URBAN TRANSPORT STUDY

IN

GREATER METROPOLITAN AREAS

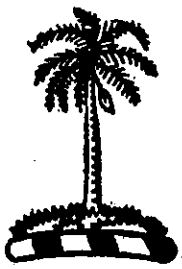
OF

GEORGETOWN, BUTTERWORTH AND BUKIT MERTAJAM

MALAYSIA

ROAD-SIDE TREES SURVEY

TECHNICAL REPORT — 08



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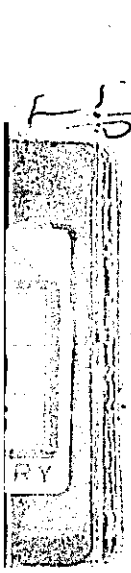

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ROAD-SIDE TREE SURVEY

CONTENTS

1. Objectives.

The objective of this road-side tree survey is to study the existing condition of roads and highways in George Town, Butterworth and Bukit Mertajam as regards to their landscape. This survey will provide the relevant information for the appraisal of the quality of landforms and landscapes.

In the effort to study and design streets or highways, the existing street-furniture and landscape, specifically that of existing plants along these roads must be considered. People identify streets by the landmarks that they possess such as distinct trees or a row of trees planted along its side.

In addition to this, special attention must be given to the existing condition of sidewalks or pavements so that the safety of pedestrians and other road-users can be analysed.

2. Benefits and Use of Road-side Trees.

Generally speaking, the benefits and use of road-side trees can be classified into three categories which are described as follows:

a) Aesthetic - as landmarks that beautify cities. as separations between roads and the hinterland which provides comfort and stimulation to the drivers as wel as the inhabitants.

b) Climatic - as protection of roads from direct sunshine and to maintain the mild microclimate.

c) Anti-pollution - as a means of reducing the sound of noisy traffic, vibrations and also pollution.
Also, to prevent the spread of fire.

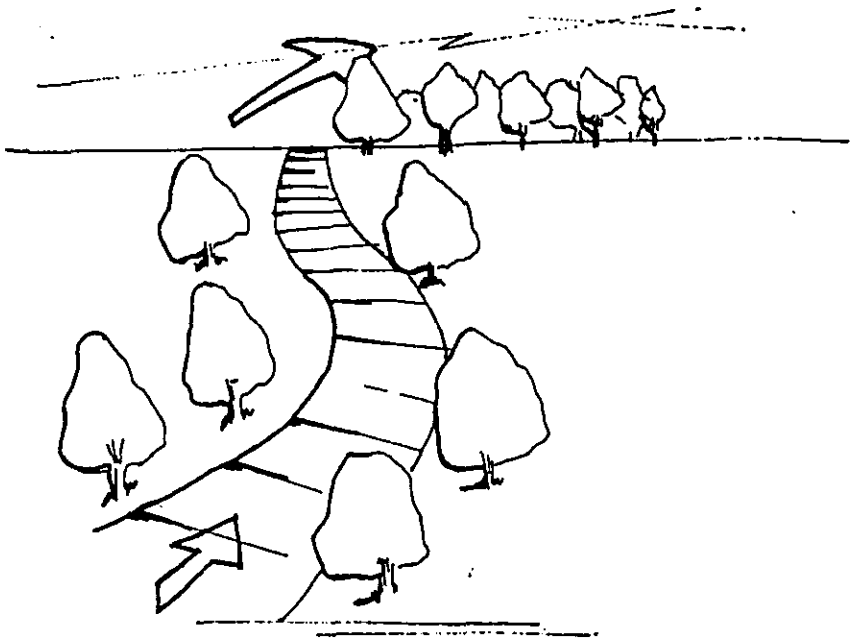
a) Aesthetic.

George Town is famous for being rich in beautiful trees, one of the popular attractions to tourists in this city.

Beautiful trees are appreciated by all, not only visually but especially in warm-climate region where they provide comfort and shade. Hence, the importance of such trees in George Town.

Trees play a very important role to landscape planners for they act as visual barriers or specific landmarks in a scenery. The use of land on either side of roads often change and it is sometimes neccessary to visually separate two areas e.g. a commercial area and a residential area. A good example of such landmarks can be found in Peel Avenue and Gottlieb Road which are easily remembered by their beautiful Royal Palms.

Road-side trees are also useful as visual aids to drivers Trees when properly planted, can provide useful hints to drivers about the direction of a road-bend. Also, trees provide good visual stimulation to drivers and hence deter them from dozing off to sleep.



b) Climatic.

Road-side trees are directly beneficial to pedestrians and other road-users as they provide shaded walking spaces from the sun and shelter from the rain. Here, it is almost indispensable that road-side tree be planted on sidewalks and this means that sidewalks should be wide enough i.e. more than 3.5m. so that the planting of trees can be done.

It is a well-known fact that enough number of trees grown in cities will have a moderating effect on the climate. In most modern cities, concrete or asphalt or asphalt is widely used and this makes the climate even warmer due to the effect of absorption and radiation of heat. Trees, therefore, not only protect the city from the direct heat of the sunshine but also promote air circulation, thus making the air cooler.

c) Anti-pollution.

The ability of trees to absorb noise or polluted air varies by area size of plantation, density of plantation, height of trees and barrier effect by certain types of trees. Regarding absorption of dust and polluted air, the leaves of trees are very important and its effects very according to the type and kind of leaves. Due to the lack of information concerning the effect of trees observed in George Town, it can only be said here that a further study is necessary.

Another effect of trees is to reduce the noise caused by traffic but reports on some experiments done show that this is effective only when there is a wide and thick growth of trees.

Hence, roadside trees observed in George Town are really inadequate for this purpose, especially so if the traffic volume increases and become more of anuisance to the public.

3 Typical Trees observed in Penang.

3-1 Road-side Trees in Penang.

One of the oldest trees in Penang is shown in the photo below.

AFRICAN BAOBAB
at MACALISTER ROAD / RESIDENCY ROAD

This tree, the African Baobab, is believed to be about 200 years old and originated from Africa.

Beside this tree, a great variety of other trees grow here which provide a very pleasant sight to the people. These are listed in the table below.

TABLE 1: LIST OF ROADSIDE TREES IN PENANG

1.	Angsana tree	– Macalister Road
2.	Rain tree	– Kelawei Road
3.	Casuarina tree	– Gurney Drive
4.	Swientia Mahogany	– Western Road, Gurney Drive, Green Lane
5.	Royal Palms	– Peel Avenue, Codrington Avenue
6.	Melia tree	– Logan Road, Residency Road
7.	Red Flame	– Vermont Road
8.	Peltophorum	– Cantonment Road, Green Lane, Jelutong Avenue.

9.	Cinnammon tree	-	Jesselton Cresent
10.	Acacia tree	-	Batu Lanchang Lane
11.	Saga tree	-	Scott Road
12.	Filicium Decipien	-	Scott Road
13.	Jacaranda	-	Nunn Road
14.	Rubber tree	-	Ayer Rajah Road
15.	Lagerstromia Loudonii	-	Jalan Mas
16.	Cassia Spectabilis	-	Birch Road
17.	Pong Pong or Cerbera	-	Taman Berjaya
18.	Cassia Siamea	-	Jalan Brother James
19.	Pongamia	-	Midlands Drive or Victoria Green Road, Jalan Sekolah La Salle
20.	Cordia Subcordata	-	Lim Eow Thoon Road
21.	Madras Thorn	-	Dato Kramat Ground
22.	Mimusops Elengi (Tanjong Tree)	-	York Road
23.	Sterculia Fortida	-	Patani Road
24.	Andira	-	Jalan Brother James, Jalan Besi
25.	Melia Excelsa	-	Western Road
26.	African Bobaob	-	In front of Peel Avenue circus
27.	Tembusu	-	Free School Road.

3-2 Tree-Directory.

Some of the road-side trees that are frequently observed in Penang are given in the following pages in a form that will enable a clearer and better understanding of them. This information was prepared with the cooperation of the Municipal Council of Penang Island.

Road Side Trees in Penang.

1. Name of Trees.

2. Shape of Trees.

Maximum Height	60'
Maximum Diameter	3'
Maximum Circum.	11'
Distance between Trees	40'
Maximum Crown of Trees.	Fairly wide - spreading crown 40'

3. Maturity Age in years. 20 years.

4. Characteristics.

Very fast growing trees. Flowers insignificant, pale yellow green, seeds bright red in nine-inch long pods.

ROAD - SIDE TREES IN PENANG.

1. Name of Tree.

ENTEROLOBIUM SAMAN.

2. Shape of Tree.

Maximum Height.	100'
Maximum Diameter.	6'
Maximum Circum.	21'
Distance between Trees.	60'
Maximum Crown of Trees.	Very wide spreading crown- Approx. 100'

3. Maturity Age in years. 30 years.

4. Characteristics.

Fairly dense dark green foliage. Flowers white and pink. Pods about 8 inches long, thick and flattened, seeds half-inch long, brown, shed from the tree.

ROAD SIDE TREES IN PENANG.

1. Name of Tree.

SWIETENIA MACROPHYLLA.

2. Shape of Tree.

Maximum Height.	80'
Maximum Diameter.	4'
Maximum Circus.	13'
Distance between Trees.	50'

Maximum Crown of Trees. Moderate, erected habit spreading 40'

3. Maturity Age in years. 20 years.

4. Characteristics.

Foliage dark glossy green. New leaves delicate pale green. Flowers on new shoots, insignificant; pods erect, massive, opening on the tree to release the large winged seeds.

ROOD-SIDE TREES IN PENANG.

1. Name of Tree.

CASSIA SPECTABILIS.

