Introduction:	This Project Profile has been prepared by ERM-Hong Kong, Ltd for China Light and Power Company Limited (CLP), in accordance with Annex 1 of the Technical Memorandum (TM) to the Environmental Impact Assessment Ordinance (Cap. 499) (hereafter refers to as EIAO), for the application for permission to apply directly for Environmental Permit.
Project Title:	Felling of 5 Power Station Chimneys at Tsing Yi Power Station
Purpose and Nature of the Project:	Demolish and remove all chimneys structure associated with the former oil-fired power station using Explosive Engineering within the boundary shown in Figure 1 and reinstate land, as part of the overall demolition project, to the satisfaction of the Government of HKSAR prior to returning to the Government.
Name of Project Proponent:	Castle Peak Power Company Limited (CAPCO) with China Light and Power Company Limited as Project Management.
Location and Scale of Project and History of Site:	The site is located on reclaimed land on the south side of Tsing Yi Island as identified in Figure 2. The site was established by CLP (CAPCO) for the purpose of building a power station and therefore has no previous land users and uses.
Name and Telephone Number of Contact Persons:	
Outline of Planning and Implementation Programme:	CLP shall employ an Explosive Engineering company through the main civil contractor to carry out the demolition of the chimneys structures. The work will start immediately when all the relevant permits and approvals are granted. (See Figure 3 - TYPS Civil Demolition Project Tentative Programme for Chimney Demolition by Explosive Engineering) The demolition work, including clearance of the site, has to be completed by 31 December 1998 in time to return the site to the Government of the HKSAR.

1. Background

The site of the Tsing Yi Power Station originally under a land lease which expired on 27 June 1997, has been extended until June 2047. China Light & Power Company Limited (CLP) will return part of the site to the Government and retain part of the site (see Figure 1). Before the Government takes over the site, CLP are required to demolish all above ground civil structures and reinstate the land to the satisfaction of the Government.

An Environmental Impact Assessment (EIA) report for the Tsing Yi Power Station Demolition: Non-Blasting Option[1] has been submitted to the Environmental Protection Department in December 1997 and was endorsed by the Advisory Committee on the Environment in February 1998. The findings of the EIA report are still relevant.

The project is an exempted designated project under Section 9(3) of the EIAO as the demolition plan was approved by the Building Authority under the Buildings Ordinance (Cap. 123) before the EIAO came into operation in April 1998. The demolition works started in March 1998 and about 26% has been completed as of 23 June 1998. By mid August 1998, except the chimneys, most of the buildings will have been demolished.

In order to reduce the hazard of people working at heights for prolonged period, it is proposed to demolish the five Tsing Yi Power Station chimneys through directional felling by the use of controlled structural weakening using explosive as oppose to the original manual demolition method. The manual method would require a large number of workers to frequently climb up the 5 chimneys to erect scaffolding and operate concrete breaking equipment at height over a 5.5 month period, during the variable weather extremes of the summer season, thus exposing them to the potential risks of falling from height and of injury caused by falling material. According to UK's Health & Safety Commission's statistics, 24% of employee fatal accidents in the UK during 1995/96 were due to falling from a height and further 12% were due to being struck by moving/falling objects. A risk assessment of the demolition of chimneys by Explosive Engineering is carried out by DNV Technica and the report is included in *Annex A* (as a separate volume).

The revised demolition plan for the chimneys' structures has been submitted to the Building Authority for approval. A separate report[2] has been produced to address the potential air quality impact for the demolition of chimneys by Explosive Engineering and is attached in *Annex B*.

This Project Profile for the Felling of 5 Chimneys at Tsing Yi Power Station is prepared in accordance with Annex 1 of the Technical Memorandum to the EIAO, making reference to previously endorsed EIA where appropriate, for the application for permission to apply directly for Environmental Permit.

2. Description of the Demolition Process by Explosive Engineering

Five chimneys of the decommissioned Tsing Yi Power Station will be demolished using directional felling by the use of controlled structural weakening using explosive planted at the bottom of the chimneys.

[1] Demolition of Tsing Yi Power Station - Non-Blasting Option: Volume II - Main Report, ERM, 1997
[2] Demolition of Tsing Yi Power Station - Controlled Explosion: Air Quality Assessment, ERM, 1998

3. Major Elements of the Surrounding Environment

3.1 *Sensitive Receivers*

The sensitive receivers identified in the previous EIA report for the Tsing Yi Power Plant are Mobil main administration building, Esso administration office, Esso laboratory/engineers office, Tien Chu chemical factory and no additional sensitive receiver is identified for the demolition of chimneys by Explosive Engineering. The nearest gazetted beach and Ma Wan Mariculture and Fishery areas are both located approximately 4-5km from the demolition site.

