Contract No. HY/2014/07
Contract Title: Central Kowloon Route – Kai Tak West

Proactive Environmental Protection Proforma under Section 14.3 of the EM&A Manual

Ref: 202101

Ref (1)	Proposed Construction Method(2)	Location/ Working Period	Anticipated Impacts	Recommended Mitigation Measures
EIA Ref 6.7.2	Construction of Cofferdam for Stage 2 Underwater Tunnel before demolition of cofferdam for Stage 1 Underwater Tunnel (details refer to the attached document)	Embayed Area of Kowloon Bay for around 4 months	Minor hydrodynamic impact is anticipated for a short period	Good site practices such as deployment of silt curtain, regular litter removal and regular inspections to minimize the water quality impact.

Notes:

(1) EIA Ref/EM&A Log Ref/Design Document Ref
(2) Details of equipment, vehicles, plants, processes, technologies for the option of construction method

Reviewed by Environmental Team Leader: _____

Date: 23 Jun 2021

Approved by Independent Checker (Environment): _____

Date: 24 June 2021

Contract No. HY/2014/07
Contract Title: Central Kowloon Route – Kai Tak West

Proactive Environmental Protection Proforma
for Revised Construction Sequence of Underwater Tunnel Construction

Introduction

Gammon Construction Limited (GCL) was commissioned by the Highways Department as the Civil Contractor for Works Contract HY/2014/07. AECOM Asia Company Limited (AECOM) was appointed by GCL as the Environmental Team (ET) to undertake the Environmental Monitoring and Audit (EM&A) programme during construction phase of the Project.

The Environmental Impact Assessment (EIA) Report for Central Kowloon Route (CKR EIA) (Register No.: AEIAR-171/2013) was approved on 11 July 2013 under the Environmental Impact Assessment Ordinance (EIAO). Following the approval of the EIA Report, an Environmental Permit (EP) for CKR was granted on 9 August 2013 (EP No.: EP- 457/2013) for the construction and operation. Variation of EP (VEP) was subsequently applied and the latest EP (EP No. EP-457/2013/C) was issued by the Director of Environmental Protection (DEP) on 16 January 2017. Further Environmental Permit (EP No. FEP-01/457/2013/C) for CKR – Kai Tak West was issued on 28 February 2018.

At times during the construction phase the Contractor may submit method statements for various aspects of construction. This state of affairs would only apply to those construction methods that the EIA has not imposed conditions while for construction methods that have been assessed in the EIA, the Contractor is bound to follow the requirements and recommendations in the EIA study. The Contractor's options for alternative construction methods may introduce adverse environmental impacts into the Project. According to Section 14.3 of the EM&A Manual, it is the responsibility of the Contractor and ET, in accordance with established standards, guidelines and EIA study recommendations and requirements, to review and determine the adequacy of the environmental protection and pollution control measures in the Contractor's proposal in order to ensure no unacceptable impacts would result. To achieve this end, the ET shall provide a copy of the Proactive Environmental Protection Proforma to the IEC for approval. The IEC should audit the review of the construction method and endorse the proposal on the basis of no adverse environmental impacts.

Original Construction Sequence for Temporary Reclamation in the CKR EIA Report

In this project, a 370m long section of the CKR tunnel between the Kowloon City Ferry Pier to the Kai Tak Development Area will pass through the seabed of Kowloon Bay and a 2-stage temporary reclamation will be adopted. According to Section 6.7.2 of the CKR EIA Report, the brief procedures of marine-based works are listed in follows:

- Stage 1 Reclamation
    1. Installation of stone columns
    2. Installation of pipepile wall
    3. Excavation, filling activities and all tunnelling works within the pipepile wall
    4. Excavated to the required depth for navigation within the pipepile wall
    5. Demolition of Stage 1 pipepile seawall by trimming of sheet piles at top of seabed

- Dredging of Navigation Channel

- Stage 2 Reclamation
    1. Repeat Step 2 to 5

The construction sequence was described in **Annex A**.

