

URBAN PROTOTYPING

An Incremental Approach to Medium Density Infill: From Row House to Modified
Stacked Courtyard.

by

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Abstract

This thesis revisits the low-rise multi-unit residential type in mature urban neighborhoods by examining its origins from a historical perspective. This thesis challenges the patterns of interrelationship and design in typical, highly individuated, row house developments, with a view to reinventing a low-rise multi-unit residential block. Using Ottawa as its testing ground, the thesis advances propositions for new housing models that critically reconsider current trends in infill and replacement housing within established low-rise neighbourhoods. The thesis pursues moderately scaled housing types in urban settings that weave private life and communal urban existence together through their architecture. The prototypes are tested on a site in Ottawa, along an urban “seam” between a traditional residential neighborhood and a new transit corridor.

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Introduction

The secluded detached home in a treed setting with green lawns is a persistent and cherished residential form in the Ottawa region. Yet at present, Ottawa's changing urban fabric offers a venue for focused consideration of new and more urban housing forms and settlement patterns. This thesis asks whether the qualities of the "house in nature" can be translated architecturally into higher density housing forms in transitional urban zones, and how this can best be achieved. We ask: can architectural design reconcile the pressures of urban life with suburban and rural ideals of individual privacy in a treed setting? The question of new urban housing forms is certainly a pressing one in Ottawa, where 134, 254 new urban dwelling types are expected to be built inside the city core in between 2006 and 2031.¹ And due to Ottawa's English settlement pattern, the city possesses large residential neighborhoods in central locations which are made up of detached houses on relatively compact urban lots, typically one hundred feet deep by thirty to fifty feet wide: the traditional fabric—houses with gardens inside the city—is in many ways quite idyllic just as it is. It is therefore not surprising that tensions result when new development disturbs traditional fabric in this city. Infill and replacement housing are the source of tensions between residents and developers in several mature Ottawa neighborhoods. Accounts of such tensions in the local newspaper, *The Ottawa Citizen*, attest to the city's growing pains on a regular basis.² How then to resolve the opposing goals of pastoral, quiet dwellings and urban living?

In Ottawa, the alternative to detached houses, and the predominant form of replacement housing, is the row house. This thesis questions the validity of typical,

¹ City of Ottawa, *Residential Land Strategy for Ottawa 2006-2031* (Department of Infrastructure Services and Community Sustainability Planning Branch, Research and Forecasting Section, Feb 2009), Publication #9-23, 17

² Spalding, Derek."Proposed Hintonburgh tower reduced to 30 storeys." *Ottawa Citizen*. The Ottawa Citizen, 14 February 2014. web. 31 March 2014.

<<http://www.ottawacitizen.com/Proposed+Hintonburg+tower+reduced+storeys/9532232/story.html>>.

highly individuated, row house developments, in particular their patterns of interrelationship. The design component presented at the end of this thesis thus proposes an alternative to the row house: a low-rise multi-unit residential block. The design criteria for such a revised model is a strong experience of individual privacy within an spatially interdependent urban settlement pattern. What is more, the revised model strives to provide a vivid experience of the environment and its seasonal processes, and to be a sort of “house in nature” in the city. (Figure 1)



Figure 1:16 Briarcliffe Drive, designed by Matthew Stankiewicz. 1970

Part One examines morphological questions pertaining to Ottawa houses from a historical perspective. Herman Muthesius's *The English House* provides a basis for outlining the interior spatial qualities of the English house.³ Frank Lloyd Wright's spatial principles, as analyzed by H. Allan Brooks in his journal article “Frank Lloyd Wright and The Destruction of the Box,” especially the opening up of closed volumes, diagonal spatial arrangements, overlapping rooms and open corners, provide a formal language

³ Muthesius, Hermann, *The English House* (New York: Rizzoli, 1979).

for revising the English influenced house plan and section.⁴ Finally, Raymond Unwin's *Town Planning in Practice*, especially the chapter "of plots and the spacing and placing of buildings and fences"⁵, and Christopher Alexander's *A Pattern Language* provide arguments for spatial separation of houses that is relational, that is to say, where the separation of dwellings also has to do with joining them together as an ensemble.⁶

Part Two of this thesis presents analytical morphological studies of various interrelated housing forms, including the attached house type, also known as the terrace house and the town house, and courtyard housing layouts. Case studies by Ludwig Mies van der Rohe, Philip Johnson, and Bjorn Utzon, and several Ottawa cluster housing and courtyard housing experiments, are examined. These provide a basis for developing new design strategies and prototypes for medium density low-rise residential building in Ottawa. In particular, qualities of light, material, and spaces in these various housing ensembles are compared. Building on these case studies, the thesis explores groupings of private living spaces with shared common spaces in order to understand their internal logic. A review of Norbert Schoenauer and Stanley Seeman's *The Court-Garden House*⁷ explains how the spaces within a cluster of courtyard house type arrangements function effectively and what architectural methods and devices are used to mix the enclosure of the house to allow for greater spatial enjoyment of the urban dwelling.

Part Three examines intensification policies in Ottawa, and a special case of urban infill sites: the newly defined public edges—"ends of blocks"—generated by the insertion of new public transportation corridors (in particular light rail). Finally, Part Four presents a design proposition for a site in Ottawa. The architectural site, design method, and four prototype studies are each developed in detail. In this section of the thesis, each

⁴ H. Allen Brooks, "Frank Lloyd Wright and The Destruction of the Box," *Journal of the Society of Architectural Historians* 38:1 (1979): 7-14.

⁵ Unwin, Raymond, Sir. *Town Planning in Practice: An Introduction to the Art of Designing Cities and Suburbs*. New York: Princeton Architectural Press, 1994, 319-326.

⁶ Christopher Alexander, *A Pattern Language: Towns, Buildings, Construction* (New York: Oxford University Press, 1977).

⁷ Norbert Schoenauer and Stanley Seeman, *The Court-Garden House* (Montreal: McGill University Press, 1962).

generative modeling diagram is assessed and critiqued. The most successful diagram serves as the basis for a fully developed design.

The following historical and precedent studies research and related urban proposal leads to a final a reflection on the broader question of architectural design as a strategy to reveal a city's latent urban order. This thesis opposes atomization and isolation, and argues for a shared public/private realm that is simultaneously more interesting from a social perspective, and richer from spatial and architectural standpoints.

PART ONE: Morphology and the Historical Perspective

Patterns of Influence

In reconsidering dominant tendencies in higher-density urban settlement patterns in Ottawa today, it is useful to examine both exterior arrangements and interior layouts from a historical perspective. Several distinct architectural traditions have contributed to traditional housing patterns in Ottawa and the current tendencies in infill housing, and a revised model depends upon an understanding of these patterns of influence. We begin this analysis of Ottawa's housing with the study of two main historical sources: -- the English garden settlement tradition for the exteriors, and Frank Lloyd Wright's plans for the interiors. The English heritage established a preference for detached homes set in gardens and for the attached house type in general. In turn, the American architect Frank Lloyd Wright perfected an architectural language that created greater openness within the detached house.

Herman Muthesius's assessments of the effect of English culture on English architecture and urban planning were operative in disseminating English domestic ideals outside and England, and are therefore relevant to understanding predominant housing forms in Ottawa. The German cultural envoi to England from 1896 to 1902 was fascinated by English residential architecture and ways of living, and documented Arts and Crafts houses extensively in his report, *Das Englische Haus* of 1904. According to Muthesius, individualism in English culture had created a strong preference for home ownership and for living in private houses outside of the urban centre in direct contact with nature. He described the English attitude to cities thus:

In England one does not live in the city, one merely stays there. To judge by the situation in England, one would be justified in asserting that the Anglo-Saxon race has been denied the gift of building cities; and this demonstrates another well-known element in its character; the inability of the individual to subordinate himself and his belongings to the whole.⁸

⁸ Muthesius, Hermann, *The English House*, ed. by Dennis Sharp, Rizzoli International Publications, New York: 1979, 7.

It is not just individualism, however, that predisposes the English to these housing forms, but also an awareness of the vitality of contact with nature.

Muthesius explained,

The most valuable gain from living in a private house is this closer contact with nature and the greater bodily and spiritual health which it brings. Even the house in the city has this great advantage over the multi-storied dwelling. It has some connection with the ground at least and it is easier to breathe fresh air.⁹

Very generally, then, we can see that the Ottawa preference for homes in nature has its roots in the English tradition. Space constraints, however, demanded urban homes with minimal footprints, and in the eighteenth century the English “adopted the nobleman’s house type as the model urban house type for the English masses, referred to as the terrace house also known as the townhouse.”¹⁰ In this type, street frontage typically measures between 6 and 9m and these houses are usually built in long, uniform rows, the effect of which is, in most cases, dreary in the extreme. Homes were typically built uniformly to the property line, and mid-block units rely on narrow front and rear exterior walls for fenestration.

The inherent flaws of this design prompted architects Norman Shaw and Ernest George, who were leaders in the English Domestic Revival, and greatly admired by Muthesius, to pioneer new standards for the London terrace homes, creating brighter and more spacious ground plans. In their plans, houses are not all flush with one another, and sometimes they are paired to flank a forecourt on the street side. In the interior, the contemporary preference for divided rooms rather than communicating rooms prevailed, with inner halls connecting rooms in each house. Concerns about natural light were a determining factor in design: “Typical of the London terrace house was the

⁹ Ibid., 9.

¹⁰ Ibid., 9.

ground plan extending no more than two rooms deep without the use of light wells should the plan extend more deeply into the site.”¹¹

The modern terrace house saw dramatic improvements in the 20th century.

The introduction of the light well as an architectural feature was among these, bringing light and air into the centre of the house and providing opportunities to light the main and service staircases, both of which typically adjoin the light well. All the ancillary rooms, such as lavatories, bathrooms, and cloakrooms, are grouped around the light well. Below is an illustration of a plan with two light wells; positioning one behind the other effectively divides the usable floor-space into three separate sections. (Figure 2)

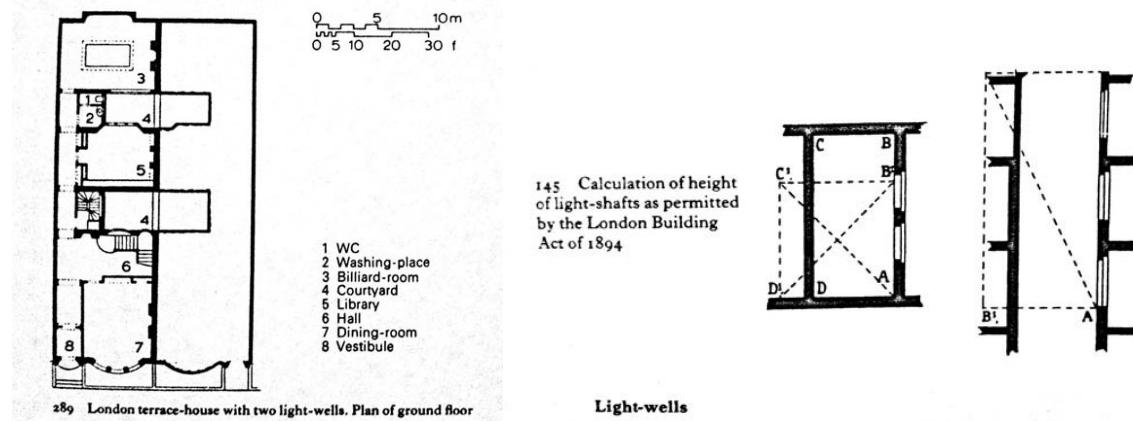


Figure 2: light wells, London terrace-house

Further improvements of the modern townhouse included building height regulations to manage light and air. Street width and empty space at the back of the lot determined allowable building height; in new streets of 50 feet or less, houses could not be taller than the street was wide. Regulations for rear lot setbacks in England were developed for house types that were not built around a courtyard in order to maximize open space for sunlight. Guidelines were precise: “The rule specified that space remaining behind the house may not be less than 10 feet wide and the area of the back of the building

¹¹ Ibid., 141.

shall not be smaller overall than 150 square feet. The legally prescribed angle of inclination is 63.5 degrees.”¹² This building strategy managed proportions and ensured access to light for neighbouring properties.

Raymond Unwin made parallel declarations in his book *Town Planning in Practice*.¹³ Unwin studied the spacing and placing of buildings on a lot, and argued that the size and number of houses to the acre was determinant in “reasonable health and comfort.” In “Nothing Gained by Overcrowding” Unwin argues that 12 units per acre are more reasonable than 20 in as much as it will cost no more to build them as fewer streets are required:

The depth of the open space increases in proportion to the height of the building, reaching a maximum under the old by-laws of 25 feet for a building 25 feet high, in some of the newer bye-laws going up to 40 feet for a building exceeding 35 feet in height. It will be seen that for cottages, which usually do not exceed 25 feet in height, the maximum depth of open space at the rear usually secured by the modern by-laws is 25 feet. With the narrow frontages usually adopted for small cottages, it is possible under these bye-laws to crowd as many as 50 houses to the acre or even more. There can be no doubt that this number is altogether excessive for reasonable health and comfort; it provides for no garden ground, only a small back yard attached to each cottage.¹⁴

Unwin’s focused interest on the study of the new exterior arrangements that would yield brighter and more picturesque environments was decisive in residential history in England, and would become the basis of new urbanism in North America, less than a century later. How then to bring greater spaciousness and light to interior of the smaller house on its smaller lot?

¹² Ibid., 75.

¹³ Unwin, Raymond, Sir. *Town Planning in Practice: An Introduction to the Art of Designing Cities and Suburbs*. New York: Princeton Architectural Press, 1994.,13

¹⁴ Ibid.,319

With regards to the question of achieving a brighter, more luminous interior, the work of another architect on the house plan proper provides a useful compliment to Unwin's research: that of Frank Lloyd Wright.

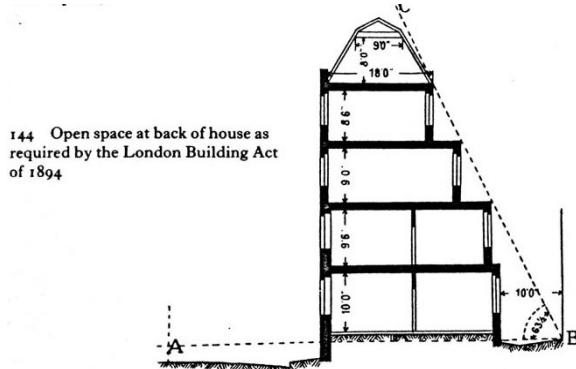


Figure 3: Open space at back of townhouse as required by the London Building Act of 1894.

