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New Zealand Handbook

**Subdivision for People
and the Environment**

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Related Documents

In this document reference is made to the following:

Standards

- NZS 4404:0000 Land subdivision and development engineering (In preparation)
- NZS 6808:1998 Assessment and measurement of sound from wind turbine generators
- AS/NZS 1546: - - - On-site domestic-wastewater treatment units
- Part 1:1998 Septic tanks
- Part 2:2001 Waterless composting toilets
- Part 3:2001 Aerated wastewater treatment systems
- AS/NZS 1547:2000 On-site domestic-wastewater management
- DWSNZ 2000 The Drinking Water Standards for New Zealand
- Code of Practice for Firefighting Water Supplies (1992)

New Zealand Legislation

Land Transfer Act 1952

Local Government Act 1974

Resource Management Act 1991

The Building Act 1991 and the Building Code Handbook 1992



Preface

This Handbook on Subdivision for People and the Environment uses the concepts of eco-villages and cohousing to provide guidelines for alternative design and use of technologies in land development and subdivision in New Zealand. It recognizes the growing interest in sustainable land development and aims to fill the current void in guiding documentation associated with alternative designs based on environmental and social responsiveness.

In New Zealand the guiding philosophy for land development and subdivision is provided through the Resource Management Act 1991 and Local Authority plans and policy statements. The land development industry has traditionally relied on set standards such as NZS 4404 *Land Subdivision and Development Engineering and District Council Codes of Practice for Subdivision and Land Development*. These standards and codes provide a degree of certainty for developers in the resource consent process that in many situations is required for the economic viability of a proposal. To date, alternative designs departing from those standards and codes, have not enjoyed this element of certainty and are considered on a case-by-case basis under the effects-based philosophy of District Plans. Where this Handbook and the guidance it provides is adopted by Councils, a degree of uncertainty will be removed from the resource consent process.

Many of the alternative designs proposed throughout New Zealand require issues surrounding ownership, construction standards, maintenance and management to be resolved in order for Local Authority approval to be gained. This Handbook provides an avenue through which those issues can be explored and addressed by providing objectives for alternative designs and desired outcomes. It is proposed that, over time, the Handbook will evolve as a New Zealand Standard which will enable it to be used as an accepted means of compliance with relevant District Plan rules, in a similar manner to NZS 4404 and current Codes of Practice.

The driving vision behind the Handbook is that of improvement of the design of subdivision and land development in New Zealand. It aims to aid in the evolution of land development by encouraging creativity in the design process rather than reliance on satisfactory traditional designs. Overall it is hoped that, through the development and use of documents such as this Handbook, land development and subdivision in New Zealand will make greater progress in striving towards the goal of sustainable management and in creating places for people to live that are both environmentally and socially responsive.



Foreword

Standards New Zealand Process

This Handbook has been created using the Standards New Zealand process for the development of New Zealand Standards. The Handbook is not a New Zealand Standard. However, it has been created in this way because of the benefits that accrue from this process and because it is intended that in the future, after use and review, the Handbook will evolve into a New Zealand Standard. The Standards New Zealand process has been adapted to include a literature review and a Local Authority consultation strategy.

A technical committee of voluntary members from stakeholder organizations was formed at the commencement of the project. This technical committee was responsible for the preparation and content of the Handbook. The basis for the composition of the committee was to secure participation of those interests involved in the topic.

The draft contents of the Handbook were subject to review at workshops of the technical committee members within their nominating organizations. The purpose of this process was to engender debate and establish specific elements for the Handbook from the differing organizations' perspectives. Where time permitted, use was made of professional meetings and conferences as workshop venues, and this resulted in the inclusion of feedback from a wide audience.

The draft was circulated as a discussion document to Local Authorities. This consultative process required discussion and receipt of feedback from both their planning and engineering staff. The draft was also released for public comment by Standards New Zealand.



Definitions

For the purposes of this Handbook the following definitions apply:

Allotment: defined in section 218 Resource Management Act 1991.

Blackwater: wastewater from toilet flushing, and from sinks used for food preparation and/or disposal of waste via garbage grinders.

Certificate of Title: a certificate registering the freehold ownership of land available to any owner(s) under the Land Transfer Act 1952.

Cohousing: the term used to describe a housing arrangement that is developed and managed by the residents themselves, that combines the autonomy of private dwellings with the advantages of community living. Cohousing developments consist of individual dwellings that are self-contained and community buildings and land, with cars kept to the edge of the site to create a pedestrian-friendly area.

Eco-villages: include the following five components:

- Human Scale incorporating neighbourhood to hamlet and village size developments where face to face relations are possible; and
- Fully Featured including all major functions of living (work, recreation, social, commerce) and catering for the full span of human age and conditions; and
- Ecologically Sensitive respecting other life forms and obeying the cyclical patterns of resource use instead of once through and dispose; and
- Healthy Human Development supporting balanced and integrated development of all aspects of human life (physical, emotional, mental, spiritual), and individual and community wellbeing, and catering for community economics, governance and social relationships; and
- Sustainability Principle including not living off capital accumulated from environmentally destructive activities elsewhere.

Ecosystem: a biological system comprising a community of living organisms (including humans) and its associated non-living environment, interacting as an ecological unit.

Effluent: generally refers to wastewater following sewage treatment.

Environment: defined in the Resource Management Act 1991.

Greywater: wastewater from clothes-washing machines, showers, baths and sinks that is not used for food preparation or the disposal of waste.

Impervious: the quality or state of being impermeable, i.e. preventing penetration by liquid. Impervious surfaces like concrete and asphalt affect the quantity and quality of run-off.

Kaitiaki: the human guardians of the natural environments, i.e. iwi, hapū or whānau group with responsibilities of kaitiakitanga.

Kaitiakitanga: the responsibilities, passed down from the ancestors, for tangata whenua to take care of the places, natural resources and other taonga in their rohe, and the mauri of those places, resources and taonga.

Mahinga kai: places where food or other resources are traditionally gathered.

Mauri: essential life force, the spiritual power and distinctiveness that enables each thing to exist as itself.

Papatuanuku: the ancestral elemental Mother, the earth, the land.



Permaculture: the harmonious integration of the land and people in such a way that the needs of food, energy and shelter are met without diminishing the natural world.

Potable: complies with the Health Criteria of the Drinking Water Standards for New Zealand.

Sewage: domestic wastewater flows from household activities in dwellings, institutional and commercial premises.

Sludge: solid matter that settles to the bottom of settling tanks in a wastewater treatment plant, or septic tanks serving individual dwellings.

Stormwater: rainfall run-off from impervious land surfaces, which may be contaminated by sediment and dissolved materials from soil and vegetated areas, roads and parking areas.

Tangata whenua: the people of the land, Māori people.

Taonga: valued resources, assets, prized possessions both material and non-material.

Tapu: sacredness, spiritual power, force or prohibition.

Tikanga: customary correct ways of doing things, traditions.

Wastewater: comprises blackwater and greywater generated by domestic activities together with process generated commercial and/or industrial waterborne wastes.

Water cycle: the natural pathway water follows in changing between liquid, solid and gaseous states as it moves in various forms through the ecosphere. Also called the hydrologic cycle.



Part 1

This Handbook has been created in two parts. Part 1 contains the educational and background information, the impetus behind the Handbook and general design process. It identifies why we need to approach sustainability in a more proactive manner in land development and improve on the traditional development process. Part 2 contains guidelines on how to achieve the approach advocated in Part 1.

It is intended that both parts of the Handbook be used in conjunction with one another. Part 1 gives meaning to the guidelines contained in Part 2 and has been structured to allow those who are not familiar with alternative concepts for land development, such as eco-villages and cohousing, to learn about them and the impetus behind the Handbook.

1.0 Introduction

This Handbook provides best practice guidelines for alternative designs and technologies for subdivision and land development in New Zealand. These guidelines have been based on the design components used in eco-villages and cohousing developments, and have been developed utilizing consultation with Local Authorities throughout New Zealand.

It is intended that this Handbook be used by professionals, Local Authorities, land developers and the public to aid in the creation of environmentally and socially sustainable communities. The guidelines form a complete design package for land development, each being interconnected with the others and having the potential to solve more than one environmental design issue. The Handbook has been structured to enable the use of each guideline individually or collectively as a design solutions in any proposed or existing subdivision.

Sections 1.1 to 1.5 outline the relevant issues the Handbook aims to address and introduce eco-villages and cohousing as guiding concepts evolving in response to the issues facing land development. A discussion of the context through which land development has evolved in New Zealand is provided along with the identification of traditional approaches that have dominated design and land development. This introductory section concludes with a discussion on the Resource Management Act 1991 and how subdivision and land development can embrace sustainability in a more proactive way through the use of this Handbook.

1.1 Eco-villages and Cohousing as Guiding Concepts

The concepts of eco-villages and cohousing are not new, historically people have been living in this manner for thousands of years. However, throughout the last few decades there has been a resurgence as people are again working together to create living patterns that reduce waste and pollution and which aim to achieve communities that are self-sustaining and in harmony with the natural environment. Most of these developments have occurred in Denmark, the Netherlands, USA and Australia. New Zealand has a few eco-villages and cohousing developments in various stages of development.

These developments have arisen out of the initiative of individuals who had a common vision of a home that is part of a community. This vision is a direct reaction against the currently available forms of housing described by Charles Moore, Architect ..

“Housing, private and public, across the developed and developing world is everywhere pretty much the same, and pretty terrible. It seems set up to crowd together unrelated and hermeneutic nuclear families whose only link with each other is that they have been brought together by some mindless central casting to play bit parts in an incomprehensible urban drama. As much attention is devoted to ensuring privacy as money will allow, with no attention to providing for community, ever..”

Eco-villages are in essence a modern attempt for people to live in harmony with nature and with each other. They are about tackling global problems at the level of our living arrangements. As such they represent a leading-edge movement towards developing sustainable human settlements and provide a testing ground for new ideas, techniques and technologies that can be integrated into the mainstream.



Eco-villages generally consist of individual households and land with extensive common facilities of land and buildings. Residents can enjoy the benefits of individual autonomy and of working together towards sustainable and self-sufficient uses of land.

“ a human scale, full featured settlement which integrates human activities harmlessly into the natural environment, supports healthy human development, and can be continued into the indefinite future” GAIA TRUST 1996.

Eco-villagers use renewable energy technology, ecological building, and human scale design to reduce exploitation of natural resources, facilitate community self-reliance, and improve quality of life. The concept is about the creation of new settlements as well as retrofitting existing villages and urban areas. An eco-village is designed in harmony with its bioregion instead of the landscape being engineered to fit construction plans. By thinking in terms of bioregions, sustainable settlements are planned which consider water availability, the ability to grow food, and accessibility.

