

**URBAN TRANSPORT STUDY  
IN  
GREATER METROPOLITAN AREAS  
OF  
GEORGE TOWN, BUTTERWORTH AND BUKIT MERTAJAM  
MALAYSIA**

**PILOT STUDY OF LAND UTILIZATION  
IN RESIDENTIAL AREAS**

**TECHNICAL REPORT - 17**



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**GOVERNMENT OF  
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TECHNICAL REPORT 17

PILOT STUDY OF LAND UTILIZATION IN RESIDENTIAL AREAS

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## 1.0

### Introduction

Residential use is a major category of landuse. As such a study of residential areas is important in aiding a better understanding of the particular landuse and subsequently to help in future projection for planning purposes.

In any planning for the future, population density must be decided on. Many factors have to be considered in the process, particularly those related to density. As such a study on some of these relationships between various aspects of the landuse will help in providing a guide to the proposed density and plan.

## 2.0

### Objective of the Study

This paper covers an overall study of various residential areas in Penang Island. The aspects studied include demographic and socio-economic characteristics, in addition to aspects on density, housing, traffic and environmental conditions.

It is hoped that from these case studies it will be possible to draw some general and specific conclusions on the related aspects and the inter-relationships of variables.

The residential areas studied include:-

- 1) Pulau Tikus
- 2) Hill Railway area in Ayer Itam
- 3) Island Park
- 4) Sungai Pinang
- 5) Island Glades
- 6) Reservoir Garden
- 7) Bayan Baru
- 8) Rex Theatre
- 9) Kampong Melayu
- 10) Rifle Range

Figure 1.1 shows the location of the study areas.

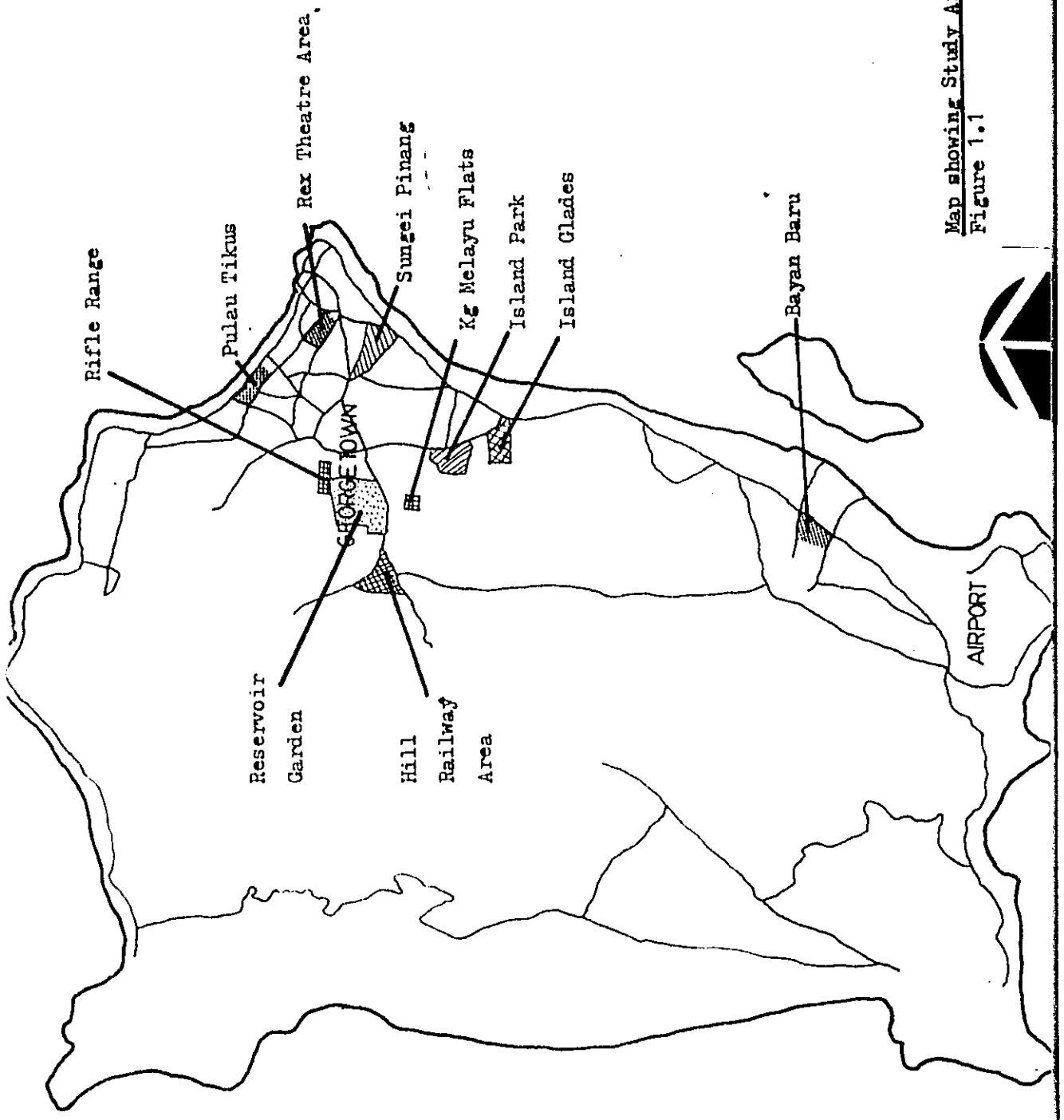
## 3.0

### Major Findings

## 3.1

### Summary of Residential Area Study

The main details of the residential areas are summarized in Table 3.1.



Map showing Study Areas  
Figure 1.1



3.1 Table 3.1 Summary of Residential Area Study

Residential Area	Traffic Zone	Population	No. of Housing Units	Type of Housing	Gross Density		Net Density		Car Trips Generated		Motorcycle Trip Generated	
1. Pulau Tikus	124	12,300	2050	mixed	39	59	59	7592	3286			
2. Hill Railway	143	2832	469	mainly temporary type-detached	82	90	90	318	670			
3. Island Park	142	5900		permanently terrace & semi-detached	100	226	226	5001	798			
4. Sungei Pinang	133	6166	1104	mixed	122	318	318					
5. Island Glades	331	6400		permanently mixed types	132	240	240	7464	2543			
6. Reservoir Garden	142	2884	556	mainly permanent & terrace type	105	142	142	1736	1264			
7. Bayan Baru	411	2327	544	permanent housing -terrace, semi-detached	174	298	298	1010	1321			
8. Rex Theatre	121	5,500	826	mainly terrace	147	222	222					
9. Kampong Melayu	142	3056	673	permanently type-mainly flats	532	654	654	549	1250			
10. Rifle Range	143	13,700	3758	permanent type mainly flats	1706	2287	2287	2122	5415			

### Types of Population Density

According to the guideline of the interim zoning plan, five types of net population density are classified as follows:-

Table 3.2 Density Types

Density Type	Persons/hac.	Persons/ac.	Units/ac.
Low Density	15 - 89	6 - 36	1 - 6
Low Medium	90 - 220	36 - 89	7 - 16
Medium Density	221 - 440	89 - 178	16 - 30
High Medium Density	441 - 880	178 - 356	31 - 60
High Density	Above 880	Above 356	Above 60

The residential areas have been classified according to the types of density as follows:-

- Low density - Pulau Tikus
- Low medium - Hill Railway Area (Ayer Itam)
  - Island Glades
  - Island Park
  - Sungei Pinang
  - Reservoir Garden
- Medium density
  - Bayan Baru
  - Rex Theatre Area
- High medium - Kampong Melayu Flats
- High density - Rifle Range

## 3.2

Problems of Residential Areas

The major problems of the various residential areas can be summarized in the table below:-

Table 3.3 Problems of Residential Areas

Residential Area	Density	Main Problems of Area
(1) Pulau Tikus	Low density	<ul style="list-style-type: none"> <li>* Congestion in the main roads</li> <li>* Poor accessibility in certain areas</li> <li>* Lack of parking in commercial areas</li> </ul>
(2) Hill Railway area (Ayer Itam)	Low medium	<ul style="list-style-type: none"> <li>* Poor housing condition</li> <li>* Poor drainage &amp; accessibility</li> <li>* Lack of proper roads for vehicles.</li> </ul>
(3) Island Park	Low medium	<ul style="list-style-type: none"> <li>* Insufficient open space &amp; commercial facilities</li> <li>* Noise &amp; safety problems on secondary distributor.</li> </ul>
(4) Island Glades	"	<ul style="list-style-type: none"> <li>* Traffic congestion in certain parts &amp; lack of parking space</li> </ul>
(5) Sungei Pinang	"	<ul style="list-style-type: none"> <li>* Environmental problems like noise &amp; air pollution particularly due to the small-scale industries in the area</li> <li>* Poor accessibility, drainage &amp; road condition</li> <li>* Poor housing condition</li> </ul>
(6) Reservoir Garden	"	<ul style="list-style-type: none"> <li>* Lack of accessibility for certain parts of the area.</li> </ul>
(7) Bayan Baru	Medium density	<ul style="list-style-type: none"> <li>* Noise from traffic in the main road</li> <li>* Congestion at the entrance of residential area at certain periods for vehicles</li> </ul>
(8) Rex Theatre	Medium density	<ul style="list-style-type: none"> <li>* Lack of open space</li> <li>* Environmental problems like noise &amp; air pollution</li> <li>* Congestion of traffic &amp; parking problem</li> <li>* Pedestrian &amp; Vehicular conflict.</li> </ul>
(9) Kampung Melayu	High medium	<ul style="list-style-type: none"> <li>* Environmental problems like noise &amp; air pollution</li> </ul>
(10) Rifle Range	High density	<ul style="list-style-type: none"> <li>* Overall congestion of people</li> <li>* Lack of open space</li> <li>* Environmental problems like noise &amp; air pollution</li> <li>* Congestion of traffic at certain times &amp; parking problems</li> <li>* Pedestrian &amp; Vehicular conflict</li> <li>* Much social problems as a result of physical problems</li> </ul>

Some general points can be observed as follows:-

- 1) Planned residential areas at low medium density with good accessibility in the form of an elaborate system of roads taking up to 30% or more of the total land area, will still face certain congestion problems. This could be mainly due to the higher income level and correspondingly a higher vehicle ownership rate.
- 2) Unplanned residential areas will face much problems of a lack of good accessibility and poor drainage.
- 3) At medium density, residential areas face even greater problems of traffic congestion than those of low medium density particularly if vehicle ownership is comparatively high as in Bayan Baru or where there is a high percentage of through-traffic.
- 4) High medium density housing experiences some form of environmental problems although not too severe. The fact that vehicle ownership rates are low help to reduce the problems of traffic congestion.
- 5) High density housing will generally experience much problems of an overall congestion of both people and traffic as in Rifle Range. This can lead to some problems of safety and those of social nature. It is recommended that density control should not be allowed for a gross density exceeding 1500 persons per hectare.

### 3.3 Gross and Net Density<sup>1</sup>

In order to arrive at a rough relationship between gross and net density, an index measuring the ratio of the gross density to the net density was used. It has found that this index varied for different residential areas and was found to be mainly between 0.6 and 0.8.

A measure of the level of self-sufficiency was attempted in order to see the relationship between this index and the index of self-sufficiency as in the

From the Table, it can be seen that for more self-sufficient residential areas, the index lies between 0.5 and 0.7. For those with lesser facilities, the index lies roughly between 0.7 and 0.8. The only residential area that has very few facilities and depends wholly on an external area has an index of 0.9.

In general therefore, for a residential area it can be concluded that for self-sufficient neighbourhoods (i.e. where the lowest level of services are provided) the gross/net density index is approximately 0.65.

---

<sup>1</sup> Gross residential density - the population per unit area of land applied to residential neighbourhood as a whole or gross residential area, including land covered by dwellings, open spaces, roads, local shops and schools.

Net residential density - the population per unit area of land applied to residential land including dwellings and gardens, and half the width of the surrounding roads, excluding local shops, open spaces and schools.



Table 3.4

## Gross Net Density Index

Density	Residential Area	Index Gross Density /net density	Index of self-sufficiency	Facilities Available	Other Comments
Low	Pulau Tikus	0.66	B	Commercial facilities, school and religious facilities	Very large
Low Medium	Hill Railway	0.91	C	Few facilities available in area itself	
	Reservoir Garden	0.74	B	Some commercial facilities serving a wider region and religious facility	
	Island Glades	0.55	A	some commercial facilities, a school and religious facilities	
Medium	Rex Theatre	0.66	A	Many commercial and religious facilities and a school.	
	Bayan Baru	0.44	B	Commercial facilities and a community centre	Existence of large incidence open space
High Medium	Kg. Melayu	0.82	B	Some commercial facilities and a school	low-cost flats
High	Rifle Range	0.75	A	Some commercial facilities, a market and a school.	low-cost flats

### Relationship of density with income

Residential neighbourhoods consist of basically unplanned and planned areas. For the unplanned neighbourhoods whether of high or low income, the density is limited and generally the maximum is only at medium density not greater than a gross density of 260 persons per hectare. Examples of unplanned areas are Sungei Pinang area and the Hill Railway area in Ayer Itam, both of low medium density.

For planned neighbourhoods, the density is able to go up to 1500 persons per hectare or more as in Rifle Range. Since with planning the land is more fully utilised, generally the density can be slightly higher except for high income areas like Pulau Tikus where low density is preferred.

Low medium density areas will be generally limited to only medium or higher income housing as low-cost housing cannot afford this density. Examples of these are Reservoir Garden, Island Park and Island Glades.

At medium density, Bayan Baru is able to incorporate some low-cost housing together with their medium-income housing. Medium density is also typical of all urban neighbourhoods in the CBD or at the fringe of the CBD where the housing units are mainly terrace units. An example is the Rex Theatre area.

High medium and high density areas generally are for low-income housing as at these densities, many environmental problems arise and the middle and high income people usually prefer lower densities.

### 3.4

#### Transport Aspect

The increasing traffic problems in residential areas show the importance of this aspect of study. Excessive traffic gives rise to noise and air pollution problems, reducing the environmental quality in the residential area. Other traffic problems like congestion at bottlenecks and lack of parking also exists in residential areas.

This part of the study summarizes some of the relationships between traffic and other landuse aspects.

#### 3.4.1

##### Accessibility

As can be observed from the table below showing the correlation between accessibility for vehicles to the residential area and vehicle/household rates, the residential areas with good accessibility have a generally much higher car ratio and a low motor-cycle ratio compared to those areas with poor accessibility. Areas with poor accessibility are noticed to have a higher motor-cycle ratio but lower car ratio.

Pulau Tikus, Reservoir Gardens and Island Park are residential areas with good accessibility, and their car ratio range from 0.6 to as high as 1.4 per household. But Sungei Pinang and the residential area off Penang Hill Railway, both having poor accessibility, have their car ratio ranging as low as 0.1 per household.

But a note of caution has to be observed for areas like the Rifle Range Flats, Kampung Melayu Flats, Rex Theatre and Bayan Baru. These areas have good accessibility but their car ratio is relatively low. The main explanation for this is accorded to the level of income of the residents which affects the car ownership rate directly. The low level of mean income probably explains the lack of ability of the residents to own cars, thus leading to a higher motor-cycle ratio.

Thus, it can be concluded that the standard of accessibility for vehicles to a residential area influences the vehicle/household rate of that residential area, holding income level constant.

Table 3.5

Measure of Accessibility against Vehicle  
Ownership Rates per Household

Residential Area	Accessibility vehicles per household	Good	Poor
	Hill Railway	Car	
M/C			0.43
Rifle Range	Car	0.12	
	M/C	0.38	
Rex Theatre	Car	0.30	
	M/C	0.68	
Island Park	Car	1.00	
	M/C	0.15	
Sungei Pinang	Car		0.12
	M/C		0.33
Kampung Melayu	Car	0.09	
	M/C	0.25	
Pulau Tikus	Car	1.39	
	M/C	0.44	
Island Glades	Car	not available	
	M/C	not available	
Reservoir Garden	Car	0.61	
	M/C	0.62	
Bayan Baru	Car	0.89	
	M/C	0.11	

### 3.4.2

#### Vehicle Population

Two kinds of population explosions have been the cause of much problems to the authorities in many parts of the world - of people and of cars. Problems arising from them can threaten to reduce the quality of the environment particularly when no planning has been done to overcome them. As such, it is necessary in any research to study the relationship of vehicle growth with other changing variables in order to have a guide for projection of future vehicle ownership levels.

#### The effects of income on motorization<sup>1</sup>

When countries are ranked by average income per person it becomes apparent that motorization and income are closely related. Figures 3.1 and 3.2 below presents a selection of 25 countries where income is correlated with motorization. The general trend is clear. Motorization seems to increase with income. Income is seen to also have an effect on motorization at city levels as in the next figure.

More important in our study is the effect of income on motorization within cities, at the neighbourhood level.

Motorization rate is taken as the number of households owning vehicles.

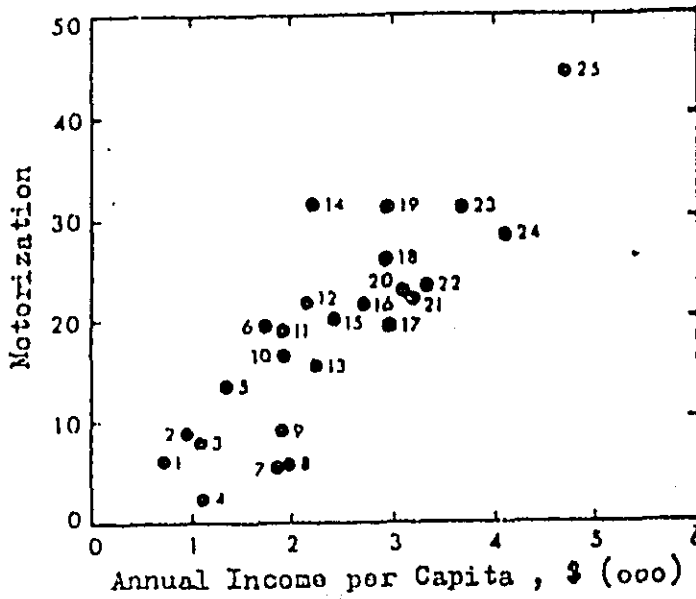
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<sup>1</sup> Note: Motorization is taken as the number of households owning vehicles.

Figure 3.1

Motorization vs. Income in  
Selected Countries, 1970

- 1 Portugal
- 2 Spain
- 3 Argentina
- 4 Greece
- 5 Ireland
- 6 Italy
- 7 Israel
- 8 Libya
- 9 Japan
- 10 Austria
- 11 Puerto Rico
- 12 U.K.



- 13 Finland
- 14 New Zealand
- 15 Netherlands
- 16 Belgium
- 17 Norway
- 18 France
- 19 Australia
- 20 W. Germany
- 21 Switzerland
- 22 Denmark
- 23 Canada
- 24 Sweden
- 25 U.S.

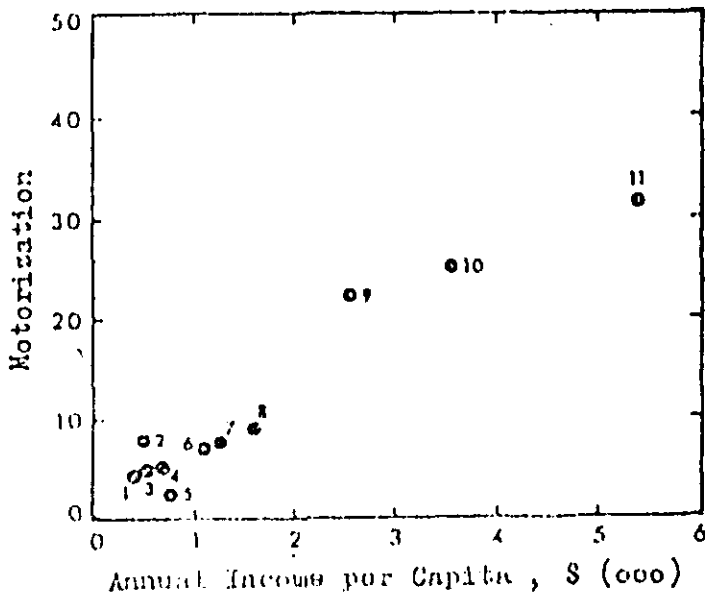
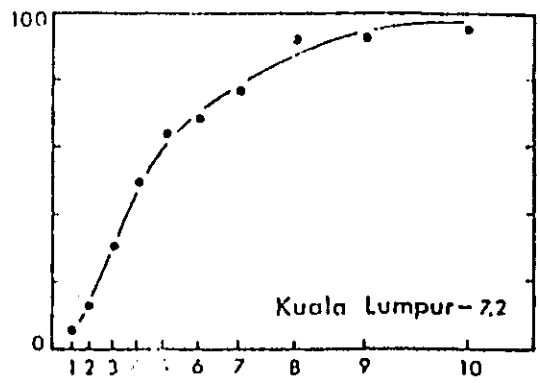
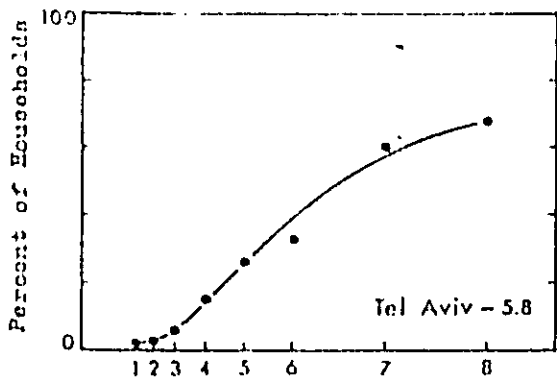
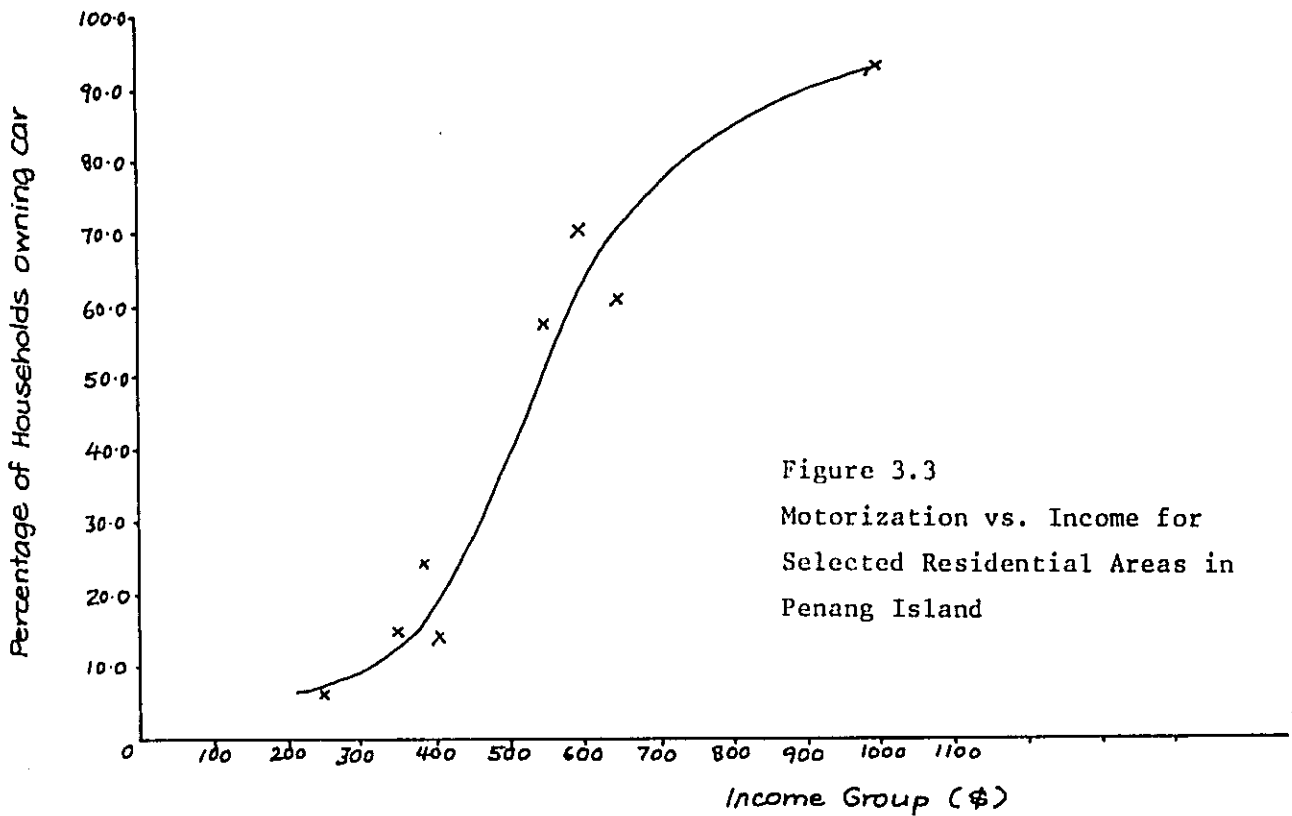


Figure 3.2

Motorization vs. Income in  
Selected Countries, 1970

Effects of Income on Motorization Within cities

Figure below shows the percentage of households owning a car vs their income level. The result is a S-shaped curve where the percentage of households owning a car initially increases slowly with increase of income but after \$400.00 per month it rises steeply until \$700.00 when it starts to level slightly. The curve is similar in shape when compared to that of Kuala Lumpur and other cities.



Households Owning Vehicles vs Motorization

An additional important relationship is the percentage of households at each given car motorization level not owning car and owning 1, 2 or 3 cars and motorcycles. The household motorization and the percentage of household owning the vehicles are taken as the average for each of the residential areas. The curves plotted out can be seen in figure below.

