SHEK O QUARRY CASTING BASIN

ENVIRONMENTAL IMPACT ASSESSMENT

EXECUTIVE SUMMARY

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1 INTRODUCTION

It has been proposed that a casting basin be constructed within Shek O Quarry for the purpose of forming immersed-tube tunnel units for the Western Harbour Crossing (WHC).

The purpose of this Environmental Impact Assessment is to provide information on the nature and extent of environmental impacts arising from the formation and operation of the proposed casting basin and from all other activities taking place concurrently at Shek O Quarry to evaluate cumulative areas of overlap between quarry and casting basin operations.

2 SITE DESCRIPTION AND OPERATIONS

Shek O Quarry is located on the western side of the D'Aguilar Peninsula facing Stanley and presently covers an area of approximately 35 hectares (Figure 1). Quarry operations extend from the Shek O Road to the coast where a barging facility is located.

The quarry abutts the Shek O Country Park and under rehabilitation proposals submitted to the Government by the quarry operator ("Preliminary Report for Development and Landscape Restoration") the quarry will commence operations on the country park side of Shek O road in order to reduce the existing slope and to achieve the final land form proposed under the rehabilitation scheme. On completion of rehabilitation, the site will be returned to the Country Park (in approximately 12 years).

The nearest village is 400 m distant at To Tei Wan (population approximately 15) and the area in general has a very low population and poor coastal access. The inshore area adjacent to To Tei Wan is classed as an inshore recreation area, and close to the southeast boundary of the proposed quarrying area is the Cape D'Aguilar Site of Special Scientific Interest (SSSI).

The proposed casting basin and infrastructure will occupy a site of approximately 14 hectares wholly within the base of the existing quarry. Two basins will be formed; one for casting and a smaller basin for storing the formed sections prior to removal from site. Each basin will have a connecting channel with the sea.

The construction of the immersed tube tunnel requires that the site be occupied for approximately three years. Prior to the channels being opened, a cofferdam will be constructed up to approximately 40m offshore to provide protection to the marine environment from blasting and dredging effects. Dredging will be relatively small scale with a maximum of 15,000 - 30,000 m^3 of sediment removed, to a maximum depth of -8m PD, as the water depth in Tai Tam Bay adjacent to the casting basin is adequate for the formed sections to be floated out.

Raw materials will be brought in by road and sea. Cement and Pulverised Fuel Ash (PFA) will be delivered by road tanker and aggregate will originate from Shek O Quarry. Steel will be brought in by ship.

The formed tunnel units will be of reinforced concrete construction and each will be approximately 100 m in length. The units will be constructed in three batches of four units each. The first batch of four concrete units will be constructed in the basin prior to the connecting channel being excavated inside the cofferdam. This will minimise the amount of sea dredging required. The formed units will then be floated out of the basin, one of which will be towed directly to the WHC site and, for subsequent castings, the remaining three units will be stored in the smaller basin. The first batch of units may, however, be ready before the holding basin is available and these units will have to be stored in an area agreed by the Marine Department.

Following completion of the above operation, concrete caisson gates will be put into position to close the connecting channels and allow the basins to be pumped out ready for casting the next sections.

3 AIR QUALITY

Dust will be generated from concrete batching, materials handling, vehicle movements over unpaved site surfaces and wind erosion of exposed site areas. There will be no exposed stockpiles associated with the Casting Basin operations; aggregates will be stored in an enclosed bin, and cement and PFA will be stored in enclosed silos. In view of the isolated location of the site, vehicle emissions are not considered to be a key issue.

To Tei Wan Village is the closest inhabited area to the casting basin site and there are a number of other potential receivers, these are listed in Table 1 and shown in Figure 1.

Table 1 Locations of Other Potential Sensitive Receivers

Location	Distance from Site (km)
Ngan Hang Village	1.0
Tung Ah Pui Village	1.3
Shek O Village	1.3
Red Hill	1.3
Hok Tsui Village	1.3
Tung Ah Village	1.5
Turtle Cove	1.7
American Club	1.9
Lan Nai Wan Village	2.2
Stanley Town	2.2

In view of the distances of these receivers from the site, and the nature of the local topography, it is considered extremely unlikely that these areas will be subject to dust impact from the casting basin operation.

Baseline monitoring of present dust levels was conducted during the summer of 1993. Dust levels as measured at the quarry boundary were high, frequently in exceedance of the 24-hour average Air Quality Objective (AQO). Dust concentrations were recorded as decreasing at weekends when quarrying does not take place. The monitoring at To Tei Wan over the short period over which measurements were taken indicated that there were exceedances of the 24-hour average AQO for Total Suspended Particulates (TSP) at the village. High dust levels in this area are sometimes visually apparent by the presence of dust on structures in the village.

However, monitoring results may be subject to local interference or exceptional quarry operation activities. It should be noted that monitoring is indicative of the existing situation; this will improve with introduction of new quarry plant which will significantly reduce dust emissions in future.

Potential impacts from the casting basin operation were assessed by computer simulation dispersion modelling. The model predicted that there should be compliance with AQO's and guideline levels arising from the combined casting and quarry operations. The casting activity will only contribute a small percentage of the overall future dust levels. Additional mitigation measures implemented on installation of new plant at the quarry will further reduce the predicted dust levels by approximately 30%.

Although the casting operation will not be the major source of dust, mitigation should still be adopted to minimise dust generation. For a typical concrete batching plant, the use of filters on vents, regular watering, water sprays at vehicle loading points and partial or total enclosure of the truck loading area could reduce dust emission by the order of 90%.

4 NOISE ASSESSMENT

Noise will result from the use of powered mechanical equipment (PME) associated with the batching and casting operations. The topography of the site means that there is considerable shielding of the sensitive areas from the casting basin activity. Also, the trucks and some plant will operate below line of sight on the casting basin floor.

The sensitive receivers identified in relation to air quality would also be the closest receivers affected by noise from batching and casting. However, To Tei Wan is completely shielded from normal activity, although there may be some noise from dredging and placement of the cofferdam. Impacts of these latter activities at Red Hill and Stanley are not likely to be as noisy as normal site activities. Other receivers are typically 1-2 km away, where it is extremely unlikely that casting activities will be audible above normal prevailing background conditions.

Country Park visitors using the Hong Kong Trail are already subject to the impact of quarrying operations. Their exposure is limited in duration and is not expected to be worse as a result of Casting Basin operations.