Cohousing is a term applied to a type of housing arrangement developed in Denmark over the last 30 years and now adopted increasingly throughout the world. Designed and managed with resident input, cohousing combines the autonomy of private dwellings with the advantages of community living through provision of common facilities of both buildings and land. Cohousing developments are pedestrian only and cars are kept to the edge of the site. In essence cohousing developments are urban eco-villages, although not all cohousing developments embrace environmental sustainability.

Achieving the eco-village and cohousing type of sustainable community is not the purpose of this Handbook, as that requires the land to be developed in conjunction with the people who intend to live there. This involves an extensive participatory design process with the future residents, establishing a means of community decision making and other social structures. The purpose of this Handbook is to introduce design concepts, ideas and technologies that eco-villages and cohousing developments use to ensure that subdivisions are developed in a more sustainable manner. The Handbook is a means of learning from the concepts of eco-villages and cohousing developments and incorporating these ideas into land development in New Zealand. Ideally all land development should be undertaken with the input from those future occupants of the land. However, it is considered that most New Zealanders are not yet ready for this change as the systems our construction industry employs do not provide for this input. What is achievable is the utilization of eco-village and cohousing design ideas to significantly improve the social and environmental sustainability of living environments that we create.

Design that is conducive to social interaction can encourage a sense of community, and this is advocated as an improvement on the current situation that often involves the creation of physical barriers to social interaction in our suburbs. Likewise there are important lessons to be learned and adopted for improvement in designing subdivision and land developments which are in harmony with the environment. Environmental issues are not distinct from social ones: strategies aimed at improving the environment can also improve the social life of citizens. Ecological and social solutions are mutually reinforcing and increasingly the economics of these solutions is making sense.



1.1.1 New Zealand Eco-villages

Eco-village and cohousing developments are becoming more common around the world and have been established as viable alternatives to the standard suburb in many countries (including Denmark, USA and Australia). Living in eco-village and cohousing developments is also becoming more appealing to New Zealanders as evidenced by the number of these developments and groups of people getting together to plan a notional community.

The Eco-village and Cohousing Association of New Zealand acts as a focal point for initiatives to further the Eco-village movement in New Zealand through sharing information and providing information links to people, projects and the global Eco-village network. Examples of eco-village and cohousing communities in New Zealand are illustrated on the following pages.

CASE STUDY

Otamatea Eco-village – A permaculture development

Kaiwaka is a small rural settlement on State Highway 1, 75 minutes drive north of Auckland, the commercial capital of New Zealand's North Island. The eco-village is 3 km to the west on a beautiful 163 ha peninsula in the Kaipara Harbour, the largest natural harbour in the Southern Hemisphere. This is a long-established farming/fishing area which enjoys a temperate Northland climate with mild, wet winters suitable for many crops from northern hemisphere to subtropical.

The eco-village is on 102 ha of the peninsula. The tip (43 ha) is indigenous forest cover protected by Queen Elizabeth II covenant (plus 20 ha pasture, both privately owned). The balance (owned by Otamatea Eco-village) is rolling pasture with pockets of native bush with one large lake. There is good potential for further water catchments (ponds) on the land. Its harbour position is well sheltered, with panoramic views of land, sea and sky. The calm tidal estuary of the Otamatea River offers good fishing and scope for water activities. This is one of NZ's narrowest points, only 20 minute's drive to the east coast. It has a rich history with a Māori pa site.

The granting of the subdivision consent marked the culmination of two years' negotiations with the Council and Land Transfer Office. The shareholders in Otamatea Ltd applied for the subdivision consent themselves and the application was publicly notified due to the proposed size of the units. The District Plan required a minimum site area of 4 ha whereas the application proposed individual sites of 2.2 ha with a share in the balance of the farm area. A reduction in the required access road width was permitted with a reduction in speed limit to 30 km/hr. An exemption from the local power board with a consent notice on titles allowed the subdivision to occur without a connection to the mains electricity supply being made for each unit. The owners are currently considering options for power supply, including individual alternative systems through wind, solar and biogas with options of connecting to the grid to sell the power. Plans to use composting toilets and wetlands treatment systems for wastewater and stormwater treatment were accepted by the Council.



Subdivision was undertaken by Unit Title with fifteen 2.2 ha units and a common area of 72 ha. Applying Unit Title subdivision to the land in this manner was a pioneering move for New Zealand. Partners set up a company (Otamatea Ltd) to buy the land on a Unit Title basis – similar to that used in apartment block ownership. Unit Titles are administered through regular meetings of the Body Corporate. When the members met to create the Body Corporate rules a number of difficulties arose in trying to apply this form of title to the community. A case study in Section 8 Land Tenure of this Handbook outlines the problems encountered.

INITIAL AIMS

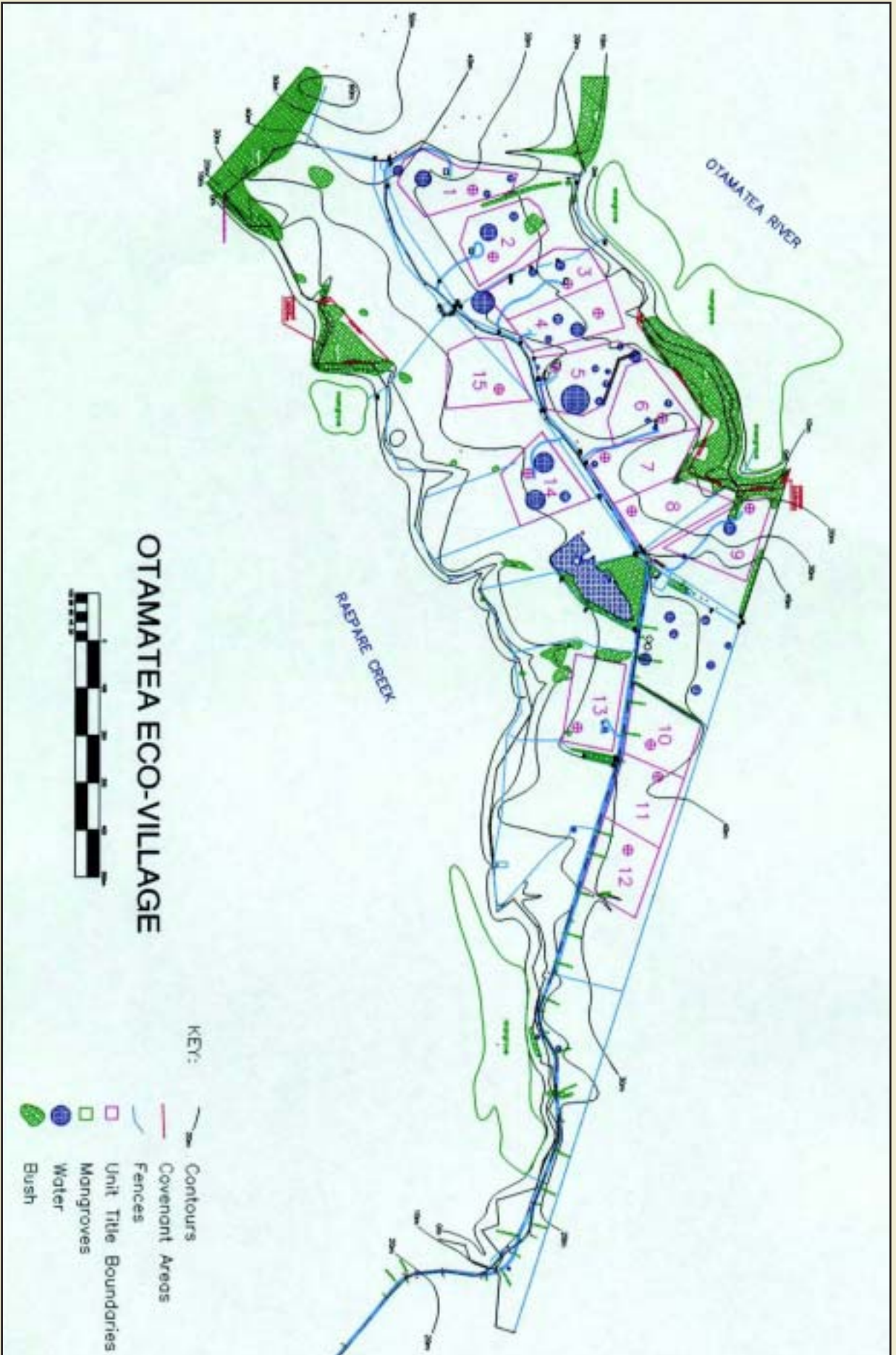
- To build all-weather road access into the property – (completed 1998).
- To establish ponds and water drainage.
- To establish community gardens and orchards.
- To continue planting of all kinds – shelterbelts, woodlots, vineyard, olives, vegetable crops.
- To attract more partners with capital to buy into and develop the project.
- To run Permaculture Design Courses.

LONG-TERM AIMS

- To build a community house.
- To create an environment fostering the regeneration of plants and wildlife.
- To achieve sustainable land management based on permaculture principles.
- To promote the use of non-toxic/energy-saving building materials.
- To benefit from living in a small community setting.
- To develop Otamatea Eco-village as an educational/resource centre.

The land was purchased in 1996 and Resource Consent was approved by Kaipara District Council in September 1997. Eleven financially committed families are involved so far. Each Unit Title costs NZ\$90,000 (includes contribution towards road, phone and setup costs). Several families are fully resident, with others building and planning their move on to the land. Visitors are welcome, by appointment. Contact Lynne Ph (09)425 9376 or email otamatea@clear.net.nz.







EARTHSONG ECO-NEIGHBOURHOOD



Perspective Sketch of Earthsong Eco-neighbourhood by JJ Chen.

Earthsong eco-neighbourhood consists of a group of people currently living in nuclear households, but with a vision of how a different way of living could be more sustaining for them individually, collectively and globally. Their vision includes building a cohousing community, which they are designing in conjunction with their architect with their basic needs in mind, while also caring for the earth that sustains them. The group aims to recreate many of the advantages of the traditional village – such as social contact, contact with nature, child care, economic efficiency, and celebration. These qualities will be combined with the sense of individual freedom and independence that is also seen as important. In addition to modelling ‘social sustainability’ the neighbourhood is being designed to the highest practical standards of environmentally sustainable human settlement, including the layout and design of neighbourhood and buildings, choice of materials, landscaping and services. It is hoped that the site will also become the home base for many green businesses.

