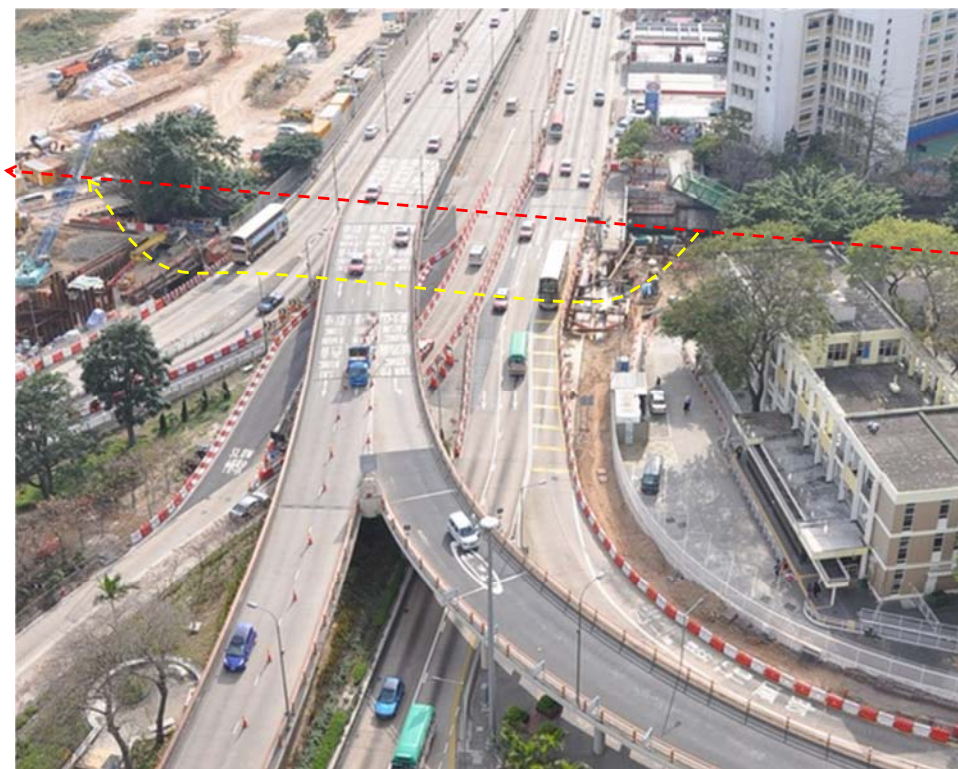
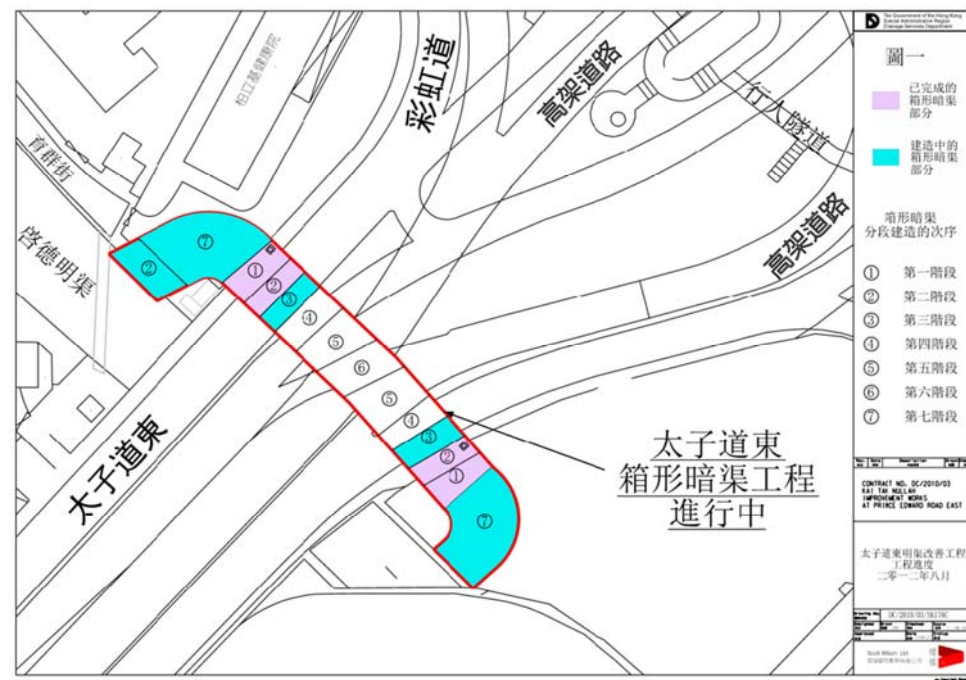
30/08/2010