The English style of housing was transported to North America, but developed its own features. There, the influential American architect Frank Lloyd Wright turned his attention to the organization of the interiors of houses. He began his architectural career in the late nineteenth century, at which point the shingle style of house was dominant. Shingle style houses featured large openings between principal rooms, creating a sense of openness. Inspired by this relatively new openness, Wright began to explore more radical ways for opening up floor plans. H. Allan Brooks analyzes Wright's spatial principles, noting the ways in which the opening up of closed volumes, diagonal spatial arrangements, overlapping rooms, and open corners provide a formal language for revising the English-influenced house plan.¹⁵

The Shingle Style also inspired Wright's occasional use of axial or cruciform plan configurations, which were an asset in his attempts to provide more openness between rooms. Wright recognized, however, the limitations of this strategy: "The basic concept of the room continued to be a box; The shingle style had large openings between

¹⁵ Brooks, "Frank Lloyd Wright and The Destruction of the Box."

principal rooms, and Wright felt this compromised privacy, so he used the axial/cruciform to remedy the loss of privacy.”¹⁶

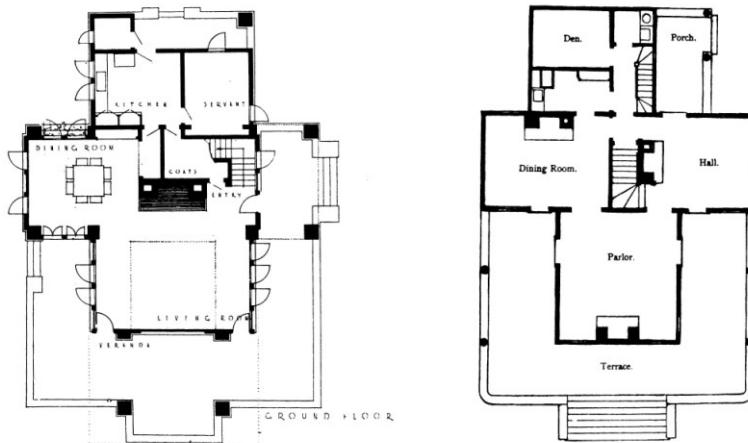


Figure 4: (Left) Frank Lloyd Wright, Charles S. Ross house, Delavan Lake, WI, 1902, plan (Hitchcock, In the Nature of Materials). (Right) Bruce Price, William Kent House, Tuxedo Park, NY, 1885, plan (Sheldon, Artistic Country-Seats, 1886-1887)

In the design of the Ross House (Figure 4), Wright dissolves the corner between the dining and living rooms, thus permitting one room to penetrate into the other. Both rooms make use of an area within the other room’s space, a unique architectural strategy which is very different from the shingle style’s spatial dynamics.

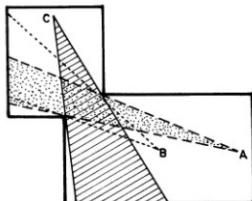
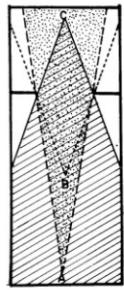
In Figure 5, “Right: A typical Shingle Style plan with large openings between the principal rooms. Left: in a Wright house, one room penetrates into the other at the corners. A, B, C show the angle of vision, taken from identical positions, into the neighboring room. Wright achieves more privacy and variety. Room dimensions in these two plans are identical ”¹⁷

In Figure 6, “the typical house composed of box-like rooms. Right: Wright’s first step is destroying the box. Rooms are interlocked, usually at the corners, with each relinquishing part of its space to the other. Sometimes this occurs at different levels creating balconies, split-levels, and varying floor and ceiling heights. The corner has been dissolved.”¹⁸

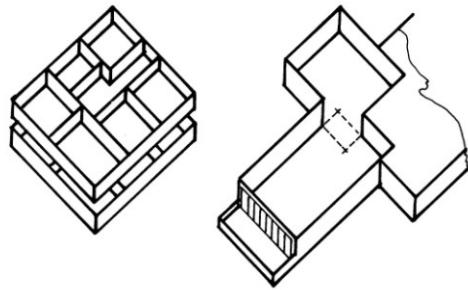
¹⁶ Ibid., 7.

¹⁷ Ibid., 9.

¹⁸ Ibid., 9.



**Figure 5: (Left) Shingle Style
vs. (Right) Frank Lloyd Wright**



**Figure 6: (Left) typical house composed of box-like rooms
(Right) Wright's house**

While these ‘Wrightian’ spaces insert openness where rooms intersect and share common space, other architectural devices are introduced to limit and control the view and privacy of the adjoining spaces. “Devices and strategies such as screening openings by various means, for example, wooden slats combined with low bookshelves (Willits house), walls that do not reach the ceiling (Roberts and Hanna houses), fireplaces or chimneys that open into the adjoining room (Martin and Robie Houses).”¹⁹ Freeing the wall from the corner was a simple idea, but the implications made this one of the most important discoveries in architecture. As Brooks explains, “Once the wall was freed from its corners it became a slab, and once it became a slab, it was no longer locked into a fixed position in space; it could be rotated on its axis, it could be divided into smaller slabs, it could (as later occurred in Cubist painting) be reassembled and reintegrated to define something new.”²⁰

¹⁹ Ibid., 9.

²⁰ Ibid., 11.

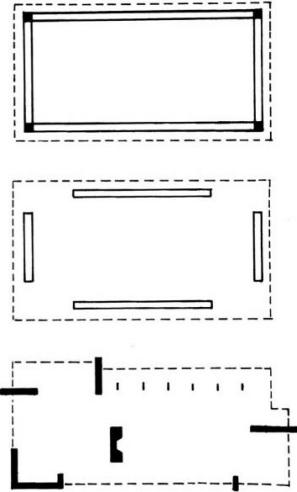


Figure 7: Diagram A, B, C: strategies of the destruction of the box.

Figure 7 demonstrates the possibilities: Diagram A, represents a rectangular room bound by its 4 walls joined together at each corner. Diagram B, each corner is eliminated and post removed. The walls are now independent planes or slabs that are noticeably separate from one another. The area within these four walls/slabs is now defined rather than enclosed. Diagram C, the abstract pattern of parts represents the schematic plan of one of Wright's Usonian houses in which the living space contains many 'rooms'. Integrated in this spatial environment can be a living room, a dining room, a hallway, a den, and the possibility of others.]²¹

According to this design philosophy, only bedrooms and bathrooms retain their integrity as private rooms. Meanwhile, piers and now independent 'slabs' of exterior walls are used in combination with a screen of windows as protection against the weather. This pattern represents the schematic strategies that Wright eventually used to develop plans for his Usonian houses, characterized by their distinctive treatment of walls that are no longer containers of space, but are increasingly shattered into piers and screens, while horizontal elements are left visually unsupported at their terminals and become cantilevered roofs and balconies.

²¹ Ibid., 12.

Wright encourages a fundamental revolution in thinking, managing the conception of spaces instead of rooms, and combining openness and continuity with strategic levels of privacy. As Brooks describes it, “The traditional concept of the room, formed by walls joined at the corners, had existed – unchallenged – since the earliest habitations, and by the 19th century its proliferation (nowhere carried to a more ridiculous extreme than in the English country house) had reached, both socially and economically, illogical bounds.”²² Wright destroys the box: the essence of his organic architecture lies in the notion that interior space must find exterior expression. Wright’s strategies focus on detached houses, but they help in developing a formal language that could be tested and applied to multi-unit building assemblies that aspire to a similar balance between openness and privacy.

Similar to the competing demands for openness and privacy within the house, house exteriors must negotiate private and public realms. In higher-density urban areas, it is especially essential to discover means of suturing together a web of private and public activities in close proximity.

There are a variety of strategies for negotiating the interface between public and private. One classic example of the interface in terrace housing is embodied by New York Brownstones (Figure 8), where the public and private boundary is defined by the vertical separation of the stair.

²² Ibid., 14.



Figure 8: N.Y. Brownstone

In other instances, the public-private interface has been given little consideration from an urban planning point of view. For instance, the Bronson Apartments (Figure 9) in Ottawa presents a muted interface with the sidewalk and street, due to a fence that has clearly been added as a corrective measure. The fence solved a privacy issue for ground level apartments facing the street, but in no way contributes to the public realm. This wall is a one-sided solution that does not take into account broader urban patterns and relationships.



Figure 9: Bronson Apartments, Ottawa

Ottawa's Byward Market - where private and public spaces are woven together in vertically stratified fashion - stands in sharp contrast to the Bronson Avenue

example. On the ground, the public has access to the Byward Market's courtyards (Figure 10), inside of which one can glimpse up to the residential domains. The urban order is exposed and legible, yet organized with complexity, making for a very interesting experience for the passer by. Here, citizens have access to the internal block, providing them with much greater sense of orientation and belonging now that the public spaces have been opened up inside them, alongside private dwellings. That which was once private has now been re-invented as a semi-private realm with shared public amenity spaces, creating complexity and interest.



Figure 10: By-ward Market, Ottawa

Christopher Alexander's A Pattern Language: guiding principles

Vienna born architect Christopher Alexander has devoted his life and thought to the issues of architecture's reception by the dweller. Coming from a belief in the dweller's fundamental understanding of built environments, Alexander has studied human settlement patterns and the human practice of making "homes," all around the world. In the context of this thesis, a study of some aspects of his thinking, as outlined in the work, *A Pattern Language: Towns, Buildings, Construction* of 1977 will be useful.

In his book, *A pattern language*, Alexander provided models for exploring the various patterns by which private spaces intersect with public spaces.²³ Alexander believed that well-functioning environments relied on an important ingredient which he termed "common land"²⁴ He believed that private realms were inherently knitted knit into the social fabric, allowing for individual expression within the private to be shared with the greater public realm:

No pattern is an isolated entity. Each pattern can exist in the world, only to the extent that is supported by other patterns: the larger patterns in which it is embedded, the patterns of the same size that surround it, and smaller patterns which are embedded in it. This is a fundamental view of the world. It says that when you build a thing you cannot merely build that thing in isolation, but must also repair the world around it, and within it, so that the larger world at that one place becomes more coherent, and more whole; and the thing which you make takes its place in the web of nature, as you make it.²⁵

Alexander described the fundamental nature of the task of making towns and buildings in terms of the manipulation of recurring patterns found in the built environment. In his research, Alexander inventoried no less than two hundred and fifty three pattern languages. He explains that the number of patterns is less about a numerical sequential order and more importantly associated to inherent connections between the patterns:

Each pattern is connected to certain 'larger' patterns which come above it in the language; and to certain 'smaller' patterns which come below it

²³ Alexander, *A Pattern Language: Towns Buildings, Construction* (New York: Oxford University Press, 1977).

²⁴ Ibid, xxiii.

²⁵ Ibid, xiii.

in the language. The pattern helps to complete those larger patterns which are ‘above’ it, and is itself completed by those smaller patterns which are ‘below’ it.²⁶

These patterns together formed what Alexander called a language. Each pattern, grouped into sequences, provided rules and principles capable of generating cohesive public and private environments. For example, Pattern 37, “House Cluster” defined rules of assembly for new clusters within existing neighborhoods. In Pattern 67, “Common Land.” Alexander noted:

Without common land no social system can survive. Just as there is a need for public land (accessible green) at the neighborhood level, so also within the clusters and work communities from which the neighbourhoods are made, there is a need for smaller and more private kinds of common land shared by a few work groups or a few families. This common land, in fact forms the very heart and soul of any cluster. Once it is defined, the individual buildings of the cluster form around it.²⁷

Therefore common land which is shared by the cluster is an essential ingredient. It acts as a focus and physically knits the group together. Alexander described the common land dynamic thus:

This common land can be as small as a path or as large as a green. On the other hand, care must be taken not to make cluster too tight or self-contained, so that they exclude the larger community or seem too constricting and claustrophobic. There needs to be some open endedness and overlapping among clusters.²⁸

The relationship of private dwellings to common land is however a sensitive one: Alexander notes, “People are different, and the way they want to place their houses in a neighborhood is one of the most basic kinds of difference.”²⁹ Some people want to live where the action is. Others want more isolation. Yet, common land and the ability to cluster are, in Alexander’s conception, necessary for both social life and individual retreat.

²⁶ Ibid, xxii

²⁷ Ibid, 337.

²⁸ Ibid., 201.

²⁹ Ibid., 93.

Most relevant for the purposes of this thesis is the fact that in his writing, Alexander also considered how to introduce clustering -- and thus increase interconnectedness -- in existing neighborhoods built without clusters and common land. In such cases he suggests the following: "In existing neighborhoods of free-standing houses, the pattern must be brought into play gradually by relaxing zoning ordinances and allowing people to gradually knit together clusters out of the existing grid."³⁰ The question of appropriate intensification in mature residential neighborhoods can at times be highly controversial; however intensification strategies are prescribed by specific planning policies that identify appropriate density targets to help form new urban neighborhoods. Nevertheless, mature urban neighborhoods do require careful planning considerations in order to determine appropriateness of future developments.

Alexander regarded the following notes on appropriate density patterns:

For densities higher than 15 houses per acre, it is almost impossible to make houses freestanding without destroying the open spaces around them; the open space which is left gets reduced to noting more than shallow rings around the houses. Apartments do not solve the problem of higher densities; they keep people off the ground and they have no private gardens.³¹

Consequentially, Alexander noted "densities of 15 to 30 houses per acre demand a row house building type to manage open landscape spaces around the house types."³² As Alexander pointed out in pattern 38 "Towns,":

Conventional row houses generally have a short frontage and a long depth, and share the party wall along their long side. Poor attributes result from this planning concept. Many of the rooms are poorly lit, and the house in general lacks privacy because linear outdoor spaces are close proximity to shared party walls. Furthermore, the inherent small yards are compromised by the fact that they are at the short ends of the house, so that only a small part of the indoor space can be adjacent to the garden.³³

Alexander recommended for row houses, "that they be located along side pedestrian paths that run at right angles to the roads and parking lots, and give each house a long

³⁰ Ibid., 200.

³¹ Ibid,205.

³² Ibid.,205.

³³ Ibid.,205

frontage and a shallow depth. The placement of house plans is suggested as long and thin along the path as possible.”³⁴ The inherent sequential order thus refers us to another the following pattern, pattern 109, “Long Thin House”.

Consideration of the proper form and dimension for the house plan is a necessary in arranging the varying degrees of privacy within the spatial composition of the house. The shape and size of each housing module must also be given consideration with regard to the exterior spatial effectiveness for the overall composition of the residential block. “Pattern (109 Long Thin House) describes the shape of a building having a great effect on the relative degrees of privacy and overcrowding in it, and this in turn has a critical effect on people’s comfort and well being. There is evidence to show that overcrowding in small dwellings causes psychological and social damage.”³⁵ Alexander made reference to a mathematical calculation described using a mean point to point distance. Compact shapes such as circles and squares are described as low in contrast to distended shapes like long thin rectangles and tall narrow towers. The latter simple shapes which increase the distance between points increase the relative privacy which people are able to get within a given area. An important consideration is to avoid clustering all of the rooms together; instead string out the rooms and spaces vertically or horizontally, so that greater distance between each room is achieved.

