

A SITE AND SERVICES MODEL, BANGKOK, THAILAND


by  
VARIN KIATFUENGFOO  
B. Arch. Chulalongkorn University (First Class Honor)  
Bangkok, Thailand  
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\_\_\_\_\_  
Varin Kiatfuengfoo, Department of Architecture, June 1981

Certified by

\_\_\_\_\_  
Horacio Caminos, Prof. of Architecture, Thesis Supervisor

Accepted by

 \_\_\_\_\_  
Julian Beinart, Chairman, Departmental Committee for Graduate Studies

  
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Submitted to the Department of Architecture on May,  
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the Degree of Master of Science in Architecture  
Studies at the Massachusetts Institute of Technology

ABSTRACT

This thesis is divided into 2 parts. The first part is the study of low-income housing situation, government housing policies, and the evaluation of the existing low-income housing dwelling environment in Bangkok. The work is based on surveys, evaluations and comparisons of four low-income housing systems which are "pay land rent" squatter settlement before and after upgrading, "pure" squatter settlement, public housing and self-help housing. The physical environment of each of the housing system is analyzed/compared in terms of land utilization/circulation efficiency and the level of series. The housing situation and the government housing policies are discussed and analyzed. Based upon the first part of the study, a site and services model is proposed to compared with the government existing one being developed. The comparison are illustrated the wasteful practices in site and services projects in terms of land utilization and circulation and negative social, economic and administrative effects occurring. Finally, a model is proposed for site and services projects which is applicable for various conditions.

The case study analysis and the comparison of existing and proposed projects are based on the methodology developed in the Urban Settlement Design for Developing Countries Program under the direction of Professor Horacio Caminos.

Thesis Supervisor: Horacio Caminos  
Title: Professor of Architecture, M.I.T.



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## ACKNOWLEDGEMENTS

The thesis is divided into 2 parts. The first is the description and evaluation of existing low-income dwelling environments and the second is the description and sequence analysis of National Housing Policy in the Bangkok Metropolitan area. The focus of the study is presented as a proposal for a site and services model located in Bangkok.

The study is derived from my field research carried out in the summer of 1980-81. Surveys and field research included socio-economic and physical aspects of the low-income settlements. Additional information in terms of maps, reports and National Housing Policy had been collected from various authorities and institutes including the Department of Town and Country Planning, the National Statistic Office of the Prime Minister, the National Housing Authority, the Bangkok Metropolitan Municipality, the Asian Institute of Technology, and Chulalongkorn University. The case studies and the National Housing Policies are utilized as supporting and complementary references for the proposed model. The existing site and services is utilized as a comparison with the proposed model. The case studies analysis and the comparison of existing and proposed projects are based on the methodology developed in the Urban Settlement Design for Developing Countries Program under the direction of Professor Horacio Caminos.

I gratefully acknowledge the guidance and support of Professor Horacio Caminos during the two years of the study. I also sincerely appreciate the assistance, encouragement, and

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## INTRODUCTION

For the past 20 years, the pressures of urbanization have had a great effect on Bangkok, the capital of Thailand. Bangkok's rapid population growth is a result of both natural growth and immigration. At the present time 10% of the total population of Thailand (4.4 million) live in Bangkok. The immigration rate continues to increase because of three main reasons: the first is the good economic condition due to the rapidly increasing industrial productivity as a result of the National Development Plan; the second is the centralization of transportation, national administration, education, culture, religion; and the third is the arid land, adverse weather and the change of seasonal monsoons. This fast population growth in Bangkok has given rise to immense social, economic, and physical problems which become worse because of the government's limited resources.

The housing situation is a major issue because both natural growth and immigration are mainly focused on the low-income sector. Consequently, there are currently 300 slum settlements and all exhibit a deteriorated condition. These settlements are attributed to the scarcity of developed urban land, high cost of construction, unavailability of construction materials, inadequate capital and lack of institutional finances. The government administration was cognizant of these needs to provide both quality and quantity of dwelling for low-income people and was actively pursuing a pragmatic housing policy. The policy implemented was in the form of massive walk-up apartments, constructed throughout the city. This housing policy faced many problems: the

high cost of construction, the heavy government subsidy to the residents, the difficulty of residents' adaptation to the new way of living and the resale of housing intended for low-income to higher income people.

As the result of the ineffective initial policy, a new policy was adapted for slum upgrading and site and services development with expandable core houses. Site and services is a national policy which is implemented in all urban areas. There are three site and service projects in the Bangkok urban area: Tung Song Hong, Rad Krabang, and Rang Sit. The site and services project at Tung Song Hong is a pilot development now underconstruction which aims to achieve reduced government subsidy, lower costs of construction and appropriate housing affordable by low-income people. Moreover the site and services project provides flexibility and variety which allows people to organize their lots so that they can easily adapt themselves to the new environment. The World Bank provides technical assistance to the site and services project at Tung Song Hong.

This study concentrates on the analysis of the housing situation of low-income sector and the initial site and services project at Tung Song Hong. Selected case studies representing the main housing systems of the very low and low-income groups have been studied as a reference to the major problems and the needs of the people. The case studies are compared and evaluated in terms of land utilization, density and circulation efficiency. Included in the

case studies are squatter settlements ( both illegal and those that pay a land rent ), Public housing, and self-help housing. The initial site and services project at Tung Song Hong is studied more in detail in terms of physical planning: land utilization, land subdivision, circulation pattern and infrastructure networks. The studies clearly show that in this project the physical design has not achieved the policy aims of cutting down construction and maintenance costs.

As the result of the studies, a modified layout is designed at Tung Song Hong to compare with the one being built. Essentially the redesigned layout is concerned with reducing costs of urban development and public responsibility by optimizing the physical design elements of the settlement. The design aims toward an efficient layout: to minimize public area, circulation areas and lengths, infrastructure and utilities length, and to maximize private and usable area. Private responsibilities are stressed and the community resources are utilized at a maximum. The project also considers the existing problems in low-income housing. The layout concept is appropriate to the other site and services projects and is readily adaptable to different site conditions.

In summary, this study is intended to develop guidelines for those involved in planning of residential developments and as a reference in the formulation of housing policies.

PHOTOGRAPH: (OPPOSITE PAGE)  
Glimpses of the low-income sector employment opportunities.  
(LEFT) Skilled labor  
(TOP RIGHT) The Sunday market, the biggest market in Bangkok. People sell all kinds of goods, from food, clothing, and animal to antiques. These work opportunities are one of the major factors which attract migrants.  
(BOTTOM RIGHT) The food stalls along the pedestrian are the most popular eating place for low-income groups.





## HOUSING DEMAND AND SUPPLY

The growth of Bangkok's housing supply has been characterized by private formal sector output catering only to the high and middle-income groups. The most important source of low-income housing supply is squatter settlement which accommodates over a million people or 25% of Bangkok population. At present, there are about 300 squatter settlements and some small squatter settlements scattering throughout the city. The population growth rate of Bangkok is 6.2% per annum as a result of the increase in immigration and the increase in natural growth rate. During the past few years, the average number of new households has been about 30,000 a year, while only 17,000-20,000 building permits for residential construction have been built annually. This means that 10,000-13,000 units have been built without permits.

The national housing movement started in 1950. During the first period from 1950-1972, there were 4 agencies working on low-income housing separately and effort duplicated without specific objective. During the second period from 1973-1974, the National Housing Authority (NHA) was formed as a single agency to cope with the low-income housing problems. The third period from 1975-1977 the NHA planned the first 5-year plan for 1976-1980. They estimated that by 1980 there would be a shortage of about 160,000 units for households earning less than US\$ 250 a month. They used the arithmetical approach to measure the housing shortage by establishing a minimum standard for housing. This created a severe housing shortage because most of the existing low-income housing did not meet the standards. The arithmetical terms were; new construction = total households - good housing stock (meet the standard). Then the policy is to construct new public housing in sufficient numbers.

In 1976 the NHA planned to construct 16,000 housing units each year in Bangkok. After 2 years of implementation, the

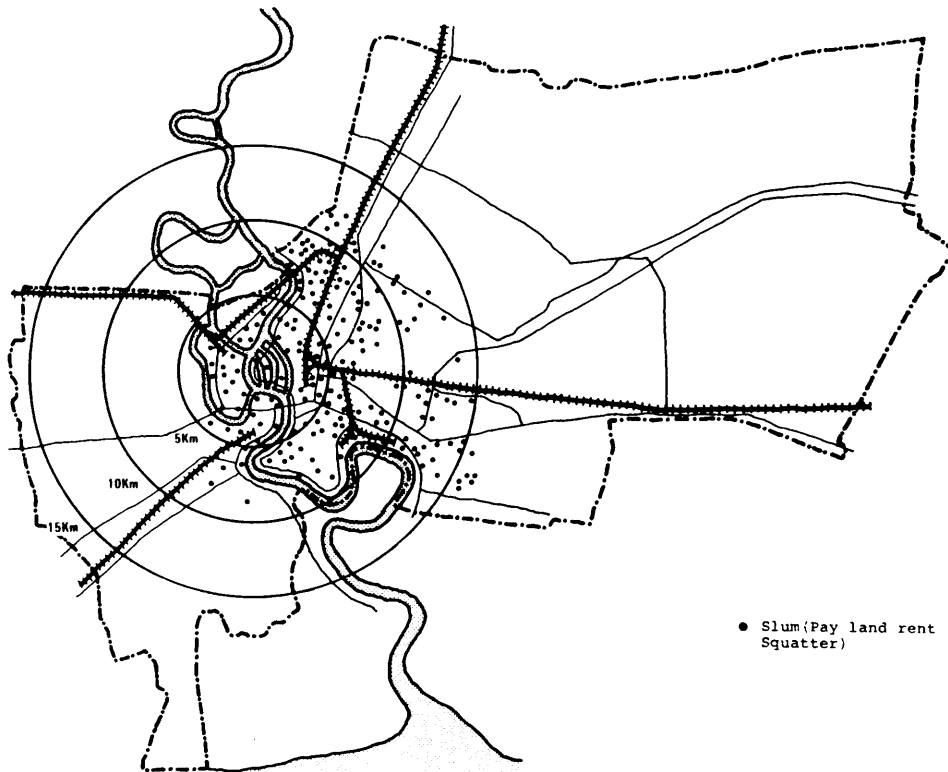
government heavily subsidized for low-income housing and built middle and high income housing aiming to make profit in order to balance the budget. But this last goal was a failure because the government housing could not compete with that of private sectors.

Since 1978, the NHA policies have moved into new directions. The first was to upgrade the existing deteriorated settlements. Slum upgrading program could be distinguished by three main components; physical, socio-economic and land tenure. The second direction was to provide sites and services with expandable core houses as new housing supply which costs less than public housing mainly of walk-up apartments.

In the first direction, the major problem is security of land tenure. The common characteristic of the land tenure in these settlements is that people pay land rent to landlord with various intermediate states of tenancy existing in the form of lease-hold contracts ranging from a year to a maximum period of 30 years. Traditionally and even today to become one's own landlord is still a much valued goal. And consequently, The NHA set up ideal goal to convince the landlords to extend 30 year leases to the tenants. But only a few cases were succeeded. Land tenure security will continue to be crucial part of upgrading policy.

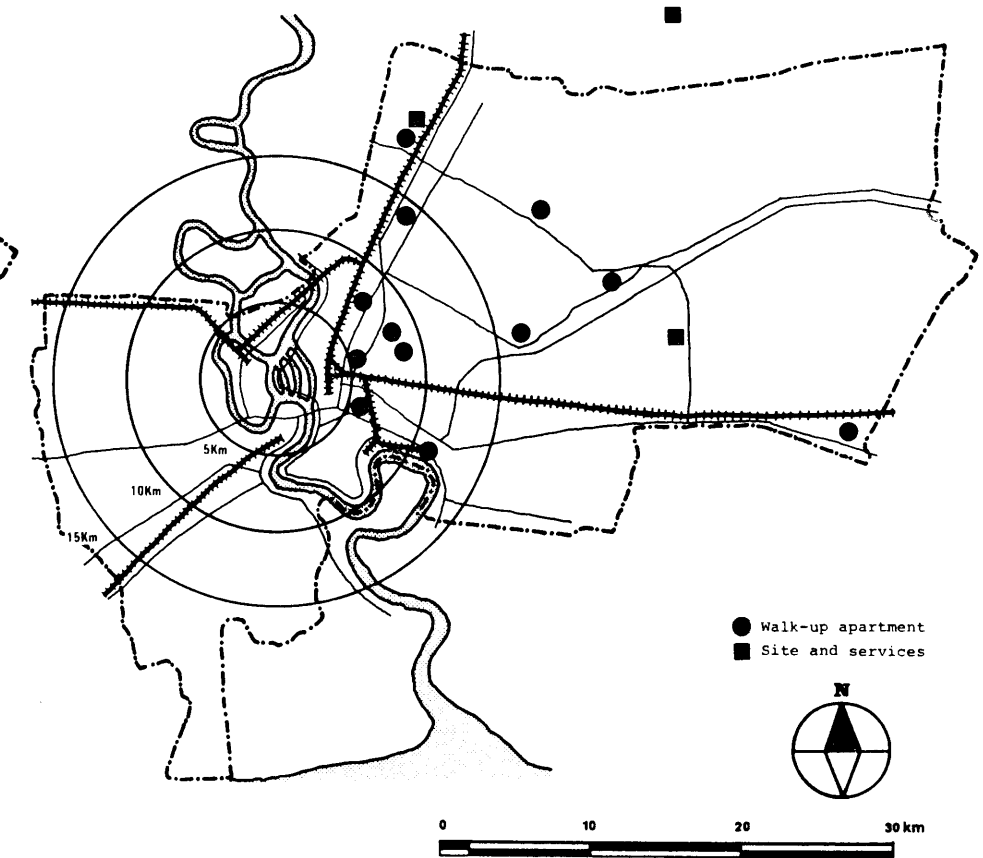
For the second direction, a presently affordable policy to provide housing supply with land tenure security is site and services with expandable core houses. In the long run this policy alone cannot satisfy urgent housing needs of the immigrants. Therefore the Fourth National Social and Economic Development Plan stresses decentralization and the creation of major centers in every region as a primary solution for immigrant problem and the uncontrolled growth of the capital.

## LOW INCOME HOUSING LOCATION



## SQUATTER SETTLEMENT LOCATION

Low-income group provides the main source of labor for all economical sectors such as commercial, industrial, construction and domestic services. They settle in the areas that they can find or change job easily and try to commute to work within walking distance to reduce transportation cost. As a result, approximately 300 squatters " pay land rent " settlements are concentrated in the center and inner ring of the city.

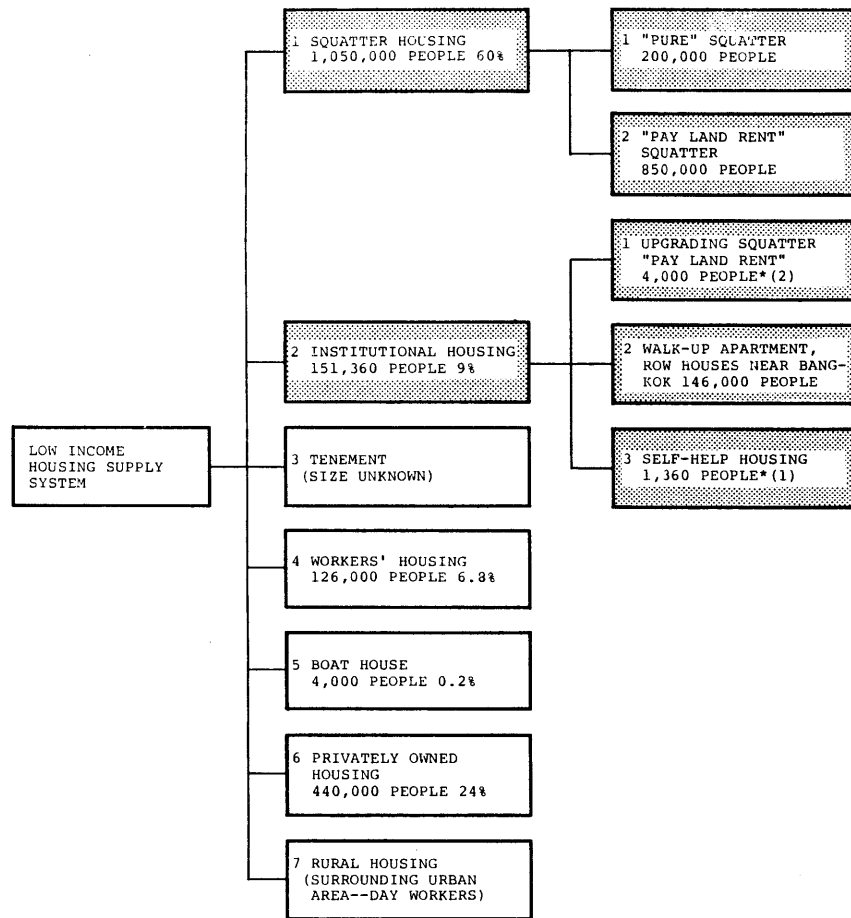


## PUBLIC HOUSING LOCATION 1:500000

The location of the early public housing projects is at the center and inner ring of the city. Due to the rapid growth of the urban area, the present location of public housing projects is at the periphery. The locations of site and services projects are also at the periphery of the city because of the scarcity and high cost of land in the city. Another reason is the new scheme to establish new communities adjacent to the industrial area at the periphery of the city.

## LOW INCOME HOUSING SYSTEM

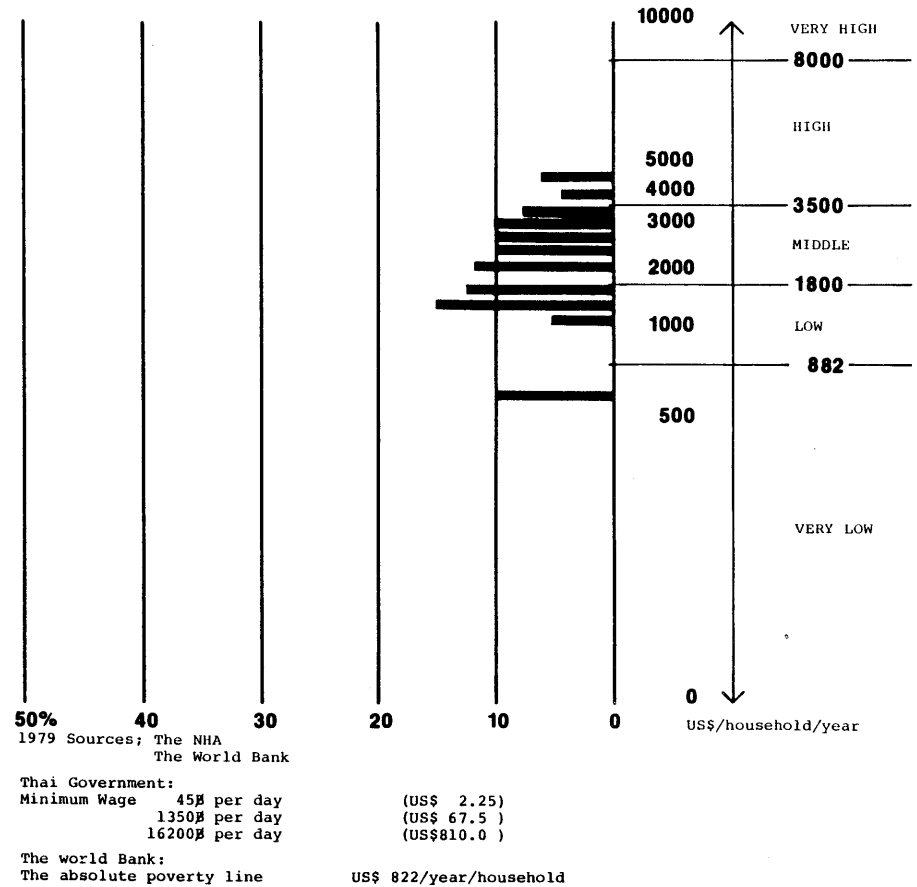
### SEVEN LOW-INCOME HOUSING SYSTEMS



Total low-income residents: 1,766,000\*(3)  
 (1) 1980 figures  
 (2) 1978 figures, all other 1976  
 (3) Modified from Angel (1975-76) and Wang Shieh-Yu (1978-79)

In 1979, the government minimum wage was US\$ 810 per year. The absolute poverty line was US\$ 822 per household per year as reported by the World Bank. The National Housing Authority classified the income groups as follows: below US\$ 900 as very low income; between US\$ 900-1800 as low in-

### INCOME LEVELS



come; between US\$ 1800-3000 as middle income; and the rest as high income. Bangkok residents who have income below the absolute poverty line is counted about 10% of city population and about 54% of total urban poverty population in Thailand. The low-income group is counted about 33% there-

fore the total low-income group is 43% of total population in Bangkok. From the recent socio-economic survey, the percentage of low-income group is increasing rapidly and creates an urgent need of low-income housing.

As the result of this situation, low-income housing deserves a serious study. This study will concentrate mainly on low-income housing types with their needs and problems.

There are 7 different low-income housing systems as follows:

1. The first system is the squatter which is the most common form of settlement for low-income groups. In 1979 approximately 1 million people or 25% of the total population lived in squatters scattering all over the city. Squatters have been considered as a deteriorated area with polluted environment. Most of the dwellings in the squatter are temporary wooden structures built on unfilled land with inadequate utilities. There are 2 subsystems of squatters. The first is pure squatters which people usually build on government owned land without paying rent and which groups together in large settlement. There are also small pure squatters of 20-50 families each that have houses built on small private or government-abandoned strip of land such as along the railroad right of way or in the canal. The second is pay land rent squatter with usually 200-300 families grouped together and houses built on small lots belonging to private landlords.
2. The second system is the institutional housing. The National Housing Authority is the only government agency that provides subsidized walk-up apartments. Recently, the NHA also provides squatter upgrading program and site and services project. The Asian Institute of Technology is the on-

ly private institution that organizes the first self-help housing for low-income groups as the experimental project.

3. The third system is the tenement which is the subdivision of large house or shop house into small cubicles and rent to the low-income people.

4. The fourth system is the workers' housing which employers provide for their employees. There are 5 subsystems; the first is workplace site housing which workers construct on the factory sites with second-hand materials; the second is factory site dormitories which young single share together; the third is domestic and maintenance staff quarter of which middle and high income residential compounds contain for maid, gardener; the fourth is institutional worker housing which usually consists of barrack-type houses constructed for workers; the fifth is itinerant construction worker housing which workers moving their families from site to site build from the available construction materials.

5. The fifth system is the boat house. They live on boats that are used for transporting goods for short distances, this type usually occupies permanent location on the canals in the city.

6. The sixth system is the privately owned housing. Commonly, it is a old housing stock more than 30 years old which is occupied by more than 4 generation and is used by multi-families per dwelling unit.

7. The seventh system is the rural housing which are houses in the rural area. The low-income people commute daily from their houses by train, bus and boat to their work places in the city.

This thesis emphasizes only on the major systems of low-income housing which are the squatter settlement and institutional housing and studies in detail in four case studies.

## NATIONAL HOUSING POLICIES, BANGKOK

PERIOD	SPONSOR AND OBJECTIVE	PROJECT SIZE	LOCATION	DWELLING								
		NO. OF UNITS PER SITE			STORYS	NO. OF UNITS						
<b>1</b> 1950-1972 23 years	Department of Public Welfare Government Housing Bank Bangkok Metropolitan Municipality without specific policies	10-1000	scatter over the city	Walk-up Apartment	4-5	456						
				Row Houses	2	522						
				Duplex Houses	2	1145						
				Detached Houses	2	1739						
TOTAL UNITS						3862						
<b>2</b> 1973-1974 2 years	The National Housing Authority (NHA) was formed in 1973 to response all public housing work from the 3 existing agencies and continued to work on them in the first 5-year period	1000-5000	in the inner ring	Walk-up Apartment	4-5	5744						
				TOTAL UNITS								
<b>3</b> 1975-1977 3 years	The NHA planned the first 5-year program for 1976-1980 to accelerate the production of supply to meet the housing demand	20-6500	Most of the projects are located in the city. Exceptionally for 3 new communities development projects will be located in the city skirt (Klong Jund, Bang-Pre-Bang Bo, Rangsit)	Walk-up Apartment	4-5	15144						
				High rise Apartment	12	2434						
				Row Houses	1-2	7795						
				Duplex Houses	1-2	7680						
				Detached Houses	1-2	1956						
TOTAL UNITS						35328						
<b>4</b> 1978-1979 1 year	The government had been financed the deficits arising from the sale of units at less than costs. In 1974 about 30% of the NHA units were occupied by ineligible families who pay key money to the legal families for buying the unit. Dissatisfaction within the government of the NHA's heavy subsidies has recently lad to revise policies in housing development.											
							a.) new housing communities	3000-20000	four new communities are located in the periphery	Site and Services		300
									Rangsit	S & S with core houses	1-2	2700
									Lat kra bang 45 kg from city	Houses	1-2	3369
									Bang Pre- Bang Bo 30 kg from city			
									Tung Song Hong 45 kg from city			
									150 communities are under this plan. Most of the communities are in the inner and center of the city. Few of them are located in the periphery.	The existing dwelling are row and detached houses, shanties, rooms	1-2	4000
							c.) assisting private sector developers by giving intensives for increasing housing construction.					
							d.) construction of walk-up apartment deriving from the previous policy	200-800	in the inner of the city and periphery	Walk-up Apartment	4-5	1720
							TOTAL UNITS					
TOTAL UNITS 1952-1979						48865						

TENURE	UNIT AREA M <sup>2</sup>	PERSON/HA	FINANCE		PUBLIC FACILITIES	PUBLIC MANAGEMENT	PEOPLE PARTICIPATION
			INCOME GROUP \$/M	FINANCIAL PROGRAM			
Rental	40-60	750	0-100	Tenants paid rent. The NHA subsidized 60-80%	Some have school, playground, community center Some have no public facilities	yes	none
Ownership	150-200	90-200	100-200	Tenants paid installment. The NHA subsidies 20-40%			
Rental	40-60	750	0-100	Tenants paid rent. The NHA subsidized 60-80%	All have public facilities	yes	none
Rental & Ownership	40-60	750-1400	below 75	Tenants paid rent. The NHA subsidized 60-80%	Some have school, playground, community center Some have no public facilities	yes	none
Ownership	150-200	90-200	75-150	The NHA subsidized 50%			
Ownership	150-200	90-200	over 250	Tenants paid full cost with 10% interest.			
Ownership	150-200	90-200	over 250	The NHA sold for profits			
Ownership	28-90	400-700	below 100	The land and dwelling construction cost would be recovered by downpayment and monthly payment from tenants. The NHA subsidized the utilities.	There are public facilities in new communities. There are jobs provided in the site and services project	yes	Tenants improve houses in site and services projects
Ownership	28-90	400-700	100-150				
Ownership		400-700	150-500				
Rental & Ownership	15-200	750-2000	below 250	All cost would be recovered by tenants.	infrastructure and utilities improvement	18 social improvement program tenure improvement	community committee work with The NHA
Rental & Ownership	40-60	1000-1900	below 250	same as 1975-1977	Some have school, playground, community center Some have no public facilities	yes	none

## BACKGROUND AND GOALS

The investigation of low-income housing environments through the four case studies illustrates both negative and positive effects as follow:

a. Observations from the squatter settlement:

Negative effects: -littering of garbage  
 -no user participation in maintenance of walkways  
 -increasing frequency of crime

causes: -poor definition of areas of responsibility and inappropriate layout  
 -inconsistency between users, responsible agent and physical control  
 -rental, no ownership

Positive effects: -mutual-help in the construction of walkways and dwellings

causes: -traditional practices in most of the rural areas; friends and relatives help each other

b. Observations from public housing:

Negative effects: -littering of garbage  
 -no user participation in the maintenance of streets, walkways and playground  
 -burglars and annoyance occurring

causes: -poor definition of areas of responsibility and inappropriate layout  
 -inconsistency between users, responsible agent and physical control  
 -low percentage of private land

c. Observations from the self-help housing

Negative effects: -not identified yet, the settlement is new and has only 16 families.

Positive effects: -the mutual-help in the construction of dwelling, etc.

causes: -well organized to provide assistance in technical, social, and economic aspects ( the Asian Institute of Technology )

The National Housing Policies for low-income groups over a 30 year period are clearly illustrated in Bangkok. The formulation and implementation of the various policies as well as the pros and cons of these policies can be seen. Observation from the National Housing Policies can be summarized as follows:

a. the first, second, and third periods: the construction of public housing in the form of walk-up or high-rise apartment

Negative effects: -high initial cost of construction and the long-term maintenance  
 -The units are often resold to the higher income group.

causes: -many unnecessary details are included  
 -inefficient and unpractical design  
 -speculation of profit and difficulty of adaptation for low-income people to a complete new environment

The negative aspects encouraged a revision of the housing policies in the fourth period.

b. the fourth period: slum upgrading programs and site and services projects were implemented

Positive effects: -reduction of the cost of construction and maintenance  
 -satisfaction with the upgrading program



- causes: -slum upgrading program mainly in infrastructure and utilities not in the dwelling units
- the site and services project primary provides a site, utilities and core houses

At the present time the appropriate policy in supplying housing for the low-income is site and services projects.

The study is a comparison of two site and services projects; the government existing one being developed and the proposed one. The goals of the comparison are to illustrate the following:

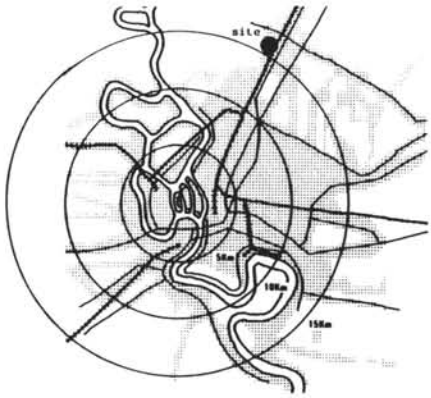
- a. The wasteful practices in the site and services projects; in terms of land utilization and circulation. These will increase the initial government costs of construction. The limited government resource should be utilized more effectively.
- b. A negative social effect; the lack of encouragement of users' participation and responsibility which will be a heavy burden to the government.
- c. A negative economic effect; the higher cost of construction and long term maintenance cost. These are derived from the consideration above.
- d. A negative administrative effect; more administrative cost.

Finally, a model is proposed for a site and services projects which is applicable for various conditions and locations.

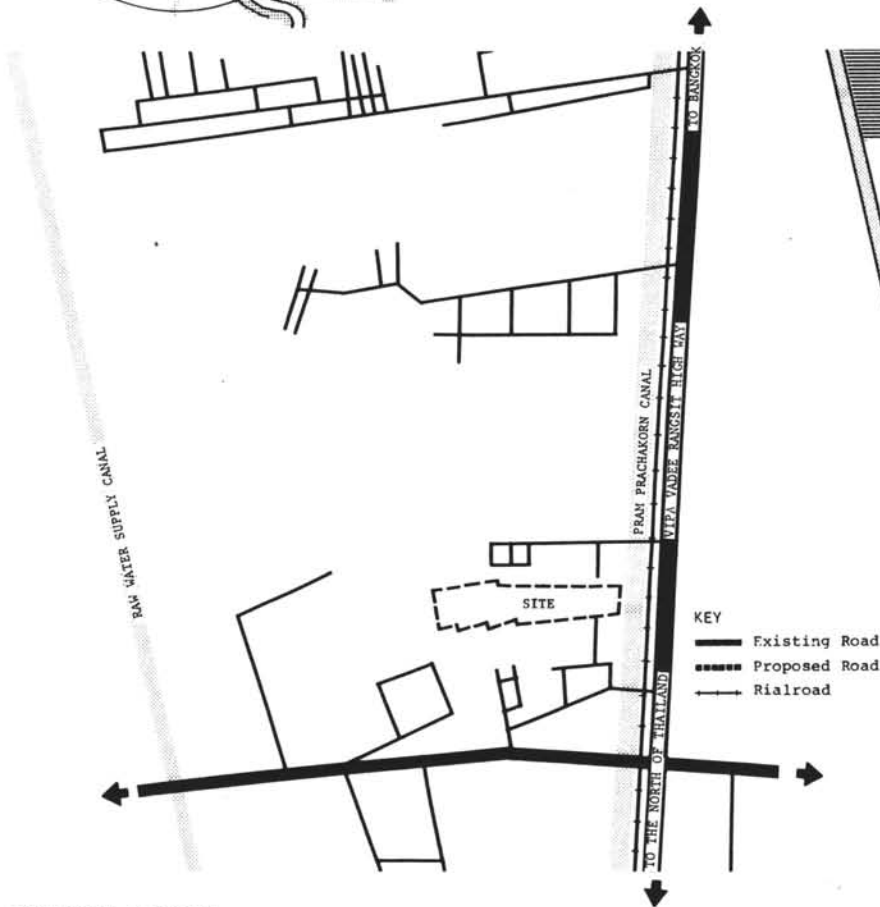


PHOTOGRAPH: (OPPOSITE PAGE) Air photograph of the site of the proposed project. The site is surrounded by the new middle and high income housing development. Vipa Vadee Rangsit Highway passes near the eastern boundary. Pram Prachakorn canal runs parallel to the highway.

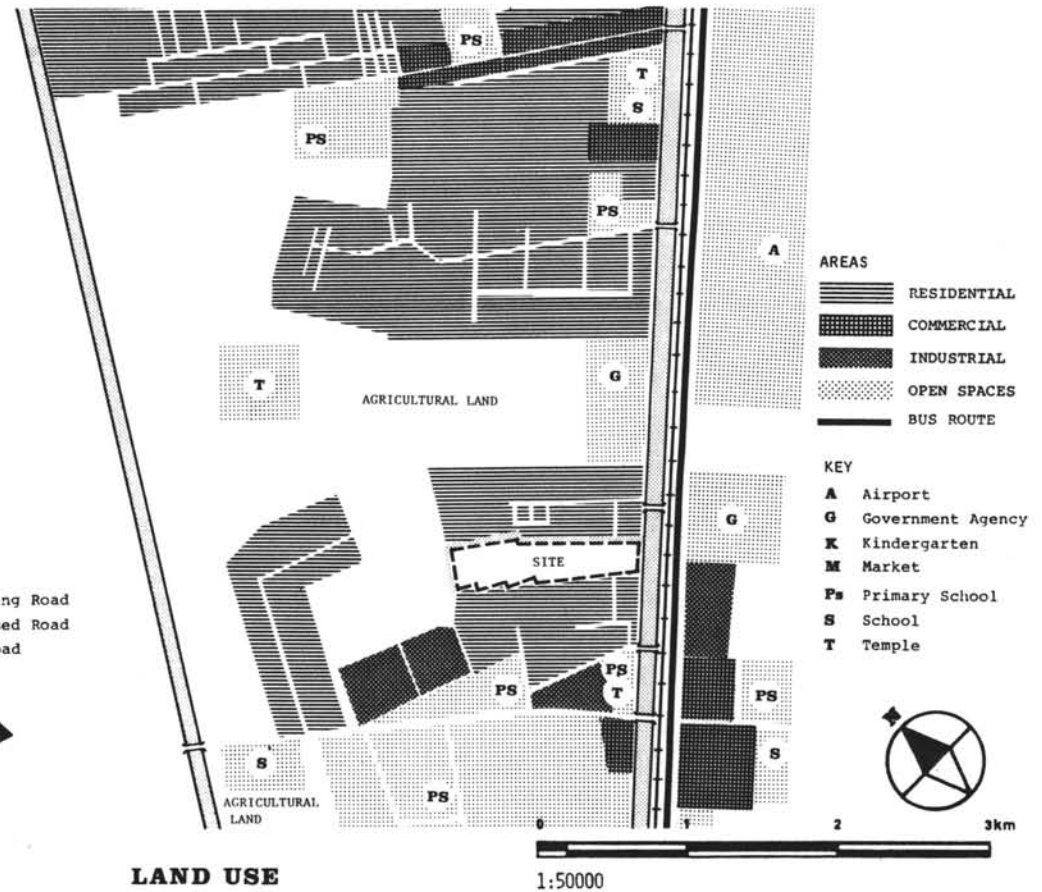
**SITE LOCATION**



The site is located at Tung Song Hong. It is a new rapid growth residential area at the periphery of Bangkok. Within 5 km radius along the high way and the road, there are temples, kindergartens, a college, schools, a health center, government agencies, a commercial center, factories, a food market, high and middle real estate development, a train station, and Bangkok International Airport.



