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# 1 Introduction

## 1.1 Project Background

To respond more flexibly to society's needs for land, it is Government's policy as announced in 2013 Policy Address to develop new land extensively and build up an abundant "land reserve" that can more than meet the short-term demand. The reserve can be used to meet future demand in a timely manner.

Land demand is influenced by various factors, including demographic change, economic performance, property market, Government policy, social needs, public expectations and nature conservation, etc. These factors and their influence to the land demand are difficult to predict, especially in relation to the long-term demand. Owing to the scarce resources of developable land in Hong Kong, ever changing land demand and the long lead time required for land production, it is the prime objective of the Government to increase the supply of developable land as a long-term strategy to cope with future development needs and to capture windfall opportunities in the fast changing market.

The Government is currently relying on rezoning, redevelopment, land resumption and redevelopment of ex-quarry sites as the major methods to supply land. However, these methods have their own challenges and problems and have been significantly affecting the Government to supply land in a timely manner. While the Government will continue to make use of these existing land supply methods, the Government is actively pressing ahead with two other land supply methods which are not commonly used in recent years, including reclamation and rock cavern development.

On 30 June 2011, CEDD commissioned Ove Arup and Partners HK Ltd. (Arup) as the Consultant to undertake this Feasibility Study to strive for an enhanced land supply strategy by focusing on two land supply methods, i.e. reclamation outside Victoria Harbour on an appropriate scale and rock cavern development. The Study includes a two-stage Public Engagement exercise to gauge public views and foster public's understanding and acceptance on the issues.

## 1.2 Objectives of Assignment

The main objectives of the assignment are to:

- conduct a territory-wide site search in Hong Kong to identify potential reclamation and rock cavern development sites to be taken forward for more detailed study based on broad technical and environmental assessment;
- launch a two-stage Public Engagement exercise to engage the public regarding increasing the land supply by reclamation outside Victoria Harbour on an appropriate scale and rock cavern development.

## 1.3 SEA and Objectives of SEA

The purpose of this SEA Report (Executive Summary) is to provide a brief summary on the SEA/environmental works undertaken under this Study and the

SEA/environmental considerations and findings throughout the site selection process for rock cavern development.

Strategic Environmental Assessment (SEA) is a systematic process, with multi-stakeholder involvement, for analysing and evaluating environmental implications of proposed policies, plans and programmes, for assisting in strategic or planning decision-making; and for following up strategic or planning decisions.

This SEA study is to identify, assess and compare, at the strategic level, the potential environmental performance and impact of the proposed sites under different scenarios. Six stages have been involved by SEA study: (i) Review of Relevant Legislations and Guidelines; (ii) Review of Baseline Conditions; (iii) Identification of Environmental Key Issues/ Constraints and Opportunities; (iv) Territory-wide Site Search; (v) Broad Environmental Assessments; and (vi) Site Shortlisting Study. It should be noted that the site selection process for rock cavern development (RCD) covers both RCD-released sites and RCD-receiving sites.

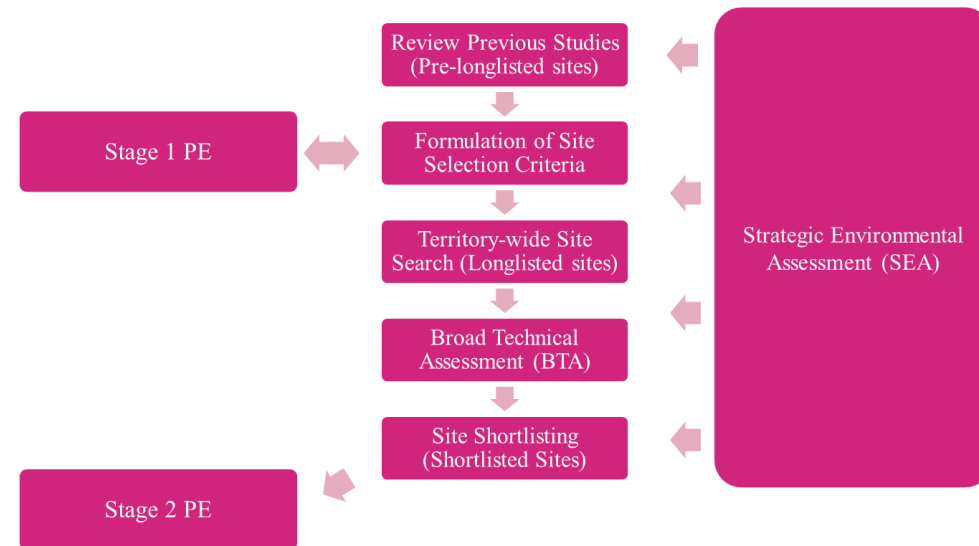
The Strategic Environmental Assessments is undertaken to provide environmental information and integrate environmental factors at the strategic level to support the site identification and shortlisting process, and to recommend follow up works and actions required under the Strategic Environmental Monitoring & Audit (SEM&A) Plan and Programme to resolve and follow up the outstanding environmental issues of the shortlisted sites.

## 1.4 Disclaimer

Any proposals pertaining to the extents, shapes, land uses, transport infrastructures, etc. for the rock cavern development sites shown in any report, are solely hypothetical assumptions for the purpose of broad technical assessment and strategic environmental assessment only. They do not represent the extents, shapes, land uses and transport infrastructures to be implemented in future regardless of whether the sites are selected for further studies or not. Indeed, all these development parameters will be developed based on future feasibility studies, statutory processes under the Environmental Impact Assessment Ordinance (EIAO), Town Planning Ordinance (TPO), etc. and public consultations.

## 2 Overall Site Selection Methodology

The site selection process carried out under this Study is broadly illustrated below:



Main tasks include:

- review of previous studies and constraints for identification of pre-longlisted sites;
- Stage 1 Public Engagement for formulation of initial site selection criteria (SSC);
- selection of longlisted sites from the pre-longlisted sites based on the initial SSC;
- refined Site Selection Criteria after Stage 1 PE;
- broad technical assessment (BTA) for the longlisted sites;
- site shortlisting based on the findings of BTA, refined SSC after Stage 1 Public Engagement to shortlist sites for consultation in PE2 and further detailed study;
- Stage 2 Public Engagement to consult the public on the shortlisted sites.

Strategic Environmental Assessment (SEA) was also carried out to provide environmental input for the entire site selection process.

## 3 Review of Previous Study and Constraints

### 3.1 Review of Previous Cavern Study

The previous Enhanced Use of Underground Space Study (the previous Cavern Study) completed a territorial-wide stock taking exercise and identified government facilities that have the potential for rock cavern development.

With reference to the Hong Kong Planning Standards and Guidelines, the facilities in the stocktaking exercise included civic centre, columbarium/mausoleum/mortuary, incinerator, indoor games/sports hall, refuse transfer facility, sewage/water treatment plant, service reservoir, slaughterhouse, transport connections and networks, and wholesale market.

### 3.2 SEA/Environmental Considerations

Eight site selection criteria were formulated to compare the relative suitability of the potential facilities for relocation into rock caverns, with details below:

Site Selection Criterion with SEA/Environmental Considerations

- Environmental Benefits (e.g. benefits brought by relocating NIMBY facilities).

Other Site Selection Criteria

- Facility Status (e.g. whether the facility has plan of expansion or upgrading, etc.);
- Existing Location (e.g. whether the site is within urban area or rural area which will have different development potential);
- Site Area (e.g. a larger site will have relatively higher development potential);
- Multi-facility Opportunities (e.g. opportunities to relocate multiple facilities nearby underground);
- Precedent Cases (e.g. facility type with successful precedent case of relocation into cavern is considered more suitable to be selected);
- Location Requirements (e.g. facility location relying on existing connection such as transport or pipes may be more complicated in terms of relocation);
- Ground Condition (e.g. if there is any suitable ground nearby for cavern construction).

### 3.3 Site Identification Methodology and Other Considerations

Based on preliminary assessment, each of the potential facilities was graded with “A”, “B”, or “C” with respect to each of the SEA/environmental-related and other site selection criteria for broad comparison. The study identified 445 existing/future government facilities that may have the potential for relocation into rock caverns based on preliminary evaluation.

These 445 government facilities were carried forward to this study. For those sites of the government facilities which were ranked with 4 or more “A” with reference to the above mentioned SEA/environmental and other site selection criteria (included 131 government facilities), they were further eliminated with considerations, including extremely small site area; no appropriate receiving sites; facilities recently completed or will be upgraded/expanded; facilities connecting to HATS dropshaft; no suitable ground for rock cavern construction; and types of facilities not suitable for relocation, e.g. incinerators, slaughterhouses, military facilities, etc.. With reference to various considerations, 78 sites for government facilities were identified as pre-longlisted sites for rock cavern development.

3.4 SEA/Environmental Considerations in the Identification of the Pre-longlisted Rock Cavern Development Sites

During review of the previous Cavern Study and further considerations, the SEA/environmental input has been involved in the pre-longlisting process by identifying the sites where the relocation of the government facilities from these sites into rock caverns could bring benefits to the environment. The relocation of these facilities into caverns could potentially enhance the environmental performances of the RCD-released sites by making them locating further from the environmentally sensitive uses. The pre-longlisted sites (both RCD-released and RCD-receiving sites) may be subject to environmental and other constraints, and would be further considered in the next steps of the site selection process.

The 78 pre-longlisted sites are listed in the following table and shown in **Figure 1**.

