

PARTICULAR SPECIFICATION

APPENDIX BH

GENERAL REQUIREMENTS FROM AGENCIES

CONTENTS

Clause No.	Title	Page PS-BH
1	URBAN REDEVELOPMENT AUTHORITY (URA).....	1
2	BUILDING AND CONSTRUCTION AUTHORITY (BCA).....	8
3	CIVIL AVIATION AUTHORITY OF SINGAPORE (CAAS).....	8
4	NATIONAL ENVIRONMENT AGENCY (NEA).....	9
5	ENERGY MARKET AUTHORITY (EMA).....	10
6	PUBLIC UTILITIES BOARD (PUB).....	11
7	SINGAPORE CIVIL DEFENCE FORCE (SCDF).....	30
8	SINGAPORE LAND AUTHORITY (SLA).....	30
9	HOUSING DEVELOPMENT BOARD (HDB).....	36
10	DEFENCE SCIENCE & TECHNOLOGY AGENCY (DSTA).....	38
11	MINISTRY OF EDUCATION (MOE).....	40
12	NATIONAL PARKS BOARD (NPARKS).....	44

1 URBAN REDEVELOPMENT AUTHORITY (URA)

1.1 General Requirements

- 1.1.1 The Contractor shall comply with all the detailed requirements and conditions imposed by MPC and the relevant technical agencies;
- 1.1.2 The Contractor shall submit his proposal to LTA and provide all necessary documentations and support to LTA for submission to URA and the relevant agencies to regularise the Master Plan subsequently where required;
- 1.1.3 The Contractor shall ensure the structural stability of all existing buildings and structures, including HDB's public housing, private housing, civic and community buildings, health and medical centres, places of worship buildings, MOE's schools and buildings and sites of heritage interest. The Contractor shall work closely with BCA, the relevant agencies and stakeholders to ensure the structural integrity of the structures and shall carry out the necessary rectification works in the event that these developments are affected.
- 1.1.4 Where changes are required to the station reflected in the current FPA submission, the Contractor shall seek planning approval for the revised proposal accordingly.

1.2 Design Conditions

- 1.2.1 The Contractor shall work with URA, NParks, HDB, JTC and other relevant agencies further to determine the final location and appropriate design treatment (e.g. greening, visual porosity) for the RTS-related at-grade structures, including entrance structures and ancillary structures such as escape staircases, ventilation shafts, cooling towers etc. at each station location.
- 1.2.2 The Contractor shall ensure that the design of CR16 station structures (in particular station entrances and ancillary structures) are designed to be as compact as possible with minimal visual impact.
- 1.2.3 The Contractor shall ensure that the design of the CR16 station structures (depot, facility buildings, station entrances etc.) adhere to the maximum allowable height limits as imposed by the relevant technical agencies.

- 1.2.4 The Contractor shall ensure that all rail-related structures along the CR16 station corridor and at the station locations are located as far away from existing development units as possible so as to minimise blockage of views and not to compromise the safety, privacy and security of unit occupiers, as the rail line will pass through built up areas with limited side table space. Additionally, where possible, the Contractor shall consult the residents and advisors early, so as to enable mitigation measures to be implemented to address residents' and advisors' concerns on the impact of these ancillary and entrance structures on their living environment.
- 1.2.5 The Contractor shall work with the Authority's Mechanical and Electrical (M&E) Consultant and in house designer to ensure that the structures (e.g. ventilation shafts, cooling towers etc.) shall not cause noise, smell, fumes, vapour and hot air nuisance to the surrounding developments, with abatement measures to be provided to mitigate the impact of noise, smell, fume, vapour or heat from the mechanical and electrical equipment. In particular, the Contractor shall ensure that the exhaust ducts of ventilation structures and cooling towers shall not face and shall be sited as far away from residential areas as possible.
- 1.2.6 The Contractor shall position all station entrances and ancillary structures to set back a maximum of 2m from the road reserves to cater for apron areas so as to minimise land take. Otherwise, the structures shall abut the road reserve, except for areas where it is required to study further with URA on the detailed location and design of the station entrances and ancillary structures, or where it is otherwise stated for the specific station.
- 1.2.7 The Contractor shall ensure that stand-alone at-grade Rapid Transit System (RTS) structures that are not planned to be integrated with future developments are compacted to minimise the required footprint. The areas around these structures shall also be adequately landscaped.
- 1.2.8 The Contractor shall work with the relevant agencies and provide the necessary structural loading for the RTS Station boxes and cut-and-cover tunnels where they will affect the development potential and development of the land parcels that lie within the 1st and 2nd Reserves of the proposed RTS.
- 1.2.9 The Contractor shall make the necessary design provisions for RTS bored tunnels which affect the development potential of future development parcels by the future 1st and 2nd Reserves of the RTS tunnels to:
- a) Withstand piling up to 3m from the tunnel structures; and
 - b) Prevent the bored tunnels from heaving as a result of future excavation works.

- 1.2.10 Where the at-grade entrance structures are planned to be integrated into the future adjacent developments, the Contractor shall design them to be structurally independent from the adjacent Station boxes to allow them to be demolished and the replacement at-grade structures connected to the Station boxes.
- 1.2.11 Where the station box is located beneath the road carriageway, side-table or future building setback, the Contractor shall maintain a minimum soil depth of 3 metres above the station box, to allow for tree-planting and for the laying of services.
- 1.2.12 Where possible, the Contractor shall design the streetscape and locate station structures and entrances to provide for a standard side table provision including footpaths, cycling paths, covered linkways, planting verge, services verge etc. so as to encourage active mobility and to ensure sufficient space for services and for tree planting.
- 1.2.13 The Contractor shall work with relevant agencies such as URA, HDB, JTC etc. to ensure seamless connectivity between the station entrances and the surrounding developments through the provision of commuter facilities such as pedestrian, cycling, and covered linkway networks, bus stops, pick-up-drop-off points etc.
- 1.2.14 On bicycle parking, the Contractor shall work with relevant agencies on the following:
- a) To ensure that bicycle parking lots distribution take into account the anticipated demand from surrounding existing/future uses in the vicinity of each station entrance;
 - b) To provide additional lots in the vicinity of the stations (e.g. via TOL, imposing requirements on Government Land Sales (GLS) sites etc.) for stations where the bike parking provision falls short of the forecasted/actual demand; and
 - c) To integrate the bicycle parking spaces or allow for relocation of the bicycle parking spaces in consideration of future developments to optimise the use of land.
- 1.3 Conditions Pertaining to Construction Works
- 1.3.1 The Contractor shall consult the relevant agencies and submit the proposals for worksite requirements for land use approvals.

- 1.3.2 The Contractor shall ensure that feedback obtained from the disclosed Environmental Impact Study (EIS) report is sufficiently addressed and MND's approval is obtained before commencing construction works.
- 1.3.3 For CR206 worksites that are near sensitive areas like residential premises and schools, The Contractor shall ensure compliance the following requirements:
- a) In general worksites for material storage, equipment storage, etc. should be located at least 100m away from residential premises.
 - b) For worksites that are in close proximity to sensitive premises, adequate mitigation measures shall be implemented to ensure that the worksite does not pose dis- amenities (e.g. noise, dust, odour etc.) to these premises.
 - c) Equipment that may generate noise/dust nuisance, including gensets, if any, should be placed as far away from residential premises as possible to minimise dis-amenities (noise, fumes, etc) posed to the residents.
 - d) Communication channels should be established for residents to provide feedback on any dis-amenities caused by the activities carried out at the subject site. The Contractor should front any feedback and provide additional mitigation measures, if required, to resolve the dis-amenities.
- 1.3.4 The Contractor shall ensure that the construction of CR206 minimises impact to the road, pedestrian and cycling traffic and commuter facilities and does not obstruct accesses to existing developments. Where commuter facilities and other public facilities are affected, the Contractor shall provide replacement facilities so as to mitigate impact to the stakeholders.
- 1.3.5 The Contractor shall interface closely with other relevant agencies/parties carrying out works in the surrounding vicinity to avoid abortive works and to ensure the works are well coordinated so as to reduce dis-amenity to the surrounding stakeholders.
- 1.3.6 Where the Contractor plans to adopt a left-in temporary earth retaining system (TERS) for stations, cut and cover tunnels and tunnel boring machine launch shafts, the Contractor shall inform URA and SLA and submit detailed plans for URA's evaluation, to ensure that the subterranean space beneath the State land will not be encumbered; the Contractor shall also consult URA and other relevant agencies on future development plans for the site, and to provide for necessary cutting down of TERS at localised locations where sewer lines, watermains and other services and infrastructure are to be made; otherwise, the Contractor shall be required to adopt other construction methods that would not encumber the subterranean space beneath State land;

1.4 Conditions Pertaining to The Treatment of Utilities

1.4.1 In areas where utility services need to be diverted to facilitate the construction of the station and tunnels, the Contractor shall:

- a) Minimise impact on development potential and impose constraints on future development sites.
- b) Avoid diverting services into State lands capable of independent development. The Contractor shall seek approval from SLA, URA and other relevant agencies should there be a need to divert services into State lands.
- c) Organise/re-organise services such that they are laid in an orderly and space-efficient manner.
- d) Seek approvals from the relevant agencies.
- e) Submit a set of the services layout plans to URA for record within 3 months of obtaining Final Planning Approval (FPA).
- f) Divert the services back to the original or permanent location after CR206 construction, for all temporary services diversions.
- g) Note the requirement for utility owners to capture accurate as-built records in accordance with the Standard and Specifications for Utility Survey.

1.4.2 At construction, utilities shall be laid in accordance with the design plan agreed upon by the relevant agencies.

1.4.3 For services diversions to existing roads, the Contractor shall consult the relevant utility owners and the diverted services shall be laid catering to total development needs.

1.4.4 Where major excavation works are carried out in existing roads e.g. construction of station boxes, the Contractor shall take the opportunity to consult utility owners and lay or pre-lay pipes for future services over the excavated area, so that future road openings can be reduced. The laid or pre-laid pipes shall be sized up to cater to total development needs.

1.5 Conditions Pertaining to Environmental and Heritage Studies

- 1.5.1 CR206 will be undergoing environmental studies. Hence, the Contractor shall ensure that CR206 works, including the worksites, will have minimal impact on the biodiversity areas identified in the respective environmental studies. The Contractor shall adopt the proposed mitigating measures and implement the Environmental Monitoring and Management Plan (EMMP) as required in EIS.

