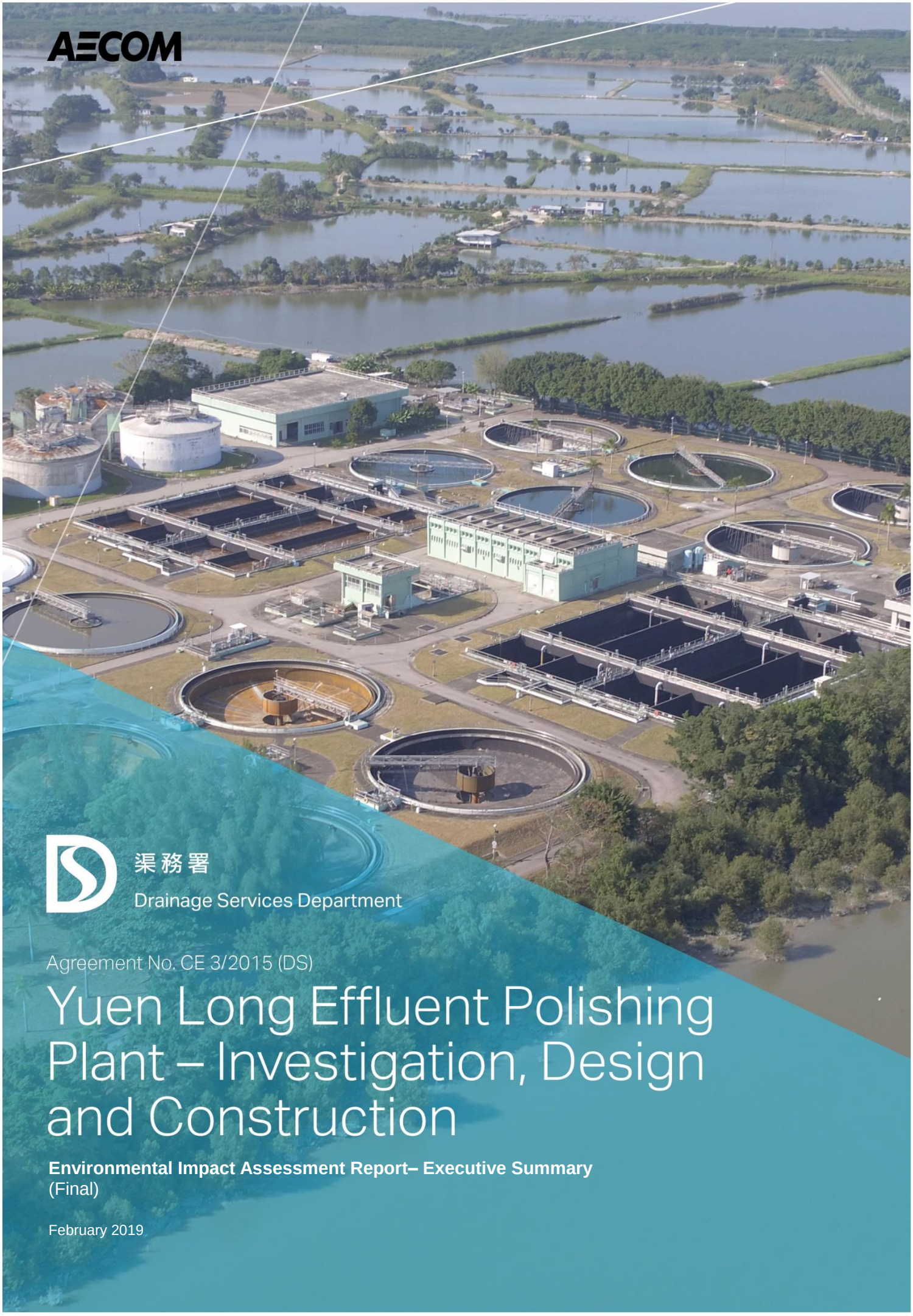

AECOM

渠務署

Drainage Services Department

Agreement No. CE 3/2015 (DS)

Yuen Long Effluent Polishing Plant – Investigation, Design and Construction

Environmental Impact Assessment Report– Executive Summary
(Final)

February 2019

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1 INTRODUCTION

1.1 Project Background

1.1.1 The existing Yuen Long Sewage Treatment Works (YLSTW), was commissioned in 1984 with a design capacity of 70,000 m^3/day at average dry weather flow (ADWF) provides secondary level treatment to sewage catchment from Yuen Long area such as Wang Chau, Yuen Long Industrial Estate, the Yuen Long Town and Kam Tin.

1.1.2 There is a need for the upgrade of YLSTW into Yuen Long Effluent Polishing Plant (YLEPP) in order to cope with the forecast increase in sewage flow upon completion of sewerage under interfacing projects, extension of village sewerage in area as planned by Environmental Protection Department (EPD), as well as the proposed housing developments in the region.

