

**LEGISLATIVE COUNCIL
PANEL ON TRANSPORT**

**WAY FORWARD FOR THE
SHEUNG SHUI TO LOK MA CHAU SPUR LINE**

SUPPLEMENTARY INFORMATION

INTRODUCTION

At the meeting of the Legislative Council Panel on Transport on 26 October 2001, Members requested the Kowloon-Canton Railway Corporation (KCRC) and the Administration to provide further information on the following –

KCRC

- (a) an undertaking that the bored tunnel option would not have any adverse impact on the level of water table which might in turn affect the wetlands in Long Valley; and
- (b) further information on the track connection between East Rail and the Sheung Shui to Lok Ma Chau Spur Line (Spur Line).

Administration

- (c) judgement of the Appeal Board on the three possible alternatives, and the feasibility of other alternative options for the Spur Line including the shifting of the alignment for the bored tunnel option away from the wetlands in Long Valley.

This paper sets out the response of KCRC and the Administration.

(A) TUNNEL CONSTRUCTION WITHOUT AFFECTING GROUND WATER

2. The following is KCRC's explanation on why the bored tunnel option would not have any adverse impact on the level of water table in Long Valley.

Tunnelling Technology

3. The tunnels of the Spur Line will be constructed using an Earth Pressure Balance Tunnel Boring Machine (EPB-TBM). An EPB-TBM comprises a watertight shield body (the Shield), shown in Figure 1, equipped with a 8.4m diameter rotating cutter head at the front, followed by approximately 100 metres of back-up facilities including an erector for placing precast tunnel units.

4. During the excavation of the tunnel, a watertight precast reinforced concrete segmental lining is erected, and when complete, is extruded from the back of the Shield as the TBM moves forward. Any void between the outer face of the concrete lining and the soil is filled with grout under pressure, which then hardens and prevents any loss of soil, and enhances the water tightness of the tunnel lining.

5. A double-seal waterproofing system, comprising an elastomeric rubber gasket and a hydrophilic gasket which expands in contact with water, is installed at the joints of the segments to ensure water tightness. The EPB-TBM is also equipped with an effective sealing system at the end of the Shield, which prevents the ingress of water and soil as the completed tunnel lining is extruded from the Shield.

6. Soil is excavated and compressed by the rotary action of the cutter head and the specially designed cutters attached to the face. The face is held firmly in contact with the soil by the hydraulic jacks which move the shield forward. Soil passes through the cutter head, but a biodegradable and nontoxic foam material is kept under pressure on either side of the face to retain the external water pressure. By this means the surrounding ground water is prevented from flowing into the machine during the excavation cycle, and therefore the existing ground water level is retained under tight control at all times.

7. Geotechnical instrumentation including peizometers, and settlement monitoring points, will be installed along the tunnel alignment to monitor the water pressure and ground settlement/movement respectively during the course of the TBM excavation.

8. During construction of the West Rail Contract DB320 - Tsing Tsuen Tunnels using the EPB-TBM technology, which is planned for the Spur Line, the leakage of water during and after the construction of tunnels was so small that it could not be measured. Minor seepage of water could be seen from the joints between segments, close to the TBM, but this disappeared as the hydrophilic gaskets absorbed moisture and swelled inside the joint to block the water path. Geotechnical instrumentation was also employed to monitor ground water levels whilst using the West Rail EPB-TBM for tunnelling through soft, water laden ground, and minimal change in ground water level was observed. The interior of the West Rail concrete lined tunnel remain dry until today, and water leakage is not expected.

9. For the Spur Line tunnels, the Corporation plans to use the same EPB-TBM from Contract DB320, and the same tunnel lining system. A more comprehensive design will be adopted for instrumentation to monitor ground water levels whilst tunnelling.

10. The same type of tunnel boring machine is being used in Holland to construct a tunnel under sensitive wetland, with fresh water and sea water strata above the tunnel. The relevant contractor has assessed that the sensitive water regime would not be disturbed using the earth pressure balancing technology.

Hydrology

11. Computer modelling based upon site investigations results has been undertaken to investigate the impacts of the rail tunnels on the ground water regime. No uncontrollable effects have been found, with the estimated impact of the rail tunnels on ground water level limited to 10mm. The impact of the tunnel option on the level of water table is one of the main issues that are being examined under the EIA Study and the details will be included in the EIA report.

