ARMOUR PARK ECO-VILLAGE

PRAIRIE SETTLEMENT FOR A SUSTAINABLE FUTURE

BY

GREGORY DARREN KILOH

A Practicum submitted to the Faculty of Graduate Studies of the University of Manitoba in partial fulfillment of the requirements of the degree of

MASTER OF LANDSCAPE ARCHITECTURE

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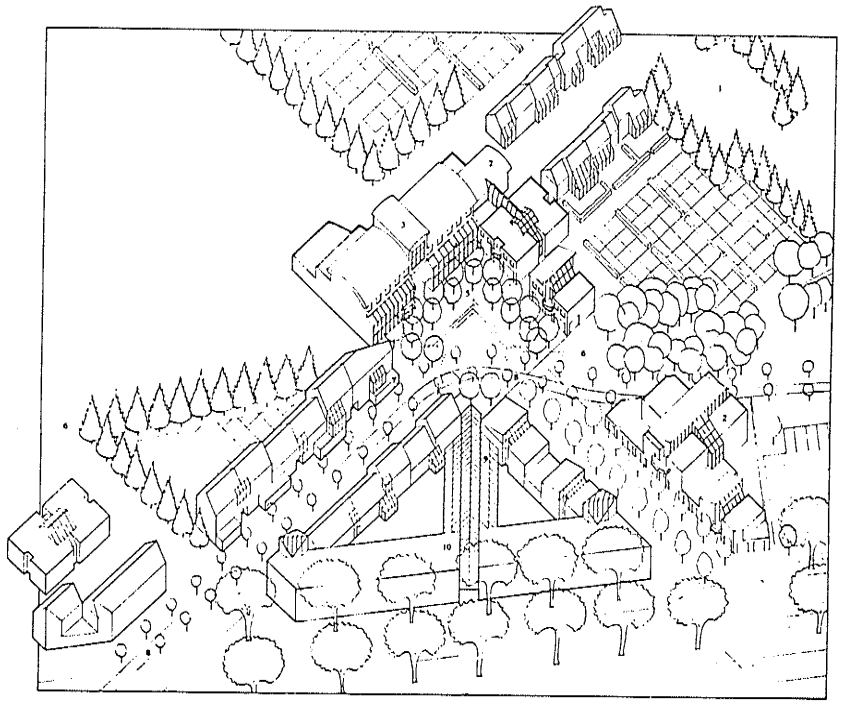

ARMOUR PARK ECO-VILLAGE

Prairie Settlement for a Sustainable Future

Gregory Darren Kiloh

A Practicum Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Landscape Architecture

Department of Landscape Architecture • University of Manitoba • Winnipeg • Manitoba • April 1995

Dedication

For all my ancestors, particularly my Babas and G.G.s, whose selfless pioneering efforts started it all; and for all the generations yet to come, in the hope that they will inherit an even better world than I.

Abstract

This study examines the potential for developing underutilized industrial land as the core of alternative model communities which address current concerns for social equity and ecological integrity. Factors which pertain to such goals are examined, case studies of similar and related developments discussed, and a demonstration plan for a site in Regina, Saskatchewan is developed.

Acknowledgments

I am greatly indebted to the Canada Mortgage and Housing Corporation, without whose financial support this study would not have been possible. Likewise, I am at least equally indebted to my parents, John and Sonja Kiloh, for all of their support over the years. Thanks to my committee: Professor Charles H. Thomsen, chair; Professor Carl R. Nelson Jr. and Ms. Marcia Nozick. Thanks to Doug Shearer for his role as an informal critic and editor. Thanks to Andrea Spakowski for her love, support, patience and encouragement during the last three years. Also, my appreciation to the Pomme de Tarans for their understanding and flexibility, particularly during the last few months, when their support was vital to the completion of this study.

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1 Introduction: Questioning the City

Any study of alternative urban form must necessarily begin with a question. This study was initiated by questioning the relationship between the city, its "countryside" and their common economy.[1] One of the key factors in this query was the discovery of large areas of publicly owned and vacant land in the core area of Regina, Saskatchewan. As well, an awareness of the non-sustainable agricultural economy which Regina depends on and the growing interest in sustainable, urban agriculture in Canada influenced early concepts.[2] Initially, the intent was to design a community which captured the dual essence of the prairie homestead: self-reliance and community co-operation. As the concept developed, it was found that others referred to such a community as an Urban Eco-village, or sustainable community.

Although these questions were asked of Regina specifically, the conditions behind them are not unique in Western Canada, nor in other minimally urbanized, agriculturally based areas. Most prairie cities and towns grew up along the railroads, and used them to attract industry to diversify their economies. Competition was stiff, and most communities were only partially successful.[3] In subsequent years, railroad use has declined for both passengers and shipping, resulting in an abundance of vacant industrial and railroad land.

Critics of the modern city often cite high cost of living, pollution, high crime rates, alienation, and other social ills. The solution, for many people, has been to flee the city for greener pastures. This pattern

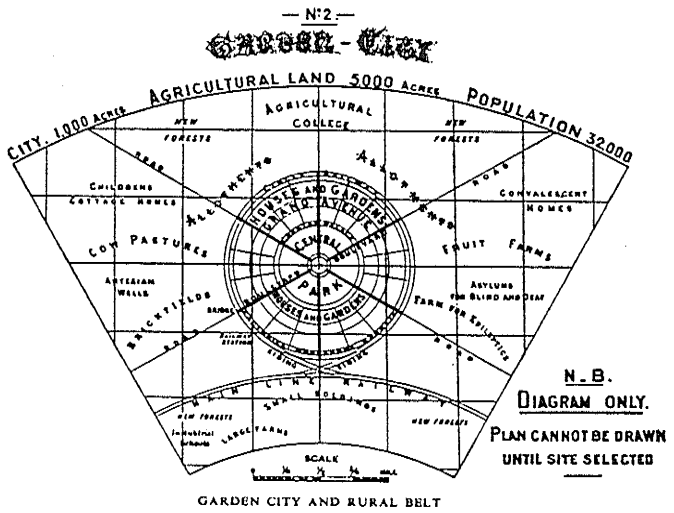


Figure 1.1 The Garden City Model

has existed at least since The Emperor Hadrian fled Rome to build his villa at Tivoli. Since the end of the Second World War, widespread availability of the automobile in developed nations, has made this option available to increasing numbers of people. However, from a global perspective, the world's mushrooming population is increasingly urban.[4] The vast majority of people who live outside of municipal boundaries in suburban, exurban or rural residential areas have strong ties to the city and are thus still part of this trend.[5]

From an ecological perspective, the city can be considered to be the primary human niche. Urban theorists are increasingly using ecological models to develop urban forms which are more compatible with

[1] The use of the term countryside as a possessive refers to Bryant's use of the term when examining exurban growth.(Bryant, C.R. et al *The City's Countryside. Longman Group.* London. 1982.) As well it relates to Jane Jacobs theories on the relationship as outlined in: *Cities and the Wealth of Nations. Principles of Economic Life.* Random House. New York. 1984.

[2] Kiloh, Greg. *Is Prairie Agriculture Sustainable?* unpublished paper prepared for Sustainable Development Seminar, Department of Landscape Architecture, 1990.

[3] Brennan, J. William. *Regina An Illustrated History.* James Lorimer and Company. Toronto. 1989. pg. 61.

[4] Giradet, Herbert. *The Gaia Atlas of Cities.* Anchor Books Doubleday. New York. 1993. pg. 68.

[5] Bryant, C.R. et al. Op. cit.

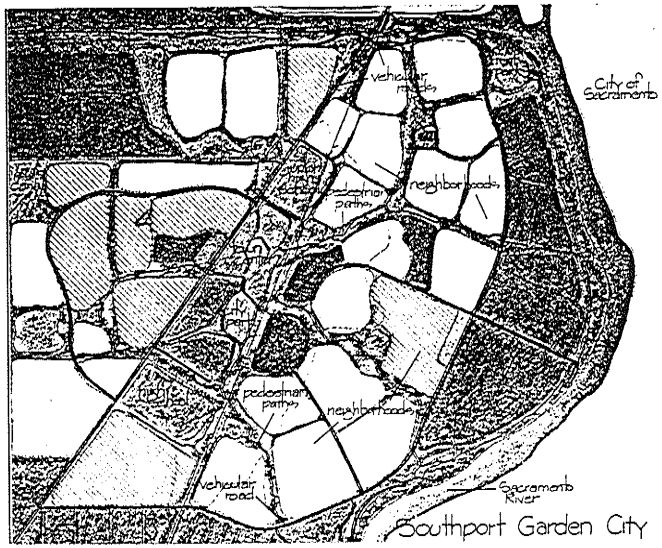


Figure 1.2 "Appropriate Planning Area" Southport Garden City, Sacramento, California

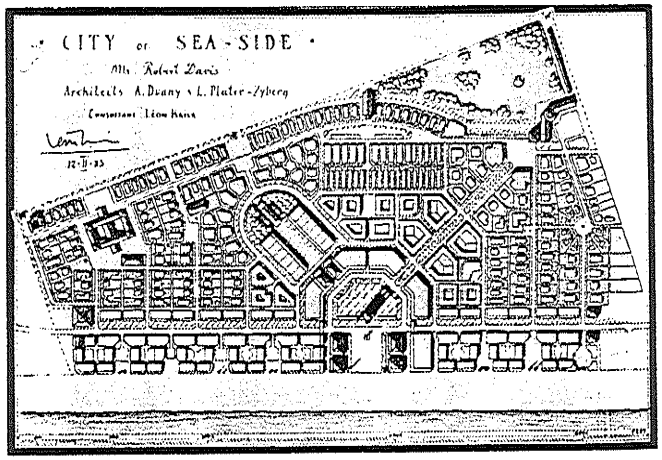


Figure 1.3 "Traditional New Town" Seaside, Florida

natural systems. Such models use adjectives such as "environmental", "ecological", "green", or "sustainable" more or less interchangeably. These models often seek to combine the advantages inherent in both urban and rural conditions through hybrid forms. Virtually all models following this approach can trace their inspiration to one common treatise: *Garden Cities for To-morrow* by Ebenezer Howard[6]

Howard felt that the continued growth of industrial London was resulting in the decimation of the countryside, and crowded, inhuman habitation. By combining the advantages of the urban economy, and the healthy surroundings of rural areas, he felt that a hybrid form of new town could eliminate the disadvantages of both. These new towns would be self reliant, combining agricultural production and industrial manufacturing. They would also be of limited size and self contained, surrounded by a greenbelt combining natural and cultivated areas. Regional growth would be accommodated not by endless sprawl, but by the agglomeration of several Garden Cities. The isolation of existing London suburbs would be lessened by an inter-municipal railway linking the Garden Cities and a somewhat larger Central City. Residents could then at once live in both a small town and larger urban region.

Although several communities following Howard's model were built in both England and the U.S., none of them managed to combine all the elements of his vision. Securing sufficient land to form the required greenbelts, and attracting industries to relocate in the new towns proved to be the most difficult goals to achieve. The result was that most of the new towns became contiguous with the suburban sprawl that accompanied the explosion in the use of

[6] Howard, Ebenezer. *Garden Cities of To-morrow.* Faber and Faber Ltd. London. 1902.

the automobile.[7]

Suburban development was at first regarded as a liberation from the crowded conditions, pollution and crime of the inner cities. However, their continued growth over the past half century have greatly altered the complexion of the modern metropolis. Densely built mono-functional urban cores and sprawling mono-functional suburbs stressed cities with increasing traffic, pollution, energy waste and crumbling infrastructure. Inner city residents lost contact with nature, while suburbanites squandered resources and displaced the natural qualities they originally sought.[8]

New models in the Garden City tradition are again being theorized and built as solutions to this problem. Michael Corbett's 'Appropriate Planning Area', Duany and Plater-Zyberk's 'Traditional New Town' and Peter Calthorpe's 'Pedestrian Pocket' all accept suburban growth as inevitable and seek to reduce the negative impact through mechanisms similar to the Garden City. As attractive as these various proposals may be, they cannot be seen as universally applicable. The required self-containment necessitates a large enough population to support the desired services. This population can only be found in large metropolitan areas with high growth rates. Smaller cities with slower growth rates must either accept suburban growth or find other alternatives.

Sustainable Development

The term 'sustainable development' was coined by the authors of *Our Common Future*, the report of the Brundtland World Commission on Environment and Development. Sustainable development is defined as: "the ability to... meet the needs of the present without compromising the ability of future generations to meet their own needs".[9] The theory of sustainable development suggests that we must balance social and environmental criteria in decision-making, and that the two are intrinsically linked.

In a broad sense, model communities have always addressed these two areas, to varying degrees and with varying sophistication. The Garden City for instance, was primarily concerned with the quality of *human environment,* and therefore was concerned more with social issues. In fairness, it was not until the environmental crisis of the 1960's and the growth in ecology (specifically urban ecology) that greater awareness could produce criticism of this omission. On the other hand, most experimental activity produced by this new awareness resulted in either rural communes or singular urban ecology house projects. The failure in both of these cases would have to be seen as primarily social. The rural communes, although primarily social experiments, failed by isolating themselves from mainstream society and therefore offered only limited applicability to urban realities. Ecology houses, although excellent examples of applying urban ecology to the single family home, left the larger picture essentially untouched. Cities are much more than the aggregation of houses.

Cities, or even smaller portions thereof, are enormously expensive, complex objects to build. Most are produced incrementally over many generations or centuries and therefore express in their parts the technology and theories prevalent in those times. It is this very diversity that makes cities so fascinating. For this reason model communities often exist only in theory and when built do not closely resemble

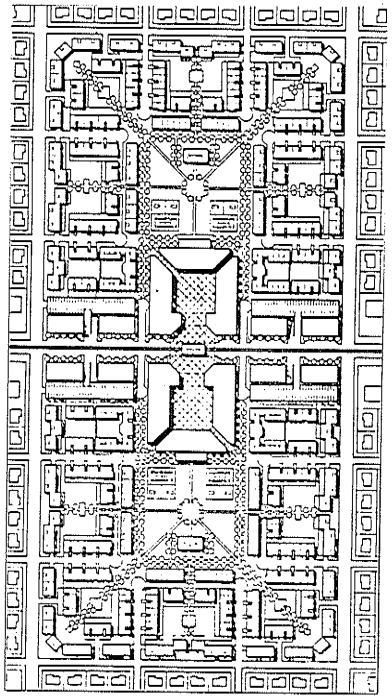


Figure 1.4
"Pedestrian Pocket"

[7] Schaffer, Daniel. *Garden Cities for America.* Temple University Press. Philadelphia. 1982. pg. 215.
[8] Smyth, Joseph. "The Economic Power of Sustainable Development: Building the New American Dream" in *Sustainable Cities: Concepts and Strategies for Eco-city Development.* Bob Walter et al. Eco-Home Media. Los Angeles. 1992. pp. 212-213.
[9] Brundtland et al. *Our Common Future.* Oxford University Press. New York. 1987. pg. xi.

Figure 1.5: Winona Phase 3

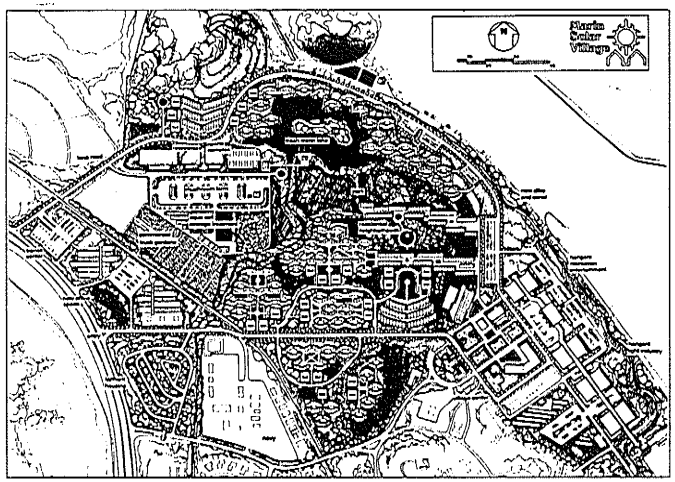


Figure 1.6: Marin Solar Village from Sustainable Communities

the original designs.

Two theoretical models have achieved a good balance between social and environmental criteria. The first, a University of Minnesota design study for the town of Winona included suggestions for energy efficiency and self-reliance as well as community structures and forms to help achieve these goals.[10] The second, *Sustainable Communities,* by Van der Ryn and Calthorpe addresses all the issues in a comprehensive form.[11] Although the book is not a singular theory or design demonstration, the work has informed Calthorpe's Pedestrian Pocket developments. Calthorpe's current work has eliminated most of the more radical environmental aspects in favour of marketability, stressing the aim of reducing automobile use.[12] If this goal could be achieved, it would tackle the primary environmental issue of the late 20th century. As the first Pedestrian Pockets are now being built, it remains to be seen whether they will be successful in this regard. Perhaps if they are, and they prove to be marketable as well, the other environmental issues will take on greater significance in Calthorpe's future work.

In the following sections, social and environmental factors will be discussed separately for the sake of clarity. It should be remembered that these two criteria are intrinsically linked and the divisions are merely conceptual. Environmental issues are also social issues and vice versa.

[10] Holloway, Dennis et al. *Winona: Towards an energy conserving community*. University of Minnesota. 1975.
[11] Van der Ryn, Sim and Calthorpe, Peter. *Sustainable Communities*. Sierra Club Books. San Francisco. 1986.
[12] Girling, Cynthia. "The Pedestrian Pocket: Reorienting Radburn" in *Landscape Journal* Vol. 12, No. 1, Spring 1993.

2 Social Factors

The Post Industrial World

Economists, futurists, and other theorists have been suggesting that civilization is undergoing a huge and rapid transition to the post-industrial age. In 1980 Alvin Toffler referred to this revolution as *The Third Wave*, in his book of the same name, the first two waves referring to the development of agriculture and the industrial revolution.[1] In the post-industrial age, energy and resource intensive, polluting, large-scale and centralized industrial production will be replaced with technology-based, simple and efficient means which may involve recycling of materials more so than the refining of raw materials. A technology-based economy lends itself to decentralized employment to the neighbourhood, or even household level. In the last few decades, the increasing numbers of people employed in the trading of information rather than materials and goods is a strong indication of this trend.

Economic Self-reliance

The theory of local economic self-reliance has emerged, principally, out of the legacy of E.F. Schumacher's *Small is Beautiful.*[2] Counter to the trend of multi-nationalism and free-trade blocks, cities and their regions are once again emerging as economic units[3]. Jane Jacobs, in *Cities and the Wealth of Nations*, argues that cities have historically been the basic economic unit, and that the notions of Gross Domestic Product and national banks are simply a product of nineteenth century nationalism. She maintains that the only true method of developing an economy is through import replacement at the local level, such that every urban unit becomes as self-reliant as possible.[4]

In addition to, and supportive of import replacement are other strategies to build local wealth. Frugality (conservation, preservation, recycling), Internal Trade (barter systems and developing local markets), Product Development (invention niche marketing) and Trade with Equal Partners.[5]

Self-reliance is not the same as self-sufficiency. Russell Anderson defines self-reliance as "the capacity for self-sufficiency, but not self-sufficiency itself. Self-reliance represents a new balance, not a new absolute."[6] Any attempt to produce locally all the needs of a community would be inefficient, wasteful, and inherently unstable both economically and environmentally. It would be pure folly to attempt to grow bananas in Saskatchewan, but ultimately wise to promote the substitution of Saskatoon berries for more exotic fruit that must be imported.

Self-reliance need not imply parochialism. Throughout most of human history it has been the trade of goods that has allowed the exchange of *ideas* to occur and advance civilization.[7] In the "information age", advances in electronics are allowing communities to communicate throughout the "global village".[8]

[1] Toffler, Alvin. *The Third Wave.* William Morrow and Company. New York. 1980.
[2] Schumacher, E.F. *Small is Beautiful. Economics as if people mattered.* Harper & Row. New York. 1973.
[3] Morris, David. *The New City States.* Institute for Local Self-Reliance. Washington D.C. 1982. pp. 5-13.
[4] Jacobs, Jane. *Cities and the Wealth of Nations. Principles of Economic Life.* Random House. New York. 1984.
[5] Nozick, Marcia. *No Place Like Home.* Canadian Council on Social Development. Ottawa. 1993. pp. 43-63.
[6] Russell Anderson quoted in Morris Op. cit.
[7] Mumford, Lewis. *The City in History.* Harcourt, Brace and World Inc. New York. pg. 71.
[8] There is a growing network of groups working towards developing ecologically integrated communities. Eco-Net is one such on-line communication tool.

Prosumption

One of the trends Toffler identified in *The Third Wave* was the emergence of the 'prosumer'. This new actor combines the old roles of producer and consumer in society. Of course, any individual in society plays both roles to some degree, but Toffler suggests that the emphasis on the division of labour will be reduced as greater self-reliance becomes more prevalent.[9]

Toffler presents an apparent contradiction in referring to the growth of both the benevolent mega-corporation and the small enterprise, but it is now easy to see how these diverse industries are compatible and mutually supportive.[10] For instance, the original Apple Computer was literally a garage industry, and has now grown into a huge corporation second only in sales to the previously huge IBM. Many of the software companies which write programmes for personal computers consist of no more than a single person and a machine[11]. A good product in this industry can generate sales in the millions of dollars. Other software companies such as Microsoft have grown to be even larger than Apple. Apple's role in pushing the computer industry from innovation to innovation in rapid succession is perhaps the primary force behind the computer revolution.[12] This revolution is in turn the primary force behind the information revolution, which of course is the main component of the post-industrial age. Another example might be the Body Shop, the British cosmetics company that started small and has grown globally through its environmental philosophy and commitments.

Curiously, Toffler doesn't mention agriculture with the exception of a discussion of bio-engineering.[13] Apparently, he felt that the trend towards monopolistic industrial agriculture will continue as the main source of our food. The current growth in organic vegetable gardening and focus on local production indicate that alternatives may co-exist.[14] Although we have a long way to go towards decentralizing agricultural production, issues of food security and quality, as well as local economic stability are fueling growth in the opposite direction. One interpretation of Toffler's notion of the 'prosumer' would be to imagine this role as the individual who participates in the local economy while providing basic needs such as food and shelter independently.

Co-operative Enterprise

The co-op movement in Canada was essentially founded in Saskatchewan. Although pioneers always co-operated informally, the unit of enterprise was based in the family farm. By 1911 Saskatchewan farmers realized that all of their profits were being siphoned off by the grain trading and milling concerns in co-operation with the banks. As these corporate entities were located outside of the region, money was not locally available for re-investment. By forming The Saskatchewan Co-operative Elevator Company, farmers pooled resources and were able to compete with the larger corporations.[15] Today, co-operatives are a mainstay of the Saskatchewan economy, and exist in such diverse forms as oil refineries, credit unions, department stores, bakeries, day cares and housing developments. In 1989, Saskatchewan's 1400 co-operatives generated rev-

[9] Toffler, Alvin. Op. cit. pp. 53-61.
[10] Frankel, Boris. *The Post-Industrial Utopians*. The University of Wisconsin Press. Madison, Wisconsin. 1987. pg. 35. Frankel failed to see the relationship between cottage industry and multi-national corporations, I offer only two examples of many that have occurred since 1980.
[11] Morris, David. *Self-Reliant Cities: Energy and the Transformation of Urban America.* Sierra Club Books. San Francisco. 1982. pg. 214. Morris suggests that since the fastest growing segment of the economy (programming) is powered only through food energy, the post-industrial world comes full circle to an agricultural base.
[12] Gruman, Galen and Heid, Jim. "Macintosh Innovations" in Macworld February 1994. pp. 86-98.
[13] Toffler, Alvin. Op. cit. pg. 356.
[14] Rogers, Susan. "Field of Greens" in *Harrowsmith* No. 109 June 1993.
[15] Brennan, J. William. Op. cit. pg. 58.

enues of $3.5 billion and 25 of them were among the province's 100 largest enterprises.[16]

In a social sense, co-operatives not only empower members economically by making everyone an owner, they remove (at least theoretically) hierarchies of power. When all members are partners, decisions must be made by building consensus. Although the degree of communication and effort can sometimes seem less efficient, empowered people are more likely to work towards positive change in such circumstances.[17]

The Electronic Cottage

Toffler's suggestions that the information age and advances in electronics would change the way we do business have certainly been proven without doubt. Toffler indicated that in 1980, 35-50% of most businesses could be conducted from home with then current technology.[18] Although the fax machine, cellular phone, and personal computer (not to mention the notebook and the pocket sized personal digital assistant) are revealing the great potential for the non-geographic office, let alone the home office, we are still seeing the construction of huge centralized office buildings. Whether this is due to conservative business practices (including within the development industry) or other factors has yet to be seen. However, a recent Ryerson Polytechnic Institute study does indicate that fully 33% of all Canadian households are used for some form of home based business.[19] This trend is sure to continue as computer literacy in society increases and further technical advances and affordability occur with information technology.

As these trends continue, our built environment will have to respond. Recent trends in suburban design have been towards privacy rather than community, creating greater alienation and isolation.[20] One explanation for the continued development of central work places might simply be the social factor. For many adults, the workplace is the only focus of social contact. Take away the office, and it would certainly increase loneliness in society. Human beings are, after all, social beings, and it is doubtful that virtual reality, video conferencing and E-mail will ever replace human contact. If the home based workplace is to become a reality, the relationship with the home and its surroundings will also have to change. It may become imperative that coffee breaks in the home office are taken at the cafe around the corner or in the common kitchen of the housing cluster.

Changing Demography

The diversity of household types in our society needs little elaboration. The nuclear family ideal of the 1950's is simply not the reality for many people today. Prior to the Second World War, the extended family was common. Today, one-person and unrelated adult households are equally common. As Toffler indicated in *The Third Wave*, this trend should not be justified as a breakdown in 'family values', but rather an indication of greater freedom of the individual.[21]

Whatever the philosophical justifications, the designs of our communities do not reflect demographic realities. According to the 1991 Census, only 60% of households in Regina could be described as a

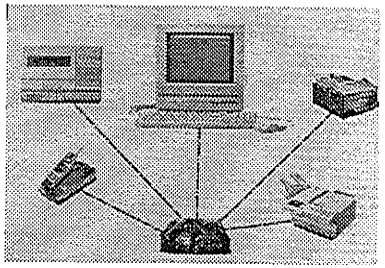


Figure 2.1: The Electronic Cottage

[16] Reid, Barton. "Co-operatives and Community Development" in *City Magazine* Fall/Winter 1993. Figures are quoted from *Partnership for Renewal: A Strategy for the Saskatchewan Economy.* Government of Saskatchewan. 1993.
[17] Cohen, Lottie. "The Co-op Approach to Neighbourhood Development" in *Sustainable Cities.* pp. 227-229.
[18] Toffler, Alvin. Op. cit.
[19] Jager, Manfred. "Home-grown enterprise" in *Winnipeg Free Press.* Sunday, October 17, 1993.
[20] Sewell, John. "Old and New City" in Gerecke, Kent. *The Canadian City.* Black Rose Books. Montreal. 1991. pg. 34.
[21] Toffler, Alvin. Op. cit. pp. 224-242.

nuclear family household. Despite this, the overwhelming majority of housing is in the form of single family detached housing. Alternatives such as apartment blocks and town housing may be more affordable, but do not necessarily meet the needs of our diverse lifestyles. In Regina, 14% of family households are headed by a single parent, of which 85% are female. Housing models which encourage and facilitate the sharing of child raising responsibilities must be developed to respond to these realities.[22]

Collaborative Housing

The Danish "bofaelleskaber" (living communities) was perhaps the first and certainly the most successful example of what has come to be most commonly known as co-housing. This term was copyrighted by McCamant and Durrett, the authors of the book by the same name, so this study will use the term collaborative housing instead.[23] This new form of housing, now increasingly common in Northern European Countries, is an exploding phenomenon in North America. Several developments have already been built in the U.S., and at least 19 are underway in Canada.[24]

Perhaps the most important innovation in collaborative housing is the common house containing a common kitchen and dining room, and often other shared facilities as well. Although individual units are typically self-contained, they are also usually about 10% smaller to accommodate the common house in the budget. As community meals are often the centre of activity, private kitchen and eating areas can be much smaller, and the duplication of living and family rooms in private homes is uncommon.

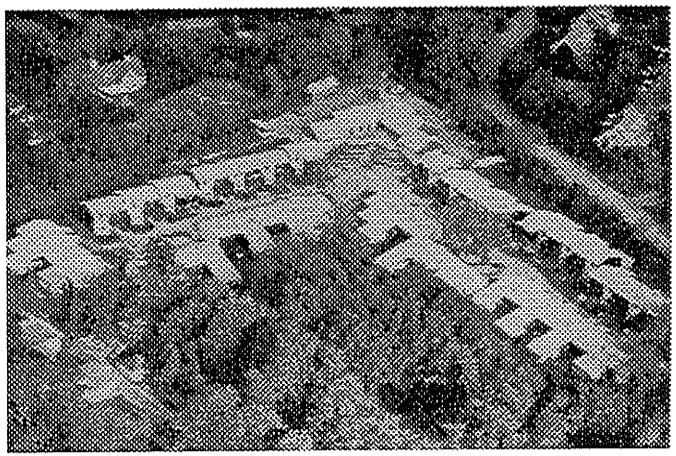


Figure 2.2: "Bofaelleskaber" Trudesland Denmark

Community building is also encouraged through other physical design. Individual units are placed closer together, and the more active zones, both interior and exterior are placed adjacent to encourage chance encounter. Perhaps the most important community-building device is the design process. Future residents meet with their design consultants directly and all decision-making is consensual. In this way, community building begins long before construction, and residents are typically quite prepared, and even quite excited about sharing their lives with their neighbours.

Although most collaborative communities are built around the townhouse model, with individual units belonging to families, it is also easy to see how this form is more compatible with non-conventional families. The single-parent family is perhaps the greatest beneficiary of the closer community. Having additional adult role models is good for the children, and casual baby-sitters are more readily available. As

[22] Franck, Karen and Ahrentzen, Sherry. eds. *New Households New Housing*. Van Nostrand Reinhold. New York. 1989.
[23] McCamant, Kathryn and Durrett, Charles. *Cohousing. A Contemporary Approach to Housing Ourselves.* Habitat Press/Ten Speed Press. Berkeley, California. 1988.
[24] Munn, Jon. "Sweat and Equity: CoHousing comes to Langley" in *City Magazine*. Vol. 14, No. 3, Summer 1993.
[25] Blundell Jones, Peter. "Three Kinds of Participation" in *Architectural Review*. March 1987. pg. 62.

well, adults without children, whether young or old, can have contact with children without the full responsibility of being a parent. Of course, conventional nuclear families need not be excluded, as diversity is often a positive attribute for communities.

Self-build and Sweat Equity

"Architecture is neither pure technology nor pure art, it is a dialogue with the place and the people." — Peter Blundell Jones on community architecture[25]

Some architects follow the philosophy that individuals know best how to house themselves, if only they have the means to do so.[26] This rather humble approach to design places entirely different demands upon a designer — facilitation becomes more important than drawing board artistry. The most common form of housing built in Canada is the single detached house, which usually does not require the participation of an architect. This form of development, as has been argued, does not presently meet all needs, and so new forms must incorporate the advantages of diversity and personal choice inherent in the single family house.

Collaborative housing, in its requirement for the community design process, goes only part way in meeting this criterion. With typical building processes, economies of scale can greatly influence affordability of a housing project, encouraging repetition. With self-build, construction systems can be developed to offer greater diversity of choice for the individual household. In some cases, the construction system itself is what allows a relatively unskilled resident to build their own house. Modular approaches and incremental growth can also offer easy flexibility as a family's structure changes over time. Discussion of the various approaches to self-build will be covered in the case studies.

Self-build has also been demonstrated to build stewardship in the built environment. In social housing projects where residents participated to some degree in the construction of the project, the level of upkeep and lack of vandalism have been markedly better than in projects where the housing was simply handed over like a gift. When an individual puts something of him/herself into a project he/she is likely going to have greater respect for it.[27]

Sweat equity is the other advantage of self-build. As a component of self-reliance, self-build can make housing affordable to the average citizen who has more free time than investment capital. This condition seems to be increasingly common in Canada, where the emerging post-industrial economy's main effect has been a crippling unemployment rate. Sweat equity is actually a very common phenomenon in Canada. Anybody who buys an older house and renovates it over time is building sweat equity in the property.

Urban Homesteading

Homesteading on the prairies in the late nineteenth century was a process that initiated the final structure of the Dominion of Canada. This pioneer spirit of building for the future in a competitive yet co-operative manner may even have left its mark on the nation's psyche as a whole. Western Canada's development is the result of optimistic and aspiring people working toward a promised future of prosper-

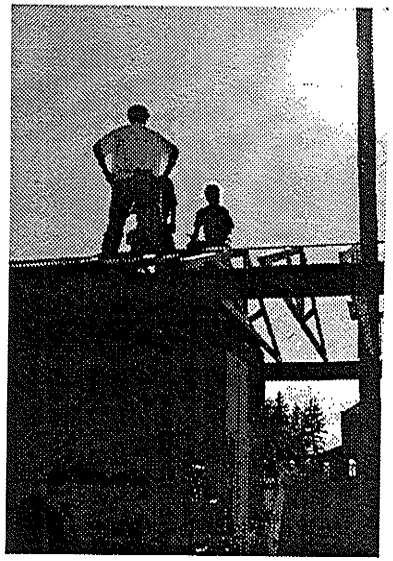


Figure 2.3: Self-build at the St. Norbert Arts and Cultural Centre

[26] see bibliography under self-reliant housing

[27] Ward, Colin. *Tenants Take Over.* The Architectural Press Ltd. London. 1974. pg. 27.

[28] Whyte, William H. *City: Rediscovering the Center.* Doubleday. New York. 1988. pg. 326.

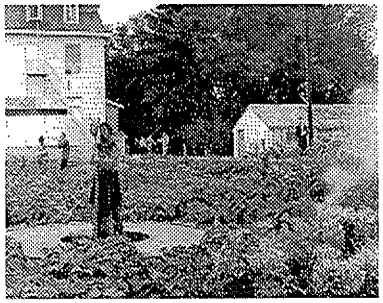


Figure 2.4: Harvest Celebration "Scarecrow is Gone?" Performance/ Installation/Text by Louise Loewen

ity and growth. The citizens of the communities that sprang up along the rivers and railroads built them with a pride that demonstrates the faith they had in their abilities to transform a challenging landscape.

"Urban homesteading" projects were developed in the 1970's in cities such as Baltimore and Philadelphia, in an effort to rejuvenate the declining core areas.[28] These projects had mixed success, largely due to the advanced state of decay of the neighbourhoods in which they were located. Homesteaders were also expected to make complex improvements that were costly and time consuming without technical assistance or financial aid. Unlike the Western homestead movement, or the subsistence homesteads of Roosevelt's New Deal, agriculture was usually not available to fall back on. Many projects either were abandoned again or resulted in local gentrification.[29]

By learning from the failures and successes of these programmes, new projects could be developed to meet current goals. Combining the advantages inherent in subsistence agriculture and community-based support networks could have a great deal of potential for rejuvenating areas in decline. The policy of turning over vacant and underutilized real estate to new owners, and a community form that allows for small scale urban agriculture and other opportunities for economic development could be applied to many communities, offering attractive prospects for the future.

Celebration

A key element of any community is celebration. Contemporary Canadian society has dozens of official celebrations every year, some religious in nature, others entirely secular. As our society changes, the nature of our celebrations will also change. One example might be the recent growth in street festivals in Winnipeg, indicating a new-found love of urbanism in the populace.

A community with a strong relationship to both the city and the land would likely develop hybrid forms of celebration. One could imagine how solstice, cultivation, and harvest festivals would take on great significance in such a community. An urban location would offer the opportunity to share the work and bounty with neighbours at these significant times of the year. Thanksgiving without the supermarket would take on a new significance for environmentally alienated urban dwellers. Artists working in all media can have a large role to play in animating such celebrations. The prevalence of environmental and social consciousness in the Canadian arts community gives a strong indication of artists' potential participation.[30]

Conclusion

We, as a species, are in the midst of a social revolution that is occurring so rapidly that single generations will know the entire history of the paradigm shift through personal experience. Such a radical shift presents extreme challenges to our society. The responding re-orientation of our social structures and the physical manifestation of our communities may need to be equally radical to cope with these changes. Perhaps the most significant shift is taking place in our recognition of the need to alter our relationship with the natural environment.

[29] Hughes, James and Bleakly, Kenneth. *Urban Homesteading*. Center for Urban Policy Research. New Brunswick, New Jersey. 1975. pp. 36-39.

[30] Grande, John K. *Art and Environment*. Friendly Chameleon Ltd. Toronto. 1992. pp. 21-24.

3 Environmental Factors

Energy

Analyzing energy flow is one of the most significant and indicative methods of studying an ecosystem. This is particularly true in urban ecology, as human beings use energy in a much different way than any other species. Our ability to control and transform energy is the basis for the advancement of civilization. For example, our ability to control fire was one of the key advances that allowed us to survive as a species.[1] Its use in cooking and metallurgy, right through to the invention of the steam engine has allowed us to manipulate our environment on an unprecedented scale.

In a stable ecosystem, energy input equals energy output, and continual recycling of energy produces organic matter. In the industrial process, we have developed linear energy flows, which for the sake of temporal efficiency does a given amount of work, and then results in waste. This process has been maintained during the last two hundred years through inexpensive (and often subsidized) non-renewable energy sources and the unaccounted for subsidy of pollution. In recent decades we have come to understand the significance of this equation. We are increasingly cognizant of the pollutants that are beginning to threaten our survival as a species.[2]

Centralized energy production is generally inefficient and/or prone to environmental impact. Burning of fossil fuels and other high carbon materials (including wood) produces atmospheric pollution.

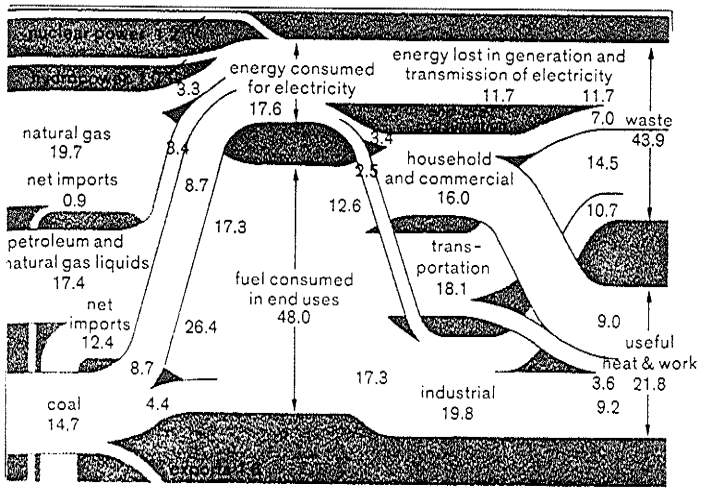


Figure 3.1: U.S. Energy production and use (10^{15} Btu)

In the U. S., 70% of the energy used to produce electricity is lost as heat.[3] Large scale hydro-electricity projects have a history of altering hydrological regimes, creating pollution, destroying habitat and often displacing indigenous peoples who receive little benefit from the development.[4] Even wind and solar farms have significant visual impact on the landscape.

Nuclear energy has potential for pollution on an incomprehensible scale. Due to enormous costs and problems with satisfactory storage of spent fuel, most countries are turning away from nuclear energy development.[5] It has been found, for instance, that energy efficiency measures cost one-sixth as much as nuclear development per unit of energy, and have the added benefit of reducing, rather than increasing, pollution.[6] The other very real concern of this tech-

[1] Roszack, Theodore. *Person / Planet.*
[2] Giradet, Herbert. Op. cit. , pg. 20-27.
[3] Morris, David. *Self-Reliant Cities.* pg. 52.
[4] Rosenberg, D.M. et al. "The Environmental Assessment of Hydroelectric Impoundments and Diversions in Canada" in Healey, M.C. and Wallace, R. R. *Canadian Aquatic Resources.* Department of Fisheries and Oceans, Ottawa. 1987. pp. 71-104. Although hydroelectricity, as a solar derivative is considered a renewable resource, attempts to increase production and storage capacity through engineered manipulation of aquatic ecosystems cannot be considered environmentally benign.
[5] May, John. *The Greenpeace Book of the Nuclear Age.* McClelland and Stewart. Toronto. 1989. pg. 338.
[6] Ibid. pg. 341.

nology is planetary security. Spent material can be upgraded for use in nuclear weapons.[7] Recent political developments in the former Soviet Union prove that we cannot guarantee the security of radio-active materials for its entire useful lifespan.

Energy distribution systems are often expensive and result in serious environmental impact. Gas pipelines and hydro corridors extend urban influences into wilderness areas by carving up terrestrial migration paths, limiting the habitat available for some large mammals. Global shipping of fossil fuels result in far too frequent oil spills.

Recent studies have begun to question the relationship between electromagnetic fields and serious, even chronic health problems. One of the main sources of powerful electromagnetic fields are the electrical transmission corridors that run from energy sources to the cities in which we live.[8] Even more alarming is the possibility that low voltage distribution lines that are typical of virtually every neighbourhood in the developed world may be associated with the promotion of childhood leukemia. This controversial and complex issue is far from resolved. However, the growing number of studies that suggest there may be serious health problems associated with electromagnetic radiation may cause us to rethink our entire system of electrical energy production, distribution and use.[9]

Energy sources, (renewable vs. non-renewable) grades of energy, (electrical vs. heavy crude) and engineered systems greatly affect the degree of environmental impact of energy use. Even the most benign production methods of human food energy can have some impact. For example, an organic vegetable garden developed in a formerly natural area will alter it irrevocably. In short, the equation energy use = environmental impact is a relatively accurate, if simplistic formula. The implication of this realization has led scientists and engineers to find ways to reduce energy use through conservation and recycling.

[7] Brundtland et al. Op. cit. pg. 183.
[8] Holdsworth, Bill and Sealey, Antony. *Healthy Buildings* Longman Group UK Limited. 1992. pg. 42.
[9] Brodeur, Paul. *Currents of Death: Power Lines, Computer Terminals, and the Attempt to Cover Up Their Threat to Your Health*. Simon and Schuster. New York. 1989. See also: *The Great Power Line Cover-up.*

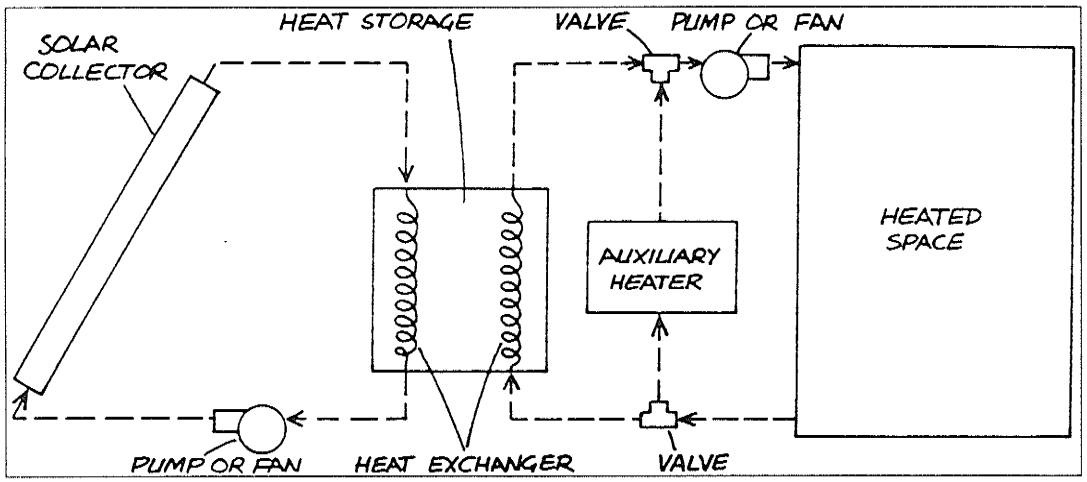


Figure 3.2: Active solar heating schematic

Solar Energy

The sun is the source of most, if not all energy on this planet. Without the sun, our planet could not maintain its atmosphere and support life as we know it. Fossil fuels are transformed organic matter, produced by solar power over millions of years and stored conveniently for our use. Regardless of whose estimates you believe, they will not last forever, and certainly will be used up in a fraction of the time it took to produce them. Radio-active material, although not necessarily produced by the sun, was formed along with the solar system and is used in a manner that crudely approximates the functioning of

the sun. The earth is essentially a huge solar collector, capturing the energy produced by a constant nuclear reaction 12 million miles away. Solar energy is the closest thing we will ever have to free energy.

Active Solar Energy Systems

Active solar energy systems are those that employ mechanical devices to collect, transfer and store solar energy. They have been developed in many forms in the last several decades and range from extremely high tech (and expensive) centralized solar furnaces that suffer from the same problems as other centralized energy sources, to home built solar hot water heaters.

All active solar energy systems consist of essentially three elements: a collector, a storage system, and an output system. Media can be gaseous (air, argon), liquid (water, glycol), solid (salts, which are also the storage device) or electrical (photo-voltaics). Most active systems have proven to be of limited use, especially for space heating, due mostly to the expense of storage devices. As well, the more complex the system, the more expensive it is; and with each transfer of energy between media, there is an energy loss. As this energy is essentially free, it may seem of limited importance; but one must also take into account embodied energy of materials in the system, even if one has an unlimited investment budget. In terms of heating, active systems are probably best limited to a hot water preheat system, since conventional water heaters already contain the storage function.

Electrical energy production through photo-voltaics is becoming increasingly affordable, as the technology for making the silicon cells is advanced. Again the greatest limitation is the storage medium, which is typically some form of battery. Breakthroughs in battery technology are imminent, as the requirement for electric vehicles in California will likely cause auto manufacturers to put a great deal of research and development into battery systems.[10]

At this point, photo-voltaics only make financial sense where conventional electricity is not available, or where it is possible to dump excess electricity to the electrical grid in exchange for cheaper rates at other times. In the U.S., anti-monopoly laws require utilities with local monopolies to accept energy from other sources in exchange for reduced rates.[11] In Canada, most energy utilities are Crown Corporations, and since we do not have the right of free enterprise enshrined in our constitution, we do not have the benefit of this sort of law. Many of the provincial energy utilities are now pursuing conservation as a cost saving measure, as it has become obvious that this option makes more sense than continually expanding production facilities. Perhaps, as part of this approach, the drawbacks of centralized production will be recognized, opening up the possibility of decentralized production, and differential rates for energy prosumers. Conversely, this option may still have limitations considering the concerns about electromagnetic fields.