1.6 Specific Conditions for CR206

- 1.6.1 The Contractor shall minimise as much as possible the requisite worksite and station box within Holland Woods Identified Biodiversity Site (IBS) to reduce the impact to the vegetation.
- 1.6.2 All vent shafts and cooling tower vents shall be designed to vent out towards the street and not into adjacent parcels. The footprints of all RTS-related at-grade structures, including Entrance 1, ventilation shafts, and cooling towers, shall be carved out from the future development sites (i.e. no loading required for all RTS-related at-grade structures). The portion of the station box that is located within the future development sites and between Entrance 1 and the Vent Shaft / Cooling Tower structure shall be loaded for 2-storey Commercial use and landscaping above, with 1 level of basement car parking. The Contractor shall work with URA on the details of the loading provision within the future development boundaries (i.e. via column stumps or via transfer slab). Where possible, knock-out panels (KOP) shall be provided on both sides of the station box to safeguard future connection to future developments at Clementi Forest and existing institutions in the event that they are redeveloped in future.
- 1.6.3 Entrance 1 and associated structures shall be sufficiently set back to accommodate a minimum 3m wide green buffer and minimum 3.6m wide covered walkway from the proposed final Road Reserve Line (RRL). The Contractor shall design and implement a minimum 3.6m wide covered walkway fronting Clementi Road that is to be well-integrated into the design of the RTS-related at-grade structures. The covered walkway is to extend up to the MPC-approved Railway Area to ensure that the future developer(s) at Holland Woods is able to implement the 3.6m wide covered walkway within their development boundary along Clementi Road to connect seamlessly with the covered walkways within the approved Railway Area.
- 1.6.4 The Contractor shall work with URA and NParks on the reinstatement of the areas affected by CR206 works, and if necessary, rationalise the railway area. Any level differences between the reinstated levels of the station box and the existing topography shall be mitigated by berm/embankment as much as possible. The top of the station box shall also be reinstated with tree planting to contribute to the sense of greenery in the area.

- 1.6.5 The Contractor shall ensure that any traffic diversion along Clementi Road does not require further worksite within Clementi Forest. The Contractor is to front and manage any feedback arising from the traffic diversion.
- 1.6.6 The Contractor shall work with MINDEF on the camp access and road arrangement along Clementi Road, Maju Drive, and Brookvale Drive, as well as any conditions required by them for the station entrance to be located abutting Maju Camp.
- 1.6.7 The Contractor shall work with NParks to minimise impact to Old Jurong Line railway and other areas of conservation significance e.g., stream within Clementi Forest Identified Biodiversity (IBS) north of the station box.
- 1.6.8 The Contractor shall work with PUB to ensure that the proposed alignment and station does not affect PUB's DTSS link sewer that will be within Clementi Road.

2 BUILDING AND CONSTRUCTION AUTHORITY (BCA)

2.1 BUILDING SETTLEMENT LIMIT AND IMPACT ASSESSMENT

- 2.1.1 The building settlement due to impact of tunnelling works shall comply with deemed-to-satisfy limits at this stage (eg. 10mm for mixed foundation, 15mm for pile foundation and 25mm for shallow foundation) unless rigorous building assessment is conducted in accordance to BCA circular “Framework on performance based impact assessment associated with Earth Retaining or Stabilsing Structures (“ERSS”) and tunnelling works” issued on 1st June 2021.
- 2.1.2 For buildings located within close proximity zone, Qualified Person (QP) shall adopt rigorous approach for the impact assessment.

2.2 POTENTIAL UNDERGROUND OBSTRUCTIONS

- 2.2.1 Specify adequate and appropriate investigations to be carried out such as geophysical survey to identify all potential underground obstructions along the station box and entrance footprint;

3 CIVIL AVIATION AUTHORITY OF SINGAPORE (CAAS)

- 3.1 Approval In Principle (AIP) subjected to the following:
 - 3.1.1 The Contractor shall ensure that any and all developments, structures and fixtures on the site do not exceed the maximum allowable height of 153.0m SHD. Such developments, structures and fixtures include those on the roof tops of the Building (such as water tanks, lift motor rooms, TV antennas, etc.) and all construction equipment and temporary structures (such as cranes, piling rigs, etc.).
 - 3.1.2 The Contractor shall submit to CAAS a certified surveyor as-built plan prior to applying to the Building Control Authority (BCA) for the Temporary Occupation Permit or Certificate of Statutory Completion for any development on the site.
 - 3.1.3 The Contractor shall obtain CAAS’ prior written approval before mobilizing and/or installing any construction machineries on the site.

4 NATIONAL ENVIRONMENT AGENCY (NEA)

4.1 GENERAL

- 4.1.1 The subject site is located within a water catchment area, where rainwater and surface runoff are collected in the downstream reservoir for treatment to produce drinking water by PUB. The proposed development shall not cause pollution directly or indirectly to our water resources. Any activity that could cause contamination problem to our water resources shall not be carried out. Please also ensure that Annex A requirements for developments in water catchment areas are duly complied with.
- 4.1.2 Sewage and used water from the proposed development shall be discharged into the public sewer. The Contractor shall check with PUB (Water Reclamation Network Department) on the point of sewer connection and the allowable discharge rate.
- 4.1.3 Refuse and other solid wastes generated from the proposed development shall be collected by a licensed waste collector for disposal at an approved waste disposal facility. The Contractor shall ensure that the proposed refuse storage and collection system (e.g. bin centre) is in compliance with the public health requirements stated in the Code of Practice on Environmental Health.
- 4.1.4 Abatement measures shall be provided for all proposed M&E equipment installed in the proposed development to mitigate the impact of noise, smell, fume, vapour or heat flux from operations and maintenance of these equipment on residential and noise sensitive premises. The Contractor shall ensure that the noise emitted from the operations of M&E equipment installed in the proposed development does not cause nuisance to surrounding residential and noise sensitive premises. The QP/developer may take reference to the NEA's Technical Guideline on Boundary Noise Limits for Air-Conditioning and Mechanical Ventilation Systems in Non-Industrial Buildings for the noise limits. A copy of the said Guideline may be viewed at the following website:
- <https://www.nea.gov.sg/docs/default-source/our-services/building-planning/technical-guideline-on-boundary-noise-limit-for-air-conditioning-and-mechanical-ventilationsystems-in-non-industrial-buildings---feb-2018.pdf>
- 4.1.5 In the event that that new major roads are introduced or major roads are being re-aligned, Noise Impact Assessment (NIA) shall be conducted for the new roads and major roads due to the re-alignment.

- 4.1.6 In the event that cooling towers are to be used for the proposed development, the proposed development shall comply with the Environmental Public Health (Cooling Towers and Water Fountains) Regulations and the Code of Practice on Environmental Health.
- 4.1.7 In line with the Singapore Standard on Code of Practice for Pollution Control (i.e. SS593:2013), when a site that had undergone past pollutive activities which could pose any risks to public health, is to be redeveloped, rezoned or reused for a non-polluting activity, a study should be conducted on the site to assess the extent of land contamination. If there are indicators that point to the presence of land contamination (e.g. visual and/or olfactory evidence) found at the subject site, a site assessment study should also be conducted on the proposed site to assess the extent of land contamination. If the site assessment study shows that the site is contaminated, the site shall be remediated before it is redeveloped for residential or any non-industrial use, to render the land safe for the intended uses before commencement of re-development. The Contractor shall comply with the site contamination study requirement if the subject site meets the abovementioned conditions.
- 4.1.8 The proposed development shall comply with all the applicable requirements and provisions of the Singapore Standard on Code of Practice for Pollution Control (i.e. SS593:2013), the Code of Practice on Environmental Health, the Environmental Protection and Management Act, the Environmental Public Health Act, the Energy Conservation Act, the Radiation Protection Act and their Regulations.
- 4.1.9 In line with the Environmental Protection and Management (Control of Noise at Construction Sites) Regulations, construction sites within 150m of residential estates have to comply with the more stringent noise limits at construction stage, especially during night time hours. Hence, The Contractor shall implement noise control measures during the construction period to ensure that the noise emission levels from the building and construction activities are within noise limits and would not cause nuisance to any nearby residents. In addition, the proposed development is not allowed to carry out construction activities from 10pm on Saturdays or eves of public holidays to 7am on the following Mondays or days after public holidays respectively.

5 ENERGY MARKET AUTHORITY (EMA)

5.1 GENERAL

- 5.1.1 The Contractor shall consult electricity and gas divisions from SP PowerGrid Ltd on the affected existing and proposed electricity and gas infrastructures (including electrical substation, electricity cables and gas pipelines etc.) in the vicinity of the Work Areas.-

5.1.2 The Contractor shall contact the relevant SPPG personnel for their comment:

- i) Ms. Tan Soo Ching (Electricity Asset Management, tansooching@spgroup.com.sg)
- ii) Ms. Bernice Chan (Electricity Network Management, bernicechan@spgroup.com.sg)
- iii) Gas Network Planning (gasplanning@spgroup.com.sg)
- iv) Mr. Lian Junyue (Gas Network Planning, JUNYUE@spgroup.com.sg)

6 PUBLIC UTILITIES BOARD (PUB)

6.1 REQUIREMENTS FROM WATER RECLAMATION NETWORK (WRN)

6.1.1 Specific Requirement for CR16

- a) The Contractor shall liaise with PUB and take into consideration PUB's repair method in his design at locations where the station structures overcrossing the DTSS link sewer.

6.1.2 The Contractor shall comply with the Code of Practice on Sewerage and Sanitary Works (2nd Edition Jan 2019 and Addendum No.1 – Mar 2021) [thereafter referred to as the "COPSSW (2nd Ed.)"].

6.1.3 The Contractor shall comply with the minimum setback from the proposed sewers (refer to the clause on the sewer/pumping main setback) and ensure that CR206 works does not impact the sewer laying works.

6.1.4 The Contractor shall make the necessary provisions required to de-conflict works on site, e.g. providing site access or temporary partial site co-location when directed by PUB (WRN) Department. Before implementing the proposed development/service in this proposal, the Contractor shall liaise and work with PUB project officers to find out more about the proposed sewers so as to better plan & budget for the deconflicting work needed.

6.1.5 Diversion of sewers due to proposed infra works (tunnel/MRT structure/roads tunnels and structures)

- i) The Contractor shall note that if any sewer is in the way of or affected by the proposed MRT and/or road structures, the Contractor shall attempt to revise its proposal to avoid affecting the existing sewer. However, if this is not possible, the affected sewer shall be diverted such that used water would continue to be conveyed away by only gravity as before. Provision of permanent pumping system as an alternative means to convey used water away by pumping is not allowed.

- ii) Where a new or existing sewer would end up above, below or close to the proposed MRT and/or road structures (thereafter referred to as “crossings”), the Contractor shall include the cost of additional sewers at all such crossings in the funding provision. The Contractor is to consult PUB(WRN) to confirm on the need for additional sewers during detailed design where details e.g. clearance between the Contractor’s structures, soil conditions are available. The additional sewer shall be provided at least 5m away (outer edge) from and parallel to the affected sewer at all crossings, unless otherwise accepted by PUB(WRN).
- iii) Permanent retaining structure shall be provided where the proposed MRT and/or road structures are constructed too close to the existing sewers, rendering future excavation to repair sewer difficult. The Contractor shall submit such proposals to PUB(WRN) for approval.
- iv) The size of the proposed diversion or additional sewer shall be stipulated by PUB. Details of the diversion sewer (pipe size, gradient, invert level, etc.) shall be submitted to PUB(WRN) for approval well before commencement of works. All lateral connections shall be identified and continue to be affected to serve the existing developments. Used water discharge from the lateral connections shall not be disrupted at all times by the proposed diversion/abandoned of sewers as to cause inconveniences to the users.
- v) The Contractor shall submit for PUB’s comment on the cross-sectional details indicating the critical horizontal and vertical clearances between the existing/proposed sewers and proposed MRT and/or road structures running parallel to or crossing the existing/proposed sewers/pumping mains when the minimum setback or vertical clearance distances required for these sewers/pumping mains could not be complied with.
- vi) All the sewerage networks within the station box outline/MRT depot and which serve only the agency’s or developer’s premises shall be considered internal drain-lines to be maintained by the owner/occupier.
- vii) Proposed sewer(s) shall be designed in accordance to the requirements stipulated in COPSSW (2nd Ed.) Section 3.2.