Site No.	Name	District
1	Tai Po Sewage Treatment Works	Tai Po
2	Sai Kung Sewage Treatment Works	Sai Kung
3	Sha Tin Transfer Station	Sha Tin
4	Aberdeen Fresh Water Service Reservoir	Southern
5	Lion Rock High Level Fresh Water Primary Service Reservoir	Wong Tai Sin
6	Yau Kom Tau Fresh Water Primary Service Reservoir	Tsuen Wan
7	Yau Kom Tau No. 2 Fresh Water Primary Service Reservoir	Tsuen Wan
8	Eastern No. 2 Fresh Water Service Reservoir	Wan Chai
9	Lion Rock Low Level Fresh Water Primary Service Reservoir	Wong Tai Sin
10	Eastern Water Treatment Works	Wan Chai
11	Tsing Yi North Low Level Fresh Water Service Reservoir	Kwai Tsing
12	Diamond Hill Fresh Water Service Reservoir & Diamond Hill Salt Water Service Reservoir	Wong Tai Sin
13	Kennedy Town Fresh Water Service Reservoir	Central And Western
14	Siu Ho Wan Sewage Treatment Works	Islands
15	Sham Tseng Sewage Treatment Works	Tsuen Wan
16	North West New Territories Refuse Transfer Station (NWNTRTS)	Tuen Mun
17	Yau Kom Tau Water Treatment Works	Tsuen Wan
18	Tseung Kwan O Fresh Water Primary Service Reservoir	Sai Kung

Site No.	Name	District
19	Tan Kwai Tsuen South Fresh Water Service Reservoir	Yuen Long
20	Tan Kwai Tsuen North Fresh Water Service Reservoir	Yuen Long
21	Tuen Mun North Fresh Water Service Reservoir	Tuen Mun
22	Tsuen Wan West Low Level Fresh Water Service Reservoir	Tsuen Wan
23	Tuen Mun West Fresh Water Service Reservoir	Tuen Mun
24	Kau Wa Keng Fresh Water Service Reservoir	Kwai Tsing
25	Tai Po Road Fresh Water Service Reservoir	Sha Tin
26	Shau Kei Wan Fresh Water Service Reservoir	Eastern
27	Shek Kip Mei No. 3 Fresh Water Service Reservoir	Sham Shui Po
28	Shek Kip Mei No. 2 Fresh Water Service Reservoir	Sham Shui Po
29	Au Tau Fresh Water Service Reservoir	Yuen Long
30	Ma On Shan Fresh Water Service Reservoir	Sha Tin
31	Yau Tong Fresh Water Service Reservoir	Kwun Tong
32	Bowen Road Fresh Water Service Reservoir	Wan Chai
33	Tsing Yi East Fresh Water Service Reservoir	Kwai Tsing
34	Eastern Fresh Water Service Reservoir	Wan Chai
35	Ma On Shan No. 2 Fresh Water Service Reservoir	Sha Tin
36	Choi Wan Road Fresh Water Service Reservoir	Kwun Tong
37	Tsing Yi East Salt Water Service Reservoir	Kwai Tsing
38	Ap Lei Chau Fresh Water Service Reservoir	Southern
39	Hatton Road Fresh Water Service Reservoir (New)	Central And Western
40	Piper's Hill Salt Water Service Reservoir	Sham Shui Po
41	Sha Tin West Fresh Water Service Reservoir	Sha Tin
42	Tsing Yi North Low Level Salt Water Service Reservoir	Kwai Tsing
43	Tsing Yi East No. 2 Fresh Water Service Reservoir	Kwai Tsing
44	Beacon Hill Intermediate Level Fresh Water Service Reservoir	Kowloon City
45	Wah Fu Fresh Water Service Reservoir	Southern
46	Choi Wan Road Salt Water Service Reservoir	Kwun Tong
47	Sha Tin Water Treatment Works	Sha Tin
48	Shek Kip Mei Fresh Water Service Reservoir	Sham Shui Po
49	Tsing Yi Preliminary Treatment Works	Kwai Tsing
50	Tsz Wan Shan Fresh Water Service Reservoir	Wong Tai Sin
51	Diamond Hill No. 2 Fresh Water Service Reservoir	Wong Tai Sin
52	Shek Lei Pui Fresh Water Service Reservoir	Sha Tin
53	Lion Rock High Level No. 2 Fresh Water Primary Service Reservoir	Kowloon City
54	Yau Tong No. 2 Fresh Water Service Reservoir	Kwun Tong
55	Ma On Shan Fresh Water Primary Service Reservoir	Tai Po
56	Outlying Islands Transfer Facilities-Mui Wo Station (OITF-MuiWS)	Islands
57	Wah Fu Salt Water Service Reservoir	Southern



Site No.	Name	District
58	Jordan Valley Salt Water Service Reservoir	Kwun Tong
59	Western No.2 Fresh Water Service Reservoir	Central And Western
60	Magazine Gap Road No. 3 Fresh Water Service Reservoir	Central And Western
61	Aberdeen No. 2 Salt Water Service Reservoir	Southern
62	Ap Lei Chau Salt Water Service Reservoir	Southern
63	Bowen Drive Salt Water Service Reservoir	Wan Chai
64	Yau Tong Salt Water Service Reservoir	Kwun Tong
65	Magazine Gap Road No. 2 Fresh Water Service Reservoir	Central And Western
66	Sha Tin West Salt Water Service Reservoir	Sha Tin
67	Aberdeen Salt Water Service Reservoir	Southern
68	Western Fresh Water Service Reservoir	Central And Western
69	Ma On Shan No. 3 Salt Water Service Reservoir	Sha Tin
70	Shau Kei Wan East High Level Salt Water Service Reservoir	Eastern
71	Ma On Shan Salt Water Service Reservoir	Sha Tin
72	Beacon Hill Intermediate Level Salt Water Service Reservoir	Kowloon City
73	Tsing Yi North High Level Salt Water Service Reservoir	Kwai Tsing
74	Hatton Road Fresh Water Service Reservoir	Central And Western
75	Hatton Road No. 2 Fresh Water Service Reservoir	Central And Western
76	Hatton Road No. 2 Fresh Water Service Reservoir (New)	Central And Western
77	Ma On Shan No. 2 Salt Water Service Reservoir	Sha Tin
78	Kwu Tung Fresh Water Service Reservoir	North

## 4 Stage 1 Public Engagement and Formulation of Site Selection Criteria (SSC)

### 4.1 Stage 1 Public Engagement

Stage 1 Public Engagement (PE1) was conducted between November 2011 and March 2012. The aim of PE1 was to seek public views on land supply by reclamation outside Victoria Harbour and rock cavern development, and the site selection criteria.

Methodology used in collecting and collating views during Stage 1 Public Engagement includes both quantitative feedback in the form of territory-wide telephone poll and feedback questionnaire, and qualitative feedback in the form of written submissions, signature campaigns or petitions organised by community groups, the online discussion forum on the PE website, comment forms collected during PE activities, and newspaper reports, etc.

To enhance the public awareness of the PE1 exercise and to encourage public participation, a series of PE activities including public forums and roving exhibitions were organized. The consultation document, PE1 Digest, was widely disseminated to the public at various outlets including District Offices, roving exhibition counters and public forums. A web version of the PE1 Digest and a promotional video was uploaded onto the Study website.

### 4.2 Site Selection Criteria

A set of SSC initially formulated through collaboration with various government departments in a Value Management Workshop (I) was put forward for discussion in PE1.

The proposed SSC were found to be largely agreeable to the general public. For rock cavern development (RCD), the two criteria related to environment include “Environmental Impact at the cavern development site” and “Environmental benefits in the vicinity of the releasing site upon relocation of existing facilities”. Based on the results of PE1, “Environmental impacts at the cavern development site” is one of the major site selection criteria considered by the public together with “Social impact at cavern development site” and “Engineering feasibility”. The SSC include:

Guiding Principles	Site Selection Criteria
Social Harmony & Benefits	Social benefits at the released site upon relocation of existing facilities
	<i>Social impact at the cavern development site</i>
Enhanced Environmental Performance	<i>Environmental impacts at the cavern development site</i>
	Environmental benefits in the vicinity of the released site upon relocation of existing facilities
Economic Efficiency & Practicality	Cost effectiveness
	Facility specific requirements

Guiding Principles	Site Selection Criteria
	<i>Engineering feasibility</i>
	Suitability of relocation based on existing facility status

### 4.3 SEA/Environmental Comments

Environmental – related Public Comments collected during Stage 1 Public Engagement include:

- Both quantitative and qualitative feedback indicated that there was broad support for relocating suitable existing government facilities into rock caverns to release surface land for other uses (supported by 69.3% in the telephone poll and 73.7% in the feedback questionnaire survey), with the exception of the possible Mount Davis site.
- Impacts on the environment and local communities as well as engineering feasibility were considered the most important site selection criteria.

### 4.4 Other Comments

Other Public Comments collected during Stage 1 Public Engagement include:

- broad support for establishment of land reserve;
- broad consensus that more land will be required to meet housing needs, for better living environment and development;
- broad support for a six-pronged approach for enhancing land supply;
- broad support on rock cavern development, with some concerns on engineering feasibility and use of caverns;

The Stage 1 Public Engagement Report and Executive Summary can be found on the Study website <http://www.landsupply.hk>.

### 4.5 SEA/Environmental Observations

Major SEA/Environmental observations noted in Stage 1 Public Engagement are summarized below:

- Overall, the amount of views received in Stage 1 Public Engagement as regards RCD and the associated SEA/environmental concerns were significantly less comparing to potential reclamation sites.
- In general, there was broad support for relocating suitable existing government facilities into rock caverns to release surface land for other uses with the exception of the possible Mount Davis site.
- Nevertheless, impacts on the environment and local communities as well as engineering feasibility were considered the most important site selection criteria.

## 5 Selection of Longlisted Sites

### 5.1 Site Longlisting Methodology

Based on review of previous Cavern Study and other considerations, a total of 78 pre-longlisted rock cavern development sites were identified for longlisting. In view of the large amount of pre-longlisted sites, a longlisting exercise was carried out which is a screening process to select a smaller batch of sites from the pre-longlist for further study (shortlisting). In the longlisting exercise, each pre-longlisted sites have undergone preliminary evaluation. Each site was graded with A, B or C with reference to different site selection criteria based on the preliminary assessment. These grades only provide preliminary indications of the relative performance of the sites with reference to the site selection criteria and are not to indicate their absolute values, and may vary with the results of any further detailed studies/assessment. In this broad comparison of the sites, the more grade As that are identified for the sites, it is assumed that it is more likely for these sites to be suitable for being selected for further study under this Assignment.

### 5.2 Initial Site Selection Criteria

As mentioned in section 4, initial site selection criteria were derived based on views collected from public in Stage 1 PE and recommendations from government departments, Environmental impacts at the cavern development site, social impact at the cavern development site and engineering feasibility are the most important site selection criteria for rock cavern development. These initial site selection criteria were categorized into SEA/Environmental Site Selection Criteria and Other Site Selection Criteria, and are summarized below:

#### 5.2.1 SEA/Environmental Site Selection Criteria

##### 5.2.1.1 Environmental Impacts at the RCD-Receiving Site

This criterion considers the environmental impacts that could be brought to the area around the RCD-receiving site. This is determined by the proximity of the site to environmentally sensitive areas such as country parks, SSSI and conservation areas.

##### 5.2.1.2 Environmental Benefits in the Vicinity of the Released Site upon Relocation of Existing Facilities

This criterion considers the environmental benefits that could be brought to the area around the RCD-released site. NIMBY facilities (e.g. refuse transfer stations, sewage treatment works) that can be relocated to cavern developments will provide large environmental benefits to the area. Facilities that currently have little impact to the environment will provide less benefit by relocating them (e.g. freshwater service reservoirs, saltwater service reservoirs).

## 5.2.2 Other Site Selection Criteria

### 5.2.2.1 Social Benefits at the Released Site upon Relocation of Existing Facilities

This criterion considers the social benefits that could be brought to the area around the RCD-released site. Issues that are considered in the exercise include the demand for space in the area surrounding the released site and the current land use of the released site. As an example areas that are perceived as having higher demand for land are considered more suitable for relocation. However, if the current land use has a social benefit, such as a sport or recreation facility (e.g. sports ground above a reservoir) the site is seen as less favourable for relocation from a social viewpoint.