Silicon, the main ingredient in the manufacture of photo-voltaics is relatively cheap and abundant (silica sand constitutes 27% of the Earth's crust). However, pollution and labour policies in much of the electronics industry which produce photo-voltaics in Third World free trade zones are also important concerns.[12]

[10] Walter, Bob. "Sustainable Energy Overview" in *Sustainable Cities.* pp. 196-198.
[11] Morris, David. *Self-Reliant Cities.* pp. 147-152.
[12] Nozick, Marcia. Op. cit. pg. 23

Passive Solar Energy Systems

The passive approach to solar energy collection removes all mechanical assistance to avoid the greater expense and higher potential for failure in mechanical systems. Passive solar collection is the simplest and most affordable solar energy system, and therefore inherently well-suited to space heating.[13] The existence of seasons and day/night temperature fluctuation are evidence that the Earth itself is, in part, a passive solar collector. From this perspective it can be seen that any building is a passive solar building, and it is simply a question of how efficient the building is. The following are rules of thumb for passive solar building design for Canadian climates. Criteria are listed in order of importance.

• Orientation: buildings should have their long axis running east/west, with the south side not more than 15° off solar south.[14]

•Windows: should be predominantly on the south side. East windows are second best when issues of light quality and view enter in. North windows should be kept to a minimum, but again can be considered for issues of light quality and view. West windows should be avoided as they are nearly impossible to shade in the summer, when the sun is at its hottest and most perpendicular position. Unless greater than average thermal mass can be supplied, window glazing area should be limited to 6% of floor area to avoid problems with excessive temperature swings. Window shading should be provided such that summer sun is excluded, while winter sun can penetrate to the interior. Mature deciduous trees are useful shading devices.[15]

•Insulation: is actually the most important factor in northern climates. If we could live in windowless, super insulated and super sealed boxes, this would be the first criterion. Windows and doors are the weak links in the thermal envelope, so the highest quality, best sealed should be considered. Although resistance values of glazing are approaching that of typical pre-energy crisis walls, window insulation is important for reducing night heat loss, especially where there are large areas of glazing. Infiltrative heat loss must be controlled by air and vapour barriers, although concerns for air quality in 'tight' buildings must be addressed by air-to-air heat exchangers. This mechanical solution is subject to the same disadvantages as active systems, in that they are expensive and subject to breakdown. They are also and not entirely satisfactory in terms of the potential for build up of contaminants and bacteria. Current building technology research is addressing the potential for wall systems that have high insulation values yet breath much the way human skin does.[16]

•Thermal mass: the equivalent of the storage system in an active system, thermal mass is generally more expensive than conventional construction, and so presents a limit to the amount of heat that can be expected from a passive system. Unless enough thermal mass can be provided to allow an increase in the glazed area, some conventional heat source is likely to be required.[17]

•Natural ventilation: is relatively simple to produce in passive solar buildings. The thermal chimney technique relies on the fact that warm air rises, bringing in cooler air to replace it. By inducing such

[13] Wright, David. *Natural Solar Architecture: A Passive Primer.* Van Nostrand Reinhold Company. New York. 1978. pp. 16-17.
[14] Allen Associates and Marbek Resource Consultants. *Passive Solar House Designs for Canada.* Canada Mortgage and Housing Corporation. 1989. pg. 7.
[15] Ibid. pp. 7-13.
[16] Holdsworth, Bill and Sealey, Antony. Op. cit. pg. 55.
[17] Allen Associates and Marbek Resource Consultants. Op. cit. pp. 18-21.

a draft, air heated above room temperature can be distributed to other parts of the building. In summer, this system can reduce or eliminate the need for air conditioning.[18]

Hybrid Solar Systems

Hybrid systems, which combine some elements of active and passive are often the most practical. The introduction of small electric fans, which require little more energy than a single light bulb, can dramatically increase the efficiency of otherwise passive systems. With fans, separate spaces for solar collection, such as greenhouses and solar attics become more efficient. The advantage of such spaces, is that by closing them off periodically from the main living spaces, the temperature can be allowed to fluctuate to a greater degree. One advantage to letting the space cool at night is that it collects heat more efficiently when the sun is shining during the day. This ability to allow higher temperature swings also decreases the limitations imposed by thermal mass. Another advantage to hybrid systems is that it has been shown that mass throughout a building can be used to store heat when warm air is moved through the building. Previously it was assumed that the sun must heat the mass through direct radiation to be useful. This finding is significant because it means that all surfaces with some mass, such as drywall, can be used as thermal storage. Thinner mass is also advantageous since the efficiency of conductive heat transfer is inversely proportional to the thickness. In other words, the first half inch of a drywall surface is twice as efficient as the next half inch.[19]

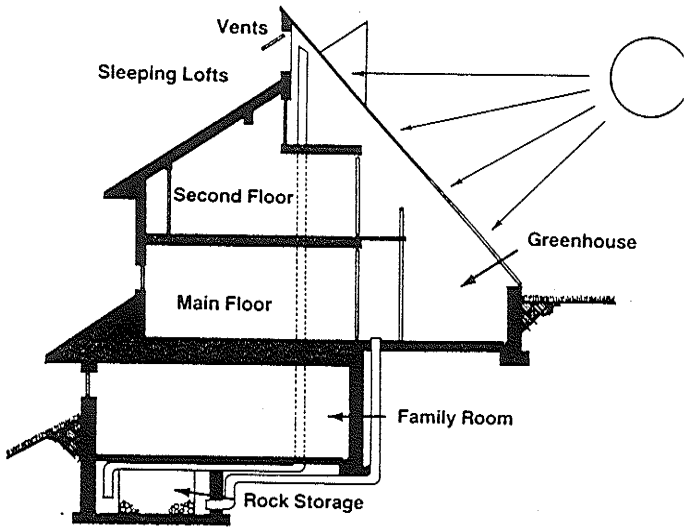


Figure 3.3: Hybrid solar house schematic

[18] Ibid. pg. 15.

[19] Simple hybrid systems such as these have been developed and utilized by Charles Simon Architect Inc. The author gained knowledge in this area when designing a solar house under the guidance of Charles Simon. See Webster, Michael. "Simon Says" in *Harrowsmith* Sept./Oct. 1986.

Wind

Wind energy is essentially another form of solar energy. Wind is simply the movement of air masses caused by differential heating from the sun. Wind is abundant and relatively reliable on the prairies, and for this reason windmills were a common solution for pumping water on early homesteads. Technological advances have produced windmills that require minimal wind to move, making this source of energy increasingly reliable. Unless windmills can be used to do work directly, however, they do not have great applicability. Using wind as a source of electrical production for instance, is subject, like all other forms of decentralized energy production, to storage limitations. For this reason wind is not an attractive solution outside of isolated communities without conventional electrical connections.[20]

The other necessary consideration of wind energy is the need to mitigate its negative impact. The same abundant prairie wind can increase energy use, stress plant material, and even strip the land of topsoil. Carefully placed vegetative windbreaks can reduce heating loads in homes by as much as 25%, and when used around fields are a major factor in soil conservation.[21] Cities have some advantages over rural areas in this regard. The built up area of a city deflects much of the wind to higher levels, such that inner city areas often have much lower average wind speeds than open areas. On the other hand, areas adjacent to taller buildings, which deflect the wind back down, can have greatly increased wind speeds and are subject to unpredictable gusting.

Biofuel

Biofuels are essentially synthetic forms of fossil fuels and suffer from the same limitations in terms of atmospheric pollution, although they do tend to burn cleaner. Distilled grain alcohol is readily available in Canada as a constituent of gasohol.

Methane, which is essentially natural gas, is produced by the decomposition of organic matter. The flatulence of herbivorous mammals is also a source of methane release. The growing trend of large scale, industrialized beef production has been targeted by some environmentalists as a major source of atmospheric pollution. As decomposition is a natural process, little can be done to avoid atmospheric pollution from methane release. It would be much more logical to reduce other sources of pollution to allow the atmosphere to balance the input of this gas as it always has. However, as it is relatively simple to collect methane, and it has the dual advantages of reducing atmospheric pollution and providing an alternative energy source, it should be taken advantage of as often as possible.

There have been many designs published for simple, homemade methane digesters that can be used to decompose organic matter, including human feces. The gas collected can be used to power vehicles, stoves, and just about any device that burns gaseous fuel. One drawback to such digesters is that they can be an explosion hazard if not properly designed and operated. In the case of a community that depends on small scale agriculture, a decision must be made as to whether methane gas or fertilizer in the form of compost is more desirable.[22]

[20] Walter, Bob. Op. cit. pp. 194-196.
[21] Moyer, R.L. "Shelterbelt Benefit to Home Heating Cost" in *American Society of Agricultural Engineers* Vol. 33(6) November-December 1990.
[22] Leckie, Jim et al. *More Other Homes and Garbage.* Sierra Club Books, San Francisco. 1981. pp. 249-274.

Geo-thermal

Another abundant and usually untapped heat source is the heat contained within the earth. In some locations, ground water is heated beyond the boiling point relatively close to the earth's surface. Geo-thermal springs usually occur in mountainous areas, where geological plates meet and allow hot springs to escape. In other locations, where parent material is further below the surface, wells can be drilled to capture the naturally produced steam.[23]

Less technologically sophisticated and expensive solutions are becoming common for the domestic market. Ground source heat pumps extract heat from the more stable year round temperatures just below the earth's surface. This device behaves very much like a refrigerator or air conditioner, and uses the same type of refrigerant or heat transfer media.[24] These media are suspected to cause ozone depletion and possibly global warming. Although the jury is out on this issue, it might be wiser to err on the side of caution and avoid this potential hazard.[25]

Conclusion

There are numerous strategies available for reducing our use of energy. Prior to the industrial revolution, we survived as a species for tens of thousands of years with little more than the sun and fire. Even the crude use of wind and hydro energy was not common prior to the Renaissance. Technology has greatly increased our standard of living since then; and certainly mass deforestation for the purpose of fuel has been greatly reduced in the industrialized world (unfortunately the same can't be said for our demand for paper!) We need not return to past discomfort if we use our technical knowledge to reduce energy use rather than finding more ways to use it. It has been determined that present world-wide energy needs can be fully provided for by renewable energy sources. Further energy efficiency development in the future is capable of providing for a growing population.[26] The best strategy in this direction is to carefully analyze all energy inputs and outputs and find ways to plug the leaks which result in pollution.

Although transference of energy from one medium to another results in loss of efficiency, this principle need not limit solutions to a well-designed overall system. The principle of co-generation is used to find other uses for waste energy. In Sweden, it is common to develop housing adjacent to large industries, not just for the convenience of workers, but for increased energy efficiency. Waste heat produced by

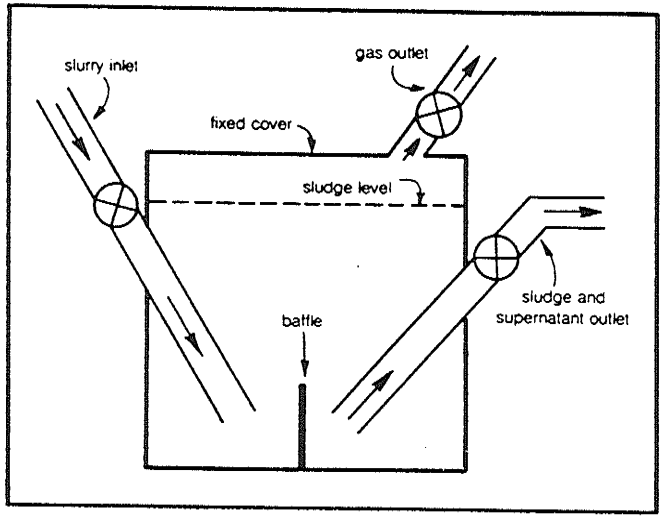


Figure 3.4: Methane digester schematic

[23] Corbett, Michael N. *A Better Place to Live: New designs for tomorrow's communities.* Rodale Press, Emmaus, Pennsylvania. 1981. pg. 73.

[24] Energy Pathways Inc. *Heating and Cooling with a Heat Pump.* Ministry of Energy, Mines and Resources, Canada. Ottawa 1990.

[25] University of Winnipeg Climatology Professor Tim Ball is one of a number of vocal critics of global warming theories. He has pointed out that the Earth's climate is constantly changing due to natural forces, and that we possess insufficient data to claim any such thing. The effect of Mount Pinatubo over the last two years lends much credence to his views.

[26] Brundtland et al. Op. cit. pg. 192.

manufacturing processes is captured and used to heat the adjacent houses. A smaller scale use of co-generation is possible with currently available co-generation plants. These plants are gas-powered internal combustion engines with a water jacket heat exchange. The energy produced by the engines is converted to electricity, while the hot water is used to heat buildings. These systems are quite efficient at the block scale, but the same limitations of decentralized production apply. To run the plants constantly to meet demand greatly reduces their efficiency, and atmospheric pollution is a very real drawback.[27]

Although many of the solutions discussed in this section are very technical in nature, advances in computer technology will eventually automate many functions in the typical house. The Smart House system, which is an electronic monitoring and automating system for all electrical and mechanical devices in the typical house is already on the market. In an age when even toasters contain micro-processors, it is not hard to imagine how houses could automatically adjust glazing reflectance, window shading, window insulation and heating and ventilation to attain optimum energy efficiency.

Many limitations to practical application have been indicated in this section. These are simply limitations that exist with current technology, and may not apply in the very near future. Any community that wishes to address environmental issues in its form and functioning must also be prepared to experiment and be an active part of the furthering of technical knowledge in these areas.

Discussion of energy use without mention of the automobile problem would be woefully incomplete. It is estimated that up to 50% of the average U.S. household energy budget is spent on automobiles.[28] In addition to this, one most consider all the embodied energy in roads and parking lots as well as the vehicles themselves. It has been suggested that 1/3 of the average city is devoted to the automobile.[29] Other statistics reveal the automobiles' poor record with air pollution and safety.[30] It would not be unreasonable to suggest that our relationship with the automobile is the number one environmental issue in the developed world. Recognition of this, and all the other negative attributes of the automobile culture, is re-orienting the goals of urban design. A true eco-village must address the other 50% of household energy use as well, however.

Guidelines for an Urban Eco-village

- Eliminate automobile use wherever possible
- Work towards achieving de-centralized energy production whenever practical
- Reduce demand through conservation measures
- Site buildings to achieve highest possible passive solar potential
- Design buildings with passive solar efficiency in mind
- Use the simplest technology as is practical to achieve energy efficient heating sources
- Consider wastes as potential sources of energy rather than pollution
- Participate in research to further knowledge on energy efficiency

[27] Van der Ryn, Sim and Calthorpe, Peter. Op. cit. pp. 28, 29.
[28] Calthorpe, Peter. *The next American metropolis: ecology, community, and the American dream.* Princeton Architectural Press. New York. 1993.
[29] Giradet, Herbert. Op. Cit. pg. 105.
[30] For further reading see: The Pollution Probe Foundation. *The Canadian Green Consumer Guide.* McClelland and Stewart. 1989. pg. 116-125.

Water

Water is perhaps the second most important element of our environment (if one can construct an hierarchy of such elements). The presence of water on Earth is what makes our planet unique from the others in our solar system, and is an integral part of the atmosphere that allows life to exist on this planet. The relative abundance of water on the planet has allowed us until now to be rather careless about its quality. Canada, blessed with 1/3 of the world's fresh water, has been one of the worst offenders.[31]

Hydrological Cycles

Until the industrial revolution, the level of pollution produced by humans was less than the capacity of natural cleansing mechanisms in hydrological cycles. Since then we have dumped unprecedented amounts of toxins and imbalanced hydrological ecosystems to the point that many can no longer cope. Dead lakes and streams and grossly mutated wildlife are evidence of the seriousness of the matter.[32]

In addition to pollution, manipulation of rivers and streams to 'improve' them for drainage, irrigation and transportation has resulted in systems that work against the nature of hydrological principles. Expensive and wasteful dredging of silted-up mouths of rivers, and extreme cases such as the Mississippi River floods of 1993 are examples of this folly. Engineering channels to be more 'efficient' reduces streams' ability to cleanse themselves and strips them of the oxygen needed to support fish and other aquatic biota.

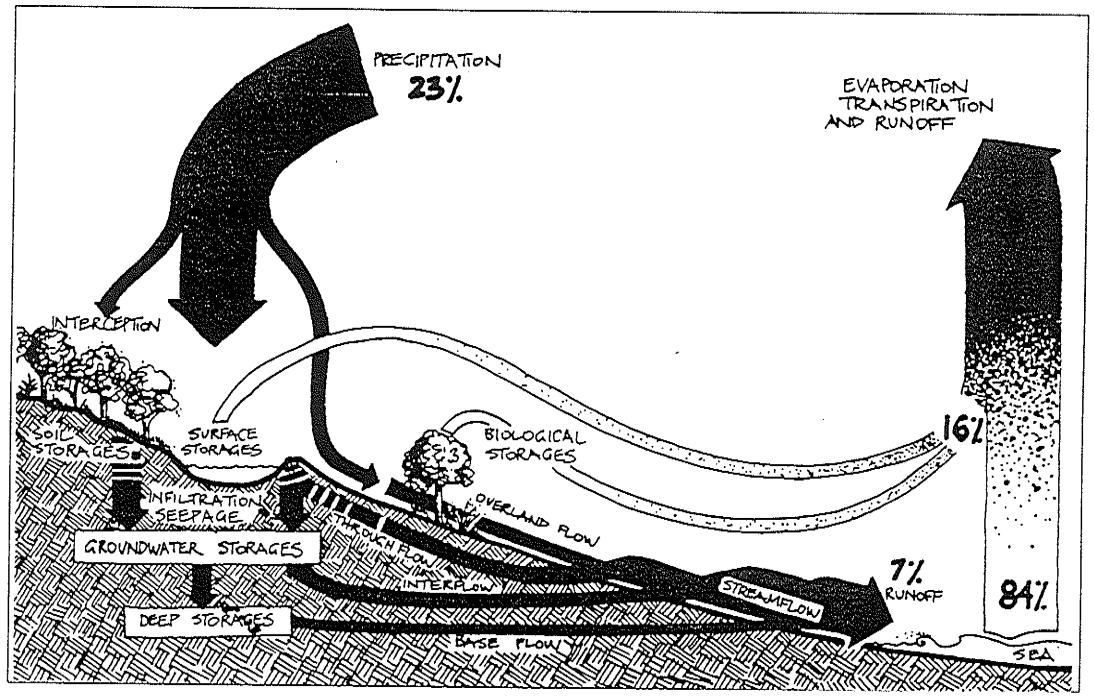


Figure 3.5: Hydrological cycle

Domestic Water Systems

Most cities have greatly altered their local hydrological cycles in a manner that resembles a factory much more closely than the natural systems they have replaced. The resultant pollution of these linear 'efficient' systems are introduced into the natural systems and, once carried away become someone else's problem.

Regina, a relatively small city with limited heavy industry, has not experienced the extreme problems common to Great Lakes Cities, but its system is representative of the standard solution to water use. Regina is unusual in that unlike most

[31] Healey, M. C. and Wallace, R. R. Op. cit. introduction pp. 1-11.
[32] Luoma, Jon R. "Superior Solution" in *Harrowsmith* October 1993. pp. 38-47.

cities, it was founded in the absence of a major water body. Wascana Creek was one of the factors involved in the location of the CPR line, but its limited flow was never envisioned to provide for much more than the railway's use.[33] If it were not for the discovery of ground water in the vicinity, Regina would never have developed beyond its earliest inception as Pile of Bones. Eventually, the growing City's water requirements necessitated the building of an aquaduct 36 miles long from Buffalo Pound Lake.[34] This extraordinarily expensive solution to poor planning has actually been quite common throughout history and has not been limited to cities with little fresh water supplies, as cities have typically not been built in such situations.

Throughout history cities have tended to foul the very water they relied upon for drinking and cooking, partly due to a lack of understanding of sewage pathogens. The Romans were master aqueduct builders, and some of their constructions are still in use over 2000 years later. Winnipeg, despite being built in an area with a multitude of rivers and streams, brings its fresh water in from Shoal Lake approximately 90 miles away. Many of the smaller streams in Winnipeg were either diverted or channeled into sewers, where they contribute to the pollution of the main rivers. Parallel storm and sanitary sewers overflow in rain storms and dump into the rivers. Other pollution comes downstream from other places. The Assiniboine River carries pollution from Regina.

Every day 75 million litres of fresh water is pumped out of Buffalo Pound Lake to be used in Regina. Every day, 75 million litres of water, chlorinated to kill pathogens, and excessively high in nitrogen is pumped into Wascana Creek where it begins its journey into the Assiniboine River system. It does not matter to what degree the various sources of water are polluted, and with which contaminants; it is all treated the same way.[35] Human feces, which contain most of the contaminants in raw sewage, are 65-80% water.[36] Conventional toilets add 5-7 gallons of water to flush and dilute the offending material, and it is further diluted by relatively clean water from every sink, tub, and shower in the house.[37] This extremely diluted concoction is piped to a remote location where solids settle out, chemicals are added to kill the pathogens, and the whole mess, including the potentially useful nutrients, is dumped into a fresh water supply.[38] The phosphates and nitrogen cause algae blooms which further degrade the water quality, and consume the dissolved oxygen, killing off aquatic biota. Chlorine, the most common pathogen killing chemical used, combines with all kinds of other chemicals that may be found in trace amounts to form chlorinated organics, some of which we know are extremely volatile and carcinogenic, others which we know little about.[39]

In contrast, China has traditionally seen "night soil" as a resource rather than a contaminant and has succeeded in supporting intensive agriculture for over 10,000 years, where most civilizations have succeeded in wearing out the soil in a tenth the time.[40] Primary treated sewage (solids settled out) has been used for irrigation on an experimental basis throughout the Prairie Provinces, for approximately 15 years.[41]

[33] Brennan, J. William. Op. cit. pg. 14.
[34] Ibid. pg. 181.
[35] Information received through direct communication with the Regina sewage treatment plant.
[36] Van der Ryn, Sim. *The Toilet Papers*. Capra Press, Santa Barbara, Ca. 1978. pg. 59.
[37] Ibid. pg. 43.
[38] Ibid. pg. 102.
[39] Campbell, Monica. *Drinking Water: Make it Safe!*. Pollution Probe. Toronto. 1983. pg. 8.
[40] Van der Ryn, Sim. Op. cit. pg. 23.
[41] The Manitoba Water Services Board. *Agricultural Irrigation Using Treated Municipal Waste Water: Manitoba Guidelines*. Province of Manitoba. 1990.

Alternative Systems

Conventional sewage systems make about as much sense as shooting a fly with an elephant gun. As Sim van der Ryn has stated "it takes forty tons of water a year to dilute a few hundred pounds of your waste that when composted fit into several five gallon cans! The best way to have clean rivers, lakes and oceans is to avoid polluting them with waste water in the first place."[42] As a great deal of money and energy has already been invested in our present infrastructure, perhaps it makes the most sense to separate the different types of waste water at the source.

Relatively clean run-off water from rain is typically directed into storm water systems which empty into natural water bodies without treatment. In some cases, run-off from streets can pick up extremely toxic chemicals, which are carried along untreated. Run-off from roofs, and especially across landscaped areas, (which is about as clean as water ever gets in a city) is used to dilute street run-off. Meanwhile, perfectly potable water is used to irrigate lawns and gardens. By impounding clean run-off and using it for irrigation, we could reduce both water usage and the potential for flooding during heavy rains. Water detention ponds have become a common solution to flash floods in suburban areas, but their full potential as water bodies has been neglected.

Grey water, which has been used for cleaning, remains relatively pure, although soaps, grease and to some degree pathogens make it unsuitable for drinking. It is, however, entirely suitable for flushing a toilet, a task which certainly does not require potable water. Commercial fixtures which combine toilets

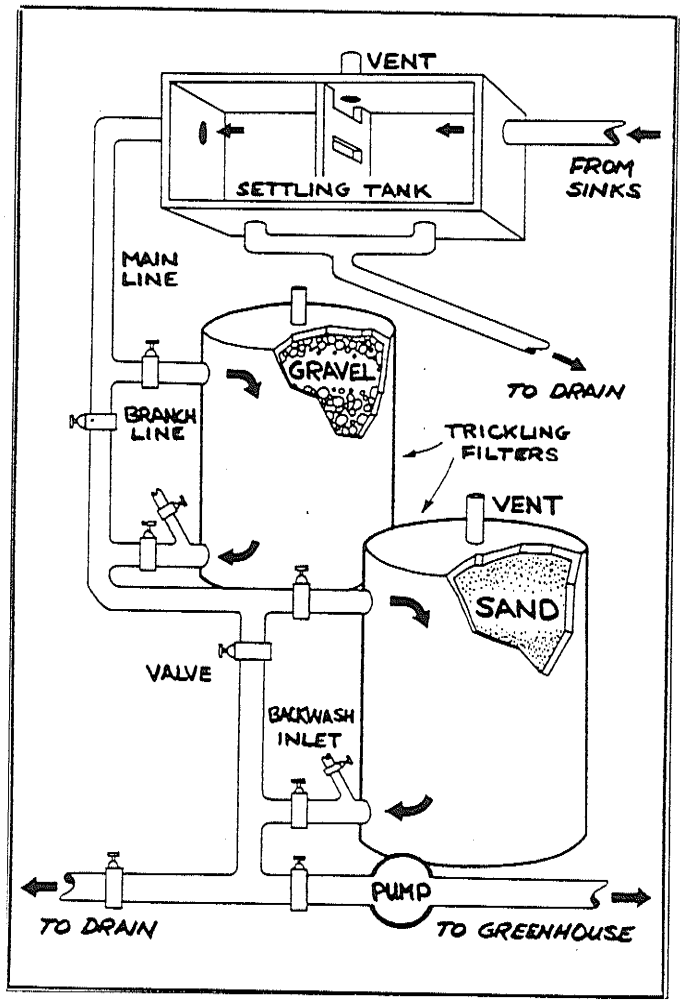
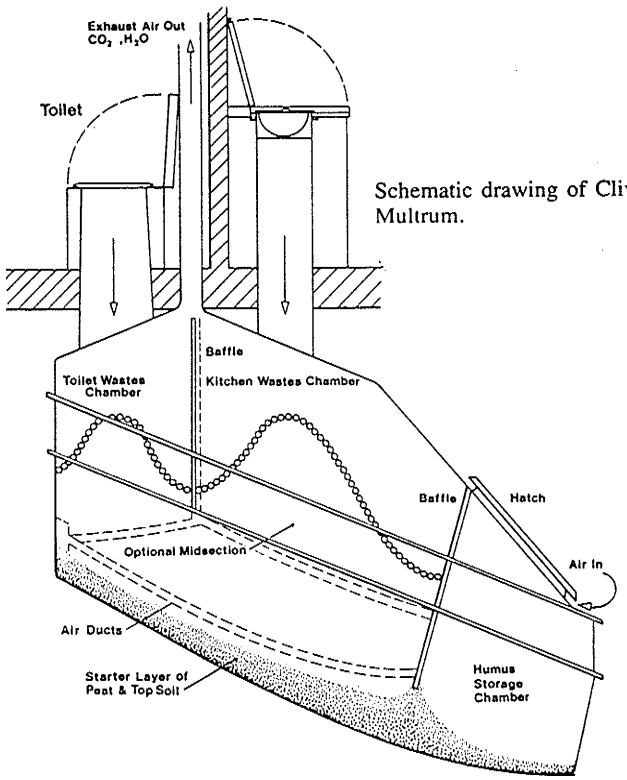


Figure 3.6: The Ecology House Greywater System

[42] Van der Ryn, Sim. Op. cit. pg. 37.
[43] Roley, Bill. "Home and Community Water Management" in *Sustainable Cities*. pp. 105-108.

and hand basins are available but for some reason, are not very common. Grey water can be used for irrigation, although certain precautions should be taken. Cleaning agents should be as mild and natural as possible, and boron must be eliminated, as it is incompatible with plant growth. Untreated grey water should only be used in a drip or leach field irrigation system, and only for larger edible plants such as fruit trees. Other irrigation should only be undertaken with processed water, using some form of biological treatment to remove any possible pathogens.[43]



Schematic drawing of Clivus Multrum.

Figure 3.7: Clivus Multrum compost toilet

Black water, which emerges from our toilets, has the curious quality of being both the most unpleasant and dangerous of waste water types, but also one of the most valuable. If human waste is to be flushed down the drain as is conventional, there are much better solutions to conventional tertiary treatment systems. On the other hand, it may not be necessary to waste both the nutrient resource and the water in this approach. Dry composting toilets, such as the Clivus Multrum, do not use water to flush waste. The composting process theoretically produces enough heat to kill pathogens in the waste, so that the finished compost is similar to standard garden compost. It is usually not recommended to use the compost directly on field crops such as vegetables but is regarded as safe for use in orchards, flower beds, forests and lawns. Compost piles must reach a certain critical size in order to retain the heat produced in the composting process. For this reason, some compost toilets include a heat coil to ensure pathogens are destroyed. A similar approach to the composting toilet is the methane digester mentioned in the previous section, which produces a different by-product.[44]

Biological Sewage Treatment Systems

The above mentioned approaches use biological solutions to waste prior to it becoming sewage. Another approach is to utilize conventional plumbing systems, but deal with the waste in a different manner. Biological sewage treatment utilizes natural systems to cleanse impurities from sewage, and the ecosystems which absorb them utilize the nutrients to maintain the growth in the

[44] Ibid. pp. 37-74.
[45] Giradet, Herbert. Op. cit. pg. 164.
[46] Todd, Nancy Jack ed. *The Book of the New Alchemists*. E.P. Dutton. New York. 1977. pp. 114-142.

ecosystem. The aforementioned agricultural irrigation schemes are a form of biological sewage treatment. Other cities irrigate forests and orchards in a similar manner.[45] This approach is the least sophisticated and the most subject to eventual contamination from heavy metals, which exist in trace amounts in modern waste. Other systems use artificial or natural wetlands to absorb the sewage. Wetlands have a higher success rate, as emergent species such as reeds and rushes have been shown to be very effective in removing heavy metals from water and soil.

The bio-shelter concept, which was developed by the New Alchemy Institute, is essentially an enclosed artificial ecosystem. The bio-shelter is an integrated solution to solar collection, aquaculture, vegetation production (suitable for humans and livestock) and biological sewage treatment. The bio-shelter is like a greenhouse with artificial wetlands containing various aquatic flora and fauna which clean sewage and use the nutrients to produce food. The original bio-shelters were integrated into single houses and were part of a self-sufficiency experiment.[46] The bio-shelter concept has been used by the quasi scientific group which has built Biosphere II, the space station/theme park in the Arizona Desert. A more useful application has been the building of municipal waste water treatment plants in Harwich, Massachusetts and Providence, Rhode Island. These biological treatment plants are suitable for a population of about 1,000 people, making them inherently well suited to decentralized planning. The pleasant smelling, plant filled greenhouses are small enough to be decentralized into neighbourhood parks, where they might be used to produce seedlings for landscape purposes. When all factors are taken into account they are cost competitive with conventional systems and less polluting.[47]

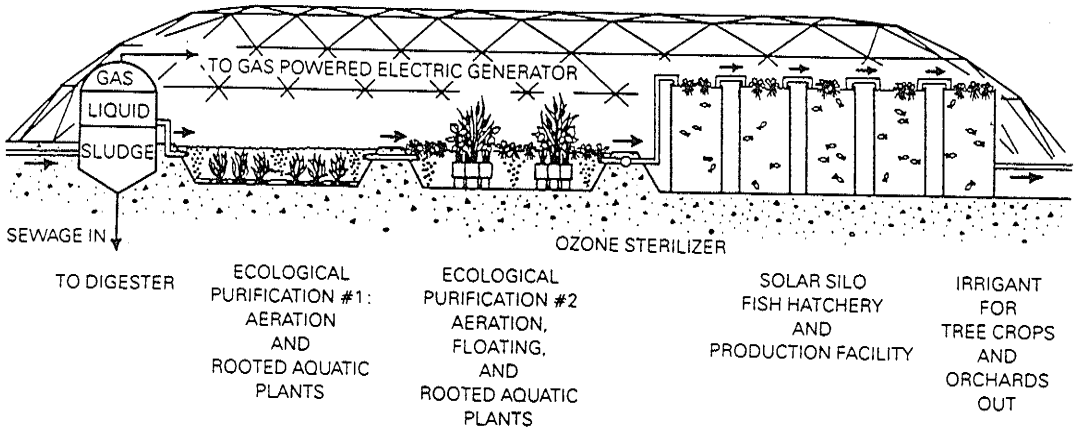


Figure 3.8: Solar aquatic sewage treatment schematic

Aquaculture

Aquaculture, the deliberate raising of aquatic species, is another potentially important component of a self-reliant community. As a high protein food source, aquaculture is a very space efficient system. Whether high-tech, industrialized, salt water fish farms, or simply stocking the farm pond with trout, aquaculture has the potential to play a large role in maintaining adequate food supplies in a world with a rapidly growing population. Aquaculture's greatest potential probably lies in integrated systems like the one mentioned above.[48]

[47] Nozick, Marcia. Op. cit. pp. 89-91.
[48] Todd, Nancy Jack ed. Op. cit. pp. 72-112.

Irrigation

The development of irrigation has allowed humanity to produce food where it couldn't before. But unwise use of this technology has also been the downfall of many civilizations. Overuse of water in arid conditions can draw dissolved minerals to the surface causing salinization and ultimately desertification. Techniques which utilize the smallest amount of water should be used, and irrigation should be timed for the cooler parts of the day to minimize evaporation.

In Saskatchewan, little other than cereal grains can be grown without irrigation. Few cash crops are worth the added investment. Urban areas have a distinct advantage in this situation. Cities typically have enormous amounts of water moving through them at any given time. Irrigation is commonly used on non-productive lawns and ornamental plants. It is not necessary to always use fresh water; waste water recycling can capture a resource that already exists.

Conclusion

Although water is a precious resource, vital to our survival, the modern world has developed a carefree attitude towards its use. Conservation initiatives and a radical re-evaluation of our municipal water systems are needed if we are to harmonize with natural systems.

Guidelines for an Urban Eco-village

- Become familiar with the local watershed as a basic understanding of bio-regional identity
- View all water, whether from the tap, in a street puddle, or in a natural water body as part of the overall hydrological cycle
- Reduce water use through conservation measures
- Recycle waste water as much as is practical
- Treat waste water of differing qualities with appropriate biological methods
- Design elements of the local water systems with integration in mind: consider irrigation, aquatic habitat and aquaculture

Earth

Earth is the substance of which our planet is made, hence its name. Although the Earth's crust is in many places much thinner than the atmosphere that surrounds it, and covers less surface area than water, it is the most tangible substance to which we can relate. Despite our technological ability to temporarily free ourselves of our constraints in the depths of the oceans and in outer space, as terrestrial beings, we relate phenomenologically to the ground. In short, earth is our home.

Soil

Soil is a subset, or perhaps, a more accurate definition of earth. Soil is essentially a mixture of organic and mineral matter, containing varying amounts of water, and floral and faunal biota. Although almost any material which can suspend moisture and nutrients can support plant growth (as in hydroponics), the lack of biota ensures that this is a linear, non self-sustaining process. Healthy, balanced soils are in fact ecosystems in themselves, and do not require additives when left in their natural state. When organic material is stripped from the land and not replaced, the nutrients embodied are not available for subsequent growth. To replace these nutrients, industrial agriculture has used artificially manufactured fertilizer, which, over time, strip organic matter from the soil. This organic matter is important not only for the nutrients it contains, it is necessary for suspending water. In a similar manner, artificial biocides used to control unwanted insects and herbaceous growth, kill beneficial soil biota. Industrial agriculture at its extreme, as well as being unsustainable, essentially mines the soil. The same process could be undertaken in vast fields of styrofoam.[49]

Urban Soils

Urban soils vary as much as cities, but some generalizations can be made. Soils in most urban areas would be classified as disturbed. Compaction occurs from earth moving equipment, foot traffic and even vibrations from adjacent automotive or train traffic. Compaction reduces air and moisture content and limits the number of plant species that will grow in the soil. Topsoil is often stripped completely, and then foreign topsoil or amendments added, resulting in immature soils with indistinct horizons. This is occasionally an advantage as native soils are not necessarily well suited to growing desirable urban plants such as vegetables and fruit.[50]

Soil Contamination

In industrial areas, soil contamination is a very serious concern. In some cases, buildings built over badly contaminated sites have been found to make people extremely sick; chronic cancer cases are perhaps the extreme. When growing food in suspect soils, even limited contamination must be taken very seriously. It is important to examine the site history, to determine what possible contaminants may exist. Some provincial environment departments maintain a log of contaminants on industrial sites and can assist in the research. In the case of rail lines, it has to be assumed that any material could have been spilled in

[49] Berry, Wendell. *The Gift of Good Land. Further Essays Cultural and Agricultural.* North Point Press. San Francisco. 1981. pg. 133.

[50] Gilbert, O. L. *The Ecology of Urban Habitats.* Chapman and Hall Ltd. London. 1989. pp. 41-54.

[51] Todd, Paula. "Toronto Sits on a Toxic Quagmire" in the *Toronto Star*. 24 March 1990.
[52] Dutton, R.A. and Bradshaw, A.D. *Land Reclamation in Cities*. Her Majesty's Stationery Office. London. 1981.
[53] McHenry, Paul Graham Jr. *Adobe and Rammed Earth Buildings: Design and construction*. John Wiley and Sons. New York. 1984. pp. vii-viii.
[54] Gulliford, Andrew. "Sod Houses: Cool in Summer and Warm in Winter" in *Fine Homebuilding* No. 31, February/March 1986. pg. 54.
[55] Wright, David. Op. cit. pg. 22.

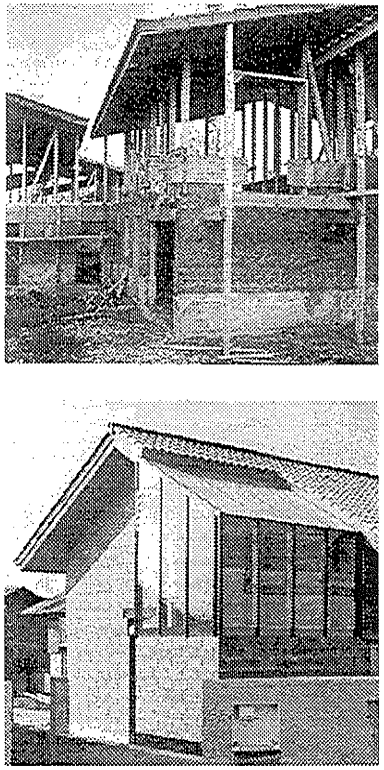


Figure 3.9: Earthen buildings by CRATerre, near Lyons, France

small amounts.[51] Once the history has been researched, a quick ground-truthing will indicate the potential hazard. Bare soil is a good indication that something is amiss, but the only way to be absolutely certain of contamination is to do chemical analysis for any potential contaminants. Areas adjacent to heavily traveled roads should be examined for lead contamination. Although lead is no longer an allowable additive to gasoline, contamination may persist from earlier contact.

In Britain, soil reclamation for urban agriculture on former building sites has found that most sites have few contaminants. The biggest problem is poor soil structure, as rubble makes the sites rather rocky. Organic matter is usually low, and must be ameliorated with fertilizer or compost. Nitrogen is usually severely deficient, but very high amounts of other nutrients are available from brick rubble. The most common contaminant is lime from mortar and concrete, resulting in a soil pH which is too alkaline. Lime concentrations can often be spread around to even out the balance, or more acidic mulch such as coniferous needles can be added.[52]

Earth as a Building Material

Subsoil has been used as a building material for thousands of years on every continent. Although earthen structures suffer from the stigma of being a poor person's solution, earthen buildings built 500 years ago are still in use. When built with appropriate details, earth buildings are second only to stone for permanence and the less tangible quality of 'substance'.[53] Earth is, in fact, probably the ideal building material in arid and semi-arid regions. Earth is inherently cool in summer and warm in winter, and is an inexpensive way of providing thermal mass. Early prairie pioneers realized this — the sod house was the most common building form in the early years. The stigma of poverty and inadequate building details reduced the popularity of sod as a building material, and most sod houses were replaced with more conventional solutions in a short period of time.[54]

From the point of view of bio-regionalism and self-reliance, we should endeavour to build with the material closest at hand. On the prairies, our excellent high clay soil has been a neglected resource. We no longer need to strictly limit our materials as the pre-railroad pioneers did, but we could take a few lessons from their frugality and inventiveness. When one examines the origins of all the materials that go into a simple house, and all the energy embodied in their transportation, it illuminates their extraordinary expense. In terms of embodied energy, a single concrete block is equivalent to about 300 adobe bricks.[55]

Earth may have building applications that we have not even begun to explore. European building science research has recently been examining the potential of using loam as an insulation material in standard cavity walls. Loam contains a lot of air space, and therefore is a good insulator. It also 'breathes' at a rate that allows adequate air change without undo heat loss. As an organic material, it does not off-gas chemicals or cause as many allergy problems for the hyper-sensitive as synthetic materials do. It also can absorb and pass on moisture, without affecting its insulative value, which is the main drawback of most insulation materials.[56]

Conclusion

Soil quality must be regarded as a fundamental concern of environmental health. Soils have to be seen as ecosystems themselves, not just 'dirt'. Concern for chemical and organic pollutants must be developed so that past errors are not repeated. Further research is needed to explore the possibilities for cleansing previously contaminated soils, rather than seeing it as a wasted resource. Research is also needed to explore and develop traditional techniques for earthen buildings. One such programme has existed in Grenoble, France since 1979. CRATerre in association with the Grenoble Architecture School has already constructed a 63 unit social housing scheme entirely out of earth, and plans are underway for an entire new town near Lyons.[57] Experimental demonstration projects are needed to change people's perception of this neglected resource.

Guidelines for an Urban Eco-village

- Learn the series of local soils, water permeability rates, and the effect of parent material
- Learn how to build topsoil quality through compost, mulching and other organic soil amendments
- Investigate unknown soils for contamination, and seek biological methods for cleansing if possible
- Determine naturally occurring radon levels and incorporate radon wells or other measures if necessary
- Develop a research programme which explores the potential for using earth as a building material, especially where the bulk of standard building materials are imported from outside of the bio-region

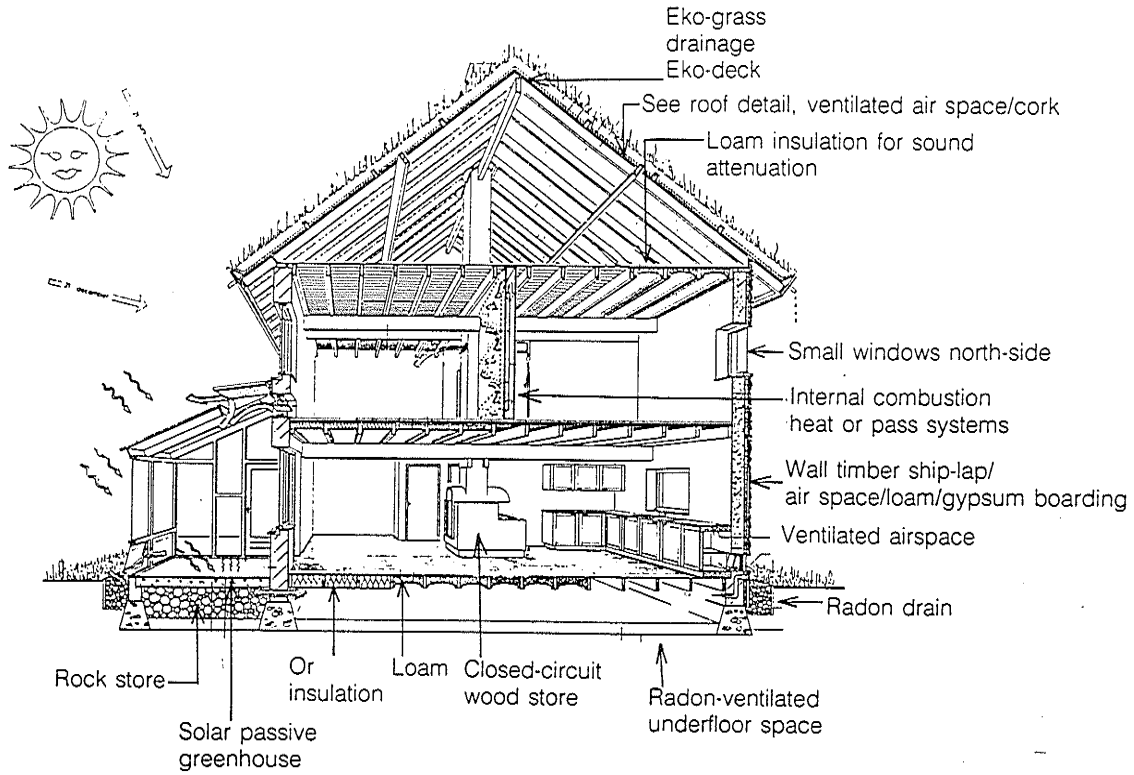


Figure 3.10: Air and moisture transfusive house using loam insulation Maaspoort, Netherlands

[56] Holdsworth, Bill and Sealey, Antony. Op. cit. pp. 84-85.
[57] Dethier, Jean. "Back to Earth" in *Architectural Review* 9/90. pp. 80-83.

Fauna and Flora

Fauna

The fauna with which we share our planet do not differ greatly from ourselves. The same basic biological needs apply to all creatures regardless of the specific feeding, breathing and reproduction systems employed. What separates us from other animals are the social structures which we have developed in order to survive and prosper. This unique ability means that we also have an ethical duty to use our social structures to serve and protect other species as well as our own. The growing recognition of the inter-relatedness of all species reinforces this view, if only for self-serving purposes. Our relationship with other creatures can be classified in two categories: domestication and isolation.

Domestication

The domestication of animals was one of the first steps towards human civilization. It has been suggested that animal domestication preceded and led to plant domestication. The two purposes of domestication, for companionship and for protein sources, may have occurred simultaneously, as dogs were bred for herding of range animals and protection from wild animals.[58] Today, the close relationship between humans and domesticated animals has been greatly altered. Most of us seldom come in contact with the animals that produce our food. Even farmers and ranchers have less contact as many slaughter animals are raised entirely in feed lots. The late twentieth century farmer is increasingly an urban dweller who "owns" livestock on paper only, much like corporate stocks. Those charged with looking after livestock do not necessarily have any bond with the animals, as they are reduced to a simple commodity.[59] In recent years, there has been an increasing trend of people questioning the industrialized process of livestock production. Cruelty to animals, the use of hormones and penicillin, pollution from concentrated raising, and the inherent lack of energy efficiency (it requires 20 times the amount of grain to raise an equivalent amount of beef protein as grain) are often cited.[60] Most urban dwellers with such convictions have chosen either to reject an omnivorous diet in favour of vegetarianism or to purchase only free range meat. Rural dwellers have the option of raising animals as an integrated part of the farm ecosystem, such that waste produced by the animals is used as fertilizer.

