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A POST-OCCUPANCY EVALUATION OF LOW-INCOME HOUSING
Do User's Values and Preferences Overlap with Sustainable Development Principles?

Amy Dryden

ABSTRACT

The objective of this study is to determine how user preferences for outdoor space support or undermine sustainable site design. The study examines how these preferences can inform site planning and offer guidelines for sustainable development. Sustainability, a cultural and ecological process, is advanced through professionally and industry derived guidelines primarily informed by ecological function. Yet, it is user needs and values that create socially sustainable places. Therefore to successfully address both ecological and social parameters of sustainability, user preferences need to be understood. Understanding user preferences is particularly important when advancing sustainable design in a non-market based system like affordable housing. Through a post occupancy evaluation (POE) survey this study explores user needs and preferences of private and public outdoor space (parking, open space and building typology) in two affordable homeownership housing developments in Oakland, California. The survey included an owner given tour of private and neighborhood outdoor space, prioritization of the outdoor spaces and making spatial trade-offs. The survey results showed a strong preference for private yard space, privacy and boundaries. These preferences need to be reconciled with the communally based approach of sustainable site design. Additionally, users desired more paved surfaces to make spaces usable. As spaces are paved over the volume of runoff increases beyond original design intentions, counter to sustainable goals. Common areas are highly valued for the large outdoor area, although rarely used by adults and often by children. Satisfying the ideals of privacy and boundaries as well as including suitable amenities can increase the frequency of use. This analysis produces

an alternative perspective as well as a set of sustainable site design guidelines, which better respond to user's needs, specifically addressing both green site design and social sustainability. Within this context designers and architects can consider the ecological and social factors of sustainable site design more critically.

INTRODUCTION

Sustainability has been the mantra to combat sprawl since the nineteen-nineties. From broad global agendas to theoretical frameworks, sustainability has made its way into the legislation of some cities as well as into the offices of professional designers and planners. These frameworks and ideologies have prompted submission of written proposals and guidelines of physical form from the building industry and professionals to advance sustainability as a practice. Sustainability requires that development be altered from conventional practices, and that those alterations must be usefully debated within the context and influence of the given social and ecological environments. With a continual increase in building, particularly residential, it is critical that developments are well planned in order to improve the quality of the environment and the satisfaction of the users.

Continued progress in building science, technology, and operations provides resources for designers, developers and planners to create and require more ecological environments. Industry defined ecological checklists provide development standards to increase densities, conserve land, natural resources and energy, which may or may not be conducive to the human environment in which it is being created. The human use of space is critical in determining the success of the design particularly because sustainable design emphasizes communal aspects of space, consequentially reducing private space.

Environmental goals should not be abandoned for social preferences. Rather ecological design must incorporate social aspects. Spaces not grounded in social understanding can fall back on ecological geometries and be confused as good design. Though site design will influence social behavior, the manipulation of space to induce ecologically informed behavior of people may be an over-estimation since cultural context plays such a strong role. A truly sustainable site incorporates both environmental values and user values to sustain community and individuals.

This study evaluates the relationships between sustainable site design guidelines and residents' preferences and values regarding outdoor space. These needs and preferences are explored through a post occupancy evaluation survey in two affordable homeownership housing developments in Oakland, California. The survey focuses on three aspects of residential site design: open space, permeable surface/parking and the building footprint. These facets represent the types of spaces most affected by sustainable site design guidelines. These priorities are compared to a composite list of ecologically derived guidelines to understand the overlap of the ecological and social ideals. This will inform a set of sustainable site development characteristics and dilemmas, for designers and planners to consider.