1.1.3 DSD has commissioned AECOM Asia Company Ltd to undertake "Agreement No. CE3/2015(DS) Yuen Long Effluent Polishing Plant – Investigation, Design and Construction Works" (the Assignment) to upgrade the YLSTW to YLEPP and cater for the future needs.

1.1.4 The Project is a Designated Project (DP) under the Environmental Impact Assessment Ordinance (EIAO). A Project Profile (No. PP-458/2012) was submitted to the Environmental Protection Department (EPD) on 27 February 2012 for application for an Environmental Impact Assessment (EIA) Study Brief under section 5(1)(a) of the EIAO and the EIA Study Brief No. ESB-241/2012 for the Project was issued on 5 April 2012 under the EIAO.

1.1.5 Subsequent to the issuance of the EIA Study Brief No. ESB-241/2012, additional scope including effluent reuse system for non-potable use and organic waste co-digestion has been proposed under the Assignment. A new Project Profile, entitled "Yuen Long Effluent Polishing Plant", was submitted on 9 Oct 2018 (No. PP-570/2018) and an EIA Study Brief No. ESB-309/2018 was issued on 14 November 2018 under the EIAO.

1.1.6 The purpose of the EIA study is to provide information on the nature and extent of environmental impacts arising from the construction and operation of the Project and associated works that will take place concurrently. This information will contribute to decisions by the Director of Environmental Protection on:

- The acceptability of any potential environmental consequences that are likely to arise as a result of the Project;
- The conditions and requirements for the detailed design, construction, operation and associated works of the Project to mitigate against potential environmental consequences wherever practicable; and
- The acceptability of residual impacts after the proposed mitigation measures are implemented.

1.2 Designated Projects under EIAO

1.2.1 The Project covers the following DP elements of Schedule 2, Part I under the EIAO (Cap.499):

- Item F.1 - Sewage treatment works with an installed capacity of more than 15,000 m^3 per day;
- Item F.4 - An activity for reuse of treated sewage effluent from a treatment plant; and
- Item G4 - A waste disposal facility (excluding any refuse collection point), or waste disposal activity, for (a) refuse; or (b) chemical, industrial or special wastes.

1.3 Purpose of this Executive Summary

1.3.1 This Executive Summary (ES) summarizes the findings, recommendations and conclusions of the EIA Report for the Project.

2 PROJECT DESCRIPTION

2.1 Purpose and Scope of Project

2.1.1 The purposes and objectives of the Project are to upgrade the existing YLSTW to YLEPP, in terms of both capacity and treatment level, in order to cater for future needs in the catchment and improve the water quality of Deep Bay. Location plan of the Project is shown in **Figure 2.1**.

2.1.2 The YLEPP will be constructed in two phases. Phase 1 works will upgrade the existing YLSTW into YLEPP with a treatment capacity of 100,000 m^3/day in ADWF. Phase 2 works will be implemented subject to further review of sewage flow projections and will further upgrade the treatment capacity to 180,000 m^3/day in ADWF.

2.1.3 Phase 1 works (**Figure 2.2**) will include the following principal elements:

1) Clearance of the existing main store and administration building for construction of the new Inlet Works, including inlet pumping station, screening and degritting facilities;
2) Demolition of existing Primary Sedimentation Tanks (PSTs) No. 5 to 8 for construction of Lamella PSTs;
3) Demolition of existing Aeration Tanks (ATs) No. 5 to 8 and existing Final Sedimentation Tanks (FSTs) No. 5 to 8 for construction of new biological and tertiary treatment facilities;
4) Reconstruction of sludge treatment facilities;
5) Demolition of existing PSTs No. 1 to 4 for construction of sludge dewatering building;
6) Demolition of existing Inlet Works for construction of new admin building;
7) Installation of odour mitigation works, including the provision of covers and installation of associated deodourizers to proposed treatment units; and
8) Other ancillary works, such as organic waste co-digestion, landscaping, E&M facilities, workshops, laboratory, roadworks etc.

2.1.4 Phase 2 works (**Figure 2.3**) will include the following principal elements:

1) Demolition of existing ATs No. 1 to 4 and existing circular FSTs No. 1, 2, 3 and 4 for construction of new biological and tertiary treatment facilities;
2) Reconstruction of sludge treatment facilities;
3) Installation of odour mitigation works, including the provision of covers and installation of associated deodourizers to proposed additional treatment units;
4) Construction of additional Lamella PSTs; and
5) Other ancillary works, such as landscaping, E&M facilities, roadworks, etc.

2.2 Need and Benefits of the Project

2.2.1 Currently, a significant portion of YLSTW catchment is still unsewered. The proposed trunk sewers and their upstream village sewerage projects in YLSTW's catchment are being or to be implemented. In the coming future, the sewerage system will be extended to Kam Tin, Fairview Park, Nam San Wai, Pat Heung, Shek Kong, Ngau Tam Mei and San Tin. These sewerage works are being implemented under Agreement No. CE 13/2006(DS) Yuen Long and Kam Tin Sewerage Stage 2 and Stage 3 – D&C and Agreement No. CE 30/2006(DS) Yuen Long and Kam Tin Sewerage and Sewage Disposal – D&C.

