Paper No. WD 8/2006
For discussion
on 8 May 2006

Consolidation of Harbour-front & Trunk Road Ideas

Discussion Paper
on
"Shallow Water" Idea

1 Introduction

1.1 For the Concept Plan preparation work at the Realization Stage of the HER, a number of issues relating to Trunk Road alignments and form of construction, requirements for reclamation, impacts of highway infrastructure on harbour-front planning intentions, and harbour-front enhancement ideas to be taken on board, raised during the Envisioning Stage consultation, need to be addressed. A report titled "Trunk Road Alignments and Harbour-front Enhancement" (Consultants' Report) outlining the Consultants' appraisal of these issues and the conclusions in respect of the feasibility or acceptability of Trunk Road alignments and harbour-front enhancement has been submitted to the HEC Sub-committee on WDII Review (Sub-committee).

1.2 A member of the Sub-committee suggested that even if the top of the Trunk Road tunnel structure is above the existing seabed level, but as long as the top of the structure is below sea level, the shallow depth of water should be maintained instead of reclaiming it in accordance with the conventional cut-and-cover method of constructing the Trunk Road tunnel structure. The idea, denoted as the "shallow water" idea, was addressed in Section 3.9 of the Consultants' Report. It is considered that the provision of shallow water above the Trunk Road tunnel structure is not a practical or reasonable idea to be pursued.

1.3 The Consultants' Report was considered by the Sub-committee at the meeting on 20 April 2006. Nevertheless, the Sub-committee requested the Consultants to elaborate further on the technical feasibility and legality of the "shallow water" idea.

1.4 The purpose of this Discussion Paper is to provide the elaboration required by the Sub-committee to support the above conclusion.

2 The "Shallow Water" Idea

2.1 **Figures 1** and **2** (which reproduce Figures 3.11 and 3.12 of the Consultants' Report) show the arrangement for the Trunk Road tunnel under the "shallow water" idea at Wan Chai and North Point respectively, if a minimum of 1m of water depth is provided above the tunnel protection layer at mean low water level (this being regarded as a practical minimum depth if water is to be "seen" over the tunnel structure during most normal sea conditions, although the tunnel will be exposed during periods of particularly low tides or severe wave conditions). **Figure 3** shows a typical section of the idea.

2.2 Due to its exposure above seabed, the Trunk Road tunnel structure would be vulnerable to ship impact, including ocean going vessels in the nearby navigation fairways and especially during typhoon periods. The consequences of structural damage to the road tunnel would be severe, and possibly catastrophic, and would take a long time to rectify. Protection in the form of a breakwater is required, as shown in the figures. A rubble mound breakwater will provide the most effective protection to the tunnel structure from vessels in the harbour, which range from small harbour craft to large ocean going vessels, without compromising navigational safety.

3. Issues to be Addressed

3.1 When examining the "shallow water" idea, several issues have been considered in arriving at the conclusion that it is not a practical or reasonable idea to be pursued.

Compliance with Protection of the Harbour Ordinance

3.2 The overriding consideration is whether the "shallow water" idea would comply with the Protection of the Harbour Ordinance (PHO) and the judgement of the Court of Final Appeal (CFA) in this respect. When examining the areas of reclamation of the "shallow water" idea and the conventional approach having cut-and-cover tunnel in reclamation, the following observations were highlighted in paragraph 3.9.7 of the Consultants' Report (which is to be read in conjunction with Figures 3.11. and 3.12 of the Consultants' Report or Figures 1 and 2 of this paper respectively).

Location	"Shallow Water" Idea		Offset against conventional approach of cut-and-cover tunnel in reclamation
	Reclamation for protective breakwaters	Area of tunnel structure above seabed	Water Area Saved (the area of reclamation of the conventional cut-and-cover tunnel that can be turned into water area (visible water surface) if the "shallow water" idea is implemented)
Wan Chai	2.5 ha	1.5ha	4.5ha
North Point	0.7ha	0.2ha	0.5ha

3.3 It was also pointed out in paragraph 4.6.8 of the Consultants' Report that the PHO requires the Harbour to be protected and preserved as a special public asset and a natural heritage of Hong Kong people, and establishes a presumption against reclamation in the Harbour. Notwithstanding that there is an overriding public need for reclamation for the project, it is essential to find the option that will best serve to protect and preserve the Harbour with the minimum area of the Harbour adversely affected by the project works.