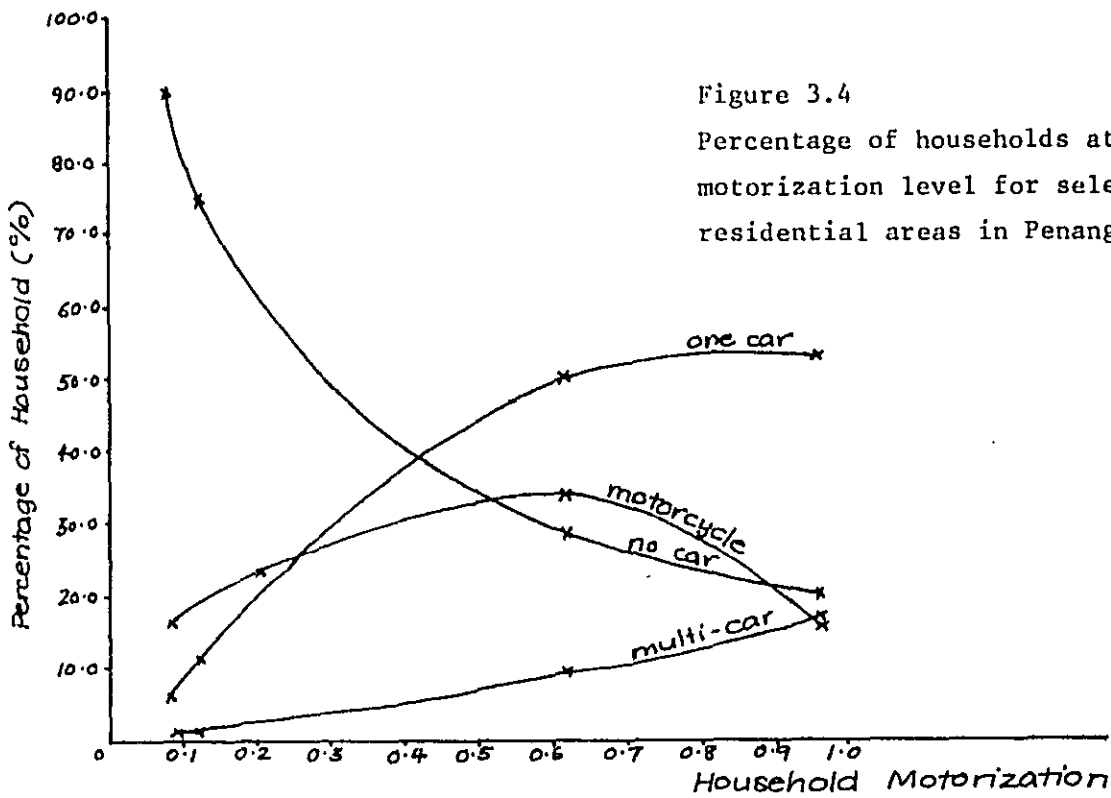
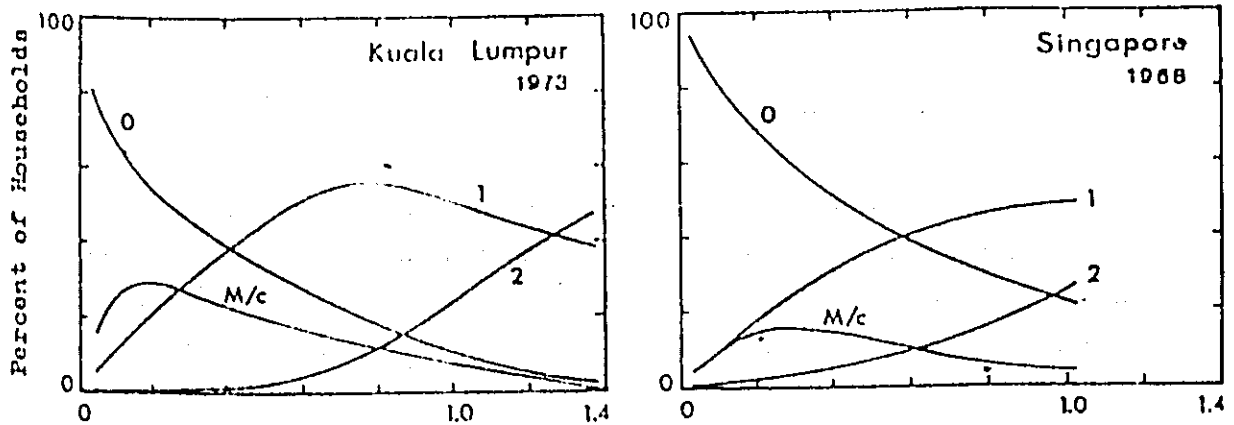


Figure 3.4  
Percentage of households at each motorization level for selected residential areas in Penang Island





Reasonably smooth curves can be obtained and when compared to that of Kuala Lumpur and Singapore, many similarities can be seen. The main difference lies in the curve for motorcycle as these two cities are basically very different from Georgetown in not having a high motorcycle rate.

At household motorization of 0.8, the curve for the one-car for Kuala Lumpur is at its maximum whereas for our study it is at 1.0 similar to that of Singapore.

The usefulness of these curves for Georgetown is that they help us to estimate the distribution pattern of vehicles among households.

Motorcycles

For most cities motorcycles are only important at low motorization levels. However the case in Georgetown is very different.

The increase in car motorization with a decrease in motorcycle motorization can be seen from the figure below presenting the motorcycle as a percentage of the car against the car motorization. The relationship seems to indicate a consistent trend even when compared to that of other cities i.e. Bangkok and Tel Aviv, except that Georgetown is at a high motorcycle motorization:

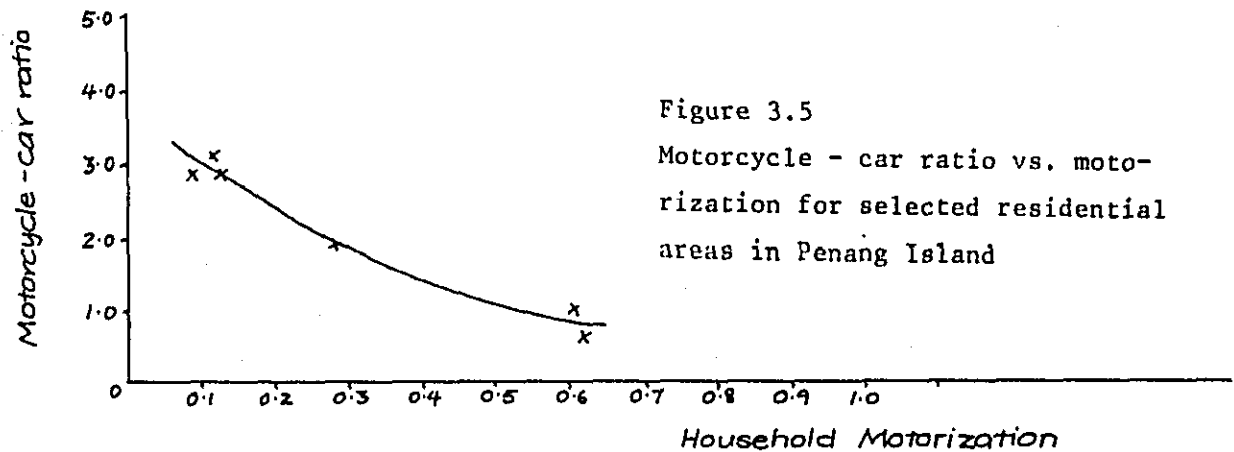
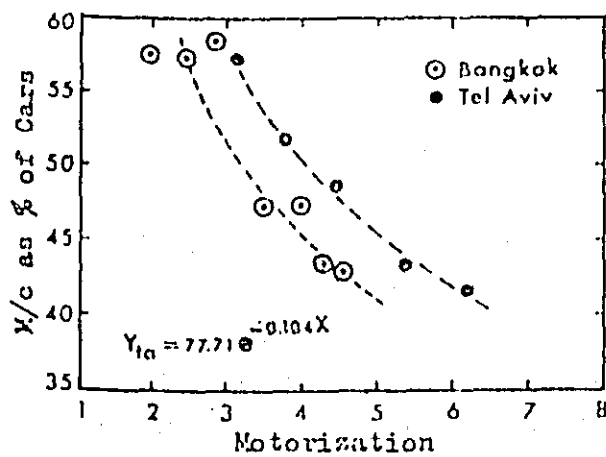
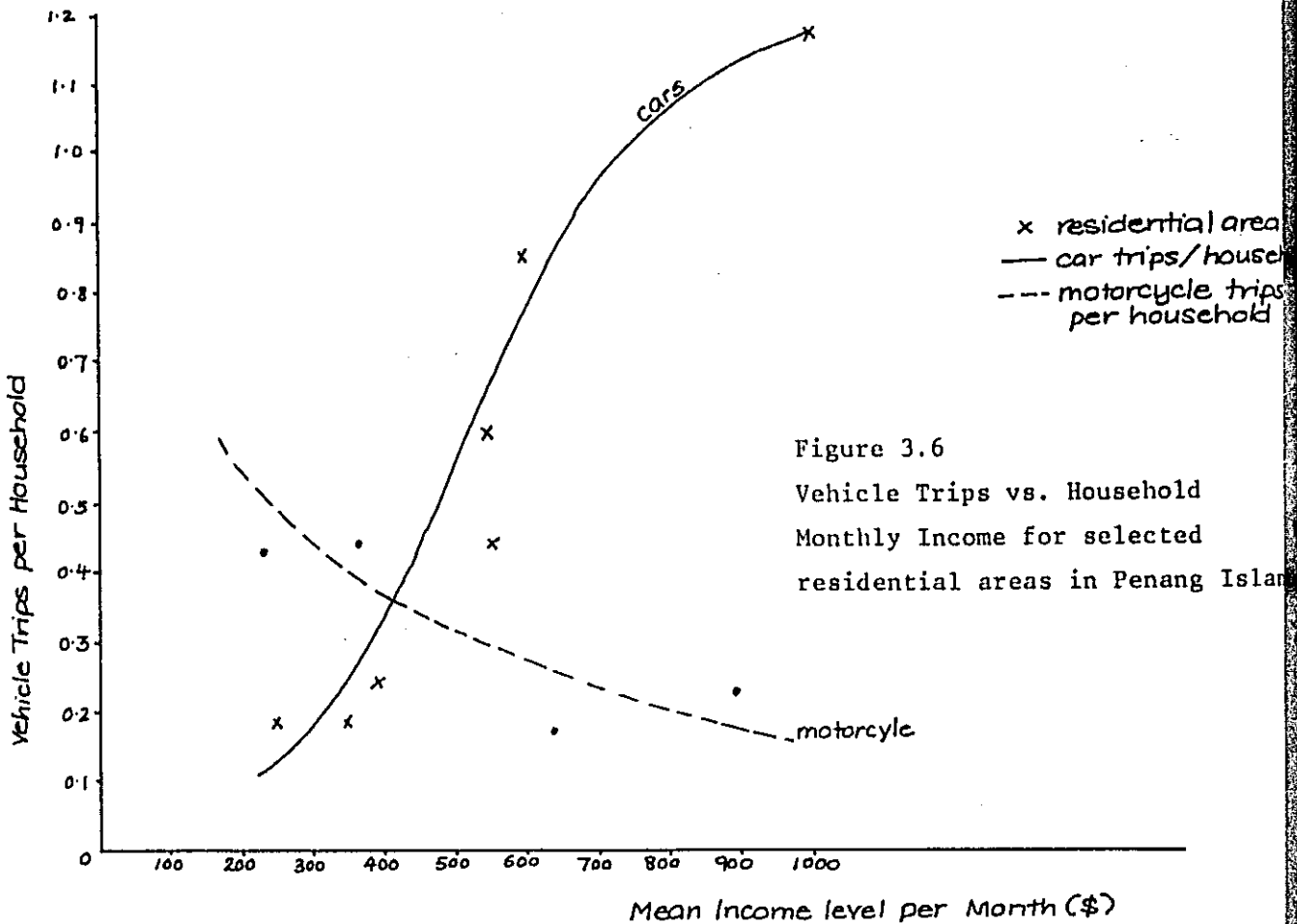


Figure 3.5  
Motorcycle - car ratio vs. motorization for selected residential areas in Penang Island



Proportions of Motorcycles

The case of motorcycle decreasing as cars increase meeting at a point as shown in figure below for Kuala Lumpur does not hold for Georgetown as motorcycles also increases as cars increases up to a certain level. As seen from the next figure, after a mean income level of \$500.00, the car rate increases whereas the motorcycle rate decreases.



We can conclude that Georgetown has a peculiar pattern of motorcycle ownership differing from other developing cities. The popularity of the motorcycle must be considered. To an extent, it effects the capacity of the roads in an area as motorcycles take up much lesser space than cars both in terms of road space for moving vehicles and parking space for stationary vehicles.

### 3.4.3 Vehicle Trip Generation

Vehicle trip generation is affected by many factors such as the rate of vehicle ownership, income, intensity of landuse, accessibility, road coverage and condition.

#### Vehicle Trips by Car/Household Rates

The number of car trips per household increases as the car ownership rate increases as shown below:- This indicates that as car ownership rates increase with higher income levels as shown in the section before, the number of trips will increase almost proportionately in the beginning. This of course will impose a heavy traffic problem on the roads in the area.

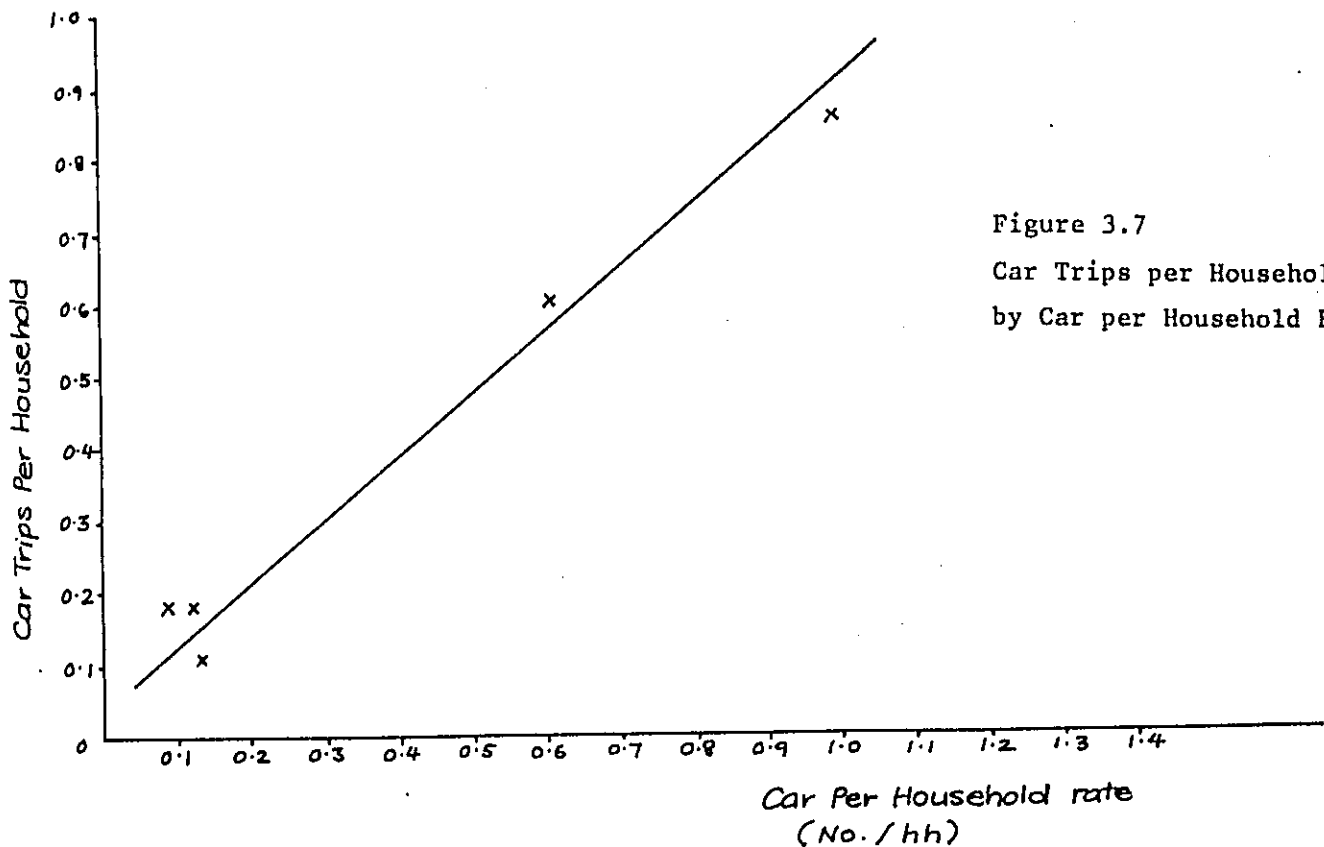


Figure 3.7  
Car Trips per Household  
by Car per Household Rate

### Vehicle Trips by Road Coverage

Vehicle trips per household increase with the increase of road coverage in the residential areas as shown in the figure below. This shows that the amount of road space provided will have some influences on the number of vehicle trips, probably in direct proportion.

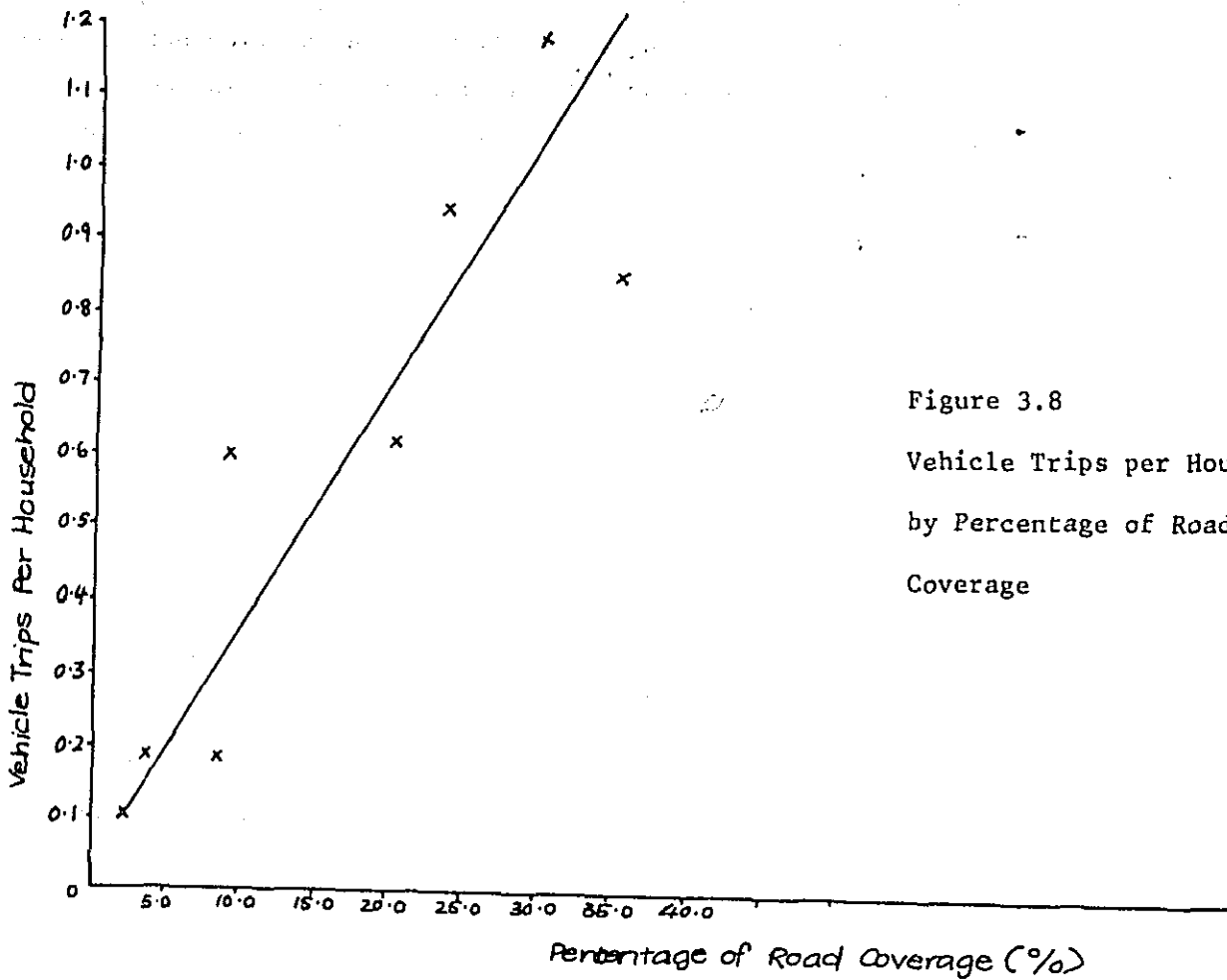


Figure 3.8

Vehicle Trips per Household  
by Percentage of Road  
Coverage

### Vehicle Trips per hectare by Density per hectare

As density per hectare increases, vehicle trips per hectare increases too. However since very high density residential areas are generally low-cost flats, as in the case of Rifle Range and Kampong Melayu Flats, the vehicle trips per hectare tend to increase at a slow rate than population density.

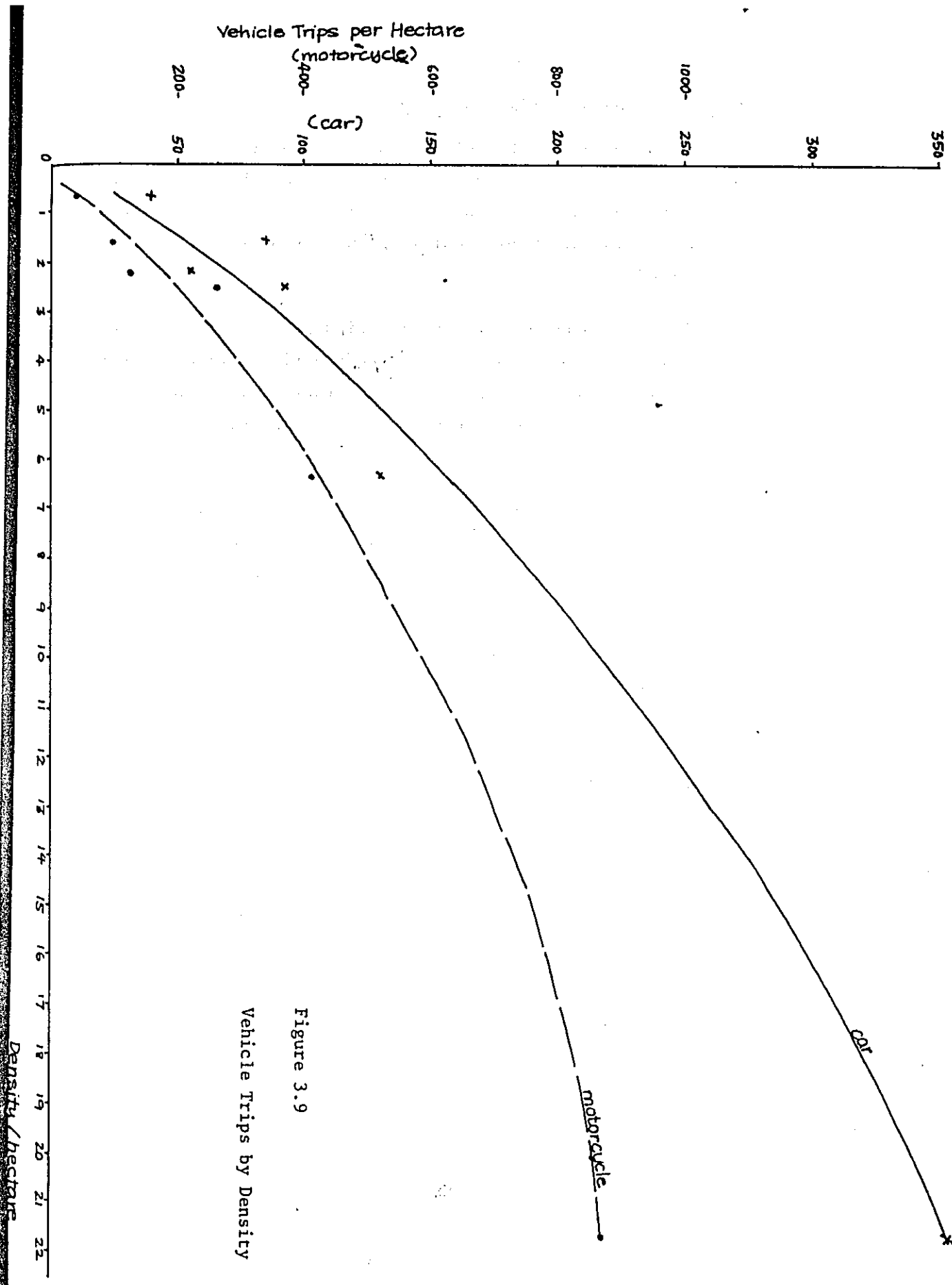


Figure 3.9  
Vehicle Trips by Density

### Determination of Maximum Density

Having obtained the relationship between the vehicle trips per hectare and density per hectare, it would be possible to determine the maximum allowable density for residential areas, if the maximum allowable vehicle trips per hectare can be determined.

The maximum number of vehicle trips per hectare allowable can be found by studying further the traffic problems of various residential areas. It depends on many factors like the type of network system and the percentage of road space.

3.5

### Conclusion

This study shows that many aspects of land use are related. Density being an important aspect of development control has been studied with relation to other aspects of the area, like socio-economic and physical problems.

The transport characteristic in particular has been emphasized as traffic problems have been seen to increasingly threaten the environment, making it unsuitable for residential use.

The study has collected information on various pilot areas in order to arrive at a better understanding of different aspects of residential use and various general trends have been observed. Deviations from these general trends can be observed in certain pilot areas and is generally related to the individual characteristics of the area itself. It is not the objective of this study to touch on these but the information provided in section 4 should be helpful for this purpose.

## 4.1

### PULAU TIKUS

#### 1. Geographic Location

Pulau Tikus is a neighbourhood community situated in the north-west corner of George Town. It is about 3 km. from the Central Business District. It is bounded by the sea front to the north-east, Gottlieb Road in the north-west, Western Road in the west, Macalister Road in the south-west and Peel Avenue and Pangkor Road in the south-east.

#### 2. Present Condition

##### 2.1 Socio-economic aspects

###### Population

There are approximately 12,300 people living in Pulau Tikus from 2056 households. The mean family size is 6.

The age structure is as shown in the table below:-

Age structure Table 4.1.1

<u>Age</u>	<u>%</u>
1 - 6	9.8
7 - 12	13.3
13 - 18	26.7
19 - 35	22.2
36 - 55	20.9
56 & Above	7.0

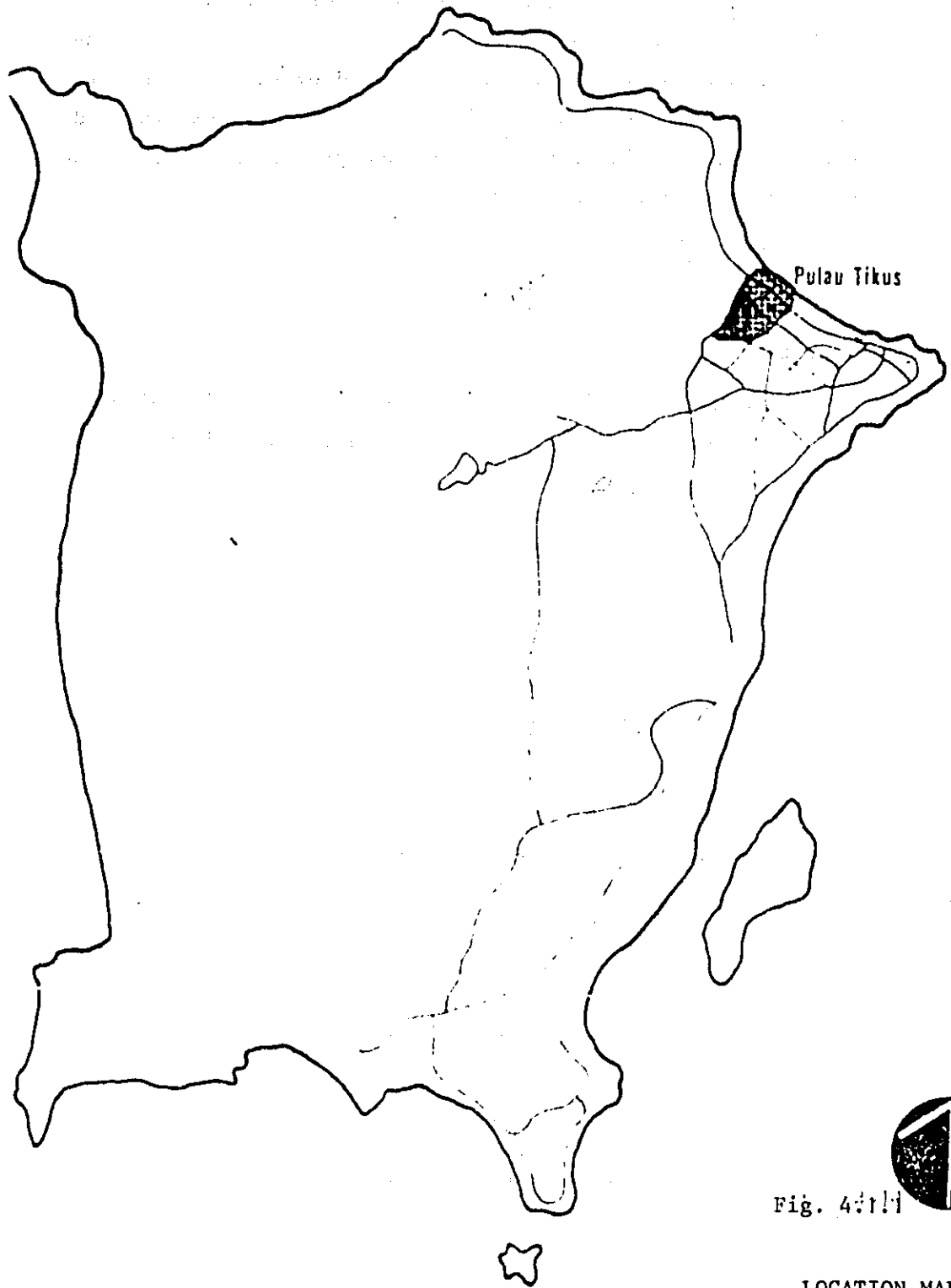
The population as a whole is a young one.