Three days of continuous noise monitoring was undertaken at To Tei Wan Village as part of the baseline studies. The results follow a distinct pattern in that the higher noise levels all occurred during the evening period due to normal village activity, rather than quarry noise (quarrying operations cease at 7pm). The casting area will be fully shielded from To Tei Wan. On the basis of the results of the monitoring programme, it is considered that casting operations will not result in an increase in noise levels at the village.

Calculations of noise levels at sensitive receivers were based on the absolute worst case when all equipment operates simultaneously from one location on the site. On this basis it was calculated that noise from the casting activities would only be experienced at Red Hill, American Club and Stanley Town. The overall operational noise level (from the quarry and casting basin together) which will be experienced at Red Hill may exceed the day-time planning criteria but only by 1 dB(A) for the worst case. Nevertheless, the excessive cumulative operational noise will be predominantly contributed from the existing quarry and contribution from the casting basin will be negligible according to the EIA.

If night time working is required, it will be necessary to obtain a Construction Noise Permit to operate the casting facility. This assessment indicates that the night time criteria should be met at the Red Hill peninsula.

Noise mitigation is an inherent feature of the casting basin layout. The batching plant is orientated to present the least area to the sensitive receivers across Tai Tam Bay. The haul route from the batcher to the basin is located to the north of the basin so that the moving trucks are shielded by the natural topography. The ancillary works are located to the north of the basin, again in the most sheltered location.

5 MARINE WATER QUALITY

Topographically, the Bay is a confined basin with limited dispersive capacity. Nonetheless, the area is considered to be of acceptable water quality by the authors of the Territorial Development Strategy Environmental Study (1992).

Receivers most likely to be affected by any change in water quality in Tai Tam Bay include bathers, water sports enthusiasts, fishing activities and sedentary marine organisms. There are no official fish culture zones within Tai Tam Bay although other commercial fishing activities have the potential to be affected particularly if any enrichment of nutrients arises as a result of casting basin operations, leading to eutrophication and plankton blooms.

The nearest public beaches are adjacent to the quarry on the south side (accessed from the sea), at To Tei Wan (400 m north of the casting basins) and Stanley, 2.2 km west. There is a hobiecat sailing club and a canoe club based at To Tei Wan beach, and the Bay adjacent to To Tei Wan village is classified as an inshore recreation area.

Nutrient concentrations are low throughout the Bay but increase slightly towards its outer margin. This suggests that the source of nutrients lies outside of the Bay. No obvious seasonal variations in nutrient concentrations have been found. Faecal coliform bacteria numbers are low throughout Tai Tam Bay.

Sediments within the Bay are mainly composed of silt with a slight increase in particle size towards the outer bay. Total organic carbon of the sediment is relatively low but nitrogen and phosphorus are relatively enriched. Thus while the water quality within Tai Tam Bay is considered good, there is potential for eutrophication if nutrients are released from the sediments or are discharged into the bay. However, although Tai Tam Bay has potential for eutrophication, the present mean value of nitrogen for waters in the Bay suggests a reasonable safety margin in this respect.

Metal concentrations in the sediments were relatively constant throughout the Bay and were within the concentration range of Class A sediments according to Works Branch Technical Circular 9/92 which therefore classifies the sediments as uncontaminated.

Potential impacts on water quality from site works arise from the following :

- *Rainwater run-off.* The impact of run-off will be the same as at present, if not slightly reduced due to the casting basin trapping some of the run-off, which will pass to settlement pits prior to discharge to the Bay.

- *Dredging.* Dredging of marine sediments will be limited to the preparation of foundations for a cofferdam. The volume of sediment to be removed is small, approximately 15,000 to 30,000 m^3 and dredging will therefore be of short duration. Dredging outside of the cofferdam will not be necessary as existing water depths are adequate for floating out formed tunnel sections.

- *Cofferdam construction.* The cofferdam will be constructed from marine sand and will not result in significant quantities of suspended sediment due to the coarse nature of the sand which will aid rapid settlement.

- *Sewage.* All sewage is to be removed from the site and delivered to an existing sewage treatment works. There will therefore not be any input of nutrients to the Bay from this source.

- *Concrete curing water.* The maximum volume of curing water is estimated as 10 m^3 per day per section and will contain residual form oil. The curing water will drain through the basin floor to be pumped to an oil-water separator and settlement tank prior to discharge to the Bay. Recovered oil will be collected by licensed collectors for disposal.

- *Floating debris* During the flooding of the casting basin with seawater no escape of debris could occur as the cofferdam will still be in place. Prior to opening the cofferdam, water inside the basin will be skimmed of any debris and oil. The cofferdam will only be opened with the approval of the Site Engineer.

All discharges must comply with the Technical Memorandum on Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters under licence from EPD.

6 MARINE ECOLOGY

Tai Tam Bay supports a diverse mixed community of pelagic and demersal species which includes large numbers of juvenile fish and crabs. The area of the Bay is approximately 8 km^2 and impacts from the casting basin will be restricted to an area of foreshore of approximately 700 m^2, relating to the cofferdam and temporary jetty construction. This equates to less than 0.01% of the area of the Bay. Although the juvenile fish and crabs represent species commercially fished offshore, the indirect impact of casting basin operations in terms of the offshore fishery via the juveniles in Tai Tam Bay will therefore be negligible.

The communities found on the shores in the vicinity of Shek O Quarry appear to be similar to those described elsewhere in Tai Tam Bay and the D'Aguilar Peninsula (Morton and Morton, 1983). As such, they do not represent unusual or outstanding communities. The beaches close to the quarry were of clean medium-to-coarse, well-sorted sand, which are generally very mobile and thus sparsely populated, characteristically by the bivalve *Donax*.

Potential impacts on marine ecology from site works arise from the following :

- *Dredging.* Physical removal of organisms will result from dredging but it is anticipated that recolonisation will take place within a relatively short space of time. Increases in suspended sediments will occur during excavation of the berth but the volume of sediment to be removed is very small. These activities are not expected to create significant adverse effects as they will be confined to a small area and water currents are low, minimising dispersion. Sediments in the study area fall within the category of Class A with respect to contamination and are unlikely to create problems arising from the release of metals into the water column during dredging.

- *Cofferdam construction.* Formation of the cofferdam from marine sands across the entrances of the basins will cause the death of organisms by smothering. The maximum area likely to be affected by smothering is estimated as 300 m^2 which is the footprint of the cofferdam. The cofferdam will be in place for approximately one year after which time it will be removed. Following removal of the sand dam the sediments will recolonise.