The question of how one integrates new shared common spaces within an existing residential fabric is a challenging one in the present. Alexander’s insights, in particular regarding densities, the relationship between private and public spaces and the placement and shape of the dwellings on their lots, will influence the design proposal for a housing district in Ottawa described in Part 4.

³⁴ Ibid.,208

³⁵ Ibid.,536

PART TWO: Courtyard House Precedents

The Courtyard House Defined

One of the challenges in increasing density is the perceived (and often real) loss of privacy and green space, a particular problem in locations where the “house in nature” is so cherished a form. Certain housing forms might, however, be able to address these concerns while still increasing density. Courtyard housing, in which single-family dwelling units surround one or more outdoor courts, offers a model for effective negotiation of private and public realms in terrace developments. Studying experiments in courtyard housing can provide a model for both yielding greater densities and encouraging spatial enjoyment of the urban dwelling.

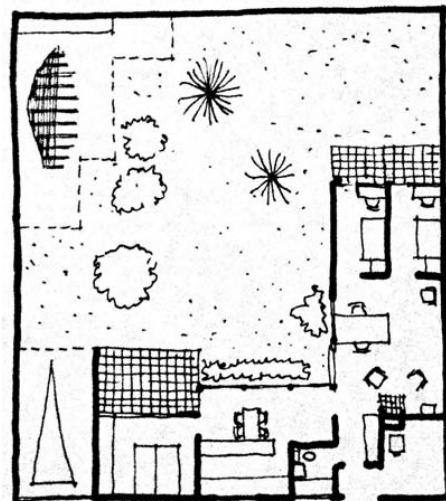


Figure 11: courtyard house design for Scania - 1953

Courtyard housing has been popular at various times and places, and a look at the morphology of courtyard house plans reveals various strategies for development in a variety of geographical locations. Relying on Schoenauer and Seeman's *The Court-Garden House*,³⁶ this thesis provides a morphological review of the court house type in

³⁶ Schoenauer and Seeman, *The Court-Garden House*.

contemporary cluster applications, identifying important attributes of their site requirements as they relate to spatial experience, light, and materiality, on one hand, and adjacencies with neighbors and relationship to shared landscapes on the other. A physical and conceptual understanding of these attributes stems from the house proper, the garden court, and the social aspects of the house. From there, a detailed review of courtyard housing examples by Ludwig Mies van der Rohe, Philip Johnson, Bjorn Utzon, and several of Ottawa's cluster housing and courtyard housing experiments provides a basis from which to develop new design strategies and prototypes for medium-density low-rise residential building in Ottawa. A descriptive analysis of these prototypes will provide insight on the internal logic of the floor plans as they negotiate private and public spaces and reveal the spatial connections that interweave the interior and exterior spaces.

Morphology of the courtyard house type

Between the years 1931 and 1938, Mies van der Rohe designed a series of projects for courtyard houses. "His first design, far-advanced for its time, was a continuous row of L-shaped houses each enclosing a private courtyard space. The exterior walls of the house facing the courtyard were conceived entirely in glass in contrast with those facing the street, which were designed of masonry with a minimum of fenestration."³⁷ (Figure 12) It is important to note the qualities of light, material, and space that are manifested by the floor plan. The public and private elevations of the house are strategically designed with contrasting material themes. Glass defines the private realm, with transparency and openness between the courtyard and the interior living space, while masonry walls block out the exterior public realm with opaque walls minimizing the intrusion of light and traffic into the interior realm.

³⁷Ibid., 55.

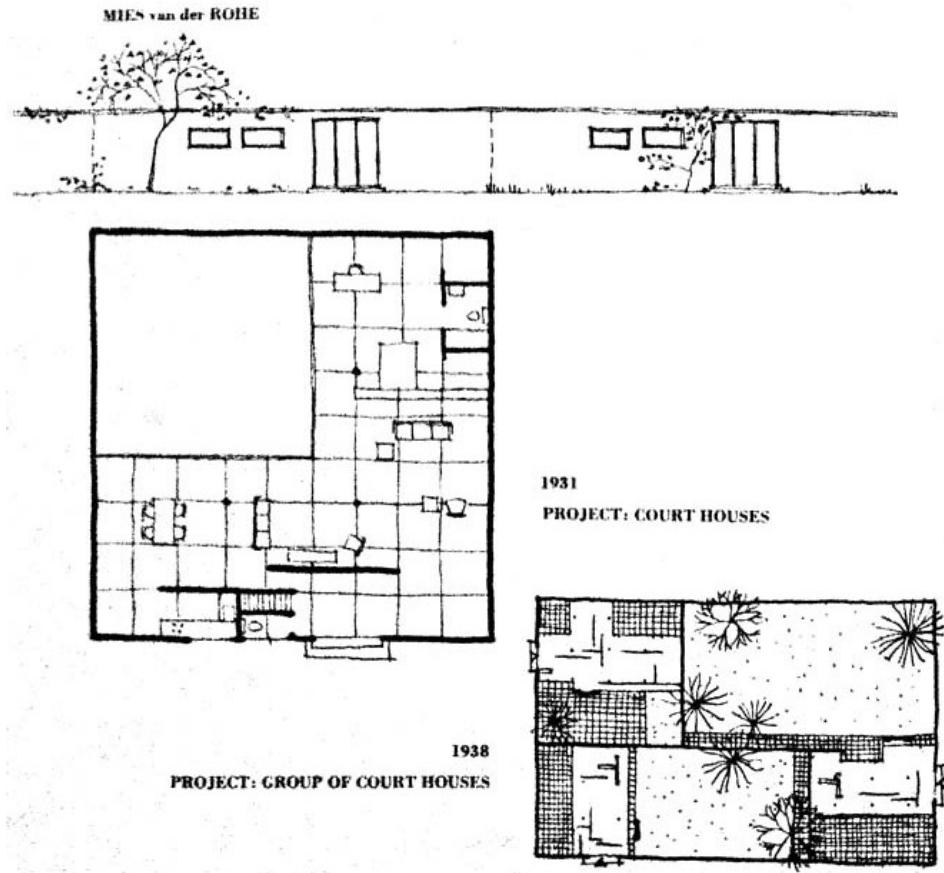


Figure 12: Mies van der Rohe, court houses 1931

The further development of his courtyard housing plans were specifically intended to incorporate privacy in the urban environment: “In 1938, Mies van der Rohe developed this concept into a rectangular walled –in grouping of three dwellings of various sizes and shapes, each having a terraced court and a larger garden-court. (Figure 12) This concept was a contemporary home intended for an urban environment yet retaining privacy of the rural or suburban home.”³⁸

Another example of the courtyard house type is the Rockefeller Guest House in New York, designed by Philip Johnson between 1949 and 1952. (Figure 13)

³⁸ Ibid.

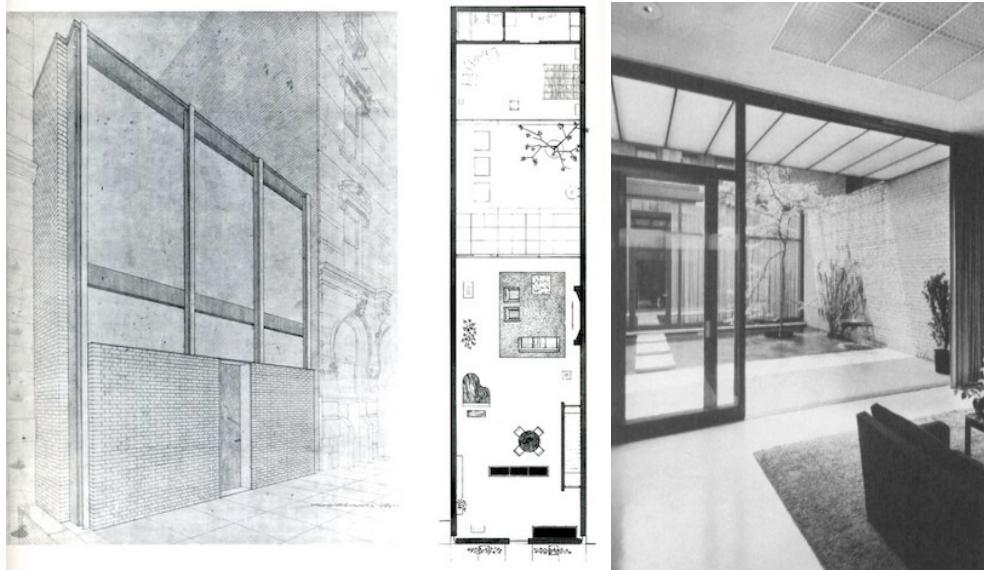


Figure 13: Philip Johnson, Rockefeller Guest House 1952

Here, Johnson uses the courtyard house concept to open up the long narrow plan of the typical dark alley house. Johnson inserts an open air courtyard into the center of this long and narrow floor plan, dividing the living spaces from the sleeping spaces with an outdoor courtyard. Within the inner court, he included a tree, a terrace, a fountain, and a pool with three stepping-stones. The landscape architect Ian McHarg assesses the success of the plan thus:

The impact of these few elements in this small space is overwhelming in contrast to the heat, fumes, noise, overpowering scale and tension of downtown Manhattan. This court, as a demonstration of the quality which can be achieved in a small urban space, is one of the most powerful exhibits as evidence of the validity of the court house concept.³⁹

The opaque material used to form the perimeter outline of this rectangular plan shelters the private interior spaces from the larger public spaces of the city. Qualities of light, material, and space created within the inner courtyard are manifested with contrasting materials of transparency and opacity that ultimately define a focal point for the private living areas. Light and shadow radiate from the plan's center rather than relying on windows along the exterior walls. As a result, the interior space naturally expands out

³⁹Ibid., 61.

through the glass walls of the inner courtyard, bringing a sense of openness to an otherwise long and narrow plan.

As the courthouse concept evolved, designs have experimented with a variety of cluster arrangements of courtyard houses with private and public courts. In 1955, for instance, George Schwindkowski developed a plan for atrium houses in Berlin. (Figure 14)

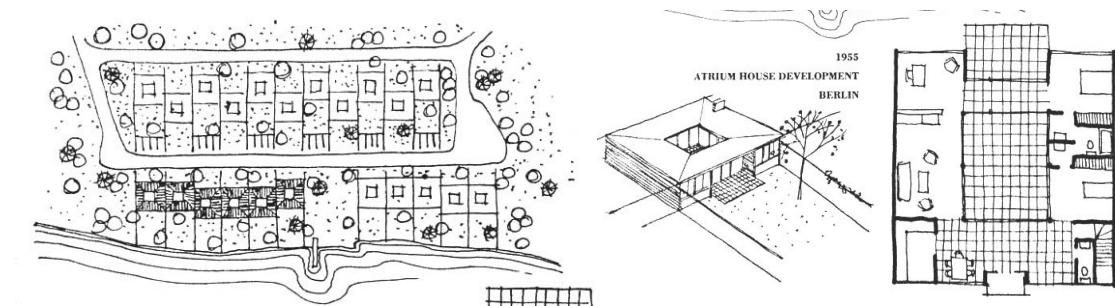


Figure 14: Atrium House Development Berlin

Here, the public realm receives attention: “Schwindkowski arranges groups of building footprints on site using rows with varied setbacks from the street in order to create a more interesting front appearance.”⁴⁰ The varied setbacks produce a public garden court, open to the street. Meanwhile, the living spaces are arranged around an inner atrium that constitutes a private courtyard. The design is characterized by the use of a deep U-shaped floor plan. Schwindkowski inserts a glass-enclosed hall across the open end which converts the court into an interior atrium. The thoughtful use of light, material, and space is crucial to this plan. A common flagstone floor in the kitchen, dining room, entranceway, and exterior atrium space creates a sense of openness by blurring the interior/exterior division. High windows in the kitchen and dining areas preserve privacy and direct attention towards the core of the dwelling, the atrium. The atrium is the chief architectural device for bringing light into the private living realm.

⁴⁰ Ibid., 83.

Jørn Utzon's Danish Kingo houses (Figure 15), built in the 1950s, are characterized by compact footprints, making it feasible to have a large common park space accessible from each private courtyard. The development's design originates from Utzon's additive approach, in which designing and building starts with one individual unit and proceeds from there, each unit being designed separately and taking into account the individual dwelling typography and context. The rows of dwellings on the site undulate, following the contours and providing each dwelling with the optimum conditions in regards to privacy, sunlight, shelter and view. All houses include a garage accessible via paved irregularly shaped enclosures between the clusters of houses. Utzon developed this concept as a rectangular walled-in grouping of dwellings. This development approaches privacy by enclosing two sides of each house by walls of varying heights, while the other sides are enclosed by neighbouring dwellings. This limits the amount of private space, but this is excused by the architect with the provision of large landscaped communal spaces. Similar to the houses in Mies van der Rohe's plans, each unit has a terraced court and a larger garden-court, creating effective spatial arrangement of public and private spaces. (Figure 14)

