土木工程拓展署
Civil Engineering and Development Department

Agreement No. CE 72/2019 (EP) Contaminated Sediment Disposal Facility at West of Lamma Island - Investigation

Method Statement for Water Quality Modelling Assessment

Project No.: 0567994

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1. INTRODUCTION

1.1 Background

Since 1992, the Civil Engineering and Development Department (CEDD) of the Hong Kong Special Administrative Region (HKSAR) Government has been managing a number of contaminated sediment disposal facilities in the Hong Kong waters, including the contaminated mud pits (CMPs) to the east of Sha Chau (ESC) and the south of The Brothers (SB). These facilities consist of some series of seabed pits, formed by the removal of existing marine sediments, for disposal of contaminated dredged/ excavated sediment generated from works within Hong Kong. According to the latest estimate, the total remaining capacity of the existing disposal facilities at ESC can only cope with the demand up to 2027 for the disposal of contaminated sediment generated from routine harbour / channel / river maintenance dredging works and future projects. A new sediment disposal facility has to be planned for in order to meet the sediment disposal demand after 2027 arising from routine harbour / channel / river maintenance dredging works and other projects.

To address the sediment disposal requirements upon the exhaustion of the existing CMPs, CEDD commissioned a preliminary study to assess the potential sites suitable for development into future CMPs. The study has identified that a portion of the seabed in the West Lamma Channel, between Cheung Chau and Lamma Island, will have good potential for development into a new contaminated sediment disposal facility ("the Project").

The Project covers a new marine contaminated sediment disposal facility involving marine dumping and dredging operation (with quantity more than 500,000 m^3). In accordance with Items C.10 and C.12, Part I of Schedule 2 under the Environmental Impact Assessment Ordinance (EIAO), the Project is classified as a designated project and therefore a statutory environmental impact assessment (EIA) is required. In accordance with the requirements of Section 5(1) of the EIAO, application for EIA study brief with the Project Profile for the New Contaminated Sediment Disposal Facility to the West of Lamma Island (No. PP-594/2019) was submitted to the Environmental Protection Department (EPD) on 9 December 2019. The EIA Study Brief of the Project (No. ESB-328/2019) were then issued by EPD on 20 January 2020. The Study Area is indicatively shown in ***Figure 1.1***.

A desktop review of baseline information has been conducted to identify the key constraints in developing CMPs within the Study Area. The key area identified for potential CMP development under the Project is presented in ***Figure 1.2***.

1.2 Objectives and Scopes of this Method Statement

This Method Statement presents information on the approach for numerical modelling and assessment works for water quality and hydrodynamic aspects of the EIA. It is important to note that at the time of writing this Method Statement, the detailed engineering information for both construction and operation activities is yet to be confirmed and therefore the modelling works are proposed to be carried out with relevant assumptions provided as appropriate.

The methodology has been based on the following three focus areas:

- Model selection;
- Input data; and
- Assessment scenarios.

1.3 Structure of this Method Statement

Following this introductory section, the remainder of this *Method Statement* is arranged as follows:

- *Section 2* presents the potential sources of water quality impacts;
- *Section 3* presents the assessment approaches and considerations for modelling assessment;

- *Section 4* presents the water quality sensitive receivers identified for assessment under this Project;
- *Section 5* presents the appropriate water quality assessment criteria;
- *Section 6* discusses the various concurrent projects that may have potential interfaces with this Project and should be considered for modelling assessment; and
- *Section 7* summarizes the modelling scenarios to be covered in the EIA Study.

Figure 1.1 Indicative Study Area for the Contaminated Sediment Disposal Facility at West of Lamma Island (WL Facility)

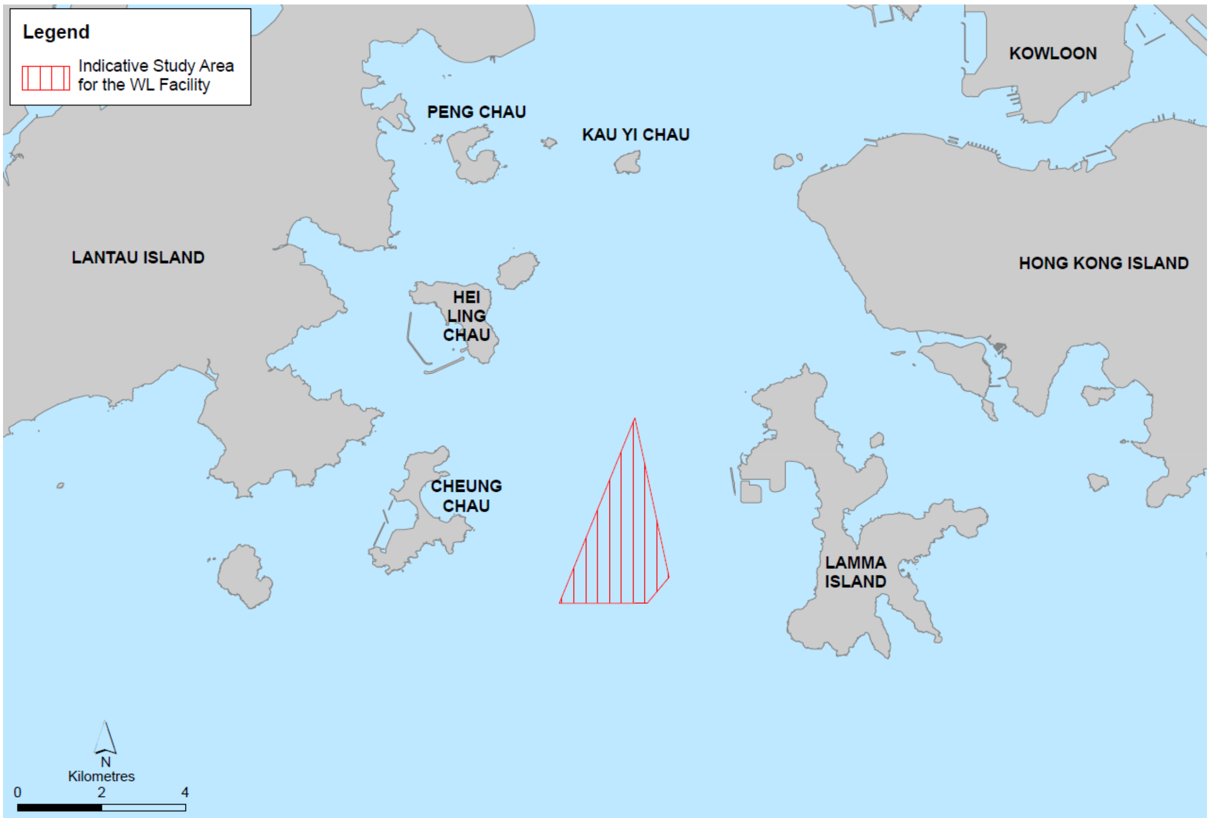
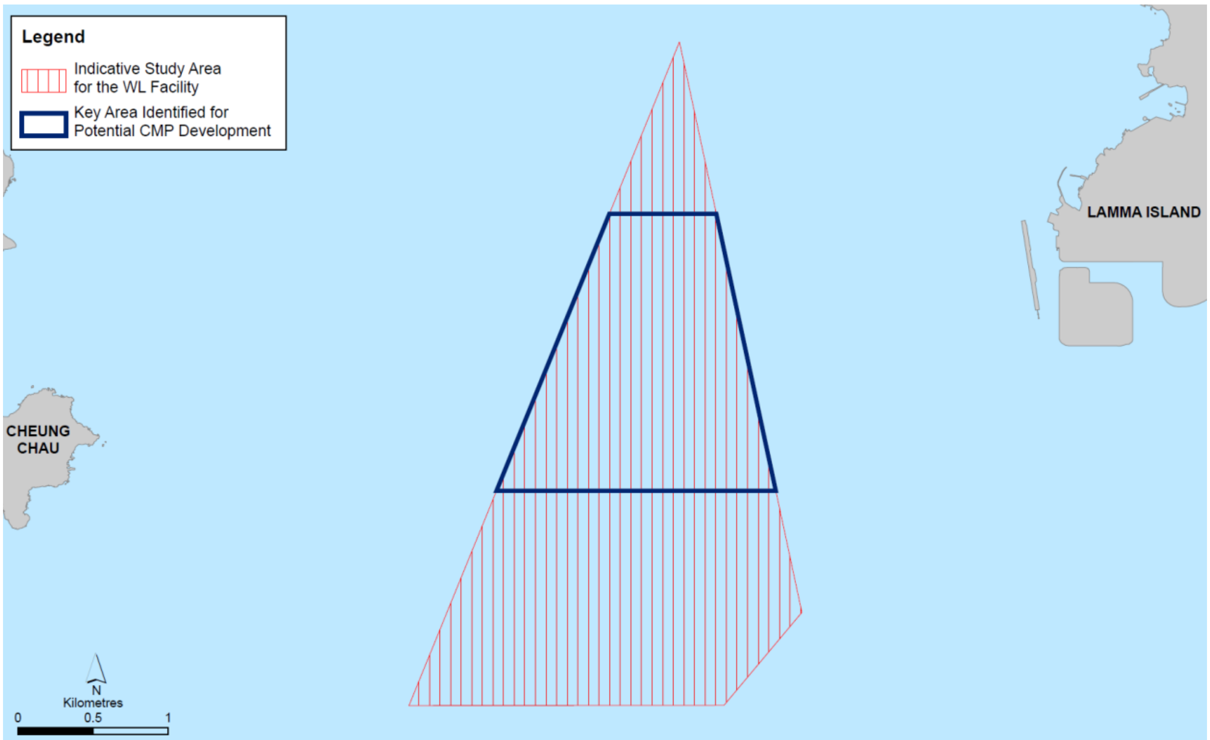


Figure 1.2 Key Area Identified for Potential CMP Development



2. KEY ISSUES FOR MODELLING

As stated in Clause 3.2.1(ii) of the Study Brief, the water quality impact assessment of this Project shall cover the issues listed below in ***Table 2.1***.

Table 2.1 Key Water Quality Issues Listed under Clause 3.2.1(ii) of the Study Brief

#	Potential Issue	Proposed Approach for this Assessment
	Construction Phase	
C1	Construction of the Project (i.e. dredging) (Sediment dispersion, associated dissolved oxygen depletion and release of contaminants from dredging)	Quantitative, Delft3D WAQ
C2	Construction of the Project (Generation of wastewater, sewage from workforce, etc.)	Qualitative (Preventive measures, effluent control and good site practice)
	Operation Phase	
O1	Operation of the Project (i.e. backfilling and capping) (Sediment dispersion, associated dissolved oxygen depletion and release of contaminants for backfilling and capping)	Quantitative, Delft3D WAQ
O2	Operation of the Project (Change in flow regime)	Quantitative, Delft3D FLOW

As shown in ***Table 2.1***, some of the potential water quality impacts, such as those associated with construction of the CMPs and disposal of sediment at the proposed CMPs, require quantitative assessment with the aid of computational modelling tools. On the other hand, some potential sources of water quality impacts are expected to be minimal based on preliminary design, with or without control measures. These potential sources of water quality impacts would be assessed qualitatively, with due consideration of built-in design control, good site practices and other control measures. As this Method Statement presents information on the approach for numerical modelling and assessment works for the EIA study, the potential sources of water quality impacts requiring only qualitative assessment are not further discussed in this Method Statement but the details will be discussed in the EIA study.

3. ASSESSMENT APPROACH AND MODELLING CONSIDERATIONS

3.1 Study Area

The CMPs are proposed to be constructed to the west of Lamma Island within the Southern Water Control Zone (WCZ) under the *Water Pollution Control Ordinance (Cap. 358)*. According to Clause 3.4.3.2 of the *EIA Study Brief*, the Assessment Area for the water quality impact assessment shall cover the Southern WCZ and Western Buffer WCZ as designated under *the Water Pollution Control Ordinance* (*Cap. 358*). For this Study, water quality impacts associated with the construction and operation of the proposed CMPs are expected to be confined within a few km from the Project boundary, beyond which changes in water quality are not expected to be significant. Water sensitive receivers (further discussed in ***Section 4*** below) within the Assessment Area would be identified and assessed in the EIA.

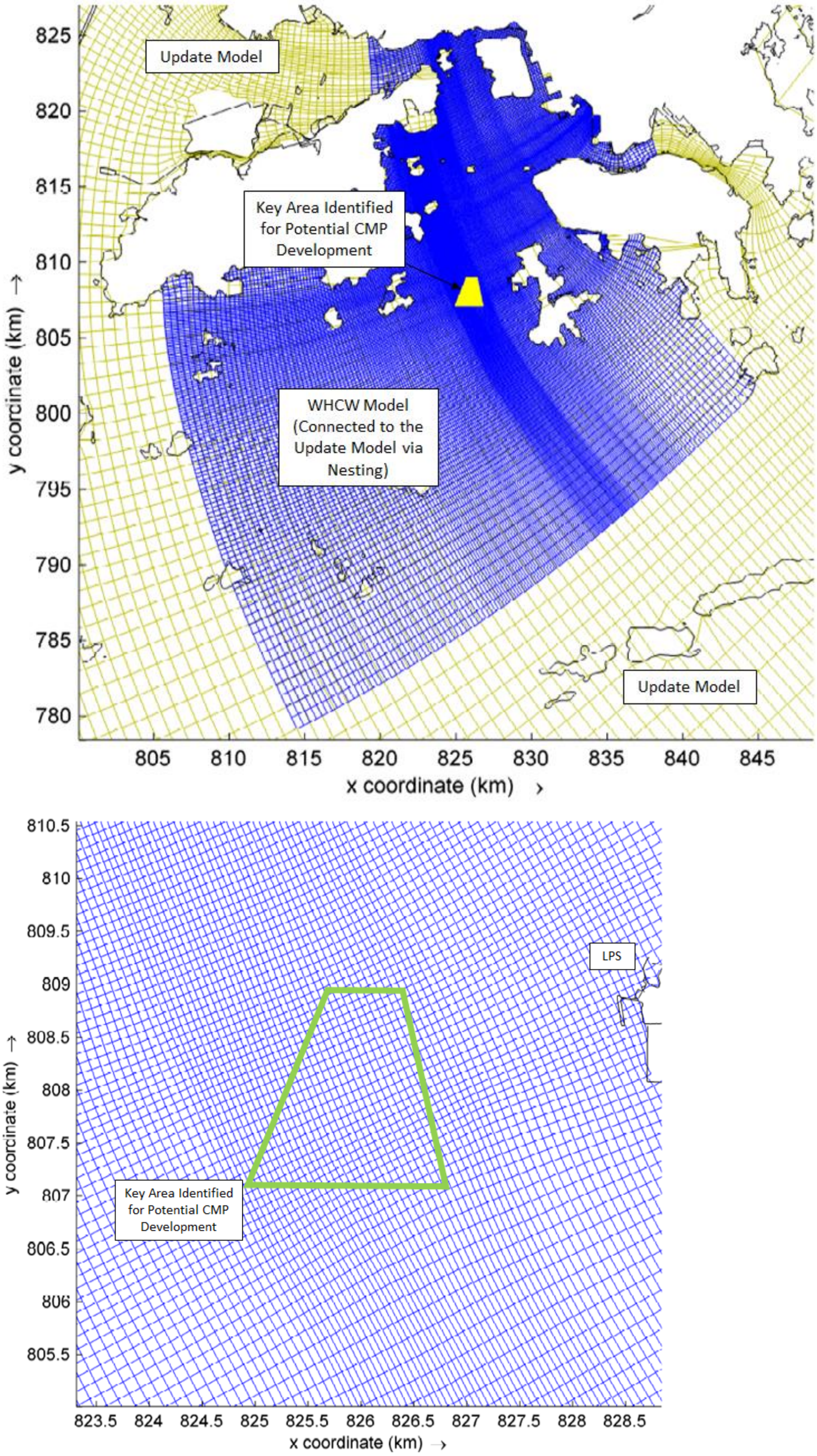
3.2 Model Selection

The Delft3D suite of models will be utilized to provide a modelling platform for hydrodynamic and water quality modelling. A Delft3D model (“WHCW model”) covering marine waters of at least 7 km from the Project boundary has been developed in a previous preliminary study (1) (referred as the Feasibility Study hereafter) for developing the proposed CMPs. The WHCW model was developed based on the Update Model developed under the *Update on Cumulative Water Quality and Hydrological Effect of Coastal Developments and Upgrading of Assessment Tool (Agreement No. CE 42/97)*. The modelling performance of the WHCW model was verified against the prediction by the Update Model in the Feasibility Study and was found to be acceptable. Further model verification would be performed for this Study after the expansion of model coverage.

For this EIA Study, the model coverage has been further extended to the South and the West of the Project Site to provide additional coverage for water sensitive receivers in the southern waters of HK. The extent and coverage of the WHCW model is shown in ***Figure 3.1***. The WHCW model has high resolution (< 75 m) at the Project site. The resolution progressively reduces outwards. The resolution at the southern boundary is slightly above 200 m and that at other open boundary is around 150 m. The WHCW model is vertically divided into 10 sigma layers.

(1) Agreement No. CE 23/2012 (EP) – Additional Service No. 3: Feasibility Study of two Potential Contained Aquatic Disposal Sites in the Southern Waters of Hong Kong. CEDD

Figure 3.1 Extent of the WHCW Model (shown in blue) and its interfaces with the Update Model (shown in green) (Top: Overview; Bottom: Close-up to the Key Area)



3.3 Coastline Configurations & Bathymetry

The latest coastline configuration of 2020/2021 will be adopted in model simulations of the potential impact from Project construction and operation in this EIA Study. Changes in coastline and bathymetry configuration due to future reclamation and other development activities will be reflected in the model setup of the relevant time horizons. The coastline to be adopted in the WHCW model is shown in ***Figure 3.2***. The changes in coastline and bathymetry configuration include the effects from the following development projects:

- Improvement Dredging for Lamma Power Station Navigation Channel (AEIAR-212/2017);
- Providing Sufficient Water Depth for Kwai Tsing Container Basin and its Approach Channel (AEIAR-156/2010); and
- Artificial Islands in the Central Waters.

The potential coastline from the artificial islands in the Central Waters based on the draft outline from information available in the public domain (2) would be taken into account in the operation phase hydrodynamic model. The latest bathymetry data obtained in April 2021 from the Hydrographic Office of the Marine Department is adopted in the WHCW model as shown in ***Figure 3.3***.

(2) https://www.lantau.gov.hk/filemanager/content/news-and-publications/p19-05e.pdf

Figure 3.2 Coastline Configuration to be Adopted in the WHCW Model

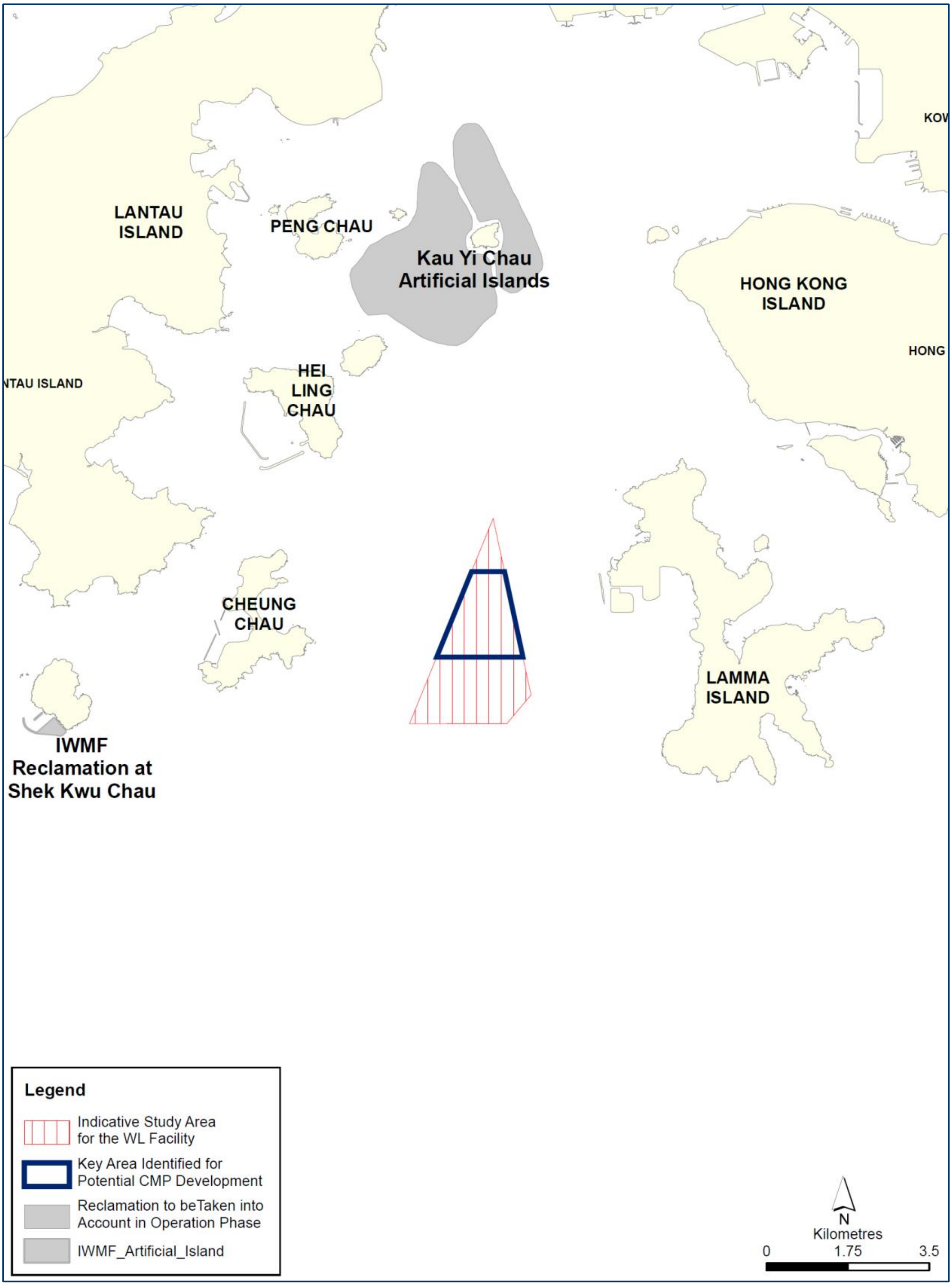
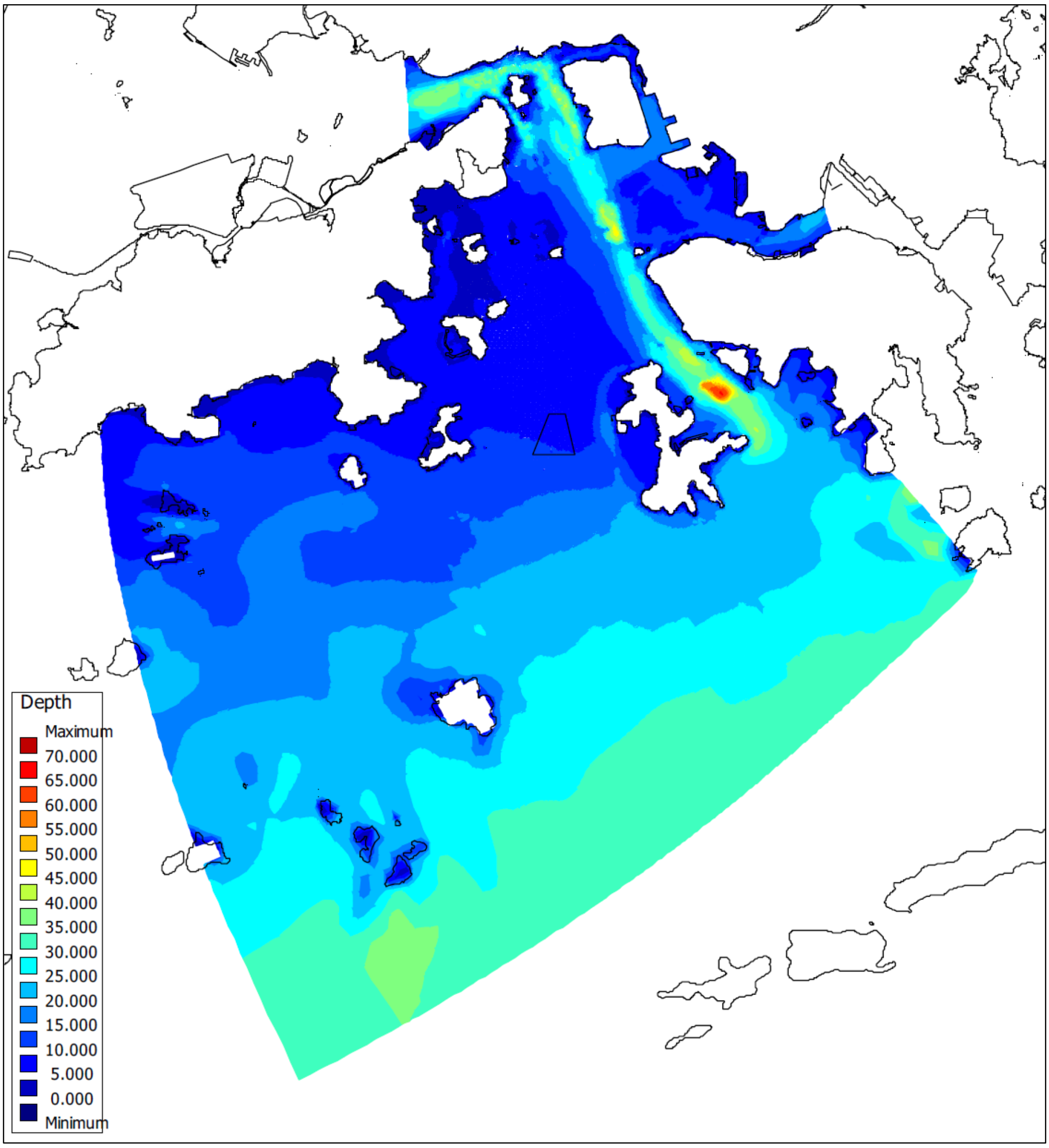


Figure 3.3 Bathymetry Data used for this Study



3.4 Boundary Conditions

The boundary conditions of the WHCW model are provided by the Update Model via nesting. This means all major influences on hydrodynamics, including major river discharges, in the outer regions are taken into account.

