

Project Profile

for

Sha Tin Cavern Sewage Treatment Works



**Drainage Services Department
The Government of the Hong Kong Special Administrative Region**

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1. BASIC INFORMATION

1.1 Project Title

- 1.1.1 The title of this Project is “Sha Tin Cavern Sewage Treatment Works” (hereinafter referred to as “the Project”).

1.2 Purpose and Nature of the Project

- 1.2.1 The proposed Project is for the development of a new sewage treatment works in caverns to be constructed at Nui Po Shan, A Kung Kok, Sha Tin, to replace the existing Sha Tin Sewage Treatment Works (STSTW).
- 1.2.2 Upon functioning of the new STSTW, the site of the existing STSTW will be released for other uses beneficial to the social and economic development of Hong Kong.
- 1.2.3 Apart from freeing up land resources, other benefits of the Project include improvements to the living environment of the Sha Tin district. With the facilities housed inside caverns, the common potential impacts of a sewage treatment works, particularly odour and visual impacts, can be much better controlled and minimized.

1.3 Name of the Project Proponent

- 1.3.1 Drainage Services Department, the Government of the Hong Kong Special Administrative Region

1.4 Location and Scale of the Project and History of the Site

- 1.4.1 The existing STSTW is located at the estuary of Shing Mun River, and provides secondary treatment with disinfection to sewage collected from the Sha Tin and Ma On Shan areas. It has a design treatment capacity of 340,000 m³/day, and effluent standards as follows:

5-day Biochemical Oxygen Demand (mg/l)	95-percentile ≤ 20	upper limit: 40
Total Suspended Solids (mg/l)	95-percentile ≤ 30	upper limit: 60
Ammonia Nitrogen (mg/l)	annual average ≤ 5	upper limit: 10
Total Nitrogen (mg/l)	annual average ≤ 20	upper limit: 35
<i>E. coli</i> (count/100 mL)	monthly geometric mean $\leq 1,000$	upper limit: 15,000

- 1.4.2 Following the outcome of the Feasibility Study referred to paragraph 2.1.1, subject to review in the investigation and design stage, the design treatment capacity and effluent standards of the relocated STSTW will be the same as that of the existing plant.
- 1.4.3 The proposed STSTW relocation site is at Nui Po Shan of A Kung Kok on the southern side of Shing Mun River. The present zoning of the site is Green Belt. There is no major previous development. Minor tracks exist on the hillside and are used by nearby villagers and hikers.

- 1.4.4 For housing the sewage treatment facilities of the new STSTW, a series of caverns connected by cross adits will be constructed, complete with ventilation shafts and access tunnels. The outlet of ventilation shafts will be situated at a remote location on the hill away from the local community. Some ancillary facilities such as administration buildings, an information centre, transformer houses and the like may be located outside the caverns near the portals of access tunnels or in Area 73 adjacent to Nui Po Shan. These are reclaimed areas currently being occupied in part by the piers of the Tate's Cairn Highway and a vehicle detention centre of the Customs and Excise Department.

1.5 Number and Types of Designated Projects

- 1.5.1 The caverns to be constructed at Nui Po Shan and the sewage treatment works to be housed inside, of an installed capacity exceeding 15,000 m³/day, are Designated Projects under Q.2 and F.1/F.2 respectively of Part I, Schedule 2 of the Environmental Impact Assessment Ordinance (EIAO).
- 1.5.2 Subject to further review in the investigation and design stage, the Project may potentially involve other elements that are Designated Projects under Part I, Schedule 2 of the EIAO, including:
- reuse of treated sewage effluent from a treatment plant, under F.4,
 - an explosive depot, under K.10,
 - a facility for the treatment of construction waste, under G.5

