HOUSING & URBAN MODELS: A CASE FOR AN URBAN, HIGH-DENSITY, LOW-RISE HOUSING IN SINGAPORE

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It is never a day without God's grace

SUMMARY

Title: **HOUSING & URBAN MODELS: A case for an urban, high-density, low-rise housing in Singapore.**

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The environment in Singapore is becoming more and more urbanised and public housing forms a major part of the urban development. The continual process of adopting the current high-density, high-rise built forms in a fast changing society has resulted in 87% of the population living in a homogenous urban environment which lacks variety and choice. It was in view of this limitation in the present model that this research was initiated.

This thesis is an investigation on the possibility of an alternative high-density, low-rise built forms which is applicable in Singapore's context. By relooking at the theories of Martin and March on built form and land use, this thesis seeks to distill out the principles on high-density, low-rise patterns of urban development. By applying these principles in the housing design of a modern society with all its complexities and its changing nature can in fact path the way forward in the housing and urban design in the 21st century.

Within the housing context, this thesis seeks to formulate a conceptual framework in which the alternative housing model can be feasible. Within these framework, the thesis also addresses the issues of regional identity in the use of the traditional shophouse built form. It looks at the problems and arguments which generated the shophouse typology and considers the directions which are now open to us.

By examining urbanism and by keeping housing as the central focus and a strategic vehicle, the object of this thesis is to consider an alternative model so that in addition to the existing high-rise pattern of housing, it will be possible to design a way forward which provides a wider range of choices and will lead to a greater opportunity for a variety of patterns of living to develop. The result of applying the shophouse typology using Martin and March's theory holds the key to the solution to the problem of urban variety in high-density housing.

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6.3.1: An introduction

From the analysis in the previous chapters on the various theories of housing and urban design, the lessons learnt throughout plus the author's own experience of working with high-density housing; it appears appropriate to apply these theories in the context of Singapore. The continual process of building more and more high-density, high-rise housing to the living environment of Singapore in a fast changing society without considering other options would only result in a greater homogeneity in the urban form. The case for putting forward an alternative urban, high-density low-rise housing model will now be further outlined in this chapter.

The strategy is first to identify a site in a new town where a housing layout has been planned according to the existing high-rise model, with a discussion on the various planning parameters and the socio-economic characteristics of the residents. This is then followed by the conceptual design of two alternative layouts with the application of principles and lessons learnt from the earlier chapters. A comparative analysis is also carried out in each case by looking at the differences between the existing layout (planned according to the present high-density high-rise model) as compared to the alternative layouts planned according to an alternative high-density, low-rise model.

6.3.2: The Site

A site of around six to eight hectares in Dover was identified as a reasonable size for the testing of an alternative layout. In addition, the consideration of a site in one of the first new towns namely Queenstown, was then thought to be most appropriate for the following reasons:-

- Queenstown was one of the first new towns where slab blocks were introduced in the 1960s by the then Singapore Improvement Trust before the present Housing and Development Board (HDB) was established.

- The site with its slabs and tower form represents a typical housing parcel planned according to the present high-density high-rise pattern adopted by the HDB.
- The arrangement of residential dwellings surrounding commercial shops in the centre is also typical of the basic building block in a neighbourhood centre in any new town.

The above reasons make the selected site in Dover, Queenstown, most appropriate for an alternative layout. It not only represents in essence a typical housing parcel planned according to the high-density, high-rise model but it also embodies the very philosophy of planning based on zoning methods. Furthermore, the site is surrounded by one of the two highest institutions of learning in the country, namely the National University of Singapore situated across the Ayer Rajah Expressway. In addition, the Anglo-Chinese School, which is one of the oldest missionary schools in Singapore to become one of the first independent secondary schools and by both Fairfield Methodist Primary and Secondary School, flanked the site across Dover Road. The site is also within the vicinity of the Science Park, which concentrates on research and design activities of computer technology for the manufacturing markets.

Figure 77 The Ayer Rajah Expressway

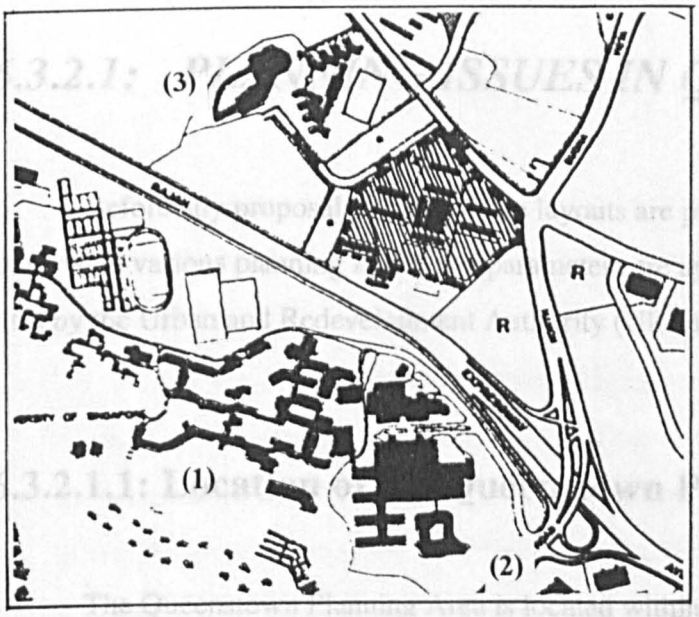


Figure 78 . The site

Figure 79 Tertiary educational institution (1)

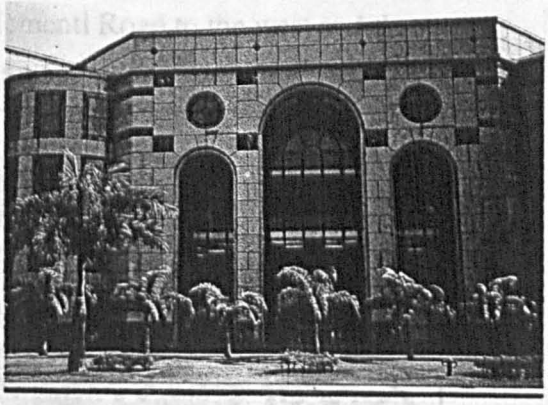


Figure 80 . Science Park premises at Ayer Rajah (2)

Figure 81 . Anglo-Chinese School in Queenstown (3)

6.3.2.1: PLANNING ISSUES IN QUEENSTOWN

Before any proposals of alternative layouts are presented, it would be useful to show what various planning issues and parameters are applied to housing development sites by the Urban and Redevelopment Authority (URA).

6.3.2.1.1: Location of the Queenstown Planning Area

The Queenstown Planning Area is located within the Central Region. It is bounded by the Ulu Pandan Canal, Ghim Moh Housing Estate and the former Tanglin Camp area to the north, Alexandra Road to the east, Clementi Road to the west and the sea to the south. It covers an area of approximately 2,188 ha. (URA, 1994)

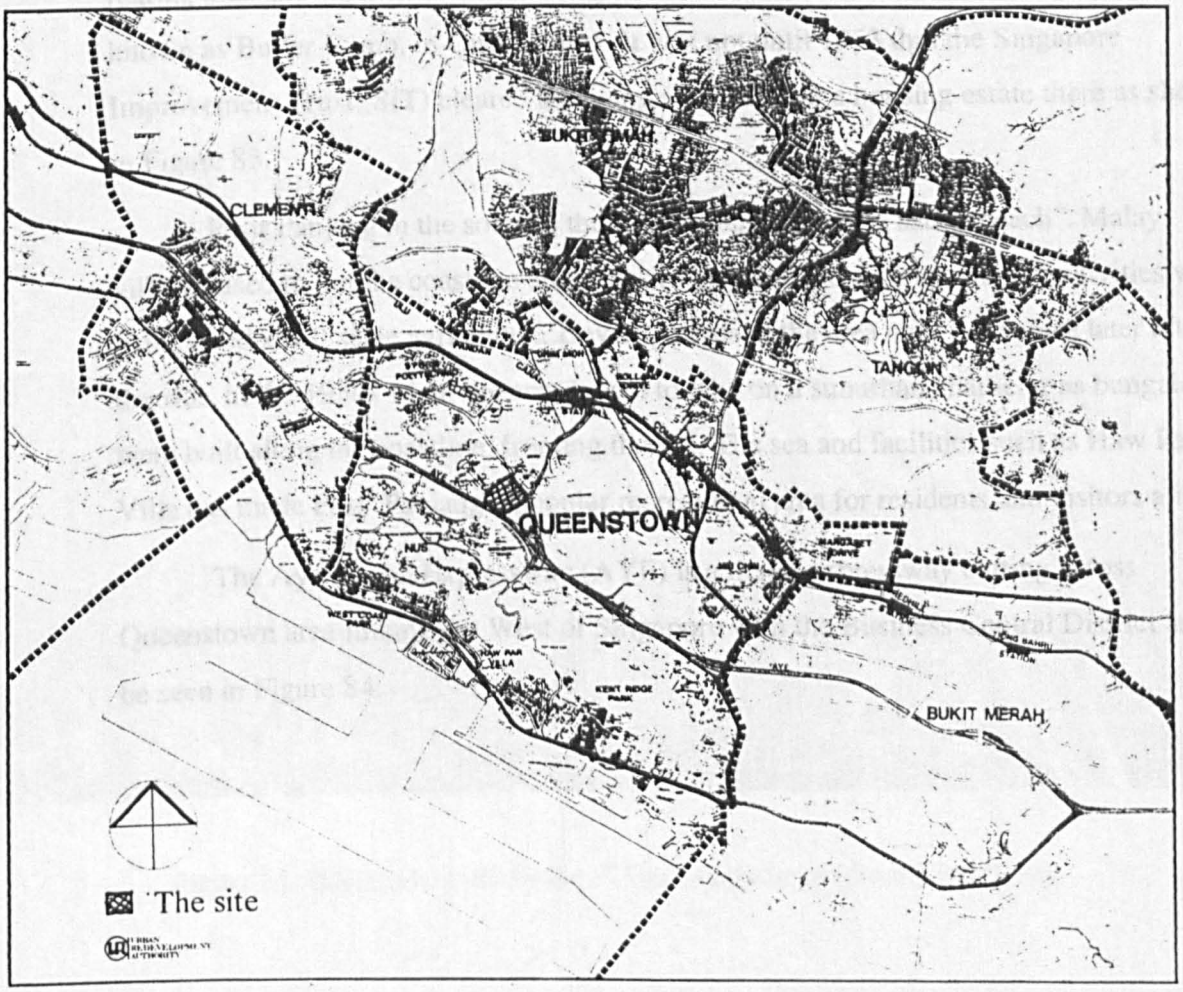


Figure 82 Queenstown Planning Area (from URA, 1994)

6.3.2.1.1.1: Historical Background

The Queenstown Planning Area can be divided into two main areas. The first is the present Queenstown housing estate and the second is further south along the coast of Pasir Panjang.

The Queenstown housing estate was one of the earliest housing estates developed by the Singapore Improvement Trust (SIT) and subsequently the Housing and Development Board (HDB). It is the first satellite town in Singapore and a major part of it was developed during the first Five-Year Building Programme (1960 - 1965). From 1952 to 1968, a total of 19,372 dwelling units were constructed.

Queenstown was previously an agricultural area. Before the war in 1942, there were hundreds of people living in attap huts cultivating vegetables, growing fruit and rearing pigs and chickens. The British government then had also set up a military camp, known as Buller Camp, in Queenstown. It was not until 1953 that the Singapore Improvement Trust (SIT) cleared the camp site and built a housing estate there as shown in Figure 83.

Pasir Panjang in the south is the Malay name for "long sandy beach". Malay villages used to dot the coastline along Pasir Panjang. The main economic activities were fishing and small scale agriculture. Developments in the area only took place later after the war. in the 1950s when the area began to take on a suburban character as bungalows were built along the coastline, fronting the sea. The sea and facilities such as Haw Par Villa has made Pasir Panjang a popular recreational area for residents and visitors alike.

The Ayer Rajah Expressway (AYE) is a major expressway cutting across Queenstown area linking the West of Singapore with the Business Central District as can be seen in Figure 84.

Figure 83. Slab blocks built by the SIT in Queenstown (from URA, 1994).

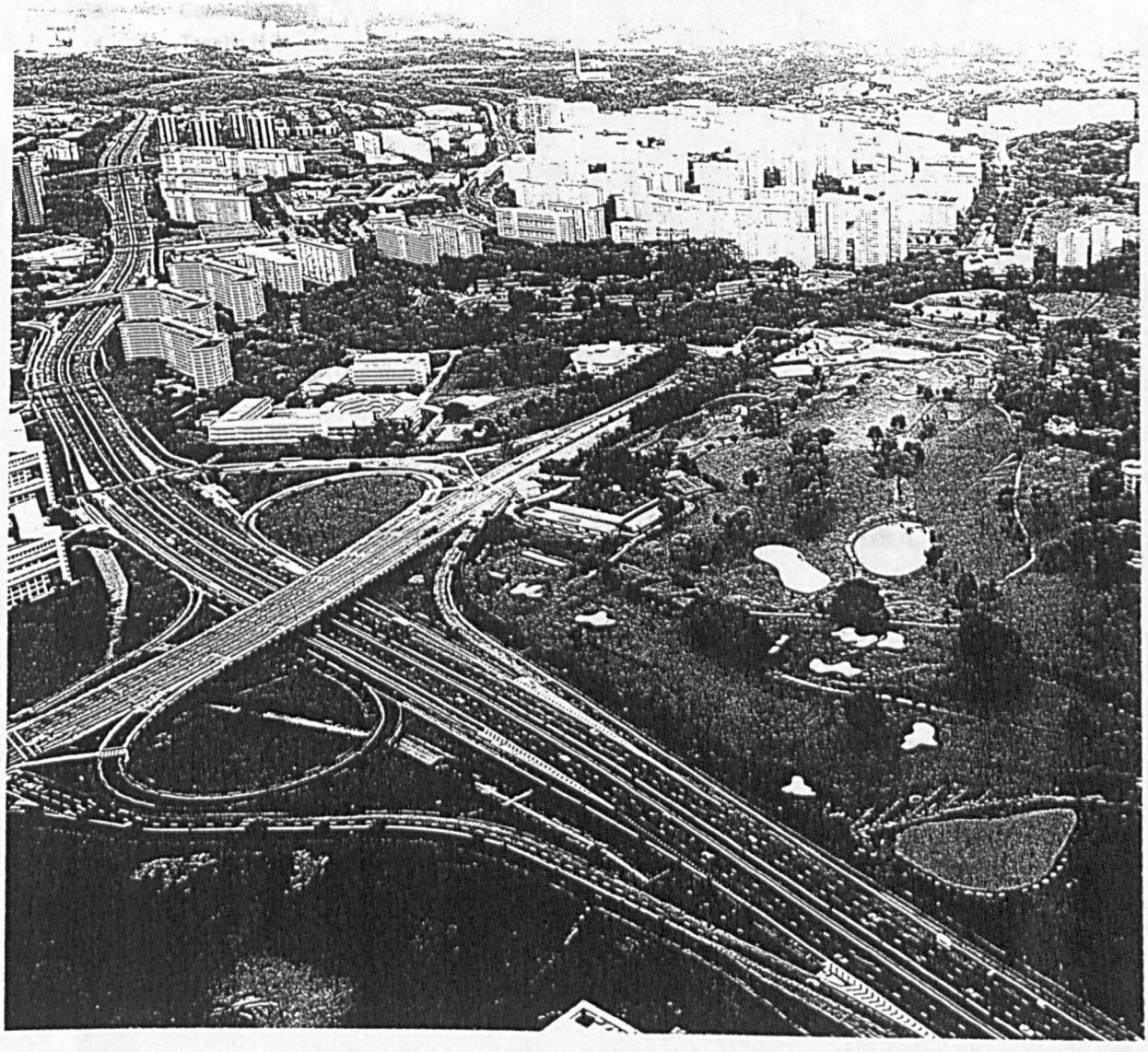


Figure 84. Typical slab and tower blocks and the Clementi Road/Ayer Rajah Expressway (from URA, 1994).

6.3.2.1.1.2: Planning Area Sub-Zones

The Queenstown Planning Area is made up of 16 sub-zones as follows:-

	Sub-zone	Land Area (Ha)	%
1.	Ghim Moh	36	2
2.	Holland Drive	46	2
3.	Commonwealth	31	1
4.	Tanglin Halt	48	2
5.	Margaret Drive	95	4
6.	Mei Chin	78	4
7.	Queensway	59	3
8.	Portsdown	139	6
9.	Buona Vista	59	3
10.	Singapore Poly.	106	5
11.	Dover	147	7
12.	National University	176	8
13.	Kent Ridge	182	8
14.	Pasir Panjang	107	5
15.	Pasir Panjang II	84	4
16.	Port	795	36
	Total	2188	100

Table 32. Queenstown Planning Area Sub-zones (from URA, 1994)

The site selected for the testing of an alternative high-density, low-rise housing is in Dover found in Zone 11 as shown in Figure 85 (page 180).

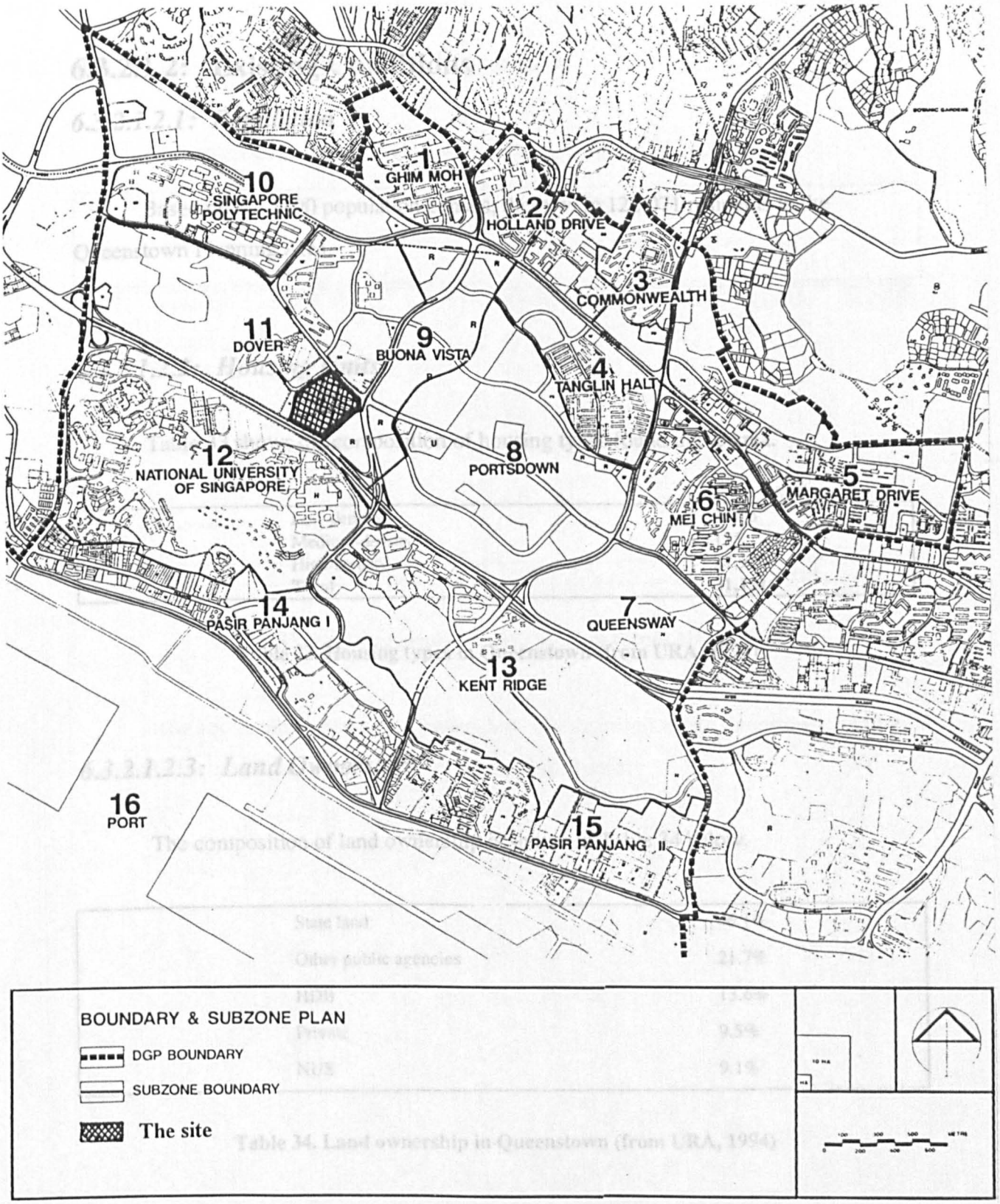


Figure 85. Boundary and Subzone Plan (the site selected is in Zone 11, Dover) (from URA, 1994)

6.3.2.1.2: Existing Conditions

6.3.2.1.2.1: Population

Based on the 1990 population census, there were 126,071 residents in the Queenstown Planning Area.

6.3.2.1.2.2: Housing Units

Table 33 shows the composition of housing types found in the area.

Low-density	3,016
Medium-density	135
High-density	27,980
Total	**31,131**

Table 33. Housing types in Queenstown (from URA, 1994)

6.3.2.1.2.3: Land Ownership

The composition of land ownership is shown in Table 34 below.

State land	46.1%
Other public agencies	21.7%
HDB	13.6%
Private	9.5%
NUS	9.1%

Table 34. Land ownership in Queenstown (from URA, 1994)

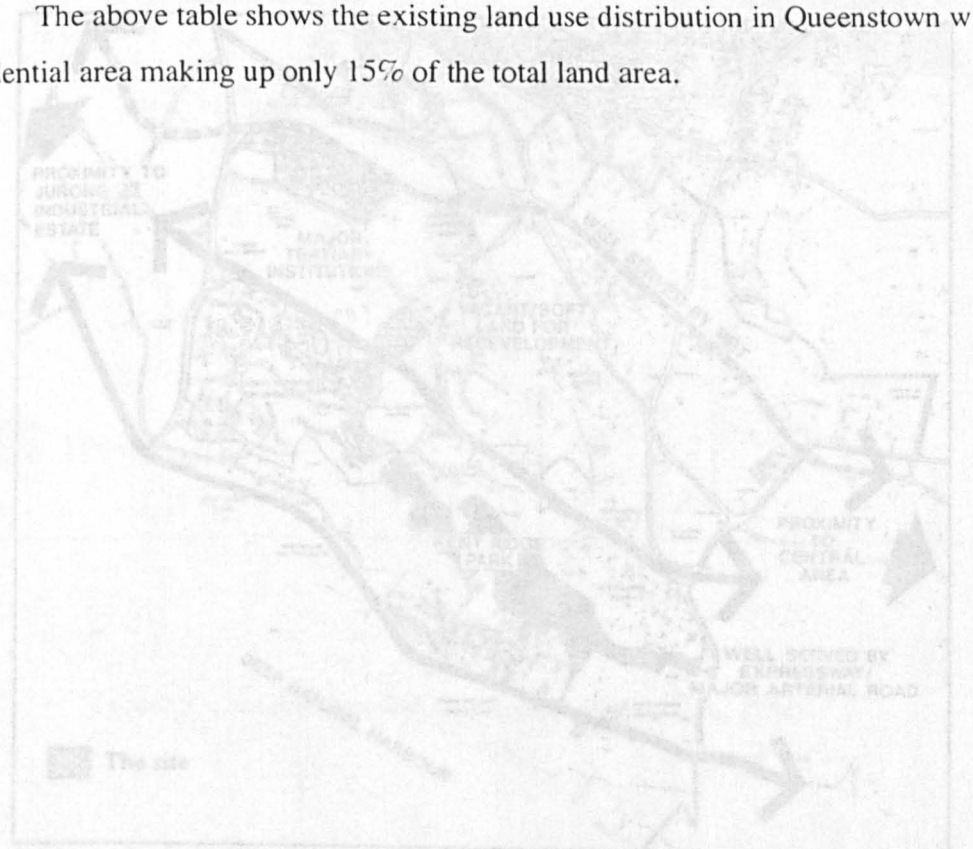
6.3.2.1.2.4: Existing Land Use Distribution

The existing land use distribution in the area is shown in Table 35.

	BROADLAND USE	LAND AREA	
		Ha	%
1.	Residential	334	15
2.	Commercial	37	2
3.	Business Park	29	1
4.	Industrial	76	4
5.	Institutional	370	17
6.	Open Space & Recreational	197	9
7.	Roads & Infrastructure	226	10
8.	Port	277	13
9.	Waterbody	16	1
10.	Others	626	28
	Total	2188	100

Table 35. Existing land use distribution (from URA, 1994)

The above table shows the existing land use distribution in Queenstown with the residential area making up only 15% of the total land area.



6.3.2.1.3: Strengths and Opportunities

The area is situated at the heart of the Technology Corridor which stretches from the city fringe to the Nanyang Technology University as proposed in the Revised Concept Plan (1991). The existence of tertiary educational and research facilities within Queenstown enhances its potential to be developed for research-based, high-technology industrial activities. Large tracts of vacant land and the relocation of interim uses offer opportunities for new developments to realise the Concept Plan's vision for the area as a Technology Corridor. Good transportation links from Queenstown to the Central Area and Jurong Industrial area make Queenstown very accessible and attractive for residential development. It is well served by the Mass Rapid Transit (MRT) System to the north and expressways to the south.

In planning for Queenstown, the natural assets of the area were also taken into consideration. For example, the deep waters and sheltered coast of Pasir Panjang makes it attractive for port development, and the natural wooded areas of Kent Ridge, one of the few high points on the south-west coast, is to be retained for recreational and leisure activities.

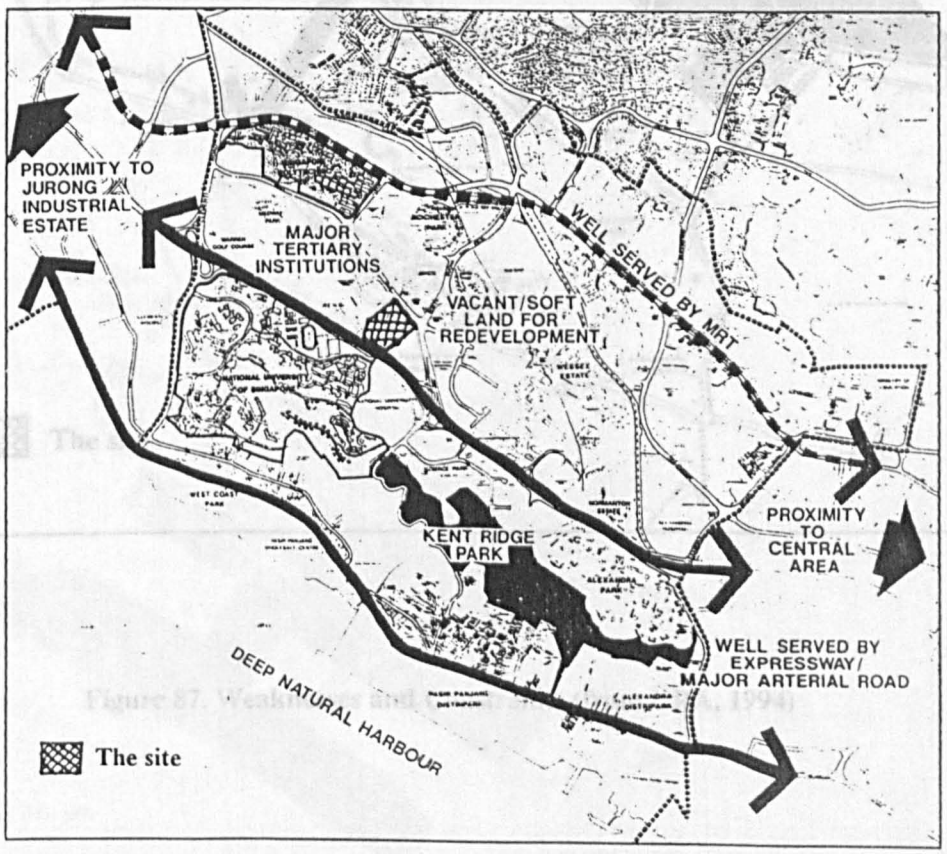


Figure 86 - Strengths and Opportunities

6.3.2.1.4: Weaknesses and Constraints

There is an inadequate north-south transport link between Queenstown and Pasir Panjang as well as poor linkages between parts of the planning area. There are also old housing and industrial estates which require upgrading and further intensification in land use.

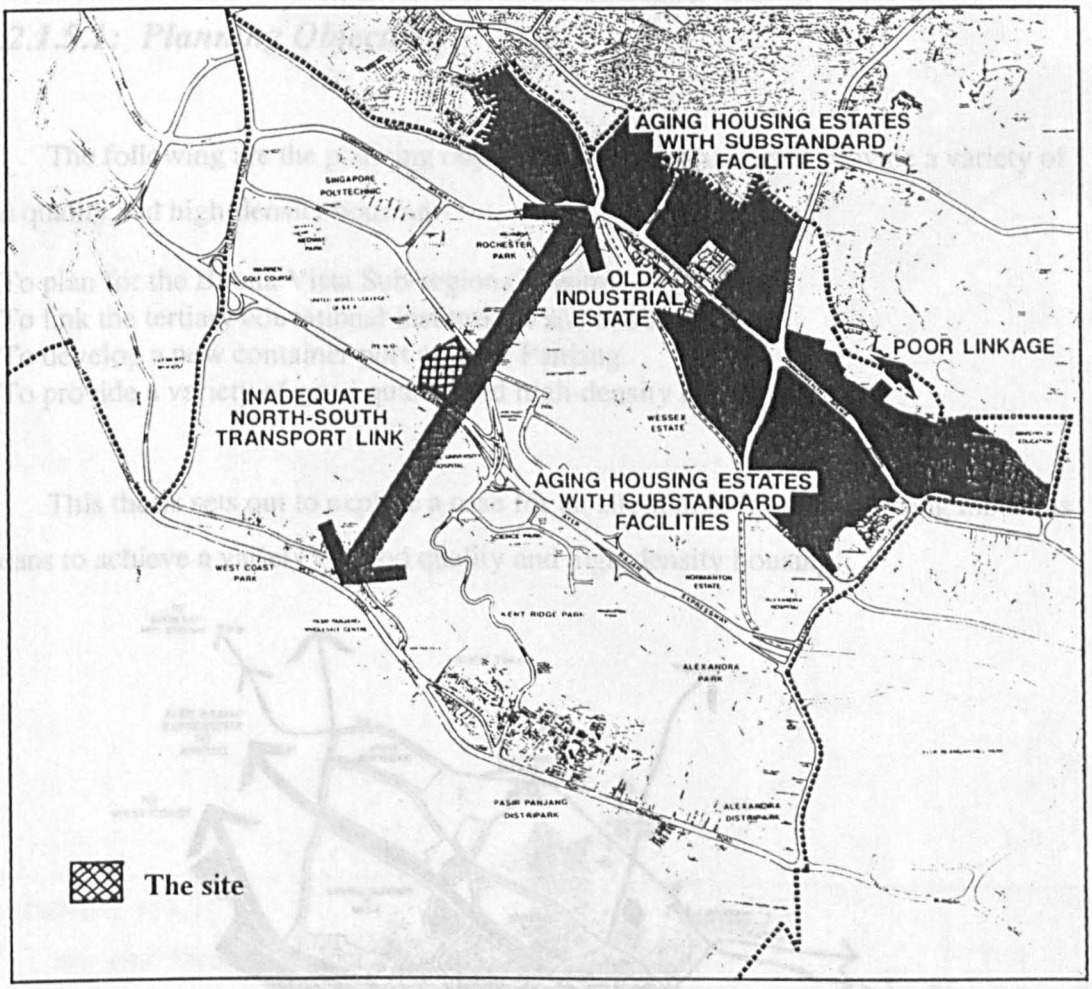


Figure 87. Weaknesses and Constraints (from URA, 1994)

6.3.2.1.5: Objectives for Queenstown in the Master Plan Proposals

Briefly, the broad vision spelled out within the Queenstown Planning Report 1994 is:

A Dynamic and Economically Vibrant Area in the heart of the South-Western Technology Corridor.

(URA, 1994)

6.3.2.1.5.1: Planning Objectives

The following are the planning objectives, one of which is to provide a variety of good quality and high-density housing:-

- To plan for the Buona Vista Sub-regional Centre.
- To link the tertiary educational institutions and business parks.
- To develop a new container port at Pasir Panjang.
- To provide a variety of good quality and high-density housing.

This thesis sets out to explore a case for an alternative low-rise housing model as a means to achieve a variety of good quality and high-density housing.

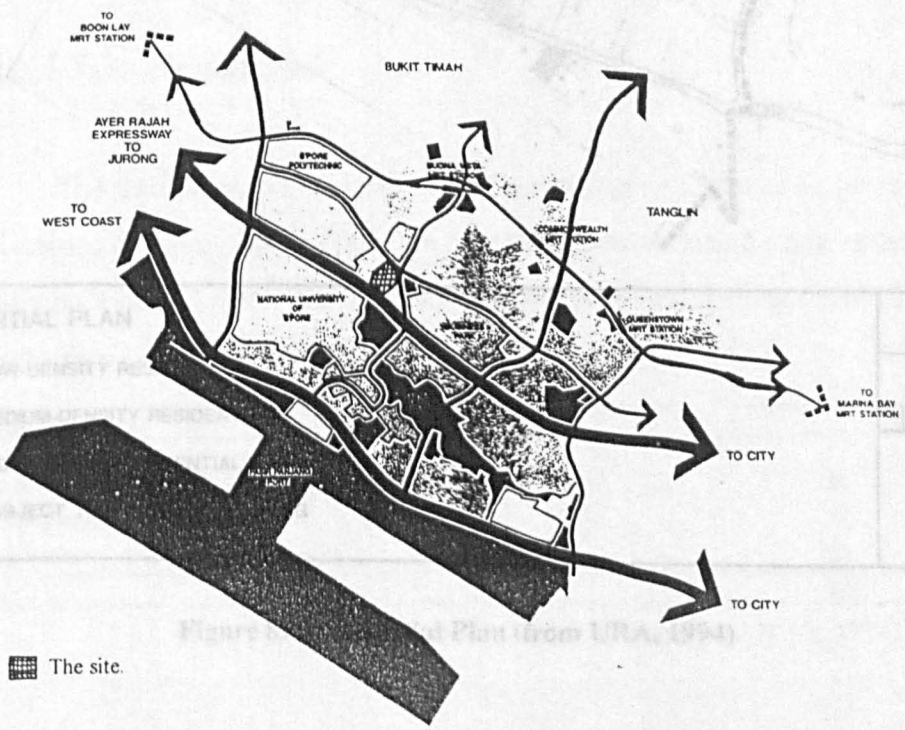


Figure 88 - Structure plan for Queenstown

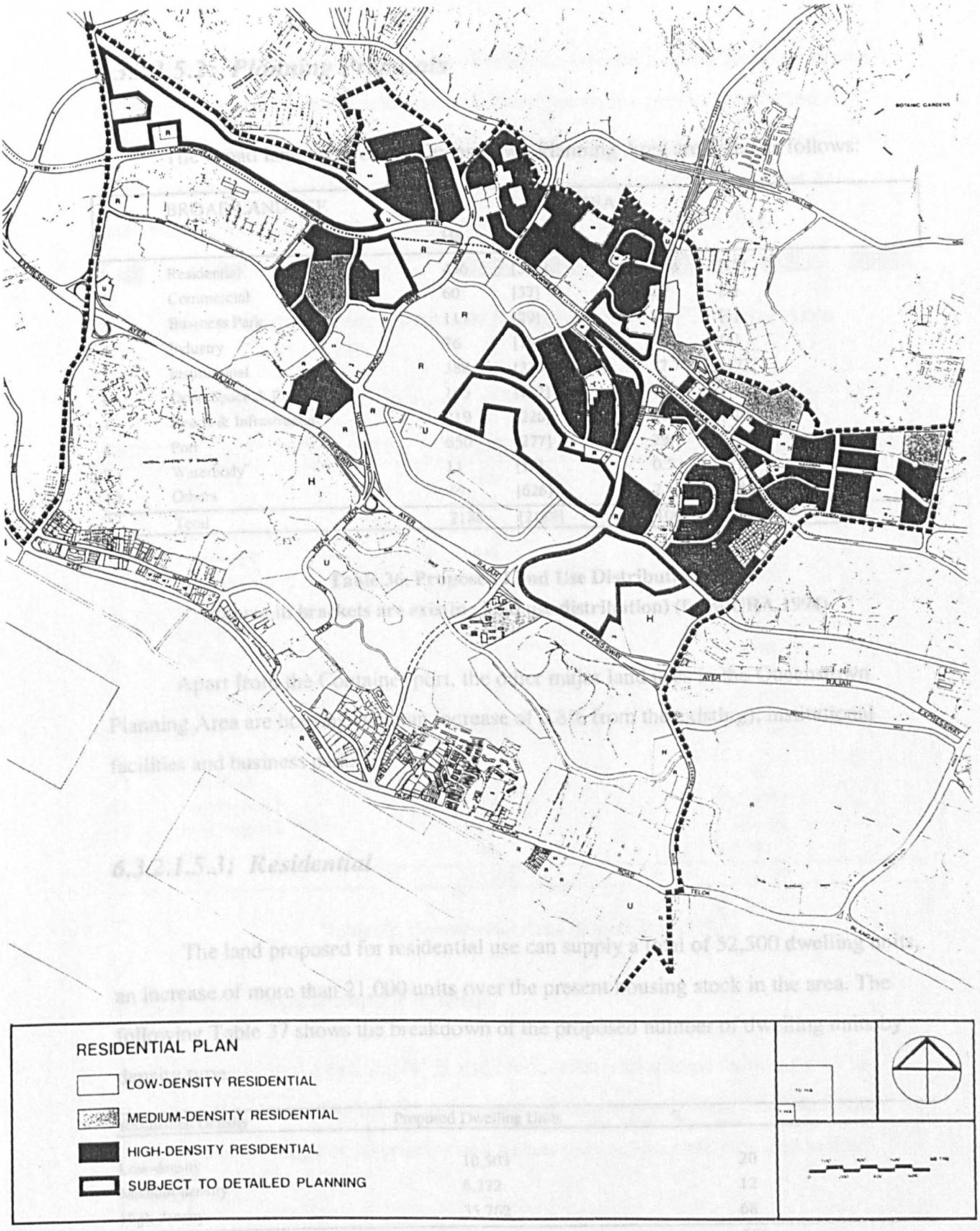


Figure 89. Residential Plan (from URA, 1994)

6.3.2.1.5.2: Planning Proposals

The broad land uses for the Queenstown Planning Area are listed as follows:

	BROAD LAND USE	LAND AREA			
		Ha		%	
1.	Residential	456	[334]	20.8	[15]
2.	Commercial	60	[37]	2.7	[2]
3.	Business Park	117	[29]	5.4	[1]
4.	Industry	76	[76]	3.5	[4]
5.	Institutional	388	[370]	17.7	[17]
6.	Open Space & Recreational	165	[197]	7.6	[9]
7.	Roads & Infrastructure	219	[226]	10.0	[10]
8.	Port	650	[277]	29.7	[13]
9.	Waterbody	11	[16]	0.5	[1]
10.	Others	46	[626]	2.1	[28]
	Total	2188	[2188]	100	[100]

Table 36. Proposed Land Use Distribution
(figures in brackets are existing land use distribution) (from URA,1994)

Apart from the Container port, the other major land uses in the Queenstown Planning Area are housing (with an increase of 5.8% from the existing), institutional facilities and business parks.

6.3.2.1.5.3: Residential

The land proposed for residential use can supply a total of 52,500 dwelling units, an increase of more than 21,000 units over the present housing stock in the area. The following Table 37 shows the breakdown of the proposed number of dwelling units by density type.

Residential Density	Proposed Dwelling Units	%
Low-density	10,503	20
Medium-density	6,272	12
High-density	35,762	68
Total	52,537	100

Table 37. Housing Units By Density Type (from URA, 1994)

Given the locational advantages of being close to the Central Area and Jurong Industrial area, residential developments in Queenstown are generally proposed at medium and high densities. New residential areas are proposed at Commonwealth Ave. West, Alexandra Park, Normanton Estate and Portsdown area. There will also be redevelopment of HDB areas at Margaret Drive and Commonwealth Ave.

6.3.2.1.5.4: Commercial Quantum for Queenstown Planning Area

The commercial quantum for the area are listed in Table 38.

	Sub-zone	Existing	Proposed
1.	Ghim Moh	11,800	11,800
2.	Holland Drive	15,000	15,000
3.	Commonwealth	5,200	5,200
4.	Tanglin Halt	15,400	15,400
5.	Margaret Drive	18,400	52,600
6.	Mei Chin	20,300	29,300
7.	Queensway	12,800	12,800
8.	Portsdown	-	10,600
9	Buona Vista	-	195,000
10.	Singapore Polytechnic	-	13,100
11.	Dover	6,700	8,800
12.	NUS	-	-
13.	Kent Ridge	-	3,100
14.	Pasir Panjang I	18,200	25,900
15.	Pasir Panjang II	180,300	180,300
16.	Port	2,700	2,700
	Total	306,800	581,600

Table 38. Commercial Area (from URA,1994)

6.3.2.1.5.5: Institutional Facilities

Apart from the existing NUH and NUS, other institutional facilities such as schools, religious buildings and community facilities are planned for the Queenstown Planning Area. A total of 10 primary and 8 secondary schools are provided in this planning area.

Schools	Number
Primary Schools	10
Secondary School	8

Table 39. School Provision (from URA, 1994)

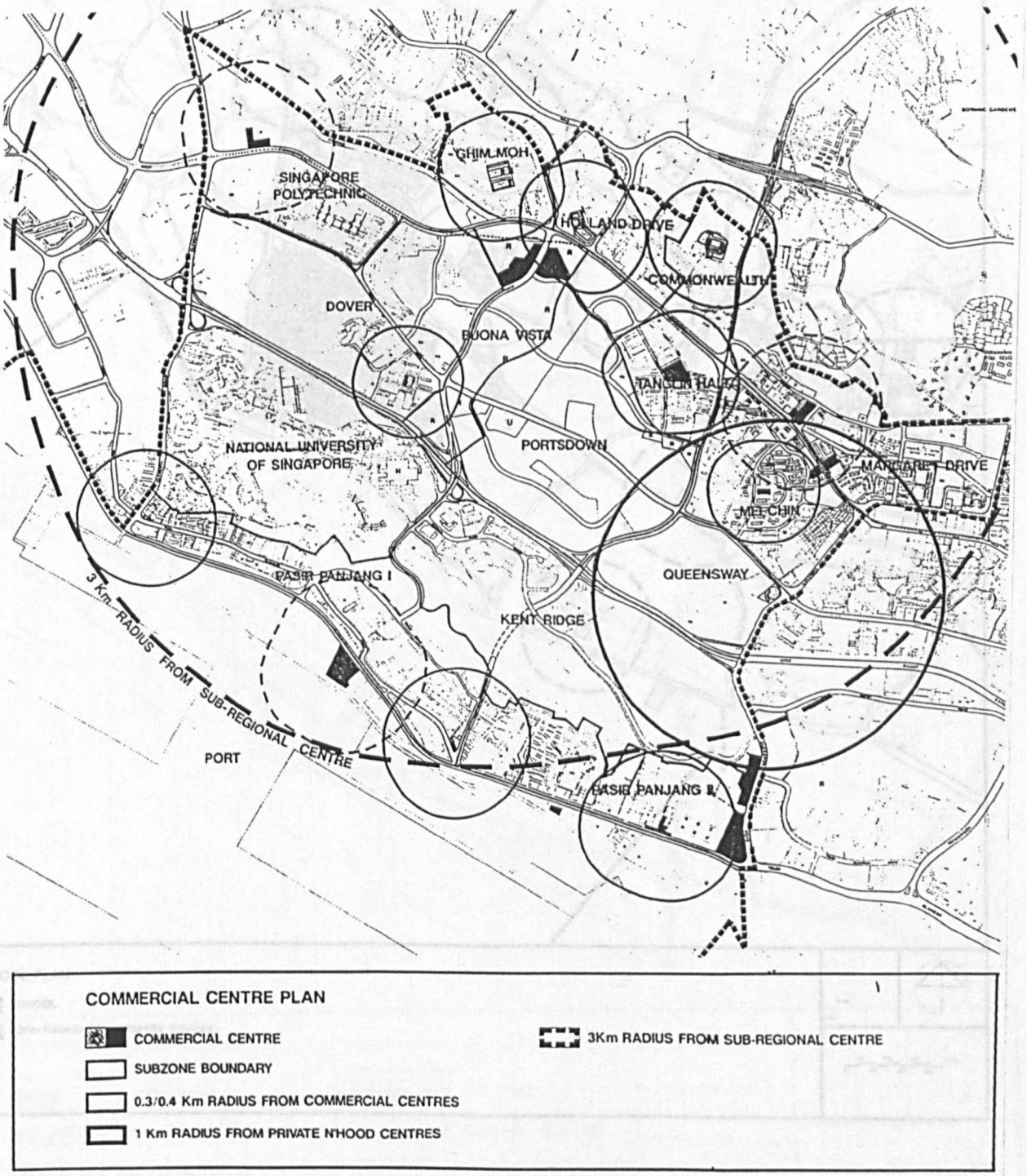


Figure 90. Commercial Centre Plan (from URA, 1994)

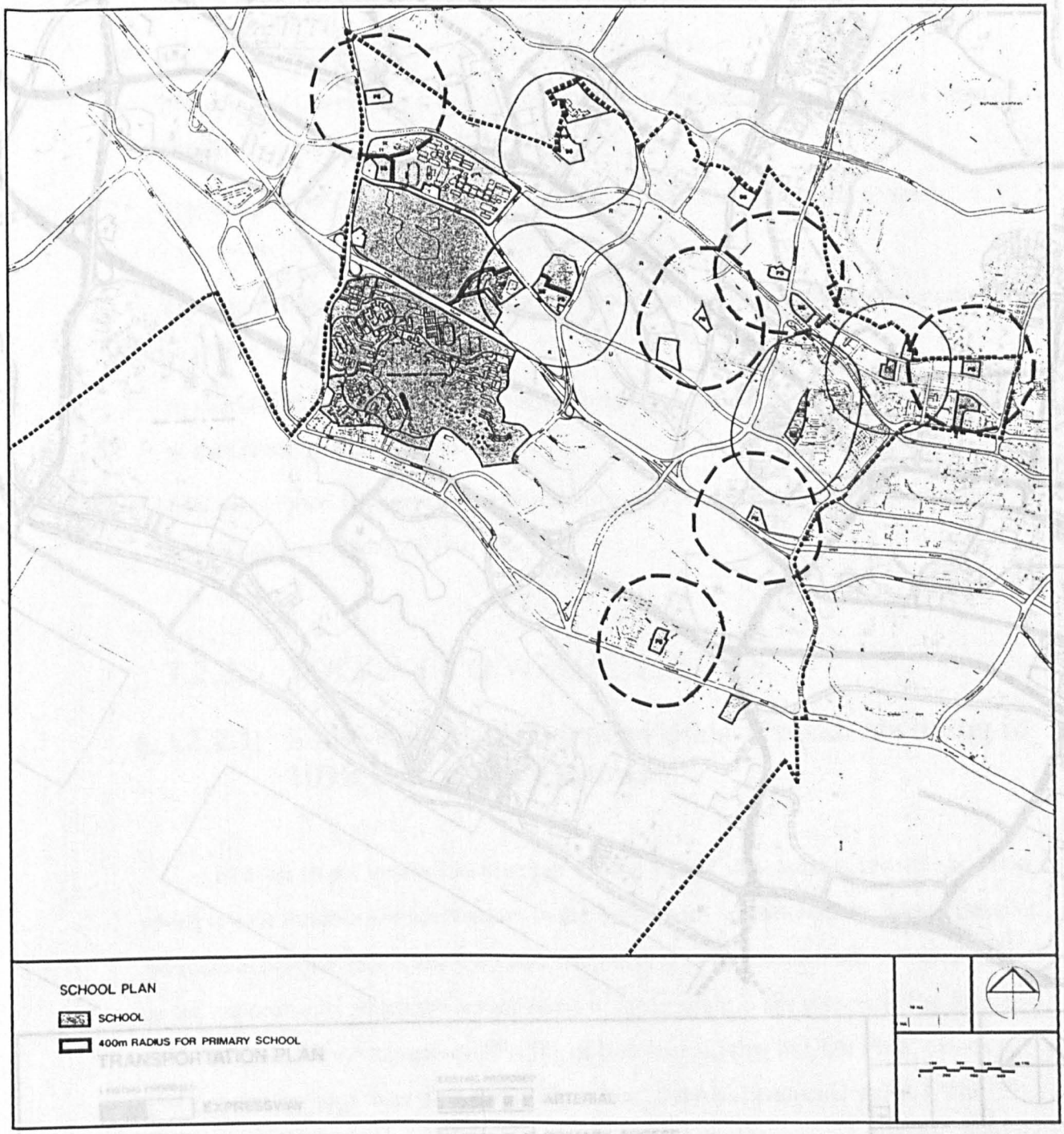


Figure 91. School Plan (from URA, 1994)

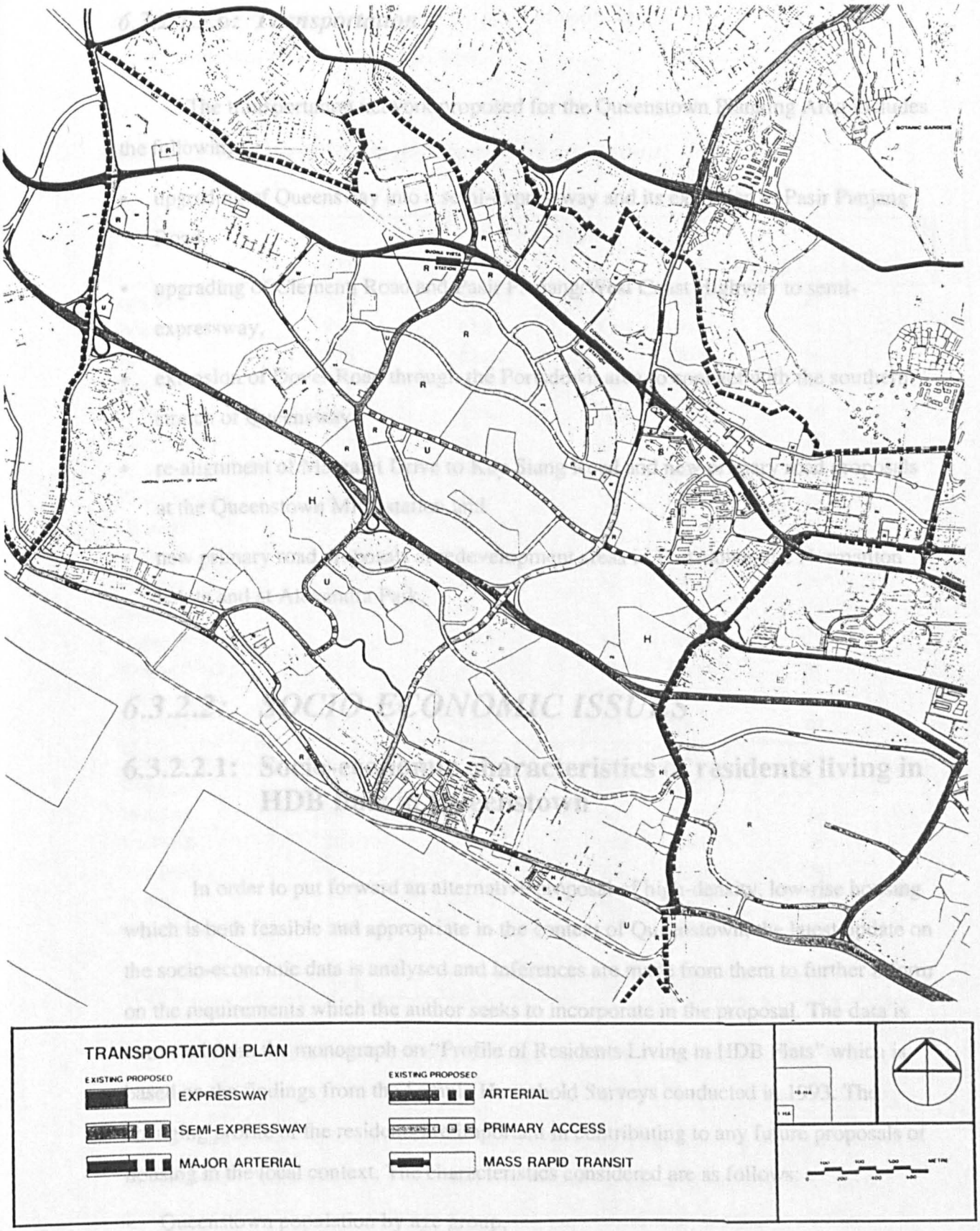


Figure 92. Transportation Plan (from URA, 1994)

6.3.2.1.5.6: Transportation

The transportation network proposed for the Queenstown Planning Area includes the following:

- upgrading of Queensway into a semi-expressway and its extension to Pasir Panjang Road,
- upgrading of Clementi Road and Pasir Panjang/West Coast Highway to semi-expressway,
- extension of Dover Road through the Portsdown area to connect with the southern stretch of Queensway,
- re-alignment of Margaret Drive to Kay Siang Road and new primary road proposals at the Queenstown MRT station and
- new primary road proposals at redevelopment areas in Portsdown, the Normanton Estate and at Alexandra Park.

6.3.2.2: SOCIO-ECONOMIC ISSUES

6.3.2.2.1: Socio-economic characteristics of residents living in HDB flats in Queenstown

In order to put forward an alternative proposal of high-density, low-rise housing which is both feasible and appropriate in the context of Queenstown, the latest update on the socio-economic data is analysed and inferences are made from them to further inform on the requirements which the author seeks to incorporate in the proposal. The data is extracted from the monograph on "Profile of Residents Living in HDB Flats" which is based on the findings from the Sample Household Surveys conducted in 1993. The changing profile of the residents are important in contributing to any future proposals of housing in the local context. The characteristics considered are as follows:

- Queenstown population by age group,

- Queenstown working population by place of work, and
- Queenstown households by flat type.