3.5 Ambient Environmental Conditions – Background Temperature and Wind

The ambient environmental conditions are closely linked to the processes of hydrodynamic changes. The wind conditions applied in the hydrodynamic simulation are 5 m/s NE for dry season and 5 m/s SW for the wet season. The same average wind speed and direction were adopted in the Update Model. Ambient air temperature, water temperature at open boundary as well as all discharges in the model was set to be 19 ºC for dry season. In wet season, air temperature and all discharge in the model was set to be 30 ºC, while water temperature at open boundary was set to be 30 ºC at surface and 22 ºC near bottom.

The hydrodynamic model has included fresh water inflows from all Pearl River outlets covered in the Update Model and the effect would be transmitted to the WHCW model through nesting. The salinity of the river outflows was assumed to be 0.1 ‰ in the Update Model and the temperatures in the dry and wet seasons were attributed to be 19 ºC and 30 ºC, respectively.

3.6 Model Validation

Model prediction in terms of water level, current (eastward velocity, northward velocity, current magnitude and direction), salinity and temperature by both models (Update Model and WHCW Model) at 5 selected locations within the model domain of the WHCW Model were compared against each other. This is to ensure the WHCW Model, derived from the Update Model, is able to reproduce the prediction by the Update Model, which is validated separately and accepted for past EIAs. Time series plots for predictions for water level, various aspects of current, salinity and temperature are provided in ***Appendix A***. As shown, the root mean square error percentages (RMSE%) for water level prediction are below 2% at all five observations points in the model domain of the WHCW model in both seasons, with negligible phase error at high water and low water. Eastward velocity, northward velocity, current magnitude and direction predicted by the WHCW Model match pretty well with the prediction by the Update Model in term of phasing and direction. Predicted salinity and temperature also match well with the predictions by the Update Model, with RMSE of <1.5 ppt and <0.5°C respectively.

3.7 Simulation Periods

To ensure settings of the initial conditions will not affect the outcomes of the modelling exercise, modelling spin-up has been included in the model. As shown in ***Table 3.1***, for each model, at least two 15 days (i.e. length of a typical spring-neap cycle in Hong Kong) of spin-up periods would be provided. The conditions after the two 15 days spin-up periods would be adopted as the initial condition of another 30-day model run, which comprises of a 15-day warm-up (to dissipate any remnant of model restart) and 15-day actual run.

Table 3.1 Model Simulation Periods

Season	Spin Up	Model Start Time	Model End Time
Wet	30-days spin-up + 2020/07/01 00:00:00 – 2020/07/16 00:00:00	2020/07/16 00:00:00	2020/07/31 00:00:00
Dry	30-days spin-up + 2020/01/01 00:00:00 – 2020/01/16 00:00:00	2020/01/16 00:00:00	2020/01/31 00:00:00

3.8 Sediment Dispersion Modelling

At the time of preparing this Method Statement, the detailed planning for the locations and phasing of the CMPs within the key area for potential CMP development is being developed. Based on past experience with CMP operation, it is expected the worst case scenario for sediment dispersion modelling would involve concurrent dredging, backfilling as well as capping at three CMPs. While the sequence of construction and operation of CMPs is not determined at this stage, for the purpose of water quality modelling of worst case scenario, it is conservatively assumed the most contaminating activity (backfilling) would be conducted at the northern CMP, followed by the second contaminating activity (dredging) at the middle CMP, and the least contaminating activity (capping) at the southern CMP.

Given the layout design of the CMPs is yet to be available, it is conservatively assumed that the sediment sources from the three CMPs for dredging, backfilling and capping would be aligned near the eastern edge of the key area for potential CMP development as shown in ***Figure 3.1*** to conservatively assess the potential maximum cumulative impacts taking into account nearby concurrent projects (further explained in ***Section 6***). It is conservatively assumed the least contaminating activity (i.e. capping, which is done with clean sediment and therefore no contaminant release) would occur at the southernmost CMP so any released contaminants from dredging and backfilling would have the longest retention time within HK waters. Also, the sediment sources are assumed to be close to the eastern edge of the CMPs to assess the worst case impact towards the nearest WSRs at Lamma Island. Based on this arrangement, it is assumed the southernmost CMP would be used first, followed by the northernmost CMP, then the middle CMP. As such, the worst case scenario would assume backfilling at the northernmost CMP, dredging at the middle CMP and capping at the southernmost CMP to be conducted concurrently.

For dredging at the middle CMP, either one trailing suction hopper dredger (TSHD) with a working rate of 256,200 m^3/week or two grab dredgers with a total working rate of 100,000 m^3/week would be deployed. The sediment source(s) is assumed to be located close to the eastern edge of the key area for potential CMP development.

Based on the typical arrangement of the existing CMP, disposal barges are typically instructed to dispose of sediments within the CMP area and located at least 100 m away from the CMP boundaries. The backfilling at the northernmost CMP is assumed to be located at 100 m away from the boundary around the middle of the east edge of the key area. Disposal rate is assumed to be 26,700 m^3/day following the current disposal practice for the existing CMPs at East of Sha Chau and the South of the Brothers, and it is subject to changes based on the findings of the water quality modelling exercise under this EIA Study.

For capping at the southernmost CMP, hopper barges (bottom dumping) or TSHDs could be used. Capping production rate is assumed to be 26,700 m^3/day following the current capping practice for the existing CMPs at East of Sha Chau and the South of the Brothers, and it is subject to changes based on the findings of the water quality modelling exercise under this EIA Study. Bottom dumping from hopper barges would result in capping materials travel through the entirety of the water column. On the other hand, capping using TSHD would involve the delivery of capping materials to the seabed through a pipe, which result in less disturbance and fine loss. For this EIA Study, it is conservatively assumed that all capping would be conducted using hopper barge for worst case assessment.

It is expected that sediment dredged from the construction of each CMP would mostly be disposed of at the sediment disposal facility at South of Cheung Chau or South of Tsing Yi, or used as capping materials for the existing CMPs to the East of Sha Chau. The exact proportion of dredged sediment that goes to capping or disposal is currently uncertain. The existing CMP to the East of Sha Chau is about 20 km away from the Study Area which is sufficiently far away from the proposed CMPs at West of Lamma so no cumulative water quality impact is anticipated. Also, capping activities at the CMPs to the East of Sha Chau were assessed separately in its approved EIA. Therefore, additional modelling assessment for capping at the CMPs to the East of Sha Chau using the sediments dredged under this Project is not deemed necessary. For open sea disposal at South Cheung Chau and South of Tsing Yi, the sediment disposal may cause cumulative impact on water quality. The open sea disposal at South Cheung Chau as well as disposal at South of Tsing Yi would both be considered as concurrent projects and further discussed in ***Section 6.4***.

3.8.1 Sediment Loss Rate

For the case of grab dredging at the middle CMP, there will be two dredgers working concurrently and continuously (i.e. 24 hr). Since the total production rate would be 100,000 m^3/week, the individual working rate is about 297.62 m^3/hr as a continuous sediment source. Sediment loss is assumed to be distributed throughout the entire water column. Sediment loss rate of 17 kg/m^3 is assumed following the same assumption in the approved EIA of AEIAR-089/2005 New Contaminated Mud Marine Disposal Facility at Airport East / East Sha Chau Area. The rate of release (in kg/s) of sediment for one dredger working at the above maximum rate is calculated as follows:

$$Loss\ Rate\ (kg/s) = Dredging\ Rate\ (m^3/s) \times Mass\ of\ Sediment\ Loss\ per\ Unit\ Volume\ Dredged\ (kg/m^3)$$

$$= 0.0827\ m^3/s \times 17\ kg/m^3$$

$$= \mathbf{1.4054\ kg/s}$$

For the case of dredging with TSHD at the middle CMP, there will only be one TSHD working continuously. According to the approved EIA of *New Contaminated Mud Marine Disposal Facility at Airport East / East Sha Chau Area (AEIAR-089/2005)*, it is assumed that TSHD with hopper size of 4,500 m^3 would be used. Following assumptions adopted in AEIAR-089/2005, about 3,050 m^3 of *in-situ* sediments would be removed in 20 minutes for each cycle. For this modelling study, it is assumed there will be 12 trips per day each last for 20 minutes and at 2 hours interval. The maximum total production rate would be 256,200 m^3/week [(3)]. Sediment release due to disturbance by the drag heads is assumed to be 7 kg/m^3 dredged [(4) (5)]. Sediment loss is assumed to be concentrated at the bottom of the water column. The rate of release (in kg/s) of sediment for one TSHD working at the above maximum rate is calculated as follows:

$$Loss\ Rate\ (kg/s) = Dredged\ In-situ\ Volume\ per\ Barge\ (m^3) \times Loss\ Rate\ (kg/m^3) \div Duration\ per\ Trip\ (s)$$

$$= 3050\ m^3 \times 7\ kg/m^3 \div 1200\ s$$

$$= \mathbf{17.7917\ kg/s}$$

Assuming a forward speed of 0.3 m/s during loading for the TSHD, the TSHD would move about 360 m forward in a 20-minute cycle. To capture this movement, the sediment source for TSHD would be modelled as a moving source along the northern part of the eastern edge of the key area for potential CMP development. Sediment load would be distributed in the corresponding model grid cell.

For backfilling in the northernmost CMP, it is assumed each barge will be loaded with 800 m^3 of sediment. TSHD could also be used as considered in AEIAR-089/2005, but it is expected to result in less sediment impact given the same disposal rate as sediment would be released at the lower part of

(3) Other sizes of TSHD could be used for the Project depending on the plant availability. Should a different size of TSHD be adopted for the Project, the maximum total production rate would still be controlled within 256,200 m3/week and the current modelling scenario is still valid and representative.

(4) Kirby, R and Land J M (1991). The impact of Dredging - A Comparison of Natural and Man-Made Disturbances to Cohesive Sedimentary Regimes. Proceedings CEDA-PIANC Conference (incorporating CEDA Dredging Days), November 1991, Amsterdam. Central Dredging Association, the Netherlands.

(5) Environment Canada (1994). Environmental Impacts of Dredging and Sediment Disposal. Les Consultants Jacques Berube Inc for the Technology Development Section, Environmental Protection Branch, Environment Canada, Quebec and Ontario Branch.

the water column, while sediment would pass through the entirety of the water column for hopper barge disposal. For this modelling study, only hopper barge disposal would be assessed to represent the worst case scenario. Given the maximum daily disposal rate of 26,700 m^3/day (based on current disposal practice for the existing CMPs at East of Sha Chau and the South of the Brothers and it is subject to changes based on the findings of the water quality modelling exercise under this EIA Study), a total of over 33 barge trip will be required at interval of less than an hour. For this modelling study, sediment loss would be modelled as source series of 5-minute release. Assuming 3% loss rate as well as 750 kg/m^3 sediment density (both of which adopted from AEIAR-089/2005), the sediment loss rate is calculated as follows:

$$Loss\ Rate\ (kg/s) = Dredged\ In-situ\ Volume\ per\ Barge\ (m^3) \times Fraction\ of\ Loss\ Rate\ (\%) \times Sediment\ Density\ (kg/m^3) \div Duration\ per\ Trip\ (s)$$

$$= 800\ m^3 \times 3\% \times 750\ kg/m^3 \div 300\ s$$

$$= \mathbf{60.0000\ kg/s}$$

For capping, the rate and arrangement are similar to that of backfilling, except the filling materials used would be uncontaminated sediments. Therefore, the same sediment loss rate would be adopted and the sediment is assumed to be distributed to the entire water column.

3.8.2 Modelling Scenarios

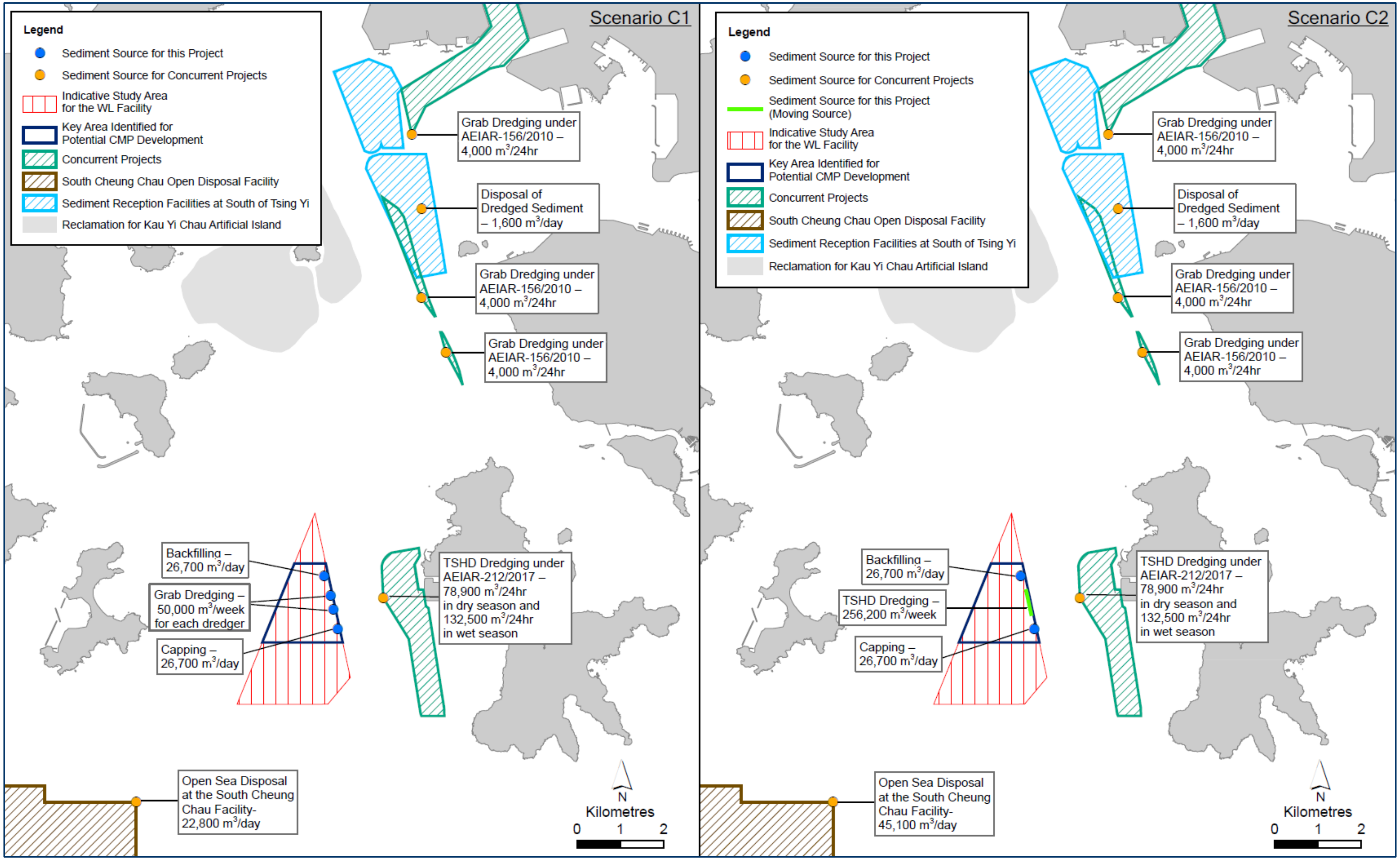
Sediment sources modelled under this Project are summarized in ***Table 3.2***. Two scenarios would be modelled for sediment dispersion modelling. Scenario C1 covers hopper barge backfilling at the northernmost CMP, grab dredging (with 2 grab dredgers) at the middle CMP and hopper barge capping at the southernmost CMP as well as other concurrent projects. Scenario C2 is similar except the dredging would be conducted with one TSHD. These two modelling scenarios are illustrated in ***Figure 3.4***.

Table 3.2 Summary of Sediment Sources Modelled under this Project

CMP	Items	Marine Works	
		Scenario C1	Scenario C2
Northernmost	Plant Used	Hopper Barge or TSHD (Model hopper barge for worst case)	
	Production Rate (m^3/day)	26,700	
	Working Hour (hr)	24	
	Sediment Loss Rate (kg/s)	60.0000 (modelled as 5 min release at 0.75 hr interval)	
	Moving source?	No	
Middle	Plant Used	Two Grab Dredgers	One TSHD
	Production Rate (m^3/wk)	100,000	256,200
	Working Hour (hr)	24	24

CMP	Items	Marine Works	
		Scenario C1	Scenario C2
	Sediment Loss Rate (kg/s)	1.4054 (for each grab dredger modelled as continuous release)	17.7917 (modelled as 20 min release at 2 hr interval)
	Moving source?	No	Yes
Southernmost	Plant Used	Hopper Barge or TSHD (Model hopper barge for worst case)	
	Production Rate (m^3/day)	26,700	
	Working Hour (hr)	24	
	Sediment Loss Rate (kg/s)	60.0000 (modelled as 5 min release at 0.75 hr interval)	
	Moving source?	No	

Figure 3.4 Sediment Sources to be Considered in Sediment Plume Modelling



3.8.3 Sediment Input Parameters

Sediment settling, erosion / resuspension as well as transport is simulated using the WAQ module of Delft3D. Relevant formulation are documented under section 13 of *D-Water Quality Processes Library Description - Technical Reference Manual* (Deltares 2021), in particular, Section 13.1 (Settling of sediment), 13.4 (Transport in sediment and resuspension), 13.10 (Calculation of bottom shear stress), For simulating sediment impacts the following general parameters will be assumed:

- Settling velocity – 0.5 mm/s
- Critical shear stress for deposition – 0.2 N/m^2
- Critical shear stress for erosion – 0.3 N/m^2
- Minimum depth where deposition allowed – 0.1 m
- Resuspension rate – 30 $g/m^2/d$

The above parameters have been used to simulate the impacts from sediment plumes in Hong Kong associated with uncontaminated mud disposal into the Brothers MBA (6), dredging for the Permanent Aviation Fuel Facility at Sha Chau (7), dredging and jetting for the Development of an Offshore Wind Farm in Hong Kong (8) and the Additional Gas-fired Generation Units Project (9). The critical shear stress values for erosion and deposition were determined by laboratory testing of a large sample of marine mud from Hong Kong as part of the original WAHMO studies associated with the new airport at Chek Lap Kok. The same settling velocity of 0.5 mm/s was adopted in multiple approved EIAs in the vicinity which involved sediment dispersion modelling, including AEIAR-218/2018 Hong Kong Offshore LNG Terminal, AEIAR-212/2017 Improvement Dredging for Lamma Power Station Navigation Channel and AEIAR-152/2010 Development of a 100MW Offshore Wind Farm in Hong Kong.

3.9 Release of Sediment-Bounded Contaminants

It is assumed the backfilling of sediment from hopper barge or TSHD would expose the sediment to the entire water column. While the majority of sediment stays close together, about 3% of sediment would be entrained into the water column. Seawater would act like a solvent to extract contaminants from the entrained sediment. The dissolved contaminants would be carried away by water current, eventually reaching the nearby WSRs through advection and diffusion. To simulate this process, it is conservatively assumed 100% of the contaminants from the entrained sediment would be lost to the water column and the contaminant levels of the sediment would be at the corresponding UCEL for all contaminants. Then an inert tracer dispersion model would be conducted to simulate the dispersion of contaminants. The dilution achieved at the WSRs would then be factored in with the equilibrium concentration of contaminants in seawater to estimate the contaminant concentration at WSRs, for assessment against the proposed assessment criteria shown in ***Table 5.2***.

The dredging of marine sediment for the construction of CMPs would also result in disturbance to bottom sediment and potential release of sediment-bounded contaminants. Surface grab sediment samples were collected in mid-2020 to determine the level of contaminants in sediment within the majority of the Study Area. The sediment quality results are presented in ***Appendix B*** for reference. The highest contaminant levels among all stations are presented in ***Table 3.3*** alongside with the LCEL and UCEL for comparison. As shown, none of the contaminant levels exceed the

(6) Mouchel (2002a) Environmental Assessment Study for Backfilling of Marine Borrow Pits at North of the Brothers. Environmental Assessment Report.

(7) Mouchel (2002b) Permanent Aviation Fuel Facility. EIA Report. Environmental Permit EP-139/2002.

(8) BMT Asia Pacific Ltd (2009). EIA for Hong Kong Offshore Wind Farm in Southeastern Waters. For HK Offshore Wind Limited. Register No.: AEIAR-140/2009

(9) ERM (2016). Additional Gas-fired Generation Units Project. EIA Report. Environmental Permit EP-507/2016.

corresponding LCEL and the sediment within the proposed Project footprint is considered to be not contaminated. Nevertheless, release of sediment-bounded contaminants from the dredging operation would be modelled together with that of the backfilling. The same methodology would be applied. The highest contaminant levels shown in ***Table 3.3*** (or any subsequent update or further survey as appropriate) would be adopted for calculation.

Table 3.3 Highest Contaminant Levels among all Stations from the Sediment Sampling conducted in mid-2020

Contaminant	LCEL (mg/kg)	UCEL (mg/kg)	Highest Contaminant Levels amongst all Stations (mg/kg)	Assessment Criteria (µg/L)
Arsenic	12	42	11	25
Cadmium	1.5	4	0.25	2.5
Chromium	80	160	49	15
Copper	65	110	43	5
Lead	75	110	46	25
Mercury	0.5	1	0.41	0.3
Nickel	40	40	24	30
Silver	1	2	0.84	1.9
Zinc	200	270	110	40
Total PCBs	0.023	0.18	<0.018	0.03
LMW PAH	0.55	3.16	0.24	3.0 (for total PAHs)
HMW PAH	1.7	9.6	1.182	
TBT (in interstitial water)	0.15 mg/L	0.15 mg/L	<0.01 µg/kg in interstitial water	0.1

The release of sediment-bounded contaminants is estimated as follows (taking arsenic release from backfilling as an example:

$$Mass\ of\ Arsenic\ Released\ per\ Trip = Volume\ of\ Sediment\ Backfilled\ per\ Trip\ \times Sediment\ Density \times Percentage\ Sediment\ Loss \times UCEL\ of\ Arsenic$$

$$= 800m^3\ per\ trip \times 750\ kg/m^3 \times 3\% \times 42\ mg/kg = 756000\ mg\ per\ trip$$

This 756,000 mg of loss per trip would be adopted for estimation of arsenic at WSRs and the same method of calculating release of sediment-bounded contaminants from backfilling applies to other contaminants parameters.