3.2 *Existing Environment*

The site is located on reclaimed land on the southern side of the Tsing Yi Island. The site was established by CLP (CAPCO) for the purpose of building the power station and has had no other previous landuse.

Adjacent to the east and west of the site there are oil and gas storage facilities operated by oil companies, ESSO and Mobil, which are potentially hazardous installations. The site backs onto a mountain to the north, which is higher than the chimneys, beyond which is open boundary. The site falls with the Victoria Harbour Water Control Zone and Western Buffer Water Control Zone. There are several industrial operators further along the southern coast of Tsing Yi Island including Tin Chiu Ve-Tsin and the Chemical Waste Treatment Facility to the east. The site also has a storm water nullah running around the northern boundary and is used to drain surface water from the site and adjacent land users. Within the site CLP also operates two IDO-fired gas turbine power generating units located to the eastern end of the site. These will remain in operation for the foreseeable future.

The nearest residential areas are located approximately 1.9km from the site to the north which is screened by the ridge. (See Figure 2).

4. Possible Impact on the Environment

4.1 Gaseous Emissions

The main source of gaseous emissions associated with demolition of the chimneys are vehicle emissions from transferring the debris, and pollutants emitted by diesel-powered emissions. The amount of debris to be removed will be the same regardless of the demolition method and the number of diesel-powered equipment will be similar for the Explosive Engineering method. The previous EIA did not identify gaseous emissions from the demolition project to cause insurmountable air quality impact on the environment and hence the demolition of the chimneys by Explosive Engineering is not expected to cause insurmountable air quality impact to the environment.

4.2 Dust

Dust generating activities associated with the demolition of the chimneys are:

- debris storage;
- material transferral on to lorries or barges; and
- dust generated during the felling of the chimneys.

The truck movement and the felling of the chimneys by explosive are the two major

dust generation activities. The material transferral will be the same as the manual demolition as the amount of demolition waste will be the same. The dust generated from truck movements has been modelled together with the manual demolition of the chimneys in the previous EIA and the results concluded that the predicted hourly TSP concentration at the ASRs are within the 500 μgm^{-3} level as specified in the TM of EIAO. The TSP levels generated by the truck movement alone will be even lower.

The dust generated by Explosive Engineering will be limited to a very short period of time and is expected to clear within 30 seconds following collapse of the structures whereas the manual demolition will be spread into a period of about five and a half months. It will occur at ground level and the majority of the particles being heavy will settle within an area close to the collapsed structures and largely within the site boundary. A separate report has been submitted to EPD (attached in *Annex B* for reference) addressing the air quality associated with the Explosive Engineering option and the results for the hourly TSP concentrations are presented in the following table. The predicted hourly TSP for the manual demolition are also presented for comparison. It should be noted that the predicted TSP concentrations for the manual demolition included the dust generated by trucks movement within the site. The Explosive Engineering option did not include dust generated by the trucks as there will be no activities within the site during the explosion.

Table 1 Predicted 1-Hour TSP concentrations (μgm^{-3}) at ASRs

	Location (Distance from Site Boundary)	TSP concentration[a] (μgm^{-3}) - Explosive Engineering	TSP concentration[a] (μgm^{-3}) - Manual Demolition[b]
A1	Mobil Main Admin Building (350m)	196	335
A2	Esso Admin Office (200m)	166	304
A3	Esso Laboratory / Engineers Office (110m)	229	461
A4	Tien Chu Chemical Factory (200m)	134	228

Note: (a) Background TSP level of 81 μgm^{-3} included.
(b) TSP level include manual demolition and truck movements

4.3 *Odour*

No adverse odour impact is envisaged for the felling of chimneys by Explosive Engineering.

4.4 *Noisy Operation*

The main noise source during the demolition of the chimneys by Explosive Engineering is during the blast. Although the majority of energy generated within the atmosphere from a blast will be of a sub-audible nature, there will also be a component that is audible (i.e. at frequencies greater than 20 Hz) and as such can be measured in terms of dB(A).

With the elimination of detonation cord, the characteristic noise of an explosive blast is no longer a "sharp crack" but rather a "dull thump". This is partly due to the detonation sequence and partly due to natural energy dissipation and attenuation.