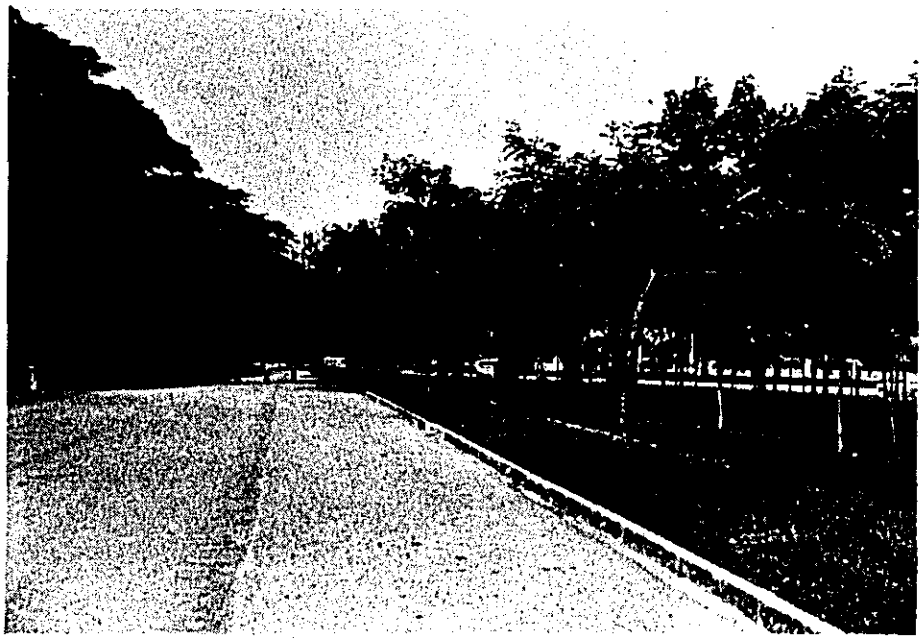
2. Shape of Tree.

Maximum Height.	20'
Maximum Diameter.	1'
Maximum Circum.	3'
Distance between Trees.	35'
Maximum Crown of Trees.	Wide spreading crown - 20'

3. Maturity Age in years. 5 years.

4. Characteristics.

Very fast growing tree. Flowers vivid yellow in large terminal inflorescences, pleasantly scented; pods ten inches long.



ROAD-SIDE TREES IN PENANG.

1. Name of Tree.

CINNAMOMUM INERS.

2. Shape of Tree.

Maximum Height.	35'
Maximum Diameter.	2'
Maximum Circum.	7'
Distance between Trees.	40'
Maximum Crown of Trees.	Crown dense and bushy - 25'

3. Maturity Age in years. 10 years.

4. Characteristics.

Medium growing tree. Young leaves an attractive reddish pink, then cream, then green. Flowers small white, in eight-inch long panicles, fruit a half-inch long berry.

ROAD-SIDE TREES IN PENANG.

1. Name of Tree.

LAGERSTROEMIA LOUDONII.

2. Shape of Tree.

Maximum Height.	35'
Maximum Diameter.	2'
Maximum Circum.	7'
Distance between Trees.	40'
Maximum Crown of Trees.	Bushy and rounded crown- 30'.

3. Maturity Age in years. 10 years.

4. Characteristics.

Medium growth. Foliage dark green and flowers purple in colour.

ROAD-SIDE TREES IN PENANG.

1. Name of Tree.

PELTOPHORUM PTEROCARPUM.

2. Shaps of Tree.

Maximum Height.	50'
Maximum Diameter.	3'
Maximum Circum.	11'
Distance between Trees.	45'
Maximum Crown of Trees.	Wide round spreading crown 40'.

3. Maturity Age in years. 10 years.

4. Characteristics.

Foliage moderately dense, mid-green. Flowers on ascending shoots above the canopy, bright gold yellow, at the same time as the new leaves; fruit a brown flat four-inch pod, seeds hard, flat, yellowish, they may be shed from the tree or retained in fallen pods.

ROAD-SIDE TREES IN PENANG.

1. Name of Tree.

PONGAMIA.

2. Shape of Tree.

Maximum Height.	35'.
Maximum Diameter.	2'.
Maximum Circum.	7'.
Distance between Trees.	40'.
Maximum Crown of Trees.	Very wide spreading crown-35'.

3. Maturity Age in years. 10 years.

4. Characteristics.

Medium growth. Foliage dark green. Flowers purple and fruit small circular.

ROAD-SIDE TREES IN PENANG.

1. Name of Tree.

CASUARINA TREE.

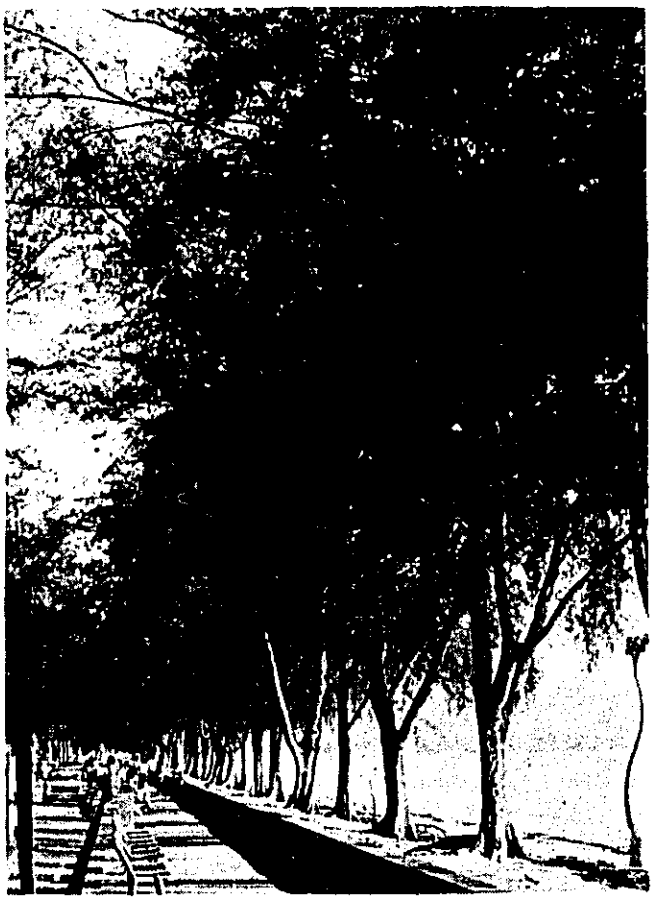
2. Shape of Tree.

Maximum Height	100'.
Maximum Diameter	4'.
Maximum Circum.	13'.
Distance between Tree	50'.
Maximum Crown of Trees.	Conical bushy segments of foliage- approx 30'.

3. Maturity Age in years. 40 years.

4. Characteristics.

Foliage soft fir like evergreen and flowers inconspicuous. Spherical with protruding tips of the fruit cells. Seed about 3/8 of an inch long shed from the tree.



ROAD-SIDE TREES IN PENANG.

1. Name of Tree.

ROYAL PALM.

2. Shape of Tree.

Maximum Height	65'.
Maximum Diameter	1¾'.
Maximum Circum.	6'.
Distance between Trees	30'.
Maximum Crown of Trees.	Erected habit with moderate spreading.

3. Maturity Age in years. 15 years.

4. Characteristics.

Foliage like coconut leaves, flowers light yellow and seeds are shed from a bunch of a tree.

ROAD-SIDE TREES IN PENANG.

1. Name of Tree.

MELIA.

2. Shape of Tree.

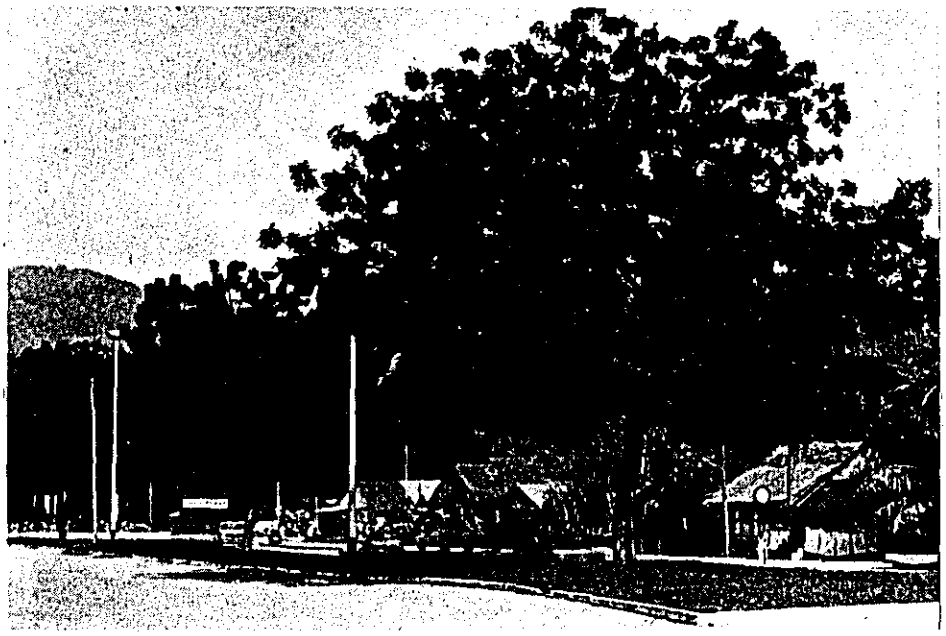
Maximum Height	50'.
Maximum Diameter	3'.
Maximum Circum.	11'.
Distance between Trees	45'.

Maximum Crown of Trees. Wide round spreading crown - 40'

3. Maturity Age in years 10 years.

4. Characteristics.

Fast growing tree. Foliage green yellow-like, with flowers inconspicuous - white and fresh, oval green fruit with only one seed.



ROAD-SIDE TREES IN PENANG.

1. Name of Tree.

RED FLAME.

2. Shape of Tree.

Maximum Height	45'.
Maximum Diameter	3'.
Maximum Circum.	11'.
Distance between Trees	40'.
Maximum Crown of Trees.	Moderate Crown - 35'.

3. Maturity Age in years. 10 years.

4. Characteristics.

Flowers very conspicuos, vivid scarlet in short panicles on new shoots, pods up to 18 inches long, flat, curved, black and woody, opening on the tree, seeds large.

ROAD-SIDE TREES IN PENANG.

1. Name of Tree.

ACACIA.

2. Shape of Tree.

Maximum Height	50'.
Maximum Diameter	2½'.
Maximum Circum	9'.
Distance between Trees	50'.
Maximum Crown of Trees.	Irrequlor spreading habit-40'.

3. Maturity Age in years 10 years.

4. Characteristics.

Very fast growing tree. Foliage grey-green, yellowing on old trees, evergreen but leaf - fall heavy;almost continuous flowing with clouds of soft yellow powder. Abundant seed in coiled pods.

ROAD-SIDE TREES IN PENANG.

1. Name of Tree.

JACARANDA.