Income Table 4.1.2

The income is as shown in the table below:-

<u>Income ( \$ )</u>	<u>%</u>	<u>cum. %</u>
0 - 200	7.5	7.5
201 - 400	16.4	24.0
401 - 600	24.0	47.9
601 - 800	32.2	80.1
801 - 1000	13.7	93.7
Above 1000	6.2	100.0





Pulau Tikus



Fig. 4:1:1

LOCATION MAP OF  
PULAU TIKUS

From the table above it can be seen that most of the people in Pulau Tikus belong to the middle income group. Compared to Penang as a whole or George Town it has a slightly higher income.

Vehicle ownership Table 4.1.3

The characteristic of vehicle ownership for households is estimated as shown in the table below:-

Vehicle Ownership Structure

No. of vehicles	Car	Motorcycle
None	600	1263
1	1040	625
2	190	87
3	12	0
Mean no.	.62	0.39

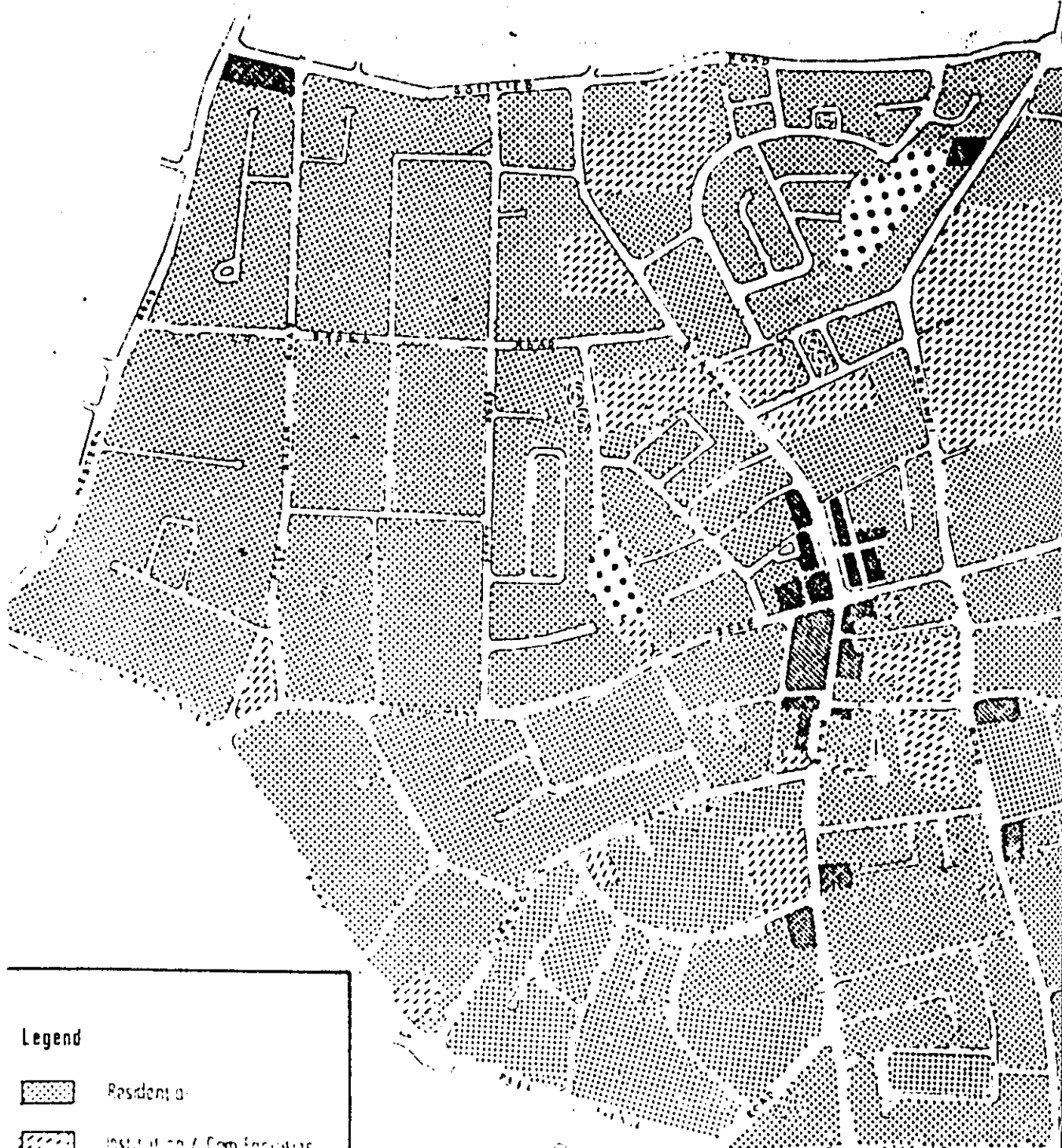
Landuse Utilization

Pulau Tikus is basically a residential area with some commercial, education, religious and open spaces. The detail breakdown is as shown in the table below:-






Landuse Classification Table 4.1.4

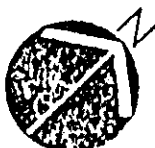
Landuse	Hectares	Acres
Residential	206.6	510.40
Roads	65.0	160.70
Commercial	8.9	21.95
Educational	17.8	43.91
Open Space	2.2	5.49
Health	0.3	0.79
Religious	5.4	13.33
Car parks	1.0	2.35
Agriculture/Vacant	6.3	15.68
Total	313.5	774.6

Source: Pulau Tikus Neighbourhood Study, 1978.



**Legend**

-  Residential
-  Institution / Com facilities
-  Commercial
-  Agriculture / Vacant Land
-  Roads



EXISTING LAND USE

PULAU TIKUS

scale 1:10000 Fig. 4.1.2

### Density

The total population is 12,300. The total number of housing units is 2050. With a gross housing area of 313.5 hectares, the gross density is 39.2 persons per hectare or 6.5 units per hectare.

The net housing area is 206.4 hectares. This gives a net housing of 59.5 persons per hectare or 9.9 units per hectare.

Table 4.1.5 GROSS & NET DENSITY

	Density per hectare		Density per acre	
	Population	Housing units	Population	Housing units
Gross density	39.23	6.53	15.88	2.65
Net density	59.53	9.92	24.09	1.07

Housing Type and Number Table 4.1.6

The number of housing units has been estimated to be 2050. The breakdown by type can be seen from the table below:-

House Type	Percentage
Detached	30.8
Semi-detached	3.1
Terrace	32.4
Shophouses	25.5
Townhouses	8.2

Source: Pulau Tikus Neighbourhood Study, July 1978.

Number of Person Trips Estimated Table 4.1.7

Trip Purpose	Non Vehicle	Motor-cycle	One car	Multi car	Total
Home based work	730 <sup>422</sup>	2982 <sup>692</sup>	4191 <sup>1040</sup>	1184 <sup>202</sup>	9087
School	481	1204	2621	835	5141
Personal - business/shopping	435	1591	3151	1155	6332
Social	241	844	2278	584	3947
All home-based	1887	6621	12,241	3758	24507

Mode	Total person trips	Occupancy	Total vehicle trips generated
Car	12526	1.65	7592
Motor-cycle	4436	1.35	3286

Note : All constants are taken from the  
Kuala Lumpur Transportation Study, 1964

Bus Network

The City Council Bus serves the main part of the area. It covers Macalister Road, Western Road, Gettlieb Road, a part of Burmah Road and Kelawei Road. The Hin Bus and Sri Negara in addition travel along Burmah Road and the upper Kelawei Road.

Bus Frequency

Burmah Road and the upper Kelawei Road have the highest bus frequencies of 15 minutes for the City Council Bus, 20 minutes for the Hin Bus and 7 minutes for Sri Negara Bus. Macalister Road and Western Road have a frequency of 35 minutes per bus and Gottlieb Road 60 minutes per bus.

2.4

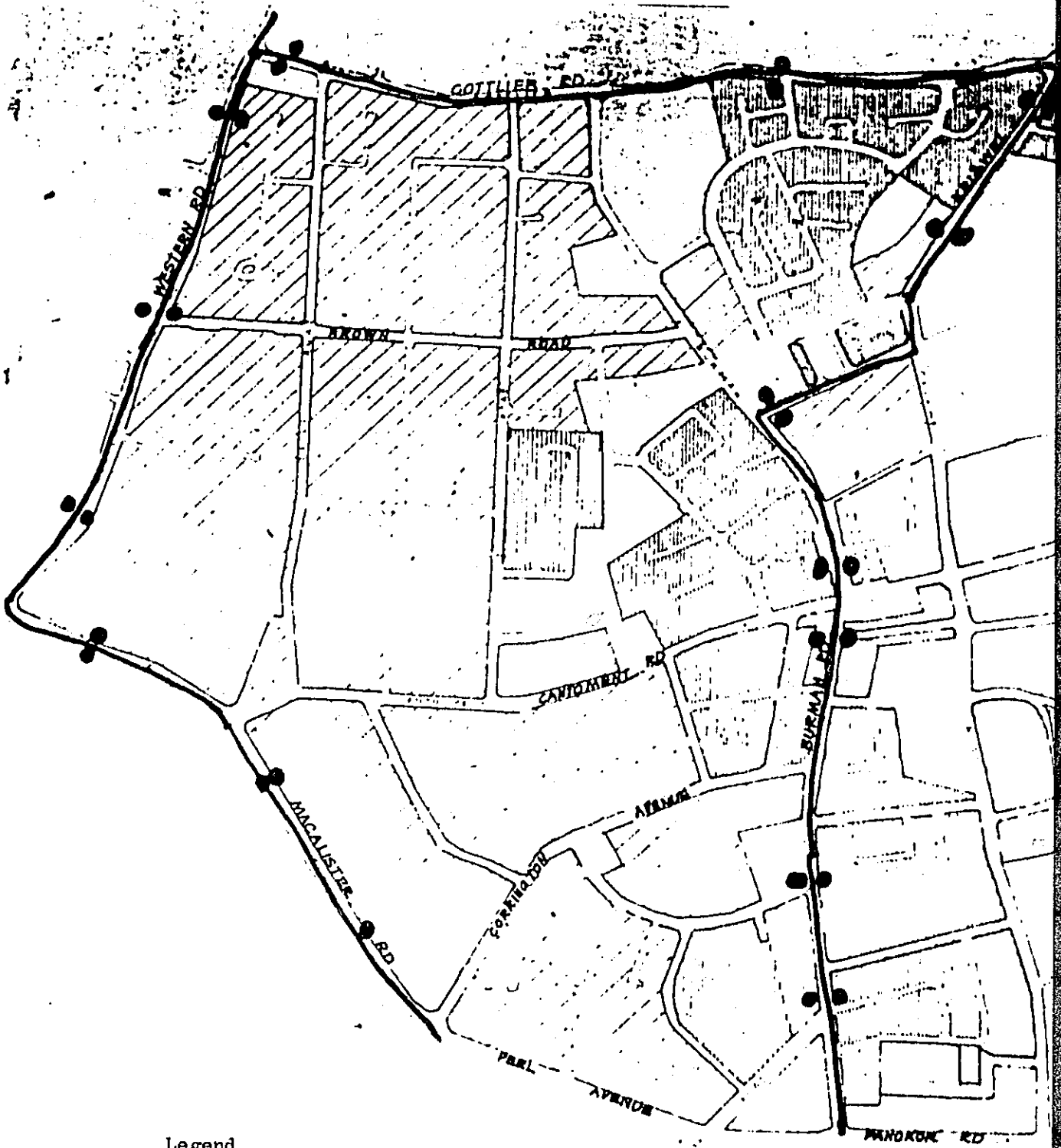
Environmental Condition

Housing Quality

Only about 16% of the houses are in good condition. The main proportion of the houses are in fair condition with only 5% in bad condition. These houses that are in bad condition are mainly non-permanent houses whereas the rest of the units are mainly permanent units of brick/concrete construction.

Other Factors

The environmental problems in this area are mainly due to traffic congestion and the total lack of open space. Through-traffic in the area causes a lack of safety to the residents in the area.



Legend

- Bus Route
- Bus Stop

Fig. 4.1/3

PULAU TIKUS : BUS ROUTE

Geographic Location

This residential area is located in a triangle with the Hill Railway Road in the north and the Ayer Itam Road in the south.

It lies directly adjacent to the Ayer Itam Market in the south-east and the Ponang Hill Railway terminal in the north-west.

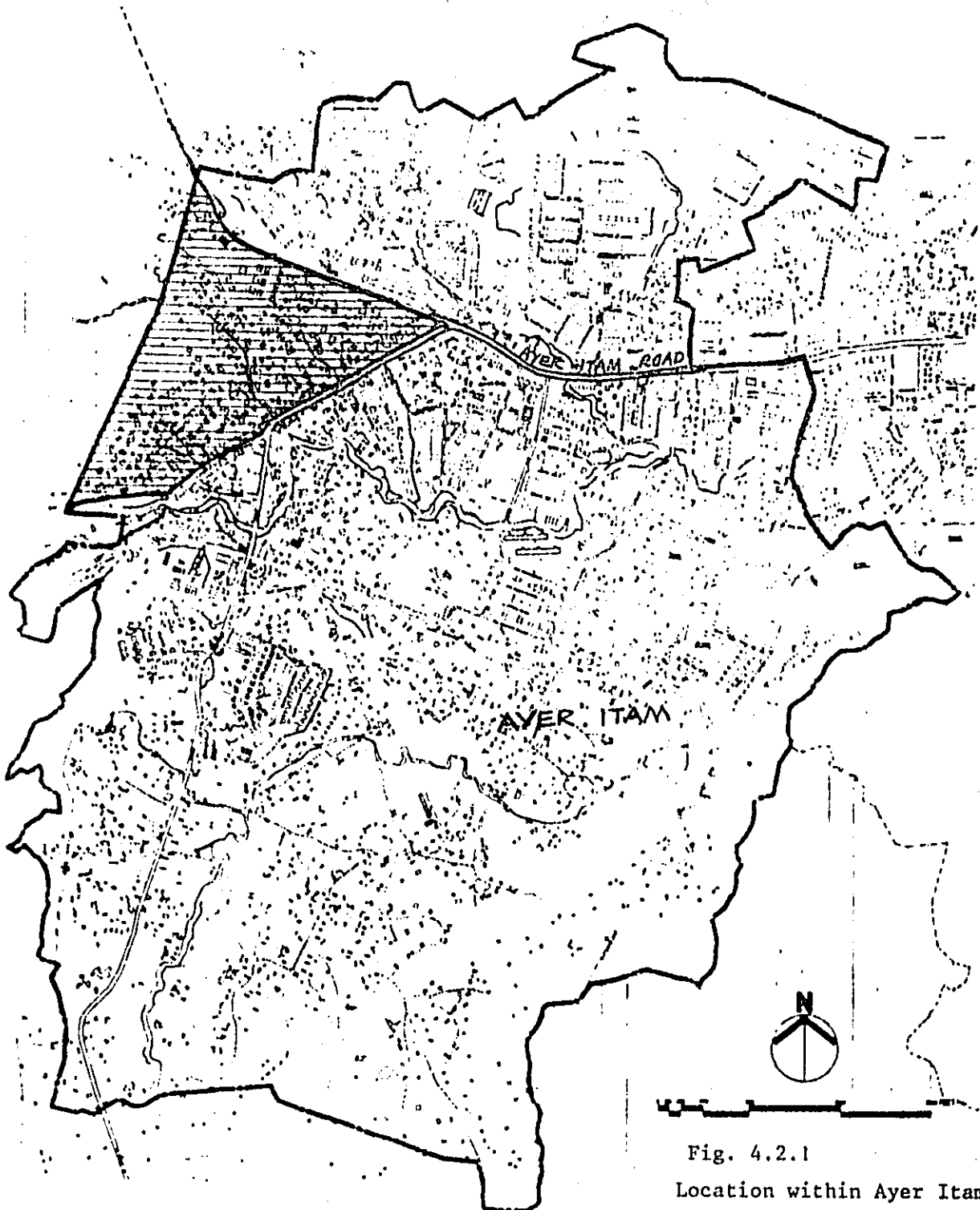
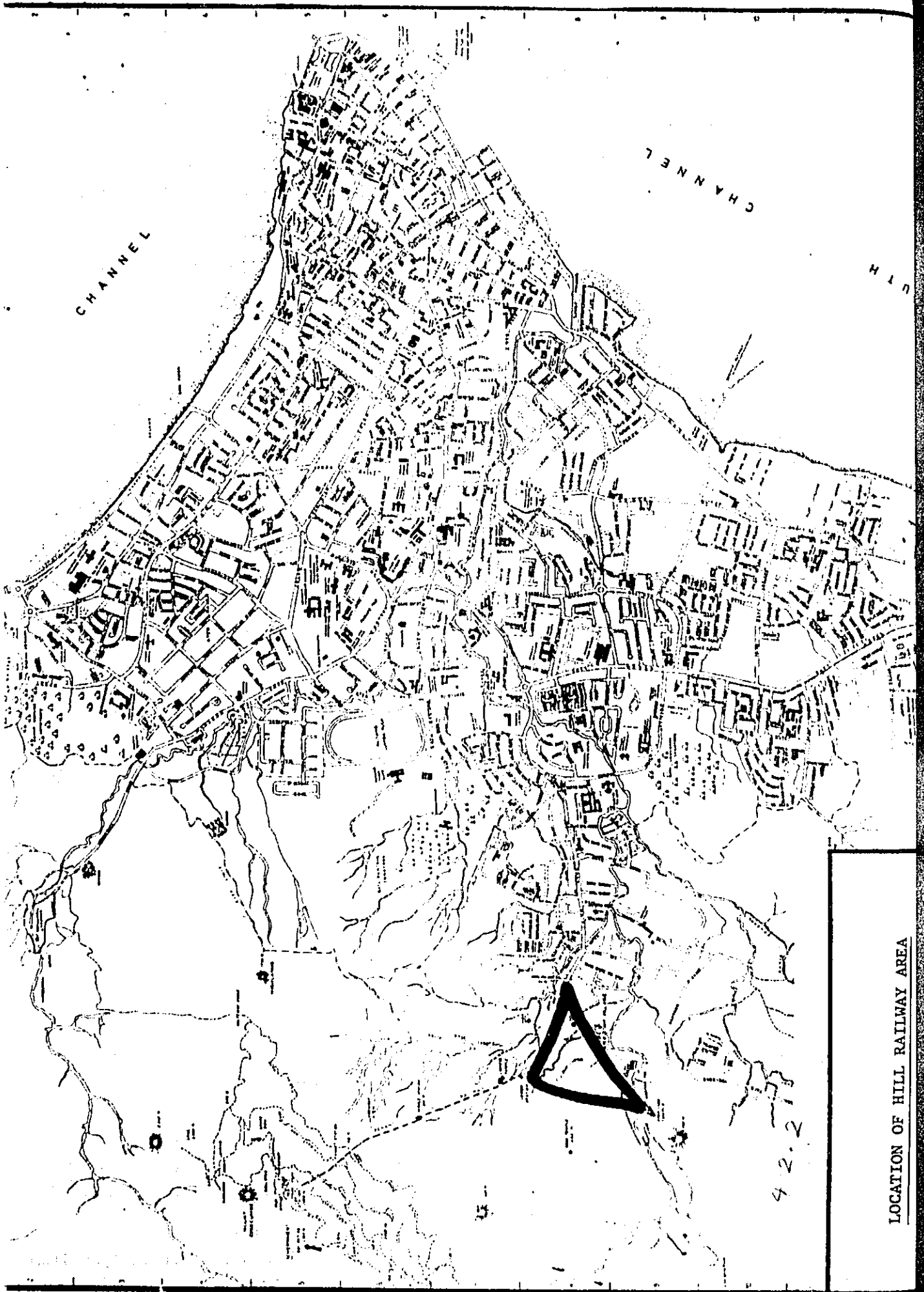


Fig. 4.2.1  
Location within Ayer Itam





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CHANNEL

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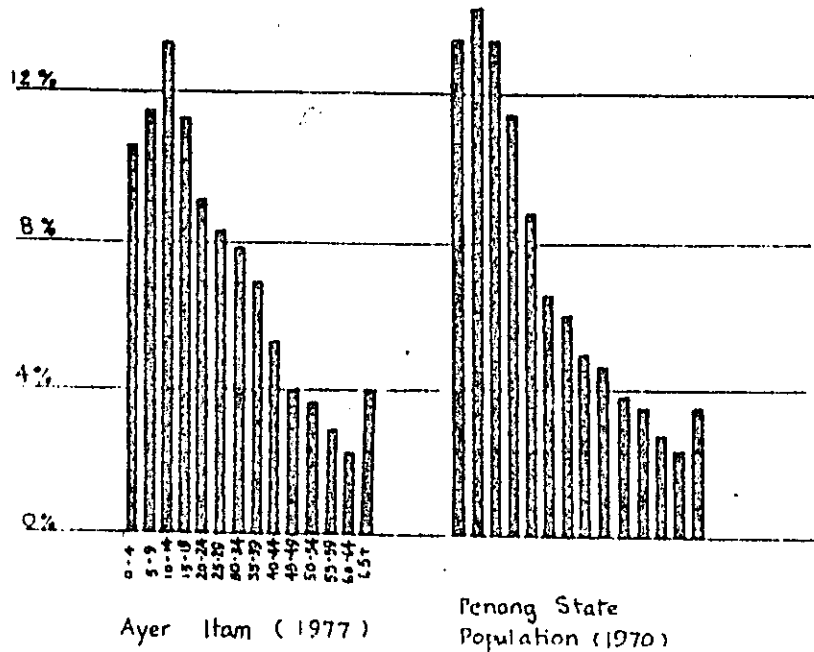
42.2

LOCATION OF HILL RAILWAY AREA

Present Condition of the AreaSocio-Economic AspectPopulation characteristic

The area has a total population of 2832 persons. The age sex structure for Ayer Itam is as shown in the figure below. The age sex structure of this area is estimated to be very similar to that of Ayer Itam.

Fig. 4.2.3 Age Sex Structure



The racial composition consists of 91.6% Chinese, 3.3% Malays and 5.1% Indians. The household size of 7.0 is fairly large when compared to that of Ayer Itam or George Town.

Household Size

Table 4.2.1

Area	Household Size (persons/hh)
Residential area (1977)	7.0
Ayer Itam (1977)	5.5
George Town (1970)	6.17

The monthly household income is as shown in the table below:-

Household Income Table 4.2.2

Income (\$)	%	Cumulative %	Ayer Itam Cumulative %	Penang State
0 - 199	12.3	12.3	9.7	28
200 - 399	40.4	52.7	57.1	67
400 - 799	28.9	81.6	88.9	89
Above 800	18.4	100.0	100.0	100

When compared to Ayer Itam as a whole, the area shows a similar income level. This is slightly higher than the Penang State income.

Vehicle Ownership

The characteristic of vehicle ownership for households is shown in the table below:-

Vehicle Ownership Structure

Table 4.2.3

No. of Vehicle	Car	Motor-cycle
none	717	537
1	95	225
2	4	38
4		
Mean no.	0.13	0.48
Total no. with vehicle		

Source : Ayer Itam Urban Development Study

Table 4.2.4

Vehicle/Household Ratio (per 1000 households)

	Residential Area (1977)	Ayer Itam (1977)	Penang State (1979)
Car	130	234	379
Motor-cycle	430	496	726

Source : Ayer Itam Urban Development Study.

This residential area has a much lower car ratio than both Ayer Itam and Penang State. The motor-cycle ratio is fairly close to that of Ayer Itam but comparatively lower than the Penang State ratio.

## 2.2

Land UtilizationLanduse

The area is basically a low density residential area with no proper arrangement of housing units. There are a number of religious facilities scattered throughout the area and some commercial areas near the surrounding roads.

The detail break down for each type of landuse is as shown in the table below:-

Landuse Classification

Table 4.2.5

Landuse	hectares	acres
Residential	31.24	77.19
Commercial	0.91	2.20
Religious	0.88	2.15
Public Buildings	0.49	1.21
Road	0.81	2.00
Industry	0.10	0.25
	34.44	85.1

### Density

The total population is 2832 persons. The total number of housing unit 469. With a gross housing area of 34.44 hectares the gross density is 82.2 persons per hectare or 13.6 units per hectare.

The net housing area is 31.24 hectares. This gives a net density of 90.7 persons per hectare

Gross and Net Density Table 4.2.6

	Density per hectare		Density per acre	
	Population	Housing units	Population	housing units
Gross Density	82.2	13.6	33.3	5.5
Net Density	90.7	15.0	36.7	6.1

### Housing Type

The following housing types are found in the area:-

1) Detached units

These are free standing units. They may vary from concrete/brick bungalows to small attap kampung-type units. This category is the largest being 56% and most are just small timber or brick/timber units.

2) Semi-detached units

They are only located in small areas in the northern part and are mainly concrete or brick buildings. These make up 23% of the total units.

3) Terrace units

Like the semi-detached units they are only located in certain areas in the northern part and are mainly concrete or brick buildings. They make up 14.5% of the total units.

### Building Materials

About 30% of the units are of brick/concrete construction. Another 30% are of brick and timber while the remaining are of timber construction.

### Age and Condition of Buildings

About  $\frac{1}{2}$  of the buildings are built before the Second World War. These are mainly timber or brick/timber buildings and are generally in poor condition.

Less than 10% are built less than 15 years ago. These are mainly terrace or semi-detached units of brick construction.

