WATER AND SANITATION IN URBAN AREAS; SURVEY OF ON-SITE CONDITIONS

BY PALMER DEVELOPMENT GROUP

WRC REPORT NO 561 /1/94

REPORT TO THE WATER RESEARCH COMMISSION

WATER AND SANITATION IN URBAN AREAS: SURVEY OF ON-SITE CONDITIONS

by

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WRC NO. 561/1/1994
ISBN NO. 1 86845 086 4

January 1994

Water Research Commission

BACKYARD LIVING IN INNER CITY TOWNSHIPS

A SURVEY OF ON-SITE ACCESS TO WATER AND WASTE SERVICES

December 1993

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TABLE OF CONTENTS

EXECUTIVE SUMMARY

Background

'Backyard shacks' are informal dwelling structures erected on legally established and serviced residential stands which also have a formal house on the stand. The extent to which they occur has been estimated by the De Loor Commission into housing policy. In mid-1990 there were an estimated 1 225 827 formal housing units in 'Black' townships with an associated 345 670 backyard shacks (De Loor, 1992, 81).

Despite increasing numbers, backyard shacks have attracted relatively little comment, systematic research and official response. This lack of information has meant that studies on access to water and sanitation or stormwater run-off quality had to rely on crude estimates regarding on-site conditions in the denser, older townships.

For example, a report by Van Ryneveld (1991) for Water and Sanitation 2000 workshops in 1991 assumed that 80% of urban backyard shack populations have access to a yard tap, with the remaining 20% having minimal provision ("slight" or limited provision). Very few (10% or less) were assumed to have access to on-site sanitation.

A national survey of urban domestic water supply coverage by Palmer Development Group in 1992 assumed that all backyard shack dwellers have access to a yard tap, whereas an earlier 1991 survey of access to sanitation defined people living in backyard shacks to have nominal access to sanitation on site. Although there was a lack of information regarding on-site conditions, this was considered an adequate level of access to sanitation.

Aims

The aim of the project was to evaluate conditions affecting water and waste services on sites where backyard shacks have been constructed. More specifically, the project aimed to determine:

- to what extent people in the informal dwellings get access to water on site. How free is their use of it and how are they charged by the main household?

- to what extent people in dwellings which do not have a toilet get access to the toilet in dwellings which have one. What do people do as an alternative?

- the situation with regard to solid waste storage and disposal on sites in order to gather information which may be used to assess the implication this may have on stormwater run-off quality.

Overview of the townships studied

A case study approach was followed and 315 sites were surveyed in six different townships across South Africa in the period December 1992 to May 1993. This broad geographic spread was important as conditions in townships and regions differ widely. The townships surveyed were Nyanga (Cape Town), Alexandra (Johannesburg), Mamelodi (Pretoria), Clermont (Durban), Kwa-Thema (Springs) and Thabong (Welkom).

Sites to be interviewed were selected from the parts of formal townships where 'backyard living' was most prevalent. The survey results are therefore representative of local areas in which most sites have at least one backyard shack. The survey is not representative of these townships as a whole, since backyard shacks are generally confined to specific parts of a township (typically the older, more centrally-located sections).

Separate interviews were conducted with the main women or siteholder in the main house and a similar person from one of the backyard shacks. A total of 4 882 people lived on the 315 sites interviewed. The site populations, number of backyard shacks and of shack-dwellers for each of the townships surveyed are shown below.

Town	No of sites surveyed	No of people living on sites interviewed	Persons per site	Backyard shacks per site (A)	No of shack-dwellers per site (B)	No of people per shack (B/A)
Alexandra	56	2 089	37.3	3.9	11.1	2.8
Clermont	54	890	16.5	2.8	8.1	2.9
Kwa-Thema	54	487	9.0	1.8	2.9	1.6
Mamelodi	52	534	10.3	1.5	4.1	2.7
Nyanga	50	378	7.6	1.3	2.4	1.8
Thabong	49	505	10.3	2	5.2	2.6
TOTAL	315	4 882	15.5	2.2	5.7	2.6

Patterns of 'backyard living'

Across the six townships surveyed there appeared to be no direct relationship between how central the township is located (in terms of access to concentrations of employment) and population density. The intensity of backyard sites on formal sites seems to be related to a number of factors, including past and present attitudes of authorities and local civic

structures, backyard shack rentals relative to other informal housing options, the availability of alternatives and general income levels.

As could be expected, the more people who live on a site, the larger was the proportion of backyard shack residents who were not related to the main household and who had to pay monthly rentals. Of the total number of shack-dwellers on sites interviewed, 69% were not relatives of the main household.

% OF SHACK DWELLERS	Alexandra	Clermont	Kwa-Thema	Mamelodi	Nyanga	Thabong	All
who are tenants	60	90	69	46	33	88	69

On most of the sites visited there was evidence of overcrowding, lack of maintenance and repair and the general effects of poverty on the living environment. The general concerns of respondents were a lack of roads, high rentals, the condition of the house and the availability of electricity. One particular concern on nearly half the sites interviewed were problems with rainwater drainage.

On 98 (or 31%) of sites some form of business was conducted from the site. On 32 of these sites businesses were conducted from the shack-dwelling which was surveyed. The most common type of businesses were shebeens, soft drinks and ice cream vendors, fruit and vegetable stalls, spaza shops and sewing and tailoring services.

Access to water and waste services

The survey found that the earlier assumptions by Van Ryneveld (1991) regarding levels of access for backyard shack-dwellers may have been too pessimistic. On only 4% of the sites did the shack-dwellers not have access to water on site. This affected a total of 43 people, or 2% of the 'backyard shack' population included in the survey. Access to on-site toilets was constrained on 10% of the surveyed sites, affecting 182 people.

% OF SITES WITH CONSTRAINED ACCESS TO ON-SITE	Alexandra	Clermont	Kwa-Thema	Mamelodi	Nyanga	Thabong	All
tap(s)	9	4	4	0	0	4	4
toilet(s)	9	4	7	12	18	10	10

Conditions varied greatly between the six townships surveyed. Alexandra was worst off in terms of access to water due, amongst other related factors, to particularly high numbers of

persons per tap on the sites. A shortage of outside toilets contributed to problems with access to sanitation on 18% of sites in Nyanga, the highest for the surveyed areas.

Solid waste emerged as the most problematic of the three services investigated. On 183 (or 58%) of the 315 sites interviewed refuse piled up in the yard and created a nuisance or health problem. This affected a total of 2 876 people, or 67% of the 4 266 persons included in the survey. The worst situation was at Thabong where, due to a collapse of regular refuse removal services, refuse was creating health and pollution problems on 82% of the sites surveyed.

REFUSE PILES UP AND MAKES A MESS	Alexandra	Clermont	Kwa-Thema	Mamelodi	Nyanga	Thabong	All
% house respondents	71	83	41	64	8	78	58
% shack respondents	75	87	32	62	10	82	58

Although the access to services situation was better than expected, overcrowding of facilities was creating tension and social problems on sites. On 23% of the sites were there arguments over access to taps, whereas 29% of sites reported arguments over access to toilets.

% OF SITES WITH ARGUMENTS OVER ACCESS TO	Alexandra	Clermont	Kwa-Thema	Mamelodi	Nyanga	Thabong	All
water	57	48	4	0	16	6	23
sanitation	68	28	11	2	50	12	29

Causes of constrained access, conflict and problems

In relation to water and sanitation services, four aspects which determine levels of access were examined: (a) standard of services, (b) intensity of use of the services, (c) the cost of the services, and (d) social relations on the site.

(a) With regard to **standard of services**, the operation and maintenance of water distribution systems in the townships was not adequate at the time of the survey except for Mamelodi and possibly Clermont. Similarly, with the exception of Mamelodi, operation and maintenance of sanitation was inadequate.

The fewer the number of taps and toilets, the greater was the probability that shack-dwellers did not have access to these facilities. Surprisingly then, the survey found that the decision

by the main household on the extent of 'backyard living' on the site was not significantly based on the number of taps or toilets available on site.

(b) **Intensity of use** relates to the number of people living on the site and visiting the site on a regular basis (e.g. to do business).

% SITES WITH >10 PERSONS	Alexandra	Clermont	Kwa-Thema	Mamelodi	Nyanga	Thabong	All
per tap	60	46	7	34	2	27	31
per toilet	73	57	28	44	14	37	37

The survey found, as was expected, that the more people there were per tap on a site, the greater the likelihood that were arguments over access to the taps, or, in an extreme situation, that shack-dwellers had no access to the taps. But, surprisingly, there was no apparent linkage between the number of persons per toilet and arguments over toilet use. Furthermore, the presence of businesses on the site requiring use of the tap or toilet use by the patrons did not necessarily mean that there would be arguments on the site over such usage.

(c) Regarding the **charges for services** to backyard shack dwellers, no practice of sales of water per unit volume used or per visit charges for toilet use for tenants were reported. Furthermore, water charges to tenants generally were in line with the official water tariff of the township.

(d) **Social relations on site** influenced the degree of access to services. It was found that, during the night, tenants usually can not obtain access to the taps and toilets inside the house. The survey therefore found that shack-dwellers who are not relatives usually have constrained access to services on site if there were no outside taps or toilets. Also there is a situation in Nyanga where the presence of large informal settlements leads site-holders to restrict access to outside taps and toilets during the day.

% OF SITES WITH	Alexandra	Clermont	Kwa-Thema	Mamelodi	Nyanga	Thabong	All
tap(s) outside which the shack-dwellers may use	89	96	100	100	70	96	92
toilet(s) outside which the shack-dwellers may use	59	96	72	98	62	73	77

The main contributing factors for problems with solid waste storage and removal were a shortage of refuse bins and bags for storing waste until collection, and the inadequate refuse removal services operated in five of the surveyed townships.

% OF SITEHOLDERS	Alexandra	Clermont	Kwa-Thema	Mamelodi	Nyanga	Thabong	All
who feel that refuse is not collected often enough	79	78	30	60	12	77	56
who feel that more bins or bags are needed	27	15	4	9	2	0	8

Consequences of 'backyard living'

A more positive side to backyard shacks is that it was found to be an important source of income to the main household (albeit often at the expense of shack-dwellers, whose rents were found to be higher than the total site rental in many cases). Shack-dwellers, on the other hand, are generally able to save on transport costs by living closer to places of employment than would otherwise be possible.

In addition, most backyard shack-dwellers enjoy far better levels of access to services than the populations of informal and squatter settlements with no dedicated or only rudimentary services. For these and other reasons (such as supporting relatives) 'backyard living' is very unlikely to disappear in future. In certain areas it may become less intense with time as serviced plots and housing become available nearby.

However, there are consequences for both environment and services provision. For example, the survey found the growth of informal housing on formal sites creates potential health and stormwater run-off quality problems. The two main problem areas were found to be uncontrolled solid waste export from sites and the overtaxing of bulk sanitation systems, leading to discharges into receiving water bodies through overflows and breakage.

It follows that where population densities are higher than planned on formal sites, considerable problems could be created particularly for waste services. However, such problems mostly related to an already weak maintenance and operating situation in the townships surveyed. It follows that the presence of backyard shacks made an already bad situation worse, but was not the major cause to such operating problems.

Recommendations

a. The information relating to on-site conditions in denser, inner city townships should be used as inputs into other Water Research Commission studies on access to water and sanitation, water usage and stormwater run-off quality. In addition it should also be made available as basic information to research workers and planners working in the field of housing and services provision generally.

b. The survey has shown that planners, urban managers and housing policy-makers have to obtain a better understanding of the dynamics and patterns of 'backyard living'. The role and impact of this important form of spontaneous informal housing will have to be carefully considered in:

- the design of houses and sites;
- in the design of reticulation and bulk infrastructure;
- setting up solid waste removal systems;
- in structuring housing finance and subsidies;
- in setting services tariffs and site rentals; and
- controlling land-use in developing urban areas.

More systematic research to produce policy guidelines - taking the findings of this survey into account - are needed in all the above fields.

c. 'Backyard living' has a number of design implications. In planning serviced sites and housing the need for outside access to taps and toilets should be considered, particularly if sub-tenancy is to play a major role in making formal housing and services affordable to developing urban communities. In addition to toilets and taps, the provision of robust containers for refuse storage should be considered as basic service requirements.

d. Solid waste is emerging as possibly the major problem area for densely occupied environments. Refuse storage and removal should be considered and provided for in plot layout designs. Waste management should not be left for the Town Council to provide as an afterthought, but must be part of an integrated water and waste systems planning exercise with physical, operational and financial implications.

LIST OF FIGURES

ACKNOWLEDGEMENTS

Without the willing help and active cooperation of numerous persons in the Water Research Commission, local authorities, planning and engineering consultants, civic associations and others this report would have been impossible to produce. The help of these people and those not listed is gratefully acknowledged.

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ACKNOWLEDGEMENTS (Continued)

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1. INTRODUCTION

1.1 Informal housing: an overview

The Urban Foundation (1991) estimates that over 7 million people in urban areas in South Africa live in informal housing, making this form of shelter a major component of the urban residential landscape. Over half of the black metropolitan population of the country live in informal housing structures.

Informal housing is to be found in and around many towns and cities in South Africa. Two broad types of informal housing in urban areas are recognised. The first is the **"spontaneous" informal housing**, which is produced outside the framework of formal township planning and development. Typically such housing lack services unless some basic services have been installed as part of an upgrading programme, or where informal housing is located within formal serviced townships. The Urban Foundation (1991) distinguishes between three categories of spontaneous informal housing:

- **Backyard shacks** are erected on sites within formal townships. They are not part of the township establishment process and have been treated in a variety of ways by local authorities, ranging from earlier overt hostility to benign neglect after the demise of Influx Control measures and political changes in the late 1980's. The Urban Foundation (1991) provides the following useful definition:

'Backyard shacks' are informal dwelling structures erected on residential properties in formal legal townships in addition to a main house.

- **Free-standing informal settlements** are clusters of informal structures located on a wide variety of land within, adjacent to or outside formal townships or suburbs.

- **Scattered informal settlements** are small clusters of informal structures often found in locales such as disused mines and on small-holdings. These settlements are typically impermanent and the residents highly mobile.

The second type of informal housing is that constructed in the context of official **"site-and-service"** schemes. These area legally established townships offering legal tenure and some services. Levels of servicing vary from the very basic (pit latrines and communal water points) to the relatively sophisticated (water-borne sewerage, piped water to individual houses).

1.2 Backyard shacks: background to the project

De Loor (1992) estimates that 377 719 (or 28%) of the 1 330 969 informal housing structures in South African urban areas in mid-1990 were backyard shacks. Only 32 049 (or 8%) of these backyard structures were not located in formal black townships.

De Vos (1992) gives the number of backyard shacks in urban areas in 1991 as 278 350 structures, somewhat lower than the De Loor estimates. Van Gas (1992) estimates the backyard shack population to be 12% of all households in the PWV, 18% in Port Elizabeth, 9% in the Durban Functional region, and 4% in the Cape Town Metropolitan area.

Beyond estimates around total numbers, very little is currently known regarding the on-site and local dynamics and patterns of 'backyard living'. The Urban Foundation (1991) notes that

> "*In most cities, spontaneous informal housing has multiplied rapidly, especially in free-standing settlements. This growth is often highly visible, attracting a great deal of attention and sometimes precipitating conflict. By contrast, increasing numbers of backyard shacks and outbuildings have attracted relatively little comment, systematic research and official response, despite the fact that they comprise a significant proportion of the informal housing...*".

The general lack of information on 'backyard' living conditions also applies to water supply and waste services (sanitation and solid waste removal). Attempts by the **Water and Sanitation 2000** group to determine the current extent of coverage of water supply and sanitation provision was complicated by uncertainties regarding conditions on sites with numerous backyard shacks.

- The commonly occurring situation in formal townships is one where there is a full waterborne sanitation. It could be assumed that everyone who lives there has access to such sanitation. However, reports from development workers indicated that access to the toilet by people who live in backyard shacks may be limited or prevented altogether.

- This situation could also affect access to water: little was known of how backyard shack dwellers get water from the main household.

Given these uncertainties, Van Ryneveld (1991,6) based his estimated coverage figures for water and sanitation in urban areas on the following broad assumption regarding backyard shacks:

> "... *those in backyard shacks and outbuildings/garages have shared access to the water and sanitation of the main building, but (especially where there are more than two dwellings per erf) access to these services would be limited*".

For national coverage estimates, Van Ryneveld (1991) assumed that **most (80%)** of urban backyard shack populations have access to a **yard tap**, with the remaining 20% having **minimal provision** (defined as "slight", where access to provision is limited). **Very few (10% or less)** were assumed to have access to **on-site sanitation.**

A national survey of urban domestic water supply coverage by Palmer Development Group in 1992 assumed that **all** backyard shack dwellers have **access to a yard tap.** In the survey report (Palmer Development,1993a,14) it is, however, noted that:

> "*This* [assumption] *may not be correct as its is possible that backyard shack dwellers who are tenants may be constrained from getting access to the tap by the landlord who occupies the main house. However, there is currently no information available to determine to what extent this occurs*".

In an earlier 1991 national survey an access to sanitation in South Africa, Palmer Development (1993) defined people living in backyard shacks as having **nominal access** to sanitation on site. Due to the lack of information regarding actual on-site conditions, this was considered **adequate access** to sanitation for the purposes of the survey.

These broad assumptions on levels of access needed to be tested through on-site surveys. Information relating to what happens on the individual sites in these dense, inner city townships would provide inputs into other research studies on access to water and sanitation, solid waste removal, water usage and stormwater run-off quality. It would also provide basic information to a wide spectrum of research workers and planners working in the field of housing or services provision generally.

1.3 Project aims

The aim of the project was to evaluate conditions affecting water supply and waste services on individual sites in developing urban areas for lower income groups where there are multiple dwellings on the site.

The specific aims were:

One: to determine to what extent people in the informal dwellings get access to water on site. How free is their use of it and how are they charged by the main household?

Two: to determine to what extent people in dwellings which do not have a toilet get access to the toilet in dwellings which have one. What do people do as an alternative?

Three: to determine the situation with regard to solid waste storage and disposal on sites in order to provide information which would assess the implication this may have on stormwater run-off quality.

1.4 Methodology

Choice of townships

A case study approach was followed and surveys investigating on-site conditions were carried out in six different townships across South Africa. This broad geographic spread is important as conditions in townships and regions of the country differ widely.

Initially is was decided to study three townships from the PWV area and one each from Durban, Port Elizabeth and Cape Town metropolitan areas. However, due to high levels of political unrest in the Eastern Cape over the first five months of 1993, survey work in KwaZakhele (Port Elizabeth) had to be postponed twice and eventually cancelled. A township from the Free State Goldfields was chosen as a replacement. The six townships (and date of survey) were:

Nyanga, Cape Town (December 1992)
Alexandra, Johannesburg (March 1993)
Mamelodi, Pretoria (March 1993)
Clermont, Durban (April 1993)
Kwa-Thema, Springs (May 1993)
Thabong, Welkom (June 1993)

Township surveys

In each of the townships visited the interview team followed the same approach. Before the township was visited the survey team coordinator contacted the local civic structures and explained the aim of the survey and for what purpose the information would be used. The civics officer then discussed this with civic members and in all cases survey work was allowed to proceed.

The brief for survey work in each of the townships was the following:

STEP 1	Obtain or view the most recent aerial photographs of the township. See in what part of the township backyard living is most intense. Draw this survey area on a map.
STEP 2	Choose at random 65 stands from the survey area which will be visited in turn until 50 stands have been interviewed. Each interviewer obtains a number of addresses and sets out on foot. If there are no people available at the address to be interviewed (or people do not want to talk to the interviewer) the next address on the list is visited.
STEP 3	Using the prepared questionnaires, interview the main women or person in the house and then the main women or person in one of the backyard shacks. There are separate questionnaires for the house and the shack. The interviews take up to an hour to complete, and often one has to stay for a visit.
STEP 4	While the interviews are being conducted, one of the team visits the Town Council offices. He speaks to the Town Engineer and Town Treasurer to obtain background information on how well water and waste systems are operating. Evidence of water pollution is also collected.
STEP 5	The interview team coordinator collects the completed questionnaires and checks them. Often he asks a interviewer to return to an address to obtain more information. He also visits some of the interviewed sites to make sure that interviews were conducted adequately.
STEP 6	The 50 or so questionnaires are sent to Cape Town where they are codified (many questions were open-ended) and entered into a database for further analysis.

In order to get a sound understanding of the physical conditions on the site and also of the relationship which exists between the main household and the backyard shack dweller, two separate 'in-depth' interviews were conducted. One interview was conducted with the site owner or senior woman on the site, and another with a similar person from one of the informal housing structures on the site.

The actual number of sites per study area for which two questionnaires were completed (and the number of people who lived on all the sites visited) are:

TOWNSHIP	No of sites interviewed	No of people living on the sites interviewed	Average no of persons per site interviewed
Alexandra	56	2 089	37
Clermont	54	890	16
Kwa-Thema	54	487	9
Mamelodi	52	534	10
Nyanga	50	378	8
Thabong	49	505	10
TOTAL	315	4 882	15

The survey was conducted on 315 sites in six different townships. This means a total of 630 questionnaires were completed. The questionnaires obtained information about the living conditions of 4 882 people on the 315 sites.

At the end of every interview the attitude of the person who was being interviewed towards the survey and the questions asked was noted. The number of 'positive' and 'negative' interviews (with 'average' left out) were:

MOSTLY POSITIVE	CLERMONT: 72% positive - 3% negative
	THABONG: 69% positive - 5% negative
	MAMELODI: 66% positive - 4% negative
	ALEXANDRA: 53% positive - 7% negative
MOSTLY OK	KWA-THEMA: 46% positive - 0% negative
	NYANGA: 27% positive - 14% negative

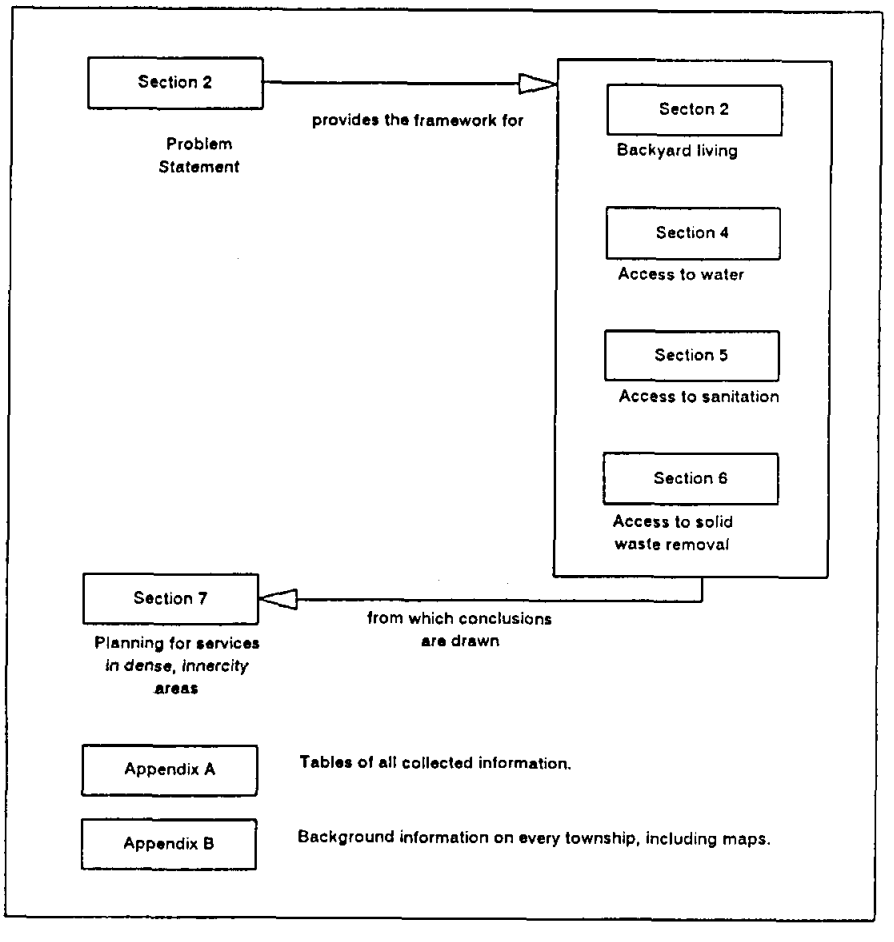
1.5 Document structure

The structure of the document reflects the procedure used for data processing:

CONSOLIDATION	**A computer program was written which extracted from the data from each township, the information asked for in the questionnaire. Answers were checked for reasonability and some data had to be discarded where sample sizes were too small.**
COMPILATION	**The information obtained from the program was consolidated into tables around particular topics or aspects of water and waste services.**
ANALYSIS	**From the consolidated tables, the information gathered was used to address the three original aims of the study. Graphs and regression analyses were used to test linkages between information.**

This report presents in its main body of text only the findings of the survey relating to the three original aims of the project. Additional information is given in the appendix.

The document is structured as follows:

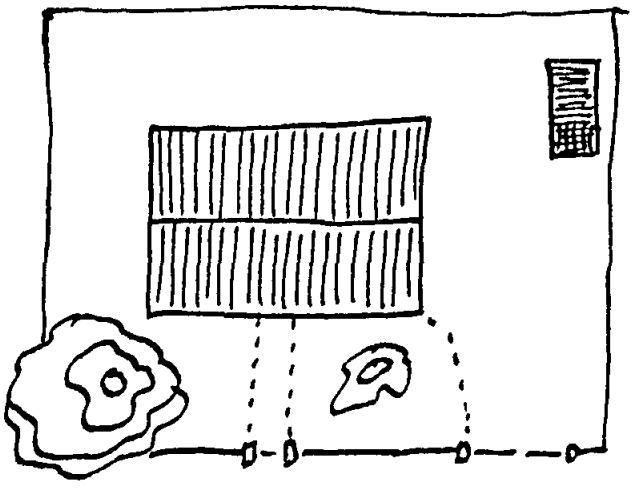


2. PROBLEM STATEMENT

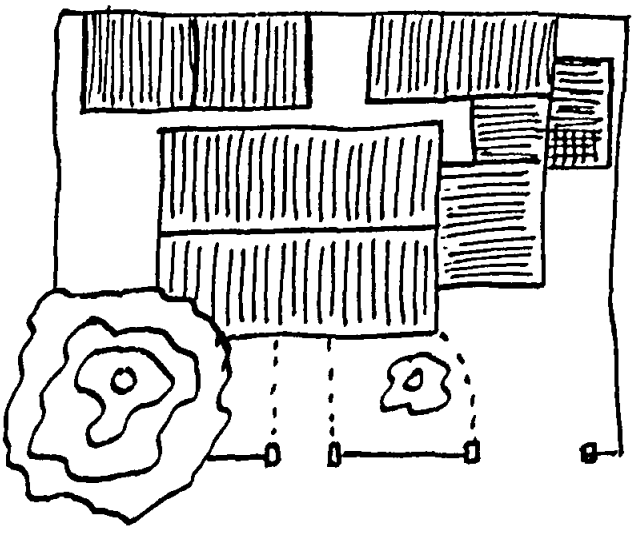
This section provides the framework for discussion in the following sections. It explains how the report analyses the information collected from interviews to address the three aims of the project.

2.1 On-site conditions: an example

In May 1993 the project team visited a site in Morapedi Road, Kwa-Thema, the layout of which is shown below.



This drawing shows the site as it was originally constructed in 1964. It is a 300 m² plot with a two-bedroom house. When the engineers originally planned the water and waste services to this site, they assumed a site population of 5 people. The site has a toilet and two taps (one outside and one in the kitchen). There is no bathroom.

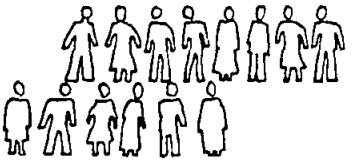


This is the site in May this year. There were three tin and wood dwellings on the site in addition to the formal house. The son of the couple who rent the house from the Council lives in one of the outside shack-dwellings with his girlfriend. He does not pay rent. The other two dwellings are rented by another young couple and by two teenagers who attend school in the township. The shack-dwellings belong to the family living in the house.

Instead of the five people engineers and planners thought would be living on the site, there were 12 people in living on the site May this year (six in the house and six outside). Yet the services provided to the site - the number of taps, toilets, refuse bins - have not been improved since the stand and house were constructed in 1964.

For example, there were originally 5 people using the toilet:

Now the same toilet is used by 12 people, all the people living on the site:



More people per toilet means some may have to wait a long time for a chance to 'go'. This can cause arguments and problems, especially early in the morning when everybody is in a rush. People may be forced into a situation where defecating on the ground is their only option, resulting in health risk and high organic and pathogen loads in stormwater run-off.

If all sites in Kwa-Thema are similarly overcrowded, water consumption and waste water flows would be far in excess of what the bulk systems have been designed to cope with. Apart from the operation and maintenance problem which this could create, waste water overflows due to blockages or overloading would also contribute to poor stormwater run-off.

2.2 Reasons for 'backyard living'

Why would people want to live in 'backyards' in informal structures?

Two important factors create a demand for 'backyard living':

- the lack of affordable housing for a large percentage of the population;
- a physical shortage of houses and serviced sites in central locations close to centres of employment.

Owners and tenants of formal sites in townships make their plots available for such informal subdivision for the following reasons:

- tenants on the site can provide income; and
- supporting relatives by providing free or cheap accommodation on site is often a social imperative.

Hiring or constructing an informal dwelling on the plot of a relative or landlord has become a very important housing option for a large percentage of the urban population. For the newly urbanised, backyard shacks are often the only obtainable and/or affordable housing option.

The Urban Foundation (1991) notes that the incidence and general importance of backyard shacks and outbuildings in an urban area seems to depend on a variety of factors:

- whether or not local authorities tolerate backyard shacks;

- the current rental in backyard shacks by comparison with other accommodation options (e.g. free-standing shack-settlements);

- relatively cheap and accessible land seems to cause people to opt for free-standing settlements rather than backyard shacks (e.g. in Durban almost half of the huge population now resident in free-standing shack settlements previously lived in the formal townships (Tongaat-Hulett, 1989));

- available services and facilities, the incomes of people, local family dynamics and a variety of other factors influence the informal housing mix.

It is mainly the more centrally located townships (in terms of employment) and the poorer and older formal parts of townships which have the highest degree of multiple dwellings on single sites.

In the next two sub-sections the potential micro (site) and macro (local area) effects of an increase in the number of people living on a site are described.

2.3 Micro effects

Levels of access to water and waste services at the household level are determined by four related factors (see Figure 1):

- the provision of services to the site and its capacity, quality, operation and maintenance;

- intensity of use as determined by the number of persons with whom the infrastructure is shared;
- the affordability of the service to the household; and
- the ease of physical access as determined by social, legal and design factors.