6.3.2.2.1.1: Queenstown population by age group

New Town	Age Group (Years)				
	< 15	15 - 19	> 60	Total	Median Age (years)
Ang Mo Kio	21.2	71.1	7.7	100.0	29
Bedok	23.9	67.8	8.3	100.0	29
Bishan	30.8	63.2	6.0	100.0	30
Bukit Batok	31.9	61.0	7.1	100.0	30
Bukit Merah	18.1	65.6	16.3	100.0	34
Bukit Panjang	31.6	60.3	8.1	100.0	30
Central Area	19.4	64.4	16.3	100.0	36
Choa Chu Kang	27.1	67.4	5.5	100.0	29
Clementi	24.3	69.6	6.1	100.0	29
Geylang	21.2	67.3	11.5	100.0	33
Hougang	27.1	65.3	7.6	100.0	29
Jurong East	23.2	71.7	5.1	100.0	29
Jurong West	25.6	68.8	5.6	100.0	27
Kallang/Whampoa	17.8	66.4	15.8	100.0	34
Marine Parade	13.7	72.0	14.3	100.0	34
Pasir Ris	29.3	67.5	3.2	100.0	29
Queenstown	14.2	72.1	13.7	100.0	33
Serangoon	25.7	68.3	6.0	100.0	31
Tampines	30.4	63.5	6.1	100.0	34
Toa Payoh	18.0	70.1	11.9	100.0	35
Woodlands	25.9	66.5	7.6	100.0	28
Yishun	30.4	65.1	4.5	100.0	27
Other Estates	20.5	63.6	15.9	100.0	33
Overall	24.1	67.1	8.8	100.0	30

Table 40. HDB Population By Age Group and New Town (source: HDB, 1995)

As can be seen clearly from the table above, the population in the age group of 60 and above in Queenstown is 13.7% and is 4.9% above that of the overall average of 8.8%. It is one of new towns where the ageing population is on the increase. The

following table compares the HDB population by age group and year:

Age Group (Years)	SHS 1987		SHS 1993	
Below 5	7.3	)	8.3	)
5 - 9	8.3	) 24.7	7.9	) 24.2
10 - 14	9.1	)	8.0	)
15 - 19	9.2	)	7.5	)
20 - 24	10.5	)	8.0	)
25 - 29	9.9	) 48.9	8.9	) 44.4
30 - 34	10.1	)	10.0	)
35 - 39	9.0	)	10.0	)
40 - 44	5.2	)	8.5	)
45 - 49	5.4	)	5.8	)
50 - 54	4.3	) 18.6	4.8	) 22.6
55 - 59	3.7	)	3.5	)
60 and above	8.0		8.8	
Total %	100.0		100.0	
Persons	2,230,150		2,411,611	
Average age (Years)	30.0		30.9	
Median age (Years)	26.8		30.0	

Table 41. HDB Population By Age Group and Year (source: HDB, 1995)

As can be seen from the table above, the proportion of persons aged 60 years and above increased by 0.8% in 1987 to 8.8% in 1993. Among those aged 40 to 59 years, the proportion has also increased by 4% over the past six years. The HDB population presented in age pyramids, as shown in Figures 93 and 94 below, also reveals the ageing structure of the population.

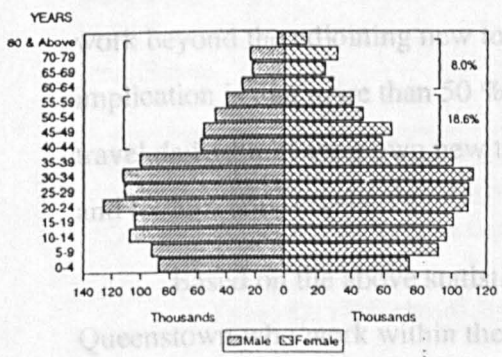


Figure 93. Age pyramid of HDB population (SHS 1987)(from HDB, 1995)

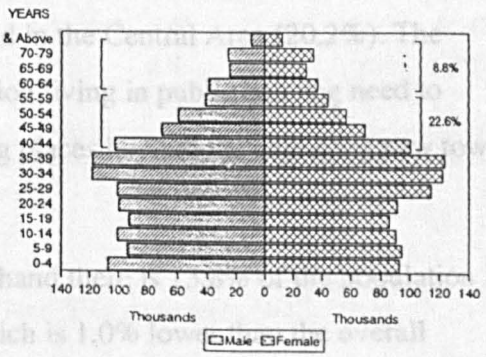


Figure 94. Age pyramid of HDB population (SHS 1993) (from HDB, 1995)

6.3.2.2.1.2: *Queenstown working population by place of work*

New Town	Place of Work					Total	
	Within NT/est	Adjoining NT/est	Beyond Adjoining	Central Area	No Fixed Place	%	No. of Persons
Ang Mo Kio	18.9	9.0	41.5	16.9	13.7	100.0	96,876
Bedok	17.0	22.7	34.6	17.2	8.6	100.0	111,283
Bishan	3.5	17.9	51.0	22.5	5.2	100.0	30,123
Bukit Batok	9.0	31.7	35.9	15.8	7.7	100.0	35,319
Bukit Merah	19.4	7.1	35.3	25.7	12.5	100.0	95,029
Bukit Panjang	4.0	7.5	70.9	12.7	4.9	100.0	21,086
Central Area	–	15.9	28.8	45.9	9.5	100.0	29,865
Choa Chu Kang	1.1	8.4	60.6	17.6	12.3	100.0	17,972
Clementi	14.6	33.2	23.1	19.9	9.2	100.0	45,885
Geylang	20.4	19.1	28.9	24.0	7.6	100.0	48,827
Hougang	10.5	17.7	43.6	17.5	10.6	100.0	79,337
Jurong East	16.3	22.2	39.7	12.6	9.3	100.0	41,392
Jurong West	24.4	24.5	31.6	12.8	6.7	100.0	70,807
Kallang/ Whampoa	22.3	10.2	38.7	22.8	6.0	100.0	37,108
Marine Parade	15.8	13.1	35.3	28.1	7.7	100.0	11,874
Pasir Ris	4.2	13.1	32.9	39.3	10.6	100.0	12,518
Queenstown	13.8	19.3	35.2	26.3	5.3	100.0	54,691
Serangoon	9.0	16.1	40.9	18.2	15.8	100.0	29,723
Tampines	8.9	20.4	45.1	18.5	7.1	100.0	85,674
Toa Payoh	18.3	14.5	35.8	24.8	6.6	100.0	57,609
Woodlands	23.5	8.9	48.2	17.5	1.8	100.0	22,851
Yishun	13.5	10.8	52.5	17.4	5.9	100.0	78,640
Overall	14.8	16.9	39.5	20.2	8.7	100.0	1,114,489

Table 42. Working Population By Place of Work and New Town (source: HDB, 1995)

As can be seen from the above table, the population working within the same new town or estate is very low, at 14.8%. The greatest percentage of working population work beyond the adjoining new town (39.5%) and in the Central Area (20.2%). The implication is that more than 50 % of the population living in public housing need to travel daily out of their own new town to working places beyond the adjoining new town and to the Central Area.

Based on the above statistics, on the one hand there is 13.8% of the population in Queenstown who work within the new town, which is 1.0% lower than the overall

14.8%. On the other hand, the figure for the Queenstown population working in the adjoining new town is 19.3%, which is 2.4% higher than the overall figure. The majority of the Queenstown population, 35.2%, actually travel to places of work beyond the adjoining new town and 26.3% work in the Central Area, which is 6.1% higher than the overall figure of 20.2%.

6.3.2.2.1.3: Queenstown households by flat type

New Town	Flat Type							Total	
	1 rm	2 rm	3 rm	4 rm	5 rm	Exec	HUDC	%	N
Ang Mo Kio	2.7	7.6	56.9	25.9	6.9	---	---	100.0	46,209
Bedok	3.3	2.8	50.1	26.9	13.4	2.1	1.4	100.0	52,893
Bishan	1.7	---	4.0	42.7	38.4	10.4	2.8	100.0	16,761
Bukit Batok	0.8	0.5	44.4	38.7	7.8	7.8	---	100.0	23,604
Bukit Merah	14.3	13.4	45.3	17.0	8.7	---	1.3	100.0	45,079
Bukit Panjang*	---	---	16.4	54.4	20.5	8.7	---	100.0	12,597
Central Area**	25.2	18.4	39.3	15.6	1.5	---	---	100.0	16,913
Choa Chu Kang*	---	1.2	6.1	62.8	16.8	13.1	---	100.0	11,061
Clementi	1.5	2.4	63.6	24.1	6.9	1.5	---	100.0	23,793
Geylang	2.9	15.1	44.8	25.0	8.6	2.5	1.1	100.0	27,936
Hougang*	1.2	0.9	26.1	47.1	13.9	8.1	2.7	100.0	35,589
Jurong East	---	---	34.3	33.5	24.7	5.0	2.5	100.0	18,731
Jurong West*	1.3	1.4	27.3	50.0	14.8	5.2	---	100.0	33,673
Kallang/Whampoa	13.2	7.6	45.1	24.8	8.3	1.0	---	100.0	25,764
Marine Parade**	---	18.4	38.0	12.5	31.1	---	---	100.0	7,613
Pasir Ris*	---	---	---	50.8	30.9	18.3	---	100.0	7,825
Queenstown	2.1	14.0	68.2	10.6	5.1	---	---	100.0	26,341
Serangoon*	---	0.3	28.6	47.0	11.7	10.2	2.2	100.0	17,701
Tampines*	0.2	0.3	26.4	43.4	21.3	7.2	1.2	100.0	46,107
Toa Payoh	4.9	10.1	48.1	24.7	9.7	2.2	0.3	100.0	31,198
Woodlands*	0.4	0.9	35.4	42.1	18.0	3.2	---	100.0	16,378
Yishun*	---	0.1	27.2	54.2	12.6	5.9	---	100.0	44,456
Other Estates	---	6.3	36.9	15.7	19.5	9.8	11.9	100.0	5,957
Overall	3.6	5.3	39.8	33.8	12.6	4.0	0.9	100.0	594,179

*New towns which are not fully completed at the time of survey

**Central Area and Marine Parade are estates

Table 43. Households By Flat Type and New Town (source: HDB, 1995)

Based on the above table, the figure for 4 and 5 room flats in Queenstown is very low compared to the overall figure. For a 4-room, it is only 10.6%, 23.2% lower than the overall of 33.8%; and for a 5-room, it is only 5.1%, which is 7.5% lower than the overall figure of 12.6%. The majority of flat types in Queenstown is 3-room flats at 68.2%, which is 28.4% higher than the overall figure of 39.8%. Furthermore, there is not a single executive flat to be found in Queenstown, whereas there are 4.0% of such flats in the overall figure. Therefore, in the alternative housing scheme, the proposal is to increase the number of 4-room and 5-room flats and the possibility of introducing executive flats will be considered.

6.3.2.3: THE EXISTING SCHEME

6.3.2.3.1: The Existing Housing Layout

The existing housing layout is shown in Figure 95. This housing parcel can be considered as a precinct consisting of 748 units of dwellings and 70 units of local shops. There are basically nine, 13-storey high slab blocks and one 26-storey high tower block and a single storey market-cum-food centre. Based on the concept of zoning, three out of the nine slab blocks are planned with ground floor shops and, together with the market-cum-food centre, they formed the local commercial facilities serving the surrounding residents as well as people from the surrounding institutions. Surface car parking spaces are provided in the layout. There is a stretch of green called the local park in-between the residential areas and the Ayer Rajah Expressway. Furthermore, there are three reserve sites which are earmarked for institutional developments in the future.

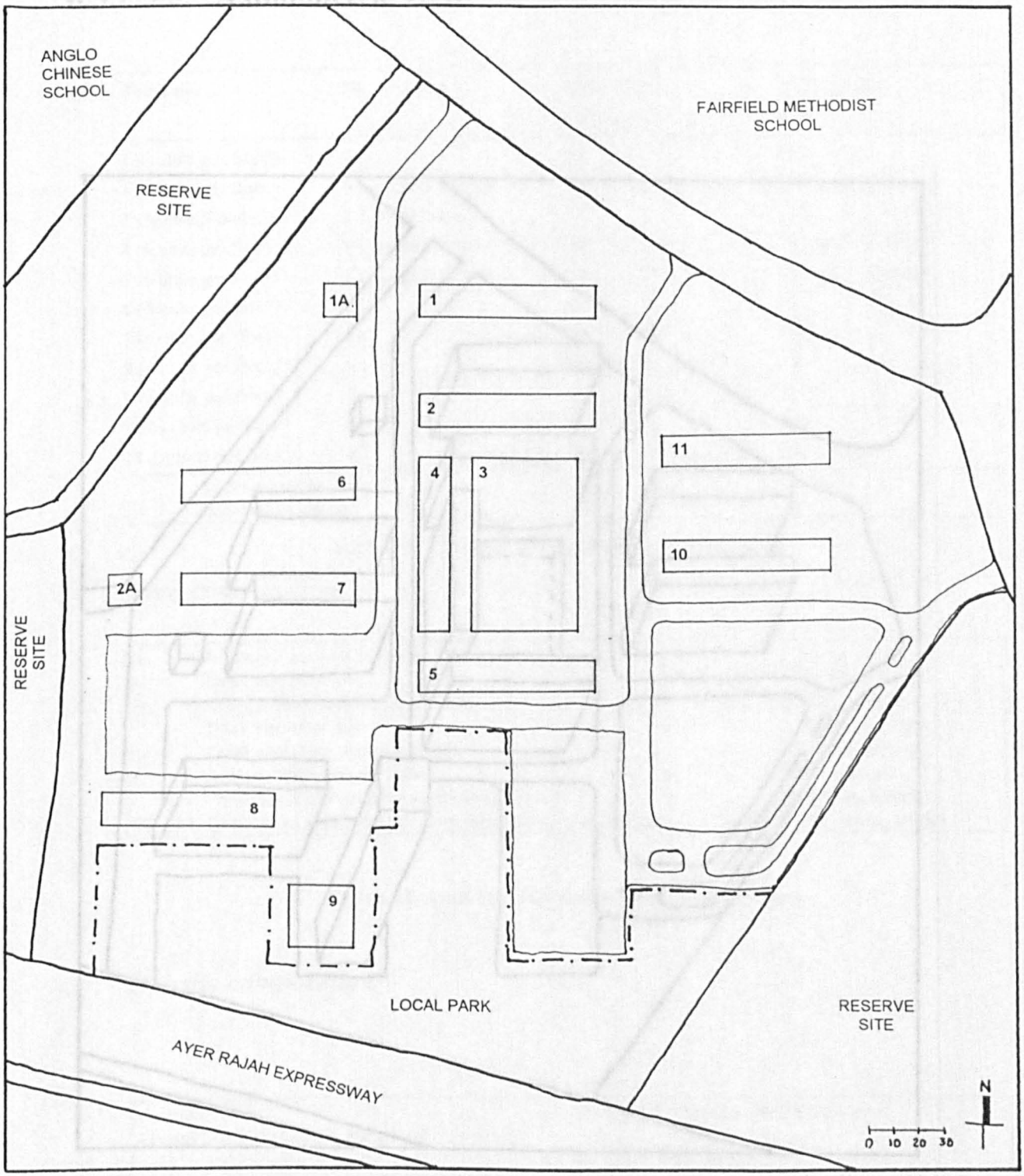


Figure 95. The Existing Housing Layout

6.3.2.3.2: Axonometric view

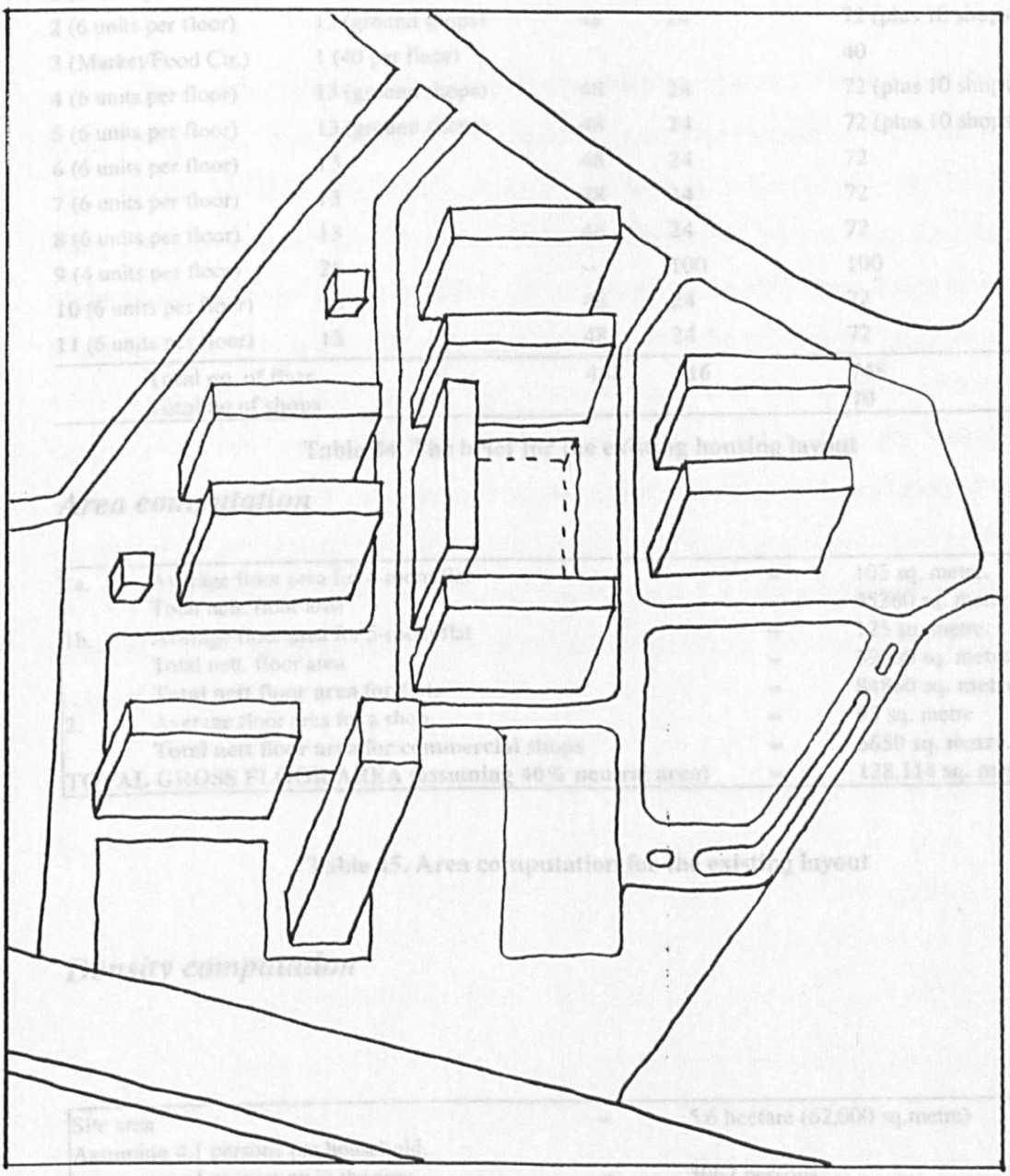


Figure 96. Axonometric view of the existing layout

6.3.2.3.3: The Statistics of the Existing Housing Layout

Block no.	No. of storey	Type of flats		No. of units
		4 room/5 room		
1 (6 units per floor)	13	48	24	72
2 (6 units per floor)	13 (ground shops)	48	24	72 (plus 10 shops)
3 (Market/Food Ctr.)	1 (40 per floor)			40
4 (6 units per floor)	13 (ground shops)	48	24	72 (plus 10 shops)
5 (6 units per floor)	13 (ground shops)	48	24	72 (plus 10 shops)
6 (6 units per floor)	13	48	24	72
7 (6 units per floor)	13	48	24	72
8 (6 units per floor)	13	48	24	72
9 (4 units per floor)	26	--	100	100
10 (6 units per floor)	13	48	24	72
11 (6 units per floor)	13	48	24	72
Total no. of flats		**432**	**316**	**748**
Total no of shops				**70**

Table 44. The brief for the existing housing layout

Area computation

1a.	Average floor area for 4-room flat	=	105 sq. metre.
	Total nett. floor area	=	45360 sq. metre.
1b.	Average floor area for 5-room flat	=	125 sq. metre.
	Total nett. floor area	=	39500 sq. metre.
	Total nett floor area for flats	=	**84860 sq. metre.**
2.	Average floor area for a shop	=	95 sq. metre
	Total nett floor area for commercial shops	=	**6650 sq. metre.**
TOTAL GROSS FLOOR AREA (assuming 40% neutral area)		=	**128,114 sq. metre.**

Table 45. Area computation for the existing layout

Density computation

Site area	=	5.6 hectare (62,000 sq.metre)
Assuming 4.1 persons per household, total population in the area	=	3067 persons
Density	=	**548 person per hectare (pph)**

Table 46. Density computation for the existing layout

Plot ratio computation

Plot ratio	=	Total gross floor area ÷ site area
Therefore, P.R	=	**2.3**

Table 47. Plot ratio computation for the existing layout

The existing housing layout is based on the plot ratio of 2.3 which was the norm in the 1970s when it was planned. The present day standard would have been at least 2.6 (HDB 1994), which is a higher plot ratio to maximise the potential of land. This point has to be taken into consideration in planning the alternative layout. Also, the calculation of the total gross floor area is based on the assumption of a 40% neutral area since in the slab and tower form (particularly the slab form) there is the provision of an access corridor on each floor and together with the void deck space on the ground floor; the neutral area tends to be rather high. The household size of 4.1 persons per household (HDB, 1995a) is the present estimate and this figure is used in the calculation of the density of the development so as to keep it consistent when compared to the alternative layout, although in the seventies it would have been at 5.2 persons per household according to the trend analysis of mean household size from 1968 to 1993 (HDB, 1995b).

6.3.3: ALTERNATIVE CONCEPT PLANNING OF HIGH-DENSITY, LOW-RISE HOUSING IN DOVER

6.3.3.1: Introduction

In planning the alternative layouts for this site, the basic planning parameters are adhered to. There are altogether two alternative schemes put forward which will be outlined in the following pages. Before going into the details of each alternative, the issues that are addressed in both the layouts are briefly as follows:

- the possibility of high-density, low-rise development and
- the use of the traditional shophouses as an appropriate typology to achieve regional identity.

In high-density, low-rise development; the maximum building height is kept at no more than four storeys. In the layouts they are kept at four storeys throughout so as to achieve the maximum plot ratio, not to mention that the tectonic qualities that is achievable at a height that relates to the human scale, as compared to the high-rise slab or tower block situation. Furthermore, according to Alexander et al. (1977), 'there is abundant evidence to show that high buildings make people crazy', which were statements they support with empirical evidence from Fanning (1967), Cappon (1971), Newman (1972) and others. So, they conclude: 'in any urban area, no matter how dense, keep the majority of buildings four storeys .....or less. It is possible that certain buildings should exceed this limit, but they should never be ..... for human habitation.'

The layouts are planned according to the courtyard principle, each with its own vehicular free courtyard garden where children can play safely. The road networks are planned with kerbside parking facilities and heavy planting throughout. In terms of sustainability, four-storey high buildings are accessible without having to depend on mechanical lifts. In addition, the use of the traditional shophouse built form means that

natural cross ventilation is possible because of the internal courtyards, which is shown in the dwelling unit plans at the end of the chapter. This has a great impact on the use of energy in that the dwelling units no longer need to depend on air-conditioning to cool the internal living spaces which is a common sight in high-rise apartments. The premise of shared courtyards both in the internal and the external gardens will help to foster communal living, an issue which is never satisfactorily resolved in the high-rise built form.

The issue of regional identity has been a question which has never been addressed sufficiently in high-rise architecture since it was not part of the culture in this part of the world before the 1960s. The typology of the shophouse built form, as discussed in an earlier chapter, can be seen to be the most appropriate built form for this region, not only because of its historical heritage but also because it is a built form which responds well to the tropical climate. The internal courtyard, or airwell, is a very effective way of inducing natural cross ventilation which not only cools the interior but also serves as a communal gathering space. The strategy of building up to four storeys will further enhance the courtyard's efficiency in creating a stack effect for natural ventilation.

As the alternative schemes unfold, the various specific issues relating to the design will be discussed.

6.3.3.2: ALTERNATIVE #1

6.3.3.2.1: The Alternative #1 Housing Layout Proposed

In this scheme, there are altogether 8 blocks of 4-storey high courtyard housing using the shophouse as a basic unit. The 26-storey tower block (block 10) which is part of the existing layout is kept as over the past 15 years it has been a landmark for this part of the Queenstown, marking one's arrival in this area. By deliberately keeping this tower block in the midst of low-rise buildings, it will serve as a contrast between the two opposite models of high-density housing. The local park is kept with a slight modification to its shape so that it is more usable. The freestanding kindergarten, surrounded by

residential units, is meant to foster an education for the young which is community-based.

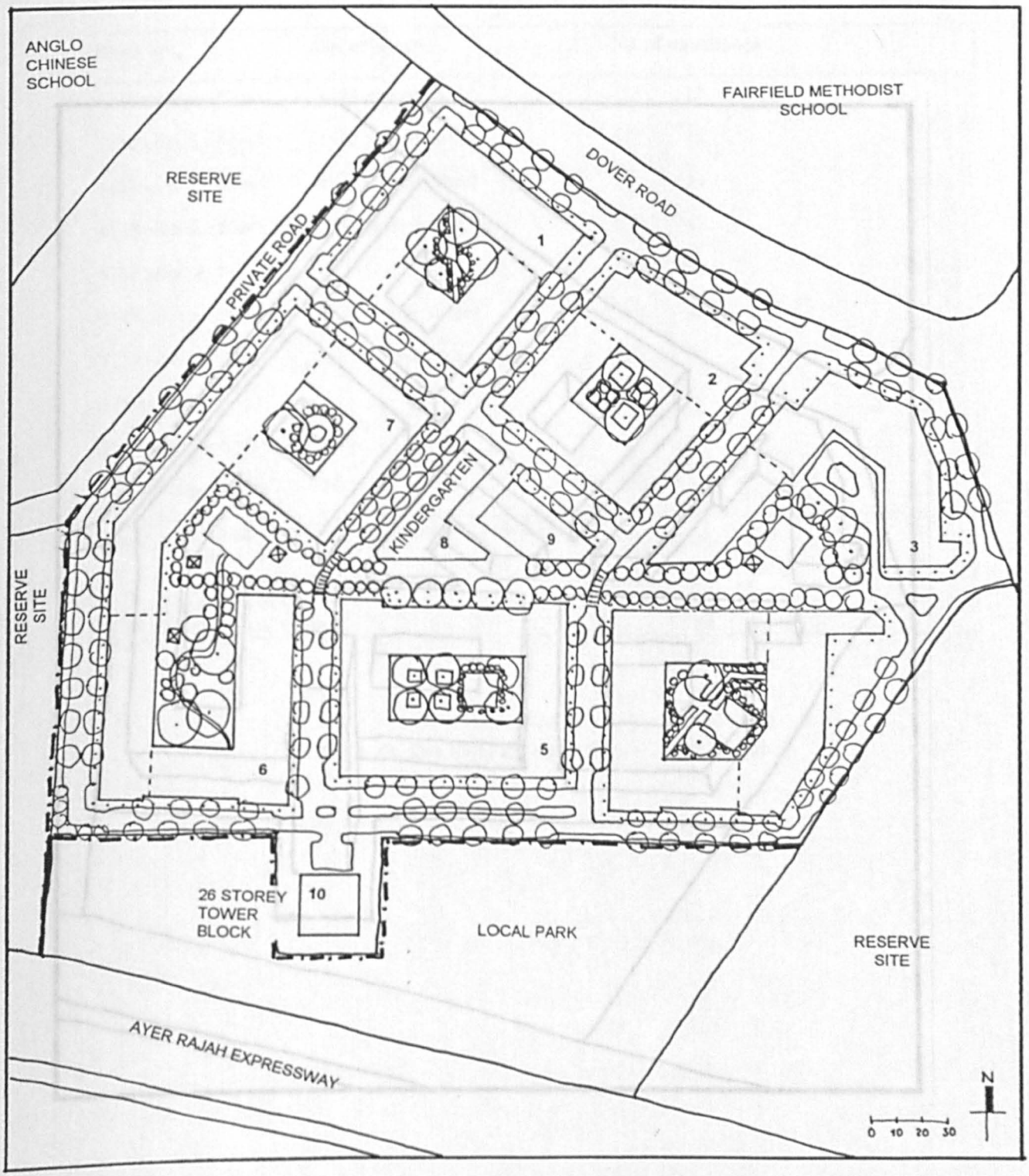


Figure 97. The Alternative #1 Housing Layout

6.3.3.2.2: Axonometric view

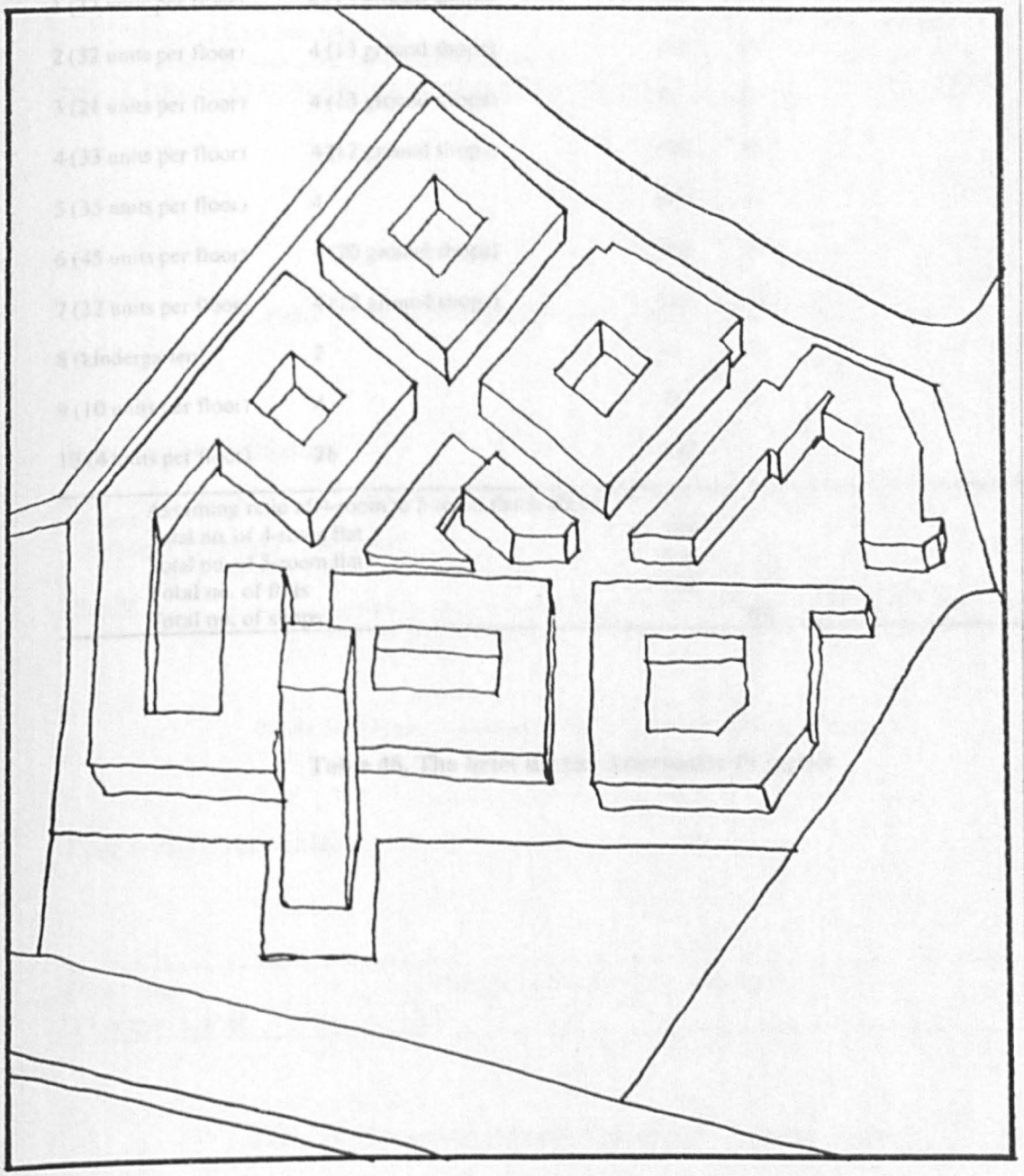


Figure 98. Axonometric view of the alternative #1 layout

6.3.3.2.3: The Statistics of the Alternative #1 Housing Layout

Block no:	No. of storey	No. of units/shops	
1 (32 units per floor)	4 (13 ground shops)	115	13
2 (32 units per floor)	4 (13 ground shops)	115	13
3 (21 units per floor)	4 (13 ground shops)	71	13
4 (33 units per floor)	4 (12 ground shops)	120	12
5 (35 units per floor)	4	140	---
6 (45 units per floor)	4 (20 ground shops)	160	20
7 (32 units per floor)	4 (13 ground shops)	115	13
8 (kindergarten)	2	---	---
9 (10 units per floor)	4	40	---
10 (4 units per floor)	26	100	---
Assuming ratio of 4-room to 5-room flat is 60:40			
Total no. of 4-room flat		586	
Total no. of 5-room flat		390	
Total no. of flats		**976**	
Total no. of shops			**84**

Table 48. The brief for the Alternative #1 layout

Area computation

1a.	Average floor area for 4-room flat (based on current std.)	=	100 sq. metre.
	Total nett. floor area	=	**58600 sq. metre.**
1b.	Average floor area for 5-room flat (based on current standard)	=	120 sq. metre.
	Total nett. floor area	=	46800 sq. metre.
	Total nett floor area for flats	=	**105400 sq. metre.**
2.	Average floor area for a shop	=	100 sq. metre
	Total nett floor area for commercial shops	=	**8400 sq. metre.**
TOTAL GROSS FLOOR AREA (assuming 30% neutral area)		=	**147940 sq. metre.**

Table 49. Area computation for the Alternative #1 layout

Density computation

Site area	=	5.6 hectare (56,000 sq.metre)
Assuming 4.1 persons per household, total population in the area	=	4002 persons
Density	=	**715 person per hectare (pph)**

Table 50. Density computation for the Alternative #1 layout

Plot ratio computation

Plot ratio	=	Total gross floor area ÷ site area
Therefore, P.R	=	**2.6**

Table 51. Plot ratio computation for the Alternative #1 layout

The size of the 4-room flat for the alternative scheme is 100 square metres and follows the current standard, as compared to the ones in the existing layout which are

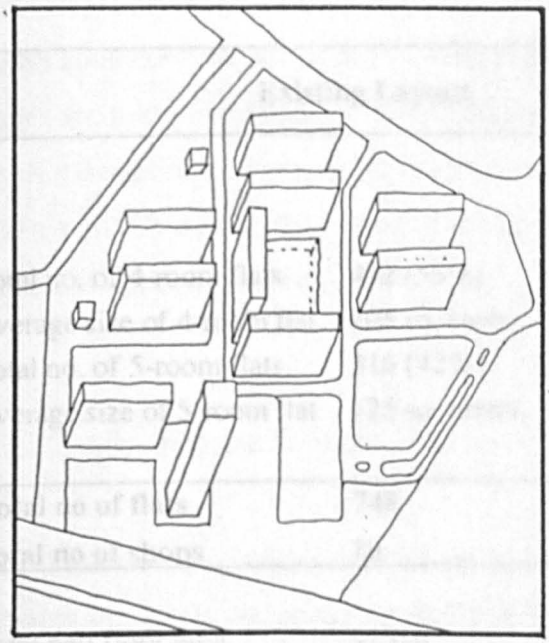
105 square metres. The same applies to the 5-room flats which are 5 square metre smaller than the ones in the existing layout. In the calculation of the total gross floor area, it is assumed that in the case of the alternative scheme the neutral area is 30%, which is 10% less than in the existing layout. This is due to the fact that in the low-rise case, there only needs to be staircase access to the higher floors, as compared to the slab block situation which requires the common corridor.

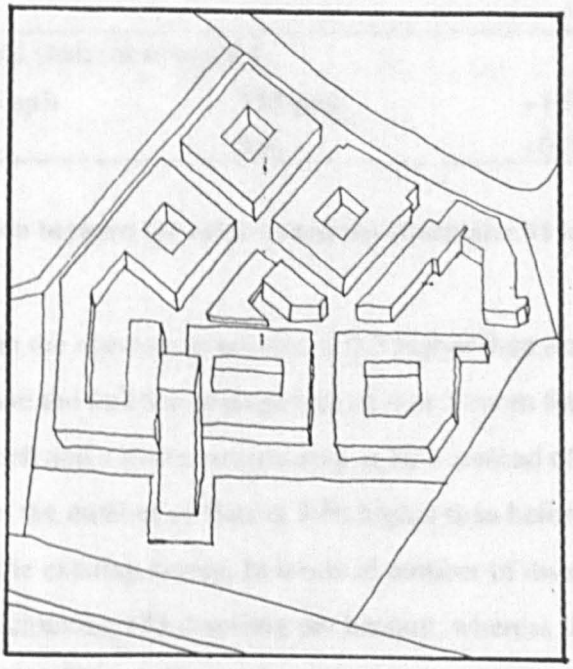
Based on the alternative scheme; the yield of the plot ratio is 2.6, which is comparable to the current standard. Interestingly enough, the density in this alternative layout is much higher than in the existing scheme, at 715 persons per hectare (pph) as compared with 548 pph.

6.3.3.2.4: A Comparative Analysis of the Existing and Alternative #1 Schemes

6.3.3.2.4.1: Axonometric comparison

As can be seen clearly from the axonometric drawing comparing the existing and the alternative scheme; the kind of physical environment achieved is very different. By having a layout based on the alternative framework with its four-storey high buildings, it is clearly possible for a wider range of patterns of living to develop immediately. This would undoubtedly lead to a greater opportunity for more varied choices and options becoming available in the kind of living environment in a new town. External spaces are no longer ill-defined as in the case of the existing high-rise layout, but spaces are meaningfully planned such that the residential units can relate to it, as in the case of the external courtyards. Traditional urban streets and urban spaces are becoming a possibility in the high-density environment.





Figures 99 & 100 Axonometric comparison between the existing (above) and the alternative #1 scheme (below)

6.3.3.2.4.2: Statistical Analysis

	Existing Layout	Alternative #1	Changes	
Total no. of 4-room flats	432 (58%)	586 (60%)	+154	(36%)
Average size of 4-room flat	105 sq. metre.	100 sq. metre.	-5	(5%)
Total no. of 5-room flats	316 (42%)	390 (40%)	+74	(23%)
Average size of 5-room flat	125 sq. metre.	120 sq. metre	-5	(4%)
Total no of flats	**748**	**976**	**+228**	**(30%)**
Total no of shops	**70**	**84**	**+14**	**(20%)**
Total nett floor area	91510	113800	+22290	(24%)
Assumed neutral area	40%	30%		
Total gross floor area	128114	147940	+19826	(15%)
Assumed 4.1 persons per household (current estimate)				
Density	**548 pph**	**715 pph**	**+167**	**30%)**
Plot Ratio	2.3	2.6	+0.3	(13%)

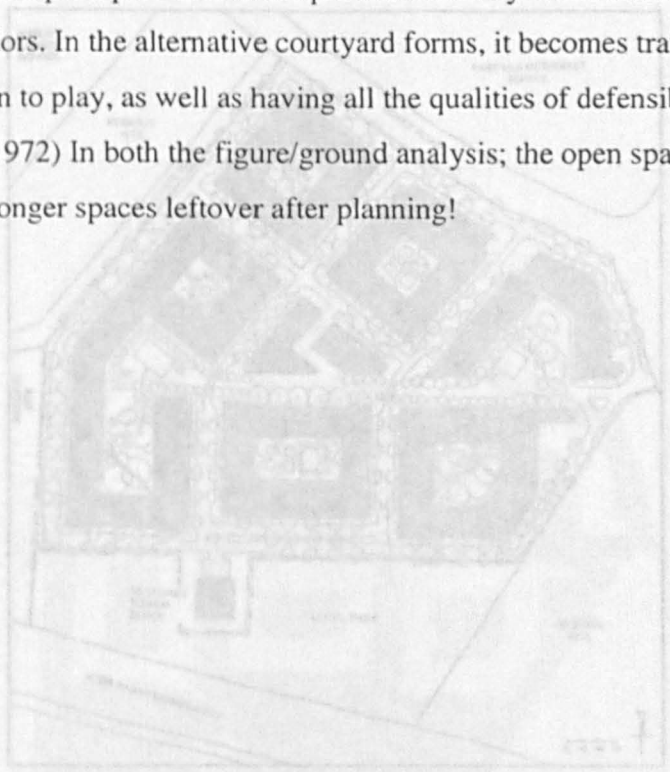
Table 52. Statistical Comparison between the existing and the alternative #1 layout

The plot ratio yield of 2.6 in the alternative scheme is 0.3 higher than that of the existing layout at 2.3. This is despite the fact the average size of 4 or 5-room flats has been reduced by 5 square metre each and a lower neutral area at 30% instead of 40% is used in the calculation. In addition, the number of flats is 30% higher than before giving a density which is 30% higher than the existing layout. In terms of number of dwelling unit per hectare, the existing layout is achieving 133 dwelling per hectare, whereas the alternative layout is achieving 175 dwelling per hectare.

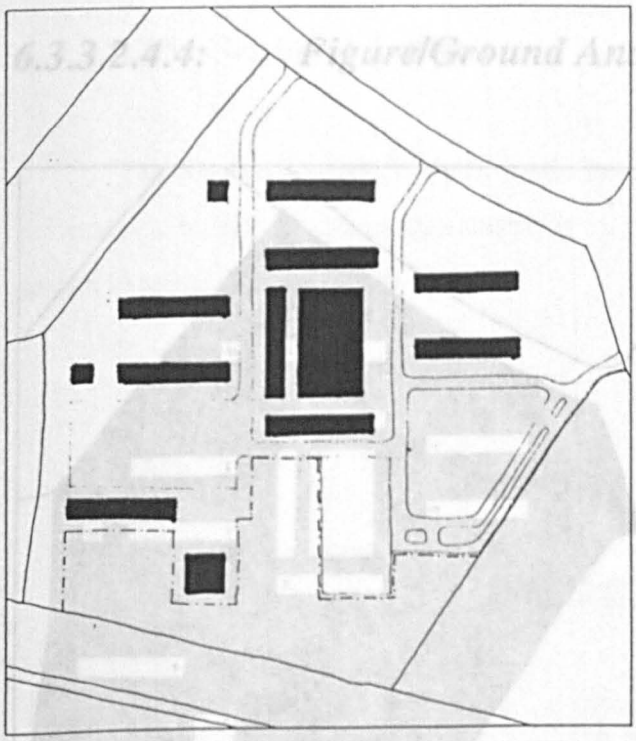
All these figures point clearly to the feasibility of developing high-density housing at low-rise. Had the plot ratio of 2.3 been kept in the alternative scheme; the building heights could be more varied and no longer need to be uniform at four storeys. This could further add to the interest of the built form seen from ground level. Overall, this layout is simply a demonstration of a possible choice within a general strategy, similar to Martin & March's (1972) theory plus the use of the shophouse typology. However, it is important to know that the possibility exists.

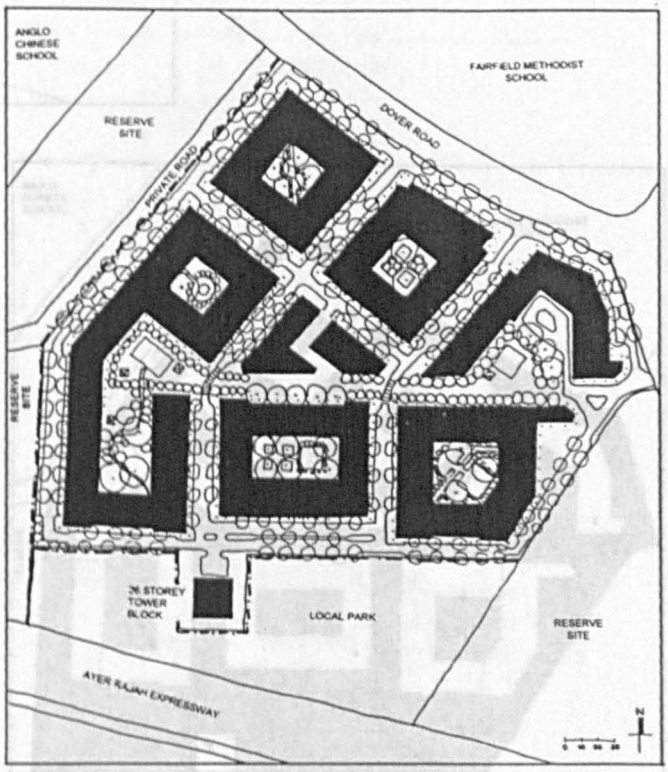
6.3.3.2.4.3: Figure/Ground Analysis 1

The use of figure/ground analysis shows clearly the relationship of the built form to that of the streets and open spaces. The alternative built form does raise far-reaching questions. For instance, the open space provided in the present block-by-block form is simply a series of traffic corridors. In the alternative courtyard forms, it becomes traffic-free courts, safe for the children to play, as well as having all the qualities of defensible space according to Newman (1972) In both the figure/ground analysis; the open spaces in the alternative scheme are no longer spaces leftover after planning!



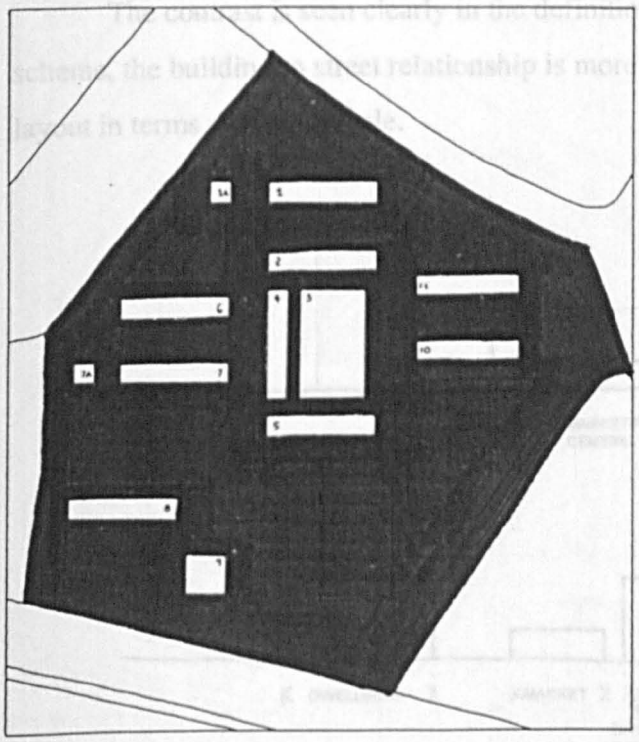
Figures 101 & 102 Comparison of figure/ground analysis 1
(buildings in black, open spaces in white)

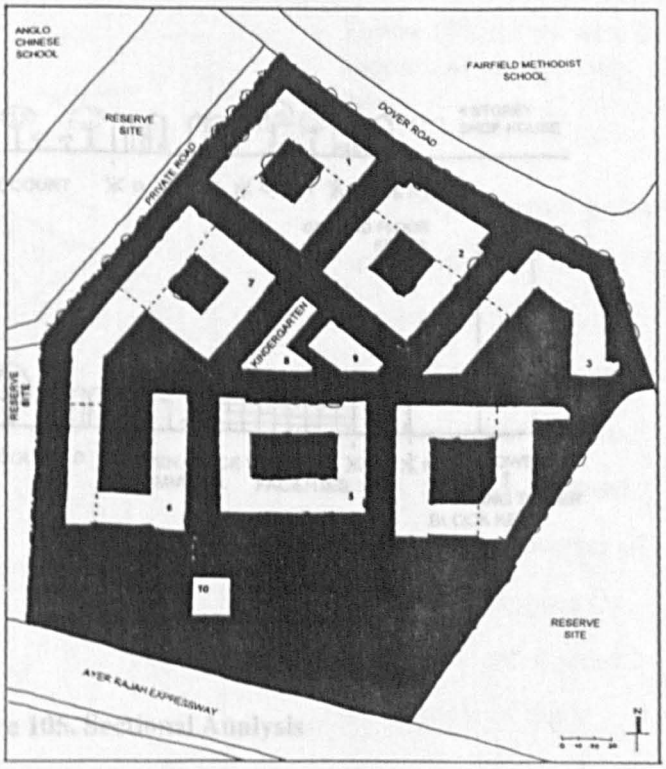




Figures 101 & 102 Comparison of figure/ground analysis 1
(buildings in black, open spaces in white)

6.3.3.2.4.4: Figure/Ground Analysis 2





Figures 103 & 104 - Comparison of figure/ground analysis 2

6.3.3.2.4.5: Sectional Analysis

The contrast is seen clearly in the definition of the street which in the alternative scheme, the building to street relationship is more desirable as compared to the existing layout in terms of human scale.

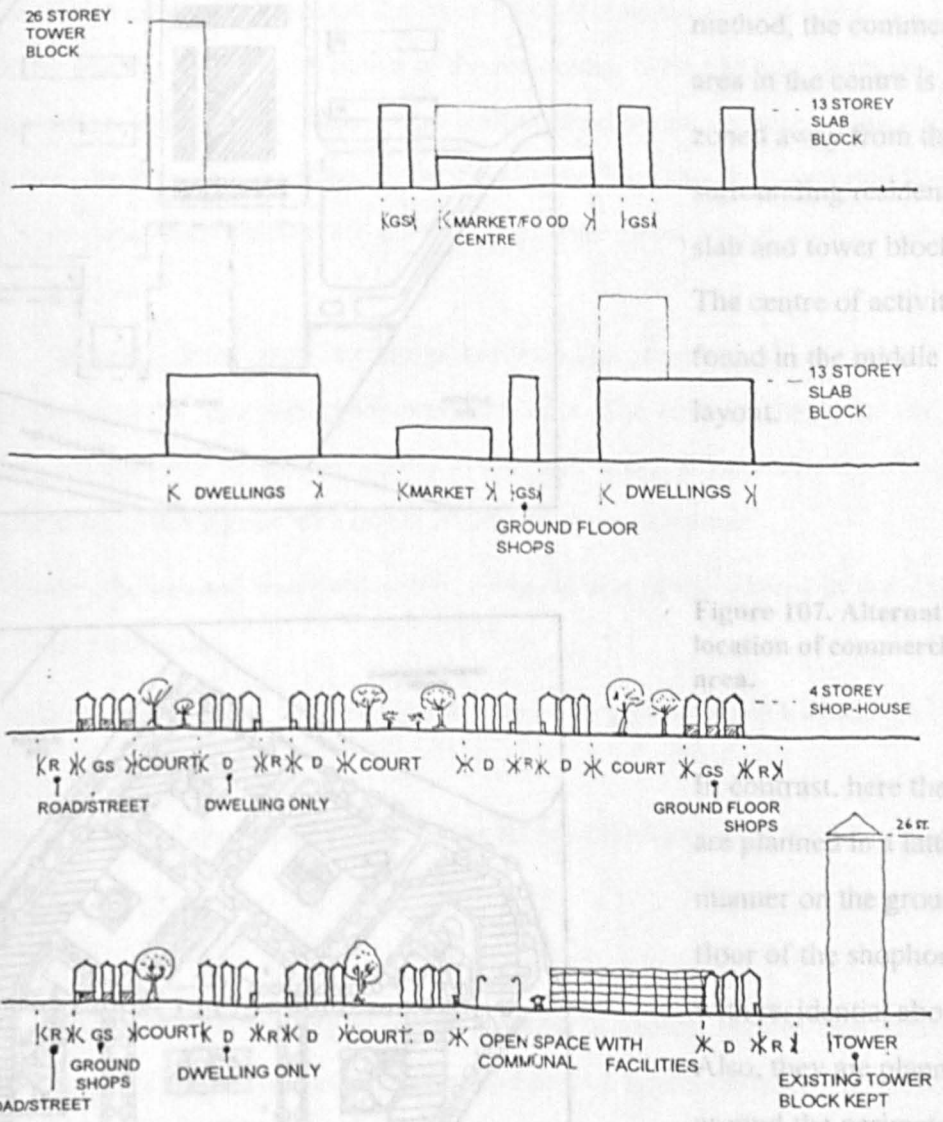


Figure 105. Sectional Analysis

6.3.3.2.4.6: Functional Analysis

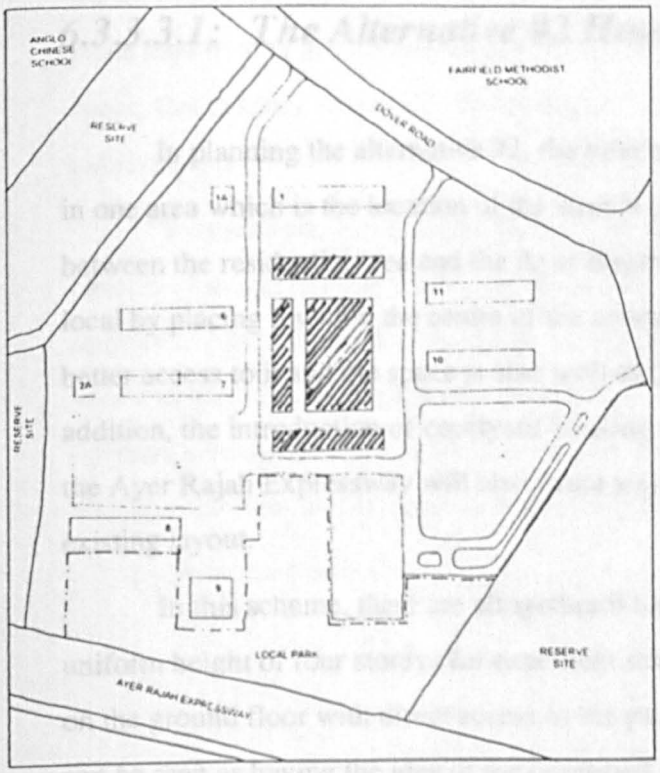


Figure 106. Existing Layout - location of commercial area

Following the zoning method, the commercial area in the centre is clearly zoned away from the surrounding residential slab and tower blocks. The centre of activities is found in the middle of the layout.

