For information

Legislative Council Panel on Planning, Lands and Works

103CD – Drainage Improvement in Northern Hong Kong Island – Hong Kong West Drainage Tunnel

108CD – West Kowloon Drainage Improvement – Lai Chi Kok Transfer Scheme

111CD – Drainage Improvement in Tsuen Wan, Kwai Chung and Tsing Yi – Tsuen Wan Drainage Tunnel

PURPOSE

This paper summarises the initial findings/conclusions of the investigation studies for the three proposed drainage tunnel schemes, viz. Hong Kong West Drainage Tunnel under **103CD**, Lai Chi Kok Transfer Scheme under **108CD** and Tsuen Wan Drainage Tunnel under **111CD**, and to brief Members on the way forward.

BACKGROUND

2. The drainage catchments of Hong Kong Island West, West Kowloon, and Tsuen Wan cover major residential, commercial and/or industrial districts; and their extensive upland catchment. The drainage systems in the urban areas of the above districts were built several decades ago to meet the flow requirements and standards at that time. The rapid urbanization of these areas in past decades has changed rural unpaved areas into built-up areas, resulting in reduced flood attenuation capacity and a substantial increase in large volumes of surface runoff. Consequently, the urban drainage systems are less capable of handling the surface runoff. During heavy rainstorms, the fast and huge flows from the hills would run along paved areas and/or steep slopes down to the above-mentioned urban areas causing flooding hazards, serious traffic congestion and disruption to shop business and tourism attractions at low-lying areas. As some of these areas are in the middle of major routes, any traffic disruption due to flooding will impact on a much wider region.

3. The traditional approach to increase the capacity of the existing drainage systems in these highly urbanized areas is to enlarge or construct additional drains or box culverts. However, due to congestion of underground utilities in the built-up area, it is often impracticable to find sufficient room in the ground to lay any new drains. It would therefore frequently necessitate the diversion of other existing utilities, if possible, to make room for the enlarged drains. This would prolong the construction period substantially. The construction would also require extensive road opening in the busy roads causing serious disruption to traffic, disturbance to the public and business operations and the possible environmental nuisance, like dust and noise for a prolonged period. To minimise the above potential problems and disturbance, the drainage tunnel schemes have therefore been proposed as an alternative approach to intercept the surface runoff in mid-hill and convey them for discharge into the sea without passing through the existing drains network further downstream, thereby reducing the extent of pipelaying works in the built-up areas.

4. We attended the Panel on Planning, Lands and Works on 5 March 2001 and 4 January 2002 for discussing the three subject drainage tunnel schemes. Members raised various concerns, including possibility of water reuse, impact of tunnel route on land use, feasibility of aligning the tunnel away from existing buildings, ground settlement induced by tunneling works, use of previous tunneling experience, geological concern for the tunnels, debris blocking the tunnels, and hygienic problems associated with the tunnels. All the concerns raised by Members were examined in the investigation studies for the three drainage tunnel projects with favourable results. An Information Note on the progress of the investigation studies was also submitted to this Panel on 27 April 2004. The investigation findings will be reported in this Paper.

5. In March 2002, we upgraded part of **103CD** to Category A as **122CD** "Drainage improvement in Northern Hong Kong Island – preliminary design and investigations", part of **108CD** to Category A as **123CD** "Lai Chi Kok Transfer Scheme – preliminary design and investigations" and part of **111CD** to Category A as **121CD** "Drainage improvement in Tsuen Wan, Kwai Chung and Tsing Yi – preliminary design and investigations" for engaging consultants to carry out the preliminary design and investigations for the above tunnel projects.

PROJECT SCOPE AND NATURE

6. The latest scope of the project **103CD** comprises the construction of a drainage tunnel of about 10.5 kilometres in length and 6.25 to 7.25 metres in diameter, 35 intake shafts connected to the drainage tunnel by about 7.5 kilometres adits, an inlet portal and an outlet portal. A site plan showing the location of the proposed Hong Kong West Drainage Tunnel is at **Enclosure 1**.