完工日期

28/08/2012

顧問/工程合約金額

港幣 100,179,117.80元







Approx. alignment of  
Prince Edward Road



Nullah section crossing the  
northern portion (above) &  
southern portion (left) of  
Prince Edward Road





# Reconstruction and upgrading Kai Tak Nullah from Prince Edward Road to Kai Tak Approach Channel/Kowloon Bay

## Reconstruction and upgrading of Kai Tak Nullah

## Scope of work

- (a) reconstruction and upgrading of Kai Tak Nullah of about 1 300 metres (m) long at the north apron area of the former Kai Tak Airport from Prince Edward Road East to Kai Tak Approach Channel into a combination of a drainage channel and multi-cell box culverts with a total width varying from about 40m at the upstream to about 70m at the downstream;
- (b) construction of two enclosed desilting compounds with vehicular access; and
- (c) ancillary works including landscaping works, environmental mitigation measures and related monitoring and audit works.

Consultant: AECOM Asia Company Limited

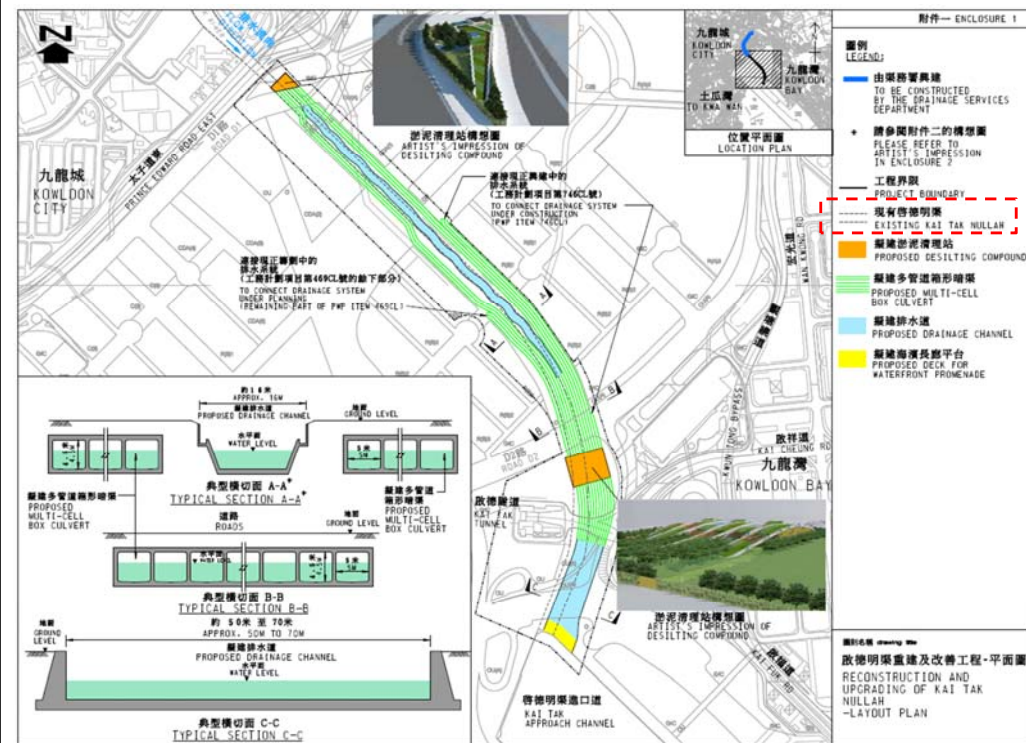
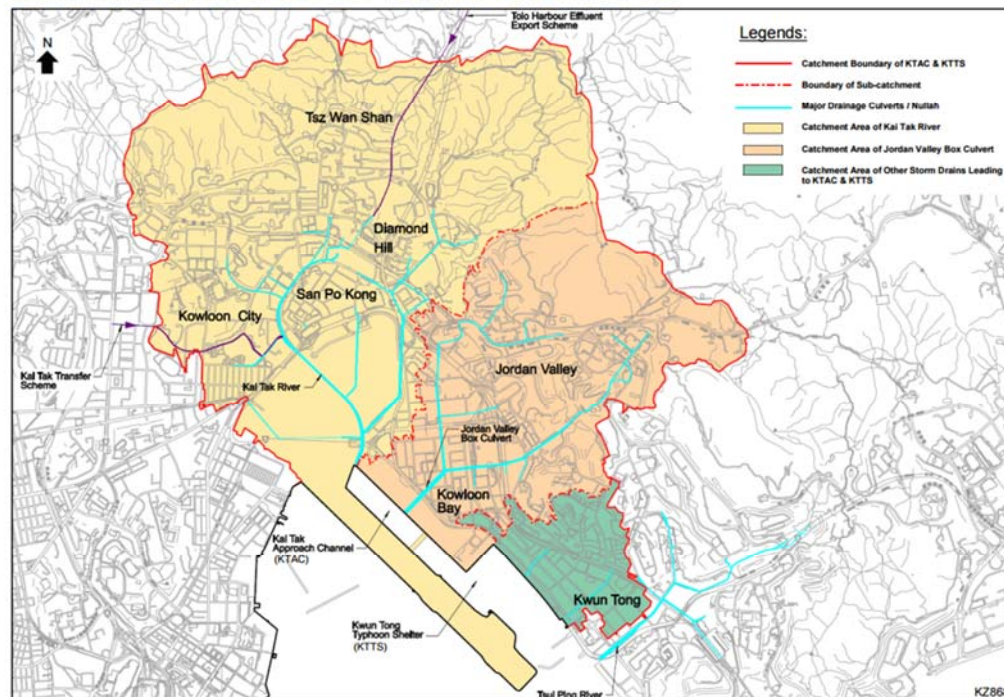
Contractor: Chit Cheung Construction Co., Ltd.