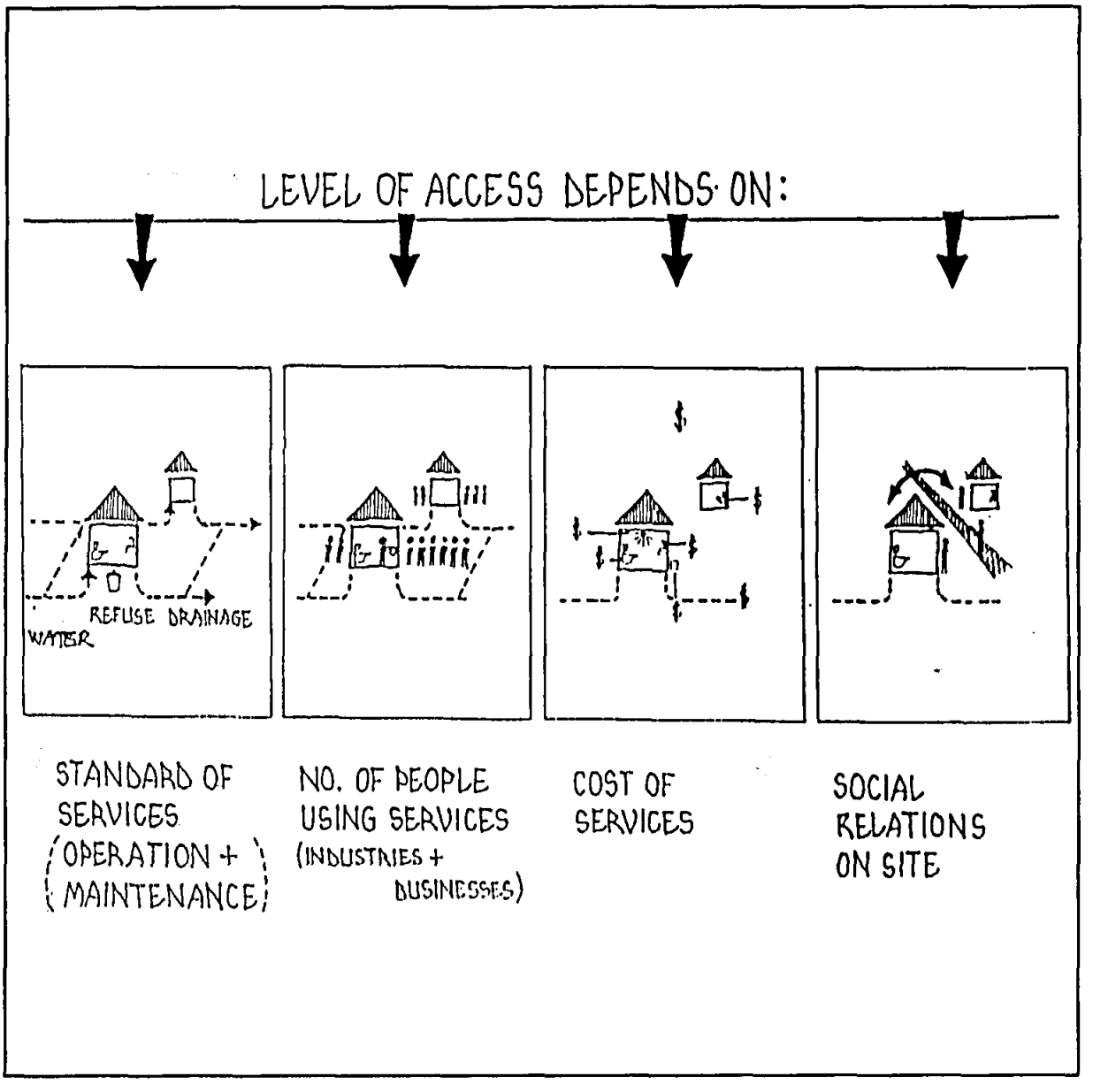


Figure 1 : Factors affecting household access to water and waste services

Multiple dwellings per site can have a number of positive and negative consequences regarding access to services and other living conditions.

a) Possible positive consequences

- Shack-dwellers can obtain on-site access to water and waste services;

- the landlord can receive a reliable income from tenancy which can supplement income and improve the ability to pay for services; and

- the total residential floor area on the site is increased at a low cost compared to formal additions to the core house.

b) Possible negative consequences

- Although total floor area may increase by constructing backyard shacks, sites become more crowded with less outdoor and living space available per person. This could result in conflict due to lack of privacy and overcrowding, and creates greater fire risk;

- service standards per person are reduced, possibly causing conflict and tension over access to taps and toilets;

- high intensity use of services could lead to problems for the operation of services, eg. blockages of pipes and piling of refuse which, in turn, could represent a health hazard;

- landlords may exploit tenants by charging high rents, by refusing access to services on site or by charging high prices for water, electricity and toilet use.

2.4 Macro effects

The main macro effect of 'backyard squatting' is the increase in population density, which increases the intensity at which land, services and facilities are used. Such increased densities could have positive and negative consequences:

a) Possible positive consequences

- The number of people who have access to the mostly adequate engineering services and facilities provided on-site in formal urban areas could increase;

- where spare capacity exists to provide services and facilities, greater levels of efficiency can be achieved as consumption levels increase;

- increased consumption of services could make upgrading of infrastructure viable given particular economies of scale;

- more households can locate closer to work in centrally-located townships, thereby saving transportation costs (public and private) and travelling time; and

- more lower income households living in one area create informal and formal trading opportunities, as spending power is spatially concentrated.

b) Possible negative consequences

- Services and facilities were often not planned to initially accommodate a larger population, which could cause overloading and breakdown of services;

- increased roof run-off due to backyard shacks increases stormwater run-off intensity;

- the breakdown and overloading of services can result in public health hazards and environmental degradation through, for example, poor quality stormwater run-off; and

- overcrowding of facilities and structures can create social conflicts and reduce quality of life.

2.5 Access to services and protection of environmental quality

The success of the export of solid and liquid waste from urban areas into the natural environment depends on the capacity of the natural systems to absorb these products (see Figure 2). This absorptive capacity is determined by the unique characteristics of the receiving (water and soil) bodies, and by the volume and characteristics of the waste products.

The controlled removal of waste products from urban areas and its treatment before release can succeed in keeping negative effects on the environment limited or at least at acceptable levels. When wastes are discharged into receiving bodies in an uncontrolled manner ('diffuse-source pollution'), then damage to receiving bodies is much harder to control or limit.

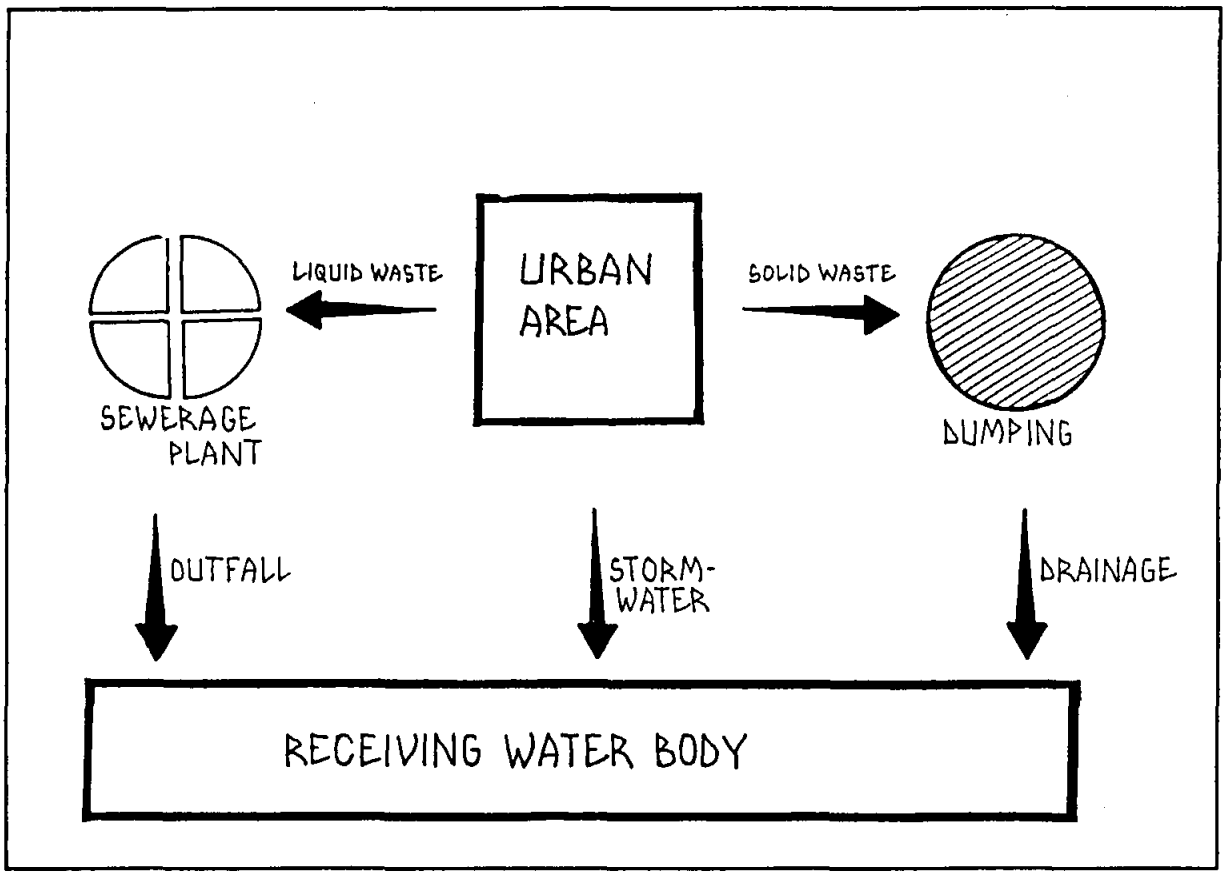


Figure 2 : The export of waste from urban areas

It follows that the impacts from water and waste on the receiving natural systems is, inter alia, determined by:

- the levels of access to services on individual sites;
- the capacity and quality of services;
- the efficient management of services; and
- use patterns (type of waste, etc).

The growth and introduction of 'backyard living' in urban areas would impact on the first two of the above factors (see Figure 3):

- where backyard shack dwellers have no access to on-site services, uncontrolled export of waste could occur through informal disposal and wash-off; and

- increased intensity of use can overtax the capacity of the water and waste systems, leading to uncontrolled waste discharges into receiving bodies through overflows and breakage.

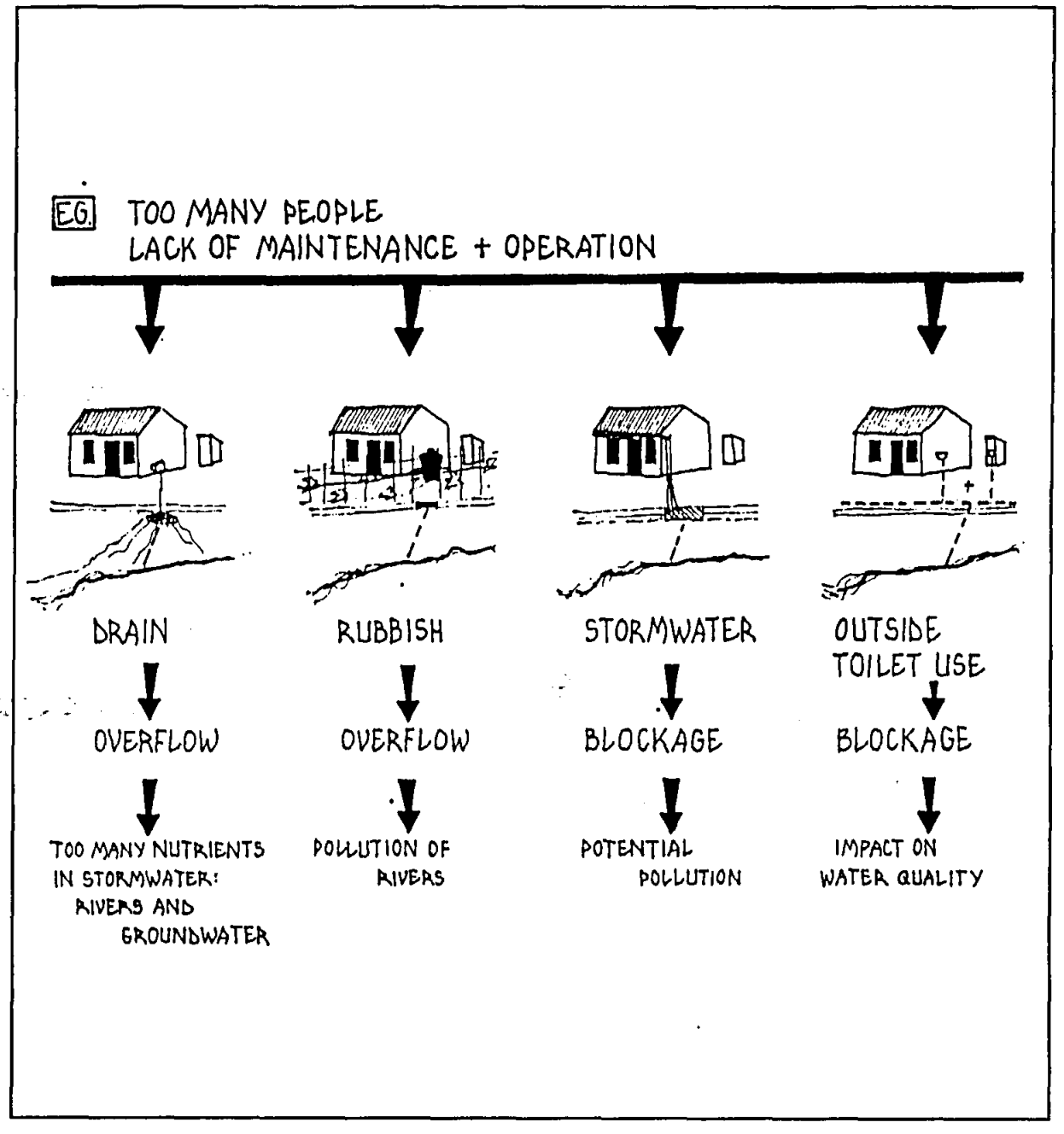


Figure 3 : Possible pollution effects resulting from 'backyard living' conditions

If negative environmental impacts from 'backyard living' in urban areas are to be kept to acceptable limits in future, the following two crucial questions need to be addressed:

- *do households living in 'backyard shacks' have ready access to water and waste services on site?*

- *can the existing services infrastructure cope with increased population densities?*

The following sections attempt to address the first of the two questions with some reference to the second question.

3. BACKYARD LIVING

What were the main features of 'backyard living' on the sites surveyed? How many shacks and people were there per site? Were the shack-dwellers relatives or tenants? How much were they paying to live on the site?

3.1 Extent of 'backyard living'

a) Housing

On the 315 sites surveyed there were an average of 2.2 shack structures additional to the core house on site.

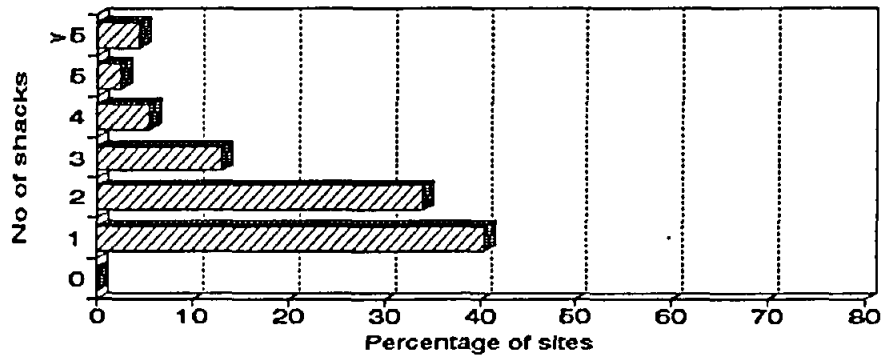


Figure 4: Shacks per site for all sites surveyed

AVERAGE NUMBER OF SHACKS	Alexandra	Clermont	Kwa-Thema	Mamelodi	Nyanga	Thabong	All
per site	3.85	2.78	1.83	1.5	1.28	2.02	2.2

Alexandra had the highest number of shacks per site, with some sites having as much as 11 shack-dwellings around the house. However, unlike the other townships surveyed, site boundaries in Alexandra are vaguely defined. Typically more than one household rents a part of the main house. Therefore 'site' in Alexandra often refers to the portion of the original 1 500m^2 yard which a household living in the main house controls. The situation in Nyanga was very different. Here there was an average of only 1.28 shacks per site, with a median of one shack per site.

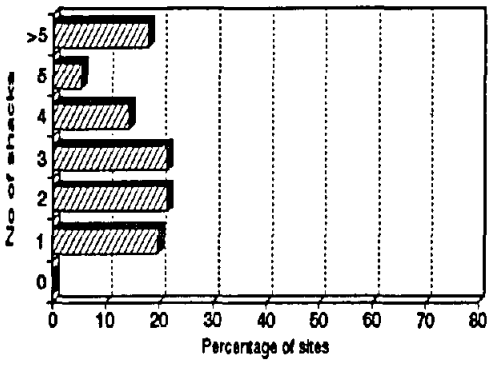


Figure 5: Shacks per site in Alexandra

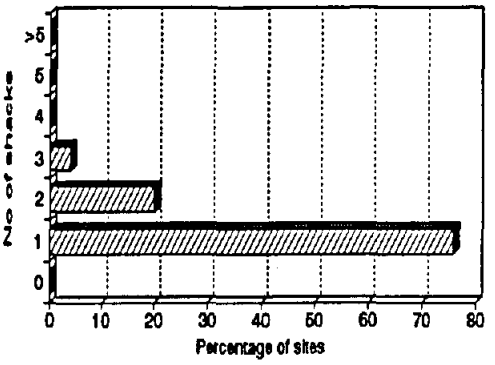


Figure 6: Shacks per site in Nyanga

The number of shacks per site counted in the survey is higher than the overall township ratios of houses to 'backyard shacks'. This is not surprising, for backyard shacks are usually concentrated only in a section of the town. For example, in Alexandra backyard shacks are constructed only in the original West Bank area, whereas in Thabong it is the older, more western section closest to Welkom which has extensive 'backyard living'. The same pattern applies to Clermont, Mamelodi and Kwa-Thema. In Nyanga the presence of large pockets and strips of informal settlements within the formally developed area has led to less intense 'backyard living'. The survey was conducted in the more intensely populated sections of the six townships (the geographic extent of the survey area in each township are shown with other background information in Appendix A). The overall housing situation in each of the six townships as in May this year is shown below.

TOWNSHIP	FORMAL HOUSES Units (A)	BACKYARD SHACKS Units (B)	BACKYARD SHACKS/ HOUSE		FREE-STANDING SHACKS Units	FLATS (units)	HOSTEL BEDS
			Overall (B/A)	Survey area			
Alexandra	15 012	14 250	0.95	3.83	4 750	1 452	8 379
Clermont	3 750	4 000	1.07	2.78	none	none	none
Kwa-Thema	12 430	13 000	1.05	1.83	3 140	none	7 482
Mamelodi	21 500	13 000	0.60	1.5	6 000	none	10 982
Nyanga	5 360	3 033	0.57	1.28	9 210	none	3 900
Thabong	11 000	15 000	1.36	2.02	6 000	none	none
TOTAL	69 052	62 283	0.90	2.2	29 100	1 452	30 743

b) Population

There were an average of 15.5 persons living on sites interviewed (with a median of 8.23). The average number of persons living in the house was 8.21 and the 'backyard shack' population 5.71. Based on the number of shacks per site, the average number of occupants per shack was 2.6.

Figure 7 shows for all the sites interviewed the total site, house and backyard shack(s) population density (i.e. total number of people living in backyard shacks).

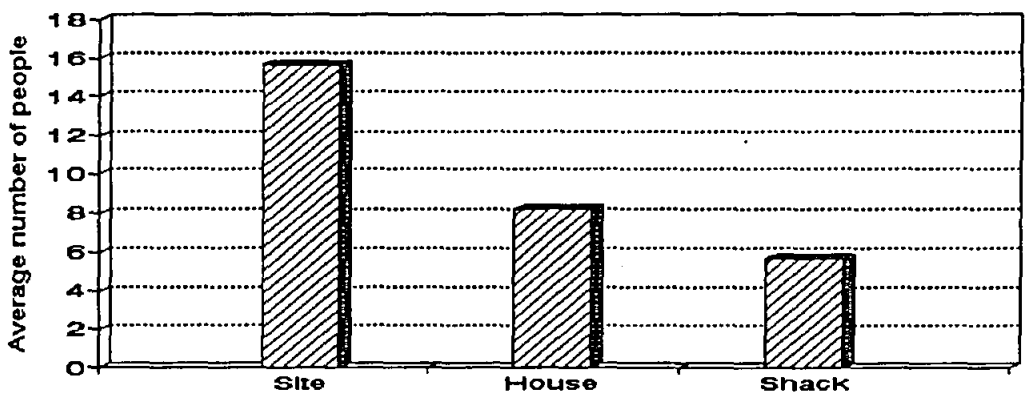


Figure 7: Population density on all sites surveyed

Following the pattern of shacks per site, average site populations were the highest in Alexandra (37.3) and the lowest in Nyanga (7.56). As with number of shacks the average for Alexandra should be treated cautiously due to the varying definitions of 'site'. Thabong has the highest number of backyard shack dwellers in relation to total site populations, which reflects the high demand for informal housing on the relatively small plots in Thabong.

AVERAGE POPULATION	Alexandra	Clermont	Kwa-Thema	Mamelodi	Nyanga	Thabong	All
per site	37.3	16.5	9.0	10.3	7.6	10.3	15.5
in backyard shacks	11.07	8.11	2.89	4.06	2.44	5.23	5.71
in backyard shacks as a % of total site population	29.7	49.2	32.1	39.4	32.1	50.8	36.8

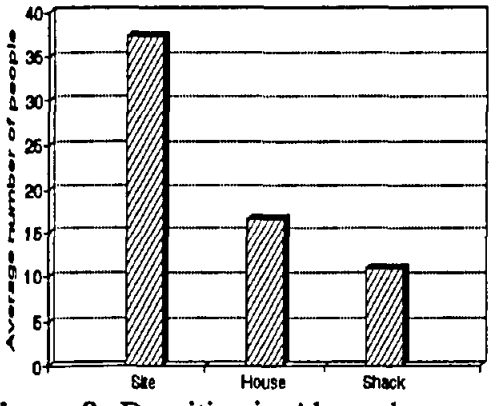


Figure 8: Densities in Alexandra

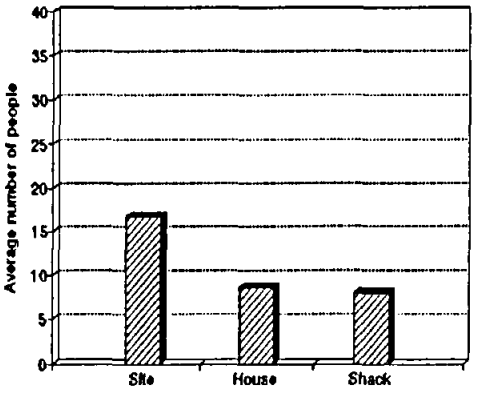


Figure 9: Densities in Clermont

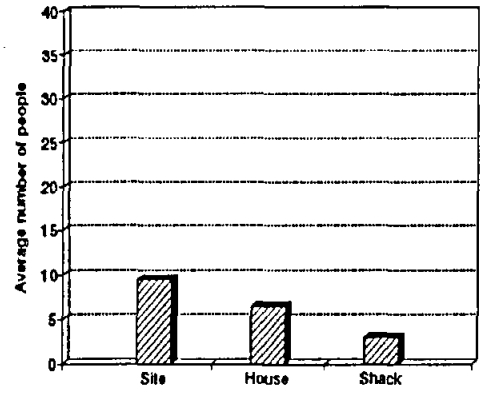


Figure 10: Densities in Kwa-Thema

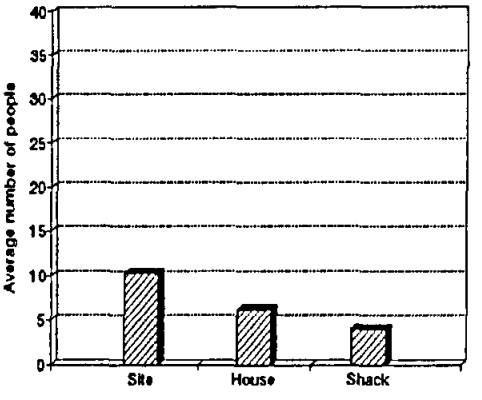


Figure 11: Densities in Mamelodi

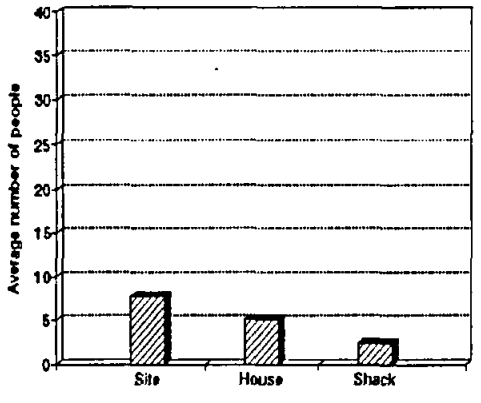


Figure 12: Densities in Nyanga

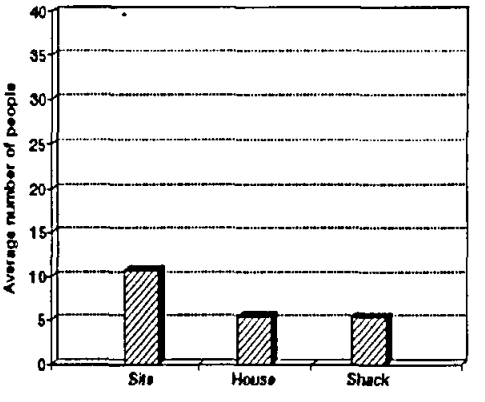


Figure 13: Densities in Thabong

3.2 Reasons for 'backyard living'

a) Demand for 'backyard shacks'

Across the six townships surveyed there appears to be no direct relationship between how central the township is located (in terms of access to concentrations of employment) and population density.

The location within the various metropolitan areas of the six townships surveyed is shown on the context maps in Appendix A. These are all relatively 'desirable' locations for the poor who seek proximity to employment opportunities and access to services and facilities which older, inner city townships generally offer. Alexandra lies in the heart of the Johannesburg North industrial belt, and its high population densities are not unexpected. Mamelodi has an equally attractive location in terms of access to industrial areas, but its 'backyard living' is much less intense. The reasons for intensification of population within townships are varied and include factors such as availability of alternatives (eg nearby informal settlements), past attitudes of authorities, local civic structures, general income levels and others (see discussion section 2.2).

b) Supply of 'backyard shacks'

Housing relatives on the site

The more people per site, the larger the proportion of backyard shacks residents who are not related to the main household and have to pay monthly rentals.

The proportion of tenants on interviewed sites in Alexandria and Clermont is shown in relation to the number of persons living on the site in Figure 14 and Figure 15 as representative examples.

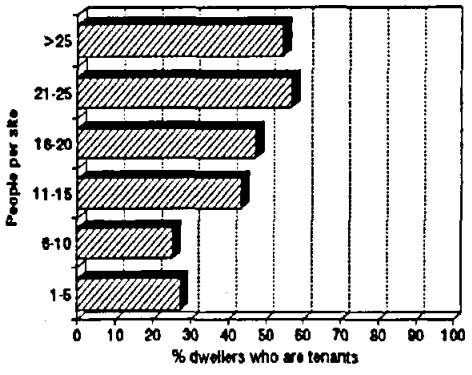


Figure 14: Proportion tenants on sites in Alexandra

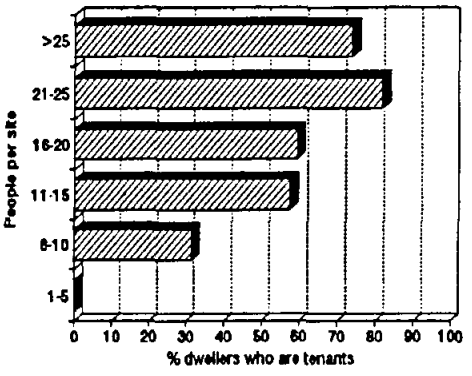


Figure 15: The proportion tenants on sites in Clermont

Whether relatives or tenants of the main household live in the backyard dwellings is very likely to influence the degree to which shack dwellers have access to the house, its services and the cost of living on the site. The proportion of shack dwellers who are tenants (not relatives) and shack dwellers who have to pay rent to the main household were:

% OF SHACK DWELLERS	Alexandra	Clermont	Kwa-Thema	Mamelodi	Nyanga	Thabong	All
who are not relatives	60	90	69	46	33	88	69
who pay rent	61	96	72	58	40	77	70

The number of shack dwellers who are tenants in Thabong, Nyanga and Clermaont, and the survey as a whole, in relation to the number of shack dwellers living on the site is shown below.

In Nyanga there were no sites with more than six shack-dwellers per site, which explains the difference between the tenant distribution for this survey area and that of Thabong and Clermont. A curious aspect of the Thabong results was the absence of tenants on sites with between 10 and 12 backyard shack-dwellers (see Figure 16). The results have been confirmed as being correct.