Isolation

The other relationship we have developed with animals could be described as isolationist. For millennia, human beings, as physically weak species, had good reason to fear wild animals. Our gradual development of tools, especially fire, has changed this relationship greatly. Today, our weapons, vehicles, and ability to greatly alter the environment pose a much greater threat to other species than they usually are to us. Despite this, we have an ingrained fear of anything wild. We alter our environments, whether urban or rural, to be efficient, safe and antiseptic. The result is that habitat for non-domestic species is constantly under threat. Even the semi-domesticated species which share our urban niche are constantly under threat from exterminators. Although some

[58] Mumford, Lewis. Op. cit. pg. 10.
[59] Berry, Wendell. Op. cit.
[60] Ibid. pg. 135.

species, such as rats, can pose health problems, only proper management of waste can reduce their numbers. Many animals have adapted to humans' unique habitat and have lived with us for centuries. Their ability to share our niche should be recognized and supported as much as possible.

Urban Animal Husbandry

The raising of livestock in cities was common throughout the world well into the 19th Century.[61] It is still common in some developing world cities, although the stigma of backwardness is working against it. Since most cities did not have any form of organized sewage and garbage disposal, dogs and pigs were most commonly kept as detritivores. As well, cows and goats were commonly kept for milk, and chickens for eggs and meat. Most cities today have by-laws against keeping any form of livestock, but the demand for pets such as rabbits, llamas and pot belly pigs has begun to throw these laws into question. Urban eco-house projects have demonstrated the value in keeping bees, chickens, rabbits, goats, sheep and fish as an integrated part of the urban eco-system. The by-products include honey, wax, eggs, meat, milk, wool and fertilizer. The minimal drawbacks of noise and smell from these animals are outweighed by their benefits.[62] Larger mammals pose a greater problem and are not recommended for urban sites, although they might be kept in limited numbers as part of a petting zoo.

Flora

Modern society's relationship to flora is much the same as its relationship to fauna. Urban planting is typically made up of non-native species planted entirely for their ornamental qualities. Many of these pedigree species are often less hardy than natives because their particular physiognomy has not fully adapted to local climate and soil conditions. External energy inputs and natural resources are frequently used to irrigate, fertilize, and control weeds and pests to equal out the balance. Some native species are considered "weeds" because of their superior abilities to compete, and because of the enormous lobbying effort of rural farmers. In the city's hinterland, monoculture farms combat "weeds" with an arsenal of chemicals.[63] Wild areas are constantly under the threat of "improvement" since land is valued only as a development commodity.

Cultural landscape values in our society tend towards the neat and antiseptic, as if there is an innate fear of wilderness. It has even been suggested that the ubiquity of the "golf-course modern" landscape is the result of an innate preference for savanna which is deeply rooted in our historical evolution as a species.[64]

The human interest in manipulating and controlling nature through gardening need not be a negative attribute. As a biological species, we must sustain agriculture as our source of nutrition. By encouraging food production as the primary goal of gardening efforts, the energy and materials invested in the process will be returned with increased energy in the form of edible produce. Other plant material which supports this goal should also be used. Plant-

[61] Hough, Michael. *City Form and Natural Process: Towards a New Urban Vernacular.* Croom Helm. London. 1984. pg. 210.
[62] Farallones Institute. *The Integral Urban House.* Introduction by Sim Van der Ryn. Sierra Club Books. San Francisco. 1979.
[63] Rowe, Stan. *Home Place: Essays on Ecology.* NeWest Publishers Ltd. Edmonton. pp. 15-27.
[64] Balling, John D. and Falk, John H. "Development of Visual Preference for Natural Environments" in *Environment and Behavior*, Vol. 14, No. 1, January 1982. pp. 5-28.

[65] See Appendix A Yield Table.
[66] Berry, Wendell. Op. cit. 238-248.

ing of windbreaks modifies the microclimate, and leguminous plants are valuable for fixing nitrogen in the soil.

Urban agriculture has historically been an important part of cities, and is currently a rapidly growing trend. However, if we are to use it as an important part of our food supply, it will necessitate a change in urban patterns. Current higher density patterns, although more efficient in terms energy and transportation, reduce a resident's access to available growing area. The more common pattern of detached single-family dwellings on relatively small lots use land inefficiently and reduce the potential area for growing. To be entirely self-sufficient in food production would necessitate a low density that could not be considered urban at all. This pattern has too many drawbacks in terms of energy use and social concerns, and so cannot be considered an adequate solution. An intermediate density of approximately 10 dwelling units/acre (du/a) is sufficient to be self-reliant in fruit and vegetable production, which are the main imported foods on the prairies. This density is actually quite similar to postwar suburban development, and as such is a good compromise between higher density urban efficiency and the lower densities which are seen as more desirable by the general public. By clustering together built areas, more advantage can be taken of urban densities and free up greater area for food production.[65]

Although the growing of grains is not realistic in urban agriculture, an ecologically integrated community may wish to be involved in research that promotes ecological advances in grain production. One interesting example of such research is being conducted in Kansas by Wes Jackson. He has set the goal for himself to develop a commercially viable perennial grain through conventional breeding with native grasses. If he is successful, permaculture could be practiced on the prairies, reducing the need for external energy inputs.[66]

Conclusion

Current "environmental awareness" is largely focused on wilderness, endangered species, and clear cutting of old growth forests, but few people stop to think that all cities are in built in what was once "nature". In some cases, intact ecosystems can still be found in cities; and all cities must still operate within the natural systems of their surrounding environment. Much could be done to make cities more natural through conservation and rebuilding of disturbed areas. Future development should take natural features into account, and conserve them as a resource, not as a development bank.

Guidelines for an Urban Eco-village

- Learn the predominant species of the bio-region, and their habitat needs
- Conserve natural areas whenever possible
- Use urban agriculture and food purchasing practices that support local food production using organic and 'environmentally friendly' methods
- Choose plant materials that either produce food or are well suited (likely indigenous) to the bio-region to minimize external inputs
- Develop a research programme to advance urban agriculture techniques

4 Case Studies

Bio-shelters

The concept of a bio-shelter was first developed by The New Alchemy Institute. A bio-shelter is a structure containing a semi-enclosed eco-system which is semi-autonomous of its surrounding environment. To be semi-autonomous it must be independent of non-renewable energy, produce substantial food for its inhabitants, and recycle all wastes.[1] The original bio-shelters were small greenhouses, often attached to houses. The concept of the bio-shelter has since been used to modify designs for everything from bus shacks to large office buildings.[2] The largest bio-shelter built to date is the Biosphere II project, which has attempted, without success, to also create a self-regulating artificial atmosphere under several domes in the Arizona desert.

Prince Edward Island Ark

The PEI Ark was built as a research centre, micro-farm and house by the Canadian branch of the New Alchemy Institute in 1975.[3] This bio-shelter, like any ecosystem, was dependent on integrated functions. Elements of the design were intended to serve multiple functions and all the elements were interdependent on one another. The following functions are described separately for the sake of clarity.

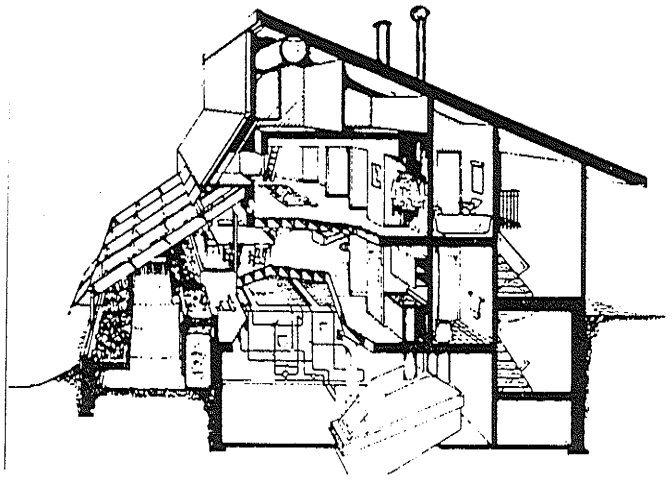


Figure 4.1: Prince Edward Island Ark sectional perspective

Energy

The Ark utilized both active and passive solar energy. A 700 square foot collector was used for both space heating and domestic water. The hot water storage tank was located below the living room and provided radiant heat through the floor. Air which was warmed in the greenhouse area was stored in a rock bin, and a heat exchanger transferred heat between the two systems as needed. Clear acrylic aquaculture ponds acted as storage for the passive component of the greenhouse area. Back-up heat was provided by a wood furnace but was seldom used. Smaller wood stoves were used for pleasure and cooking.[4] Electricity was generated by a windmill that provided electricity to the local utility in exchange for electricity on calm days.[5]

[1] Todd, Nancy Jack ed. Op. cit. pg. 114.
[2] Todd, John and Nancy Jack. *Bioshelters, Ocean Arks, City Farming.* Sierra Club Books. San Francisco. 1984.
[3] Todd, Nancy Jack ed. Op. cit. pg. 117.
[4] Ibid. pg. 123.
[5] Ibid. pg. 118.

[6] Ibid. pg. 125.
[7] Ibid. pg. 117.
[8] Ibid. pp. 128-129.

Food Production

Fish were raised in an indoor aquaculture system which also served as part of the solar collection system. Greens were grown hydroponically in the top of the ponds, utilizing the nutrients produced by the fish and oxygen produced by the algae. Other vegetables were also grown in conventional soil beds in the greenhouse.

Waste Recycling

Human waste, food scraps and other organic matter produced in the greenhouse were composted in a biological toilet with the intention of returning the nutrients to the soil in the greenhouse. Nutrients not utilized in the aquaculture system were applied to the greenhouse soil. Greywater was released from the system. The abundance of plants helped to purify air within the building.[6]

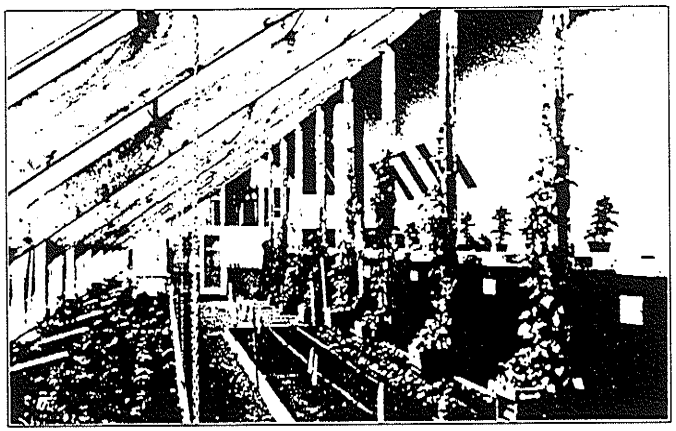


Figure 4.2: Production greenhouse area

Summary

Although the PEI Ark was expensive and technologically sophisticated, its designers felt that there was still potential for the concept to be utilized in regular housing. The cost was seen to be justifiable by the potential income from electrical production, tree nursery, and other mini-farm functions.[7] The knowledge required to operate the system was to be simplified with a computer programme that would monitor and automate functions. They also rationalized the required stewardship as being similar to raising a pet or watering an indoor plant.[8]

Some of the ideas developed in this experimental facility may be achievable in the average home. The use of a greenhouse space to raise food and provide space heating for a house has been repeated many times, although it is still not common. So far the greatest product of the research has been the development of biological sewage treatment plants for cold climate communities. As they are cost competitive with standard systems, capable of decentralization and do not pollute, they are sure to become more common in the future.

Eco-houses

The Integral Urban House — Farallones Institute

The Integral Urban House (IUH) in Berkeley, California is perhaps the best known, best documented, and most sophisticated of a multitude of similar eco-house demonstration projects that sprung up in the 1970's. The Farallones Institute, the sponsoring agency, was formed in 1972 by a group of architects, engineers and biologists who were seeking ways of creating dwellings that responded to the principles of the environmental movement. Two of the biologists in the group, Bill and Helga Olkowski, had been experimenting with many of the principles since the early 1960's. They argued persuasively for an urban location, since that was where most people lived, and cities created great environmental stresses.[9]

The house and yard integrate three main activities: solar energy; food raising; and waste recycling; as well as the humans who operate them. The house, an older bungalow with a high ground floor, was seen as a recycling project in itself. The ground floor contained a reception/office area, shops, greenhouse and two bedrooms. The main floor contained the main living area as well as a large seminar room/office. One member of the group lived on site as the caretaker.[10]

Solar Energy

Solar space heating was handled largely by the attached greenhouse, in addition to windows on the south wall. No additional thermal mass was provided

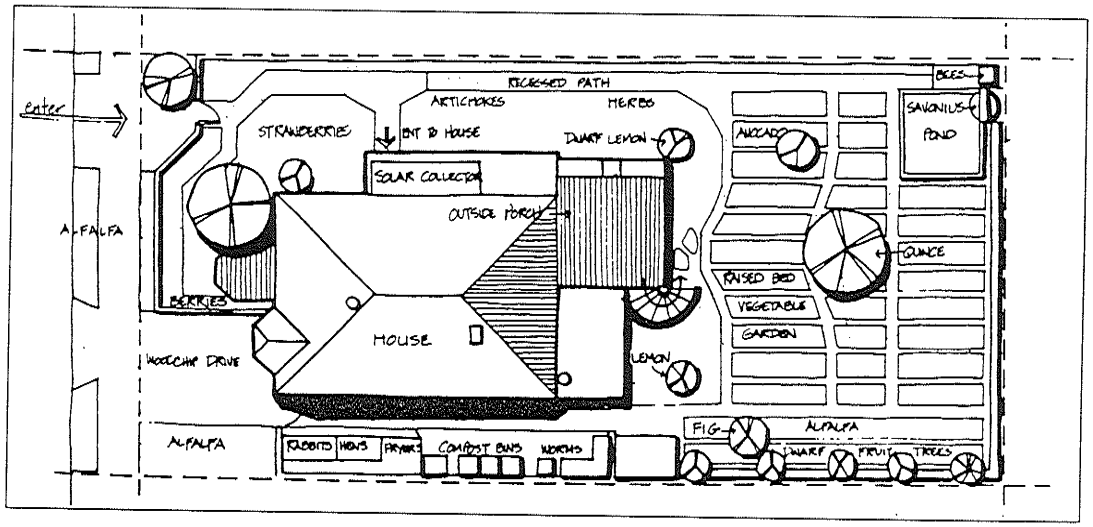


Figure 4.3: The Integral Urban House, site plan

in this space. Large windows were kept in other walls, although they certainly would have lessened the efficiency of the house. This lack of stringent measures was perhaps more affordable in California, with its relatively mild climate. Additional solar space heating was provided by a bottle wall in the bathroom window. This simple solar collector consisted of five tiers of one gallon glass jugs, filled with blackened water. External insulated shades reflected sunlight onto the window during the day and insulated the collector when closed at night, allowing heat to radiate to the interior. The rack of jugs also served as a screen from the deck outside the bathroom. A flat plate, water-filled, collector was used to heat domestic water. This was supplemented by a small electric water heater on cloudy days. A solar oven on the deck was used much like a standard backyard barbecue.[11]

[9] Farallones Institute. Op. cit.
[10] Ibid. pp. viii-x.
[11] Ibid. pp. 35-41.

Figure 4.4: Integral design schematic

Food Raising

The food produced at the IUH was seen as another technique of utilizing all the solar energy which fell on the site. The greenhouse was used for starting plants as well as raising salad vegetables in the winter. Most of the backyard was dedicated to growing vegetables in season. In addition, containers with lightweight soil mixtures demonstrated the possibilities of growing vegetables on rooftops. Fruit trees and vines throughout the site supplied fresh fruit in season. Alfalfa, strawberries and herbs were used as ground cover in heavier traffic areas. The alfalfa was cut and fed to rabbits, who along with chickens provided higher protein food. Fish were raised in a 2000 gallon pond as a protein supplement. Bees were kept to produce honey and pollinate the crops. The hives were placed above the fish pond, so that the dead insects could feed the fish directly. A fly trap kept pests down and again the dead insects served as food for the chickens.[12]

Innovations in food preparation and storage were also explored. A large pantry in the kitchen provided a space for storing canned produce. A cool closet, essentially a small, reverse-insulated room on the north wall utilized natural convection currents to keep fruit and vegetables at the proper temperature, without the need for a refrigerator. A combination gas/wood burning stove was used for heating as well as cooking.[13]

Waste Recycling

Recycling initiatives, though they were unusual at the time, are not as uncommon today. In particular,

removing recyclable solids from the trash stream and composting of food wastes is now quite common. Less common was the approach to human wastes. A waterless composting toilet was used, and the composted material used to fertilize fruit trees and ornamentals. Greywater was collected, filtered, and mixed with human urine for high nutrient irrigation.[14]

Integral Design

The integral design process used in designing the IUH meant that elements were not operating in isolation. By examining energy, nutrient and chemical cycles in the system, certain relationships were established that increased recycling and created loops from linear paths. One example was the location of the bee hives above the pond. Another community relationship was established on the north side of the house. This small side yard did not receive enough sun to be useful for growing, so the animal shelters and compost bins were located there. The rabbits were placed above the chickens, so that the chickens could feed off the fly larvae in the rabbit feces. The fly trap located above the compost bins kept fly populations down, and provided additional food for the chickens. Chicken and rabbit manure could be conveniently added to the compost piles.[15]

Summary

The Integral Urban House showed that many innovations could be made at the domestic scale with minimal education and lifestyle adjustments. Like many of its contemporary projects it served to educate the general public in alternatives, and furthered research in these areas by exchanging information with other eco-houses. Despite these successes, few of the innovations beyond recycling, composting and improved energy efficiency of houses have become common in the intervening 15 years. The energy crisis served as 'fuel' for the growth of the environmental movement at that time. Subsequent fossil fuel discoveries and competition among OPEC countries have reduced concerns since then; but ignoring our fossil fuel dependency will catch up with us eventually. The recent upsurge in environmentalism seems to have been connected largely with concern for global warming. Critics of these theories and events such as the Mount Pinatubo cooling effect may be lessening environmental concern once again. Perhaps it is time again for a new group of domestic oriented demonstration projects to be built that will push standards in other directions.

Although the IUH influenced its neighbourhood by reinforcing an area that was becoming rundown, environmental solutions at the community scale could not be fully explored.[16] People such as Peter Calthorpe and Michael Corbett, working in the same area, and undoubtedly influenced by Sim Van der Ryn, have been exploring some of these issues at the community scale. At this level of exploration, issues such as transportation and social dynamics can begin to be examined.

[12] Ibid. pg. 10
[13] Ibid. pg. 41.
[14] Ibid. pg. 10.
[15] Ibid. pg. 39.
[16] Ibid. pg. 9.

[17] Corbett, Michael N. Op. cit. pp. 32-37.
[18] see the discussion on the Pedestrian Pocket following.
[19] Corbett, Michael N. Op. cit. pp. 67-69.
[20] Ibid. pp. 94-97.

Sustainable Communities

Village Homes, Davis, California

Village Homes, a subdivision of Davis, California remains, after 20 years, one of the most environmentally and socially innovative built communities. The integral conservation features of the individual homes were not as intensively developed as many of the eco-house projects, but the overall physical planning and community conception were more complete. Despite the many planning initiatives, the density (7-8 du/a) was not much higher than a typical suburban subdivision. Although Michael Corbett, the designer and developer of Village Homes, argues that this is an appropriate and humane density[17], current initiatives are using higher densities and greater mixes of uses to combat the ubiquitous automobile.[18]

Figure 4.5: Village Homes

Energy Conservation

Energy conservation features at Village Homes began where they should, with the planning. Every house was laid out with full solar exposure, which allowed every house to develop its passive solar potential. A City of Davis planning ordinance which required high energy efficiency in housing ensured that all the houses had appropriate fenestration, shading and insulation. Some houses were outfitted with active solar water heating systems as well. Landscaping was designed with energy conservation in mind by using deciduous trees for shading.[19]

Urban Agriculture

Small individual vegetable gardens on the open yard sides of the houses were encouraged and generally undertaken. In addition, larger community garden areas were set aside at the peripheries of the site. These areas included vineyards and orchards as well. Perennials, shrubs and trees planted throughout the site were chosen for their food producing abilities.[20]

Physical Planning

In addition to the consistent solar orientation, the layout of streets, pedestrian paths and drainage were dealt with in innovative ways. The circulation system was similar to the Radburn model, with an exterior collector road and longer, curving culs-de-sac. Parking and small fenced courtyards were placed on the street side of the houses, while open common yards with a central pathway ran between houses on the other side. All paths eventually lead to a commu-

nity centre and a small cluster of commercial buildings. The drainage was designed such that run-off drains away from the street, towards shallow swales and intermittent creeks on the open side. This approach allowed a greater amount of run-off to be slowly absorbed into the ground as it would in a natural system, and eliminated the need for storm sewers.[21]

Social Initiatives

As a community, Village Homes automatically had a stronger social agenda than a single eco-house. The presence of the open yards, common areas and community centre also made it more socially progressive than the standard subdivision. However, the emphasis on single-detached dwellings was prejudiced towards nuclear families and did not fully recognize the social diversity prevalent in contemporary society.[22] Affordability was addressed to some degree by developing a self-build programme that allowed lower income families to acquire financing without a down payment.[23]

Summary

Although Village Homes remains one of the most innovative communities, it is perhaps a sad commentary on the conservatism of the development industry and the perceived marketability of such innovation. Many of the innovations explored in the eco-houses were downplayed, and the low-density pattern of suburbia did not fully address transportation or social concerns. Village Homes could perhaps be seen as an important transition between standard suburban development and more enlightened, environmentally-responsive communities; but its relative obscurity and its failure to spawn copies means that a huge transition must still take place.[24]

[21] Ibid. pp. 87-89.
[22] Corbett, Judy and Michael. *Energy and the Human Environment.* Monograph Series No. 103. College of Human Ecology, Michigan State University. East Lansing Michigan. 1984. pg. 1. Of 240 units at Village Homes, only 20 are rental apartments.
[23] Corbett, Michael N. Op. cit. pg. 62.
[24] Corbett, Judy and Michael. Op. cit. pg. 11. The authors themselves state: "We do not view Village Homes as an ideal. We see it as a practical step in the right direction."

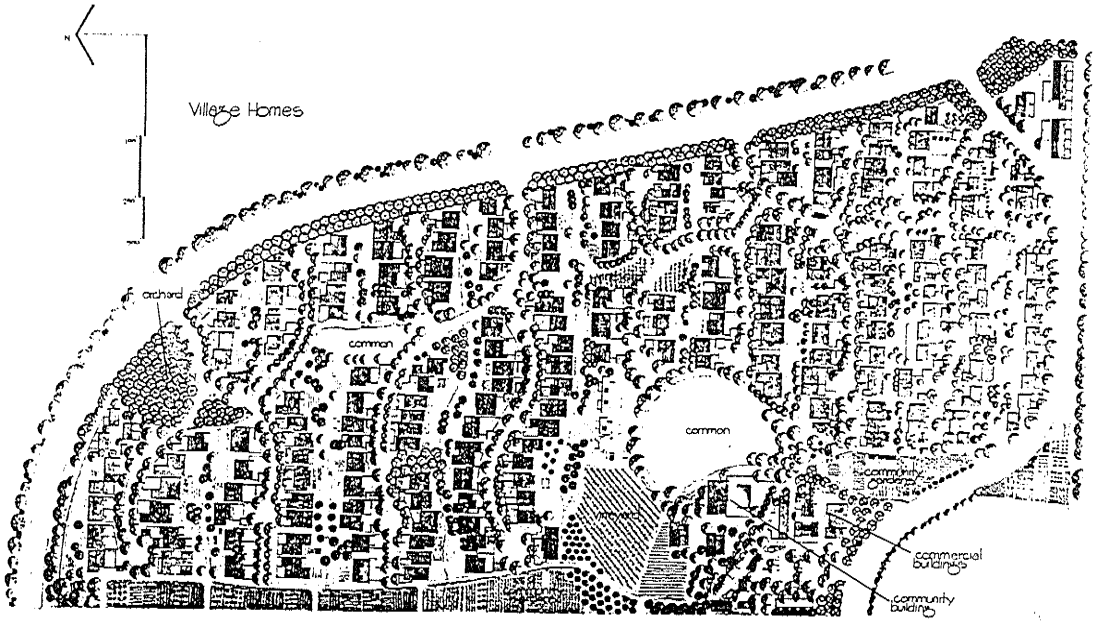


Figure 4.6: Village Homes, site plan

The Pedestrian Pocket

The theory behind the Pedestrian Pocket model was developed in early collaborations between Peter Calthorpe and Sim Van der Ryn, which was documented in their book, *Sustainable Communities*.[25] Since then, Calthorpe has developed the concept into a marketable suburban form which has recently come to fruition in Laguna West. Concerns for energy efficiency, resource recycling and food production have been sacrificed for the sake of developing a new suburban form that would be readily accepted by the suburban home buying public.

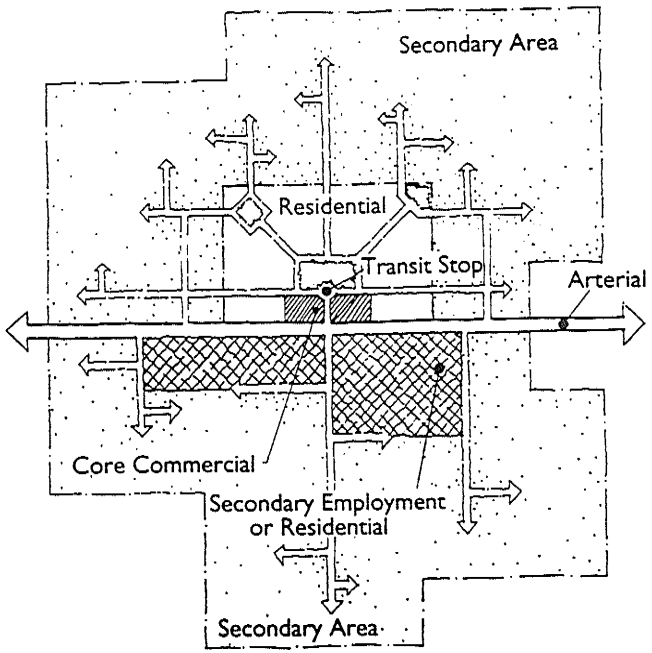


Figure 4.7: Transit-Oriented Development

Physical Form

The Pedestrian Pocket model attacks suburban sprawl by primarily focusing on the need to reduce automobile use. This is hoped to be achieved through a combination of three elements: light rail transit, pedestrian primacy and mixed use development. In order for this strategy to be successful, all three elements must be integrated. The entire development is within a 1/4 mile (10 minute walking) radius of the heart of the community, the light rail station. Clustered around the station is the "downtown" consisting of up to 1,000,000 square feet of "back office" space, shopping, entertainment, parking and other services. Up to 2,000 units of "low-dense" housing are clustered in neighbourhoods in the surrounding 50 - 120 acres. Each neighbourhood contains services such as convenience stores, schools and recreation, all located for ease of pedestrian access. Greenspaces separate neighbourhoods and connect them to the central area.[26]

Regional Planning

The Pedestrian Pocket is not intended to stand alone. For the light rail to be viable, it must link several Pedestrian Pockets to a central city. Each of these developments could take on specific roles, such as technology park, shopping centre, or entertainment centre. They could also serve as park-and-ride locations for other suburban developments without direct rail connections.[27]

[25] Van der Ryn, Sim and Calthorpe, Peter. Op. cit.
[26] Calthorpe, Peter. "The Pedestrian Pocket: New Strategies for Suburban Growth" in *Sustainable Cities*. pp. 27-35.
[27] Ibid.

Laguna West

Laguna West was developed concurrently with Calthorpe's Transit-Oriented Development (TOD) study for Sacramento County, which evolved from the Pedestrian Pocket model. The developer, attracted by Calthorpe's ideas has produced what has come to be seen as the first test of both the Pedestrian Pocket model and the TOD guidelines. The core of the site, a 100 acre TOD mixed use town centre was surrounded by a 72 acre lake, and 450 acres of more typical residential neighbourhoods consecutively. Diagonal links of boulevards, public facilities and open spaces linked the three zones. The north and west sides of the site consisted of 350 acres of commercial/light industrial/office zoned properties. Streets dead-ending into adjacent properties indicate some thought was given to local connections, however, the linkage systems developed were not extended. Likewise, provision for some sort of greenbelt reserve was not included.[28]

As the development is relatively new, it remains to be seen how successful it may become. It has been reported that neighbours from adjacent subdivisions have taken to driving to the site to use the open space amenities.[29] Perhaps if a proposed triple cluster TOD / Pedestrian Pocket north of Sacramento is approved and built, the regional goals of the model will begin to have an impact on the region and suburban growth patterns throughout North America.

Summary

These related forms of sustainable communities are focused on suburban conditions and tend to deal with providing alternatives to automobile use. This is certainly an important issue, and a critical one to tackle in Southern California and Florida, where the projects are being proposed. At best they have to be seen as transitional projects towards the ultimate goal of sustainable cities.

[28] Girling, Cynthia. Op. cit. pp. 40-50.
[29] Kahn, Eve. "Laguna West: Suburbia's Future?" in *Landscape Architecture* July 1993. pp. 34-35.

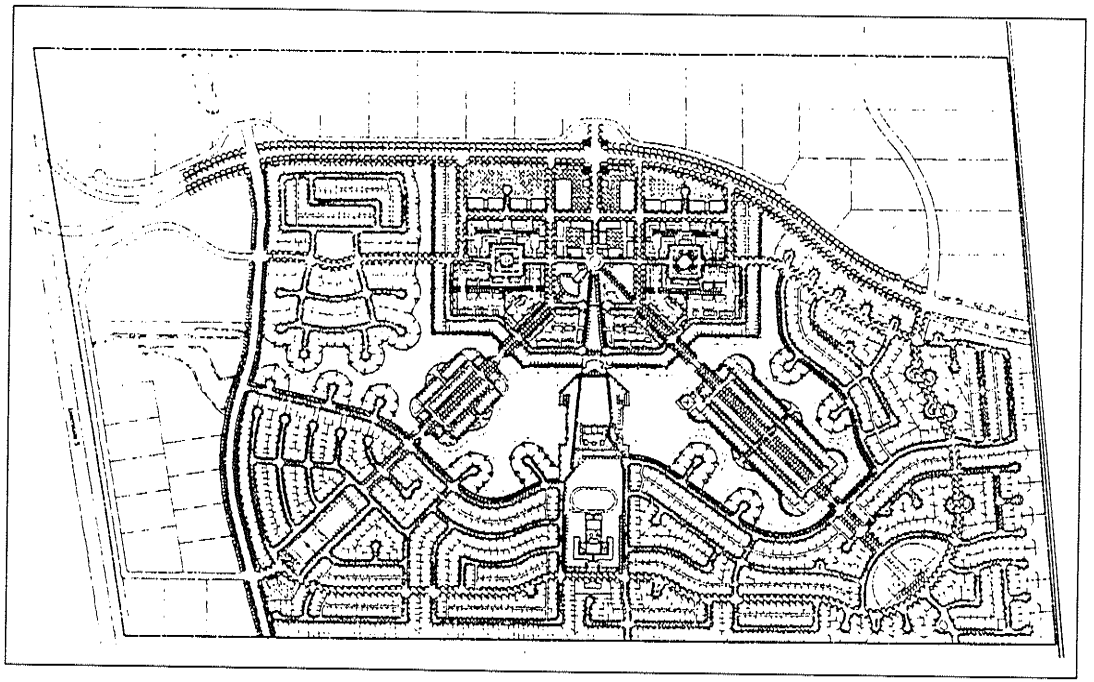
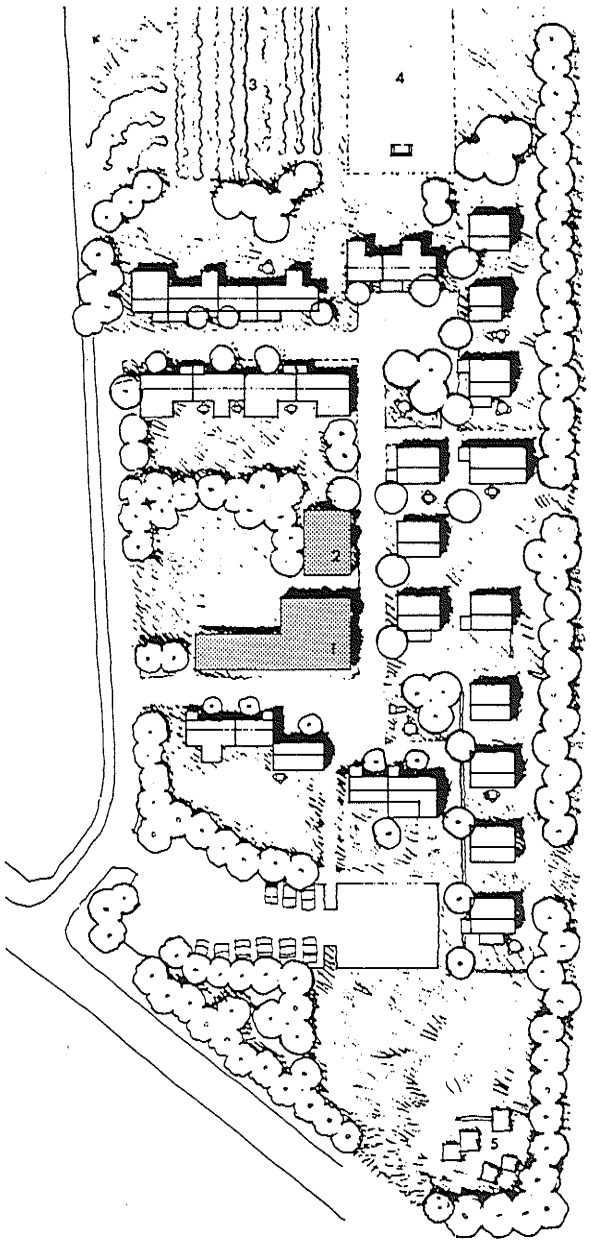


Figure 4.8: Laguna West site plan



Site plan: 1. common house. 2. bicycle and tool storage, 3. vegetable garden, 4. soccer field, 5. playground.

Figure 4.9: Sol og Vind site plan

Collaborative Communities

As discussed in the introduction, this new form of housing is rapidly growing in popularity throughout the Western World. Many of the currently proposed eco-villages and sustainable communities are using this model in their development plans. The dense, automobile-reduced planning is advantageous from land use and transportation points of view. The greater emphasis on community is a growing ideal for almost all environmental groups.[30] Although all collaborative communities share these attributes, two of the original Danish bofaellesskaber stressed environmental agendas in their development plans.

Sol og Vind (Sun and Wind)

Of the two Danish bofaellesskaber, Sol og Vind has been the better documented. The residents stressed in their goals the desire to achieve energy efficiency through planning and design and to use renewable energy as much as possible.

Site Plan

Although the site was suburban, the long north-south orientation is similar to many North American city blocks. This proves to be significant in a community which wishes to maximize energy efficiency. The residents stated a preference for two storey houses with small footprints in order to minimize land use, but found the requirement for solar access created a layout that was more spread-out than usual.[31]

Energy System

Each individual house was sited and designed to take advantage of passive solar potential, and many included greenhouse additions on the south side. An active system, consisting of 7,000 square feet of liquid-filled, flat plate collectors, was mounted on the common house and half of the individual house roofs. The storage tanks were located below the common house. Hot water was supplied for space heating and domestic use throughout the community. This system supplied 30% of the community's requirements.

Back-up heat was originally supplied by a solid waste (mostly wood) incinerator located in the common house basement. After the first year, it was decided this back-up required too much work, and a gas-fired boiler was installed as a replacement.

The community owned an electricity-generating windmill on a hilltop one and a half miles away. All electricity was sold directly to the electrical utility in exchange for preferred rates. The electricity generated was equivalent to 10% of the community's needs.[32]

Food Production

The existence of a large common garden indicates a concern for other forms of self-reliance. Although no specific information is available on the garden, it would not appear to be an attempt to maximize production. Similar gardens are a relatively common feature in other collaborative housing developments and may be more a reflection of the suburban lifestyle than other ideals.

Overdrevet

This community emerged from the same group that formed to develop Sol og Vind, but split off to pursue a more rural site. It is perhaps the most environmentally focused of all Danish bofaellesskaber.

Site Plan

This rural site was somewhat larger than most, and had an overall density of less than 4 du/a. The units were extremely tightly clustered, however, such that three or four units were housed in one barn-like building. All of these buildings were clustered around a courtyard that appears much like a farmyard. An existing agricultural building was renovated into a workshop and teen hangout.

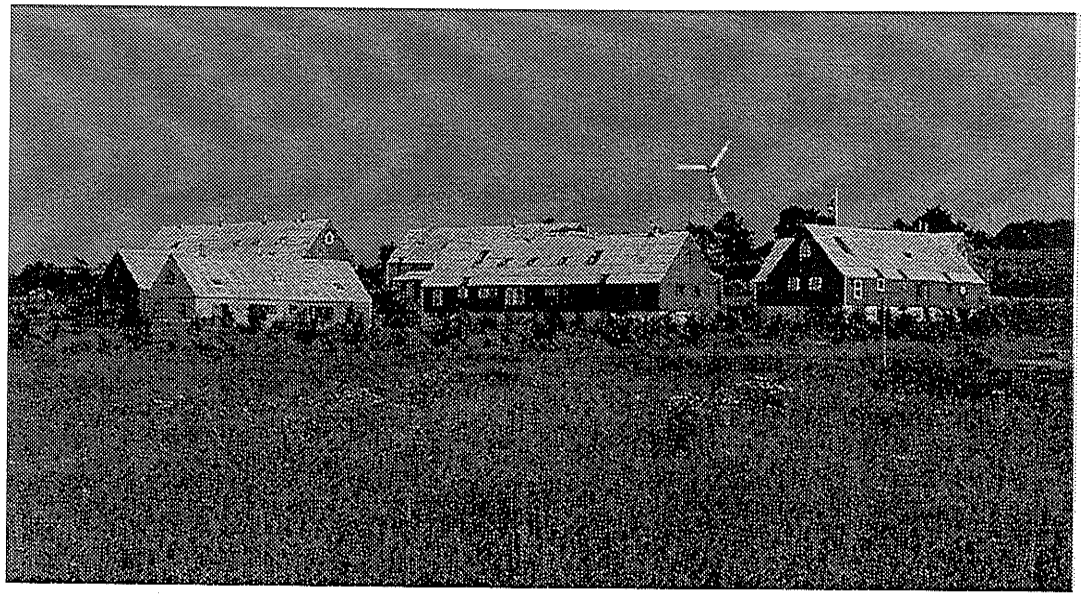


Figure 4.9: Overdrevet

[30] Walter, Bob et al eds. Op. cit. 1992.
[31] McCamant, Kathryn and Durrett, Charles. Op. cit. pg. 51.
[32] Ibid. pg. 53.

Energy System

Overdrevet utilized a system similar to Sol og Vind, which included solar hot water panels and a wind-powered electrical generator. Specifics of the system are not readily available in the literature.

The houses were inherently more energy efficient because of their minimized exterior areas. They also employed brick interior walls, and concrete floor slabs for thermal mass, triple glazed windows, and super-insulated exterior walls. Even though Denmark has very strict heat loss standards for all construction, residents of Overdrevet paid less than half the amount on their heating bills as neighbours with similar-sized houses.

Food Production

Overdrevet contained an organic vegetable garden of over 1 acre, as well as chicken, sheep and rabbits.[33]

Summary

The growing popularity of the collaborative community model, and its adoption by the eco-community development movement will probably ensure its continued use in coming decades. Whether it will ever be attractive to the majority of the population which seems to prefer the privacy of the suburban lifestyle remains to be seen. The interest displayed does indicate, however, that many hunger for alternatives in North America's homogenous housing industry.

Urban Eco-Villages

Through the literature search of this study, it was discovered that at least two very similar projects were currently in the development stage. It is likely that the ideas developed out of similar precedents, but it is the particular sites which made them so similar. A brief discussion is offered here, not because they informed this study (the ideas were developed concurrently, so the similarity is somewhat coincidental), but because of their remarkable similarity. Both projects are in the development stage, but there is support in each of the municipalities to actually develop them.

Affordable Sustainable Community Project

This project is being developed by the University of Calgary Department of Environmental Studies for a site in the Inglewood community of Calgary. The site is in an underdeveloped, lower income, residential and industrial area adjacent to the Bow River, two kilometres east of downtown Calgary. The project emerged from a review of Scandinavian precedents in sustainable urban planning. Scandinavian municipalities, particularly those in Denmark, have been building with sustainability in mind for over a decade. Several built projects, and particularly those in the planning stages, are extremely sophisticated examples. Projects range from single urban housing blocks, small semi-rural eco-villages, right through large town extensions and small new towns. The ASC team has been the first to substantially document these innovative projects in English.[34]

[33] Ibid. pg. 62

[34] Perks, William and Van Vliet, David. *Assessment of Built Projects for Sustainable Communities.* Canada Mortgage and Housing Corporation. Forthcoming.

Community Partnerships

From inception, the University of Calgary team has been working with a broad range of constituents to achieve their goal. A team of 'experts' from the municipal planning department, housing societies, housing industry representatives and area residents attended workshops to review Scandinavian initiatives and discuss strategies for incorporating them into the Calgary market. Additionally, a 'house-seeker proxy group', assembled from the general public, participated in the design of the selected site. The provisional site has not yet been finalized, but has the advantage of being municipally owned. The development is envisioned as a University/City/Industry joint venture with individual housing society projects. The demonstration project is intended to have a broad public education role through research and demonstration of the possibilities inherent in the approach.[35]

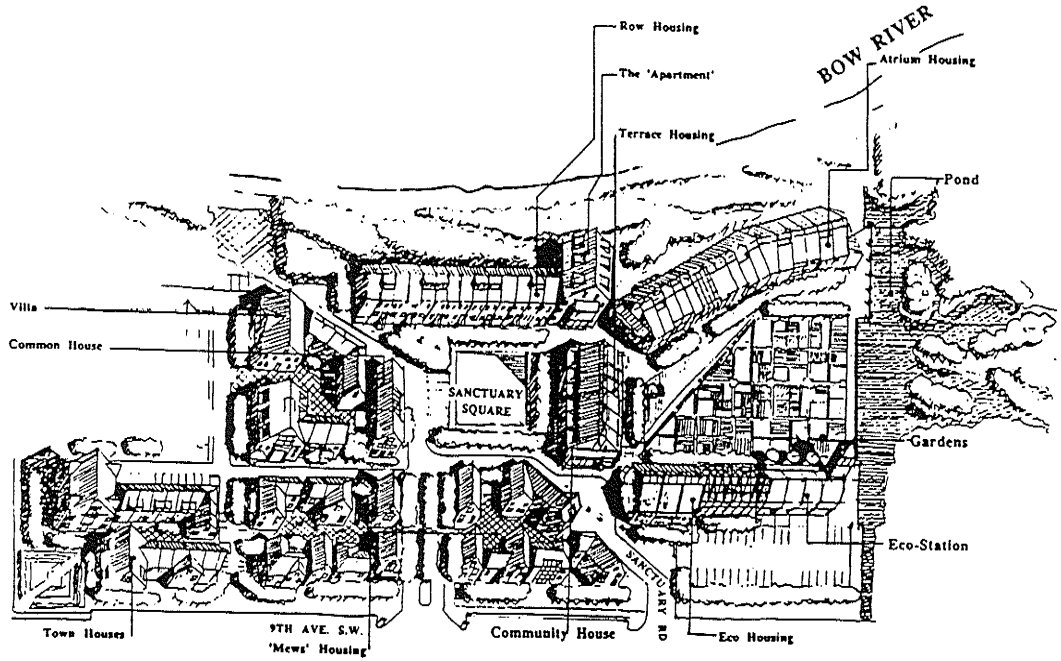


Figure 4.11: Affordable Sustainable Community, Calgary

Demonstration Plan

The proposed site is a 3 hectare property on the south bank of the Bow River. To the northwest is a residential area, to the southwest a decommissioned refinery site that is slated for a naturalization project, and to the southeast is the Inglewood Bird Sanctuary, surrounded by a meander of the Bow River. The built programme calls for 120-150 passive solar housing units in a wide variety of low/dense housing types including collaborative housing. Limited commercial and 'work at home' provisions are made in some of the buildings. A 'Community House' with resources, services and daycare separates a central square from

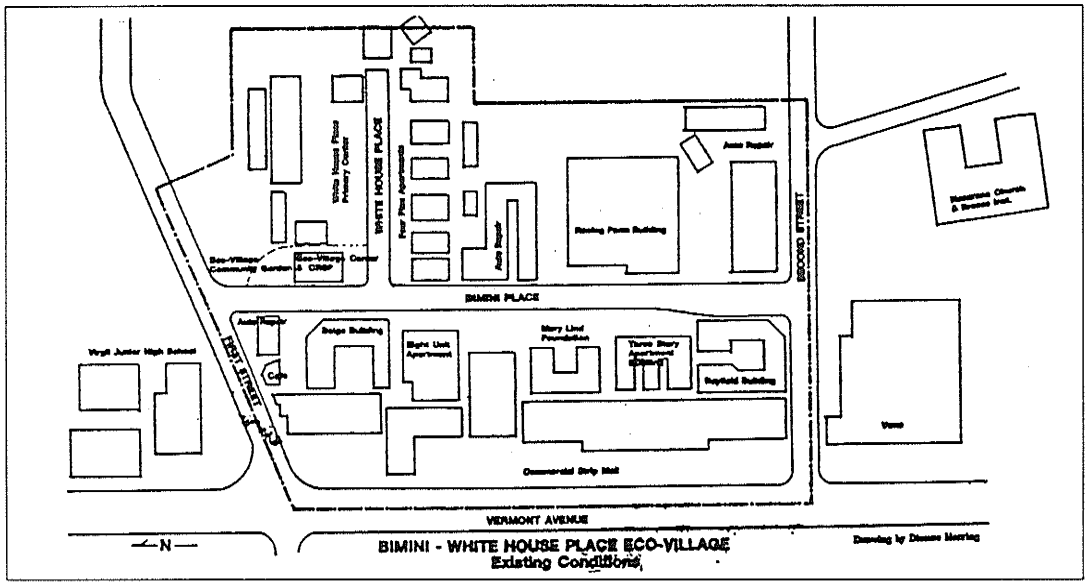
[35] Perks, William and Van Vliet, David. "Sustainable Community Design: Restructuring and Demonstration." in *Plan Canada*, November 1993. pp. 30-36.
[36] Perks, William and Van Vliet, David. *Assessment of Built Projects for Sustainable Communities.*

the community garden area. An Eco-Station containing the district co-generation plant and biological sewage treatment would be the focus of the public education centre. A storm water retention pond would serve as the final stage of sewage treatment and supply the gardens with irrigation water.