(B) CONSTRUCTION OF EAST RAIL CONNECTION

12. The following is an account of KCRC's supplementary information on track connection between East Rail and Spur Line.

13. Construction of the cut-and-cover tunnel will interface with the existing East Rail Sheung Shui to Lo Wu Line. A construction scheme has been designed to ensure that there will be uninterrupted operation of East Rail.

14. Figures 3 to 6 show the sequence of construction of the cut-and-cover tunnel adjacent to the existing Sheung Shui to Lo Wu Line. To accommodate the Spur Line, about 1 km of the existing East Rail tracks north of Sheung Shui Station will be temporarily diverted eastward to maintain the operation of the East Rail. The cut-and-cover tunnel will then be constructed at the space vacated by the East Rail tracks using diaphragm wall. To protect the operating tracks from being affected by the construction activities, a substantial enclosure will be erected above them, as shown in Figure 4.

15. To monitor any movement of tracks that may happen during the course of construction, an automatic real-time continuous instrumentation monitoring system will be implemented on the existing rail tracks to record their movements. The automatic monitoring system will be manned by competent personnel who will alert and directly communicate with the East Rail Operations Department in case movement exceeding the allowable limits is detected.

16. A series of contingency plans have been developed for various warning levels corresponding to the exceedence of certain allowable limits, and will be implemented when such warning levels are reached. The same instrumentation monitoring practices, which are being implemented on the Airport Railway for West Rail Contract CC402 - Nam Cheong Station, and on the East Rail for East Rail Extensions Contracts TCC400 - Tai Wai Station and TCC500 - Tai Wai Depot, have demonstrated the reliability of such a system in detecting any alarming track movement and hence in safeguarding against uninterrupted railway service.

17. In addition, prior to commencement of the construction work, the Contractor will be required to submit a detailed method statement for review by the Corporation. The method statement shall include a risk assessment outlining all possible construction risks together with preventive and mitigation measures. The supervisory personnel of both KCRC and the Contractor will ensure that the construction works are carried out strictly in accordance with the approved method statement, and that the identified risks are satisfactorily mitigated.

18. By adopting the above measures, adverse effects of the cut-and-cover tunnel construction on East Rail operations will be kept within the acceptable risk levels, and disruption to East Rail services could be avoided.

(C) ALTERNATIVE ALIGNMENTS

19. The issue of alternative alignments was addressed in great detail in the course of the Appeal. The Appeal Judgement contains the following -

“when..... assessing whether an alternative is ‘practical and reasonable’ all the circumstances must be taken into account and a balanced judgment reached.”

“of many matters which must be weighed in assessing ‘practical and reasonable’ included are adverse impacts, engineering constraints, extra-time involved, additional cost and even government policy (accepting it as a fact).”

“We have each reached a view on the practicality and reasonableness of the alternatives advanced.”

“On all the evidence we heard the possible alternatives which could be practical and reasonable were reduced to three:-

- a) the viaduct as proposed;*
- b) the bored tunnel on the same alignment; and*
- c) the Northern Link.*

The Northern Link, however, is outside any useful consideration for this appeal. This alternative would require a major change of government

policy even if it would be possible to implement it in a timely fashion to satisfy the need.”

The full text of the judgement can be found at the internet site of the Environmental and Food Bureau.

20. Apart from the gazetted alignment, other suggested alternative alignments of the Spur Line had been considered by Government and KCRC and they are considered to be prohibitive in terms of programme, cost, impact on the local community and environmental impact. . The Appeal Board also did not regard any of these alternatives as ‘practical and reasonable’.

21. The Northern Link (NOL) linking North West New Territories and Lok Ma Chau is designed as a long-term complement to, but not a replacement of, the Spur Line project. The NOL is only at a conceptual stage and the planning is much less advanced than the Spur Line. On the other hand, the Spur Line is required urgently to ease the congestion at Lo Wu and, together with the NOL, to provide the strategic linkage of East Rail and West Rail in the northern part of the New Territories. The Spur Line will also serve as the transport backbone for the proposed Kwu Tung North New Development Area.

22. Following careful consideration of the Appeal Board findings, and recognising the long lead time (at least 2 years) required for the necessary additional studies that would be required to prove the environmental acceptability of the viaduct option, KCRC has decided to adopt the bored tunnel approach to construct the Long Valley section for the Spur Line project. Having regard to factors including engineering and safety requirements, environmental, project programme, land use and planning aspects and impact on the local community, Government has endorsed the bored tunnel approach as the practical way forward for the Spur Line project.