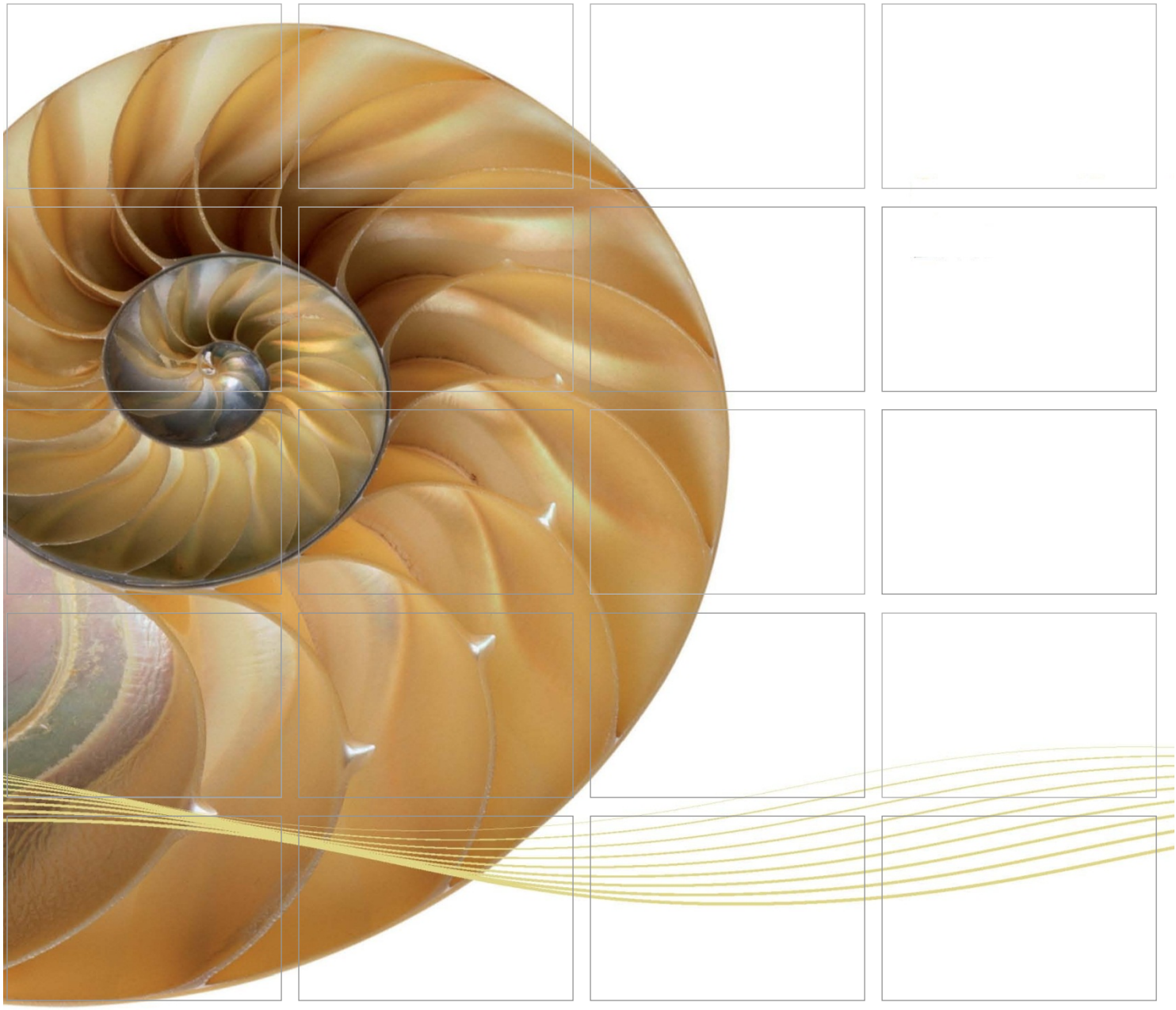

Contract No. HY/2012/08
Tuen Mun – Chek Lap Kok Link – Northern Connection Sub-sea Tunnel Section

Enhanced TSP Monitoring Plan

28 October 2013

Environmental Resources Management
16/F, DCH Commercial Centre
25 Westlands Road
Quarry Bay, Hong Kong
Telephone 2271 3000
Facsimile 2723 5660

www.erm.com

Contract No. HY/2012/08
Tuen Mun – Chek Lap Kok Link – Northern Connection Sub-sea Tunnel Section

Enhanced TSP Monitoring Plan

Document Code: 0212330_Revised Enhanced TSP Monitoring Plan_v3_2013_10_28.docx

Environmental Resources Management

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25 Westlands Road
Quarry Bay, Hong Kong
Telephone: (852) 2271 3000
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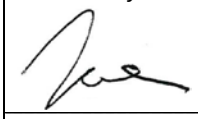
http://www.erm.com

Client:	Project No:
DBJV	0212330
Summary: This document presents the Enhanced TSP Monitoring Plan for Tuen Mun – Chek Lap Kok Link Northern Connection Sub-sea Tunnel Section.	Date: 28 October 2013 Approved by:  *Mr Craig Reid* *Partner* Certified by:  *Mr Jovy Tam* *ET Leader*

Revision	Description	By	Checked	Approved	Date
	Enhanced TSP Monitoring Plan	VAR	JT	CAR	28/10/13

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Certificate No. FS 32515

Ref.: HYDHZMBEEM00_0_1377L.13 28 October 2013

AECOM By Fax (2450 3099) and By Post
Supervising Officer Representative's Office
Room 201, 2nd Floor,
River Trade Terminal Office Building,
201 Lung Mun Road, Tuen Mun, Hong Kong

Attention: Messrs. Edwin Ching / Mr. Andy Westmorelan

Dear Sir,

Re: Agreement No. CE 48/2011 (EP)
Environmental Project Office for the
HZMB Hong Kong Link Road, HZMB Hong Kong Boundary Crossing Facilities, and Tuen Mun-Chek Lap Kok Link – Investigation

Contract No. HY/2011/08
Tuen Mun – Chek Lap Kok Link
Northern Connection Sub-sea Tunnel Section
Enhanced TSP Monitoring Plan (EP Condition 2.4)

Reference is made to the submission of a revised Enhanced TSP Monitoring Plan certified by the ET Leader (ERM's Document Code: "0212330_Revised Enhanced TSP Monitoring Plan_v3_2013_10_28.docx") provided to us via email on 28 October 2013.

We are pleased to inform you that we have no adverse comments on the captioned Enhanced TSP Monitoring Plan. We write to verify the captioned submission in accordance with Condition 2.4 of EP-354/2009/A.

Thank you for your kind attention. Please do not hesitate to contact the undersigned or the ENPO Leader Mr. Y H Hui should you have any queries.

Yours sincerely,
Tony Cheng
Independent Environmental Checker
Tuen Mun – Chek Lap Kok Link

c.c. HyD – Mr. Stephen Chan (By Fax: 3188 6614)
HyD – Mr. Matthew Fung (By Fax: 3188 6614)
AECOM – Mr. Conrad Ng (By Fax: 3922 9797)
ERM – Mr. Jovy Tam (By Fax: 2723 5660)
Dragages – Mr. C.F. Kwong (By Fax: 3543 1010)

Internal: DY, YH, SC, ENPO Site

Q:\Projects\HYDHZMBEEM00\02_Proj_Mgt\02_Corr\HYDHZMBEEM00_0_1377L.13.doc

ENVIRON Hong Kong Limited 英環香港有限公司
Room 2403 Jubilee Centre, 18 Fenwick Street, Wan Chai, Hong Kong. Tel: 852 3465 2888 Fax: 852 3465 2899
www.environcorp.com

CONTENTS

1 INTRODUCTION

According to the findings of the Northwest New Territories (NWNT) Traffic and Infrastructure Review conducted by the Transport Department, Tuen Mun Road, Ting Kau Bridge, Lantau Link and North Lantau Highway (NLH) will be operating beyond capacity after 2016 due to the increase in cross boundary traffic, developments in the NWNT, and possible developments in North Lantau, including the Airport developments, the Lantau Logistics Park (LLP) and the Hong Kong – Zhuhai – Macao Bridge (HZMB). In order to cope with the anticipated traffic demand, two new road sections between NWNT and North Lantau – Tuen Mun – Chek Lap Kok Link (TM-CLKL) and Tuen Mun Western Bypass (TMWB) are proposed.

An Environmental Impact Assessment (EIA) of TM-CLKL ("the Project") was prepared in accordance with the EIA Study Brief (No. ESB-175/2007) and the *Technical Memorandum of the Environmental Impact Assessment Process* (*EIAO-TM*), which was submitted under the Environmental Impact Assessment Ordinance (EIAO) in August 2009. Subsequent to the approval of the EIA (EIAO Register Number AEIAR-145/2009), an Environmental Permit (EP-354/2009) for TM-CLKL was granted by the Director of Environmental Protection (DEP) on 4 November 2009, and a variation to the EP (EP-354/2009A) was issued on 8 December 2010.

The *Supplementary Information on Construction Air Quality in Tuen Mun* (1) (the *Supplementary Information*) submitted under *Section 8.(1)* of the EIAO for the Project stated that exceedances of the annual Total Suspended Particulates (TSP) criteria of 80μg/m^3 were anticipated at seven existing Air Sensitive Receivers (ASRs) in the Pillar Point area during the construction stage of the Project. As per *Condition 2.4* of the EP of TM-CLKL, an enhanced monitoring plan on TSP level at Tuen Mun ("the Enhanced TSP Monitoring Plan") is required to be submitted to the DEP for approval at least 1 month before the commencement of construction of the Project. The Enhanced TSP Monitoring Plan shall include the locations and frequency of monitoring and details of the measures to mitigate any upsurge of TSP level including increase the frequency of monitoring of TSP and stoppage of works.

This Enhanced TSP Monitoring Plan has been prepared by ERM-Hong Kong, Limited (ERM) on behalf of Dragages-Bouygues Joint Venture (DBJV), the Contractor for *Contract No. HY/2012/08*, and presents the methodology for enhanced monitoring of TSP level at Tuen Mun to be undertaken in accordance with *Condition 2.4* of the EP.

(1) EIA reports related to HZMB. Supplementary Information on Construction Air Quality in Tuen Mun. Further information submitted under Section 8.(1) of the Ordinance. Available from http://www.epd.gov.hk/eia/register/report/eiareport/eia_1742009/further_info/pdf/Supplementary%20Details%20for%20ACE%20R6%20-%20marked%20up%20EPD%202509.htm

1.1 PROJECT SCOPE

The TM-CLKL comprises a dual 2-lane highway connecting the proposed Tuen Mun Western Bypass at the southern coast of Tuen Mun Area 40 and the Airport and Tung Chung (*Figure 1.1*). The construction of TM-CLKL will be undertaken under the following five separate contracts:

- Contract I (appointed under *Contract No. HY/2012/07*) – Southern Connection Viaduct Section;
- Contract II (appointed under *Contract No. HY/2012/08*) – Northern Connection Sub-sea Tunnel Section ("Northern Connection");
- Contract III – Northern Connection Toll Plaza and Associated Works (the "toll plaza");
- Contract IV – Northern Connection Tunnel Buildings, Electrical and Mechanical Works ("tunnel buildings"); and
- Contract V – Northern Connection Traffic Control and Surveillance System ("TCSS").

The scope of the above Contracts is indicated in *Figures 1.2-6*, respectively.

Under *Contract No. HY/2012/08*, DBJV is commissioned by the Highways Department (HyD) to undertake the design and construction of the Northern Connection Sub-sea Tunnel Section of TM-CLKL, including the northern landfall at Tuen Mun.

Specifically, the scope of Contract No. *HY/2012/08* includes:

- design and construction of sub-sea TBM tunnels (two tubes with cross passages) across the Urmston Road, connecting Tuen Mun Area 40 and HKBCF, of approximately 4 km in length with dual 2-lane carriageway;
- design and construction of cut-and-cover tunnels (two boxes with cross passages) at both the southern landfall and the northern landfall for construction of approach roads to the sub-sea TBM tunnels, of approximately 1.5 km in length;
- construction of northern landfall reclamation of approximately 16.5 hectares and about 2.0 km long seawalls;
- design and construction of ventilation buildings at the southern and northern landfalls;
- design and construction of at-grade roads at the southern and northern landfalls;
- construction of extension of the existing 4-cell box culvert adjacent to the River Trade Terminal (RTT);
- provision of a temporary pontoon for the affected existing Government berths;