### 5.2.2.2 Social Impact at the RCD-Receiving Site

This criterion considers the social impact that could be brought to the RCD-receiving site. Issues that are considered in the ranking exercise are the facility type that will be relocated to the area. As an example relocating a NIMBY facility to a densely populated area will be ranked relatively lower due to its adverse impact to the near local community.

### 5.2.2.3 Engineering Feasibility

This criterion considers the engineering aspects of the cavern construction and facilities relocation works. Issues that are considered in the exercise include ground condition and constraints of nearby connection.

Ground condition will affect the ease of cavern construction and hence the suitability of facilities relocation. It relates to a general review of the topography that may be suitable for cavern development in the vicinity.

### 5.2.2.4 Cost Effectiveness

The larger the area that the existing facility occupies then the greater the potential cost benefit of releasing the land for other uses.

### 5.2.2.5 Facility Specific Requirements

This criterion considers any facility specific requirements such as operation and maintenance requirements that may require special space-saving and operational technology in addition to general engineering requirement.

### 5.2.2.6 Suitability of Relocation based on existing facility status

The status of the facility is based upon that as reported by the various government departments. It was considered that there was greater merit in considering the facility for placement into a cavern if it was to be replaced / expanded or upgraded or if there were plans for a new facility.

## 5.3 SEA/Environmental Findings in the Longlisting Process for Rock Cavern Development

The pre-longlisted RCD sites have been evaluated under each of the initial SSC outlined above. 21 nos. of RCD sites are selected to form the longlisted sites as shown in **Figure 2**.

It is worth to highlight that given the nature and scale of RCD sites, the environmental concerns for most of the pre-longlisted RCD sites are not significant and can likely be resolved by proper assessment and mitigation measures. Nevertheless, among these 21 nos. longlisted RCD sites, they may still have different degree of environmental concerns. For those sites with relatively higher environmental concerns (e.g. chimney emission and Consultation Zone of landfill and PHI near Tai Po Sewage Treatment Works; encroachment upon ecological sensitive area Tsiu Hang Special Area and Ma On Shan Country Park for Sai Kung Sewage Treatment Works; and hazard to life from Water Treatment Works near Siu Ho Wan Sewage Treatment Works), they were still selected into the longlist for further broad technical assessment and shortlisting because of other considerations such as more social benefit, higher development potential, less social impact, higher cost-effectiveness, etc. Nevertheless, the longlisted sites selected is summarized below:

No.	Facility Name	Location
1	Beacon Hill Intermediate Level Fresh Water Service Reservoir	Kowloon City
2	Tsing Yi Preliminary Treatment Works	Kwai Tsing
3	Tai Po Sewage Treatment Works	Tai Po
4	Sai Kung Sewage Treatment Works	Sai Kung
5	Sha Tin Transfer Station	Sha Tin
6	Sham Tseng Sewage Treatment Works	Tsuen Wan
7	Siu Ho Wan Sewage Treatment Works	Islands
8	Tuen Mun North Fresh Water Service Reservoir	Tuen Mun
9	Diamond Hill No. 2 Fresh Water Service Reservoir	Wong Tai Sin
10	Diamond Hill Fresh Water Service Reservoir & Diamond Hill Salt Water Service Reservoir	Wong Tai Sin
11	Tsuen Wan West Low Level Fresh Water Service Reservoir	Tsuen Wan
12	Eastern No. 2 Fresh Water Service Reservoir	Wan Chai
13	North West New Territories Refuse Transfer Station (NWNTRTS)	Tuen Mun



No.	Facility Name	Location
14	Lion Rock High Level No. 2 Fresh Water Primary Service Reservoir	Kowloon City
15	Tsing Yi North Low Level Fresh Water Service Reservoir	Kwai Tsing
16	Kwu Tung Fresh Water Service Reservoir	North
17	Kennedy Town Fresh Water Service Reservoir	Central And Western
18	Piper's Hill Salt Water Service Reservoir	Sham Shui Po
19	Tsing Yi North Low Level Salt Water Service Reservoir	Kwai Tsing
20	Jordan Valley Salt Water Service Reservoir	Kwun Tong
21	Shau Kei Wan East High Level Salt Water Service Reservoir	Eastern

For those RCD sites which were not selected into the longlist, although there are many sites with relatively less environmental concerns (e.g. Shek Kip Mei Fresh Water Service Reservoir, Tan Kwai Tsuen South Fresh Water Reservoir, Tan Kwai Tsuen North Fresh Water Reservoir, etc.), they were not selected into the longlist because of other considerations such as social impact, engineering feasibility, cost-effectiveness, facility specific requirement, suitability of relocation based on current status, etc.

## 6 Broad Environmental Assessments

### 6.1 Broad Environmental Assessments

Broad environmental assessments were carried out as part of the broad technical assessments of the study for the longlisted rock cavern development sites. Broad technical assessments were also carried out for the longlisted sites on other different aspects, including land use, urban planning and urban design; geotechnical appraisal; traffic impact assessment; civil works, e.g. water, drainage, sewerage, etc.; aircraft and helicopter operations impacts; sustainability assessment; and implementation, construction and costing.

The environmental performances of the 21 longlisted rock cavern development sites have been studied in the broad environmental assessments of the study. Different environmental aspects, including air quality, noise, water quality, ecology, fisheries, landscape and visual, waste management, hazard to life, landfill gas hazard and land contamination have been assessed in broad terms to identify the potential environmental issues/constraints and opportunities of each longlisted rock cavern development site at the strategic level. Detailed assessments in further studies and statutory EIAO and town planning processes will be needed in future to confirm the environmental acceptability and mitigation measures required on these different sites and their development proposals.

Any proposals pertaining to the extents, shapes, land uses, transport infrastructures, etc. for rock cavern development sites shown in any report, are solely hypothetical assumptions for the purpose of broad technical assessment and strategic environmental assessment only. They do not represent the extents, shapes, land uses, transport infrastructures to be implemented in future regardless of whether the sites are selected for further studies or not. Indeed, all these development parameters will be developed based on future feasibility studies, statutory processes under EIAO, TPO, etc. and public consultation.

### 6.2 Key Environmental Issues of Longlisted Sites

#### 6.2.1 RCD Site 1 Beacon Hill Intermediate Level Fresh Water Service Reservoir

The RCD-released site with the potential for residential development adjoins Lung Cheung Road. Vehicular emission and road traffic noise are the key potential environmental concerns.

#### 6.2.2 RCD Site 2 Tsing Yi Preliminary Treatment Works

The RCD-released site with the potential for residential development is enclosed by Tsing Yi Road and Tsing Yi Interchange. Vehicular emission and road traffic noise are the major potential environmental concerns. Another concern is the fixed operational noise from the nearby Container Terminal 9 (CT9).



**6.2.3 RCD Site 3 Tai Po Sewage Treatment Works**

The RCD-released site with the potential for high technology enterprises is located within the eastern extent of the Tai Po Industrial Estate. Chimney emission and fixed plant noise from industry estate are the major potential environmental concerns. The released site is located within the 250m Consultation Zone of the restored Shuen Wan Landfill and within the 1,000m Consultation Zone of Potentially Hazardous Installation, Tai Po Gas Production Plant. Furthermore, a holistic study of water quality impact on Tolo Harbour and land contamination investigation for the RCD released site are required.

**6.2.4 RCD Site 4 Sai Kung Sewage Treatment Works**

The RCD-released site with the potential for residential and GIC facilities development is located close to industrial uses/workshops and marine police station with helipad and will be potentially subject to industrial/residential interface problems, helicopter noise and marine emission. For the development option that involves reclamation, potential impact on water quality is also a concern. Potential impact on the ecological sensitive areas in view of its encroachment upon the Tsiu Hang Special Area and Ma On Shan Country Park for the RCD-receiving site, landscape and visual impact due to vicinity of Country Park and land contamination for RCD-released site are also key issues to be concerned.

**6.2.5 RCD Site 5 Sha Tin Transfer Station**

The RCD-released site with the potential for GIC Use (Tertiary Education or Vocation Training Facility) is located close to a proposed columbarium, Tate's Caine Highways and industrial workshops. There are concerns on the potential air quality & odour impact, road traffic noise, fixed noise impact from the above industrial uses and also land contamination on the development proposals.

**6.2.6 RCD Site 6 Sham Tseng Sewage Treatment Works**

The RCD-released site is with the potential for residential and GIC facilities development and is located to the near Garden Bakery factory, Castle Peak Road, Tuen Mun Road, electric sub-station, and marine traffic route. The RCD-released site will be potentially subject to odour, industrial/residential interfacing issues, vehicular emission, road traffic noise, fixed plant noise, marine emission and also land contamination problems.

**6.2.7 RCD Site 7 Siu Ho Wan Sewage Treatment Works**

The RCD-released site with the potential for residential development is located close to various NIMBY facilities, such as Siu Ho Wan Water Treatment Works, different waste facilities, various bus depots, etc., North Lantau Highway, Airport Express & Tung Chung Line. There are concerns on different environmental and land use interfacing issues, including hazard to life, air quality & odour impact, road traffic noise, railway noise, fixed noise impact on the development proposals. Land contamination for the RCD-released site and hazard to life from Water Treatment Works are also subject to further studies.

**6.2.8 RCD Site 8 Tuen Mun North Fresh Water Service Reservoir**

The RCD-released site with the potential for residential development is located in relatively remote position and moderately close to Yeung King Road. The cumulative impacts in air and noise aspects by the proposed Tuen Mun Western Bypass should be considered.

**6.2.9 RCD Site 9 Diamond Hill No. 2 Fresh Water Service Reservoir**

The RCD-released site with the potential for residential development is located in close vicinity to Po Kong Village Road, Diamond Hill crematorium, columbarium and cemetery. Potential air quality impact, smoke and odour nuisance, road traffic noise impact on the proposed development are the major environmental issues.

**6.2.10 RCD Site 10 Diamond Hill Fresh Water & Salt Water Service Reservoir**

The RCD-released sites with the potential for residential and GIC facilities developments adjoin Wong Tai Sin Hospital and are close to Our Lady of Maryknoll Hospital. There will be potential chimney emission issue on the sites from the hospitals, road traffic noise, vehicular emission and fixed noise impact from electric substation and pump houses. Potential impact on the ecological sensitive areas in view of its encroachment upon the Lion Rock Country Park is also key issue to be concerned.

Visual impact on Country Park visitors should be studied as the receiving site is at the downhill of the ridge line of the Lion Rock Hill and Unicorn Hill (MacLehose Trail Section 5), trail from Fat Chong Temple to Lion Rock Hill in highly utilized by hikers/morning walkers.

