5. WATER QUALITY IMPACT

5.1 Introduction

5.1.1 The assessment of potential water quality impact has been carried out associated with the construction and operation phases of the Project. Recommendations for mitigation measures have been provided in accordance with the criteria and methodology given in the Technical Memoranda (TMs) under the Water Pollution Control Ordinance (WPCO), and Annexes 6 and 14 in the Technical Memorandum on Environmental Impact Assessment.

5.2 Environmental Legislation, Standards and Guidelines

Environmental Impact Assessment Ordinance (EIAO)

5.2.1 The Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM) is issued by the EPD under Section 16 of the EIAO. It specifies the assessment method and criteria that need to be followed in the EIA. Reference sections in the EIAO-TM provide the details of the assessment criteria and guidelines that are relevant to the water quality impact assessment, including:

- Annex 6 Criteria for Evaluating Water Pollution
- Annex 14 Guidelines for Assessment of Water Pollution

Water Pollution Control Ordinance (WPCO)

5.2.2 The Water Pollution Control Ordinance (Cap. 358) is the major legislation relating to the protection and control of water quality in Hong Kong. According to the Ordinance and its subsidiary legislation, Hong Kong waters are divided into ten water control zones (WCZ). Corresponding statements of Water Quality Objectives (WQO) are stipulated for different water regimes (marine waters, inland waters, bathing beaches subzones, secondary contact recreation subzones and fish culture subzones) in each of the WCZ based on their beneficial uses. The assessment area for the road and junction improvement works in this Project covers Victoria Harbour (Phase 2) WCZ. The corresponding WQOs are listed in the **Table 5.1**.

Table 5.1 Summary of Water Quality Objectives for Victoria Harbour (Phase 2) WCZ

Parameters	Objectives	Sub-Zone
Offensive odour, tints	Not to be present	Whole zone
Colour	Not to exceed 50 Hazen units, due to human activity	Inland waters
Visible foam, oil scum, litter	Not to be present	Whole zone
E coli	Not to exceed 1000 per 100 mL, calculated as the geometric mean of the most recent 5 consecutive samples taken at intervals between 7 and 21 days	Inland waters
Dissolved oxygen (DO) within 2 m of the seabed	Not less than 2.0 mg/l for 90% of the sampling occasions during the whole year	Marine waters
Depth-averaged DO	Not less than 4.0 mg/l for 90% of the sampling occasions during the whole year; values should be calculated as the annual water column average (expressed normally as the arithmetic mean of at least 3 measurements at 1m below surface, mid depth and 1m above the seabed. However in water	Marine waters

Parameters	Objectives	Sub-Zone
	of a depth of 5m of less the mean shall be that of 2 measurements – 1m below surface and 1m above seabed, and in water of less than 3m the 1m below surface sample only shall apply.)	
Dissolved Oxygen (DO)	Not less than 4.0 mg/l	Inland waters
pH	To be in the range of 6.5 - 8.5, change due to human activity not to exceed 0.2	Marine waters
	Not to exceed the range of 6.0 - 9.0 due to human activity	Inland waters
Salinity	Change due to human activity not to exceed 10% of ambient	Whole zone
Temperature	Change due to human activity not to exceed 2^oC	Whole zone
Suspended solids (SS)	Not to raise the ambient level by 30% caused by human activity	Marine waters
	Annual median not to exceed 25 mg/l due to human activity	Inland waters
	Annual mean not to exceed 0.021 mg(N)/l as unionized form	Whole zone
Nutrients	Shall not cause excessive algal growth	Marine waters
	Annual mean depth-averaged inorganic nitrogen not to exceed 0.4 mg/l	
Total inorganic nitrogen (TIN)	Annual mean depth-averaged inorganic nitrogen not to exceed 0.4 mg(N)/l	Marine waters
5-Day biochemical oxygen demand (BOD_5)	Not to exceed 5 mg/l	Inland waters
Chemical Oxygen Demand (COD)	Not to exceed 30 mg/l	Inland waters
Toxic substances	Should not attain such levels as to produce significant toxic, carcinogenic, mutagenic or teratogenic effects in humans, fish or any other aquatic organisms.	Whole zone
	Human activity should not cause a risk to any beneficial use of the aquatic environment.	Whole zone