Peak noise levels from the use of explosives are comparable to the sort of levels routinely generated by cars, etc, only in this case the noise would exist for less than a second for each initiation and cover a 10 second total time period. It is because of this very brief duration and its infrequent occurrence that blast noise is rarely measured in terms of dB(A) but rather looked at as part of the air overpressure generated and measured by the more meaningful parameter of dB. The predicted air overpressure level at the boundary of the exclusion zone (300 metres) is 118 to 123 dB.

The likely audible noise level at 300 metres is 88 to 93 dB L_{Amax}. Given that this noise level is likely to occur over a 10 second period and assuming existing ambient noise level of 55 dB L_{Aeq}, the corresponding $L_{Aeq\ 30\ minutes}$ will range from 66 to 71 dB which is within the noise criteria for daytime construction activities of 75 $dBL_{Aeq\ 30\ minutes}$.

As there are no noise sensitive receivers identified in the vicinity of Tsing Yi Power Station, no noise impact is envisaged from the demolition of the chimneys by Explosive Engineering.

4.5 *Night Time Operation*

No night time work is envisaged.

4.6 *Traffic Generation*

Traffic generated by the demolition activities will mainly comprise of lorries arriving and departing the site with construction waste material. It is expected that the majority of structural steel will be removed off site by barges. The number of lorry and barge trips will be the same as the manual demolition as the amount of construction waste material to be removed will be the same. There will be sufficient space on site for waiting and/or parking and hence no congestion caused by the lorries is envisaged on the public roads near the site.

4.7 *Liquid Effluent, Discharges, or Contaminated Runoff*

Potential sources of impacts upon water quality from demolition of chimneys, as part of the overall demolition process of Tsing Yi Power Plant, could include the following activities:

- site run-off and surface water drainage containing elevated levels of SS after rainfall;
- run-off from general demolition activities; and
- sewage effluents generated from the workforce.

The previous EIA has identified the following potential sensitive receivers:

- gazetted beaches located approximately 5km from the demolition site
- Ma Wan Mariculture and Fishery areas located approximately 4-5km from the demolition site

The demolition of chimneys by Explosive Engineering will not generate additional discharge as compared to the manual demolition. In addition, the demolition programme could be shortened by using Explosive Engineering. The previous EIA assessed the potential water quality impact associated with the demolition of the Tsing Yi Power Station and concluded no insurmountable water quality impacts will result from the demolition activities provided that all the recommended

mitigation measures are implemented. The water quality assessment and the recommended mitigation measures could be found in *Section* 5 of the EIA report for *Demolition of Tsing Yi Power Station - Non-Blasting Option* (Please refer to the EIAO Register, Report No. EIA-133/BC).

4.8 Generation and Disposal of Waste or By-products

The main waste type generated from demolition of the chimneys by Explosive Engineering is construction and demolition (C&D) waste. The C&D waste could potentially impact on the limited space of the landfills in Hong Kong if not managed properly. The amount of C&D waste from the chimneys will be the same as demolition by manual method and has been estimated in the previous EIA. The report concluded that provided the recommendations are implemented, the storage, handling, collection, transport and disposal of wastes arising from the demolition of Tsing Yi Power Station will be in full compliance with the regulatory requirements. The waste assessment and the recommendations could be found in *Section 6* of the EIA report for *Demolition of Tsing Yi Power Station - Non-Blasting Option* (Please refer to the EIAO Register, Report No. EIA-133/BC) and the Waste Management Plan subsequently submitted to EPD (attached in *Annex* C.)

4.9 Storage, Handling, Transport and Disposal and Hazardous Materials or Wastes

No hazardous chemicals will be used or generated from the demolition of the chimneys.

Small amount of Asbestos Containing Materials (ACM) are present in the corrugated roof sheeting in some of the smaller buildings and no ACM is present in the chimneys brick linings. There is however, potential ACM filler remaining in the caps of the chimneys although this has yet to be confirmed. Due to the safety and difficulties of obtaining bulk samples from the caps in situ, it is planned for the caps to be removed, lowered to ground level and then sampled for confirmation. Should ACM be present in the caps, then for the handling and disposal of ACM, it is proposed that the abatement procedure adopted will be based on a methodology as described in an existing Tsing Yi Asbestos Abatement Plan. All ACM would be removed by Registered Asbestos Contractors before the demolition of the chimneys by Explosive Engineering.

4.10 Quantitative Risk Assessment

A Risk Assessment report for the demolition of the chimneys conducted by DNV Technica is included in *Annex A* (as a separate volume) with this submission. The following summarise the findings of the Risk Assessment:

- *Background*

The Tsing Yi Power Station has reached the end of its economic life. The generating plant and equipment have been removed and the buildings are to be demolished. The demolition of the five chimneys at the power station requires a quantitative risk assessment to be carried out due to the proximity of the site to the Esso and Mobil Tsing Yi Terminals which store dangerous hydrocarbons. Two methods for the demolition have been proposed, the manual demolition and explosive demolition, and they are reviewed here for their possible impact upon people and property.