Community Connections

The block patterns extend the adjacent residential street patterns but alter them to suit the requirements of pedestrian primacy and reduced road widths. A diagonal path is interrupted by the central square and serves as the connection point for the Bow River bike path to the central area. Bus connections to downtown are available on the main street to the south of the site. The storm water retention pond acts as a buffer to the bird sanctuary, and contributes to waterfowl habitat.[36]

Figure 4.12: L.A. Eco-Village site plan



L.A. Eco-Village

This urban eco-village was proposed for Los Angeles, perhaps the city that requires the most immediate attention. Los Angeles is now the 6th largest city in the world, among the most polluted, and is the paradigm of an automobile dependent city.[37] Ironically, it is always the worst cases which spawn the most fervent actions. The organizing group also sponsored the most recent eco-city conference which produced the book *Sustainable Cities*.[38]

The core of this proposed community was an 11 acre inert landfill site. Of this, three or four acres were conventionally developable. The site was expected to contain four collaborative housing clusters of 18-30 units each, community facilities, neighbourhood commercial space, an ecological business incubator and extensive gardens and open space. Most of the site was to be used for neighbourhood recycling and gardening until it is fully developed.

Performance criteria for the project were impressive. Eco-Village residents would produce 40% of their food on site through organic vegetable gardens and orchards. Neighbours with community land trust membership would also have gardens on the site. Water conservation and reclamation would reduce water use by 90%. Passive and active solar, wind and biomass energy sources and conservation would reduce energy consumption by 75%. Solid waste production would be reduced by 90% through reduction, reuse and recycling. Building materials would be non-toxic, and locally produced and recycled where possible. Transportation would be primarily pedestrian and bicycle. Transit connections, a local electric bus service and vehicle pooling

[37] Giradet, Herbert. Op. cit. pp. 128, 183.
[38] Walter, Bob et al eds. Op. cit.
[39] Arkin, Lois. "The Los Angeles Eco Village: A Sustainable Urban Community" in *Sustainable Cities*. pp. 273-280.

would reduce automobile use.

The planning group consulted closely with neighbouring communities throughout the process. They did not see the village contained to the 11 acre site, but spread into neighbouring areas, and linked to the entire city and the world through communication networking.[39]

Following the L.A. Riots, the organizing group decided that the inner city needed special attention and directed the focus away from the landfill site in Montecito Heights. Instead, they chose a two block neighbourhood immediately surrounding the Co-operative Resources & Services Project, one of the founding organizations. The neighbourhood contains approximately 170 rental housing units, schools, institutions and work places. Efforts are being directed towards converting housing to co-operatives, building community relationships, taming traffic, establishing an eco-business incubator in a disused factory, and developing knowledge in composting, community gardening and urban forestry.[40]

Summary

The existence of these other similar projects is a strong indication of the validity of the idea. Since neither of them are yet fully developed, only the proposals can be evaluated. If history is any guide, it is likely that they will not meet all their objectives; but they may serve as important steps in the evolution of cities. It is particularly encouraging that such a sophisticated project is emerging from Los Angeles, partly because of the critical point that city is at, but also because California tends to be the origin of many trends on this continent.

Self-build

The self-build movement varies greatly in process, ideology and purpose throughout the world. In pre-industrial cultures, it has been the norm to provide oneself with housing. It is now conventional wisdom to support and facilitate self-build in the slums of developing world cities. The site-and-services approach to this critical housing problem has been found to be much more affordable, sustainable and humane in these circumstances.[41] Self-build in the developed world has largely been connected to the back-to-the land / D.I.Y. (do-it-yourself) movements. A few architects and organizations have purposely sought to develop self-build techniques for affordable and social housing projects in the developed world.

Habitat for Humanity

Habitat for Humanity is a non-profit, nondenominational, Christian missionary organization working throughout the world to provide decent, affordable housing for the disadvantaged. They utilize a great deal of volunteer labour in both planning and construction, and have high profile members such as former U.S. President Jimmy Carter, working in public relations and on building sites.[42] Their success has been enormous, and they are rapidly becoming the largest home builder in the U.S. Architecturally, their housing is quite conservative, both for the sake of affordability and avoiding social stigma. In Winnipeg, they avoid using townhouse models simply because they are associated with lower-cost development, even though they would be inherently more efficient in energy and land use than detached

[40] CRSP. *L.A. Eco-Village and Co-op Networker*. Summer 1993. pp. 3-5, 14-16.
[41] Giradet, Herbert. Op. cit. pp. 128-131.
[42] Nozick, Marcia. Op. cit. pg. 169.

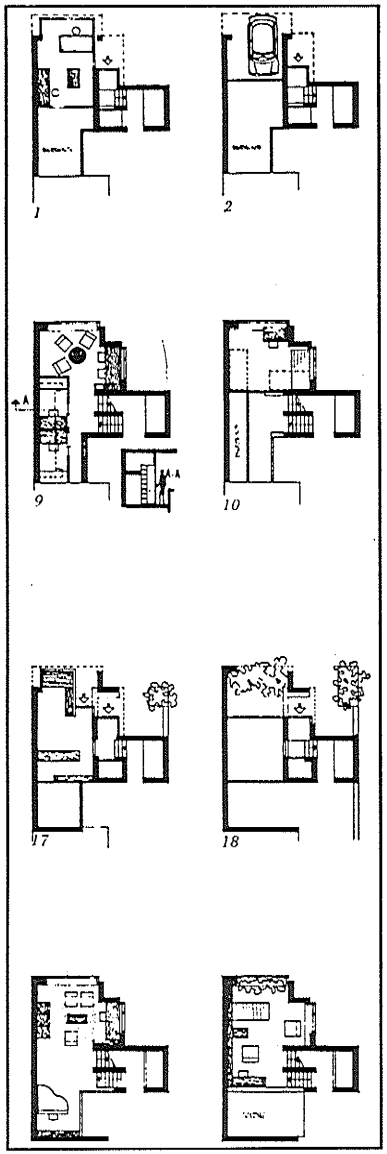


Figure 4.13: Diagoon Housing, Delft, Netherlands: matrices of unit variations

housing.[43] It is primarily their financing approach which is of interest to this study

Financing

Habitat families are selected by the board based on their need and likely ability to be successful in helping themselves by working with Habitat. Homeowners are required to contribute 500 hours of sweat equity into their and other Habitat houses in lieu of a down payment. They work alongside the thousands of volunteers who attend the work camps which can produce entire neighbourhoods of completely finished houses in less than a week. Rather than a traditional mortgage, Habitat arranges a loan, amortized over 12 to 15 years, with zero interest. The capital necessary for this revolving fund is raised through private donations and church congregation loans.[44] The default rate on these loans has been less than 1%. The $40-50,000 loan per house includes a 10% tithe which is donated to Habitat programmes in developing countries. Habitat homeowners and volunteers frequently travel to other countries for extended work camps.[45]

Building Material Recycling

The Winnipeg chapter of Habitat for Humanity also runs a building materials recycling company. An increased awareness of the embodied energy in building materials and the cost of landfill is behind this growing industry.[46] Several individuals in Winnipeg are also harvesting lumber from trees removed from Winnipeg's urban forest for the same reasons. These recycling and re-use strategies are very compatible with an environmental community, and could play an important role in both the development and employment processes.

Diagoon Housing — Delft, Netherlands

Herman Hertzberger is a Dutch architect who has spent a lifetime designing buildings that are primarily concerned with the user. Although some of his projects incorporate elements of self-build, his approach is usually at a more psychological level. He strives to create spaces that are flexible and interpretable without dictating use. Unlike Mies van der Rohe's "universal space", Hertzberger's spaces are small and well articulated so as to suggest to the human senses how they should be engaged. Details such as railings, stairs and window openings in his buildings are extraordinarily tactile, and beg to be touched. His structuralist approach to design results in buildings which contain multivalent, interlocking spaces that layer thresholds, developing a space for social interaction where barriers might otherwise exist.

Hertzberger's Diagoon project, an eight unit experimental housing scheme was intentionally left incomplete to encourage residents to participate. Each unit contained interlocking, split floor plates, connected vertically by a stair topped with a skylight. This three-dimensional, transitional element, in an otherwise open plan, produced spaces which had their own sense of enclosure without actually being rooms. Residents were encouraged to define the spaces as they wished and to use lightweight partitions and built-in furniture to separate rooms for the purpose of visual and acoustical privacy. Matrices of plan

variations indicate the incredible diversity of uses that can be developed from a single unit type. This system was also extremely flexible in responding to change without requiring additional space to be added. Parts of the facade such as the windows and porch elements were also designed as a system and can be altered by residents with little effort.[47]

Lucien Kroll

This Belgian architect has also dedicated his life's work to the user, often working directly with community groups in defiance of authorities' wishes. He is perhaps best known for the Louvain Catholic University Medical Student Buildings, which he designed and built with students. The chaotic appearance of the facades are a visual record of his anarchist approach to architecture. The system he developed is based on the S.A.R. modular system developed by John Habraken. Kroll believes that even a module of 100 mm is extremely crude and limiting.[48] As a result, his buildings appear to have absolutely no continuity. They are in fact very precisely figured out so that the user has full control over how the spaces will be configured, and how the building will appear. Although Kroll exhibits incredible humility in allowing the user to determine the design of the building, a Kroll building is unmistakable because of the genius of the systems employed. Kroll is currently working on Ekolonia, a demonstration Eco-Village in the Netherlands.

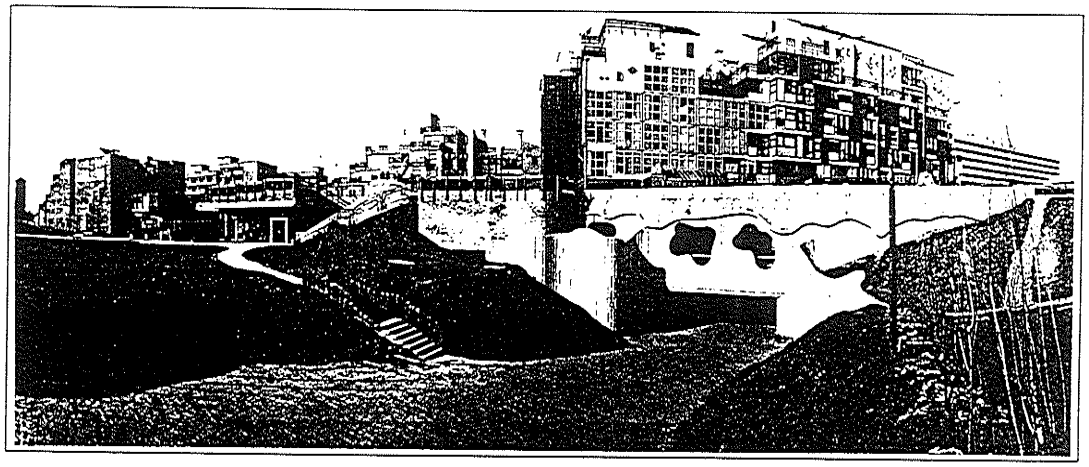


Figure 4.14: Medical Student Buildings, Louvain Catholic University, Brussels, Belgium.

[43] Lecture given at the Faculty of Architecture, University of Manitoba by members of the Winnipeg chapter of Habitat for Humanity, 19 March 1992.
[44] Nozick, Marcia. Op. cit. pp. 170-171.
[45] Lecture notes 19 March 1992.
[46] Nozick, Marcia. Op. cit. pg. 49.
[47] Lüchinger, Arnulf. *Herman Hertzberger: Buildings and Projects.* Arch-Edition. Den Haag. 1987. pp. 72-85.
[48] Kroll, Lucien. *The Architecture of Complexity.* B.T. Batsford Ltd. London. 1986.

5 Demonstration

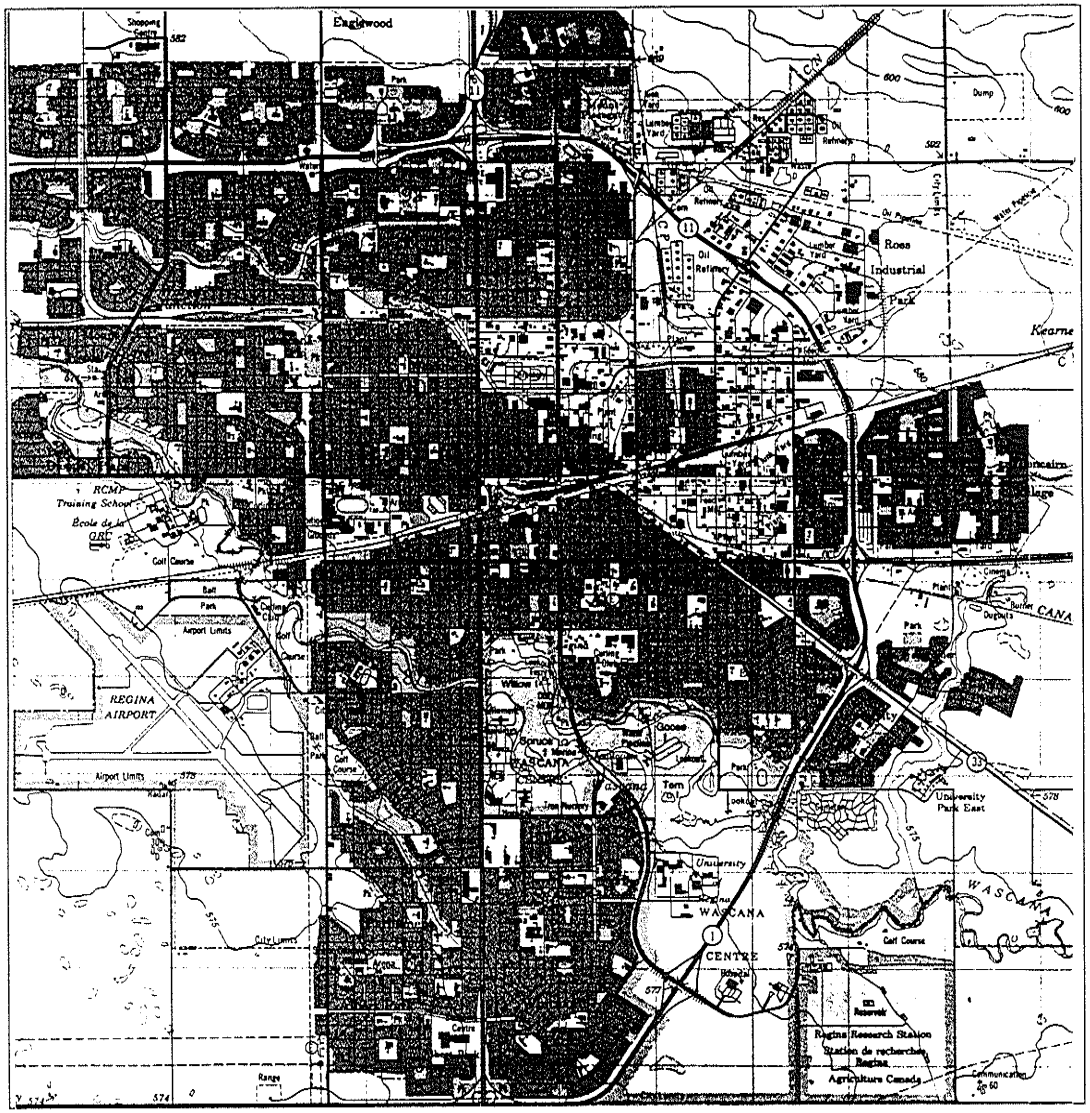


Figure 5.1: Map of Regina

Context: Regina, Saskatchewan

Socio-Economic Conditions

Regina, the capital of Saskatchewan, is a city of approximately 185,000. The economy is mixed, but is largely based in government services and agricultural sectors. Economic performance has always been relatively stable if a little sluggish. A minor boom in the 1970's, due to high commodity prices in Saskatchewan's major industries; wheat, potash, oil, and uranium, was followed by very poor performance during most of the 1980's. Modest economic growth in the first half of the 1990's has been projected. A population growth rate of 1.2% has also been projected for the same period.[1]

Physical Description

Regina is perhaps the quintessential prairie city. It is located in the middle of the prairies between Calgary and Winnipeg. The landscapes of these latter two cities, perched on the edges of the prairie, are greatly influenced by the foothills of the Rockies and the Red River Valley ecotone respectively. Unlike Edmonton and Saskatoon, Regina does not benefit from the mixed forests of the aspen parkland. Despite the fact that every tree growing in Regina was planted by hand, it appears on the horizon (or from a plane) as an oasis in its surrounding semi-arid desert.[2] George Baird, a Toronto Architect and Urbanist, has stated

that in Regina "trees can be said to define urbanity."[3]

Morphologically, the grid of the Dominion Land Survey, spread over the gently rolling prairie, has greatly influenced Regina's form.[4] The roughly octagonal city boundaries cover approximately 43 sections and are bisected on the northwest — southeast diagonal by Wascana Creek and its string of parks and golf courses. Approximately half of the southeast quadrant contains Wascana Centre, one of the largest urban parks in the world.[5] The southwest quadrant is devoted mostly to the airport, while the northeast is largely industrial. Suburban growth is limited largely to the northwest and southeast along Wascana Creek. Outward growth is extremely limited by land use and environmental factors. The airport and industrial areas limit growth to the southwest and northeast. The Condie Moraine — an aquifer recharge and bird sanctuary to the northwest, and low lying, poorly drained land to the south, present environmental constraints.

Numerous opportunities for residential development have been identified in the inner city, and redevelopment of some areas has become quite popular in recent years.[6] Postwar depopulation of the inner city has been well documented. In 1956, 36,200 people, or 40% of the population lived in the inner city, compared to 21,800 or 13% in 1981.[7] The single greatest opportunity to reverse this trend has been a long-standing proposal to relocate the central rail yards.

Global Rail Relocation, the removal of the two rail yards and associated branch lines, has been an official policy of the City of Regina for nearly fifty years.[8] This long-standing policy has caused much speculation as to the use of the main rail yard just

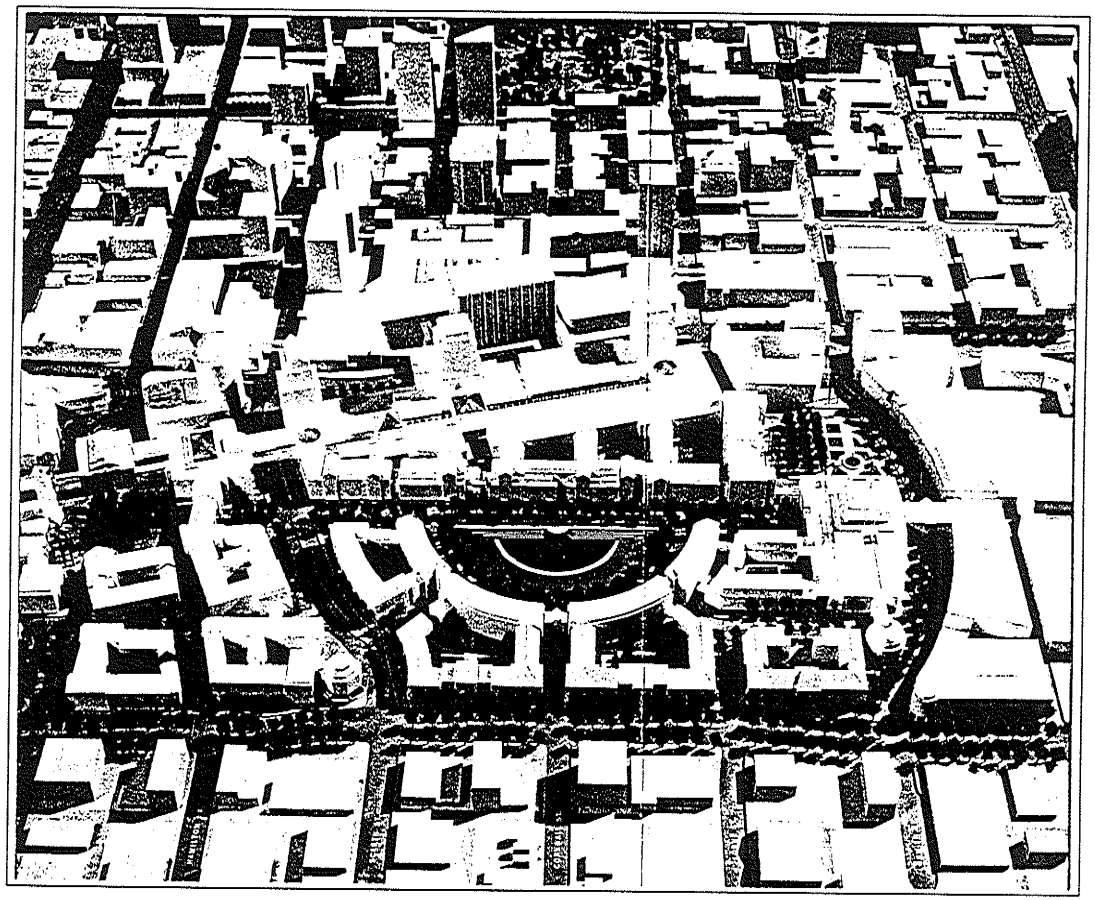


Figure 5.2: Renaissance Regina view of model

[1] City of Regina Urban Planning Department. "Socioeconomic Forecasts and Implications 1992— 1996."
[2] "More Trees" in *The Regina Leader Post.* December 1987.
[3] Egan, P. et al. *Regina Traces: George Baird and Associates.* unpublished student paper University of Toronto School of Architecture 1984.
[4] see Appendix C Typological Study.
[5] Wascana Centre is not, strictly speaking, a park but a controlled development area in a park like setting. At 2300 acres it is more than three times the size of New York's famed Central Park.

north of Downtown. An international competition was held in 1976 for proposals for this site. An in-house design team was subsequently assembled, and in consultation with George Baird, Clifford Wiens, and Paul Merrick, produced a master plan for the site.[9] The new development would have to pay for the City's share of the cost of the relocation scheme, and as a result would require a built density that was unprecedented for Regina. Although Regina was experiencing rapid economic and population growth during the study period, the plan would require most of the City's projected growth over a twenty year period to be completed. The master plan was excellent from an urban design point of view, but appeared hopelessly optimistic by the time it was unveiled in 1986 — at the beginning of an economic downturn from which Regina has yet to truly recover. Despite the Federal, and subsequently Provincial governments' bail-out of the funding support, this project remains official policy in the City of Regina Planning Department.[10] Rail Relocation may eventually come to fruition, but the form and timing are yet to be determined. Never-the-less, the peripheral areas contain large quantities of vacant land that were either branch lines or adjacent industrial property, and are excellent redevelopment opportunities.

Description of Neighbourhood

Regina's historic Eastend, also commonly known as Germantown, or Garlic Flats, has always been a non-British immigrant neighbourhood.[11] Today, most of the descendants of the original Eastern European immigrants have moved out to the suburban areas as successive generations have prospered. The current "immigrant" population is primarily Vietnamese and Native Canadian, a large percentage of the latter group coming from reserves and remote areas. The City of Regina has recently declared part of the area "Chinatown", which is seen by some to be a racial slight against the Vietnamese.

In 1913, concern for the "disgraceful" sanitary conditions in Germantown led to a social survey of the area which was carried out by J. S. Woodsworth. He found that the area consisted of 607 homes containing 697 families. Most of these "homes" were three room shacks without proper foundations and 60% of them lacked plumbing.[12] As late as the 1980's, a few of these substandard houses remained without plumbing, and floors were badly heaved due to the lack of foundations.[13]

As most of the early residents of the Eastend were marginally employed as casual labourers, the early labour union movement played a large role in the social life of the neighbourhood. Many of the area's ethnic cultural halls doubled as labour temples.[14] Market Square on the west edge of the area served as the location of the Regina Riot in 1935. The riot was the result of the Federal Government's attempt to stop the On-to-Ottawa Trek staged in protest by 1,400 labourers who had been relegated to Prime Minister R. B. Bennet's relief camps.[15]

The triangular Eastend annex bounded by Winnipeg Street, Victoria Avenue, and Arcola Avenue was cut off from its quarter section by the merge point of the CPR Arcola and CNR Glenavon branch lines. The area developed as a primarily residential area, and like Germantown lacked basic services. The present intermingling of pre-war and

[6] Macdonald, Therese. "Downtown is Popular Again" in *The Regina Leader Post*. 1991?
[7] City of Regina. *Urban Development Plan: Railway Relocation.* Appendix A to the application of the City of Regina pursuant to the Railway Relocation & Crossing Act. 1984. pg. 18.
[8] Dundas, Colleen. "Relocation has Long History" in *The Regina Leader Post* Feb. 23 1987.
[9] City of Regina Rail Relocation Office. *Renaissance Regina.* Promotional pamphlet. 1986.
[10] O'Brien, Mike. "Rail Relocation Plans Off the Track Forever" in *The Regina Leader Post* January 13 1991.
[11] Brennan, J. William. Op. cit. pg. 65.
[12] Ibid. pg. 65.
[13] In the summer of 1986 I was employed by the City of Regina as part of a property condition survey to develop a data base for the new Area Maintenance Bylaw.
[14] Brennan, J. William. Op. cit. pg. 115.
[15] Ibid. pg. 140.

post-war housing is a testament to the fact that the area was sporadically developed, with many vacant lots.[16] In its early form, the area was a transition from urban and rural areas, and many of the vacant lots were used in a manner similar to farmyards, with livestock relatively common.

The area immediately to the north of the tracks, and south of the CPR mainline, developed as an early industrial park. The City acquired some of the land in this area as compensation from the Federal Government for the townsite trustees' refusal to pay taxes between 1883 and 1904.[17] The City had also acquired other property due to tax delinquency following the collapse of the initial building boom in 1914. As a result, the City had title to more than 4,000 lots in 1904 and more than 3,000 lots were in arrears after the 1914 collapse.[18] This situation was used to advantage by the city to consolidate development and plan growth in the absence of any planning law. This strategy was used to attract an abattoir in 1905 and a General Motors assembly plant in 1928.[19] Industrial activity in Regina has always been met with mixed success, but the city remains relatively well-industrialized given its size and isolation from markets. Despite this, much of the vacant industrially-zoned property owned by the city remains undeveloped.

Figure 5.3: Site neighbourhood aerial photo

[16] see Appendix C Typological Study
[17] Brennan, J. William. Op. cit. pg. 47.
[18] Ibid. pg. 123.
[19] Ibid. pp. 61, 106.

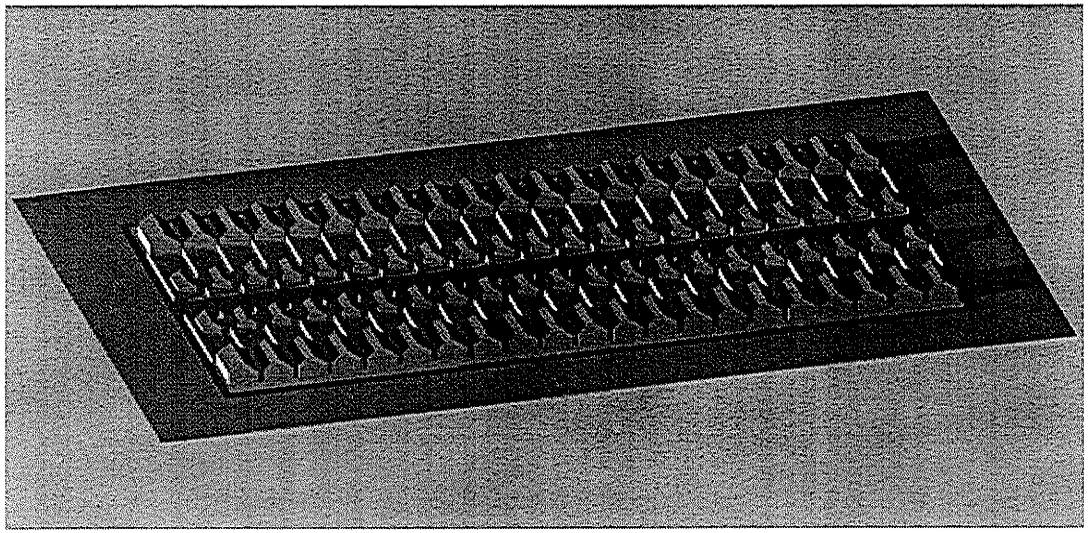


Figure 5.4 a: Typical Block — No passive solar potential — 13 du/a

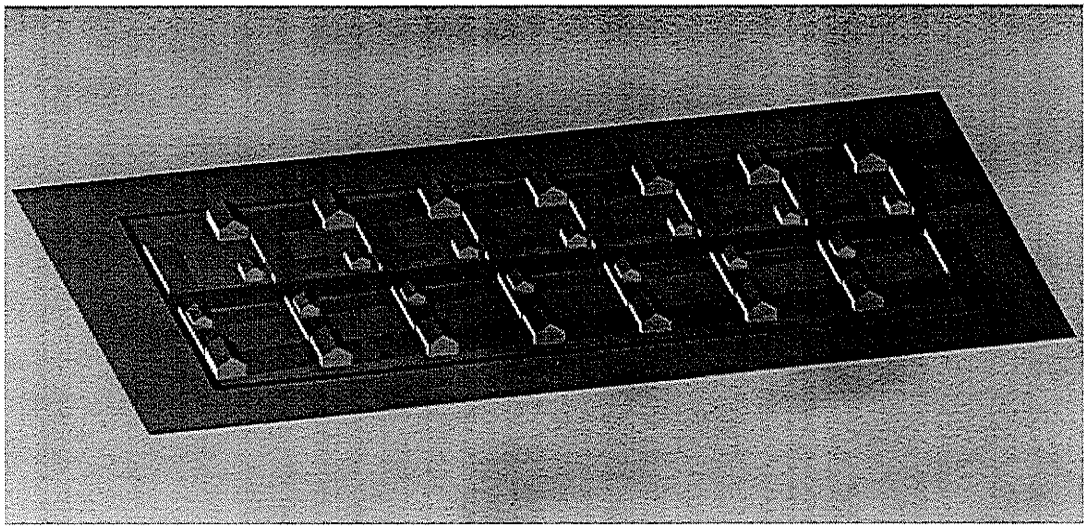


Figure 5.4 b: Maximum density for detached housing with passive solar — 4.5 du/a

Typological Transformation

This series of drawings illustrates the strategy undertaken to transform the typical block structure of the area to one that is compatible with the goals of greater energy and food self-reliance. As a derivative of the existing structure, new development is sensitive to the context of the area, and allows for incremental change of existing properties. All shadows are cast at noon December 21, to illustrate the most severe circumstances.

Figure 5.4 a) illustrates the existing structure and the severe constraints it imposes on passive solar gain and the area available for food production.

Figure 5.4 b) illustrates the maximum density possible under the existing structure, given the requirement for maximum solar exposure at noon, December 21. Buildings are placed on existing lot increments and represent a slight compromise on this requirement. In order to fully eliminate shading, buildings would require separation of three full lots or seventy-five feet. This would lower density even further.

Figure 5.4 c) illustrates a cluster solution to the re-structuring. Buildings still respect the existing lot structures, with a north - south separation of two lots. The small courtyards are in scale with the small houses, and provide for some semi or fully private outdoor space adjacent to each unit. Most of the site is left open for productive gardens. A larger common house is also included to meet the requirements of a collaborative housing cluster. An attached garage for car pool vehicles replaces the back alleys and multiple small garages. This change will be possible through social and site planning that aims to eliminate the need for personal vehicles.

Figure 5.4 d) illustrates a variation on the above, which includes a higher density garden apartment building. This low rise building, in its base configuration, includes eight studio apartments and a common atrium used for circulation and passive solar collection. An additional third storey could be added, boosting density without compromising building code regulations. As a small building under three storeys high, this structure falls under Section 9, allowing for greater flexibility in fire and structural requirements.

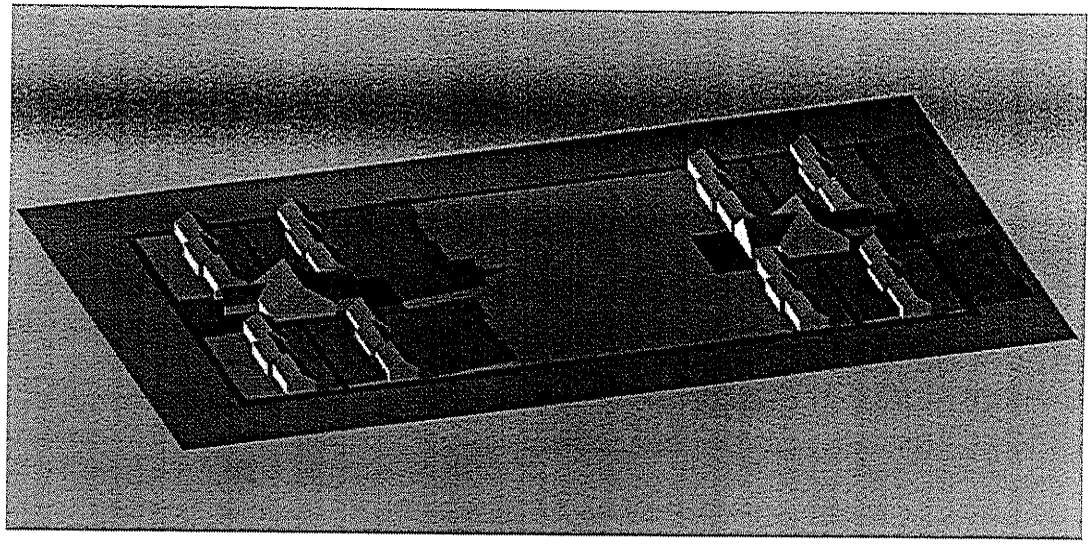


Figure 5.4 c: Passive solar clusters with common house, car pool garage, common garden — 8 du/a

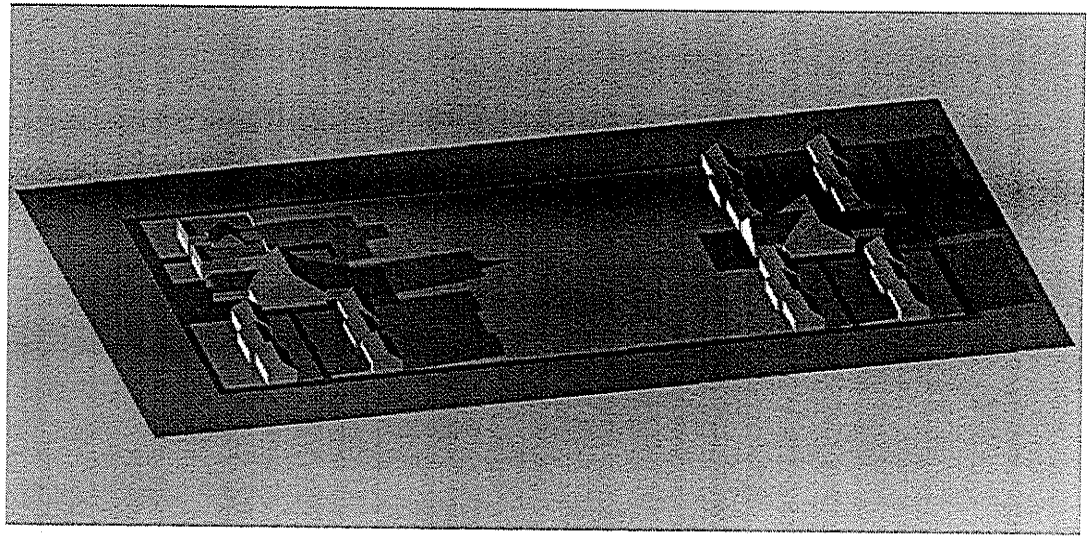


Figure 5.4 d: Passive solar clusters including garden apartment — additional density and greater diversity of unit size — 10 du/a

[20] Personal communication dated 16 February 1994.
[21] Saunders, Carolyn. "Some Regina Buildings are Untouchable" in *The Regina Leader Post* June 4, 1987
[22] Brennan, J. William. Op. cit. pg. 61.
[23] Saunders, Carolyn. Op. cit.
[24] Anonymous. City of Regina Heritage Tour Pamphlet. 1985.
[25] Saunders, Carolyn. Op. cit.
[26] Brennan, J. William. Op. cit. pg. 106.
[27] Saunders, Carolyn. Op. cit.
[28] Anonymous. City of Regina Heritage Tour Pamphlet. 1985.

Site Analysis

Natural Features

This drawing illustrates the generalized drainage patterns, existing vegetation, sunpath diagram and wind rose. Also shown are those parts of the site which may contain less than ideal soil conditions. A title search for contaminants through Saskatchewan Environment and Resource Management revealed "that there are no contaminated site concerns"[20]. The property containing bitumen storage tanks has been indicated because it would be prudent to do further testing at this location before attempting to grow plants intended for consumption. The rail line rights-of-way are also indicated because early spills may have gone unrecorded. Soils used in the rail bed construction are likely less than ideal for growing conditions and are certainly heavily compacted. Extensive soil remediation may be required to establish good growing conditions.

Figure 5.5: Naturalization on abandoned rail right-of-way

Heritage Properties

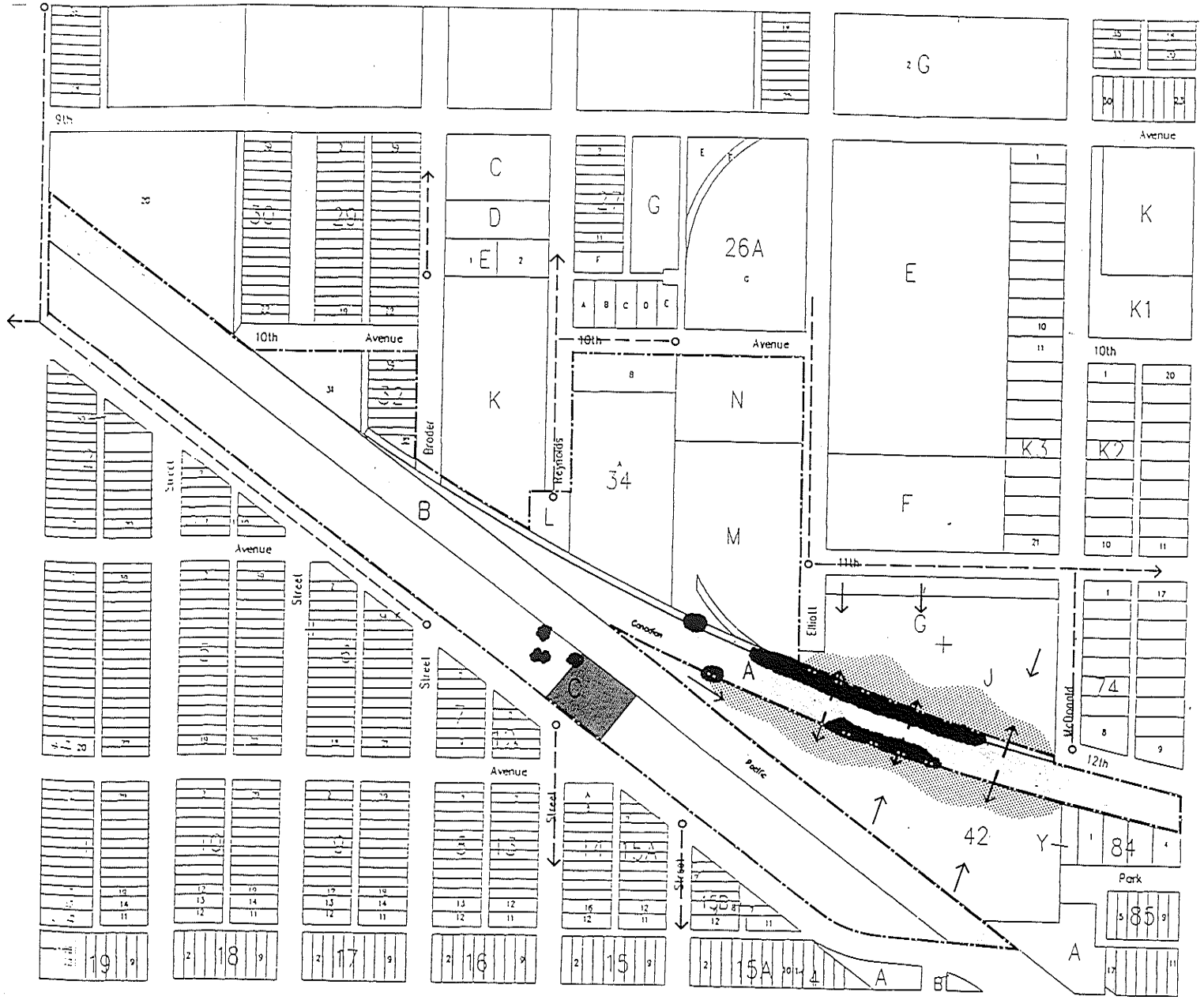
The Regina Light and Power building was built in 1904 when the city bought out and expanded the privately owned Regina Light and Power Company, established in 1890.[21] The coal fired generator was the city's only source of electricity until 1914, when the larger Regina Power House (now the Saskatchewan Science Centre) was built on the edge of Wascana Lake.[22] In 1964, the city sold off the power company to SaskPower, and the building now houses the Regina Police Junior Band.[23]

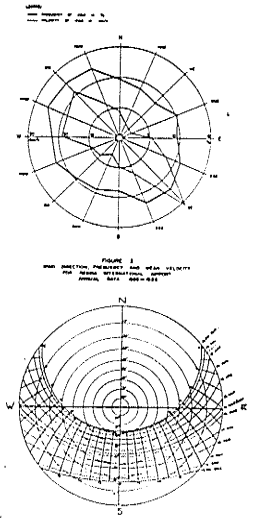
The Regina Brewing Company established its first operation directly south of this site, across Dewdney Avenue in 1906-07. The present building, now Molson's Brewery was built 1928-29.[24]

The General Motors plant, when constructed in 1928, was thought to be the key to Regina's industrial prosperity. Its peak capacity of 30,000 cars per year employed 850 people.[25] The stock market crash and ensuing depression quickly changed all that. By August 1930, the entire labour force had been laid off. Production resumed at about half capacity in 1937 and 1938, only to be suspended with the outbreak of World War II in 1939.[26] The Building then became Saskatchewan's largest munitions factory, supplying artillery for battles in North Africa and employing 600 people. Automobile production never resumed, and today the building houses a mixture of office and light industrial uses.[27]

The Shell Oil Company Gas Station, built in 1925, is the last remaining gas station of its kind and era in Regina.[28]

The Old No. 1 Firehall, located on the historic market square, was constructed in 1921 on the





Demonstration site

Naturalized areas

Low lying areas

Generalized surface drainage

Subsurface drainage

Potentially poor soils

Bitumen storage

Rail line r.o.w.

NATURAL FEATURES

N

0 20 40 80m

foundations of the Regina Market building, which was built in 1908. The building, of Belgian influenced design by Clemesha and Portnall, was designated a municipal heritage site in 1982. The building has been restored and now houses community facilities. The Market Square served as the location of the Regina Riot in 1935.

The Saskatchewan Courier Publishing Company was the publisher of the German language weekly *Der Courier*. The paper played a significant role in an area commonly known as Germantown. Reginans of German ethnic origin were second only to the British in number prior to World War II. The paper was the target of much ethnic tension during the First World War, being attacked twice in 1916 and 1917. The paper voluntarily ceased publishing in German in 1918 just two weeks prior to the Federal government banning all publishing in 'enemy alien' languages.[29] German language publication was revived in 1920, and the paper grew to be the most widely read German paper in Canada by the mid 1930's.[30]

St. Nicholas Romanian Orthodox Church was constructed in 1902 to house the congregation of Romanian immigrants who first arrived in Regina in 1890.[31] It also served other orthodox congregations prior to their ability to build their own churches.[32] St. Nicholas is the second oldest church in Regina's core area, and the oldest Romanian church in North America.[33]

The Ukrainian National Federation Auditorium was built in 1931.

The Ukrainian Labour Farmer Temple was founded 1917 through the amalgamation of a Ukrainian language lending library and a branch of the Ukrainian Social Democratic Party. They acquired the Romanian Hall for their purposes, and later built this building in 1923.[34]

Frederick Lee, a postal employee, first occupied the house at 1138 12th Ave. in 1915. The tiny house without a foundation is characteristic of the typical worker's house in this neighbourhood.[35]

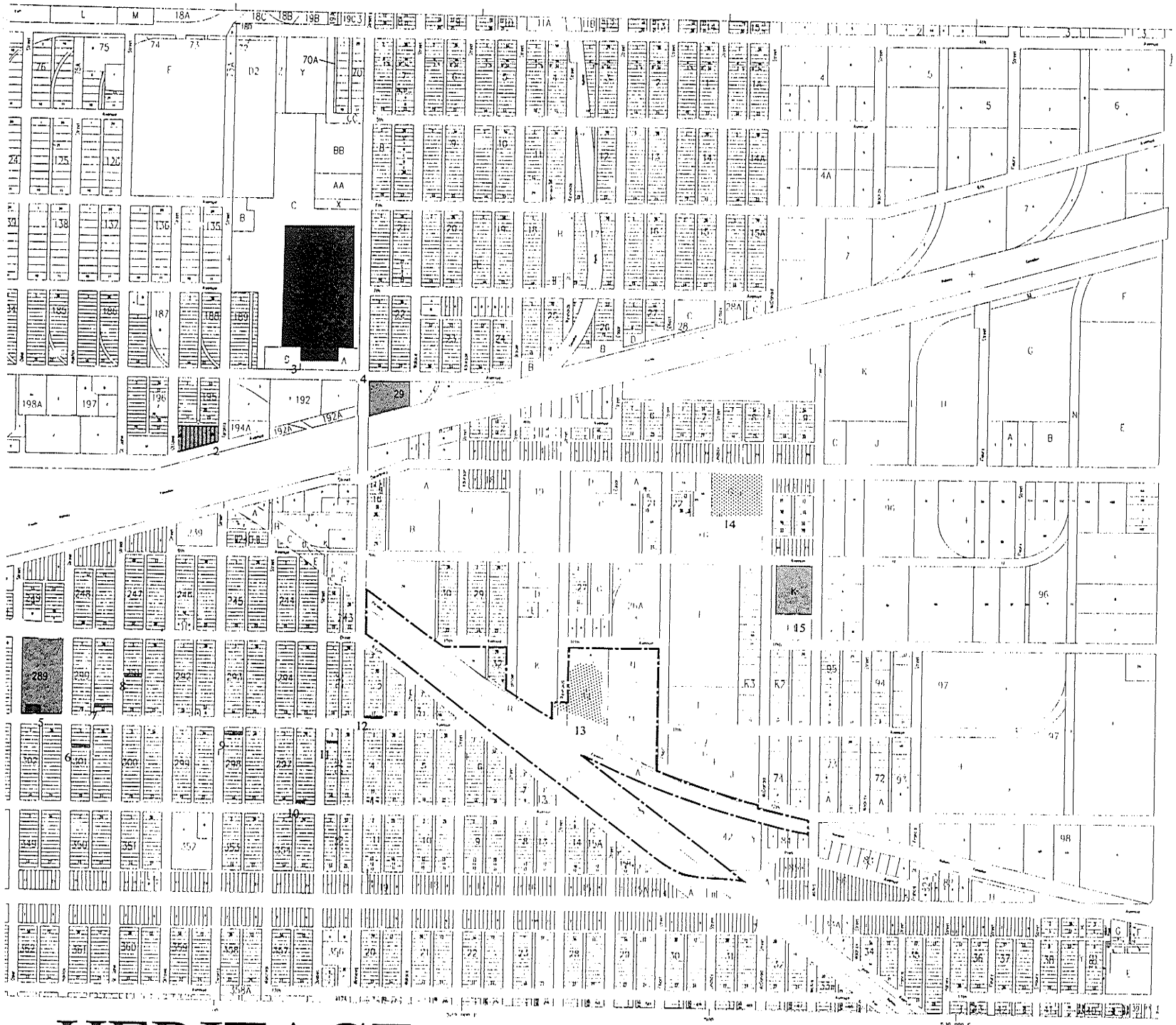
The Serbian Eastern Orthodox Holy Trinity Church was built in 1934. The Serbian Canadian Cultural Club was built in 1939.[36]

The only heritage structure to have been built on the demonstration site was the Abattoir built by Hugh Armour in 1905. This enterprise was seen as a major move towards an industrial economy in Regina, but was less competitive with larger facilities in Moose Jaw, Winnipeg, and Calgary.[37] The abattoir was demolished in the mid 1980s. The entire subdivision of Tuxedo Park had been subdivided and developed by Armour and was acquired by the city through tax delinquency in 1928.[38] Much of this property remains vacant to this day.