7 TERRESTRIAL ECOLOGY

The only terrestrial ecology issues for the proposed casting basin lie outside the quarry site. They are in the surrounding area where the proximity of the site to the Shek O Country Park and D'Aguilar Site of Special Scientific Interest should be taken into consideration. There are no existing habitats and species of interest within the quarry site.

Proposals submitted by the quarry operators to restore and landscape Shek O Quarry (Shek O Quarry Preliminary Report for Development and Landscape Restoration) would result in the removal of approximately 9 hectares of land within the Shek O Country Park. No detailed ecological assessment was carried out in 1991 when plans for the restoration of the quarry were drawn up but a detailed description of vegetation in the area was provided. As part of this casting basin report, a preliminary ecological survey of this area has been undertaken.

In ecological terms, the area to the north of the Shek O Road is of low conservation significance. However, this is not true of the area to the southeast of the quarry face which supports well developed natural tall scrub/woodland immediately adjacent to the D'Aguilar Peninsula SSSI and is part of that area proposed for excision under the

rehabilitation contract (see Figure 2). This area is of high conservation significance and therefore, it would be detrimental to the ecology of the area if this land was removed. It is therefore recommended that the current proposals are reassessed and that alternatives which are most sensitive to the ecology of the area are investigated. A buffer zone between the quarry restoration and the SSSI boundary would protect the viability and long-term future of the SSSI.

The proximity of the Country Park and Site of Special Scientific Interest are not seen as major constraints to the casting basin provided careful planning and consideration of these issues is given to the casting basin in general and to the south-eastern boundary of the quarry in particular.

8 WASTE ARISINGS

The continued quarrying will generate little waste, with future arisings unlikely to be significantly more than is produced from existing quarry operations. The potential key impacts from the casting basin have been identified as the loss of material from flooding of the casting basin and the discharge of sewage effluent.

Careful cleaning of material from the basin will be necessary prior to each flooding. Control of this will require specified contract conditions and the presence of an independent checker.

It is proposed to tanker all sewage generated from the site to an off site treatment works.

9 VISUAL IMPACT

As the casting basin will be predominantly below ground the visual impact of the working area will be minimal. Gross visual impact will therefore remain much as at present for the quarry operations. The nearest receptors from which the quarry can be viewed are Red Hill and Stanley, 1.3km and 2.2km distant respectively. To Tai Wan, 400m north of the quarry is screened from it by a high ridge. The quarry is visible from To Tei Wan beach only from the low water mark or by crossing the rocks which form a small headland at the south end of the beach. Settlements on the west of the D'Aguilar Peninsula are screened by the ridge of the Peninsula.

Night time operations will require lighting to be provided around the Casting Basin. Such lighting will be directed downwards into the Basin and will not be directed across the Bay towards residential areas. Although the lighting will be visible from the Stanley Peninsula, it is not considered that this will be visually intrusive.

10 ENVIRONMENTAL MONITORING AND AUDIT

An Environmental Monitoring and Audit Manual has been prepared in discussion with EPD which sets out a programme for monitoring air, noise and water quality and terrestrial ecology. Some of the latter requirements will also be undertaken by the quarry operators.

Monitoring stations have been proposed together with sampling frequencies and reporting requirements. Action plans have been prepared in the event of deteriorating environmental quality which require the casting basin operators to take mitigating steps in consultation with EPD.

The monitoring programme will be undertaken by an independent Consultant whose work will be subject to audit by a third party.

11 CONCLUSIONS

The construction and operation of a casting basin in Shek O Quarry will result in relatively minor impacts on the environment and will not significantly increase the environmental impact of the existing quarry operations. With suitable mitigation measures and control of site activities based on an Environmental Monitoring and Audit Manual, the impacts of the individual and cumulative activities of the casting basin and quarry should not result in a deterioration in current environmental standards.

Assessments of air and noise impacts have been based on conservative data and therefore represent worst case scenarios. On this basis, the only possible cause for concern would be night working. As the operators propose to work primarily on dayshift, with night time working until 1.00 am or 2.00 am only required to finish-off concrete pours, most plant equipment would not be operational at that time and night time noise will be significantly lower than during the day. Night working would only be considered late in the fabrication programme if deadlines were likely to overrun. In such an eventuality, special attention and re-evaluation of requirements would be required. A Construction Noise Permit would be required for night-time work and the Casting Basin operator would have to comply with the conditions of the Permit.

In terms of impacts relating to work outside of the casting basin, the prime concern is the effect of proposed land-take areas in relation to the quarry rehabilitation programme, in particular, land between the present quarry boundary and the D'Aguilar Peninsula SSSI to the south. This area of land, in addition to being of scientific interest in its own right, is important in providing a buffer zone between the quarry and the SSSI. Alternative viable options for the rehabilitation plans should be considered in discussion between the quarry operators and government. At the same time, opportunities for wildlife enhancement by retaining and forming vertical rock faces in the south of the quarry should be considered.