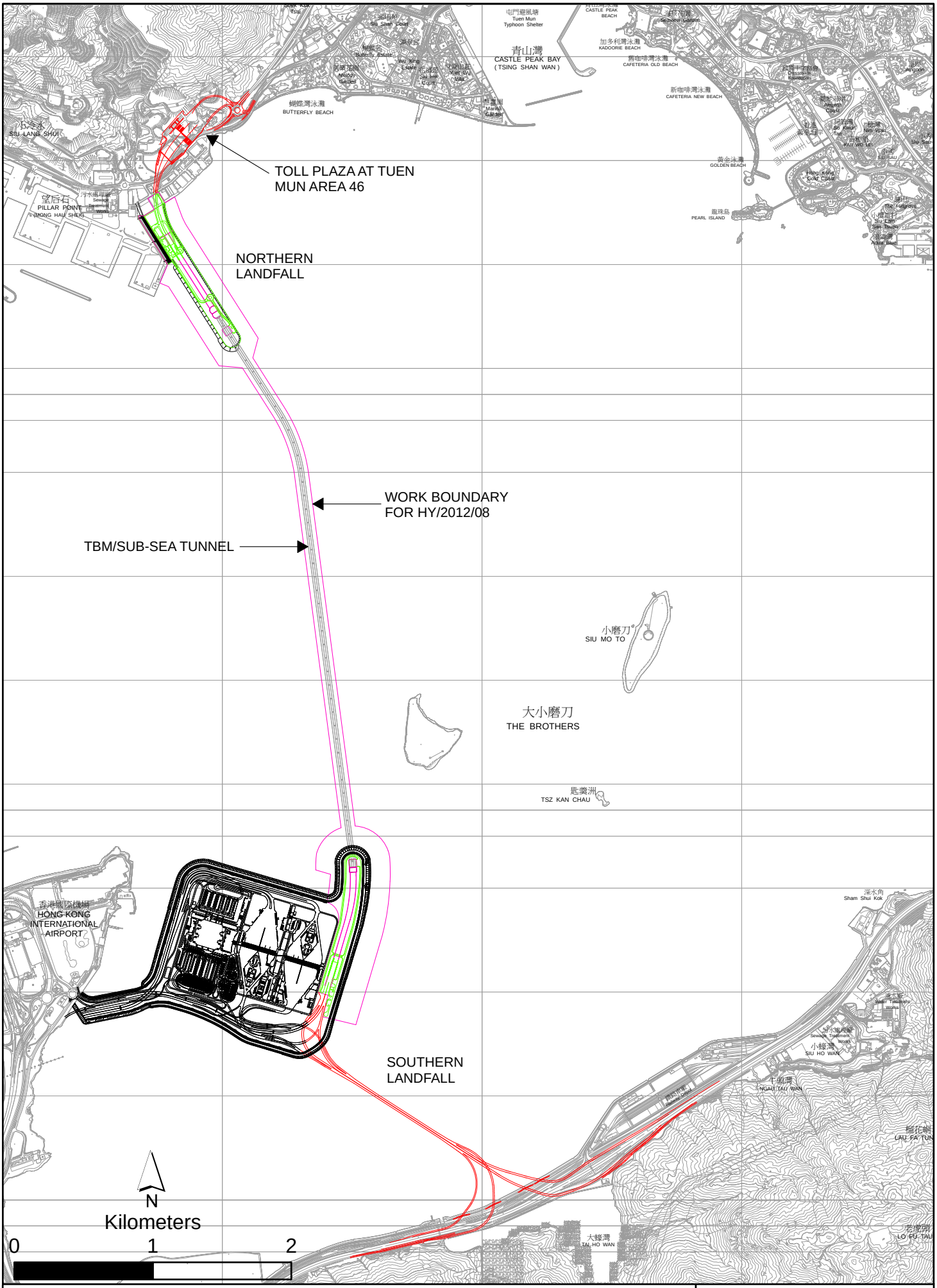

Figure 1.1

Layout of Tuen Mun - Chek Lap Kok Link

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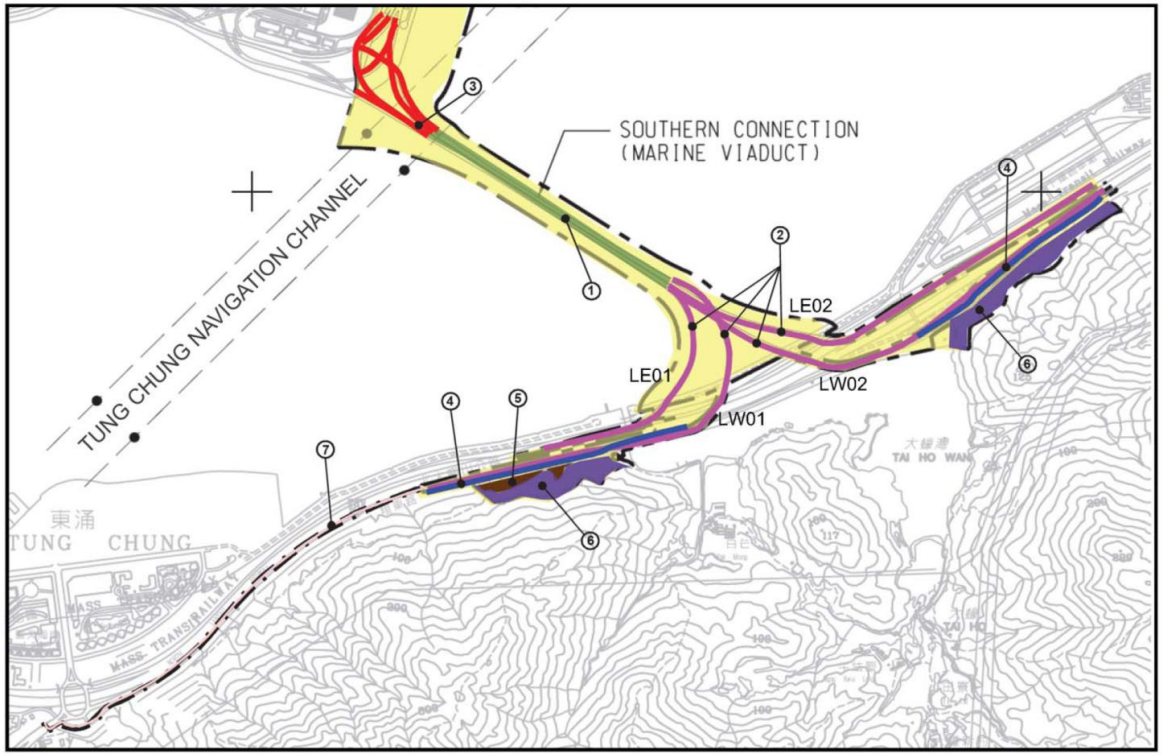
Date: 23/10/2013

Environmental Resources Management

ERM



① Southern Connection – Marine mainline Viaduct about 1.1km)

② Southern Connection – Slip Road Viaduct
- LE01
- LE02
- LW01
- LW02

③ Connections to HKBCF around 2.0 km long

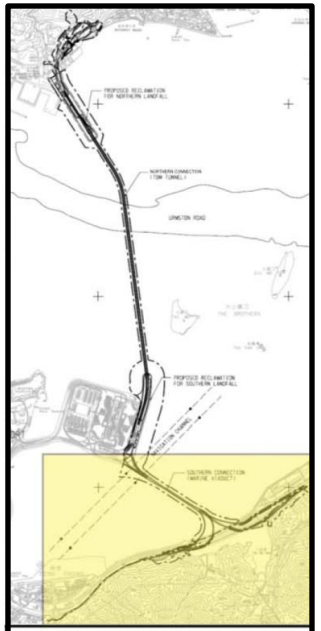
④ Re-alignment of Cheung Tung Road

⑤ Slopeworks along Cheung Tung Road

⑥ Natural Terrain Hazard Mitigation Works at Cheung Tung Road

⑦ Laying of Firemain along Cheung Tung Road

⑧ Drainage, sewerage, waterworks, utilities and landscaping works



KEY PLAN

AECOM

PROJECT
TUEN MUN - CHEK LAP KOK LINK - DESIGN AND CONSTRUCTION

CLIENT
HIGHWAYS DEPARTMENT
Hong Kong - Zhuhai - Macao Bridge Hong Kong Project Management Office

ISSUE/REVISION

I/R	DATE	DESCRIPTION	APP.

STATUS

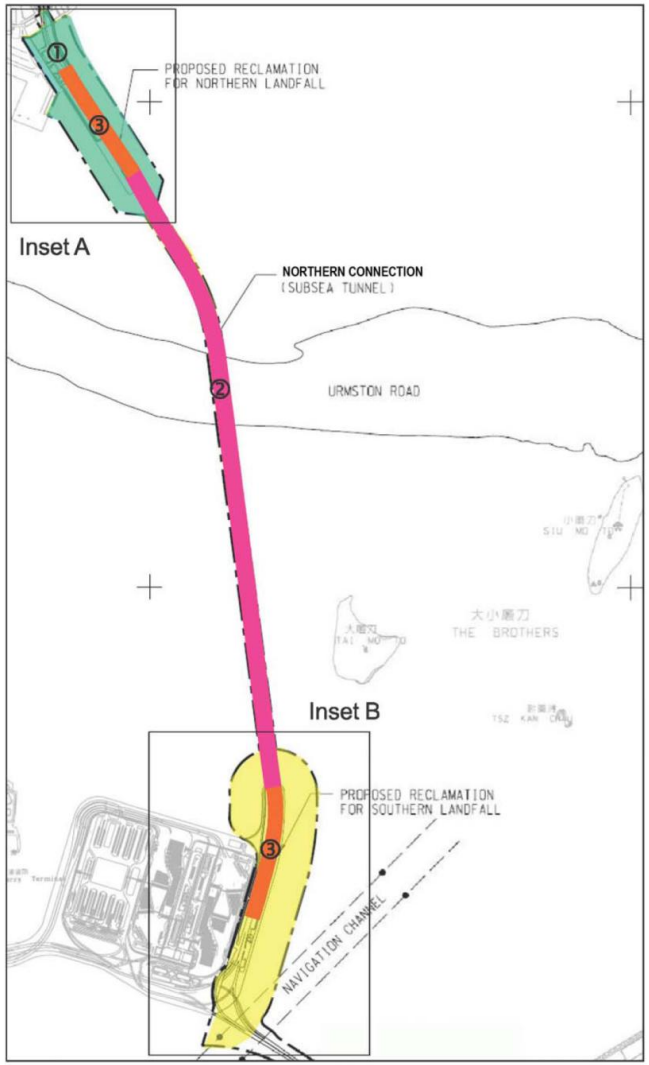
SCALE
A1 1:100 A3 1:200

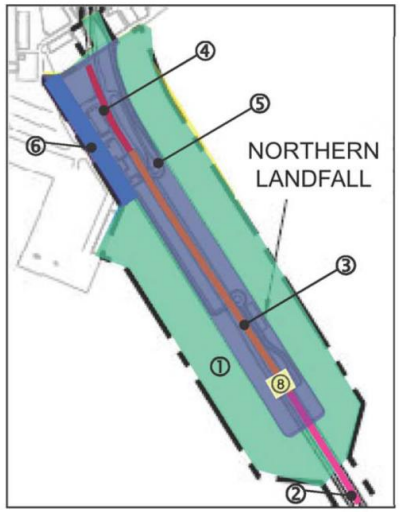
Figure 1.2

PROJECT NO. 60240249
CONTRACT NO. CE7/2011 (HY)

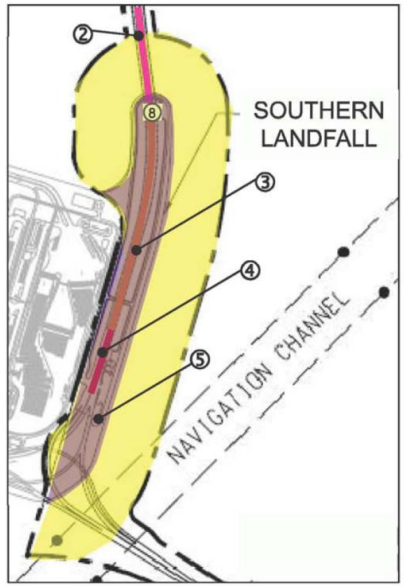
SHEET TITLE
Contract I - Southern Connection Viaduct Section

SHEET NUMBER
FIGURE 1.2





Inset A



Inset B

① Northern Reclamation of around 16.5ha with 2.10km seawall (including temporary portion for berthing and reprovisioning of Governmnet berths)

② TBM Tunnel (2 tubes) – around 4km

③ Cut and Cover Tunnels at Southern and Northern Landfalls – around 1.6km

④ Approach Ramp Structures and Retaining Walls to Cut and Cover Tunnel

⑤ At-grade roads at Southern and Northern Landfall

⑥ Box Culvert Extension at Northern Landfall

⑦ Drainage, sewerage, waterworks, utilities and at Southern and Northern Landfalls

⑧ North Ventilation Building and South Ventilation Building

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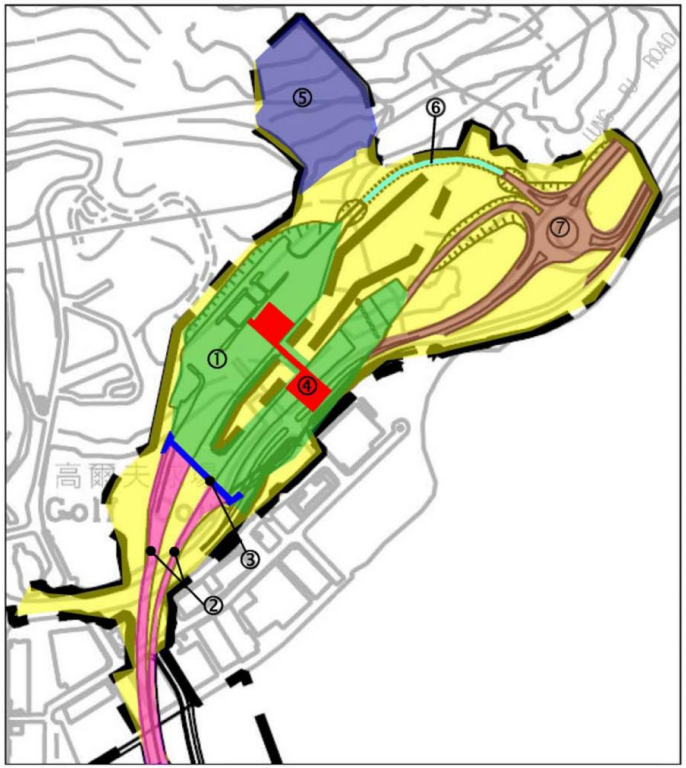
A1 1:100 A3 1:200

Figure 1.3

PROJECT NO. 60240249
CONTRACT NO. CE7/2011 (HY)

SHEET TITLE
Contract II - Northern Connection Sub-sea Tunnel Section

SHEET NUMBER
FIGURE 1.3



① Toll Plaza of 5.3ha

② Associated Connections including Viaduct Connecting North Portal Area

③ Footbridge

④ Toll Booth, Canopy and Toll Collector Subway

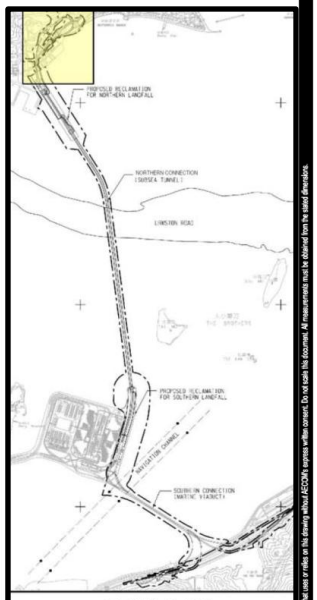
⑤ Natural Terrain Hazard Mitigation Works

⑥ Drill and Blast Tunnel - around 230m (vehicular underpass)

⑦ Lung Mun Road and Lung Fu Road Junction Modification works, Slip Roads and Roundabout

⑧ Slope Works

⑨ Drainage, sewerage, waterworks, utilities and landscaping works at Toll Plaza Area and along Lung Mun Raod and Lung Fu Road


KEY PLAN

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Hong Kong - Zhuhai - Macao Bridge Hong Kong Project Management Office

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STATUS

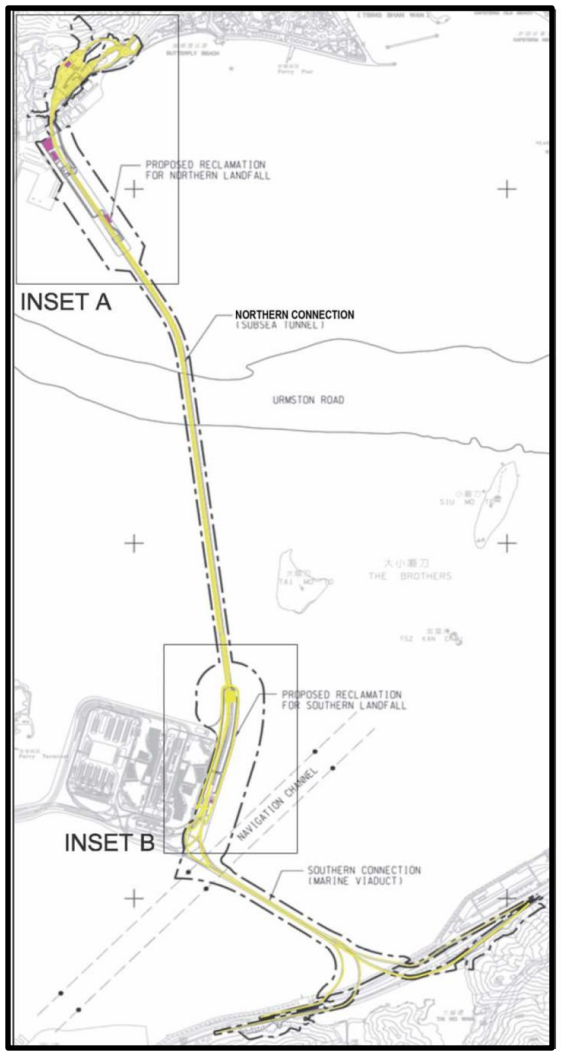
SCALE
A1 1:100 A3 1:200

Figure 1.4

PROJECT NO. 60240249
CONTRACT NO. CE7/2011 (HY)