3.4 Therefore, from the PHO perspective, it has to be decided whether the following three items of work for the "shallow water" idea would constitute reclamation under the PHO or otherwise infringe the principle under the PHO that the Harbour is to be protected and preserved:

(a) the area occupied by the breakwater for protecting against ship impact;

(b) the area that would be occupied by the tunnel above seabed; and

(c) the remaining area in between the existing shoreline and the breakwater (excluding the area referred to in (b) above).

3.5 With regard to (a) above, the area occupied by the breakwater for protecting the proposed tunnel against ship impact constitutes new land formed from the seabed or foreshore and should therefore be regarded as reclamation under the PHO. With regard to (b) above, the area that would be occupied by the tunnel above seabed also constitutes reclamation under the PHO because it should be regarded as new land formed from the seabed or foreshore although such newly-formed land is submerged below the high water mark. The PHO applies to both of these areas and they should therefore be subject to the "overriding public need test". As for (c) above concerning the remaining area in between the existing shoreline and the breakwater (excluding the area referred to in (b) above), although this area does not involve any land formation such part of the Harbour has been so adversely affected by the works in question that the principle of protecting and preserving the Harbour under the PHO can be regarded as infringed. This area should therefore be taken into account in determining the total area of the Harbour affected by the proposed project works and be subject to the "overriding public need test" as if it were an area of reclamation of the Harbour. This interpretation of the PHO has been considered by the Department of Justice via the Administration. According to the Administration, the Department of Justice has advised that this interpretation and approach in assessing the merits of the "shallow water" idea would be in compliance with the PHO.

3.6 Under the conventional cut-and-cover approach, the blue hatched areas in Figures 1 and 2 would have to be reclaimed. On the other hand, for the "shallow water" idea, the area of the breakwater and the area of tunnel structure above seabed, together with the affected area of the Harbour in the area of water behind the breakwater, will involve an infringement of the principle of protecting and preserving the Harbour under the PHO, as discussed in paragraph 3.5 above.

3.7 Comparing the conventional cut-and-cover approach and the "shallow water" idea, with reference to Figures 1 and 2, the blue hatched areas represent the area of the Harbour that will be affected under the PHO in either case. The area of the protective breakwaters, which lie outside the blue hatched areas, is the additional affected area of the Harbour under the PHO for the "shallow water" idea. Clearly, the "shallow water" idea will result in an infringement of the principle of protecting and preserving the Harbour under the PHO to a greater extent. Therefore this idea should not be adopted over the conventional approach for constructing the Trunk Road tunnel in reclamation. Nevertheless, assessments on other issues are described below for completeness.

Water quality

3.8 The required arrangement for the "shallow water" idea, with a breakwater for protecting the Trunk Road tunnel at certain distance from the shoreline, will create an area of embayed water. The situation is quite similar to that at the existing Causeway Bay Typhoon Shelter (CBTS), to which reference can be made.

3.9 Water quality at the CBTS is always a concern. Measurements of high *E. coli* content (5,000 cfu/100mL) at the CBTS indicates faecal contamination. Debris and waste water from the drainage outfalls accumulate at the embayed areas and become an eyesore and cause odour nuisance.

3.10 The inferior water quality at the CBTS is contributed mainly by two factors. Firstly, the flushing effect of the natural water current is very low within an embayed area. This will be particularly apparent at the corners of the embayed water or at areas of shallow water depth (existing water depth at the southwest corner of the CBTS is around 2 to 3m). Debris is trapped, especially during low tides.

3.11 Secondly, the stormwater from the culverts or drains that discharges into the CBTS carries with it certain pollutants which are trapped in the embayed water body for some time before they are eventually flushed into the open sea. The following existing four culverts and drainage pipes discharge into the CBTS at locations shown in **Figure 4**.

Outfall Discharge Location	Reference Name	Outfall Size (cell no. x W(mm) x H(mm) or Pipe Dia. (mm))	Invert Level of Outfall (approx. mPD)
West Corner of Typhoon Shelter	Drainage Pipe P	675 dia.	+1.4
Typhoon Shelter	Culvert Q	2x2440x2740	+0.05
East Corner of Typhoon Shelter	Culvert R	1x4570x2900	+0.34
East Corner of Typhoon Shelter	Drainage Pipe S	750 dia.	+1.37

3.12 For comparison purposes, there are three existing culverts or drains, at the locations shown in **Figure 1** and with details as described below, which would discharge into the embayed area and pond of stagnant water that would be created at the Wan Chai waterfront under the "shallow water" idea as highlighted in the typical section given in Figure 3.