**6.2.11 RCD Site 11 Tsuen Wan West Low Level Fresh Water Service Reservoir**

The proposed RCD-released site with the potential for residential developments is close to Route Twisk. Vehicular emission and road traffic noise are the key potential environmental concerns.

**6.2.12 RCD Site 12 Eastern No.2 Fresh Water Service Reservoir**

The RCD-released site with the potential for residential developments adjoins Wong Nai Chung Gap Road and close to Hong Kong Adventist Hospital. There will be potential chimney emission issue on the site from the hospital. There are also potential vehicular emission and road traffic noise to the proposed development.

### 6.2.13 RCD Site 13 North West New Territories Refuse Transfer Station (NWNTRTS)

The proposed RCD-released site with the potential for residential development has potential impact by noise and air pollution generated by the adjacent elevated Yuen Long Highway, Shun Tat Street and Tung Fuk Road as well as visual impact imposed by the noise barrier. There will be potential concern in water quality impact as the site is close to Hung Shui Hang watercourse. Land contamination investigation and cumulative impact on air and noise aspects due to increase in traffic with future developments associated with the proposed Hung Shui Kiu New Development Area are also subject to further studies.

### 6.2.14 RCD Site 14 Lion Rock High Level No. 2 Fresh Water Primary Service Reservoir

The RCD-released site with the potential for residential development is in vicinity to Lung Cheung Road and Lion Rock Tunnel Road. Vehicular emission and road traffic noise are the key potential environmental concerns.

### 6.2.15 RCD Site 15 & 19 Tsing Yi North Low Level Fresh & Salt Water Service Reservoir

The RCD-released sites with the potential for local open space and residential development are in vicinity to Tsing Yi Road West and Lin To Road. Vehicular emission and road traffic noise are the key potential environmental concerns.

### 6.2.16 RCD Site 16 Kwu Tung Fresh Water Service Reservoir

The RCD-released site with the potential for residential development is located in relatively remote position and moderately close to Kwu Tung Road. There is also key potential concern due to encroachment upon Conservation Area of terrestrial habitat. Cumulative impact in air quality, noise, water quality, waste management, landscape and visual and ecology impact with New Territories New Development Areas should be carried out.

### 6.2.17 RCD Site 17 Kennedy Town Fresh Water Primary Service Reservoir

The RCD-released site is with the potential for residential development. The proposals of widening the existing access road and/or constructing an elevated bridge to connect the RCD-released site with the existing road networks will have potential noise impact on the surrounding sensitive uses, including HKU New Halls and Kwun Lung Lau. For the RCD-receiving site, there would be potential impact on the ecological sensitive areas in view of its encroachment upon terrestrial ecological areas in Mount Davis. Culture Heritage Mount Davis Battery is in vicinity.

### 6.2.18 RCD Site 18 Piper's Hill Salt Water Service Reservoir

The RCD-released site with the potential for residential development is located close to Tai Po Road, industrial buildings in Lai Chi Kok and Caritas Medical Centre. There will be potential chimney emission issue on the site from the hospital and industrial uses, and also potential road traffic noise, vehicular emission and fixed noise impact. Potential impact on the ecological sensitive areas in view of its encroachment upon the Lion Rock Country Park is also key issue to be concerned. Furthermore, there would be hazard to life issue as the site is located within the 1,000m Consultation Zone of the Shek Lei Pui Water Treatment Works.

### 6.2.19 RCD Site 20 Jordan Valley Salt Water Reservoir

The RCD-released site with the potential for residential development is located close to Shuen Lee Tsuen Road. The RCD-released and RCD-receiving sites would be located within the 250m Consultation Zone of the restored Jordan Valley Landfill. Vehicular emission, road traffic noise and landfill gas hazard are the key potential environmental concerns.

### 6.2.20 RCD Site 21 Shau Kei Wan East High Level Salt Water Service Reservoir

The RCD-released site with the potential for residential development is located close to Tai Tam Road and Pamela Youde Nethersole Eastern Hospital. There will be potential chimney emission issue on the sites from the hospital. There are also potential vehicular emission and road traffic noise to the proposed development.

## 6.3 Overall Strategic Environmental Findings of the Longlisted Rock Cavern Development Sites

### 6.3.1 Overall Strategic Environmental Performance

It is considered that relocation of NIMBY facilities/uses into caverns could bring benefits/opportunities to the environment. Among the 21 longlisted sites, some of them are sewage treatment works and refuse transfer stations which are generally regarded as NIMBY facilities. Relocation of these facilities into rock caverns would potentially enhance the environmental performances of the RCD-released sites.

Several observations can be made by the broad environmental assessments:

- All the Recommend Longlisted RCD Sites have different degree of environmental constraints. Generally there is no highly environmentally favourable sites have been identified.
- The sites with less environmental constraints: RCD Site 8 Tuen Mun North Fresh Water Service Reservoir, RCD Site 12 Eastern No.2 Fresh Water Service Reservoir, RCD Site 14 Lion Rock High Level No. 2 Fresh Water Primary Service Reservoir, RCD Site 16 Kwu Tung Fresh Water Service Reservoir and RCD Site 20 Jordan Valley Salt Water Reservoir.

- The sites with more environmental constraints: RCD Site 3 Tai Po Sewage Treatment Works, RCD Site 4 Sai Kung Sewage Treatment Works and RCD Site 7 Siu Ho wan Sewage Treatment Works.
- The common environmental constraints are: air quality, noise, water quality, ecology, landscape and visual and land contamination.
- The common air quality and noise pollution sources are traffic noise, vehicular emission, industrial/chimney emissions since the RCD- released sites are close to the developed area.
- Water quality and ecology are the common environmental concerns if the RCD-receiving sites are located closely to the Country Parks or Water Gathering Ground. There would also be potential impact on water quality for the new sewage discharge outfalls of the relocated sewage treatment works affecting efficiency of pollutant dispersion.
- All RCD-receiving and RCD-released sites will generate large quantities of C&D waste/materials requiring proper waste treatment and disposal.
- Land contamination is the environmental issue for the RCD-released sites of Sewage Treatment Works and Refuse Transfer Stations.

### 6.3.2 Considerations of Mitigation Measures

Some sites may have relatively significant environmental impacts, they may be reduced to acceptable levels with possible mitigation measures subject to future detailed studies/assessments. Impacts on landfill gas hazard and culture heritage may be likely mitigated according to previous engineering experience subject to detailed assessments. Other impacts, such as air quality impact by chimney emission, may be mitigated subject to further studies/assessments, such as feasibility studies and EIAs.

#### Air Quality and Noise

- Construction dust and noise impact are normally considered as short-term impact and proper mitigation measures, except under special situations, have been proven to be effective in many previous examples.
- Operational air quality and noise impact require detailed investigation and modelling assessment. Potential air pollution and noise sources from RCD-receiving sites' portals and road networks connecting the sites, etc.. For RCD-released sites, proper measures, such as barriers, buffer distances, building layout and design, etc., should be provided to mitigate road traffic, fixed plant noise problems and air quality impacts.

#### Water Quality, Ecology, Landscape and Visual

- Potential impact on water quality during construction phase will normally be mitigated by good site practice. For the operational stage, the current capacity of the existing sewage treatment works should be investigated and any upgrade required to cater for proposed development on RCD-released sites should be explored. Further assessments will also be needed to address the potential impacts of RCD-receiving sites on water quality, such as groundwater contamination. For the relocation of sewage treatment works into cavern, efficiency of pollutant dispersion of the new sewage discharge outfalls should be considered.

- Ecology impact will require baseline survey and monitoring and impact assessment to confirm and evaluate the extent of the mitigation measure.
- Potential impact on landscape and visual during construction phase and operational phase will normally be mitigated by integrated landscape and urban design and viewing corridors.

#### Waste management and land contamination

- RCD-receiving and RCD-released sites will generate large quantities of C&D waste/materials requiring proper treatment and disposal. On-site sorting of C&D materials will need to be carried out to recover the inert as well as the reusable and recyclable materials prior to the off-site disposal of non-inert C&D waste and surplus C&D materials.
- Potential land contamination impact on RCD-released sites could be likely mitigated according to the past experience. If the proposed site has potential land contamination issue, decontamination, restoration and improvement works are recommended subject to detailed assessments to make the site suitable for future developments e.g. residential development, public parks and recreational or leisure facilities etc..

#### Hazard to life

- Quantitative risk assessments are required for any proposed developments on the sites falling within the PHI Consultation Zones to assess and address the hazard to life impacts.



## 7 Site Shortlisting and Key Environmental Issues and Opportunities of the Shortlisted Rock Cavern Development Sites

### 7.1 Site Shortlisting Methodology

Site shortlisting is to select shortlisted sites from the longlist by qualitative assessment based on the results of BTA and refined SSC. This shortlisting process is to select sites that have higher potential for consultation with the public in PE2 and further detailed study. All the shortlisted sites will need to eventually go through separate feasibility studies, statutory processes under EIAO, Town Planning Ordinance, etc. and public consultations to confirm their environmental acceptability and mitigation measures required.

Qualitative review was undertaken to take into account the potential key issues/constraints and possible mitigation measures of the longlisted sites.

With reference to the feedback from PE1, environmental impact is one of the key site selection criteria considered by the public during the public engagement activities, and therefore environmental impact is initially considered in the site shortlisting stage together with impact on local community and engineering feasibility which is also considered as the key criteria by the public in Stage 1 PE.

The selected sites are then assessed with reference to other key considerations revealed from the Broad Technical Assessments in the site shortlisting process. These may include but are not limited to development potential and constraints, and geotechnical appraisal, etc.. Environmental-related factors, such as planning constraints and land use interfacing issues, such as air quality impact, noise impact, ecological impact etc. were also considered in site shortlisting together with other factors.

### 7.2 Site Shortlisting with SEA/Environmental Considerations

To facilitate the site shortlisting study with respect to SEA/environmental considerations, environmental performance indicators (EPIs) were established to compare the relative environmental performances of the longlisted sites. The proposed strategic EPIs have considered many factors including environmental legislations, standards and guidelines, e.g. Hong Kong Planning Standards and Guidelines (HKPSG), Water Pollution Control Ordinance (WPCO), Environmental Impact Assessment Ordinance (EIAO), Air Pollution Control Ordinance (APCO), Waste Disposal Ordinance (WDO), Noise Control Ordinance (NCO), and /or any other relevant guidelines / legislation, as appropriate.

To facilitate site comparison in site shortlisting, SEA was involved in the qualitative assessment, with reference to environmental performance indicators, to consider the environmental issues/constraints of the longlisted sites and the likelihood of environmental mitigation measures to address the potential issues/constraints.

