LegCo Panel Meeting on Planning, Lands and Works

Meeting 4 January 2002

Proposed Drainage Tunnel Schemes for Flood Prevention

Comments from Association of Consulting Engineers of Hong Kong (ACEHK)

Background

Members of ACEHK have been involved in the planning, investigation, design and construction of most of the tunneling projects in Hong Kong and participated in the feasibility study for these three drainage tunnel schemes. Of particular relevance is ACEHK members' participation in the Waterworks tunnels that collect runoff from the hillsides and transfer water between reservoirs and treatment works. The WSD tunnels extend to more than 100km and have many similar features to the proposed drainage tunnels. Some of these WSD tunnels have been in service for 40 years or more. ACEHK members are also currently involved in DSDs Kai Tak Transfer Scheme that will intercept and transfer floodwater from Waterloo Road and Kai Tak nullah through a 4.4m-diameter tunnel.

ACEHK can also draw on the experience of members working on the West Kowloon Drainage Improvements projects where consideration has been given to all the possible alternatives for relieving flooding in this densely urbanized area. Options considered have included upgrading local drains, flood storage, and tunnels to suit particular circumstances. Construction is now underway on each of these options.

ACEHK is pleased to provide the following comments on the issues the LegCo Panel raised on the Administration's proposals for drainage tunnel schemes for flood prevention.

Why is there a Need for Interception Schemes?

Parts of the urban areas are prone to flooding as a result of development increasing runoff and extending flow paths. The flooding can be relieved by increasing the capacity of the existing drains, storing the peak runoff and discharging at a controlled rate, or by diverting some of the flow away from the flood prone areas.

For local flooding problems, increasing the capacity of the drains is usually the most cost-effective option. However, as the size of the required drains increases this option becomes progressively more difficult and expensive because of the presence of utilities, disruption to traffic and inconvenience to the public, especially shop keepers. For the largest drains, this option is impractical in densely developed urban areas.

Where there is sufficient space, provision of a tank to store peak flows can be a cost-effective solution. In densely developed urban areas, there are few locations where this option is practical. In addition, since the water in the tank has to be pumped out after the passage of the main flood, a diversion is likely to be more cost-effective if practicable.

Diversion of runoff to relieve undersized drains in urban areas is a practical alternative to increasing the size of downstream drains in urban areas for the following reasons:

- The diversion can be routed to minimize disruption to the public, shopkeepers, traffic, utilities and to cause minimal environmental impact.
- The size of the diversion can be reduced as the intakes are on high ground and full use can be made of the driving head to push the water through the diversion at high velocity. This is particular advantageous for diverting flows that would otherwise drain through reclaimed land areas where gradients are flat and drains are consequently very large.

Diversion of runoff will usually be a more attractive option than flood storage when there is sufficient head to drive the flow through the diversion for the following reasons:

- Flows will pass by gravity through the system and there is therefore no risk of mechanical or electrical plant failures.
- The system will require minimal maintenance.

In ACEHKs view, the proposal to intercept and divert the flows is the best solution to the flooding problems prevalent in Hong Kong Island, West Kowloon and Tsuen Wan.

Why Tunnel Interception Schemes?

The proposed Yuen Long Bypass Floodway in the North West new Territories is an open nullah and a good example of a diversion scheme to relieve flooding in Yuen Long town. However, the topography and extent of the urbanized area makes the option of an open channel not practical on Hong Kong Island or in West Kowloon or Tsuen Wan. ACEHK considers that the use of tunnels to divert the flows at these locations is the most practical alternative.

Are the Proposed Drainage Tunnel Schemes Practical?

The proposed drainage tunnel schemes are very similar to the WSD water tunnels that have been in service for many years. The only significant difference will be that the drainage tunnels will discharge into the sea and not reservoirs or treatment works. All the features that will be adopted in the proposed drainage tunnel schemes are well proven, mostly in Hong Kong. The intake structures will be a similar design to those used to capture water from stream courses into the WSD tunnels. Many kilometers of tunnels of similar diameters and length have been successfully completed in Hong Kong. The outlets to the tunnels will require energy dissipation devices. Although these have not been widely used in Hong Kong, design parameters are well documented and there are many successful examples overseas.

ACEHK concludes that the proposed drainage tunnel schemes are practical and are merely a different application for well proven technologies.

Are the Proposed Drainage Tunnel Schemes Cost-effective?

The direct costs of the proposed tunnel schemes are likely to be similar to the costs of upgrading the downstream drains, where physically possible. Although the costs of tunnelling are high, this is offset by:

- The tunnel size can be reduced compared with the equivalent downstream drain because the water velocities are higher.
- There will be few requirements to divert other utilities to make way for the drains.
- There will be few interfaces with third parties, which will reduce contract administration costs.
- The capitalized maintenance costs will be less than for the equivalent downstream drains as the tunnels will require minimal maintenance, particularly as they can be designed to be self-cleansing and so siltation will not be a problem.

The drainage tunnel schemes will also minimize disruption and so have far less impact on the public than the alternatives of upgrading the drains in the urban areas. The savings in social costs will be great but are not easily quantifiable.

Works on the proposed tunnel schemes can be completed sooner than the equivalent upgrading works on drains in the urban areas. The benefits of the schemes can therefore be realized sooner which will save flood damage costs and public anxiety.

ACEHK concludes that the proposed drainage tunnel schemes are a cost-effective means of achieving the desired level of flood protection.