

Harbour-front Enhancement Committee

**Construction of Central-Wan Chai Bypass (CWB)
Tunnel Section in Causeway Bay Typhoon Shelter (CBTS)
and ex-Wan Chai Public Cargo Working Area (ex-PCWA)**

Important Note

This paper was prepared solely for demonstrating and discussing the need of temporary reclamation works for the construction of the Trunk Road Tunnel Option. It is not intended to, and should not, be relied upon by any other party that either the Tunnel Option or any other option is the preferred option for the construction of Central-Wan Chai Bypass.

Purpose

This paper seeks Members' views on the Consultants' findings that the Overriding Public Need Test in compliance with the Protection of the Harbour Ordinance ("PHO") for the temporary reclamation to provide working platform for constructing the tunnel section of the Central-Wan Chai Bypass and Island Eastern Corridor Link (the "Trunk Road") in CBTS and ex-PCWA has been met.

Background

2. There was support from the public on the proposed Trunk Road Tunnel as revealed from the extensive public engagement exercise entitled "Harbour-front Enhancement Review - Wan Chai, Causeway Bay and Adjoining Areas" ("HER") carried out from May 2005 to June 2007 under the steer of the then Harbour-front Enhancement Committee ("HEC") Sub-committee on Wan Chai Development Phase II ("WDII") Review ("HEC Sub-committee"). The details of the consultations are shown in **Annex 1**.

3. The need for temporary reclamations during construction was raised in the reports entitled "Trunk Road Alignments & Harbour-front Enhancement"

(April 2006)¹ and “Report on Cogent and Convincing Materials to Demonstrate Compliance with the Overriding Public Need Test” (February 2007) (the “CCM Report”)². These reports have been uploaded onto the website of the Government and a link has also been provided on the HEC website for public reference. The temporary reclamations were described in the project profile for WDII and CWB that was exhibited in August 2006 under the Environmental Impact Assessment Ordinance for public comments. The issue of temporary reclamations was also described when the then Legislative Council Panel on Planning, Lands and Works, Town Planning Board and the four District Councils of Hong Kong Island were consulted on the WDII and Trunk Road projects and the relevant Outline Zoning Plans in May to June 2007.

4. In the light of the Court of First Instance’s judgment in a judicial review³ on 20 March 2008 that the PHO applies to the proposed temporary reclamations referred to in the road scheme of the Trunk Road gazetted under the Roads (Works, Use and Compensation) Ordinance on 27 July 2007, we engaged the consultants to examine the overriding public need for the temporary reclamation that is required for constructing the Trunk Road Tunnel⁴ as well as its compliance with the PHO and to consult the public about the findings.

Methods of Construction

5. According to the CCM Report, the Trunk Road Tunnel Option serves best to protect and preserve the Harbour amongst all feasible options. By having the Trunk Road Tunnel running beneath the seabed in the CBTS and immediately to the west as well as within the ex-PCWA, permanent reclamation in these areas could be avoided. However, temporary reclamation at these locations would be required to facilitate tunnel construction.

6. Moreover, to maintain the existing traffic during construction of the Trunk Road connection to the existing Island Eastern Corridor, a temporary bridge for temporary traffic diversion would also be required.

¹ The “Report on Trunk Road Alignments and Harbour-front Enhancement” (April 2006) describes the step-by-step derivation of the Trunk Road Tunnel as the option that serves best to protect and preserve the Harbour.

² The CCM Report describes the comprehensive package of materials which explain how the presumption against reclamation is rebutted by an overriding public need for reclamation, in compliance with the PHO and Court of Final Appeal Judgment on 9 January 2004.

³ The judicial review applied by the Society for Protection of the Harbour on 3 October 2007.

⁴ The need for temporary reclamation for re-provisioning of part of the typhoon shelter is being reviewed separately.

7. The Trunk Road Tunnel layout in CBTS and ex-PCWA is shown in Annex 2. The technical constraints/requirement for construction works in the vicinity include-

- (i) varying ground and seabed conditions;
- (ii) existing and planned infrastructure, such as Cross Harbour Tunnel (“CHT”), the proposed Shatin to Central Link (“SCL”), utilities and the existing seawalls at the CBTS, etc;
- (iii) minimum disruptions to the operation of the CBTS; and
- (iv) the requirement to provide connection of slip road from Hing Fat Street/Tsing Fung Street to the Trunk Road Tunnel at the CBTS (“Slip Road 8”).