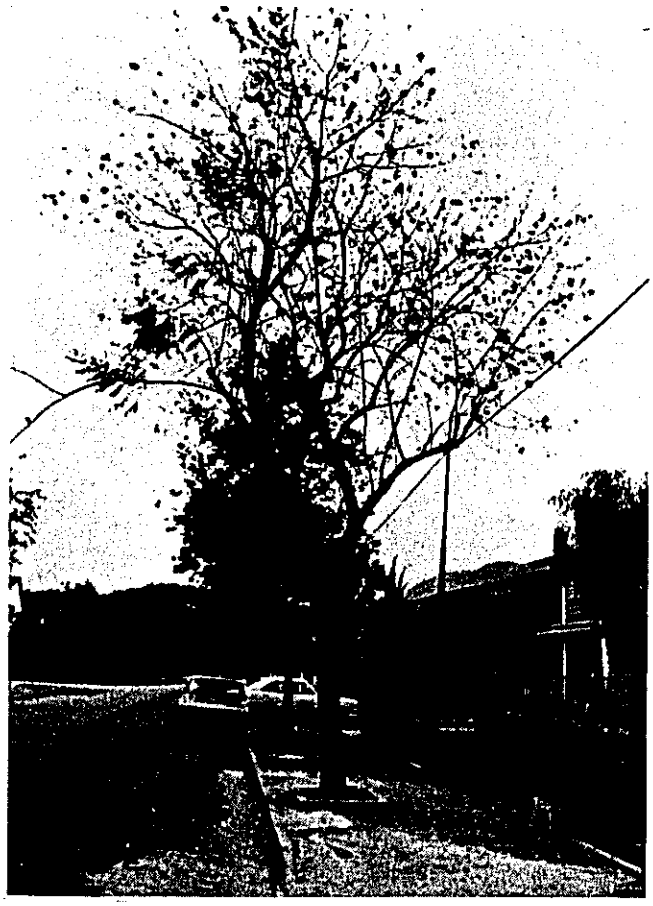
2. Shape of Tree.

Maximum Height	30'.
Maximum Diameter	2'.
Maximum Circum	7'.
Distance between Trees	35'.
Maximum Crown of Trees.	Erected branching with moderate spreading - 20'.

3. Maturity Age in years 10 years.

4. Characteristics.

Slow growing tree. Foliage pale gree, light and feathery. Flowers borne on newly - leafing branches in attractive clusters of pale lilac-blue trumpets, pods short, opening on the tree.



ROAD-SIDE TREES IN PENANG.

1. Name of Tree.

MIMUSOPS ELENGII.

2. Shape of Tree.

Maximum Height	40'.
Maximum Diameter	3'.
Maximum Circum	11'.
Distance between Trees	40'.

Maximum Crown of Trees. Spreading and rounded crown-30'.

3. Maturity Age in years. 15 years.

4. Characteristics.

Slow to medium growth. Foliage green, flowers small, white and fragrant. Fruit about one inch long, green, ripening to orange, fleshy, containing one seed.

ROAD-SIDE TREES IN PENANG.

1. Name of Tree.

ANDIRA.

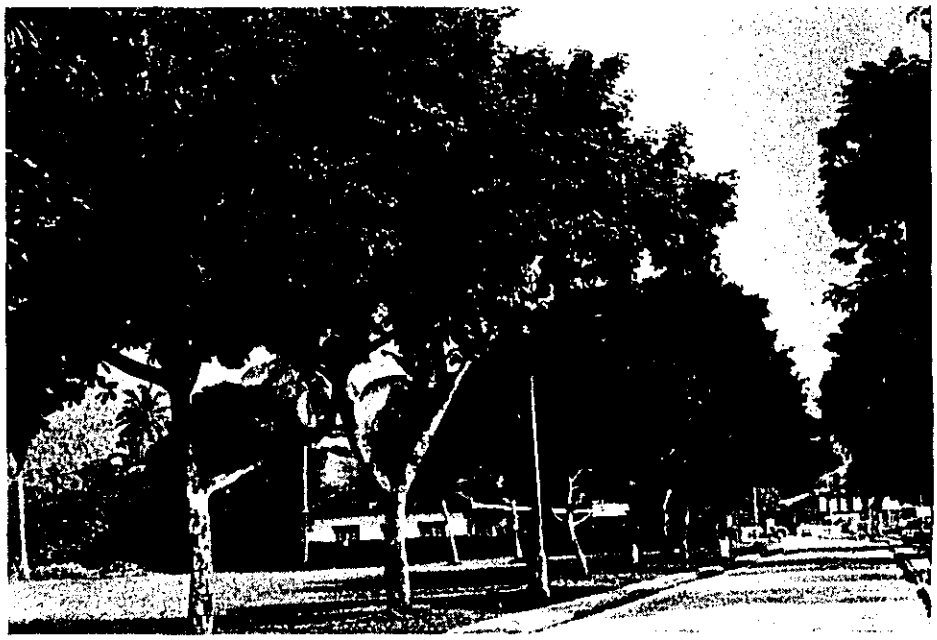
2. Shape of Tree.

Maximum Height	30'.
Maximum Diameter	2',
Maximum Circum	7'.
Distance between Trees	40'.
Maximum Crown of Trees.	Bushy Crown-30'.

3. Maturity Age in years. 10 years.

4. Characteristics.

Fast growing with evergreen dark foliage. Flowers small, purple. Fruits about two-inches, oval shape.



SURVEY METHOD.

3 - 1 Roads to be surveyed.

The following major roado were chosen for road-side tree survey.

a) GEORGE TOWN.

1. Gurney Drive.
2. Kelawai Road.
3. Bagan Jermal Road.
4. Burmah Road.
5. Western Road.
6. Macalister Road.
7. Dell Avenue.
8. Pangkor Road.
10. Light Street.
11. Farguhar Street.
12. Northam Road.
13. Penang Road.
14. Chulia Street.
15. Beach Street.
16. Weld Quay.
17. Dato Keramat Road.
18. Bridge Road.
19. Gelutong Road.
20. Sungei Pinang Road.
21. Perąk Road.
22. Scotland Road.
23. Ayer Itam Road.
24. Batu Gantong Road.
25. Green Lane.
26. Batu Lancang Lane.
27. Hamilton Road.
28. Batu Lancang Road.

4 - 2. SURVEY PROCEDURE.

The surveyor was required to go to the site (road selected) and to complete the survey sheet attached (Fig.1). They also had to sketch a section of the site in order that the existing condition of road is shown which may consist of:

- location of trees.
- condition of pavement.
- present use of land.
- characteristic of road shoulder.

In addition to these, they were also required to make remarks which may prove useful for the purpose of analysis and evaluation.

Regarding to the survey on the age of trees, it was not possible to conduct it due to some technical difficulties.

Fig. 1 ROADSIDE TREE SURVEY. JICA - UTS

Sect Street Name: _____

Surveyed by: _____ Date: _____

Sketch

Remarks

I T E M S	Type of Trees			
No. of Trees				
Average dia. of Trees (Shade)				
Average Height				
Circumference of Trunk				
Distance between Trees				
Distance from edge of road				
Width of Pavement				
Width of Road Shoulder				
Adjacent Lane Use				

5 ANALYSIS

5 - 1 Distribution of Road-side Trees.

Among the central areas of the three towns, road-side trees are the most lush in George Town especially in the north-west parts where there are many public establishments that are surrounded by low density housing areas.

These road-side trees should therefore be conserved as for as possible in order that the existing pleasant environment is maintained.

On the other hand, the C.B.C. of Georgetown is rather scarce in road-side trees. This seems to be the case in most commercial areas ehere road-side trees are rare although there is a strong need for them due to the large number of pedestrians in these areas.

The southern part of the city is also rather scarce in road-side trees. It is necessary to note that more atttention must be given to newly developed housing areas that seem to have a poor growth of trees.

For Butterworth and Bukit Mertajam most of trees are found in the properth line (not in the road reserve). So in this case, there will no restriction for future widening of Road Carriageway.The Following figures shows the distribution of the road-side trees.