Outfall Discharge Location	Reference Name	Outfall Size (cell no. x W(mm) x H(mm) or Pipe Dia. (mm))	Invert Level of Outfall (approx. mPD)
Wan Chai Harbour-front	Culvert M	2x2740x2590	-0.6
Wan Chai Harbour-front	Drainage Pipe N	1800 dia.	+0.51
Wan Chai Harbour-front	Culvert O	3x3740x3200	+0.31

3.13 It can be seen that the size of outfalls and the respective catchment areas along the Wan Chai waterfront would be at least comparable to that of the outfalls that discharge into the CBTS. (Diversion of these outfalls to outside the Wan Chai waterfront area would require the construction of major culvert structures in reclamation over the top of the Trunk Road tunnel, thereby negating the idea of removal of reclamation of the shallow water idea with the intention of saving water area.) With the discharge from these outfalls into the embayed water area created by the "shallow water" idea, it is anticipated that poor water quality conditions similar to those at the southwest corner of the CBTS may result, with the potential for similar *E. coli* content of up to 5,000 cfu/100mL, compared to a water quality objective that includes limiting *E. coli* content to 180 cfu/100mL below which limit (under the beach grading system) water quality is considered "poor".

3.14 The creation of this condition is highly undesirable not just from the general water quality point of view but also from the harbour-front enhancement perspective. The creation of an embayed and polluted water area such as this would also be cause for major concern under the Environmental Impact Assessment Ordinance (EIAO).

Opportunities for harbour-front enhancement

3.15 As shown in **Figure 5.2 to 5.4** of the Consultants' Report, a green leisure zone, with landscaped recreational areas and alfresco dining (outdoor cafes, etc) are proposed on the area along the Wan Chai shoreline for harbour-front enhancement. These proposals would add vibrancy to the waterfront.

3.16 With the "shallow water" idea, the existing shoreline along Wan Chai waterfront will be retained and there will be very little area available for harbour-front enhancement. The promenade will be narrow and barely accessible. See attached **Figure 5**.

Marine use of the water body

3.17 The shallow water depth will restrict access by the range of vessels (ferries, pleasure craft, etc) that would normally require access to the waterfront. The marine use of this water body would therefore be compromised.

3.18 If the "shallow water" idea is pursued, the existing cross harbour ferry services that are provided at the Wan Chai North Ferry Pier would be cut off. These essential ferry services would have to be reprovided at a nearby location. Reprovisioning the ferry pier at the breakwater is a solution, with a pedestrian bridge provided to connect the ferry pier at the breakwater with the existing promenade. The new ferry pier together with the pedestrian link will constitute reclamation (of area 0.5ha), which is additional to the reclamation areas described in paragraph 3.2 above. Moreover, the pedestrian link will sub-divide the water body of the "saved water area" into two disconnected parts, further jeopardising any meaningful use of this water area.

