

Copyright is owned by the Author of the thesis. Permission is given for a copy to be downloaded by an individual for the purpose of research and private study only. The thesis may not be reproduced elsewhere without the permission of the Author.

Massey University Library
New Zealand & Pacific Collection

The Effect of Urban Parks
on
Residential Property Values.

A thesis presented in partial
fulfilment of the requirements for the degree
of Doctor of Philosophy in Geography at
Massey University.

Harold W. Bockemuehl

1974

Abstract

This thesis presents the report on an inquiry into the relationship between residential property valuation and distance to urban parks and recreational areas in the New Zealand cities of Christchurch, Palmerston North, Wanganui and Hastings. Open spaces make up an important part of the contemporary urban landscape, and as major features of urban patterns they may be expected to exert a measurable influence upon property values in their surrounding areas. An empirically based framework is developed to permit the measuring of the strength and direction of this relationship, that is, whether property values increase or decrease as distance from the park becomes greater. The data are subjected to statistical tests, including correlation using the Pearson product-moment method, and linear and curvilinear regression.

The introduction reviews the generally accepted requirements for open space in cities of western European culture, and presents a brief historical account of the development of the movement towards urban parks. Particular attention is given to the establishment of open space in New Zealand, where parks have been planned into virtually all communities from their earliest days.

Five hypotheses are postulated, and each is tested against the empirical findings for each city. These hypotheses are, firstly, in a neighbourhood which develops around a park or reserve, residential property valuations are highest alongside the open space, and decline with increasing distance from it. The influence will vary with differing characteristics of the space. Secondly, the positive, or appreciating, influence of a park, as postulated in the first hypothesis, will decline as distance to the open rural landscape decreases. Thirdly, the positive influence of a park will decline with a decrease in average property values for a neighbourhood. Fourthly, the positive influence of a park will increase with an increase in housing density. Finally, the average property values of neighbourhoods surrounding open

spaces are higher than average values of those areas which do not have ready access to parks.

Findings of the study support three of the hypotheses. Strongest support is found for Hypothesis III, the postulation that the appreciative influence of a park declines with a decrease in average values in the surrounding area. Alpha levels of significance beyond the 0.001 level are noted consistently.

The first and last hypotheses, which suggest the existence of an appreciative effect on both micro and macro scales, are also upheld. The average value of properties adjacent to the 44 parks considered in the study exceed by 11.3 per cent the average for those properties 200 metres further from the parks. Furthermore, a difference of 7.93 per cent is found between average values for properties in park-oriented neighbourhoods and those in areas further away from open spaces.

The other two hypotheses are rejected for lack of support by findings of the study.

ACKNOWLEDGEMENTS

Research is seldom the work of one individual. In the course of investigation for this study, the writer received assistance from many people. Special thanks are due to:

Professor K.W. Thomson, Dean of Social Science, Massey University, who supervised the research and provided guidance, critical review and encouragement;

Mr B.G.R. Saunders, Reader in Geography, Massey University, who proposed the research topic, suggested the initial readings and approach to the study, and served as major advisor on the thesis committee;

Mr E.G. Thomas, Lecturer in Geography, Massey University, who served on the thesis committee;

Mrs Lilian Griffin, M.A., who draughted most of the maps;

Nola Simpson, Massey University Computer Unit, and Mr S. Henry, Computer Science Department, University of Montana, who provided computer programs;

Professor R. Banaugh, Chairman of Computer Science Department, and Dr D. Loftsgaarden, Associate Professor of Mathematics, University of Montana, who commented on the statistical work;

the New Zealand Department of Valuation, and especially Mr B. de Lautour, Urban District Valuer, Palmerston North, Mr A.P. Faulls, Urban Valuer, Christchurch, Mr N. Jenkin, District Valuer, Napier, and Mr J. Brown, District Valuer, Wanganui, who made valuation files available, explained the valuation technique and provided information regarding urban development in New Zealand cities;

Mr H.G. Gilpin, Director of Botanic Gardens, Parks and Reserves, Christchurch; Mr J.W. Bolton, Director of Reserves, Palmerston North; Mr M.R. Boothby, Superintendent of Parks and Reserves, Wanganui; Mr J.G.C. MacKenzie, Superintendent of Parks, Hastings; and the City Engineers of Palmerston North, Christchurch and Wanganui for their cooperation;

and finally, to the writer's wife and daughter, Maybelle and Karen, who maintained cheerful dispositions through the long hours of research and writing. To these, and to all who helped in any way, the writer is deeply grateful.

TABLE OF CONTENTS

	Page
ACKNOWLEDGEMENTS	iv
TABLE OF CONTENTS	vi
LIST OF TABLES	vii
LIST OF FIGURES	viii
CHAPTERS IN TEXT	
I Introduction	1
II Methodology	22
III Christchurch	49
IV Palmerston North	82
V Hastings	124
VI Wanganui	150
VII Summary	174
APPENDICES	
I List of New Zealand Cities.	193
II Coefficients of Correlation, Zones 5 through 10.	194
III Letter of Authorisation.	196
IV Analysis of Variance Data.	197
V Regression Angles.	199
VI Regression Residuals Used for Mapping.	200
BIBLIOGRAPHY OF WORKS CONSULTED	
Books, Articles, Thesis, etc.	217
Government Publications	231

LIST OF TABLES

	Page
2.1 Slope of Terrain, as Percentage of City Area.	23
2.2 Distance of Optimum Correlation.	27
3.1 Christchurch Open Spaces.	51
3.2 Average Property Valuations, Christchurch.	52
4.1 Palmerston North Open Spaces.	84
4.2 Average Property Valuations, Palmerston North.	88
5.1 Hastings Major Open Spaces.	126
5.2 Average Property Valuations, Hastings.	128
6.1 Wanganui Open Spaces	152
6.2 Average Property Valuations, Wanganui	153
7.1 Classification of Parks According to Function.	181
7.2 Average Values for Appreciating Parks, by Regression Function.	184
7.3 Comparison of Values, Park-oriented vs. Random Sample Properties.	187

LIST OF FIGURES

	Page
1.1 Map showing location of cities in New Zealand.	16
2.1 Schematic representation of park, showing expanding outline, zones, and quadrants.	26
2.2 Hypothetical depreciation curve for housing.	37
3.1 Map of Christchurch study area, in relation to city.	50
3.2 Map of Hagley Park area, showing regression residuals.	54
3.3 Regression graphs for Christchurch parks.	55-57
3.4 Map of Elmwood Park area, showing regression residuals.	59
3.5 Map of Edgar Macintosh Park area, showing regression residuals.	61
3.6 Map of Malvern Park and Rugby Park areas, showing regression residuals.	63
3.7 Map of Horseshoe Lake Reserve and Burwood Park areas, showing regression residuals.	64
3.8 Map of Richmond Domain area, showing regression residuals.	67
3.9 Map of Papanui Domain area, showing regression residuals.	68
3.10 Map of St Albans Park area, showing regression residuals.	70
3.11 Map of Shirley Golf Course area, showing regression residuals.	72
3.12 Map of St James Park area, showing regression residuals.	74
3.13 Map of Macfarlane Park area, showing regression residuals.	76
3.14 Valuation profile of single-unit state housing in Macfarlane Park area.	78
4.1 Map of Palmerston North study area.	83
4.2 Map of Centennial Lagoon--Hokowhitu Golf Course area, showing regression residuals.	89

	Page
4.3 Regression graphs for Palmerston North parks.	91-93
4.4 Map of Hokowhitu Domain area, showing regression residuals.	95
4.5 Map of Esplanade Park complex area, showing regression residuals.	97
4.6 Map of Brightwater Terrace Golf Course area, showing regression residuals.	99
4.7 Map of Buick Crescent Park area, showing regression residuals.	101
4.8 Map of Waterloo Crescent Park area, showing regression residuals.	102
4.9 Map of Monrad Park area, showing regression residuals.	104
4.10 Map of Papaeoia Park area, showing regression residuals.	106
4.11 Map of Awapuni Park area, showing regression residuals.	107
4.12 Map of Puriri Street Basketball Courts and Humber Park areas, showing regression residuals.	109
4.13 Map of Coronation Park area, showing regression residuals.	111
4.14 Map of Takaro Park area, showing regression residuals.	112
4.15 Map of Savage Crescent Park area, showing regression residuals.	114
4.16 Map of Agricultural and Pastoral Association Showgrounds area, showing regression residuals.	116
4.17 Map of Milverton Park area, showing regression residuals.	118
4.18 Map of Memorial Park area, showing regression residuals.	119
5.1 Map of Hastings study area.	125
5.2 Map of Frimley Park area, showing regression residuals.	129
5.3 Regression graphs for Hastings parks.	130-132
5.4 Map of Flaxmere Park area, showing regression residuals.	134
5.5 Map of Windsor Park and Mayfair Park areas, showing regression residuals.	135

	Page
5.6 Map of Cornwall Park area, showing regression residuals.	137
5.7 Map of St Leonards Park area, showing regression residuals.	139
5.8 Map of Hawke's Bay Jockey Club Racecourse and Ebbett Park areas, showing regression residuals.	141
5.9 Map of Akina Park area, showing regression residuals.	143
5.10 Map of Kirkpatrick Park area, showing regression residuals.	145
6.1 Map of Wanganui study area.	151
6.2 Map of Kowhai Park area, showing regression residuals.	154
6.3 Regression graphs for Wanganui parks.	156-157
6.4 Map of Wanganui Domain area, showing regression residuals.	158
6.5 Map of Wanganui Racecourse area, showing regression residuals.	160
6.6 Map of Lorenzdale Park area, showing regression residuals.	162
6.7 Map of Williams Domain and Wanganui East Showgrounds areas, showing regression residuals.	164
6.8 Map of Virginia Lake and Peat Park areas, showing regression residuals.	166
6.9 Map of Victoria Park area, showing regression residuals.	168
6.10 Map of Castlecliff Beach Domain area, showing regression residuals.	170
7.1 Size of park <u>vs.</u> regression angle.	175
7.2 Average age of housing <u>vs.</u> regression angle.	177
7.3 Average property value <u>vs.</u> regression angle.	178

CHAPTER I

INTRODUCTION

Throughout history every urban settlement has included land for communal or community purposes. Although a geographical study of this phenomenon would be interesting and of value, the scope of this thesis is much more narrowly defined. Past studies have placed the greater share of emphasis or attention upon public lands which have been devoted to functions requiring buildings or construction of some sort, such as property reserved for administrative or governmental purposes, for religious functions or for communications and transportation. Public land which has been set aside as urban open space has received much less attention, and it is towards that land that this thesis is directed.

For the purpose of this study, open space may be classified functionally into economic space and by exclusion, non-economic areas. Economic space includes those places where the majority of persons using the space do so for economic or administrative purposes. The agora of classical Greek cities, which functioned as a market place as well as a meeting place for citizens, provides an example of this type of space. Other examples include the town square or market place of an English city, or the plaza of Spanish urban areas. Non-economic areas are all those open spaces which do not come under the 'economic' classification above, and include spaces such as golf courses and athletic fields, where either participants or spectators are required to pay fees to attend, as well as parks, playgrounds, etc., which are open to free public access and use. This thesis is concerned with non-economic areas of open space intended primarily for amenity or recreational purposes.

Most people, urban dwellers as well as urban scholars and planners, believe parks have a beneficial effect on their surroundings. Platt (1972:

56) declares that " . . . the openness of a particular site may contribute to the . . . economic value of other property in the vicinity," while Stewart (1967: 67) is even more emphatic when he declares that neighbourhoods must have open space for recreation if they are to maintain their value, and warns that " . . . it has been forecast that many of Toronto's residential districts could be slums by 1980 due to an absence of park lands, school sites and parking space." Yeates (1965: 69) finds that "the influence of recreational and physical amenities on land values . . . appears to have increased in relative importance during the past 50 years." Thomson (1969: 70) notes that "people do not necessarily have to ever use a park to feel that it is an asset to the community." And, as might be expected, planning documents give unqualified approval:

Open space land--whether used for public parks and recreation, or to conserve natural resources, historic, and scenic areas--improves the quality of urban life. It is a necessary component of a viable urban environment (U.S. HUD, 1971).

Nor is this solely a recently derived attitude. Parks established in mid-nineteenth century London and New York were intended to provide amenities which would "civilise and refine the national character, foster the love of rural beauty, and increase the knowledge of and taste for rare and beautiful trees and plants." (Chadwick, 1966: 181). In addition, they were expected to pay for themselves and even make a small profit for their developer-owners.

Occasionally a dissenting voice is heard. Jane Jacobs, an urban critic, is quite outspoken in condemning the assignment of such qualities to all parks (Jacobs, 1964: 101):

It is necessary too, in understanding park behaviour, to junk the false reassurance that parks are real-estate stabilizers or community anchors. Parks are not automatically anything, and least of all are these volatile elements stabilizers of values or of their neighbourhoods and districts.

However, even Jacobs acknowledges that parks can be of value, economically as well as aesthetically, to a community (Jacobs, 1964: 102):

The best known of [founder William] Penn's four squares is Rittenhouse Square, a beloved, successful, much-used park, one of Philadelphia's greatest assets today, the centre of a fashionable neighbourhood--indeed, the only old neighbourhood in Philadelphia which is spontaneously rehabilitating its edges and extending its real-estate values.

It is noteworthy that even an avowed critic of town planning attributes to a park the capability of "extending its real-estate values."

Statement of Purpose

"A significant aspect of scientific inquiry is the search for order or pattern." (Taaffe, 1970: 8). This thesis presents a report on an inquiry into the relationship between residential property valuation and proximity to selected open spaces, such as parks and recreational areas, in four New Zealand cities--Christchurch, Palmerston North, Wanganui and Hastings. Open spaces make up an important part of the contemporary urban landscape, and as major features of urban patterns they may be expected to exert a measurable influence upon their surrounding areas. The strength of this relationship, and whether it is negative or positive; that is, whether property values increase or decrease as distance from the open space increases, provides the data upon which the thesis is based. It is anticipated that a number of features or characteristics of the open space will affect the relationship. These features, such as size, function and degree of development of the space, are considered in turn.

The purpose of the thesis is to determine empirically the pattern of property values around urban parks, to analyse by means of linear and curvilinear regression the correlations between the variable factors considered and to account for the residuals from the regressions. In addition, it is hoped that this study will encourage the establishment of more urban parks, especially in new residential areas, and that it will add to the urban geography literature by stimulating other research in this field. Studies of this nature are well within the field of geography, as was pointed out in a recent publication (Commission on College Geography, 1970: 11):

In essence, the core of geography has changed little over the years and even though several traditions can be identified in the study of the discipline, basically all scholars in the field share a common goal: they are primarily interested in discovering, describing, and accounting for the location, distribution, and spatial association of things as they occur on the face of the earth as a whole, or in any part of it.

Definitions

City.

A city in New Zealand is officially defined as an urban area which has at least 20,000 population and which has been awarded the status to function as a 'city' under the Municipal Corporations Act. In practice, the 20,000 minimum population is not absolutely binding: Upper Hutt has city status with only 19,084 inhabitants, while Mt Roskill and Mt Albert retain borough status while recording populations of 33,472 and 25,721 respectively. This thesis considers as cities those settlements which are so identified in the 1966 New Zealand Census.

Unimproved Value.

The unimproved value of the land is determined as though the property under consideration has no buildings or other improvements on it, but with all other factors considered as they exist on the date of valuation (MacLachlan, 1967). Selling price of the unimproved and unencumbered land is the only consideration, and it is assumed that the price is arrived at between a 'willing seller and a willing buyer', but neither is required to sell nor buy (McVeagh, 1967).

Capital Value.

This is the market value of the land, including all improvements, buildings, etc. Again, the 'willing seller-willing buyer' condition is assumed to exist.

Regression Angle.

This is the angle at which the line of regression intersects the vertical or y-axis of the regression graph. It is measured clockwise, and is expressed in degrees.

Open Space.

The definition of open space set down by the Christchurch Regional Planning Authority (1966: 2) is accepted. Under this definition, open space is " . . . that space which is permanently preserved and currently used for recreational purposes and whilst usually and desirably in public ownership may also be in private ownership provided that the facilities are readily available to members of the general public with few, if any, restrictions."

Primarily Active Open Space.

This term refers to open space which provides facilities for physical activities conducted within a set of rules and which attracts the majority of its visitors as spectators or users of those facilities. It should be noted that although golf courses could be included in this definition, they are considered separately in this study.

Primarily Passive Open Space.

This is open space to which the majority of visitors come to enjoy passive recreation or to participate in unorganised games, even though some active facilities are provided.

Statement of Hypotheses

Within the parameters of this study, five hypotheses are postulated. Each is tested and accepted, rejected or modified in subsequent chapters.

Hypothesis I.

In a neighbourhood which centres on an open space, residential property valuations are highest alongside the open space, and decline with increasing distance from it. The influence will vary with differing characteristics of the space.

Hypothesis II.

The positive, or appreciating, influence of a park postulated in Hypothesis I will decline as distance to the open rural landscape decreases. It is assumed that even though the open countryside may not be sufficiently near a property to constitute an intervening recreational opportunity, a prospective property owner will be less apt to demand a site near a park if the countryside is relatively near at hand.

Hypothesis III.

The positive influence of a park will decline with a decrease in average property values for a neighbourhood. That is, property owners in more wealthy areas are willing and able to spend more money for a parkside location. If sites near the park were assigned premium values in poorer neighbourhoods, the result would be to increase prices and eventually raise the neighbourhood to a higher status.

Hypothesis IV.

The positive influence of a park will increase with an increase in housing density. It is expected that when private open space is less available, public open space will exert a stronger appreciating effect.

Hypothesis V.

The average property values of neighbourhoods surrounding open spaces are higher than average values of those areas which do not have ready access to parks.

Review of Literature

Urban open space has provided a focal point for a number of studies, papers and reports. The history of philosophical thought on parks and park planning is well documented in articles as well as general reference works on parks and open spaces (see, for example, Chadwick, 1966; Mandelker, 1962; Tetlow and Goss, 1968; Jew, 1969; and Speedy, 1966).

In a recent article, Forward (1970: 517) notes that although residential land use has the lowest priority for space in his study, waterfront land "plays such an important role, both economically and aesthetically, within coastal cities that it is worthy of careful investigation as a separate resource."

Other facets of open space have received attention. In recent years scholars from several disciplines have gathered valuable empirical data pertaining to social characteristics of park users, attitudes towards parks, and perception of open spaces. A recent study, representative of these efforts, notes the social characteristics of the population around selected parks, and

attempts to correlate the use of parks by different segments of the population against park function (Thomson, 1969). In addition, a number of studies have been undertaken to establish or recommend minimum and optimum standards for open space in the urban environment. These are usually ordered by regional authorities or governmental planning agencies, and the typical report includes a catalogue of existing spaces and associated facilities, as well as an attempt to forecast community needs and to identify land uses for future development (for example, see Ministry of Housing, 1956, 1967; Auckland Regional Authority, 1967; or Crawford, 1970).

Although the literature is noteworthy chiefly because of the paucity of studies in the focal area of this thesis, the need to understand the patterns of land values is readily acknowledged.¹ Hoyt (1960: 109) declares these patterns to be " . . . the common denominator of all types of land uses . . .", and laments the lack of effort in this field. More recently Ritter (1971: 185) expresses the need in these words:

Urban research acknowledges the importance of recognizing variation in land value structure of the city. Understanding the patterns and processes of land value variation is essential to explanation of the structure of cities in guiding policy decisions directing city growth.

And Taaffe (1970: 13) stresses the need for illustrative studies of spatial distributions and interrelationships among distance, land values and other features in order to "make it possible to isolate more precisely the effects of certain changes."

Functions of Open Space

It is not within the scope of this study to catalogue and discuss all the various purposes of open spaces in urban areas. According to Allison (1968: 82), parks and green belts may function to control urban sprawl, to structure neighbourhoods, or to " . . . provide separation and breathing space between incompatible urban and industrial development, visual relief from a continuous built up environment and space for a feeling of isolation, seclusion and fresh air." Platt (1972) suggests classifications of recreational,

ecologic, aesthetic and circulatory, while Tunnard and Pushkarev (1963) propose the functions of productive, ornamental, protective and recreational.

Still another functional classification is set forth by Clawson (1969: 140-141). According to him, open space may:

1. provide light and air to buildings;
2. provide space within built-up areas to relieve sense of crowding;
3. provide recreational space;
4. accomplish ecological functions, such as the prevention of flood damage;
5. shape the city or separate urban units; or
6. reserve vacant space for the future when it may perform one or more of these functions.

A more subjective classification is presented by Tankel (1963), who declares that open spaces may be divided into those which are used, are viewed, are felt, do urban work, or help to shape the urban development program.

Although discussion of the merits of each classificatory scheme may be a valid study in Town Planning, this thesis considers space from the aspect of only two functions: amenity and recreation.

Elliot (1969b), who identifies seven purposes of open space, states that each space should fulfill more than one purpose if possible, and the more of them a space fills, the more efficiently it is used. Similarly, in this study space which serves both as a recreational area and an amenity may be expected to exert a stronger appreciating effect on properties in its surrounding areas.

It would serve no useful purpose here to draw a sharp distinction between the two functions, amenity and recreation, as it is hoped that all recreational areas will provide at least some amenity value, and space which functions primarily as an amenity will also be used for passive recreation. However, it is appropriate to distinguish between the two functions.

Amenity.

A dictionary defines 'amenity' as the attractiveness and aesthetic value of real estate. Sir William Holford (quoted in Mandelker, 1962: 32) expresses it rather differently, although with little more clarity:

. . . amenity is not a single quality, it is a whole catalogue of values. It includes the beauty that an artist sees and an architect designs for; it is the pleasant and familiar scene that history has evolved; in certain circumstances it is even utility--the right thing in the right place. . .

For the purpose of this thesis, 'amenity' is more or less synonymous with 'beautification', and an 'open space amenity' is one which is intended to improve the quality or desirability of living in the surrounding area.

Recreation Area.

A recreation area may be classified as either intended for active or passive pursuits. Active recreation areas are those which cater to participation in organised sports, governed by specific rules of play; while passive recreation areas include playgrounds, playspaces, and areas set aside for informal activity, such as walking.

Open Space Needs

Several years ago Whyte (1959: 9) observed that " . . . there have already been a plethora of studies on open space needs," but even so their numbers have continued to increase during the ensuing decade or so. One of the first of these studies came in 1925, when the Great Britain National Playing Fields Association formulated a standard for British cities, setting six acres of playing space per 1,000 population as the amount required to accommodate the physical needs of the population (Ministry of Housing, 1956). After re-evaluating the social and demographic patterns in 1955, the Association concluded that its original standard was still valid (Ministry of Housing, 1956).

When wooded areas and other open spaces which are not planned as playing space are included, the requirements increase sharply. The National Recreation

Association compared proposed standards for some 60 municipalities in the United States and found "general agreement that 10 acres of park land per 1,000 population should be provided." (Butler, 1962: 1).

However, more recently established towns have been planned to include much greater proportions of open space. Nearly 35 per cent of Welwyn, a British New Town, is in reserves and parks (Breckenfeld, 1971). That amounts to about 30 acres per 1,000 population. And the zoning ordinance for Columbia, Maryland (a 'New Town' in the United States) requires at least 20 per cent of the land to be assigned to permanent open space (Breckenfeld, 1971).

New Zealand cities fall generally above the standards cited for British and United States cities, and well below the limits established for 'New Towns'. In view of Johnson's (1967: 54) observation that "part of the attraction of modern low density suburbs is connected with their access to open space--a factor which complicates the detailed pattern of land values in these areas," it is probably that the patterns of property values considered will be affected by the generous assignment of park lands in New Zealand cities. Determination of such an effect, which would require comparative studies in other countries, must necessarily lie outside the scope of this thesis.

Historical Account of Open Space Development

New Zealand cities present a fertile area for studies relating to open space and associated urban patterns. A brief historical account of the development of urban open space patterns should serve to point out the reasons for this. Simultaneously, it should provide a partial justification for the selection of New Zealand cities as a setting for this study.

Recreational and amenity open space is a relatively recent phenomenon in cities of western European culture. Among the several factors to which this can be attributed, three are especially important. Firstly, space within urban limits was used very intensively in eighteenth century Europe--a legacy

of the era of walled cities, as well as the response to primitive communications methods. Open space was just not available for 'wasteful' uses such as playgrounds or parks. Secondly, few urban centres contained large numbers of people, and none were large in area. Until the middle of the nineteenth century, all city dwellers lived within two or three miles--a comfortable hour's walk--of the open space of rural landscapes (Dahms, 1966). Finally, leisure time was a rare luxury for all but the most wealthy classes, and the philosophy of the day made no provision to introduce such a frivolity for the working classes.

Continental European Cities.

The movement to include open spaces as an integral part of cities grew slowly. Leon Battista Alberti, writing in 1449, suggested (quoted in Burke, 1971: 72):

. . . a City is not built wholly for the sake of Shelter, but ought to be so contrived that besides more Civil conveniences there may be handsome Spaces left for Squares, Courses for Chariots, Gardens, Places to take the Air in, for Swimming, and the like, both for Amusement and Recreation.

In 1612, Alberti's suggestion was taken up in France, when the Place des Vosges was laid out around a public open square which had been planted with grass, flowers and trees (Burke, 1971).

The move to reserve public open space proceeded slowly in continental cities, although a number of German cities had developed public gardens by the closing decade of the eighteenth century. Parks were established in a rather random pattern, with only one common factor (Chadwick, 1966: 249):

. . . the passing into disuse of town fortifications at various times gave opportunities for laying out extensive promenades and public gardens, which in some cases were to provide completely encircling belts or rings of greenery.

Not until the years following 1853, when Louis-Napoleon appointed Baron Haussmann as town planner of Paris, did an European city develop a comprehensive pattern of parks and gardens. Haussmann claimed the "distinction of

being the creator of the first real urban park system."² (Chadwick, 1966: 152).

British Cities.

A royal proclamation by Queen Elizabeth I established the first "green belt city" in England. In an effort to control London's squatter problem in 1580, the proclamation, quoted in Platt (1972: 29), required all persons:

. . . to desist and forbear from any new buildings of any house or tenement within three miles from any of the gates of the said city of London, to serve for habitation or lodging for any person, where no former house hath been known to have been in the memory of such as are now living. . .

The industrial revolution had a profound impact on urban patterns in several ways. Existing cities expanded rapidly, both in area and in total population, and a number of towns quickly attained city status. The percentage of population which was classified as urban increased sharply, as did the rate of urbanisation for the nation. The reintroduction of residents of these large cities to open spaces--a reversal of the 'deterioration of the urban environment'--was a major goal of leaders of the park movement in mid-nineteenth century Britain. Undoubtedly they would have concurred with Duhl's (1963: 149) observation that "Open space, when once it is experienced, can rarely be replaced. It provides for us that continuity with the past which our personal identity requires."

Rapid growth of industrial towns in eighteenth century England is described by Tetlow and Goss (1968: 24) in a recent publication:

The effect [of rapid urbanisation] on living conditions in towns was catastrophic; the overwhelming growth of the working class population brought disaster. Houses were needed for them and houses were built--the greatest possible number of the smallest type on the smallest area of land, packed tightly round the factories and the mines, with no open space, no sanitation and the most primitive services.

With few exceptions, recognition of the need for open space in British cities lay dormant until the nineteenth century, when social critics gave it public

expression.³ Bessbrook, a Northern Ireland village founded in 1846 by John Richardson, gained considerable attention as one of the earliest attempts to plan open space into a British town. Bessbrook contained "generous areas of open space in the form of village greens, playing fields and allotments." (Burke, 1971: 137).

One of the more influential advocates of planning open space into new towns was Edward Gibbon Wakefield.⁴ A book written by Wakefield in 1829 set down a completely developed scheme for colonisation (referenced by Burke, 1971). The scheme proposed the settlement of a balanced segment of British society into the newly developing colony of Australia. The town, into which the colony was to settle, would be laid out with generous areas designated for use as parks and green belts.

Although their contributions to the 'Green Belt Movement' came too late to have effect on the initial patterns of most New Zealand cities, Ebenezer Howard and Sir Raymond Unwin deserve mention. Howard's 'Garden City' concept, first expressed in published form in 1898, drew heavily on a number of utopian schemes of the previous decades in proposing 'cluster cities', grouped around a central city (Osborn, 1946). Although most of his suggestions have been distorted by later 'proponents' of his ideas "gardens and parks were an essential part of the scheme," and Howard's ideas have maintained a fair amount of popularity through the succeeding years (Jones, 1966: 65).

Sir Raymond Unwin, who collaborated with Howard in planning the first 'Garden City' to become fact, gained an international reputation as a town planner who emphasised open spaces (Tetlow and Goss, 1968). Together they deserve a significant share of the credit for the continued emphasis upon park planning in English speaking countries during the past fifty years.

Australian Cities.

Adelaide, South Australia, provided the first opportunity to incorporate Wakefield's ideas. The town plan of Adelaide, drawn in 1836 and surveyed in 1837, shows the central core of the city surrounded by an encircling belt of public open space which separates the city business section from the suburbs. Meinig (1962: 175) rightly calls this "a fresh idea in city planning."

Although Adelaide was not considered by Wakefield to be a satisfactory test of his theory of colonising, for reasons which are not pertinent to this thesis, the concept of a town centre surrounded by a band of public park lands was widely accepted in South Australia. During the period from 1865 through 1889, approximately 80 per cent of all towns surveyed in that state were planned in accordance with this model, and even today some 249 government townships--more than 67 per cent of the total--retain the parkland characteristic (Williams, 1966). Unfortunately, as Meinig (1962: 188) points out, the plan was too rigidly applied:

To reserve land for recreational and other public use was admirable; automatically to girdle the central district with a parkland of fifty to five hundred acres was rarely advantageous. Those communities that never developed beyond village size were all too often surrounded by a weed-infested wasteland, those few that did grow to considerable size found themselves "locked up" by their parklands "as completely as many European towns were once upon a time hemmed in by fortifications".

Even those South Australian towns which were not planned as 'parkland towns' were not deprived of open space. The instructions of Sir Rowland Hill in 1836 to the company which surveyed a number of towns included these words (quoted in Riddell, 1959: 4):

You will make the necessary reserves for squares, public walks and quays. In all your surveys you will reserve as a public road all land on the coast within not less than 100 feet of highwater mark, and you will also reserve a road at least 66 feet wide, along each side of every navigable river and around every lake.

The Wakefieldian plan was introduced into neighbouring Victoria during the 1840's, and although the belts of parklands were referred to as 'reserves', most of them were later alienated, and scarcely any of them remain intact at this time (Powell, 1970).

New Zealand Cities.

The New Zealand Company formed the vehicle for the introduction of Edward Gibbon Wakefield's colonisation plan into this country. Four settlements--Wellington, Wanganui, New Plymouth and Nelson--were founded by the

Company in 1840-41 (see Figure 1.1). Wakefield's town plan, with its generous reserves for parks and green belts, served as the model for these settlements.

The instructions of the New Zealand Company directors to Captain Mein Smith, surveyor of Wellington, emphasise the Company's insistence upon the open space feature (quoted in O'Donnell, 1970: 3-4):

Your directors furnished the Surveyor-General with full instructions in regard to the surveys and especially to the laying out of the plan of the town. They desire that ample reserves should be made for all public purposes such as a cemetery, a market place, wharfage and probable public buildings, a botanical garden, a park and extensive boulevards--that a broad belt of land should be left for public use between the town and country sections--that in the form of the town and future should be provided for rather than the present--and that the public convenience should be consulted and the beautiful appearance of the city secured so far as possible, rather than the immediate profit of the Company.

Further instructions to Captain Smith stressed the future of the town belt in even stronger terms (quoted in Williams, 1966: 88):

. . . It is, indeed, desirable that the whole outside of the town, inland, should be separated from the country sections by a broad belt of land which you will declare that the Company intends to be public property, on conditions that no buildings be ever erected on it.

The plan was also adopted for the church settlements of Dunedin (1848) and Christchurch (1850). Instructions to Captain Joseph Thomas (Letter book 47/1: 9-10), chief agent and surveyor for the Canterbury Association which founded Christchurch, were less explicit, as is evident from his letter to J.R. Godley, agent for the Canterbury Association:



Figure 1.1

Map showing location of cities in New Zealand. The emphasised cities form the study areas for this thesis.

Source: New Zealand Census, 1966.

Survey Office, Canterbury Assn.
Lyttelton 15th April 1850

Sir,

Having completed the maps of Christchurch, I beg to refer to my instructions on leaving England. They are as follows:

"However the Chief Town may be situated, you will be most particular in making it readily accessible; if it be a Sea Port, by providing every facility for the landing of the Colonists and their goods; if an Inland town, by a good road communication.

"The Capital of the Settlement is to be called Christchurch. You will select for it a block of One thousand acres, and in laying out the plan of the Town, the Association wish that you should make ample reserves for all public purposes. . ."

I have the Honor to be

(signed) J. Thomas.

The colonisation plans of Wakefield and the New Zealand Company were not completely successful, as the plans for expansion on the basis of large-scale agriculture failed to materialise. Although the failure to incorporate the complete scheme at Adelaide was not vindicated in New Zealand, the prevalence of public open space in the New Zealand cities of today is a visible legacy of the Wakefieldian ideal.

Christchurch. Christchurch, the first city considered in this study, was laid out with an encircling green belt, but much of the original open space was soon alienated. The settlement failed to prosper, and became insolvent in less than five years. In order to prevent complete financial collapse, the town belt on three sides was subdivided and sold by 1858 (Grundy, 1959). Only Hagley Park to the west remained intact.

Although the "town belt of Christchurch has disappeared completely for all time . . . " (Pownall, 1955: 216), it lasted sufficiently long to focus the settlement inwardly. Virtually all sections within the initial town boundaries were sold and occupied before the surrounding lands were taken up

for residential development (Hayward, 1970). Hagley Park, which with 419 acres must be considered as generous by any standards, remains the nucleus for the city's system of open spaces.

Palmerston North. The concept of planned open space was not restricted to settlements founded on Wakefield's plan. In 1848 J.T. Stewart visited a clearing of about 900 acres along the west bank of the Manawatu River, and suggested a township for the site. Palmerston North was laid out under his direction in 1866 and 1867 (Pownall, 1955). 'The Square', some 17 acres of open space around which the city has expanded, was set aside at the town's inception and has remained inviolate, except for a railway right-of-way which traversed it for about eight decades. However, the Square was merely unused open space with little to commend it as a scenic amenity until 1904, when Palmerston North residents began planting shrubs in an effort to make it a 'renowned beauty spot' (Bradfield, 1962: 16). One early map (c. 1878) shows the 'Public Square' as presently delimited (except for the railway), as well as a "Public Reserve for Use of Township Extending to River Manawatu," which includes the open spaces now occupied by the contiguous group of parks and reserves between Park Road, Fitzherbert Avenue and the Manawatu River. An 1895 map of the city reveals a pattern of open spaces which, with the exception of additions as the city has expanded, has changed very little.

The bulk of today's open space in Palmerston North was either "Crown Granted or set aside by Special Act of Parliament" (Riddell, 1959: 5). As Pownall (1955: 28-29) points out:

Palmerston North was laid out under the direction of the government, although . . . neither planned nor organised to the same extent as the company settlements; instead the national government chose the site, surveyed and sold the land. . .

Wanganui. This city, the second colony established by the New Zealand Company and the third oldest European city in New Zealand, was situated on the Wanganui River some three miles upstream from its mouth, although the city has since expanded its boundaries to the Tasman Sea. Williams (1966) errs when he declares that this city's town belt dates from 1861. A map dated 1841 shows a 'Public Reserve' surrounding 'Virginia Water' (now Virginia Lake) and extending southward to connect with another 'Public Reserve' twenty chains in

width enclosing the proposed town site to the north and west of the river. Another proposed reserve is shown along the south side of the river. In general, the present pattern of open space is a heritage of the well-preserved pattern of reserves proposed in that early map.

Hastings. Christchurch and Palmerston North started as 'colonial' settlements (Pownall, 1955). Hastings, on the other hand, began as a private enterprise. When Francis Hicks subdivided his portion of the Heretaunga block into town lots in 1873, he did not allocate any land for open space (MacKenzie, 1969). However, by 1885 Windsor Park and Queen Square had been established (map, 1885). Hastings was quickly and adequately supplied with additional park-lands through three other sources: gifts by private donors, purchases made by the city, and space set aside during the subdivision of land in State Housing Blocks (MacKenzie, 1969). As a result of fortuitous gifts and carefully selected purchases, the city now has a pattern of well-distributed parks and playgrounds.

Other Settlements. Auckland, the second oldest city in New Zealand, was founded in 1840 just eight months after Wellington. Although Governor Hobson established it as the colonial capital, he failed to designate any public open spaces, as the Royal Instructions of 1840, which directed Hobson to establish reserves for a number of purposes, including "public convenience, utility, health or enjoyment" were effective from 5 December 1840--some ten weeks after the official founding of Auckland (Alexander, 1966). Hobson's oversight was remedied in 1845 when the Domain "was set aside for public use by Sir George Grey" as the first of Auckland's now numerous parks and reserves (Laing, 1969).⁵

Hamilton, which began as a Volunteer Militia settlement in 1864, had a girdling town belt, as well as some 63 acres of land set aside as 'Borough Endowments' (Westwood, 1962: 126):

The original township was laid out surrounded by an extensive town belt, of approximately $8\frac{1}{2}$ to 9 chains in width. Thus was provided an excellent area of permanent open space--now totalling in the neighbourhood of 186 acres.

In 1856 Invercargill also began its existence as a parkland town with an encircling town belt which is still intact on three sides of the city. And even such a small village as Rongotea, which has yet to exceed 1,000 population, was laid out in 1879 around a square which was reserved as a recreation ground (Bradfield, 1962).

Open Space Legislation.

As indicated previously, open spaces were planned into early settlements in response to official instructions, but the amount of land to be reserved was usually left to the discretion of the surveyor. The first legislation to establish minimum standards for New Zealand cities was the Plans of Towns Regulations Act 1875, which carried among its provisions the requirement to reserve for recreation ground at least ten per cent of the total area of a town.

When subsequent Land Acts repealed or superseded this legislation, provisions of the Survey Regulations dictated the minimum area requirements for reserves in subdivisions. In 1923 the lower limit was established at five per cent of the total area. Legislation which controlled this feature during the period from 1924 to 1946 charged the Minister of Lands with the responsibility of ensuring the provision of adequate reserves, although the five per cent minimum still applied (Alexander, 1966).

More recent legislation allows local authorities to exert full control over subdivision, and most cities now collect fees in lieu of land parcels. The fees collected may be used to purchase public open space or to develop or improve existing park facilities.

New Zealand occupies a unique position in the world. It is the only nation which has had open space planned into all its cities from their earliest days. Alexander (1966: 5) expresses it in this way:

. . . since the beginning of European settlement in New Zealand, there has been legislation to provide for the creation of reserves. The example of providing them was set by the New Zealand Company and the Crown.

NOTES

¹A useful bibliography of publications dealing with macroscale spatial interaction and distance decay may be found in Olsson (1970: 321-233), while exhaustive treatment of spatial autocorrelation is presented by Cliff and Ord (1973).

²For purposes of comparison, it is well to note that New York City's Central Park, established in 1856, initiated the development of urban park systems in the United States.

³For the history of development of the English park and the landscape movement in Britain, see Chadwick (1966: 19-36).

⁴A concise account of Wakefield's activities as they relate to New Zealand settlement is contained in 'Wakefield, Edward Gibbon', in An Encyclopaedia of New Zealand (1966).

⁵Pages 1 and 2 of Laing (1969) provide a good review of the history of establishing parks in New Zealand's largest metropolitan area.

CHAPTER II

METHODOLOGY

Planning the Study

A number of decisions were made during the development of the methodology used in this thesis. The following paragraphs discuss each decision and the rationale which led to determination of the final selection.

Selection of Cities.

The New Zealand Census of 1966 identifies 23 settlements of 'city' status. It is well beyond the capability of this study to attempt to use all 23 cities. The study is restricted to four communities, a number which is manageable but still permits considerable diversity within the sample. It is felt that the use of random selection techniques will not produce a representative cross section of the total population; rather, each city is selected because it represents a category and possesses certain characteristics which are determined, intuitively as well as discursively, to be desirable for this study. It is recognised that this deviation from standard statistical technique restricts the reliability of any statistical inferences drawn from the study. In return, the selected cities provide a fair representation of New Zealand's urban areas, and there is no reason to assume that the findings will not apply to other New Zealand cities.

City Size. The 23 cities are divided into three groups, according to population (Appendix I). Group I, made up of cities of more than 70,000 population, includes the main city in each of the four metropolitan centres--Auckland, Wellington, Christchurch and Dunedin--as well as Manukau, which is in the Auckland metropolitan area. Group II, with cities from 30,000 to 70,000 inhabitants, contains the provincial centres of Hamilton, Palmerston North, Invercargill, Wanganui and New Plymouth, along with Lower Hutt, a city in the

Wellington-Hutt complex. The 12 cities with less than 30,000 population are placed in Group III. The cities selected from these three groups are Christchurch, Palmerston North, and Hastings.¹ Wanganui, a city in Group II, is also included although it does not possess all the necessary criteria; i.e., it is not sited on level terrain. Wanganui data are of value for comparing and contrasting with data from the other selected cities.

Level Terrain. View is one of the most important determinants of a high quality, expensive residential site. In one of the first studies conducted into the nature of the relationship between housing value and site elevation, Blumenfeld (1948: 399) found " . . . in every case a consistent correlation between rent and altitude. . . ." Any attempt to establish the appreciative effect of open space on residential land must include accurate determination of the amount of that effect which is related to the view from the property, especially if the land has an elevated site. In order to keep the effect of view from influencing other price determinants, only cities sited on predominantly level terrain are selected. Table 2.1 indicates the percentage of each city in the various slope categories.

Table 2.1
Slope of Terrain, as Percentage of City Area

<u>Slope Category</u>	<u>City</u>			
	Christchurch*	Palmerston North	Hastings	Wanganui
Low	100	97.7	100	73
Low to undulating		2.2		15.3
Undulating		0.1		3.2
Steep				8.2
Precipitous				0.3

Source: Pownall (1955: 21).

*That part of Christchurch considered in this study.

Other Considerations. South Island, with five of New Zealand's 17 urban areas,² has 27.4 per cent of the total urban population (New Zealand Census, 1966: 14-15), and South Island cities house 22.1 per cent of the total city population. It would be inappropriate to fail to include a South Island city in the sample; Christchurch fulfills that requirement. In addition, the

selected cities represent urban population on both the eastern and western sides of the nation, and coastal cities as well as inland settlements are included.

As discussed in Chapter I, the founding of New Zealand's cities can be classified into four distinct categories, and all are represented in this study. Both Wanganui, which was colonised by the New Zealand Company, and Christchurch, established under religious auspices, represent the Wakefieldian city plan and its concern with open space. Palmerston North was laid out under the direction of the national government, and Hastings represents the private enterprise settlements.

Finally, ease of access to the cities is given some consideration. Hamilton fulfills all the selection criteria fully as well as Palmerston North in Group II, and the only factor against choosing Invercargill to represent the 'second order' cities was its South Island location, which would give that island undue emphasis in the study. However, no city in any group fits the criteria better than the selected city, and Palmerston North provides the additional advantage of allowing the data-gathering procedures to be developed and refined in a familiar setting.

In summary, although the selection of cities is made in subjective fashion while keeping the above factors in mind, the selected cities represent the best possible choice for the purpose of this thesis.

Size of Open Spaces.

In studying a feature which might vary in size along a continuum from an almost miniscule bit of public open space on the one hand to hundreds of acres, such as Hagley Park on the other, it is necessary to establish a minimum size limit. The limit for inclusion is set as follows: open spaces of five or more acres are included; those of four acres or less are excluded.³

Shape of Complementary Area.

The shape of the area surrounding each open space is developed using an 'expanding outline' concept; i.e., by outlining bands of equal width, hereinafter called 'zones', following the outline of the park, so that the outer limit of each zone maintains a constant linear distance from the park

perimeter (Figure 2.1). In this way, the zones represent areas of equal distance from the edge of the park, rather than from the park centre--a difference of importance when considering large or irregularly shaped open spaces.⁴

Although it is conceded that physical access to a park is seldom gained by a straight line path, direct linear distance is used because many park users, especially children, follow access routes along paths other than public thoroughfares. In addition, 'visual access' to a park, usually an attractive influence, as well as 'aural access', such as the sounds of the crowd at sporting events and quite often a distraction, are essentially dependent upon straight line distance. A concise discussion of the definition of accessibility in ways other than direct linear distance is presented by Kissling (1969).

The standard residential section in New Zealand is 132 feet deep. The distance of 50 metres (approximately 164 feet) is selected for the width of the zones surrounding open spaces, so that each zone approximates a tier of residential properties around the park.

Initially a total of ten zones were developed around each park, unless proximity to other open spaces precluded construction of the full number. It was felt that the 500 metres thus included would exceed the maximum distance an open space would affect property values, and subsequent investigation fully justifies this decision.

The resultant shapes of the complementary areas resemble Thiessen polygons in those neighbourhoods where parks are near enough to one another to preclude construction of the full ten zones; in areas where parks are more sparsely distributed, the shapes resemble the expanded outline of the open spaces.

Size of Complementary Area.

Preliminary treatment of the data includes calculation of Pearson product-moment correlation coefficients 'r' to determine the relationship between distance from the open space and the property value averages. Basic to the use of correlation as a statistical technique is the concept that

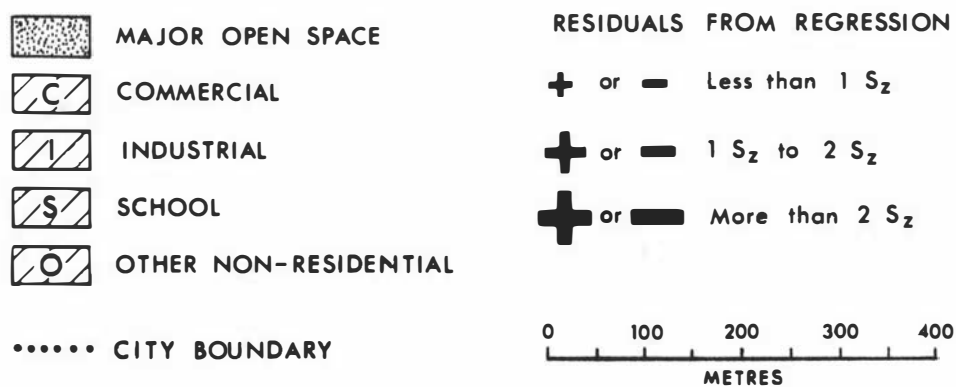
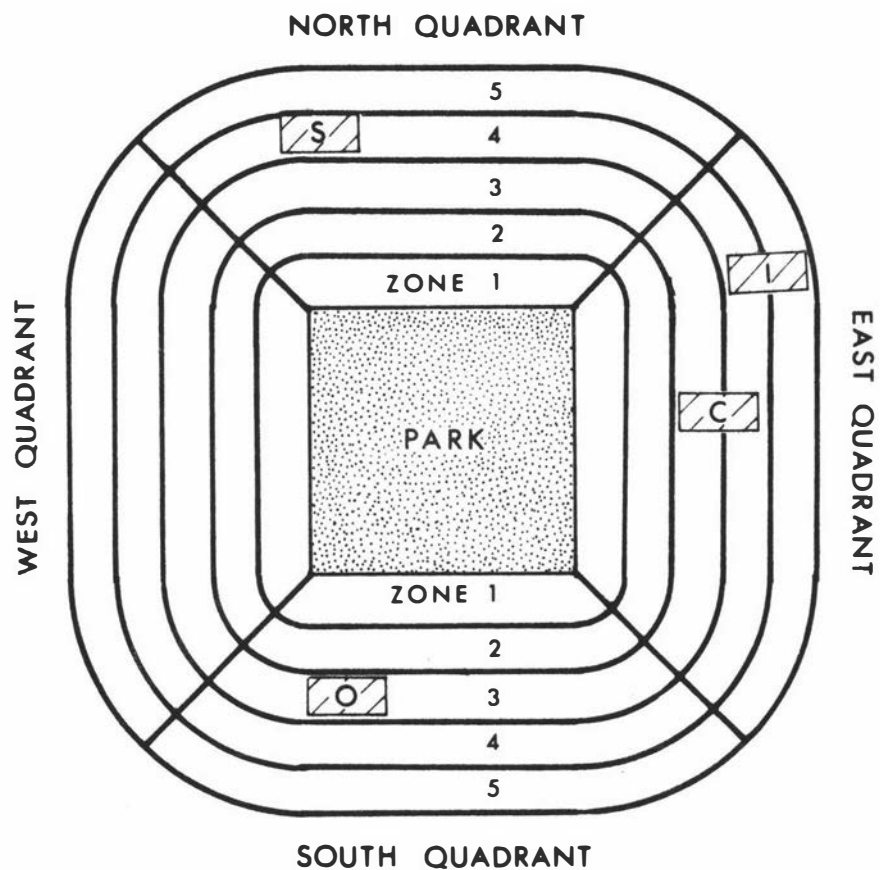


Figure 2.1 Schematic representation of park, showing expanding outline, zones, and quadrants.

correlation coefficients indicate interdependence between variables, although with no implication of functional relationship (see, for example, Greer-Wootten, 1972: 51).

Inspection of the 'r' values (Appendix II) reveals that significant interdependence between the selected variables is not maintained to a distance of 500 metres by any of the 50 parks chosen for study. Conversely, most of the spaces display correlation patterns which deteriorate sharply beyond the fifth zone, or 250 metres from the park perimeter. From Table 2.2, which summarises the limits of interdependence for the subject parks, one can conclude that in general the areas surrounding parks display an appreciating (or depreciating) effect over a distance of some 250 to 300 metres; beyond that distance, little interrelationship is observed.⁵ These findings relate closely to those of a recent study (Grey and others, 1970: 81), which finds that "land uses located more than two blocks [about 250 metres] from the origin point draw fewer pedestrians the further they are from the origin point, and the drop-off is very fast," In order to allow comparison of valuation patterns, the complementary areas are limited to five zones, or 250 metres.

Table 2.2
Distance of Optimum Correlation

City	Zone	Number of Parks				
		5	6	7	8	9
Christchurch	9	2	0	1	1	0
Palmerston North	12	2	2	1	0	0
Hastings	8	1	1	0	0	0
Wanganui	<u>6</u>	<u>2</u>	<u>1</u>	<u>1</u>	<u>0</u>	<u>0</u>
Totals		35	7	4	3	1

Use of Government Valuation Records.

The decision to use government valuation records to establish property values was an easy choice to make, depending only upon permission to have access to the records, which was readily granted (Appendix III). In fact, a study of this nature could be achieved only through the use of these data,

compiled by a staff of highly skilled valuers and analysts with many years' experience in each city.

Based upon compilations of recent real estate transactions and his knowledge of the local market, the government valuer first establishes the unimproved value of the land according to the considerations mentioned earlier. The value of improvements is then estimated; the two values combine to become capital value.

Although valuation depends heavily upon the subjective judgment of the valuer, he is ". . . in constant touch with the market, records of all sales and transactions and changes in land use are recorded and studied. Each sale of property is carefully broken down with a view to ascertaining what the market is prepared to pay. . ." (Clarke, 1961: Part ONE, Sec. 2, Para. 9). Thus land values are determined by competition for each site.

The main disadvantage in using these records is that although all properties in a city are valued as of a specific date, that date varies between cities. As a result, figures from one city are not directly comparable to any other. In addition, each city is 'gazetted' only once each five years, so that the listed values may be well out of date.

Use of Capital Value.

Most previous studies of land values in New Zealand are based upon unimproved values. For example, Curtis (1968: 56) declares that his study ". . . has been concerned with the determination of the unimproved value of properties . . . in order to obtain a more accurate picture and to simplify analysis." And Clarke (1961: Part TWO, Sec. 1, Para. 10), in choosing between the two values, concludes, "Although figures of capital value will provide some guide to overall relative property values they are not as good a guide as unimproved values." Knetsch (1962: 1723) also notes that "The value of proximity to small neighbourhood parks is almost wholly capitalized in values of adjacent land. . ."

Nonetheless, capital value is selected as the base for this study with the belief that the fine detail of the land value pattern will be displayed

more clearly. Valuers usually determine a constant valuing factor which is used to establish unimproved values along a portion of a street.⁶ Differences in unimproved property values would not be discernible along those streets which are oriented perpendicular to open spaces, except in a general way. However, it is hypothesised that a property owner near an amenity open space, for example, will perceive his property as more valuable than the adjacent section, and his perception will be reflected by an increased expenditure for improvements. Consequently, the use of capital value, which consists of the sum of unimproved value and the value of improvements, should produce a pattern of values which is sensitive to appreciative and depreciative factors. As Platt (1972: 54) writes, "It is the owner's perception of how to optimize economic rent from his property which effectuates the translation of land economics into patterns of land usage."

Restriction to Residential Properties.

All property zoned for commercial or industrial use is excluded from this study, because the advantages to be gained through a park-side location for those activities are strongly overshadowed by a number of other locational factors. In addition, those residential sections in Christchurch which have been designated for the Northern Motorway are excluded, as the buildings and other improvements have been allowed to deteriorate in the face of impending condemnation.

It is further decided to include multiple residential structures, such as apartment buildings, with less than ten housing units. Houses are classified according to the original purpose of the structure; i.e., a house built as a duplex is considered as two units, and the value of improvements is divided by two before computing mean values, although a house constructed as a single-family dwelling and subsequently divided into two flats is still considered as a single unit.

Factors Affecting Property Values.

A number of factors affect residential property values; some are dependent upon intervening distances and their effect diminishes with an increase in distance, while other factors are essentially discrete in nature. This part of the thesis discusses the major factors and describes how their

effects are accounted for through the organisation of the study. Some, such as the effect of view which was previously discussed, have been 'planned out' of the study as much as possible; the effects of others are explained during the analysis of regression residuals in succeeding chapters.

As noted previously, the intent of this thesis is to establish empirically the effect of urban parks on residential property values. Of the factors which affect these values, it is not proposed that nearness to parks is the sole, or even the main, determinant. Rather, it is readily acknowledged that the effect of view, proximity to the city centre or secondary peak value intersections, location along main thoroughfares, age of housing or any of a number of factors may be of sufficient strength to mask the effect which is the central theme of this study.⁷ Brigham (1965: 325) does not attempt to identify specific factors, but considers the functional determinants of residential land values to be the characteristics of topography, amenities, accessibility to economic activity, present and future use, and historical factors. Mills (1969) also identifies the characteristics which he finds to determine urban land rents, and concludes that topographical features and the associated view are dominant.

Most of these features mentioned above are outside the control of the urban planner and administrator. For example, 'view' usually implies the presence of a major landscape feature such as a mountain, lake, river or stream, or a site which is elevated above its surroundings. Major features, such as the bodies of water in Lakeside, California or Canberra, A.C.T., Australia, may be man-made, but this is seldom feasible unless a 'New Town' is planned. Even then the high costs involved place the development of these features beyond the capability of most communities. In addition, construction of such features may be highly speculative. The amenity effect of topographic features and parks cannot be predicted accurately because, as Brigham (1965: 328) notes, it is a "qualitative factor determined subjectively by different individuals."

Distance-Related Factors. Although Taylor (1971: 222) notes that "distance decay functions have been evolved in two separate research fields: spatial interaction studies in the social sciences and gene dispersal research in

genetics," only social science studies are considered here. The predicted change in value of a variable with a change in distance from a phenomenon provides theoretical framework for studies such as Reilly's (1931) classic work in predicting retail sales hinterlands, Clark's (1951) generalisations of urban population densities and the study by Davis (1965) on the growth of an urban area. As Taylor (1971) indicates, data transformation may be necessary to interpret the nature of the distance-decay function.

A discussion of some representative studies, together with the data transformation used and the results obtained, is presented. Hägerstrand (1968: 371), a prominent scholar in the field of diffusion of innovation, uses frequency of telephone calls as the measure of interaction, and finds "for the sample region taken as a whole, the relative frequency of calls decreases on the average very nearly with the square of the distance."

Proximity to Central Business District. A number of studies deal with the decay of land values as distance from the city centre increases. The Central Business District (CBD) " . . . is associated with a disproportionately higher level of land values than the rest of the urban area it dominates." (Yeates and Garner, 1971: 334). Property nearer the CBD usually has a higher value than land further from the city centre.

The theoretical relationship between land values on the one hand, and proximity to primary or secondary peak value intersections and location along main thoroughfares--Brigham's (1965) 'accessibility' characteristic--on the other, has been the subject of several studies (see, for example, Alonso, 1960, 1964; Mohring, 1961; Wingo, 1961; Beckmann, 1969; Muth, 1961; Casetti, 1971; or Hochman and Pines, 1971). Alonso (1960) uses families of bid rent curves to graph the theoretical distances from the CBD where commercial, residential and agricultural land uses will prevail; in a later (1964) study, he determines that the correlation between land values and the straight-line distance from the CBD approximates a linear relationship.

Yeates (1965: 57) declares that "an assumption basic in classical theory and implicit in the work of Alonso is that land values decline with distance from the center of the city." Obviously he is concerned primarily

with industrial and commercial properties when he concludes, "Locations away from the (city) center incur greater transport costs, and thus land values decline reflecting decreasing accessibility, smaller market hinterlands, and lower net returns." (Yeates, 1965: 57).

In predicting values of residential properties in Los Angeles, California, Brigham (1965), as noted earlier, also uses such accessibility variables as straight-line distance to the CBD and road distance to the nearest freeway interchange. Using linear regression, Brigham (1965: 332) reports:

. . . a 10-per cent increase in distance from the CBD is associated with a decrease of about ten percent (sic) in land values.

In conclusion, . . . there is clearly a relationship between land value and accessibility to urban activity but . . . this relationship . . . is far from stable when different samples are examined.

Rickert (1965) also notes close correlations between accessibility and land values, although he includes industrial and commercial properties along with residential land. Accessibility is determined by straight-line distance to the CBD, road distance to the CBD and road distance to the nearest highway intersection. Rickert obtains best fit of the regression line by using logarithmic transformation of data.

Daly (1967: 37) also finds distance from the CBD to be " . . . an important part of the matrix of forces," but certainly not the only factor which determines land values. Other positive determinants are found to be proximity to shopping centres, the beach, lakes or schools, and accessibility to bus stops and train facilities, along with separation from industrial properties. Topography, or land on an elevated site, is the other major factor noted.

The predictive model developed by Knos (1962) achieves accuracy for land values in Topeka, Kansas, using distance-decay hypotheses which postulate that urban land values vary inversely with the reciprocal of the distance from two points of reference. These points are the centre of the CBD and the

major business thoroughfare in the city. Knos also finds close correlation between land values--essentially residential properties--and rather arbitrarily defined sectors which represent the main directions of growth of the city.

On the other hand, Mills (1969) obtains disappointing results from his regression of residential land values against distance from the CBD, and concludes that restriction to residential properties excludes the most valuable properties, detracting from the study's reliability. He also finds that log.-log. regression describes this distance-decay relationship most accurately.

The classic studies of Burgess (1929) and Hoyt (1939) also postulate a constant relationship to the limits of their regions of concern. Although they do not present their data in quantified terms, both hypothesise an increase in socio-economic status of neighbourhood with an increase in distance from the city centre.

A refreshing deviation from the pattern previously described, in which the distance-decay function remains constant in direction through the entire region under study, is found in Johnston's (1970) study. Although he finds increasing socio-economic residential status with an increase in distance from the CBD, the increase does not extend through the entire region. Johnston notes that the highest status suburbs are located in areas between the CBD and the urban fringe, rather than on the periphery.

The varying nature and strength of the distance-decay function is well documented, as is indicated by the representative studies briefly discussed above. As a result of that function, proximity to the CBD may be an especially important factor in the average residential property values for complementary areas around open spaces located near the centre of town. The appreciating effect of this factor could overshadow the more subtle variations in value which are the subject of this study. The impact is effectively submerged by averaging the values of all properties in a zone, i.e., on all sides of a subject open space, so that the average distance of all properties from the CBD is the same as the distance from the centre of the

park to the CBD. Although the relationship is not linear according to the findings of most of the studies mentioned above, it approaches that condition with increased distance from the CBD, and only centrally located open spaces will display patterns which are distorted for this reason.

Proximity to Major Street. As indicated above, accessibility or ease of access by automobile is an attractive feature for most properties, although the atmospheric and noise pollution associated with main thoroughfares tend to cancel out the appreciating effect. With the cooperation of City Engineers in three of the cities, traffic counts and estimates were obtained for all streets aligned parallel with the park in each complementary area. These data are considered in explaining residuals from regression.

Proximity to Railway. A site adjacent to railway facilities is highly desirable for industrial property, but the effect on residential sites is quite the opposite. It is not possible to remove the impact of railways from the value patterns in this study; instead, it must be considered during the analysing phase. Fortunately, residential areas are well separated from railway lines in the sample cities, and only 7 of the 50 open spaces under consideration may be expected to show a strong influence from this factor.

Proximity to Noxious Functions. Nearness to a noise-producing activity, such as an airport, may have a depreciating effect on residential values. Because such a function will effect a large area uniformly, it may serve to differentiate between higher-priced and lower-priced neighbourhoods, but it will exert no appreciable effect on patterns studied in this thesis.

A noxious activity such as a rubbish tip, for example, will produce a much more localised depreciation. Only two such activities affect the properties studied in this thesis: the effect of two shingle crushers along the Manawatu River in Palmerston North can be discerned.

Discrete Factors. A number of factors which influence property values are not associated with intervening distances. The effect of view has already been discussed; it matters little whether the view is of a nearby lake or a distant mountain.

Use of Numerical Factor. Those physical features of a section which are readily quantifiable have been incorporated into a numerical factor by the

government valuers. The use of this factor adjusts the unimproved value of the property to a basic figure, which allows comparison of prices of sections having dissimilar features.

The standard residential section has 55 feet of street frontage and is 132 feet deep. Deviation from these figures, or from the basic rectangular shape of the section, must be taken into consideration, as McClintock (1959: 107-8) notes:

The main requisites of a good residential site are adequate house space at a reasonable distance from the street and a satisfactory yard space at the back for domestic purposes. A section which does not conform to this standard may need to be discounted in value.

Instances of drawbacks are: 1. Narrow frontage widening towards the rear when the house has to be built at the back of the section. 2. Wide frontage narrowing towards the back, with the house site too close to the road. 3. Shallow section with wide frontage when the yard has to be sited at the side of the house instead of at the rear. 4. Irregularly shaped sections.