Water Supplies Department (WSD) Water Quality Criteria

5.2.3 Besides the WQOs set under the WPCO, WSD has specified a set of criteria for water quality at flushing water intakes and the details are summarised in the following table:

Table 5.2 Summary of Water Quality criteria for WSD intake

Parameter (in mg/L unless otherwise stated)	Target Limit
Colour (HU)	< 20

Parameter (in mg/L unless otherwise stated)	Target Limit
Turbidity (NTU)	< 10
Threshold Odour Number (odour unit)	< 100
Ammonia Nitrogen (NH3-N)	< 1
Suspended Solids (SS)	< 10
Dissolved Oxygen (DO)	> 2
5-day Biochemical Oxygen Demand (BOD5)	< 10
Synthetic Detergents	< 5
E.coli (count per 100mL)	< 20,000

Note: This criteria has been taken as reference when assessing water quality at flushing water intakes

Water Quality Criteria for Cooling Water Intakes

5.2.4 The Mass Transit Railway Corporation (MTRC) stipulates a limit on SS (40mg/L) at its cooling water intakes. This will be adopted for the cooling water intakes of Kowloon Station and the proposed Express Rail Link and will also be applied to the intakes of commercial buildings potentially affected this project.

Technical Memorandum on Effluent Discharge Standard

5.2.5 Besides setting the WQOs, the WPCO controls effluent discharging into the WCZs through a licensing system. Guidance on the permissible effluent discharges based on the type of receiving waters(foul sewers, stormwater drains, inland and coastal waters) is provided in the *Technical Memorandum on Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters*(TM-DSS). The limits given in the TM cover the physical, chemical and microbial quality of effluents. Any effluent discharge during the construction and operational stages should comply with the standards for effluents discharged into the inshore waters or marine waters of Victoria Harbour as given in the TM-DSS.

Practice Notes

5.2.6 A practice note (PN) for professional persons was issued by the EPD to provide environmental guidelines for the handling and disposal of construction site discharges. The Practice Note (PN) for Professional Persons on "Construction Site Drainage" (ProPECC PN 1/94) issued by EPD provides good practice guidelines for dealing with ten types of discharge from a construction site. These include surface runoff, groundwater, boring and drilling water, bentonite slurry, water for testing and sterilisation of water retaining structures and water pipes, wastewater from building constructions, acid cleaning, etching and picking wastewater, and waste water from site facilities. Practices outlined in the ProPECC PN 1/94 should be followed as far as possible during construction to minimize the water quality impact due to construction site drainage.

5.3 Proposed Assessment Area

5.3.1 In order to evaluate the construction and operational water quality impact from the Project works, the proposed assessment area would cover those existing water sensitive receivers within 300m from the Project site. **Figure 5.1** illustrates the proposed assessment area for this Project.

5.4 Identification of Water Sensitive Receivers

5.4.1 Water sensitive receivers that are potentially affected by the construction and operation of the proposed road improvement works have been identified. No inland watercourse such as river or stream has been identified in the Study Area. The water sensitive receivers are identified as follows:

- New Yau Ma Tei Typhoon Shelter (NYMTTS)
- MTRC Kowloon Station Flushing Water Intake
- West Kowloon Terminus (MTRC) Cooling Water Intake
- China H.K. City Cooling Water Intake
- Harbour City Cooling Water Intake
- Ocean Centre Cooling Water Intake
- Intake for West Kowloon Cultural District District Cooling Water System
- The Elements Water Intake
- Proposed Water Intake of Independent Cooling System for Mega Performance Venue/Exhibition Center & Hotel
- WSD Kowloon south flushing water intake
- Yau Ma Tei WSD flushing water intake
- MTRC Kowloon Station Cooling Water Intake

The locations of water sensitive receivers are shown in **Figure 5.1**. With the implementation of the mitigation measures during the construction and operation of the Project Works, water quality impacts on the water sensitive receivers are not anticipated. There are no beaches, seawater intake points, river courses and drainages around the work sites.

5.5 Assessment Methodology

5.5.1 The Study Area includes all areas within 300m from the Project boundary, and covers relevant water sensitive receivers that have a bearing on the environmental acceptability of the Project within the Victoria Harbour (Phase 2) WCZ.