1.6 Name and Telephone Number of Contact Persons

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2. OUTLINE OF PLANNING AND IMPLEMENTATION PROGRAMME

2.1 Project Planning and Implementation

- 2.1.1 In May 2012, the Drainage Services Department (DSD) commenced a detailed Feasibility Study on the relocation of STSTW to caverns. The study comprised various preliminary technical assessments, including geotechnical appraisal, evaluation of appropriate sewage and sludge treatment technologies, as well as assessment of necessary modifications to the upstream sewerage and downstream disposal systems to suit the Project.
- 2.1.2 Substantially completed in end 2013, the Feasibility Study affirmed Nui Po Shan at A Kung Kok as the optimum relocation site, and that there was no insurmountable technical issues with the Project.
- 2.1.3 The Feasibility Study also included a comprehensive public engagement (PE) exercise to seek and take account of the views of the public for building consensus on the Project. The PE comprised a wide range of activities, including a media briefing, roving exhibitions, deodorization demonstration, visits to Stanley Sewage Treatment Works (an existing sewage treatment works built in caverns), focus group meetings with professional and environmental organizations, community group meetings, a public forum, etc. During these events, overseas experience of cavern sewage treatment works and the outcome of the preliminary technical assessments were shared with the stakeholders. There was also extensive media coverage on the PE information.
- 2.1.4 DSD consulted the Health and Environment Committee of the Sha Tin District Council on the findings of the Feasibility Study on 7 November 2013. The Committee generally supported proceeding with the investigation and design of the Project.
- 2.1.5 DSD will engage consultants to undertake the investigation, design, and construction supervision of the Project. DSD will operate and maintain the completed works.

2.2 Project Programme

- 2.2.1 Appointment of consultants for investigation and design of the Project is scheduled for late 2014.
- 2.2.2 Construction of the Project is tentatively scheduled to substantially commence in 2017 for completion in 2027.

2.3 Project Interface

- 2.3.1 The Project will have interface with the following projects. Close liaison will be maintained with the respective project teams to address any interfacing issues and cumulative impacts.

- (a) Modifications, improvement and re-provisioning of Sha Tin Main sewage pumping station, A Kung Kok sewage pumping stations and Ma On Shan sewage pumping station

These three sewage pumping stations are conveying sewage to the existing STSTW, with design capacities as follows:

Sewage Pumping Station	Design Capacity (ADWF in m ³ /day)
Sha Tin Main SPS	242,300
A Kung Kok SPS	100
Ma On Shan SPS	68,600

These pumping stations and their associated sewerage system may need modification, improvement or re-provisioning to provide sufficient head and capacity as well as for sewage conveyance to the relocated STSTW. Works are expected, tentatively, to start around 2021 for completion in 2026.

(b) Proposed Sha Tin Intermediate Sewage and Effluent Pumping Station (STISEPS)

This new pumping station is proposed to replace the existing Sha Tin Effluent Pumping Station (STEPS) for (i) conveyance of treated effluent from the Tai Po Sewage Treatment Works (with a design treatment capacity of 120,000 m³/day) to the Sha Tin portal of the Tolo Harbour Effluent Export Scheme (THEES) effluent export tunnel, and (ii) providing the necessary additional pumping head to convey the sewage from the existing Pak Shek Kok No. 3 SPS, Chinese University SPS and Shui Chong Street SPS (total design capacity about 29,000 m³/day) to the new STSTW. The tentative location of the STISEPS is at the existing staff quarters near the western corner of the existing STSTW. Works are expected, tentatively, to start around 2021 for completion in 2026.

(c) Widening of Tai Po Road (Sha Tin Section)

CEDD is conducting an investigation study on the widening of Tai Po Road (Sha Tin Section) between Sha Tin Rural Committee Road and Fo Tan Road. Construction works are tentatively scheduled to commence in end 2017 for completion by 2021.

(d) Tolo Harbour Sewerage of Unsewered Areas, Stage II

This project covers the provision of sewerage to a number of unsewered areas in Sha Tin. Works are on-going and expected to be completed by 2020.

(e) Tolo Harbour Effluent Export Scheme (THEES) Upgrading

EPD has conducted a study "Investigation of Tolo Harbour Effluent Export Scheme (THEES) Upgrading Options and Impacts to Tolo Harbour Water Quality". Projects may arise accordingly for upgrading of the THEES.

