

LEGISLATIVE COUNCIL

JOINT MEETING
PANEL ON PLANNING, LANDS AND WORKS
PANEL ON HOUSING

Unusual Settlement in Tseung Kwan O

BACKGROUND

Ground settlement is a normal phenomenon in newly reclaimed land. It is expected to continue for many years at an ever decreasing rate after completion of the reclamation. We first knew about the unusual ground settlement in localized yet undeveloped reclaimed lands at the southern part of Tseung Kwan O (TKO) Town Centre in April 1999. We immediately in mid 1999 commissioned the consultant to conduct a desktop study. In September 1999, we received a desktop study report which recommended ground investigation works be carried out. We immediately proceeded with the recommended site investigations to find out the cause of the unusual ground settlement in TKO Town Centre. We informed members of the situation on 6 December 1999.

AREAS AFFECTED BY UNUSUAL GROUND SETTLEMENT

2. Unusual ground settlement has been reported in three areas of TKO, namely TKO Industrial Estate, TKO Area 86 and TKO Town Centre, shown in Annex A (Drawing No. TKZ0092).

3. The Hong Kong Industrial Estates Corporation (HKIEC) reclaimed the land for the TKO Industrial Estate by employing their own consultants and contractors. The HKIEC is undertaking its own investigations to establish the extent and to ascertain the cause of the unusual ground settlement.

4. TKO Area 86 is an undeveloped site which will be developed by the Mass Transit Railway Corporation (MTRC) as a comprehensive development area. It is currently a construction site for the depot of the MTRC Tseung Kwan O Extension (TKE).

5. The developed part of the TKO Town Centre is the focus of concern of TKO residents. Sheung Tak Estate, Kwong Ming Court, Po Ming Court, Tong Ming Court and Beverly Garden are in this area, together with seven schools (see location plan at Annex B). At the undeveloped area to the south of the developed part, three lots for private housing, a Private Sector Participation Scheme (PSPS) housing site, an MTRC property development, an electricity sub-station and the MTRC TKE are at various stages of construction.

PROGRESS OF THE INVESTIGATION

6. Because of the large area within the TKO Town Centre over which we have recorded unusual ground settlement and the considerable depth of the strata to be explored, these investigations are complex and time consuming. We have completed the drilling of 53 deep boreholes in 18 groups up to 80 metres into the ground and installed various ground investigation instruments to measure groundwater levels and ground settlement in different soil layers. Soil samples are collected and are being tested in the laboratory. We are monitoring the installed instruments to establish trends in ground settlement and change in ground water levels.

7. We record different degrees of groundwater draw-down at the bedrock level within the Town Centre area. At the developed area to the north, no or only very slight groundwater draw-down is observed. Draw-down at the southern part of the reclamation is more substantial.

8. Construction activities which involve dewatering from the ground such as basement construction, piling works and other factors such as uneven thickness of marine deposit layer or inadequate compaction of backfill around building foundations and underground building services may contribute to local unusual settlement. We are investigating all factors that may have contributed to any of the ground settlement in the Town Centre. The information from the initial boreholes has revealed highly variable and complex geology in the Town Centre. We need more information for our investigations and more time to analyse the information to identify the causes and mechanisms behind the unusual settlement.

9. Initial readings from the ground investigation instruments we installed are showing that the groundwater levels in some areas of the reclamation have stabilized.

QUANTUM OF GROUND SETTLEMENT

10. We have been measuring total ground settlement comprising both normal and unusual settlement. Ground settlement at different parts of the Town Centre has slowed down substantially. We are presently recording ground settlement of only 0 to 2mm per month at about 80% of the Town Centre ground settlement monitoring points.

11. At the Sheung Tak Estate, Kwong Ming Court and Po Ming Court area, no noticeable additional ground settlement to the natural settlement has been recorded.

12. At Tong Ming Street we have recorded maximum total settlement of 42mm since April 1999. After rapid settlement from April to May 1999 when settlement briefly reached a peak rate of up to 25mm/month, the rate has reduced to 0-4mm/month.

13. In the same period at Tong Tak Street, we have recorded total settlements of 127mm and 206mm in front of Tong Ming Court and Beverly Gardens respectively. The rate of settlement in this street in March has generally reduced to 0-5mm/month from a maximum of 30mm/month in 1999. At an isolated area at the east end of Tong Tak Street, however, we are recording a maximum settlement of 10mm/month. It should be noted that extensive building construction activities are taking place just to the south of Tong Tak Street.

14. At Tong Ming Court, the Housing Department has installed 15 surface settlement markers. The cumulative ground settlements up to March 2000 since the earliest reading commenced in May 1999 range from 8mm to 75mm.

15. At Beverly Garden, TDD has been monitoring ground settlement within the Estate. We have recorded settlement since 3 December 1999 ranging from 5mm to 45mm. The larger settlement is recorded along the southern boundary of the development close to a development site where piling, basement excavation and ground water pumping have been in progress.

SAFETY OF BUILDING AND UTILITIES

16. The private buildings and building sites in the affected area include one PSPS (Beverly Garden) in the Town Centre, 12 low-rise (below 6 storey) buildings in the Industrial Estate, and 11 construction sites. Buildings Department (BD) has carried out a preliminary assessment of the possible effect of the unusual ground settlement and ground water draw-down on these buildings and building sites. The assessment concludes that no building sites are at risk, nor any buildings endangered.