6.1.6 Existing/Proposed Roadworks, Linkways, Overhead Bridges, Cycling Paths and Footpaths

- i) Manholes shall not be buried under any circumstances. Where there is a need to raise or lower any existing manholes, the Contractor shall liaise with PUB(WRN)'s Network Management Branch and carry out the necessary works at their own cost and expense. The final manhole top level shall be surveyed using the affected existing manhole's invert level as the Temporary Bench Mark (TBM). As-built drawings, showing the final top levels of the impacted manholes, shall be submitted to WRN. For such proposals, the Contractor is to contact Mr Muhd Nur Afiq Selamat (email: muhd_nur_afiq_selamat@pub.gov.sg) or Mr Muhd Nabil Mohd Raus (email: muhd_nabil_mohd_raus@pub.gov.sg) at Tel 6517 2230 from PUB(WRN) Department.
- ii) Road widening results in a narrower sidetable, thus the Contractor shall allow manholes to be constructed on the carriageway in future if there is inadequate space in the sidetable. If the road widening is not carried out by the Contractor, the Agency/Developer responsible for the road widening project shall be responsible to secure the above-mentioned permission from the Contractor for future manholes to be constructed on the carriageway.
- iii) Existing manholes currently located in the sidetable might end up on the carriageway after the road extension/widening works. The Contractor or the Agency/Developer responsible for the road widening project shall divert such manholes to the sidetable.
- iv) All covered linkways/ overhead bridges erected above proposed or existing sewers shall be designed to be demountable, with bolted joints connections, to facilitate speedy future repair of the sewers.
- v) The Contractor shall consult PUB(WRN) Department early when planning the proposed cycling path/footpath network. This is so that PUB(WRN) Department could advise on PUB(WRN) Department's requirements, and if there are any existing sewers, proposed/on-going sewerage works that might be affected by the proposed cycling path.
- vi) For locations where part of the proposed cycling paths are within the sewerage reserve owned by Ministry of Sustainability and the Environment (MSE) and managed by PUB (WRN) Department, the Contractor shall grout or remove any abandoned sewers/pumping mains affected by the proposed cycling path. The Contractor shall seek MSE's permission to occupy the sewerage reserve to construct the cycling path.
- vii) All manholes, existing as well as those proposed by the Contractor on proposed cycling paths/footpaths, shall adopt the use of standard heavy duty manhole covers, which comply with COPSSW (2nd Ed.). The installation of standard heavy duty manhole covers shall be carried out by the LTA/Developer/Owner at their own cost & expense.

- viii) Manhole covers, existing as well as those proposed by the the Contractor on proposed cycling paths shall be painted over with coloured high strength coating system RAL1003 or RAL3001 with adequate anti-slip resistance suitable for outdoor use as required by the Contractor. Application of high strength coloured coating on manhole covers for manholes on proposed cycling paths shall be carried out by the Contractor at their own cost & expense.
- ix) The Contractor shall allow unfettered access by PUB(WRN) to carry out maintenance/repair/upgrading or any other works on the sewerage infrastructure on the cycling paths/footpaths. PUB(WRN) shall be allowed to construct new sewerage infrastructure e.g. manholes/chambers and sewers/pumping mains on/underneath the cycling paths/footpaths should there be space constraints in future.
- x) For any works carried out by the the Contractor that affect/damage the sewerage infrastructure, the Contractor shall reinstate the condition of the affected/damaged sewerage infrastructure, complete with the re-coating of the entire road/footpath/cycling path, resurfacing/milling and/or patch as a whole, etc. at their own cost & expense. The Contractor shall consult PUB(WRN) on any works around the cycling paths that may affect the existing sewerage infrastructure.

6.1.7 Abandoning of Sewers / Pumping Mains

- i) PUB's approval shall be obtained for any proposed abandonment of sewers/pumping mains/manholes/chambers/drain-lines as well as the manner in which they will be abandoned. The Contractor shall note that the upstream (inlet) and downstream (outlet) ends of the abandoned sewer connections, drain-lines or sewers/pumping mains of all sizes shall be sealed watertight with 225mm thick brick plugs rendered with cement mortar.
- ii) All abandoned sewers/pumping mains of diameter 300mm or larger and abandoned sewers/pumping mains of all sizes within the road reserve shall be grouted with cement grout or other approved materials.
- iii) All abandoned manholes/chambers are to be demolished, filled up with well compacted approved material, and the manhole frames and covers removed. Details of the requirements can be found in the COPSSW (2nd Ed.) and "Standard Requirements for Abandoning of Disused Sewerage System" for compliance [https://www.pub.gov.sg/Documents/StdReq_sealing.pdf].
- iv) The abandoned sewers/pumping mains/manholes/chambers/drain-lines, including the manner of abandonment (remove, seal, grout, partial demolition, etc.), shall be indicated on the as-built drawings submitted to PUB(WRN) Department. The following details shall also be included:

- a) whether the abandoned sewers/pumping mains/drain-lines are removed, grouted or sealed;
- b) For manholes/chambers that are only partially demolished with approval from PUB(WRN), the extent of demolition shall be shown;
- c) the exact extent/length of the abandoned sewers/pumping mains/drain-lines that is removed, grouted or sealed;
- d) the exact locations of the watertight seals; and
- e) the type of watertight seals.

6.1.8 General Requirements

- i) No building/structure/piling/retaining structure, etc. (whether temporary or permanent), except lightweight and demountable elements (such as awnings, surface drains, compound boundary wall & fencing, planting troughs and link-way shelters), shall be sited over or across any sewers/pumping mains without the approval of PUB. All proposed structures shall be kept as far away from the existing sewers/pumping mains as possible and no nearer than the following minimum lateral clearances (also known as sewer/ pumping main setback):

Sewer / Pumping Main Nominal Diameter (mm), D	Sewer / Pumping Main Depth (m)	Minimum Setback Distance (m)*
≤ 600	≤ 3	1.0
	> 3 and ≤ 5	1.5
	> 5	2.0
> 600 to 1500	All	0.5D + 2.5
> 1500 to 2500		0.5D + 3
> 2500		0.5D + 4
Deep Tunnel Sewerage System (DTSS)		0.5D + 6
*measured from the outermost edge of the structure, including footings and overhangs, to the centreline of the sewer/pumping main pipe or DTSS.		

More details can be found in COPSSW (2nd Ed.) Sections 1.2.4 and 1.2.5.

- ii) No sewerage systems (including abandoned sewers/ pumping mains, any sensors, meters, equipment, instruments, etc. within manholes) shall be altered/interfered with without the approval from PUB(WRN). Where diversion/removal of any sewer/pumping main is required, it shall be carried out by the LTA/Developer/Owner at their own cost & expense. Details of the diversion (pipe size, gradient, invert level, etc.) shall be submitted to PUB(WRN) for approval before the commencement of works.
- iii) The Contractor shall be responsible for seeking approval from all relevant authorities/landowners for the proposed sewerage works to be carried out beyond the development site. Such approval or consent from the landowner/authorities shall not include any conditions that require PUB to provide a letter of undertaking to divert the sewerage infrastructure in future. The Contractor is to ensure that all sewerage and sanitary designs comply with PUB's Code of Practice.
- iv) All sewers and manholes shall be readily accessible at all times to PUB(WRN) for inspection and maintenance.
- v) All new vortex chambers shall be provided with air-tight and water-tight manhole covers. For any enquiries or clarifications, please contact Mr Peh Kok Heng (Tel: 6517 2225 or email: PEH_Kok_Heng@pub.gov.sg) or Mr Zulhilmi Mohammad Arif (Tel: 6517 2215 or email: Zulhilmi_MOHD_ARIF@pub.gov.sg) from PUB(WRN) Department.
- vi) Where there are any Specified Activities within the public sewer corridor [i.e. 10m for sewer/main of diameter <900mm, 20m for sewer/main of diameter ≥ 900mm and 40m for DTSS tunnel] as stipulated in COPSSW (2nd Ed.) Section 2.1.2, a written approval from the Director, Water Reclamation Network (WRN) Department of PUB should first be obtained before carrying out the specified activities at the site. The Contractor shall submit the Application Form via the Protection of Water and Sewer Pipes (POWS) at <http://bpu.pub.gov.sg/pows> prior to any commencement of the specified activities. The applicant shall refer to COPSSW (2nd Ed.) Section 2 for the technical requirements on sewer protection.
- vii) Large diameter sewers are critical pipelines that serve very large catchments. Any damage to these sewers could lead to used water overflow/leaks affecting a sizable area where the consequential pollution/environment impact could be catastrophic. In this respect, the Contractor is advised to keep the proposed works away from these critical large diameter sewers at the earliest planning stage where possible.

- viii) For the protection of large diameter ($\geq 900\text{mm}$) sewers and DTSS tunnels & structures, the following shall be strictly complied with:
- a) The Contractor shall comply with PUB's requirements for protection of large diameter ($\geq 900\text{mm}$) sewers and DTSS tunnels & structures given in COPSSW (2nd Ed.) Section 2.2.
 - b) A registered surveyor shall be engaged to ascertain the exact locations of all existing sewers and the DTSS tunnel in the vicinity of the proposed works. The layout plan, cross-sectional and longitudinal details indicating the vertical and horizontal distances between the proposed works/specified activities (including tunnelling, pipe/cable laying, piles, earth retaining or any other structures, etc.) and the edges of all existing sewers/DTSS tunnel endorsed by the registered surveyor shall be submitted. On request, we would provide the "as-built" DTSS tunnel X-Y coordinates/levels and details to facilitate the surveying works and preparation of the detailed plans.
 - c) To obtain information on the alignment and details of the DTSS tunnel/structures in the vicinity of the proposed site, the Contractor may liaise with and send the request to Mr Pham Huy Phuong (email: PHAM_Huy_Phuong@pub.gov.sg) or Mr Jason Lim (email: Jason_LIM@pub.gov.sg) or Ms Angeline Loh (email: Angeline_LOH@pub.gov.sg) with a copy of the purchased SIP for the area.
 - d) The detailed plans for the proposed works or specified activities must be submitted early to allow PUB(WRN) sufficient time to evaluate.
- ix) The Contractor must check for the presence of public sewerage pipelines by referring to the Sewerage Information Plan (SIP) and through site investigation. The SIP is available on SLA's INLIS at <https://app1.sla.gov.sg/inlis/#/PUB/UP/Search>. The Contractor should note that the sewerage information in SIPs is indicative and for reference only. A thorough site investigation, including trial trenches, shall be carried out to determine the exact position and levels of the existing sewers.
- x) The guideline on 'Prevention of Damage to Public Sewerage System' can be found in PUB website at https://www.pub.gov.sg/Documents/WRN_AdvisoryNotes.pdf. The Contractor is required to submit a notification to our Network Management Branch (NMB) at least 7 days before the commencement of any works or specified activities within the public sewer corridor.

