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## **1.0 Basic Information**

### **1.1 Project title**

Siu Ho Wan Water Treatment Works Extension  
Preliminary Project Feasibility Study

### **1.2 Purpose and nature of the project**

The proposed project comprised the upgrading of Siu Ho Wan Treatment Works and the associated raw water transmission system to cope with the water demands of the developments in North Lantau New Town, Northshore & North-East Lantau area and Discovery Bay. The project consists of:

- i) Extension of Siu Ho Wan Water Treatment Works from the capacity of 150,000 m<sup>3</sup>/day to 300,000 m<sup>3</sup>/day with an option for further upgrading to 350,000 m<sup>3</sup>/day together with the associated upgrading in capacity of the Siu Ho Wan Raw Water Pumping Station and Siu Ho Wan Treated Water Pumping Station;
- ii) Construction of a raw water booster pumping station between Ta Pang Po and Siu Ho Wan and the laying of the associated water mains;
- iii) Demolition and re-provisioning of the existing Pui O 'A' pumping;
- iv) Upgrade in capacity of Pui O 'B' pumping station;
- v) Duplication of two sections, approximately 2km, of 1200mm diameter water mains in Pui O.

### **1.3 Name of project proponent**

Water Supplies Department

### **1.4 Location and scale of project and history of site**

Location plans numbered **Figures 1, 2 & 3** are attached herewith. The site for the proposed Siu Ho Wan Treatment Works upgrading is within the boundary of the existing Siu Ho Wan Treatment Works (**Figure 2**). The location of the site is about 100m south of the North Lantau Highway which is bounded by a Sewage Treatment Plant in the southwest and North Lantau Service Road in the north. The site area is approximately 5.8 hectares, formed by cutting a hill original with a natural rock slope.

The alternative sites for the proposed raw water booster pumping station are shown in **Figures 1 & 2**. The proposed site will have an area of approximately 0.5 hectares and the pumping station will be about 8m in height. One of the alternative sites is proposed to locate 800m South from Ta Pang Po (**Figure 1**) while the other alternative site is proposed to locate immediately next to the entrance of Siu Ho Wan Water Treatment Works (**Figure 2**). The upgrading of the Pui O 'A' raw water pumping station and the upgrading of Pui O 'B' raw water pumping station, which

located next to the South Lantau Road with 0.5 and 0.7 hectares respectively, will take place within the boundary of the existing pumping stations. The site for the duplication of two sections of the existing water main (about 2 km in length) at Pui O is under the existing public road – South Lantau Road (~1.6 km) or under cultivated land (~0.4 km, **Figure 3**).

### **1.5 *Number and type of designated project***

The proposed Siu Ho Wan Treatment Works Extension is a designated project which is classified as Category E.2 under Schedule 2 of the Environmental Impact Assessment Ordinance (EIAO). The proposed Siu Ho Wan Water Treatment Work extension is adjoining by a sewage treatment plant in the south west and a refuse transfer station in the north west. There are no other designated projects at the alternative sites of proposed raw water booster pumping station, the sites for the upgrading of the Pui O ‘A’ raw water pumping station and the uprating of Pui O ‘B’ raw water pumping station and the site for the duplication of sections ‘a’ and ‘b’ of the existing water main at Pui O.

### **1.6 *Contact person***

Chief Engineer/Planning of Water Supplies Department

## **2.0 Outline of Planning and Implementation Programme**

A consultant has been hired to conduct the preliminary project feasibility study. It is also intended to engage consultants to implement this project at the subsequent stages.

The preliminary project feasibility study for this project will be completed by February 2000. The project is proposed to be included in the 2000 RAE. The project has also taken into account the on-going Northshore Lantau Development Feasibility Studies. The construction works are tentatively scheduled to commence in 2005 for completion in 2008 to cope with the development of North Lantau Development. A tentative project programme is shown in **Figure 4**.

## **3.0 Possible Impacts on the Environment**

### **3.1 *During construction stage***

#### Outline Process Involved

The construction activities within the boundary of the existing Siu Ho Wan Water Treatment Works will include excavation, mainlaying, erection of concrete structures, and installation of E&M equipment.

The construction activities for the proposed booster pumping station at Ta Pang Po will include earthworks (excavation and fill), main laying, erection of concrete structures, and installation of E&M equipment.

The construction activities within the boundary of existing Pui O 'A' and 'B' pumping stations will include removal of old E&M equipment and installation of new E&M equipment, demolition of existing concrete structures as well as concrete structure works and mainlaying.

The construction activities for the proposed duplication of sections 'a' and 'b' water main at Pui O will include excavation, mainlaying backfilling and road reinstatement work.

#### Gaseous Emissions

Gaseous emission will be generated from the construction equipment and vehicles.

#### Dust

Dust may be generated from the construction activities, mainly earthworks. Construction dust may affect the operation of the existing Siu Ho Wan Water Treatment Works, the Siu Ho Wan Sewage Treatment Works, as well as residents, restaurants, and students closed to the mainlaying site at Pui O. If dust is generated by the construction activities within Siu Ho Wan Water Treatment Works boundary, it is possible that it will affect the quality of water in the treatment trains. Therefore, it is important that appropriate control measures should be adopted.