In the better class residential areas there is a ready sale for large frontage sections and they are likely to command as much per foot as the smaller ones. In the average locality, however, and especially where rating is on unimproved value, the larger frontage sections which are not wide enough to carry more than one building, do not sell for as much foot frontage as do the average sized sections and the value of the additional frontage must be given some discount.

Corner sections are usually valued about five per cent higher than inside sections, although each property is rated on its own merits. And back sections are normally considered less desirable than property fronting on the street, with the valuation and the numerical factor adjusted to reflect the difference. Finally, sections sited above the road contour have a higher price, and slope is also accounted for by the numerical factor.

Through the use of the factor the unimproved value of every section considered in this study is adjusted so that it represents a standard size, standard shape, flat, mid-block, front section level with the road. Removal

of the effects of these features on property values allows the impact of open spaces to be more readily studied.

State Housing. Housing units owned by the State Advances Corporation are identified with the thought that because they are built and maintained by an impersonal body, their values might not show any correlation with distance to open space, and the patterns of private housing values will be hidden or sharply modified.

Average values for all zones were computed, including and excluding state housing units from the population, and visual inspection confirms that when combined with privately owned dwellings, state housing has little effect on the patterns which are of interest to this study. As a result, state housing units are retained as part of the population. Another factor which lends weight to that decision is that some open spaces--Kirkpatrick Park in Hastings, for example--are dominated by state housing units in some zones, and elimination of these units would necessitate removal of those open spaces from the study.

Other Factors. Two other characteristics which affect valuation should be mentioned. Aspect, or orientation with regard to the sun, can be of some importance to an individual site, although the selection of level cities and the averaging of properties tends to minimise this effect.

The value of housing, which varies with age, makes up the greater proportion of capital value. Forrest (1965) found a linear correlation between age and value of housing to be as high as .80 for the first 50 years, although as Figure 2.2 shows, the pattern of depreciation determined by Maher (1967: Figure 1.1) is far from linear.

Although this study does not focus on age of housing, entire neighbourhoods develop at roughly the same time, and the age of housing throughout the zones in each quadrant of a complementary area is considered to be sufficiently constant to allow this factor to be dismissed as a major variant; it is considered in explaining regression residuals.

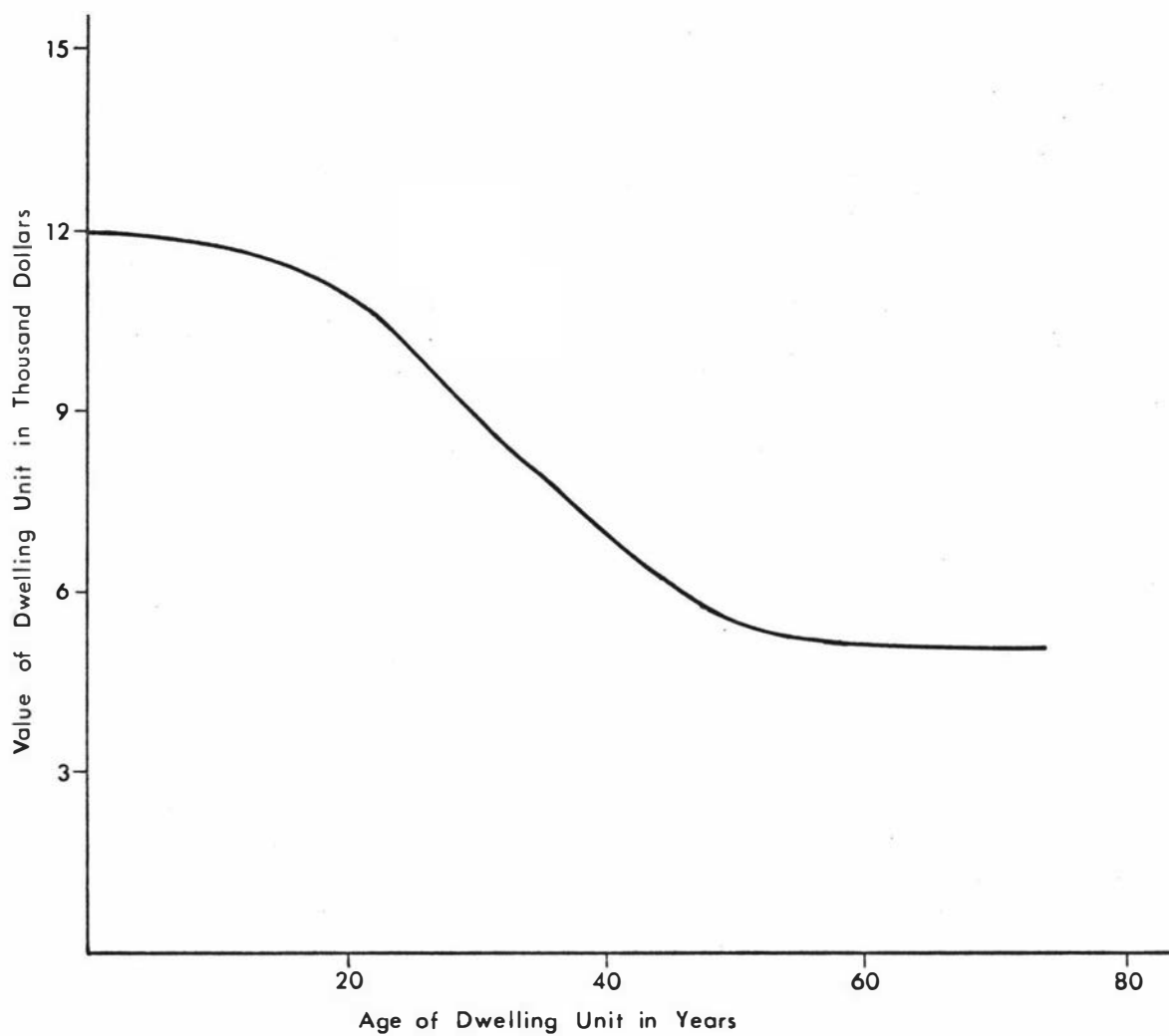


Figure 2.2 Hypothetical depreciation curve for housing.

Source: after Maher, 1967: Figure 1.1

Older homes, either in groups or as isolated individual units, remain until their replacement is a viable economic opportunity. As Brigham (1965: 333) notes:

Assuming a free market exists, single-family homes will be removed to make room for apartments (or other more intensive uses) when the value of the land alone, in the new use, exceeds the value of both land and buildings in the old use. If the old buildings are in very good shape and are therefore valuable in the old use, it is relatively difficult for conversions to occur.

Replacement of older housing on a large scale is not a feasible way to increase total residential property value as long as the existing housing meets established standards.

Conversely, urban administrators and planners may well achieve an increased tax base at little additional cost when new neighbourhoods are established. Under existing legislation, open space must be provided for new residential developments in New Zealand cities.⁸ Careful attention to size and function of the open space allows for maximum positive effect on values.

Although increasing the value of properties of individual private owners is not necessarily the goal of urban planners, it may be of considerable indirect importance. As Platt (1972: 1) points out, officials of some communities " . . . view open space as a waste of potential tax revenue." Attitudes which hold that urban open space is a luxury resulting in an unwarranted reduction in the tax base of a city may be countered effectively by evidence which shows that the loss of the open space from the rating rolls is offset by an increase in rateable values of other properties. Platt (1972: 58) identifies other points which may be used to offset arguments against establishment of open spaces:

Where development which would occur in the absence of an open space decision would demand more in services than it paid in taxes, the community would experience a net fiscal loss if the land were developed. Furthermore, in the case of prominent

public recreation sites, there are likely to be economic gains from tourism which off-set part of the costs of thwarting development.

Moreover, there are intangible effects which may cut either way. The avoidance of air and water pollution, crowding on highways, and loss of scenery may count as benefits to a local public, whether immediately perceived or not. On the other hand, the same local people may feel encroached upon by members of regional public of different race or life style who would use the public park.

Gathering the Data

Cadastral maps with a scale of 1:7,920 are used to locate all potential open spaces and schools considered in this study. Prior to gathering the data, each potential space is visited to insure that it is functioning as an open space within the context of this study.⁹ Data pertaining to probable function, condition and facilities of each space are noted.

After the list of parks for each city is compiled and verified, the size and function of each unit is established. This step is accomplished with the assistance of appropriate city officials who classify each park as either primarily a passive recreation area even though it may have facilities for active pursuits, or as primarily an active recreation area, although it may receive extensive passive use.¹⁰ Golf courses are considered separately.

When the classification into the passive and active categories is dependent upon whether the criterion used is the attraction to neighbourhood residents or the attraction for the majority of visitors, the former criterion was to be used.

The initial intention was to further divide each category into the classifications of, for example, almost exclusively active recreation and primarily active recreation but with heavy passive use. However, one city official declined to follow the proposal and provided a listing into primarily passive use and primarily active use, based upon attraction to neighbourhood residents. That classification is used in order to permit inter-city comparisons and generalisations.

Next a transparent overlay is attached to the map, all spaces are outlined and annotated, and the boundary of the study area is drawn on the overlay. The expanding outline zones are then marked, and the resulting complementary area is delineated into quadrants which are used so that general areas can be identified to aid in analysing regression residuals while keeping within the Valuation Department restrictions against property recognition.

The quadrants are developed by extending lines from the park toward the intercardinal points of the compass, so as to produce quadrants in the cardinal directions. In general, the lines extend from the main area of the park, although some deviation is permitted for specific reasons. For example, the quadrant lines follow along streets if possible, because streets are more apt to delineate neighbourhoods than are rigidly located lines. Also, the lines are positioned to allow inclusion in each zone of the quadrant enough houses to allow mapping of residuals within the Valuation Department's imposed constraints, if possible. Finally, the quadrant lines are adapted to the shape of the park, where appropriate, so that a park which is oriented in cardinal directions will have quadrantal lines radiating from its corners.

The identification of quadrants or sectors as areas of higher or lower value housing is not without precedent. Hoyt (1955: 92-93) finds a "great concentration of higher valued houses in the Northwest sector of Washington, [D.C.]," and declares, "In all American cities, the high value houses are found in one sector of the city, and the expansion of the higher income families tends to move outward in this one sector."

Although on a different scale, the quadrants established in this study are similar in some ways to the "marked sectoral variation in the general level of the value surface" which Garner (1967: 337) anticipates. However, the sectors which Garner describes radiate from the CBD, rely upon accessibility as the main causal factor and are used to describe the land value surface of the entire urban area, which tends to support Hoyt's (1939) classic study. Garner (1967: 338) acknowledges that "accessibility relates

directly to costs of operation and profit levels" for commercial and industrial activities, but that it may have only minimal effect on residential property values.

In contrast, the sectors used here are developed along compass directional lines using the park as a nucleus, and are used for mapping in order to facilitate the discussion of observed patterns. Identification of sectors of higher or lower average values is not a goal of this study, although such quadrants are noted where they appear.

The validity of the use of quadrants to group properties for mapping purposes is tested by analysis of variance, where the variation of property values within each group or quadrant of a zone is compared to the variation of these data for the other quadrants of the same zone. Analysis of variance requires the postulation of a null hypothesis that the population means for both types of data are equal (Blalock: 1960). Among the several assumptions are that the data have normal distribution and equal population standard deviations (Blalock: 1960). If these assumptions are correct, the within-groups variation reflects only random variation, and should be approximately the same for each group or quadrant (Hays: 1963). In that instance, the differences between the within-groups and the between-groups variations will not attain significance, and the null hypothesis will be supported. However, "if between-sample differences are significantly greater than within-sample differences, it can be assumed that the sample is a meaningful group or class." (Herbert, 1973: 275).

In this study, 15 of the 45 parks are randomly selected and analysis of variance is performed for the properties in each of the 5 zones for each selected park.¹¹ The between-groups variation, or the variation between quadrants, is found to be statistically significant in at least two of the five zones in each complementary area; that is, the variance noted will occur by chance less than five in each 100 times (see Appendix IV). Significant variance is also noted in 52 of the 75 instances tested, which is 69.3 per cent of the analyses performed. On the basis of these results, the quadrants are

considered to have generally dissimilar characteristics, thus constituting valid groups for the purpose of mapping.

It is acknowledged that rotation of quadrants, i.e., repositioning of quadrant boundaries, will impose upon the stability of the quadrantal mean values and could alter the values of the mapped residuals. However, it is not possible to verify statistically the degree of this instability, due to data retrieval problems resulting from an imperfection in methodology. It is unlikely, though, that changes would exceed one standard deviation of the residuals, and the residual values displayed on the maps must be interpreted with that knowledge in mind.

The Valuation Department field slips are consulted for every property within the study boundaries. The first step is to verify the residential character of the section; all non-residential properties are disregarded. The parcel of land is next located on the map, and those properties which are not within 500 metres of an open space are sampled at a 1-in-10 ratio. All other properties are included in the population. The following data are gathered for each property included: city, open space, zone, quadrant, value of improvements, unimproved value, numerical factor, age of housing, distance from school grounds and characteristics of that space, if applicable, and the identification of state housing.¹² Properties are assigned to the zone which contains the largest area of land; where that decision is not an obvious one, properties are assigned to the zone which contains the street access to the section. Only 'section to park' distances are recorded, and no effort is made to identify house location on the section.

Analysing the Data

Valuation Patterns.

Patterns of property values fall into four general categories. Firstly, there are those patterns which show a decrease in values as distance from the open space increases, and the park is considered to have appreciated the values in its complementary area.

The second category includes those patterns which are the reverse of the first group; i.e., property values increase with an increase in distance from the park, which is considered to have a depreciating effect on its surroundings.

Patterns in the third category show values in zone 1 to be higher than those in zone 2, but with a reversal of that trend in subsequent zones. These patterns may be considered as reflecting a general depreciating effect by the open space, although with an overriding influence by another factor, such as location in a major thoroughfare, providing the initial appreciating force.

Finally, there are those patterns which fail to qualify for inclusion in any of the other groupings. The two parks in Palmerston North which fail to establish any pattern are dropped from further consideration; four parks in Wanganui are retained for comparative purposes.

Regression Equations.

Correlation and regression analysis, applied to the sets of gathered data, require the fitting of a line to the data under observation. A certain amount of restraint must be applied in selecting the line to be fitted, especially when treating a small number of paired observations, as exists in this study. In curvilinear regression, "there is practically no limit to the different kinds of curves which can be . . . described by mathematical equations." (Ezekiel and Fox, 1959: 70). Although a curve which passes directly through all the points of the data will eliminate all residuals, it provides little information to allow comparison of data patterns. Consequently, only two basic mathematical equations are used in this study; that which provides the 'best fit' is selected, although in many instances the selected regression formula provides only slightly better description than the other formula. Linear regression is expressed by the equation $Y = a + bX$, while $\log Y = a + b \log X$ represents curvilinear regression expressing logarithmic functions on both axes.

The rationale for electing to use both linear and curvilinear regression should be mentioned. Linear regression is selected because it is the more

common statement of relationship and is easier to interpret. However, it is anticipated that a power relationship may exist between the two variables, at least as pertains to the inner zones. Knetsch (1962: 1723) notes, "A developer of a subdivision bordering Rock Creek Park in the Washington (D.C.) metropolitan area has a price \$1,000 higher for lots directly bordering the park than for all others in the area. Observations such as this can be found in many similar situations."

The regression equation used to establish the 'fingerprint' or identifying characteristics of each park is calculated using average values for all residential properties in each of the five zones. The graphs displayed in Figures 3.3, 4.3, 5.3 and 6.3 reflect those 5-point patterns from which the park is classified into either the appreciating or depreciating and logarithmic or linear categories.

After those classifications are made, a second regression equation is calculated using as inputs the average values for properties in each quadrant of each zone. The logarithmic or linear characteristic established by the 5-point regression equation determines whether the logarithmic or linear function is used in this calculation, which may have from 5 to 20 points, depending upon the distribution of residential properties around the park. The results of this regression equation are used only for mapping purposes. After the standard deviation of the regression residuals is determined, the data are displayed on the map of the park area. This use of quadrants for mapping serves as a compromise between the Valuation Department restrictions and the complexity of mapping each individual property on the one hand, and the generalised pattern produced by the 5-point regression equation on the other. In addition, the use of standard deviation of the residuals provides an objective way of establishing the relative importance of deviations from the values predicted by regression.

Testing the Hypotheses.

In order to evaluate the hypotheses it is necessary to establish a means of comparing the valuation profiles for the open spaces. The feature demanded of the method is the ability to identify differences between the

park profiles in a quantifiable dimension; ease of quantification and understanding is a secondary feature. Three methods are given serious consideration.

The Lorenz curve, or more specifically the Gini coefficient of the curve, is first considered as a graphic and quantifiable way of presenting cumulative percentages of a phenomenon. An inherent weakness of the Lorenz curve (as well as the other two methods considered) is that it allows no indication of the total number of units considered. For example, a neighbourhood consisting of 100 houses is not differentiated from one made up of only 10 houses, if the average values are equal. This weakness seriously impairs the value of the Lorenz curve as a statistical description for some types of distribution, but does not limit its use in this study. However, it is found that the Gini coefficient is not sufficiently sensitive to identify subtle differences between profiles, so the Lorenz curve is not adopted for use.

The 'b' value of the regression equation, which establishes the slope of the regression line, is next considered. It possesses all the required characteristics, although it necessitates the use of a common logarithmic table to convert values for those open spaces which are subjected to curvilinear regression on a logarithmic scale.

Finally, a decision is made to use the regression angle, which is an expression of the angular displacement of the regression line from the vertical (see Appendix V). This technique fulfills all the demanded characteristics, and possesses the additional advantage of being readily understood by a larger audience.

After the regression line is located on a graph, the angle at which it intersects the y-axis of the graph is measured. Values selected to represent increments on the graph are as follows: each unit on the x-axis represents one 50-metre zone; each unit on the y-axis is equivalent to \$1,000 in average value. Choice of alternative values will alter the value of the regression angle, but the relationship between angles will be retained. A regression

angle of 90 degrees identifies an open space which exerts no effect on the valuation profile, as determined by this study. Regression angles of more than 90 degrees mark the appreciating parks, with the extent of appreciative effect indicated by increasing value of the angle; depreciating open spaces are identified by angles of less than 90 degrees.

Linear regression lines established by the 5-point regression equations are used to establish regression angles, as they show greater deviation from the 90 degree 'neutral' value for a given set of data. Selection of logarithmic regression lines produces similar results, although the numerical value of the deviation is smaller.

After the residuals from regression are discussed, evaluation of the hypotheses includes correlation of the regression angle with the variables identified in the hypothesis.

NOTES

¹Only that part of Christchurch City north of the Avon River and west of Lake Terrace Road is included in the study. This makes up 42 per cent of the area of the city, and contains about 44 per cent of the total population. The selected area is considered to be sufficiently large to represent the city, reduces the data-gathering labour by half, and is sited on level terrain.

²The Auckland urban area includes four cities, while the Wellington-Hutt area includes four more. Hence the 23 cities comprise only 17 distinct urban areas.

³Of more than 150 spaces identified in the four cities, only 3 are between 4 and 5 acres in size. Milverton Park (Palmerston North) and Lorenzdale Park (Wanganui) are included in the study; Abberley Park (Christchurch) with 4.3 acres, is excluded.

⁴Narrow accessways to the park, although technically part of the open space, are disregarded in constructing the zones.

⁵The limit for each open space is established as that zone beyond which the correlation decreases after 'r' value is tested for significance using Student's 't' statistic, and taking into consideration the degrees of freedom for the correlation.

⁶This is necessary, since the figures must represent selling prices, and only a fraction of the properties along a street in established neighbourhoods will be sold during the five-year period between valuating dates.

⁷It is outside the bounds of this study and would serve no useful purpose to list all the factors which affect urban residential property values.

⁸A survey taken in 1966 shows that 10 of the 23 cities assess charges, ranging from five to ten per cent of the appraised value upon subdivision; two cities, Napier and Hastings, charge a flat rate per subdivided section; Christchurch demands four perches of land per subdivided section, although cash payment may be accepted under certain circumstances; and Invercargill requires no payment of any kind for subdivisions which produce less than three new sections (see Alexander, 1966: Appendix III).

⁹The need for this step may be better appreciated with the knowledge that Londons Park in the Castlecliff district of Wanganui is presently used as a rubbish tip.

¹⁰Classification of parks is supplied by Mr H.G. Gilpin, Director of Botanic Gardens, Parks and Reserves, Christchurch; Mr J.W. Bolton, Director of Reserves, Palmerston North; Mr M.R. Boothby, Superintendent of Parks and Reserves, Wanganui; and Mr J.G.C. MacKenzie, Superintendent of Parks, Hastings.

Admittedly the classification is subjective, but it relies upon the judgment of these knowledgeable individuals.

¹¹Five parks considered in the study have houses located in only one quadrant, and are removed from the population before sampling is performed. Those parks are Waterloo Crescent Park, Puriri Street Basketball Courts and Coronation Park (Palmerston North), Flaxmere Park (Hastings), and Castlecliff Beach Domain (Wanganui).

¹²Those properties included via the sampling technique cannot display major space, zone or quadrant data.

CHAPTER III

CHRISTCHURCH

The part of Christchurch selected for observation in this study has some 13 primary open spaces set in a well-distributed pattern; only the cluster of spaces in the northeast corner forms an obvious concentration (Figure 3.1).

Hagley Park, by virtue of its size and the variety of activities it offers, attracts park users from the entire metropolitan Christchurch area, and any evaluation of the adequacy of parks in a part of the city must necessarily include only a part of this green space. In this study it is assumed that utilisation of the park by residents of the study area is in direct proportion to the percentage of Christchurch's population living in the study area. Consequently, only 44 per cent of the total area of Hagley Park is included in the study.¹

As Table 3.1 indicates, the 13 primary spaces embrace 462.7 acres, or about 6.5 acres per thousand population for the 71,090 inhabitants. Inclusion of some 18 smaller playgrounds and playspaces, along with the small amenity open space, Abberley Park, increases the open space by an additional 49.8 acres, and provides 7.2 acres per thousand persons. Thus the standard for playing space set by the Great Britain National Playing Field Association is surpassed; and with the addition of playspaces associated with schoolyards, the measure of ten acres of open space per thousand population, proposed by the United States National Recreation, is approached. But because physical access to school playspace by nonstudents is not generally permitted, one must conclude that although Christchurch meets universally accepted standards for open space, it has little excess. Use of an alternate

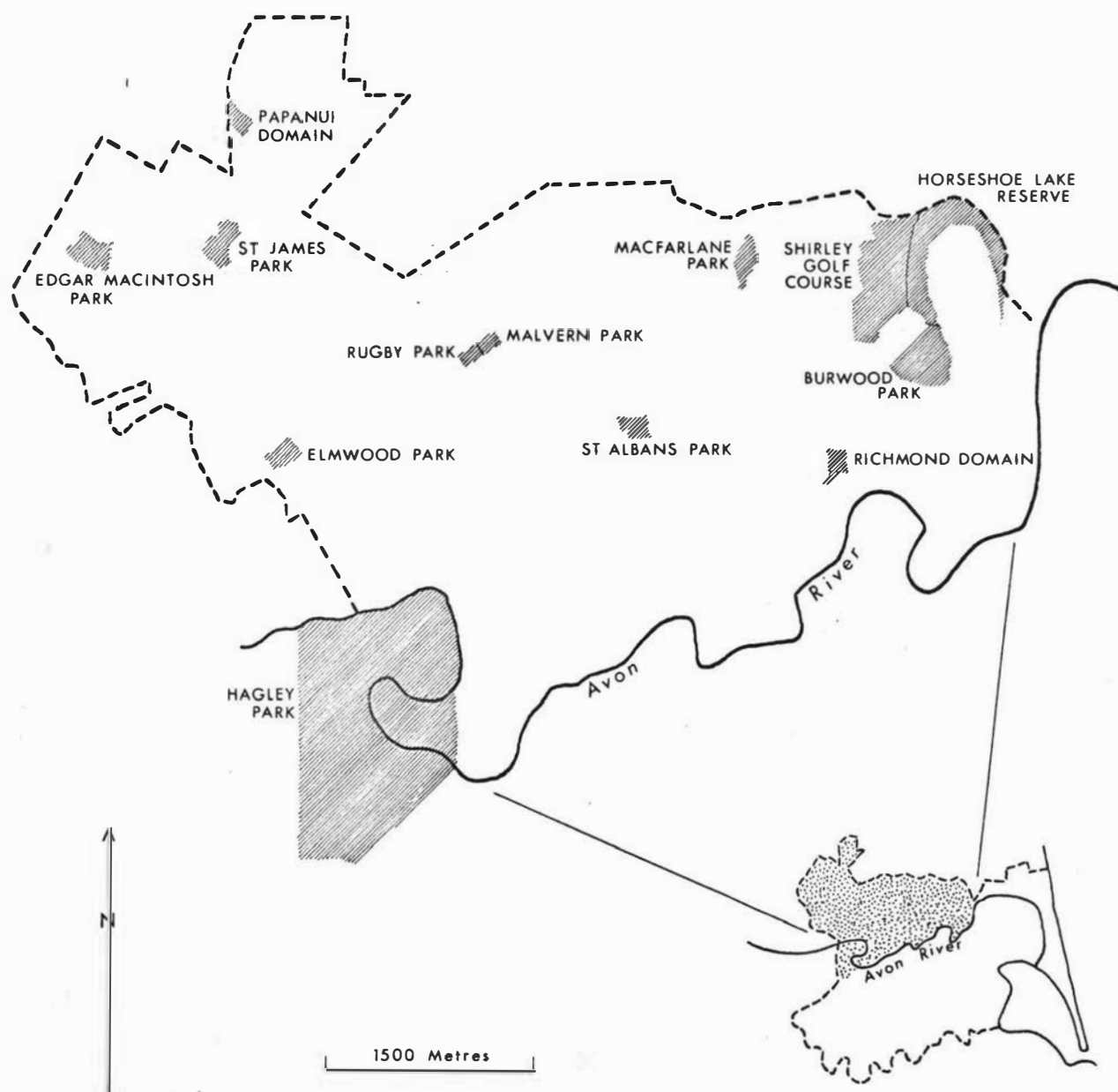


Figure 3.1 Map of Christchurch study area, in relation to city.

Table 3.1
Christchurch Open Spaces

<u>Open Space</u>	<u>Area (acres)</u>
Hagley Park	184.4
Elmwood Park	14.7
Edgar Macintosh Park	12.9
Malvern Park	6.3
Horseshoe Lake Reserve	71.7
Burwood Park	34.7
Richmond Domain	7.0
Papanui Domain	6.7
St Albans Park	15.3
Shirley Golf Course	81.0
St James Park	8.5
Macfarlane Park	12.9
Rugby Park	<u>6.6</u>
Total	462.7

Source: Christchurch City Planning
Department

criterion confirms this conclusion: the 512.5 acres of accessible open space amounts to slightly more than 9.4 per cent of the 5,448 acres of Christchurch's area.

Christchurch falls far short of meeting its locally established goal of five acres of 'neighbourhood areas' per thousand population (Christchurch Regional Planning Authority). When Hagley Park, Shirley Golf Course (Christchurch Golf Club) and Rugby Park, which function to serve the entire metropolitan area, are removed from consideration, less than 3.4 acres per thousand population remain as neighbourhood and district open space. Since the supply of open space seems to be no more than minimally adequate, it may be expected to exert an appreciating effect where it exists in this city.

Appreciating Parks

As may be noted in Table 3.2, no less than 9 of the 13 open spaces in Christchurch display patterns of appreciated property values. Each park is studied in turn; the sequence is established by the average value of the

Table 3.2
Average Property Valuations, Christchurch²

Open Space	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	r*	@
Hagley Park	\$16,585	12,179	10,521	10,024	9,074	-0.993 ^b	.005
Elmwood Park	12,752	10,404	10,230	9,782	9,697	-0.951 ^b	.010
Edgar Macintosh Park	9,525	9,390	9,345	9,303	9,318	-0.977 ^b	.005
Malvern Park	9,248	8,307	8,014	7,852	7,668	-0.988 ^b	.005
Horseshoe Lake Res.	8,304	8,153	7,801	7,686	7,657	-0.955 ^a	.010
Burwood Park	7,980	7,916	7,891	7,707	7,372	-0.915 ^a	.025
Richmond Domain	8,068	7,728	6,881	6,579	6,470	-0.972 ^b	.005
Papanui Domain	7,739	7,554	7,350	6,727	6,257	-0.971 ^a	.005
St Albans Park	6,159	5,834	5,711	5,558	5,560	-0.964 ^b	.005
Shirley Golf Course	7,500	7,788	7,856	7,934	8,027	+0.980 ^b	.005
St James Park	6,654	6,742	6,804	6,967	8,491	+0.802 ^a	.060
Macfarlane Park	6,000	6,088	6,195	6,386	6,863	+0.933 ^a	.010
Rugby Park	7,824	6,818	6,937	7,029	7,609	+0.906 ^{a**}	.050

* correlation coefficient, Pearson Product Moment method.

a calculated using linear function.

b calculated using logarithmic function.

@ alpha level of significance, using 1-tailed test and degrees of freedom df = n-2.

** correlation coefficient calculated for zones 2 through 5.

surrounding properties, with the most expensive neighbourhood considered first.

A general description of each part is accompanied by discussion of value 'profiles' and residuals from regression when necessary. It should be noted that no attempt is made to analyse residuals of less than one standard deviation, except as they form general patterns.

Hagley Park.

The discussion of Christchurch's open spaces commences with Hagley Park, a remnant of the city's first green belt (Figure 3.2).³ This park embraces a broad spectrum of facilities within its bounds, providing both active and passive recreational space as well as a strong amenity attraction. However, all the facilities for organised activities are located at some distance from the residential area considered in this study, so the park is classified as a primarily passive recreation space.⁴

Located less than half a mile from the civic centre of a large city, a park of more than 400 acres is expected to appreciate properties in its vicinity, and the average valuation for properties in the 50 metre zone nearest the park is the highest noted in the entire study. It is also worthy of mention that the Hagley Park complementary area is the only one in the study in which the average unimproved values exceed the value of improvements, which indicates an older developed area in a particularly desirable location.

The Hagley Park area represents the most valuable residential area in Christchurch. Residential properties in this complementary area are zoned 'R-3' and 'R-4', authorising high density residential development, which also tends to increase property values. Although such zoning may serve to differentiate between park patterns, it cannot be expected to influence valuations within the complementary area, because the entire area is so zoned.

As Figure 3.3a indicates, the regression equation for this park has a high 'b' value; that is, the slope of the regression line is quite steep. Although this reflects the desirability of a parkside location, it also includes to some extent the influence of the nearby city centre, for as

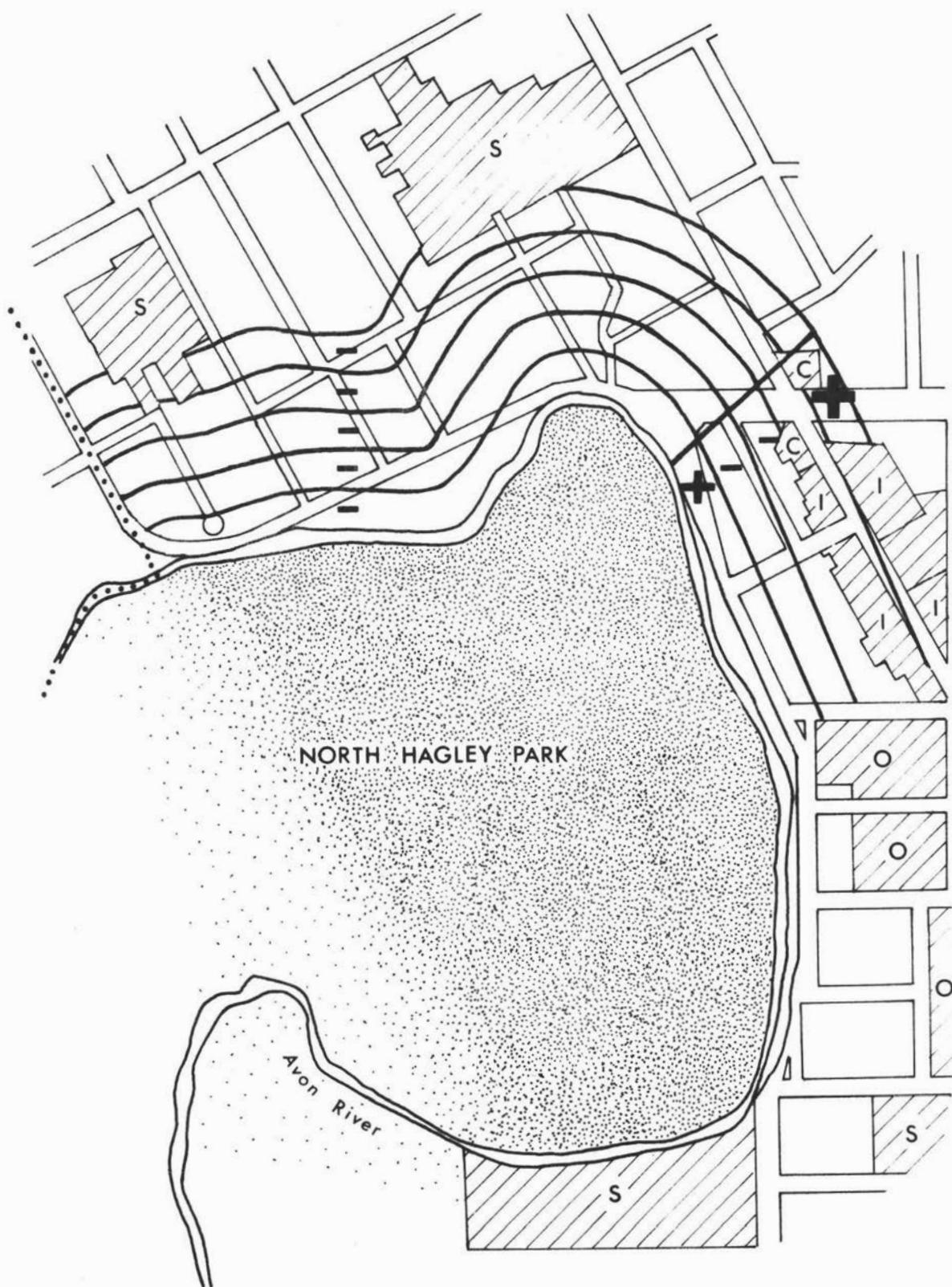


Figure 3.2 Map of Hagley Park area, showing regression residuals. See Figure 2.1 for legend.

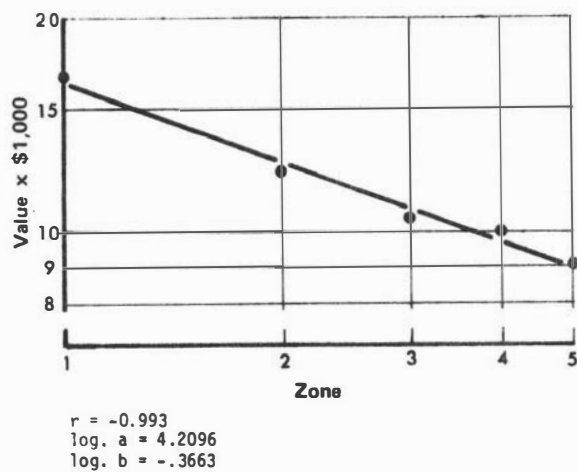


Figure 3.3a Hagley Park.

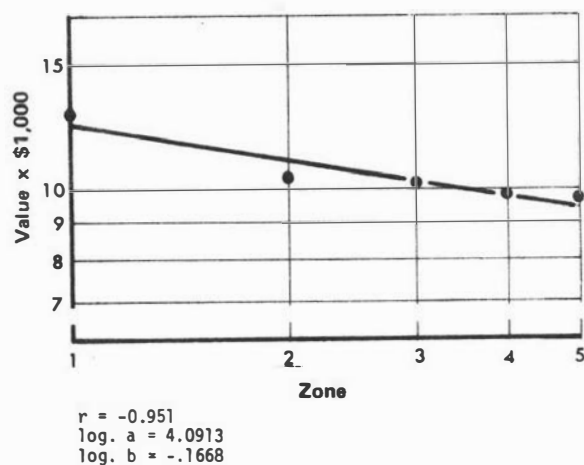


Figure 3.3b Elmwood Park.

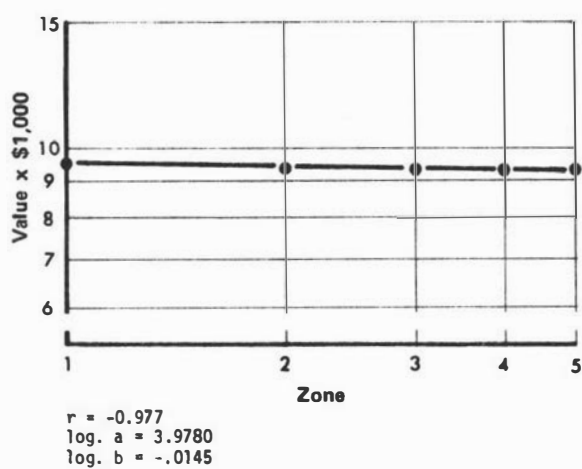
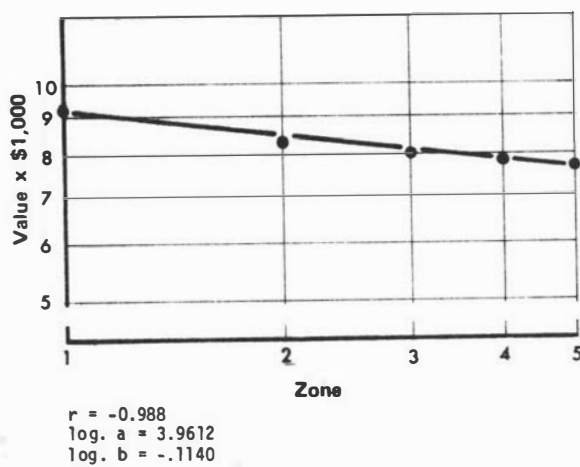
Figure 3.3c
Edgar Macintosh Park.

Figure 3.3d Malvern Park

Figure 3.3 Curvilinear regression graphs for Christchurch parks.

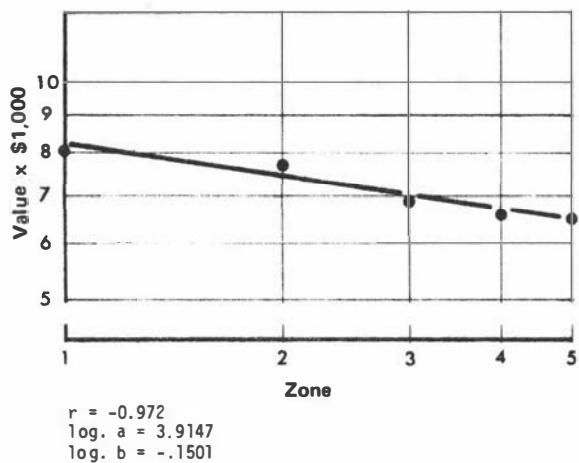


Figure 3.3e Richmond Domain.

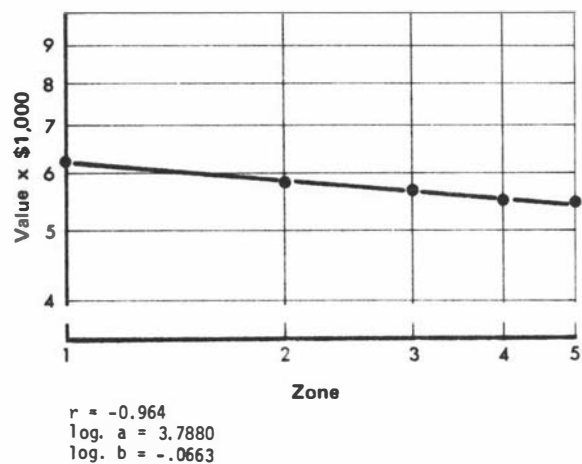


Figure 3.3f St Albans Park.

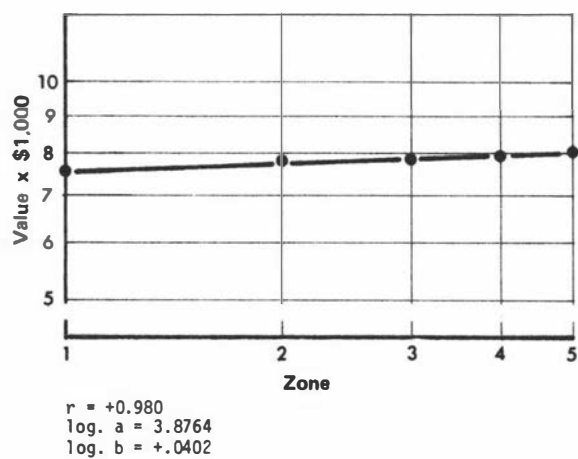


Figure 3.3g
Shirley Golf Course

Figure 3.3 Curvilinear regression graphs for Christchurch parks.

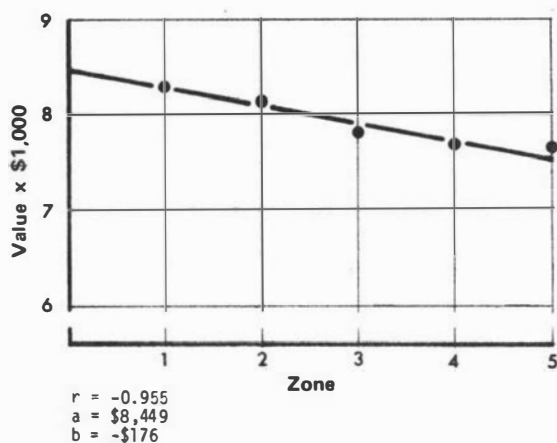


Figure 3.3h
Horseshoe Lake Reserve

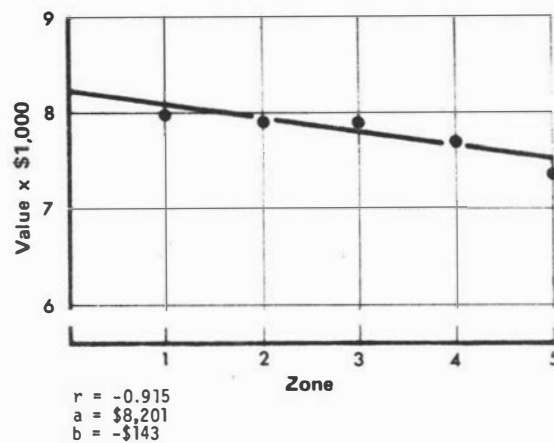


Figure 3.3i Burwood Park.

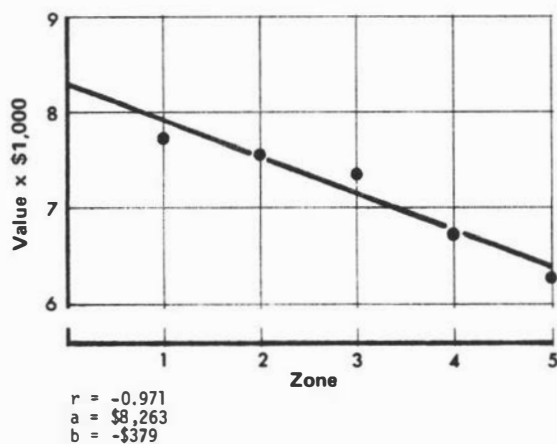


Figure 3.3j Papanui Domain.

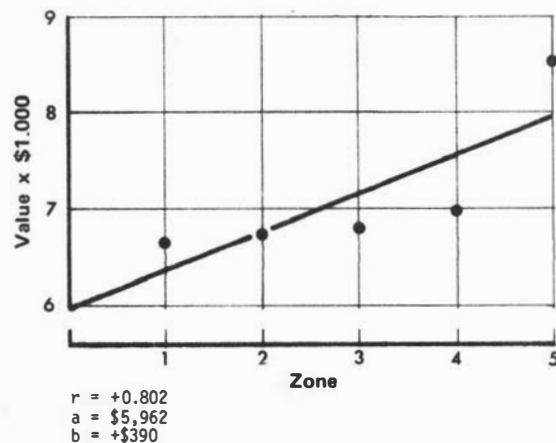


Figure 3.3k St James Park.

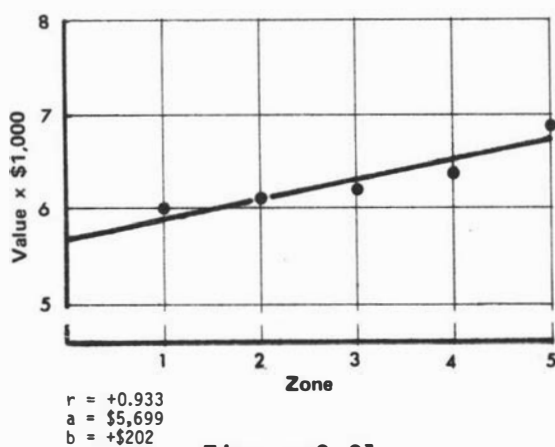


Figure 3.3l
Macfarlane Park.

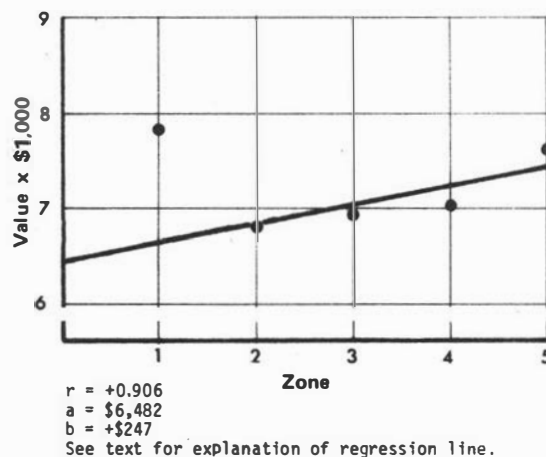


Figure 3.3m Rugby Park.

Figure 3.3 Linear regression graphs for Christchurch parks.

Brigham (1965: 327) notes, " . . . cost is not a linear function of distance but increases at an increasing rate as one travels into a congested area." Influence of the CBD could not be minimised by averaging for this park because the side of the park opposite the city centre represents the city boundary, and the adjacent properties outside the city are not included in this study. In addition, part of the complementary area of Hagley Park has undergone recent redevelopment, with some older homes demolished and replaced by expensive apartment blocks, while others have been converted to flats or nonresidential uses. This redevelopment is partially responsible for the extremely high values noted. However, when all recently constructed residences in the area are removed from consideration, the effect is to slightly reduce the slope of the regression line, while retaining almost the exact relationship between zones.

Elmwood Park.

This park of nearly fifteen acres provides space chiefly for active recreation in a well-maintained, tree-lined setting (Figure 3.4). The facilities cater to a wide variety of sports, with four cricket wickets representing the dominant activity. Facilities for rugby, soccer, hockey, tennis, bowls and croquet are also available. Although Elmwood Park also receives heavy use for passive recreation, it is considered as a primarily active park in this study. Its complementary area embraces properties with the second highest values noted in Christchurch, and it has maintained its status as a prestigious residential area since its development some fifty years ago. The high values for zone 1 are attributed to the strong park appreciative effect; the more gradual slope of the regression line reflects the extended area of influence of this park as well as the general desirability of the neighbourhood.

With the exception to be noted later, the west and north quadrants contain the lower-priced homes of this complementary area; the Addington-Picton Railway along zone 5 makes that area less desirable, while a few older houses depress the average values for zones 2 and 3. In turn, the east quadrant has developed as the area of more expensive homes.

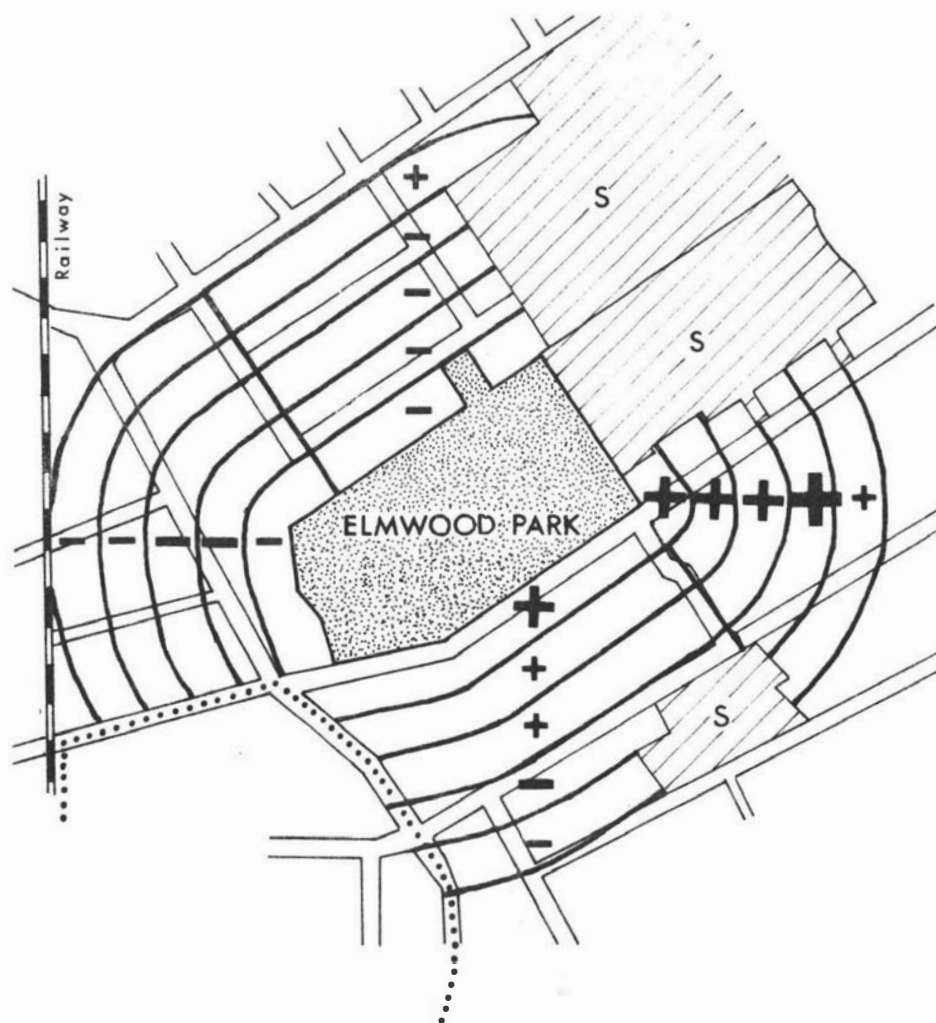


Figure 3.4 Map of Elmwood Park area, showing regression residuals.
See Figure 2.1 for legend.

In addition to this general pattern, two characteristics of the map of residuals merit further attention. The high positive value in zone 4 of the east quadrant stems from a cluster of high quality homes, while the presence of two schools with extensive grounds has reduced the numbers of residential properties which are averaged in that area. The result is a strong influence on average values exerted by a very few properties.

A sharp decline in values in the outer zones of the south quadrant is associated with the Elmwood Normal School. In contrast to the spacious and open school grounds noted above, this school occupies a rather small space and is completely enclosed by high barriers which prevent even visual access to its grounds. The neighbouring properties have the lowest values of this entire complementary area.

Edgar Macintosh Park.

In direct contrast to the old, established character of the two previous parks and their neighbourhoods, this open space represents one of the newest neighbourhood developments considered, with most houses constructed between 1955 and 1965 (Figure 3.5). Although the park is well-landscaped and neatly attended, it exerts only minimal appreciating effect on surrounding properties. Strong emphasis on active pursuits, particularly soccer and rugby, reduces the amount of space oriented toward passive activities, and tends to counteract the effect created by the well-maintained grounds and tree-lined roads.

The neighbourhood is developed with similar construction materials and techniques throughout, which results in uniformity of cost. Consequently it is difficult to identify the factors responsible for the rather minor differences in valuation averages, even though they are emphasised by the standard deviations of the residuals.

Two features do stand out on the residual map. Firstly, the quadrants to the south and west of the park contain the more expensive housing units, which are predominately associated with cul-de-sac street patterns. And secondly, the row of lower-priced housing which lies in the outer zone of the west quadrant epitomises an older and less imaginative style of planning.

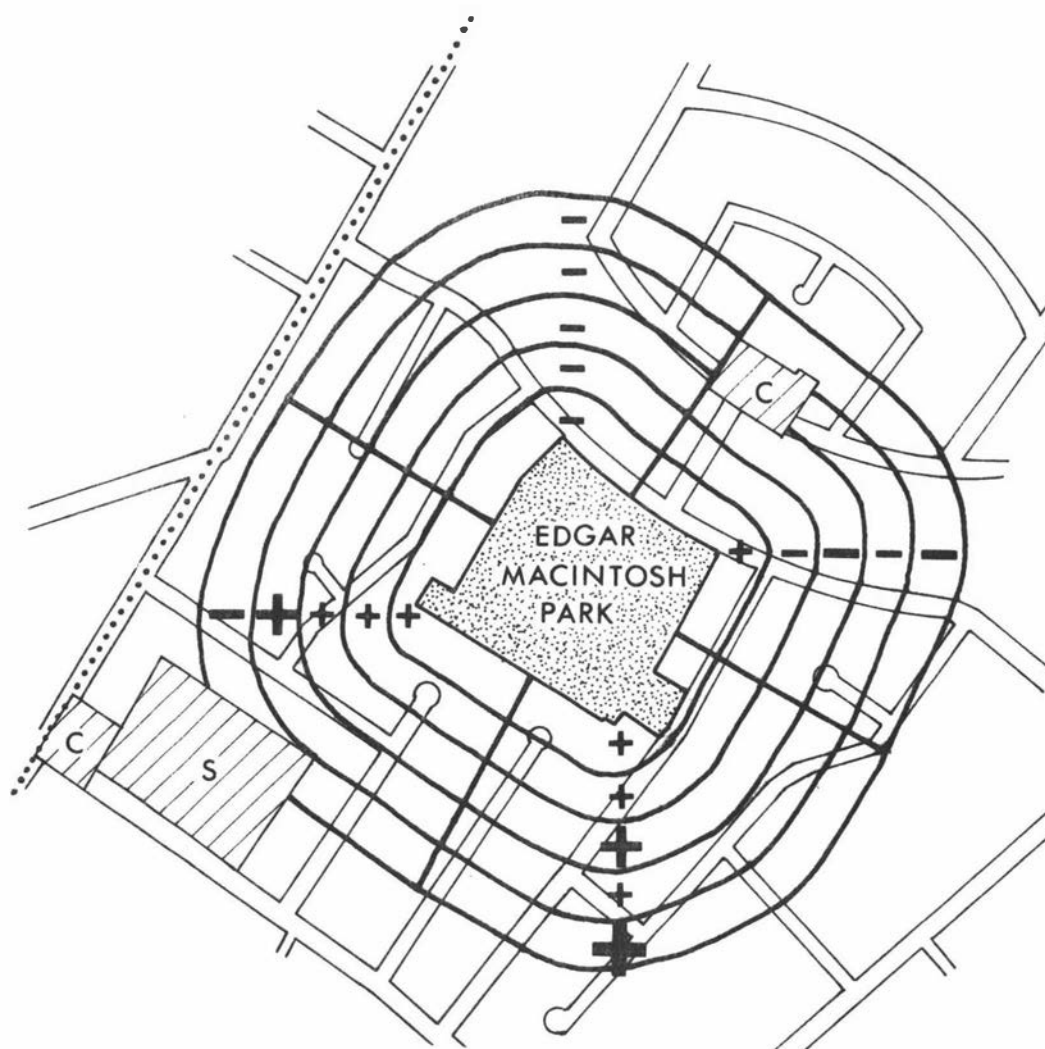


Figure 3.5 Map of Edgar Macintosh Park area, showing regression residuals. See Figure 2.1 for legend.

However, it must be emphasised that even the larger residuals represent quite small dollar values in this homogeneous neighbourhood.

Malvern Park.

This open space, if considered together with adjoining Rugby Park to the southwest, might be expected to form the nucleus for a single homogeneous complementary area (Figure 3.6). The housing dates from about 1926 to 1938 in both neighbourhoods, with few exceptions. But because of the difference in function and character of the two adjacent parks, it was decided to consider each as a separate unit, at least during the initial stages of the study; they could be combined later if the two sets of data showed similar characteristics. However, the patterns of valuation are quite dissimilar, and the parks are considered separately.

Malvern Park is classified as a passive park although it has some facilities for active recreation. Property values follow the classic pattern for park appreciative effect, and the map of residuals requires little comment. The north quadrant is the more desirable area, and although the zone 1 average falls slightly below the estimated value, the total value of its properties needs only a total of \$1,440 increase to result in a positive residual. The east quadrant emphasises the appreciative effect, with parkside values much higher than those further away.

Horseshoe Lake Reserve.

A totally undeveloped open space which is located on the city's perimeter might be expected to depreciate surrounding property values; at best, it should have a neutral effect (Figure 3.7). Nonetheless, valuation patterns around Horseshoe Lake Reserve indicate a gentle but definite premium effect of the park. This reserve shares with Edgar Macintosh Park the distinction of being the newest area of housing development included in the Christchurch study area. In general, houses date from the 1955-1965 decade, although a few scattered units are of more recent construction, and a few older houses remain, remnants of an era when the Horseshoe Lake area was devoted to rural activities. The unanticipated appreciative effect must be attributed to the assessment of the park by residents of the neighbourhood according to its potential value as a recreation area, rather than its established value.

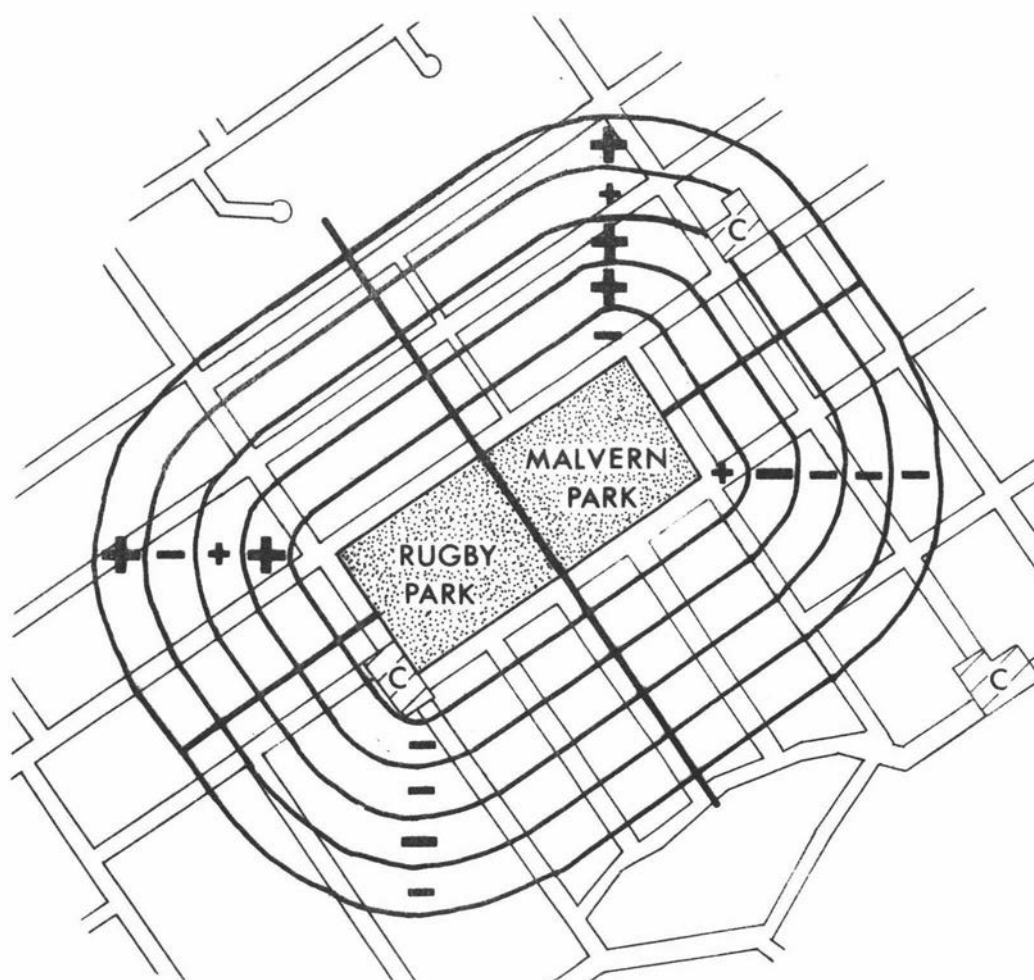


Figure 3.6 Map of Malvern Park and Rugby Park areas, showing regression residuals. See Figure 2.1 for legend.