Construction Water Quality Impact

5.5.2 The proposed construction methods of the elevated and at-grade roads as well as the junction works in the Project have been reviewed and potential sources of water quality impact that may arise during construction phase are described. All the identified sources of potential water quality impact were then evaluated and their impact significance determined.

Operational Water Quality Impact

5.5.3 Activities during the operation phase have been reviewed and potential sources of water quality impact are described in **Section 5.7**. This task includes identifying pollutants from point discharges and non-point sources that could affect the quality of surface water run-off.

5.5.4 The need for mitigation measures to reduce any identified adverse impact on water quality to acceptable levels was determined. The principles were to avoid, reduce and

remedy the impact. Effectiveness of the mitigation measures was assessed and any residual environmental impact, i.e. the net impact remaining after implementation of proposed mitigation measures is defined.

5.6 Existing Conditions

5.6.1 As mentioned, there is no inland watercourse such as river or stream in the Study Area. For the marine environment, the closest EPD water quality monitoring station in Victoria Harbour is VM6 as indicated in **Figure 5.2**. The summary of monitoring data at VM6 in 2010 is provided in **Table 5.3**.

Table 5.3 Baseline Marine Water Quality Condition for Victoria Harbour WCZ

Parameter		Victoria Harbour (Central)	WPCO WQO (in marine waters)
		VM6	
Temperature (^oC)		23.2 (16.64 – 27.7)	Not more than 2 ^oC in daily temperature range
Salinity		31.4 (28.8 – 33.4)	Not to cause more than 10% change
Dissolved Oxygen (DO) (mg/L)	Depth average	5.2 (3.6 – 6.5)	Not less than 4 mg/L for 90% of the samples
	Bottom	4.2 (1.9 – 5.2)	Not less than 2 mg/L for 90% of the samples
Dissolved Oxygen (DO) (% Saturation)	Depth average	73 (54 – 95)	Not Available
	Bottom	58 (28 – 76)	Not Available
pH		7.9 (7.6 – 8.2)	6.5 - 8.5 (± 0.2 from natural range)
Secchi disc Depth (m)		2.7 (1.0 – 5.2)	Not Available
Turbidity (NTU)		3.1 (1.0 – 5.5)	Not Available
Suspended Solids (SS) (mg/L)		3.5 (1.0 – 6.9)	Not more than 30% increase
5-day Biochemical Oxygen Demand (BOD_5) (mg/L)		1.0 (0.6 – 1.7)	Not Available
Ammonia Nitrogen (NH_3-N) (mg/L)		0.177 (0.109 – 0.310)	Not Available
Unionised Ammonia (UIA) (mg/L)		0.006 (0.002 – 0.018)	Not more than 0.021 mg/L for annual mean
Nitrite Nitrogen (NO_2-N) (mg/L)		0.031 (0.009 – 0.053)	Not Available
Nitrate Nitrogen (NO_3-N) (mg/L)		0.141 (0.051 – 0.27)	Not Available
Total Inorganic Nitrogen (TIN)		0.35	Not more than 0.4 mg/L for

Parameter	Victoria Harbour (Central)	WPCO WQO (in marine waters)
	VM6	
(mg/L)	(0.19 – 0.51)	annual mean
Total Kjeldahl Nitrogen (mg/L)	0.32 (0.23 – 0.47)	Not Available
Total Nitrogen (TN) (mg/L)	0.49 (0.30 – 0.67)	Not Available
Orthophosphate Phosphorus (OrthoP) (mg/L)	0.030 (0.017 – 0.048)	Not Available
Total Phosphorus (TP) (mg/L)	0.05 (0.03 – 0.06)	Not Available
Silica (as SiO_2) (mg/L)	0.91 (0.36 – 1.80)	Not Available
Chlorophyll-*a* (μg/L)	3.3 (0.3 – 15.6)	Not Available
E coli (cfu/100 mL)	4400 (550 – 13000)	Not Available
Faecal Coliforms (cfu/100 mL)	11000 (1300 – 29000)	Not Available

Notes:
1. Data source: Marine Water Quality In Hong Kong in 2010.
2. Except as specified, data presented are depth-averaged values calculated by taking the means of three depths: Surface, mid-depth, bottom.
3. Data presented are annual arithmetic means of depth-averaged results except for *E. coli* and faecal coliforms that are annual geometric means.
4. Data in brackets indicate the ranges.