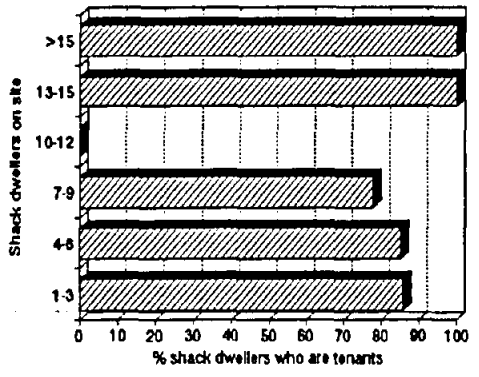


Figure 16: Proportion of tenants amongst shack dwellers on sites in Thabong

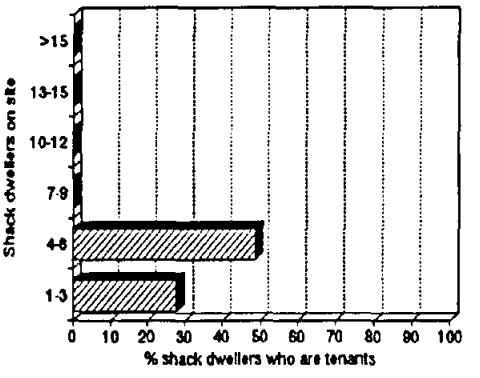


Figure 17: Proportion of tenants amongst shack dwellers on sites in Nyanga

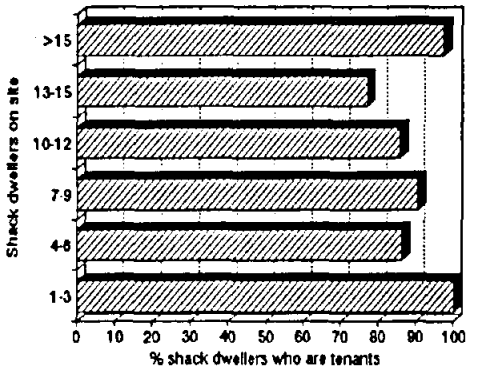


Figure 18: Proportion tenants amongst shack dwellers in Clermont

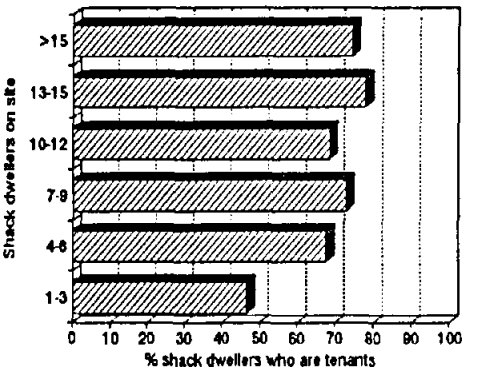


Figure 19: Proportion of tenants amongst shack dwellers on all sites surveyed

Income from rentals

On-site tenancy is an important source of income for the main household on site. Of the 212 sites where shack respondents had to pay rent (including service charges), the monthly average was R35.05 and the median R 30.64 per shack.

The average rentals charged to the siteholder in the six townships is shown in Figure 20. From the comparison of these average shack rentals to site rentals in Figure 21 it is evident that the 'landlords' are earning enough from letting people live in their yard to pay their monthly rentals/service charge and earn a surplus (shown is the rent income from one shack-

dwelling interviewed per site). Where there are more shacks, income could be higher. The average number of shacks per site was 2.2.

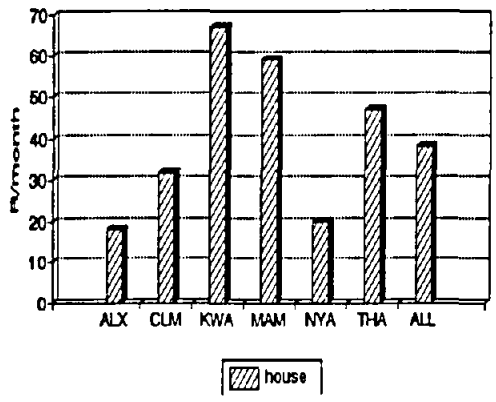


Figure 20: Average site rentals/service charges (per month)

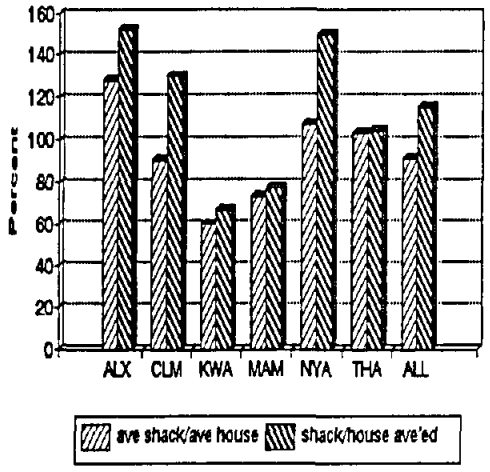


Figure 21: Shack rentals as a proportion of site rentals

In Figure 21 two methods are used to calculate average shack rentals versus site rentals. Firstly, all shack and all site rentals are averaged and them divided into each other for each township. Secondly, shack and site rentals for each site are divided into each other and the sum for the township averaged.

Ownership of sites

There appears to be no relationship between private ownership of a site and house and the degree of 'backyard living' on the site.

	Alexandra	Clermont	Kwa-Thema	Mamelodi	Nyanga	Thabong	All
% of surveyed sites belonging to the main household on the site	14	69	74	92	90	96	72
number of people living in backyard shacks	11.07	8.11	2.89	4.06	2.44	5.23	5.71

3.3 On-site arrangements

On most the sites visited there was evidence of overcrowding, lack of maintenance and repair and the general effects of poverty on the living environment.

General problems on the site

This is what shack and site respondents told interviewers when asked for any final comments:

- *37 (or 6%) wanted better roads*
- *27 (or 4%) thought rents were too high (mostly in Clermont and Mamelodi).*
- *17 (or 3%) noted that the house or shack-dwelling is in a state of disrepair and badly maintained (mostly in Alexandra).*
- *17 (or 3%) noted that they are boycotting rent payments (mainly in Alexandra).*
- *12 (or 2%) wanted electricity services improved.*

Other problems noted were that backyard shacks make the site too crowded (8); people want their own homes and sites (8 shack-dwellers); services need to be improved generally (6).

One particular concern was the drainage of rain water from the site (see Figure 22).

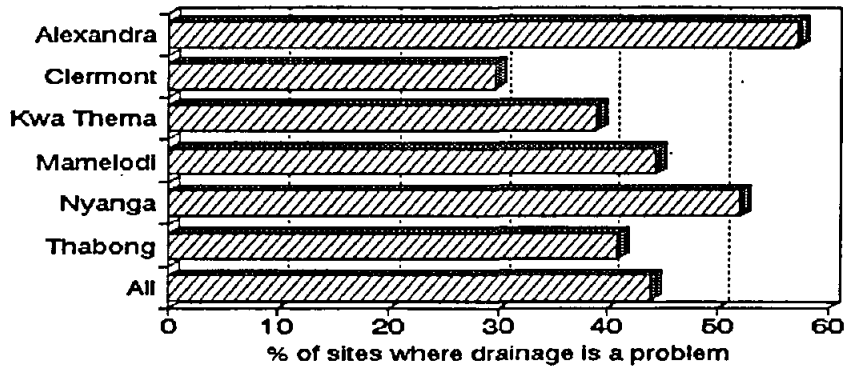


Figure 22: Problems with rainwater drainage

Businesses on the site

On 98 (or 31%) of sites there was some form of businesses conducted from the site. On 32 of these sites there were some businesses conducted from the shack-dwelling which was surveyed.

The most common type of business on sites was shebeens (28), followed by soft drinks and ice cream selling (14), fruit and vegetables (12), spaza shops (10) and sewing and tailoring (10).

Spatial arrangements on site

A wide variety of spatial arrangements are used to organise the shacks on the site. Some representative examples were taken from each township and are shown in Figure 23 to Figure 28 at a scale of roughly 1:2000.

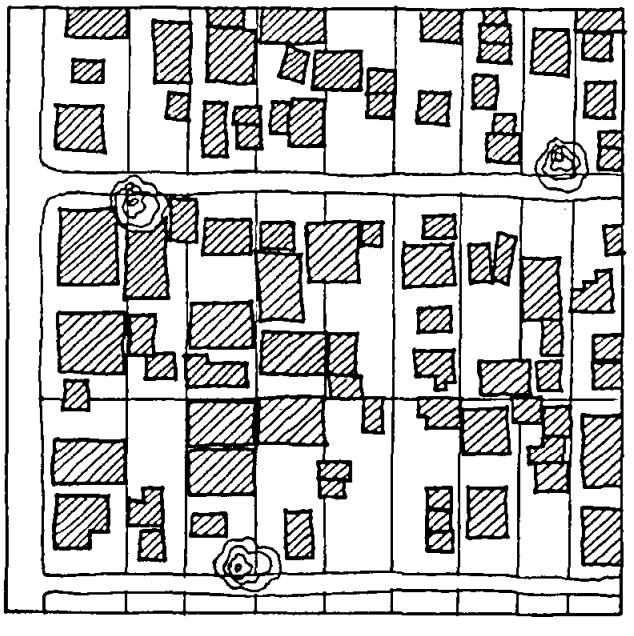


Figure 23: Site arrangements in Alexandra

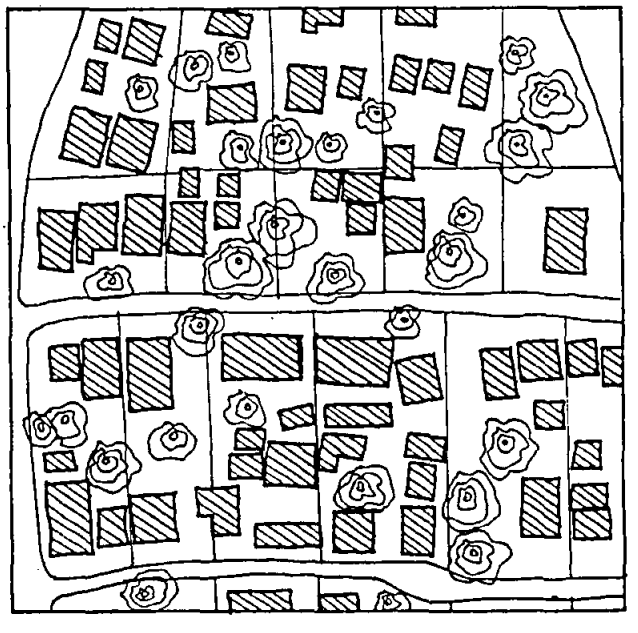


Figure 24: Site arrangements in Clermont

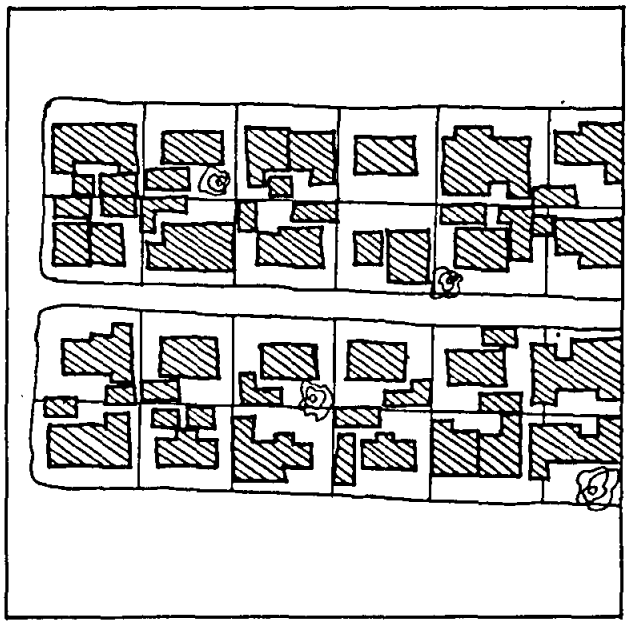


Figure 25: Site arrangements in Kwa-Thema

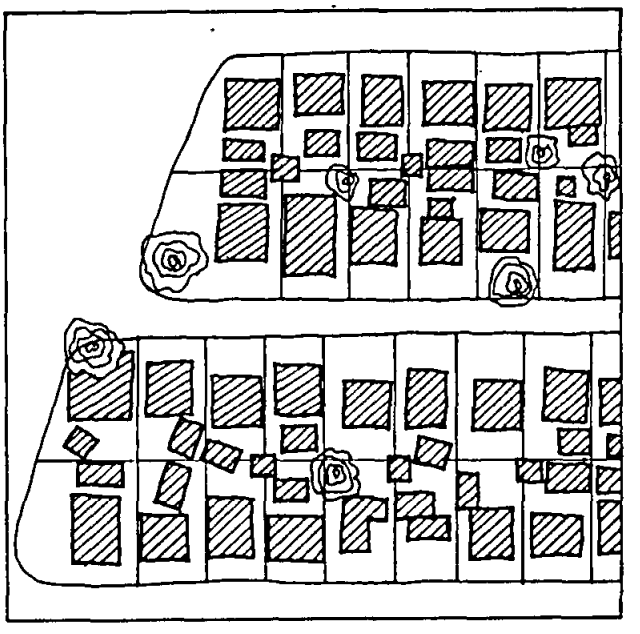


Figure 26: Site arrangements in Mamelodi

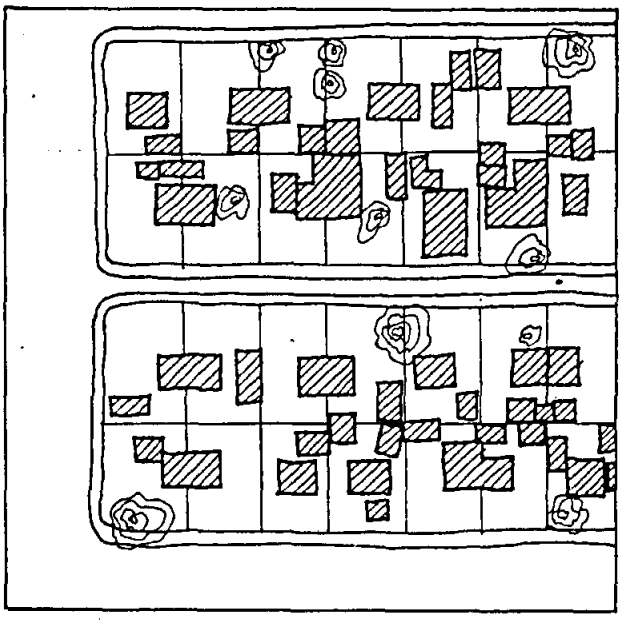


Figure 27: Site arrangements in Nyanga

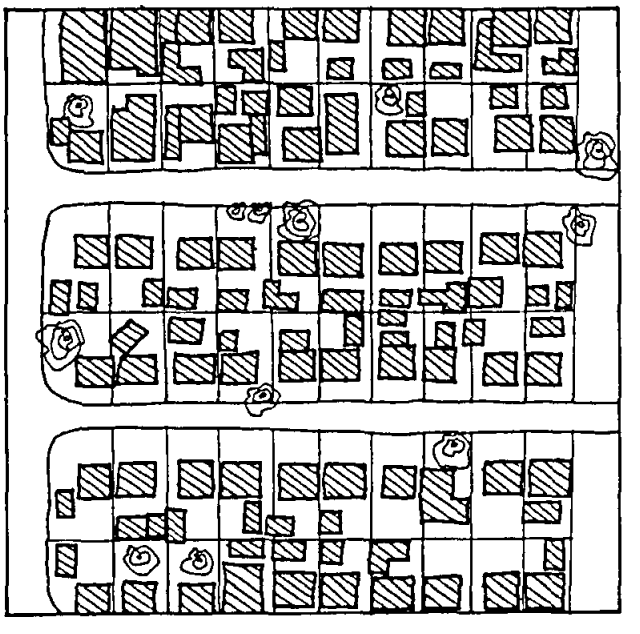


Figure 28: Site arrangements in Thabong

4. ACCESS TO WATER

To what extent do people in the backyard dwellings have access to water on site, how free is their use and how are they charged by the main household?

4.1 Levels of access

Shack dwellers did not have access to water on the site at 4% (13) of the sites surveyed. This affected a total of 43 people, or 2% of the 'backyard shack' population included in the survey. It follows that the majority of persons living on sites with multiple dwellings have access to water on site.

Of the six townships, Alexandra was the worst off with lack of access to water on 9% of sites interviewed, whereas no respondents on sites in Mamelodi and Nyanga reported such problems:

CONSTRAINT ON ACCESS TO ON-SITE TAPS	Alexandra	Clermont	Kwa-Thema	Mamelodi	Nyanga	Thabong	All
% of sites	9	4	4	0	0	4	4

71 (or 23%) of house and/or shack respondents reported that there were arguments on the site over access to taps.

Again, Alexandra was the worst off: 39% of house respondents and 46% of shack respondents reported arguments. In contrast, no arguments over access to water were reported on any of the interviewed sites in Mamelodi. The response from the townships was:

ARGUMENTS OVER ACCESS TO WATER	Alexandra	Clermont	Kwa-Thema	Mamelodi	Nyanga	Thabong	All
% house respondents	39	41	2	0	8	4	16
% shack respondents	46	20	4	0	10	4	15
% sites	57	48	4	0	16	6	23

What are the causes of such lack of access to water on site and arguments over access to taps?

In line with the argument put forward in section 2, four aspects which determine levels of access to water were examined to address this question:

- the standard of services
- the number of people using the services
- the cost of the services
- social relations on site

4.2 Standard of service

Overall township situation

The level of services in each of the townships in May 1993 is given below.

TOWNSHIP	RETICULATION	DESCRIPTION
Alexandra	All formal stands	Wash units on West Bank; All house connections in new housing in East and West
Clermont	65% house connections 35% standpipes	Standpipes at 1:10 and 1:20 per household
Kwa-Thema	All formal stands	House connections
Mamelodi	All formal stands	House connections
Nyanga	All formal stands	House connections
Thabong	68% house connections 11% yard taps 15% public standpipes	Standpipes at 1:50 and 1:200 per household

Operation and maintenance affects the standard of the service provided. At the time of the surveys, the following situation prevailed in each township:

Alexandra	Serious problems with maintenance of water distribution system due to a lack of operating funds and skilled staff.
Clermont	System is maintained moderately well with substantial improvement over last year.
Kwa-Thema	High number of breakages and leaks leads to high water losses (estimated to be 42%).
Mamelodi	Few operation and maintenance problems.
Nyanga	Problems with maintenance of system as a result of huge deficits on operating account and shortage of skilled staff.
Thabong	System is not well-maintained due to a lack of technical staff and funding.

Except for Mamelodi and possibly Clermont, operation and maintenance of water distribution systems in the townships was not adequate at the time of the survey.

Water on site

All the sites surveyed had at least one tap on site. The average (and median) number of taps per site in each of the townships was 2.

NUMBER OF TAPS	Alexandra	Clermont	Kwa-Thema	Mamelodi	Nyanga	Thabong	All
per site	2.95	1.61	2.07	1.17	2.4	1.81	2.01

Within each township, the number of taps per site varied considerably. The frequency distributions of Alexandra, Nyanga and all sites overall are shown below.

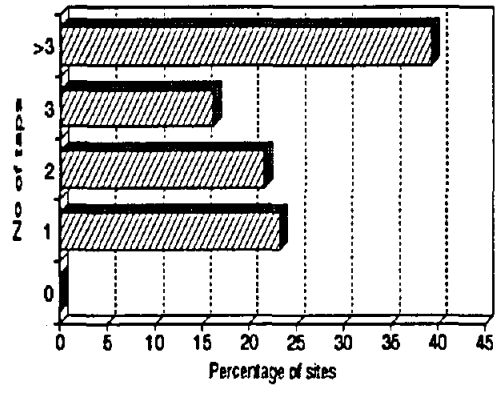


Figure 29: Taps per site in Alexandra

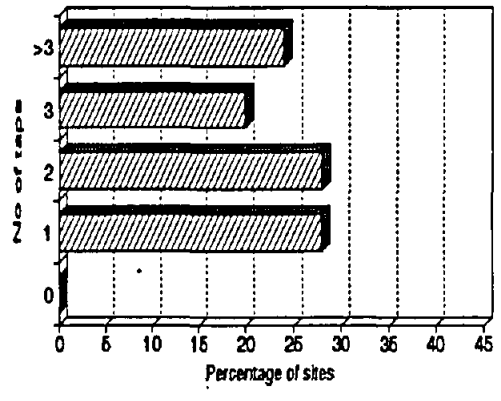


Figure 30: Taps per site in Nyanga

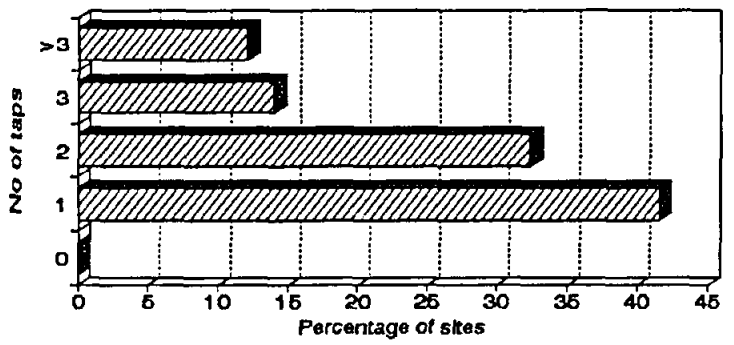


Figure 31: Taps per site on all sites surveyed

The number of taps per site compared to the 'backyard' populations per site show little correlation.

> The decision by the main household on the extent of 'backyard living' on the site is not significantly based on the number of taps available on the site.

Of the 13 sites on which shack-dwellers do not have ready access to water on tap, nearly half have only one tap on the site (see Figure 32).

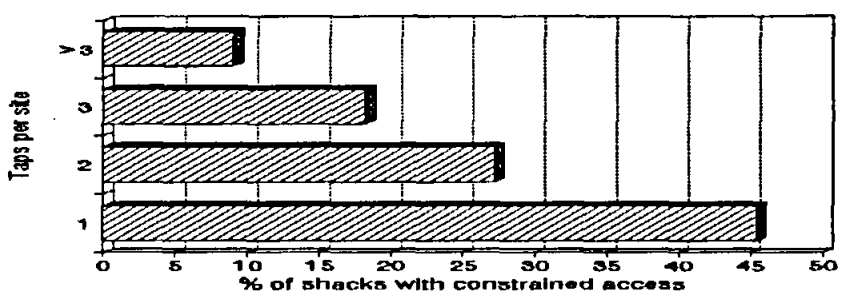


Figure 32: Taps per site on sites with constrained access

> Backyard shack dwellers who do not have access to water on site mostly live on sites where there are only a limited number of taps on the site.

4.3 Intensity of use

People living on the site

The average number of persons per tap for the whole survey was 6.82 (and the median 6.5).

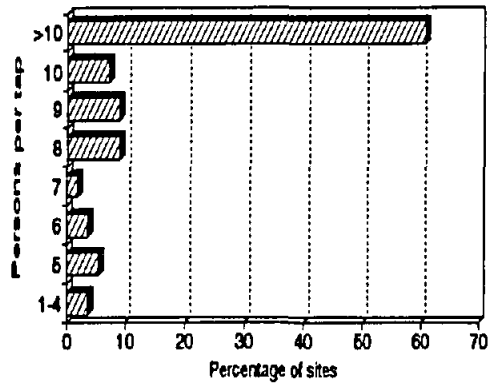


Figure 33: Persons per tap in Alexandra

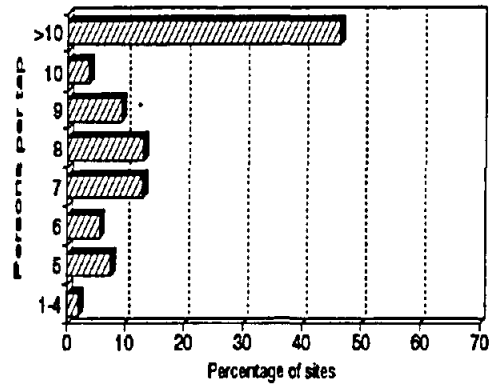


Figure 34: Persons per tap in Clermont

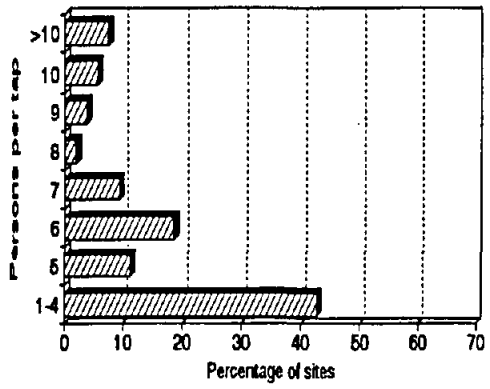


Figure 35: Persons per tap in Kwa-Thema

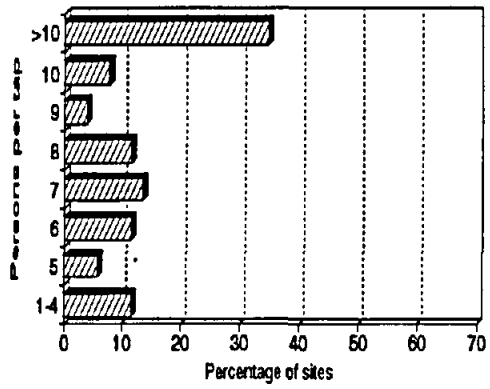


Figure 36: Persons per tap in Mamelodi

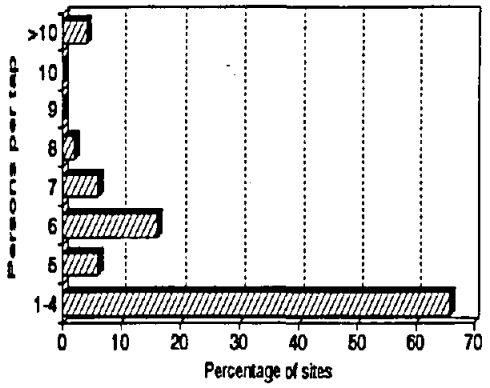


Figure 37: Persons per tap in Nyanga

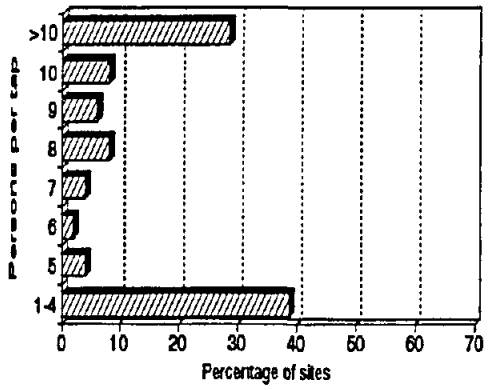


Figure 38: Persons per tap in Thabong

The larger the number of people who use a tap, the more likely that there will be arguments (especially during peak hours). In four townships there were significant percentages of sites on which there were more than 10 persons per tap:

PERSONS PER TAP	Alexandra	Clermont	Kwa-Thema	Mamelodi	Nyanga	Thabong	All
% of sites with >10	60	46	7	34	2	27	31

Tested within a simple regression analysis, there is a very significant correlation between arguments on a site and the number of persons per tap[1]. Of the 71 sites on which there are arguments, 44% have more than 10 persons per tap (22% have more than 14 persons per tap) (see Figure 39). Analysis of the situation on all 315 sites shows that arguments over access to taps generally increases the more persons there are per tap (see Figure 40).

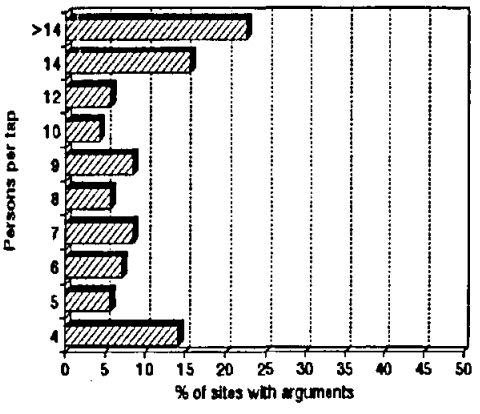


Figure 39: Persons per tap for sites on which there are arguments over taps

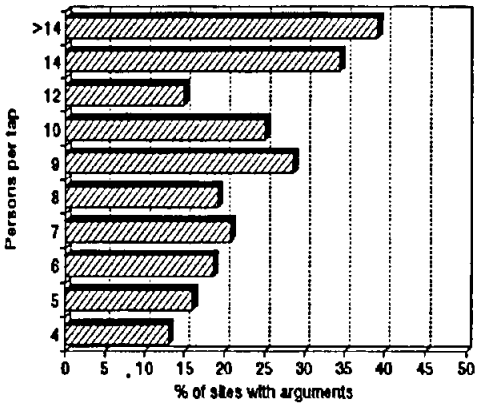


Figure 40: Persons per taps and arguments over access to taps for all sites surveyed

On the 11 sites where shack-dwellers do not have access to water on site the number of persons per tap may also play an important role (although the small sample size makes accurate testing of the relationship difficult). As shown in Figure 41, on 62% of the sites on which there is a constraint on access there are more than 10 persons per tap.

[1] Based on a probability level of 0.95.

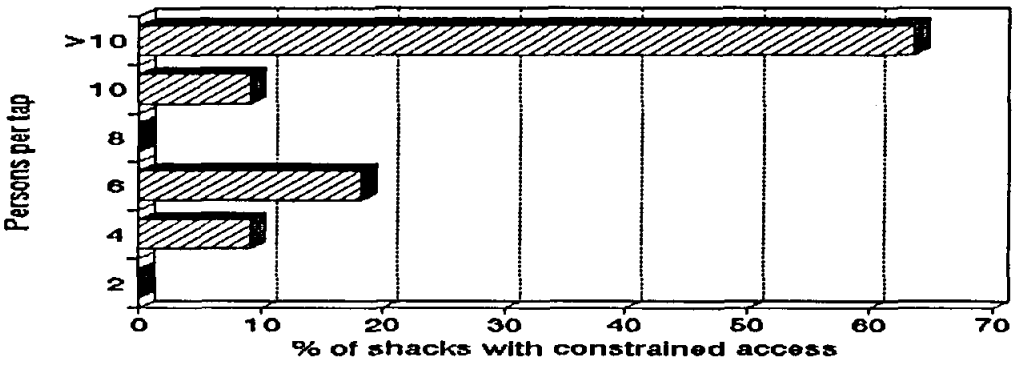


Figure 41: Taps per site for sites on which there is constraint on access to taps

There is a significant correlation between the intensity of use of taps (and a lack of access) and arguments over tap use. Overcrowding of sites is reducing the level of service available to house and shack dwellers.

People visiting the site

Businesses bring people to a site on a regular basis. If the visitors use taps, this will increase the intensity of use and could lead to arguments over access to taps. The total number of sites with businesses is shown in Figure 42, whereas the number of sites with businesses requiring water for their operation is shown in Figure 43.

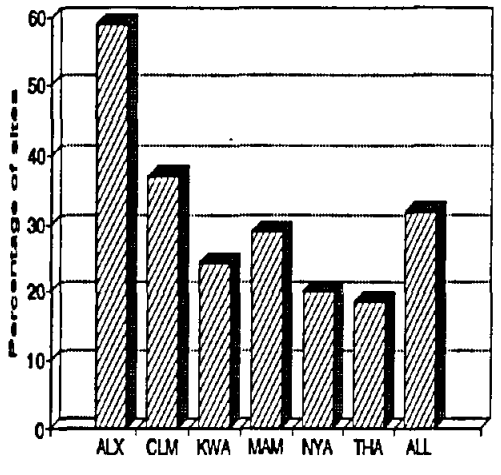


Figure 42: Sites with businesses

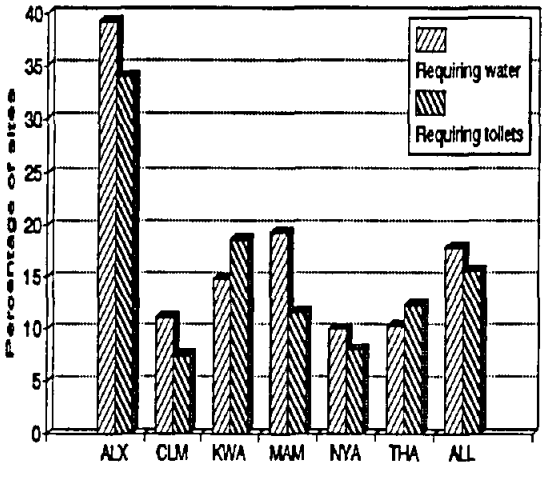


Figure 43: Sites with businesses requiring tap and toilet use

Of the 87 sites on which there are businesses, 49 require use of water on site. On 7 of the sites with water-using businesses are there arguments over access to taps (4 of these have shebeens on the site). However, arguments over water on the 38 sites with businesses requiring no use of water were more frequent. Of the 38 sites with shebeens, there were arguments over taps on only 4 (11%).