Based on the site shortlisting exercise, the following three pilot schemes for rock cavern development are shortlisted:

- (1) Sai Kung Sewage Treatment Works;
- (2) Sham Tseng Sewage Treatment Works;
- (3) Diamond Hill Fresh Water and Salt Water Service Reservoirs.

It is worth to highlight that given the nature and scale of RCD sites, the environmental concerns for most of the longlisted RCD sites are not significant and can likely be resolved by proper assessment and mitigation measures. Nevertheless, among these 3 nos. shortlisted RCD sites, Sai Kung Sewage Treatment Works may have relatively higher environmental concern due to potential encroachment upon ecological sensitive area Tsiu Hang Special Area and Ma On Shan Country Park. It is still shortlisted because of other considerations such as more social benefit, higher development potential and higher cost-effectiveness.

On the other hand, for those RCD sites which were not shortlisted, although there are some sites with relatively less environmental concerns (e.g. Beacon Hill Intermediate Level Fresh Water Service Reservoir, Tuen Mun North Fresh Water Service Reservoir, Diamond Hill No. 2 Fresh Water Service Reservoir, etc.), they were not selected into the longlist because of other considerations such as social impact, engineering feasibility, cost-effectiveness, facility specific requirement, etc.

As a result of the site shortlisting process, priority is given to relocation of those NIMBY facilities near urban or developed areas, thus creating synergy with the surrounding areas. Avoiding selecting those facilities already with recreational or leisure uses as far as possible. Owing to technical constraints or unavailability of suitable cavern sites, the feasibility of relocating some large facilitates such as water treatment works should be subject to further studies.

The shortlisted sites were taken forward for consultation in PE2, while the remaining sites may be studied further if opportunities arises in the future.

The locations of the three shortlisted sites for rock cavern development is shown in **Figure 3**.

### 7.3 Shortlisted Sites and Key Environmental Issues and Opportunities

The section provides a qualitative discussion of the key environmental and other issues/constraints and opportunities of each of the shortlisted sites with reference to the broad environmental assessments undertaken for each site.

#### 7.3.1 Sai Kung Sewage Treatment Works

Sai Kung Sewage Treatment Works is at approximately +6mPD elevation with site area 21,554 m<sup>2</sup>. The RCD-released site has the potential for residential and GIC facilities development. Key environmental issues for this site include:

- Land use interfacing issues with the adjacent marine helipad and industrial workshops for the RCD-released site.
- Potential ecological impact due to potential encroachment upon Tsiu Hang Special Area and Ma On Shan Country Park by the RCD-receiving site.



- Potential water quality impact for the reclamation option of the RCD-released site and due to the new sewage outfall discharge of the RCD-receiving site.
- Potential landscape and visual impact due to potential encroachment upon ecological sensitive area Tsiu Hang Special Area and Ma On Shan Country Park by the RCD-receiving site.

Major environmental and non-environmental opportunities and constraints of this site are shown in **Figure 4**.

### 7.3.2 Sham Tseng Sewage Treatment Works

Sham Tseng Sewage Treatment Works is at approximately +5mPD elevation with site area 10,964 m<sup>2</sup>. The RCD-released site has the potential for residential and GIC facilities development. Key environmental issues for this site include:

- Potential land use interfacing issues with the nearby Garden Bakery factory and electric sub-station, and road traffic noise and vehicular emission from Castle Peak Road and Tuen Mun Road for the RCD-released site.
- Potential water quality impact due to the new STW outfall discharge of the RCD-receiving site.

Major environmental and non-environmental opportunities and constraints of this site are shown in **Figure 5**.

### 7.3.3 Diamond Hill Fresh Water and Salt Water Service Reservoirs

Diamond Hill Fresh Water Service Reservoir is adjacent to the Diamond Hill Salt Water Reservoir. The RCD-released sites has the potential for residential and GIC facilities developments. They are at approximately +89mPD elevation with total site area 13,774 m<sup>2</sup>. Key environmental issues for this site include:

- Chimney emission from the nearby hospitals, road traffic noise and vehicular emission from the adjoining roads and fixed plant noise for the RCD-released site.
- Potential impact on the ecological sensitive areas and visual impacts due to potential encroachment upon the Lion Rock Country Park by the RCD-receiving site.

Major environmental and non-environmental opportunities and constraints of this site are shown in **Figure 6**.

### 7.3.4 Potential Cumulative Environmental Impacts/Benefits

Apart from the individual environmental issues/opportunities of the respective shortlisted site, there are cumulative impacts/benefits induced by the three shortlisted sites. Relocation of the two shortlisted NIMBY facilities (Sai Kung Sewage Treatment Works and Sham Tseng Sewage Treatment Works) into caverns could potentially enhance the environmental performances of the areas in the vicinity of the RCD-released sites.

Nevertheless, the development of the three rock cavern sites will generate large quantities of C&D waste/materials requiring proper waste management measures for treatment and disposal. Land contamination would be the issue for the released sites of the two shortlisted STWs.

The proposed developments of the RCD-released sites would be potentially subject to road traffic noise and vehicular emission. Road traffic noise and vehicular emission may also be induced to the surrounding areas of the released sites due to their development proposals. Relocation of the Sai Kung STW and Diamond Hill FWSR and SWSR into rock caverns will have potential impacts on the terrestrial ecological significant areas.

There may be impacts on water quality from the relocated facilities if there are groundwater contamination; new sewage discharge outfalls of the two relocated STWs; and reclamation option of Sai Kung STW's RCD-released site. Additional sewage discharges from the proposed developments on the RCD-released sites may also bring implications on water quality requiring sufficient sewerage facilities for proper sewage treatment.

## 8 Stage 2 Public Engagement

### 8.1 Stage 2 Public Engagement

Stage 2 Public Engagement (PE2) was conducted between 21 March 2013 and 21 June 2013. The aim of PE2 was to seek public views on the possible land uses for the shortlisted sites as well as the areas of concern to be addressed in future technical studies.

Methodology used in collecting and collating views during Stage 2 Public Engagement includes qualitative feedback in form of response to open-ended questions in questionnaires, gists of discussions at public forums or other PE meetings, written submissions in form of individual letters or emails, signature campaigns or petitions organized by interest parties, etc.

To enhance the public awareness of the PE2 exercise and to encourage public participation, a series of PE activities including public forums and roving exhibitions were organized. The consultation document, PE2 Digest, was widely disseminated to the public at various outlets including District Offices, roving exhibition counters and public forums. A web version of the PE2 Digest was uploaded onto the Study website.

The Panel on Development of the Legislative Council was consulted on 23 April 2013. Government representatives attended a Special Meeting of the Panel on 1 June 2013 to listen to the views of the deputation. Seven District Councils, in which constituencies the five potential reclamation sites and three Rock Cavern Development (RCD) sites and the possible artificial islands are located, were also consulted, amongst other stakeholders including green groups, local concerns groups and residents' groups.

The Stage 2 Public Engagement Report and Executive Summary can be found on the Study website <http://www.landsupply.hk>.

### 8.2 SEA/Environmental Comments

Major SEA/environmental comments on RCD received during Stage 2 Public Engagement y include:

- Ecological conservation was common major SEA/environmental concerns shared by all three pilot RCD schemes.
- Major SEA/environmental concerns as regards Diamond Hill Fresh Water/Salt Water Service Reservoirs into Rock Cavern were noise pollution near the development site, air pollution near development sites and urban greening needs.
- Major SEA/environmental concerns as regards Sai Kung STW was impact on marine ecology.
- Major SEA/environmental concerns as regards Relocation of Sham Tseng STW was air pollution near the development site.

### 8.3 Other Comments

Other major Public Comments received during Stage 2 Public Engagement include:

- Land reserve, residential development (in particular public rental housing), recreational or leisure facilities and public parks were the four land uses that received most support among those providing feedback on reclamation.
- For the three pilot RCD schemes, residential development (in particular public rental housing), public parks, and recreational or leisure facilities were three possible land use that received the most support.

### 8.4 SEA/Environmental Observations

Major SEA/Environmental Observations noted in the Stage 2 Public Engagement are summarized below:

- Overall, the amount of views received in Stage 2 Public Engagement as regards RCD and the associated SEA/environmental concerns were significantly less comparing to potential reclamation sites.
- Nevertheless, major SEA/environmental concerns about the pilot schemes were mainly related to the ecological conservation, noise and air pollution, and impact on marine ecology (only for reclamation option of Sai Kung STW).

## 9 Strategic Environmental Monitoring and Audit (SEM&A) Plans

The follow-up actions / mitigation measures which would be implemented by the relevant departments / parties are presented in this section. It should be reminded that some of the follow-up actions / mitigation measures are initially recommended for further consideration.

### 9.1 Sai Kung Sewage Treatment Works

- Negotiation with Marine Police and the industrial operators (Joseph Wong And Co (hk) Ltd.) on the relocations of the Marine Police site (including helipad) and the nearby industries/workshops for comprehensive planning and development of the RCD-released site with the surrounding areas.
- Consultation with the Country and Marine Parks Board and applications for the consent of Country and Marine Parks Authority for the potential impacts/encroachment on Tsiu Hang Special Area and Ma On Shan Country Park by the RCD-receiving site.
- Statutory EIAO processes for the development of RCD-receiving site and town planning processes (such as amendments to plans, planning applications), other future studies /assessments, etc.
- Key environmental issues to be addressed, including land use interfacing issues with the nearby industrial uses/workshops; helicopter noise; water quality impact from the reclamation option of the RCD-released site and due to the new sewage outfall discharge of the relocated STW; ecological impact arisen on the Special Area and Country Park arisen from the RCD-receiving site, land contamination of the RCD-released site, etc..

### 9.2 Sham Tseng Sewage Treatment Works

- Statutory EIAO processes for the development of RCD-receiving site and town planning processes (such as amendments to plans, planning applications), other future studies /assessments, etc.
- Key issues to be addressed, including air quality (including odour emission from Garden Bakery factory, vehicular emission etc.), noise impacts (including road traffic noise, fixed plant noise, etc.) on the RCD-released site, land contamination of the RCD-released site, water quality impact due to from the new sewage outfall discharge of the relocated STW, etc.

### 9.3 Diamond Hill Fresh Water and Salt Water Service Reservoirs

- Consultation with the Country and Marine Parks Board and applications for the consent of Country and Marine Parks Authority for the potential impacts/encroachment on the Country Park by the RCD-receiving site.
- Statutory EIAO processes for the development of RCD-receiving site and town planning processes (such as amendments to plans, planning

applications), other future studies /assessments, etc. Key environmental issues to be addressed, including air quality (including chimney emission from the hospitals, vehicular emission, etc.), noise impacts (including road traffic noise, fixed plant noise, etc.) on the RCD-released site, ecological impact on the Country Park arisen from the RCD-receiving site, etc.