Innismore School which served the small residential population was demolished in 1988 after sitting empty for years.[39]

The Western Milling Company Flour Mill was the second flour mill in Regina, constructed in 1892.[40] The small mill, although not able to compete to a great degree with larger facilities in Moose Jaw, still stands and is operational.[41] Its orientation, askew to the street grid, but parallel to the CPR mainline is testament to the fact that the structure predates the subdivision of the area.

[29] Brennan, J. William. Op. cit. pg. 113.
[30] Ibid. pg. 119.
[31] Anonymous. City of Regina Heritage Tour Pamphlet. 1985.
[32] Brennan, J. William. Op. cit. pg. 66.
[33] Anonymous. City of Regina Heritage Tour Pamphlet. 1985.
[34] Brennan, J. William. Op. cit. pg. 115.
[35] Anonymous. City of Regina Heritage Tour Pamphlet. 1985.
[36] Ibid.
[37] Brennan, J. William. Op. cit. pg. 106.
[38] Ibid. pg. 123.
[39] "School is Gone" *The Regina Leader Post*, Feb. 4, 1988.
[40] Brennan, J. William. Op. cit. pg. 25.
[41] Ibid. pg. 61.



1. The Regina Light and Power Building
2. Regina Brewing Company (Molson's Brewery)
3. General Motors Factory
4. Shell Service Station
5. Old No. 1 Firehall and Old Market Square
6. Saskatchewan Courier Publishing Company
7. St. Nicholas Romanian Orthodox Church
8. Ukrainian National Federation Auditorium
9. Ukrainian Labour Farmer Temple Association Hall (AUUC)
10. Lee House 1138 12th Ave.
11. Ukrainian People's Home
12. The Serbian Eastern Orthodox Holy Trinity Church and The Serbian Canadian Cultural Club
13. Hugh Armour's Abbatoir (demolished 1985)
14. Innismore School (demolished 1988)
15. Western Milling Company Flour Mill

Demonstration site

Designated properties

Significant properties

Demolished

N

0 50 100 200m

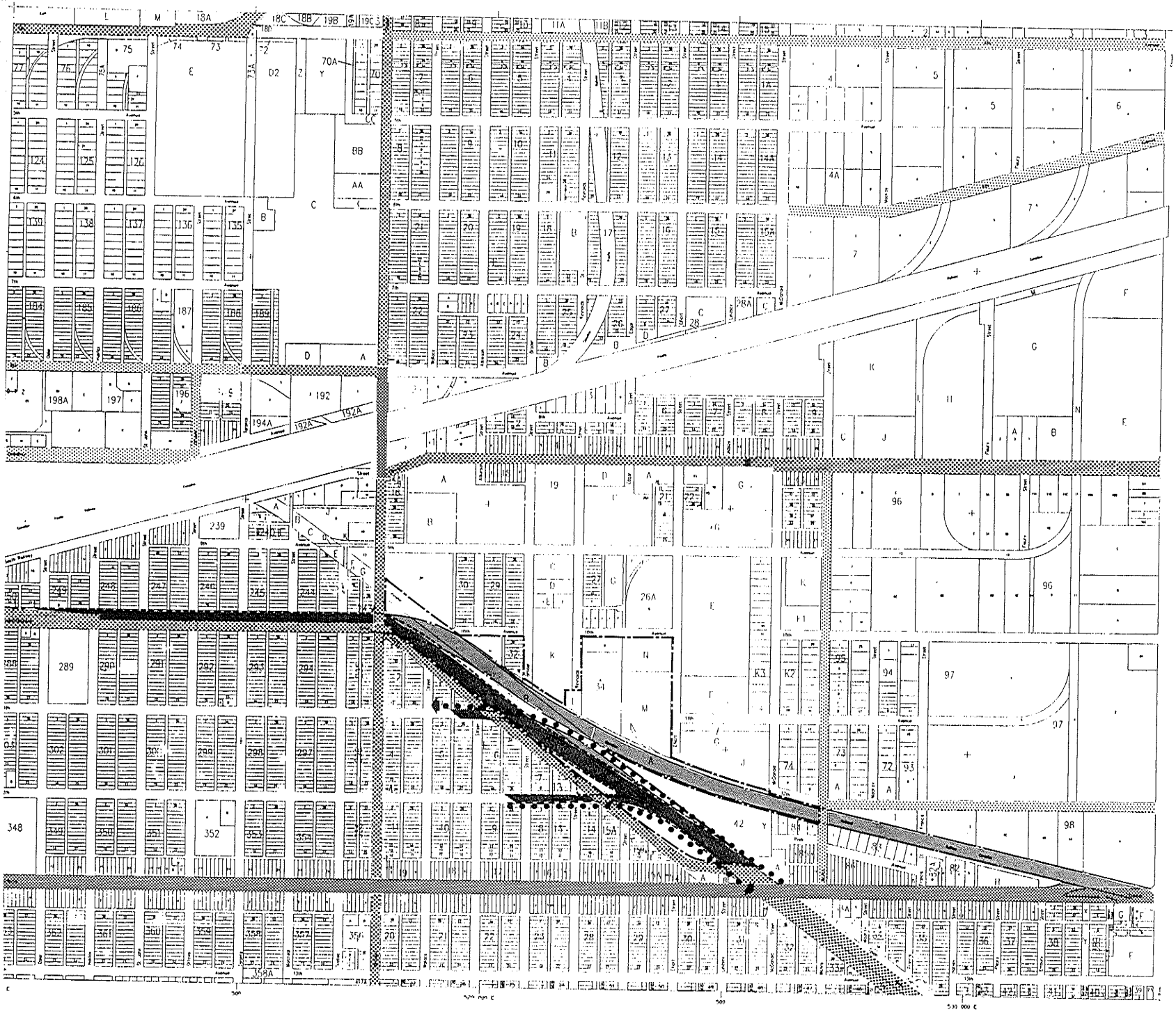
HERITAGE PROPERTIES

Figure 5.6: Arcola Avenue looking north at Victoria Avenue

Traffic Patterns

This drawing diagrams the proposed 'improvements' to Arcola Avenue and the eventual development of the Glenavon Expressway. Although Arcola Avenue and Saskatchewan Drive carry at most moderate levels of traffic, and traffic jams are essentially unknown in Regina, the City sees the need to develop expressways through the middle of the city into downtown. This roadway development is made possible through rail relocation, and only serves to replace one barrier with another. This plan dates from approximately twenty years ago, and at that time represented dated thinking.[42] In the early seventies, citizens of municipalities throughout North America protested such plans in reaction to massive freeway building in the 1960's. By this time, it had been shown that freeways and parking lots are self-fulfilling prophesies — the more traffic engineering caters to cars, the more they are used, and the demand for improvements continues. Although the 1991 Development Plan pays lip service to the "sustainable community", policies such as these indicate otherwise. A more sustainable approach to the development of Arcola Avenue and Saskatchewan Drive would follow the suggestion given in the 1986 *Renaissance Regina* pamphlet which states that Saskatchewan Drive would be developed "in the tradition of Regina's exceptional treed avenues." This approach, coupled with the proposed Southwest Transit Way and the development of a bike path on the CNR Glenavon right-of-way connecting to the burgeoning suburban areas would be much more "sustainable".

[42] Jacobs, Jane. *The Death and Life of Great American Cities.* Random House. New York. 1961. pg. 349.



Demonstration site

Proposed Road Expansion

Short term

Long term

Traffic Category	Vehicles/day
Light	0 -9999
Moderate	10000 -19999
Heavy	20000 & over

Proposed transit corridor

TRAFFIC PATTERNS

N

0 50 100 200m

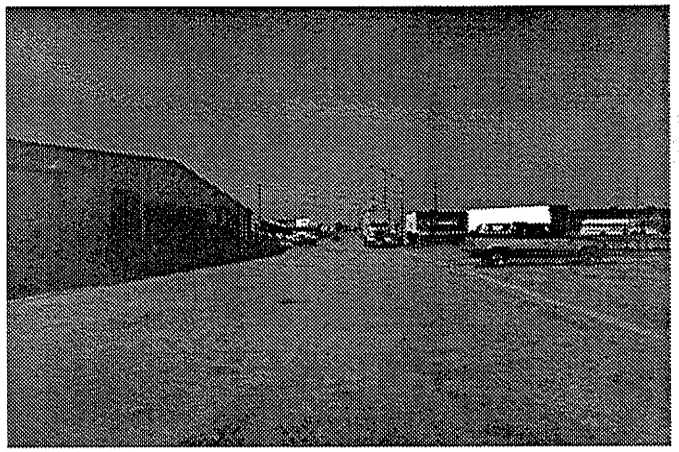


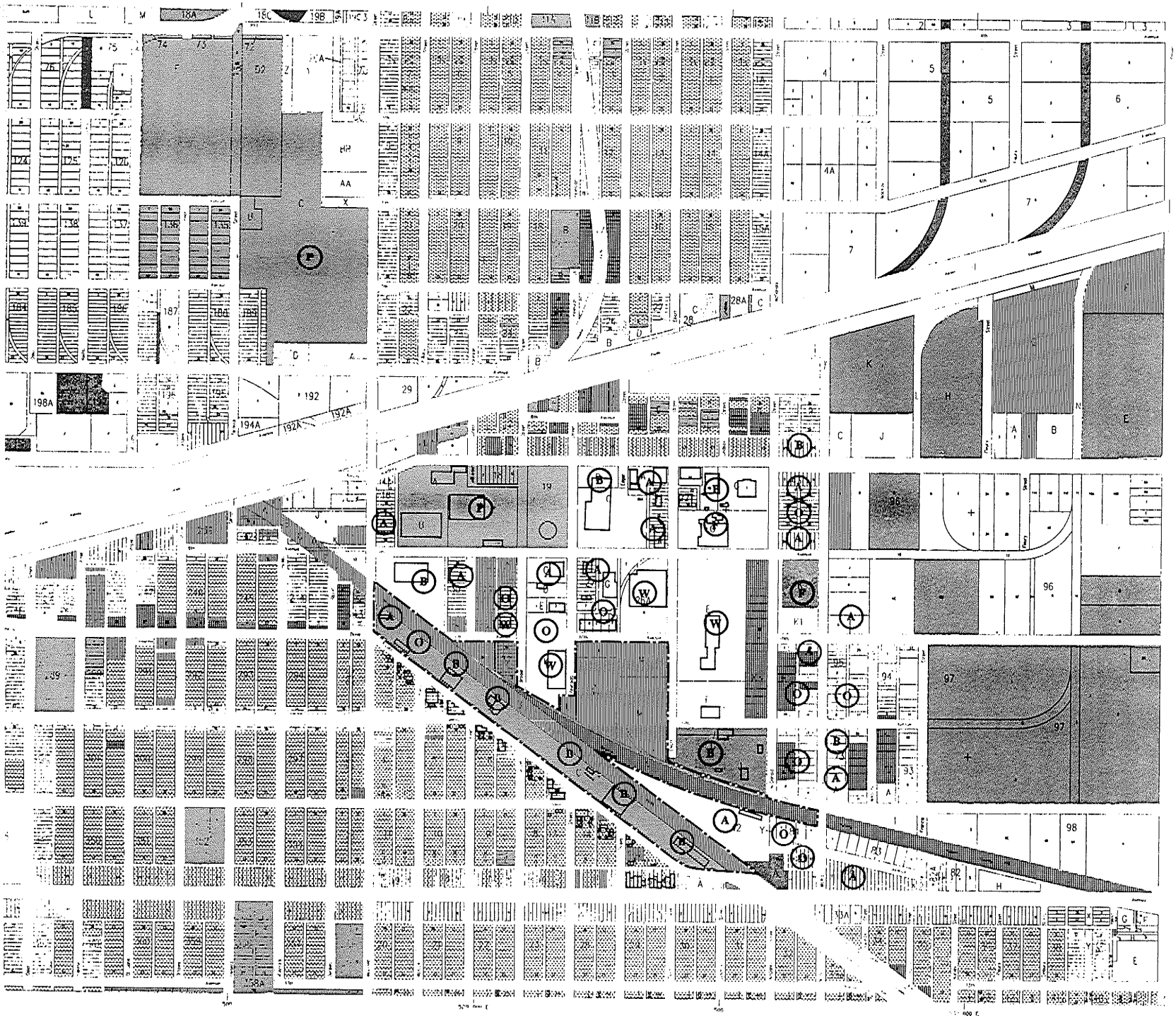
Figure 5.7: Adjacent warehouse

Land Use and Ownership

This drawing indicates land use as well as publicly owned property in and adjacent to the chosen demonstration site. Publicly owned property has been identified as it is the most useful property for an urban homesteading project. The large block of vacant land between Reynolds and Elliot, the original location of Hugh Armour's abattoir is presently owned by University Hospital in Saskatoon. The hospital acquired the land as a gift in 1989 after the abattoir was closed. Although the hospital is not a government institution per se, as a publicly funded institution it is not inconceivable that they would consider trading the title of the land to a senior level of government in exchange for support of a hospital development project. A hospital spokesperson has confirmed their desire to liquidate the title. The strip of land between Arcola Avenue and the former right-of-way of the CPR Arcola branch line is presently owned by the City of Regina. The present businesses are slated for demolition when the Arcola Avenue and Glenavon Expressway projects are developed.[43]

The commercial/light industrial category is used to designate wholesale, warehouse, office and repair activities. The heavy industrial category denotes those activities that are associated with manufacturing. The sub categories are used to further identify the type of activity. It is interesting to note the high percentage of automobile-based businesses. A 1988 City of Regina study on commercial activity in the core area indicated that 30% of consumer expenditure in Saskatchewan is automobile related.[44]

[43] Glenavon Expressway Study prepared by DelCan for the City of Regina.
[44] Derek Murray Consulting Associates. *Development Study for the Scarth Street Mall Technical Report.* August 1988.



Demonstration site

Residential and community

Public ownership

Vacant

Commercial / light industrial

Heavy industrial

Industrial Categories

(A) Automotive

(B) Building materials

(F) Food processing

(P) Public works yard

(W) Warehouse

(O) Office

LAND USE AND OWNERSHIP

N

0 50 100 200m

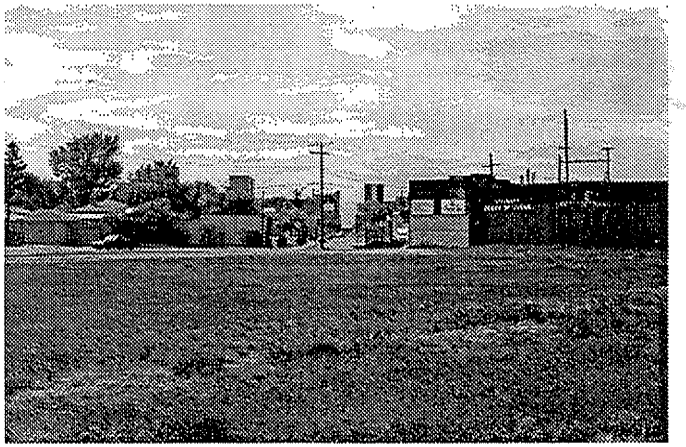


Figure 5.8: View down 11th Avenue towards downtown

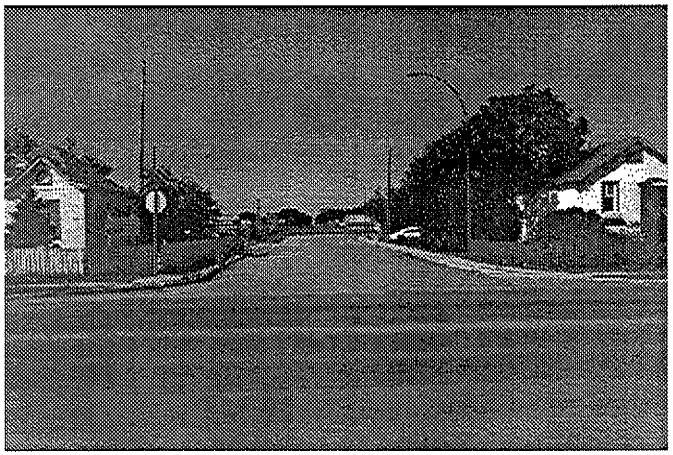
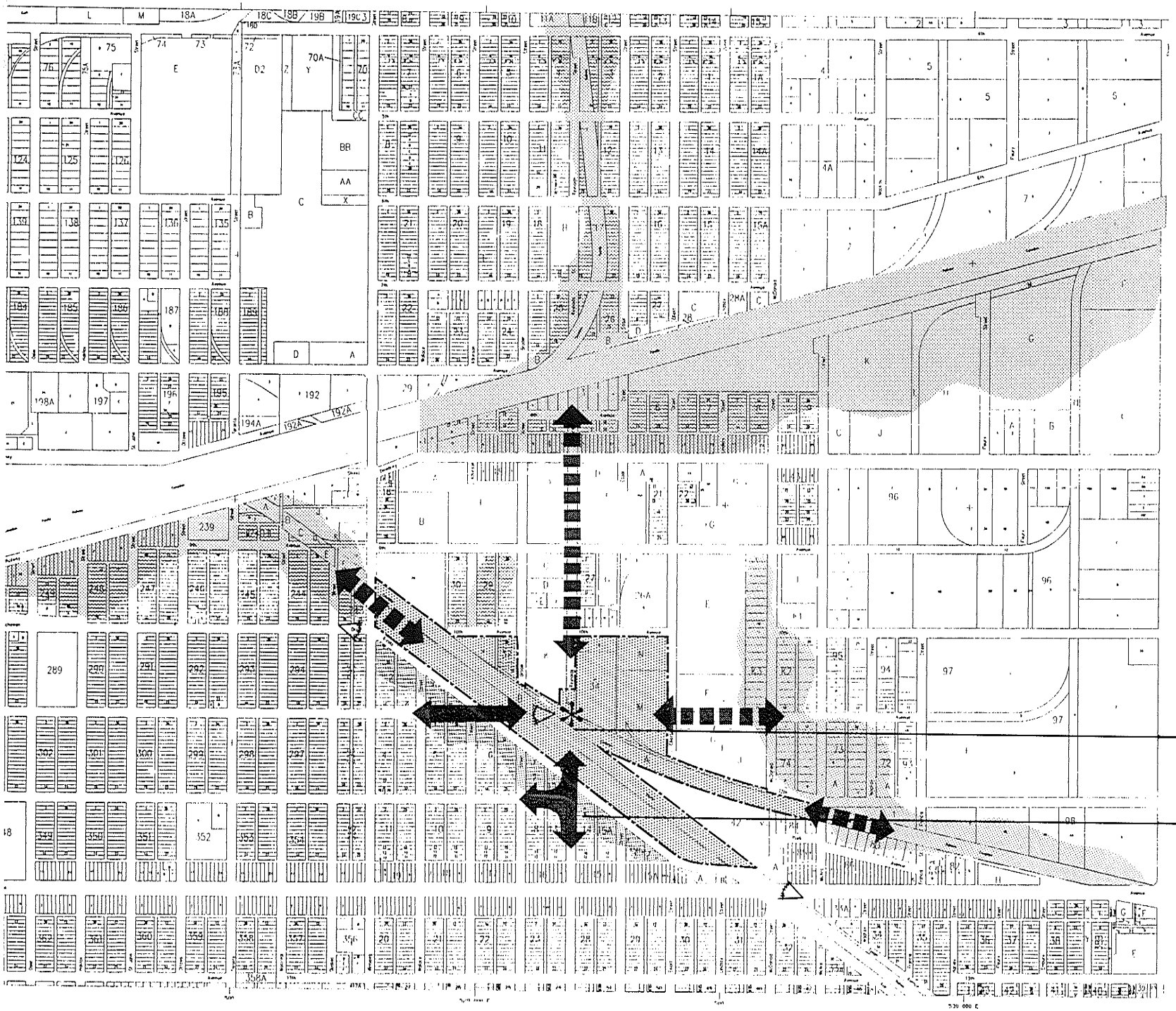


Figure 5.9: Innismore neighbourhood north of demonstration site

Connections

This drawing illustrates connections between the demonstration site and the immediate surroundings. Visual connections to and from the site relate to the traffic patterns and open areas. Strong connections between adjacent neighbourhoods are indicated for both circulation and contextual concerns. The potential growth connections are a summary of the various factors illustrated in the Land Use and Ownership drawing. These areas are particularly well suited to the proposed form of development.



CONNECTIONS

N

0 50 100 200m

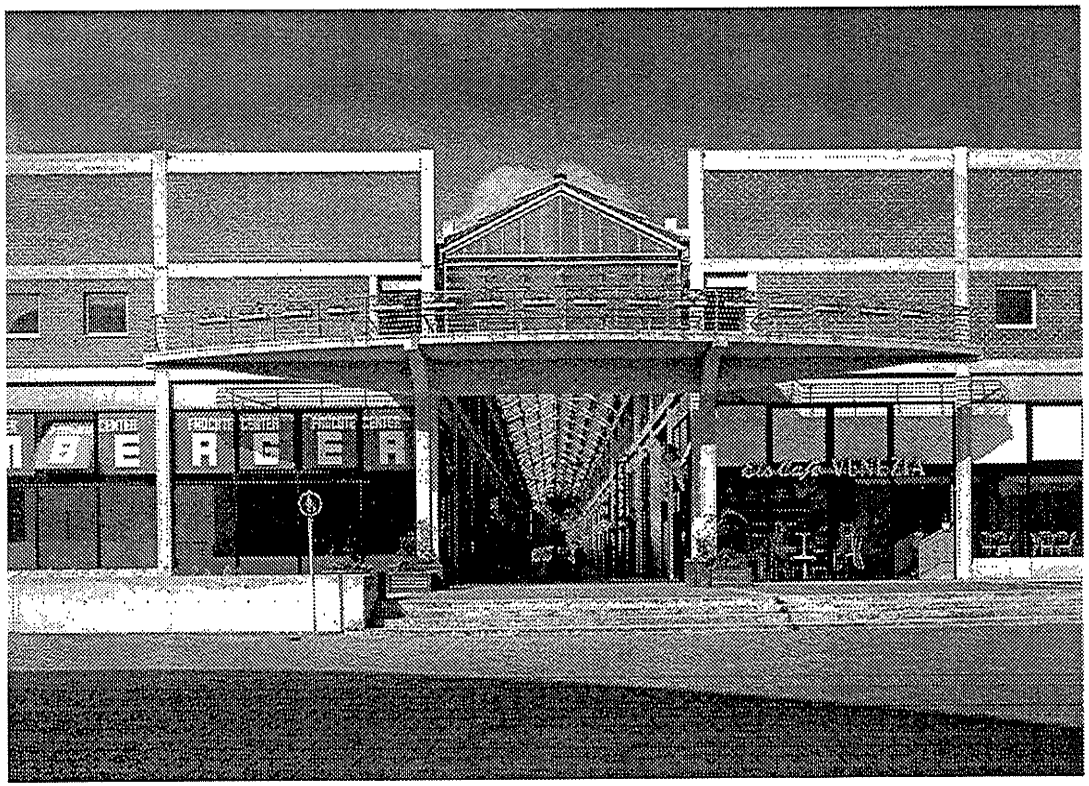
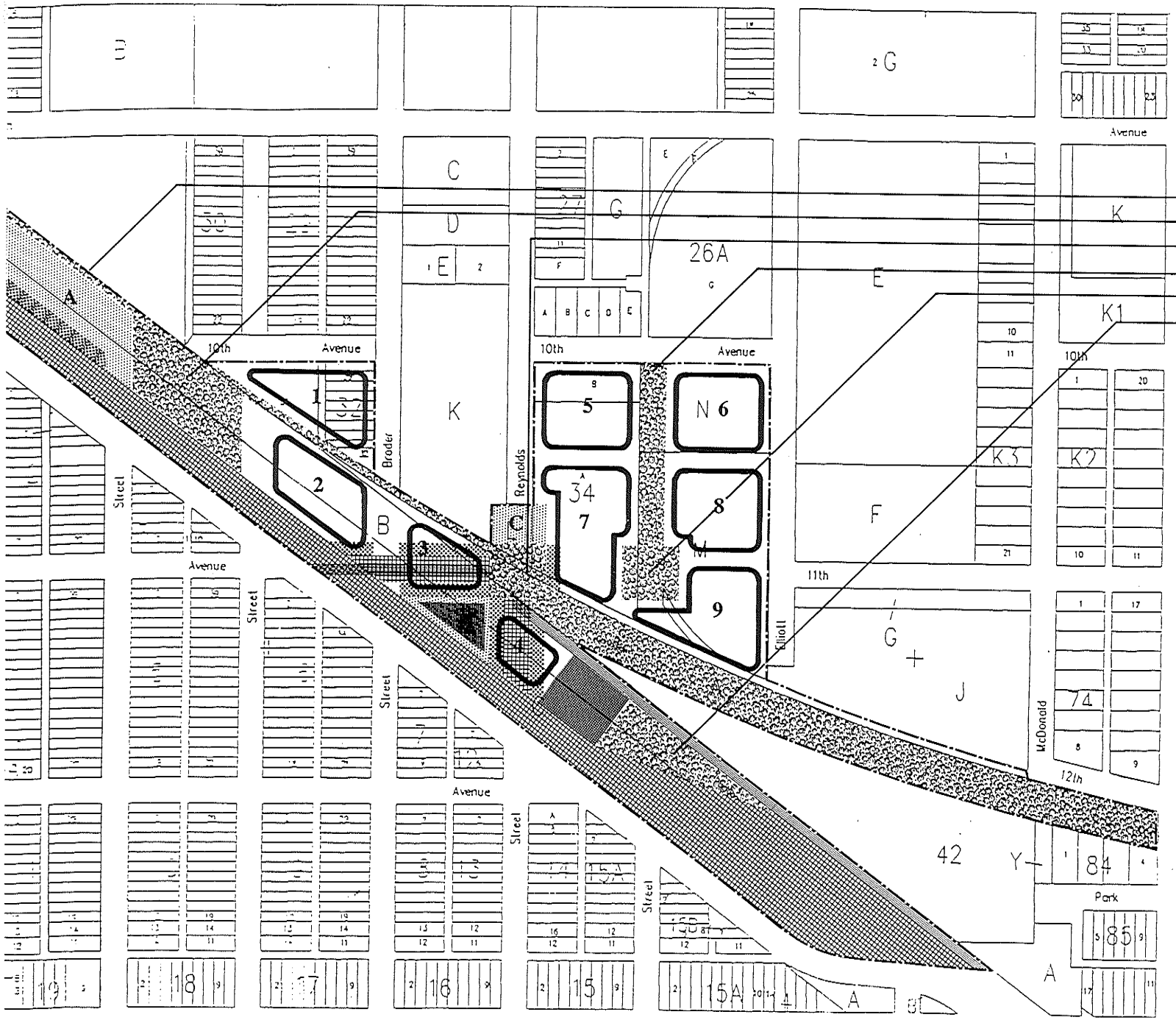


Figure 5.10: Residential units above commercial with glazed passageway by Josef Paul Kleihues, Germany

Functional Programme

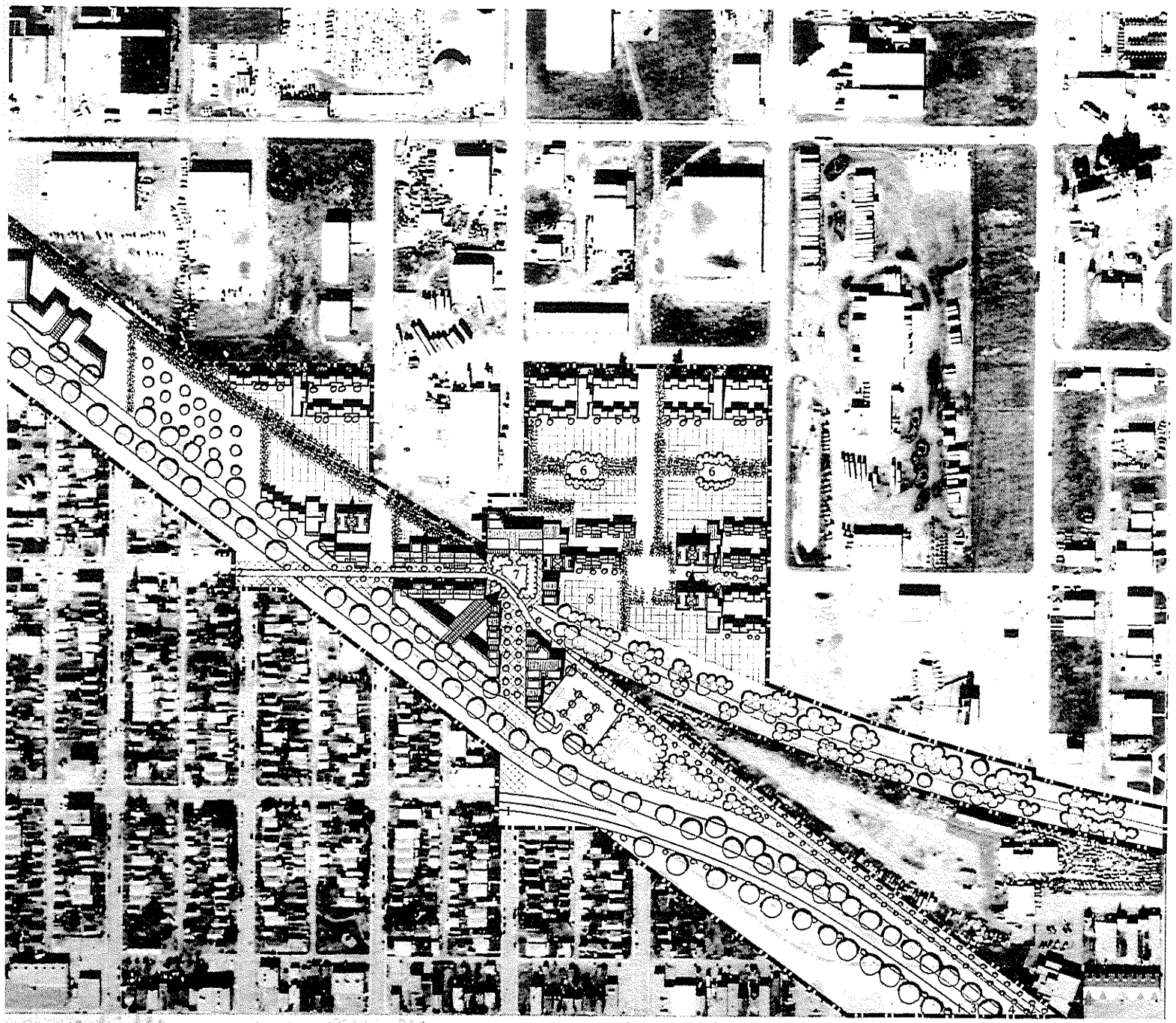
This drawing outlines the programme for the demonstration site, taking into account all of the factors in the site analysis drawings.



FUNCTIONAL PROGRAMME

Masterplan

This drawing illustrates the physical form of the community within the defined demonstration site. Areas shown in greater detail are further developed in subsequent drawings.



Demonstration site

1. Transitway eastbound
2. Transitway westbound
3. Arcola Avenue eastbound
4. Arcola Avenue westbound
5. Community garden
6. Dugout
7. Pool

MASTERPLAN

N

0 20 40 80m

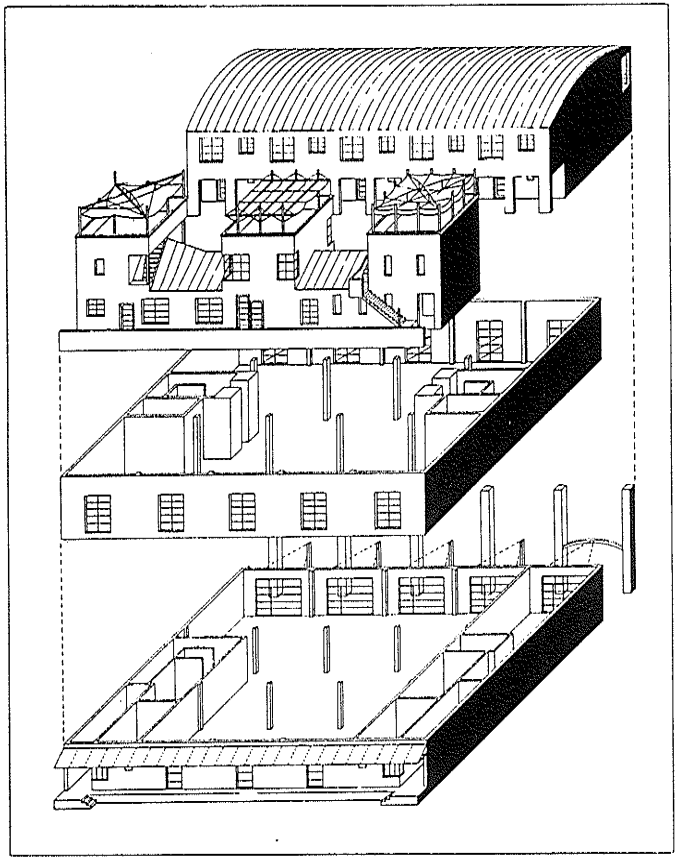


Figure 5.11: Living above the store — Mixed use building, Seaside by Steven Holl

Market Square

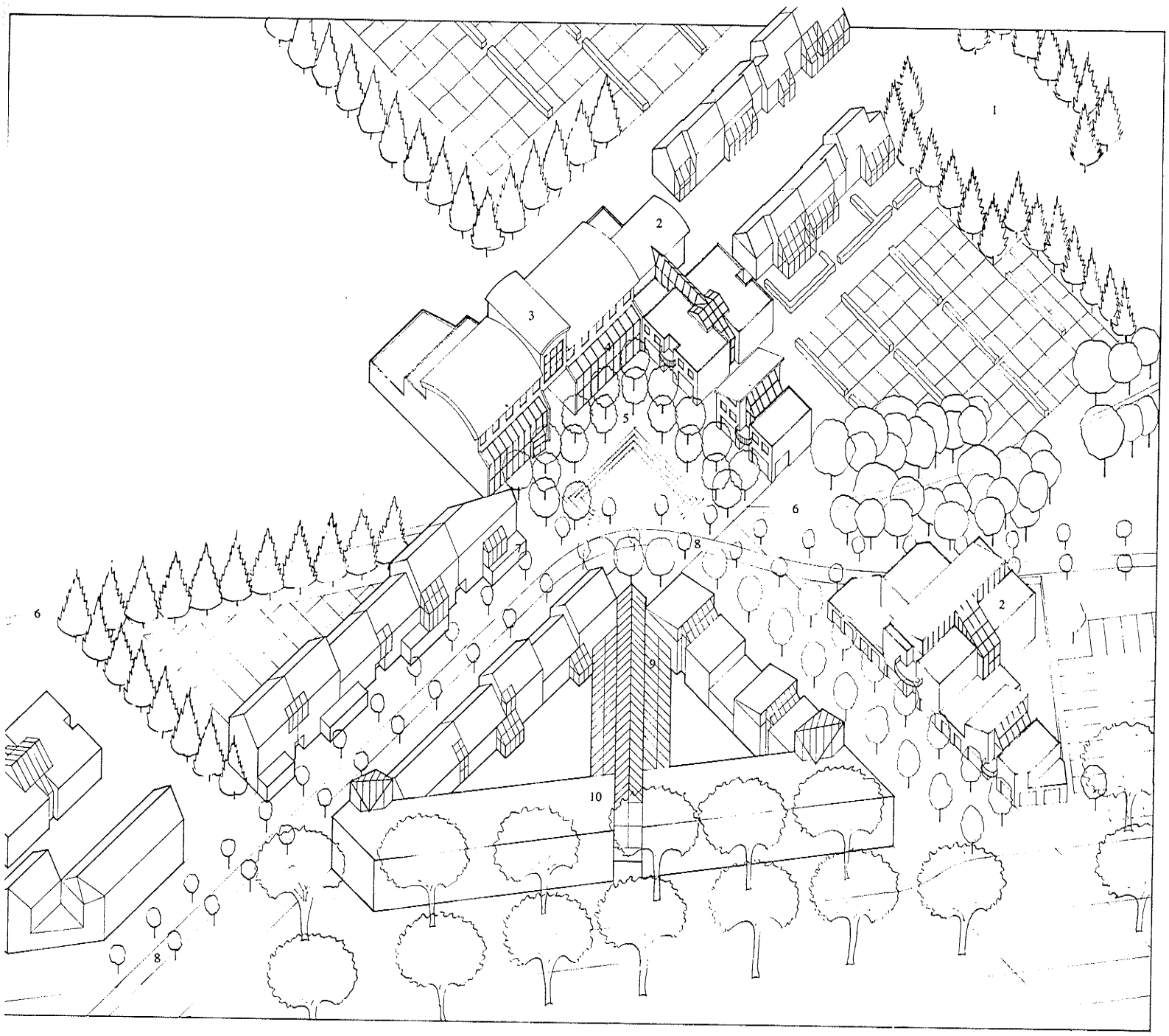
This drawing develops the elements that contribute to the unique character of the market square. The community square, a green counterpart to the market square is restricted to use by the community. It can be planted in turf for gatherings or recreation, native forbes and grasses, or dedicated to special crops not grown in the gardens. The adjacent common garden is for the use of the clusters with less land, and a more commercially based economy. The denser buildings, especially those facing north-south running Reynolds street, use atria to retain passive solar potential.

The community building, which visually terminates Reynolds street, bridges the street to provide emergency vehicle access to the square, and allow pedestrian and bicycle movement. The building houses the central solar aquatic sewage treatment system, office and resource centre, and an assembly hall on the ground floor, with hostel space above.

The market square itself can be used by the community, and others upon invitation, to sell surplus produce and other products. In inclement weather, the market hall extends this activity.

The office building, which is bisected by the market hall, contains commercial shops at grade and offices above. The building's form protects the market square and adjacent housing from noise generated along the busier Arcola Avenue.

The building closest to the square houses a transit shelter, cafe and newsstand. The facility could also provide change rooms, lockers, and bike stands for those transferring from bicycle to transit commuting.



1. Community square
2. Common house
3. Community building
4. Solar aquatic sewage treatment
5. Market square
6. Bike path
7. Transit terminal / Cafe / Newstand
8. Transit way
9. Market hall
10. Office building

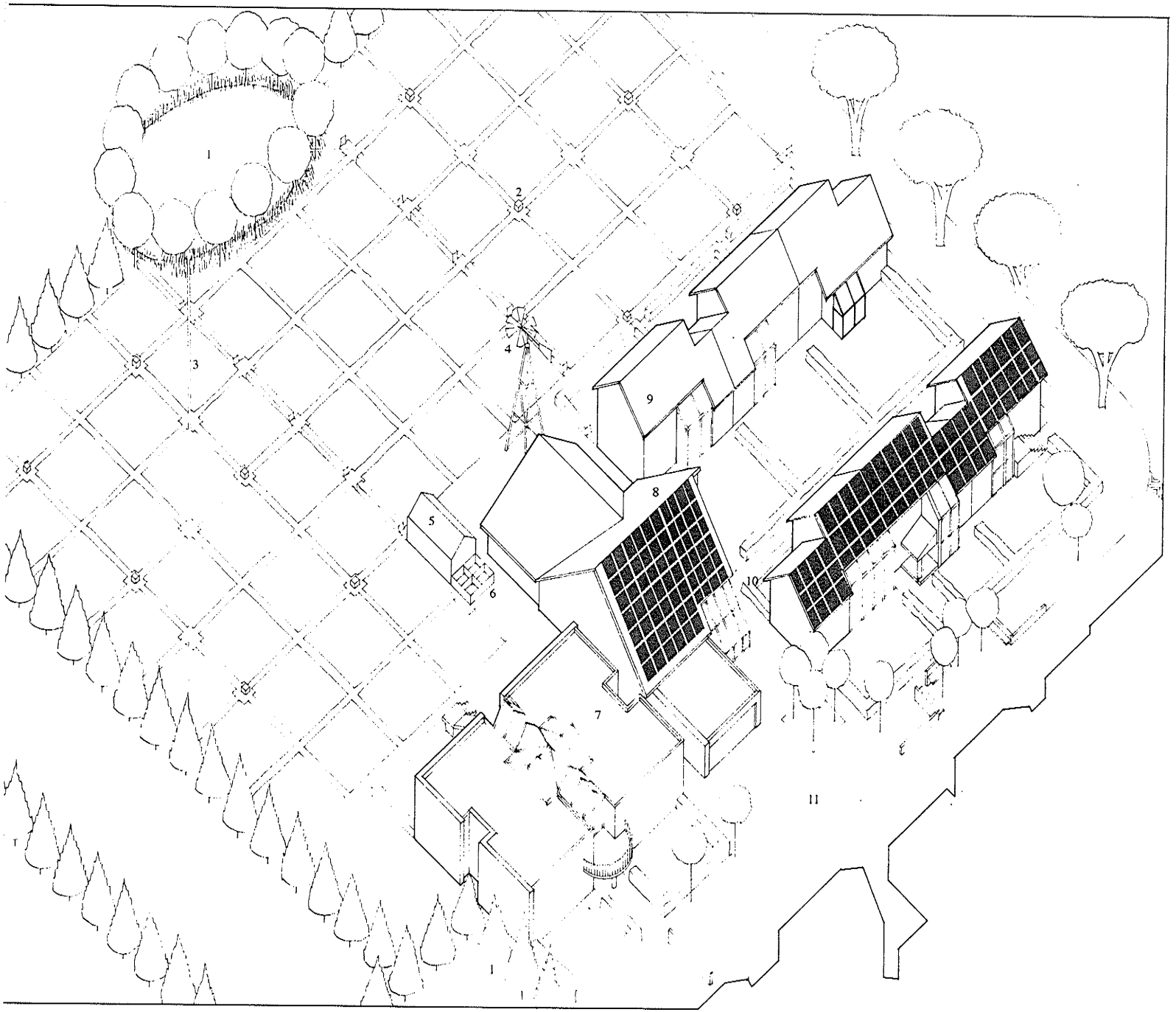
MARKET SQUARE

N

0 2.5 5 10m

Typical cluster

This drawing illustrates, in greater detail, the relationship between the various buildings, woonerf street, courtyard, gardens and other landscape elements.