7. The latest scope of the project **108CD** comprises the construction of a reduced Lai Chi Kok Transfer Scheme and an Inter-reservoirs Transfer Scheme (please refer to paragraph 14 below). The former comprises the construction of drainage tunnels of about 3.7 kilometres in length and 4.9 metres in diameter, 10 intake shafts, a stilling basin, an outfall structure with pumping facilities and about 350 metres adits, while the latter includes the construction of a transfer tunnel of about 2.8 kilometres long and 3 metres diameter and the associated intake and outfall structures. Site plans showing the location of the proposed Lai Chi Kok Transfer Scheme and the Inter-reservoirs Transfer Scheme are at **Enclosures 2 and 3**.

8. The latest scope of the project **111CD** comprises the construction of a drainage tunnel of about 5.1 kilometres in length and 6.5 metres in diameter with 3 intake shafts, one outfall and about 100 metres adits. A site plan showing the location of the proposed Tsuen Wan Drainage Tunnel is at **Enclosure 4**.

INITIAL FINDINGS AND CONCLUSIONS OF THE INVESTIGATION STUDIES

9. In November 2002, we commissioned the Investigation consultancies for the three tunnel projects to review the recommendations of the drainage master plan studies and carry out the preliminary design and investigations for the proposed drainage tunnels. The Investigation consultancies are nearing completion and have confirmed the technical feasibility of the proposed drainage tunnel schemes. We are now ready to proceed to the design stage. The initial findings of the investigation studies are given in the following paragraphs.

Benefits of the projects

10. At present, majority of the drains in North Hong Kong Island, Sham Shui Po, Cheung Sha Wan, Lai Chi Kok, Tsuen Wan and Kwai Chung are up to standard. However, there still exist a certain amount of the drains (varying between 15% to 20% for different area in the concerned districts) possessing only a flood protection standard for rainfall of a return period of one in 20 years or below. Substantial portion of the areas are therefore at risk under heavy rainstorm, and hazard of rapid flows down steep roads potentially exists. Upon completion of the three proposed drainage tunnel schemes, the general standard of flood protection in areas can be enhanced to withstand a rainstorm with a return period of one in 50 years or more. Furthermore, the risk of rapid flow hazard can be vastly reduced.

11. We have conducted detailed property and damage assessment surveys to assess the benefits brought about by these drainage tunnel schemes. The results show that in terms of the tangible benefits, the implementation of the proposed drainage tunnel projects will bring an overall net benefit by minimising flood damage, including damage to properties, roads, cars, goods and merchandises, repair and clean up costs etc. In addition, intangible and social benefits such as minimizing the nuisance to the public, disruption to traffic and loss of business, and improving human safety and health due to rapid flow hazard along steep roads and the flood related diseases would be derived from the proposed drainage tunnels. The commercial and financial centres in the Central, Admiralty and Wan Chai areas, the urban/residential areas in Western District, Lai Chi Kok, Cheung Sha Wan, Sham Shui Po, Kwai Chung and Tsuen Wan would be better protected from flooding. It would help to build and maintain a positive image of Hong Kong as being a world class city. By diverting the upland flows to the proposed drainage tunnels, the extent of drainage upgrading works required in the congested lower catchment urban area would also be drastically reduced. Traffic disruptions and disturbances to the public would be minimised. The living environment of our society is generally improved.

Ground investigations

12. We have already carried out comprehensive ground investigations and obtained information of ground conditions and geotechnical data to establish the geotechnical feasibility of the three proposed drainage tunnels. The proposed tunnels are also designed to align away from the developed area in most sections and would run at mid-hill level, penetrating into the rock strata in upland areas well above sea level. The construction of the proposed drainage tunnels would unlikely encounter insurmountable engineering problems or induce unacceptable ground settlement problems to the surrounding areas and nearby developments.

Feasibility of water reuse

13. We have critically reviewed the drainage tunnel schemes to study the feasibility of water reuse for the three drainage tunnels. The studies have concluded that it is not cost effective to adopt measures or revise the tunnel schemes so as to achieve the water reuse purpose in the cases of the Hong Kong West Drainage Tunnel and the Tsuen Wan Drainage Tunnel. It is because the tunnels are either very far away from the reservoirs/water treatment works or at a level much lower than such water supply facilities so that substantial cost and land would be required for the additional water conveying facilities.