Reference is made to the "Marine Water Quality in Hong Kong in 2010" on water quality at Victoria Harbour. An overall improvement of water quality has been recorded since commissioning of Harbour Area Treatment Scheme (HATS) Stage 1 in 2002. However, the improvement was mainly observed in the eastern Victoria Harbour while the western harbour area was still affected by the elevated E.coli bacteria comparing with those before HATS. On the other hand, compliance has been achieved for dissolved oxygen (DO) (bottom), dissolved oxygen (depth-average) total inorganic nitrogen (TIN), and unionised ammonia (UIA) at VM6.

The summary of monitoring data at Yau Ma Tei Salt Water Pumping Station, location as indicated in **Figure 5.2**, in December 2012 is also provided in **Table 5.4**.

Table 5.4 Marine Water Quality Condition for Yau Ma Tei Salt Water Pumping Station

Parameter	Yau Ma Tei Salt Water Pumping Station
Temperature	21.2 ^{o}C
Odour	NO ODOUR
Colour	<3 Hazen

Parameter	Yau Ma Tei Salt Water Pumping Station
pH value at 25 ^{o}C	7.9
Turbidity	2.3 NTU
Conductivity at 25 ^{o}C	50100 μS/cm
Ammoniacal Nitrogen	0.26 mg/L
Chloride (Cl)	17600 mg/L
Biochemical Oxygen Demand (BOD_5)	<2.0 mg/L
Dissolved Oxygen	5.1 mg/L
Coliform	6200 cfu/100mL
E. coli	6200 cfu/100mL
HPC (24 hrs at 37 ^{o}C)	150 cfu/mL

5.7 Identification of Potential Impact

Construction Phase Water Quality Impact Assessment

5.7.1 Potential sources of water quality impact associated with the construction of the proposed road improvement works include general construction activities, construction site run-off and drainage, accidental spillage, sewage effluent from construction workforce and excavation activities.

General Construction Activities

5.7.2 The land-based construction works could have the potential to cause water pollution. Various types of construction activities may generate wastewater. These include general cleaning and polishing, wheel washing, dust suppression and utility installation. These types of wastewater would contain a high concentration of suspended solids (SS). If uncontrolled, these effluents could lead to deterioration in water quality.

Construction Site Run-off

5.7.3 Construction site run-off would cause potential water quality impact. Potential pollution sources of site run-off may include:

- Run-off and erosion of exposed bare soil and earth, drainage channel and earth working area.
- Release of any bentonite slurries, concrete washings and other grouting materials with construction run-off, storm water or ground water dewatering process.
- Wash water from dust suppression sprays and wheel washing facilities.
- Fuel, oil and lubricants from maintenance of construction vehicles and equipment.
- Apart from wash water from dust suppression sprays, the other source has only negligible contribution to the site run-off. For the contribution of water spray, about 10% of wash water from dust suppression sprays will become site run-off. From Chapter 3, spray intensity of 0.13L/m^2 will be applied once per hour. With the site area of approximate 10,000m^2, the site run-off is about 3.1m3/day.

5.7.4 During rainstorms, site run-off would wash away the soil particles on unpaved lands and areas with the topsoil exposed. The run-off is generally characterized by a high concentration of SS. Release of uncontrolled site run-off would increase the SS levels

and turbidity in the nearby water environment. Site run-off may also wash away contaminated soil particles and therefore cause water pollution.

With the site area of approximate 10,000m^2, the design year of 1 in 100 and the duration of 10 minutes, the estimated peak site run-off during storm is about 0.17m^3/s.

Wind blown dust would be generated from exposed soil surfaces in the works areas. It is possible that wind blown dust would fall directly onto the nearby water bodies when a strong wind occurs. Dispersion of dust within the works areas may increase the SS levels in surface run-off causing a potential impact to the nearby sensitive receivers.

Accidental Spillage

5.7.5 A large variety of chemicals may be used during construction activities. These chemicals may include petroleum products, surplus adhesives, spent lubrication oil, grease and mineral oil, spent acid and alkaline solutions/solvent and other chemicals. Accidental spillage of chemicals in the works areas may contaminate the surface soils. The contaminated soil particles may be washed away by construction site run-off or stormwater drainage which in turn causes water pollution.