2.2.2 A water quality improvement programme is being implemented under Agreement No. CE37/2012(DS) Improvement of Yuen Long Town Nullah (Town Centre Section) Stage 1 Improvement Works. This project will involve provision of a dry weather flow interceptor (DWFI) system to intercept the polluted dry weather runoff from Yuen Long Creek to YLEPP

for treatment. In addition to the above mentioned projects, sewage flow from other existing and planned developments from Kam Tin South, Ngau Tam Mei and Wang Chau, including the proposed multi-storey buildings in the vicinity of Yuen Long Industrial Estate, in the catchment would also contribute to the flow build-up at YLEPP.

2.2.3 Having considered the abovementioned projects and population projections, the projected ADWF will reach approximately 180,000 m^3/day in Year 2041. Given the current treatment capacity of YLSTW is only 70,000 m^3/day, a capacity shortfall of YLSTW is anticipated in future. Thus, there is a need to upgrade the treatment capacity of YLSTW. The treatment level of YLSTW will also be upgraded for improvement of water quality of the discharge waterbody.

2.2.4 With the YLEPP in place, opportunities to treat the sewage from those unsewered areas will be created after completion of the Project, which provides centralised tertiary sewage treatment. Compared to de-centralised systems such as scattered septic tanks and local treatment plants, YLEPP will give higher treatment efficiency and cost effectiveness as well as improve the living environment of these areas. With the enhancement of odour management of the YLEPP (covering all odorous facilities and installation of deodorization units), odour nuisance to the surrounding area would be effectively controlled and minimized.

2.2.5 The Project will also provide opportunity to upgrade the existing YLSTW treatment level to a tertiary treatment level to meet the requirement of "No Net Increase in Pollution Load to Deep Bay". Given the high effluent standard of tertiary treatment, the increased pollution loadings due to capacity increase will be offset by the upgraded treatment performance of YLEPP as well as the anticipated reduction of pollution loads from unsewered area within Deep Bay catchments through sewerage connection. It is anticipated that water quality improvement to the surrounding waterbodies will be resulted from implementation of the Project.

2.2.6 As a sustainability consideration, co-digestion of organic wastes with sewage sludge within YLEPP will be adopted to enhance energy recovery from the anaerobic digestion process. Additional facilities for organic wastes co-digestion, including reception facilities, digesters and ammonia stripping plants, will be located within the YLEPP's footprint.

2.3 Consideration of Alternative Design and Layout

Consideration of Phased Installation

2.3.1 Formulation of the implementation programme of YLEPP is based on a number of factors, including requirements of statutory procedures, site constraints and estimated construction period. It could be necessary to ensure that the implementation programme could cope with the buildup of sewage flow in the catchment. According to the sewage flow projections, the projected ADWF to YLEPP will be up to 180,000 m^3/day in 2041. However, the exact sewage flow is highly subject to the implementation programme of individual projects and population growth in the catchment. A phased implementation programme and layout design are required to cater for the potential future changes.

2.3.2 While all the proposed upgrading works will be taken place within YLSTW boundary, one of the challenging tasks for upgrading YLSTW to YLEPP is to maintain the operation of existing YLSTW during construction period. The treatment capacity of existing YLSTW is 70,000 m^3/day, containing eight equal sets of sewage treatment streams. During Phase 1 works, half of these treatment streams will be decommissioned and demolished. The remaining treatment capacity will then be significantly reduced during the construction period of Phase 1 works and capacity shortfall of such operation mode may be happened in Year 2026. As such, it is necessary to complete the Phase 1 works in or before Year 2026.

2.3.3 To deal with the above concerns, it is considered prudent to increase the treatment capacity of YLEPP Phase 1 to increase the flexibility for implementing Phase 2 upgrading works.

The recommended treatment capacity for YLEPP Phase 1 would be 100,000 m^3/day, being the maximum capacity that could be provided in the area when half of the existing treatment streams is decommissioned for carrying out the upgrading works. The tentative treatment capacity of Phase 2 YLEPP will be designed up to 180,000 m^3/d.

2.3.4 The proposed construction programme and installation phasing of YLEPP is presented in **Table 2.1**.

Table 2.1 Implementation Programme

	Recommended Phased Installation	
	Treatment Capacity (m^3/day)	**Tentative Year of Commissioning**
Existing	70,000	-
Phase 1	100,000	2026
Phase 2	180,000	2030(1)

Note: (1) The implementation programme of Phase 2 works will be subject to further review on sewage flow projections

Sewage Treatment

2.3.5 The treatment option evaluation mainly focuses on the biological treatment processes as this is the critical part in YLEPP layouts.

