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Proposed Helipad
at the
China Light and Power Co. Ltd.
Shatin Central Warehouse

Noise Impact Assessment
Report

November 1994

Harris & Sutherland

ZHA-047/8C

9' in ZP1/NI/38
Harris & Sutherland

R1073/6
Issue 1
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Report**

November 1994

**HARRIS & SUTHERLAND (FAR EAST)
IN ASSOCIATION WITH
SIR ALEXANDER GIBB & PARTNERS LTD.**

REPORT CONTROL SHEET

Client : China Light & Power Company, Limited
 Project : Proposed Helipad at Shatin Central Warehouse
 Subject : Noise Impact Assessment Report

REPORT No. R/1073/6

This report has been compiled by

Gerard O' Reilly

From contributions by
 Harris & Sutherland & Sir Alexander Gibb & Partners

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CL&P HELIPAD AT
SHATIN NOISE IMPACT ASSESSMENT

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1 INTRODUCTION

1.1 Scope

The purpose of this Noise Impact Assessment (NIA) is to provide information on the nature and extent of noise impact arising from the construction and operation of the proposed project and to comment on the overall acceptability of the noise impact.

1.2 Basic Information

1.2.1. Project Title

Proposed Helipad at CL&P Shatin Central Warehouse

1.2.2 Purpose and Nature of the Project

The objective of this project is to facilitate the transportation of essential spare parts and materials to remote areas. Helicopter flights from the warehouse will also be used to transport spare parts and materials to other parts of the Territory in the event of widescale traffic disruption and/or in the event of civil strife.

The provision of the helipad at their warehouse will help CL&P to maintain a reliable power supply to the public, particularly in outlying and remote areas. The facility would be for private use only.

CL&P will only operate from the heliport during daytime, which is defined as 7a.m. to 7p.m. Alternative arrangements exist for dealing with night-time emergencies. In view of the primary use of the helipad as a strategic resource for use in effecting emergency repairs only, the anticipated average usage is 2 flights per month.

The nature of the project consists of the construction of a roof-top helipad on the CL&P warehouse at Shatin. The detailed design and appropriate aviation safety requirements will all be to the International Civil Aviation Organisation standards and recommendations.

1.2.3 Name of Project Proponent

China Light & Power Company Limited (CL&P)

1.2.4 Location of the project

Shatin Central Warehouse
STTL 327 No. 6 On Lai Street
Area 11
Shatin

The location of the project and the proposed approach and take-off paths to and from the helipad are shown on the enclosed drawing 1073/001.

1.2.5 Contact Persons

Project Proponent: CL&P: Mr. Allan D. Painter Tel: 3606217

Project Consultant: Harris & Sutherland : Mr. R.A.M. Watkins
Tel: 8809788

1.2.6 Project Budget

The project budget is of the order of HK\$4 million.

1.3 Major Elements of the Surrounding Environment

The site location, approach and take-off paths and locations at which ambient noise levels have been measured are shown on drawing 1073/011. The principal land usage around the proposed helipad site is also indicated. The CL&P Warehouse is located at STTL 327, On Lai Street, Area 11, Shatin. It is bounded by On Lai Street to the North-East, On Sum Street to the South-East, an open storage area to the North-West and an adjacent warehouse building to the South-West. The surrounding buildings are all commercial buildings/warehouses. Within Area 11 there are works in progress on several sites. These are all commercial/warehouse developments, similar to the present buildings.

Beyond the immediate environs there are several sensitive receivers which would be affected by the noise impact of helicopter operations to and from the helipad. These include the residential developments along the Shing Mun River Channel; Ravana Garden, Garden Vista and Pictorial Garden. Also a school is located between Ravana Garden and Garden Vista. To the South-West, on the opposite side of the Nullah is City One Shatin. The residential blocks closest to the approach paths are those at the North-East corner of City One, that is, near the junction of Tai Chung Kiu road and Siu Lek Yuen road.

Further away to the South-East, the housing estates at Siu Lek Yuen and Kwong Yuen lie beneath an approach path. However their distance from the CL&P warehouse means that a helicopter would be at elevation of approximately 280m above ground level, and the noise impact would therefore be reduced. At approximately 1.1 km to the North-East the Shatin Hospital lies near the end of an approach path.

1.4 Possible Noise Impacts

Possible noise impacts arise during the construction phase and the operation phase. The principal components of the proposed helipad are :-

- Steel Supporting Structure
- Steel Access Stairs
- Helipad deck in reinforced concrete
- Fire Fighting & Electrical Services

The steel components will be prefabricated off site and assembled at the site. The helipad deck slab will be cast in situ. There will be no demolition or breaking out of the existing building, and clearly no foundation works. The site activities will have a minimal noise impact on the environment, particularly so compared with the noise from the surrounding construction sites. Therefore the noise impact from construction will not be considered any further.