SHEET TITLE
Contract III - Northern Connection Toll Plaza and Associated Works

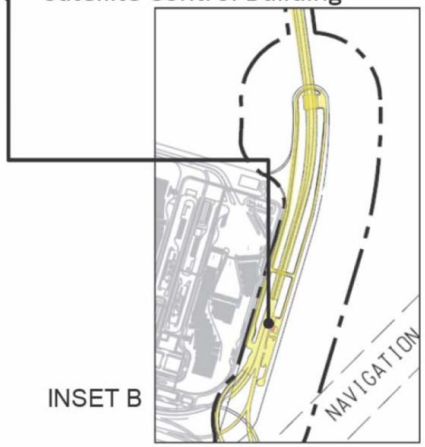
SHEET NUMBER
FIGURE 1.4



① Route-wide E & M Works

② Buildings

- Toll Control Building
- Maintenance Depot & Training Ground
- Administration Building
- Petrol Filling Station
- Reprovisioned Customs and Excise Department and Fire Services Department Building and Berth
- Satellite Control Building



③ Landscape works at Southern and Northern Landfalls

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STATUS

SCALE
A1 1:100 A3 1:200

Figure 1.5

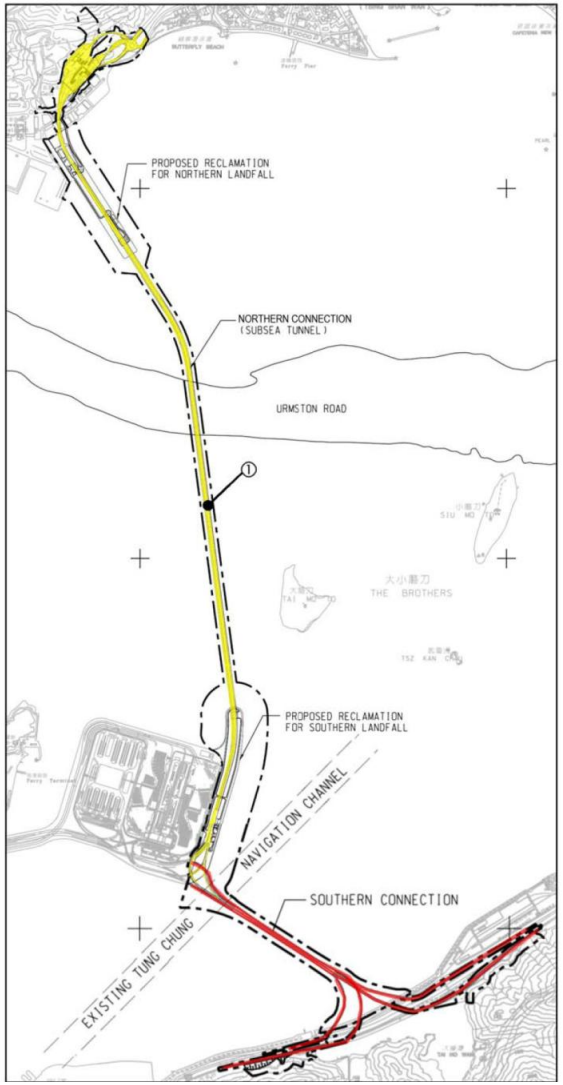
PROJECT NO. 60240249
CONTRACT NO. CE7/2011 (HY)

SHEET TITLE
Contract IV - Northern Connection Tunnel Buildings, Electrical and Mechanical Works

FIGURE 1.5

① TCSS

- TM-CLKL (Northern Connection)
- TM-CLKL (Southern Connection), with detailed design and construction supervision under CE13/2010 (CE)



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Hong Kong - Zhuhai - Macao Bridge Hong Kong Project Management Office

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I/R	DATE	DESCRIPTION	APP.

STATUS

SCALE
A1 1:100 A3 1:200

Figure 1.6

PROJECT NO. 60240249
CONTRACT NO. CE7/2011 (HY)

SHEET TITLE
Contract V - Northern Connection Traffic Control and Surveillance System

SHEET NUMBER
FIGURE 1.6

- design and construction for modification of a section of vertical seawall of approximately 220m in length at the southern landfall to sloping seawall;

- design and construction of associated civil, structural, building, geotechnical, marine, environmental protection, drainage and sewerage, waterworks and utility works; and

- design and construction of advance SEM provision to facilitate installation of tunnel and route-wide E&M, TCSS and other utilities.

1.2 SCOPE OF THE ENHANCED TSP MONITORING PLAN

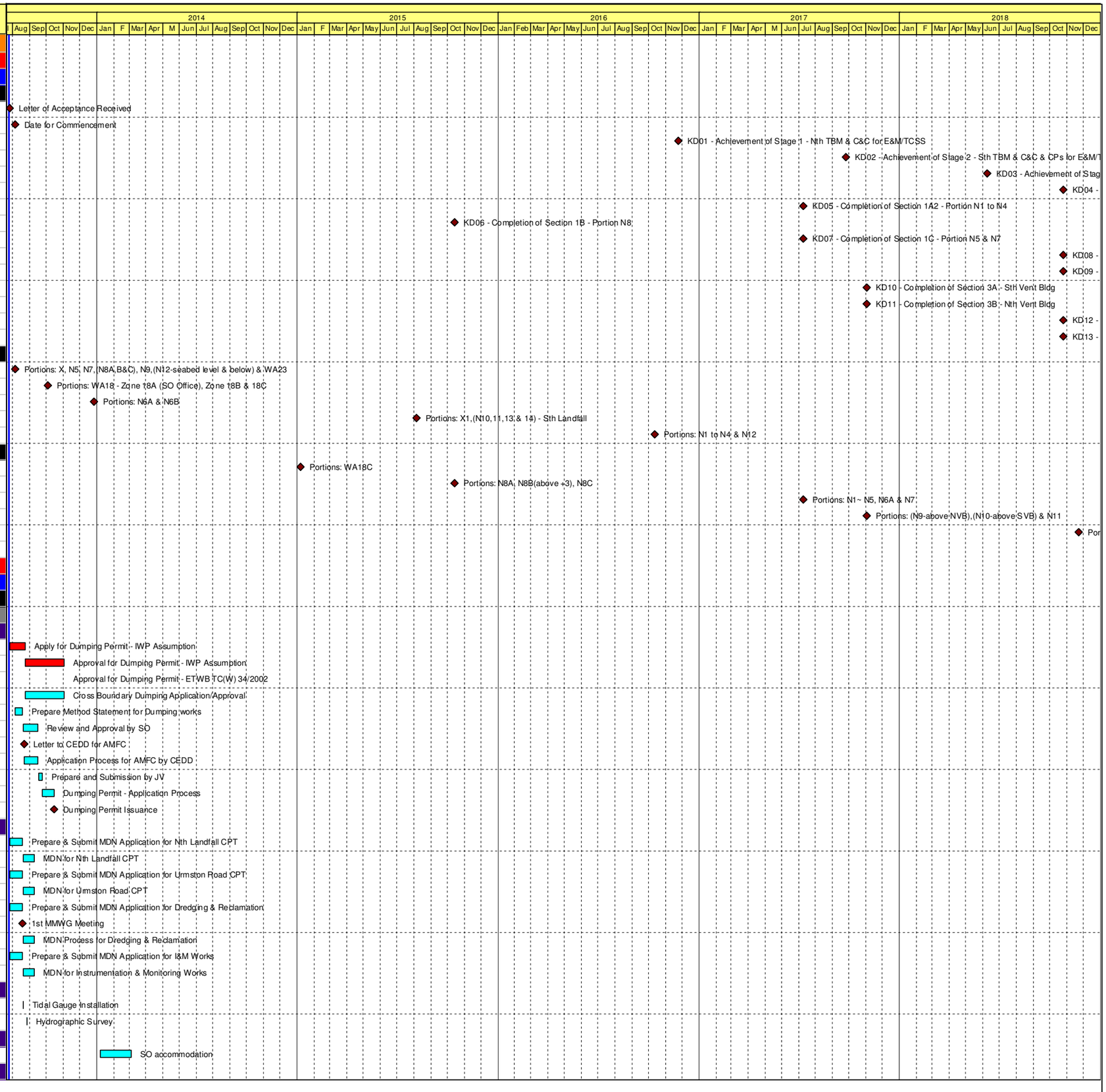
This Enhanced TSP Monitoring Plan is prepared under *Contract No HY/2012/08* which involves the construction of the Northern Connection in the Tuen Mun area. While other construction works in the Tuen Mun area will be undertaken by Contracts III (ie construction of toll plaza), IV (construction of tunnel buildings) and V (installation of TCSS), respectively, and are thus outside the scope of the current *Contract*, this Enhanced TSP Monitoring Plan is applicable to the construction works of all contracts within the Tuen Mun area (ie Contracts II-V) under *Condition 2.4* of *EP-354/2009/A*.

1.3 WORKS PROGRAMME

The construction works of the Northern Connection under *Contract No. HY/2012/08* are anticipated to commence in November 2013. The preliminary construction programme and the corresponding Contract components are provided in *Figures 1.7 and 1.8*, respectively.

Given that other construction works within the Tuen Mun area (eg construction of the toll plaza, tunnel buildings and TCSS etc) will be undertaken under Contracts III, IV and V which have not been awarded yet (ie Contracts III, IV and V), the construction programmes are yet to be available.

Activity ID	Activity Name	Original Duration	Start	Finish
TMCLK - Northern Connection Sub-Sea Tunnel Section				
Preliminaries				
Contract Dates				
Commencement and Completion Dates				
KD001	Letter of Acceptance Received	0		26-Jul-13*
KD005	Date for Commencement	0	05-Aug-13*	
KD010	KD01 - Achievement of Stage 1 - Nth TBM & C&C for E&M/TCSS	0		24-Nov-16*
KD020	KD02 - Achievement of Stage 2 - Sth TBM & C&C & CPs for E&M/TCSS	0		25-Sep-17*
KD030	KD03 - Achievement of Stage 3 - Tunnel & Shafts for E&M/TCSS	0		09-Jun-18*
KD040	KD04 - Completion of Section 1A1 - Portion N12	0		25-Oct-18*
KD050	KD05 - Completion of Section 1A2 - Portion N1 to N4	0		10-Jul-17*
KD060	KD06 - Completion of Section 1B - Portion N8	0		13-Oct-15*
KD070	KD07 - Completion of Section 1C - Portion N5 & N7	0		10-Jul-17*
KD080	KD08 - Completion of Section 1 - Reclamation/ Culvert	0		25-Oct-18*
KD090	KD09 - Completion of Section 2 - TBM, C&C Tunnel & Ramp	0		25-Oct-18*
KD100	KD10 - Completion of Section 3A - Sth Vent Bldg	0		02-Nov-17*
KD110	KD11 - Completion of Section 3B - Nth Vent Bldg	0		02-Nov-17*
KD120	KD12 - Completion of Section 4 - Remaining Works	0		25-Oct-18*
KD130	KD13 - Completion of Section 5 - Protection of Trees	0		25-Oct-18*
Site Possession Date				
AD010	Portions: X, N5, N7, (N8A, B&C), N9, (N12-seabed level & below) & WA23	0	05-Aug-13*	
AD020	Portions: WA18 - Zone 18A (SO Office), Zone 18B & 18C	0	04-Oct-13*	
AD030	Portions: N6A & N6B	0	28-Dec-13*	
AD040	Portions: X1, (N10, 11, 13 & 14) - Sth Landfall	0	06-Aug-15*	
AD050	Portions: N1 to N4 & N12	0	13-Oct-16*	
Handover Date				
HD010	Portions: WA18C	0		06-Jan-15*
HD020	Portions: N8A, N8B(above +3), N8C	0		13-Oct-15*
HD030	Portions: N1~ N5, N6A & N7	0		10-Jul-17*
HD040	Portions: (N9-above NVB), (N10-above SVB) & N11	0		02-Nov-17*
HD050	Portions: X, X1, N6B, (N8B+3 & below), (N9-below NVB), (N10-below SVB) & N12~...	0		22-Nov-18*
HD060	Portions: WA18A, WA18B & WA23	0		25-Oct-19*
Works Area				
Northern Landfall				
Construction				
Establishment				
Sediment Quality Report/Dumping Permit				
DS094	Apply for Dumping Permit - IWP Assumption	24	27-Jul-13	23-Aug-13
DS09410	Approval for Dumping Permit - IWP Assumption	58	24-Aug-13	02-Nov-13
DS09980	Approval for Dumping Permit - ETWB TC(W) 34/2002	82	27-Jul-13	02-Nov-13
DS100	Cross Boundary Dumping Application/Approval	58	24-Aug-13	02-Nov-13
DS102	Prepare Method Statement for Dumping works	13	05-Aug-13	19-Aug-13
DS104	Review and Approval by SO	28	20-Aug-13	16-Sep-13
DS110	Letter to CEDD for AMFC	0		23-Aug-13*
DS115	Application Process for AMFC by CEDD	21	23-Aug-13	16-Sep-13
DS120	Prepare and Submission by JV	6	17-Sep-13	24-Sep-13
DS130	Dumping Permit - Application Process	21	25-Sep-13	15-Oct-13
DS140	Dumping Permit Issuance	0	16-Oct-13	
Apply for Mairne Department Notice				
CGI0010	Prepare & Submit MDN Application for Nth Landfall CPT	20	27-Jul-13	19-Aug-13
CGI0020	MDN for Nth Landfall CPT	21	20-Aug-13	09-Sep-13
CGI0240	Prepare & Submit MDN Application for Urmston Road CPT	20	27-Jul-13	19-Aug-13
CGI0250	MDN for Urmston Road CPT	21	20-Aug-13	09-Sep-13
CGI0260	Prepare & Submit MDN Application for Dredging & Reclamation	20	27-Jul-13	19-Aug-13
CGI0265	1st MMWG Meeting	0		19-Aug-13*
CGI0270	MDN Process for Dredging & Reclamation	21	20-Aug-13	09-Sep-13
CGI0280	Prepare & Submit MDN Application for I&M Works	20	27-Jul-13	19-Aug-13
CGI0290	MDN for Instrumentation & Monitoring Works	21	20-Aug-13	09-Sep-13
Hydrographic Survey				
CGI0085	Tidal Gauge Installation	1	20-Aug-13	20-Aug-13
CGI0090	Hydrographic Survey	1	27-Aug-13	27-Aug-13
SO accommodation				
CTW0000	SO accommodation	42	08-Jan-14	04-Mar-14
GI to Determine Dredged Level				