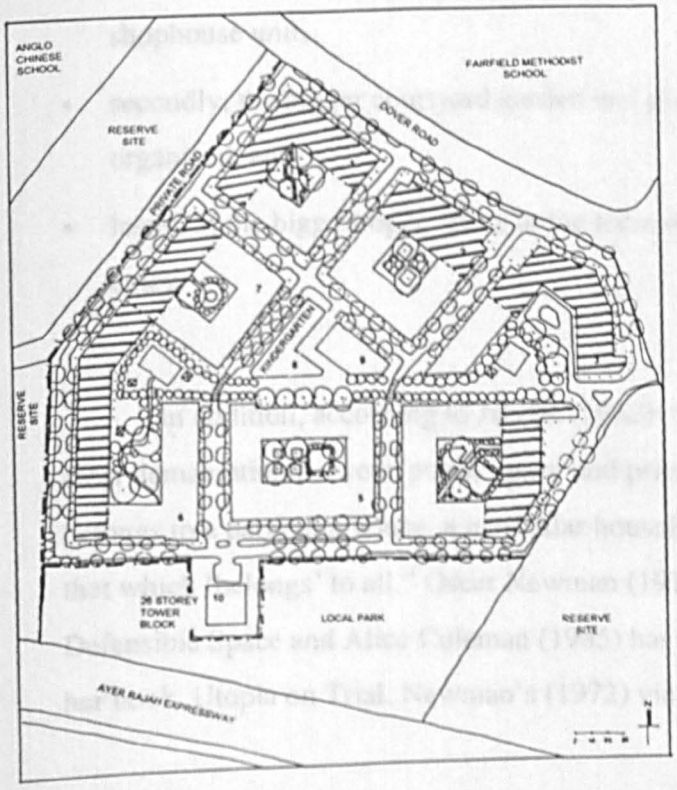


Figure 107. Alternative #1 - location of commercial area.

In contrast, here the shops are planned in a lattice manner on the ground floor of the shophouses with residential above. Also, they are planned around the perimeter of the layout keeping the quiet residential areas in the middle of the layout.

6.3.3.3: ALTERNATIVE #2

6.3.3.3.1: The Alternative #2 Housing Layout Proposed

In planning the alternative #2, the scheme deviates from the planning parameters in one area which is the location of the stretch of green called the local park, placed between the residential area and the Ayer Rajah Expressway. This local park is now made local by placing it within the centre of the residential layout so that all residents have better access to it and the space is also well-defined by the courtyard housing. In addition, the introduction of courtyard housing with offices on the ground floor facing the Ayer Rajah Expressway will also make a better street architecture as compared to the existing layout.

In this scheme, there are altogether 9 blocks of courtyard housing, all kept to a uniform height of four storeys for expedient sake. The kindergarten is located in block 9 on the ground floor with direct access to the park which is vehicular free. The scheme can be seen as having the idea of the courtyard at three levels:

- firstly, the internal courtyard within the basic unit of the scheme in the individual shophouse unit,
- secondly, the bigger courtyard garden and playground around which the housing is organised, and
- lastly, in the biggest open space in the form of the local park which all residents can enjoy.

In addition, according to Jacobs (1962): "if a street is to be safe, there must be a clear demarcation between public space and private space, between the territory which belongs to a particular house, a particular household, a particular shop or whatever and that which 'belongs' to all." Oscar Newman (1972) elaborates on this point in his book, Defensible Space and Alice Coleman (1985) has brought even more statistical evidence in her book, Utopia on Trial. Newman's (1972) view is that there should be a hierarchy of

space-types from the most public that is from the street to the most private, the inside of the dwelling. Between these extremes there will be semi-public space, clearly reserved for those who live, or are visiting the dwellings for legitimate purposes, and semi-private space, that is space which clearly belongs to a single dwelling even though it is open to public access.

Furthermore, for an urban living with all its exuberant diversity, a vast range of choices of things to do is made available to everyone. This parcel as a whole serves a number of functions: living, working, shopping, eating, and so on. These should be so varied in kind that different kinds of people come and go at different times, working to different schedules, come to the same place, the same street for different purposes, using the same facilities at different times and in different ways.

Here, the feasibility of the alternative paradigm is further strengthened.

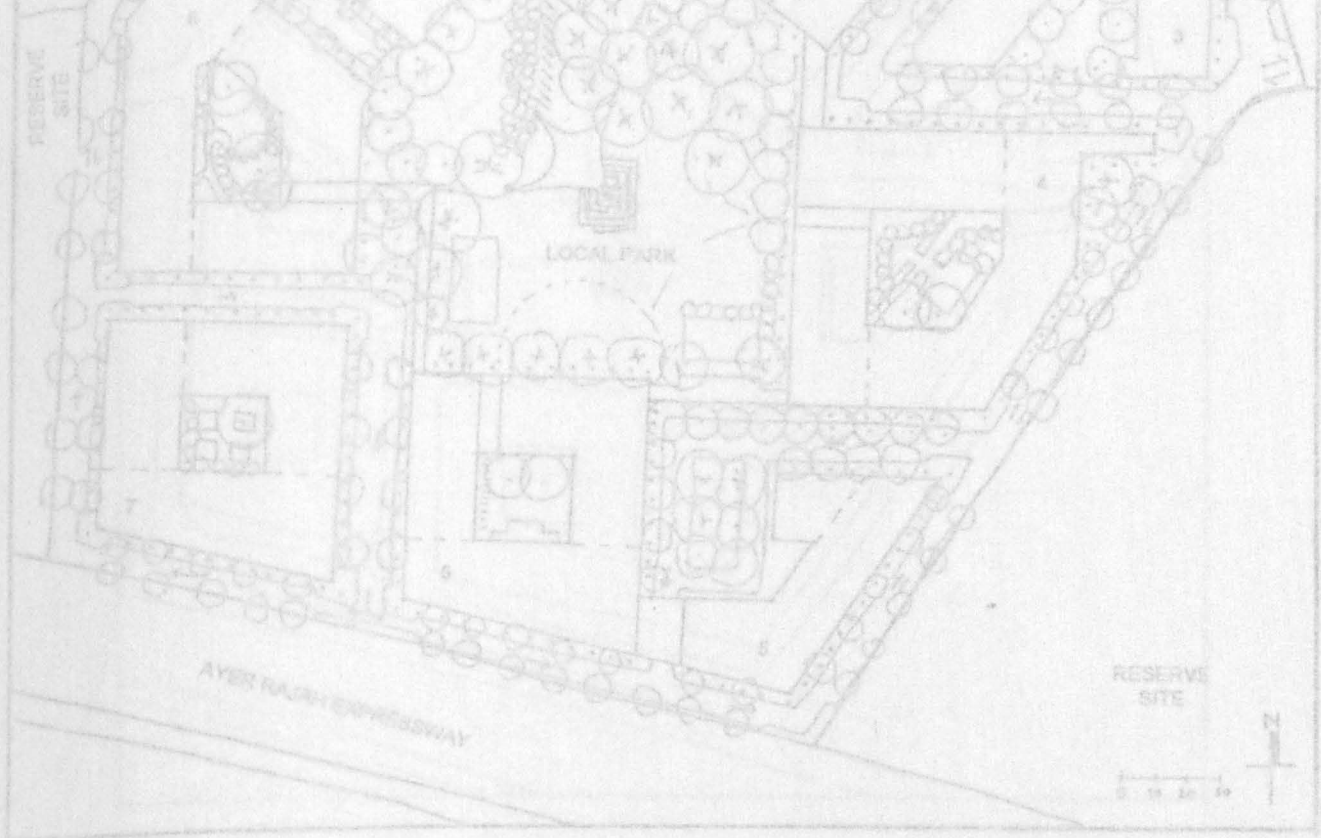


Figure 108. The Alternative #2 Housing Layout

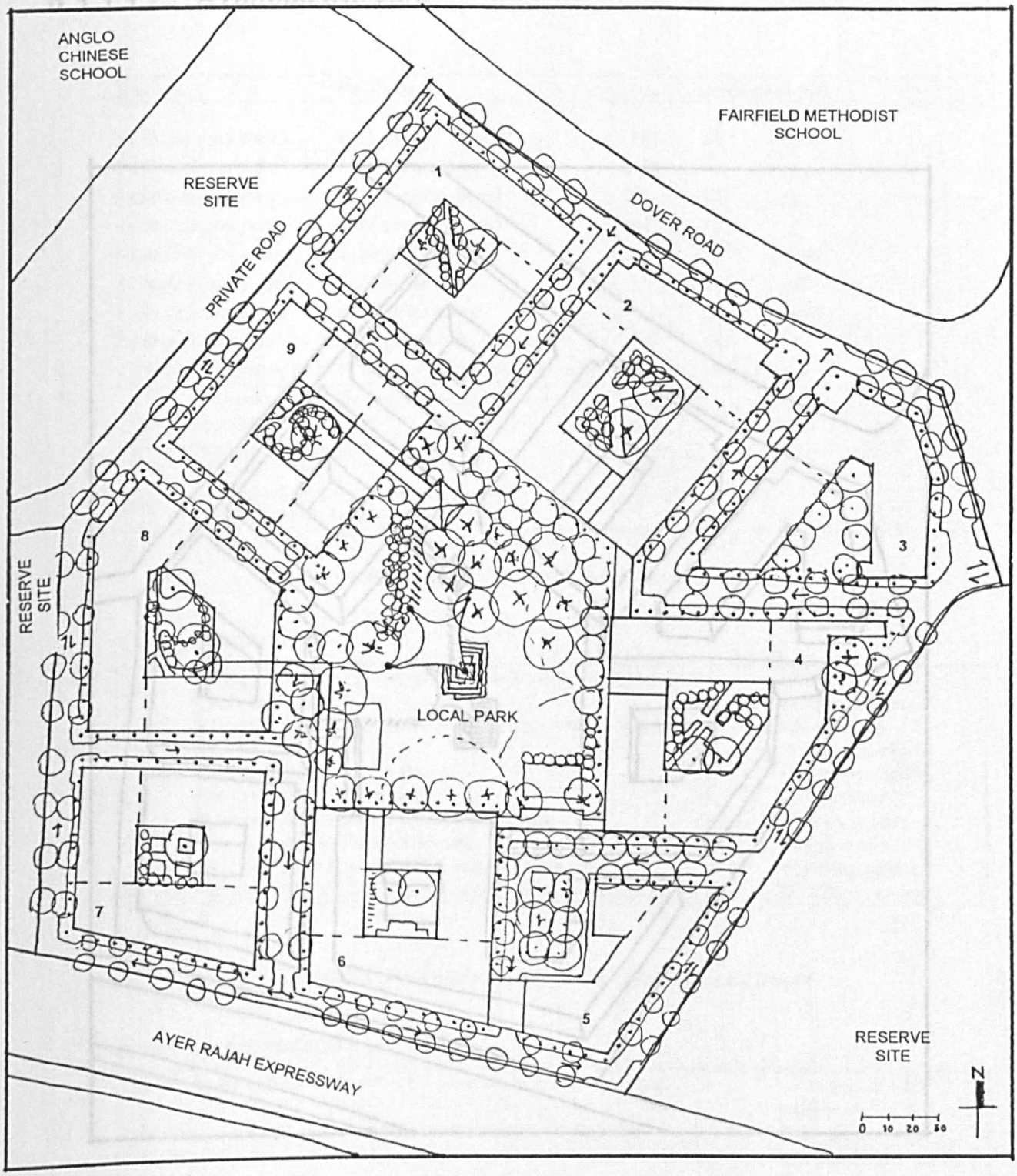


Figure 108. The Alternative #2 Housing Layout

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6.3.3.3.2: Axonometric view

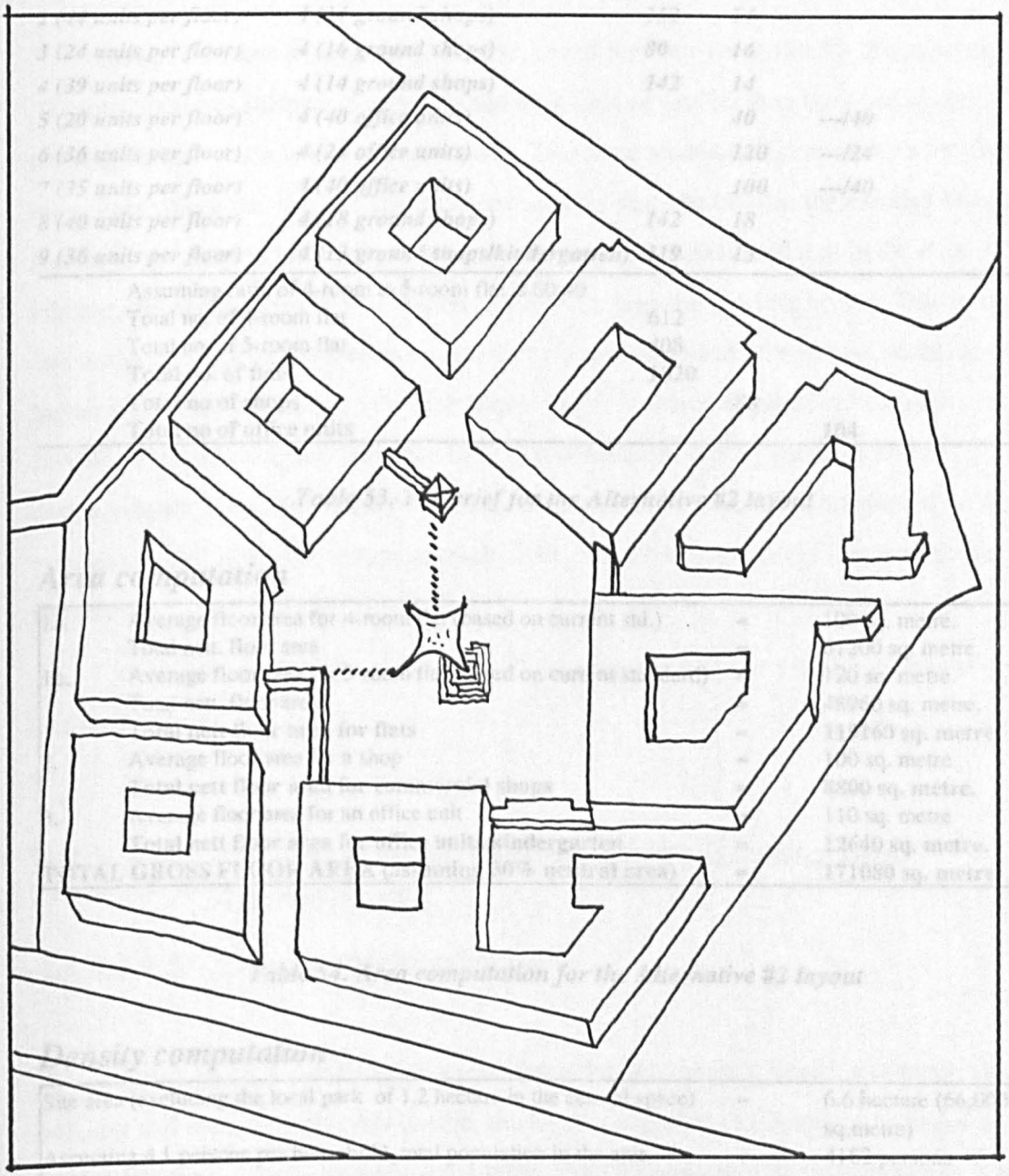


Figure 109. Axonometric view of the alternative #2 layout

6.3.3.3.3: The Statistics of the Alternative #2 Housing Layout

Block no:	No. of storey	No. of units/shops/office		
1 (32 units per floor)	*4 (13 ground shops)*	*115*	*13*	
2 (44 units per floor)	*4 (14 ground shops)*	*162*	*14*	
3 (24 units per floor)	*4 (16 ground shops)*	*80*	*16*	
4 (39 units per floor)	*4 (14 ground shops)*	*142*	*14*	
5 (20 units per floor)	*4 (40 office units)*		*40*	*---/40*
6 (36 units per floor)	*4 (24 office units)*		*120*	*---/24*
7 (35 units per floor)	*4 (40 office units)*		*100*	*---/40*
8 (40 units per floor)	*4 (18 ground shops)*	*142*	*18*	
9 (36 units per floor)	*4 (13 ground shops/kindergarten)*	*119*	*13*	
	Assuming ratio of 4-room to 5-room flat is 60:40			
	Total no. of 4-room flat	612		
	Total no. of 5-room flat	408		
	Total no. of flats	**1020**		
	Total no of shops		**88**	
	Total no of office units			**104**

Table 53. The brief for the Alternative #2 layout

Area computation

1a.	Average floor area for 4-room flat (based on current std.)	=	100 sq. metre.
	Total nett. floor area	=	61200 sq. metre.
1b.	Average floor area for 5-room flat (based on current standard)	=	120 sq. metre.
	Total nett. floor area	=	48960 sq. metre.
	Total nett floor area for flats	=	**110160 sq. metre.**
2.	Average floor area for a shop	=	100 sq. metre
	Total nett floor area for commercial shops	=	**8800 sq. metre.**
3.	Average floor area for an office unit	=	110 sq. metre
	Total nett floor area for office units/kindergarten	=	**12640 sq. metre.**
TOTAL GROSS FLOOR AREA (assuming 30% neutral area)		=	**171080 sq. metre.**

Table 54. Area computation for the Alternative #2 layout

Density computation

Site area (excluding the local park of 1.2 hectare in the central space)	=	6.6 hectare (66,000 sq.metre)
Assuming 4.1 persons per household, total population in the area	=	4182 persons
Density	=	**633 person per hectare (pph)**

Table 55. Density computation for the Alternative #2 layout

Plot ratio computation

Plot ratio	=	Total gross floor area ÷ site area
Therefore, P.R	=	2.6

Table 56. Plot ratio computation for the Alternative #2 layout

As in the case of alternative #1, the size of the four-room flat for this scheme is 100 square metres following current standards. This is smaller than the ones in the existing layout which is 105 square metres. The same standards are applied to the five-room flats where the size is 5 square metre smaller than the ones in the existing layout. Again, in the calculation of the total gross floor area, it is assumed that in the case of this scheme, the neutral area is 30% which is 10% less than the existing layout. This is again due to the fact that in the low-rise case, there is only the need of staircase access to the higher floors, as compared to the slab block situation which requires the common corridor. Having said that, Newman (1972) recommends that in higher-density developments, common stairways should serve as small a number of residential units as possible so that residents recognise each other, but more importantly they recognise intruders.

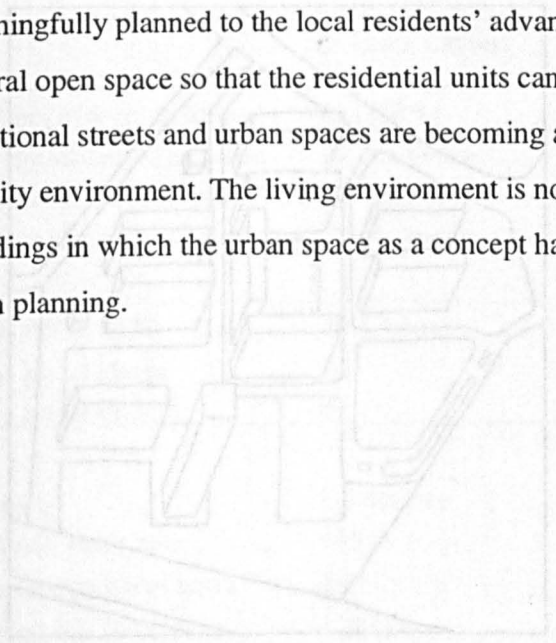
Overall, based on the alternative #2 scheme; the yield of the plot ratio is at 2.6, with a density of 633 pph.

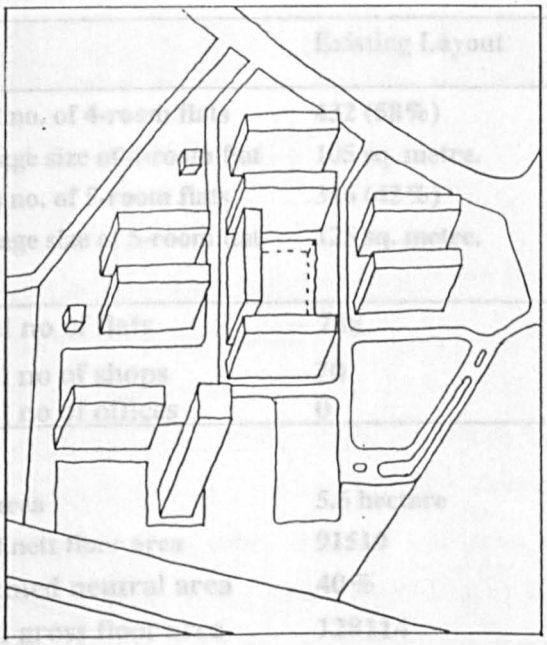
6.3.3.3.4: A Comparative Analysis of the Existing and Alternative #2

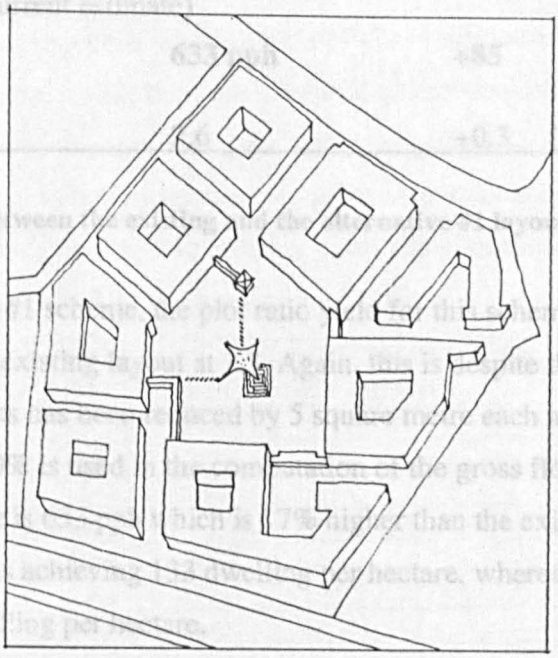
6.3.3.3.4.1: Axonometric comparison

Once again, it can be clearly seen from the axonometric drawing comparing the existing and the alternative #2 scheme, the kind of physical environment achieved is vastly different. A layout based on the alternative framework with its four-storey high buildings makes it possible for a wider range of patterns of living to take place. Again, this would undoubtedly lead to a greater opportunity for a variety of choices and options

becoming available in the living environment which is clearly lacking in the case of the high-rise slab and tower blocks. External spaces are no longer ill defined, but are meaningfully planned to the local residents' advantage. The local park now occupies a central open space so that the residential units can relate and access directly to it. The traditional streets and urban spaces are becoming a possibility in this alternative high-density environment. The living environment is not just a conglomeration of free-standing buildings in which the urban space as a concept has been clearly ignored in 20th-century town planning.







Figures 110 & 111. Axonometric comparison between the existing (above) and the alternative #1 scheme (below)

6.3.3.3.4.2: Statistical Analysis

	Existing Layout	Alternative #2	Changes	
Total no. of 4-room flats	432 (58%)	612 (60%)	+180	(42%)
Average size of 4-room flat	105 sq. metre.	100 sq. metre.	-5	(5%)
Total no. of 5-room flats	316 (42%)	408 (40%)	+92	29%)
Average size of 5-room flat	125 sq. metre.	120 sq. metre	-5	(4%)
Total no of flats	748	1020	+272	(36%)
Total no of shops	70	88	+18	(26%)
Total no of offices	0	104	+104	(-----)
Site area	5.6 hectare	6.6 hectare	+1.0	(18%)
Total nett floor area	91510	131600	+40090	(44%)
Assumed neutral area	40%	30%		
Total gross floor area	128114	171080	+42966	(34%)
Assumed 4.1 persons per household (current estimate)				
Density (16%)	548 pph	633 pph	+85	
Plot Ratio	2.3	2.6	+0.3	(13%)

Table 57. Statistical Comparison between the existing and the alternative #1 layout

As in the case of the alternative #1 scheme, the plot ratio yield for this scheme is 2.6 which is 0.3 higher than that of the existing layout at 2.3. Again, this is despite the fact the average size of 4 or 5-room flats has been reduced by 5 square metre each and a lower neutral area at 30% instead of 40% is used in the computation of the gross floor area. In addition, the density achievable is 633 pph which is 17% higher than the existing layout at 548 pph. The existing layout is achieving 133 dwelling per hectare, whereas the alternative layout is achieving 155 dwelling per hectare.

All these figures clearly point to the feasibility of developing high-density, low-rise housing. Again, had the plot ratio been kept at 2.3 in this alternative #2 scheme; the building heights could be more varied and no longer need to be uniform at four storeys

which will further add to the interest of the built form when seen and experienced from ground level.

6.3.3.3.4.3: Built Potential Analysis

In considering the built potential of the slab/tower form when compared to that of the shophouse form, the overall gross floor area of each storey is divided by the site area in each cases. This is then plotted on the x-y axis with the Built Potential against the number of storey height. In the following figure, the Built Potential of the shophouse built form has been deliberately built up till eight storeys until it reached a figure of more than 5.0. This, for argument sake, would be similar to the extreme case of high-density, high-rise housing in Hong Kong where tower blocks go up to 40 storeys throughout, as compared to the ones in Singapore which are at the maximum of 30 storeys, as recently introduced in the past year or so.

The analysis shown here correlates to Martin and March's (1972) speculation, discussed in an earlier chapter, in which at low rise, the built potential of the low-rise anti-form is much higher compared to the built potential of the slab/tower block. This inevitably meant that it is far more sensible to build high-density at low-rise than at high-rise. The realisation of such a scheme would be possible one day when the advantages of high-density, low-rise could be fully appreciated by the housing authorities.

COMPARATIVE ANALYSIS OF THE BUILT POTENTIAL OF SLAB/TOWER FORM AND SHOPHOUSE FORM AT DIFFERENT STOREY HEIGHT		
Storey height	Built Potential 1	Built Potential 2
1	0	0.66
2	0.33	1.32
3	0.49	1.98
4	0.66	2.64
5	0.82	3.3
6	0.98	3.96
7	1.15	4.62
8	1.31	5.28
9	1.47	
10	1.64	
11	1.8	
12	2	
13	2.13	

Table 58. Comparative Built Potential Analysis
(BP 1: Built Potential of Slab/Tower Form, BP 2: Built Potential of Shophouse Form)

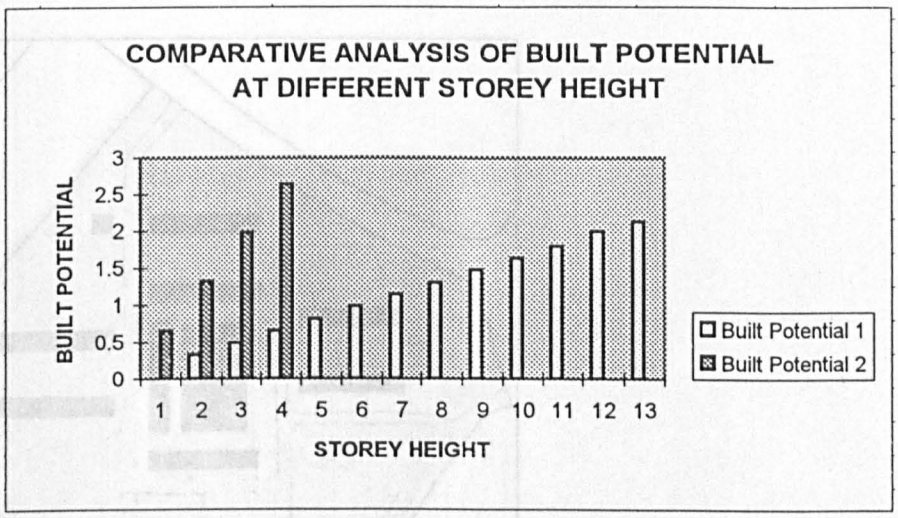


Figure 112. Graph of Built Potential against Storey Height
(BP 1: Built Potential of Slab/Tower Form, BP 2: Built Potential of Shophouse Form)

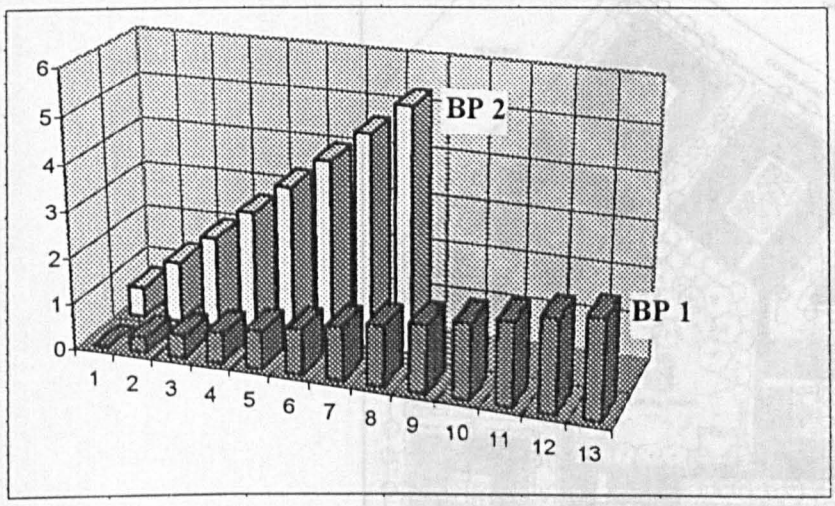
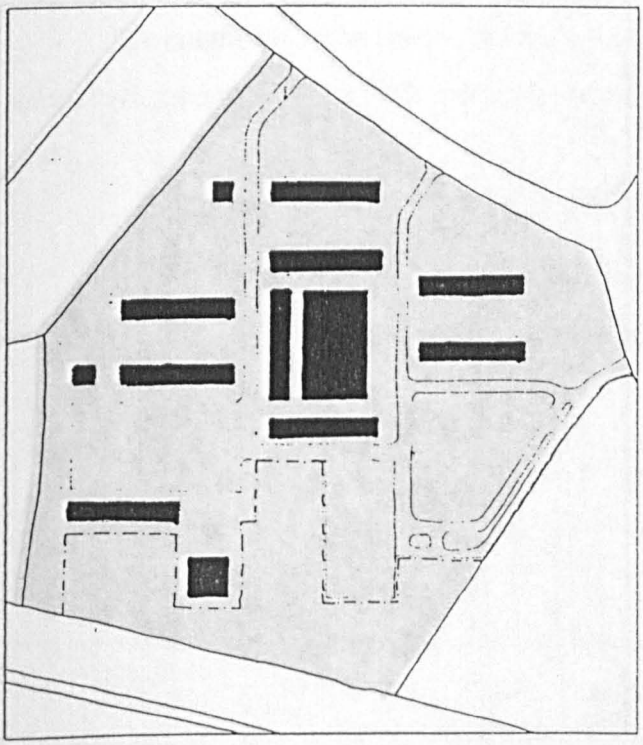
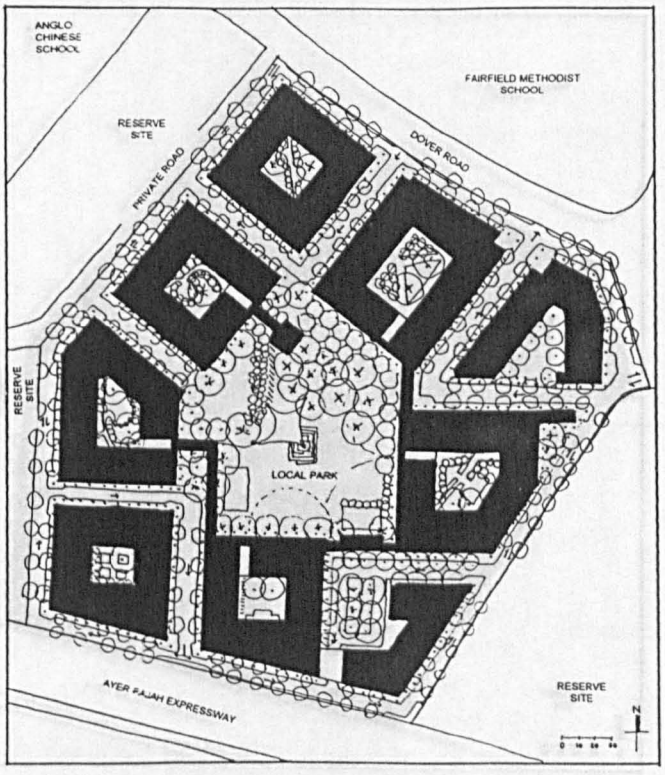


Figure 113. Three dimensional graph of Built Potential against Storey Height
(BP 1: Built Potential of Slab/Tower Form, BP 2: Built Potential of Shophouse Form)

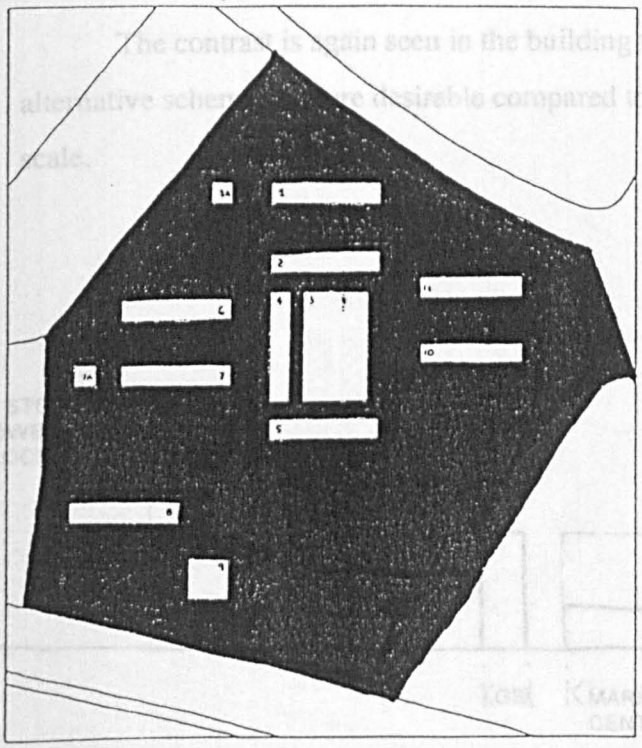
6.3.3.3.4.4: Figure/Ground Analysis 1

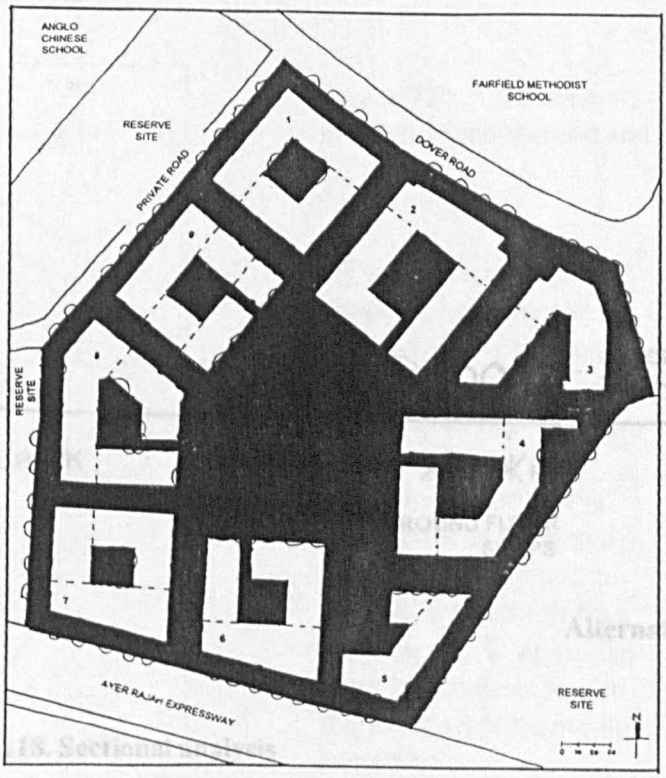




Figures 114 & 115 - Comparison of figure/ground analysis 1

6.3.3.3.4.5: Figure/Ground Analysis 2

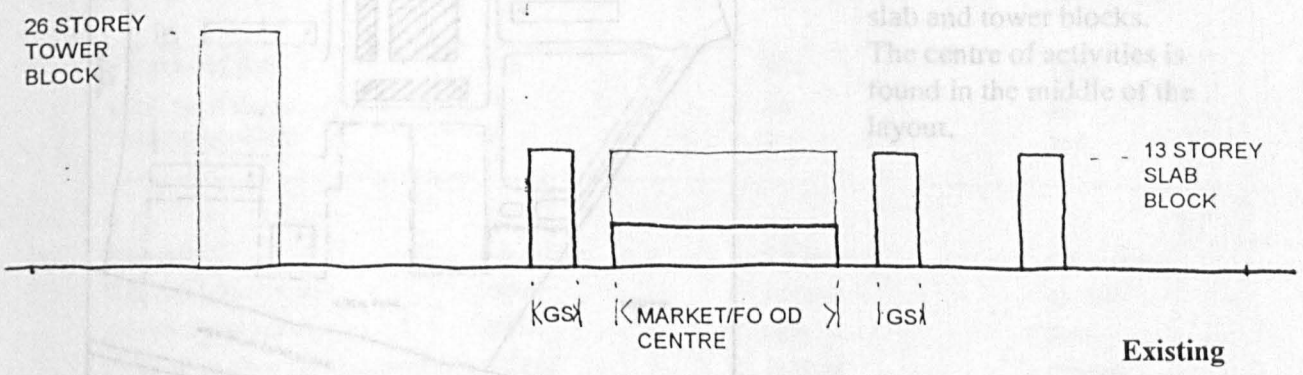




Figures 116 & 117 - Comparison of figure/ground analysis 2

6.3.3.3.4.6: Sectional Analysis

The contrast is again seen in the building to street relationship which in the alternative scheme, is more desirable compared to the existing layout in terms of human scale.



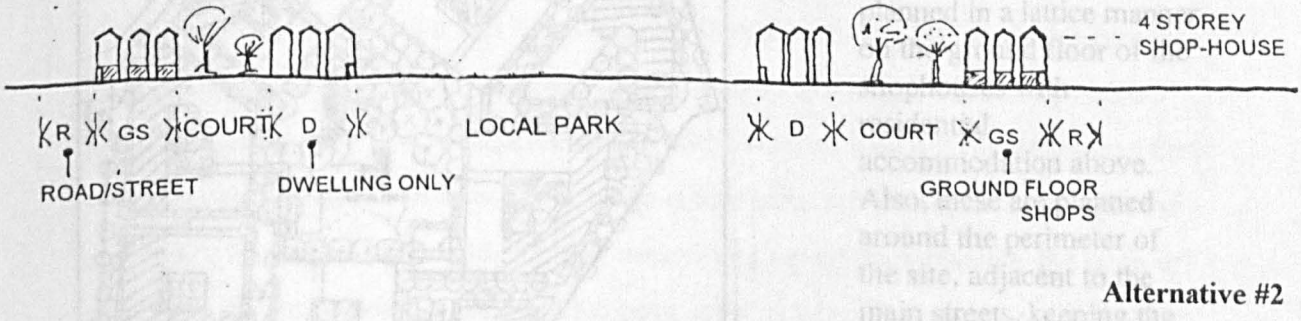


Figure 118. Sectional analysis

6.3.3.3.4.7: Functional Analysis

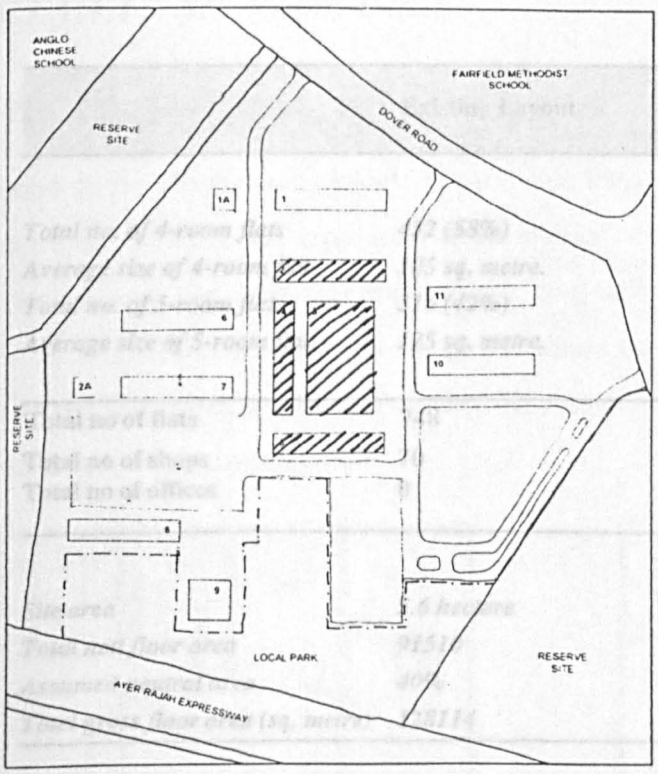


Figure 119. Existing Layout - location of commercial areas.

Following the zoning method, the commercial area in the centre is clearly zoned away from the surrounding residential slab and tower blocks. The centre of activities is found in the middle of the layout.

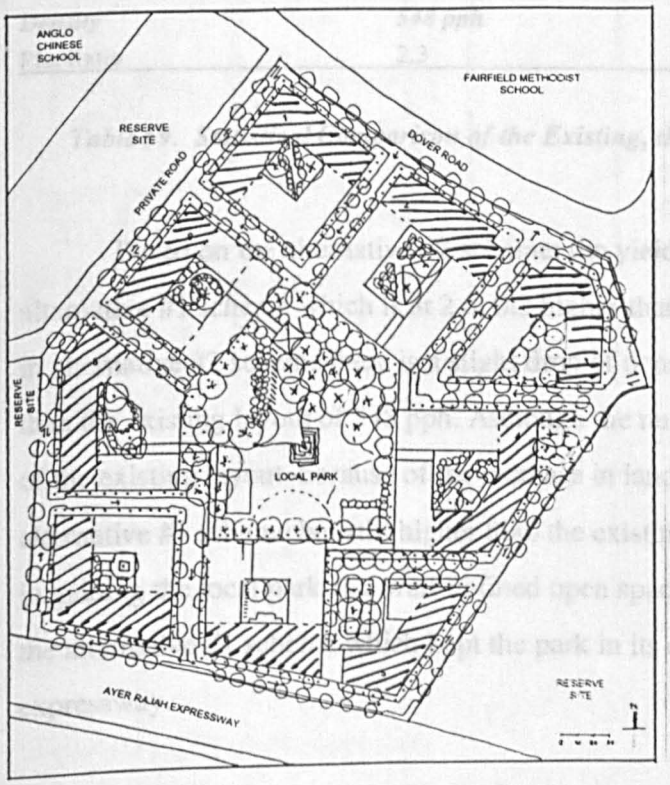


Figure 120. Alternative #2 - location of commercial and office area

By contrast, here the shops and offices are planned in a lattice manner on the ground floor of the shophouses with residential accommodation above. Also, these are planned around the perimeter of the site, adjacent to the main streets, keeping the quiet residential areas in the inner areas facing the local park.

6.3.3.3.5: Statistical Comparison of the Existing, the Alternative #1 and Alternative #2

	Existing Layout	Alternative #1	Alternative #2
Total no. of 4-room flats	*432 (58%)*	*586 (60%)*	*612 (60%)*
Average size of 4-room flat	*105 sq. metre.*	*100 sq. metre.*	*100 sq metre*
Total no. of 5-room flats	*316 (42%)*	*390 (40%)*	*408 (40%)*
Average size of 5-room flat	*125 sq. metre.*	*120 sq. metre*	*120 sq metre*
Total no of flats	748	976	1020
Total no of shops	70	84	88
Total no of offices	0	0	104
Site area	*5.6 hectare*	*5.6 hectare*	*6.6 hectare*
Total nett floor area	*91510*	*113800*	*131600*
Assumed neutral area	*40%*	*30%*	*30%*
Total gross floor area (sq. metre)	*128114*	*147940*	*171080*
Assumed 4.1 persons per household (current estimate)			
Density	*548 pph*	*715 pph*	*633 pph*
Plot Ratio	2.3	2.6	2.6

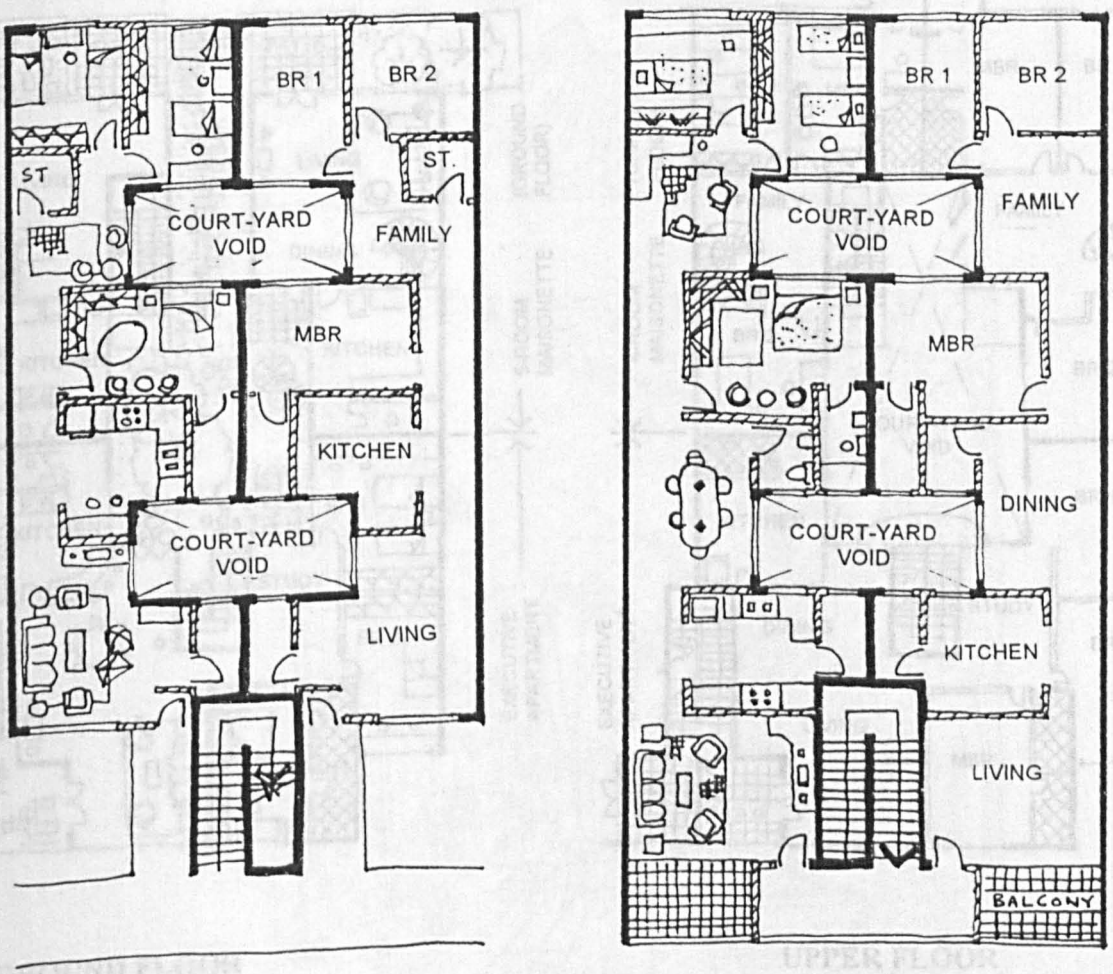
Table 59. Statistical Comparison of the Existing, the Alternative #1 and Alternative #2

Based on the alternative #2 scheme; the yield of the plot ratio is similar to the alternative #1 scheme which is at 2.6, 0.3 higher than the existing layout. As for density, in alternative #2 scheme there is a slight drop of density to 633 pph but it is still higher than the existing layout of 548 pph. Although the number of flats is 38% higher than that of the existing layout, because of the increase in land area, this density is lower than the alternative #1 scheme but still higher than the existing layout. Nevertheless, the trade-off in gaining the local park as a well-defined open space is worth it as compared to that in the alternative #1 scheme which kept the park in its existing location adjacent to the expressway.

6.3.3.4: Conceptual Layout of Housing Units

6.3.3.4.1: 4/5 Room Units

The following plans show how the 4 and 5-room dwelling units could be planned based on the shophouse typology. In each case there are two internal courtyards which encourage natural cross ventilation of the interior of the dwellings. The close proximity of certain spaces like the dining areas overlooking each other follows the same pattern as in the traditional shophouses where neighbourliness was very much in existence then. In high-density living, the issue of community cannot be avoided but should be enhanced in the design of the dwelling units.

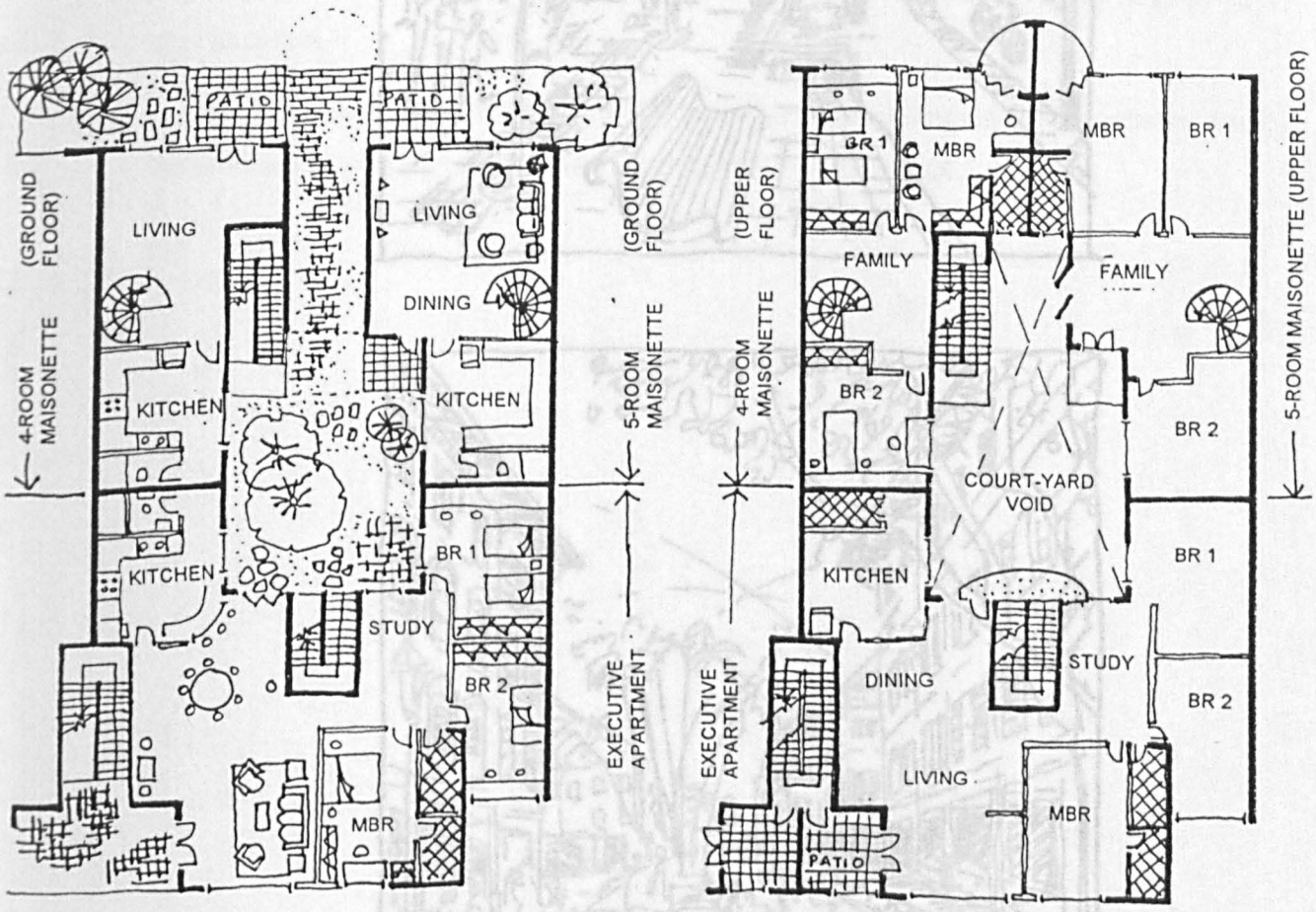


GROUND FLOOR (4-room unit) UPPER FLOOR (5-room unit)

Figure 121 & 122. 4/5 room units after the shophouse form with courtyards

6.3.3.4.2: 4/5 Room/Executive Units

The consideration of injecting some executive units is also a pertinent issue in high-density living where the mixing of various socio-economic groups can contribute to community building and natural surveillance (because of the greater range, variety and time patterns of usage according to Newman (1972)). Therefore, the attempt here is to indicate how that mixture of flat types could be feasible in the courtyard design. The use of open balconies in the courtyard could enhance neighbourliness beside giving the ground a better human scale.



GROUND FLOOR **UPPER FLOOR**

Figure 123 & 124 . 4/5 room and executive units after the shophouse form with courtyard

6.3.3.5: Images

Figure 125 & 126. Sketch perspertives showing the low-rise shophouse with its characteristic tropical architecture

6.3.4: Conclusions

The main objective of this thesis was the formation of a conceptual framework for an alternative urban, high-density, low-rise housing design which would be applicable to the local context. By applying the various theories and principles of housing and urban design in a high-density, low-rise built form, two alternative schemes were tested against an existing layout, and the results clearly point to a possible direction forward for a feasible and viable high-density, low-rise model. This alternative paradigm which has been very much neglected in previous years, when the housing objective was to solely meet the housing needs of a fast growing population within a limited resources, should be given its due attention.