Considerations on choice of construction methods include-

- (i) minimisation of reclamation;
- (ii) environmental impacts;
- (iii) allowing a reliable, safe and low risk construction method based on the available engineering techniques; and
- (iv) maintaining fairness and competitiveness during open tendering (construction method must be well proven and widely adopted by most contractors).

8. The consultants have examined various construction methods for constructing the Trunk Road Tunnel beneath the seabed of the CBTS and ex-PCWA, including “Immersed Tube Tunnel Construction”, “Bored Tunnel Construction” and “Cut-and-cover Tunnel Construction”. The discussion referring to CBTS below is deemed to be applicable to the ex-PCWA as well.

Immersed Tube Tunnel Construction

9. Immersed tube tunnel (“IMT”) involves floating and sinking precast units into place just below the seabed level like Cross Harbour Tunnel, Eastern Harbour Crossing and Western Harbour Crossing. Before sinking the precast units, excavation of a trench and removal of soft materials from the seabed are required to provide a firm foundation.

10. However, construction of the Trunk Road tunnel section running through the CBTS at a deep level would require an extremely deep open cut trench

(up to around 30m deep, with side slopes). A typical section is shown in Annex 3. Due to the close proximity, excavation of this deep trench would affect roads and services behind the southern seawalls (e.g., Victoria Park Road and intakes of the cooling systems), disturb typhoon shelter breakwater and affect the operation of the CBTS. During excavation of the deep trench, the CHT structure may be damaged, thus paralysing one of the most vital road links in Hong Kong. Moreover, installation of a retaining structure in front of the existing CBTS seawall has found to be technically not feasible due to the great depth. Floating of precast units into the CBTS would also require dredging of the seabed of the CBTS which would seriously affect the continual operation of the typhoon shelter.

11. IMT construction is therefore considered not feasible in this instance.

Bored Tunnel Construction

12. The consultants have also examined bored tunnel construction using a tunnel boring machine (“TBM”). This method involves boring of circular tunnel section through the soil and rock under the existing seabed. The bored tunnel surface will then be protected with tunnel concrete lining. For the dual 3-lane Trunk Road configuration in eastbound and westbound carriageways, two separate circular tunnel bores of at least 15.5m in diameter would be required.

13. For tunnelling beneath the soft seabed sediments in the CBTS, the TBM construction would require a minimum soil cover of at least 1.5 times the diameter of the bored tunnel above the tunnel to ensure ground stability in the vicinity. Throughout the CBTS, the soil cover would not be sufficient for safe construction by TBM. A typical section is shown in Annex 4.

14. Moreover, Slip Road 8 is a shallow tunnel connecting the mainline tunnel at an oblique angle in the CBTS. Its connection to the mainline tunnel would end up with a very long merging section. If TBM were to be adopted for constructing the mainline tunnel, cutting into such a long length of the constructed bored tunnel tube to create the required connection opening would seriously affect the structural integrity of the bored tunnel. If the Slip Road 8 connection could not be constructed as a result, this would undermine the function of the Trunk Road in relieving traffic congestion.

15. Other considerations include the technical feasibility of using TBM with diameter greater than 15m in mixed ground (i.e. rock, alluvium and marine

sediments) condition and through hard rock condition (TBM with diameter greater than 15m through hard rock has not been used anywhere else). The extent of permanent reclamation along the Wan Chai and North Point shorelines would also be increased due to greater separation required between eastbound and westbound bored tunnels to ensure ground stability. In view of the above, construction of the Trunk Road Tunnel through the CBTS by TBM is considered not feasible.

Cut-and-Cover Construction

16. For cut-and-cover construction using diaphragm walls, the diaphragm walls would be constructed first to form an enclosure. The soil inside the diaphragm walls would then be excavated to the bottom level for construction of tunnel. Upon completion, the space above the tunnel would then be backfilled to the original seabed level. Diaphragm wall construction is a reliable method used as retaining wall systems and foundations. The advantage is that they can be installed in close proximity to existing structures and provide effective retaining functions for soil and underground water behind the diaphragm walls. This method is well-suited to the construction of the deep Trunk Road Tunnel with varying depths and complex tunnel and connection layout at the CBTS. The associated section is shown in **Annex 5**.

17. This form of construction will not cause any disturbance to existing adjacent infrastructure, does not have any minimum ground cover or clearance restrictions, will readily enable the Slip Road 8 connection and facilitates the minimum extent of permanent reclamation at the adjoining areas.