The group has purchased 4 acres (1.67 ha) at Swanson Road in Ranui within Waitakere City and have obtained resource consents to develop the site, including 32 rammed earth and macrocarpa dwellings of a range of sizes which will be freehold through Unit Title subdivision. The houses have been designed to a high standard of environmental architecture which includes the use of non-toxic materials, energy and water saving fittings and services, and edible landscaping. Construction commenced in late 2000.



The site was purchased in April 1999 with the group spending 8 weeks establishing the project design brief so as to reflect residents' actual needs and was then handed over to the architect. Engineers and wastewater consultants were commissioned to prepare reports outlining the feasibility of on-site rainwater collection and wastewater treatment. A major report on this subject evaluating costs and benefits of these new technologies was prepared by the Council's Ecowater Division. Indications were that higher up-front capital costs of these facilities would be paid back quicker, and are theoretically much cheaper options in the long term than the traditional engineered 'pump it to the ocean'/'pump it from the river' solutions. The resource consent application was lodged on 22 December 1999 and represented the culmination of 6 months' work assembling preliminary designs and costings. The resource consent granted by Waitakere City Council on 24 March 2000 made specific reference to the commitment the group is showing towards the environment. Aspects of the processing were made significantly easier as a result of the group members submissions toward the District Plan process in 1996. Building consent was lodged in September 2000 with building due to start in November 2000. Use of innovative technology and design components such as porous permeable paving products, vegetated swales to direct, treat and absorb stormwater, and rainwater collection tanks have led to the group making an application for a grant from Infrastructure Auckland because of the projects' contribution over and above Council's requirements to Auckland's water problems.



Earthsong layout with clustered houses and peripheral parking.



This information has been sourced from Earthsong Eco-Neighbourhood Information Booklet and website www.cohousing.pl.net.

1.2 Issues

The use of design concepts and technologies that eco-village and cohousing developments incorporate, has significant potential to improve the living environments we create through land subdivision in New Zealand. Learning from these developments and borrowing from the innovative design ideas they use can enable us to address on a smaller home scale and in a way that people can directly relate to and experience, the seemingly complex and global environmental problems.

In order to achieve the creation of more sustainable subdivisions we need to recognize and act on the following issues:

- **To promote sustainable management under the Resource Management Act 1991 we cannot continue to approach residential subdivision and land development based on traditional trends practices.**

The purpose of the Resource Management Act 1991 is to promote the sustainable management of natural and physical resources, but the land development industry has been slow to take up the challenge of focusing on sustainable management and consider the changes and alternatives that need to be implemented to improve traditional design. Alternative designs and technologies needs to be considered to ensure that land development strives towards the creation of communities and neighbourhoods that minimize their effects on the environment and provide for the social and economic wellbeing of people living within them. (Section 5 RMA 1991).

- **The Resource Management Act 1991 provides for effects-based Regional and District Plans through which the implementation of new and innovative solutions for land development can be undertaken. The successful adoption of alternative designs depends on the degree of certainty offered in the resource consent process by rules, standards and codes of practice.**

The Resource Management Act 1991 set up a hierarchy of Local Authorities responsible for various aspects of promoting sustainable management within our communities. Land development is largely controlled through District or City Plans outlining objectives, policies and rules. These District Plans have identified local issues and set goals in terms of what is wished to be seen from the resolution of each issue. Within the effects-based philosophy of District Plans there is opportunity for the implementation of new and innovative solutions while still meeting the intentions of the District Plan objectives and policies. It is considered that the widespread adoption of alternative land development practices through the opportunities provided by effects-based District Plans has not occurred, as there is a traditional reliance on prescriptive codes of practice for subdivision and land development to provide certainty in the consent process. The adoption of alternative designs for subdivision and land development depends upon the degree of acceptability of alternative designs and accordingly the degree of certainty available for developers in the resource consent process.

- **A barrier to those proposing innovation and alternative solutions is the adherence to traditional subdivision and engineering standards by Local Authorities. A lack of accepted standards upon which to assess alternative design solutions is central to Local Authority concerns in approving them.**

The adherence to a set of traditional subdivision and engineering standards by Local Authorities is a barrier to those proposing alternative solutions. This is linked to a general lack of input into the planning process from people who have knowledge and an interest in promoting alternatives. The effects-based philosophy of the Resource



Management Act 1991 does not integrate well with prescriptive codes of practice. At the same time, Local Authority responsibilities for health, maintenance and management of community infrastructure provided for under the Local Government Act 1974 require that land development be able to meet certain prescribed requirements. Before approval can be given to alternative designs and technologies, an assessment of the proposal's ability to meet health, maintenance and management responsibilities must be undertaken. This is made most difficult when there is a lack of accepted standards through which to assess alternative designs and technologies and offer an acceptable alternative code of practice.

- **There is a general lack of understanding of design concepts and technology performance for the development of land based on the concepts of eco-villages and cohousing.**

The lack of accepted standards for alternative designs and technologies for land development is a significant knowledge gap. This has constrained the introduction and use of alternative designs and technologies in New Zealand. It has constrained our ability to respond to sustainable management in subdivision and land development through the use of new ideas and technologies, and means that New Zealand is behind other countries in the world where these types of development are increasing (West 2001).

- **There is an increasing demand for land development and subdivision to occur in an environmentally conscious manner, that enables people to live a healthier lifestyle with a greater sense of community, and that this demand will continue to grow.**

This demand will continue to grow in the future as communities are forced to confront local environmental and social issues. Local Authorities and those involved with the land development industry need to anticipate and keep up with the demands of society in terms of changing living arrangements, the effects of these on the environment and of society's increasing environmental consciousness.

- **Environmental problems for Local Authorities are accumulating due to pressures on the capacity of aging sewage reticulation and wastewater treatment systems, stormwater systems, water supply services and roading networks.**

Along with the increasing demand for more environmentally conscious land development, Local Authorities and developers are faced with problems surrounding pressures on the capacity of aging infrastructure. Many Districts need to make choices regarding future wastewater servicing, stormwater disposal, water supply and roading networks. These issues are directly linked to choices regarding subdivision and land development and as such provide a window of opportunity exists for the consideration of alternative options for the supply of these services, both on an individual development scale and district wide.

- **A large proportion of New Zealand cities and towns have been based on the same traditional designs. Future sustainable land development needs to be integrated with the existing development and infrastructure.**

There is a great diversity of land development and subdivision demands and requirements across New Zealand. Some small communities are facing large population increases and demand for new 'green field' development whereas other districts have introduced limits on urban expansion in favour off more efficient 'brown field' redevelopment within existing planning zone boundaries. Accordingly, alternative



designs and technologies for sustainable land development need to be considered in terms of both green field and brown field development. Green field developments need to be able to integrate with existing conventional infrastructure systems and incorporate consideration of upstream and downstream effects of alternative designs and technologies on existing neighbourhoods. Similarly, brown field development needs to be considered in terms of sustainable design and technologies for retrofitting of buildings and higher density redevelopment and the effects of this on existing neighbourhoods.

This Handbook recognizes and acts on the above issues by providing a series of objectives and expected performance outcomes for alternative designs and technologies for sustainable land development using lessons from the concepts of eco-villages and cohousing. In addition, examples of the methods through which these objectives and outcomes can be met are provided.

1.2.1 Suggestions for Use

The intention is that the methods are viewed as being only one possible design solution but other innovative ideas can be used so long as the solution is able to meet the desired performance outcomes. In this manner the Handbook can provide those in the land development industry with some degree of certainty about the acceptability of alternative proposals, while at the same time providing flexibility to apply new ideas compatible with the desired environmental outcomes of a District Plan framework and the effects-based philosophy of the Resource Management Act 1991.

The objectives and outcomes promoted in this Handbook are applicable to all scales of development from the backyard infill subdivision to a 500 lot subdivision. The degree to which some suggested alternatives are feasible within developments will, however, depend on the scale of the development and the ability of those alternatives to integrate with existing neighbourhoods.

Through implementing the objectives promoted in this Handbook, land development and subdivision projects can minimize costs, waste fewer resources, protect and enhance the environment, and provide healthier living environments for people, thereby improving our quality of life and distinguishing developments in the market place.



1.3 Context

There are a number of trends which are moving New Zealanders towards consideration of different forms of land development for urban and rural residential housing and other uses. These trends are nothing new – they have been present for a number of years and are happening throughout most industrialised and urbanised countries. They can be summarised under the headings demographics, housing choice, sustainability, and liveability.

1.3.1 Demographics

Overall, New Zealand's population is an aging one. In 2000 some 12 % of our population is over 65 and this age group will expand to 25 – 26 % of the total population by 2051 (NZ Statistics projections June 2000). This change in age structures of population coupled with falling birth rates may well mean that people and families will require less space for individual households, but may demand more in the way of community support structures and access to community facilities and public open space. It may also mean that more may be spent on housing (already our largest single household financial commitment), as less would need to be spent on education and care of fewer young people. Nuclear families are already a minority amongst household types (some 31 % of all family types) (Davey 1998), and overall household size has been decreasing for a number of years.

However, this overall picture conceals some other important demographic trends which have implications for land development, particularly in urban areas. Some sub-populations are increasing faster than the general rate (Māori and Polynesians generally), and some migrant families tend to be large and consist of extended families within the one household. Social norms amongst these populations can also reinforce the idea of living in close proximity to kin and extended family networks. Their housing needs will be different from the norm, and group housing and/or tenancy rather than owner-occupier housing could be sought by these population groups.

New Zealand is also an urbanising population with some 69.4 % of the population contained within the fifteen main urban areas (over 30,000 population) and 56.2 % of those in 6 main urban areas Auckland, Hamilton, Napier-Hastings, Wellington-Hutt Valley, Christchurch and Dunedin. Pressure on urban centres is also coming from internal migration (13,400 northwards in the 5 years between 1991 and 1996), and settlement of overseas migrants (some 55.3 % of all new migrants and 44.7 % of all migrants have settled in Auckland). (NZ People and Places Series II 1996). These urban areas are now confronting the twin pressures of population growth and decreasing household size (i.e. more households, with less people, on more land) on their physical and social resources. The imposition of urban limits to growth, and the encouragement of densification of inner city areas and growth within transit-related corridors have profound implications on the ways in which land will be developed within New Zealand cities and towns.