14. For the original Lai Chi Kok Transfer Scheme, some of the water intercepted by the scheme are the overflow from the Kowloon group of reservoirs during heavy rainstorms in the wet season, which will eventually be conveyed to the sea. We commissioned a study in July 2004 to explore the feasibility of inter-reservoirs transfer of the overflow with a view to achieving both flood prevention and water conservation objectives. The study has recommended that it is feasible and cost-effective to intercept and convey the overflow from the Kowloon group of reservoirs to Lower Shing Mun Reservoir by the implementation of an Inter-reservoirs Transfer Scheme (IRTS) to achieve the said objectives. By intercepting and transferring away the overflow from the Kowloon group of reservoirs, the IRTS, which forms an integral part of the overall flood control for the Lai Chi Kok Transfer Scheme, together with a reduced size main tunnel of the Scheme (from 6.4 metres to 4.9 metres) will achieve the same flood protection level as the Original Lai Chi Kok Transfer Scheme with an overall cost saving of $60 million or 5.3% in capital cost. The financial implications are compared as follows-

	Original Lai Chi Kok Transfer Scheme for flood protection	Revised Lai Chi Kok Transfer Scheme		
		Reduced Lai Chi Kok Transfer Scheme	Inter-reservoirs Transfer Scheme	Total
Capital cost $ million	1,120	880	180	1,060
Annual recurrent cost $million	2.9	2.5	0.2	2.7

There is an extra benefit that the IRTS will generate an average annual additional raw water yield of about 2.5 million cubic metres with a corresponding annual saving of about $8 million. Government therefore plans to implement the reduced Lai Chi Kok Transfer Scheme and IRTS under **108CD** to bring up the flood protection standard in stages and achieve water conservation objective.

Environmental implications

15. Both the Hong Kong West drainage tunnel and the Tsuen Wan drainage tunnel schemes are designated projects under the EIA Ordinance. We have completed the EIA Reports and the environmental permits are required for these two tunnel projects. The findings have indicated that with the implementation of mitigation measures, the proposed works would not give rise to long term adverse environmental impacts and any construction impact can be mitigated by the recommended measures.

16. The reduced Lai Chi Kok Transfer Scheme is not a designated project under the Environmental Impact Assessment (EIA) Ordinance but we have carried out an Environmental Study (ES). The findings of the study have indicated that with the implementation of mitigation measures, the proposed works would not give rise to long term adverse environmental impacts. The IRTS is a designated project under the EIA Ordinance. We have completed an environmental review which envisaged no insurmountable environmental impacts arising from the proposed IRTS works which is located away from environmental sensitive areas. Nevertheless, we will undertake a full EIA during the next stage of investigation and design for the IRTS.

17. The construction of the proposed drainage tunnels will generate substantial amount of construction and demolition (C&D) materials. We have prepared comprehensive C&D materials management plans under respective Investigation studies. We will fully consider necessary measures to minimize the generation of C&D materials and to reuse/recycle C&D materials as much as possible during the detailed design stage.

18. As regards the potential impacts on the existing buildings/structures and nuisance to the nearby residents arising from the construction of the drainage tunnels by the traditional blasting method, our studies have concluded that the impacts and nuisance could be kept within acceptable limits. We will further review and refine the requirements on blasting for incorporation into the contract documents. We will also consult the relevant District Councils before the finalization of any proposed blasting scheme.

Sedimentation and hygienic issues

19. We have reviewed the design of the drainage tunnels and proposed maintenance arrangements to avoid accumulation of debris and silt at the tunnel intakes and the stilling basin at the outlet. For the Hong Kong West and Tsuen Wan Drainage Tunnels, the intakes have been designed with a screen to prevent rubbish and large objects from entering into the tunnel system. The tunnels have also been designed such that no stagnant water will be trapped inside the tunnel, and stormwater will flow at a self-cleansing velocity during a rainstorm so that debris and silt picked up by the stormwater will be washed downstream. A water quality survey has also been undertaken on site and confirmed that the water likely to be intercepted by the tunnels will not cause a water quality problem. Apart from the rubbish screen, security fence will also be provided to prevent trespass into the tunnels.