6.2 REQUIREMENTS FROM WATER SUPPLY NETWORK (WSN)

6.2.1 Protection of Watermains

- i) The Water Supply Plans shows the approximate positions of PUB existing and proposed water main of 100 mm diameter and above in the vicinity of the proposed site. Smaller submain to customers' premises / properties are not indicated. The Contractor is to determine by means of trial holes the exact alignment and levels of all existing water pipe during the design stage and let PUB(WSN) know whether they are affected by the proposed works so that we can advise whether diversion is required. If diversion is required for water pipes of 300 mm diameter and below, consultation must be made at least 6 months ahead and the Contractor shall carry out the diversion at their own cost. Diversion of existing PUB's water pipes of 500 mm and above, being vital PUB's water pipes should be avoided unless absolutely necessary. If diversion is unavoidable, please engage a qualified pipe laying contractor with CR07 work head to carry out the diversion of the affected existing watermains. When the Contractor's consultant is on board, the Contractor's consultant shall consult PUB(WSN) again on the alignment of the proposed CR206, with details such as the exact locations of the tunnels and stations boxes with the clearances of the proposed Contractor's structures from the affected water pipes. PUB(WSN)'s approval shall be sought again via consultation during the detailed design of the CR206.
- ii) The latest Water Supply Plan is available on SLA's INLIS portal at <https://www.sla.gov.sg/INLIS/#/PUB/UP/Search>. Please refer to Annex B for PUB WSN Advisory-Prevention of Damage to Watermains which provides the details on the protection and submission requirements for applications by the Contractor to seek PUB's approval prior to the commencement of the proposed works that will be carried out in the vicinity of our water mains. This submission shall be made via our online submission portal, Protection of Water and Sewer pipes (POWS) at <https://bpu.pub.gov.sg/pows>. The Contractor is to contact PUB officer's Mr Shahrudin ([Shahrudin ABDUL SAMAD@pub.gov.sg](mailto:Shahrudin_ABDUL_SAMAD@pub.gov.sg)) or Mr Abu ([Abu Hasli ABU BAKAR@pub.gov.sg](mailto:Abu_Hasli_ABU_BAKAR@pub.gov.sg)) at 68852473 / 68852477 if you need any clarifications.
- iii) For small mains diversion (300mm diameter & below), please contact Cheng Chuan KUA (PUB) [KUA Cheng Chuan@pub.gov.sg](mailto:KUA_Cheng_Chuan@pub.gov.sg) or Suriani KAMSAN (PUB) [Suriani KAMSAN@pub.gov.sg](mailto:Suriani_KAMSAN@pub.gov.sg).
- iv) For large mains diversion (larger than 300mm diameter), please contact Kai Yeong LOH (PUB) [LOH Kai Yeong@pub.gov.sg](mailto:LOH_Kai_Yeong@pub.gov.sg) or Suriani KAMSAN (PUB) [Suriani KAMSAN@pub.gov.sg](mailto:Suriani_KAMSAN@pub.gov.sg).

6.2.2 Service Reservoir Management

- i) For working near the PUB Service Reservoirs and Central Pipeline Reserve, the Contractor shall comply to the conditions and requirements in attached PUB WSN Advisory-Prevention of Damage to Watermains. The Contractor shall take note on the approximate location of the watermains in relation to their works.
- ii) The Contractor shall carry out an impact assessment of the tunnelling works on Service Reservoir tanks and submit a detailed report to PUB for approval. The report shall include the following details:
 - a) The ground conditions, geotechnical profiles and relevant borehole logs.
 - b) The proposed tunnelling equipment and methods, and sequencing of the tunnelling works.
 - c) Assessments of impact on the use of the proposed tunnelling equipment /methodology on the service reservoir tanks including vibrations, ground movement, etc. transfer from the tunnelling works to the service reservoir tanks and how the impacts would be minimised, if they cannot be totally avoided.
 - d) Method statement & risk assessments of the proposed tunnelling works particularly the impact on structural integrity of the service reservoir tanks. It shall contain the details of work to be carried out, the sequence and program, the procedure, identify the equipment and materials to be used, the tests and monitoring works to be carried out, including addressing all the possible hazards that might occur and the proposed mitigating measures. This method statement shall be approved by PUB, prior to commencement of any work, to ensure that quality of work and safety of personnel, public and existing structures, utilities and operation is not compromised.
- iii) At pre-construction stage, the Contractor is required to:-
 - a) To carry out pre-condition and post tunnelling dilapidation survey by a registered surveyor
 - b) Bear all cost involve in draining the reservoir for the survey,
 - c) Be liable for all damages to the structures, pipelines etc and claims arising from the tunnelling works

- d) Compensate PUB fully in the event of any mishap to the reservoir/pipe works
- e) Submit details of all risks and third-party insurance
- iv) During implementation stage, LTA are required to :-
 - a) liaise closely with PUB on details of tunnelling works next to the service reservoirs
 - b) Submit to PUB the monitoring report and update PUB on the ground movements and vibration
 - c) Carry out dilapidation survey by a registered surveyor
 - d) Bear all cost of protection, cost of repair, if damage and diversion of affected pipe works.
- v) The Contractor shall contact Senior Engineer, Soh Ban Khoon at 92216733 for any further clarification.

6.2.3 Water Supply to Work Sites

- i) If temporary water supply is required at the various work sites, the water supply meter at the various sites shall be sited in a location next to PUB existing watermains and the Contractor shall lay his own water service pipes downstream of the water meter to the worksite. The Contractor shall engage a Licensed Plumber to submit the Notification of WSI Works to Centralised Services Department, PUB before commencement of work and to seek the necessary clearance from Water Reclamation (Network) Department, PUB for the temporary water supply to be turned-on.

6.2.4 Submission of Plans for Mainline Stations

- i) The design of the internal water reticulation system of the stations shall comply with the Public Utilities (Water Supply) Regulations, Singapore Standard 636 - Code of Practice for Water Services and all other relevant statutory requirements. The modes of water supply to be adopted are as follows:

S/n	Height of Highest Fittings Above Mean Sea Level	Method of Supply
i)	Less than 25 metres	Direct
ii)	Above 25 metres but below *37 metres	Indirect supply through high level storage tanks
iii)	Above 37 metres	Indirect supply through low level tank with pumping to high level tanks

	(* Refers to height of inlet pipe to high level storage tanks)
--	--

- ii) Notwithstanding the above modes of supply, where water is essential for the operations of the proposed development, storage tanks of capacity equivalent to 1 day's water requirements shall be provided for the purpose of maintaining a continuous supply of water in the event of supply interruptions. Where pumping system or storage tanks are required for the water services, a Professional Engineer must submit the Notification of WSI Works together with a set of drawings to Centralised Services Department. If all the fittings in the water service installation are receiving direct water supply from PUB mains, then a licensed plumber shall be engaged to submit the Notification of WSI Works and a set of the drawings to Centralised Services Department prior to commencement of the installation work.
- iii) PUB is presently supplying NEWater for direct non-potable purposes such as for cooling towers, industrial processes, general washing, landscaping, and other non-potable purposes. All new non-domestic premises such as commercial and industrial developments, etc, including those existing premises undergoing addition/alteration works where it is applicable to use NEWater, are therefore required to provide a dedicated NEWater pipe system now to facilitate the supply NEWater when it becomes available in future. Provision shall also be made for a NEWater storage tank to be installed within the premises with its inlet not higher than 115 mRL and a capacity equivalent to the 1 day's non-potable water requirement. There shall be no cross connection between the PUB water and NEWater supply pipelines. Developers/ consultants may consult PUB during the pre-planning stage on the detailed requirements.
- iv) Water conservation measures as stipulated in the Public Utilities (Water Supply) Regulations and SS 636 – Code of Practice for Water Services shall be adopted.
- v) Since April 2019, PUB has mandated the sale, supply and installation of at least 2-tick water fittings in all new and existing premises undergoing Addition & Alteration works. The proposed development should obtain the Water Efficient Building (Basic) Certification by PUB.
- vi) Unless with written permission by PUB, fixed or movable sprinklers are not allowed to be used to deliver any form of water supplied by PUB, including potable water, NEWater, raw water, effluent water, industrial water for watering any garden, lawn or other land including commercial market gardens, commercial nurseries, sports grounds, golf courses, race courses, public and club tennis courts. Where possible, developers are encouraged to use drought tolerant plants.

- vii) For non-domestic developments with estimated water requirements at least 5,000 m³/month, and government developments with estimated water requirements at least 3,000 m³/month, private water meters in accordance to PUB's requirements to monitor water usage in the key areas as stipulated in the Fourth Schedule of the Public Utilities (Water Supply) Regulations shall be installed.
- viii) Wherever possible, alternate sources of water (such as industrial water, high grade industrial water, sea water, recycled water, rainwater and AHU condensate etc) should be used to meet the non-potable water requirements of the proposed development.
- ix) Wherever possible, water recycling system should be set up to reclaim water for reuse for non-potable purposes such as production process, toilet flushing, irrigation and as cooling tower make up water, etc.
- x) The Contractor shall use non-water cooled systems (such as air-cooled, refrigerant-cooled, etc) for cooling purposes wherever possible.
- xi) Cooling towers should achieve minimum 7 and 10 Cycles of Concentration (COC) using potable water and NEWater respectively.

6.3 REQUIREMENTS FROM CATCHMENT & WATERWAYS (C&W)

6.3.1 Specific Requirement for CR16

6.3.2 The Contractor shall survey the dimension of the existing earth stream and ensure sufficient hydraulic capacity (ie. equivalent to the hydraulic capacity of 3.5m X 3 m box drain minimally). General requirement as follows:

- a) No structures/services shall be constructed/laid within the Drainage Reserve (DR). The Contractor shall submit detailed survey plans showing the existing drains within the site for the accurate plotting of drainage reserves.
- b) All embankments, structures of viaducts, ventilation buildings, etc shall be set and located outside the DR. They shall be stable and independent of the drainage structures, and their design must not take into consideration the passive resistance offered by the existing or proposed drain structures and ground within the DRs. All the proposed facilities and structures in the vicinity of the existing or planned drainage facilities shall be designed with structural and geotechnical consideration to cater for future widening and deepening of drainage channels. The Contractor must incorporate in the design and take all necessary precautions to ensure that any proposed works will not affect and cause any damage, structural and geotechnical distress or instability to the existing canals and other drainage facilities. Any damage or adverse effects to

drains/drainage facilities shall be immediately reported to PUB and made good to the satisfaction of PUB.

- c) All railway reserve lines shall be indicated clearly in the plan submissions. Where the 1st Reserve Line encroaches into the Drainage Reserve (DR) or a roadside drain, the Board may require the drain within the 1st Reserve Line to be upgraded in conjunction with the proposal. We will provide our drainage requirements when provide with more details of the design.
- d) For proposed elevated structures over a drain / DR, sufficient headroom of minimum 5.4m vertical clearance shall be provided between the soffit of the proposed structure and the approved minimum platform level, or the adjacent existing/proposed road/ground levels, whichever is the highest.
- e) There may be smaller drains within the site. The Contractor shall determine the details of these drains on site. Surface runoff from the site and all neighbouring lots must be allowed to discharge through the drains within the site.
- f) Where structures are permitted to be constructed within / across drains / DR, the conditions listed in Clause 5.4 of the Code of Practice on Surface Water Drainage shall be complied with. All service pipes, cables and conduits including sewer pipes shall under cross any drain encountered in the works with not less than the minimum clearance as stipulated in Clause 5.5 of the Code of Practice on Surface Water Drainage.