- *Overview of Study*

The hazards from explosive demolition of the Tsing Yi Power station chimneys have been considered with respect to the resultant off-site risk. Comparison with the manual demolition risk has also been made.

The following cases have been considered in the study:

1. Existing operation of the terminal.

2. "Shut-down" operation at the terminals. This includes closure of Tsing Yi Road, shut-down and evacuation of Mobil and Esso Oil Terminals empty nearest Mobil oil tank, no ships at jetties, no road tankers on site containing any liquid LPG, all isolation valves closed on pipework on site, spectators located at a safe distance (3 chimney height away).

3. "Shut-down" at the terminals plus inventories in Esso LPG spheres reduced to less than 200te each and nearest Mobil oil tank emptied, plus all of the measures in case (2) above. Spectators can be positioned approximately 450m (corresponding to 3 chimney heights) away from the base of the chimneys.

The demolition exercise is a transient or one-off operation and is difficult to compare the quantitative risk results with the Hong Kong Risk Guidelines, which require a frequency to be calculated. Thus the probability has been assumed to occur in a single year.

- *Conclusions*

For cases (2) and (3), the cumulative risks are imperceptibly different from that of the existing operation of the terminal and lie in the ALARP region of the HKRG.

The incremental risks for case 2 and 3 lie in the acceptable region, see *Figure 4*.

The mitigation measures for both cases 2 and 3 tend to mitigate the risks for the existing terminal since they are in place for longer than the brief period of the initiation, thus offsetting the small incremental risk.

Overall it is concluded that the explosive demolition of the Tsing Yi Power Station Chimneys can be carried out within the requirements of the HKRGs provided that the recommendations listed below are implemented.

The expected loss of life from manual demolition has been calculated to be 0.035 fatalities. That for explosive demolition, case 3, has been calculated to be 0.00006 fatalities. These are primarily amongst workers.

4.11 Disruption of Water Movement or Bottom Sediments

The demolition of the chimneys will not cause disruption of Water Movement or Bottom Sediments.

4.12 Unsightly Visual Appearance

As the demolition of the chimneys by Explosive Engineering will occur within a period of a few minutes as compare to manual demolition which will take several months, no unsightly visual appearance is envisaged. The overall visual

appearance will be significantly improved after the chimneys, and the power station, are removed.

4.13 Ecological Impacts

No ecological impacts is envisaged from the demolition of the chimneys.

4.14 Thermal Energy

It is estimated that the three smaller and shorter 130m high chimneys will require 19kg of explosive per chimney, and that the two bigger and taller 150m high chimneys will require 32kg of explosives per chimneys.

Due to the very small quantity of explosive used, the protection around the chimneys, the detonation sequence and its instantaneous energy dissipation and attenuation, the thermal energy is considered too small to be of concern.

5. Environmental Protection Measures

5.1 Dust

Whilst the predicted dust levels at the nearest ASRs are well within the hourly criterion, the following dust control measures are recommended to minimise the dust nuisance of the site:

- the site should be wetted to reduce air emission from the impact of debris; and
- monitoring for dust generated during the demolition is also recommended at the site boundary to check that the dust criterion is met.

5.2 Water Quality

The mitigation measures to minimise potential water quality impacts are detailed in *Section 5.6* of the previous EIA report (Please refer to the EIAO Register, Report No. EIA-133/BC).

5.3 Waste

The mitigation measures to avoid or minimise potential impacts associated with waste arising from demolition of the chimneys, and the power plant, at Tsing Yi Power Station are detailed in *Section 6.4* of the previous EIA report (Please refer to the EIAO Register, Report No. EIA-133/BC) and the Waste Management Plan, attached in *Annex C*.

5.4 Risk

The following summarise the recommendations of Risk Assessment. Please also refer to the report included with this submission (*Annex A*):

The following recommendations should be implemented, as risk reduction measures, if their cost is low, in order to ensure that the explosive demolition of Tsing Yi Power Station chimneys carried out within the HKRGs.

- The nearest Mobil oil tank be emptied for the duration of the felling.

- Fire detection (heat/flame) nd fire-fighting foam system on all oil tanks and bunds should be fully tested prior to the demolition exercise and be ready for remote activation by oil terminal staff.

- Water sprays on LPG spheres should be fully tested prior to the demolition exercise and ready for remote activation by oil terminal staff.