The operation of helicopters from the proposed helipad will have an effect on the noise climate of the surrounding area. There is therefore a need to identify whether locating it on the CL&P building will contravene the noise limits set out in the Hong Kong Planning Standards and Guidelines (HKPSG) chapter 9.

2 EXISTING SITUATION

A survey of existing noise levels at thirteen locations, in the vicinity of the proposed CL&P Shatin Helipad was undertaken by Eastern Technical Services Ltd between the 22nd of June 1994 and the 1st of July 1994. Hourly measurements were taken during rush hour and non-rush hour periods. Rush hours were classified as 08.00 to 09.30 and 17.00 to 18.30. Whilst non-rush hour periods were taken as 10.00 to 12.30 and 14.30 to 16.30. The date and time of each measurement is shown on Figure 1073/12.

Monitoring of existing noise levels was carried out at the worst-affected Noise Sensitive Receiver (NSR) locations, as can be seen from the following table :-

	Location	Remarks
A	Ground level at open space	Directly below flight path at 270°. Representative of floating restaurant.
B	Roof top City One Shatin	Closest residential building to flight path at 270°.
C	Street level Sin Lek Yuen Road	Representative of street level along edge of residential area.
D	Street level Sin Lek Yuen Road	Directly below flight path at 160°.
E	Street level at nullah	Representative of Sin Lek Yuen Residential Area.
F	Roof top Ravana Garden	Residential building closest to helipad, and flight path at 270°.
G	Roof top CLP building	Office at 15/F is NSR closest to helipad.
H	Street level On Muk Street	Directly below flight path at 160°. Representative of streets within commercial zone around CLP building.
I	Street level On King Street	Point in residential zone closest to helipad. Representative of Ravana Gardens, School and Garden Vista.
J	Street level On Lai Street	Street closest to helipad and below approach path at 42°. Similar to "H", representative of streets within commercial zone.
K	Roof top Garden Vista	Together with "N", representative of residential buildings in Garden Vista and Pictorial Garden.
L	Street level	Directly below flight path at 42°.

Nine of the thirteen monitoring stations were located at street level. These locations are designated A, C, D, E, H, I, J, L and M. During the rush hour period at these monitoring stations, background noise levels (L_{90}) varied between 59 dB(A) and 66 dB(A). During the non-rush hour period background noise levels varied between 58 dB(A) and 66 dB(A) and hence indicate no perceptible change between the rush hour and non-rush hour periods.

Four of the thirteen monitoring stations were located on the roof tops of residential or office buildings. These locations are designated as B, F, G and K. During the rush hour period at these monitoring stations background noise levels varied between 56 dB (A) and 67 dB(A). During the non-rush hour period, background noise levels varied between 56 dB(A) and 67 dB(A) and hence also indicate no perceptible change between the rush hour and non-rush hour periods.

In addition it is noteworthy that at locations C, D, H, I, J and L, the L_{Amax} level exceeds the criteria set for helicopters.

From Figure 1073/12 it can be seen that the times for the noise measurements are spread throughout the period when the helicopters will operate (7a.m. to 7p.m.). The fact that there is no perceptible change between the rush hour and non-rush hour period at each location indicates that the background noise measured is typical of the whole period.

The weather conditions prevailing during measurements were recorded. No readings were taken during rain. The average wind speed never exceeded 5m/s, refer Figure 1073/12.