Estimated cost: \$2.488 billion

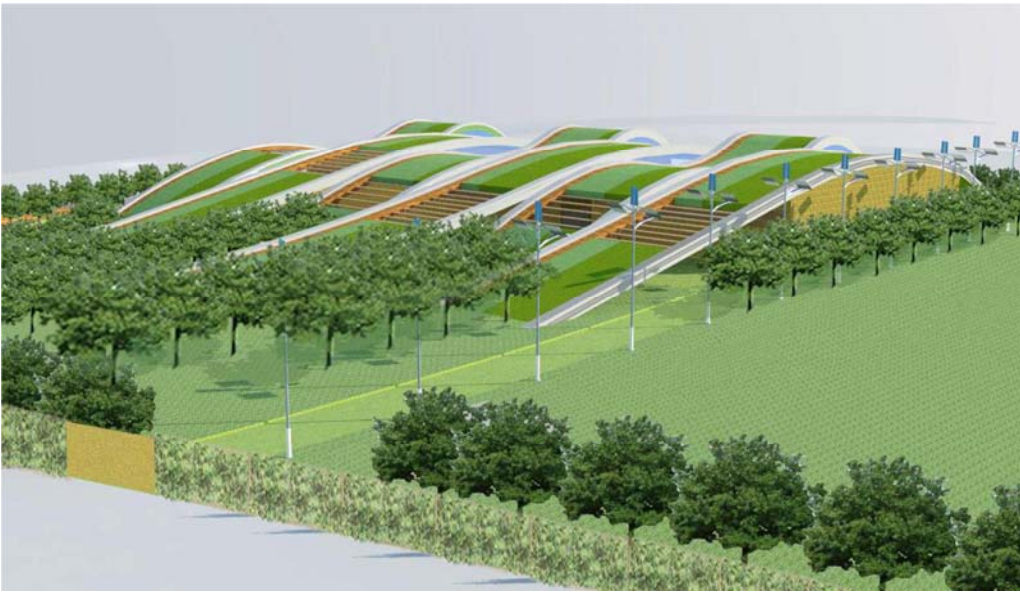
Contract period: January 2013 – Mid 2018