Shortage of taps

Intensity of use is also reflected in the number of respondents who indicated that there is a shortage of taps on the site (see Figure 44).

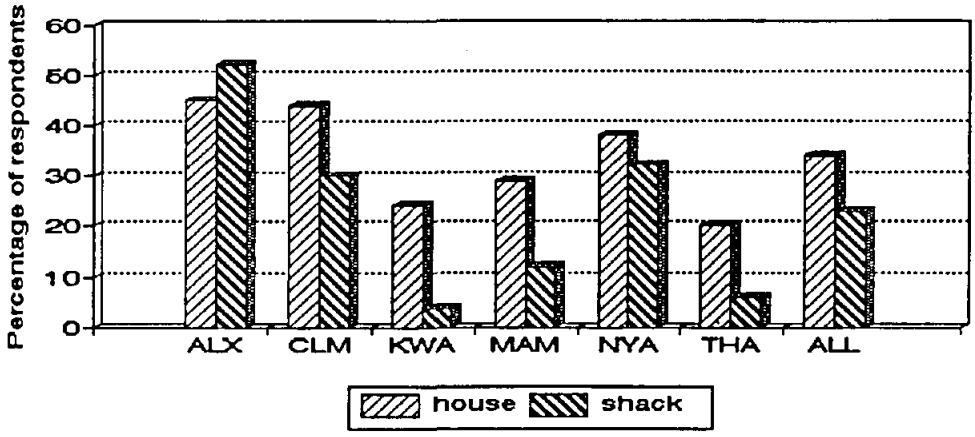


Figure 44: Perceived shortage of taps on the site

4.4 Cost of the service

Water charges are generally included in shack rentals (see Figure 45). The percentage of sites interviewed where the main households charges shack dwellers a separate amount for water were:

SEPARATE WATER CHARGES	Alexandra	Clermont	Kwa-Thema	Mamelodi	Nyanga	Thabong	All
% of sites	0	69	7	2	0	29	18

The degree to which shack-dwellers are charged separately for water is strongly linked to the accounting procedures in the townships (see Figure 46). Where water is metered and accounts sent (as in Clermont), shack-dwellers are charged a proportion of the account. Where water is not metered or no account is received, shack-dwellers pay a fixed monthly rental which includes water (as does the main household).

On all sites where water is charged separately a monthly amount was charged: no examples of fixed charges per container or metered connections to shacks were found for sites surveyed. Water levies varied between R 2.50 to R 11.00 per month, with an average of R 7.14 and a median of R5.00.

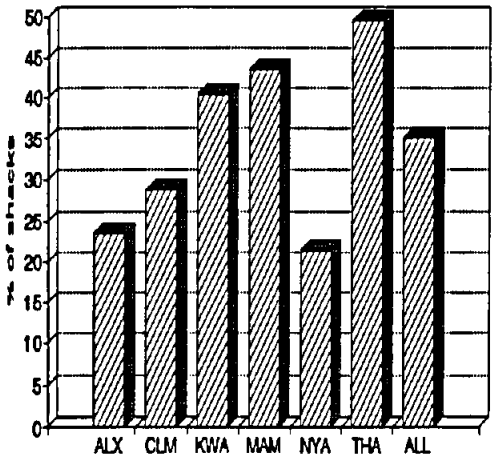


Figure 45: Average monthly shack rentals

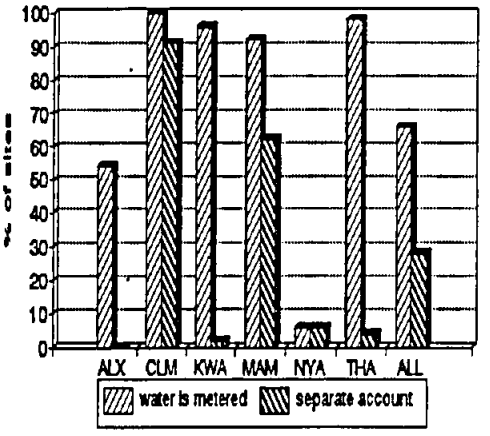


Figure 46: Metering and billing of the site's water consumption

4.5 Social relations on site

Degree of tenancy

In Mamelodi and Nyanga, where the majority of shack dwellers are relatives, levels of access to water were highest (see section 3). This positive relationship between degrees of access and type tenancy applied to all townships except Alexandra.

Location of taps

The location of taps on sites which shack dwellers may use will also affect level of access to water. If such taps are inside the house, shack dwellers who are not relatives are unlikely to have access to water in the evening and at times during the day when the house is locked. If such taps are located outside, use is more convenient and can not easily be constrained by the main household.

% OF SITES WITH	Alexandra	Clermont	Kwa-Thema	Mamelodi	Nyanga	Thabong	All
tap outside which shack dwellers may use	89	96	100	100	70	96	92

The location of taps on sites and the degree to which shack dwellers have access to these is shown in Figure 47 to Figure 50.

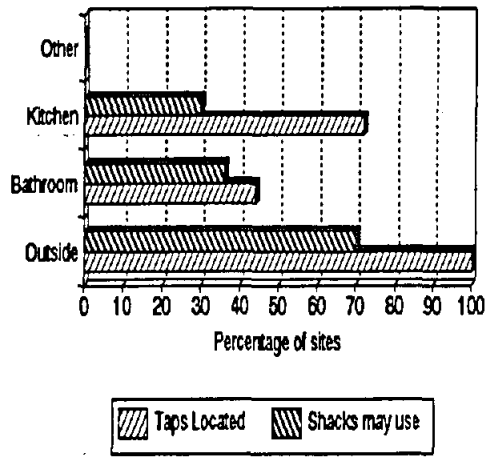


Figure 47: Location of taps and shack dwellers access on sites in Nyanga

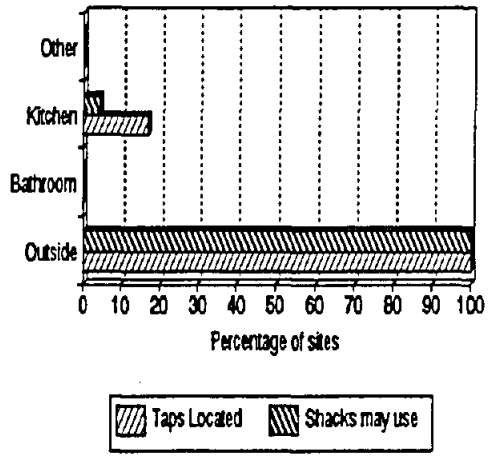


Figure 48: Location of taps and shack dwellers access on sites in Mamelodi

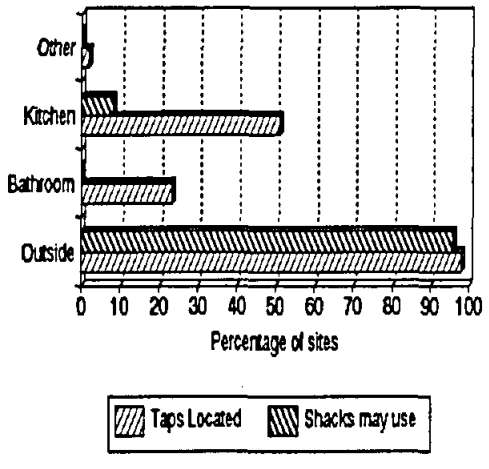


Figure 49: Location of taps and shack dwellers access on sites in Thabong

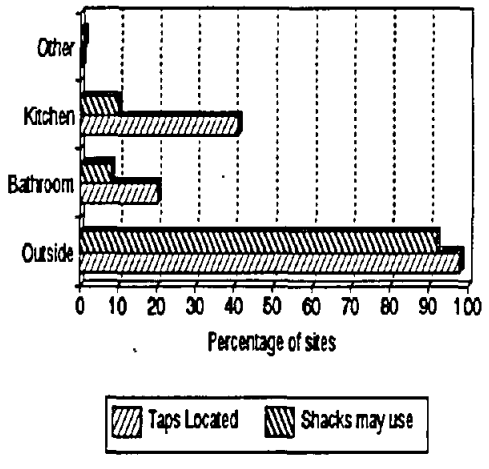


Figure 50: Location of taps and shack dwellers access on all sites interviewed

In Nyanga there appears to be a strong relationship between people not being allowed to use taps on site and the degree of arguments about access to water on sites. In the other

townships (except Alexandra to some degree) this attitude is much less of a problem and constraint to shack dwellers. In Nyanga's case it probably relates strongly to the large number of informal settlements within the formal townships which have no water supplies. These households have to obtain water from surrounding formal stands and communal washing facilities at hostels. This pressure from outside the yard to obtain access to taps could place the households in formal houses on the defensive by restricting access to outside taps.

The preferred locations by respondents for additional taps on the site is are shown in Figure 51.

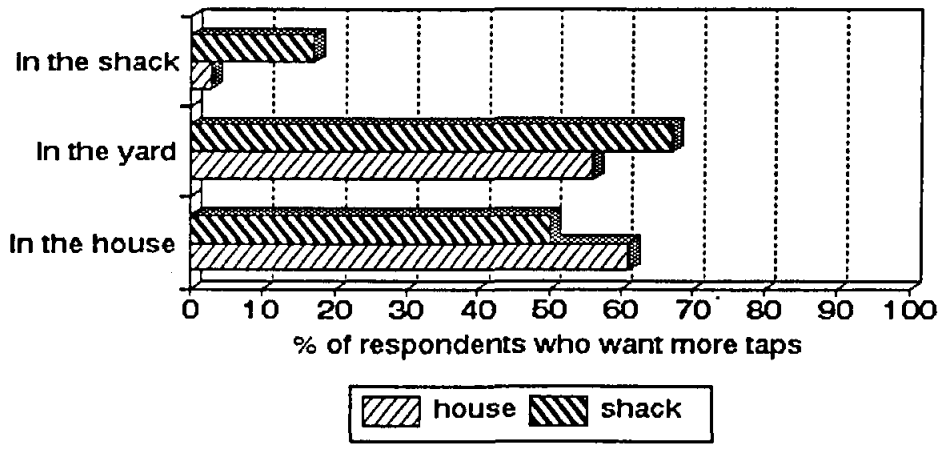


Figure 51: Preferred location of additional taps on the site

4.6 Summary

The main findings of the survey were:

Access to water on site	▸ on 13 sites (or 4%) shack-dwellers did not have access to water on site. ▸ on 71 sites (or 23%) there were arguments on site over access to taps.
Standard of service	▸ except for Mamelodi and Clermont, operation and maintenance of water distribution systems were problematic. ▸ the fewer taps there were per site, the greater the probability that shack-dwellers did not have access to water on site.
Intensity of use	▸ on 31% of the sites were there more than 10 persons per tap. ▸ the more people there were per tap on a site, the greater the likelihood that there were arguments over access to the taps, or that shack dwellers had no access to the taps.
Cost of service	▸ only 18% of shack dwellers are charged separately for water, and in all cases this was a monthly amount usually based on the monthly account received from the Town Council. ▸ there were no sites where shack dwellers were paying exploitative prices for on-site water.
Social relations on site	▸ shack dwellers who are not relatives are likely to have constrained access to water on site if there are no outside taps on the site. This seems particually true where there are unserviced informal settlements in the proximity.

5. ACCESS TO SANITATION

To what extent do people in the backyard dwellings, which do not have their own toilet, get access to the toilet(s) on the site? What do people do as an alternative to using on-site sanitation?

5.1 Levels of access

Respondents on 31 (or 10%) of the sites interviewed indicate that shack dwellers can not readily use the on-site toilet(s). This affected a total of 182 people, or 10% of the backyard shack population covered in the survey. It follows that a large majority of persons living on sites with multiple dwellings have adequate access to an on-site toilet. (99% of sites surveyed had, at least, 1 flush toilet on site.

Of the six townships, Nyanga was the worst off with a lack of access to toilets on 18% of sites.

CONSTRAINT ON ACCESS TO ON-SITE TOILET(S)	Alexandra	Clermont	Kwa-Thema	Mamelodi	Nyanga	Thabong	All
% of sites	9	4	7	12	18	10	10

Respondents on 91 (or 29%) of sites reported that there were arguments on the site over access to toilets.

Alexandra was the worst off: 48% of house respondents and 45% of shack respondents reported arguments which affected a total of 67% of sites. In contrast, only 2% of the house and none of the shack respondents in Mamelodi reported arguments.

ARGUMENTS OVER ACCESS TO TOILET(S)	Alexandra	Clermont	Kwa-Thema	Mamelodi	Nyanga	Thabong	All
% of house respondents	48	17	7	2	36	6	20
% of shack respondents	45	24	6	0	32	6	19
% of sites	68	28	11	2	50	12	29

8% of house respondents and 12% of shack respondents indicated that people have to use an alternative to on-site toilet(s).

The responses from the townships were:

PEOPLE HAVE TO USE OFF-SITE TOILET OPTIONS	Alexandra	Clermont	Kwa-Thema	Mamelodi	Nyanga	Thabong	All
% of house respondents	22	4	0	2	16	4	8
% of shack respondents	32	26	0	1	10	0	12

The most common alternative to using the on-site toilet(s) is the neighbouring property. Other alternatives are schools, the workplace, buckets, the garden and bushes.

The alternatives to on-site toilet use were given as the following for all the townships:

OFF-SITE TOILET ALTERNATIVES PEOPLE HAVE TO USE	Neighbour	Buckets	Workplace	School	Bushes	Garden	Other /not say
% of house respondents	56	8	4	4	4	0	24
% of shack respondents	84	0	3	0	0	3	10

What are the causes of such a lack of access to on-site toilet use, to arguments over access to toilets and the need to 'go' elsewhere?

In line with the arguments put forward in section 2, fours aspects which determine levels of access to sanitation were examined in the survey to address this question:

- the standard of services
- the number of people using the services
- the cost of the services
- social relations on site

5.2 Standard of service

Overall township situation

The level of services in each of the townships in May 1993 is given below.

TOWNSHIP	RETICULATION ON FORMAL STANDS (May 1993)	COMMENTS
Alexandra	100% waterborne sewerage	Wash units on West Bank, standard house connections on the East Bank; Communal ablution blocks with buckets in squatter settlements
Clermont	80% waterborne sewerage 10% buckets 10% conservancy tanks	
Kwa-Thema	100% waterborne sewerage	Site and service plots in informal settlements
Mamelodi	100% waterborne sewerage	Communal ablution blocks in squatter settlements using conservancy tanks
Nyanga	100% waterborne sewerage	Bucket system in informal areas; communal ablution blocks at the hostels. Some squatter areas without sanitation services.
Thabong	91% waterborne sewerage 9% no sanitation	Serviced plots on eastern periphery have no on or off-site sanitation

Operation and maintenance affects the standard of the service provided. At the time of the survey, the following situation prevailed in each township:

Alexandra	Extensive overloading of system on the West Bank due to overcrowding. Frequent blockages occur and spillage from buckets and blocked pipes into Jukskei River are common. Buckets difficult to service in squatter settlements.
Clermont	Blockages result from misuse and some of the older pipes are collapsing. Difficult on-site access to buckets and conservancy tanks reduces operating efficiency. System copes adequately with peak loads.
Kwa-Thema	System overloaded due to overcrowding: carries three times the designed flow per day. Frequent blockages due to misuse and dumping of solid waste into manholes result in overflows. Sullage often discharged into streets.
Mamelodi	Few operation and maintenance problems.
Nyanga	Bucket system is not operating well: spillage is common and collection infrequent. Waterborne system overloaded, resulting in overflow and blockages during peak hours. Blockages also result from sand and rubbish entering the waste water system.
Thabong	The waterborne system is overloaded due to much higher than designed for load factors. Blockages and breakages occur on a frequent basis. Operation and maintenance is very weak due to a lack of trained and motivated staff.

With the exception of Mamelodi, the presence of large numbers of backyard shack populations was overloading the waterborne systems in all the townships, adding stress to the often already inadequate maintenance and operation situations.

These circumstances would undoubtedly have reduced the level of service available to residents and increased tension around access to the toilet when pipes are blocked or overflowing.

When asked at the end of the interview if there were any final comments on the toilet situation, this is what respondents said:

- *75 (or 12%) complained about the lack of maintenance on toilets and pipes in the blocks;*
- *68 (or 11%) stated that there are insufficient toilet facilities on the site;*
- *8 (or 1%) noted that there is conflict on the site over the cleanliness of the toilet.*
- *7 (or 1%) complained about regular blocking of drains.*

Toilets on site

All except 3 sites in Clermont (1% of the survey sample) had a waterborne toilet (or toilets) on site. The average number of toilets per site was 1.4 (and the median 1).

NUMBER OF TOILETS	Alexandra	Clermont	Kwa-Thema	Mamelodi	Nyanga	Thabong	All
per site	2.75	1.41	1.28	1.02	1.04	1.09	1.43

As with on-site taps the number of toilets per site varied considerably within townships. For example, the complex site layout arrangements in Alexandra means that there may be two or more of the communal washing units on a site.

Frequency distributions of toilets per site for Alexandra, Nyanga and all the sites surveyed is shown below.

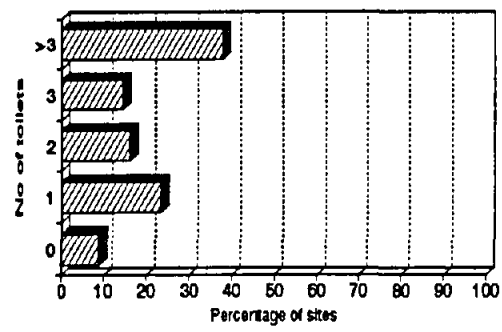


Figure 52: Toilets per site in Alexandra

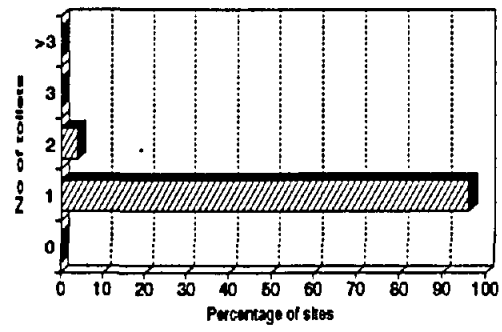


Figure 53: Toilets per site in Nyanga

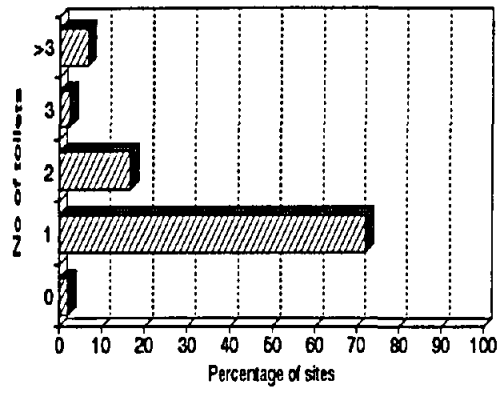


Figure 54: Toilets per site on all sites surveyed

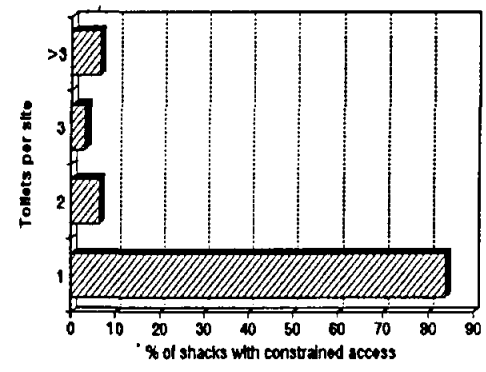


Figure 55: The number of toilets on sites with constrained access

There appears to be no correlation between the degree of 'backyard living' and the number of toilets available on a site.

When deciding to make available shacks or space for shacks on the site, the facilities available seem not be a determining factor for the main household.

On the 31 sites on which shack-dwellers did not have ready access to the on-site toilet(s), 83% have only one toilet on the site (see Figure 55).

Backyard shack dwellers who do not have access to the on-site toilet(s) predominantly live on sites where there is only one toilet.

5.3 Intensity of use

People living on the site

The average number of persons per toilet for the whole sample was 9.34 (with a median of 8.5). Again the situation in Alexandra, Nyanga and for all the sites surveyed is shown below.

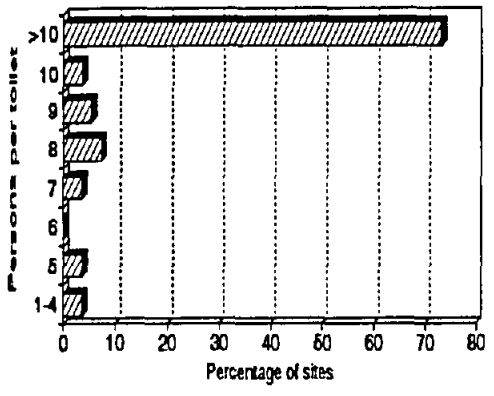


Figure 56: Persons per toilet in Alexandra

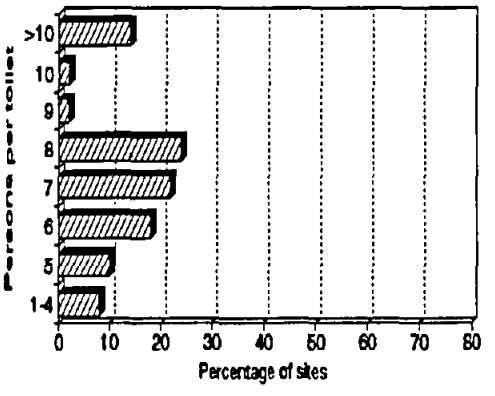


Figure 57: Persons per toilet in Nyanga

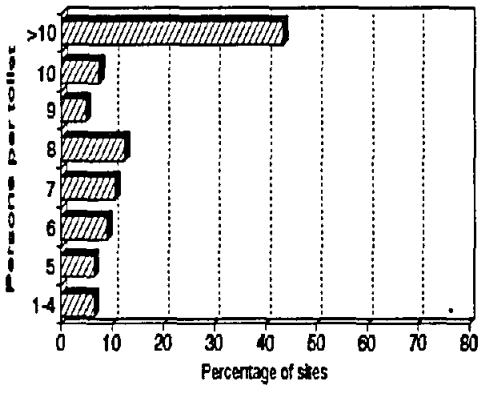


Figure 58: Persons per toilet on all sites surveyed

The larger the number of people who use the toilet(s), the more likely it is that there will be arguments. In all townships there were some sites with more than 10 persons per toilet:

PERSONS PER TOILET	Alexandra	Clermont	Kwa-Thema	Mamelodi	Nyanga	Thabong	All
% of sites with >10	73	57	28	44	14	37	37

Of the 91 sites on which there were arguments over toilet use, 46% have more than 10 persons per toilet (21% have more than 14 persons per toilet) (see Figure 59). Analysing the situation on all 315 sites shows that arguments over toilet use is not strongly linked to the number of persons per toilet (see Figure 60).

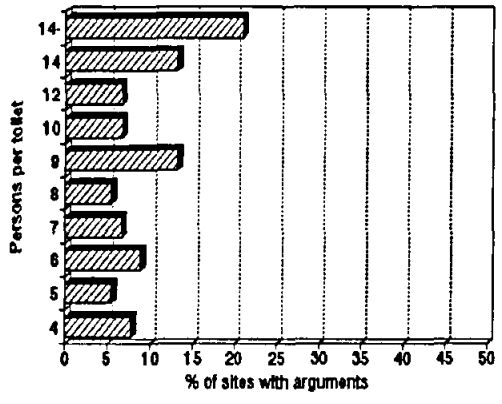


Figure 59: Persons per toilet for sites on which there are arguments over toilets

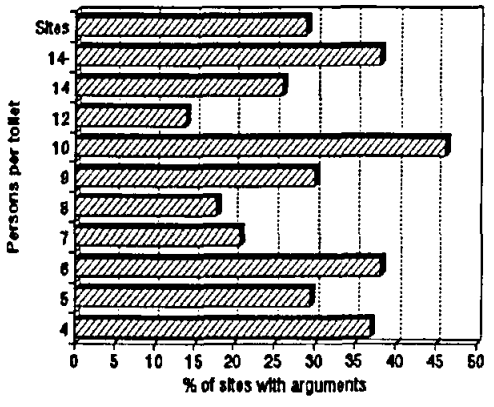


Figure 60: Persons per toilet and arguments over toilet use on all sites surveyed

On the 31 sites where shack-dwellers do not have access to the on-site toilet(s), the number of persons per toilet seems to play a stronger role. As shown in Figure 61, on 42% of sites on which there is a constraint on access there are more than 10 persons per toilet.

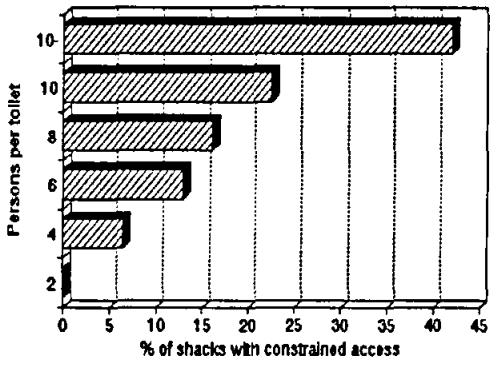


Figure 61: Toilets per person for sites on which there is constraint on toilet use

The relationship between the intensity of toilet use and a lack of access to toilet on site is not certain.

People visiting the site

Businesses bring people to a site on a regular basis. If the visitors use toilets, this will increase the intensity of use and could lead to arguments over toilet use. The total number of sites with businesses requiring taps and toilet use is given in Figure 43, Figure 62.

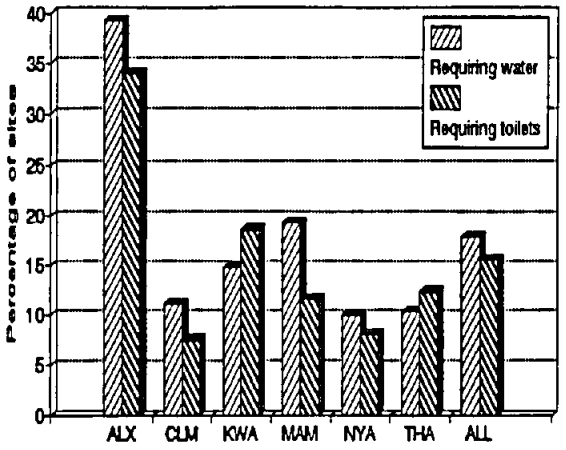


Figure 62: Sites with businesses requiring tap and toilet use

The linkage between arguments over access to toilets and whether there is a business on site appears no more conclusive than the linkage between businesses and arguments over access to taps (see section 3). Of the 87 sites in all townships with businesses on site (28% of total sample) there are arguments over access to the toilet on 17 (or 20%). The same figure for sites without businesses (228) is 45 (or 20%).

Waste water disposal

Waste water disposal practices on site affects general hygiene and could lead to blockages in the toilet.

DISPOSAL OF WASTE WATER BY	Drain	Toilet	Garden	Street	Elsewhere
% of businesses on sites	54	18	5	18	5
% of sites	86	17	7	7	1

Shortage of toilets

Intensity of use is also reflected in the number of respondents who indicated that there is a shortage of toilets on the site (see Figure 63). The linkage between person per toilet and a perception of a need for more toilets is not evident. For example, whereas Nyanga has the lowest number of persons per toilet, over 50% of respondents felt that more toilets were required on site.

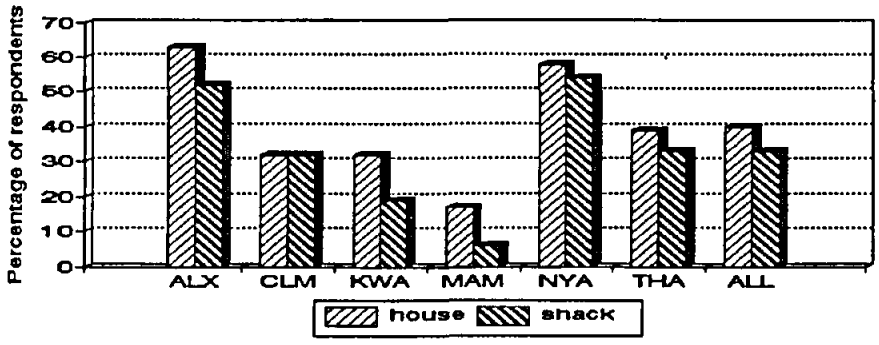


Figure 63: The perception of persons interviewed of the shortage of toilets on site

5.4 Cost of the service

The survey found no examples of shack-dwellers being charged per visit to the toilet. On all the sites visited payment for the use of the toilet was included in the monthly rental.

5.5 Social relations on site

When the only toilet on the site is located in the house, access for shack-dwellers who are of no relation to the household may be limited at certain times of the day or generally. To have sufficient access to sanitation on site, tenant shack-dwellers need access to an outside toilet at all hours.

% OF SITES WITH	Alexandra	Clermont	Kwa-Thema	Mamelodi	Nyanga	Thabong	All
toilet(s) outside	59	96	72	98	62	73	77
bathrooms in the house	5	7	44	0	44	23	20

In Nyanga many sites have only one toilet (which is located within the house). On 9 of the sites in Nyanga tenants living in 'backyard shacks' are not allowed to use the toilet in the bathroom. These people would have to 'go' elsewhere. According to shack-dweller survey responses, 20% use the garden, 20% the workplace and 60% the neighbour's toilet as an alternative. According to the house respondents in Nyanga, 26% use the bushes, 25% the neighbour's toilet and 25% communal washing facilities.