1.3.2 Housing Choice

The quarter acre section of our childhood is fast disappearing in urban areas in favour of smaller section sizes (down to as low as 250 m²) and the range of housing types is becoming bewildering in terms of choice (terraced townhouses, duplexes, stand-alone townhouses, two or more storey apartment blocks, high-rise residential apartment suites and studios, home units in a block, converted commercial buildings and warehouses, houses with attached flats or studios, etc). It is now recognized that people and households may have different housing needs and



different affordability patterns during their lives (Clark and Dieleman 1996). A recent study reported by O’Byrne (2000) indicates the existence of at least 12 housing groups, each having distinct housing needs based on life circumstances, income and the affordability of housing choice at different times in peoples’ lives. He further challenges our pre-conceptions about housing solutions by linking it into an Affordable Living Strategy, involving transport, urban form, education, justice, welfare, health, employment, environment, regional development and other strategies which all affect housing and vice-versa.

Affordability is obviously a large factor in housing choice. Research done by Bourassa (2000) indicates that the housing choice of Polynesian populations may be constrained by lack of assured income to finance long-term housing purchase. Other forms of tenure could prove more attractive, including social and affordable housing options currently being looked at by government.

1.3.3 Sustainability

“With a few notable exceptions at the city level, the concept of sustainable urban development is largely being ignored in New Zealand with a lack of leadership and vision. Sustainable development involves improving the efficiency of resource use, reducing waste and addressing environmental, economic and social issues in an integrated way.”

PCE REPORT CITIES AND THEIR PEOPLE JUNE 1998, P. IV

More and more land on the periphery of our cities and towns is being eaten up by urban sprawl. Recent statistics by the Parliamentary Commissioner for the Environment indicate that while the population has risen by an annual average of just under 1 %, our consumption of land for urban expansion has been growing at 4 % per year. Density of our urban areas is quite low by international standards (Auckland 1000 m² versus Paris at 5500) but at 85 % we have one of the more urbanised populations in the world, (compared with Japan 77 %, USA 76 % and France 73 %). In Auckland, this rate of expansion means finding the equivalent space for a city the size of Dunedin (approximately 110,000 extra people) every 5 years within its existing urban area.

Efficiency of transport naturally looms quite large within urban areas. The ability to move ourselves and goods and services around the streets, roads and highways of urban areas is increasingly constrained. Traditional methods have focused on building more infrastructure (roads and motorways) and improving traffic management. The longer-term focus of improving accessibility by proximity to workplaces, shopping centers, etc. (Cervero 1996), which involves controlling land use and employing conscious urban design, has received much less attention until quite recently. Sustainable land development which takes into account proximity of work, education, recreation, and health opportunities to places of residence has much more to offer in terms of longer-term sustainability than adding another few kilometres of roading and subsequent parking spaces to our cityscapes.

Environmental resources also suffer by indiscriminate land development. Streams and coastal estuaries are polluted, natural areas and their biodiversity disappear, and water and energy supplies are sourced from ever-increasing distances. Air pollution blankets inner cities, and the hard paving of surfaces increases stormwater run-off with subsequent adverse effects on freshwater and coastal environments. Landfills bulge with the wastes of the urban consumer society.





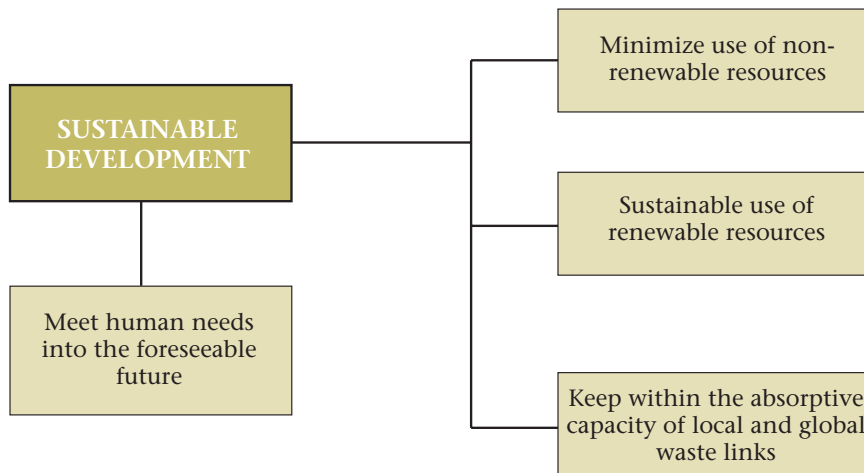
Christchurch on a still winter's day.

There are also the social costs from poor development practices manifested in statistics such as hospital admittances (particularly the elderly and the young in poor quality and badly heated housing), crime and vandalism, and road accidents (Public Health Commission reports to Minister of Health 1994; 1995).

Environmental, social and economic aspects of sustainable development are addressed in the Agenda 21 non-binding convention which New Zealand assented to after the Rio Earth Summit in 1992 (MFE 1993). Some local authorities have initiated projects which cover aspects of Agenda 21 (Knight 2000), but overall the recognition of the inter-linking of these issues and subsequent action at a local level is poor. Conventional land development patterns tend to predominate.

Cities and communities are inherently not purely sustainable entities, the goal is to make these systems more sustainable. This means creating and recreating community systems that rely less on importing energy, resources and ideas (they create their own as much as possible) and add as much local value as possible to maximize positive outputs (commodities that have less environmental impact) while minimizing negative outputs (wastes). This requires a new way of thinking and accounting for progress, and inclusion of those variables that may be excluded from the market currently while encouraging creative solutions that have low environmental impacts.





Source: Adapted from Fowke and Prasad (1996)

1.3.4 Liveability

“Urban design is a key factor in maintaining the liveability, viability and sense of place of urban neighbourhoods.”

PCE REPORT 1998 THE CITIES AND THEIR PEOPLE .

Liveability consists of a number of related qualities, such as amenity values, control of noise, perceptions of safety, and sense of “place” which comes from inhabiting communities with shared histories, rather than just housing in proximity. These qualities are becoming much more important to the formation of new communities and to the maintenance of existing communities.

Liveability is enhanced by good neighbourhood design; by encouraging sociability; by crime prevention through design methods; and by careful attention to the provision and relationship of public spaces, semi-public spaces and private areas within streetscapes. With a greater recognition that we want to live well and equitably, not just merely exist, urban design and planning for liveability have great potential for sustainable land development (PCE 1998).

Liveability also involves a necessary recognition of heritage of both buildings and sites. These provide identity to places and link us with our ancestors. The use of place names which reflect that local heritage (rather than the heritage of some other place or people) is to be encouraged.

“Why, I ask you, do so many people flock to those countries where beautiful towns and villages and landscapes still exist? Why do so many architects, planners and developers frequent such places on their holidays?”

HRH PRINCE CHARLES A VISION OF BRITAIN, 1989. P77

Aesthetics should be a vital part of developments. The appeal of many overseas places (Provence, Tuscany, the Monterey coast of California) comes from the way in which buildings and landscape link together in harmonious wholes. After all, anyone can create ugly places but it takes practice and skill to help create beautiful places that live within the memory. Attention to detail, importance of vistas and links between elements often immeasurably enhance the appeal of places. [See Tibbalds 1990].



Tibbald's Principles of Good Land Development [Tibbalds 1990]

1. Consider places before buildings
2. Have the humility to learn from the past and respect your context
3. Encourage the mixing of uses in towns and cities
4. Design on a human scale
5. Encourage the freedom to walk about
6. Cater for all sections of the community and consult with them
7. Build legible (recognizable or understandable) environments
8. Build to last and adapt
9. Avoid change on too great a scale at the same time
10. With all the means available, promote intricacy, joy and visual delight in the built environment

The scale and staging of developments also affects liveability. Large-scale land development interventions with huge earthworks, and the consequent social and environmental impacts on surrounding neighbourhoods reduce liveability for those neighbourhoods. Where developments are staged, it is important to tailor provision of social infrastructure (land used for community purposes) to likely patronage.

Absence or shortage of social infrastructure for residents reduces liveability and decreases sustainability, whereas too much social infrastructure too early places a high economic burden on developers and local authorities and may remove later choice.

1.3.5 Governance and Partnerships

Local Authorities are becoming more aware that their functions extend beyond "rates, roads, rubbish and rats." Their functions include a role of articulating a vision for future development, both quantitative and qualitative, in consultation with the residents of that area. Many local authorities have now produced Strategic Plans which include vision statements of how they wish their region to grow and develop.



CHRISTCHURCH'S VISION FOR THE FUTURE

- Christchurch people enjoy belonging to their local community, their city and Canterbury.
- All people from different backgrounds feel welcome here.
- The unique position of tangata whenua is acknowledged and respected.
- Children are nurtured, young people are encouraged, and the elderly respected.
- Neighbours help each other and join together to enjoy shared aims.
- People are free from the threat of crime or injury.
- Everyone has access to good housing, health care and education, and to sufficient resources for their wellbeing.
- Everyone has opportunities for fun, sport, recreation, art and culture.
- Unique characteristics – including heritage buildings and natural features are preserved.
- The beauties of our garden city its trees, flowers and open spaces are enhanced.
- The quality of air, water, and soils, of hills, plains, streams and open spaces is improved.
- Convenient and efficient transport is available for individuals and business.
- Christchurch has a thriving economy and full employment.

Yet this vision – of a clean green and sustainable New Zealand– will only come about through attitude and behaviour change of a range of institutions and individuals from national to local levels. Legislation can consolidate changes already agreed to, but it is commitment and partnerships at local levels which begin to change the patterns of development that we have been so long used to.

The use of partnerships to develop social and entertainment facilities for local populations is well established in New Zealand society, and it needs partnerships to start addressing issues of developing land in a sustainable and equitable manner for all. Methods such as Canterbury Dialogues (a partnership between local government, business sector and local communities) and Wellington's Our City: Our Future process, a long term-plan and vision for Wellington city, show the way towards integrative sustainable development. In both these examples, the development of sustainability indicators through community participation was a valuable innovative strategy to guide future action. There are also a range of governmental, business and community based initiatives throughout the country that are making headway on a myriad of issues that impact upon the sustainability of our communities.

1.3.6 Challenging Our Worldview

"Attitudes towards the land must ultimately be based on attitudes to life".

CLARENCE GLACKEN 1970

If we are to hold our heads high to the "clean green NZ" image, we must first begin to learn to respect our home environments. Respect for the environment does not only come from the introduction of legislation: it is likely to come from incremental changes and responses of the development industry in New Zealand, Local Authorities and of ordinary New Zealanders themselves.

Land development in New Zealand is very much a market-driven activity based on the traditional engineering and planning standards that have been practised and proven in the past. Responding to the Kiwi dream of the quarter acre section, our



homes, suburbs, towns and cities evolved together with the infrastructure we all rely on today. Our roading networks, wastewater collection and treatment systems, stormwater disposal systems, landfills, power supplies, water treatment systems and standards evolved accordingly. They are as much ingrained in our culture as our common belief that New Zealand is clean and green.