20. For the Lai Chi Kok Transfer Scheme, the entry shafts to the tunnels have been designed with grit traps and trash screen to limit sedimentation entering the tunnels and prevent debris from being washed in. In addition, a stilling basin with the dual purpose of stilling flows and trapping sediment is included at the upstream end of the main tunnel. Whilst water will be retained in the main tunnel for a considerable period, with these measures the quality of water that is retained will not cause any problem. Water quality sampling has been carried out and confirms the low level of contaminants in the water which will enter the tunnels.

Land acquisition

21. The tunnel alignments have been carefully designed to minimize encroachment upon private land as far as possible. The designed locations and depths of the tunnels are such that they are away from and well below existing and future developments and are mostly in the rock strata. Disturbance to built-up areas and impacts on future development will therefore be kept to a minimum. For the Hong Kong West drainage tunnel and Lai Chi Kok Transfer Scheme, the tunnel alignments will not encroach upon any private land. For the Tsuen Wan drainage tunnel, five private lots will be affected. We will liaise with individual landowners to obtain their consent so as to provide easements over private lands for the construction and maintenance of the proposed drainage tunnels.

Traffic implications

22. The alignments of the tunnels have been selected to locate away from busy roads although some of the works areas are still required to be connected to the public road network. Traffic impacts due to the works are assessed to be minimal. Preliminary temporary traffic management schemes for construction of the tunnels have been drawn up and the relevant authorities including Transport Department and Police have been consulted. The schemes are considered acceptable by relevant authorities.

Procurement strategy

23. We have examined the various procurement strategies and concluded that it is most cost-effective to adopt the Design and Build (D&B) approach for the proposed drainage tunnel projects. Such procurement approach could ensure the detailed design and construction be carried out in an integrated manner and to best utilise individual tenderer’s resources for works of similar nature.

24. Although contractors will be responsible for producing the detailed design for the majority of the proposed works, we would still need to carry out a reference design and develop the Employer's Requirements to set out the project requirements, quality of the works and constraints. The reference design and Employer's Requirements will also form the basis for cost-estimation and tender preparation. In addition, we would study the project delivery techniques under the D&B procurement approach and select a suitable contract arrangement for these projects. Due to inadequate in-house expertise, we propose to employ consultants to carry out the reference design, contract documentation and tender for the implementation of the proposed works.

FINANCIAL IMPLICATIONS

25. We have updated the cost estimates of the three drainage tunnel projects as follows -

Proposed schemes	Capital Cost $ million	Annual recurrent cost $ million
Hong Kong West Drainage Tunnel	2,170	5.3
Revised Lai Chi Kok Transfer Scheme	1,060	2.7
Tsuen Wan Drainage Tunnel	990	3.5

PUBLIC CONSULTATION

Hong Kong West Drainage Tunnel

26. We consulted Planning, Transport and Environmental Protection Committee of Wan Chai District Council on 24 May 2005, Food, Environment, Hygiene and Works Committee of Central and Western District Council on 26 May 2005, and Planning, Works and Housing Committee of Southern District Council on 6 June 2005. All three committees supported the implementation of the project.

Lai Chi Kok Transfer Scheme

27. We consulted the Sham Shui Po District Council on 12 May 2005 regarding the revised flood control strategy for the Lai Chi Kok Transfer Scheme as

mentioned in paragraph 14. Members expressed support for the implementation of the revised Lai Chi Kok Transfer Scheme.

Tsuen Wan Drainage Tunnel

28. We consulted the Environment and Health Affairs Committee of the Tsuen Wan District Council on 5 May 2005, the Tsuen Wan District Council on 17 June 2005, and the Housing and Development Committee of the Kwai Tsing District Council on 7 June 2005. They all expressed support for the implementation of the project.

WAY FORWARD

29. The preliminary design and investigation of the drainage tunnels are nearing completion. The initial findings have confirmed that the three proposed drainage tunnel schemes are technically feasible. We are now ready to proceed to the next stage. As we will adopt the D&B procurement approach for the proposed drainage tunnel projects, we plan to employ consultants to carry out reference design, contract documentation and tender for the implementation of the proposed works by end 2005/early 2006. As the latest estimate for employing consultants under each of the project is less than $15 million, we will charge this amount to the block allocation Subhead 4100DX "Drainage works, studies and investigations for items in Category D of the Public Works Programme". We will also proceed with the investigation stage study for the IRTS in due course and the cost estimate of the assignment is being carried out. If necessary, we will seek funding from the Finance Committee at a later date.