Sewage Effluent from Construction Workforce

5.7.6 During the construction of the Project, the workforce on site will contribute to the local population of the area, although the number of workers will vary over the construction period. Potential impact may arise from wastewater generated from eating areas, temporary sanitary facilities and waste disposal areas.

With the assumption of about 150 workers on site and each workers will generate 0.06m3/day/workers of wastewater (in accordance with Sewerage Manual by DSD), the wastewater generation is about 9m^3/day.

5.7.7 The above potential sources of water quality impact could affect the water quality at the identified WSRs in terms of elevated Turbidity, BOD, NH 3-N and E. coli and depletion in DO level. From the salt water quality data monitored by WSD at Yau Ma Tei Salt Water Pumping Station, the Turbidity (2.3 NTU), BOD (< 2.0 mg/L), NH 3-N (0.26 mg/L) and E.coli (6200 cfu/100ml) in the vicinity of the WSRs were well below and the DO (5.1 mg/L depth averaged) was well above relevant criteria (Criteria for Turbidity, BOD, NH 3-H, E. Coli and DO are 10 mg/L, 10 mg/L, 1 mg/L, 20000 cfu/100ml and 2 mg/L respectively for flushing water intakes). **Table 5.5** Illustrate the situation clearly.

Table 5.5 Comparison of Monitored Salt Water Quality Data against WSD Criteria

	Yau Ma Tei Salt Water Pumping Station, monitored by WSD	**Criteria of WSD flushing water intakes**
Colour (HU)	< 3	< 20
Turbidity (NTU)	2.3	< 10
Threshold Odour Number (odour unit)	No odour	< 100
Ammonia Nitrogen (NH3-N) (mg/L)	0.26	< 1
Dissolved Oxygen (DO) (mg/L)	5.1	> 2
5-day Biochemical Oxygen Demand	< 2.0	< 10

	Yau Ma Tei Salt Water Pumping Station, monitored by WSD	Criteria of WSD flushing water intakes
(BOD5) (mg/L)		
E.coli (count per 100mL)	6200	< 20,000

5.7.8 Water quality impacts from the land-based construction works will be controlled to comply with the standards of Water Pollution Control Ordinance by implementing the recommended mitigation measures. All the effluents and runoff generated from the works areas will be treated so as to comply with discharge standards listed in the Technical Memorandum on Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters and the discharge license under Water Pollution Control Ordinance. No unacceptable water quality impacts are expected from the land-based construction activities.

Consider the relatively small quantity of potential discharges above and the seawater flushing capability, it is anticipated that the water quality parameters at the WSRs will not be largely varied and compliance will still be achieved.

Nevertheless, mitigation measures are proposed to minimise pollutant discharge related to the road construction works. Details of which are provided in **Section 5.8**.

Cumulative Impact from Concurrent Projects

5.7.9 The concurrent projects are listed in **Section 2.4**. No adverse cumulative water quality impact is anticipated provided that the mitigation measures recommended in **Section 5.8** will be properly implemented and that water quality impact will be controlled in the concurrent projects.

Operation Phase Water Quality Impact Assessment

5.7.10 The only source of operational phase water quality impact would be from surface runoff. The runoff may contain grit, oil and debris from the road users including vehicles and pedestrians. Since road drainage system design has already included silt traps in the gully inlets to remove silt and grit before the runoff enters the public storm water drainage system, it is expected that the impact on water quality will be minimal. No further mitigation measure is therefore required.

With the area of the new roads of approximate 8,000m2, the peak surface run-off during storm is about 0.6m^3/s based on the design year of 1 in 200 and 10 minutes duration.

5.8 Recommended Water Quality Mitigation Measures

Construction Phase

General Construction Activities

Boring and Drilling Water

5.8.1 Water used in ground boring and drilling for site investigation or rock / soil anchoring should as far as practicable be re-circulated after sedimentation. When there is a need for final disposal, the wastewater should be discharged into storm drains via silt removal facilities.

Wheel Washing Water

5.8.2 All vehicles and plant should be cleaned before they leave a construction site to minimize the deposition of earth, mud, debris on roads. A wheel washing bay should be provided at every site exit if practicable and wash-water should have sand and silt settled out or removed before discharging into storm drains. The section of construction road between the wheel washing bay and the public road should be paved with backfall to reduce vehicle tracking of soil and to prevent site run-off from entering public road drains.