Similarly, dredging of CMPs would also result in sediment disturbance and release of contaminants. Following the scenarios proposed for sediment dispersion modelling, two different modes of contaminants release would be considered for grab dredging and TSHD dredging. For grab dredging, continuous release of contaminants distributed evenly over the entire water column is assumed. Release rate of arsenic is calculated as follows as a demonstration for one grab dredger:

$$Loss\ Rate\ (mg/s) = \ Dredging\ Rate\ (m^3/s) \times \ Loss\ Rate\ (kg/m^3) \times Contaminant\ Level\ of\ Arsenic\ (mg/kg)$$

$$= \ 0.0827\ m^3/s\ \times\ 17\ kg/m^3\ \times 11\ mg/kg$$

$$= \ \mathbf{15.4597}\ \boldsymbol{mg/s}$$

For TSHD dredging, the release of arsenic is calculated as follow:

$$Loss\ Rate\ (mg/s) = Dredged\ In-situ\ Volume\ per\ Barge\ (m^3) \times Loss\ Rate\ (kg/m^3) \div Duration\ per\ Trip\ (s) \times Contaminant\ Level\ of\ Arsenic\ (mg/kg)$$

$$= 3050\ m^3 \times 7\ kg/m^3 \div 1200\ s \times 11\ mg/kg$$

$$= \mathbf{195.7083\ mg/s}$$

3.9.1 Modelling Scenarios

Sources of inert tracer for contaminant release modelling under this Project are summarized in ***Table 3.4***. The modelling will follow the proposed scenarios for the sediment dispersion modelling exercise. As shown, two scenarios would be modelled following the arrangement for sediment dispersion modelling. For both scenarios, capping is assumed to be carried out at the southernmost CMP. Since clean sediments would be used for capping, no release of sediment-bounded contaminants is assumed for capping. For each of the two sources, a separate inert tracer would be discharged to account for the different initial concentration at equilibrium.

Table 3.4 Summary of Contaminant Release Rate Modelled under this Project

CMP	Items	Marine Works	
		Scenario C3	Scenario C4
Northernmost	Plant Used	Hopper Barge or TSHD (Model hopper barge for worst case)	
	Arsenic (mg/s per plant)	2520.0000	
	Cadmium (mg/s per plant)	240.0000	
	Chromium (mg/s per plant)	9600.0000	
	Copper (mg/s per plant)	6600.0000	
	Lead (mg/s per plant)	6600.0000	
	Mercury (mg/s per plant)	60.0000	
	Nickel (mg/s per plant)	2400.0000	
	Silver (mg/s per plant)	120.0000	
	Zinc (mg/s per plant)	16200.0000	
	Total PCBs (mg/s per plant)	10.8000	
	LMW PAH (mg/s per plant)	189.6000	
	HMW PAH (mg/s per plant)	576.0000	
	TBT (mg/s per plant)	4.9500	
Middle	Plant Used	Two Grab Dredgers	One TSHD
	Arsenic (mg/s per plant)	15.4597	195.7083
	Cadmium (mg/s per plant)	0.3514	4.4479
	Chromium (mg/s per plant)	68.8657	871.7917
	Copper (mg/s per plant)	60.4332	765.0417
	Lead (mg/s per plant)	64.6495	818.4167
	Mercury (mg/s per plant)	0.5762	7.2946
	Nickel (mg/s per plant)	33.7302	427.0000
	Silver (mg/s per plant)	1.1806	14.9450
	Zinc (mg/s per plant)	154.5966	1957.0833
	Total PCBs (mg/s per plant)	0.0253	0.3203
	LMW PAH (mg/s per plant)	0.3373	4.2700
	HMW PAH (mg/s per plant)	1.6612	21.0298

CMP	Items	Marine Works	
		Scenario C3	Scenario C4
	TBT (in interstitial water) (mg/s per plant)	7.73E-06	0.0001

Note: Interstitial water is the aqueous solution that occupies the pores between particles of sediment. The testing and toxicity criterion for TBT applies to the interstitial water only but not the bulk of sediment. Given the lack of water content data in sediment with project site (where dredging would occur) and sediment to be received, the average dry percentage of sediment at all EPD Sediment Quality Monitoring Stations from 1986 to 2019 is 45%, while that for the two nearest EPD Sediment Quality Monitoring Station are 47%. This means such values is quite representative of the situation in Hong Kong. For this Study, pore water of (100%-45%) = 55% by weight is assumed for TBT loss rate.

3.10 Depletion of Oxygen

The degree of DO depletion exerted by a sediment plume is a function of the sediment oxygen demand of the sediment, its concentration in the water column and the rate of oxygen replenishment. The impact of the sediment oxygen demand on DO concentrations has been calculated based on the following equation:

$$\text{DO Depletion }(\text{mg } O_2/L) = \text{ DO Depletion }(\text{g } O_2/m^3)$$
$$= \text{ SS }(\text{g DW}/m^3) \times \text{ Chemical Oxygen Demand of Sediment }(\text{g } O_2/\text{g DW})$$

The assumption behind this equation is that all the released organic matter is eventually re-mineralized within the water column. This results in an estimated depletion with respect to the background DO concentrations. This DO depletion depends on the quality of the released sediments, i.e. chemical oxygen demand. The maximum chemical oxygen demand of 28,000 mg/kg from the nearby EPD sediment quality monitoring stations SS3 and SS4 from 1986-2020 would be used for calculation. The maximum oxygen depletion would be estimated from the maximum SS elevation predicted at the WSRs with a factor of 28,000 mg/kg.

3.11 Release of Nutrients

An assessment of nutrient release during marine dredging for CMPs would be carried out based on the predicted SS elevation and the testing results of EPD sediment monitoring station SS3 and SS4. It is roughly estimated organic-nitrogen (Org-N) released into the water column would be on average staying in the model domain for less than 3 days given the very high current velocity (up to >1 m/s) around the Project site. In this period of time, the released Org-N is assumed to be mineralized into inorganic nitrogen under optimal condition. Based on typical mineralization rate of 0.1/day (taken from typical value adopted in the Update Model), the mass of Org-N can be calculated to be Exp(-0.1×3) = 74%. This means about 26% of Org-N would turn into inorganic nitrogen in this period.

In the calculation for release of nutrient, it is assumed that 26% of Org-N (calculated from TKN – NH_3) concentrations in the sediments would be released to the water based on the previous estimation. The remaining ammonia-N is also assumed to be released into the water column as well. The maximum predicted SS concentrations at each WSR is multiplied by 26% of the maximum concentration of Org-N in sediment (mg/kg) plus 100% of ammonia nitrogen at the EPD sediment quality monitoring station SS3 and SS4. Based on the data published since 1986 (10), maximum TKN at these two stations is 960 mg/kg, while that for ammonia-N is 28 mg/kg. Accordingly, the maximum potential elevation in TIN (mg/L) per kg of sediment is calculated to be ((960 mg/kg – 28 mg/kg)×26% + 28 mg/kg×100%) = 270.32 mg/kg . While nitrate and nitrite may also be constituent of TIN in marine water, they are generally in negligible concentration in view of low electrochemical potential of marine sediment. The calculations of maximum elevation in TIN (from TKN) at WSRs are shown below:

$$\text{TIN }(\text{mg }/L) = \text{ SS }(\text{mg DW}/L) \times \text{ TIN Release Potential in Sediment }(\text{mg N/kg DW}) \times 10^{-6}$$

(10) Data of TKN and ammonia-N between 1987-2020 are available from EPD routine sediment quality monitoring data.

Unionized ammonia (UIA) is also a water quality parameter of concern listed under WQO. Ammonia nitrogen is the sum of ionized ammonia and UIA. Under normal conditions of Hong Kong waters, more than 90% of the ammonia nitrogen would be in ionized form. EPD marine water quality monitoring data at SM6 and SM7 (same locations as SS3 and SS4) from 1986 to 2020 indicated that ~ 7.2% of ammonia nitrogen exists as UIA on average. For the purpose of assessment, this averaged value would be adopted for estimation of UIA from disturbance of marine sediments due to marine construction works. In view of the mineralization of organic nitrogen will contribute to the increase of levels of ammonia, the calculations of NH_3-N are based on maximum TIN concentrations from estimated in the previous step. Note that it is a highly conservative approach since it is assumed that 100% of TIN exists as ammonia but this is unlikely to occur in reality. The maximum SS concentration at each WSR is multiplied by the following factors to predict the maximum UIA elevations:

$$\text{UIA (mg}/L) = \text{SS (mg DW}/L) \times \text{TIN Release Potential in Sediment (mg N/kg DW)} \times 10^{-6} \times 7.2\%$$

3.12 Change in Flow Regime

The proposed facilities would require dredging of seabed, causing a localised depression. During the operation of each CMP, the depression would continuously be backfilled, causing the depression to be reduced. When a CMP reaches its disposal capacity, it would then be capped with clean sediments. Throughout these processes, the change in seabed level at these sub-pits may cause localized change in flow regime. To assess the potential change in flow regime, hydrodynamic modelling would be conducted for scenarios with and without the depressions due to the proposed CMPs. Similar to the case of sediment dispersion modelling, the worst case scenario in terms of change in flow regime is assumed to be in the midway of the operation of the middle CMP, when the northernmost CMP is being dredged (assume midway from the original seabed to the designed depth of the CMP), the middle CMP is being backfilled (assume midway between the designated top and bottom of the CMP) and the southernmost CMP is being capped (assume midway of the designed top of the CMP and the designed top of the capping material layer). The predicted change in current velocity would then be compared with a base case scenario, where such depression of CMPs does not exist. The adopted bathymetry for the operation phase flow regime change modelling is summarized below in ***Table 3.5***.

Table 3.5 Bathymetry adopted for Operation Phase Flow Regime Change Modelling

CMP	Scenario O1	Scenario O2
	Base Case Scenario	**Project Worst Case**
Northernmost	Bathymetry based on latest bathymetry provided by Marine Department, taking into account effect of other navigational dredging projects	Seabed level at the designed depth of the CMP
Middle		Seabed level midway between the designated top and bottom of the CMP
Southernmost		Seabed level midway of the designed top of the CMPs and the designed top of the capping material layer
Other Locations within the Model Domain	Bathymetry based on latest bathymetry provided by Marine Department, taking into account effect of other navigational dredging projects. The potential coastline of the artificial islands in the Central Waters is also taken into account.	

3.13 Uncertainties in Assessment Methodologies

3.13.1 Uncertainties in Sediment Transport Assessment

Uncertainties in the assessment of the impacts from suspended sediment plumes will be considered when drawing conclusions from the assessment. In carrying out the assessment, the worst case assumptions have been made in order to provide a conservative assessment of environmental impacts. These assumptions are as follows:

- The assessment is based on the peak sediment release rate for grab /TSHD dredging, backfilling and capping. Based on the past operation pattern at existing facilities, operation at peak rate is very unlikely and if happened, will only occur for short periods of time. Thus the proposed scenario is very conservative;
- The proposed modelling scenarios cover the worst case in term of plant use (i.e. simulate hopper barge disposal instead of TSHD);
- The modelled locations for dredging / backfilling / capping are selected such that the sediment sources are at its shortest distance from the nearest sensitive receivers. This ensures the worst case water quality impact be modelled and assessed in this modelling study despite of the uncertainties in;
- The calculation of sediment loss rates is based on conservative estimates for the types of plant and methods of working; and
- Past records of EM&A at existing CMPs to the East of Sha Chau indicate exceedance of water quality objectives rarely occurs, indicating the operation of such CMPs would not result in significant water quality impact.

The following uncertainties have not been included in the construction / operation phase marine construction modelling assessment:

- *Ad hoc* navigation of marine traffic;
- Propeller scour of seabed sediments from vessels;
- Near shore scouring of bottom sediment; and
- Access of marine barges back and from the site.

3.13.2 Uncertainties in Contaminant Release Assessment

Similar to the case of sediment dispersion modelling, uncertainties in the assessment of the impacts from contaminant release modelling assessment will be considered when drawing conclusions from the assessment. The worst case assumptions have been made in the assessment in order to provide a conservative assessment of environmental impacts. These assumptions are as follows:

- Concentration of all sediment-bounded contaminants are assumed to be at the corresponding UCEL;
- Release of sediment-bounded contaminants is assumed to be instantaneous and 100% loss is assumed from the entrained sediment. In reality, the release of sediment-bounded contaminants takes time and generally cannot reach its completion;
- For backfilling, sediment-bounded contaminants would already be loss to the water column when the sediment was first disturbed for its removal from the seabed. Such loss has not been taken into account; and
- Such contaminants are represented with conservative tracer, which omits all potential sinks of such contaminants.

3.13.3 Uncertainties in Dissolved Oxygen Depletion and Nutrient Release Assessment

The worst case assumptions have been made in the assessment of DO depletion and nutrient release in order to provide a conservative assessment of environmental impacts. These assumptions are as follows:

- Maximum chemical oxygen demand and TKN concentration would be adopted in the calculation; and
- Maximum SS elevation would be adopted for the assessment.

3.13.4 Uncertainties in Flow Regime Change Assessment

Uncertainties in flow regime change modelling would also be addressed and conservative assumptions are made accordingly as follows:

- Conservative assumptions in terms of concurrent CMPs operation; and
- Simulation covers at least one whole spring-neap cycle for dry and wet seasons to illustrate representative tide conditions.

4. WATER QUALITY SENSITIVE RECEIVERS

WSRs in the vicinity of the Project site are identified as below, including coral communities, gazetted and non-gazetted bathing beaches, seawater intakes, fish culture zone, Green Turtle nesting ground, secondary contact recreation subzones, habitat for finless porpoise, nursery area and spawning ground for commercial fisheries resources and potential marine park. In addition, other WSRs of concern which are further away are also included. These WSRs are listed in ***Table 4.1*** and shown in ***Figure 4.1***.

Table 4.1 Water Sensitive Receivers (WSRs) in the Vicinity of the Project Site

Description	Location	Model Output Location	Geodesic Distance from Key Area (km)
Fisheries Sensitive Receivers			
Fish Culture Zone	Cheung Sha Wan FCZ	FCZ1	6.9
(FCZ)	Lo Tik Wan FCZ	FCZ2	4.7
	Sok Kwu Wan FCZ	FCZ3	4.5
	Ma Wan FCZ	FCZ4	14.7
Marine Ecological Sensitive Receivers			
Marine Park (MP)	Potential South Lamma MP	MP1-A	3.8
		MP1-B	2.6
		MP1-C	4.6
	Proposed South Lantau MP	MP2	11.3
Corals	Cheung Chau	CR01	3.7
		CR11	3.2
		B1	4.0
	Hei Ling Chau	CR02	3.9
		CR03	3.7
		CR09	6.5
	Chi Ma Wan Peninsula	CR04	6.4
	Sunshine Island	CR05	4.8
		CR06	4.7
		CR07	4.9
		CR08	5.5
	Kau Yi Chau	CR10	6.8
		CR26	7.3
		CR27	7.5
	Siu Kau Yi Chau	CR28	8.1
		CR29	8.1
		CR30	7.8
	Hung Shing Yeh	CR20	3.7
	Ha Mei Wan	CR21	3.5
	Pak Kok	CR22	4.3
	Shek Kok Tsui	CR23	3.0
	Sandy Bay	CR24	7.0

Description	Location	Model Output Location	Geodesic Distance from Key Area (km)
	Green Island	CR25	7.9
	Peng Chau	CR31	8.6
		CR32	8.3
		CR33	8.1
		CR34	7.6
		CR35	7.3
	Sham Wan	TNG	5.4
Green Turtle Nesting Ground	Sham Wan	TNG	5.4
Water Quality Sensitive Receivers			
Gazetted Beaches	Cheung Chau Tung Wan Beach	B1	4.0
	Kwun Yam Wan Beach	B2	3.4
	Hung Shing Yeh Beach	B3	3.9
	Lo So Shing Beach	B4	3.9
	Tung Wan Beach, Ma Wan	B5	14.5
	Approach Beach	B6	16.3
	Ting Kau Beach	B7	16.5
	Lido Beach	B8	16.5
	Casam Beach	B9	16.3
	Hoi Mei Wan Beach	B10	16.2
	Gemini Beach	B11	16.1
	Anglers' Beach	B12	16.2
Non-gazetted Beaches	Tai Kwai Wan	NB3	4.5
	Po Yue Wan	NB4	5.0
Seawater Intakes	Pumping Station at Tai Kwai Wan	NB3	4.5
	Sha Wan Drive	C1	6.8
	Wah Fu Estate	C2	6.5
	Lamma Power Station	C3	2.6
	Integrated Waste Management Facilities at Shek Kwu Chau	C4	8.2
	Offshore LNG Terminal	C5	11.8
	Tsuen Wan	C6	16.8
	MTR Tsing Yi Station	C7	14.1
	MTR Kowloon Station	C8	11.9
	China H.K. City	C9	12.4
	Queen Mary Hospital	C10	7.1
	Kwai Chung Hospital	EMSD1	14.0

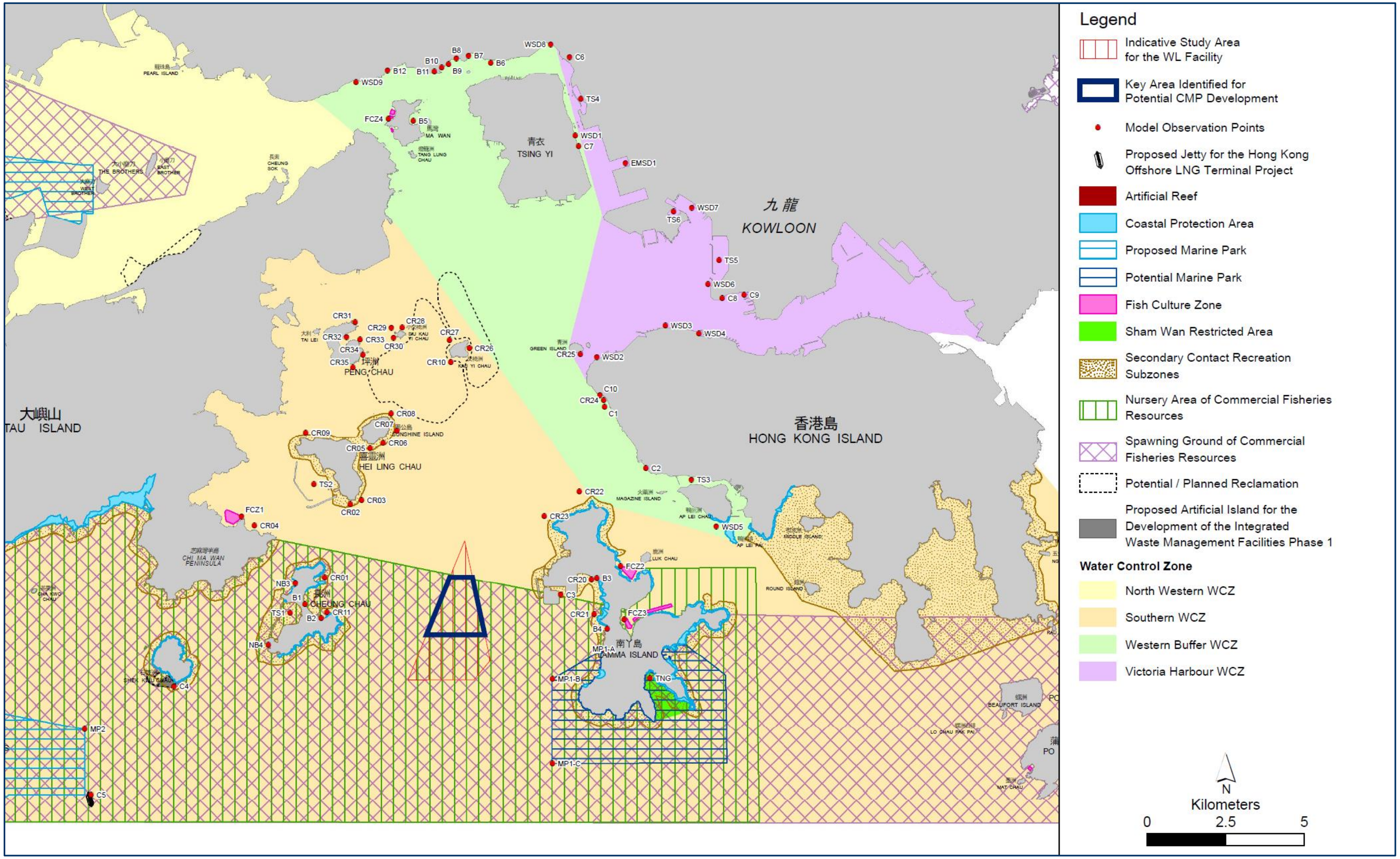
Description	Location	Model Output Location	Geodesic Distance from Key Area (km)
WSD Flushing Intakes	Tsing Yi	WSD1	14.4
	Kennedy Town	WSD2	8.0
	Sheung Wan	WSD3	10.1
	Centrol Water Front	WSD4	10.6
	Ap Lei Chau	WSD5	7.9
	Kowloon South	WSD6	11.9
	Cheung Sha Wan	WSD7	13.6
	Tsuen Wan	WSD8	17.1
	Near Hong Kong Garden	WSD9	16.0
Typhoon Shelters	Cheung Chau	TS1	4.4
	Hei Ling Chau	TS2	5.2
	Aberdeen	TS3	7.6
	Rambler Channel	TS4	15.6
	New Yau Ma Tei	TS5	12.8
	Government Dockyard	TS6	13.3

Remarks:
There are some other WSRs, such as secondary contact recreation subzones, habitat for finless porpoise, nursery area and spawning ground for commercial fisheries resources, cover larger swath of marine waters in Hong Kong. No separate observation points would be set for these WSRs. Instead, these WSRs are represented by observation points of other WSRs within their areas as indicated below:

- Secondary contact recreation subzones: CR01-CR03, CR05-CR09, CR11, CR20-CR23, TNG, B1-B4, NB3-NB4, C3-C4
- Habitat for finless porpoise: observation points in the Assessment Area, especially the proposed and potential marine parks (i.e. MP1-A-MP1-C and MP-2)
- Nursery area and spawning ground for commercial fisheries resources: FCZ2-FCZ3, MP1-A-MP1-C, MP-2, CR01, CR11, CR21, TNG, B1-B4, NB3-NB4, C3-C5, TS1

Note that the list of identified WSRs is not meant to be exhaustive, but is a representative list of WSRs that may potentially be impacted by the Project. In most cases, WSRs on the “first line of impact” are chosen, while WSRs of similar nature (and thus have similar sensitivity and assessment criteria) may not be included.

Figure 4.1 Water Sensitive Receivers



Note: The proposed and potential marine parks (i.e. proposed South Lantau Marine Park and potential South Lamma Marine Park) also represent the habitat for finless porpoise.

5. ASSESSMENT CRITERIA

Water Quality Objectives (WQOs) in WCZs of the Assessment Area will be used to assess water quality impacts in Dissolved Oxygen (DO), Total Inorganic Nitrogen (TIN), Unionized Ammonia (UIA) and Suspended Solids (SS) in the process of dredging, backfilling and capping (***Table 5.1***).

Table 5.1 Summary of Assessment Criteria

Parameters	Southern WCZ	Western Buffer WCZ
Dissolved Oxygen (Bottom) (mg/L)	Not less than 2 mg/L for 90% of samples for all WCZs	
Dissolved Oxygen (Depth-averaged) (mg/L)	Not less than 4 mg/L for 90% of samples for all WCZs Not less than 5 mg/L for FCZ	
Total Inorganic Nitrogen (mg/L)	0.1	0.4
Unionized Ammonia (mg/L)	0.021	
Suspended Solids (mg/L)	Not to raise the natural ambient level by 30% & Not to exceed 50 mg/L for FCZ (1)	

Note (1): CityU CCPC. (2001). Consultancy Study on Fisheries and Marine Ecological Criteria for Impact Assessment. Submitted to Agriculture, Fisheries and Conservation Department of HKSAR Government.

Impacts to coral communities will also be assessed with regard to sediment deposition. Hard or hermatypic corals are susceptible to increased rates of sediment deposition, with the sensitivities to sedimentation being determined largely by the particle-trapping properties of the coral colony and ability of individual polyps to reject settled materials.

Information presented by Pastorok and Bilyard [11] has been regarded as the primary text when discussing the effects of sedimentation on corals. Pastorok and Bilyard have suggested the following criteria:

10 - 100 g/m^2/day	slight to moderate impacts
100 - 500 g/m^2/day	moderate to severe impacts
> 500 g/m^2/day	severe to catastrophic impacts

Assessment criterion for sedimentation at coral communities of < 100 g/m^2/day was adopted in the approved EIAs of *Development of an Offshore Wind Farm in Hong Kong (AEIAR-152/2010)* and *Improvement Dredging for Lamma Power Station Navigation Channel (EIA-251/2017)*. The same assessment criterion will be adopted under this Study.

Similar to the approved EIA of the *New Contaminated Mud Marine Disposal Facility at Airport East / East Sha Chau Area (AEIAR-089/2005)* the same approach and assessment criteria for the potential release of contaminants from sediment disposal is adopted. It is assumed open disposal at the CMP would only be allowed for sediment of Category M or below while disposal of Category H sediments would be firstly disposed into geo-bags made of impervious geotextile before disposal into the CMP. In view of the above, the worst case assessment would involve calculation of maximum level of contaminants at backfilling operation based on Upper Chemical Exceedance Level (UCEL, upper limit for contaminant concentration of Category M sediment). The UCEL for each contaminants of concern are listed below in ***Table 5.2***.