2.3.6 A preliminary review of potential biological treatment processes, including proven treatment processes, market availability, overseas and local experiences and the emerging treatment process, have been conducted. Two major types of treatment process include the following:

- Conventional Activated Sludge (CAS)
- Compacted-type Technologies

2.3.7 In considering the footprint for various biological treatment options, CAS will involve a considerably larger volume of excavation works and higher construction period. Thus, Compacted-type Technology were recommended.

Effluent Reuse

2.3.8 In order to reduce water consumption in future operation and maintenance of YLEPP, reuse of treated effluent is adopted as one of the sustainability considerations.

2.3.9 The treated effluent will only be reused for the purposes of chemical preparation, water supplement to deodorisation units and cleaning of treatment equipment, which consumed majority part of water demand in daily operation and maintenance of YLEPP.

2.3.10 All the treated effluent reuse will be applied to YLEPP internally via an automatic close-loop system without direct human contact. With proper preventive measures in place, potential health and hygiene impacts are not anticipated during operation and maintenance of the effluent reuse system.

Sludge Treatment

2.3.11 Sludge treatment at existing YLSTW consists of primary sludge thickening by gravity thickeners, anaerobic digestion and dewatering by membrane filter presses. Biogas generated in anaerobic digestion process is currently used to generate power by micro-turbine on-site. The generated power is then used to warm up the digesters for the sludge digestion process.

2.3.12 Sludge cake from future YLEPP will be conveyed to the Sludge Treatment Facility (STF) in Tuen Mun for incineration. Prior to conveyance to the STF, the following handling options are considered:

- Dewatering with prior anaerobic digestion including organic waste co-digestion
- Dewatering with prior anaerobic digestion without organic waste co-digestion
- Direct dewatering without digestion and organic waste co-digestion

2.3.13 Anaerobic digestion is recommended as this can reduce the volume of sludge to be disposed of to STF, and allow the recovery of heat and energy from the biogas generated for utilization within YLEPP.

2.3.14 As a sustainability consideration, co-digestion of organic wastes with sewage sludge within YLEPP is recommended to enhance energy recovery from the anaerobic digestion process. Additional facilities for organic wastes co-digestion, including reception facilities, digesters and ammonia stripping plants, will be located within the YLEPP's footprint.

Layout

2.3.15 Consideration of layout options were numerous engineering constraints and environmental considerations. The internal layout of YLEPP has been formulated taking account of the following factors:

- The locations, size and arrangement on new treatment facility is bounded by recommended treatment options. Thus, compacted size treatment facility is provided in the layout.
- In green building consideration, energy recovery from biogas is recommended. Thus, chimneys from Combined Heat and Power (CHP) is required in YLEPP.
- The required treatment capacity would limit the size of treatment units and so as the requirement of odour emission and the requirement on deodorization units to cater the odour nuisance due to sewage treatment process.
- The layout of different treatment units is determined with due considerations of not only the process requirements, but also environmental factors, e.g. most of the air emission sources are located in approximately middle of the site with sufficient setbacks from the surrounding sensitive receivers.
- The scale and size of above-ground structures are determined by striking a balance between the plant's hydraulics and visual impacts to the surroundings. Most of the structures are designed with heights below the tree lines at the eastern and western sides which could serve as visual screens.
- There is a need to continue operation of YLSTW, thus Phase 1 construction should be commenced on eastern side of the site. Considerations have also been made on provision of temporary measures, if necessary, to ensure adequate treatment during the course of Phase 1 construction.

Consideration of Locations for the New Treatment Facilities

2.3.16 The location of new treatment facilities is bounded by the inlet pipes and effluent outfall at the southern and eastern sides respectively. In order to minimize the scale of construction, existing sewage inlet pipes/chambers and effluent outfall would be retained and reused in YLEPP. In addition, all the construction works and new facilities would be within the existing YLSTW to avoid additional project footprint. The new treatment facilities arrangement is then designed under these boundary conditions.

Avoidance and Reducing Environmental Impacts from Design and Layout

2.3.17 In order avoid and minimize environmental impact in terms of air quality, noise, water quality, ecological, landscape and visual aspect, the following major design and layout will be adopted in YLEPP:

- All the treatment units will be covered and ventilated via deodorization units. Thus, odour impact would be minimized.
- All the treatment facilities and building will be ventilated with silencers at lourvers. Thus, fixed noise impact would then be minimized.
- A set of design measures will be installed to avoid and minimize the chance on emergency discharge
- All the construction works and new facility will be well within the existing YLSTW. No additional footprint will be required and direct loss of nearby habitats are avoided.
- All the treatment units and buildings are designed with due considerations on minimizing the building heights by such means as adopting equipment that requires low headroom. This is to ensure all the aboveground structures would not be excessively bulky so as to minimize the visual impacts.
- All the trees along the eastern and northern boundary of the site be retained as much as possible in order to maintain a tree-barrier surrounding YLEPP to avoid/minimise visual impact.
- YLSTW's existing effluent discharge point and emergency discharge points at nearby river / nullah will be retained for YLEPP in order to avoid direct impact to nearby water body.