- A 3 chimney height exclusion zone is proposed which exceeds the standard requirement and will minimise the chance of ejecta or debris hitting any spectators.

- No road tankers containing liquid LPG or oil products are to be present within the 3 chimneys height exclusion zone.

- Marine tankers are to be well beyond the 3 chimney height exclusion zone (suggest 1km unless empty).

- The processes on the Mobil and Esso sites (all vessels and pipework) are to be fully isolated during initiation. Combined with testing the water sprays on the spheres, above should virtually eliminate the possibility of BLEVE.

- Initiation should not be carried out if high or gusting winds are expected, to avoid the possibility of the chimney falling in an unplanned direction or at an unplanned time.

- Initiation should not be carried out if heavy rain has occurred, as this tends to increase the likelihood and effect distance of landslides.

- The consequences of debris or a missile hitting a ship or boatload of spectators could be significantly worse than a single fatality. The ship or boat could sink, resulting in multiple fatalities. Boats in the area should be kept well beyond the 3 chimney height exclusion zone.

- If it is found to be practicable and cost effective, the contents of the Esso tankers are to be reduced to less than 200te per tank during the felling process.

- The independent technical review of this report (Appendix V) has highlighted the need for the demolition contractor to have in place a robust safety management system for both the explosive and manual methods. This would include a system for identification of hazards similar to the SWIFT technique used here but applied using an expert multi-disciplinary team (including the demolition contractors and for the explosive method, the oil companies).

6. Environmental Monitoring and Audit

An Environmental Monitoring and Audit (EM&A) Manual has been produced for the demolition project. Monthly progress reports are produced and submitted to EPD and an Independent Environmental Checker. The first monthly report indicated that no exceedance of relevant standards and guidelines are recorded for the demolition activities. The environmental monitoring will continue until the end of the demolition project, including the demolition of the chimneys by Explosive Engineering, to ensure that these standards and guidelines are met.

7. Summary

The potential environmental impacts associated with the demolition of thechimneys by Explosive Engineering has been identified and assessed and mitigation measures has been recommended, where appropriate, in this Project Profile. No insurmountable environmental impacts are envisaged provided that the mitigation measures and recommendations are implemented.