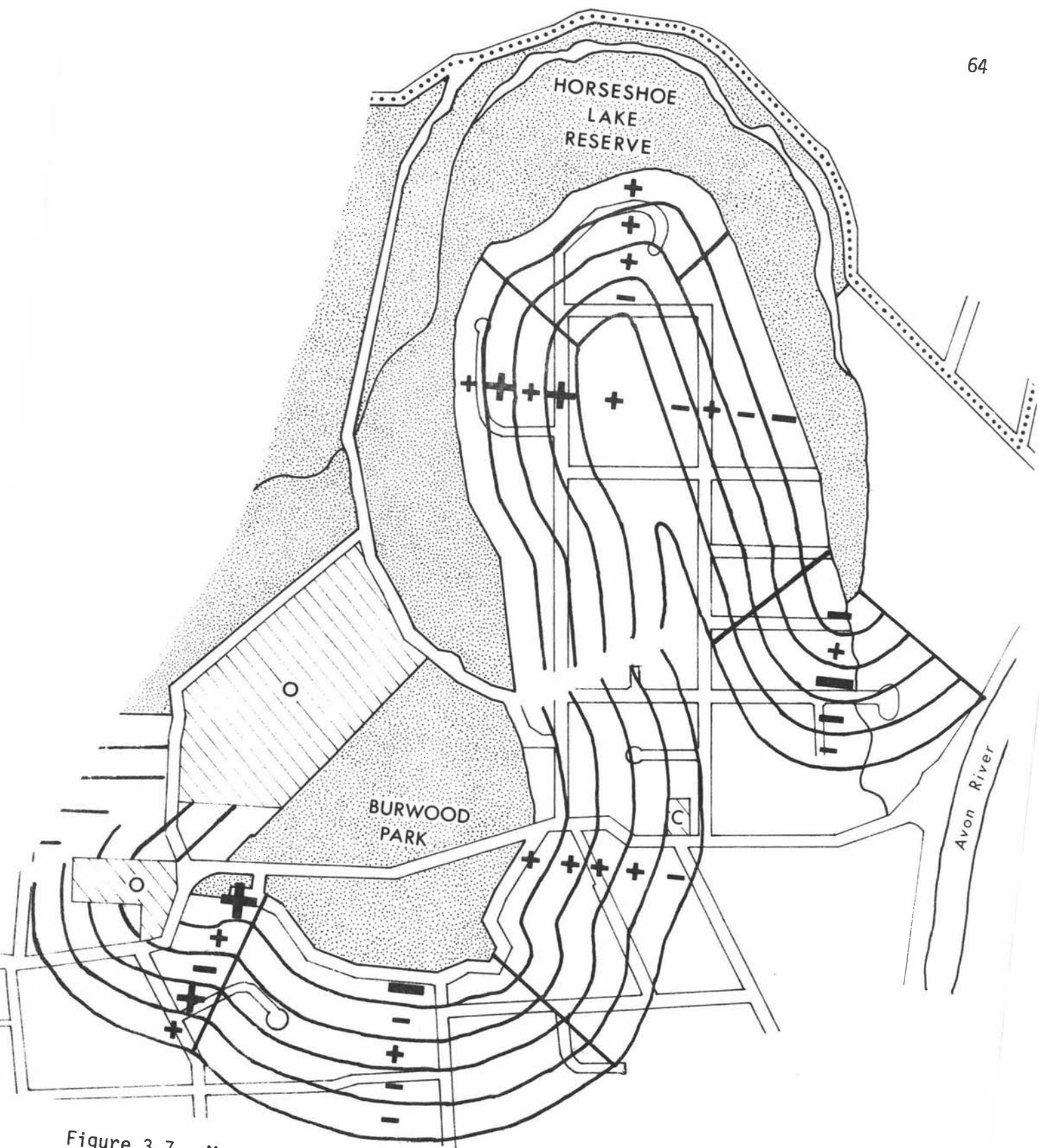


Figure 3.7 Map of Horseshoe Lake Reserve and Burwood Park areas, showing regression residuals. See Figure 2.1 for legend.

The high positive residuals are associated with recent development, while the lower values mark the areas with older houses or those sections still devoted to rural land uses.

Burwood Park.

This park adjoins Horseshoe Lake Reserve as part of the concentration of open spaces in the northeastern corner of the study area (Figure 3.7). Both neighbourhoods are considered to be middle to lower middle class residential areas with the occasional more expensive home, and mean property values of the two complementary areas are of similar magnitude.⁵ Comparison of the regression graphs reveals a remarkably similar profile of valuations.

But a number of dissimilarities exist between the two open spaces and their areas. The housing around Burwood Park dates from the decade of the 1940's, with a few houses some 50 or more years old. This is a factor in the lower mean valuation of the Burwood Park neighbourhood, although Forrest's (1965) findings indicate that the valuation differential attributable to housing age should be at least four times as great as that which is noted.

Two other closely interrelated characteristics--function of the park and its degree of development, or level of maintenance--merit consideration. Burwood Park is a long-established, very well-maintained area which is devoted primarily to passive recreational space. As a park of this nature, it must be considered to be an amenity for the neighbourhood. Conversely, the undeveloped character of Horseshoe Lake Reserve allows only passive recreation, such as strolling in natural surroundings, to be pursued at this time, even though the potential for development undoubtedly influences property values to some extent. As indicated previously, the more intensively used space should exert a stronger effect on its neighbourhood. The appreciating effect of Burwood Park's facilities appears to offset a major portion of the depreciating effect of housing age.

Most of the older houses are concentrated in the south quadrant, especially along the park perimeter; they account for the significant negative residuals shown on the map. The higher reading in zone 3 is influenced by a recent cul-de-sac development, and the more expensive houses built there.

Richmond Domain.

The neighbourhood surrounding the Domain developed during the decade following the first World War (Figure 3.8). Modest in size and lacking the landscaping and maintenance normally associated with parks which exhibit a strong appreciating effect, Richmond Domain is devoted almost exclusively to active recreation space, with six tennis courts and one rugby field, although the latter is used only occasionally for its intended purpose.

The 'b' value of the regression equation is quite high in comparison to values for other Christchurch spaces. Although the general appreciative effect of the park is considered to be the dominating factor in the profile, the steep slope of the regression line is attributed to some extent to the presence of a small group of high quality homes to the north and east of the Domain--an enclave of prestige dwellings which lies in the two 50-metre zones between the Domain and Dudley Creek. This tree-line waterway, which possesses a strong amenity value, has probably augmented the appreciative effect of Richmond Domain on those properties along its banks. However, if the 15 properties of the enclave are excluded as an anomaly, the correlation coefficient remains significant at the .005 level and the more gradual slope of the regression line more nearly approximates the expected slope.

Papanui Domain.

The profile of this neighbourhood shows striking resemblance to that of Richmond Domain (Figure 3.9). The two spaces are similar in size, function and degree of development or level of maintenance. For example, three rugby fields set in a space of less than seven acres establishes active recreation as the dominant function of the park, and rugby fields are seldom neatly manicured.

However, three major differences distinguish the districts surrounding these two open spaces. Although a few residences date from as far back as the turn of the century, the neighbourhood around Papanui Domain is generally much younger than the Richmond area, with most houses built between 1950 and 1955. As previously noted, this should result in a higher average value. But empirically the Richmond Domain values are found to be the greater.⁶ Papanui's location well away from the CBD can be expected to decrease

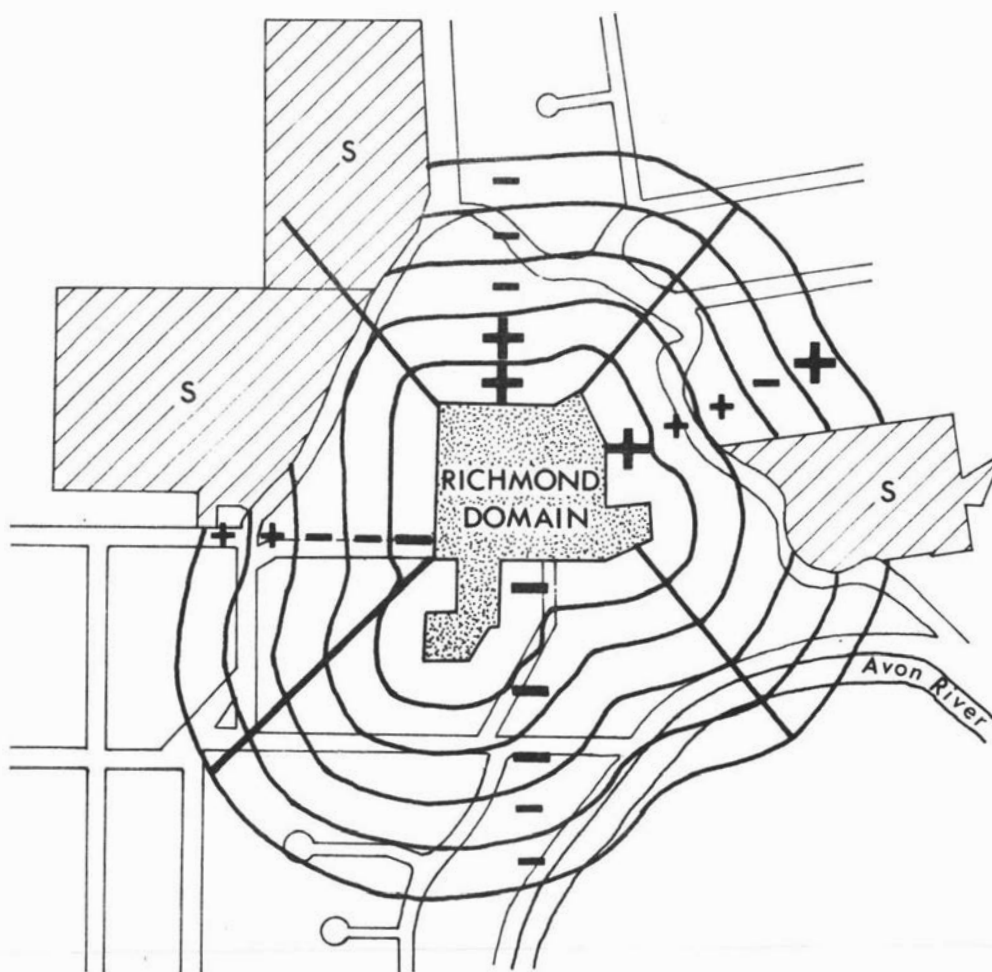


Figure 3.8 Map of Richmond Domain area, showing regression residuals. See Figure 2.1 for legend.

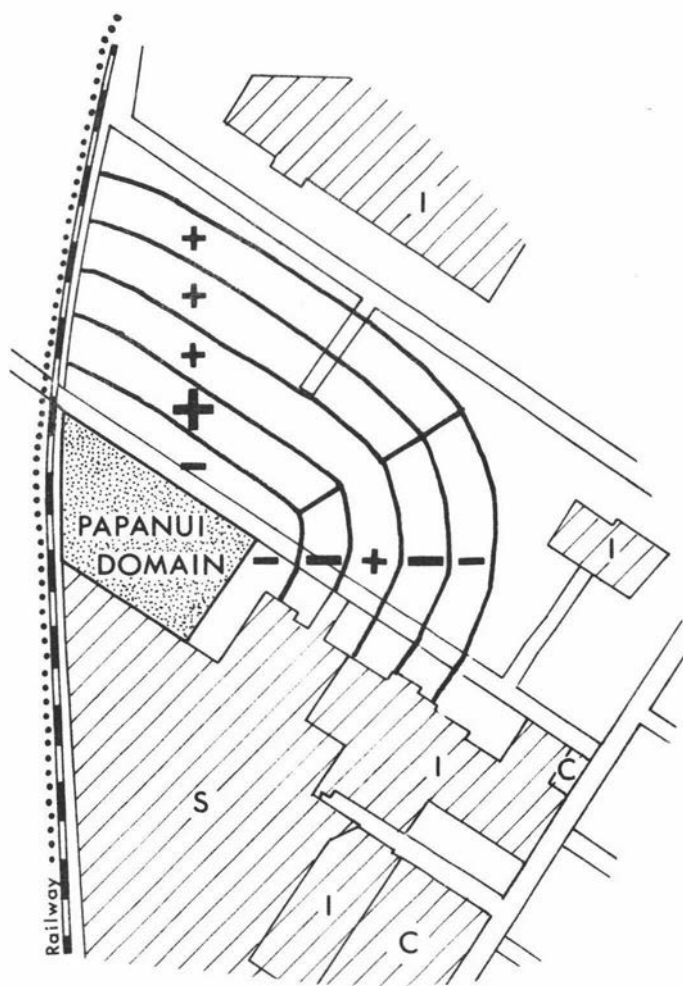


Figure 3.9 Map of Papanui Domain area, showing regression residuals. See Figure 2.1 for legend.

property values, and proximity to the city boundary with the more readily available open space of the countryside detracts from the effectiveness of the Domain as a neighbourhood centre.

The third major difference between Papanui and Richmond districts is that while the latter area is almost exclusively devoted to residential development, Papanui also embraces an industrial complex, including a rubber factory.

The pattern of residuals displayed must be studied with the knowledge that nearly half of the total properties are found in zone 5, the outermost ring; the four inner zones contain between 10 and 16 units each. This small universe, combined with occasional significant differences in age of some units, reduces the conclusions which may be drawn from this park. In fact, the only generalisation which is supportable is the appreciative effect of the Domain. Although the area may be less desirable than most residential districts in Christchurch, sites near the Domain are preferred above others in this neighbourhood.

St Albans Park.

Although much of this park of more than 15 acres is devoted to passive recreation, facilities for soccer, cricket, rugby, bowling and croquet account for most of the use (Figure 3.10). Consequently, St Albans Park is classed a primarily active open space. A definite appreciative effect is shown by the regression graph, although the park's influence on valuations appears to extend only through four zones, or 200 metres.

The St Albans neighbourhood shares with Hagley Park the distinction as the oldest residential neighbourhood in the Christchurch study area, with most houses built prior to 1920. The few more recent structures are inexpensive multi-unit dwellings. In direct contrast to the Hagley Park area, the St Albans district is the lowest priced area in Christchurch, averaging only 51 per cent of the Hagley Park average and more than 10 per cent below the second lowest priced district.

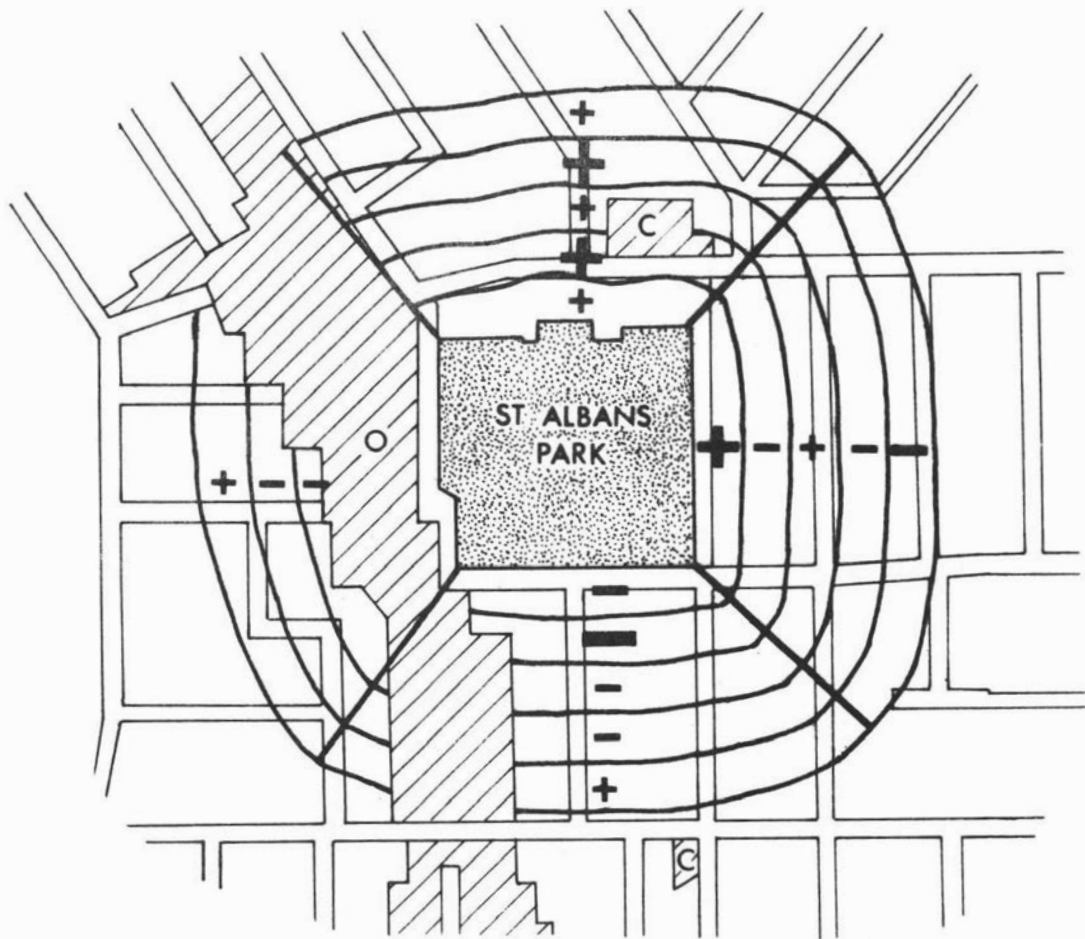


Figure 3.10 Map of St Albans Park area, showing regression residuals. See Figure 2.1 for legend.

Anticipation of the Northern Motorway, which will pass through the district, is a major factor in the generally low valuations. The motorway will skirt the west side of St Albans Park, and condemnation proceedings are completed against most of the properties in the inner three zones in that quadrant. Although unimproved values remain high, the average value of improvements is affected as the older houses are allowed to deteriorate while awaiting demolition.

The map of regressions also shows a pattern of negative residuals in the south quadrant, where zoning for higher density residential use has not yet been followed by the authorised construction. Again, the general condition of that area suffers as a number of properties await redevelopment.

Depreciating Parks

Only three open spaces in Christchurch are classified as having a depreciating effect on their surroundings. Each of the three displays a different set of characteristics--function, size and appearance--but they share one common feature: each is the focal point for a neighbourhood of lower-priced housing.

Shirley Golf Course.

The site of Christchurch Golf Club, this open space consists of 81 acres within the city and 54 acres in adjacent Waimairi County to the north⁷ (Figure 3.11). The neighbourhood represents a mature, well-established housing area. Development was not concentrated in any period, and the houses date generally from 1920 to 1940 with a very few more recent units.

Although a golf course might be expected to inflate surrounding property values, the Shirley Golf Course appears to have the opposite effect. This is attributed to two factors: the golf course presents the rather untidy appearance of its 'rough' along the perimeter, and it occupies somewhat higher ground than the surrounding terrain. The higher site restricts visual access to the neatly trimmed fairways, and the entire space is restricted from physical access by non-members. Hence, residents see only the untidy fringe, which detracts from the desirability of the adjacent housing sites.

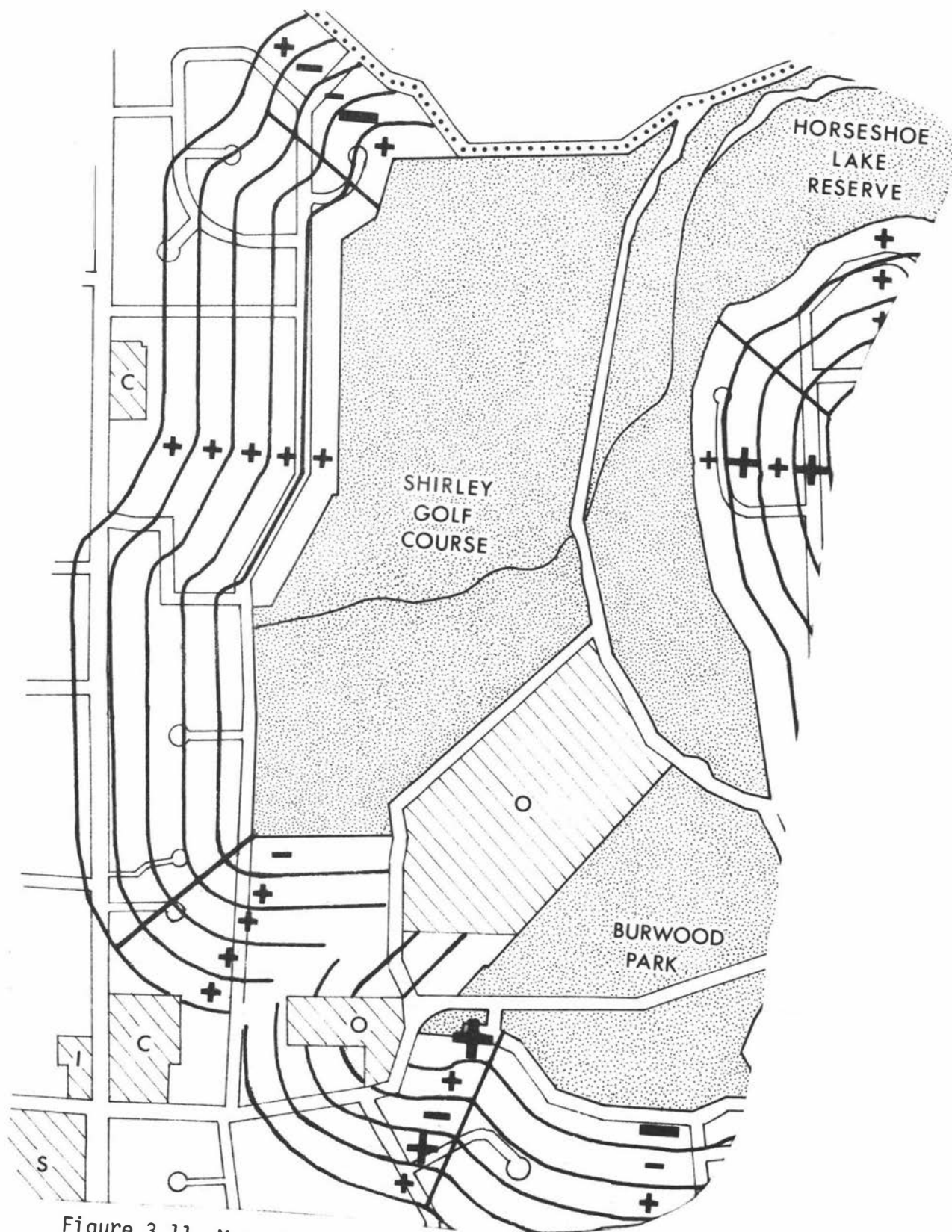


Figure 3.11 Map of Shirley Golf Course area, showing regression residuals. See Figure 2.1 for legend.

The map reveals a stable pattern of residuals, with the exception of the north quadrant, where the small number of houses included in each zone allows an individual property to exert considerable influence on average values.

St James Park.

Almost totally enclosed by houses on three sides and an embankment on the fourth, and generously endowed with mature trees, St James Park provides a secluded setting for informal neighbourhood activity (Figure 3.12). Although modest in size, it provides space for two cricket wickets, a rugby ground, croquet greens and an athletic track. In spite of the heavy emphasis on active recreation, the grounds are carefully landscaped and neatly maintained, so the intensity of the park's apparent depreciating effect on its neighbourhood is rather unexpected.

Explanation of the profile and regression residuals must consider four main factors: the rather small number of properties involved, significant differences in age of housing, the effect of main thoroughfares on values, and the impact of the Addington-Picton Railway which borders the park to the east.

Commercial and industrial zoning to the east and north of the park reduces the number of houses considered in those sectors. As a result, sharp fluctuations in averages can be caused by one or two properties which differ appreciably in value from their neighbours.

Older homes are predominant in the St James area, with most constructed between 1900 and 1926. Clusters of houses of more recent construction distort the general pattern of values and account for nearly all of the residuals noted in the inner four zones.

The sharp rise in zone 5 values shown in the park profile is attributed to the presence of main traffic arteries. As Berry, et al. (1963) note, land values reflect accessibility of a site and the resultant intensification of competition for that site. Although the competition shows up most noticeably on non-residential land, the improved values of residential properties are affected directly to some extent by a location on the main road north from

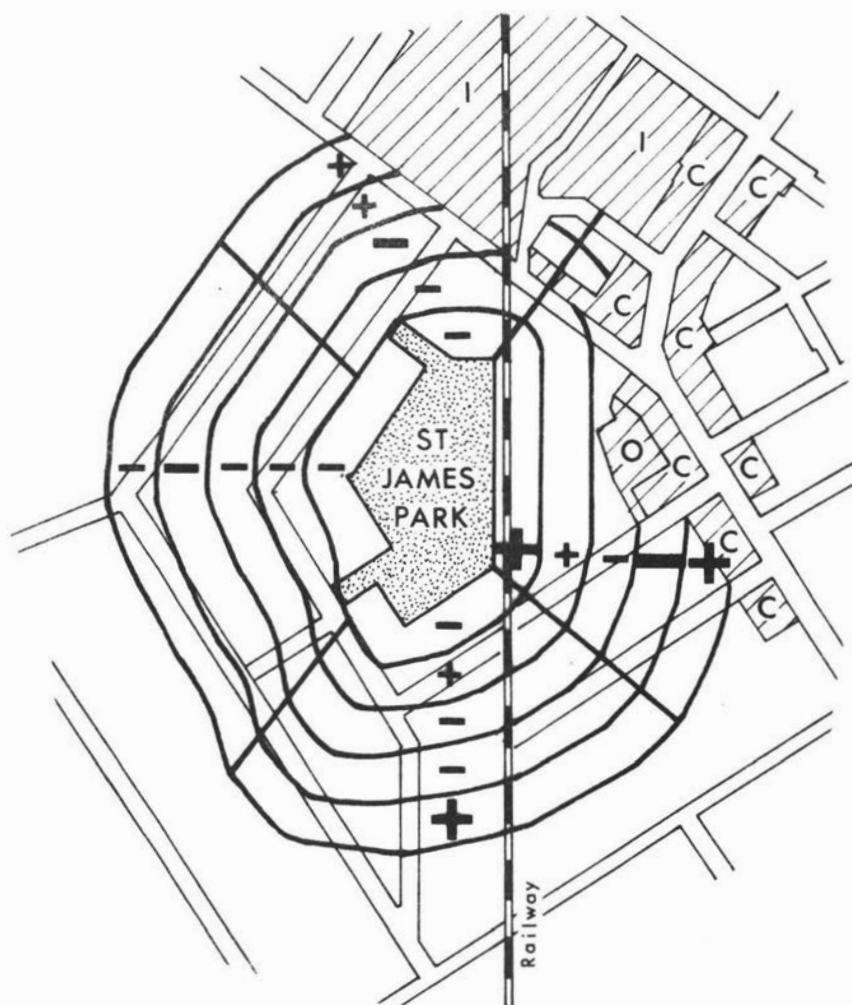


Figure 3.12 Map of St James Park area, showing regression residuals. See Figure 2.1 for legend.

Christchurch. But the greater effect of these arteries is produced indirectly, in that a location on the main route led to early development at a time when ease of communication was of major importance in the selection of a residential site. Several of these older residences have been replaced by new homes during the past two decades, leading to a younger average age, and the accompanying higher average value, in the outer zone.

Finally, the railway, which traverses the elongated axis of the complementary area adjacent to the park is credited with producing the 'reverse appreciative effect' of St James Park, as a site near the park is also a location near the railway. In other words, the depreciating effect of the railway is assumed to have overshadowed any appreciating effect the open space might produce.

Macfarlane Park.

This park is devoted almost exclusively to active recreation, with rugby fields occupying most of its 13 acres (Figure 3.13). An elongated space of similar area extends from the southern end of the park, providing additional space for informal recreation.

The Macfarlane Park neighbourhood, built as a large State Housing development about 1945, has one of the lowest average values found in the Christchurch study area. However, the St Albans district, which carries the dubious distinction of having the lowest average value, is made up of houses some 25 to 50 years older than the area now under discussion.

Because all state houses constructed in this area were intended to be of similar quality, the park should have little effect on the valuation profile. But the regression graph shows a definite positive correlation between the two variables, i.e., the park exhibits a depreciating effect. This is accounted for through a number of factors.

Privately constructed homes are generally more expensive than state houses, and although less than five per cent of the housing in the complementary area is of private construction, those houses exert a strong influence on the averages. In addition, they are concentrated in two small areas which

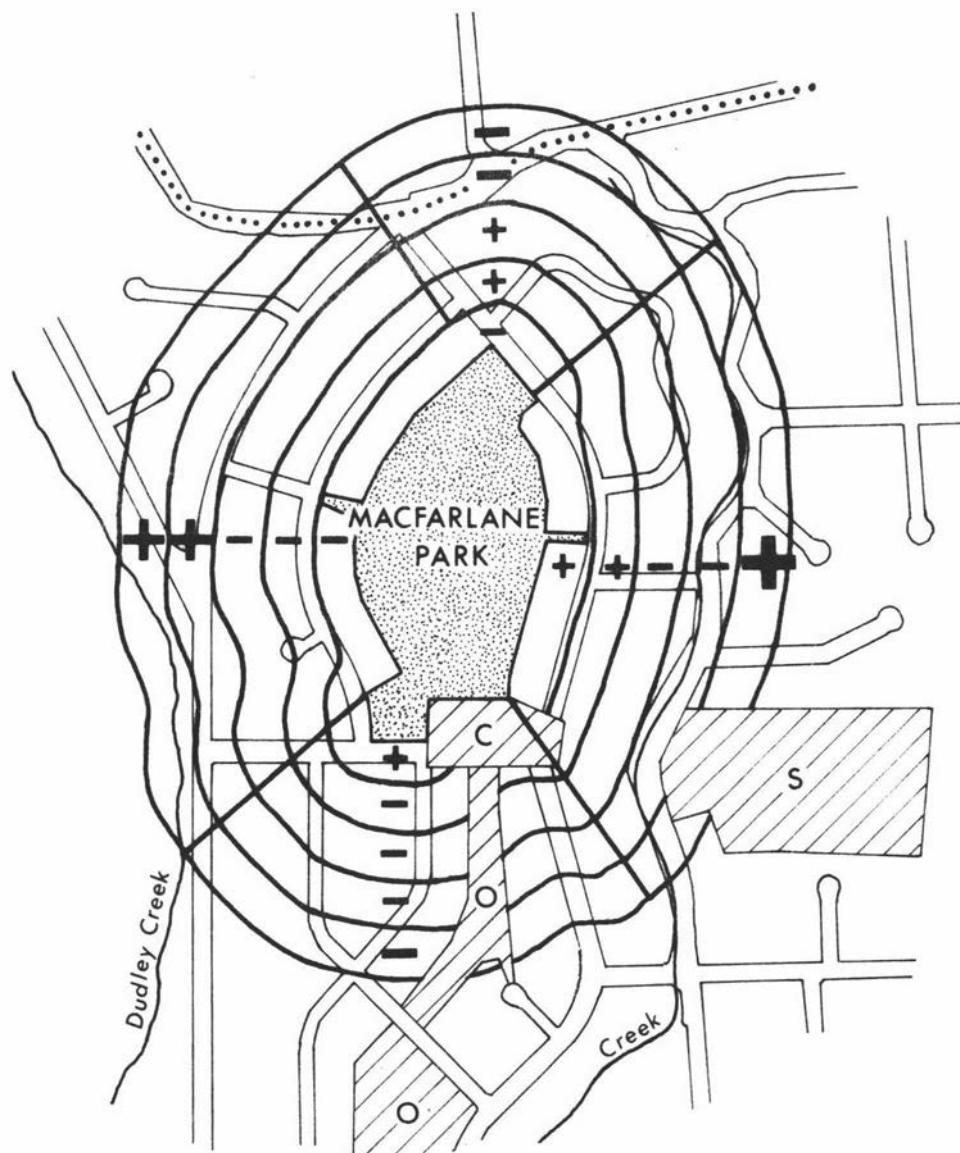


Figure 3.13 Map of Macfarlane Park area, showing regression residuals. See Figure 2.1 for legend.

are marked by high positive residuals. The concentration results because all the building sites in the three inner zones received state houses, which precluded private construction near the park. The higher-priced private homes are built on available sites in zones 4 and 5, increasing the average values there. The highest-priced homes are located near two creeks which parallel the park along these two outer zones, reflecting the general desirability of a residential site beside a creek.

Although provisions allow occupants to purchase state houses, only 32 per cent of the 427 houses in this complementary area are privately owned. Owner-occupied houses usually receive better maintenance and care than rented units, which is reflected in their higher valuations.

One additional factor disturbs the expected profile. Multi-unit state houses are generally valued lower per unit than single-family houses, and five of the seven multi-unit structures are sited beside the park. As Figure 3.14 shows, when all multi-unit and privately owned homes are removed from consideration, the resultant profile shows an evenly distributed pattern of values.

Other Parks

Rugby Park.

Only one of Christchurch's parks failed to find classification in the two major categories. Rugby Park, which serves all of Canterbury as well as the Christchurch metropolitan area, is a totally enclosed sportsground and could well have been excluded from consideration in this study. (Figure 3.6). However, its position adjacent to Malvern Park provides an excellent opportunity to compare the effect of totally different types of parks on otherwise similar neighbourhoods.

The housing in both areas was constructed at approximately the same time, with nearly all units built between 1926 and 1938, and the two parks are similar in size and shape. But the valuation profiles are quite dissimilar. While Malvern Park reflects an appreciative effect, as indicated previously, values in zone 1 around Rugby Park are moderately high, but drop

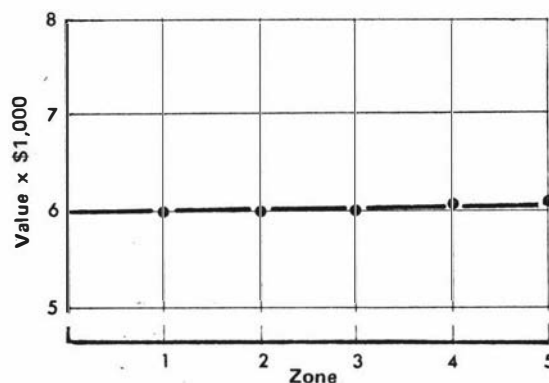


Figure 3.14 Valuation profile of single-unit state housing in Macfarlane Park area.

sharply to zone 2; they then increase gradually away from the park. Only after reaching zone 5 are the average values for the two parks comparable.

A more detailed comparison of zone 1 averages for the two areas shows Malvern Park to be 19.6 per cent higher than its neighbour. The most dramatic difference occurs along Malvern Avenue, which borders both parks on the southeast. While the average unimproved values are almost identical for the seven properties in each of the two areas, the values of houses along Malvern Park average nearly 43 per cent higher than those beside Rugby Park.

Similarly, although the map of residuals indicates a very high positive residual value for zone 2 northwest of Rugby Park, the average value of improvements in that zone are 23.4 per cent lower than similar properties in the adjacent zone of Malvern Park's complementary area.

Evaluating the Hypotheses

Hypothesis I.

The basic concept of this study--that of park appreciative effect, with declining values away from the open space--seems to be generally substantiated

in Christchurch. Of 13 parks considered, 9 are classed as exerting an appreciating effect; the characteristics which lead to exclusion of the remaining 4 parks from this group are identified. The average regression angle for the 13 open spaces is 100.7 degrees, which equates with a 'b' value of \$180 in the regression equation.

The hypothesis may be tested in another fashion. Data are combined for all 13 parks, and the average values are determined for all properties in each zone. Linear regression of these values provides a 'b' value of \$191 for the city.

Hypothesis II.

This hypothesis anticipates a decline in the appreciating influence of a park as distance to rural land decreases. Distance in metres from the centre of each park to the nearest rural land is measured. Those values are then tested for correlation with the regression angles previously determined; a correlation coefficient of $r = +0.770$ is noted. Using degrees of freedom $df = 11$, 'Student's t' statistic $t = 4.006$ is computed. The alpha level of significance is determined to be 0.01 for the nondirectional test.

The hypothesis can be slightly modified to bring into consideration distance from the CBD. To accomplish this, the distance is measured from the CBD (in this instance, the Cathedral Square) to the centre of the park. To this is added the distance from the park to the nearest rural area; this latter distance is calculated as a percentage of the sum of the two distances. Correlation of these percentages with the regression angles reveals $r = +0.777$ and $t = 4.096$. Again, the characteristic is significant at the 0.01 level, and this hypothesis is substantiated and accepted.

Hypothesis III.

Valuation profiles of the parks can be correlated with any of a number of average values. When the average value for all properties in the complementary area is used, values of $r = +0.648$ and $t = 2.818$ result; this correlation is significant at the two per cent level.

Use of zone 1 values which are estimated by linear and curvilinear regression provides the closest correlation, as calculations of $r = +0.868$

and $t = 5.794$ reveal. A significance level of 0.001 is achieved. Selection of actual zone 1 values for correlation with the regression angles results in similar, although slightly lower, readings and the correlation remains significant at the 0.001 level. This hypothesis is accepted regardless of which of the above values is chosen to evaluate it.

Hypothesis IV.

Although a positive correlation between park appreciative effect and density of housing was postulated, the correlation is not statistically significant. A correlation coefficient of $r = -0.07$ was calculated, from which a value of $t = 0.233$ was computed. This hypothesis cannot be substantiated by the data from Christchurch, and is rejected for this city.

Hypothesis V.

This hypothesis, which postulates higher values for park-centred neighbourhoods than for other areas, is closely related to Hypothesis I. The 10 per cent random sample of properties outside the 13 complementary areas provides an indication of the average values which can be expected for those residential areas without available open space. Comparison of the average value of the sample properties to that of all properties within the complementary areas indicates the general level of appreciation attributable to open space in this city.

A total of 3,740 properties with an average value of \$7,874 lie within the 13 complementary areas. This figure compares favourably with the \$7,415 average for 1,234 houses included in the random sample, amounting to a higher value of 6.19 per cent.

No minimum percentage is established to form the limit for statistical significance, as the data do not fulfill the criteria for parametric testing. In the absence of significance established by formal testing procedures, the figures and differences between them are interpreted subjectively. The percentage noted is considered to be of sufficient magnitude to warrant acceptance of the hypothesis.

NOTES

¹Henceforth, unless specifically indicated to the contrary, 'Christchurch' refers only to that part of the city which constitutes the study area of this thesis.

²The city of Christchurch was 'gazetted', or valued by the Valuation Department, on 1 November 1969.

³Data from which the regression residuals are obtained are presented in Appendix VI.

⁴Classification of Christchurch parks into 'primarily passive' or 'primarily active' categories is based upon information furnished in an interview in June, 1970 with personnel of the Directorate of Botanic Gardens, Parks and Reserves, Christchurch City Council. Classification is confirmed by Gilpin (1973) for all open spaces except Hagley Park, Horseshoe Lake Reserve, Shirley Golf Course and Rugby Park; these spaces are categorised by this author.

⁵The 310 properties in the Horseshoe Lake Reserve complementary area have an average value of \$7,957 while the Burwood Park neighbourhood average is \$7,703 for 274 properties.

⁶The 95 properties within the Papanui area average \$6,831 compared to the Richmond Domain average of \$7,004 for 234 properties. The reduced number of houses in the Papanui Domain population results from its location adjacent to the city boundary, which eliminates housing in the western half of the complementary area, and from the large block of land taken up by Papanui High School to the south of the Domain.

⁷In conversation of 22 June 1970, the Secretary of the Christchurch Golf Club indicated that some 24 acres of the land outside the city is not presently in use, but that its incorporation into the golf course is planned.

CHAPTER IV

PALMERSTON NORTH

Palmerston North, for which the Square has been a focal point since its founding, developed with ample open space set aside (Figure 4.1). As indicated previously, the pattern of open spaces has remained relatively constant as the city grew, with new parks added as additional residential areas were incorporated into the city. Comparison of a current map with an early map (1895) of the city shows that during the ensuing 75 years only two areas which had been identified as 'reserves' have subsequently been developed as residential land. Remnants of those reserves remain as Savage Crescent Park and the Awatea Street Park-Palmerston North Girls' High School Playground. One other major open space--Awatapu Golf Course--has been subdivided, although the Brightwater Terrace Golf Course is set aside as a replacement for the older course.

The city includes an area of 10,630 acres within its boundaries, although the Aokautere district, which lies across the Manawatu River to the south, is "currently designated as rural land." (Crawford, 1970: 3). Consequently, the 1,790 acres of Aokautere are excluded from this study. Although some rather extended parts of the study area have a decidedly rural flavour, practically all of it is zoned as urban; this area of 8,840 acres is considered as the city of Palmerston North.¹

As Crawford (1970) points out, the parks and reserves are evenly distributed throughout the city, but the larger open spaces are concentrated to the south and east.

An inventory of parks to be studied shows 22 individual parks forming 17 units for study; 5 parks are agglomerated into one unit referred to

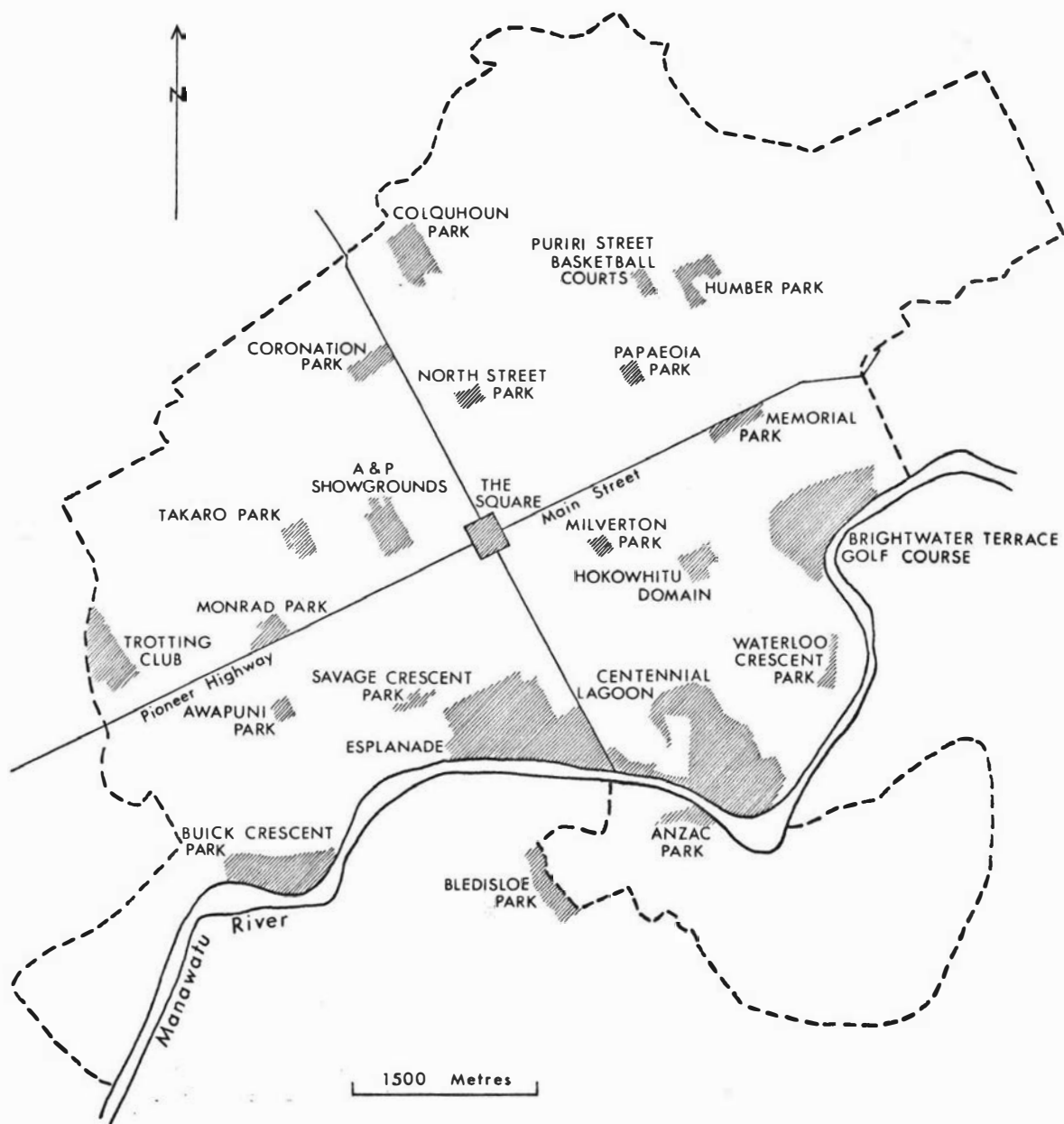


Figure 4.1 Map of Palmerston North study area.

henceforth as the Esplanade, and the Centennial Lagoon and Hokowhitu Golf Course are considered together as one. These open spaces combine for a total of 604.2 acres as shown in Table 4.1.

Table 4.1
Palmerston North Open Spaces

Open Space	Area (acres)
Centennial Lagoon*	147.5
Hokowhitu Domain	16.5
Esplanade**	153.5
Brightwater Terrace Golf Course	112.5
Buick Crescent Park	33.0
Waterloo Crescent Park	7.0
Monrad Park	11.0
Papaeoia Park	7.5
Awapuni Park	6.0
Puriri Street Basketball Courts	6.5
Coronation Park	18.5
Takaro Park	12.0
Savage Crescent Park	7.0
Humber Park	15.0
Agricultural & Pastoral Showgrounds	34.0
Milverton Park	4.7
Memorial Park	12.0
Total	604.2

* Includes Centennial Lagoon and Hokowhitu Golf Course.

** Includes the Esplanade, the Lido Swimming area, Ongley Park, Manawaroa Park and the Sports-ground.

Source: Mr. J. W. Bolton, Director of Reserves,
City of Palmerston North.

The 17 open spaces do not include several large parks which are omitted from consideration for lack of sufficient residential development in their complementary areas. A number of newer parks associated with rapid urban growth form the most significant group. While Christchurch has been able to accommodate much of the increase in population through subdivision and infilling of larger sections, most cities are experiencing considerable peripheral growth. The emphasis on open space in New Zealand cities leads to the

designation of actual or proposed new parks to accommodate residents of the new neighbourhoods.

Four features combine to pose problems when new parks are included in a study such as this. Firstly, the study expects owners of the surrounding residential properties to evaluate the probable or potential value of a park, rather than its established value. As a result, determination of park appreciative effect for these spaces is much less reliable than for older, established parks.

Secondly, the houses tend to be concentrated along one side of the new park, rather than surrounding it, with the properties on the side nearest the city developed first. Consequently, the effect of the CBD or secondary peak property value intersections cannot be balanced out. The result can only be a decrease in apparent appreciative effect, or an increase in negative effect of the new, undeveloped park.

The third aspect is closely associated with the previous point. Neighbourhoods around newly established parks often have large areas of undeveloped land, with relatively few houses constructed. The reduced population of properties in a given zone or a quadrant of a zone subjects average values to sharp fluctuations, especially where new urban development is interdigitated with older rural dwellings.

Finally, the new parks are almost invariably near rural land. If Hypothesis II of this study is substantiated, these parks must be expected to display a reduced, or even a negative, appreciative effect as a result of this one locational feature.

The larger parks which are not selected as open spaces are identified later in this chapter, along with a brief mention of the reason for non-selection for each.

Land set aside for proposed parks makes up a considerable portion of Palmerston North's open space acreage. In general, these parks are briefly

mentioned in the study and then dismissed, because they have insufficient housing associated with them to justify inclusion, and they provide little attraction for recreation. However, where the proposed reserve is adjacent to an existing park and is intended to increase the area of the older park with little change in function, the proposed area may be treated as an extension of the older park and the combined space considered as a unit.

In addition to the open space within the city, Palmerston North has two regional parks which come under the city's jurisdiction although they are located outside the city boundaries. The smaller of them, Bledisloe Park, consists of about 26 acres of native bush between the city boundary and Massey University. No residences are located within its complementary area, so evaluation of its appreciative effect is not attempted. The Pohangina Reserve, nearly 834 acres of native bush, lies 25 miles north of Palmerston North. It provides passive recreation and free play space for all residents of the Manawatu district.

The main open spaces provide almost 13 acres per thousand population for the 46,832 residents of the city. This is more than double the standard suggested by the Great Britain National Playing Field Association (Ministry of Housing, 1956), and is well in excess of the more generous standard of ten acres per thousand people set by the United States National Recreation Association (Butler, 1962). Although the open spaces make up only 6.8 per cent of the city area, this does not indicate a shortage of park space. Rather, it points up the low population density of the city and indicates that much open space may be in private, rather than public, gardens.

Some of the other open space is presently functioning as public park. The Square, for example, provides the city centre with 17 acres of public open space, with about half of it devoted to gardens. Anzac Park, which overlooks the city from a site high on a bluff along the Manawatu River, has some 18 acres of gardens which attract visitors from throughout the city. Colquhoun Park, with 28 acres of soccer and rugby fields, is not included in the study because although this new park has residential land adjacent to it,

only eight houses had been constructed within 250 metres of the park as of the time of the field survey.

In addition to the above, 15 well-scattered playgrounds and playspaces have a combined area of 36 acres, and 18 acres of land are used by bowls, tennis and croquet areas not otherwise accounted for in the total. Thus, some 117 acres of open space must be added to the previously established total to gain a true evaluation of the extent of public open space in Palmerston North. With a total of 721 acres of parks, it is now calculated that the city has more than 15 acres of open space for each thousand residents.²

Finally, nine proposed reserves comprise 124 additional acres. Individually they vary in size from playgrounds of less than half an acre to a 57-acre block along Roberts Line, some distance northeast of the built-up residential portion of the city.

Appreciating Parks

The generous amount of open space in Palmerston North, combined with the perimeter location of several of the parks, may be expected to reduce the overall appreciative effect of parks. As Table 4.2 shows, only eight individual parks show patterns of appreciated values.

Centennial Lagoon.

The lagoon and its associated space, together with Hokowhitu Golf Course, comprise one of the largest open spaces in Palmerston North (Figure 4.2). When considered along with the Teachers' Training College area, which is encompassed by the open space under consideration, this becomes the largest space in the Palmerston North study.

As the name 'Centennial Lagoon' suggests, this area was dedicated in 1940 as part of New Zealand's centennial celebration. The lagoon is an ox-bow lake, or a cut-off meander of the nearby Manawatu River. As an amenity open space, Centennial Lagoon consists of 31 acres of open lawn attractive to passive recreation activities. An appendage of some 10.5 acres of grassed

Table 4.2
Average Property Valuations, Palmerston North³

Open Space	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	r*	@
Centennial Lagoon	\$12,445	11,070	10,488	10,350	10,014	-0.982 ^b	.005
Hokowhitu Domain	12,351	11,409	10,161	10,030	9,955	-0.928 ^b	.025
Esplanade	10,455	10,185	9,962	9,142	8,859	-0.974 ^a	.005
Brightwater Golf	11,437	9,320	9,018	8,955	8,878	-0.921 ^b	.025
Buick Crescent	9,761	9,519	9,328	8,960	8,884	-0.987 ^a	.005
Waterloo Crescent	8,929	8,663	8,555	8,277	7,601	-0.949 ^a	.010
Monrad	8,083	7,863	7,834	7,653	7,328	-0.964 ^a	.005
Papaeoia	7,544	7,386	6,922	6,906	6,948	-0.920 ^b	.025
Awapuni	7,861	7,905	8,161	8,310	8,501	+0.996 ^a	.005
Puriri Street	5,976	6,927	7,148	7,671	8,209	+0.986 ^b	.005
Coronation	6,015	6,509	7,775	8,030	8,263	+0.969 ^b	.005
Takaro	6,511	6,616	6,848	6,955	7,001	+0.975 ^a	.005
Savage Crescent	6,246	6,491	6,561	6,666	7,963	+0.844 ^a	.050
Humber	6,328	6,356	6,465	6,439	6,821	+0.854 ^a	.050
A & P Showgrounds	5,946	5,985	6,026	6,092	6,261	+0.942 ^a	.010
Milverton	7,453	7,362	7,453	7,615	7,676	+0.986 ^{a**}	.010
Memorial	6,749	5,611	5,926	6,477	7,375	+0.976 ^{a**}	.025

* correlation coefficient, Pearson Product Moment method.

^a calculated using linear function.

^b calculated using logarithmic function.

@ alpha level of significance, using 1-tailed test and degrees of freedom df = n-2.

** correlation coefficient calculated for zones 2 though 5.

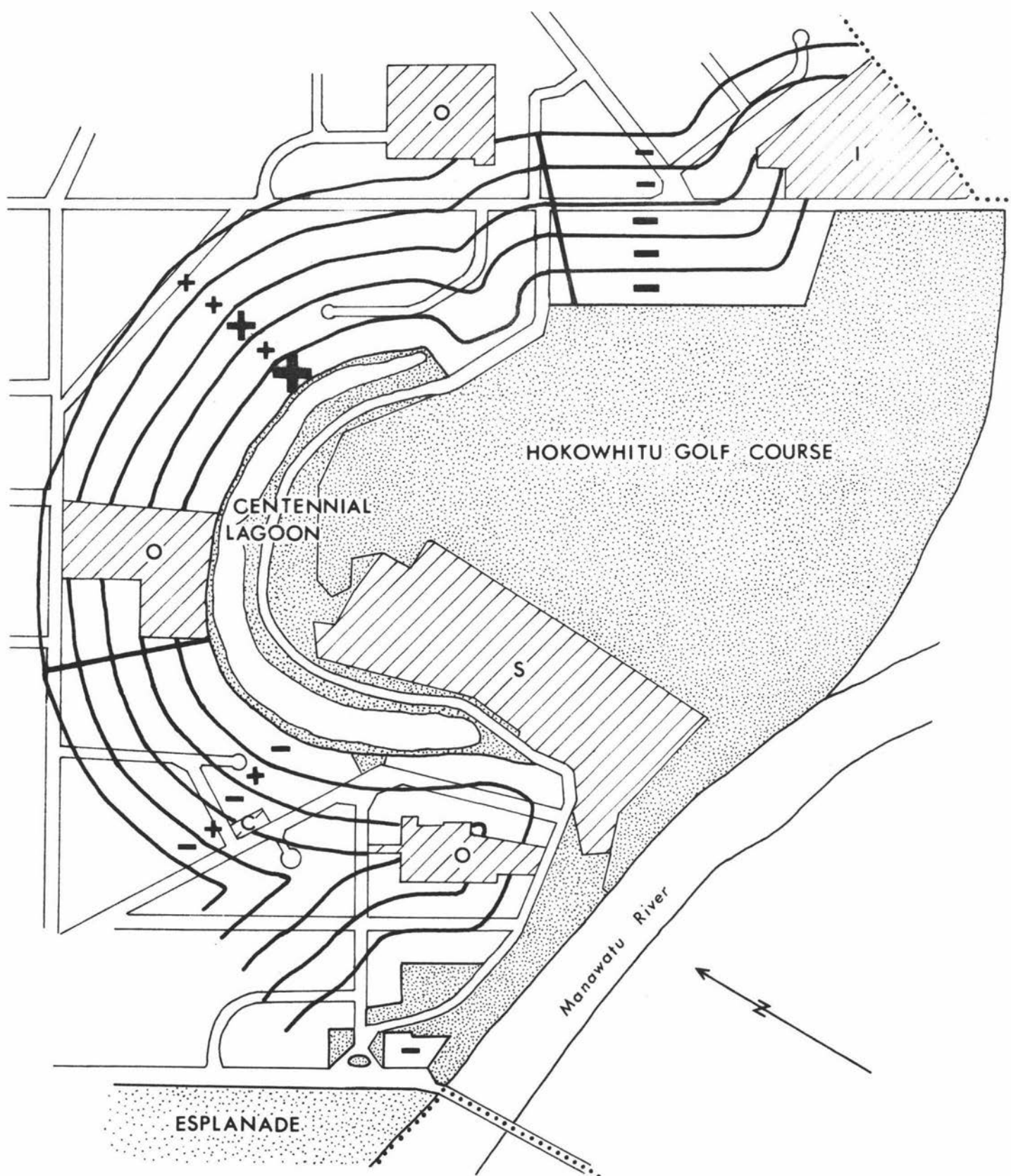


Figure 4.2 Map of Centennial Lagoon--Hokowhitu Golf Course area, showing regression residuals. See Figure 2.1 for legend.

playspace extends along Centennial Drive and the Manawatu River to virtually connect with the Esplanade complex of parks.

Hokowhitu Golf Course has been the home of the Manawatu Golf Club since 1895; it was expanded to an 18-hole course ten years after its founding (Seifert, 1970: 13). About 1930, the club administration began to develop the course into a park-like area, planting a wide variety of trees and shrubs. This pattern continues to the present, with the 106 acres now generally recognised as one of New Zealand's most attractive golf courses. The two units of this open space are considered together as an amenity with a district-wide attraction, with functional classification as a golf course.⁴

The complementary area of this park complex was built up over some 70 years, and a few aging mansions remain to identify it as a highly desirable neighbourhood of past decades--a status which it retains to the present. Subdivision and infilling are more recent phenomena, although nearly one-fourth of the residences date from 1940 or earlier. More recent construction was concentrated first in the west quadrant; houses in the north and east quadrants are about ten years newer on the average. This accounts for the generally negative residuals which Figure 4.2 displays for the west quadrant.

The map of residuals reveals two other characteristics. First, the more desirable area, marked by high positive residuals, overlooks the lagoon and the golf course. Although the expensive homes along the northeast part of the lagoon account for much of the high average value, slope of the valuation profile regression line shown in Figure 4.3a is maintained by properties throughout the entire north quadrant. These properties are served only by streets along the perimeter of the complementary area, and the more expensive properties are located on back sections--sites usually associated with lower valuations. In view of this, the high 'b' value of the regression equation is particularly impressive.

The second characteristic noted on the map of residuals is the strong negative values found near the east side of the golf course. A shingle crusher and concrete manufacturing plant located adjacent to the golf course

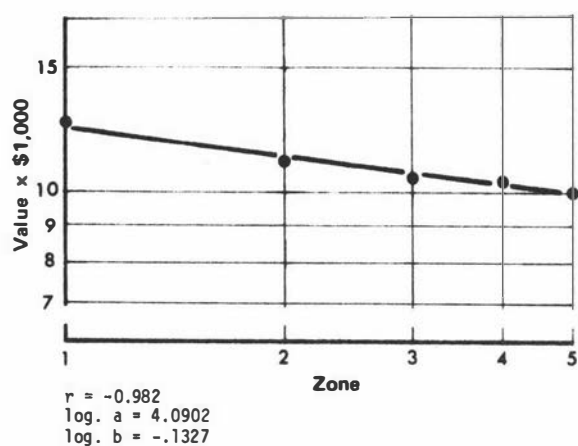


Figure 4.3a
Centennial Lagoon.

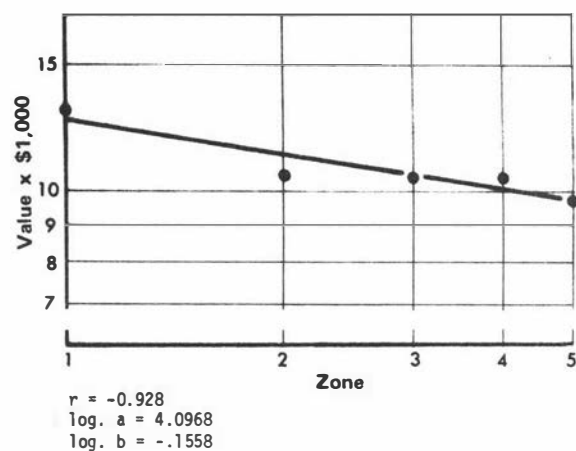


Figure 4.3b Hokowhitu Domain.

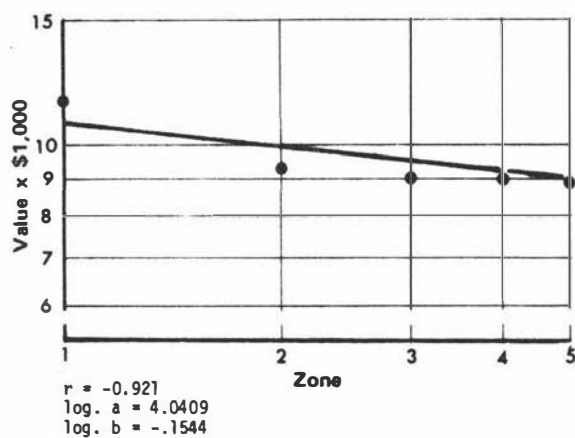


Figure 4.3c
Brightwater Terrace Golf Course.

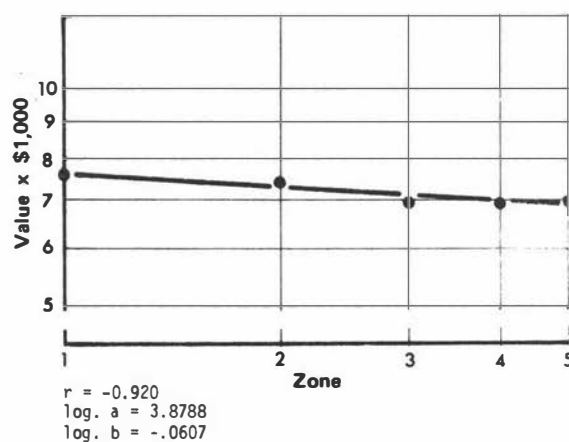


Figure 4.3d Papaeoia Park.

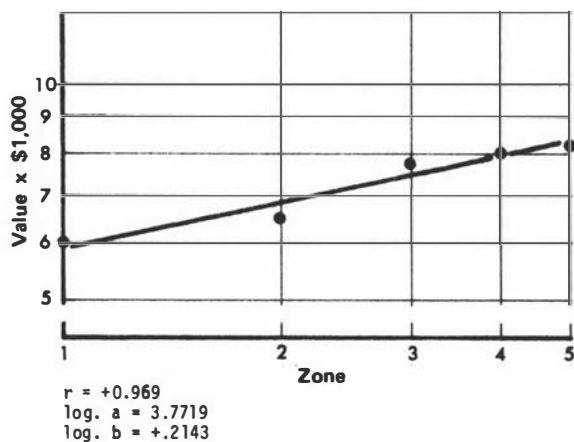


Figure 4.3e Coronation Park.

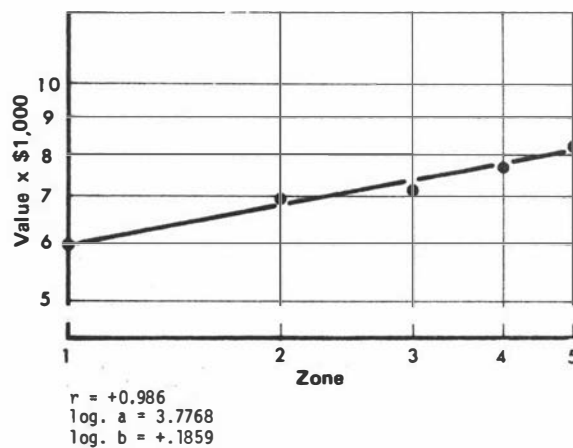


Figure 4.3k
Puriri Street Basketball Courts.

Figure 4.3 Curvilinear regression graphs for Palmerston North parks.

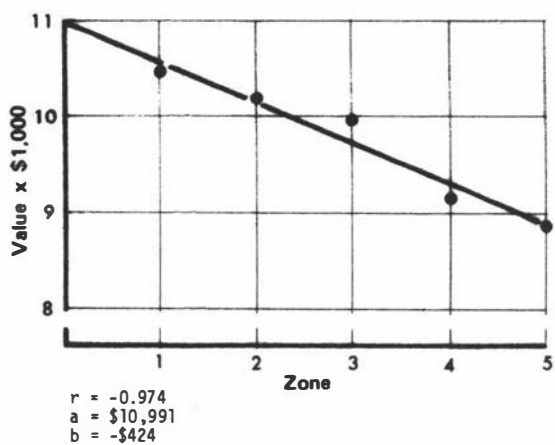


Figure 4.3f Esplanade.