Proposed Construction Sequence for Temporary Reclamation

According to the latest development on the marine works, dredging of navigation channel as shown in **Annex A** is not necessary at this stage for marine access of Naphtha Tanker from TownGas, GCL proposes to revise the construction sequence for the Stage 1 and Stage 2 reclamation works as shown in **Annex B**.

In the proposed scheme, the revised construction sequence of marine works are summarized as below:

Part 1 Works – Stage 1 Reclamation

- Installation of steel working platform (as proposed in Proforma Ref:2018-01)
- Installation of sheetpile and pipepile wall
- Excavation, filling activities and all tunnelling works within the pipepile wall

Part 2 Works – Stage 2 Reclamation

- Installation of steel working platform (as proposed in Proforma Ref:2018-01), sheetpile and pipepile wall

Part 3 Works – Stage 1 Reclamation Remaining Works (in parallel with Part 2 Works)

- Excavated to the required depth within the pipepile wall
- Demolition of Stage 1 pipepile seawall by trimming of sheet piles at top of seabed

Part 4 Works – Stage 2 Reclamation

- Installation of remaining steel working platform (as proposed in Proforma Ref:2018-01)
- Installation of remaining sheetpile and pipepile wall
- Excavation, filling activities and all tunnelling works within the pipepile wall
- Excavated to the required depth within the pipepile wall
- Demolition of Stage 2 pipepile seawall by trimming of sheet piles at top of seabed

Anticipated Environmental Impacts of Proposed Scheme

In the proposed scheme, part of the steel working platform, sheetpile and pipepile wall for Stage 2 Reclamation will be constructed before the removal of Stage 1 Reclamation, the water quality impact and hydrodynamic regime due to the proposed scheme was described below.

Anticipated Water Quality Impact

Without the dredging works to be carried out for navigation channel, the potential impact on water quality was eliminated and the water quality impacts would be greatly improved when compared with the approved EIA Report. Before the installation of sheetpile / pipepile and removal works for Underwater Tunnel Stage 1 and Stage 2, enclosed silt curtain would be installed. As stated in the CKR EIA Report, minor seabed disturbance is anticipated for these works and the water quality impact could be mitigated by good site practices such as provision of perimeter silt curtain.

Anticipated Hydrodynamic Impact

Started from June 2021, steel working platform will be carried out for Stage 2 Reclamation**.** Stagging piles will be installed to support the steel decks which is to be constructed above water. In view of the hydrodynamic impact, these limited and scattered piles will only impose very minimal impact on the hydrodynamic regime of the area in this period.

During the construction of the pipepile and sheetpile for the Stage 2 Reclamation from July 2021 to August 2021, the pipepile and sheetpile will gradually forms wall and may affect the water flow within this embayed area in Kowloon Bay.

Based on Section 6.7.2.1 of the CKR EIA Report as extracted in **Annex C**, the water circulation at this embayed area is already in a low tide (0.001 to 0.06 m/s and 0.006 to 0.064 m/s for dry and wet season respectively) compared to that typhoon shelter and outer Kowloon Bay. The change of hydrodynamic regime due to temporary reclamation will only last for less than 5 years. Thus, the hydrodynamic impact is insignificant.

According to the revised construction sequence, removal of pipepile and sheetpile for Stage 1 Reclamation will be carried out gradually from Mid-Sep 2021 and this removal works is planned to be completed in October 2021 and the change in hydrodynamic regime, if any, will be reduced. After the reinstatement of the temporary reclamation for Underwater Tunnel Stage 1 in October 2021, the remaining construction and reinstatement works for Underwater Tunnel Stage 2 will be the same as that assumed in the CKR EIA report.

In this revised construction sequence, at least a 60m in width of navigation channel will be maintained at all time. With the short period of overlapping Stage 1 and Stage 2 temporary reclamation, based on the conclusion of the approved CKR EIA Report, the hydrodynamic impact is insignificant.