#### Odour

*Nil*

#### Noise

Construction noise will be generated through the use of conventional construction plants and equipment.

#### Night-time Operation

*Nil*

#### Traffic Generation

Traffic diversion may be needed during the installation of new main at Pui O. The noise will be generated at the diverse road.

#### Construction site runoff

Potential impact on the receiving water bodies, i.e. Siu Ho Wan near the Siu Ho Wan site and Pui O Wan as well as natural streams near the Pui O site, may arise from the construction site runoff.

#### Generation and Disposal of Waste

Uncontrolled management and disposal of excavated materials and construction waste could cause adverse impacts.

### Hazardous Waste

*Nil*

### Disposal of Spoil Materials

Spoil Materials might be generated during the demolition of Pui O "A" pumping station.

### Risk of Accidents associated with Hazardous

The risk of chlorine release accidents from the storage, use, handling and transport of liquid chlorine will increase during the construction, especially when extension of the existing chlorine storage facility is found necessary.

### Disruption of Water Movement

Limited rearrangement of the existing inland storm water drain will be required at the proposed booster pumping station sites.

### Visual and Landscape Impact

Potential visual and landscape impacts anticipated from the construction activities of the booster pumping station and main laying.

### Ecological Impacts

There are a lot of trees along the South Lantau Road need to be removed, and approximately 8000m<sup>2</sup> of woodland or shrubland need to be cleared should the proposed duplicated pipeline laid at the area other than under the existing public road or footpath at Pui O. An estimated 1600 m<sup>2</sup> of shrubland or woodland need to be cleared should the option of laying most of the proposed duplicate pipeline under the existing public road be adopted.

## **3.2 *During operation stage***

### Gaseous Emissions

*Nil*

### Dust

*Nil*

### Odour

*Nil*

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### Noise

The pumps are potential noise sources during the operation of the proposed pumping stations.

### Night-time Operation

*Nil*

### Traffic Generation

*Nil*

### Storm and Wastewater Water Discharge

Detail Drainage Impact Assessment (DIA) will be conducted during the Detailed Design Stage to assess the impact of drainage towards the surrounding environment.

The process wastewater generated during the treatment works operation is normally recycled back to the raw water inlet. No wastewater will be discharged from the operation of the treatment works. The domestic wastewater is discharged to the sewer and treated in the sewage treatment plant.

### Waste Generation

Sludge will constitute to be the major operational waste. An estimated 5 dry weight tones per day of solid sludge will be produced from the proposed extension. Sludge will be de-watered on site then disposed of at landfill. When Stage II of the treatment works comes in operation, ultimate disposal to licensed landfill such as WENT will be applied. When the disposal license is granted, which will be under strict management, sludge will not pose particular problem as the sludge volume will constitute only a small portion of the daily input to the landfill.

During the maintenance of mechanical equipment, drained lubricant will be discarded.

### Storage, Use, Handling and Transport of Liquid Chlorine & Potassium Permanganate

Siu Ho Wan Water Treatment Works Extension may increase the use and storage of liquid chlorine from 73 tons (under a throughput of 300,000 m<sup>3</sup>/day) to maximum 84 tons (under a throughput of 350,000 m<sup>3</sup>/day) for 60 days storage on site. The existing Hazard Assessment, Planning Study and Action Plan (HS-PS-AP) for Siu Ho Wan Treatment Works endorsed by the Coordinating Committee on Land-use Planning and Control relating to Potential Hazardous Installation (CCPHI) in 1992 was prepared based on a chlorine storage of 73 tons, a further hazard assessment may thus be required should the treatment works be updated to 350,000 m<sup>3</sup>/day.

Approximately 21 tons of potassium permanganate will be stored and handled within the water treatment works. Potassium permanganate is classified as Category 7 dangerous goods and the storage, conveyance and packing of potassium permanganate (in excess of 10 kg) is subject to the Dangerous Goods (General) Regulations.

### Disposal of Spoil Materials

*Nil*

### Disruption of Water Movement

*Nil*

### Visual and Landscape Impact

Potential visual and landscape impacts anticipated from the establishment of the booster pumping station.

## **4.0 Major Elements of the Surrounding Environment**

The existing and planned sensitive receivers and sensitive parts of the natural environment, which might be affected by the designated project, are identified according to different locations.

### Siu Ho Wan Water Treatment Works Extension

- Siu Ho Wan Water Treatment Works (by Chlorine Hazardous and dust)
- Siu Ho Wan Sewage Treatment Works (by Chlorine Hazardous)
- Airport Railway and Highway (by Chlorine Hazardous)
- Gas Reception Station (by Chlorine Hazardous)
- Proposed Aviation Fuel Storage Site (by Chlorine Hazardous)
- Refuse Transfer Station (by Chlorine Hazardous)
- Railway Depot (by Chlorine Hazardous)
- Undetermined use area, amenity area and open space (by Chlorine Hazardous)
- Lantau North Country Park – Approximately 4000m away from the Siu Ho Wan Water Treatment Works

### Proposed Sites (Site 1 and 2) for Booster Pumping Station

- Lantau North Country Park – Approximately 4000m and 5000m away from the Site 1 and Site 2 for proposed Booster Pumping Station.