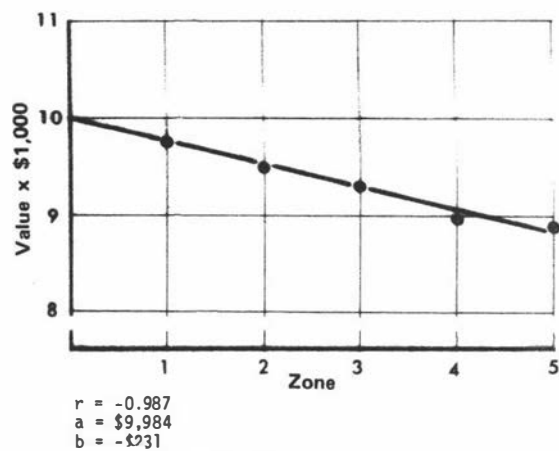
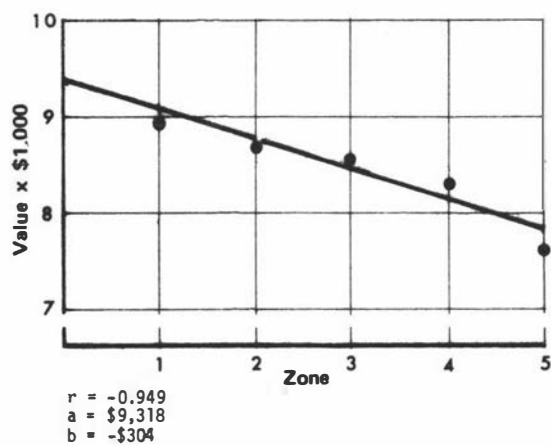
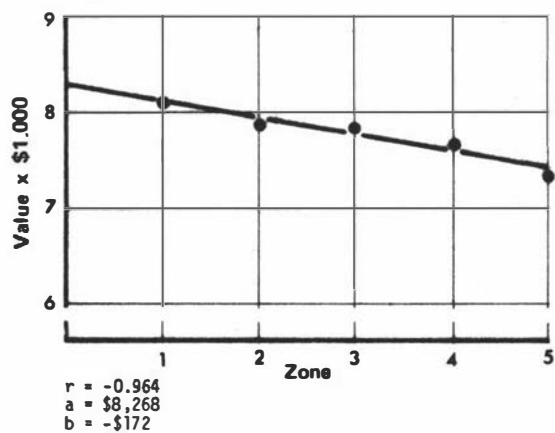
Figure 4.3g
Buick Crescent Park.Figure 4.3h
Waterloo Crescent Park.

Figure 4.3i Monrad Park.

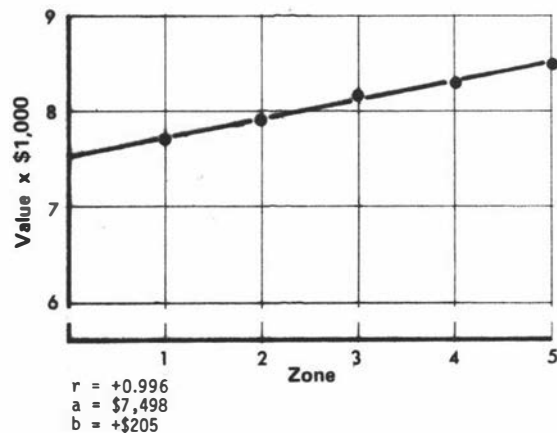


Figure 4.3j Awapuni Park.

Figure 4.3 Linear regression graphs for Palmerston North parks.

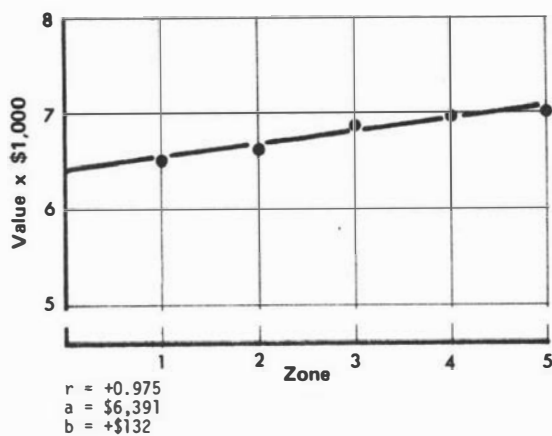


Figure 4.3l Takaro Park.

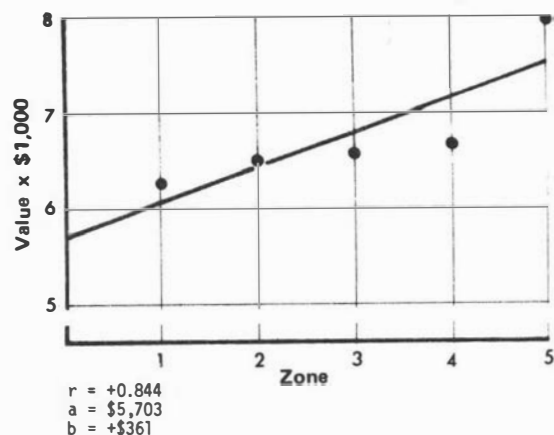
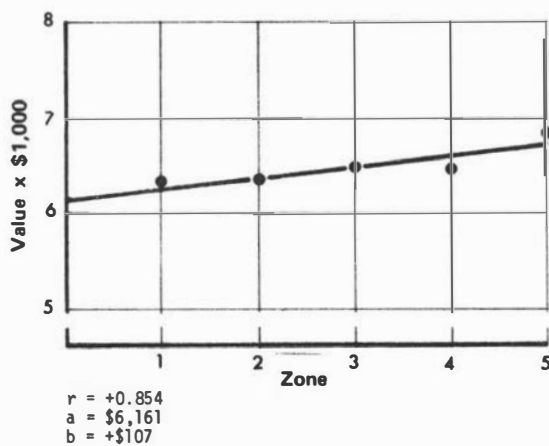
Figure 4.3m
Savage Crescent Park.

Figure 4.3n Humber Park.

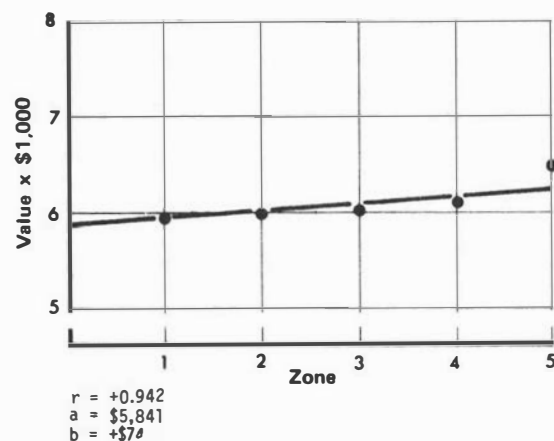
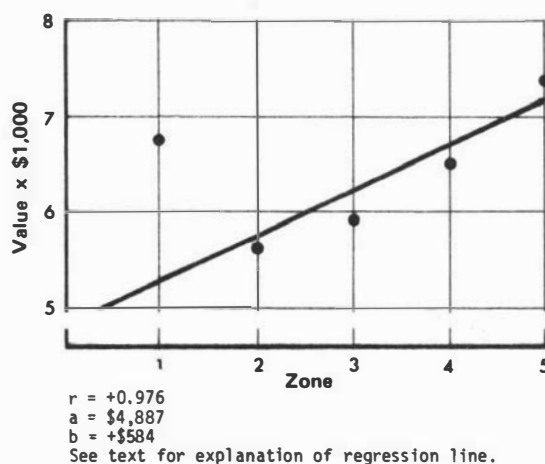
Figure 4.3o
A & P Showgrounds.

Figure 4.3p Memorial Park.

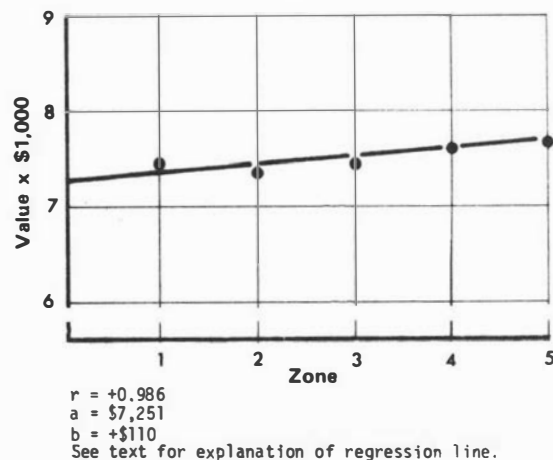


Figure 4.3q Milverton Park.

Figure 4.3 Linear regression graphs for Palmerston North parks.

produces a significant amount of noise and dust pollution, and the noxious character of this industry depresses residential values in its vicinity. However, in spite of this distraction, the complementary area for this open space complex has the highest average value noted in Palmerston North, along with a pronounced appreciative effect.

Hokowhitu Domain.

This open space of 16.5 acres is one of the city's older parks (Figure 4.4). First set aside as Hokowhitu Domain Reserve, control over it passed from the Domain Board to the City Council in 1913 (New Zealand Gazette, 1913: 3208). The park provides space for both passive and active recreation, with 8.5 acres set aside for field hockey and social cricket, and 5 acres devoted to playspace, including a children's playground with swings and other equipment. The remaining area is occupied by the Hokowhitu Bowling Club grounds. In spite of the apparent dominance of active recreation space, this park is classified as a 'primarily passive' recreation, based upon daily observations over a considerable period of time.

The map of residuals requires some explanation. This area has the second highest average values noted in Palmerston North, and negative residuals do not necessarily indicate low values. The south and west quadrants, with generally negative residuals, represent much older development, with about half of the houses built prior to 1940. In addition, the Hokowhitu School to the northwest and the large sections platted throughout these two quadrants combine to reduce the total number of properties considered. As a result, one or two very old houses can drop the average value by several hundred dollars.

The high negative value adjacent to the south side of the park represents only five houses, all quite old. They face the bowling grounds, with its high fences and clubhouse, rather than fronting directly on to the open space of the park. This reduces the value of the properties somewhat, and also makes them less attractive for redevelopment.

A four-acre tract along the south side of the Domain had been occupied by an orchard of marginal production. During the course of this study, the

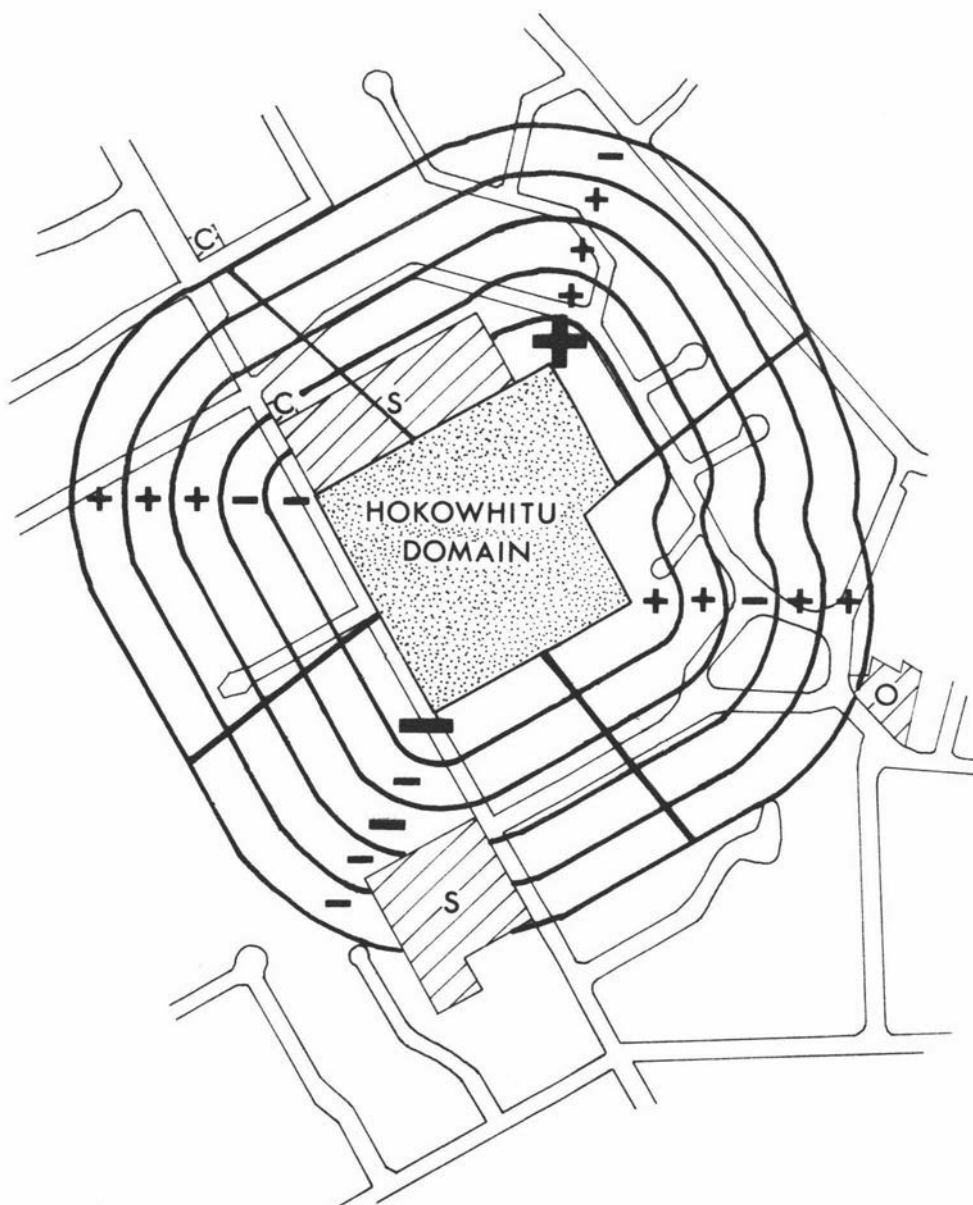


Figure 4.4 Map of Hokowhitu Domain area, showing regression residuals. See Figure 2.1 for legend.

tract was subdivided, and the construction of houses there can be expected to eliminate the high negative residual and also increase the already steep slope of the regression line.

Most of the houses in the north and east quadrants were built during the past decade, resulting in generally positive residuals. The lower value indicated in zone 5 of the north quadrant results from the presence of a number of older homes.

The Esplanade.

This park complex, also one of the oldest in Palmerston North, provides a wide variety of attractions (Figure 4.5). The Esplanade itself, with 82 acres, makes up more than half of the 153.5 acre total. This section of the park is classed as a garden park, or an amenity, and embraces several formal garden areas along with wooded acreage displaying both indigenous and exotic species.

A feature of this park complex is its open character, as the individual parks are allowed to merge with each other; only the Lido, a 10-acre swimming facility, remains separate. Soccer, cricket, rugby, hockey and softball are accommodated in the other segments of the agglomeration. As a result of the open nature of the complex, the active recreation fields, when not in use, appear as extensions of the Esplanade, so that the entire area seems to be an amenity open space, and is classified as primarily passive recreation space.

The pattern of housing development requires little comment. The small segment identified as the west quadrant dates from 1962 and later, the area east of the park was built up in the mid-1950's, and a few other houses of post-1945 construction are well-scattered throughout. But nearly 90 per cent of the housing was built prior to World War II.

The residuals pattern reflects the age of housing, with the newer areas showing significantly higher values. The high negative value along the north side of the park is attributed to a few state houses of the Savage Crescent development which fall into this complementary area, and a number of houses



Figure 4.5 Map of Esplanade Park complex area, showing regression residuals. See Figure 2.1 for legend.

which remain from the early development along Park Road. The appreciative effect of this large park complex will appear even stronger as new residences replace the older ones.

Brightwater Terrace Golf Course.

This municipal golf course was established in 1963, replacing Awatapu Golf Course, which was marked for subdivision and residential development. The open space consists of approximately 94.5 acres, along with a proposed addition of 18 acres adjoining it to the northeast (Figure 4.6). The entire area of 112.5 acres is considered as a unit in this study.

Although the golf course is new, it is developing quite rapidly into a park-type area. When fully matured, it will provide a very attractive setting for golf, and should be considered as an amenity for those residents who live nearby. Unfortunately, since 1963 flooding of the golf course proper by the nearby Manawatu River has twice washed out a number of planted trees and covered the grassed expanse with sand and silt. The full development of the course as a visual attraction is delayed while the replanted trees gain a degree of maturity.

Key features on the map of residuals are the positive values in zone 1 and the consistent negative values in zone 2. The golf course has a stop bank some 20 feet high along the full extent of the first zone, so the properties overlooking the course have the appreciating effect of an elevated site added to the effect of a parkside location. The negative values depicted in zone 2 reflect the barrier of the stop bank, which virtually eliminates even glimpses of the open space from these sites.

The housing development dates generally from the mid-1950's in the west quadrant, while rather extensive construction is still under way in the other two quadrants; the few older houses west of the course are counterbalanced by a scattering of newer structures.

Although some depreciating effect was anticipated from the 15-acre reserve for a proposed school, no consistent or appreciable difference is

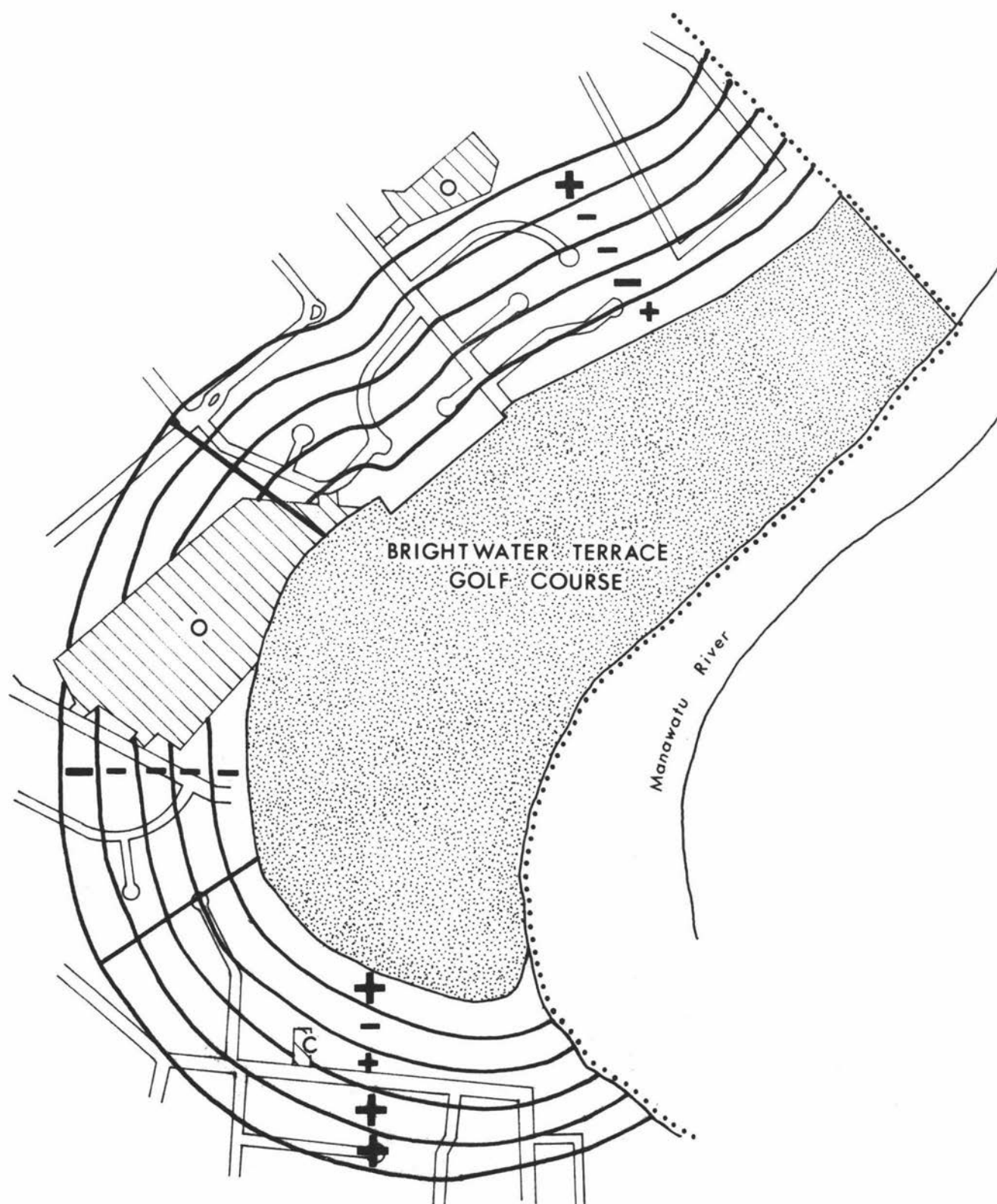


Figure 4.6 Map of Brightwater Terrace Golf Course area, showing regression residuals. See Figure 2.1 for legend.

noted between the average values of properties near the school site and those further away.

Finally, the high values of zones 4 and 5, south quadrant, are associated with a recently developed quality subdivision.

Buick Crescent Park.

This park was set aside in 1970, making it the youngest in the entire study (Figure 4.7). As considered, it consists of 33 acres, although only 6 acres is formally established; the remaining space carries the status of 'proposed reserve'. The entire acreage remains undeveloped, and the park's attraction at this time is only that of unattended open space. In spite of this seeming drawback, Buick Crescent Reserve displays a strong appreciative effect.

This effect is associated with recent construction in the north quadrant, where more than half of the area remains to be subdivided and built upon. The few older houses in this neighbourhood were built some 20 years ago, and are concentrated along the west end of the park. Thus, the lower values noted in the west quadrant reflect an area of earlier development, although presence of the city rubbish tip and sewage treatment plant, both of which are located nearby, must be expected to depress values significantly.

Waterloo Crescent Park.

Waterloo Crescent and the adjoining areas were built up as a state housing development about 1960; only three houses along Manawatu Street pre-date the state housing scheme (Figure 4.8). Upon completion of the construction, the Housing Department in 1961 set aside the seven-acre recreation reserve in lieu of a cash contribution. The reserve is used mainly as a passive recreation space for free play, although a soccer field occupies the central area.

Houses in this state housing development are of uniform age and similar in style and construction, which should result in a profile in which the regression line has minimum slope. Furthermore, location of the park along the city boundary and the presence of a moderately travelled main thoroughfare

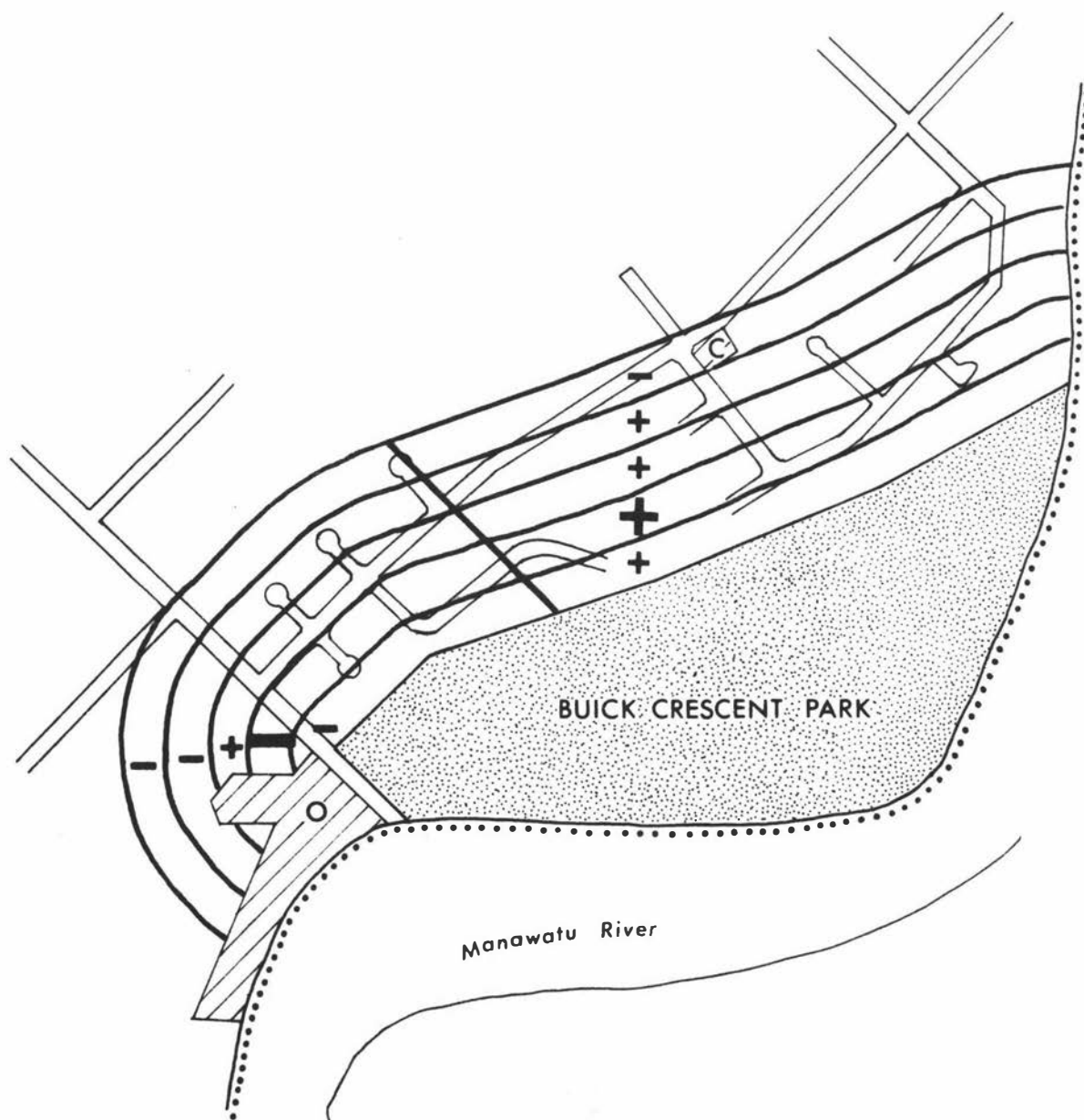


Figure 4.7 Map of Buick Crescent Park area, showing regression residuals. See Figure 2.1 for legend.

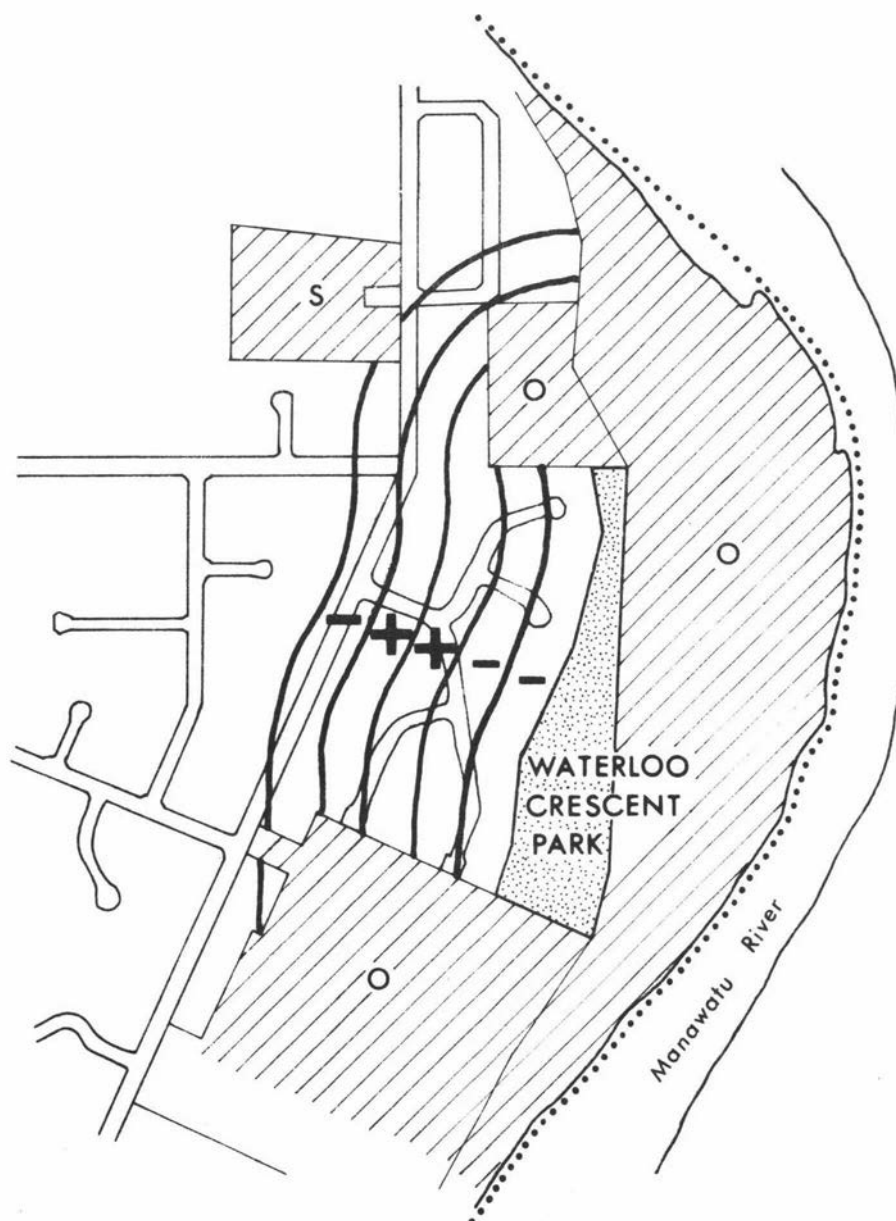


Figure 4.8 Map of Waterloo Crescent Park area, showing regression residuals. See Figure 2.1 for legend.

along zone 5 should induce a negative effect. However, the park has a moderately strong appreciating effect.

The map of residuals must be interpreted with the knowledge that the standard deviation of the residuals amounts to only \$142. Thus, the strong negative value of zone 5 becomes a positive value by excluding from consideration the three older houses.

Finally, the 14-acre reserve for a proposed secondary school does not appear to have any effect on adjoining properties--a finding consistent with those noted previously.

Monrad Park.

Monrad Park, a modest 8.5 acres in size, is almost completely surrounded by non-residential land (Figure 4.9). A small proposed reserve to the southwest is maintained along with the main body of the park, and these two units are considered as one larger park of 11 acres total. A parallel strip of land is also designated as 'proposed reserve', but it is not considered as part of the park in this study, as it is undeveloped and unmaintained.

The Monrad Intermediate school grounds add nothing to the park, but a proposed school site of more than 14 acres adjoins the park to the northwest. This space is also neatly tended along with the park and the effect is that of an open space of some 25 acres extent. The park proper, which is used for soccer and hockey, is classified as a primarily active area; the other spaces are devoted to passive recreation.

Most of the housing in the Monrad Park complementary area was built between 1961 and 1965, although the area to the south is of older construction. The park dates from 1965, when it was given to Palmerston North by the Housing Department upon completion of a large state housing project in the vicinity.

The map of residuals needs little explanation. The inner zones to the north and east include only non-residential property, so no values are shown here. The east quadrant contains privately constructed housing with

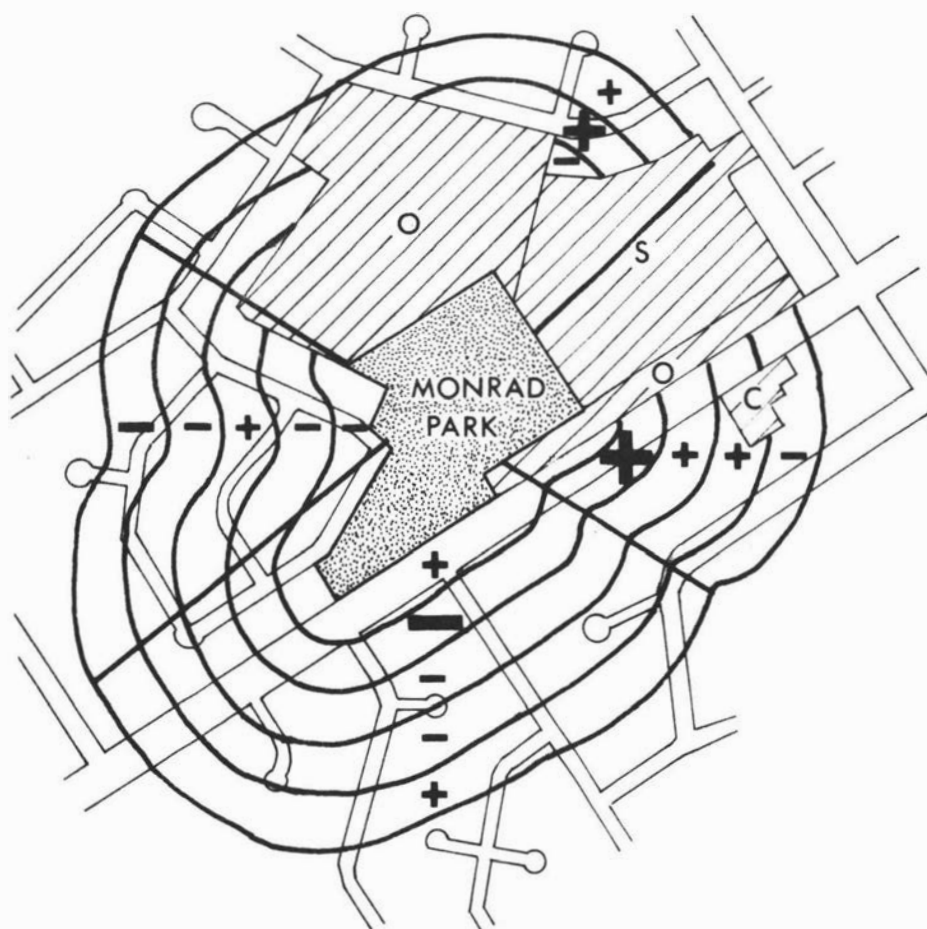


Figure 4.9 Map of Monrad Park area, showing regression residuals. See Figure 2.1 for legend.

associated higher values, while state housing is concentrated to the west, leading to negative residuals. The most noteworthy feature of the profile is the definite appreciative effect, which is unusual in less expensive neighbourhood housing.

Papaeoia Park.

This park is actually slightly larger than 10 acres, although 2.5 acres is set aside for senior citizens flats. The remaining space is devoted to passive recreation and hockey and is considered to be a primarily passive recreation area (Figure 4.10). The park is very well-maintained, with flowers, shrubs and mature trees around its perimeter.

Properties in this complementary area have the lowest average value of any appreciating park in Palmerston North. However, this reflects the age of the houses rather than the general desirability of the neighbourhood. Practically the only post-World War II construction is found in a small cul-de-sac near the south corner of the park; much of the housing dates from 1920, when the park was dedicated.

The strong negative residuals south and west of the park reflect the presence of the senior citizen flats, which have a low value per unit. The higher values in zones 2 and 3 south of the park are associated with the more recent housing previously mentioned. Strong positive residuals are also displayed in the east quadrant, where houses on the terrace of 'Terrace End' show the effect of view associated with a slightly elevated site.

Depreciating Parks

No less than seven of Palmerston North's parks have profiles of a depreciating nature. As noted in the Christchurch part of the study, the only common feature for the seven parks is the generally low value of the surrounding properties.

Awapuni Park.

This area gains its position as the highest valued among the depreciating parks by virtue of the relative recency of its development (Figure 4.11). It is the youngest park in this category, being established in 1964.

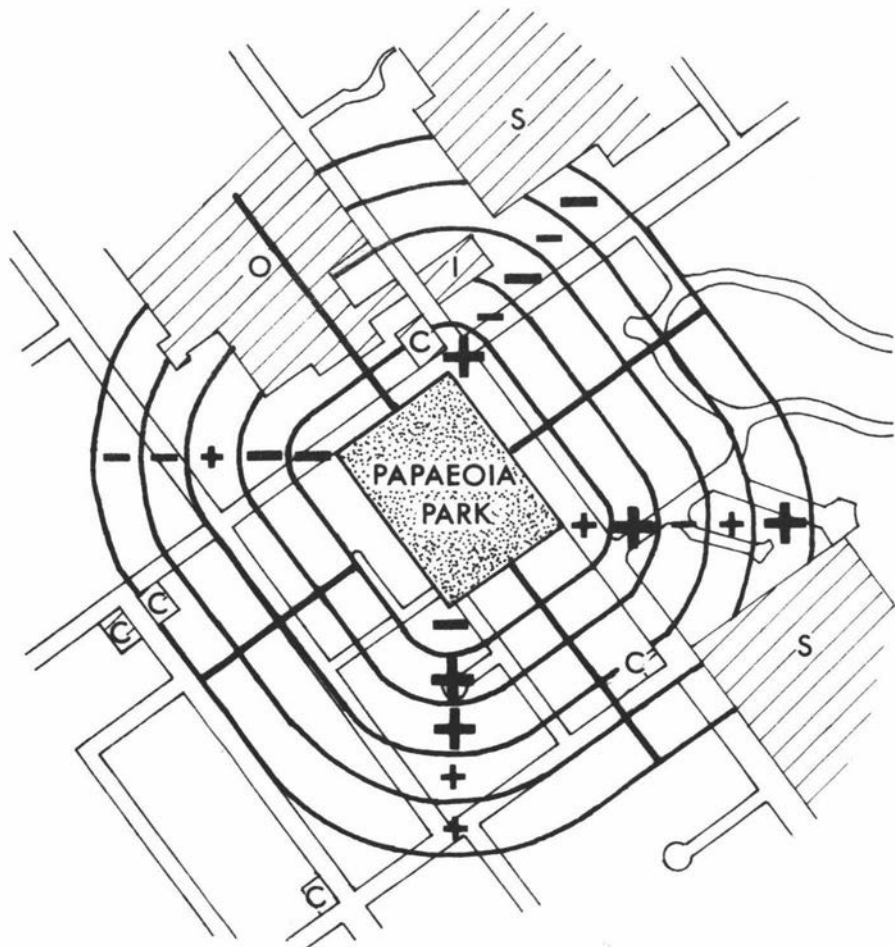


Figure 4.10 Map of Papaeoia Park area, showing regression residuals. See Figure 2.1 for legend.

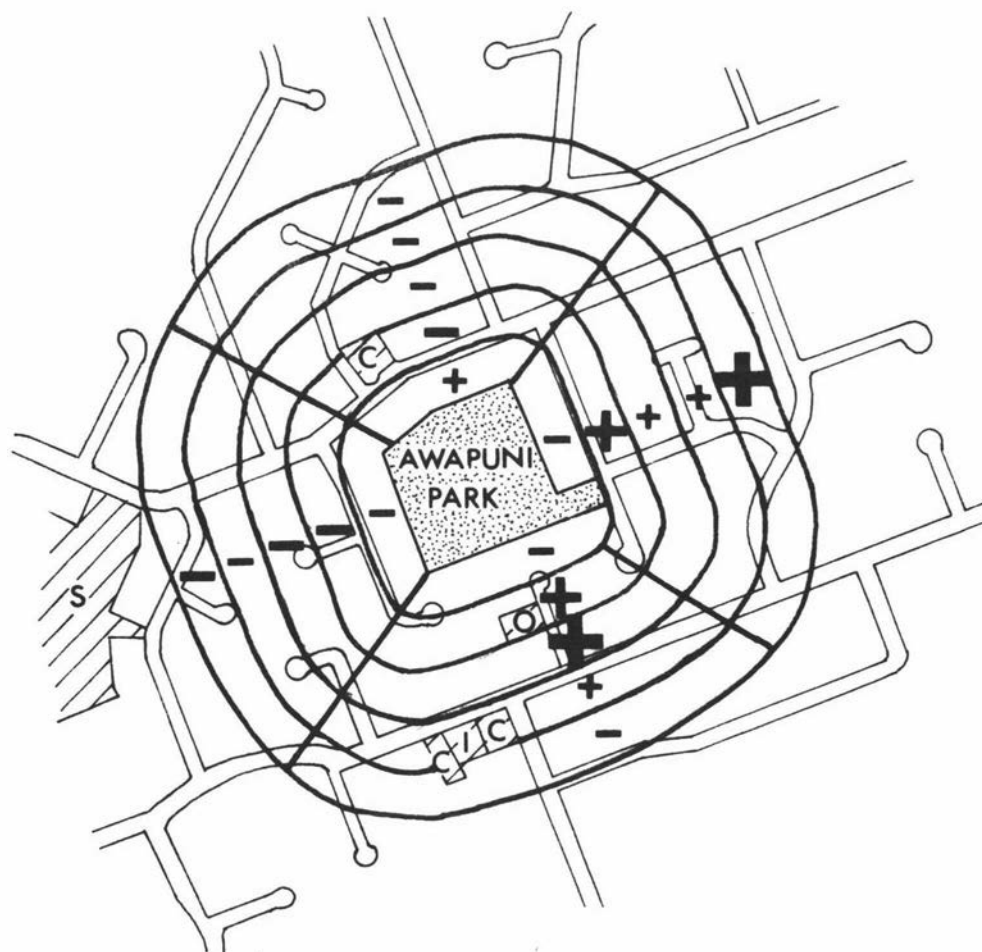


Figure 4.11 Map of Awapuni Park area, showing regression residuals. See Figure 2.1 for legend.

Virtually all the housing construction took place after 1953, when the area was incorporated into the city.

The open space, intended for soccer and cricket, also receives heavy use from free play. However, the dominant use is for active recreation. In addition, a small playground is located in one corner, making it more attractive to families with young children.

Awapuni Park is almost completely enclosed by residential land, with access to the outside at only three points. This is considered to seriously detract from its effectiveness as a neighbourhood focal point, and leads toward the depreciating effect.

The area to the west and northwest of the park was built up first with inexpensive housing, accounting for the negative residuals noted on the map. Later, a moderate number of state houses were constructed in the west quadrant; their value, which is generally lower than that of private homes of similar age, accounts for the strong negative values noted there. At the same time, as newer structures they carry higher valuations than those nearer the park, which accentuates the apparent depreciating effect of the park. The high positive values in the east and south quadrants result from pockets of more expensive housing, generally associated with cul-de-sac street patterns.

Puriri Street Basketball Courts.

This active recreation reserve represents an unusual situation (Figure 4.12). The 6.5-acre area, which also contains public tennis courts, occupies the site of a disused metal pit. An adjacent proposed reserve of 10 acres is also an old metal pit, but because no attempt has yet been made to develop it into a usable public space, it is not considered here.

The reserve has very few residences within its complementary area, and the property owners obviously do not consider it favourably, as the steep negative slope of the regression line indicates. One can conclude that a recreational reserve of this nature represents little improvement over its previous function, as evaluated by residents of the neighbourhood.

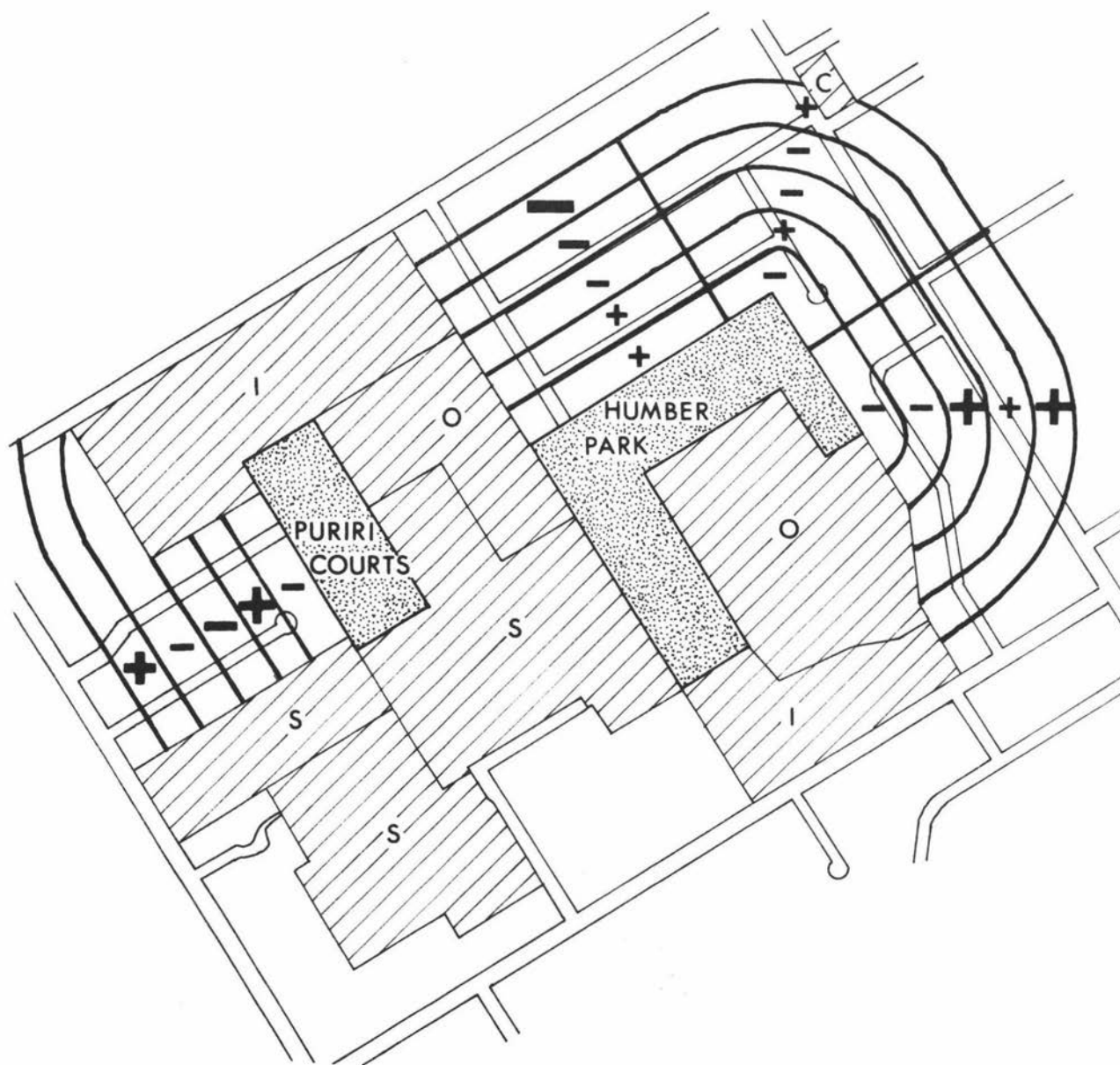


Figure 4.12 Map of Puriri Street Basketball Courts and Humber Park areas, showing regression residuals. See Figure 2.1 for legend.

Coronation Park.

This open space presents a profile similar to that of Puriri reserve (Figure 4.13). The complementary area is confined to one quadrant which reaches toward the city centre. This accounts for a part of the negative effect exhibited by the park, although the main factor is considered to be the railway and its terminal complex which parallels the park to the north.

Coronation Park, an area of nearly 18.5 acres, is devoted almost exclusively to rugby. Only recently has other activity, such as the flying of model aeroplanes, become popular. Most of the housing in its complementary area was built prior to 1940, and antedates the park, which was established in 1947. No factor is identified to account for the regression residuals, although the small value of populations in this area must be noted.

Takaro Park.

This park, which is classed as a primarily active recreation area, has been the centre of a neighbourhood since its dedication in 1920 (Figure 4.14). Mature trees set off the five acres devoted to bowls and tennis from the seven acres of soccer grounds. In spite of the park's pleasant atmosphere, it exerts a slight, although definite depreciating effect.

Although no single feature is identified to which this is attributed, two characteristics of this park are considered to combine to produce the effect. Firstly, the park boundaries do not extend to the perimeter roads; rather, residential sections form the border for most of the park, especially that area set aside for soccer. With no street space to act as a buffer, the distraction of noise from an active recreation reservation appears to offset the attraction of a parkside location. Secondly, a number of newer homes are found in the outer zones in all quadrants except the east; i.e., toward the CBD. Although many of these are state houses, their youthfulness is sufficient to produce a negative appreciative effect. Adjustment of values for age of housing according to the findings of either Forrest (1965) or Maher (1967) allows Takaro Park to display approximately a neutral effect. An industrial complex within the complementary area does not seem to have any depreciating impact on the park profile.

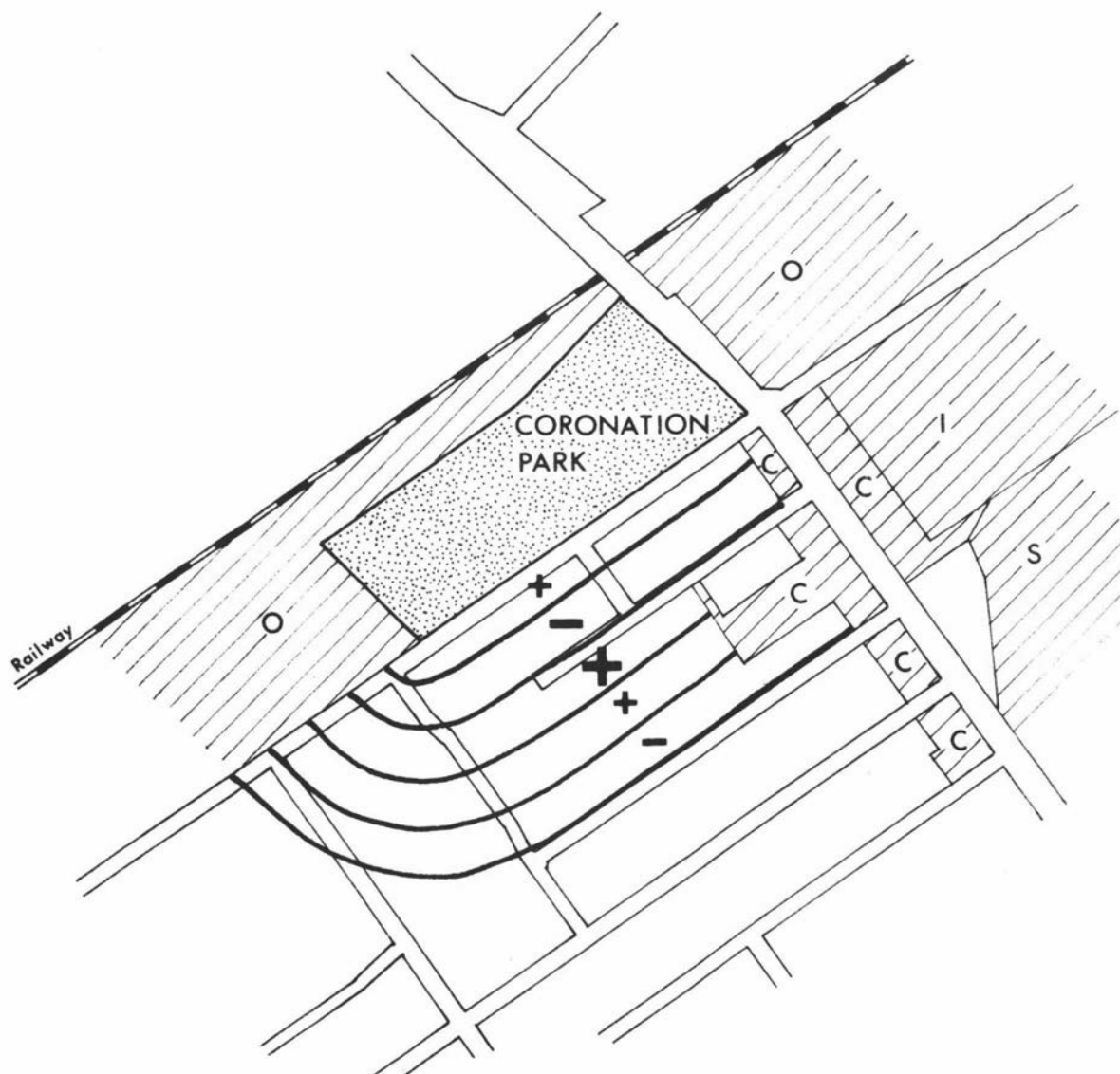


Figure 4.13 Map of Coronation Park area, showing regression residuals. See Figure 2.1 for legend.



Figure 4.14 Map of Takaro Park area, showing regression residuals. See Figure 2.1 for legend.

Savage Crescent Park.

The Savage Crescent area is one of the earliest state housing developments in New Zealand (Figure 4.15). The park, which is primarily a neighbourhood playspace devoted to passive recreation, was given by the Housing Department to Palmerston North city in 1946, although the houses were constructed some eight years previously. Houses in the outer two zones are not part of the state development; they were built as privately owned residences during the 1930's, although some clusters of houses date from the 1955-1965 decade.

The residuals shown on the map reflect average age of housing very closely, with high positive values associated with the more recent construction. Proximity to the Esplanade complex and to the city boundary reduces the size of the complementary area.

Humber Street Park.

The area around Humber Street Park is one of inexpensive housing (Figure 4.12). A state housing development, completed about 1950, accounts for the majority of houses, although the area east of the park has seen much construction in the last five years.

The park, which caters almost exclusively to social cricket, hockey, rugby and soccer, was established in piecemeal fashion. A 2.5-acre block was dedicated in 1951; the main body of this 15-acre park was established in 1962 and 1966 through separate purchases. The proposed reserve to the south and east is an abandoned metal and clay pit which was also used as a rubbish tip in the past. Eventual inclusion of this 18-acre space into the park complex will increase the available facilities and space, but will have little effect on the profile of the residential pattern, which is already well-established. The proposed reserve to the west is mentioned in conjunction with the discussion of Puriri Street Basketball Courts.

Although the park profile indicates a moderate depreciating effect, housing in the west quadrant reflects the opposite pattern. Houses there relate to the larger expanse of the park, have access to the main park entrance and are less effected by the more distant metal and clay pit. In

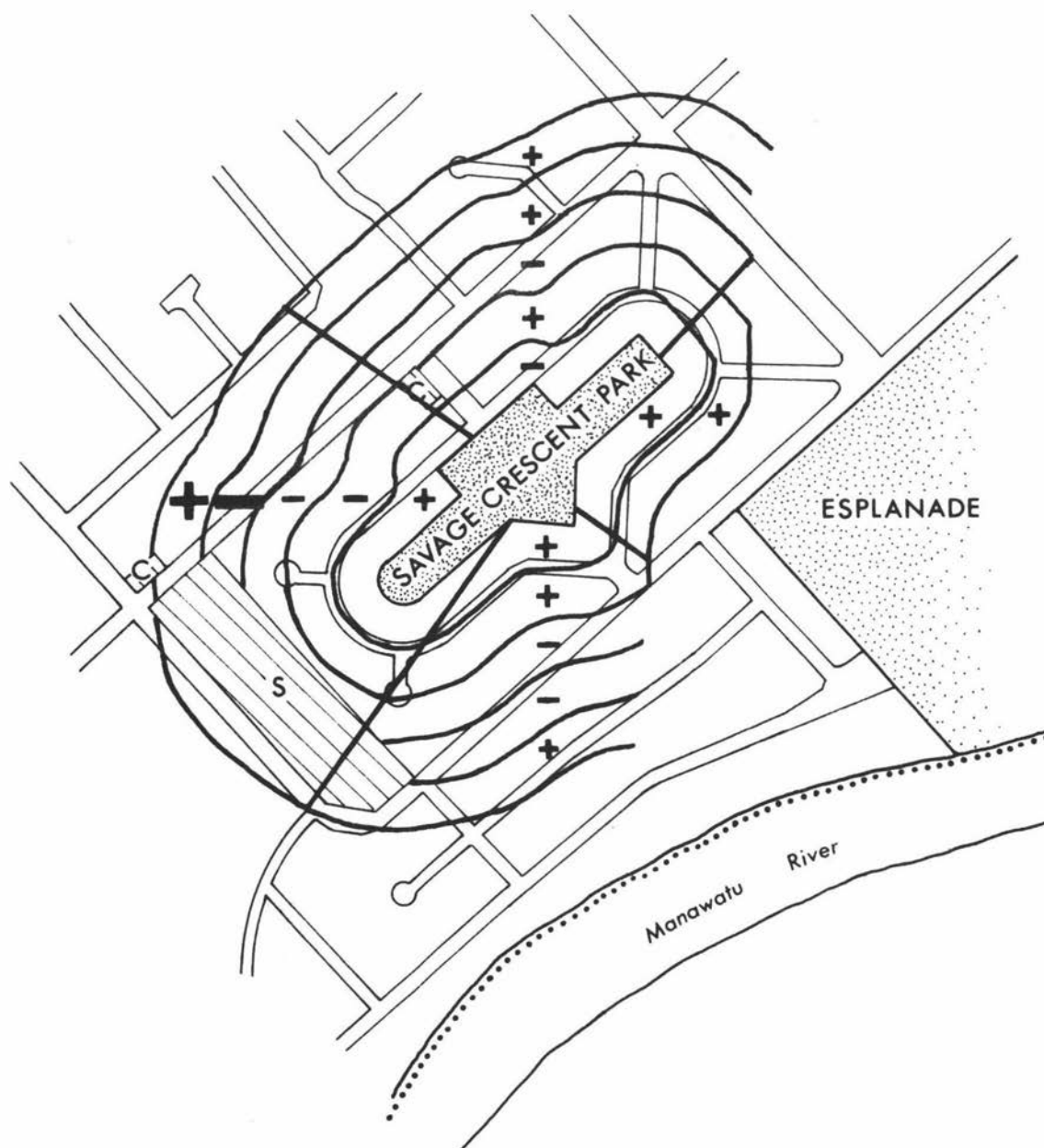


Figure 4.15 Map of Savage Crescent Park area, showing regression residuals. See Figure 2.1 for legend.

addition, the outer zones are adjacent to an industrial area in Tremaine Avenue. Strong positive values in the east quadrant mark new housing development there.

Agricultural and Pastoral Association Showgrounds.

This area, completely fenced on all sides, was operated by the Agricultural and Pastoral Association for several decades (Figure 4.16). Only recently has its classification changed from commercial to public open space. It is the venue for an annual agricultural show, and is also used throughout the year for spectator sports, such as rugby union, and stock car and motorcycle racing. It is classified functionally as a primarily active open space for purposes of this study.

The Showgrounds was established nearly a century ago; much of the housing approaches that age, and the complementary area shows the lowest average values found in Palmerston North.

As the regression graph shows, the Showgrounds has little effect on the pattern of the park profile. Undoubtedly the noise accompanying car races depresses property values, but apparently values are similarly affected throughout the complementary area. Properties nearer the CBD have higher unimproved value averages than those further away, but the average value of improvements is lower, keeping capital values approximately equal.

Other Parks

A number of parks are not included in the two major categories. As previously mentioned, Anzac Park and the trotting club area have no houses near them, and residential development does not appear to be imminent. On the other hand, the Square is omitted because the expanding CBD has displaced residential sites in its complementary area.

North Street Park, an older open space, is located between two large school reserves. About half of its 15 acres is used as an extension of a school play area; the remainder is dominated by bowls and tennis facilities. The housing in this area dates from the 1920-1930 decade, and is so limited

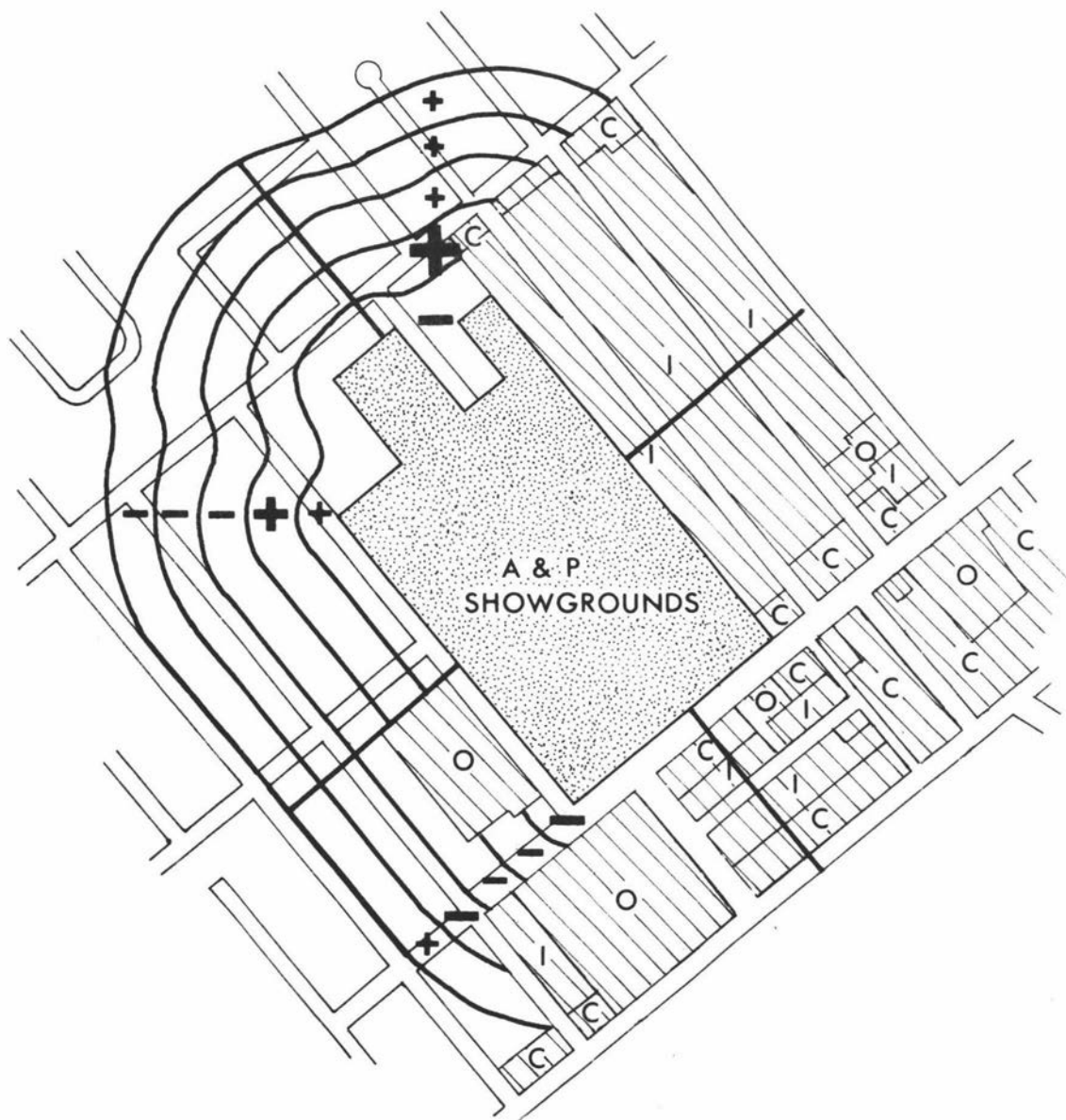


Figure 4.16 Map of Agricultural and Pastoral Association Showgrounds area, showing regression residuals. See Figure 2.1 for legend.

in amount that it is impossible to display average values cartographically while maintaining the confidential nature of property valuations demanded by the Valuation Department.