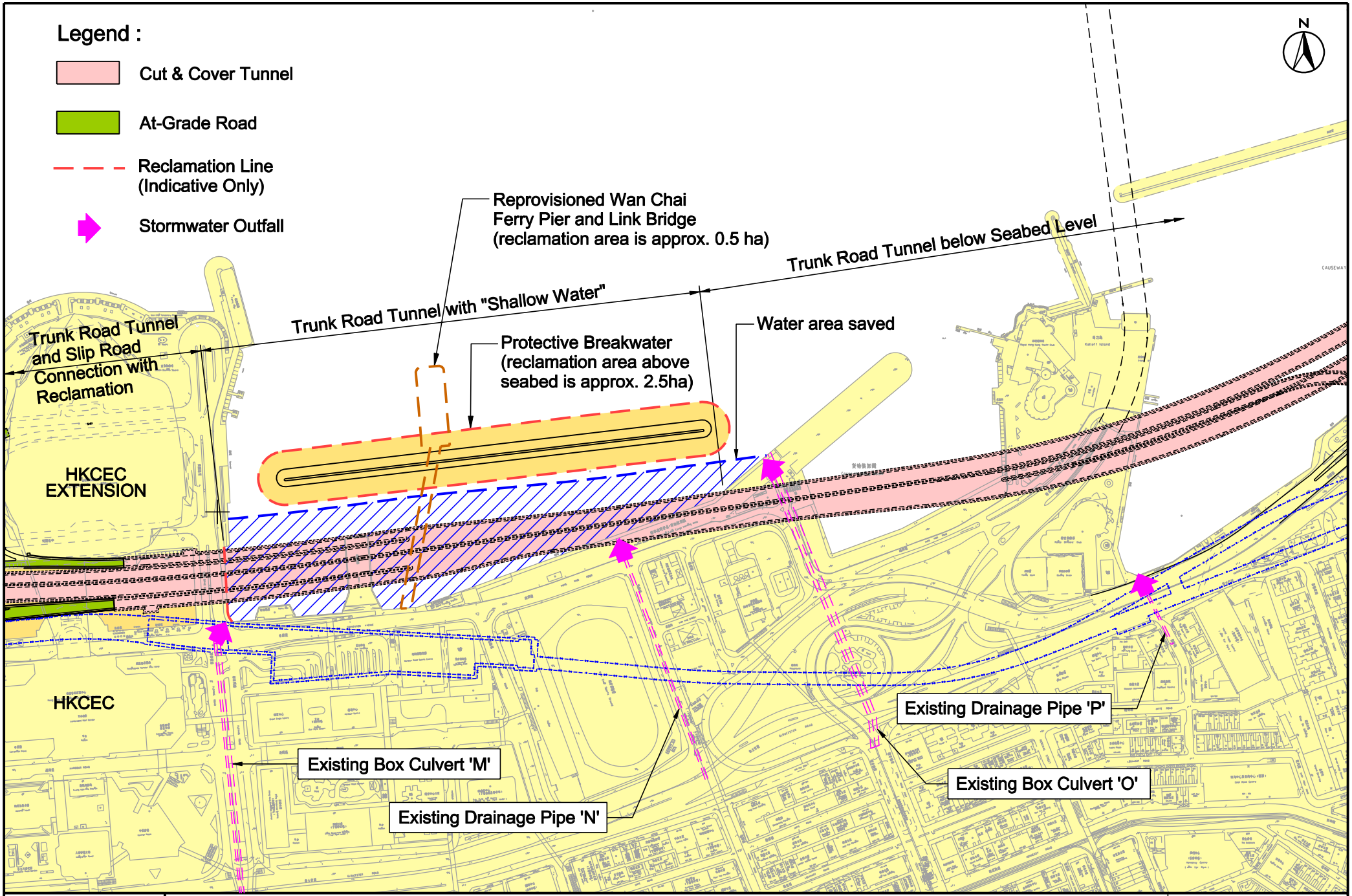
3.19 Even limited recreational use by small craft (eg rowing or sailing) may not be feasible due to the poor water quality (as discussed in paragraph 3.13), as the water quality would not comply with health standards for secondary contact water recreational use. Secondary contact zones generally have an *E. coli* limit of 610 cfu/100mL as a water quality objective, whereas, if a similar situation were to occur as in the CBTS due to embayment, *E. coli* content of up to 5,000 cfu/100mL may occur in the areas sheltered by the breakwaters (ie the "saved water area").

4 Conclusion

4.1 For reasons stated above, the perceived benefits of "seeing the water surface" that could be brought about through this "shallow water" idea will be completely offset by the following adverse consequences associated with it:

- the "shallow water" idea would not comply with the PHO as it will result in an infringement of the principle of protecting and preserving the Harbour under the PHO to a greater extent than the conventional cut-and-cover tunnel in reclamation;
- the "shallow water" idea will result in an embayed water area with a pond of stagnant water similar to the poor conditions of the existing southwest corner of the CBTS, with trapped debris, possible faecal contamination and odour nuisance;
- the "shallow water" idea provides little opportunity for harbour-front enhancement with the retention of the existing narrow and barely accessible promenade along the Wan Chai waterfront;
- the "shallow water" idea restricts the marine use of the waterfront area, including essential ferry services, and even limited recreational use by small craft may not be feasible due to water quality problems.