FIGURE 1073/12
MEASURED NOISE LEVELS

Location	Measurement Period			Noise Levels dB(A)			Comments	Wind Speed m/S
	Date	Time	See below	L ₁₀	L ₉₀	L _{Amax}		
A		1700-1800	R	66.1	60.1	80.9	Traffic noise and 1 aeroplane	2 E
	22/6	1530-1630	NR	67.6	61.1	85.2		2 E
B	28/6	0830-0930	R	68.6	66.6	69.2	Lift Motor Lift Motor	4 E
		1000-1100	NR	69.1	66.6	69.2		4 E
C	23/6	0830-0930	R	70.1	60.1	87.7	Traffic noise Traffic noise and emergency sirens	4 E
		1000-1100	NR	71.1	60.6	94.5		4 E
D	24/6	0830-0930	R	74.6	63.6	88.0	Traffic noise Traffic noise	2 N
		1000-1100	NR	75.6	65.1	94.7		3 NNE
E	1/7	1701-1801	R	67.3	60.4	83.2	Traffic noise Traffic noise	5 WSW
		1530-1630	NR	69.8	60.2	80.2		5 WSW
F	23/6	1700-1800	R	58.1	55.6	79.9		5 E
		1530-1630	NR	58.1	55.6	79.7		5 E
G	29/6	0820-0920	R	69.1	66.6	69.2	Emergency siren	4 E
		1000-1100	NR	69.1	66.6	69.3		4 E
H	2/7	0830-0930	R	70.6	58.6	92.0	Large lorry passing Large lorry passing	3 W
		1000-1100	NR	69.6	58.6	88.5		3 W
I	29/6	1700-1800	R	75.3	65.0	91.6	Traffic noise Traffic noise	3 SE
		1530-1630	NR	74.8	63.6	90.3		3 SE
J	30/6	0830-0930	R	76.0	61.3	89.1	Traffic noise Traffic noise	3 SE
		1000-1100	NR	77.1	60.7	88.5		3 SE
K	28/6	1700-1800	R	68.4	66.6	68.8		3 E
		1530-1630	NR	68.6	66.1	68.9		3 E
L	1/7	1703-1803	R	76.1	60.1	90.2	Emergency siren Traffic noise	4 WSW
		1528-1628	NR	66.6	57.6	91.0		4 WSW
M	1/7	0830-0930	R	62.8	59.1	74.1	Traffic noise Traffic noise	4 WSW
		1000-1100	NR	65.1	60.9	71.3		4 WSW

R - Rush Hour
NR - Non-Rush Hour

3 PREDICTED NOISE LEVELS

Helicopter noise will be centred around the CL&P Shatin Helipad and will have greatest impact at properties which lie in the vicinity of the proposed flight paths. In addition to the thirteen measurement locations detailed in Section 2 a further eight locations have been selected for prediction purposes and are designated as N, O, P, Q, R, S, T and U. These are located on the roof tops of residential or office buildings. A total of twenty one prediction locations, were chosen, designated A through U and are detailed on drawing 1073/011.

Given the complication of intervening buildings, and the use of the L_{Amax} noise level to set noise limits, the production of noise contours would not represent the most accurate method of describing the noise from helicopters operating from the CL&P Shatin Helipad.

In assessing the emission inventory of the helicopter noise, the following assumptions have been made:

1. The helicopter operating from the CL&P Shatin Helipad will be a ~~Twin Squirrel (Aerospatial 355B)~~ Noise data was obtained from the Institute of Acoustics (IOA) proceedings Vol .14 Part 4 (1992) "Noise Levels of Helicopters Performing Elevated Pad Take-off and landing Procedures". The tests were carried out at the Helicopter Noise test site at Bruntingthorpe, UK. In addition level flight data was obtained from on site measurements in Survey, UK by the Local Authority. The IOA proceedings are included as Appendix A.
2. The L_{Amax} noise level associated with level flight is 77 dB(A) at a distance of 152.5m.
3. The approach and take-off angle is 6°.
4. The decision height for take-off and landing is 27.4 metre above the helipad.
5. Noise levels are calculated assuming that the helicopter flight starts and ends at the top of the decision height.

The results of the noise predictions are detailed in Figure 1073/13 and shown graphically on drawing 1073/011.

FIGURE 1073/13
PREDICTED L_{Amax} NOISE LEVELS

Prediction Location	Height of Receiver Above Ground (m)	Closest Approach Distance (m)	Maximum Noise Level at Receiver L_{Amax} (dB(A))	Comment
A	1.5	185.2	75	Ground Level
B	93.7	111.6	80	Residential Block Roof
C	1.5	263.9	72	Ground Level
D	1.5	223.8	74	Ground Level
E	1.5	267.9	72	Ground Level
F	93.7	100.2	81	Residential Block Roof
G	118.0	34.7	90	Helipad/Office Roof
H	1.5	175.8	76	Ground Level
I	1.5	207.9	74	Ground Level
J	1.5	154.9	77	Ground Level
K	93.7	178.4	76	Residential Block Roof
L	1.5	184.7	75	Ground Level
M	1.5	213.7	74	Ground Level
N	93.7	146.8	77	Residential Block Roof
O	93.7	184.0	75	Hospital Roof
P	93.7	178.0	76	Residential Block Roof
Q	93.7	193.7	75	Residential Block Roof
R	93.7	149.5	77	Residential Block Roof
S	93.7	137.0	78	Residential Block Roof
T	118.0	59.8	85	Office Block Roof
U	118.0	115.5	79	Office Block Roof

4 EVALUATION OF NOISE IMPACT

4.1 Noise Limits

The Hong Kong Planning Standards and Guidelines (HKPSG) Chapter 9 sets out maximum noise levels (L_{Amax}) for helicopter operations which should not be exceeded.