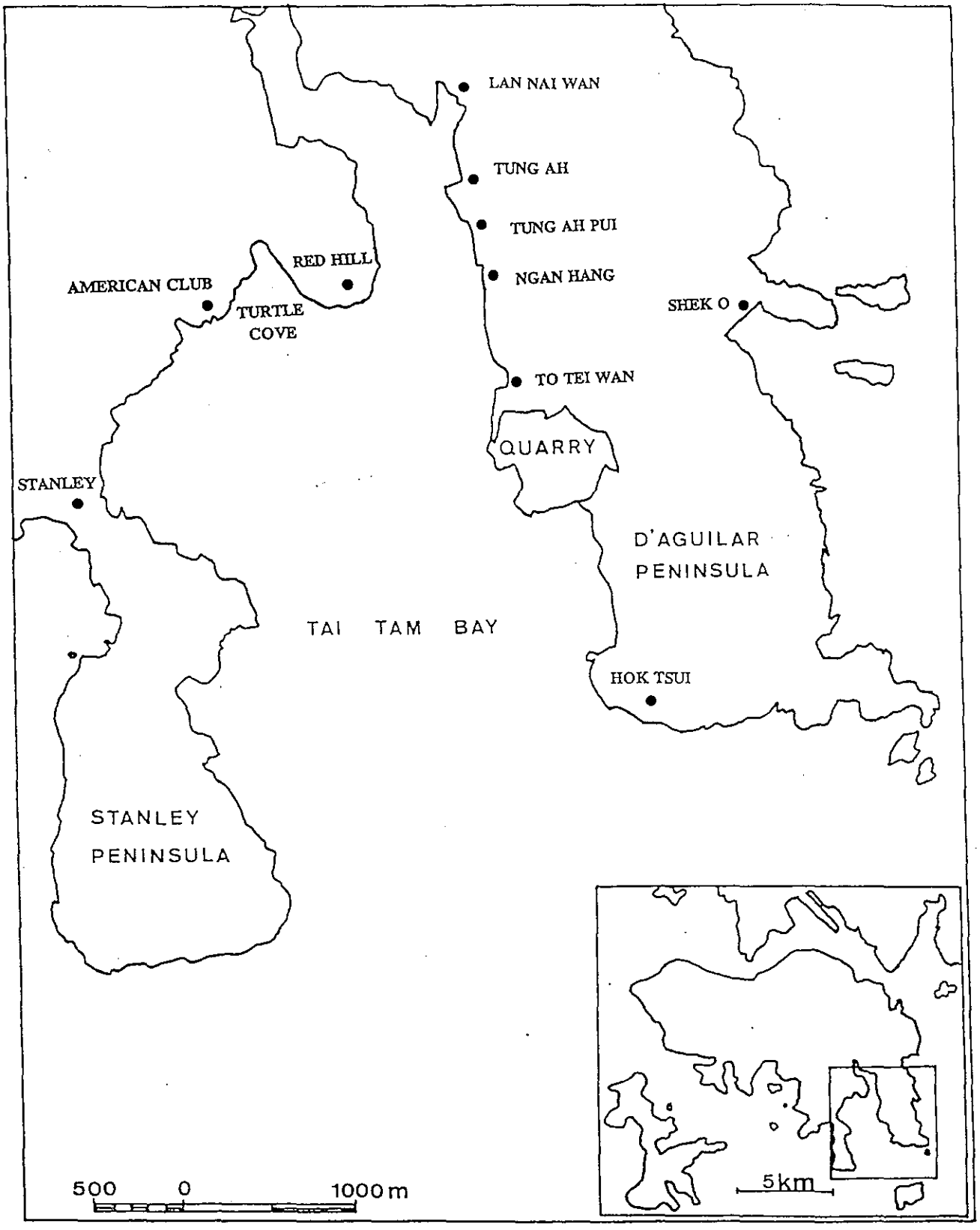


Figure 1 Location of Shek O Quarry

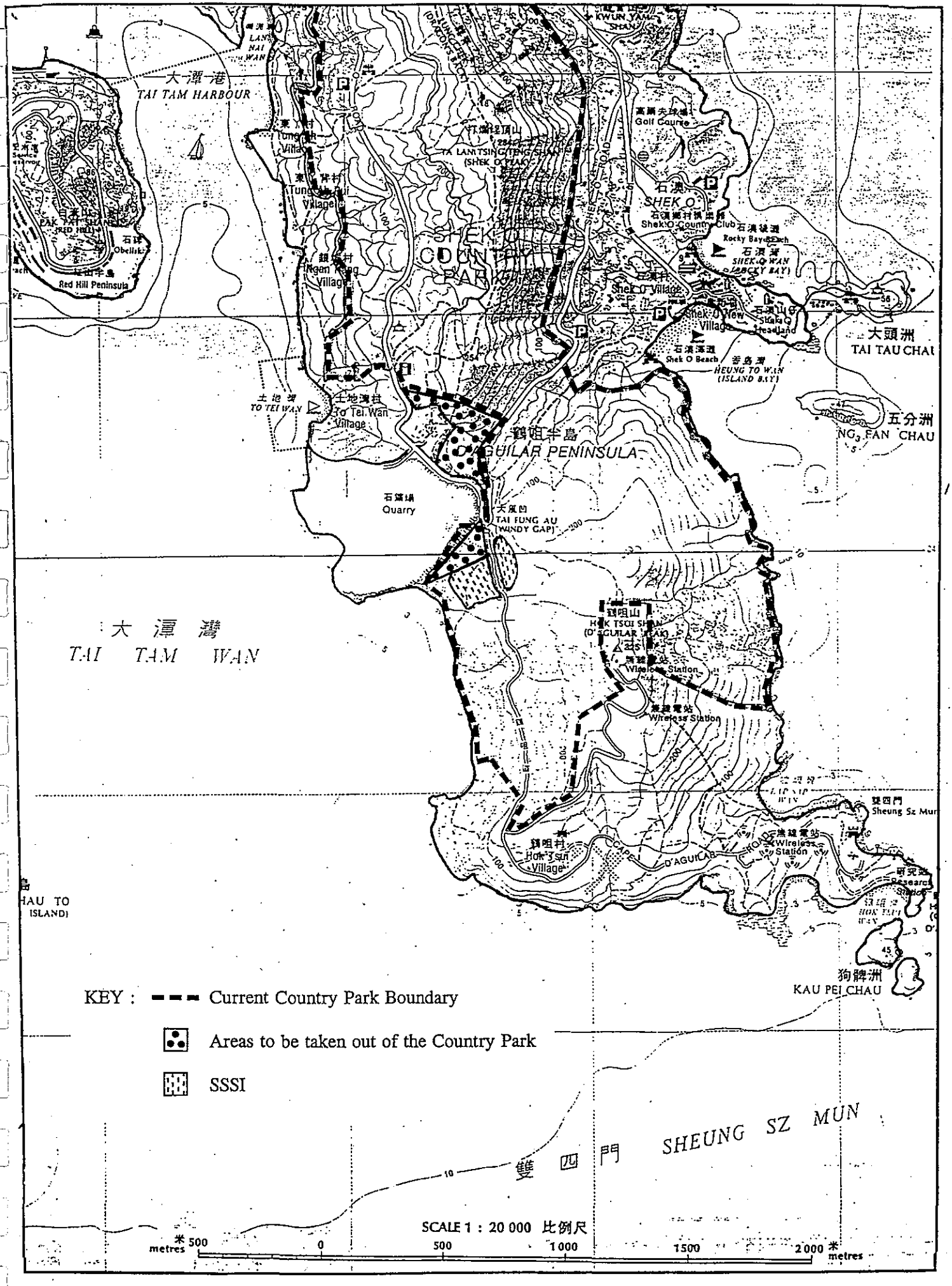


Figure 2 **Current and Proposed Future Shek O Country Park Boundaries Relation to D'Aguilar Peninsula SSSI and Existing Quarry Face**