18. In view of the above, it can be concluded that the only practically feasible form of construction for the Trunk Road tunnel sections at the CBTS and ex-PCWA is by cut-and-cover method.

The Need for Temporary Reclamations

19. Construction of diaphragm walls by cut-and-cover method requires a dry working platform with safe working environment on which the contractor's construction plant could stand. It is not feasible to construct diaphragm walls through water. Therefore, when constructing the Trunk Road Tunnel through the CBTS, a working platform would need to be formed first by temporary reclamation. This construction method would also enable staged construction works in the CBTS and ex-PCWA to minimize the mooring area to be affected at any one time;

to maintain acceptable water quality standards; and to ensure uninterrupted seawater supply from the CBTS to the existing cooling systems for the adjacent buildings.

20. To facilitate cut-and-cover tunnel construction, the possible alternative to temporary reclamation is the use of cofferdam. The cofferdam would need to be installed around the works area and dewatered for the construction works to be carried out. For deep excavation within the cofferdam (up to 35 metres below sea level), there is a risk that the very high water and soil pressures would lead to movement and subsequent ground settlement and thus damage to adjacent structures as well as underground facilities such as the CBTS seawall and the CHT. The ingress of water would also cause safety concerns. (Past experience suggests that cofferdam with depth of around 20m below sea level would already be considered a ‘deep’ cofferdam, so working at nearly twice this depth would certainly create both technical difficulties and safety issues.) Moreover, the cofferdam would also be susceptible to damage from accidental ship impact, as the typhoon shelter would still be in operation. The cofferdam approach is shown in **Annex 6**.

21. Due to the above reasons, it is concluded that temporary reclamation is the only practically feasible and safe approach for constructing the Trunk Road Tunnel through the CBTS and the ex-PCWA by cut-and-cover method. Temporary reclamation will be removed and the seabed reinstated after construction of the Trunk Road Tunnel.

Minimum Extent of Temporary Reclamation

22. The extent of temporary reclamation is determined primarily by the extent of the temporary seawall (approximately 20m) on both sides of the tunnel, which is derived from the same principles as presented in the CCM Report⁵. The minimum overall extents of temporary reclamation required to facilitate the construction of the Trunk Road Tunnel beneath the seabed of the CBTS and the ex-PCWA are 6.4ha and 1.9ha respectively. The extent of the proposed temporary reclamation is shown in **Annex 7**. Through a staged construction approach, it is estimated that the affected area of the Harbour in respect of temporary reclamation at any one time in the CBTS will range from 1.8ha to 3.7ha, whilst at the ex-PCWA

⁵ According to Annex O of the CCM Report, the separation between the edge of the Trunk Road tunnel structure and the seawall copeline is determined by the clearance between the seawall foundation and the diaphragm wall of the Trunk Road tunnel in order to maintain the stability of rubble mount foundation of the temporary seawall and facilitate construction of the diaphragm wall.

the area of temporary reclamation will range from 0.7ha to 1.2ha. The durations of the individual temporary reclamation stages will vary from around 1 year to just over 3 years. The overall duration from the first stage up to the removal of the final stage of temporary reclamation will be around 6 years. An illustrative construction staging plan for the works through the CBTS is shown in **Annex 8**. These areas are the minimum extents of temporary reclamation required to meet the overriding public need for the construction of the Trunk Road Tunnel.

Environmental Impact Assessment

23. Environmental Impact Assessment (EIA) Report for the Trunk Road project has been submitted under the EIA Ordinance. The results revealed that, after the implementation of mitigation measures, temporary reclamation would not cause unacceptable environmental impacts. The Advisory Council on the Environment endorsed the EIA Report on 14 February 2008 with conditions. The Director of Environmental Protection is considering the EIA Report in accordance with the relevant procedures.

Removal of Temporary Reclamation

24. The Government has committed in the Trunk Road scheme gazetted on 27 July 2007 under the Roads (Works, Use and Compensation) Ordinance that the temporary reclamation works will be removed after construction of the Trunk Road Tunnel and the existing sea-bed reinstated. Provisions will be added to the contract documents ensuring that the temporary reclamation works to be carried out by the contractor will be the minimum extent of temporary reclamation, the temporary reclamation will be removed after the completion of the Tunnel construction, and seabed will be reinstated.