30. Subject to availability of funds, the D&B contracts of the three drainage tunnel projects are programmed to start in 2007/08 for completion in 2011 and the works of IRTS to start in 2010 for completion in 2012.

Environment, Transport and Works Bureau
June 2005

ENCLOSURE 1 附件一

圖例
LEGEND

擬建之出水口
PROPOSED TUNNEL DISCHARGE OUTLET

擬建之支隧道
PROPOSED ADITS

擬建之主隧道及水流方向
PROPOSED MAIN TUNNEL AND FLOW DIRECTION

工程計劃項目第103CD/B
PWP ITEM No. 103CD/B

A	29.06.05	GENERAL REVISIONS	SIGNED

圖則名稱 drawing title

港島北雨水排放系統改善工程 - 港島西雨水排放隧道

DRAINAGE IMPROVEMENT IN NORTHERN HONG KONG ISLAND - HONG KONG WEST DRAINAGE TUNNEL

繪畫 drawn	SIGNED C. K. LAM	日期 date 29.04.05
核對 checked	SIGNED W. C. LAM	日期 date 29.04.05
批核 approved	SIGNED W. C. IP	日期 date 29.04.05

部門 office 工 程 管 理 部
PROJECT MANAGEMENT DIVISION

圖則編號 drawing no. SK-T6-05-009A

比例 scale N.T.S.

香港特別行政區政府渠務署
DRAINAGE SERVICES DEPARTMENT
GOVERNMENT OF THE HONG KONG SPECIAL ADMINISTRATIVE REGION

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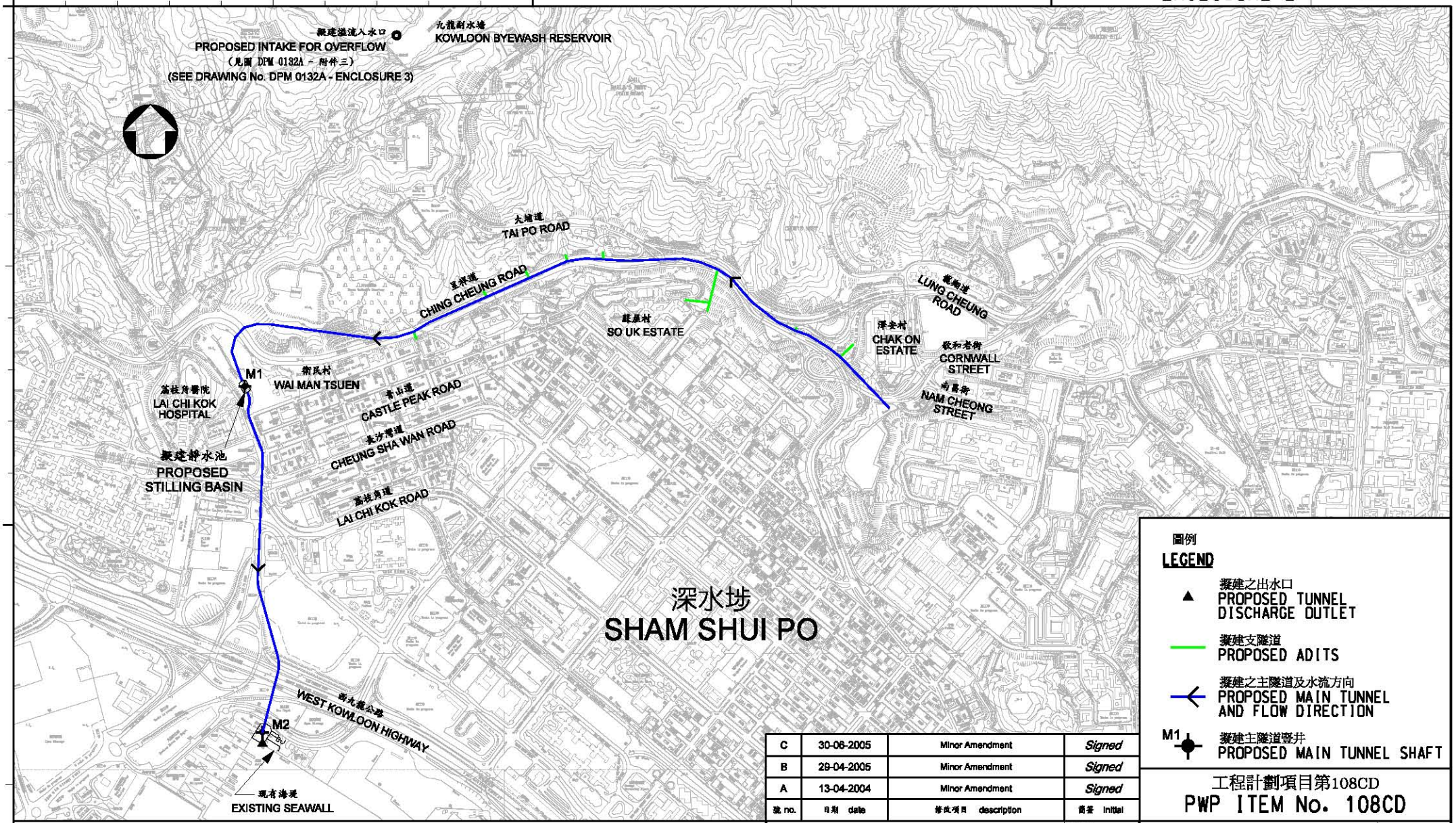
ENCLOSURE 2 附件二