石澳石礦場鑄件盆地

環境影響評估

執行摘要

石澳石礦場鑄件盆地
環境影響評估
執行摘要

1. 引言

爲興建西區過海隧道(西隧)，一個用作鑄造隧道構件的盆地(鑄件盆地)有需要被設立，而石澳石礦場是建議中的地點。

本環境影響評估旨在提供有關該鑄件盆地在建造及操作期間所帶來的環境影響。另外亦會評估在同期間於石澳礦場上進行的所有其他活動而產生的累積影響。

2. 地盆概述及操作

石澳礦場位於鶴咀半島以西，面向赤柱，現時佔地約三十五公頃(圖一)。採礦活動自石澳道起向西伸延至海邊設有供躉船起卸用之設施的地方。

石澳礦場毗連石澳郊野公園。根據石礦場經營者向政府提交的修復工程建議(發展及景觀修復初步報告)，採礦活動將在石澳道近郊野公園處展開，其目的在於減低現時斜坡之斜度以達致在修復計劃中所建議的最終地形。在是項修復工程駿工時(約在十二年內)，該工地將重新納入郊野公園之範圍。

離礦場約四百米的土地灣是最接近工地的村落；該處人口稠疏(約爲十五人)，亦缺乏碼頭設施。在土地灣附近的沿岸水域被列爲沿岸康樂地區；另外在擬建石礦場東南面的地區，亦被列爲鶴咀特別具科學研究價值的地點(SSSI)。

擬建之鑄件盆地及有關設施將建於現有的石礦場內，佔地約十四公頃。兩個盆地將被挖掘，一個用作鑄造構件，而另一個較細小的盆地則用作擺放已完成及等待被運走的隧道構件。兩個盆地均有渠道接連往海上。

建造所有隧道構件需佔用該工地約三年時間。爲避免海洋環境受爆石及挖泥工程影響，在挖掘渠道前，會在離岸約四十米處建造一圍堰。因爲大潭灣附近水深足夠讓隧道構件被拖出，故所涉及的挖泥數量並不大；只需在近岸處挖至-8米PD的水深，及最多約需挖一萬五千至三萬立方米的沉積土。

建築原料將會由陸路及水路運往工地。英泥及煤灰會由貨車運送，碎石將由石礦場本身提供；而鋼料則經由躉船運送。

隧道構件每節約長一百米，以鋼筋水泥鑄成。構件會分三批鑄造，每批包括四件構件。在圍堰內之挖掘渠道工程施工前，第一批的四件混凝土構件將會在盆地內鑄造。這樣會減少在海中挖泥的數量。當鑄成後，構件會被拖出盆地。其中一件會直接被拖往西隧工地，而餘下的構件會存放在較細的盆地內，以騰出空位用作鑄造下一批構件。由於在完成第一批構件時，存放用的盆地可能尚未完成，故該批的三件構件須要存放於一個經海事署同意的地點。

在完成上述過程後，在盆地與渠道的接口處會加上一度以混凝土沉箱建成的閘門以封閉連接往海上的渠道，盆地內的海水會被泵出，以便鑄造另一批構件。

3. 空氣質素

製造混凝土、搬運建築材料、車輛在沒舖設路面的道路上行駛及露天工地的風化作用等過程，均會產生塵埃。鑄件盆地的操作將不會有物料存放在露天的地方：碎石會放在密封的箱內，而英泥及煤灰則會儲存在密封的儲存塔內。鑑於本工地位處偏僻，所以因車輛排放物而帶來的影響將不會嚴重。

土地灣是離工地最近而有人居住的地方，另外附表一及圖一亦列出區內其他可能受影響的地方。

附表一 區內其他可能受影響地方的位置

地點	距離工地(千米)
銀坑村	1
東丫背村	1.3
石澳村	1.3
紅山半島	1.3
鶴咀村	1.3
東丫村	1.5
龜背灣	1.7
美國會所	1.9
爛泥灣村	2.2
赤柱村	2.2

鑑於這些對污染感應強的地方與工地有一定距離，加上附近的天然地形，相信鑄件盆地的操作會對這些地方產生塵埃影響的機會不大。

基線塵埃水平的監察已於1993年夏天完成。結果顯示在石礦場邊界的塵埃水平偏高；經常高於廿四小時平均的空氣質素指標。在週末，當沒有採礦活動時，

量度出的塵埃水平有下降的趨勢。在土地灣的短期監察顯示該處的廿四小時平均總懸浮粒子量超出空氣質素指標水平。從村落建築物上所積聚的灰塵可明顯看出當地的塵埃水平頗高。

但監察的結果亦可能受到附近因素的扞擾或不尋常的採礦活動的影響。值得注意的是監察結果可以反映出現時的情況；而當新的採礦機械裝置後，預料未來的塵埃排放將可顯著地減少。

電腦模擬擴散系統已被用作評估由鑄件盆地所引致的潛在影響。模擬結果顯示自石礦場及鑄件盆地所排放的累積塵埃，預料可符合空氣質素指標的水平。而由鑄件盆地所引致的塵埃則只佔將來塵埃總數的少部份。將在裝置新的採礦機械時增設的緩和措施，足使預期的塵埃水平進一步減少達百份之三十。

雖然鑄件盆地的操作並不是塵埃的主要來源，但仍然有需要採取緩和措施以求盡量減少塵埃的產生。以製造混凝土的裝置爲例，在喉管內加上過濾網、在工地及貨車起卸地區洒水、將起卸地區作局部或完全遮蓋等，約可減低達百份之九十的塵埃產生。

4. 噪音評估

鑄造構件及製造混凝土所使用的機動設備皆是噪音的來源。工地的地形爲鑄件盆地及對噪音感應強的地方之間提供一道有效的屏障。另外，工地的車輛及部份的機械將會在盆地的底部操作，低於視線之外。

在空氣質素評估中所訂立的感應強的地方亦是最接近工地而受操作噪音影響的地方。除了挖泥及建造圍堰工程所可能產生的噪音外，由於地形關係，土地灣將被阻隔於平常工程所產生的噪音；而在紅山半島及赤柱，上述工程的噪音亦不及在盆地內的其他工程活動所發出的噪音。除土地灣外，其餘感應強的地方均離工地一至二千米，因此從正常本底噪音中察覺出自鑄件盆地所產生噪音的機會很微。