3. POSSIBLE IMPACTS ON THE ENVIRONMENT

3.1 Brief Description of the Project

- 3.1.1 Under the Project, a new STSTW will be installed in a cavern environment to replace the existing one. The new STSTW will provide secondary treatment and disinfection, for the effective reduction of biochemical oxygen demand, suspended solids, nitrogen and *E. coli* in the sewage. Dewatered sludge will be transported to the Sludge Treatment Facility at Tuen Mun for thermal incineration.
- 3.1.2 The treated effluent will be discharged to the existing THEES effluent tunnel for conveyance to Kai Tak River for disposal. Subject to further assessment in the investigation and design stage, connection to the existing STSTW submarine outfall for flow bypass outside normal operation may be replaced by a seawall outfall.
- 3.1.3 There are various treatment technologies available to constitute the sewage and effluent treatment processes mentioned above. A comprehensive review will be carried out in parallel with the environmental impact assessment to determine the appropriate ones to be adopted. For disinfection in the main sewage treatment process, it will be through ultra-violet irradiation or alternatives other than chlorination.
- 3.1.4 Subject to further appraisal in the investigation and design stage, a portion of the treated effluent may be polished to effluent reuse quality for non-potable uses such as toilet flushing and controlled irrigation.
- 3.1.5 Major construction activities of the Project include blasting, earthworks, handling of excavated materials, piling, construction of concrete structures, pipe laying by open trench or trenchless methods, installation of electrical and mechanical equipment, material transportation and demolition works.

3.2 Potential Environmental Impacts: Construction Phase

Air Quality

- 3.2.1 Potential air quality impacts may arise from dust emissions generated by construction activities such as tunnel and cavern excavation, cutting, filling, rock crushing, stockpiling, construction vehicle movements, as well as demolition works.

Noise

- 3.2.2 Airborne noise may be generated during construction, demolition, tunnel and cavern excavation using drill-and-blast methods, piling, material transportation, etc. Groundborne noise may be generated from tunnel and cavern excavation using drill-and-blast methods and use of other powered mechanical equipment. Subject to further review, temporary haul roads for the construction of the Project may be provided between Ma On Shan Road and the works sites at Nui Po Shan, which may necessitate the removal of part of the existing noise barriers on Ma On Shan Road, leading to localized potential traffic noise impact.

Water Quality

- 3.2.3 Potential water quality impacts may arise due to the following:

- Construction site run-off and drainage from works areas;
- General construction activities such as dust suppression sprays, washing of construction vehicles/equipment, etc.;
- Sewage from the construction workforce;
- Construction of the emergency bypass outfall; and
- Groundwater control measures for tunnel and cavern construction.

Ecology

- 3.2.4 The majority of construction activities will be carried out in caverns or in urbanized areas. There may be limited potential impact to terrestrial ecology due to the construction of ventilation shaft outlet, which is expected to be located within woodland habitats, and tunnel portals, which are expected to be situated in developed areas and plantation woodland habitats.
- 3.2.5 There may be minor and transient potential impact to marine ecology due to the construction of the emergency bypass outfall.

Fisheries

- 3.2.6 There may be minor and transient potential impact to fisheries due to the construction of the emergency bypass outfall.

Waste

- 3.2.7 Excavated materials will arise from the construction of tunnels and caverns, foundation works for related structures, other underground works like sewerage, and demolition of the existing STSTW. There will also be a limited amount of general refuse and chemical waste generated from the various construction works.

Land Contamination

- 3.2.8 Land contamination is not expected at the cavern site at Nui Po Shan, which is inside bedrock in an undeveloped area. For the demolition of the existing STSTW, there may be some potential land contamination, but it is also noted the sewage being treated is predominantly from domestic rather than industrial sources.

Cultural Heritage

- 3.2.9 Based on the preliminary environmental review conducted in the Feasibility Study, there is no heritage site, i.e. declared monuments, proposed monuments, graded historic sites/buildings, sites of archaeological interest and Government historic sites identified by the Antiquities and Monuments Office (AMO), in the vicinity of the project site.
- 3.2.10 Further away, there are two graded historic buildings at Tai Shui Hang, but these are some 400 m from the proposed caverns. The nearest site of archaeological interest is the Pak Kong - Mui Tsz Lam Trackway, which is more than 500 m from the proposed caverns. No impact is expected to arise from the Project on these installations.

Landscape and Visual

- 3.2.11 There may be short-term visual impact arising from temporary facilities like noise barriers.

Hazards

- 3.2.12 Explosives will be required for tunnel and cavern excavation using drill-and-blast methods. There are hazards associated with the transportation, storage and use of explosives, and these will all be subjected to close control in accordance with the requirements of Mines Division of CEDD.