	105th	Jingletown
Comparable Conditions		
resident profile	30-80% median income	80% median income
homeownership	first time	first time
cost of home	$117,000	$98,000-$129,000
number of units	40	53
communal open space	yes	yes
square footage of home	1080-1180	900-1424
Variable Conditions		
density	12 d.u./acre	23 d.u./acre
development type	single family	townhouses
development profile	4-3 bdrm	32-2 bdrm, expand to 4
	15 - 3 bdrm, expand to 4	9-3 bdrm, expand to 5
	21 - 4 bdrm, expand to 5	5 - 3 bdrm with office
construction type	new	new
parking conditions	2 spot tandem driveway	2 spot tandem driveway
	auto and pedestrian street	shared parking lot
		auto pedestrian court
Ecological Conditions		
infill property	no	yes
increased density of area	yes	yes
attached housing	no	yes
drought tolerant landscaping*	yes	yes
near transit	no	yes
stormwater treatment	no	no

* this was called for in plans but not necessarily planted.

Table 1. A comparison of the characteristics of the Jingletown and 105th Avenue Developments.

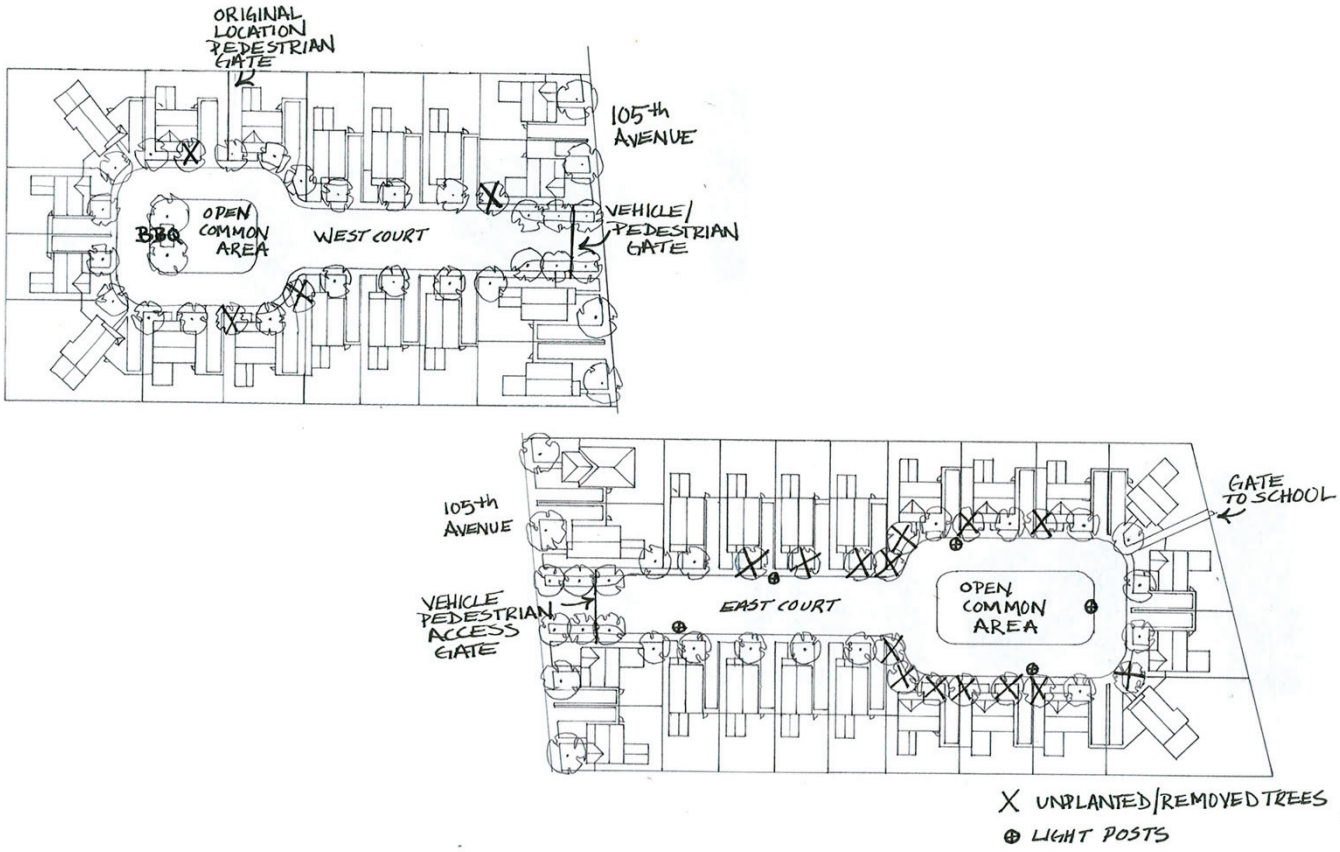

Figure 1. The East and West Court plan of the 105th Avenue development.