現時使用港島徑及郊野公園的人仕已受到採礦活動的影響。這些影響均屬短暫性質，而預料鑄件盆地的操作不會增加現時的噪音水平。

連續三天的噪音監察已在土地灣村進行，作爲基線噪音水平研究的一部份。監察結果顯示較高的噪音水平全部發生在傍晚時候，而噪音主要是來自村內之活動，不是來自石礦場(採礦活動在晚上七時停止)。土地灣及建議之鑄件盆地將完全被地形遮隔；從本底噪音研究結果可以確定鑄件盆地的運作將不會增加在村內的噪音水平。

在進行噪音評估時，是根據「最惡劣的情況」來計算；即是假設所有在工地上的機械均同時在同一地點操作。根據這項假設，評估結果顯示只有紅山半島、美國俱樂部及赤柱村會感到由工地發出的噪音。而在紅山半島，整體的操作噪音(即來自石礦場與及鑄件盆地)預算會在假設最惡劣情況下超過日間的規劃標準1分貝。但是根據本評估研究，過量的累積操作噪音主要是來自現有的採礦活動，相對而言，鑄件盆地操作時的噪音將會十分輕微。

如果鑄件盆地須要進行晚間操作，則事先需要申請建築噪音許可証。本評估顯示在紅山半島的噪音水平將可符合晚間的噪音標準。

鑄件盆地的位置本身已是有效的噪音緩減措施。混凝土製造設施將適當地放置，以盡量減少面向大潭灣對岸的感應強的地方。接連鑄件盆地的車路將會位於盆地的北面，因此進出盆地的車輛會被地形所遮隔。而其他的輔助設施亦會放置在盆地的北面。

5. 海洋水質

大潭灣屬於被地形限制的港灣，只有有限的水流擴散能力。然而，根據拓展署的「策略性環境研究(1992)」指出，該區的水質被列爲可接受。

因大潭灣內水質改變而受影響的包括泳客、參與水上運動的人仕、捕魚活動及生活於該水域內的生物等。大潭灣內並沒有認可的養魚區，但因鑄件盆地工序而使水中養份增加，引致海水富營養化及過量的浮游生物繁殖等過程，對區內的捕魚活動將有潛在的影響。

最接近工地的公眾泳灘包括礦場以南的海灘(須由水路前往)、土地灣(鑄件盆地以北四百米)、以及工地以西二千二百米的赤柱泳灘。大潭灣近土地灣村附近的水域被列作沿岸康樂地區；該地區有一個風帆會及一個獨木舟會以土地灣作爲會址。

在大潭灣內的海水含養量低，但在灣外處有輕微增加；這表示營養物來自海灣外。水中的含養量沒有明顯的季候性變化。大潭灣內的大腸桿菌數量普遍偏低。

大潭灣內的沉積物主要是海泥，在近外灣的地方海泥比較粗糙。在沉積物中所含的總有機炭成份偏低，而氮及硫的含量則比較高。所以大潭灣內的水質可算是良好的。但當有營養物排放到水中或是從沉積物中釋放出來時，仍是有富營養化的潛在可能。雖然如此，灣內水中的平均含氮量顯示這可能性不大。

在大潭灣內沉積物的金屬含量很平均，根據工務科的技術通告9/92，灣內的沉積物均屬甲級，即爲未受污染的沉積物。

有可能由工程產生的水質污染來源包括：

- 雨水徑流：雨水徑流的影響應比現有情況輕微減少，因部份雨水會在鑄件盆地被收集，經由沉澱池再排出海灣。

- 挖掘海泥：挖掘海底沉積物將只局限於進行圍堰的地基工程，約需挖走一萬五千至三萬立方米的沉積物，因此挖掘海泥所需的時間將會很短。因爲灣內水深足以容許隧道組件被拖出，所以不須要在圍堰以外的水域挖泥。

- 建造圍堰：圍堰本身將以海沙堆成。因海沙的粒子較粗糙而且很快沉澱，所以預期在水中不會形成大量的懸浮物。

- 污水：所有在工地內的污水將運往現有的污水處理廠處理，因此將不會有任何污水排放往大潭灣內。

- 混凝土用水：在鑄造混凝土時將須要大量灑水，每一組件每日約須灑十立方米水。這些水將帶有殘留的模油。這些徑流會在盆地底部收集，經由隔油池及沉澱池，再排放出海灣。隔出的油脂，會經由持牌的承建商收集及處理。

- 漂浮垃圾:當海水被注入盆地時，圍堰仍未拆除，因此不會有垃圾漂浮出圍堰之外。在拆去圍堰前，盆地內漂浮垃圾及油浮會被隔去。圍堰只可以在獲得地盤工程司的准許後方可拆除。

所有排放入大潭灣的污水必需經環境保護署發放牌照以及符合技術備忘錄-排入去水渠及污水渠系統、內陸及海岸水域的污水標準才可排放。

6. 海洋生態

大潭灣內生活著各種類的海洋及海底生物、其中包括了大量的幼魚及蟹類。大潭灣的面積約爲八平方千米,而受鑄件盆地因建造圍堰及臨時碼頭而影響的面積約爲七百平方米(約只佔海灣總面積的萬份之一)，因此雖然幼魚及蟹類是沿岸的商業魚穫，由鑄件盆地所引致對沿岸捕魚業的間接影響並不嚴重。

在石澳礦場附近岸邊所生活的生物，與在大潭灣及鶴咀半島其他地方所發現的無異(敘述於Morton and Morton, 1983)，並沒有不尋常或特別的生物。在礦場附近的海灘，沙粒屬於中至粗，而且大小的沙粒明顯地分隔。這類沙灘的流動性較大，因此只有很少生物在灘上生活，而雙貝類動物是其中的主要生物。

由工程產生對海洋生態的潛在影響包括：

- 挖掘海泥：海洋生物會在挖海泥時一併被挖走，但相信在很短時間內它們可重新在原處繁殖。在挖掘臨時碼頭時會增加水中懸浮物，但因爲所挖的數量很少，估計這工序不會帶來很大的影響。加上區內水流緩慢，減少擴散的範圍，所以有關的影響會是很局部的。另外，研究範圍內沉積物的污染程度被列爲甲級，表示在挖泥過程中，在沉積物中釋放出金屬物的機會很微。