圖例
LEGEND

- 擬建之出水口 PROPOSED TUNNEL DISCHARGE OUTLET
- 擬建支隧道 PROPOSED ADITS
- 擬建之主隧道及水流方向 PROPOSED MAIN TUNNEL AND FLOW DIRECTION
- M1 擬建主隧道豎井 PROPOSED MAIN TUNNEL SHAFT

號 no.	日期 date	修改項目 description	簡署 initial
C	30-06-2005	Minor Amendment	*Signed*
B	29-04-2005	Minor Amendment	*Signed*
A	13-04-2004	Minor Amendment	*Signed*

工程計劃項目第108CD
PWP ITEM No. 108CD

圖則名稱 drawing title

荔枝角雨水轉運計劃 -- 擬建之荔枝角雨水轉運計劃路線圖

LAI CHI KOK TRANSFER SCHEME -- PLAN OF THE PROPOSED LAI CHI KOK TRANSFER SCHEME

繪畫 drawn	*Original Signed*	T.C. CHAN	日期 date 08-02-2002
核對 checked	*Original Signed*	H.S. WONG	日期 date 18-02-2002
批核 approved	*Original Signed*	Y.F. KAN	日期 date 18-02-2002

部門 office 工 程 管 理 部
PROJECT MANAGEMENT DIVISION

圖則編號 drawing no. DPM 0035C
比例 scale N.T.S.

香港特別行政區政府渠務署
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GOVERNMENT OF THE HONG KONG SPECIAL ADMINISTRATIVE REGION