**CIRCULATION**



**LAND USE**

1:50000

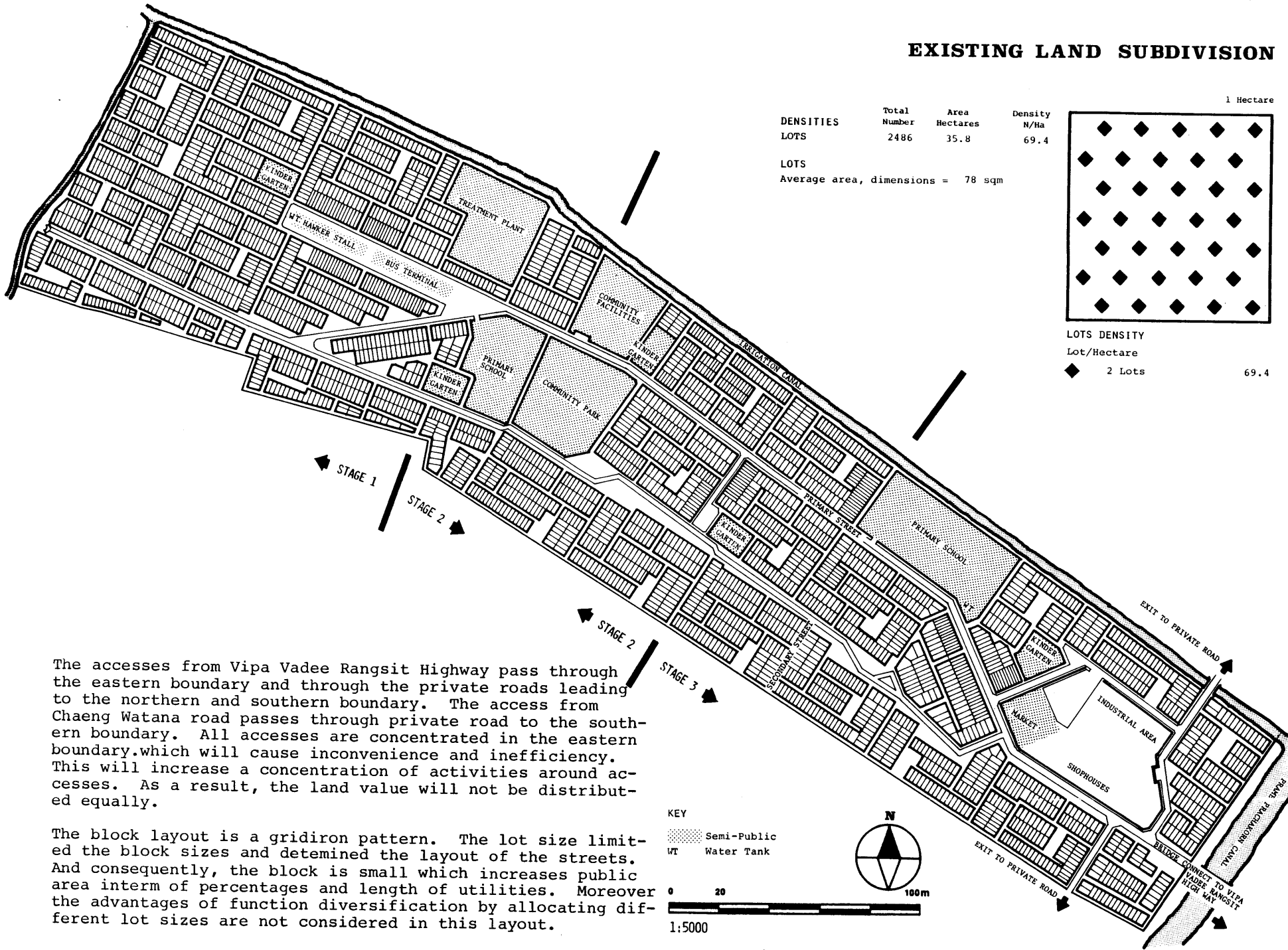
**SITE DATA**

<p>LOCATION: At Tung Song Hong, Lak-si subdistrict, Bangkhen district, Bangkok, 17 km north of the city center, 2 km south of Bangkok International Airport, 0.2 km from the Vipa Vadee Rangsit Highway and 3 km from Chaeng Watana Road.</p> <p>AREA: Gross area of the site 43 Ha</p> <p>SHAPE: Irregular, average length 1,400m, average width 300m</p> <p>BOUNDARIES: North: private real estate development South: private real estate development East: privately owned land and Prem Prachakorn canal. West: privately owned land</p> <p>ACCESSES: Existing road and bridge on the east connect with the highway. Existing road passing through private road on the north to the highway. Existing road passing through private road on the south to the highway and Chaeng Watana Road. Proposed road on the west to Chaeng Watana Road.</p> <p>TOPOGRAPHY: It is almost completely flat land which is used to be rice field with clay soil.</p> <p>TRANSPORTATION: Public transportation includes bus and train.</p> <p>INFRASTRUCTURE: Water supply: underground water, feasible by NHA Sewage disposal: not available, feasible</p>	<p>Storm drainage: irrigation and Prem Prachakorn canal</p> <p>Refuse collector: not available, feasible by NHA</p> <p>Electricity: available, feasible by NHA</p> <p>Telephone: available, feasible by NHA</p> <p>LAND OWNERSHIP: The NHA purchased in 1966. The present cost is US\$ 50,000/Ha</p> <p>AIRPORT, ZONING: Under airport zoning, no building can exceed 5 storeys</p> <p>GOVERNMENT REGULATION: Under laws of Bangkok Metropolitan Municipality area.</p> <p>OTHER FACTORS: Views: neutral Smoke Odors: none Dust: none Flooding: annually flooding 0.3m above the existing soil level Noise: some from airport</p> <p>CLIMATE: Winter humidity-moderate, temperature-moderate, wind northeast to southwest Summer humidity-moderate, temperature-high, wind southwest to northwest Rainy humidity-high, temperature-moderate, wind southwest to northeast, annually rainfall in every 2 years is 57 mm/hr.</p>
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**PROJECT PROGRAM**

	EXISTING		PROPOSED	
TOTAL AREA	43.0 Ha		43.0 Ha	
PROPOSED DESIGN AREA FOR A COMPARISON	35.8 Ha		35.8 Ha	
GROSS DENSITY(Person/Ha)	695		730	
NET DENSITY (Person/Ha)	1,193		1,024	
POPULATION	24,860		26,120	
<b>LAND UTILIZATION</b>				
PUBLIC(Streets, walkways, open spaces)	10.1 Ha	28.0%	5.3 Ha	14.3%
SEMI-PUBLIC(Open spaces, schools, community centers)	4.9 Ha	13.8%	5.1 Ha	14.4%
PRIVATE AND SEMI-PRIVATE(dwelling, shops, factories, lots, cluster courts)	20.8 Ha	58.2%	25.4 Ha	71.3%
TOTAL	35.8 Ha	100.0%	35.8 Ha	100.0%
<b>RESIDENTIAL AREAS</b>				
NUMBER OF LOTS(Assuming 10 persons/lot)	2486		2612	
DIMENSION OF LOTS(m x m)	4.8 x 14.6		5.0 x 15.0	
	4.8 x 16.7		5.0 x 17.0	
	3.6 x 22.2		5.5 x 11.0	
	6.0 x 13.3		6.0 x 13.0	
AVERAGE LOT AREA(m <sup>2</sup> )	78.0		75.0	
<b>INDUSTRIAL AREAS</b>				
NUMBER OF LOTS	Instant building for rent		40-60	
AVERAGE LOT AREA	Total area of 0.55 Ha		150-200 m <sup>2</sup>	
<b>COMMUNITY FACILITIES</b>				
	Primary schools: 3000 pupils, 2 schools		Primary schools: 3000 pupils, 2 schools	
	Kindergarten: 1200 pupils, 5 schools		Kindergarten: 1200 pupils, 5 schools	
	Main community center, food market, hawker stalls, minibus terminal, community park, administrative office, treatment plant		Main community center, food market, hawker stalls, minibus terminal, community park, administrative office, treatment plant	
	Parking lots, pedestrian mall, factory		None	
<b>DEVELOPMENT</b>				
	Progressive in Stages		Progressive in stages	
TARGET INCOME GROUP(US\$/year/household)	600-900	25.0%	600-900	25.0%
	900-1800	60.0%	900-1800	60.0%
	1000-3000	15.0%	1000-3000	15.0%
DESIGNER	National Housing Authority		Thesis proposal	

### EXISTING LAND SUBDIVISION

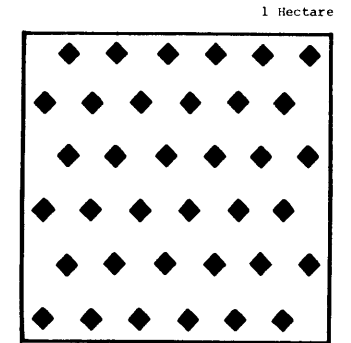


The accesses from Vipa Vadee Rangsit Highway pass through the eastern boundary and through the private roads leading to the northern and southern boundary. The access from Chaeng Watana road passes through private road to the southern boundary. All accesses are concentrated in the eastern boundary which will cause inconvenience and inefficiency. This will increase a concentration of activities around accesses. As a result, the land value will not be distributed equally.

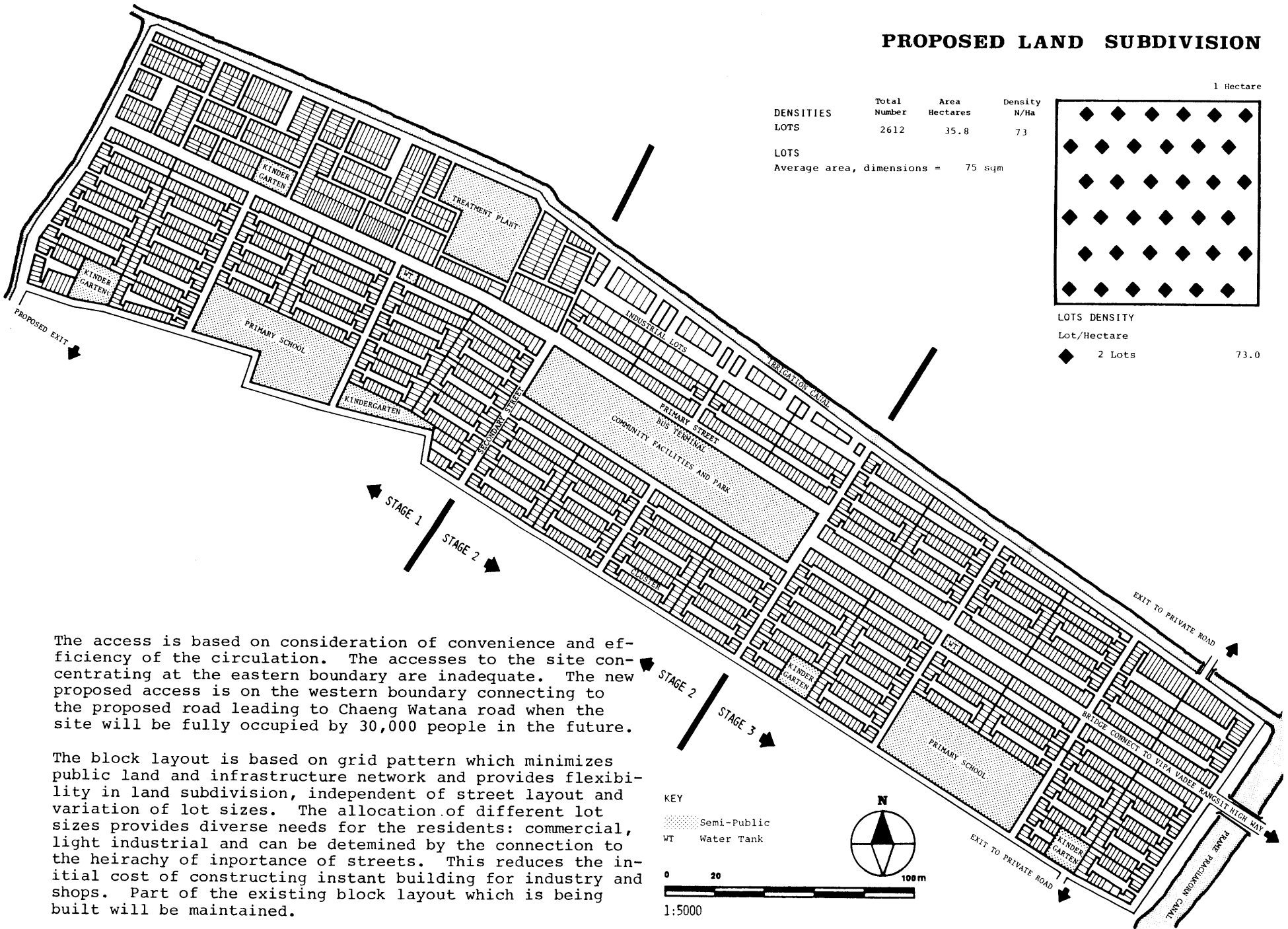
The block layout is a gridiron pattern. The lot size limited the block sizes and determined the layout of the streets. And consequently, the block is small which increases public area in terms of percentages and length of utilities. Moreover the advantages of function diversification by allocating different lot sizes are not considered in this layout.

# PROPOSED LAND SUBDIVISION

DENSITIES	Total Number	Area Hectares	Density N/Ha
LOTS	2612	35.8	73
LOTS			
Average area, dimensions = 75 sqm			



LOTS DENSITY  
Lot/Hectare  
◆ 2 Lots 73.0



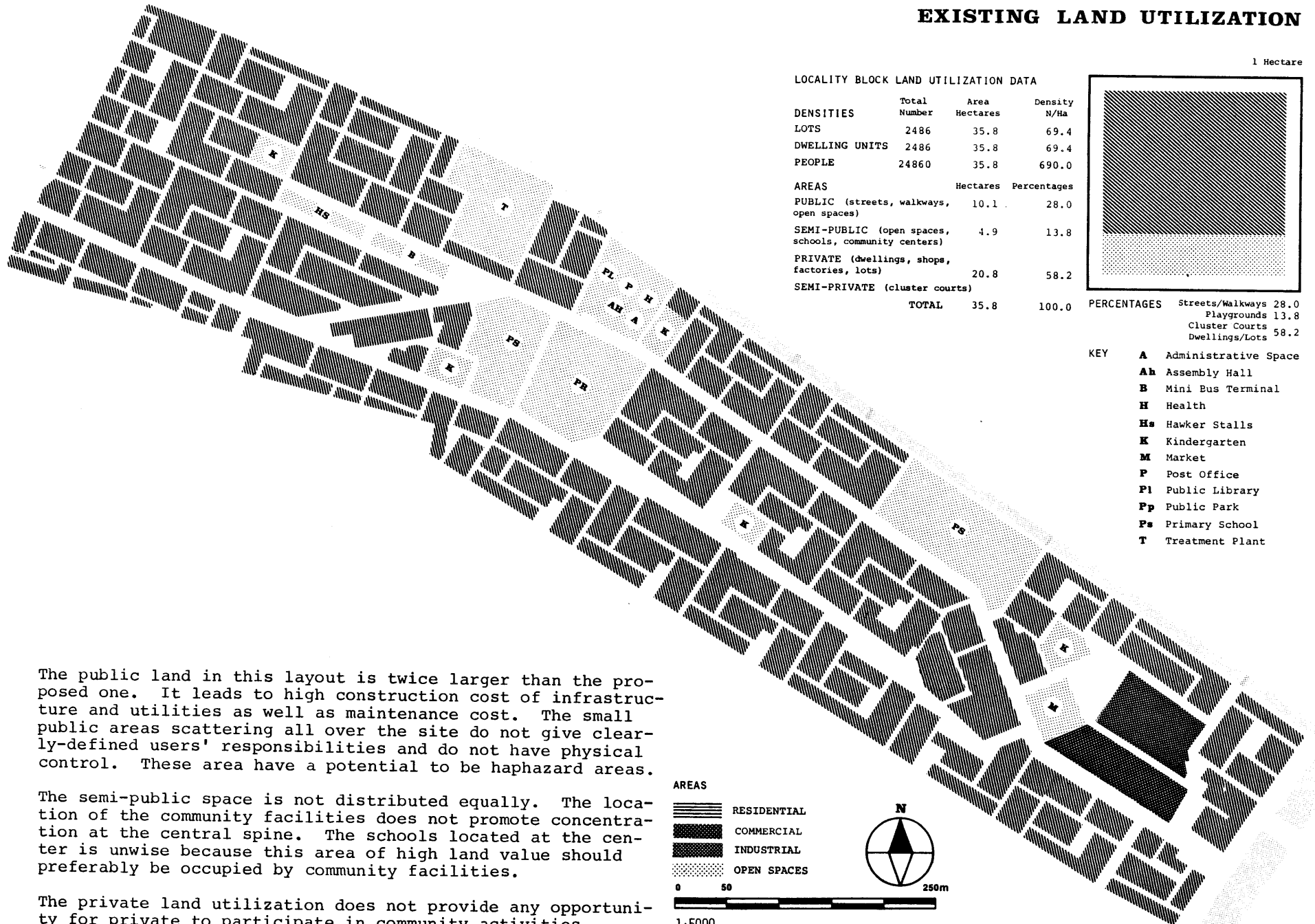
The access is based on consideration of convenience and efficiency of the circulation. The accesses to the site concentrating at the eastern boundary are inadequate. The new proposed access is on the western boundary connecting to the proposed road leading to Chaeng Watana road when the site will be fully occupied by 30,000 people in the future.

The block layout is based on grid pattern which minimizes public land and infrastructure network and provides flexibility in land subdivision, independent of street layout and variation of lot sizes. The allocation of different lot sizes provides diverse needs for the residents: commercial, light industrial and can be determined by the connection to the hierarchy of importance of streets. This reduces the initial cost of constructing instant building for industry and shops. Part of the existing block layout which is being built will be maintained.

KEY  
 [Dotted Pattern] Semi-Public  
 WT Water Tank



## EXISTING LAND UTILIZATION

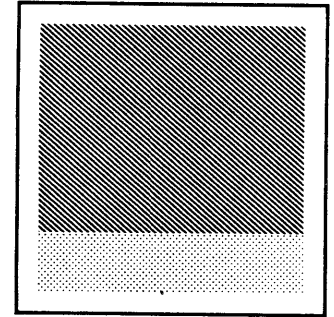


LOCALITY BLOCK LAND UTILIZATION DATA

DENSITIES	Total Number	Area Hectares	Density N/Ha
LOTS	2486	35.8	69.4
DWELLING UNITS	2486	35.8	69.4
PEOPLE	24860	35.8	690.0

AREAS	Hectares	Percentages
PUBLIC (streets, walkways, open spaces)	10.1	28.0
SEMI-PUBLIC (open spaces, schools, community centers)	4.9	13.8
PRIVATE (dwellings, shops, factories, lots)	20.8	58.2
SEMI-PRIVATE (cluster courts)		
<b>TOTAL</b>	<b>35.8</b>	<b>100.0</b>

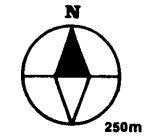


PERCENTAGES

Streets/Walkways	28.0
Playgrounds	13.8
Cluster Courts	
Dwellings/Lots	58.2

- KEY
- A** Administrative Space
  - Ah** Assembly Hall
  - B** Mini Bus Terminal
  - H** Health
  - Hs** Hawker Stalls
  - K** Kindergarten
  - M** Market
  - P** Post Office
  - Pl** Public Library
  - Pp** Public Park
  - Ps** Primary School
  - T** Treatment Plant

- AREAS
- RESIDENTIAL
  - COMMERCIAL
  - INDUSTRIAL
  - OPEN SPACES



1:5000

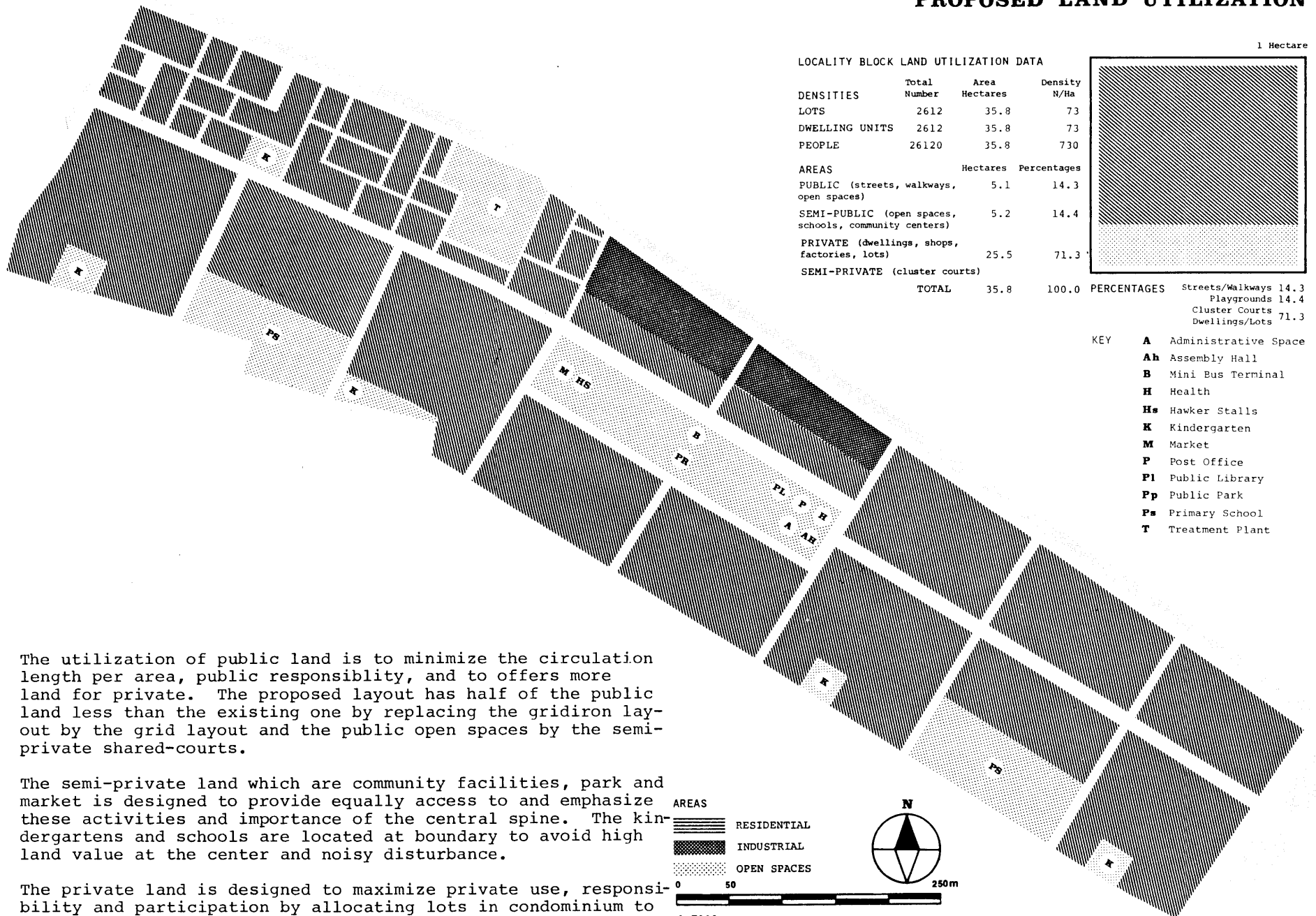
The public land in this layout is twice larger than the proposed one. It leads to high construction cost of infrastructure and utilities as well as maintenance cost. The small public areas scattering all over the site do not give clearly-defined users' responsibilities and do not have physical control. These area have a potential to be haphazard areas.

The semi-public space is not distributed equally. The location of the community facilities does not promote concentration at the central spine. The schools located at the center is unwise because this area of high land value should preferably be occupied by community facilities.

The private land utilization does not provide any opportunity for private to participate in community activities.



# PROPOSED LAND UTILIZATION

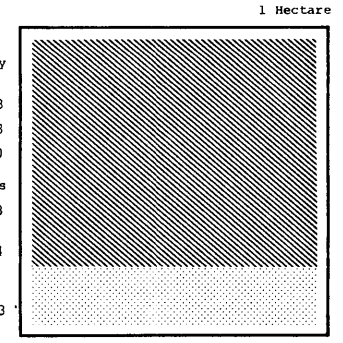


LOCALITY BLOCK LAND UTILIZATION DATA

DENSITIES	Total Number	Area Hectares	Density N/Ha
LOTS	2612	35.8	73
DWELLING UNITS	2612	35.8	73
PEOPLE	26120	35.8	730

AREAS	Hectares	Percentages
PUBLIC (streets, walkways, open spaces)	5.1	14.3
SEMI-PUBLIC (open spaces, schools, community centers)	5.2	14.4
PRIVATE (dwellings, shops, factories, lots)	25.5	71.3
SEMI-PRIVATE (cluster courts)		
<b>TOTAL</b>	<b>35.8</b>	<b>100.0</b>



PERCENTAGES

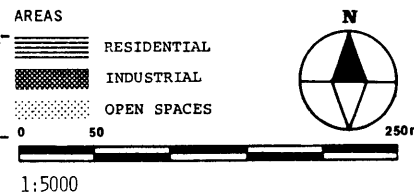
Streets/Walkways	14.3
Playgrounds	14.4
Cluster Courts	71.3
Dwellings/Lots	

- KEY
- A** Administrative Space
  - Ah** Assembly Hall
  - B** Mini Bus Terminal
  - H** Health
  - Hs** Hawker Stalls
  - K** Kindergarten
  - M** Market
  - P** Post Office
  - Pl** Public Library
  - Pp** Public Park
  - Ps** Primary School
  - T** Treatment Plant

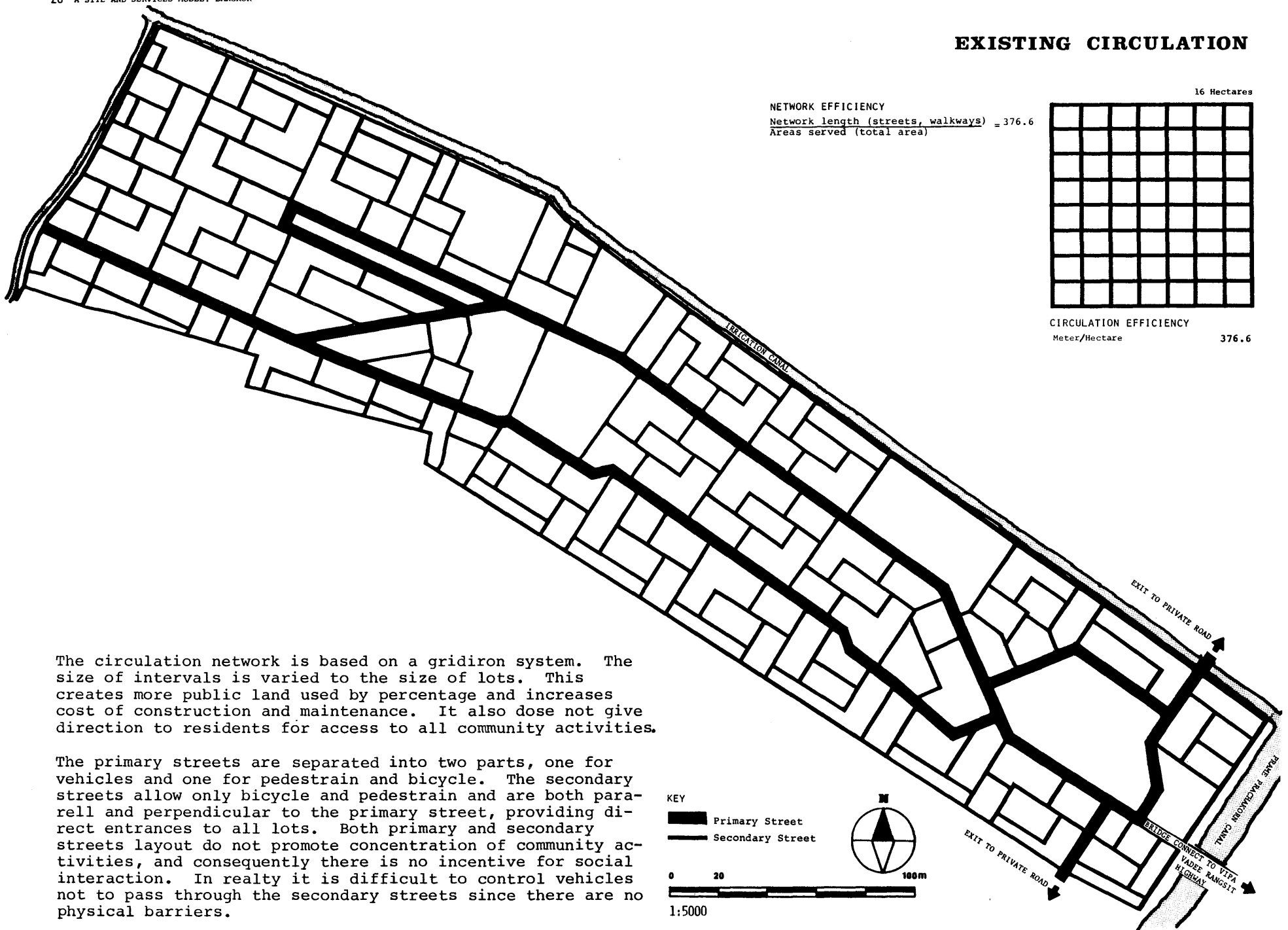
The utilization of public land is to minimize the circulation length per area, public responsibility, and to offers more land for private. The proposed layout has half of the public land less than the existing one by replacing the gridiron layout by the grid layout and the public open spaces by the semi-private shared-courts.

The semi-private land which are community facilities, park and market is designed to provide equally access to and emphasize these activities and importance of the central spine. The kindergartens and schools are located at boundary to avoid high land value at the center and noisy disturbance.

The private land is designed to maximize private use, responsibility and participation by allocating lots in condominium to create social interaction.



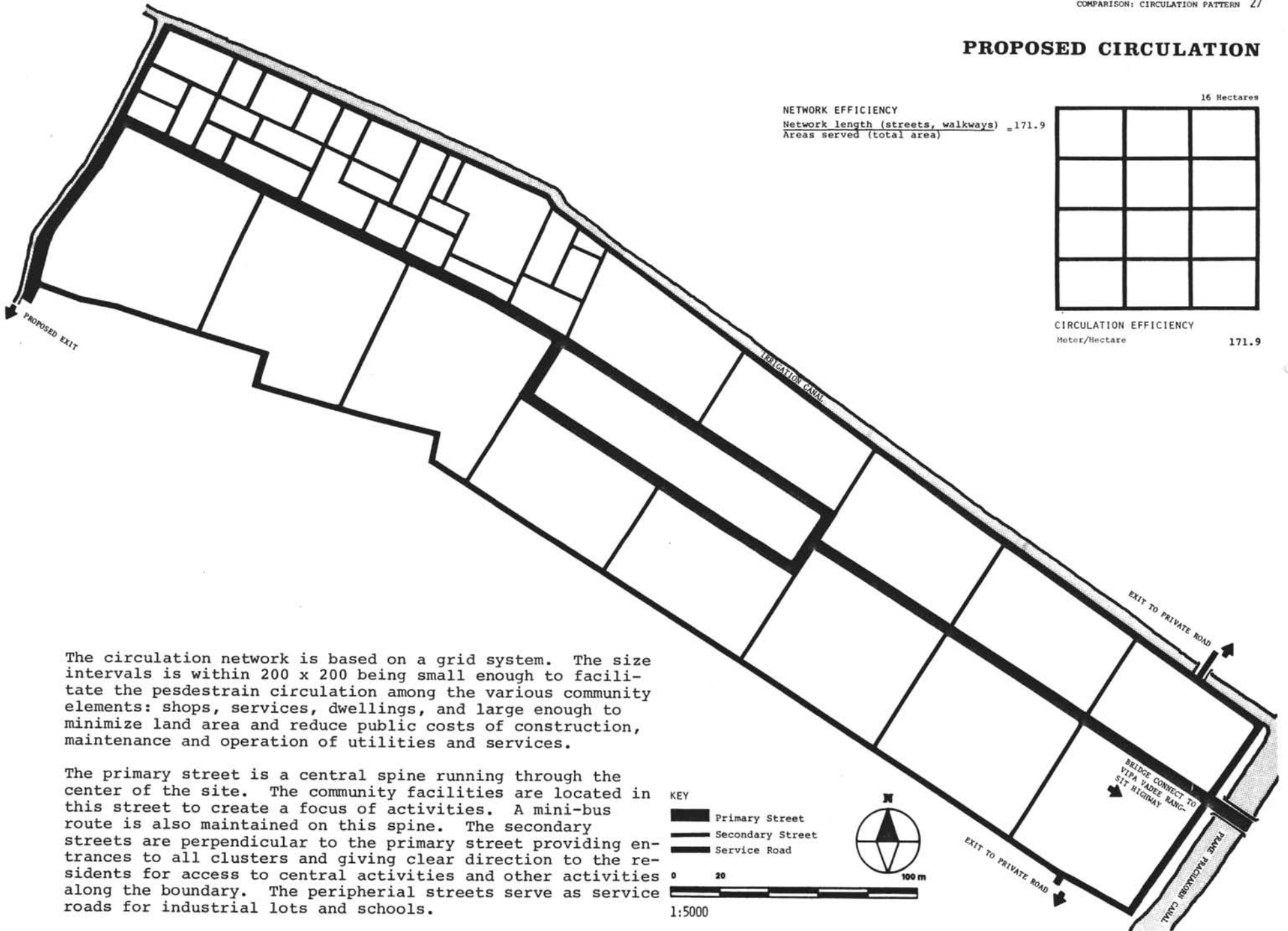
### EXISTING CIRCULATION



The circulation network is based on a gridiron system. The size of intervals is varied to the size of lots. This creates more public land used by percentage and increases cost of construction and maintenance. It also dose not give direction to residents for access to all community activities.

The primary streets are separated into two parts, one for vehicles and one for pedestrain and bicycle. The secondary streets allow only bicycle and pedestrain and are both parrell and perpendicular to the primary street, providing direct entrances to all lots. Both primary and secondary streets layout do not promote concentration of community activities, and consequently there is no incentive for social interaction. In realty it is difficult to control vehicles not to pass through the secondary streets since there are no physical barriers.

## PROPOSED CIRCULATION



The circulation network is based on a grid system. The size intervals is within 200 x 200 being small enough to facilitate the pedestrian circulation among the various community elements: shops, services, dwellings, and large enough to minimize land area and reduce public costs of construction, maintenance and operation of utilities and services.

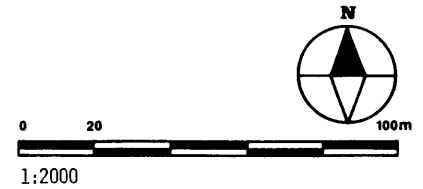
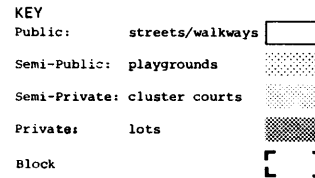
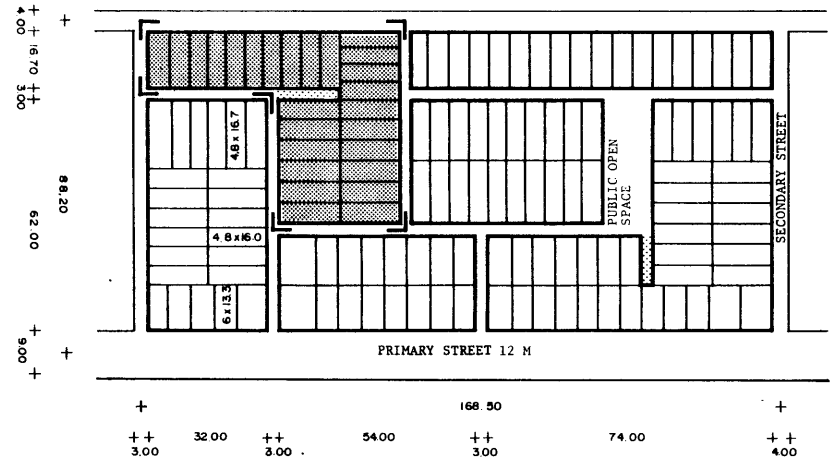
The primary street is a central spine running through the center of the site. The community facilities are located in this street to create a focus of activities. A mini-bus route is also maintained on this spine. The secondary streets are perpendicular to the primary street providing entrances to all clusters and giving clear direction to the residents for access to central activities and other activities along the boundary. The peripheral streets serve as service roads for industrial lots and schools.



### EXISTING BLOCKS

The layout does not reach the goals of a site and services which is intended to maximize private ownership of land and private participation and minimize construction cost.

The existing blocks show the typical layout with grouped blocks surrounded by public circulation that provided access directly to each lot. As a result of individual lot having direct connection of public circulation, the length of circulation per area is much greater than the that of the proposed layout. This implies higher construction cost and is a heavy burden for government to maintain infrastructure and utilities. In addition, this design and ownership decreases the private responsibility and participation in the community. This can cause haphazard in public area such as over-build by individuals.