Construction Site Run-off

5.8.3 The site practices outlined in ProPECC PN 1/94 "Construction Site Drainage" should be followed as far as practicable to minimise surface run-off and the chance of erosion. The following measures are recommended to protect water quality and sensitive uses of the coastal area, and when properly implemented should be sufficient to adequately control site discharges so as to avoid water quality impact:

5.8.4 Surface run-off from construction sites should be discharged into storm drains via adequately designed sand/silt removal facilities such as sand traps, silt traps and sedimentation basins. Channels or earth bunds or sand bag barriers should be provided on site to properly direct stormwater to such silt removal facilities. Perimeter channels at site boundaries should be provided on site boundaries where necessary to intercept storm run-off from outside the site so that it will not wash across the site. Catchpits and perimeter channels should be constructed in advance of site formation works and earthworks.

5.8.5 Silt removal facilities, channels and manholes should be maintained and the deposited silt and grit should be removed regularly, at the onset of and after each rainstorm to prevent local flooding. Any practical options for the diversion and re-alignment of drainage should comply with both engineering and environmental requirements in order to provide adequate hydraulic capacity of all drains. Minimum distance of 100m should be maintained between the discharge points of construction site run-off and the existing saltwater intakes. No effluent will be discharged into typhoon shelter.

5.8.6 Construction works should be programmed to minimize soil excavation works in rainy seasons (April to September). If excavation in soil cannot be avoided in these months or at any time of year when rainstorms are likely, for the purpose of preventing soil erosion, temporary exposed slope surfaces should be covered e.g. by tarpaulin, and temporary access roads should be protected by crushed stone or gravel, as excavation proceeds. Intercepting channels should be provided (e.g. along the crest / edge of excavation) to prevent storm runoff from washing across exposed soil surfaces.

Arrangements should always be in place in such a way that adequate surface protection measures can be safely carried out well before the arrival of a rainstorm.

5.8.7 Earthworks final surfaces should be well compacted and the subsequent permanent work or surface protection should be carried out immediately after the final surfaces are formed to prevent erosion caused by rainstorms. Appropriate drainage like intercepting channels should be provided where necessary.

5.8.8 Measures should be taken to minimize the ingress of rainwater into trenches. If excavation of trenches in wet seasons is necessary, they should be dug and backfilled in short sections. Rainwater pumped out from trenches or foundation excavations should be discharged into storm drains via silt removal facilities.

5.8.9 Construction materials (e.g. aggregates, sand and fill material) on sites should be covered with tarpaulin or similar fabric during rainstorms.

5.8.10 Manholes (including newly constructed ones) should always be adequately covered and temporarily sealed so as to prevent silt, construction materials or debris from getting into the drainage system, and to prevent storm run-off from getting into foul sewers. Discharge of surface run-off into foul sewers must always be prevented in order not to unduly overload the foul sewerage system.

5.8.11 Good site practices should be adopted to remove rubbish and litter from construction sites so as to prevent the rubbish and litter from spreading from the site area. It is recommended to clean the construction sites on a regular basis.

Effluent Discharge

5.8.12 There is a need to apply to EPD for a discharge licence for discharge of effluent from the construction site under the WPCO. The discharge quality must meet the requirements specified in the discharge licence. All the runoff and wastewater generated from the works areas should be treated so that it satisfies all the standards listed in the TM-DSS. Minimum distances of 100 m should be maintained between the discharge points of construction site effluent and the existing seawater intakes and no effluent will be discharged into typhoon shelter. The beneficial uses of the treated effluent for other on-site activities such as dust suppression, wheel washing and general cleaning etc., can minimise water consumption and reduce the effluent discharge volume. If monitoring of the treated effluent quality from the works areas is required during the construction phase of the Project, the monitoring should be carried out in accordance with the relevant WPCO licence which is under the ambit of regional office (RO) of EPD.

Accidental Spillage

5.8.13 Contractor must register as a chemical waste producer if chemical wastes would be produced from the construction activities. The Waste Disposal Ordinance (Cap 354) and its subsidiary regulations in particular the Waste Disposal (Chemical Waste) (General) Regulation should be observed and complied with for control of chemical wastes.

5.8.14 Any service shop and maintenance facility should be located on hard standings within a bounded area with sumps and oil interceptors being provided. Maintenance of vehicles and equipment involving activities with potential for leakage and spillage should only be undertaken within the areas appropriately equipped to control these discharges.