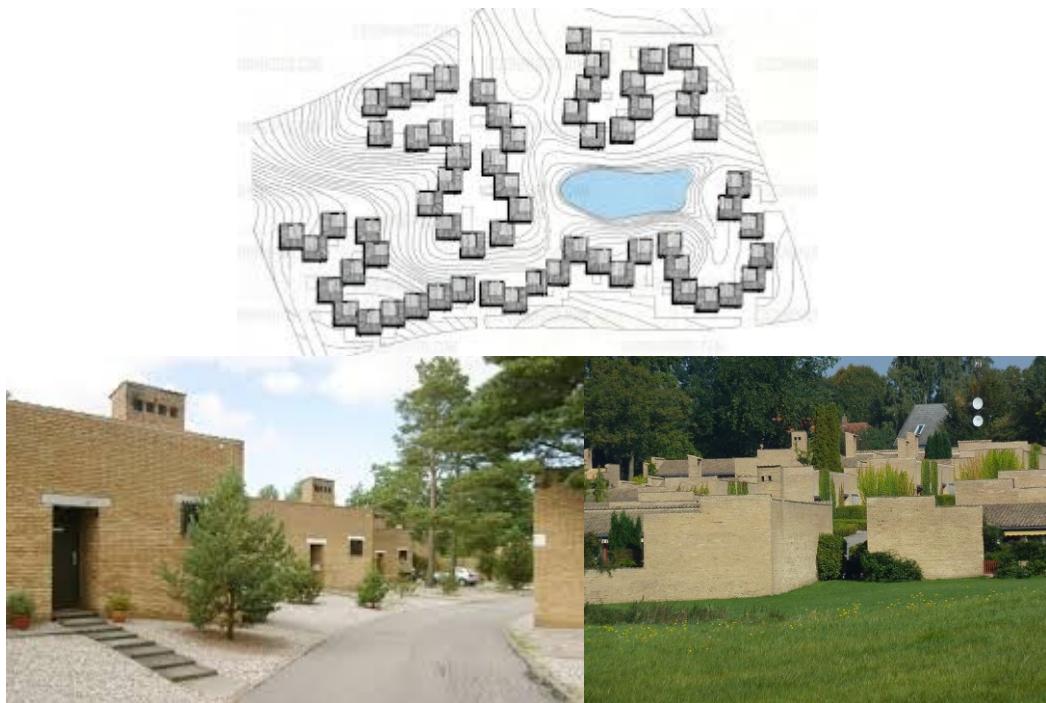


Figure 15: Kingo Houses, Jørn Utzon

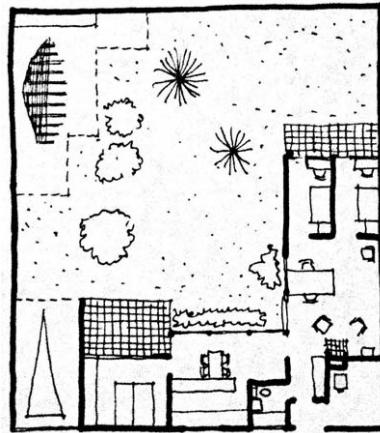


Figure 16: Courthouse Plan - Jørn Utzon

The house plan was designed to expand in two directions along the peripheral wall surrounding the property, producing an L-shaped structure organized around an open garden located at the center of the plot of land. The use of the L-shaped plan allows for groupings into terrace dwellings surrounded by common gardens. Befitting a northern climate, each court area is orientated so as to maximize sunlight through southern exposure. Furthermore, by concentrating the fenestration about the interior court, a greater amount of sunlight and daylight can be gained within the house through reflection from light-coloured ground surfaces and walls. (Figure 19)

The plan incorporates various efficiencies that contribute to the effective functioning of both interior and exterior spaces. The private courtyard provides opportunities for variety of themes and activities, including private gardens, outdoor dining, and a recreational activity space. (Figure 17)

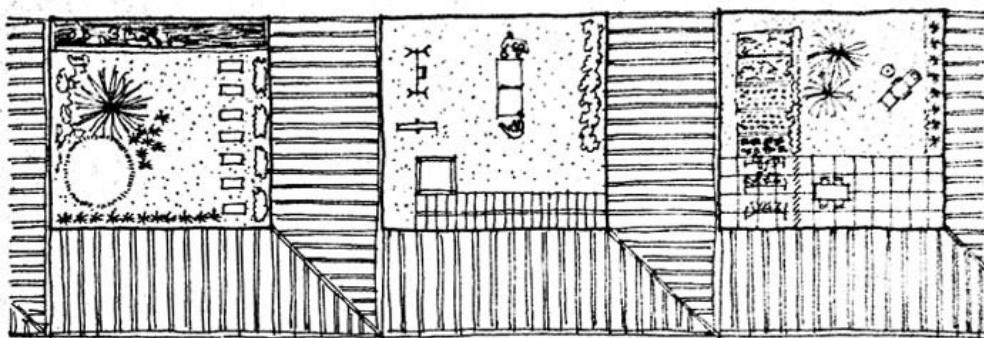


Figure 17: Courtyard Themes

In the interior, space planning for noise organizes the house to keep bedrooms and living spaces in separate zones. The smaller apertures along the perimeter wall provide maximum privacy while providing cross-ventilation. Utility rooms located between the public street and private living quarters function as a sound buffer for street noise.

(Figure 18)

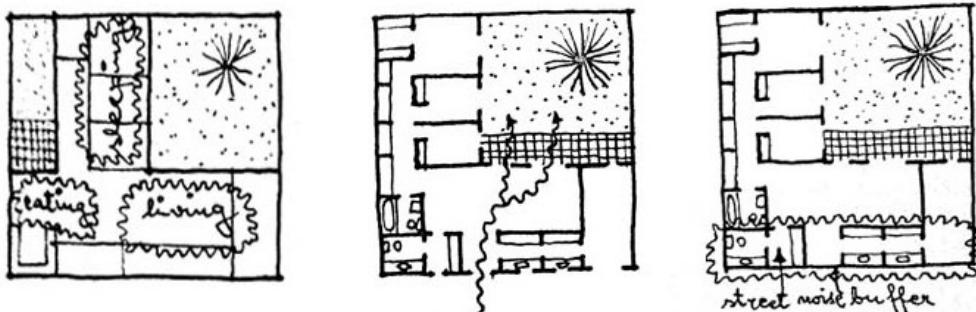


Figure 18: Spatial Planning - Courtyard House

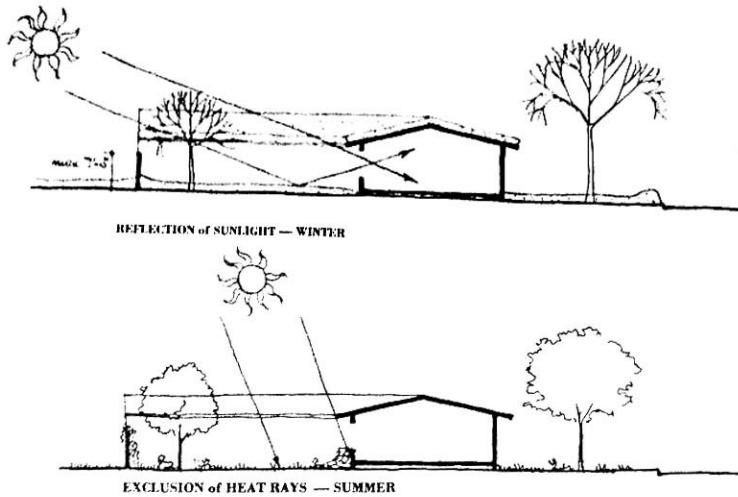


Figure 19: Courtyard facing South

Local Precedents

The courtyard houses of Mies van der Rohe and Jørn Utzon present effective architectural innovations in the clustering of multiple dwelling units. Their influence can be seen at the local level, where many historic urban neighborhoods have examples of vernacular multi-unit low-rise housing developments that increase yields and are sensitive to scales of existing neighborhood. Several Ottawa developments have experimented with courtyard housing as a way of reconciling the pressure to increase urban density while attempting to preserve the open yard qualities in neighbourhoods dominated by detached single-family homes.

Loyola Court (Figure 21), constructed in the 1970s, is comprised of clusters of two-storey homes assembled in a checkerboard pattern that negotiates private and public intersections. The development includes a total of 138 units on 8.15 acres of land that yield a total density of 17 units per acre of land. The streetscape has a staccato effect created by the checkerboard configuration, and outdoor courtyard spaces are defined by the walls of the individual courtyard houses. As with some of the classical courtyard developments, blank walls of adjacent buildings allowing interior living space to open up to private outdoor courtyards.



Figure 20: Loyola Court in Beacon Hill, Ottawa, by Campeau



Figure 21: Loyola Court in Beacon Hill, Ottawa, by Campeau

More recently, the Hintonburg Six, completed in 2011, is an award-winning local courtyard development of six homes.⁴¹ Here, the rear yard concept has been

⁴¹ Debanné, Janine: "Hintonburg Heroes," Canadian Architect, Vol. 59 No. 1, January 2014, pp. 18 - 22.

removed altogether and replaced with a shared semi-private realm. The site plan creates an intersection of private and public outdoor spaces assembled within a grouping of small two-storey detached single-family house modules. Although these houses do not rely on their physical connections to create a typical private walled-in court, together they form a negative space within the block assembly, which creates a semi-private outdoor courtyard space. Lightweight porous screens contain the private realm of each patio, and each unit backs onto the ground-oriented central outdoor courtyard. (Figure 22)



Figure 22: Hintonburg Six in Hintonburg, Ottawa, by Colizza Bruni



Figure 23: Hintonburg Six in Hintonburg, Ottawa, by Colizza Bruni

Collectively, these case studies, past and present, international and local, demonstrate the inherent potential of the courtyard house type. From the perspective of inhabitants, courtyard housing fulfills the basic requirements of contemporary living patterns: open planning and zoned living areas, family privacy combined with proximity to nature. Meanwhile, from a sustainable urban planning perspective, courtyard housing offers intensification in infill housing developments that nevertheless respects the scale of existing neighbourhoods.

PART THREE:

Local Conditions: Intensification in Ottawa and “End of Block” Infill Sites

Ottawa's rapid growth in recent years poses development challenges. Concerns for sustainability call for increased density, achieved in part by densification of the urban core. The city suffers, however, from a lack of planning policies that guide new infill projects in a way that respects the character of existing neighbourhoods. Many of Ottawa's cherished historical residential communities are currently dominated by small-scale, low-rise development, but are targeted by developers with profit-driven agendas who seek revised planning policies that would allow for mid- and high-rise infill

developments. Developers and community associations are thus engaged in heated debates about appropriate urban residential form and scale for infill housing in Ottawa, and the city faces pressing demands from both groups as it develops zoning policies to help manage density and intensification in its urban core.

In developing its policies, the city makes reference to the province of Ontario's policies and directives for intensification as outlined in the document *Residential Land Strategy for Ottawa 2006-2031*.⁴² This document outlines specific land use strategies for the purpose of achieving appropriate density targets within existing communities. In general, the guidelines include intensification targets that guide new residential construction toward more urban forms of development that remain reasonable from a market perspective. Specifically, the document sets density targets at key stations and locations along the rapid transit networks, in order to support the city's transit investment and modal split objectives. Concrete targets are meant as a useful tool for planners. "Density targets are measured in people and jobs per net hectare. This provides approvals staff with a better measure with which to evaluate an application that would contain residential units against the minimum density requirements for the area."⁴³ The density target for this theoretical site is in the range of 170 to 285 people per net hectare. This translates to 2.5 people per dwelling which is the equivalent of 27 to 45 units per acre.⁴⁴ In order to achieve density targets, the guidelines allows for changes in building patterns: "These guidelines are outlined to promote the growth of the inner city block to occur with more dominant forms of mid and high rise structures."⁴⁵

⁴⁵

While the province's document seems to support the developers' position, creative low-rise infill housing is in fact a way of increasing density while remaining sensitive to scale

⁴² City of Ottawa, *Residential Land Strategy for Ottawa 2006-2031* (Department of Infrastructure Services and Community Sustainability Planning Branch, Research and Forecasting Section, Feb 2009), Publication #9-23, 73.

⁴³ Ibid., 73.

⁴⁴ Ibid., 73

⁴⁵ Ibid., 73.

in existing neighbourhoods. Low-rise infill housing within existing underdeveloped urban streets offers many advantages: it increases density, increases security in urban grey areas, re-uses existing urban infrastructure, and can offer variety in building type, morphology, and scale. Ottawa and other Canadian cities can strategically incorporate the low-rise housing strategies to help meet future housing needs. Implementing plans that incorporate low-rise infill will support typological diversity, encourage more sustainable ways of living, and foster urban renewal and growth of cities.

Part of the city's densification planning involves development of public transit infrastructure, and this has implications for infill development in two ways. The first and most obvious is the emphasis on densification near access points to the rapid transit network. A less obvious but intriguing result is the way that transit development alters the spaces around it, opening up new areas and creating new possibilities for infill development. These newly created spaces change orientation, making public spaces that were previously private, and so development here must be especially attentive to the interface between private and public.

The conversion of abandoned rail lines is an example of how this works. In some areas, abandoned rail networks are being re-purposed, and new rail lines proposed within the existing urban fabric. This has implications for the communities on either side of the rail lines. Historically, the city's industrial rail networks divided residential communities. Housing developments stretched alongside rail lines formed closed block settlement patterns, and residential lots featured blank walls and privacy fencing wherever side yards and rear yards abutted the rail corridor. This ensured minimal visual exposure, but also created a sort of 'lost industrial trench.' Now, however, as the city inserts light rail networks into the city fabric, new edge districts are created along them. Formerly quiet residential streets flanking the planned rail lines are destined to take on new roles as urban edges.

In particular, the end of block areas where residential streets formerly trailed quietly off into overgrowth are now transformed into swaths of land with very public interfaces. Development of these ends-of-blocks calls for an overall approach that takes into consideration densification goals, building typologies, existing scale, and the interweaving of public and private realms with built forms. This thesis suggests a new vocabulary for a low-rise housing type that creates new urban spaces and knits together the social realms of private and public life.

PART FOUR

Design Proposition: End-of-Block Infill in Little Italy, Ottawa

Site Analysis

The proposed site for this thesis is an end-of-block zone in the mature residential neighborhood known as Little Italy in the City of Ottawa. An industrial rail line creating a lost trench has been re-purposed with the O-Train public light rail transit system, and running along the eastern side of the rail line, a public linear park pathway occupies an easement of land measuring approximately 50 feet in width. This linear public park/transit way links to the city's expansive Capital Pathway network, with North-South connections to Dow's Lake and the Rideau Canal Western Pathway-South and the Ottawa River Pathway-North. Blank walls and privacy fencing continue to dominate the edges of this new public multi-purpose transit way, but the pathway along the trench itself has now been transformed into an urban amenity and green space for bicycles riders and pedestrians. (Figure 25, Figure 26, Figure 27)

The proposal is to develop currently empty spaces at the end of street blocks abutting the eastern edge of the new pedestrian pathway. This spot is ripe for development, as Little Italy has become one of Ottawa's most desired commercial and residential areas. New planning policies for densification in this area are expected to attract a diverse demographic population, welcoming students and young families while retaining the long-standing residents of this traditionally Italian community. The area is attractive to a variety of individuals for a number of reasons. It is near a major federal government employment center as well as the Carleton University campus. It is known for its numerous independently-owned shops and retail spaces, including a number of renowned Italian restaurants that define Preston Street's commercial character. The neighbourhood plays host to a variety of annual festivals, including Italian Week and the Ferrari Festival, The Tulip Festival, and the internationally-renowned Winterlude Festival

offering citizens a chance to skate on the longest ice surface in the world, the Rideau Canal. Given its proximity to Dow's Lake, the Rideau Canal, the public light rail transit, and a multi-use path with connections leading to the Ottawa River, the site is rich in possibility, providing an opportunity to transform once-abandoned urban swaths of land into one of Ottawa's most enticing environments.

The site encompasses three end-of-street blocks abutting the new pedestrian pathway park that runs alongside the O-Train light rail rapid transit line. The dead-end streets function as pedestrian connections between the commercial activity on Preston Street and the multi-use path along the O-Train line. The end blocks are contained between the streets of Adeline and Pamilla, Pamilla and Norman, and Norman and Beech (Figure 24). Each block is comprised of typical 25'x100' lot dimensions. The blocks are each made up of eight commercial lots fronting onto Preston Street and twenty back-to-back residential lots fronting the residential streets that run perpendicular to the O-Train corridor. The intensification strategy proposed will also introduce concepts to improve the public realm of the O-train pathway in attempts to re-invent the urban amenity space. Together, the blocks will form a new edge district within the existing community of Little Italy.