Similarly, the area along Dittmer Drive must be excluded from the study. Although the small park there dates from 1890, the complementary area is only recently undergoing residential development; it was the site of Awatapu Golf Course until 1963. Again, the reduced number of houses precludes mapping of residuals.

Milverton Park and Memorial Park.

Although these two open spaces fail to find classification in the two main categories, they merit some discussion here. Both parks follow a profile similar to that noted for Rugby Park, Christchurch, in that the park exerts a depreciating effect on properties with the exception of those in the innermost zone, where values are higher than the zone 2 averages.

Milverton, the smallest park considered in this city, was a gift to Palmerston North in 1924 (Figure 4.17). Its 4.7 acres are divided between a schoolboy soccer field and neighbourhood playspace. The Milverton Park complementary area was developed between 30 and 60 years ago, with some older residences located nearer the city centre. The east quadrant was last to be built up, and developed as an upper class neighbourhood; its status today is one of an older, although still very desirable, area as the strong positive values indicate.

Memorial Park, on the other hand, was a metal pit when the houses were built around it (Figure 4.18). The effect of perception of this noxious land use is reflected in the generally low average values and the sharp depreciating effect depicted by its regression line.

Since 1946, when Memorial Park was established, the metal pit has been transformed into an athletic track and field at the northeast end, and an amenity garden park at the other. The park can be considered as either passive or active space, as its area is evenly divided between the two functions, and each section of the park is totally independent of the other. Property

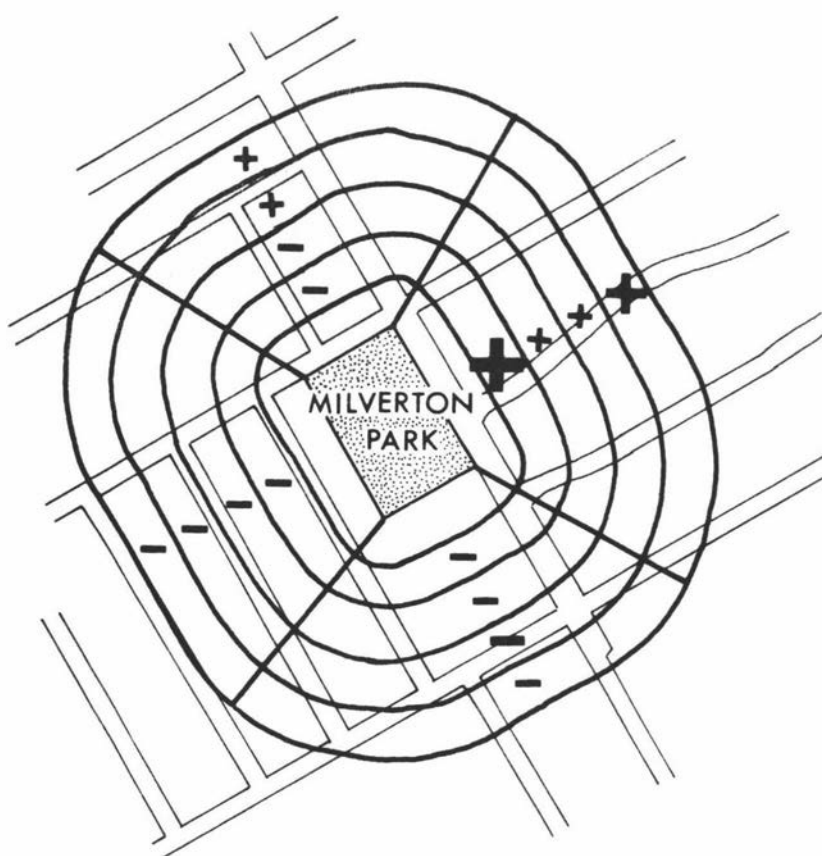


Figure 4.17 Map of Milverton Park area, showing regression residuals. See Figure 2.1 for legend.

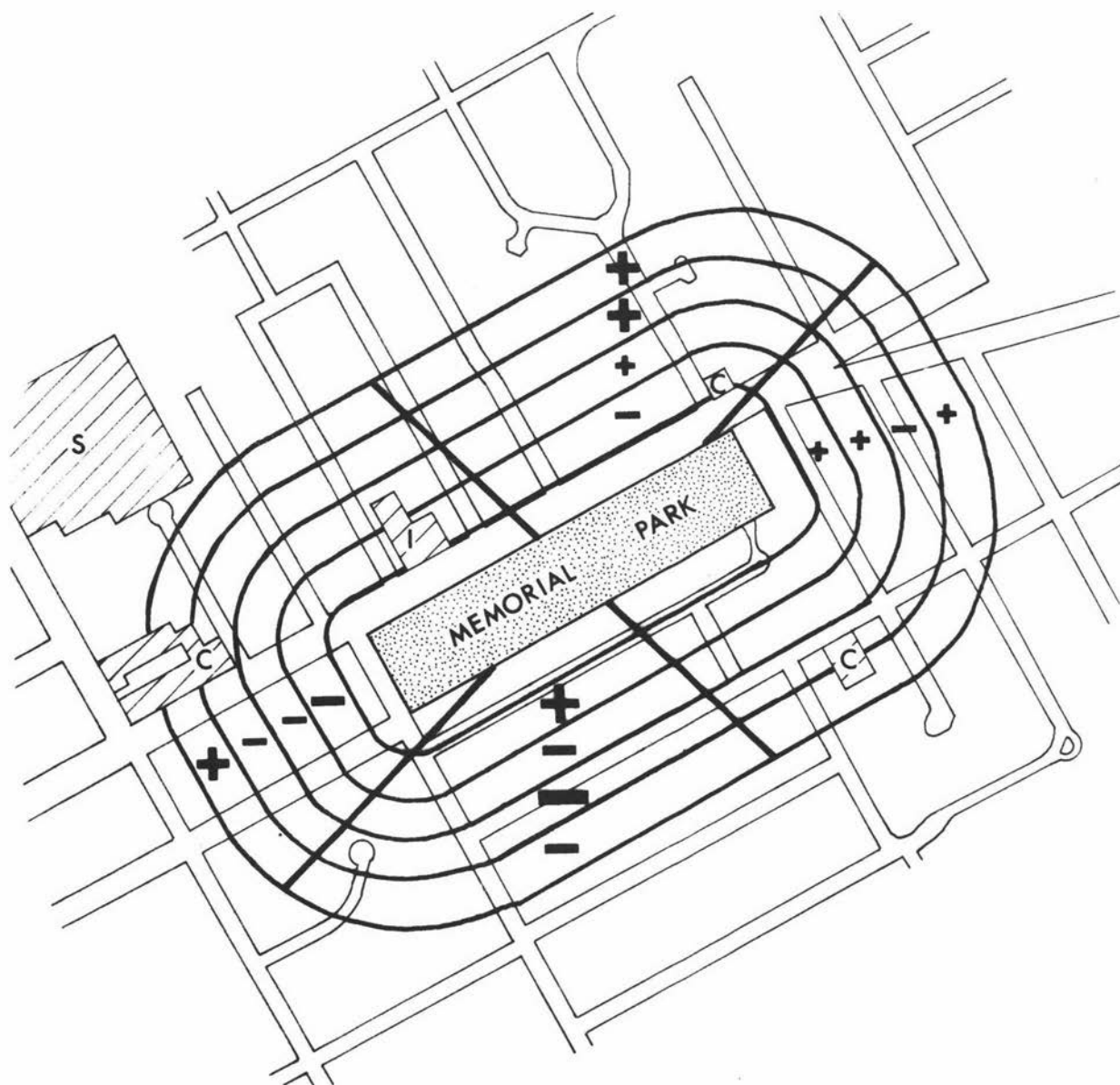


Figure 4.18 Map of Memorial Park area, showing regression residuals.
See Figure 2.1 for legend.

owners in the inner zone which overlooks the amenity park have responded to that amenity by improving and maintaining their houses in such a way as to produce the high values noted in the park profile. The increased average value is produced solely by value of improvements; the unimproved values show a definite depreciating effect by the park.

The map of residuals shows the outer zones of the south quadrant to contain the least expensive housing. This results from the general depreciation of inexpensive housing associated with the unimaginative subdivision practices followed in the decade or two preceding 1940. In addition, this area has little access to the facilities of Memorial Park because of the sunken site which the park occupies, and because the entrances to the park are located on the opposite side. The strong positive residuals to the north mark properties on a low terrace, while the quality houses in a new development raise average valuations for the outer zone in the west quadrant.

Evaluating the Hypotheses

Hypothesis I.

The existence of a park appreciative effect is tested first. When the data for all parks are combined to establish averages for all properties in each zone, solution of the linear regression equation produces a 'b' value of \$98 for this city.

Of the 17 open spaces considered, only eight appear to substantiate this hypothesis, while seven reflect a depreciating effect; the remaining two parks fit into neither classification, although they tend generally to be depreciators of property valuations. The average regression angle is only 91° , representing a 'b' value of less than \$27 in the regression equation. On this basis, the hypothesis cannot be accepted as stated.

However, the hypothesis may be modified to include only those reserves which existed as parks or proposed parks at the time of housing development in the area. This excludes from consideration the two parks which were developed from metal pits after housing patterns were established.

The hypothesis is restated in this way: in a neighbourhood which develops around a park or reserve, valuations of residential properties are highest alongside the open space, and decline with increasing distance from it.

With Memorial Park and Puriri Street Basketball Courts excluded, the average regression angle exceeds 95^0 ('b' value = \$94) for the 15 parks considered under this criterion, and the amended hypothesis is tentatively accepted.

Hypothesis II.

Correlation of regression angles with distance to rural land is established using both expressions of distance described in Chapter III. Although the hypothesis appears to be valid for Christchurch, correlations for Palmerston North are not sufficiently strong to approach statistical significance. Using 'distance to rural land' as an argument, a correlation coefficient of $r = -0.219$ is established; the coefficient increases to $r = -0.259$ when the 'percentage of distance' method is used. Neither correlation is significant at the 0.05 level, and the hypothesis is rejected for this city.

This is attributed in part to the presence of the Manawatu River, which acts as an effective barrier to the expansion of residential development toward the east and south. Open spaces, which were sited along the river to take advantage of lower land prices there at the time of their establishment, are nuclei for several desirable neighbourhoods. However, the river restricts access to land on the outer side of each park, and residential development cannot take place. This results in rural land and parks existing side by side.

Hypothesis III.

The strongest correlations in this study are those associated with this hypothesis. The relationship is close between the park valuation profile, as reflected by the regression angle, and average values for all properties in the associated complementary area, actual values of zone 1 properties, or estimated zone 1 averages. Although correlation with the latter parameter provides the closest 'fit', with an $r = +0.9195$ and Student's 't' statistic

of $t = 9.060$, the correlation for each of the combinations is significant at the 0.001 level. This hypothesis is substantiated and accepted.

Hypothesis IV.

No correlation between park appreciative effect and density of housing is established. A correlation coefficient of $r = +0.083$ is determined, from which a 't' statistic of $t = 0.321$ is computed, using 15 degrees of freedom. This hypothesis must be rejected for Palmerston North.

Hypothesis V.

Values of properties chosen by random sample from outside the complementary areas suggest that they are noticeably lower than those properties associated with open spaces. The average capital value is \$7,381 for the 713 units selected at random, compared to the average of \$7,928 for the 4,963 properties located within the park complementary areas. Thus, the park-oriented properties are 7.41 per cent higher than those in the other category.

Again, with no minimum percentage set to establish statistical significance, no inferences are supported. However, the magnitude of this differential in average valuations lends considerable weight to the hypothesis, which is accepted for this city.

NOTES

¹The airport and the refuse tip, with 322 and 200 acres, respectively, are included in this 'urban' area, even though such functions are not usually located within city boundaries.

²The trotting club grounds, with 56 acres located just inside the city, is not included among the open spaces in this study.

³Palmerston North was gazetted, or valued, on 1 November 1968.

⁴This author is responsible for assigning the functional classifications used in this study to the Centennial Lagoon-Hokowhitu Golf Course, Brightwater Terrace Golf Course, Agricultural and Pastoral Showgrounds, Hokowhitu Domain and the Esplanade. Classification of all other Palmerston North parks into primarily passive and primarily active categories is based upon information furnished in 1970 by Mr J.W. Bolton, Director of Parks and Reserves, and Mr P. Crawford, Research Planner, Palmerston North City Council.

CHAPTER V

HASTINGS

Although Hastings began without open space set aside for public use, that deficiency has been corrected through the gifts of private citizens, reserves set aside in lieu of cash contributions by subdividers and a number of judicious purchases. The result is a well-distributed pattern of major open spaces, supplemented by a few small neighbourhood playgrounds. Figure 5.1 shows the location of major spaces.

The city boundary of Hastings encompasses 4,222 acres. Included in this total is the new suburb of Flaxmere, an area under development some four miles west of the city centre. Although Flaxmere is planned to house eventually some 10,000 persons in addition to providing facilities for extensive industrial and commercial areas, most of the suburb and the strip of land which connects it to the city proper is presently undeveloped. Consequently, the decision was made to retain only the developed area, and to exclude from this study 917 acres, consisting of 392 acres of undeveloped residential and commercial land, 242 acres zoned as rural, 181 acres of undeveloped industrial space, 62 acres of existing or proposed reserve land with no associated residential land and 40 acres set aside to be used for schools, churches and other community functions. The exclusion of these lands reduces the area of Hastings to 3,305 acres.

Ten major parks, totally 302.8 acres of land, are considered in this study, as Table 5.1 shows. These parks make up slightly more than nine per cent of the city area, providing in excess of eleven acres of park for each thousand of Hastings' 26,867 residents.

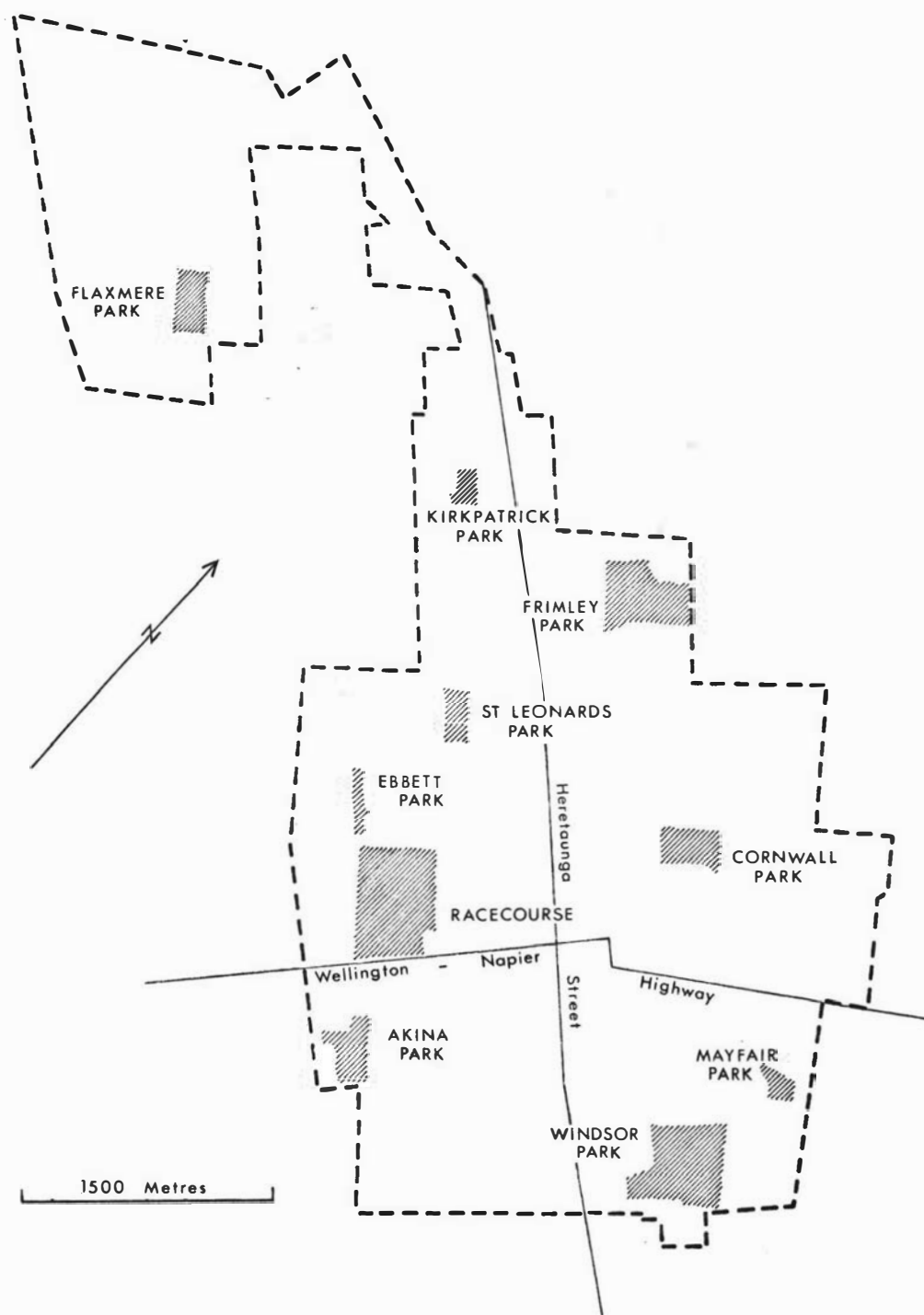


Figure 5.1 Map of Hastings study area.

Table 5.1
Hastings Major Open Spaces

<u>Open Space</u>	<u>Area (acres)</u>
Frimley Park	47.8
Flaxmere Park	25.0
Windsor Park	64.5
Cornwall Park	21.2
St Leonards Park	11.4
Hawke's Bay Jockey Club Racecourse	82.6
Ebbett Park	8.2
Akina Park	23.4
Kirkpatrick Park	9.7
Mayfair Park	<u>9.0</u>
Total	302.8

Source: Hastings City Council, Parks Dept.,
Annual Report, 31 March 1969

However, other public open space is not accounted for in the list of parks, and those areas, which total 41.1 acres, should be included before considering the adequacy of open space in this city. The largest unit in this category is Nelson Park, with 10.6 acres. This enclosed sportsground was at first identified for inclusion in the study, but it was found to be almost entirely surrounded by non-residential land; only 21 houses are found within its complementary area. Other parks include Civic Square, Victoria (Queen) Square, neighbourhood parks, playgrounds, tennis and bowls areas and the Town Gardens.

In all, some 343.9 acres, or more than ten per cent of the city, is in open space. This amounts to nearly 13 acres per thousand population, which is well in excess of the standard of 10 acres established by the United States National Recreation Association (Butler, 1962), and more than twice the minimum set by the Great Britain National Playing Fields Association (Ministry of Housing, 1956). In summary, Hastings has a much more generous supply of open space than Christchurch, and slightly less than that noted for Palmerston North.

Appreciating Parks

The parks of Hastings show the most consistent appreciative effect noted in this study. As Table 5.2 shows, no less than eight of the ten are classed as appreciating parks. Again, they are considered in sequence, with the most expensive neighbourhood considered first.

Frimley Park.

One of the most attractive parks in New Zealand, Frimley Park combines facilities for both passive and active recreation (Figure 5.2). Grounds are provided for school rugby and soccer, and the aquatic centre is an attraction for all city residents. But the rose garden, botanical display and spacious lawns are the features which make the park a city-wide amenity, and Frimley Park is considered to be a primarily passive recreation area.²

Housing in this complementary area has the highest average value noted in the entire study, although comparison of inter-city data should not be emphasised because of differences in market factors, dates of valuation, etc. Although the park appreciative effect displayed is overshadowed by Hagley Park, for example, the slope of the regression line is quite steep, as Figure 5.3a indicates.

Most of the houses were constructed between 1955 and 1960, although a number of older houses remain, particularly in the south and west quadrants, which are more accessible to the city centre. Clusters of these older buildings account for the strong negative residuals displayed on the map, although it must be stressed that negative residuals in this area do not indicate inexpensive housing.

The highest average values are concentrated in the north quadrant, where the city boundary approaches the park to reduce the size of the complementary area. Few houses were built there prior to the main period of development, and the newer houses are generally of high value throughout the area. The high positive residuals in the outer zones reflect the presence of one or two luxury homes in fields of limited population.

Table 5.2
Average Property Valuations, Hastings¹

Open Space	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	r*	@
Frimley Park	\$14,139	11,134	10,792	10,444	10,300	-0.943 ^b	.010
Flaxmere Park	13,156	11,336	9,090	8,930	8,844	-0.966 ^b	.005
Windsor Park	9,994	8,526	8,230	8,115	8,016	-0.950 ^b	.010
Cornwall Park	10,994	8,593	8,189	7,719	7,735	-0.962 ^b	.005
St Leonards Park	8,512	8,476	8,445	8,412	8,348	-0.988 ^a	.005
HBJC Racecourse	8,911	7,986	7,635	7,509	7,418	-0.976 ^b	.005
Ebbett Park	8,600	7,614	7,547	7,530	7,500	-0.877 ^b	.025
Akina Park	8,040	7,514	7,233	7,161	7,116	-0.975 ^b	.005
Kirkpatrick Park	7,989	7,994	8,009	8,017	8,017	+0.958 ^a	.010
Mayfair Park	7,650	7,593	7,598	7,612	7,665	+0.990 ^{a**}	.010

* correlation coefficient, Pearson Product Moment method.

^a calculated using linear function.

^b calculated using logarithmic function.

@ alpha level of significance, using 1-tailed test and degrees of freedom df = n-2.

** correlation coefficient calculated for zones 2 through 5.

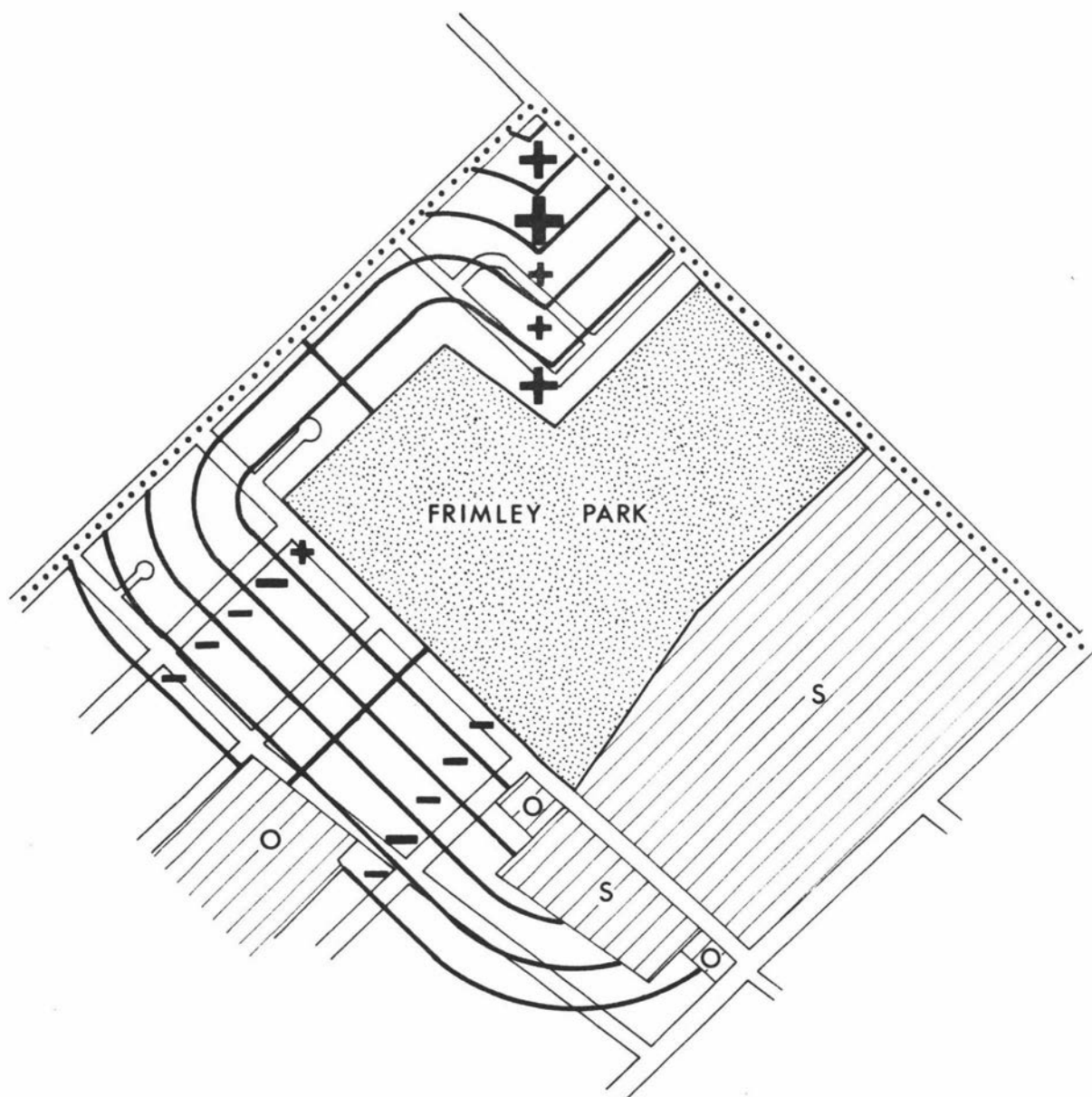


Figure 5.2 Map of Frimley Park area, showing regression residuals. See Figure 2.1 for legend.

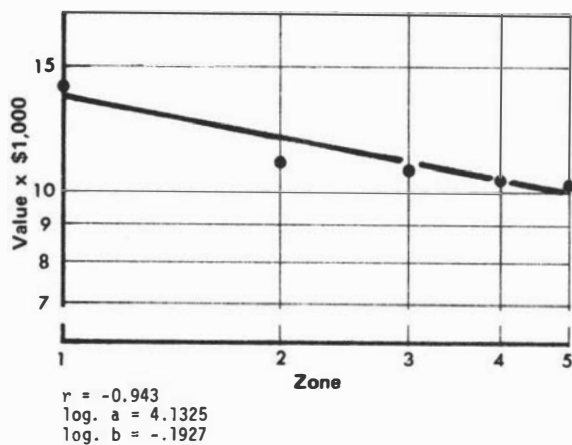


Figure 5.3a Frimley Park.

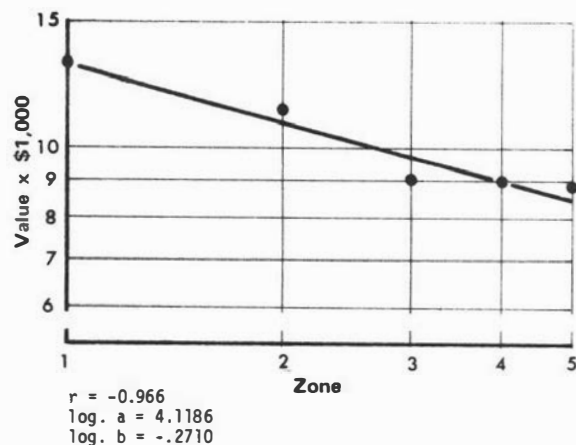


Figure 5.3b Flaxmere Park.

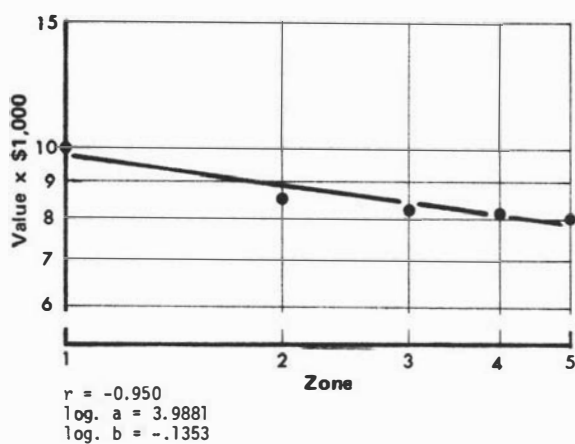


Figure 5.3c Windsor Park.

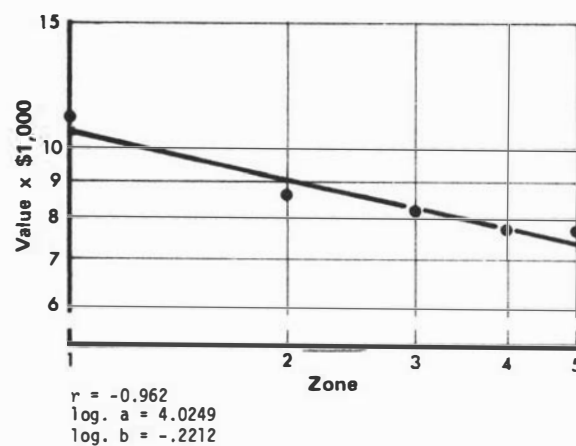


Figure 5.3d Cornwall Park.

Figure 5.3 Curvilinear regression graphs for Hastings parks.

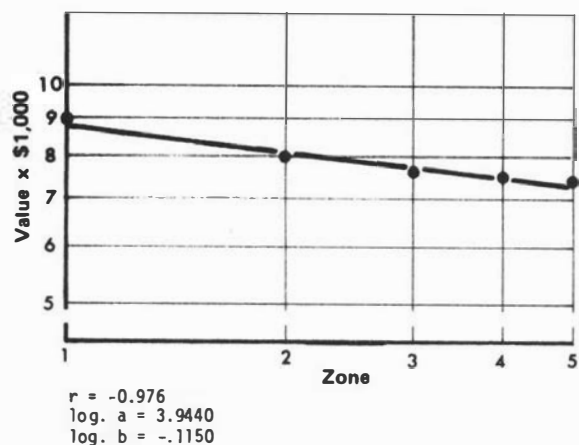


Figure 5.3e Racecourse.

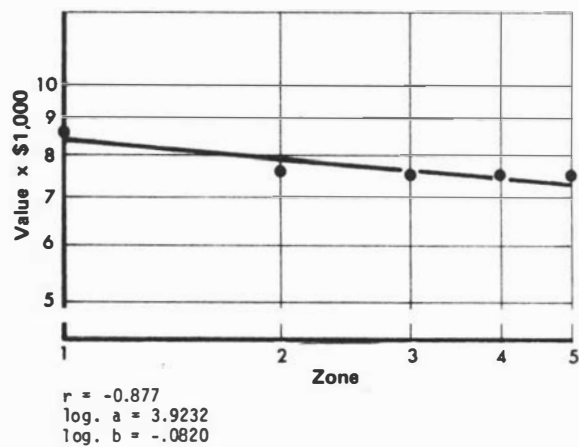


Figure 5.3f Ebbett Park.

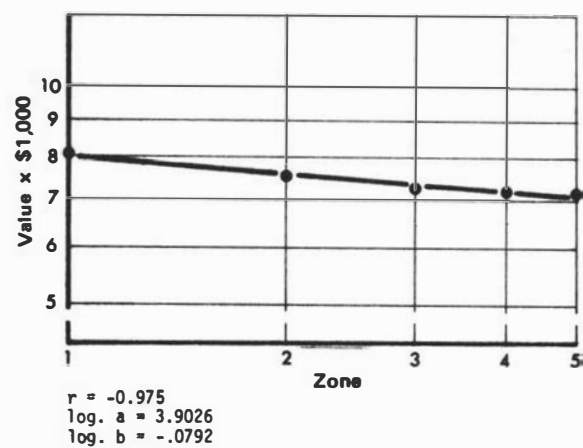


Figure 5.3g Akina Park.

Figure 5.3 Curvilinear regression graphs for Hastings parks.

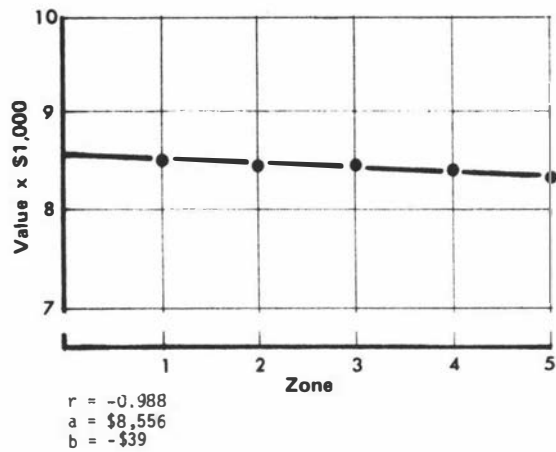


Figure 5.3h St Leonards Park.

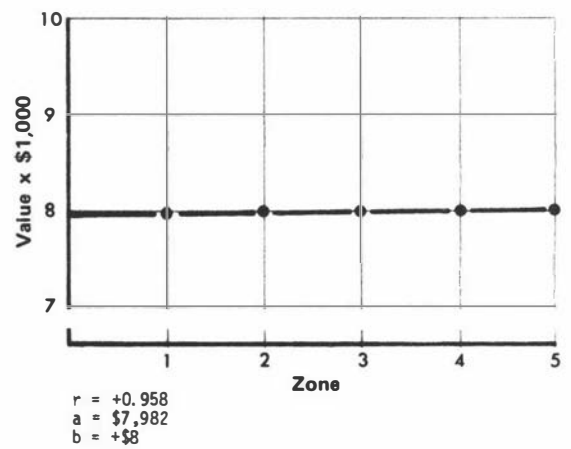


Figure 5.3i Kirkpatrick Park.

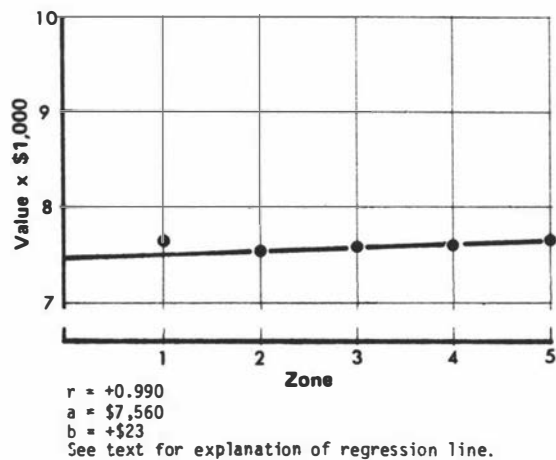


Figure 5.3j Mayfair Park.

Figure 5.3 Linear regression graphs for Hastings parks.

Flaxmere Park.

This park was established as the focal point of the new suburb of Flaxmere (Figure 5.4). Some 25 acres of the open space is presently under development; another 17 acres is to be added later. The section of proposed park is not included in the inventory of open space, but the entire area of 42 acres is considered as a passive park for the purpose of this discussion.

Although the newest park in the study is Buick Crescent Park in Palmerston North, this neighbourhood is unique in that all houses in the complementary area have been built since 1967. No older structures remain to interfere with the pattern of park appreciative effect which is the central theme of this study.

Only one quadrant of the area has experienced any residential development, and the percentage of sections which have been built upon in that quadrant varies from 51 per cent in zone 1 to 28 per cent in zone 4. In spite of the reduced number of properties considered, Flaxmere Park exhibits a strong appreciative effect, as the slope of the regression line indicates.

The map of residuals should be interpreted in conjunction with the average values which Table 2 presents. Property averages for the first three zones establish a very steep regression angle, while a further increase in distance from the park has less effect on values.

Windsor Park.

This open space, the oldest in the Hastings study, was established as 'The Park' almost ninety years ago (Map of Hastings, 1885). Primarily a city-wide amenity attraction for passive recreation, Windsor Park also provides grounds for hockey, cricket and basketball, as well as swimming baths and a children's paddling pool (Figure 5.5). Its size, in excess of 64 acres, permits the dispersion of the active recreation facilities, so that the perimeter areas of the park present attractive views to adjacent residential properties.

Most of the housing around Windsor Park dates from about 1935 to 1940. Prior to that time, much of the complementary area was occupied by the

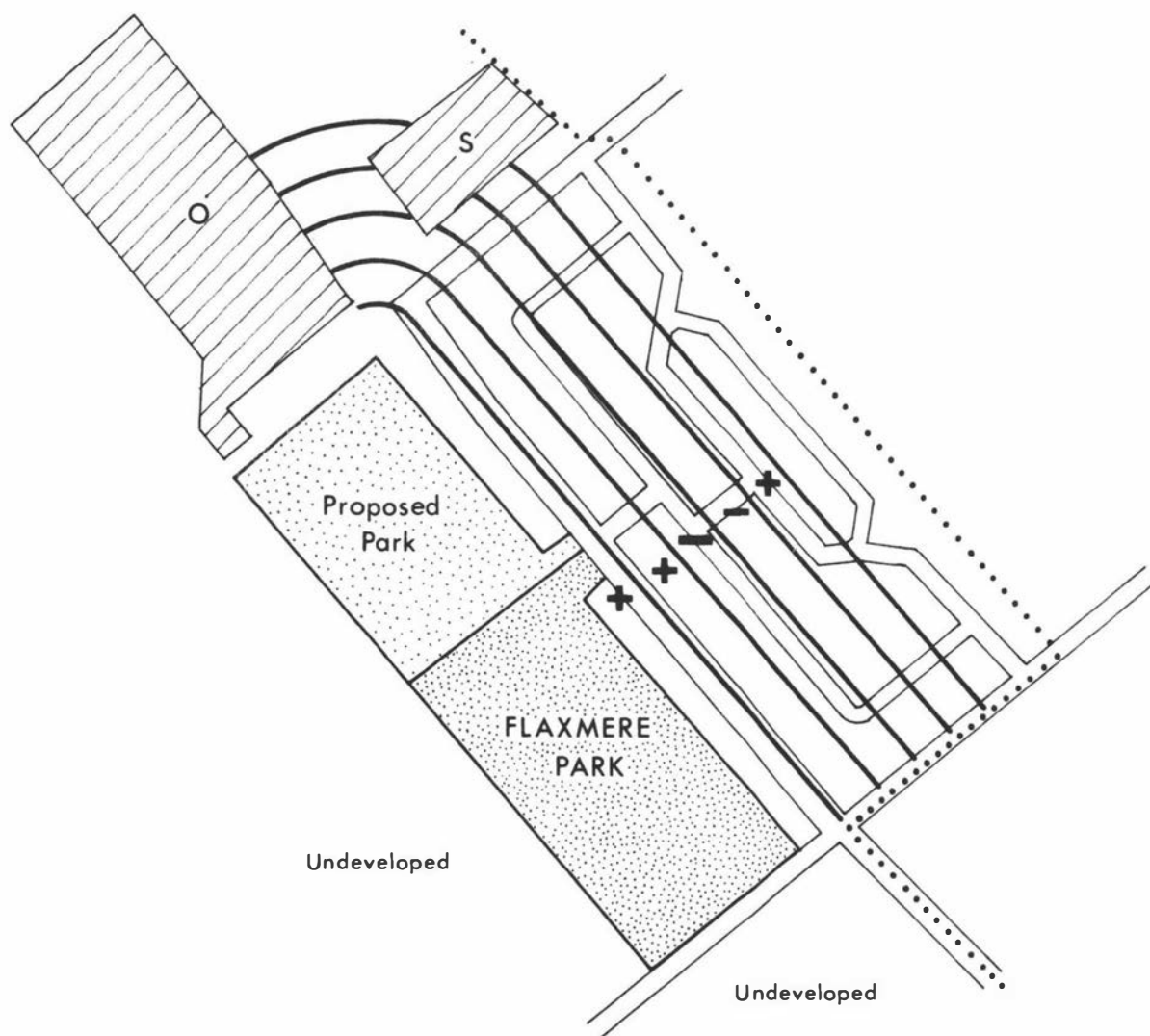


Figure 5.4 Map of Flaxmere Park area, showing regression residuals. See Figure 2.1 for legend.

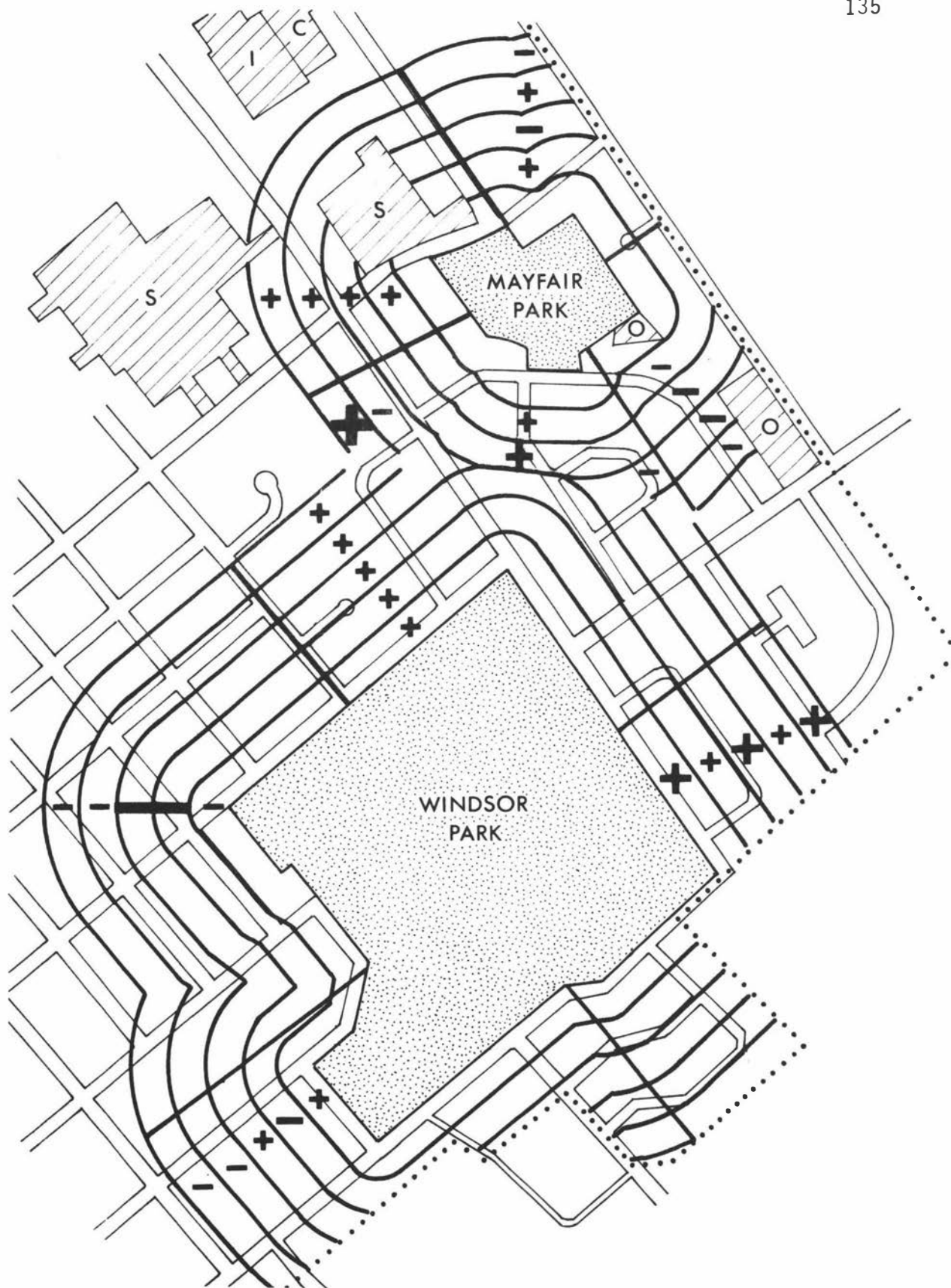


Figure 5.5 Map of Windsor Park and Mayfair Park areas, showing regression residuals. See Figure 2.1 for legend.

Parkvale Golf Club, a public course operated by the Hastings Borough Council (Jenkin, 1971). This area and two other neighbourhoods were developed during the decade of the 1930's to accommodate normal urban growth as well as to replace housing destroyed in 1931 by earthquake and fire.

Average property values of this park profile reflect a strong appreciative effect, especially for the first two zones; further increase in distance from the park brings a much more moderate decline in value.

The properties north and east of the park have averages which are consistently higher than estimates by regression analysis. This is especially so in the east quadrant, where three of the five zones display averages in excess of one standard deviation of the regression residuals; the other two zones closely approach that value.

Conversely, the west quadrant has lower average values. A public camping area located at the park's west end detracts from the attractiveness of the area. That, combined with the presence of a few houses which antedate the main period of construction, serves to account for the generally negative residuals and the occasionally strong negative factor.

Cornwall Park.

This open space, with flowers, shrubs and mature trees in abundance, functions as a passive recreation area and an amenity for the city and surrounding district (Figure 5.6). In addition, it is the site of the Hastings cricket facility, with five wickets provided. It is classified as a primarily passive open space.

Cornwall Park has been the central feature of an expensive residential area since its establishment. Construction of houses around the park began about 1905, and development was essentially complete within five years of that date. Although a few houses have been built more recently, much of the newer construction consists of multiple-unit dwellings, with per-unit values which approximate those of the older houses.

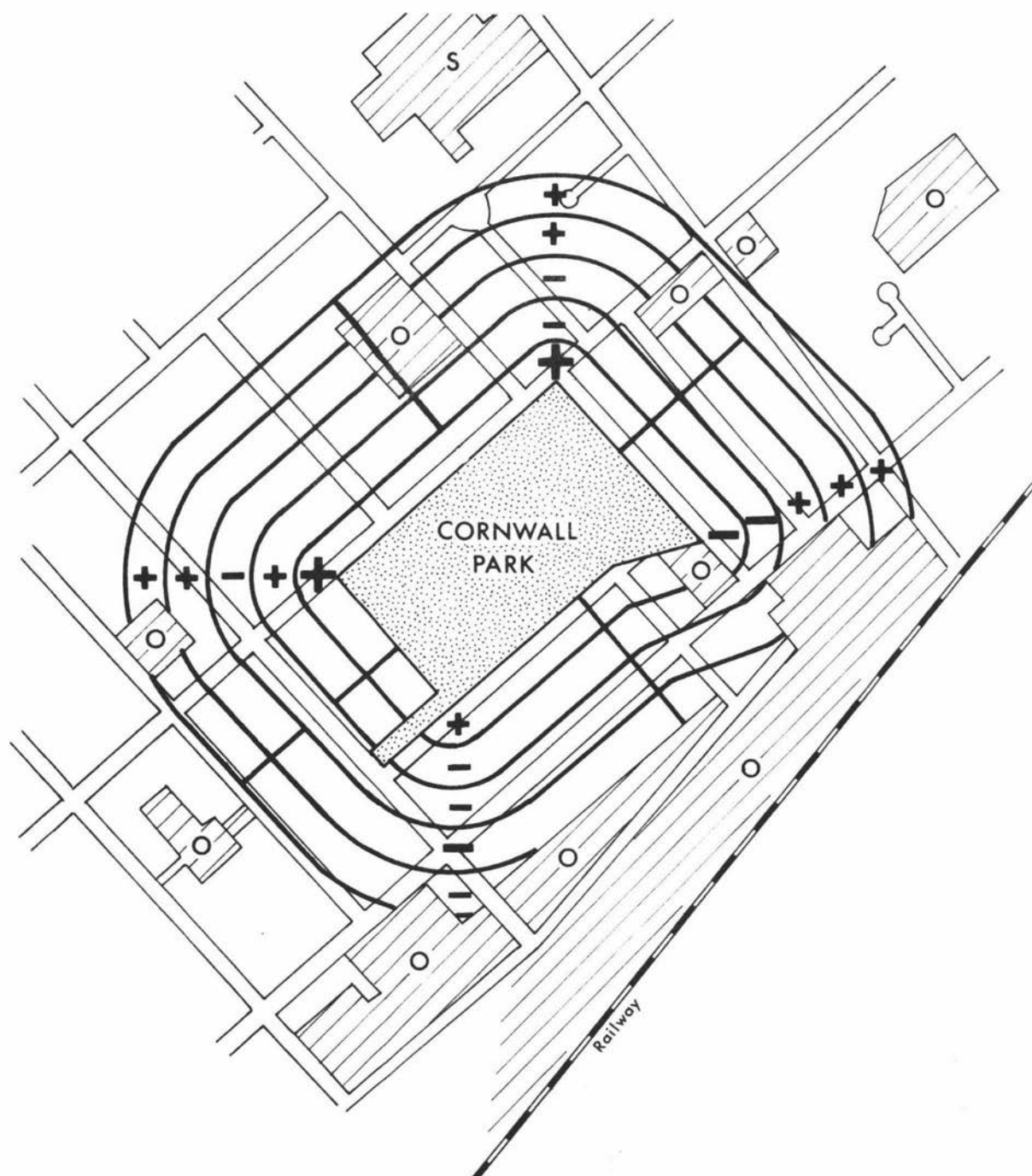


Figure 5.6 Map of Cornwall Park area, showing regression residuals. See Figure 2.1 for legend.

In spite of the age of most of the housing, this area has retained its status. The park exerts a strong appreciating influence on property values, as the regression graph reveals. The map of residuals emphasises that influence, as three of the quadrants display much higher values alongside the park than in more distant zones. Only in the east quadrant, where the park emphasis is on active recreation rather than the amenity effect, are strong negative residuals found near the park. The low values found in the south quadrant reflect the encroachment of industrial zoning into an older residential area.

St Leonards Park.

The chief attractions of St Leonards Park are its soccer fields, and although it also serves as a neighbourhood playspace, it is classified as an active recreation open space (Figure 5.7). The area around the park is one of middle class housing; average property value for its complementary area is \$8,412, which compares closely to the \$8,415 average for all properties in the ten park areas considered in Hastings.³

The main body of housing was built between 1950 and 1955, although a number of houses which are much older are found throughout the area. This effect on the park profile is counterbalanced by several pockets of new construction.

Two features act as major distractions to the general desirability of the neighbourhoods. An industrial area adjoins the park to the north and east, while further to the north a cemetery depresses values of those properties in its proximity. These two features also take the place of residential land, which results in a reduced number of properties in some quadrants.

Although St Leonards Park is included in the inventory of appreciating open spaces, its apparent effect on property values is very slight. The regression graph shows a constant slope, but less than \$200 difference is noted between the averages for the inner and outer zones. However, considerable deviation from the average exists within the pattern, as the map of residuals reveals. The low averages in the south quadrant result from the

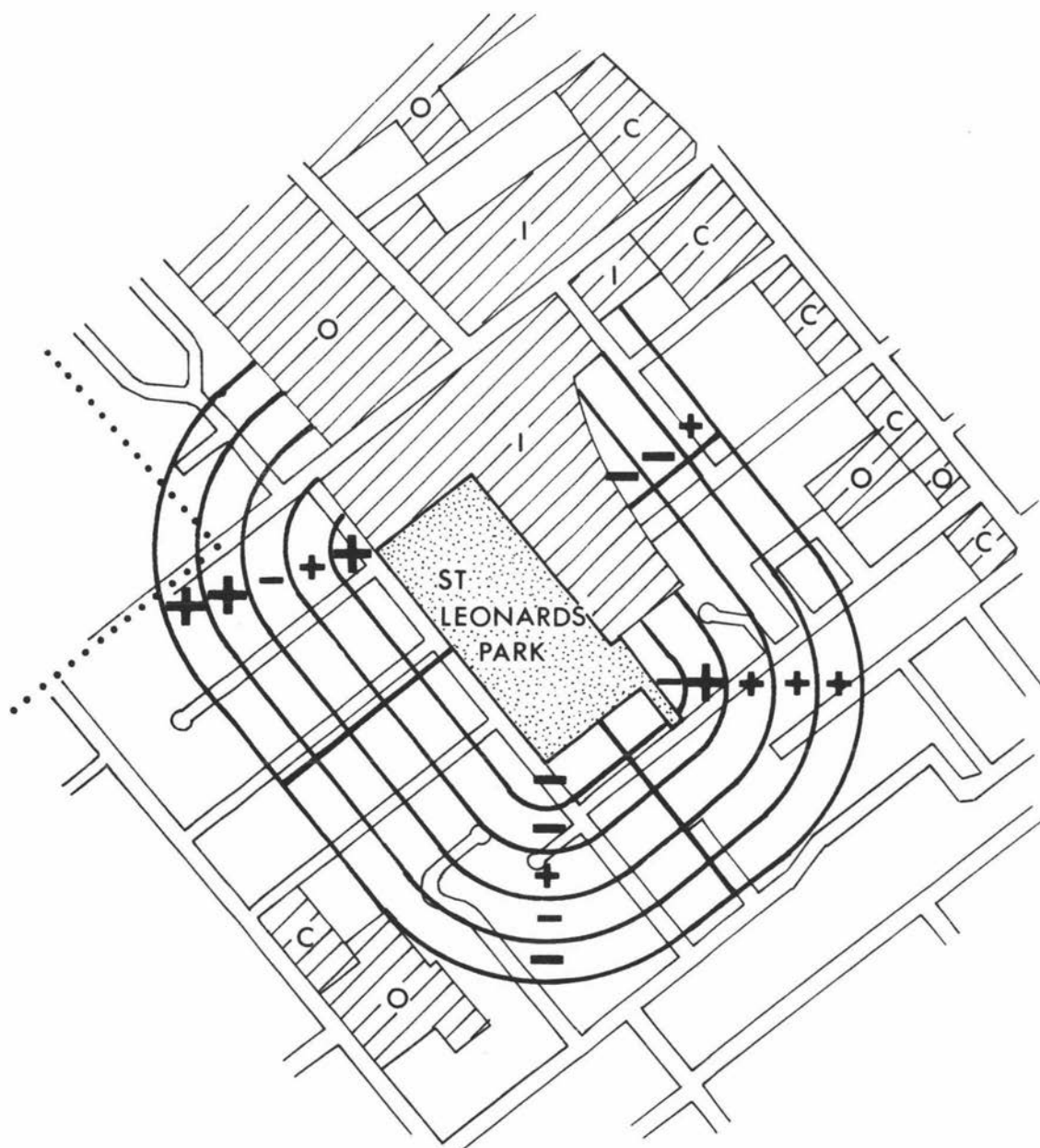


Figure 5.7 Map of St Leonards Park area, showing regression residuals. See Figure 2.1 for legend.

presence of several older houses, some of which suffer from poor maintenance and neglect, while the large negative residuals north of the park reflect the previously mentioned influence of the cemetery and the industrial complex. Positive residuals to the east and west are brought on by newer housing, particularly the higher-value homes associated with cul-de-sac developments.

Hawke's Bay Jockey Club Racecourse.

An open space of this size located less than one-half mile from the city centre is expected to have a strong influence on surrounding properties (Figure 5.8). Depending upon the function, character, and appearance of the space, the influence could either increase or depress values.

As may be noted in the regression graph, the Racecourse has a substantial appreciating effect on its neighbourhood. Much of this is attributed to the fact that the Racecourse is completely unfenced, except for the barriers which mark the actual racetrack. As a result, the surrounding area offers essentially unrestricted vistas of a broad expanse of grassed area.⁴ The Racecourse is considered to be an active recreation area.

Although the Racecourse dates from about the turn of the century, most of the housing was built during the 1920-1930 decade. Older homes comprise much of the housing in the zone nearest the CBD. As commercial and industrial zoning invades the residential area, housing maintenance decreases, and the average capital value declines sharply. The result is a 'zone in transition' similar to that described by Burgess (1929). Most other major residuals stem from abnormal fluctuation of values associated with a small size of universe, caused by the preponderance of non-residential land to the south and east of the Racecourse, and the presence of Ebbett Park and its complementary area to the west.

Ebbett Park.

Although Ebbett Park provides some facilities for tennis and basketball, it is used primarily as a neighbourhood playground (Figure 5.8). As the regression graph shows, the appreciative effect is strong only for those properties immediately adjacent to the park. The average of \$8,600 for zone 1 suggests that a parkside location here is considered to be quite desirable. This is borne out by noting that only two complementary areas in Hastings

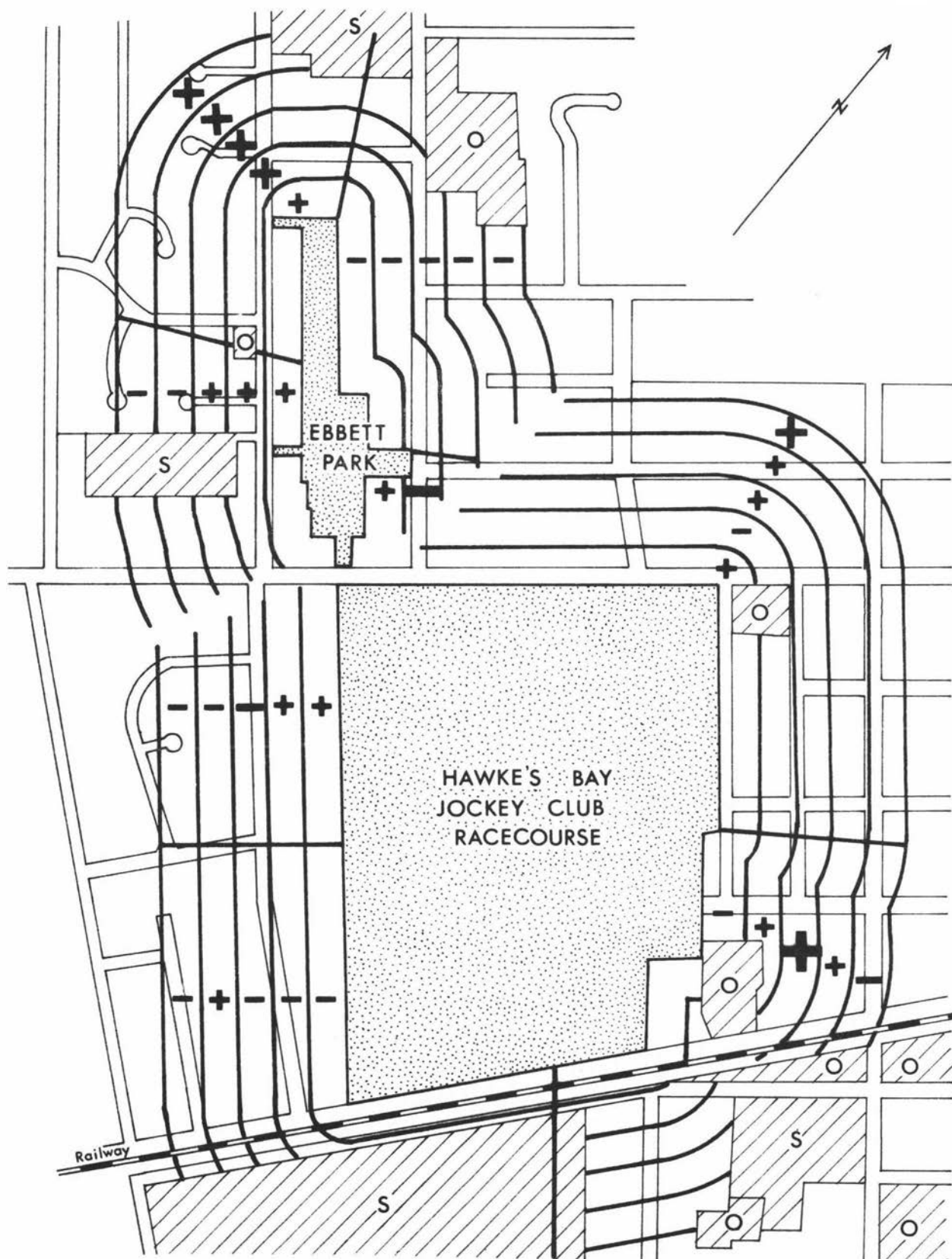


Figure 5.8 Map of Hawke's Bay Jockey Club Racecourse and Ebbett Park areas, showing regression residuals. See Figure 2.1 for legend.

have averages above that figure. However, from zone 2 outward, appreciative effect is almost indiscernible; only one complementary area in the city has an average less than the \$7,614 established for zone 2 of this park.

In addition to the general pattern noted for most open spaces, where effect of the park diminishes as the distance to the park increases, at least three factors contribute to the distinctive profile of Ebbett Park. Firstly, the activities to which the park caters are not distractive, nor do they attract participants from considerable distances. This allows development of high averages for the inner zone, as discussed above. Secondly, the park is nearly enclosed by residential areas, with only four entrance lanes. Properties which do not share a common border with the park have only restricted access to it. This is especially important in the northern quadrant, where a residence only 50 metres by direct line from the park may be more than 350 metres from the nearest access point. Finally, a number of state houses are located in the outer zones. These houses, which are generally of constant value, are newer than their neighbours and are valued higher. Consequently, they raise the average values of the outer zones slightly, tending to produce a profile with a straight line.

The main period of construction was between 1935 and 1940, although the area featuring cul-de-sac street patterns west of the park represents post-1950 development. This area of newer housing is marked on the map by strong positive residuals. The single strong negative residual results from a small cluster of much older houses.

Akina Park.