5.8.15 Disposal of chemical wastes should be carried out in compliance with the Waste Disposal Ordinance. The *Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes* published under the Waste Disposal Ordinance details the requirements to deal with chemical wastes. General requirements are given as follows:

- Suitable containers should be used to hold the chemical wastes to avoid leakage or spillage during storage, handling and transport.
- Chemical waste containers should be suitably labelled, to notify and warn the personnel who are handling the wastes, to avoid accidents.
- Storage area should be selected at a safe location on site and adequate space should be allocated to the storage area.

Sewage Effluent from Construction Workforce

5.8.16 The construction workforce on site will generate sewage. It is recommended to provide sufficient chemical toilets in the works areas. A licensed waste collector should be deployed to clean the chemical toilets on a regular basis.

Notices should be posted at conspicuous locations to remind the workers not to discharge any sewage or wastewater into the surrounding environment. Regular environmental audit of the construction site will provide an effective control of any malpractices and can encourage continual improvement of environmental performance on site. It is anticipated that sewage generation during the construction phase of the project would not cause water pollution problem after undertaking all required measures.

Disposal of Excavated Sediment

5.8.17 No dredging of marine sediment will be carried out under this Project. It is proposed to adopt marine disposal of the sediment excavated from the piling works for the viaducts (please see Section 6 below for further details). The contractor shall obtain valid marine dumping permit issued by the Director of Environmental Protection under the Dumping At Sea Ordinance (DASO) for the operation of marine disposal of the sediment. There will be no operation of barging point. During transportation and disposal of the excavated marine sediment, the following measures should be taken to minimise potential impacts on water quality.

- The bottom of all barges should be sealed tightly to prevent leakage of materials during transport;
- Barges or hoppers should not be filled to a level that will cause overflow of materials during loading or transportation;
- All vessels should be sized so that adequate clearance is maintained between vessels and the seabed in all tidal conditions, to ensure that undue turbidity is not generated by turbulence from vessel movement or propeller wash;
- Loading of barges and hoppers should be controlled to avoid splashing of material into the water around.
- Transport barges or vessels shall be equipped with automatic recording equipment as specified by the Environmental Protection Department.

- Mitigation measures for land-based activities as outlined in **Section 5.7** should be applied to minimize water quality impacts from site runoff and excavated surfaces where appropriate.

Operation Phase

5.8.18 A surface water drainage system will be provided to collect road runoff. The following measures are recommended to ensure road runoff will comply with the standards stipulated in the TM for discharges into storm water drains:

- The road drainage should be directed through silt traps in the gully inlets to remove silt and grit before entering the public storm water drainage system;
- The design capacity of silt traps should be sufficient to cater for treating all the surface water; and
- The silt traps should be regularly cleaned and maintained in good working condition. In particular adequate cleaning of silt traps should be carried out to ensure all of them are in good service condition

Evaluation of Residual Impact

5.8.19 With the full implementation of the recommended mitigation measures for the construction and operation phases of the proposed Project, no residual impact on water quality are anticipated.

5.8.20 During construction and operation of the Project, change of hydrology, flow regime and ground water levels is not anticipated. In addition, the Project will not cause significant adverse impact on sediment erosion or deposition and water and sediment quality.

Environmental Monitoring and Audit Requirements

5.8.21 No adverse water quality impact would be expected during the construction and operation of the Project, provided the recommended mitigation measures are properly implemented. Water quality monitoring is therefore not considered necessary. However, it is recommended that regular site inspections during the construction phase should be undertaken to inspect the construction activities and works areas in order to ensure the recommended mitigation measures are properly implemented.

5.9 Conclusion

Construction Phase

5.9.1 The key issue from the land-based construction activities would be the potential for release of wastewater from surface works areas and open cut excavation. Minimisation of water quality deterioration could be achieved through implementing adequate mitigation measures. Regular site inspections should be undertaken routinely to inspect the construction activities and works areas in order to ensure the recommended mitigation measures are properly implemented.

Operation Phase

5.9.2 The only source of potential impact on water quality during the operation phase will be runoff from the road surfaces. It is anticipated that the water quality impact associated with the operation phase would be minimal and acceptable, provided that the recommended mitigated measures for the surface water drainage system are properly implemented.