Non Critical Activity
Critical Activity
Milestone

HY/2012/08 - TMCLK Northern Sub-sea Tunnel Section

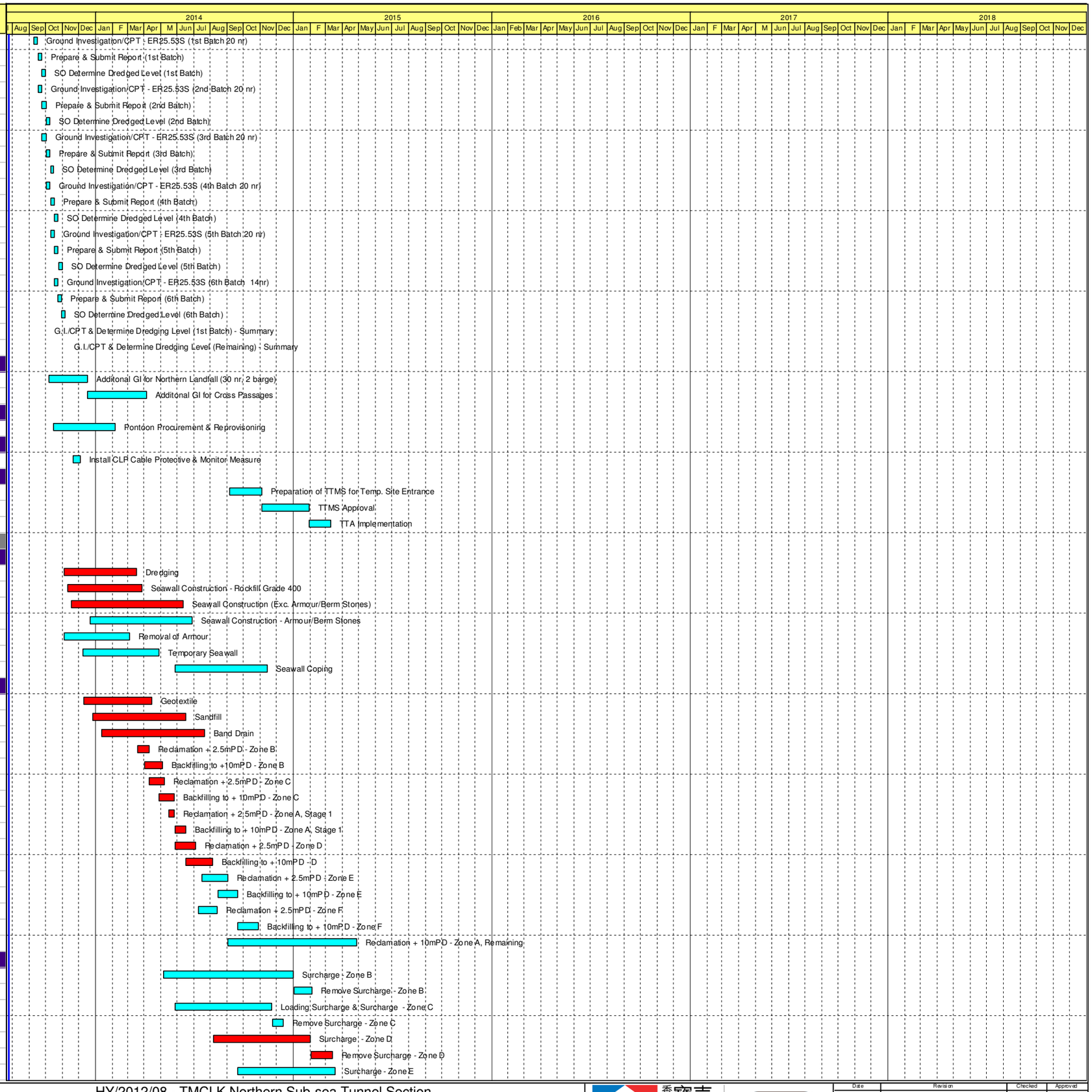
Initial Works Programme - Construction

Dragages HongKong 香港寶嘉
A member of the Bouygues Construction group
BOUYGUES TRAVAUX PUBLICS
Dragages - Bouygues Joint Venture 寶嘉 - 布依格聯營

Date	Revision	Checked	Approved
12-Aug-13			

Figure 1.7

Activity ID	Activity Name	Original Duration	Start	Finish
CGI0030	Ground Investigation/CPT - ER25.53S (1st Batch 20 nr)	6	10-Sep-13	16-Sep-13
CGI0040	Prepare & Submit Report (1st Batch)	6	17-Sep-13	24-Sep-13
CGI0050	SO Determine Dredged Level (1st Batch)	7	25-Sep-13	01-Oct-13
CGI0060	Ground Investigation/CPT - ER25.53S (2nd Batch 20 nr)	6	17-Sep-13	24-Sep-13
CGI0070	Prepare & Submit Report (2nd Batch)	6	25-Sep-13	02-Oct-13
CGI0080	SO Determine Dredged Level (2nd Batch)	7	03-Oct-13	09-Oct-13
CGI0100	Ground Investigation/CPT - ER25.53S (3rd Batch 20 nr)	6	25-Sep-13	02-Oct-13
CGI0110	Prepare & Submit Report (3rd Batch)	6	03-Oct-13	09-Oct-13
CGI0120	SO Determine Dredged Level (3rd Batch)	7	10-Oct-13	16-Oct-13
CGI0130	Ground Investigation/CPT - ER25.53S (4th Batch 20 nr)	6	03-Oct-13	09-Oct-13
CGI0140	Prepare & Submit Report (4th Batch)	6	10-Oct-13	17-Oct-13
CGI0150	SO Determine Dredged Level (4th Batch)	7	18-Oct-13	24-Oct-13
CGI0160	Ground Investigation/CPT - ER25.53S (5th Batch 20 nr)	6	10-Oct-13	17-Oct-13
CGI0170	Prepare & Submit Report (5th Batch)	6	18-Oct-13	24-Oct-13
CGI0180	SO Determine Dredged Level (5th Batch)	7	25-Oct-13	31-Oct-13
CGI0190	Ground Investigation/CPT - ER25.53S (6th Batch 14nr)	5	18-Oct-13	23-Oct-13
CGI0200	Prepare & Submit Report (6th Batch)	6	24-Oct-13	30-Oct-13
CGI0210	SO Determine Dredged Level (6th Batch)	7	31-Oct-13	06-Nov-13
CGI0220	G.I./CPT & Determine Dredging Level (1st Batch) - Summary	17	10-Sep-13	30-Sep-13
CGI0230	G.I./CPT & Determine Dredging Level (Remaining) - Summary	41	17-Sep-13	06-Nov-13
Additional GI				
CGI0300	Additonal GI for Northern Landfall (30 nr, 2 barge)	60	08-Oct-13	17-Dec-13
CGI0310	Additonal GI for Cross Passages	84	18-Dec-13	04-Apr-14
Pontoon Temporary Reprovisioning				
CTW0010	Pontoon Procurement & Reprovisoning	90	15-Oct-13	07-Feb-14
CLP Cable Monitoring				
CCL0010	Install CLP Cable Protective & Monitor Measure	12	21-Nov-13	04-Dec-13
TTMS				
CTW100	Preparation of TTMS for Temp. Site Entrance	48	05-Sep-14	03-Nov-14
CTW110	TTMS Approval	72	04-Nov-14	29-Jan-15
CTW120	TTA Implementation	28	30-Jan-15	10-Mar-15
Seawall, Reclamation & Surcharge, Ph.1				
Seawall Construction				
CMW0500	Dredging	106	04-Nov-13	17-Mar-14
CMW0510	Seawall Construction - Rockfill Grade 400	110	11-Nov-13	28-Mar-14
CMW0520	Seawall Construction (Exc. Armour/Berm Stones)	161	18-Nov-13	11-Jun-14
CMW0530	Seawall Construction - Armour/Berm Stones	146	23-Dec-13	28-Jun-14
CMW0540	Removal of Armour	96	04-Nov-13	05-Mar-14
CMW0550	Temporary Seawall	108	09-Dec-13	28-Apr-14
CMW0560	Seawall Coping	142	27-May-14	13-Nov-14
Reclamation & Backfilling				
CMW0100	Geotextile	99	10-Dec-13	15-Apr-14
CMW0110	Sandfill	133	28-Dec-13	17-Jun-14
CMW0120	Band Drain	149	13-Jan-14	21-Jul-14
CMW0130	Reclamation + 2.5mPD - Zone B	17	20-Mar-14	09-Apr-14
CMW0140	Backfilling to +10mPD - Zone B	24	02-Apr-14	05-May-14
CMW0150	Reclamation + 2.5mPD - Zone C	20	10-Apr-14	08-May-14
CMW0160	Backfilling to + 10mPD - Zone C	23	28-Apr-14	26-May-14
CMW0170	Reclamation + 2.5mPD - Zone A, Stage 1	9	16-May-14	26-May-14
CMW0180	Backfilling to + 10mPD - Zone A, Stage 1	17	27-May-14	16-Jun-14
CMW0190	Reclamation + 2.5mPD - Zone D	32	27-May-14	04-Jul-14
CMW0200	Backfilling to + 10mPD - D	42	17-Jun-14	05-Aug-14
CMW0210	Reclamation + 2.5mPD - Zone E	41	16-Jul-14	01-Sep-14
CMW0220	Backfilling to + 10mPD - Zone E	30	15-Aug-14	19-Sep-14
CMW0230	Reclamation + 2.5mPD - Zone F	31	09-Jul-14	13-Aug-14
CMW0240	Backfilling to + 10mPD - Zone F	30	20-Sep-14	27-Oct-14
CMW0250	Reclamation + 10mPD - Zone A, Remaining	188	02-Sep-14	27-Apr-15
Consolidation & Surcharge Removal				
CMW0700	Surcharge - Zone B	240	06-May-14	31-Dec-14
CMW0710	Remove Surcharge - Zone B	29	02-Jan-15	04-Feb-15
CMW0720	Loading Surcharge & Surcharge - Zone C	180	27-May-14	22-Nov-14
CMW0730	Remove Surcharge - Zone C	18	24-Nov-14	13-Dec-14
CMW0740	Surcharge - Zone D	180	06-Aug-14	01-Feb-15
CMW0750	Remove Surcharge - Zone D	29	02-Feb-15	13-Mar-15
CMW0760	Surcharge - Zone E	180	20-Sep-14	18-Mar-15



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HY/2012/08 - TMCLK Northern Sub-sea Tunnel Section

Initial Works Programme - Construction

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Figure 1.7

Activity ID	Activity Name	Original Duration	Start	Finish
CMW0770	Remove Surcharge - Zone E	25	19-Mar-15	21-Apr-15
CMW0780	Surcharge - Zone F, Stage 1	105	28-Oct-14	09-Feb-15
CMW0790	Remove Surcharge - Zone F, Stage 1	13	10-Feb-15	03-Mar-15
CMW0800	Surcharge - Zone F, Remaining	180	10-Oct-14	07-Apr-15
CMW0810	Remove Surcharge - Zone F, Remaining	13	08-Apr-15	22-Apr-15
CMW0820	Surcharge - Zone A (Remaining)	180	28-Apr-15	24-Oct-15
CMW0830	Remove Surcharge - Zone A (Remaining)	12	26-Oct-15	07-Nov-15
CMW0840	Surcharge - Zone A, Stage 1	180	17-Jun-14	13-Dec-14
CMW0850	Remove Surcharge - Zone A , Stage 1	12	15-Dec-14	30-Dec-14
Seawall, Reclamation & Surcharge, Ph.2				
Seawall Construction				
CMW1100	Dredging - Phase 2 (Zone G)	18	13-Oct-16	02-Nov-16
CMW1110	Seawall Construction (Zone G)	57	27-Oct-16	04-Jan-17
CMW1120	Vertical Seawall - Bermstone - (Zone G)	18	23-Dec-16	16-Jan-17
CMW1130	Vertical Seawall - Seawall Coping - (Zone G)	78	23-Dec-16	03-Apr-17
Reclamation & Backfilling				
CMW1140	Geotextile (Zone G)	11	07-Nov-16	18-Nov-16
CMW1150	Sandfill (Zone G)	21	14-Nov-16	07-Dec-16
CMW1160	Band Drain (Zone G)	30	26-Nov-16	03-Jan-17
CMW1170	Public Fill below 2.5mPD- Phase 2	24	21-Dec-16	20-Jan-17
CMW1180	Public Fill above 2.5mPD - Phase 2	48	09-Jan-17	11-Mar-17
Consolidation & Surcharge Removal				
CMW1190	Surcharge - Phase 2	105	12-Mar-17	24-Jun-17
CMW1200	Removal of Surcharge - Phase 2	12	26-Jun-17	10-Jul-17
CMW1210	Turnover Portion N1 to N4	0		10-Jul-17
Extension of Box Culvert				
CCW0100	Pre-Drlling	82	28-Oct-14	03-Feb-15
CCW0110	Bored Pilings	119	11-Nov-14	13-Apr-15
CCW0120	Culvert Construction Stage 1 - CH186 - 385	140	04-Mar-15	22-Aug-15
CCW0130	Culvert Construction Stage 2 - CH0 - 186	140	23-Apr-15	09-Oct-15
CCW0140	Culvert Construction Stage 3 - CH385 - 399 - West	59	02-Nov-15*	12-Jan-16
CCW0150	Culvert Construction Stage 4 - CH385 - 399 - East	59	13-Jan-16	31-Mar-16*
Launching Shaft				
Diaphragm wall				
CDW0010	B- Diaphragm Wall Mobilization & Setting Up	20	07-May-14	29-May-14
CDW0020	B- Guide Wall / Predrilling	36	21-May-14	03-Jul-14
CDW0030	B- Diaphragm Wall Construction	48	30-May-14	26-Jul-14
CDW0040	B - Toe Grouting	24	28-Jul-14	23-Aug-14
Excavation				
CEX0010	Excavation - Soft	75	25-Aug-14	22-Nov-14
CEX0020	Excavation - Rock	73	24-Nov-14	26-Feb-15
CEX0030	Temporary Base Slab & Tunrover to TBM Team	36	17-Feb-15	10-Apr-15
Cut & Cover Tunnel (Excl. Launching Shaft)				
Diaphragm wall				
CDW0200	C- Mobilization & Site Setup	24	09-Jun-14	07-Jul-14
CDW0210	C- Pre-drilling & Guide Wall	24	30-Jun-14	28-Jul-14
CDW0220	C - Diaphragm Wall Construction	46	28-Jul-14	19-Sep-14
CDW0230	C - Shear Pin/Toe Grouting	24	20-Sep-14	20-Oct-14
CDW0240	D - Diaphragm Wall Construction	57	20-Sep-14	27-Nov-14
CDW0250	D - Toe Grouting	24	28-Nov-14	27-Dec-14
Excavation				
CEX0200	Zone B & C - Excavation	111	13-Jan-15	04-Jun-15
CEX0210	Zone B & C - Excavation - Rock	12	05-Jun-15	18-Jun-15
CEX0300	Zone D - Excavation - Soft - Stage 1	48	07-Mar-15	07-May-15
CEX0400	Zone D - Excavation - Soft - Stage 2	36	02-May-15	13-Jun-15
CEX0500	Zone E - Excavation - Soft (I)	23	15-Jun-15	13-Jul-15
C&C Tunnel Construction				
CCN0200	Zone B & C - Tunnel Structure	108	30-Jun-15	06-Nov-15
CCN0300	Zone D - Tunnel Structure - Stage 1	77	04-May-15	04-Aug-15
CCN0400	Zone D - Tunnel Structure - Stage 2	94	08-Jun-15	26-Sep-15
CEX0220	Zone B & C - Backfilling	41	07-Nov-15	24-Dec-15
CEX0350	Zone D - Backfilling - Stage 1	25	05-Aug-15	02-Sep-15
CEX0430	Zone D - Backfilling - Stage 2	18	21-Sep-15	13-Oct-15
CTW0500	Provide Temporary Road for Portion N8	66	22-Jul-15	08-Oct-15
CTW0510	Turnover Portion N8	0		13-Oct-15