fig. 2a

DISTRIBUTION OF ROADSIDE TREES

georgetown

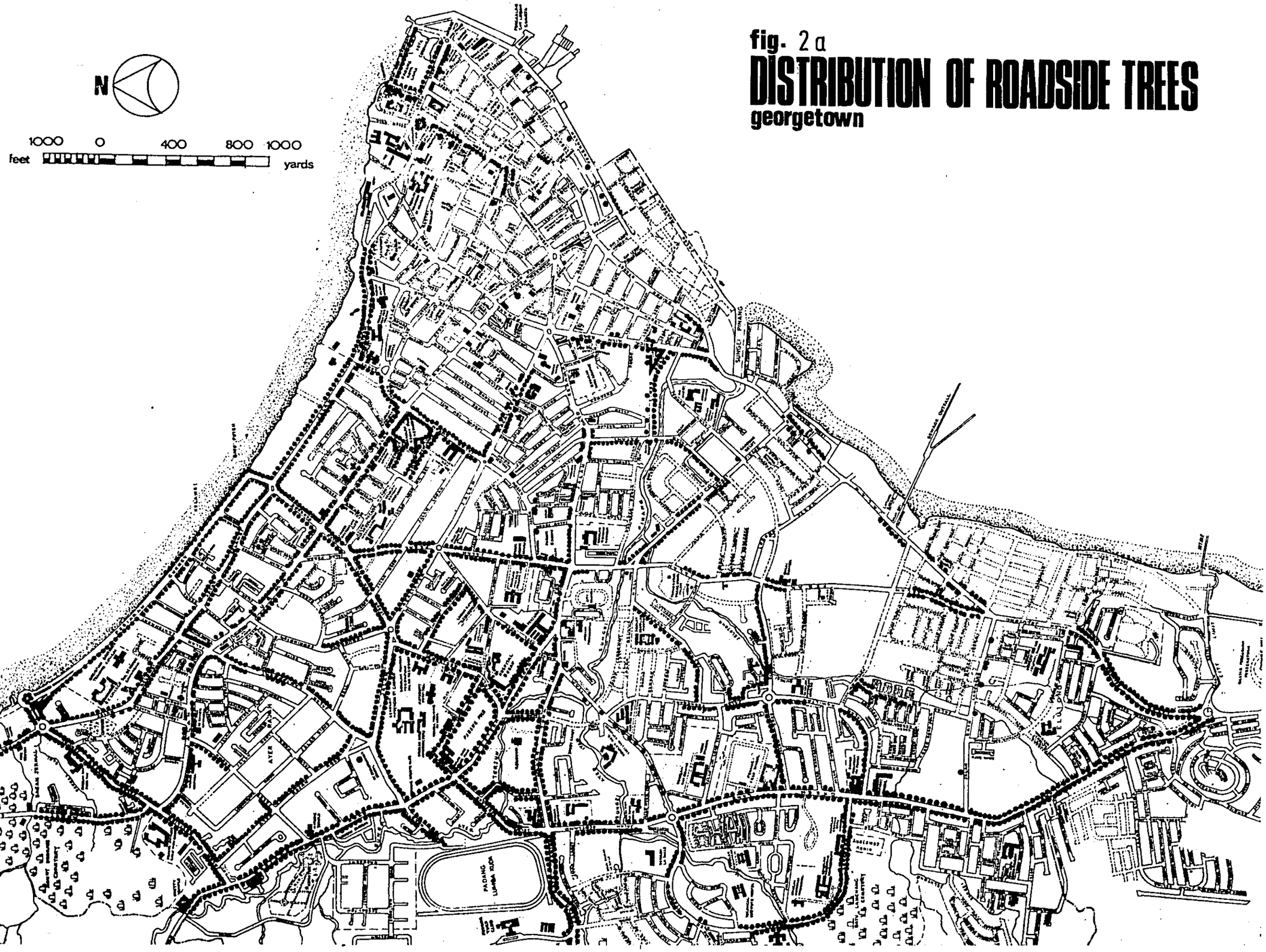


fig. 2b

DISTRIBUTION OF ROADSIDE TREES

bukit mertajam

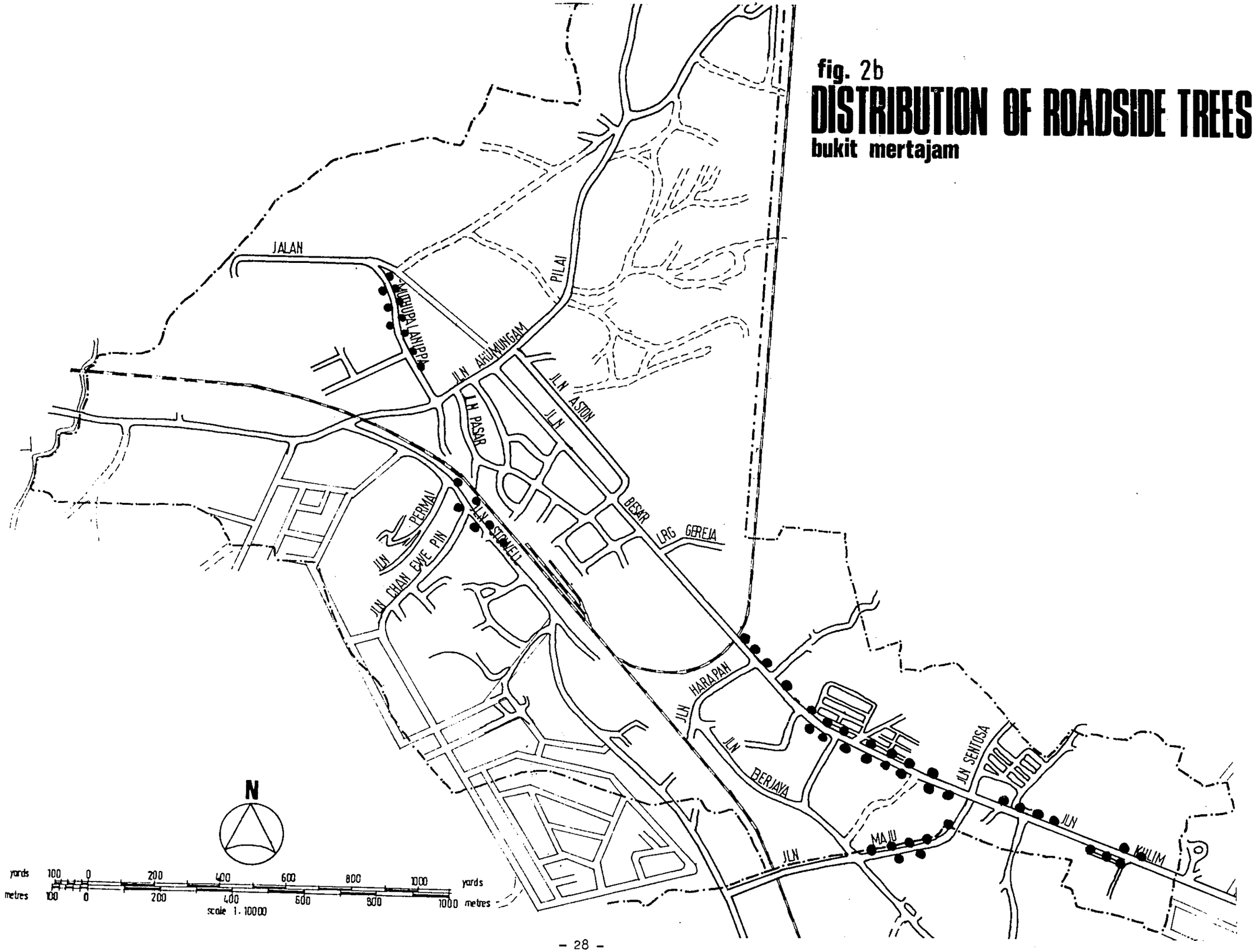


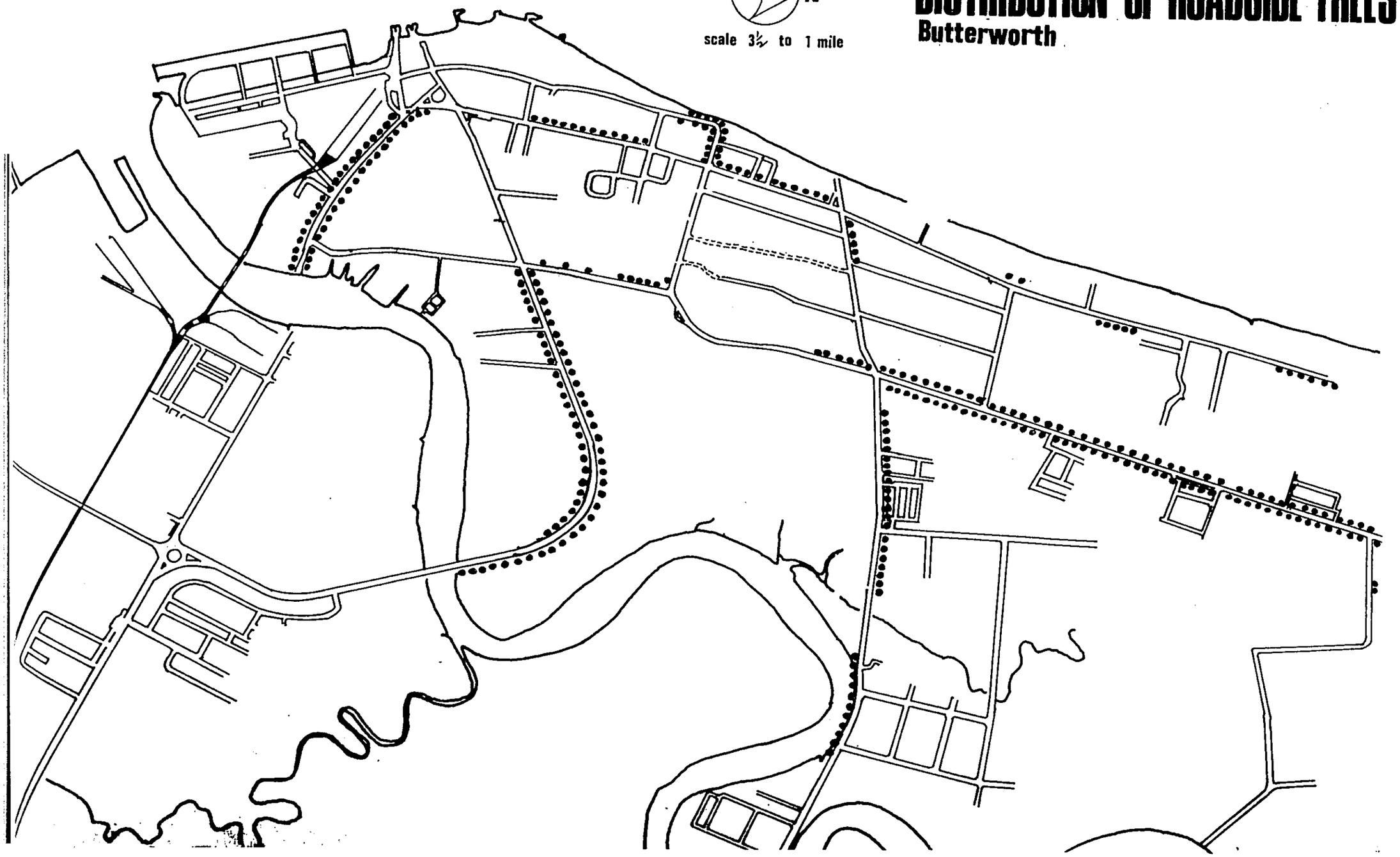
fig. 2c

DISTRIBUTION OF ROADSIDE TREES

Butterworth

N

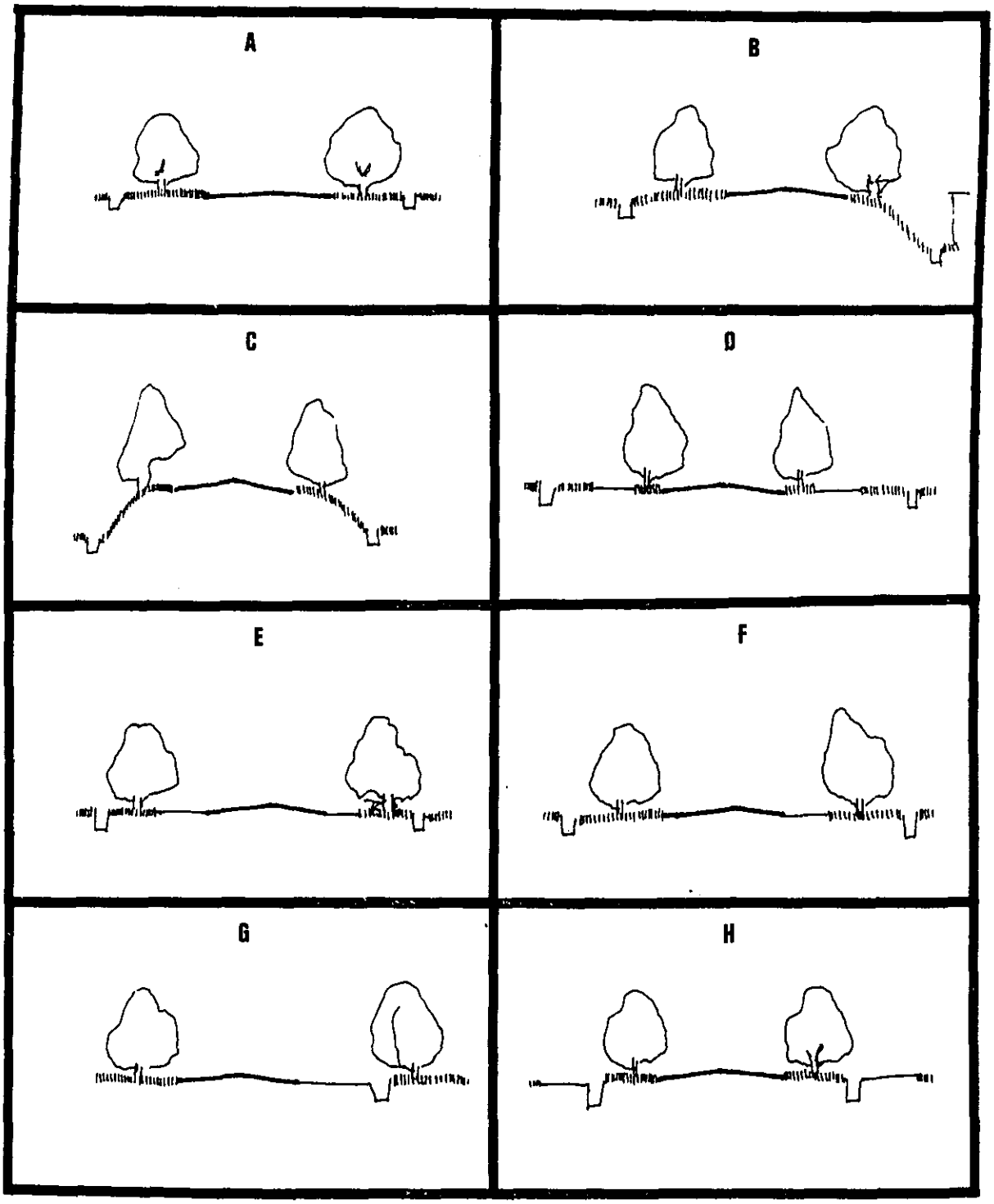
scale 3½ to 1 mile



5-2 TYPICAL SECTIONS OF ROADS.

There are various types of roads existing and the distance of trees from a drain, the existence of carriageways, side-walks and road-shoulders varies by type of road sections. In order to grasp