These are:

- i. L_{Amax} of 85 dB(A) at all domestic premises including temporary housing accommodation, hotels and hostels, education institutions including kindergartens, nurseries and all others where unaided voice communication is required, places of public worship, courts of law and hospitals, clinics, convalescences and homes for the aged.
- ii. An L_{Amax} of 90 dB(A) at office buildings.

4.2 Discussion of Predictions

The maximum noise levels (L_{Amax}) predicted at ground level, locations A, C, D, E, H, I, J, L and M range from 72 dB(A) to 77 dB(A).

The maximum predicted noise levels at the roof of office and residential buildings, B, F, G, K, N, O, P, Q, R, S, T and U range from 76 dB(A) to 90 dB (A).

Maximum noise levels are predicted not to exceed 85 dB(A) at the ground based prediction points.

Maximum noise levels are predicted not to exceed 85 dB(A) at the roof tops of residential buildings in the vicinity of the Helipad.

Maximum noise levels are predicted not to exceed the 90 dB(A) criteria for office buildings.

4.3 Conclusions

The noise impact is found to be within acceptable limits because:

- the maximum noise levels (L_{Amax}) at representative sensitive receivers are predicted not to exceed the standards given in Table 4.1 of the Hong Kong Planning Standards and Guidelines.
- the predicted frequency of use of the helipad is twice per month.
- the helipad will be used during the daytime period (7a.m. to 7p.m.) only.

It is therefore proposed that noise control or mitigation measures are not necessary.

5. NOISE LEVEL MONITORING

Upon commencement of operations from the helipad, a set of noise measurements of the operational helicopter will be undertaken to demonstrate compliance with the Hong Kong Planning Standards and Guidelines. The operational helicopter will travel to and from the helipad along each of the three approach and take-off surfaces. Noise measurements will be taken simultaneously at the same locations as previously. This will allow comparison with the previous predicted noise levels.

APPENDIX A.

**EMISSION INVENTORY
NOISE MEASUREMENT FLIGHT TEST FOR AEROSPATIALE AS355 F HELICOPTER**

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NOISE LEVELS OF HELICOPTERS

In considering the total noise environment around a helipad a number of issues have to be considered and these have been addressed briefly in this paper. Of particular importance, is the inclusion of ground running noise in the calculations for $L_{Aeq,T}$ as it has been found that this can dominate the noise environment in the vicinity of the facility.

8. REFERENCES

- [1] DORA Communication 7908, 'A Guide to the Calculation of NNI'
- [2] "Noise Measurement Flight Test for Aerospatiale- AS355 F Twin Star Helicopter: Data/Analysis", Report No FAA-EE-84-04.