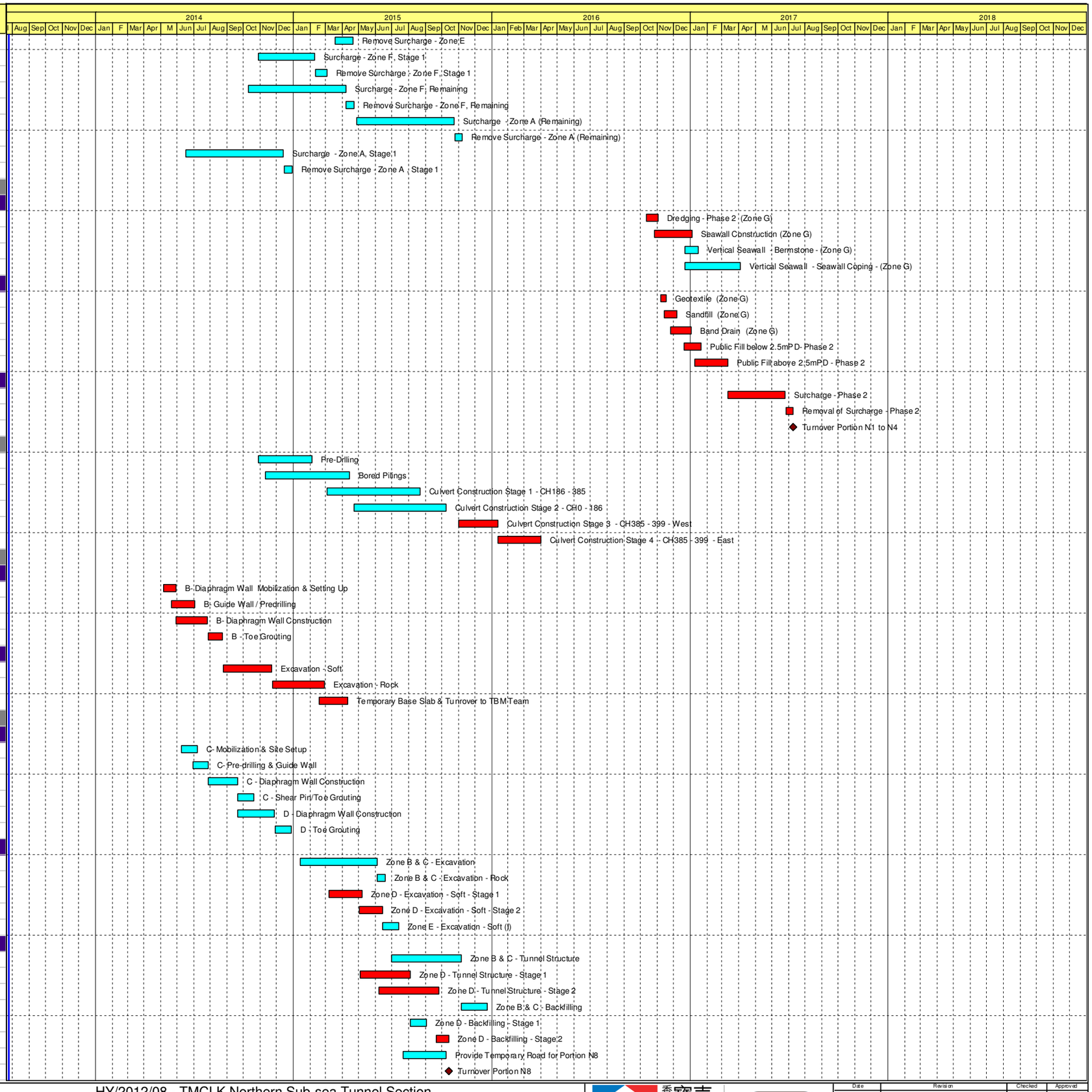

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Figure 1.7

Activity ID	Activity Name	Original Duration	Start	Finish
Intermediate Slab/Provision for TCSS/E&M				
CCN0900	All Areas - Intermediate Slab	137	30-Dec-15	22-Jun-16
CEM0900	Advanced Works for TVS/ E&M/Provision TCSS for Stage 1	113	17-Mar-16	04-Aug-16
Approach Ramp				
Area E				
CCF0010	Zone E - Sheet Piling	90	20-Sep-14	08-Jan-15
CCN0700	Zone E - Structure (I)	98	21-Jul-15	14-Nov-15
CEX0070	Zone E - Backfilling (I)	12	16-Nov-15	28-Nov-15
CFD0010	Zone E - Pile Test	24	16-Dec-14	15-Jan-15
CFD0020	Zone E- Tension Piles	72	20-Sep-14	15-Dec-14
Area G				
CCF1010	Zone G - Sheet Piling	23	11-Jul-17	05-Aug-17
CCN1010	Remaining Zone E & Zone G - Structure	94	26-Oct-17	23-Feb-18
CEM1010	Provision works for E&M/TCSS (for Stage 3)	40	10-Mar-18	30-Apr-18
CEX1010	Remaining Zine E & Zone G - Excavation - Soft	34	14-Sep-17	25-Oct-17
CEX1020	Remaining Zone E & Zone G - Backfilling	48	24-Feb-18	25-Apr-18
CFD1010	Zone G- Tension Piles	32	11-Jul-17	16-Aug-17
CFD1020	Zone G - Pile Test	24	17-Aug-17	13-Sep-17
Cut & Cover Tunnel at Launching Shaft				
CCF0800	ELS for Airduct	48	15-Feb-17	12-Apr-17
CCN0800	Airduct	83	15-Jun-17	20-Sep-17
CCN0810	Launching Shaft - C&C Tunnel Structure + Vent Tunnel	168	15-Feb-17	07-Sep-17
CEM0810	Provision for TCSS & E&M works	24	21-Oct-17	18-Nov-17
CEX0800	Excavation for Airduct	48	13-Apr-17	14-Jun-17
CEX0810	Launching Shaft - Backfilling	96	08-Sep-17	04-Jan-18
Roadworks				
CRD0010	Underground Sewar & Drainage	408	05-Dec-16	03-May-18
CRD0020	Watermian & Undergournd Utilities	360	23-Feb-17	17-May-18
CRD0030	Roadworks	324	25-Apr-17	01-Jun-18
CRD0040	Road Furniture	72	17-Mar-18	15-Jun-18
Ventilation Building				
Piling				
CFDN010	Mobilization & Setting Up Piling Rigs	24	26-Mar-15	27-Apr-15
CFDN020	N - Piling (Socket H-piles)	78	28-Apr-15	31-Jul-15
CFNN030	N - Pile Test	24	01-Aug-15	28-Aug-15
Cofferdam				
CCFN010	Sheet Piling - 212 lin.m	42	09-Nov-15	29-Dec-15
CEXN010	Excavation	82	30-Dec-15	15-Apr-16
Structure				
CCNN010	Substructure	95	16-Apr-16	09-Aug-16
CCNN020	Superstructure	64	10-Aug-16	26-Oct-16
CCNN030	Curing & Remove Formwork	18	27-Oct-16	16-Nov-16
Finishing/E&M				
CEMN020	E&M & Equipments Installation (by Others)	72	06-Feb-17	06-May-17
CFSN010	Finishing Works	155	17-Nov-16	03-Jun-17
CFSN020	Remaining Finishing Works	96	06-Mar-17	04-Jul-17
CFSN030	Handover Portion N9	0		04-Jul-17
TBM Tunnel & Cross Passages				
Construction				
Temporary Substation				
CTS0010	Temporary Substation construction	250	20-Mar-14	21-Jan-15
CTS0020	CLP Installation	197	24-Nov-14	30-Jul-15
CTS0030	Temporary Power On	0		30-Jul-15
CTS1000	HDD Tube Installation for Cable Laying	218	17-Jun-14	12-Mar-15
CTS1100	Cable Laying	96	13-Mar-15	11-Jul-15
TBM Tunnel				
CTB0010	Setting up Backup Facilities	120	05-Feb-15	10-Jul-15
CTB0020	Setting up TBM for 1st Drive	87	11-Apr-15	08-Jul-15
CTB1000	SB (CH6,676 ~CH2,512) TBM Excavation	432	31-Jul-15	15-Oct-16
CTB1900	TBM - Remove 1st TBM & Demobilzation	60	16-Oct-16	14-Dec-16
CTB2010	Setting Up TBM for 2nd Drive	87	09-Jul-15	05-Oct-15
CTB3000	NB (CH6,676 ~ CH2512) TBM Excavation	425	06-Oct-15	13-Dec-16
CTB3900	TBM - Remove 2nd TBM & Demobilzation	60	14-Dec-16	14-Feb-17
Cross Passages				
CP49 (by Ground Treatment)				

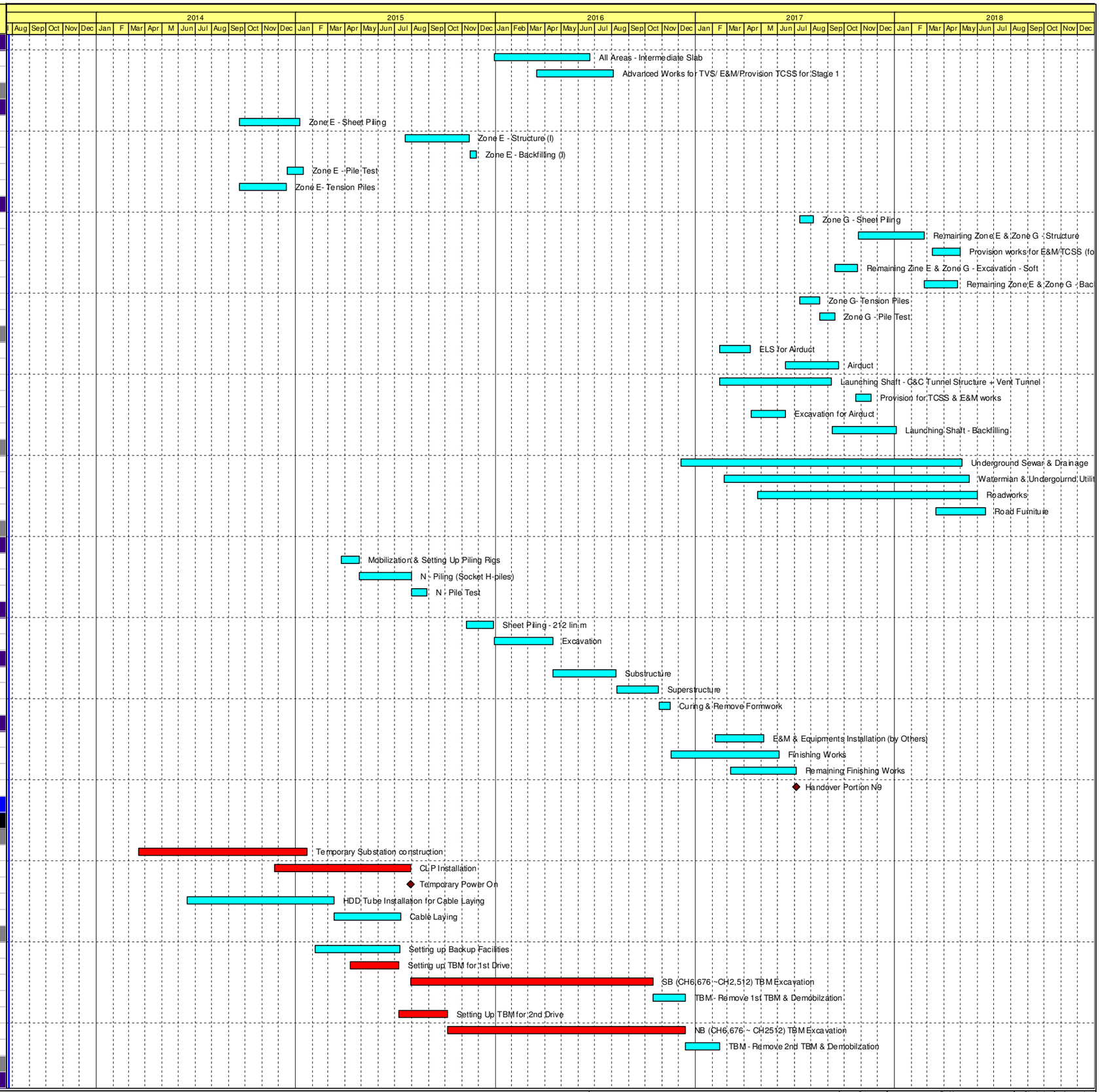

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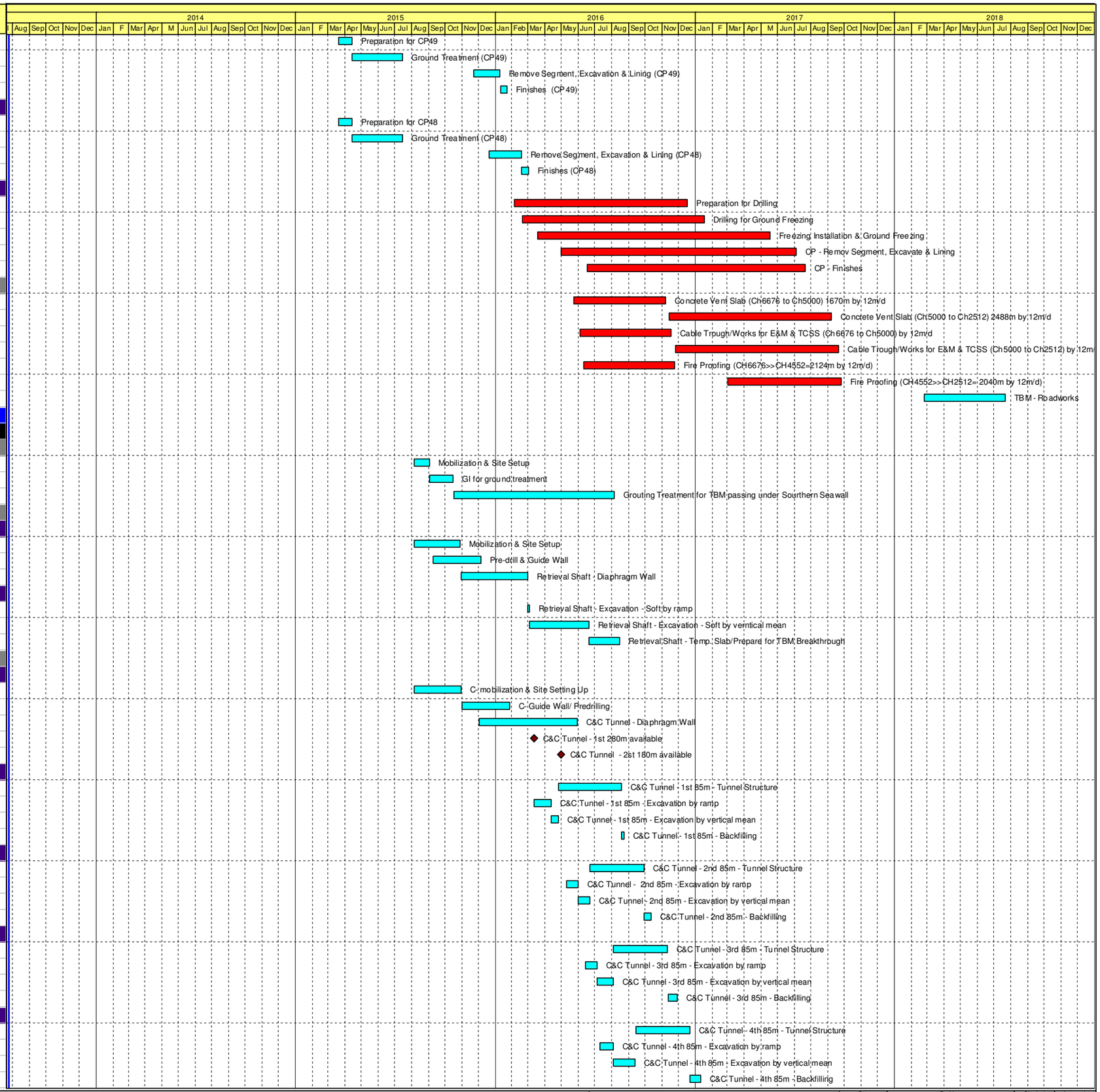
Figure 1.7