### Pui O Pumping Stations A & B Upgrading

- Residential Area (Pui O Lo Wai Tsuen) – Approximately 50m away from the Pumping Stations.
- Agricultural areas - Approximately 100m away from Pumping Station A.
- Lantau South Country Park – Approximately 50m away from the Pumping Stations

### Pui O Watermain Duplication of Sections ‘a’ and ‘b’

- Residential Villages Area (Lo Uk Tsuen, Pui O San Wai Tsuen, Pui O Lo Wai Tsuen) – Approximately 10m away along the proposed watermain

- School (Pui O School) - Approximately 20m away from the proposed watermain
- Shops and Restaurants – Next to the South Lantau Road
- Agricultural areas - Approximately 5m along the proposed watermain
- Lantau South Country Park – Average 300m away from proposed watermain.
- Beach at Pui O (Pui O Wan) – Approximately 50m away from proposed watermain.
- Natural streams – the proposed watermain will cross some natural streams.
- Pui O archaeological site – next to or inside the west part of the archaeological site boundary.

## 5.0 Environmental Protection Measures

The proposed Siu Ho Wan Water Treatment Works Extension and Pui O “A” and “B” Pumping Station upgrading will be assigned within the existing facilities/sites boundaries to minimize the environmental impacts. Two alternative sites for the proposed new booster pumping station and alternative alignment of Pui O sections “a” & “b” pipeline will be evaluated for the environmental impacts during EIA Study. An archaeological impact assessment will be conducted for the mainlaying at Pui O during the EIA study. The ultimate selection of the site / alignment should minimize the environmental impacts.

### 5.1 *During construction stage*

#### Gaseous Emissions

Gaseous emission generated from the construction equipment and vehicles is not expected to cause any unacceptable impact.

#### Dust

To minimize potential dust generated during the construction phase, standard control measures listed below will be considered:

- Watering work sites
- Covering stockpiles or exposed soil
- Careful handling and the containment or damping of dusty materials
- Prompt site restoration
- Vehicle washing before leaving the site
- On site vehicle speed restrictions

The control measure to mitigate the adverse effect of the dust on the quality of water in the open channels and basins of the treatment trains shall be identified in the EIA Study.

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### Noise

Mitigation measures to minimize potential noise impacts during the construction phase will adopt the practicable approaches which are commonly used at construction works sites in Hong Kong. They are primarily:

- Constructing temporary noise barriers
- Selecting quiet plant and working methods
- Reducing number of operating plant on site
- Restrict the time and period for the operation of extensive noise generated works such as piling.

### Traffic Noise Impact

Mitigation measures such as providing noise barriers at strategic locations should be identified and implemented to minimize potential noise impacts on the nearby NSRs during the construction phase.

### Construction Site Runoff

The potential impacts from construction sites runoff could be minimized by implementing mitigation measures such as temporary on-site drainage system, bunding of fuel stores and careful site management as recommended in the *Practice Note for Professional Persons PN 1/94 (Construction Site Drainage)* issued by EPD.

### Waste Management

Excavated materials would require disposal and where possible be re-used off site as fill. The Fill Management Committee (FMC) and the EPD should be consulted during the EIA study and design and construction stage on the method of disposal by the contractor and should be included as a requirement in the tender document. The contractor should prepare a proper on-site waste management plan.

### Disposal of Spoil Materials

Proper disposal methods of spoil Materials should be identified during EIA study if spoil materials will be generated.

### Risk of Accidents associated with Hazard

The measures to minimize the risk of chlorine release accidents from the storage, use, handling and transport of liquid chlorine will be identified during the EIA study and implemented during the construction stage.

### Disruption of Water Movement

The limited rearrangement work for the existing inland storm water drain will be carried out according to a predetermined work plan which will minimize the disruption, if any to the potential storm water movement.



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### Visual and Landscape Impact

Reducing the construction period to the absolute minimum would mitigate the visual and landscape impact. In addition, construction site activity should be maintained in a neat and orderly manner, avoiding the unnecessary build-up of litter, rubble and building waste to surrounding areas. Screening of construction works along North Lantau Highway should be provided to minimize the impact during the construction.

### Ecological Impacts

A tree survey will be conducted to identify which trees will be subject to removal at the EIA study stage. Approval from Government is required for tree felling in accordance with the Works Branch Technical Circular 24/94. Potential ecological impacts from tree falling should be minimized through a compensatory tree planting as required by the Government.

## **5.2 *During operation stage***

### Noise

The use of enclosure and reduction of the percentage of opening/gap in the pumping station could reduce the pump noise to the acceptable level. Since the Pui O pumping stations are only about 50 m from the nearest residential area (Pui O Lo Wai Tsuen), all practical noise mitigation measures, including the provision of enclosure for the pumps, location of enclosure opening away from the noise sensitive receivers, and provision of acoustic louvre/silencer at the opening as needed, would be considered to address the pump noise.

### Storm Water Discharge

Measures such as material exposure control and infiltration control to minimize storm water pollution, should be identified during the EIA study stage and implemented if feasible in the design and construction of the project. All the facility sites should be kept clean during the operation to minimize the storm water pollution.