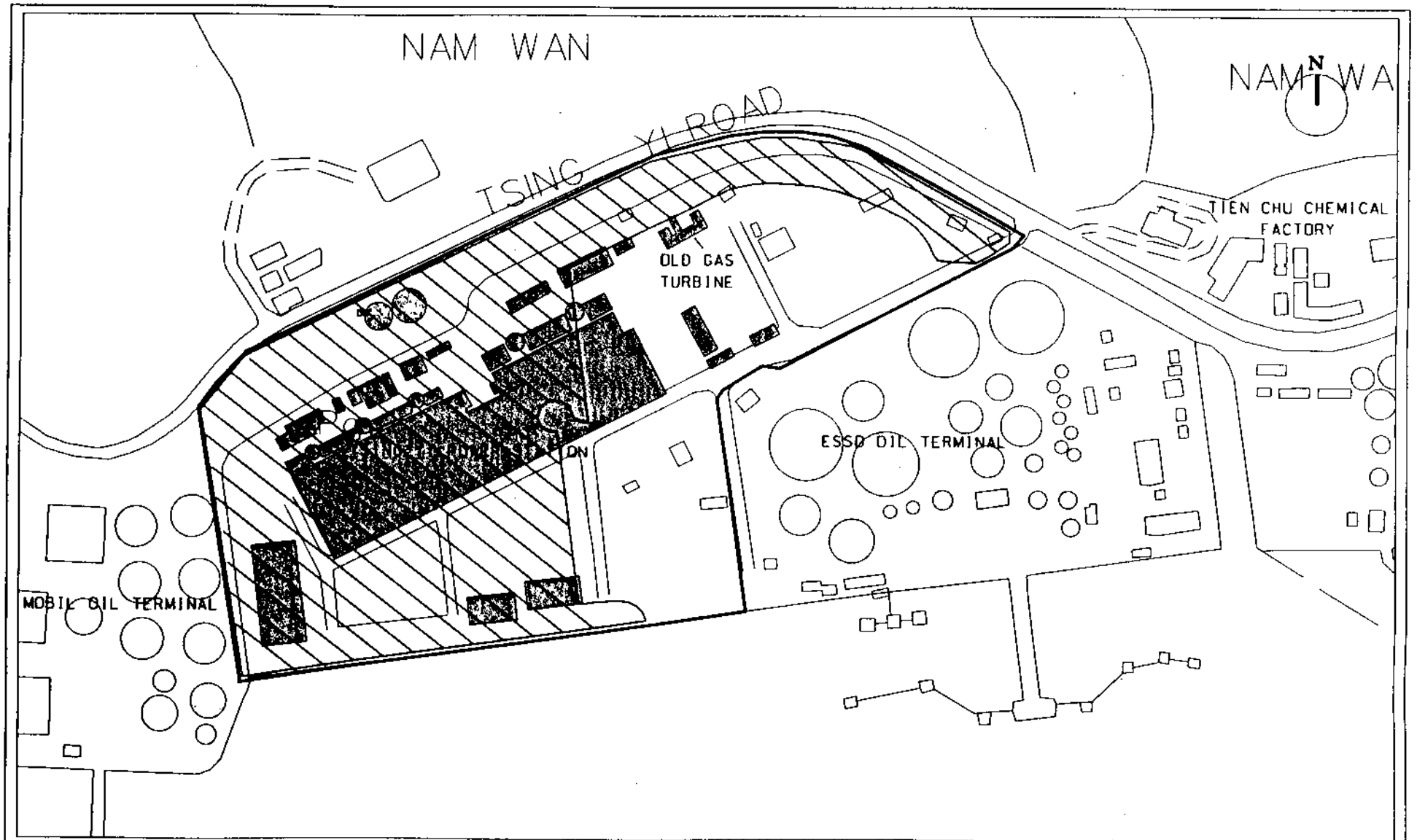


Figure 1 Tsing Yi Power Station Site

Date : 14 July 1997 | Drawing No. /Contract/C1674/C1674_1

Sources :

Prepared by ERM's GIS & MAPPING Group

KEY

- Power Station Site
- Section to be Returned to Government
- Above Ground Structures to be Demolished

ERM Hong Kong
6th Floor
Hecny Tower
9 Chatham Road
Tsimshatsui, Kowloon
Hong Kong