Public Engagement for Tunnel Construction

25. During the period from April to July 2008, we have been in touch with various professional institutions and consulted four District Councils (DCs) on Hong Kong Island on the temporary reclamation for Trunk Road Tunnel construction. A widely publicized public forum was held on 19 July 2008. Relevant information and materials have been posted onto the Highways Department's website. We shall further consult the Legislative Council and the public and brief the Town Planning Board before end 2008. The public

engagement plan for temporary reclamation required for Trunk Road Tunnel construction is shown in **Annex 9**.

Professional Bodies

26. We have engaged the Hong Kong Institution of Engineers and Hong Kong Construction Association on the need for temporary reclamation for the Trunk Road Tunnel construction on 7 and 11 April 2008 respectively. A Joint Professional Forum for Hong Kong Institution of Engineers, Hong Kong Institute of Architects, Hong Kong Institute of Planners, Hong Kong Institute of Surveyors and Hong Kong Institute of Landscape Architects was also held on 16 June 2008.

27. There was general support to the Trunk Road project. Some attendees appreciated that the proposed tunnel construction method with temporary reclamation at the ex-PCWA and CBTS would be a practically feasible, safe way of construction and the best option in satisfying the Overriding Public Need Test under the PHO. They urged for early implementation of the project. Some of them indicated concerns on the impact to the operation of the CBTS, precautionary measures against damaging the CHT, interface with the proposed SCL, dredging in CBTS and marine construction traffic arrangement within the CBTS.

District Councils

28. The four DCs of Hong Kong Island were consulted in July 2008. Members of the Central and Western DC, Wan Chai DC and Southern DC supported early implementation of the project and raised no objection to the proposed construction method. As the typhoon shelter is within the boundary of Eastern DC, members decided to set up a Working Group to help foster the public engagement process. Through the Working Group, interested Eastern DC members could seek more detail information on the technical issues relating to the construction methods and related issues. The Working Group held its first meeting on 29 July 2008. Members of the Working Group were concerned about the re-provisioning arrangement of the CBTS and the environmental impacts of the project. We will continue to engage the Eastern DC through the Working Group.

Public Forum

29. The public forum was held on 19 July 2008. Invitation letters and leaflets for the public forum have been distributed widely to the HEC, the

secretariats of the Legislative Council and all District Councils, stakeholders and concerned parties including Society for Protection of the Harbour, local community groups, professional bodies, green groups and residents' associations to encourage participation from the public. We have also advertised the public forum in newspapers and posted the leaflets in various public places for collection by the general public. The purpose of the public forum was to brief the public on our consultants' findings and to gauge public views. Public views were also collected through post or internet.

30. In general, there was no objection to the proposed temporary reclamation for the Trunk Road Tunnel construction. However, there were questions concerning matters of details, including the need for temporary reclamation to form temporary typhoon shelter and the associated consultation plan, construction method of the Trunk Road Tunnel beneath the CHT, staging arrangement of the temporary reclamation, associated environmental impacts and impacts on the operation of the CBTS, feasibility to adopt mixed construction method, marine construction traffic arrangement within the CBTS as well as the need of the Slip Road at Causeway Bay, etc. These questions could be addressed either in detailed design stage or construction stage.

Temporary Typhoon Shelter/Breakwater

31. After we have established the overriding public need for the proposed temporary reclamation for the Trunk Road Tunnel construction and that the temporary reclamation area is the minimum, we can define the extent of the affected areas in the CBTS and examine whether there is any other viable re-provisioning arrangement which could reasonably minimize temporary reclamation. We will consult the affected users, key stakeholders, the public, the concerned DCs, the HEC, the Legislative Council and brief the Town Planning Board in due course.

Conclusion

32. Cut-and-cover method is the only practically safe and feasible method of construction for the Trunk Road Tunnel at the CBTS and ex-PCWA, although it will require temporary reclamation. Temporary reclamation will be kept at the minimum and be removed and the seabed reinstated after construction of the Trunk Road Tunnel.

33. The Overriding Public Need for construction of the Trunk Road Tunnel has been demonstrated in the CCM Report. The purpose of the temporary reclamation is for the construction of the Trunk Road Tunnel with minimum permanent reclamation, and therefore, ultimately, to serve best to protect and preserve the Harbour. Without the temporary reclamation, the Trunk Road Tunnel cannot practically be constructed. There is consequently an overriding public need for the temporary reclamation in the CBTS and the ex-PCWA for the Tunnel Option. The above findings and the public views gathered will form the basis of the cogent and convincing materials for the temporary reclamation for constructing the Trunk Road Tunnel at the CBTS and the ex-PCWA.