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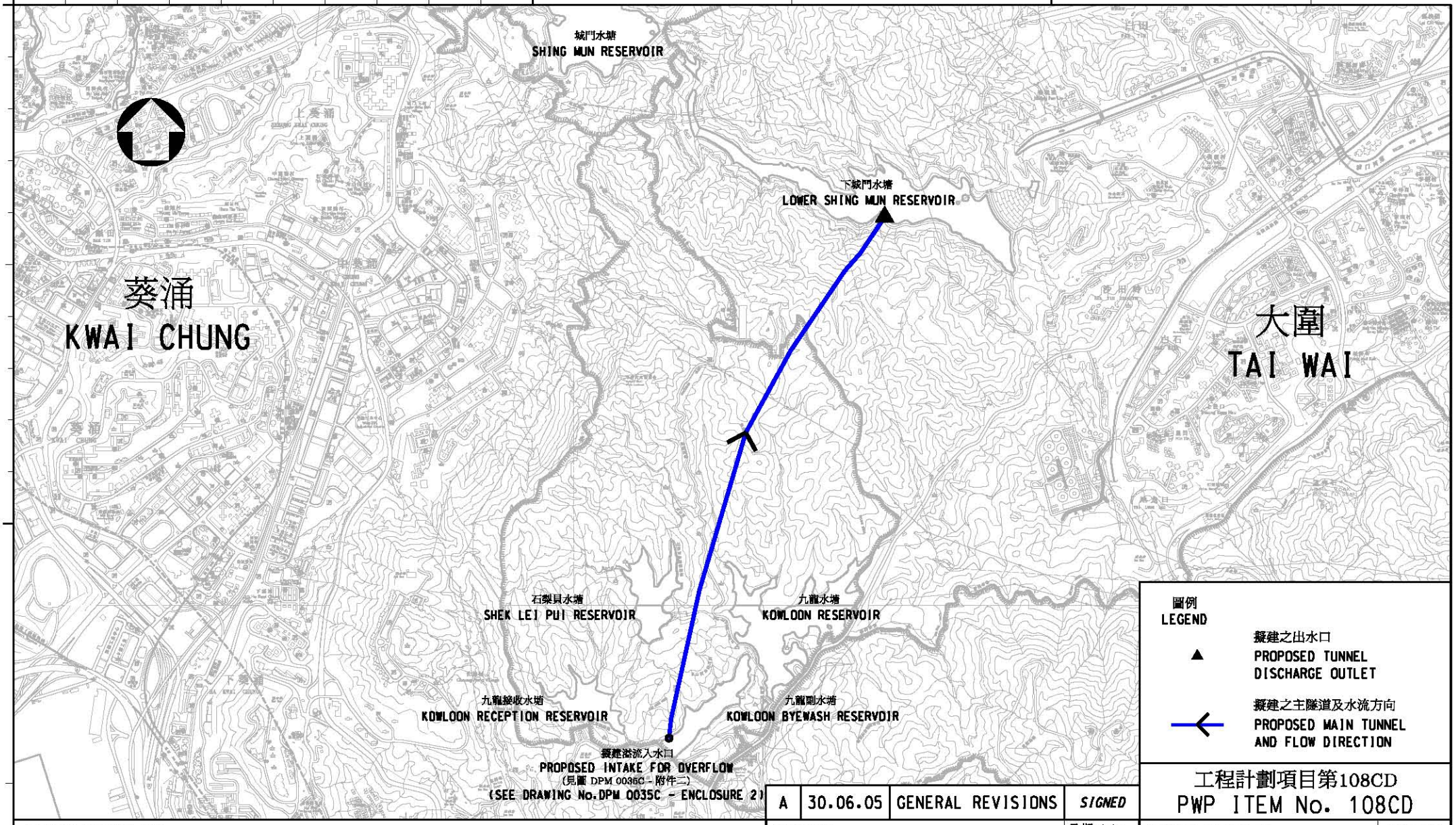
ENCLOSURE 3 附件三



A	30.06.05	GENERAL REVISIONS	SIGNED

工程計劃項目第108CD
PWP ITEM No. 108CD

圖則名稱 drawing title

荔枝角雨水轉運計劃 -- 擬建之水塘間轉運隧道計劃
LAI CHI KOK TRANSFER SCHEME -- PLAN OF THE PROPOSED INTER-RESERVOIR TRANSFER SCHEME

繪畫 drawn	SIGNED	C. K. LAM	日期 date 27.06.05
核對 checked	SIGNED	T. M. YIP	日期 date 27.06.05
批核 approved	SIGNED	Y. F. KAN	日期 date 27.06.05

部門 office 工 程 管 理 部
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圖則編號 drawing no. DPM 0132A

比例 scale N. T. S.