- 圍堰建造：在盆地的出口建造圍堰會令該處的生物因窒息而死亡。估計受影響的地方包括圍堰的範圍，最大約爲三百平方米。圍堰約會在一年後拆除，屆時水中生物將會在海床重新繁殖。

7. 陸上生態

唯一可能受擬建之鑄件盆地影響的陸上生態位於石礦場以外的石澳郊野公園及鶴咀特別具科學研究價值的地點。現時在石礦場內並沒有存在的生境和有價值的生物種類。

在石礦場經營者向政府提交的礦場修復建議中(石澳礦場發展及景觀修復初步報告)，石澳郊野公園內約九公頃的用地將被移走。在該礦場修復研究於九一年進行時，並沒有包括詳細的生態評估，但曾對區內生長之植物作出詳細的描述。初步的陸上生態監察已在本研究內進行，作爲環境影響評估的一部份。

就陸上生態而言，石澳道以北的地區只有很低的保存價值。但在礦場的東南面，鶴咀特別具科學研究價值的地點旁邊，則生長著天然的叢林及樹林。該處將是修復工程的工地範圍內(見圖二)。該處有很高的保存價值；因此若被移去，則對該區的生態有很大的影響。所以建議將現時的擬建的修復工程重新評估，以研究出其他方法使對生態的影響減少。在石礦場及SSSI之間建立一個緩衝區可以保護區內之生態及SSSI的長遠發展。

只要在規劃時顧及到對附近生態的影響，特別是礦場東南面的地區；鄰近郊野公園及SSSI並不會對建議中的鑄件盆地構成很大的限制。

8. 產生的廢料

預算石礦場工程將產生少量廢料，而將來廢料產量將會與目前石礦場工程所產生的數量相約。從鑄件盆地產生的廢料主要來自隨盆地積水時排出的廢物及污水的排放。

在每次盆地積水時，必須小心清理盆地內的積水。爲控制這項工序，將會在工程合約內加入特別條款，另外會聘請獨立的人員在場查核。

所有在工地內所產生的污水將會被運往工地以外加以處理。

9. 景觀影響

因爲鑄件盆地將建在水平以下，所以對景觀的影響十分輕微，而整體的景觀影響會與現時石礦場相近。最近而可以望向石礦場的地方包括紅山半島及赤柱，離石礦場分別爲一千三百米及二千二百米。礦場以北四百米的土地灣因有一山脊阻隔，所以只可在退潮時在海邊或攀過海灘以南的石咀才可以看見石礦場。鶴咀半島以西的地區均被半島本身的山脊所擋隔。

在鑄件盆地的晚間操作將需要照明。照明的燈光會向下照射到盆地上，而不會射向大潭灣對岸的住宅區。雖然在赤柱半島上可以看到這些燈光，但相信不會構成視覺上的影響。

10. 環境監察及審核

在與環保署討論後，空氣質素、噪音、水質及陸上生態的監察計劃已列明在「環境監察及審核手冊」之內。建議的監察站位置及採樣次數和報告範圍亦被列明。該手冊註明在發現環境受污染時，鑄件盆地的使用者應在諮詢環保署的意見後，採取適當的緩和措施。