Our past dreams for future New Zealand society did not, however, anticipate the environmental and social challenges we are faced with today. Today we take our children to the beach where we swam as a child and are confronted with a sign “not safe for swimming”. At home in our isolated box-type house behind a 1.8 m high fence we know little more about our neighbours than the sound of their washing machine in the mornings. We wonder why we are faced with water restrictions as we flush litres of high-quality water down the toilet. And every weekend when we mow the lawns, we hear another three neighbours mowing away in the street. During the week we drive along our roads to drop our children off at school, the route which is within biking distance but too busy for children to cycle along. We carry on to commute another 30 minutes to our workplace in the center of town. What we come to realise is that what we have inherited from our past is subdivision and land development done as if people and the environment didn't matter.

We have not always lived like this. The concepts of eco-villages and cohousing are nothing new. All our ancestors lived in communal village-type settings at some time in the past. The concepts are not even new to New Zealand, where Maori pa-based housing, communal villages and papakainga have been traditional forms of living, enabling strong relationships with the local environment to be sustained.

1.4 Traditional Approaches

The traditions of subdivision and land development in New Zealand are ingrained in our culture so that in practice they are seldom questioned. However, this may change, as we know that land development and subdivision are market driven and there is a growing demand for properties that enable people to live a more sustainable lifestyle.

The introduction of the Resource Management Act 1991 was perceived both nationally and internationally as the beginnings of a new approach to planning and environmental management in New Zealand. The Act's purpose is the sustainable management of natural and physical resources. That purpose is expected to be achieved in a way that enables good social, economic and cultural outcomes, but there has been ongoing debate about whether that occurs in practice. Because effects on natural and physical resources are often easier to identify, understand and control, consent authorities tend to focus on those matters. An underlying assumption may be that, if the natural environment is healthy, many of our social, economic and cultural needs will also be satisfied.

Eco-villages and cohousing are initiatives that seek to address social and economic issues through the sustainable management of natural and physical resources in our living environments. Viewing these initiatives in contrast with common approaches to land development provides us with the opportunity to learn important lessons about ourselves and about our environment. It enables us to understand our local environment and learn to live within its limits through direct interaction with it. Subdivision and land development are much more than processes that enable titles to be transferred, and the Resource Management Act 1991 has provided us with the opportunity to recognize and act on this.



1.5 Resource Management Act 1991

“Every New Zealander has a duty to avoid, remedy, or mitigate any adverse effect on the environment arising from an activity carried out by or on behalf of that person..”.

SECTION 17 RMA1991

The Resource Management Act is a means of planning how people use, develop and protect natural and physical resources. These resources include rivers, lakes, coastal and geothermal areas; land, including soils; forests and farmlands; the air; the constructed environment of buildings, bridges, and other structures in cities and towns. The Act places the emphasis on the effect a proposed activity will or might have on the environment.

Environmental management in New Zealand reflects the principle of the sustainability of natural and physical resources. This principle recognizes that while people need to use resources, they should not use the resources to the point where they no longer exist.

Under the Resource Management Act (Section 5), sustainable management means “managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic and cultural wellbeing and for their health and safety while

- Sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and
- Safeguarding the life supporting capacity of air, water, soil and ecosystems; and
- Avoiding, remedying or mitigating any adverse effects of activities on the environment.”

In the past in New Zealand, natural and physical resources were governed by more than 50 different laws. The Resource Management Act 1991 replaced more than 20 major statutes, including the planning legislation, water and soil legislation, and the laws covering geothermal resources, air and noise pollution, and coasts.

The Act contrasts with the previous legislation. In terms of subdivision and land development the Act replaced the key statute under which this was controlled, the Town and Country Planning Act 1977. The Town and Country Planning Act provided for Councils to direct where development should occur, and what the land should be used for, and was characterised as a prescriptive approach. Decision making included the balancing of adverse environmental effects against economic benefits.

In contrast, the Resource Management Act provides a more environmentally conscious framework within which people can make their own decisions about where development can occur and what sort of development the land should be used for. The Act focuses on the effects of activities and requires that any adverse effects on the environment be avoided, remedied or mitigated. All plans and policy statements developed under the Act need to be justified in terms of the environmental effects they seek to address.

The Resource Management Act also differs significantly from previous legislation by acknowledging Māori relationships with the environment and accepting a holistic approach to environmental management. Under section 8 of the Act, Māori have had their status as tangata whenua and Treaty partner fully recognized. In addition, recognition and provision for the relationship of Māori and their



culture and traditions with their ancestral lands, water, sites, waahi tapu and other taonga (section 6(e)) is to be made, along with a requirement to have particular regard to kaitiakitanga (section 7(a)). For land development this is a significant change, as it provides an opportunity for a wider understanding of the Maori relationship with the environment and of Māori resource management techniques. This has the potential to provide a deeper understanding of our local environments in terms of not only managing our effects but also understanding the way we view the environment and how this affects our actions within it.

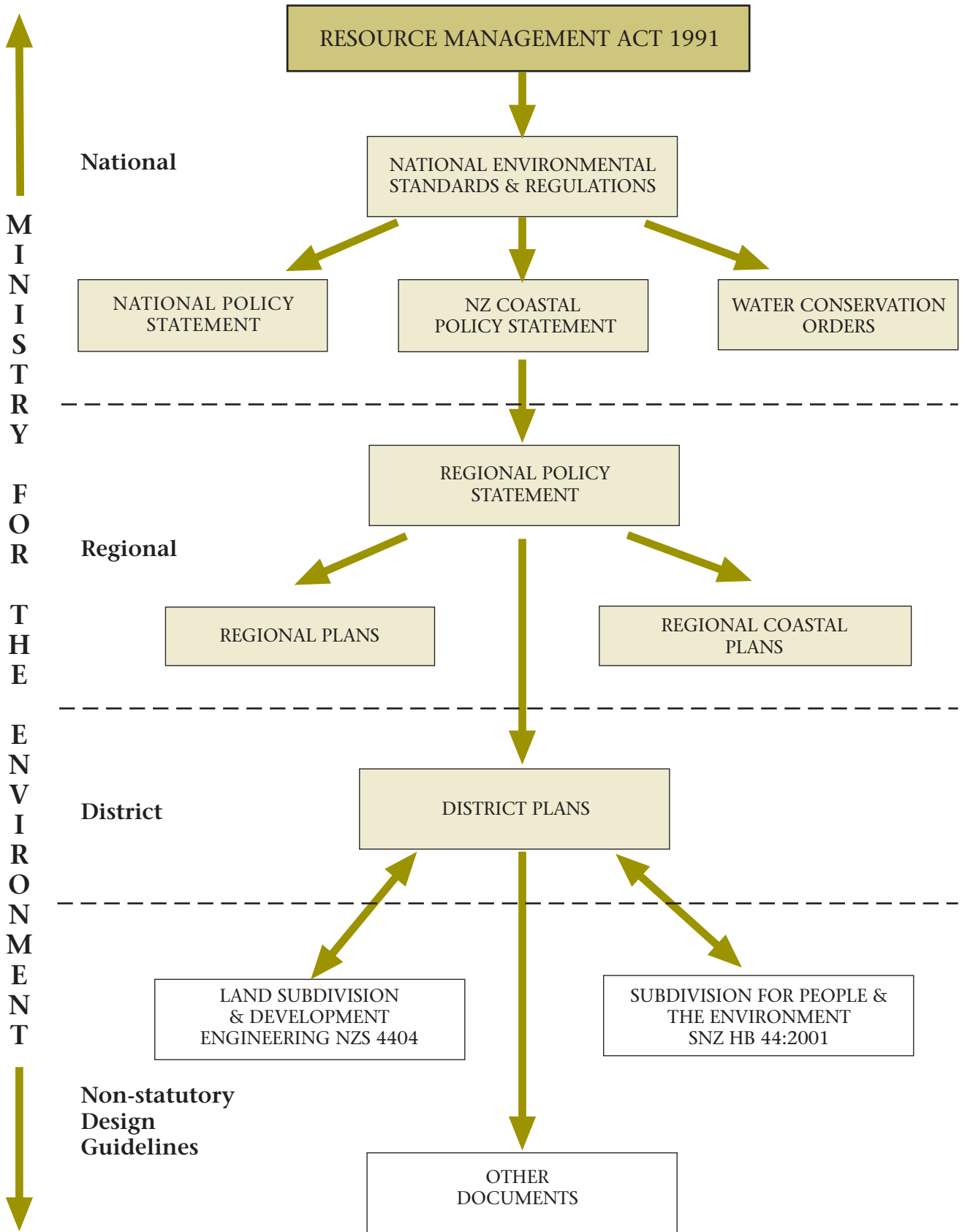
1.5.1 Regional and District/City Councils

Under the Resource Management Act, decisions are usually made at a regional or district level. New Zealand is split into 12 Regional Councils, four Unitary Authorities (which function as both Regional and District/City Councils), and 70 District/City Councils. Each region encompasses at least one or more district/city. Councils must write plans and/or policy statements providing for the sustainable management of their area's natural and physical resources. These plans contain policies, rules and other requirements that control resource use and can affect what people do.

“District Plans” (which include plans prepared by both City and District Councils) set out the circumstances in which consents for subdivision and land use are required. “Regional Plans” (prepared by Regional Councils) set out the circumstances in which other consents are required. Those other consents can deal with issues such as bores for groundwater, bridging streams, and earthworks on erosion prone land. The functions of the different types of Councils, and the processes for preparing and operating a Plan are controlled by the Act.



Diagram 1



Most District Plan's policies and rules directly refer to a Code of Practice for Subdivision and Engineering which development proposals can follow as a means of compliance. In some Districts the Codes were developed in conjunction with the Proposed District Plan and went through the public notification process, while in other Districts the Codes were not part of the public notification process. Other District Councils have adopted NZS 4404:1981 Code of Practice for Urban Land Subdivision, which is currently being reviewed (refer NZS 4404). In time the Handbook will evolve into a New Zealand Standard where it will be able to be referred to within District Plans as a guiding document for alternative designs and technologies as a means of compliance, as illustrated in Diagram 1. Not all District Plans are outcomes-based and it is the intention of the Handbook to encourage District Plans to change over time to enable the incorporation of the Handbook as a means of compliance in an effects-based system. The Handbook should be viewed as an informed bottom-up approach to encouraging effects-based decisions for subdivision and land development. It will interact with the NZS 4404 *Land Subdivision and Development Engineering* as an alternative guideline.