4.2 It is therefore concluded that the "shallow water" idea with the provision of shallow water above the Trunk Road tunnel structure is not practically feasible and should not be pursued.



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WAN CHAI DEVELOPMENT PHASE II - PLANNING AND ENGINEERING REVIEW

ILLUSTRATION OF "SHALLOW WATER" TRUNK ROAD IDEA - WAN CHAI

FIGURE 1

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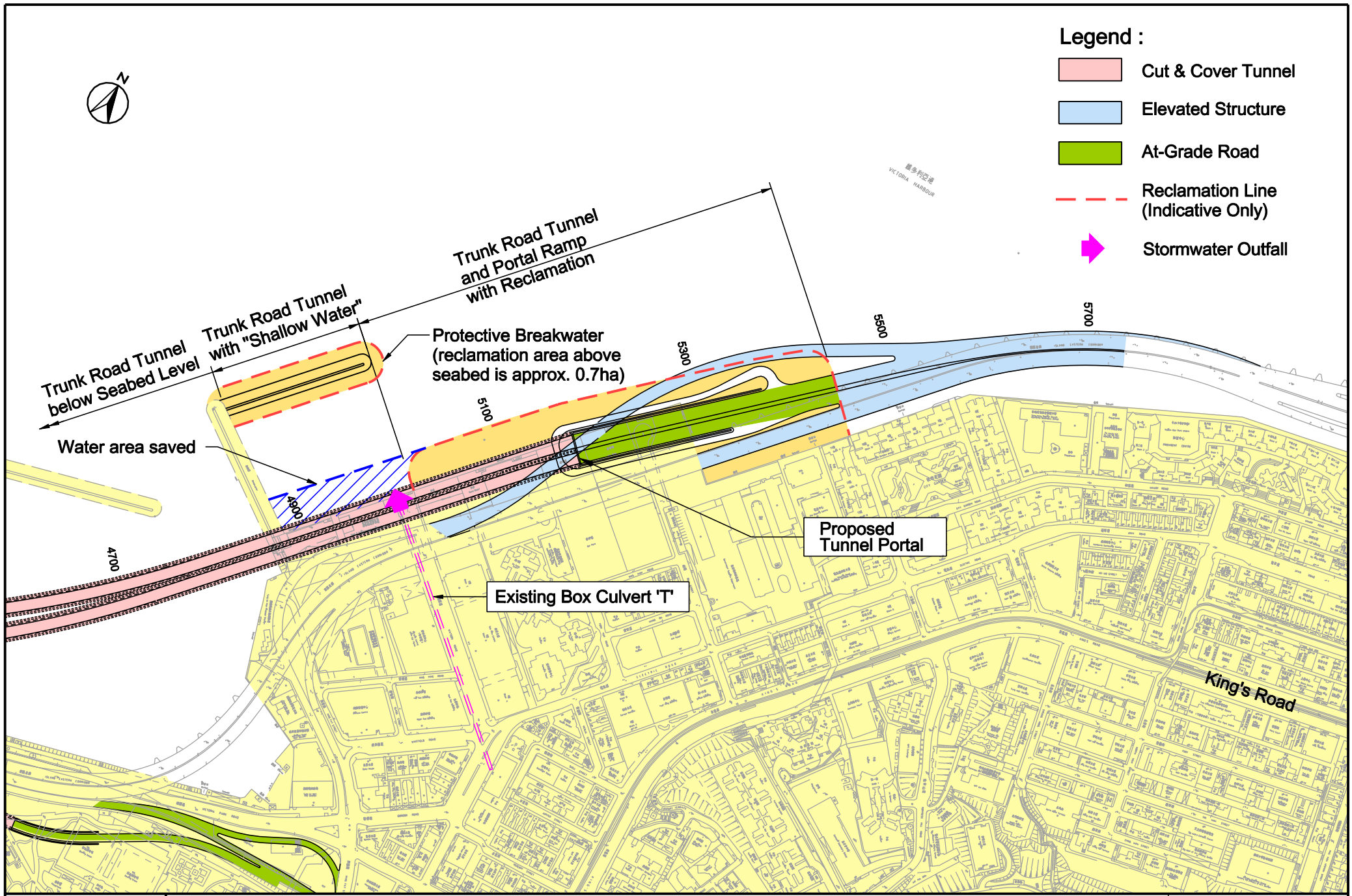