(11) Pastorok RA and Bilyard GR (1985). Effects of sewage pollution on coral-reef communities. Marine Ecology Progress Series 21: 175-189.

Table 5.2 Upper Chemical Exceedance Levels and Proposed Assessment Criteria for Contaminants

Parameter	Unit	Assessment Criteria Adopted
Metals		
Cadmium (Cd)	$\mu g\ L^{-1}$	5.5 [a]
Chromium (Cr)	$\mu g\ L^{-1}$	4.4 [a]
Copper (Cu)	$\mu g\ L^{-1}$	1.3 [a]
Nickel (Ni)	$\mu g\ L^{-1}$	70 [a]
Lead (Pb)	$\mu g\ L^{-1}$	4.4 [a]
Zinc (Zn)	$\mu g\ L^{-1}$	8 [a]
Mercury (Hg)	$\mu g\ L^{-1}$	0.4 [a]
Arsenic (As)	$\mu g\ L^{-1}$	13 [a]
Silver (Ag)	$\mu g\ L^{-1}$	1.4 [a]
PAHs		
Total PAHs	$\mu g\ L^{-1}$	0.2 [b]
PCBs		
Total PCBs	$\mu g\ L^{-1}$	0.03 [b]
Organotins		
Tributyltin (TBT)	$\mu g\ L^{-1}$	0.006 [b]

Notes:

(a) Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Default guideline value for protection for 95% Species in Marine water. Available at: https://www.waterquality.gov.au/anz-guidelines/guideline-values/default/water-quality-toxicants/search
For chromium, the more stringent standard for Cr(VI) is adopted. For arsenic, there is no standard for marine water, standard for freshwater for As(V) was thus adopted which is more conservative than that for As(III).

(b) U.S. Environmental Protection Agency, National Recommended Water Quality Criteria, 2009. (https://www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-table). The Criteria Continuous Concentration (CCC) is an estimate of the highest concentration of a material in surface water (ie saltwater) to which an aquatic community can be exposed indefinitely without resulting in an unacceptable effect. CCC is used as the criterion of the respective compounds in this study.

6. CONCURRENT PROJECTS

There are a few concurrent projects that could have significant water quality impact in the vicinity of the Project area. They are listed and further discussed below.

6.1 Improvement Dredging for Lamma Power Station Navigation Channel (AEIAR-212/2017)

This project covers the dredging for navigation channel at west of Lamma Island for Lamma Power Station (LPS). According to the EIA submitted for public inspection, the proposed maintenance dredging work involves deepening the existing navigation channel to -16.5 mPD (Principal Datum). Dredging methods using grab dredgers or TSHD were considered. According to the environmental permit (EP) issued for this Project, the allowed dredging rates are summarized in ***Table 6.1*** below.

Table 6.1 Allowable Maximum Dredging Rate for Grab Dredger and TSHD Options for EP-535/2017

	Dry Season				Wet Season			
Working Zone (1)	Zone 1	Zone 2	Zone 3	Zone 4	Zone 1	Zone 2	Zone 3	Zone 4
Grab Dredger								
Maximum allowable dredging rate (m^3/hr)	2,070	3,760	3,730	2,400	3,000	3,070	2,640	1,600
Maximum allowable dredging rate (m^3/day)	49,800	90,400	89,600	57,800	72,100	73,700	63,500	38,500
TSHD								
Maximum allowable dredging rate (m^3/hr)	3,280	5,730	7,160	2,630	5,520	3,280	2,710	920
Maximum allowable dredging rate (m^3/day)	78,900	137,600	171,900	63,300	132,500	78,800	65,100	22,200

Note: (1) Please refer to EP-535/2017 (available at https://www.epd.gov.hk/eia/register/permit/latest/ep5352017.htm) for the working zones.

Concurrent dredging by grab dredger and TSHD is not allowed under the EP (EP-535/2017). TSHD generally allows higher production rate for dredging and result in higher sediment loss and would be considered as a worst case condition for assessing cumulative impact. Concurrent dredging at Zone 1 would be modelled because it is the closest to the proposed key area for CMP development under this Project.

6.2 Providing Sufficient Water Depth for Kwai Tsing Container Basin and its Approach Channel (AEIAR-156/2010)

This project involves the deepening of seabed level at the Kwai Tsing Container Basin, the northern and western fairways to -17.5 mCD (Chart Datum). According to the environmental permit EP-426/2011/A, no more than one grab dredger with closed grab (or one cutter suction dredger) shall be operated within each of the five main zones and at most 3 grab dredgers with closed grab (or one cutter suction dredger) can work at one time within the project area. For this EIA study, three grab dredgers working at the 3 southernmost dredging zones, namely northern Fairway, and two other zones at western Fairway. The maximum allowable dredging rate of 4,000 m^3/day for each grab dredger for 24 hr continuous operation would be modelled for worst case assessment.

6.3 Artificial Islands in the Central Waters

This project involves reclamation at marine waters near Kau Yi Chau. The project is currently in planning stage and there is little information available. Preliminary information obtained from the public domain indicated project construction could proceed as early as 2027. Engineering design on project construction is not currently available. Given the recent trend on major reclamation in Hong Kong (i.e. Hong Kong Boundary Crossing Facilities, the Expansion of Hong Kong International Airport into a Three-Runway System (3RS Project), Tung Chung New Town Extension (East) and the Integrated Waste Management Facilities Phase 1), it is expected non-dredged method(s) would be widely implemented so as to reduce the amount of dredging required. Furthermore, marine filling is expected to be commenced behind (partially) completed seawall, together with silt curtain surrounding the works area to minimize the offsite migration of fine from the required dredging, ground improvement and marine filling operations.

Given the lack of construction details and uncertainties for this potential reclamation, cumulative sediment impact from project construction would not be taken into account in this Study. The project proponent for the potential artificial islands in the central waters will conduct separate water quality modelling assessment based on the appropriate details to be developed during its planning and investigation stage. Effect of potential change in coastline would be taken into account for assessment for operation phase flow regime change.

6.4 Open Sea Disposal Area at South Cheung Chau

This open sea disposal area covers a large swath of waters south of Cheung Chau and Shek Kwu Chau. This open sea disposal area receives uncontaminated sediment from various projects. According to the EIA Report for the Hong Kong Offshore LNG Terminal project (AEIAR-218/2018), sediment disposal rate at the South of Cheung Chau sediment disposal facility in 2019 was about 8,500 m^3/day (59,500 m^3/week), which is about 13 barge loads per day for a typical 650 m^3 barge. Assuming 100% of dredged sediment from the construction of CMPs at west of Lamma will be disposed at South of Cheung Chau sediment disposal facility, the total sediment disposal per day at the South of Cheung Chau sediment disposal facility would be about 22,800 m^3/day for Scenario C1 and 45,100 m^3/day for Scenario C2.

6.5 Sediment Disposal at South of Tsing Yi

This open sea disposal area is located in waters south of Tsing Yi to receive uncontaminated sediment. According to CEDD, the disposal of dredged sediment at the South Tsing Yi facilities would be targeted at the deepest location based on the latest bathymetry to-date. It is anticipated the facilities would only receive dredged sediment at rate of 1,600 m^3/day. For this modelling exercise, it is assumed two hopper barge disposal of 800 m^3 would be conducted each day at 12-hour interval. The sediment loss rate is estimated to be 60.00 kg/s during the disposal period of 5 min, which is the same as that assumed for the hopper barge disposal for this Project.

6.6 Lamma Power Station (LPS) and Additional Gas-Fired Generation Units

Cooling water is discharged from multiple generation units at LPS into the sea as part of the normal operation. In addition to the existing generation units, HK Electric has started to construct two new gas-fired units (known as "L10" and "L11") at the LPS Extension. No marine works would be required for the construction of this project, therefore no cumulative impact on SS elevation would be expected. The discharge of cooling water is also not expected to result in notable change in flow regime during Project operation. No cumulative water quality impact from this concurrent project is expected.

6.7 Outlying Island Sewerage Stage 2 - Upgrading of Cheung Chau Sewage Collection, Treatment and Disposal Facilities (Register No.: AEIAR-181/2013)

This project involves the expansion and upgrade of existing sewerage facilities in Cheung Chau. Treated effluent is proposed for non-potable reuse, with remaining portion discharged via an outfall. According to the approved EIA, no marine dredging activities and marine based construction works would be required. Therefore, no cumulative impact would be expected from the dredging, backfilling and capping works from the Project. The discharge of treated sewage effluent is not expected to result in notable change in flow regime during Project operation. No cumulative water quality impact from this concurrent project is expected.

6.8 Outlying Islands Sewerage Stage 2 - South Lantau Sewerage Works (Register No.: AEIAR-210/2017)

This project involves the provision of sewer and sewage treatment at South Lantau. According to the approved EIA, minor marine construction works would be conducted for installation of submarine outfall for treated sewage effluent at over 10 km away from the proposed CMP sites at West Lamma. Therefore, no significant cumulative impact would be expected from the dredging, backfilling and capping works from the Project. The discharge of treated sewage effluent is not expected to result in notable change in flow regime during Project operation. No cumulative water quality impact from this concurrent project is expected.

6.9 Development of a 100MW Offshore Wind Farm in Hong Kong (AEIAR-152/2010)

This project involves the development of an offshore wind farm Southwest of the Lamma Island, locating > 2 km from the key area for potential CMP development. A submarine cable connecting between the proposed offshore wind farm and the LPS is proposed to be installed by dredging and jetting works. The project will produce around 100 MW of electricity and the power will be supplied directly to the HK Electric grid. Major potential sources of impact include dredging (with a maximum production rate of 2,500 m^3 day^{-1}) and jetting (with a maximum jetting speed of 360 m hr^{-1}) from marine construction, scouring and change in flow regime during project operation. As assessed in the EIA report for the project, potential impacts arising from the proposed construction works are predicted to be very localised and transient in nature. No unacceptable adverse impacts to water quality are predicted to occur at the sensitive receivers with the adoption of appropriate mitigation, e.g. silt curtains during dredging works. During the operation phase, adverse impacts to water quality are not expected to occur. In addition, the proposed wind farm will have a negligible effect on hydrodynamics, local erosion and sedimentation patterns. The construction and operation of the offshore windfarm are planned on or after 2024, subject to the development plan to be published by HK Electric. Negligible cumulative impact on water quality would be expected from this project. The effect of this project is thus not considered in the construction phase and operation phase water quality modelling exercise.

6.10 Integrated Waste Management Facilities (IWMF) at Shek Kwu Chau (Register No. AEIAR-163/2012)

This project involves the construction of an incinerator as well as other waste handling facilities on an artificial island southwest of Shek Kwu Chau, at more than 8 km from the proposed CMPs at west of Lamma. Marine construction involves installation of cellular sheetpile cofferdam as seawall, reclamation within seawall as well as other minor marine works including jetting installation of subsea cable and installation of anti-scouring protection layer for the vertical seawall. Given project marine works has already been commenced since 2018, project marine works is expected to be completed before 2024. No cumulative construction phase water quality impact would be anticipated.

Also, in view of the large separation distance, significant cumulative change in flow regime is not anticipated.

6.11 Hong Kong Offshore LNG Terminal (Register No. AEIAR-218/2018)

This project involves the construction of an offshore LNG terminal at marine water south of Lantau Island and its subsequent operation. Construction involves the installation of submarine gas pipelines from the Black Point Power Station and Lamma Power Stations to the proposed jetty location.

Construction of this Project is underway for completion by 2022 and no cumulative sediment impact is anticipated. Project operation involves the discharge of cooled water from regasification of LNG as well as other minor discharges. These are not expected to have cumulative water quality impact with the construction and operation of the proposed CMPs at West Lamma.

7. SUMMARY OF MODELLING SCENARIOS

A summary of modelling scenarios to be conducted is provided ***Table 7.1*** below.

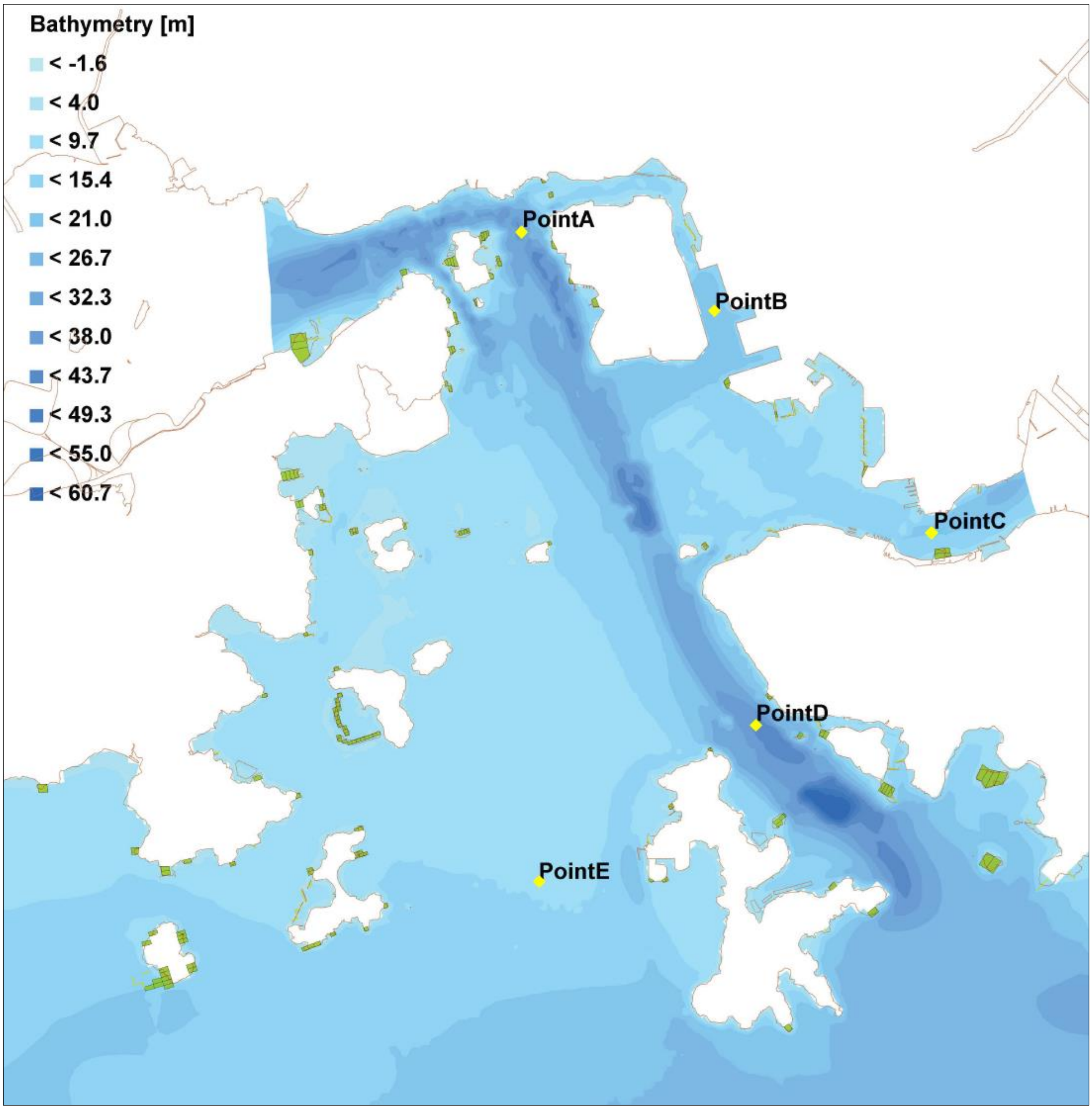
Table 7.1 Modelling Scenarios to be Conducted under this Study

Scenario ID	Description	Key Sources Considered
C1	Sediment dispersion modelling for concurrent grab dredging, backfilling and capping, together with other concurrent projects	<u>From this Project:</u> Grab Dredging - 50,000 m^3/week for each dredger (total 2 grab dredgers) Backfilling - 26,700 m^3/day Capping - 26,700 m^3/day <u>Other concurrent projects:</u> Improvement Dredging for Lamma Power Station Navigation Channel - 78,900 m^3/day (dry season); 132,500 m^3/day (wet season) Providing Sufficient Water Depth for Kwai Tsing Container Basin and its Approach Channel – 4,000 m^3/day Open Sea Disposal at South Cheung Chau - 22,800 m^3/day Sediment Disposal at South of Tsing Yi – 1,600 m^3/day
C2	Sediment dispersion modelling for concurrent TSHD dredging, backfilling and capping, together with other concurrent projects	<u>From this Project:</u> TSHD Dredging - 256,200 m^3/week Backfilling - 26,700 m^3/day Capping - 26,700 m^3/day <u>Other concurrent projects:</u> Improvement Dredging for Lamma Power Station Navigation Channel - 78,900 m^3/day (dry season); 132,500 m^3/day (wet season) Providing Sufficient Water Depth for Kwai Tsing Container Basin and its Approach Channel – 4,000 m^3/day Open Sea Disposal at South Cheung Chau – 45,100 m^3/day Sediment Disposal at South of Tsing Yi – 1,600 m^3/day
C3	Contaminant release modelling for concurrent grab dredging and backfilling	Grab Dredging - 50,000 m^3/week for each dredger (total 2 grab dredgers) Backfilling - 26,700 m^3/day
C4	Contaminant release modelling for concurrent TSHD dredging and backfilling	TSHD Dredging - 256,200 m^3/week Backfilling - 26,700 m^3/day
O1	Hydrodynamic modelling, base case scenario without project	<u>Change in bathymetry</u>: Improvement Dredging for Lamma Power Station Navigation Channel, Providing Sufficient Water Depth for Kwai Tsing Container Basin and its Approach Channel <u>Coastline:</u> Kau Yi Chau Artificial Islands
O2	Hydrodynamic modelling, base case scenario with project	<u>Change in bathymetry</u>: Depression for 3 sub-pits under this Project, Improvement Dredging for Lamma Power Station Navigation Channel, Providing Sufficient Water Depth for Kwai Tsing Container Basin and its Approach Channel <u>Coastline:</u> Kau Yi Chau Artificial Islands

APPENDIX A

WHCW MODEL VERIFICATION

Location of Observation Points



Location (RMSE% against Update Model)	Time Series Plot – Water Level
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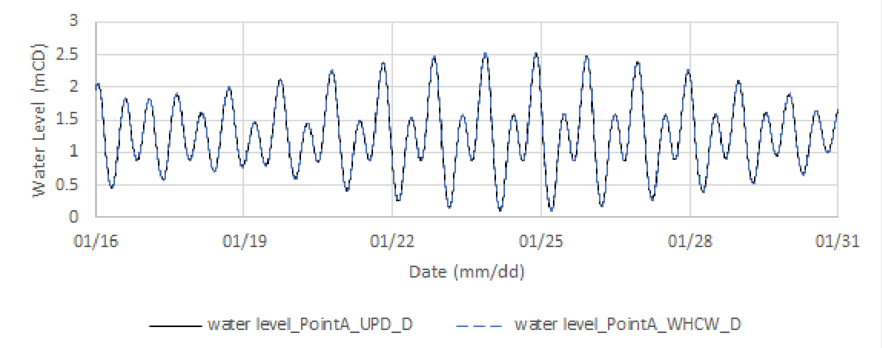
Point A (0.59%)	

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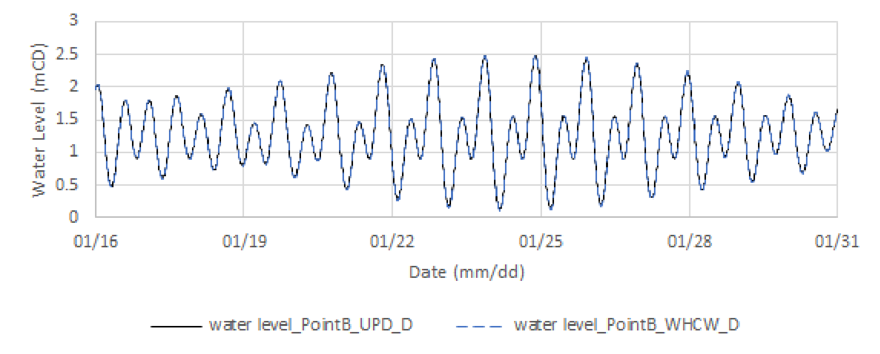
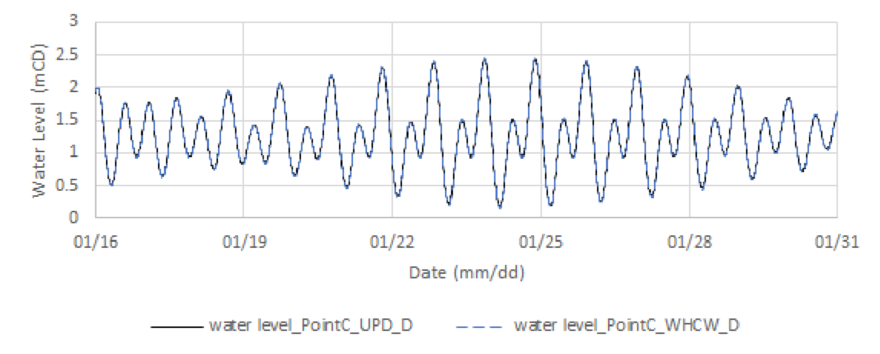
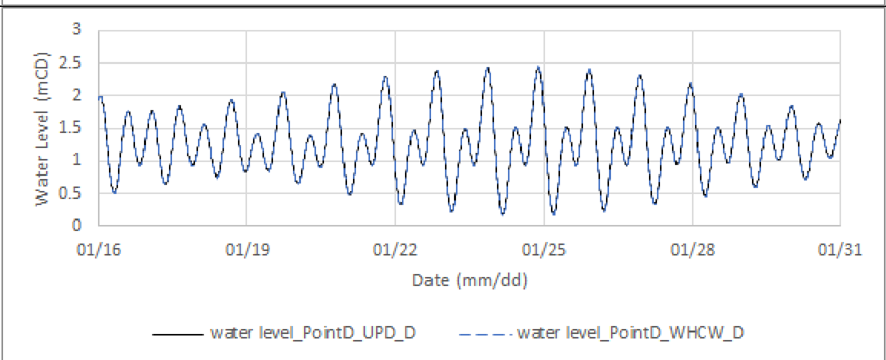
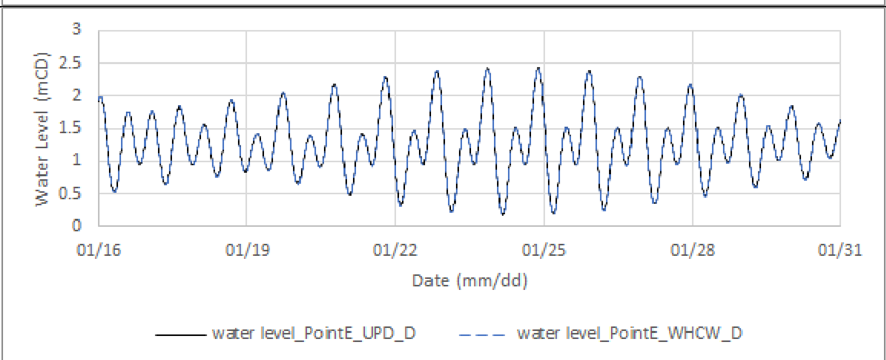
Point B (0.50%)	
Point C (0.72%)	
Point D (0.49%)	
Point E (0.37%)	
<u>Wet Season</u>	