17. For buildings under construction, BD has issued letters to the responsible authorised persons and developers in early November 1999, advising them to carry out their own investigation so as to assess the effect of the ground settlement on the buildings under construction and to ensure that these new developments including all associated works and utilities will be constructed in accordance with the requirements of the Buildings Ordinance. So far, the developers of two of the industrial buildings under construction have completed the investigation and confirmed that the buildings are structurally safe. BD has subsequently issued occupation permits to these buildings on 24.11.99 and 12.1.2000 respectively. For other construction sites (2 in TKO Industrial Estate and 7 in the Town Centre including 1 PSPS site and 2 MTRC developments), the respective registered structural engineers will finalize their assessment when further details and monitoring results of additional instrumentation are available.

18. The piles for the Housing Authority (HA) residential buildings (including Tong Ming Court, Kwong Ming Court, Po Ming Court and Sheung Tak Estate) were all designed to extend down to bedrock. Housing Department is closely

monitoring the settlement at these buildings and no signs of abnormal building settlement is recorded. There were also no apparent defects noted on building structures. However, it is noted that ground settlement has been affecting some pavements, roads and external areas of Tong Ming Court.

19. As regards Beverly Garden, BD has arranged with TDD to provide survey check points to monitor the building movement since 3 December 1999. No building settlement has been recorded. BD will continue to closely monitor these buildings.

20. TDD has met all utility companies who have confirmed there should be little risk to their installations. The utility companies have also agreed to increase the frequency of the regular inspections in affected areas.

PROGRESS OF MAINTENANCE AT AFFECTED HOUSING ESTATES

21. To closely monitor the unusual settlement, the Housing Department has installed another 28 building check points at Tong Ming Court during the Maintenance Period. According to the survey up to March this year, there is no evidence yet of building settlement in the development.

22. The Housing Department has also instructed the Contractor to make good external paving areas at Tong Ming Court identified with evident subsidence during the Maintenance Period.

23. BD have carried out four site visits to Beverly Garden between November 1999 and February 2000, in response to reports of defects made by the Owners' Committee. A total of 23 domestic units were inspected. None of the defects inspected appeared to be settlement related though some ground settlement had occurred at some open areas within the site of Beverly Garden. The probable causes of such building defects are shrinkage, temperature stress, workmanship and construction methods.

24. The developer of Beverly Garden has employed their consultant to carry out regular settlement surveys for Beverly Garden. There are altogether 134 check points installed at the tower blocks, foul water manholes and storm water manholes. According to the developer, the surveys revealed that settlement has been observed in the external areas of Beverly Garden. As regards the underground utilities, the design of these utilities is able to accommodate the effect of settlement at this stage.

25. According to the estate manager of Beverly Garden, rectification of defects caused by ground settlement, viz. subsided paving blocks, cracked drainage pipes, cracks on fence walls, pavement, carpark entrance, road paving and manholes have been completed.

26. As TDD is investigating into the cause of the unusual ground settlement, the Housing Department will continue to monitor the situation.

NEXT STEP

27. The initial results of our investigation indicate that the geology of TKO is very complex. However, the settlement monitoring indicates that over much of the Town Centre the rate of ground settlement is much reduced and appears to be reverting back to normal settlement rates. Further, the ground water draw down in the bed-rock has stabilized and at some locations, the ground water level has started to rise. Because of the very complicated geology we cannot yet confirm the causes and mechanisms behind the ground settlement or the magnitude of settlement attributable to each cause. Therefore, we cannot yet predict how much more settlement will eventually occur. We need to drill additional boreholes for installation of more instruments, the taking and testing of more soil samples so as to collect supplementary field data. This supplementary data, together with existing data, will assist us in understanding the geological situation, identifying the causes of the ground settlement and in making predictions of magnitude and timing of further settlement.

28. In a few months time, we shall have obtained and analysed the required supplementary information and prepared a detailed report. In the mean time, all relevant Departments will continue to monitor the situation and keep residents informed of developments.

ATTENDANCE

Mr H K WONG	Director of Territory Development
Mr D J CLIMAS	Acting Project Manager/NTE, Territory Development Department
Mr K C NG	Chief Engineer/Tseung Kwan O, Territory Development Department
Mr M L WAN	Acting Principal Assistant Secretary for Housing (Project Management), Housing Bureau
Ms Ophelia TSANG	Acting Principal Assistant Secretary for Housing (2), Housing Bureau
Mr K S YING	Chief Manager/Management, Sai Kung & Sham Shui Po, Housing Department
Ms Peggy CHAN	Chief Estate Surveyor/Rental Housing and Private Sector Participation Scheme, Housing Department
Mr Ian GALLOWAY	Acting Chief Architect (2), Housing Department
Ms Ferna SHUM	Senior Architect (7), Housing Department
Mr W C LEE	Acting Assistant Director, Geotechnical/Mainland, Civil Engineering Department
Mr K H HUI	Chief Structural Engineer, Buildings Department
Mr Geoffrey WOODHEAD	Principal Assistant Secretary, Planning and Lands Bureau