My hypothesis is this: if the values regarding outdoor places (yard space, neighborhood space and parking) of low-income homeowners are understood, then the site design can be acceptably and thoughtfully altered to include ecological design guidelines. This is particularly critical because much of sustainable design focuses on a reduction of private space and an expansion of communal space. Additionally, low-income homeownership does not operate in a market driven system. My expectation is that communal space although valued is less valued than private space. If this is true then it has design implications on sustainable site design guidelines.

STUDY SITES

After a review of several developments in the city of Oakland, CA, two developments were chosen for this study. The 105th Avenue project in East Oakland developed by East Bay Habitat for Humanity, a volunteer based affiliate of a national organization, and the Jingletown Villas in the Fruitvale District developed by Oakland Community Housing Inc. (OCHI), a community based homeownership and rental developer, met the criteria. Several factors were considered and determined to be consistent across the two developments, including jurisdiction, square footage, low-income, rate of homeownership, site layout, age of stock and housing price (See Table 1). The projects have a comparable number of total units, only the density and therefore housing typology vary. Each development has its own history of design and development, which influenced the respective final designs.

EAST BAY HABITAT FOR HUMANITY AND THE 105TH AVENUE SITE

East Bay Habitat for Humanity was formed in 1988 as an independent affiliate of Habitat for Humanity International, a Christian-based, non-profit, affordable housing developer. Their mission is to create homeownership opportunities for low-income families by building decent, affordable houses and to enhance neighborhoods by working with homeowners and the community. East Bay Habitat serves families in Alameda and West Contra Costa Counties whose income is 30% - 80% of the median income (low and very low) as defined by the US Department of Housing and Urban Development.

The homes, built primarily with volunteer labor, are sold to low-income families with no monetary down payment required and a zero interest mortgage. Families are required to invest 500 sweat equity hours as a down payment for the land and the house with a thirty-year mortgage. Because East Bay Habitat is the developer as well as the lending institution, the mortgage payments accrued from completed homes are used to fund future projects. In 1999, with volunteer labor, homeowner

sweat equity and private funding, East Bay Habitat completed the 40 single-family homes project on 105th Avenue.

Design of the East and West Court

The East and West Courts on 105th Avenue are two private streets located in the Sobrante Park neighborhood within walking distance of a middle and an elementary school, several churches, a corner store and a newly built charter school. Other commercial facilities are as little as 2 miles away. The development consists of two cul de sac streets with 18 and 22 two-story single-family homes. Each cul de sac has an automatic vehicle gate and two locked pedestrian gates. The building setbacks are 10 feet on the main roadway; this minimum setback was determined by the designer. A 5-foot setback was used for the houses at the back of the court because of the reduced foot and vehicular traffic. An access gate was placed at the rear of the lot for pedestrian access to the middle school located behind the development. The Homeowner's Association maintains the private street and common space (See Figure 1).

The development has 12 dwelling units/ acre on the 3.4 acre site consisting of three and four bedroom with two exceptions- one five and one six bedroom. Private yards are fenced along the back and side yards with an access gate on both sides of each house. The 25-foot long driveways are all privately owned with additional parking in the street. Parking is restricted at the cul de sac to allow for emergency vehicle access.

The paved surfaces make up approximately 50% of the site including buildings (20% of that 50%) and driveways and the street (30% of the 50%). The common green open space makes up 9% of the entire development while private yards account for 41% of the total open space (See Figures 2 and 3). Each house was to have a tree planted in the front yard unless removed by the resident or never planted in some cases.