### Waste Management

Sludge cakes currently produced at the existing WTWs are acceptable to be disposed of at the landfill. The same disposal method will be adopted for the treatment work extension. Therefore, major impacts are not predicated for the sludge disposal.

Used lubricating oil generated from the maintenance of mechanical equipment will be disposed of properly in accordance with Waste Disposal Ordinance.

### Storage, Use, Handling and Transport of Liquid Chlorine & Potassium Permanganate

As SHWWTW use and stores liquefied chlorine in 1 tones drums, it falls within the definition of a Potentially Hazardous Installation (PHI) as adopted by CCPHI. Under the guidelines of the committee, preparation of HA-PS-AP for WTW is required. The existing HA-PS-AP were completed and endorsed by CCPHI in 1992. For increase in storage, usage, handling and on-site transport of chlorine, further HA may be required

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to demonstrate the compliance of Hong Kong Risk Guidelines. Practicable and cost-effective risk mitigation measures should be identified to reduce the risk level to as low as reasonably practicable. The revised HA-PS-AP has to seek the endorsement of CCPHI. Additional risk reduction measures such as duplicate absorber, if found necessary, should be implemented.

Revision of HA-PS-AP may not be necessary should the proposed option of using ozone as the primary disinfectant be adopted for the extension.

The potential risk associated with storage, use, handling and transport of potassium permanganate should be assessed during the EIA Study and measures such as stored in the dangerous goods storage room should be implemented to minimize the risk.

#### Visual and Landscape Impact

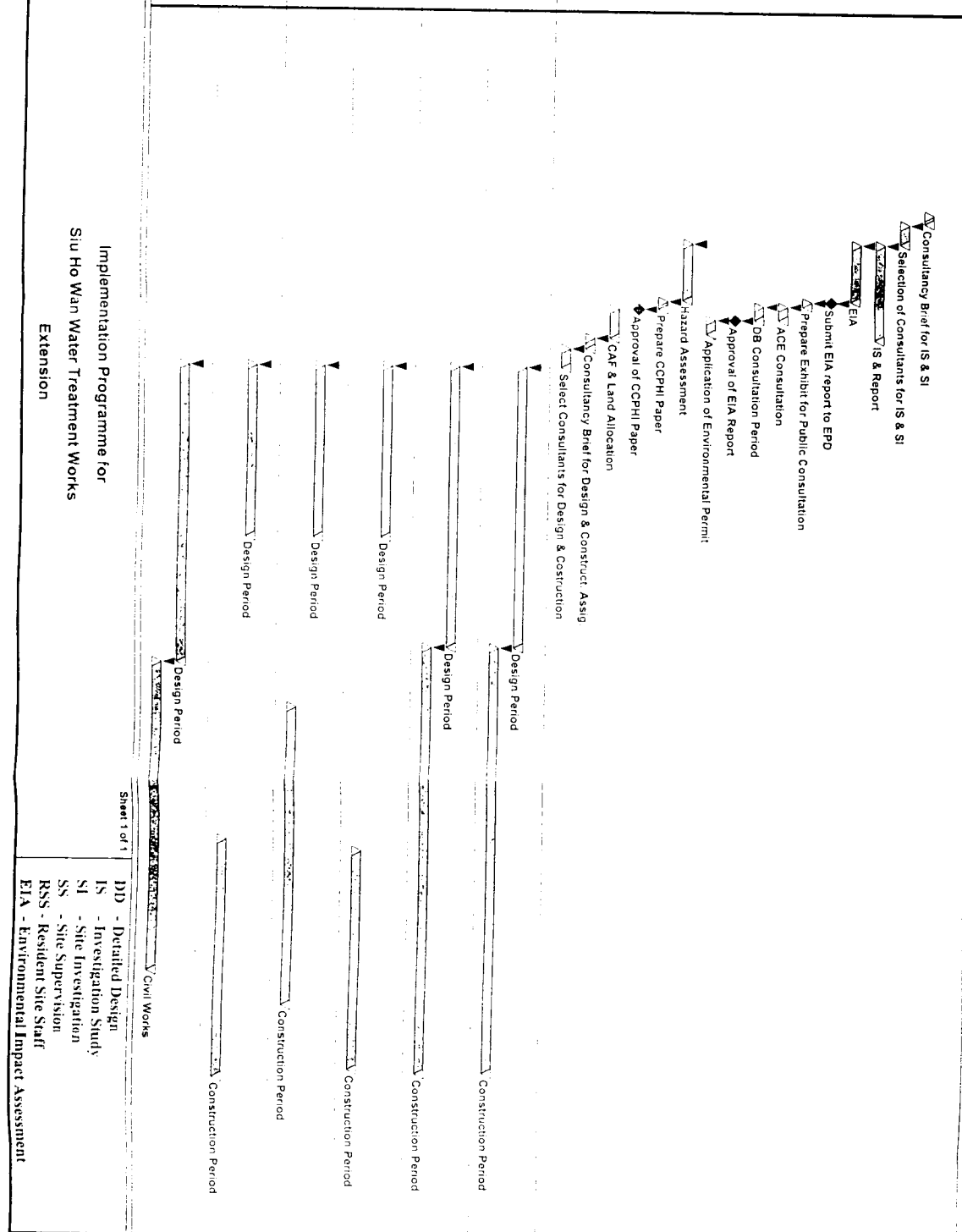
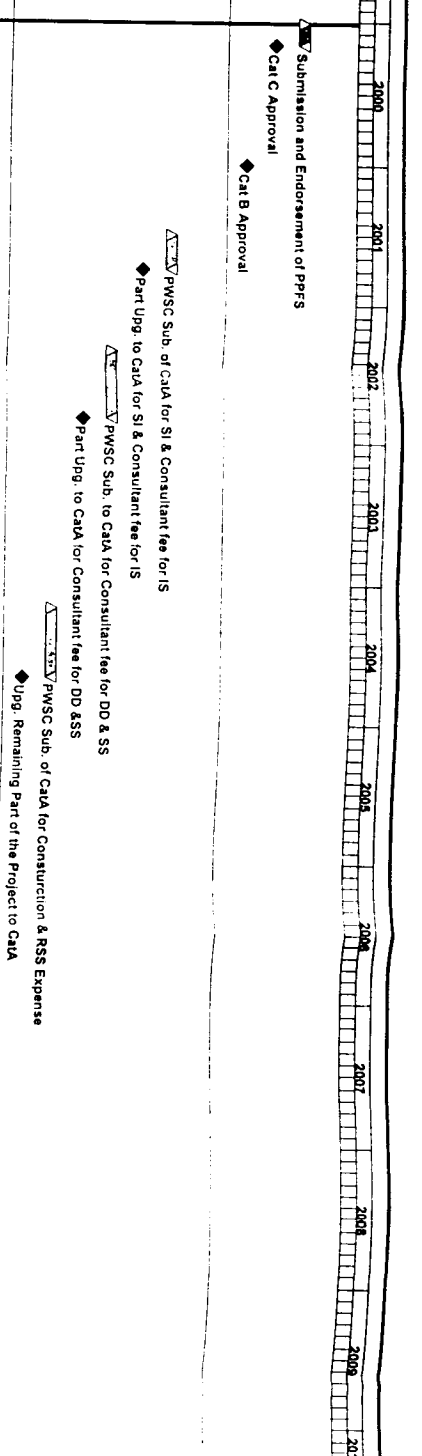
Architectural finishes will be provided on the external surface of the booster pumping station at Siu Ho Wan and at the Pui O 'A' and 'B' raw water pumping stations. Moreover, the site will be surrounded with a planting strip to enhance its appearance. The planting should be comparable with the landscaping along the North Lantau service road. Landscaping will be provided at the Siu Ho Wan Water Treatment Works site to blend the site into the background.