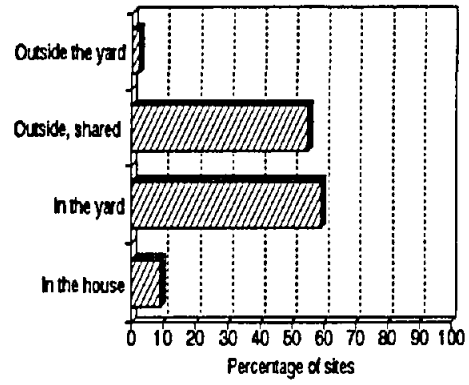


Figure 64: Location of toilets on sites in Alexandra

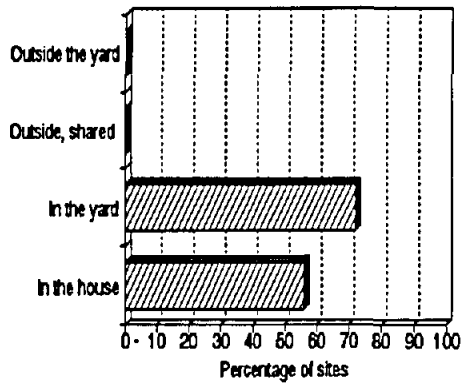


Figure 65: Location of toilets on sites in Kwa-Thema

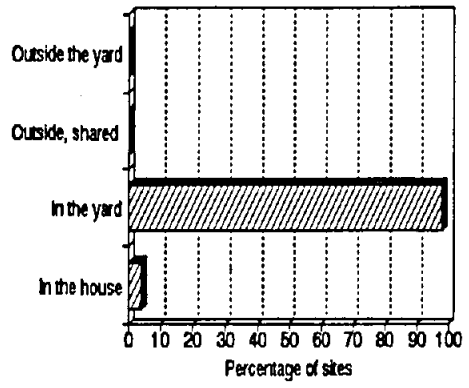


Figure 66: Location of toilets on sites in Mamelodi

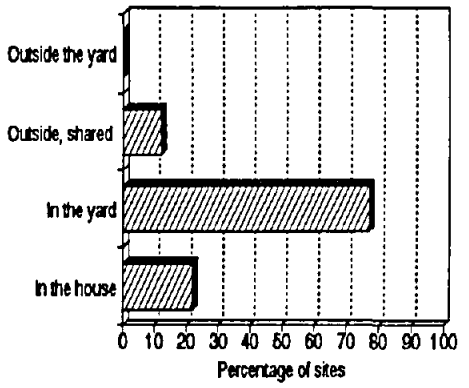


Figure 67: Location of toilets on all sites interviewed

The preferred locations by respondents for additional toilets on site are shown in Figure 68.

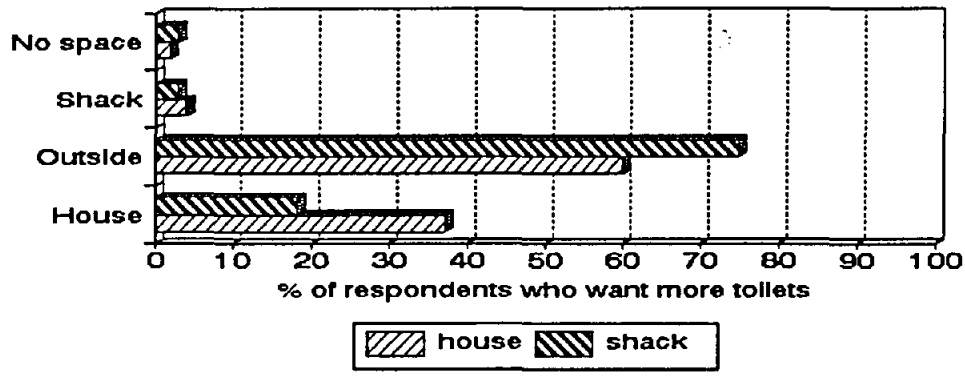


Figure 68: Preferred location of additional toilets

5.6 Summary

The main findings of the survey were:

Access to on-site toilet(s)	▸ shack-dwellers do not have access to the on-site toilet(s) on 31 (or 10%) of sites. ▸ on 91 sites (or 29%) were there arguments over toilet use.
Standard of service	▸ with the exception of Mamelodi, operation and maintenance of the sanitation systems are inadequate. ▸ the fewer toilets there were per site, the greater the probability that shack-dwellers *did not have use of the on-site toilet(s)*
Intensity of use	▸ on 37% of the sites there were more than 10 persons per toilet. ▸ there was no apparent linkage between the number of persons per toilet and arguments over toilet use. ▸ the presence of businesses on the site requiring toilet use by patrons did not necessarily mean that there would be arguments on the site.
Cost of service	▸ no example of payment per visit to the toilet(s) was found. ▸ on all the sites where shack-dwellers could use the toilet, the cost is included in the monthly rental.
Social relations on site	▸ shack-dwellers who are not relatives of the household are likely to have constrained access to the toilet in the house. If there is no outside toilet, there is no access to on-site sanitation (33% of sites had no outside toilet(s)).

6. SOLID WASTE SERVICES

What is the situation with regard to solid waste storage and disposal on site?

6.1 Level of access

On 183 (or 58%) of the 315 sites interviewed refuse piled up in the yard or street and created a nuisance or health problem. This affected a total of 2 876 people, or 67% of the 4 266 persons included in the survey. Problems with solid waste removal emerged as the most critical of the three services investigated.

Of the six townships, the most problems were reported in Clermont, with 83% of house and 87% of shack respondents complaining about solid waste. The lowest number of complaints were in Nyanga. The responses from the various townships were:

REFUSE PILES UP AND MAKES A MESS	Alexandra	Clermont	Kwa-Thema	Mamelodi	Nyanga	Thabong	All
% house respondents	71	83	41	64	8	78	58
% shack respondents	75	87	32	62	10	82	58

What are possible implications this may have on stormwater runoff quality?

The poor stormwater water quality entering the Jukskei River at Alexandra (Wimberley, 1992), the Umgeni River at Clermont (Hudson, 1991; Simpson, 1992) and the Withokspruit at Kwa-Thema (personal observation, May 1993) have been linked to refuse pollution problems in these townships. At Thabong refuse is carried by wind across a wide region, whereas ocean pollution from stormwater canals from Nyanga and other townships is a concern in False Bay (Quich, 1993a; Quich, 1993b).

What are the causes of such widespread problems with solid wastes on sites?

In line with the argument put forward in section 2, three aspects which determine levels of access to water were examined in the survey to address this question:

- the standard of the service
- the number of people generating waste
- the location of refuse on the site

6.2 Standard of service

The official service situation in the townships is shown below. In all the towns except Thabong some form of refuse removal service was being operated. The official number of collection from sites per week is compared to the number of collections which the respondents in the interviews said actually took place. 8% of respondents stated that there was no refuse removal services from the site.

TOWNSHIP	NUMBER OF COLLECTIONS PER WEEK		CONTAINERS PROVIDED
	Official response	Survey response	
Alexandra	1	1.25	Plastic bags provided free of charge to all sites. Larger containers provided on street corners.
Clermont	2	1.02	None. Refuse is dumped on the sidewalk. Some skips provided at gathering places.
Kwa-Thema	2	1.88	Drums and skips at major intersections.
Mamelodi	2	1.54	Bins can be bought from the Council, but few have done so. Refuse dumped on the sidewalk for collection.
Nyanga	2	2.07	Plastic bags and bins. Skips provided in informal areas. Garden refuse collected from sidewalks once per month.
Thabong	sporadic	(1.29)	None. Dumped on the sidewalks.

The confusing difference between the official number of collections of refuse per week and the number of collections which respondents say there are per week can be associated with infrequent removals not following a set pattern. At Thabong only five respondents indicated that refuse is being collected in their section of the township. In the other townships refuse collection is often interrupted by political and industrial action, creating problems with refuse storage on site.

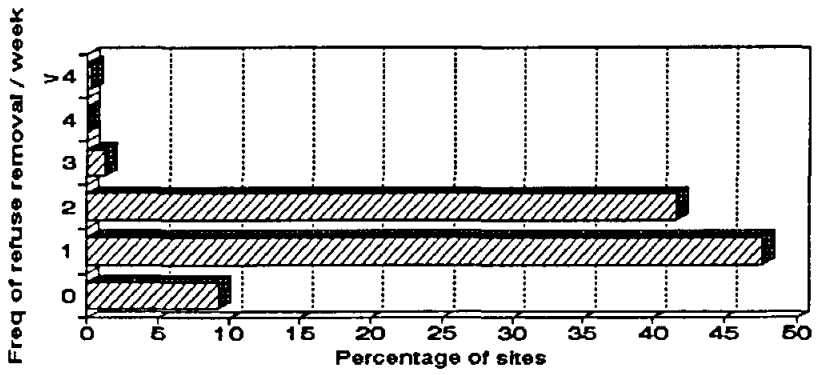


Figure 69: Frequency of refuse removal according to all persons interviewed

At the time of the surveys, the following situation prevailed in each township:

Alexandra	**Service has improved substantially over the last two years after new a township-wide system was introduced early in 1992. Current problems relate to indiscriminate dumping by residents and hawkers.**
Clermont	**Lack of refuse bins, plastic bags and skips causes a mess in the streets and at the dumping sites.**
Kwa-Thema	**Serious shortage of bins (need 26 000, have 6 500) leads to rubbish being dumped on street corners and in open spaces.**
Mamelodi	**A shortage of bins is creating pollution problems on sidewalks and when solid waste is dumped into the stormwater system.**
Nyanga	**A shortage of bins leads to spillage and dumping of refuse on open land, causing litter and stormwater quality problems. Problems are also experienced with pieces of furniture, car wrecks, etc being dumped on street corners. The accumulation of garden refuse on sidewalk is a nuisance factor.**
Thabong	**A lack of funds and staff means that no regular system is provided. Pollution and health problems have been linked to this lack of solid waste removal from sites and streets.**

When asked if they had any comments on the solid waste service, the following responses were given:

■ *76 (or 14%) of house respondents felt that the service was not operating well. Not surprisingly, 50% of those complaining were from Thabong. In Clermont there was a also high degree of concern over the infrequency of the service.*

■ *The need for proper containers was expressed by 9% of house respondents (7% of shack respondents). Obtaining more bags were a particular concern in Alexandra where they are distributed free of charge by the Council, but only in limited quantities per site per week. The large site populations required more bags than what was provided. In Clermont there was strong concern that some form of container be provided, whereas 10% of house owners in Mamelodi complaint about them having to buy bins from the Council.*

6.3 Intensity and manner of use

More people create more waste, and more waste per site is likely to cause problems unless there are sufficient containers (bins or bags) and these are emptied (or removed) on a regular basis. The previous section has shown that the refuse removal systems in the townships are not operating well (with the possible exception of Alexandra). It is then not surprising that the majority of residents interviewed ask for more frequent collection (see Figure 71) and more refuse bags and bins to contain the refuse (see Figure 72).

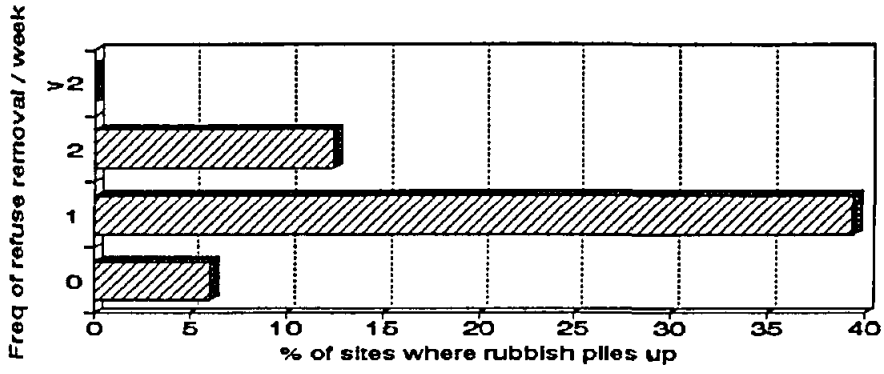


Figure 70: The influence of frequency of service on site conditions

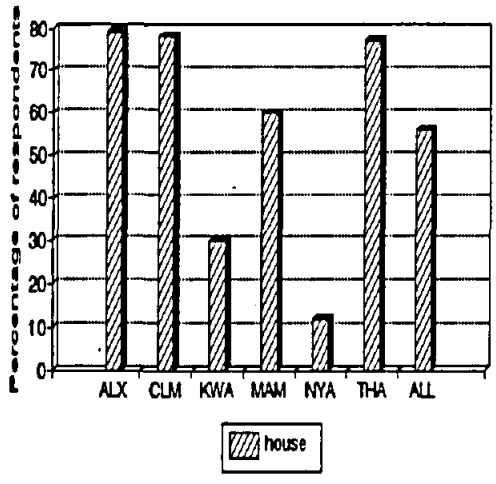


Figure 71: Respondents who feel refuse is not collected often enough

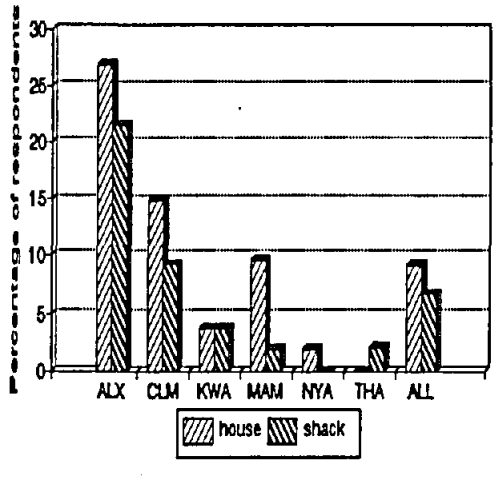


Figure 72: Respondents who require more refuse bins or bags

6.4 Location of refuse on site

Responses from the house and shack interviews to where refuse is kept until collection is shown below. The percentages of house and shack respondents who keep their refuse in the yard, street or elsewhere were noted (non-respondents are not shown). Some households keep their refuse in more than one place until collection.

Refuse is kept until collection in the	Alexandra		Clermont		Kwa-Thema		Mamelodi		Nyanga		Thabong		All	
	Hse	Shk	Hse	Shk	Hse	Shk	Hse	Shk	Hse	Shk	Hse	Shk	Hse	Shk
yard	88	75	93	89	93	96	96	98	94	98	94	94	78	78
street	13	20	6	0	2	0	2	0	0	0	0	0	4	4
elsewhere	7	2	2	0	2	0	2	0	6	2	0	0	3	1

The overall site situation in the storage of refuse until collection is shown in the following figures:

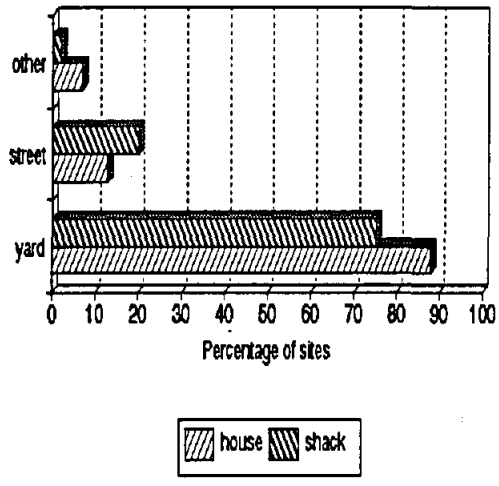


Figure 73: The location of refuse in Alexandra

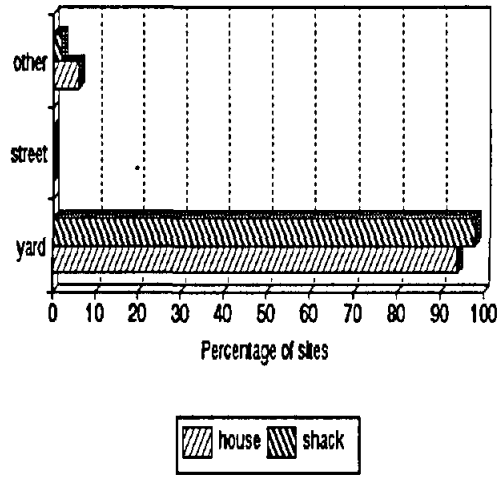


Figure 74: The location of refuse in Nyanga

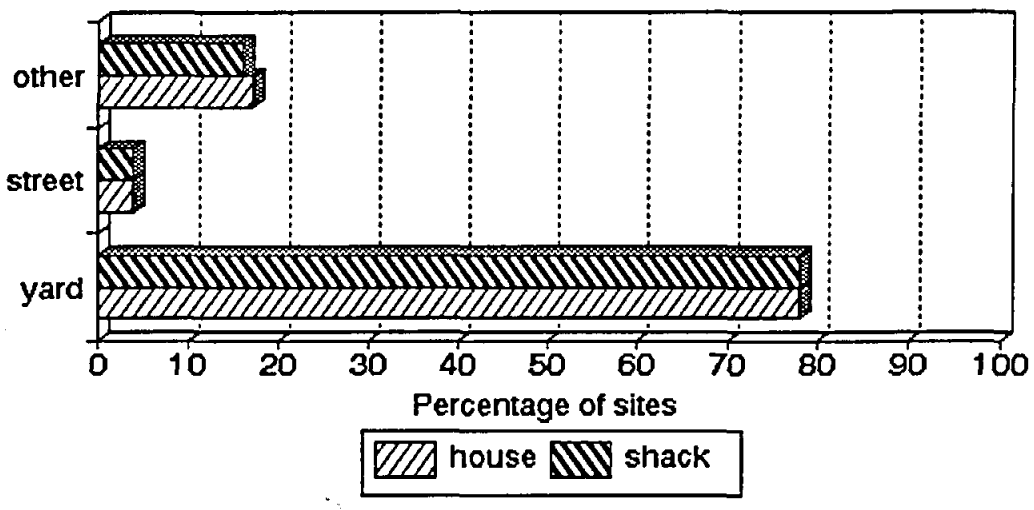


Figure 75: The location of refuse on all sites interviewed

6.5 Summary

The main findings of the survey were:

Waste disposal	▸ on 183 sites (or 58%) refuse piled up in the yard and made a mess.
Water quality	▸ poor stormwater quality from surveyed townships has been linked with on-site problems with refuse storage and removal.
Standard of service	▸ services were generally infrequent and unreliable. ▸ the shortage of refuse bins and bags created pollution problems for respondents.
Location of refuse	▸ 5% of respondents keep their refuse outside the yard until collection

7. CONCLUSIONS

7.1 Summary of survey results

The six-township survey of 315 sites has provided important information regarding conditions affecting water and waste on individual sites in developing urban areas for lower income groups where there are multiple dwellings per site.

The survey found that the earlier assumptions by Van Ryneveld (1991) regarding levels of access for backyard shack-dwellers (see section 1) may have been too pessimistic, whereas those of Palmer Development (1993a) should be refined given the information obtained in this survey.

The survey findings in relation to access to services can be summarised as follows:

- **Access to water: nearly all of the people in the shack-dwellings had access to water on site. On sites where there were constraints or arguments on the use of taps the main contributing factors were: the number of taps, the number of people per tap and the location of the tap on the site. No practice of point sales of water to tenants was reported, and water prices charged were generally in accordance to the official water tariff in the township.**

- **Access to sanitation: most of the people in the shack-dwellings had access to on-site toilet(s). On sites where there were problems over toilet use this was mainly related to: general operation and maintenance, the number of toilets, and the location of the toilet on the site. As an alternative to the on-site toilet people use their workplace, the neighbour's toilet, the garden and the veld. No practice of per visit charges for toilet use was reported.**

- **Solid waste services: refuse storage and removal was problematic on most of the sites. Linkages between such problems and poor stormwater quality are suspected in four of the six townships. The major contributing factors were a shortage of refuse bins and bags for storing waste until collection, and the very weak refuse removal services operated in five of the surveyed townships.**

7.2 General conclusions

A number of observations can be made in relation to the survey results:

a. 'Backyard living' allows access to formal services to a large urban population who would otherwise not have access to such services. As such, it can be assumed that the majority of backyard shack-dwellers enjoy significantly better levels of access to services than the populations of informal and squatter settlements with no dedicated or only rudimentary services.

b. 'Backyard living' can be an important source of income to the main householder (who may not actually own the property). It assists in paying for site rentals or bond repayments and shares the cost of service connections and supplies to the site. The shack-dwellers are generally able to save on transport costs by living closer to places of employment than what would otherwise be possible. For these and other reasons (such as supporting relatives) 'backyard living' is very unlikely to disappear in future. In certain areas it may become less intense with time as serviced plots and housing become available nearby.

c. The overcrowding of sites is creating considerable problems for particularly waste services in the densely settled parts of townships. However, such problems mostly relate to an already weak maintenance and operation situation shortage in most developing urban areas. 'Backyard living' is making an already bad situation worse, but it is not the major cause of such operating problems.

d. From the information obtained on each of the services, the following emerge as the major requirements for improving services to those in 'backyard living' conditions:

   - An improvement in the water supply situation of shack-dwellers who are tenants of the main households requires a sufficient number of taps in relation to the site population located outside the house.

   - An improvement in the sanitation situation of shack-dwellers who are tenants of the main household requires an outside toilet which is well-maintained and operating.

   - An improvement in the solid waste service to 'backyard shack' dwellers requires provision of solid containers for refuse storage inside the yard and an easily

understood, reliable removal or disposal service which operates at twice weekly intervals (or some other, regular arrangement).

7.3 Recommendations

a) Research orientated recommendations

a. The information relating to on-site conditions in denser, inner city townships should be used as inputs into other Water Research Commission studies on access to water and sanitation, water usage and stormwater run-off quality. In addition it should also be made available as basic information to research workers and planners working in the field of housing and services provision generally.

b. This report has raised many issues relating to the way water, sanitation and solid waste services are used in well established areas on sites with backyard shacks. However, the results can not be applied broadly to all urban areas due to this focus on a particular type of housing situation. Given the great importance which is likely to be attached to improving the provision of these services to poorly served people, over the next decade, research on the use of these services across a broader range of urban living conditions may offer substantial benefits. Such research should be orientated towards assessing existing patterns of use and people's attitudes to water and waste services. It should consider formal single unit dwellings, formal multiple unit dwellings, site and service schemes, and informal "squatter" areas. This would provide an important basis for future planning for services provision in these areas.

b) Design and planning orientated recommendations

a. The survey has shown that planners, urban managers and housing policy-makers have to obtain a better understanding of the dynamics and patterns of 'backyard living'. The role and impact of this important form of spontaneous informal housing will have to be carefully considered in:

- the design of houses and sites;
- in the design of reticulation and bulk infrastructure;
- setting up solid waste removal systems;
- in structuring housing finance and subsidies;
- in setting services tariffs and site rentals; and
- controlling land-use in developing urban areas.

More systematic research to produce policy guidelines - taking the findings of this survey into account - are needed in all the above fields.

b. 'Backyard living' has a number of design implications. In planning serviced sites and housing the need for outside access to taps and toilets should be considered, particularly if sub-tenancy is to play a major role in making formal housing and services affordable to developing urban communities. In addition to toilets and taps, the provision of robust containers for refuse storage should be considered as basic service requirements.

c. Solid waste is emerging as possibly the major problem area for densely occupied environments. Refuse storage and removal should be considered and provided for in plot layout designs. Waste management should not be left for the Town Council to provide as an afterthought, but must be part of an integrated water and waste systems planning exercise with physical, operational and financial implications.

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APPENDIX A

BACKGROUND INFORMATION ON EVERY TOWNSHIP, INCLUDING MAPS

CONTENTS

LIST OF MAPS

TOWN Alexandra

LOCATION

Alex is situated approximately 12 km north-east of Johannesburg central and 4km east of Sandton CBD, between the eastern bypass (N3) and old Pretoria main road.

TOPOGRAPHY

Alexandra is divided by Jukskei River into areas known as the East and West Banks which slope gradually towards the river.

AREA

Administrative area 469 ha (of which 330 is developed), divided into the West Bank (358 ha), East Bank (102 ha) and Syferfontein (9 ha).

ADMINISTRATION

Independent local authority established on 16 September 1983, but collapsed under political pressure in 1986. Currently managed by TPA through an Administrator. Bulk services are supplied by the Central Witwatersrand Regional Services Council (WCRSC).

BACKGROUND

Development of Alex began with subdivision of the farm in 1905 as a freehold area for blacks and 'Coloureds'. During the late 1940's the area grew rapidly despite the absence of basic infrastructure. In 1963 the Government decided to substantially redevelop the area; family houses were to be demolished and the area was to consist entirely of clusters of huge, single-sex hostels for 35 000 workers. Between 1963 and 1964 45 000 families were forcefully resettled to Meadowlands in Soweto and Tembisa in the East Rand. Deproclamation of township as freehold area followed.

After sustained resistance and local pressure, the resettlement policy was reversed in 1979 and a master plan was developed to allow for the accommodation of 65 000 residents on a family basis and 6 000 on a single basis in the town. The plan called for the demolition of all unsuitable buildings, with residents removed to suitable structures. Sheer numbers and cost led to the abandonment of the Master Plan in the mid-1980's. An 'Urban Renewal Plan' was formulated which recommended that all existing dwelling units be retained, formal stands be demarcated and each stand then be provided with vehicle access and basic engineering services. This plan was implemented between 1987-90 in three phases at a cost of R 146 million. Informal settlement were constructed during this period on land set aside as flood zones and green open space.

ACCESS

Convenient access to three major road networks is possible: the M1 freeway, the N3 freeway, and the Old Pretoria Road. The nearest railway station is in Johannesburg city centre.

EMPLOYMENT

Major office/town centre employment is in Johannesburg (16 km), Sandton (8 km) and Midrand (16 km). General industrial employment occurs in Kew (2 km), Wynberg (2 km), Marlboro (1 km) and Midrand (16 km). Unemployment estimated at 35%.

INCOME

Average monthly household income levels (1993):

Income range	Percentage of population
less than R 399	22
R 400-599	20
R 600-799	18
R 800-999	16
more than R 1000	24

HOUSING AND PEOPLE

POPULATION

Estimates vary between 180 000 and 310 000. A population of size of 200 000 seems reasonable estimate.

DENSITY

Gross density of 427 pph; on average 5.4 persons per household.

DWELLINGS

Formal housing units (*)	15 012 (853 East Bank)
Backyard shacks	14 250 (West Bank only)
Free-standing shacks	4 750
Hostel beds	8 379
Flats	1 452

(*) Includes rooms within old municipal houses on the West Bank occupied by individual households.

OWNERSHIP

70% of formal houses and 52% of flats owned by the municipality

PLOT SIZE

Original 1905 township layout comprised 2 500 erven of 1 145m2 each in a conventional grid system. Ruling plot size in West Bank 150 m^2 (formal plot sizes have very little meaning) and East Bank 180-550 m^2.

GROWTH

Stabilised densities in West Bank and residential expansion on East Bank on 343 undeveloped but sold plots. North Bank new focus for development.

BULK SERVICES

WATER

Supplied by CWRSC via Randjieslaagte reservoir.
Major problem: Lack of water storage capacity will hamper planned development on far East Bank.

SANITATION

The CWRSC accepts all sewerage and the Johannesburg City Council as agent to the RSC has recently completed the construction of a relief outfall.

ROADS

Major access to the main road network is adequate.

DRAINAGE

Natural slopes provide adequate drainage to central Jukskei River.

SOLID WASTE

All collected waste dumped at Johannesburg City Council Linbro Park waste disposal site under contract to the CWRSC.

ELECTRICITY

Supplied and maintained by Eskom as an agent to the RSC, using a pre-paid metering system.

INTERNAL SERVICES

WATER

The Council operates the distribution system assisted, as necessary, by Randburg and Sandton municipalities. All originally subdivided plots have been supplied with washing units which includes taps shared by all households living on the site. Some of the older privately-owned houses have house connections. Each of the shack settlements on zoned open space within the West Bank has a public standpipe or two (1 per 20 stands average). The large shack area adjacent to Jukskei River has no water reticulation.

Major problem: serious problems are experienced with meter reading and maintenance of the system due to a lack of operating funds and skilled staff.

SANITATION

All originally subdivided stands on West Bank have been supplied with ablution blocks, where a water-borne WC is shared by all on the site. The East Bank has a conventional water-borne system. The large shack settlement on Jukskei River has communal bucket toilets shared by 4-5 households. The pockets of informal settlements in the zoned green open space has no sewerage provision (15 000 people).

Major problem: the sewerage system on the West Bank was designed for a substantially smaller population, which results in gross overloading. Frequent blockages occur throughout the system and spillage from the bucket system and blocked pipes into the Jukskei River is common. Lack of waste water recipients of water on West Bank (only one washbasin) leads to waste water being tipped on the ground or stormwater system. Buckets difficult to access and service due to layout.

SOLID WASTE

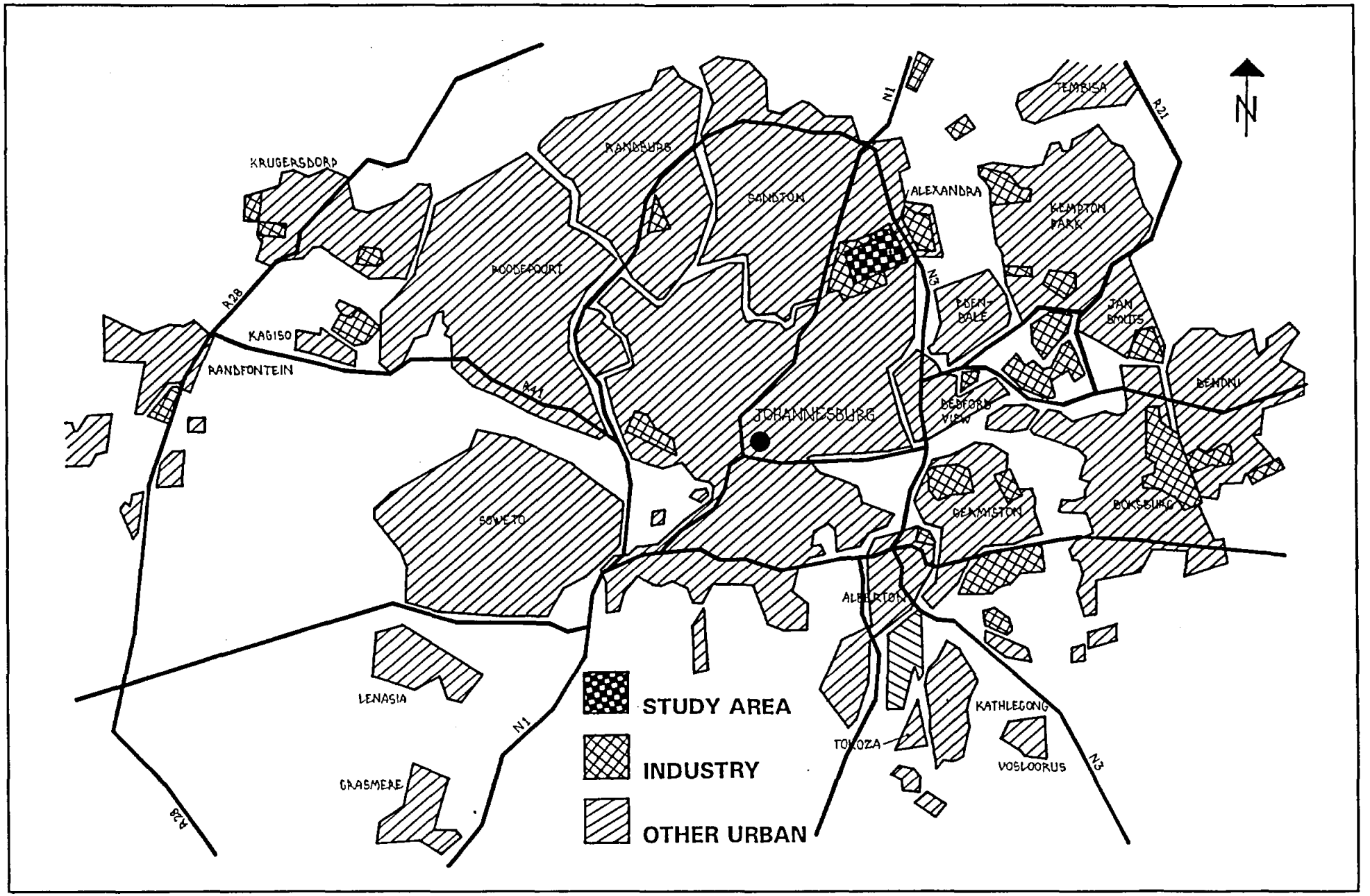
For many years an inadequate solid waste removal system caused huge water and soil pollution and health problems. Early in 1992 Munitech Ltd was awarded a R11 million three-year contract to develop a new system. Refuse is now collected once a week in each of five defined zones, operated by three contractors (of which two are local). Plastic bags are handed to every house and shack household free of charge. Bags are collected by a street cleaners who carries them to bulk bins placed on every street corner. Additional skips are also supplied for garden waste, in shack areas and points of major littering. Payment of street cleaners is linked to performance ie. how clean the streets are at the end of the week).