Design Intent

Design intent was influenced by the design process, which included three public workshops, city requirements, East Bay Habitat for Humanity and their budget constraints, the volunteer architects, the city, and the immediate community. The developers felt it essential to get the community's input due to their familiarity with the neighborhood; the development would be a new part of their community. The workshops with the neighbors were the most influential force in the design process. They were clear about what they wanted to see in their neighborhood and what they expected to work.

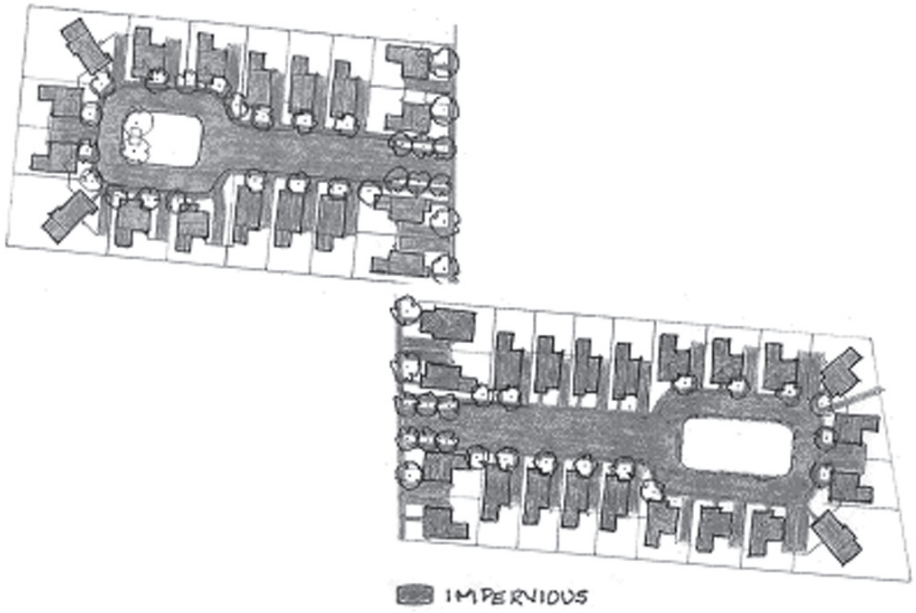

Figure 2. These diagrams represent the impervious area of the site.

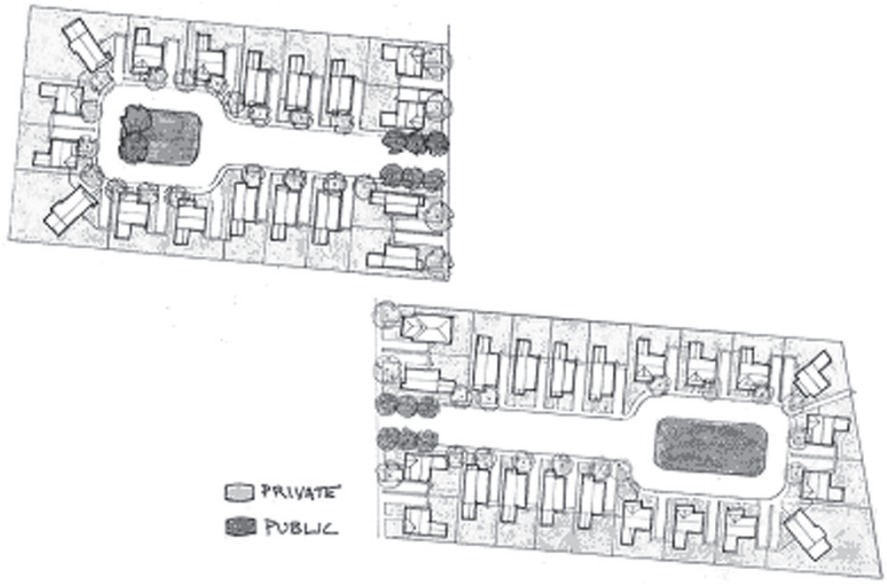

Figure 3. These diagrams illustrate the majority of the open space of development is on private property.