Mitigation Measures to be implemented

According to the CKR EIA Report, given the improved water quality and insignificant hydrodynamic impact due to the revised construction sequence, in additional to deployment of silt curtain, other mitigation measures are recommended as follows:

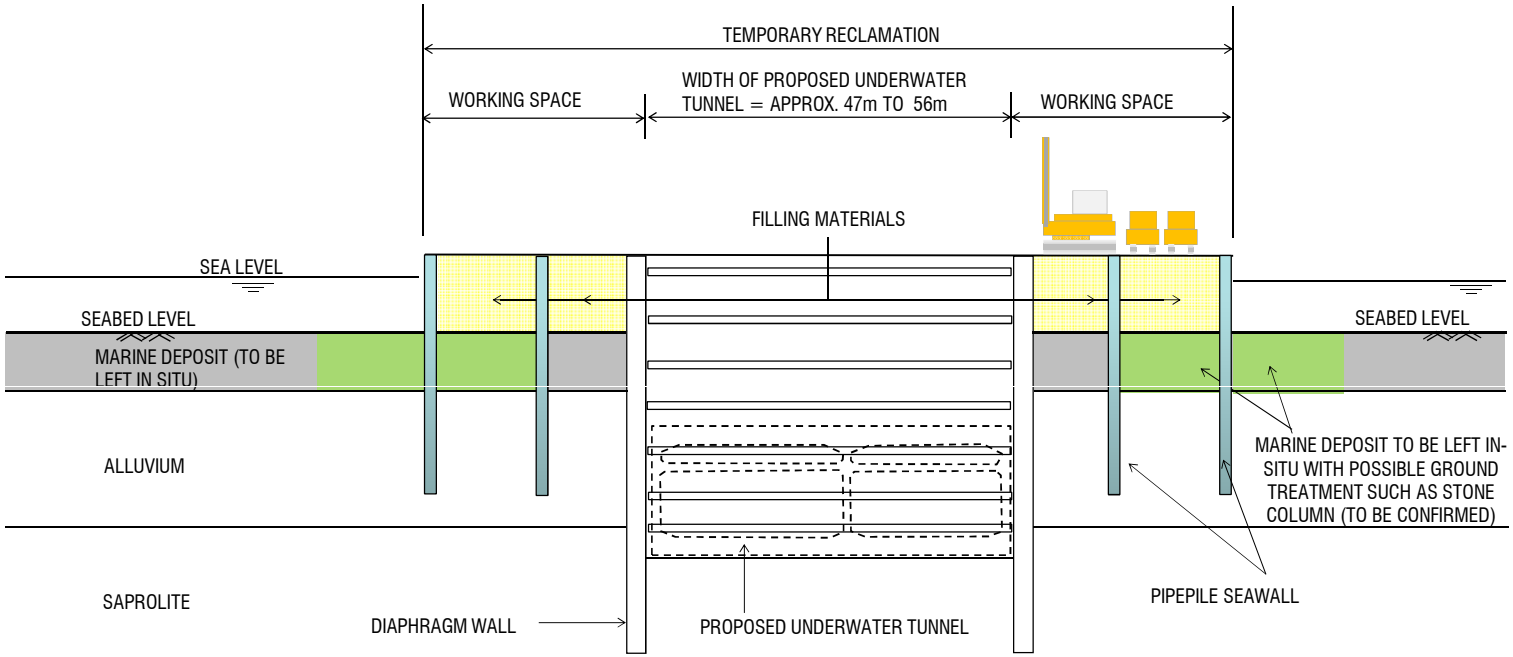
- Illegal discharges to the embayed marine water is strictly prohibited; and
- Regular litter / rubbish clearance in the embayed marine water should be implemented.