Figure 24: Proposed Site

The end block for the site includes the four lots at the end of each street, which can be rotated to face the O-Train corridor while still retaining 25'x100' lot dimensions. This yields a land area of 2,500 square feet/lot. The aggregate area of all eight lots is .46 acres. The current neighborhood density is 17.39 units/acre, which corresponds to one unit per lot for the 8-lot, 0.46 acre parcel. The proposal for this thesis attempts to double (at the very least) the density noted. It should also be noted that by conventional standards, one could add a granny suite to each of the existing houses to achieve this goal. Alternatively, one could build the eight lots with stacked towns, the preferred approach in the current market in wood-frame construction. Assuming a stacked town is 20' x 40' deep: one could propose 12 stacked townhouse units on the site, with room for 20' back-yards for all of the units at grade. The net yield would achieve a total of 24 units for a density of 52 units per acre. Regardless of its ability to provide adequate density, the townhouse approach is not entirely satisfactory from the standpoint of

spatial quality, as it produces narrow dwellings with limited light sources. The following conceptual site study diagrams will serve to illustrate this point.

Thus, the proposal for this thesis includes a target density of 30-50 units per acre or 187 to 312 people per net hectare, which is the equivalent of 14 to 23 units for each of the proposed end-of-street blocks. These numbers are in direct correlation with target densities as set out by the city of Ottawa's land strategy document.⁴⁶

The proposed site is located in an R3 zone, a mixed residential zone that limits the building height to 14.5m for apartment buildings and 11m for attached low-rise multi-unit housing. For this proposal, the residential end-of-street block will be reinvented by providing a balance of low-rise unit types, fronting onto both the existing end of streets as well as the public O-train pathway. The predominant edge of the site faces southwest, giving maximum sunlight exposure for the proposed residential block. These new residential blocks will have the potential to offer new urban porch experiences along the transit corridor. More importantly, this plan attempts to reconcile the struggles of a site that could be characterized as 'living in wilderness' in Ottawa and now is transitioning into an urban public realm connected to an urban park and public transit, a space reclaimed from Ottawa's industrial residues, with potential to be developed into an ecological site and creative art district.



Figure 25: Block A | Adeline and Pamilla

⁴⁶ City of Ottawa, *Residential Land Strategy for Ottawa 2006-2031* (Department of Infrastructure Services and Community Sustainability Planning Branch, Research and Forecasting Section, Feb 2009), Publication #9-23, 73.



Figure 26: Block B | Pamilla and Norman



Figure 27: Block C | Norman and Beech

Concept Diagrams for the Ends-of-Blocks – Site Study

This thesis proposes a development plan that organizes the meeting of the private and public realms in this newly-constituted urban fabric through a medium-density residential block of attached houses. A series of conceptual massing diagram studies – four in total -- tests groupings of private dwellings in terms of their ability to weld private and public realms. In the following section, each massing diagram study is described analytically, and then critiqued using criteria derived from the historical precedents studied in Parts 1 and 2 of this thesis. The City of Ottawa’s density goals and the newly formed end-of-block sites studied in Part 3 are also brought to bear on the massing diagram studies.

In Site Study Diagram 1.0 (Figure 28), blocks from right to left will be named A, B, and C. The zoning envelope for this particular area permits a maximum building height of 11m for a low-rise attached house type. As previously stated, the three blocks include eight lots each and are currently developed with detached single family homes with a density of 17.39 houses per acre.

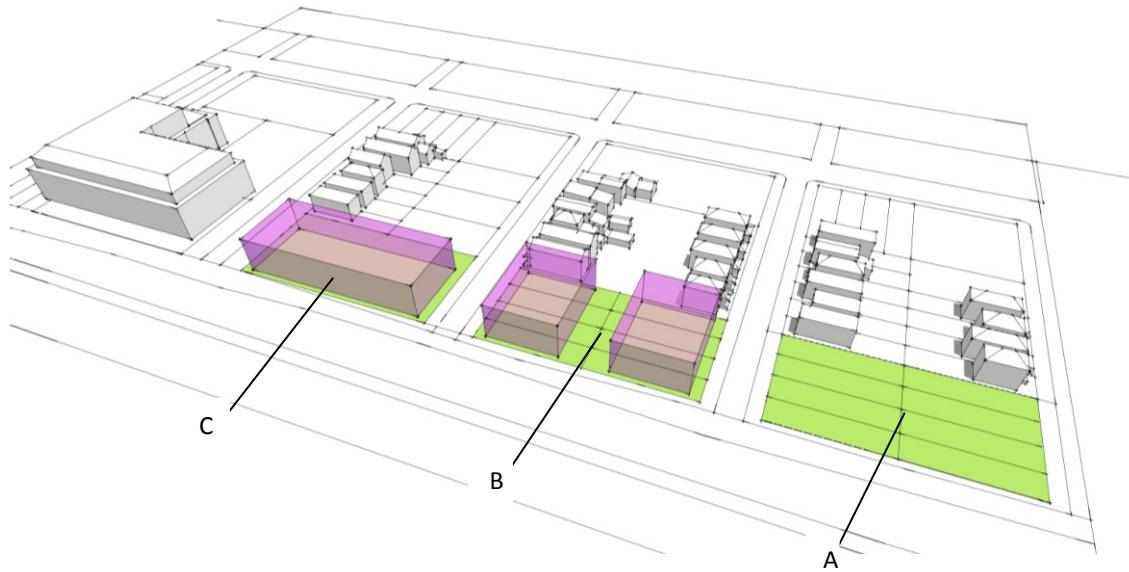


Figure 28: Site Study Diagram 1.0

In Site Study Diagram 2.0 (Figure 29), block A illustrates the current land parcel, divided into eight lots with an area of 2500 sf. per lot. Block B illustrates the allowable zoning footprint for a detached house at 1,100 sf. with a maximum building height of 11m highlighted with the purple ghosted volume.

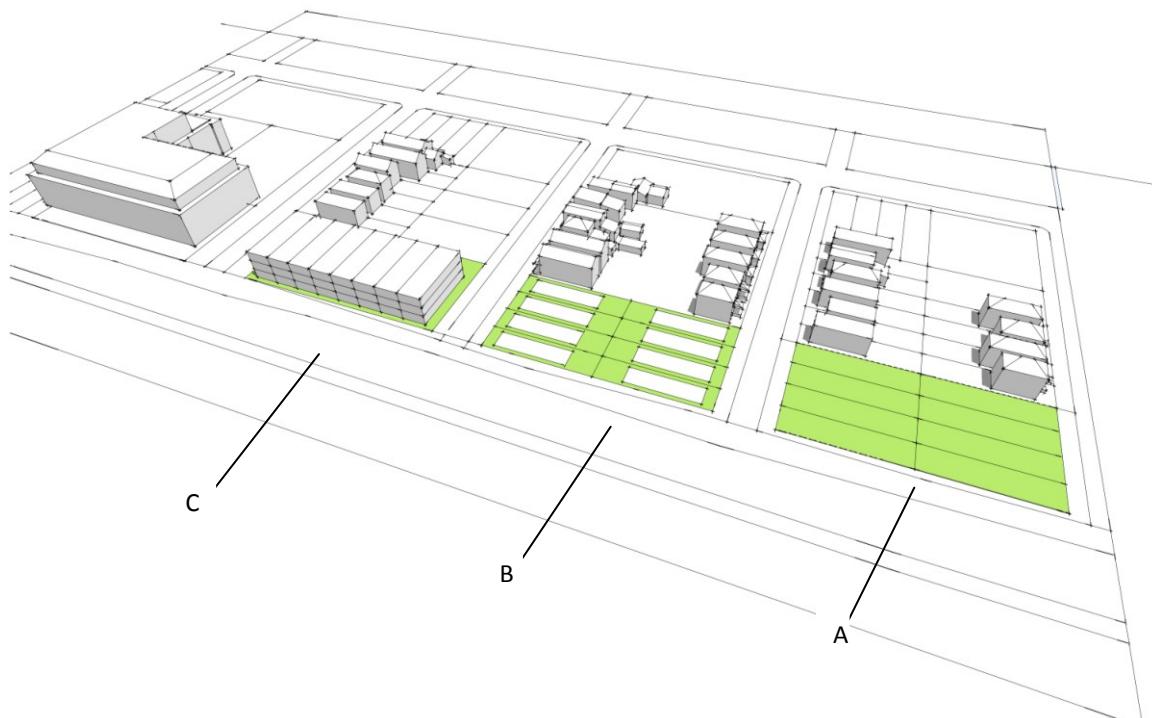


Figure 29: Site Study Diagram 2.0

Alexander's idea that the 15 to 30 houses per acre density demanded a row house building type is here employed. The attached row house concept is a contemporary solution to increase density, however, it does present other challenges. Block C (Figure 29) illustrates attached row houses fronting onto the O-Train path. This attached housing type consists of unit modules with short frontage and a long depth with a shared party wall along their long side. Drawing parallel arguments with Christopher Alexander's remarks on the reduced privacy and light for this long and narrow house type, the conventional row house type is also not a good "end-of-block" house type for this proposal because the long and narrow footprint does not turn the corner well. The challenge lies in the ability to provide units fronting on both the existing dead-end streets as well as rotating units facing the public O-train pathway. The long and narrow town house form lacks the ability to articulate the block with varied setbacks in order to create open space that better negotiates the private and public realms.

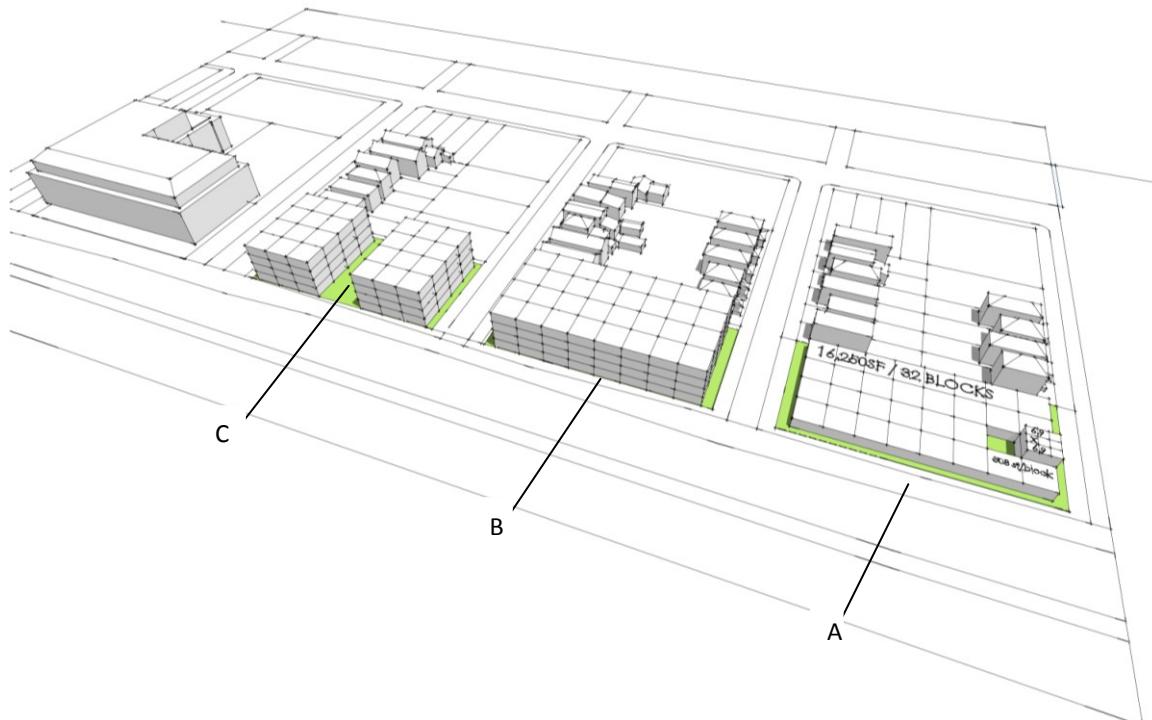


Figure 30: Site Study Diagram 3.0

Opting for a dynamic volumetric module to test alternative forms of massing for this site, Site Study Diagram 3.0 (Figure 30) illustrates a modular breakdown of the site's permitted zoning envelope. Here, the four lot divisions from east to west have been superimposed, with the eight rotated lot divisions spanning north to south. The resulting 25ft x 25ft grid includes a module with a total area of 625 sf. From this module, a range of dwelling unit types can be designed using one, two, or three modules, yielding gross floor areas of approximately 625 sf, 1250 sf and 1875 sf.

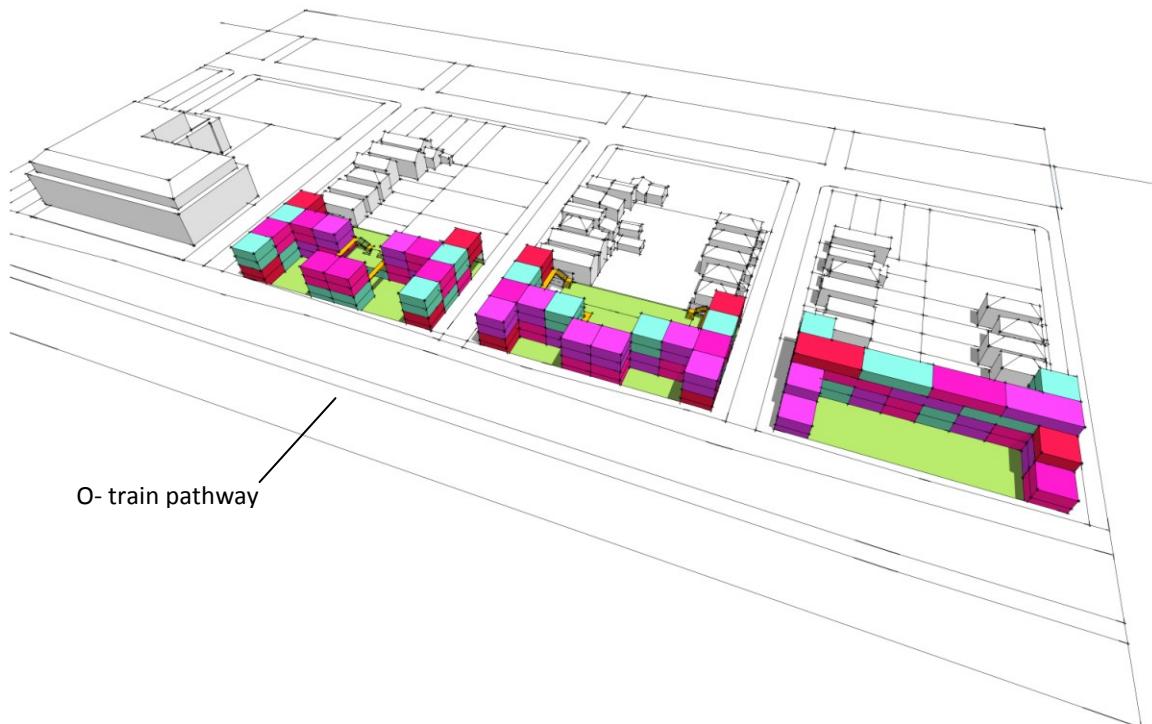


Figure 31: site study diagram 4.0

Site Study Diagram 4.0 (Figure 31) illustrates the re-assembly of a row house type into smaller clusters of units with varied setbacks that open up the end block and insert openness with common grounds and semi-private gardens. Here, all parking is set below grade as a shared common amenity for each block. This maximizes open space to organize the housing modules with connections to outdoor gardens. The building envelope for each site study diagram is composed of four levels, with the first level

depressed slightly into the ground in order maximize floors and units within the permitted 11m building height.