1.5.2 Resource Consents

(Refer to section 10.0 for resource consent requirements and processes)

A resource consent gives a person or organization permission to use or develop a natural or physical resource, and/or carry out an activity that affects the environment in some way for a stated period. Resource consents replace the many different permissions granted under previous law.

Under the Resource Management Act there are five types of resource consent:

- (a) Land use consent
- (b) Subdivision consent
- (c) Water permit
- (d) Discharge permit
- (e) Coastal permit.

All applications for consents follow the same procedures. Anyone proposing to carry out any development or use a natural resource should check District and Regional Plans to see what type and category of consent is needed. The applicant will also need to work out what impacts the proposal is likely to have on the environment and submit this to the consent authority. The applicant may also have to explain what consultation has taken place with any persons who may be affected by the proposal and with local iwi.

Some of these resource consent applications will require public notification. This gives the community a chance to consider the application and to make a submission if they wish.



2.0 Design Process

“When you build a thing you cannot merely build that thing in isolation, but must also repair the world about it, and within it. and the thing which you make takes its place in the web of nature.”

CHRISTOPHER ALEXANDER, 1977

Sections 2.1 to 2.5 introduce the components of the design process, including the design framework from which all objectives and outcomes from each section of the Handbook have been derived. Site assessment methods and checklists for gaining an understanding of a particular site chosen for development are also provided along with guidelines for creating site and concept plans. Example site and concept plans are included in section 2.6.

2.1 Design Framework

In shaping the places where people live we shape the patterns of our behaviour and the way in which we relate to the environment. For New Zealand to achieve sustainable management as required under the Resource Management Act 1991 we need to adopt and practice a caring attitude towards the environment. Our success, and success in terms of design advocated by this Handbook, is linked to the way we view the land, our land ethic.

LAND ETHIC: The obligation to treat the environment carefully and sensitively, as you would treat yourself and the people close to you. “All ethics so far evolved rest upon a single premise: that the individual is a member of a community of interdependent parts The land ethic simply enlarges the boundaries of the community to include soils, water, plants and animals, or collectively: the land A land ethic changes the role of Homo sapiens from conqueror of the land-community to plain member and citizen of it” (Aldo Leopold, 1949).

A DICTIONARY OF GREEN IDEAS (1988)

In applying a land ethic in terms of sustainable land development and design there are three overall criteria which form the design framework to be adopted:

2.1.1 Criterion 1: Environmental Responsiveness

The creation of sustainable neighbourhoods and communities requires that development be responsive to the receiving environment.

We need to ensure that development can be integrated within the dynamics of the systems in the environment in a manner that they can cope with. Design therefore needs to be responsive to the particular environment chosen for development. Such a design will use natural features and resources for infrastructure such as stormwater management, roading, water supply and building sites in a manner that ensures that the effects of those activities now and in the future are acceptable.

2.1.2 Criterion 2: Resource Efficiency

Land development design that is responsive to the environment and promotes sustainability requires the efficient use of resources.

By undertaking design that is responsive to the receiving environment, elements of resource efficiency will automatically be achieved. For example, low-impact roading that is responsive to the natural features of a site, using roadside drainage swales as water collection and stormwater disposal systems, may also reduce the need for expending resources on earthworks, stormwater pipes and irrigation



systems. Resource efficiency can be applied directly in the design process and should be viewed as a process of using fewer resources to achieve the same outcomes. Efficient use of resources in terms of land, construction materials, water, energy and circulation patterns requires their incorporation into an integrated design process.

2.1.3 Criterion 3 : A Sense of Community

In creating places in which people are expected to live, design should include provision for people's wellbeing, a sense of community and the development of a positive relationship with the local environment.

In creating places for people to live, there is a responsibility to consider not only how people will interact with that particular environment but also how that environment or development will affect people's wellbeing and sense of community spirit. Issues of safety, identity and interaction are all elements for consideration in the design process. Opportunities need to be provided for future transport choices, recreational and leisure facilities, future community land uses such as planting projects and social gatherings need to be provided for, as does the ability to obtain privacy. Through designing to encourage community in a development, greater potential exists for those people living in the neighbourhood to take responsibility for that environment and develop their land ethic. This aids in the continued environmentally responsive maintenance and development of that neighbourhood long after the design and subdivision of the land.

DESIGN FRAMEWORK



All three design criteria are interconnected with one another and can be used so as to reinforce each other, as discussed in the example above and as illustrated in the diagram above. The nature of design for a sustainable environment means that many of the objectives and outcomes identified in this Handbook can be achieved by just one design solution. When this occurs it makes the design process more complex but has the greatest potential for a successful result. Any successful design process based on principles of sustainability must evolve from an in-depth understanding of the site concerned. Sustainable design is not a matter of superimposing a design on a site, but of creating a design that is responsive to the characteristics of that site.



2.2 Understanding the Site

2.2.1 Objective

To gain an in-depth understanding of the physical and social processes of a site to ensure that subsequent design is able to integrate within the constraints of those systems and hence have minimal effect on that particular environment.

New Zealand consists of a range of dynamic and young landscapes ranging from coastal dunes to river flats, hill country and mountains. Many of these environments have been subject to development, with the most concentrated urban development occurring in the coastal areas, plains and hill country environs. The nature of design requires that we have a real understanding of the particular environment within which development is to take place. It is important to ensure that a site proposed for development is suitable for human occupation as a safe and healthy environment for both people and the ecosystems that constitute the site. In general, sites or landscapes that are favoured by people are those in which we subconsciously know we can survive.

Most of us want to do more than just survive and we therefore need to know what the implications will be of building in a particular environment. Some systems are more tolerant than others and some are more suitable for a particular purpose than others. We need to understand the particular environment of a site so that we can ensure that any design will be compatible and fit within the constraints of that system. When you make a statement about a particular environment you can automatically visualise it and all the plants and animals that it comprises. For example, when we describe an area as coastal we automatically associate it with sand, dune landforms, and wind-blown coastal plants. We are able to make these pictures in our minds of the particular environment named because all its constituent features are appropriate for that environment. The work of humans should also be appropriate for that environment and should be able to be integrated with the picture that is formed in our mind.

To achieve an appropriate design and to select a suitable site for development for residential, rural residential or rural occupation we therefore need to gain an in-depth understanding of the site in terms of biophysical features and processes, social processes and characteristics, and physical services. The checklist below indicates the type of information that needs to be considered to gain a genuine understanding of a site. The amount of information required depends on the scale of the proposed development and the characteristics of the particular site and the checklist can be adapted to suit any circumstances. In most instances it will be necessary to understand the characteristics of the particular entity, and its relationships to other entities and the overall environmental systems on the site. Differences between seasons and how this affects the system will also need to be understood.



Site Evaluation Checklist

UNDERSTANDING THE LANDSCAPE: Biophysical Features and Processes

Understanding	Explanation	Check
Water catchment Ground and surface water flows Drainage processes Ponding areas Wetland systems River and stream dynamics Water quality, quantity, flow	<i>Water is one of the most vital elements in an environment as well as being a constant natural force of change. Understanding the water catchment from its source to its outfall is required along with recognizing that water will be a major determinant in the design process.</i>	
Geology Notable landforms and features Formation processes Soil types and structures Erosion or other sensitive areas Slopes	<i>The geology of the site needs to be evaluated in terms of its ability to cope with development, with roading, building sites, proposed land uses, and infrastructure. Understanding the processes of formation will also aid in the integration of the design with the local environment.</i>	
Vegetation Type Size Location Significance and rarity Health, pests and diseases Links with adjoining vegetation Process of regeneration Habitats it affords	<i>Existing vegetation needs to be incorporated within any proposed development. Identification of areas where it can be enhanced and relationships with adjoining vegetation can be extended will affect decisions in the design process.</i>	
Natural hazards Flooding Inundation Erosion Subsidence Earthquakes Storms Global warming	<i>Many sites in NZ are subject to natural hazards. The risk associated with those hazards is often increased as a result of the action or location of human activities. It is important to evaluate natural hazards, the degree of associated risk, and human management of those risks.</i>	
Climate Average rainfall Microclimates in the site Seasonal variations Extreme events Movement of the sun Predominant winds	<i>Many aspects of the site development relate to the climate experienced on site, especially when considering the use of power generating technology to use the renewable power sources of wind, sun and water.</i>	

UNDERSTANDING THE LANDSCAPE: Biophysical Features and Processes

Understanding	Explanation	Check
Open space/conservation areas Local ecological corridors Wildlife habitats Local open space networks Esplanade reserves	<i>Proximity to open space and conservation networks is useful information for design and can provide community benefits as well as a means of integration.</i>	

UNDERSTANDING THE LANDSCAPE: Social Processes and Characteristics

Element	Explanation	Check
Community identity Historical contexts Settlement patterns Existing land uses Future land use trends Environmental awareness Community issues Zoning	<i>Developments that create places in which people will live are more than just an assembly of housing sites. A site needs to be assessed in relation to the overall community with which it is going to integrate to provide information on the direction and aspirations of the community.</i>	
Māori relationships Taonga Waahi tapu Waahi taonga Rahui Mahinga kai Koiwi Hikoi Mauri Kaitiaki Historic Places Trust Heritage Register	<i>The significance of the site to iwi will need to be considered prior to development design. The local iwi will be able to advise of the significance of the site to them, of any practices or current uses of the resources on site. They will also be able to advise of the potential for uncovering archaeological or other cultural sites during any proposed earthworks and the general acceptability or otherwise of systems proposed for the development such as on-site treatment of domestic wastewaters.</i>	
Relationship of Site Effects of adjoining land uses Proximity to: Work places Shopping areas Schools Recreational and leisure facilities	<i>The relationship of the site to community infrastructure is an important aspect in developing land on which people can live and enjoy the benefits of community services without unnecessary travel.</i>	

UNDERSTANDING THE LANDSCAPE: Social Processes and Characteristics

Element	Explanation	Check
Property information Tenureship Covenants and easements Zoning Designations Future council initiatives	<i>Legal property information along with future local authority planning intentions all have the potential to affect the development proposal and activities proposed for the site.</i>	

UNDERSTANDING THE LANDSCAPE: Physical Structures and Services

Element	Explanation	Check
Site specific infrastructure Existing buildings Existing service mains Existing service connections Roading within the site Surfaced areas Underground structures, tanks	<i>Any proposed development will need to integrate with existing infrastructure networks both on-site if it is a retrofitting development and off-site for green field development. In particular local roading, cycleway and pedestrian networks will need to be evaluated.</i>	
Local infrastructure Local road network Public transport networks Pedestrian networks Cycle networks Waste disposal facilities Recycling facilities Electricity suppliers and grids Telecommunication suppliers Reticulated water services Wastewater treatment and effluent disposal systems Stormwater systems	<i>The location and capability of existing service connections to the site will also be useful in designing the extent of independence of the development in terms of services.</i>	

The aim of the site evaluation and assessment is to create a detailed picture of site characteristics and the ecosystem into which it fits. The evaluation is a development tool that needs to extend beyond the site. Surrounding natural features, land uses and human management of the area all have the potential to impact on the proposed development. For example, there is little to be gained from the intention to use stream water for human use in a development if it is polluted by upstream land uses before it enters the site, as it could entail an on-site treatment process. The site evaluation and assessment is an important component of the development phase as it will ensure that the best approach to the development of the site is taken and will significantly help in avoiding future problems. In order for a development to solve the complex and integrated patterns of a particular environment much of the work must be done up front. It is likely that the site evaluation will involve a period of monitoring to gain a full understanding of the processes occurring.