## Catchment Area of KTAC and KTTS

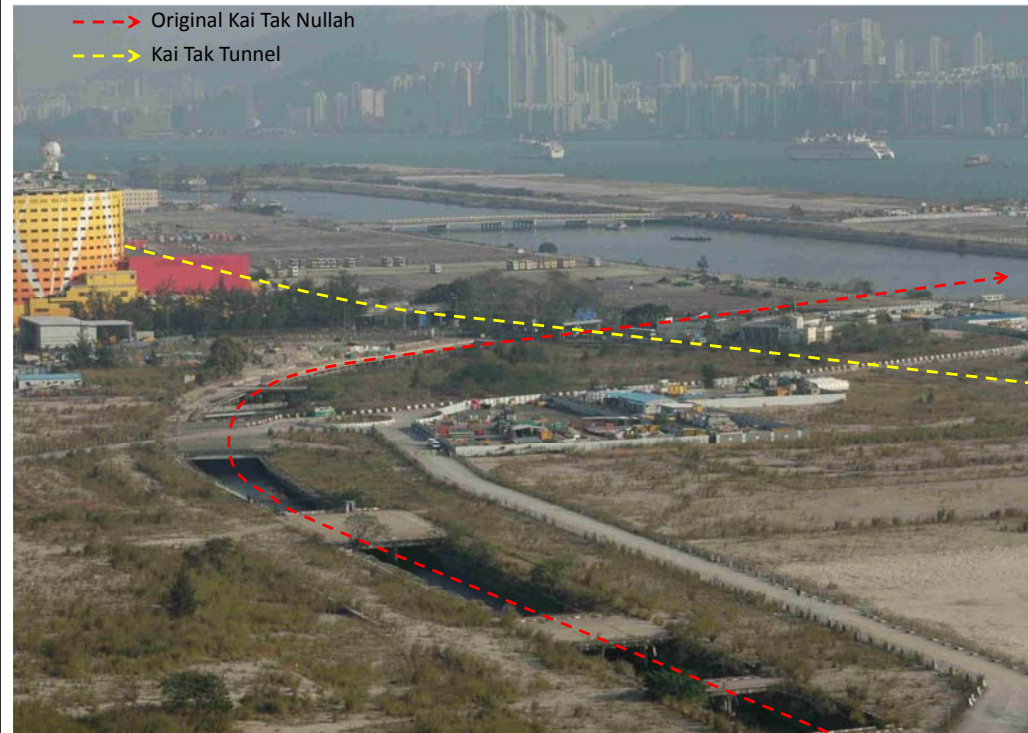
## Annex 1







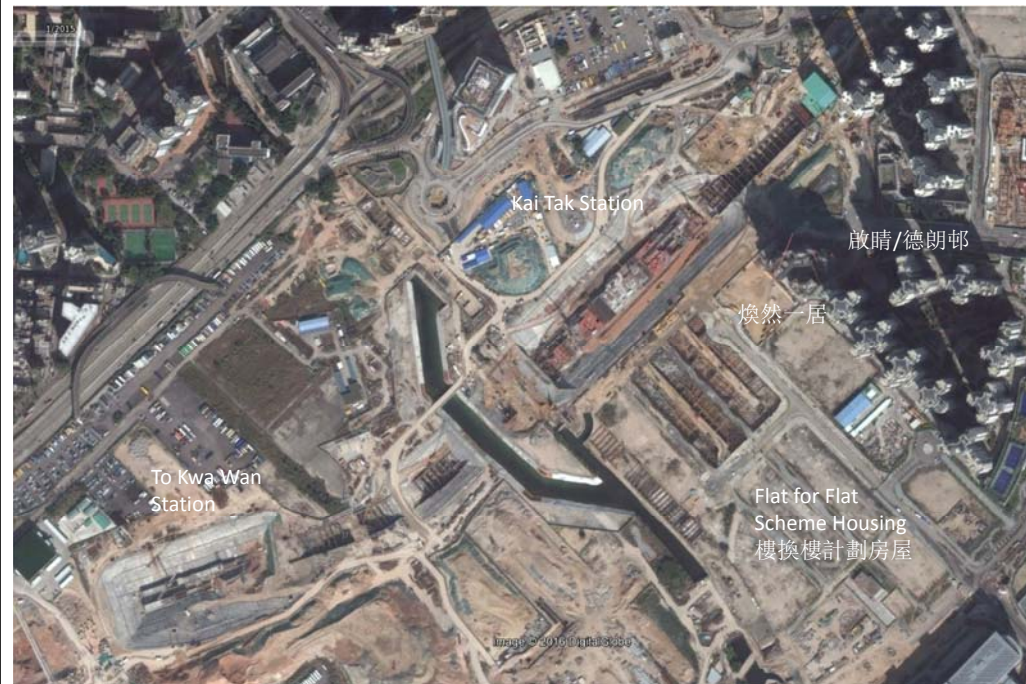
Landscape work to be provided to make the di-silting compound looks green and natural that merged to the overall environment.







Kai Tak Nullah inside the Kai Tak Airfield as seen in 2011



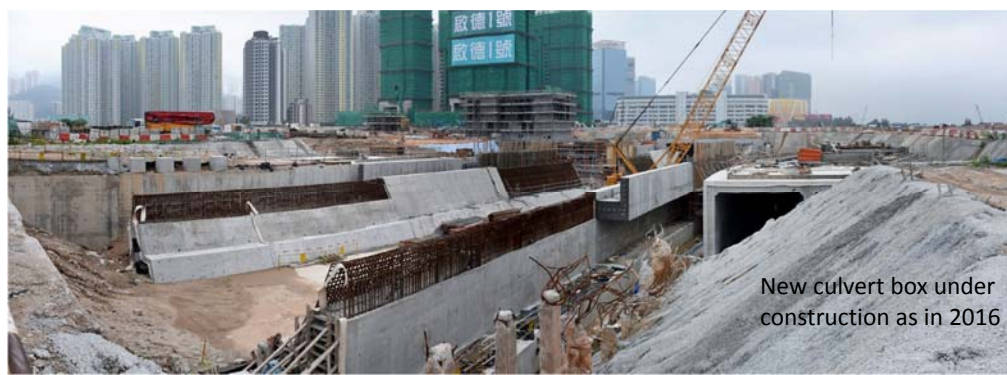
Kai Tak area as seen in early 2015



Original Kai Tak Nullah partially diverted as seen in 2014











Casting the  
box culvert



Landscaping work inside the nullah





One of the most challenging point of the SCL at Kai Tak  
 – the tunnel tube crossing the new nullah tube,  
 both are constructed using cut-and-cover method