## **6.0 Use of Previously Approved EIA Reports**

*Nil.*

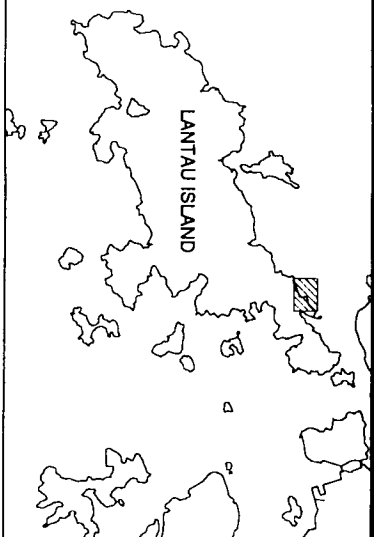
Activity ID	Activity Description	Duration	Start Date	Finish Date
1000	Submission and Endorsement of PPS	42	03JAN00	29FEB00
1005	Cat C Approval	0		29FEB00
1006	Cat B Approval	0		02JAN01
<b>PMSC</b>				
1007	PMSC Sub of CAIA for SI & Consultant fee for IS	65	02JUL01	28SEP01
1008	Part Upg to CAIA for SI & Consultant fee for IS	0		28SEP01
1009	PMSC Sub to CAIA for Consultant fee for DD & SS	131	01MAY02	30OCT02
1010	Part Upg to CAIA for Consultant fee for DD & SS	0		30OCT02
1015	PMSC Sub of CAIA for Construction & RSS Expense	131	01MAR04	30AUG04
1020	Upg Remaining Part of the Project to CAIA	0		30AUG04
<b>Design &amp; Construction Phase</b>				
<b>General</b>				
1062	Consultancy Brief for IS & SI	20	03SEP01	28SEP01
1065	Selection of Consultants for IS & SI	45	01OCT01	30NOV01
1072	IS & Report	216	03DEC01	30SEP02
1075	EIA	130	03DEC01	31MAY02
1078	Submit EIA report to EPD	0		03JUN02
1082	Prepare Exhibit for Public Consultation	10	04JUN02	17JUN02
1084	ACE Consultation	32	18JUN02	31JUL02
1085	DB Consultation Period	32	18JUN02	31JUL02
1083	Approval of EIA Report	9		31JUL02
1090	Application of Environmental Permit	33	03AUG02	16SEP02
1092	Hazard Assessment	130	03DEC01	31MAY02
1094	Prepare CCPH Paper	20	03JUN02	28JUN02
1095	Approval of CCPH Paper	0		29JUN02
1096	CAF & Land Allocation	66	01JUL02	31SEP02
1099	Consultancy Brief for Design & Construct Assn	23	01OCT02	31OCT02
1104	Select Consultants for Design & Construction	43	01NOV02	31DEC02
<b>Siu Ho Wan Water Treatment Work Extension</b>				
1102	Design Period	414	02JAN03	09MAY03
1103	Construction Period	533	11MAY03	05DEC03
<b>Bi-Stage Pumping Station</b>				
1104	Design Period	614	02JAN03	13MAY03
1105	Construction Period	535	11MAY03	05DEC03
<b>Upgrading of Siu Ho Wan Pumping Station</b>				
1106	Design Period	391	02JAN03	01JUN04
1107	Construction Period	490	23JAN03	12NOV03
<b>Upgrading of Pui O A Pumping Station</b>				
1108	Design Period	367	02JAN03	01JUN04
1109	Construction Period	453	14JUN03	14MAY04
<b>Upgrading of Pui O B Pumping Station</b>				
1110	Design Period	367	02JAN03	01JUN04
1111	Construction Period	501	02DEC03	28DEC03
<b>Relocation of Pui O C &amp; D Raw Water Pipeline</b>				
1112	Design Period	639	02JAN01	20JUN05
1113	Construction Period	634	02JUN05	20JAN06