CASE STUDY

Waiheke Island Coastal Estate, DJ Scott Associates

This case study has been used purely to demonstrate a landscape approach to subdivision layout and design. It is not suggested that this development contains all the characteristics of an eco-village.

Waiheke Island Coastal Estates is a subdivision consisting of 49 rural residential allotments. The subdivision was developed through a catchment management approach which played a critical role in determining the final subdivision layout. Catchments on the site were identified as landscape components and within them there were interrelated systems of water, soil, flora and fauna communities, biotic life and also human activities. Some catchment maps from this project are illustrated on the following pages.

Catchments are natural entities which vary in scale and provide a logical means for understanding the complex natural systems operating within and outside a site. The catchment process allows the principal focus to be on the natural environment rather than on activities. The process is evolutionary, and identification and analysis of many factors contribute to the final design of the lot layout and boundaries so as to conform to natural systems. Factors influencing the layout are based on an analysis of the existing landscape and how future management can assist with achieving sustainability.

The advantages of using a catchment approach are summarized below:

- (a) It provides a recognizable picture which is a useful tool for illustrating the interconnected nature of elements in ecological systems to affected parties, iwi, Local Authorities and other institutions.
- (b) It provides an integrative framework within which the basic components of the catchment and their interaction can be understood.
- (c) The catchment becomes the basic unit, providing an easy framework for ongoing refinement of the planning and design process. For example, it enables environmental impact assessments to become specific in determining thresholds and parameters, and it enables individual properties to be viewed within the context of the whole.
- (d) Catchments range from small to broad scale and the process can be applied to any site.

A typical catchment analysis includes catchment maps each illustrating the elements that characterise the landscape such as topography, geology, soils, hydrological regime and vegetation. The aim is to identify and analyse these elements so that the inter-relationships can be assessed. The intended outcome is to arrive at a design that ensures sustainable development, management and use of the subject site.

In many situations the elements of the catchment will exist in a deteriorated state. However, they still require identification. These areas are likely to require restoration as part of the project rather than being areas that can support development. The desired end result is to identify areas for preservation



(restoration) and areas for development. Where these areas are located depends on the land use capabilities identified within the catchment. In this case study, the analysis maps are included in section 2.6.

Map showing existing site features.



Map of survey results to locate and identify archaeological sites.



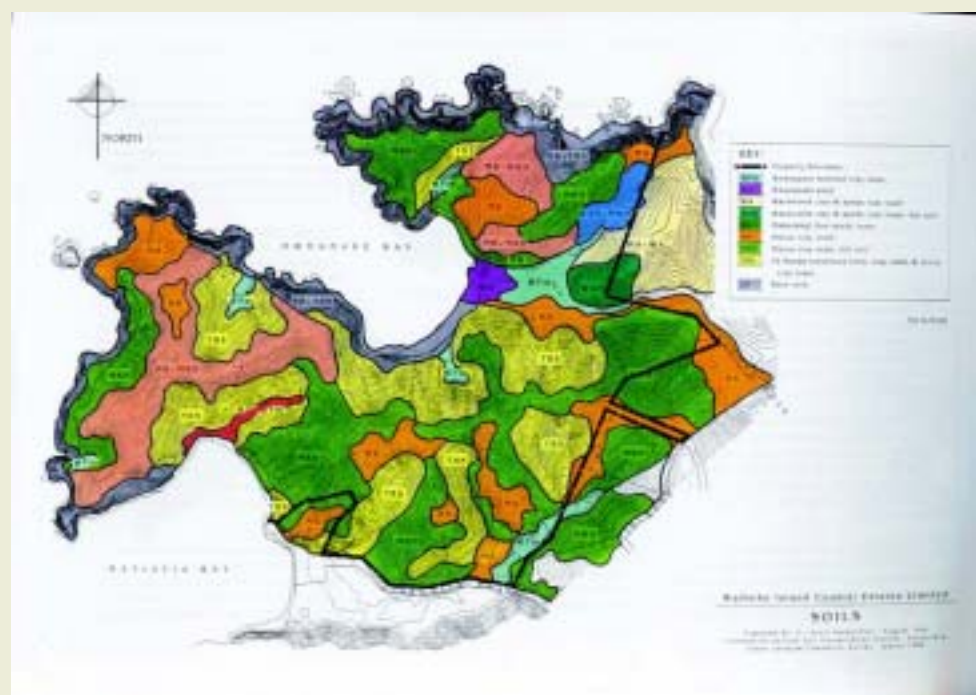
The objectives of catchment management are to:

- (a) Encourage land uses which facilitate good drainage;
- (b) Conserve soils;
- (c) Efficiently allocate available water resources and maintain water quality standards so that no particular use is irreversibly lost;
- (d) Preserve and enhance viable representative samples of natural ecosystems;

Map showing topography including catchment ridgelines.



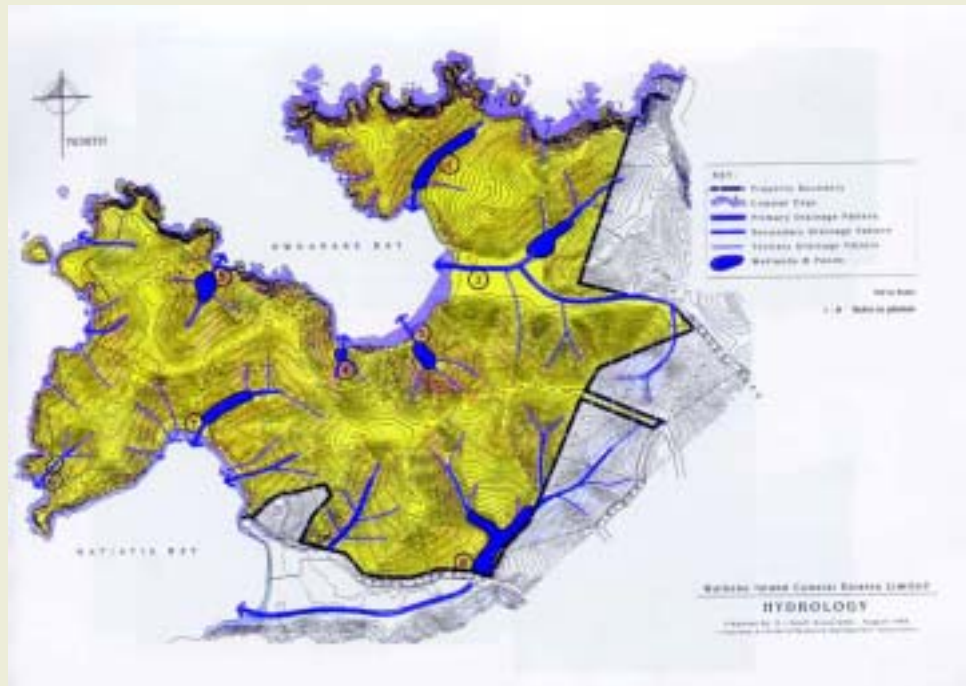
Map showing soil types and characteristics (stability, fertility).



- (e) Manage the introduction of exotic species, flora and fauna in a way that does not compromise other objectives;
- (f) Protect the long-term assimilative capacity of natural waste receiving systems;
- (g) Identify areas of land appropriate for a variety of human uses, settlements and growth patterns.

SOURCE SCOTT, DENNIS (1998) SUSTAINABLE DEVELOPMENT STRATEGIES OF THE NEW ZEALAND LANDSCAPES, NZILA CONFERENCE.

Map showing hydrologic cycles.



Map showing existing vegetation.



2.3 Methods of Collecting and Assessing Information

For a design to be successful there needs to be identification of constraints and opportunities, conflicts and potential ways of conflict resolution, for the integration of a proposed development with the local environment in terms of both environmental and social compatibility. There are a number of planning and management tools available for such a comprehensive site analysis, including catchment mapping, McHargs overlay technique, GIS mapping, etc. Computer models are useful but care has to be taken so as to include subjective values and to question the decisions the models make to ensure a valid interpretation. Visual/diagrammatic forms of information management generally have the most benefit as they are easily understood by most people and can be useful to provide the public, local authorities and future residents with an understanding of the detailed picture the evaluation has built up of the site processes and patterns and how it relates to the overall community. Visual/diagrammatic representations of the site evaluation also provide a useful basis for concept plans, and design and layout of the proposed development.

There are a number of different sources and methods for collecting the information required to gain an in-depth understanding of the site. This Handbook is about creating healthy places for people to live while minimizing the effects of development on the environment. As such this requires a genuine attentiveness to understanding the site and requires the incorporation of information not usually considered in the design process. A combination of hard (objective) and soft (subjective) information is required to create a rich picture of the systems contained within a particular site. There are a number of different sources and approaches that can be used to collect hard and soft information regarding a particular site, some of which are discussed below:

2.3.1 Collection of Hard Information

For any site, a wealth of information is available on paper and is held in various institutions such as local authorities and their libraries, government departments (Ministry for the Environment, Department of Conservation, Historic Places Trust, Statistics NZ, Land Information NZ, etc.), and Crown Research Institutes such as NIWA and local universities, and private organizations such as engineering and surveying firms. The information held in the files of these organizations can include:

- (a) Topographical maps
- (b) Zoning maps
- (c) Soil and vegetation maps and surveys
- (d) Catchment maps
- (e) Land use maps
- (f) Hazard maps
- (g) Aerial photographs
- (h) Historic maps
- (i) New Zealand archaeological association files
- (j) Records of waahi tapu (often oral) held by local iwi
- (k) Existing building plans
- (l) Existing service mains and connections



- (m) Climate information : rainfall, wind and sunlight data
- (n) Environmental impact reports on nearby developments
- (o) State of the environment reports
- (p) Roading and public transport maps
- (q) Land transfer plans
- (r) Heritage register.