LAND UTILIZATION DIAGRAMS

LOCALITY BLOCK LAND UTILIZATION DATA

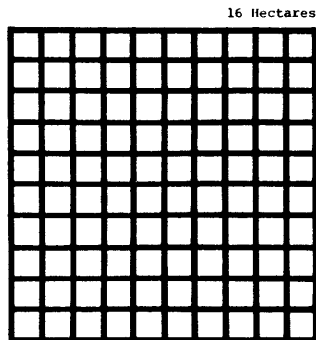
DENSITIES	Total Number	Area Hectares	Density N/Ha
LOTS	140	1.48	94.6
DWELLING UNITS	140	1.48	94.6
PEOPLE	1400	1.48	946.0

AREAS	Hectares	Percentages
PUBLIC (streets, walkways, open spaces)	.28	19.2
SEMI-PUBLIC (open spaces, schools, community centers)	-	-
PRIVATE (dwellings, shops, factories, lots)	1.19	80.2
SEMI-PRIVATE (cluster courts)	.01	.6
<b>TOTAL</b>	<b>1.48</b>	<b>100.0</b>

NETWORK EFFICIENCY

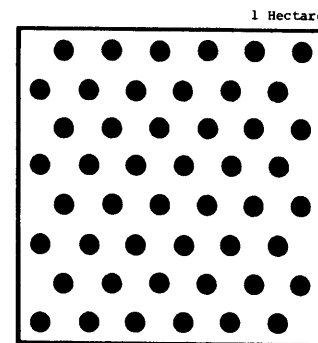
Network length (streets, walkways) = 499  
 Areas served (total area) LOTS  
 Average area, dimensions = 85 sqm



CIRCULATION EFFICIENCY

Meter/Hectare **499**

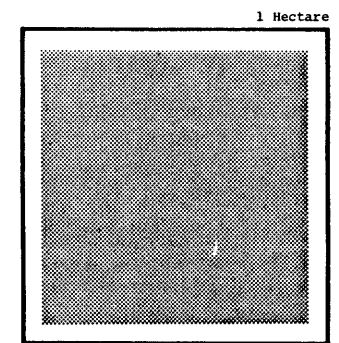
16 Hectares



DENSITY Persons/Hectare **946**

● 20 Persons

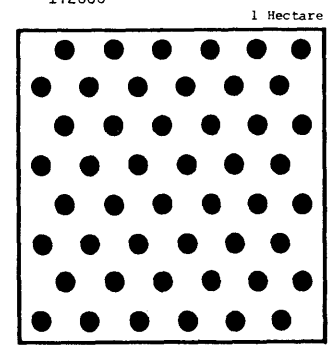
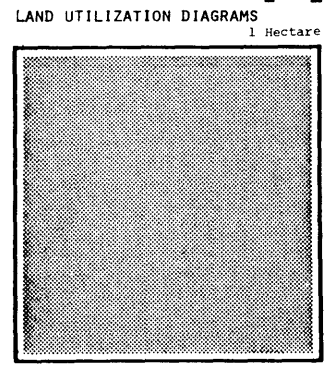
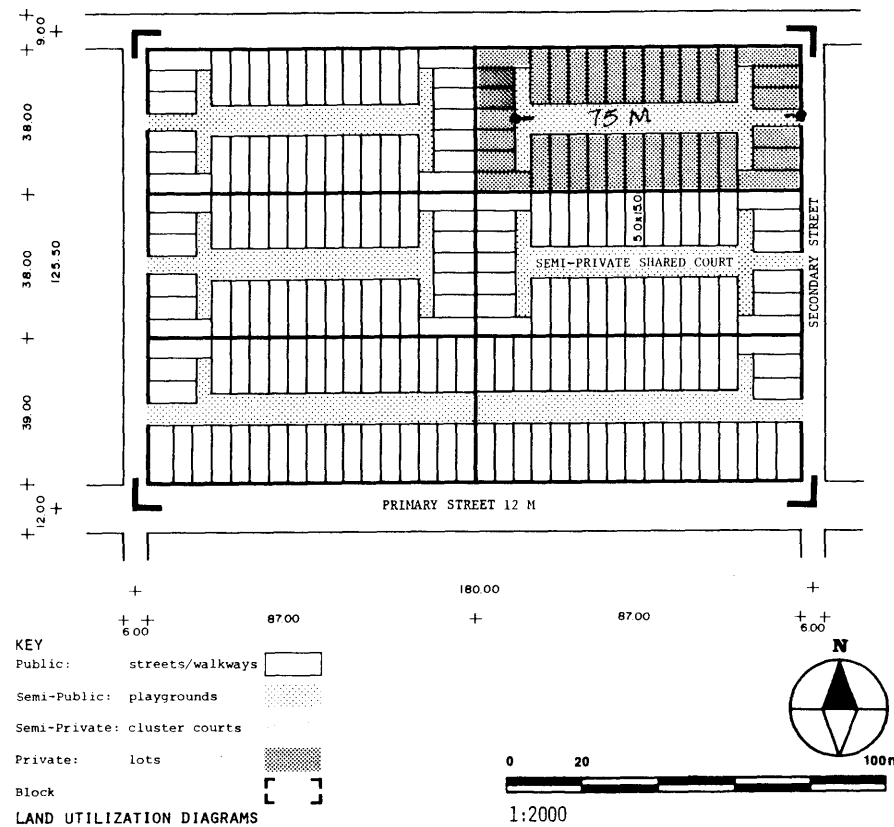
1 Hectare



PERCENTAGES Streets/Walkways 19.2  
 Playgrounds -  
 Cluster Courts .6  
 Dwellings/Lots 80.2

1 Hectare

# PROPOSED BLOCK



PERCENTAGES

Streets/Walkways	9.2
Playgrounds	-
Cluster Courts	19.2
Dwellings/Lots	71.4

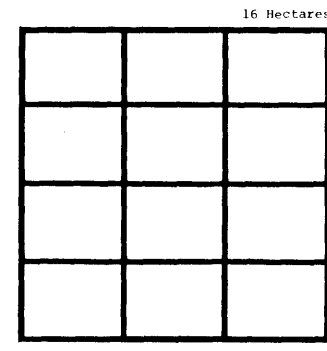
DENSITY Persons/Hectare 955

● 20 Persons

BLOCK is a portion of land bounded and served by public lines of circulation.  
 LOT is a measured parcel of land having fixed boundaries and access to public lines of circulation.  
 CLUSTER is a group of lots (owned individually) around a semi-private court ( owned in condominium).  
 CONDOMINIUM is a system of direct ownership of a single unit in multi-unit arrangement. The individual owns the unit in much the same manner as if it were a single-family dwelling; he holds direct legal title to the unit and appropriate interest in the common areas and underlying ground.

The revised block layout is designed to illustrate land subdivision which allows minimization of public ownership of land, lengths of infrastructure per area served, public or government ownership, responsibility and provision of services and maximization of private ownership of land and private participation and responsibility.

The block plan shows a typical block with lots grouped around a semi-private common court that served for access to the lots as well as for other activities of their occupants. This court is owned in condominium by the owners of the lots who share its use. The court is assured of better control and and maintenance by virtue of its condominium ownership, being dead-ended and with a limited number of users. More - over the ownership and mutual maintenance will create the social interaction among the residents and eventually more residents will participate the community activities. And this will create private responsibility to the community as well.



CIRCULATION EFFICIENCY

Meter/Hectare 178

LOCALITY BLOCK LAND UTILIZATION DATA

DENSITIES	Total Number	Area Hectares	Density N/Ha
LOTS	210	2.2	95.5
DWELLING UNITS	210	2.2	95.5
PEOPLE	2100	2.2	950.0

AREAS	Hectares	Percentages
PUBLIC (streets, walkways, open spaces)	.2	9.2
SEMI-PUBLIC (open spaces, schools, community centers)	-	-
PRIVATE (dwellings, shops, factories, lots)	7 1.57	17.4
SEMI-PRIVATE (cluster courts)	.43	19.2
<b>TOTAL</b>	<b>2.2</b>	<b>100.0</b>

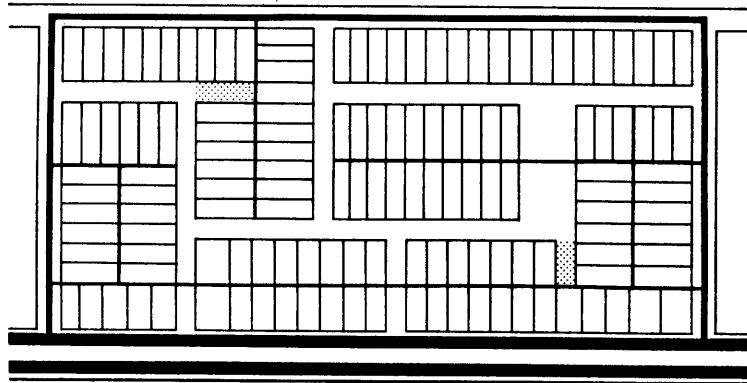
NETWORK EFFICIENCY

Network length (streets, walkways) = 178

Areas served (total area) LOTS

Average area, dimensions = 75 sqm

## WATER SUPPLY



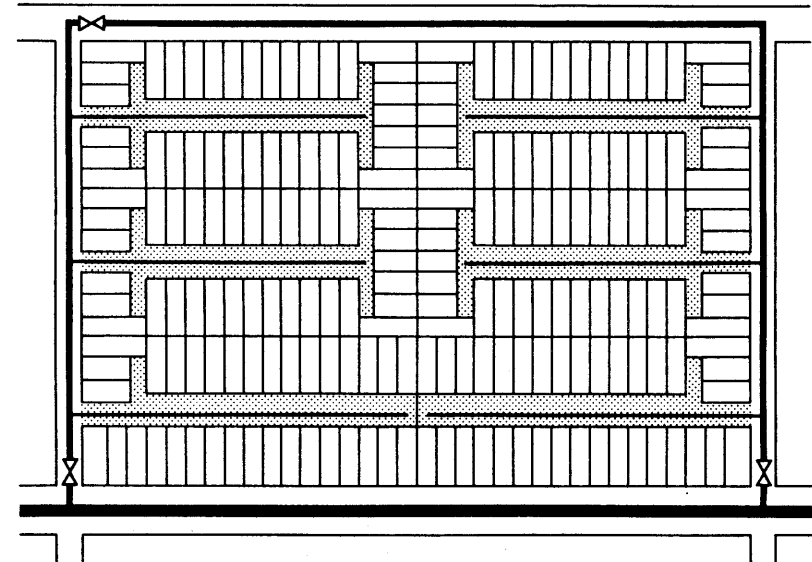
### EXISTING LAYOUT

#### EXISTING WATER SUPPLY

A pipe network runs to the two separated sets of sediment tank, elevated reservoir and pumping station. Sources of water are ground water wells in the site. The rate of portable water supply will be 150 litres/man/day and the designed average pressure head is 15 m. The distribution pipes run between the lot boundaries to reduce costs of service connections but the result leads to many disadvantages as follow; 1.) They require the " instant " construction of water facilities service each lot in order to control proper installation. This will increase the initial cost of construction. 2.) Lines are on private land, creating difficulty of access for repairs, control and maintenance 3.) Foundations, footings, or other construction may damage the network. 4.) By placing the services in a fixed point on the lot, it impairs its flexibility of use. Eventhough the NHA tries to reserve a strip of land for access to repair pipes, the result will be high cost of maintenance.

#### PROPOSED WATER SUPPLY

The network is designed as a close grid system with no dead ends. The sources of water and the collectors are the same as those of existing scheme. The distribution pipes in semi-private shared-court can be constructed by mutual-help. Gate valves to shut off water supply for maintenance can be provided at minimum and people should have access to water from other block if the interior flow is interrupted in the acceptable maximum distance of 200 m.

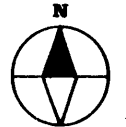


### PROPOSED LAYOUT

LAYOUT	PIPE				TOTAL LENGTH	M/HA
	PRIVATE SIZE (INCH)		PUBLIC SIZE (INCH)			
	2"	4"	10"			
EXISTING (area 1.5 Ha)	408	174	118	432	840	568
PROPOSED (area 2.2 Ha)	481	304	96	400	881	401

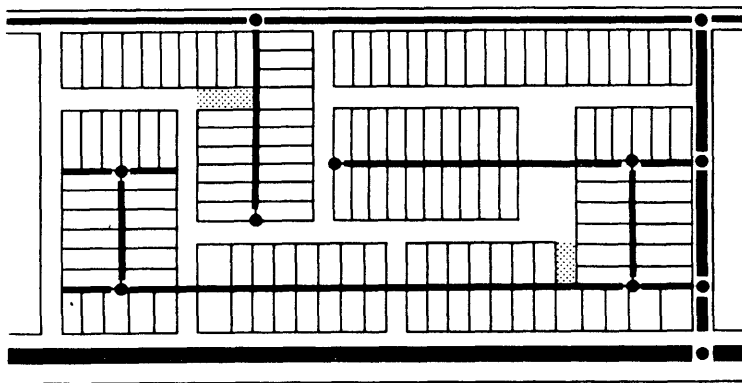
#### KEY

- 10" Pipe
- 4" Pipe
- 2" Pipe



1:2000

## SEWAGE DISPOSAL



**EXISTING LAYOUT**

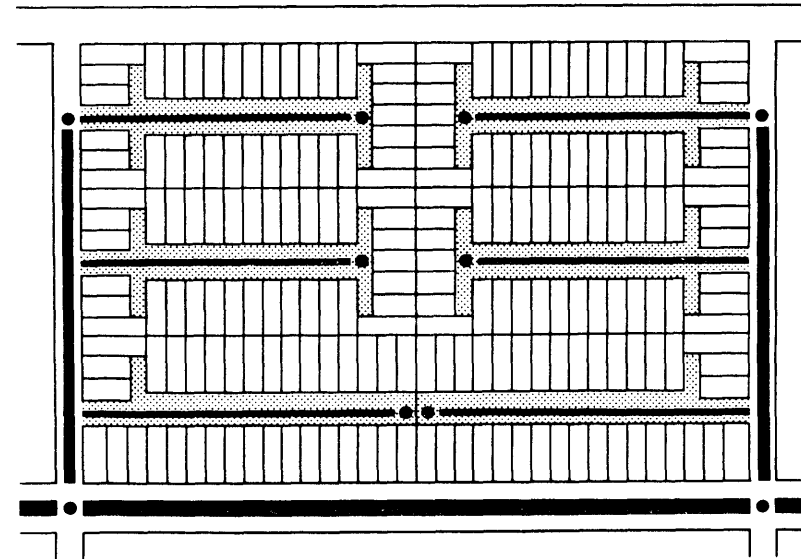
### EXISTING SEWAGE DISPOSAL

A water borne sewerage runs into a treatment plant located near the irrigation canal. The distribution pipes run between the lot boundaries to reduce costs of service connection but there are actually disadvantages as described in the existing water layout.

### PROPOSED SEWAGE DISPOSAL

A water borne sewerage system and a treatment plant will be used as in the existing scheme. But length of the pipes in public area is much shorter than that of the existing scheme. The lots distribution pipes in the semi-private shared-court can be built and maintained by mutual-help, and consequently lowering the government initial cost of construction and maintenance cost. The connection pipes to the lot is located in the middle of the court. This has more advantages than the existing scheme. Manholes will be provided one for every three clusters, at changes of direction, at dead ends, and at approximately 100 m intervals for cleaning purposes.





Septic tanks and pit latrine can be provided as alternative schemes. However, they are feasible only after a study of soil absorption and the dangers of ground water pollution. Compost latrine is useful, whenever the system is culturally acceptable.

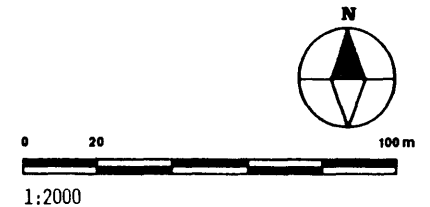


**PROPOSED LAYOUT**

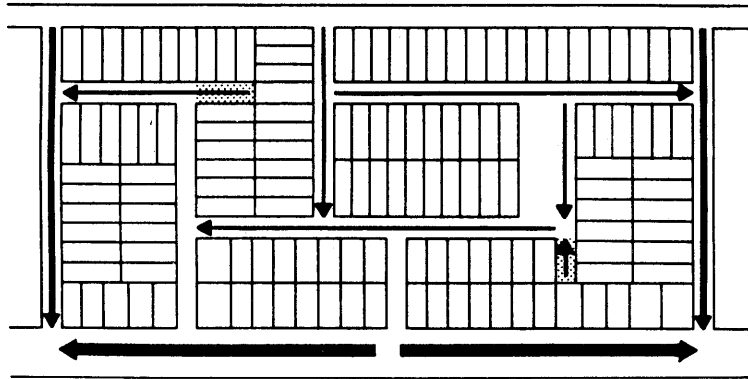
LAYOUT	PIPE					TOTAL LENGTH	M/HA
	PRIVATE SIZE (INCH)	PUBLIC SIZE (INCH)					
		6"	8"	18"			
EXISTING (area 1.5 Ha)	584		44	84	128	712	484
PROPOSED (area 2.2 Ha)	618		38	65	90	193	811
					618		369

KEY

-  18" Pipe
-  8" Pipe
-  6" Pipe
-  Manholes



## FLOOD PROTECTION AND STORM DRAINAGE



**EXISTING LAYOUT**

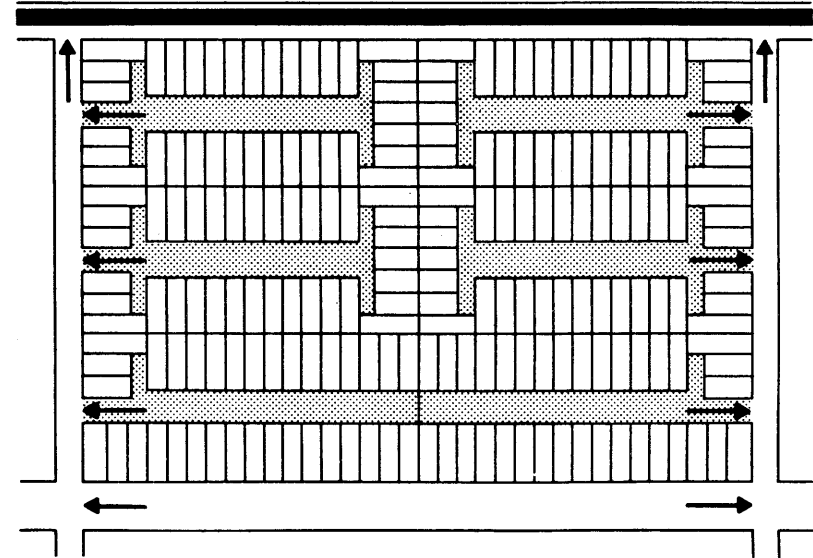
### EXISTING FLOOD PROTECTION AND SURFACE DRAINAGE

The site is raised by landfill of 0.80 m creating a down slope toward the road in the middle of the site. In the surface drainage, a network of covered ditched and underground pipes are used. The network drains water into the irrigation canal with 2 electric pumps.

### PROPOSED FLOOD PROTECTION AND SURFACE DRAINAGE

The site is raised by landfill of 0.83 m at the middle of the site and 0.30 at the boundary creating a 0.35% slope downward to the boundary. For the surface drainage, the shared-courts and streets are used as primary interceptors and the water is channeled along the shared-courts and streets in shallow ditches. The deep ditch and the irrigation canal at the boundary act as flow collectors to the Pram Prachakorn canal and also prevent water from entering.

The covered ditches along two sides of the streets are more expensive, require maintenance and therefore have been avoided in the proposed scheme. If the slopes of the streets are carefully designed and constructed, the shallow ditches will be adequate for the drainage propose. The flood protection scheme eliminates the underground pipes and electric pumps and this lowers the construction and maintenance costs as well.

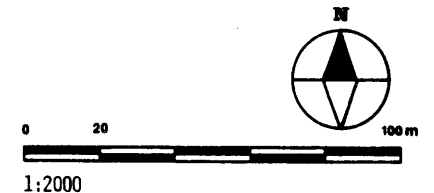


**PROPOSED LAYOUT**

LAYOUT	DITCH				TOTAL LENGTH	M/HA
	PRIVATE SIZE m <sup>2</sup>	PUBLIC SIZE m <sup>2</sup>				
	.3x.3 1.2x1.6	.3x.3	.5x.5	1x1		
EXISTING (area 1.5 Ha)	39	84	86	379	549 39	588 397
PROPOSED (area 2.2 Ha)	90				90	41

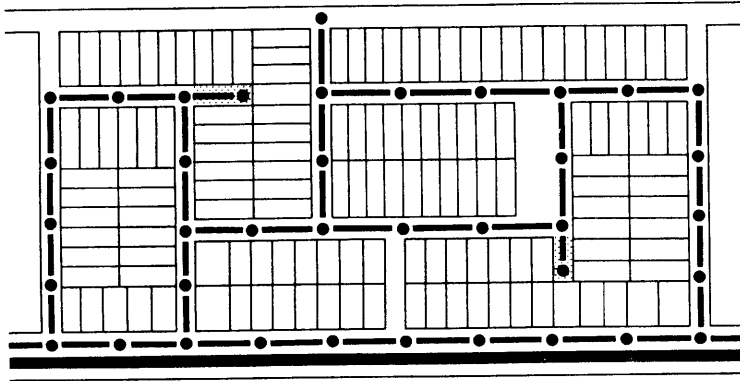
**KEY**

- 1.2 x 1.6 m Ditch
- 1.0 x 1.0 m Covered Ditch
- 0.5 x 0.5 m Covered Ditch
- 0.3 x 0.3 m Covered Ditch





# STREET ELECTRICITY



**EXISTING LAYOUT**

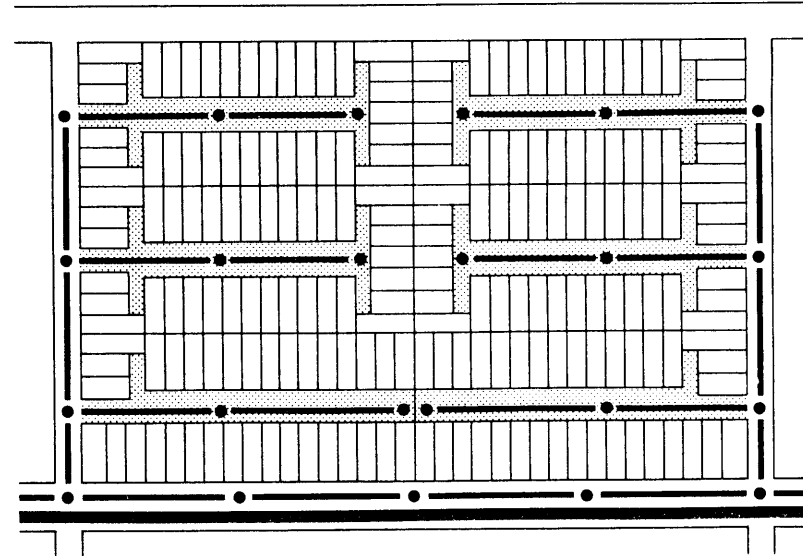
**EXISTING ELECTRICITY**

The high tension is located along the primary street on 0.40 m interval poles. The low tension is distributed to the lots on the 0.20 m interval poles. The designed consumption for each lot is 15 Amp. Street lighting intensity for the main streets is not less than 0.6 ft-candle, and 0.4 ft-candle for the secondary streets.

**PROPOSED ELECTRICITY**

The high tension is located along the primary street and connected to the transformers at the intersections. The low tension is distributed on the secondary streets. The lot distribution low tension in the semi-private shared-court can be connected to the street low tension by mutual-help, lowering the public initial costs of construction and maintenance. The low tension pole interval is at maximum interval of 0.45 m. Both the length of low tension per area and the number of poles are less than those of the existing scheme.

The distribution low tension can be placed between the lot boundaries to reduce service connection as an alternative scheme. However this is feasible only after there is an agreement of responsibility between the residents in three clusters and proper initial structure to install the low tension on the property lines.



**PROPOSED LAYOUT**

LAYOUT	TENSION				M/HA
	PRIVATE TENSION TYPE	PUBLIC TENSION TYPE		TOTAL LENGTH	
		LOW	LOW		
EXISTING (area 1.5 Ha) 39		685	84	769 39 808	546
PROPOSED (area 2.2 Ha) 26		463	57	520 26 546	248

**KEY**

- High Tension
- Low Tension
- Poles



1:2000

## CONCLUSIONS

The housing situation in Bangkok Metropolitan area will continue to deteriorate with the city's current growth rate.

While the government's policies of slum upgrading and site and services are realistic and appropriate at the present time, there exist wasteful practices in the design of site and services projects with negative social and economic consequences.

The need for efficacy of urban layouts is imperative in directing development so as to minimize initial outlay and maximize socio-economic returns from public inputs. In the design of proper layouts, two principal components to be considered at the planning stage are land utilization and circulation, the basic characteristics of which are identified as follow:

### LAND UTILIZATION:

The proposed land utilization introduce distinctly a coherent relationship between users' responsibility and physical control which basic for an effective use of the land and which is ignored in the existing project.

TYPE	USER	RESPONSIBILITY AGENT	PHYSICAL CONTROL
PUBLIC (streets, walkways, open spaces)	unlimited	public sector	minimum
SEMI-PUBLIC (schools, playgrounds, open spaces)	limited group of people	public sector/ user	partial/complete
SEMI-PRIVATE (cluster courts)	group of owners	user	partial/complete
PRIVATE (dwellings, lots)	owner/tenant	user	complete

### CIRCULATION:

The proposed circulation illustrates a more efficient layout of lines of circulation and access than the existing one in terms of circulation lengths per area served.

LINES OF CIRCULATION (streets, walkways)	LINES OF ACCESS (dead-end streets or loops for pedestrians, vehicles or both)
-serve for through circulation and provide direct access to lots on their sides	-never serve for through circulation; serve only abutters by providing direct access to the lots on their sides
-unlimited number of users	-limited number of users
-on public land	-on semi-private/private land
-long and generally connected at both ends with different circulation lines	-short and generally connected of one or both ends to the same line of circulation
	-limited to a maximum length of 100m for reasons of safety

From the comparison of the proposed and existing layout regarding land utilization and circulation, the proposed layout is seen to be able to achieve more desirable effects and therefore serve as a model for all site and services projects by some specific design concepts described as follows:

- a. The purpose: A meaningful practice of design; maximization of privately owned land and minimization of publicly owned land.  
Achieved by: A grid layout and a cluster-court design with condominium ownership  
These reduce publicly owned land interms of percentage of circulation per area and provide more privately owned land.
- b. The purpose: Positive social effects; the encouragement of individual responsibility and participation  
Achieved by: A clear definition of the extent of the users' territory and a provision of semi-private area and condominium ownership in shared-courts.  
These promote social interaction and mutual-help to maintain the shared-courts.
- c. The purpose: Positive economic effects; the reduction of

## EVALUATIONS

initial cost of construction and maintenance  
 Achieved by: A grid layout and a cluster-court design and condominium ownership

These minimize lengths and areas of public streets; minimize lengths of services and utilities basic networks; permit the separation of utilities basic networks and service connections which can be developed progressively and financed separately.

- d. The purpose: Positive administrative effects; less administration costs and guarantees provided by groups

Achieved by: The condominium subdivision

These make it unnecessary for the public institutions to deal with individuals but with groups of people of cooperatives.

The four case studies represent a major dwelling systems of the low-income sector of Bangkok. They have been evaluated and compared with the existing and proposed site and services projects. The evaluations provides a comparative view of the percentages, densities and network efficiency.

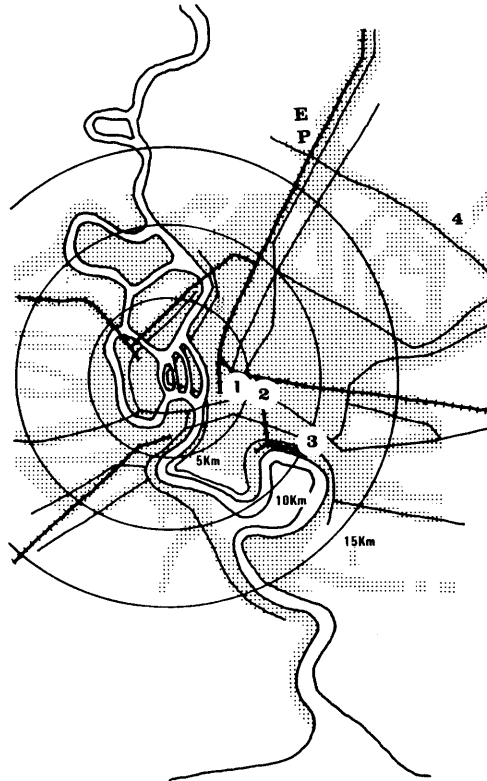
The existing low-income housing systems provide the most important source of information for formulating low-income housing policies and programs; a guideline to land utilization, distribution and subdivision; also insight into issues concerning population, densities, income ranges, cultural and social values.

The proposed site and services project is based on information from the existing low-income housing systems and the National Housing Policies. The layout is designed and compared to the existing one to illustrate the more efficient scheme in the utilization of limited resources.

The proposed project has two advantages scheme. The first is the most efficient circulation. This minimizes the investment in construction of infrastructure and utility networks and reduces the public responsibility and cost of maintenance and operation because of the least circulation length per area. The optimal amount of privately owned land is also achieved, not only in terms of saleable land but also the increase of private responsibility. The system of condominium ownership is used to create social interaction among the users to share use and responsibility. As a result, these create both social and economic positive effects to over all settlement development.

The diagrams on the following pages show a summary of the evaluations of the case studies in a comparative manner.

**LAND UTILIZATION:  
PATTERNS, PERCENTAGES,  
DENSITIES CIRCULATION**



- 1 KING PETCH
- 2 KING PETCH SQUATTER
- 3 KLONG TOEY
- 4 LAD PHRAO
- P TUNG SONG HONG PROPOSED
- E TUNG SONG HONG EXISTING



**COMPARATIVE PROJECTS AND CASE STUDIES**

The case studies are examples of existing dwelling environment in Bangkok. The existing site and services projects is illustrated the government design. The proposed project used in comparing with the case studies and the existing one in the evaluation of efficiency of physical layouts.

**PERCENTAGES**

Proportion of public and private areas are indicators in determining maintenance, responsibility, user control and functional efficiency of a layout. For example, a large percentage of land for circulation results in high costs of installation per sector, indicating an inefficient layout.

**DENSITY**

The number of persons per hectare relates to both the number of lots and the types of dwellings per hectare. This determines the intensity of land use; low densities reflect higher development costs per person.

**CIRCULATION EFFICIENCY**

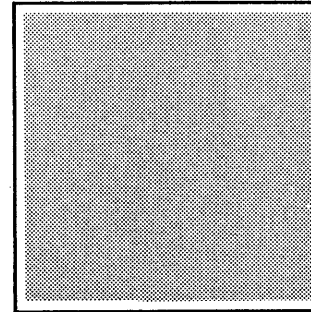
A relation between public circulation lengths and the area served indicates the network efficiency; a high ratio reflects a less efficient network in terms of direct capital investment and future maintenance costs.

**COMPARATIVE PROJECTS**

**TUNG SONG HONG  
PROPOSED**

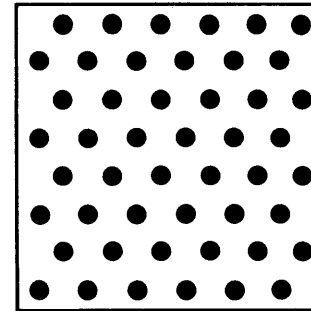
Site and services, Public scheme, Very low/ low/ middle income

1 Hectare



PERCENTAGES	Streets/Walkways	9.2
	Playgrounds	-
	Cluster Courts	-
	Dwellings/Lots	90.6

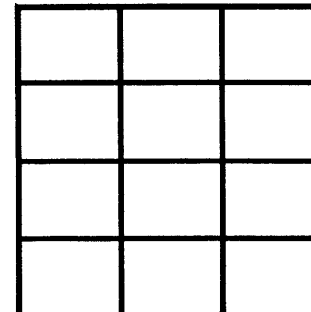
1 Hectare



DENSITY	Persons/Hectare	950
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● 20 Persons

16 Hectares



CIRCULATION EFFICIENCY

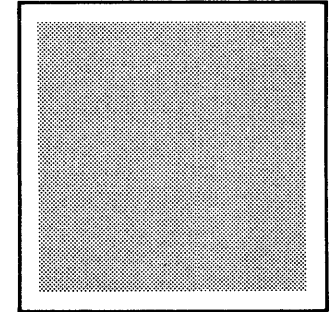
Meter/Hectare

178

**TUNG SONG HONG  
EXISTING**

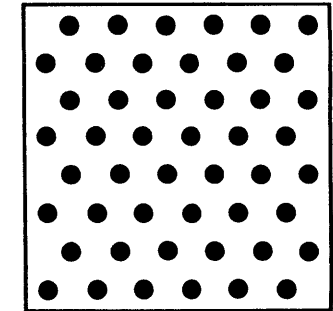
Site and services, Public scheme, Very low/ low/ middle income

1 Hectare



PERCENTAGES	Streets/Walkways	19.2
	Playgrounds	-
	Cluster Courts	-
	Dwellings/Lots	80.8

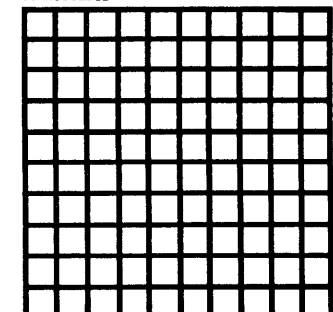
1 Hectare



DENSITY	Persons/Hectare	946
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● 20 Persons

16 Hectares



CIRCULATION EFFICIENCY

Meter/Hectare

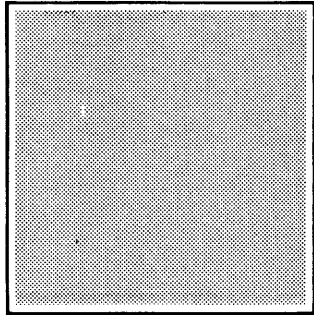
499

**CASE STUDIES**

**1a KING PETCH BEFORE UPGRADING 1978**

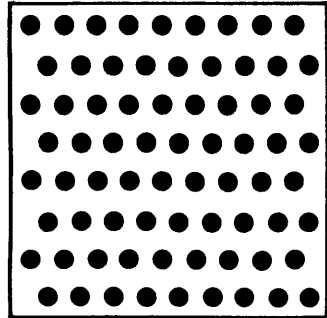
Squatter "pay land rent" settlement, Popular Very low/ low/ middle income

1 Hectare



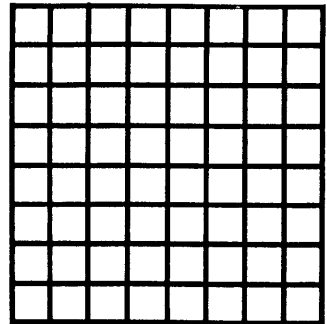
PERCENTAGES	Streets/Walkways	9
	Playgrounds	-
	Cluster Courts	92
	Dwellings/Lots	

1 Hectare



DENSITY Persons/Hectare 1484

● 20 Persons  
16 Hectares

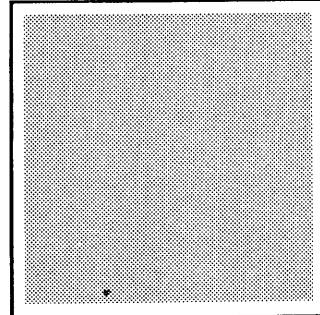


CIRCULATION EFFICIENCY Meter/Hectare 393

**1b KING PETCH AFTER UPGRADING 1980**

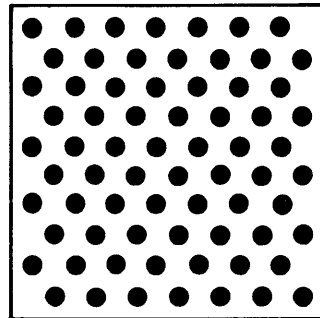
Squatter "pay land rent" settlement, Popular Very low/ low/ middle income

1 Hectare



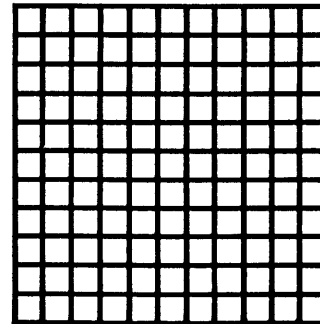
PERCENTAGES	Streets/Walkways	16.3
	Playgrounds	-
	Cluster Courts	83.7
	Dwellings/Lots	

1 Hectare



DENSITY Persons/Hectare 1400

● 20 Persons  
16 Hectares

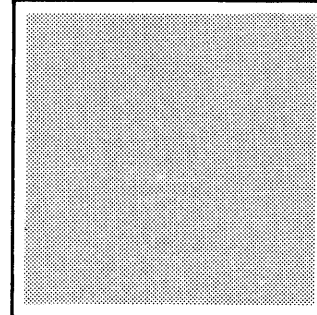


CIRCULATION EFFICIENCY Meter/Hectare 554

**2 KING PETCH SQUATTER**

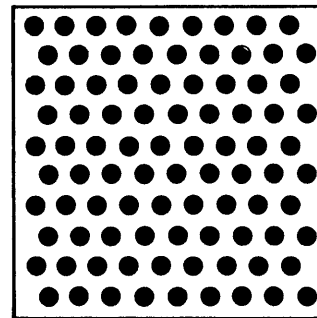
Squatter settlement, Popular, Very low/ low income

1 Hectare



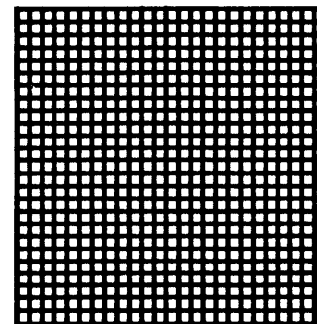
PERCENTAGES	Streets/Walkways	11.25
	Playgrounds	-
	Cluster Courts	-
	Dwellings/Lots	88.75

1 Hectare



DENSITY Persons/Hectare 1875

● 20 Persons  
16 Hectares

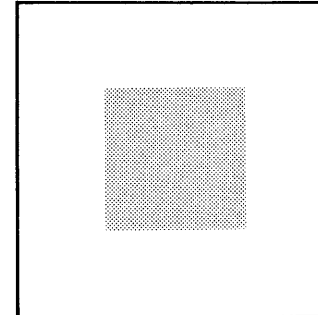


CIRCULATION EFFICIENCY Meter/Hectare 1200

**3 KLONG TOEY**

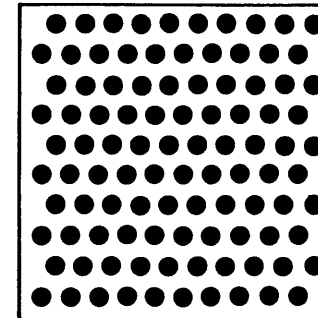
Public housing, Walk-ups, Low income

1 Hectare



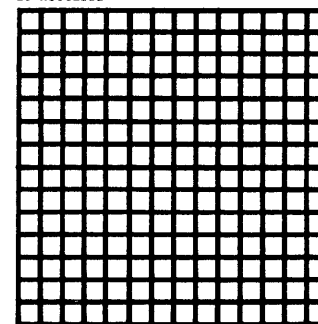
PERCENTAGES	Streets/Walkways	77.2
	Playgrounds	-
	Cluster Courts	-
	Dwellings/Lots	22.8

1 Hectare



DENSITY Persons/Hectare 2023

● 20 Persons  
16 Hectares

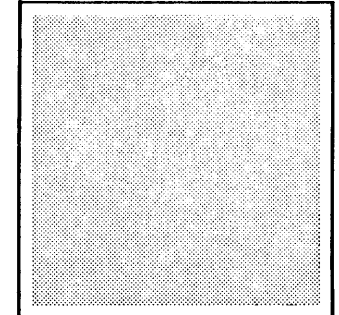


CIRCULATION EFFICIENCY Meter/Hectare 655

**4 LAD PHRAO**

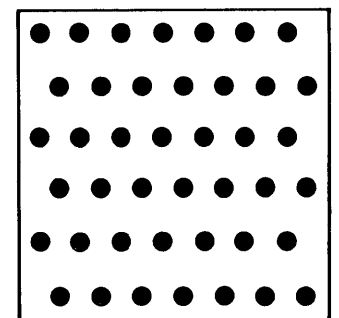
Self-help housing, Private, Row houses, Low/ middle income

1 Hectare



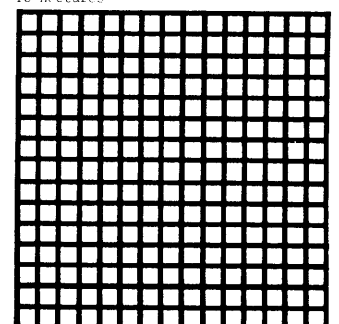
PERCENTAGES	Streets/Walkways	15.4
	Playgrounds	-
	Cluster Courts	-
	Dwellings/Lots	84.4

1 Hectare



DENSITY Persons/Hectare 830

● 20 Persons  
16 Hectares



CIRCULATION EFFICIENCY Meter/Hectare 759



## APPENDIX

This section provides supporting and complementary references that have been utilized for the design of a proposed site and services project at Bangkok. It will permit one to look further into the existing low-income housing documentation of socio-economic and physical surveys of dwelling environments in Bangkok.