## 10 Conclusion

SEA has been carried out as part of the study to provide environmental consideration in each step of the site selection process. SEA has identified that the potential sites for rock cavern development have different environmental issues/constraints and there are no highly environmental favourable potential rock cavern development sites. Each of the shortlisted sites for rock cavern development has different potential environmental issues/constraints and opportunities. In the future, further studies/assessments, statutory EIAs and town planning processes will be needed to confirm the environmental acceptability of these different shortlisted sites for rock cavern development before their construction programmes commence.

### 10.1 Site Selection Process

Apart from other considerations, the study involved SEA to take into account environmental consideration throughout the site selection process of rock cavern sites, including the following:

- In the review of previous study and constraints stage, 78 pre-longlisted rock cavern sites were identified taking into account the environmental benefits for relocating the government facilities into rock caverns.
- In the longlisting stage, 21 longlisted rock cavern sites were identified with reference to the environmental-related site selection criteria consulted in the Stage 1 PE, including environmental impacts and benefits of rock cavern development sites.
- In the broad technical assessment stage, broad environmental assessment was carried out on the 21 longlisted rock cavern sites to identify the key environmental issues/constraints and possible mitigation measures.
- In the site shortlisting stage, the 21 longlisted rock cavern sites were further evaluated and compared with reference to the broad environmental assessment findings adopting some indicators on environmental performance. Three rock cavern sites (including both RCD-released and RCD-receiving sites for each site) were shortlisted/identified for the Stage 2 PE.

### 10.2 Shortlisted Sites for Rock Cavern Development

The three shortlisted RCD sites are:

- (1) Sai Kung Sewage Treatment Works;
- (2) Sham Tseng Sewage Treatment Works;
- (3) Diamond Hill Fresh Water and Salt Water Service Reservoirs.

The relocation of the shortlisted sites currently used for sewage treatment works into rock caverns could potentially enhance the environmental performance of the RCD-released sites. Due to environmental/land use planning constraints in the areas of the sites and other consideration factors, these shortlisted rock cavern sites also have different potential environmental issues, including:

#### Sai Kung Sewage Treatment Works

- Land use interfacing issues with the adjacent helipad and industrial uses for the RCD-released site.
- Impact on ecological significant areas as the RCD-receiving site encroaching upon Tsiu Hang Special Area and Ma On Shan Country Park.
- Water quality impact with reclamation option of RCD-released site and due to new sewage outfall for the relocated STW.

#### Sham Tseng Sewage Treatment Works

- Land use interfacing issues with the adjacent factory, road networks and electric sub-station for the RCD-released site.
- Water quality impact due to new sewage outfall for the relocated STW.

#### Diamond Hill Fresh Water and Salt Water Service Reservoirs

- Chimney emission from the nearby hospitals for the RCD-released site.
- Land use interfacing issues with the adjacent road networks and fixed plants for the RCD-released site.
- Impact on ecological significant areas as the RCD-receiving site encroaching upon Lion Rock Country Park.

These shortlisted RCD sites were taken forward for consultation in PE2, while the remaining sites may be studied further when opportunities arise in the future.

It is worth to highlight that throughout the entire site selection process under the Study, the SEA identified different environmental and planning benefits/issues of all the sites assessed. The relocation of the shortlisted sites currently used for sewage treatment works into rock caverns could potentially enhance the environmental performance of the RCD-released sites. Due to environmental/planning constraints throughout the territory and other consideration factors, these shortlisted rock cavern sites also have different potential environmental issues. It is important that the shortlisted sites are required to go through statutory processes under the EIAO, statutory planning processes under the Town Planning Ordinance, further detailed studies/assessments, etc. and public consultations in future to confirm their environmental acceptabilities.

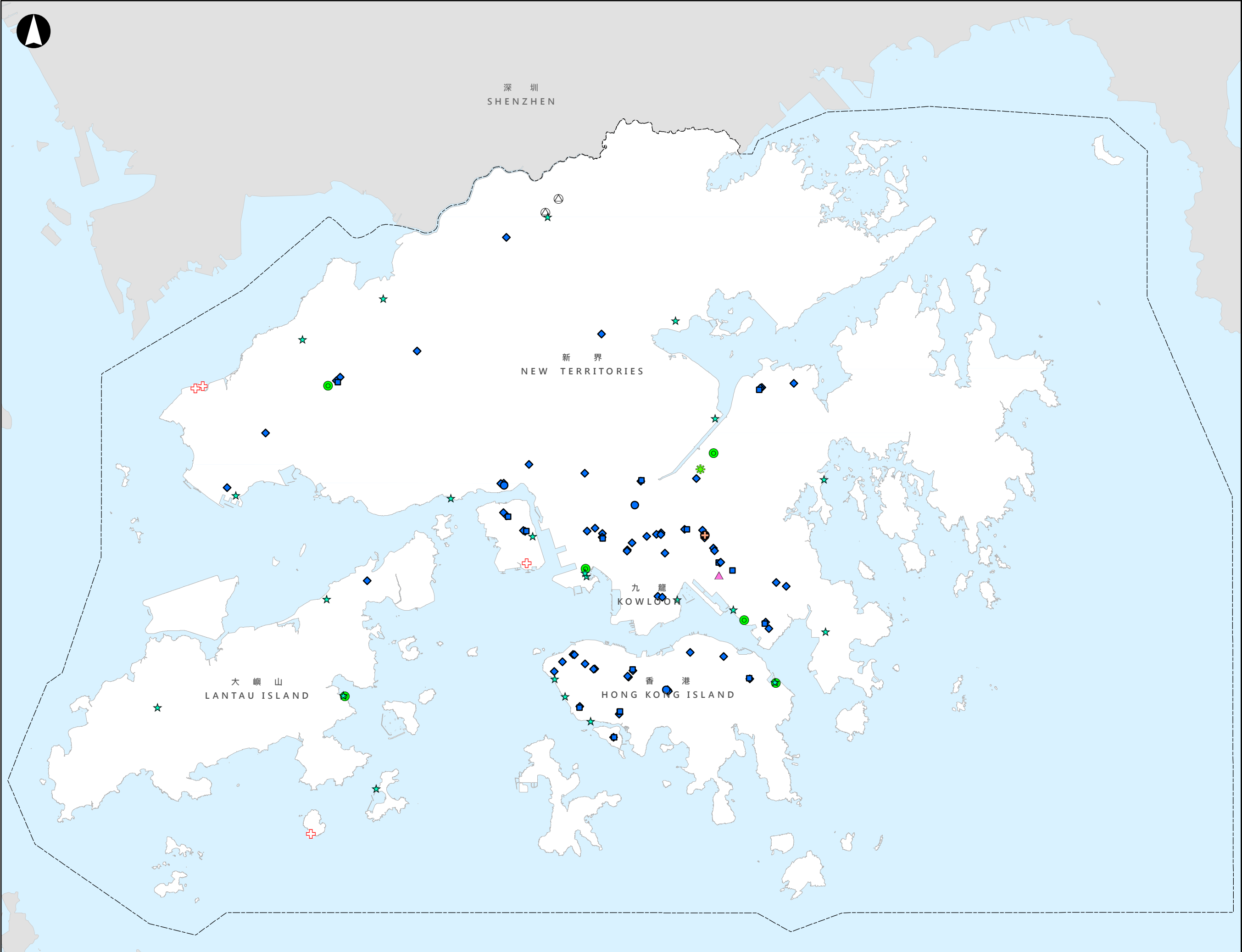
### 10.3 Works Ahead of the Shortlisted Sites for Rock Cavern Development

The government may carry out further detailed feasibility studies, and will go through the statutory processes under the EIAO and the Town Planning Ordinance, etc. and public consultations for the shortlisted RCD sites, during which the details of the development proposals, including the development parameters, RCD-released and receiving site locations, mitigation measures, etc. will be developed and further discussed with the public.



Figures

- Figure 1 Pre-longlisted RCD sites
- Figure 2 Recommended Longlisted Sites for Rock Cavern Development
- Figure 3 Shortlisted Sites for Rock Cavern Development
- Figure 4 Development Constraints and Opportunities (Sai Kung Sewage Treatment Works)
- Figure 5 Development Constraints and Opportunities (Sham Tseng Sewage Treatment Works)
- Figure 6 Development Constraints and Opportunities (Diamond Hill Fresh Water and Salt Water Service Reservoirs)



Legend

- Selected Government Facilities
- Fresh Water Service Reservoir
- Salt Water Service Reservoir
- Water Treatment Works
- Sewage Treatment Works
- Civic Centre
- Sport Centre
- Columbarium
- Slaughterhouse
- Refuse Transfer Station
- Incinerator

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Issue	Date	By	Chkd	Appd

ARUP

Level 8, Festival Walk  
80 Tai Chee Avenue  
Kowloon Tong, Kowloon  
Hong Kong

Client

Civil Engineering and Development Department

Job Title

Agreement No. CE 9/2011 (CE)  
Increasing Land Supply by Reclamation and Rock Cavern Development cum Public Engagement - Feasibility Study