this situation , each road section was classified into the categories as shown in the following figures.

Fig. 3 TYPES OF ROAD SECTION.



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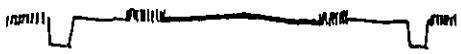

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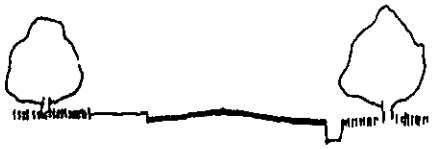

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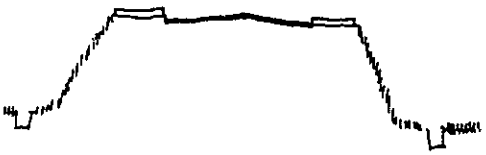
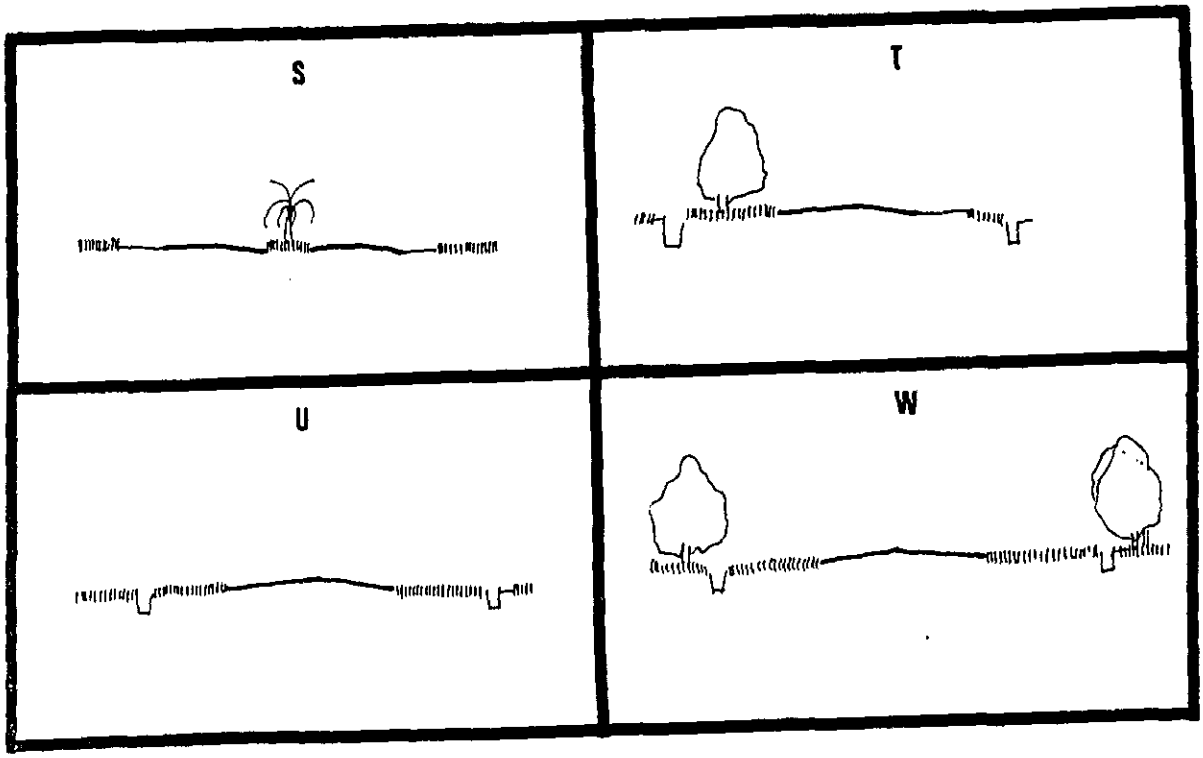


P

Q

R

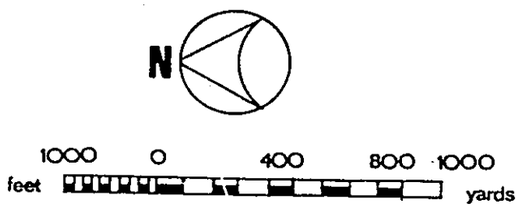


This analysis show where a side-walk exists and where it does not.