The following site study diagram in (Figure 32) illustrates three variations of end-of-block massing configurations, with the addition of activity nodes at the intersection of each block along the public pathway. (Figure 32) These parks create focal points at the end of the streets and could act as “common land” gathering multi-generations to share and enjoy this public amenity space, from playing children to the elderly involved in different activities. Formally, these small parks fuse into the large linear park along the rail line and Dutch architect Aldo Van Eyck’s playground designs can serve as inspiration for these ends of block parks, since their open-ended designs welcomed not only children but all generations to enjoy. For example a landscaped area can include abstracted objects such as low perimeter walls that define the edges of the park and can also serve as a bench for the elderly for a rest stop along the path while a bent bar encored in the ground can be a sculptural piece in the landscape or play structure for children (Figure 33)

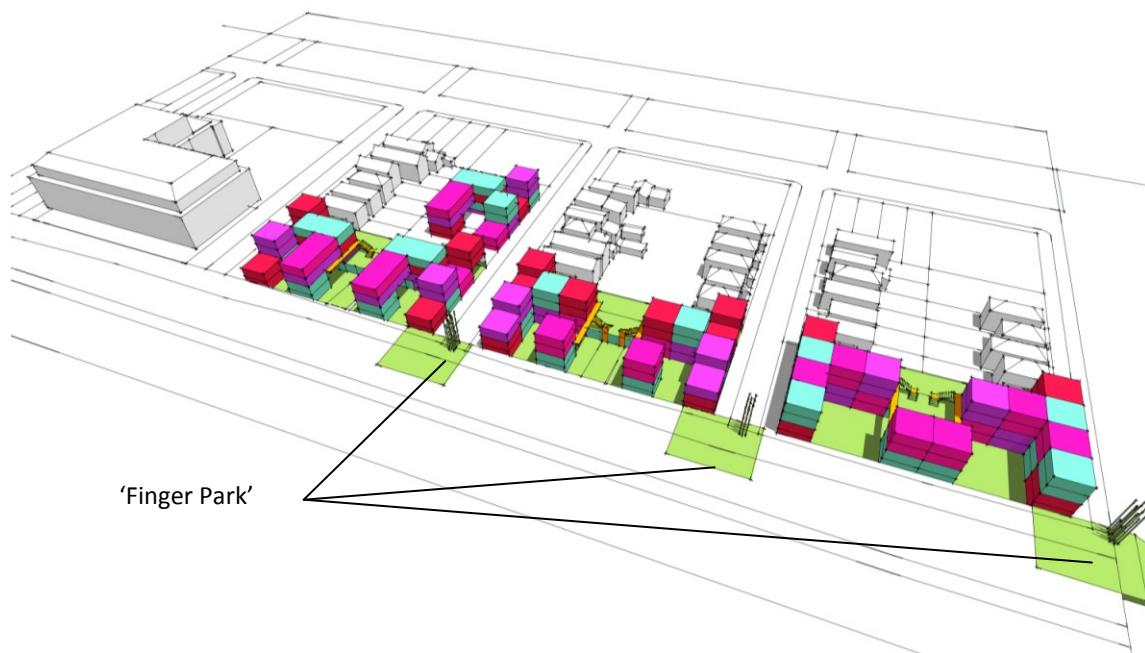


Figure 32: Site Study Diagram 5.0



Figure 33: Dijkstraat: Amsterdam-Centrum, 1954

Site Study Diagram 5.1 proposes a stacked courtyard cluster arrangement comprised of a stacked townhouse type on two levels. (Figure 34) Each of the colours represents a stacked townhouse unit. The unit is composed of 2 and 3 grid modules as described above with a total GFA of 1250 to 1875sf. This end block diagram suggests a total of 22 units rendering a yield of 47.82 units per acre. In this study diagram, the cluster of units arranged to create outdoor courtyards can provide various levels of privacy in combination with vertical and horizontal separations between living spaces and private bedrooms. Similar to Mies van der Rohe, Philip Johnson, and Jørn Utzon, in their courtyard house arrangements, the overlapping volumes and their exterior materiality could be articulated using materiality's of varying transparencies, which can denote between the public and private spaces arranged within. The strategy of providing varied setbacks from the public pathway is informed by Alexander's idea of varying setbacks in order to create a range of privacy degrees for each unit. This strategy attempts to manage building proportions with varying building setbacks. This ensures access to light for existing neighbouring properties in order to provide interest and a more luminous

and airy exterior. The resulting building arrangement creates varying levels of open space at the front and back of the lot to form a series of courtyards. These exterior open spaces help to maximize sunlight in and around each unit providing connections with outdoor gardens. A building setback at the rear of the block is left as open landscape; there, a semi private laneway provides rear laneway access to internal courtyard addresses. This strategy also stems from building separation ideals from both Muthesius and Unwin to provide light and air to existing neighboring properties.

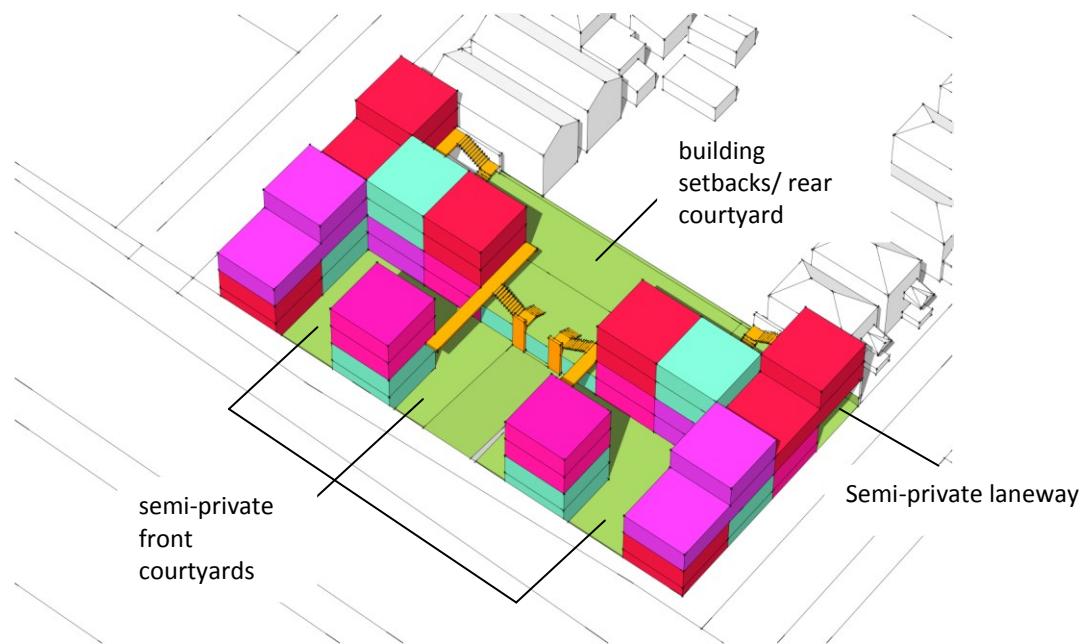


Figure 34: Site Study Diagram 5.1

In the Site Study Diagram 6.0 (Figure 35) each end block features a stepped building configuration. Drawing parallels' from Utzon's Kingo Houses, the clustering arrangement in this example is terraced with south-west facing interior and exterior private dwelling units providing interconnections between the public and private realms. The building arrangements form a cascading stepped configuration that creates a semi-private open courtyard space at the front and rear of the end block. Each of the colours represents a stacked townhouse unit. This end block diagram suggests a total of 19 units rendering a yield of 41.3 units per acre. In this strategy, exterior massing proportions are adjusted

to ensure air flow and light within the cluster of units as well as the existing neighbouring properties to east. The front courtyard opens up to the public pathway providing south-west sunlight exposure. A landscape wall with planting is proposed along the south-west property line to define the public-private interface between the semi-private courtyards and the linear public park along the rail line.

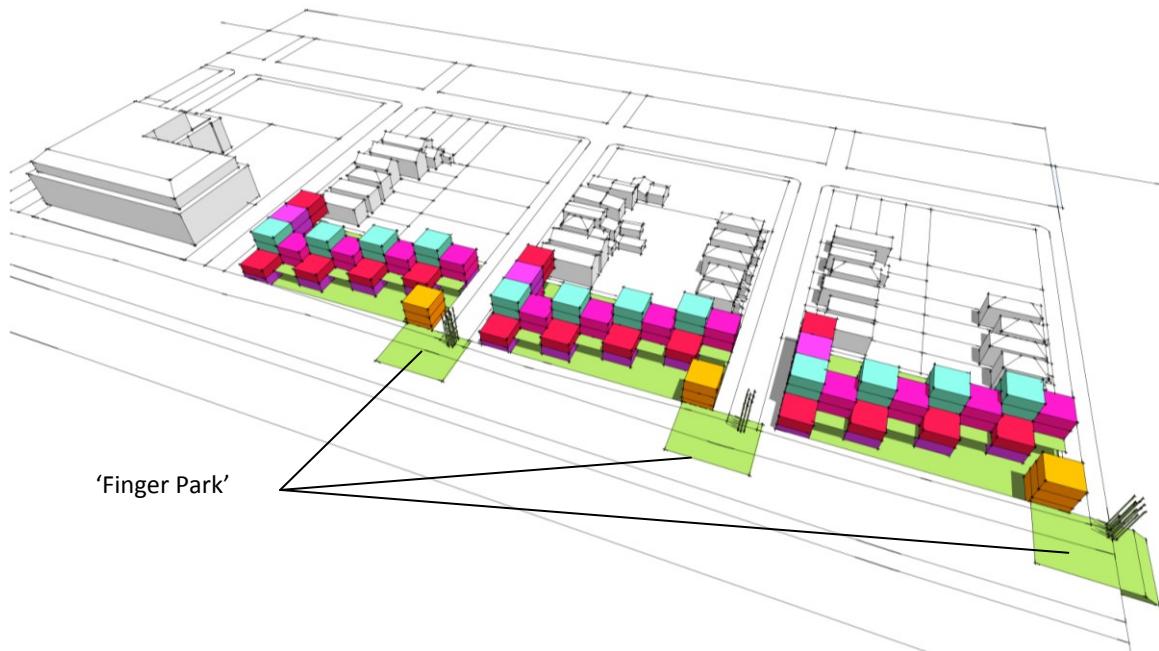


Figure 35: Site Study Diagram 6.0

The south facing courtyard scheme poses certain problems as to the interface between the private residential domain and the large public park and transitions must be handled carefully. Within the stepped southern courtyard shared by four blocks, Site Study Diagram 6.0 positions a fifth block (orange module in Figure 35 and Figure 36). This separate “corner module” is placed along the park edge, and is intended to function as a public amenity space, or ‘corner store,’ re-enforcing the notion of a shared common ground as described in Christopher Alexander’s work (Figure 36). The placement of the ‘corner amenity’ module is strategically organized to provide a shared public realm in conjunction with the focal points (finger parks) proposed at the end of the street.

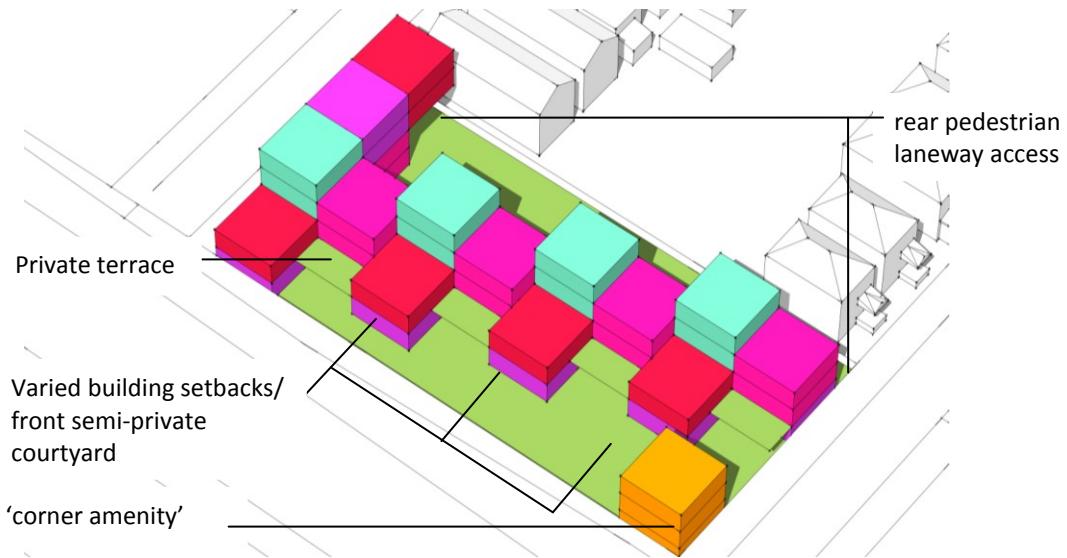


Figure 36 : Site Study Diagram 6.1

Project Proposal - Final Design

Site Study Diagram 7.0 (Figure 37) the south-west facing courtyard scheme serves as the basis chosen as the final design scheme for this thesis. The south-west facing courtyard scheme is further developed with a typical stacked townhouse unit type. Each of the colours represents a stacked townhouse unit.



Figure 37 Site Study Diagram 7.0

This end block diagram (Figure 37) includes a total of 16 units rendering a total yield for the end block of 35 units per acre. The building envelope includes four levels; with the first level depressed slightly into the ground in order maximize the number of units within the permitted 11m building height for a wood-frame construction. All parking is set below grade as a shared common amenity for each block. This maximizes open space at street level to organize the housing modules with connections to outdoor gardens.