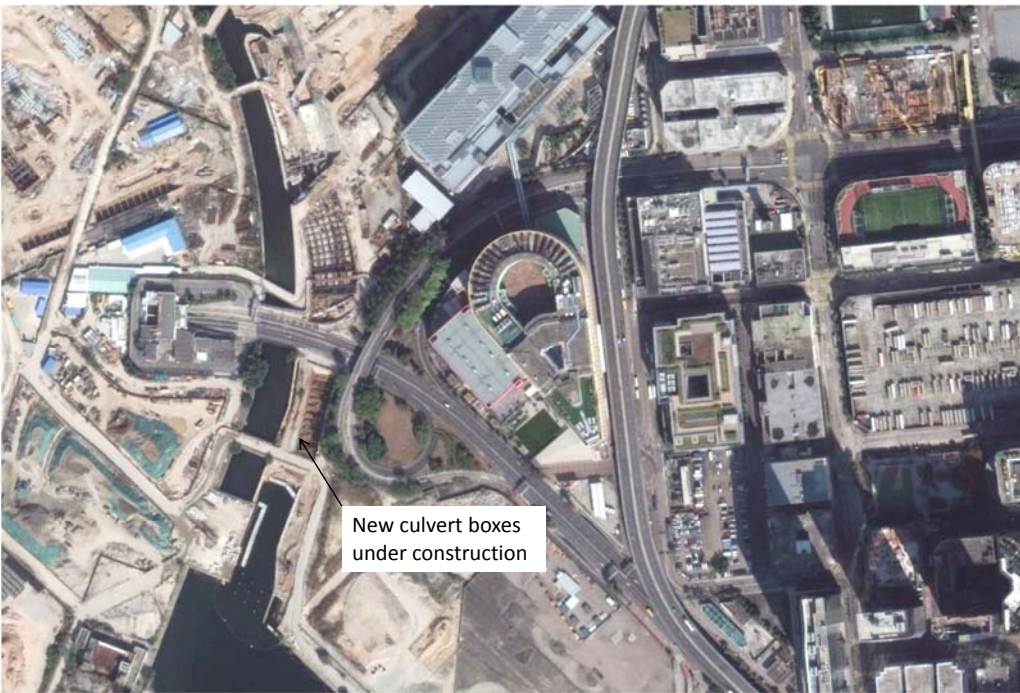


Early 2016



Early 2017





Outfalling point of Kai Tak Nullah onto the Kai Tak Approach Channel (early 2015)



Temporary traffic and carriage diversion arrangement for the Kai Tak Tunnel and the outfall of the Kai Tak Nullah