2.3

### Traffic Condition

#### Accessibility

There is poor accessibility for almost all the housing units except those at the periphery, just next to Ayer Itam Road and Hill Railway Station Road, or the newly built up brick semi-detached houses in the north. The area is mainly served by unmetalled roads and footpaths. Accessibility to other parts of George Town is good as Ayer Itam Road is a primary distributor.

#### Road Network and Road Widths

The area is bounded on the north by the Hill Railway Road which is a secondary distributor connection to Ayer Itam Road, a primary distributor which forms the boundary on the eastern side.

The access roads to the area are very small and mostly unmetalled roads of widths from 3m. to 6m. The widths of the Hill Railway Station Road and the Ayer Itam Roads are 12.2m. (including reserves).

### Road Condition

The roads on the boundary of the area are in fair condition but the smaller access roads into the area itself are in very poor condition.

### Bus Network

The area is served by the City Council Bus and the Lim Seng Seng Bus which travel along both Ayer Itam Road and Hill Railway Station Road.

### Bus Frequency

The bus frequency of the City Council Bus (No. 1) on Ayer Itam Road is 12 minutes and for the No. 8 Bus which goes to the Hill Station it is 40 minutes. In addition a bus (No. 12) goes to Jelutong and it has a frequency of 45 minutes.

Table 4.2.7  
Number of Trips Generated (Estimated)

<u>Trip purpose</u>	<u>Non-vehicle</u>	<u>Motorcycle</u>	<u>One-car</u>	<u>Multi car</u>	<u>Total</u>
Work	830	608	209	24	1671
School	547	245	131	17	940
Business/shopping	494	324	158	22	998
Social	274	172	114	10	570
	2145	1349	612	73	4179

Mode	Total person trips	Occupancy	Total vehicle trips
Car	524	1.65	318
Motorcycle	905	1.35	670

Note : All constants are taken from the  
Kuala Lumpur Transportation Study, 1964

Environmental ConditionHousing Quality

The houses in this area are generally of poor quality with only 13% in good condition and our 60% in poor condition. A large proportion consists of semi-permanent buildings and are generally old in age. About 50% have been built before the Second World War.

Other Factors

As a whole the area lacks many of the essential utilities and suffers from poor drainage. There is also the additional problem of a lack of good roads in the area. What exists is mainly non-metalled paths. There is a general lack of proper planning and houses are placed haphazardly thereby not utilizing the land efficiently.



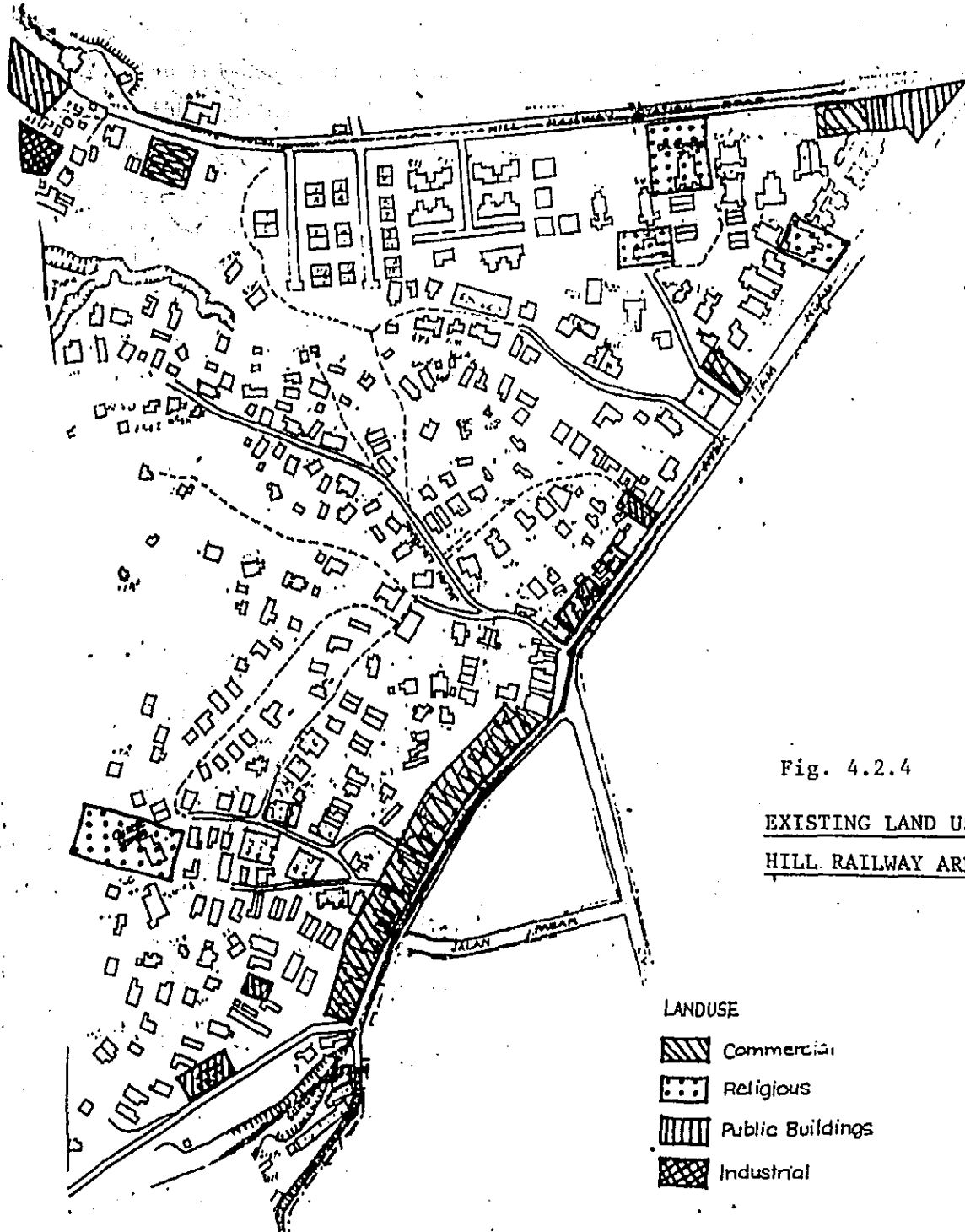






Fig. 4.2.4

EXISTING LAND USE  
HILL RAILWAY AREA

- LANDUSE
-  Commercial
  -  Religious
  -  Public Buildings
  -  Industrial

## 4.3

## ISLAND PARK -

### Geographic Location

1

The residential area is made up of Island Park and Guan Joo Seng estate, there are basically no physical or clearcut distinction between the two, except that Island Park was developed by Island and Peninsular Sdn. Bhd. and Guan Joo Seng was developed by a private developer Guan Joo Seng Sdn. Bhd.

The residential area is located about 8 km. from George Town C.B.D. It is bounded on the east side by Green Lane, on the north by Lorong Batu Lancang and on the west by a stream which act as municipality boundary. The extent of Guan Joo Seng is from the north up to Tingkat Tembaga in the south. While Island Park starts from there up to the outer ring of Taman Green View in the south.

2

### Present Condition of the Area

2.1

#### Socio-Economic Aspect

##### Population

#### Population Age-Sex Structure

Table 4.3.1

Age Group	Male	%	Female	%	Total	%
0 - 6	272	10.2	267	9.1	539	9.1
7 - 12	332	12.5	385	12.2	717	12.1
13 - 18	276	10.4	345	10.5	621	10.5
19 - 24	356	13.4	439	13.5	795	13.5
25 - 30	321	12.0	395	12.1	716	12.1
31 - 36	301	11.3	331	10.7	632	10.7
37 - 42	248	9.3	286	9.0	534	9.1
43 - 48	173	6.5	186	6.1	359	6.1
49 - 54	114	4.3	161	4.6	275	4.6
55	272	10.2	440	12.1	712	12.1
Total	2665	100	3235	100	5900	100

\* Source : Appraisal of a residential neighbourhood  
Island Park and Guan Joo Seng, U.S.M.

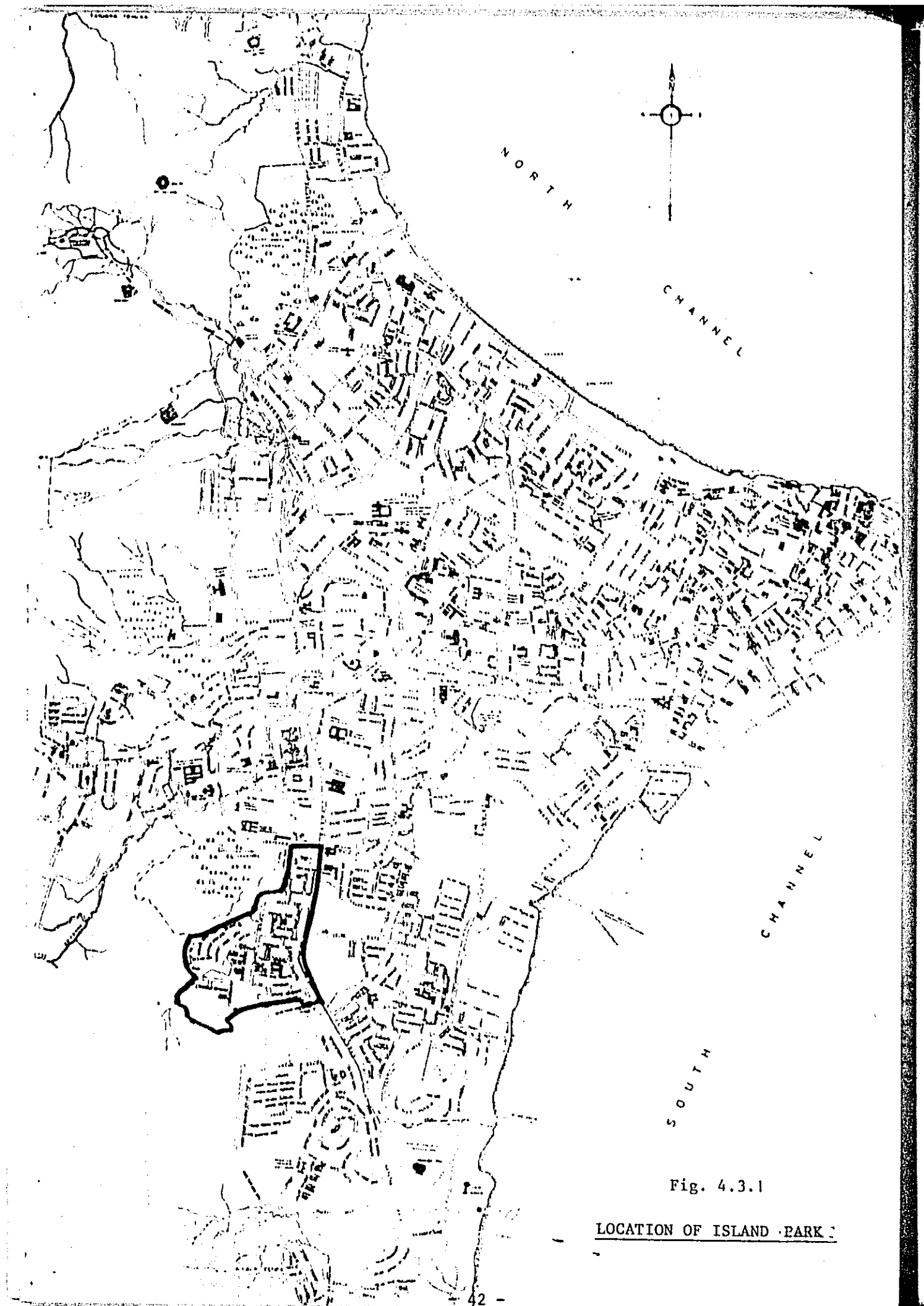


Fig. 4.3.1

LOCATION OF ISLAND PARK

There are a total of 5,900 population in the residential area. 87.1% of the community are Chinese, 4.6% are Malay, 5.6% Indian and 2.6% other races.

Household Size

Majority of the household has 3-5 members per household. The household size distribution is as follows.

Table 4.3.2

Household size	Number	%
0 - 2	97	8.8
3 - 5	565	51.2
6 - 8	315	28.6
9 - 11	83	7.5
11	43	3.8

The mean household size is 5.35. This is slightly smaller than the average household size.

Table 4.3.3 Household Income

Income	Number	%
260	475	18.4
251 - 500	602	23.3
501 - 750	616	23.8
751 - 1000	568	21.9
1001 - 1500	198	7.7
1500	125	4.8
Total	2584	100.0

The mean household income in the area is about 600/=.

### Vehicle Ownership

The vehicle ownership pattern is shown below:-

Table 4.3.4

No. of Vehicle	Car	Motor-cycle
none	21.5	
1	53.6	8
2	16.7	8
3	0	0
4	0	0
Mean	0.96	0.15

There are a total of 1,065 cars and 168 motor-cycle own in the area. This gives about 1 car per dwelling unit and about 1 motor-cycle per every 6.5 dwelling unit or 150 motor-cycle per 1,000 dwelling units.

The car ownership here is very high compare to the other urban area in George Town or Penang. This is due to the fact that this area is mainly a higher middle income residential area.

### Land Utilisation

The area is predominantly residential, the detail breakdown of the land utilisation is shown below:-

Table 4.3.5

Land Use	Hectares	Acres	%
Residential	26.15	64.62	44.9
Commercial *	0.53	1.3	0.90
Education	1.06	2.62	1.82
Religious	1.94	4.8	1.95
Open Space/Park	8.50	21.02	8.49
Roads	20.83	51.46	35.8
Total	59.01	145.82	100.0

\* Includes access roads

Legend





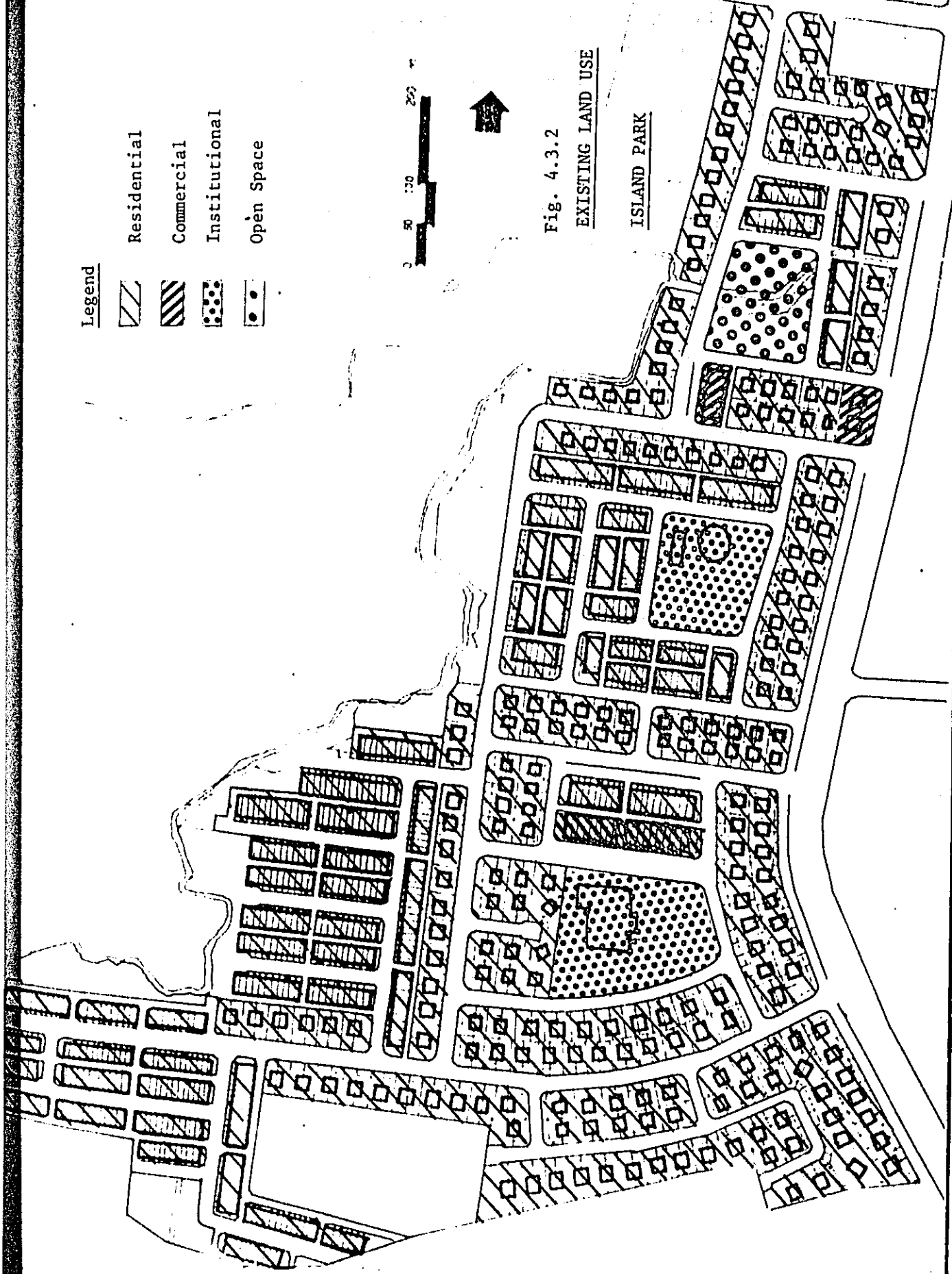
-  Residential
-  Commercial
-  Institutional
-  Open Space



Fig. 4.3.2  
EXISTING LAND USE

ISLAND PARK



In this residential layout, circulation or road space takes up a high proportion due to the fact that the residential area here mainly caters for the higher income people and vehicle accessibility here is high.

#### Density

This area has a population of 5,900 with a total area 59 hectares the gross residential density is 100 person per hectare or 40 persons per acre. The net density is 226 persons per hectare or 91 p.p.a.

#### House Types

Basically, there are two main dwelling types. Double storey semi-detached and double storey terrace houses.

Table 4.5.6 House Types

Area	Semi-Detached		Terrace		Shop-house	
	No.	%	No.	%	No.	%
Island Park	270	51.92	250	48.08	-	
Guan Joo Seng	221	37.9	336	57.63	26	4.46
Total	491	44.5	586	53.12	26	2.35

Terrace houses made up more than 50% of the total housing unit.

## Traffic and Transportation Condition

### The Existing Road System

#### Road Hierarchy

Green Lane and Lorong Batu Lanchang form the primary road to the residential area. Green Lane links the area to George Town and southern part of Penang, Lorong Batu Lanchang provides linkage between this area and Ayer Itam.

The secondary roads include Jalan Mas Persiaran Besi, Jalan Tembaga, Jalan Besi and Leboh Raya Mas. They function as collector roads linking the residential area with the primary road.

The local distributors include all the other residential frontage roads providing access to every individual lot. Some examples of local distributors here are Lintang Besi, Taman Besi, Persiaran Tembaga and Medan Tembaga. They include the cul-de-sac roads.

#### Road Width

The width of the road carriage-way for each type of the roads are as follows:-

Table 4.5.7

Hierarchy of Road	Example	Road Carriage-way
Primary Road	Green Lane	44' - 0"
Secondary Road	Jalan Besi	24' - 0"
Local Road/ Access Road	Leboh Raya Besi	16' - 0"
Back Lane	-	11' - 0"



### Public Transport Services

As in Island Glades area, public buses only travel along the primary road, i.e Green Lane and Lorong Batu Lanchang. The internal residential area are only accessible by private vehicles.

Green Lane has a fairly high frequency of bus service.

### Generated Traffic in the Area

The number of daily trips estimated for the Island Park population is as follows:-

Table 4.5.8

Trip Purpose	Non Vehicle	Motor-cycle	One car	Multi car	Total
Home base work	391 230 <sup>1</sup>	724 168 <sup>1</sup>	2377 590 <sup>1</sup>	1078 184 <sup>1</sup>	4570
School	262	292	1487	760	2801
Personal Business - Shopping	236	386	1787	1052	3461
Social-Recreation	130	205	1292	531	2158
All home based	1019	1607	6943	3421	12990

Mode	Total Person Trips	Occupancy	Total Vehicle Trips
Car	8252	1.65	5001
Motorcycle	1077	1.35	798

Note : All constants are taken from the  
Kuala Lumpur Transportation Study, 1964

## 4.4

### SUNGEI PINANG

#### 1.

#### Geographic Location

The Sungei Pinang residential area is located on the fringe of George Town Central Business District.

It is roughly triangular in shape, bounded on the South-Western side by Jelutong Road and Brick Kiln Road and on the Northern side by Pesiaran Perak, Cheah Choo Yew Road and Timah Road.

Landuse on the surrounding area are predominantly residential except for the stretch along Sungei Pinang Road which are mostly Small-Scale industries and Cottage industries.

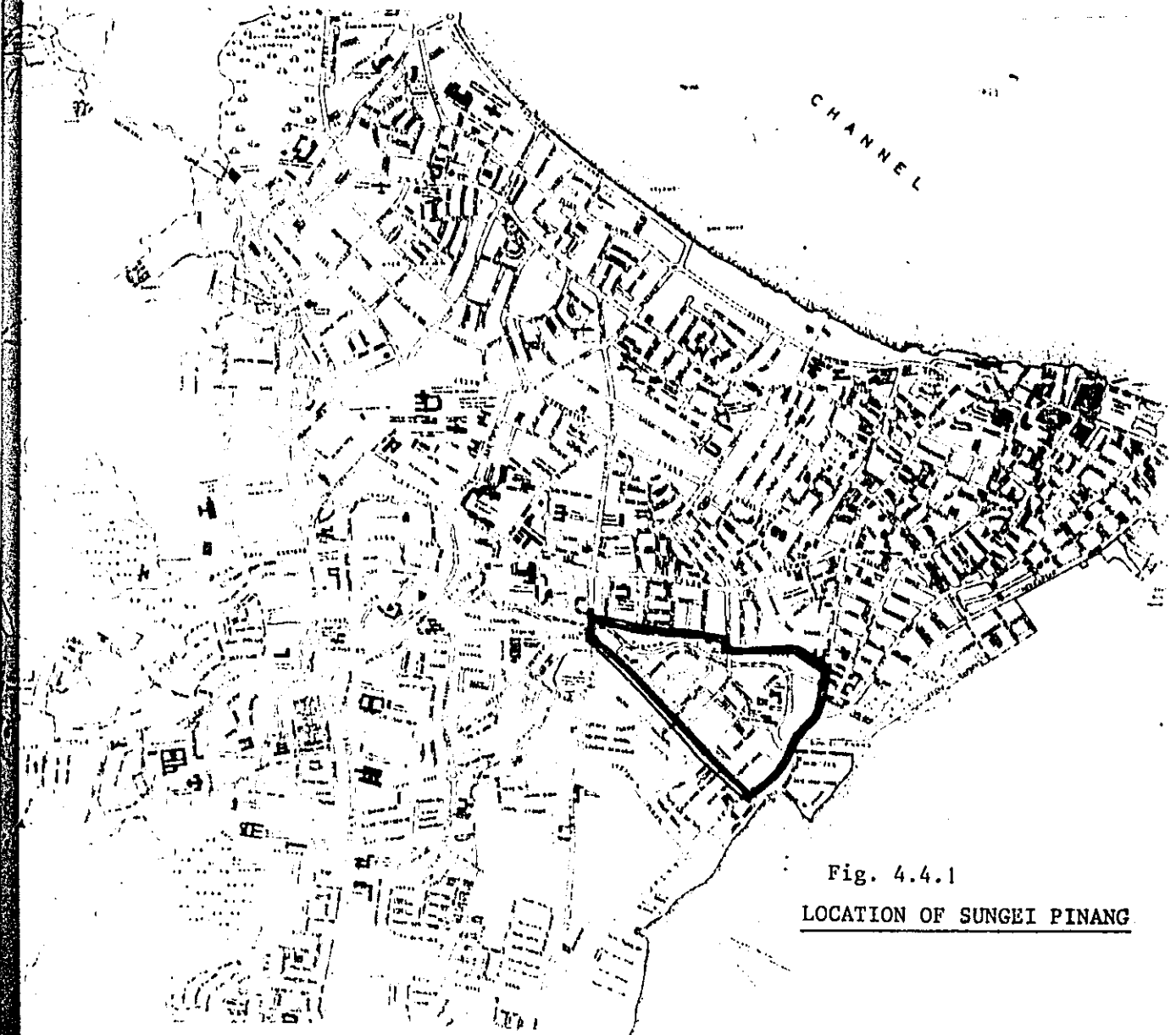


Fig. 4.4.1

LOCATION OF SUNGEI PINANG

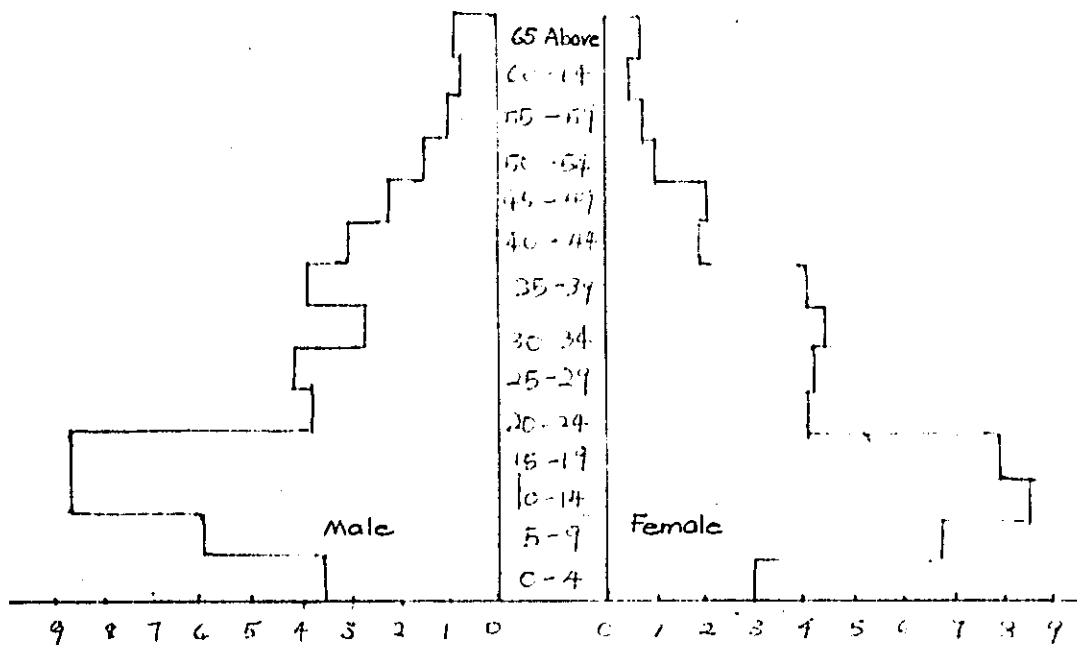
2 Present Condition of the Area

2.1 Socio-Economic Aspect

Population Characteristic

The area has a total population of 6,166 persons. The age and sex structure of Sungei Pinang Area is shown in the following figure.

The economically active age group, between 15 to 54 years consists of 58.7% of the total population. The age-sex structure is roughly similar to that of the Penang State.



Malays and the Indians are the two main communities here. Malay consists of 46.5%, Indian 43.1% and Chinese only form 10.4%. The average household size is 5.94 which is rather high compared to the Penang State average 5.77 or national average of 5.63 for urban areas.