3.3 Potential Environmental Impacts: Operation Phase

Air Quality

- 3.3.1 The sewage treatment facilities of the new STSTW are potential odour sources. Nevertheless, they will be housed deep inside in caverns, which serve as very effective natural barriers against odour impacts to the surroundings.
- 3.3.2 The sludge transportation vehicles from the new STSTW to the Sludge Treatment Facility may be potential odour sources if they are not properly designed and managed.

Noise

- 3.3.3 Most of the equipment and fixed noise sources of the new STSTW will be located deep inside caverns, which are very effective natural barriers against noise propagation. Some ventilation equipment may be located outside the caverns and constitute a potential fixed noise source if not properly designed.
- 3.3.4 Some traffic will be generated at the Nui Po Shan area relating to the operation and maintenance of the new STSTW. With reference to the existing STSTW, the future traffic volume, and noise impact arising, is expected to be limited only.

Water Quality

- 3.3.5 The effluent disposal arrangement of the new STSTW will be the same that of the existing plant. During normal operation, treated effluent will be discharged to the THEES effluent export tunnel, which will in turn transport the flow to Kai Tak River for discharge into the Victoria Harbour. In the case of THEES tunnel maintenance or other emergencies, treated effluent may be discharged via an emergency bypass outfall to the Tolo Harbour for a short period of time. As the design capacity and effluent standards will be the same as the existing plant, no significant water quality impact is expected from the Project unless there are changes in the design capacity or effluent standards subsequently in the investigation and design stage.

Ecology

- 3.3.6 As the new STSTW will be located inside caverns, no significant effect on terrestrial and marine ecology is expected.

Fisheries

- 3.3.7 No effect on fisheries is anticipated.

Human Health

- 3.3.8 The non-potable reuse of treated effluent from the new STSTW, if pursued, may have potential concerns for human health.

Waste Management

- 3.3.9 Sewage sludge will be generated from the new STSTW. The sludge will be dewatered and transported to the Sludge Treatment Facility in Tuen Mun for treatment and disposal. A limited amount of screenings, grit, general refuse and chemical waste is also expected during the operation.

Landscape and Visual

- 3.3.10 As major treatment facilities of the new STSTW will be hidden inside caverns, there should be potential visual enhancement to the area of Shing Mun River estuary. Some ancillary structures of the new STSTW may be located outside caverns in front of the generally green backdrop of Nui Po Shan, but mainly around the vicinity of the existing Tate's Cairn Highway.

4. MAJOR ELEMENTS OF THE SURROUNDING ENVIRONMENT

4.1 Existing and Planned Sensitive Receivers

4.1.1 The major sensitive receivers of the surrounding environment in the vicinity of the Project are listed below.

Table 4.1 Major Sensitive Receivers Nearby

Types	Sensitive Receivers
Residential Developments	Chevalier Garden, Low-rise residential buildings on Tai Shui Hang North Street and Tai Shui Hang South Street, Kam Tai Court, Ah Kung Kok Fishermen Village
Educational Institutions	Wellborn Kindergarten, Hay Nien Primary School, Ma On Shan Tsung Tsin Secondary School, S.K.H. Ma On Shan Holy Spirit Primary School
Government / Institute / Community	Hong Kong Mountaineering Union, Breakthrough Youth Village, Cheshire Home Sha Tin, The Neighbourhood Advice-Action Council Harmony Manor, Shing Mun Springs Rehabilitation Centre, Sha Tin Hospital, Sha Tin Racecourse, Penfold Park
Water Bodies	Tolo Harbour, Shing Mun River Channel (main channel and tributaries), Mui Tsz Lam River, Tai Shui Hang Channel, WSD Sha Tin Saltwater Intakes.
Fish Culture Zones	Yim Tim Tsai, Yim Tim Tsai (East), Yung Shue Au, Lo Fu Wat.
Areas of Conservation Value	Ma On Shan Country Park, Conservation Area, Mui Tsz Lam Fung Shui Wood.
Site of Cultural Heritage	Two Grade 3 Historic Buildings at Tai Shui Hang, A newly proposed historic building at the Chinese University of Hong Kong

5. ENVIRONMENTAL PROTECTION MEASURES AND IMPLICATIONS

5.1 Potential Measures to Minimize Environmental Impacts

Construction Phase

Air Quality

- 5.1.1 Location of the plant for rock spoil handling inside caverns will be explored to reduce dust dispersion. Good site practices and dust control measures including those set out in the Air Pollution Control (Construction Dust) Regulation of the Air Pollution Control Ordinance will be set out in the works contracts for implementation to control and mitigate dust impacts on the nearby sensitive receivers. With the measures in place, it is expected that the construction dust impact will be minimized to acceptable levels.