This section is comprised of 3 parts:

- 1.) Thailand national context
- 2.) Bangkok urban context
- 3.) Four case studies

This is followed by a glossary, references and explanatory notes.

*PHOTOGRAPH: (OPPOSITE PAGE) Chao Phraya River  
It is the most important river in Bangkok and the country. It is a primary source of transportation and the main source of water for both agriculture and non-agriculture user. It originates in the northern part of Thailand, passing through the central region and the capital city, and finally connects to the gulf of Thailand about 30km from Bangkok.*

## NATIONAL CONTEXT THAILAND

**PHYSIOGRAPHIC SETTING:** The Kingdom of Thailand is situated in southeast Asia, bounded by Burma and the Indian Ocean on the west, Cambodia and the Gulf of Siam on the east, Laos on the north and Malasia on the south. Lying between 97°22' and 105°37' East Longitude and 5°37' and 20°27' North Latitude. It consists of four regions; northern, central, northeastern and southern with total area of 514,000 sqkm. The northern region consists of mountain ranges running from north to south with dense forest. The central region is a large hilly area cut by the flat and fertile Chao Phraya and other river valleys which are the most important in agricultural and economic part of country. The northeastern region consists of the Khorat Plateau with some hilly area. The southern region is on the slender part of Malay Peninsula and is a mountainous area which is flanked by the sea.

**CLIMATE:** It lies entirely within the tropical zone with temperatures ranging from 16°-32°C. The monsoonal wind system prevails, causing rainy and dry seasons. The southwest monsoon begins from May to October, bringing annually about 1000-1600 mm of rain. The northeast monsoon begins from November to February, bringing little rain. The hottest period is from March to May.

**HISTORY:** The Thai ancestors inhabited in southern China 4,500 years ago. Being threatened by Chinese armies, they migrated toward the south. In 651 A.D. they founded the Kingdom of NanChao which was destroyed in 1253. They fled to the plains of Indochina Peninsula and founded the Kingdom in Sukothai city. The Kingdom extended its boundary to the south and the capital was transferred to Ayudaya city in 1350. After the Burmese invasion, Rama I founder of the present ruling dynasty, founded Bangkok as the new capital in 1782. Rama V carried out a virtual revolution through modernization and led the country to survive from the European colonialism. The absolute monarchy ended in 1932, the present government

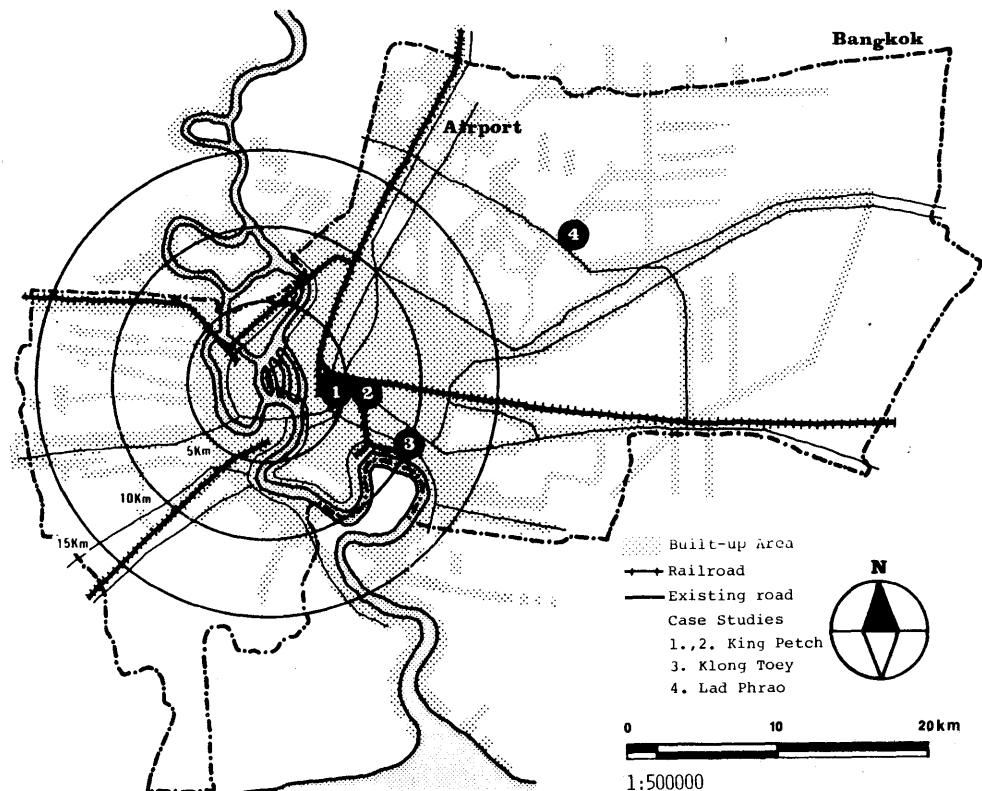
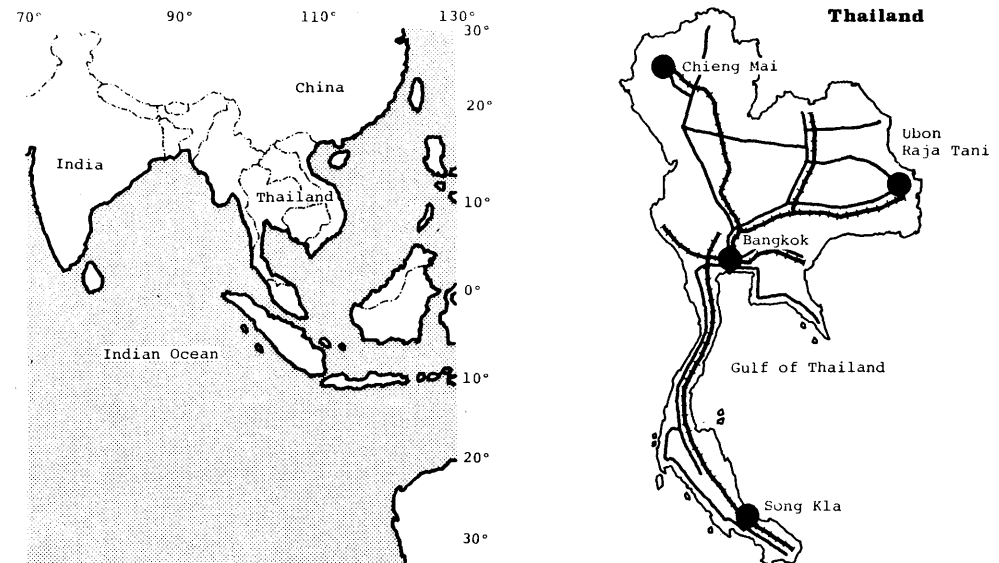
is democratic with a king as the head of the state under the constitution.

**ECONOMY:** In 1979, per capita GNP stood at US\$ 450, the Gross Domestic Product was US\$ 28,221 million and annual growth rate was 7.7%. The official foreign exchange rate was US\$ 1 to 20 baht. Thailand's economy is based on agriculture with rice as the major crop. In 1961, the government established The First National Social and Economic Development Plan aimed to diversify crops, to expand irrigation and to establish new manufactures.

**GOVERNMENT:** Thailand has a constitutional monarchy. The National Assembly is composed of a lower and an upper House. The Judiciary consists of the Supreme and Lesser Courts. The government is classified into 3 levels of administrations; central, in Bangkok; local, in provinces through villages; and local units in communes. The primary units of territorial administration are 72 provinces which are subdivided into districts. Districts are subdivided into villages and then villages are subdivided into communes.

**DEMOGRAPHY:** In 1979, the population was 47 million with an annual growth rate of 3.3%. The density was 91.94 persons per sqkm. About 20% of the population was in urban area. People are highly concentrated in the central region of the Chao Phraya river valleys. The population is classified by ethnic group as follows; 85-90% Thais, 5-10% Chinese, 5% Malay-speaking Muslims and less than 1% khmer.

**HOUSING:** In 1979, there were 1,188,942 households in the municipal area of which 691,550 households were in Bangkok Metropolitan area. It was more than 50% of urban population or 10% of the total population in Bangkok with annual growth rate of 6.2%. The other main urban areas annual growth rate is 5%. From the National Housing Authority survey in 1975, the new housing demand reached a minimum 20,000 units per year in urban areas. The NHA planned to construct total 120,000 new housing units in a five year period from 1976-1980.





# URBAN CONTEXT BANGKOK

**PHYSIOGRAPHIC SETTING AND CLIMATE:** Bangkok Metropolitan is located approximately in the center of the central region, 30 miles north of the Gulf of Thailand, 13°45' North Latitude and 100°28' East Longitude. It is on a flat alluvial plain of the Chao Phraya river, averaging only 1 m above the sea level and a ground water table rarely more than 1 m below the surface imposes severe constraints on the development of drainage and sewerage systems. The surrounding countryside is a flat plain on which the major crop rice is grown. It is in the tropical climate with an annual average temperature of 29 c° and the mean annual rainfall is 1250 mm. The climate is dominated by monsoons. There are 3 main seasons; rainy from May to October, winter from November to January and summer from February to May.

**HISTORY:** Bangkok was founded by King Rama I as the new capital of Thailand in 1782. It was chosen because of its superior defensive qualities. Situated on the eastern side of a large loop of the river, the city was protected from military attack by a swampy plain to the east as well as the river. The river provided access to the sea and water for a system of canal which is used to be the principal transportation networks. In King Rama IV (1865), began to contact to the west. The city had become an important commercial, education and government center. At present, Bangkok's modern development becomes the center of cultural, political, commercial, industrial center which provides employment opportunities not to be found in other parts of the country. As a result attracts a great level of immigration and increases the urban built-up area from 13.3 sqkm in 1910 to 253 sqkm in 1977.

**GOVERNMENT:** Bangkok, the capital, is the seat of a highly centralized national government. The Bangkok Metropolitan is included Bangkok and Thonburi provinces and subdivided into 22 districts (khet) with total area of 1549 sqkm in 1980 which is governed by the Bangkok Metropolitan Administration (BMA). The BMA was established in 1972 to consolidate the city management functions as follows; primary educa-

tion, slaughterhouses, pawnshops, public parks, public health, markets, fire protection, garbage disposal, maintenance of local roads and waterways, urban planning and building code enforcement.

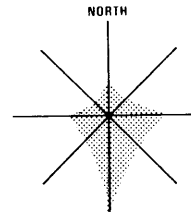
**ECONOMY:** In 1979 the average households income of the Metropolitan was estimated at US\$ 2,400 compared to US\$ 1,800 of the rest of the country. Bangkok is the main port and transportation hub, commercial, financial center and headquarter for a number of international agencies and multinational business. The 25% of industrial establishment in Thailand are located in the Metropolitan area. Bangkok contributed 27% of the national GDP in 1976. Unemployment rates have been unusually low, estimated at less than 2.5% during the first half of the 1970s.

**DEMOGRAPHY:** The Bangkok population was 4.8 m million in 1979 with a annual growth rate of 6.2% which composed of the annual natural population growth rate of 2.9% and the annual immigration growth rate of 3.3%. The population was 400,000 in 1856 and reached 1 million in 1950s. The population had climbed to 4 million in 1974. Typical immigrant are young people under thirty years of age, unmarried male or female from village in the northeastern region and central plains who move to Bangkok to seek employment as laborers or services workers. The 1970 census showed that about 35% of Bangkok's population were born outside Bangkok.

**NATIONAL AND URBAN CONTEXTS SOURCES**

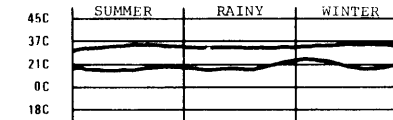
- Topography/Circulation: (accurate) Planning maps, the Ministry of Interior, 1979
- Land use pattern: (accurate) IBID
- Growth pattern: (accurate) IBID
- Climate pattern: (accurate) Statistic handbook, Thailand National Statistical Office, 1978
- Photographs: Jarin and Varin Kiat-fuengfoo
- General information: -Statistic handbook of Thailand 1978, National Statistical Office
- The Survey of immigration 1978
- The Socio-economic survey 1975-76 Greater Bangkok Metropolitan area.

BANGKOK LATITUDE 13°45' N

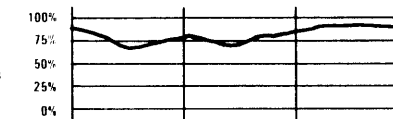


WIND

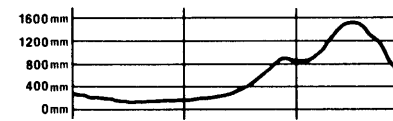
TEMPERATURE



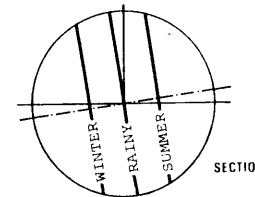
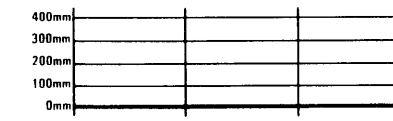
HUMIDITY



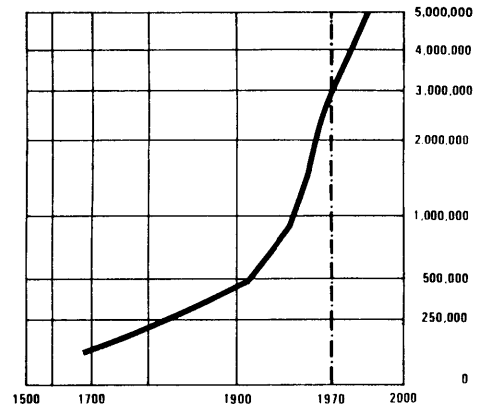
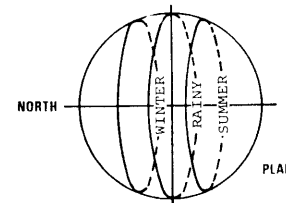
RAIN



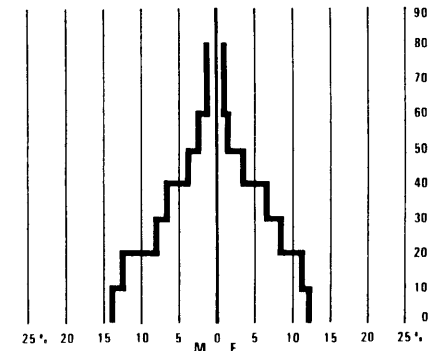
SNOW



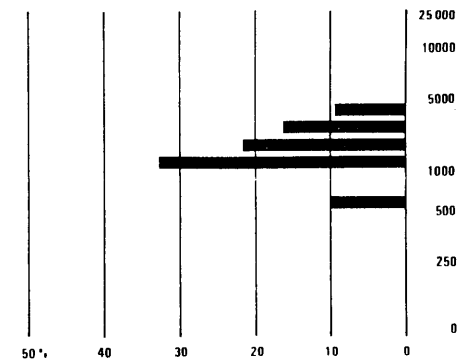
SUN



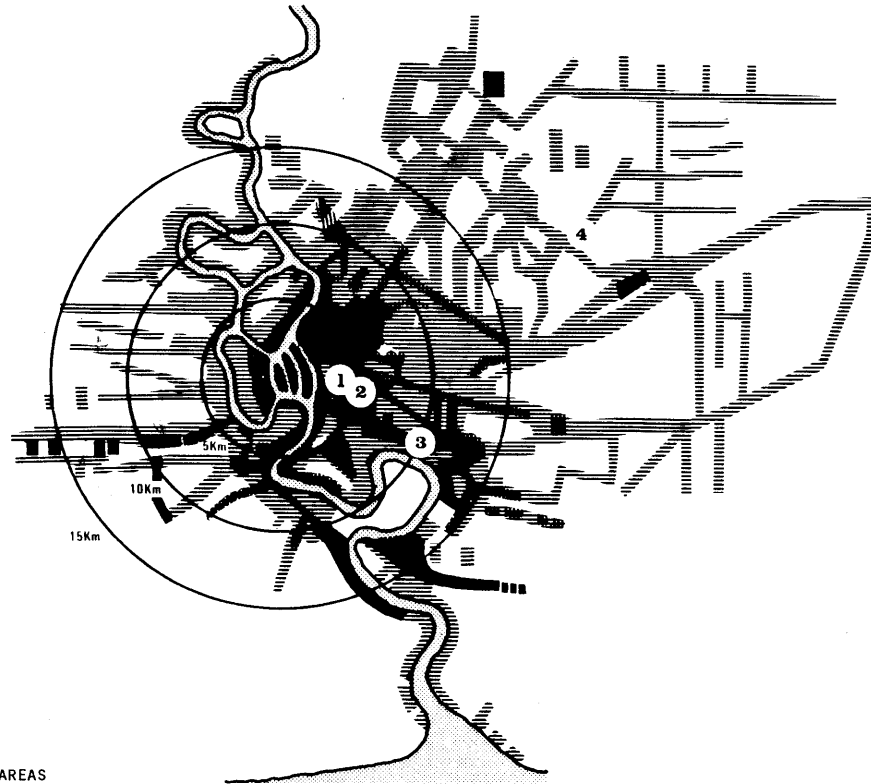
URBAN POPULATION GROWTH  
horizontal: dates vertical: population  
Source:



URBAN POPULATION DISTRIBUTION  
horizontal: percentages vertical: ages  
males: M females: F  
Source:



URBAN ANNUAL INCOME DISTRIBUTION  
horizontal: percentages vertical: dollars  
Source:



**AREAS**

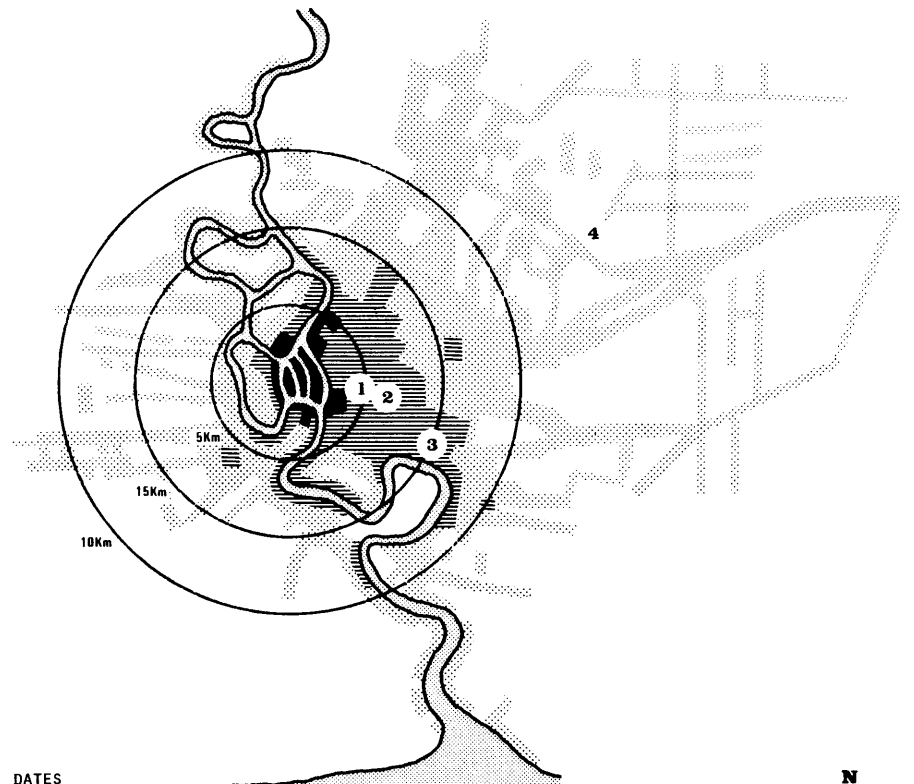
	RESIDENTIAL	1., 2. KING PRATCHIN
	COMMERCIAL	3. KLONG TOEY
	INDUSTRIAL	4. LAD PHRAO

**URBAN LAND USE PATTERN**

**SOCIO-ECONOMIC:** An average household size is 6 persons. In 1979 the subsistence average for a family was US\$ 2,000. The absolute poverty line in urban area was US\$ 170 per capita per year or US\$ 1,020 per household annually in 1976. The distribution of the incomes are as follows; 10% of the population below the poverty line considering as very low-income group, 33% of the population in low-income group, 48% of the population in middle-income group and 9% of the population in high-income group. The majority of the population are Thais, the remainder are those who have Chinese or Indian ethnic origins. Most of low-income people are settle in slum areas, accomodating

over 1 million people or about 25% of Bangkok's population. These settlements are concentrated in the city center and spread to the peripheries. The middle-income people concentrates in the commercial district. The upper-income people are in the commercial and dispersed to the suburban area.

**URBAN DEVELOPMENT:** The city has developed in narrow strips along the transportation arteries, leaving large land gaps undeveloped or utilized for rice paddies. It has been an uncontrolled city until late in 1960, following with three years of study, the Greater Bangkok Plan 1990 was submitted to the Thai government

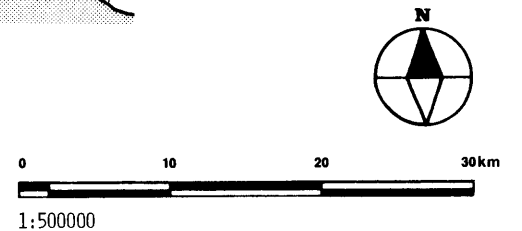


**DATES**

	1910	13.3 km <sup>2</sup>
	1948	96.4 km <sup>2</sup>
	1977	750.0 km <sup>2</sup>

**URBAN GROWTH PATTERN**

by the American consultants. It can be considered as the first attempt at a comprehensive urban plan in Thailand. This plan was revised many times to accommodate to the growth of the city. The latest plan was the Greater Bangkok Plan 2000. The plan targets were; limiting number of population to 7.5 million, controlling the urban built-up are to 1,000 sqkm with the highest density of 1,562.5 people/Ha by providing green belt surrounding the urban area, using multi nuclei as a urban structure to reduce the density of the central business district, improving and increasing public utilities and infrastructure. This plan has been implement along with the National Social And



Economic Development Plan which aims to; develop major urban area in the regional sectors, develop satellite cities around Bangkok, develop the rural area, decrease the annual growth rate of population.

*PHOTOGRAPH: (OPPOSITE PAGE) Bangkok Metropolitan Area A fast growing city with very high population density packed in row-rise buildings. 4-5 story row-houses are the typical buildings for commercial purpose. High-rise building are mostly located in the business center.*





## CASE STUDIES

The following section contains case study examples of selected low-income dwelling environment within the Bangkok Metropolitan area. The case studies have been selected on the basis of income group, housing type and location.

The selected case studies illustrate the major systems of low-income housing. These systems are squatter settlement and public and private institution low-income housing. (from the chart of seven low-income housing system page 12 ) The case studies are represented at four levels:

**LOCALITY:** A locality is defined as a relatively self-contained area. It is generally within physical boundaries.

**LOCALITY SEGMENT:** All localities differ in size and shape; for purposes of comparison, a segment of 400 meters by 400 meters is taken from each locality.

**LOCALITY BLOCK:** Within each locality segment, a typical residential block is selected in order to compare land utilization (patterns, percentages, densities and circulation).

**DWELLING UNIT:** A typical self-contained unit for an individual, a family or a group is selected from the locality segment.

The case studies are arranged by locality as indicated in the following:

### KING PETCH

A "pay land rent" squatter on private and public land developed privately and houses very low, low and middle income groups. This type of settlement is representative of 25%

of total population of Bangkok mostly located in the city center or inner ring. At the present time these settlements are under the government upgrading program.

### KING PETCH SQUATTER

A small "pure" squatter settlement on strips of abandoned land and houses very low and low income people. This type of settlement is representative of 2% of the total population of Bangkok and scatters all over the city.

### KLONG TOEY

A public walk-up apartment scheme developed by the National Housing Authority for low and middle income sectors. This type of settlement is representative of 3.5% of total population of Bangkok and located at the inner ring and periphery of the city.

### LAD PHRAO

A first self-help housing scheme developed by the Asian Institute of Technology to be an experimental tool for studying the feasibility of self-help housing in Thailand. The project is mainly for low-income groups.

A total of four case studies were evaluated and compared with existing and the proposed site and services project (see evaluation page 35)

*PHOTOGRAPH: (OPPOSITE PAGE) Squatter Settlement. General view of a "pay land rent" squatter settlement. The settlements are located in the center or inner ring of the city because of the access to the job markets. They are very fast growing which house more than one million people or 25% of the total population of the Bangkok Metropolitan Area.*

## 1 KING PETCH

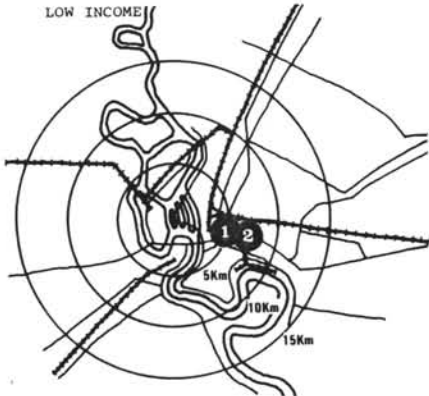
SQUATTER "PAY LAND RENT" SETTLEMENT,  
POPULAR, VERY LOW/LOW/MIDDLE INCOME

### 1a Before Upgrading

### 1b After Upgrading 1978

## 2 KING PETCH SQUATTER

SQUATTER SETTLEMENT, POPULAR, VERY LOW,  
LOW INCOME



**LOCATION:** The community is located along the Mahanark canal in the city center. The two major accesses are Charoenphol and Rama I road. It is one of the mixed commercial and residential areas in the heart of Bangkok Metropolitan area. The settlement covers an area of 12.8 hectares.

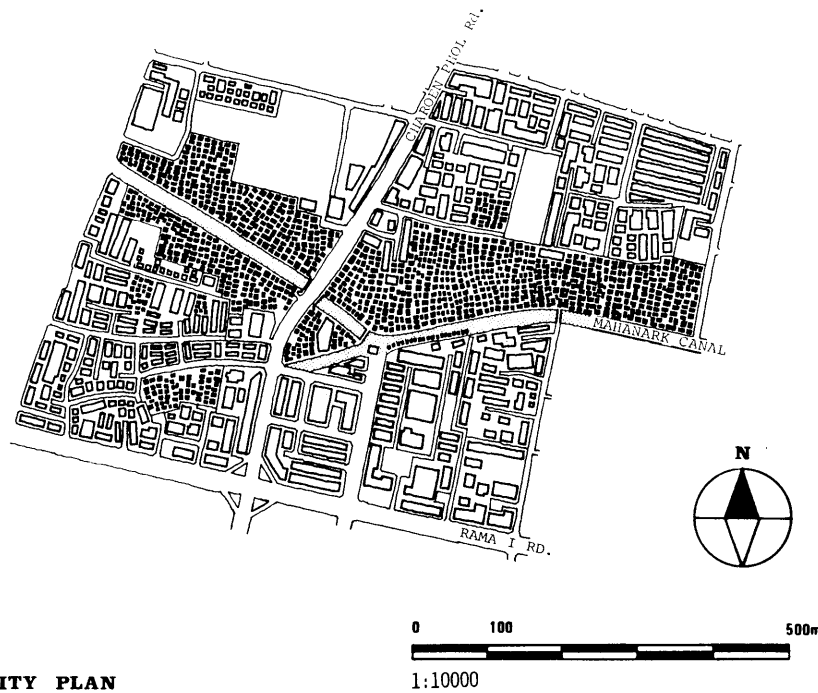
**ORIGINS:** The community was established at the fringe of the city about 200 years ago by Cambodian Muslim migrants. 67% of the land in the community belongs to the government; the remainder is privately owned. After World War II, the expansion of the city engulfed this area and it became a mixed commercial and residential center. The community changes from a rural village to an uncontrolled urban low-income settlement which provides temporary and permanent shelter for immigrants. During the last 20 years, newly established commercial areas within 1 kilometer surrounding the community have provided more jobs to the residents; consequently, the community continues to grow rapidly.

**PHOTOGRAPH: King Petch**

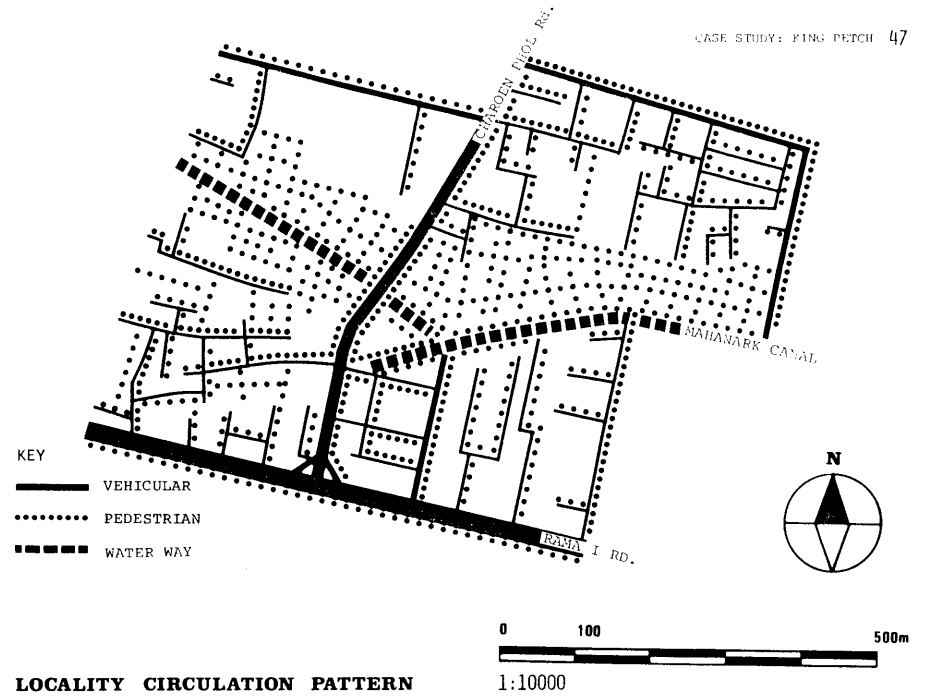
(TOP) The settlement before upgrading; notice the littering and garbage in the canal and the deteriorated walkway.

(BOTTOM) The settlement after upgrading; the improvement of the canal and a new walkway.

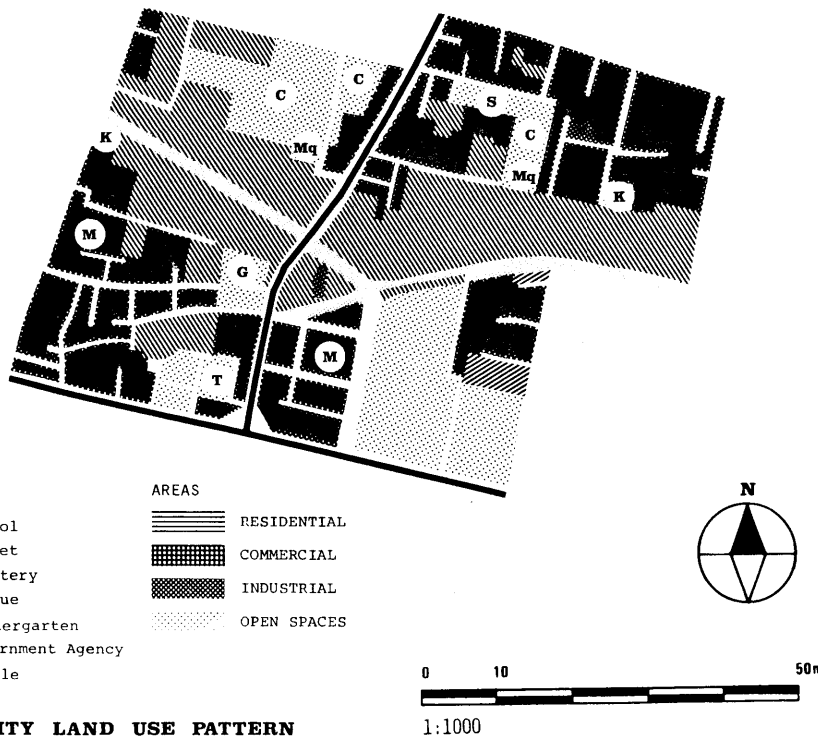




LOCALITY PLAN



LOCALITY CIRCULATION PATTERN



- |                            |              |  |
|----------------------------|--------------|--|
| <b>KEY</b>                 | <b>AREAS</b> |  |
| <b>S</b> School            | RESIDENTIAL  |  |
| <b>M</b> Market            | COMMERCIAL   |  |
| <b>C</b> Cemetery          | INDUSTRIAL   |  |
| <b>Mq</b> Mosque           | OPEN SPACES  |  |
| <b>K</b> Kindergarten      |              |  |
| <b>G</b> Government Agency |              |  |
| <b>T</b> Temple            |              |  |
| Bus                        |              |  |

LOCALITY LAND USE PATTERN

**LAYOUT:** The community is comprised of three areas; Ban Khrua, Wat Phrayayang and Charoenphol. The locality is divided by the Charoenphol road into distinct east-west sides. The Mahanark canal further divides the community into the north-south sections. The northern boundary is a congested mixed commercial and residential area with 2 markets 6 schools and a temple. The southern boundary along the Rama I road is a commercial with 2 markets, a vocational training school and again a temple. The western boundary is a mixed commercial and residential area with 2 schools and 3 temples. The eastern boundary is a newly developed commercial and entertainment area adjacent to the National Stadium. A characteristic of the locality is the growth along the canal further development inward into the inland. Vehicles cannot pass through the community because the rapid construction of new houses encroaches on the public circulation. The pedestrian circulation layout is perpendicular to the canal because it is used as the main transportation but now is converted into a drainage collector.

**LAND USE:** The locality is predominantly residential with commercial activities along the major pedestrian routes. A number of do-

mestic and light industries are scattered throughout the neighborhood. There are very few vacant lots. The 3 mosques and 2 Buddhist temples from community centers and provide open spaces for children playgrounds. Most of the area is connected directly to piped water but pressure is frequently low. Electricity is also provided. The pit latrine and septic tank are primary method of sewage disposal. Both the storm water and over-flow sewage is drained directly into the canal but garbage along the pedestrian walkways blocks the waterflow which results in flooding in the rainy season and in dry season the area is water-logged creating unhygienic conditions. The refuse disposal system and fire protection are inadequate.

**CIRCULATION:** The primary approach to the area is Charoenphol road. The secondary approach is the Rama I road. Water transportation is also used. The internal circulation is only for pedestrians which is composed of narrow, unstable, elevated wooden walkways. Accidents frequently happen because of the broken walkways and lack of street lighting. Vehiculars occur only on the peripheral roads. Public bus transportation is adequate and convenient, both on Charoenphol and Rama I roads.

**POPULATION:** Presently the community houses approximately 14,800 people in 1,500 detached and semi-detached houses. There are 1.8 families per house because relatives and families usually stay in the same house and the average household size is 5.5 members. 60% of the population are under 15 years old. 48% of the population are male. 13% of the population are illiterate.

**INCOME:** The average annual household income is US.\$ 138 in 1977. The household income distribution is as follows: 20% of very low income, 50% of low income, 20% of middle income, 10% of high income. The majority of the people work within the 30-minute driving distance. The employment distribution is as follow: 45% of private business employees, 15% of government employees, 20% of self-employees. The unemployment rate is 15% which mostly occurs in the population of 20-30 years of age.