Activity ID	Activity Name	Original Duration	Start	Finish
CCP4900	Preparation for CP49	18	20-Mar-15	14-Apr-15
CCP4910	Ground Treatment (CP49)	75	15-Apr-15	15-Jul-15
CCP4920	Remove Segment, Excavation & Lining (CP49)	48	23-Nov-15	09-Jan-16
CCP4930	Finishes (CP49)	12	11-Jan-16	23-Jan-16
CP48 (by Ground Treatment)				
CCP4800	Preparation for CP48	18	20-Mar-15	14-Apr-15
CCP4810	Ground Treatment (CP48)	75	15-Apr-15	15-Jul-15
CCP4820	Remove Segment, Excavation & Lining (CP48)	60	20-Dec-15	17-Feb-16
CCP4830	Finishes (CP48)	12	18-Feb-16	02-Mar-16
CPs (47 ~ 9) (by Ground Freezing)				
CCP0010	Preparation for Drilling	255	05-Feb-16	17-Dec-16
CCP0020	Drilling for Ground Freezing	273	19-Feb-16	18-Jan-17
CCP0030	Freezing Installation & Ground Freezing	426	18-Mar-16	17-May-17
CCP0040	CP - Remov Segment, Excavate & Lining	432	30-Apr-16	05-Jul-17
CCP0050	CP - Finishes	321	18-Jun-16	21-Jul-17
Remaining Works				
CCN8000	Concrete Vent Slab (Ch6676 to Ch5000) 1670m by 12m/d	139	24-May-16	07-Nov-16
CCN8010	Concrete Vent Slab (Ch5000 to Ch2512) 2488m by 12m/d	238	15-Nov-16	07-Sep-17
CEM8000	Cable Trough/Works for E&M & TCSS (Ch6676 to Ch5000) by 12m/d	139	04-Jun-16	18-Nov-16
CEM8010	Cable Trough/Works for E&M & TCSS (Ch5000 to Ch2512) by 12m/d	238	26-Nov-16	19-Sep-17
CFS8000	Fire Proofing (CH6676>>CH4552=2124m by 12m/d)	139	11-Jun-16	24-Nov-16
CFS8010	Fire Proofing (CH4552>>CH2512= 2040m by 12m/d)	170	02-Mar-17	25-Sep-17
CRD8000	TBM - Roadworks	120	23-Feb-18	21-Jul-18
Southern Landfall				
Construction				
Ground Treatment for Stone Columns				
CGT0010	Mobilization & Site Setup	24	06-Aug-15	02-Sep-15
CGT0015	GI for ground treatment	36	03-Sep-15	16-Oct-15
CGT0020	Grouting Treatment for TBM passing under Sourthern Seawall	235	17-Oct-15	06-Aug-16
Retrieval Shaft				
Diaphragm wall				
CDW1010	Mobilization & Site Setup	70	06-Aug-15	29-Oct-15
CDW1030	Pre-drill & Guide Wall	72	10-Sep-15	05-Dec-15
CDW1040	Retrieval Shaft - Diaphragm Wall	96	30-Oct-15	29-Feb-16
Excavation				
CEX2000	Retrieval Shaft - Excavation - Soft by ramp	3	01-Mar-16	03-Mar-16
CEX2010	Retrieval Shaft - Excavation - Soft by verntical mean	86	04-Mar-16	20-Jun-16
CEX2020	Retrieval Shaft - Temp. Slab/Prepare for TBM Breakthrough	48	21-Jun-16	16-Aug-16
Cut & Cover Tunnel & Approach Ramp				
South Diaphragm Wall				
CDW1100	C- mobilization & Site Setting Up	72	06-Aug-15	31-Oct-15
CDW1110	C- Guide Wall/ Predrilling	72	02-Nov-15	27-Jan-16
CDW1120	C&C Tunnel - Diaphragm Wall	140	02-Dec-15	30-May-16
CDW1130	C&C Tunnel - 1st 280m available	0		11-Mar-16
CDW1140	C&C Tunnel - 2st 180m available	0		30-Apr-16
South C&C Tunnel - Section 1				
CCN1100	C&C Tunnel - 1st 85m - Tunnel Structure	95	26-Apr-16	18-Aug-16
CEX1100	C&C Tunnel - 1st 85m - Excavation by ramp	23	12-Mar-16	12-Apr-16
CEX1110	C&C Tunnel - 1st 85m - Excavation by vertical mean	11	13-Apr-16	25-Apr-16
CEX1120	C&C Tunnel - 1st 85m - Backfilling	4	19-Aug-16	23-Aug-16
South C&C Tunnel - Section 2				
CCN1200	C&C Tunnel - 2nd 85m - Tunnel Structure	83	23-Jun-16	29-Sep-16
CEX1200	C&C Tunnel - 2nd 85m - Excavation by ramp	17	11-May-16	31-May-16
CEX1210	C&C Tunnel - 2nd 85m - Excavation by vertical mean	18	01-Jun-16	22-Jun-16
CEX1220	C&C Tunnel - 2nd 85m - Backfilling	9	30-Sep-16	12-Oct-16
South C&C Tunnel - Section 3				
CCN1300	C&C Tunnel - 3rd 85m - Tunnel Structure	83	04-Aug-16	11-Nov-16
CEX1300	C&C Tunnel - 3rd 85m - Excavation by ramp	18	14-Jun-16	05-Jul-16
CEX1310	C&C Tunnel - 3rd 85m - Excavation by vertical mean	25	06-Jul-16	03-Aug-16
CEX1320	C&C Tunnel - 3rd 85m - Backfilling	15	12-Nov-16	29-Nov-16
South C&C Tunnel - Section 4				
CCN1400	C&C Tunnel - 4th 85m - Tunnel Structure	83	14-Sep-16	22-Dec-16
CEX1400	C&C Tunnel - 4th 85m - Excavation by ramp	21	11-Jul-16	03-Aug-16
CEX1410	C&C Tunnel - 4th 85m - Excavation by vertical mean	35	04-Aug-16	13-Sep-16
CEX1420	C&C Tunnel - 4th 85m - Backfilling	14	23-Dec-16	11-Jan-17



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HY/2012/08 - TMCLK Northern Sub-sea Tunnel Section

Initial Works Programme - Construction

Dragages - Bouygues Joint Venture 寶嘉 - 布依格聯營

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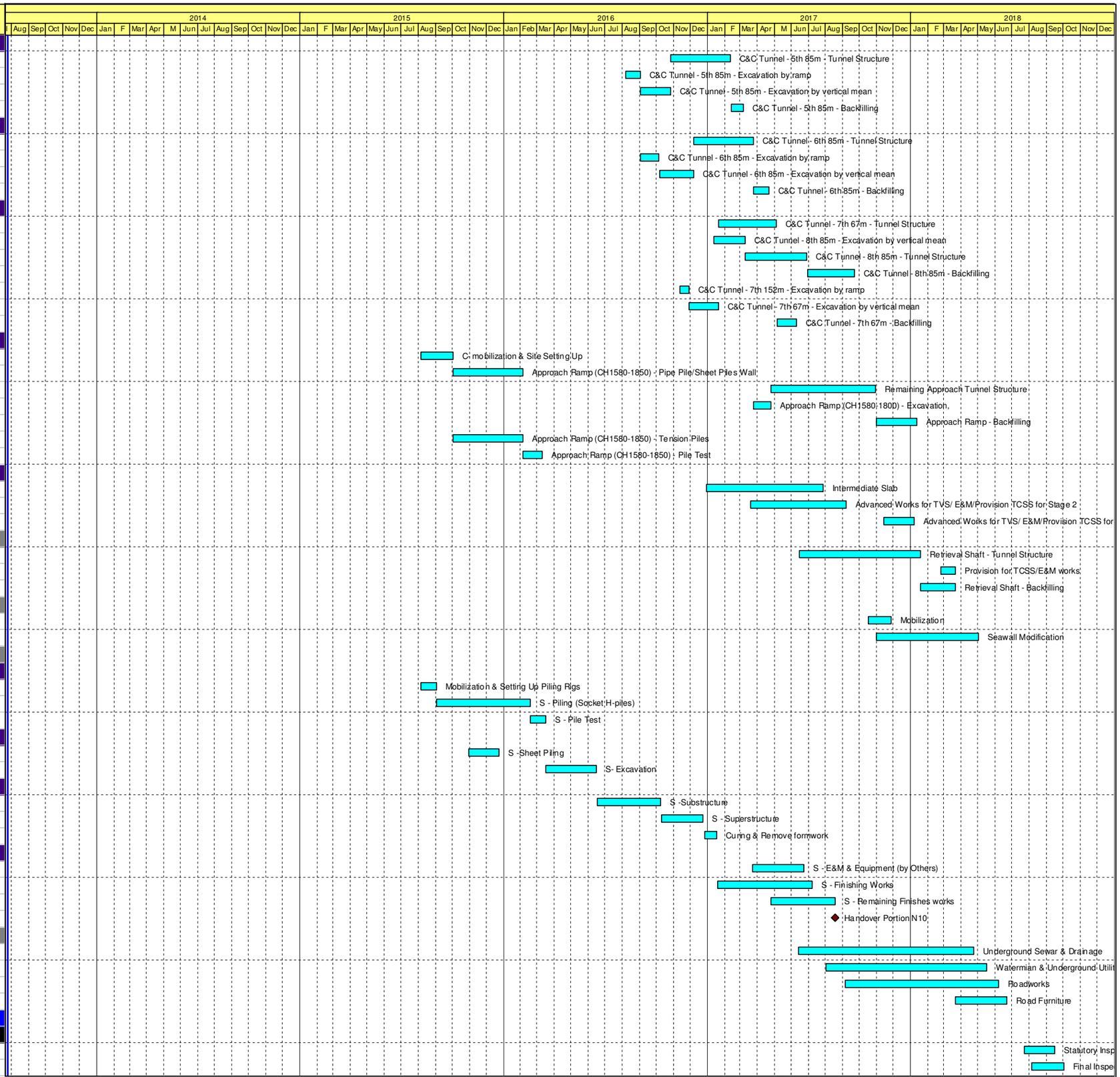
Figure 1.7

Activity ID	Activity Name	Original Duration	Start	Finish
South C&C Tunnel - Section 5				
CCN1500	C&C Tunnel - 5th 85m - Tunnel Structure	83	28-Oct-16	11-Feb-17
CEX1500	C&C Tunnel - 5th 85m - Excavation by ramp	23	08-Aug-16	02-Sep-16
CEX1510	C&C Tunnel - 5th 85m - Excavation by vertical mean	44	03-Sep-16	27-Oct-16
CEX1520	C&C Tunnel - 5th 85m - Backfilling	19	13-Feb-17	06-Mar-17
South C&C Tunnel - Section 6				
CCN1600	C&C Tunnel - 6th 85m - Tunnel Structure	83	08-Dec-16	24-Mar-17
CEX1600	C&C Tunnel - 6th 85m - Excavation by ramp	27	03-Sep-16	06-Oct-16
CEX1610	C&C Tunnel - 6th 85m - Excavation by vertical mean	52	07-Oct-16	07-Dec-16
CEX1620	C&C Tunnel - 6th 85m - Backfilling	20	25-Mar-17	21-Apr-17
South C&C Tunnel - Section 7				
CCN1700	C&C Tunnel - 7th 67m - Tunnel Structure	78	21-Jan-17	05-May-17
CCN1800	C&C Tunnel - 8th 85m - Excavation by vertical mean	42	13-Jan-17	09-Mar-17
CCN1810	C&C Tunnel - 8th 85m - Tunnel Structure	88	10-Mar-17	28-Jun-17
CCN1820	C&C Tunnel - 8th 85m - Backfilling	72	29-Jun-17	21-Sep-17
CEX1700	C&C Tunnel - 7th 152m - Excavation by ramp	15	12-Nov-16	29-Nov-16
CEX1710	C&C Tunnel - 7th 67m - Excavation by vertical mean	42	30-Nov-16	20-Jan-17
CEX1720	C&C Tunnel - 7th 67m - Backfilling	29	06-May-17	09-Jun-17
Open Ramp				
CCF1100	C- mobilization & Site Setting Up	48	06-Aug-15	02-Oct-15
CCF1110	Approach Ramp (CH1580-1850) - Pipe Pile/Sheet Piles Wall	103	03-Oct-15	04-Feb-16
CCN1900	Remaining Approach Tunnel Structure	155	25-Apr-17	30-Oct-17
CEX1900	Approach Ramp (CH1580-1800) - Excavation,	22	25-Mar-17	24-Apr-17
CEX1910	Approach Ramp - Backfilling	60	31-Oct-17	11-Jan-18
CFD1100	Approach Ramp (CH1580-1850) - Tension Piles	103	03-Oct-15	04-Feb-16
CFD1110	Approach Ramp (CH1580-1850) - Pile Test	24	05-Feb-16	10-Mar-16
All Areas				
CCN9500	Intermediate Slab	164	31-Dec-16	27-Jul-17
CEM9510	Advanced Works for TVS/ E&M/Provision TCSS for Stage 2	140	20-Mar-17	07-Sep-17
CEM9520	Advanced Works for TVS/ E&M/Provision TCSS for Stage 3	44	14-Nov-17	06-Jan-18
Cut & Cover Tunnel at Retrieval Shaft				
CCN7500	Retrieval Shaft - Tunnel Structure	180	15-Jun-17	18-Jan-18
CEM7500	Provision for TCSS/E&M works	24	23-Feb-18	22-Mar-18
CEX7500	Retrieval Shaft - Backfilling	48	19-Jan-18	22-Mar-18
Seawall Modification				
CMW2100	Mobilization	36	16-Oct-17	27-Nov-17
CMW2120	Seawall Modification	144	31-Oct-17	02-May-18
Ventilation Building				
Piling				
CFDS010	Mobilization & Setting Up Piling Rigs	24	06-Aug-15	02-Sep-15
CFDS020	S - Piling (Socket H-piles)	132	03-Sep-15	17-Feb-16
CFDS030	S - Pile Test	24	18-Feb-16	16-Mar-16
Cofferdam				
CCFS010	S -Sheet Piling	48	30-Oct-15	24-Dec-15
CEXS010	S- Excavation	72	17-Mar-16	16-Jun-16
Structure				
CCNS010	S -Substructure	95	17-Jun-16	08-Oct-16
CCNS020	S - Superstructure	65	11-Oct-16	24-Dec-16
CCNS030	Curing & Remove formwork	18	28-Dec-16	18-Jan-17
Finishing/E&M				
CEMS010	S - E&M & Equipment (by Others)	72	23-Mar-17	22-Jun-17
CFSS010	S - Finishing Works	133	19-Jan-17	08-Jul-17
CFSS020	S - Remaining Finishes works	96	25-Apr-17	18-Aug-17
CFSS030	Handover Portion N10	0		18-Aug-17
Roadworks				
CRD1000	Underground Sewar & Drainage	254	13-Jun-17	24-Apr-18
CRD1010	Watermian & Underground Utilities	230	02-Aug-17	16-May-18
CRD1020	Roadworks	218	06-Sep-17	07-Jun-18
CRD1030	Road Furniture	72	23-Mar-18	22-Jun-18
Testing & Commissioning/Inspection & Handover				
Construction				
CTC0010	Statutory Inspection	48	23-Jul-18	15-Sep-18
CTC0020	Final Inspection & Handover	48	06-Aug-18	02-Oct-18



Non Critical Activity
Critical Activity
Milestone

HY/2012/08 - TMCLK Northern Sub-sea Tunnel Section

Initial Works Programme - Construction

Dragages HongKong
A member of the Bouygues Construction group
Dragages - Bouygues Joint Venture 寶嘉 - 布依格聯營

Date	Revision	Checked	Approved
12-Aug-13			

Figure 1.7

Rev.	Description	Date	Checked
A	FIRST ISSUE	10SEP13	PKV

Designed By: PKV
Drawn By: DAI
Approved By: SPo PP
Date: 10SEP2013

Main Contractor: Dragages Hong Kong — A member of the Bouygues Construction group; Bouygues Travaux Publics
Dragages - Bouygues Joint Venture 實嘉 - 布依格聯營

Client: 路政署 HIGHWAYS DEPARTMENT

Contractor's Designer: ARUP Ove Arup & Partners Hong Kong Limited

Project: Contract No. HY/2012/08
Tuen Mun - Chek Lap Kok Link -
Northern Connection Sub-Sea Tunnel Section

Drawing Title: Figure 1.8 NORTHERN LANDFILL GENERAL LAYOUT (CONFORMING)

Drawing no.: TMCLKL8-DBJ-NTH-DWG-00138
Scale: 1:5000 @ A3
CADD Ref.: TMCLKL8-DBJ-NTH-DWG-00138-DFT-A
Issue Status: DFT (DRAFT)
Revision: A

2 ENHANCED TSP MONITORING

2.1 INTRODUCTION

The following section provides the details of the Enhanced TSP Monitoring Plan to be undertaken by the Environmental Team (ET) under *Condition 2.4* of *EP-354/2009/A*. The objective of the enhanced monitoring of TSP is to provide an increased monitoring frequency of TSP to allow any deteriorating air quality to be readily detected and timely action taken to rectify the situation. The enhanced monitoring also covers additional TSP monitoring station with a view to confirming that no unacceptable construction dust impact is detected at nearby sensitive receiver. It should be noted that all relevant air quality mitigation measures recommended or specified in the EP, EIA, EM&A Manual, Environmental Management Plan, Method Statements, and General and Particular Specifications of this Project will be strictly followed to reduce potential construction dust impacts

Based on the findings presented in TM-CLKL EIA study, major construction dust nuisance is associated with exposed land-based site areas and the reclamation areas when the following construction activities are undertaken:

- Excavation;
- Road works;
- Slope works;
- Foundation works;
- Construction of road and superstructures;
- Wind erosion from reclaimed areas, open sites and stockpiling areas; and
- Demolition of existing structure.