The final concluding chapter will summarise the main findings of this research and recommendations for an alternative high-density, low-rise model.

Chapter 7:

CONCLUSIONS AND RECOMMENDATIONS

7.1 - An introduction..... 237
7.2 - Summary of Findings 237
7.4 - Conclusions..... 247

7.1: An introduction

This chapter addresses the conclusions of the overall research work in the form of summaries of findings which outlined the case for the alternative high-density, low-rise model in Singapore. It points out the potentialities and the limitations of the conceptual framework proposed.

7.2: Summary of findings

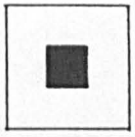
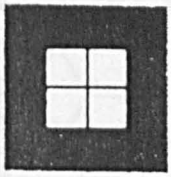
The main objective of this thesis was the formation of a conceptual framework for an alternative urban, high-density, low-rise housing design which would be applicable to the local context. By applying the various theories and principles of housing and urban design in a high-density, low-rise built form, four case studies were tested and discussed in the previous chapter. And in the fourth case study in which a particular site was being tested, the results clearly point to a possible direction forward for a feasible and viable high-density, low-rise model. This alternative paradigm which has been very much neglected in previous years when the housing objective was to solely meet the housing needs of a fast growing population within a limited resources, should be given its due attention. The following table is a summary on the question of what form of high-density, low-rise is possible in Singapore. The summary considers the following ten issues:-

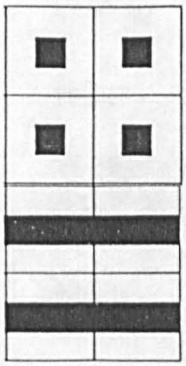
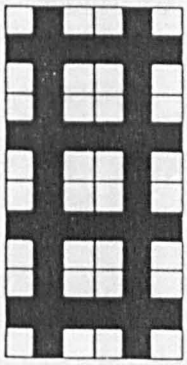
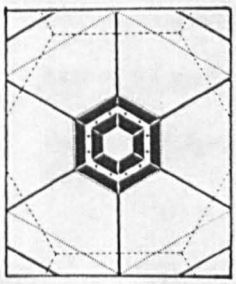
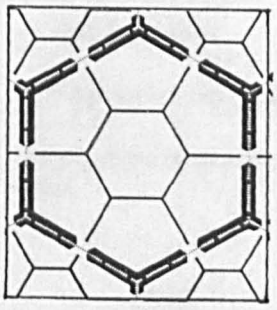
1. form,
2. built potential,
3. open space,
4. function,
5. movement, traffic, land use and street pattern,
6. sustainability - energy and cooling load,
7. social,
8. choices/diversity of housing types,

9. defensible space and
10. density.

By comparing the high-density, high-rise model and the alternative high-density, low-rise model under the 10 issues, the potentialities and the limitations of each model can be seen clearly.

Table 60. A summary of comparisons between the alternative schemes with the existing layout

	Issue	Existing	Alternative	Comments
1.	**FORM**	 **tower** **slab**	 **courts**	The possibility of the alternative form of courts has far-reaching effects. The variety of patterns of living that can be developed is important in the case of high-density living.
2.	**BUILT POTENTIAL**	Ineffective at low-rise	Effective at low-rise	At 4 storeys, the density and the plot ratio achieved can match that of high-rise tower and slab blocks.

	Issue	Existing	Alternative	Comments
3.	**OPEN SPACE**			The open space in the present block by block (or tower) form is simply a series of open corridors. In the court forms, it provides traffic-free courts.
4.	**FUNCTION**	 **concentrated**	 **linear/ dispersed**	This correlates to Martin & March's (1972) speculation on Howard's garden cities in a linear antiform. The present yardstick implicitly assumes that as densities increase, houses decrease in favour of flats, and low buildings give way to high. They argue that this is only true because of the professional separation of land use planning from its architectural implication.

	Issue	Existing	Alternative	Comments
5.		**TREE**	**LATTICE**	This correlate with Christopher Alexander's observation in his essay "A City is not a Tree".
	MOVEMENT	segregation	shared streets	
	TRAFFIC	concentrate	disperse	
	LAND USE	zoned	mixed	
	STREET PATTERN	enclaves	connectivity	
6.	**SUSTAINABILITY**			
	ENERGY	The need of lifts	Non-lift	
	COOLING LOAD	The need of air-conditioned	Cross ventilation. Non-air/conditioned	
7.	**SOCIAL**	Lack of private/semi-public realm	Existence of private/ semi-public realm	
		Lack of neighbourliness	Community based	
		Lack of human scale	Human scale is inherent	
		Problems of dead streets after dark.	Lively street most of the time.	
8.	**CHOICES/DIVERSITY**	Limited	Varied	according to Jacobs (1962)
9.	**DEFENSIBLE SPACE**	Weak	Strong	according to Newman (1972)
10.	**DENSITY**	high	high	

The high-density, high-rise housing model used as the frame of reference for this thesis has been positioned in the general history of Singapore as a necessary strategy employed in solving the acute problems of housing in the growing population in the 1960s, 70s and 80s. An important recognition is that despite the fact that the high-density, high-rise model has been successful in the local context, it is argued that in the progressive and changing society of Singapore, there ought to be a much greater variety and contrast of urban form in its public housing. More choices and patterns of living within public housing should be made available for the general public besides the high-rise form of living. In the context of Singapore's public housing in which the slab and tower blocks are the predominant built forms which house more than 85% of the population, the question posed is - do we continue in the present tradition of high-rise development which will further add to the existing stock of high-rise flats? Or is there another way forward in the design for high-density living?

Based on the various case studies tested, the density which is feasible in terms of high-density, low-rise development is in the range of the plot ratio of 1.7 to 2.1. Such a plot ratio will yield a total of approximately 110 to 135 dwelling per hectare or with the density of approximately 450 to 550 person per hectare. But if the intensity of the development is intensified to a plot ratio of 2.5, this model can still work with lesser outdoor space with a total of approximately 160 dwelling per hectare at a density of approximately 650 person per hectare. As noted earlier, an important conclusion emerging from the comparative study of Tao Payoh and Kampong Glam is that tall buildings do not necessarily imply an intensive use of land, the amount of withdrawn land will still be high. This suggests that in conjunction with a rise in plot ratio, we should look to increasing the site cover. In other words, some of the ideologies guiding planning practise need to be re-examined perhaps as a related research subject.

The limitations of building forms like the slab and tower were recognised and the investigation into the potentialities of other geometries such as the court form revealed how the form of a building did have a considerable effect on the efficiency of land use. In addition, the studies showed how one form of building with a plot ratio of 3:1 could be

accommodated in eight storeys, whereas elsewhere, in some situations, the same plot ratio would require tall towers.

In addition to the main argument regarding the relationship of built form to land use, the argument against zoning as a planning norm in today's context is put forth. The principle of the fresnel square is seen in its influence in the planning of high-density development and its application in the various case studies shows clearly that a new geometry can evolve with the planning of various facilities within the housing parcel. This runs counter to that of the Modern Movement theories of separation of function pioneered by people like Tony Garnier, which is very similar to the situation in Singapore. In contrast to that of the Modern Movement high-rise built form, the alternative low-rise built form in a high-density development is a direct result of this geometrical principle. The idea of a land use classification or zoning as a means of order has, over the years, changed to an administrative device for 'land accouting'. The sterility in the present housing environment is a product of zoning, the segregation into pure uses of the activities of the town. If the basis for segregation of uses is because of the incompatibility which results from substandard working conditions of the past, the pertinent question today is must we assume that these conditions and segregation still persist and will persist in the 21st century?

Furthermore, too much attention has been paid to urban design in terms of rationalist and functionalist concepts. Both have neglected the real needs of the people. The application of such concepts have resulted in the disappearance of the street which traditionally is an essential element of the city as can be seen in the shophouse typology. The scale of our habitat has changed from living next to each other to existence next to each other, usually in layers. In communities of the past, the life and activities are always organised along the street, which rightfully should be returned to its position as belonging to the community. All these are only possible in the alternative model for high-density, low-rise built form where the scale of the development is sympathetic to the user from the street level.

The mix of urban activities and housing types is essential for a better environment.

The pleasure of living in a place does not depend so much on grandiose things but on the way in which the different functions are interwoven. The greater the variety of activities, the livelier the town. A new town with properly integrated functions will never have difficulty in continuously evolving or in regenerating itself. Above all, it should contain housing as well as the usual services so that this mixture stimulates the social involvement of citizen and the use of urban space. Within the high-density, high-rise housing model, there is a general lack of cohesiveness, identity, sense of enclosure and territoriality. In playing the mathematical game so carefully, planners and architects have sub-consciously created miles and miles of meaningless green spaces and organised nowhere. Van Eyck call this 'the housing gruel'. He further states that the root of the evil is perhaps to be found in the long prevailing attitude that one could set buildings more or less anywhere in the green spaces of the park-like city. High-rise blocks on pilotis, over enormous pockets of open green spaces brings to death the 'street' and the life it brings. Once the pride of the public realm, it has now been made solely for movement whether of cars on roads or of people along corridors.

The alternative model with its hierarchy of courtyards provide the potential, where living is not restricted only to the dwelling unit itself. Living means activities, contacts and reactions to the environment. We do not live only in the dwelling unit but also on the playground, the walks, the squares, the public gardens and so on. The strategic placement of facilities and services at the local level into a network of access pattern maybe the key to forming a more coherent community. This then leads to a point which is not possible to be dealt with in great depth in this thesis but it suffice to say that the alternative model of high-density, low-rise is a model which is sustainable in the face the future energy crisis.

The challenge of designing a resource-conserving and climatically appropriate tropical city was highlighted in the mid-1980s. Beinhart (1985) observes that it is apparent that there is a serious lack of models developed exclusively for the city in the Tropics. City planners and architects in South-east Asia, as elsewhere, cannot escape from the responsibility for the environmental crisis which threatens our planet. It is essential that every design decision should be sensitive to the ecological repercussions at

a local, regional and global level (McHarg, 1969). In the case of Singapore, the sustainability of life-style is very dependent on fossil fuel. Powell (1992) observes that there is a contrast of styles in the presentations by the two principal speakers at the City Trans-Asia conference that accompanied the launch of the Singapore Revised Concept Plan. On the one hand, Singapore's former Chief Planner, Liu (1991), gave an upbeat vision of the future of the island. On the other hand, Bacon (1991), on a salutary note asked "What will you do when the oil runs out as it assuredly will by the year 2040?" If Bacon's predictions were accurate, the question was, what fuel would drive the Singapore economy when currently it was estimated that 50% of the energy was used for air-conditioning (Powell, 1992)? Singapore will need an alternative energy source and this will have its implications on urban design and housing built form, not to mention the general built form.

Figure 127. Rowell court housing estate (1980s) - contrasting forms (from HDB, 1985)

The alternative model of high-density, low-rise model will no doubt greatly reduce the dependence on air-conditioning and this is possible with the adoption of the traditional shophouse typology which has an inherently built-in system of cross ventilation by way of internal courtyards. Furthermore, the over-dependence on the use of mechanical lifts in the high-rise slab and tower blocks need not be the case in the low-rise courtyard housing which only requires staircase access.

With regard to one of the sub-issue on Regional Identity which was discussed in an earlier chapter, according to Yeang (1987), regionalism seeks to incorporate in the built environment the 'spirit' of the place. Its intentions are for a contextual built environment which respond to the local conditions rather than to international trends. More specifically, the emergent regional urban environment of these intentions, seeks its architectural significance through relating its built configuration, aesthetics, organisation and planning, landscaping, materials and technologies to the particular place and time. Powell (1992) notes that Singapore is the most advanced city in Southeast Asia in terms of housing and infrastructure development. Yet, these considerations should form the underlying intentions in developing the urban identity for the Singapore's new town. The present pursuit on "Toward a Tropical City of Excellence" should include the tropical aesthetics in its landscape and urban form and not just simplistically adopt the styles from developed nations in temperate areas of the world. Out of this search, the regional flavour of tectonic expression will grow and hopefully blossom into one which is picturesque in quality.

In contrast to the current high-rise patterns of living, the shophouse typology, because of its vernacular and urban character, is a possible answer as demonstrated in the previous chapter in the comparative analysis of the alternative model of high-density, low-rise housing. On a personal note, the invaluable experiences gained working in the pilot project on the restoration of old shophouses in Tanjong Pagar (April 1987 to June 1988), had not only convinced me of the inherent qualities within this built form but also its possible application in the context of public housing in new towns. This conceptual framework should be further researched into and be developed as a potential and viable alternative high-density, low-rise model for housing. Likewise, the "five-footway"

because of its origin and early role in the city's streetscape should be used as a unique connecting physical and visual feature for the city. Both the shophouse and its "five-footway", as historically representatives urban feature, are clearly apparent. Their adaptative use as a model for housing and an organising principle for urban design responds to the regional climate and gives validity to the local life-styles besides providing a distinctive Asian image to this region. The further development of this model will inevitably give rise to a whole range of choices and patterns of living.

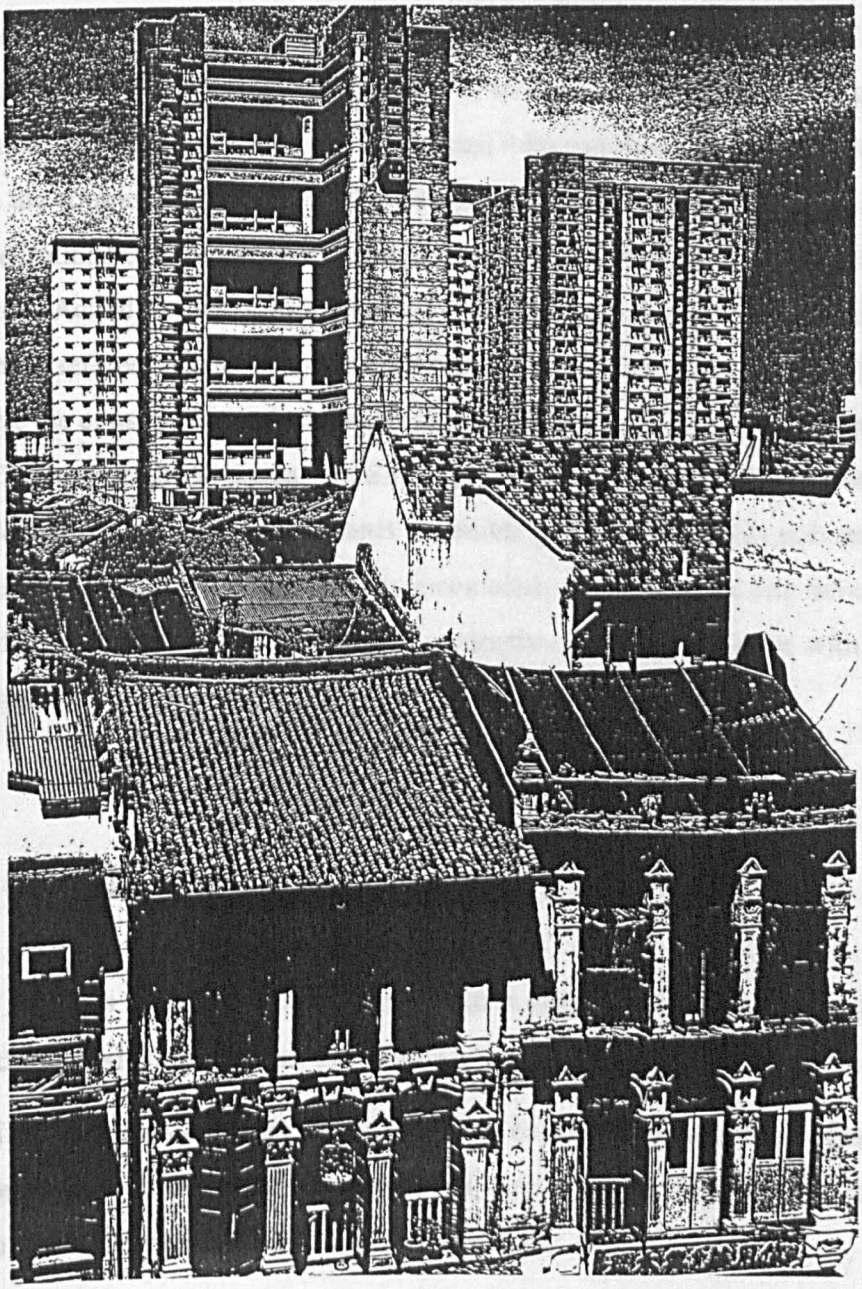


Figure 128 **Kreta Ayer Complex in Chinatown - contrasting scales (from HDB, 1985)**

The Next Step Forward

There are several ways of thinking about the implementation of housing projects in the city. The IBA (Germany) experience in holding a competition to attract world renowned architects may not be directly applicable in the Housing and Development Board context. However, the idea of having a competition amongst the architects within the Architectural Department is a possible means of generating more varied approaches using the high-density low-rise model. The opportunities offered to the architects to consider other options other than the present high-density, high-rise model may lead to a breakthrough in developing other patterns of living. For example, a real site which is earmarked for redevelopment can be selected with real physical constraints laid down. From the competition entries, a pilot scheme can then be planned out with all the considerations of the living environment considered, including that of the construction industry. Actual studies of its many aspects at different stages of the development will be a form of reference point from which further schemes can be developed. The need to involve the construction industry early in the development of the pilot scheme will be beneficial especially in the case of Singapore where the construction industry over the last few decades has been geared towards the building of high-rise built slab and tower blocks. The careful phasing in the implementation of low-rise housing development would have to be gradual to allow the construction to be able to cope with the changes taking place.

7.3 Conclusions

By this time, it is becoming clear that in the context of Singapore, the problem of providing good housing is not one problem but three:-

- Firstly, the most obvious is the problem of continuing to provide a good environment for the immediate needs of an individual, family, or any other individual who have chosen to live together as a unit - a household.

- Secondly, it is the problem (one which is harder to understand, harder to prescribe for) of organising housing and other facilities in a way that will allow the members of separate households to come together as a community in various ways. Communities in which people can eat and drink and laugh and play together, share equipment and facilities, solve common problems, and learn from each other - where people can feel protected, safe among friends.
- Thirdly, and by far the hardest to grasp in its true dimensions, is the problem of making places that are sustainable, places whose demands on the earth's resources are consistent with what the earth can afford to give, today, tomorrow, and in the future.

It is the author's view that the alternative high-density, low-rise model is the solution to the above problems. The alternative model has inherently in it that qualities and principles of architecture and urban design that endure even in the present and future fast-changing society. The task now is to apply those principles which in turn will influence the kind of built form proposed in the overall built environment.

In the case of Singapore, where housing for almost everyone is provided by design, not by evolution, this thesis forms the starting point; good housing must adequately addresses the problems of dwelling at home, dwelling in the community, and dwelling which is sustainable. To date, no contemporary society is known to have been able to address these problems as fully or as effectively as it should be. In Singapore, where traditional shophouses are still alive (that of Chinatown, Little India, Kampong Glam and elsewhere), thriving in the midst of the much more technologically advanced age of computers and fibre optics. It is clear that the traditional built form is still a possibility, and the author would even advocate that the concept still works better, all things considered. This suggests that we should build more compactly. The important lesson learnt from the spatial configuration of early shophouse settlements in Asia is the technique of close packing, and we will do well to reconsider ways to re-insert some of these important principles in contemporary settlements.

Particularly in Singapore, perhaps more than anywhere else, the attempt to match the success of the present high-density, high-rise housing, by consciously extracting the lessons from the past for use in the present, would no doubt face tremendous criticism and resistance. However, the great potential of the alternative high-density, low-rise model cannot be easily undermined but should be given further attention by further research into its other aspects of building sciences, etc. The possibility of generated projects based on this alternative paradigm in fact will come very close to the goal of good housing which adequately addresses the problems of dwelling at home, dwelling in the community and dwelling which is sustainable.

It is also clear that the process which generated the traditional shophouses and towns in Singapore cannot be duplicated in our time. Our needs are too different, our contexts are changing too rapidly and our culture is too varied. Yet, the basic shophouse typology has been very versatile in adapting to the different times for many decades. The almost timelessness of this built form ought to be given very careful and further research. We must use our resources and expertise and most importantly adopt an open creative mind which constantly thinks and seeks to improve and innovate in our effort to design a way forward, then we may one day hopefully make good housing. We can no longer depend on yesterday's plans for tomorrow's living. The findings of this thesis shed light on these issues, allowing us to see the problems for what they are, so that we can all approach this essential task, the deliberate creation of good dwellings by consciously seeking to design a way forward into the next millennium.

The alternative model does not question the present planning goals but suggests a land-use strategy which will create a markedly different physical form for the global city in the 21st century. Between the two extremes of high-density, high-rise and high-density, low-rise, there are tremendous number of answers and almost an unlimited number of ways in which we can design the living environment. This thesis, by deliberately choosing the opposite and alternative high-density, low-rise model to that of the present model has proved the point that an alternative framework is feasible and can exist. This model, though conceptual, is transferable to other situations and other cities where high-density living is inevitable. The options are ours to plan and decide, all the more if we lay

alongside the alternative paradigm next to the existing model. We have every reason to be confident because we have the means to design a way forward in our future urban housing.

Singapore is undoubtedly a success story and has even set a new paradigm. It is seen as a model by other countries aspiring to attain its standard of living. To further reach the goal of housing which is sustainable, community-based and meeting the changing needs of the residents today, an appropriate framework must be created. A framework of rules and options wherever possible and a physical framework where necessary. If the framework were a good one, if it ensured that the necessary issues are effectively dealt with, it would help us move closer to the desired goal in the future. Within such a framework, residents can be given real, meaningful dwelling spaces in which they will use to make places for themselves that really work - not only places that really work for who they are, but also places that work for the community at large, and will continue to work for future generations.

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A1.1: An introduction

The feasibility of any proposal for an alternative housing model that attempts to give people a wider option of living would be profoundly benefitted by the input from the social findings and research field.

Housing needs to be designed in such a way that it deters crime and provides security for residents. Fortunately, the problem has been extensively researched into ascertain whether there is any correlation between the planning and the form of housing and the incidence of crime. Analysis has also been made of crime patterns in different forms of housing and several authorities such as Jane Jacobs, Nicholas Taylor, Oscar Newman, Colin Ward, Alice Coleman and others have made recommendations about how a safer environment can be achieved.

Therefore this chapter is a documentation of some of the theories and issues on the security of housing. Each section oultines in terms of key findings of each theory put forward by the various authorities.

A1.2: The theories of Jane Jacobs

The fact that the planning and form of housing could have an effect on the incidence of crime was first highlighted by Jane Jacobs in 1962 in her book "The Life and Death of Great American Cities." She highlighted Greenwich Village in New York city as an example of an ideal environment for urban living. She lived on Hudson Street, not far from the river, and wrote of its many qualities in her book. When this was first published, it infuriated those whose lives had been devoted to the design, planning and building of brave new worlds based on Le Corbusier's vision of the Radiant City (Broadbent, 1990).

For Jacobs (1962), the streets and squares of the Village were the very essence of which real urban fabrics are made. For as she says: 'Think of a city and what comes to

mind?' Its streets. If the city's streets looked interesting, the city looked interesting and they looked dull, the city looked dull.' Unlike suburban or even small town streets, city streets are full and lively with people. Many of them may be strangers, who give the city streets the vitality they should have. But strangers, of course, can be menacing, so the 1bedrock attitude of a truly urban city street is that people need to feel safe and secure even among all those strangers (Broadbent, 1990).

No one feels really secure within the canyons of Wall Street or of Midtown Manhattan. Nor does anyone feel secure within - or between - the slab-blocks and towers of the Corbusean City. Such areas have to be policed, regularly, otherwise they are simply not safe for those who are obliged to be there. In a real city street - the kind which Jane Jacobs approves - such policing is quite redundant. For according to her:

> *the public peace - the sidewalk and street peace....is not kept primarily by the police, necessary as the police are. It is kept primarily by an intricate, almost unconscious, network of voluntary controls and standards among the people themselves, and enforced by the people themselves.*

Such controls cannot be achieved by simply spreading building to low densities, whether in suburban estates, or in high-rise slab-blocks in parkland. They need a certain minimum density of people, of buildings and of building use. A well-used street is also likely to be a safe street.

In writing about the street in this way, Jacobs is drawing on her personal experience of many streets in many places, especially in the North End of Boston and of course in Greenwich Village. However, as she points out, certain parts of Uptown Manhattan also have the qualities she seeks. These include some of the grander Avenues such as Lexington and Madison. These, with their shops and galleries, have the requisite vitality needed for lively - and therefore safe - street life. Fifth Avenue has this too, as it passes through Midtown Manhattan where it is lined with some of the finest shops in the world. However, Uptown, as it passes Central Park is no longer safe. Park Avenue in the same area suffers from the same fate itself. For here, they are largely residential; there is

no longer that mix of uses which is needed for liveliness and therefore, for safety (Broadbent, 1990).

A1.2.1: KEY FINDING - "The street"

Jacobs goes on to analyse the things which give a street that liveliness. She suggests there are three main conditions:

1. Firstly, if a street is to be safe, there must be a clear demarcation between public space and private space, between the territory which belongs to a particular house, a particular household, a particular shop or whatever and that which 'belongs' to all. Oscar Newman elaborates on this point in his book, Defensible Space (1972) and Alice Coleman has brought even more statistical evidence in her book, Utopia on Trial (1985)

2. Secondly, a constant surveillance must be kept; the eyes of those whom Jane Jacobs calls: 'the natural proprietors of the street' must be scanning it all the time. Their scanning will be easier if the buildings planned with projections and recesses, bay windows, balconies, stoops, steps and so on which lined the street are orientated towards it. All of which will make it easier for the 'proprietors' to see up and down the street, thus maintaining a constant vigil.

3. Thirdly, the street itself and the sidewalks in particular must be in constant use. The street must actually go from one place where people want to be to another, and there must be enough attractions along the street itself for them to want to linger there. An empty street has nothing much to offer but those who love their fellow human beings find it fascinating, not to say hugely entertaining, simply to watch the world go by. Quite simply we enjoy 'people watching' and if that is made easy for them then the 'proprietors' of the street will spend a great deal of their time doing it.

So the street will gain and maintain a reputation for being interesting, lively and

secure. People will enjoy going there to see and to be seen. The street will take on a life of its own.

Any street which lacks these basic conditions may be perceived as insecure, hostile and indeed actively dangerous. They may simply stay away, thus leaving the street exclusively to those who have no option but to use it. Innocent or not they will be stuck with all the problems that this may raise. Secondly, they may think of the street as something like a safari-park, full of wild animals, in which one leaves one's car at one's peril. Thirdly, the younger residents in particular may form gangs, stake out 'their' particular 'turf' or territory and defend it from unwelcome intruders. Indeed Leonard Bernstein's West Side Story (1956) - set in the Upper West Side of Manhattan - depicted such behaviour on the part of the Jets and the Sharks.

But teenage gangs are by no means the only urban groups to stake out their 'turfs' in this way. Jacobs describes, for instance, those fenced or walled suburban enclaves where certain of the more prosperous middle classes languish, protected by their security guards. Jacobs sees such segregation - whichever kind of 'gang' has chosen its 'turf' - as sterile and destructive of proper urban life. Jacobs likes to see the people of her natural street; 'loitering on busy corners, hanging around candy stores or bars, drinking soda-pop on the steps'. She also loves the places where people do these things; the candy stores themselves, the bars, the bodegas and the restaurants for it is these above all else which provide for such behaviour.

Such things - mixed in with housing - are too messy for the planner who, in addition to planning their physical environment, also wants to plan the lives of those who will live within it. So he plans his meeting rooms for them, his craft rooms, his art rooms, his games rooms, his pedestrian malls with their outdoor benches and those neat globular lights which make all planned urban schemes everywhere look the same.

Jacobs dislikes such things intensely and finds them no substitute for her natural street. Not only are they planned according to the planner's concept of what people should do in their spare time, the very names they attach to the rooms they have planned:

meeting room, craft room, and so on imply the things that people must be planned to do, implying that they will not do them unless their leisure time is planned and supervised, which of course is anathema to Jacobs. In her view, the fundamental point about urban life - as distinct from certain other kinds of life - is that people must be free to come and go as they please with no outside interference or constraint.

People must be given choices and the kind of diversity which Jacobs (1962b) has in mind.Things like grocery stores, pottery schools, movie houses, candy stores, florists, art shows, immigrants' clubs, hardware stores, eating places of many kinds, and so on form part of that choice and diversity. Every natural street needs things of this kind and each street too should have its own specific amenities: a Gallery for African Sculpture, a Drama School, a Romanian Tea House and other such exotica. The street which has such things becomes special, and people go there for those special things.

Jacobs points out that Wall Street - which Le Corbusier admired so much - is entirely lacking in such things. When Jacobs was writing (late 1950s) some 400,000 people commuted into the Financial District each day and a vast, undetermined number, came to visit them in their offices. Yet, in terms of the amenities and services which such people needed everyday, this extremely rich district was thoroughly impoverished. One would not necessarily look for a drama school or even a tea house but Wall Street was lacking - in even - such basic things as bars and restaurants. It had indeed been rich in such amenities at one time. There had once been food-stores, hardware-stores and so on, the kind of places in which busy people might do a little essential shopping at lunch time. However, these had been forced out by economic pressures, escalations in property values, the lack of a resident population, and so on. The requisite variety of urban choices can only be sustained by a large resident population and in an area such as Wall Street, there simply is no room for such a population.

A1.2.2: KEY FINDING - "The four basic rules"

For Jacobs (1962) the essence of urban life lies in exuberant diversity, in the making available to anyone, at any time, a vast range of choices of things to do. That diversity can be generated by the form of the street itself. Indeed one can design for it by observing four basic rules. They are:-

1. That a district as a whole serves at least two, and preferably more, primary functions: living, working, shopping, eating, and so on. These should be so varied in kind that different kinds of people come and go at different times, working to different schedules, come to the same place, the same street for different purposes. using the same facilities at different times and in different ways.

2. That no block along the street exceed a certain length, which Jacobs then goes on to specify. She finds the 900 feet or so between certain of Manhattan's Avenues are far too long and prefers to see it crossed by several short streets thus making access easier between the east-west streets and giving many corner sites.

3. That buildings of different ages co-exist in what she calls a 'close-grained' mingling. There should be quite a high proportion of old buildings because of their importance to the economy of the street.

4. That there be a high concentration of people in the street, including that essential nucleus of those who live there, work there, and act as its 'proprietors'

Jacobs is quite clear that these four conditions form the very heart of her thesis, the core of her book, and she goes on to expand on each of them.

Her plea for mixed uses, of course, contradicts directly and absolutely the argument for zoning on which so much post-Corbusean planning has been based. There was a certain logic to segregation where industry - such as steel-making - was large in scale, noisy, polluting, a great generator of traffic and so on. In the age of electronics when so much can be done at small scale, where the factory itself may be a small, clean,

quiet, neat and tidy place, that argument has lost its force. Sophistication obviously makes it increasingly possible for larger and larger numbers to live - as they did in medieval times - literally over the shop.

As for the concentration of people as Jacobs points out, there are subtle but compelling differences between crowding and density. For if a given area contains enough buildings, of the right kind, then very considerable densities can be achieved without anyone feeling overcrowded.

Of course this depends on location. In the suburbs, for instance, it may be perfectly possible to build houses at a density of, say, six to the acre. Each will have a generous garden but such gardens, and indeed such densities, are simply not feasible in the city. Apart from the cost of land, which prohibits such densities anyway, they, by their very nature, are simply not urban.

Suburbs may be built at, say, 10 dwellings to the acre but as they approach 20, so urban values begin to take over. At six to the acre, all the neighbours know each other; or at least they know who is who, even though they may keep very much to themselves. However, even with 20 dwellings to the acre quite close together, neighbours may still be strangers to each other and if one such estrangement manifested itself then they might as well be comparable to accept real strangers in the city.

Urban vitality starts for Jacobs at 100 dwellings to the acre, a density which allows for a great variety of dwelling form. In Greenwich Village, for instance, densities range from 125 to 200 or more dwellings to the acre. These are achieved by the mixing of dwelling types; including single family (row) houses, houses with flats over them, tenement blocks, apartment houses with flats, 'elevator apartments' and so on. Between the streets themselves, some 60 to 70% of the land is covered with building and the remainder is left open as small courts and yards. Such land-use ratios are high indeed but they have the advantage, for she feels in that way, they force people out of their dwellings and into the streets whilst ensuring, at the same time, that the courts and back yards are perceived as private space.

Above such densities, however, dwellings have to be packed so closely together - especially if there are generous open-spaces between - that a certain uniformity is bound to creep in. And uniformity of architectural form, for Jacobs, spells, inevitably, social uniformity.

In summary, this book was the first real indictment of modern planning methods and the form of new urban and suburban architecture. Jane Jacobs analysed and criticized modern planning theories for rigidly separating land uses into different parts of the city and for concentrating similar uses into exclusive centres, such as civic, cultural, shopping, etc. She criticized new residential developments which arranged housing within green spaces away from streets, and compared this to the traditional pattern of streets and sidewalks which contained the life of the great cities. To demonstrate how new developments, particularly housing, were a failure, she drew attention to the higher incidence of crime. She observed that since public places like streets and parks lacked intensive use and surveillance there was a high incidence of street crime. In short, the author thought that new planned developments in the cities would only be successful if they followed the traditional street patterns with mixed uses, rather than succumbing to the alien utopian theories of Ebenezer Howard, Le Corbusier and other twentieth-century planners.

A1.3: Nicholas Taylor

In his book on The Village in the City, Nicholas Taylor (1973) studies the suburbs of London in a similar way as Jacobs has done for the streets of Manhattan. He traces a history of the English town and the English house up to and including the tower blocks. As he said he learned much about housing when he was canvassing for the Labour Party from the base which he and his wife had set up for their family in the south-east London suburb of Lee. As he says:

it was increasingly borne in on me by commonsense and by personal observation

> *that this kind of house did in fact satisfy not just myself and my own family but an extraordinarily wide range of ages and income groups. These quite anonymous litter houses, built by Victorian speculative builders, were in fact marvels of sophisticated design, based not so much on self-conscious artistic decision-making as on gradual evolution over centuries of ordinary family life, which is itself, anthropologically, something very sophisticated.*
>
> (Taylor, 1973)

As Taylor goes on to point out, the architects themselves who at the time of building high-rise flats for other people were living in older houses on the ground. They simply failed to relate 'what was good for their own families to what was good enough for other people's.'

Taylor extols the virtues of the front door which opens directly on to the street with its associate private space defined by its threshold and two or three steps. He points out also the virtues of the traditional back yard: 'with its effortless ability to absorb on equal terms the baby's pram, the toddler's toys, the housewife's washing lines and the dog's kennel, everyone of them closely overlooked from the kitchen'. He also extols the virtues of the small front garden as an encouragement to self-expression 'with its semi-public display of roses, rocks and gnomes', not to mention the back garden, 'with its semiprivate sand-pits, shrubs and sheds'.

Such things are quite impossible in the high-rise flats with their useless public space between the blocks, their common entrance halls, their lift halls on each floor. They offer no chance at all for self-expression, no chance, even, for informal outdoor living in the summer. For it is of such things, according to Taylor, that freedom is made: 'blossoming literally in the private gardens and psychologically in the well-rooted growth of family life'.

Taylor's street, of course, encourages that sense of neighbourly responsibility, proprietorship, which Jane Jacobs found in her Greenwich Village Street. But Taylor's neighbours are quieter. They do not favour 'the kind of clattery hothouse Naples-in-the suburbs' which Jacobs - or even her Hampstead equivalents - view with such romantic affection: he favours quieter human relationships.

Taylor's house, of course, was built about the time the motor car was being invented (1886). As he points out, a street like his can accommodate the cars of those who live there, actually outside their own front doors, where the cars themselves contribute to self-expression, and therefore to their owners' sense of identity, as do their front gardens and, indeed, the fronts of their houses themselves. But parked in the street a car is unprotected, from the weather, or even from vandals; not that vandalism seems to be much of a problem in Taylor's London street. But as he points out the lower densities of Hampstead Garden Suburb, permitting detached and semi-detached houses as they do, also made it possible - as cars began to be fashionable, around 1911 or so - for car-ports and even for garages to be added.

Faced with the problems of building new housing at high densities whilst accommodating the car, Taylor advocats courtyard housing of the kind which Richard McCormac actually built for the London Borough of Merton at Pollard's Hill (which will be discussed in the next chapter under Perimeter Housing). In this case the garages are located around the periphery of the development in short access streets.

A1.4: Oscar Newman's Defensible Space

The most comprehensive study of security in housing, and the one which made the most definitive recommendations for the production of a safe environment in all forms of housing, was made by Oscar Newman in his book Defensible Space - People and Design in the Violent City, which was first published in 1972. Oscar Newman (1972) suggests that Jane Jacob's view on urbanity presents unsupported hypotheses. As he points out, the presence of commercial or institutional facilities in a project does not necessarily lead to that kind of proprietorial surveillance which Jacobs suggests it would. On the contrary, he says, the New York City Housing Authority Police found that projects adjacent to commercial streets suffered proportionately higher crime rates.

Unlike Jacobs, Newman supports his contentions with statistical analyses. He

finds correlations, for instance, between project size and building height with the mean number of crimes per thousand of population which, summarized, are as given in Table 4.

Project	Building height 6 storeys or less	Higher than 6 storeys
1000 units or less	47	51
More than 1000 units	45	67

Table 61. Crimes per thousand according to project size and building height

He finds double-loaded corridors particularly dangerous, these are corridors lined with apartments on both sides for which reason no-one can watch them from outside. He also finds more crime in the spaces between housing blocks than in the public streets which border them. The latter, indeed, sound rather like Jane Jacobs' streets where no one feels responsible for the spaces between the blocks. They create indeed a kind of no-man's land which, in Newman's view, can be made much safer, not to say usable, if someone feels responsible for them.

It is based on these grounds that Newman developes his concept of Defensible Space, that is space controlled by the residents in such a way that any potential criminal is recognized, and dealt with as an intruder. Newman defines defensible space in the following way:-

> *Defensible space is a surrogate term for the range of mechanisms - real and symbolic barriers, strongly defined areas of influence, and improved opportunities for surveillance - that combine to bring an environment under the control of its residents. A defensible space is a living residential environment which can be employed by the inhabitants for the enhancement of their lives, while providing security for their families, neighbours and friends.*

So in Newman's view there should be a hierarchy of space-types from the most public

that is from the street to the most private, the inside of the dwelling. Between these extremes there will be semi-public space, clearly reserved for those who live, or are visiting the dwellings for legitimate purposes, and semi-private space, that is space which clearly belongs to a single dwelling even though it is open to public access.

Thus new projects should be designed and old projects modified to incorporate these hierarchies of spaces. In one of the various cases Newman analysed the objectives that is:

1. to intensify tenant surveillance of the grounds,

2. to reduce public areas by unambiguous differentiation between grounds and paths; thus creating a hierarchy of public, semi-public, and private areas and paths,

3. to increase the sense of proprietorship felt by residents,

4. to reduce the stigma of public housing and to allow residents to relate better to the surrounding community,

A1. to reduce inter-generational conflict among residents within the project and

6. to intensify the use of semi-public ground within the project in predictable and socially beneficial ways, and to encourage and extend the areas for which tenants feel responsible.

To be able to examine accurately the correlation between housing design and the incidence of crime, requires access to detailed statistics on the physical form of the housing, a profile of the residents occupying the housing and the recorded incidence of crime. Here Newman was unbelievably lucky in that New York's largest housing organization, the New York City Housing Authority (NYCHA) had collected detailed criminal records on their stock of 150,000 dwellings over several years. It also happened that the NYCHA owned every conceivable type of housing, from two-storey terraced houses to thirty-six-storey tower blocks, located in most districts in New York City.

Newman's study produced some significant findings which support the use of low-rise buildings to house families with children. For example, the lowest recorded crime rates occurred in three-storey buildings, whereas buildings higher than six storeys and developments larger than 1,000 dwelling units suffered significantly higher crime rates. In high-rise buildings a higher proportion of crime took place inside the interior public spaces than in low-rise buildings. It was pointed out though that high-rise housing is successful for higher-income households with few children who are protected by permanent security devices and staff, but in lower-income housing which did not have this additional security, it failed.

In order to achieve a secure environment Newman established four main principles which should be adopted in the design of new housing or for alterations of existing housing which would be summarised as in the following:-

A1.4.1: KEY FINDING - "Territoriality"

a. All spaces both outside and inside buildings should be under the control or influence of the residents as far as possible.

b. External spaces need to be defined in such a way as to distinguish their private or semi-private use from the public streets and footpaths. Walls, fences and gates clearly define territoriality, but symbolic devices may also be used, such as changes in level, steps, gateways, portals, etc.

c. In higher-density developments, common stairways should serve as small a number of residential units as possible so that residents recognise each other, but more importantly they recognise intruders.

d. External communal areas - such as play areas, drying greens, parking - where possible should be accessible from and be in close proximity to the entrances of buildings or from the private domain.

A1.4.2: KEY FINDING - "Surveillance"

a. As well as providing windows for daylight and ventilation, windows should also be used to survey all public spaces, both external and internal, so that any criminal feels he is under natural and continual surveillance.

b. Gable ends of terraced housing should have windows to overlook adjoining streets or open space.

c. Front entrances to buildings should be adjacent to streets so that they can be surveyed by passing pedestrians and motorists; conversely housing along streets ensures surveillance of the streets. Entrances sited further away or in a different direction away from the street are more vulnerable to crime.

d. It is preferable if all common areas within buildings - staircases, lift lobbies, landings, etc. - are visible from the street outside the building and, where regulations permit, should also be overlooked by windows from the dwelling units.

e. Fire-escape stairs should where possible be located on the outside of buildings, be glazed and discharge any users (such as criminals) to the front of the buildings.

A1.4.3: KEY FINDING - "Building image"

a. Building forms and layout which stand out as completely different should be avoided since they indicate that the residents and the buildings are not well-protected to resist crime.

b. In very large redevelopment projects where there is an existing grid of streets, the streets should be retained rather than be closed off. This will help the scheme from appearing to be totally different and will maintain street surveillance.

c. High-rise housing blocks occupied by low-income families should be avoided because they are particularly vulnerable to crime.

d. Interior finishes and furnishings in interior public spaces should be warm and attractive to residents. Institutional hard materials, which may be vandalized, may encourage an urge to test their destructiveness.

A1.4.4: KEY FINDING - "Juxtaposition of residential areas with other facilities"

a. The mixture of housing with some institutional and commercial facilities helps to improve security in the area during the hours of intensive use.

b. Parks and playgrounds should be overlooked by housing. Long thin parks, 200 to 400 ft (61-122 m) maximum, are suggested so that it is possible to survey the interior of the park.

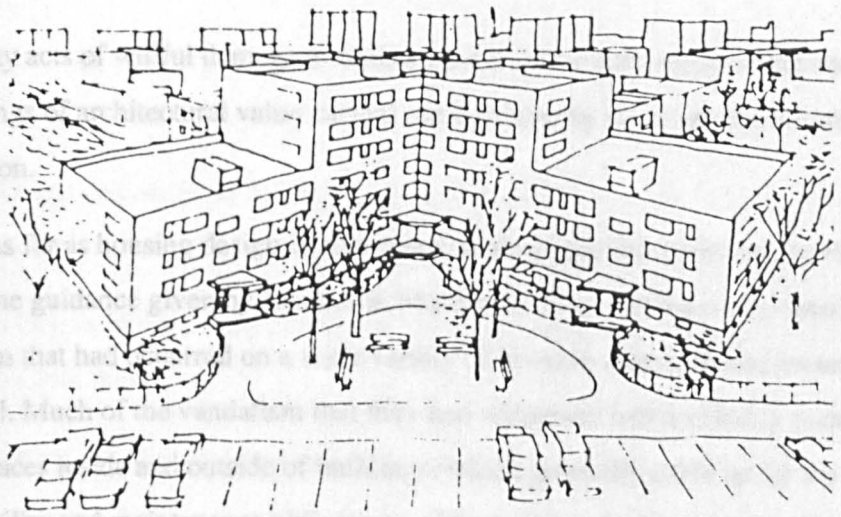

Figure 129. Brownsville Housing, New York with a triangular 'buffer zone' easily observed from the apartment windows, used for play, sitting and parking (from Newman, 1972)

Oscar Newman developed the principles of defensible space in more detail in his book Design Guidelines for Creating Defensible Space in 1976. In this handbook, he showed how new housing could be designed to reduce the risk of crime for different social groups, particularly those most vulnerable to crime. The handbook was directed at all those involved in the design process - architects, developers, housing authorities, etc. In addition to exploring alternative housing layouts the book also made recommendations on building construction and ironmongery.

A1.5: Colin Ward - The issue of vandalism in housing

At about the same time that Newman's defensible space theories appeared in Britain, Colin Ward (1973) edited another book on a related subject entitled "Vandalism". This book was a collection of papers by sociologists, criminologists, social psychologists and architects. Analysis was made on different forms of vandalism, ranging

from petty acts of willful damage to buildings and motor cars, to the complete demolition of buildings of architectural value carried out by property developers profiteering from such action.

As far as housing design is concerned, perhaps the most relevant section in the book is the guidance given by Leather & Matthews. They carried out a detailed study on vandalism that had occurred on a wide variety of housing estates in and around Liverpool. Much of the vandalism that they had witnessed had inevitably occurred in the public spaces inside and outside of buildings, which generally came under the responsibility and maintenance obligations of the local authorities. Many of their recommendations to avoid or minimize vandalism were inevitably linked with the need to achieve a more secure dwelling environment. Although some of the practical recommendations overlap with Oscar Newman's principles, the following points listed are woth noting.

A1.5.1: KEY FINDING - "Overall planning"

a. As much surveillance as possible should be provided to public spaces and circulation routes.

b. Garages should be located adjacent to dwellings or, where this is not possible, along frequently used streets.

c. Large, flat, hard-surfaced areas such as parking or service areas may attract ball games and could give rise to broken windows and other damages or annoyances.

d. Footpaths should be designed to follow natural lines, particularly through green spaces.

e. In cul-de-sacs or streets where traffic volumes are light, pedestrian footpaths should be integrated with the street in order to increase surveillance.

A1.5.2: KEY FINDING - "Detailed planning"

a. Natural and artificial lighting should be provided to all circulation areas inside buildings, particularly to high-risk areas such as lift lobbies.

b. In blocks of flats, internal circulation spaces should be avoided or reduced to an absolute minimum.

c. Vertical circulation areas should be capable of surveillance at all levels.

d. Meter cupboards and stores located in open entrance lobbies should be avoided.

e. Small hidden recesses in buildings, unrelated to any particular dwelling, should be avoided.

f. Vulnerable trees and plants should be protected by more prickly shrubs.

g. More mature trees and shrubs should be planted in public spaces. Conversely younger trees and shrubs are more likely to survive in private gardens.

A1.5.3: KEY FINDING - "Applied finishes"

a. Strongly textured surfaces generally suffer less graffiti than smooth ones.

b. Walls with strongly patterned surfaces or bold, contrasting colours are less liable to receive graffiti. The pattern should not be too large otherwise graffiti could appear within one area of colour.

c. Damage to applied surfaces is particularly pronounced when the surface colour is very different from the colour of the material below.

d. Materials used below the surface finish should be as durable as possible.

A1.5.4: KEY FINDING - "Materials"

a. Small areas of glass are less liable to damage than larger areas.

b. Thicker glass should be considered where it is liable to attack and polycarbonate glazing may be necessary in high-risk areas.

c. Roughcast cement render should be substituted for gypsum plaster in high-risk areas because it is more resistant to physical damage and less prone to graffiti.

d. Vertical tile-hanging, weatherboarding and large flat areas of sheet materials should not face high-risk areas.

e. If timber is used in high-risk areas then it should be close grained with an impregnable, preservative finish.

f. Hard-surface areas made with small sets or blocks should be set in bitumen or other material to prevent their removal.

A1.5.5: KEY FINDING - "Components and services"

a. Damage to light fittings can be reduced if fittings are inaccessible.

b. Wall-mounted light fittings should be recessed or concealed where possible.

c. Door construction and ironmongery should be designed according to the intensity of use and its location.

d. Rainwater pipes located near intensively used areas should be concealed or recessed.

e. All pipes and cables should be concealed where possible.

f. Walls and fences should be at least 2 metre high to prevent climbing - vertical

metal railings provide good security but timber fences with vertical palings, provide additional privacy.

A1.6: Closing streets

According to Colquhoun & Fauset (1991), one of the approaches to the creation of a more secure environment in existing residential areas has been the closure of some residential streets. The theory behind this is that by closing the street a cul-de-sac can be created complete with symbolic portals at the entrance. The area is then perceived as a private space and a homogeneous neighbourhood is created with the result that residents can easily recognize intruders. The process was first implemented in St. Louis in the 1950s where the streets of wealthy residents were completely privatised. Similar modifications have been carried out in other American cities which, according to Newman, have resulted in marked reductions in crime.

Possibly the best documented study of a street closure was that of Asylum Hill in Hartford, Connecticut. Here several streets were formed into cul-de-sacs or had narrowed street access. Crime statistics revealed an initial reduction in crime, though a few years later crime had returned to the previous levels. The latter was caused by the fact that the police presence in the area had been terminated and that there were more groups of teenagers and men loitering in the area, as a result of not restricting pedestrian access when the original streets were closed. The residents much preferred the new street arrangements as they could watch each other's houses. Furthermore, they found it easier to recognize strangers and also reported that the quieter streets had the effect of increasing property values.

Poyner (1983) in his book Design Against Crime discusses, among other security measures, the relationship between housing layouts without through traffic and the incidence of crime. He comes to the conclusion that street layouts in residential areas should preferably be designed to avoid through movement by foot and car. It is also

suggested that the access point to the street or area should be narrowed and have some symbolic gateway to signal the private nature of the street. For example, residential areas up to about 4,000 dwellings are suggested and these should have limited access and be separated from commercial users.

A1.7: Recommendations In Cheshire County Council (Design aid, housing: roads second edition 1988)

Some of the latest advice on street security is contained in the second edition of the Cheshire County Council Design Aid Housing: Roads, published in 1988. This recommends the following ideas to 'balance attractiveness with increased security'.

- Through movements of vehicles and pedestrians in housing should generally be avoided: linking paths should be avoided unless absolutely necessary for emergency vehicles' access or service provision.
- The identification of clearly related small groups of houses - clusters, courts, squares, etc., can contribute to a strong sense of ownership, and help to generate mutual concern as well as inhibiting casual intrusion by strangers.
- Houses facing through routes or main roads are clearly visible, very accessible and hence at extra risk.
- Landscaping needs to be designed in such a way to avoid creating spaces where criminals can hide; hedges should not be too close to houses, to prevent burglary, or near to footpaths to prevent attacks on pedestrians.
- Separate rear access to houses adds to the risk.
- A mixture of household types within a housing group encourages greater range, variety and time patterns to natural surveillance.

- Lighting locations and levels must be carefully designed to avoid exaggerated pools of very light and very dark areas.
- Damage-resistant materials and details are essential.

A1.8: Alice Coleman's Utopia On Trial

A more recent and controversial book on security in housing is Alice Coleman's Utopia on Trial: Vision and Reality in Planned Housing, published in March 198A1. Coleman (1985) builds on Newman's work in her Utopia on Trial. She and her colleagues at King's College, London extended very much further the kind of statistical work that Newman and his team had done. They measured the frequencies with which various kinds of anti-social behaviour occurred in different kinds of estates: from single-family houses though houses divided into flats to purpose-built, low-rise blocks of flats and, most particularly, high-rise blocks of flats of the kind mentioned by Newman and which her team had found so alienating.

Coleman's team mapped the occurrence of such behaviour in no less than 4099 blocks of flats containing, between them, 106 520 individual dwellings thus accommodating, collectively, some quarter of a million people. They also mapped the same range of behaviour in and around 4172 individual houses.

The behaviour itself extended, in ascending order of social disturbance, from the more-or less casual dropping of litter, through the deliberate spraying of graffiti, damage by deliberate vandalism, the number of children in care, the deposit of urine and even faeces in entrances, corridors, lifts and so on.

	Single family houses (1800)	Converted houses (200)	Purpose-built flats (4099)
Litter	19.8	37.0	86.1
Dirty and decayed litter	4.0	16.5	4A1.7
Graffiti	1.2	0.5	76.2
Damage	1.9	2.5	38.8
Urine	0.0	0.0	7.5
Faeces	0.1	0.0	7.5

Table 62. Percentage abuse levels by dwelling type

In one study, for instance, they compared the percentage incidence of these things in single-family houses, houses converted into flats and purpose-built flats with the results given in Table A1. There are clear increases of Coleman's anti-social behaviour as one moves from single-family flats to flats in converted houses to purpose-built blocks of flats.

Then she analysed in much more detail than Newman ever did the features of high-rise flats which seemed to correlate most strongly with anti-social behaviour. She finds that for 15 blocks of flats, containing between them, 4099 dwellings her anti-social behaviour patterns seemed to be related - in percentage - to the design features given in Table 63 [combined from Coleman's Tables 7 and 9, (Broadbent, 1990)].

Variables to do with size:	
Number of dwellings served by same entrance	57.7
Number of dwellings in the block	46.7
Number of storeys to the block	41.1
Number of storeys in each dwelling: i.e. flats, maisonettes etc.	13.8
Variables to do with circulation routes:	
Number of overhead walkways between blocks	32.6
Number of connected lifts, staircases etc.	26.7
Number of interconnected exits	22.4
Corridor type (single or double loaded)	20.6
Features of the grounds and the layout:	
Spatial organization: public, semi-private, ambiguous, etc.	31.2
Number of access points from street into site	24.6
Number of blocks sharing site	18.3
Number of play areas	7.1
Characteristics of entrances:	
Type: communal or separate for each flat	9.8
Access: from street, internal court etc.	8.5
Between stilts and/or garages	6.6

Table 63. Relative influence of design variables

In each case where numbers are concerned; number of dwellings, number of blocks, number of storeys to each, number of walkways connecting them, number of escape routes and so on, more seems to mean, invariably, worse. Even children in large numbers seem to overwhelm, for as Coleman says, multi-storey layout with large schools, rather public playgrounds also means that children tend to spend their time together, rather than with adults, including their parents, and thus they have less chance to learn what good behaviour is supposed to be.