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ILLUSTRATION OF "SHALLOW WATER" TRUNK ROAD IDEA - NORTH POINT

FIGURE 2

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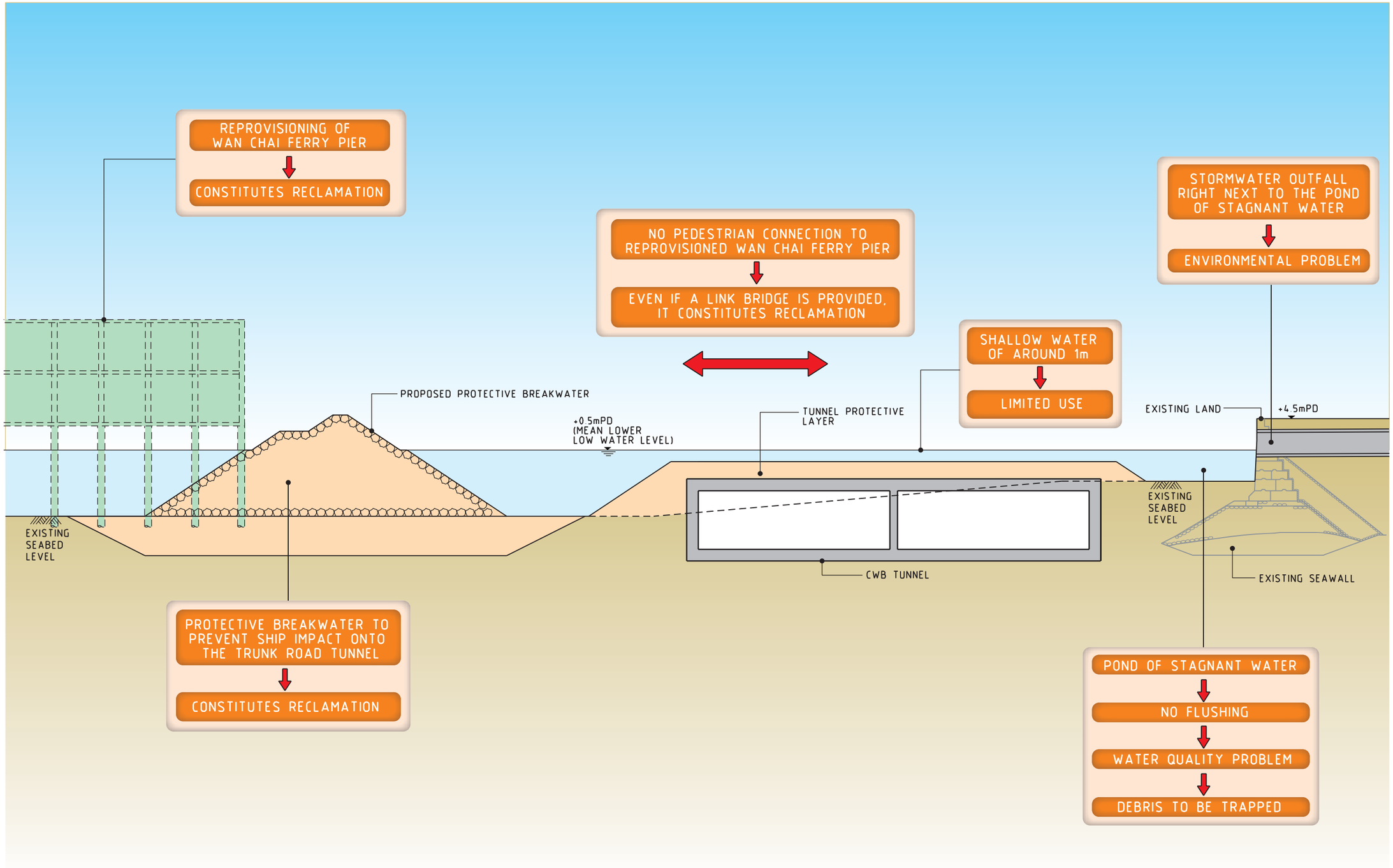