Amongst the above construction activities, excavation, slope works, foundation works, construction of road and superstructures, wind erosion from reclaimed areas, open sites and stockpiling areas are the major sources of dust nuisance relevant to construction activities for the Northern Connection under *Contract No. HY/2012/08* and other construction works within the Tuen Mun area under Contracts III, IV and V. As such this Enhanced TSP Monitoring Plan is proposed to be implemented for these main types of construction activities.

2.2 MONITORING STATIONS

The proposed monitoring stations for the enhanced TSP monitoring are shown in *Figure 2.1* and detailed in *Table 2.1*.

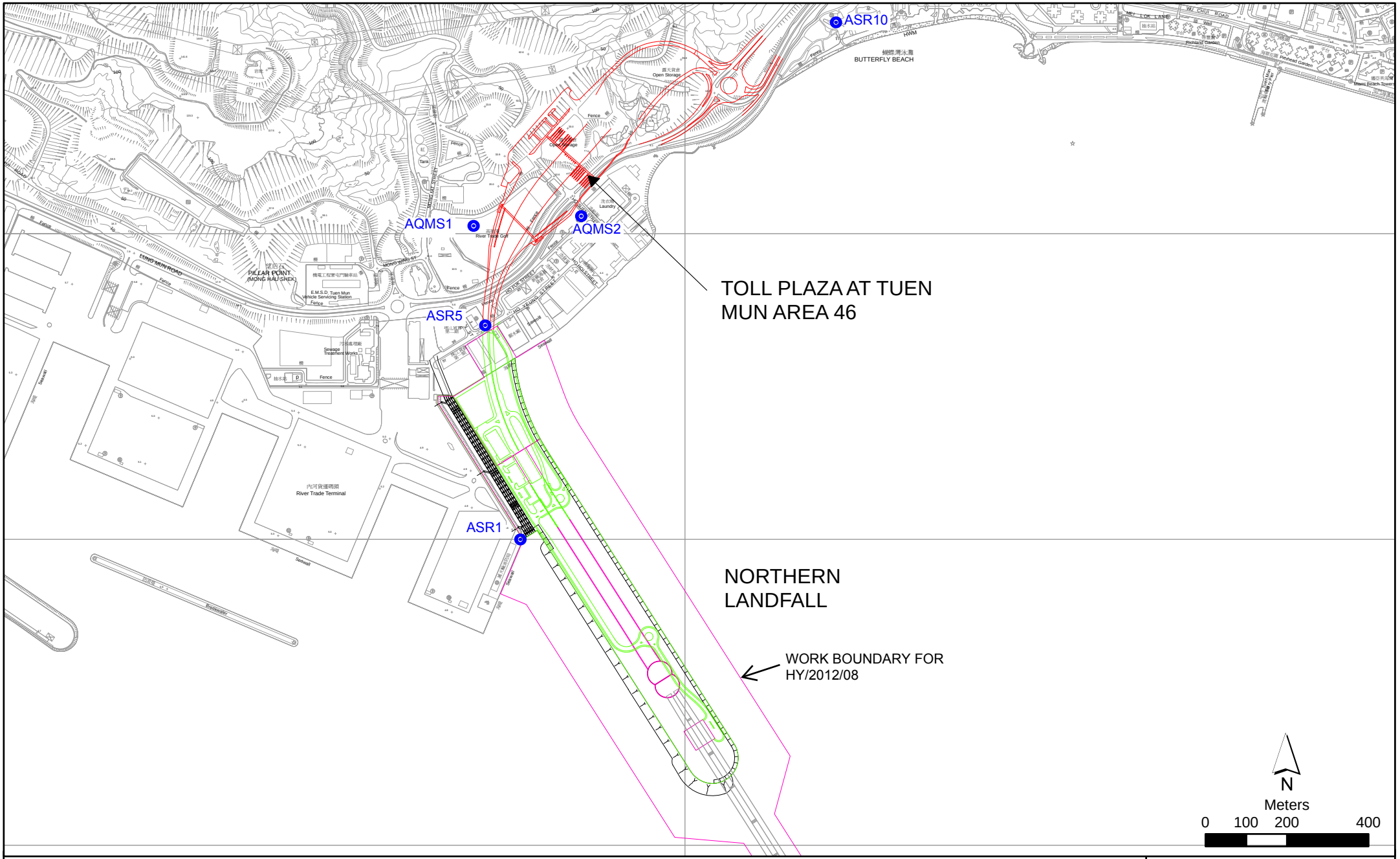


Figure 2.1

Air Quality Monitoring Stations for the Enhanced TSP Monitoring

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Date: 23/10/2013

Environmental Resources Management

ERM

It is proposed that the monitoring locations will be designed to cover the dust-generating land-based construction works from the Northern Connection, toll plaza, tunnel buildings and TCSS to identify the direct impacts to air quality sensitive receivers (ASRs).

As determined by the TM-CLKL EIA study, ASR1 and ASR5 are proposed in the approved EM&A Manual as the dust monitoring location for air quality monitoring during the construction phase. Based on the requirements stated in the EM&A Manual, 1 set of 24-hour TSP and 3 sets of 1-hour TSP monitoring will be conducted at ASR1 and ASR5 at least once in every six days during the construction phase. For the purpose of this Enhanced TSP Monitoring Plan, ASR1 and ASR5 will also be included as near-field monitoring stations for the construction activities of Northern Connection.

Three additional monitoring stations, AQMS1, AQMS2 and ASR 10, are proposed in the Enhanced TSP Monitoring Plan. AQMS1 is the abandoned Rive Trade Golf where the site office under *Contract No. HY/2012/08* is located. AQMS1 is at approximately 60 m to the west of the toll plaza works site and 270 m to the north of Northern Connection works boundary. AQMS2 [(1)] is located at the bare ground in the proximity of the toll plaza works site and approximately 300 m to the northeast of Northern Connection works boundary. These two stations are added to capture the dust impacts from the construction of the toll plaza. They are also serving as mid-field monitoring stations for the construction of the Northern Connection. The third additional station, ASR10, is located at the Butterfly Beach Park at 170 m to the east of the land-based works site boundary. This is a far-field monitoring station which serves as a check-point to provide TSP measurements to indicate the background TSP levels of the Tuen Mun area.

No far-field air quality monitoring station is proposed to the west of the works site boundary for the Enhanced TSP monitoring Plan since the area is industrial in nature and air quality is mainly affected by nearby activities such as operations of the Fill Bank at Tuen Mun Area 38 (TMFB). It would thus be difficult to use data collected in this far field area to show any additional dust impacts from the TMCLKL works. As such, additional TSP monitoring station is not considered necessary at this area.

Given that no ASR is identified within the northern part of the works site boundary, and the construction works are marine-based in nature in the southern part of the works site boundary, no far-field air quality monitoring station is proposed for the Enhanced TSP Monitoring Plan in both the northern and southern parts of the works site.

(1) AQMS2 is an alternative monitoring station for Butterfly Laundry which is an ASR (ie ASR6) identified in the approved EIA Report. AQMS2 is being proposed for monitoring since access to Butterfly Laundry is not granted to the ET at the moment to undertake the air quality monitoring. Should access be granted to the ET, air quality monitoring will be undertaken at Butterfly Laundry instead of AQMS2 in the impact monitoring phase.

Table 2.1 Enhanced TSP Monitoring Plan – Monitoring Stations

Air quality monitoring station	Location	Landuse	No. of Storey	Horizontal Distance to the Major Construction Area (m)	
				Northern Landfall	Toll Plaza
ASR1	Tuen Mun Fireboat Station	Office	1	< 50	< 50
ASR5	Pillar Point Fire Station	Office	5	< 50	> 500
AQMS1	Previous River Trade Golf	Bare ground	0	270	60
AQMS2	Bare ground at Ho Suen Street	Bare ground	0	350	< 50
ASR10	Butterfly Beach Park	Recreational uses	0	> 1000	170

The status and locations of dust sensitive receivers may change after issue of this Enhanced TSP Monitoring Plan. If this happens, the ET shall agree with the SOR, in consultation with the IEC, to propose the alternative/updated air quality monitoring station(s).

2.3 MONITORING PARAMETER

TSP levels have been proposed for measurement based on *Supplementary Information* that exceedances of the annual TSP criterion are predicted in the Pillar Point area during the construction phase of the Northern Connection and toll plaza. 1-hour and 24-hour TSP levels shall be measured to indicate the impacts of construction dust on air quality.

In addition to the TSP measurements, all relevant data including weather conditions, elapsed-time meter reading for the start and stop of the sampler, identification and weight of the filter paper, any other special phenomena and work progress of the concerned site shall be recorded in detail by the ET.

2.4 MONITORING EQUIPMENT & METHODOLOGY

The 1-hour and 24-hour TSP levels shall be measured by following the standard high volume sampling method as set out in the *Title 40 of the Code of Federal Regulations, Chapter 1 (Part 50), Appendix B*.

The high volume samplers (HVS) shall be equipped with an electronic mass flow controller and be calibrated against a traceable standard at regular intervals. All the equipment, calibration kit, filter papers, etc. shall be clearly labelled.

HVS in compliance with the following specifications shall be used for carrying out the 1-hour and 24-hour TSP monitoring:

- 0.6-1.7 m^3/min (20-60 SCFM) adjustable flow range;
- equipped with a timing/control device with +/- 5 minutes accuracy for 24 hours operation;
- installed with elapsed-time meter with +/- 2 minutes accuracy for 24 hours operation;
- capable of providing a minimum exposed area of 406 cm^2 (63 in^2);
- flow control accuracy: +/- 2.5% deviation over 24-hr sampling period;
- equipped with a shelter to protect the filter and sampler;
- incorporated with an electronic mass flow rate controller or other equivalent devices;
- equipped with a flow recorder for continuous monitoring;
- provided with a peaked roof inlet;
- equipped with a manometer;
- able to hold and seal the filter paper to the sampler housing in a horizontal position;
- easy to change the filter; and
- capable of operating continuously for 24-hr period.

The ET shall agree with the SOR, in consultation with the IEC, the position of the HVS. When positioning the samplers, the following points shall be noted:

- a horizontal platform with appropriate support to secure the samplers against gusty wind shall be provided;
- the distance between the sampler and an obstacle, such as buildings, shall be at least twice the height that the obstacle protrudes above the sampler;
- a minimum of 2 m of separation from walls, parapets and penthouses is required for rooftop samplers;
- a minimum of 2 m of separation from any supporting structure, measured horizontally is required;
- no furnace or incinerator flue is nearby;
- airflow around the sampler is unrestricted;

- the sampler is more than 20 m from the dripline;
- any wire fence and gate, to protect the sampler, shall not cause any obstruction during monitoring;
- permission must be obtained to set up the samplers and to obtain access to the monitoring stations;
- a secured supply of electricity is needed to operate the samplers; and
- no two samplers should be placed less than 2 m apart.

Calibration of dust monitoring equipment shall be conducted upon installation and thereafter at bi-monthly intervals. The transfer standard shall be traceable to the internationally recognised primary standard and be calibrated annually. The calibration data shall be properly documented for future reference by concerned parties, such as the IEC. All the data shall be converted into standard temperature. The flow-rate of the sampler before and after the sampling exercise with the filter in position shall be verified to be constant and recorded.

If direct reading dust meter is proposed to measure 1-hour TSP levels on an *ad hoc* basis, sufficient information shall be submitted to the IEC to prove that the instrument is capable of achieving a comparable result as that of the HVS and may be used for the 1-hour sampling. The instrument should also be calibrated regularly and the 1-hour sampling shall be checked periodically by the HVS to check the validity and accuracy of the results measured by the direct reading method.

Wind data monitoring equipment will be set up at suitable location for logging the wind speed and wind direction at or near one of the air quality monitoring stations proposed in *Table 2.1* which are located near the source of dust from the construction works area. The wind data monitoring equipment should be installed and operated by considering the following conditions:

- the wind sensors should be installed on mast at an elevated level 10 m above ground so that they are clear of obstructions or turbulence caused by the buildings;
- the wind data should be captured by a data logger to be downloaded for processing at least once a month;
- the wind data equipment should be re-calibrated at least once every six months; and
- wind direction should be divided into 16 sectors of 22.5 degrees each.

In exceptional situations, the ET may propose alternative methods to obtain representative wind data upon approval from the SOR and agreement from the IEC.

2.5 LABORATORY MEASUREMENT AND ANALYSIS

A clean laboratory with constant temperature and humidity control and equipped with necessary measuring and conditioning instruments shall be used for sample analysis and equipment calibration and maintenance. The laboratory shall be HOKLAS accredited.

Filter paper of size 8"x10" shall be labelled before sampling. It shall be a clean filter paper with no pin holes and shall be conditioned in a humidity controlled chamber for over 24-hr and be pre-weighed before use for the sampling.

After sampling, the filter paper loaded with dust shall be kept in a clean and tightly sealed plastic bag. The filter paper shall then be returned to the laboratory for reconditioning in the humidity controlled chamber followed by accurate weighing by an electronic balance with a readout down to 0.1 mg. The balance shall be regularly calibrated against a traceable standard. All the collected samples shall be kept in a good condition for 6 months before disposal.

2.6 MONITORING PERIOD AND FREQUENCY

2.6.1 *Enhanced TSP Monitoring Plan - Baseline*

Baseline monitoring will be conducted to collect representative TSP data from the five monitoring stations. This baseline monitoring will provide data for comparison with TSP data collected during the construction phase.

The baseline monitoring will be conducted at the air quality monitoring stations listed in *Table 2.1* for 14 consecutive days prior to the start of the construction works to obtain daily 24-hour TSP samples. 1-hour sampling shall also be undertaken at least 3 times per day during the same period. Monitoring shall take place prior to the commencement of any construction works of the Northern Connection, toll plaza, tunnel buildings and TCSS. The proposed monitoring frequency is detailed in *Table 2.2*.