Appendices

Annex A – Construction Sequence of 2-stage reclamation in CKR EIA Report
Annex B – Proposed Construction Sequence for Underwater Tunnel Stage 1 and Stage 2 Interface
Annex C - Abstract of Section 6.7.2 of the CKR EIA Report

ANNEX A

Construction Sequence of 2-stage reclamation in CKR EIA Report



TYPICAL SECTION OF PROPOSED TEMPORARY RECLAMATION
FOR CONSTRUCTION OF UNDERWATER TUNNEL (PIPEPILE SEAWALL SCHEME)

Rev	Description	By	Date

Consultant
ARUP Mott MacDonald
Joint Venture

Project title
Agreement No. CE 43/2010 (HY)
Central Kowloon Route - Design and Construction

Drawing title
Typical Section of Proposed Temporary Reclamation (Pipepile Seawall Scheme)

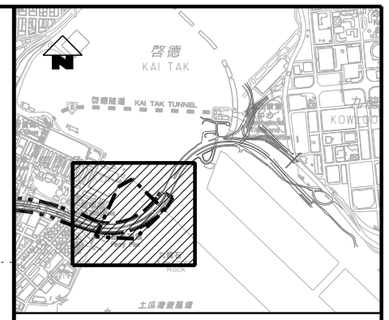
Drawing no. **Figure A3.3.1** Rev.

Drawn	Date	Checked	Approved
		—	—

Scale | Status

路政署 HIGHWAYS DEPARTMENT
主要工程管理處 MAJOR WORKS PROJECT MANAGEMENT OFFICE

838000 E
838200 E
838400 E
820200 N
820000 N
819800 N
MA TAU KOK
KAI TAK
KOWLOON BAY
TO KWA WAN
九龍灣
KOWLOON BAY
Kowloon Bay
EXTENT OF STAGE 1
TEMPORARY RECLAMATION
EXTENT OF STAGE 2
TEMPORARY RECLAMATION
MARINE ACCESS OF NAPHTHA
TANKER DURING STAGE 1
TEMPORARY RECLAMATION
0 10 20 30 40 50
METRES
1 : 1000



KEY LOCATION PLAN

LEGEND

- EXTENT OF TEMPORARY RECLAMATION
- EXCAVATION FOR TUNNEL CONSTRUCTION WITHIN TEMPORARY RECLAMATION
- SURFACE DREDGING FOR NAVIGATION
- EXCAVATION FOR NAVIGATION WITHIN TEMPORARY RECLAMATION

Rev	Description	By	Date
A	FIRST ISSUE	RC	07/12

Consultant
ARUP Mott MacDonald
Joint Venture

Project title
Agreement No. CE 43/2010 (HY)
Central Kowloon Route -
Design and Construction

Drawing title
PROPOSED TEMPORARY RECLAMATION AND DREDGING FOR UNDERWATER TUNNEL (STAGE 1)

Drawing no.	Rev.
CKR/SK/24/1207	A

Drawn	Date	Checked	Approved
RC	07/12	HYJL	DS

Scale 1:1000 @ A1
Status PRELIMINARY

路政署
HIGHWAYS DEPARTMENT
主要工程管理處
MAJOR WORKS PROJECT MANAGEMENT OFFICE

Printed by : 24/07/2012
Filename : J:\217722\ARUP\GEO\SKETCH\CKR_SK_24_1207.dgn

838000 E
838200 E
838400 E
820200 N
820000 N
819800 N

MA TAU KOK

KAI TAK

TO KWA WAN

KOWLOON BAY

九龍灣
KOWLOON BAY

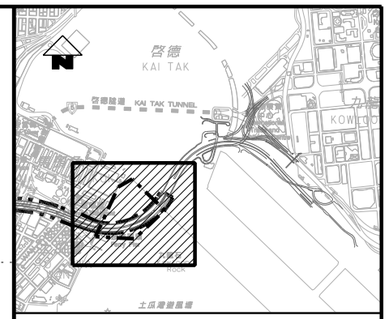
九龍灣
Kowloon Bay

EXTENT OF STAGE 1
TEMPORARY RECLAMATION

EXTENT OF STAGE 2
TEMPORARY RECLAMATION

MARINE ACCESS OF NAPHTHA
TANKER DURING STAGE 2
TEMPORARY RECLAMATION

0 10 20 30 40 50
METRES
1 : 1000



KEY LOCATION PLAN

LEGEND

EXTENT OF TEMPORARY RECLAMATION

EXCAVATION FOR TUNNEL CONSTRUCTION WITHIN TEMPORARY RECLAMATION

Rev	Description	By	Date
A	FIRST ISSUE	RC	07/12

Consultant
ARUP Mott MacDonald
Joint Venture

Project title
Agreement No. CE 43/2010 (HY)
Central Kowloon Route -
Design and Construction