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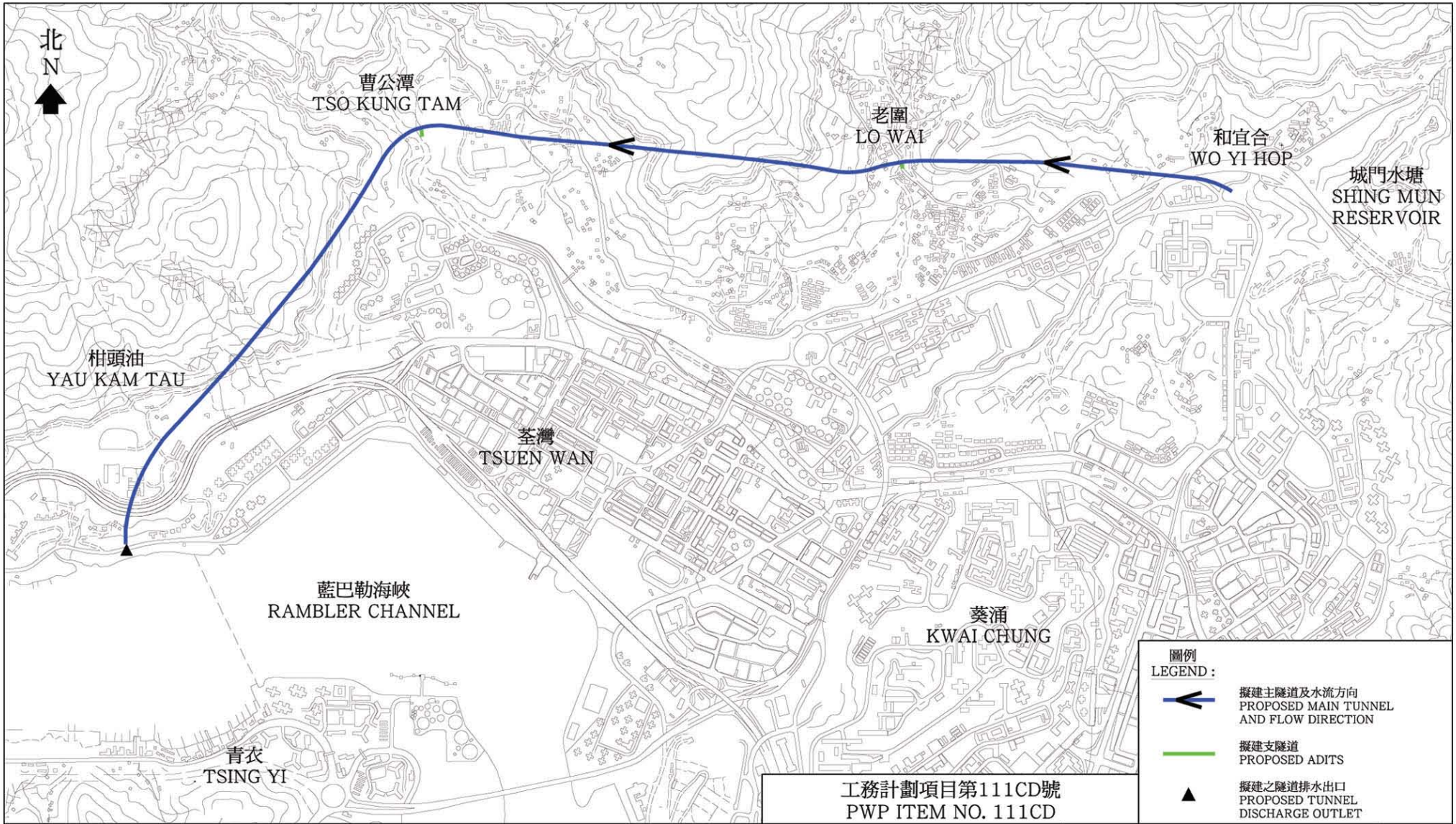

工務計劃項目第111CD號
PWP ITEM NO. 111CD

圖則名稱 drawing title

荃灣, 葵涌及青衣雨水排放系統改善計劃
荃灣雨水排放隧道
DRAINAGE IMPROVEMENT IN TSUEN WAN, KWAI CHUNG AND TSING YI
TSUEN WAN DRAINAGE TUNNEL

繪畫 drawn	C.W. CHAN	日期 date 29-04-2005
核對 checked	K.K. UY	日期 date 29 04 2005
批核 approved	W.K. HO	日期 date 29-04-2005
部門 office	顧問工程管理部 CONSULTANTS MANAGEMENT DIVISION	

圖則編號 drawing no. DCM/2005/017

比例 scale N.T.S.

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