1. Dugout
2. Bee hives
3. Flowform water chain
4. Windmill
5. Tool shed and livestock
6. Compost
7. Garden apartment
8. Common house
9. Rowhouse
10. Solar panels
11. Woonerf

TYPICAL CLUSTER

N

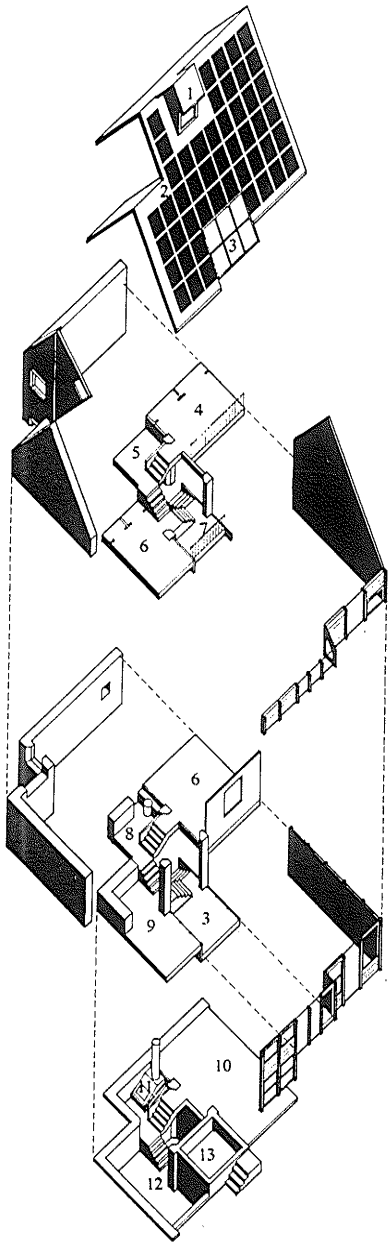
0 2.5 5 10m

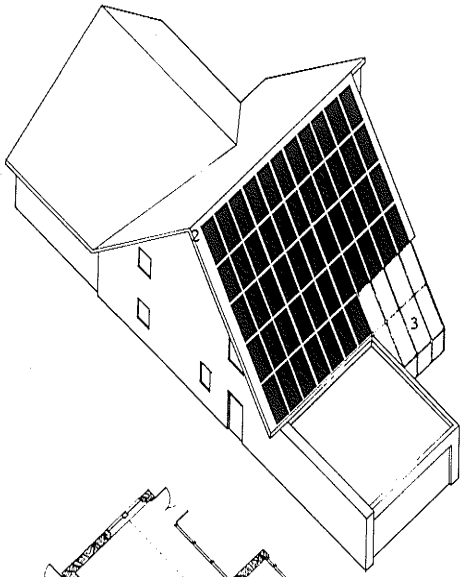
Row and Common Houses

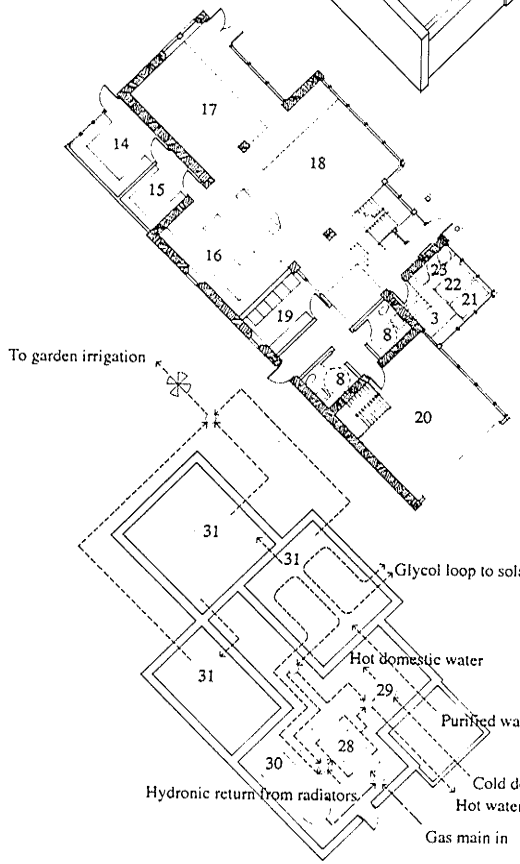
The exploded axonometric of the Row house illustrates how each room is distributed on a separate floor plate. This multiple split level is intended to provide greater flexibility of use, similar to Hertzberger's Diagoon Houses. The central stairwell links spaces and at the same time can be closed with a simple partition. The stairwell also acts as a thermal chimney, a passive ventilation shaft linked to the greenhouse and an operable clerestory at the top of the house. Thick adobe walls on the north and west walls have few, small windows and protect the house like a windbreak, as well as act as thermal mass to store the passive solar gain. The south and east walls are lightweight, balloon framed walls with generous glazing, especially on the south. The balloon frame allows the small wood framed floor plates to be suspended, and therefore ultimately flexible over time. Changes in use can be accommodated internally without altering the external envelope.

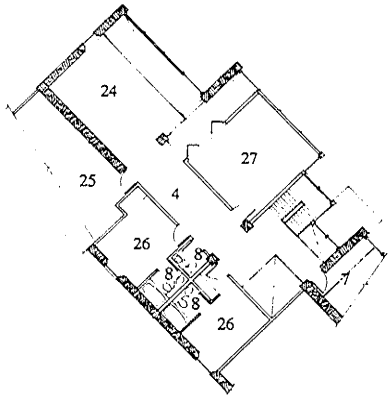
The Common House is fairly typical of the type in collaborative housing, with the addition of a few amenities specific to the Eco-village programme. A summer kitchen and pantry allow garden produce to be managed efficiently. The pantry, outside the main envelope, but insulated and partly heated acts as a cold room. The greenhouse contains the solar aquatic treatment system for all the greywater produced in the cluster. The garage is large enough to house three vehicles, which would be shared by the entire cluster. Since most employment is provided within the community, and there are good transit and bicycle connections to downtown, the private automobile can be eliminated. A truck or van for hauling materials and/or people, a small, possibly electric car for around town errands, and another vehicle for longer, out of town trips would provide flexibility and convenience.

The schematic diagram of the basement level illustrates how the greywater recycling system and district heating system are integrated. Solar panels mounted on the roof of the common house and half of the row houses heat water in the primary cistern, which acts as thermal storage. A heat exchange coil provides heat for the entire cluster through a hot water radiant system. Back-up heat is provided by high efficiency gas fired boilers which is supplemented by a methane digester. The cisterns, which store approximately three months worth of recycled greywater, are slowly emptied for irrigation in the dryer summer months, when heat is not required. When cisterns do not require filling, recycled water is released to the storm sewer.









---> Direction of flow

○ Water valve

◯ Gas valve

1. Clerestory
2. Solar panels
3. Greenhouse
4. Loft
5. W.C. or storage
6. Bedroom
7. Upper greenhouse
8. W.C.
9. Kitchen
10. Living (or workshop)
11. Compost toilet
12. Bedroom or office
13. Rock storage
14. Summer kitchen
15. Pantry
16. Common kitchen
17. Sitting / playroom
18. Dining
19. Laundry
20. Garage
21. Rooted aquatic plants
22. Rooted and floating aquatic plants
23. Fish tanks
24. Crafts or office
25. Attic
26. Guest
27. Quiet sitting / library
28. Boilers
29. Water heater
30. Methane digester
31. Cisterns

ROW AND COMMON HOUSES

N

0 2 4 8m

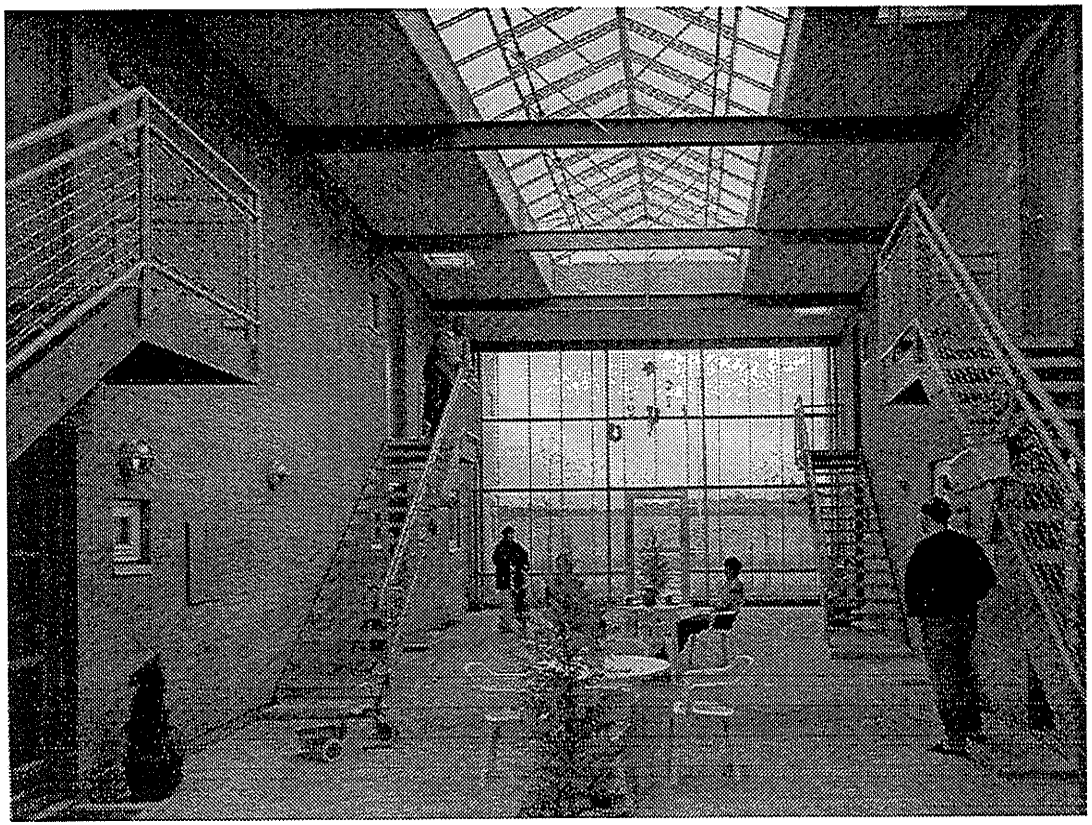
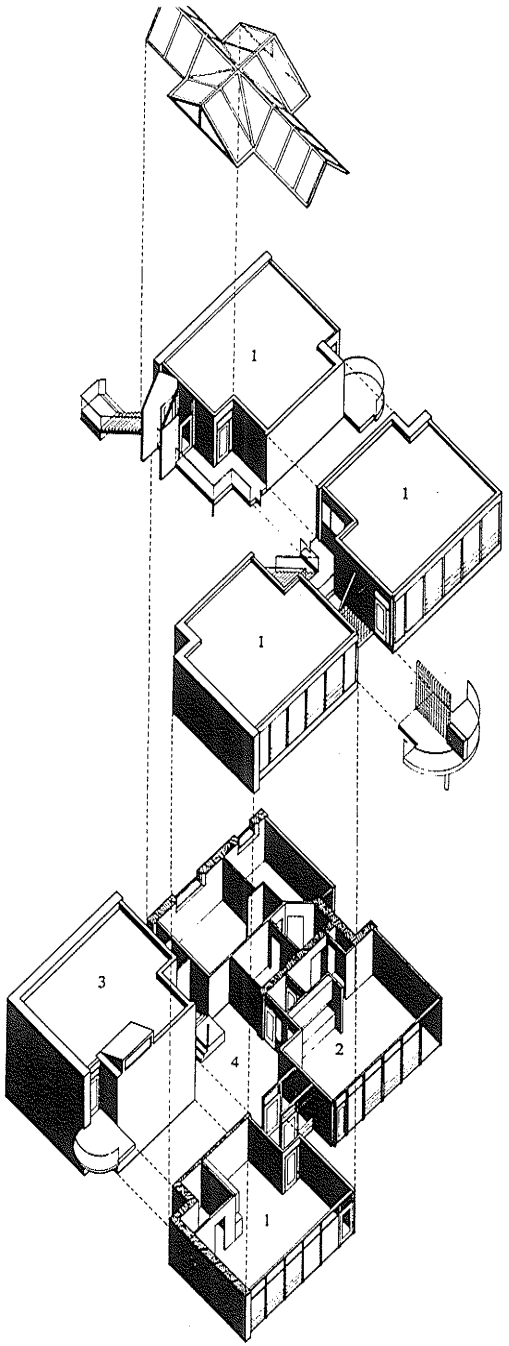
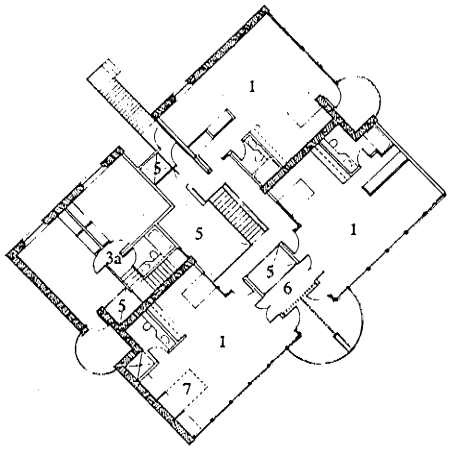


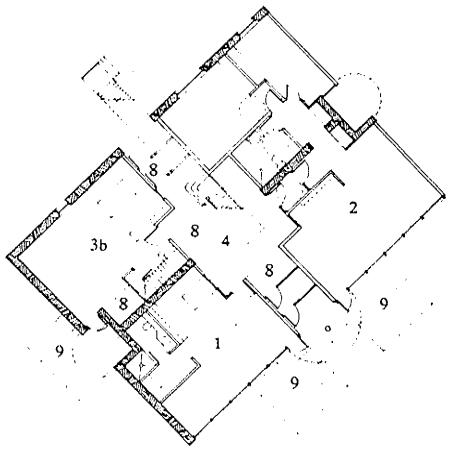
Figure 5.12: Atrium Housing, Odense, Denmark

Garden Apartment

This drawing illustrates the flexibility of this building type. Like the row and common houses, the north and west walls are adobe while the south and east are wood frame. In addition, the party walls between units are adobe, providing good sound separation and additional thermal mass. The atrium, doubling as the circulation core, allows light and solar gain to reach deep into the building. The illustrated building is two stories, but this type could be three stories without requiring an elevator or more restrictive building codes. The illustration shows how eight studios units can be modified to create a two bedroom duplex apartment, a fully accessible two bedroom apartment and four studio apartments. The duplex apartment, having small windows on the north side, borrows south light from a clerestory window and a window above the stair opening into the atrium. The four studio units display different variations on the layout of these small spaces. The two second floor south units share a greenhouse shelf in the atrium.







1. Studio apartment
2. Accessible 2 bedroom apartment
3. Two bedroom duplex apartment

3a. (Upper)

3b. (Lower)

4. Atrium
5. Open to below
6. Plant shelf
7. Murphy bed
8. Open above
9. Patio

GARDEN APARTMENT

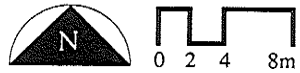


Figure Ground

This drawing illustrates how the proposed built form links the existing neighbourhood. The smaller grain pattern and attention to the block structure reinforce its relationship to the residential area to the south, while the aggregate form of linked structures mediate with the coarser grain of the industrial buildings to the north. Atria are indicated, as they are neither fully indoor or outdoor spaces.

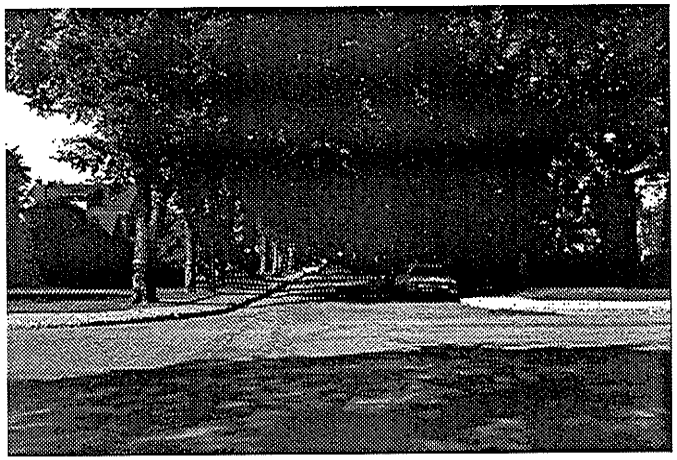


Figure 5.13: Distinctive pattern of American Elm street trees in Regina

Landscape Form

This drawing illustrates the patterns formed by landscape elements. Combined with the figure ground, it would give an approximation of the masterplan. The outline species list was developed through two criteria. Species were chosen either for their food production capabilities, or for their appropriateness as 'native' species. As few trees are strictly native to the high, semi-arid plain around Regina, many species had to be chosen from the prairie region as a whole.

White Spruce, although principally found on the northern edge of the aspen parkland, is occasionally found on the north slopes of the nearby Qu'appelle Valley. It is also a common windbreak species in agricultural areas nearby, and a common ornamental in Regina. Swiss Stone Pine, was chosen primarily as a source of pine nuts. The two species would be intermixed to avoid a monoculture.

Boulevard trees are a combination of American Elm and Plains Cottonwood. The American Elm is the most common street tree in Regina, and is now under threat from the arrival of Dutch Elm Disease. If the disease spreads rapidly, it will greatly alter the general appearance of Regina. It is still important to use it, however, as young, healthy specimens may eventually develop defense mechanisms against the disease. In the mean time, research is looking for other solutions to the epidemic. Plains Cottonwood, which has the closest size and habit to American Elm, is used to avoid a monoculture and to develop a succession approach to the planting. Existing boulevard plantings are all of a similar age. Trees that do not succumb to disease die of old age, all around the

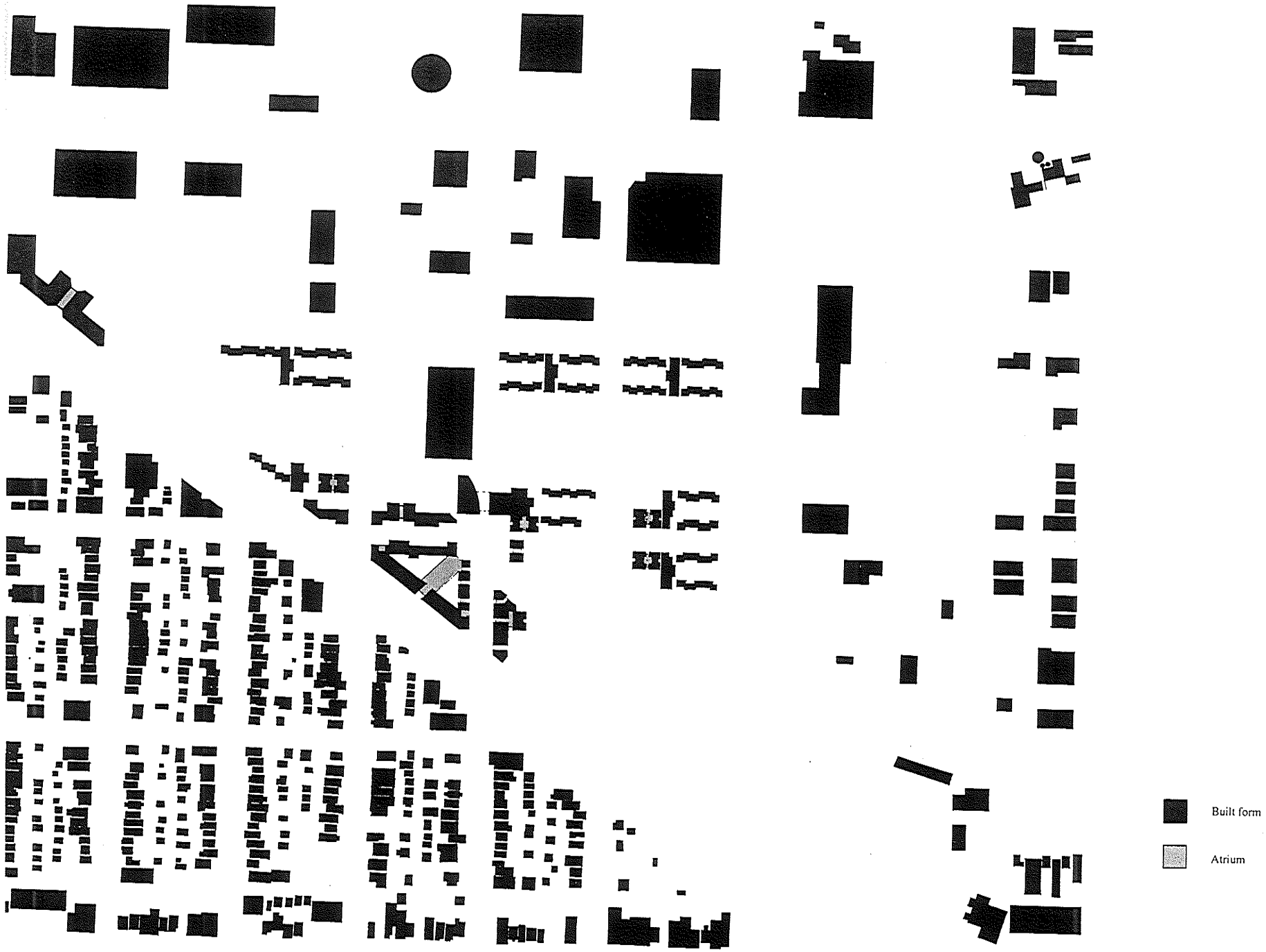
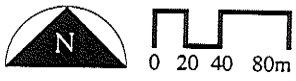


FIGURE GROUND



same time. By combining species with different growth rates and life spans, sustainable forestry can maintain a healthier, more diverse urban forest.

There is now a broad range of hardy fruit trees available for the prairies. Orchard trees listed are some of the hardiest. A large selection of apples are available and should be chosen to get a good mix of flavours and ripening rates, to have fruit available throughout the season.

Smaller fruit trees are used on the south side of houses where they are more protected and can provide shading of windows in the summer.

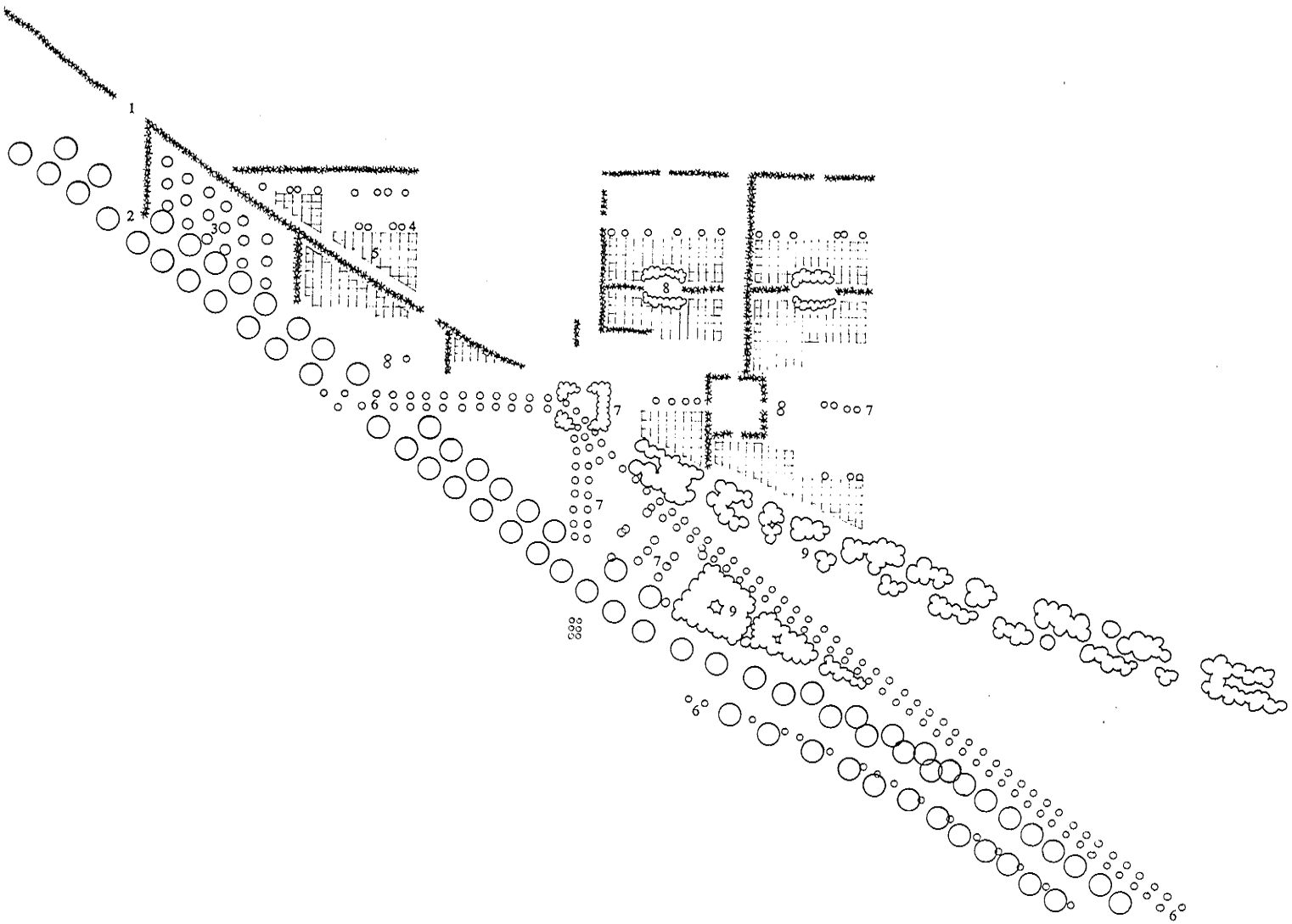
Shrubs are used to define private yards and provide shade and windbreaks in the gardens. They are chosen for their berries, or in the case of caragana to fix nitrogen in the soil. Caragana pods are also edible, although they must be picked when they are young and tender, as they become bitter and tough very quickly.

Schubert choke cherry is used for its distinctive colour to set off the Transit way from adjacent areas. To be most affective, this should be consistent throughout the city, and strictly limited to transit ways in public areas.

Street trees are the smaller of the river bottom species which do well as street trees on the prairies. Street rights-of-way in the demonstration site are the same as the rest of the city, but setbacks are eliminated, and in some cases, encroachments are allowed, effectively narrowing the paved area. For this reason, elms would not be appropriate.

The trees around the dugouts are intended to replicate the aspen bluffs found in lower, wetter areas of the gently rolling prairie surrounding Regina. The Trembling Aspen would initially be planted in a formal ellipse, and through suckering would take on a less formal quality over time.

Species used in the 'naturalized' areas would be primarily those found in the aspen bluff community, with the exception of the larger Balsam Poplar. This species, usually found further north in aspen parkland, is widely used as an ornamental in Regina, and has 'naturalized' itself on the site through windborne seed.



1. WINDBREAK
   Picea glauca — White Spruce
   Pinus cembra — Swiss Stone Pine

2. BOULEVARD TREES
   Populus deltoides — Plains Cottonwood
   Ulmus americana — American Elm

3. ORCHARD
   Malus sp. var. — True and Crabapples
   Prunus sp. var. — plums
   Pyrus ussuriensis var. 'urc' — Pear

4. SMALL FRUIT TREES
   Amelanchier alnifolia — Saskatoon
   Corylus americana — American Hazelnut
   Prunus tomentosa — Nanking Cherry
   P. virginiana var. melanocarpa — Chokecherry
   Ribes sp. — currants and gooseberries
   Viburnaum trilobum — Highbush Cranberry

5. SHRUBS
   Caragana arborescens —Common Caragana
   Rosa rugosa — Rugosa Rose
   Rubus sp. — Raspberry

6. TRANSITWAY
   Prunus virginiana var. melanocarpa 'Schubert' — Schubert Chokecherry

7. STREET TREES
   Acer negundo — Manitoba Maple
   Fraxinus pennsylvanica — Green Ash
   Tilia americana — Basswood

8. DUGOUTS
   Populus tremuloides — Trembling Aspen
   Salix sp. — willows

9. 'NATURALIZED AREAS'
   Alnus sp.—elders
   Amelanchier Alnifolia — Saskatoon
   Cornus stolinifera — Red Osier Dogwood
   Populus balsamifera — Balsam Poplar
   P. tremuloides — Trembling Aspen
   Prunus pennsylvnica — Pincherry
   P. virginiana — Chokecherry

LANDSCAPE FORM

N

0 20 40 80m

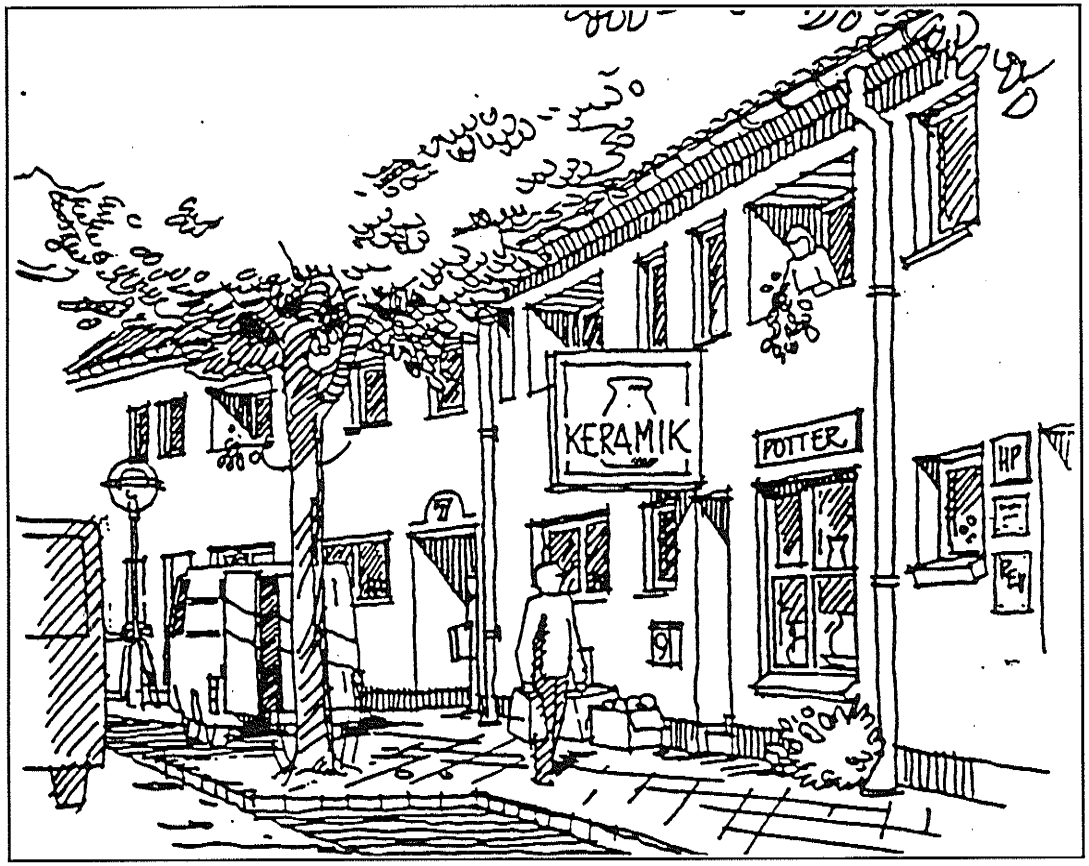
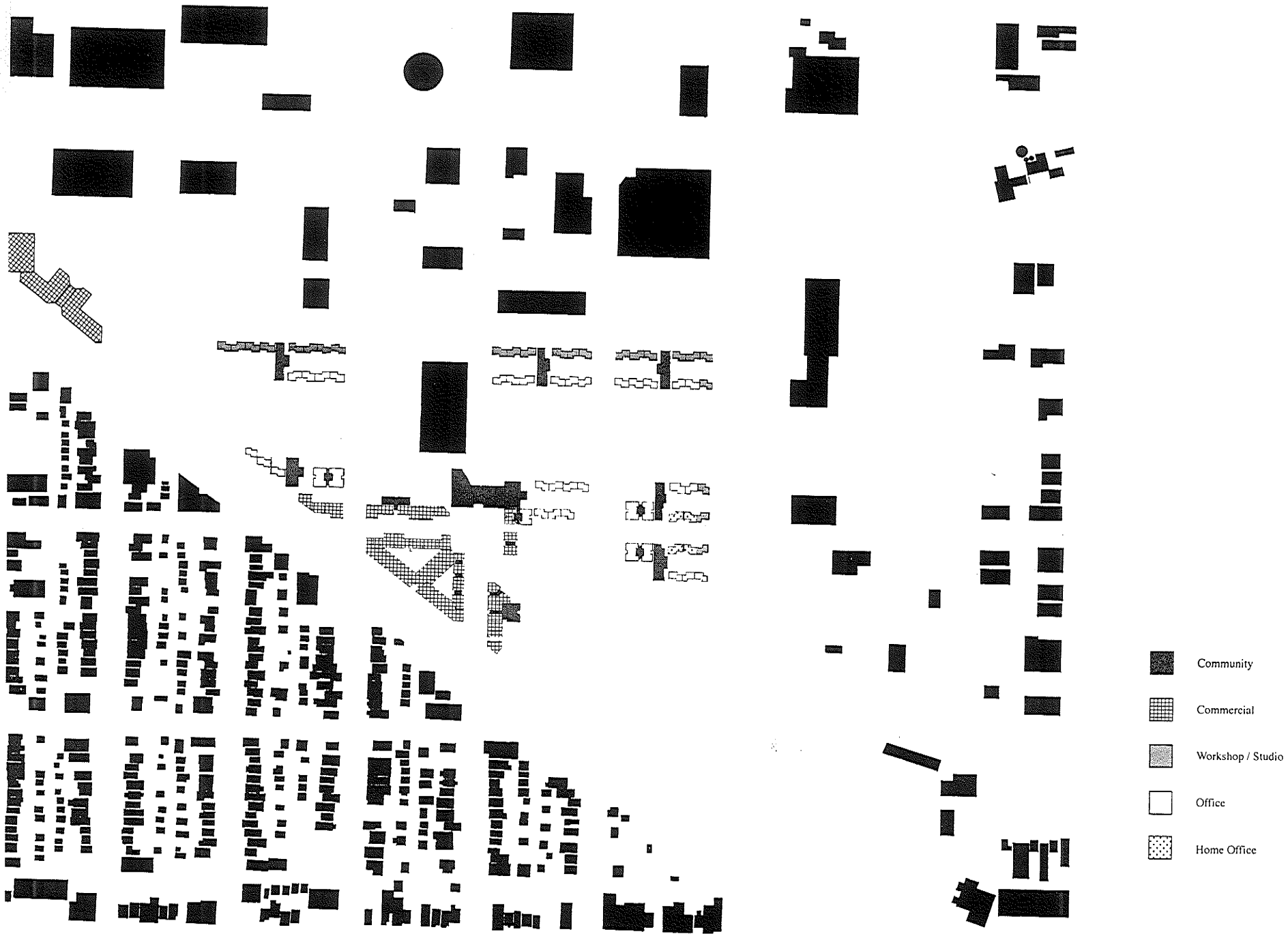


Figure 5.14: Living and working together — Egebjerggard, Denmark

Ground Floor Use

This drawing illustrates the uses and occupations allowed in the various buildings. The community category illustrates those buildings which are strictly community on the ground floor. Commercial uses are strictly limited to the area around the market square and the strip commercial development at the intersection of Arcola Avenue and Winnipeg Street. The following less restricted uses can be located in these areas but not vice versa. Workshops and studios which require the shipping and receiving of supplies and finished product are restricted to units with direct access to perimeter streets. Professional offices that might require occasional visitors for meetings are restricted to those units which face the internal woonerf streets. The final category, home office, is the least restrictive. This category is intended for telecommuters or writers who would not have a need for meetings. This category would not in fact be restricted to the ground floor, as those occupied in this category might prefer the seclusion of a garret office.



GROUND FLOOR USE

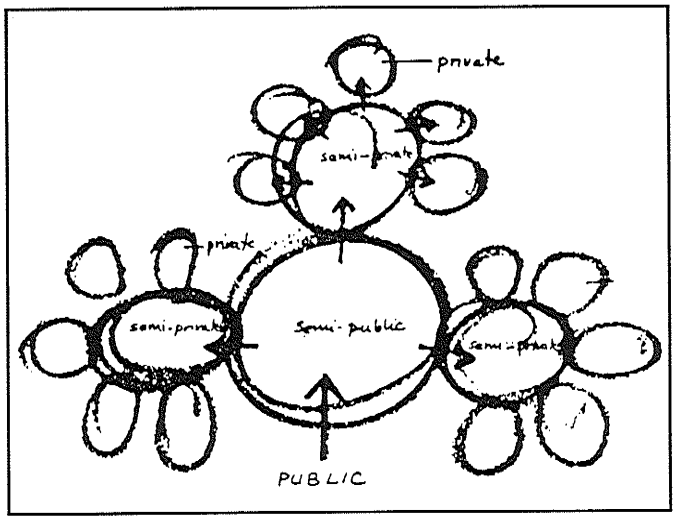
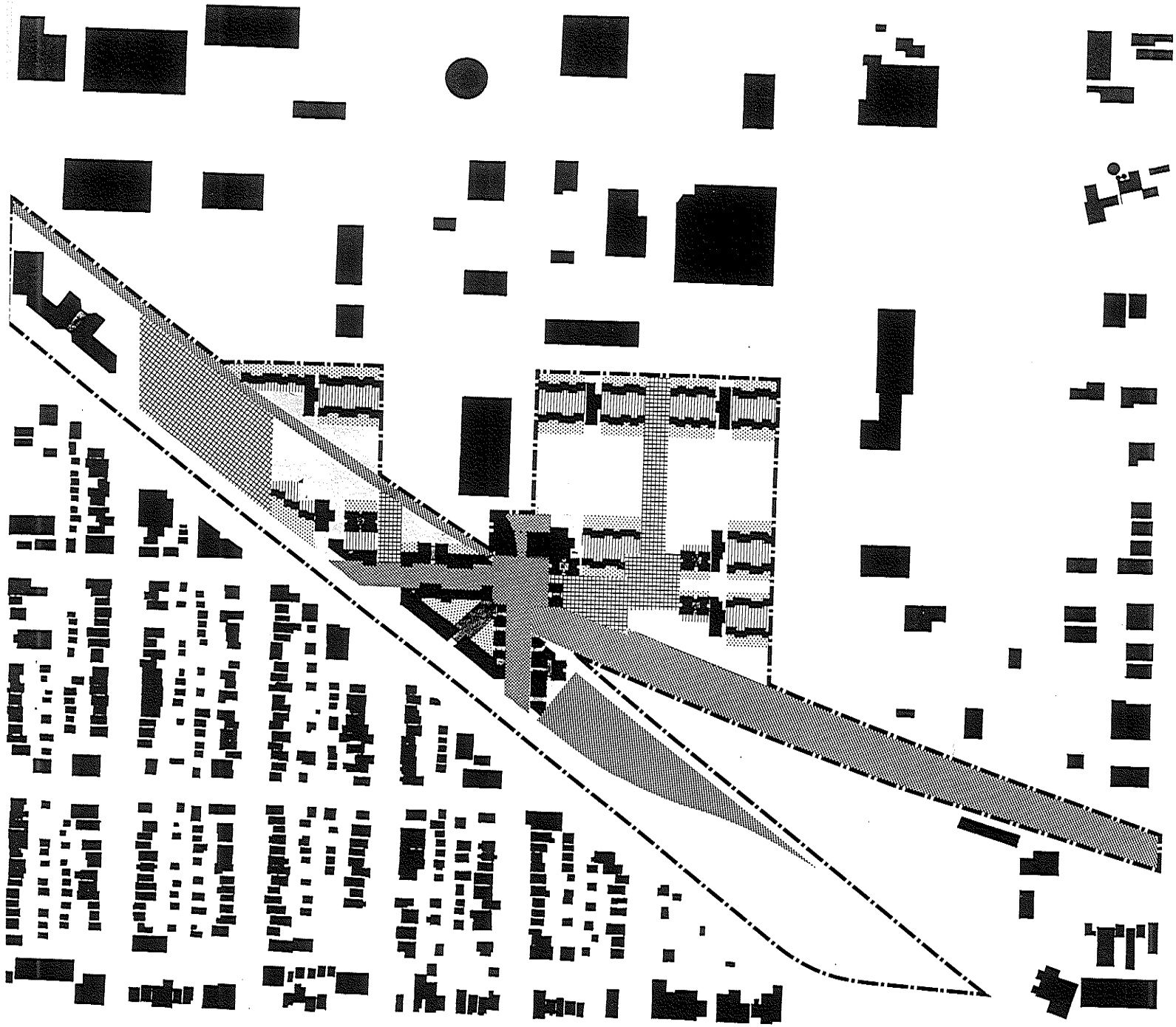


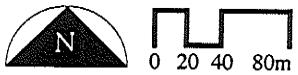
Figure 5.15: Diagram of spatial domains showing clear definition of levels of community and privacy in housing area

Open Space Domains

This drawing illustrates the various domains of open space and their relationship to adjacent buildings. A distinction is made between the semi-public space accessible by the community as a whole, from that accessible to individual clusters.



OPEN SPACE DOMAINS



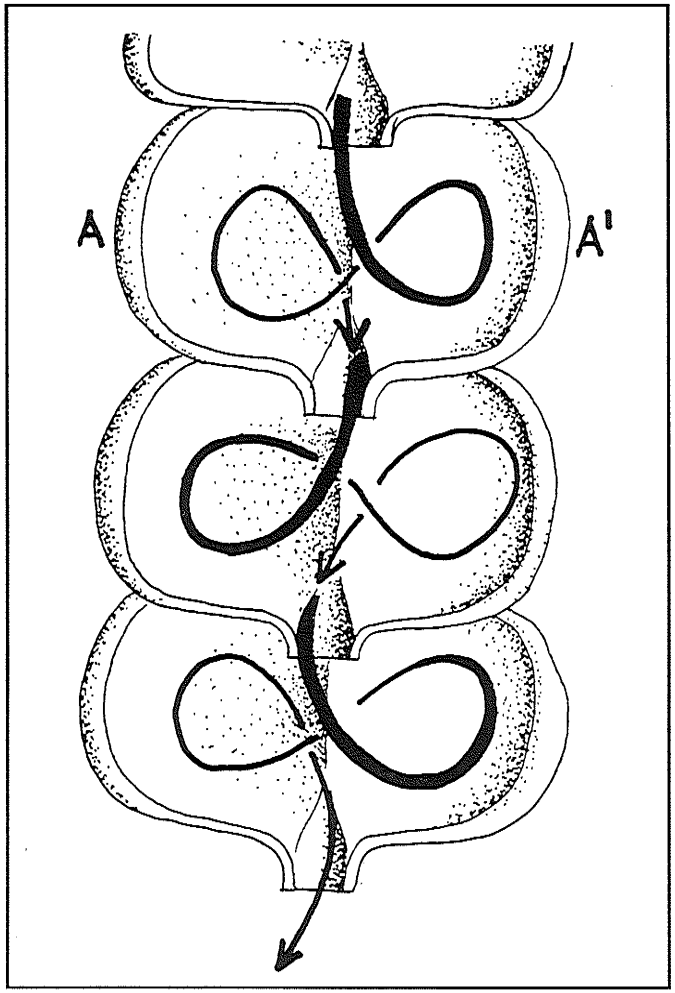
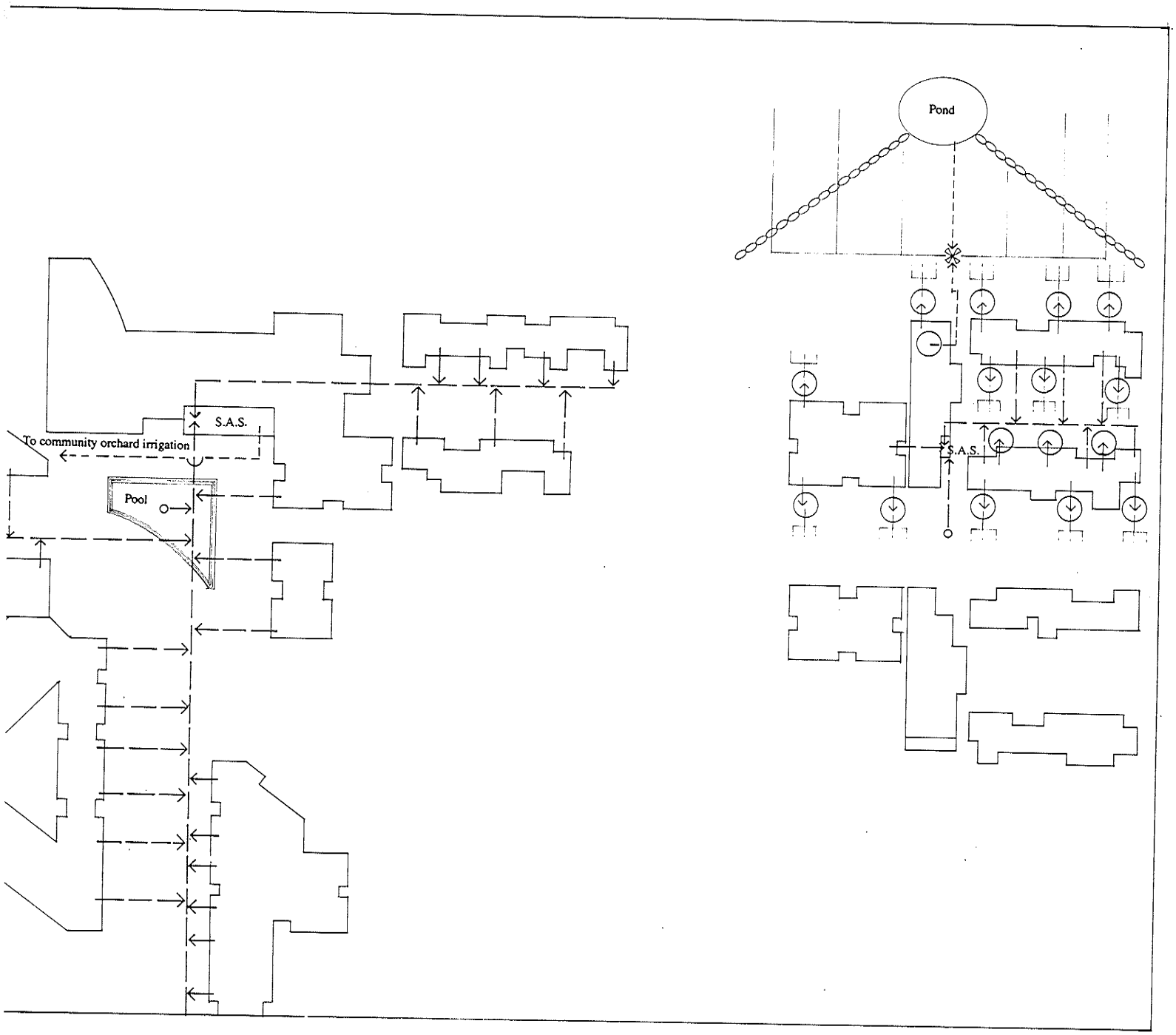


Figure 5.16: Flowform

Water Management

This schematic diagram illustrates how water is managed on the site. Each cluster, with the exception of the area surrounding the market square manages all water internally. The central area combines three clusters because of the greater amount of hard surfaced area and less open space. Surface runoff is collected in a pool and gradually released into the system. Cisterns below the pool hold water from the pool and the sanitary sewers. The waste water is processed in the central solar aquatic treatment plant in the community building. Processed water is used for orchard irrigation, with surplus water being released into the storm sewer.

Runoff water in the individual clusters is used primarily for irrigation. Roof run-off is collected in cisterns and used for irrigation in individual yards. Surface run-off, which has a greater likelihood for contamination is drained towards the dugout ponds. The run-off runs through the gardens in flowform water chains which purify by aeration and deposition of sediment. Emergent grass species such as rushes and reeds in the marshy edges of the ponds act as biological filters to further purify the water. Windmills then pump the water up to the gardens for irrigation. Greywater produced in the houses is recycled in solar aquatic systems in the common house, collected in cisterns in the basement, and then used for irrigation in the dry months.



Sewer

Treated water

Drain

Roof run-off

Cistern

Irrigation

Flowform water chain

S.A.S. Solar aquatic sewage treatment facility

Windmill

WATER MANAGEMENT

N

0 5 10 20m

Development Year One

In the first year of development, only part of the community building is constructed. The building, containing hostel-like living space is intended to be temporary and of minimal standards to meet the basic needs of the site's pioneers. Succeeding groups can in turn use the facility as they develop their clusters. Upon final build-out, the hostel can be used to house groups or individuals who wish to stay for short periods while studying the community.