監察計劃將由一獨立的顧問公司執行，而該顧問公司的工作亦會另外受到審核。

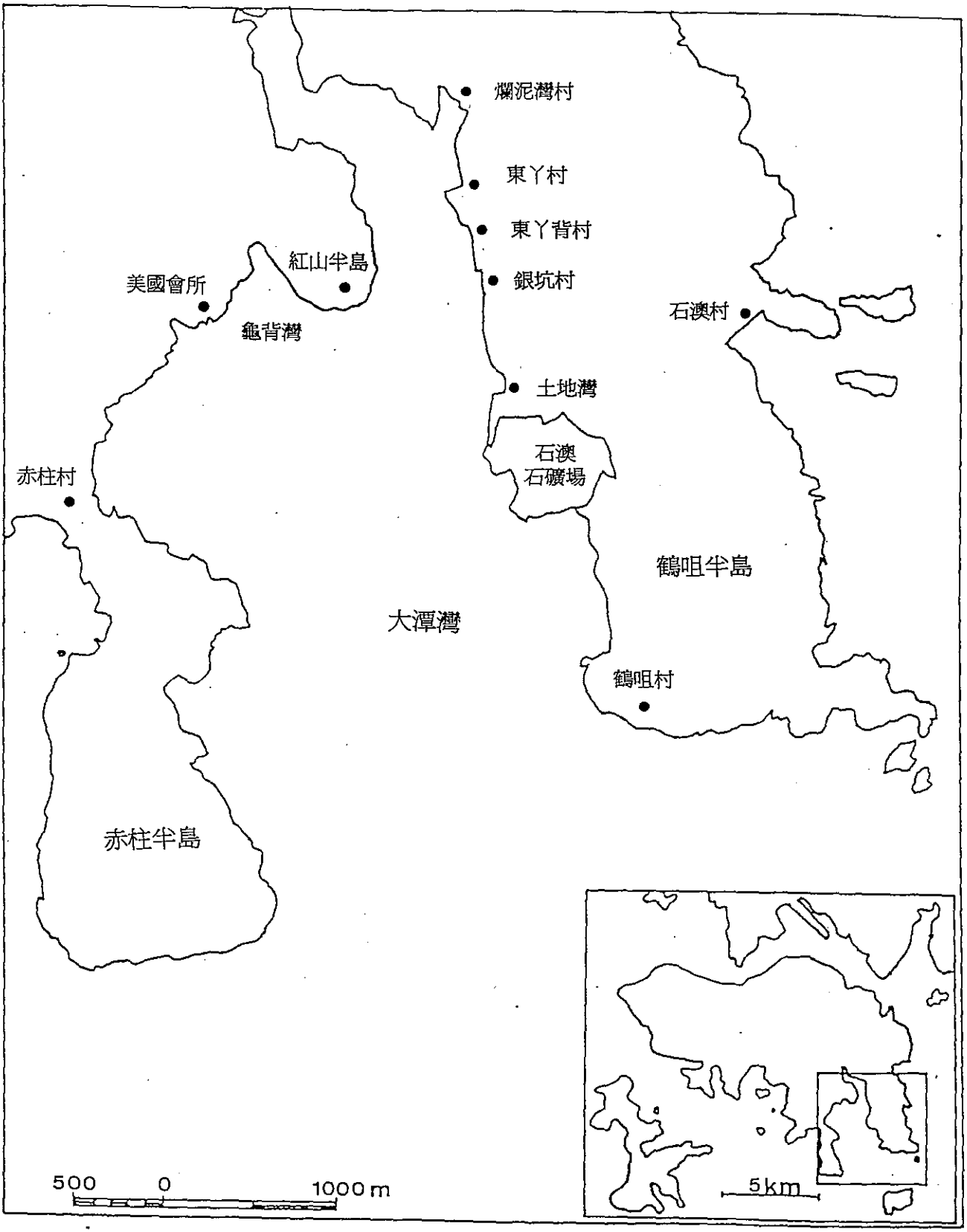
11. 總結

建造及操作建議中的鑄件盆地將對附近環境帶來的影響不大；預料不會增加現時石礦場運作時候的影響。根據「環境監察及審核手冊」內對工地活動的監管以及執行合適的緩和措施，由鑄件盆地和石礦場引起的個別及累積影響，將不會使目前的環境質素變壞。

因本研究的空氣污染及噪音評估皆基於保守的數據以代表「最惡劣的情況」，所以唯一值得關注的是晚間工作的影響。盆地操作者基本上計劃只在日間進行工程。傾倒混凝土可能會延至凌晨一時或二時才完成，但其他大部份的機械會停止操作，所以晚間的噪音會比日間顯著地減少。在施工後期，如未能趕及預

期進度，才會考慮在晚間施工。但如眞的須要在晚間施工，操作者需向環保署申請建築噪音許可証，而亦需要符合許可証上列明的條件。

就鑄件盆地以外的工程來說，在石礦場修復計劃中建議收回礦場以南，接連礦場及SSSI的土地，是最值得關注的。該地除了本身具科學研究價值外，亦是礦場及SSSI之間的緩衝區。石礦場經營者應在與政府相討修復計劃時考慮保留該緩衝區。同時在礦場以南應考慮保存及設立垂直的崖壁，以爲野生動物提供棲息的機會。


爛泥灣村
東丫村
東丫背村
銀坑村
紅山半島
美國會所
龜背灣
石澳村
土地灣
石澳
石礦場
赤柱村
鶴咀半島
大潭灣
鶴咀村
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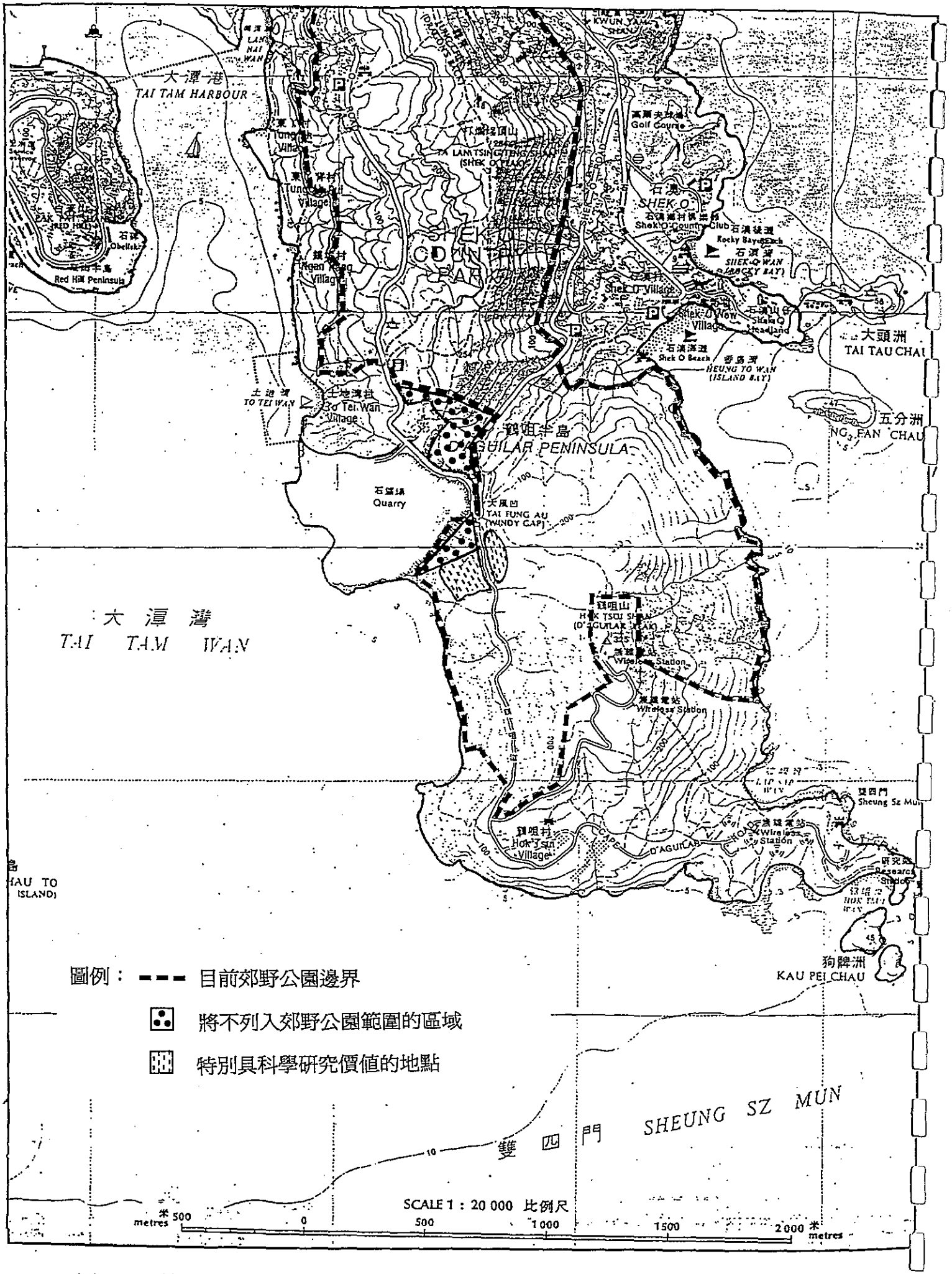
圖一　石澳石礦場的位置



圖二　目前及建議中將來的石澳郊野公園邊界與鶴咀特別具科學研究價值地點和現有採石面的關係