Like Newman she has her strategies for discouraging, anti-social behaviour. The main principles can be found later. Like him, she suggested they be applied to new designs and used to retro-fit existing designs. Unlike Newman, however, she anticipates - and answers - her critics. She found that size alone is by no means bad in itself, nor is the

age of the building. Nor is density in itself, indeed in some cases she advocates increases rather than reductions in density. But she found that much anti-social behaviour is related to the density of children.

She maintained that poverty, unemployment, the concentration of problem families in certain blocks, do not correlate with anti-social behaviour. Indeed she pointed out that however bad these things may have been in the 1980s, they were even worse in the 30's. But most people then lived in houses, in streets with all the advantages that Jane Jacobs described. Except that, curiously enough, Coleman found that far from having beneficial effects, the presence of shops, places of recreation, entertainment and so on can bring anti-social behaviour if they are located within a housing estate.

A1.8.1: KEY FINDING - "Coleman's principles"

The main principles of her findings were as follows:

1. There should be windows adequate for effective surveillance in front ground-floor living rooms.

2. Front doors should not project forward to impede the line of sight from the windows. Glass panels in or beside the doors would assist surveillance.

3. There should be no other projections from the facade which obstruct the view of the street from the windows, e.g. garages, meter compartments, etc.

4. The buffer zone in front of the house should be an individual garden and not a shared lawn. There should also be waist-high walls or fences between neighbouring and front gardens along the street frontage, which should also have gates. Low step-over fences that do not deter dogs and high faceless hedges or walls that impede surveillance and flimsy fencing materials should be avoided.

A1. The minimum garden depth is 3 m but houses should not be set back much further than this if they are to have proper surveillance of the street.

6. Back gardens should be back-to-back without exits onto paths or roads. This design maximizes security for toddlers, security against intruders and privacy. Access should be from the front between detached or semi-detached houses, through tunnels between pairs of terraced houses, or though the garage. Tunnel access should begin inside the front gardens and not as an alleyway direct from the street. Layouts where the front of one row of houses faces the back of the next row are to be avoided.

7. Each garage should be incorporated into the territory of the house where it is fully under its owner's control and less vulnerable to crime than in a segregated group of garages. The garage should not replace the main front window, making the house faceless.

8. Houses should be arranged in traditional streets, with all the open spaces allocated to individual front and back gardens. Corner houses, where the front garden swings round to face both roads, are preferred to end houses with windowless end elevations.

9. To further ensure security, there should also be only one way into each housing group. Main footpaths are also best located so as not to pass through individual housing groups in order to reduce the possibility of disturbances, particularly of elderly people by young people passing too close to their windows.

While these principles in themselves are entirely laudable, if they are taken too literally the result could be an austere and monotonous environment. The level of satisfaction of people with their homes relates to the quality of the environment and it clearly requires great skill to achieve this within the context of Alice Coleman's requirements.

Some of the results and recommendations contained in Alice Coleman's book have been seriously questioned by some authorities. For example, the rejection of the use of cul-de-sac in housing layouts. Many crime-prevention departments of police

authorities report that small cul-de-sac serving up to twenty dwellings are self-policing and that quite a number of crimes have been detected in cul-de-sac because residents in such areas have quickly recognized intruders. The police also consider that Coleman's preferred housing solution, of long streets containing semi-detached houses, attracts potential burglars since they are less noticeable than in cul-de-sac.

Oscar Newman has also been critical of some Coleman's findings, particularly the lack of attention given to social factors interacting with physical form as the cause of housing failure. An example of this is Coleman's view that high-rise housing is uninhabitable in any situation. But Newman points out, high rise is quite suitable for the elderly, working couples or single people, but does not work for families with children and lower-income families.

This criticism is further endorsed by the results of remedial work to existing estates carried out by the Safe Neighbourhoods Unit (SNU) established by Westminster City Council. In an article in the Architects' Journal, John Farr of the SNU says that the attempts to correlate problems with design variables have failed.

> *Alice Coleman's view, which looks like common sense, just doesn't seem to hold up. In fact, our survey shows that people living on long corridors are actually less concerned about crime. It's not a question of design; more important is the question of where that most one-parent families and children live.....unless child densities are reduced there won't be any significant difference.*
>
> (Heck, 1987)

In summary, Alice Coleman's study of more than 100,000 homes in England had found that people were clearly happier in housing where the space around their dwellings was overlooked by windows and, 'what tends to bring out the worst in people are developments in which residents have no such clear territorial identity, and in which the design of their homes prevents them from watching over the spaces outside their windows' (Colquhoun & Fauset, 1991).

A1.9: Conclusions

In this chapter, the process to document and to identify the most relevant issues in public housing were described. For a better understanding of the theories, the identified findings were classified accordingly as "key finding".

The following are among the key findings:-

- Jacob's plea for mixed uses, contradicts directly the argument for zoning on which so much post-Corbusean planning had been based, which is the case in the new town structural plan in Singapore.
- By looking at Taylor's works, one realises that his emphasis on the proper front door which opens directly on to the street is quite impossible in high-rise flats with their useless space between the blocks, their common entrance corridors and their lift halls on each floor. They offer no chance at all for self-expression, no chance even for informal outdoor living.
- Oscar Newman's defensible space is a living residential environment which can be employed by the inhabitants for the enhancement of their lives, while providing security for their families, neighbours and friends.
- Alice Coleman builds on Newman;s work in her Utopia on Trial and her analysis on the features of high-rise flats which seem to correlate most strongly with anti-social behaviour goes further than what Newman ever did.
- The strategies and the remedies to tackle vandalism at the various levels of the design from planning the housing layout down to the detailings were outlined in Colin Ward's book.

The above documentation of the various social theories and issues of housing forms an important knowledge base for this thesis.

Appendix 2:

Theories and Concepts of Urban Design

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A2.1: An introduction

This chapter is a study of the various theories and approaches of urban design which are used as a reference for this thesis. The initial notion that it is possible to formulate a "canon of urban design" from this research begs many questions, not to mention the least of which is deciding what in the vast literature should be left out. Nevertheless, this chapter is an attempt to assemble the works from leading urban designers such as Gordon Cullen, Kevin Lynch, Christopher Alexander, Charles Moore and Rowe and Koetter and hopefully in the process lead to good principles of urban planning and design with potential application to Singapore.

A2.2: Gordon Cullen

Gordon Cullen developed the idea of Townscape in 1945 when he joined The Architectural Review as an assistant editor. Cullen's beautifully illustrated essays on the subject were collated to form the book called Townscape (Cullen, 1961) and republish later, in edited form, as The Concise Townscape (Cullen, 1971). According to Cullen "just as there is an art of architecture, so there is an art of relationship", in which all the elements which go to the making of an environment - buildings, trees, nature, water, traffic, advertisements and so on - are woven together in such a way that drama is released. Cullen argued that this could not be achieved by scientific research, although Cullen accepted the need for demographers, engineers, traffic experts and so on. The result of their work according to Cullen is:

> *that a town could take one of several patterns and still operate with success. Here then we discover a pliability in the scientific solution and it is precisely in the manipulation of this pliability that the art of relationships is made possible....the aim is.....simply to manipulate within the tolerances.*
>
> (Cullen, 1971)

According to Cullen, that manipulation will be a visual matter: 'for it is almost entirely through vision that the environment is apprehended', He argued that:

> *vision is not only useful but it evokes our memories and experiences, those responsive emotions inside us which have the powers to disturb the mind when roused. It is this unlooked-for surplus.*

This unlooked-for surplus according to Cullen can be appreciated in three ways. They are:-

A2.2.1: Serial vision

Serial vision is stimulated when, in addition to the existing view which is immediately present, there are also hints of a different, emerging view. A long straight road or an open square can only give one the first of these whereas delight and interest are stimulated by contrasts, the 'drama' of juxtaposition.

A2.2.2: Place

Cullen suggested that there were two strong characteristics regarding the sense of place. On one hand there was the sense of being in a particular place - a street or square - of being 'here'. On the other hand, there was an equally strong sense that around and outside it there were other places which one might think of as 'there'.

A2.2.3: Content

According to Cullen, content is a matter of architectural style, scale, materials and layout, but he also cited colour, texture, style, character, personality and uniqueness as important components of content. Given the hotchpotch nature of old towns, he said:

> *there exists at the back of our minds a feeling that could we only start again we could get rid of this hotchpotch and make all new and fine and perfect. We would create an orderly scene with straight roads and with buildings that conformed in height and style. Given a free hand that is what we might do.....create symmetry, balance, perfection and conformity. After all, that is the popular conception of the purposes of town planning.*

He used the analogy of a party, which started with the meeting of strangers, all observing the proprieties, making polite conversation in rather general terms so that no one revealed a personality. He said, it was an exhibition of manners, of how one ought to behave, which was very boring. One was a good-natured wit, another was simply exuberant; each one acted as a foil for the others. People enjoyed themselves because they had agreed to differ, within certain recognised bounds. Cullen's view, of course, was that planning should be more like the latter stages of his party rather than the earlier, stiff and formal stranger.

Cullen's message was clear enough. His highly appealing sketches showed many examples of his serial vision, ways of defining a 'place', by means of enclaves, enclosures, focal points, precincts, outdoor rooms, hereness and thereness, closed vistas, deflections, projections and recessions, undulations, not to mention punctuations, the sense of possession, advantage and so on. He included contexts: metropolitan, urban, arcadian, rural, industrial and so on; and at a whole range of details and devices by which one actually 'reads' his environment. These included intimacy, propriety, bluntness, nostalgia, exposure, illusion, metaphor, relationships, scale, distortions, calligraphy, advertising and many more. He also included the delights of the so-called 'functional' tradition: at iron and other bridges, at railings, fences and steps, at textures, lettering, bollards, cobblestones and so on. From this he analysed a wide range of environments, showing

with his sketches how they could be improved.

The result of all this, as Cullen said in the Introduction to his Concise edition (1971), was 'a superficial civic style of bollards and cobbles.....traffic-free pedestrian precincts and .....the rise of conversation'. But these, for Cullen, were merely the superficials; there had been no widespread understanding of what he was trying to do. In a very real sense, the deceptively easy nature of his presentation blinded people to the profundity of what he was trying to say (Broadbent, 1990).

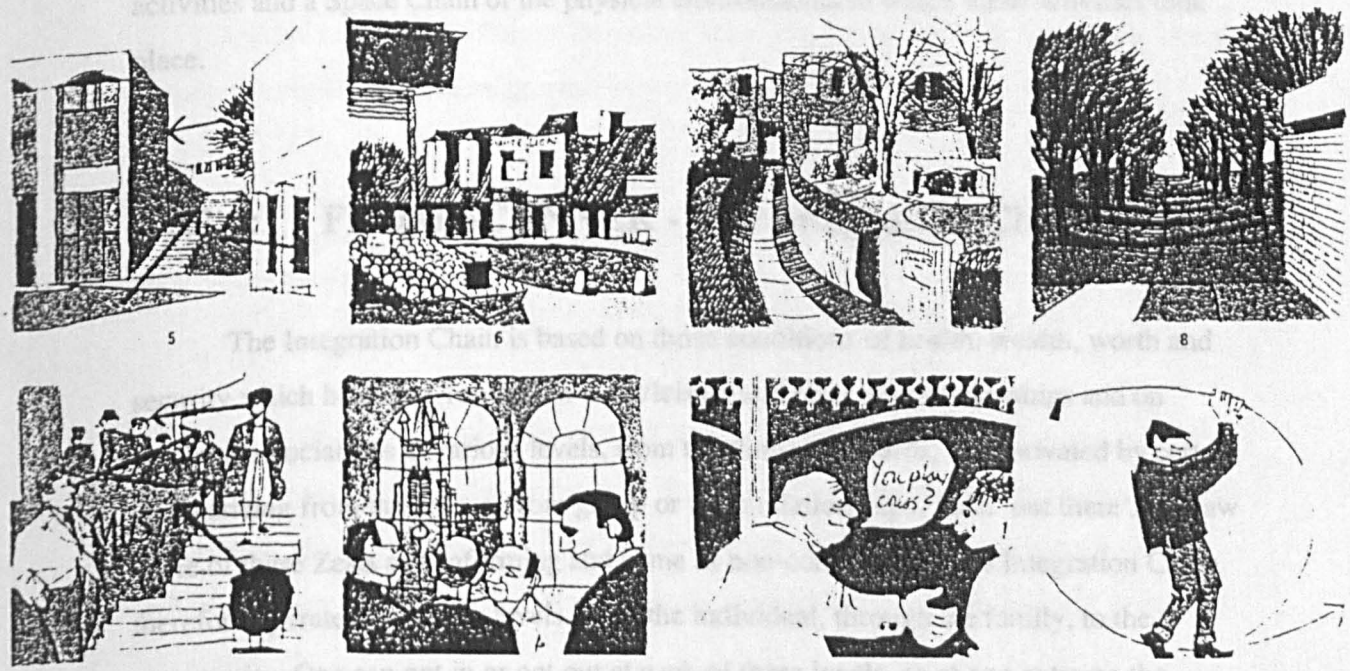

Figure 130. Gordon Cullen(1966): activities and spaces [from Cullen, G., *The Scanner*, 1966]

After publishing Townscape, Cullen was commissioned by Alcan Industries - producers of aluminium - to undertake some theoretical studies in planning, such as a Circuit Linear Town and A Town called Alcan, as a platform for new ideas. One of these, The Scanner (Cullen 1966) which was published as a 24-page brochure, was concerned

specifically with the fabric of the town: the roads, the paths and the buildings. There, in some thirty drawings, a two-page chart and a 3000 word worked example, with 9 plans and 6 townscape comparisons, he got closer to the heart of the matter than Sitte did in some 75000 words and 115 plans. The Scanner itself is his two-page chart, the first page of which was concerned with Human Factors and the second with Physical Factors:-

- Human Factors: mean those conditions of happiness or sadness, fulfillment or despair, which arise from total human relationships.
- Physical Factors: mean the actual shape and arrangement of the urban environment, the mould into which mankind is poured.

Cullen saw these as a pair of interlinked chains: an Integration Chain of human activities and a Space Chain of the physical environments in which these activities took place.

A2.2.4: FROM SCANNER - The Integration Chain

The Integration Chain is based on those conditions of health, wealth, worth and security which he called Tenure; on work/leisure and their interrelationships and on personal associations at various levels, from the family outwards, all motivated by certain Zests arising from the senses, from group or team relationships, from 'out there'. He saw some of these Zests as conforming and some as non-conforming. The Integration Chain therefore operates at various levels, from the individual, through the family, to the community. One can opt in or opt out at each of these levels, so at one extreme the individual will opt out in his search of solitude, retreat or withdrawal, whilst at the other he may opt into some group activity within the community.

A2.2.5: FROM SCANNER - The Space Chain

Cullen's spatial chain of physical factors is literally built by a community of a certain size, composition and in a certain location; it has a particular pattern of density, transport systems and so on and it is built within a given landscape with a particular climate, and a pattern of wild nature, agriculture and industry. Cullen saw the Space Chain as motivated - hopefully - by an identity of place which itself is based on sympathy for the site and the complex combination of those factors which made for homogeneity with those which offer foils. The Space Chain for Cullen was largely an optical matter in which light, perspective and serial vision all play their part and, like the Integration Chain, it operated at three levels : internal, external (built) and external (natural).

Cullen's two chains and the individual were interlinked by what he called a 'maze factor', a term which, as he suggested, might need clarification:-

> *The intention is to suggest that pleasant degree of complexity and choice which, although it is contained within a coherent framework, allows the individual to find his personal path. We feel that this degree of personal initiative, both socially and visually, helps to identify a person with his environment.*

As Cullen saw it, the designer could take this (or his own) Scanner as a *map* of the design problem. It could even be used as a *check list* against which the designer could ask himself 'Have I considered...." or 'Is there provision for.....' In particular it would force him to draw out of the environment those things which were unique and particular to a certain place.

THE SCANNER: Have I considered . . .?

HUMAN FACTORS

TENURE

HEALTH

PHYSICAL
- Use of body in exercise
- Population drift in old age
- Preventive medicine in planning

MENTAL
- Effects of high density
- Loneliness symptoms going to (a) doctor (b) pub (c) church

WEALTH

PERSONAL
- Money buys the best sites
- 2-house, 2-car families
- Wealth sets trend for mass imitation

REGIONAL
- Population drift to favoured areas
- Balanced use of wealth for amenities

WORTH
- Personal character contributions, as a 'card', etc.
- Leadership in marginal skills, spare time activity and sport

SECURITY

PHYSICAL
- Railings
- Segregation of motor-car etc.
- Security of person and property

MENTAL
- Assurance
- Leasehold
- Rights of ownership
- C.P.O.'s

WORK/LEISURE

WORK FOUND IN LEISURE
- Employment for the old
- .. for the financially independent
- .. for doers of good works
- .. during vacations

LEISURE SCALE

DAY
- Lunch clubs
- Tea breaks
- TV
- Pub
- Entertaining
- Homework
- Extra mural studies

WEEKEND
- Spectator activity
- Sport
- Theatre, gardening
- Shopping
- Gatherings: social, church, political

HOLIDAYS
- First holiday travelling: tourism, caravans, coastline
- Second holiday at home: park, communal facilities such as workshops, halls, arena

LEISURE FOUND IN WORK
- Vocation
- Dedication
- Religious orders

ASSOCIATION

PRIMARY

CHILDLESS COUPLE
- Place of one's own
- Town centre
- Entertainments
- Near work
- Minimum maintenance

MARRIED WITH CHILDREN
- Life-cycle housing
- Mechanization in home
- Flexibility of plan
- Garden
- Quiet
- Hygiene

SECONDARY

ENTERTAINMENT
- Pubs and clubs
- Societies
- Parade and loitering
- Town centre
- Library
- Home entertainment

PLACE OF WORK
- Working groups
- Leadership
- Social clubs
- Sports

EDUCATION
- Schools as community centres
- Youth club
- Walking distance to school
- Car rota

RELIGION
- Place of worship
- Place to preach
- Needs of various religions (e.g. education, lay activities, rites, calendar events)

INTEGRATION

INTEGRATION CHAIN

INDIVIDUAL		MAZE FACTOR	FAMILY		MAZE FACTOR	COMMUNITY	
opting out	*opting in*	→	*opting out*	*opting in*	→	*opting out*	*opting in*
The Key	Living room		House boundary	Schools		Identity of place	New blood
Solitude	Play area		Integrity of family	Church		Close, alley, courtyard	Development
Retreat	Communal garage		Sunday lunch	Shopping		Village, town	Transport links
Withdrawal	Pets			Tenant groups			

BETWEEN INCOMES
- Mixed housing
- Common ground through marginal skills, spare-time activity and sport

BETWEEN AGES
- Graduated retirement
- Tidal flow to common ground between age groups
- Life-cycle housing

ZESTS

CONFORMING

OUT THERE
- Adventure playgrounds
- Speed, danger, climbing, sailing, walking, pot-holing

GROUP OR TEAM
- Dancing, choir music, games

THE SENSES
- Sex
- Food and drink
- Arts
- Human spirit
- Search for meaning

NON—CONFORMING

OUT THERE
- Rebellion
- Nomads and tramps
- Hooligans

GROUP OR TEAM
- Gangs
- Vandals

THE SENSES
- Perversion
- Drunkenness
- Pep pills
- Car idolatry

Figure 131 - Gordon Cullen (1966): human factors

THE SCANNER: Have I considered . . .?

PHYSICAL FACTORS

COMMUNITY

SIZE
- Choice of climacteric sizes based on:
- Time cycle (e.g. weekly sufficiency)
- Growth of amenities
- Transport capacity

COMPOSITION
- Balance of imbalance of:
- Ages
- Occupation
- Wealth

LOCATION
- The art of siting
- Catchment area
- Dominant or dependent
- Economic viability
- Communications

REGION
- Regional characteristics
- Seasonal fluctuations

GROWTH
- Projected growth
- Change of composition
- Self-limiting community

PATTERN

DENSITY

LOW
Peace, tranquillity, space, health, low land-use, random pattern, poor public transport, difficult for industrialized building, cash sale of houses, limited traffic segregation

MEDIUM
Degree of privacy and space, medium land-use, possibility of corporate visual groups, viable for public transport, viable for industrialized building, mortgage, horizontal segregation (Radburn etc.)

HIGH
Maximum need for amenity space, optimum land use, greater possibility of visual cohesion, public transport, optimum industrialized building, council rent, vertical traffic segregation

TRANSPORT

TRAFFIC TO PEOPLE
- Transport flow: motorway, clearway, amenity of traffic
- Problem of proximity: noise, smell, sight, nodal points, parking

PEOPLE TO TRAFFIC
- Exercise
- Peace of mind
- Environment
- Commuting
- Ease of contact or segregation

GIVEN PATTERNS

BY-LAWS
- Daylighting
- Road widths
- Sight angles
- Fire access

TRENDS
- Snob designs and colours
- Pop art
- Layouts and gimmicks

INDUSTRIALIZED BUILDING
- Crane swing
- Unit weight
- Factory siting
- Production flow

LANDSCAPE

CATEGORIES
- Wild nature
- National park
- Uplands
- Coastline, estuary
- Arable land
- Industrial land
- Parkland
- Green Belt
- Rough Green Belt
- Twilight land
- Suburb
- City

CLIMATE
- Prevailing wind
- Local climate
- Artificial climate
- Population drift

NATURE
- Wild life
- Nature reserves
- Ecology
- Air pollution
- Industrial waste

AGRICULTURE & INDUSTRY
- New patterns of farming
- Factory farming
- Clean industry
- Automation
- Power/service grids

OPTICS

SPACE CHAIN

INTERNAL
- A room
- Sequence of rooms
- Flow of spaces
- Connection: stairs, ramps

MAZE FACTOR

EXTERNAL (BUILT)
- Courtyard
- Street
- Square
- Formal garden

MAZE FACTOR

EXTERNAL (NATURAL)
- Avenue
- Park and lake
- Hills and sea
- Horizon and sky
- Panorama

LIGHT
- Cubism
- Geometry
- Silhouette
- Texture
- Colour
- Artificial light
- Exploratory power of light

PERSPECTIVE
- Effects of foreshortening
- Division and organization of space
- Intrusion and excision by height
- The visual globe

SERIAL VISION
- Seeing in movement
- Development
- Joining and separating
- Growth of apparent size

IDENTITY OF PLACE

SITE SYMPATHY

AMBIENCE
- City
- Market town
- Suburb
- Quartier
- Village
- Genius loci

OBJECTS
- Character of building
- Historical appraisal
- Vitality
- Significant position

NATURE
- Levels
- Sky
- Water
- Trees and plants

COMBINATION

HOMOGENEITY
- Conformity
- Manners
- Heirarchy
- Enclosure

FOILS
- Scale
- Style
- Surprise
- Follies

Figure 132 - Gordon Cullen (1966): physical factors

A2.3: Maryculter

In 1974, Cullen prepared a proposal for Maryculter, a new urban village near Aberdeen. This was prepared for Christian Salvesen (Properties) Ltd, with David Gosling as Planning Consultant and Kenneth Browne as co-Design Consultant. Cullen himself was perfectly clear that any design study should start with a proper scientific survey and the Maryculter study was a model of its kind, taking into account as it did location, land ownership, topography, landscape, existing development, services, geology and subsoil. David Gosling's team then worked out on this basis their proposals for the village's overall form, circulation, community facilities, population/employment/density, open space and recreation, landscape, main drainage and phasing and it was within this framework that Cullen then presented his concept. He saw this in terms of a Habitat for Houses, a Townscape Plan, and the Way to the Heart, followed by the detailed treatment of four neighbourhoods: East Park, Kaleyards, The Wynds and Burnside.

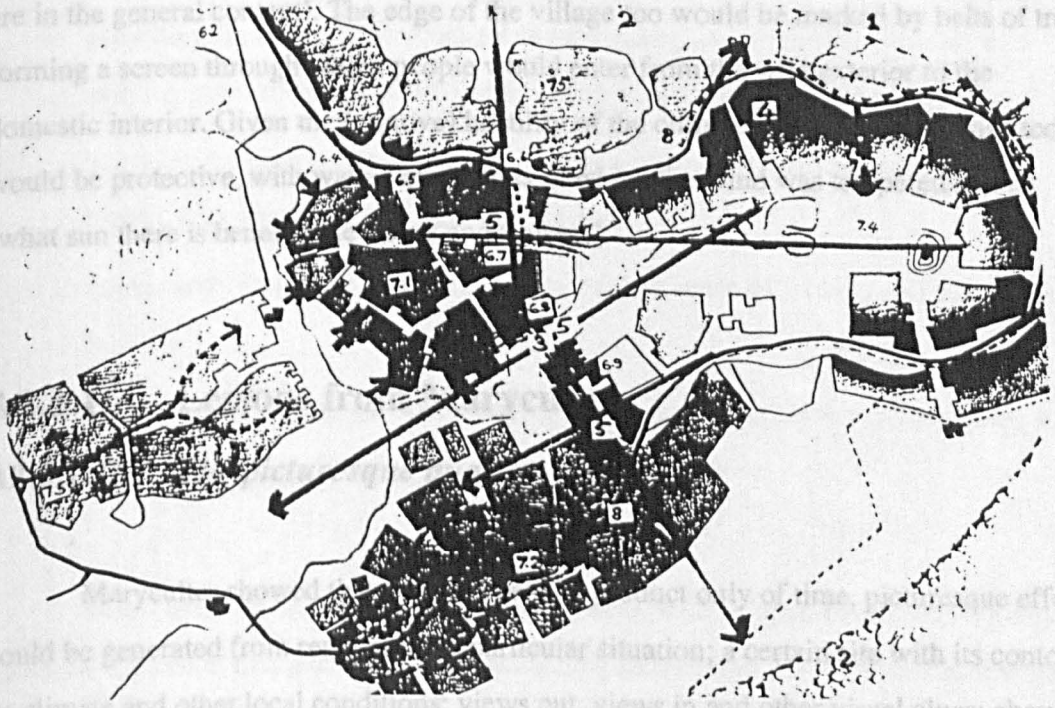

Figure 133. Gosling, Cullen and Donaghue (1974): New Town of Maryculter: plan analysis (from Gosling et al.,1974)

The general flavour was set by David Gosling with sketches for the houses which in scale, form and materials were derived from the local vernacular within an overall philosophy which Cullen himself described: 'the main purpose of this plan is to try to convert mass housing into an individual experience, to produce a sense of Identity, and Belonging'. The key question, as they saw it, was 'People live in houses, but where do houses live?'

A natural amphitheatre was formed within the site, which in itself suggested a U-shaped enclosure surrounding a park, opened to the west with the main housing areas looking inwards on the parkland. This would establish immediately a sense of hereness within the village and thereness outside it. The main east-west axis formed by the open U would be cut about halfway along by a north-south axis, the High Street with a central market place and shops, whilst elsewhere in the scheme would be various markers or recognition points: a church steeple, a single tree closing the vista at the end of a street, a flagpole, a single red building in a street which was otherwise white and so on. These would be so placed as to form a network in which 'people quite understand where they are in the general context'. The edge of the village too would be marked by belts of trees forming a screen through which people would enter from the wild exterior to the domestic interior. Given the (relative) hostility of the climate, the house groupings too would be protective, with walled enclosures in which the wind was tempered so that 'what sun there is benefits the plants and flowers'.

A2.3.1: Lessons from Maryculter

A2.3.1.1: The picturesque quality

Maryculter showed that far from being a product only of time, picturesque effect could be generated from response to a particular situation; a certain site with its contours, its climate and other local conditions; views out, views in and other visual clues; above all, a desire on the part of the designers to respond to a place rather than imposing their own sterile geometry (Broadbent, 1990).

A2.3.1.2: Principles for creating a sense of identity

The Maryculter report, proposed a number of principles which could be applied to other places wherever a sense of identity was required. These include:

1. fitting the development to the site.
2. providing a central nucleus with the necessary authority, scale, and incident.
3. providing distinctive housing areas, each with its own identity, idiosyncrasy and individuality.
4. avoiding a vast, amorphous spread by separating the various developments so that each has recognizable edges or boundaries.
5. encouraging a sense of individual places, not to mention aiding navigation, by providing a network of recognizable landmarks, each of which may act as a rallying point for some particular function or some particular zone.

A2. using the existing topography, and careful planting, to encourage a sense of drama, thus providing memorable situations.

7. using carefully planned enclosures to provide a sense of locality and place (I am here)
8. leading people from one (enclosure) experience to another toward a climax, so that the unfolding drama itself will stick in the memory.

Maryculter was never built, but the principles which Cullen described certainly could be applied to many developments according to the clues that their environments offer. As the Maryculter team suggested, these devices need not incur any extra cost; they could be achieved by simply reorganizing or regrouping the elements from which any development would have to have been made in any case. Given the least evocative site,

say a perfectly flat site and with the most benign of climates, one can still think in terms of a nucleus - with recognizable landmarks - surrounded by areas of housing, each with its individual identity. And even the most benign of climates has certain suggestions to make about roof-form, wall density, the sizes and shapes of openings, whilst the laws, as it were, of the picturesque still have things to tell us about the visual - and climatic - advantages of curving streets, irregular places, colonnades, arcades and so on.

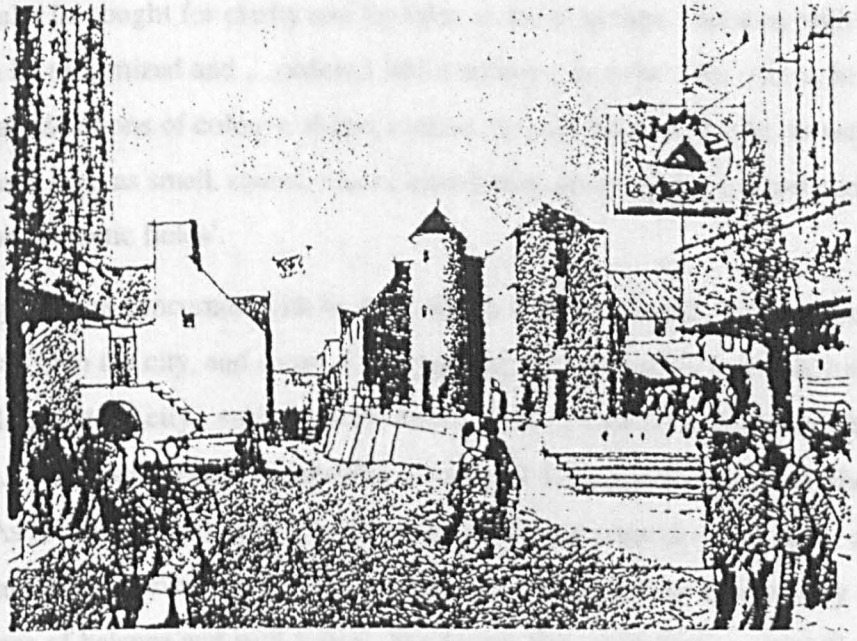

Figure 134. Maryculter: town centre perspective (from Gosling et al.,1974)

A2.4: Kevin Lynch

Kevin Lynch set forth his analysis of the urban scene in his book entitled The Image of the City (1960). Lynch had been working with Georgy Kepes at the Center for Urban and Regional Studies at the Massachusetts Institute of Technology and Kepes himself had edited a series of books (1965-6) to do with our perception of movement.

Above all, Lynch was concerned with The Image of the Environment. He said 'every citizen has had long associations with some part of the city, and his image is soaked in memories and meanings'. He also said 'moving elements in the city, and in particular the people and their activities, are as important as the stationary physical parts'.

Whilst he pointed out that 'Nearly every sense is in operation' as we perceived the city, Lynch was primarily concerned with the visual quality of the (American) city. His approach was 'by studying the mental images of (the) city which was held by its citizens'. In particular he sought for clarity and legibility in the cityscape, 'the ease with which its parts can be recognized and ....ordered into a coherent pattern'. We read it, he said, by 'the visual sensations of colours, shape, motion, or polarization of light, as well as the other senses such as smell, sound, touch, kinesthesia, sense of gravity, and perhaps of electric or magnetic fields'.

Lynch was concerned with how we found our way around, how we located ourselves within the city, and so on. He suggested, that one could orientate himself easier in a regular, gridded city - such as Manhattan - given 'a structural understanding of (which) .....one could order a substantial quantity of facts and fancies about the world we live in'. As for the irregular city:...let the mishap of disorientation once occur and the sense of anxiety and even terror that accompanies it reveals to us how closely it is linked to our sense of balance and well-being'. For Lynch, the word 'lost'.....was disastrous.

To know where we are within the city, we have to build up a workable image of each part. Each of these images will consist of the following:

1. identity - our recognition of its 'individuality or oneness' within the city as a whole.

2. our recognition of its spatial or pattern relationships to other parts of the city, also to ourselves.

3. its particular meaning for each of us, 'whether practical or emotional'.

Lynch called: 'that quality in a physical object which gives it a high probability of evoking a strong image in any given observer' its imageability which in turn depends on 'that shape, colour, or arrangement which facilitates the making of vividly identified, powerfully structured, highly useful mental images of the environment.'

Lynch tested his concept of imageability by conducting field studies in Boston, Massachusetts, Jersey City, New Jersey, and Los Angeles, California. He concluded that several key elements come into play as one constructed one's images of the city. He identified them as paths, edges, districts, nodes and landmarks.

The following are Lynch's definitions:-

A2.4.1: Paths

Paths to Lynch are the channels of movement which people take, regularly, occasionally or may, potentially, take. They may include paths, streets, walkways, bus or tram lines, canals, railways and so on. As Lynch says, we observe the city as we are moving through it and for many people, the paths themselves, and those elements of the city they perceive as they move along them predominate in their images of the city. They are, as Lynch put it 'coordinate axes'.

A2.4.2: Edges

Edges for Lynch are linear elements which people do not use as paths. They perceive them, rather, as linear breaks or boundaries of some kind. They may be physical boundaries such as walls, railway cuttings, canals, shorelines, or they may simply be boundaries between adjacent developments. Whilst not so dominant as paths, such boundaries are 'important organizing features' for many people especially when, in the form of, say, water or city wall they play the role of 'holding together generalised areas';

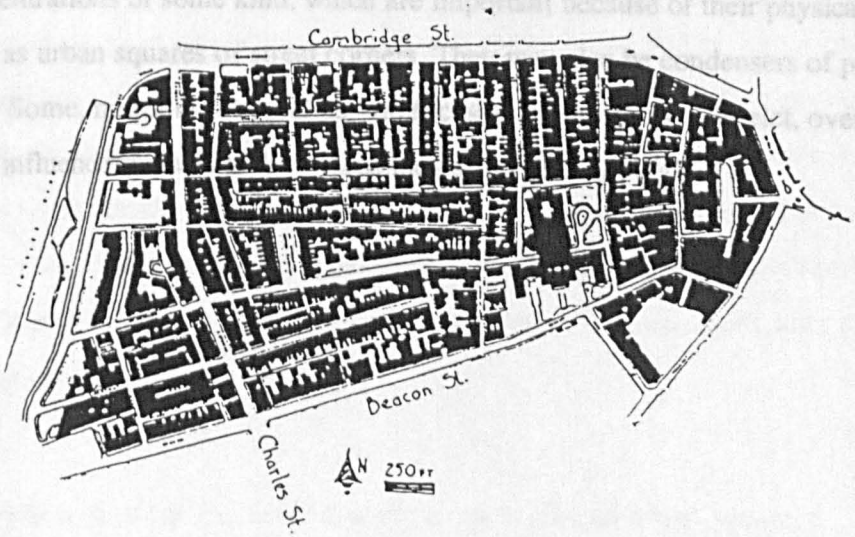

Figure 135.Boston Images: maps (from Lynch, 1960)

A2.4.3: Districts

Districts for Lynch are 'medium to large sections of the city which people visualize as having a two-dimensional extent. Nor only do they form districts on the map, they are also recognizable, especially from within, as having some common, identifying character, which indeed may be so strong that one has a distinct, mental impression of entering 'inside of'. This may be recognizable also from outside. Most people, according to Lynch find this idea of district to be most important in building up their 'Image of the City'. Indeed, according to the city - and the individual perceiver - they may be more important than paths;

A2.4.4: Nodes

Nodes are strategic points within the city to or from which the observer travels. They may be crossings or convergences of paths, junctions, places where one changes from one mode of transport to another. Futhermore, they may be concentrations of some kind, which are important because of their physical form; such as urban squares or street corners. They may also be condensers of particular uses. Some, nodes in fact, will be 'the focus and epitome of a district, over which their influence radiates and of which they stand as a symbol';

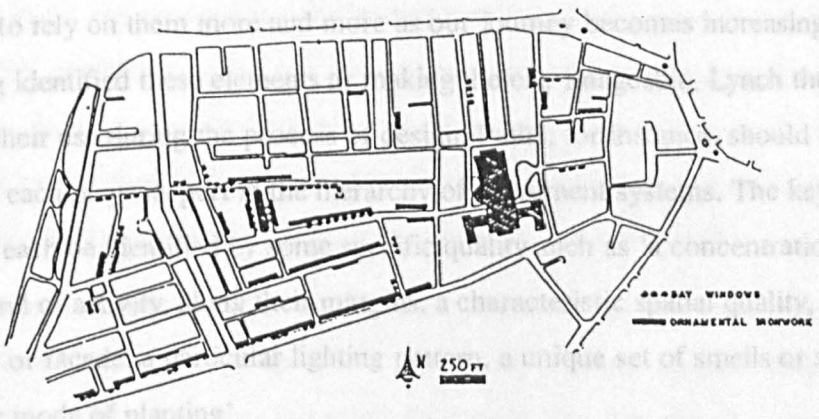

Figure 136. Boston Images: visual form (from Lynch, 1960)

A2.4.5: Landmarks

Landmarks too are reference-points but the observer does not actually use them. They consist, rather, of 'simply defined physical objects' such as a building, a sign, a store or even a mountain. A landmark in this sense will be a physical object which, because of its form, may be singled out from the surrounding environment. They may be large, man-made objects such as a tower, a spire or a dome, soaring over the rooftops and acting as radial reference from many points within the city. They may be distant mountains which serve a similar purpose; the sun itself, even though it moves, may act as a landmark in this sense. Its movement, after all, is slow and its directions known.

Landmarks also occur at a smaller scale; a tree within an urban square, a particular sign, a shop front, a door or even a doorknob. These, and other urban details.....fill in the image (for) most observers.

Lynch suggested that we make frequent use of such clues in our search for the identity of elements within the city and even for our understanding of urban structure. Also, we seem to rely on them more and more as our journey becomes increasingly familiar. Having identified these elements as making the city imageable, Lynch then went on to describe their use during the process of design. Paths, for instance, should be planned so that each plays its part in the hierarchy of movement systems. The key lines, he said, should each be identified by some specific quality such as 'a concentration of some special kind of activity, along their margins, a characteristic spatial quality, a special texture of floor or facade, a particular lighting pattern, a unique set of smells or sounds, a typical detail or mode of planting'.

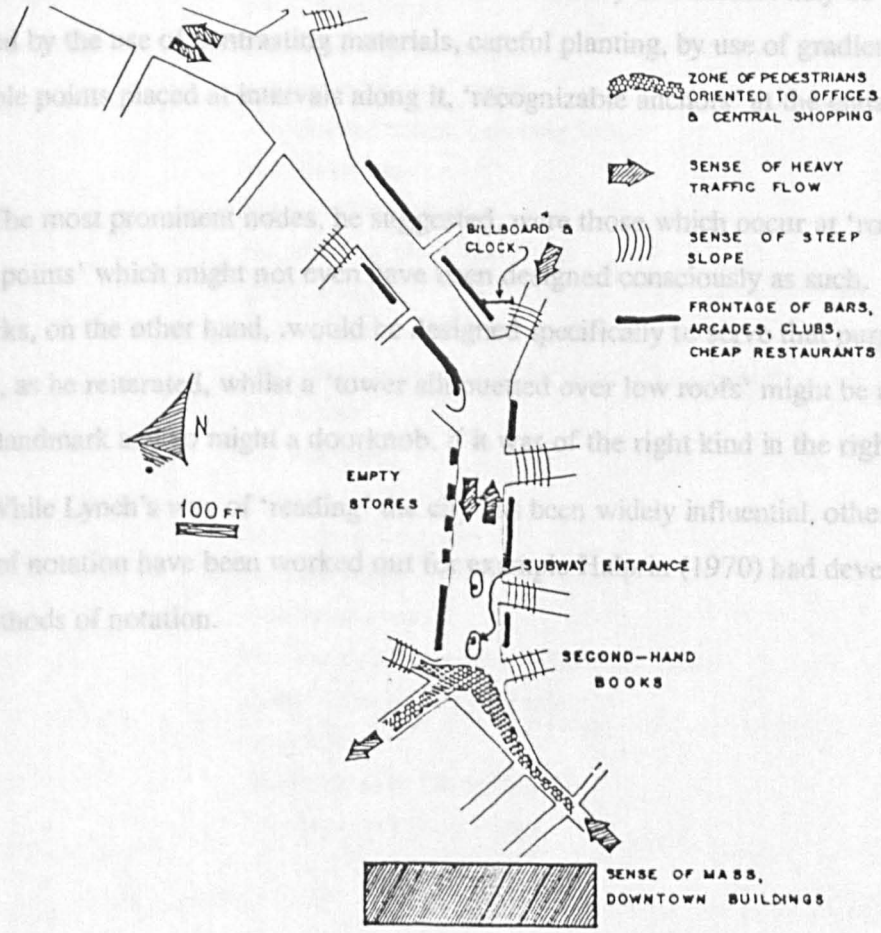

Figure 137. Boston Images: elements (from Lynch, 1960)

He insisted on a perceivable clarity of direction since, he says, the 'human computer' was disturbed by long successions of turnings, or by gradual, ambiguous curves which in the end produce major directional shifts'. At the same time he recognized the 'kinesthetic' qualities of paths, our sense of motion as we moved along them - turning, rising, falling - which collectively make deep impressions. If we were moving at high speed in, say, 'a great descending curve which approached a city center' those impressions could be even deeper producing, as he said, 'an unforgettable image'.

In his book, Lynch described applications for each of his major elements. It may, for instance, be difficult to design specific edges for, say a central business district although there are clues as to how this might be done in, say, 'the abrupt cessation of a medieval city at its wall, the fronting of skyscraper apartments on Central Park, the clear transition from water to land at a sea-front...'The boundary of a district may be reinforced by the use of contrasting materials, careful planting, by use of gradients, identifiable points placed at intervals along it, 'recognizable anchors' at the ends, and so on.

The most prominent nodes, he suggested, were those which occur at 'route decision points' which might not even have been designed consciously as such. Landmarks, on the other hand, .would be designed specifically to serve that purpose although, as he reiterated, whilst a 'tower silhouetted over low roofs' might be an obvious landmark and so might a doorknob, if it was of the right kind in the right place..

While Lynch's way of 'reading' the city has been widely influential, other effective systems of notation have been worked out for example Halprin (1970) had developed other methods of notation.

Table 64. Lynch (1960) : Boston Images: Verbal (from Lynch, 1960)

More than half the subjects expressed the following as part of their image of the Hill (roughly descending order):

a sharp hill.
narrow, pitching streets
the State House
Louisburg Square and its park
trees
handsome old houses
red brick
inset doorways

There are other frequent mentions of:

brick sidewalks
cobblestone streets
views of the river
a residential area
dirt and trash
social distinctions
corner stores on the back side
blocked or "curving" streets
the fence and statues, Louisburg Square
varied roof tops
signs on Charles Street
the gold dome of the State House
purple windows
some apartment houses in contrast

Still other comments are added by at least three people:

parked cars
bay windows
ironwork
houses packed together
old street lamps
the Charles River
the view to the Massachusetts General Hospital
children at play on the back side
black shutters
antique shops on Charles Street
three- and four- storey houses

A2.5: Christopher Alexander

A2.5.1: Pattern Language

In A Pattern Language (1977) Christopher Alexander and colleagues applied a pragmatic, approach to Towns, Buildings and Construction. Each Pattern consists of a fragment of the environment, at one or three other scales which, on the basis of their observations, is known to work. There are 253 such Patterns each introduced by a photograph, an argument in favour of the Pattern, and supporting evidence, including, sometimes, further photographs and drawings amounting in each case to five pages or so.

The first 20 pages are concerned with scales - not to mention social strategies - much greater and more complex than those of urban space design including:

1. independent regions,
2. the distribution of towns,
3. city country fingers,
4. agricultural valleys,
5. lace of country streets and so on, including:
8. mosaic of subcultures,
10. magic of the city,
12. community of 7000,
15. neigbourhood boundary,

Many of the Patterns are concerned with issues in urban space design, these include:

21. four storey limit: 'There is abundant evidence to show that high buildings make people crazy', which were statements they support with Empirical evidence from Fanning (1967), Cappon (1971), Newman (1972) and others.

So, they conclude: In any urban area, no matter how dense, keep the majority of

buildings four storeys .....or less. It is possible that certain buildings should exceed this limit, but they should never be ..... for human habitation.'

The relationship of built form to land use will be studied in greater depth later and especially on the research carried out by Martin and March in Cambridge.

32. shopping street: 'Shopping centres depend on access.....However shoppers themselves....need quiet, comfort, and convenience, and access from pedestrian paths...',

61. small public squares: 'A town needs public squares: they are the largest, most public rooms, that a town has. But when they are too large, they look and feel deserted',

69. public outdoor room: 'There are very few spots along the streets of modern towns....where people can hang out, comfortably, for hours at a time',

95. building complex: 'a building cannot be a human building unless it is a complex of still smaller buildings or smaller parts which manifests its own internal social facts'.

Other Patterns are used to advocate:

97. shielded parking,

100. pedestrian street,

115. courtyards that live,

119. arcades,

and many other things which, at a small-is-beautiful, vernacular scale can indeed afford delight in the built environment.

, Having presented their Patterns in these ways, Alexander and his colleagues then went on to produce design results (in the Oregon Experiment (1975)) and even built results like The Linz Cafe (1981). In practice, many of the Patterns ring true and they have been applied quite widely. Others must be taken with a pinch of salt. Neither can these or any other Patterns, be applied in all cultures, all climates or all social conditions.

A2.5.2: A city is not a tree

This essay by Christopher Alexander provided a new and insightful way of looking at the city. Two simple, contrasting diagrams showed beyond doubt that it is relationships and not separateness that made cities, and it is for this same reason that I have developed an interest in urban design.

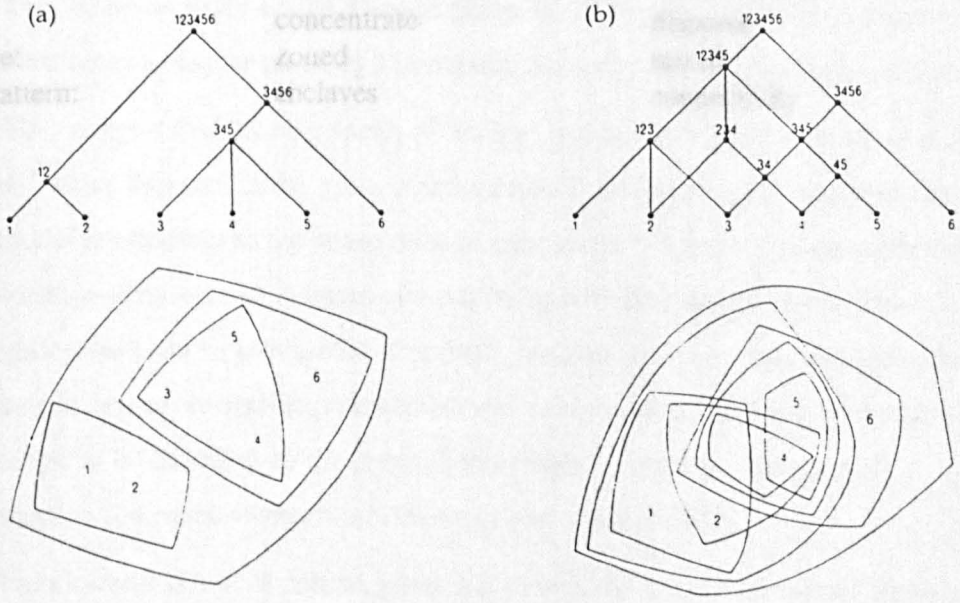

Figure 138. "A city is not a tree"
(a) "Tree" showing separated elements. (b) "Semi-lattice" showing overlapping elements (from Alexander, 1966)

The tree structure above shows how in this century we have separated out different forms fo human activity by constructing environments which segregate: if we are driving then we have nothing to do with pedestrians and if we are at work then we have no interest in home, and so on. The second diagram shows how similar elements can be grouped within a semi-lattice structure which allows a far greater number of linkages. As Alexander says;

> *We can see just how much more complex a semi-lattice can be than a tree in the following fact: a tree based on twenty elements can contain at most nineteen*

further subsets of the twenty, while a semi-lattice based on the same twenty elements can contain more than 1,000,000 different subsets.

These diagrams remain just as relevant today!

Issue	*Tree*	*Lattice*
Movement:	segregation	shared streets
Traffic:	concentrate	disperse
Land use:	zoned	mixed
Street pattern:	enclaves	connectivity

A2.6: Charles Moore

A2.6.1: Background

The fullest presentation of Charles Moore's views occurred in Body, Memory and Architecture (1977) which he wrote with Kurt Bloomer. They explore the psychology of perception, as it has developed during the 20th Century.

They examine Body-Image Theory; Body, Memory and Community. Robert Yudell contributes a chapter on Body Movement, drawing, naturally enough, on Dance.

They suggest that dancers speak of 'feeling' space. They learn to think of it as real 'stuff' which they can 'hold, push, pull, and touch'. More than the rest of us they 'feel a critical relationship to the space outside their bodies'. Above all they understand the significance of movement in terms of front/back; left/right and up/down. Thus, Movement upward can be interpreted of growth, longing, and reaching, and movement downwards as one of absorption, submersion and compression. Similarly, movement in a horizontal plane is identified, by the great choreographer Laban as 'the zone of communication and social interaction' (Bloomer and Moore, 1977)

The choreographer, of course, plans and directs the three-dimensional movements which dancers will make on a usually horizontal stage. The architect designs a three-dimensional stage around which people are obliged to move on. Buildings, in other words, 'can encourage a choreography of dynamic relationships among the persons moving within their domains'. So the architect, too whether he likes it or not, is a choreographer of other people's movements in space. Since this is inevitable, he may as well do it with conviction, providing sequences of movement which people find interesting and enjoyable.

A2.6.2: Kresge College (1966-74)

Kresge College is a serious response to users' need, climate, economics (hence the cheap construction) and so on. William Turnbull had drawn up a Master Plan for the University of California at Santa Cruz in 1967. This included a number of residential colleges, one of which (no.6) was located to the west, where the side was bounded by steep ravines with rocky knolls and groves of redwood.

In 1970 they established a course on 'Creating Kresge College' which drew enthusiastic responses from the students. One particular group of students - Ashbaugh, Palmer, Wulfing and Kramartz - attempted to define the students' environmental needs, using survey techniques; these included types of accommodation, furniture, attitudes towards public space and privacy, eating facilities and so on. They suggested that the various kinds of accommodation; administrative, academic, residential and social facilities ought to be interspersed, whilst instead of the 'dorms' which were the normal units of residence on American campuses, there ought to be a mixture of eight-person units, and four-person units on the various apartment buildings. There was a demand also for octet units, that is two-storey open living spaces each for eight (very friendly)students. In the event, four of these were built.

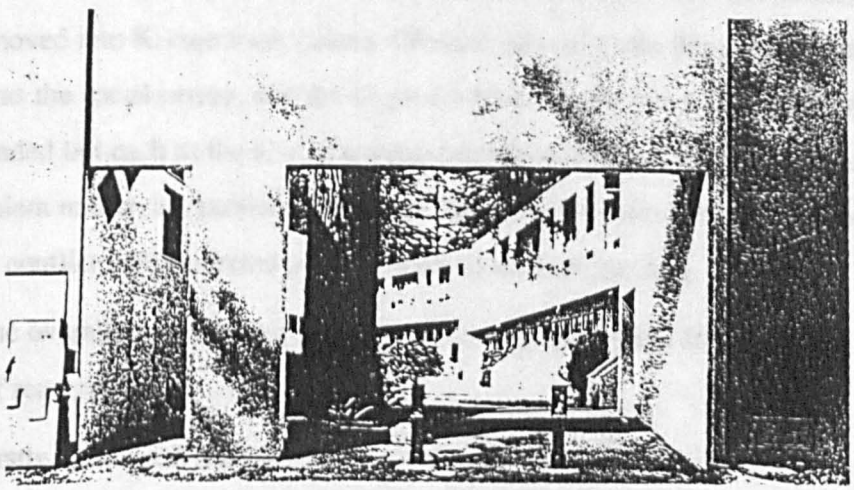

Figure 139. MLTW/Moore-Turnbull (with Buchanan, Calderwood and Simpson) (1966-74): Kresge College: entrance arch.

A2.6.3: The Scheme

Moore and Turnbull worked with great ingenuity to accommodate these 'needs' and designed a college which, instead of being grouped around a conventional quad which in any case would have been difficult on this particular site, took the form of a 1000 foot L-shaped street along which administrative, academic, residential and social accommodation were interspersed.

They devised a highly flexible system of residential accommodation in which each student would be provided with knock-down, space-making elements which could be used as required on a simple do-it-yourself basis. Architects and students together decided on a modular system, a Finnish one, based on cubes which could be built up in many configurations. In addition to a basic set of cubes, each student was given a desk top, a bedboard, foam mattress and a director's chair. They also decided on the mix of residential unit-forms - including the required octets - and on the unit furniture which can be put together in various configurations.