Demonstration site

1. Incubator building
2. Community garden
3. Common
4. Naturalization

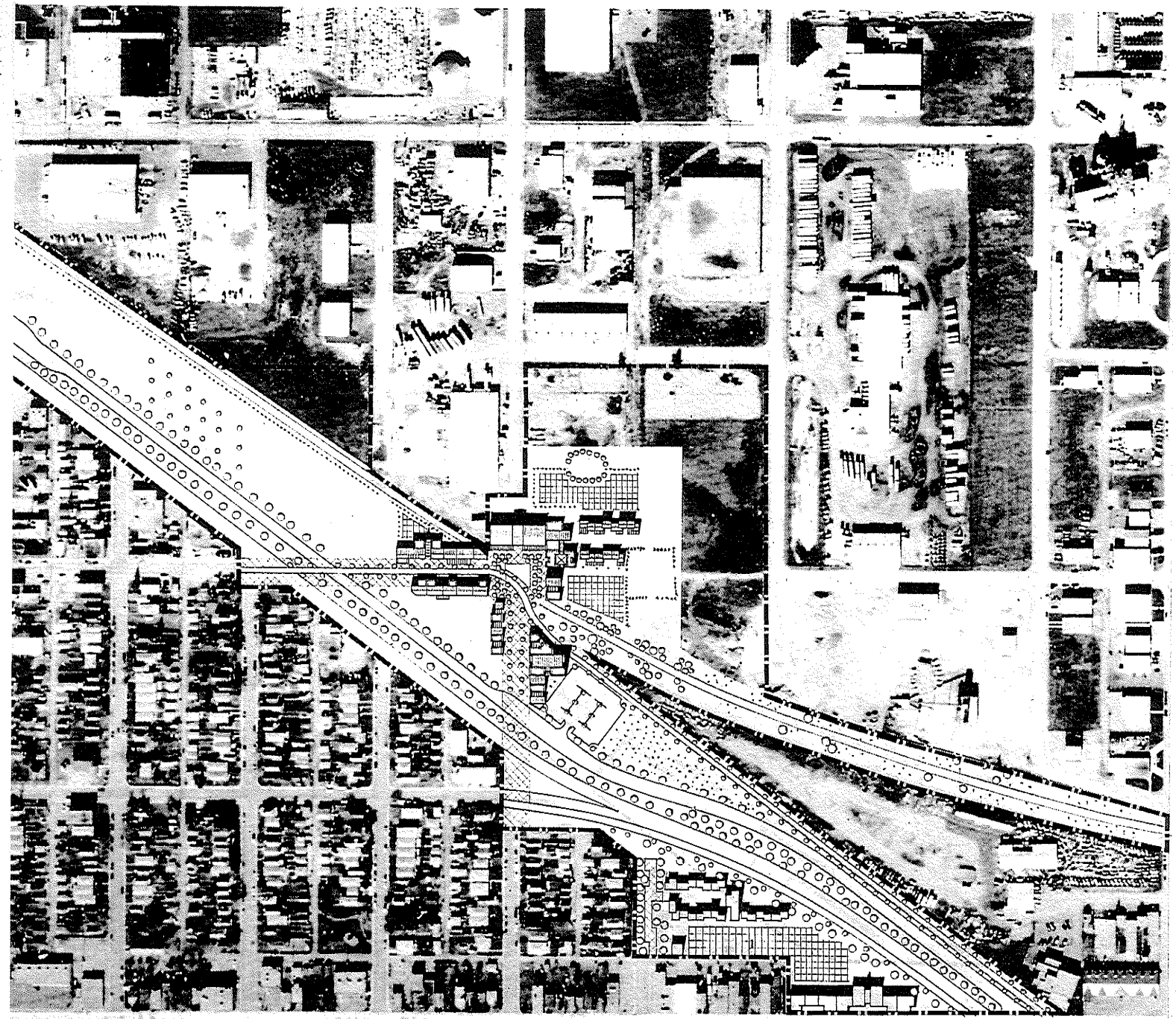
DEVELOPMENT YEAR ONE

N

0 20 40 80m

Development Year Five

By the fifth year of development, the three clusters surrounding the market square are developed. The community building continues to house new community members as they develop their parts of the site. Realignment of Arcola Avenue allows an annex to be developed as well. Landscape elements are largely in place, and beginning to mature.



Demonstration site

1. Annex No. 1

DEVELOPMENT YEAR FIVE

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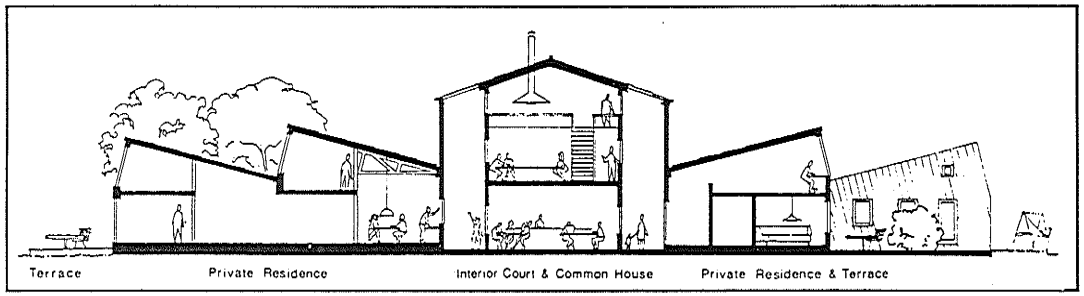
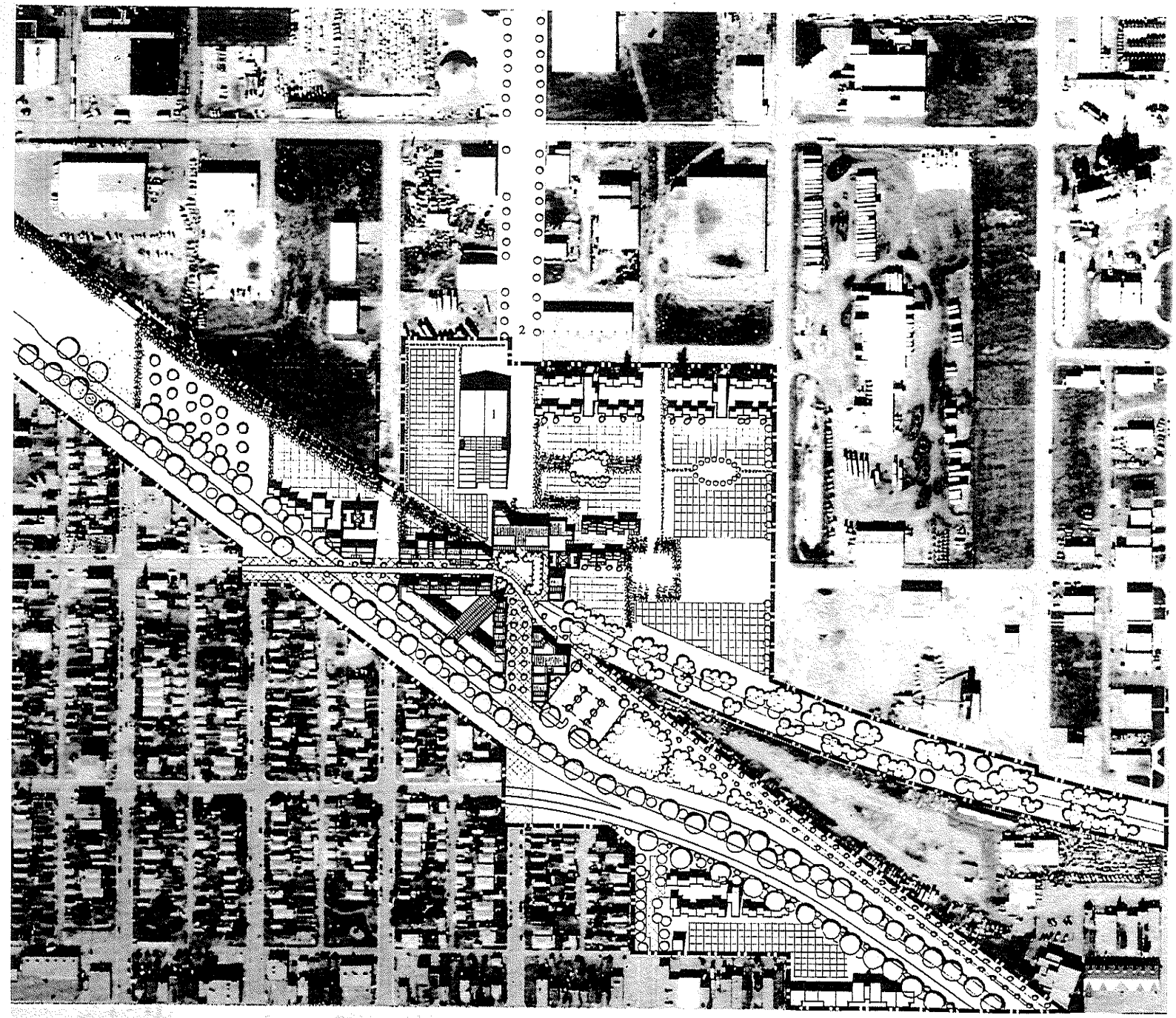


Figure 5.17: Industrial building converted to collaborative housing

Development Year Ten

After ten years, most of the central area, including the office building and market hall have been completed. Garden areas are being developed in advance of construction of housing clusters. The adjacent warehouse building is also annexed, being redeveloped to combine a housing cluster and business. The business, based on 'green' principles might be a building material recycling company or manufacturer of energy efficient building products. A campaign is started to enhance the neighbourhood with street trees. Concentrating on Reynolds Street provides a connection towards the Innismore neighbourhood to the north.



Demonstration site

1. Annex No. 2
2. Street tree project

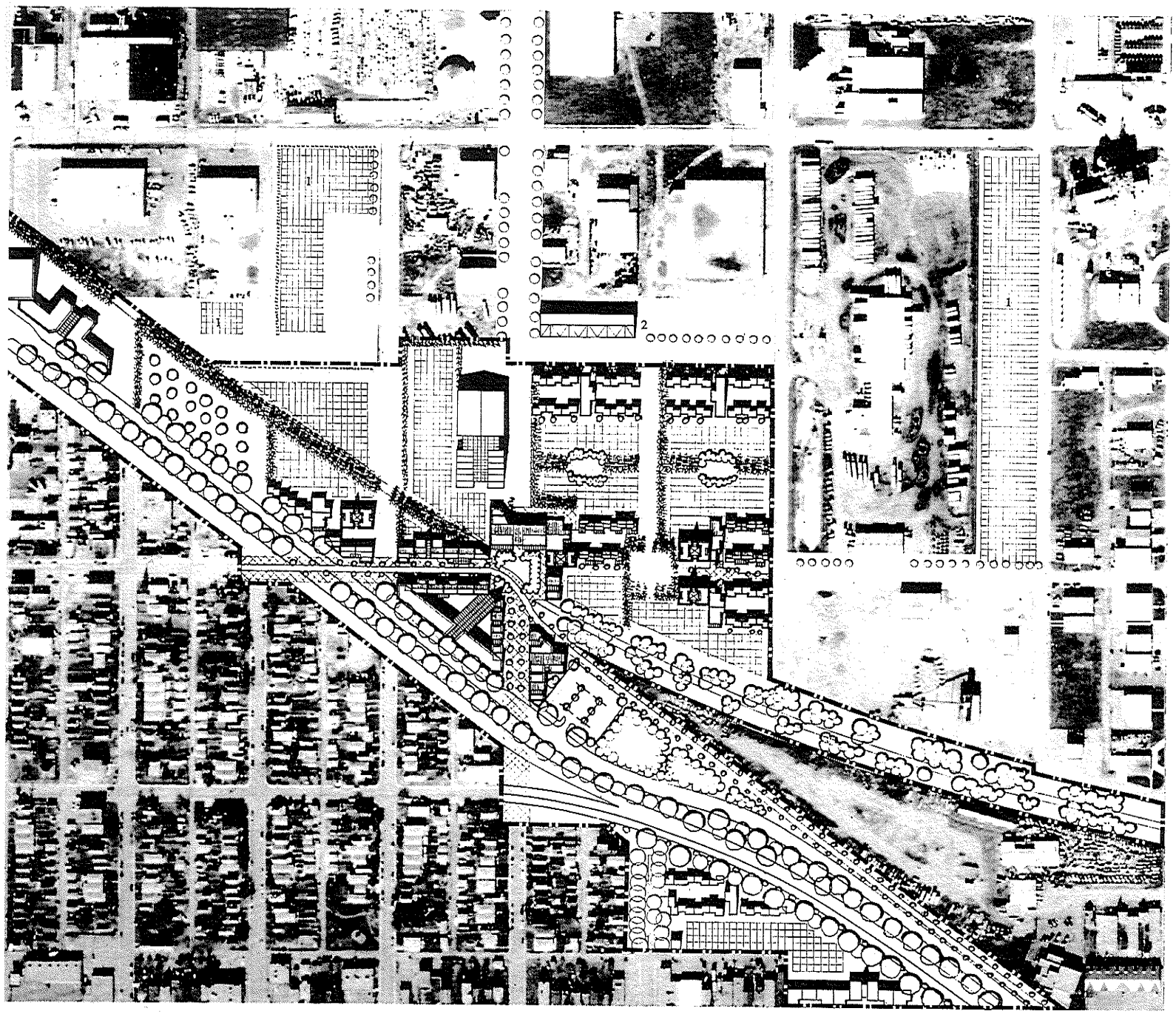
DEVELOPMENT YEAR TEN

N

0 20 40 80m

Development Year Fifteen

After fifteen years, almost all of the clusters and the strip commercial property have been developed. This commercial property could be developed earlier if a partnership with an outside developer is used. For the community's purpose, it should remain a low priority. Community gardens are established on vacant properties in the neighbourhood, and the street tree programme extended. The strip office building immediately north of the site is redeveloped to include housing on upper floors.



Demonstration site

1. Community gardens
2. Redevelopment

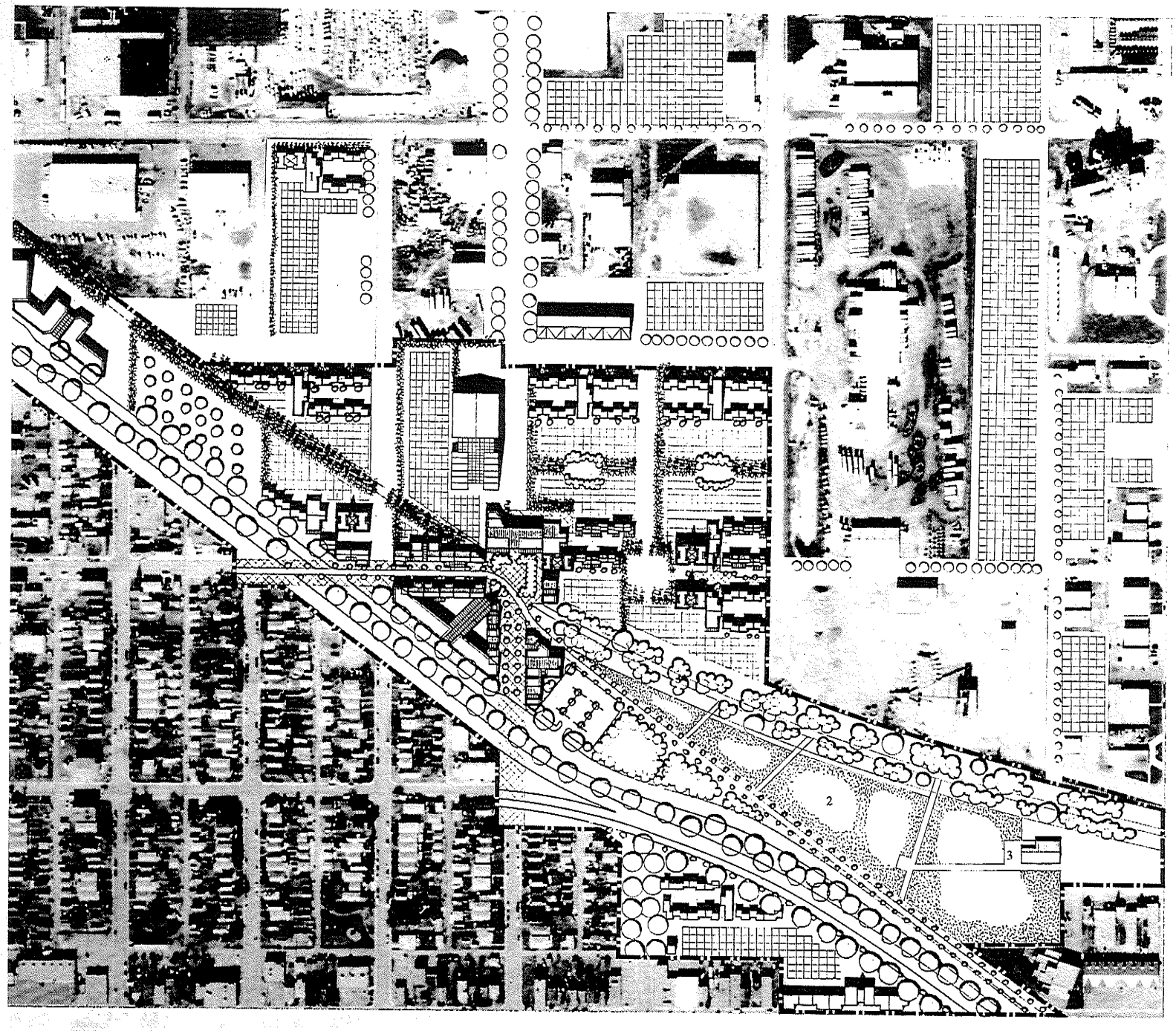
DEVELOPMENT YEAR FIFTEEN

N

0 20 40 80m

Development Year Twenty

After twenty years, all of the clusters have been developed and a new cluster is built on neighbouring vacant property. Community gardens and street tree plantings have spread further. The low lying auto wrecking yard becomes a site for a constructed wetland, which is used to impound and treat runoff water in the neighbourhood. The auto wrecker's office is recycled into an interpretive centre.



Demonstration site

1. New cluster
2. Constructed wetlands
3. Interpretive centre

DEVELOPMENT YEAR TWENTY

N

0 20 40 80m

6 Implementation

Collaborative Theory

As this study is theoretical in nature, it lacks a client group to define goals and collaborate on the design. The demonstration plan should be seen as a first presentation to a client group, which would be followed by a collaborative design process. It is necessary to envision the client as an environmental group taking on the challenge to undertake this project. A core group of active members with similar goals might form the nucleus of this community, and attract others from a wide spectrum to join in their vision over time. This core group would likely be, on average, young and reasonably well educated. People with backgrounds in these areas would be an asset to the group: Architecture, Biology, Building Trades, Community Economic Development, Engineering, Fine Art, Horticulture (particularly organic gardening), Landscape Architecture, Social Work, and Systems Ecology, to name a few. Future participants should be selected primarily for their commitment to the general goals of the community and the project. A sliding scale between needy and resourceful should be used for evaluation; i.e. someone with limited resources who desires to change their life, need not bring as many skills or resources to the group as someone who has experience, knowledge, or other resources to offer. In this manner, the community could sponsor disadvantaged individuals or small groups of immigrants, in order to achieve the social and economic diversity required in a true community.

Urban Homestead

As an urban homesteading project, the process would begin with a land grant from one or more levels of government to the community group. The L.A. Eco Village is supported by the municipal government in a similar manner.[1] In exchange, the group would agree to develop the property to a certain level in a given amount of time, much as pioneers did under the original homestead act. In addition to property improvement guarantees, the city would benefit from an increase in property tax base. The community could also agree to maintain public accessibility to the research conducted through site tours, continuing education programmes and publications.

Community Land Trust

The land acquired through the urban homestead agreement would be placed in a Community Land Trust (CLT) to remove the property from the speculative market. A CLT is a non-profit organization which holds property in perpetuity. CLT members lease the land but own the improvements on it. This would guarantee that individual members could not profit personally from the title transfer, and that the community would remain affordable even if the market value of surrounding property increased. The individual then becomes a steward, not a land owner, and short sighted decisions based on short term

[1] Arkin, Lois. Op. cit. pg. 274.

economic gain become less attractive. A 99 year lease, with a nominal fee to cover taxes and maintenance, would be paid by individual lease holders or through the cluster housing co-operatives. Membership in a CLT is open to any member of a community that meets membership requirements. In this way, neighbours could have access to community amenities or could maintain garden plots prior to full development.[2]

Co-operatives

The individual collaborative housing clusters might best be developed as individual co-operatives. This would allow each cluster to have direct decision-making power over the common houses and commonly held gardens. Individual clusters could then also use different ownership options, or be developed by separate housing associations. Co-operatives are similar to CLTs in that the real estate is held in common with individual households leasing at cost. Financing is to the co-operative as a whole. Members leaving a co-operative are entitled to their original capital contribution only. Should a co-operative dissolve, the assets are liquidated and donated to a non-profit organization.

Membership in the co-operatives could be gained through a combination of sweat equity during the development phase, and/or a typical down payment. Members unable to contribute through self-help construction for any reason (i.e.. disabilities) would have to make larger capital contributions. Some form of government support might aid them in the increased costs where warranted.[3]

Individual cluster co-operatives may also wish to operate as commercial co-operatives. The common gardens might act as the focus of a food co-operative. Since most produce is seasonal, it is often better to sell surplus in order to purchase other food, rather than attempting to consume everything in season. Such food co-operatives have historically been organized in order to purchase specialty items such as "health food", but a prosuming co-operative might also sell specialty items to the general public.[4] Other co-operatives might be formed to trade in recycled building materials, renewable energy equipment, or consulting services.[5]

The Condominium Option

Another common form of group ownership that is compatible with collaborative housing is the condominium. In some ways it is more compatible because it achieves a greater balance between community and privacy, which is one of the attractive attributes of the collaborative model, compared to other forms of communal living. Condominium ownership helps to protect sweat equity investment and rewards initiative for those who have high maintenance standards, as each household has clear title to its portion. It offers proportionately less protection from real estate speculation for this reason. The main structural difference between a condominium and a co-operative is that regulatory laws and financing apply directly to a household as opposed to the group. Traditional condominiums in North America are not known for their ability to build community co-operation as much as co-operatives are.[6] It is possible that the community building attributes of the collaborative housing model, (which

[2] For more on Community Land Trusts see Nozick, Marcia. Op. cit. pp. 110-115.
[3] For more on housing co-ops see Selby, Joan Louise and Wilson, Alexandra. *Canada's Housing Co-operatives.* Co-operative Housing Foundation of Canada Research Paper #3.
[4] For more on food co-ops see Cohen, Lottie. Op. cit. pp. 227-229.
[5] For more on worker co-ops see Nozick, Marcia. Op. cit. pp. 118-120.

is similar to traditional co-operatives) would have greater influence than the legal structure.

Financing

Since conventional financing for alternative communities is rare, alternative financing may be necessary. Credit Unions, being a form of community based co-operative enterprise are often more receptive to unconventional developments. Another option might be for the CLT membership to establish a community loan fund which would operate in the same manner as Habitat for Humanity's revolving loan fund. This option would require a certain critical mass of membership to be achieved and might limit the pace of development if relied upon too heavily. Community loan funds are also useful tools in establishing community economic development by supporting small businesses.[7]

Community Supported Agriculture

Community supported agriculture (CSA) is an emerging trend in Canada. Essentially a form of food co-operative, local farmers sell subscriptions to a portion of their annual vegetable crop (and sometimes other food such as eggs and fruit) to city dwellers who don't have access to land, or the knowledge, to grow their own. Farmers get a guaranteed income, (up-front when they need it to purchase seeds and supplies) and community support in bad years. Consumers get fresh, good quality food (usually organic) at a reasonable price, and the knowledge that they are contributing to the local economy. Farmers often invite the customers out to the farm to learn about the process and help with the work during busy times. This system could be extensively used on the site early on, before all of the development is complete. The associations developed could be spun off to help other local producers as well.[8]

LETS Barter Credit

The Local Exchange Trading System (LETS) is a technique for building a local economy that is particularly well suited to prosumers. Rather than purchasing with cash, LETS members get credit on another member's goods through a computer accounting system. Since there is no capital to gain interest in a bank account, there is no advantage to building credit, only to purchase some other good or service in the system. This encourages local trade with equal partners and supports those who are cash poor but time and skills rich.[9]

Individual Enterprise

Like the collaborative community model, community and privacy need to be balanced. Individuals who wish to pursue individual enterprise should have every opportunity to do so. Most of the housing units are integrated with either home offices, studios, or commercial spaces. Some of these, particularly the commercial spaces, could be rented to outside enterprises, or run by the unit owners. Co-operation among individual enterprises need not be excluded. For instance, a housing cluster with many small consulting businesses might choose to share a computer, photocopier, or other equipment and set up a small office in the common house.

[6] Fromm, Dorit. *Collaborative Communities. Cohousing, Central Living, and Other Forms of Housing with Shared Facilities.* Van Nostrand Reinhold. New York. 1991. pg. 201.
[7] For more on community loan funds see Nozick, Marcia. Op. cit. pp. 115-118.
[8] For more on CSA see Nozick, Marcia. Op. cit. pp. 160-161.
[9] Ibid. pp. 52-54.

Public / Community Co-operation

Certain aspects of the plan, beyond the initial government support, require co-operation with the public sector, and/or external private sector. Certain infrastructure improvements would be required to be undertaken by the city (possibly with other government support). The Arcola Avenue improvements and transit infrastructure would be public sector responsibilities. The community, however, might be able to look after certain aspects of maintenance, particularly landscape, at a much reduced cost. The natural regeneration areas could be planted and maintained by the community with some public support. Commercial space, on or near the square, could be used as a transit terminal, with the individual owner or the community looking after maintenance and security. The office block on Arcola Avenue could be developed by the community for their purposes, or it could be developed privately under the agreement of the community land trust. The commercial development and associated housing or office space at Arcola Avenue and Winnipeg Street could be developed similarly.

7 Conclusion

"indeed the first utopia was the city itself" — Lewis Mumford[1]

Many aspects of this proposal may seem Utopian, but in fact, there is nothing in it that has not been done before. The study started out as an attempt to synthesize many different examples, that, when added together, made a fully-featured ecologically-integrated and socially-equitable community. The synthesis becomes more complex with each issue that is addressed, and each feature that is added. None-the-less, there are already numerous similar examples in existence in Scandinavian countries, and hopefully, two soon to be built on this continent.

The term Utopia was coined by Thomas More for his book of the same name. The term is an ambiguous mid-term between the Greek terms outopia (no place) and eutopia (good place). As an ideal, utopia can never be achieved, or at least maintained, without becoming a dystopia counter to its ideals.(Mumford) Never-the-less, the act of seeking utopia remains an important human activity; for if we ceased to seek improvement in our conditions, the process of civilization which has maintained us as a species would also cease.

There are essentially two types of utopia. The first, the literary utopia, is essentially a vehicle of social criticism, and traces its history from Plato's Republic through More's Utopia to B.F. Skinner's Walden II. The second form of utopia are the model communities of Fourier, Owen, and currently, Soleri. These model communities are often put into practice by their proponents or disciples, and in an attempt to fit them to real world parameters, become what Toffler refers to as practopia which "offers a positive even revolutionary alternative, yet lies within the range of the realistically attainable."

This proposal could be seen as a practopia; it is not intended to be a solution to every problem, but offers an alternative for those who cannot find their utopia in existing communities. It seeks to be compatible with its surroundings as well as being a criticism or alternative to them. It may be seen as an evolutionary step along the path established by Fourier and Owen, but especially along the branch established by Howard and followed by Stein, Corbett and Calthorpe.

There are a myriad of possibilities for alternative development scenarios that could make our cities more ecologically-integrated and socially-equitable places. This study develops just one of these possibilities. Although it is site specific, and developed for a particular socio-economic condition, the basic principles can be developed for any context.

What is important about this proposal, is that it offers an alternative that does not presently exist. Alternatives are needed, if only to demonstrate that they can exist. It has become increasingly clear to most that we cannot continue on as we have, if we are to survive as a species. We owe it to those who are yet to come to ensure that we not only survive, but also prosper.

[1] Mumford, Lewis. "Utopia, The City and The Machine" in Manuel, Frank. ed. *Utopias and Utopian Thought*. Houghton Mifflin Company, Boston. 1966. pg. 3.

Appendix A— Yield Table

Location	Growing Season	Yield	Y(persons/acre/4mos.)	Source
Melbourne, Aus.	8 months	350 m^2 80% 4 persons	19	
	4 months	16 sq. ft./person/GS	172	Bartholemew[1]
Pennsylvania	130 days	900 sq.ft. 4 persons	50	Minnich[2]
England	8 months	.156 acre/person	3.2	Howard[3]
	6 months	100 sq. ft./person	286	Jeavons[4]
Palo Alto	8 months	1400 sq. ft./person	16	Jeavons[5]
Taiwan	12 months	72 m^2/5 persons	93	Wade[6]
Peurto Rico	8 months	30 m^2/4 persons	270	Wade[7]
New Brunswick	4 months	30 shares / 3 acres	40	CSA conf.[8]
South Carolina	8 months	1000 sq. ft./person	22	Freeman[9]

Yields vary significantly in these examples, but when the extremes are ignored, it appears that an average subsistence diet of vegetables can be produced for 40 people on one acre during the growing season. This does not take into account the possibility of extending growing seasons by starting plants early in greenhouses, or growing salad vegetables year round. It also should be noted that yields vary greatly due to annual climate variatons, site condtions, and experience of gardeners. At a density of 10 du/a, and an average of 3.3 persons per dwelling unit, 1000 sq. ft. of non growing area is available per dwelling unit. Therefore an average net density (site area only) of 10 du/a should be sufficient if a cluster site is designed carefully.

[1] Bartholomew, Mel. *Square Foot Gardening*. Rodale Press Emmaus Pennsylvania. 1981. Modified Biodynamic / French Intensive Method

[2] Minnich, Jerry. *Gardening for Maximum Nutrition*. Rodale Press Emmaus Pennsylvania. 1983. This yield estimate is for year round consumption assuming preservation is used.

[3] Howard, Ebenezer. *Garden Cities of To-morrow*. Faber and Faber Ltd. London. 1902. Howard's estimates for the required area of greenbelt included all forms of agriculture and forestry as well as recreational space.

[4] Jeavons, John. *How to Grow More Vegetables than You Ever Thought Possible on Less Land than You Can Imagine*. Ten Speed Press. Berkeley, California. Biodynamic/French Intensive Method. This data has been criticized as being unrealistic and bad math. However, other stations using this method report similar results. Includes soft fruits.

[5] Ibid. This yield estimate is for a totally balanced diet including grains and beans.

[6] Wade, Isabel. *City Food*. Urban Resource Systems Inc. San Francisco. 1986. Biodynamic / French Intensive Method.

[7] Ibid.

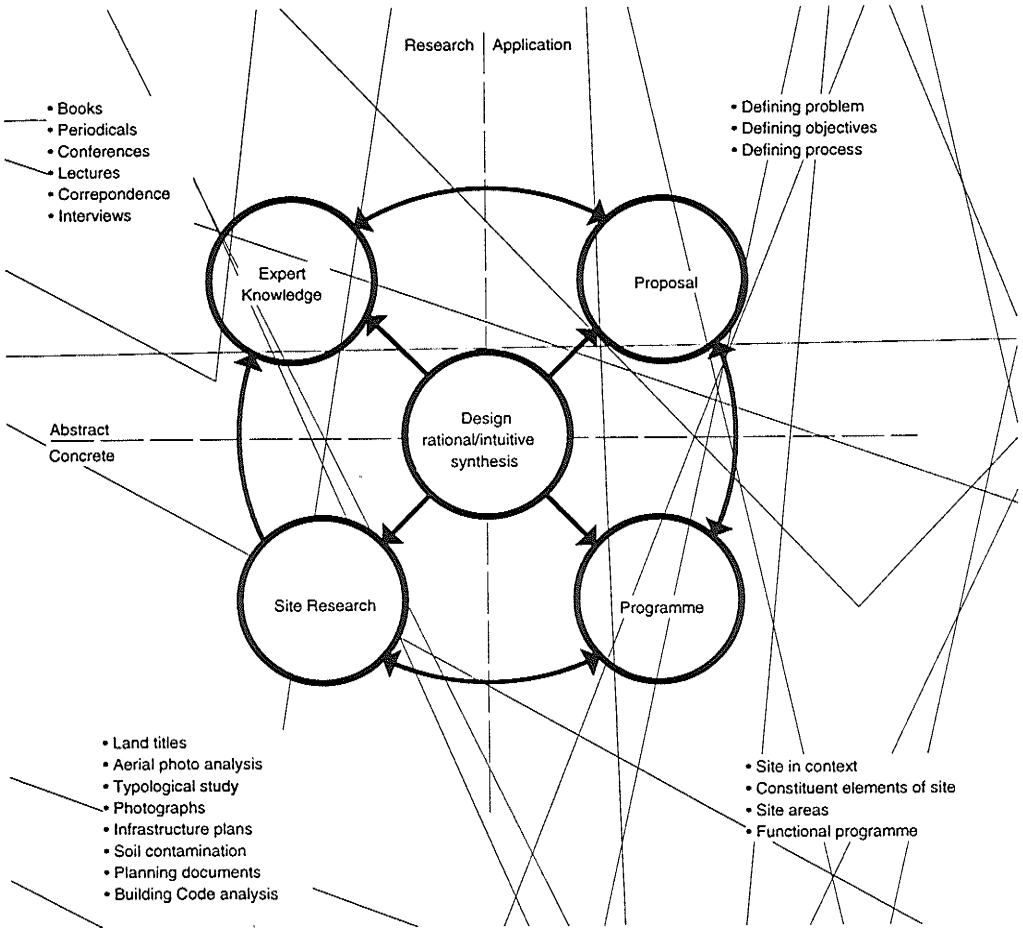
[8] From notes taken at Community Shared Agriculture conference "People and the Land — Sharing the Vision" Winnpeg, March 5 & 6 1993. Shares consisted of 20-25 lb. delivered twice a week from June to October, plus some winter root crops.

[9] Freeman, John A. *Survival Gardening*. John's Press. Rockhill, South Carolina. 1982. Total nutritonal diet for year round consumption. Biodynamic / French Intensive Method.

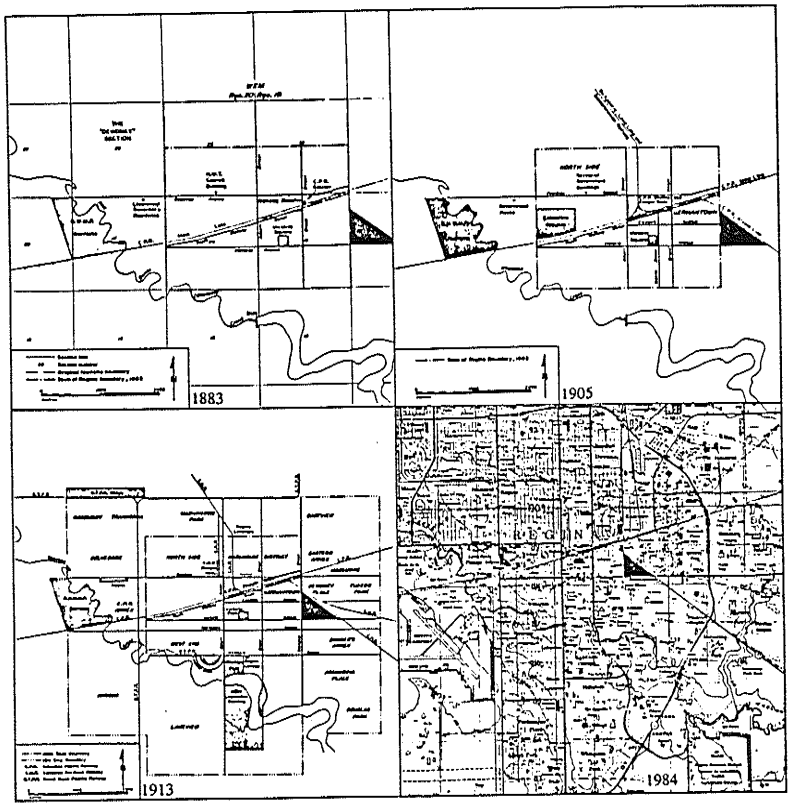
Appendix B — Process

A good design process is much like a healthy ecosystem. The flow of information through the system is cyclical, and all stages in the process are inter-related. By way of contrast, a design process which is linear and apparently efficient like a factory will leave much to be desired.

All designers develop different processes which are unique to themselves. It is the lifetime of learning how to design that makes one a good designer. All studies are also somewhat unique and non replicable. What works in one instance will not necessarily be appropriate in another.



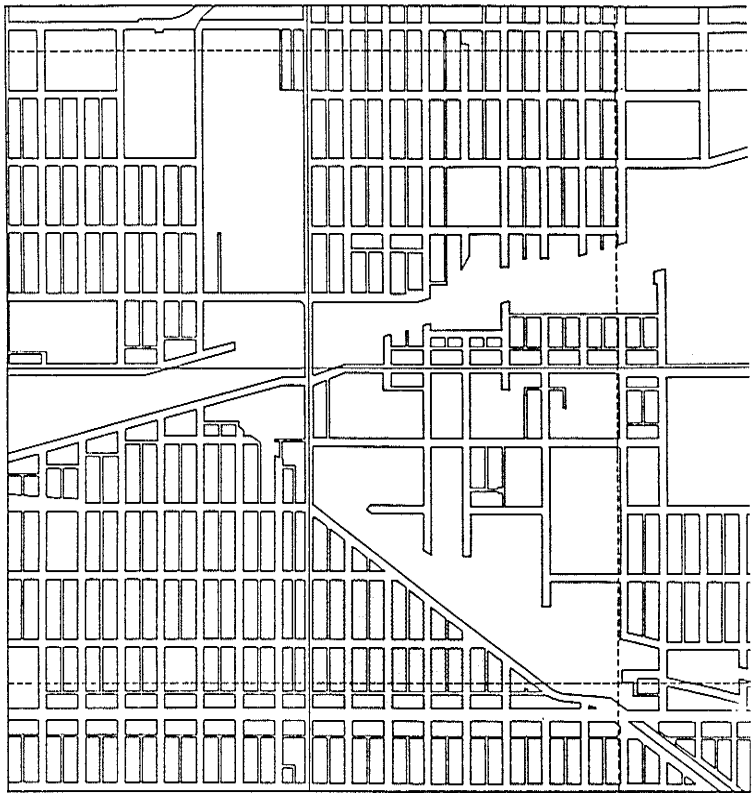
Appendix C — Typological Study



Regina, like the typical prairie railroad town, is ordered primarily by the section grid system that was laid upon the prairie region to facilitate settlement. Dewdney Avenue and Winnipeg Street were laid out along section lines while Victoria Avenue was laid out south of the quarter section line to avoid interference with the alignment of the CPR mainline. The alignment of the CPR Arcola branch line, built in 1903, introduced a topological element to the standard grid iron layout of the East End. Garlic Flats is a colloquial moniker for a section of the East End or Germantown that lay outside of city limits until 1911. The name is derived from the culinary habits of the Eastern European immigrants that settled in this area. Development of residential lots was sparse until after the Second World War, and vacant lots were frequently used to grow vegetables and raise livestock.

Figure 1. REGINA
Historical Urban Development

Garlic Flats



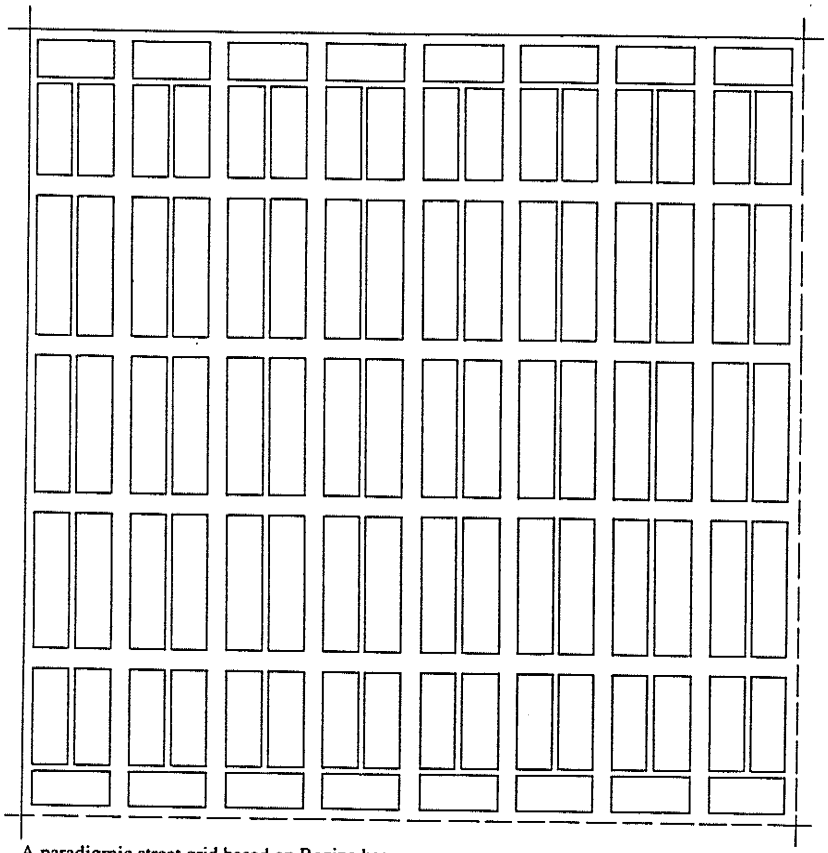
The topological element of the railyards and coarse grain of the adjacent industrial properties distorts the standard grid iron of Regina in the Garlic Flats area. Street alignment deviations from the section grid system are apparent in this area.

Section Line
Quarter Section Line

North

0 50 100 200

Figure 2. GARLIC FLATS
The URD in Context Plan



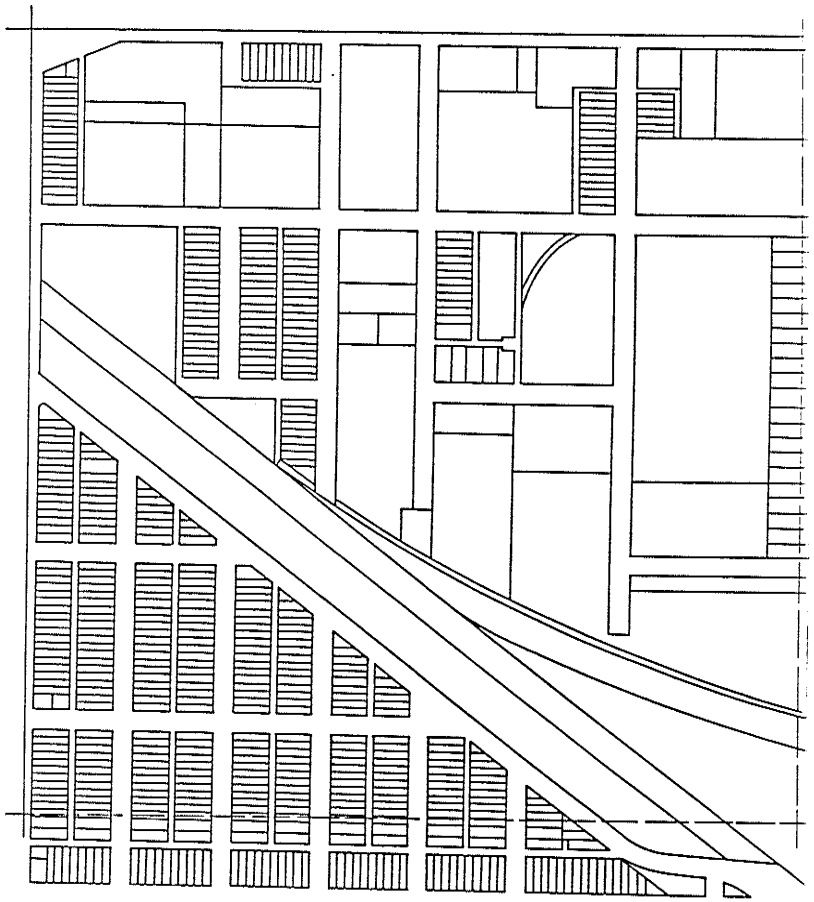
A paradigmic street grid based on Regina has been postulated for a quarter section. Using the survey chain as a unit of measurement, a quarter section can be exactly divided into forty blocks. As applied in Regina, these blocks were based on multiples of 25' x 125' lots rather than the exact chain measurement. Corrections were taken up in odd sized blocks and the deviated street pattern. As a result, this exact paradigm does not exist anywhere in Regina.

Section Line
Quarter Section Line

North

0 50 100 200m

Figure 2.1 GARLIC FLATS
The URD Paradigmic Grid Pattern



The standard Regina lot pattern contrasts with the coarser grain of industrial properties and the linear pattern of the railroad rights-of-way. Originally, the entire area was subdivided equally to facilitate land speculation when the city was established. By the time the area was annexed by the city in 1911, many properties were vacant or had been abandoned when the initial boom subsided. These properties were consolidated and reserved by the city in order to attract industrial investment.

Section Line
Quarter Section Line

North

0 50 100 200m

Figure 3. GARLIC FLATS
The URD Land Parcellization

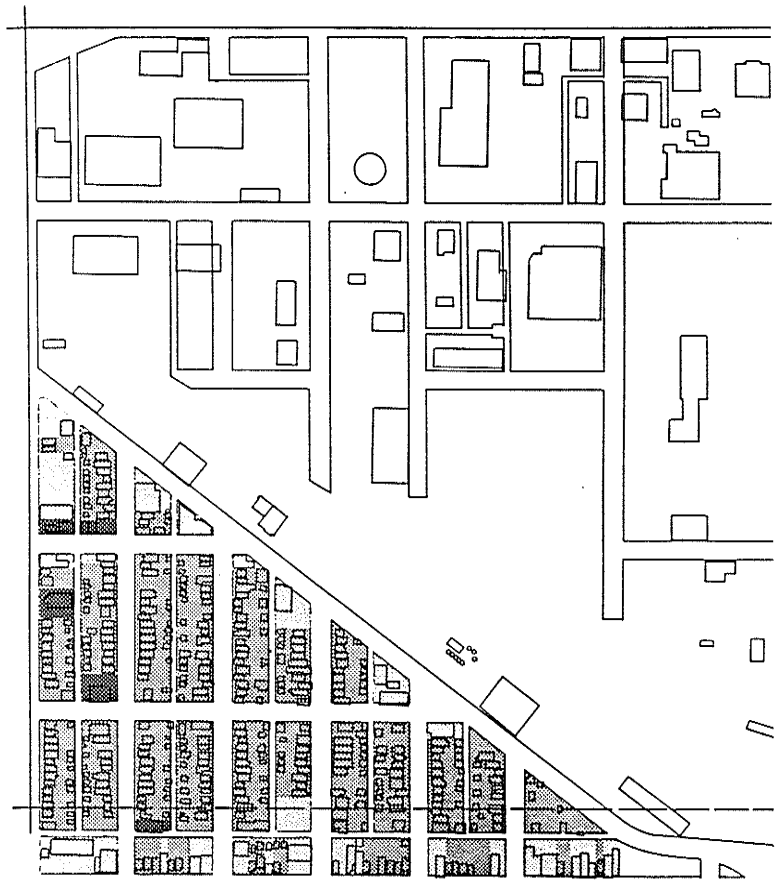
The fine grain of small detached houses and outbuildings contrasts with the much larger adjacent industrial buildings. This contrast is mediated somewhat by the presence of medium sized semi-detached commercial and institutional buildings on the peripheral streets.