Avoidance and Minimization of Emergency Discharges

2.3.18 The design layout would adopt measures to ensure the reliability and to avoid and minimize the risk of emergency discharges of YLEPP. The following design measures would be adopted at YLEPP:

- Provision of adequate standby units and peaking factors
- Provision of by-pass mechanism at coarse and fine screens
- Provision of reliable power supply
- Provision on interim emergency by-pass
- Regular maintenances and inspections
- Application of Emergency Response Plan

2.4 Construction Methods and Sequences of Works

Consideration of Demolition Methods

2.4.1 The implementation of YLEPP will mainly be carried out by demolition of existing buildings/structures of YLSTW for construction of new treatment facilities. With reference to the Code of Practice for Demolition of Buildings (DCDB, Buildings Department 2004), several main methods of techniques for the demolition works of the Project are identified, including:

- Implosion;
- Breaker (excavator mounted);
- Wrecking ball;
- Cutting and drilling;
- Non-explosive demolition agents;
- Thermal lance; and
- Water jet.

2.4.2 Implosion induces higher environmental dis-benefit which does not offer any potential reduction in polluting impacts in the form of noise, vibration and dust and is not efficient for

slabs and walls that will require demolition. It is also hard to maintain a live STW during implosion.

2.4.3 Demolition by breakers (excavator mounted) is top down method for demolishing all types of structures. The environmental dis-benefit is that machine mounted breakers do not offer any potential reduction in dust, noise or vibration emissions (DCDB, 2004). However, these methods are considered having most efficient demolition rate which is an environmental benefit due to shortening of the construction periods and capability to cater the tight programme

2.4.4 Wrecking ball is generally suitable for dilapidated buildings but would not be applicable in this case where the clear space to the edge of the structures is limited in places and structures have substantial steel reinforcement. This application also demands high level skill operators and well-maintained equipment.

2.4.5 Other abovementioned methods with environmental benefits in the form of noise, vibration and dust can be raised by using equipment such as crushers, circular saw cutting, wire saw cutting, and stitch drilling which are effective for all structures and can reduce vibration, noise and dust. Non-explosive demolition agent can also reduce vibration, noise and dust but is not applicable to slabs and walls. The use of thermal lance and or high-pressure water jets would not generally be recommended unless there are no other viable alternatives since it would induce longer construction time.

2.4.6 These methods would generally result in lesser environmental impacts (DCDB, 2004), but the demolition rate of using these methods are generally longer and, therefore, difficult to meet the tight programme (to completed Phase 1 works by Year 2026). Nevertheless, a selection of the above processes could be used for noise sensitive locations and seasons.

2.4.7 A variety of top-down methods are recommended to be used and various element from a suite of powered mechanical equipment have been assumed to be in use at locations or seasons with less sensitive to noise exposure. The use of breakers is efficient and noise and dust impacts can potentially be controlled by a range of practical mitigation measures (e.g. noise barriers, dust control) familiar to the construction industry in Hong Kong.

2.4.8 Other quieter methods such as crushers, circular saw cutting, wire saw cutting, and stitch drilling would be adopted for the period from November to March to minimise the construction noise impacts on overwintering waterbirds.

Consideration of Foundation Methods

2.4.9 The foundation options are highly subject to the ground conditions. According to the latest ground investigation findings, the site is constrained by geotechnical constraints (e.g. deep bed rocks, presence of marbles, high water table, etc.). In considering the geotechnical feasibility, the following foundation method is shortlisted:-

- Bored piles (Large diameter boring by reverse circulation drill (RCD))
- Percussive piles
- Box rafts
- Shallow foundation (for light-duty structures only)

2.4.10 In considering the construction noise and ecological impact, raft foundation, shallow foundation and bored piles by reverse circulation drill will be adopted as far as possible. However, due to ground conditions constraints and programme constraints, foundation method such as percussive piling may be required. In order to avoid construction noise and the associated indirect impact to waterbirds, percussive piling, if any, will only be adopted in wet season.

2.5 Construction Programme

2.5.1 The Project construction works are anticipated to commence in 2020 with completion of the Project by 2026 and 2030 for Phase 1 and Phase 2 respectively.

3 KEY FINDINGS OF THE ENVIRONMENTAL IMPACT ASSESSMENT

3.1 Air Quality Impact

3.1.1 Potential air quality impacts associated with the construction and operational phases of the project have been assessed in accordance with the criteria and guidelines as stated in the requirements given in Section 3.4.1 and Appendix B of the EIA Study Brief, as well as Annexes 4 and 12 of EIAO-TM. The assessment area for air quality impact assessment is within 500m from the boundary of the Project site.