Given the sites proximity to a university campus, government complex and the immediate historical single family residential neighbourhood, a multi-unit cluster of three unit types was designed to offer flexibility in the arrangement of multiple clusters throughout the site. (Figure 38)

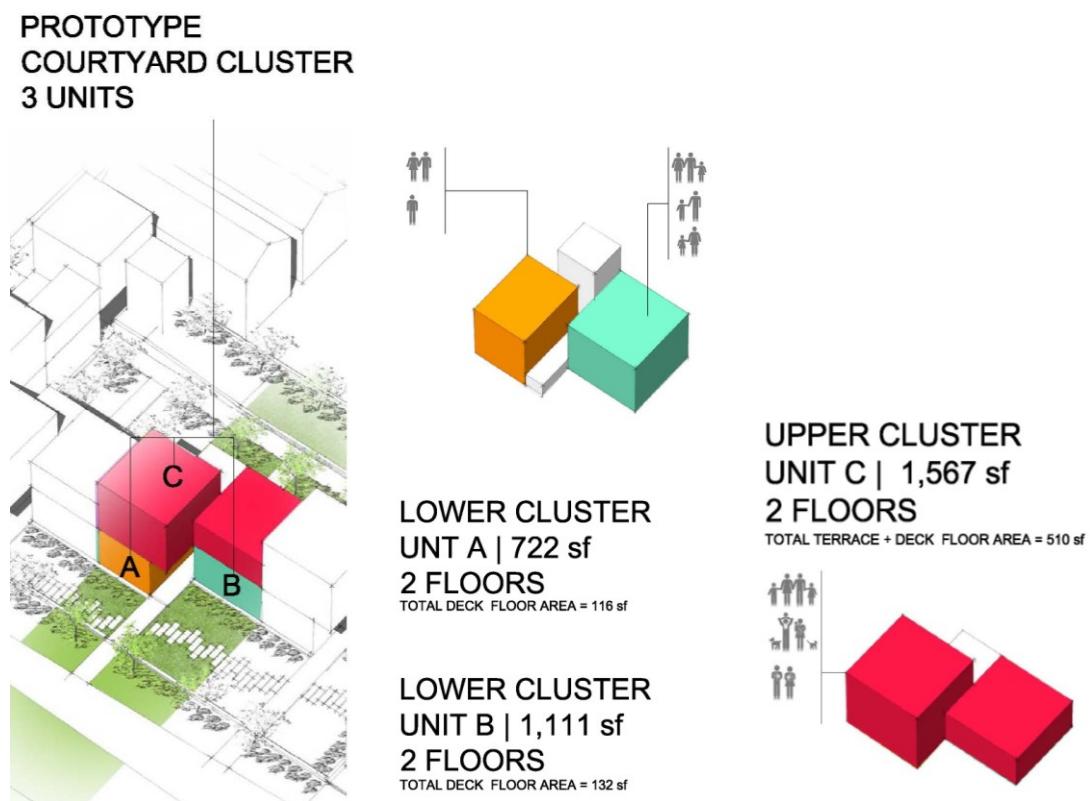


Figure 38 Prototype Courtyard Cluster

The stacked townhouse cluster includes a one bedroom unit with an area of 722 square feet, a two bedroom unit with an area of 1,111 square feet and a three bedroom unit

with an area of 1,567 square feet. With reference to site diagram 3.0 (Figure 30), The modular footprint for each of the three units originates from the 25' x 25' modular breakdown of the site. A total of six stacked townhouse clusters make up this southwest facing courtyard scheme. Three of these clusters are designed to turn the corner and rotate the end block to face the front courtyard along the O-Train pathway. A new 'urban porch' steps down toward the urban pathway while the remaining three clusters extend the existing street fabric towards the end of street before rotating the block.

The design intentions for the site arrangement are reflected in the design and planning of the individual dwelling units; to insert openness within the plan by organizing the private and social spaces of each unit, to create a hierarchy of different internal and external living spaces, to offer a mix of unit sizes to encourage a range of residents, and to draw on the surrounding historical low-rise residential neighbourhood to drive the outcome of the form.



Figure 39 Unit Floor Plans

A range of household sizes have been designed for varying demographic household types of the area. One, Two and three bedroom units are mixed throughout the dwelling clusters to support the interaction between people from all life cycle stages, to avoid segregation of groups and to ensure flexibility in ownership. The design of the grouped clusters draws on local design precedence, Hintonburgh Six and Loyola court to drive the outcome of form, plan and section.

The entrance for the lower cluster units is located on the second floor and is accessed from the top of the raised porch which cuts through the block and also connects to the rear stair access for the upper cluster unit on the third floor. (Figure 40)



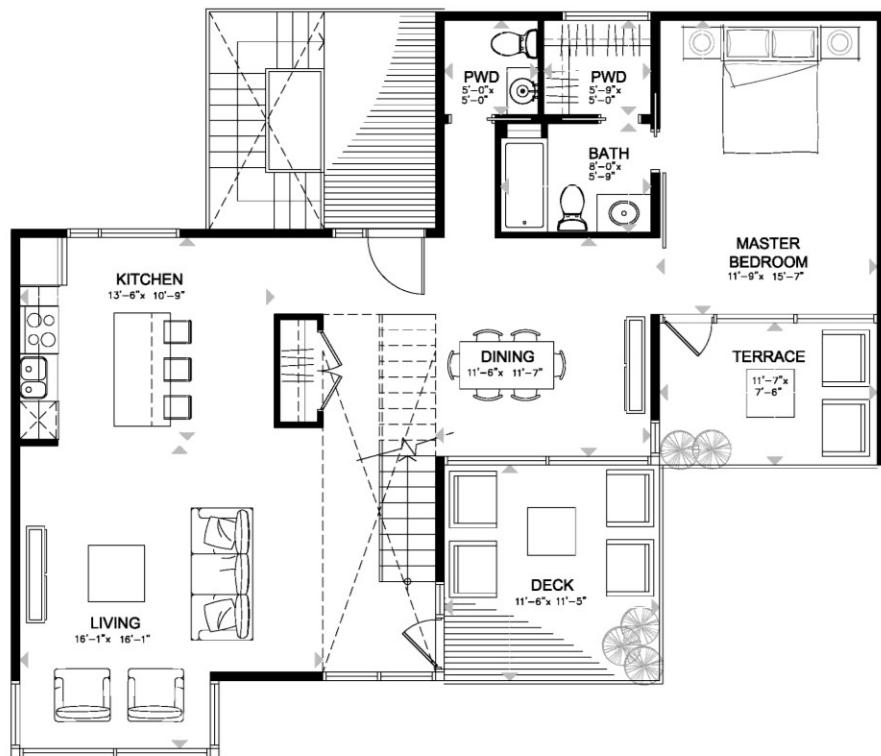
Figure 40 Cross Section A

The internal spatial configuration for each of the units was a response to the site and to necessary internal adjacencies. Each level of the dwelling has been divided into social and private functions and the layout is determined by the degree of privacy and connection to outdoor gardens each level requires. (Figure 43)



Figure 41 Cross Section B

Drawing parallel's from Frank Lloyd Wright's spatial organizing principles, the main floor plan of the large three bedroom unit is reflective of Wright's strategy to create diagonal overlapping spaces rather than individual living rooms and the exterior corners were dissolved with the introduction of corner windows.



The rooms have also been positioned to maximize light, air and privacy as well as connections to outdoor gardens. Exterior private balconies and terraces are also important features that insert openness into the plan and expand the interior living spaces with connections to outdoor gardens.

The semi-private outdoor courtyard gardens provide public and private interfaces for private dwellings and the surrounding context. Pedestrian movement is strategically organized around the site with the objective to create quality community spaces and adequate privacy for dwelling units. Each stacked townhouse cluster is designed with a shared semi-private pathway that provides access to each unit as well as linking the front and rear courtyards of the proposed end block. The upper cluster unit is accessed with a private 'open-air' stair located within the rear courtyard. The added porosity (Figure 42) with each pathway cutting through the block creates intersections of private and public life in and around the front and rear garden courtyard.



Figure 42 semi-private outdoor courtyard garden

The landscape components are designed to maximize open space and to organize the housing modules with connections to outdoor gardens. Figure 43 illustrates the various outdoor amenity spaces which define outdoor public and private realms. Cross sections A and B Illustrates various relationships between the private units and outdoor semi-private courtyard gardens as well as the public pathway and the existing neighbouring houses. (Figure 40, Figure 41)



Figure 43 Site Study Diagram 7.1

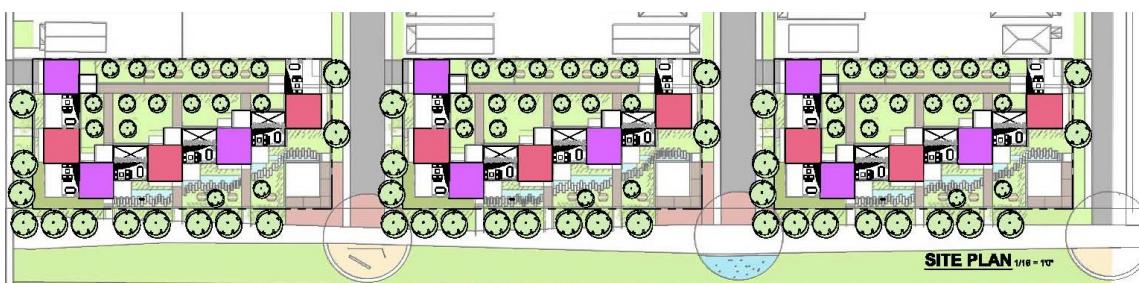


Figure 44 Site Plan

The addition of Community gathering spaces have been designed as ‘focal points’ which could include public amenity parks or ‘land art’ locations at the end of each ‘dead-end’ street. The proximity to each corner amenity pavilion serves as an extension of the public amenity corner. An example program for these amenity pavilions could be a daycare centre with outdoor landscape playground areas. These corner amenity pavilions represent a ‘placeholder’ that could accommodate various uses to benefit the communal living arrangements of a multi-unit residential development. Alternatively, these could also serve as simple open landscape spaces. Given the high volume of commuters on bikes, these open corners could serve as the landscape community spaces on the east side rather than the west site of the path in order to yield pedestrians from crossing over the path and to promote the health and safety of the general public.

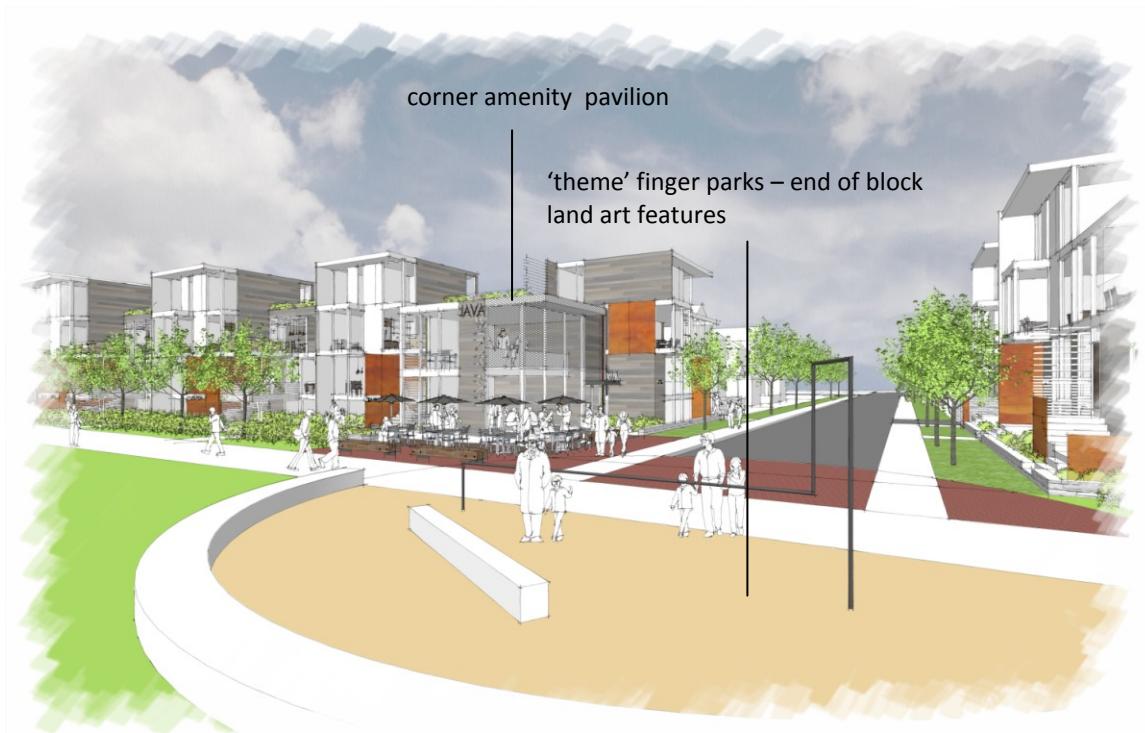


Figure 45 Community Gathering Spaces



Figure 46 Unit C - master bedroom view of rear courtyard garden

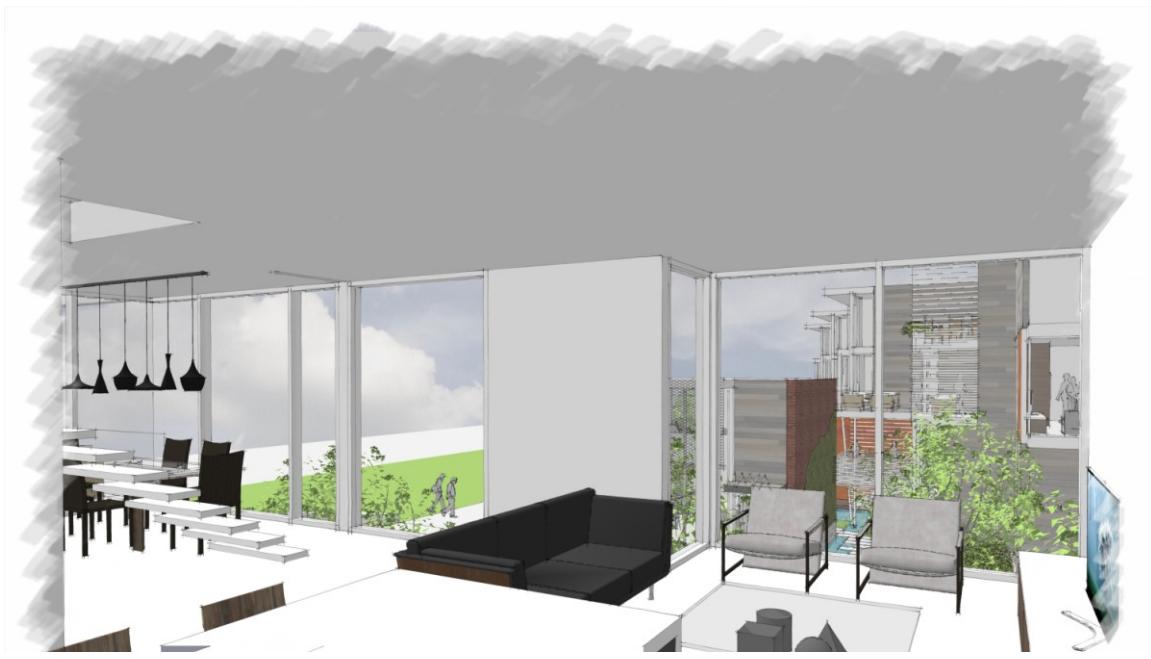


Figure 47 Unit C - Kitchen, Dining, Living room



Figure 48 North Elevation - Parking Access

Conclusion

As Ottawa's architects, planners and citizens grapple with the question of appropriate form and scale for new housing within mature neighborhoods, and as they debate the question of how to organize the meeting of private and public realms in new end-of-block/public corridor zones, we wonder: is continuity with the past possible? Can the qualities of the English-inspired house in the green, with its mix of privacy and clustered sociality, be realized at a higher density, in urban settings?