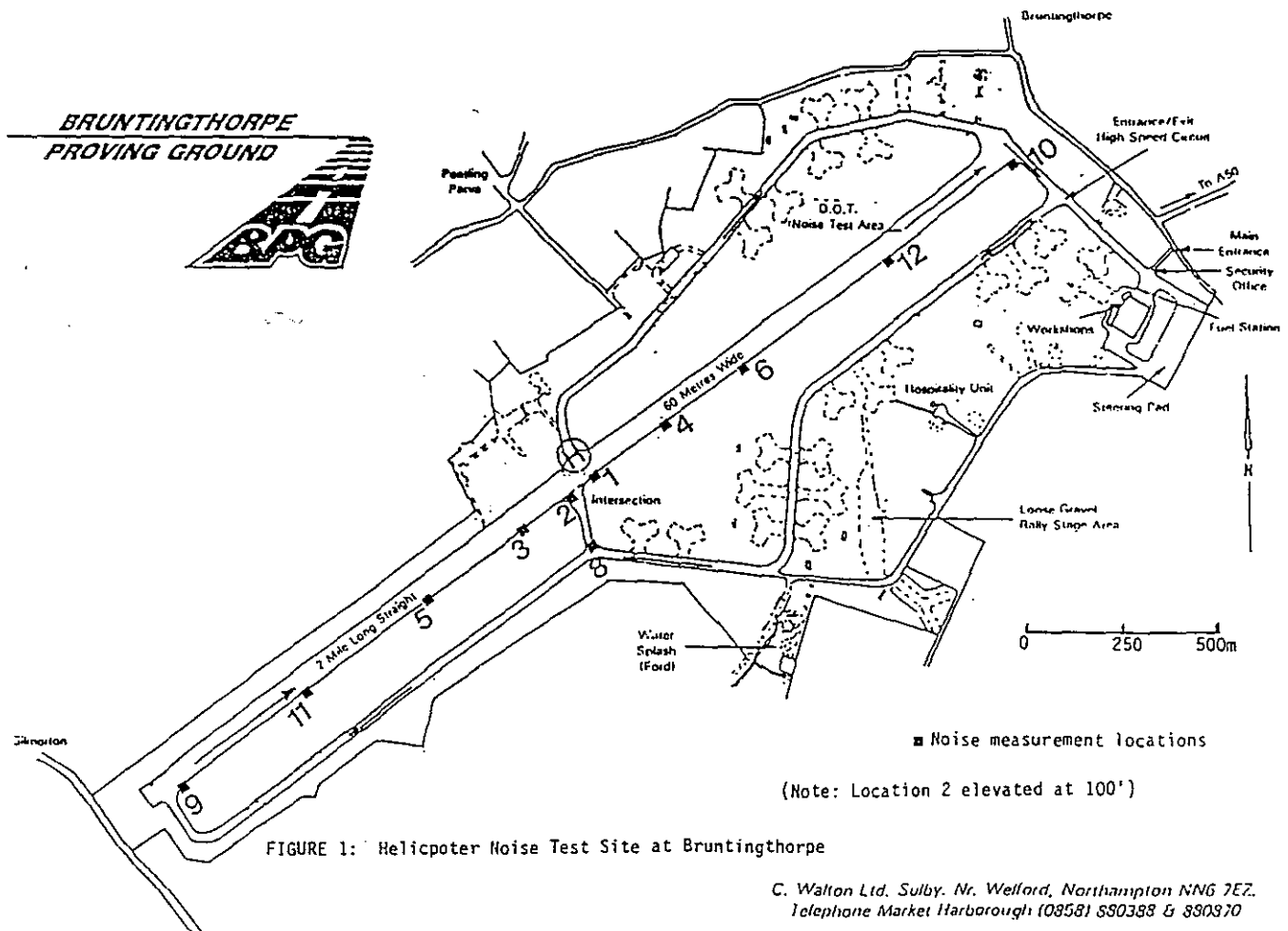


FIGURE 1: Helicopter Noise Test Site at Bruntingthorpe

C. Walton Ltd. Sulby, Nr. Welford, Northampton NN6 7EZ.
Telephone Market Harborough (0858) 880388 & 890370

NOISE LEVELS OF HELICOPTERS

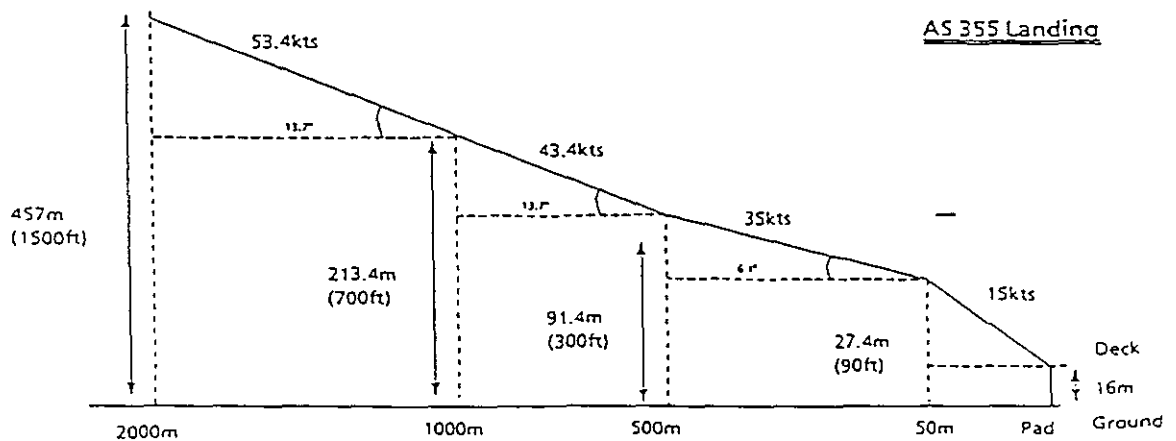
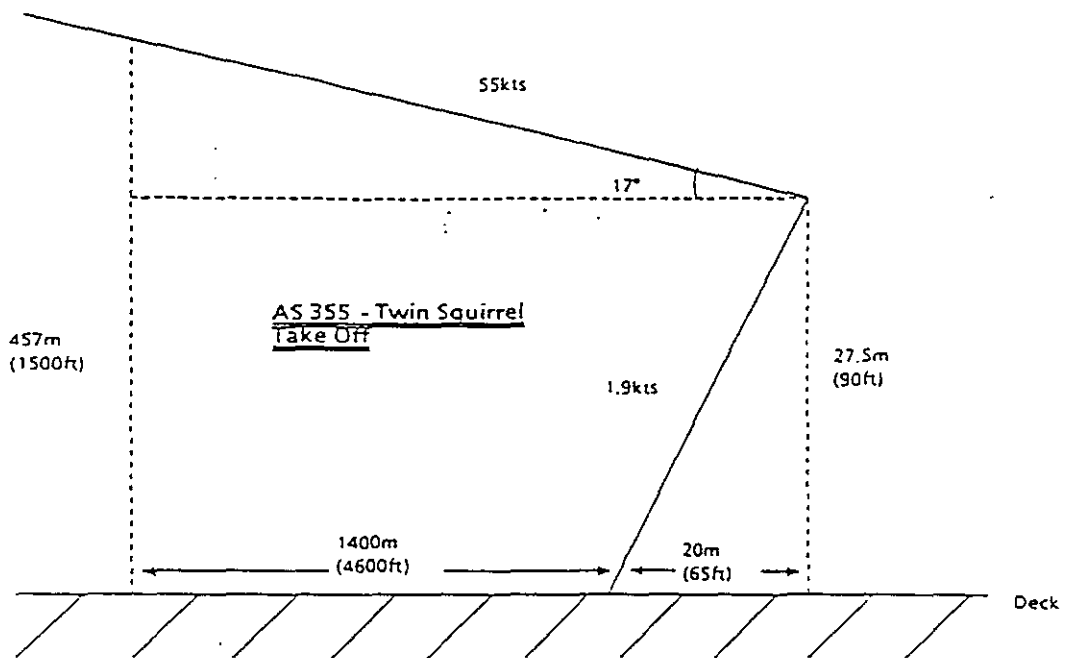