Table 2.2 Monitoring Frequency of Baseline Enhanced TSP Monitoring Plan

Monitoring Parameter	Monitoring Location	Frequency	Monitoring Condition
1-hour TSP	ASR1, ASR5, ASR10, AQMS1, AQMS2	3 times per day for 14 consecutive days	Before commencement of any construction works of the Northern Connection, toll plaza, tunnel buildings and TCSS.
24-hour TSP	ASR1, ASR5, ASR10, AQMS1, AQMS2	Daily for 14 consecutive days	Before commencement of any construction works of the Northern Connection, toll plaza, tunnel buildings and TCSS

The monitoring schedule for baseline monitoring shall be developed by the ET and provided to the SOR and IEC for agreement prior to the monitoring works.

In the event that insufficient baseline monitoring data or questionable results are obtained, the ET shall liaise with the DEP to agree on an appropriate set of data to be used as a baseline reference and submit this data to the SOR and IEC for approval.

Ambient conditions may vary seasonally and shall be reviewed at three monthly intervals. If the ET considers that the ambient conditions have changed and a repeat of the baseline monitoring is required to be carried out for obtaining updated baseline levels, the monitoring should be at times when the Contractor's activities are not generating dust, at least in the proximity of the monitoring stations. Should a change in ambient conditions be determined, the baseline levels and, in turn, the TSP Action and Limit Levels criteria, shall be revised. The revised baseline levels and TSP Action and Limit Levels shall be agreed with the DEP and supplied to the IEC.

2.6.2 Enhanced TSP Monitoring Plan - Construction Phase

The Enhanced TSP Monitoring Plan will be implemented simultaneously with the air quality impact monitoring in the EM&A programme. In addition to the TSP monitoring at ASR1 and ASR5, monitoring will also be undertaken at the additional monitoring stations AQMS1, AQMS2 and ASR10 following the frequency of air quality impact monitoring stated in the EM&A Manual. The data collected will be used to provide an indication of whether there is any significant increase in TSP levels upon commencement of construction activities of the Northern Connection, toll plaza and tunnel buildings. TSP monitoring, including those required under the approved EM&A Manual (ie for ASR1 and ASR5 only) and this Enhanced TSP Monitoring Plan, will not be implemented during the TCSS installation works which will not involve any civil works.

The major sources of dust nuisance arising from the Northern Connection, toll plaza and tunnel buildings are related to excavation, slope works, foundation works, construction of road and superstructures, wind erosion from reclaimed areas, open sites and stockpiling areas. Therefore, during these construction activities, the TSP monitoring frequency will be increased at all air quality monitoring stations such that any deteriorating air quality can be readily detected and timely action taken to rectify the situation. The Enhanced TSP Monitoring Plan during construction phase is summarized in *Table 2.3*.

Table 2.3 Enhanced TSP Monitoring Plan – Construction Phase

Monitoring Parameter	Monitoring Location	Frequency	Monitoring Condition (1)
1-hour TSP	ASR1, ASR5, ASR10, AQMS1, AQMS2	3 times per day every six days	Throughout the Northern Connection, toll plaza and tunnel buildings construction works
24-hour TSP	ASR1, ASR5, ASR10, AQMS1, AQMS2	Daily every six days	Throughout the Northern Connection, toll plaza and tunnel buildings construction works
1-hour TSP	ASR1, ASR5, ASR10, AQMS1, AQMS2	3 times per day every three days	Northern Connection During excavation works for launching shaft, excavation work for Cut and Cover Tunnel and Cut and Cover Tunnel Construction Toll Plaza During excavation, slope works, construction of road and superstructures and wind erosion from open sites and stockpiling areas Tunnel Buildings During excavation, foundation works, construction of superstructures and wind erosion from open sites and stockpiling areas
24-hour TSP	ASR1, ASR5, ASR10, AQMS1, AQMS2	Daily every three days	Northern Connection During excavation works for launching shaft, excavation work for Cut and Cover Tunnel and Cut and Cover Tunnel Construction Toll Plaza During excavation, slope works, construction of road and superstructures and wind erosion from open sites and stockpiling areas Tunnel Buildings During excavation, foundation works, construction of superstructures and wind erosion from open sites and stockpiling areas

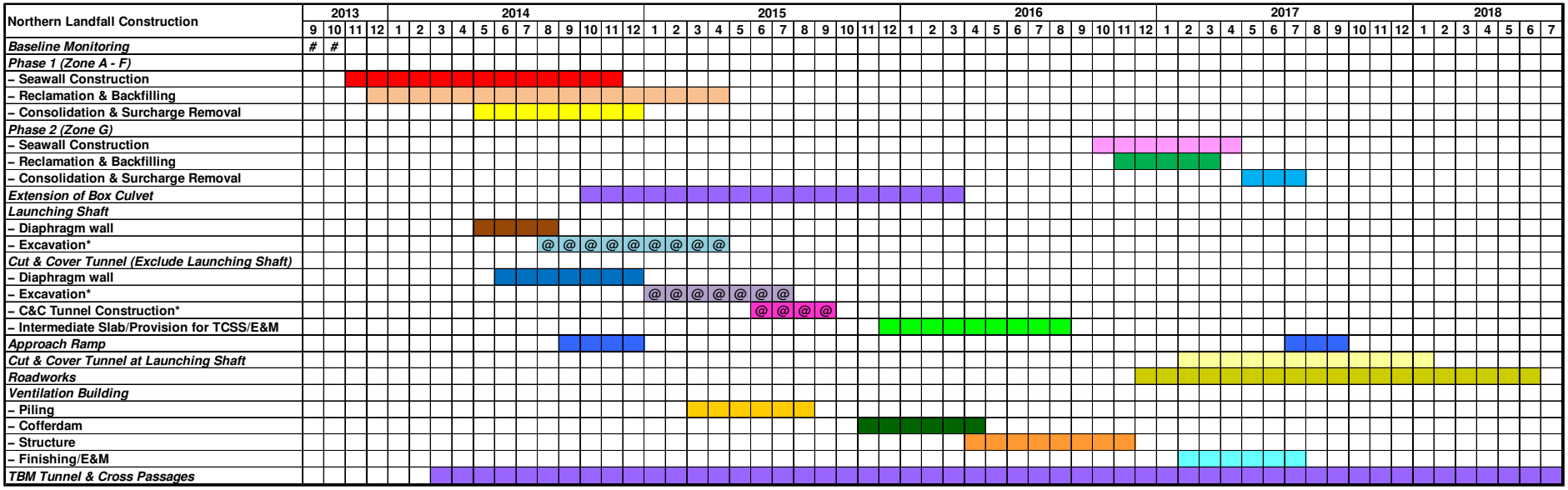
Noted:
(1) The Enhanced TSP Monitoring Plan will be undertaken when any of the monitoring condition(s) is triggered.

A preliminary Enhanced TSP Monitoring Programme is provided in *Figure 2.2*. The monitoring programme is developed based on the construction schedule supplied by the Contractor under the *Contract No HY/2012/08*, and will be agreed with EPD and supplied to the IEC. The construction programmes of the toll plaza and tunnel buildings are not available during the preparation of this Plan since the construction contracts are not yet awarded. The Enhanced TSP Monitoring Programme will be updated when the construction programmes of the toll plaza and tunnel buildings are available for consideration.

The ET will notify the SOR and IEC at least one month before the monitoring frequency will be increased according to the Enhanced TSP Monitoring Plan

(ie at least one month before commencement of relevant works for which increased monitoring frequency is required in accordance with *Table 2.3*).

Figure 2.2 Preliminary Monitoring Programme for Enhanced TSP Monitoring Plan (+)



Notes:

"+": Enhanced TSP Monitoring will be undertaken during the entire construction period from November 2013 to July 2018 for the construction of the northern connection.

"#" : Baseline Monitoring

"@" : Increase TSP monitoring frequency (i.e. 1-hour TSP at ASR1, ASR5, ASR 10, AQMS 1 and AQMS 2 – 3 times per day every three days; 24-hour TSP at ASR1, ASR5, ASR 10, AQMS 1 and AQMS 2 – daily every three days) for the northern landfall construction. TSP monitoring frequency will also be increased during construction of the toll plaza and tunnel buildings when any of the monitoring conditions stated in *Table 2.3* is triggered.

" * " : Construction works induce major dust nuisance

2.7 AIR QUALITY COMPLIANCE

The baseline monitoring results will form the basis for determining the Action and Limit Levels (A/L Levels) for the impact monitoring of the 24-hour TSP and 1-hour TSP levels. According to the *Supplementary Information on Construction Air Quality in Tuen Mun* (1) ("the *Supplementary Information"*) submitted under *Section 8.(1)* of the *EIAO* for the Project, the annual average TSP results from EPD monitoring station in Yuen Long is ranged from 100 to 103 μg/m³ between 2003 to 2008 which exceeded the AQO criterion of annual TSP (80 μg/m³). More recent information on annual average TSP levels, however, showed that exceedance of the AQO criterion was only recorded in 2011 during the period of 2009 to 2012 (2009: 77 μg/m³; 2010: 78 μg/m³; 2011: 86μg/m³; 2012: 68 μg/m³). This annual AQO TSP criterion of 80 μg/m³ will also be adopted as the A/L Level of the Enhanced TSP Monitoring. The proposed Action and Limit Levels are shown in *Table 2.4*.

Table 2.4 Enhanced TSP Monitoring Plan – TSP Action and Limit Level

Parameter	Action Level	Limit Level
24-hour TSP Level in μg/m³	For baseline level ≤ **200 μg/m³** Action level = (Baseline*1.3+ Limit level)/2 For baseline level **>200 μg/m³** Action level = Limit level	260
1-hour TSP Level in μg/m³	For baseline level ≤ **384 μg/m³** Action level = (Baseline*1.3+ Limit level)/2 For baseline level **> 384 μg/m³** Action level = Limit level	500
Annual Average 24-hour TSP Level in μg/m³	Action level = Limit level	80

The above A/L Levels are used to determine whether operational modifications are necessary to mitigate construction dust impacts, particularly in relation to reducing the TSP levels. The impact monitoring results will be evaluated against the A/L Levels. In the event that the A/L Levels are exceeded, appropriate actions in Event and Action plan (*Table 2.5*) should be undertaken and a review of works should be carried out by the Contractor(s).

Any noticeable change to air quality will be recorded in the monitoring reports and will be investigated and remedial actions will be undertaken to reduce impacts. Should exceedance be confirmed to be related to the works of the TM-CLKL Project, additional mitigation measures recommended in the

(1) EIA reports related to HZMB. Supplementary Information on Construction Air Quality in Tuen Mun. Further information submitted under Section 8.(1) of the Ordinance. Available from http://www.epd.gov.hk/eia/register/report/eiareport/eia_1742009/further_info/pdf/Supplementary%20Details%20for%20ACE%20R6%20-%20marked%20up%20EPD%202509.htm

Supplementary Information should be considered for implementation, including but not limited to the following:

- More frequent watering at the areas of exposed soil [(1)] ;
- Requiring that temporary hydroseeding of exposed surfaces which are not proposed to be touched for a period of time be undertaken;
- Implementing further dust suppression or screening measures at the concerned ASRs;
- Scheduling the works to avoid key dusty construction activities of concurrent contracts where possible; and
- Stoppage of construction works would be taken if deemed necessary to mitigate any project-related upsurge of TSP level.

Particular attention will be paid to the Contractor(s)'s implementation of the recommended dust-reducing mitigation measures.

(1) Currently, the Contractor is required to undertake watering at least 12 times per day for the Tuen Mun area. The time intervals between each watering should not exceed 1.5 hours.

Table 2.5 Enhanced TSP Monitoring Plan – Event and Action Plan

Event	Action			
	ET [(a)]	IEC [(a)]	SOR [(a)]	Contractor(s)
Action Level				
Exceedance recorded	1. Identify the source. 2. Repeat measurement to confirm finding. If two consecutive measurements exceed Action Level, the exceedance is then confirmed. 3. Inform the IEC and the SOR. 4. Investigate the cause of exceedance and check Contractor's working procedures to determine possible mitigation to be implemented. 5. If the exceedance is confirmed to be Project related after investigation, increase monitoring frequency to daily. 6. Discuss with the IEC and the Contractor on remedial actions required. 7. If exceedance continues, arrange meeting with the IEC and the SOR. 8. If exceedance stops, cease additional monitoring.	1. Check monitoring data submitted by the ET. 2. Check the Contractor's working method. 3. If the exceedance is confirmed to be Project related after investigation, discuss with the ET and the Contractor on possible remedial measures. 4. Advise the SOR on the effectiveness of the proposed remedial measures. 5. Supervisor implementation of remedial measures.	1. Confirm receipt of notification of failure in writing. 2. Notify the Contractor. 3. Ensure remedial measures properly implemented.	1. Rectify any unacceptable practice 2. Amend working methods if appropriate 3. If the exceedance is confirmed to be Project related, submit proposals for remedial actions to IEC within 3 working days of notification 4. Implement the agreed proposals 5. Amend proposal if appropriate

Event	Action			
	ET [(a)]	IEC [(a)]	SOR [(a)]	Contractor(s)
Limit Level				
Exceedance recorded	1. Identify the source. 2. Repeat measurement to confirm finding. If two consecutive measurements exceed Limit Level, the exceedance is then confirmed. 3. Inform the IEC, the SOR, the DEP and the Contractor. 4. Investigate the cause of exceedance and check Contractor's working procedures to determine possible mitigation to be implemented. 5. If the exceedance is confirmed to be Project related after investigation, increase monitoring frequency to daily. 6. Carry out analysis of the Contractor's working procedures to determine possible mitigation to be implemented. 7. Arrange meeting with the IEC and the SOR to discuss the remedial actions to be taken. 8. Assess effectiveness of the Contractor's remedial actions and keep the IEC, the DEP and the SOR informed of the results. 9. If exceedance stops, cease additional monitoring.	1. Check monitoring data submitted by the ET. 2. Check Contractor's working method. 3. If the exceedance is confirmed to be Project related after investigation, discuss with the ET and the Contractor on possible remedial measures. 4. Advise the SOR on the effectiveness of the proposed remedial measures. 5. Supervisor implementation of remedial measures.	1. Confirm receipt of notification of failure in writing. 2. Notify the Contractor. 3. If the exceedance is confirmed to be Project related after investigation, in consultation with the IEC, agree with the Contractor on the remedial measures to be implemented. 4. Ensure remedial measures are properly implemented. 5. If exceedance continues, consider what activity of the work is responsible and instruct the Contractor to stop that activity of work until the exceedance is abated.	1. Take immediate action to avoid further exceedance. 2. If the exceedance is confirmed to be Project related after investigation, submit proposals for remedial actions to IEC within 3 working days of notification. 3. Implement the agreed proposals. 4. Amend proposal if appropriate. 5. Stop the relevant activity of works as determined by the SOR until the exceedance is abated.

Note: (a) ET – Environmental Team; IEC – Independent Environmental Checker; SOR – Supervising Officer's Representative

3 RESULTS AND REPORTING

3.1 BASELINE MONITORING

The *Baseline Monitoring Report* will describe the baseline monitoring requirements presented in *Section 2* and weather data, and present the baseline monitoring results. The laboratory analysis reports will be appended in the report. The requirements of *Baseline Monitoring Report* stipulated in *Section 12.4* of the Project's EM&A Manual will be followed.

3.2 IMPACT MONITORING

The monitoring results during impact monitoring will be compared with the baseline monitoring results and evaluate against the proposed Action/Limit levels in this Enhanced TSP Monitoring Plan. Monitoring results during the construction phase together with the findings will be presented in the *Monthly EM&A Reports*. Annual average TSP level during the construction phase with the findings will be presented in the *Annual EM&A Reports*.