Drawing title
PROPOSED TEMPORARY RECLAMATION AND DREDGING FOR UNDERWATER TUNNEL (STAGE 2)

Drawing no.	Rev.
CKR/SK/24/1208	A

Drawn	Date	Checked	Approved
RC	07/12	HYJL	DS

Scale: 1:1000 @ A1
Status: PRELIMINARY

路政署
HIGHWAYS DEPARTMENT
主要工程管理處
MAJOR WORKS PROJECT MANAGEMENT OFFICE

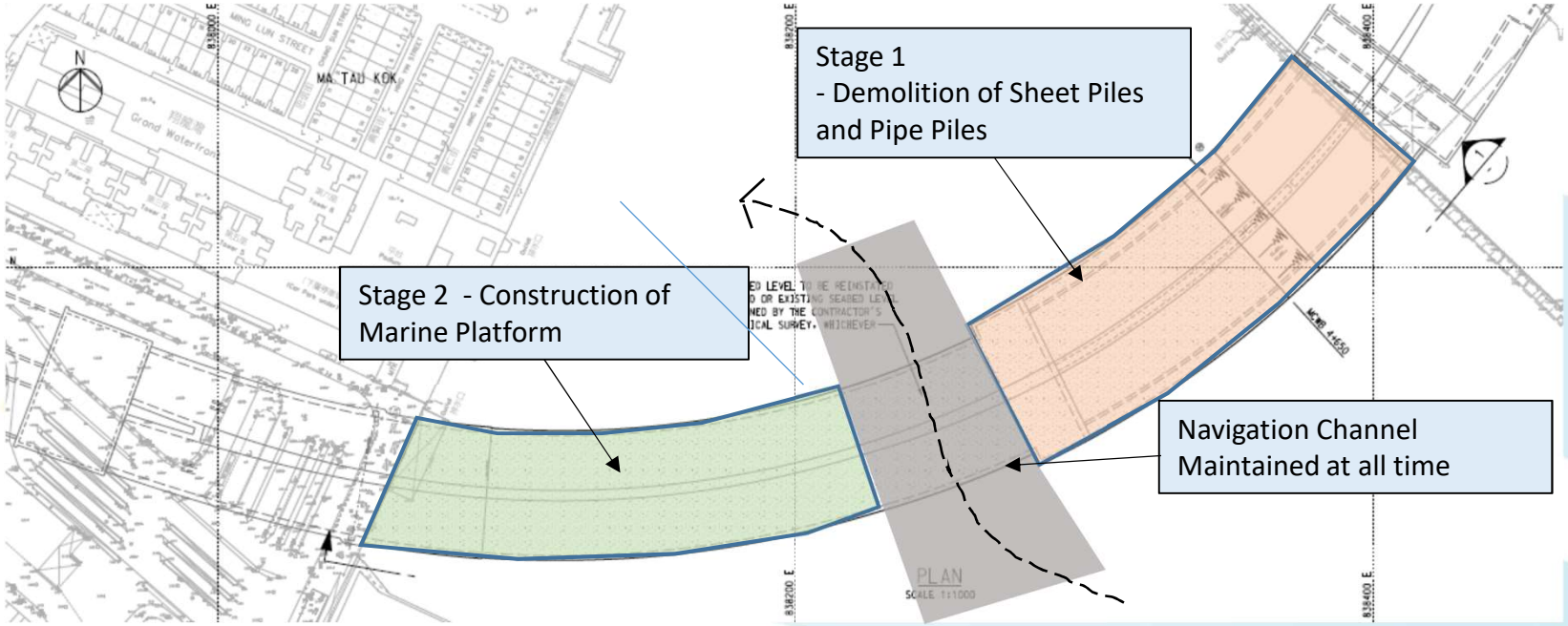
Printed by : 24/07/2012
Filename : J:\217722\ARUP\GEO\SKETCH\CKR_SK_24_1208.dgn