Activity in this park centres around rugby and softball grounds, and although much of the space receives its heaviest use from passive recreational activities, Akina Park is classified as a primarily active open space (Figure 5.9). A location alongside the neatly maintained school grounds to the west makes the 23 acres of Akina Park seem even more generous. As a result, the active recreation areas are not cramped for space, and a 'buffer zone' of playspace is carefully maintained between them and the residential areas. This appears to offset the depreciating effects expected from an active

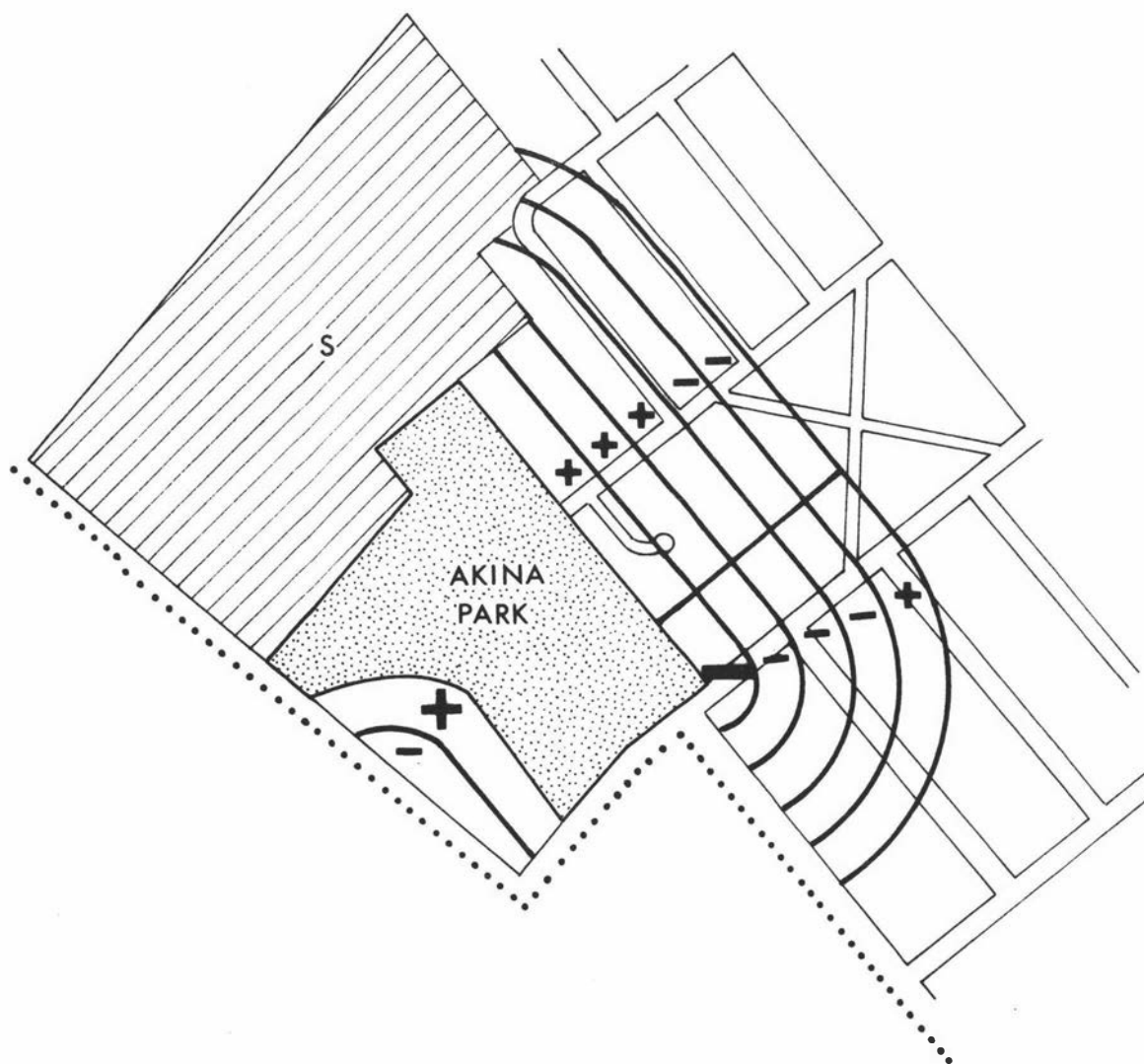


Figure 5.9 Map of Akina Park area, showing regression residuals. See Figure 2.1 for legend.

recreational park located near the city boundary. In the case of Akina Park, the result is a definite, although moderate, appreciating effect.

Although a few houses date from an earlier period, most of the housing was built between 1930 and 1935. Where clusters of the older houses remain, average values are sharply depressed. These areas are marked by negative residuals on the map.

Depreciating Parks

Only one park in Hastings is classified in this category, and it would be almost as accurate to declare that Kirkpatrick Park displays no effect at all. In keeping with the findings for Christchurch and Palmerston North, this neighbourhood is one of the least expensive areas, although it does not carry the lowest average found in Hastings.

Kirkpatrick Park.

This is one of the newest open spaces in the city; established as a recreation reserve in 1965, it became Kirkpatrick Park a year later (Figure 5.10). It serves as a neighbourhood playspace and passive recreation area for the community, with no provision for active recreation. The surrounding neighbourhood was developed as state housing between 1960 and 1965, with a number of multi-unit dwellings concentrated chiefly in the two inner zones. This reduces the average values for those zones, as state housing multi-unit structures generally have a lower price per unit than detached houses.

The homogeneity of the area is reflected by the 'straight line' profile shown in the regression graph, where a difference of only \$28 exists between the inner and outer zone averages. The large residuals shown for zone 1 result from the multi-unit characteristic mentioned above, as properties in the north quadrant are exclusively multi-unit, while more than half of the structures in the south quadrant are of single unit construction.

The relative youthfulness of housing is the main reason for higher property values in this complementary area. If the value of improvements is depreciated at the rate which Forrest (1965) finds to be valid--i.e., one

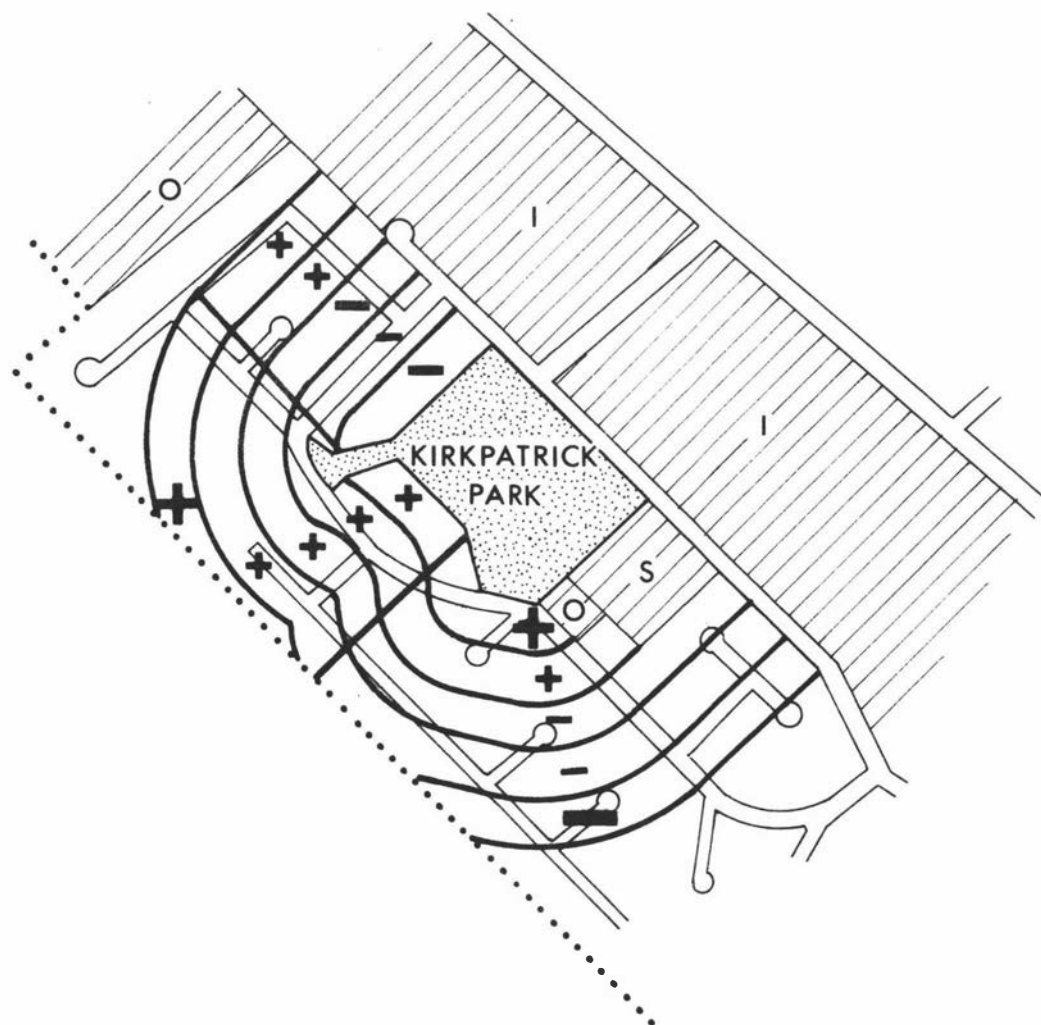


Figure 5.10 Map of Kirkpatrick Park area, showing regression residuals. See Figure 2.1 for legend.

per cent per annum for the age differential--Kirkpatrick Park becomes by far the lowest valued neighbourhood in Hastings. In fact, depreciation at only half the rate established by Forrest produces that result.

Other Parks

Mayfair Park.

Only one park in Hastings failed to find classification in either of the two main categories (Figure 5.5). In general, Mayfair Park displays a profile similar to that of Rugby Park in Christchurch, with higher values in zone 1 dropping to low averages in zone 2, and following the pattern for depreciating parks from there outward. However, the differences between zone averages for this park are very small, and the regression line is similar to that displayed by Kirkpatrick Park.

Mayfair Park also forms the nucleus for a state housing development, and was given to the city in 1955 upon completion of the housing construction. The park provides neighbourhood playspace as a secondary function, but its primary use is for soccer, including inter-city games.

The map of residuals requires little comment. The entire neighbourhood is quite homogeneous, so little difference in valuation is needed to reflect a residual exceeding one standard deviation. In addition, the larger residuals are readily accounted for, as the lower value areas are those containing multi-unit structures, while the high positive residual marks an area which is almost devoid of state-owned houses.

Evaluating the Hypotheses

Hypothesis I.

This hypothesis is strongly supported by the empirical evidence found in Hastings. When the combined data for all parks are used, a 'b' value of \$412 is calculated through the linear regression equation.

All but two of the ten parks considered display valuation profiles of an appreciating nature; the remaining two appear to have nearly a neutral effect.

Furthermore, the regression lines for no less than seven parks have relatively steep slopes. The average regression angle is 109.3 degrees, which represents a 'b' value of \$355 in the regression equation. The hypothesis is substantiated and is accepted without qualification for this city.

Hypothesis II.

The two previously introduced expressions of distance from park to rural land are established for Hastings parks, and the correlation is computed between regression angles and each distance representation. As noted for Palmerston North, correlations are not sufficiently close to suggest statistical significance. The 'distance to nearest rural land' argument provides a correlation coefficient of $r = +0.297$, while the 'percentage of distance' criterion finds a value of $r = +0.116$. Since neither value approaches statistical significance at the 0.05 level, the hypothesis is considered to be invalid, and is rejected for Hastings.

Hypothesis III.

As noted for the other cities, this hypothesis provides the most significant correlations of this study. The average value for all residential properties in the complementary area produces a coefficient of $r = +0.760$ ($t = 3.134$) when correlated against the regression angle. This is significant at the 0.02 level, which is the least significant figure of the three computed. Estimated and actual zone 1 values show coefficients of $r = +0.902$ ($t = 5.890$) and $r = +0.907$ ($t = 6.076$) respectively, both of which are significant beyond the 0.001 level. Regardless of the statistic used, this hypothesis is considered to be fully substantiated, and is accepted.

Hypothesis IV.

Correlation of housing density and park appreciative effect is not statistically significant in Hastings. A coefficient of $r = +0.130$ is noted, which allows computation of $t = 0.371$ using eight degree of freedom. Since these figures do not approach the minimum acceptable level of significance, the hypothesis is rejected for Hastings.

Hypothesis V.

Properties in the complementary areas around parks are much higher than those selected at random from outside the areas. The average capital values

are \$8,415 for 2,705 park-oriented properties, and \$7,287 for 480 properties chosen by random sample.

Although no statistical inferences are supported, the difference of 15.48 per cent must be considered to be of sufficient magnitude to uphold the hypothesis, which is accepted as valid for this city.

NOTES

¹Hastings was gazetted, or valued, on 1 October 1969.

²All Hastings parks except the Hawke's Bay Jockey Club Racecourse are classified as either primarily passive or primarily active by Mr J.G.C. MacKenzie, Superintendent of parks, Hastings City Council.

³When the random sample of properties outside the complementary areas are included, the average value for Hastings properties drops to \$8,313.

⁴This is in direct contrast to the effect of the Wanganui Racecourse, which is also located near the centre of a city of comparable size. In Wanganui, the Racecourse is enclosed by a high, solid fence which effectively blocks any view of the open space inside. The surrounding area has sharply depressed average property values.

CHAPTER VI

WANGANUI

Although this city was originally intended for complete consideration as a representative of cities with between 30,000 and 45,000 residents, Wanganui data are now included primarily for comparison with those of the other cities. As Table 2.1 shows, some 27 per cent of the city is built on sloping terrain, and seven of the ten parks studied show moderate to severe distortion of property values as a result of terrain elevation. Consequently, the conclusions which may be drawn from the Wanganui data are restricted, and the city merits less detailed comment than the other study areas.

The city of Wanganui, as considered in this study, covers an area of 6,068 acres. The airport and the portion of the Wanganui River which runs through the city, although actually within the city boundaries, are excluded.

The ten parks which are identified for study are well-distributed throughout the city, as only the residential area extending along the river to the northeast is without a major park (Figure 6.1). These parks, which are listed in Table 6.1, provide a total of 420.4 acres of public recreation space. This amounts to only 7 per cent of the city area. However, with 11.8 acres of open space per thousand population, open space is quite adequate in Wanganui.

Four other parks must be included in the inventory. Cooks Gardens (13.7 acres), Queens Park Domain (21.2 acres) and Moutoa Gardens (2.7 acres) are omitted because they are surrounded by non-residential land, and Aramoho Park (7.8 acres) has very few residences near it. By including these parks, the total space reaches 465.8 acres. In addition, two 18-hole golf courses are

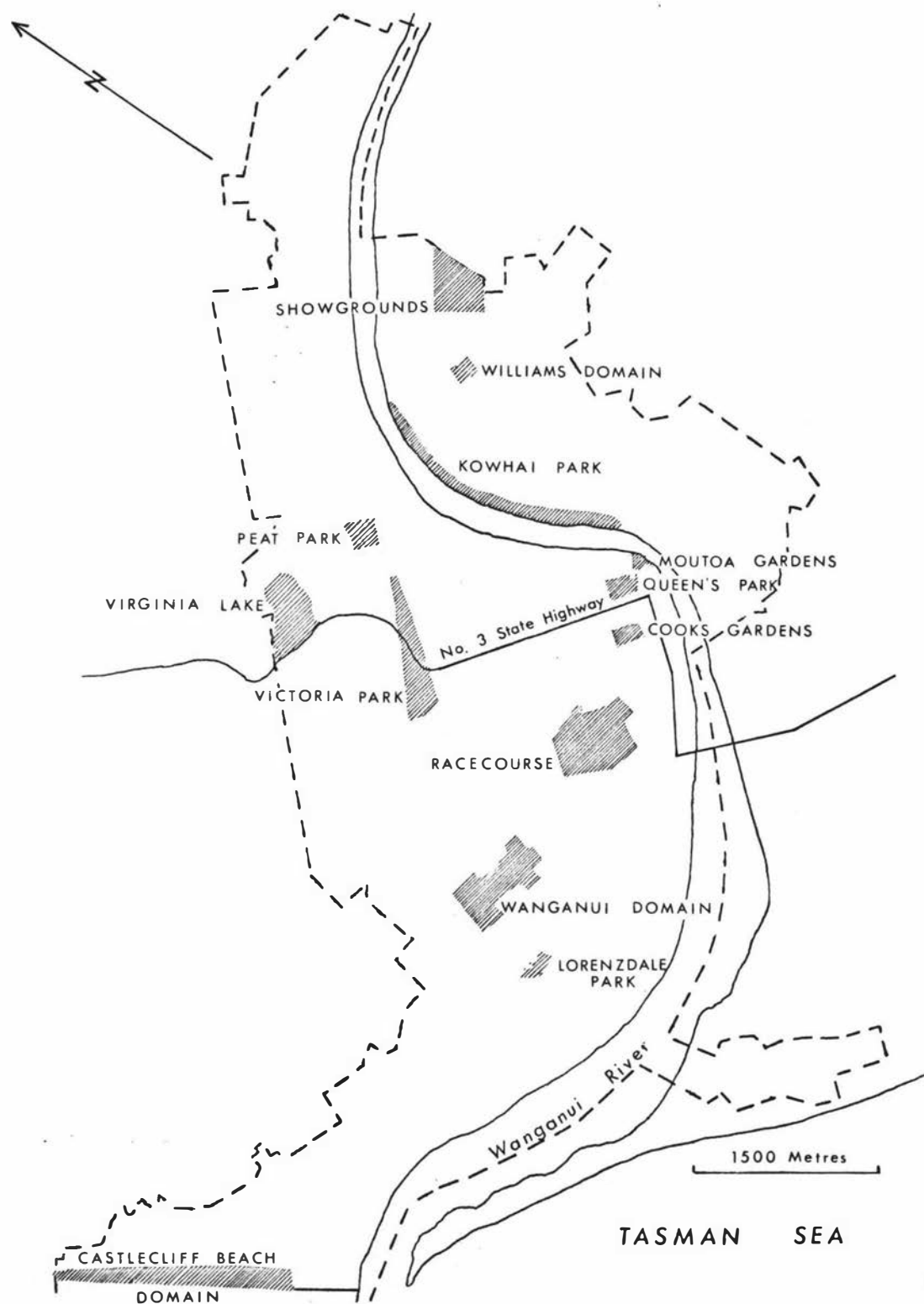


Figure 6.1 Map of Wanganui study area.

outside the city boundary, and the river provides space for both active and passive recreation. As noted for Palmerston North, the low population density of the city suggests that private open space is abundant.

Table 6.1
Wanganui Open Spaces

<u>Open Space</u>	<u>Area (acres)</u>
Kowhai Park	46.9
Wanganui Domain*	56.5
Wanganui Racecourse+	81.1
Lorenzdale Park	4.5
Williams Domain	6.3
Wanganui East Showgrounds	46.4
Virginia Lake	47.3
Peat Park	13.4
Victoria Park#	52.8
Castlecliff Beach Domain	<u>65.2</u>
Total	420.4

* Includes Gonville Domain.

+ Includes Spriggins Park.

Includes Laird Park.

Source: Mr M.R. Boothby, Superintendent
of Parks and Reserves, Wanganui.

Appreciating Parks

As Table 6.2 reveals, only two of the ten open spaces in Wanganui can be considered as appreciating parks. This is the result of at least two factors: the low population density of the city, with the concomitant abundance of private open space, and the distorting effect of view, which excludes from this category some parks which otherwise would probably be included. Again, the open spaces in each category are discussed in descending order of average property values.

Kowhai Park.

This open space, which is also referred to by the cumbersome name of James McGregor Memorial Park and Children's Playground, extends along the river for more than two kilometres (Figure 6.2). It was originally ceded to the Wanganui Beautifying Society by the Wanganui Harbour Board, and in 1935

Table 6.2
Average Property Valuations, Wanganui¹

Open Space	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	r*	@
Kowhai Park	\$ 8,358	7,010	5,951	5,838	5,784	-0.974 ^b	.005
Wanganui Domain	6,527	6,388	6,256	5,871	5,868	-0.964 ^a	.005
Wanganui Racecourse	5,688	5,775	5,910	6,234	6,451	+0.976 ^a	.005
Lorenzdale Park	5,537	5,588	5,667	5,745	5,751	+0.977 ^a	.005
Williams Domain	5,078	5,143	5,393	5,396	5,361	+0.913 ^b	.025
Wanganui East Showgrounds	3,348	4,436	4,584	4,978	5,013	+0.963 ^b	.005
Virginia Lake	10,388	9,901	9,551	9,707	9,919	-0.707 ^b	N/S
Peat Park	7,958	9,904	6,172	6,766	7,354	-0.479 ^a	N/S
Victoria Park	6,743	5,992	5,813	5,972	6,087	-0.748 ^b	N/S
Castlecliff Beach Domain	4,793	4,006	4,146	5,239	4,603	+0.270 ^a	N/S

* correlation coefficient, Pearson Product Moment method.

^a calculated using linear function.

^b calculated using logarithmic function

@ alpha level of significance, using 1-tailed test and
degrees of freedom df = n-2.

N/S not significant at .05 level.

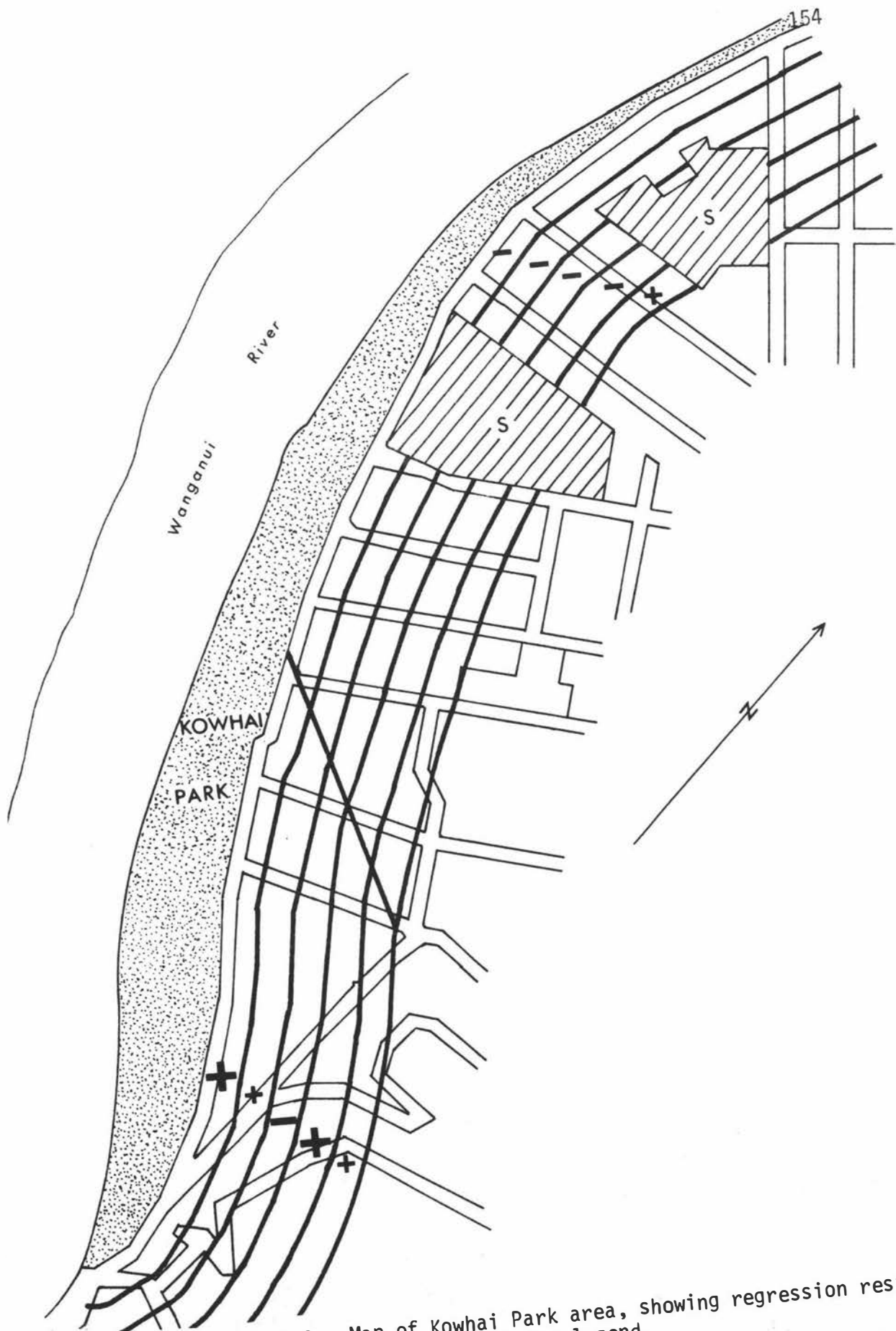


Figure 6.2 Map of Kowhai Park area, showing regression residuals. See Figure 2.1 for legend.

title was transferred to the city. The park is maintained in a natural state; roads, picnic tables and a large playground are the main 'improvements' to that natural condition, although space is also provided for the Motor Boat Club and the Jet Boat Wharf. Kowhai Park is classed as a primarily passive recreation area.²

Two periods of construction account for most of the housing. The main building period occurred between 1923 and 1928, and a second peak followed World War II, with the years between 1947 and 1955 of most importance. In spite of the relatively old housing, this area remains a desirable neighbourhood, and has the highest value regression angle of the parks considered in Wanganui (Figure 6.3a).

Terrain is rather level except near the southeast end of the park, where the steep slopes of Bastia Hill rise sharply from the river bank. Some choice residential sites within the complementary area there are more than 50 metres above the park.

The generally higher terrain in the south quadrant is reflected by higher average values there, and all regression residuals which merit mention are associated with terrain elevation. The strong negative residual shown in zone 3 results from an area of lower relief where several older houses remain; the high positive residual in the adjacent zone reflects several newer houses built on the steep slopes above that area.

Wanganui Domain.

For the purpose of this study, both the Wanganui Domain and the Gonville Domain are considered as one park (Figure 6.4). Wanganui Domain is the site of the Wanganui Municipal Golf Course, a 9-hole public course, while the Gonville Domain is devoted to croquet and hockey. Since the golf course provides by far the main attraction, that classification is assigned to this open space even though the smaller area is a primarily active recreation area.

This open space is a Crown Reserve, and in 1924 was transferred from the Gonville Town Board to Wanganui. Almost all housing in zones 1 and 2 of the east quadrant was constructed within a year or two of that date, and the

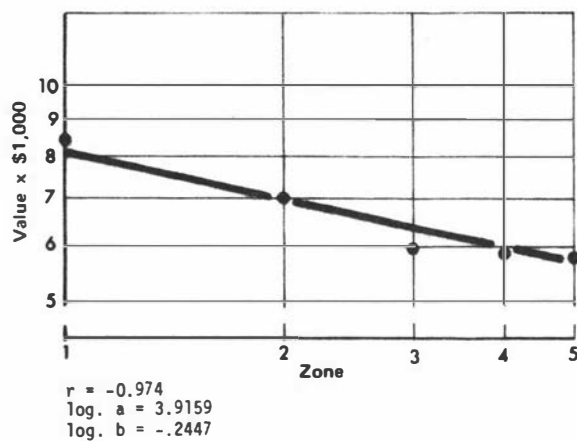


Figure 6.3a Kowhai Park

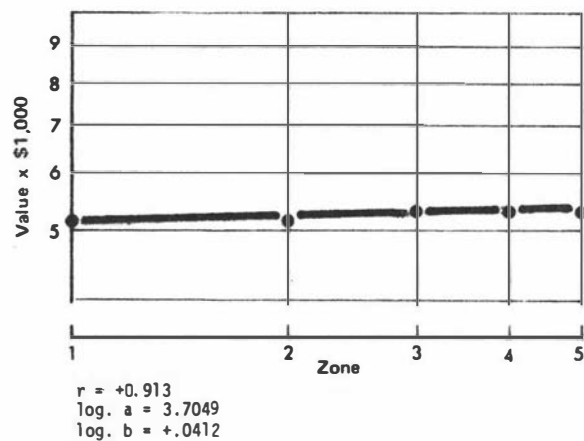


Figure 6.3e Williams Domain

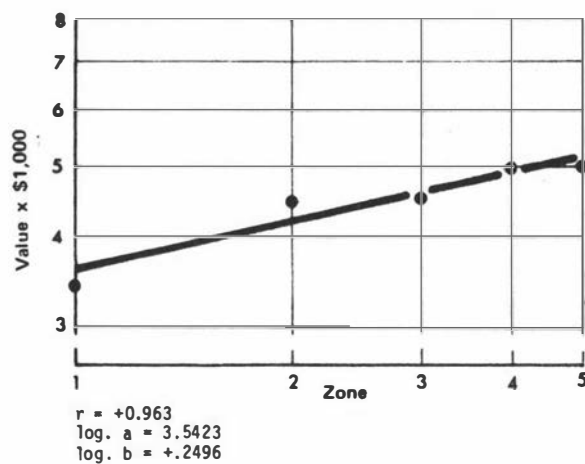


Figure 6.3f Wanganui East Showgrounds

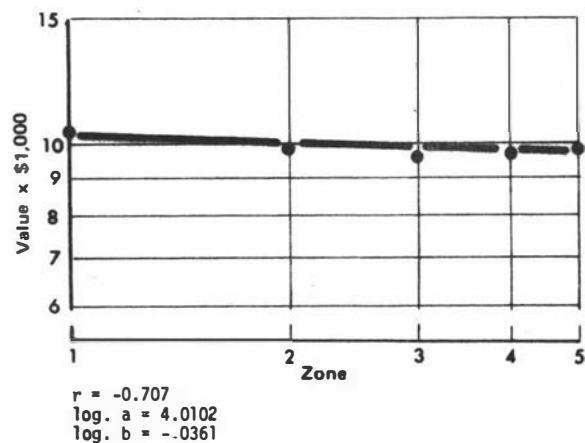


Figure 6.3g Virginia Lake

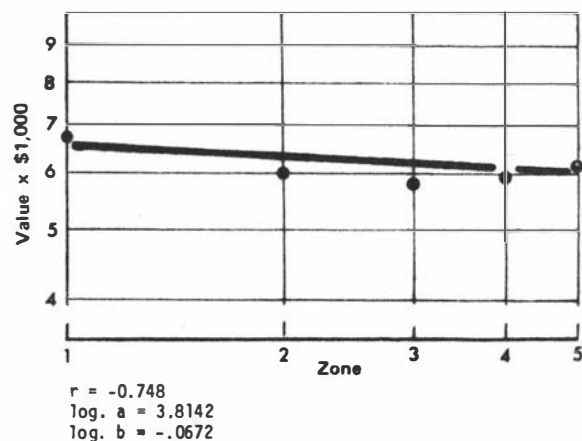


Figure 6.3i Victoria Park

Figure 6.3 Curvilinear regression graphs for Wanganui parks.

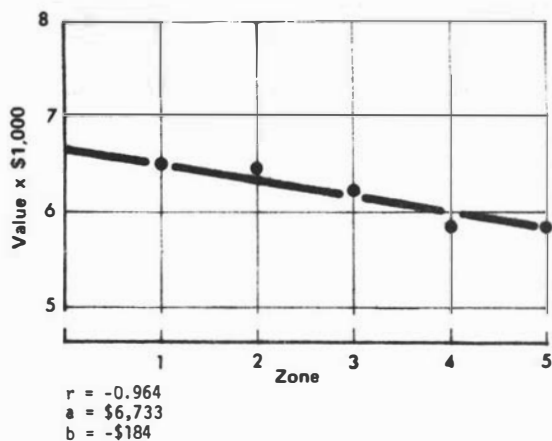


Figure 6.3b Wanganui Domain

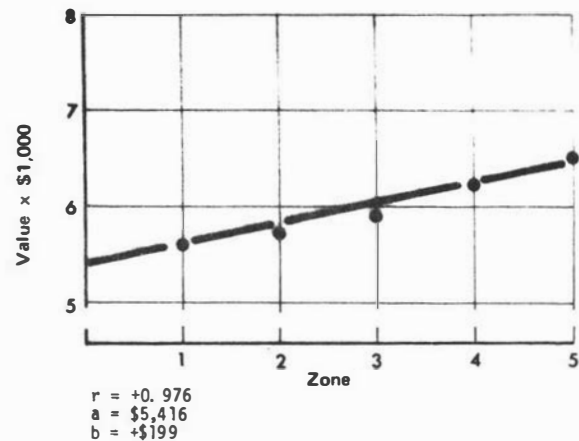


Figure 6.3c Wanganui Racecourse

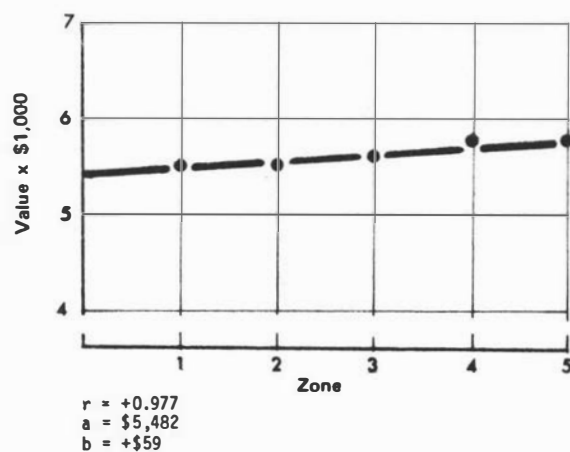


Figure 6.3d Lorenzdale Park

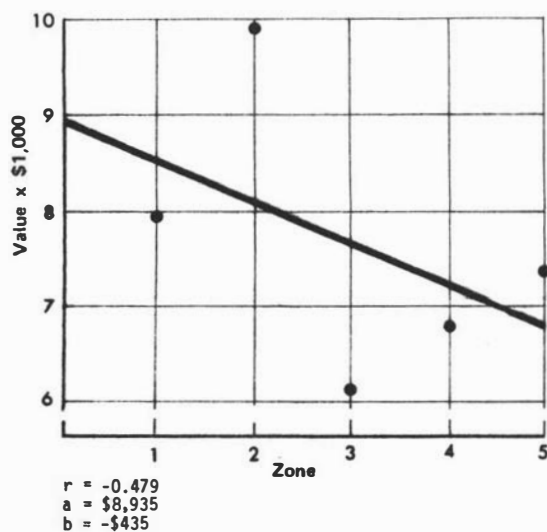


Figure 6.3h Peat Park

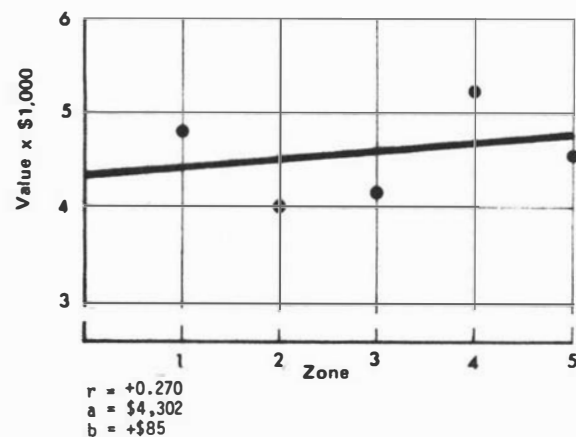


Figure 6.3j Castlecliff Beach Domain

Figure 6.3 Linear regression graphs for Wanganui parks.

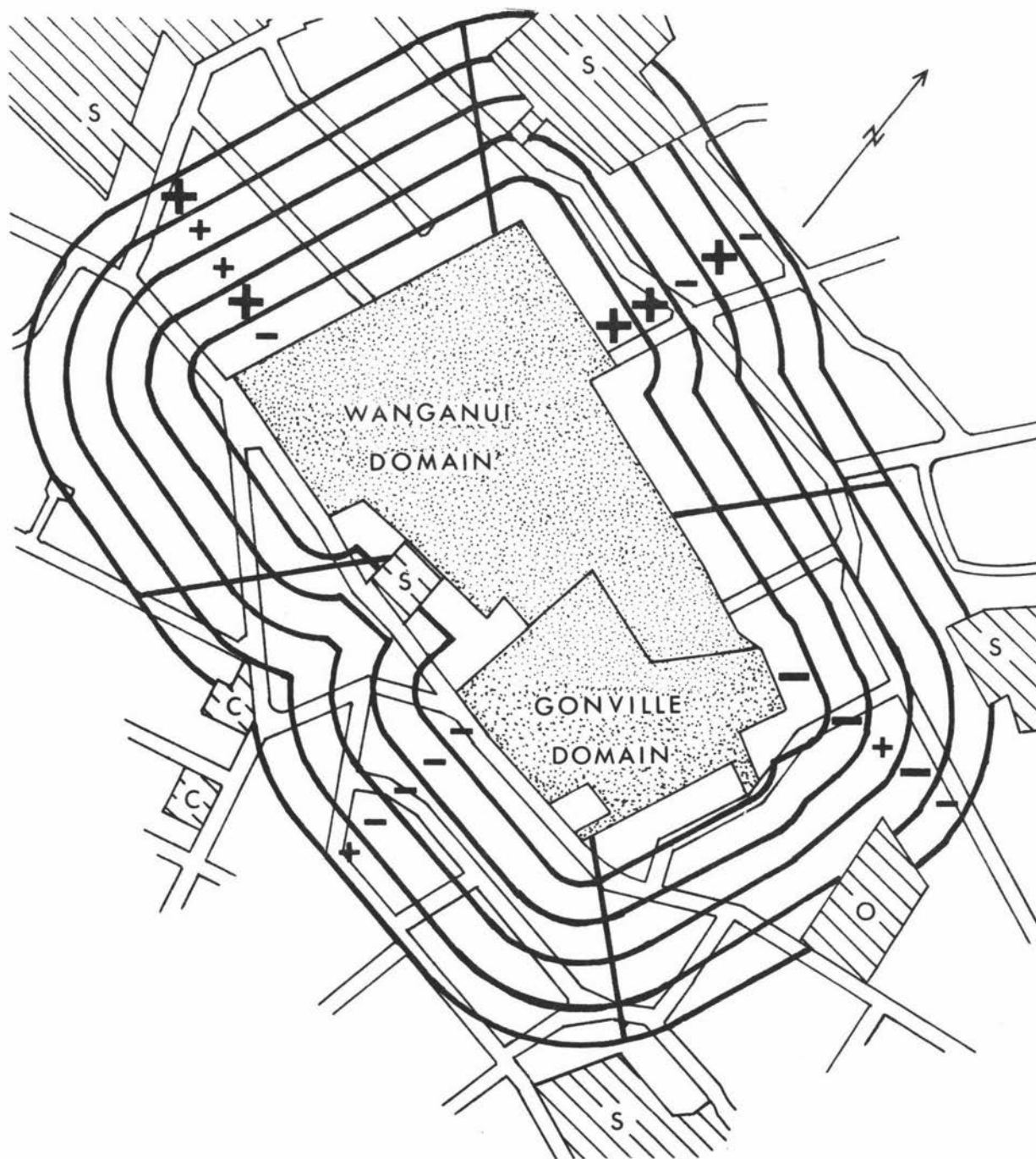


Figure 6.4 Map of Wanganui Domain area, showing regression residuals. See Figure 2.1 for legend.

housing throughout that entire quadrant is quite old. The strong negative residuals reflect the older housing, although the effect of proximity to an active recreation area is also apparent through the three inner zones.

Elsewhere, most of the housing was built after 1947, and a fair amount of structures less than five years old account for the higher values noted in the west quadrant. Most of the houses north of the golf course are of recent construction also. In addition, the terrain, which is generally from 20 to 40 feet above the golf course, influences property values in that area.

Depreciating Parks

Four of the Wanganui open spaces are classified as depreciating parks, although two of them display regression lines with very gentle slopes. The other two, Wanganui Racecourse and Wanganui East Showgrounds, show strong depreciating patterns.

Wanganui Racecourse.

The area considered under this title includes the Racecourse facility, operated by the Wanganui Racing Club, together with Spriggins Park, a rugby ground consisting of 7.6 acres adjoining the Racecourse to the east (Figure 6.5). Both areas are long-standing open spaces, as they appear on an old map of Wanganui (c. 1880), although Spriggins Park is referred to as the 'Cricket Ground'.

The rugby ground is completely enclosed by a high wooden fence, so that visual access is denied, and the adjacent properties have the lowest average value noted in this complementary area. Values rise sharply in this quadrant as distance to the park increases, although part of the increase must be attributed to influence of the CBD.

The Racecourse is also fenced around most of its perimeter, so that the depreciating effect of this open space is not unexpected. Most of the complementary area is flat and uninspiring, and the housing is generally homogeneous in quality as well as age, with most houses constructed during the first

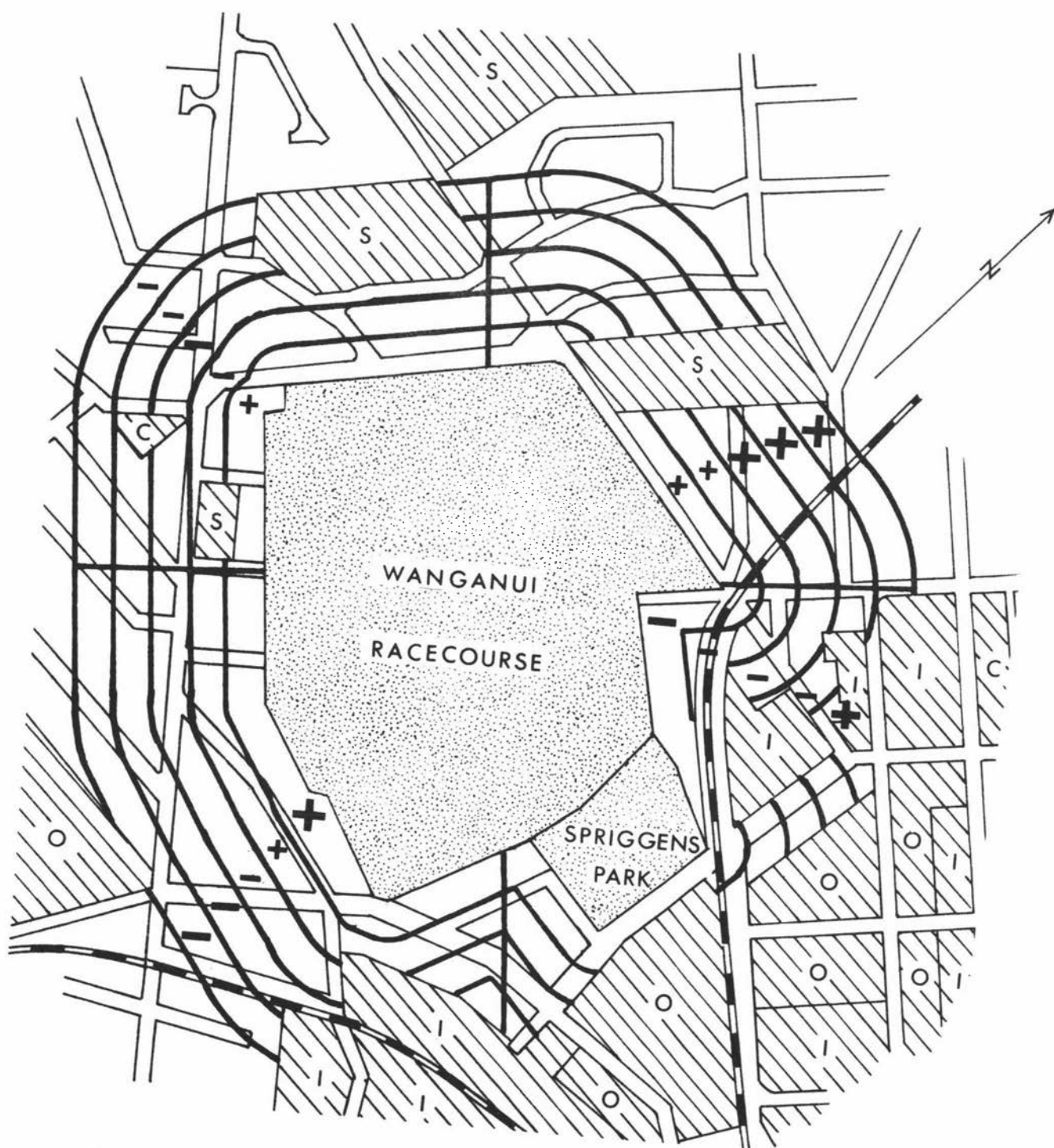


Figure 6.5 Map of Wanganui Racecourse area, showing regression residuals. See Figure 2.1 for legend.

decade of this century. Consequently, the area has little to commend it, and the fenced Racecourse provides no attraction.

The area of higher ground north of the Racecourse is marked by the strong positive residuals shown in Figure 6.5, although the average values also reflect replacement of a few old houses on the more desirable, elevated sites by new homes. Influence of the Wanganui-Castlecliff Railway and associated industrial development depresses values south of the Racecourse.

Lorenzdale Park.

This park, the smallest in the entire study, was given to the city in 1923 as a memorial to a World War I soldier (Figure 6.6). It remained as the centre of an almost undeveloped residential area for more than two decades. More than 80 per cent of the houses in the complementary area were constructed between 1945 and 1950, with state houses accounting for most of the units.

Facilities at Lorenzdale Park consist of a soccer field and playground equipemnt towards the east end, while the west end of the park is somewhat higher in elevation and is left in a natural state. Dickson (1970: 143) describes it as " . . . an untidy grassed area with a few swings and even less visual appeal than the worst open spaces of Wanganui East," even though he has few words of approval for the Wanganui East open spaces.

The regression line of this park, which is classified as a primarily active recreation area, shows a rather gentle depreciating slope. The strong positive residuals in the west quadrant reflect the generally elevated terrain in that direction, while that found in the east quadrant appears to result from the combined effect of location along a main thoroughfare and the absence of state housing units, which have held down average values throughout most of the area. The residences in the outer zones of the south quadrant are the oldest in this complementary area, with an average age of more than 40 years; negative values reflect that age.

Williams Domain.

This open space is part of the original Crown Grant, although it was granted first to the Wanganui East Town Board. The area is flat and

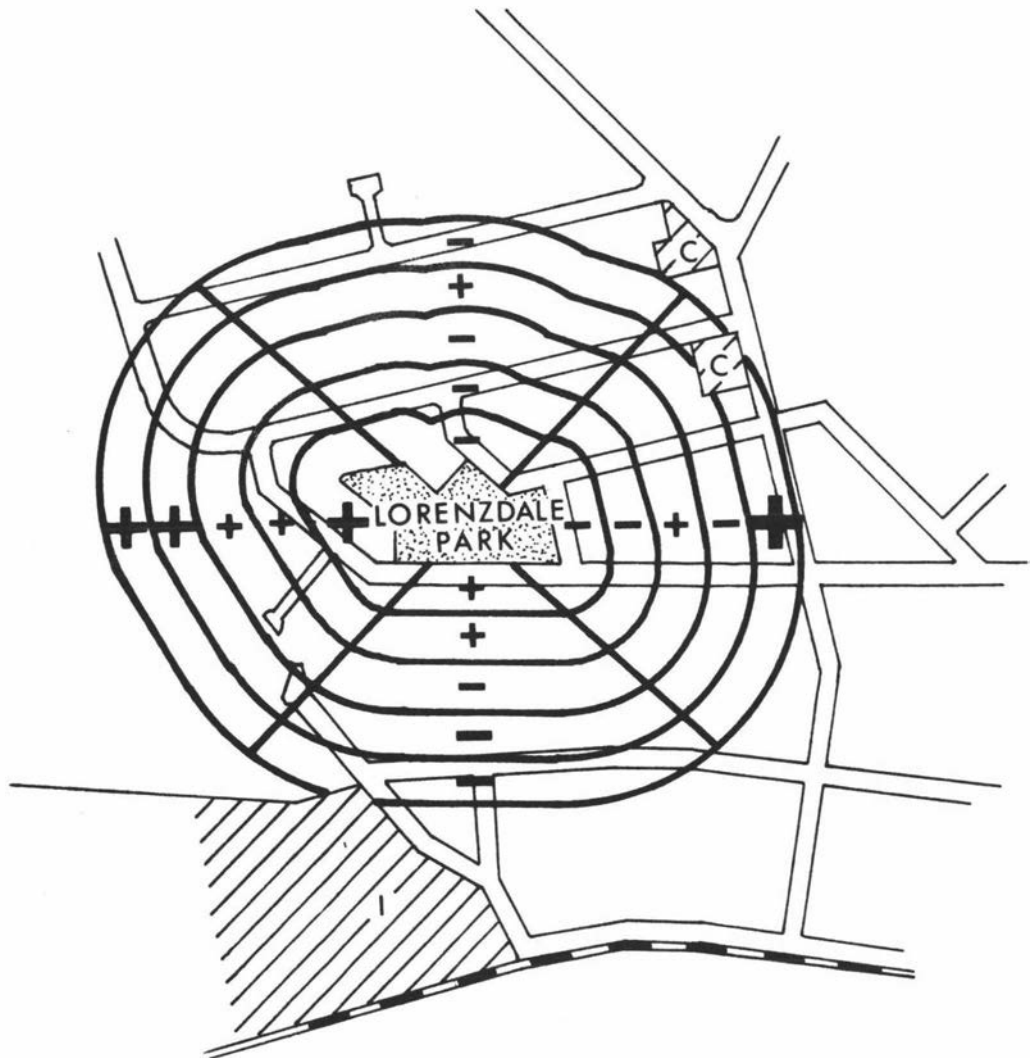


Figure 6.6 Map of Lorenzdale Park area, showing regression residuals. See Figure 2.1 for legend.

uninteresting, with a rugby field forming the main attraction (Figure 6.7). The Domain is classed as a primarily active recreation space.

According to Dickson (1970: 142), Williams Domain " . . . is a flat area in which the monotony is broken only by goalposts, swings, and a solitary row of trees. It is almost completely devoid of any other vegetation or of contrast in elevation. One doubts if the area has ever been used effectively."

Most housing was built between 1923 and 1928, although a few houses date from each decade of this century. Some state houses were constructed about the time of World War II, and although these newer units are located in the inner zones, they do not exert sufficient influence to offset the depreciating effect displayed by the park.

Properties in the north quadrant suffer from the depressing influence of the railway and associated railway shops and industrial warehouses. On the other hand, the strong positive residuals to the west reflect the absence of properties with very low value usually found in all areas, rather than any exceptionally high-priced properties. Finally, quadrantal values must be considered while keeping in mind that this area has one of the lowest averages found in the entire study.

Wanganui East Showground Reserve.

The Showgrounds, recently renamed Wembley Park, was "ceded to the City by the Wanganui A. & P. Association in 1936 with special rights to stage agricultural shows. It has not yet been availed of for this purpose." (Boothby: 1971). The space is used occasionally for archery, soccer and rodeo contests, and is also the venue for traveling circus performances (Figure 6.7). Use of the space for neighbourhood passive recreation is minimal, so the park is classed as an active recreation area.

The neighbourhood is the least desirable considered in this city. Although the Castlecliff Beach Domain complementary area shows a slightly lower average value, that figure includes a large number of beach houses or 'baches', while all houses near the Showgrounds are used as full-time residences.

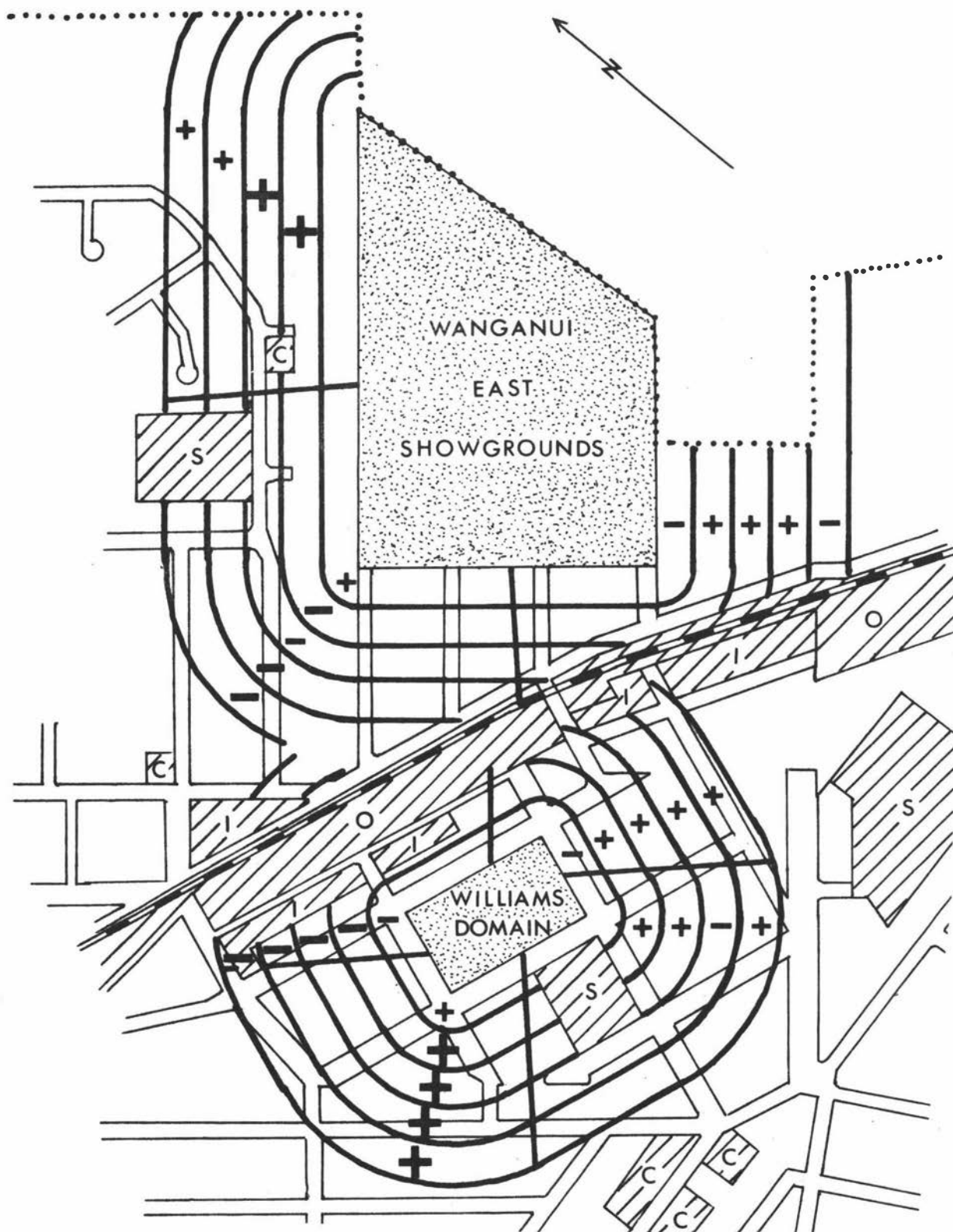


Figure 6.7 Map of Williams Domain and Wanganui East Showgrounds areas, showing regression residuals. See Figure 2.1 for legend.

The area, which was called Eastown before merging with Wanganui, was built up during three discrete periods. Most housing in the west quadrant was built between 1908 and 1912, while the houses south of the Showgrounds were constructed about 1952. The most recent building is concentrated in the area north of the park, where the majority of houses date from 1956 to 1960, although a few are of more recent construction.

A number of state housing units are found in the two outer zones north of the park; all but one of them are multi-unit structures with a low per-unit value. Consequently, the slope of the regression line is eased somewhat. In spite of that, the pattern of values shows a strong depreciating effect for the park, with all significant residuals reflecting mainly the age of housing.

Other Parks

Four parks in Wanganui fail to be included in the two major categories. However, none follow the pattern which is described by the deviant parks in the other cities. Rather, in every instance the pattern of the Wanganui parks discussed here shows the strong influence of terrain elevation and the resulting view. Meaningful statistical inferences as to the appreciative qualities of these open spaces are not drawn, as they would necessarily have to rely heavily on subjective judgments.

Virginia Lake.

This area, which was the original Wanganui city water supply, was purchased in 1886 for the city by the Public Works Department (Boothby: 1971). Housing in the complementary area dates mainly from 1908 to 1912, although the few homes which are older than that are more than counterbalanced by a number of newer ones. Nonetheless, the area is a prestigious one which has kept its value for many decades, and shows little sign of decadence. The lake and surrounding grassed area and facilities function as a city-wide amenity attraction which caters solely to passive recreation (Figure 6.8).

The complementary area has by far the highest average property value noted in Wanganui. However, because of its location atop St John's Hill and

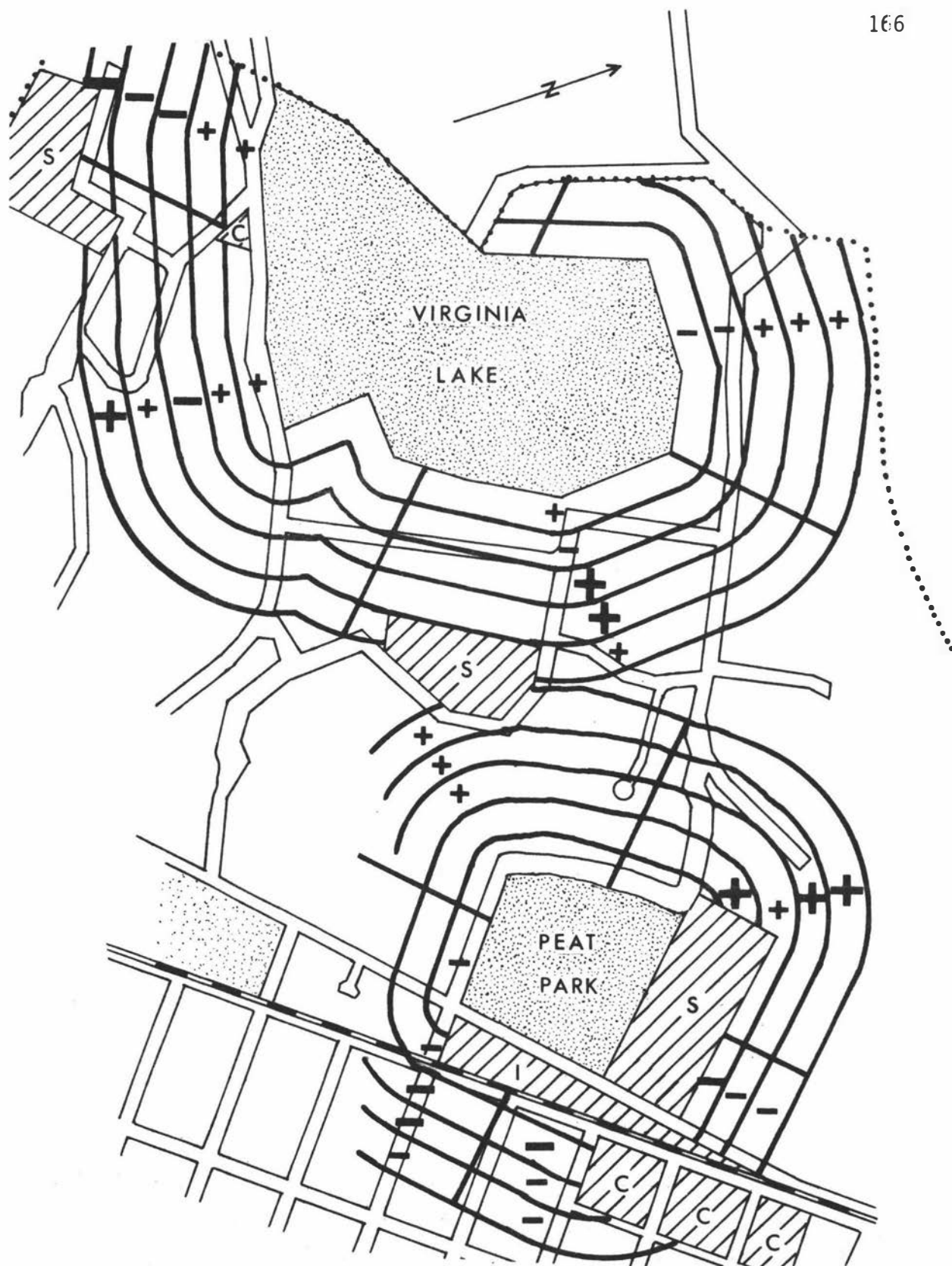


Figure 6.8 Map of Virginia Lake and Peat Park areas, showing regression residuals. See Figure 2.1 for legend.

the view associated with that elevated site, the lake does not exhibit the definite appreciative effect which is anticipated. Precipitous terrain, especially in the outer zones of the east and south quadrants, provides outstanding views of open country and the Wanganui River in the distance.

The negative residuals west of the lake result from the low number of properties because of the city boundary, and the presence of a very few old houses, while the strong positive residuals on the map appear to be direct reflections of view-affected values.

Peat Park.

This area was established in 1911 as a play area for primary school children, and adults are specifically prohibited from using the facilities (Figure 6.8). Soccer and rugby fields form the main attraction, making this an active recreation space, although a small area along the northwest side is set aside as a deer park.

The pattern of residuals is affected by several factors. There are very few properties, especially in the two inner zones; the houses located in the north quadrant reflect the effect of view, as some of them are sited more than 100 feet above the level of the park; and the railway which parallels the southeast boundary of the park prevents access. High, closely woven wire fences keep people from the railway tracks, and also restrict visual access from that direction. A petrol distribution plant in the commercial area between the park and the railway adds to the disruption of visual access. In addition, a considerable difference in age of housing is apparent. Houses near the park generally date from 1950 to 1955, although those residences across the railway are much older, with construction mainly in the decade before World War I.

Victoria Park.

This open space, which includes the steep bush-clad face of a terrace together with an elongated strip of level land along the higher ground, is part of the town belt set aside in 1840 during the original survey of Wanganui (Figure 6.9). With the exception of two streets which traverse it, the lower portion of the park remains as undeveloped open space. Facilities are provided on the upper level for cricket, tennis, bowls, croquet and basketball.

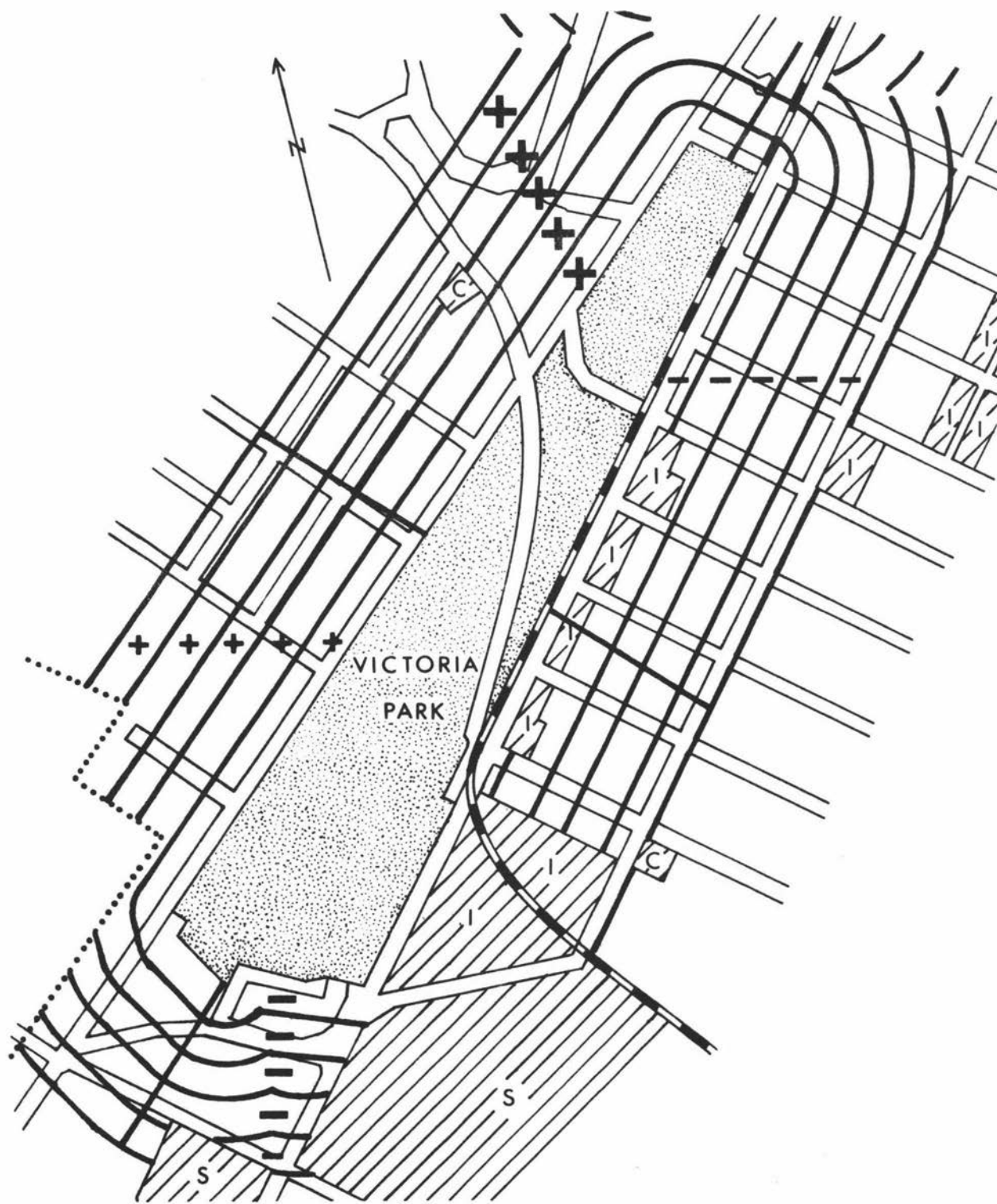


Figure 6.9 Map of Victoria Park area, showing regression residuals. See Figure 2.1 for legend.