Noise

- 5.1.2 Noise barriers and other blasting containment will be installed to reduce noise levels and withstand blast pressure due to the tunnel and cavern excavation using drill-and-blast methods. Traffic noise mitigation measures would be recommended to alleviate noise impact of construction vehicles to nearby NSRs as required.
- 5.1.3 General good site practices, including the location of noisy machinery away from sensitive receivers, the use of silencers, mufflers and acoustic shields on plant and equipment, regular maintenance of plant and equipment and reduction in number of machines used at any one time, prevention of plant idling, etc will be adopted to control noise impact.
- 5.1.4 The need for further mitigation measures, such as noise enclosures, would be identified during the EIA to help control construction noise impact to meet the stipulated requirements.

Water Quality

- 5.1.5 Silt removal facilities will be provided to remove any silt before the discharge of site runoff during the construction of the Project as well as the decommissioning of the existing STSTW. The design of temporary on-site drainage and silt removal facilities will comply with the guidelines stipulated in the EPD's Practice Note for Professional Persons, Construction Site Drainage (ProPECC PN 1/94).
- 5.1.6 Appropriate mitigation and monitoring measures will be developed to mitigate any impact on watercourses due to construction of the emergency bypass outfall and groundwater control in tunnel and cavern construction.

Ecology

- 5.1.7 Appropriate mitigation measures will be developed and implemented for any potential ecological impact identified in the EIA.

Fisheries

- 5.1.8 Appropriate mitigation measures will be developed and implemented for any potential fisheries impact identified in the EIA.

Waste Management

- 5.1.9 A comprehensive Construction and Demolition Material Management Plan (C&DMMP) will be drawn up at an early stage before construction, with a view to minimizing the generation of construction & demolition materials, and enhancing the on-site and off-site reuse of excavated material, in particular the rock spoil from cavern construction. Close liaison with the Quarries Section of CEDD will be maintained in the investigation and design stage.
- 5.1.10 Other mitigation measures include the adoption of good housekeeping practices, and sorting and segregation of wastes for reuse and disposal.

Land Contamination

- 5.1.11 The presence and extent of land contamination, mainly in the existing STSTW site, will be investigated further as part of the ground investigation works of the Project. Remediation measures if found necessary will be drawn up in accordance with EPD's relevant guidance notes and EPD's advice.

Cultural Heritage

- 5.1.12 Detailed assessment will be carried out during the EIA to assess any potential cultural heritage impact and the mitigation measures required.

Landscape and Visual

- 5.1.13 Hoardings with beautification features will be erected at the project site boundaries as far as practicable to minimize the visual impact of construction activities. Proper control over site cleanliness and stockpiling of materials will be exercised to alleviate visual intrusion. Design of noise barriers shall be visually unobtrusive through the use of transparent materials or greening measures.

Hazards

- 5.1.14 Potential hazards associated with the transportation, storage and use of explosives for tunnel and cavern construction will be assessed in detail. Close liaison will be maintained with the Mines Division of CEDD, and all relevant requirements will be incorporated. Safety precautions and control measures will be proposed and implemented.

Operation Phase

Air Quality

- 5.1.15 Odour containment measures with de-odorization facilities will be provided to the sewage treatment processes inside the caverns. Air vented from the caverns will go through a ventilation shaft located at a remote location on the hill to enhance dilution and dispersion. Preliminary odour impact assessment conducted in the Feasibility Study has revealed that with these measures the new STSTW would not cause potential odour impact to any of the air sensitive receivers in the proximity of the new STSTW. Further detailed assessment will be conducted as part of the EIA.