Project Start	Project Finish	Project Name	Run Date
03JAN00	26DEC08	03JAN00	10JAN00
03JAN00	26DEC08	03JAN00	10JAN00

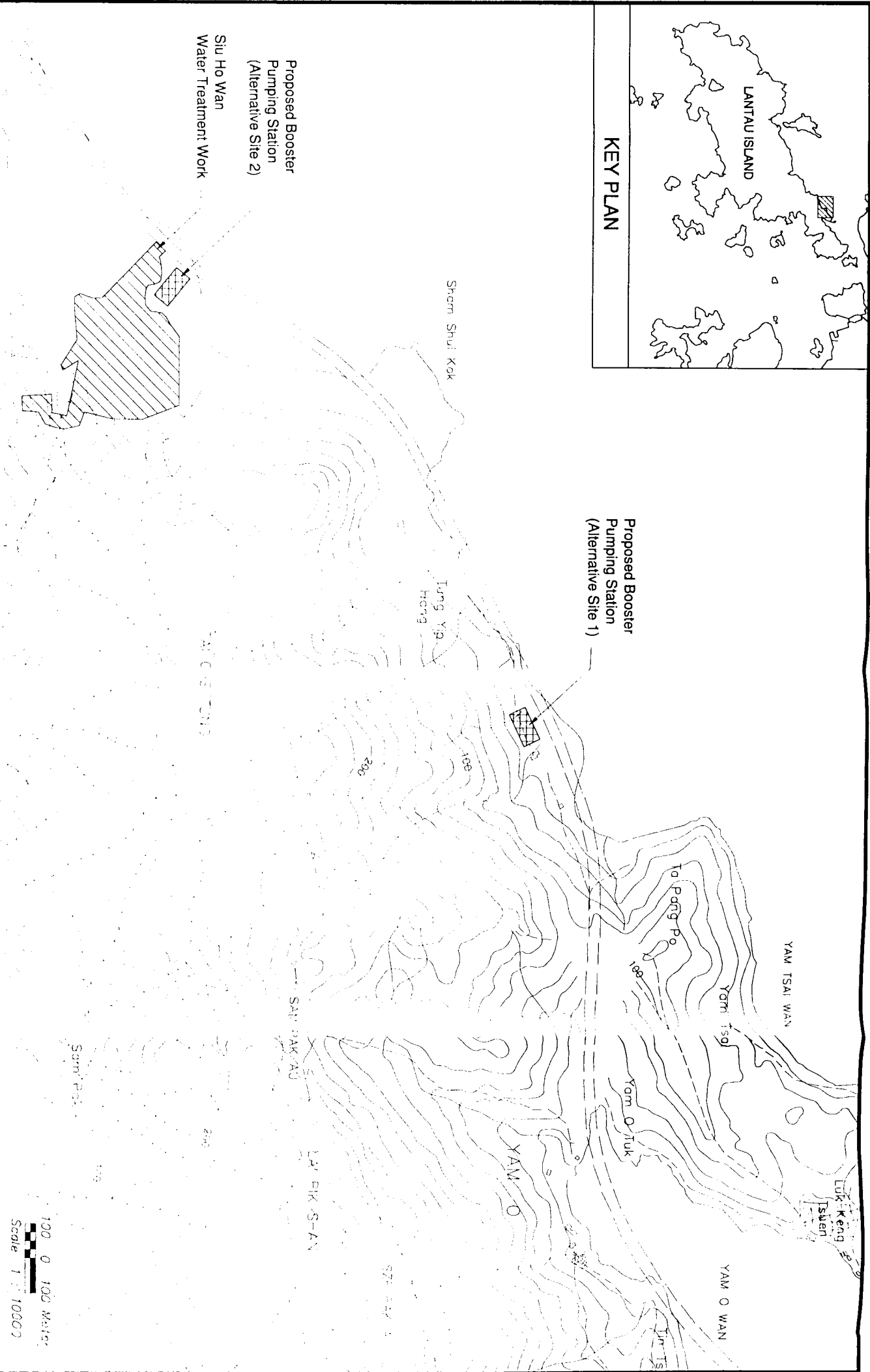


Implementation Programme for  
 Siu Ho Wan Water Treatment Works  
 Extension

Sheet 1 of 1  
 DD - Detailed Design  
 IS - Investigation Study  
 SI - Site Investigation  
 SS - Site Supervision  
 RSS - Resident Site Staff  
 EIA - Environmental Impact Assessment