**LOCALITY SEGMENT:** The segment is representative of the urban area that has uncontrolled residential area, schools, religious areas with cemeteries, and mixed commercial and residential areas. It is one of the very high density ( 900-1,600 persons/hectare ) areas in Bangkok Metropolitan area. It is a mixed-income area. The low-income people provide needed-labor to this area and consequently, the community grows rapidly. 90% of the lots are rented and have shanties, row-houses, and a number of detached and semi-detached units. The majority of units contain 2-3 rooms with a verandah. Toilet facilities are attached to the units. Bathe area and kitchens are in the open space. Within the segment the King Petch squatter settles on the Mahanark canal opposite to the King Petch squatter ( pay land rent ). It is representative one of the many newly settlements which appeared during this past 10 years when the immigrants intruded small abandon pieces of private and government owned land.

400m —

300m —

200m —

100m —

0m —



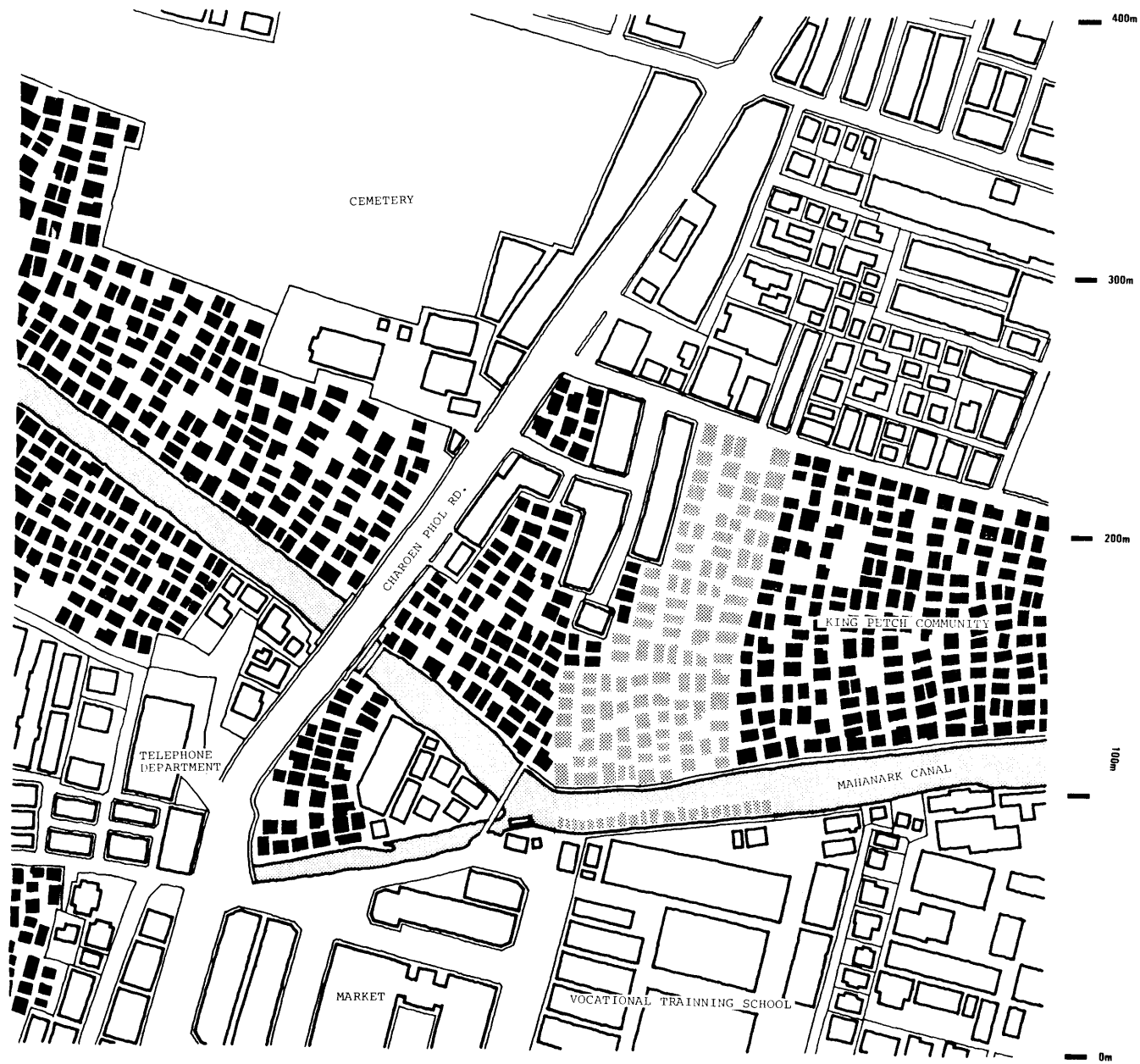
0 50 100 150m

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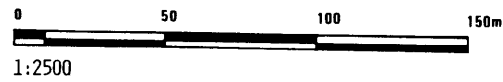


LOCALITY SEGMENT AIR PHOTOGRAPH





LOCALITY SEGMENT PLAN



**1a KING PETCH  
Before Upgrading 1978**

**SLUM INITIAL PROBLEMS**

The initial slum upgrading program started in 1977, and was under the responsibility of the National Housing Authority. The present slum upgrading plan is for 1979-1983. The objectives of the plan are as follows: to cope with the problem of insufficient housing supply, to decrease government spending on new housing, to improve the socio-economic situation of the residents, to improve the environment of the area, and to ensure the residents security of tenure. There are 3 levels of upgrading: the first level is upgrading as permanent residential areas, the second level is upgrading as long-term temporary residential areas, the third level is upgrading as short-term temporary residential areas.

In 1976, the National Housing Authority surveyed 108 slum areas in Bangkok. There were four major reasons for selecting the King Petch community as the initial pilot project for slum improvement. First, more information on land tenure and maps of the area were available than any other areas; second, it is a medium-sized central city community close to employ-

ment; third, it is the third largest slum area; and fourth, it is considered that the community's integration and level of organization would reinforce an improvement program.

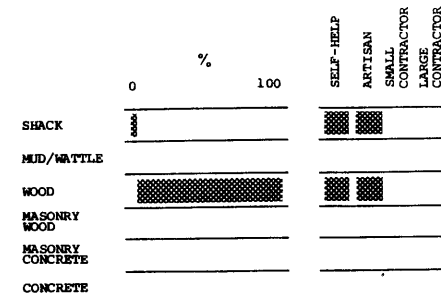
The major physical problems faced by the community were as follows; inadequacy of the internal circulation network and deteriorated wooden walkways, low pressure and inadequate water supply, inadequate fire protection, inadequate drainage and waste disposal. Garbage was usually thrown into the open space and the canal. In addition the sewage disposal was unhealthy, consequently, contaminated the soil, water and air. All these problems contributed to health hazards. During the National Housing Authority survey in 1976, 44% of the families had had a member sick. The major types of illness reported by residents were colds and skin diseases and moreover there were malnutrition, intestinal infection and respiratory diseases in children.

The major socio-economic problems faced by the community were as follows; a high unemployment

rate of women and young people, a high rate of people earning inadequate income, lack of knowledge in health-care and an abuse of time of young people.

The land security problem faced by the community was that the residents had only short-time leases for 1-2 years, which was a very brief time to provide for any kind of security.

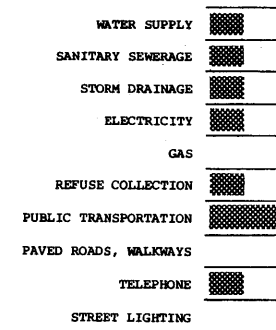
**LOCALITY CONSTRUCTION TYPES**



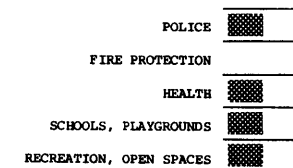
The chart shows (1) approximate percentage of each construction type within the total number of dwellings and (2) building group that generally produces each type.

Quality of information: Approximate

**LOCALITY UTILITIES AND SERVICES**



**LOCALITY COMMUNITY FACILITIES**

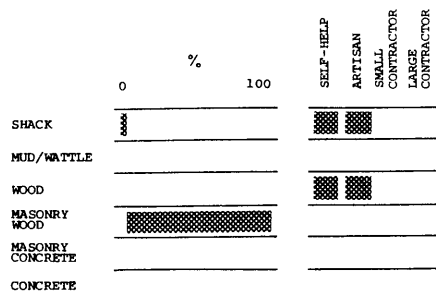


The chart illustrates the approximate availability of utilities, services, and community facilities at three levels: NONE, LIMITED, ADEQUATE.

Quality of information: Approximate

## 1b KING PETCH After Upgrading 1980

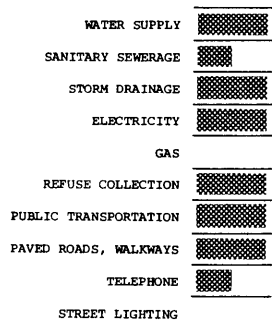
### LOCALITY CONSTRUCTION TYPES



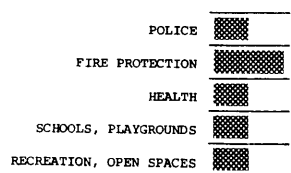
The chart shows (1) approximate percentage of each construction type within the total number of dwellings and (2) building group that generally produces each type.

Quality of information: Approximate

### LOCALITY UTILITIES AND SERVICES



### LOCALITY COMMUNITY FACILITIES



The chart illustrates the approximate availability of utilities, services, and community facilities at three levels: NONE, LIMITED, ADEQUATE.

Quality of information: Approximate

**PHYSICAL IMPROVEMENT:** The upgrading programs comprised the improvement of utilities, infrastructure and community center facilities. The utility and infrastructure programs were as follow: the access network consisted of walkway that would generally follow the existing circulation pattern and were constructed of precast concrete except for elevated narrow types which are wooden platforms supported on concrete posts; the drainage system was provided along the walkways and the existing drains were rehabilitated; the water supply consisted of adding new distribution pipes along the walkways, rehabilitating the existing distribution pipes, and increasing water pressure by providing additional wells; sewage disposal focused mainly on improvements in septic tank effluent pipes in order not to contaminate the soil, ground water and canal; refuse disposal collection points and containers were provided and 20 garbage carts were used to carry garbage from the streets to collection points by the community groups; electricity and street lighting were only improved in essential components such as replace-

ment of poles and rewiring; fire protection schemes included the provision of 2 mobile diesel pumps with adequate hose lengths to reach the canal and fire extinguishers which would be installed at strategic locations in the area; and two community centers were built.

**SOCIO-ECONOMIC IMPROVEMENTS:** The need for socio-economic improvement was essential and urgent. There were many reasons: 57% of wives were unemployed or stayed home as housewives; most of the unemployed were 21-30 years of age; 20% of the household heads were in unstable jobs or underemployed and consequently 35% of the households earned insufficient income to live. Therefore The National Housing Authority provided six improvement programs: the first was the adult career training program, such as handicraft, dress making etc., the second was the day care program; the third was the health care and family planning program; the fourth was the food cooperative program; the fifth was the provision of a small-scale business loan program; and the sixth was community organization and

participation program to reinforce community self-help efforts.

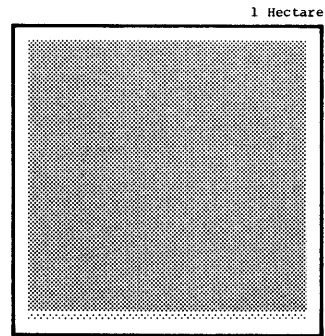
**LAND TENURE IMPROVEMENTS:** 67% of the land in King Petch community was owned by the Treasury's Estate Department. These lands were currently under short-term leases, normally for one year. Responsibility for these lands would be transferred to The National Housing Authority which would issue 20 year leases to the tenants and increase the rents to amortize the recoverable costs.

**COST AND RECOVERY:** The estimated average cost of physical upgrading per family was US\$ 210. The capital cost of improvement would be recovered directly from the residents through plot leases for the construction cost of the walkways, drainage system, canal dredging and refuse disposal equipment. Costs would be recovered indirectly from monthly utility charges for electricity and water supply, and from general government revenues for the fire fighting equipment.

**BEFORE UPGRADING 1978**

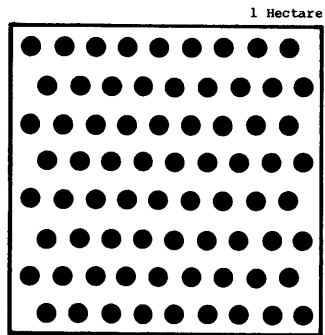
LOCALITY BLOCK: The block used to be defined by a main street, a walkway along the canal and winding internal walkways. All the lots are clearly defined with fences of walls of the dwelling units as private area. Semi-private areas are dead-end walkways. There are 96 dwelling units and a number of them are old houses at least 30 years old occupied by extended families. The dwelling were constructed of wood frame, wood wall and tile roof which later, replaced by galvanized corrugated zinc roof. It consists of 2-3 rooms which are subdivided into spaces with light partitions or curtains, a toilet, and a verandah. The wide internal walkway and the walkways along the canal are social gathering places with grocery and food shops.

**LAND UTILIZATION DIAGRAMS**



PERCENTAGES

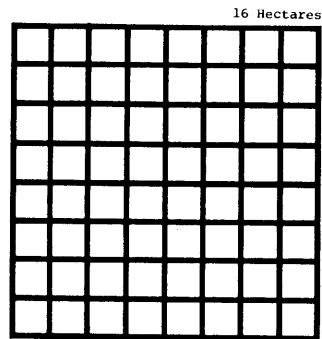
Streets/Walkways	9
Playgrounds	3
Cluster Courts	3
Dwellings/Lots	88



DENSITY

Persons/Hectare	1484
-----------------	------

● 20 Persons



CIRCULATION EFFICIENCY

Meter/Hectare	393
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**LOCALITY BLOCK LAND UTILIZATION DATA**

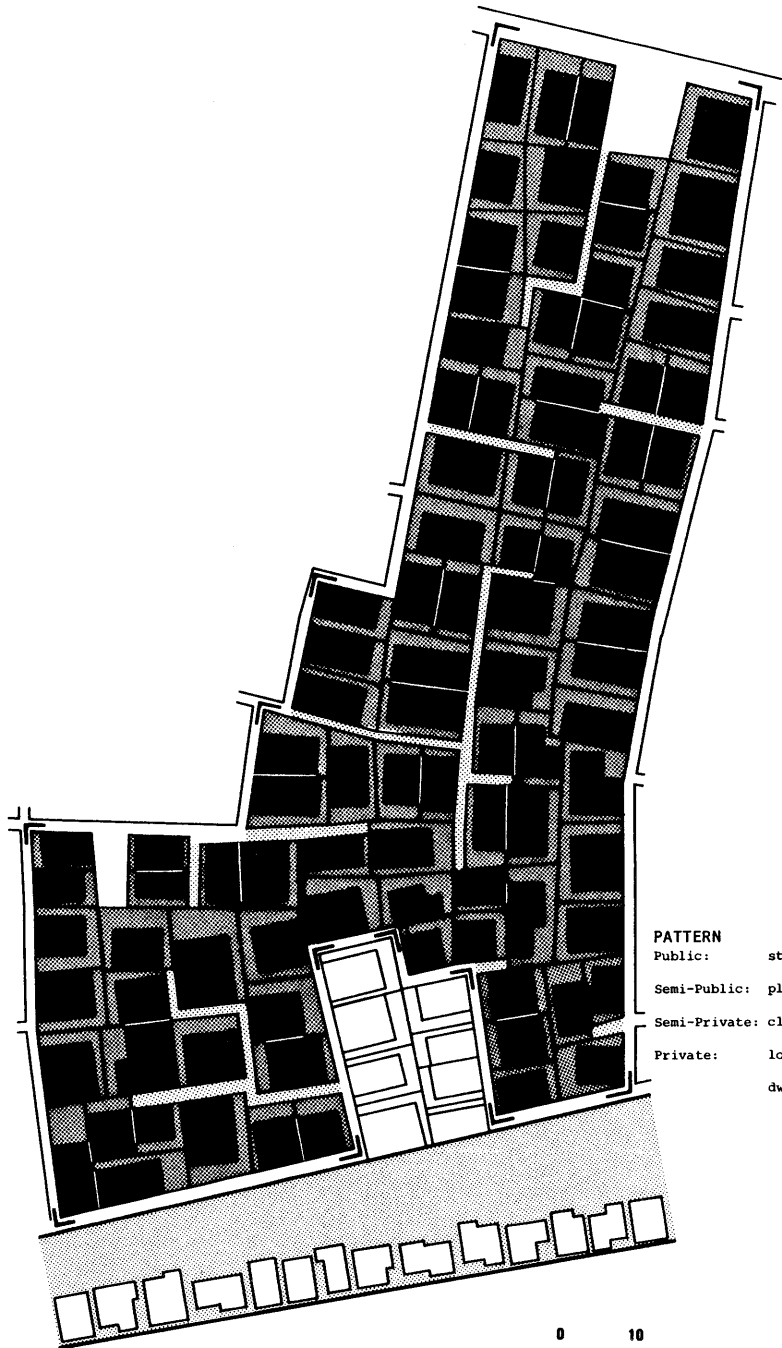
DENSITIES	Total Number	Area Hectares	Density N/Ha
LOTS	98	.64	153
DWELLING UNITS	96	.64	150
PEOPLE	950	.64	1484

AREAS	Hectares	Percentages
PUBLIC (streets, walkways, open spaces)	.057	9.0
SEMI-PUBLIC (open spaces, schools, community centers)	-	-
PRIVATE (dwellings, shops, factories, lots)	.567	88.0
SEMI-PRIVATE (cluster courts)	.016	3.0
TOTAL	.64	100.0

NETWORK EFFICIENCY  
 $\frac{\text{Network length (streets, walkways)}}{\text{Areas served (total area)}} = 393$

LOTS  
 Average area, dimensions = 58 sqm



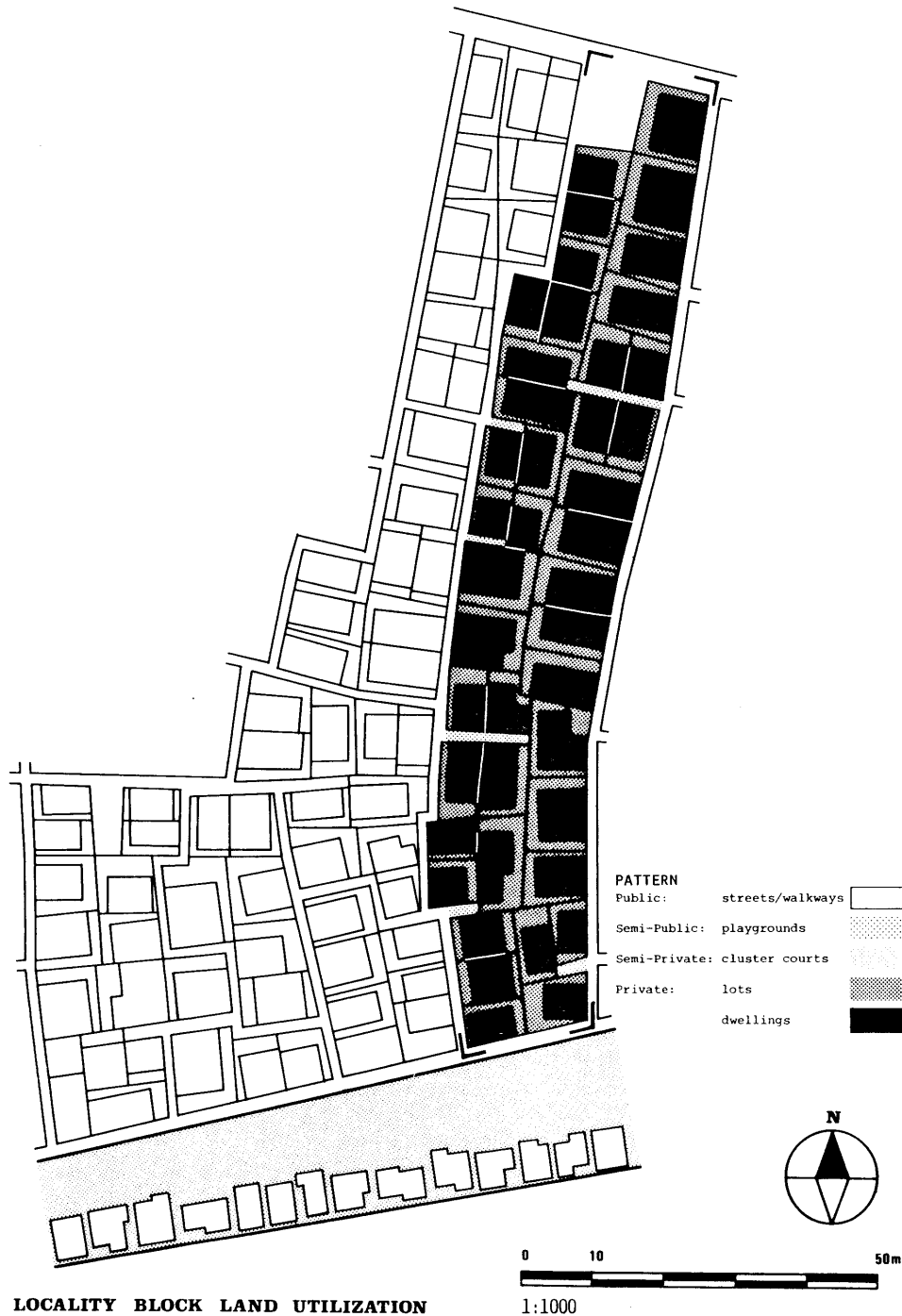
**PATTERN**

Public:	streets/walkways	
Semi-Public:	playgrounds	
Semi-Private:	cluster courts	
Private:	lots	
	dwellings	

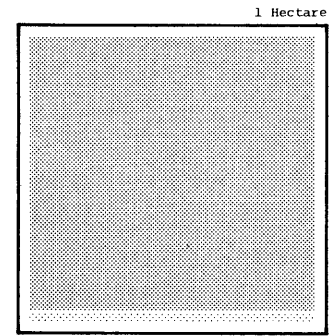


**LOCALITY BLOCK LAND UTILIZATION**

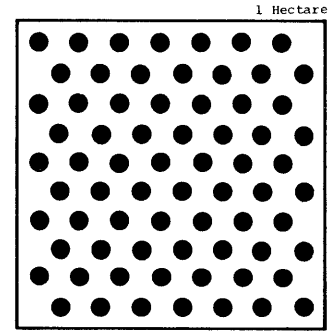
1:1000



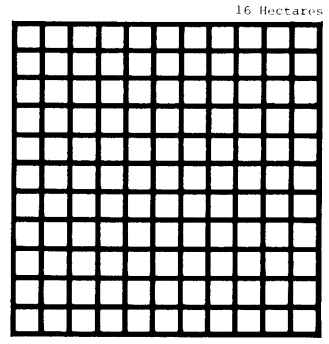
LAND UTILIZATION DIAGRAMS



PERCENTAGES Streets/Walkways 16.3  
Playgrounds -  
Cluster Courts 1.2  
Dwellings/Lots 82.5



DENSITY Persons/Hectare 1400  
● 20 Persons



CIRCULATION EFFICIENCY Meter/Hectare 554

AFTER UPGRADING 1980

LOCALITY BLOCK: The block is defined by public primary and secondary circulation. The small vehicle streets and main walkway along the canal on the front and the back and the internal walkways on the side are secondary circulations. The upgrading circulation scheme was planned to have more direct and wider perpendicular secondary walkways to connect the primary circulations so that people would not get lost and reduced the chances to commit crime in the small winding walkways. The primary walkway along the canal is a community social gathering place with small food shops, handicraft work shops etc. There are different kinds of activities during the whole day such as children playing, people talking and gathering in the outdoor food stalls.

LOCALITY BLOCK LAND UTILIZATION DATA

DENSITIES	Total Number	Area Hectares	Density N/Ha
LOTS	43	0.29	148
DWELLING UNITS	41	0.29	141
PEOPLE	406	0.29	1400

AREAS	Hectares	Percentages
PUBLIC (streets, walkways, open spaces)	.0473	16.3
SEMI-PUBLIC (open spaces, schools, community centers)	-	-
PRIVATE (dwellings, shops, factories, lots)	.2382	82.5
SEMI-PRIVATE (cluster courts)	.0045	1.2
TOTAL	.29	100.0

NETWORK EFFICIENCY  
Network length (streets, walkways) = 554  
Areas served (total area)

LOTS  
Average area, dimensions = 56 sqm

LOCALITY BLOCK LAND UTILIZATION

0 10 50m  
1:1000

**PHYSICAL DATA**

(related to dwelling and land)

**DWELLING UNIT**

type: SHANTIES/ROOMS/HOUSES  
 area (sq m): 55  
 tenure: RENT/ILLEGAL OWNERSHIP

**LAND/LOT**

utilization: PRIVATE  
 area (sq m): 60  
 tenure: LEGAL RENT/OWNERSHIP

**DWELLING**

location: CITY CENTER  
 type: DETACHED  
 number of floors: 1-2  
 utilization: SINGLE & MULTIPLE  
 physical state: BAD

**DWELLING DEVELOPMENT**

mode: INCREMENT  
 developer: POPULAR  
 builder: SELF-HELP/ARTISAN  
 construction type: WOOD/SHACK  
 year of construction: 1920'S

**MATERIALS**

foundation: WOOD  
 floors: WOOD  
 walls: WOOD  
 roof: GALVANIZED SHEET/CERAMIC TILES

**DWELLING FACILITIES**

wc: 1  
 shower: 1  
 kitchen: 1 OUTSIDE  
 rooms: 1-4  
 other: COVERED PORCH

**SOCIO-ECONOMIC DATA**

(related to user)

**GENERAL: SOCIAL**

user's ethnic origin: THAI/CHINESE  
 place of birth: CENTRAL REGION  
 education level: PRIMARY SCHOOL

**NUMBER OF USERS**

married: 2  
 single: 2  
 children: 5  
 total: 9

**MIGRATION PATTERN**

number of moves: 1  
 rural - urban: 1940  
 urban - urban: -  
 urban - rural: -  
 why came to urban area: -

**GENERAL: ECONOMIC**

user's income group: LOW  
 employment: SELF-EMPLOYED  
 distance to work: 3-5 KM  
 mode of travel: WALKING

**COSTS**

dwelling unit: \$ 500-1,500  
 land - market value: \$ 500,000/HA

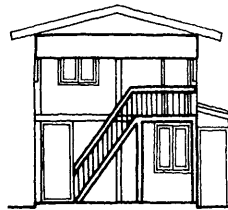
**DWELLING UNIT PAYMENTS**

financing: SELF FINANCED  
 rent/mortgage: \$ 6-10/MONTH RENT LAND  
 % income for rent/mortgage: 8%

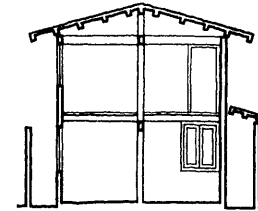
PHOTOGRAPH: (OPPOSITE PAGE) King Petch

(TOP LEFT) The existing condition of the deteriorated walkway; note the broken wood panels and accumulation of garbage and sewage along the sides. (BOTTOM LEFT) The walkway underconstruction; a reinforced concrete structure.

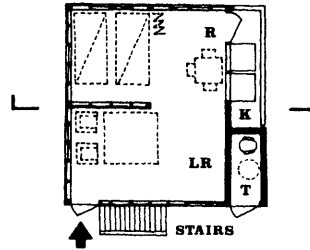
(RIGHT) The present walkway; it becomes a social gathering place with food and grocery stores along the sides and serves as a childrens' playground.



ELEVATION



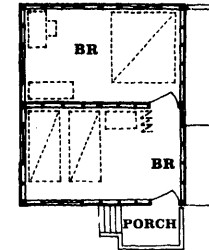
SECTION



FIRST FLOOR PLAN

**KEY**

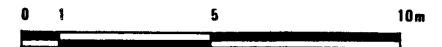
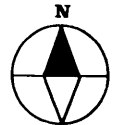
- LR Living Room
- D Dining/Eating Area
- BR Bedroom
- K Kitchen/Cooking Area
- T Toilet/Bathroom
- L Laundry
- C Closet
- S Storage
- R Room (multi-use)



SECOND FLOOR PLAN

**CASE STUDY SOURCES**

- Locality plan: (accurate) Air photograph, NHA maps, 1977
- Land use pattern: (accurate) IBID
- Circulation pattern: (accurate) IBID
- Segment plan: (accurate) IBID
- Block land utilization: (approximate) Field survey, 1980 and NHA maps
- Typical dwelling: (approximate) Field survey, 1980
- Physical data: (approximate) IBID
- Socio-economic data: (approximate) IBID
- Photographs: Jarin and Varin Kiatfuengfoo, 1980
- General information: Field survey, Varin Kiatfuengfoo, 1980
- NHA, 1977



1:200

**TYPICAL DWELLING**



## 2 KING PETCH SQUATTER

**ORIGINS:** In 1978, the group of food stall owners who habitated temporarily in the vocational training school were evicted because the school needed to expand the new academic buildings. Some inhabitants still wanted to sell food in the school settled adjacent to the retaining wall outside the school boundary along the Mahanark canal. The shanties multiplied very quickly because plenty of jobs were available; employment areas were easily accessible by walking or cheap public transportation; and because the initial settlers recommended the area to friends and relatives. After 2 years there are 21 households. The Metropolitan Municipality has a plan to move them out because the dwellings block part of the water transportation.

**LOCATION:** The King Petch squatter is located on the Mahanark canal in the city center opposite to the King Petch (pay land rent). The major accesses are the roads from Rama I and Charoenphol roads. There is a direct water transportation from Mahanark canal which connect the country major river. The settlement covers a water surface of 0.09 hectares.

**LAYOUT:** The site is on the Mahanark canal

along the outside retaining wall of the vocational training school. There is a surface 0.08 m. wide of retaining wall which people use as a walkway. People built shanties on stilts over the canal and attached to the retaining wall. The canal is narrow which allow only one row of continuous shanties to build without blocking all the water transportation. Some of the households have opened food shops, work shops and junk shops along the walkway. It is an illegal settlement, public utilities are not available at all. People take advantages from the school lighting along the fence and some of them connect electricity from school. Most of the dwellings have ceramic-earth jars in front of the dwellings in order to store water which they need to buy and carry far away. Both drinking, and usable water is from these containers. The dwelling units have toilets drain directly into the canal. The kitchens are outside for good ventilation and easy drain. People bathe outside.

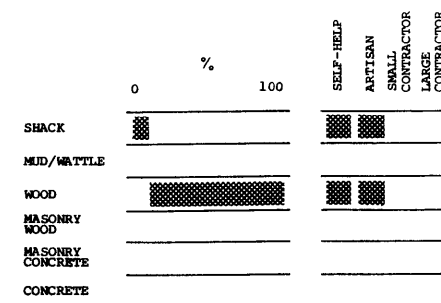
**LAND USE AND CIRCULATION:** The settlement has a high density of population with only a gap between dwellings. There are no facilities. The only internal circulation is the walkway

over the retaining wall and every dwelling connects directly to it. Vehicles cannot pass through the site. The major approaches are streets from Rama I and Charoenphol roads. The minor approach is from the canal.

**INCOME:** From the survey, the average household income is US\$ 1,200. The range of the income is from low to very low. All of the residents have jobs in this area within walking-distance. There are two major types of occupations. The first are different kinds of self-employed hawkers. The second is unskill labor.

**POPULATION:** There are 21 dwelling units with average household size of 7 persons. Most of the residents were evicted from other areas or migrated from rural area. Now they are also afraid to be evicted from this squatter. The children can not go to school because they do not have legal house registration to apply for school. Some of children work even though it is illegal.

### LOCALITY CONSTRUCTION TYPES

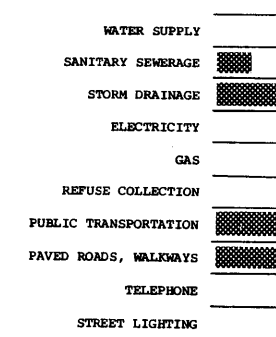


The chart shows (1) approximate percentage of each construction type within the total number of dwellings and (2) building group that generally produces each type.

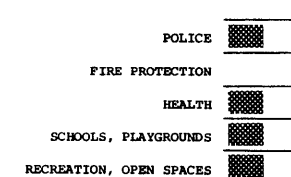
Quality of information:

Approximate

### LOCALITY UTILITIES AND SERVICES



### LOCALITY COMMUNITY FACILITIES

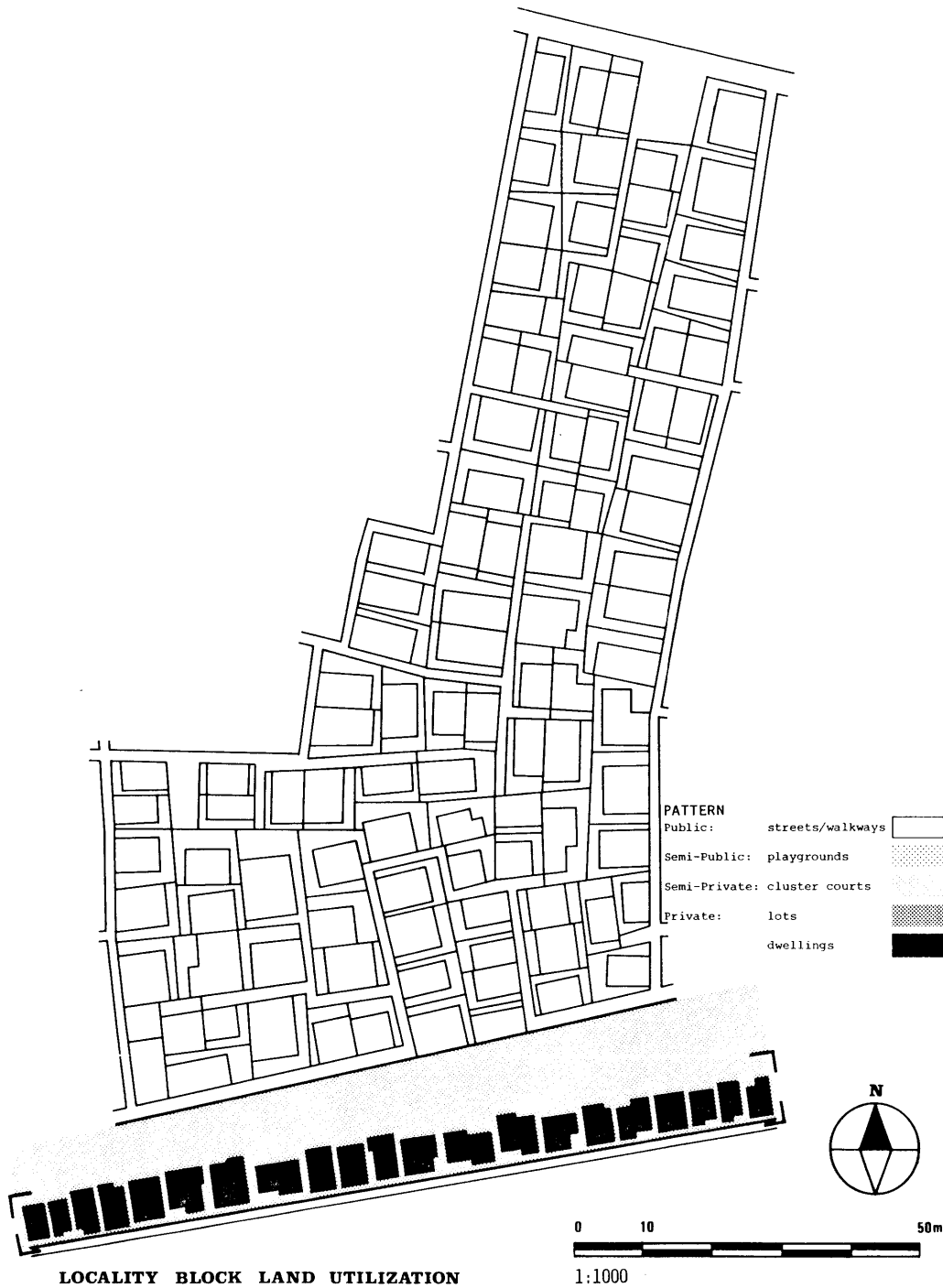


The chart illustrates the approximate availability of utilities, services, and community facilities at three levels: NONE, LIMITED, ADEQUATE.

Quality of information:

Approximate





**PATTERN**

Public: streets/walkways [white box]

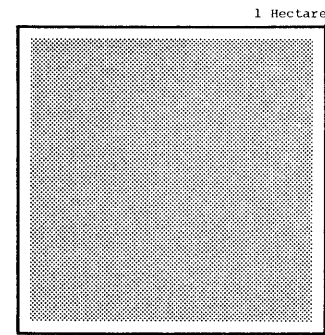
Semi-Public: playgrounds [dotted box]

Semi-Private: cluster courts [cross-hatched box]

Private: lots [diagonal lines box]

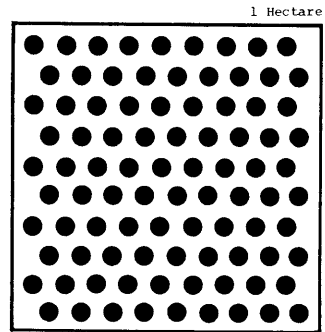
          dwellings [solid black box]

**LAND UTILIZATION DIAGRAMS**



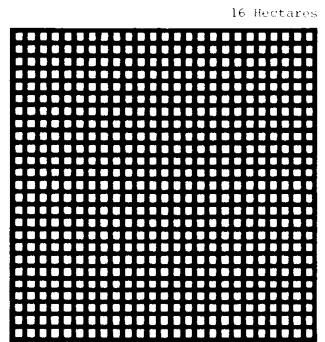
**PERCENTAGES**

Streets/Walkways 11.25  
Playgrounds -  
Cluster Courts -  
Dwellings/Lots 88.75



**DENSITY** Persons/Hectare 1875

● 20 Persons



**CIRCULATION EFFICIENCY**

Metres/Hectare 1200

**LOCALITY BLOCK:** The block is defined by two public circulation, a canal and a walkways on the front and back, and the boundary of dwelling units on the side. There are 21 dwelling units in the block and were built with only a narrow gap under the roof between two adjacent units. The total settlement area can be classified as private area. The walk ways are the only type of public area to which every unit has a direct access. The residents bought cheap second-hand materials or got materials from the refuse disposal. The dwelling units are generally in poor conditions, made of wood panels, wood frame and galvanized corrugated zinc roof. The dwelling consists of one or two rooms with toilet, a verandah for kitchen of bathing and a covered frony porch for opening small shop and storing water jars.