6.3.3 Drainage

- a) The Inter-Ministerial Committee on Climate Change (IMCCC) endorsed the proposal for drainage design to protect catchments for the projected 75th percentile increase in rainfall intensity due to climate change. Based on the asset life of the drain of 50 years, this corresponds to a 25% increase in rainfall intensity and the revised rainfall intensity incorporating the additional 25% increase shall be used in the design of the drainage infrastructure.
- b) Existing canals and outlet drains affected by the Works shall be reconstructed by the Contractor in accordance to design standards stipulated in the latest Code of Practice (COP) on Surface Water Drainage and incorporating the 25% increase in rainfall intensity. The proposed sizes shall be approved by PUB.

- c) Existing roadside drains/culverts within and in the vicinity of the proposed work sites, if affected by the Works, shall be upgraded by the Contractor to cater for increased runoff from the development in accordance to design standards stipulated in the latest COP on Surface Water Drainage and incorporating the 25% increase in rainfall intensity.
- d) The Contractor shall ensure that the CR206 sites are provided with an effective drainage system to intercept and discharge the surface water runoff. In addition, new drains contingent to the type and nature of the development may be evolved and built within the development site in conjunction with the CR206 proposal. The Contractor shall submit comprehensive drainage plans and details of the proposed drainage system / road and tunnel drainage system / permanent / temporary drain diversion, etc. at the detailed design planning stage to PUB for approval before construction.
- e) The design, calculations and detailed drawings of drainage proposals shall be endorsed by a Professional Engineer (PE) and shall include the connection details and transitions to existing drains. Site investigations shall be carried out to establish and confirm information on the existing drains that the proposed drains/culverts are to be connected to. Site investigations on the position of services shall also be carried out so that the design can be optimised to avoid diversion of services and that unavoidable diversions of services can be identified early.

6.3.4 Flood Protection Requirements

- a) The Minimum Platform Level (MPL) shall not be lower than 4.0m above Singapore Height Datum for developments along the southern coast/4.5m above Singapore Height Datum for developments along the northern coast; or 1m above the adjacent existing/proposed road/ground levels, whichever is the highest for the railway alignment/stations of CR16.
- b) Crest protection is required for all entrances, exits or openings to basement or underground structures. The minimum crest level for all the entrances, exits and openings including the proposed escape shafts / ventilation shafts shall be at least 300mm above the adopted platform level or 1.3m above the adjacent road/ ground levels, whichever is higher.
- c) The principles and standards for flood protection of underground rapid transit system outlined in Appendix 3 of the Code of Practice on Surface Water Drainage shall be complied with.

- d) The drainage system for proposed underground facilities and tunnels must be carefully planned, designed and implemented. There must be an effective segregation of the underground facilities and tunnels' catchments from the surface drainage with the creation of segregation road crest and flood protection walls. The minimum crest/threshold level and pumped drainage system for the underground facilities and tunnels shall strictly be in accordance with the Code of Practice on Surface Water Drainage.
- e) The Contractor shall submit certified site survey plans showing the adjacent road/ground levels and the proposed platform levels of the sites for our comments/clearance before the commencement of earthworks or construction works.
- f) In complying with the MPL requirement, the Contractor shall ensure that the runoff within, upstream of and adjacent to the proposed development shall be effectively drained away without causing drainage problems within the development site or in the vicinity of the site. Any proposal to lower the existing ground levels within the development site which are higher than the MPL shall be submitted for PUB's approval.

6.3.5 Water Catchment Requirements

- a) Stringent water pollution control measures shall be incorporated in the design and during the construction of the proposed CR206.
- b) Storage of toxic and hazardous materials is not allowed in the water catchment area and all sewage and sullage water are to be discharged into the public sewers.
- c) The construction of the proposed CR206 shall not result in any changes in catchment boundary and any loss of catchment yield in the respective Water Catchment Areas. The Contractor shall conduct hydrological and hydrogeological studies to determine the impacts on surface and groundwater hydrology in the respective Water Catchment Areas due to the development. The Contractor shall propose adequate mitigation measures, if required, to PUB for comments and approval before the finalization of the design of the proposed CR206 Line.
- d) Effective earth and sediment control measures shall be submitted by a Qualified Erosion Control Professional (QECF) to Catchment & Waterways Department, PUB for approval before commencement of any works in the respective Water Catchment Areas, including preliminary works such as soil investigation.

- e) If there is any earth filling work at the development site, the Contractor shall use good earth free of any debris or construction waste materials. If sand is used for backfilling, the Contractor shall not use marine sand. Only washed sand with chloride content not exceeding 0.01% (by Weight) shall be allowed. Test reports on the chloride content of the washed sand shall be submitted to Catchment & Waterways Department, PUB for records before commencement of work.
- f) The Contractor is to forward a copy of the as-constructed drawings for segments of the CR206 that undercrosses PUB's critical infrastructure (e.g. any of the raw water mains, etc).

6.3.6 Peak Runoff Control and ABC Waters Requirement

- a) PUB has in 2006 launched the Active, Beautiful and Clean Waters (ABC Waters) Programme. As part of the Programme, PUB has launched ABC Waters design guidelines which provide ideas on how natural runoff treatment systems termed ABC Waters design features such as rain gardens, vegetated swales and bioretention swales can be integrated within a development. These features detain/ slow down stormwater runoff and improve water quality by using plants and soil. They also enhance landscape and biodiversity of the development. Specific information on the design of these features can be found at the website: <https://www.pub.gov.sg/abcwaters/designguidelines>.
- b) Industrial, commercial, institutional and residential developments greater than or equal to 0.2 hectares in size are required to control the peak runoff discharged from the development sites. The maximum allowable peak runoff to be discharged to the public drains will be calculated based on a runoff coefficient of 0.55, and for design storms with a return period of 10 years and for various storm durations of up to 4 hours (inclusive). Peak runoff reduction can be achieved through the implementation of ABC Waters design features and structural detention and retention features, such as:
 - i) Detention tanks;
 - ii) Retention/Sedimentation ponds;
 - iii) Wetlands;
 - iv) Bioretention swales;
 - v) Bioretention basins or rain gardens;
 - vi) Porous pavements.

The Contractor shall be required to submit details (calculations and/or hydraulic model results) showing how the proposed system meets the required peak runoff rates. Due consideration shall be given to meeting ABC Waters stormwater quality objectives, which will often require treatment of stormwater runoff using ABC Waters design features. For design guidance on the ABC Waters design features, the Contractor can refer to the ABC Waters Guidelines and relevant chapters in the Engineering Procedures, available on the PUB website.

- c) PUB encourages the implementation of ABC Waters design features in the development as well as the achievement of ABC Waters certification. Information regarding ABC Waters Certification can be found via the link: <https://www.pub.gov.sg/abcwaters/certification>. If applicable, the design and construction supervision of ABC Waters design features as well as drawing up the maintenance plan for these features shall be carried out by an ABC Waters Professional. The Contractor could contact Ms Ong Geok Suat (ong_geok_suat@pub.gov.sg) and Ms Theresa Marie Lee (theresa_marie_lee@pub.gov.sg) for issues related to ABC Waters design features.

6.3.7 Drain Diversion

- a) The Contractor shall locate and identify all drains within and in the vicinity of the work site. The execution of the works shall not change, disrupt, fill, block, divert or disturb the existing overland flow or the existing system of drains unless an alternative approved drainage system has been provided and approval by PUB. The runoff within, upstream of and adjacent to the work site shall be effectively drained away without causing flooding within the work site or in areas outside the work site at all times.
- b) Where temporary or permanent diversions of drains are necessary to facilitate the construction, the Contractor shall submit proposals to be endorsed by a professional engineer (PE) including hydraulic calculations for the diversion drains to PUB for approval. The diversion drains shall be based on gravity flow and shall have at least the hydraulic capacity of the existing system for temporary diversion or constructed to a size as stipulated by PUB for permanent diversion drains. Any drainage reserves required for permanent diversion drains shall be secured, free of encumbrances by the Contractor for PUB. Appropriate drainage reserves shall be set aside for drains in accordance to Appendix 1 of the Code of Practice on Surface Water Drainage.

- c) Where the Contractor proposes for a series of diversions drains to be carried out in phases in tandem with the works, the complete sequence and timetable of drain diversions and integration of the drain diversion work with the construction work shall be submitted as one proposal from the onset of works for PUB's approval.
- d) The Contractor shall be responsible for the structural and cleansing maintenance of the temporary diversion drains. The ground on both sides of the diversion drains shall be levelled and kept clear of obstruction. Paved access and safety measures shall be provided to enable inspection of the diversion drains at all times. The Contractor shall ensure that the diversion drains are kept in good structural condition and the diversion drains are free flowing at all times.
- e) The Contractor shall restore flow and reinstate the drain to its original condition and remove the temporary drain diversions as soon as the temporary drain diversions are no longer required.

6.3.8 Safeguarding of Existing Drains / Drainage Facilities During Construction

- a) The Contractor shall take due care and precautionary measures to ensure that no damage or settlement occurs to any existing drain/drainage facilities during the works. The Contractor shall carry out an impact assessment to establish the influence zone of the proposed works which affect the existing drains and drainage facilities. The impact assessment to be submitted to PUB shall be endorsed by a Qualified Person (QP).
- b) Pre-work and post-work surveys shall be submitted to PUB and shall cover all drains/drainage facilities in the area affected by the work. All drains/drainage facilities shall be located and identified. The survey shall show the levels of the drains/drainage facilities and shall be accompanied by a set of photographs showing the conditions of the drains/drainage facilities. All survey work shall be carried out by a Registered Surveyor. The Contractor shall monitor the condition of the drainage facilities, rectify and reinstate drainage facilities affected by the works, and carry out final desilting of drains for PUB's inspection before vacating the site.

- c) Where jet-grouting work is to be carried out near drainage facilities, The Contractor shall submit detailed pre-work and post-work surveys to the PUB. The Contractor shall take stringent precautionary measures to safeguard drainage facilities during the jet-grouting work. The functional and structural integrity of these facilities shall not be impaired by any upheaval or other ground movement. If adverse effect is caused by the jet-grouting work, The Contractor shall implement remedial works immediately to the satisfaction of PUB.
- d) The Contractor shall carry out soil instrumentation for monitoring the soil / geo-technical / structural movements or changes at and around the work-site in particularly existing drains / drainage facilities throughout the contract period. The Contractor shall set the critical alert levels and put in place a contingency plan to rectify any damages to the drains / drainage facilities. The soil instrumentation shall be monitored daily and weekly summary reports of the results of the soil instrumentation shall be endorsed by a Professional Engineer and submitted to PUB for record. Any breach of the alert levels and/or anomaly found in the reports shall be immediately reported to PUB and rectify immediately to the full satisfaction of PUB. Details of the contingency plan including the schedule of works and organisation chart of the developer / developing agency and consultant / contractor shall be submitted to PUB before commencement of works.
- e) In the event of breach of alert levels and/or anomaly in the soil instrumentation results, The Contractor shall alert PUB immediately and activate the contingency plan to mitigate and rectify the situation. The analysis and rectification reports of the affected drains and drainage facilities shall be submitted to PUB for comments or approval.
- f) The Contractor shall conduct a joint visual inspection and any defects identified shall be made good to the full satisfaction of PUB and shall follow up with an incident report for the affected drains and drainage facilities within 3 days including remedial / repair works. If necessary, briefing / meeting shall be conducted by the Contractor to address the damage and follow up actions to rectify the situation.
- g) The method of construction of temporary drains and/or drains affected by the works shall be submitted to PUB for comments and approval before commencement of the works. Upon completion of the works, post-condition survey and topography survey of the affected drains shall be submitted, and PUB may request for joint site inspection of the rectification works.
- h) The Contractor shall inform PUB in writing at least two weeks before the commencement of any work at the site which affects drains.