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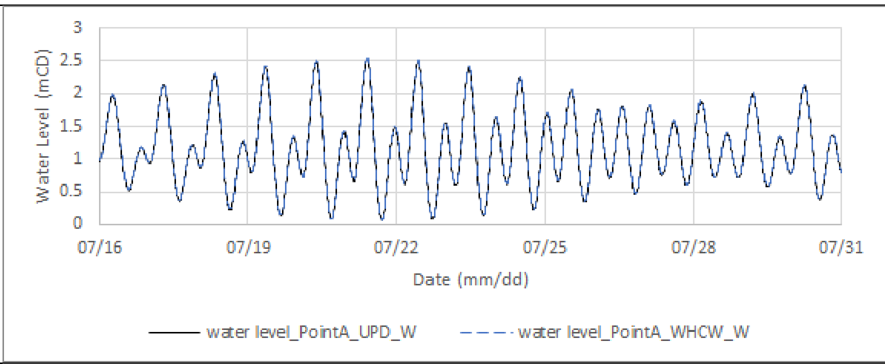
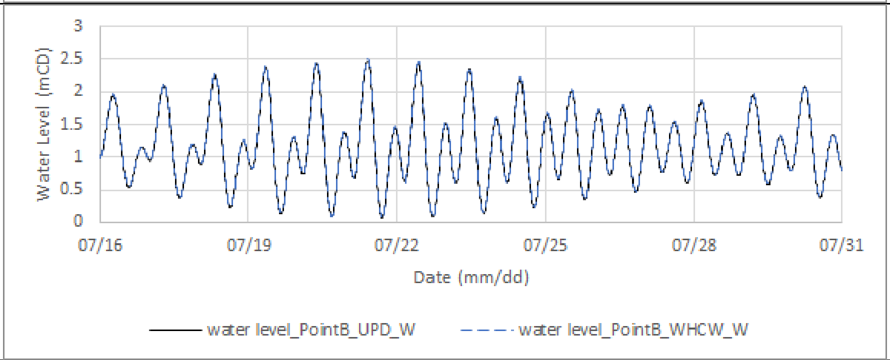
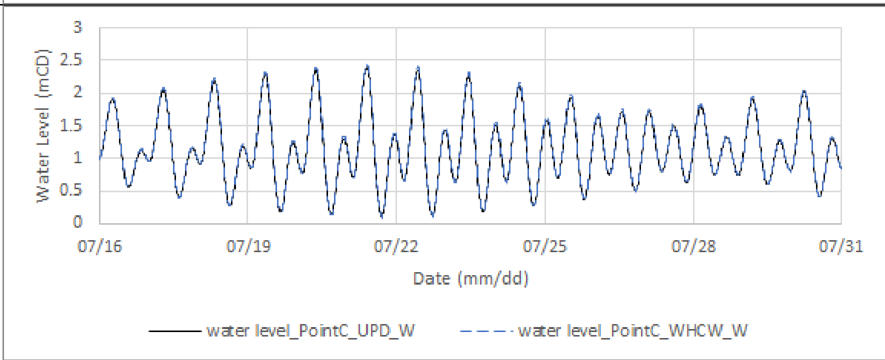
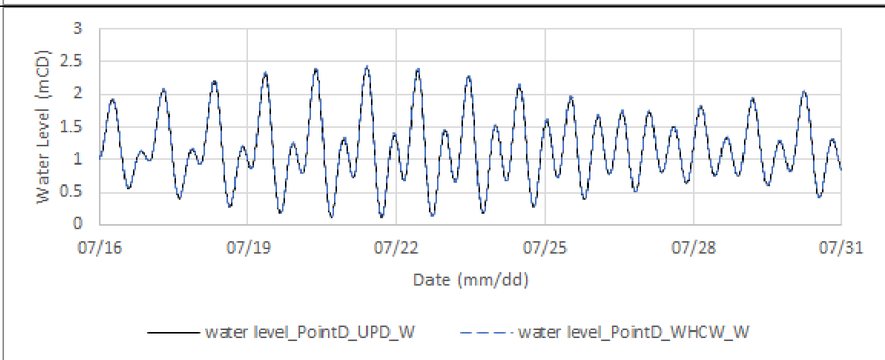
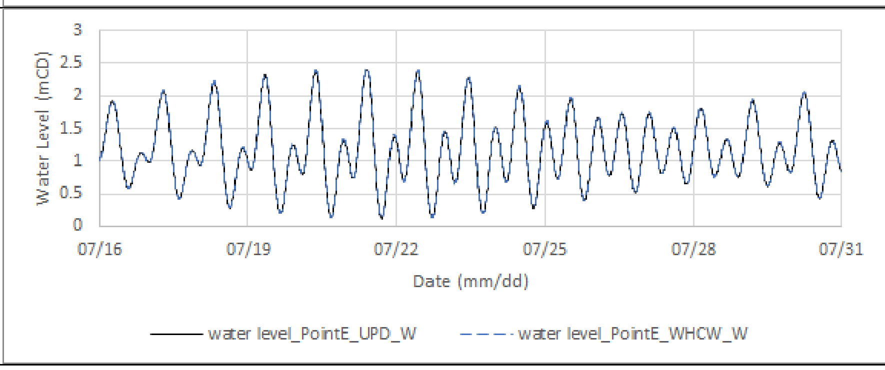
Point A (0.87%)	
Point B (0.86%)	
Point C (1.24%)	
Point D (0.74%)	
Point E (0.62%)	

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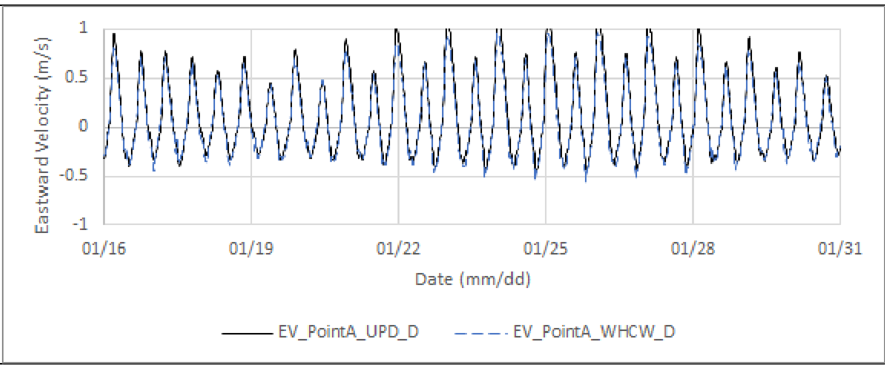
<tr><td>Point A</td><td>
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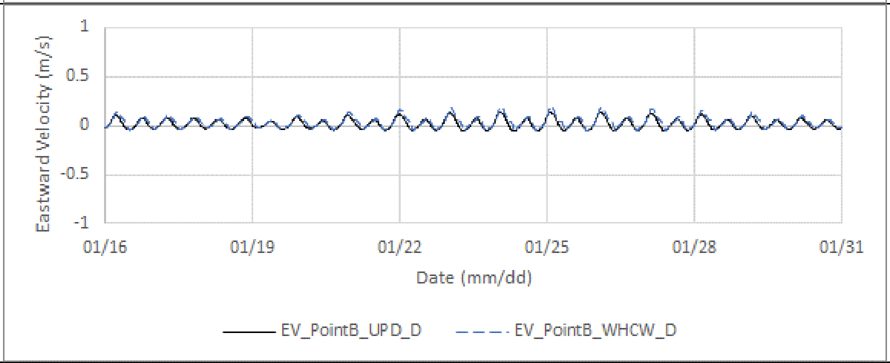
<tr><td>Point B</td><td>
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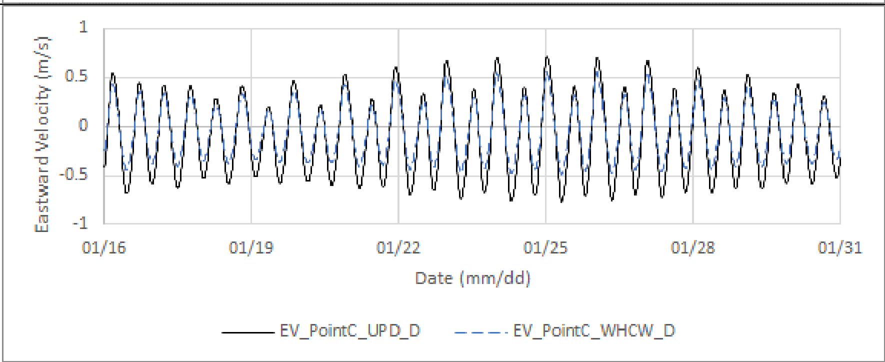
<tr><td>Point C</td><td>
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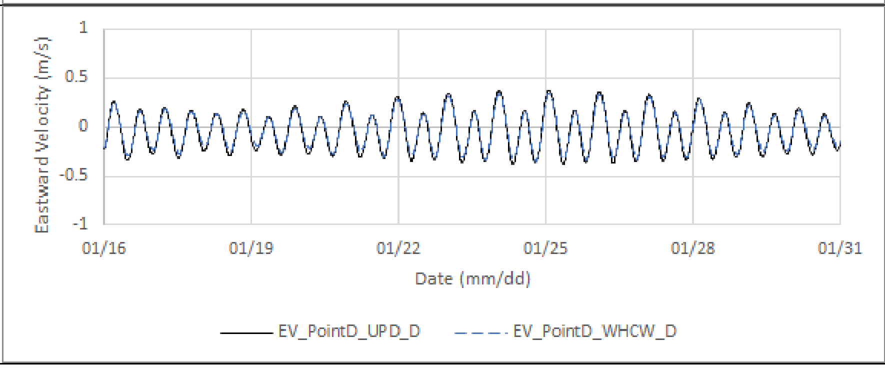
<tr><td>Point D</td><td>
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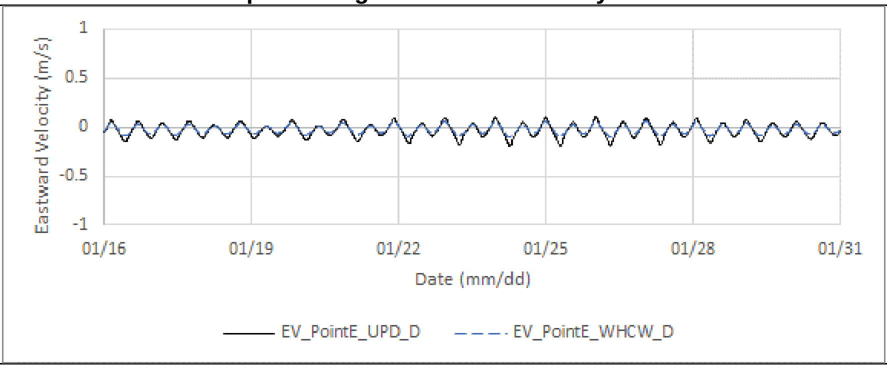
Point E	
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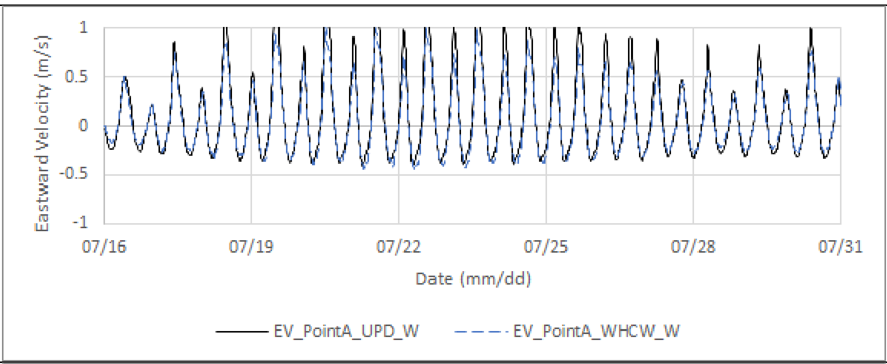
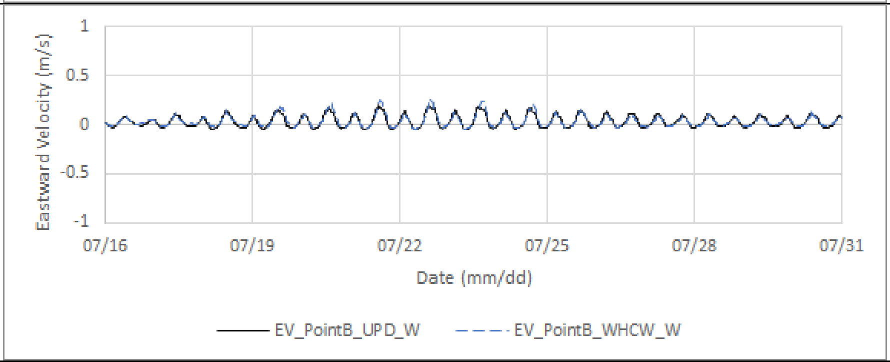
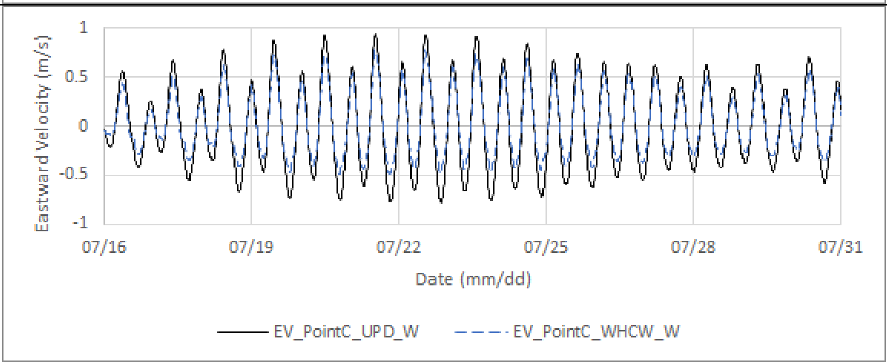
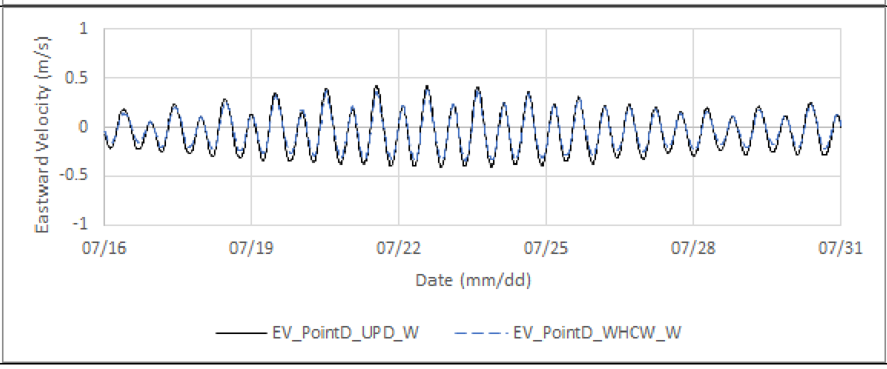
Point A	
Point B	
Point C	
Point D	

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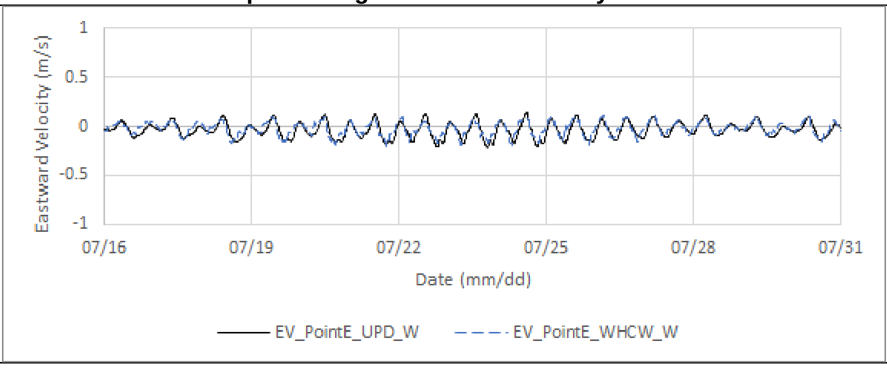
<tr><td>Point E</td><td>
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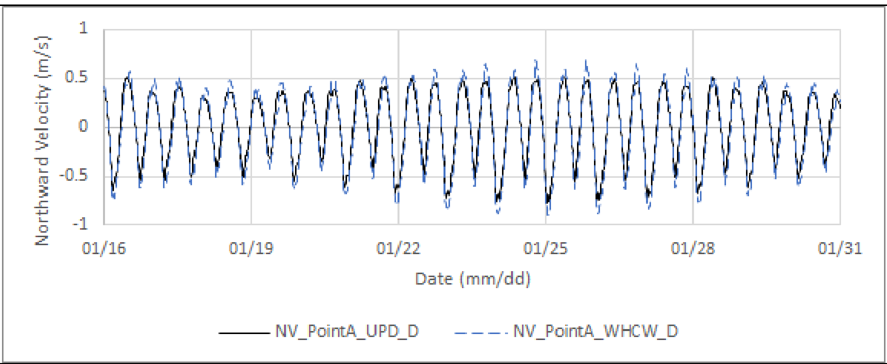
<tr><td>Point A</td><td>
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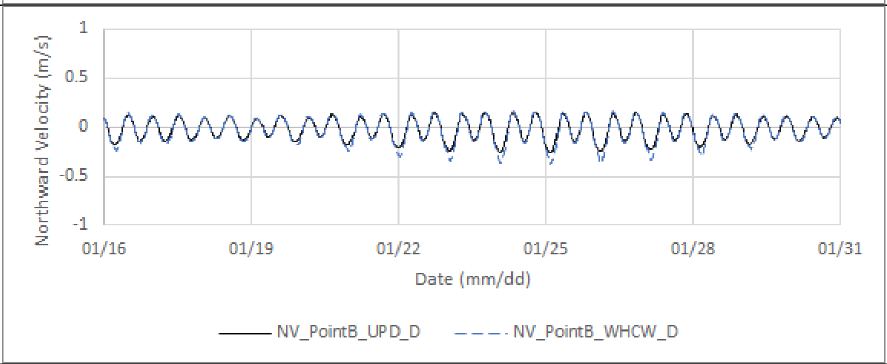
<tr><td>Point B</td><td>
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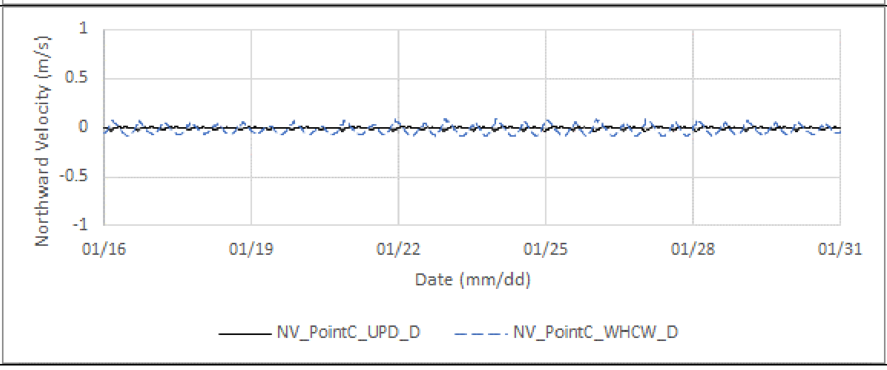
<tr><td>Point C</td><td>
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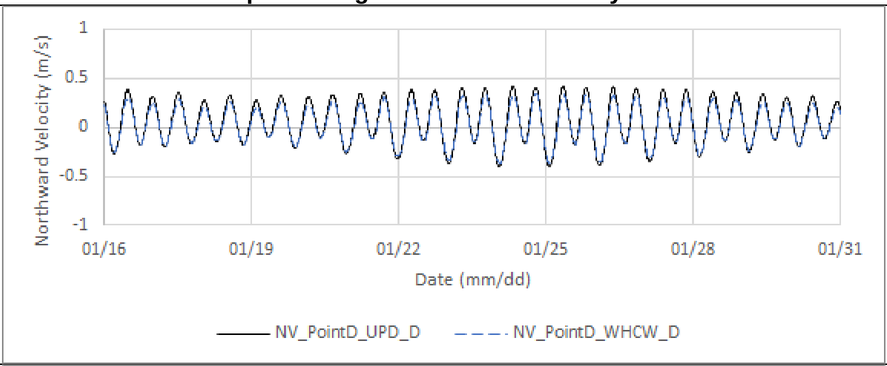
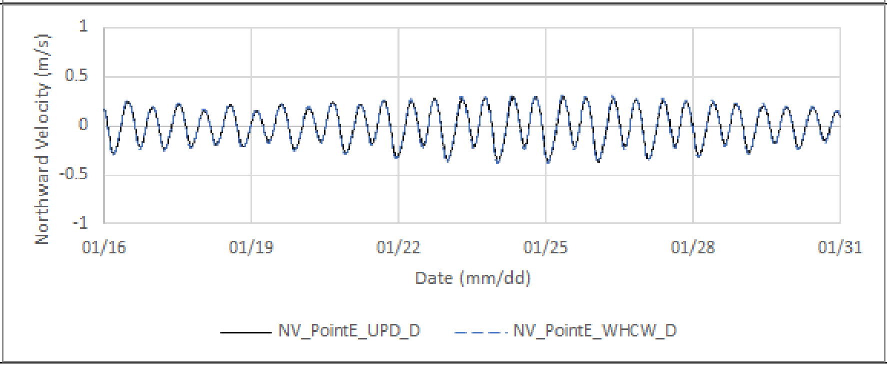
Point D	
Point E	
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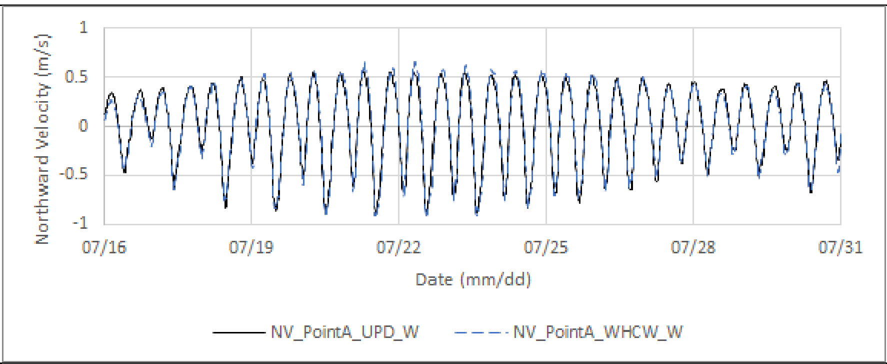
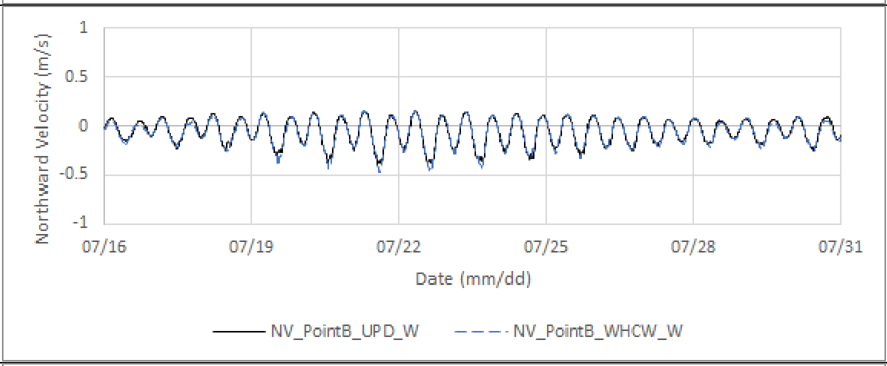
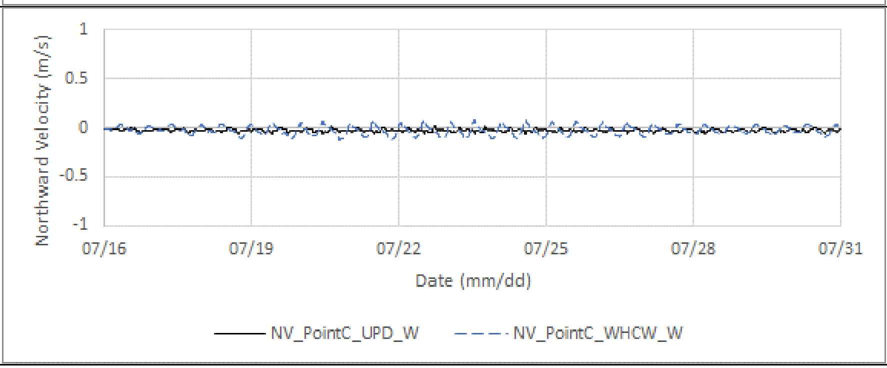
Point A	
Point B	
Point C	