fig.4a

LOCATION OF ROADS SECTION

georgetown



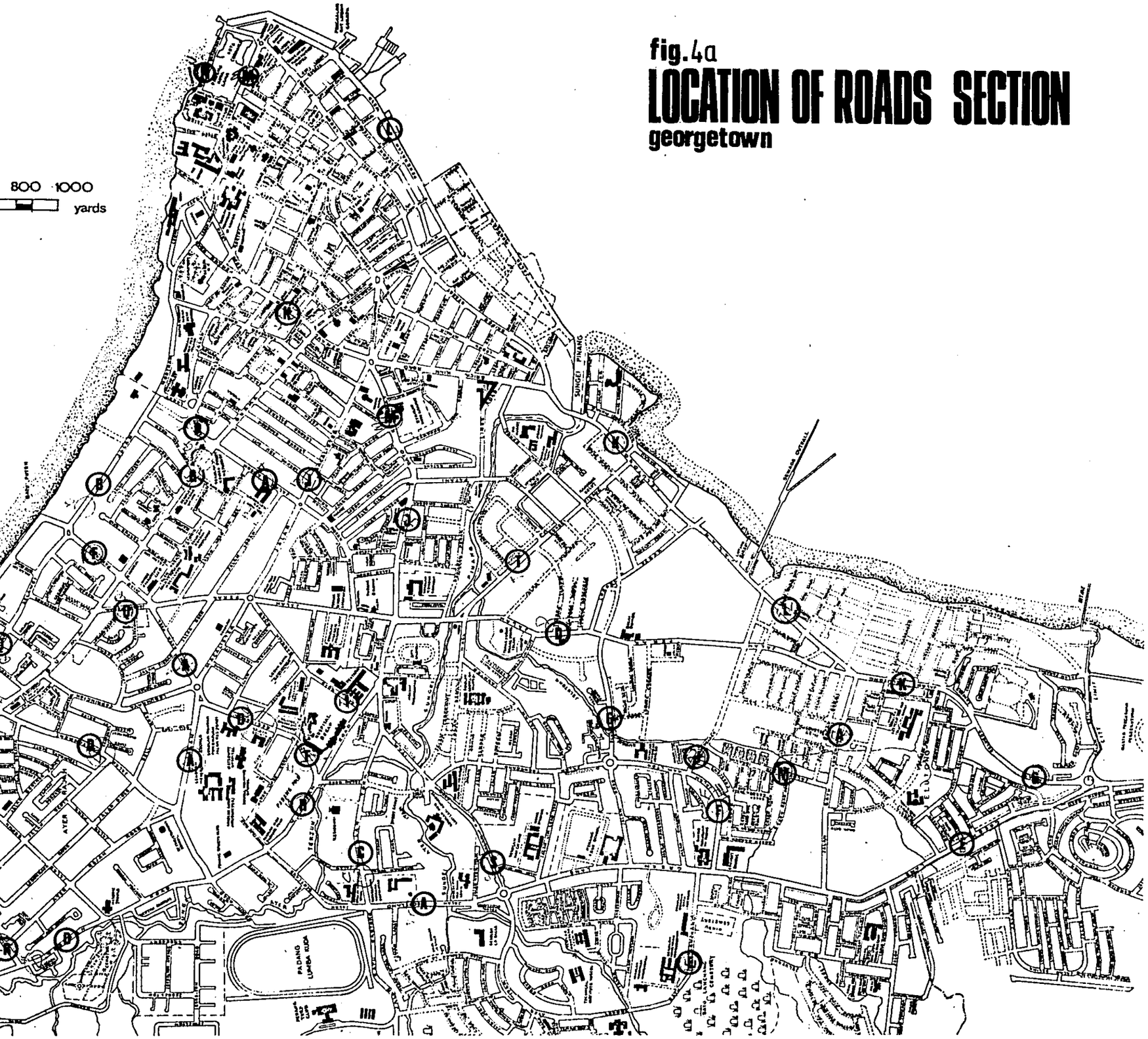


FIG. 4b

LOCATION OF ROADS SECTION

bukit mertajam

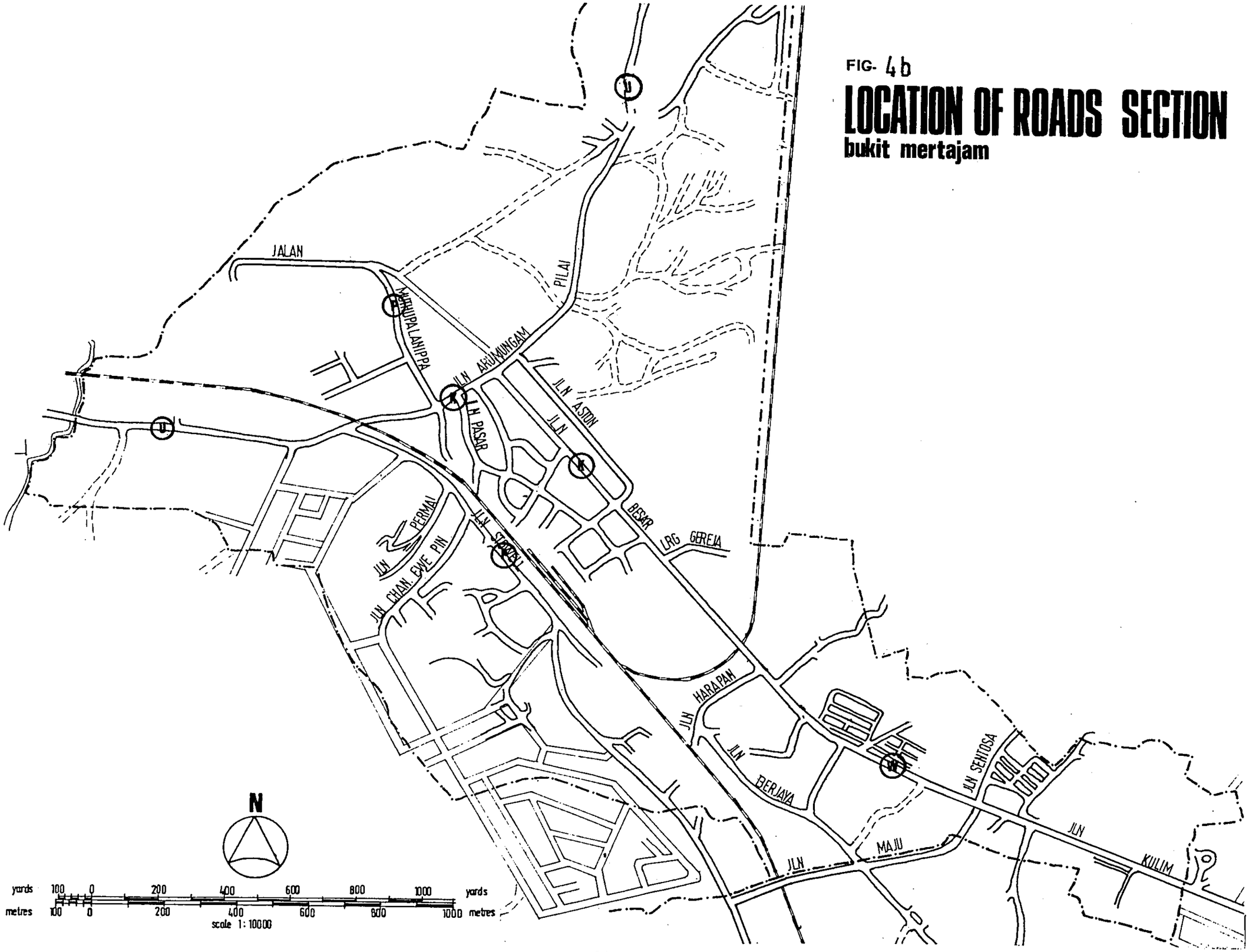


fig. 4c

LOCATION OF ROADS SECTION

Butterworth

N

scale 3½ to 1 mile

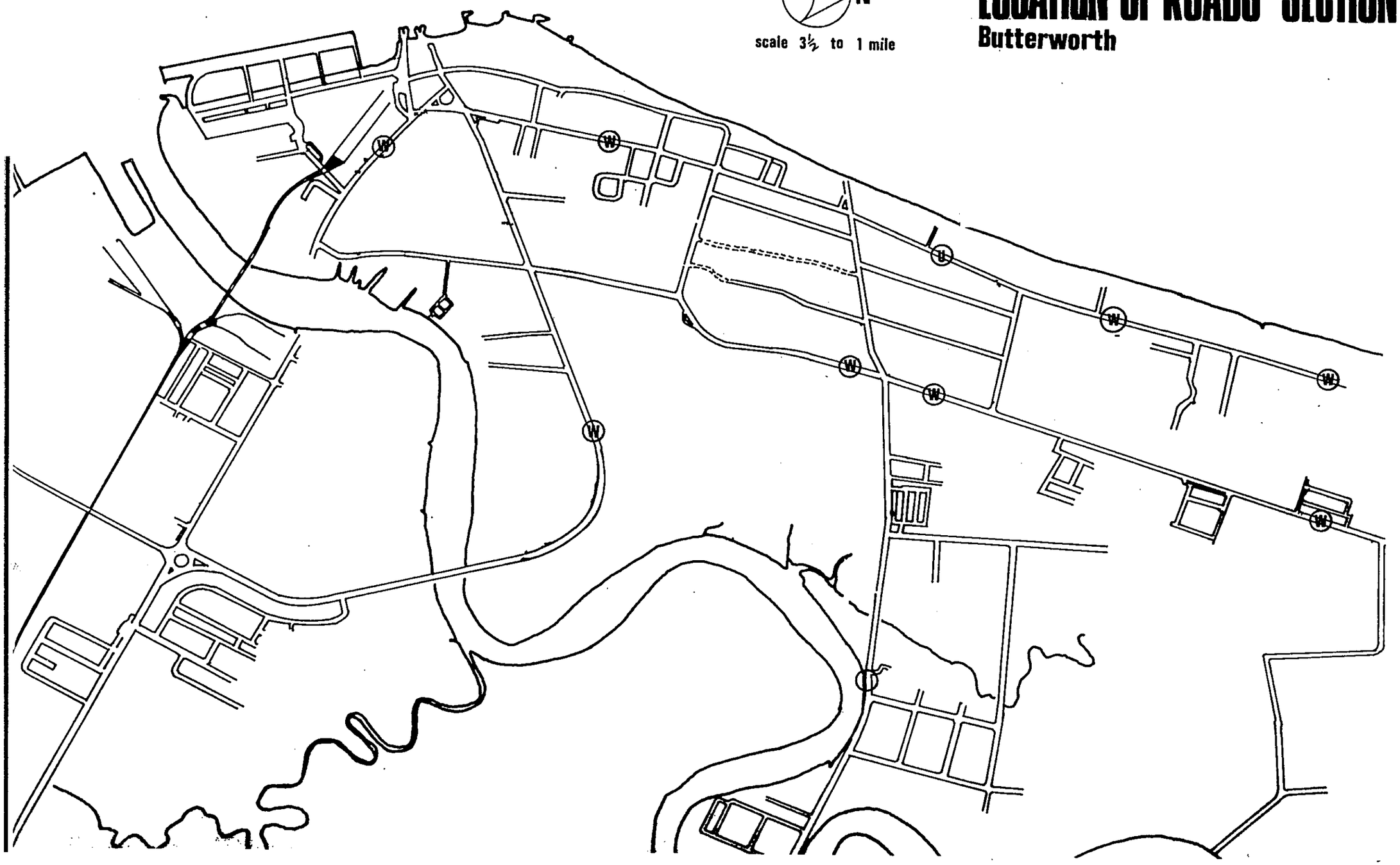
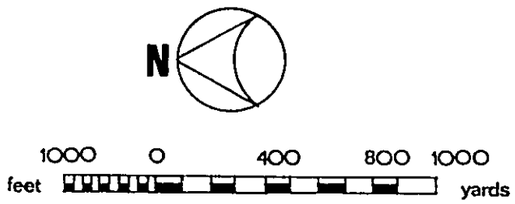


fig. 5

EXISTING ROADSIDE PEDESTRIAN

georgetown



LEGEND

	Pedesterian on One Side.
	Pedesterian on Both Side.

5-3 An Assessment of the need for the Preservation of Trees.

a) Identification of the roadside trees to be conserved.

In order to identisy roadside trees that are to be preserved, it is first necessary to provide some justification as to the need for preservation i.e acusding to its value and its usefulness. However, this report only evaluates the need for preservationfrom the aesthetic point of view due to two limiting factors, i.e the nature of this project and the lock of time.

i) Beautiful Trees.

Though the aesthetic value of trees is a subjective matter it is necessary to make this evaluation in an objective way. The main elements by which a tree is defined as beautiful are its shape, its appeal, its combination with the surrounding scenary etc.

The evaluation table prepared here cousists of two components i.e hevght of trees and shade of trees. These are chosen because tall trees are easy to recognise as landmarks and various shady tree provide scenic beauty as well as protection from the direct rays of the sun.

Table 2. Evaluation table for Beautiful Trees.

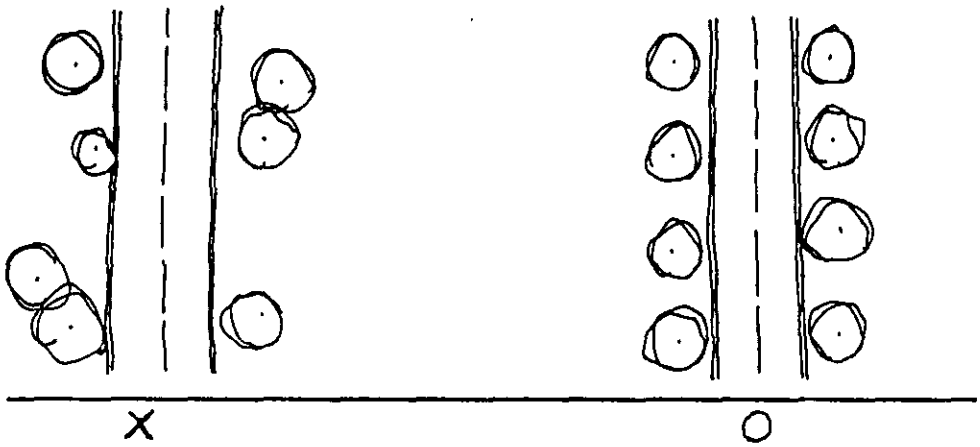
Shade of Trees (Diameter) / Height of Trees.	< 10 ft.	10 - 40 ft.	40 ft. and above
< 35 ft.	A Growing Trees.	B Nominal Size Trees. (Beautiful sometimes)	C Beautiful and Shady.
35 - 75 ft.	D Beautiful Trees. (Only)-Royal Palm -Pinang -Coconut	E Beautiful Trees.	F Beautiful Trees.
70 ft. and above	G Bad -to be cut down if necessary.	H Bad (old tree) -to be cut down if necessary.	I Still beautiful (Usually old trees)

The above table shows how we define beautiful trees. In addition to this information, the following elements are also considered.