- i) The Contractor shall submit the section on Particular Requirements (Drainage) in the tender documents for our comments and/or approval at least one month before calling of construction tenders.
- j) The planning, design, construction activities and procedures for plan submission shall comply fully with the requirements as stipulated in the latest edition of the Code of Practice on Surface Water Drainage and The Sewerage and Drainage (Surface Water Drainage) Regulations 2007. The Code of Practice can be downloaded from the PUB website at <http://www.pub.gov.sg>
- k) Effective erosion and sediment control measures shall be provided by the Contractor and he shall provide such effective measures and facilities with inputs from Qualified Erosion Control Professional (including site management system and perimeter cut-off drain, silt traps, storage ponds, treatment plants, etc.) to ensure clean discharge that complies with the statutory requirement. The proposed erosion and sediment control measures shall be submitted by a Qualified Erosion Control Professional (QECP) to Public Utilities Board before commencement of works. All affected watercourses shall be de-silted and cleared until completion of work. Information on ECM (Earth Control Measures) requirements can be found in the website www.pub.gov.sg/ECM.

7 SINGAPORE CIVIL DEFENCE FORCE (SCDF)

7.1 For All Stations

- 7.1.1 For Fire Safety requirements, the Contractor is required to comply with the Fire Safety Act and Regulations (please see attachment for details). If the Contractor needs any clarification on Fire Safety requirements, he should consult the Fire Safety Department (FSD) located at SCDF Headquarters.
- 7.1.2 The Contractor shall also refer to Annex C for SCDF requirement.

8 SINGAPORE LAND AUTHORITY (SLA)

8.1 General comments for affected Private, Statutory Board and Ministry lands

- a. If the Contractor's proposed development boundary differs from the return boundary, the Contractor is to re-consult SLA's Land Planning and Coordination Department;
- b. For portions of the alignment less than 30m below ground, please seek approval from the land owners. For portions of the alignment more than 30m

below the ground, the Contractor is advised to inform the affected private land owners at least 2 months before commencement of the Contractor's works if the works affect the private land owners;

8.2 Ministries' Land

The Contractor to inform SLA's Purchase & Return Department of the development timeline in advance so that sufficient time is given to MND/NParks, MHA/SPF, MOE and MSE to complete any necessary reinstatement/demolition works for the timely return and handover of the affected lands. The affected lands are to be returned free from encumbrances to SLA, with the date of return tied to CR206 taking over date. The land return should not result in any remnant or landlocked land:

8.3 Statutory Boards' lands

- a. For statutory boards' lands that are affected by the proposal but do not require land return, LTA is to seek approval from the respective landowners;
- b. The return of the land and subterranean space should not result in the creation of any remnant or landlocked land

8.4 Private lands

- a. The return of all the affected land should be arranged on an "as is-where is" and back-to-back basis with the handing over of the sites to landowner. The land return should not result in any remnant or landlocked land as well. The Contractor is to bear all costs for the land return and related fees/ charges including but not limited to survey fees, valuation fees, etc. incurred in the return of the affected lands. The Contractor will also need to work with all the respective landowners to assist in the necessary reinstatement and/or reconfiguration works at his own costs;
- b. The Contractor will need to re-consult SLA if there are additional properties (with private interests) that will be affected by the Contractor's proposed works;

8.5 Tenancies (TAs) and Temporary Occupation Licences (TOLs) on State land

- a. The Contractor should minimise the disruption of the existing tenancies (TAs) and temporary occupation licenses (TOLs) and is required to provide SLA advance notice prior to the intended date of site entry;
- b. The Contractor should front all appeals from affected tenants/licensees and media queries which may arise due to the CR206 project;

8.6 State land

- a. For the State land affected, the Contractor shall coordinate with URA for an alignment of both underground and at grade structures which will pose the least constraints to the future development potential of the State land, and the Contractor is to liaise with URA to provide the appropriate amount of structural loading where necessary so that the future development potential of the State land will not be affected. LTA/URA may also wish to explore realigning the existing roads above the tunnels and re-parcel the State land, or aligning the tunnels below the future roads;
- b. Ancillary structures and bicycle parking on State land will need to be incorporated in the future development boundary for land optimization and to ensure no remnant land is created (subject also to the outcome of the wider review on the ownership model for such lands). The Contractor is to consult and work closely with URA and agencies on the location of all ancillary MRT structures;
- c. For any proposed launching shafts, receiving shafts and any other temporary sheet piles, the Contractor is to entirely remove all structures that are not part of the tunnel wall upon completion of tunneling activities;
- d. Please ensure that there is continued access to all State land and buildings during construction of the proposal;
- e. For the proposed slope embankment at CR16.
 - a. The proposed slope should be designed and endorsed by a PE;
 - b. The proposed slope works are to be kept within LTA's RTSA notice boundary or worksite TOL boundary;
 - c. The Contractor is to take all appropriate preventive measures to ensure that there is no illegal dumping on site;
 - d. The Contractor is to abide by NEA's guidelines for proper disposal of soil at dumping grounds approved by NEA;
 - e. The Contractor is to engage a qualified Superintending officer on site to ensure the disposal of soil is carried out properly;
 - f. The Contractor is to rectify any defects / water ponding on the adjacent State land arising from their construction works;
 - g. The Contractor is to engage a QP for their assessment to address possible flooding/ ponding issues and to ensure that the capacity of drain/drainage system is sufficient to intercept and discharge all runoffs into public drains. The Contractor is to take the necessary actions, at their own cost and expense, to prevent all runoff from overflowing/discharging into the adjacent land;
 - h. The Contractor is to consult SLA's Land Asset Management Division

in advance on the details of the proposed works and reinstatement requirements for handover of the slope to SLA for management and maintenance;

8.7 Serving of Notice Under RTSA/TOL to Enter State Land

- 8.7.1 For all proposed works on State land and entrance structures or MRT-related structures like ventilation shafts, cooling towers, the Contractor is required to notify LTA to serve notice under the Rapid Transit Systems Act (RTSA) to SLA's Tenancy and Licence Management for their construction, management and maintenance after construction at least 2 months prior to site entry. The approval of SLA's Collector of Land Revenue as required under the RTSA should be obtained prior to site entry and construction of CR206.
- 8.7.2 No remnant or landlocked land is to result from the boundary of the areas taken up by the Contractor under RTSA.
- 8.7.3 The Contractor is to apply for a Temporary Occupation Licence (TOL) for the use of State land as site office, precast yard, storage area etc, where applicable through SLA TOL portal at app1.sla.gov.sg/tol at least 8 weeks in advance from the proposed site entry date. No site entry or commencement of works is allowed prior to commencement of TOL.
- 8.7.4 For the portions of the proposal where land return is required, the Contractor is to serve notices under the RTSA for the entire area that is returned, so as not to create remnant land. If the proposed RTSA boundary differs from the return boundary, the Contractor is to re-consult SLA's Land Planning and Coordination Department.

8.8 Incidental Spaces

- 8.8.1 For any incidental spaces on State land, the Contractor is to notify LTA to serve notices under the RTSA for the construction of the proposed incidental space area. The notice is to be served to SLA's Tenancy and Licence Management department at least 2 months prior to site entry and construction of the incidental space.
- 8.8.2 If there are any incidental spaces proposed, the Contractor shall consult SLA for comments. Should there be incidental space, the following requirements shall be handed over to SLA:
 - a) Certificate of statutory completion
 - b) Warranty for waterproofing works

- c) Cadastral survey for the incidental space
- d) Development interface report

8.8.3 In addition, if the interim spaces are not going to be sealed and are intended for interim use, the Contractor is to work with SLA's Business Planning & Development Department on the interim use and note the following requirements:

- i) For Food and Beverage (F&B) and retail area proposed, the Contractor will have to seek URA's approval for these uses to be allowed at the incidental space.
- ii) For each unit of retail/F&B, there must be independent connections of utilities such as water, electricity and gas (F&B) must be provided. Space for air-conditioning must be catered.
- iii) To provide sub-metering for each unit of retail/F&B.
- iv) The proposed layout for retail/F&B must be cleared by Fire Safety Bureau.
- v) To provide toilets for the incidental space.
- vi) Grease traps and exhaust must be provided for F&B space.
- vii) To provide drainage and sewerage connection for each unit of retail/F&B.
- viii) Common lift and staircases are to be connected to the common area.
- ix) Escalators/lifts at the incidental space should be maintained by the Contractor.

8.8.4 The proposed layout should be cleared with PUB on the points of sewer connection and the allowable discharge rate.

8.8.5 The proposed layout must comply with all the applicable requirements and provisions of the Code of Practice on Pollution Control, the Code of Practice on Environmental Health, the Code of Practice on Sewerage and Sanitary Works, the Code of Practice on Surface Water Drainage, the Environmental Protection and Management Act, the Environmental Public Health Act, the Sewerage and Drainage Act, and their Regulations.

8.9 Utility Diversions

8.9.1 For any permanent or temporary diversion of utilities arising from the construction of the proposal, the Contractor is to keep the utilities within road reserve.

8.10 Replacement Facilities on State Land

8.10.1 The Contractor is to seek SLA's clearance for any additional replacement facilities on State land like substations, car parks, road diversions etc.

8.11 Expunction of Roads

8.11.1 Prior to any physical expunction of road, the Contractor is to ensure that sufficient time and proper signages are well established on site, for public awareness of the intended permanent closure of roads;

8.11.2 If there is any expunction of road where the affected land will be returned to SLA for maintenance, the Contractor would need to reinstate the land to the following conditions, subject to the detailed reinstatement requirements of NParks/SLA:

8.11.3 Remove tarmac, kerbs, roadside drains and signages and grade the ground to match with the adjoining land to ensure that there is no water ponding or drainage problem.

- a. Remove all lampposts, and underground utility services from the expunged road.
- b. Close turf the land to the satisfaction of NParks and SLA.
- c. Where applicable, LTA is to seek approval from URA and all other relevant agencies to rezone the "Road" to other uses.
- d. Remove all trees. Note that NParks' approval must be obtained for trees removal.

8.11.4 The Contractor is to ensure that there is continued access to adjacent/nearby developments while the road expunction is carried out;

8.12 General

8.12.1 All State land and State Buildings are to be duly reinstated to SLA's satisfaction if they are to be returned to SLA after the completion of the respective projects (rail, road etc.).

8.12.2 The Contractor is to address issues that arise due to the construction of the respective projects (rail, road etc), e.g. drainage, water ponding, structure safety.

8.12.3 All utility connections and any diversion of services, if required, are to be kept entirely within the road/drainage reserves. No State land is to be affected.