In one respect, they overdid their provision for the users' needs. The students of the late 1960s who participated in the design had a particular concept of togetherness, which centred on the washrooms. For example, they felt that there was nowhere quite like the showers for getting to know each other. However, the users (students) who actually moved into Kresge took quite a different view of these things. For them, the kitchen was the social centre, and the original kitchens were too small. They were, in fact, later extended but each at the loss of a study-bedroom. There is no clearer example of the basic problem underlying participation - that the (extreme) tastes of one generation might well be in conflict with (extreme or even normal) taste of the next.

' The overall layout follows the idea of a street, as distinct from an open quad, for a number of reasons:-

1. Firstly, because it provides a clear and understandable structure, within which the various components of the College can be organized;

2. Secondly, because its linear form established an easy link for pedestrians from one

part to another of the College and to other parts of the University;

3. Thirdly, because the street itself, like any village street, is a focus for communal activities.

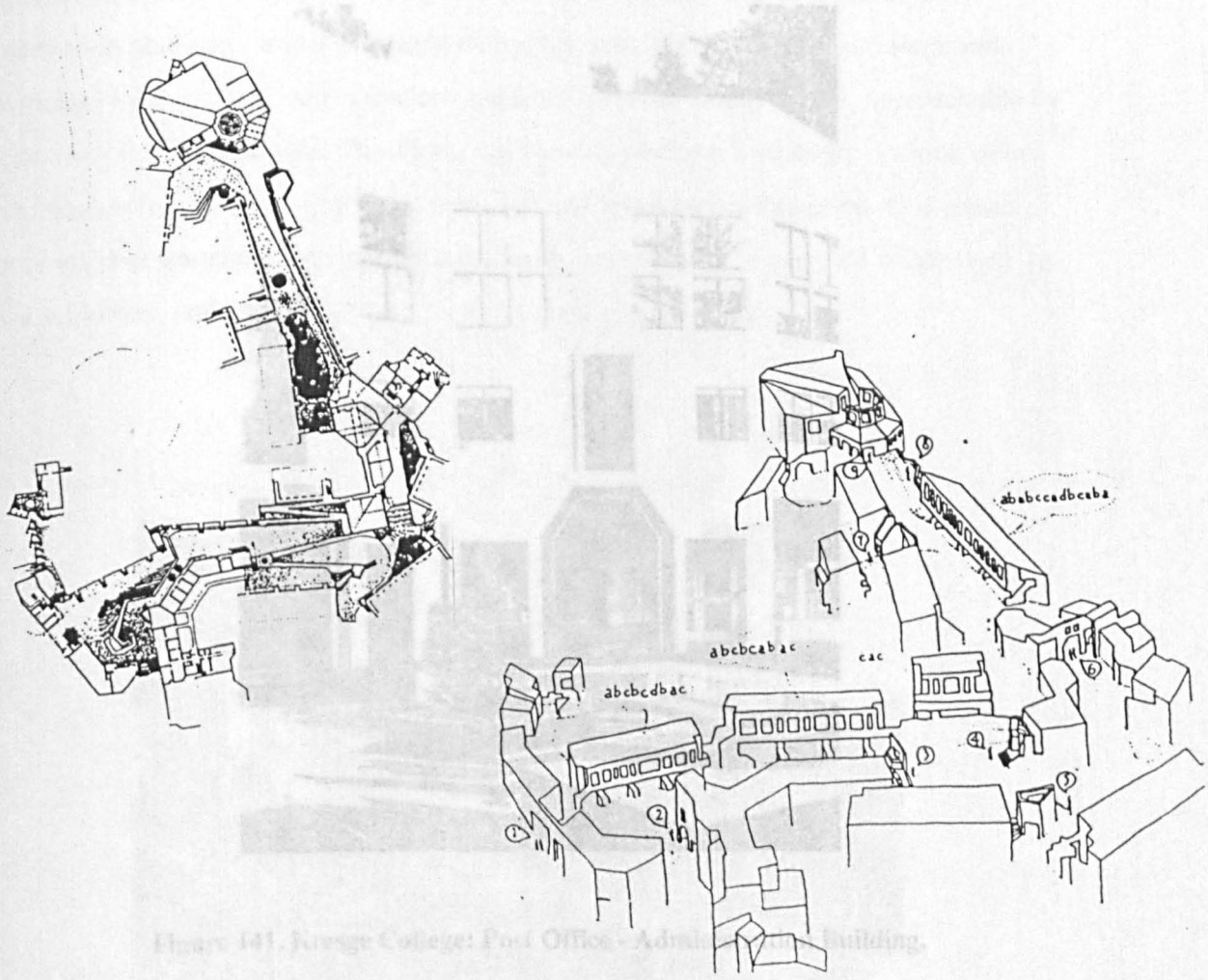

Figure 140. Kresge College: plan and trivial monuments (from A & U, 5,1978)

The buildings also have backs which face on to the forest, thus offering privacy. On the contrary, the forest itself is so thick and the buildings themselves so closed on that side that one cannot really move along the backs. As a result, the students indeed are forced to use the street as their major circulation route and this, together with the fact that most buildings have balconies looking on to the street, made them feel that they were 'on show'. The octets and the 'on stage' nature of being in the street means that Kresge

is no place for introverts.

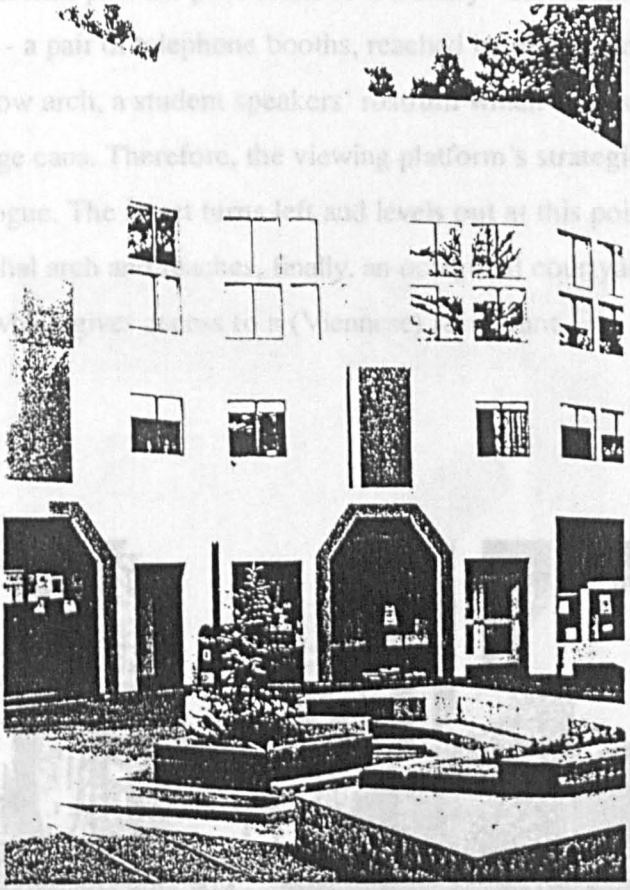

Figure 141. Kresge College: Post Office - Administration Building.

At first sight, the buildings which actually lined the street are in conflict with the picturesque intentions. For, in their general forms, they are similar to those stark, white, linear houses which Le Corbusier built for the Weissenhof Siedlung in Stuttgart (1927). Yet, in a sense the starkness of the buildings reinforces the point that, in picturesque planning, it is the urban spaces themselves that have the greatest effects, rather than the buildings, which lined them (Broadbent, 1990).

The street itself is punctuated by a number of incidents, starting at the lower end

with a monumental gateway which opens on to an arena with a system of steps which spiral down to a central drain. There is a post office and administrative offices - to the right of the arena and, beyond that, the Provost's house. The Main Street, lined with student residences, ascends past the post office to a laundry - surmounted by an observation platform - a pair of telephone booths, reached by monumental steps and celebrated by a rainbow arch, a student speakers' rostrum which stands, approachable by steps, over the garbage cans. Therefore, the viewing platform's strategic position offers an invitation for dialogue. The street turns left and levels out at this point. One passes under another triumphal arch and reaches, finally, an octagonal courtyard which used to have a fountain and which gives access to a (Viennese) restaurant.

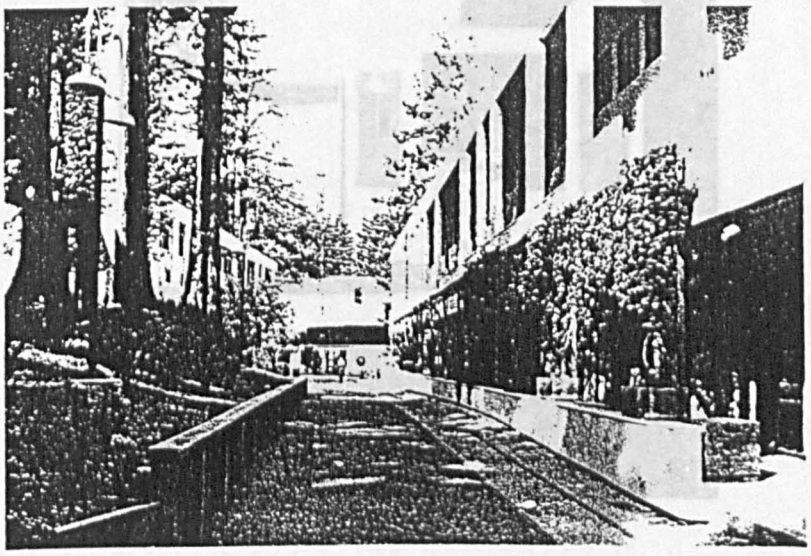

Figure 142. Kresge College: Upper Street

Turnbull (1977) comments on these markers:

The octagonal court at the upper (northern) end provides an entry to the town hall/assembly and restaurant building.

The library is denoted by a two-storey gateway. The laundry, a symbolic town watering hole is emphasized by a rather large triumphal arch. It is echoed across the space of the middle plaza by a raised bandstand, situated to conceal the main trash box.

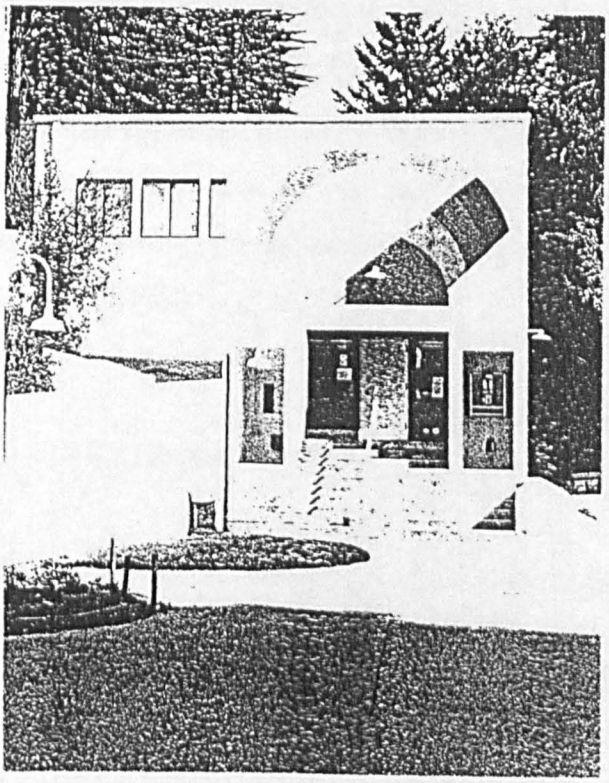

Figure 143. Kresge College: Main Street, telephone booths.

Moore himself thought of this as a podium or pulpit for student orators, noting its physical location vertically over the garbage. Turnbull continues:

> *Other importances, such as telephone booths, are enlarged as street markers to serve as commentary on the importance of communications in student and faculty life in much the same manner that a street does for a village or a small*

town.....The street creates a centre for the College, a place where people meet. It establishes a unique character and identity, setting the place apart from its traditional quadrangle-inspired neighbours. It is a space which organizes and enriches the life of the College in much the same manner that a street does for a village or a small town.

Kresge College shows that, in skilled hands, picturesque planning can be achieved.

A2.7: Rowe and Koetter

A2.7.1: Collage City

Colin Rowe and Fred Koetter first published their Collage City in 1975. Like Rossi, the Kriers and others before them they had been greatly disillusioned by the Utopian schemes of Le Corbusier, not to mention his many predecessors, from Sir Thomas More onwards. Indeed they traced an intriguing history even cinematic to a point of the Utopian ideal, and the various philosophies behind it.

They criticised that by the late 1940s, Modern Architecture 'had certainly arrived but the New Jerusalem was not exactly a going concern; and slowly it began to appear that something had gone wrong'. Two different oppositions were emerging: 'the cult of townscape and the cult of science fiction'.

A2.7.1.1: "The cult of townscape"

They see townscape as 'a cult of English villages, Italian hill towns, and North African casbahs.....a matter of felicitous happenings and anonymous architecture'. They suggested, it had begun to emerge in The Architectural Review in the early 30s. They drew attention, particularly, to two articles in the Review by Amedee Ozenfant, Le Corbusier's associate, who was living in London at that time, urged that rather than sketching hypothetical plans for the year 3000 - for London or Paris - architects should accept 'the present, the actual condition of the English capital! Her past, her present and her immediate future'.

Instead of Utopian visions, Ozenfant was concerned with 'what is immediately realizable'. He was, in a sense, applying Duchamp's idea of the ready-made to existing buildings in the city as much as he and Le Corbusier had applied it, fifteen years earlier, to the products of mass-production: industrial windows, Thonet bentwood chairs and so on.

Rowe and Koetter found this highly significant. Ozenfant himself represented a direct connection to Cubist and post-Cubist tradition within which, of course, collage, the pasting of newspaper cuttings and other, more-or less flat objects on to the picture, had played such a crucial part.

According to Rowe and Koetter, townscape itself could be seen, as it were, through collage-coloured spectacles. It could, in other words, be interpreted:

> *a derivative of the late eighteenth century Picturesque; and, as it implicated all that love of disorder, cultivation of the individual, distaste for the rational, passion for the various, pleasure in the idiosyncratic and suspicion of the generalised which may, sometimes, be supposed to distinguish the architectural tradition of the United Kingdom.*

A2.7.1.2: "The Cult of Science Fiction"

Their other alternative to Modernism, Science Fiction, 'identifies itself with mega-buildings, lightweight throwaways, plug-in variability, over-city grids.....linear cities, integration of buildings with transport, movement systems and tubes'.

Rowe and Koetter characterized certain works of Superstudio as representing the ultimate Science Fiction city and they characterized Main Street in the Florida Disneyworld as the ultimate application of Townscape. Naturally enough, they found both of these wanting; sometimes for the same - Utopian - reasons and they concluded their analysis by asking three questions which were:-

1. Why should we be obliged to prefer a nostalgia for the future to a nostalgia for the past?
2. Could not the model city which we carry in our minds allow for our known psychological (they might have added physiological) constitutions?
3. Could not this ideal city behave, at one and the same time, quite explicitly as both theatre of memory and theatre of prophecy?

Given Le Corbusier's intention of ensuring sun, space and greenery for everyone,

Rowe and Koetter saw his Ville Radieuse as a setting for Rousseau's noble savage. Indeed Le Corbusier's individual buildings, raised as they are on pilotis, seemed to exist in themselves while offering the least possible interaction with the surface of the earth!

Since Le Corbusier's buildings hardly touched the ground, they could hardly enclose urban spaces. Rowe and Koetter presented a telling comparison, with figure/ground illustrations, between the centre of Parma and the Plan for Saint-Die by Le Corbusier which, for many years, adorned the dust-covered of English editions of Towards a New Architecture.

In these figure/ground plans the buildings are black, the spaces between them white and while one can read off the Parma plans the streets, squares and courtyards of the medieval city, all one reads from Le Corbusier's Plan are vast open spaces between his abstract buildings. Such streets, squares and paths as there are consist, merely, of level-paved surfaces meandering across the landscape and in no way enclosed by the buildings.

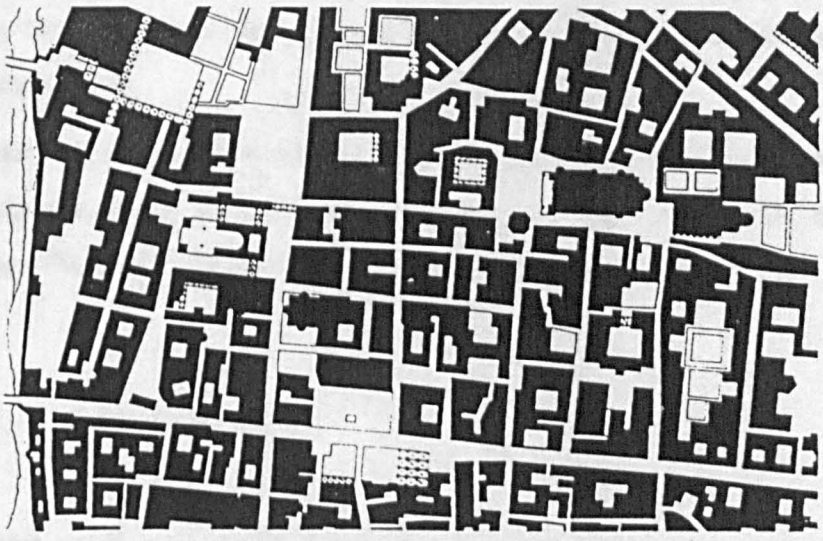

Figure 144. Rowe and Koetter (n.d): figure/ground plan of Parma (from Rowe and Koetter, n.d.)

Comparing Le Corbusier's Plan Voisin - his application of the Ville Radieuse to Paris - with Asplund's contemporary (1922) Plan for a Royal Chancellery in Stockholm

they found the latter far more responsive to the grain of the city. Thus they saw Corbusier's Plan as a statement of historical destiny - design for a reconstructed society, and Asplund's as a statement of historical continuity.

A2.7.1.3: Le Corb's Plan not DISMISS!

Yet Rowe and Koetter did not dismiss Le Corbusier outright. They found that both of these ways of looking at the city had their values - spatially as well as sentimentally. Their aim, therefore, was to reconcile the two.

A2.7.1.4: Clues!

They found clues as to how this could be done in the Palazzo Farnese in Rome and the Hotel de Beauvais in Paris where, in each case, buildings which in themselves were fairly regular are crammed on to quite irregular sites by the use of regular and irregular courtyards.

Like Venturi (1966), Rowe and Koetter revived the idea of poche to define 'the imprint upon the plan of the traditional heavy structure' and in these cases it also served to disengage the principal spaces of the buildings from each other.

A2.7.1.5: Dichotomies

Rowe and Koetter attached great importance to the apparent opposition between all-of-a-piece design such as Versailles and the assemblage of fragments such as one noticed in Hadrian's Villa at Tivoli. Which led them to other dichotomies; between design using scientific analysis and design by public participation, between the engineer, who calculated everything precisely and the 'bricoleur' who improvised with whatever

happened to be at hand. They continued with their dichotomies; between, for instance, 17th century Rome and London. They saw Rome as:

> *that collision of palaces, piazza and villas (surely it should be ville?).....that inextricable fusion of implosion and accommodation, that highly resilient traffic jam of intentions, an anthology of closed compositions and ad hoc stuff in between, which is, simultaneously, a dialectic of ideal types plus a dialectic of ideal types with empirical content.*
>
> (Rowe & Koetter, 1975)

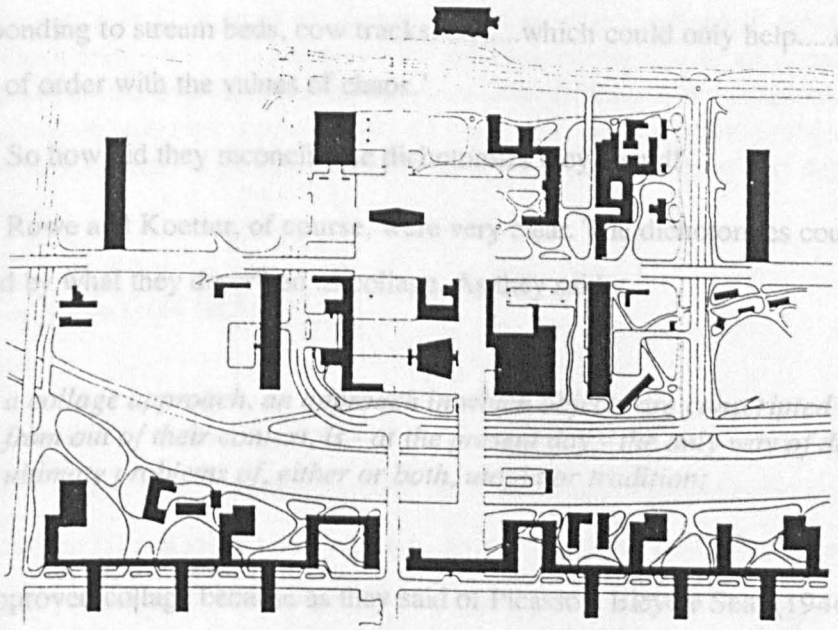

Figure 145. Rowe and Koetter (n.d): figure/ground relationship in Le Corbusier's Plan for Saint-Die (from Rowe and Koetter, n.d)

This Rome, with its 'assertive identity of subdivisions' leads to an equivalent interpretation of ancient Rome, 'where forum and thermae pieces lie around in conditions of inter-dependence, independence, and multiple interpenetrability.' Rowe and Koetter

offered Rome, in these and other manifestations, as an alternative to the 'disastrous urbanism of social engineering and total design'. So again they saw an opposition, between 'an abstract, would-be scientific idealism and a concrete, would-be populist empiricism'.

What was more they saw Rome as an imploded version of London. Given a much blander topography, enlarging the set-pieces and diluting their impact, they saw parallels between the Forum of Trajan and Belgravia, the Baths of Caracalla and Pimlico, the Villa Albani and Bloomsbury, the Villa Giulia and Westbourne Terrace. So the 'bri-colage' of Rome, Imperial and Papal, found their 19th century, more or less bourgeoise equivalents in: 'a compilation of rationally gridded field, mostly corresponding to estate structure, with conditions of confusion and picturesque happening in between, mostly corresponding to stream beds, cow tracks, etc.....which could only help.....qualify the virtues of order with the values of chaos.'

So how did they reconcile the dichotomies they found!

Rowe and Koetter, of course, were very clear. The dichotomies could only be resolved by what they described as collage. As they said:

> *a collage approach, an approach in which objects are conscripted or seduced from out of their context, is - at the present day - the only way of dealing with the ultimate problems of, either or both, utopia or tradition;*

They approved collage because as they said of Picasso's Bicycle Seat (1944) - in which the seat formed the head and the handlebars formed the horns of a bull's head. Picasso himself, having effected this first translation from bicycle to bull, looked forward to another in which his sculpture, thrown on to a scrap heap, might encourage someone else to put the elements to their original use again.

As Rowe and Koetter reiterated:-

> *Remembrance of former function and value (bicycles and minotaurs); shifting context; an attitude which encourages the composite; an exploitation and*

recycling of meaning.....desuetude of function with corresponding agglomeration of reference; memory, anticipation, the connectedness of memory and wit; this laundry list of reactions to Picasso's proposition; and, since it is a proposition evidently addressed to people, it is in terms such as these, in terms of pleasures remembered and desired, of dialectic between past and future, of an impacting of iconographic content, of a temporal as well as a spatial collision, that resuming an earlier argument, one might proceed to specify an ideal city of the mind.

Furthermore:-

the provenance of the architectural objects introduced into the social collage need not be of great consequence. It relates to taste and conviction. The objects can be aristocratic, or they can be 'folkish', academic or popular. Whether they originate in Pergamum or Dahomey, in Detroit or Dubrovnik, whether their implications are of twentieth or the fifteenth century, is no great matter. Societies and persons assemble themselves according to their own interpretations of absolute reference and traditional value; and, up to a point, collage accommodates both hybrid display and the requirements of self-determination.

A2.8: Conclusions

The author is aware of a number of other milestones in urban design thought that have had to be omitted from this selective list for reasons of expediency. For example, the great architectural visions of the twentieth century city from Le Corbusier and Frank Lloyd Wright through to Team X and the technological utipias of Archigram and others in the 1960s though exciting are beyond the intended content of this research. Nevertheless, the various positions and principles from this chapter form an important part of this thesis which in the context of Singapore, urbanism is an issue of deep concern throughout this island city.

Appendix 3:

Housing Forms and Solutions - Case Studies

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A3.1: An introduction

This chapter assembles the various housing solutions which have been implemented in the Western part of the world. The question concerned is:- How has housing been accomplished by other countries? In order to understand this, case studies from the western countries were selectively done. The purpose is to find out principles of planning and design and lessons for practical application in the context of Singapore. The premise for this chapter is that the systematic study of various housing schemes will clarify the issue of density limitation and its opportunities. More importantly, the case studies aim to be a useful source of reference for future design of housing. In the process, it hopes to reflect an attitude of both research and inquiry in the issues of the human habitat which is constantly being updated and expanded upon so that the design of housing and the urban environment will prove to be adequate in the next millennium.

A3.2: Working on the Case Study

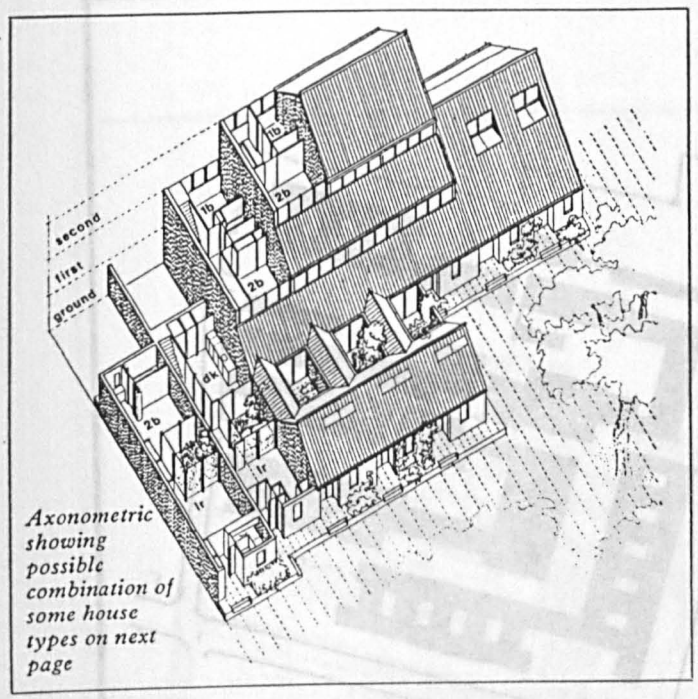
The various housing solutions are in the form of analytical case study. It works with knowledge from past times and the present. The systematic study about floor plans collected in the 1960s today appears just as valuable as the more conceptual and individual designs in the housing design of the 1980s.

The 1960s started out from the basis of the typical user or resident. His or her needs were researched, converted into parameters, and then used to work out the minimum requirements. This was also the basis for the evaluation of housing floor plans. A lot of work was concentrated on the floor plan of the individual apartment in terms of its insulation and ventilation, and on optimising the functional usage. The results were often depicted by the use of systematic floor plans and books of this period were commonly organised typologically, with comparisons and evaluations of schematised floor plans.

On the other hand, the 1980s stressed the conceptual ambitions of the

architect; attention was given to the special solution, the unique building plan. The architect developed his ideas on building volume and space which is expressed in the usage of light, materials, colours, and images. This formed the background against which his built architecture was being measured. He concentrated on the outward appearance and on access spaces where he could bring his idea of the dramatisation of living most readily to expression. This architecture is represented most appropriately by photographs. Rather than classifying, comparing, or evaluating, the documentations of the 1980s presented the projects as individualities.

This case study tries to follow both paths and attempts, through the way in which it is structured, to achieve a synthesis of both forms of representation. This selective documentation included case study studied by Colquhoun, I and Fauset, P.G. (1991) focuses on floor plans, sections, site plans and a small photo as a visual supplement. The use of systematised additional information in the margins gives some of the basic information on the project under study. The accompanying small text describes the freedom as well as constraints connected with that type of housing. The examples are mainly concentrated on the high-density, low-rise built forms which hope to prove beyond a shadow of a doubt to be the appropriate model for housing in which high density is an inevitable form of housing for the rising population.



Axonometric showing possible combination of some house types on next page

A3.2.1: Setchell Road Redevelopment
London Borough of Southwark

Architects: Neylan and Ungless

Number of units: 312 units and a centre with ships and tenant's hall.

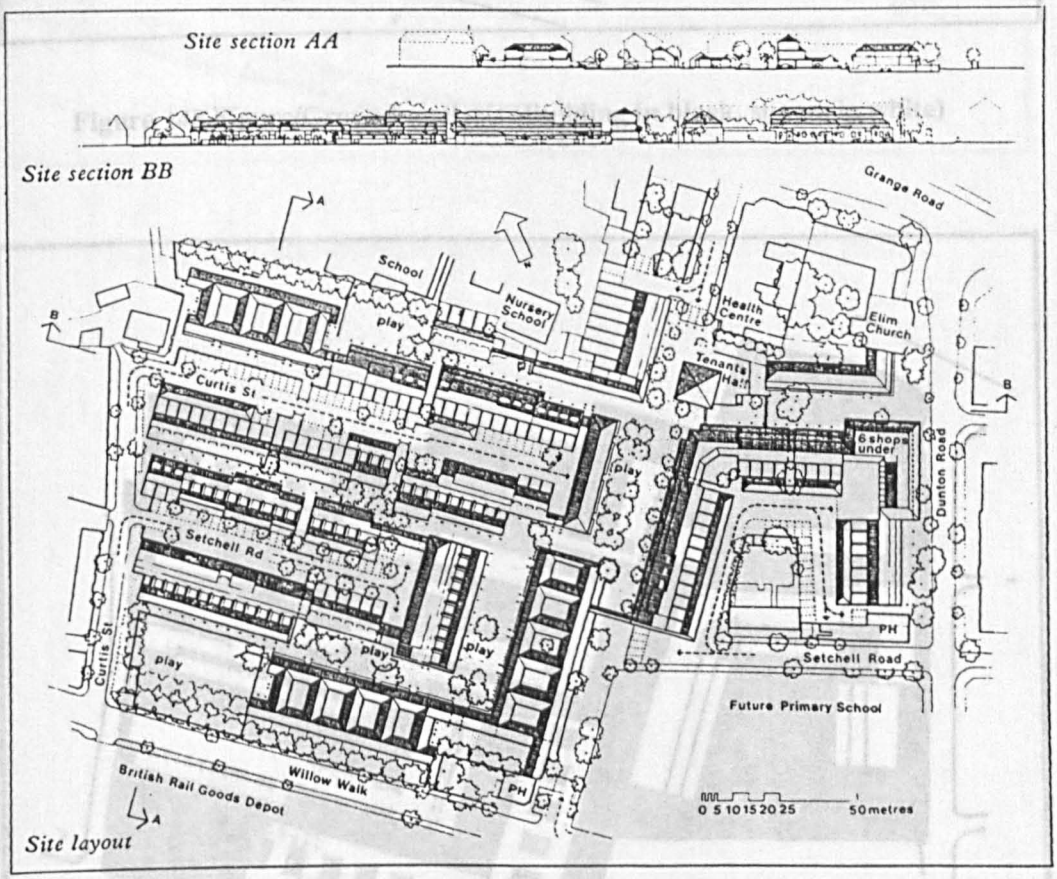
Site Area: 3.43 hectares (8.48 acres)

Density: 91 dwellings per hectare.

Building type: row and courtyard housing, 1 - 3 storey high.

Open areas: courtyard gardens and outdoor space.

Parking: open carparking [241 spaces]



Figures 146, 147 . Axonometric and Site Layout, Setchell Road Redevelopment

At first sight the scheme may appear nothing out of the ordinary; only close study reveal its exceptional combination of "unforced logic and formal sensitivity" (The Architect's Journal 1973). The low profile and pitched roofs convey a cottage - even garden city - atmosphere. Yet the density is 91 dwellings per hectare. This remarkably high density was achieved by the use of very narrow frontages, courtyard planning in the houses, old persons housing round a column courtyard, a pedestrianised layout and integrated garages. The density of this scheme was comparable to that in tower and slab block developments at that time.

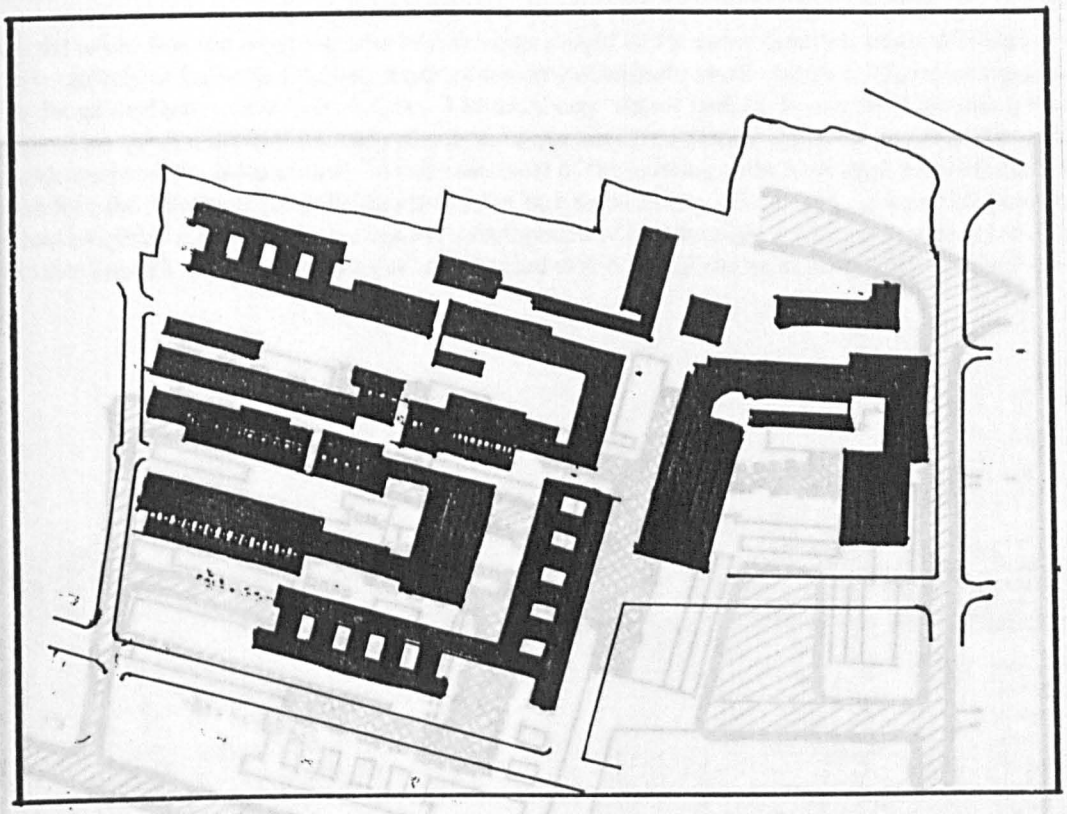


Figure 148 Figure/Ground analysis (Building in black, spaces in white)

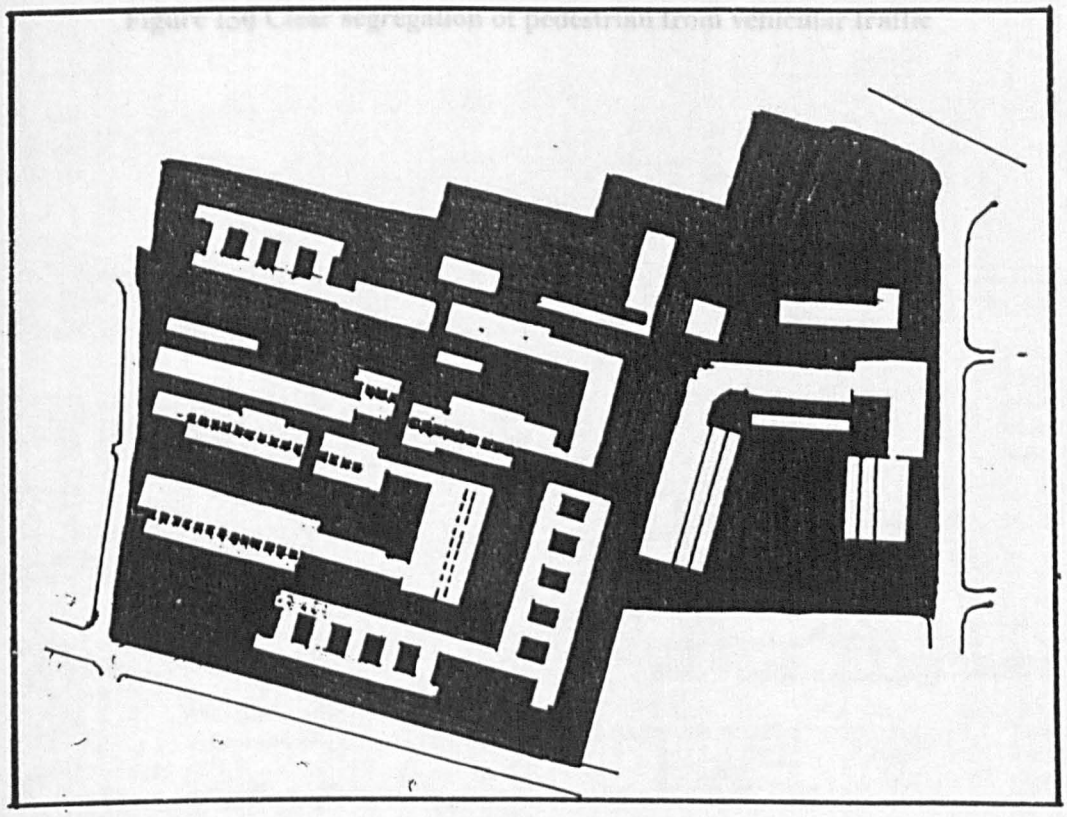


Figure 149 Figure/Ground analysis (Building in white, spaces in black)

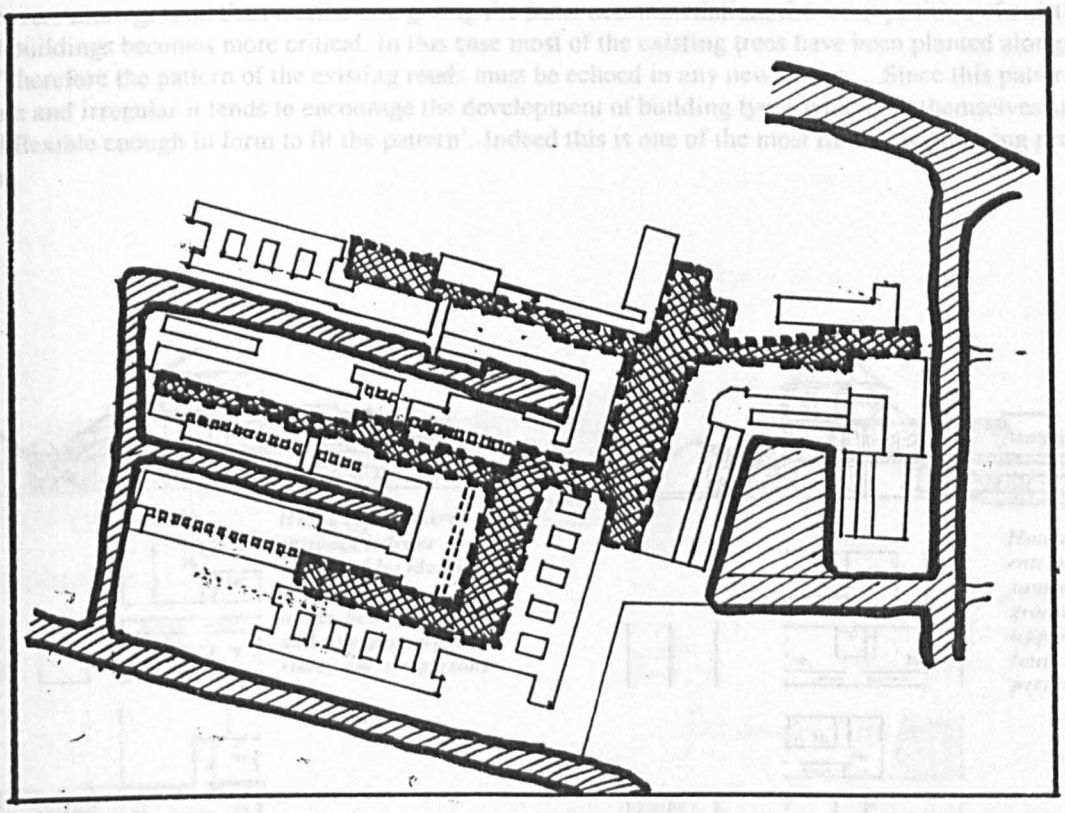


Figure 150 Clear segregation of pedestrian from vehicular traffic

The brief asked that the large majority of dwellings should be for small families, many of which can be presumed to be elderly or for large families, many of whom will include small children. Therefore dwellings in contact with the ground seem ideal in both cases. The architects' report goes on to explain: 'because a low rise scheme covers more ground than a taller one giving the same accommodation, the exact position of existing trees and buildings becomes more critical. In this case most of the existing trees have been planted alongside the roads.....Therefore the pattern of the existing roads must be echoed in any new layout.....Since this pattern is small scale and irregular it tends to encourage the development of building types which are themselves small in scale and flexible enough in form to fit the pattern'. Indeed this is one of the most innovative housing produced in Britain.

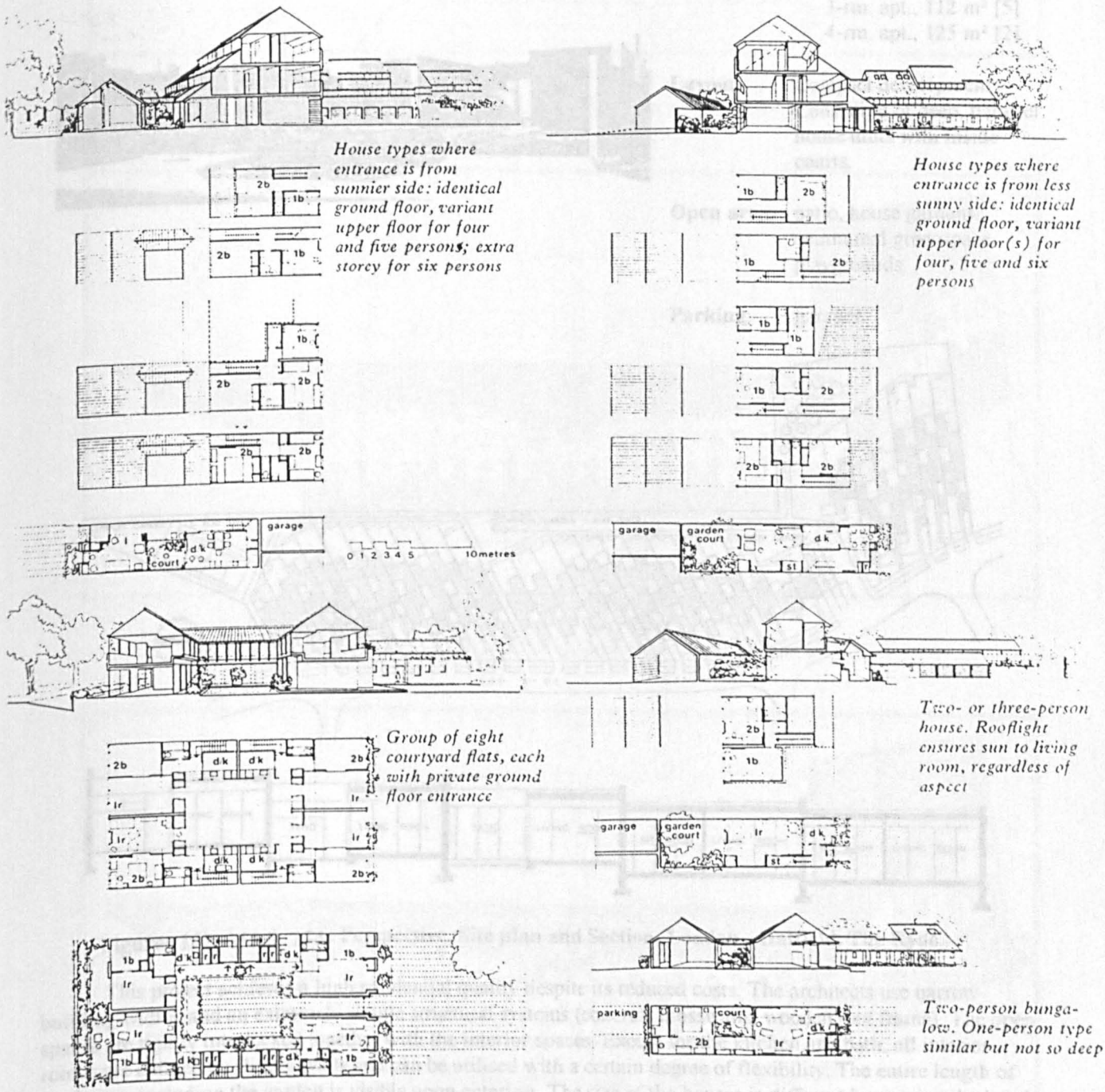


Figure 151. Floor plans and Sections, Setchell Road Redevelopment

A3.2.2: London - Hatfield, The Ryde

Architects: Peter Phippen, Peter Randall, David Parkes.

Number of units: 28

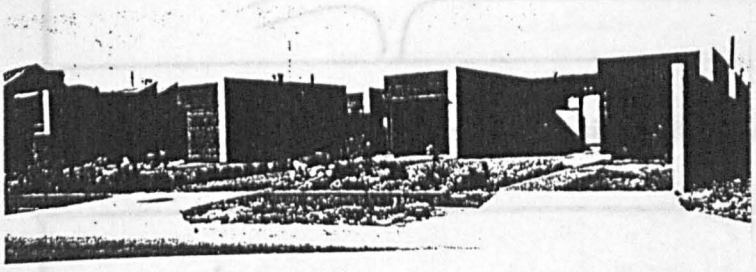
Building type: Row houses, 1 storey

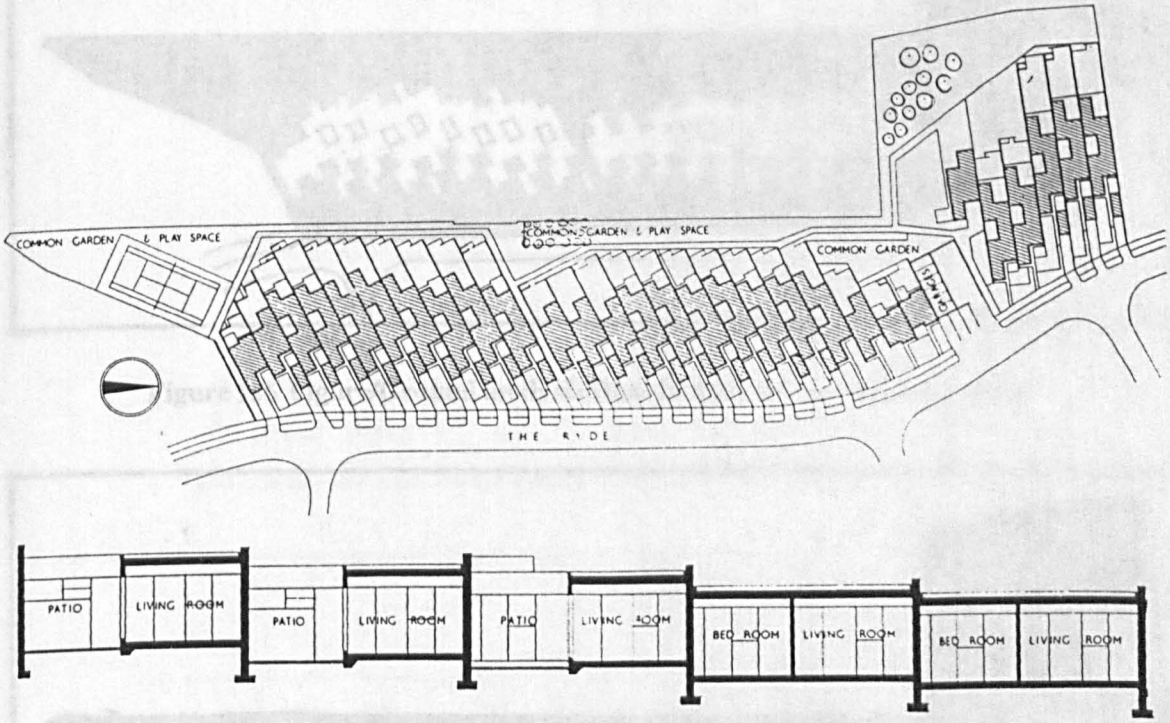
Size of units: 1-rm. apt., 58 m² [11]
2-rm. apt., 86 m² [10]
3-rm. apt., 112 m² [5]
4-rm. apt., 125 m² [2]

Layout: Compact development Consisting of deep, parallel house units with inside courts.

Open areas: patio, house gardens, communal greenspace, playgrounds.

Parking: garages.





Figures 152, 153 & 154. Perspective, Site plan and Section, London - Hatfield, The Ryde

This project achieves a high residential quality despite its reduced costs. The architects use narrow building widths and an extremely simple structural systems (concrete crosswalls, wooden roof frame). The open spaces are tightly interlocked together with the interior spaces. Except for the kitchen and bath, all interior rooms are defined by sliding walls and can be utilised with a certain degree of flexibility. The entire length of the house, including the garden is visible upon entering. The size of the houses is different by varying the lenght of the buildings between the crosswalls. These houses were based on those devised by Chermayer and Alexander from their book, Community and Privacy.