3.1.2 Potential air quality impacts from the construction works of the Project would mainly be related to construction dust from site clearance, excavation, demolition, piling, pipe works construction and wind erosion. Quantitative fugitive dust assessments have been conducted, taking into account the cumulative impact caused by nearby concurrent sources within 500m from the boundary of the Project site. With the implementation of mitigation measures specified in the Air Pollution Control (Construction Dust) Regulation together with the recommended dust suppression measures including watering once every two hours on heavy construction works areas and adopting good site practices, no adverse dust impact at air sensitive receivers would be anticipated due to the construction activities of the Project.

3.1.3 Potential air quality impacts during operational phase would come from odour emission from the sewage treatment processes in YLEPP and ammonia stripping units. Odour emitted would all be treated in the deodourizing units with odour removal efficiency of 90 – 95% for odour from sewage treatment processes and 70% for odour (ammonia) from ammonia stripping units before venting to the atmosphere. The other odour emission sources in the YLIE have also been considered in the cumulative odour impact assessment. With the implementation of odour control measures, the assessment results show that the predicted odour concentrations at all ASRs located in the vicinity of YLEPP would comply with the odour criterion (5 odour units based on an averaging time of 5 seconds) stipulated in the EIAO-TM.

3.1.4 During operation phase, flue gas emission would be emitted from the stacks of CHP, boiler and ammonia stripping units in the YLEPP. Cumulative air quality impact arising from YLEPP operation, the vehicular emissions from the open roads, and industrial chimney emissions within the 500m assessment area has been assessed for Phase 1 and Phase 2. Assessment results indicate that potential cumulative air pollutants including nitrogen dioxide, respirable suspended particulates, fine suspended particulates, sulphur dioxide, and ammonia concentrations at all the representative ASRs would comply with the AQOs and relevant international standards. No adverse air quality impact would be anticipated during the operation of YLEPP.

3.2 Noise Impact

3.2.1 Potential noise impacts associated with the construction and operational phases of the project have been assessed in accordance with the criteria and guidelines as stated in the requirements given in Section 3.4.2 and Appendix C of the EIA Study Brief, as well as Annexes 5 and 13 of the EIAO-TM. The study area for noise impact assessment is defined by a distance of 300m from the site boundary of the Project.

3.2.2 Construction noise is expected from the use of Powered Mechanical Equipment (PME) during various construction activities, such as demolition of the existing YLSTW, foundation and superstructure works for the proposed YLEPP, at all land-based works areas within Project boundary. Noise impact arising from construction activities of the Project was assessed. The predicted maximum unmitigated construction noise levels at the representative noise sensitive receivers (NSRs) in the vicinity of the Project work sites would be 76 – 80 dB(A) for Phase 1 and 67 – 71 dB(A) for Phase 2. With the use of movable noise barrier as mitigation measure for the exceedance in Phase 1, the predicted maximum construction airborne noise levels at the representative NSRs would be 72 – 75 dB(A), complying with the EIAO-TM criteria.

3.2.3 The noise impact associated with the operation of the Project was assessed. Based on the plant design information, the predicted fixed plant noise levels at all the representative NSRs would be comply with the criteria with the implementation of mitigation measures including locating plants inside plantrooms (with installed sound proof door and silencers at air inlet and outlet) and provision of silencers for ventilation fans. Commissioning test should be conducted to ensure the compliance of noise standards for fixed plant noise.

3.3 Water Quality Impact

3.3.1 The water quality impact assessment was conducted in accordance with the requirements in Annexes 6 and 14 of the EIAO-TM and the requirements in Section 3.4.3 and Appendix D of the EIA Study Brief. The Study area for water quality impact assessment covered the Deep Bay Water Control Zone (WCZ) as designated under Water Pollution Control Ordinance (WPCO), including inland water bodies within 500m from the site boundary.

3.3.2 Minor water quality impact would be associated with land-based construction. Impacts may result from surface runoff, accidental spillage, and sewage from on-site construction workers. Impacts could be controlled to comply with the WPCO standards by implementing the recommended mitigation measures. No unacceptable water quality impact would be expected during the construction phase of the Project with the recommended mitigation measures properly implemented.

3.3.3 The treated effluent will be discharged to Shan Pui River during normal operation. The existing YLSTW will be upgraded to YLEPP in which a more stringent effluent design standard tertiary treatment will be provided. It is anticipated that overall water quality in Deep Bay will be improved and the Project will meet the “Requirement of No Net Increase in Pollution Load to Deep Bay”

3.3.4 Emergency discharges from the Project would be the consequence of pump failure, interruption of the electrical power supply or failure of treatment units. Mitigation measures, including dual power supply, standby pumps, treatment units and equipment, would be provided to avoid the occurrence of any emergency discharge. An emergency response plan will be formulated to minimize the impact of emergency discharges and facilitate subsequent management of the emergency. No unacceptable water quality impact would be expected during the operational phase of the Project with the recommended mitigation measures properly implemented.

3.4 Waste Management Implication

3.4.1 The wastes impact assessment was conducted in accordance with the criteria and guidelines as stated in the requirements given in Section 3.4.4 and Appendix E of the EIA Study Brief, as well as Annexes 7 and 15 of the EIAO-TM.