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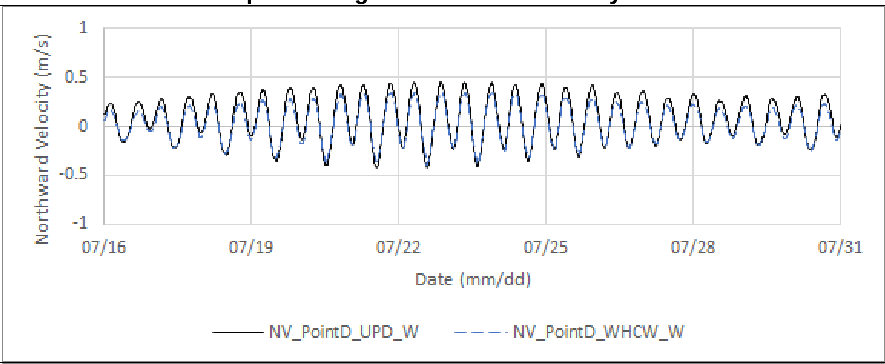
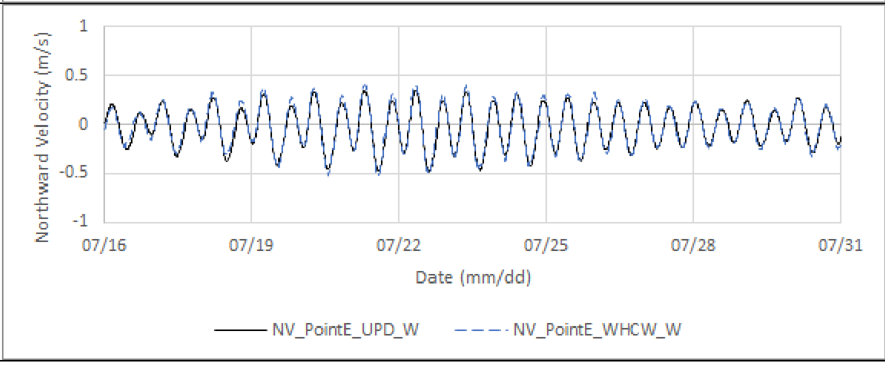
Point D	
Point E	

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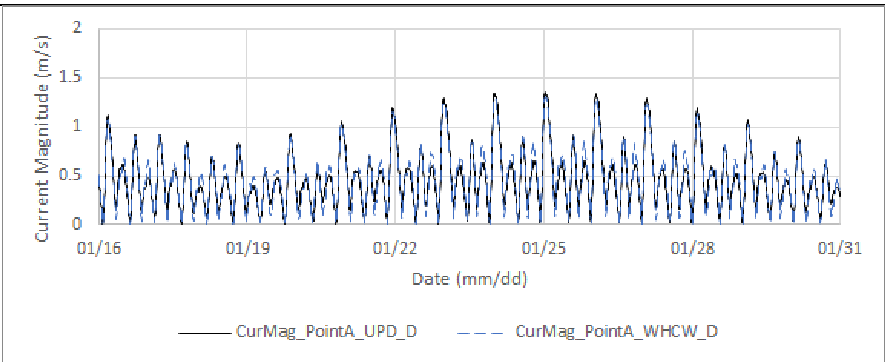
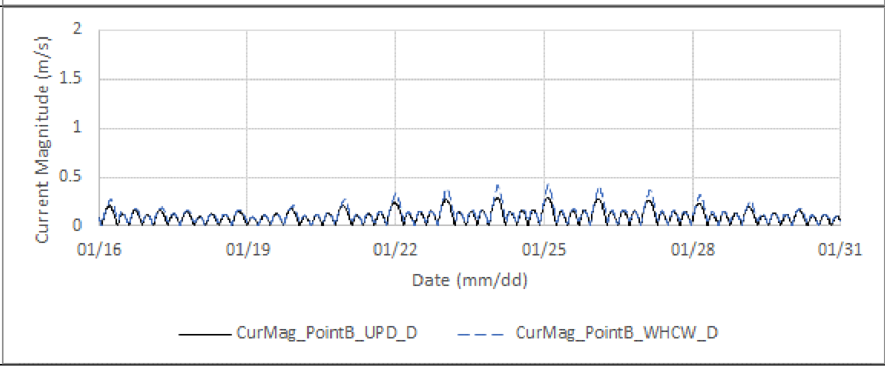
Point A	
Point B	

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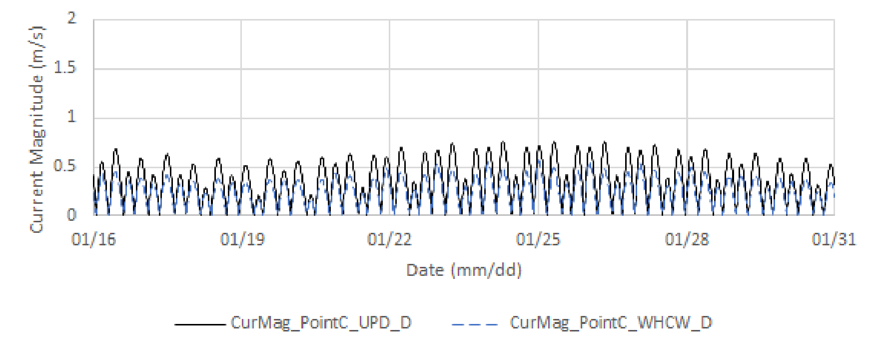
<tr><td>Point C</td><td>
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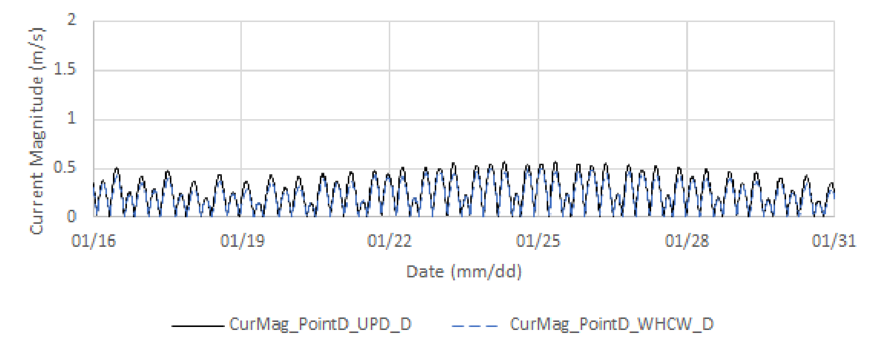
<tr><td>Point D</td><td>
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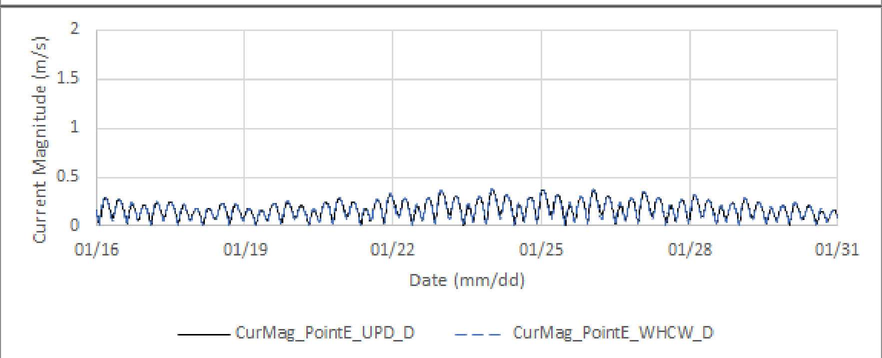
<tr><td>Point E</td><td>
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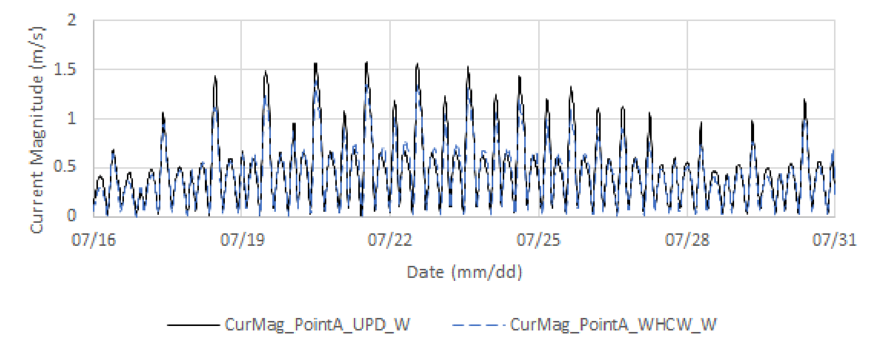
<tr><td>Point A</td><td>
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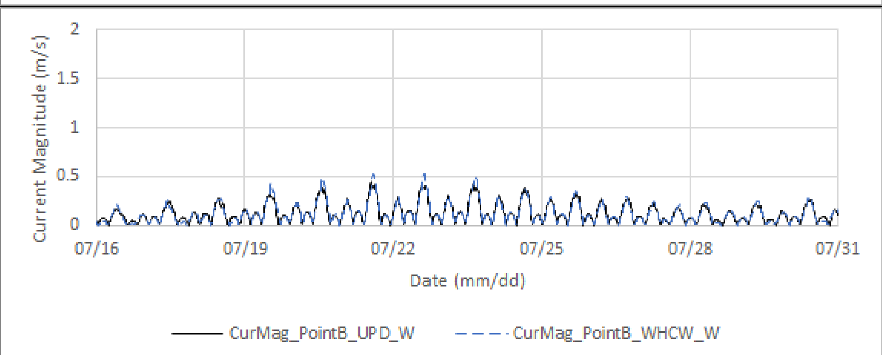
<tr><td>Point B</td><td>
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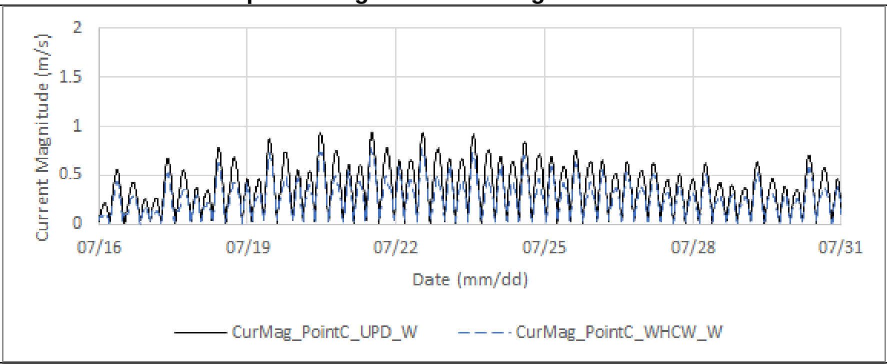
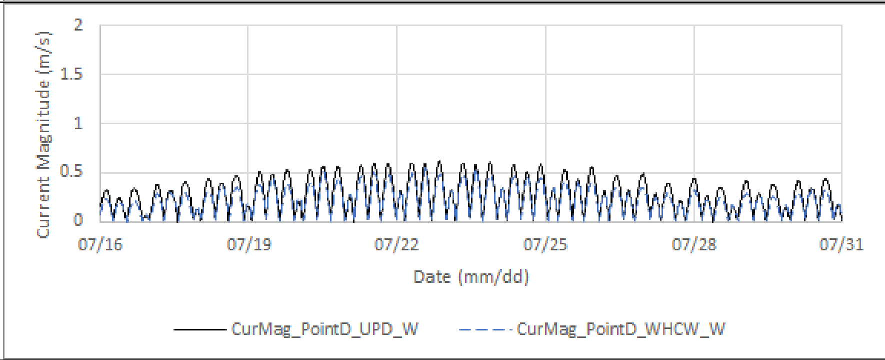
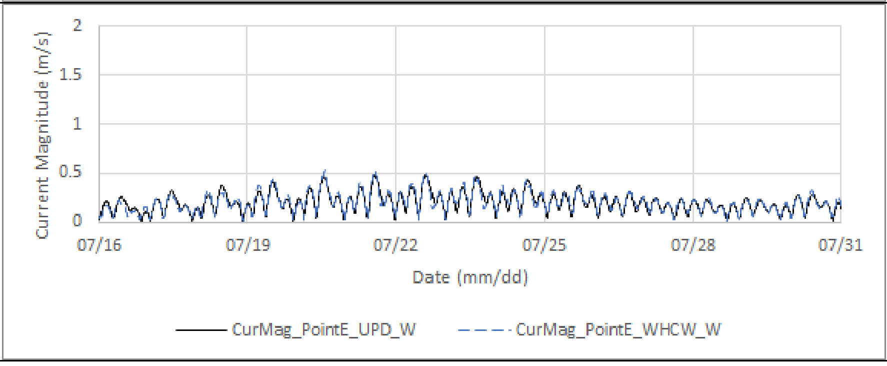
Point C	
Point D	
Point E	

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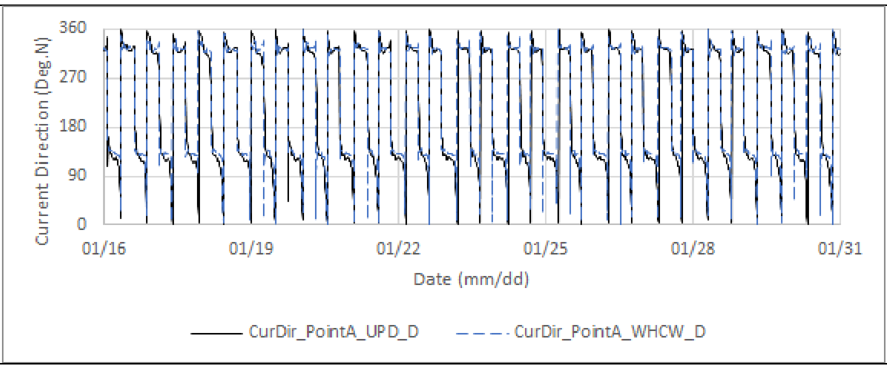
Point A	

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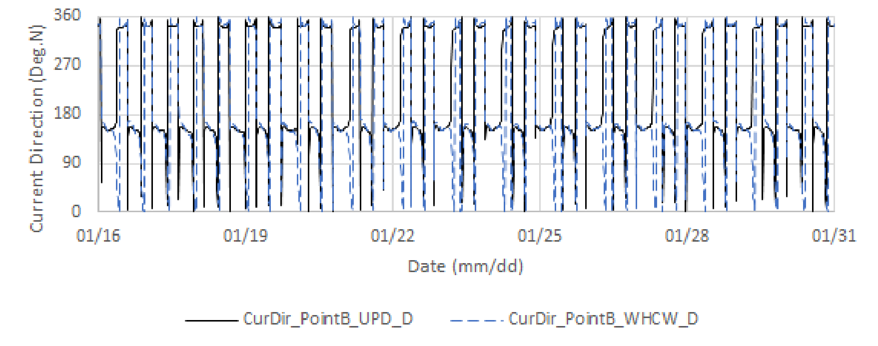
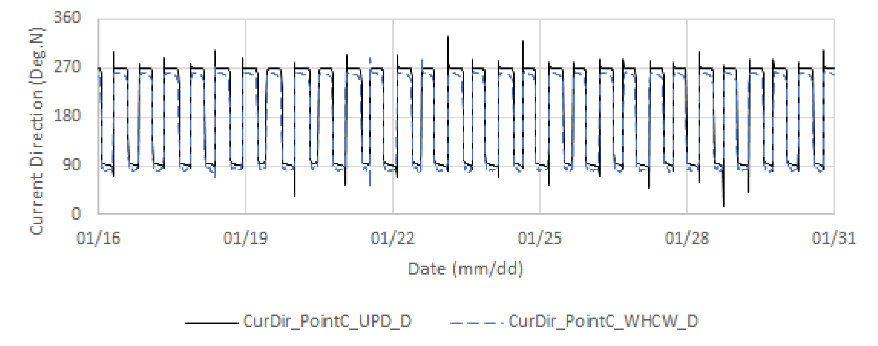
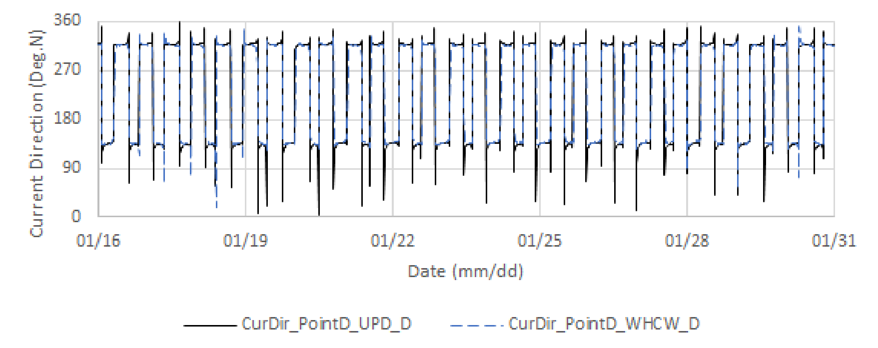
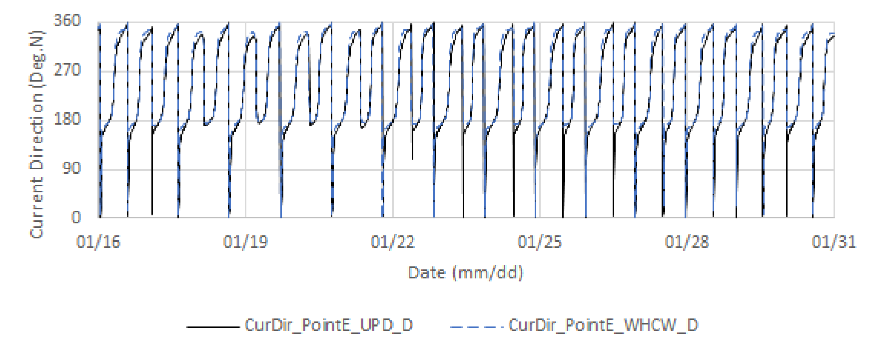
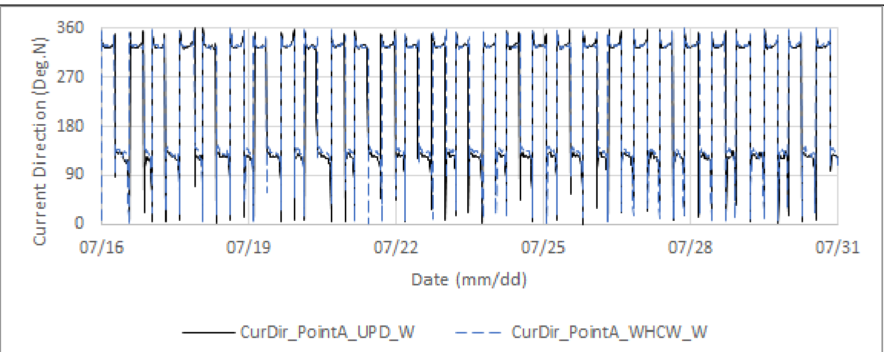
Point B	
Point C	
Point D	
Point E	
Wet Season	
Point A	

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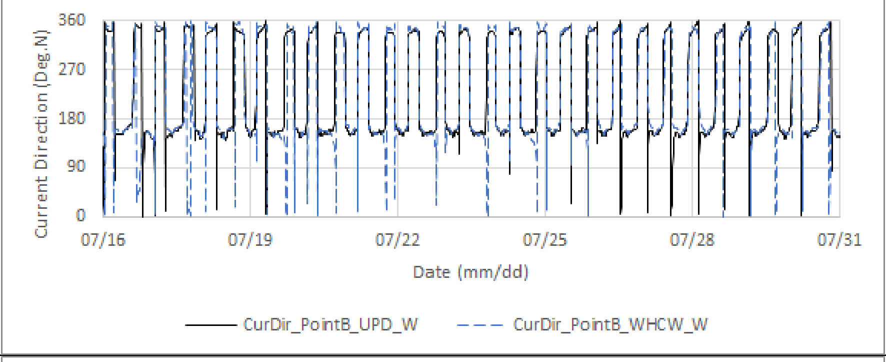
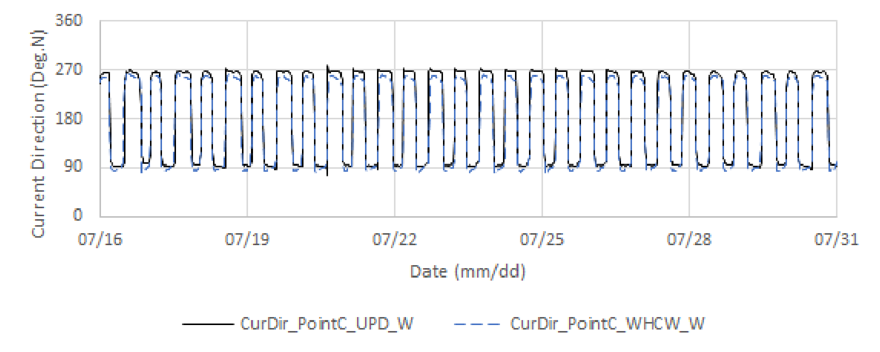
<tr><td>Point B</td><td>
</td></tr>
<tr><td>Point C</td><td>
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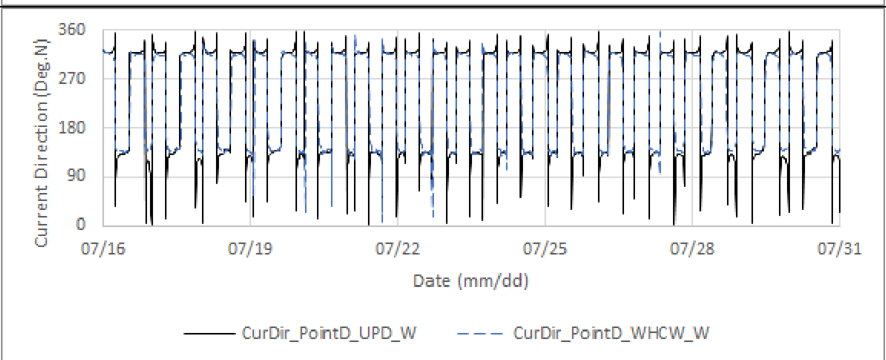
<tr><td>Point D</td><td>
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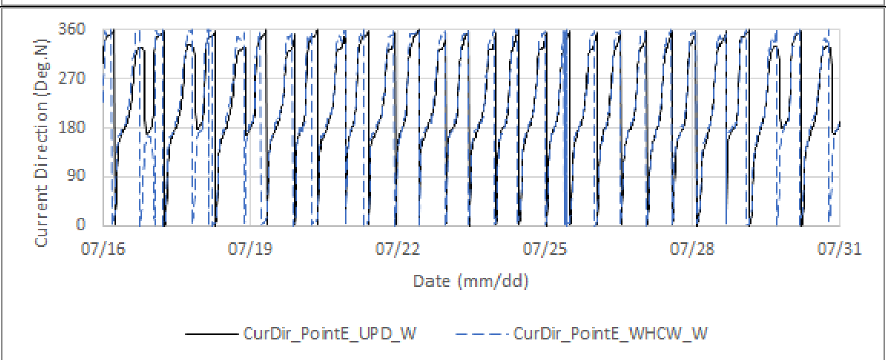
<tr><td>Point E</td><td>
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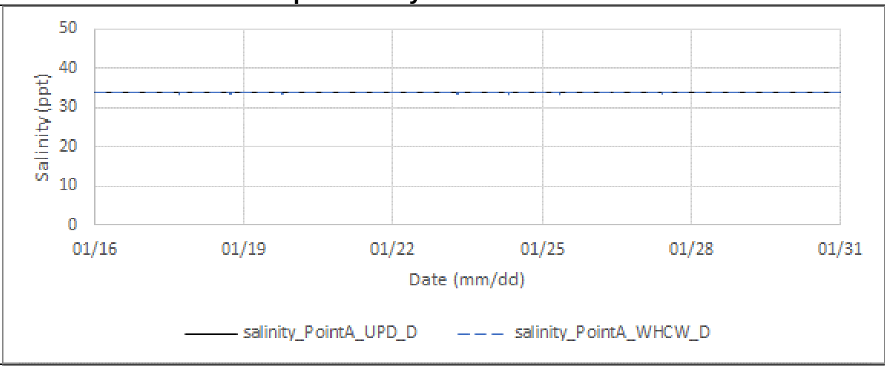
Location	Time Series Plot – Mid-depth Salinity
Dry Season	