Drawing Title

PRE-LONGLISTED SITES

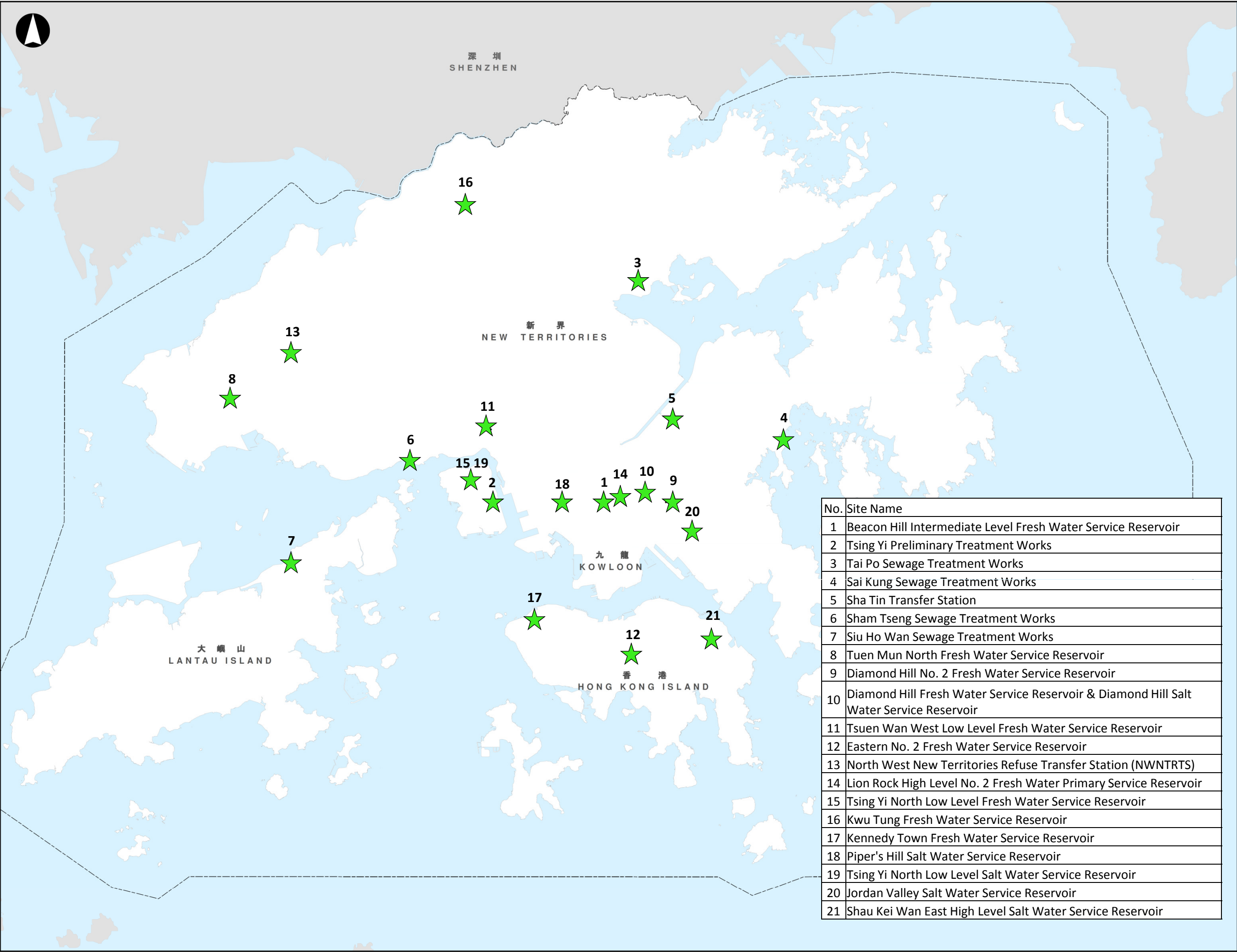
Scale at A3

1:200,000

Drawing Status

Draft

Job No	Drawing No	Issue
217499	1	P1



**Legend**

★ Longlisted RCD Sites

No.	Site Name
1	Beacon Hill Intermediate Level Fresh Water Service Reservoir
2	Tsing Yi Preliminary Treatment Works
3	Tai Po Sewage Treatment Works
4	Sai Kung Sewage Treatment Works
5	Sha Tin Transfer Station
6	Sham Tseng Sewage Treatment Works
7	Siu Ho Wan Sewage Treatment Works
8	Tuen Mun North Fresh Water Service Reservoir
9	Diamond Hill No. 2 Fresh Water Service Reservoir
10	Diamond Hill Fresh Water Service Reservoir & Diamond Hill Salt Water Service Reservoir
11	Tsuen Wan West Low Level Fresh Water Service Reservoir
12	Eastern No. 2 Fresh Water Service Reservoir
13	North West New Territories Refuse Transfer Station (NWNTRTS)
14	Lion Rock High Level No. 2 Fresh Water Primary Service Reservoir
15	Tsing Yi North Low Level Fresh Water Service Reservoir
16	Kwu Tung Fresh Water Service Reservoir
17	Kennedy Town Fresh Water Service Reservoir
18	Piper's Hill Salt Water Service Reservoir
19	Tsing Yi North Low Level Salt Water Service Reservoir
20	Jordan Valley Salt Water Service Reservoir
21	Shau Kei Wan East High Level Salt Water Service Reservoir

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2019-01-01

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MMW

Issue	Date	By	CHKD	Appd

Meters

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ARUP

Louis K. F. Fung  
80 Tai Chee Avenue  
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Hong Kong

Client

Civil Engineering and Development Department

Job Title

Agreement No. CE 9/2011 (CE)  
Increasing Land Supply by Reclamation and Rock Cavern Development cum Public Engagement - Feasibility Study

Drawing Title

Recommended Longlisted Sites for Rock Cavern Development

Scale at A3

1:200,000

Drawing Status

Preliminary

Job No

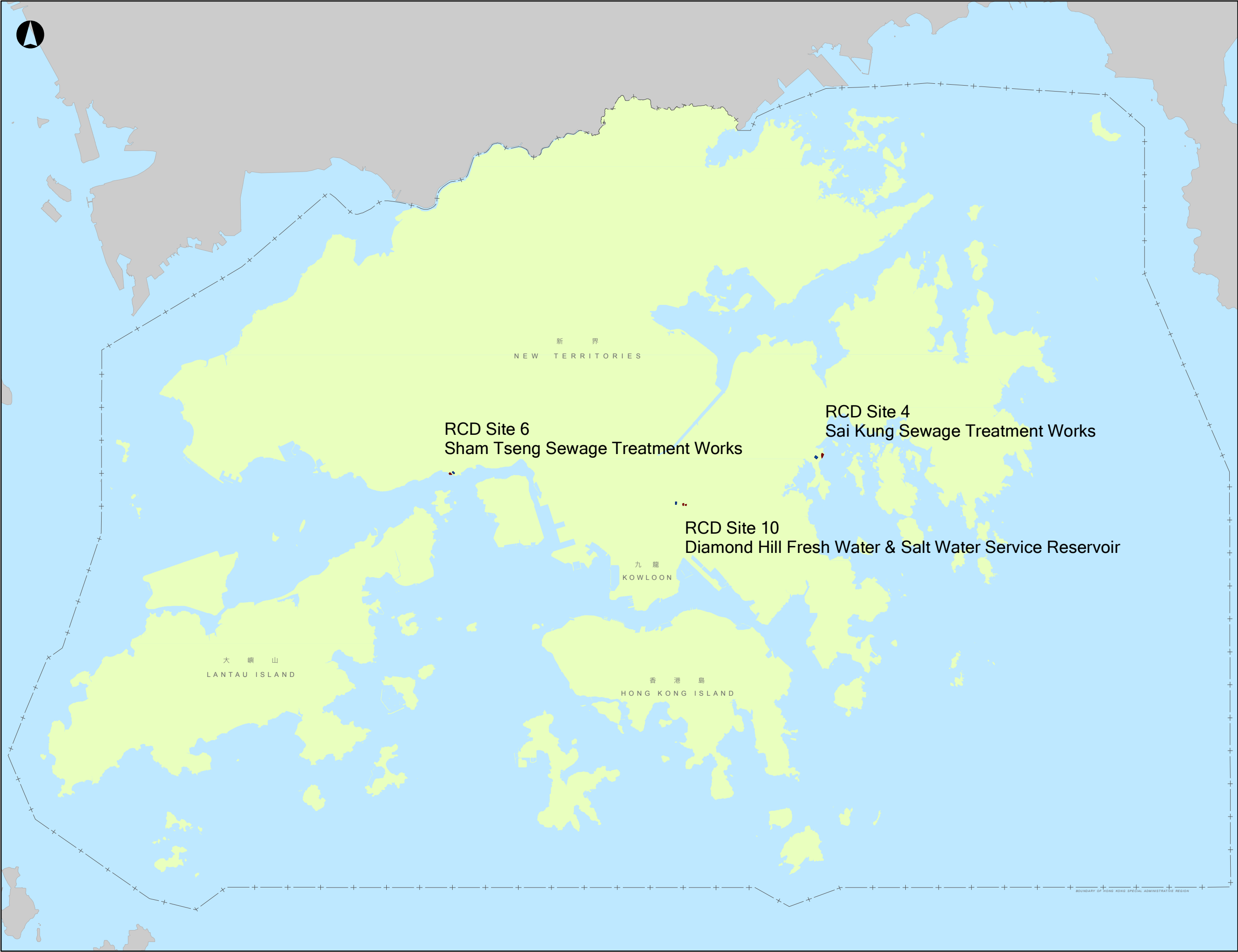
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Drawing No

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Issue

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Legend

- RCD-released Sites
- RCD-receiving Sites

**Note:**  
The size, shape and location of the releasing site, access road and portal are hypothetical assumptions for the purpose of BTA only. They do not represent any future design to be implemented.

D1	2019-09-10	SC		
Issue	Date	By	Chk'd	App'd



**ARUP**

Level 5, Festival Walk  
80 Sai Chee Avenue  
Kowloon Tong, Kowloon  
Hong Kong

Client  
**Civil Engineering and Development Department**

Job Title  
**Agreement No. CE 9/2011 (CE)  
Increasing Land Supply by Reclamation and Rock Cavern  
Development cum Public Engagement - Feasibility Study**

Drawing Title  
**Recommended Shortlisted RCD Sites**

Scale of A3  
**1:200,000**

Drawing Status  
**Draft**




Job No. 2143999 Drawing No. 3 Issue D1



## Major Opportunities

- 1 The redevelopment of the proposed releasing site will offer a residential solution space that enjoys a pristine waterfront location fronting the Inner Port Shelter.
- 2 The proposed RCD-released site will offer an opportunity to extend the existing waterfront promenade adjacent to the Lake Court which current terminates at the Marine Police East Divisional Headquarters. The extension of the waterfront promenade will enhance the open space provision of the area and will promote the public accessibility to the waterfront.
- 3 Given its proximity to a number of low-density residential developments, the proposed RCD-released site is suitable for residential development in terms of land-use compatibility if the adjacent industrial uses and helipad are relocated.
- 4 The future residents of the releasing site will be able to enjoy the greenery environment offered by the Tsiu Hang Special Area nearby.
- 5 The relocation of the subject sewage treatment works will remove "NIMBY" development etc from the surrounding residential development.
- 6 The adjacent underutilised industrial site and Marine Police East Divisional Headquarters (subject to its relocation and reprovisioning) will offer opportunities to develop comprehensively with the RCD released site for additional housing provision.
- 7 The RCD-released site with the potential for GIC facilities development.