Major problems: litter pollution has decreased substantially since operation of the new system, but indiscriminate dumping is still taking place in stormwater drains, rivers and on open land, especially in the shack areas.

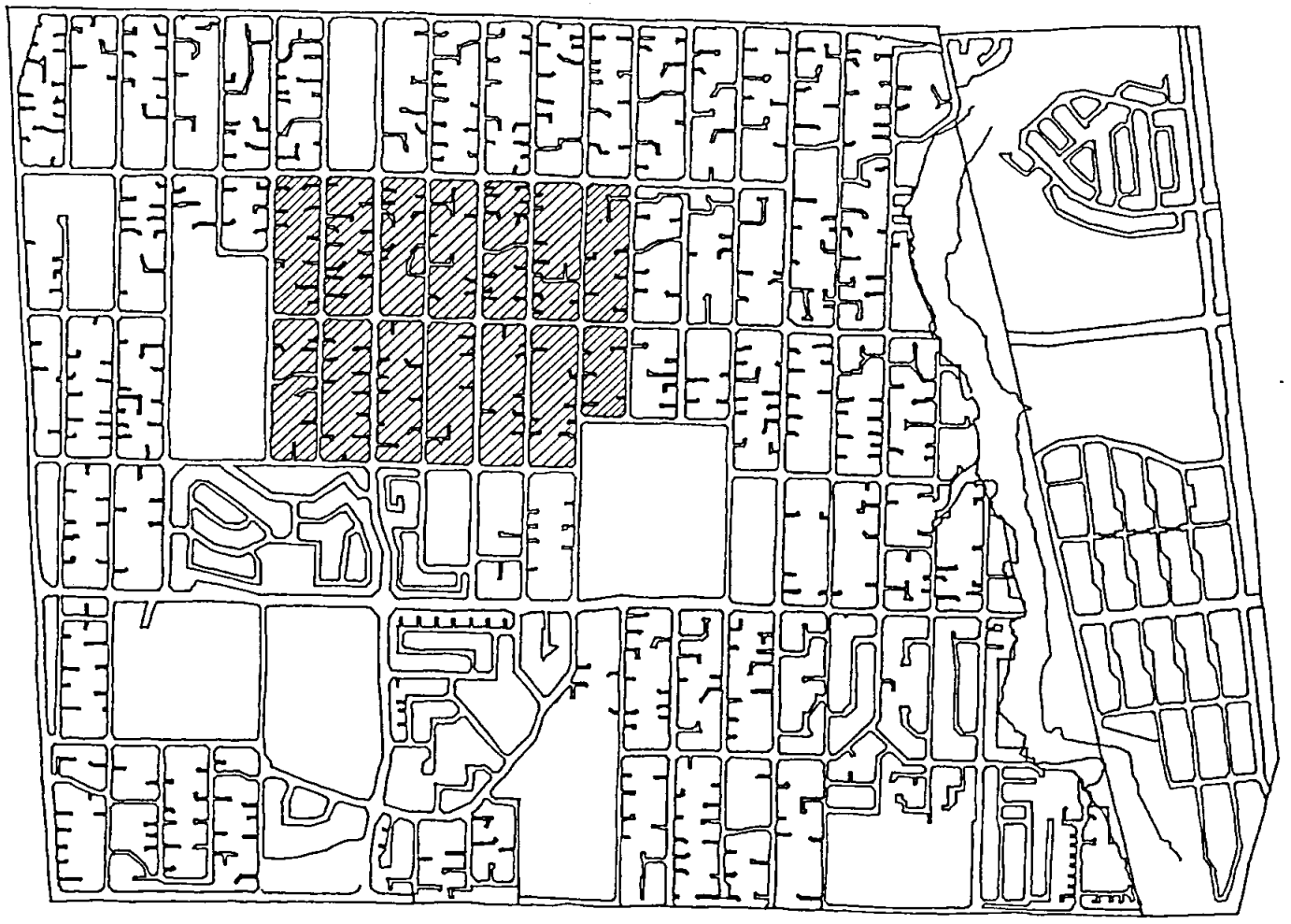
SERVICE FEES

Monthly flat rate for all services (excluding electricity and VAT):

West Bank houses:	R 8.00 plus R5.00 for each room
East Bank houses:	R 48.00
Backyard shacks:	R 11.40
Free-standing shacks:	R 11.40



Map 1: Johannesburg Metropolitan Area



Map 2: Alexandra Local Area showing area surveyed

TOWN

Clermont

LOCATION

Located adjacent and to the north of New Germany.

STRUCTURE

Steep terrain next to rivers and an undulating landscape defines the patterns of settlement in Clermont.

AREA

Administrative area of 650 ha of which approximately 70% is developed, and a further 20% earmarked for residential development.

ADMINISTRATION

Independent Local Authority administered by the Community Services Branch of the Natal Provincial Administration (NPA). Advisory Board structure collapsed in 1988.

BACKGROUND

Between 1858 and 1876 the Berliner Lutheran Mission Station of Christiannaburg was established in Clermont on an area of land some 650 hectares in extent. In 1931 permission was obtained from the state to sell all but 10 hectares for an African settlement, and in 1937 Clermont was proclaimed an approved township with 3500 sites. The sale of land to Blacks was halted in 1937 with the passing of the Native Laws Amendment Act (No 48 of 1937). This led to the dissolution of the developer, Clermont Township (Pty) Ltd, and in 1941 a Local Health Commission was established by the Natal Provincial Council to manage the area. This was later superseded by a Development Services Board.

The growth of the industrial sector of New Germany and the consequent migration to Clermont of large number of Black labour led to the rapid growth of the shack population of Clermont. In 1962 the sale of stands in Black townships were resumed under new legislation. In April 1974 the administration of the township was taken over by the then Department of Bantu Administration and Development. With the abolition of the Department in 1991, the administration of the township became the responsibility of the NPA Community Services Branch.

ACCESS

Access via Shepstonne/Posselt Road

EMPLOYMENT

Surrounding work opportunity areas are Pinetown, New Germany and Durban.

HOUSING AND PEOPLE

POPULATION

Estimates range between 60 000 and 115 000. A population of 95 000 appears a reasonable estimate.

DENSITY

164 pph. 12.8 persons per household, or 30 persons per site.

DWELLINGS

Formal sites:	3 750 (of which 2900 are formal houses and rest inferior substantial houses)
Backyard shacks:	4 000
Vacant sites:	541

PLOT SIZE

540 m2 (80% of formal stands)

BULK SERVICES

WATER

Supplied by Umgeni Water Board (via Port Natal Ebhodwa) and Pinetown Water. Insufficient bulk water storage capacity constrains development.

SANITATION

Effluent discharged to KwaDabeka C sewerage works which discharges into Umgeni River.

ROADS

Major access provided through New Germany and MR 577.

DRAINAGE

Drainage provided by pipes along the 28 km of roads, parks and valleys.

SOLID WASTE

Refuse removal services handled by NPA and taken to NPA controlled site in Clermont which is nearing the end of its life.

ELECTRICITY

Supplied and maintained by Durban Electrical. The whole formal area is reticulated.

INTERNAL SERVICES

WATER

There are 2 500 domestic private house connections (66 % of formal sites). The rest of the area has formal standpipes at an average of 1:10 and 1:20 households per standpipe in various areas.

Major problems: very high water losses caused by breakages of 70% in 1990 have been reduced substantially through an upgrading and leak detection scheme. The system now has the capacity to cope with the higher than planned densities. Reticulation is still incomplete. Water meters tampered with or purposefully obstructed.

SANITATION

80% of formal stands have waterborne sewerage, 10% have conservancy tanks and 10% are on a bucket system.

Major problems: the system copes adequately with peak loads and is currently upgraded to cope for future growth. Blockages result from misuse of system and some of the older infrastructure is collapsing, requiring regular maintenance and repairs. Difficult access to buckets and conservancy tanks reduces efficiency of the system.

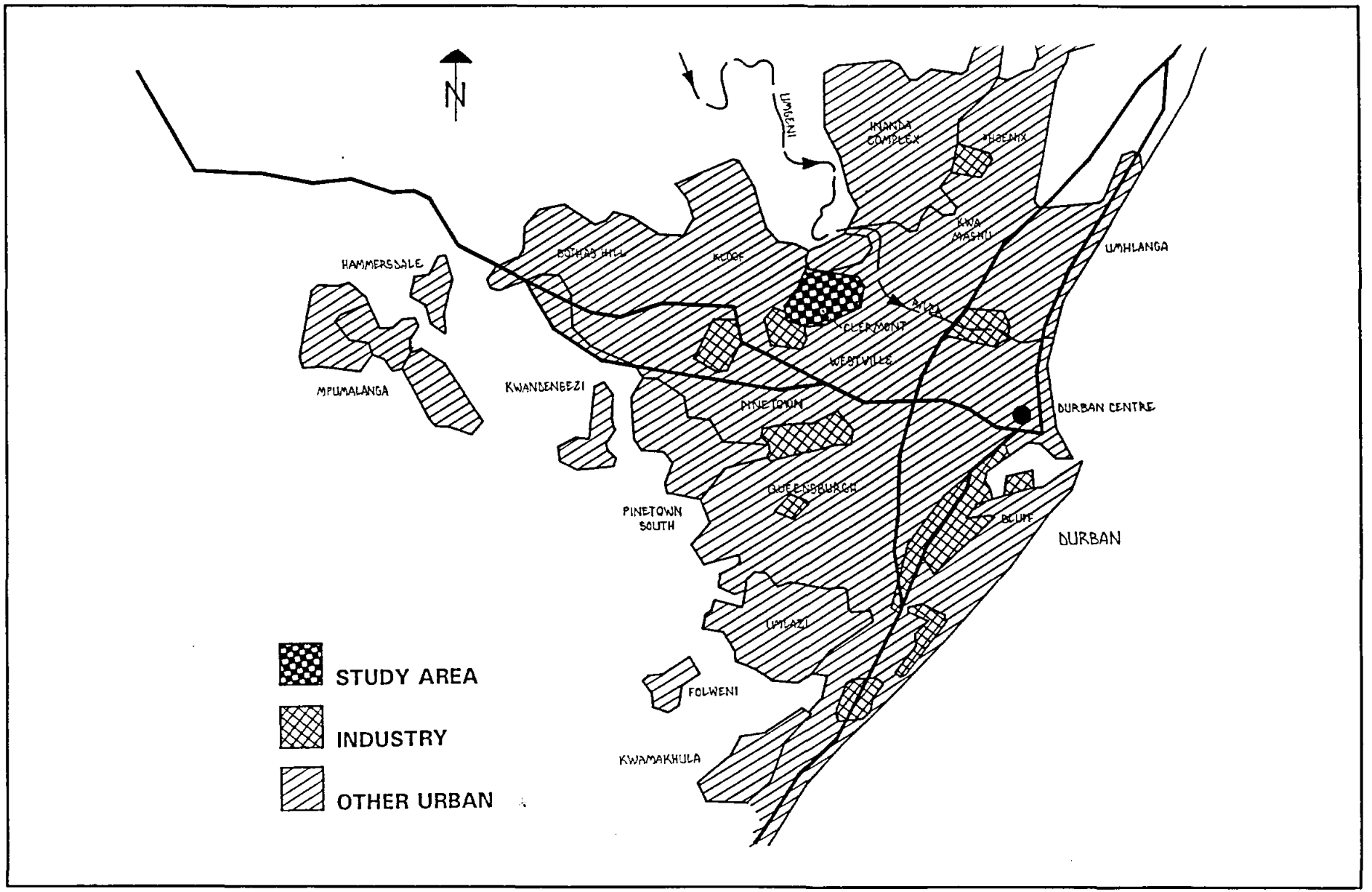
SOLID WASTE

Household refuse collected twice a week from sidewalks. Skips provided at neighbourhood dumping sites. The Council has two compacters and 4 tractors at its disposal.

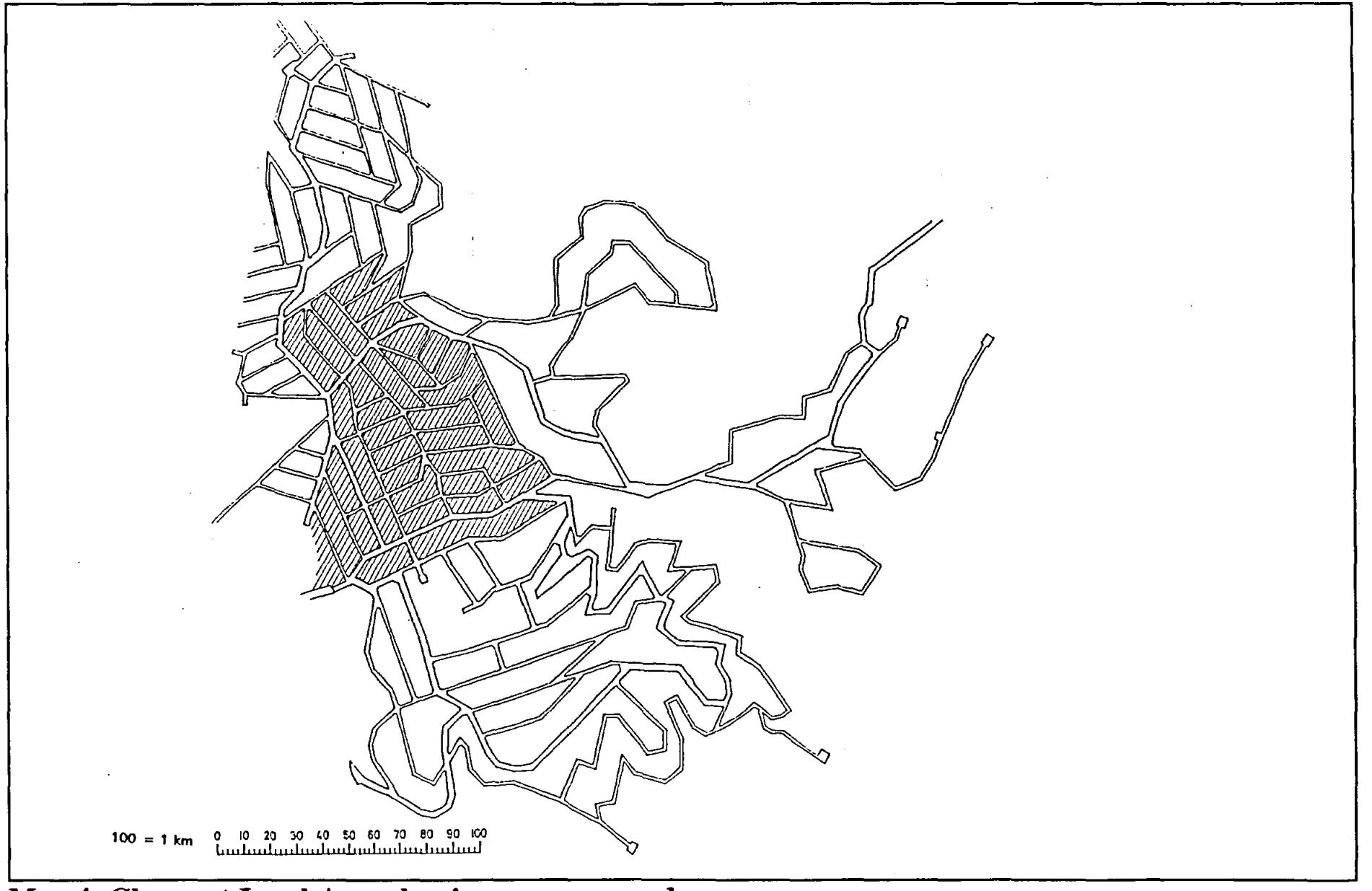
Major problems: mess in streets and at informal dumping sites due to a lack of bins, plastic bags and sufficient number of skips. Litter problem in township and pollution of stormwater.

SERVICE FEES

Water: metered and sold at 35 c/kl. 2769 accounts are being send out, of which approximately 52% are paid. The average water consumption is 56kl or R 22.40 *per site.*



Map 3: Durban Metro Area



Map 4: Clermont Local Area showing area surveyed

TOWN

Kwa-Thema

LOCATION

East Rand, approximately 65km from Johannesburg and 11km from Springs to the east.

TOPOGRAPHY

Land is generally flat with low laying areas. Flood line around Withokspruit divides township into northern and southern parts.

AREA

Administrative area of 1198ha, of which 1090 is developed.

ADMINISTRATION

Kwa-Thema Town Council, an independent local authority established in 1984 to replace Administration Board.

BACKGROUND

Established in 1951 to accommodate black families removed from Payneville near Springs 10km south-east of Kwa-Thema. Great deal of violent unrest occurred in the town in 1985 characterised by right-wing vigilante activity. Has since seen less violence than other Eat Rand townships, possible due to the absence of many political parties - it is mainly an ANC-aligned area. The recent education crisis has seen the first flare-up of major unrest in the area in years. Long-term plans are to establish Kwatsaduza by merging the neighbouring townships of Kwa-Thema, Tsakane and Duduza into one city.

ACCESS

The nearest freeway and railway station are approximately 10km from Kwa-Thema.

EMPLOYMENT

Most residents work in Springs, and commute by taxis and buses. Train links to other East Rand towns such as Benoni, Brakpan, Boksburg and Germiston. Unemployment estimated at 70%.

HOUSING AND PEOPLE

POPULATION

Estimates range between 80 000 and 230 000. 175 000 is thought to be a reliable estimate.

DENSITY

160 pph. 7.1 person per house.

DWELLINGS

Formal houses:	12 430
Backyard shacks:	13 000
Free-standing shacks:	3 140
Hostel beds:	7 482

OWNERSHIP

Approximately half the formal houses belong to the Town Council, and the rest of formal houses and sites to private owners.

PLOT SIZE

Average size of 20mx15m = 1300m^2

GROWTH

Expanding southwards around IDT site and service project.

BULK SERVICES

WATER

Supplied by Rand Water Board. Infrastructure recently upgraded.

Major problems: system overloaded due to higher than planned population in the town. System was designed to provide 10 Ml per day, but 12 Ml are currently demanded. As a result the reservoir es emptied within half an hour when pumping is halted. Currently some of the main lines are being upgraded to cope with the high demand.

SANITATION

Outfall sewer operated by East Rand RSC

ROADS

Easy access to major roads. Road system overloaded during peak hours.

DRAINAGE

No regional drainage facility exists. Local system drains via Withokspruit and Blesbokspruit to Vaal River.

SOLID WASTE

Bulk service supplied by the East Rand RSC. Waste transfer station erected in Kwa-Thema for regional waste removal.

ELECTRICITY

Supplied by Eskom. 90% of town reticulated.

INTERNAL SERVICES

WATER

All formal sites have metered domestic connections. In the informal site and service area pubic standpipes have been provided for 1200 sites.

Major problems: high water losses on system (42%) due to breakages and leakages.

SANITATION

Sewer system serves all stands.

Major problems: the system was designed for a smaller population and can not handle loads. It was designed to carry 600 l per site per day, but currently carries on average 1400-1500 l per day per site. Frequent blockages due to misuse and dumping of solid waste into manholes result in overflows. Residence and backyard shack dwellers discharge sullage into streets, creating unsanitary conditions. Upgrading of R2.5 million planned.

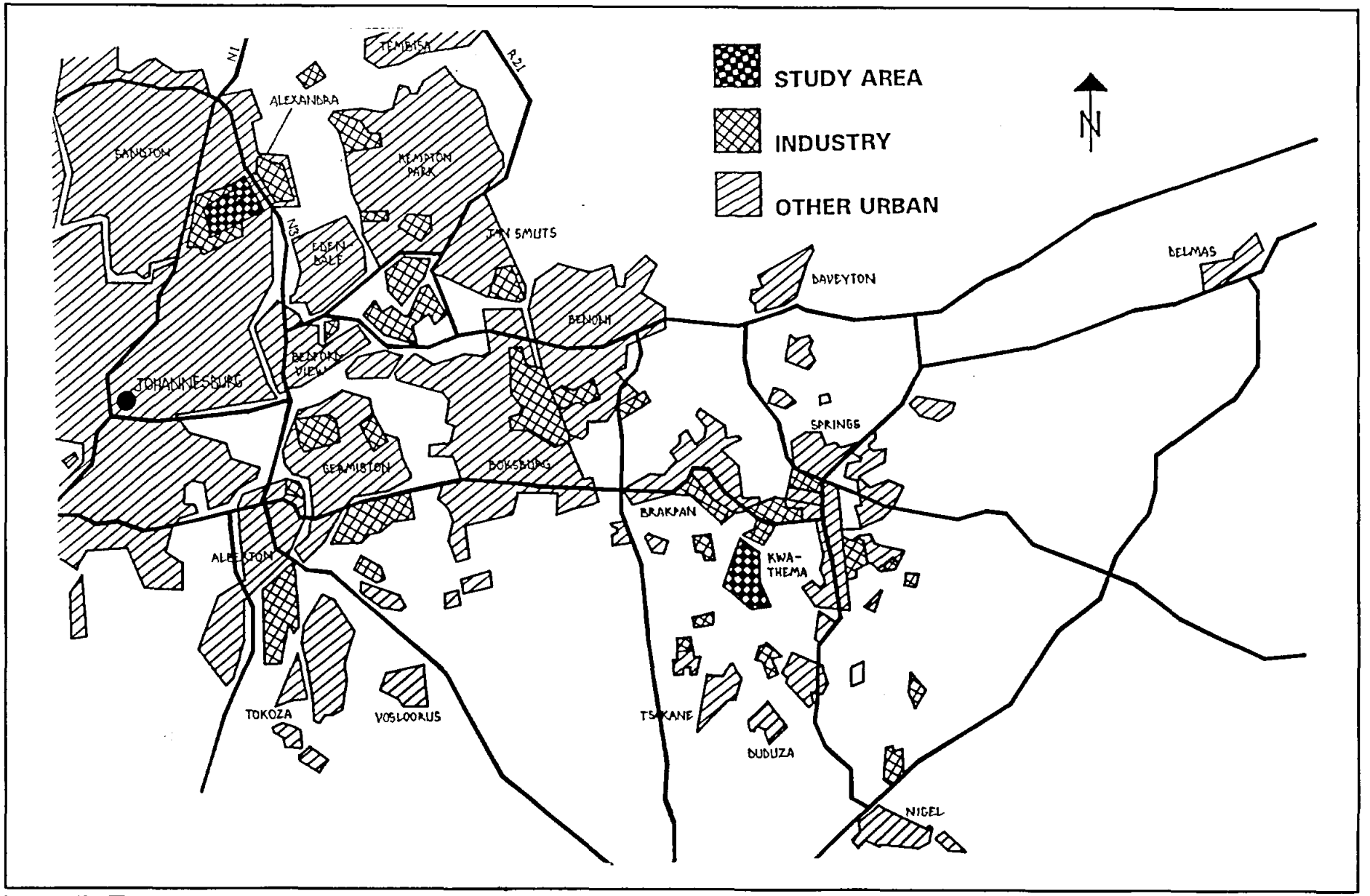
SOLID WASTE

Twice weekly house collections from drums and mass containers at strategic locations.

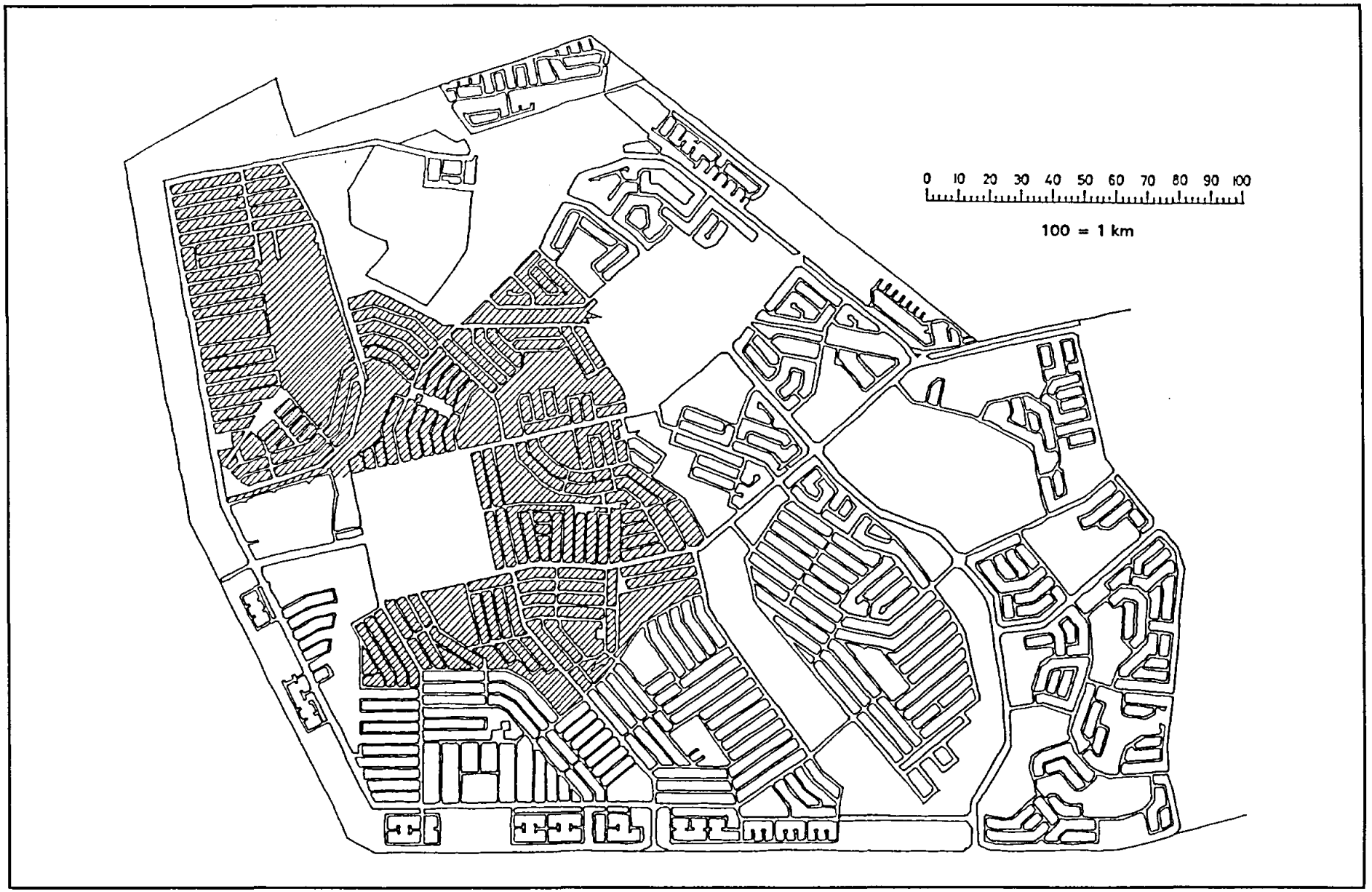
Major problems: shortage of drums (need 25 620, have 6 500) leads to rubbish being dumped on street corners and open spaces. This in turn causes storm water blockages and potential public health problems. Low stormwater quality causes serious pollution problems in Withokspruit (to the west) and Blesbokspruit (to the east).

SERVICE FEES

Flat monthly levy of R82 (which approximately 25% of households pay) covers electricity (R32), water (R30) and refuse and sewerage (R20).



Map 5: East Rand Metropolitan Area



Map 6: Kwa Thema Local Area showing area surveyed

TOWN

Mamelodi

LOCATION

Mamelodi is located on the eastern periphery of the Pretoria metropolitan area, approximately 30 km from the central city. It is adjacent to Eersterust in the west, the former 'Coloured' residential in Pretoria, and Silverton in the south-west.

STRUCTURE

The town is located along the slopes of the Magaliesberg, with the oldest parts closest to the city. The new informal settlements are located on the eastern edge of the township past the railway line.

ADMINISTRATION

Mamelodi Town Council

BACKGROUND

Mamelodi was established in June 1953 to accommodate black people being removed from Riverside, Eastwood and Lady Selborne in Pretoria in terms of Group Areas Act. Its growth stopped in 1968 whem government froze all new black housing developing in urban areas, a policy which was reversed in 1978. The township was granted municipal status in 1984.

Growth of the town was strictly controlled untill the demise of influx control when a sudden increase in backyard shacks occurred throughout the older western parts of Mamelodi. Informal settlement in the east began in 1989 and a substantual number of backyard shack dwellers moved to the new settlement. This internal movement and construction of more formal houses led to a slight decrease in population densities since 1990.

ACCESS

Mamelodi has good connections to the rest of the city via the rail and road network.

EMPLOYMENT

The major centres of general industrial employment are the close-by industrial areas of Watloo, Dispatch and Silvertondale, some of the most important industrial areas in Pretoria.

INCOME

Monthly income per household in 1991:

Income range	Percentage of households
R1-599	45
R600-799	17
R800-900	14
R1000-1999	20
R2000+	4

HOUSING AND PEOPLE

POPULATION

Estimates range between 160 000 and 440 000. 315 000 considered a reliable estimate.