Advice Sought

34. Members are invited to note and comment on the Consultants' findings raised in this paper and the public engagement plan.

Attachments

Annex 1 – Public Engagement undertaken under HER

Annex 2 – Trunk Road Tunnel Layout, Trunk Road Tunnel Plan & Profile through ex-PCWA and CBTS

Annex 3 – Typical Sections through Immersed Tube Tunnel

Annex 4 – Typical Section through Bored Tunnel

Annex 5 – Typical Section through Temporary Reclamation

Annex 6 – Illustrative Cofferdam Approach

Annex 7 – Temporary Reclamation Layout Plan

Annex 8 – Construction Staging at CBTS

Annex 9 – Public Engagement Plan for Temporary Reclamation Required for Trunk Road Tunnel Construction

Highways Department

August 2008

**Central-Wan Chai Bypass and Island Eastern Corridor Link
(Trunk Road)**

**Public Engagement undertaken under Harbour-front Enhancement Review –
Wan Chai, Causeway Bay and Adjoining Areas (HER)**






The HER project comprised of three stages: the “Envisioning”, “Realization” and “Detailed Planning” Stages.

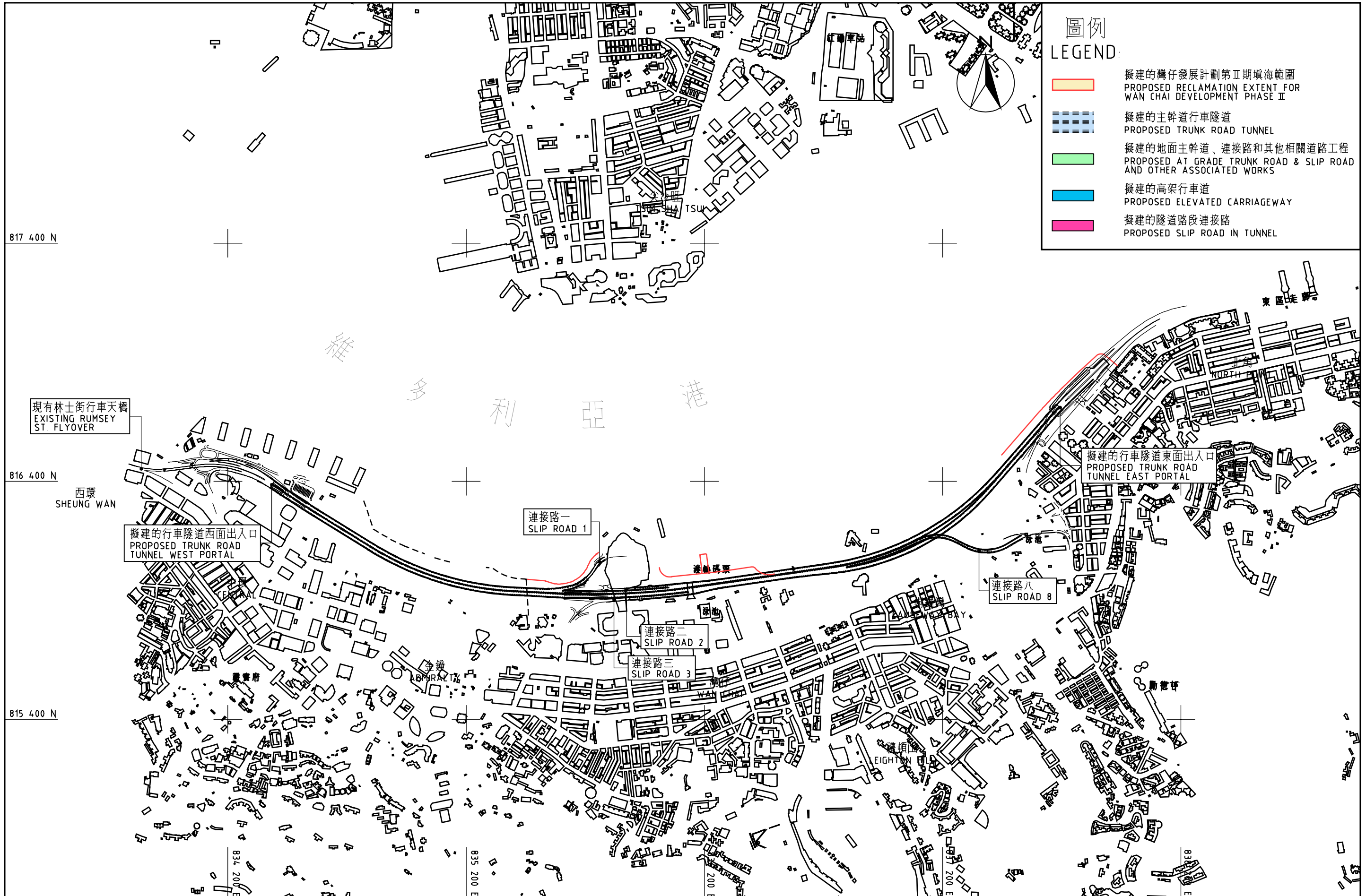
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|---|---------------|
| 1. Envisioning Stage | May 2005 – |
| Public engagement on the need for constructing a Central-Wan Chai Bypass | Nov 2005 |
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| 2. Public Engagement on alignment options for the Trunk Road- | |
| HEC Sub-committee | 20 April 2006 |
| Town Planning Board | 21 April 2006 |
| HEC Sub-committee | 8 May 2006 |
| Works and Development Committee of Eastern District Council | 11 May 2006 |
| Traffic and Transport Committee of Southern District Council | 15 May 2006 |
| Wan Chai District Council | 16 May 2006 |
| Transport Advisory Committee | 17 May 2006 |
| Joint Forum of Hong Kong Institute of Architects, Hong Kong Institution of Engineers, Hong Kong Institute of Landscape Architects, Hong Kong Institute of Planners and Hong Kong Institute of Surveyors | 20 May 2006 |
| Legislative Council Panel on Planning, Lands and Works (LegCo PLW Panel) | 23 May 2006 |