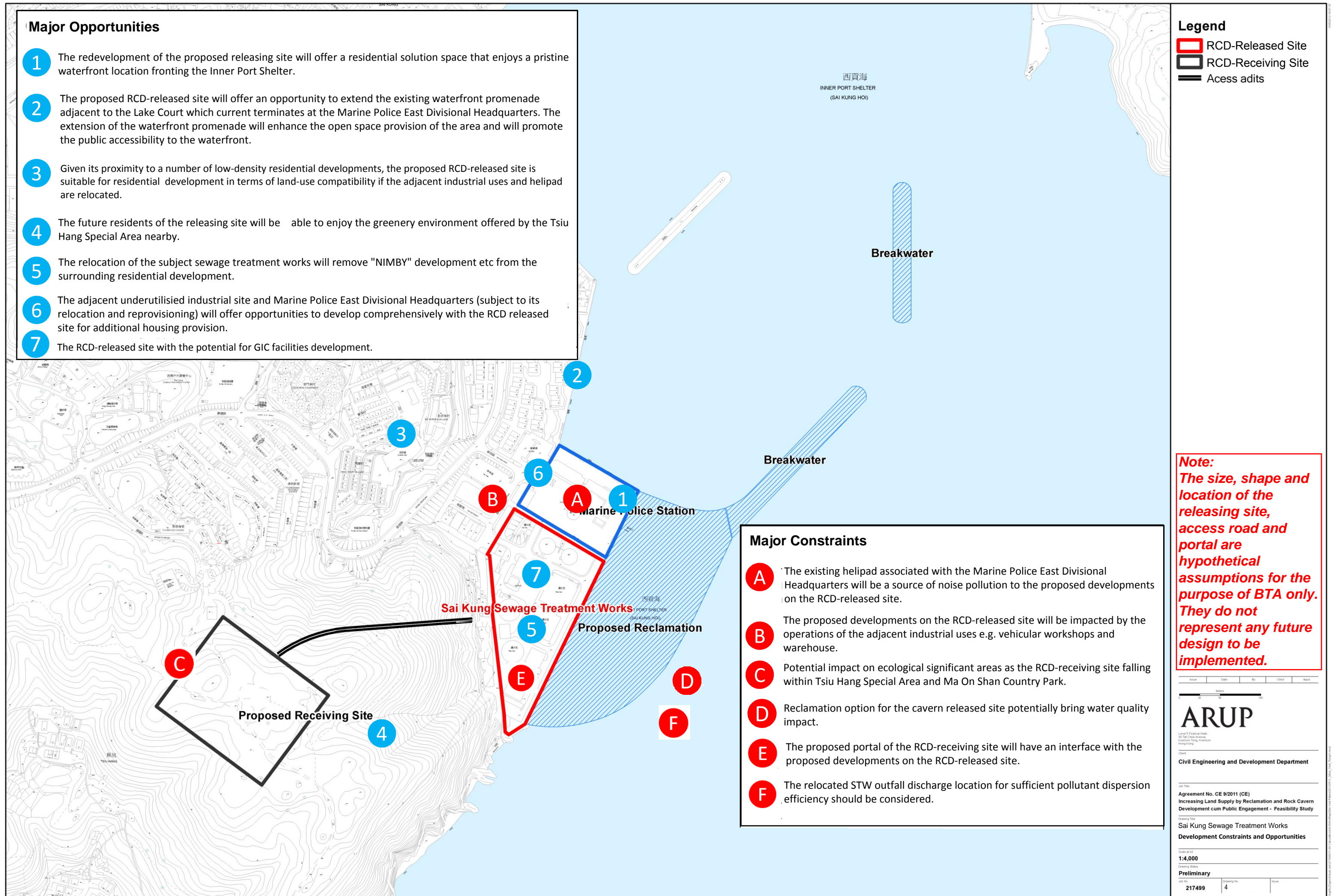
## Legend

-  RCD-Released Site
-  RCD-Receiving Site
-  Access adits

**Note:**  
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## Major Constraints

- A The existing helipad associated with the Marine Police East Divisional Headquarters will be a source of noise pollution to the proposed developments on the RCD-released site.
- B The proposed developments on the RCD-released site will be impacted by the operations of the adjacent industrial uses e.g. vehicular workshops and warehouse.
- C Potential impact on ecological significant areas as the RCD-receiving site falling within Tsiu Hang Special Area and Ma On Shan Country Park.
- D Reclamation option for the cavern released site potentially bring water quality impact.
- E The proposed portal of the RCD-receiving site will have an interface with the proposed developments on the RCD-released site.
- F The relocated STW outfall discharge location for sufficient pollutant dispersion efficiency should be considered.



Issue	Date	By	Check	Appd

Scale: 1:4,000

**ARUP**

Level 5, Festival Walk  
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Client:  
Civil Engineering and Development Department

Job Title:  
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Development cum Public Engagement - Feasibility Study

Drawing Title:  
Sai Kung Sewage Treatment Works  
Development Constraints and Opportunities

Scale of A3:  
1:4,000

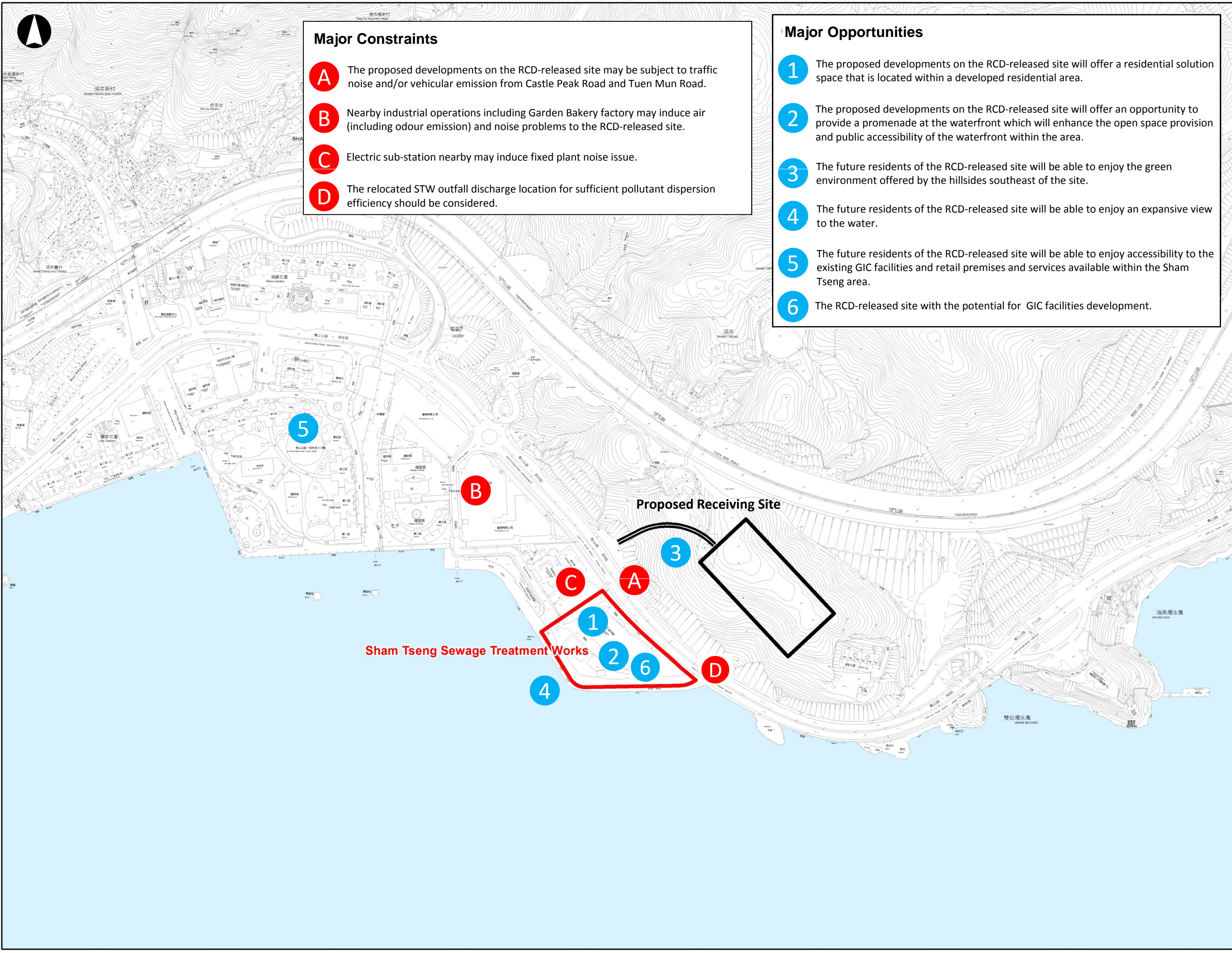
Drawing Status:  
Preliminary

Job No:  
217499

Drawing No:  
4

Issue:





- ### Major Constraints
- A** The proposed developments on the RCD-released site may be subject to traffic noise and/or vehicular emission from Castle Peak Road and Tuen Mun Road.
  - B** Nearby industrial operations including Garden Bakery factory may induce air (including odour emission) and noise problems to the RCD-released site.
  - C** Electric sub-station nearby may induce fixed plant noise issue.
  - D** The relocated STW outfall discharge location for sufficient pollutant dispersion efficiency should be considered.

- ### Major Opportunities
- 1** The proposed developments on the RCD-released site will offer a residential solution space that is located within a developed residential area.
  - 2** The proposed developments on the RCD-released site will offer an opportunity to provide a promenade at the waterfront which will enhance the open space provision and public accessibility of the waterfront within the area.
  - 3** The future residents of the RCD-released site will be able to enjoy the green environment offered by the hillsides southeast of the site.
  - 4** The future residents of the RCD-released site will be able to enjoy an expansive view to the water.
  - 5** The future residents of the RCD-released site will be able to enjoy accessibility to the existing GIC facilities and retail premises and services available within the Sham Tseng area.
  - 6** The RCD-released site with the potential for GIC facilities development.

### Legend

- RCD-Released Site
- RCD-Receiving Site
- Access adits

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Issue	Date	By	CM	Appr

0 50 100 Meters

## ARUP

Level 8 Festival Walk  
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Hong Kong

Client:  
Civil Engineering and Development Department

Job Title:  
Agreement No. CE 9/2011 (CE)  
Increasing Land Supply by Reclamation and Rock Cavern Development cum Public Engagement - Feasibility Study

Drawing Title:  
Sham Tseng Sewage Treatment Works  
Development Constraints and Opportunities

Scale of A3:  
1:4,000

Drawing Status:  
Issue

Job No	Drawing No	Issue
217499	5	A1



## Major Opportunities

- 1 The RCD-released site is located adjacent to existing GIC facilities which could provide solution space for their expansion if required.
- 2 The existing GIC facilities are readily accessible to the future residents of the RCD-released site.
- 3 The future residents of the RCD-released site could enjoy the greenery environment.
- 4 The proposed developments on the RCD-released site for residential purpose will augment the housing supply within the existing urban area.
- 5 RCD-released site could provide land for GIC facilities.

## Major Constraints

- A Chimney emission from the nearby hospitals, and road traffic noise and vehicular emission from adjacent roads.
- B An existing green area immediate north to the RCD-released site serves as a breathing space in the densely built-up area, which is also designated as a non-building area (NBA). The proposed development on the RCD-released site will need to avoid compromising the function NBA.
- C Potential fixed plant noise from the adjacent electric sub-station and pump houses.
- D Potential impact on ecological significant areas as the RCD-receiving site falling within Lion Rock Country Park.

**Legend**

- RCD-Released Site
- RCD-Receiving Site
- Access roads

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