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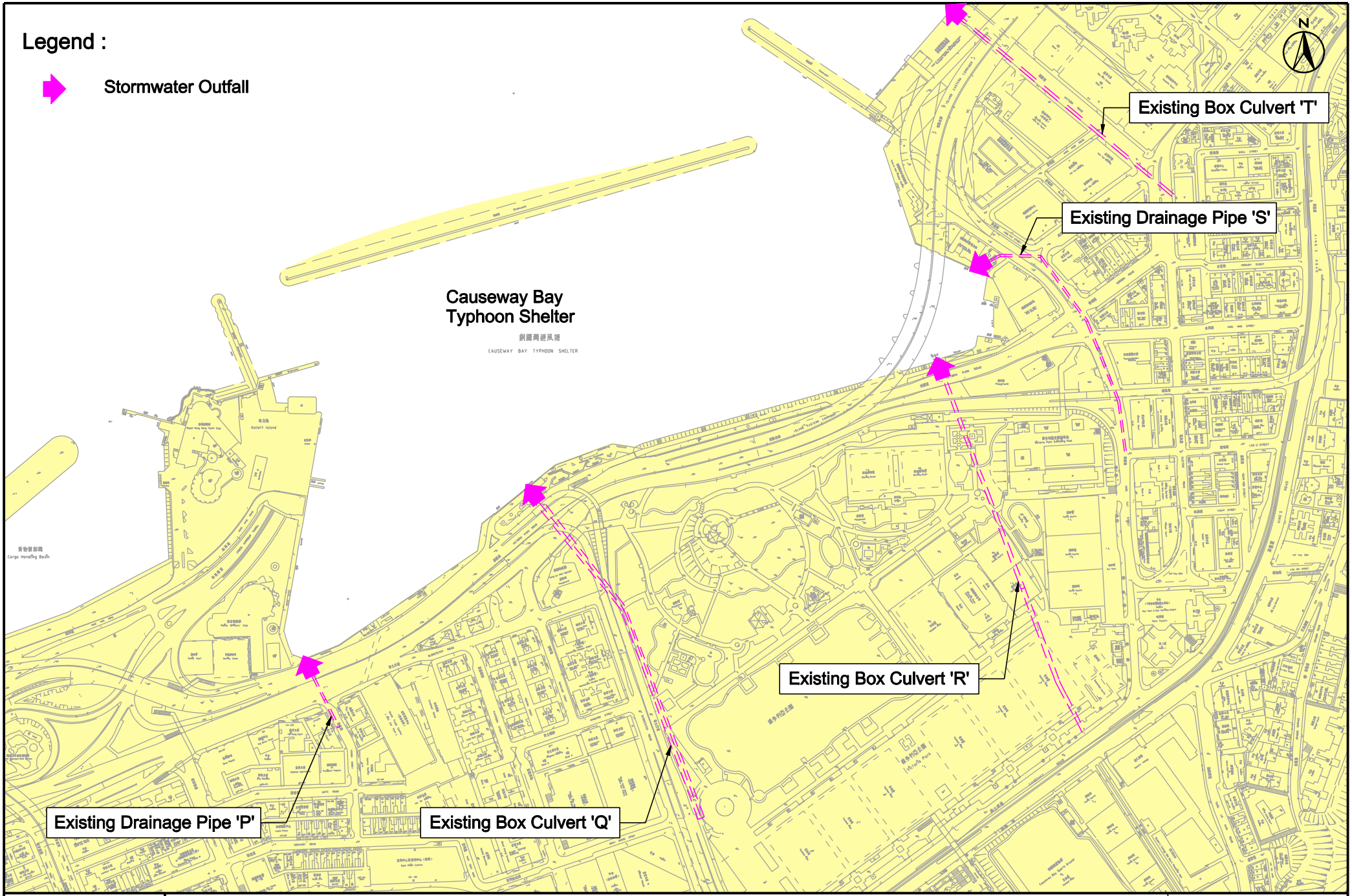
WAN CHAI DEVELOPMENT PHASE II - PLANNING AND ENGINEERING REVIEW