Central and Western District Council	25 May 2006
LegCo PLW Panel	9 June 2006
3. Realization Stage	
Public engagement on the Concept Plan of Wan Chai Development Phase II based on Trunk Road Tunnel alignment through roving exhibition, telephone survey, road-side survey, community workshops and consensus building town hall meeting.	Jun 2006 – Dec 2006
HEC Sub-committee	13 Jun 2006
LegCo PLW Panel	26 Jun 2006
Town Planning Board	25 Aug 2006
HEC Sub-committee	31 Aug 2006
Task Force of HEC Sub-committee	6 Sept 2006
Wan Chai District Council	26 Sept 2006
Collaborator's Working Session	14 Oct 2006
Central and Western District Council	19 Oct 2006
Eastern District Council	19 Oct 2006
Southern District Council	23 Oct 2006
LegCo PLW Panel	28 Oct 2006
Consensus Building Town Hall Meeting	16 Dec 2006
4. Detailed Planning Stage	
Public Engagement on Recommended Outline Development Plan and draft Outline Zoning Plans based on Trunk Road Tunnel alignment	

Town Planning Board	3 & 20 April 2007
HEC Sub-committee	14 May 2007
Wan Chai District Council	15 May 2007
Traffic and Transport Committee of Central and Western District Council	17 May 2007
LegCo PLW Panel	29 May 2007
Works and Development Committee of Eastern District Council	31 May 2007
Planning, Works and Housing Committee of Southern District Council	4 June 2007
Wan Chai District Council	11 Jun 2007
Public Briefing	23 June 2007
Town Planning Board	29 June 2007

圖例
LEGEND:

-  擬建的灣仔發展計劃第二期填海範圍
PROPOSED RECLAMATION EXTENT FOR WAN CHAI DEVELOPMENT PHASE II
-  擬建的主幹道行車隧道
PROPOSED TRUNK ROAD TUNNEL
-  擬建的地面主幹道、連接路和其他相關道路工程
PROPOSED AT GRADE TRUNK ROAD & SLIP ROAD AND OTHER ASSOCIATED WORKS
-  擬建的高架行車道
PROPOSED ELEVATED CARRIAGEWAY
-  擬建的隧道路段連接路
PROPOSED SLIP ROAD IN TUNNEL



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中環灣仔繞道和東區走廊連接路
CENTRAL - WAN CHAI BYPASS AND ISLAND EASTERN CORRIDOR LINK
主幹道隧道佈局圖
TRUNK ROAD TUNNEL LAYOUT

附件二
ANNEX 2
三張之第一張
SHEET 1 OF 3