DENSITY

8.18 persons per household; 15.9 persons per site.

DWELLINGS

Formal houses:	21 500
Backyard shacks:	13 000
Free-standing shacks:	6 000
Hostel beds:	11 000

OWNERSHIP

A large proportion of formal houses are privately-owned. Backyard shacks generally belong to site owners and are rented to relatives or tenants.

PLOT SIZE

Average size of $300m^2$

GROWTH

Population currently growth at 5.8% p.a., expected to increase sharply when transport subsidies to Kwa-Ndebele, Lebowa and Bophuthatswana are phased out.

BULK SERVICES

WATER

Supplied by Rand Water Board to reservoirs R3 and R4 and Pretoria City Council from their Garsfontein reservoir to reservoir R2. .

Major problems: some upgrading is needed between reservoirs R4 and R2. After such upgrading all water will be supplied by Rand Water Board.

SANITATION

Discharged to Baviaanspoort wastewater treatment works operated by Pretoria City Council.

No major problems.

ROADS

Good access to main road network and N1 and N3 freeways.

DRAINAGE

Adequate drainage into Pienaarsrivier and Edendalspruit.

No major problems.

SOLID WASTE

Solid waste is disposed at own municipal dumping site to the east of the town.

ELECTRICITY

Supplied by Pretoria City Council.

INTERNAL SERVICES

WATER

The formal area of Mamelodi is fully reticulated and plots have house connections. In the informal settlement public standpipes are provided at an average of 1 for 20 households.

Major problems: none.

SANITATION

The whole formal area is served by an inner-block water borne sewerage system. In the informal areas septic tanks at public wash houses are emptied on a regular basis. Bucket system has been phased out over last two years.

Major problems: the system is overloaded during peak hours, which creates blockages and overflowing into streets and of the sewerage works. Public wash houses in the informal area are not maintained to a sufficient standard.

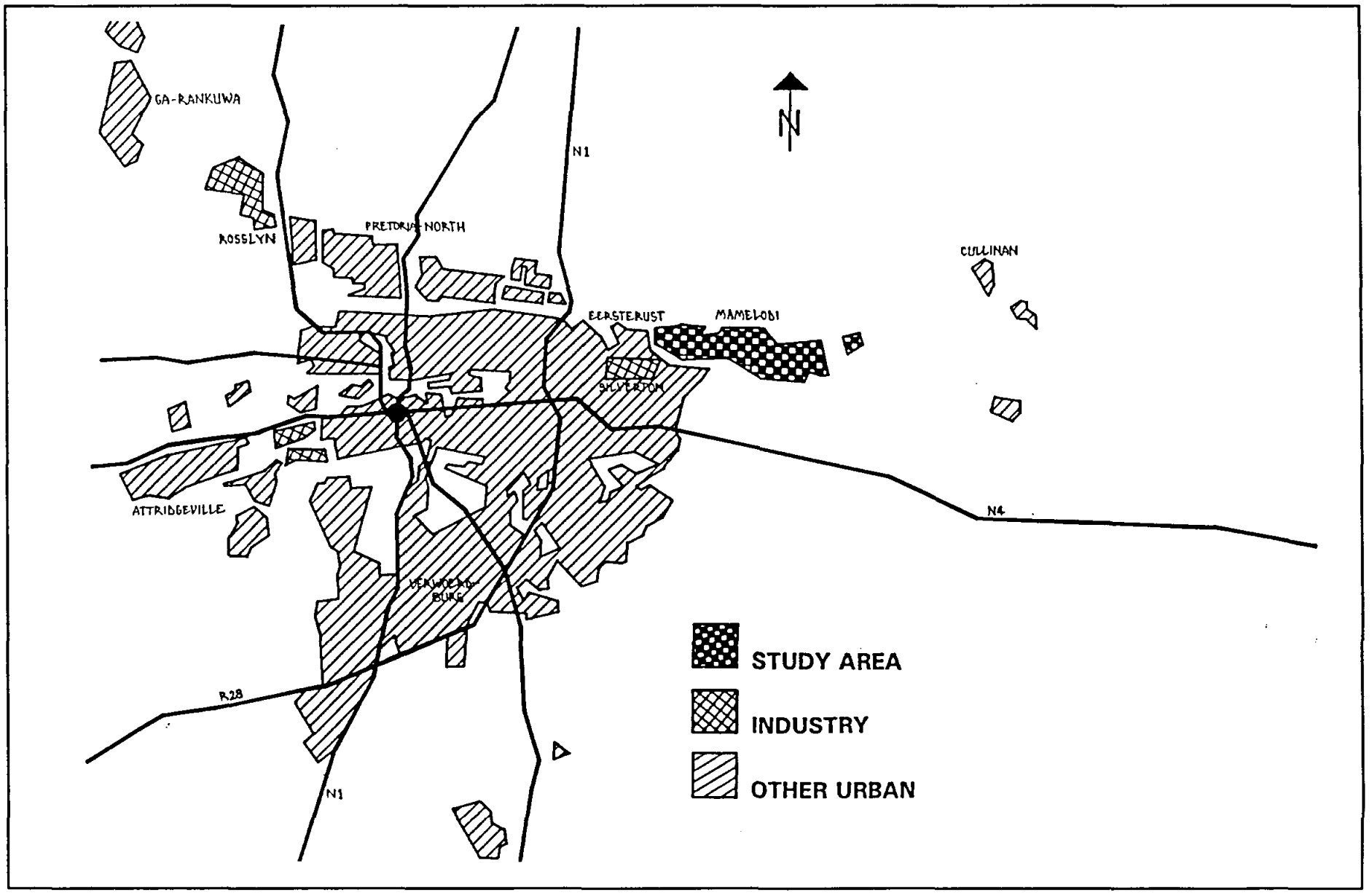
SOLID WASTE

Twice weekly collection by private contractor of refuse placed in bins. These bins have to be bought from the Council.

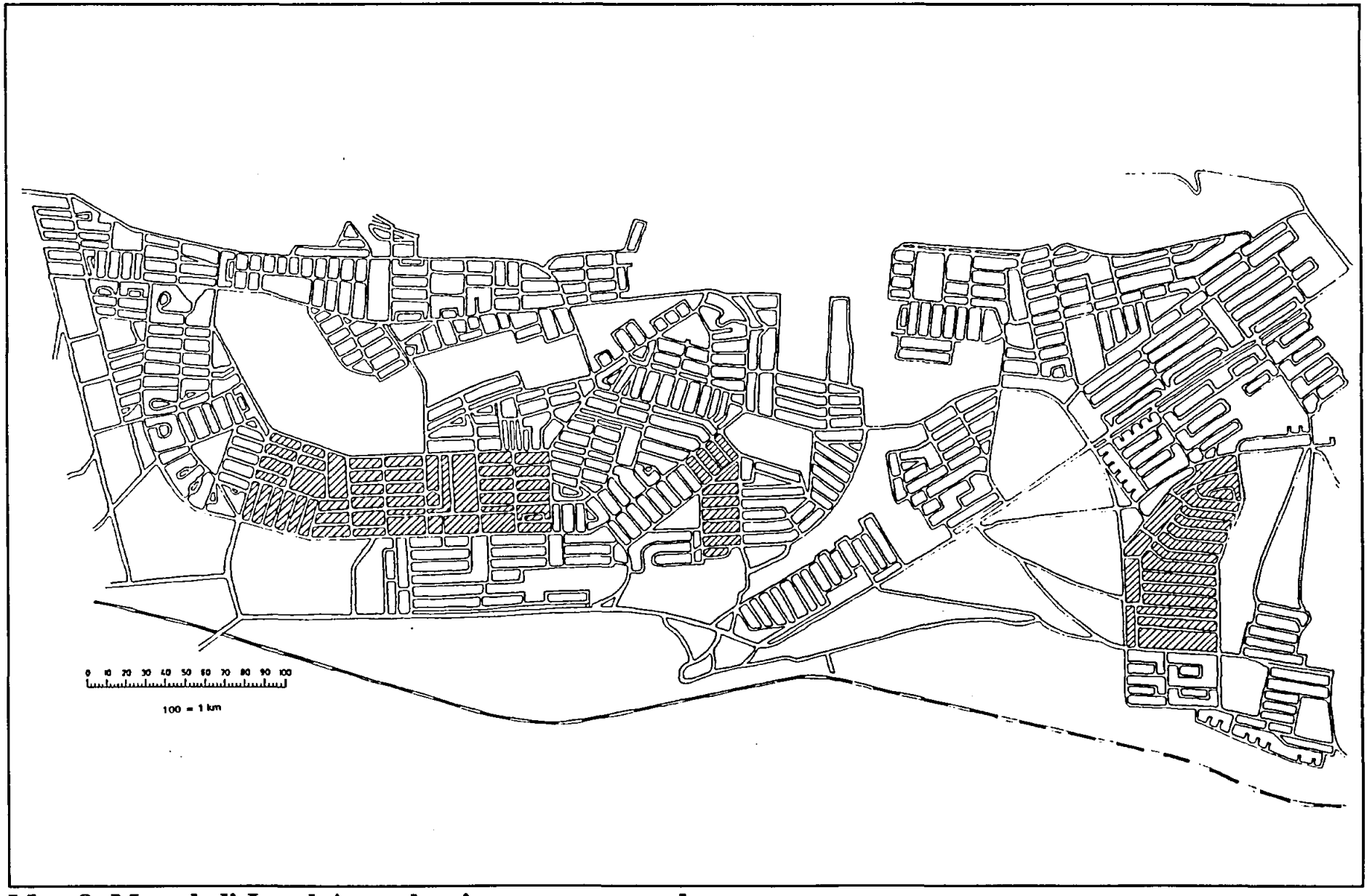
Major problem: a lack of bins leads to refuse being dumped on streets, creating pollution problems in stormwater draisn and open areas.

SERVICE FEES

Water metered and charged at 80c per kl.
Flat rate levy for sewerage of R 12.60 per month.
Flat rate levy for solid waste removal of R 9.00 per bin per month.



Map 7: Pretoria Metropolitan Area



Map 8: Mamelodi Local Area showing area surveyed

TOWN

Nyanga

LOCATION

South of the N2 freeway to Somerset West on the Cape Flats, 20km from Cape Town city centre.

TOPOGRAPHY

Very flat, sandy plain results in serious drainage problems. Very high water table which reaches ground during rainy seasons.

STRUCTURE

Guguletu, Nyanga and Crossroads form a single entity bounded by the N2 in the north, Landsdowne Road in the south, and the Mitchells Plain railway line in the west. Nyanga consist of a formally developed section and an extensive squatter area to the north along the N2 freeway.

AREA

294ha

ADMINISTRATION

Ikapa Municipality consists of the areas of Langa, Nyanga and Guguletu.

BACKGROUND

Established in 1965 as state-owned housing estate. The area received bulk of 62 000 refugees displaced by conflicts in the area in the 1970's.

ACCESS

Well connected via rail, freeway and primary roads to rest of city.

EMPLOYMENT

The major area of employment is Epping Industria and commercial and industrial pockets in Greater Cape Town.

HOUSING AND PEOPLE

POPULATION

Estimates range between 90 000 and 180 000. A population of 105 000 seems an appropriate estimate.

DENSITY

365 pph. 5.5 persons per household.

DWELLINGS

Formal houses	5 360
Backyard shacks	3 033
Free-standing shacks	9 210
Hostel beds	3 900
Empty formal sites	230 (serviced)

OWNERSHIP

PLOT SIZE

Ruling plot size is 150-180 m^2

GROWTH

BULK SERVICES

WATER

Supplied by Cape Town City Council

SANITATION

Discharged to Cape Flats wastewater treatment works operated by Cape Town City Council.

ROADS

Good access to main road network and N2 freeway

DRAINAGE

Drainage is difficult due to flat terrain and is served by canals which drain the catchment. The quality of the run-off into False Bay is poor.

SOLID WASTE

Solid waste is disposed at the Swartklip disposal site operated by Cape Town City Council.

ELECTRICITY

Supplied by Eskom.

INTERNAL SERVICES

WATER

Formal stands have taps on site. The informal areas are served with public standpipes at an average of 1:20 households.

Major problems: meters are not read and no accounts are send out. Huge deficit on water bill of R15 million per anum reduces operating and maintenance capacity.

SANITATION

Most formal stands have waterborne sewerage, whereas other sites are served with a bucket system operated by the Western Cape RSC in KTC, Millers Camp, Mping Square, Black City, Herbie Drive, Mpetha Square and Freedom Sqaure.

Major problems: bucket system not operating well. Spillage is common and collection is infrequent due to problems with access to sites, political disturbances and breakdown of tractors. Waterborne system designed for lower population densities, which results in overflow and blockages during peak hours. Blockages also occur from sand and rubbish entering or being dumped into manholes.

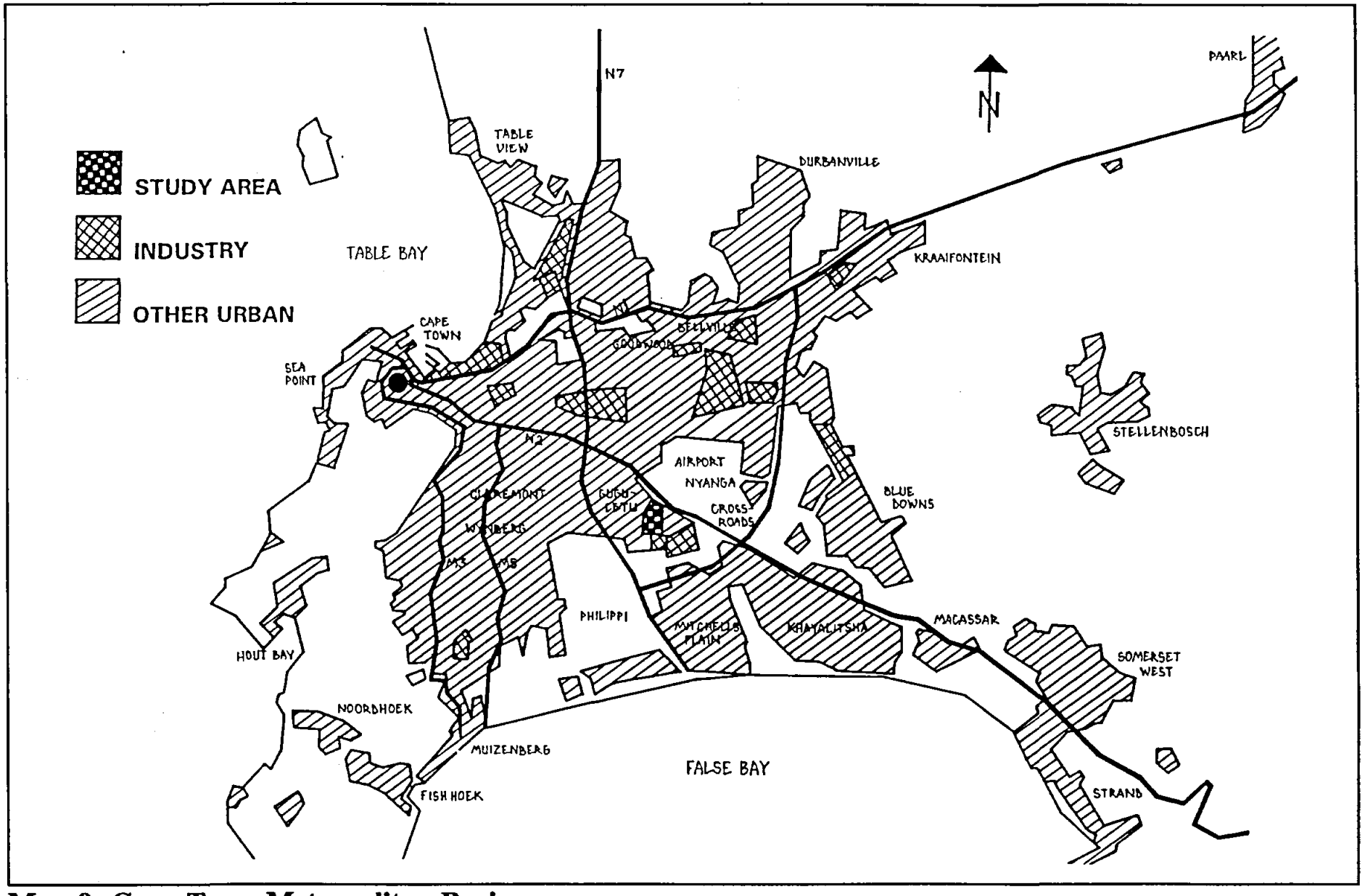
SOLID WASTE

Twice weekly door to door service is provided by the Council in the formal areas. Collection is from bags and bins. In informal area a private contractor picks up litter from strategic points a few times a week. It is planned to place skips in these areas. Bulk refuse bins are currently being provided at strategic vantage points in the informal areas. These are emptied regularly by a contractor. Garden refuse is collected once per month with lifting equipment.

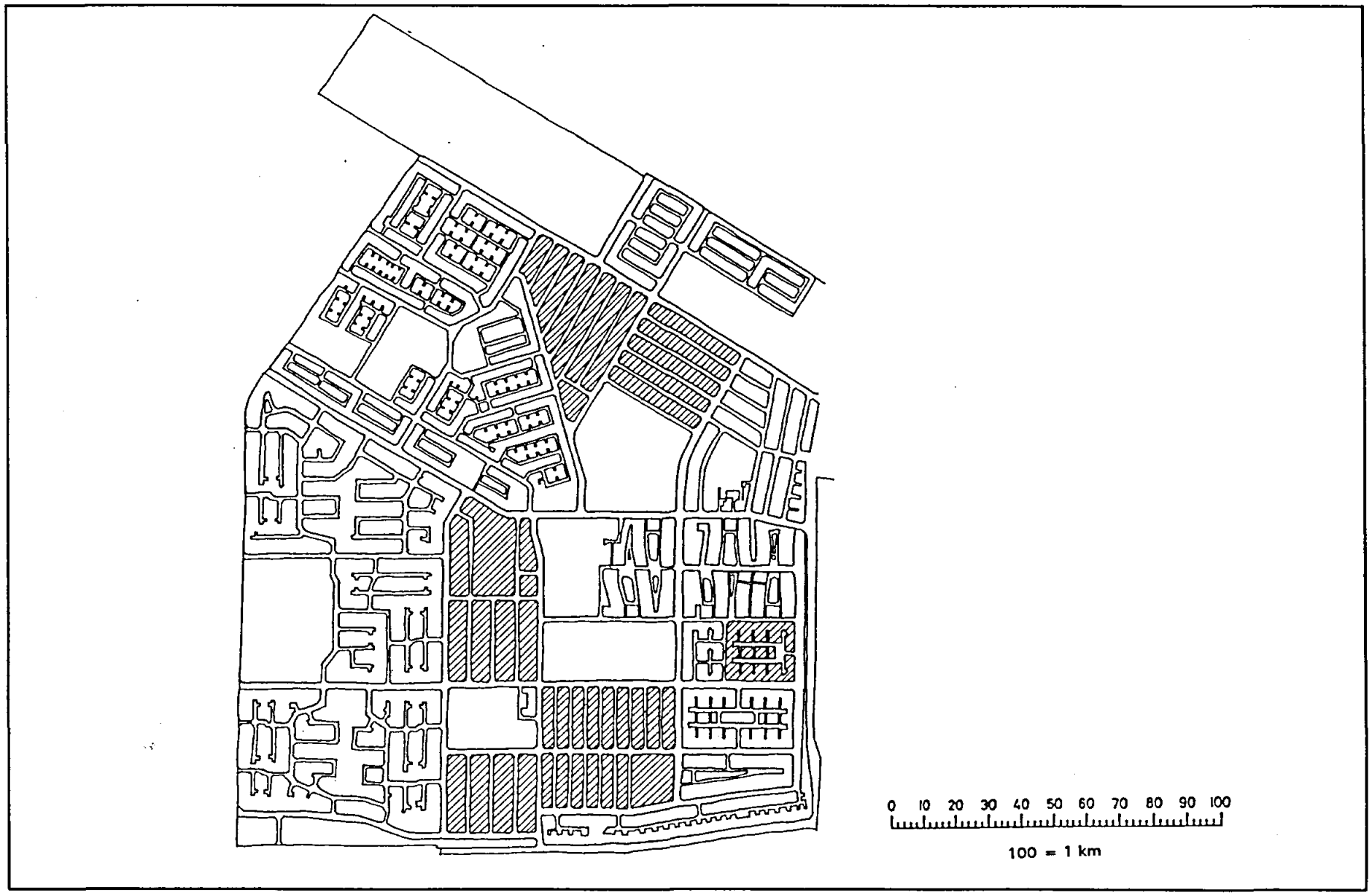
Major problems: lack of bins for refuse leads to spillage and dumping on open land, causing litter problem and water pollution. Problems with large pieces of furniture, car wrecks etc being dumped on street corners. Garden refuse accumulates on sidewalks due to infrequent collections and spills.

SERVICE FEES

Flat rate levy of R 3.90 per month for water. R 0.40 flat per month levy for sanitation services.



Map 9: Cape Town Metropolitan Region



Map 10: Nyanga Local Area showing area surveyed

TOWN

Thabong

LOCATION

Thabong is located 6 km to the east of Welkom city centre, and directly south of Riebeeckstad.

STRUCTURE

The town has four distinct parts: the older municipal housing development closest to the city (Old Thabong); the adjacent private housing development; the recent South African Housing Trust and Bloemanda development and the site and service schemes on the furthest edge of the township.

ADMINISTRATION

In terms of a co-operation accord between Thabong Town Council and Welkom Municipality signed end of 1991, senior officials from the Municipality have taken control over the management functions of the township while still reporting to the town council of Thabong.

BACKGROUND

In 1948 land was purchased by the Welkom Township Company - a subsidiary of the Anglo-American Corporation - for the establishment of a mining town. Welkom was designed as a total entity in the Garden City and classic apartheid doctrines. Thabong was designated a development area for Blacks in 1952. Since then it has been extended several times eastward away from Welkom.

Very strict influx control until 1986 allowed only labour for Welkom mines, industry and retail to live in Thabong. After the demise of influx control the population of the Township doubled within three years. Most of this new growth took the form of backyard shacks, as miners brought their families to live with them or people moved in from other smaller towns and farms to be closer to the main centre of employment in the Gold Fields. The decline of the gold mining industry since 1990 led, however, to a third of mining and two-thirds of industrial employment being lost in Welkom.

Anglo American embarked on a large-scale housing project in Thabong in 1986, but halted development when the mining activity began to decline. As a consequence of this decline and a lack of housing funds, formal housing construction came to a halt in the area over the last two years. At present the township has no squatter settlement as squatters living on the edge of the township in protest against high backyard shack rentals were moved onto site and service plots over the last two years. The Civic Association maintains close control over any further squatting in the township.

ACCESS

The town is connected to Welkom and other Gold Field towns via rail and Constantia Street, which connects to the major north-south routes.

EMPLOYMENT

Major employments is on the mines at Welkom (24% of employment), the Voorspoed industrial area, in homes and shops in Welkom and informal employment (30%).

INCOME

Estimated monthly household income in 1992

Income Range	Percentage of households
Less than R500	60%
More than R500	40%

HOUSING AND PEOPLE

POPULATION

Estimates range between 88 547 and 280 000 people. A population of approximately 220 000 seems a realistic figure.

DENSITY

5.9 persons per household, or 15 persons per site.

DWELLINGS

Formal houses:	11 000
Backyard shacks:	15 000
Free-standing shacks:	6 000 (site and service)

GROWTH

Estimated at 6% per anum, as opposed to Gold Fields average of 3%. As people move into site and service schemes in informal settlements their places in backyard shacks are taken by new urban migrants. A lack of sites and squatter settlements in Thabong is furthermore causing development of squatter settlements in smaller towns for people who would ideally like to live in Thabong.

BULK SERVICES

WATER

Supplied from Gold Fields Water Board (14.4 Ml per day average).

SANITATION

Sewerage works immediately to the south of Thabong built with excess capacity.

ROADS

Tar roads in good condition.

SOLID WASTE

Landfill site managed by Council.

INTERNAL SERVICES

WATER

In Old Thabong half the houses have private house connections and the rest taps in the yard. In the private housing development areas all houses have water in the house, whereas most site and service have public standpipes at an average of 50-200 households per standpipe.

Major problems: water systems not well-maintained due to a lack of technical staff and funding. Non-payment of accounts leads to periodic cut-off of bulk water supply by Gold Fields Water Board. Water supply in eastern site and service area not adequate to meet basic needs.

SANITATION

All sites, except the site and service plots on the eastern edge, have water-borne sanitation on site. On the site and service plots no sanitation has been provided.

Major problems: sewerage system was designed for substantially lower densities in Old Thabong. The presence of backyard shack inhabitants leads to overloading of the system with blockages and breakages occurring regularly. Operation and maintenance of the system is very weak due to a lack of trained and motivated staff. Since 1992 the situation has improved slightly. The absence of any sanitation in the eastern edge (18 000 people) leads to unhealthy conditions, and this situation is being addressed through the provision of public wash houses.

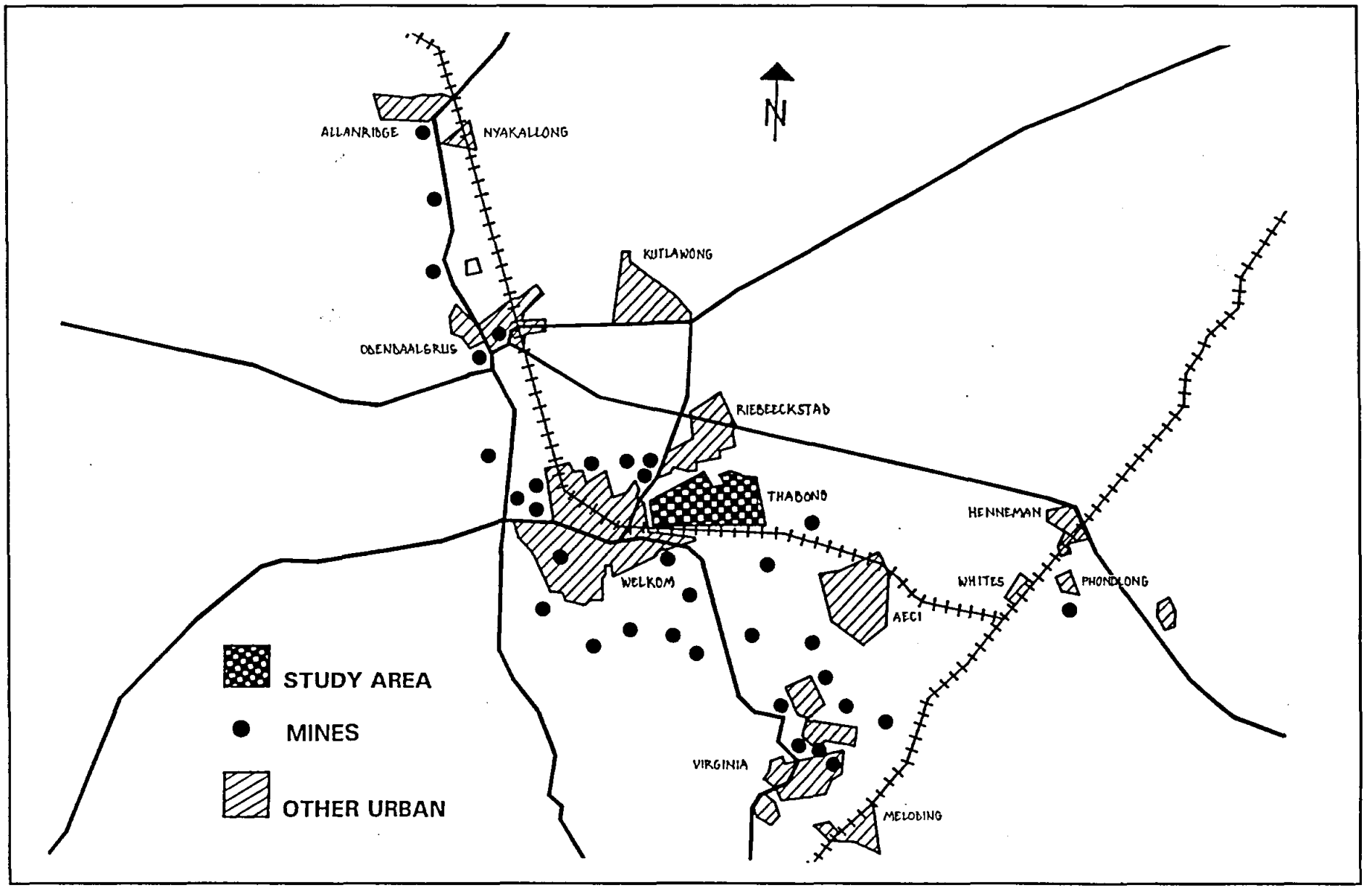
SOLID WASTE

The refuse removal system is weak and sporadic. People dump household and garden refuse on sidewalks where the Council picks it up on an irregular basis. The system function slightly better in the middle class housing development.