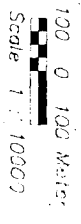


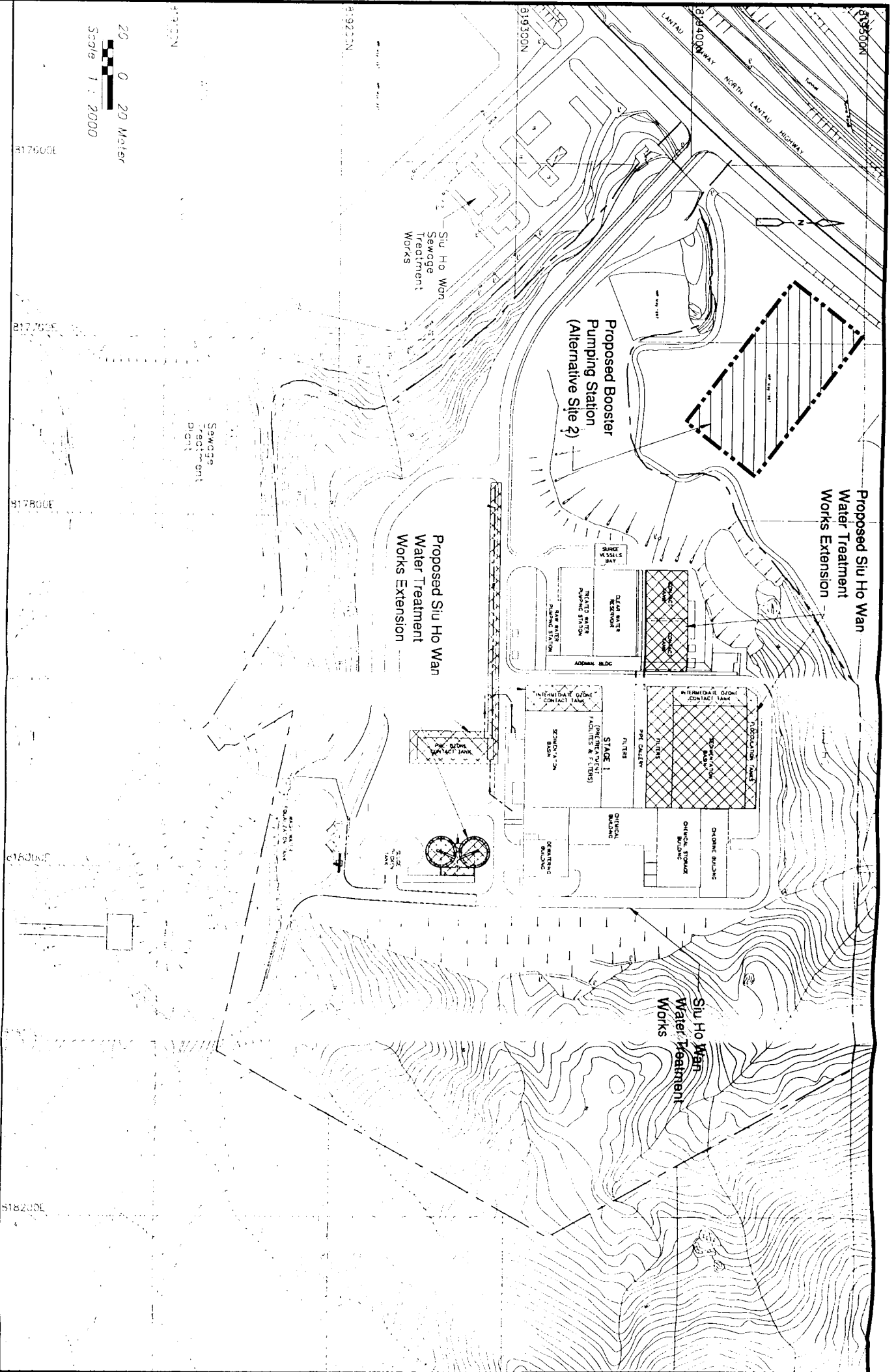
KEY PLAN



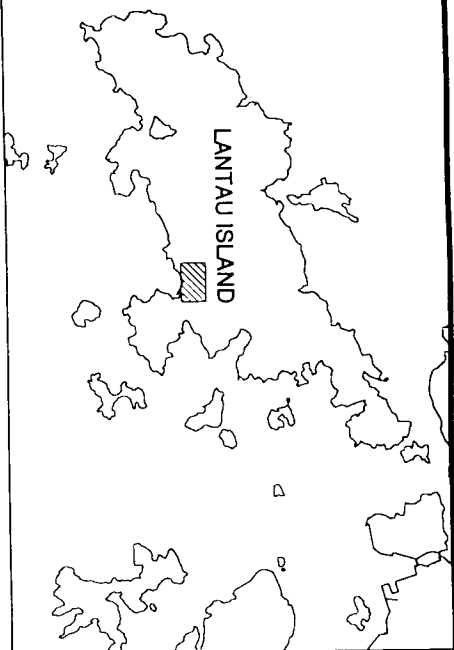
Proposed Booster Pumping Station (Alternative Site 2)  
Siu Ho Wan Water Treatment Work