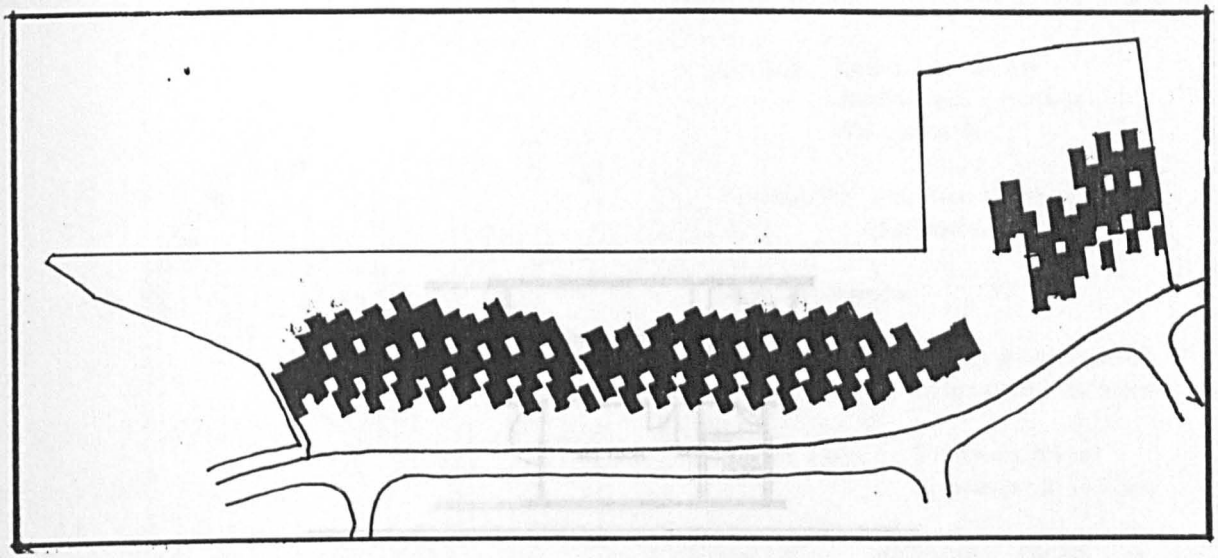


Figure 155 Figure/Ground analysis (Building in black, spaces in white)

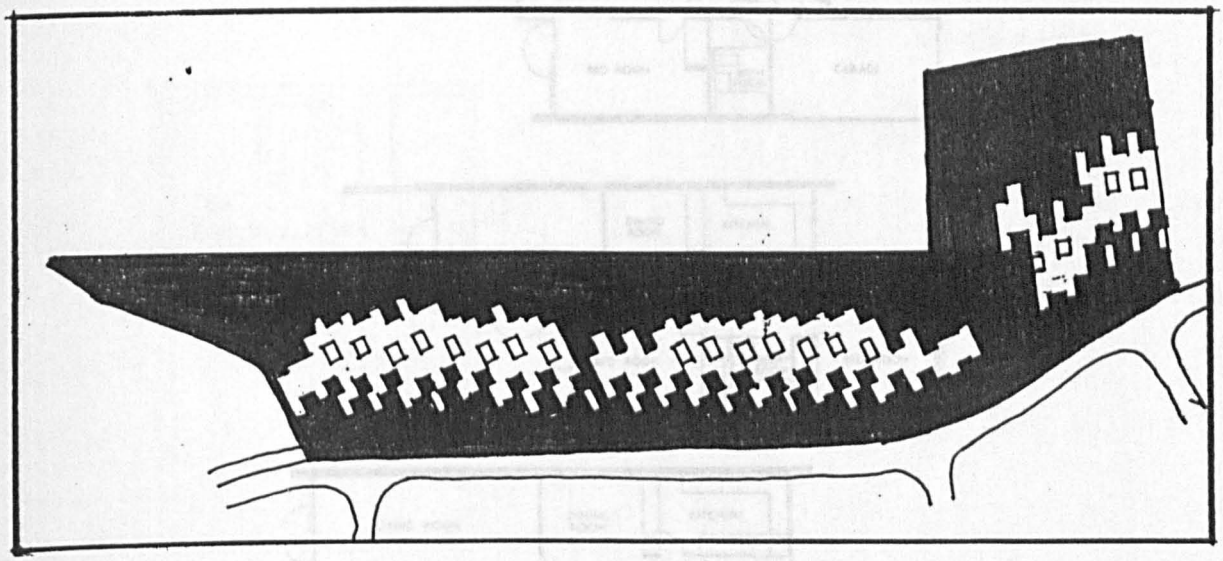


Figure 156 Figure/Ground analysis (Building in white, spaces in black)

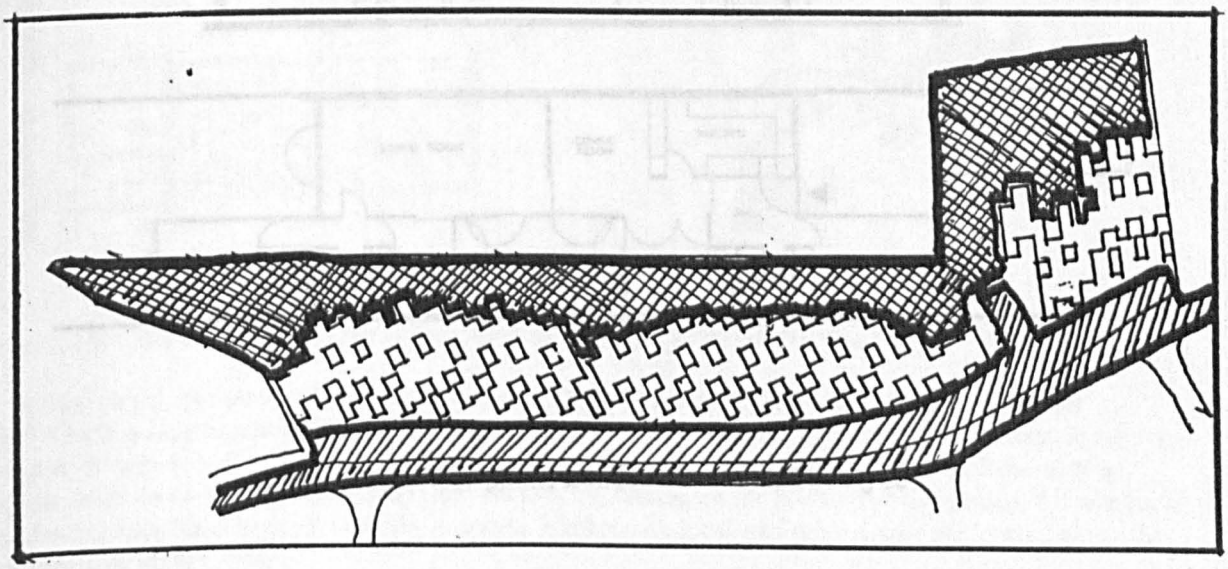


Figure 157 Clear segregation of pedestrian from vehicular traffic

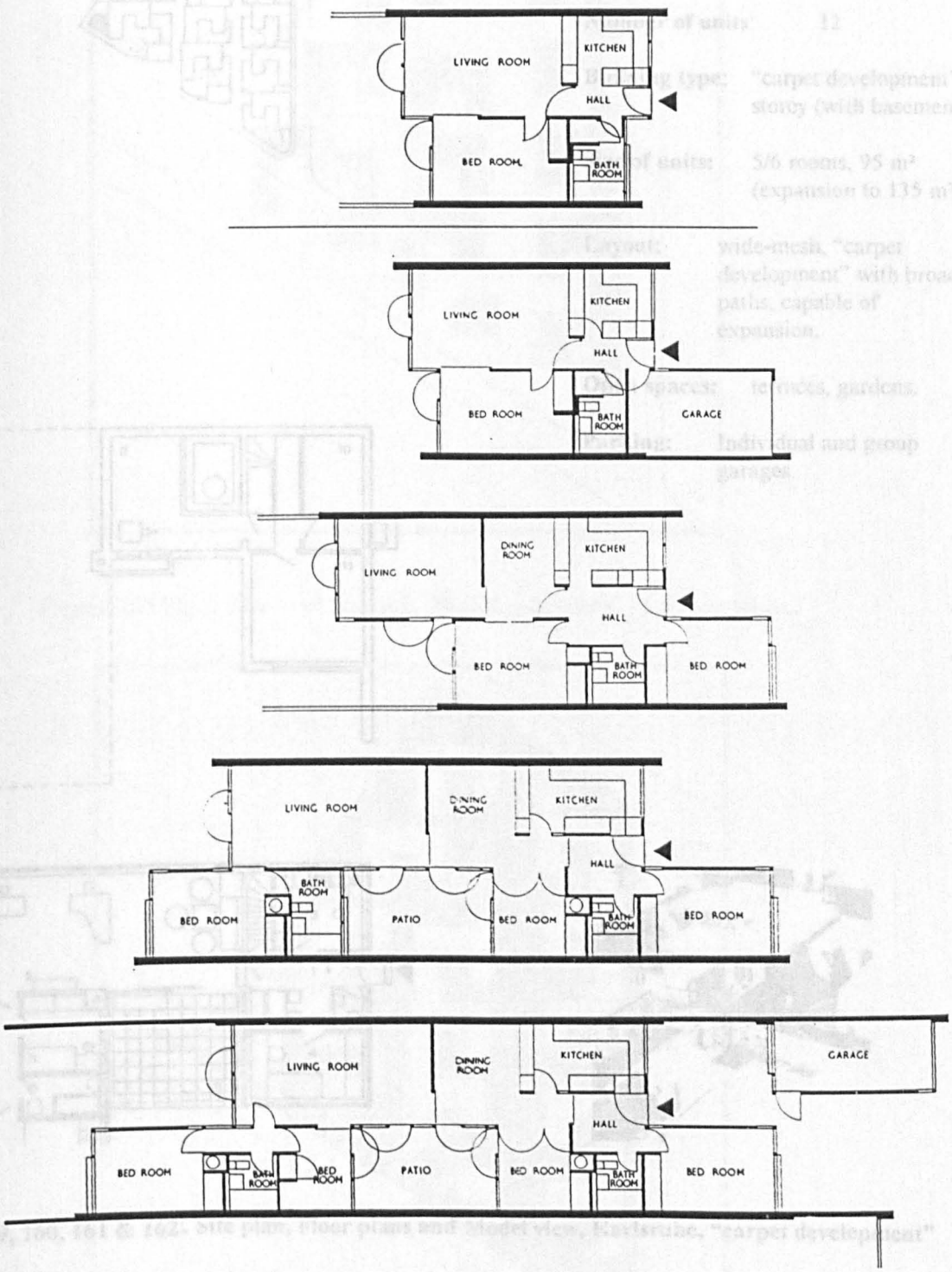


Figure 158 . Floor plans, London - Hatfield, The Ryde

A.3.2.3: Karlsruhe, "carpet development", Ludwig-Windhorst-Str.

Architects: Reinhard Gieselman, Karlsruhe/Vienna.

Number of units: 12

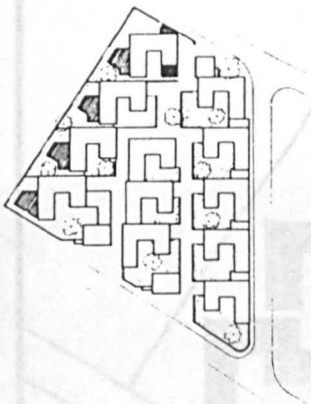
Building type: "carpet development", 1 storey (with basement).

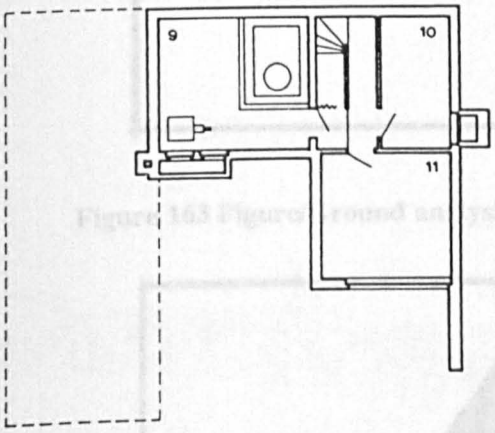
Size of units: 5/6 rooms, 95 m² (expansion to 135 m²)

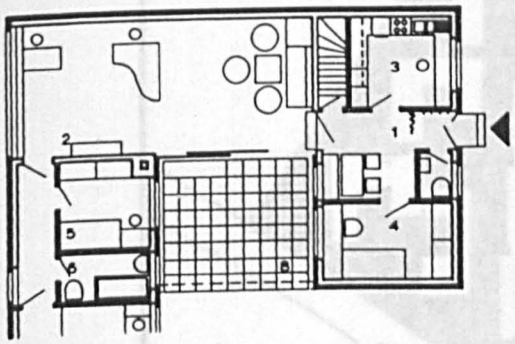
Layout: wide-mesh, "carpet development" with broad paths, capable of expansion.

Open spaces: terraces, gardens.

Parking: Individual and group garages.







Figures 159, 160, 161 & 162. Site plan, Floor plans and Model view, Karlsruhe, "carpet development"

In this project, the semi-atrium houses consist of three house wings surrounding a paved interior courtyard which is supplemented by a garden. The kitchen, dining room, and guest room/w.c. is located next to the entrance. A narrow stairway lead to the basement. The stretched living room opens through the sliding doors to the inner courtyard and through a large window, depending on the position of the garden. All windows of the bedrooms face the courtyard. Only the entrance, kitchen windows, and garden gate are located along the apartment path or on the square.

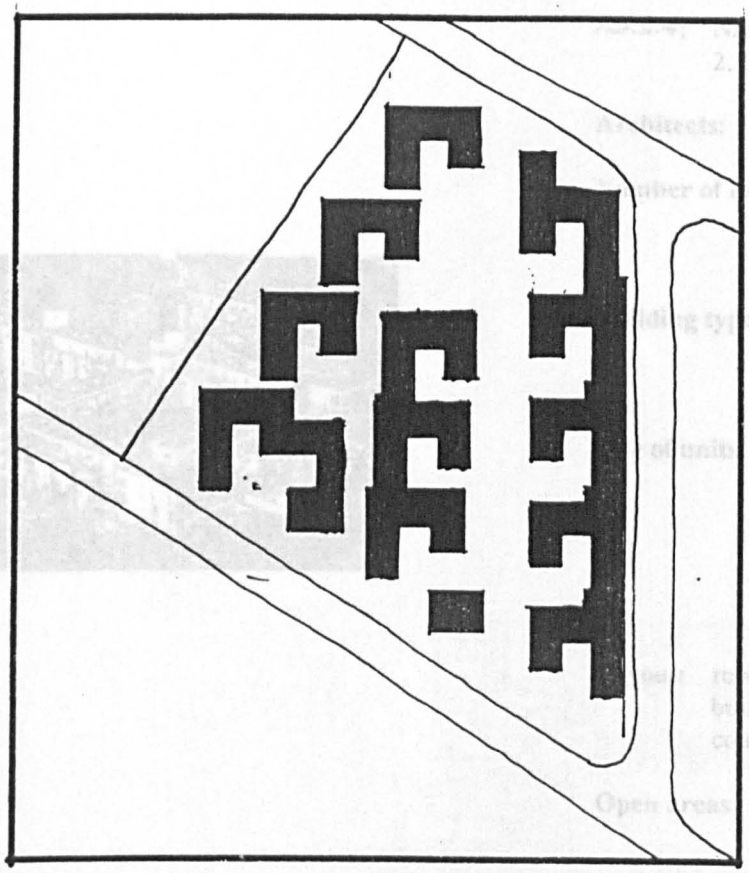


Figure 163 Figure/Ground analysis (Building in black, spaces in white)

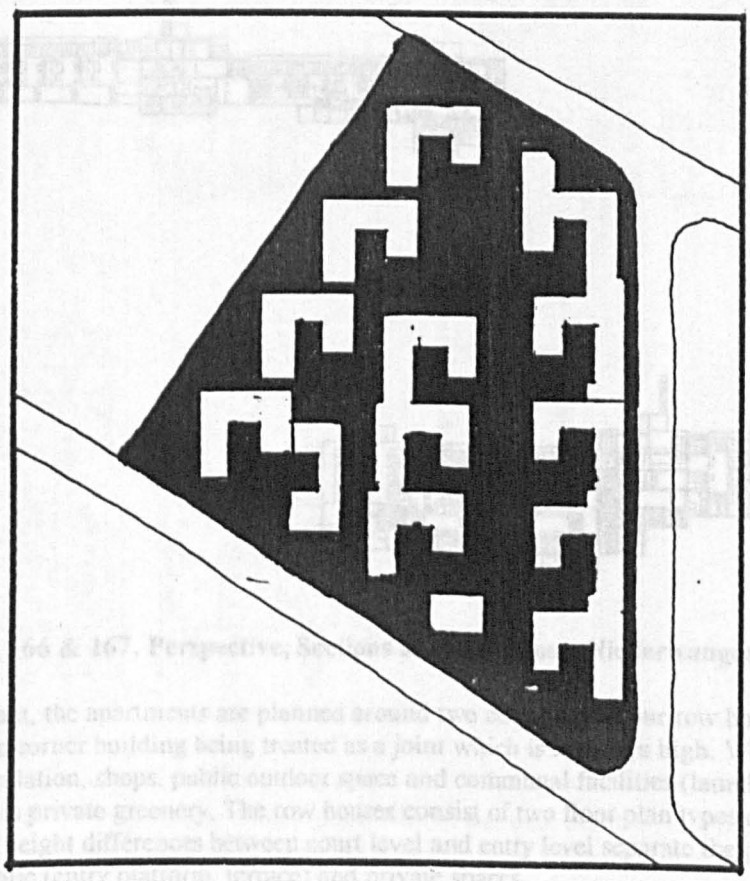


Figure 164 Figure/Ground analysis (Building in white, spaces in black)

A3.2.4: Niederwangen, Siedlung Ried 2, Brueggbuhlstrasse

Architects: Atelier 5, Bern

Number of units: 93, 11 studios/commercial spaces.

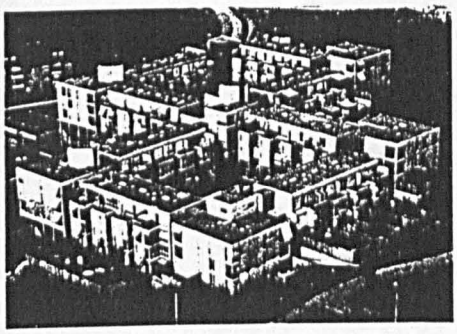
Building type: row houses, 3/4 storeys, corner houses, 5 storeys.

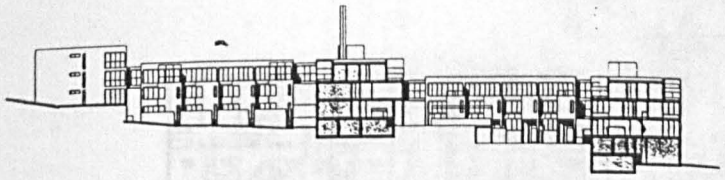
Size of units: 1½ rm. apts., 30/36 m²
2½ rm. apts., 50/54 m²
3½ rm. apts., 75/83 m²
4½ rm. apts., 100/104 m²
4½ and 5½ rm. mais., 104/130 m²

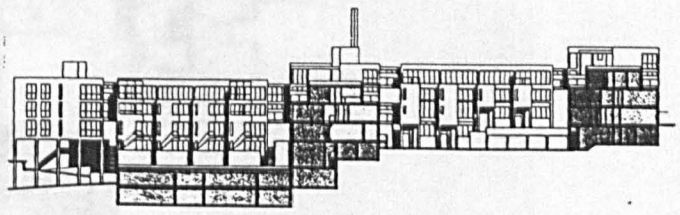
Layout: row houses and corner buildings around two square courtyards.

Open areas: public outside space with pergolas, private terraces and gardens.

Parking: open parking spaces, subterranean garage.







Figures 165, 166 & 167. Perspective, Sections and Elevations, Niederwangen, Siedlung Ried 2

In this layout, the apartments are planned around two courtyards. Four row houses make up one side of a courtyard with the corner building being treated as a joint which is 5 storeys high. Within the courtyard, there are ramps for circulation, shops, public outdoor space and communal facilities (laundry, club room). On the outer court, there is private greenery. The row houses consist of two floor plan types developing vertically and horizontally. The height differences between court level and entry level separate the public space (courtyard) from the semi-public (entry platform, terrace) and private spaces.

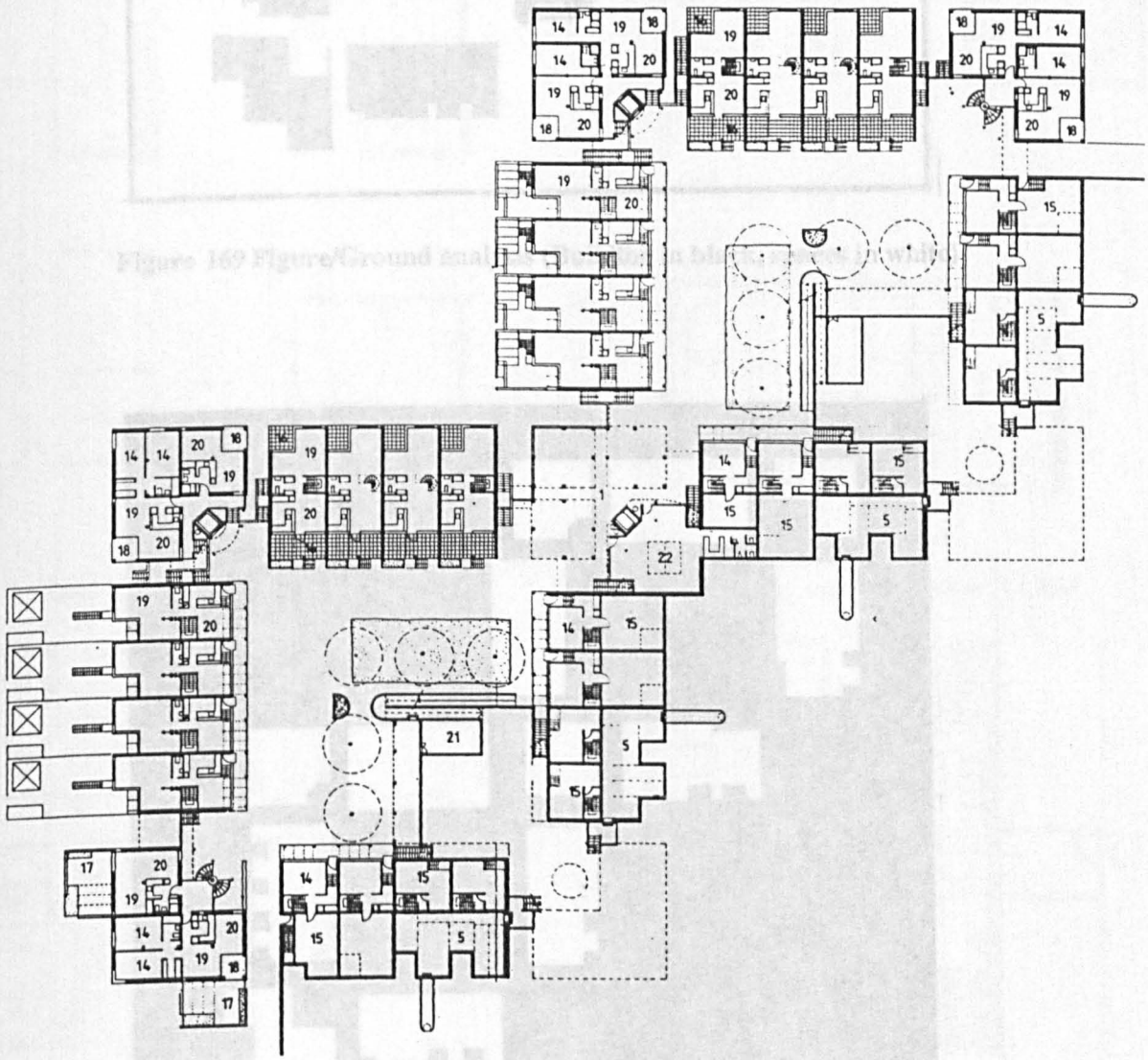


Figure 168 Block plan, Niederwangen, Siedlung Ried 2

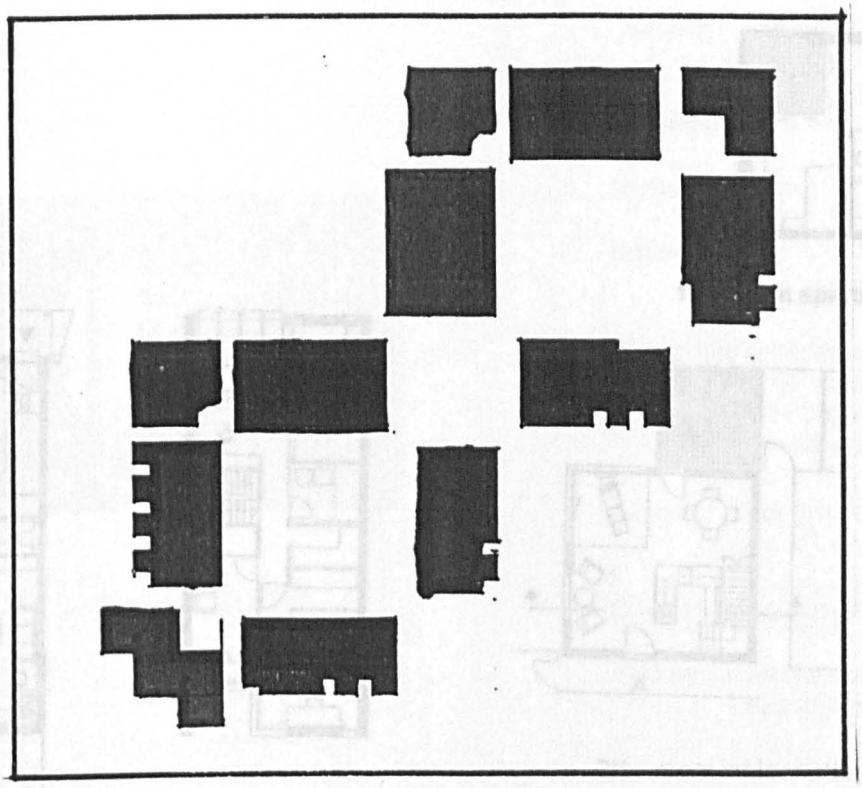


Figure 169 Figure/Ground analysis (Building in black, spaces in white)

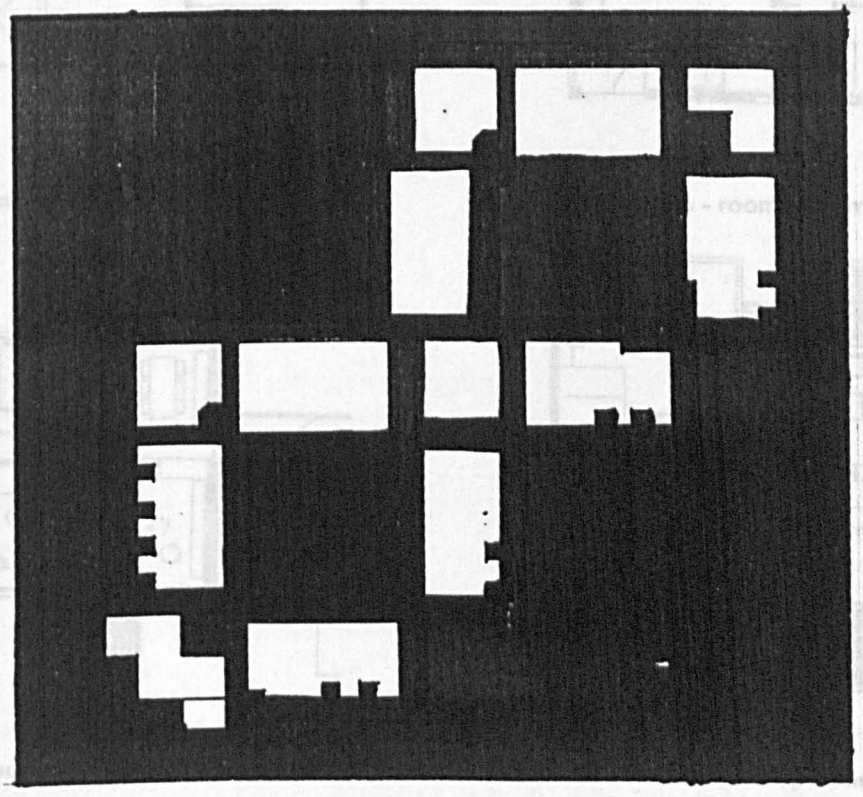
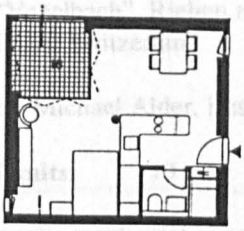
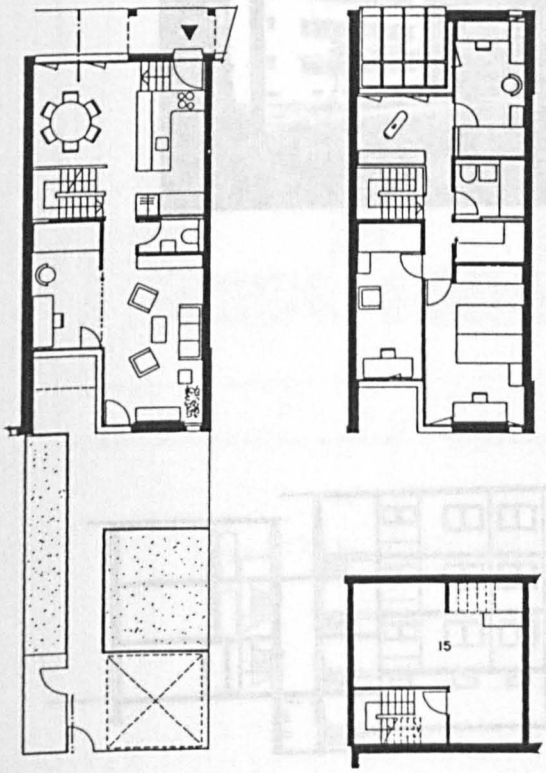
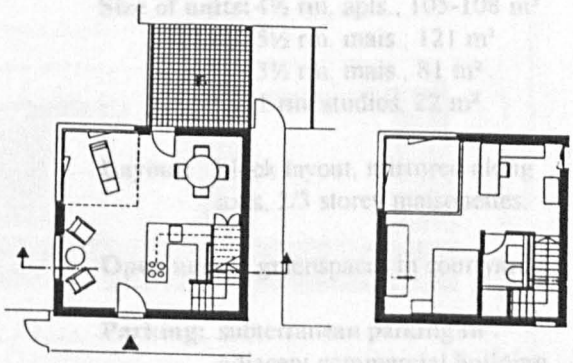


Figure 170 Figure/Ground analysis (Building in white, spaces in black)



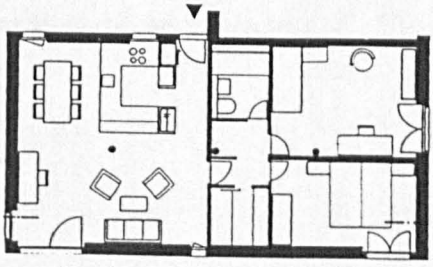
1½ - room apartment; 30m²



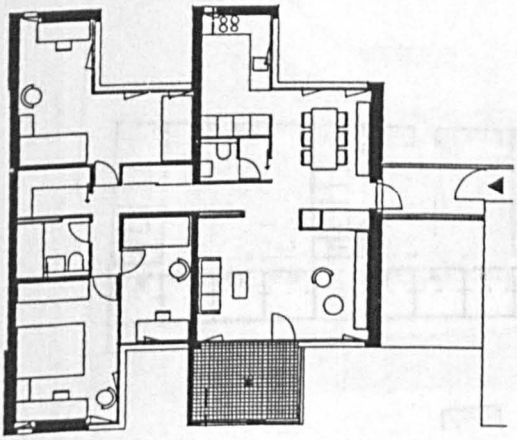


2½ - room maisonette; levels 1, 2; 53m²

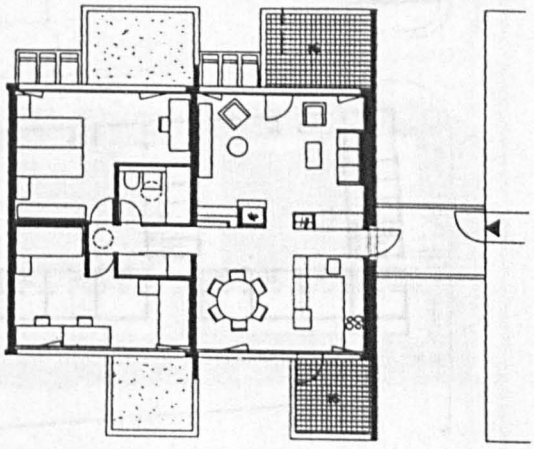
4½ - room maisonette; level 1, 2, 3; 104m²



3½ - room apartment; 74.5m²



4½ - room apartments; 99m²



3½ - room apartment; 82m²

Figure 171 Floor plans, Niederwangen, Siedlung Ried 2

A3.2.5: "Vogelbach", Riehen near Basel, Switzerland

Architects: Michael Alder, Basel

Number of units: 40

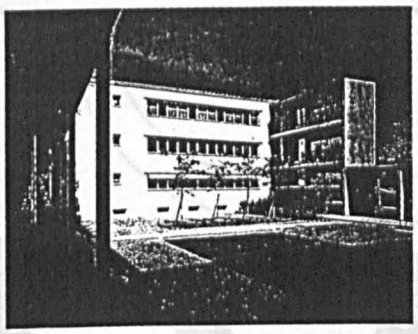
Building type: residential courtyards, 3 stories.

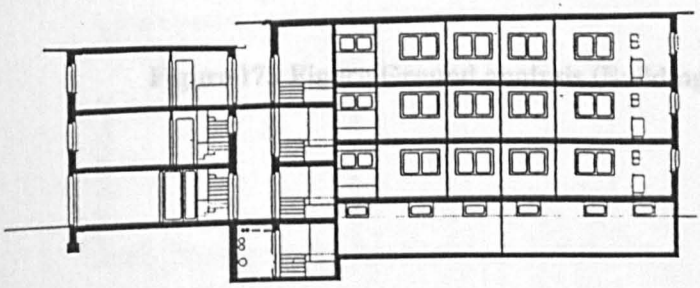
Size of units: 4½ rm. apts., 105-108 m²
5½ rm. mais., 121 m²
3½ rm. mais., 81 m²
1 rm. studios, 22 m²

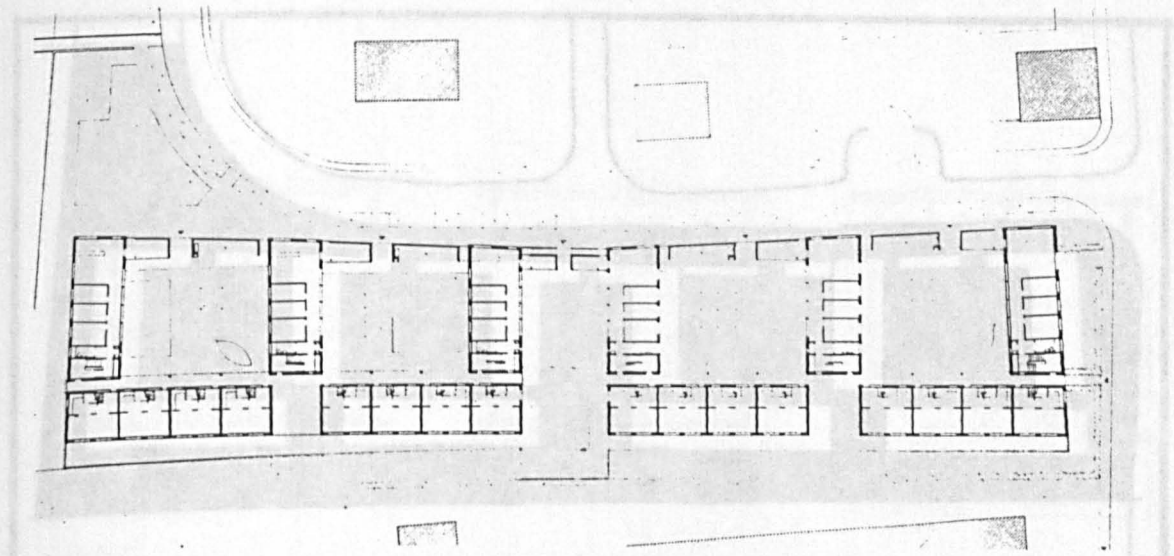
Layout: block layout, mirrored along axis, 2/3 storey maisonettes.

Open areas: greenspaces in courtyards.

Parking: subterranean parking in adjacent commercial building.







Figures 172, 173 & 174 Perspective, Section and Site layout, "Vogelbach", Riehen

This development consists of four blocks, two on each side of the main path. The floor plans are extremely simple and clear. On one wing, three-storey maisonettes are placed in a row like single-family houses. There is clear zoning in the floor plans. Kitchens, baths, stairwells, expanded corridor zones face north and all rooms open to the south.

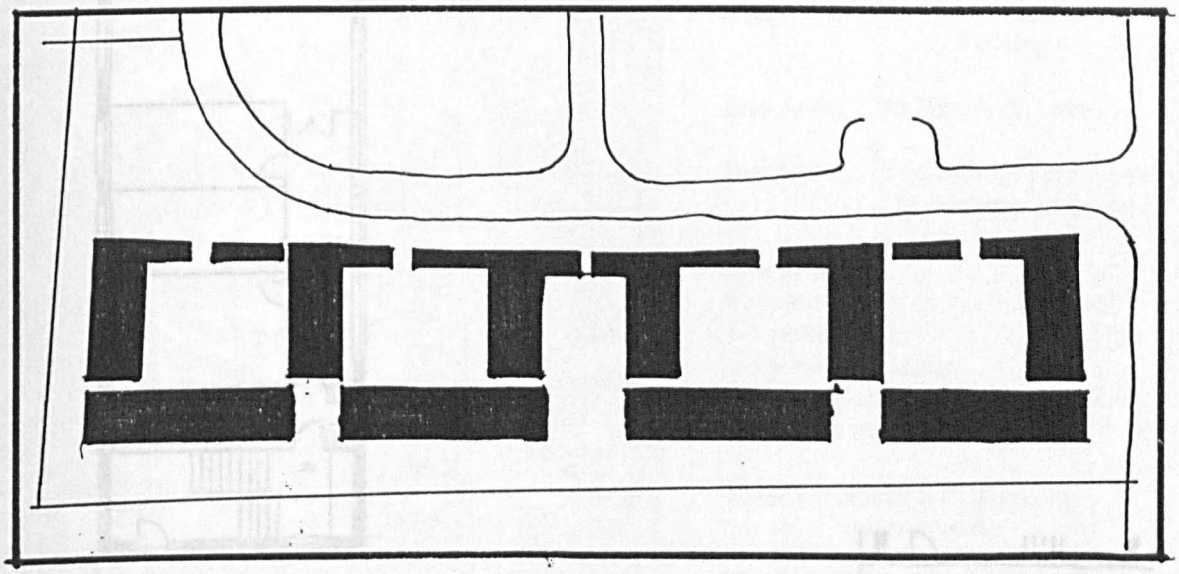


Figure 175 Figure/Ground analysis (Building in black, spaces in white)

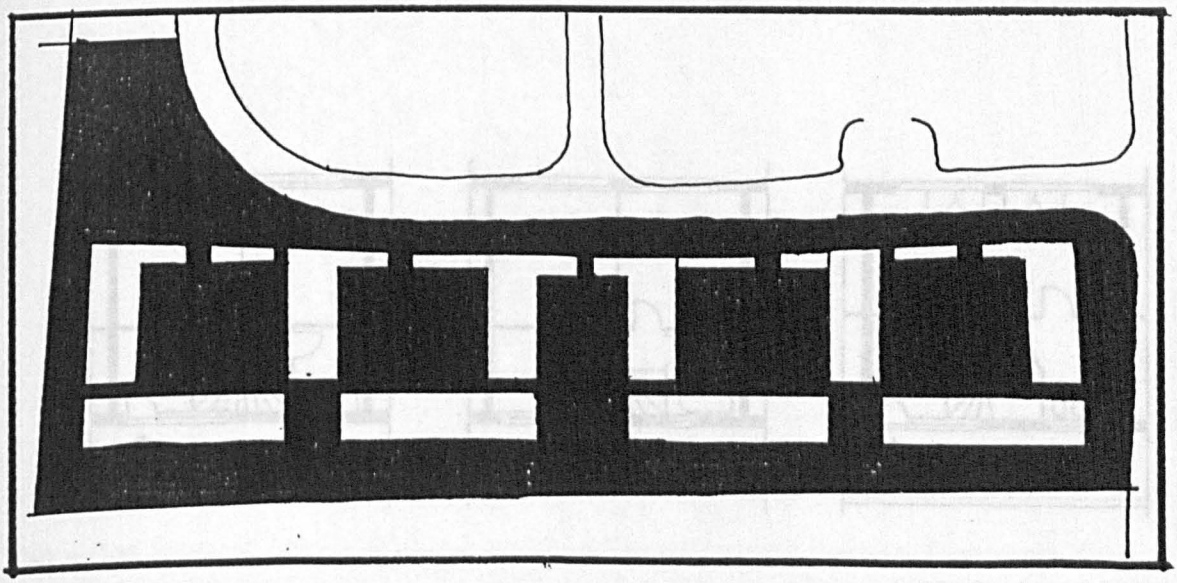


Figure 176 Figure/Ground analysis (Building in white, spaces in black)

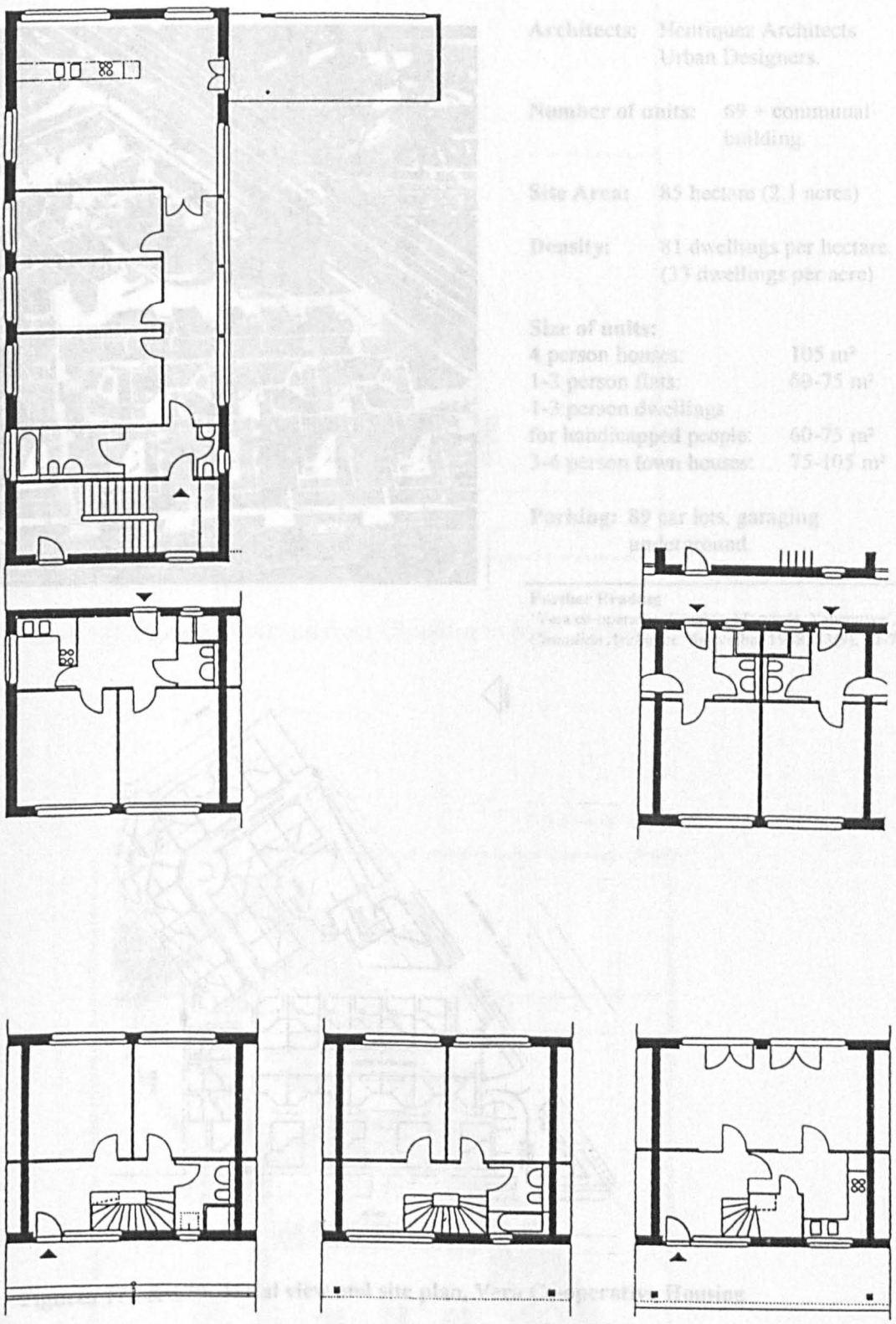
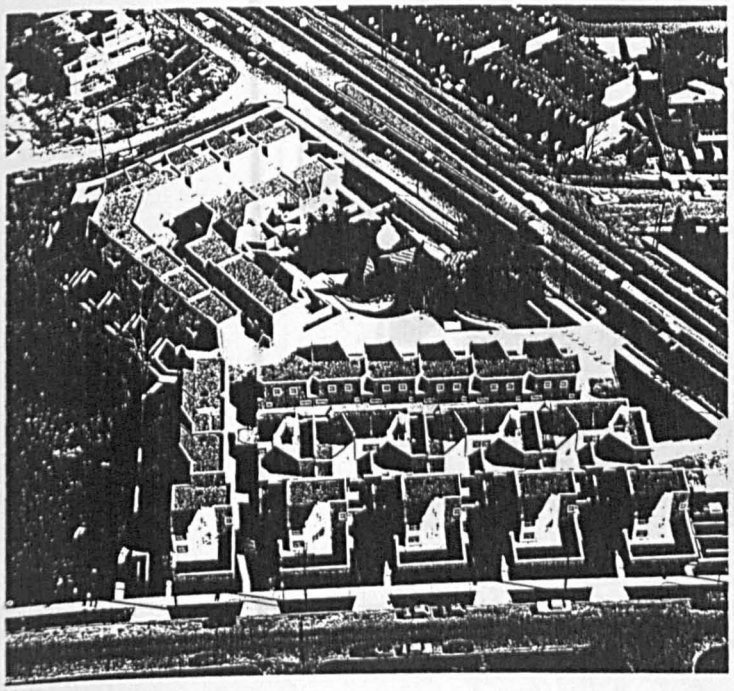


Figure 177 Floor plans, "Vogelbach", Riehen

A3.2.6: Vera Co-operative Housing, Vancouver, Canada.



Architects: Henriquez Architects Urban Designers.

Number of units: 69 + communal building.

Site Area: 85 hectare (2.1 acres)

Density: 81 dwellings per hectare. (33 dwellings per acre)

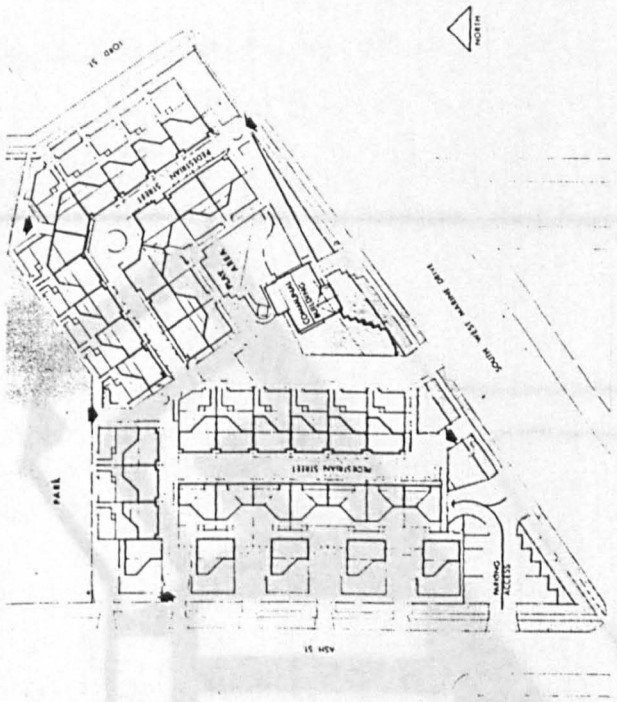
Size of units:

4 person houses:	105 m²
1-3 person flats:	60-75 m²
1-3 person dwellings for handicapped people:	60-75 m²
3-4 person town houses:	75-105 m²

Parking: 89 car lots, garaging underground.

Further Reading

'Vera co-operative housing, Marysole, Vancouver'. *Canadian Architect.*, September 1988, **33(9)**, 22-7.



Figures 178 & 179 Aerial view and site plan, Vera Co-operative Housing

This project has the appearance of a small village with its variety, yet it is designed cohesively. The scheme addresses the issue of the concept of 'my own house' in a form of an affordable terraced housing project. This notion of an 'identifiable house' is expressed by means of a small pitched roof element added on to each unit. This image, which is derived from the most primitive image of 'house' gives the unit a feeling of being detached and additional gateposts located in the rear courtyards further reinforce the feeling of identity (Colquhoun & Fauset, 1991a). The dwellings are grouped on either side of a 'pedestrian street' which provides a

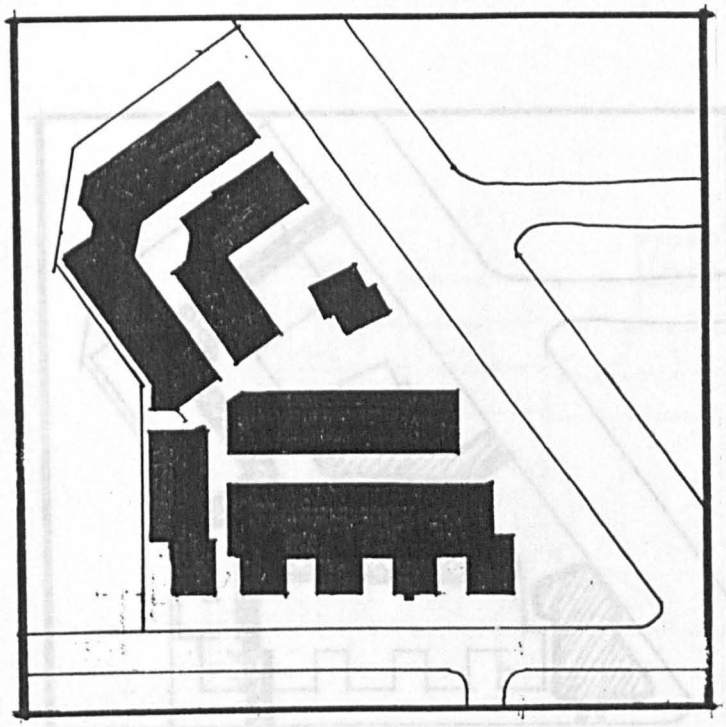


Figure 180 Figure/Ground analysis (Building in black, spaces in white)

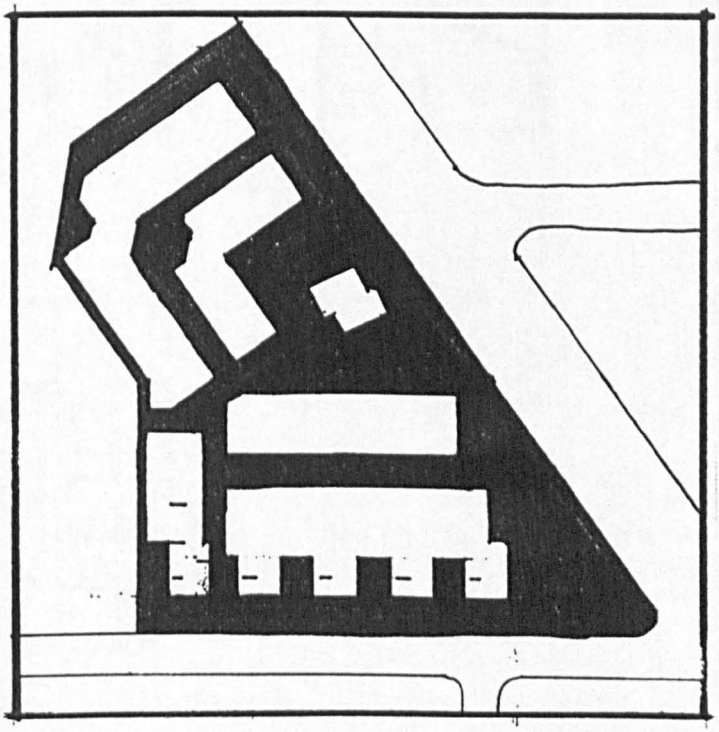


Figure 181 Figure/Ground analysis (Building in white, spaces in black)

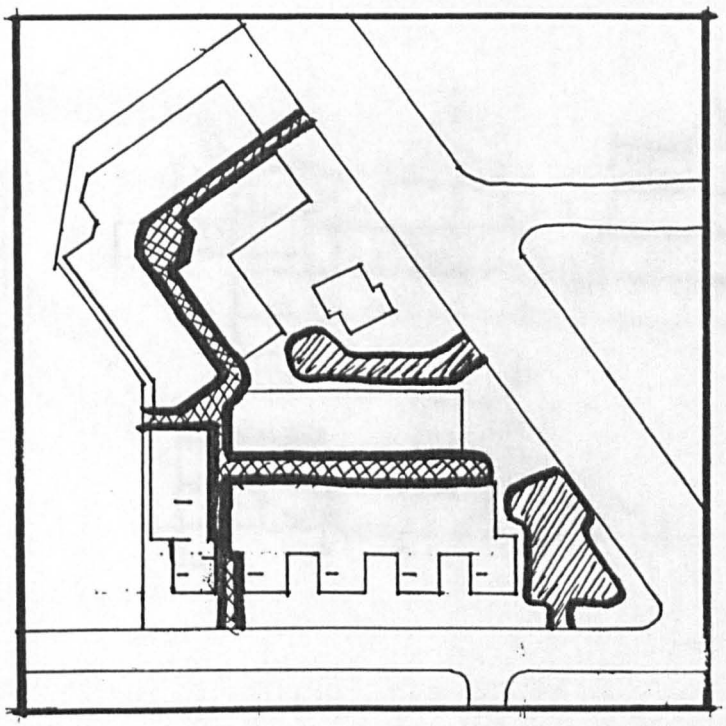


Figure 182 Clear segregation of pedestrian from vehicular traffic

safe playing space for the children. Each dwelling has a front door onto the pedestrian street and an enclosed patio at the rear.

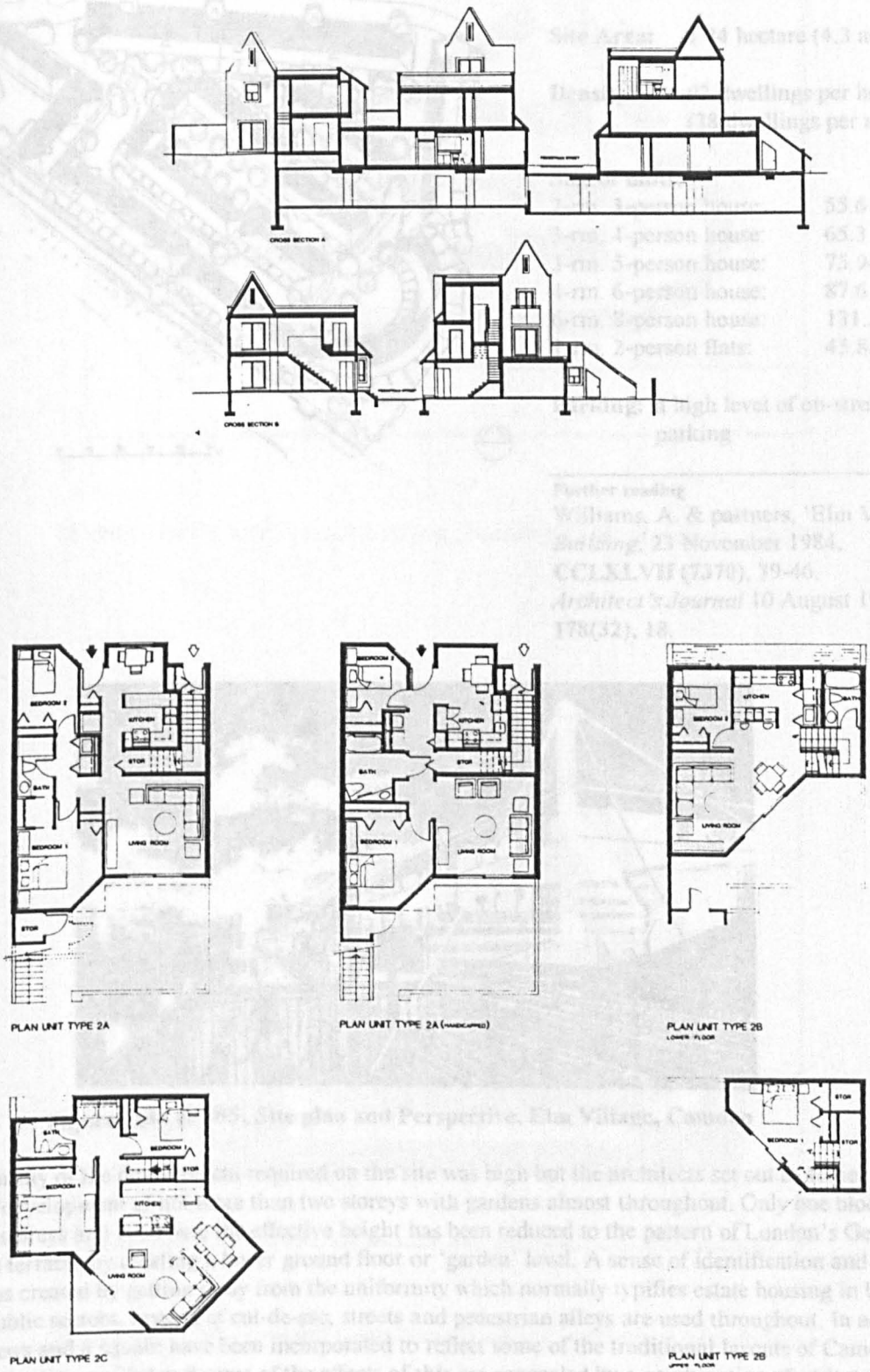


Figure 183 Sections and Floor plans, Vera Co-operative Housing

A3.2.7: Elm Village, Camden, London (1985)

Architects: Peter Mishcon and Associates.