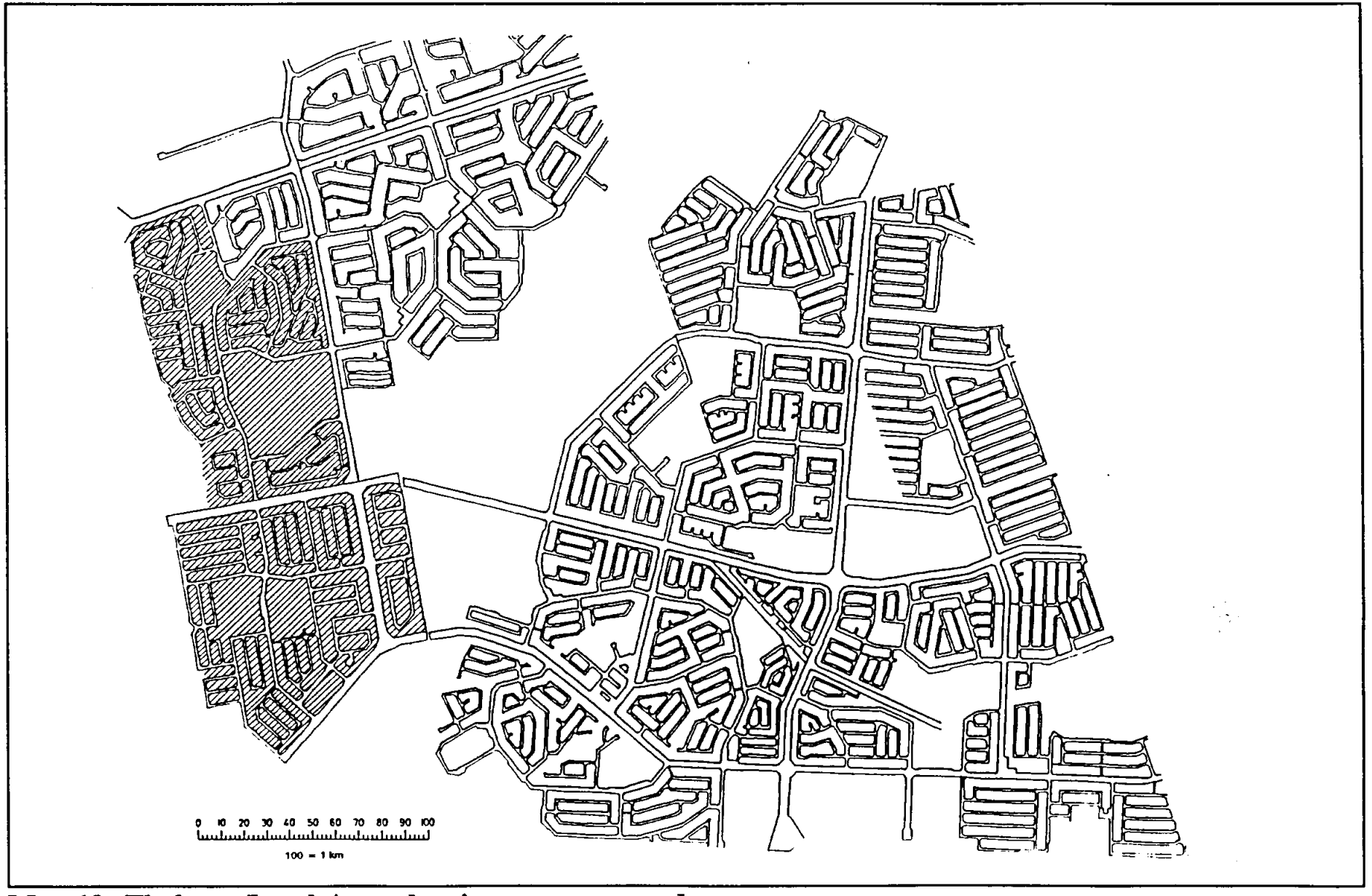
Major problems: lack of funds and staff to operate system adequately. Lack of refuse removal leads to extensive pollution and health risks in the township.

SERVICE FEES

Flat monthly levy of R25.00 for all services. Water is not metered. Few households pay the levy.



Map 11: Goldfields Metropolitan Area



Map 12: Thabong Local Area showing area surveyed

APPENDIX B

SUMMARY OF ALL DATA COLLECTED

LIST OF TABLES

Tables marked like this contain data not discussed in main body of text.

1. Sites and dwellings

	Alexandra	Clermont	Kwa-Thema	Mamelodi	Nyanga	Thabong	Overall
Number of sites and houses in survey	56	54	54	52	50	49	315
Percentage of surveyed sites which belong to siteholders[1]	14%	69%	74%	92%	90%	96%	72%
Average number of shacks per site	3.85	2.78	1.83	1.5	1.28	2.02	2.2

[1] Either official owner or renting from the municipality.

2. Population on surveyed sites

	Alexandra	Clermont	Kwa-Thema	Mamelodi	Nyanga	Thabong	Overall
Number of people included in survey	2 089	890	487	534	378	505	4 883
Average number of persons per site	37.3[1]	16.79	9.19	10.27	7.56	10.52	13.72
Average number of persons living in the main house	16.73	8.77	6.3	6.21	5.12	5.31	8.21
Average number of persons living in backyard shacks per site	11.07	8.11	2.89	4.06	2.44	5.23	5.71
Percentage of the survey population who live in backyard shacks	41.4%	48.3%	31.4%	39.5%	32.3%	49.7%	40.0%
Average number of persons per backyard shack. Based on number of shacks on site.	4.32	4.22	1.65	2.87	1.92	2.65	2.97

[1] Site boundaries in Alexandra are ill-defined. This figure represents the population of the portion of the site which the site holder controls. 62% of respondents knew the total site population size.

3. Relationships between site occupants

	Alexandra	Clermont	Kwa-Thema	Mamelodi	Nyanga	Thabong	Overall
Percentage of the survey population who are not relatives of the site holder.	55%	64%	22%	19%	11%	43%	43%
Percentage of persons living in the main house who are tenants	45%	39%	0.02%	0.01%	0.01%	0.31%	25%
Percentage of persons living in backyard shacks who are tenants	60%	90%	69%	46%	33%	88%	69%
Percentage of backyard shacks interviewed where shack-dwellers are not relatives of the site holder	66%	93%	59%	36%	26%	85%	61%

4. Site rent and services payment

	Alexandra	Clermont	Kwa-Thema	Mamelodi	Nyanga	Thabong	Overall
Average monthly rent or service fee for sites who receive accounts	R 18.29	R 31.85	R 67.03	R 59.19	R 19.89	R 47.00	R 38.21
Percentage of sites which receive monthly accounts	89%	94%	54%	90%	98%	91%	86%
Perceptions of site holders on what is included in monthly rent/services fee (percentage of all interviewed sites). Including sites where separate account for water is received.							
Site and house	88%	98%	67%	73%	40%	14%	64%
Water	34%	24%	74%	60%	12%	90%	49%
Electricity	0%	4%	74%	79%	0%	8%	28%
Sanitation	20%	35%	17%	42%	4%	18%	23%
Refuse removal	20%	82%	39%	40%	24%	82%	47%
Maintenance and repairs	0%	0%	6%	10%	8%	0%	4%
Other	0%	26%	2%	4%	80%	0%	18%

5. Shack rental and service charges

	Alexandra	Clermont	Kwa-Thema	Mamelodi	Nyanga	Thabong	Overall
Average monthly rent or service fee for backyard shacks for those that pay rent.	R 23.53	R 28.84	R 40.49	R 43.45	R 21.35	R 49.45	R 35.05
Percentage of backyard shacks which have to pay rent	61%	96%	72%	58%	40%	77%	70%
Included in monthly rent/services fee (percentage of all interviewed shacks)							
Water	27%	24%	54%	25%	6%	70%	34%
Electricity	0%	17%	57%	37%	14%	10%	22%
Sanitation	21%	19%	15%	2%	2%	41%	17%
Refuse removal	14%	4%	9%	4%	2%	37%	11%
Other	4%	0%	0%	4%	10%	0%	3%

6. Running businesses on sites

	Alexandra		Clermont		Kwa-Thema		Mamelodi		Nyanga		Thabong		Overall	
Percentage of sites where some form of business is conducted	59%		37%		24%		29%		20%		18%		31%	
Percentage of backyard shacks interviewed in which some form of business is conducted	28%		15%		0%		4%		10%		0%		10%	
Type of businesses (number)	House	Shack	House	Shack	House	Shack	House	Shack	House	Shack	House	Shack	House	Shack
Soft drink and ice cream selling	2	1	0	1	3	0	3	0	2	1	1	0	11	3
Sewing and tailoring	1	2	1	0	0	0	0	0	2	2	0	0	4	4
Shebeen	8	4	4	3	7	0	3	1	2	1	5	0	29	9
Vegetables and fruit selling	2	4	3	1	0	0	1	0	0	0	1	0	7	5
Witchdoctor	2	0	0	0	0	0	0	0	0	0	0	0	2	0
Spaza shop	5	0	0	1	2	0	2	0	0	0	0	0	9	1
Shoe repair	2	1	3	1	0	0	0	0	0	0	0	0	5	2
Hair salon	0	1	0	0	0	0	0	0	0	0	0	0	0	1
Electrician	0	0	2	0	0	0	0	0	1	0	0	0	3	0
Chicken/meat selling	0	0	1	0	1	0	1	0	0	0	0	0	3	0
Battery charging	0	0	2	0	0	0	0	0	0	0	0	0	2	0
Creche	0	0	0	0	0	0	0	0	1	1	0	0	1	1
Other	0	0	0	0	0	0	0	0	1	0	0	0	1	0

7. Businesses using water

	Alexandra	Clermont	Kwa-Thema	Mamelodi	Nyanga	Thabong	Overall
Percentage of sites with businesses which require toilet use	34%	7%	19%	12%	8%	12%	16%
Percentage of sites with businesses which require water	40%	11%	15%	19%	10%	10%	18%
Percentage of businesses on sites which require water	54%	38%	62%	63%	47%	56%	54%
Percentage of businesses where clients use the toilet(s) on site	56%	25%	77%	38%	33%	67%	47%
Disposal of waste water (number of businesses)							
In the toilet	14	0	0	1	0	0	15
Outside	8	6	0	0	0	0	14
In the drain	11	7	8	9	4	5	44
In the garden	2	0	2	0	0	0	4
Elsewhere	3	0	0	1	0	0	4

9. Paying for water

	Alexandra	Clermont	Kwa-Thema	Mamelodi	Nyanga	Thabong	Overall
Percentage of sites where water is metered	54%	100%	96%	92%	6%	98%	66%
Percentage of sites where an account for water is received	0%	91%	2%	62%	6%	4%	28%
Average value of the last monthly account for water received for sites which are billed	-	R 46.92	R 20.30	R 5.83	R 351[1]	R 20.00	R 40.24
Percentage of sites where backyard shack dwellers pay a separate monthly fee for water	0%	69%	7%	2%	0%	29%	18%
Average of last monthly water fee to shack dwellers who pay separately for water	-	R 7.86	N/A	N/A	-	R 11.00	R 8.14

[1] Includes large amount of one household for 12 months arrears

10. Level of access to water

	Alexandra	Clermont	Kwa-Thema	Mamelodi	Nyanga	Thabong	Overall
Average number of taps per site	2.95	1.61	2.07	1.17	2.4	1.81	2.01
Percentage of sites where shack dwellers interviewed do not have access to water on site	9%	4%	4%	0%	0%	4%	4%
Total number of persons living in backyard shacks who do not have access to water on site	30	4	2	0	0	7	43

11. Patterns of water usage

Alexandra - siteholder

PLACES	Percentage of sites where the people living on the site usually			
	Cook	Wash	Do the dishes	Do the laundry
In the house	100	100	98	2
In the shack	4	4	5	2
Outside in the yard	0	0	0	96
Elsewhere	0	0	0	0

Alexandra - shack respondent

PLACES	Percentage of shacks where the shack-occupants usually			
	Cook	Wash	Do the dishes	Do the laundry
In the shack	91	86	91	0
In the house	11	9	11	0
Outside in the yard	0	5	0	95
Elsewhere	0	2	0	0

Clermont - siteholder

PLACES	Percentage of sites where the people living on the site usually			
	Cook	Wash	Do the dishes	Do the laundry
In the house	96	94	35	0
In the shack	2	4	4	4
Outside in the yard	2	2	63	94
Elsewhere	4	0	0	0

Clermont - shack respondent

PLACES	Percentage of sites where the shack-occupants usually			
	Cook	Wash	Do the dishes	Do the laundry
In the shack	98	85	41	4
In the house	0	4	6	4
Outside in the yard	0	6	52	91
Elsewhere	2	6	0	0

Kwa-Thema - siteholder

PLACES	Percentage of sites on which the people living on the site usually			
	Cook	Wash	Do the dishes	Do the laundry
In the house	100	96	98	15
In the shack	0	0	0	4
Outside in the yard	0	2	2	91
Elsewhere	0	2	0	7

Kwa-Thema - shack respondent

PLACES	Percentage of shacks in which the shack-occupants usually			
	Cook	Wash	Do the dishes	Do the laundry
In the shack	76	89	78	6
In the house	24	27	22	2
Outside in the yard	0	0	0	96
Elsewhere	0	2	0	0

Mamelodi - siteholder

PLACES	Percentage of sites on which the people living on the site usually			
	Cook	Wash	Do the dishes	Do the laundry
In the house	98	98	89	4
In the shack	6	6	4	0
Outside in the yard	0	0	12	96
Elsewhere	0	0	0	0

Mamelodi - shack respondent

PLACES	Percentage of shacks in which the shack-occupants usually			
	Cook	Wash	Do the dishes	Do the laundry
In the shack	75	94	73	0
In the house	27	12	27	0
Outside in the yard	0	0	4	100
Elsewhere	0	0	0	0

Nyanga - siteholder

PLACES	Percentage of sites on which the people living on the site usually			
	Cook	Wash	Do the dishes	Do the laundry
In the house	96	94	96	46
In the shack	38	58	24	0
Outside in the yard	0	4	12	68
Elsewhere	0	6	0	0

Nyanga - shack respondent

PLACES	Percentage of shacks in which the shack-occupants usually			
	Cook	Wash	Do the dishes	Do the laundry
In the shack	34	62	26	0
In the house	66	36	30	16
Outside in the yard	0	2	6	62
Elsewhere	0	4	0	0

Thabong - siteholder

PLACES	Percentage of sites on which the people living on the site usually			
	Cook	Wash	Do the dishes	Do the laundry
In the house	98	98	94	8
In the shack	0	0	0	0
Outside in the yard	0	0	2	96
Elsewhere	0	0	0	0

Thabong - shack respondent

PLACES	Percentage of shacks in which the shack-occupants usually			
	Cook	Wash	Do the dishes	Do the laundry
In the shack	90	94	84	0
In the house	10	4	8	0
Outside in the yard	0	0	8	98
Elsewhere	0	0	0	0

Overall - siteholder

PLACES	Percentage of sites on which the people living on the site usually			
	Cook	Wash	Do the dishes	Do the laundry
In the house	98	97	85	12
In the shack	8	11	6	2
Outside in the yard	0.3	2	15	91
Elsewhere	1	1	0	1

Overall - shack respondent

PLACES	Percentage of shacks in which the shack-occupants usually			
	Cook	Wash	Do the dishes	Do the laundry
In the shack	78	85	66	2
In the house	23	13	17	4
Outside in the yard	0	2	12	91
Elsewhere	0.3	2	0	0

12. Usage of taps on site

Alexandra - siteholder

	Percentage of sites which have taps located:	Percentage of sites on which the taps are used for			
		Cooking	Washing	Doing the dishes	Doing the laundry
Outside	93	70	71	70	95
Bathroom	5	0	5	0	4
Kitchen	39	32	25	32	5
Elsewhere	0	0	0	0	0

Alexandra - shack respondent

PLACES	Percentage of sites where the taps which shack-dwellers may use are located:	Percentage of shacks where the taps on the site to which shack-dwellers have access are used for			
		Cooking	Washing	Doing the dishes	Doing the laundry
Outside	89	93	93	91	95
Bathroom	2	0	0	2	0
Kitchen	4	2	2	5	0
Elsewhere	4	4	4	4	4

Clermont - siteholder

	Percentage of sites which have taps located:	Percentage of sites on which the taps are used for			
		Cooking	Washing	Doing the dishes	Doing the laundry
Outside	98	78	76	76	94
Bathroom	7	2	4	4	4
Kitchen	11	20	20	20	2
Elsewhere	0	0	0	0	2

Clermont - shack respondent

PLACES	Percentage of sites where the taps which shack-dwellers may use are located:	Percentage of shacks where the taps on the site to which shack-dwellers have access are used for			
		Cooking	Washing	Doing the dishes	Doing the laundry
Outside	96	96	94	94	94
Bathroom	2	0	4	0	0
Kitchen	2	2	2	4	4
Elsewhere	0	0	0	0	0

Kwa-Thema - siteholder

	Percentage of sites which have taps located:	*Percentage of sites on which the taps are used for*			
		Cooking	Washing	Doing the dishes	Doing the laundry
Outside	100	50	37	50	89
Bathroom	44	4	35	4	20
Kitchen	51	50	22	50	7
Elsewhere	0	0	0	0	0

Kwa-Thema - shack respondent

PLACES	*Percentage of sites where the taps which shack-dwellers may use are located:*	*Percentage of shacks where the taps on the site to which shack-dwellers have access are used for*			
		Cooking	Washing	Doing the dishes	Doing the laundry
Outside	100	87	89	89	94
Bathroom	9	0	9	2	9
Kitchen	13	13	7	13	2
Elsewhere	0	0	0	0	0

Mamelodi - siteholder

	Percentage of sites which have taps located:	Percentage of sites on which the taps are used for			
		Cooking	Washing	Doing the dishes	Doing the laundry
Outside	100	87	88	87	100
Bathroom	0	0	0	0	0
Kitchen	17	14	12	14	0
Elsewhere	0	0	0	0	0

Mamelodi - shack respondent

PLACES	Percentage of sites where the taps which shack-dwellers may use are located:	Percentage of shacks where the taps on the site to which shack-dwellers have access are used for			
		Cooking	Washing	Doing the dishes	Doing the laundry
Outside	100	98	100	96	100
Bathroom	0	0	0	0	0
Kitchen	4	0	2	2	0
Elsewhere	0	0	0	0	0

Nyanga - siteholder

	Percentage of sites which have taps located:	Percentage of sites on which the taps are used for			
		Cooking	Washing	Doing the dishes	Doing the laundry
Outside	100	46	68	48	70
Bathroom	44	0	44	0	6
Kitchen	72	6	8	4	38
Elsewhere	0	0	0	0	0

Nyanga - shack respondent

PLACES	Percentage of sites where the taps which shack-dwellers may use are located:	Percentage of shacks where the taps on the site to which shack-dwellers have access are used for			
		Cooking	Washing	Doing the dishes	Doing the laundry
Outside	70	40	68	40	62
Bathroom	36	0	26	0	0
Kitchen	30	4	6	2	16
Elsewhere	0	0	0	0	0

Thabong - siteholder

	Percentage of sites which have taps located:	Percentage of sites on which the taps are used for			
		Cooking	Washing	Doing the dishes	Doing the laundry
Outside	98	51	51	53	92
Bathroom	23	0	21	0	4
Kitchen	51	45	27	45	2
Elsewhere	2	0	2	0	2

Thabong - shack respondent

PLACES	Percentage of sites where the taps which shack-dwellers may use are located:	Percentage of shacks where the taps on the site to which shack-dwellers have access are used for			
		Cooking	Washing	Doing the dishes	Doing the laundry
Outside	96	90	94	90	98
Bathroom	0	0	4	2	0
Kitchen	8	6	6	6	0
Elsewhere	0	0	0	0	0

Overall - siteholder

	Percentage of sites which have taps located:	Percentage of sites on which the taps are used for			
		Cooking	Washing	Doing the dishes	Doing the laundry
Outside	98	94	66	64	90
Bathroom	20	1	18	1	6
Kitchen	41	28	19	28	9
Elsewhere	0.3	0	0.3	0	1

Overall - shack respondent

PLACES	Percentage of sites where the taps which shack-dwellers may use are located:	Percentage of shacks where the taps on the site to which shack-dwellers have access are used for			
		Cooking	Washing	Doing the dishes	Doing the laundry
Outside	92	84	90	84	91
Bathroom	8	0	7	1	2
Kitchen	10	4	4	5	4
Elsewhere	1	1	1	1	1

13. Disposal of waste water

Percentage of sites which dispose their waste water in the:	Alexandra		Clermont		Kwa-Thema		Mamelodi		Nyanga		Thabong		Overall	
	Site	Shack	Site	Shack	Site	Shack	Site	Shack	Site	Shack	Site	Shack	Site	Shack
Drain	63	63	94	82	100	98	100	100	62	58	98	100	86	83
Garden	11	10	21	50	4	0	4	0	4	4	0	2	7	11
Toilet	45	36	2	4	0	2	6	10	42	38	6	0	17	15
Street	32	30	7	13	0	0	0	0	0	0	0	0	7	8
Other	2	5	2	6	0	0	0	0	0	4	2	0	1	3
No response	0	0	0	0	0	2	0	0	0	0	2	0	0.3	0.3

14. Arguments between people over access to an insufficient number of taps

	Alexandra		Clermont		Kwa-Thema		Mamelodi		Nyanga		Thabong		Overall	
	Site	Shack	Site	Shack	Site	Shack	Site	Shack	Site	Shack	Site	Shack	Site	Shack
Percentage of sites surveyed where there were arguments over access to taps	39	46	41	20	2	4	0	0	8	10	4	4	16	15
Percentage of surveys in which the respondent feels there is an insufficient number of taps on the site	45	52	44	30	24	4	29	12	38	32	20	6	34	23

15. Preferential locations of additional taps in the site

	Alexandra		Clermont		Kwa-Thema		Mamelodi		Nyanga		Thabong		Overall	
	Site	Shack	Site	Shack	Site	Shack	Site	Shack	Site	Shack	Site	Shack	Site	Shack
Average number of additional taps which respondents would wish to have on site	3.42	2.93	1.12	1.14	1.18	0	3.93	1.2	1.53	1.4	1	1	2.27	2
Percentage of respondents who would wish to have additional taps in the:														
House (general)	35	14	6	14	9	0	33	10	16	47	14	0	21	29
Kitchen	4	0	12	0	100	0	47	0	53	0	57	0	38	0
Bathroom	4	0	6	0	18	0	13	20	16	0	0	0	10	2
Outside (general)	27	100	100	93	0	100	7	20	53	53	14	100	38	91
Frontyard	12	0	0	0	9	0	7	0	11	0	0	0	7	0
Backyard	12	0	6	0	0	0	0	0	0	0	0	0	4	0
Side of the house	39	0	6	0	0	0	7	0	0	0	0	0	13	0
Not specified	4	0	0	0	0	0	0	0	0	0	0	0	1	0

16. Location of toilets

	Alexandra	Clermont	Kwa-Thema	Mamelodi	Nyanga	Thabong	Overall
Average number of toilets per site	2.75	1.41	1.28	1.02	1.04	1.09	1.43
Percentage of sites where the toilet(s) is/are located in:							
In the house	9	6	56	4	26	35	22
Outside in the yard	59	96	72	98	62	73	77
Outside, shared with the neighbour	55	0	0	0	12	0	12
Outside the yard	2	0	0	0	0	0	0.3

17. Insufficient access to on-site toilet and alternatives

	Alexandra		Clermont		Kwa-Thema		Mamelodi		Nyanga		Thabong		Overall	
	Site	Shack	Site	Shack	Site	Shack	Site	Shack	Site	Shack	Site	Shack	Site	Shack
Percentage of sites where respondents indicate that not everybody living on the site can readily use the on-site toilet	9	0	2	2	7	0	9	2	16	10	10	0	9	2
Percentage of sites where respondent indicates that there are arguments over using the toilet	48	45	17	24	7	6	2	0	36	32	6	6	20	19
Percentage of sites where respondent feels there are an insufficient number of toilets on the site	63	52	32	32	32	19	17	6	58	54	39	33	40	33
Percentage of respondents who indicate that people have to use alternative off-site toilet options	22	32	4	26	0	0	2	1	16	10	4	0	8	12
Percentage of sites where people use as an alternative for on-site toilet the :														
Workplace	0	0	0	0	0	0	0	0	13	20	0	0	4	3
School	8	0	0	0	0	0	0	0	0	0	0	0	4	0
Neighbour	8	89	100	86	0	0	100	100	25	60	100	0	56	84
Buckets	0	0	0	0	0	0	0	0	25	0	0	0	8	0
Garden	0	11	0	0	0	0	0	0	0	20	0	0	0	3
Bushes	0	0	0	14	0	0	0	0	13	0	0	0	4	0
Elsewhere	0	0	0	0	0	0	0	0	13	0	0	0	4	0

18. Preferred placement of additional toilets

	Alexandra		Clermont		Kwa-Thema		Mamelodi		Nyanga		Thabong		Overall	
	Site	Shack	Site	Shack	Site	Shack	Site	Shack	Site	Shack	Site	Shack	Site	Shack
The average number of additional toilets which respondents think are required (only those that said there were insufficient).	2.50	2.31	1.08	1.13	1	1	1	1	1.14	1.12	1.67	1	1.57	1.51
Percentage of respondents who would prefer additional toilets to be located in the:														
House (general)	17	7	6	12	41	20	33	33	48	26	32	0	29	14
Bathroom	0	0	6	0	0	0	33	67	21	7	0	0	8	4
Outside (general)	23	38	65	83	35	40	33	0	41	63	68	100	40	60
The backyard shack area	6	10	6	0	6	0	0	0	0	0	0	0	5	3
Backyard	23	24	0	0	0	10	0	0	0	0	0	0	6	8
Side of the house	26	10	0	0	0	0	0	0	0	0	0	0	7	3
There is no space on the site	6	10	0	6	6	0	0	0	0	0	0	0	2	4

19. Location of refuse on site

Percentage of respondents who indicate that refuse is kept until collection in the:	Alexandra		Clermont		Kwa-Thema		Mamelodi		Nyanga		Thabong		Overall	
	Site	Shack	Site	Shack	Site	Shack	Site	Shack	Site	Shack	Site	Shack	Site	Shack
Yard	88	75	93	89	93	96	96	98	94	98	94	94	78	78
Street	13	20	6	0	2	0	2	0	0	0	0	0	4	4
Elsewhere	7	2	2	0	2	0	2	0	6	2	0	0	3	1

20. Removal of refuse and associated problems

	Alexandra		Clermont		Kwa-Thema		Mamelodi		Nyanga		Thabong		Overall	
Average number of refuse collections per week	1.25		1.02		1.88		1.54		2.07		1.29		1.5	
Percentage of siteholders who feel that refuse is not collected often enough	79		78		30		60		12		77		56	
Average preferred number of collections per week	-		2.19		2.5		2.35		-		-		2.16	
	Site	Shack	Site	Shack	Site	Shack	Site	Shack	Site	Shack	Site	Shack	Site	Shack
Percentage of respondents who observe that refuse piles up and makes a mess	71	75	83	87	41	32	64	62	8	10	78	82	58	58

21. Drainage problems

	Alexandra		Clermont		Kwa-Thema		Mamelodi		Nyanga		Thabong		Overall	
	Site	Shack	Site	Shack	Site	Shack	Site	Shack	Site	Shack	Site	Shack	Site	Shack
Percentage of respondents who indicated that rain water pools give them difficulty	48%	34%	22%	15%	35%	19%	38%	31%	46%	40%	31%	24%	37%	27%
Number of respondents who take action about rain water pools by														
Digging trenches	7	2	1	0	1	0	4	4	12	7	4	3	29	16
Placing down stepping stones, planks, corrugated iron, newspaper or concrete slabs	14	8	2	6	1	0	7	8	4	4	2	2	30	28
Throw down sand or ash	6	3	2	0	2	1	4	4	4	2	0	0	18	10
Removing water by hand	2	1	0	1	9	4	3	1	2	2	0	0	16	9
Doing nothing	2	5	3	1	6	4	1	1	2	6	6	6	20	23
Other	0	0	1	0	0	0	1	0	1	0	0	0	3	0

22. General comments on water supply

Number of respondents who voluntarily stated that:	Alexandra		Clermont		Kwa-Thema		Mamelodi		Nyanga		Thabong		Overall	
	Site	Shack	Site	Shack	Site	Shack	Site	Shack	Site	Shack	Site	Shack	Site	Shack
There are insufficient facilities on site	9	11	3	4	0	0	0	0	3	0	0	0		
Taps are broken, or maintenance of taps and pipes is weak	3	4	9	1	1	0	1	0	0	0	1	0		
Operating of water supply system is weak	0	0	11	3	19[1]	8[1]	4[1]	2[1]	9[2]	6[3]	1[1]	2[1]		
Cost of water supply is problematic	0	0	5	1	0	0	0	0	1	0	3	0		
No water is available on site	0	0	0	0	1	0	0	0	0	0	1	0		

[1] Water supply is shut down without notice [2] 5 respondents complain of water supply shut down without notice [3] 3 respondents complain of water supply shut down without notice

23. General comments on sanitation

Number of respondents who voluntarily stated that:	Alexandra		Clermont		Kwa-Thema		Mamelodi		Nyanga		Thabong		Overall	
	Site	Shack	Site	Shack	Site	Shack	Site	Shack	Site	Shack	Site	Shack	Site	Shack
There are insufficient toilet facilities on the site	15	8	7[1]	7[1]	2	4	0	0	14	10	1	0	39	29
Toilets are broken, or maintenance of toilets and pipes is weak	6	0	1	5	13	7	13	3	10	1	12	4	55	20
Access to toilets on sites not possible at night	0	0	0	0	0	0	0	0	0	3	0	1	0	4
There is conflict between residents over the cleanliness of the toilet	4	4	0	0	0	0	0	0	0	0	0	0	4	4

[1] Respondents want waterborne sanitation

24. General comments on refuse removal

Number of respondents who voluntarily stated that:	Alexandra		Clermont		Kwa-Thema		Mamelodi		Nyanga		Thabong		Overall	
	Site	Shack	Site	Shack	Site	Shack	Site	Shack	Site	Shack	Site	Shack	Site	Shack
The refuse removal service is insufficient	4	5	6	11	6	2	3	3	2	2	22	10	43	33
The site requires more bins or plastic bags	15	12	8	5	2	2	5	1	1	0	0	1	29	21
Streets are dirty from refuse which spills	0	1	2	2	3	0	0	0	0	0	1	0	6	3
Careless people and animals cause scattering of refuse	1	3	0	0	0	0	1	0	0	0	0	0	2	3

25. General comments

Number of respondents who voluntarily stated that:	Alexandra		Clermont		Kwa-Thema		Mamelodi		Nyanga		Thabong		Overall	
	Site	Shack	Site	Shack	Site	Shack	Site	Shack	Site	Shack	Site	Shack	Site	Shack
We boycott rent payment at present	12	2	0	0	1	0	0	1	0	0	0	0	14	3
The house or shack-dwelling is in a state of disrepair and badly maintained	19	2	0	0	6	0	8	1	5	2	1	2	39	7
Backyard shacks make the site too crowded	3	4	0	0	1	0	0	0	0	0	0	0	4	4
Rents and tariffs are too high and unfair	1	1	7	1	2	1	8	2	2	1	1	0	21	6
We need better maintained roads	0	1	5	12	1	1	9	6	0	0	2	0	17	20
Blocking of drains is a major problem	1	2	1	1	0	0	1	0	1	0	0	0	4	3
We want our own homes and sites	0	9	0	0	0	0	0	0	0	1	0	0	0	10
We want electricity, and electricity should not be cut off without warning	3	0	1	1	6	1	0	0	0	0	0	0	10	2
We need better services urgently	0	0	2	0	2	0	2	0	0	0	0	0	6	0

26. Attitudes of respondents during the survey interview

Percentage of respondents who the person interviewing assessed to have a attitude towards the survey which is:	Alexandra		Clermont		Kwa-Thema		Mamelodi		Nyanga		Thabong		Overall	
	Site	Shack	Site	Shack	Site	Shack	Site	Shack	Site	Shack	Site	Shack	Site	Shack
Negative	9	5	4	2	0	0	4	6	18	12	0	10	6	6
Average	29	41	9	17	35	35	17	37	38	56	14	25	24	35
Positive	57	52	65	78	41	50	75	58	28	28	82	55	58	54
No attitude registered	5	2	22	4	24	15	4	0	16	4	4	10	13	6