In addition, a panoramic viewpoint is set aside near the Great North Road. This viewpoint attracts sufficient visitors to establish the classification of Victoria Park as a primarily passive space.

The passive classification is of little importance in evaluating the impact of this park, as the effect of terrain relief overrides any appreciating effect which may exist. In addition, high hedges and trees restrict the view from a number of properties along the northwest border of the park.

Houses along the lower side of the park--that is, the side nearest the CBD--are quite old, having been constructed between 1908 and 1912, while those on the opposite side of the park date from about 1925 to 1940. A number of houses of very recent construction are found northeast of the park. In general, the regression residuals reflect the effect of a combination of view and age of housing. Although the park tends toward an appreciating pattern, it is far from being statistically significant.

Castlecliff Beach Domain.

This Crown Reserve was transferred to Wanganui in 1924 by the Gonville Town Board when that town merged with the larger city. As might be anticipated, the Domain provides for passive recreation (Figure 6.10).

The sand dunes in the Domain vary in height up to 40 feet along the greater part of the open space; near the northern end they reach 80 feet. In general, the residential areas of the first 3 zones are 5 to 10 feet lower than the terrain of the park. Residents who live there cannot see the Tasman Sea from their houses, and property values are quite low. The outer two zones include terrain which is much higher, and the resulting view exerts a strong impact on the pattern of values. As a result of that disturbing effect on values, correlation is far from being statistically significant.

Most of the area was subdivided prior to 1923, and housing in the complementary area dates from pre-1900 to the present, with nearly 40 per cent of it constructed since 1956. However, some 26 per cent of the houses were built between 1918 and 1921, and another 10 per cent predate that period. Consequently, average age of housing is of little use in interpreting broad value

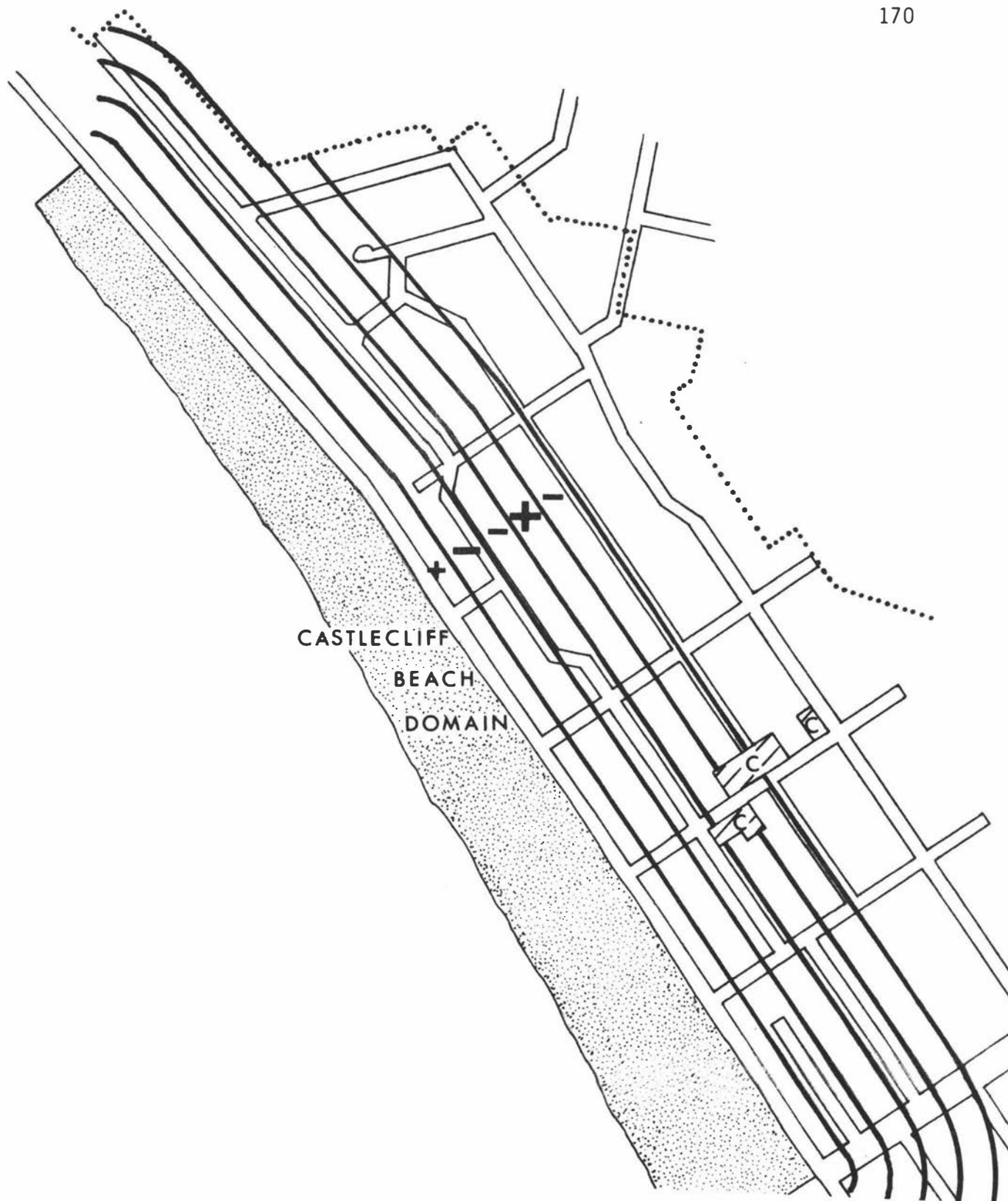


Figure 6.10 Map of Castlecliff Beach Domain area, showing regression residuals. See Figure 2.1 for legend.

patterns, except to note that areas of higher elevation near the north end of the park remained almost totally undeveloped until 15 years ago. Hence, those properties show the effect of both view and recency of construction.

Although the average value of properties in this area is the lowest noted in this study, this is not indicative of the least desirable neighbourhood studied. Rather, many of the structures are beach houses, or 'baches'. These second homes are used only during holidays, and tend to be functional and somewhat austere. In addition, Wanganui was 'gazetted' two years or more before the other cities in the study, so that values reflect little of the recent inflation of real estate prices.

Evaluating the Hypotheses

Hypothesis I.

Little support for this hypothesis is noted in Wanganui. The combined data for all parks produces a 'b' value of -\$118 with linear regression. If data are used for only the six parks which display statistically significant patterns, the 'b' value remains almost the same at -\$115. Use of the average regression angle is less encouraging; the average for all ten parks is only 93.9 degrees, while the six significant parks average to exactly 90 degrees.

Clearly the Wanganui data are influenced by factors other than proximity to parks; terrain elevation is the dominant factor. Only the Racecourse, Williams Domain and Wanganui East Showgrounds are centred on level terrain. Although this hypothesis is not substantiated for this city, the rejection is considered to result from the effect of view, and should not influence acceptance for the study as a whole.

Hypothesis II.

Correlations of data in support of this hypothesis fail to approach statistical significance. As noted for both Palmerston North and Hastings, use of the 'distance to nearest rural land' argument provides the better correlation. Using that argument, a coefficient of $r = +0.729$ is calculated for the six parks with significant patterns; $r = +0.381$ is determined when data

for all ten parks are used. Neither is significant at the 0.05 level and the hypothesis is rejected.

Hypothesis III.

This postulation which has the strongest support in the other cities, also is upheld in Wanganui. However, it is the only hypothesis to be substantiated by the Wanganui data. The three expressions of the hypothesis set down for the other cities are tested against both the data for only six parks and that for all ten parks. Correlation of regression angles against average property values, estimated zone 1 values and actual zone 1 values produces values of $r = +0.845$, $r = +0.959$ and $r = +0.952$, respectively, for the six significant parks. When data for all ten parks are used, values of $r = +0.488$, $r = +0.749$ and $r = +0.730$, respectively, are found. As noted for other cities, the estimated zone 1 values produce the closest correlation, which is significant at the 0.01 level for six parks, and at the 0.02 level for the ten units. This hypothesis is accepted for Wanganui.

Hypothesis IV.

Correlation of housing density and regression angle is not statistically significant in this city. With data for all ten parks considered, a coefficient of $r = -0.021$ is calculated, from which $t = 0.059$ is computed, using eight degrees of freedom. With the non-significant parks omitted, a coefficient of $r = +0.064$ is determined, which allows computation of $t = 0.008$, using four degrees of freedom. These figures are far from being statistically significant, and the hypothesis is rejected for Wanganui.

Hypothesis V.

Little difference is noted between the properties chosen by random sample and those within the complementary areas of parks. The 405 random sample properties have an average value of \$5,872 compared with an average of \$6,124 for properties within the complementary areas of all ten parks, and \$5,891 for properties around the six parks with significant patterns. Differences of 4.3 per cent and less than one-half of one per cent are negligible, and the hypothesis is rejected for this city.

NOTES

¹Wanganui was gazetted or valued by the Valuation Department on 1 November 1966.

²Functional classification into the 'primarily passive' and 'primarily active' categories for five Wanganui parks is accomplished by this author. Those parks are Kowhai Park, Wanganui Domain, Racecourse, Virginia Lake and Castlecliff Beach Domain. The other five parks are classified by Mr M.R. Boothby, Superintendent of Parks and Reserves, Wanganui.

CHAPTER VII

SUMMARY AND CONCLUSION

Summary

General Findings.

The complex task of summarising the foregoing data into meaningful generalisations and patterns is best accomplished through the use of graphs. Three graphs, each combining data for all four cities, are prepared for analysis.

Park Size and Appreciative Effect. The first graph, shown in Figure 7.1, uses as arguments the size of the park and its regression angle.¹ Calculations produce a correlation coefficient of $r = +0.403$ ($t = 3.051$; $z = 2.821$), which is significant at the 0.01 level.² Visual inspection of the graph reveals that of the 22 parks larger than 20 acres in extent, only five show regression angles of less than 90 degrees; these depreciating parks are Shirley Golf Course (Christchurch), Agricultural and Pastoral Showgrounds (Palmerston North), and the Racecourse, Wanganui East Showgrounds and Castlecliff Beach Domain (Wanganui). As noted in previous chapters, four of these open spaces present unattractive facades to surrounding areas, while Castlecliff Domain is affected by the effect of higher terrain in the outer zones. In spite of the strong depreciating effect of some parks, the 22 units combine for an average regression angle of 101.7 degrees. The slope of this angle represents the considerable 'b' value, or decrease in value, of \$213 with each 50-metre increase in distance from the park.

In contrast, the 28 parks which are smaller than 20 acres in size show an average regression angle of 91.1 degrees, which indicates almost a neutral effect. Furthermore, these open spaces are nearly evenly divided, with 13 parks associated with increasing values and 15 showing a depreciating effect.

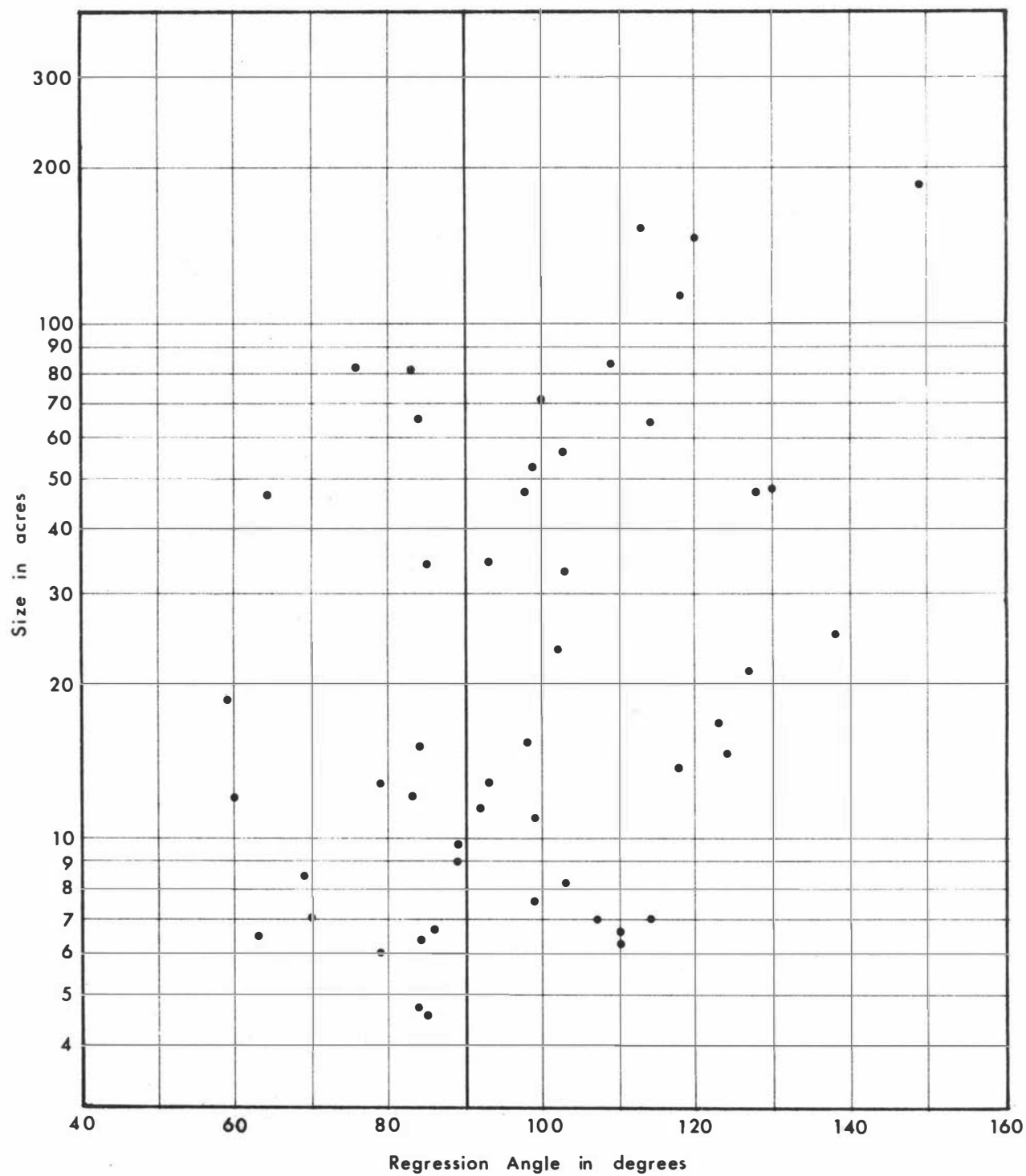


Figure 7.1 Size of park vs. regression angle.

Thus, a significant trend is discernible between the larger and smaller open spaces, with the larger parks responsible for a considerable amount of the appreciative effect.

Age of Housing and Appreciative Effect. A second graph, shown in Figure 7.2, compares average age of housing in the complementary area of each park with its associated regression angle. A correlation coefficient of $r = -0.003$ ($t = 0.017$; $z = 0.018$) shows no statistically significant relationship between these two factors. In this instance, no pattern is noted through visual inspection of the graphed data and the graph is dropped from further consideration.

Property Values and Appreciative Effect. The third graph, Figure 7.3, displays data derived from average property values plotted against regression angles. Economic forces which affect the property market and prices were not constant for the four cities considered. Each was gazetted at a different time. In addition, it is inappropriate to attempt direct comparison of property values for cities which are divergent in size, location, function, etc.

In order to facilitate inter-city comparison of data, it is necessary to convert the figures to a common level; the level selected is the mean value for all park-oriented properties within each city. Thus, the value used for a park on this graph is established as a percentage, calculated using the averages of the park and the city.

As noted in earlier chapters, close correlation is found between average property value and appreciative effect, as measured by regression angles. When the data for the four cities are combined, correlation is found to be highly significant, with a coefficient of $r = +0.633$ ($t = 5.669$; $z = 4.433$). This is statistically significant at the 0.001 level.

Visual inspection of the graphed data finds them grouped into three distinct clusters, with only five parks which fail to be accommodated by one of the groups. The search for homogeneous characteristics for those parks which are grouped together identifies two main features: size and function.

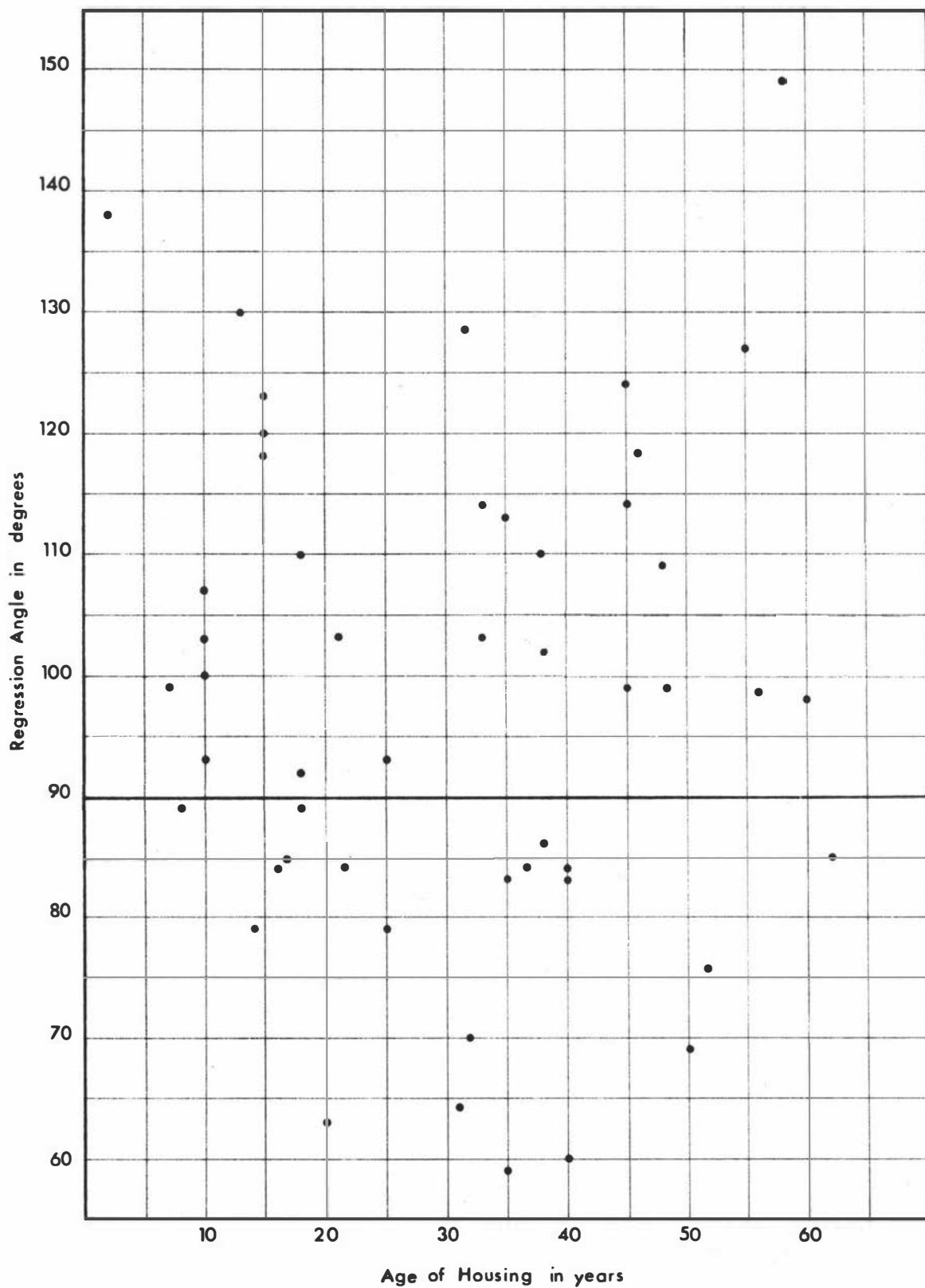


Figure 7.2 Average age of housing vs. regression angle.

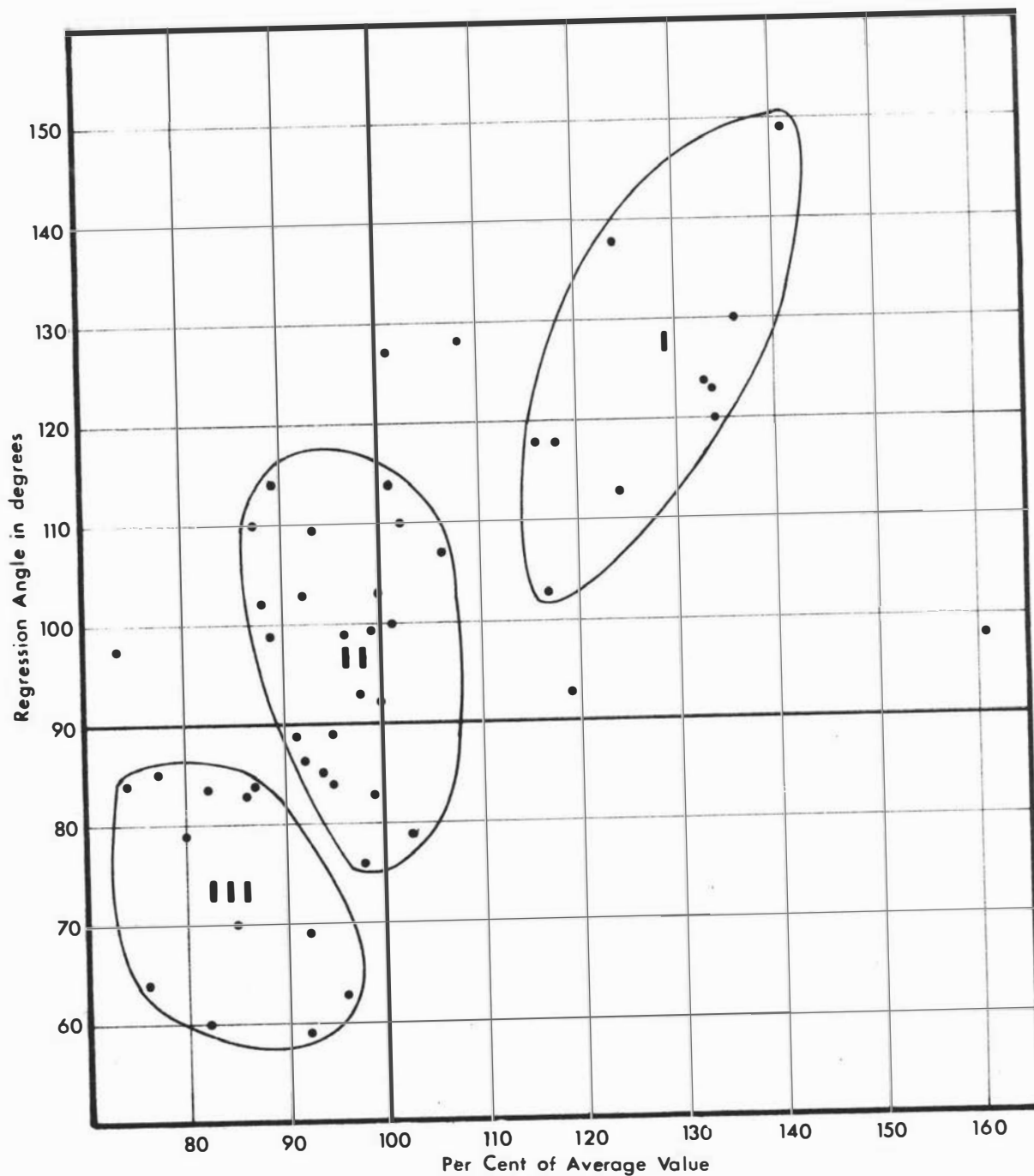


Figure 7.3 Average property value vs. regression angle. Value is converted to per cent of average value for city to facilitate graphic comparison.

The correlation of size and regression angles has previously been explored, although it is noted that eight of the ten parks in Group I are larger than 20 acres, while the other two (Elmwood Park, Christchurch, and Peat Park, Wanganui) are just smaller than the median calculated for parks in this study. However, the converse does not hold true, as the parks in Group III are not necessarily the smallest under consideration.

Park Function and Property Values. Function of the park is a reliable characteristic of homogeneity for the groups. Except for Peat Park, Wanganui, which has its profile distorted by the effect of view, all the parks in Group I emphasise either passive recreation or golf, and with only four exceptions, those in Group III focus upon active recreation pursuits. Those four parks are easily accounted for: Savage Crescent Park (Palmerston North) is a playspace and the central point for an aging state housing development; the profile for St James Park (Christchurch) is disturbed by the main north highway and railway and associated commercial development; the pattern for Memorial Park (Palmerston North) developed while the area was used as a metal pit; and the profile for Castlecliff Beach Domain shows the effect of view.

The parks in Group II are rather evenly divided, with ten and eleven parks devoted to active and passive activities, respectively. In addition, Shirley Golf Course and Wanganui Domain are included in this grouping.

The five parks which fail to find inclusion in the major groupings are identified as Cornwall Park (Hastings), St Albans and Edgar Macintosh Parks (Christchurch), and Kowhai Park and Virginia Lake (Wanganui). The first two are associated with very old neighbourhoods and the depreciated values have dropped the parks out of consideration with their peers. Conversely, Edgar Macintosh Park is sufficiently new to have a position above its anticipated place on the graph; in a few years, depreciation can be expected to have dropped the average values down nearer the city's average without significant change to the regression profile. Patterns for the two Wanganui parks are distorted by the effect of view.

The aspect of park function and its relationship to effect on property values merits further attention. Open space is classified into three categories: primarily active recreation, usually with a secondary passive recreation function; primarily passive recreation, usually with a secondary active recreation function; and golf courses. Identification of each park in this study is shown in Table 7.1, where only Memorial Park (Palmerston North) and the four Wanganui parks which show no consistent pattern are not included. Although the even allotment of space to passive and active pursuits allows Memorial Park to be added to either Category 1 or Category 2, its history of development suggests that it be excluded from this discussion. These five parks are omitted from further consideration in this study.

Active Recreation Parks. The parks which cater primarily to active recreational activity are not considered to be attractive neighbours, as indicated by the average regression angle of 89 degrees. This average drops to 88.1 degrees when the Hawke's Bay Racecourse is removed from this group--an action which is at least partially justified, as the Racecourse is active for only a few days each years. Quite obviously, parks which focus on active recreation are not looked upon with favour by their neighbours even though they are considered to be a necessity by the community as a whole.

Passive Recreation Parks. Parks which cater, either exclusively or primarily, to passive recreation are found generally to appreciate their surrounding residential properties, as shown by the average regression angle of 110 degrees for this category. When compared to the figure of 88.1 degrees previously established for active recreation spaces, the difference amounts to \$403 for each 50-metre increment. It is of interest to note that the Hawke's Bay Jockey Club Racecourse, with a regression angle of 109 degrees, fits very well into this category.

Only three of the parks appear to depreciate their surroundings; Savage Crescent Park and Milverton Park (Palmerston North) are of minimum size and are located in older neighbourhoods, while the Kirkpatrick Park (Hastings) area is almost exclusively state housing.

Table 7.1
Classification of Parks According to Function

Category 1 Primarily Active	Category 2 Primarily Passive	Category 3 Golf Courses
Christchurch		
Elmwood Park	Hagley Park	Shirley
Edgar Macintosh	Malvern Park	
Richmond Domain	Horseshoe Lake Reserve	
Papanui Domain	Burwood Park	
St Albans Park		
St James Park		
Macfarlane Park		
Rugby Park		
Palmerston North		
Monrad Park	Hokowhitu Domain	Centennial Lagoon
Awapuni Park	Esplanade	Brightwater Terrace
Puriri Street Basketball	Buick Crescent Park	
Coronation Park	Waterloo Crescent Park	
Takaro Park	Papaeoia Park	
Humber Park	Savage Crescent Park	
A. & P. Showgrounds	Milverton Park	
Hastings		
St Leonards Park	Frimley Park	
Hawke's Bay Racecourse	Flaxmere Park	
Akina Park	Windsor Park	
Mayfair Park	Cornwall Park	
	Ebbett Park	
	Kirkpatrick Park	
Wanganui		
Racecourse	Kowhai Park	Wanganui Domain
Lorenzdale Park		
Williams Domain		
Wanganui East Showgrounds		

This level of appreciative effect is stronger than anticipated, especially when it is understood that no less than three of the eight parks are restricted to this group because they are completely undeveloped, and no active sport can be accommodated. In fact, their attraction is purely that of 'open' space.

Golf Courses. The four golf courses included in this study are considered separately from other open spaces. Golf is an organised sport and could be included with active recreation, but because of the size and nature of golf courses, they are considered separately. Based on the very small sample obtained in this study, golf courses are considered to be appreciative open spaces, with an average regression angle of 106.0 degrees. It is felt that Shirley Golf Course represents an anomaly, and a larger sample would have revealed an even more intense appreciative effect.

Logarithmic and Linear Functions.

A total of 42 parks display patterns which approach statistical significance when values for all five zones are regressed. That is, by choosing between the logarithmic and linear options to obtain the best fit of regression line, the alpha levels of significance vary from less than 0.005 to 0.060, with only one park showing a value of more than 0.050 which is usually considered to be the maximum level which is statistically significant. The average alpha level for the 42 parks is 0.012, a very high figure which adds to the confidence with which the results of this study are viewed.

However, neither logarithmic nor linear relationship is dominant, as 23 parks find a best fit with the logarithmic function and 19 show a linear relationship. Four other parks have higher values adjacent to the open space but display a depreciating effect in the outer zones. Descriptions of these parks are presented as a linear regression of the four outer zones, although the entire pattern can be better described through more complex formulae, such as those for hyperbolic or parabolic curves using higher powers of the x-variable. However, within the constraints of the two types of equations used in this study, a logarithmic function better describes the relationship which exists between the inner zones. If these four parks are considered to be in the logarithmic category, that group embraces 27 parks, or 58.7 per cent of the total. Whether or not they are justifiably considered to be described as displaying a logarithmic pattern, they must be removed from the linear category for purposes of final evaluation.

Scrutiny of the list of appreciating parks shows that 18 of them follow a logarithmic pattern, while only 9 have a linear relationship (Table 7.2).

The logarithmic pattern parks tend to be those with the higher average values. For example, the average for all properties within complementary areas of these parks is \$8,761 which is 9.3 per cent greater than the \$8,018 average for linear parks. When zone 1 averages are used, the difference is much greater: values of \$10,462 and \$8,477 represent a difference of 23.4 per cent.

In earlier chapters, Palmerston North parks are noted to have shown the least appreciative effect of the three main cities in the study, while Hastings parks exert by far the greatest appreciative effect. Similarly, as may be determined from the data presented in Table 7.2, only four of Palmerston North's eight appreciating parks are identified by logarithmic patterns, and the average values for the logarithmic parks exceed those for linear parks by the least percentage. On the other hand, Hastings parks show the highest figures for these features. The two appreciating parks in Wanganui are not sufficient to be a valid representation, although they follow very closely the trend established by the other appreciating parks.

Of the 15 depreciating parks, only five find a best fit with a logarithmic regression line. They are Shirley Golf Course (Christchurch), Puriri Street Basketball Courts and Coronation Park (Palmerston North), and Williams Domain and Wanganui East Showgrounds (Wanganui). All five present unattractive facades to their surrounding areas.

No less than 18 of the 23 parks described by logarithmic functions display an appreciating effect. Conversely, the 19 parks which have characteristics of linear relationship are evenly divided, with 9 appreciating and 10 depreciating parks.

These data strongly suggest that neighbourhood recognition of the appreciative qualities of a park tends to approximate a power relationship, especially in cities where open space, both private and public, is relatively scarce. A linear relationship is more likely to develop in circumstances where the appreciative effect is reduced. This supports Knetsch's (1962) observation referred to earlier that in a metropolitan area where recreation

Table 7.2
Average Values for Appreciating Parks, by Regression Function
Logarithmic Function Parks Linear Function Parks

Park	Average Zone 1	Average all zones	Park	Average Zone 1	Average all zones
Christchurch					
Hagley Park	\$16,585	\$11,102	Horseshoe Lake	\$ 8,304	\$7,957
Elmwood Park	12,752	10,469	Burwood Park	7,980	7,748
E. Macintosh Park	9,525	9,356	Papanui Domain	7,739	6,831
Malvern Park	9,248	8,048			
Richmond Domain	8,068	7,004			
St Albans Park	6,159	5,724			
Palmerston North					
Centennial Lagoon	12,445	10,629	Esplanade	10,455	9,831
Hokowhitu Domain	12,911	10,583	Buick Crescent	9,761	9,292
Brightwater Terrace	11,437	9,318	Waterloo Crescent	8,929	8,362
Papaeoia Park	7,544	7,066	Monrad Park	8,083	7,609
Hastings					
Frimley Park	14,139	11,428	St Leonards Park	8,512	8,412
Flaxmere Park	13,156	10,406			
Windsor Park	9,994	8,532			
Cornwall Park	10,994	8,472			
Racecourse	8,911	7,790			
Ebbett Park	8,600	7,776			
Akina Park	8,040	7,373			
Wanganui					
Kowhai Park	8,358	6,625	Wanganui Domain	6,527	6,121

space is in short supply, sections bordering on a park attract premium prices, even though little effect is noted on the prices of sections a short distance away.

Final Evaluation of Hypotheses.

The major findings of this study are associated with the five hypotheses which are tested and reported upon. The validity of each hypothesis is summarised for the four cities and final acceptance or rejection is indicated.

Hypothesis I. This hypothesis as originally postulated reads:

In a neighbourhood which centres on an open space, residential property valuations are highest alongside the open space, and

decline with increasing distance from it. The influence will vary with differing characteristics of the space.

In order to accommodate the conditions found in Palmerston North, it is necessary to modify the hypothesis so that it pertains only to those parks or reserves which existed at the time of neighbourhood development. Data are presented according to both statements of the hypothesis, and little difference exists between them.

The average of 'b' values taken from regression equations for the 46 parks considered is -\$177.99 which equates to a regression angle of 100 degrees. Using the re-stated hypothesis, which drops from consideration the two parks developed from metal pits, the average 'b' value increases to -\$202.73 or a regression angle of 101.3 degrees. A random sample would be expected to show no 'b' value at all, so this entire value is attributed to park appreciative effect.

The average value of \$7,732 is established for all park-oriented properties in the study. Hence, properties in zone 1 around the 'composite park' average \$699 more than those in the outer zone. Since this amounts to more than 9 per cent of the total value, the hypothesis is considered to be upheld.

Under the re-stated hypothesis, with Puriri Street Basketball Courts and Memorial Park deleted, an average value of \$7,767 is calculated for the 44 complementary areas. Zone 1 properties average \$874 more than those in zone 5, which is more than 11.3 per cent of the total value. Refinement of the data strengthens support for the hypothesis.

The influence of characteristics such as size, function and degree of development of the open space is covered in detail in previous pages. The conclusion is advanced that function of the park is the most important aspect in determining influence. A park which caters primarily to passive recreational activities tends to appreciate property values in its vicinity, while one focussing on active pursuits has the opposite effect.

Hypothesis II. This hypothesis suggests that the appreciative effect of a park will decline as distance to the open rural landscape decreases. Although it was found to be valid for Christchurch, data for the other three cities failed to support the hypothesis and it is rejected for the study.

The findings noted in this study suggest that the hypothesis may be valid for larger cities, with validity decreasing with a decrease in area of the subject urban place. This is an understandable concept and was the main reason for the exclusion from this study of urban areas smaller than city size. However, insufficient data are available from which to attempt any conclusion pertaining to this phenomenon.

Hypothesis III. The postulation that the appreciating influence of a park will decline with a decrease in average property values for its complementary area is well founded. As stated in previous chapters, this feature produces the most reliable correlation found in the entire study. Both estimated and actual zone 1 values prove to be significant beyond the 0.001 level for each city.

When the data for all cities are combined, correlation is found to be significant beyond the 0.001 level, regardless of which criterion is employed. The three factors which are explained earlier--average value of all properties in each complementary area, values estimated by regression for zone 1 properties and actual zone 1 averages--when correlated against regression angles, provide correlation coefficients of +0.678 ($t = 6.118$; $z = 4.548$), +0.866 ($t = 11.486$; $z = 5.809$) and +0.864 ($t = 11.377$; $z = 5.795$), respectively.

Hypothesis IV. Yeates (1965: 59) proposes that "If there is a negative relationship between land values and distance from the center of the city, and if population densities decrease with distance from the center of the city, then land values and population densities should be positively related." However, this hypothesis, which anticipates a positive correlation between park appreciative effect and density of housing, is not supported for any individual city. Combining of data for the four cities does not gain support, as the correlation coefficient of $r = +0.022$ ($t = 0.143$;

$z = 0.144$) shows. The lack of interdependence between these two factors is emphasised by the fact that correlations are not constant in direction among the sample; two cities show a negative relationship and two show a positive correlation. It is concluded that the two factors are quite independent of each other. The hypothesis is considered to be invalid and is rejected.

Hypothesis V. This statement, which expects property values in the neighbourhood of parks to be higher than those some distance away, is supported in each city studied. As Table 7.3 shows, an average value of \$7,732 is established for the 13,231 properties located within the complementary areas of parks, while the 2,832 properties outside the areas averaged only \$7,164. Although no criterion is set to designate statistical significance, the park-oriented units are valued 7.93 per cent higher than the others. This is intuitively accepted as sufficient to support the hypothesis and it is fully accepted.

Table 7.3
Comparison of Values
Park-oriented vs. Random Sample Properties

City	<u>Park-oriented</u>		<u>Random Sample</u>		Difference in Average Value
	Number of Properties	Average Value	Number of Properties	Average Value	
Christchurch	3,740	\$7,874	1,234	\$7,415	6.16%
Palmerston North	4,963	7,928	713	7,381	7.41%
Hastings	2,705	8,415	480	7,287	15.47%
Wanganui	1,823	5,891	405	5,872	0.00%
Totals	13,231	\$7,732	2,832	\$7,164	7.93%

Other Findings.

Several findings not directly associated with the postulated hypotheses were noted. Because it was not possible to fully investigate these phenomena, they were studied with varying degrees of thoroughness. They are presented here in the hope that they will stimulate and aid future research.

The most important feature which is not fully explored is the effect on property values exerted by schools and school grounds. Each school site was

identified, rather subjectively, according to the appearance and level of maintenance of the grounds, as well as the presence or absence of perimeter fences or hedges. These data were recorded for each property within three 50-metre zones of the school, except for those houses located within 100 metres of a park.

Findings, based on 2,823 properties, strongly suggest that school grounds which are relatively open to view from surrounding residential sections have an appreciating effect on those properties, while grounds enclosed by solid fences and hedges depreciate their neighbourhoods. The level of maintenance of the grounds generally reflects the socio-economic level of the neighbourhood. In keeping with the findings noted in association with Hypothesis III, the neatly maintained grounds sited near more expensive residential areas exerted the strongest appreciative effect, provided the school grounds permitted visual access. One may conclude that while the erection of fences or hedges around a school ground may be necessary to maintain proper supervision and control, selection of a fencing material which does not obstruct the view may well be a sound economic move even though it is more costly at the start.

A second finding not previously stressed is support of the conclusions reached by Grey, in that the number of people attracted to a phenomenon decreases sharply beyond about 750 feet distance (Grey, 1970, p. 81). Owen (1972: 106), writing about conditions in the United States, is even more emphatic:

Compared to the automobile, relatively little is known about the power, range, and operating costs of human beings, but it has been concluded that people refuse to walk more than 800 feet between parked car and destination and that the average nonstop trip distance on foot ranges from 400 to 600 feet per person.

Conclusions reached in this study suggest that a similar areal extent exists for foot traffic, and consequently, property appreciative effect, of a park. In addition, foot traffic patterns in New Zealand may be quite similar to those in the United States. If subsequent research proves this to be

correct, it could lead to significant changes in urban commercial development, transportation networks, automobile parking, etc., in New Zealand cities.

A third feature observed is the apparent correlation between cul-de-sac street patterns and higher value properties. Clusters of houses in culs-de-sac proved to be the causal factors for a surprisingly large number of high positive residuals from regression. Many of the instances result from new construction intruding into older neighbourhoods, but in some cases the cul-de-sac developments were of equal or greater age. Although some investigation has been undertaken on this topic, this may be a fertile field for additional research (Dickson, 1969).

Areas of Further Research.

The need exists for interdisciplinary studies, as well as for additional research by geographers and other social and behavioural scientists. Questions raised by this study cover a spectrum from those of a geographic nature to topics far afield, and include:

1. How do the patterns of property values discovered in this work relate to distributional patterns of the residences of park users? A study of this nature would require questionnaire surveys of households within complementary areas in addition to surveys undertaken at the parks themselves, in order to identify visitors from more distant areas.
2. How have valuation patterns changed through time? Maturing of the park, the residents and the housing may be expected to have produced major changes in park profiles in the past.
3. What effect on valuation patterns may be expected as a result of recent developments and attitudes towards transportation and residential patterns in cities? Urban parks serve as a link to the past for city-dwellers whose roots are in the open countryside. People who represent later generations of city-dwellers may have different attitudes, needs and perception of urban open space.
4. To what extent are the correlations between average values and park appreciative effect noted in this study the result of social, rather than purely economic, conditions? Some of the depreciative

effect of certain parks may be more a reflection of attitudes of the resident social groups, rather than of economic status.

5. Do certain minority groups feel uncomfortable in or near parks which are oriented to the needs of the majority? This consideration is closely associated with the previous one, although its solution allows for the development of parks which more closely suit the needs of small segments of the society.

Conclusion

As with most urban features, parks have both good and bad characteristics. Among their undesirable features are the need for greater land area to support urban functions, the added cost of reticulating urban services to that increased area and the reduced tax base of a given area of urban land. However, present-day scholars agree that among the attributes of parks, the disadvantages associated with them are outweighed by the advantages.

This study sets out to identify one of those attributes--the micro-scale effect of urban parks on residential property values; i.e., it attempts to verify the existence of an appreciative effect of parks. The findings, based on empirical data gathered in four New Zealand cities, suggest that postulation of a general appreciative effect is supported, but the effect varies sharply with characteristics of parks and their surrounding areas. The closest interrelationship noted is between the appreciative effect and average property values, as parkside sites are found to be most in demand by residents of more expensive neighbourhoods.

Recreational open spaces are important features of the contemporary urban landscape, and their importance increases as greater numbers of city dwellers demand more opportunities for outdoor recreation. Yet accommodating these needs demands more than merely setting aside more open space. If a park is to develop its maximum value to a community or neighbourhood, it must provide the facilities needed and demanded by local residents, but it must also be fully accepted as a satisfactory neighbour by property owners in its vicinity. On the basis of findings in this study, a park which provides for

active recreation only should be sited away from residential areas, if possible; one which provides active recreational facilities for neighbourhood use should combine generous space for passive recreation if it is to be accepted as a desirable feature by local residents.

The findings noted do not represent the attainment of a final goal, and during the course of research more questions are raised than are answered. Some of these questions are set down on previous pages; others are only implied. Yet answers to these and many other questions must be forthcoming if urban life is to be rewarding rather than frustrating. Hopefully this work will be used as a firm foundation and starting point for additional studies to develop a better understanding of man's interaction with his urban environment.

NOTES

¹Semi-logarithmic paper is used to conserve space, while allowing easier discrimination among the parks of smaller area.

²The critical-ratio z-test is normally used to test the significance of 'r' when the number of pairs in the universe is 30 or larger. For the sake of continuity, t-values are also presented.

APPENDIX I

List of New Zealand Cities

Group I--larger than 70,000

<u>City</u>	<u>Population</u>
Christchurch	161,566
Auckland	149,989
Wellington	131,655
Dunedin	77,149
Manukau	73,218

Group II--30,000 to 70,000

Hamilton	63,000
Lower Hutt	57,403
Palmerston North	46,832
Invercargill	43,572
Wanganui	35,629
New Plymouth	31,843

Group III--under 30,000

Napier	28,645
Whangarei	27,560
Timaru	27,314
Hastings	26,867
Nelson	26,218
Rotorua	25,978
Gisborne	24,939
Tauranga	23,390
Takapuna	23,098
Porirua	22,190
Papatoetoe	20,576
Upper Hutt	19,084

APPENDIX II

Coefficients of Correlation, Zones 5 through 10

<u>Park</u>	<u>Zone</u>					
	5	6	7	8	9	10
<u>Christchurch</u>						
Hagley	-0.993	-0.903	-0.844	-0.831	-0.792	-0.756
Elmwood	-0.951	-0.844	-0.842	-0.784	-0.794	-0.655
Edgar Macintosh	-0.977	-0.365	-0.441	-0.630	-0.737	-0.816
Malvern	-0.988	-0.924	-0.871	-0.825	-0.815	-0.833
Horseshoe Lake	-0.955	-0.223	-0.393	-0.660	-0.020	-0.363
Burwood	-0.915	-0.929	-0.718	-0.748	-0.798	-0.770
Richmond	-0.972	-0.960	-0.856	-0.851	-0.794	-0.814
Papanui	-0.971	-0.258	-0.479	-0.634	-0.554	-0.277
St Albans	-0.964	-0.525	-0.441	-0.298	-0.234	-0.315
Shirley	+0.980	+0.483	+0.616	+0.611	+0.474	+0.594
St James	+0.802	+0.676	+0.375	+0.464	+0.503	+0.409
Macfarlane	+0.933	+0.959	+0.965	+0.968	+0.817	+0.761
Rugby	+0.846	+0.902	+0.919	+0.931	+0.750	+0.622
<u>Palmerston North</u>						
Cent. Lagoon	-0.971	-0.919	-0.914	-0.894	-0.822	-0.744
Hokowhitu	-0.928	-0.864	-0.562	-0.701	-0.680	-0.749
Esplanade	-0.974	-0.898	-0.600	-0.760	-0.826	-0.776
B'water Terrace	-0.921	-0.818	-0.662	-0.665	-0.605	-0.196
Buick	-0.987	-0.944	-0.806	-0.781	-0.573	-0.484
Waterloo	-0.949	-0.971	-0.734	-0.727	-0.743	-0.265
Monrad	-0.964	-0.966	-0.834	-0.843	-0.774	-0.754
Papaeoia	-0.920	-0.404	-0.413	-0.153	-0.391	-0.417
Awapuni	+0.996	+0.948	+0.902	+0.929	+0.848	+0.862
Puriri	+0.986	+0.302	+0.412	+0.387	+0.351	+0.440
Coronation	+0.969	+0.263	+0.851	+0.857	+0.807	+0.755
Takaro	+0.975	+0.985	+0.990	+0.880	+0.867	+0.867
Savage	+0.844	+0.904	+0.912	+0.860	+0.871	+0.413
Humber	+0.854	+0.861	+0.882	+0.897	+0.705	+0.803
A & P Showgr.	+0.942	+0.837	+0.746	+0.725	+0.700	+0.659
Milverton	+0.986	+0.150	+0.179	+0.310	+0.022	+0.310
Memorial	+0.976	+0.754	+0.792	+0.762	+0.595	+0.363
<u>Hastings</u>						
Frimley	-0.943	-0.930	-0.945	-0.829	-0.826	-0.795
Flaxmere	-0.966	-0.871	-0.839	-	-	-
Windsor	-0.950	-0.847	-0.806	-0.832	-0.811	-0.770
Cornwall	-0.962	-0.880	-0.858	-0.778	-0.773	-0.778

APPENDIX II, cont.

<u>Park</u>	<u>Zone</u>					
	5	6	7	8	9	10
St Leonards	-0.988	-0.802	-0.868	-0.831	-0.842	-0.683
Racecourse	-0.976	-0.782	-0.854	-0.883	-0.836	-0.561
Ebbett	-0.877	-0.751	-0.501	-0.504	-0.194	-0.185
Akina	-0.975	-0.906	-0.919	-0.898	-0.881	-0.753
Kirkpatrick	+0.958	+0.971	+0.641	+0.771	+0.841	+0.813
Mayfair	+0.899	+0.346	+0.676	+0.749	+0.797	+0.512
<u>Wanganui</u>						
Kowhai	-0.974	-0.850	-0.872	-0.789	-0.786	-0.687
Wanganui Domain	-0.964	-0.968	-0.546	-0.456	-0.245	-0.100
Racecourse	+0.976	+0.912	+0.532	+0.589	+0.733	+0.773
Lorenzdale	+0.977	+0.385	+0.587	+0.750	+0.586	+0.367
Williams Domain	+0.913	+0.071	+0.106	+0.183	+0.387	+0.560
Showgrounds	+0.963	+0.886	+0.930	+0.942	+0.877	+0.507
Virginia Lake	-0.707	-0.066	-0.142	-0.365	-0.067	-
Peat	-0.479	-0.634	-0.360	-0.504	-0.433	-0.340
Victoria	-0.748	-0.539	-0.659	-0.539	-0.440	-0.033
Castlecliff	+0.270	+0.149	+0.054	+0.071	+0.162	+0.265

APPENDIX III

HEAD OFFICE,
LOCAL GOVERNMENT BUILDING,
114-116 LAMBTON QUAY,
P.O. Box 2397 WELLINGTON

VALUATION DEPARTMENT

12/1131

8 January 1970

Mr H.W. Bockemuehl,
C/- Department of Geography,
Massey University,
PALMERSTON NORTH.

Dear Sir,

The Assistant Valuer-General is agreeable to your having access to our valuation records for your thesis work.

The approval is subject to the following conditions:

1. No confidential information relating to a particular property is to be published in any way in which it can be recognised.
2. Should the time of any member of the staff be necessary to help extract the information you want this should be at a time to suit the convenience of the Department.
3. A copy of whatever you prepare should be made available to the Department to read.

Please contact the Branch Manager in each centre to make suitable arrangements and present this letter to him as your authority.

Yours faithfully.

(signed)
E.J. Smith
for VALUER-GENERAL

APPENDIX IV

Analysis of Variance Data

Park	Zone	Degrees of Freedom	F Value	Significance
Elmwood	1	3/47	30.7716	.01
	2	3/37	10.1288	.01
	3	3/53	16.8091	.01
	4	3/49	3.4791	.05
	5	3/71	3.0556	.05
St Albans	1	2/63	3.2935	.05
	2	2/66	3.5483	.05
	3	3/79	0.0490	N/S
	4	3/97	0.2601	N/S
	5	3/96	2.7739	.05
St James	1	3/32	4.6791	.01
	2	3/39	3.7162	.05
	3	3/54	1.6414	N/S
	4	3/48	2.9000	.05
	5	3/66	2.9816	.05
Burwood	1	2/47	6.0817	.01
	2	2/43	4.0773	.05
	3	2/56	3.3431	.05
	4	2/52	2.3709	N/S
	5	2/64	3.1866	.05
Brightwater Terrace	1	2/46	3.8123	.05
	2	2/56	3.9253	.05
	3	2/78	3.6975	.05
	4	2/71	6.4587	.01
	5	2/92	17.5671	.01
Hokowhitu Domain	1	3/43	5.1607	.01
	2	3/40	2.0436	N/S
	3	3/91	13.6293	.01
	4	3/56	5.0210	.01
	5	3/96	3.5250	.05
Monrad	1	1/14	0.4206	N/S
	2	2/28	3.4822	.05
	3	3/46	0.1654	N/S
	4	3/82	3.2941	.05
	5	3/93	0.9116	N/S

Park	Zone	Degrees of Freedom	F Value	Significance
Takaro	1	3/45	3.1861	.05
	2	3/64	5.7129	.01
	3	3/68	1.2318	N/S
	4	3/77	0.4739	N/S
	5	3/69	3.4110	.05
Humber	1	2/35	3.3103	.05
	2	2/42	0.9874	N/S
	3	2/45	4.1190	.05
	4	2/55	3.1881	.05
	5	2/25	4.0277	.05
Ebbett	1	3/50	0.3907	N/S
	2	3/48	9.4686	.01
	3	2/48	0.2600	N/S
	4	2/44	5.6981	.01
	5	2/37	3.6621	.05
Frimley	1	2/42	3.2710	.05
	2	2/53	6.5828	.01
	3	2/29	0.0037	N/S
	4	2/46	3.7527	.05
	5	2/27	3.7428	.05
St Leonards	1	2/20	3.8781	.05
	2	2/22	6.8177	.01
	3	3/42	1.9763	N/S
	4	3/63	3.0471	.05
	5	3/79	2.9866	.05
Lorenzdale	1	3/50	0.5026	N/S
	2	3/37	0.3152	N/S
	3	3/47	0.2764	N/S
	4	3/46	3.6507	.05
	5	3/64	4.8741	.01
Kowhai	1	1/79	10.7659	.01
	2	1/35	0.8594	N/S
	3	1/55	0.1438	N/S
	4	1/64	4.4608	.05
	5	1/77	0.4236	N/S
Virginia Lake	1	3/38	0.3604	N/S
	2	3/44	0.7722	N/S
	3	3/46	3.4603	.05
	4	3/33	3.1541	.05
	5	3/26	6.3102	.01

APPENDIX V

Regression Angles*			
Park	Angle	Park	Angle
Christchurch		Palmerston North	
Hagley	149	Centennial Lagoon	120
Elmwood	124	Hokowhitu Domain	123
E. Macintosh	93	Esplanade	113
Malvern	110	Brightwater Terrace	118
Horseshoe Lake	100	Buick Crescent	103
Burwood	93	Waterloo Crescent	107
Richmond	114	Monrad	99
Papanui	110	Papaeoia	99
St Albans	98	Awapuni	79
Shirley Golf	83	Puriri Street	63
St James	69	Coronation	59
Macfarlane	79	Takaro	83
Rugby	86	Savage Crescent	70
		Humber	84
		A & P Showgrounds	85
		Milverton	84
		Memorial	60
Hastings		Wanganui	
Frimley	130	Kowhai	128
Flaxmere	138	Wanganui Domain	103
Windsor	114	Racecourse	76
Cornwall	127	Lorenzdale	85
St Leonards	92	Williams Domain	84
Racecourse	109	Showgrounds	64
Ebbett	103	Virginia Lake	98
Akina	102	Peat	118
Kirkpatrick	89	Victoria	99
Mayfair	89	Castlecliff Domain	84

*Determined using 5-point linear regression graphs.