3.4.2 Construction and Demolition (C&D) materials will be generated from excavation and demolition activities. Based on the latest layout, the volume of surplus C&D materials is estimated to be approximately 240,000 m^3 of inert material and 59,200 m^3 of non-inert material.

3.4.3 Inert C&D materials from the above construction works will be sorted and reused as filling material as much as possible. The surplus will be transported and disposed at Tuen Mun Area 38 Fill Bank for use as filling material by other projects. Non-inert waste will be recycled as far as possible before disposed to landfill. Opportunities in minimisation of generation and maximisation of reuse would be continually investigated during the detailed design and construction phases. With the implementation of the recommended good site practices and mitigation measures for the handling, transportation and disposal of the identified waste arising, no adverse environmental impacts would be anticipated.

3.4.4 Excavated sediment of approximately 176,000 m^3 will be generated. Based on the results of the chemical and biological screening, approximately 70,000 m^3 of sediment is suitable for Type 1 – Open Sea Disposal, 73,000 m^3 of sediment is suitable for Type 1 – Open Sea

Disposal (Dedicated Sites), and 33,000 m^3 of sediment requires Type 2 – Confined Marine Disposal with reference with ETWB TCW No.34/2002. With the implementation of the recommended mitigation measures, no adverse environmental impacts would be expected from the transportation and disposal of excavated sediments.

3.4.5 Other waste materials, including general refuse and chemical waste will also be generated throughout construction. Provided that these identified wastes will be handled, transported and disposed of using the recommended methods and that good site practices would be strictly followed, adverse environmental impacts are not expected.

3.4.6 The main waste types to be generated during the operation phase would be grit and screenings, and dewatered sludge. The collection, transportation and disposal practices of the grit and screenings would follow the existing arrangements currently in operation at the existing YLSTW. The dewatered sludge would be disposed of to the proposed Sludge Treatment Facilities. Provided proper handling procedures and disposal method are adopted, adverse environmental impacts are not expected during the operation phase.

3.5 Land Contamination

3.5.1 The land contamination assessment is conducted in accordance with the criteria and guidelines as stated in the requirements given in Section 3.4.4 and Appendix E of the EIA Study Brief, as well as Section 3.1 of Annex 19 of the EIAO-TM.

3.5.2 Based on the site appraisal, there are areas within the existing YLSTW considered to be with potential land contamination concerns. A sampling and testing programme, targeting the existing YLSTW had been proposed. Since the site will continue to operate, the proposed Site Investigation (SI) works and any necessary remediation action are recommended to be carried out after the phased decommissioning of existing YLSTW within the Project area but prior to the construction. Further site walkover, assessment and remediation (if any), including the submission of Supplementary Contamination Assessment Plan (CAP(s)), Contamination Assessment Report/ Remediation Action Plan (CAR(s)/RAP(s)) and Remediation Report (RR(s)) would follow Environmental Protection Department's prevailing guidelines and recommendation in the EIA Study.

3.5.3 With the implementation of further site walkover, land contamination assessment and, if required, remediation works for the Project Site, any soil/groundwater contamination would be identified and properly treated prior to the re-development. Land contamination impacts are therefore considered surmountable to future occupants.

3.6 Ecological Impact (Terrestrial and Aquatic)

3.6.1 The Ecological Impact Assessment was conducted in accordance with the relevant requirements as specified in Section 3.4.5 and Appendix F of the EIA study brief, as well as Annexes 8 and 16 of the EIAO-TM.

3.6.2 A literature review and 12-month ecological field surveys covering both dry and wet seasons have been conducted. A total of nine habitat types, including developed area, plantation, orchard, shrubland, grassland, reedbed, mangrove, pond (both active and inactive) and modified watercourse, were recorded within the 500m assessment area from recent surveys, with developed area being the only habitat recorded within the Project site. The ecological values of the wetland associated habitats including reedbed, mangrove, pond (both active and inactive) and modified watercourse (Shan Pui River and Kam Tin River), are moderate or moderate to high. The other habitats, except shrubland which is of low to moderate ecological value, are considered of low ecological value. Species of conservation importance recorded within the assessment area included two flora, 39 avifauna, eight butterflies, four odonate, six herpetofauna, six mammal species and the endemic Bent-winged Firefly. One avifauna and two mammal species of conservation importance were recorded within the Project area.

3.6.3 The wetland habitats within the assessment area supported a large number of overwintering waterbirds that over 2,000 individuals of 23 overwintering / migratory waterbirds species of conservation importance recorded during the dry season months, with the confluence of Shan Pui River and Kam Tin River as well as active ponds at the northwest part of the assessment area in Fung Lok Wai being the key wetland habitats that supported the greatest abundance and diversity of waterbirds. Significantly lower diversity and abundance of waterbirds were recorded during wet season months, with ardeids that are common and present all year around in Hong Kong being the dominant species. No breeding or nursery behaviour of any species were identified within the assessment area.