Depending upon the quality and quantity of existing hard information available for a particular site it may also be necessary to commission new topographical surveys of the particular site and adjoining properties.

2.3.2 Collection of Soft Information

Hard information on a particular site is generally the easier to come by and utilize. Collection of soft information is the more difficult and time-consuming task and often requires you to start from the beginning and to take an experiential approach to site assessment i.e. in terms of everyday experience. It provides us with an enhanced understanding of the particular community and its relationship to the environment. There are a number of different ways of gathering this type of information, but a combination of them is most successful. All of these approaches involve talking to people, and it is therefore important to be open and to listen. It is also important to remember that the design phase has not yet taken place and that you should not go to the site with predetermined ideas such as where the road will be going. It is inappropriate to design before knowing the site.

Evidence of Activity

Every site contains 'tracks' or evidence of activity on the land – a story written on the land itself. Tracks include both natural features and social features and could include the physical evidence people leave of their activities within a neighbourhood. Collecting evidence requires a constant refocusing between the details and the whole pattern around them. We tend to look at things, identify them, acknowledge that we know what they are and move on. It is easy to miss details or to see only what we expect to see. By reassessing familiar objects we can often learn something new. Evidence of current activity at a site can provide important information for design.

Interviewing and Walkovers

Talking to local people often reveals the most valuable things about a site, and usually local people are only too happy to share what they know. At any site, interviewing neighbours is a must, and also past owners or locals who have lived in the area for their lifetime. When interviewing neighbours you need to listen, be open and let them tell the story. Often getting to know the neighbours early on and giving them the opportunity to tell you their story will help the consent process and/or when the proposal goes out for public notification.

Local Authority staff are also valuable for interviewing. District and Regional Councils hold a considerable amount of institutional knowledge regarding the local environment. Interviewing Council staff not only provides access to the information held on Council records but also gives you an indication of how the Council staff visualise the site in relation to the local environment.



2.4 Cultural Site Assessment

The significance of a site and its natural features to iwi along with historical and environmental connections to the area need to be incorporated into the site assessment and resultant rich picture. Any proposals for the development of the site will also need to be discussed with the local iwi to ensure they are compatible with the aspirations of the iwi for resource management in the area. It is a requirement under the Resource Management Act to consider Maori relationships with the environment in resource decision making. Consideration of deeper spiritual connections to the environment will benefit the level of understanding gained of a site and the resultant design for development.

Objective information alone cannot provide us with a full understanding of a site and we need to consider subjective connections such as the Maori spiritual relationship with the environment. Cultural site assessments will need to be undertaken by the local iwi, but it is necessary to have a basic understanding of the Maori view to understand the significance of the results of site assessment.

Maori relationships with the natural environment are based on the central concept of whanaungatanga, being related to the natural world. The whole of the created reality possesses mauri giving humans place and purpose within the world. Through **mauri** all things are connected to nature, all things are descended from common ancestors, so all elements of the natural world possess life and a universal living spirit. Preservation of mauri is all-important. In every life, use is made of the environment and therefore there is a constant risk of limiting or affecting the mauri. To protect it, a set of rules governing conduct and behaviour (tikanga) had to be followed.

Tikanga are based on the general understanding that people belong to the land and have a responsibility as **kaitiaki** (or guardians) to the land. It incorporates concepts such as **tapu** (sacredness or under restriction) and **rahui** (temporary restriction). These are controls which manage the relationship of humans with the environment. Observing tikanga is part of the ethic and exercise of kaitiakitanga.

Kaitiakitanga is an environmental management system that was developed by tangata whenua to fulfil their responsibility to the environment. Kaitiakitanga includes guardianship, care, wise management and resource indicators for the state of mauri. Kaitiakitanga is exercised by kaitiaki and may only be practised by the iwi, hapu or whanau that has tino rangatiratanga (customary authority) in the tribal area. The recognition of this in the Resource Management Act provides an avenue through which all New Zealanders can benefit from Maori knowledge of resources and the management of our environment.



2.5 Integration with Existing Neighbourhoods

Neighbourhoods exist within a context. Contexts include:

- (a) The physical environment;
- (b) The transportation infrastructure;
- (c) The water supply and wastewater disposal infrastructure;
- (d) The planning zone and its restrictions or opportunities;
- (e) The social infrastructure such as libraries, schools and health services;
- (f) The local economic environment with its shops, supermarkets, service industries and the like.

While it is important that each neighbourhood have an identity and a sense of place (apart from the naming of streets and areas), neighbourhoods should also be developed to integrate with existing neighbourhoods and the infrastructure available. Design processes need to evaluate the effects of activities undertaken on adjoining sites, both during construction and after development, to ensure compatibility with the development proposed. Integration both physically and visually with the surrounding environment can be important, and in some cases coding may be suggested as one method to aid visual design integration.

Similarly, any proposal for a site needs to be evaluated in terms of the effects it may have on adjoining properties. Design concepts that involve use of natural waterways and drainage features, on-site wastewater management, earthworks to create wetlands and ponds, power generation by on-site water, or by wind or solar technology will all have the potential to affect adjoining properties and downstream locations. However it is likely that using the “design by nature” principles suggested in Part One, that these effects will be less detrimental to both the natural and human environment and will promote greater sustainability in the use of resources.



2.6 Analysis and Concept Plan

“Our client is man – whose body and senses conditioned through countless centuries of living near nature, yearns to see the sky and the earth and the green and trees.”

CHARLES BLESSING 1959

In considering the layout of a site subject to a land development project the design needs to include consideration of two main objectives:

2.6.1 Objectives

- (a) To provide a planning and site development process that :
- (i) Is based on recognition of the natural environment, the ecosystems within which a site exists and the interconnectedness of components within a system.
 - (ii) Incorporates at each stage of design the lessons learned from evaluation of previous stages.
 - (iii) Is flexible and sensitive to the likely diverse future needs of individuals and groups.
- (b) To establish a community or development that promotes sustainability through integration with the environment and ecosystems on the site and enhancement of all aspects of the community.

The key to approaching sustainable land development lies with the recognition that a site needs to be viewed in terms of the landscape itself and the natural systems operating within it, rather than focusing on the activities that are proposed to be carried out on it. Instead of viewing a site in terms of how it can be modified to accommodate the proposed activities we should concentrate on how the proposed activities can be modified to ensure positive utilization of the landscape with minimal disruption to the natural systems operating within it.

A starting point in any design process is the mapping of the chosen site and the identification of natural and social features. This is where the site assessment and evaluation can be utilized to provide information to form the base map(s) of the concept plan. The purpose of the concept plan is as a discussion document for consultation with the local community, iwi and the local authorities. The concept plan developed from the rich picture also enables design of areas for development and preservation, service areas, roading and allotments and building sites to be accommodated in the areas selected as most appropriate in terms of the design objectives.

Useful design guidelines for developing the concept plan are contained in Part 2 of the Handbook. Because it is not possible for a site to contain areas compatible for every use or strict incorporation of every guideline, trade-offs will ultimately be required, and the development of the concept plan will inevitably be a balancing act. This is not to say that designs can fly in the face of best practice for sustainable design, but acceptable compromises will need to be made intuitively, considering both objective and subjective information.

Example site analysis and concept plans formed from the catchment analysis case study in section 2.2 are illustrated below. These provide an indication of what can be achieved and the level of detail and information required to gain an understanding of a site and the major ecosystems which constitute it and to which it belongs.



CASE STUDY

Waiheke Island Coastal Estates, DJ Scott Associates

This case study has been used purely to demonstrate a landscape approach to subdivision layout and design. It is not suggested that this development contains all the characteristics of an eco-village.

The main design intent for this development layout was to move towards a more sustainable land management system based on a catchment management approach. Overall layout was based on an analysis of land use capability and landscape pattern. The resulting lot boundaries and layouts conform to natural systems. The housing density relates to land form rather than an arbitrarily imposed minimum lot size.

To address sustainable management, baseline limits need to be recognized such as the minimum instream flows to sustain aquatic habitats, water abstraction rates, rates of soil loss, etc. When these issues are determined, the resilience, productivity and vulnerability of the systems can be identified. The landscape can then be divided into two distinct parts: one that should be protected, and one that is capable of development and for which mitigation measures can be determined. The design sequence used in this study is outlined below, with the catchment maps being illustrated in section 2.2 and analysis maps being shown on the following pages.

1.Site Detail Maps

Preliminary site data investigation and plotting. See section 2.2.

2.Site Analysis Map

Illustrated on the following page.

3.Outline Plan of Development

See following pages.

4.Preliminary Discussion Plan

See following pages.

5.Scheme Plan

See following pages.

6.Consultation

Consultation with iwi, local interest groups and statutory authorities was included at the relevant stages and influenced the final design.

7.Archaeological Report

An archaeological survey was undertaken, and the sites were mapped and described in a report. Archaeological site conservation was an integral part of the design, with sites being avoided when decisions were made about the siting of physical works.

8.Building Envelope Plans

Nominated residential areas were shown as building envelopes with restrictions on height.

9.Restrictive Covenants

Restrictions on the type and colour of building materials to minimize visual effects were considered. In combination with the District Plan rules, sensitive and appropriate development should result.



The Site Analysis Map is based on the contour plan, with the ridgelines being plotted to define individual catchments. The main drainage patterns are then added, tracing the floor of each catchment. Wetlands and ponds have been located and mapped and site topography has been characterised and mapped on the basis of slope. The coastal margin was characterised and mapped together with significant vegetation.

The Outline Plan of Development follows the site analysis map. The topographic constraints are used to establish feasible areas/locations for possible dwelling sites, open space, productive areas, reserves, areas for conservation planting, and the location of access ways within the property.

Site analysis map.



Outline plan of development derived from the site analysis map.



The preliminary Discussion Plan adds more detail by shading out the steep terrain for revegetation, and sketching areas potentially suited for rural residential development. Suitable house sites were shown and a clear pattern of development emerged that was based on the attributes and limitations of the property. The result was to divide the land into two distinct areas, one for protection and one allowing appropriate levels of rural residential housing. The Scheme Plan was prepared from the design parameters outlined in the Preliminary Discussion Plan.

SOURCE: SCOTT, DENNIS (1996) ASSESSMENT OF ENVIRONMENTAL EFFECTS FOR OWHANAKE, DJ SCOTT and ASSOCIATES, AUCKLAND

Preliminary discussion plan.



Scheme plan.



NOTES