In summary, this thesis has tested alternative building forms as part with the goal of offering a more interesting urban living experience, and one that better connects public and private realms. The proposed urban dwelling prototypes aim at relieving the pressures of intensification by choosing to remain at a smaller scale that corresponds better to that of Ottawa's mature urban neighborhoods yet at the same time increasing the net yield of 17.39 units per acre by at least half for a total of 35 units per acre. While this prototype may not offer the maximum density achievable in comparisons to the conventional stacked townhouse or the concrete slab apartment building with a double loaded corridor: it does however at least double the existing density and is on target with local density targets while remaining sensitive to the scale and qualities of the English-inspired house in the green setting.

The various site study diagrams determined effective solutions for bringing the public

and private realms into closer proximities without compromising either of them.

Exterior arrangements – informed by case studies by Ludwig Mies van der Rohe, Philip Johnson, and Bjorn Utzon, and several Ottawa cluster housing and courtyard housing experiments – included an outdoor courtyard. These exploited the latter's capacity to be an essential organizing device in the weaving together of public and private realms in close proximity with each other. The courtyard emerged as the strategy for achieving greater spatial enjoyment inside and in the vicinity of the urban house type.

The study of various historical principles, including those of Frank Lloyd Wright, provided necessary references to strategically assemble and define the space within each unit. While impossible to verify without constructing them and subsequently interviewing dwellers, and comparing findings with interviews of dwellers in standard row houses, the goal of course was increased spatial enjoyment.

In contrast with highly individuated row houses, where interior layouts are obliged to be linear (as they must follow a strict party wall separation), the interior spaces proposed here have been designed to structure more dynamic relationships between units that are more complex and differentiated. For example, the proposed stacked townhouse cluster includes three unique dwelling units which create varying relationships between units and outdoor spaces in comparison to conventional linear form. Additionally, the interior layouts establish heightened connections with the environment and its seasonal processes. In particular, living spaces are strategically organized around an outdoor courtyard garden and bedrooms are oriented to the east for morning sunlight. The units come to recall houses “in nature” even though they belong to a multiple configuration, and are sited in an urban context.

This thesis began with the question of how to build near or within established historical low-rise neighborhoods in a manner that respects their scale. The research and related design propositions have attempted to demonstrate that higher density ground-oriented housing is not only achievable, but also, that it can generate improved built fabrics with regards to urban living. The prototype developed for this thesis is adaptable to end-block configurations, and in principle could be studied further to integrate itself within inner block configurations with varying solar orientations. Continuity with the past is possible with direct references to the vernacular composition of indoor spaces interconnected with outdoor garden spaces, rooted in the English traditions of domestic spaces.

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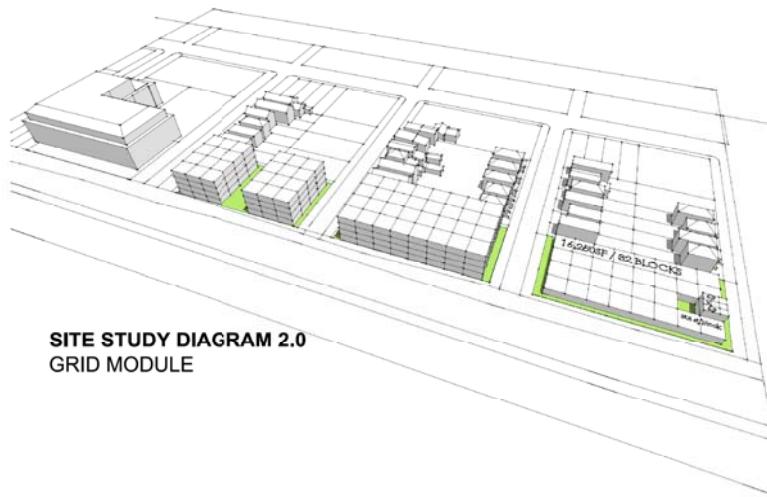
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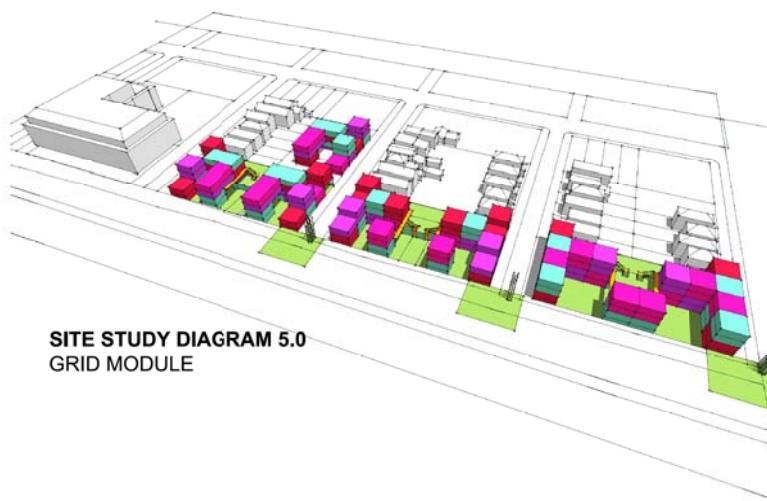
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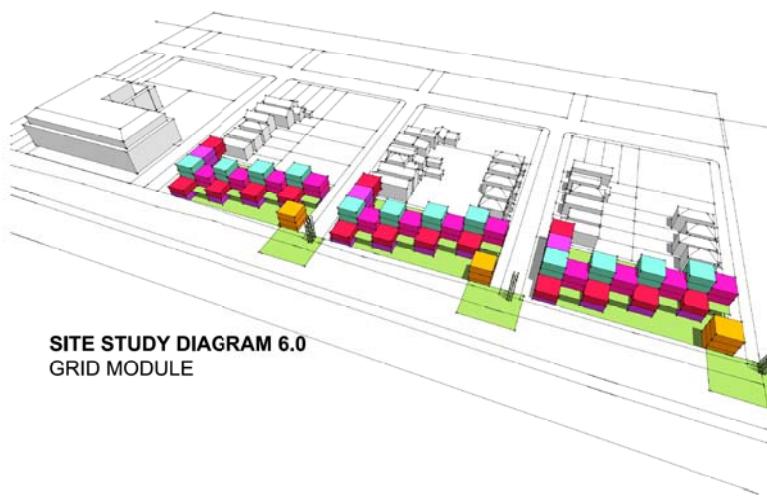
SITE STUDY DIAGRAM 2.0
ZONING | R4S



SITE STUDY DIAGRAM 2.0
GRID MODULE



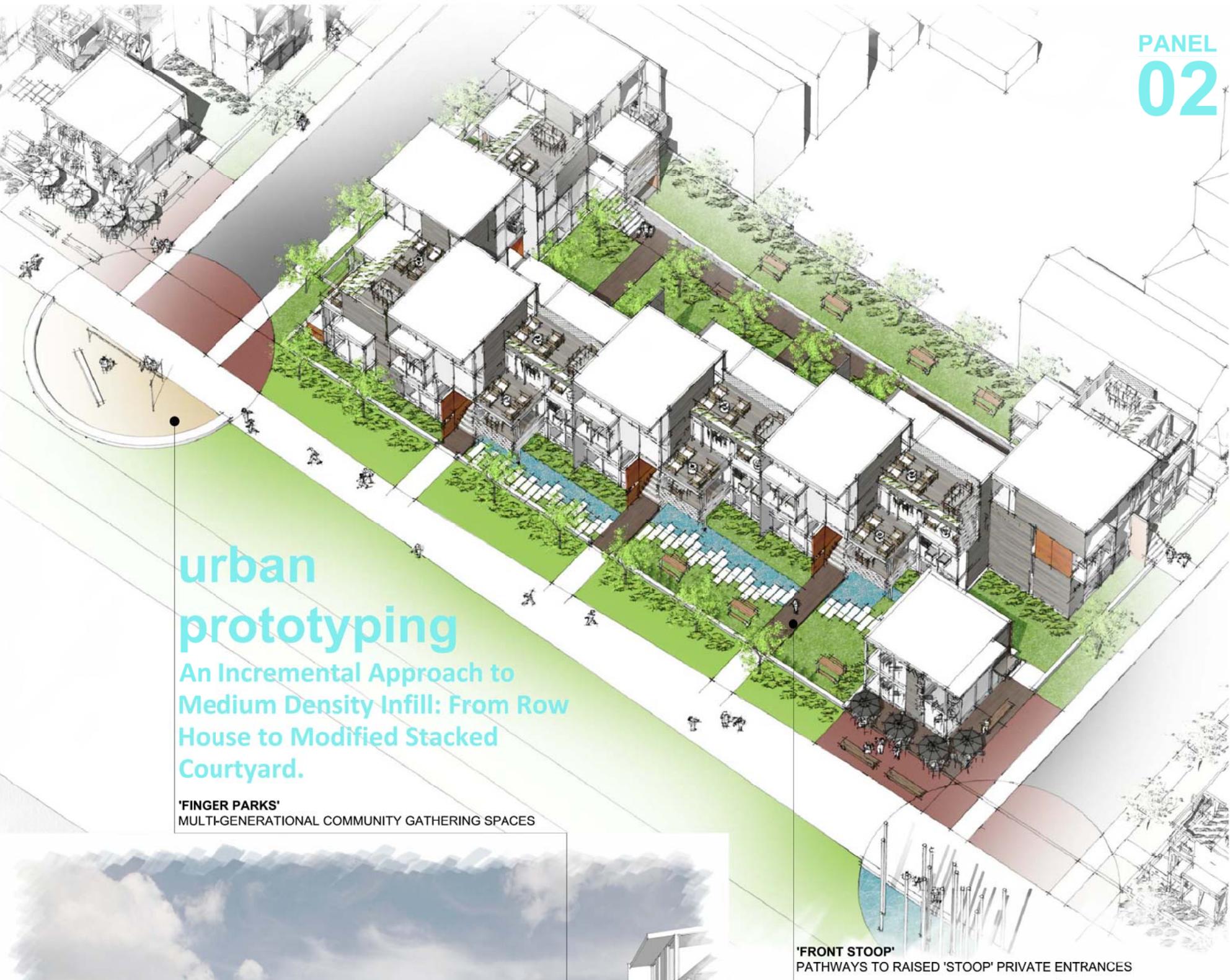
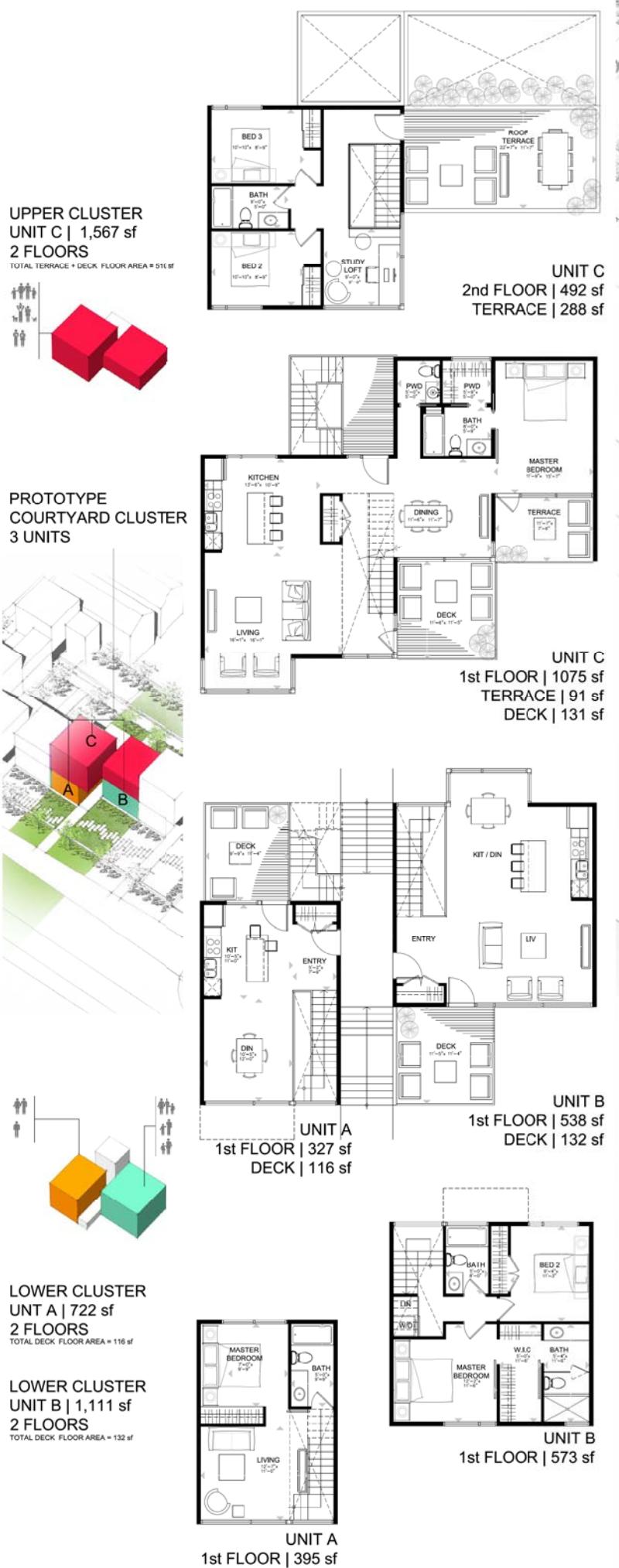
SITE STUDY DIAGRAM 5.0
GRID MODULE



SITE STUDY DIAGRAM 6.0
GRID MODULE

SITE STUDY DIAGRAM 7.0
PROPOSED COURTYARD CLUSTER









UNIT C - MASTER BEDROOM
VIEW OF REAR COURTYARD