TYPICAL CROSS-SECTION FOR "SHALLOW WATER " IDEA

FIGURE 3

P:\projects\97103\drawing\figure\FIG3.dgn



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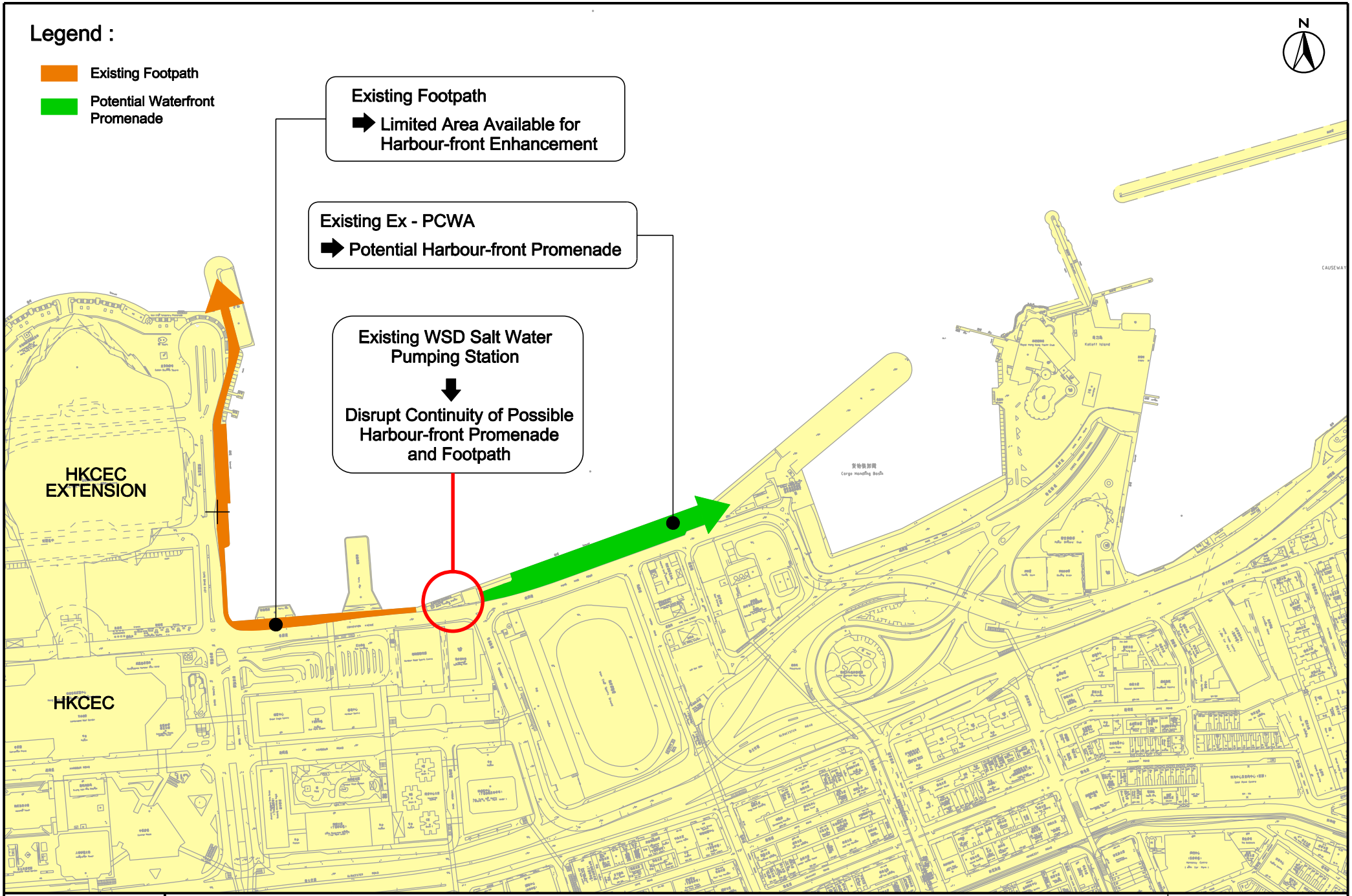
EXISTING OUTFALLS ALONG CBTS SHORELINE

FIGURE 4

Q:\97103\drawing\report\Shallow Water Discussion paper\FIGURE4.dgn



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WAN CHAI DEVELOPMENT PHASE II - PLANNING AND ENGINEERING REVIEW

EXISTING SHORELINE ALONG WAN CHAI HARBOUR-FRONT

FIGURE 5

Q:\97103\drawing\report\Shallow Water Discussion paper\FIGURE5.dgn