Population Age Structure.

Table 4.4.1

Age Group	Male		Female		Total	
	No.	%	No.	%	No.	%
0 - 4	216	3.5	185	3.0	401	6.5
5 - 9	364	5.9	413	6.7	777	12.6
10 - 14	561	9.1	524	8.5	1085	17.6
15 - 19	530	8.6	487	7.9	1017	16.5
20 - 24	228	3.7	247	4.0	475	7.7
25 - 29	254	4.1	253	4.1	507	8.2
30 - 34	160	2.6	272	4.4	432	7.0
35 - 39	234	3.8	253	4.1	487	7.9
40 - 44	179	2.9	117	1.9	296	4.8
45 - 49	136	2.2	123	2.0	259	4.2
50 - 54	86	1.4	62	1.0	148	2.4
55 - 59	55	0.9	49	0.8	104	1.7
60 - 64	43	0.7	37	0.6	80	1.3
65 +	49	0.8	49	0.8	98	1.6
Total	3095	50.2	3071	49.8	6166	100

The monthly household income is shown in the following table:-

Table 4.4.2 Household Income Distribution

Household Income	% of Total Household	Cum %
0 - 199	4.7	4.7
200 - 499	70.3	75.0
500 - 799	16.9	91.9
above 800	8.1	100.0

Source : Sungei Pinang Urban Renewal Study 1978.

The average monthly household income is 407.8 dollars which is slightly higher than the Penang average but lower than the Peninsular Malaysia mean household income for urban areas in 1970 which is \$428.0 per month.

### Vehicle Ownership

The characteristic of vehicle ownership for the household is shown below.

Table 4.4.3 Vehicle Ownership Structure

No. of Vehicles	Car	Motor-cycle
none	1429	1271
1	145	347
2	2	44
3	0	4
4	0	0
Mean No.	0.12	0.33

This area has a very low vehicle ownership compare to other residential area. The rate of 120 cars per 1,000 household and 330 motor-cycle per 1,000 household is comparatively lower than that of Penang State of 379 car per 1,000 and 726 per 1,000 household. This may be due to the poor condition of road in the area.

2.2

### Land Utilisation

#### Land Use

The landuse is predominantly residential but basically the intensity of use is very low. A relatively high percentage of land is utilised for industries and a considerable amount is still vacant and unkept.

Table 4.4.4  
LANDUSE CLASSIFICATION

Landuse	Hectares	Acres
Residential	19.4	48.0
Commercial	3.96	9.8
Education	2.71	6.7
Religious	0.85	2.1
Industrial	6.71	16.6
Roads and infrastructure	4.13	10.2
Vacant	5.9	14.6
Open Space	1.86	4.6
Government institution	5.02	12.4
Total	50.54	125.0

Density

There are a total of 6,166 persons from 1,203 household. The total number of housing units is 1,104. The total area is 50.54 hectares hence the overall population density in the area is 122 person per hectare. With a net residential area of 19.4 hectares, the net population density is 318 persons per hectare.

Housing-Type

There are a number of house types in the area:-

Table 4.4.5 Number of Units by House Type

Terrace	412	units
Shophouse	7	"
Detached	3	"
Kampung Type	292	"
Flats	390	"
Total	1,104	"

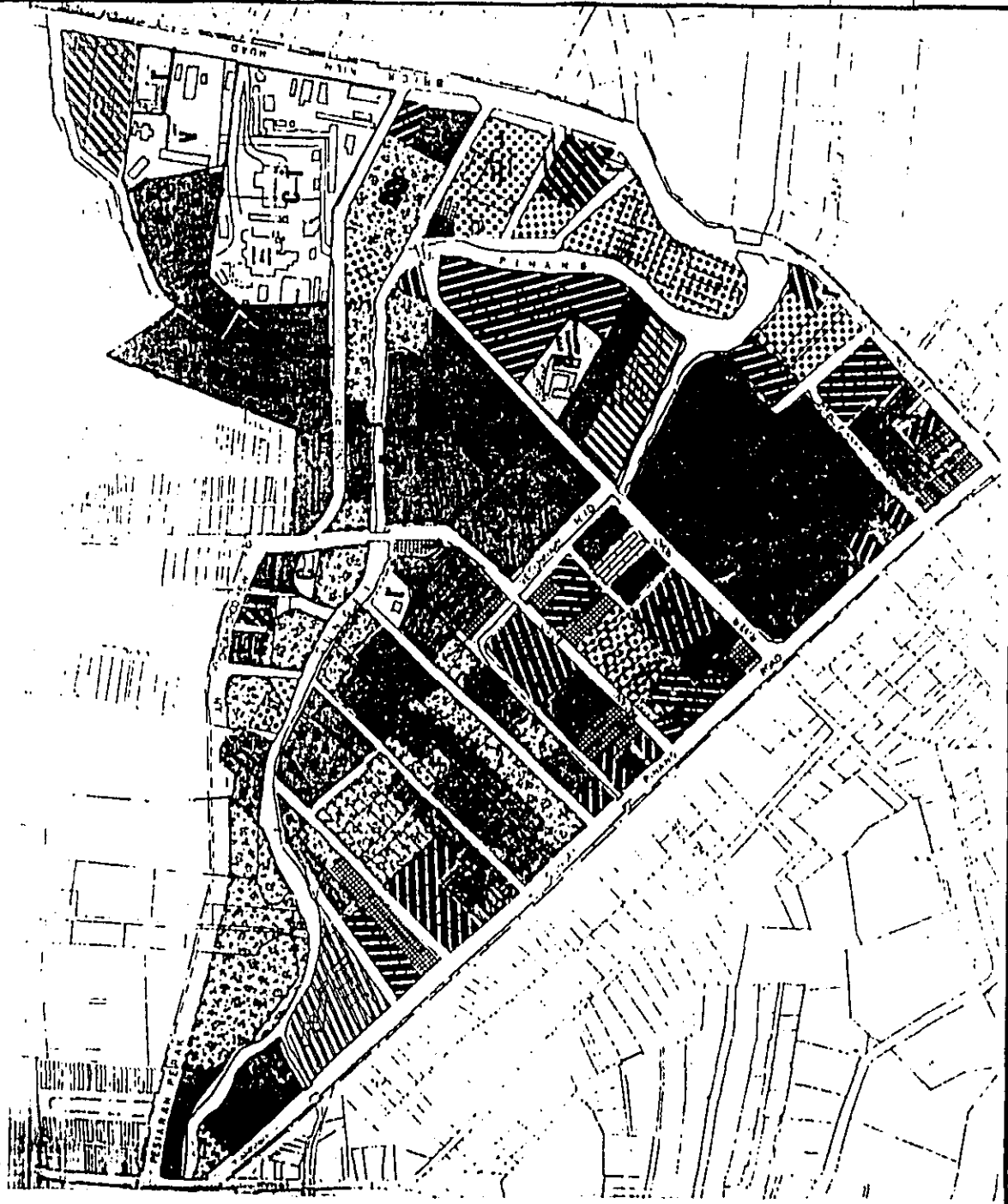
Fig. 4.4.2

**EXISTING LAND USE**

**SUNGEI PINANG**

- RESIDENTIAL
- COMMERCIAL
- WAREHOUSING
- INDUSTRY
- SCHOOL
- RECREATION OPEN SPACE
- ANIMAL INFIRMARY
- VACANT
- RELIGIOUS BUILDING
- CITY INCINERATOR
- COMMUNITY HALL
- HEALTH CLINIC
- SUB STATION
- RYKUN TEMPAKANG
- VETERINARY DEPT

0 1 2 3 4 5 6 7 8 9 10 11 12  
SCALE 6 CHAINS TO 1 IN



Majority of the units are terrace houses (412 units) follow by 390 units of flat and 292 Kampung Type houses.

#### Age and Condition of Building

Most of the houses are very old, some dating from prewar days. The newer houses are mostly in the resettlement area known as Kampung Selut. These houses are of timber structure but generally in good condition.

The houses of poor structural condition are mainly those found near Jelutong Road and some of those on both Sungei Pinang where some squatter housing exists.

#### Traffic and Transportation Condition

##### The Existing Road System

The residential area is bounded by Perak Road, Sungei Pinang Road, Jelutong Road on the South and East respectively and on the North by Timah Road and Kuantan Road. The road in the area serve two way traffic.

##### Road Hierarchy

Jelutong Road and Sungei Pinang Road are the two primary roads in the area. Petani Road, River Road, Lives Road and Timah Road form the secondary distributors, linking the local or access road and the residential area to the primary roads. Foot path leading to the individual lots are usually unpaved.

Jelutong Road has a carriage-way of about 40' - 0" wide, the width is however not constant throughout, it varies between 33' - 0" to 40' - 0" width. Petani Road and River Road vary between 22' - 0" to 24' - 0" in carriage-way. The local or access road ranges from 11' - 0" to 16' - 0". Most of which are in the form of cal de sac road and are non through roads.

##### Public Transport Services

The types of public transport serving the area are buses, trishaw and taxi.



### Public Bus Routes

Perak Road, Jelutong Road, Dato Keramat Road are the major bus routes serving the area. Jelutong Road is run by both the Municipal Council bus and Yellow Bus. The only means of public transport inside the area is the Municipal bus passing through Petani Road, Sungei Pinang Road to Perak Road.

### Frequency of Bus Services

Jelutong Road has an fairly high bus frequency as it is overlaped by Yellow bus and Municipal Council bus. The Yellow bus serving Jelutong Road from Jalan Maxwell terminal to Jelutong has a frequency of 15 minutes to 30 minutes.

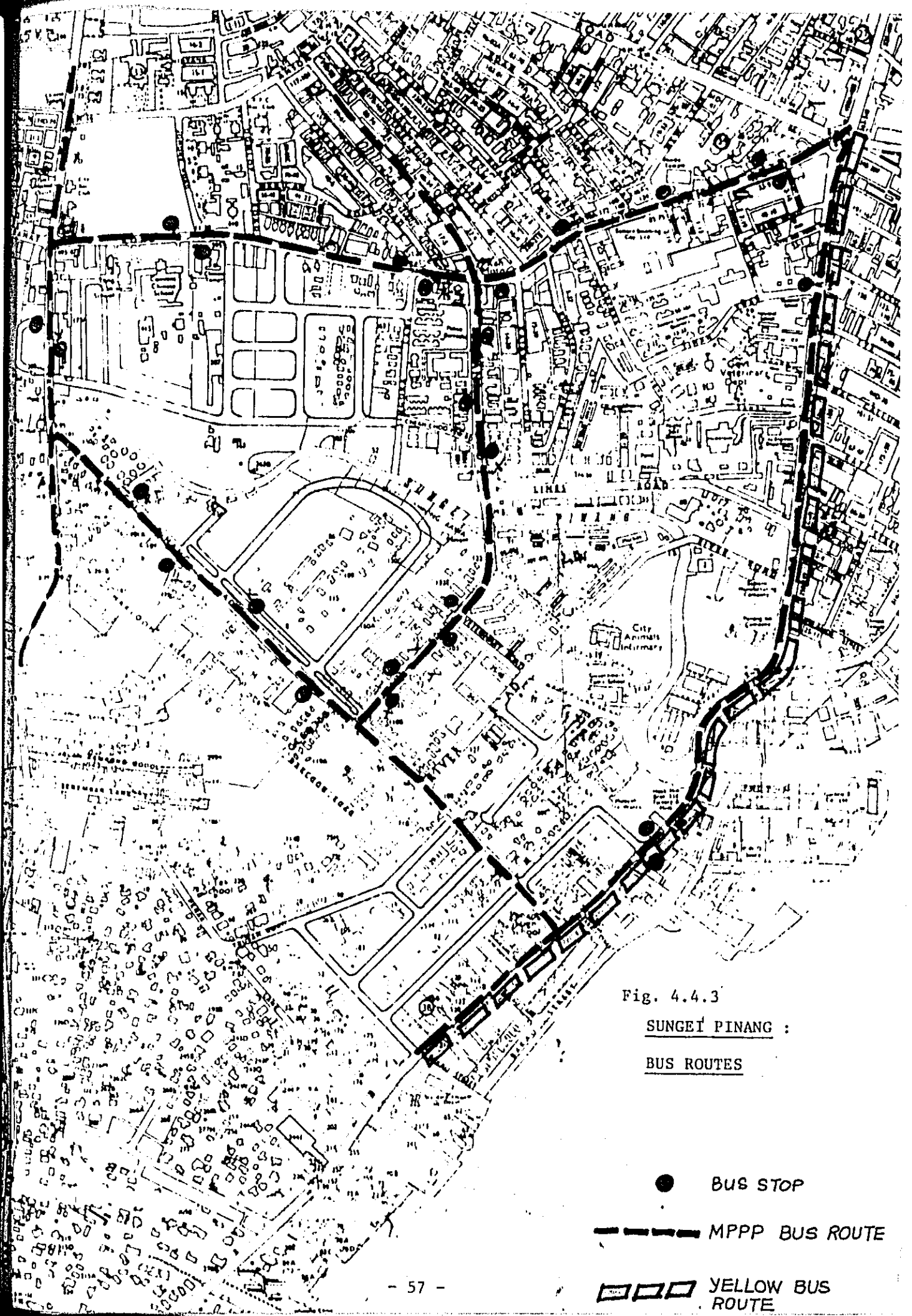


Fig. 4.4.3  
SUNGEI PINANG :  
BUS ROUTES

- BUS STOP
- MPPP BUS ROUTE
- YELLOW BUS ROUTE

## ISLAND GLADES

1

Geographic Location

Island Glades is located about 5 miles or 8 km from George Town C.B.D. The residential area is enclosed by a range of hills on the west and Jalan Yeap Chor Ee on the south. It is separated from Island Park in the north by a stretch of unorganised landuses which include a coconut plantation, an abandoned factory, and some unused open space.



Fig. 45.1

LOCATION OF ISLAND GLADES

SOUTH

2

Present Condition

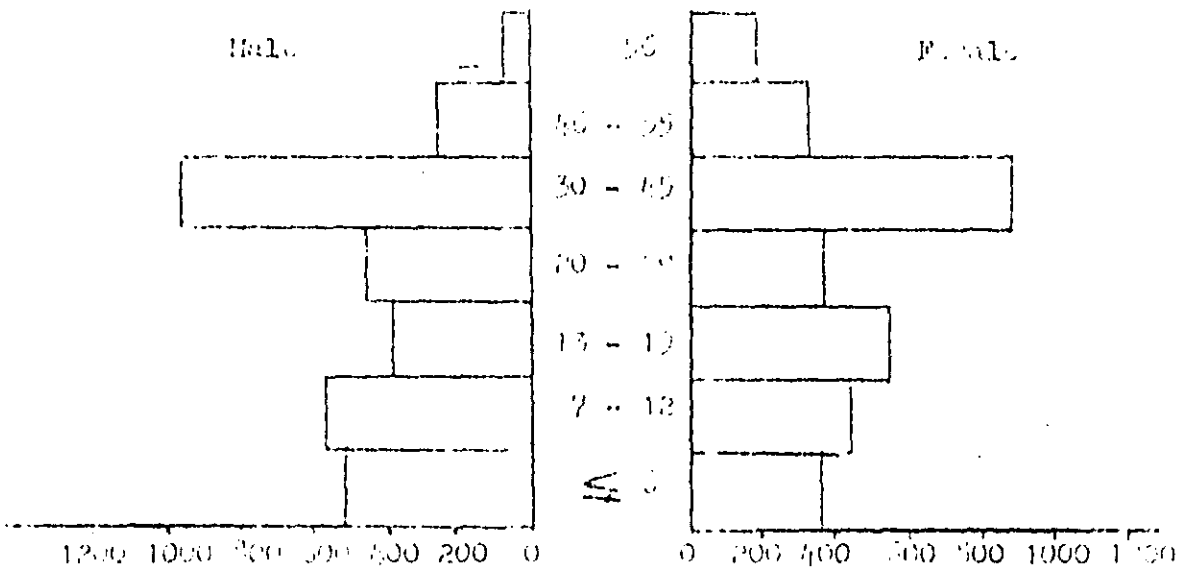
2.1

Socio-Economic Characteristic

Population Characteristic

The population of Island Glades is distributed evenly among both sexes. The active working population make up the majority of the total population.

Fig. 4.5.2 AGE SEX STRUCTURE



Ethnic Composition Table 4.5.1

Ethnic Group	No.	%
Malay	480	7.5
Chinese	5297	82.76
Indians & Others	623	9.74
	6400	100.00

Majority of the population are Chinese, Malays and Indians make up less than 20%.

### Household Size

The distribution of household size is as shown below.

Table 4.5.2

Family Size	%
3	10
4	33
5	20
6	24
7	5
8	5
9	3
Total	100

Majority of the household size falls between 4 to 6 persons. The mean household size is 5.37.

Income Structure Table 4.5.3

Monthly Household Income	%	Cum %
0 - 500	5	5
501 - 800	29	34
801 - 1200	33	67
1201 - 2000	32	99
> 2000	1	100
Total	100	

Majority of the household income fall within the range of M\$ 500 to M\$ 2000 per month.

### Vehicle Ownership

Island Glades is a middle income residential area and shows a high proportion of vehicle ownership. There is no household without at least a motor-cycle. 17% of the population has two or more cars per household.

Vehicle Ownership Table 4.5.4

No. of Vehicle	% of Ownership
2 cars	17
1 car	76
1 motor-cycle bicycle	44
	23
Total	100

2.2 Land Utilisation

Land Use

Table 4.5.5

Land Use	Hectares	Acres	%
Residential	26.66	65.87	48.95
Commercial	0.48	1.18	0.88
Education	3.78	9.34	6.94
Religious	0.38	0.95	0.71
Open Space	3.72	9.21	6.84
Roads*	12.9	31.84	23.66
Utilities	0.22	0.55	0.40
Land under new housing develop- ment	6.29	15.55	11.56
Total	54.43	134.57	100.00

Housing is the main uses in the area, occupying 48.95% of the total area. Road occupy the second highest percentage with 23.66%.

\* includes access roads

Legend






-  Residential
-  Commercial
-  Institutional
-  Open Space
-  Education

Fig. 4.5.3  
EXISTING LAND USE  
ISLAND-GLADES



### Density

The total area of this residential development is 54.45 hectares. With a population of 6,400 the gross density in the area is 117.5 persons per hectare (47.56 p.p.a). The net density is 240 persons per hectare (97.16 p.p.a).

The gross housing density is 21.87 dwelling units per hectare (8.85 unit/ac.) and the net housing density is 44 units per hectare or 18 dwelling units per acre.

Table 4.5.6

### House Types

The dwelling units in the area can be divided into 6 types as shown below:-

House Types	No. of unit	%
1 Double Storey Detached	58	4.87
2 Double Storey Semi-Detached	114	9.57
3 Terrace	712	59.30
4 Single Storey Terrace	261	21.4
5 Shop-house	29	2.43
6 Squatter resettlement houses	17	1.43
Total:	1191	100.00

The distribution of the housing types is as shown in the map.

### Age and Condition of Building

Most of the houses have the same material and construction standard except the squatter resettlement houses. House type number 1 to 5 have a life span of approximately 60 years and are of permanent nature. They are constructed of tiles over bricks. The squatter resettlement houses are of timber wall and zinc roof. These are considered as temporary with a life span of approximately 30 years.

Most of the houses are of good condition as they are relatively new, only 8 years. The condition of the squatter resettlement houses are fair.



## Traffic and Transportation Condition

### The Existing Road System

#### Road Hierarchy

The hierarchy of the roads is as shown in the map.

Green Lane forms the primary distributor in the area, linking the residential area to George Town and other parts of Penang Island. The connection with Island Glades residential area is through Jalan Yeap Chor Ee and Jalan Delima which act as the secondary distributors. The local distributors include all residential cul-de-sacs, development roads and other service roads in the neighbourhood which provide direct access to individual lots.

#### Road Width

The primary road - Green Lane has a carriage-way of 44' - 0", The secondary distributors has a carriage-way of 22' - 0", they are Jalan Delima and Jalan Yeap Chor Ee.

The rest of local distributors vary from 11' - 0" to 16' - 0" in width. An example is Lorong Delima, having a carriage-way of 16' - 0" providing a direct access to houses in the area. Back lanes usually has a carriage-way of 11 feet.

### Traffic Generated in the Area

The volume of traffic generated during the peak hour on the different road types in the area is shown below:-

Table 4.5.7

Road types	Bus		Car		Motor-cycle	
Primary distributor	152	17%	424	50%	279	33%
Local distributor	104	20%	246	48%	163	32%
Access road	10	7%	82	60%	45	33%

Traffic Count at the road junction.

U.S.M. Survey, 1977/1978.

The trips generated by the population per day is as below:-

### Trip Production by Mode

Table 4.5.8

Vehicle/mode	Sample	Percentage	Population*
Car	204	59.5	2690
Motor-cycle	77	22.5	1015
Bus	62	18.0	818
Total	343	100.0	3705

(\* Daily person trip) *The above represents a 100% survey*

This trip generation is based on the interviews of the trips made by the respondent household on the previous day. Trips made by bus here include factory buses and school buses, as such the actual trips made by public buses is very minimal.

Table 4.5.9  
Traffic Generated

Trip Purpose	Non Vehicle	Motor-cycle	One car	Multi car	Total
Home Based	273	523	904	262	
Work	472	2254	3643	1535	7904
School	311	910	2278	1082	4581
Personal	281	1202	2739	1498	5720
Business-Shopping					
Social-Recreation	155	758	1979	757	3649
All home based trips	1219	5124	10639	4872	21854

Mode	Total person trips	Occupancy	Total vehicle trips
Car	12315	1.65	7464
Motorcycle	3433	1.35	2543

Note : All constants are taken from the  
 Kuala Lumpur Transportation Study, 1964

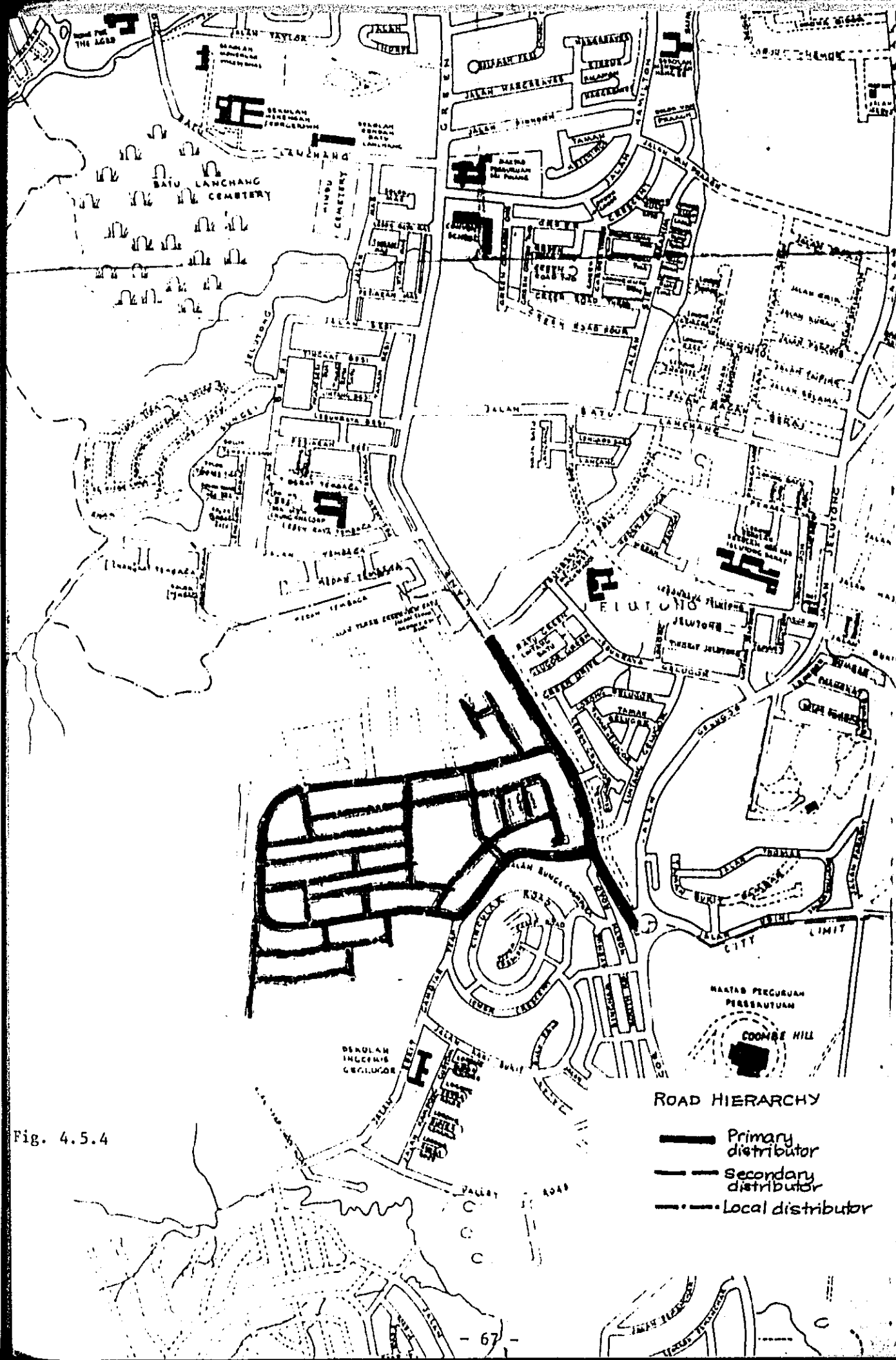


Fig. 4.5.4

**ROAD HIERARCHY**

- Primary distributor
- Secondary distributor
- - - -** Local distributor

### Public Transport Services

Municipal Council bus only runs along Green Lane. The internal area is not served by public transport. However, the residential areas are accessible within about 1/4 mile walking distance from the bus route.

The City Council bus operating along Green Lane provides a fairly high frequency of service since the Green Lane roundabout is the terminal point for the City Council buses.

4.6

RESERVOIR GARDEN

1.