3.6.4 Potential direct impacts on recognised sites of conservation importance within the assessment area (including the Ramsar Site, Priority Site, WCA, WBA (outside the Project site), SSSI and CA) and natural habitats have been avoided through confinement of construction works within the boundary of the existing YLSTW.

3.6.5 Major indirect impacts due to construction noise disturbances from demolition using breakers mounted on excavators and percussive piling works on key wetland habitats within assessment area and in close proximity to the Project site as well as migratory / overwintering waterbirds have been avoided through scheduling of the percussive piling works and demolition using breakers mounted on excavators outside dry season (i.e. November to March, which is the peak overwintering period of waterbirds).

3.6.6 With the implementation of the recommended mitigation measures (e.g. avoidance of percussive piling and demolition using breakers mounted on excavators and use of alternative quieter construction method during peak overwintering period within dry season; careful phasing of construction activities; provision of noise barriers around Project site, provision of moveable noise barrier/acoustic mat for piling plants and breaker; use of enclosure for construction plant, use of quality powered mechanical equipment (QPME); restriction of construction hours of construction activities with powered mechanical equipment (PME); etc.), no unacceptable adverse residual impacts would be expected during construction or operation phase. Ecological monitoring should be conducted during construction phase to monitor the effectiveness of proposed mitigation measures and detect any unpredicted indirect ecological impacts arising from the proposed Project and the implementation of mitigation measures would be subject to regular audit as part of the EM&A programme.

3.7 Fisheries Impact

3.7.1 Potential impacts on fisheries have been assessed in accordance with Section 3.4.6 and Appendix G of the EIA study brief as well as Annexes 9 and 17 of the EIAO-TM.

3.7.2 No important spawning or nursery grounds were identified in the immediate vicinity of the existing YLSTW. There are no existing fish culture zones within the Deep Bay WCZ.

3.7.3 The Project would only involve land-based construction works within the footprint of existing YLSTW. No loss of active or inactive fishponds are anticipated within the assessment area. There would be no loss of oyster culture area or fishing ground near Deep Bay. With the implementation of mitigation measures recommended in the Water Quality Impact Assessment Section for controlling water quality impact, the Project would not cause any unacceptable water quality impact to adjacent fishponds or oyster culture area and fishing ground near Deep Bay during construction and normal operation. No unacceptable water quality impacts to adjacent fishponds, oyster culture area and fishing ground during emergency discharge from YLEPP are anticipated. Groundwater table monitoring will be undertaken during construction phase of the Project.

3.8 Landscape and Visual Impacts

3.8.1 A Landscape and visual impact assessment has been carried out in accordance with Section 3.4.7 and Appendix H of the EIA study brief, Annexes 10 and 18 of the EIAO-TM, and EIAO Guidance Note No.8/2010.

3.8.2 As the entire project will be developed within the existing YLSTW and most of the existing perimeter trees will be retained, the Project will not have substantial landscape and visual impacts during construction and operation phases. As a whole, it is considered that the residual landscape and visual impacts of the proposed Project is considered acceptable with proposed mitigation measures implemented during construction and operation phases.

3.9 Hazard to Life

3.9.1 Hazard assessment in relation to potential hazard to life due to biogas was conducted in accordance with the relevant requirements as specified in Section 3.4.8 and Appendix I of the EIA study brief, as well as Section 2 of Annex 4 of the EIAO-TM.

3.9.2 The assessment findings revealed that both the individual and societal risk levels would meet relevant requirements stipulated in the Hong Kong Government Risk Guidelines (HKRG), i.e. the off-site individual risk level is far below 1×10^{-5} per year and the societal risk falls into the “Acceptable” region. Therefore, the biogas risk associated with the operation of the YLEPP is considered acceptable.

4 ENVIRONMENTAL MONITORING AND AUDIT (EM&A)

4.1.1 Environmental Monitoring and Audit (EM&A) requirements for air quality, noise, water quality, waste management, land contamination, ecological (terrestrial and aquatic), fisheries, and landscape and visual impacts as well as hazard to life have been recommended, with regular site inspection and audits during construction phase to ensure that the recommended mitigation measures are properly implemented. The EM&A requirements are specified and detailed in the EM&A Manual.

5 CONCLUSION

5.1.1 The findings of the EIA provided information on the nature and extent of the environmental impacts likely to arise from the construction and operation of the YLEPP. The EIA has, where appropriate, identified mitigation measures to ensure compliance with environmental legislation and standards.

5.1.2 Overall, the EIA concluded that the Project would comply with the requirements of the EIA Study Brief and EIAO-TM with the implementation of the proposed mitigation measures during the construction and operational phases of the YLEPP. The schedule of implementation of the proposed mitigation measures has been provided in the EIA Report. An EM&A programme has also been recommended to check the effectiveness of the proposed mitigation measures.