ANNEX B

Proposed Construction Sequence for Underwater Tunnel Stage 1 and Stage 2 Interface

KTW - Proposed Work Procedures

- No open dredging is required
- Concurrent for Stage 1 sheet piles and pipe piles demolition and Stage 2 marine platform construction
- Maintain necessary navigation channel at all time



ANNEX C

Abstract of Section 6.7.2 of the CKR EIA Report

Nevertheless, due to constraints in site access, further site investigation (SI) works at Ma Tau Kok will be required to further investigate the potential of land contamination prior to construction which would need to be carried out after possession of site by the contractor (see **Chapter 8**). If contaminated site found, discharge/ recharge of groundwater generated from this area may affect the groundwater quality, if uncontrolled.

6.7.1.6 Accidental Spillage

The site coverage would be rather large during the construction phase. The soil of site area may be potentially contaminated by accidental spillage of grouting materials, surplus adhesives, lubrication oil, grease, acidic/alkaline solutions, petroleum products, chemical solvents, etc. Site runoff may wash the contaminated soil into stormwater drains or watercourses and cause water quality impact.

6.7.2 Marine-based Works

Temporary reclamation and re-location of navigation channels at To Kwa Wan will include dredging activities. As discussed in **Section 3.5**, a pipepile seawall method will be applied for the temporary reclamation. This will avoid the need for open dredging and subsequent filling. Compared with traditional fully dredged method, the total in-situ dredging volume for marine channel outside pipepile walls could be reduced from 357,500 m^3 to 19,700 m^3 (~95% reduction). With the adoption of pipepile seawall method, excavation and filling activities will be carried out within pipepile walls. Thus no contact of marine water with the works is anticipated for temporary reclamation. However, dredging activities will still be occurred during the re-location of navigation channels, as shown in **Appendix 3.3**. The brief procedures of marine-based works are listed in follows:-

Stage 1 Reclamation: Jan 2015 to Dec 2016 (Tentative)

- Step 1: Installation of stone columns
- Step 2: Stage 1 Reclamation – Installation of pipepile seawall
- Step 3: Stage 1 Reclamation – Excavation, filling activities and all tunneling works within the pipepile seawall
- Step 4: Stage 1 Reclamation – Excavation of filled materials and sediment to the required depth for navigation within the pipepile seawall
- Step 5: Demolition of Stage 1 pipepile seawall (except the interfacing part) by trimming of sheet pipes at top of seabed.

Dredging of Navigation Channel: Jan 2017 to Feb 2017 (Tentative)

- Step 6: Dredging of navigation channel

Stage 2 Reclamation: Mar 2017 to Apr 2019 (Tentative)

- Step 7: Stage 2 Reclamation (repeat Step 2 to 5)

The following potential water quality impacts were identified:

- Change of hydrodynamic regime due to temporary reclamation
- Sediments loss due to dredging
- Contaminant release due to dredging
- Stone Column Installation
- Seawall Demolition

Apart from temporary reclamation and their associated works, there will be a proposed barging point at Kwai Chung (see **Figure 3.2.1**). Since, the existing land use of this barging point is already barging activities occupied by other projects. Thus, there will be basically no additional construction works on the proposed barging point, except minor facilities might be erected on land base.

6.7.2.1 Change of Hydrodynamic Regime due to Temporary Reclamation

The 3-dimensional modeling tool, Delft3D, is adopted to simulate the hydrodynamic and water quality impact due to the construction and operation of CKR. The Delft3D-FLOW module was used for hydrodynamic simulations.