<table>
<tr><th>Location</th><th>Time Series Plot – Mid-depth Salinity</th></tr>
<tr><td>Point A</td><td>
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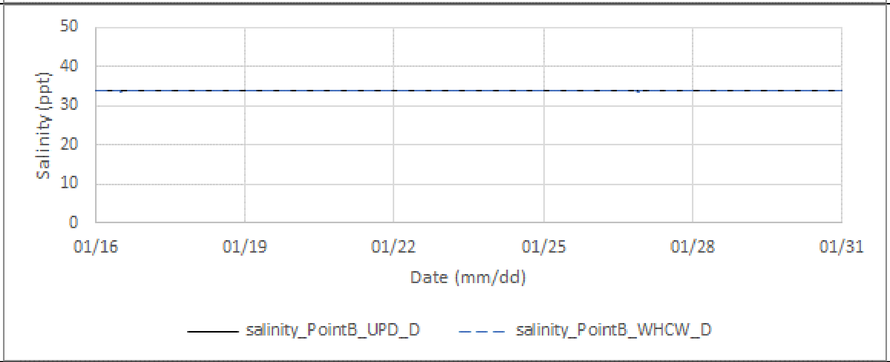
<tr><td>Point B</td><td>
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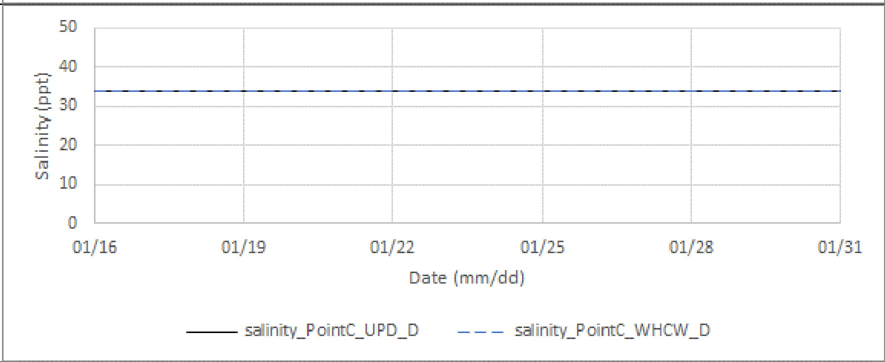
<tr><td>Point C</td><td>
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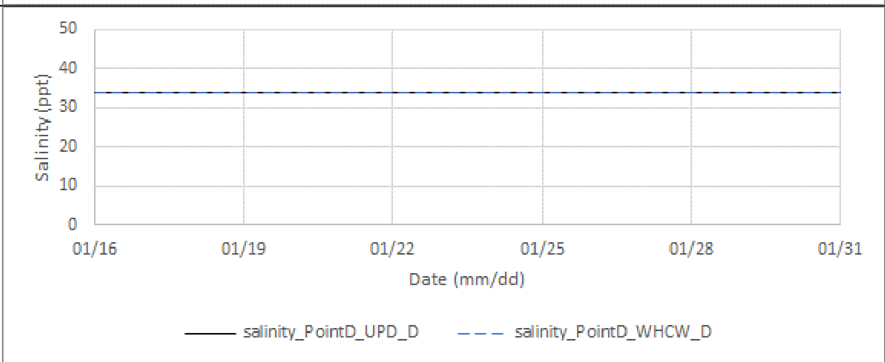
<tr><td>Point D</td><td>
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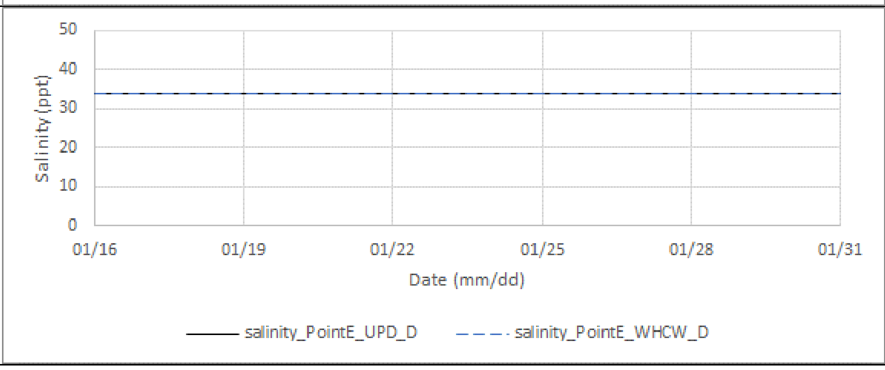
<tr><td>Point E</td><td>
</td></tr>
<tr><td colspan="2"><u>Wet Season</u></td></tr>
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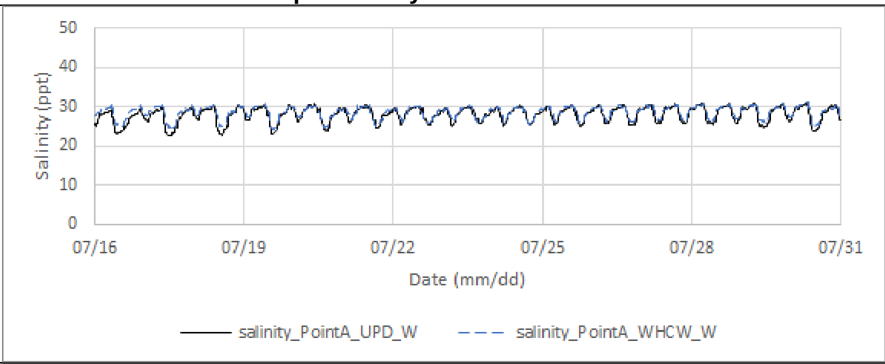
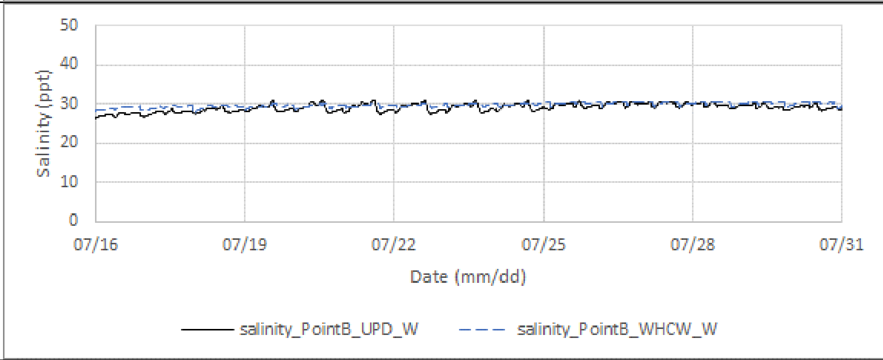
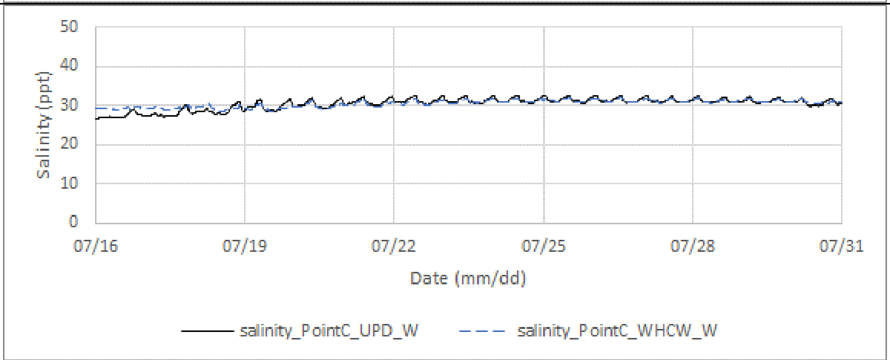
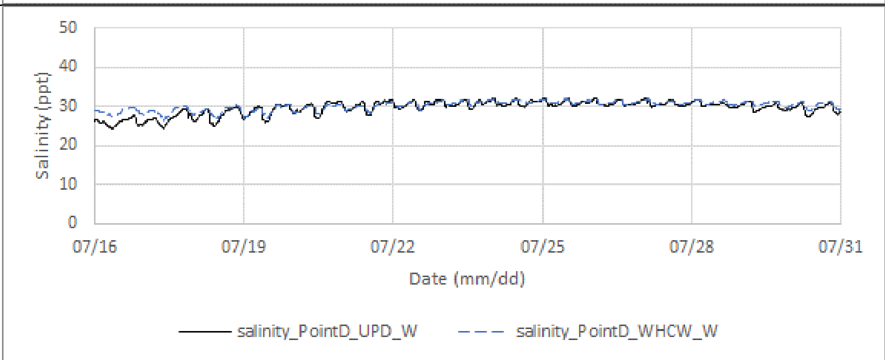
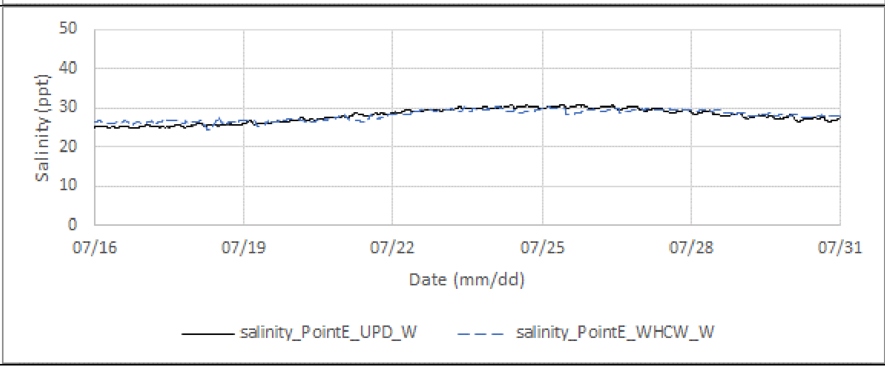
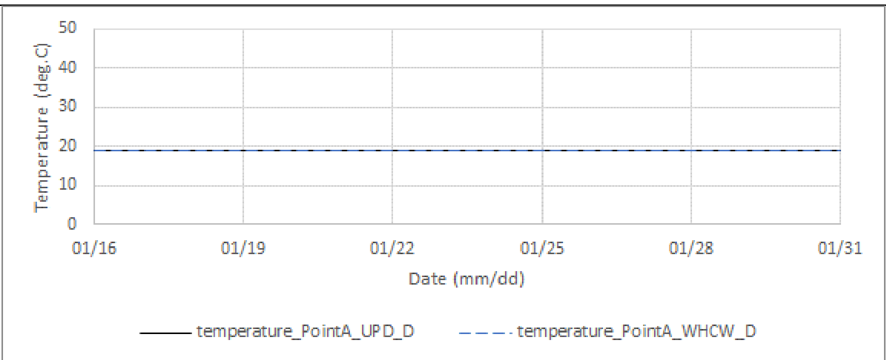
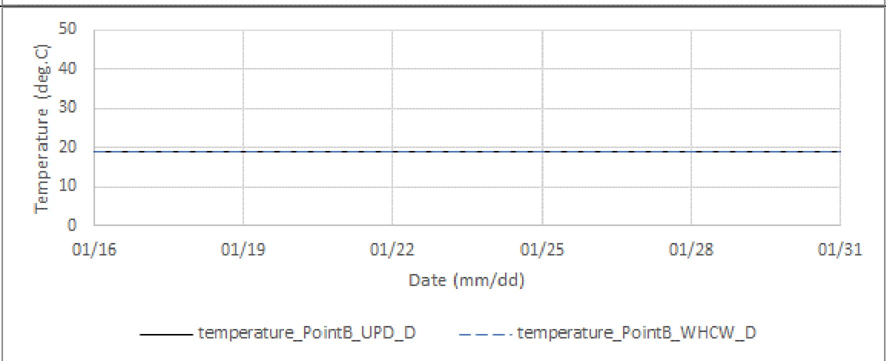
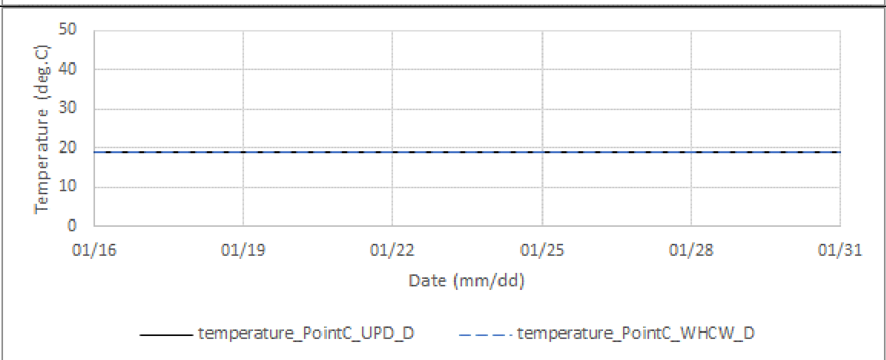
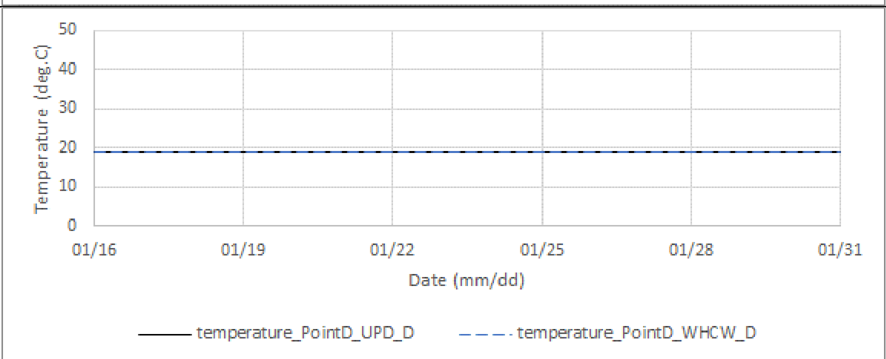
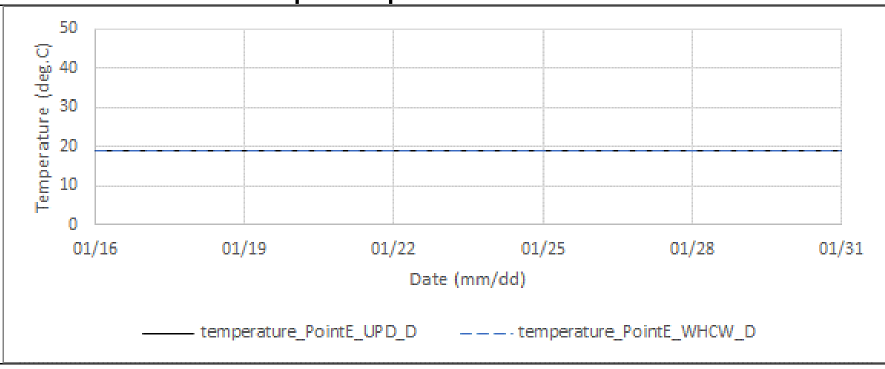
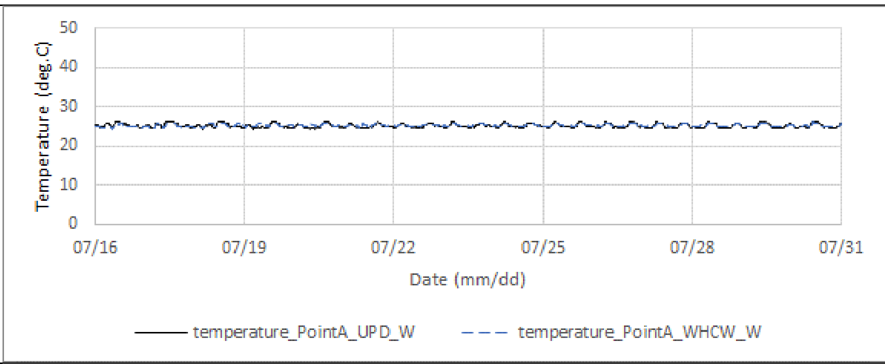
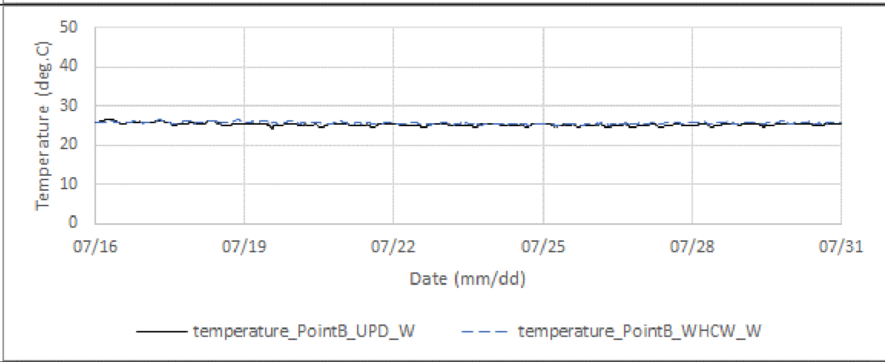
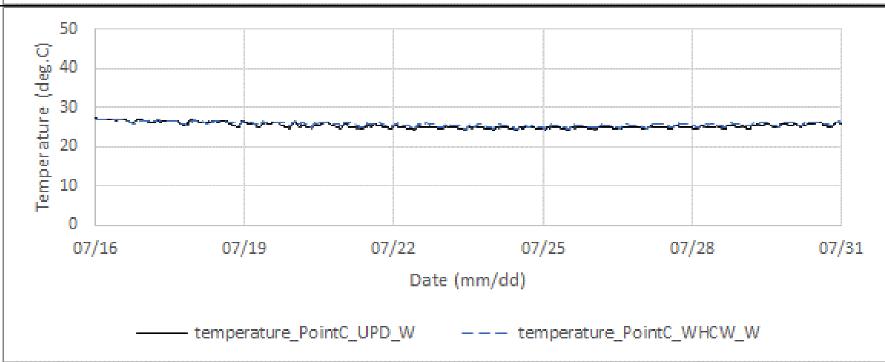
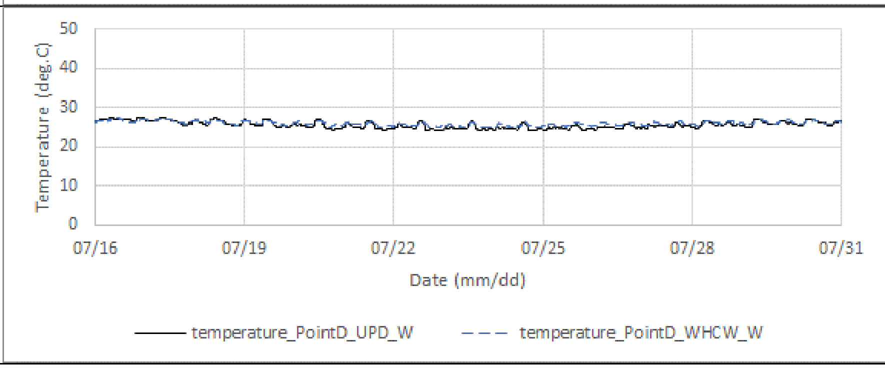
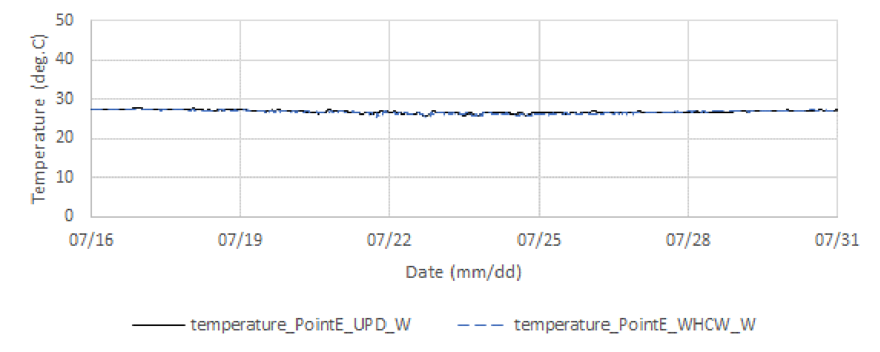
Location	Time Series Plot – Mid-depth Salinity
Point A	
Point B	
Point C	
Point D	
Point E	

Location	Time Series Plot – Mid-depth Temperature
Dry Season	
Point A	
Point B	
Point C	
Point D	

Location	Time Series Plot – Mid-depth Temperature
Point E	
<u>Wet Season</u>	
Point A	
Point B	
Point C	
Point D	