The neighbors presented a strong voice against some of the initial design decisions including collective parking, attached clustered housing, kids' play space separated from the vehicles and a communal open space that interfaced with the neighborhood. The neighbors conveyed that people needed their own private space to supervise. They were concerned that semi public areas such as a common parking area would not be well used if becoming public to the neighborhood. In their experience, common areas with ambiguous ownership were not well supervised. The neighborhood believed private fenced property would be the most successful design for the neighborhood.

Prospective homeowners were not necessarily choosing the neighbors or the neighborhood; they were choosing affordability and the opportunity to have a house. With such diversity amongst people with a broad range of lifestyles, privacy is essential.

OCHI AND JINGLETOWN

Oakland Community Housing (OCHI) was formed as a private non-profit housing development corporation in 1973 to serve residents whose homes were demolished by City Center Redevelopment. Beginning as a collaborative effort of a grassroots community-based coalition, their goal is to make a positive impact on people's lives by producing and managing quality affordable housing, including rental and home ownership units. As a developer and property manager OCHI provides services for the residents such as after-school programs, counseling, community computer resources and onsite daycare.

OCHI, working with the City of Oakland, was the developer and manager for the Jingletown Villas development, which included an equity share program for first time homebuyers who make 80% of the median income, was completed in 1997. Despite the layers of regulations through HUD and the city, Jingletown was highly recognized for good design. HUD and National Partners of Homeownership selected the development as a model for responding to community needs and innovative construction. Additionally, the development received the 1997 Pacific Coast Builders Golden Nugget Award for Best Affordable Attached Housing.

Design

Mike Pyatok of Pyatok Architects was the architect who worked with OCHI along with 60 people from the surrounding neighborhood to design the development and select the building typologies. Jingletown is comprised 53 townhouses on three parallel private streets off of a residential street in the Fruitvale District of Oakland. The development is within walking distance of an elementary school and a shopping area. It is within 3/4 mile of the Fruitvale BART. The neighborhood is tucked in between the major roadways of 12th Street, 29th Avenue, the 880 freeway and an on/off ramp for the 880 freeway. There are approximately 18 units to a pedestrian court, which is similar to the total units on each cul de sac at 105th Avenue. The building typologies mimic the surrounding architecture to integrate with the single-family character of the neighborhood housing stock (See Figure 4).

The 20-foot wide auto-pedestrian courts were designed with colored concrete, bollards and rolled curbs identifying the multi-use roadway creating a more pedestrian friendly environment than the conventional asphalt road. The entrance on each of the courts is not gated, however there are private property postings at the sidewalk. Individual houses with 5-8 foot setbacks have private fenced front and back yards as well as 15-foot long private driveways or designated parking spaces. The houses are grouped in clusters of 8 and 10 dwelling units around a smaller common area, complemented by the larger area at

