12.3.13 The Contractor shall include all works required in order to carry out the pumping tests such as piezometers, observation wells, dewatering wells, submersible pumps, level switch, monitoring, etc. The cost for such works shall be deemed to have been included in the Contract Price. Method statement and drawings showing the proposed pumping tests shall be included.

12.3.14 A detailed report on the pumping test shall be submitted upon completion of the pumping tests. Excavation can only commence when the results from the pumping tests are deemed acceptable to the QP(S) and the Engineer.

12.3.15 Notwithstanding the above proposed groundwater control measures, the Contractor shall limit the piezometric water pressure drawdown during the excavation / mining to not more than 2m below the existing levels to limit the consolidation settlements. Once the limit of the lowering of the groundwater level is breached or when the ground settlements due to the groundwater drawdown are found to exceed the critical levels, the Contractor shall activate the groundwater control measures.

12.4 Construction of Earth Retaining or Stabilising Structure (ERSS) Walls

12.4.1 The Contractor shall produce method statements and shop drawings for the ERSS walls to suit his construction methods. The information provided should include the method and machinery to construct the ERSS wall, lifting and handling of the rebar cage, the use of stabilizing fluids, the interface with transversing sewers and utilities etc. The shop drawings shall include the rebar arrangement, and the termination level corresponding to soil condition. The Contractor shall be responsible for sealing off the ingress of water through the ERSS walls and/or gaps in ERSS prior to further excavation.

12.4.2 Where there is presence of rock Grade IV or better above the FEL, the ERSS shall toe in at least 2m below FEL.

12.4.3 The Contractor shall note that the ERSS shall be designed to minimize the construction period and to protect the surrounding structures and services. Should fluvial sand be envisaged where the ERSS is located, the Contractor shall propose measures to maintain stability and to reduce the risk of water drawdown during construction of the ERSS. The Contractor shall be fully responsible for ERSS stability and take all necessary measures to ensure ERSS stability.

12.4.4 The use of diesel piling hammers shall not be permitted. Only silent piler or equivalent equipment shall be used and the Contractor shall submit details of this equipment to the Engineer for acceptance.

12.5.13 Where a waterstop is used between diaphragm wall panels, the Contractor shall install the waterstop to a minimum requirement of at least 5m below formation level or at least 1m into stratum with permeability less than 1E-7 m/s, whichever is deeper. Where waterstop installation fails to meet the above criteria, the Contractor shall propose alternative groundwater control measures to the acceptance of the Engineer. Notwithstanding this minimum requirement, the Contractor is responsible to design and install the waterstop and relevant groundwater control measures to requirements from other authorities in order to safeguard adjacent buildings and infrastructures.

If waterstop bars are used, vertical grouting shall be carried out behind all diaphragm wall joints where the ground is permeable, to a minimum of 1m above and 2m below ground with permeability less than 1x10-7m/s (e.g. F1 sand, other permeable soil). This is irrespective of whether it is above or below the Final Excavation Level (FEL). The Contractor shall propose actual vertical length of grout required based on soil investigation and excavation records from the diaphragm wall and submit for the Engineer's acceptance. When the diaphragm wall is exposed, the Contractor shall repair any joints or part of wall body that have jetting, spraying or leakage of water.

The Contractor may propose alternative joint design such as those formed using over-cutting method, which would be subjected to the Engineer's acceptance.

12.5.14 The Contractor shall ensure his proposed diaphragm wall machine has features that enable strict control of the verticality and twisting during the excavation process. In this respect, the diaphragm wall machine shall be equipped with real-time monitoring of excavated trench profile via the cutters and grabs, including monitoring of deflections on the XX and YY axes, rotation about the ZZ axis and deviation from the vertical. Such reports shall be submitted to the Engineer following the completion of excavation for each diaphragm wall panel.

12.5.15 The Contractor shall sequence his works such that the diaphragm wall panels are not excavated so close to other recently cast panels which contain workable concrete or unset concrete, such that a flow of concrete or instability could be induced or damage caused to any panel. This sequence of works shall be submitted to the Engineer for acceptance prior to commencement of the diaphragm wall excavation works.

12.5.16 Before commencing concreting of a diaphragm wall panel, the Contractor shall satisfy himself that the concrete supplier has sufficient quantity of concrete to construct the panel in one continuous operation. The Contractor shall ensure that the concreting rate is sufficient to prevent poor quality diaphragm wall panels. Where the density of the reinforcement cage is high, the Contractor shall employ a very workable cohesive concrete.

12.19.7 The Contractor shall seek clearance from LTA-Traffic Analysis & Projects (TA&P) Division and all other relevant authorities prior to the commencement of traffic diversion. The Contractor shall engage nearby stakeholders or grassroots organization for traffic diversion that may pose constraint to residents/shop owners in the vicinity. After obtaining comments from relevant stakeholders, thereafter, the Contractor shall submit any updates to the approved traffic diversion scheme arising from his engagement with the relevant stakeholders and his method of temporary diversion scheme to TA&P and relevant authorities for approval, and to the Engineer for acceptance. All cost and time associated with the above shall be deemed to be included in the Contract Price.

12.19.8 The Contractor's appointed PE and Traffic Consultant shall submit detailed plans of all temporary traffic diversion schemes, approved by the necessary traffic and road safety authorities, independent checkers and Project Safety Review (PSR) (Roads), to the Engineer for acceptance. The Contractor may refer to the temporary traffic diversion and reinstatement plans shown on the Authority's Drawings for his reference and design development. All temporary traffic diversions shall comply with the requirements stated in the Contract Documents. The Contractor shall comply with the requirements for Temporary Traffic Control Safety Submissions as given in the **Appendix D** of the General Specification.

12.19.9 NOT IN USE.

12.19.10 The Contractor shall engage a qualified Traffic Consultant accepted by the Engineer to carry out the traffic study and design detailed traffic diversion schemes which are workable for the proposed construction method and sequence. The traffic study shall include but not limited to collection and analysis of traffic data of existing traffic volume and movements, traffic modelling and simulation (by approved software tools, as determined by the Authority), analysis of traffic performance for every stages of the traffic diversion, including pedestrian counts at junction crossings, etc. The traffic diversion schemes will be subject to the Engineer's acceptance. The traffic diversion schemes will be subject to the Engineer's acceptance. The Contractor shall establish the boundary of the study area. This shall include existing condition such as carpark ingress/egress to/from buildings, bus stops, pedestrian crossing facilities, parking, loading and unloading. The study area shall be discussed and agreed with the Engineer at the inception stage.