Proposed Booster Pumping Station (Alternative Site 1)



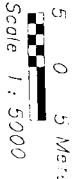
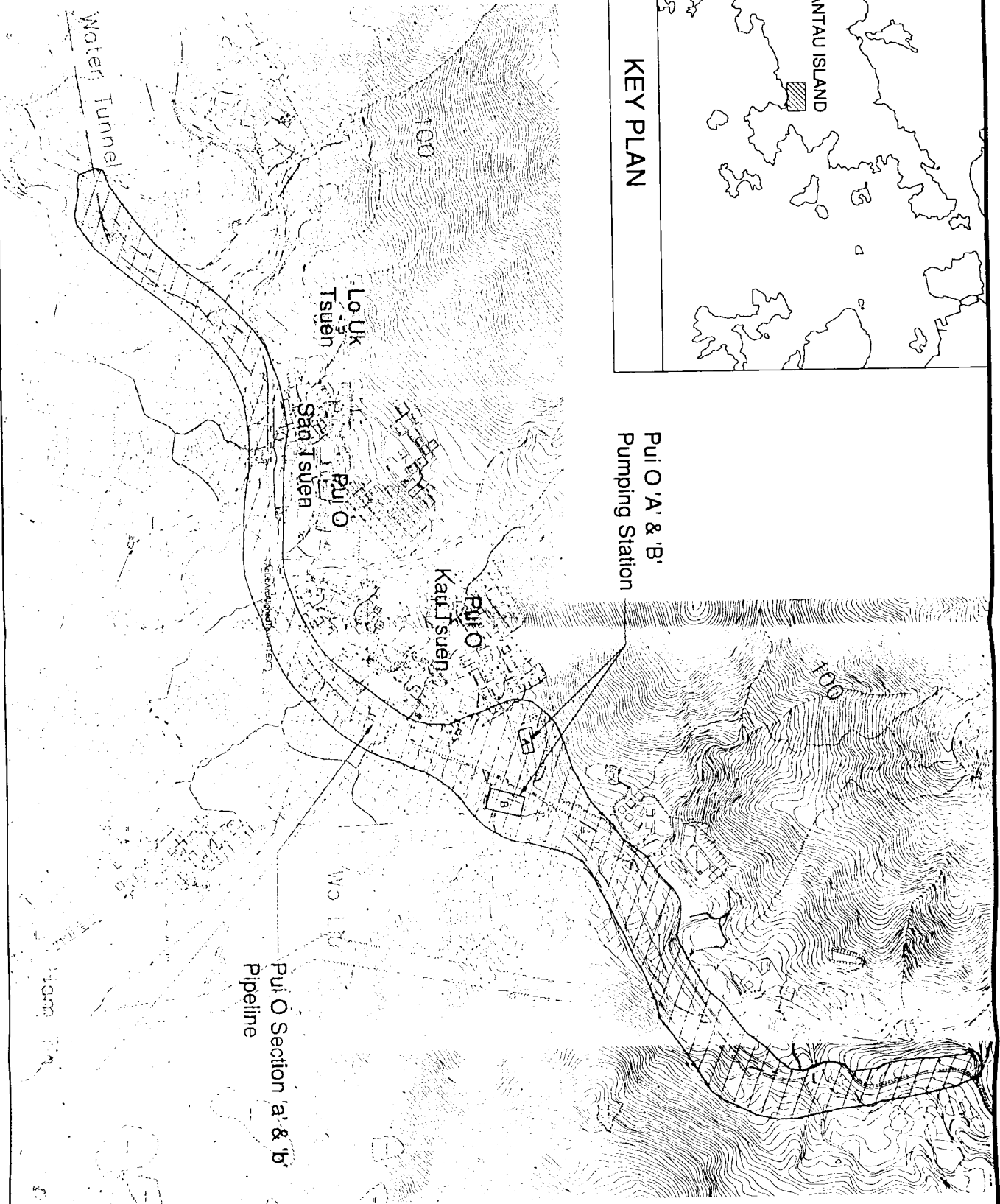


Preliminary Project Feasibility Study for the Project  
 "Siu Ho Wan Treatment Works Extension"  
 Location Plan for Siu Ho Wan Section



KEY PLAN

Pui O 'A' & 'B'  
Pumping Station



Water Supplies Department

Preliminary Project Feasibility Study for the Project  
"Siu Ho Wan Treatment Works Extension"  
Location Plan for Pui O Section