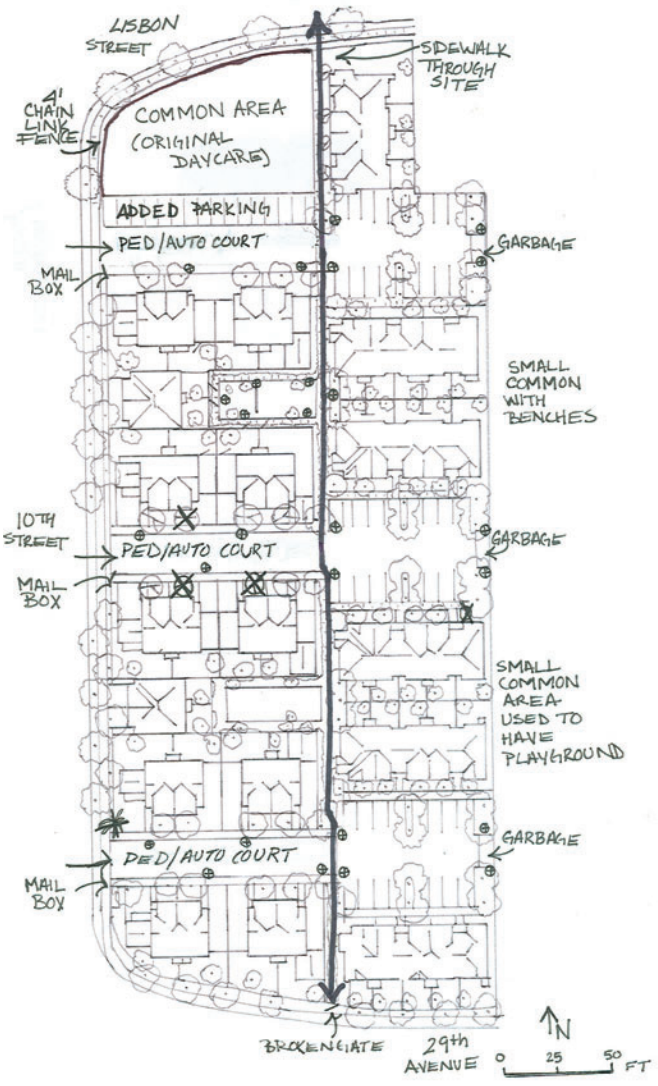

Figure 4. Annotated plan of the 53 townhouse development of Jingletown Villas.

the north end of the property. A central walkway runs through the development for easy pedestrian access to the school and shopping area. The access at 29th Avenue is gated. The 53 townhouses at 23 dwelling units /acre on this 2.3 acre site were designed to accommodate lower income and allow for lower mortgages and stretch subsidies.

Seventy percent of the site is covered, 38% of which is buildings, and driveways and the street make up the remaining percentage. The remaining open space is divided between 19% common green open space and 21% private (See Figure 5 and 6).

Design Intent

Pyatok had several design intents for the development including providing visual and physical access to the animal shelter park area which was not permissible, pedestrian access through the site via a north/south sidewalk integrating the development with the community, grass play in the common areas and hard surface play the pedestrian/ auto courts and clustering houses to back up to small landscaped areas. The houses with low backyard fences allowed residents to be in their backyards and easily supervise the common area. The original intent was to build a community center and daycare on the north end of the site. Without the funds available, the community serendipitously received a larger open space with a short 4-foot chain link fence, which marks the main corner between the neighborhood and the development.

The only ecological practice utilized by both developments was to increase the local density. This is often the driving force for affordable housing because increased densities result in lower costs.