FIGURE 2: Defined Elevated Pad Flight Profiles For AS-355

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NOISE LEVELS OF HELICOPTERS

HELICOPTER NOISE TRIAL - BRUNTINGTHORPE

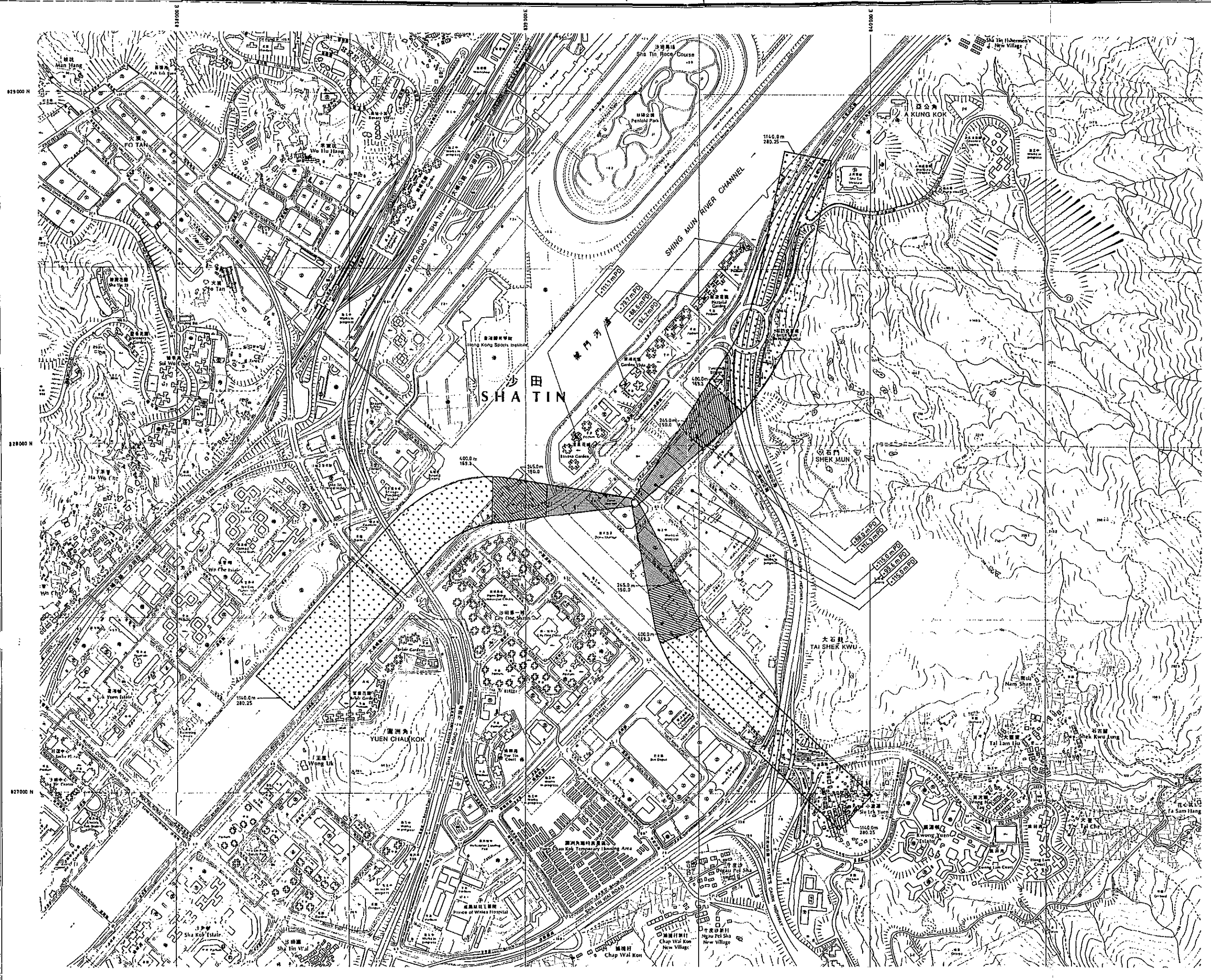
1	Date:	14th September 1990	12	Payload Available:	475 kg (elevated platform)
2	Helicopter Type:	AS355 - F1	13	Basic Weight:	1645 kg
3	Helicopter Registration:	G-SASU	14	Crew Weight:	80 kg
4	Operator:	Aer Omega	15	Fuel Weight:	255 kg
5	Captain:	Capt. James Barnes	16	Pax or Ballast:	80 kg
6	Wind:	NNW 0 - 10 knots	17	Operating Weight:	2060 kg
7	Temperature:	20°C 50% RH	18	Fuel Used:	151 kg
8	Cloud:	Haze	19	Ops Weight end of Trial:	1909 kg
9	Weather Remarks:	Generally fine, wind light, no rain	20	Time Trial Commenced:	13.45
10	MAUW:	2400 kg	21	Time Trial Finished:	15.40
11	RTOW:	2200 kg	22	Flight Time During Trial:	1 hour