**LOCALITY BLOCK LAND UTILIZATION DATA**

DENSITIES	Total Number	Area Hectares	Density N/Ha
LOTS	21	.08	262.5
DWELLING UNITS	21	.08	262.5
PEOPLE	147	.08	1837.5

AREAS	Hectares	Percentages
PUBLIC (streets, walkways, open spaces)	.009	11.25
SEMI-PUBLIC (open spaces, schools, community centers)	-	-
PRIVATE (dwellings, shops, factories, lots)	.072	88.25
SEMI-PRIVATE (cluster courts)	-	-
<b>TOTAL</b>		

**NETWORK EFFICIENCY**

Network length (streets, walkways) = 1200  
Areas served (total area)

**LOTS**

Average area, dimensions = 34 sqm

**PHYSICAL DATA**

(related to dwelling and land)

**DWELLING UNIT**  
 type: SHANTIES/ROOMS/HOUSES  
 area (sq m): 15-30  
 tenure: ILLEGAL OWNERSHIP

**LAND/LOT**  
 utilization: PRIVATE  
 area (sq m): 20-40  
 tenure: ILLEGAL

**DWELLING**  
 location: CITY CENTER  
 type: DETACHED  
 number of floors: 1  
 utilization: SINGLE  
 physical state: BAD

**DWELLING DEVELOPMENT**  
 mode: INCREMENT  
 developer: POPULAR  
 builder: SELF-HELP  
 construction type: WOOD/SHACK  
 year of construction: 1978

**MATERIALS**  
 foundation: WOOD POSTS  
 floors: WOOD  
 walls: WOOD  
 roof: GALVANIZED SHEET

**DWELLING FACILITIES**  
 wc: 1  
 shower: 1 OUTSIDE  
 kitchen: 1 OUTSIDE  
 rooms: 1  
 other: COVERED PORCH

**SOCIO-ECONOMIC DATA**  
 (related to user)

**GENERAL: SOCIAL**  
 user's ethnic origin: THAI  
 place of birth: CENTRAL REGION  
 education level: PRIMARY SCHOOL

**NUMBER OF USERS**  
 married: 2  
 single: -  
 children: 3  
 total: 5

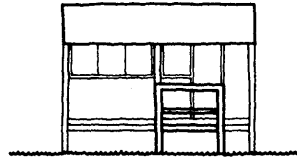
**MIGRATION PATTERN**  
 number of moves: 2  
 rural - urban: 1976  
 urban - urban: -  
 urban - rural: -  
 why came to urban area: EMPLOYMENT

**GENERAL: ECONOMIC**  
 user's income group: VERY LOW  
 employment: SELF-EMPLOYED  
 distance to work: 2-4 KM  
 mode of travel: -

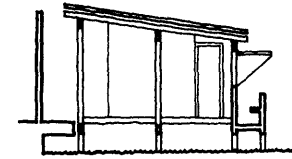
**COSTS**  
 dwelling unit: \$ 100-130  
 land - market value: NONE

**DWELLING UNIT PAYMENTS**  
 financing: SELF FINANCED  
 rent/mortgage: -  
 % income for rent/mortgage: -

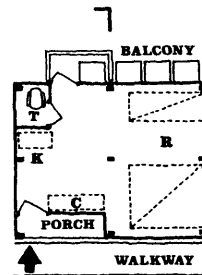
*PHOTOGRAPH: (OPPOSITE PAGE) King Petch Squatter  
 A "pure" squatter settlement along the public canal  
 in the city center. This type of settlement grew  
 rapidly in the last ten years because of migration.*



ELEVATION



SECTION



PLAN

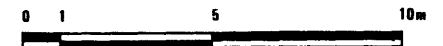
**KEY**

- LR Living Room
- D Dining/Eating Area
- BR Bedroom
- K Kitchen/Cooking Area
- T Toilet/Bathroom
- C Closet
- R Room (multi-use)

**TYPICAL DWELLING**

**CASE STUDY SOURCES**

- Locality plan: (accurate) Air photograph, 1979
- Land use pattern: (accurate) IBID
- Circulation pattern: (accurate) IBID
- Segment plan: (accurate) IBID
- Block land utilization: (approximate) Field survey, 1980
- Typical dwelling: (approximate) IBID
- Physical data: (approximate) IBID
- Socio-economic data: (approximate) IBID
- Photographs: Jarin and Varin Kiatfuengfoo, 1980
- General information: Field survey, Varin Kiatfuengfoo, 1980

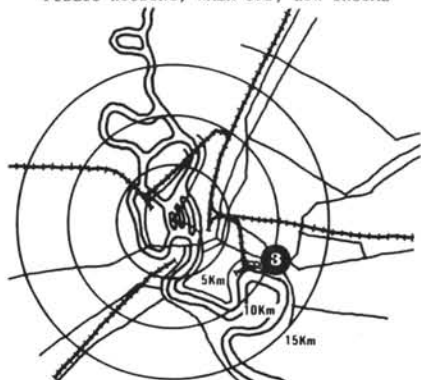


1:200



### 3 KLONG TOEY

PUBLIC HOUSING, WALK-UPS, LOW INCOME

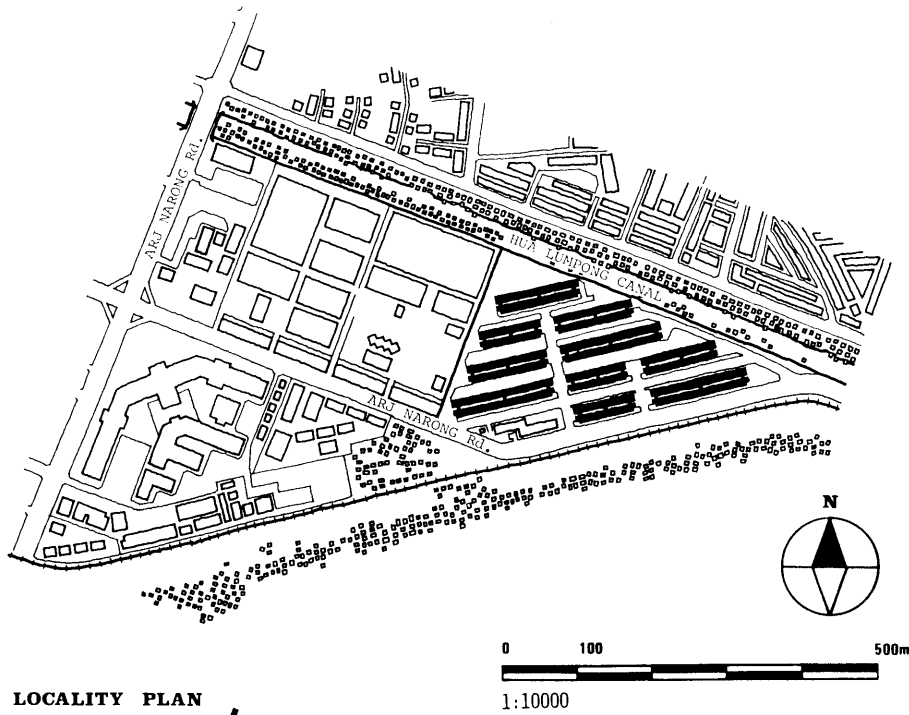


**LOCATION:** The Klong Toey public housing is located in the industrial area of the inner ring in Bangkok Metropolitan area. It lies opposite to the Klong Toey squatter settlement which is the largest squatter area in the city. The area is accessible by one major road, Arj-Narong road which runs along the railroad that leads to Bangkok port. The whole area is owned by the Port Authority. In 1978 started the construction of rapid transit route from the port passing in the front of the site.

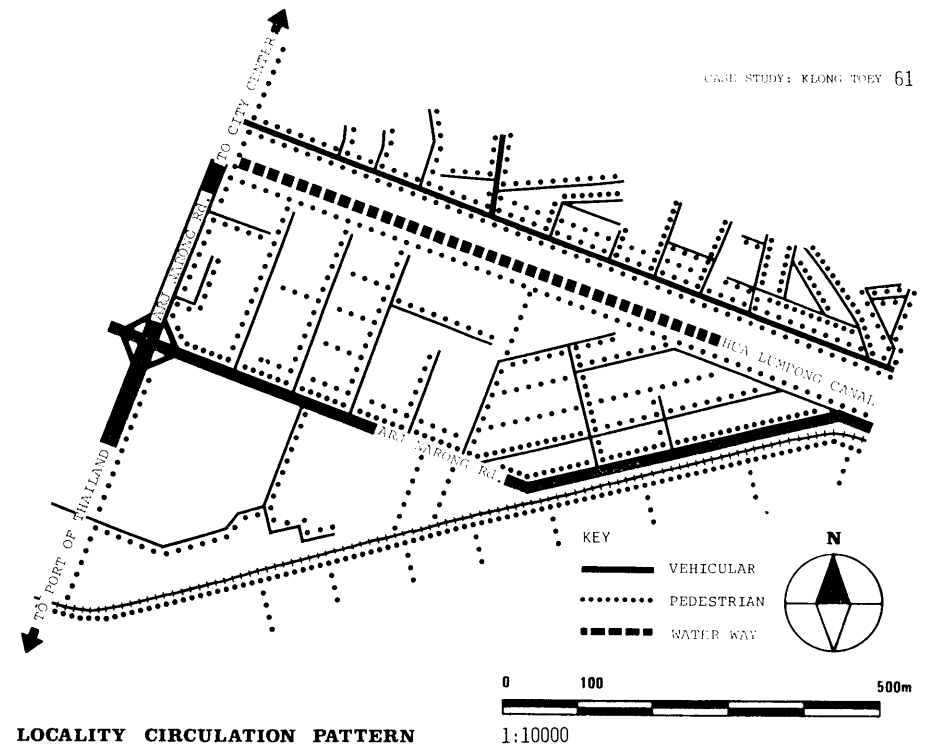
**ORIGINS:** The port's rapid growth, its location and job opportunities had attracted people from different parts of Thailand. As a result, in 1950's the development of the port accentuated the growth of the squatter settlement, forming the largest squatter area in the city, with 36,500 people in 1975. The Port Authority had a development plan for the whole area. The authority wanted to move the residents to the new community because it was considered as a sub-standard area with inadequate utilities, facilities, deteriorated housing which created unhealthy physical conditions and crime rate. The National Housing Authority considered it too sub-standard to be upgraded, and proceeded to plan new housings. Therefore walk-up apartments for total a 7,500-8,000 units will be built. This case study covers the first phase of the project which was finished in 1978.

**PHOTOGRAPH:** Klong Toey  
 (TOP) A street in the rainy season; note the pooling in the inadequately drained areas. Garbage is thrown everywhere illustrating the lack of users' responsibility in maintaining community facilities  
 (BOTTOM) The main access to the community; a food market. The residents and nearby low-income people sell food as a means of income.

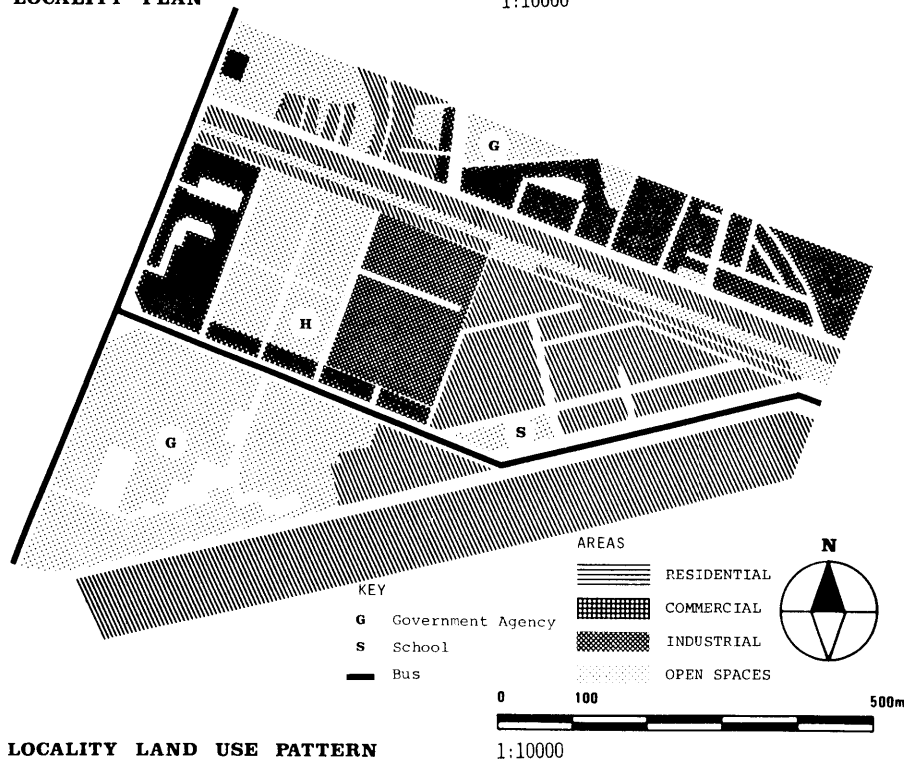




LOCALITY PLAN



LOCALITY CIRCULATION PATTERN



LOCALITY LAND USE PATTERN

LAYOUT: Two 5 story apartments are grouped in pairs with open courts, 3 m wide between them. The buildings laid parallel with the Arj-Narong road in the southern boundary. The Hua-Lumpung canal and the squatter along this are adjacent to the northern boundary. The eastern boundary is the Port Authority. The layout of the project intent to provide usable spaces between buildings by having one major vehicle road cutting through the middle of the site and others roads, passing along the the periphery and the sides of the buildings. Unfortunately, as a consequence of the layout, the residents had no responsibility over the spaces. Instead of being useful spaces they become areas where people throw garbage. Open spaces on the ground floor under the buildings are used as hawker stalls and playgrounds instead of the outdoor open spaces.

LAND USE: The project is primary residential, with an area of 7.4 Ha and a gross density of 1,762 persons/Ha. There are 2,093 families in the project. The National Housing Authority provided public utilities; electricity and street lighting, water supply, sewage disposal, refuse collection, storm drainage, fire protection and minimum facilities for the

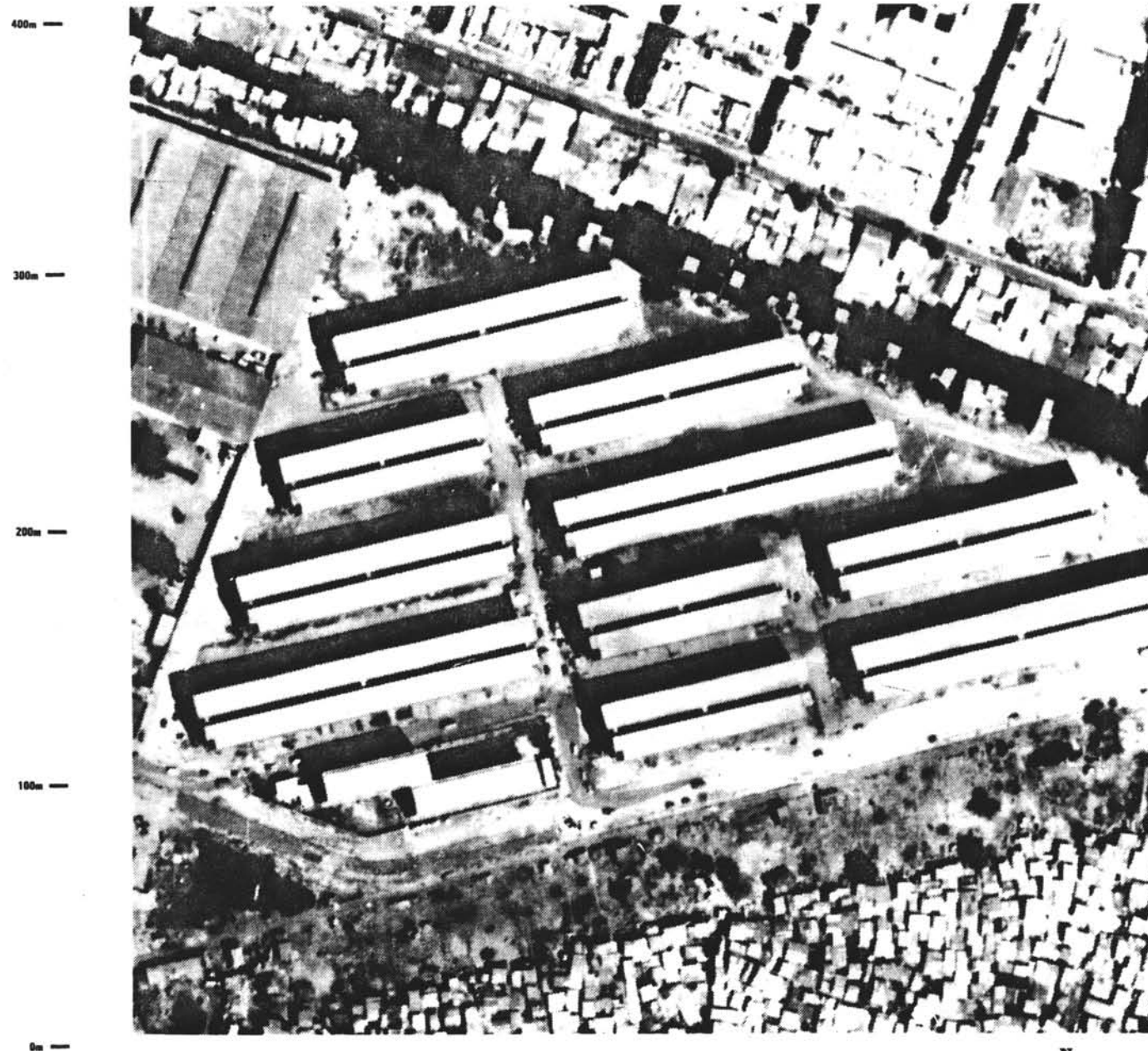
area; a school, a health center, a day care, a job and career planning office, a youth center, hawkers stalls and playgrounds. Some of the public facilities are located on the ground floor of the apartments. Hawker stalls are allowed along the major road and openspaces near the canal but some of the owner looking for shade, prefer to place them on the ground floor of the buildings despite that it is prohibited. Playgrounds were planned to be the open spaces between the buildings but children like to play in the open spaces under the apartments. There are no trees and the maintenance is poor in all the open spaces.

CIRCULATION: The only road to the area is the Arj-Narong road with a main access and three minor accesses. Most of the internal streets are for vehicle. Some of these streets are finished with concrete surface and some are unfinished. There are no paved walkways so that people have to walk along the streets. The public transportation is available on the Arj-Narong road. Most of the streets are deteriorated despite that they are only 2 years old due to irresponsibility of the residents toward the community.

**POPULATION:** All residents in the project are from the Klong Toey squatter. The average household size is 7 persons and most of the households are extended families. Some of them feel that the apartment unit is too small. Some of them converted part of the unit into small shops for grocery, dress making, beauty salon etc., to earn extra income.

**INCOME:** The purpose of the project is to provide housing for families which have income less than US\$ 900/year. 56% of the residents have jobs around this area which they can walk to work. The rest commute conveniently with the public bus transportation. The people's occupations are distributed as follows: 29% of unskill labor, 22% of skill labor, 19% of self-employees and hawkers, 23% of government and private employees. 23% of total residents work for The Port Authority. During the survey, There are some complaint from the residents that they cannot afford to pay steadily their rent which they never had to do.

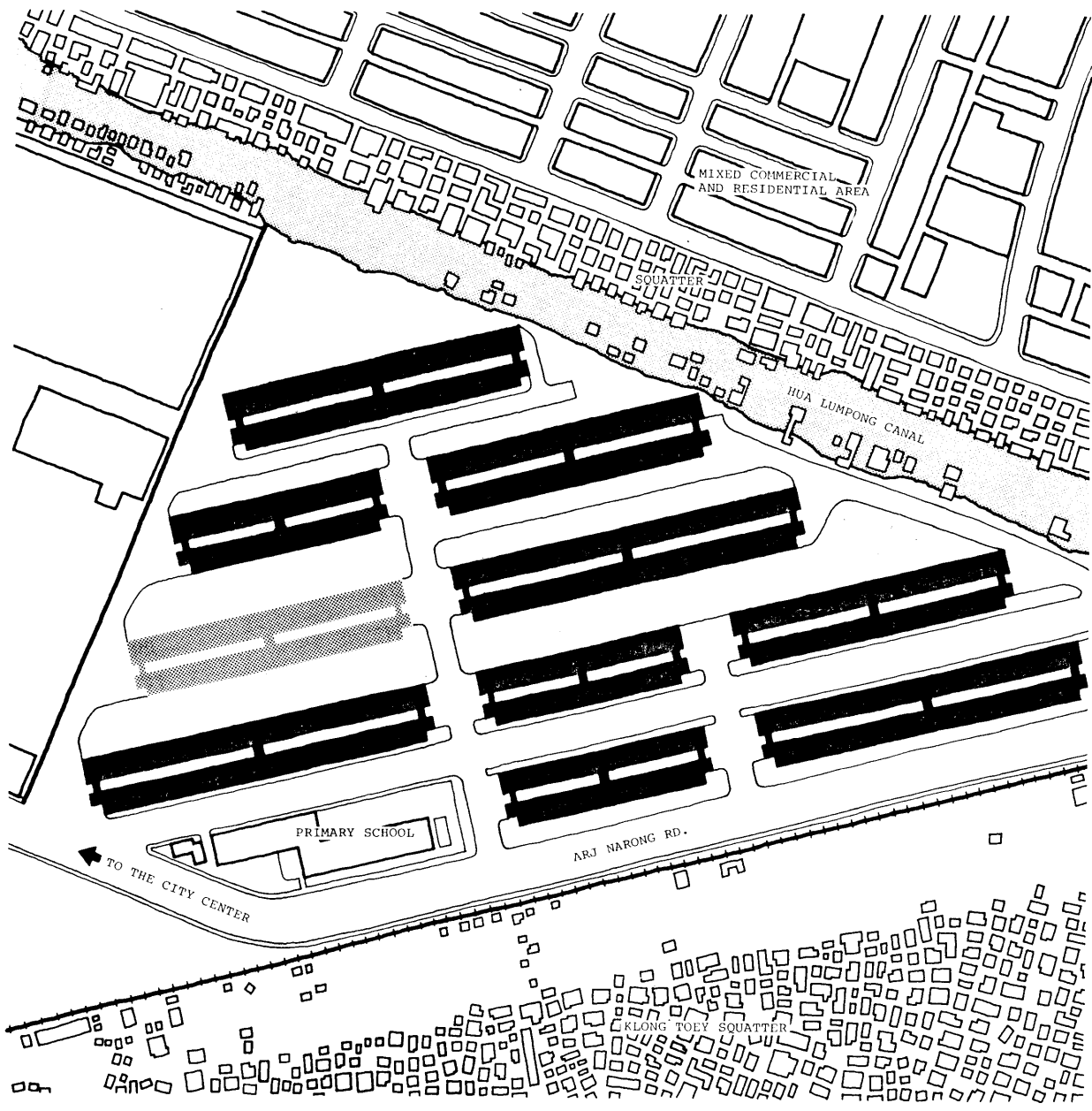
**LOCALITY SEGMENT:** The segment is representative of the typical rented-walk-up apartments that The National Housing Authority constructed during these last 7 years. The residents are all low-income. They try to maximize the utilization of the space by setting up stalls. This area therefore becomes a mixed residential and commercial area due to the real economic need of the residents.



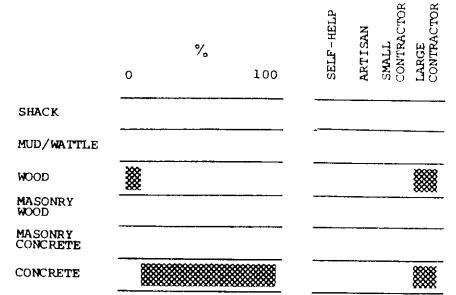
LOCALITY SEGMENT AIR PHOTOGRAPH

0 50 100 150m  
1:2500





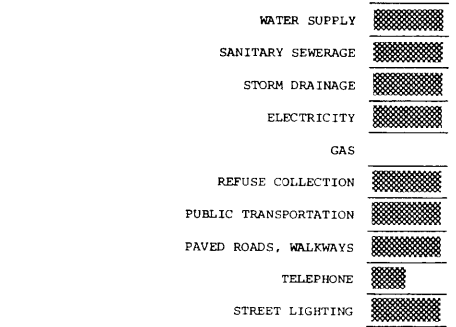
LOCALITY CONSTRUCTION TYPES



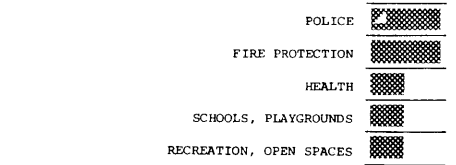
The chart shows (1) approximate percentage of each construction type within the total number of dwellings and (2) building group that generally produces each type.

Quality of information: Accurate

LOCALITY UTILITIES AND SERVICES



LOCALITY COMMUNITY FACILITIES

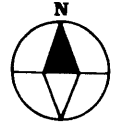
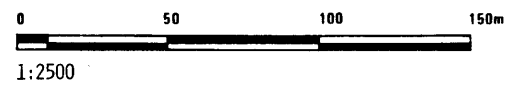


The chart illustrates the approximate availability of utilities, services, and community facilities at three levels: NONE, LIMITED, ADEQUATE.

Quality of information: Accurate

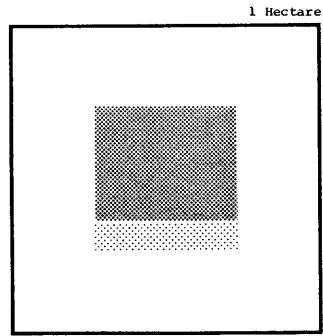
[Cross-hatch pattern] SELECTED BLOCK

LOCALITY SEGMENT PLAN

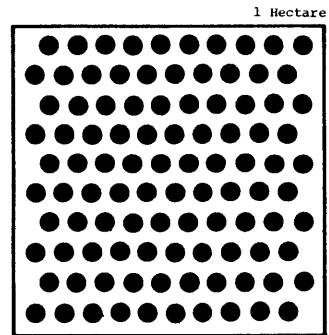


LOCALITY BLOCK: These apartments were rented to the residents. The pair of buildings contain 208 units. Each unit contains one bedroom, a multi-purposed area, a kitchen, a bath and toilet. They are single-loaded corridor buildings with open courts in the middle. It is quite noisy and has poor cross-ventilation because the two buildings are too close. The open spaces surrounding the buildings are places where people throw garbage from their apartments regardless of having garbage disposal shafts, due to a lack of responsibility to the community.

LAND UTILIZATION DIAGRAMS



PERCENTAGES Streets/Walkways 77.2  
Playgrounds -  
Cluster Courts 3.7  
Dwellings/Lots 19.1



DENSITY Persons/Hectare 2023  
● 20 Persons

LOCALITY BLOCK LAND UTILIZATION DATA

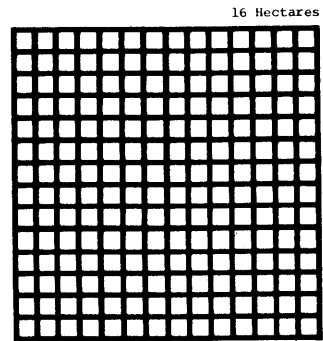
DENSITIES	Total Number	Area Hectares	Density N/Ha
LOTS	1	.514	1.95
DWELLING UNITS	208	.514	404.60
PEOPLE	1040	.514	2023.00

AREAS	Hectares	Percentages
PUBLIC (streets, walkways, open spaces)	.397	77.2
SEMI-PUBLIC (open spaces, schools, community centers)	-	-
PRIVATE (dwellings, shops, factories, lots)	.098	19.1
SEMI-PRIVATE (cluster courts)	.019	3.7
TOTAL	.514	100.0

NETWORK EFFICIENCY

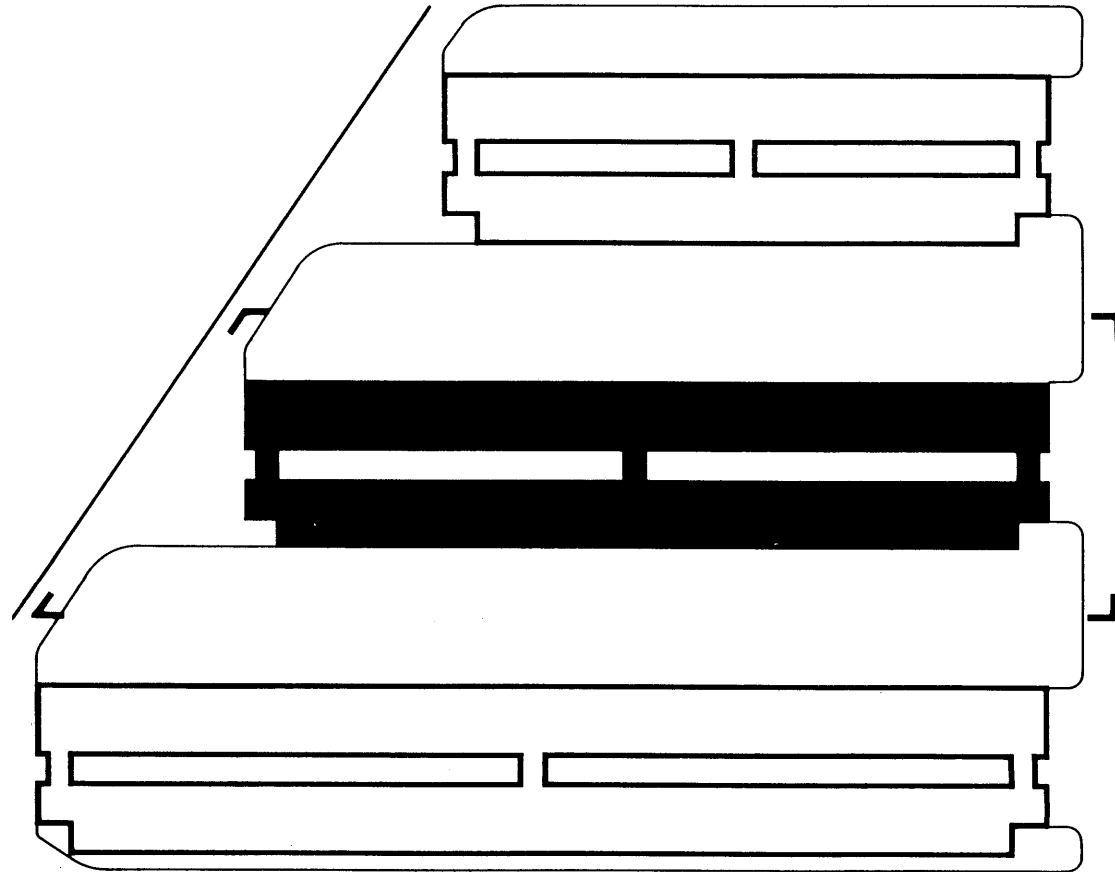
Network length (streets, walkways) = 655  
Areas served (total area)

LOTS  
Average area, dimensions = -



CIRCULATION EFFICIENCY

Meter/Hectare 655



PATTERN

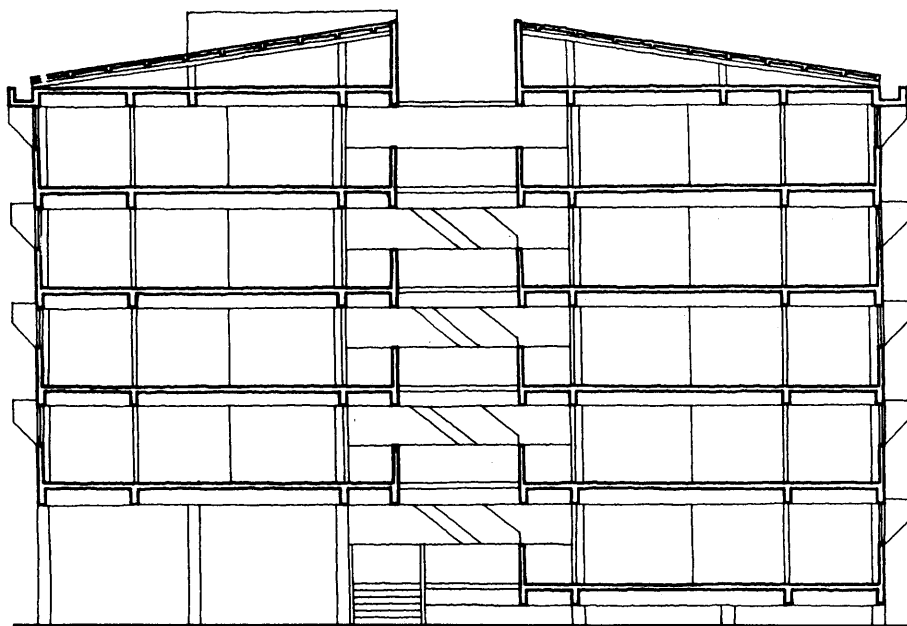
- Public: streets/walkways
- Semi-Public: playgrounds
- Semi-Private: cluster courts
- Private: lots
- dwellings



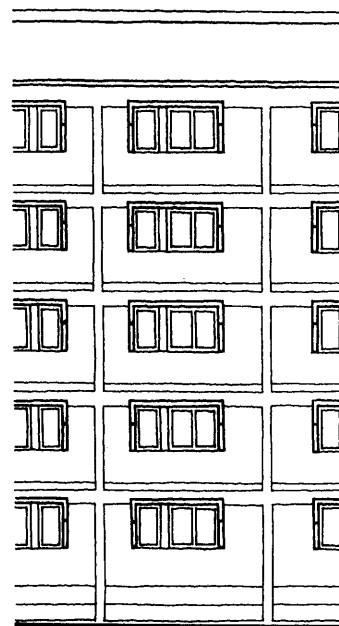
LOCALITY BLOCK LAND UTILIZATION

1:1000





SECTION



ELEVATION

**PHYSICAL DATA**  
(related to dwelling and land)

DWELLING UNIT  
 type: APARTMENT  
 area (sq m): 40  
 tenure: LEGAL RENTAL

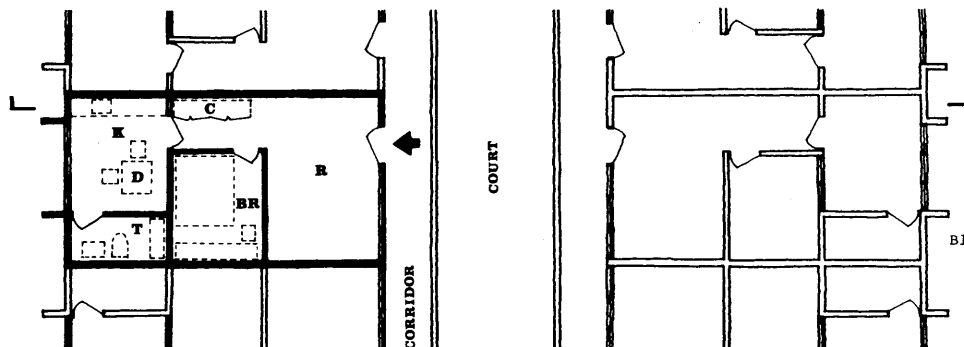
LAND/LOT  
 utilization: PUBLIC  
 area (sq m): -  
 tenure: LEGALRENTAL

DWELLING  
 location: INNER CITY  
 type: WALK-UP  
 number of floors: 4  
 utilization: SINGLE  
 physical state: GOOD

DWELLING DEVELOPMENT  
 mode: INSTANT  
 developer: PUBLIC  
 builder: LARGE CONTRACTOR  
 construction type: CONCRETE  
 year of construction: 1978

MATERIALS  
 foundation: CONCRETE  
 floors: CONCRETE  
 walls: CONCRETE BLOCK  
 roof: ADBESTOS SHEET

DWELLING FACILITIES  
 wc: 1  
 shower: 1  
 kitchen: 1  
 rooms: 2  
 other: -



PLAN

**CASE STUDY SOURCES**

Locality plan: (accurate) Air photograph, NHA maps, 1978  
 Land use pattern: (accurate) IBID  
 Circulation pattern: (accurate) IBID  
 Segment plan: (accurate) IBID  
 Block land utilization: (accurate) IBID  
 Typical dwelling: (accurate) IBID  
 Physical data: (approximate) Field survey, 1980  
 Socio-economic data: (approximate) IBID  
 Photographs: Jarin and Varin Kiat-fuengfoo, 1980  
 General information: Field survey, Varin Kiatfuengfoo, 1980  
 NHA, 1980

**SOCIO-ECONOMIC DATA**  
(related to user)

GENERAL: SOCIAL  
 user's ethnic origin: THAI  
 place of birth: CENTRAL REGION  
 education level: PRIMARY SCHOOL

NUMBER OF USERS  
 married: 4  
 single: -  
 children: 5  
 total: 9

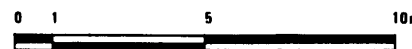
MIGRATION PATTERN  
 number of moves: 4  
 rural - urban: 1960  
 urban - urban: -  
 urban - rural: -  
 why came to urban area: EMPLOYMENT

GENERAL: ECONOMIC  
 user's income group: LOW  
 employment: HARBOUR EMPLOYEE  
 distance to work: 3-5 KM  
 mode of travel: WALKING

**KEY**

- LR Living Room
- D Dining/Eating Area
- BR Bedroom
- K Kitchen/Cooking Area
- T Toilet/Bathroom
- L Laundry
- C Closet

**TYPICAL DWELLING**



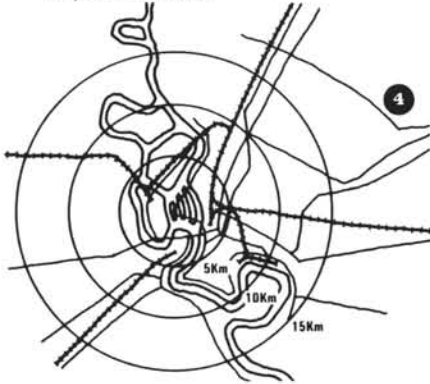
1:200

COSTS  
 dwelling unit: \$ 4,500  
 land - market value: \$ 312,500/HA

DWELLING UNIT PAYMENTS  
 financing: SUBSIDY/SELF FINANCED  
 rent/mortgage: \$ 15/MONTH RENT  
 % income for rent/mortgage: 10%

## 4 LAD PHRAO

SELF-HELP HOUSING, PRIVATE, ROW HOUSES,  
L/W/MIDDLE INCOME



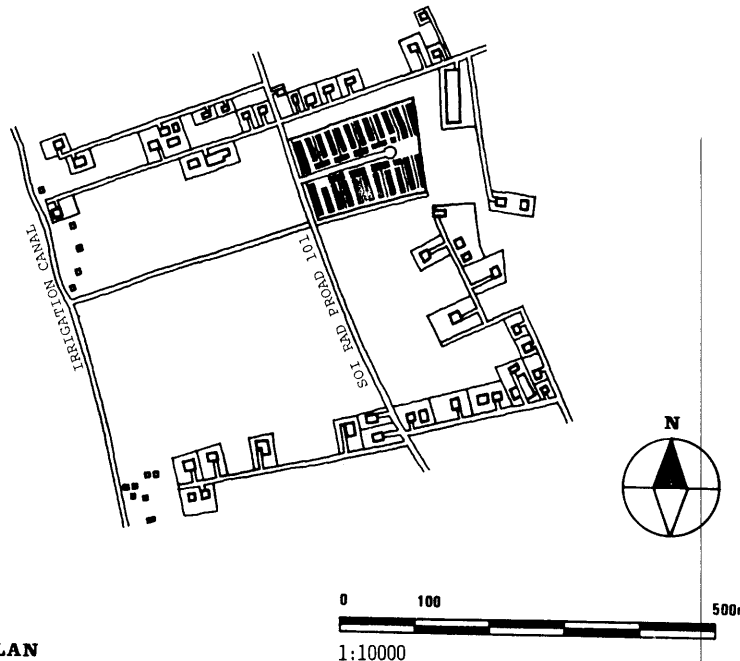
LOCATION: The community is located 14 km. from the city on the paved minor road, with a drainage canal along one side, 1.5 km from the major road. The only one access is the major Lad Phrao Road. It is a new rapid growth residential, commercial and services area. The community covers an area of 1.7 Ha.