The approved SEK Model was nested from the Update Model, which is a regional model developed and calibrated under the Update on Cumulative Water Quality and Hydrological Effect of Coastal Developments and Upgrading of Assessment Tool (1998). The SEK Model was also validated for hydrodynamic and water quality modeling under EIA – Kai Tak Development (EIA-157/2008). The model was therefore be adopted for hydrodynamic and so as the water quality modeling (see **Section 6.7.2** below) in the present study.

Despite that SEK Model has been calibrated in that EIA study, calibration or validation of the model was required in this Study as coarse grids used in SEK Model are not suitable for the Project. Therefore, the refinement of grids will be made by either domain-decomposition or nesting process. Moreover, the pollution load inventory inside the model will be updated according to the latest information. Details of modeling parameters and calibration are attached in **Appendix 6.2**.

The temporary reclamation will be divided into two phases. The construction of Stage 1 temporary reclamation platform will be erected at the eastern part of Kowloon Bay during January 2015 to December 2016 while Stage 2 temporary reclamation platform will be erected at western part of Kowloon Bay near Ma Tau Kok Public Pier and will stay from March 2017 to April 2019. The graphical presentation on reclamation sequence is presented in **Appendix 3.3**. The following modeling scenarios were therefore identified[2]:

- Scenario H0 – Base Scenario
- Scenario H2a – Stage 1 Reclamation
- Scenario H1a – Stage 2 Reclamation
- Scenario H1b – Stage 2 Reclamation (with Kai Tak Runway Opening)

[2] While the Kai Tak Runway Opening will be operated in 2018 (see Table 6.6a), it is unlikely to have hydrodynamic cumulative impact during Stage 1 scenario but will be considered in Stage 2 scenario.

The modeling results were presented in **Appendix 6.3** and the results are summarized in the table below.

Table 6.7: Summary of Hydrodynamic Impact due to Temporary Reclamation

Indicators	Season	Base Case	Stage 1 Reclamation	Stage 2 Reclamation	Stage 2 Reclamation (with Kai Tak Runway Opening)
Accumulated Flow ($\times 10^8 m^3$)					
Victoria – TST to WC	Dry	14.8	14.8	14.8	14.8
	Wet	3.4	3.4	3.4	2.8
Lei Yue Mun	Dry	14.7	14.7	14.7	14.8
	Wet	3.3	3.3	3.3	2.7
Average Velocity (m/s)					
WSR 1	Dry	0.076 (0.003-0.180)	0.076 (0.004-0.180)	0.076 (0.004-0.180)	0.084 (0.012-0.194)
	Wet	0.127 (0.025-0.312)	0.126 (0.028-0.310)	0.126 (0.027-0.310)	0.138 (0.020-0.332)
WSR 2	Dry	0.046 (0.002-0.110)	0.046 (0.002-0.110)	0.046 (0.002-0.109)	0.037 (0.004-0.103)
	Wet	0.141 (0.020-0.497)	0.138 (0.020-0.477)	0.138 (0.020-0.478)	0.154 (0.020-0.523)
WSR 3	Dry	0.034 (0.003-0.066)	0.034 (0.003-0.067)	0.034 (0.003-0.067)	0.041 (0.006-0.092)
	Wet	0.059 (0.010-0.168)	0.059 (0.009-0.158)	0.059 (0.010-0.159)	0.068 (0.014-0.161)
Embayed Area	Dry	0.008 (0.001-0.060)	0.006 (0.000-0.055)	0.007 (0.000-0.052)	0.012 (0.002-0.048)
	Wet	0.030 (0.006-0.064)	0.023 (0.003-0.056)	0.031 (0.004-0.067)	0.028 (0.008-0.064)

According to the modeling results, it is observed that the change of average velocity due to the temporary reclamation is less than 0.007m/s (refer Base Case and Stage 1 Reclamation).