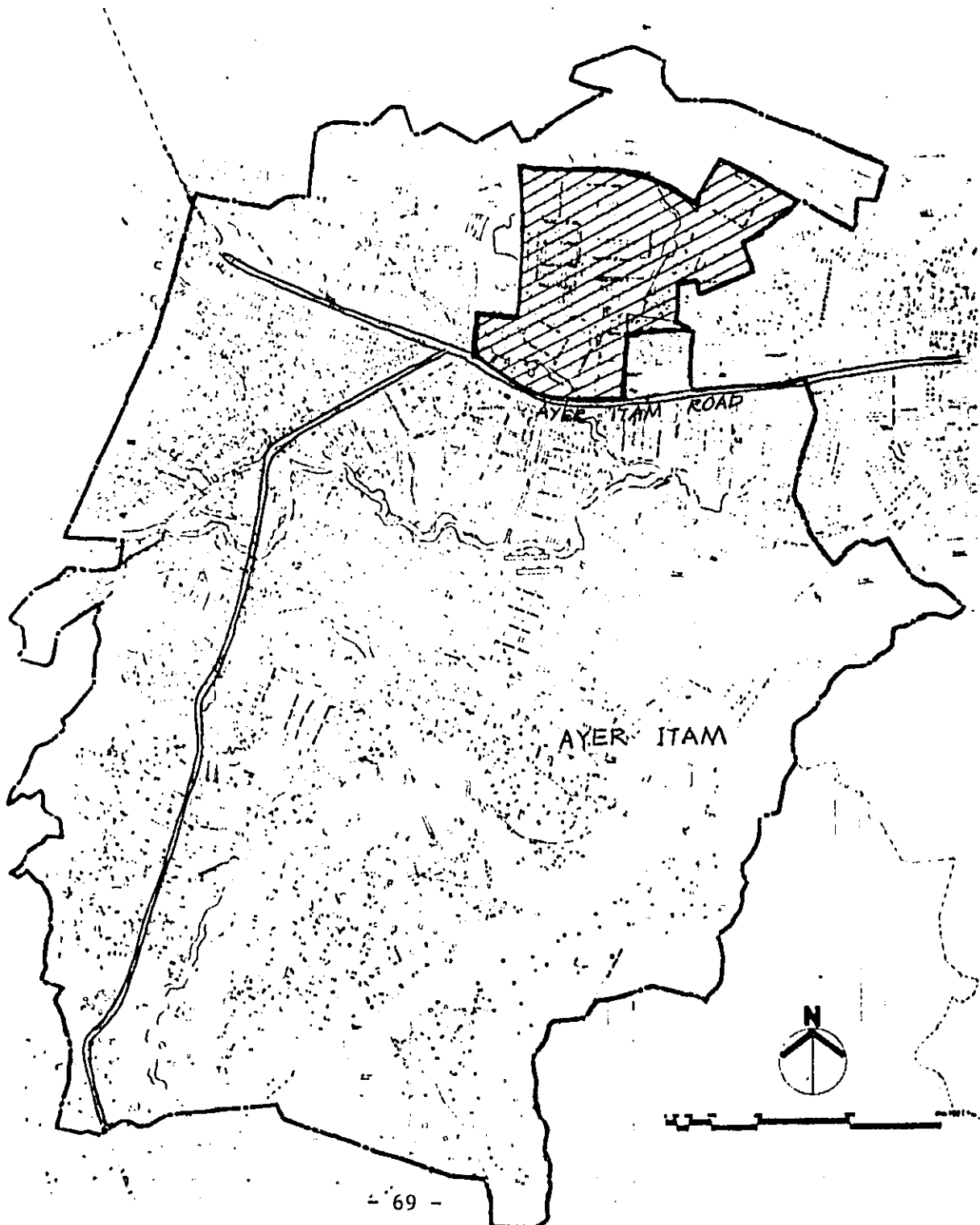
Geographic Location

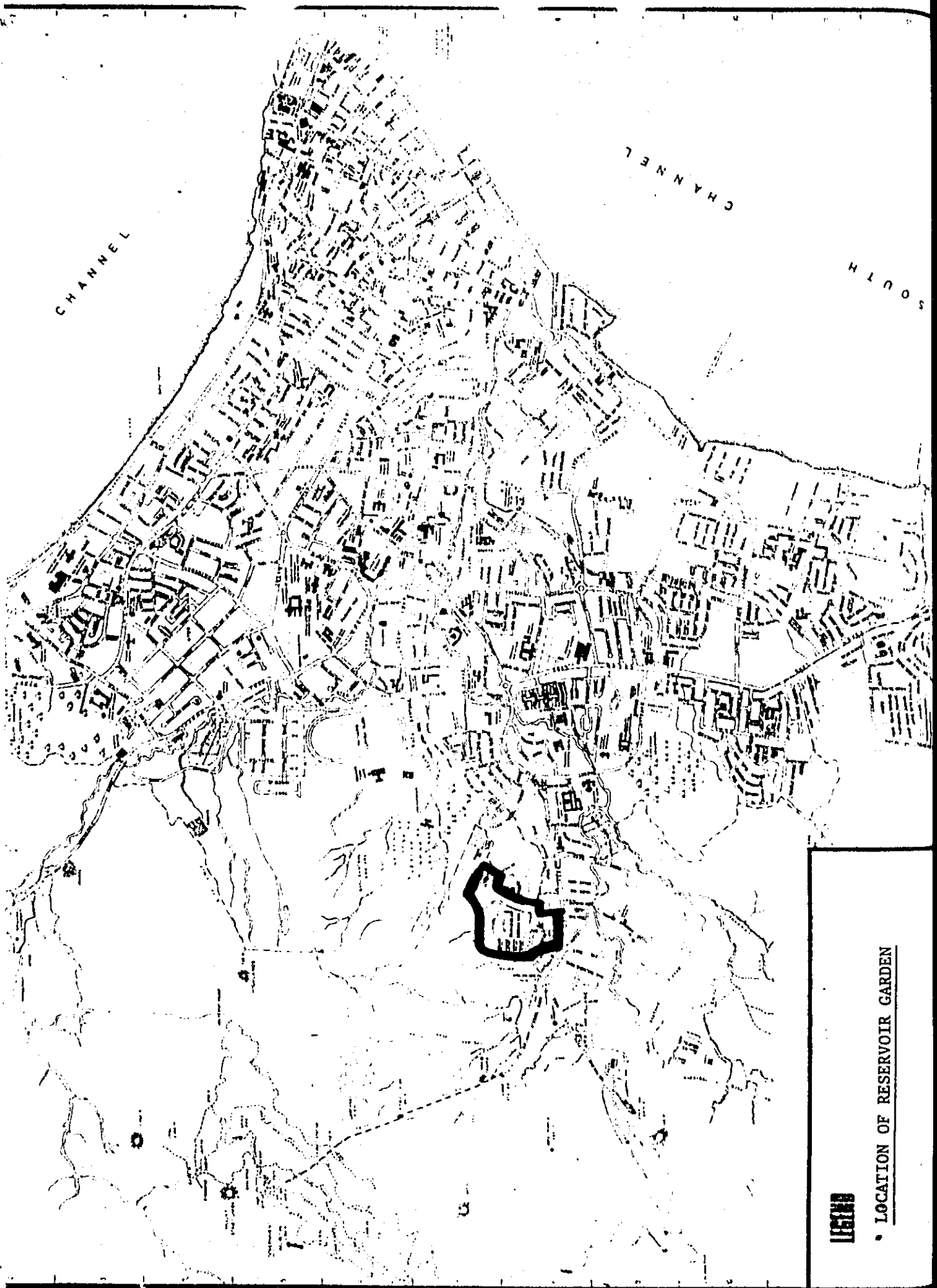
This residential area is located in the north-eastern part of Ayer Itam. It is about 4 km from George Town Central Business District.

On the north-eastern side is the Rifle Range and the northern side the Federal Reserve Unit Camps. It is bounded by Ayer Itam Road on the south.

Fig. 4.6.1

LOCATION WITHIN AYER ITAM





115100  
• LOCATION OF RESERVOIR GARDEN

2. Present Condition of the Area.

2.1. Socio-Economic Aspect

Population Characteristics

The area has a total population of 2884 persons. The age sex structure for Ayer Itam is as shown in the figure below. The age sex structure for this area itself is not available. It can be observed that it has a similar structure to that of Penang state.

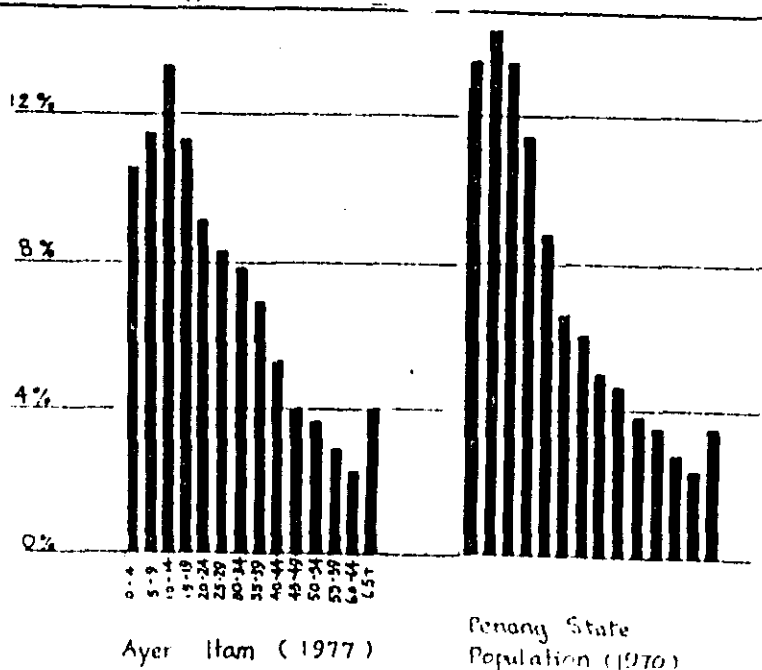
The racial composition consists of 85.8% Chinese, 5.7% Malays and 8.5% Indians. The household size of 5.8 is similar to that of Penang State.

Household Size Table 4.6.1

Area	Household size (persons/hh)
Residential Area (1977)	5.8
Ayer Itam (1977)	5.5
George Town (1970)	6.17
Penang State (1970)	5.77

Source: Ayer Itam Urban Development Study.

Fig. 4.6.3





The monthly household income is as shown in the table below:-

Income (\$)	%	Cumulative %	Ayer Itam Cumulative %	Penang State
0 - 199	5.3	5.3	5.7	28
200 - 399	29.8	35.1	57.1	68
400 - 799	33.3	68.4	88.9	88
800 - ABOVE	31.5	100.0	100.0	100

Table 4.6.2 Income

When compared to Ayer Itam as a whole, the area shows a higher income value. This is mainly due to the fact that the Reservoir Garden is a housing estate built for medium and high income people.

When compared to Penang State the difference is even greater.

#### Vehicle Ownership

The characteristics of vehicle ownership for households is shown in the table below:-

Vehicle Ownership Structure Table 4.6.3

No of vehicle per household	Car	Motorbikes
None	270	290
1	242	207
2	39	46
3	3	10
4	2	3
Mean no per household	0.61	0.62

Source: Ayer Itam Urban Development Study.

Vehicle/Household Rates Table 4.6.4

	Residential Area no/1000 households	Ayer Itam no/1000 households	Penang State (1979) no/1000 households
Car	610	239	379
Motorcycle	615	496	726

Source: Ayer Itam Urban Development Study (1977)

Compared to Ayer Itam as a whole this Residential Area has a comparatively much higher vehicle ownership. The car ratio is also much higher than the ratio for Penang state but the motorcycle ratio is slightly less.

Land UtilizationLanduse

The area is basically a residential area with one religious building, a small community hall two open spaces. The detail breakdown for each type of landuse is as shown in the table below:-

LANDUSE CLASSIFICATION

Table 4.6.5

Landuse	hactares	acre
Residential	20.27	50.08
Commercial	1.62	4.00
Religious	23	0.57
Open Space	28	0.69
Community Facilities	0.12	0.29
Road	2.10	5.20
River Reserves	2.90	7.17
	27.52	68.00

Density

The total population is 2884 persons from 497 households. The total number of housing units is 556. With a gross housing area of 27.52 hectares the gross density is 104.8 persons per hectare or 20.2 units per hectare.

The net housing area is 20.27 hectares. This gives a net density of 142.3 persons per hectare or 27.4 units per hectare.





Gross Net Density Table 4.6.6

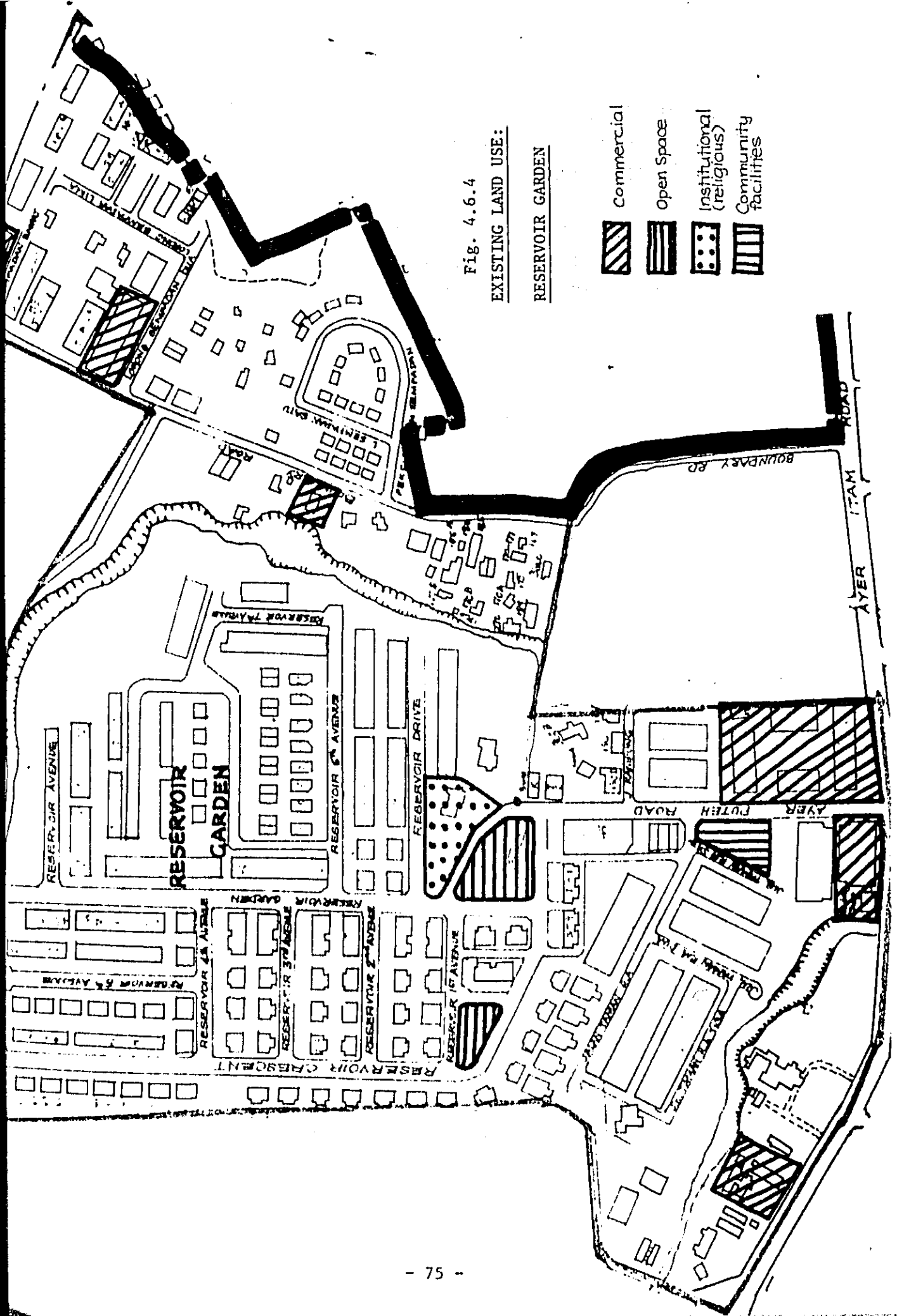
	Density per hectare		Density per acre	
	Population	Housing units	Population	Housing units
Gross Density	104.8	20.2	42.4	8.2
Net Density	142.3	27.4	57.6	11.1

Fig. 4.6.4

EXISTING LAND USE:

RESERVOIR GARDEN

-  Commercial
-  Open Space
-  Institutional (religious)
-  Community facilities



### Housing Types

A survey indicate the following housing types:-

1. Detached Units

These are free standing units. However they may vary from large concrete mansions in the Reservoir Garden itself to small attap kampong-type units on the small squatter settlement along Boundary Road. These make up only 8.6 % of the total number of dwelling units.

2. Semi-detached units

They make up almost 30 % of the units in the area. They are mainly concrete or brick buildings.

3. Terrace Units

These units are the dominant type about 60 % of the total units in the area with a total of 331 units. These units are all of brick construction.

4. Shophouses

These are only 7 shophouses in the area forming 1.3 % of the total units. These shophouses also seen as residential units.

### Building Materials

The Reservoir Garden itself has been built-up solely with brick/concrete housing units. This forms 90 % of the total units. The remaining 10 % is made up of timber or brick/timber units.

### Age and condition of Housing Units

The age of buildings is generally less than 15 years old as Reservoir Garden was not built before then. The squatter houses however may be as old as 30 or 40 years old, and are generally in poor or fair condition only.

The houses in the Reservoir Garden itself are generally of good condition structurally and aesthetically.

### Utilities

As for electricity, water supply and sanitation, all units in the Reservoir Garden have these facilities. The remaining houses generally have electric and water supply but do not have flush toilet system.

### Number of housing units

The number of housing units classified according to type is as shown in the table below:-

Table 4.6.7

Housing Type	No	%
Detached	48	8.6
Semi-Detached	160	28.8
Terrace	331	59.5
Shophouses	7	1.3
Others	10	1.8
Total	556	100

2.3

### Traffic Condition

#### Accessibility

All housing units in Reservoir Garden itself are accessible directly by vehicles as all housing units face an access road. However, there are some houses along Boundary Road in the north-eastern part which are temporary units. These units have no direct access but in general they are situated not far from the road. The area as a whole has good accessibility and is connected by the road network to other parts of Penang Island.

#### Road Network and Road Widths

There is a good network of roads serving Reservoir Garden. These roads are generally at right angles and enclose rectangular blocks.

The secondary distribution are Ayer Puteh Road, which connects Ayer Itam Road to Reservoir Garden and Boundary Road which serves to connect the north-eastern part to Ayer Itam Road.

The widths of all roads including reserves are 12m. which is the minimum for all roads under the maintenance of M.P.P.P.

#### Road Condition

Except for the footpaths in the area along parts of Boundary Road, the net are made up of metralled roads in good condition.

#### Bus Network

The City Council Bus and the Lim Seng Seng Bus travel along Ayer Itam Road and Boundary Road only. As a result the area in the north-western part of Reservoir Garden is not within 250m. from the Bus stops. The furtherest part is about 400m. away from the bus stop.

Table 4.6.8  
Number of Person Trips Estimated

<u>Trip Purpose</u>	<u>Non-vehicle</u>	<u>Motorcycle</u>	<u>One-car</u>	<u>Multi car</u>	<u>Total</u>
Home based work	225	1146	975	258	2604
School	148	463	610	182	1403
Personal-business/shopping	134	612	733	252	1731
Social	74	325	530	127	1056
All home base	581	2546	2848	819	6794

Mode	Total person trips	Occupancy	Total vehicle-trips generated
Car	2865	1.65	1736
Motorcycle	1706	1.35	1264

Note : All constants are taken from the  
Kuala Lumpur Transportation Study, 1964

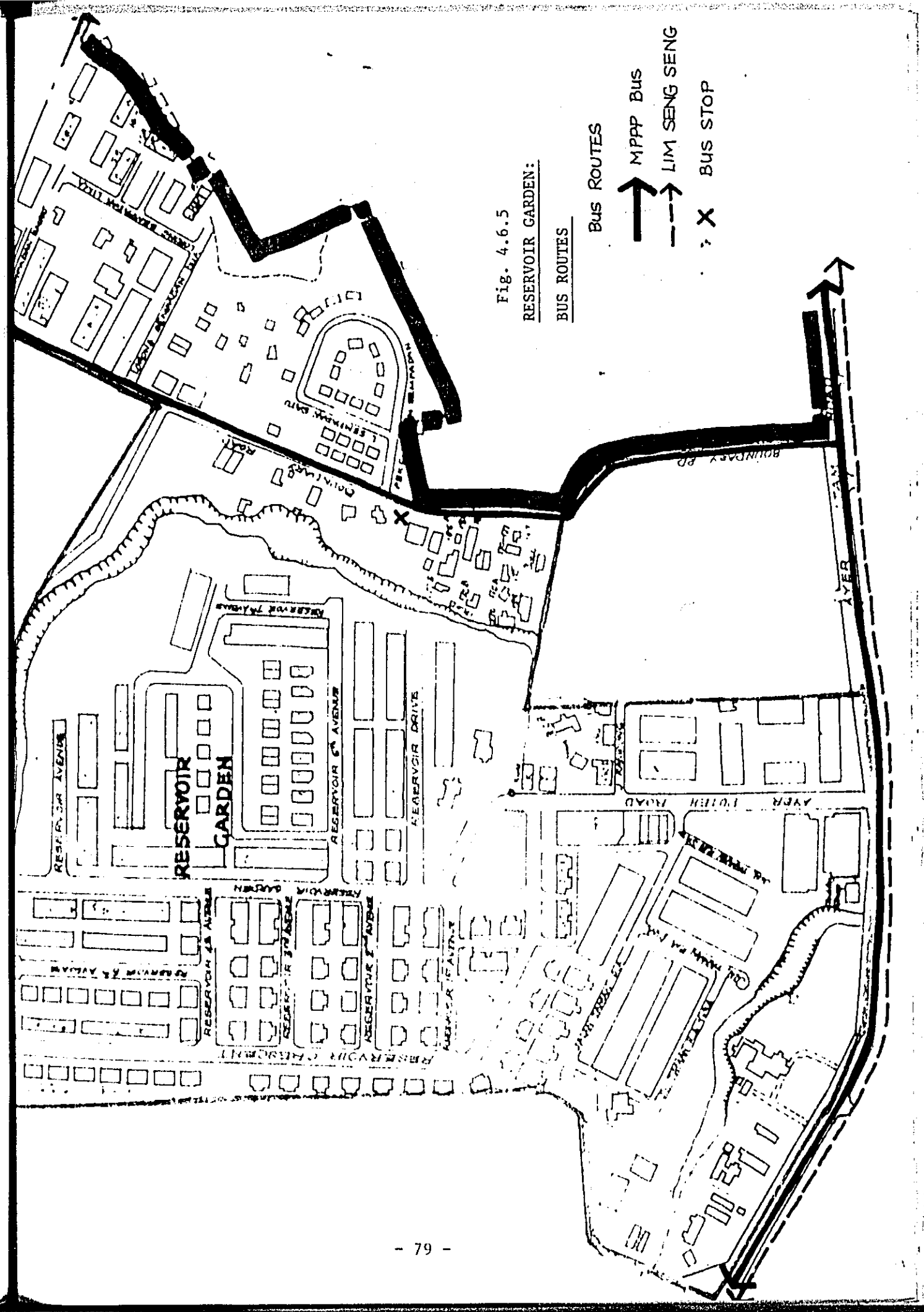


Fig. 4.6.5

RESERVOIR GARDEN:

BUS ROUTES

Bus Routes

- MPPP Bus
- - - → LIM SENG SENG
- X BUS STOP



Environmental ConditionHousing Quality

Except for a few scattered semi-permanent houses along Boundary Road, the rest of the houses are of high quality being of brick/concrete construction and provided with all necessary utilities including sanitation.

Other aspects

There is an open space but it is not fully utilised. The environmental condition is generally quite conducive for living as the area is quiet, does not suffer from excessive noise pollution except those directly next to Boundary Road. Air pollution is also minimal especially for Reservoir Garden itself.

## 4.7

BAYAN BARU1 Geographic Location

It lies in the south-east portion of Penang Island, along the main arterial road leading to Penang International Airport in Bayan Lepas. It is about 10 miles from George Town, but strategically located near the Free Trade Industrial Zone of Bayan Lepas. Bayan Baru is made accessible to George Town via Sungai Nibong area.

2 Present Condition of Area2.1 Socio-Economic AspectsPopulation

Bayan Baru has a total population of 2,327 people, the breakdown of which is shown in the table below.

Table 4.7.1 STATUS IN FAMILY

Status in Family	Number	% of Total
Husband	586	25.2
Wife	873	37.5
Son/Daughter	244	10.4
Tenant	184	7.9
Worker	286	12.3
Others	154	6.6
Total	2327	100.0%

Source : 'Young Workers' Survey', Nov, 1977.

Income Level

The income level of the population of Bayan Baru is as follows:-

Table 4.7.2

Income	Number	% of the Total
\$300 & below	572	52.9
\$301 - 600	252	23.4
\$601 - 900	117	10.8
\$901 & above	140	12.9
Total	1,081	100.0%

Source : 'Young Workers' Survey', Nov, 1977.

## Vehicle Ownership

Bayan Baru appears to have relatively high vehicle ownership which could be due to factors like the lack of efficient public transport, the need to shop in George Town or other areas in Penang because of the lack of facilities, or probably because work places are located all over the island. The table below shows the vehicle ownership structure in Bayan Baru. (Vehicle ownership/ 100 population)

Table 4.7.3 VEHICLE OWNERSHIP

Vehicles	Bayan Baru
Car/Vans	8.8
Motor-bikes	11.8
Others (lorries, buses)	-
Total	20.6

Source : Bayan Baru Study, July, 1978.

## 2.2

### Land Use Utilization

#### Land Use Category and Area

The total breakdown of land use of Bayan Baru is shown in the table below. Housing is the major land use occupying 36% of the total area. Open spaces provided for public recreation (excluding incidental space) take up about 21% of the total land acreage. Roads occupy the next highest percentage of 19%. However, land use for community facilities are found to be missing in the existing land use pattern.

Table 4.7.4 LANDUSE CLASSIFICATION

Land Use	Bayan Baru		
	acreage	hectares	%
Housing	14.5	58	36
Public Open Space	1.6	06	4
Incidental Open Space	8.4	34	21
Roads*	7.6	31	19
Commercial	0.4	02	1
Substation (LLN)	0.4	02	1
Land under New housing development	7.3	29	18
Total	40.2	163	100.0%

Source : Bayan Baru Study, July 1978

\* Includes access roads

### Density

The total population is 2327 and housing units is 544. Gross housing area is 13.4 hectares and net housing area is 7.8 hectares.

Table 4.7.5

	Population per hectare	Housing unit per hectare
Gross density	173.7	40.6
Net density	298.3	69.7

### House Type and Number

As indicated in the following table, the number of terrace units vastly outnumbered the semi-detached and flat units. This reflects the residential characteristic of Bayan Baru, with a poor mix of house typology.

Table 4.7.6

House Type	Number of Units	%
Semi-detached	74	13.6
Terrace	431	79.2
Flats	39	7.2
Total	544	100.0%

Source : Bayan Baru Study, July 1978

### Population Density and Housing Density

Bayan Baru falls under the medium density classification with 70.4 persons per acre over its total acreage of 40.2 acre.

Its housing density also falls within the 'medium density' classification. The density is 13.5 dwelling units/acre.