TABLE 3: Helicopter Details for September 1990 AS-355 Noise Trial

Helicopter	Date	Lateral Offset of Ground Track From Measurement Position		Height	Air Speed Knots	$L_{A_{max}}$ dB	L_{A_E} dB
AS-355 F1	6/90	60 m	NW	1500 ft	114	70.3	80.8
	6/90	60 m	NW	1200 ft	114	71.5	82.2
	6/90	60 m	NW	1000 ft	114	72.2	82.8
	6/90	60 m	NW	800 ft	114	73.3	82.9
	9/90	60 m	NW	1500 ft	120	69.5	80.3
	9/90	60 m	NW	2000 ft	120	66.5	79.2
	9/90	410 m	NW	1500 ft	120	67.4	79.6
	9/90	190 m	SE	1500 ft	120	69.0	79.4
	9/90	60 m	NW	500 ft	120	77.7	85.8
S-76A	6/90	60 m	NW	1500 ft	140	72.5	82.6
	6/90	60 m	NW	1200 ft	130	75.1	84.2
	6/90	60 m	NW	1000 ft	130	74.6	83.9
	6/90	60 m	NW	800 ft	140	78.3	86.6
A-109A	6/90	60 m	NW	1500 ft	130	72.8	83.3
	6/90	60 m	NW	1200 ft	130	73.7	84.9
	6/90	60 m	NW	1000 ft	130	75.7	85.4
	6/90	60 m	NW	800 ft	125	76.4	87.0

TABLE 4: Summary of Overflight Noise Levels, dB 'Slow', Bruntingthorpe Noise Tests

APPENDIX B
DRAWINGS




Notes

LEGEND FOR APPROACH PATH

400.0m = DISTANCE FROM FATO
169.3 = ELEVATION mPD

Rev	Description of Revision	Date	By

Client



CHINA LIGHT & POWER CO., LTD

Harris & Sutherland
Consulting Engineers
11th Floor, Central House, 28 Tieng Chung Street, Quarry Bay, Hong Kong
Tel: 4697788