In the embayed area formed by the temporary reclamation, it is observed that the current directions will be changed due to the semi-enclosed opening. The velocity variations at the embayed area are less than 0.007m/s and 0.001 m/s due to the Stage 1 and 2 Reclamations (project only) respectively. Nevertheless, the water circulation at this embayed area is already in a low side (0.001 to 0.060 m/s and 0.006 to 0.064 m/s for dry and wet season respectively) compared to that typhoon shelter and outer Kowloon Bay (WSR 1 to WSR 3). The change of hydrodynamic regime due to temporary reclamation will only last for less than 5 years (around Jan 2015 to Apr 2019). Thus, hydrodynamic impact is insignificant and the associated water quality impact including dissolved oxygen profile (which the re-aeration rate is a function of velocity) would be negligible.

The Kai Tak runway opening will be operated in 2018, where will have about 16-month concurrent period. With the operation of Kai Tak runway opening during Stage 2 Reclamation, pollutant from Kai Tak Nullah and Approach Channel may be diluted and dispersed to Kowloon Bay and the embayed area[6-8]. These pollutants are dominated by the implementation of Tolo Harbour Effluent Export

Scheme (THEES), which diverts the secondary treated effluent from the Tai Po and Sha Tin sewage treatment works, and also the existing pollutants from Kai Tak Nullah and Kai Tak Approach Channel. According to the modelling prediction under in the EIA Report of Kai Tak Development (EIA-157/2008), the annual mean ammonia nitrogen and unionised ammonia levels would exceed the existing WQO[6-8] at the embayed area. This pollutant plume may further trapped inside the embayed area if Stage 2 Reclamation occurred. This phenomenon is also shown in the salinity plot in **Appendix 6.3** (H1b-D-SL-ET, H1b-D-SL-FT, H1b-W-SL-ET, H1b-W-SL-FT).

Additional scenario, Scenario H2b-DN, representing a do-nothing scenario with Kai Tak Runway Opening was modelled for comparison. The comparison of salinity levels with and without Stage 2 Reclamation was presented in **Appendix 6.3A**. Marginal change in salinity levels is observed with and without Stage 2 Reclamation. In general speaking salinity levels will be reduced at surface layer but increase in bottom layer with the presence of Stage 2 Reclamation. These changes are considered to be minor and will not further deteriorate the water quality and the impact were mainly due to the Kai Tak runway opening, which is a not related to CKR project.

According to the model result, the velocity variations at the embayed area is +0.004 m/s and -0.002 m/s in dry and wet season respectively during Stage 2 Reclamation with Kai Tak runway opening. Similar to the above, given the embayed area is already under a low flow condition, major change of water circulation due to the Project is not anticipated. There are also no WSR within the embayed area. Thus, the associated water quality impact is considered to be minor. In addition, according to the latest programme, Environmental Bureau will further review the tentative operation date of Kai Tak runway opening in end 2013 and the actual operation date is likely to be further delayed. Thus, cumulative impact from Stage 2 Reclamation and Kai Tak runway opening might not exist if programme changed. For conservative consideration, the maximum overlapping period of Stage 2 Reclamation and Kai Tak runway opening will only last for about 16 months. Thus, such minor impact is reversible after demolishment of Stage 2 Reclamation. Once the Stage 2 Reclamation is demolished, the water quality regime will remain as that predicted in the EIA for Kai Tak Development.

Given the insignificant hydrodynamic and water quality impact due to temporary reclamation, generic mitigation measure is recommended as follows:

- Illegal discharges to the embayed marine water is strictly prohibited; and
- Regular litter/rubbish clearance in the embayed marine water should be implemented.

6.7.2.2 Sediment Loss due to Dredging

With the adoption of pipepile seawall approach using double-layer seawall method, excavation and filling activities will be carried out within the temporary reclamation area enclosed by double-layer seawall. Thus no contact of marine water with the works is anticipated for temporary reclamation.

Demolition of temporary reclamation will involve excavation of bulk fill. The proposed construction method adopts an approach where the double-layer seawall not be removed until completion of all excavation works within the temporary