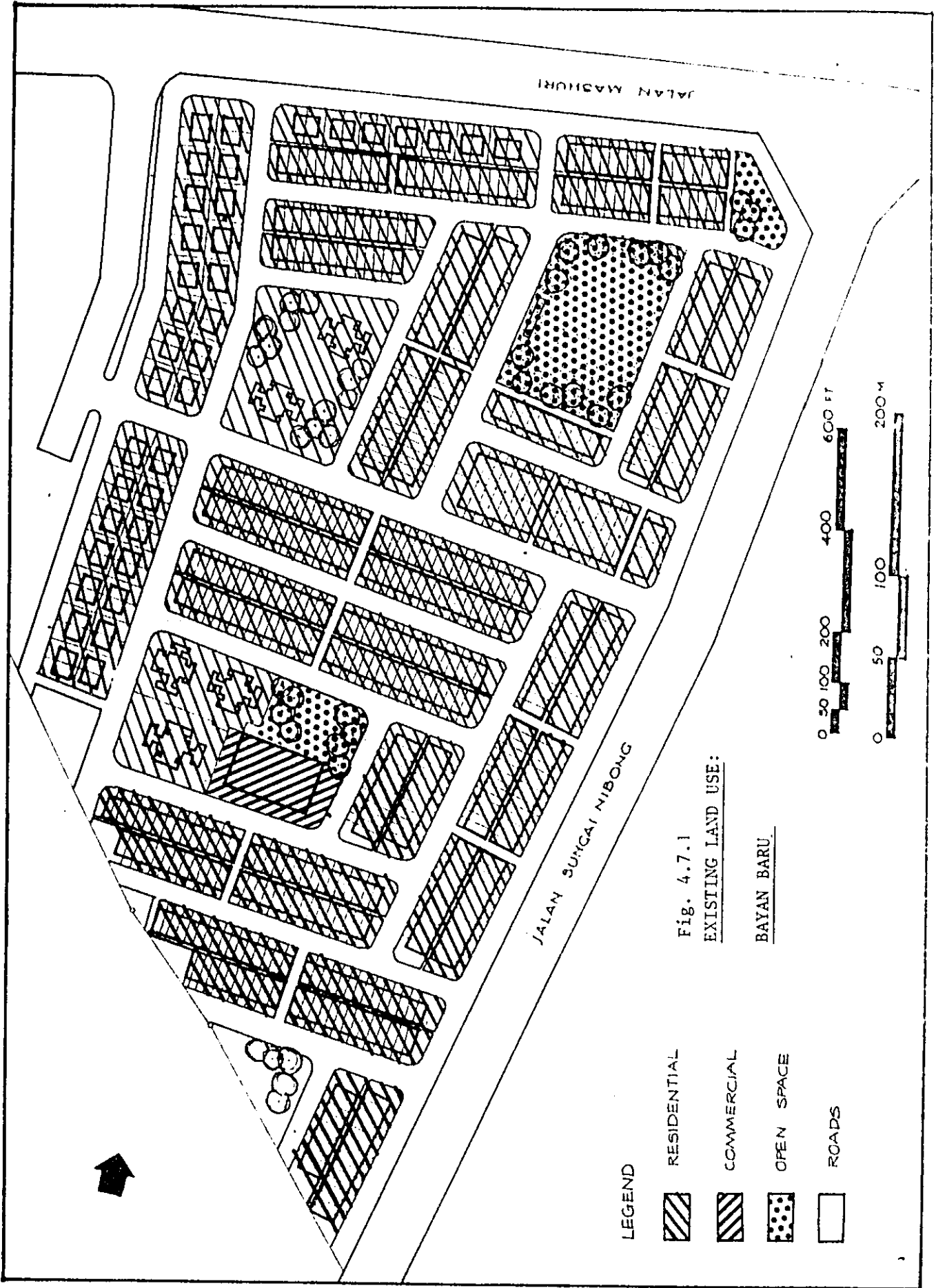


Fig. 4.7.1  
EXISTING LAND USE:

BAYAN BARU.

- LEGEND
- RESIDENTIAL
  - COMMERCIAL
  - OPEN SPACE
  - ROADS

Transport ConditionAccessibility

In terms of accessibility, the semi-detached houses are most accessible. The terrace units are in the inner parts of the residential area; thus there is a greater distance to travel and more junctions to traverse.

As regards to service accessibility, goods can be delivered easily to the commercial centre and the shop houses via the service access just outside their five-footways.

In general, the accessibility to the residential area is basically via the main road, Jalan Sg. Nibong, through Jalan Mahsuri.

Road Widths and Network

The road widths in Bayan Baru is listed out below.

Table 4.7.7

Types of Roads	Width of Reserves	Examples
Primary	132 ft.	J. Sg. Nibong
Secondary	50 - 60 ft.	J. Mahsuri, J. Mayangpasir, J. Nibong
Local	40 ft.	Lintang Nibong, Tingkat Nibong Dua, Medan Mayangpasir
Access	20 ft.	Lebuhraya Mayangpasir Lrg. Mayangpasir Satu

Source : Bayan Baru Study, July 1978

- 1) The primary road is Jalan Nibong located on the eastern side of Bayan Baru. It links on to George Town in the North and Bayan Lepas in the South.
- 2) The secondary roads lead from the two entrances and surround the commercial centre. They link the primary roads to the local roads.

The road network is basically gridiron which has been modified by staggering the junctions in order to reduce the number of cross junctions.

### Generated Traffic in Area<sup>4</sup>

The number of trips estimated for the whole population of Bayan Baru was found to be as follows:-

Table 4.7.8

Types of Trips	% of Total	No. of Trips Estimated
Work Trips	69	2691
School Trips	9	351
Shopping & Recreational Trips	22	858
Total	100%	3900

Source : Bayan Baru Study, July 1978.

Work trips by far forms the largest proportion of trips made. School trips performed by school-going children is comparatively fewer in number. Shopping and recreational trips follow the needs, mood and desires of the individual population and are made more often on weekends.

### Daily Vehicle Trips Generated

Table 4.7.9

Car	1010
Motor-cycle	1321
Bus	1569

Source: Bayan Baru of Neighbourhood Study.

<sup>4</sup> Note: Possible inaccuracy due to the small sample.

4.8 REX THEATRE

1 Location

The residential area is located in the centre of George Town. The area is bounded on three sides by district distributors Burmah Road, Penang Road and Macalister Road. The fourth side is bounded by Anson Road.

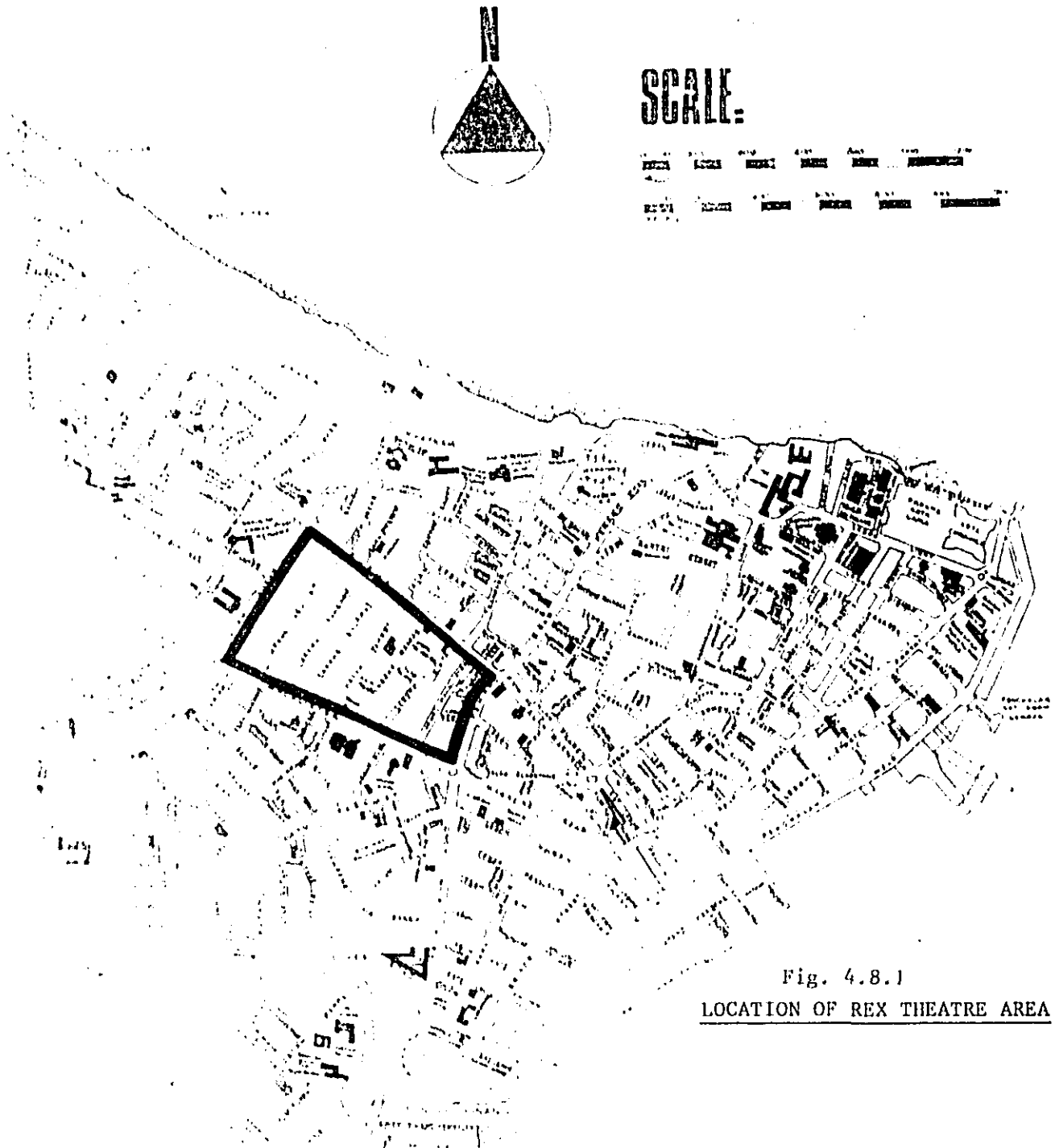


Fig. 4.8.1  
LOCATION OF REX THEATRE AREA



2. Present Condition of the Area

2.1 Socio-Economic Aspect

Population Characteristic

The area has a total population of 5,500 persons. The age structure for this residential area is as shown in the table and figure below:-

Age Structure Table. 4.8.1

	% in Study Area (1978)	% for Penang State (1970)
1 - 6	10.0	19.4
7 - 12	8.0	17.0
13 - 18	15.0	15.0
19 - 35	34.0	23.6
36 - 55	20.0	16.6
Above 56	13.0	8.4

Source: Rex Theatre Urban Renewal Study, 1978

A comparison with the age structure of Penang State shows an unusually large proportion of the age group between 19 and 35.

There is also a generally higher proportion of older people than the state and correspondingly a lower proportion of younger people.

The household size 7.0 is fairly large when compared to that of George Town or Penang State.

This reflects partly the low socio-economic status of the residents and also the existense of many 'extended' families.

Household size Table 4.8.2

Area	Household size (persons/hn)
Residential area (1978)	7.0
George Town (1970)	6.17
Penang State (1970)	5.77

### Household Income

The monthly household income is as shown in the figure below:-

Monthly Household Income Table 4.3.3

Income ( \$ )	Residential area		Penang State
	%	cum. %	cum. %
0 - 199	32	32	28
200 - 399	38	70	68
400 - 799	22	92	88
Above 800	8	100	100

When compared to Penang State, this area has a comparatively lower income level. When compared to urban areas in Penang it would be even lower. This shows the very low socio-economic status of the people being in this area.

### Vehicle Ownership

The area itself has a relatively low vehicle ownership rate. When compared to the 1970 vehicle/household ratio it is almost similar, despite the 8 years difference in time and the fact that this is an urban area. This is partly a reflection of the low socio-economic states of the residents here and the fact that transport need is less being within walking distance to many of the facilities in George Town and the bus terminus.

Table 4.8.4

	Study Area *		Penang **
	No of vehicles	No of vehicles/100 household	No of vehicles/100 household
Car	288	30	34
Motorcycle	652	68	65
Bicycle	528	55	

\* 1978 Source : Rex Theatre Urban Renewal Study

\*\* 1970 Source : Census.

Land UtilisationLanduse

The area is basically a residential area but due to its central location & good accessibility it has been experiencing much commercial pressure and many residential areas are slowly changing to commercial use. However in general the commercial and institutional areas are located mainly along the main roads in the periphery of the area.

The detail landuse is shown in Map below.

Table 4.8.5 LANDUSE CLASSIFICATION

Landuse	Area (hactares)	Acres
Residential	25.1	6.2
Commercial or residential/commercial	7.3	1.8
Institutional	1.2	3
Roads (inc access roads)	3.3	8.4
Others (includes an unused oil mill and a cemetery)	1.1	2.6
Total	38	94

Density

The population is 5580 persons from 960 households. The total number of dwelling units is 826. With a gross housing area of 38 hectares, the gross density is 146.8 persons per hectare or 21.7 dwelling units per hectare.

The net housing area is 25.1 hectares. This gives a net density of 222.3 persons per hectare or 32.9 dwelling units per hectare.

### Trips per day

The number of trips made in a day was found from an interview survey of the area.

The breakdown according to travel modes is as follows:-

Table 4.8.6 TOTAL TRIPS

Mode	Total person trips per day	Person trips per vehicle	Occupancy	Trips per vehicle	Total vehicle trips
Car	1328	4.6	1.9	2.4	691
Motorcycle	1887	2.9	1.2	2.4	1565
Bicycle	1507	2.8	1	2.8	1478
Bus	660	-	-	-	-
Walk	1608	-	-	-	-
Total	6990				3734

Source : Rex Theatre Urban Renewal Study, 1978.

From the analysis it was found that a total of 3734 vehicle trips are generated per day. Out of this 19 % are car trips, 42 % motorcycle trips and 39 % bicycle trips.

### Housing Type

The neighbourhood has 826 residential units but out of this 35% are also used for some commercial purposes. The basicity of residential units is limited primarily to terrace units with only a small percentage of detached and semi-detached units.

The types can be classified as:-

- 1) Terrace units - These include double and single storey units. A large proportion of the units, particularly the double storey units are shophouses.
- 2) Semi-detached units - These are fewer in number and are generally single or double storey.
- 3) Detached units - These range from old bungalows to small shacks in dilapidated condition. There are only 8% of such units.
- 4) Flats/apartment units - These are generally four storey walk-up flats. They form only 2%.

Housing Types Table 4.8.7

House Types	%
Terrace	89.4
Semi-detached	2.4
Detached	8
Flats	0.2
	100

Source: Rex Theatre Urban Renewal Study, 1978

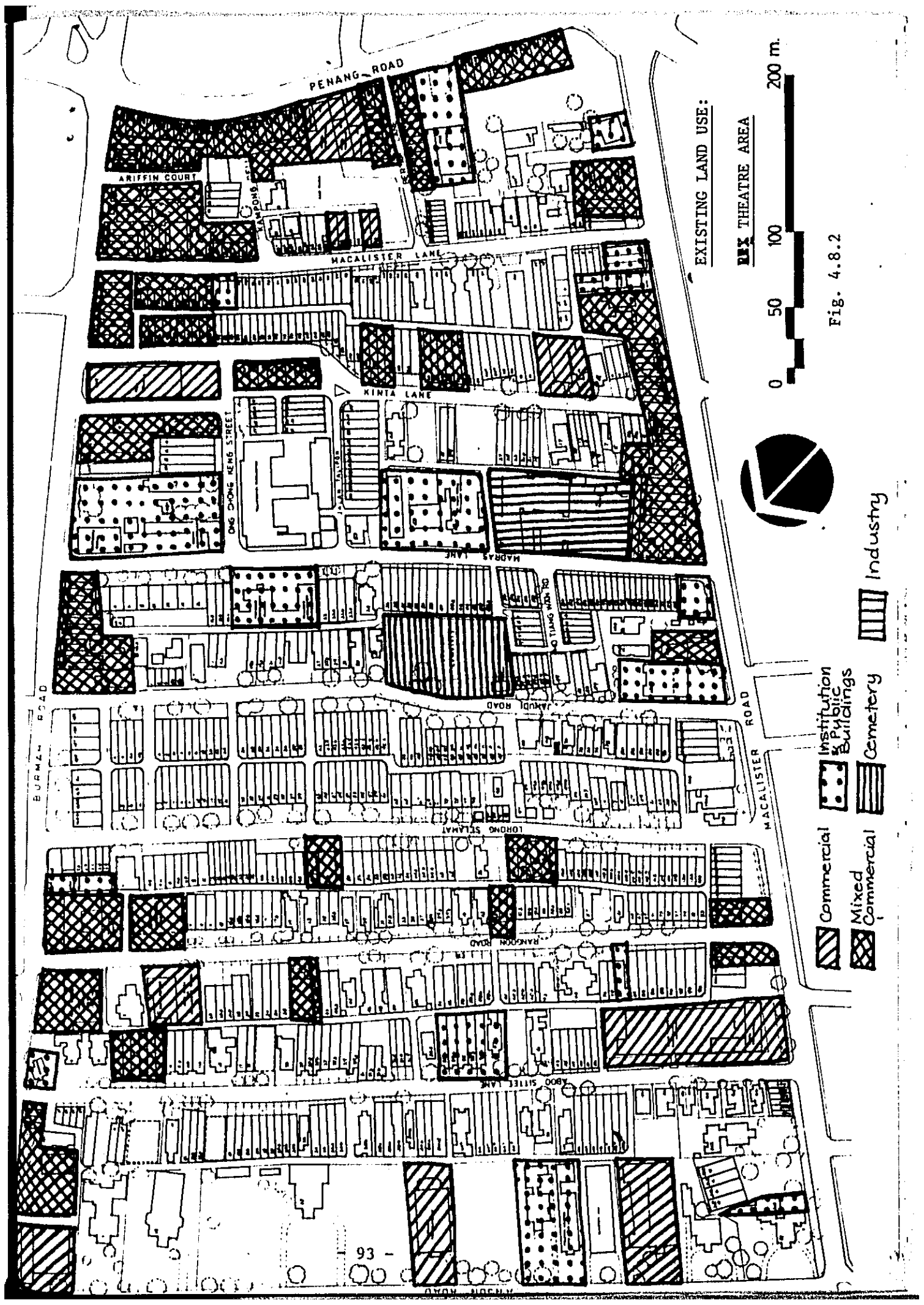
### Age and Condition

A large proportion are pre-war structures with less than 10% built within the last 10 years. Only a small proportion are in good condition as the main proportion consists of buildings in fair condition.

Building Condition Table 4.8.8

Condition	No.	%
Good	134	16.2
Fair	644	78.0
Bad	48	5.8
	826	100.0

Source: Rex Theatre Urban Renewal Study, 1978.








EXISTING LAND USE:

THEATRE AREA



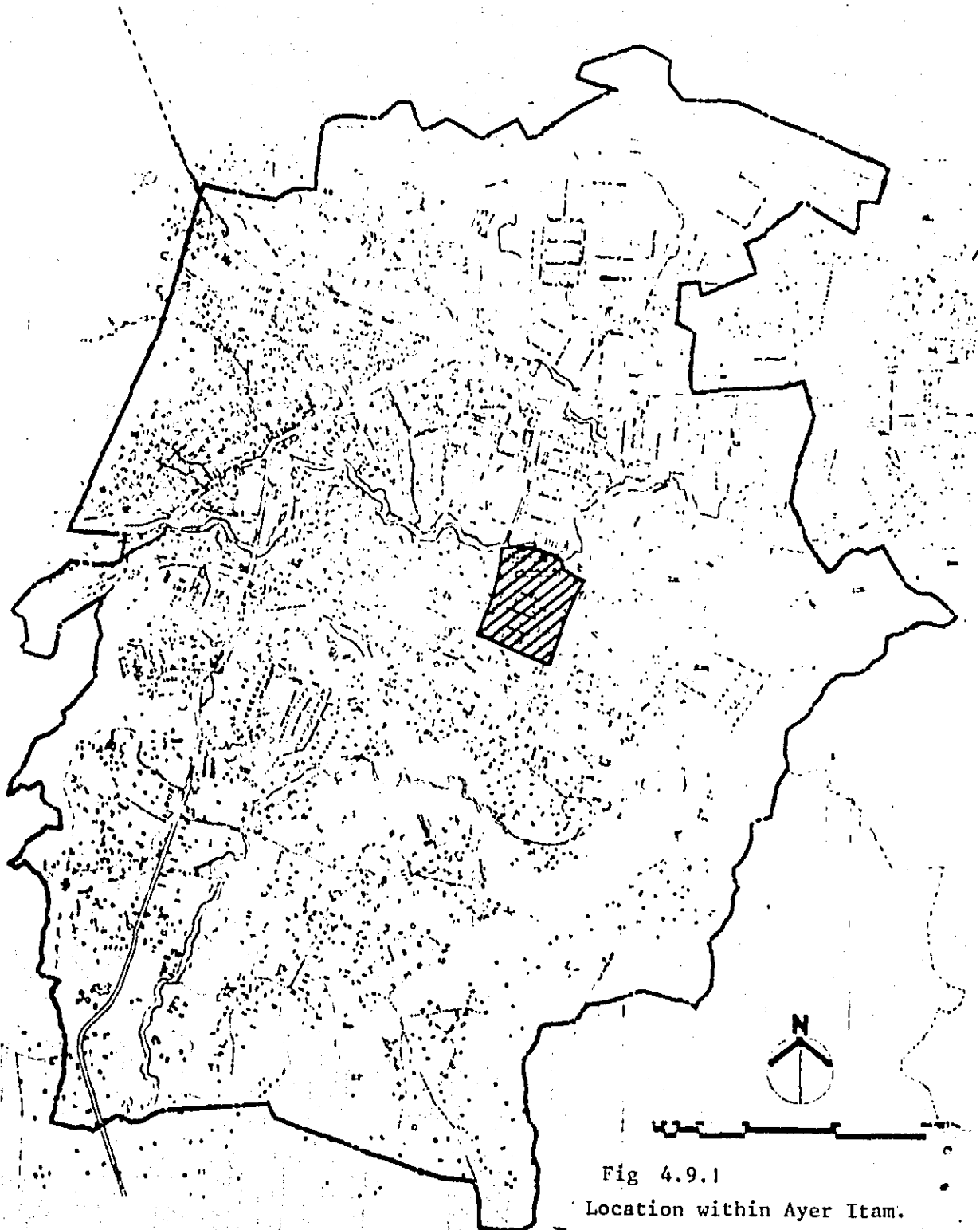
Fig. 4.8.2

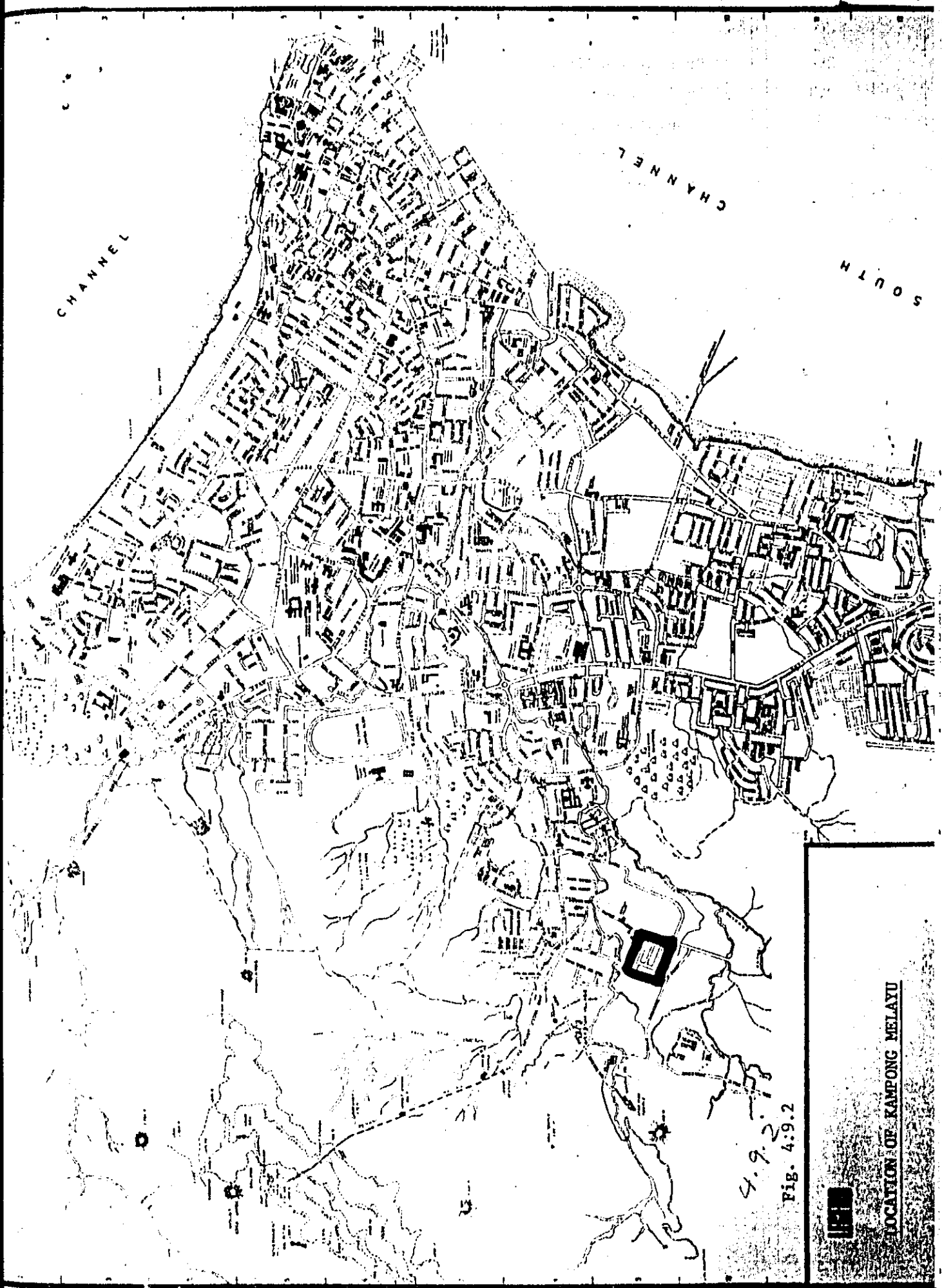
-  Commercial
-  Mixed Commercial
-  Institution & Public Buildings
-  Cemetery
-  Industry

1. Geographic Location

This residential area is located in the central of the Ayer Itam town. It is about 4 km. from George Town Central Business District.

It is surrounded by residential all around it. Much of the surrounding residential units consist of squatter settlement of low density.





4.9.2  
Fig. 4.9.2

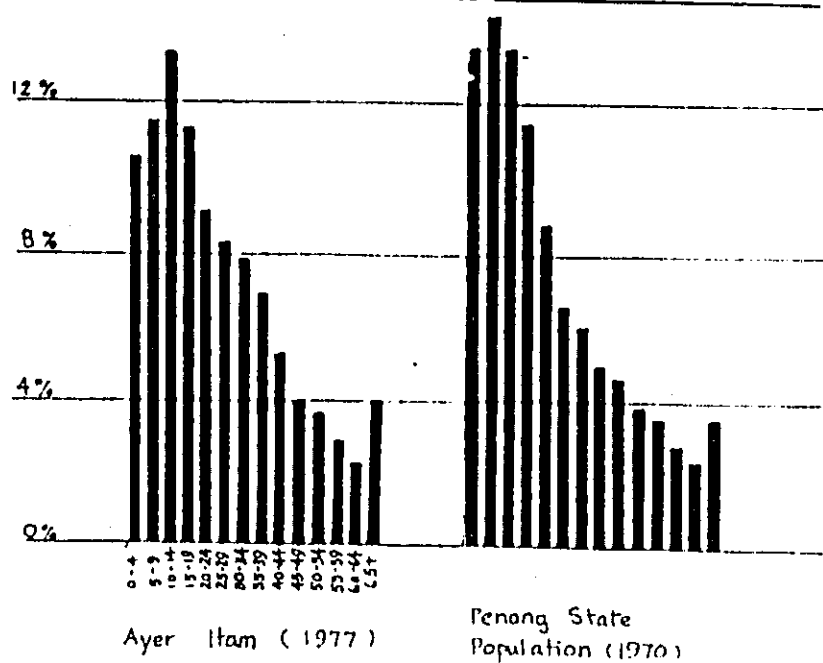
LOCATION OF KAMPONG MELAYU



2. Present Condition of the Area  
 2.1 Socio-economic aspect  
Population characteristic

The area has a total population of 3056 persons. The age structure for Ayer Itam is shown in the figure below. It is estimated that Kg. Melayu Flats has a higher percentage of young people between the ages of 20 to 30 consisting of young couples.