8.12.4 No remnant land is to be created.

8.12.5 No site is to be landlocked.

9 HOUSING DEVELOPMENT BOARD (HDB)

9.1 General Requirement

- 9.1.1 Generally, the rail alignment and station box should avoid cutting across development parcels so as not to encumber or constrain any future developments. Where unavoidable, the alignment should minimise such encroachment as much as possible to reduce the properties affected and avoid sterilising land for future development or redevelopment.
- 9.1.2 The ancillary facilities including all road related and commuter facilities shall be located within the approved, safeguarded road reserves as much as possible. The Contractor shall coordinate with LTA and plan and implement the pedestrian, cycling and covered linkway connectivity around the station to ensure good first mile last mile connections to surrounding developments.
- 9.1.3 Please also ensure that mitigating measures on noise and dust pollution are in place to minimize dis-amensities to the existing residents.

9.2 Landscaping Matters

- 9.2.1 All the existing trees fell within State land and vacant land are under NParks' purview.
- 9.2.2 All the existing trees on HDB land should be preserved as far as possible. Approval for tree removal will only be granted when it is unavoidable, and all tree removal requests must be accompanied by tree replacement proposals.
- 9.2.3 Should the proposed construction works affect any shrubs and other landscape features, the Contractor will need to consult the relevant Town Council(s) separately. Any proposed replacement shrub species and location of shrubs proposed to be planted within HDB land are to be agreed and endorsed by the relevant Town Council(s).
- 9.2.4 For any proposed addition works which encroach on the green buffer and/ or peripheral tree planting verge, clearance from the rightful departments must be obtained.
- 9.2.5 All proposed structures should not damage the root systems of existing mature trees and to comply with tree protection zone (TPZ) guidelines.

9.3 Public Communications with Affected Parties and Stakeholders

- 9.3.1 The Contractor is required to notify all affected parties at the appropriate time and deal with all queries pertaining to the affected land and HDB properties due to the CRL and the associated works, including and not limited to blockage of views, concerns about nuisance, etc.
- 9.3.2 The Contractor is requested to take appropriate safety precaution to ensure that the surrounding residents' safety is not compromised due to any of the Contractor's works.
- 9.3.3 The Contractor shall engage the Advisers for affected HDB properties. Where structures and works come close to HDB blocks, the Contractor will be required to front additional engagement with the affected HDB residents.

9.4 Town Council Matters

- 9.4.1 If the common property of HDB estates managed by the Town Council is affected by the proposal, the Contractor is required to:
 - a) Seek prior written clearance from the Town Councils concerned on its proposal before commencement of works;
 - b) Liaise with the Town Council concerned to clearly demarcate and spell out areas of maintenance responsibility for the site between itself and the Town Council to avoid future dispute;
 - c) Liaise with the Town Council on the relocation and reinstatement of existing facilities and amenities to suitable locations determined by the Town Council at the Contractor's own costs;
 - d) Take all necessary measures to ensure residents'/public safety at all times in the course of carrying out works on the common property of the HDB housing estates; and;
 - e) Take appropriate measures to abate or minimize any noise, dust and other nuisance/inconvenience during the period of work and use and attend promptly to all public enquiries/complaints pertaining to such issues.

10 DEFENCE SCIENCE & TECHNOLOGY AGENCY (DSTA)

- 10.1.1 The Contractor should note that CR206 is in the vicinity of MINDEF's premises. The proposed development and related operations and activities must not affect any of its facilities, infrastructure and services at any point in time, including during the construction period. The proposed development must also not impose any constraint on MINDEF or curtail its existing and future developments, operations and activities in any way. This includes causing any dis-amenities which may be directly or indirectly associated with the proposed development including but not limited to nuisance, pollution or security threats (e.g. trespass). If necessary, The Contractor is to carry out detailed studies to address MINDEF's operational, safety, security and technical risk due to such dis-amenities, and put in place measures to ensure that MINDEF's infrastructure, operations, safety and security are not compromised.
- 10.1.2 The Contractor shall not affect the current access road(s) leading to MINDEF's premises (including Maju Drive). The accesses must remain unobstructed and the military operations are not to be constrained at any point in time, including during the construction period.
- 10.1.3 The Contractor is to work with Army to ensure the continuous right turns in-and-out of Maju Camp, such as the discharge of military vehicles and articulated vehicles (such as 40ft trailer) from Maju Camp via Brookvale Drive before the signalised junction outside Maju Drive is removed. Thereafter, the new access will be converted into an emergency access for Maju Camp
- 10.1.4 The Contractor is to ensure that any retaining wall constructed should not encroach on MINDEF land.
- 10.1.5 The Contractor is to avoid creating remnant or land-locked land parcels or resulting in an irregular configuration on MINDEF land.
- 10.1.6 The Contractor is to ensure that the works associated with the proposed development (whether permanent, temporary, transient or stationary), including but not limited to working area, storage, slope-cutting or retaining wall etc, should be contained within the proposed working space of approximately 0.1 ha and not further encroach into MINDEF land.
- 10.1.7 The Contractor is to relocate, replace and/or reinstate all affected facilities, infrastructure and services, which include but is not limited to MINDEF's fence and CCTVs, to an operational state and to MINDEF/DSTA's specifications at Contractor own cost before the affected ones are removed. The Contractor is to arrange a joint site recce with MINDEF/DSTA to determine the affected facilities infrastructure and services.

- 10.1.8 The Contractor is to carry out detailed studies to address MINDEF's operational, safety, security and technical risk due to such dis-amenities, and put in place measures to ensure that MINDEF's infrastructure, operations, safety and security are not compromised.
- 10.1.9 The Contractor is to ensure that all necessary measures are carried out to prevent water ponding or larvae/mosquito breeding within the site boundary and around MINDEF premises at all times. The Contractor is also to check the drainage in the area and ensure that necessary diversion etc are carried out at its own cost to prevent the above. In addition, The Contractor is to front any public feedback if the complaint is found to be due to CR16 works.
- 10.1.10 The Contractor shall be responsible to seek the necessary approval (e.g. planning clearance/permission/TOP/CSC) from the relevant authorities for the new/replacement facilities and services prior to the handing over to MINDEF. The as-built plans of the new fencing are to be made available to MINDEF upon project completion.
- 10.1.11 The Contractor shall ensure that all developments, structures and fixtures on the said Land shall not exceed the maximum height of **160m Singapore Height Datum (SHD)**. Such developments, structures and fixtures include those on the roof tops, whether permanent, temporary, transient or stationary (including but not limited to the building superstructure, TV antennae, water tanks, lift motor rooms, cranes, maintenance equipment, lightning conductors, moving objects, vegetation etc.) and all construction equipment and temporary structures (including but not limited to cranes, piling rigs, etc.) which shall all be subject to the same height limit.
- 10.1.12 Republic of Singapore Air Force's (RSAF) clearance shall be sought for the use of construction equipment and temporary structures above **120m SHD** (Email: Height_Control@defence.gov.sg). If the Contractor wish to pre-consult RSAF on the maximum allowable height for the use of construction equipment and temporary structures, The Contractor can consult RSAF with a copy of this letter. For civil aviation height and requirements, please consult the Civil Aviation Authority of Singapore ("CAAS"). The more stringent height restriction(s) from the respective agencies shall apply.
- 10.1.13 The terms and conditions to the carrying out of works on the sites are in Annex D. Before the start of the works, please liaise with Mr. Ng Tian Kok, DSTA-BI (Estates Management) at ntiankok@dsta.gov.sg (Email) and 6819 5799 (Tel). CR206 construction on the sites can commence only after MINDEF has returned the relevant lands to the State.

- 10.1.14 The Contractor shall re-consult MINDEF through DSTA early should there be any changes to the proposal, as approval from MINDEF/SAF has to be obtained; and
- 10.1.15 The Contractor is to provide the boundary in soft copy (geo-referenced to SVY21 datum) of and to peg on ground the land return that has been finalised with SLA.
- 10.1.16 All capital and operating costs or expenses incurred to meet all DSTA/MINDEF's conditions and requirements will be borne and constructed by the Contractor.
- 10.1.17 The Contractor shall consult DSTA through URA - Development Control Group when the detailed development plans are available. The Contractor is advised to consult the relevant agencies to ensure the feasibility of the proposed works and to review all planning and technical requirements of the various agencies to ensure that there are no conflicting requirements affecting MINDEF's land or resulting in further land take from MINDEF, and MINDEF's requirements will be observed. Where any such conflicts arise, the contractor may not compromise on MINDEF's requirements. Should the Contractor request for a re-consideration of the requirements imposed, the Contractor shall front and handle it and where necessary, adjust the planning parameters for the site to ensure compliance with MINDEF's requirements.

11 MINISTRY OF EDUCATION (MOE)

11.1 Preliminaries

- 11.1.1 Details/ drawings of all proposed works affecting any MOE site must be submitted for MOE School Campus Department's comments before implementation.
- 11.1.2 Possible implications of the proposed development on MOE's operations, future encumbrances or requirements such as land reserves or maintenance access imposed on the MOE as a consequence of the proposed development/ works shall be surfaced and explicated by the Contractor for MOE's concurrence. Unforeseeable implications are deemed subject to future discussion and MOE approval.
- 11.1.3 A pre-construction site condition survey is to be carried out by a certified surveyor and the report must be submitted to MOE at least 2 months before construction commences.

- 11.1.4 Before commencement of any construction works, the Contractor shall engage a qualified Professional Engineer (PE) to prepare an engineering evaluation report. The report shall incorporate the following:
- a) A visual inspection to all the buildings and ancillary facilities in the school;
 - b) An appropriate sensitivity analysis to check and assess the impact of construction work on the existing MOE buildings and compound at all stages;
 - c) The proposal for rectification works to address any expected defects resulting from the works during the course of construction. This may include specifications for remedial grouting or structural repair, settlement repairs to drains, sewer, external slabs, etc.
- 11.1.5 The Contractor is to propose measures and work with the relevant stakeholders involved to alleviate potential traffic and safety issues in the vicinity of the school.
- 11.1.6 A briefing to MOE is to be conducted by the Contractor and its relevant Consultants on the type of works that will be carried out and how MOE will be affected.
- 11.1.7 A schedule of works shall be given to MOE at least 3 months before commencement of construction. Thereafter, monthly updates on progress of works and regular checks to school buildings for e.g. cracks, soil settlement, ground upheaval, depression or cavity formations, shall be carried out. The Contractor is to seek regular feedback from MOE pertaining to the construction works.
- 11.1.8 Hoardings shall be erected to prevent unauthorized entry into MOE premises at all points and at the perimeter, if the existing perimeter fencing needs to be removed. The hoardings are to be properly finished and painted.
- 11.1.9 Adequate notices and signage shall be erected to inform MOE staff and of specific “out-of-bounds” areas. Where necessary physical barriers shall be also be provided.
- 11.1.10 Details of the Contractor’s contact person whom MOE can liaise with shall be provided to the MOE and shall be updated as and when there is a change.

- 11.1.11 If demolition is required, the Contractor is liable to pay for all costs of the new works, abortive works, holding facilities, temporary facilities, piles extraction, new pilings, underpinning etc. to enable the MOE's operation to run smoothly. This will also include any compensation cost to MOE for loss of use of facilities affected by the Contractor's works.