- Foliage.
- Shape of Trees.
- Appeal.

ii) BEAUTIFUL ROADSIDE TREES.

Road-side trees do not consist of one tree only but of many trees standing along the streets. Accordingly, people associate beauty of trees with the proper density.



Three categories were prepared for this purpose. Average distance between trees (spacing bet. trees).

< 20 FT.	Spacing between Trees are very close.
20-45 FT.	Spacing between trees in good order.
>46 FT.	Spacing too large — need more plants.

Through these two studies, the following roads are listed here as roads with beautiful road-side trees.

Table 3: LIST OF ROADS WITH BEAUTIFUL TREES.

A. George Town.

1.	Green Lane	(shady)
2.	Batu Lancang lane	(shady)
3.	Scotland Road	(shady)
4.	Western Road	(shady)
5.	Perak Road	(shady)
6.	Gottlieb Road	(Aesthetic - Royal Palms)
7.	Peel Avenue	(Aesthetic - Royal Palms)
8.	Burmah Road	(shady)
9.	Bagan Jermal Road	(shady)
10.	Kelawai Road	(shady)
11.	Gurney Drive	(shady, Aesthetic, etc.)
12.	Peel Avenue	(Aesthetic)
13.	Northam Road	(shady)
14.	Anson Road	(shady)
15.	Residency Road	(shady)
16.	York Road	(shady)

B. Butterworth

1.	Jalan Raja Uda	(Aesthetic, shady)
2.	Jalan Club	(Aesthetic)
3.	Jalan Bagan Luar	(Aesthetic)
4.	Jalan Bagan Dalam	(shady)
5.	Jalan Chain Ferry	(shady)

C. Bukit Mertajam

1.	Jalan Kulim	(shady)

fig. 6a

ROADS WITH BEAUTIFUL TREES

georgetown

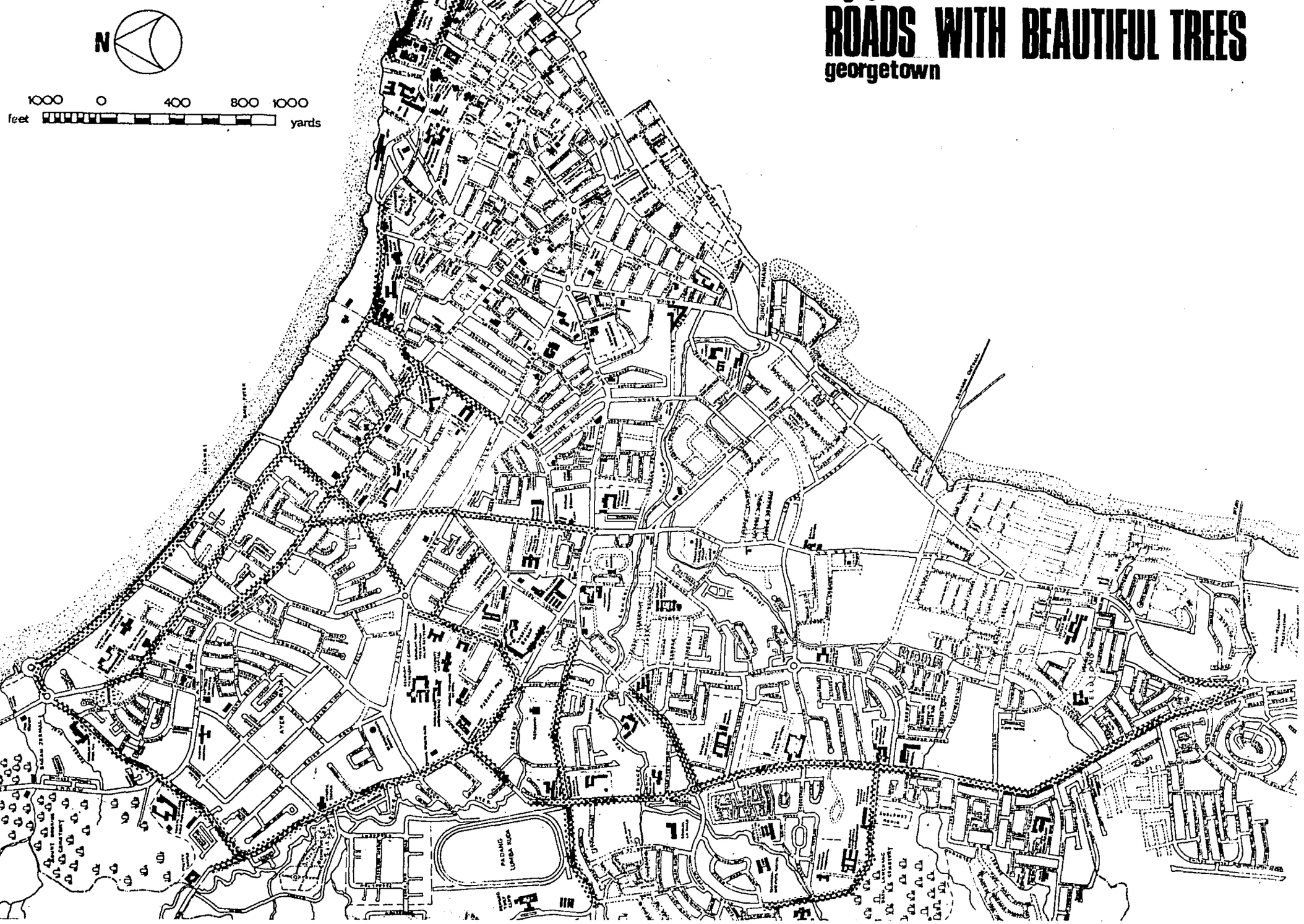


FIG. 6b

ROADS WITH BEAUTIFUL TREES

bukit mertajam

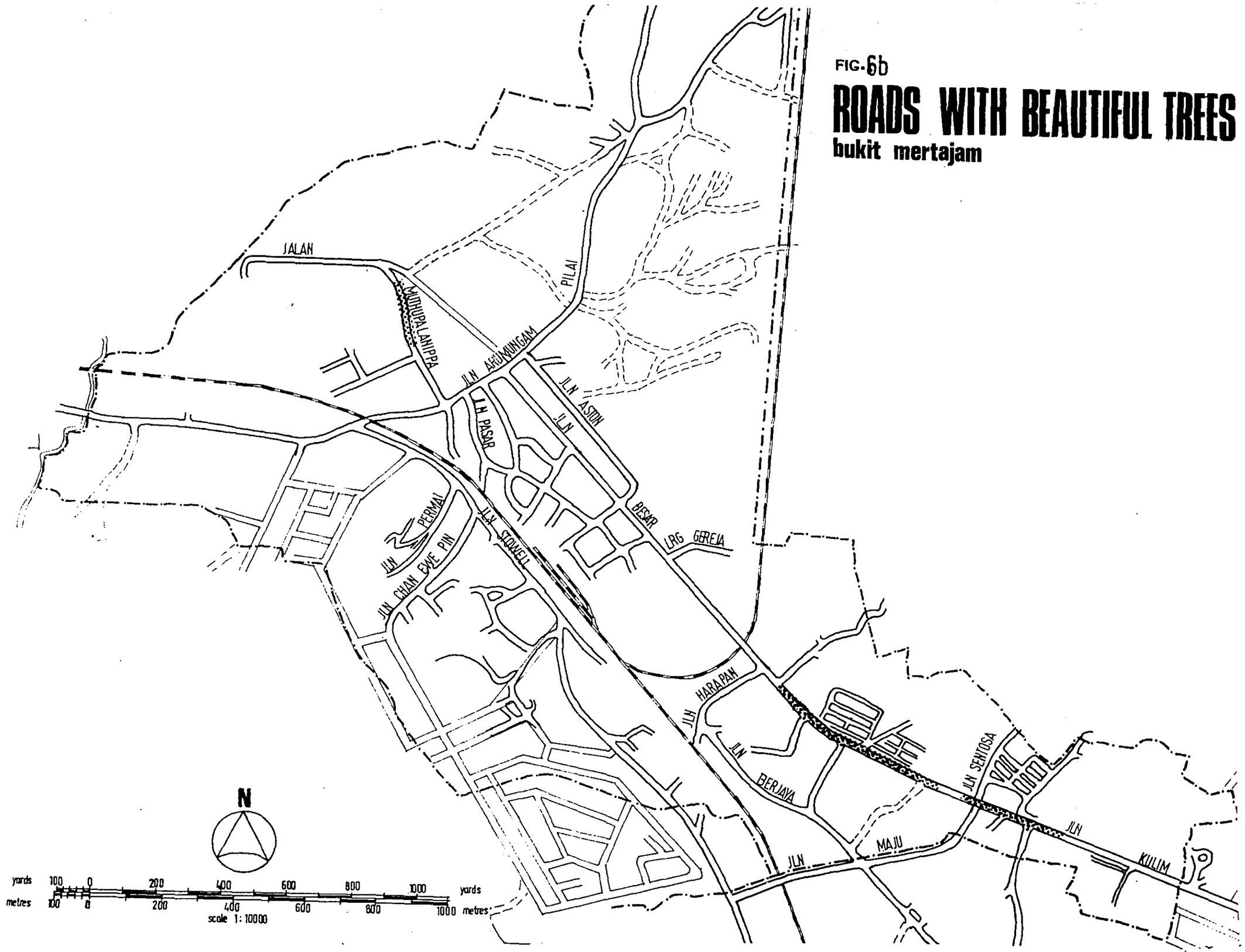
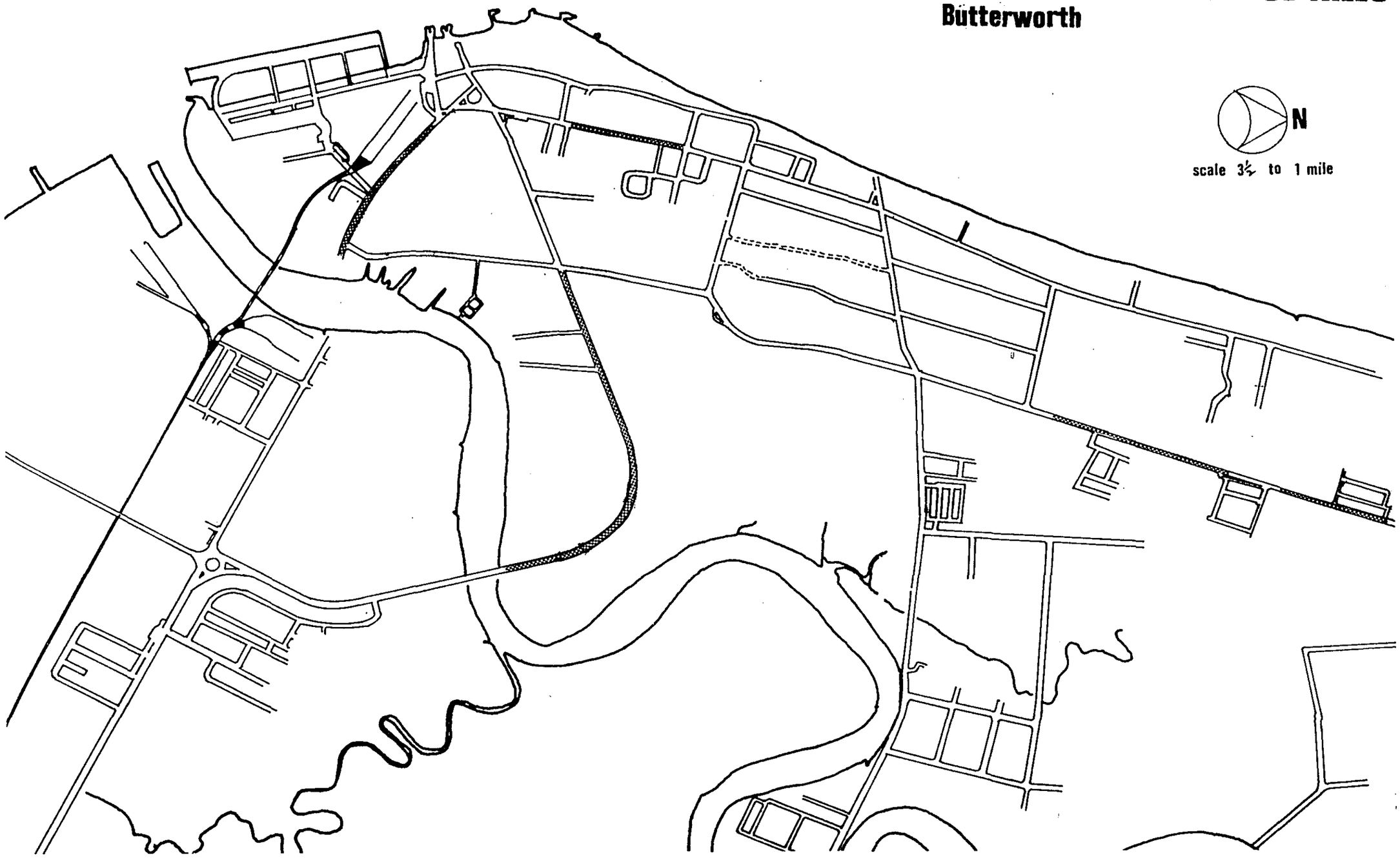