- 5.1.16 For the transportation of sludge, vehicles with water-tight containers will be used. The surface of the vehicles will be cleaned and dried before they leave the caverns.

Noise

- 5.1.17 Appropriate mitigation measures will be developed and implemented for any potential noise impact identified in the EIA.

Water Quality

- 5.1.18 Standby sewage treatment units and equipment will be provided to cater for operation and maintenance needs. The need for alternative power supply to the effluent conveyance facilities will be investigated in the EIA to reduce the probability of effluent bypass.

- 5.1.19 Appropriate precautionary measures to minimize the potential groundwater drawdown, including the implementation of pre-grouting, post-grouting and installation of waterproof linings would be recommended for the design of the proposed tunnels and caverns.

Ecology

- 5.1.20 Appropriate mitigation measures (e.g. on noise and water quality) will be developed during the EIA stage to mitigate the potential ecological impact due to the operation of the relocated STSTW. In case of plant/power failure or emergency overflow, the measures mentioned in **Section 5.1.19** should be adopted to minimize the water quality impact and hence, the potential impact on marine ecology.

Fisheries

5.1.21 Appropriate mitigation measures will be developed and implemented for any potential fisheries impact identified in the EIA.

Human Health

5.1.22 Appropriate quality standards for non-potable effluent reuse, if pursued, would be proposed to minimize any potential impact to human health. The quality of reuse water will be closely monitored to ensure compliance with the standards.

Waste Management

5.1.23 Good housekeeping and practices will be adopted to minimize potential impacts from the waste generated, including the use of closed containers for transportation.

Landscape and Visual

5.1.24 Greening, aesthetic design of buildings and structures, green roofs, landscaping features, etc will be implemented to enhance the visual quality of ancillary facilities and the above ground structures and achieve a harmonious design for these facilities to blend with the surrounding environment. Design of noise barriers shall be visually unobtrusive in accordance with the scheme approved by relevant authorities where appropriate.

6. USE OF PREVIOUSLY APPROVED EIA REPORTS

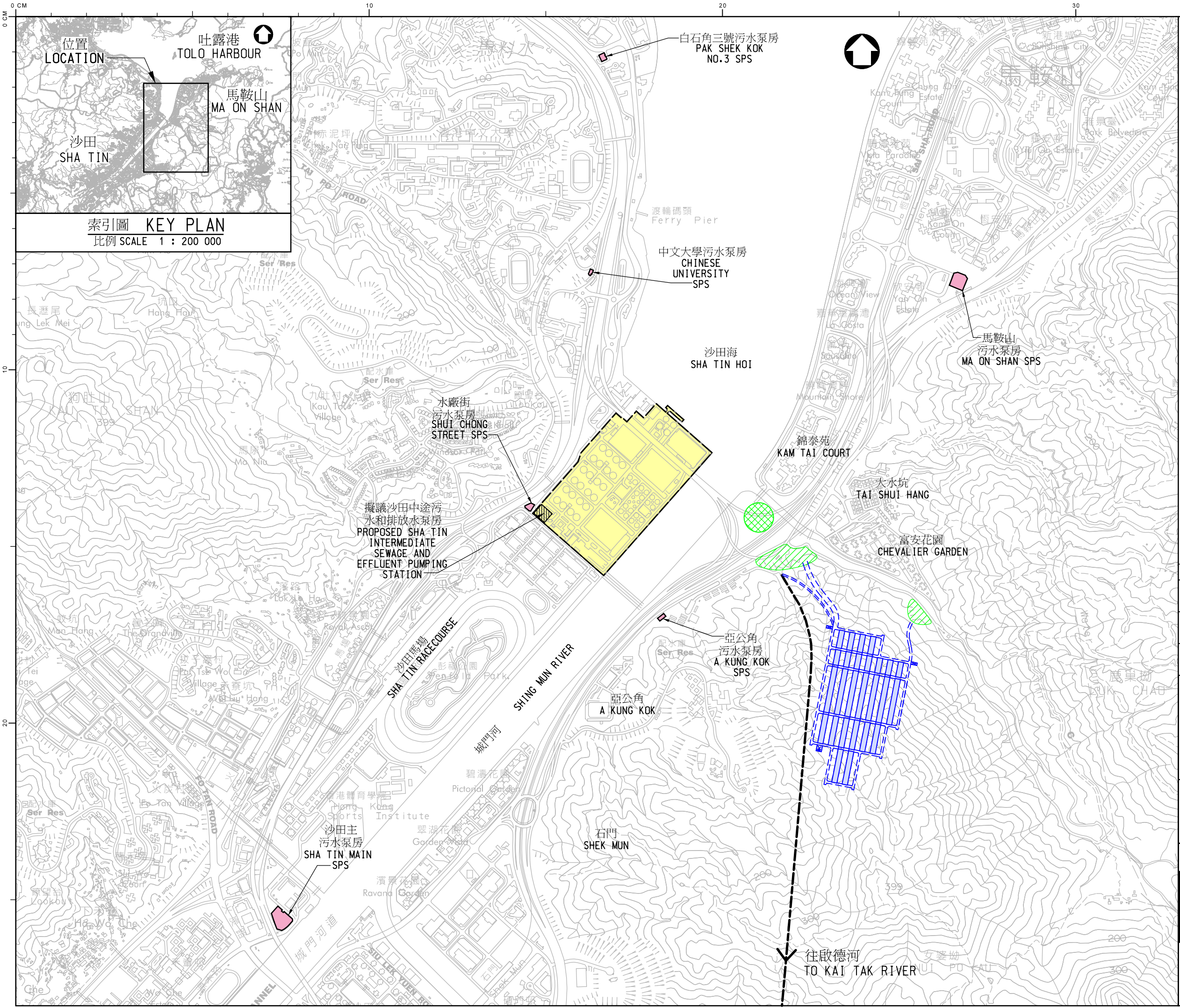
6.1.1 No previously approved EIA report exists for the Project. Reports of the following in the Register may nevertheless be relevant for reference:

- Sha Tin Sewage Treatment Works Stage III Extension – EIA Study [EIA-022/1999]
- Tai Po Sewage Treatment Works Stage V – EIA Study [EIA-097/2004]

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Figure

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註 NOTES:

1. 擬議岩洞、隧道、出入口及附屬設施的佈局有待詳細設計。
THE LAYOUT OF PROPOSED CAVERNS, TUNNELS, PORTALS AND ANCILLARY FACILITIES IS SUBJECT TO DETAILED DESIGN.

2. 為保持清晰，將進行更改、改善和重置的現有上游污水收集系統及吐露港經處理排放水輸送計劃沒有顯示。
EXISTING UPSTREAM SEWERAGE AND THEES TO BE MODIFIED, IMPROVED AND REPROVISIONED ARE NOT SHOWN FOR CLARITY.

- 圖例 LEGEND:
- 現有沙田污水處理廠
EXISTING SHA TIN SEWAGE TREATMENT WORKS (STSTW)
 - 擬議岩洞、通風豎井、隧道及重置沙田污水處理廠主體設施
PROPOSED CAVERNS, VENTILATION SHAFTS, TUNNELS AND MAIN FACILITIES OF RELOCATED STSTW
 - 擬議重置沙田污水處理廠入口設施
PROPOSED PORTAL FACILITIES OF RELOCATED STSTW
 - 擬議重置沙田污水處理廠附屬設施
PROPOSED ANCILLARY FACILITIES OF RELOCATED STSTW
 - 現有上游污水泵房
EXISTING UPSTREAM SEWAGE PUMPING STATIONS (SPS)
 - 現有吐露港經處理排放水輸送隧道
EXISTING TOLO HARBOUR EFFLUENT EXPORT SCHEME (THEES)

	姓名 name	日期 date
繪畫 drawn	C. L. KWAN	09 MAY 2014
核對 checked	Ir K. H. CHAN	09 MAY 2014
批核 approved	Ir H. S. KAN	09 MAY 2014

圖則名稱 figure title

沙田岩洞污水處理廠
SHA TIN CAVERN SEWAGE TREATMENT WORKS

比例 scale

FIGURE 1 圖則一

1:15000
OR
AS SHOWN

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部門 office

污水工程部
SEWERAGE PROJECTS DIVISION

香港特別行政區政府渠務署
DRAINAGE SERVICES DEPARTMENT
GOVERNMENT OF THE HONG KONG
SPECIAL ADMINISTRATIVE REGION