Section of nullah crossing the Kai Tak Tunnel



Desilting facility

Construction of the desilting facility as seen in July 2016

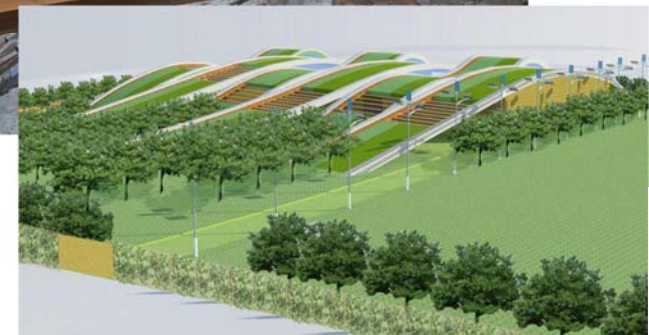
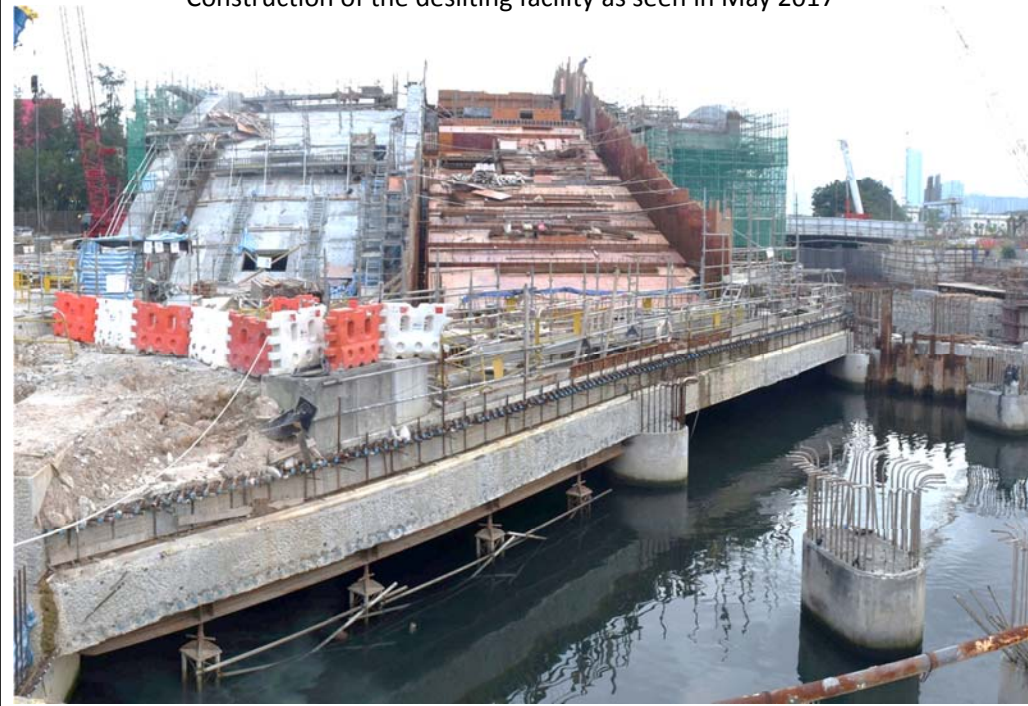




Construction of the desilting facility  
as seen in July 2016



Construction of the desilting facility as seen in May 2017





Nullah outfall towards the Kai Tak Approach Channel



Outfall into the Kowloon Bay  
as seen in early 2016







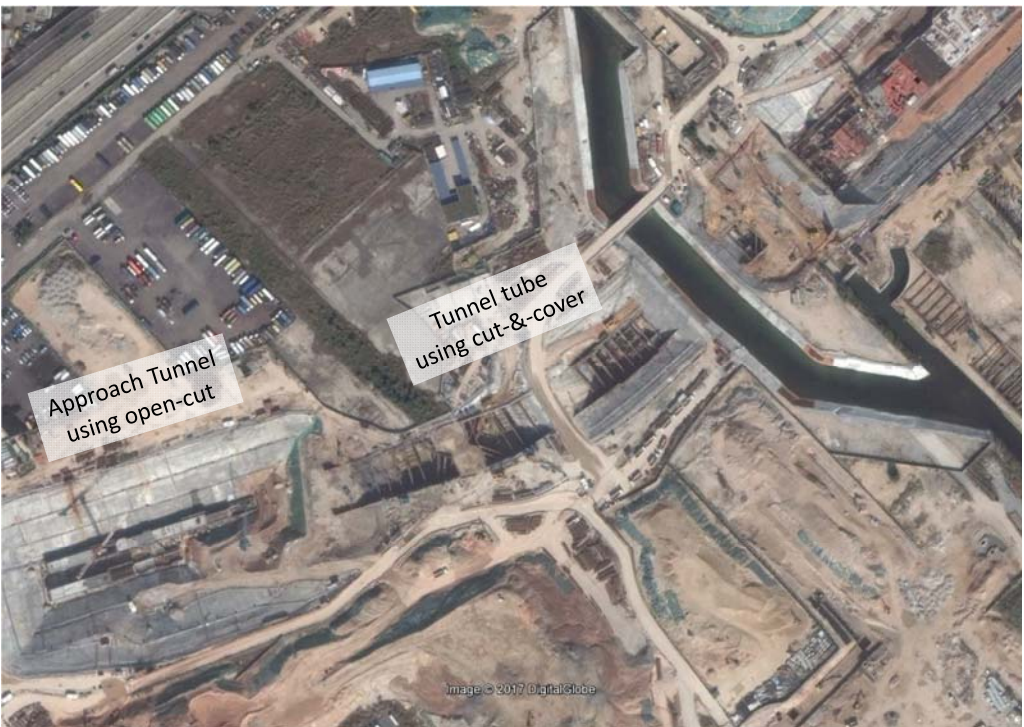
An artistic impressive drawing of the completed landscape