ERM

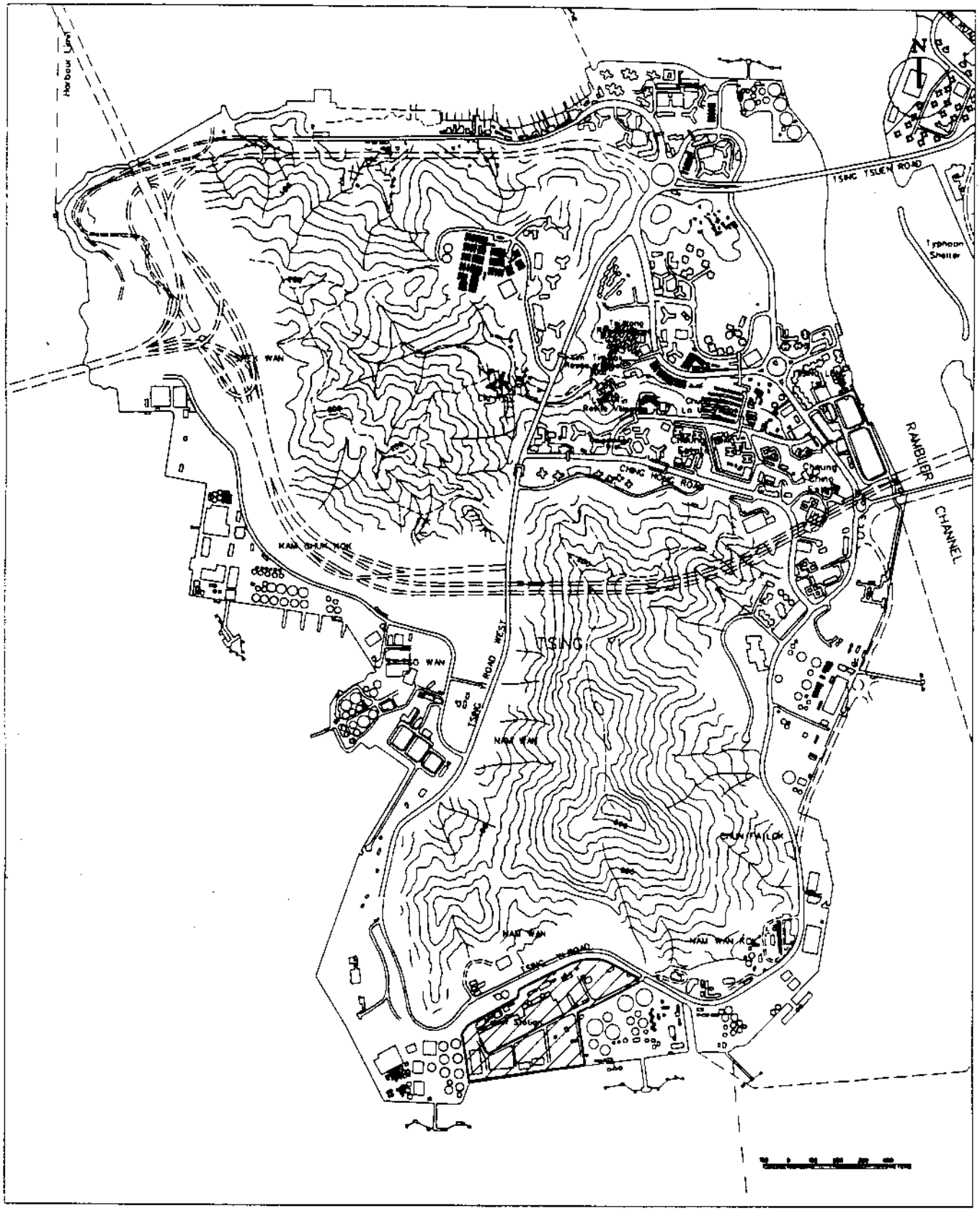


Figure 2 Location of Power Station

Date : Nov 97

Drawing No. /Contract/C1674/C1674_2

Sources:

Prepared by ERM's GIS & MAPPING Group

KEY

Power Station Site

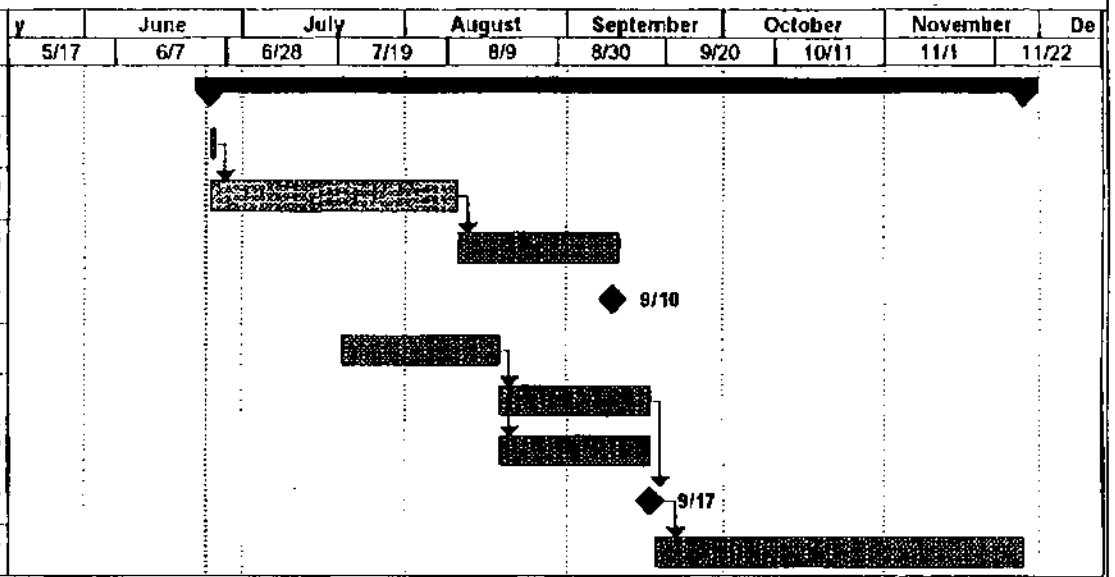
ERM Hong Kong
6th Floor
Hecny Tower
9 Chatham Road
Tsimshatsui, Kowloon
Hong Kong

ERM

Figure 3

TYPS Civil Demolition Project
Tentative Programme for Chimney Demolition by Explosive Engineering

ID	Task Name	Start	Finish
1	**Demolition by Explosive Engineering**	Jun 26 '98	Nov 27 '98
2	Submit Project Profile	Jun 25 '98	Jun 25 '98
3	Approval to Apply Environmental Permit	Jun 25 '98	Aug 10 '98
4	Application for Environmental Permit	Aug 11 '98	Sep 10 '98
5	Environmental Permit Granted	Sep 10 '98	Sep 10 '98
6	BD Approval of Alternative Chimney Demolition Plan	Jul 20 '98	Aug 18 '98
7	Application for Consent to Commencement of Work	Aug 19 '98	Sep 16 '98
8	Submission of Site Safety Supervision Plan	Aug 19 '98	Sep 16 '98
9	BD Consent Granted	Sep 17 '98	Sep 17 '98
10	Demolition by Explosive Engineering	Sep 18 '98	Nov 27 '98