Location	Time Series Plot – Mid-depth Temperature
Point E	

APPENDIX B

SEDIMENT QUALITY SURVEY RESULTS

Sample ID	GS-1	GS-2	GS-3	GS-4	GS-5	GS-6	GS-7	GS-8	GS-9	GS-10	GS-11	GS-12
Sampling Location	826100E 809399N	826286E 809323N	826025E 809213N	826210E 809138N	826395E 809062N	825950E 809028N	826135E 808953N	826320E 808877N	826433E 808774N	825874E 808843N	826059E 808767N	826244E 808692N
Sampling Depth	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m
Sampling Date	29/5/2020	29/5/2020	29/5/2020	29/5/2020	29/5/2020	10/6/2020	10/6/2020	10/6/2020	10/6/2020	10/6/2020	10/6/2020	10/6/2020
Sampling Time	11:40	11:25	11:10	10:50	10:35	9:15	9:30	9:50	10:00	10:45	10:35	10:25
Cd, mg/kg	0.07	0.07	0.07	0.06	0.25	<0.05	0.06	0.07	0.07	<0.05	<0.05	<0.05
Cr, mg/kg	27	27	29	29	49	21	27	32	30	31	24	26
Cu, mg/kg	27	27	24	28	29	31	33	42	40	41	35	34
Hg, mg/kg	0.26	0.11	0.11	0.09	0.09	0.06	0.08	0.14	0.1	0.09	0.11	0.07
Ni, mg/kg	17	18	19	18	21	13	17	19	19	20	15	16
Pb, mg/kg	33	32	34	33	34	25	32	36	35	37	46	32
Ag, mg/kg	0.19	0.18	0.25	0.25	0.22	0.16	0.17	0.19	0.2	0.21	0.13	0.16
Zn, mg/kg	96	91	95	94	95	70	89	98	97	100	83	88
As, mg/kg	9.6	9	10	9.7	10	7.1	9.3	9.8	9.6	9.4	8	7.6
Acenaphtene, µg/kg	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8
Acenaphtylene, µg/kg	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8
Anthracene, µg/kg	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8
Fluorene, µg/kg	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8
Naphthalene, µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Phenanthrene, µg/kg	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8
Low molecular weight PAHs	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Benzo(a)anthracene, µg/kg	<10	<10	<10	11	<10	27	29	19	15	14	<10	<10
Benzo(a)pyrene, µg/kg	<10	<10	<10	15	11	15	47	31	31	29	<10	<10
Benzo(b)fluoranthene , µg/kg	11	<10	<10	20	14	70	65	49	43	47	<10	<10
Benzo(k)fluoranthene, µg/kg	<10	<10	<10	<10	<10	10	32	19	17	16	<10	<10
Benzo(g,h,i)perylene, µg/kg	<10	<10	<10	12	<10	27	29	24	19	21	<10	<10
Chrysene, µg/kg	<10	<10	<10	<10	<10	20	21	13	17	16	<10	<10
Dibenzo(a,h)anthracene, µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Fluoranthene, µg/kg	<10	<10	<10	12	<10	50	53	19	18	18	<10	<10
Indeno(1,2,3-cd)pyrene, µg/kg	<10	<10	<10	<10	<10	25	25	26	25	23	11	11
Pyrene, µg/kg	<10	<10	<10	12	<10	64	64	17	17	16	<10	<10
High molecular weight PAHs	101	<100	<100	122	105	318	375	216	212	210	101	101
2,4'-Dichlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2',5-Trichlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,4,4'-Trichlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 3,5'-Tetrachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 5,5'-Tetrachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,3', 4,4'-Tetrachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
3,3', 4,4'-Tetrachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 4,5,5'-Pentachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,3,3', 4,4'-Pentachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,3', 4,4',5-Pentachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
3,3', 4,4',5-Pentachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 3,3',4,4'-Hexachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 3,4,4',5'-Hexachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 4,4',5,5'-Hexachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
3,3', 4,4',5,5'-Hexachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 3,3',4,4',5-Heptachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 3,4,4',5,5'-Heptachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 3,4',5,5',6-Heptachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Total PCB	<18	<18	<18	<18	<18	<18	<18	<18	<18	<18	<18	<18
Tributyltin (TBT) in Interstitial water, µg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Sample ID	GS-13	GS-14	GS-15	GS-16	GS-17	GS-18	GS-19	GS-20	GS-21	GS-22	GS-23	GS-24
Sampling Location	826430E 808616N	825799E 808658N	825984E 808582N	826169E 808507N	826354E 808431N	826539E 808356N	825723E 808472N	825908E 808397N	826094E 808322N	826279E 808246N	826464E 808171N	825648E 808287N
Sampling Depth	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m
Sampling Date	10/6/2020	10/6/2020	10/6/2020	10/6/2020	10/6/2020	11/6/2020	11/6/2020	11/6/2020	11/6/2020	11/6/2020	11/6/2020	11/6/2020
Sampling Time	10:15	11:10	11:20	11:30	11:40	9:05	10:45	10:30	10:10	9:50	9:30	11:00
Cd, mg/kg	0.06	<0.05	0.06	0.05	0.07	0.06	0.05	0.07	<0.05	<0.05	<0.05	<0.05
Cr, mg/kg	27	31	31	20	30	25	27	28	25	25	25	26
Cu, mg/kg	33	38	39	20	35	29	34	38	31	31	29	34
Hg, mg/kg	0.07	0.08	0.12	<0.05	0.12	0.11	0.12	0.1	0.07	0.09	0.1	0.17
Ni, mg/kg	17	19	19	12	19	16	17	18	16	16	16	16
Pb, mg/kg	31	36	35	27	35	31	34	33	30	29	29	34
Ag, mg/kg	0.18	0.16	0.34	0.09	0.18	0.14	0.28	0.21	0.16	0.16	0.14	0.17
Zn, mg/kg	85	100	99	80	97	82	95	94	87	84	80	87
As, mg/kg	9	9.6	11	7.2	9.1	7.8	9	9.4	7.6	7.6	8.6	8.7
Acenaphtene, µg/kg	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8
Acenaphtylene, µg/kg	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8
Anthracene, µg/kg	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8
Fluorene, µg/kg	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8
Naphthalene, µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Phenanthrene, µg/kg	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8
Low molecular weight PAHs	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Benzo(a)anthracene, µg/kg	<10	<10	<10	18	20	<10	<10	<10	<10	<10	<10	<10
Benzo(a)pyrene, µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzo(b)fluoranthene , µg/kg	<10	11	11	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzo(k)fluoranthene, µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzo(g,h,i)perylene, µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chrysene, µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Dibenzo(a,h)anthracene, µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Fluoranthene, µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Indeno(1,2,3-cd)pyrene, µg/kg	13	14	13	12	13	<10	<10	<10	<10	<10	<10	<10
Pyrene, µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
High molecular weight PAHs	103	105	104	110	113	<100	<100	<100	<100	<100	<100	<100
2,4'-Dichlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2',5-Trichlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,4,4'-Trichlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 3,5'-Tetrachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 5,5'-Tetrachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,3', 4,4'-Tetrachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
3,3', 4,4'-Tetrachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 4,5,5'-Pentachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,3,3', 4,4'-Pentachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,3', 4,4',5-Pentachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
3,3', 4,4',5-Pentachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 3,3',4,4'-Hexachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 3,4,4',5'-Hexachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 4,4',5,5'-Hexachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
3,3', 4,4',5,5'-Hexachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 3,3',4,4',5-Heptachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 3,4,4',5,5'-Heptachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 3,4',5,5',6-Heptachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Total PCB	<18	<18	<18	<18	<18	<18	<18	<18	<18	<18	<18	<18
Tributyltin (TBT) in Interstitial water, µg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Sample ID	**GS-25**	**GS-26**	**GS-27**	**GS-28**	**GS-29**	**GS-30**	**GS-31**	**GS-32**	**GS-33**	**GS-34**	**GS-35**	**GS-36**
Sampling Location	825833E 808212N	826018E 808136N	826203E 808061N	826389E 807985N	826574E 807910N	825572E 808102N	825757E 808027N	825943E 807951N	826128E 807876N	826313E 807800N	826498E 807725N	826684E 807649N
Sampling Depth	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m
Sampling Date	11/6/2020	11/6/2020	11/6/2020	11/6/2020	11/6/2020	12/6/2020	12/6/2020	12/6/2020	12/6/2020	12/6/2020	11/6/2020	11/6/2020
Sampling Time	11:20	11:45	12:05	12:25	12:45	10:45	10:30	10:15	10:00	9:40	12:55	13:05
Cd, mg/kg	0.05	<0.05	<0.05	<0.05	<0.05	0.05	0.06	<0.05	<0.05	<0.05	<0.05	<0.05
Cr, mg/kg	25	25	25	23	22	26	25	25	22	27	23	24
Cu, mg/kg	31	28	30	31	23	43	30	31	22	28	23	25
Hg, mg/kg	0.3	0.16	0.07	0.09	<0.05	0.08	0.1	0.11	<0.05	0.06	<0.05	<0.05
Ni, mg/kg	16	16	16	15	14	17	16	16	14	18	15	15
Pb, mg/kg	33	32	29	31	26	30	29	29	30	31	27	27
Ag, mg/kg	0.16	0.14	0.15	0.14	0.1	0.13	0.19	0.17	0.1	0.13	0.11	0.11
Zn, mg/kg	84	85	80	72	68	85	80	81	76	88	74	76
As, mg/kg	7.7	7.9	7.7	7.3	6.9		8.4	8.2	7.6	8.3	7.3	7.1
Acenaphtene, µg/kg	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8
Acenaphtylene, µg/kg	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8
Anthracene, µg/kg	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8
Fluorene, µg/kg	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8
Naphthalene, µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Phenanthrene, µg/kg	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8
Low molecular weight PAHs	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Benzo(a)anthracene, µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzo(a)pyrene, µg/kg	<10	<10	<10	<10	<10	<10	<10	16	<10	<10	<10	<10
Benzo(b)fluoranthene , µg/kg	<10	<10	<10	<10	<10	<10	<10	21	<10	<10	<10	<10
Benzo(k)fluoranthene, µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzo(g,h,i)perylene, µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chrysene, µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Dibenzo(a,h)anthracene, µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Fluoranthene, µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Indeno(1,2,3-cd)pyrene, µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Pyrene, µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
High molecular weight PAHs	<100	<100	<100	<100	<100	<100	<100	117	<100	<100	<100	<100
2,4'-Dichlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2',5-Trichlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,4,4'-Trichlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 3,5'-Tetrachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 5,5'-Tetrachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,3', 4,4'-Tetrachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
3,3', 4,4'-Tetrachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 4,5,5'-Pentachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,3,3', 4,4'-Pentachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,3', 4,4',5-Pentachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
3,3', 4,4',5-Pentachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 3,3',4,4'-Hexachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 3,4,4',5'-Hexachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 4,4',5,5'-Hexachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
3,3', 4,4',5,5'-Hexachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 3,3',4,4',5-Heptachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 3,4,4',5,5'-Heptachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 3,4',5,5',6-Heptachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Total PCB	<18	<18	<18	<18	<18	<18	<18	<18	<18	<18	<18	<18
Tributyltin (TBT) in Interstitial water, µg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Sample ID	GS-37	GS-38	GS-39	GS-40	GS-41	GS-42	GS-43	GS-44	GS-45	GS-46	GS-47	GS-48
Sampling Location	825497E 807917N	825682E 807841N	825867E 807766N	826052E 807690N	826238E 807615N	826423E 807539N	826608E 807464N	826723E 807364N	825421E 807732N	825607E 807656N	825792E 807581N	825977E 807505N
Sampling Depth	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m
Sampling Date	12/6/2020	12/6/2020	12/6/2020	12/6/2020	12/6/2020	12/6/2020	12/6/2020	12/6/2020	17/6/2020	17/6/2020	17/6/2020	17/6/2020
Sampling Time	11:00	11:10	11:25	11:38	11:55	12:10	12:20	12:35	12:50	12:40	12:30	12:20
Cd, mg/kg	<0.05	0.07	<0.05	<0.05	0.06	<0.05	<0.05	0.06	0.06	0.06	<0.05	<0.05
Cr, mg/kg	23	27	24	27	36	24	26	23	24	24	21	24
Cu, mg/kg	25	31	28	30	32	27	27	22	22	21	20	20
Hg, mg/kg	<0.05	0.16	0.17	0.09	0.07	0.09	0.05	0.07	0.1	0.13	0.08	0.08
Ni, mg/kg	14	17	16	17	24	15	16	15	16	15	14	17
Pb, mg/kg	30	32	30	32	43	26	30	25	30	28	26	29
Ag, mg/kg	0.1	0.16	0.13	0.13	0.15	0.12	0.12	0.1	0.14	0.15	0.13	0.12
Zn, mg/kg	80	88	80	90	110	74	82	72	79	72	69	78
As, mg/kg	7.7	8.1	7.2	8.1	10	7	7.4	7.5	7.1	6.1	5.3	7.1
Acenaphtene, µg/kg	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8
Acenaphtylene, µg/kg	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8
Anthracene, µg/kg	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8
Fluorene, µg/kg	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8
Naphthalene, µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Phenanthrene, µg/kg	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8
Low molecular weight PAHs	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Benzo(a)anthracene, µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzo(a)pyrene, µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzo(b)fluoranthene , µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzo(k)fluoranthene, µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzo(g,h,i)perylene, µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	12	<10	<10	<10
Chrysene, µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Dibenzo(a,h)anthracene, µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	42	<10	<10	23
Fluoranthene, µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Indeno(1,2,3-cd)pyrene, µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	20	11	10	12
Pyrene, µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
High molecular weight PAHs	<100	<100	<100	<100	<100	<100	<100	<100	100	<100	<100	<100
2,4'-Dichlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2',5-Trichlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,4,4'-Trichlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 3,5'-Tetrachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 5,5'-Tetrachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,3', 4,4'-Tetrachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
3,3', 4,4'-Tetrachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 4,5,5'-Pentachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,3,3', 4,4'-Pentachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,3', 4,4',5-Pentachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
3,3', 4,4',5-Pentachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 3,3',4,4'-Hexachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 3,4,4',5'-Hexachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 4,4',5,5'-Hexachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
3,3', 4,4',5,5'-Hexachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 3,3',4,4',5-Heptachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 3,4,4',5,5'-Heptachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 3,4',5,5',6-Heptachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Total PCB	<18	<18	<18	<18	<18	<18	<18	<18	<18	<18	<18	<18
Tributyltin (TBT) in Interstitial water, µg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Sample ID	GS-49	GS-50	GS-51	GS-52	GS-53	GS-54	GS-55	GS-56	GS-57	GS-58	GS-59	GS-60
Sampling Location	826162E 807430N	826347E 807354N	826533E 807279N	826718E 807203N	825346E 807546N	825531E 807471N	825716E 807395N	825901E 807320N	S260S7E S07245N	S26272E S07169N	S26457E S07094N	S26642E S0701SN
Sampling Depth	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m
Sampling Date	17/6/2020	17/6/2020	12/6/2020	12/6/2020	17/6/2020	17/6/2020	17/6/2020	17/6/2020	17/6/2020	17/6/2020	17/6/2020	17/6/2020
Sampling Time	12:10	12:00	13:10	12:48	13:05	13:20	13:30	13:40	13:50	14:00	14:10	14:20
Cd, mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.06	0.09	<0.05	<0.05	<0.05
Cr, mg/kg	14	19	23	25	22	23	20	25	21	23	22	24
Cu, mg/kg	11	16	36	19	17	22	16	22	18	20	18	18
Hg, mg/kg	0.05	0.05	<0.05	<0.05	0.08	0.1	0.07	0.1	0.1	0.14	0.07	0.07
Ni, mg/kg	9	13	15	16	15	15	13	17	14	15	15	16
Pb, mg/kg	20	23	24	25	25	29	25		25	27	26	27
Ag, mg/kg	0.06	0.09	0.08	0.07	0.1	0.14	0.1	0.13	0.11	0.1	0.11	0.11
Zn, mg/kg	50	64	70	72	70	76	67	79	69	71	71	73
As, mg/kg	4.2	5.4	7	7.5	7.7	7.5	5.5	6.6	7.6	6.3	7.S	6.2
Acenaphtene, µg/kg	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8
Acenaphtylene, µg/kg	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8
Anthracene, µg/kg	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8
Fluorene, µg/kg	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8
Naphthalene, µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Phenanthrene, µg/kg	<8	<8	<8	<8	<8	<8	<8	<8	14	10	14	10
Low molecular weight PAHs	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Benzo(a)anthracene, µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzo(a)pyrene, µg/kg	<10	<10	<10	<10	<10	11	<10	<10	<10	<10	<10	<10
Benzo(b)fluoranthene , µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzo(k)fluoranthene, µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzo(g,h,i)perylene, µg/kg	<10	<10	<10	<10	<10	10	<10	10	<10	<10	<10	<10
Chrysene, µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Dibenzo(a,h)anthracene, µg/kg	21	24	<10	<10	24	<10	<10	<10	<10	<10	<10	<10
Fluoranthene, µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Indeno(1,2,3-cd)pyrene, µg/kg	10	13	<10	<10	12	14	10	12	10	12	10	12
Pyrene, µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
High molecular weight PAHs	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
2,4'-Dichlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2',5-Trichlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,4,4'-Trichlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 3,5'-Tetrachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 5,5'-Tetrachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,3', 4,4'-Tetrachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
3,3', 4,4'-Tetrachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 4,5,5'-Pentachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,3,3', 4,4'-Pentachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,3', 4,4',5-Pentachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
3,3', 4,4',5-Pentachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 3,3',4,4'-Hexachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 3,4,4',5'-Hexachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 4,4',5,5'-Hexachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
3,3', 4,4',5,5'-Hexachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 3,3',4,4',5-Heptachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 3,4,4',5,5'-Heptachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 3,4',5,5',6-Heptachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Total PCB	<18	<18	<18	<18	<18	<18	<18	<18	<18	<18	<18	<18
Tributyltin (TBT) in Interstitial water, µg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Sample ID	**GS-61**	**GS-62**	**GS-63**	**GS-64**	**GS-65**	**GS-66**	**GS-67**	**GS-68**	**GS-69**	**GS-70**	**GS-71**	**GS-72**
Sampling Location	S26766E S0692SN	S25270E S07361N	S25456E S072S6N	S25641E S07210N	S25S26E S07135N	S26011E S07059N	S26196E S069S4N	S263S2E S0690SN	826567E 806833N	826752E 806757N	825195E 807176N	825380E 807100N
Sampling Depth	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m
Sampling Date	1S/6/2020	1S/6/2020	1S/6/2020	1S/6/2020	1S/6/2020	1S/6/2020	1S/6/2020	1S/6/2020	18/6/2020	18/6/2020	18/6/2020	18/6/2020
Sampling Time	9:50	12:05	11:50	11:35	11:20	11:05	10:50	10:35	10:20	10:05	12:20	12:35
Cd, mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	0.06
Cr, mg/kg	21	18	24	27	19	20	21	26	23	23	24	23
Cu, mg/kg	16	16	22	19	13	17	17	21	18	17	22	21
Hg, mg/kg	0.1	0.1	0.1	0.23	0.33	0.23	0.05	0.08	0.05	<0.05	0.06	0.08
Ni, mg/kg	15	12	16	18	11	14	14	18	15	16	16	15
Pb, mg/kg	25	25	31	32	18	24	24	30	26	24	30	28
Ag, mg/kg	0.84	0.12	0.15	0.18	0.08	0.12	0.14	0.2	0.11	0.09	0.14	0.13
Zn, mg/kg	65	60	77	82	49	65	66	81	71	67	77	73
As, mg/kg	7.8	6.2	8.7	9.2	5.2	7.5	7.5	8.1	8.3	8.1	9.1	8.4
Acenaphtene, µg/kg	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8
Acenaphtylene, µg/kg	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8
Anthracene, µg/kg	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8
Fluorene, µg/kg	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8
Naphthalene, µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Phenanthrene, µg/kg	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8
Low molecular weight PAHs	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Benzo(a)anthracene, µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzo(a)pyrene, µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzo(b)fluoranthene , µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzo(k)fluoranthene, µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Benzo(g,h,i)perylene, µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Chrysene, µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Dibenzo(a,h)anthracene, µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Fluoranthene, µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Indeno(1,2,3-cd)pyrene, µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Pyrene, µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
High molecular weight PAHs	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
2,4'-Dichlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2',5-Trichlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,4,4'-Trichlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 3,5'-Tetrachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 5,5'-Tetrachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,3', 4,4'-Tetrachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
3,3', 4,4'-Tetrachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 4,5,5'-Pentachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,3,3', 4,4'-Pentachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,3', 4,4',5-Pentachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
3,3', 4,4',5-Pentachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 3,3',4,4'-Hexachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 3,4,4',5'-Hexachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 4,4',5,5'-Hexachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
3,3', 4,4',5,5'-Hexachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 3,3',4,4',5-Heptachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 3,4,4',5,5'-Heptachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 3,4',5,5',6-Heptachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Total PCB	<18	<18	<18	<18	<18	<18	<18	<18	<18	<18	<18	<18
Tributyltin (TBT) in Interstitial water, µg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Sample ID	GS-73	GS-74	GS-75	GS-76	GS-77	GS-78	GS-79	GS-80	GS-81	GS-82	GS-83	GS-84
Sampling Location	825565E 807025N	825751E 806950N	825936E 806874N	826121E 806799N	826306E 806723N	826491E 806648N	826677E 806572N	826862E 806497N	S25119E S06991N	S25305E S06915N	S25490E S06S40N	S25675E S06764N
Sampling Depth	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m
Sampling Date	18/6/2020	18/6/2020	19/6/2020	19/6/2020	19/6/2020	19/6/2020	19/6/2020	19/6/2020	19/6/2020	19/6/2020	19/6/2020	19/6/2020
Sampling Time	12:50	13:05	10:00	10:10	10:20	10:30	10:40	10:50	12:30	12:20	12:10	12:00
Cd, mg/kg	<0.05	0.15	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Cr, mg/kg	25	23	21	24	23	22	23	23	18	19	20	24
Cu, mg/kg	23	20	16	20	18	16	17	16	17	16	16	19
Hg, mg/kg	0.1	0.15	0.09	0.07	0.1	<0.05	0.05	<0.05	0.11	<0.05	<0.05	0.06
Ni, mg/kg	17	16	14	16	16	15	16	16	12	13	14	17
Pb, mg/kg	31	30	24	27	26	23	23	22	22	22	23	28
Ag, mg/kg	0.13	0.14	0.1	0.12	0.13	0.09	0.09	0.07	0.11	0.09	0.08	0.1
Zn, mg/kg	76	83	64	73	73	65	67	63	61	60	63	74
As, mg/kg	7.9	8.3	7	7.5	7	7.6	7.6	7.6	6.6	6.6	6.4	8.1
Acenaphtene, µg/kg	<8	<8	<8	<8	<8	<8	<8	<8	76	95	18	74
Acenaphtylene, µg/kg	<8	<8	<8	<8	<8	<8	<8	<8	15	16	<8	15
Anthracene, µg/kg	<8	<8	<8	<8	<8	<8	<8	<8	41	52	12	42
Fluorene, µg/kg	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8	<8
Naphthalene, µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	15	15	<10	16
Phenanthrene, µg/kg	<8	<8	<8	<8	<8	<8	<8	<8	37	49	8	37
Low molecular weight PAHs	<50	<50	<50	<50	<50	<50	<50	<50	189	232	<50	189
Benzo(a)anthracene, µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	64	71	12	67
Benzo(a)pyrene, µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	69	322	<10	315
Benzo(b)fluoranthene , µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	94	95	<10	95
Benzo(k)fluoranthene, µg/kg	<10	<10	<10	<10	12	<10	<10	<10	91	92	17	92
Benzo(g,h,i)perylene, µg/kg	<10	<10	<10	10	12	11	<10	11	54	57	10	57
Chrysene, µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	65	74	12	70
Dibenzo(a,h)anthracene, µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Fluoranthene, µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	115	138	25	123
Indeno(1,2,3-cd)pyrene, µg/kg	<10	<10	12	13	15	14	13	14	<10	<10	35	177
Pyrene, µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	166	176	33	177
High molecular weight PAHs	<100	<100	102	103	109	105	103	105	718	1024	165	1173
2,4'-Dichlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2',5-Trichlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,4,4'-Trichlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 3,5'-Tetrachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 5,5'-Tetrachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,3', 4,4'-Tetrachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
3,3', 4,4'-Tetrachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 4,5,5'-Pentachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,3,3', 4,4'-Pentachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,3', 4,4',5-Pentachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
3,3', 4,4',5-Pentachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 3,3',4,4'-Hexachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 3,4,4',5'-Hexachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 4,4',5,5'-Hexachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
3,3', 4,4',5,5'-Hexachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 3,3',4,4',5-Heptachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 3,4,4',5,5'-Heptachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,2', 3,4',5,5',6-Heptachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Total PCB	<18	<18	<18	<18	<18	<18	<18	<18	<18	<18	<18	<18
Tributyltin (TBT) in Interstitial water, µg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Sample ID	GS-85	GS-86	GS-87	GS-88	GS-89	GS-90	Reference Grab	EPD Station: SS3 (Average)	EPD Station: SS4 (Average)
Sampling Location	825860E 806689N	826046E 806613N	826231E 806538N	826416E 806462N	826601E 806387N	826786E 806312N	850234E 820057N	826180E 805903N	825719E 810037N
Sampling Depth	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	0.0-0.9m	Bulk Sample	Bulk Sample
Sampling Date	19/6/2020	19/6/2020	19/6/2020	19/6/2020	19/6/2020	19/6/2020	23/6/2020	1986 - 2020	1986 - 2020
Sampling Time	11:50	11:40	11:30	11:20	11:10	11:00	10:35	0.25	0.35
Cd, mg/kg	<0.05	<0.05	<0.05	<0.05	0.06	<0.05	<0.05	31	36
Cr, mg/kg	22	22	23	22	24	26	23	25	37
Cu, mg/kg	17	18	17	16	17	17	15	0.12	0.15
Hg, mg/kg	0.41	<0.05	0.05	<0.05	0.08	0.2	0.38	21	22
Ni, mg/kg	15	16	16	16	17	19	17	38	44
Pb, mg/kg	24	25	25	24	25	26	27	0.17	0.22
Ag, mg/kg	0.21	0.09	0.2	0.07	0.09	0.08	0.11	95	110
Zn, mg/kg	67	68	69	66	70	76	69	7.5	8.8
As, mg/kg	7.4	8.3	6.8	7.5	8.3	8.4	7.9	0.25	0.35
Acenaphtene, µg/kg	98	17	75	94	17	74	<8	27	27
Acenaphtylene, µg/kg	16	<8	17	15	<8	16	<8	30	30
Anthracene, µg/kg	54	12	48	54	13	44	<8	3	3
Fluorene, µg/kg	<8	<8	<8	<8	<8	<8	<8	5	5
Naphthalene, µg/kg	15	<10	16	20	<10	17	<10	36	39
Phenanthrene, µg/kg	52	8	43	49	8	39	<8	8	8
Low molecular weight PAHs	240	<50	204	236	52	194	<50	108	111
Benzo(a)anthracene, µg/kg	75	11	74	73	13	68	<10	5	7
Benzo(a)pyrene, µg/kg	<10	37	335	280	18	331	<10	8	11
Benzo(b)fluoranthene , µg/kg	96	13	106	94	19	100	<10	8	11
Benzo(k)fluoranthene, µg/kg	89	15	106	0	20	99	<10	4	6
Benzo(g,h,i)perylene, µg/kg	<10	<10	<10	69	13	22	<10	8	12
Chrysene, µg/kg	77	11	80	76	12	72	<10	5	7
Dibenzo(a,h)anthracene, µg/kg	<10	<10	<10	<10	<10	<10	<10	3	3
Fluoranthene, µg/kg	144	23	140	141	26	127	<10	13	14
Indeno(1,2,3-cd)pyrene, µg/kg	<10	28	<10	179	39	<10	<10	5	10
Pyrene, µg/kg	182	31	203	180	35	184	<10	14	16
High molecular weight PAHs	663	180	1044	1182	195	1003	<100	73	73
2,4'-Dichlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	N/A	N/A
2,2',5-Trichlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	N/A	N/A
2,4,4'-Trichlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	N/A	N/A
2,2', 3,5'-Tetrachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	N/A	N/A
2,2', 5,5'-Tetrachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	N/A	N/A
2,3', 4,4'-Tetrachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	N/A	N/A
3,3', 4,4'-Tetrachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	N/A	N/A
2,2', 4,5,5'-Pentachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	N/A	N/A
2,3,3', 4,4'-Pentachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	N/A	N/A
2,3', 4,4',5-Pentachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	N/A	N/A
3,3', 4,4',5-Pentachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	N/A	N/A
2,2', 3,3',4,4'-Hexachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	N/A	N/A
2,2', 3,4,4',5'-Hexachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	N/A	N/A
2,2', 4,4',5,5'-Hexachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	N/A	N/A
3,3', 4,4',5,5'-Hexachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	N/A	N/A
2,2', 3,3',4,4',5-Heptachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	N/A	N/A
2,2', 3,4,4',5,5'-Heptachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	N/A	N/A
2,2', 3,4',5,5',6-Heptachlorobiphenyl, µg/kg	<1	<1	<1	<1	<1	<1	<1	N/A	N/A
Total PCB	<18	<18	<18	<18	<18	<18	<18	15	15
Tributyltin (TBT) in Interstitial water, µg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	N/A	N/A

Remark: Sediment sampling locations are presented in ***Figure B1***.

Figure B1 Surface Grab Sediment Samples Collected within Study Area