Table 4.9.3 Age Sex Structure



As indicated by the name 'Kampong Melayu', the area is predominantly or Malay area with 74% of the residents of Malay race. 20.2 are Chinese and only 5.8% are Indians.

The household size is fairly small being only 3.5. This is due to the fact that many of the residents are young unmarried people or young couples who have only one or two children.

Area	Household size (persons/hn)
Kampong Melayu (1977)	3.5
Ayer Itam (1977)	5.5
George Town (1970)	6.17
Penang State (1970)	5.77

The monthly household income is as shown in the table below:-

Income (\$)	%	Cum. %	Ayer Itam Cum. %
0 - 199	9.4	9.4	9.7
200 - 399	62.0	71.4	57.1
400 - 799	23.3	94.7	88.9
Above 800	5.5	100	100

When compared to Ayer Itam as a whole, this area shows a lower income level but it is slightly higher than that of Penang State. This is a considerably low income level for urban areas. It reflects the low socio-economic status of the people particularly those staying in the low-cost Kg. Melayu Flats.

#### Vehicle Ownership

The characteristics of vehicle ownership for households is shown in the table below:-

No. of vehicles	Car	Motorcycle
none	617	532
1	52	117
2	3	21
3	1	3
4		
mean no.	0.09	0.25

Source : Ayer Itam Urban Development Study.

Vehicle/Household Ratio Table 4.9.4

(per 1000 households)

	Residential Area (1977)	Ayer Itam (1977)	Penang State (1979)
Car	90	239	379
Motorcycle	250	496	726

Source : Ayer Itam Urban Development Study

Compared to Ayer Itam as a whole this residential area has a comparatively very low vehicle ownership rate. It is also very much lower than the Penang State Ratio. The low vehicle ownership ratio reflects the low socio-economic status of the residential area.

## 2.2

### Land Utilization

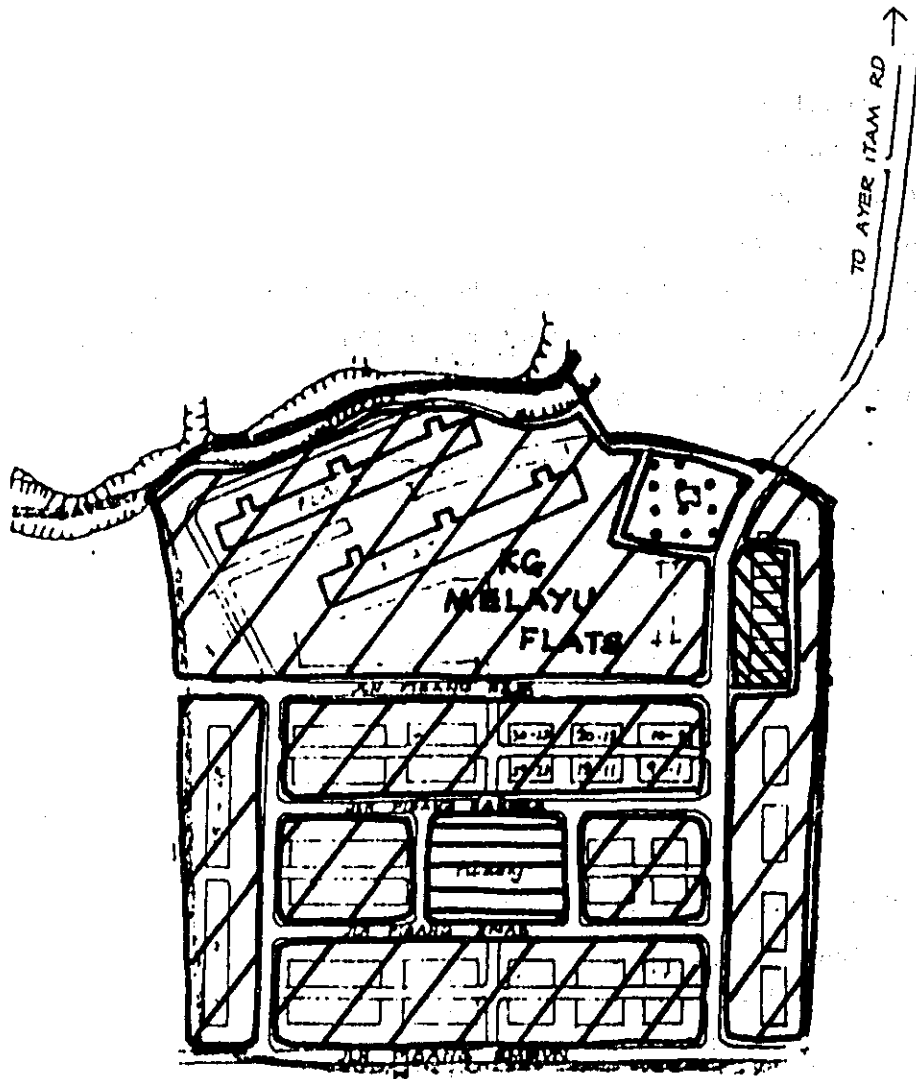
#### Landuse

The area is largely taken up by residential units with only a school, an open space and some commercial establishments.

The detail breakdown for each type of landuse is as shown in the table below:-

Table 4.9.5 Landuse Classification

Landuse	hectares	acres
Residential	4.67	11.55
Commercial	0.21	0.51
Educational	0.21	0.51
Open Space	0.25	0.63
Roads	0.40	1.00
Total	5.74	14.2



Legend





-  Residential
-  Commercial
-  Open Space
-  Education

Fig. 4.9.4 EXISTING LAND USE : KAMPONG MELAYU

Density

The total population is 3056 persons. The total number of housing units is 673. With a gross housing area of 5.74 hectares, the gross density is 532.4 persons per hectare or 117.2 units per hectare.

The net housing area is 4.67 hectared. This gives a net density of 654.4 persons per hactare or 144.1 units per hectare.

Gross and Net Density Table 4.9.6

	Density per hectare		Density per acre	
	population	housing units	population	housing units
Gross Density	532.4	117.2	215.4	47.4
Net Density	654.4	144.1	264.8	58.3

Number of Trips Generated (Estimated)

Table 4.9.7

<u>Trip Purpose</u>	<u>Non-vehicle</u>	<u>Motorcycle</u>	<u>One car</u>	<u>Multi car</u>	<u>Total</u>
Work	242	1134	383	23	1782
School	159	458	239	17	873
Business/shooping	144	605	288	23	1060
Social	798	321	208	12	1339
	1343	2518	1118	75	5054

Mode	Total person trips	Occupancy	total vehicle trip generated
Car	905	1.65	549
Motorcycle	1687	1.35	1250

Note : All constants are taken from the  
Kuala Lumpur Transportation Study, 1964

2.3

Traffic Condition

Accessibility

There is good accessibility to almost all housing units except a few squatres houses.

Kampong Melayu Road connects the area to Ayer Itam Road!

Road Network and Road Widths

The area is served by a secondary road, the Kampong Melayu Road which joins to the primary distributor, the Ayer Itam Road. The area in the south consists of access roads leading directly to the terrace houses.

2.4

Environmental Condition

Housing Quality

Almost all the housing units in this area are in good condition being all constructed less than 15 years ago. The units are of brick/concrete construction and have all the necessary utilitres including sanitation.

Other Factors

As a whole the environmental condition is fair. However, the open spaces provided for the Kampung Melayu flats are not sufficient.

Geographic Location

The residential area is located in the north-eastern part of Ayer Itam. It is about 4 km from George Town Central Business District.

On the southern edge it is surrounded by cemeteries and on the western edge by the government Federal Reserve Unit Camps. The rest of the surrounding areas are basically residential in nature.

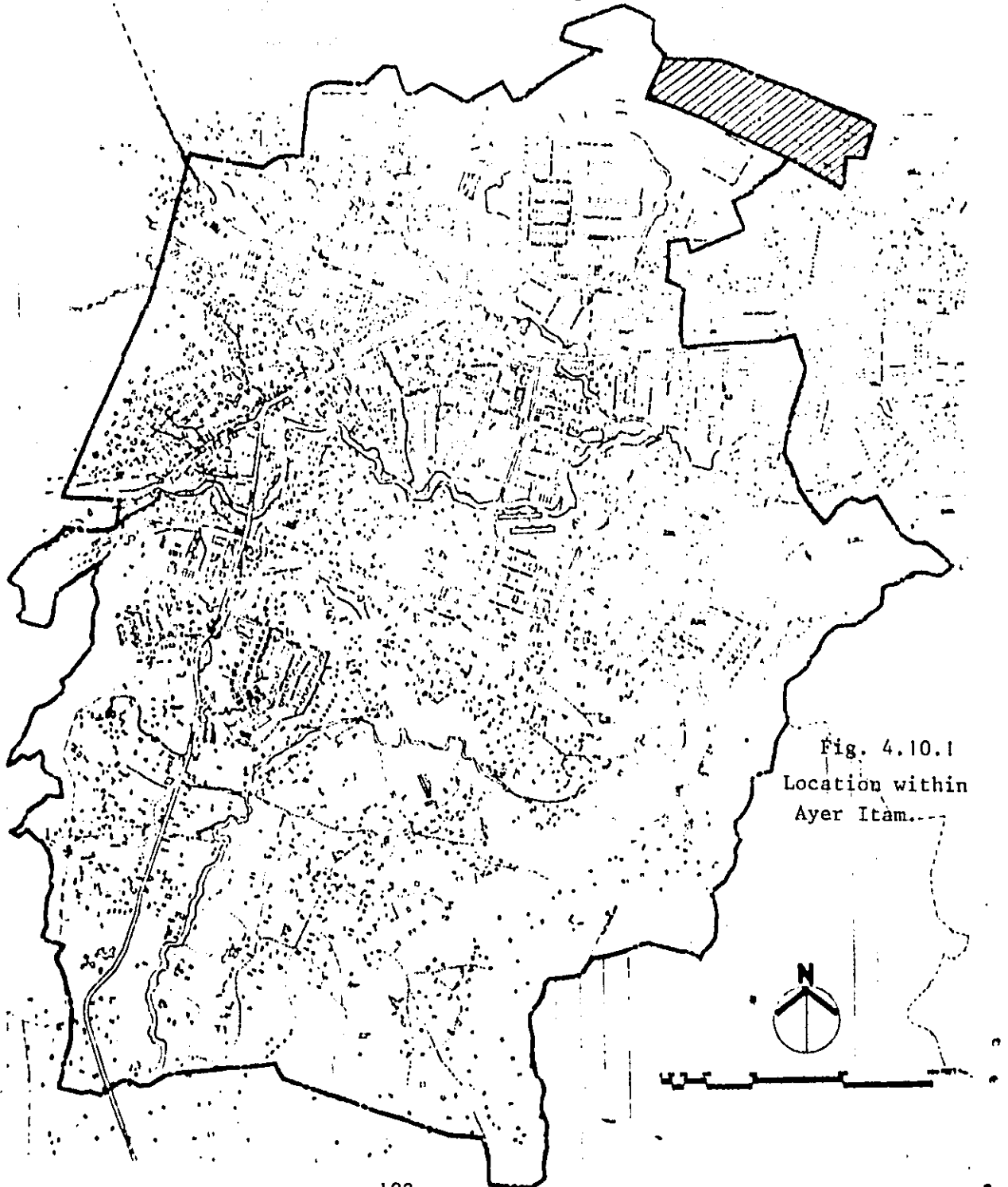


Fig. 4.10.1  
Location within  
Ayer Itam.

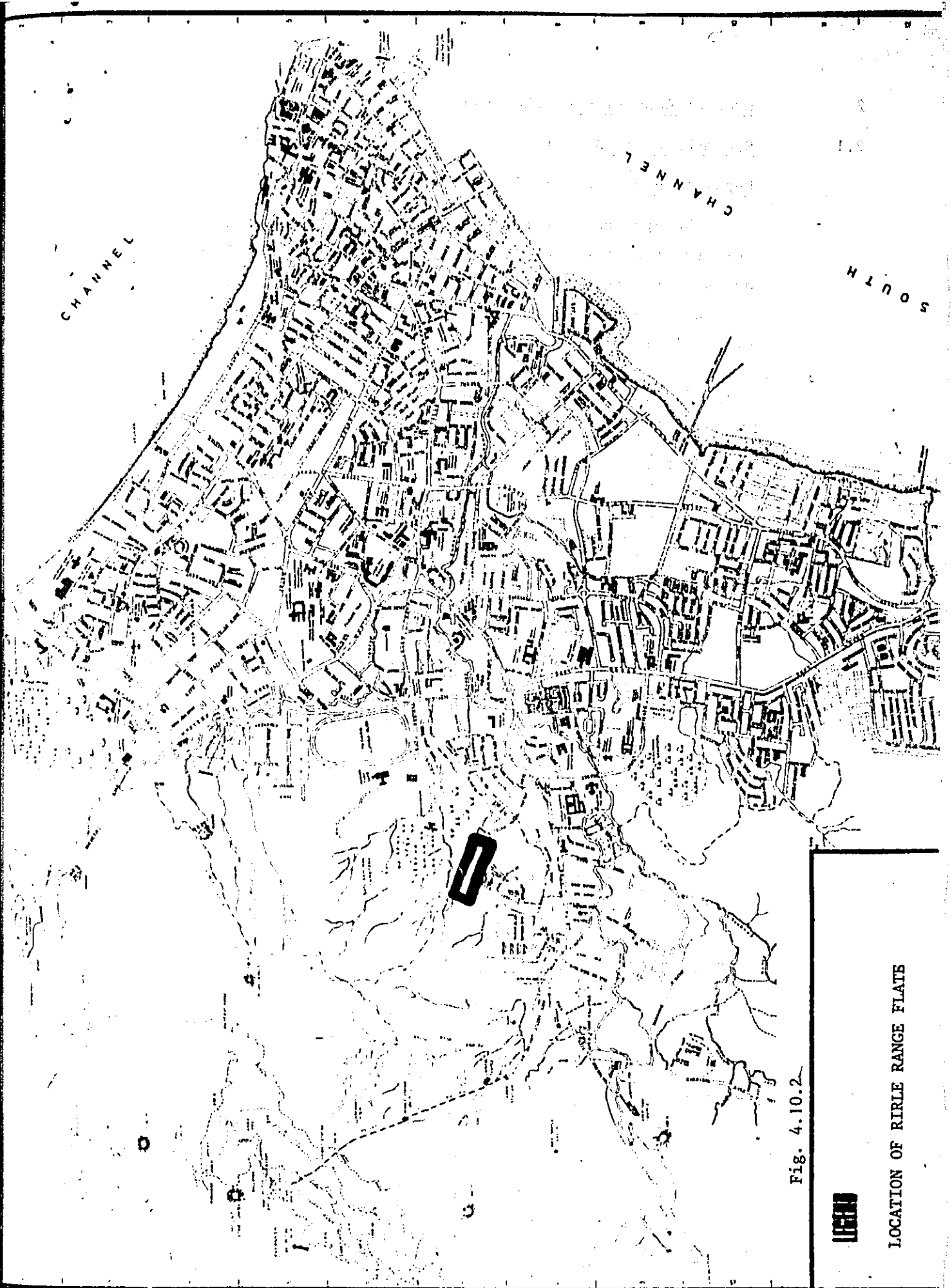


Fig. 4.10.2



LOCATION OF RIRLE RANGE FLATS

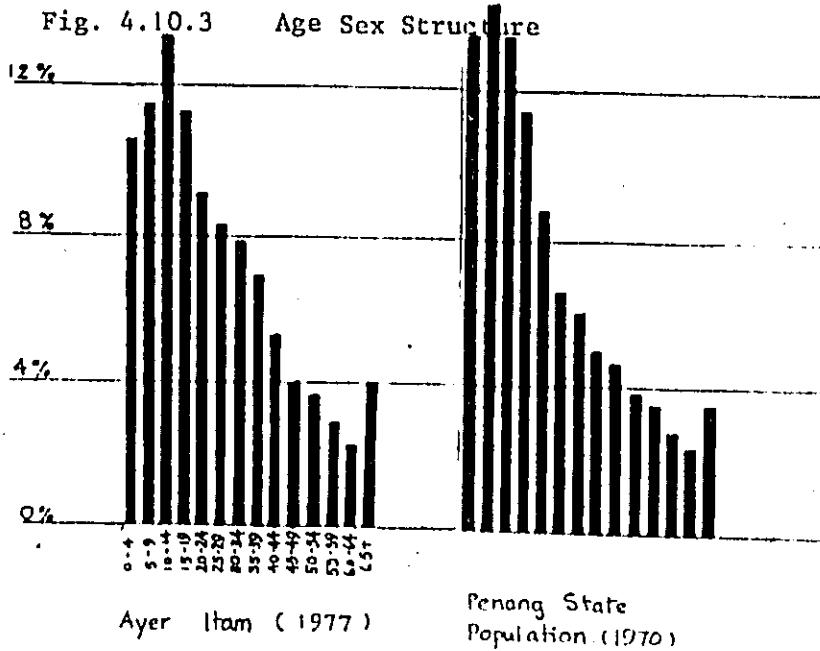


Present Condition of the Area

Socio-Economic Aspect

Population characteristics

The area has a total population of 11,840 persons. The age sex structure for Ayer Itam is as shown in the figure below. The age sex structure for this area is not available. It has a similar structure to that of Penang State although the age group of 0 - 19 is slightly lower.



It is estimated that Rifle Range has a higher percentage of young people between ages of 20 - 30. The racial composition consists of 73% of Chinese, 13% of Malays and 11% of Indians.

The household size of 4.40 is fairly small when compared to Ayer Itam or George Town.

Household Size

Table 4.10.1	Household size (persons/hh)
Residential area (1977)	4.40
Ayer Itam (1977)	5.5
George Town (1970)	6.17
Penang State (1970)	5.77

Source : Ayer Itam Urban Development Study.

The monthly household income is as shown in the table below:-

Monthly Income Table 4.10.2

Income (\$)	%	Cum %	Ayer Itam Cum %	Penang State Cum %
0 - 199	10.3	10.3	9.7	28
200 - 399	55.4	65.7	57.1	68
400 - 799	29.0	94.7	88.9	88
Above 800	5.4	100.0	100.0	100

When compared to Ayer Itam as a whole, this area has a comparatively much lower income level which is almost similar to that of Penang State. The low socio-economic status of the residents is partly due to the fact that Rifle Range is basically a low-cost flat.

#### Vehicle Ownership

The characteristic of vehicle ownership for households is shown in the table below:-

Vehicle Ownership Structure Table 4.10.3

No. of vehicles	Car	Motor-cycle
none	2867	2120
1	389	1067
2	4	65
3	0	8
4	0	0
Mean no.	0.12	0.38

Source : Ayer Itam Urban Development Study

Compared to Ayer Itam area as a whole, this residential area has a comparatively low vehicle ownership rate of 80 cars per 1000 households and 380 motorcycles per 1000 households. This is much lower than both the Ayer Itam and Penang State ratios.

Table 4.10.4

Vehicle/Household Ratio (per 1000 households)

Residential Area (1977)    Ayer Itam (1977)    Penang State (1979)

Car	120	234	379
Motorcycle	380	496	726

Source : Ayer Itam Urban Development Study

2.2 Land Utilisation

Landuse

The area is basically a residential area with only limited commercial and community facilities. There is a complete lack of open space for recreation purposes.

The detail area of each type of landuse is as shown in the table below:-

Table 4.10.5    Landuse Classification

Landuse	hactares	areas
Residential	5.99	14.80
Commercial	0.74	1.84
Education	0.98	2.41
Religions	0.04	0.11
Road	0.28	0.69
Total	8.03	19.85

Density

The total population is 13,700 persons from 3,113 households. The total number of housing units is 3,758. With a gross housing area of 8.03 hactares, the gross density is 1706.1 persons per hactare or 468.0 units per hactare.

The net housing area is 5.99 hactares. This gives a net density of 2287 persons per hactare or 627.4 units per hactare.

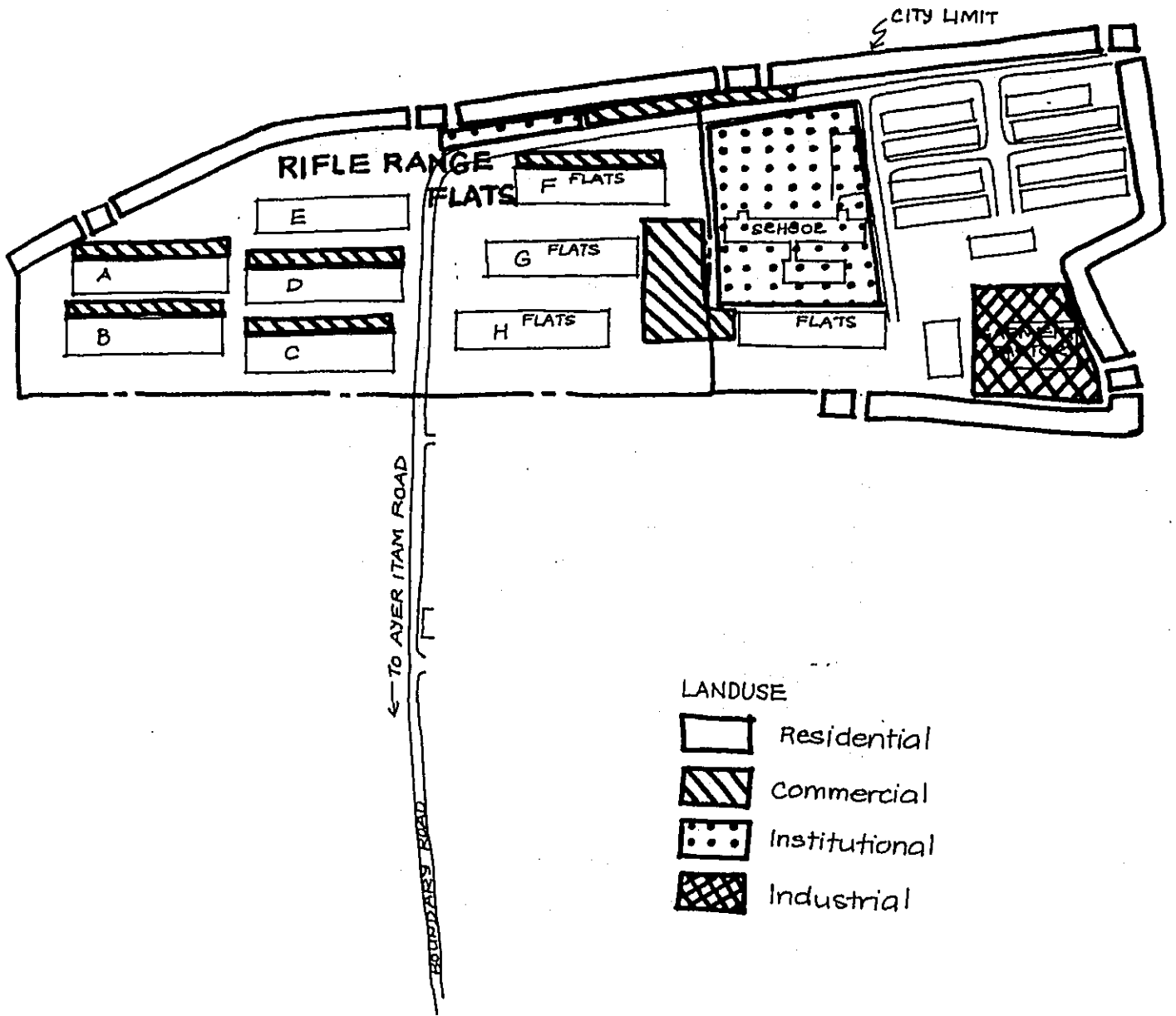


Fig. 4.10.4

EXISTING LAND USE : RIFLE RANGE FLATS

## DENSITY

Table 4.10.6

	Density per hectare		Density per acre	
	population	housing units	population	housing units
Gross density	1706.1	468.0	690.4	189.4
Net density	2287.0	627.4	925.5	253.9

### Housing Type

The main housing type is the multi-storey flats/apartment. The area is made up of 5 blocks of 17 storey flats and 4 blocks of 18 storey flats. The number of these units is 3655. There are another 100 units of terrace houses in the north-eastern side, together with 2 shophouses and 1 detached house. This brings the total number of units to 3758.

### Building Materials

The units are all of brick/concrete construction, bring high rise flats that have been constructed only about 10 years ago.

### Age and Condition

The units are all about 10 years old and are in sound condition with all utilities provided.

Table 4.10.7 Housing Type

<u>Housing Type</u>	<u>No.</u>	<u>%</u>
Flats	3655	97.3
Terrace	100	2.7
Shophouse	2	
Detached	1	
	<u>3758</u>	<u>100.0</u>

### Traffic Conditions

#### Accessibility

There is good accessibility to all housing units in the area. All units are accessible by vehicles up to within 50m. away from the units. There is also good accessibility to other areas of George Town.

#### Road Network and Road Widths

The area is served basically only by Boundary road from which small access roads branch. Boundary Road is a secondary distributor connection to Ayer Itam Road which is a primary distributor. The width of Boundary Road is 12m. (including road reserve). Parking is available at the roadside at certain places.

#### Road Condition

Boundary Road is a metalled road in good condition. Access roads to the school and the different blocks are also in good condition.

#### Bus Network

The residential area is served by the City Council Bus and the Lim Seng Seng Bus which travel along Boundary Road, and link the area with George Town Central Business District. The coverage is efficient. Due to the high concentration of population in the small area the longest distance to the bus-stop is only about 150m.

#### Frequency

A total of 49 one-way bus trips are made each day by the City Council. During peak hours, the frequency is about 15 minutes whereas during non-peak hours it is less, being about once in every 25-30 minutes. In addition, the Lim Seng Seng Bus makes about 25 trips a day with roughly a frequency of 30 minutes.

Number of Trips Generated (Estimated)

Table 4.10.8

Trip Purpose	Non-vehicle	Motorcycle	One-car	Multi car	Total
work	3460	4913	1568	23	9,964
school	2280	1984	980	17	5,621
business/shopping	2060	2622	1179	23	5,884
social	114	1391	852	12	2,369
	7914	10910	4579	75	23,478

Mode	Total person trips	Occupancy	Total vehicle trips
Car	12526	1.65	7592
Motorcycle	4436	1.35	3286

Note : All constants are taken from the  
Kuala Lumpur Transportation Study, 1964

2.4 Environmental Condition

Housing Quality

The houses are all permanent units in good structural condition and have been built only about 10 years ago with all utilities provided.

Other Factors

The area desperately lacks open space and there is congestion of people and traffic along the roads. Overall there is a lack of space for the movement needs of the large population.