Project:
Date: Jun 24 '98

Task
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Milestone
Rolled Up Progress

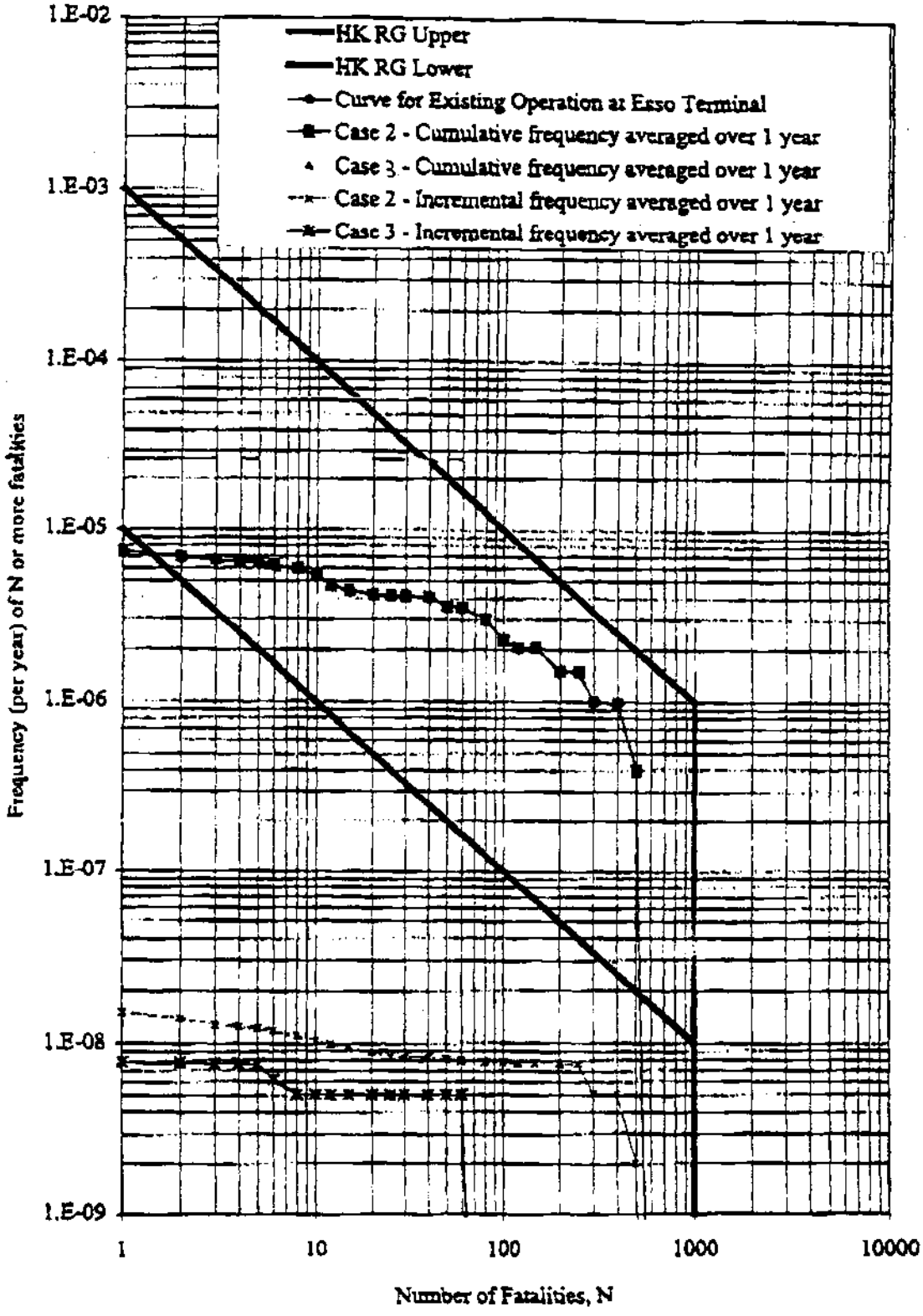


Figure 4

FN CURVES FOR CASES 2 AND 3

FILE C1674/C1674H
DATE 24/06/98

The following annexes are not available at this website:

Annex A : Risk Assessment
Annex B : Air Quality Assessment for Demolition 5 Chimneys using Explosive Engineering
Annex C : Waste Management Plan

Please visit other locations as stated in the advertisement notice for information.