已評估的環保連接系統可能伸延路段  
Assessed Possible Extensions of EFLS

Construction of the  
tunnel tube within the Kai Tak section  
using open-cut and Cut-&-cover  
arrangement





The tunnel tube between the two stations constructed cut-and-cover method (late 2014)

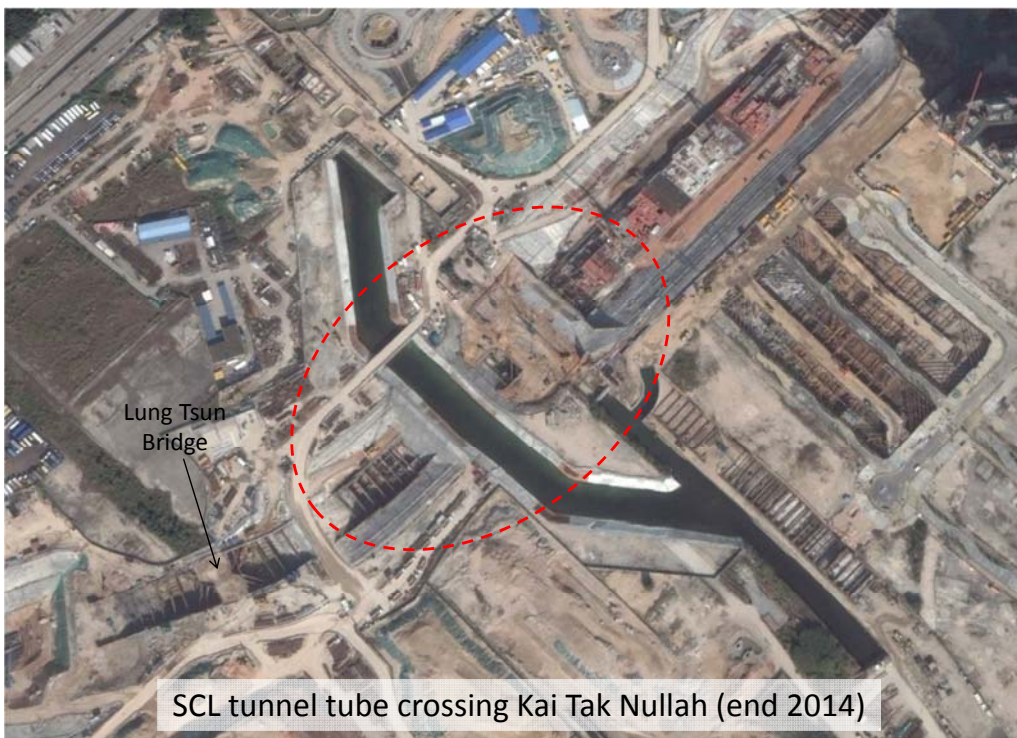


The cut-and-cover tunnel connecting into the station structure (Kai Tak Station)



SCL tunnel tube crossing Kai Tak Nullah (mid 2014)





End of Part 1 about Hong Kong River  
Regeneration based on the Kai Tak River  
Improvement project