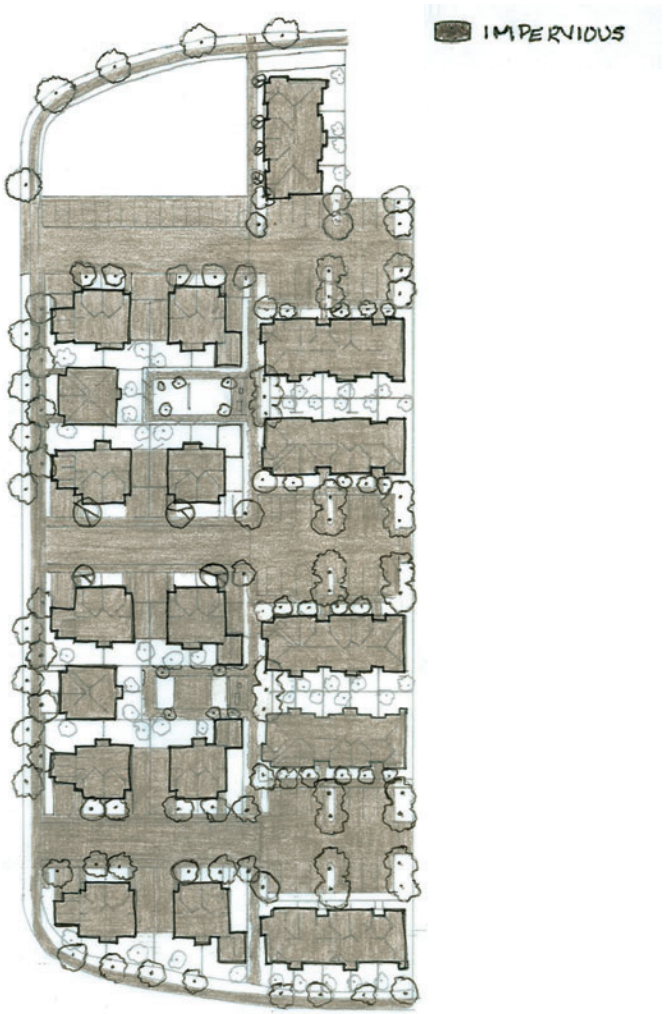

Figure 5. This diagram represents the 70% impermeable surfaces of the Jingletown development.

PRACTICABILITY OF SUSTAINABILITY

Through efforts to encourage sustainability and make it more accessible, not-for-profit organizations, developers and designers have worked to create physical conceptions of this ideology. Sustainability concepts such as minimizing environmental impacts, conserving natural resources, encouraging superior building design to enhance health, safety and well being of the residents, providing durable, low maintenance dwellings and making optimum use of existing infrastructure, were integrated into planning doctrine through aspects of land use planning and site design. Focusing on

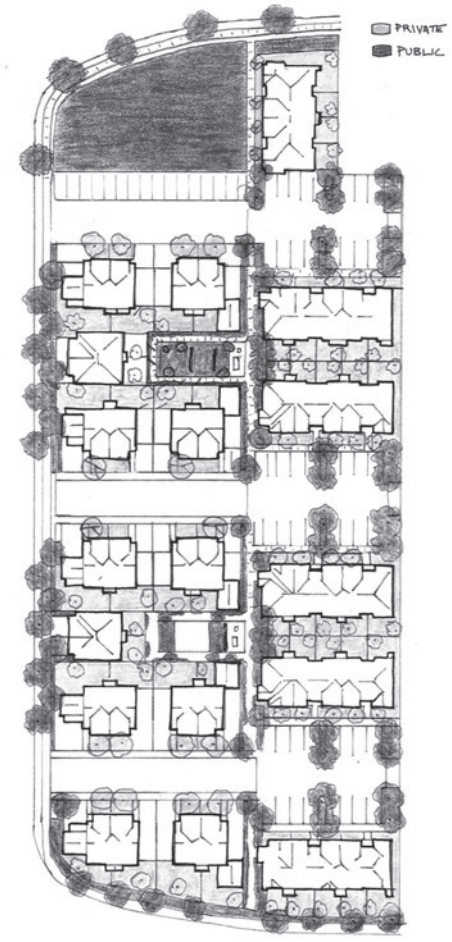

Figure 6. In Jingletown the open space is relatively equally distributed between public and private property.

environmentally sensitive development, designers and planners were encouraged to address the construction practices, life-cycle costs of building materials and dismantling operations: the cradle to grave approach.

In the Bay Area alone, there are several sources of guidelines for sustainable commercial and residential development addressing these aspects of building design. Organizations range from regional coalitions, including the Bay Area Alliance for Sustainable Development, to county waste managements such as Alameda Waste County Management Association to municipal offices like the San Francisco Mayor's Office of Housing. These guidelines are often broken down into four main categories: site and building design, resource conservation, energy and water efficiency, health and safety. These goals are realized through several aspects of site design including impermeable surfaces, housing typology, land use, landscaping and open space and the preservation of natural resources.

1. Impervious surfaces include roofs / buildings and paved ground surfaces for streets, sidewalks and driveways are deemed unsustainable both in energy intensive production of the material and the effects on the hydrologic cycle and the micro-climate. A reduction in paved area reduces consumption of nonrenewable energy used in production and the material itself, and decrease total volume and pollutant level of stormwater and ambient temperature.
2. Land use and land use patterns affect every aspect of sustainable design. Conventional land use patterns increase automobile use, land development and infrastructure costs. Infill development and mixed use utilizes vacant parcels and existing infrastructure increasing density and population in urban areas in proximity to amenities while providing an alternative to driving, thus reducing travel needs and creating a more pedestrian friendly community. These ideologies are reflected in New Urbanism.
3. Landscaping (and preserving natural resources) has an ecological impact as well as social while providing a functional space. In California, traditional landscaping irrigation consumes 40-60% of the residential water use. Trees and other vegetation reduce water runoff, decrease the impacts of the heat island effect and provide an appealing aesthetic. Using plants appropriate for the climatic conditions lessens the burden on municipal water supplies creating a positive regional impact.