Number of units: 162

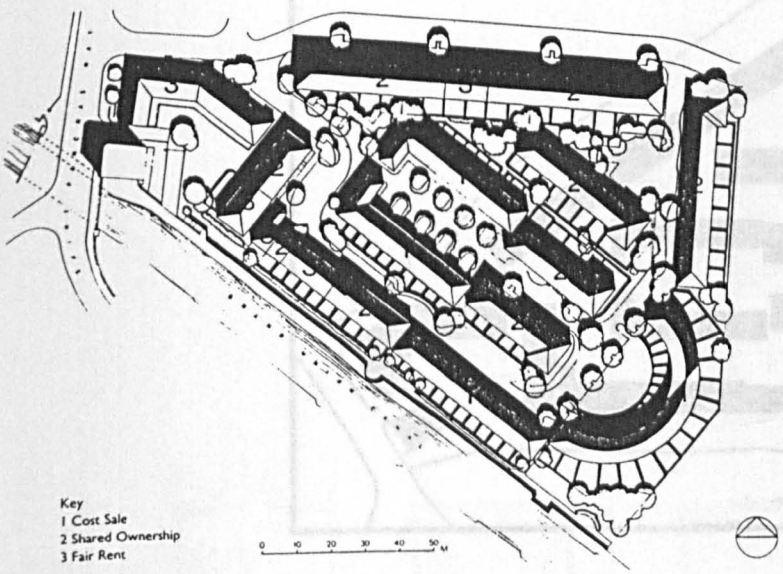
Site Area: 1.74 hectare (4.3 acres)

Density: 93 dwellings per hectare (38 dwellings per acre)

Size of units:

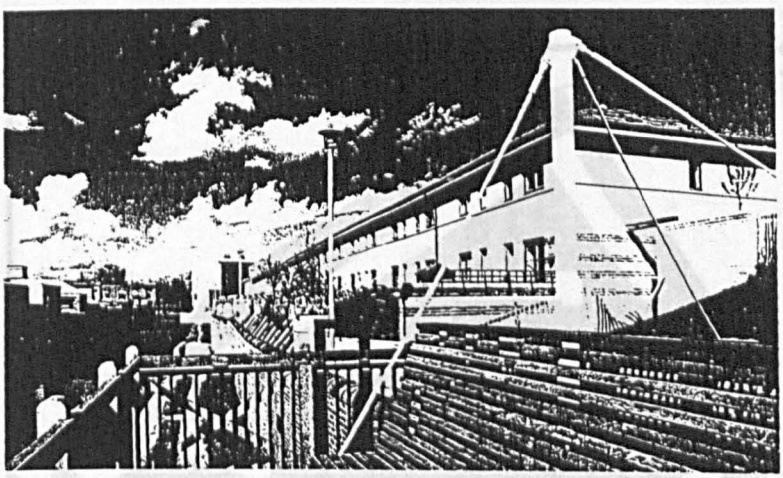
2-rm. 3-person house:	55.6 m²
3-rm. 4-person house:	65.3 m²
3-rm. 5-person house:	75.94 m²
4-rm. 6-person house:	87.6 m²
6-rm. 8-person house:	131.53 m²
1-rm. 2-person flats:	45.8-48.6 m²

Parking: a high level of on-street parking



Further reading

Williams, A. & partners, 'Elm Village', *Building*, 23 November 1984, **CCLXLVII (7370)**, 39-46.
Architect's Journal 10 August 1983, **178(32)**, 18.



Figures 184 & 185. Site plan and Perspective, Elm Village, Camden

The density of the development required on the site was high but the architects set out to achieve this with low-rise development of not more than two storeys with gardens almost throughout. Only one block rises as high as three storeys and even here the effective height has been reduced to the pattern of London's Georgian and Victorian terraces by creating a lower ground floor or 'garden' level. A sense of identification and familiarity was created by getting away from the uniformity which normally typifies estate housing in both the private and public sectors. Instead of cul-de-sac, streets and pedestrian alleys are used throughout. In addition, a crescent, a mews and a square have been incorporated to reflect some of the traditional layouts of Camden's. On-street parking is provided and some of the effects of this are concealed by a combination of pedestrian and vehicular movement in a shared surface system. The use of level differences in an otherwise flat site and the generous use of planting also help create an interesting environment (Colquhoun & Fauset, 1991b).

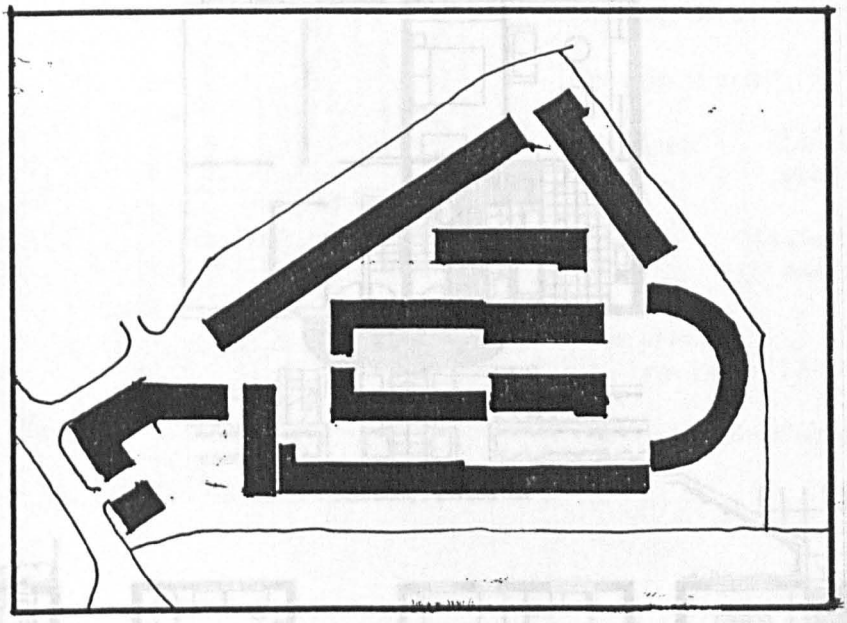


Figure 186 Figure/Ground analysis (Building in black, spaces in white)

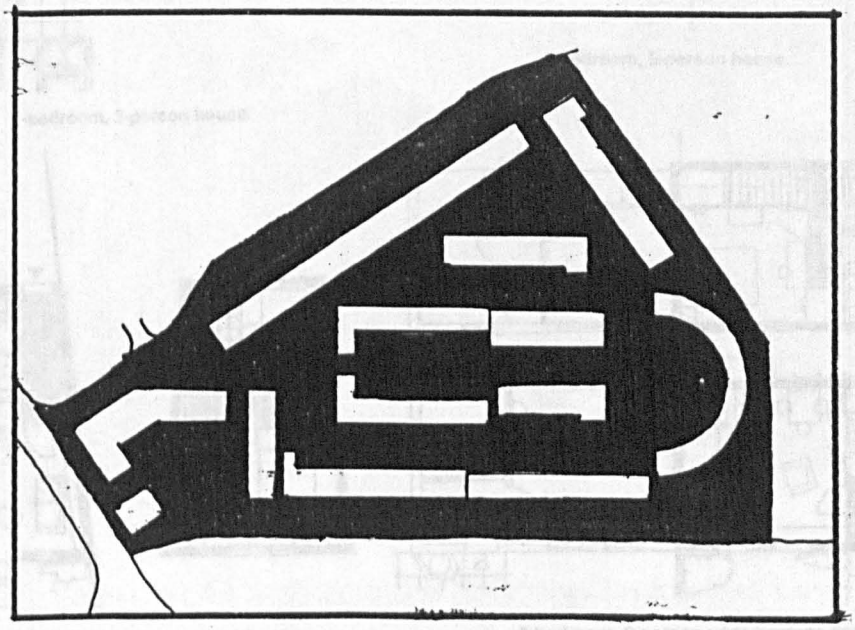
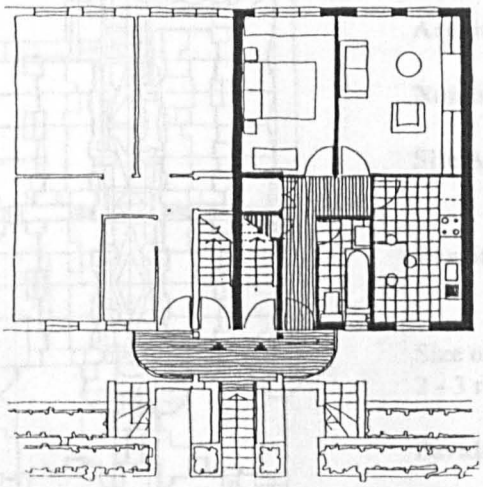
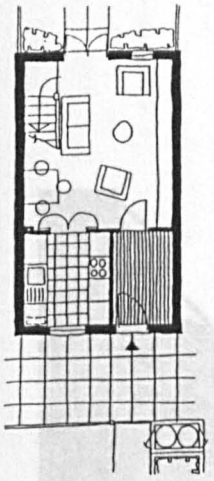


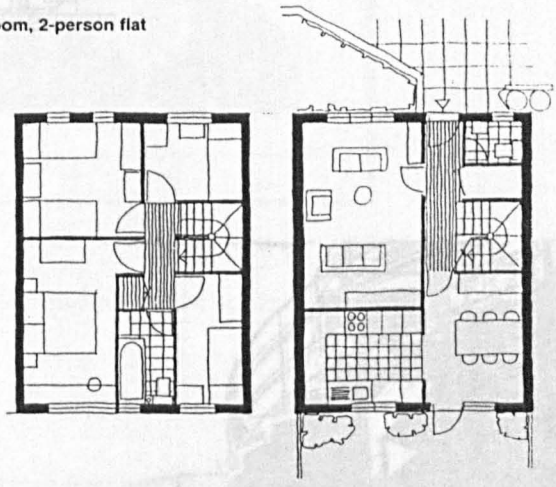
Figure 187 Figure/Ground analysis (Building in white, spaces in black)



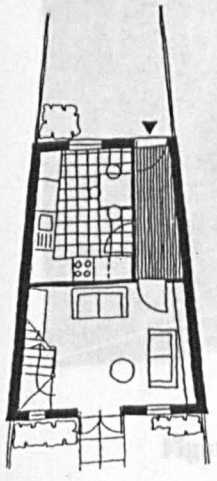
1-bedroom, 2-person flat



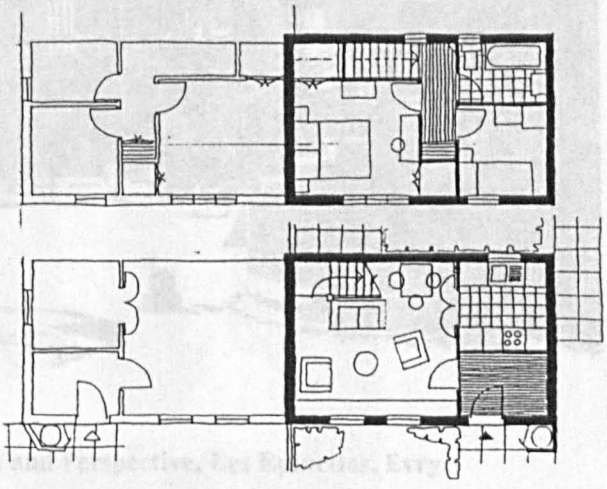
2-bedroom, 3-person house



3-bedroom, 5-person house

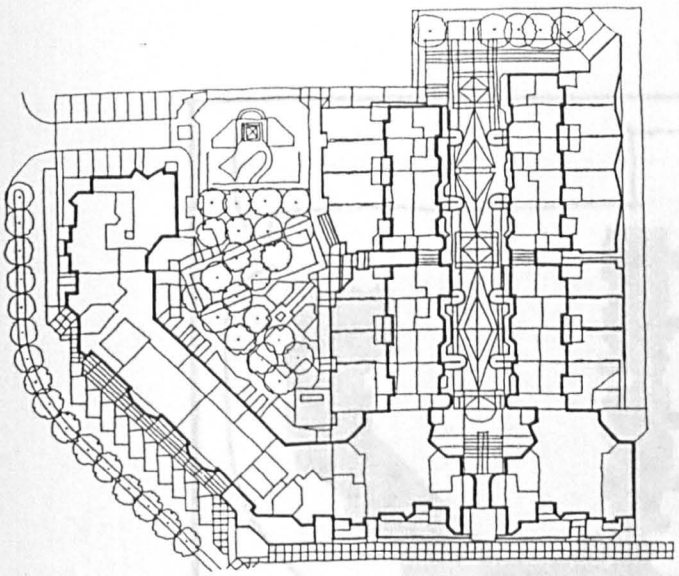


2-bedroom, 3-person crescent house



2-bedroom, 3-person wide frontage house

Figure 188 Floor plans, Elm Village, Camden



A3.2.8: Les Epinettes, Evry, near Paris, France.

Architects: Alain Sarfati

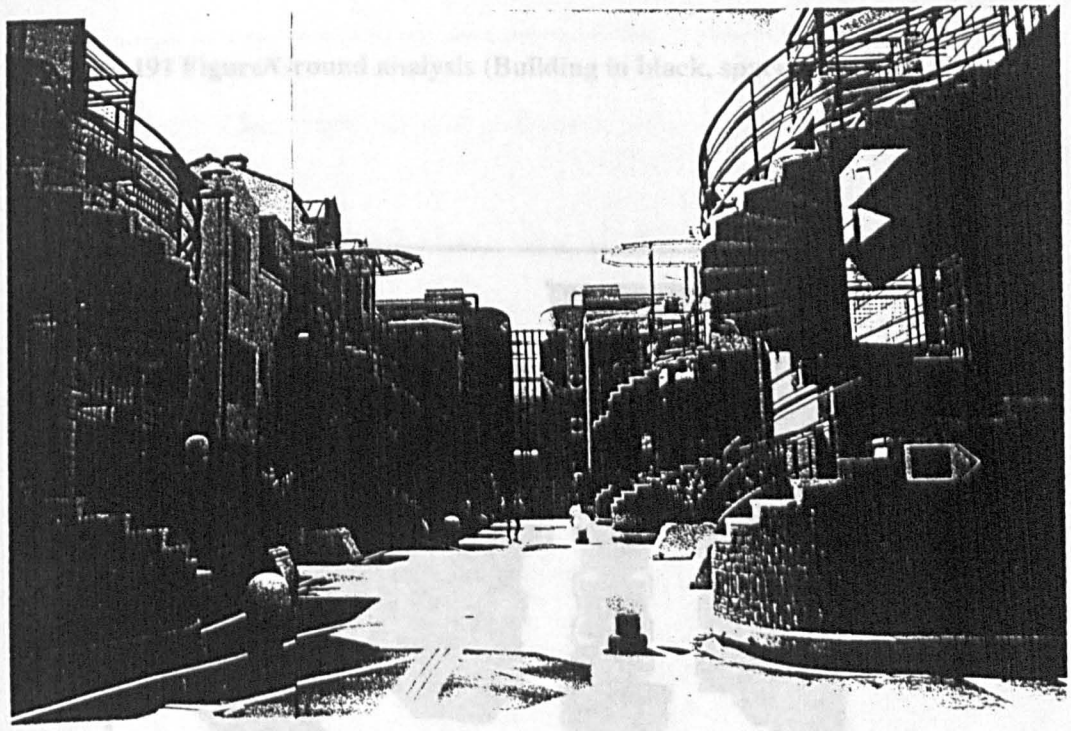
Number of units: 103

Site Area: 0.8 hectares (1.97 acres)

Density: 128 dwellings per hectare (53 dwellings per acre)

Size of units:
2 - 3 rm. flats : 75-80 m²

Parking: 116 underground garages.



Figures 189 & 190. Site plan and Perspective, Les Epinettes, Evry

The 103 flats are arranged on either side of a pedestrian concourse and around a central communal garden. Access to the upper dwellings overlooking the concourse is gained via series of spiral staircases capped with glass umbrellas that would grace the entrance to any Parisian Metro station. Ground floor dwellings have small private gardens. The communal garden is laid out in a formal manner with pergolas and climbing plants, a covered bandstand, sculptures and lush planting of all kinds (Colquhoun & Fauset, 1991c). The pedestrian concourse and the dwellings on either side of it are built above underground garaging which is a common arrangement for much of the recently constructed housing in the French new towns.

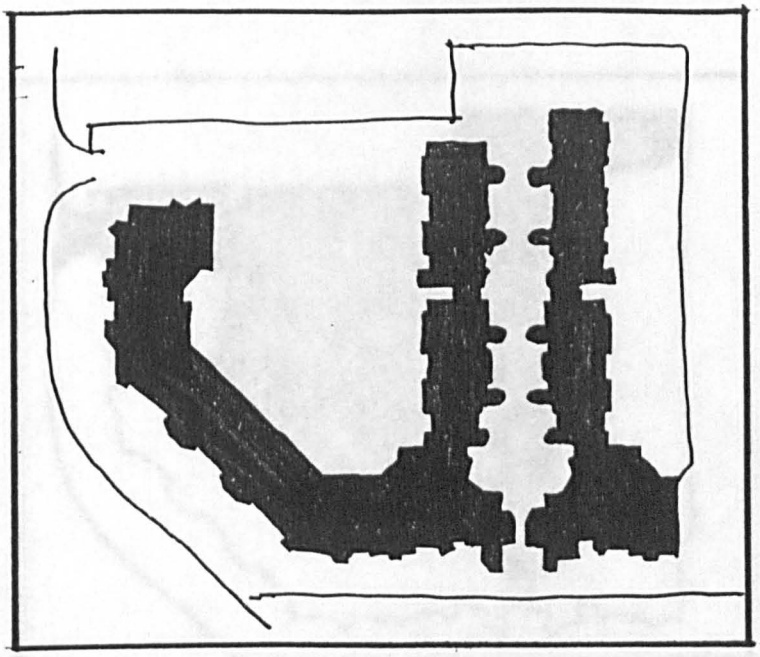


Figure 191 Figure/Ground analysis (Building in black, spaces in white)

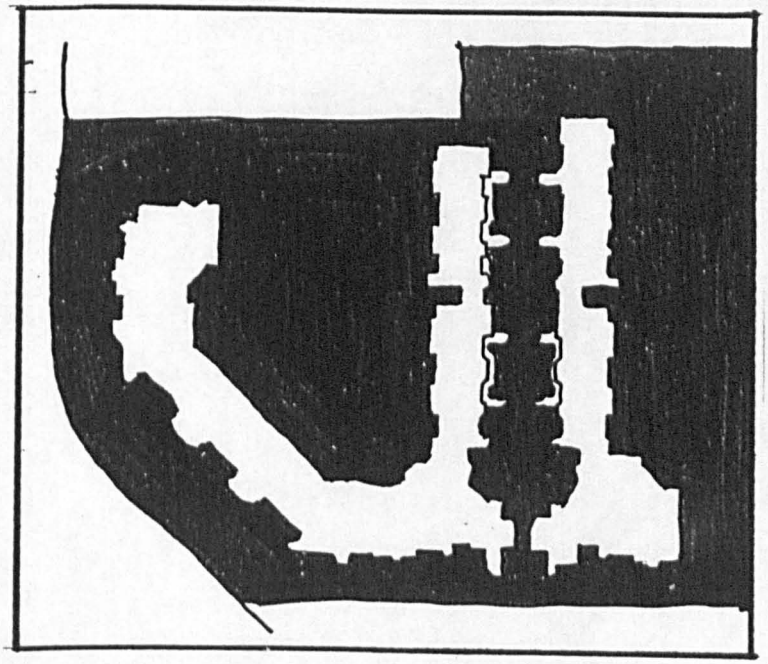


Figure 192 Figure/Ground analysis (Building in white, spaces in black)

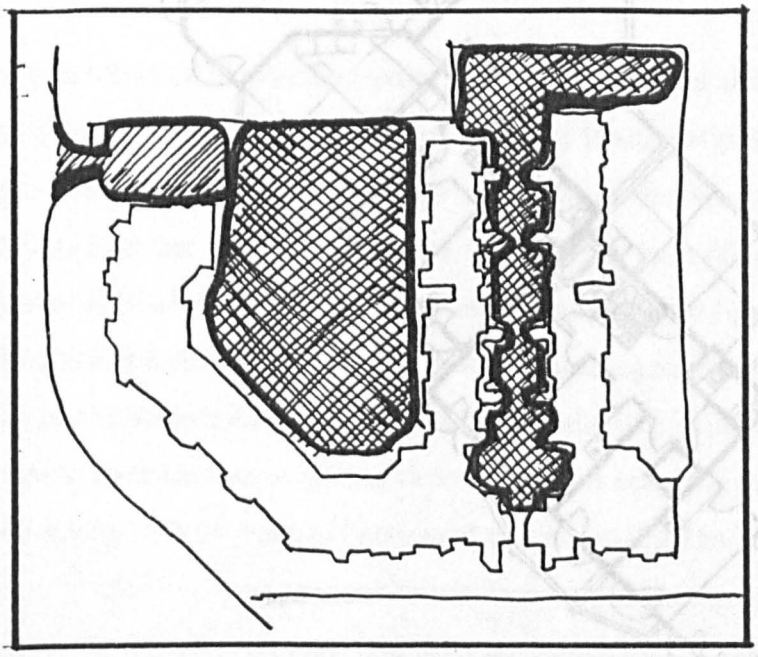


Figure 193 Clear segregation of pedestrian from vehicular traffic

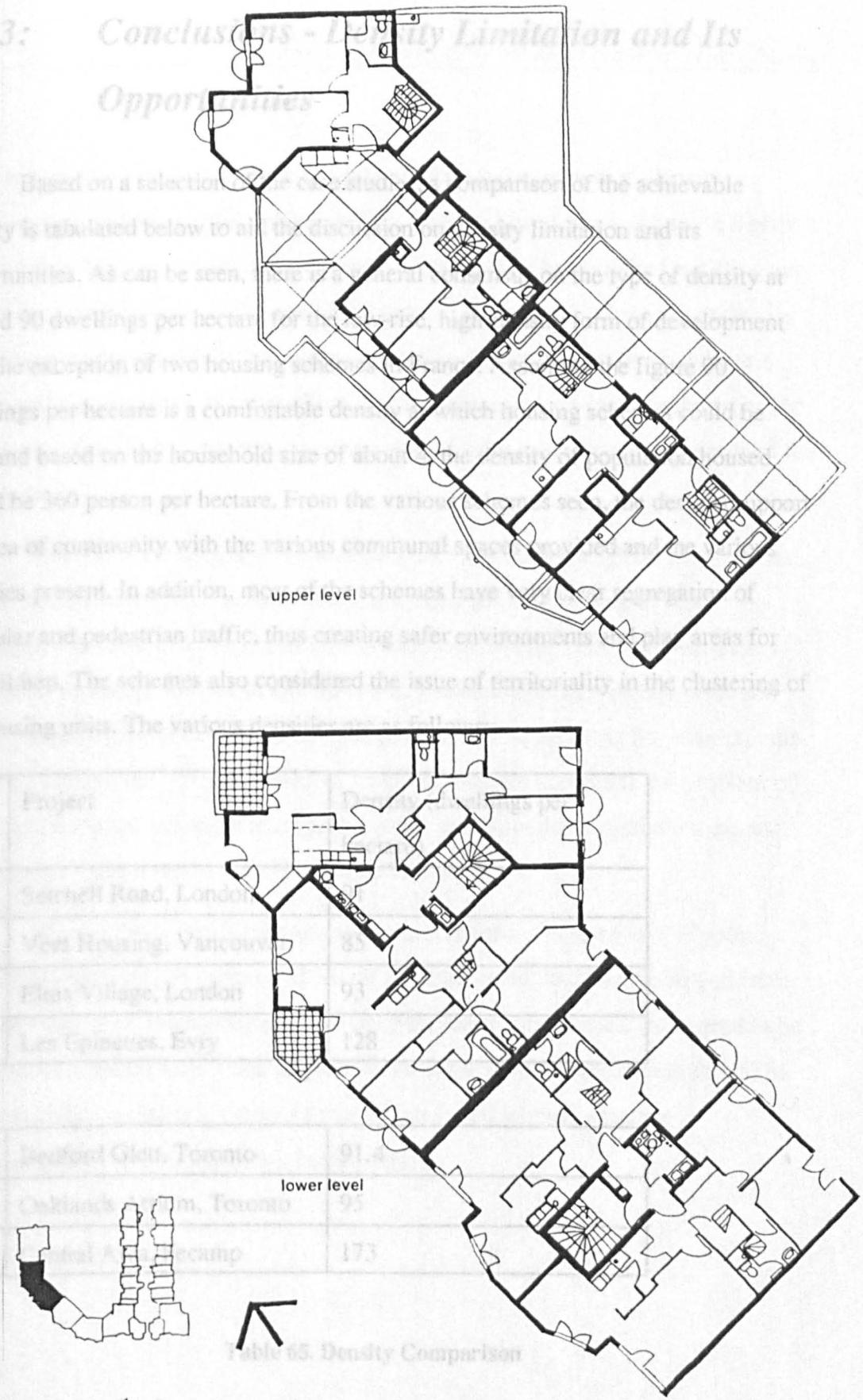


Figure 194 . Floor plans, Les Epinettes, Evry

A3.3: Conclusions - Density Limitation and Its Opportunities

Based on a selection of the case studies, a comparison of the achievable density is tabulated below to aid the discussion on density limitation and its opportunities. As can be seen, there is a general consensus on the type of density at around 90 dwellings per hectare for the low-rise, high-density form of development with the exception of two housing schemes in France. Assuming the figure 90 dwellings per hectare is a comfortable density at which housing schemes could be built and based on the household size of about 4, the density of population housed would be 360 person per hectare. From the various schemes seen, the designs support the idea of community with the various communal spaces provided and the various facilities present. In addition, most of the schemes have very clear segregation of vehicular and pedestrian traffic, thus creating safer environments and play areas for the children. The schemes also considered the issue of territoriality in the clustering of the housing units. The various densities are as follows:-

	Project	Density (dwellings per hectare)
1.	Setchell Road, London	91
2.	Vera Housing, Vancouver	85
3.	Elms Village, London	93
4.	Les Epinettes, Evry	128
1*.	Bedford Glen, Toronto	91.4
2*.	Oaklands Atrium, Toronto	95
3*.	Central Area, Fecamp	173

Table 65. Density Comparison

1*, 2*, 3* - Included for purpose of comparison.

Clearly from the above, there is a close correlation between density limitations

and its opportunities. It is an issue of tradeoff when it comes to high-density development and the question of how high is high, or how dense is dense. In higher density development, certain environmental concerns may be sacrificed resulting very ineffective environment as discussed in Chapter 2. Vice versa, in lower high density development, the potential environment created in the housing layout may have a better and higher chance of being effective environment which can be enjoyed by the residents. After all, the concept of housing should be to meet the various needs of the residents.

The aim of creating new communities and in fostering neighbourliness must not be seen as a statistical problem that is involving the determining of ideal population and area of a neighbourhood around its shopping centre and secondary school, its sub-neighbourhoods around primary schools and then precincts around play-lots; and each circumscribed by its appropriate circle denoting however minutes of walk. Though the 'game of numbers' help designers to appreciate the problem of housing the masses in a more manageable scale, we learned that right numbers and sizes do not make a community (Buchanan 1985)

'A community needs coherent and cohesive form and some sort of public realm beyond roads and parks to which all residents relate to. Neighbourhoods then need not only clear boundaries and foci but their roads and dwelling units need to be disciplined to define streets that suggest social units. In turn these streets should be hierarchically organised to create a sense of integrated wholeness to the neighbourhood,' according to Buchanan (1985).

Appendix 4:

Addressing the issue of Sustainability in Housing and Urban Design

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> *'Sustainable Development' has become something of a bandwagon phrase. Politicians mouth it; planners state it as their objective; developers lay claim to it. But many of these claims are so much hollow rhetoric. The phrase is being used as a badge of environmental respectability, or as an incantation which by mere repetition will work miraculous change. The problem is to know what it means.....how to convert armchair rhetoric into practise.*
>
> (Barton, 1996)

The guide book entitled "Sustainable Settlements" by Barton et al (1995) is a manual of practice in the field of sustainability. It is undoubtedly a landmark in the evolution of planning practice in the United Kingdom. The challenge of designing a resource-conserving and climatically appropriate tropical city was highlighted in the mid-1980s. Beinhart (1985) observes that it is apparent that there is a serious lack of a model developed exclusively for the city in the Tropics. City planners and architects in Southeast Asia, as elsewhere, cannot escape responsibility for the environmental crisis which threatens our planet. It is essential that every design decision should be sensitive to the ecological repercussions at a local, regional and global level (McHarg, 1969).

In considering the issues relating to sustainability in housing and urban design, this study draws lessons from Sustainable Settlements to identify some key principles of housing and urban design that contribute to a sustainable development. Inevitably the principles selected provide only what the author deems relevant to the context of Singapore. Most of these principles concerned with design at the neighbourhood scale, whereas the scope of the guide itself is much broader, ranging from strategic locational decisions down to the design of individual buildings.

A4.1: An introduction

During the 1980s, ecological perspectives on landscape, planning and design, gradually made their presence felt in a variety of initiatives, plans and studies (Carmona, 1996). These broader concerns were encapsulated in the concept of 'sustainable development', emerging globally. (Brundtland Commission, 1987). According to him,

"the British Government's response drew together existing planning and environmental policies in the White Paper 'This Common Inheritance', which made the interrelationships between policies, and the obvious gaps, very clear." Furthermore, he added:

> *Meanwhile, the European Commission's 'Green Paper on the Urban Environment', also published in 1990 identified a range of urban quality concerns, such as appropriate open and civic space provision, which along with concepts such as compact and mixed forms of development and the maintenance of regional identity, developed an agenda for 'green' urban design.*
>
> (Carmona, 1996)

As a result, in the 1990s, the new generation of unitary and district-wide development plans are now grappling with how to integrate their traditional focus upon contextual design and urban conservation with the increasingly accepted sustainable imperative.

A4.2: Sustainability:- What does it mean?

Most definitions of urban design now include reference to a sustainable dimension. Tibbalds (1992) talks about creating 'lasting environments', Lang (1994) is concerned about the 'biogenetic environment' as 'the setting, or physical frame for human life'. The Urban Design Group (1994) in Britain itself in its 'Agenda for Urban Design', includes the statement that 'urban design is concerned with the careful stewardship of the resources of the built environment in the creation and maintenance of ....the public realm. Similarly, a key limitation of one of the best known theoretical frameworks for urban design 'Responsive Environments' has long been recognised by its authors as the omission of the ecological dimension. Subsequently, Bentley (1990) attempted to redress this weakness in a short paper entitled 'Ecological Urban Design' (Carmona, 1996). Carmona observes that this paper added energy efficiency, cleanliness and wildlife support as sustainability concepts to the core 'responsive' concepts of permeability, variety, legibility and robustness.

The environmental and ecological dimensions of urban design have steadily

emerged, driven as much by practice and local initiative as by theoretical pronouncement. Many of the ideas about the interpenetration of town and country can be traced back to the pioneers of planning like Howard, Geddes and Unwin. Thus sustainable urban design now fits within a framework for urban design that includes the well established townscape, public realm and perceptual concerns. Blowers (1993) notes that of greatest significance in sustainability terms are the problems of depletion of scarce natural resources, escalating pollution and the destruction of bio-diversity.

Figure 195. Sustainable Urban Design (from Carmona, 1996)

Recent research has focussed upon the environmental stock as regards to global ecology (air quality, climate, bio-diversity), regional resources (air, water, land, minerals, energy resources) and the local human environment (buildings, infrastucture, open space, aesthetics, cultural heritage). Most arguments are based on that sustainability should focus on the satisfaction of basic human needs (shelter, health, food, employment) and the retention of self-sufficient ecosystems (Carmona, 1996). Carmona further identifies six key dimensions namely they are the spatial form, movement, design and development, energy, ecology and environmental management - which help to define a new set of issues to inform urban design theory and policy prescription.

In Barton et al's (1995) guide on Sustainable Settlements, 'sustainability' is taken as referring to global ecology, and 'development' is recognised as being much broader than economic growth. Sustainable development is therefore about maintaining and enhancing the quality of human life which encompasses social, economic and environment; while living within the carrying capacity of supporting eco-systems and the resource base. Accordingly the two key principles that emerge from this definition are:

- first, satisfying human needs, recognising the obligation for inter-generational as well as intro-generational equity; and
- second, increasing the level of self-sufficiency at different scales: building, locality, town, and region.

Successful environmental planning is seen as a matter of integration and collaboration among the public, private and environmental organisations. One of the problems facing planners, architects and designers is the fragmented nature of knowledge and practice. This resulted in tensions between different aspects of environmental concern. Very often, each area possesses its own set of experts and specialist agencies. The challenge facing us is to make sense of these disparate elements and Barton (1996) rightly notes that only collaboration between all interests and the involvement of agencies and people at different levels can ensure that sustainability works. He gives the example that the value of green design may be severely compromised by the process of construction and by subsequent users' ignorance. and more broadly, the market and

institutional trends towards a car-based dispersed pattern of land use may seem too powerful to be reversed. However, though the odds are there, there is a remarkable and widespread shift in attitudes taking place as discussed in the Introduction earlier on.

The following are some of the principles on sustainability selected to be part of the proposed conceptual framework for an alternative urban, high-density, low-rise housing design applicable to the context of Singapore. Where necessary certain design parameters have been adapted to suit the local tropical climatic conditions in Singapore.

A4.3: Principles for sustainable development

A4.3.1: Principle 1: Increasing Local Self-Sufficiency.

Barton (1996) proposes that one way of approaching the problem of sustainable design is to see each development as an organism or a mini eco-system in its own right. A home, or an estate, or a town is an eco-system in the sense that it provides the essential local habitat for the people. It creates its own micro climatic conditions, and therefore should provide as far as possible for their comfort and sustenance.

A settlement is like a living organism in that it has the capacity to reproduce or renew itself and Barton refers this to the people and the built environment. On one hand, it ingests quantities of food, fuel, water, oxygen and other raw materials. On the other hand, it ejects waste fuels, solids and atmospheric emissions (Figure 196)

This concept is relevant at a range of different scales, from individual home or building up to a region. At every level the designer or decision maker should be trying to maximise the level of autonomy of the ecosystem while enhancing its life-giving qualities. In essence, that implies reducing the dependence on the environment for resources, and logically reducing the pollution of the wider environment by waste products.

Figure 196. A settlement seen as an ecosystem -like a living organism, having the capacity to reproduce or renew itself. There is a need to reduce dependence on the wider environment for resources and reduce pollution by waste products (from Barton, 1996)

A4.3.1.1: What is local?

Barton feels that it is awkward to identify the smallest appropriate unit for a given aspect of the environment. The temptation is to adopt the area of responsibility or administration. However, the Guide suggests defining 'local' by:

- the pattern of human behaviour - for example the commuting hinterland of a town is the relevant scale when dealing with broad questions of land use/transport integrations, irrespective of local neighbourhood boundaries. Easy walking distance is a key factor in relation to local shops and services.
- the availability of practicable technology - for example the individual building is potentially the most relevant unit in relation to cooling, being technically capable of

self-sufficiency.

However, he warns of mechanistic assumptions as factors may apply at several different levels, and vary between places and over time.

A4.3.1.2: Local Diversity

Greater self-sufficiency at any particular level will imply a move away from the "monoculture" ethos which has prevailed in the recent era. Uniformity need to be replaced by a rich diversity, zoned uses by mixed uses, car-dependence by choice of mode and single tenure estates by mixed tenure. At the level of the neighbourhood the principle of increased local autonomy can be reflected in:

- clustering of local jobs and facilities at the heart of the area,
- the provision of a wide range of housing types,
- building energy demand management,
- use of local energy sources where possible,
- reduction of water demand and use of local water sources,
- local treatment of foul and surface water and
- recycling of wastes locally.

It is recognised that some of these run counter to current trends, yet they are technically feasible and the ecological reasons for pursuing them are paralleled by social reasons.

A4.3.2: Principle 2: Human Needs

According to Barton, the eco-system principle safeguards environmental integrity and it should be matched by concern for human needs. The starting point for sustainable development is the satisfaction of basic human needs of shelter, health, opportunities for

work, access to facilities and a pleasant environment. Social and environmental goals are often mutually reinforcing. For example, the provision for a range of different kinds and sizes and tenures for housing in a neighbourhood increases both social choice and environmental sustainability. An energy-efficient housing stock reduces fuel poverty and helps ensure comfort level, as well as cutting fuel use and pollution. The improvement of the local environment brings about traffic reduction and walking is made more pleasant, health enhancement and aesthetic enjoyment as well as a reduction in exhaust emissions. An attractive, safe and well supervised pedestrian environment can also work towards social stability and the creation of a sense of community.

A4.3.3: Principle 3: Structure Development Around Energy-Efficient Movement Networks

While most modern development planning uses the road network as the key structural element, a sustainable design takes the circulation of people on foot and bike and the effectiveness of public transport as starting points. The rationale is to reduce the level of car reliance and to reduce the need to travel. This in turn comes with the social benefits of increasing transport choice for all groups of people in the population, and further enhances local security and community.

The infra-structure of public transport provision in a privatised system is not purely for the private operators. Barton notes that when setting out a development brief for an area, the planner can effectively predetermine the viability of public transport by the disposition of roads, footways and land uses. The operators should be brought into the consultation process as early as possible. The overall pattern of development should then be designed so that a good level of public transport accessibility is afforded to all parts of the development with the minimum number of routes. The points where routes meet or cross (nodes) then become the locations for jobs and services.

A4.3.3.1: Pedestrian Permeability and Access

There is a tension between the conventions of cul-de-sac housing layouts, with alley links often blocked to reduce danger and escape routes, and the need for a dense network of routes giving good 'permeability' and maximum access of any place to another. Barton suggests that the answer lies partly in good layout, which ensure any links between cul-de-sacs are easily policed by residents and avoiding threatening features such as blind corners or thick shrubbery on the pathway. The answer also lies in creating neighbourhoods where walking is the natural and pleasurable means of access between activities and which becomes a social activity in itself. Therefore, the number of people on the streets and paths itself provides security.

Plans and development briefs need to specify clearly the way the local network should link seamlessly into networks in surrounding areas. It should identify key desire lines from housing to services, jobs and leisure activities. The main routes should radiate out from local centres/bus stops with the variety and attractiveness of the potential walk experience, and the absence of points of intimidation or severance. The distances people are prepared to walk help define the pattern of housing and local facility provision. At the risk of undue prescription, the Guide suggests specific and achievable standards. A few of these standards - particularly the 400 metre maximum between home and a potentially good bus route - can perhaps provide a "bottom line" for siting and layout negotiations.

A4.3.4: Principle 4 - The Open Space Network

Traditionally, open space is seen in terms of the provision of separate spaces for different interests. Now there are compelling reasons notes Barton, to plan open space networks serving a number of interrelated purposes. They are:

- open space network with footpath and cycling links,
- local provision of parks, play areas, sports fields,

- wildlife refuges and corridors,
- local treatment of foul and surface water and
- pollution absorption and sound attenuation.

A4.3.5: Principle 5 - Linear Concentration

While compactness (as in the EU's compact city ideal) may be a desirable attribute for sustainable settlements, especially when these settlements are human-scaled (less than 5 km radius, easy cycling distance), there are obvious disadvantages if gross densities become too high. Barton remarks that the possible problems are summed up by the highly loaded phrase "town cramming", implying loss of open space, reduced choice and flexibility, less room to breathe. However, the implication of planning for public transport and for open space corridors is linearity rather than compactness.

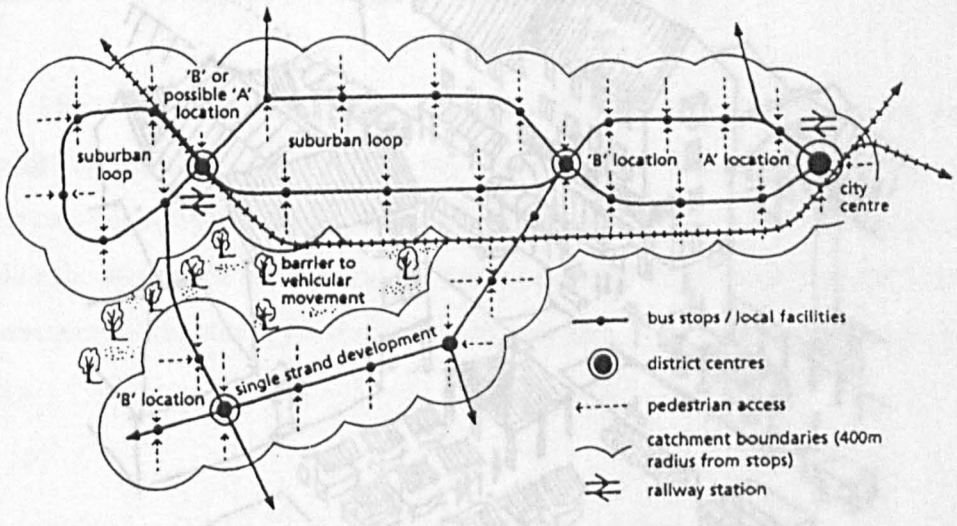


Figure 197. Principles of pubic transport planning indicating linear catchment zones to bus stops and central area magnets at 'A' locations served by the rail (equivalent to Singapore's MRT system) system (from Barton, 1996)

He continues:

> *Use intensity could vary in relation to the level of public transport accessibility and closeness to prime pedestrian foci, grading from high intensity uses near local high streets to low intensity uses near open country, open space wedges, or major roads. Linear bands of higher intensity are thus complemented by urban greenways. The overall average density is still likely to be higher than conventional late 20th century suburban development.*
>
> (Barton, 1996)

This is not so much because housing is at higher densities (though balanced provision of flats and terraced housing for the growing number of small households could influence that) but because commercial uses should be at high density. He feels strongly that the current fad for retail and office parks on the urban fringe, surrounded by vast car parking are hostile both to pedestrians and public transport operation, should be relegated to history. Instead, employment and service facilities should, where possible, be concentrated in mixed use town and district centres. The traditional local high street provides one useful model we can follow.

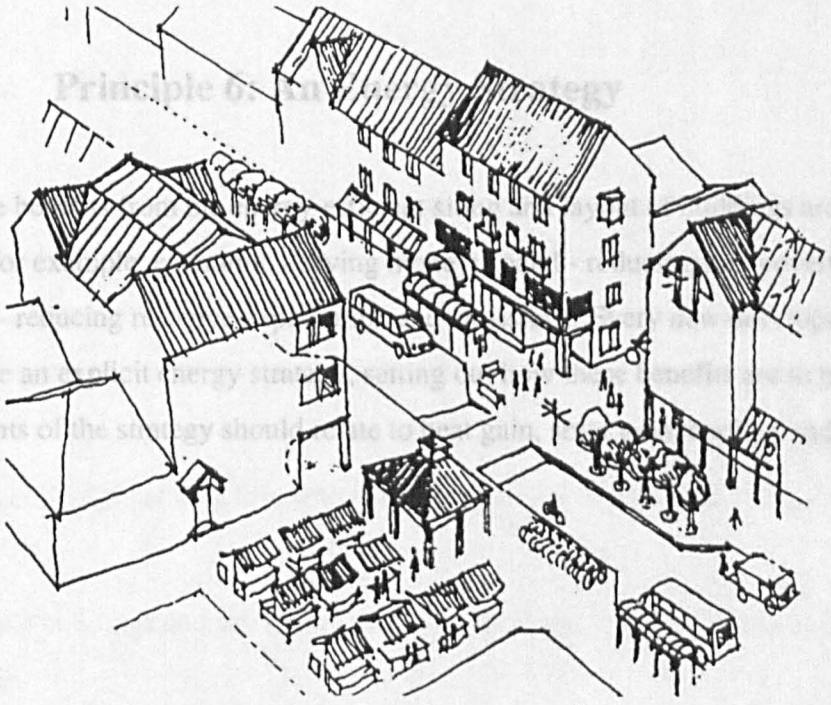


Figure 198. Possible use of high street form acting as a social focus for the community (from Barton, 1996)

A4.3.5.1: The future high street

The linear concentration of varied retail, social, cultural and commercial activities, plus flats and town houses, along a 'high street' provides varied benefits by comparison with compact centres. Some of these benefits are:

- better access from homes to the local facilities,
- flexibility of hinterland size for facilities over time and at any time,
- a wide range of property values, permitting marginal users frontage space,
- a common focus for main pedestrian, bus and bike routes and
- a linear, mixed use focus for possible district cooling mains.

Existing high streets should be maintained or rejuvenated, and in new areas the potential for progressive development of a new high street, acting as the social focus of the community, can be planned from the outset.

A4.3.6: Principle 6: An Energy Strategy

The benefits from the energy-efficient siting and layout of buildings are many. There are for example: economic - saving money; social - reducing fuel poverty, and ecological - reducing resource exploitation and emissions. Every new development ideally should have an explicit energy strategy, setting out how these benefits are to be achieved. The elements of the strategy should relate to heat gain, solar gain, cooling and embodied energy.

A4.3.6.1: Reducing heat gain

The form of buildings (detached, terraced, slab or tower) can influence heat gain/loss by more than 50%. Another influence is siting in relation to wind exposure. To ensure minimum long-term fuel consumption, the following should be considered:

- insulate the dwellings and increase cross-ventilation,
- increase the proportions of shophouse forms and terraces in any scheme, thereby also providing for changing patterns of household formation,
- use landscape creatively to provide more sheltered microclimate for buildings and external spaces,
- encourage layouts which increase 'wind tunnel' effects,
- minimise solar heat gain and
- use of shading devices as filters.

A4.3.6.2: Embodied Energy

According to Barton, the energy input required to quarry, transport and manufacture building materials, plus the energy used in the construction process, can amount to a quarter of the life-time's energy requirement of a very energy-efficient building. To reduce embodied energy, without compromising longevity or efficiency, he suggests:

- design buildings for long life, with ease of maintenance and adaptability to changing needs,
- construct buildings and infrastructure out of local and low-energy materials where possible,
- reduce the proportion of high rise, detached or single-storey developments,
- design layouts which minimise the extent of roadway and utility pipework per

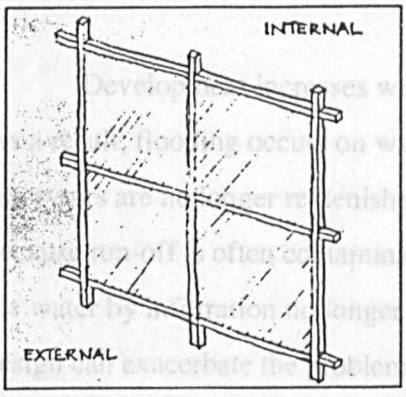
dwelling,

- re-use existing buildings and structures wherever possible and
- create a strategy.

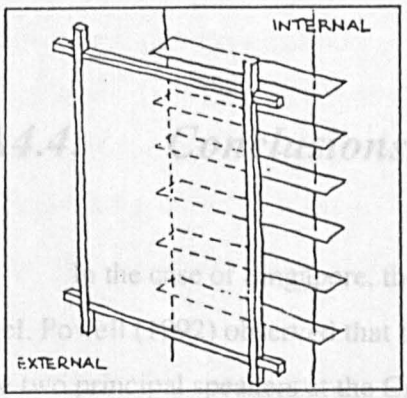
Every community and every development needs to have an explicit energy strategy which works to reduce heat gain and the embodied energy while opening up possibilities of renewable energy use. The possibility of using photovoltaic technology to tap on the existing solar energy source has yet to be explored in depth, but one which has great potential in the tropics

Shading Devices To Reduce Heat Gain

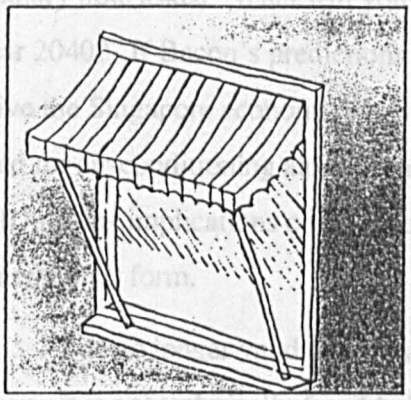
The following are some of the shading devices which can act as filters to reduce heat gain (from Yeang, 1987)



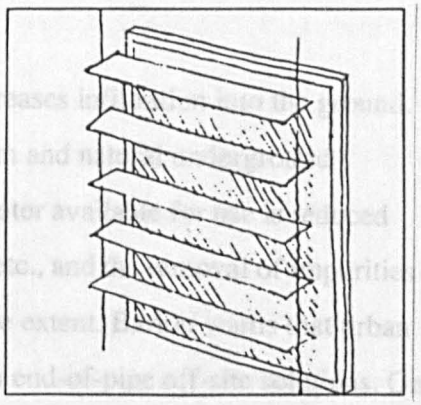
a. Tinted glass or applied reflective surface offers protection in any orientation but has thermal problems associated with accompanying exterior dazzle from the reflective films.



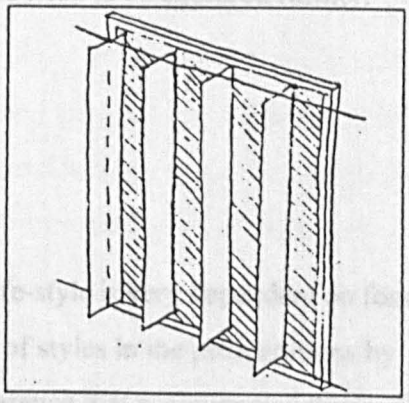
b. The easily installed internal louvres intercept energy but tend to act as convector heaters with little control once the energy has been allowed to penetrate the glass.



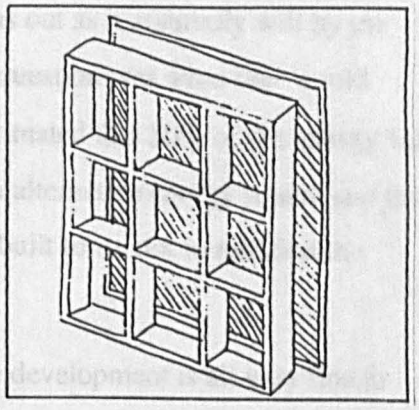
c. The traditional canvas shop blinds are simple but vulnerable to wind. Can be efficient when fitted with side chicks but limited to use on low-rise buildings.



d. Very efficient shading device from high-angle noon-day sun; can be fixed, movable, slatted or solid to promote ventilation. To reduce conduction of solar heat, preferably mounted clear of the building.



e. Efficient shading from low-angle sun in the morning and evening but with difficulty of protection on windows facing the east or west. Where solar impact is excessive use movable complete shutters.



f. The combination of (d) and (e) results in a group of smaller windows with deep reveals to provide for a better cut-off. Fixed fins can offer a separate structure from the building proper.

Figure 199 - Shading devices to reduce heat gain

A4.3.7: Principle 7: Water Strategy

Development increases water run-off and decreases infiltration into the ground. As a result, flooding occurs on waterways downstream and natural underground reservoirs are no longer replenished. The quality of water available for use is reduced because run-off is often contaminated by vehicle oils etc., and the removal of impurities in the water by infiltration no longer happens to the same extent. Barton warns that urban design can exacerbate the problems further, relying on end-of-pipe off-site solutions. On the contrary, it can work towards sustainable solutions, by minimising consumption, encouraging on-site infiltration and waste treatment. The appropriate technologies for roof water collection and purification and use therefore need to be explored further.

A4.4: Conclusions

In the case of Singapore, the sustainability of life-style is very dependent on fossil fuel. Powell (1992) observed that there was a contrast of styles in the presentations by the two principal speakers at the City Trans-Asia conference that accompanied the launch of the Singapore Revised Concept Plan. For example, Singapore's former Chief Planner, Liu (1991) gave an upbeat vision of the future of the island. In contrast, Bacon's (1991), salutary note asked "What will you do when the oil runs out as it assuredly will by the year 2040?" If Bacon's predictions were accurate, the question was what fuel would drive the Singapore economy when currently it was estimated that 50% of the energy was used for air-conditioning alone? Singapore will need an alternative energy source and this will have its implications on urban design and housing built form, not to mention the general built form.

It is no longer valid to say that while sustainable development is all very fine in theory, it is not technically feasible in practice. On the contrary, most of the principles and techniques of sustainable design are tried and tested, though admittedly on an disaggregated basis. What is new is the challenge and obligation to adopt them

comprehensively at all the different levels. Barton feels that if the reason for inaction is not technical, then it is due to the conservatism of the market, to political, bureaucratic and professional inertia.

Sustainable development provides a purpose and rationale for housing and urban design. To Barton, it is a goal which is above the relativism of competing financial interests or aesthetic preferences. Achieving it is difficult, relying on consistent, committed application from both the government and private sector. It will not be possible without effective collaboration arrangements between environmental, energy, water, transport, planning and development interests. Therefore, it has to be seen as a community and inter-agency goal.

Development can only proceed hand-in-hand with the sustainable use of resources and ecologically-conscious design will ensure that the future of the planet is not heavily mortgaged. There must be a radical shift in our values and sensibilities, expressed in a code of 'environmental ethics' for professionals concerned with the planning, design and administration of the built environment. Ecologically-consciousness must become a cornerstone of professional practice.