Date	MAY, 1994.	Designed	T. T.	Drawn	SETO
Scale	1:5000	Checked	GOR	Approved	

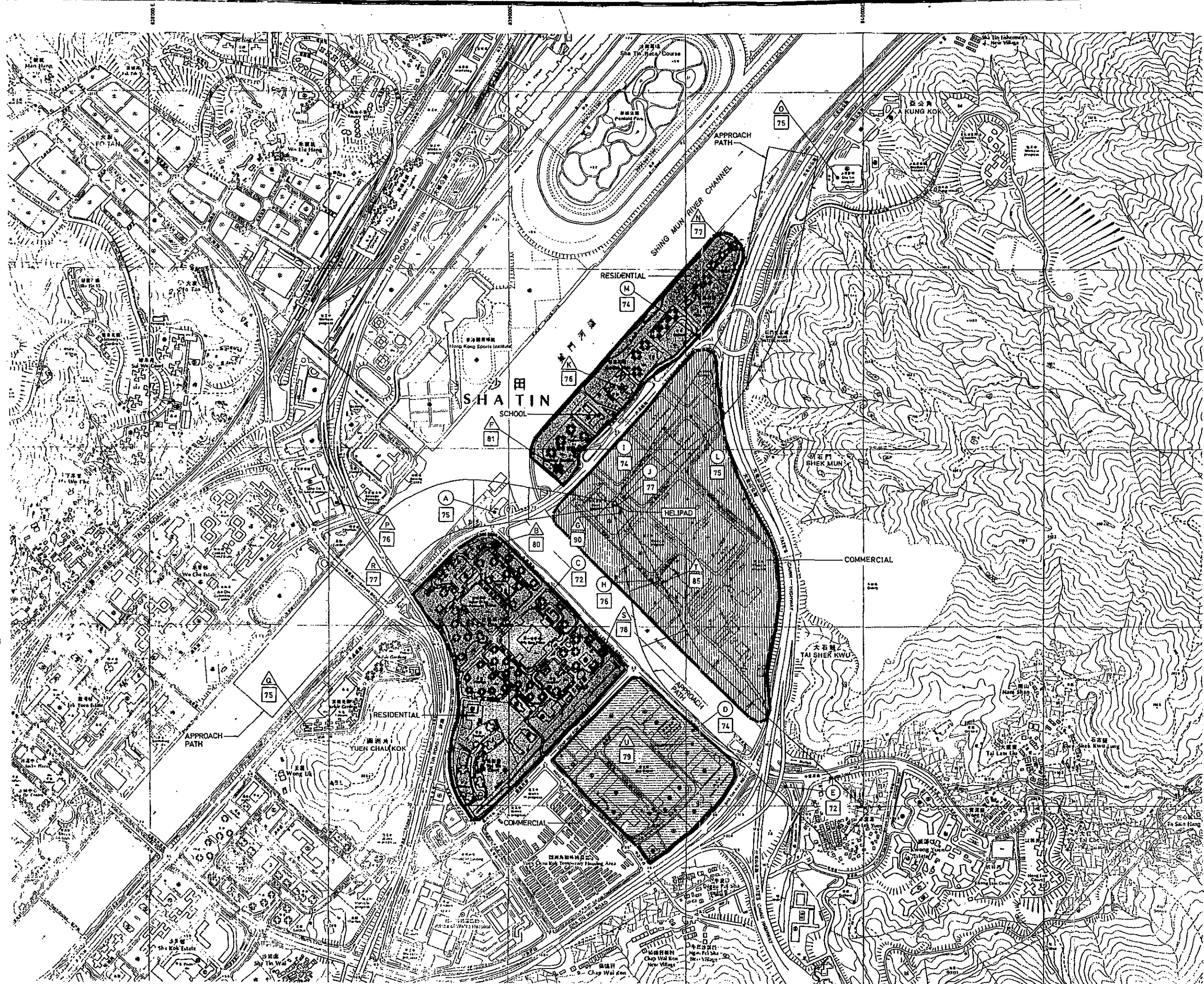
Project

HELICOPTER PAD ON SHATIN WAREHOUSE

Title

SITE LOCATION, APPROACH PATHS AND BUILDING HEIGHTS


Drawing No.	1073/001	Revision	
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Notes
 1. FOR DETAILS OF APPROACH PATHS REFER TO DRAWING 1073/001.

Rev	Description of Revision	Date	By

Client



CHINA LIGHT & POWER CO., LTD

Harris & Sutherland
 Consulting Engineers
 15th Floor, Cornwell House, 28 Tong Chong Street, Quarry Bay, Hong Kong
 Tel. 880 9788

Date	MAY, 1984.	Designed	T.T.	Drawn	SETO
Scale	1:5000	Checked	GOR.	Approved	

Project

HELICOPTER PAD ON SHATIN WAREHOUSE

Title

PREDICTED LA max NOISE LEVELS AND PRINCIPAL LAND USAGE

Drawing No	1073/011	Revision	
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