fig. 6c

ROADS WITH BEAUTIFUL TREES

Butterworth



b) POSSIBILITY OF WIDENING ROADS.

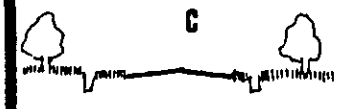
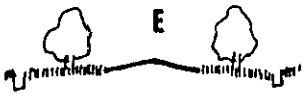
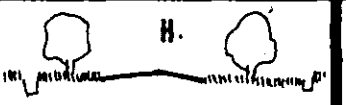
Here, the decision to widen roads is influenced greatly by the need to preserve valuable trees.

In order that the road-side trees that are to be preserved can be identified, an evaluation table as follows was prepared:

TABLE 4. EVALUATION TABLE.

a Width of Road Shoulder.

b Distance from trees to edge of road.

a \ b	5 ft. (1.5 m)	5 ft. to 15 ft. 1.5 ft. " 4.5 ft.	15 ft. & above 4.5 m above
5 ft & less (1.5m)	A not possible	B  1. trees in the property line.	C  1. Trees in the property line.
5ft to 15 ft. 1.5m-4.5m.	D  -not possible to widen road Cariageway. -possible to provide sidewalks.	E  -possible for widening road cariageway. -possible to provide sidewalks.	F  -possible for widening road cariageway. -possible to provide sidewalks -possible to plant new trees.
15 ft. 4.5m.	G  -cut down trees and plant new ones.	H.  -possible for widening roads. -possible to provide sidewalks -possible to plant new trees.	I -possible for widening roads. -possible to provide pedestrian walks. -possible to provide bicycle lanes. -possible to plant new trees (Depends on the width of Road Shoulder or Road Reserve)

If the road is planted with beautiful trees and falls into the boxes of A, B and C in Table 3, it would be difficult to widen the road without having them chooped down.

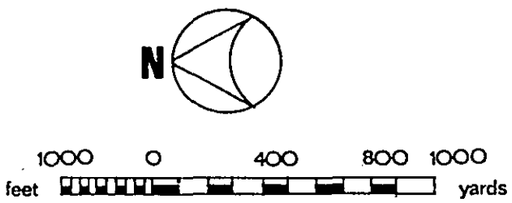
Major roads to be preserved are Jalan Kelawei, Jalan Northam, Jalan Burma, Jalan Perak and Jalan Scotland.

Also, some roads such as Jalan Gottlieb, Gurney Drive and Green Lane should be preserved as far as possible. Wheras in Butterworth and Bukit Mertajam it is desirable for most of the roads to be widened in the future as they are categoried in boxes F and I.

fig. 7a

ROADS TO BE PRESERVED

georgetown



LEGEND	
	impossible to widen the road without Chopping Trees.
	undesirable to widen the road.

fig. 7b

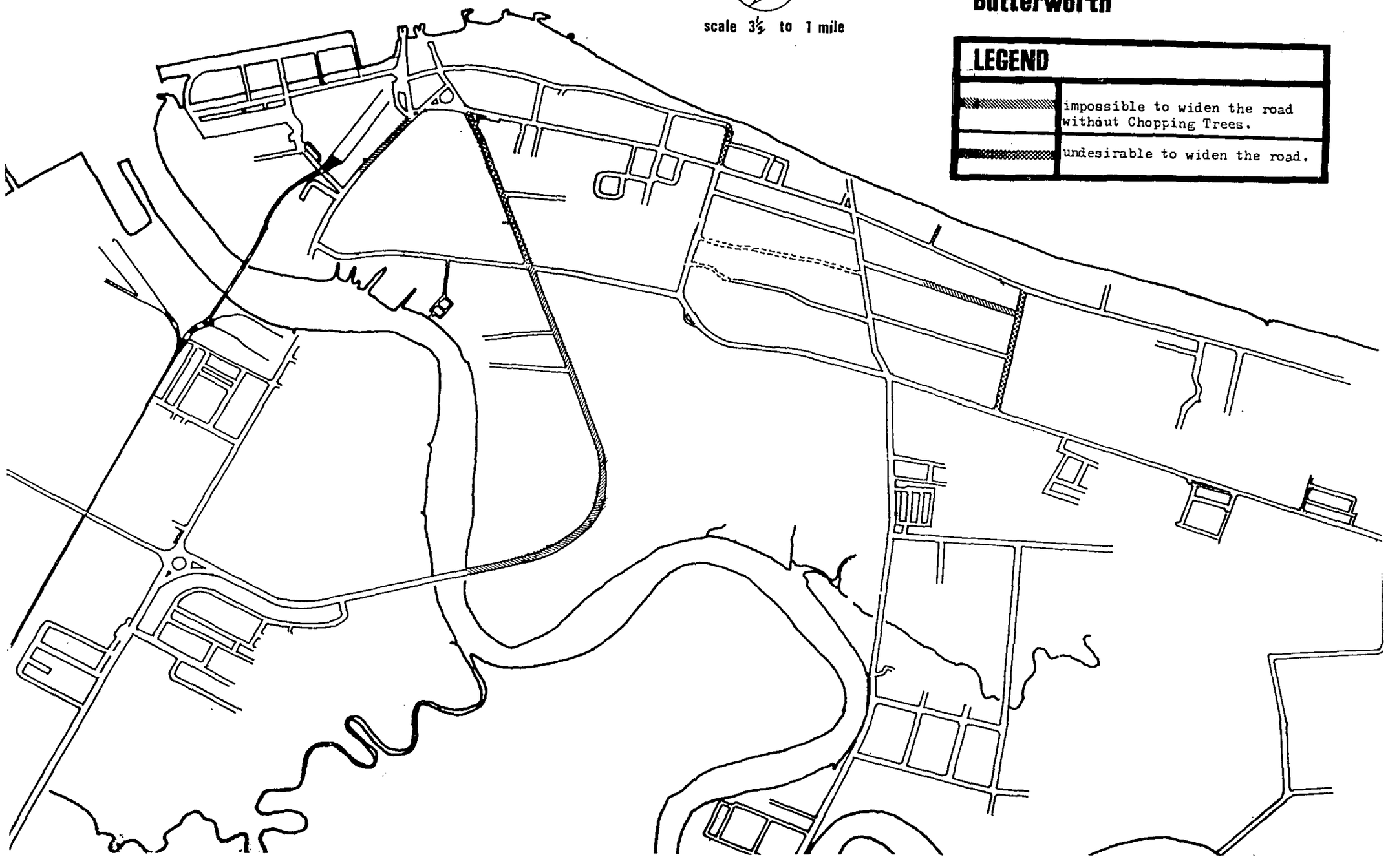
ROADS TO BE PRESERVED

Butterworth

N

scale 3½ to 1 mile

LEGEND	
	impossible to widen the road without Chopping Trees.
	undesirable to widen the road.



List of Tables.

List of Figures.