Section Line
Quarter Section Line

North

0 50 100 200m

Figure 4. GARLIC FLATS
The URD Figure Ground Pattern Plan



Public land uses which are typically commercial properties occur almost exclusively along the peripheral streets. Civic land uses, typically ethnic social clubs and churches are somewhat more integrated with the residential fabric. Private land uses typically contain single family houses, although a few multi-family buildings and vacant properties are present.

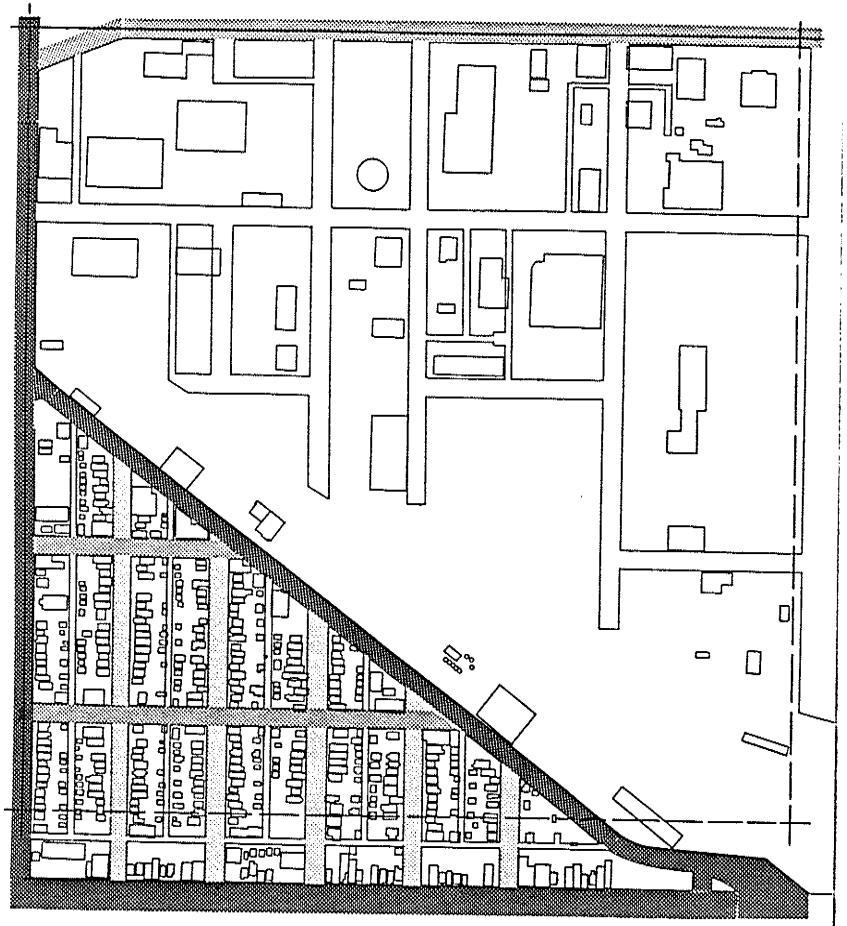
Private
Civic
Public

Section Line
Quarter Section Line

North

0 50 100 200

Figure 5. GARLIC FLATS
The URD Land Use Pattern Plan



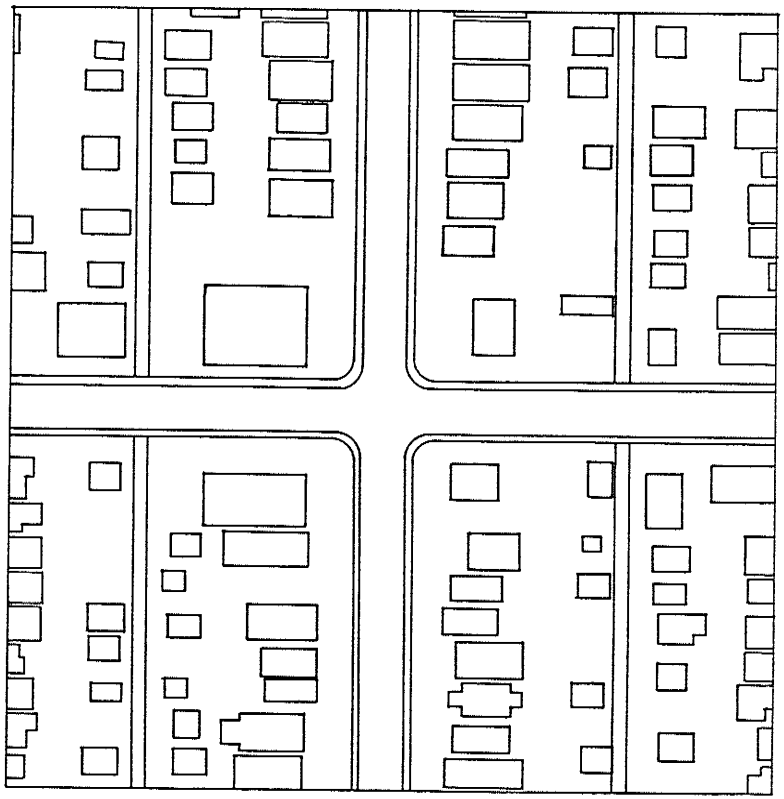
Metropolitan Arterials
Core Area Secondary
Local Neighbourhood Street

Section Line
Quarter Section Line

North

0 50 100 200m

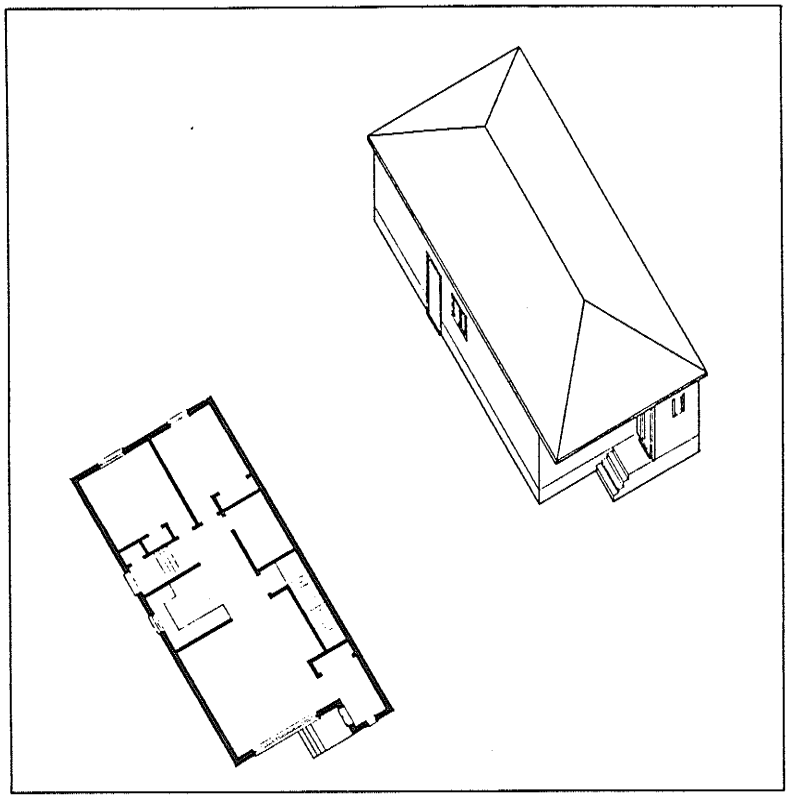
Figure 6. GARLIC FLATS
The URD Circulation Pattern Plan



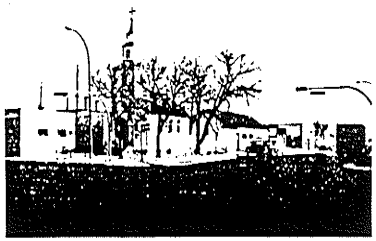
North

0 50 100 200m

Figure 7. GARLIC FLATS
The URD Segment Plan

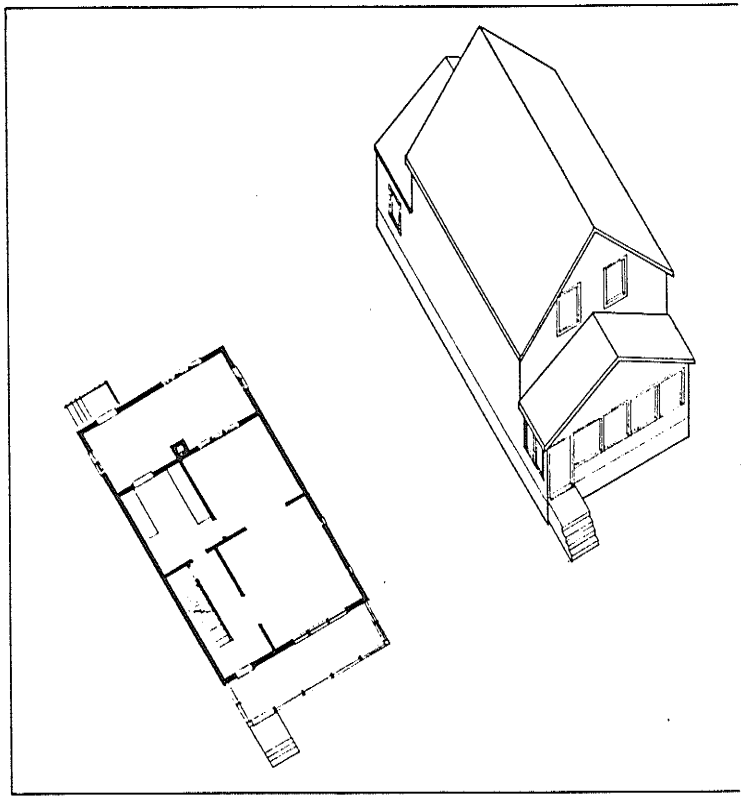


This type is common in the URD, a standard design with variations which was infilled on vacant lots in the post-war period when Regina experienced a residential building boom. The preference for fully detached housing remained in this period even though adjacent eaves nearly touch in many infill situations.



0 5 10 20m

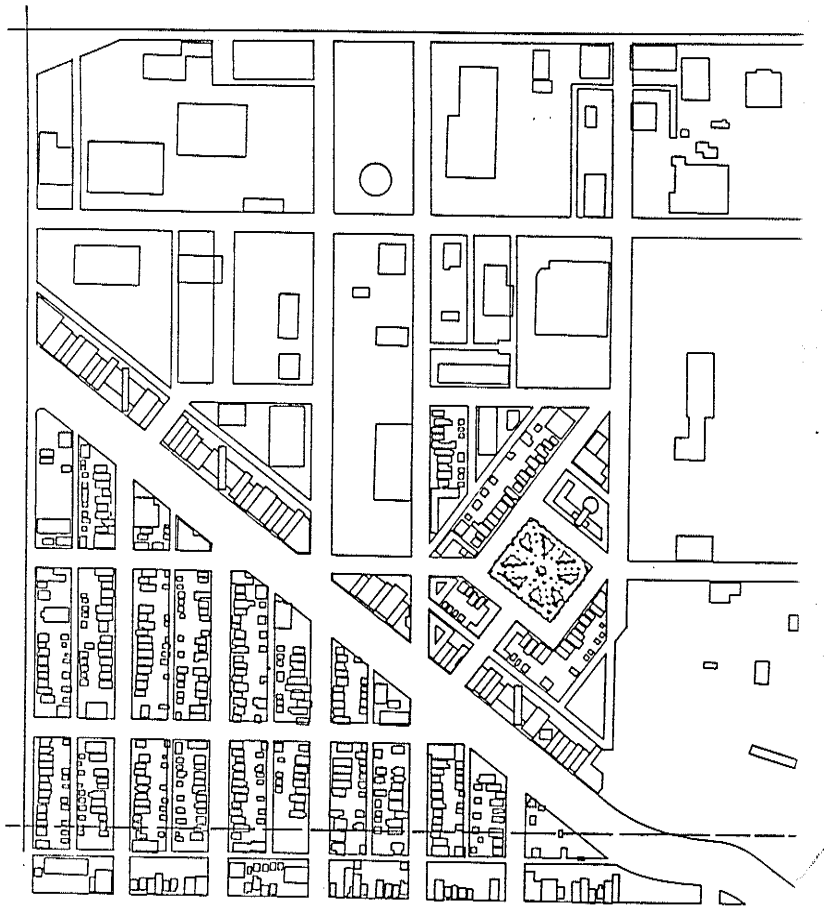
Figure 8.1 GARLIC FLATS
Dwelling Plan and Axonometric



This type is the larger of the early houses built in the URD at the turn of the century. One-and-one-half and single storey houses with similar footprints were also built during this period. Many of the smaller ones lack basements or proper foundations and some lacked indoor plumbing less than a decade ago.

0 5 10

Figure 8. GARLIC FLATS
Dwelling Plan and Axonometric



Integration is the goal of this transformation. The orientation introduced by Arcola Avenue is used in a positive manner rather than simply distorting the edges of the existing grid. Alignments and intersections of the two grids are respected and reinforced with new buildings. New residential properties extend into the industrial area, and are accompanied by new light industrial properties at the edges. The residential properties are organized around a square reminiscent of Victoria Park, Regina's original public open space.

Figure 9. GARLIC FLATS
Transformation

Appendix D — Annotated Bibliography

The Urban Homestead

Building a self-reliant community through ecology

An annotated bibliography prepared for fulfillment of

Special Topics 36.707

Department of Landscape Architecture

University of Manitoba

Advisor: C. H. Thomsen

Greg Kiloh

April 16, 1993

Table of Contents

Introduction

This bibliography is intended to be a comprehensive although not necessarily exhaustive review of literature pertaining to self-reliant urban communities. Because the subject is by nature holistic, the areas of enquiry range a great deal. The bibliography is structured around various themes which together constitute a complete examination of the issues required to develop a self-reliant urban community. All of these various subjects are inter-related and cannot be examined in isolation but have been organized here as such to give the review some coherence. Many of the selected writings could be entered in various categories but are organized by their primary focus. Themes are arranged alphabetically by the selected headings. Books and articles are mixed together as relatively few articles were found to have direct relevance.

Note on call numbers:
ARCH is Faculty of Architecture Library, University of Manitoba.
ENG is Faculty of Engineering Library, University of Manitoba.
SCI is Faculty of Science Library, University of Manitoba.
MAIN is Winnipeg Public Library, Downtown Branch.
ISBN denotes private collection.

Annotated Bibliography

Bio-regional Architecture

Golany, Gideon S. *Earth Sheltered Habitat.* Van Nostrand Reinhold Company. New York. 1983. (ARCH NA 2542.7.G64 1983)
An overview of issues regarding earth sheltered buildings both historical and contemporary. Not overly technical nor profound information. Design illustrations, particularly those covering urban design are naive and poorly done.

McHenry, Paul Graham Jr. *Adobe and Rammed Earth Buildings: Design and construction.* John Wiley and Sons. New York. 1984. (ARCH TH 4818 A3 M3 1984)
This book reveals the long and honourable history of building with earth. Limitations are fewer than imagined, but details for avoiding problems are discussed and illustrated.

Norberg-Schulz, Christian. *Genius Loci. Towards a phenomenology of Architecture.* Rizzoli. New York. 1979. (ARCH NA 2542.4.N6713)
The phenomenological approach to architecture is to find meaning in the tangible world around us. The implication in this theory is that every place is unique and that interventions have more power when they recognize the inherent qualities of place.

Scalise, James W. ed. *Earth Integrated Architecture.* College of Architecture, Arizona State University. Tempe Arizona. 1975 (ARCH NA 2542.35.E37)
This document is essentially a studio report compiled by students in the College of Architecture. The technical research, although largely based on Arizona conditions, is fairly comprehensive and could serve as a valuable guide if used with caution. Design projects illustrated are not terribly sophisticated and serve little purpose.

Case Studies

Anonymous. "Institute for Regenerative Studies" in *Landscape Architecture* Vol. 78 No. 7, November 1988. (ARCH PER 712 L239)

This project, designed by John Tillman Lyle will provide a research and education facility for studying regenerative landscapes. The project uses an integrated approach utilizing food production, sewage recycling and aquaculture.

Clarke, Robin. *Building for Self-sufficiency*. Universe Books, New York. 1977. (ISBN 0-87663-230-4)

Documentation of experiences at a rural commune in Wales. Covers building techniques, alternative energy sources, and food production.

Coates, Gary J. ed. *Resettling America: Energy, Ecology, and Community*. Brick House Publishing Co., Inc. Andover Massachusetts. 1981. (Dafoe HT 123.R45)

The text book of urban homesteading as I have defined it. Many of the articles are written by authors appearing elsewhere in this bibliography. More than a compendium or primer on the subject, it also contains excellent references. Unfortunately, it is now a decade out of date, and leaves one wondering if all the statements made are still relevant. It will be necessary to search for updates on many of the subjects until a planned second edition is completed.

The section *Contemplative Communities* covers case studies that combine, to a great degree, the requirements of sanctity and community necessary to meet Coates definition of the eco-community of the meta-industrial world.

The section *Rural New Towns* discusses two resident established communities in the rural U.S. Although New Communities Inc. of Georgia and Cerro Gordo in Oregon are not urban, their process of establishment and general goals are very similar to the proposed urban community.

The section *Urban Decentralization* speaks more directly to the chosen topic. In the introduction, Coates discusses the University for Man Appropriate Technology Addition that he has been involved with in association with his position at the College of Architecture at Kansas State University in Manhattan Kansas. "Self-Help Housing and the Cities" by Michael Freedberg discusses a sweat equity programme begun in New York City at 519 East 11th Street. Not only did residents renovate a nearly condemned tenement, they included energy conservation measures and received vital job training in doing so. Their enthusiasm soon spread through the neighbourhood, as the project became a model for other buildings. Community gardens and community co-operatives were eventually established. "Beyond Solar" by Peter Calthorpe is an introduction to his work that was further elaborated in the book he wrote with his partner Sim Van der Ryn (see Sustainable Communities). "Urban Agriculture" by William and Helga Olkowski discusses much of the same material in *The Integral Urban House*. "The Cheyenne Community Solar Greenhouse" by Gary M. Garber discusses a community project that gave high school students an opportunity to research appropriate technology as well as learn to build in wood frame construction, gave seniors a place to meet and an activity to fill their days, and provided fresh organic produce year round for the communities poor. Cheyenne's high altitude gives it a climate that is nearly as severe as Regina's. "The Davis Experience" by Marshall Hunt and David Bainbridge provides some of the background material on the planning changes in Davis that lead to Village Homes (See Corbett). "The Appropriate Technology Vision and the Future of Our Communities" by Dennis R. Holloway describes projects undertaken by the School of Architecture and Landscape Architecture at the University of Minnesota, including Winona (see Holloway).

Biotechnology and Regional Integration examines these same issues at a regional scale. "Agricultural Landscapes: Strategies Toward Permanence" by Earle A. Barnhart discusses work done by New Alchemy Institute (see Todd). "New Roots for Agriculture" by Wes Jackson discusses his efforts to establish perennial grains at the land Institute in Salinas Kansas.

Corbett, Michael N. *A Better Place to Live: New designs for tomorrow's communities*. Rodale Press, Emmaus, Pennsylvania. 1981. (ARCH HT 65 C67)

This book by the developer/designer of Village Homes, Davis, California, illustrates the theories that were put into place in Davis, and how the 'appropriate planning area' model can be used in new and existing communities in the future.

Farallones Institute. *The Integral Urban House*. Introduction by Sim Van der Ryn. Sierra Club Books. San Francisco. (ARCH TH 4812 F37 1979)

A history of the Integral Urban House project in Berkeley, California. The project was a demonstration of the concept of self-reliant urban living. An illustrated guide to the processes required to achieve self-reliance includes knowledge gained through the operation of the house as well as associated research.

Holloway, Dennis et al. *Winona: Towards an energy conserving community*. University of Minnesota. 1975. (ARCH 2542.3 W55)

This book is based on papers and exhibition produced by students in the Energy Design Studio in the School of Architecture and Landscape Architecture at the University of Minnesota. The town of Winona was chosen as a prototypical site for extensive alterations to produce a more energy conserving community. The development of locally based economy, urban agriculture, resource recycling etc. are the same that would be required to develop an ecological community. The age of the study requires caution on technical issues and retrofitting an existing community brings up different issues than building from scratch, but the scope and rigour of the project is exemplary and an excellent precedent.

Pollution Probe. *Ecology House Reports*. Toronto.

Information package compiled by Pollution Probe with an emphasis on research results of the now defunct Ecology House adjacent to the Ecology Park in Toronto.

Sellers, David. "Settlement Patterns in America" in *Progressive Architecture* Vol. 72 No. 8 August 1991. (ARCH PER 720.5 P37)

A brief article by the Vermont Architect who pioneered design build in the Sugarbush area. His recent projects are re-examining the way in which Americans settle, whether urban, suburban or rural. All projects utilize the same notions as the urban homestead.

Van der Ryn, Sim. "Eco-villages: Toward Sustainable Architecture" in *Progressive Architecture* Vol. 72 No. 8 August 1991. (ARCH PER 720.5 P37)

This brief article outlines the attributes embodied in three recent projects by this long time advocate of environmental design.

Collaborative Communities

Franck, Karen and Ahrentzen, Sherry. eds. *New Households New Housing.* Van Nostrand Reinhold. New York. 1989. (Dafoe HD 7287.85.N48 1989)

A collection of essays regarding new forms of housing that are developing in recognition of late twentieth century demographics. Examples range from co-housing to single room occupancy hotels. Historical examples of similar solutions in other periods are also given. There is a strong emphasis on housing that is directed towards single mothers, as the vast majority of the authors are women.

Fromm, Dorit. *Collaborative Communities. Cohousing, Central Living, and Other Forms of Housing with Shared Facilities.* Van Nostrand Reinhold. New York. 1991. (ARCH HD 7287.86 E85 F76 1991)

The most complete and up to date book on cohousing, it is stronger academically than previous writings (see McCamant and Durrett). The book is divided into three sections: European Collaborative Housing, which discusses the historical evolution of the movement; American Collaborative Housing, which discusses the emerging movement in that country; and Development of Collaborative Communities, which is a guide to establishing a cohousing community.

Fromm, Dorit. "Collaborative Communities" in *Progressive Architecture* Vol. 74 No. 3 March 1993. (ARCH PER 720.5 P37)

An update on her book, this article focuses on the first generation of communities to be built in the U.S.

McCamant, Kathryn and Durrett, Charles. *Cohousing. A Contemporary Approach to Housing Ourselves.* Habitat Press / Ten Speed Press. Berkeley, California. 1988. (ARCH HD 7287.72 O4 M37 1988)

The original English language book on the subject of cohousing. (The authors in fact, copyrighted the term 'Cohousing'). The book is directed to the general public more so than design professionals, and is there for an attractive and interesting book, but has been surpassed by subsequent work. (see Fromm)

Selby, Joan Louise and Wilson, Alexandra. *Canada's Housing Co-operatives.* Co-operative Housing Foundation of Canada Research Paper #3. (ARCH HD 7287.72.C2 S453 1988)

An overview of the history of the Canadian co-operative housing movement and its role in social housing and community development.

Economic Self-reliance

Jacobs, Jane. *Cities and the Wealth of Nations. Principles of Economic Life.* Random House. New York. 1984. (ARCH HT 321.J319 1984)

In this book, Jacobs argues that cities are, have always been, and will continue to be the principle economic unit, despite the focus in recent centuries on centralist, nation based economic planning. She points out that cities build economic security through import replacement; the implication being that the city must be seen as a producer, not a consumer of goods. This basic theory is at the root of all self-reliant community development.

Morehouse, Ward ed. *Building Sustainable Communities: Tools and Concepts for Self-Reliant Economic Change.* The Bootstrap Press. New York. 1989. (ARCH HT 388 B85 1989)

A book from The Other Economic Summit (TOES) and the Intermediate Technology Development Group. Issues such as community land trusts and local economic trading systems are discussed clearly and concisely.

Morris, David. *The New City-States.* Institute for Self-Reliance. Washington D.C. 1982. (ARCH JS 341.M67 1982)

The complete version of Morris' essay in *Sustainable Communities* (see Coates), the author presents the thesis that cities are becoming states in themselves both politically and economically. This argument suggests that cities should be examined as economic and ecological units in their road towards self-reliance and sustainability.

Nozick, Marcia. *No Place Like Home: Building Sustainable Communities.* Canadian Council on Social Development. Ottawa. 1992. (ISBN 0-88810-415-4)

A timely book principally on sustainable *economic* development, it addresses issues beyond economics. In many ways an update of *Small is Beautiful*, it draws from current thought on sustainable development, and includes many examples from Winnipeg and Canada.

Schumacher, E.F. *Small is Beautiful. Economics as if people mattered.* Harper & Row. New York. 1973. (MAIN 330 SCH)

The book that started it all! Schumacher's legacy has been to create a whole new view of the world, its economics, environment and political systems. Unfortunately, those for whom bigger is more powerful are still in power, and have not yet gotten the message. This is probably due to the fact that a new view of the world is a threat to them, but ultimately their power is a greater threat to themselves and all the rest of us.

Energy Efficiency and Self-reliance

Allen Associates and Marbek Resource Consultants. *Passive Solar House Designs for Canada*. Canada Mortgage and Housing Corporation. 1989. (ARCH TH 7414.P377 1989)

A guide to passive solar house design for the Canadian climate. The first section deals in fundamentals and gives good rules of thumb based on current technology (1989) and northern circumstances. The emphasis is on conventional construction and design rather than specific passive solar techniques. For instance, the recommendation for overheating and heat loss is to limit the solar aperture rather than providing adequate mass and thermal window insulation. Part two illustrates the principles through a wide range of designs which are evaluated for various locales.

Knowles, Ralph L. *Sun Rhythm Form*. The MIT Press. Cambridge Massachusetts. 1981. (ARCH TJ 810 K56)

The author, one of the pre-eminent experts on solar energy illustrates a methodology for determining solar access in the built environment.

Littler, John and Thomas, Randall. *Design with Energy: The Conservation and Use of Energy in Buildings*. Cambridge University Press, U.K. 1984. (ARCH TJ 163.5.B84L57 1984)

A fairly comprehensive, although possibly overly technical, examination of the subject. Although it is written from the British point of view, case studies are taken from around the world. Somewhat more current than most books on the subject.

Merrill, Richard and Gage, Thomas. *Energy Primer*. Portola Institute, Menlo Park, California. 1974. (ARCH TJ 163.9 E536 1978)

A compendium of products, book reviews, and illustrated projects covering all aspects of appropriate technology. Produced at the height of activity in the area, it has an incredible breadth. Unfortunately, being nearly twenty years old, one must use information with caution. Never the less, much of the information is still valuable.

Morris, David. *Self-Reliant Cities*. Institute for Local Self-Reliance / Sierra Club Books. San Francisco. 1982. (ARCH HD 4605.M67 1982)

In this volume, Morris discusses how municipalities can increase energy self-reliance.

Public Works Canada. *Winning Low Energy Designs*. 1980. (ARCH NA 2542.3.W5)

Documentation of a competition for theoretical commercial buildings in Regina and Sherbrook. Of particular interest is the first place design for Regina designed by Rod Robbie with Michael Hough. The proposed mixed use development is conceived as a complete ecosystem integrating urban agriculture, biological sewage treatment and solar energy.

Environmental Architecture

Branch, Mark Alden. "The State of Sustainability" in *Progressive Architecture* Vol. 74 No. 3 March 1993. (ARCH PER 720.5 P37)

An overview of the current status of Architecture in regard to environmental issues. Projects and issues examined include Martin Liefhebber's winning entry to the CMHC "Healthy Housing" competition, embodied energy and recycling of building materials, Rocky Mountain Institute, non-toxic materials, and pedestrian oriented urban design.

Knevitt, Charles. *Space on Earth*. Thames Television International Ltd. London. 1985. (ARCH NA 2542.4.K53)

A general personal manifesto on humanism in architecture. Chapter Five: New Directions is of particular interest to the subject as it covers both community architecture and environmental issues in architecture.

Pearson, David. *The Natural House Book*. Conran Octopus Ltd. London. 1989. (ARCH TH 6057.A6 P4 1989b)

This book, directed at the general public, is an attempt to address issues of ecology, health, and spiritualism in the single family home. All are covered to some extent, but the balance is on health, and the non-toxic home.

Vale, Brenda and Vale, Robert. *Green Architecture. Design for a sustainable future*. Thames and Hudson Ltd. London. 1991. (ARCH 2542.3.V35 1991b)

This book is an attempt to formulate criteria for sustainable architecture. It falls short primarily in that it deals with buildings more so than with the greater context which they are built in. As an attractive and light read it promotes the cause well but does not have much depth for those compiling research. Its greatest attribute may be that it is a relatively recent publication.

Wells, Malcolm. *Gentle Architecture*. McGraw Hill Inc. 1981. (ARCH NA 2542.35.W44 1981)

A wide ranging, largely philosophical, thematically technical treatise on a gentler architecture allied with and indebted to Wright's 'organic architecture'. Well's approach builds on his experience as a environmentalist who practices architecture, and as a pioneer in earth-sheltered and solar architecture.

Green Issues

Berg, Peter et al. *A Green City Program for the San Francisco Bay Area and Beyond.* Planet Drum Foundation. Wingbow Press. San Francisco. 1989. (ARCH HT 243.U62 C234 1990)

A general guide to 'greening' cities at the municipal and neighbourhood level. Written in the somewhat naive style of the Bay area, (see Register) but does have some helpful suggestions towards viewing the city as an ecological unit.

Berry, Wendell. *The Gift of Good Land. Further Essays Cultural and Agricultural.* North Point Press. San Francisco. 1981. (MAIN 630.973 Ber)

The author, both farmer and philosopher, owes most of his thoughts in this book to two sources. One, Henry David Thoreau, who in his book, *Walden* espoused the simple over the pretentious. The other, E.F. Schumacher advised that smaller is always better. These two ideas taken together, suggest a way of farming which is a way of living. Family values and spirituality derived from working the soil is suggested to be the salvation of agriculture and world ecology.

Cholette, Kathryn et al. "Green City: an introduction" in *City Magazine* Vol.11 No. 1, Summer/Fall 1989. (ARCH PER 300 C4989 MAG)

A review of the Green Cities Conference attended by six City Magazine writers which has greatly influenced the editorial direction of the publishing collective. Included are outlines for the Green City programs in New York and San Francisco, as well as an ecological audit to determine how 'green' a community is.

Epp, Ray. "Food Security for the Sustainable City" in *City Magazine* Vol. 13 No.1 Winter 1991/1992. (ARCH PER 300 C4989 MAG)

Epp, co-owner of the Tall Grass Prairie Bread Co., a Winnipeg Co-op which controls production of its bread from field to home, discusses the role food must have in a sustainable society.

Fukuoka, Masanobu. *The One Straw Revolution.* Rodale Press Emmaus Pennsylvania. 1978. (MAIN 631.58 FUK)

The legendary Japanese micro-biologist/farmer reveals his enlightenment and lays out his approach to natural farming. He maintains that natural farming is a spiritual as well as physical act, and one cannot achieve harmony with nature and God without raising one's own food.

Fukuoka, Masanobu. *The Road Back to Nature.* Japan Publications Inc., Tokyo and New York. 1987. (ISBN 0-87040-673-6)

Further essays on the master's techniques, wisdom, travels, and plans to save the world.

Gayton, Don. *The Wheatgrass Mechanism.* Fifth House Publishers, Saskatoon. 1990. (ARCH QH 106.2 P6 G39 1990)

Essays on prairie ecology written with scientific information and a poetic style that captures the essence of the prairie landscape. In particular the chapter 'Symbiosis' describes innovative agriculture practiced by Don and Dorothy Swenson south of Moose Jaw, including a domestic sewage effluent irrigation system.

Gordon, David ed. for Pollution Probe. *Green Cities: Ecologically sound approaches to urban space.* Black Rose Books, Montreal. 1990. (DAFOE QH 541.5 C6 G74 1990)

Essays on urban ecology and sustainable urban development. "The Ecological City as a Self-reliant City" by David Morris discusses the inefficiencies inherent in urban economies that are overly dependent on international trade. "Urban Agriculture and Urban Land Use" by Dr. Robert Dorney reveals that agriculture within cities is already very common and productive. In "Urban Agriculture in the Green City", Harry Pelissero presents a more skeptical view of the romantic notion of urban agriculture.

Nicholson-Lord, David. *The Greening of the Cities.* Routledge and Kegan Paul Ltd. London. 1987. (ARCH HT 169.G7 N52 1987)

A philosophical examination of the green movement, its roots, history and directions. Written from the British perspective, it deals largely with the movement in that country, although is not limited in its examples. Of particular interest is the chapter entitled "Earthworks" which focuses on the city farm and urban forestry movements.

Register, Richard. *Ecocity Berkeley: Building cities for a healthy future.* North Atlantic Books. Berkeley, California. 1987. (MAIN 307.14 REG)

This book presents a somewhat naive, fanciful vision of the city of the future. The basic principles of ecologically responsive cities are presented, but the applications using Berkeley as a model do not do the issue justice, and probably do more to discredit the work of more academically serious theorists in the field.

Roseland, Mark. *Toward Sustainable Communities. A Resource Book for Municipal and Local Governments.* National Roundtable on the Environment and Economy. Ottawa. 1992. (ISBN 1-895643-09-0)

A compendium of articles culled from a broad spectrum of sources. Although there is little original material, (and what is original is written in bureaucraticease) it is a useful resource to locate source material.

Todd, John and Nancy Jack. *Bioshelters, Ocean Arks, City Farming.* Sierra Club Books. San Francisco. 1984. (ARCH GF 50 T6 1984)

The founders of the New Alchemy Institute discuss their philosophy, and describe the technical accomplishments and potentials of their applied research. Of particular importance is their tested and proven bioshelter, a solar powered greenhouse integrating aquaculture, intensive agriculture and sewage treatment. Nine precepts of biologically informed design are laid out, followed by a discussion of the application of these principles to existing urban communities. The history and potential future practice of agriculture is described, with particular emphasis on the role human societies play in the global ecosystem.

Van der Ryn, Sim and Calthorpe, Peter. *Sustainable Communities*. Sierra Club Books. San Francisco. 1986. (MAIN 307.14 VAN)

These two authors, pioneers in the field of designing and building sustainable communities, lay out their philosophies of urban design and illustrate it with case studies of their work. Included are essays by: Paul Hawken; Clare Cooper Marcus; David Morris; John Todd; and David Katz. The most relevant to the area of the study is the latter, entitled: 'Metro Food Systems and the Sustainable City'. The author is highly critical of the productivity estimates given by the proponents of the Biodynamic/French intensive method (see Jeavons), but none the less concludes that the post-industrial city will have to become more self-reliant and energy conserving in its food distribution systems.

Ward, Colin. *Welcome, Thinner City*. Bedford Square Press. London. 1989. (ARCH HT 166.W37 1989)

A recent contribution from the British anarchist and housing advocate. Particularly worthy chapters are: "City People *Can* House Themselves" and the following "Can They Make Jobs Too? The Italian Lesson", and of course "Green Cities" which discusses urban agriculture.

Land Reclamation

Dutton, R.A. and Bradshaw, A.D. *Land Reclamation in Cities*. Her Majesty's Stationery Office. London. 1981. (ARCH HT 178.G7D87)

This guide to methods of establishment of vegetation on urban waste land in the British example offers a good overview of the issues. Discusses allotments and urban farms.

Resource Recycling

Van der Ryn, Sim. *The Toilet Papers*. Capra Press, Santa Barbara, Ca. 1978. (ARCH TD 774 V36)

Promotion of biological techniques of sewage management, with a particular emphasis on viewing human waste as a resource, not a menace.

Siddiqi, Sally and Chabannes, Giles. "Greenhouses that Grow Clean Water" in *Progressive Architecture* Vol. 73 No. 10 October 1992. (ARCH PER 720.5)

A brief article illustrating a Solar Aquatics sewage treatment facility in an urban infill context.

Self-reliant Housing

Eccli, Eugene ed. *Low-cost, Energy Efficient Shelter for the Owner and Builder*. Rodale Press Emmaus Pennsylvania. 1976. (ARCH TH 4815 L68)

A series of essays intended to aid the owner/builder. Subjects cover financing, regulations, planning, design, construction and energy efficiency.

Habraken, N.J. et al. *Variations: The Systematic Design of Supports*. MIT Press. Cambridge Massachusetts. 1976. (ARCH TH 4809.N4 D4613 1976)

A detailed description with examples of the S.A.R. system of modular co-ordinated design and construction developed following the author's analysis of industrialized mass housing published as *Supports*. The system recognizes and allows for residents' needs and desires to modify their environments.

Haynes, Charles. *Self Help Housing*. Pulp Press. Vancouver. 1979. (ARCH TH 4815 H39)

A manual and documentation of the Acadia House, designed and built at U.B.C. by a team of amateurs. Acadia is a single family, hybrid solar house done at low cost with low embodied energy.

Kellett, Peter and Köncke, Carlos. "Squatters, Self-builders and Supports: a research based design proposal" in *Open House International* Vol. 12 No. 4 1987. (ARCH PER 720 O)

In this article, the authors propose a methodology for applying the S.A.R. system (see Habraken) to organize a squatter settlement in Columbia. The well established and productive movement of self-build housing is then improved by the introduction of standards that do not impose limitations on an active solution to the housing problem.

Kern, Ken. *The Owner Built Home*. Ken Kern Drafting. Oakhurst CA. 1972. (ARCH TH 4815 K47)

The ultimate cottage industry book on self-reliance. Despite the authors crusade against bureaucracy and specialized labour, it contains much wisdom, as well as practical instruction and is well referenced to a very broad selection of literature.

Kroll, Lucien. *The Architecture of Complexity*. B.T. Batsford ltd. London. 1986. (ARCH NA 2760 K7613 1986)

The author describes his theories and working methods stemming from 20 years of resident design participation and modular construction techniques. His technique is an adaptation of the S.A.R. module, feeling that even a 10 cm module is too crude and limiting. (See Habraken)

Rudofsky, Bernard. *Architecture Without Architects. An introduction to non-pedigreed architecture*. The Museum of Modern Art / Doubleday & Co. Inc. New York. 1964. (ARCH 720.9 R835 Ar)

This book, documentation of the exhibit of the same name, helped to introduce the sophistication of the vernacular to architects during the height of the modern movement. This view has been a great ally to the self-build housing movement in developing countries, but has had primarily stylistic influence in the developed world.

Urban Agriculture

Abraham, George (Doc) and Katy. *Organic Gardening Under Glass.* Rodale Press Emmaus Pennsylvania. 1975 (MAIN 635.0444 ABR)
Possibly the most complete and informative guide to the use of greenhouses in gardening.

Anonymous. *Organizing a Local Cornucopia Project: A Manual for changing your food system.* Rodale Press, Emmaus, Pennsylvania. 1982. (ARCH HD 9000.65 O74)
A manual for organizing local grass roots responses to the vulnerability and dysfunctional industrial food system, encouraging more healthful, self-reliant lifestyles.

Bartholomew, Mel. *Square Foot Gardening.* Rodale Press Emmaus Pennsylvania. 1981. (MAIN 635 BAR)
A modified intensive approach based on square foot module instead of rows, intended to create maximum flexibility in a garden layout.

Clay, Grady. "Bio-Regional Farming" in *Landscape Architecture* Vol. 73 No. 2, March 1983. (ARCH PER 712 L239)
A review of what has now come to be known as "community shared agriculture" in Oregon, it matches urbanites to farmers to share in the bounty and hardship of agriculture while eliminating the middlemen and influential chemical companies in industrial agriculture.

Craft, Mark A. *Winter Greens: Solar greenhouses for cold climates.* Renewable Energy in Canada series. Firefly Books Ltd. Scarborough Ontario. 1983 (ARCH SB 416 W 56)
A very thorough manual on the use of solar greenhouses to grow vegetables in northern climates. Covers both greenhouse construction and planting techniques.

Creasy, Rosalind. *The Complete Book of Edible Landscaping.* Sierra Club Books, San Francisco. 1982. (ARCH SB 473 C73)
A very comprehensive guide to using edible plants in the home landscape.

Hough, Michael. "Metro Homestead" in *Landscape Architecture* Vol. 73 No. 1, January 1983. (ARCH PER 712 L239)
Hough's overview of the potential and need for productive landscapes in urban areas.

Jeavons, John. *How to Grow More Vegetables than You Ever Thought Possible on Less Land than You Can Imagine.* Ten Speed Press. Berkeley, California. (MAIN 635 JEA)
A manual for the Biodynamic/French intensive method developed by Alan Chadwick and further research by Ecology Action. Productivity claims of this method are astounding. Extensive bibliography.

Melby, Pete. *Simplified Irrigation Design.* Van Nostrand Reinhold. New York. 1988. (ARCH TC 805.M56 1988)
A very thorough manual for sprinkler and drip irrigation intended for landscape architects.

Minnich, Jerry. *Gardening for maximum Nutrition.* Rodale Press Emmaus Pennsylvania. 1983. (MAIN 635 MIN)
A detailed examination of garden yields from the point of view of nutrition as well as quantity.

Naimark, Susan. *A Handbook of Community Gardening.* Boston Urban Gardeners Inc. 1982. (ARCH SB 457.3 H26 1982)
A handbook written out of the experience gained in pioneering urban gardening in Boston.

Poincelot, Raymond P. *Toward a More Sustainable Agriculture.* AVI Publishing Co. Inc. Westport, Connecticut. 1986. (MAIN S 604.6.P65)
A very academic and balanced examination of sustainability in agriculture. The author is strictly addressing the conventional, large scale industrial agriculture common today, but issues of energy and resource conservation apply to urban agriculture as well.

Pollution Probe. *Chemicals and Organic Alternatives in Agriculture.* Toronto.
Information package compiled by Pollution Probe.

Pollution Probe. *Organic Pest Control for Home and Garden.* Toronto.
Information package compiled by Pollution Probe.

Powell, Thomas and Betty. *Your Garden Homestead on Inches, Yards, or Acres.* Houghton Mifflin Co. Boston. 1977. (MAIN 635.0973 POW)
Discusses vegetable, fruit and nut production and storage, organic farming techniques, and other related sources of nutrition and income.

Stern, Peter. *Small Scale Irrigation.* Intermediate Technology Publications Ltd. and International Irrigation Information Centre. 1979. (ENG TC 809 S737 1988)
This manual was intended for use in Third World Countries, so is applicable to low cost solutions. It covers all the basics required in designing various basic irrigation schemes.

Warner, Sam Bass. *To Dwell is to Garden.* Northeastern University Press. 1987. (ARCH SB 457.3 W37 1987)
A history of the community gardening movement in three parts. Part one is an overall history, part two a series of portraits of Boston urban gardeners, and part three a description of various ethnic gardens.

Wickers, David. *The Complete Urban Farmer.* Viking Press, New York. 1977. (SCI SB 322 W53 1977)
A basic guide to growing and storing vegetables anf fruits with extensive plant descriptions including recipes.

Urban Design

Anderson, Stanford ed. *on Streets*. The MIT Press. Cambridge Massachusetts. 1986. (ISBN 0-262-51039-1)

A collection of essays from a wide perspective based on one simple thesis: that the street is the pre-eminent urban form. Contributors include Architects, urbanists, historians and social scientists and the various articles examine streets from those varied perspectives.

Appleyard, Donald. *Livable Streets*. University of California Press. Berkeley and Los Angeles. 1981. (ARCH HE 337 A65 1981)

The definitive text on the subject of taming traffic in residential streets. This book is the result of a career dedication to the goal of pedestrian safety, and draws on studies conducted throughout the Western World.

Gehl, Jan. *Life Between Buildings: Using Public Space*. Van Nostrand Reinhold Company. New York. 1987. (ISBN 0-442-23011-7)

Danish architect and urbanist Jan Gehl's treatise on engendering a more social urban environment. Written from the perspective of years of behavioural research around the world, he has assembled a comprehensive guide for planning and designing more humanistic urban environments.

Hough, Michael. *City Form and Natural Process. Towards a new urban vernacular*. Croom Helm. London. 1984. (ARCH 9031.H66 1984)

This book, one of the seminal on the subject of urban ecology and its relationship to design, has influenced the way the city is viewed. If the city is to be integrated with nature, then its energy and resource cycles must be closed to become a stable ecosystem. Chapter 6, City Farming is of particular interest to this study.

Moudon, Anne Vernez ed. *Public Streets for Public Use*. Van Nostrand Reinhold Company. New York. 1987. (ARCH HT 166 P82 1987)

A wide ranging collection of essays regarding the pre-eminence of streets in cities and their use beyond automobile traffic. Of particular importance to this study is "A Closer Look at the Users of Woonerven" by Brenda Eubank-Ahrens.

Newman, Oscar. *Defensible Space: Crime prevention through urban design*. The MacMillan Co. New York. 1972. (ARCH HV 6177 N49 1972)

In this seminal book on applied urban territoriality, the author examines a multitude of housing projects throughout the United States, and develops a set of design guidelines that can be used to provide more security in vulnerable urban environments.

Spirn Anne Whiston. *The Granite Garden: Urban nature and human design*. Basic Books Inc. New York. 1984. (ARCH HT 166 S638 1984)

The other seminal book on urban ecology and its design implications. (See Hough) Spirn's work is often more technically detailed and has concrete suggestions that every city can adopt. Spirn's ideas tend to focus on conventional concepts of the city, where as Hough theorizes new approaches to urban environments.

Tolley, Rodney. *Calming Traffic in Residential Areas*. Brefi Press. Dyfed Wales. 1989. (Eng HE 335.T644 1990)

A review of traffic taming initiatives in Britain and Western Europe.