11.2 Construction Stage

- 11.2.1 The Contractor is to comply with the following requirements at the appropriate timelines or as necessary from time to time during the works:

- a) Provide measuring devices, including but not limited to settlement markers, building markers, crack meters and tilt meters, so as to monitor disturbance such as vibration, soil settlement or possible pollution at the affected areas/ school sites.
- b) Liaise with the MOE Managing Agent on the appropriate locations for the placement of the measuring devices. The Contractor shall submit a monthly instrumentation report to MOE. If the reading exceeds permitted levels, the Contractor must let MOE know of the remedial measures that will be taken
- c) Regularly monitor construction noise levels affecting MOE (measured at the block nearest to the works) to ensure it is kept within permitted limits as specified by National Environment Agency (NEA). MOE shall reserve the right to request for work stoppage if the noise is beyond tolerance.
- d) Regularly monitor and ensure that construction dust generated does not affect the air quality within MOE compound and this is kept within the approved levels set by NEA. In the event that the noise and dust levels exceed NEA's permitted limits or becomes intolerable/ unsuitable for conducive school operations, the Contractor shall be prepared to propose and put in any measures required to ensure that MOE can continue its operations such as install air-conditioning units to the affected blocks or enhance the room acoustic to mitigate the noise. Additional utility costs arising from the air-conditioning must be borne by the Contractor.
- e) Provide MOE with an emergency plan to address any unforeseen situation that concerns the safety of users of the buildings e.g. cracks to beams and columns, sunken road.
- f) Consult and provide MOE with a rectification schedule for making good all defects.

- 11.2.2 The Contractor is to ensure that construction activities do not impede/ disturb MOE operations. No activity that may affect MOE operations is allowed to commence without the prior approval from MOE. MOE may impose on the Contractor and its development works particular “black-out” or “down” times at any such period as required. E.g. for user safety during emergency drills, national examinations etc.
- 11.2.3 The Contractor shall take all safety precautions while work is in progress and ensure at all times that its construction activities do not pose a safety hazard to the MOE staff. MOE shall be consulted, if necessary, on any other precautions as and when required.
- 11.2.4 If any of the compound areas/ services (including perimeter fencing, underground services, etc.) is affected, reinstatement/ repair to the affected areas/ services must be carried out immediately and to the satisfaction of MOE. All defects or disrupted services arising from the construction works must be made good to its original condition. The Contractor shall provide alternative solutions or provide for temporary services if any of the works cannot be fully restored.
- 11.2.5 The Contractor must monitor and ensure that the structural integrity of the building is sound at all times and that there is no ground movement in the premises. The Contractor is to engage a PE to certify at every 25% mark of the construction stage that the school premises are structurally safe for use during construction works.
- 11.2.6 If the works have to encroach into the MOE premises during construction, the Contractor must seek approval from MOE. Separate access, segregation of works from the MOE and security personnel shall be deployed to ensure no unauthorised entry or loitering of workers within the MOE compound.
- 11.2.7 In the event of any urgent matter affecting MOE operations, the Contractor must contact the MOE Managing Agent and MOE immediately.

11.3 Post-Construction

- 11.3.1 All costs pertaining to repair works affecting the MOE beyond the construction period must be borne by the Contractor and/ or its relevant consultants/ contractors.
- 11.3.2 A final building survey and report including a rectification schedule must be submitted to MOE to provide an overview on all repair works to be executed.

- 11.3.3 All peripherals and access keys belonging to the MOE that might have been issued during the works shall be returned and handed over to MOE at completion of the works.

12 NATIONAL PARKS BOARD (NPARKS)

- 12.1 The Contractor shall review the planning and technical requirements of other agencies to ensure that they do not conflict with:
- 12.1.1 NParks' requirements as set out in the Section 12.5 and 12.6 below. Such requirements include but shall not be limited to planning and technical requirements relating to substructures (e.g. basements and services), vehicular access and drainage realignment.
- 12.1.2 The provisions of the legislation that NParks administers, especially the Parks and Trees Act, the Parks and Trees Regulations and the Wildlife Act. These may include undertaking measures as required by relevant authorities to ensure that the existing and/or future green verges within the Project area, as well as the planting areas surrounding the Project, will not be affected by any proposed commuter facilities such as cycling paths, covered linkways and pedestrian overhead bridges.
- 12.2 The Contractor is to front any feedback arising from CR206. The Contractor shall engage the relevant stakeholders e.g. Advisor, residents, etc. on the potential loss of greenery and impact to the Clementi Forest and other vegetated areas before the start of the Project. In addition, the Contractor is to come up with a comprehensive communications plan to address any feedback that might potentially arise from this Project.
- 12.3 Please note that this reply is limited to specific technical considerations under our purview and is based on the information provided to us. In the event that there are new information or circumstances arising, such as additional requirements by other agencies (e.g. road widening, additional soil investigation, grouting works, proposed access), there may be a change in our position. In such an event, you are required to re-submit the updated plans and information for our re-assessment; and is valid for a period of two (2) years from the date of this letter. If the Project is not implemented within two (2) years of the date of this letter, this reply will no longer be valid, in which event, you are required to consult NParks' Greenery and Development Planning (GDP) Branch again.

12.4 Further details of NParks' requirements can be found in the Guidelines on Greenery Provision and Tree Conservation for Developments, available on NParks website: <https://www.nparks.gov.sg/partner-us/development-plan-submission/guidelines-on-greenery-provision-and-tree-conservation-for-developments>

12.5 Section A: General Terms and Conditions

The Contractor shall adhere to all of NParks' general requirements below:

- (a) Pursuant to the Parks & Trees Act (Cap.216) read together with the Parks and Trees Regulations (Reg. 1), any tree with a girth exceeding one metre measured one metre from the ground, growing on any tree conservation area or any vacant land shall not be cut except with the prior approval of the Commissioner of Parks and Recreation.
- (b) The Contractor shall ensure that roadside trees and green verge(s) abutting the Project site are not to be affected, especially by vehicular ingress/egress, acceleration/deceleration/storage/vehicular lanes, services access, bus stops, and any structure required under statute to be erected to divert or reconstruct services or road features/elements, etc. Similarly, the Developer shall ensure that pick-up/drop-off points, taxi lay-bys, loading/unloading bays and fire engine accessways are to be located within the proposed site.
- (c) All diverted and future services are to be laid within the carriageway or within the service verge only. Should there be a need to encroach into the planting verge due to technical reasons deemed justifiable by NParks, the services would have to be recessed to at least 2.0m below ground. Any manholes or other above-ground structures are not to be installed within the planting verge. In addition, any permanent structures installed should be flushed with the ground.
- (d) There must not be any change of soil level to the roadside planting verge or areas within any Nature Reserve, ecologically sensitive areas, forested sites or vacant lands without prior approval from NParks' Greenery and Development Planning (GDP) Branch.
- (e) There must not be any widening and/or raising of existing carriageways and realignment of road kerbs and drains on abutting roads without prior approvals from the relevant authorities.
- (f) Development works are to be confined within the Project site and approved working boundaries. There must not be any illegal

dumping or storage of construction materials beyond the approved boundaries. The Project shall not encroach into the road reserve and affect any roadside table.

- (g) Please note that planting areas within adjacent developments are regulated by NParks. Therefore, any proposed works within the planting areas affecting the turf and trees / shrubs will require approval from both NParks and the respective landowner(s) prior to actual implementation on site. This also applies to the provision of planting areas and grass pavers for open air parking areas at street level within adjacent developments.
- (h) The Contractor shall consult NParks' GDP Branch early at the detailed design stage on the cutting of any trees that may be affected by the proposed development with a survey plan of the site (dated not more than 2 years from the date of this letter) and its peripheral roads, at a scale of at least 1:500, clearly indicating information of trees, such as location, species, height, and girth. All other relevant additional information such as plans on construction hoardings should also be submitted.
- (i) The Contractor is to consult NParks' GDP Branch on the tree protection criteria for all trees to be conserved during early detailed design stage.
- (j) The Contractor is to inform NParks at least 8 weeks before the commencement of works for NParks to transplant/salvage existing affected plants within the Project site and/or along affected roadside tables. As such, the Contractor would have to bear the cost of transplanting affected trees. Please factor in the time needed for transplanting works and greenery reinstatement, as well as for engaging a certified landscaping company for these works into your contract.
- (k) Please also note that any affected greenery (including planting areas within adjacent developments) would have to be reinstated to NParks' satisfaction. This includes any turfing, tree replacement, shrub planting, and its associated maintenance cost deemed necessary by NParks, which will have to be borne by the Contractor.
- (l) The Contractor is to adhere to all recommended mitigation measures stated in the Environmental Impact Assessment (EIA) reports. An Environmental Monitoring and Management Plan (EMMP), that has been accepted by NParks, is to be carried out before commencement of any works on site.
- (m) Standard roadside planting verges and service verges are to be provided for all reinstated/new roads.

- (n) 2m-wide peripheral planting verges are to be provided around station structures. Where station structures are to be amalgamated with future development, requisite green buffer is required based on the category of road that the structure is fronting.
- (o) Trellises are to be provided for all new covered linkways.
- (p) All roadside planting verges and other planting areas should have a minimum soil depth of 2m, be generally flat (according to NParks' requirements) and designed with sufficient drainage to prevent water ponding.
- (q) Green roof is to be provided on the station entrances as agreed with the Contractor. Station entrances located within or next to parks shall be fully provided (100%) with green roof. For station entrances with adequate at-grade greenery provisions around the entrances and along the roads adjacent to these entrances (including green verges and trellis plantings for the first 400m of covered linkways from MRT stations), the provision of green roof can be omitted. Please note that this agreement is specific to CRL2 station entrance rooftops only.
- (r) The Contractor is to incorporate vertical greenery for the facades of CRL2 station entrances and ancillary buildings that cannot be adequately screened by roadside or perimeter tree planting.

12.6 Section B: Other Technical Requirements

- (a) Please liaise with the respective landowners for their concurrence and requirements on the transplanting/removal/replacement of affected trees/plants including reinstatement works that are within adjacent development or areas not maintained by NParks.
- (b) Please ensure all conserved/retained trees, including trees on neighbouring or adjoining land/common boundary and roadside trees, are properly protected and shall not be affected by the Proposal.
- (c) The conservation of trees of significant value, especially mature trees may require a certified arborist's tree assessment report, depending on the proposal. Please factor in the time and cost required for such assessment.
- (d) The Contractor are to comply with the provisions of the Environmental Management and Monitoring Plan (EMMP). Please note that no works are to begin without NParks' review of the Advance Engineering Study (AES) report(s) and EMMP.
- (e) Before land clearance, the Contractor must consult the Director-

General, Wildlife Management (“Director-General”) (through the NParks Wildlife Management & Outreach Branch at nparks_mailbox@nparks.gov.sg). The Director-General will subsequently issue to the Contractor directions to carry out wildlife-related measures under Section 10 of the Wildlife Act to safeguard the health, welfare, safety of any wildlife or class of wildlife, or public health or safety in relation to wildlife or the health of the ecosystem. The Contractor is required to present the following at the consultation:

- a. Site hoarding plan with vegetation clearance staging; and
- b. Wildlife assessment plan to be prepared by a wildlife contractor to assess the presence of wildlife, and development of trapping plans (if required).

12.7 CR16 Maju Station:

- (a) The Contractor is to work with NParks on the future Park Connector along Clementi Road (southbound)
- (b) The Old Jurong Line and the tunnel under Clementi Road are not to be affected by the works.
- (c) The Contractor is to work with NParks on the reinstatement plans for the Clementi Forest affected by the works .
- (d) The Contractor is to carry out drainage measures adequately during the reinstatement of Clementi Forest to prevent water ponding.