ORIGINS: This community is the first project of the self-help housing project which The Asian Institute of Technology set up in 1978. It is intended as a teaching tool and an experiment in developing new housing arrangement for low-income people in Bangkok with the cooperation from the National Housing Authority who provides staffs and advisors. For the necessity legal organization the promoter registered the self-help housing group as a company with non-profit status. The director and shareholders worked voluntarily and the company only employed the full-time professionals, consultants, social promoters and skilled workers for assisting the people. This company intended to be only an intermediary organization and provides necessary access to technical and financial resources and legal ownership for housing. The company received donor funds which would be revolving funds used initially to purchase land and construct infrastructure and then, after being reimbursed by the residents, reinvesting them in the next project.

PHOTOGRAPH: Lad Phrao

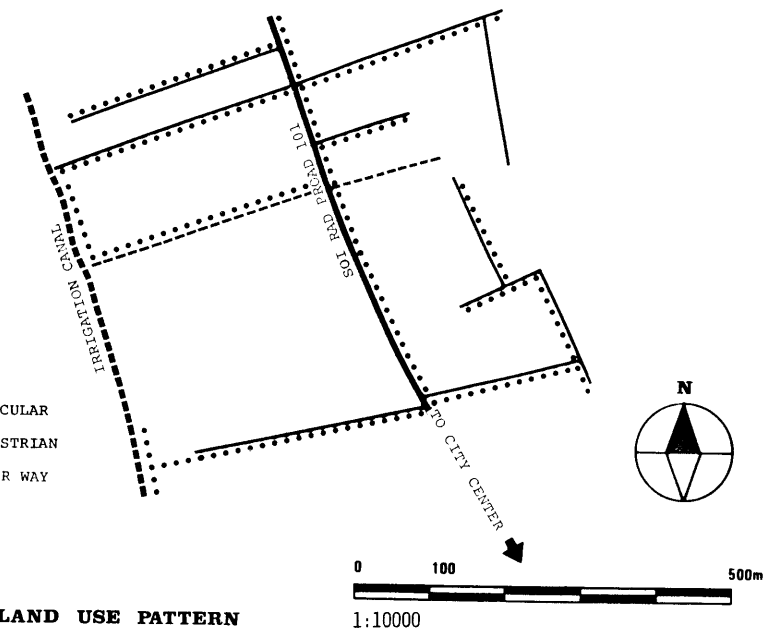
(TOP) The construction of the dwelling by mutual-help.  
(BOTTOM LEFT) The artist painted the dwelling wall in celebration of the first finished group of dwelling.  
(BOTTOM RIGHT) Women and children work as well as men in the mutual-help construction of dwelling.





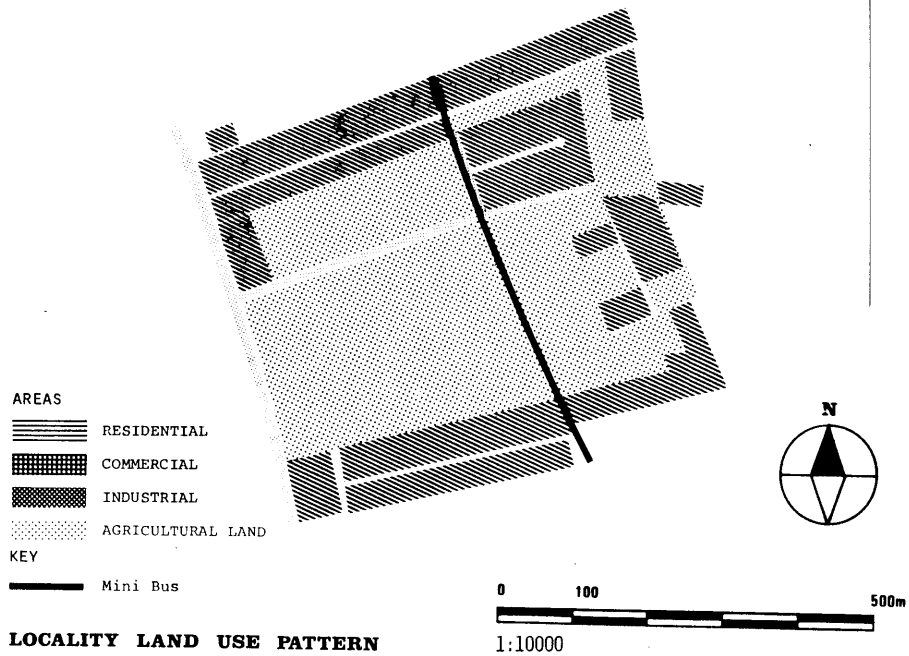
LOCALITY PLAN






1:10000



LOCALITY LAND USE PATTERN

1:10000



- AREAS**
-  RESIDENTIAL
  -  COMMERCIAL
  -  INDUSTRIAL
  -  AGRICULTURAL LAND
- KEY**
-  Mini Bus

LOCALITY LAND USE PATTERN

1:10000

**LAY OUT:** The site is surrounded by a low-density residential area with scattering small factories along the road. A school is located at a walking-distance on the grounds of a large temple. Electricity and telephone services are available. There is a natural drainage canal along one side of the site. It is a fast growing residential area with rapid increasing demand on domestic job which will provide more job opportunities to the residents.

**LAND USE:** The primary use of the community is residential. The commercial area adjacent to the road is going to be sold to the public as to recover the infrastructure costs. There

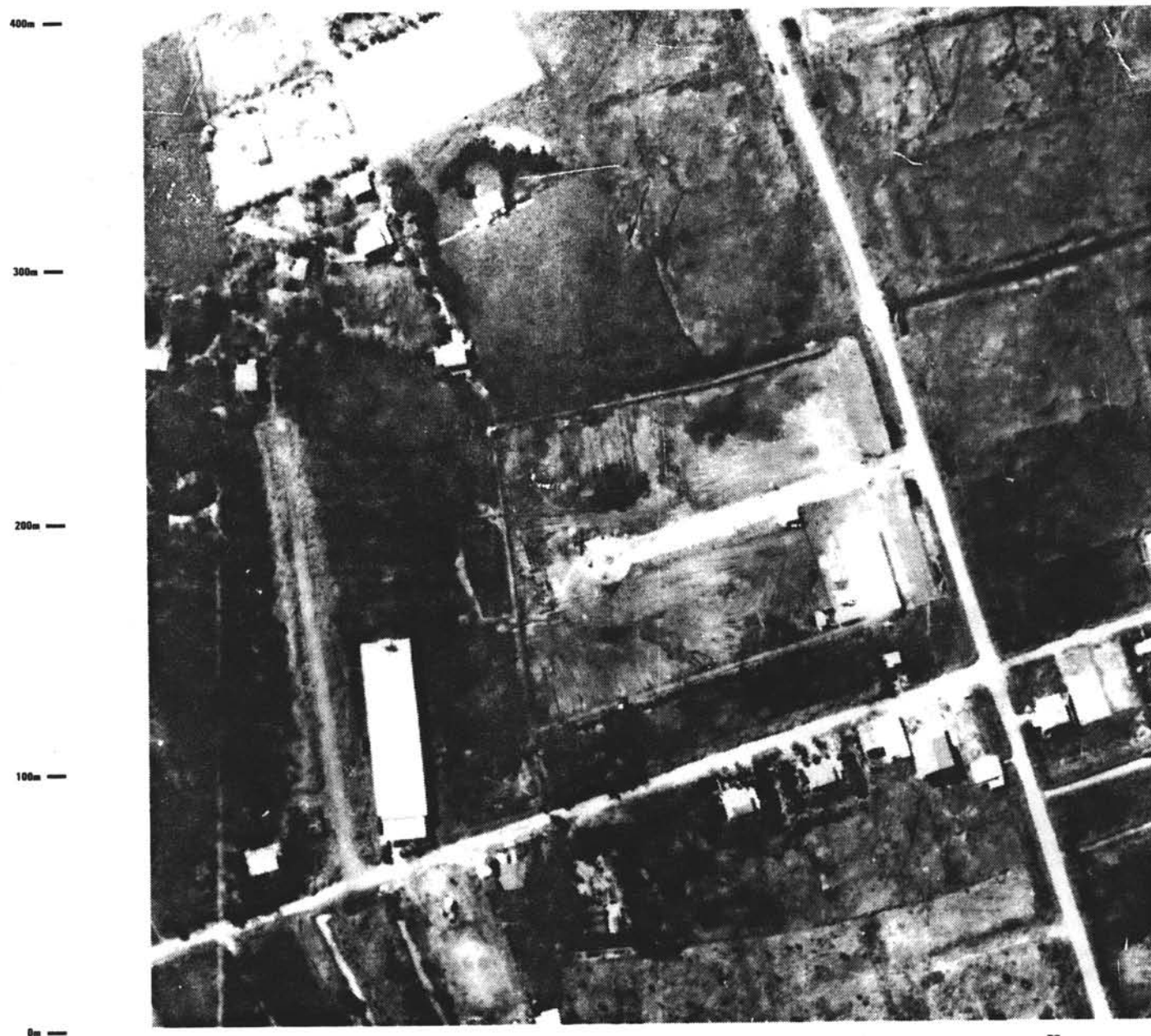
will be community facilities area which includes a community hall, a market, a factory and workshops, a clinic, a playground and an open air pavilion.

**CIRCULATION:** A main road through the middle of the site serves as a community spine. All the clusters of houses are located along the spine. Each cluster has a road 6.00 m wide opened to the spine. Electricity, water supply, drainage, sewage lines are located on the spine and extend into the cluster road. The community facilities are located at the end of the spine. There is a pedestrian way 0.80 m wide in the perimeter of the entire site.

**POPULATION:** The company selected families by sending out 2,000 application forms and brochures in the area surrounding the site; 1,000 replies were received and consequently 200 families were selected by interviews. The criteria for selection was: real household and per capita income, current housing situation and ownership, job location, ability to pay, building skills and willingness to work and attend education courses.

**INCOME:** The average income of the families is US\$ 155/month. The residents paid for the land and building materials. They gave 20% down payment on the house in two ways; the first is from the people for 1,500 hours of labour which equal to US\$ 450, the second is from the people's saving which equals to US\$ 200. The monthly payment are US\$ 32 with 12% interest to the Housing Welfare Bank. The infrastructure costs will be recovered from selling 15 shop houses to the public.

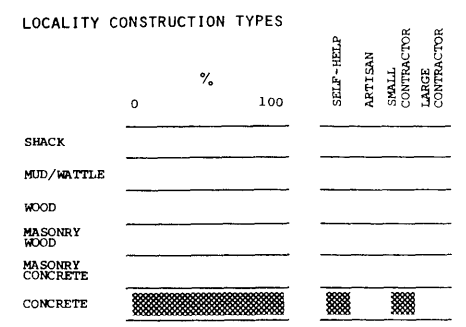
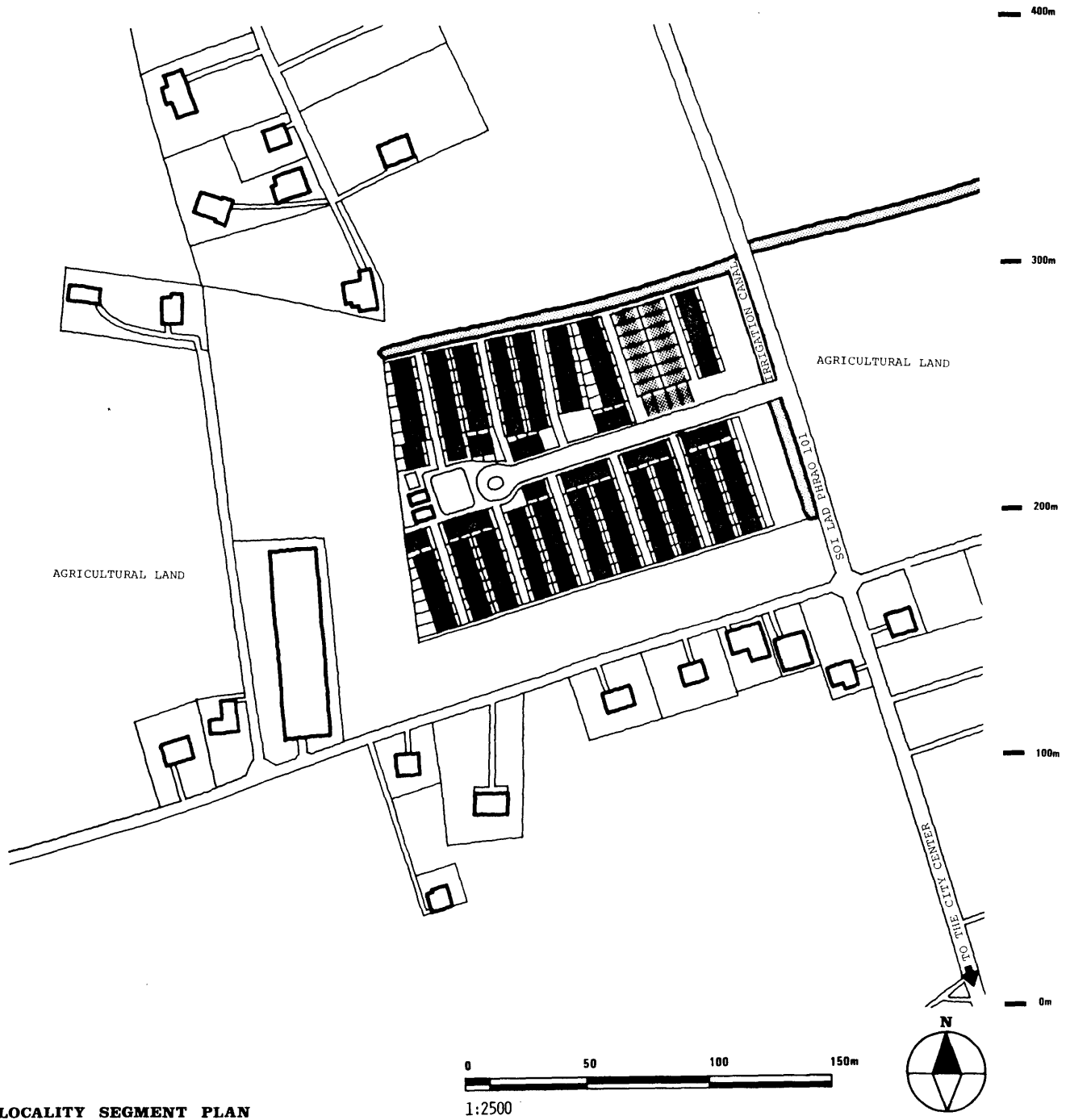
**LOCALITY SEGMENT:** The community has a gross density of 706 people/hectare. The site subdivided into 200 lots and the average lot size is 5.00x12.00 sqm. One cluster groups together 16-20 lots. There are 11 clusters. Houses on the lots are built by mutual help. Each group of 16-20 families build houses. A lottery system would be used to assign owners. The infrastructure utilities are water supply, electricity, garbage disposal, sewage, drainage, telephone and constructed by a contractor.



**LOCALITY SEGMENT AIR PHOTOGRAPH**

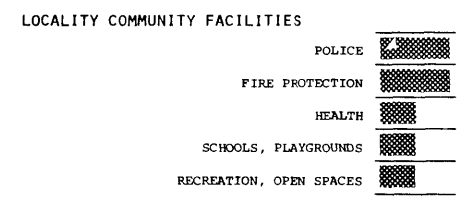
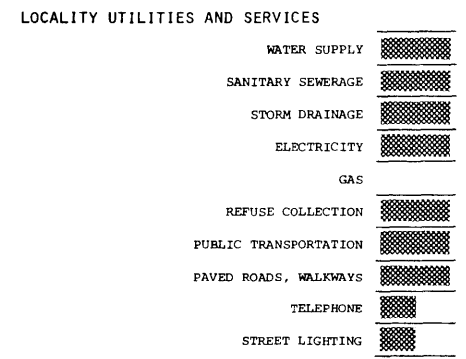
0 50 100 150m  
1:2500





The chart shows (1) approximate percentage of each construction type within the total number of dwellings and (2) building group that generally produces each type.

Quality of information: Accurate



The chart illustrates the approximate availability of utilities, services, and community facilities at three levels: NONE, LIMITED, ADEQUATE.

Quality of information: Accurate

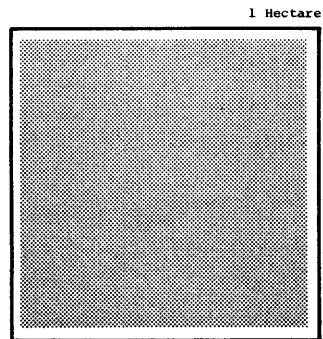
[Cross-hatch pattern] SELECTED BLOCK

LOCALITY SEGMENT PLAN

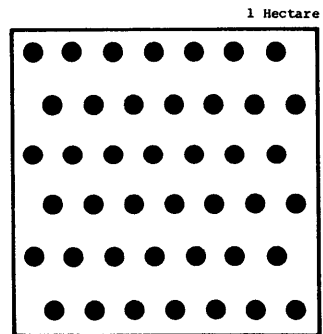


**LOCALITY BLOCK:** The block represents one cluster. People complete the houses of each cluster in 12 months. The dwelling units are 2-story row houses without interior partition and completely finished only the second floor. The ground floor has only a finished-floor and a bath room. The structure is a bearing wall of concrete blocks and supported by 2 m concrete piles with 0.50 m spacing foundation. Most of the structural elements are prefabricated on the site.

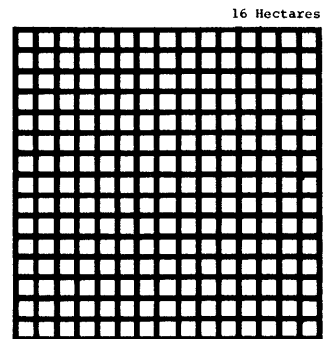
**LAND UTILIZATION DIAGRAMS**



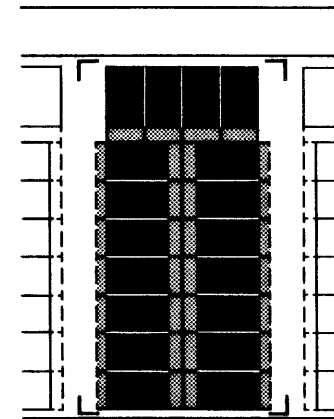
**PERCENTAGES** Streets/Walkways 15.4  
Playgrounds -  
Cluster Courts -  
Dwellings/Lots 84.6



**DENSITY** Persons/Hectare 830  
● 20 Persons



**CIRCULATION EFFICIENCY** Meter/Hectare 759



**LOCALITY BLOCK LAND UTILIZATION DATA**

DENSITIES	Total Number	Area Hectares	Density N/Ha
LOTS	18	.13	138
DWELLING UNITS	18	.13	138
PEOPLE	108	.13	830

AREAS	Hectares	Percentages
PUBLIC (streets, walkways, open spaces)	0.02	15.4
SEMI-PUBLIC (open spaces, schools, community centers)		
PRIVATE (dwellings, shops, factories, lots)	0.11.	84.6
SEMI-PRIVATE (cluster courts)	-	-
<b>TOTAL</b>	<b>0.13</b>	<b>100.0</b>

**NETWORK EFFICIENCY**

Network length (streets, walkways) = 759  
Areas served (total area)

**LOTS**  
Average area, dimensions = 61 sqm

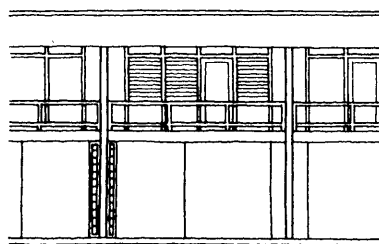
**PATTERN**

- Public: streets/walkways
- Semi-Public: playgrounds
- Semi-Private: cluster courts
- Private: lots
- dwellings

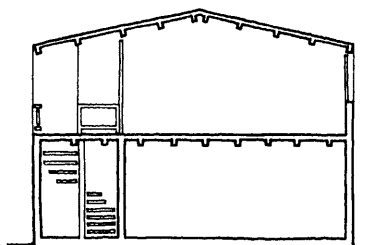


**LOCALITY BLOCK LAND UTILIZATION**

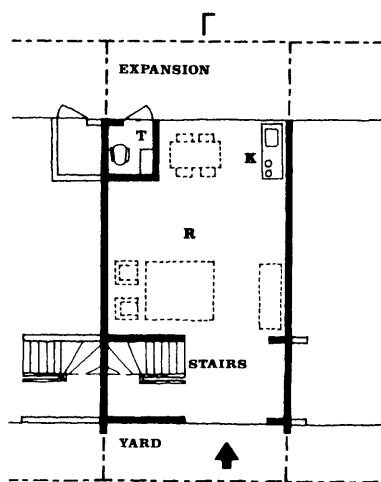
1:1000



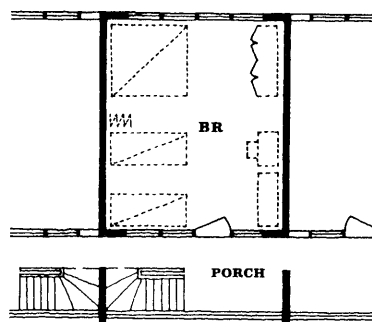
ELEVATION



SECTION



FIRST FLOOR PLAN



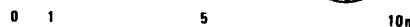
SECOND FLOOR PLAN

KEY

- LR Living Room
- D Dining/Eating Area
- BR Bedroom
- K Kitchen/Cooking Area
- T Toilet/Bathroom
- R Room (multi-use)

CASE STUDY SOURCES

- Locality plan: (accurate) Air photograph, A.I.T. plan,
- Segment plan: (accurate) IBID
- Block land utilization: (accurate) A.I.T. plan 1979, Field survey
- Typical dwelling: (accurate) IBID
- Physical data: (approximate) Field survey, 1980
- Socio-economic data: (approximate) IBID
- Photographs: Jarin and Varin Kiat-Fuengfoo, 1980
- General information: Field survey, 1980



1:200

PHYSICAL DATA  
(related to dwelling and land)

- DWELLING UNIT
  - type: HOUSES
  - area (sq m): 100
  - tenure: LEGAL OWNERSHIP
- LAND/LOT
  - utilization: PRIVATE/SEMI-PRIVATE
  - area (sq m): 60
  - tenure: CONDOMINIUM IN THE COURT
- DWELLING
  - location: PERIPHERY
  - type: ROW HOUSES
  - number of floors: 2
  - utilization: SINGLE&MULTIPLE
  - physical state: GOOD
- DWELLING DEVELOPMENT
  - mode: INSTANT
  - developer: INSTITUTE
  - builder: SELF-HELP
  - construction type: CONCRETE BRICK
  - year of construction: 1978

- MATERIALS
  - foundation: CONCRETE
  - floors: CONCRETE
  - walls: CONCRETE
  - roof: ADBESTOS SHEET

- DWELLING FACILITIES
  - wc: 1
  - shower: 1
  - kitchen: 1
  - rooms: 2
  - other: COVERED PORCH

SOCIO-ECONOMIC DATA  
(related to user)

- GENERAL: SOCIAL
- user's ethnic origin: THAI
- place of birth: CENTRAL/NORTH EASTERN
- education level: PRIMARY SCHOOL

- NUMBER OF USERS
  - married: 2
  - single: -
  - children: 4
  - total: 6

- MIGRATION PATTERN
  - number of moves: 2
  - rural - urban: 1960's
  - urban - urban: -
  - urban - rural: -
- why came to urban area: EMPLOYMENT

- GENERAL: ECONOMIC
- user's income group: LOW
- employment: TAXI DRIVER
- distance to work: 5-7 KM
- mode of travel: BUS

- COSTS
  - dwelling unit: \$ 750
  - land - market value: \$ 125,000/HA

- DWELLING UNIT PAYMENTS
  - financing: SELF FINANCE
  - rent/mortgage: DOWN PAYMENT/\$32/MONTH
  - % income for rent/mortgage: 25%

# GLOSSARY

The criteria for the preparation of the definitions have been as follows:

-FIRST PREFERENCE: definitions from "Webster's Third New International Dictionary", Merriam-Webster, 1971.  
-SECOND PREFERENCE: definitions from technical dictionaries, text books, or reference manuals.

-THIRD PREFERENCE: definitions from the Urban Settlement Design Program (U.S.D.P.) files. They are used when existing sources were not quite appropriate/satisfactory.

Words included for specificity and to focus on a particular context are indicated in parenthesis.

Sources of definitions are indicated in parenthesis. (See also: REFERENCES).

X

ACCESSES. The pedestrian/vehicular linkages from/to the site to/from existing or planned approaches (urban streets, limited access highways, public transportation systems, and other systems such as: waterways, airlines, etc.) (U.S.D.P.)

ACTUAL LAND COST. "(The cost of land is)...set solely by the level of demand. The price of land is not a function of any cost conditions; it is set by the users themselves in competition." (Turner, 1971)

AD VALOREM (TAX). A tax based on a property's value; the value taxed by local governments is not always or even usually the market value, but only a valuation for tax purposes. (U.S.D.P.)

AIRPORT DISTURBANCE. The act or process of destroying the rest, tranquility, or settled state of the site by the annoyance of airport noise, vibration, hazards, etc.) (Merriam-Webster, 1971)

AIRPORT ZONING RESTRICTIONS. The regulation of the height or type of structures in the path of moving aircraft. (Abrams, 1971)

ALTERNATING CURRENT (A.C.) (an electric) current that reverses its direction of flow at regular intervals. (ROTC ST 45-7, 1953)

AMENITY. Something that conduces to physical or material comfort or convenience, or which contributes satisfaction rather than money income to its owner. (Merriam-Webster, 1971)

AMPERES. Amperes (amp) are a measure of the rate of flow of electricity. It is somewhat comparable to the rate of flow of water (quantity/time). A steady current produced by one volt applied across a resistance of one ohm. (ROTC ST 45-7, 1953)

APPRAISAL. An estimate and opinion of value, especially by one fitted to judge. (Merriam-Webster, 1971)

APPROACHES. The main routes external to the site (pedestrian/vehicular) by which the site can be reached from other parts of the urban context. (U.S.D.P.)

ASSESSED VALUE. A valuation placed upon property by a public officer or board as a basis for taxation. (Keyes, 1971)

ASSESSMENT. The valuation of property for the purpose of levying a tax or the amount of the tax levied. (Keyes, 1971)

BACKFILL. Earth or other material used to replace material removed during construction, such as in culvert, sewer, and pipeline trenches and behind bridge abutments and retaining walls or between an old structure and a new lining. (DePina, 1972)

BARRIER. (A boundary) as a topographic feature or a physical or psychological quality that tends to separate or restrict the free movement (to and from the site). (Merriam-Webster, 1971)

BETTERMENT (TAX). A tax on the increment in value accruing to an owner because of development and improvement work carried out by local authorities. (U.S.D.P.)

BINDER COURSE. A transitional layer of bituminous paving between the crushed stone base and the surface course (to increase bond between base and surface course). (DePina, 1972)

BITUMINOUS. A coating of or containing bitumin; as asphalt or tar. (DePina, 1972)

BLOCK. A block is a portion of land bounded and served by lines of public streets. (U.S.D.P.)

BOUNDARY. Something (a line or area) that fixes or indicates a limit or extent (of the site). (Merriam-Webster, 1971)

BUILDING CODE. "A body of legislative regulations or by-laws that provide minimum standards to safeguard life or limb, health, property, and public welfare by regulating and controlling the design, construction, quality of materials, use and occupancy, location and maintenance of all buildings and structures within the city, and certain equipment specifically regulated therein." (BOCA, 1967)

BUILDING DRAIN. Lowest horizontal piping of the building drainage system receiving discharge from soil, waste, and other drainage pipes. It is connected to the building sewer. (ROTC ST 45-7, 1953)

BUILDING MAIN. Water-supply pipe and fittings from the water main or other source of supply to the first branch of the water-distribution system of a building. (ROTC ST 45-7, 1953)

CESS POOL. An underground catch basin that is used where there is no sewer and into which household sewage or other liquid waste is drained to permit leaching of the liquid into the surrounding soil. (Merriam-Webster, 1971)

X CIRCULATION. System(s) of movement/passage of people, goods from place to place; streets, walkways, parking areas. (U.S.D.P.)

CLAY. A lusterless colloidal substance, plastic when moist (crystalline grains less than 0.002mm in diameter). (U.S.D.P.)

CLEANOUT. A plug or similar fitting to permit access to traps or sewer lines. Cleanouts are usually used at turns and other points of collection. (ROTC ST 45-7, 1953)

X CLIMATE. The average condition of the weather at a particular place over a period of years as exhibited by temperature, wind, precipitation, sun energy, humidity, etc. (Merriam-Webster, 1971)

COLLECTION SYSTEM. The system of pipes in a sewage network, comprised of house service, collection lines, manholes, laterals, mains. (U.S.D.P.)

COMBINED SEWER. A sewer that carries both storm water and sanitary or industrial wastes. (DePina, 1972)

COMMUNITY. The people living in a particular place or region and usually linked by common interests: the

region itself; any population cluster. (U.S.D.P.)

X COMMUNITY FACILITIES/SERVICES. Facilities/services used in common by a number of people. It may include: schools, health, recreation, police, fire, public transportation, community center, etc. (U.S.D.P.)

COMMUNITY RECREATION FACILITIES. Facilities for activities voluntarily undertaken for pleasure, fun, relaxation, exercise, self-expression, or release from boredom, worry, or tension. (U.S.D.P.)

COMPONENT. A constituent part of the utility network. (U.S.D.P.)

X CONDOMINIUM. Condominium is a system of direct ownership of a single unit in a multi-unit whole. The individual owns the unit in much the same manner as if it were a single family dwelling; he holds direct legal title to the unit and a proportionate interest in the common land and areas. Two types of condominiums are recognized: *HORIZONTAL*: detached, semi-detached, row/grouped dwelling types; *VERTICAL*: walk-up, high-use dwelling types. (U.S.D.P.)

CONDUCTORS. Materials which allow current to flow such as aluminum, copper, iron. (ROTC ST 45-7, 1953)

CONDUIT. A pipe or other opening, buried or above ground, for conveying hydraulic traffic, pipelines, cables, or other utilities. (DePina, 1972)

CONSERVATION EASEMENT. An easement acquired by the public and designed to open privately owned lands for recreational purposes or to restrict the use of private land in order to preserve open space and protect certain natural resources. (U.S.D.P.)

CONURBATION. Area of large urban communities where towns, etc. have spread and became joined beyond their administrative boundaries. (A.S. Hornby, A.P. Cowie, J. Windsor Lewis, 1975)

CONURBATION. An aggregation or continuous network of urban communities. (Merriam-Webster, 1963)

CORPORATION COCK/CORPORATION STOP. A water or gas cock by means of which utility-company employees connect or disconnect service lines to a consumer. (Merriam-Webster, 1971)

COSTS OF URBANIZATION. Include the following: *CAPITAL*: cost of land and infrastructure; *OPERATING*: cost of administration, maintenance, etc.; *DIRECT*: include capital and operating costs; *INDIRECT*: include environmental and personal effects. (U.S.D.P.)

CURRENT (See: ALTERNATING CURRENT, DIRECT CURRENT). An electric current is a movement of positive or negative electric particles (as electrons) accompanied by such observable effects as the production of heat, of a magnetic field, or of chemical transformation. (Merriam-Webster, 1971)

CYCLE. One complete performance of a vibration, electric oscillation, current alternation, or other periodic process. (Merriam-Webster, 1971)

DAM. A barrier preventing the flow of water; a barrier built across a water course to confine and keep back flowing water. (Merriam-Webster, 1971)

DEPRECIATION ACCELERATION (TAX). A tax incentive designed to encourage new construction by allowing a faster write-off during the early life of a building. (U.S.D.P.)

X DESIGN. 1) The arrangement of elements that make up a work of art, a machine or other man-made object. 2) The process of selecting the means and contriving the elements, steps, and procedures for producing what will adequately satisfy some need. (Merriam-Webster, 1971)

X DETACHED DWELLING. Individual dwelling unit, separated from others. (U.S.D.P.)

DEVELOPMENT. Gradual advance or growth through progressive changes; a developed tract of land (U.S.D.P.)

DEVELOPMENT SIZE. There are two general ranges of size: *LARGE*: may be independent communities requiring their own utilities, services, and community facilities; *SMALL*: generally are part of an adjacent urbanization and can use its supporting utilities, services, and community facilities. (U.S.D.P.)

DIRECT CURRENT (D.C.) (An electric current that) flows continuously in one direction. (ROTC ST 45-7, 1953)

DISCHARGE (Q). Flow from a culvert, sewer, channel, etc. (DePina, 1972)

DISTANCE. The degree or amount of separation between two points (the site and each other element of the urban context) measured along the shortest path adjoining them (paths of travel). (Merriam-Webster, 1971)

DISTRIBUTION (STATION). The part of an electric supply system between bulk power sources (as generating stations or transformation station tapped from transmission lines) and the consumers' service switches. (Merriam-Webster, 1971)

DISTURBED SOIL. Soils that have been disturbed by artificial process, such as excavation, transportation, and compaction in fill. (U.S.D.P.)

DRAINAGE. Interception and removal of ground water or surface water, by artificial or natural means. (De Pina, 1972)

DUST/DIRT. Fine dry pulverized particles of earth, grit, refuse, waste, litter, etc. (Merriam-Webster, 1971)

DWELLING. The general, global designation of a building/shelter in which people live. A dwelling contains one or more dwelling units! (U.S.D.P.)

DWELLING BUILDER. Four groups are considered: *SELF-HELP BUILT*: where the dwelling unit is directly built by the user or occupant; *ARTISAN BUILT*: where the dwelling unit is totally or partially built by a skilled craftsman hired by the user or occupant; payments can be monetary or an exchange of services; *SMALL CONTRACTOR BUILT*: where the dwelling unit is totally built by a small organization hired by the user, occupant, or developer; 'small' contractor is defined by the scale of operations, financially and materially; the scale being limited to the construction of single dwelling units or single complexes; *LARGE CONTRACTOR BUILT*: where the dwelling unit is totally built by a large organization hired by a developer; 'large' contractor is defined by the scale of operations, financially and materially; the scale reflects a more comprehensive and larger size of operations encompassing the building of large quantities of similar units, or a singularly large complex. (U.S.D.P.)