APPENDIX VI

Regression Residuals Used for Mapping

Park	Quadrant ^a	Zone ^b	Ave. Value ^c	Residual ^d	S.D. ^e
<u>Christchurch</u>					
Hagley	N	1	\$15,688	-0.0183	-0.59
	E	1	18,267	0.0478	+1.54
	N	2	12,280	-0.0202	-0.65
	E	2	12,697	-0.0057	-0.18
	N	3	10,442	-0.0295	-0.95
	E	3	10,794	-0.0151	-0.48
	N	4	10,024	-0.0039	-0.12
	N	5	8,964	-0.0188	-0.60
	E	5	10,843	0.0638	+2.06
Elmwood	N	1	9,934	-0.0781	-0.82
	E, S ^f	1	15,853	0.1249	+1.31
	W	1	11,149	-0.0280	-0.29
	N	2	10,023	-0.0348	-0.37
	E	2	13,664	0.0998	+1.05
	S	2	11,150	0.0115	+0.12
	W	2	8,427	-0.1101	-1.16
	N	3	9,031	-0.0570	-0.60
	E	3	13,623	0.1215	+1.27
	S	3	11,532	0.0492	+0.52
	W	3	7,847	-0.1180	-1.24
	N	4	8,332	-0.0756	-0.79
	E	4	17,862	0.2556	+2.68
	S	4	7,855	-0.1012	-1.06
	W	4	8,528	-0.0655	-0.69
	N	5	9,950	0.0142	+0.15
	E	5	11,078	0.0608	+0.64
	S	5	9,379	-0.0115	-0.12
	W	5	8,439	-0.0574	-0.60
Edgar Macintosh	W	1	9,611	0.0039	+0.26
	N	1	9,351	-0.0080	-0.52
	E	1	9,585	0.0027	+0.17
	S	1	9,573	0.0022	+0.14
	W	2	9,546	0.0069	+0.45
	N	2	9,336	-0.0028	-0.18
	E	2	9,165	-0.0108	-0.71
	S	2	9,481	0.0039	+0.25
	W	3	9,609	0.0132	+0.86
	N	3	9,208	-0.0053	-0.34
	E	3	8,786	-0.0256	-1.68
	S	3	9,712	0.0179	+1.17
	W	4	9,628	0.0166	+1.09
	N	4	9,223	-0.0021	-0.13

Park	Quadrant ^a	Zone ^b	Ave. Value ^c	Residual ^d	S.D. ^e
Edgar Macintosh (cont.)	E	4	9,001	-0.0127	-0.83
	S	4	9,334	0.0031	+0.20
	W	5	8,787	-0.0212	-1.39
	N	5	9,158	-0.0032	-0.21
	E	5	8,789	-0.0211	-1.38
	S	5	10,172	0.0424	+2.79
Malvern	N	1	9,012	-0.0069	-0.26
	E	1	9,492	0.0157	+0.59
	N	2	9,030	0.0286	+1.08
	E	2	7,585	-0.0471	-1.79
	N	3	8,687	0.0320	+1.21
	E	3	7,619	-0.0249	-0.94
	N	4	8,222	0.0225	+0.85
	E	4	7,355	-0.0259	-0.98
	N	5	8,118	0.0281	+1.07
	E	5	7,232	-0.0221	-0.84
Horseshoe Lake	W	1	7,399	-\$722	-1.79
	E	1	8,416	295	+0.73
	S	1	8,399	278	+0.69
	W	2	7,811	-195	-0.48
	E	2	8,529	523	+1.30
	S	2	8,125	119	+0.29
	W	3	8,234	343	+0.85
	E	3	7,959	68	+0.17
	S	3	7,075	-816	-2.02
	W	4	7,728	-48	-0.12
	E	4	8,308	532	+1.32
	S	4	7,349	-427	-1.06
	W	5	7,759	99	+0.25
	S	5	7,608	-52	-0.13
Burwood	W	1	9,536	\$1250	+2.02
	E	1	8,713	427	+0.69
	S	1	6,950	-1336	-2.16
	W	2	8,180	97	+0.15
	E	2	8,279	196	+0.31
	S	2	7,498	-585	-0.94
	W	3	7,139	-741	-1.20
	E	3	8,024	144	+0.23
	S	3	7,925	45	+0.07
	W	4	8,466	788	+1.27
	E	4	7,751	73	+0.11
	S	4	7,432	-246	-0.39
	W	5	7,959	484	+0.78
	E	5	6,948	-527	-0.85
	S	5	7,407	-68	-0.11

Park	Quadrant ^a	Zone ^b	Ave. Value ^c	Residual ^d	S.D. ^e
Richmond	W	1	6,905	-0.1367	-1.78
	N	1	12,175	0.1096	+1.43
	E	1	12,816	0.1319	+1.72
	S	1	7,338	-0.1103	-1.44
	W	2	7,411	-0.0350	-0.46
	N	2	10,489	0.1159	+1.51
	E	2	9,294	0.0633	+0.83
	S	2	6,668	-0.0809	-1.06
	W	3	6,893	-0.0250	-0.33
	N	3	6,642	-0.0411	-0.54
	E	3	8,645	0.0734	+0.96
	S	3	5,918	-0.0912	-1.19
	W	4	7,581	0.0458	+0.60
	N	4	6,005	-0.0554	-0.72
	E	4	6,585	-0.0154	-0.20
	S	4	6,769	-0.0034	-0.04
	W	5	6,673	0.0146	+0.19
	N	5	6,143	-0.0227	-0.30
	E	5	8,031	0.0937	+1.22
	S	5	6,024	-0.0312	-0.41
Papanui	N,E ^f	1	7,739	-\$485	-0.48
	N	2	9,635	1948	+1.94
	E	2	6,365	-1322	-1.32
	N,E ^f	3	7,350	201	+0.20
	N	4	7,300	689	+0.69
	E	4	5,582	-1029	-1.03
	N	5	6,666	592	+0.59
	E	5	5,480	-594	-0.59
St Albans	N	1	6,138	0.0036	+0.11
	E	1	6,986	0.0598	+1.84
	S	1	5,420	-0.0505	-1.55
	N	2	6,421	0.0410	+1.26
	E	2	5,831	-0.0009	-0.03
	S	2	5,024	-0.0656	-2.02
	W	3	5,543	-0.0124	-0.38
	N	3	6,114	0.0302	+0.93
	E	3	5,893	0.0142	+0.44
	S	3	5,378	-0.0255	-0.79
	W	4	5,476	-0.0103	-0.32
	N	4	6,107	0.0371	+1.14
	E	4	5,460	-0.0115	-0.35
	S	4	5,375	-0.0183	-0.56
	W	5	5,588	0.0043	+0.13
	N	5	5,799	0.0204	+0.63
	E	5	5,011	-0.0430	-1.32
	S	5	5,894	0.0275	+0.84

Park	Quadrant ^a	Zone ^b	Ave. Value ^c	Residual ^d	S.D. ^e
Shirley Golf	W	1	7,474	0.0001	+0.01
	N	1	7,794	0.0183	+0.82
	S	1	7,470	-0.0001	-0.01
	W	2	7,849	0.0134	+0.60
	N	2	6,467	-0.0707	-2.99
	S	2	7,965	0.0198	+0.89
	W	3	7,886	0.0107	+0.48
	N	3	7,678	-0.0009	-0.04
	S	3	7,819	0.0070	+0.31
	W	4	7,988	0.0130	+0.53
	N	4	7,108	-0.0377	-1.69
	S	4	7,901	0.0083	+0.37
	W,N ^f	5	8,035	0.0130	+0.58
	S	5	7,903	0.0058	+0.26
St James	W,N,S ^f	1	6,205	-\$80	-0.12
	E	1	7,557	1272	+1.95
	W	2	6,388	-327	-0.50
	N	2	6,522	-193	-0.30
	E	2	6,846	131	+0.20
	S	2	7,130	415	+0.64
	W	3	6,735	-409	-0.63
	N	3	6,443	-701	-1.07
	E	3	7,095	-49	-0.08
	S	3	6,949	-195	-0.30
	W	4	6,837	-737	-1.13
	N	4	8,148	574	+0.88
	E	4	6,197	-1377	-2.11
	S	4	6,973	-601	-0.92
	W	5	7,988	-16	-0.02
	N	5	8,591	587	+0.90
	E	5	9,041	1037	+1.59
	S	5	8,673	669	+1.03
Macfarlane	W,N ^f	1	5,836	-\$122	-0.31
	E	1	6,181	223	+0.57
	S	1	6,047	89	+0.23
	W	2	5,938	-194	-0.50
	N	2	6,405	273	+0.70
	E	2	6,391	259	+0.66
	S	2	5,923	-209	-0.54
	W	3	6,095	-211	-0.54
	N	3	6,462	156	+0.40
	E	3	6,287	-19	-0.05
	S	3	6,066	-240	-0.62
	W	4	6,900	419	+1.08
	N	4	5,935	-546	-1.40
	E	4	6,359	-122	-0.31
	S	4	6,214	-267	-0.69
	W	5	7,344	689	+1.77

Park	Quadrant ^a	Zone ^b	Ave. Value ^c	Residual ^d	S.D. ^e
Macfarlane (cont.)	N	5	6,029	-\$626	-1.61
	E	5	7,563	908	+2.33
	S	5	6,195	-460	-1.18
Rugby	W	2	7,192	\$450	+1.50
	S	2	6,445	-297	-0.99
	W	3	7,122	196	+0.66
	S	3	6,675	-251	-0.84
	W	4	7,088	-23	-0.08
	S	4	6,786	-325	-1.09
	W	5	7,726	430	+1.44
	S	5	7,116	-180	-0.60
<u>Palmerston North</u>					
Centennial Lagoon	W	1	11,023	-0.0132	-0.45
	N	1	13,028	0.0594	+2.32
	E	1	10,348	-0.0407	-1.39
	W	2	10,835	0.0085	+0.29
	N	2	11,153	0.0211	+0.72
	E	2	9,678	-0.0405	-1.39
	W	3	9,854	-0.0156	-0.54
	N	3	11,261	0.0423	+1.45
	E	3	9,350	-0.0384	-1.32
	W	4	10,298	0.0156	+0.53
	N	4	10,453	0.0221	+0.76
	E	4	9,816	-0.0052	-0.18
	W	5	9,308	-0.0189	-0.65
	N	5	10,183	0.0201	+0.69
	E	5	9,360	-0.0165	-0.56
Hokowhitu Domain	W	1	10,166	-0.0310	-0.45
	N	1	15,977	0.1654	+2.38
	E	1	11,560	0.0248	+0.36
	S	1	7,469	-0.1649	-2.38
	W,S ^f	2	9,668	-0.0351	-0.51
	N	2	11,339	0.0341	+0.49
	E	2	11,137	0.0263	+0.38
	W	3	11,418	0.0474	+0.68
	N	3	11,623	0.0552	+0.80
	E	3	9,006	-0.0556	-0.80
	S	3	8,379	-0.0870	-1.25
	W	4	10,251	0.0080	+0.11
	N	4	11,727	0.0664	+0.96
	E	4	10,460	0.0167	+0.24
	S	4	8,720	-0.0623	-0.90
	W	5	11,161	0.0506	+0.73
	N	5	8,890	-0.0482	-0.70
	E	5	10,684	0.0316	+0.46
	S	5	9,013	-0.0423	-0.61

Park	Quadrant ^a	Zone ^b	Ave. Value ^c	Residual ^d	S.D. ^e
Esplanade	W	1	11,467	\$700	+0.82
	N	1	9,691	-1076	-1.26
	E	1	10,163	-604	-0.70
	W	2	11,567	1217	+1.42
	N	2	9,469	-881	-1.16
	E	2	10,161	-189	-0.22
	W	3	10,834	901	+1.05
	N	3	9,284	-649	-0.76
	E	3	11,788	1855	+2.17
	N	4	9,051	-465	-0.54
	E	4	9,241	-275	-0.32
	N	5	8,760	-339	-0.39
	E	5	8,902	-197	-0.23
Brightwater Terrace	W	1	10,654	-0.0112	-0.27
	N	1	11,383	0.0176	+0.43
	S	1	12,210	0.0480	+1.17
	W	2	9,182	-0.0302	-0.74
	N	2	8,903	-0.0436	-1.07
	S	2	9,775	-0.0030	-0.07
	W	3	9,161	-0.0046	-0.11
	N	3	8,437	-0.0404	-0.99
	S	3	9,390	0.0061	+0.15
	W	4	8,434	-0.0216	-0.53
	N	4	8,124	-0.0379	-0.93
	S	4	10,448	0.0714	+1.74
	W	5	7,373	-0.0654	-1.60
	N	5	9,679	0.0528	+1.29
	S	5	9,882	0.0619	+1.51
Buick Crescent	W	1	9,050	-\$354	-0.87
	N	1	9,761	357	+0.88
	W	2	8,381	-898	-2.21
	N	2	9,978	699	+1.72
	W	3	9,301	148	+0.36
	N	3	9,336	183	+0.45
	W	4	8,860	-167	-0.41
	N	4	9,116	89	+0.21
	W	5	8,857	-44	-0.10
	N	5	8,887	-14	-0.03
Waterloo Crescent	W	1	8,929	-\$84	-0.59
	W	2	8,663	-46	-0.32
	W	3	8,555	150	+1.06
	W	4	8,277	176	+1.24
	W	5	7,601	-196	-1.38
Monrad	W	1	8,022	-\$88	-0.24
	S	1	8,162	52	+0.14
	W	2	7,791	-154	-0.42

Park	Quadrant ^a	Zone ^b	Ave. Value ^c	Residual ^d	S.D. ^e
Monrad (cont.)	E	2	8,685	\$740	+2.01
	S	2	7,180	-765	-2.08
	W	3	8,016	236	+0.64
	N	3	7,426	-354	-0.96
	E	3	8,133	353	+0.96
	S	3	7,744	-36	-0.10
	W	4	7,496	-119	-0.32
	N	4	8,237	622	+1.69
	E	4	7,634	19	+0.05
	S	4	7,380	-235	-0.64
	W	5	7,006	-444	-1.21
	N	5	7,798	348	+0.95
	E	5	7,239	-211	-0.57
	S	5	7,490	40	+0.11
Papaeoia	W,S ^f	1	6,756	-0.0499	-1.35
	N	1	8,358	0.0425	+1.15
	E	1	7,589	0.0006	+0.02
	W	2	6,411	-0.0551	-1.49
	N	2	7,234	-0.0026	-0.07
	E	2	8,026	0.0425	+1.15
	S	2	8,108	0.0469	+1.27
	W	3	7,078	-0.0018	-0.05
	N	3	6,454	-0.0697	-1.88
	E	3	6,963	-0.0089	-0.24
	S	3	7,921	0.0471	+1.27
	W	4	6,600	-0.0249	-0.67
	N	4	6,578	-0.0263	-0.71
	E	4	7,585	0.0356	+0.96
	S	4	7,180	0.0117	+0.32
	W	5	6,706	-0.0123	-0.33
	N	5	6,200	-0.0464	-1.25
	E	5	7,518	0.0374	+1.01
	S	5	7,456	0.0338	+0.91
Awapuni	W	1	7,173	-\$665	-0.92
	N	1	7,980	142	+0.20
	E,S ^f	1	7,768	-70	-0.10
	W	2	7,173	-852	-1.18
	N	2	7,258	-767	-1.06
	E	2	9,103	1078	+1.49
	S	2	9,037	1012	+1.40
	W	3	7,138	-1075	-1.49
	N	3	7,781	-432	-0.60
	E	3	8,760	547	+0.76
	S	3	9,762	1549	+2.15
	W	4	7,937	-463	-0.64
	N	4	8,279	-121	-0.17
	E	4	8,442	42	+0.06
	S	4	8,722	322	+0.45

Park	Quadrant ^a	Zone ^b	Ave. Value ^c	Residual ^d	S.D. ^e
Awapuni (cont.)	W	5	7,604	-\$984	-1.36
	N	5	8,103	-485	-0.67
	E	5	10,124	1536	+2.13
	S	5	8,274	-314	-0.43
Puriri Street Basketball	W	1	5,976	-0.0004	-0.06
	W	2	6,927	0.0078	+1.08
	W	3	7,148	-0.0113	-1.57
	W	4	7,671	-0.0038	-0.53
	W	5	8,209	0.0076	+1.06
Coronation	S	1	6,015	0.0073	+0.55
	S	2	6,509	-0.0229	-1.72
	S	3	7,775	0.0165	+1.24
	S	4	8,030	0.0037	+0.28
	S	5	8,263	-0.0046	-0.35
Takaro	W	1	7,679	\$1197	+2.08
	N	1	6,060	-422	-0.73
	E	1	5,810	-672	-1.16
	S	1	6,434	-48	-0.08
	W	2	7,338	762	+1.32
	N	2	6,386	-190	-0.33
	E	2	6,233	-343	-0.59
	S	2	5,475	-1101	-1.91
	W	3	6,963	293	+0.50
	N	3	6,792	122	+0.21
	E	3	7,003	333	+0.57
	S	3	6,898	228	+0.39
	W	4	7,126	361	+0.62
	N	4	6,688	-77	-0.13
	E	4	7,025	260	+0.45
	S	4	6,663	-102	-0.17
	W	5	7,419	560	+0.97
	N	5	7,376	517	+0.89
	E	5	5,772	-1087	-1.89
	S	5	6,266	-593	-1.03
Savage Crescent	W	1	6,787	\$650	+0.80
	N	1	5,698	-439	-0.54
	E	1	6,255	118	+0.14
	S	1	6,302	165	+0.20
	W	2	6,366	-48	-0.05
	N	2	6,575	161	+0.19
	E	2	6,437	23	+0.02
	S	2	6,895	481	+0.59
	W	3	6,623	-69	-0.08
	N	3	6,546	-146	-0.18
	S	3	6,521	-171	-0.21
	W	4	4,099	-2870	-3.54

Park	Quadrant ^a	Zone ^b	Ave. Value ^c	Residual ^d	S.D. ^e
Savage Crescent (cont.)	N	4	7,084	\$115	+0.14
	S	4	6,668	-301	-0.37
	W	5	8,131	885	+1.09
	N	5	7,947	701	+0.86
	S	5	7,990	744	+0.91
Humber	W	1	6,811	\$408	+0.92
	N	1	6,239	-164	-0.37
	E	1	6,219	-184	-0.41
	W	2	6,454	59	+0.13
	N	2	6,492	97	+0.21
	E	2	6,082	-313	-0.70
	W	3	6,148	-239	-0.53
	N	3	6,161	-226	-0.51
	E	3	7,117	730	+1.65
	W	4	5,910	-468	-1.05
	N	4	6,142	-236	-0.53
	E	4	6,785	407	+0.91
	W	5	5,423	-947	-2.14
	N	5	6,785	415	+0.93
	E	5	7,032	662	+1.49
A & P Showgrounds	W	1	6,424	\$529	+0.62
	N	1	5,012	-883	-1.04
	S	1	4,758	-1137	-1.33
	W	2	6,917	914	+1.07
	N	2	8,210	2207	+2.60
	S	2	5,258	-745	-0.87
	W	3	5,988	-122	-0.14
	N	3	6,792	682	+0.80
	S	3	5,368	-742	-0.87
	W	4	5,902	-316	-0.37
	N	4	6,622	404	+0.47
	S	4	5,335	-883	-1.04
	W	5	6,112	-213	-0.25
	N	5	6,598	273	+0.32
	S	5	6,358	33	+0.03
Milverton	W	2	6,843	-\$734	-0.87
	N	2	6,833	-744	-0.88
	E	2	9,762	2186	+2.60
	S	2	7,352	-225	-0.26
	W	3	7,392	-227	-0.27
	N	3	7,249	-370	-0.44
	E	3	7,911	292	+0.34
	S	3	7,440	-179	-0.21
	W	4	7,257	-404	-0.48
	N	4	8,080	419	+0.49
	E	4	8,347	686	+0.81

Park	Quadrant ^a	Zone ^b	Ave. Value ^c	Residual ^d	S.D. ^e
Milverton (cont.)	S	4	6,472	-\$1189	-1.41
	W	5	6,964	-738	-0.87
	N	5	8,162	460	+0.54
	E	5	9,033	1331	+1.58
	S	5	7,136	-566	-0.67
Memorial	W	2	4,575	-\$916	-1.01
	N	2	5,435	-56	-0.06
	E	2	6,048	557	+0.61
	S	2	6,697	1206	+1.33
	W	3	5,625	-231	-0.25
	N	3	6,140	284	+0.31
	E	3	6,233	377	+0.41
	S	3	4,743	-1113	-1.23
	W	4	5,997	-225	-0.24
	N	4	7,598	1376	+1.52
	E	4	5,892	-330	-0.36
	S	4	4,394	-1828	-2.02
	W	5	7,658	1070	+1.18
	N	5	7,538	950	+1.05
	E	5	6,675	87	+0.09
	S	5	5,381	-1207	-1.33
<u>Hastings</u>					
Frimley	W	1	12,096	0.0077	+0.08
	N	1	15,580	0.1176	+1.25
	S	1	11,481	-0.0150	-0.16
	W	2	8,441	-0.1300	-1.39
	N	2	11,970	0.0217	+0.23
	S	2	9,702	-0.0695	-0.74
	W	3	10,000	-0.0455	-0.49
	N	3	12,045	0.0353	+0.38
	S	3	10,009	-0.0451	-0.48
	W	4	10,458	-0.0184	-0.20
	N	4	18,279	0.2242	+2.39
	S	4	7,812	-0.1450	-1.55
	W	5	10,462	-0.0122	-0.13
Flaxmere	N	5	14,371	0.1257	+1.34
	S	5	9,557	-0.0515	-0.55
	E	1	13,156	0.0005	+0.03
	E	2	11,336	0.0174	+0.98
	E	3	9,090	-0.0308	-1.73
Windsor	E	4	8,930	-0.0046	-0.26
	E	5	8,844	0.0175	+0.98
	W	1	8,990	-0.0356	-0.74
	N	1	10,117	0.0157	+0.32
	E	1	11,191	0.0596	+1.24

Park	Quadrant ^a	Zone ^b	Ave. Value ^c	Residual ^d	S.D. ^e
Windsor (cont.)	S	1	10,297	0.0234	+0.48
	W	2	7,107	-0.0964	-2.01
	N	2	9,095	0.0107	+0.22
	E	2	9,676	0.0376	+0.78
	S	2	7,830	-0.0543	-1.13
	W	3	6,536	-0.1086	-2.26
	N	3	8,494	0.0052	+0.10
	E	3	9,693	0.0625	+1.30
	S	3	8,635	0.0123	+0.25
	W	4	7,689	-0.0210	-0.43
	N	4	8,309	0.0127	+0.26
	E	4	8,969	0.0459	+0.95
	S	4	7,930	-0.0075	-0.15
	W	5	7,403	-0.0241	-0.50
	N	5	8,021	0.0107	+0.22
	E	5	9,414	0.0802	+1.67
	S	5	7,318	-0.0292	-0.60
Cornwall	W,N ^f	1	14,163	0.1220	+1.97
	E	1	8,104	-0.1205	-1.94
	S	1	12,033	0.0512	+0.82
	W	2	10,428	0.0591	+0.95
	N	2	7,989	-0.0566	-0.91
	E	2	7,797	-0.0672	-1.08
	S	2	8,995	-0.0051	-0.08
	W,S ^f	3	7,795	-0.0263	-0.42
	N	3	8,201	-0.0042	-0.07
	E	3	8,300	0.0010	+0.02
	W	4	8,618	0.0464	+0.75
	N	4	8,474	0.0391	+0.63
	E	4	7,913	0.0093	+0.15
	S	4	5,857	-0.1214	-1.96
	W	5	7,990	0.0361	+0.58
	N,E ^f	5	8,083	0.0411	+0.66
	S	5	7,285	-0.0040	-0.06
St Leonards	W	1	9,695	\$901	+1.45
	E	1	8,633	-161	-0.25
	S	1	8,102	-692	-1.11
	W	2	8,769	142	+0.22
	E	2	9,466	839	+1.35
	S	2	7,778	-849	-1.37
	W	3	8,373	-87	-0.14
	N	3	7,737	-723	-1.17
	E	3	8,760	300	+0.48
	S	3	8,726	266	+0.42
	W	4	9,072	778	+1.25
	N	4	7,457	-837	-1.35
	E	4	8,743	449	+0.72
	S	4	7,805	-489	-0.79

Park	Quadrant ^a	Zone ^b	Ave. Value ^c	Residual ^d	S.D. ^e
St Leonards (cont.)	W	5	8,787	\$660	+1.06
	N	5	8,613	486	+0.78
	E	5	8,142	15	+0.02
	S	5	7,129	-998	-1.61
Hawke's Bay Racecourse	W	1	9,629	0.0324	+0.99
	N	1	9,128	0.0092	+0.28
	E	1	8,416	-0.0260	-0.80
	S	1	8,423	-0.0257	-0.79
	W	2	8,318	0.0088	+0.27
	N	2	7,820	-0.0180	-0.55
	E	2	8,363	0.0111	+0.34
	S	2	7,952	-0.0108	-0.33
	W	3	6,968	-0.0448	-1.37
	N	3	7,981	0.0142	+0.43
	E	3	9,280	0.0796	+2.44
	S	3	7,518	-0.0118	-0.36
	W	4	7,010	-0.0256	-0.79
	N	4	7,731	0.0169	+0.52
	E	4	7,991	0.0313	+0.96
	S	4	7,460	0.0014	+0.04
	W	5	6,776	-0.0275	-0.84
	N	5	8,114	0.0507	+1.55
	E	5	6,212	-0.0653	-1.99
	S	5	7,218	-0.0001	-0.00
Ebbett	W	1	8,798	0.0240	+0.58
	N	1	8,098	-0.0120	-0.29
	E	1	8,557	0.0119	+0.28
	S	1	8,734	0.0208	+0.50
	W	2	8,721	0.0504	+1.22
	N	2	7,198	-0.0329	-0.79
	E	2	5,839	-0.1238	-3.00
	S	2	7,948	0.0101	+0.24
	W	3	8,294	0.0463	+1.12
	N	3	7,176	-0.0165	-0.40
	S	3	7,549	0.0055	+0.13
	W	4	8,198	0.0539	+1.30
	N	4	6,755	-0.0302	-0.73
	S	4	6,721	-0.0324	-0.78
	W	5	8,025	0.0543	+1.31
	N	5	7,030	-0.0032	-0.07
	S	5	6,665	-0.0263	-0.63
Akina	N	1	7,661	0.0396	+0.56
	E	1	4,663	-0.1760	-2.51
	S	1	9,199	0.1190	+1.70
	N	2	8,272	0.0659	+0.94
	E	2	6,920	-0.0116	-0.16
	S	2	6,770	-0.0211	-0.30

Park	Quadrant ^a	Zone ^b	Ave. Value ^c	Residual ^d	S.D. ^e
Akina (cont.)	N	3	7,410	0.0140	+0.20
	E	3	6,906	-0.0165	-0.23
	N	4	7,189	-0.0020	-0.02
	E	4	7,166	-0.0034	-0.04
	N	5	6,258	-0.0645	-0.92
	E	5	8,269	0.0565	+0.80
Kirpatrick	W	1	7,876	\$44	+0.14
	N	1	7,372	-460	-1.49
	S	1	8,273	441	+1.43
	W	2	7,985	38	+0.12
	N	2	7,935	-12	-0.03
	S	2	8,005	58	+0.18
	W	3	8,249	188	+0.61
	N	3	7,692	-369	-1.20
	S	3	8,000	-61	-0.19
	W	4	8,366	191	+0.62
	N	4	8,402	227	+0.73
	S	4	7,887	-288	-0.93
	W	5	8,699	410	+1.33
	N	5	8,532	243	+0.79
	S	5	7,636	-653	-2.12
Mayfair	W	2	7,708	\$174	+0.61
	N	2	7,746	212	+0.75
	E	2	7,407	-127	-0.45
	S	2	7,571	37	+0.13
	W	3	7,686	103	+0.36
	N	3	7,104	-479	-1.70
	E	3	7,240	-343	-1.22
	S	3	8,014	431	+1.53
	W	4	7,665	31	+0.11
	N	4	7,658	25	+0.08
	E	4	7,324	-309	-1.09
	S	4	7,575	-58	-0.20
	W	5	7,781	99	+0.35
	N	5	7,482	-200	-0.71
	E	5	7,437	-245	-0.87
	S	5	8,331	649	+2.30
<u>Wanganui</u>					
Kowhai	E	1	7,996	-0.0328	-0.89
	S	1	9,958	0.0625	+1.69
	E	2	6,935	-0.0147	-0.39
	S	2	7,214	0.0025	+0.06
	E	3	5,995	-0.0312	-0.84
	S	3	5,734	-0.0505	-1.37
	E	4	5,577	-0.0294	-0.79
	S	4	6,728	0.0521	+1.41

Park	Quadrant ^a	Zone ^b	Ave. Value ^c	Residual ^d	S.D. ^e
Kowhai (cont.)	E	5	5,722	0.0075	+0.20
	S	5	6,080	0.0339	+0.92
Wanganui Domain	W	1	6,475	-\$226	-0.44
	N	1	7,696	995	+1.97
	E	1	5,764	-937	-1.85
	S	1	6,580	-121	-0.23
	W	2	7,012	528	+1.04
	N	2	7,396	912	+1.80
	E	2	5,816	-668	-1.32
	S	2	6,131	-353	-0.69
	W	3	6,461	194	+0.38
	N	3	6,115	-152	-0.29
	E	3	6,334	67	+0.13
	S	3	6,169	-98	-0.19
	W	4	6,317	267	+0.52
	N	4	6,614	564	+1.11
	E	4	5,521	-529	-1.04
	S	4	5,612	-438	-0.86
	W	5	6,370	538	+1.06
	N	5	5,736	-96	-0.19
	E	5	5,337	-495	-0.98
	S	5	5,876	44	+0.08
Wanganui Racecourse	W	1	5,542	\$136	+0.13
	N	1	5,976	570	+0.57
	E	1	4,322	-1084	-1.07
	S	1	6,574	1168	+1.16
	W	2	4,925	-672	-0.67
	N	2	5,835	238	+0.24
	E	2	4,877	-720	-0.71
	S	2	6,202	605	+0.60
	W	3	4,747	-1040	-1.03
	N	3	7,166	1379	+1.37
	E	3	5,036	-751	-0.74
	S	3	5,786	-1	-0.00
	W	4	5,379	-598	-0.59
	N	4	7,529	1552	+1.54
	E	4	5,468	-509	-0.50
	S	4	4,850	-1127	-1.12
	W	5	5,205	-963	-0.95
	N	5	7,924	1756	+1.74
	E	5	7,650	1482	+1.47
	S	5	4,748	-1420	-1.41
Lorenzdale	W	1	5,860	\$359	+1.28
	N	1	5,375	-126	-0.45
	E	1	5,332	-169	-0.60
	S	1	5,546	45	+0.16
	W	2	5,694	111	+0.40

Park	Quadrant ^a	Zone ^b	Ave. Value ^c	Residual ^d	S.D. ^e
Lorenzdale (cont.)	N	2	5,440	-\$143	-0.51
	E	2	5,464	-119	-0.43
	S	2	5,603	20	+0.07
	W	3	5,829	163	+0.58
	N	3	5,600	-56	-0.20
	E	3	5,889	223	+0.80
	S	3	5,411	-255	-0.91
	W	4	6,112	364	+1.30
	N	4	5,757	9	+0.03
	E	4	5,625	-123	-0.44
	S	4	5,305	-443	-1.58
	W	5	6,173	343	+1.23
	N	5	5,562	-268	-0.96
	E	5	6,439	609	+2.18
	S	5	5,286	-544	-1.94
Williams Domain	W	1	5,553	0.0456	+0.93
	N	1	4,694	-0.0274	-0.56
	E	1	4,892	-0.0095	-0.19
	W	2	5,832	0.0632	+1.29
	N	2	4,111	-0.0887	-1.81
	E	2	5,087	0.0038	+0.08
	S	2	5,110	0.0058	+0.12
	W	3	5,802	0.0587	+1.20
	N	3	4,206	-0.0810	-1.66
	E	3	5,340	0.0227	+0.46
	S	3	5,142	0.0063	+0.13
	W	4	5,880	0.0630	+1.29
	N	4	4,177	-0.0855	-1.75
	E	4	5,236	0.0126	+0.26
	S	4	5,051	-0.0030	-0.06
	W	5	5,902	0.0634	+1.30
	N	5	4,256	-0.0786	-1.61
	E	5	5,318	0.0182	+0.37
	S	5	5,223	0.0103	+0.21
Showgrounds	W	1	3,461	0.0156	+0.16
	S	1	2,737	-0.0864	-0.88
	W	2	2,846	-0.1505	-1.54
	N	2	6,164	0.1852	+1.90
	S	2	4,316	0.0304	+0.31
	W	3	3,929	-0.0578	-0.59
	N	3	5,688	0.1028	+1.05
	S	3	5,366	0.0775	+0.79
	W	4	3,341	-0.1619	-1.66
	N	4	5,577	0.0606	+0.62
	S	4	5,623	0.0642	+0.66
	W	5	4,090	-0.1001	-1.03
	N	5	5,712	0.0449	+0.46
	S	5	4,867	-0.0246	-0.25

Park	Quadrant ^a	Zone ^b	Ave. Value ^c	Residual ^d	S.D. ^e
Virginia Lake	W	1	10,612	0.0115	+0.52
	N	1	10,300	-0.0015	-0.07
	E	1	10,386	0.0022	+0.10
	S	1	10,367	0.0014	+0.06
	W	2	9,988	0.0023	+0.10
	N	2	9,450	-0.0217	-0.97
	E	2	9,842	-0.0041	-0.19
	S	2	10,035	0.0044	+0.20
	W	3	9,050	-0.0305	-1.37
	N	3	9,875	0.0074	+0.33
	E	3	10,493	0.0338	+1.51
	S	3	9,091	-0.0285	-1.28
	W	4	8,960	-0.0277	-1.24
	N	4	9,920	0.0165	+0.74
	E	4	10,275	0.0318	+1.42
	S	4	9,567	0.0008	+0.03
	W	5	8,040	-0.0692	-3.10
	N	5	9,750	0.0145	+0.65
	E	5	9,871	0.0199	+0.89
	S	5	10,264	0.0368	+1.65
Peat	S	1	7,958	-\$1612	-0.49
	N	2	15,513	6537	+1.98
	S	2	7,660	-1316	-0.40
	W	3	9,420	1037	+0.31
	N	3	11,222	2839	+0.86
	E	3	4,970	-3413	-1.03
	S	3	3,969	-4414	-1.33
	W	4	9,859	2106	+0.64
	N	4	11,180	3391	+1.03
	E	4	5,098	-2691	-0.81
	S	4	3,669	-4120	-1.25
	W	5	10,319	3124	+0.94
	N	5	10,783	3588	+1.08
	E	5	5,439	-1756	-0.53
	S	5	3,896	-3299	-0.99
Victoria	W	1	6,820	0.1077	+0.69
	N	1	8,922	0.2244	+1.42
	E	1	4,171	-0.1059	-0.68
	S	1	3,116	-0.2325	-1.49
	W	2	6,947	0.0935	+0.69
	N	2	9,302	0.2203	+1.41
	E	2	4,699	-0.0763	-0.49
	S	2	3,513	-0.2027	-1.30
	W	3	6,808	0.0717	+0.46
	N	3	9,011	0.1935	+1.24
	E	3	4,616	-0.0971	-0.62
	S	3	3,650	-0.1990	-1.28
	W	4	6,715	0.0565	+0.36

Park	Quadrant ^a	Zone ^b	Ave. Value ^c	Residual ^d	S.D. ^e
Victoria (cont.)	N	4	9,424	0.2037	+1.31
	E	4	4,832	-0.0864	-0.55
	S	4	3,720	-0.2000	-1.28
	W	5	6,921	0.0625	+0.40
	N	5	9,530	0.2014	+1.29
	E	5	4,844	-0.0925	-0.59
	S	5	4,316	-0.1426	-0.92
Castlecliff Beach	E	1	4,793	\$406	+0.94
	E	2	4,006	-466	-1.08
	E	3	4,146	-411	-0.95
	E	4	5,239	596	+1.38
	E	5	4,603	-125	-0.29

^aLetter N, E, S or W, standing for North, East, South or West, respectively, indicates direction of quadrant from park.

^bX-value in regression equation.

^cY-value in regression equation.

^dResidual is average property value (Y) minus estimated value by regression (YHAT). Linear or logarithmic data are shown, depending upon whether linear or logarithmic regression is used.

^eStandard deviation, calculated by dividing the residual value by the standard deviation of the residuals.

^fWhere less than four houses are found in one zone-quadrant, the data are combined with the adjacent zone-quadrant having the nearest value, and the combined average is used.

BIBLIOGRAPHY OF WORKS CONSULTED

Books, Articles, Theses, etc.

- Abend, N.A., 1971: The Urban Environment, in M.R. Levin (ed.), Exploring Urban Problems, 322-379.
- Alanen, A.A., 1972: American "Utopias" in an Urban Age: The Development of New Towns and Planned Communities, 1890-1970, Vol. 1, Papers 27th Annual Meeting, SEast. Div., Ass. Am. Geogr., 1-5.
- Alexander, B.N., 1966: The Purpose and Provision of Reserves in Relation to Residential Development, Unpublished paper presented to Forum on Planning for Residential Development, sponsored by the N.Z. Institute of Surveyors and the Department of Town Planning, University of Auckland.
- Alley, P.C., 1954: Post-War Housing Expansion in Metropolitan Christchurch. Unpublished M.A. Thesis in Geography, Canterbury University College.
- Allison, A.K., 1968: Buildings and Landscapes, N.Z. Parks and Reserves, 82-86.
- Alonso, W., 1960: A Theory of the Urban Land Market, Pap. Proc. Reg. Sci. Ass., 149-158.
- Alonso, W., 1964: Location and Land Use.
- American Public Health Association, 1960: Planning the Neighborhood.
- Anonymous, 1969: Parks and Recreation in the Urban Crisis, Parks and Recreation, 35-46.
- Armstrong, R.W. and Bovee, B., 1962: Where People Go, Parks Must Grow, Am. City, 100-102.
- Armytage, W.H.G., 1961: Heavens Below: Utopian Experiments in England 1560-1960.
- Ashworth, W., 1954: The Genesis of Modern British Town Planning.
- Atkisson, A.A. and Robinson, I.M., 1969: Amenity Resources for Urban Living, in H.S. Perloff (ed.), The Quality of the Urban Environment: Essays on "New Resources" in an Urban Age, 179-201.
- Barlowe, R., 1958: Land Resource Economics.

- Bartholomew, H., 1955: Land Use in American Cities.
- Beckmann, M.J., 1969: On the Distribution of Urban Rent and Residential Density, J. econ. Theory, 60-67.
- Bedggood, L.R. (ed.), 1970: Open Spaces in the Developing Community.
- Bell, G. and Tyrwhitt, J. (eds.), 1972: Human Identity in the Urban Environment.
- Beresford, M., 1967: New Towns of the Middle Ages.
- Berry, B.J.L. and others, 1963: University of Chicago Department of Geography Research Paper No. 85.
- Berry, B.J.L. and Marble, D.F. (eds.), 1968: Spatial Analysis: A Reader in Statistical Geography.
- Black, W.J., 1968: A Farsighted Study and Some Blind Spots, Archit. Forum, 44-49.
- Blake, P., 1966: Le Corbusier: Architecture and Form.
- Blalock, H.M., 1960: Social Statistics.
- Blumenfeld, H., 1948: Correlation Between Value of Dwelling Units and Altitude, Land Econ., 396-402.
- Bolton, J.W., 1970: Personal communication.
- Bolton, J.W., 1971: Personal communication.
- Boothby, M.R., 1971: Personal Communication.
- Bradfield, A.G.S., 1962: The Precious Years.
- Brauer, D.G., 1970: Placing a Dollar Sign on Urban Parks, Parks and Recreation, 14-16.
- Breckenfeld, G., 1971: Columbia and the New Cities.
- Brigham, E.F., 1965: The Determinants of Residential Land Values, Land Econ., 325-334.
- Brown, J.B., 1967: Social and Fiscal Implications of the Incidence of Unimproved Value Rating and Modern Trends, N.Z. Valuer, 59-68.
- Buckman, W.A. and others (eds.), 1969: Urban Challenges.
- Burgess, E.W., 1929: Urban Areas, in T.V. Smith and L.D. White (eds.), Chicago: An Experiment in Social Science Research, 113-138.

- Burke, G., 1971: Towns in the Making.
- Butler, E.W. and Kaiser, E.J., 1971: Prediction of Residential Movement and Spatial Allocation, Urban Affairs, 477-495.
- Butler, G.D., 1958: Recreational Areas, Their Design and Equipment.
- Butler, G.D., 1959: Introduction to Community Recreation.
- Butler, G.D., 1960: Playgrounds: Their Administration and Operation.
- Butler, G.D., 1962: Standards for Municipal Recreation Areas.
- Butler, G.D., 1963: Recreation Area Standards, Recreation Mag., 29-33.
- Caldwell, L.K., 1970: Environment: A Challenge for Modern Society.
- Casetti, E., 1971: Equilibrium Land Values and Population Densities in an Urban Setting, Econ. Geogr., 16-20.
- Chadwick, G.F., 1966: The Park and the Town.
- Chapin, F.S., Jr., 1957: Urban Land Use Planning.
- Chapin, F.S., Jr., 1967: Existing Techniques of Shaping Urban Growth, in H. W. Eldredge (ed.), Taming Megalopolis. Volume II: How to Manage an Urbanized World, 726-746.
- Chorley, R.J. and Haggett, P. (eds.), 1967: Models in Geography.
- Cicchetti, C.J., 1971: Some Economic Issues in Planning Urban Recreational Facilities, Land Econ., 14-23.
- Clark, C., 1951: Urban Population Densities, Jl R. statist. Soc., Series A., 490-496.
- Clarke, K.V., 1961: A Study in Land and Property Values and Town and Country Planning in New Zealand. Unpublished Dip. T.P. Thesis, University of Auckland.
- Clawson, M., 1960: Suburban Development Districts: A Proposal for Better Urban Growth, J. Am. Inst. Planners, 69-83.
- Clawson, M., 1963: Land and Water Recreation.
- Clawson, M., 1969: Open (Uncovered) Space as a New Urban Resource, in H.S. Perloff (ed.), The Quality of the Urban Environment, 139-175.
- Clawson, M.; Held, R.B.; and Stoddard, C.H., 1960: Land for the Future.
- Clawson, M. and Knetsch, J., 1966: Economics of Outdoor Recreation.

- Clay, N., 1971: Mini Parks--Diminishing Returns, Parks and Recreation, 22-26.
- Clay, N., 1972: Landscapes for Urban Play, Archit. Forum, 34-40.
- Cliff, A.D. and Ord, J.K., 1973: Spatial Autocorrelation.
- Clonts, J.A., Jr., 1970: Influence of Urbanization on Land Values at the Urban Periphery, Land Econ., 489-497.
- Comey, A.C. and Wehrly, M.S., 1939: Planned Communities.
- Commission on College Geography, 1970: Geography in the Two-Year Colleges.
- Cooke, M.B. (Compiler), 1966: A Digest of the New Zealand Valuer 1945-1966.
- Cosgrove, I. and Jackson, R., 1972: The Geography of Recreation and Leisure.
- Crafts, E.C. (ed.), 1966: Outdoor Recreation Standards.
- Cranwell, B.S., 1968: Waterfront Recreation. Unpublished Dip. T.P. Dissertation, University of Auckland.
- Creese, W.L. (ed.), 1962: The Legacy of Raymond Unwin: A Human Pattern for Planning.
- Creese, W.L., 1966: The Search for Environment: The Garden City: Before and After.
- Crosswhite, W.M., 1962: Discussion: Land Values and Parks in Urban Fringe Areas, J. Fm Econ., 1726-1729.
- Cullingworth, J.B., 1964: Planning for Leisure, Urban Studies, 1-25.
- Cullum, K.R., 1969: Population Density Structure and Residential Location in the Auckland Urban Area 1945-1966. Unpublished M.A. Thesis in Geography, University of Auckland.
- Cunningham, N.J., 1956: Open Space in Relation to Urban Development.
- Curtis, B.J., 1968: The Volcanic Cones of Auckland. Unpublished Dip. T.P. Thesis, University of Auckland.
- Curtis, J.E., 1969: How Parks Will Shape Urban Development, Am. City, 87-89.
- Dahinden, J., 1972: Urban Structures for the Future.
- Dahms, F.A., 1966: The Journey to Work in Metropolitan Auckland: A Geographic Analysis. Unpublished Ph.D. Thesis in Geography, University of Auckland.
- Daly, M.T., 1967: Land Value Determinants: Newcastle, New South Wales, Aust. geogr. Stud., 30-39.

- Danfield, H.G., 1953: Recreation in the American Community.
- Darling, F.F. and Milton, J.P., 1966: Future Environments of North America.
- Davis, J.L., 1965: The Elevated System and the Growth of Northern Chicago.
- Davis, J.T., 1960: Land Use Characteristics In and Around the Central Business Districts of Eight Cities. Unpublished Ph.D. Dissertation in Geography, Clark University.
- Davis, J.T., 1971: Sources of Variation in Housing Values in Washington, D.C., Geogr Analysis, 63-76.
- Denman, D.R.; Roberts, R.A.; and Smith, H.J.F., 1967: Commons and Village Greens.
- Dennison, H.L., 1963: Triple-Benefit Waterfront Project, Am. City, 110-112.
- Dickson, T.G., 1969: Culs-de-sac and Community Life, in W.A. Buckman and others (eds.), Urban Challenges, 55-64.
- Dickson, T.G., 1970: The Origin and Evolution of Urban Form in Wanganui East, Gonville and Castlecliff. Unpublished M.A. Thesis in Geography, Massey University.
- Downing, P.B., 1973: Factors Affecting Commercial Land Values: An Empirical Study of Milwaukee, Wisconsin, Land Econ., 44-56.
- Dryden, J.G., 1969: Administrative Aspects of Coastal Recreation. Unpublished Dip. T.P. Dissertation, University of Auckland.
- Duhl, L.J., 1963: The Human Measure: Man and Family in Megalopolis, in L. Wingo, Jr. (ed.), Cities and Space: The Future Use of Urban Land, 133-152.
- Dyos, H.J. (ed.), 1966: The Study of Urban History.
- Editors of Fortune, 1957. The Exploding Metropolis.
- Eldredge, H.W., (ed.), 1967: Taming Megalopolis. Volume II: How to Manage an Urbanized World.
- Elias, C.E., Jr. (ed.), 1964: Metropolis: Values in Conflict.
- Elliot, M.B., 1969a: Open Space in Urban Areas, paper read at the New Zealand Town and Country Planning Conference.
- Elliot, M.B., 1969b: Planning for Public Open Space in New Suburban Areas. Unpublished Dip. T.P. Dissertation, University of Auckland.
- Ely, R.T. and Wehrwein, G.S., 1964: Land Economics.

- Everly, R.E., 1972: Innovative Park Design, Am. City, 72-74.
- Ezekiel, M. and Fox, K.A., 1959: Methods of Correlation and Regression Analysis, Linear and Curvilinear.
- Fava, S.F., 1968: Urbanism in World Prespective.
- Fookes, T.W., 1966: The Influence of Rating Systems on Auckland's Urban Development. Unpublished M.A. Thesis in Geography, University of Canterbury.
- Forrest, J., 1965: Residential Renewal in New Zealand, in Proc. 4th N.Z. Geogr. Conf., 151-159.
- Forward, C.N., 1970: Waterfront Land Use in the Six Australian State Capitals, Ann. Ass. Am. Geogr., 517-532.
- Francis, D.J., 1963: Urban Development of Upper Hutt 1945-1961; the Evolution of a "New Town." Unpublished M.A. Thesis in Geography, Victoria University of Wellington.
- Francombe, D.M.I., 1968: Recreation Reserves and Open Spaces in the Borough of Mount Roskill. Unpublished Dip. T.P. Thesis, University of Auckland.
- Freeman, T.W., 1958: Geography and Planning.
- French, J.S., 1971: The First People's Park Movement, Landsc. Archit., 25-29.
- Friedman, J. and Miller, J., 1965: The Urban Field, J. Am. Inst. Planners, 312-320.
- Garner, B.J., 1966: The Internal Structure of Retail Nucleations.
- Garner, B.J., 1967: Models of Urban Geography and Settlement Location, in R.J. Chorley and P. Haggett (eds.), Models in Geography, 303-360.
- Garrison, W.L. and Marble, D.F. (eds.), 1967: Quantitative Geography, Part I: Economic and Cultural Topics.
- Geddes, P., 1915: The Evolution of Cities.
- Gibson, C., 1973: Urbanization in New Zealand: A Comparative Analysis, Demography, 71-84.
- Gilpin, H.G., 1973: Personal communication.
- Goldberg, M.A., 1970: Transportation, Urban Land Values and Rents: A Synthesis, Land Econ., 153-162.
- Gooch, R.B., 1963: Selection and Layout of Land for Playing Fields and Playgrounds.

- Goodman, W.I. and Frend, E.C. (eds.), 1968: Principles and Practice of Urban Planning.
- Gottmann, J., 1961: Megalopolis.
- Gottmann, J. and Harper, R.A. (eds.), 1967: Metropolis on the Move: Geographers Look at Urban Sprawl.
- Gray, D. and Pelegriano, D.A. (eds.), 1973: Reflections on the Recreation and Park Movement.
- Greer-Wootten, B., 1972: A Bibliography of Statistical Applications in Geography.
- Grey, A.L. and others, 1970: People and Downtown: Use, Attitudes, Settings.
- Gruen, V., 1964: The Heart of Our Cities.
- Grundy, A.A., 1959: The Geographic Character of Residential Christchurch. Unpublished M.A. Thesis in Geography, University of Canterbury.
- Guggenheimer, E.C., 1969: Planning for Parks and Recreation Needs in Urban Areas.
- Gutheim, F., 1963: Urban Space and Urban Design, in L. Wingo, Jr. (ed.), Cities and Space: The Future Use of Urban Land, 103-131.
- Gutkind, E.A., 1962: The Twilight of Cities.
- Haar, C.M., 1959: Land-use Planning: A Casebook on the Use, Misuse, and Re-use of Urban Land.
- Haar, C.M., 1963: The Social Control of Urban Space, in L. Wingo, Jr. (ed.), Cities and Space: The Future Use of Urban Land, 175-229.
- Hägerstrand, T., 1968: A Monte Carlo Approach to Diffusion, in B.J.L. Berry and D.F. Marble (eds.), Spatial Analysis: A Reader in Statistical Geography, 368-384.
- Haggett, P., 1966: Locational Analysis in Human Geography.
- Hall, E.T., 1966: The Hidden Dimension.
- Hauser, P.M. (ed.), 1965: The Study of Urbanization.
- Hayes, C.R., 1957: Suburban Residential Land Values Along the C.B. & Q. Railroad, Land Econ., 177-181.
- Hays, W.L., 1963: Statistics.
- Hayward, J., 1970: Personal communication.

- Herbert, D., 1973: Urban Geography: A Social Perspective.
- Hochman, O. and Pines, D., 1971: Competitive Equilibrium of Transportation and Housing in the Residential Ring of an Urban Area, Environment and Planning, 51-62.
- Horton, F.E. and Reynolds, D.R., 1971: Effects of Urban Spatial Structure on Individual Behavior, Econ. Geogr., 36-48.
- Howard, E., 1945: Garden Cities of Tomorrow.
- Hoyt, H., 1939: The Structure and Growth of Residential Neighborhoods in American Cities.
- Hoyt, H. and others, 1955: The Pattern of Home Values in Washington, D.C. Standard Metropolitan Area, in Economic Survey of Montgomery and Prince Georges Counties, Maryland, 92-93.
- Hoyt, H., 1960: Changing Patterns of Land Values, Land Econ., 109-117.
- Hurd, R.M., 1924: Principles of City Land Value.
- Jacobs, A.B., 1967: Observations on Chandigarh, J. Am. Inst. Planners, 18-26.
- Jacobs, J., 1961: Why Parks Live or Die, Archit. Forum, 144-146.
- Jacobs, J., 1964: The Death and Life of Great American Cities.
- James, F.J. and Hughes, J.W., 1972: Economic Growth and Residential Patterns.
- Jamieson, G.B.; Mackay, W.K.; and Latchford, J.C.R., 1967: Transportation and Land Use Structure, Urban Studies, 201-217.
- Jefferies, R.L., 1966: Urban Subdivisions--An Economic Analysis, in M.B. Cooke (ed.), A Digest of the New Zealand Valuer, 1945 to 1966, 173-179.
- Jefferies, R.L., 1969: The Riddle of Housing Costs and Housing Values, N.Z. Valuer, 3-5.
- Jenkin, N., 1971: Personal communication.
- Jew, P.J., 1969: Regional Recreation, paper read at the New Zealand Town and Country Planning Conference.
- Johnson, J.H., 1967: Urban Geography.
- Johnston, R.J., 1970: On Spatial Patterns in the Residential Structure of Cities, Can. Geogr., 361-367.
- Johnston, W.B. (ed.), 1969: Human Geography: Concepts and Case Studies.
- Jones, E., 1966: Towns and Cities.

- Kaplan, M., 1965: The Role of Planner and Developer in the New Community, Wash. Univ. Law Q., 88-104.
- Keeble, L., 1964: Principles and Practice of Town and Country Planning.
- Kent, T.J., Jr., 1970: Open Space for the San Francisco Bay Area.
- Kissling, C.C., 1969: Distance, Interaction and Activity Patterns, in W.B. Johnston (ed.), Human Geography: Concepts and Case Studies, 61-77.
- Knetsch, J.L., 1962: Land Values and Parks in Urban Fringe Areas, J. Fm Econ., 1718-1726.
- Knos, D.S., 1962: The Distribution of Land Values in Topeka, Kansas, in B.J.L. Berry and D.F. Marble (eds.), Spatial Analysis: A Reader in Statistical Geography, 269-289.
- Kovatch, G.; Barber, J.B.; Casey, R.F.; and Zames, G., 1971: Transportation Systems Technology: A Twenty Year Outlook.
- Laing, R.M., 1969: Open Space for Recreation in Metropolitan Auckland. Unpublished M.A. Thesis in Geography, University of Auckland.
- Landahl, W.L., 1972: Vest Pocket Parks and a County, Parks and Recreation, 20-21.
- Latham, M.M.B., 1966: Towards a Concept of Urban Design. Unpublished Dip. T.P. Thesis, University of Auckland.
- Lawson, S.F. (ed.), 1969: Workshop on Urban Open Space.
- Levin, M.R. (ed.), 1971: Exploring Urban Problems.
- Levin, M.R., 1971: Land Use Patterns and Problems, in M.R. Levin (ed.), Exploring Urban Problems, 66-131.
- Levine, L., 1964: Land Conservation in Metropolitan Areas, J. Am. Inst. Planners, 204-216.
- Lyle, J.N., 1970: People Watching in Parks, Landsc. Archit., 30-31 and 51-52.
- McClintock, W.G. and others, 1959: Principles and Practice of Urban Valuation in New Zealand.
- McHarg, I., 1969: Design with Nature.
- McKelvey, B., 1969: The City in American History.
- MacKenzie, J.G.C., 1969: Personal communication.
- MacKenzie, J.G.C., 1970: Personal communication.

- MacLachlan, R.J., 1967: Unimproved Value: Its History, Development and Difficulties, N.Z. Valuer, 48-59.
- McVeagh, J.P., 1967: McVeagh's Land Valuation Law.
- Maher, C.A., 1967: Age and Housing Quality in Three Urban Areas. Unpublished M.A. Thesis in Geography, University of Canterbury.
- Mandelker, D.R., 1966: Green Belts and Urban Growth.
- Marble, D.F., 1967: A Theoretical Exploration of Individual Travel Behavior, in W.L. Garrison and D.F. Marble (eds.), Quantitative Geography, Part I: Economic and Cultural Topics, 33-53.
- Mayer, A., 1968: Greenbelt Towns Revisited.
- Mayer, H.M. and Kohn, C.F. (eds.), 1959: Readings in Urban Geography.
- Meining, D.W., 1962: On the Margins of the Good Earth.
- Mills, E.S., 1969: The Value of Urban Land, in H.S. Perloff (ed.), The Quality of the Urban Environment: Essays on "New Resources" in an Urban Age, 231-253.
- Mitchell, L.S., 1966: Recreational Geography: Its Definition and Illustration, Memorandum Folio XVIII, Southeastern Division, Association of Geographers, 160-167.
- Mitchell, L.S., 1968: An Evaluation of Central Place Theory in a Recreation Context: The Case of Columbia, South Carolina, SEast. Geogr., 46-53.
- Mitchell, L.S., 1969: Toward a Theory of Public Urban Recreation, in Proc. Ass. Am. Geogr., 103-108.
- Mitchell, L.S. and Faris, D.D., 1972: Open Space in Four Southern Piedmont Cities, Vol. 1, Papers 27th Annual Meeting, SEast. Div., Ass. Am. Geogr., 81-84.
- Mitchell, N.D. and Stelling, C.A., 1967: County Parks and Open Space Planning, Parks and Recreation, 28-30.
- Mohring, H., 1961: Land Values and the Measurement of Highway Benefits, J. Political econ., 236-249.
- Moore, D.B., 1957: Recreational Use in Indianapolis, Am. Waterworks J., 1160-1168.
- Morris, A.E.J., 1972: History of Urban Form: Prehistory to the Renaissance.
- Morrison, J.P., 1948: The Evolution of a City.
- Moriarty, B.M., 1970: A Test of Alternative Hypotheses of Urban Residential Growth, in Proc. Ass. Am. Geogr., 97-101.

- Mumford, L., 1963: The Highway and the City.
- Mumford, L., 1966: The City in History.
- Muth, R.F., 1969: Cities and Housing.
- Muth, R.F., 1971: The Derived Demand for Urban Residential Land, Urban Studies, 243-254.
- National Academy of Sciences, 1972: Urban Growth and Land Development: The Land Conversion Process.
- O'Donnell, L.A., 1970: Open Spaces in the Developing Community--Comprehensive Development, in L.R. Bedggood (ed.), Open Spaces in the Developing Community, 1-9.
- Olmsted, F.L., 1968: Landscape into Cityscape.
- Olsson, G., 1970: Explanation, Prediction, and Meaning Variance: An Assessment of Distance Interaction Models, Econ. Geogr., 223-233.
- Osborn, F.J., 1969: Green Belt Cities.
- Owen, W., 1972: The Accessible City.
- Papageorgiou, A., 1967: Architectural Schemata for Outdoor Recreation Areas of Tomorrow, Daedalus, 1158-1172.
- Papageorgiou, G.J., 1971: The Population Density and Rent Distribution Models Within a Multicentre Framework, Environment and Planning, 267-282.
- Perloff, H.S., 1968: Issues in Urban Economics.
- Perloff, H.S. (ed.), 1969: The Quality of the Urban Environment.
- Pirenne, H., 1925: Medieval Cities: Their Origin and the Revival of Trade.
- Platt, R.H., 1972: The Open Space Decision Process: Spatial Allocation of Costs and Benefits.
- Polaschek, R.J. (ed.), 1956: Local Government in New Zealand.
- Poole, M.A. and O'Farrell, P.N., 1971: The Assumptions of the Linear Regression Model, in Trans. Inst. Br. Geogr., 145-158.
- Powell, J.M., 1970: The Victorian Survey System, 1837-1860, N.Z. Geogr., 50-69.
- Pownall, L.L., 1955: The Contemporary New Zealand Town: A Study in Urban Geography. Unpublished Ph.D. Thesis, Canterbury University College.
- Putnam, R.G.; Taylor, F.J.; and Kettle, P.G. (eds.), 1970: A Geography of Urban Places: Selected Readings.

- Rancich, M.T., 1970: Land Value Change in an Area Undergoing Urbanization, Land Econ., 32-40.
- Rapkin, C., 1969: Developing Economic Patterns of Urban Land Uses, N.Z. Valuer, 462-469.
- Rasmussin, S.E., 1967: London: The Unique City.
- Ratcliff, R.U., 1949: Urban Land Economics.
- Reilly, W.J., 1931: The Law of Retail Gravitation.
- Reiner, T.A., 1963: The Place of the Ideal Community in Urban Planning.
- Rettie, D.F., 1969: Park Values and the City, Natn. Pks Mag., 8-10.
- Rhodes, E.A., 1973: The Human Squares: Athens, Greece, Ekistics, 124-132.
- Rickert, J.E., 1965: The Present and Potential Role of State and Local Taxation in the Preservation or Development of Open Space in Urban Fringe Areas.
- Riddell, R.B., 1959: Open Space Requirements for Urban Areas with Particular Reference to New Zealand. Unpublished Dip. T.P. Thesis, University of New Zealand.
- Ritter, F.A., 1971: An Appraisal of Measures of Residential Land Value, Econ. Geogr., 185-191.
- Robinson, F.S., 1968: The Role of Land Use Survey in the Planning Process and Methods of Land Use Data Collection in New Zealand. Unpublished Dip. T.P. Thesis, University of Auckland.
- Robson, B.T., 1965: An Ecological Analysis of the Evolution of Residential Areas in Sunderland, Urban Studies, 120-143.
- Rodgers, B., 1969: Leisure and Recreation, Urban Studies, 368-384.
- Rolfe, E., 1965: Analysis of the Spatial Distribution of Neighborhood Parks in Lansing: 1920-1960, Pap. Mich. Acad. Sci., 479-491.
- Russell, J.A., 1968: Some Legal Aspects of Parks and Reserves Administration, N.Z. Parks and Reserves, 117-120.
- Saarinen, E., 1943: The City.
- Saarinen, T.F., 1969: Perception of Environment, Commission on College Geography Resource Paper No. 5.
- Schneider, K.R., 1971: The Architecture of Urban Space, Archit. Forum, 48-52.

- Seifert, H.A., 1970: The First 75 Years of the Manawatu Golf Club.
- Seyfried, W.R., 1963: The Centrality of Urban Land Values, Land Econ., 275-285.
- Seymour, W.N., Jr. (ed.), 1969: Small Urban Spaces.
- Shivers, J.S. and Hjelte, G., 1971: Planning Recreational Places.
- Shomon, J.J., 1972: Open Land for Urban America. Acquisition, Safekeeping, Use.
- Siegal, S.A., 1960: The Law of Open Space.
- Silvernail, R.G., 1966: A Geography of Recreation? A Status Report, Memorandum Folio XVIII, SEast. Div., Ass. Am. Geogr., 195-200.
- Simmons, J., 1970: Interaction Patterns, Urban Affairs Quarterly, 213-232.
- Smart, G., 1965: Green Belts--Is the Concept Out of Date? In Ctry Plann., 374-378.
- Smith, F., 1972: Man and His Urban Environment.
- Smithson, A.M., 1967: Urban Structuring: Studies of Alison & Peter Smithson.
- Speedy, S.I., 1966: A Subdivider's Point of View, in M.B. Cooke (ed), A Digest of the New Zealand Valuer, 1945 to 1966, 149-163.
- Steiner, R., 1966: Reserved Lands and the Supply of Space for the Southern California Metropolis, Geogr. Rev., 344-362.
- Stewart, J.I., 1967: Real Estate Appraisal in a Nutshell.
- Stroud, R.G., 1969: Designation/Zoning--An Explanation, N.Z. Valuer, 37.
- Sweet, D.C., 1969: The Geographer's Role in the Urban Planning Process, SEast. Geogr., 25-35.
- Taaffe, E.J. (ed.), 1970: Geography.
- Tankel, S.B., 1963: The Importance of Open Space in the Urban Pattern, in L. Wingo, Jr. (ed.), Cities and Space: The Future Use of Urban Land, 57-71.
- Taylor, P.J., 1971: Distance Transformation and Distance Decay Functions, Geogr. Analysis, 221-238.
- Taylor, N., 1973: The Village in the City.
- Telling, A.E., 1967: Planning Law and Procedure.

- Tetlow, J. and Gross, A., 1968: Homes, Towns and Traffic.
- Thomas, E.N., 1960: Maps of Residuals from Regression: Their Characteristics and Uses in Geographic Research.
- Thompson, W.R., 1971: Urban Economics, in M.R. Levin (ed.), Exploring Urban Problems, 132-171.
- Thomson, J., 1969: Neighbourhood Reserves. Unpublished Dip. T.P. Thesis, University of Auckland.
- Thorsell, J.W., 1970: Open Space for the Urban Region, in R.G. Putnam; F.J. Taylor; and P.G. Kettle (eds.), A Geography of Urban Places: Selected Readings, 363-370.
- Tunnard, C. and Pushkarev, B., 1963: Man-Made America: Chaos or Control.
- Vollmer, A.H., 1968: Variety is the Spice, Parks and Recreation, 26-27.
- Von Eckardt, W. and Goodman, C., 1963: Life for Dead Spaces.
- Warren, V.R.C., 1969: Geography and Planning in Palmerston North. Unpublished M.A. Thesis in Geography, Massey University.
- Weaver, R.C., 1967: Recreation Needs in Urban Areas, Natn. Pks Mag., 10-13.
- Webber, M.M., 1963: Order in Diversity: Community Without Propinquity, in L. Wingo, Jr. (ed.), Cities and Space: The Future Use of Urban Land, 23-54.
- Weber, M., 1958: The City.
- Weimer, A.M. and Hoyt, H., 1960: Principles of Real Estate.
- Wendt, P.F., 1957: Theory of Urban Land Values, Land Econ., 228-240.
- Westwood, L.G., 1962: Hamilton City 'Its Establishment and Development.' Unpublished Dip. T.P. Thesis, University of Auckland.
- Whyte, W.H., 1968: Securing Open Space for Urban America: Conservation Easements.
- Whyte, W.H. (ed.), 1962: Standards for Municipal Recreation Areas.
- Whyte, W.H., 1968: The Last Landscape.
- Willhelm, S. and Sjoberg, G., 1960: Economic vs. Protective Values in Urban Land Use Change, Am. J. econ. Soc., 151-161.
- Williams, M., 1966: Parkland Towns of Australia and New Zealand, Geogr Rev., 67-89.

- Williamson, N.J., 1968: Economic Aspects of Town Planning and Land Values. Unpublished Dip. T.P. Dissertation, University of Auckland.
- Williamson, N.J., 1969: Land Values as a Planning Criterion, N.Z. Valuer, 31-36.
- Willie, C.V., 1961: Land Elevation, Age of Dwelling Structure, and Residential Stratification, Prof. Geogr. 7-11.
- Wingo, L., Jr., 1961: Transportation and Land Use.
- Wingo, L., Jr., 1963: Cities and Space: The Future Use of Urban Land.
- Wright, F.L., 1963: The Living City.
- Wurster, C.B., 1963: The Form and Structure of the Future Urban Complex, in L. Wingo, Jr. (ed.), Cities in Space: The Future Use of Urban Land, 73-101.
- Yeates, M.H., 1965: Some Factors Affecting the Spatial Distribution of Chicago Land Values, 1910-1960, Econ. Geogr., 57-70.
- Yeates, M.H. and Garner, B.J., 1971: The North American City.
- Zucker, P., 1959: Town and Square: From the Agora to the Village Green.

Government Publications

- Auckland Regional Authority, 1967: Preliminary Report No. 5, Recreation--Open Space, Regional Master Plan.
- Auckland Regional Authority Planning Division, 1969: Report on Open Space in the Auckland Metropolitan Area.
- Christchurch City Engineers Dept., 1967: Christchurch Development.
- Christchurch Regional Planning Authority, n.d.: Regional Policy No. 4: A Report on Recreational Open Space, cyclostyled paper.
- Crawford, P., 1968: An Analysis of Areas and Dimensions of Residential Sections in Palmerston North City: Report Number 6.
- Crawford, P., 1970a: Parks, Reserves, Playfields and Open Spaces in Palmerston North.
- Crawford, P., 1970b: Site Coverage of Residential Sections in Palmerston North City.

- Dunedin City Planning Department, 1968: Recreation: Report 4, Development Plan Series.
- Hastings City Council, 1969: Annual Report, Parks Department.
- Hastings map, 1885, in Alexander Turnbull Library collection, Wellington, acquisition number 3248.
- Mercer, J.C.B., 1969: The Growth and Distribution of Building in Palmerston North--1945-1988.
- Ministry of Housing and Local Government, 1956: Open Spaces--Technical Memorandum No. 6.
- Ministry of Housing and Local Government, 1956: Derelict Land and Its Reclamation--Technical Memorandum No. 7.
- Ministry of Housing and Local Government, 1967: Provision of Playing Pitches in New Towns.
- New York State Office of Planning Coordination, 1971: Outdoor Recreation on Long Island.
- New Zealand Census, 1966: Table 8, Population of Urban Areas.
- New Zealand Gazette, 1913: 23.10.1913.
- Palmerston North map, 1878, in Palmerston North City Library collection.
- Palmerston North map, 1895, in Alexander Turnbull Library collection, Wellington, acquisition number 5802.
- Stephenson, G., 1964: Report on Town Planning for Wellington City, mimeographed paper.
- Thomas, Captain J., 1850: Letters, in Book 47/1, Lands and Surveys Library, Christchurch.
- U.S. HUD, 1970: Pamphlet Number HUD-50-MD, Small Urban Parks.
- U.S. HUD, 1971: Pamphlet Number HUD-225-MD, Open Space Land Program.
- Wanganui map, 1841, in Alexander Turnbull Library collection, Wellington.
- Wanganui map, c. 1880, in Alexander Turnbull Library collection, Wellington, no acquisition number.
- Wellington Regional Planning Authority, 1966: The Wellington Regional Planning Scheme.
- Wellington Regional Planning Authority, n.d.: Report No. 16: Recreation.