DWELLING DENSITY. The number of dwellings, dwelling units, people or families per unit hectare. Gross density is the density of an overall area (ex. including lots, streets). Net density is the density of selected, discrete portions of an area (ex. including only lots). (U.S.D.P.)

DWELLING DEVELOPER. Three sectors are considered in the supply of dwellings: *POPULAR SECTOR*: the marginal sector with limited or no access to the formal financial, administrative, legal, technical institutions involved in the provision of dwellings. The housing process (promotion, financing, construction, operation) is carried out by the Popular Sector generally for 'self use' and sometimes for profit. *PUBLIC SEC-*



**TOR:** the government or non-profit organizations involved in the provision of dwellings. The housing process (promotion, financing, construction, operation) is carried out by the Public Sector for service (non-profit or subsidized housing). **PRIVATE SECTOR:** the individuals, groups or societies, who have access to the formal financial, administrative, legal, technical institutions in the provision of dwellings. The housing process (promotion, financing, construction, operation) is carried out by the Private Sector for profit. (U.S.D.P.)

**DWELLING DEVELOPMENT MODE.** Two modes are considered: **PROGRESSIVE:** the construction of the dwelling and the development of the local infrastructure to modern standards by stages, often starting with provisional structures and underdeveloped land. This essentially traditional procedure is generally practiced by squatters with de facto security of tenure and an adequate building site. **INSTANT:** the formal development procedure in which all structures and services are completed before occupation. (U.S.D.P.)

**DWELLING FLOORS.** The following numbers are considered: **ONE:** single story; generally associated with detached, semi-detached and row/group dwelling types. **TWO:** double story; generally associated with detached, semi-detached and row/group dwelling types. **THREE OR MORE:** generally associated with walk-up and high-rise dwelling types. (U.S.D.P.)

**DWELLING GROUP.** The context of the dwelling in its immediate surroundings. (U.S.D.P.)

**DWELLING/LAND SYSTEM.** A distinct dwelling environment/housing situation characterized by its users as well as by its physical environment. (U.S.D.P.)

**DWELLING LOCATION.** Three sectors are considered in single or multi-center urban areas. Sectors are identified by position as well as by the density of buildings as follows: **CENTER:** the area recognized as the business center of the city, generally the most densely built-up sector; **INNER RING:** the area located between the city center and the urban periphery, generally a densely built-up sector; **PERIPHERY:** the area located between the inner ring and the rural areas, generally a scatteredly built-up sector. (U.S.D.P.)

**DWELLING PHYSICAL STATE.** A qualitative evaluation of the physical condition of the dwelling types: room, apartment, house; the shanty unit is not evaluated. **BAD:** generally poor state of structural stability, weather protection, and maintenance. **FAIR:** generally acceptable state of structural stability, weather protection, and maintenance with some deviation. **GOOD:** generally acceptable state of structural stability, weather protection, and maintenance without deviation. (U.S.D.P.)

**DWELLING TYPE.** The physical arrangement of the dwelling unit: **DETACHED:** individual dwelling unit, separated from others. **SEMI-DETACHED:** two dwelling units sharing a common wall (duplex). **ROW/GROUPED:** dwelling units grouped together linearly or in clusters. **WALK-UP:** dwelling units grouped in two to five stories with stairs for vertical circulation. **HIGH-RISE:** dwelling units grouped in five or more stories with stairs and lifts for vertical circulation. (U.S.D.P.)

**DWELLING UNIT.** A self-contained unit in a dwelling for an individual, a family, or a group. (U.S.D.P.)

**DWELLING UNIT AREA.** The dwelling unit area (m<sup>2</sup>) is the built-up, covered area of a dwelling unit. (U.S.D.P.)

**DWELLING UNIT COST.** The initial amount of money paid for the dwelling unit or the present monetary equivalent for replacing the dwelling unit. (U.S.D.P.)

**DWELLING UNIT TYPE.** Four types of dwelling units are considered: **ROOM:** A SINGLE SPACE usually bounded by

partitions and specifically used for living; for example, a living room, a dining room, a bedroom, but not a bath/toilet, kitchen, laundry, or storage room. **SEVERAL ROOM UNITS** are contained in a building/shelter and share the use of the parcel of land on which they are built (open spaces) as well as common facilities (circulation, toilets, kitchens). **APARTMENT:** A MULTIPLE SPACE (room/set of rooms with bath, kitchen, etc.) **SEVERAL APARTMENT UNITS** are contained in a building and share the use of the parcel of land on which they are built (open spaces) as well as some common facilities (circulation). **HOUSE:** A MULTIPLE SPACE (room/set of rooms with or without bath, kitchen, etc.) **ONE HOUSE UNIT** is contained in a building/shelter and has the private use of the parcel of land on which it is built (open spaces) as well as the facilities available. **SHANTY:** A SINGLE OR MULTIPLE SPACE (small, crudely built). **ONE SHANTY UNIT** is contained in a shelter and shares with other shanties the use of the parcel of land on which they are built (open spaces). (U.S.D.P.)

**DWELLING UTILIZATION.** The utilization indicates the type of use with respect to the number of inhabitants/families. **SINGLE:** an individual or family inhabiting a dwelling. **MULTIPLE:** a group of individuals or families inhabiting a dwelling. (U.S.D.P.)

**EASEMENT.** Servitude: a right in respect of an object (as land owned by one person) in virtue of which the object (land) is subject to a specified use or enjoyment by another person or for the benefit of another thing. (Merriam-Webster, 1971)

**EFFICIENCY.** Capacity to produce desired results with a minimum expenditure of energy, time, money or materials. (Merriam-Webster, 1971)

**EFFLUENT.** Outflow or discharge from a sewer or sewage treatment equipment. (DePina, 1972)

**ELECTRIC FEEDER.** That part of the electric distribution system between the transformer and the service drop or drops. (HUD, Mobile Court Guide, 1970)

**ELECTRIC SERVICE DROP.** That part of the electric distribution system from a feeder to the user's service equipment serving one or more lots. (HUD, Mobile Court Guide, 1970)

**ELECTRIC TRANSFORMER.** A device which changes the magnitude of alternating voltages and currents; generally from distribution voltages to user voltages; a distribution component that converts power to usable voltage. (TM 5 765 US Army, 1970; U.S.D.P.)

**ELECTRICAL CIRCUIT.** A closed, complete electrical path with various connected loads. Circuits may either be 'parallel' (voltage constant for all connected loads) or 'series' (voltage divided among connected loads). Parallel circuits are fixtures wired independent of each other, which are used in nearly all building wiring. (U.S.D.P.; ROTC ST 45-7, 1953)

**ELECTRICAL FREQUENCY.** The number of times an alternating electric current changes direction in a given period of time. Measured in cycles per second: hertz. (ROTC ST 45-7, 1953)

**ELECTRIC GROUND.** The electrical connection with the earth or other ground. (Merriam-Webster, 1971)

**ELECTRICAL NETWORK COMPONENTS.** It is composed of the following: **GENERATION:** produces electricity; **TRANSMISSION:** transports energy to user groups; **DISTRIBUTION STATION:** divides power among main user groups; **SUBSTATION:** manipulates power into useful energy levels for consumption; **DISTRIBUTION NETWORKS:** provides electric service to user. (U.S.D.P.)

**ELECTRIC PHASE.** May be either a single-phase circuit (for small electrical devices) or a three-phase circuit (for heavy equipment, large electrical devices). In single-phase only one current is flowing through

the circuit with the voltage dropping to zero twice in each cycle. In three-phase currents flow through the circuit with the power never dropping to zero. (U.S.D.P.)

**ELECTRICAL POWER.** The source or means of supplying energy for use; measured in watts. (U.S.D.P.)

**ELECTRICAL WIRING SYSTEMS.** May either be single-phase or three-phase. **SINGLE-PHASE:** 2 hot wires with 1 neutral wire; **THREE-PHASE:** 3 hot wires with 1 neutral wire. (ROTC ST 45-7, 1953)

**ELECTRICITY.** Electrification: the process (network) for supplying (the site) with electric power. (Merriam-Webster, 1971)

**EMBANKMENT (or FILL).** A bank of earth, rock, or other material constructed above the natural ground surface. (DePina, 1972)

**EROSION.** The general process whereby materials of the earth's crust are worn away and removed by natural agencies including weathering, solution, corrosion, and transportation; (specific) land destruction and simultaneous removal of particles (as of soil) by running water, waves and currents, moving ice, or wind. (Merriam-Webster, 1971)

**EXCRETA.** Waste matter eliminated from the body. (U.S.D.P.)

**EXISTING STRUCTURE.** Something constructed or built (on the site). (U.S.D.P.)

**EXPLORATORY BORING.** Initial subsurface investigations (borings) are done on a grid superimposed on the areas of interest and on areas indicated as limited/restricted/hazard in the initial survey. (U.S.D.P.)

**EXTERIOR CIRCULATION/ACCESSES (SITE PLANNING).** The existing and proposed circulation system/accesses outside but affecting the site. These include limited access highways as well as meshing access to the surrounding area. Exterior circulation/accesses are generally given conditions. (U.S.D.P.)

**FAUCET (also TAP).** A fixture for drawing liquid from a pipe, cask, or other vessel. (Merriam-Webster, 1971)

**FINANCING.** The process of raising or providing funds. **SELF FINANCED:** provided by own funds; **PRIVATE/PUBLIC FINANCED:** provided by loan; **PUBLIC SUBSIDIZED:** provided by grant or aid. (U.S.D.P.)

**FIRE/EXPLOSION HAZARDS.** Danger: the state of being exposed to harm; liable to injury, pain, or loss from fire/explosion (at or near the site). (Merriam-Webster, 1971)

**FIRE FLOW.** The quantity (in time) of water available for fire-protection purposes in excess of that required for other purposes. (Merriam-Webster, 1971)

**FIRE HYDRANT.** A water tap to which fire hoses are connected in order to smother fires. (U.S.D.P.)

**FIRE PROTECTION.** Measures and practices for preventing or reducing injury and loss of life or property by fire. (Merriam-Webster, 1971)

**FLEXIBLE PAVEMENT.** A pavement structure which maintains intimate contact with and distributes loads to the subgrade and depends upon aggregate interlock, particle friction, and cohesion for stability. (DePina, 1972)

**FLOODING.** A rising and overflowing of a body of water that covers land not usually under water. (U.S.D.P.)

**FLOODWAY FRINGE.** The floodplain area landward of the natural floodway which would be inundated by low velocity flood waters. (U.S.D.P.)

**FLOW METER.** A device to measure flow of water. (U.S.D.P.)

**FLUSH TANK TOILET.** Toilet with storage tank of water used for flushing bowl. (U.S.D.P.)

**FLUSH VALVE TOILET.** Toilet with self-closing valve which supplies water directly from pipe. It requires adequate pressure for proper functioning. (U.S.D.P.)

**FOOT CANDLE.** A unit of illuminance on a surface that is everywhere one foot from a uniform point source of light of one candle and equal to one lumen per square foot. (Merriam-Webster, 1971)

**FUMES.** Gaseous emissions that are usually odorous and sometimes noxious. (Merriam-Webster, 1971)

**GAS.** A system for supplying natural gas, manufactured gas, or liquefied petroleum gas to the site and individual users. (U.S.D.P.)

**GRADE.** Profile of the center of a roadway, or the invert of a culvert or sewer. (DePina, 1972)

**GRID BLOCKS.** The block determined by a convenient public circulation and not by dimensions of lots. In grid blocks some lots have indirect access to public streets. (U.S.D.P.)

**GRIDIRON BLOCKS.** The blocks determined by the dimensions of the lots. In gridiron blocks all the lots have direct access to public streets. (U.S.D.P.)

**GRID LAYOUTS.** The urban layouts with grid blocks. (U.S.D.P.)

**GRIDIRON LAYOUTS.** The urban layouts with gridiron blocks. (U.S.D.P.)

**GOVERNMENT/MUNICIPAL REGULATIONS.** In urban areas, the development of the physical environment is a process usually controlled by a government/municipality through all or some of the following regulations: Master Plan, Zoning Ordinance, Subdivision Regulations, Building Code. (U.S.D.P.)

**HEAD.** (Static) The height of water above any plane or point of reference. Head in feet = (lb/sq. in. x 144)/(Density in lb/cu. ft.) For water at 68°F. (DePina, 1972)

**HIGH-RISE.** Dwelling units grouped in five or more stories with stairs and lifts for vertical circulation. (U.S.D.P.)

**HOT WIRE.** Wire carrying voltage between itself and a ground. (ROTC ST 45-7, 1953)

**HYDRAULICS.** That branch of science or engineering that deals with water or other fluid in motion. (DePina, 1972)

**ILLEGAL.** That which is contrary to or violating a rule or regulation or something having the force of law. (Merriam-Webster, 1971)

**INCOME.** The amount (measured in money) of gains from capital or labor. The amount of such gain received by a family per year may be used as an indicator of income groups. (U.S.D.P.)

**INCOME GROUPS.** A group of people or families within the same range of incomes. (U.S.D.P.)

**INCREMENT (TAX).** A special tax on the increased value of land, which is due to no labor/expenditure by the owner, but rather to natural causes such as the increase of population, general progress of society, etc. (U.S.D.P.)

**INFRASTRUCTURE.** The underlying foundation or basic framework for utilities and services: streets; sewage, water network; storm drainage, electrical network;

- gas network; telephone network, public transportation; police and fire protection; refuse collection, health, schools, playgrounds, parks, open spaces. (U.S.D.P.)
- INSULATOR. A material or body that is a poor conductor of electricity, heat, or sound. (Merriam-Webster, 1971)
- INTERIOR CIRCULATION NETWORK (SITE PLANNING). The pedestrian/vehicular circulation system inside the site. It should be designed based upon the exterior circulation/accesses and land development requirements. (U.S.D.P.)
- INTERVAL. A space of time (or distance) between the recurrences of similar conditions or states. (Merriam-Webster, 1971)
- KILOWATT (kw). (1000 watts) A convenient manner of expressing large wattages. Kilowatt hours (kwh) measure the total quantity of energy consumed in a given time. One kwh represents the use of an average of 1 kilowatt of electrical energy for a period of 1 hour. (ROTC ST 45-7, 1953)
- LAMPHOLE. A vertical pipe or shaft leading from the surface of the ground to a sewer, for admitting light for purposes of inspection. (U.S.D.P.)
- LAND COST. Price: the amount of money given or set as the amount to be given as a consideration for the sale of a specific thing (the site). (Merriam-Webster, 1971)
- LAND DEVELOPMENT COSTS. The costs of making raw land ready for development through the provision of utilities, services, accesses, etc. (U.S.D.P.)
- LAND LEASE. The renting of land for a term of years for an agreed sum; leases of land may run as long as 99 years. (U.S.D.P.)
- LAND-MARKET VALUE. Refers to: 1) the present monetary equivalent to replace the land; 2) the present tax based value of the land; or 3) the present commercial market value of the land. (U.S.D.P.)
- LAND OWNERSHIP. The exclusive right of control and possession of a parcel of land. (U.S.D.P.)
- LAND SUBDIVISION. The division of the land in blocks, lots and laying out streets. (U.S.D.P.)
- LAND TENANCY. The temporary holding or mode of holding a parcel of land of another. (U.S.D.P.)
- LAND UTILIZATION. A qualification of the land around a dwelling in relation to user, physical controls and responsibility. *PUBLIC* (streets, walkways, open spaces): user -anyone/unlimited; physical controls -minimum; responsibility -public sector. *SEMI-PUBLIC* (open spaces, playgrounds, schools): user -limited group of people; physical controls -partial or complete; responsibility -public sector and user. *PRIVATE* (dwellings, lots): user -owner or tenant or squatter; physical controls -complete; responsibility -user. *SEMI-PRIVATE* (cluster courts): user -group of owners and/or tenants; physical controls -partial or complete; responsibility -user. (U.S.D.P.)
- LAND UTILIZATION: PHYSICAL CONTROLS. The physical/legal means or methods of directing, regulating, and coordinating the use and maintenance of land by the owners/users. (U.S.D.P.)
- LAND UTILIZATION: RESPONSIBILITY. The quality/state of being morally/legally responsible for the use and maintenance of land by the owners/users. (U.S.D.P.)
- LATERAL SEWER. A collector pipe receiving sewage from building connection only. (U.S.D.P.)
- LATRINE. A receptacle (as a pit in the earth or a water closet) for use in defecation and urination, or a room (as in a barracks or hospital) or enclosure (as in a camp) containing such a receptacle. (Merriam-Webster, 1971)
- LAYOUT. The plan or design or arrangement of something that is laid out. (Merriam-Webster, 1971)
- LEVELS OF SERVICES. Two levels are considered: *MINIMUM*, are admissible or possible levels below the standard; *STANDARD*, are levels set up and established by authority, custom of general consent, as a model, example or rule for the measure of quantity, weight extent, value or quality. (U.S.D.P.)
- LIFT PUMP. A collection system component that forces sewage to a higher elevation to avoid deep pipe networks. (U.S.D.P.)
- LOCALITY. A relatively self-contained residential area/community/neighborhood/settlement within an urban area which may contain one or more dwelling/land systems. (U.S.D.P.)
- LOCALITY SEGMENT. A 400m x 400m area taken from and representing the residential character and layout of a locality. (U.S.D.P.)
- LOCATION. Situation: the way in which something (the site) is placed in relation to its surroundings (the urban context). (Merriam-Webster, 1971)
- LOT. A measured parcel of land having fixed boundaries and access to public circulation. (U.S.D.P.)
- LOT CLUSTER. A group of lots (owned individually) around a semipublic common court (owned in condominium). (U.S.D.P.)
- LOT COVERAGE. The ratio of building area to the total lot area. (U.S.D.P.)
- LOT PROPORTION. The ratio of lot width to lot depth. (U.S.D.P.)
- LUMINAIRE. In highway lighting, a complete lighting device consisting of a light source, plus a globe, reflector, refractor, housing and such support as is integral with the housing. (DePina, 1972)
- MANHOLE. An access hole sized for a man to enter, particularly in sewer and storm drainage pipe systems for cleaning, maintenance and inspection. (U.S.D.P.)
- MATRIX (OF BASIC REFERENCE MODELS). A set of models of urban layouts arranged in rows and columns. (U.S.D.P.)
- MASTER PLAN. A comprehensive, long range plan intended to guide the growth and development of a city, town or region, expressing official contemplations on the course its transportation, housing and community facilities should take, and making proposals for industrial settlement, commerce, population distribution and other aspects of growth and development. (Abrams, 1972)
- MEDIAN BARRIER. A double-faced guard rail in the median or island dividing two adjacent roadways. (DePina, 1972)
- MESHING BOUNDARIES. Characterized by continuing, homogeneous land uses or topography, expressed as: *LINES*: property lines, political or municipal divisions, main streets, etc.; *AREAS*: similar residential uses, compatible uses (as parks with residential). (U.S.D.P.)
- MICROCLIMATE. The local climate of a given site or habitat varying in size from a tiny crevice to a large land area, but being usually characterized by considerable uniformity of climate. (Merriam-Webster, 1971)
- MODE OF TRAVEL. Manner of moving from one place (the site) to another (other parts of the urban context). (U.S.D.P.)
- MODEL (OF URBAN LAYOUT). A representation of an urban residential area illustrating circulation, land utilization, land subdivision, and utility network of a specific layout and lot. (U.S.D.P.)
- MUTUAL OWNERSHIP. Private land ownership shared by two or more persons and their heir under mutual agreement. (U.S.D.P.)
- NATURAL FEATURES. Prominent objects in or produced by nature. (U.S.D.P.)
- NATURAL UNDISTURBED SOIL. Soils that have not been disturbed by artificial process. Although natural, they depend greatly on local conditions, environment, and past geological history of the formations. (U.S.D.P.)
- NEIGHBORHOOD. A section lived in by neighbors and having distinguishing characteristics. (U.S.D.P.)
- NETWORK EFFICIENCY (LAYOUT EFFICIENCY). The ratio of the length of the network to the area(s) contained within; or tangent to it. (U.S.D.P.)
- NEUTRAL WIRE. Wire carrying no voltage between itself and a ground. (ROTC ST 45-7, 1953)
- NOISE. Any sound (affecting the site) that is undesired (such as that produced by: traffic, airports, industry, etc.) (Merriam-Webster, 1971)
- ODOR. A quality of something that affects the sense of smell. (Merriam-Webster, 1971)
- OHMS (electrical). The unit of resistance to the flow electricity. The higher the number of ohms, the greater the resistance. When resistance is constant, amperage (and wattage) are in direct proportion to voltage. Resistance varies inversely with the cross-sectional area of the wire. Ohms = volts/amperes.  $R = E/I$ . The practical mks unit of electrical resistance that is equal to the resistance of a circuit in which a potential difference of one volt produces a current of one ampere or to the resistance in which one watt of power is dissipated when one ampere flows through it and that is taken as standard in the U.S. (U.S.D.P.; ROTC ST 45-7, 1953; Merriam-Webster, 1971)
- OPTIMIZE/OPTIMIZE. To bring to a peak of economic efficiency, specially by the use of precise analytical methods. (Merriam-Webster, 1971)
- ORGANIC SOILS. Soils composed mostly of plant material. (U.S.D.P.)
- OXIDATION POND (LAGOON). A method of sewage treatment using action of bacteria and algae to digest/decompose wastes. (U.S.D.P.)
- PERCENT RENT/MORTGAGE. The fraction of income allocated for dwelling rental or dwelling mortgage payments; expressed as a percentage of total family income. (U.S.D.P.)
- PIT PRIVY/LATRINE. A simple hole in the ground, usually hand dug, covered with slab and protective superstructure; for disposal of human excreta. (U.S.D.P.)
- PLANNING. The establishment of goals, policies, and procedures for a social or economic unit, i.e. city. (U.S.D.P.)
- PLOT/LOT. A measured parcel of land having fixed boundaries and access to public circulation. (U.S.D.P.)
- POLICE PROTECTION. Police force: a body of trained men and women entrusted by a government with the maintenance of public peace and order, enforcement of laws, prevention and detection of crime. (Merriam-Webster, 1971)
- POPULATION DENSITY. It is the ratio between the population of a given area and the area. It is expressed in people per hectare. It can be: *GROSS DENSITY*: includes any kind of land utilization, residential, circulation, public facilities, etc. *NET DENSITY*: includes only the residential land and does not include land for other uses. (U.S.D.P.)
- POSITION. The point or area in space actually occupied by a physical object (the site). (Merriam-Webster, 1971)
- PRIMER. A small introductory book on a specific subject. (U.S.D.P.)
- PRIVATE LAND OWNERSHIP. The absolute tenure of land to a person and his heirs without restriction of time. (U.S.D.P.)
- PRIVY. A small, often detached building having a bench with one or more round or oval holes through which the user may defecate or urinate (as into a pit or tub) and ordinarily lacking any means of automatic discharge of the matter deposited. (Merriam-Webster, 1971)
- PROJECT. A plan undertaken; a specific plan or design. (U.S.D.P.)
- PUBLIC CIRCULATION. The circulation network which is owned, controlled, and maintained by public agencies and is accessible to all members of a community. (U.S.D.P.)
- PUBLIC FACILITIES. Facilities such as schools, playgrounds, parks, other facilities accessible to all members of a community which are owned, controlled, and maintained by public agencies. (U.S.D.P.)
- PUBLIC SERVICES AND COMMUNITY FACILITIES. Includes: public transportation, police protection, fire protection, refuse collection, health, schools, and playgrounds, recreation and open spaces, other community facilities, business, commercial, small industries, markets. (U.S.D.P.)
- PUBLIC SYSTEM (general). A system which is owned and operated by a local governmental authority or by an established public utility company which is controlled and regulated by a governmental authority. (HUD/AID, Minimum Standards, 1966)
- PUBLIC UTILITIES. Includes: water supply, sanitary sewerage, storm drainage, electricity, street lighting, telephone, circulation networks. (U.S.D.P.)
- PUMP. A device or machine that raises, transfers, or compresses fluids or that attenuates gases especially by suction or pressure or both. (Merriam-Webster, 1971)
- REFUSE COLLECTION. The service for collection and disposal of all the solid wastes from a community. (U.S.D.P.)
- RESERVOIR. Large-scale storage of water; also functions to control fluctuations in supply and pressure. (U.S.D.P.)
- RESIDENTIAL AREA. An area containing the basic needs/requirements for daily life activities: housing, education, recreation, shopping, work. (U.S.D.P.)
- RESISTANCE. The opposition to electrical flow. (Resistance increases as the length of wires is increased and decreases as the cross-sectional area of wires is increased). (ROTC ST 45-7, 1953)
- RIGHT-OF-WAY. A legal right of passage over another person's ground (land), the area or way over which a right-of-way exists such as: a path or thorough-fare which one may lawfully use, the strip of land devoted to or over which is built a public road, the land

occupied by a railroad, the land used by a public utility. Rights-of-way may be shared (as streets; pedestrians and automobiles) or exclusive (as rapid transit routes; subways, railroads, etc.) (Merriam-Webster, 1971; U.S.D.P.)

**ROADWAY (HIGHWAY).** Portion of the highway included between the outside lines of gutter or side ditches, including all slopes, ditches, channels, and appurtenances necessary to proper drainage, protection, and use. (DePina, 1972)

**ROW/GROUPED HOUSING.** Dwelling units grouped together linearly or in clusters. (U.S.D.P.)

**RUNOFF.** That part of precipitation carried off from the area upon which it falls. (DePina, 1972)

**RUNOFF-RAINFALL RATIO.** The percentage (ratio) of stormwater runoff that is not reduced by evaporation, depression storage, surface wetting, and percolation; with increased rainfall duration, runoff-rainfall ratios rise increasing runoff flow. (U.S.D.P.)

**SAND.** Loose, distinguishable grains of quartz/feldspar, mica (ranging from 2mm to 0.02mm in diameter). (U.S.D.P.)

**SANITARY SEWERAGE.** The system of artificial usually subterranean conduits to carry off sewage composed of: *excreta*: waste matter eliminated from the human body; *domestic wastes*: used water from a home/community containing 0.1% total solids; and some *industrial wastes*, but not water from ground, surface, or storm. (U.S.D.P.)

**SEMI-DETACHED DWELLING.** Two dwelling units sharing a common wall (duplex). (U.S.D.P.)

**SEPTIC TANK.** A tank in which the organic solid matter of continuously flowing sewage is deposited and retained until it has been disintegrated by anaerobic bacteria. (Merriam-Webster, 1971)

**SERIES CIRCUIT.** Fixtures connected in a circuit by a single wire. When one fixture is out, the circuit is broken. Fixtures with different amperages cannot be used efficiently in the same circuit. (ROTC ST 45-7, 1953)

**SETTLEMENT.** Occupation by settlers to establish a residence or colony. (U.S.D.P.)

**SEWAGE.** The effluent in a sewer network. (U.S.D.P.)

**SEWER.** The conduit in a subterranean network used to carry off water and waste matter. (U.S.D.P.)

**SEWER BUILDING CONNECTION.** The pipe connecting the dwelling with the sewer network. (U.S.D.P.)

**SEWERAGE.** Sewerage system: the system of sewers in a city, town or locality. (Merriam-Webster, 1971)

**SHAPE.** Form/configuration of the site surface as defined by its perimeter/boundaries. (U.S.D.P.)

**SHOPPING.** (Facilities for) searching for, inspecting, or buying available goods or services. (U.S.D.P.)

**SILT.** Loose, unconsolidated sedimentary rock particles (ranging from 0.02mm to 0.002mm in diameter). (U.S.D.P.)

**SITE.** Land (that could be) made suitable for building purposes by dividing into lots, laying out streets and providing facilities. (Merriam-Webster, 1971)

**SITE AREAS.** Two types are considered: *GROSS AREA*: includes the whole site or the bounded piece of ground. *USABLE AREA*: includes only the portion of the site that can be fully utilized for buildings, streets, playgrounds, recreation facilities, gardens, or other structures. (U.S.D.P.)

**SITE AND SERVICES.** The subdivision of urban land and the provision of services for residential use and complementary commercial use. Site and services projects are aimed to improve the housing conditions for the low income groups of the population by providing: a) *SITE*: the access to a piece of land where people can build their own dwellings; b) *SERVICES*: the opportunity of access to employment, utilities, services and community facilities, financing and communications. (U.S.D.P.)

**SIZE.** Physical magnitude or extent (of the site), relative or proportionate dimensions (of the site). (Merriam-Webster, 1971)

**SLOPE.** Degree or extent of deviation (of the land surface) from the horizontal. (Merriam-Webster, 1971)

**SMOKE.** The gaseous products of burning carbonaceous materials made visible by the presence of carbon particles. (Merriam-Webster, 1971)

**SOIL.** Soil structure: the arrangement of soil particles in various aggregates differing in shape, size, stability, and degree of adhesion to one another. (Merriam-Webster, 1971)

**SOIL INVESTIGATION.** It is the process to find the soil structure and other characteristics. It may include the following stages: initial soil survey, exploratory boring, construction boring. (U.S.D.P.)

**SOIL PIPE.** The pipe in a dwelling which carries the pipe discharge from water closets. (U.S.D.P.)

**SOIL SURVEY (INITIAL).** An on-site examination of surface soil conditions and reference to a GENERAL SOIL MAP. It is used to reveal obvious limitations/restrictions/hazards for early planning consideration. (U.S.D.P.)

**STACK.** The vertical pipe in a dwelling of the soil-, waste-, or vent-pipe systems. (ROTC ST 45-7, 1953)

**STANDARD.** 1) Something that is established by authority, custom or general consent as a model or example to be followed. 2) Something that is set up and established by authority as a rule for the measure of quantity, weight, extent, value or quality. (Merriam-Webster, 1971)

**STANDPIPE.** A pipe riser with tap used as a source of water for domestic purposes. (HUD/AID, Minimum Standards, 1966)

**STORM DRAINAGE.** Storm sewer: a sewer (system) designed to carry water wastes except sewage (exclusively storm water, surface runoff, or street wash). (Merriam-Webster, 1971)

**STREET LIGHTING.** Illumination to improve vision at night for security and for the extension of activities. (U.S.D.P.)

**SUBDIVISION REGULATIONS.** Regulations governing the development of raw land for residential or other purposes. (Abrams, 1972)

**SUBGRADE.** The layer of natural soil or fill (compacted soil) upon which the pavement structure including curbs is constructed. (DePina, 1972)

**SUBMAIN or BRANCH SEWER.** A collector pipe receiving sewage from lateral sewer only. (U.S.D.P.)

**SUBSISTENCE INCOME.** The minimum amount of money required for the purchase of food and fuel for an average family to survive. (U.S.D.P.)

**SULLAGE.** Drainage or refuse especially from a house, farmyard, or street. (Merriam-Webster, 1971)

**TAP (also FAUCET).** A fixture for drawing a liquid from a pipe, cask, or other vessel. (Merriam-Webster, 1971)

**TAX EXEMPTION.** A grant by a government of immunity from taxes; (a ten-year tax exemption on new housing in New York stimulated new construction in the 1920's; to ease its housing shortage, Turkey granted a ten-year tax exemption on new buildings). (Abrams, 1966)

**TAX INCENTIVE.** Favorable tax treatment to induce the beneficiary to do something he would not otherwise be likely to do. (U.S.D.P.)

**TAX STRUCTURE - TAXATION.** The method by which a nation (state, municipality) implements decisions to transfer resources from the private sector to the public sector. (U.S.D.P.)

**TELEPHONE.** An electrical voice communication network interconnecting all subscribing individuals and transmitting over wires. (U.S.D.P.)

**TENURE.** Two situations of tenure of the dwelling units and/or the lot/land are considered: *LEGAL*: having formal status derived from law; *EXTRALEGAL*: not regulated or sanctioned by law. Four types of tenure are considered: *RENTAL*: where the users pay a fee (daily, weekly, monthly) for the use of the dwelling unit and/or the lot/land; *LEASE*: where the users pay a fee for long-term use (generally for a year) for a dwelling unit and/or the lot/land from the owner (an individual, a public agency, or a private organization); *OWNERSHIP*: where the users hold in freehold the dwelling unit and/or the lot/land which the unit occupies; *EMPLOYER-PROVIDED*: where the users are provided a dwelling unit by an employer in exchange for services, i.e. domestic live-in servant. (U.S.D.P.)

**TITLE.** The instrument (as a deed) that constitutes a legally just cause of exclusive possession (of land, dwellings, or both). (Merriam-Webster, 1971)

**TOILET.** A fixture for defecation and urination, esp. water closet. (7th Collegiate Webster, 1963)

**TOPOGRAPHY.** The configuration of a (land) surface including its relief and the position of its natural and man-made features. (Merriam-Webster, 1971)

**TRANSPORTATION.** Means of conveyance or travel from one place (the site) to another (other parts of the urban context). (Merriam-Webster, 1971)

**TRAP.** A fitting that provides a water seal to prevent sewer gases and odors being discharged through fixtures. (ROTC ST 45-7, 1953)

**TREATMENT WORKS.** Filtration plant, reservoirs, and all other construction required for the treatment of a water supply. (ROTC ST 45-7, 1953)

**UNIT.** A determinate quantity adopted as a standard of measurement for other quantities of the same kind. (Merriam-Webster, 1971)

**URBAN TRANSPORTATION.** Means of conveyance of passengers or goods from one place to another along ways, routes of circulation in a metropolitan context. (U.S.D.P.)

**URBANIZATION.** The quality or state of being or becoming urbanized; to cause to take on urban characteristics. (U.S.D.P.)

**USE TAX.** The tax on land aimed primarily at enforcing its use or improvement. (U.S.D.P.)

**USER INCOME GROUPS.** Based upon the subsistence (minimum wage) income per year, five income groups are distinguished: *VERY LOW* (below subsistence level): the income group with no household income available for housing, services, or transportation; *LOW* (1 x subsistence level): the income group that can afford no or very limited subsidized housing; *MODERATE* (3 x subsistence level): the income group that can afford limited housing and rent only with government assistance; *HIGH* (5 x subsistence level): the income

group that can afford housing without subsidy, by cash purchase, through mortgage payments, or by rent; *VERY HIGH* (10 x subsistence level): the income group that represents the most economically mobile sector of the population. (U.S.D.P.)

**USUFRUCT.** The right to profit from a parcel of land or control of a parcel of land without becoming the owner or formal leasee; legal possession by decree without charge. (U.S.D.P.)

**UTILITIES.** Include: water supply, sanitary sewerage, storm drainage, electricity, street lighting, gas, telephone. (U.S.D.P.)

**UTILITY/SERVICE.** The organization and/or infrastructure for meeting the general need (as for water supply, wastewater removal, electricity, etc.) in the public interest. (U.S.D.P.)

**VALVE.** A water supply distribution component which interrupts the supply for maintenance purposes. (U.S.D.P.)

**VENT.** A pipe opening to the atmosphere, which provides ventilation for a drainage system and prevents trap siphonage or back pressure. (ROTC ST 45-7, 1953)

**VIBRATION.** A quivering or trembling motion (such as that produced by: heavy traffic, industry, aircraft, etc.). (Merriam-Webster, 1971)

**VIEWS.** That which is revealed to the vision or can be seen (from the site). (Merriam-Webster, 1971)

**WALK-UP.** Dwelling units grouped in two to five stories with stairs for vertical circulation. (U.S.D.P.)

**WASTE PIPE.** A pipe (in a dwelling) which carries water from wash basins, sinks, and similar fixtures. (ROTC ST 45-7, 1953)

**WATER SUPPLY.** Source, means, or process of supplying water, (as for a community) usually involving reservoirs, pipelines, and often the watershed from which the water is ultimately drawn. (Merriam-Webster, 1971)

**WATERSHED.** The catchment area or drainage basin from which the waters of a stream or stream system are drawn. (Merriam-Webster, 1971)

**WATERWORKS.** The whole system of reservoirs, channels, mains, and pumping and purifying equipment by which a water supply is obtained and distributed to consumers. (Merriam-Webster, 1971)

**WATT.** Watts (w) measure the power of the flow of energy through a circuit. Wattage is the product of volts times amperes. Both watts and horsepower denote the rate of work being done. 746w = 1hp. (ROTC ST 45-7, 1953)

**ZONING ORDINANCE.** The demarcation of a city by ordinance into zones (areas/districts) and the establishment of regulations to govern the use of land and the location, bulk, height, shape, use, population density, and coverage of structures within each zone. (U.S.D.P.)

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## EXPLANATORY NOTES

### QUALITY OF INFORMATION

The quality of information given in drawings, charts and descriptions has been qualified in the following manner:

Approximate	:when deducted from different and/or not completely reliable sources.
Accurate	:when taken from reliable or actual sources.
Tentative	:when based upon rough estimations of limited sources.

### QUALITY OF SERVICES, FACILITIES AND UTILITIES

None	:when the existence of services, facilities and utilities are unavailable to a locality.
Limited	:when the existence of services, facilities and utilities are available to a locality in a limited manner due to proximity.
Adequate	:when the existence of services, facilities and utilities are available to a locality.

### METRIC SYSTEM EQUIVALENTS

#### Linear Measures

1 centimeter	= 0.3937 inches
1 meter = 100 centimeters	= 39.37 inches or 3.28 feet
1 kilometer = 1,000 meters	= 3,280.83 feet or 0.62137 miles
1 inch	= 2.54 centimeters
1 foot	= 0.3048 meters
1 mile	= 1.60935 kilometers

#### Square Measures

1 square meter	= 1,550 square inches or 10.7639 square feet
1 hectare = 10,000 sq. meters	= 2.4711 acres
1 square foot	= 0.0929 square meters
1 acre	= 0.4087 hectares

All income, cost and rent/mortgage data have been expressed in terms of the U.S. equivalent;  
1 US Dollar = 20.0 Baht (May 1981)