The community components of ecologically informed spaces such as public spaces and shared lots cannot be integrated into design without understanding the needs of the community. For example, LEED provides guidelines that address sustainability issues including increased densities to reduce land consumption, prevent sprawl and provide green spaces for community gatherings. Yet, the characteristics of open space are not addressed to achieve the LEED rating for density; instead, the existence of common green space is generalized as beneficial to the community. In another case, it has been illustrated that people are less concerned with the housing type and more concerned with parking security, privacy and yards. There is less of a focus on façade than user needs. If needs are sacrificed or disregarded then the community building touted design has impeded community.

Social sustainability, which considers quality of life issues, requires the inclusion of the explicit and implicit needs of the users, both individually and as a community, into the design plan. Development patterns can either inhibit or contribute to the establishment of strong communities and neighborhoods. Therefore awareness of the relationship between human behavior and the built environment is paramount. With this in mind, Corbett and Corbett, through their work in developing Village Homes state "the key to sustainable development lies in having planners and engineers understand and work with nature and human nature rather than habitually trying to overcome them."

Designers have addressed, investigated, experimented with and reviewed how these social factors are manifested in physical design. Based on the previously discussed literature the following qualitative characteristics would promote successful environments for the individual as well as the community: Common open space; Pedestrian access; Privacy- balance of public and private; Shared space including parking, mailboxes, courts for chance encounters; Vegetation and trees; Integration into the neighborhood both by design and physical access; Diverse housing; Activism in the neighborhood; Knowing ones neighbors and Participating in civic affairs.

For a place to be sustainable (and successful), it must respond to the human use and the function of the space. Philosophically, development practices need to be altered to sustain our population, yet the alterations must be developed within the context of the human environment. To understand the human component and user satisfaction, residential developments (in this case) must be surveyed.

A post occupancy evaluation ties the concepts of social sustainability, ecological design and trade-offs together for analysis.

METHODOLOGY

A POE strives to establish how a particular built environment satisfies its user's needs and perceptions, hence how it facilitates and/or deters human activities. In evaluating design decisions and environments, questions like what was the intended use versus the actual use?, what is the comfort level of the people? and what spaces are important for function

or value? are asked. By understanding the effects buildings have on their users and occupants, designers can minimize problems and maximize benefits for future designs to address user needs.

In light of the research, I chose to use the POE survey as my method of eliciting information to understand user's preferences and values for outdoor areas in residential developments. A three-part survey instrument, conducted in person, was developed to fulfill this goal of understanding values and needs, as well as the trade-offs users would be willing to make. A multiple method approach, triangulation of measurement, was used to enhance the credibility of the results thus producing a richer data set. The total population sampled was 93 households. I was able to survey 50% (20) of the 105th Avenue development and 38% (18) of the Jingletown development, resulting in a total of 38 surveyed households. The total sample is considerable but likely is not large enough to make a statistically significant comparison between the two developments. Every effort was made to solicit every homeowner in each development, including several follow-up visits if a homeowner was not at home. One survey was conducted in Cantonese and three in Spanish. The survey was voluntary and I offered no compensation.

In the first section of the survey, residents were asked to give me a tour of their private outdoor spaces and the neighborhood outdoor space. "Neighborhood" was defined as the development. This ethnographic approach was developed primarily to provoke the residents to think about how these spaces are used, by whom and when while they were looking at the space. It was my belief that this would produce a more "honest" response and description of the spaces, as well as trigger recollection of the uses of the space in question. It is also my assumption that this recent discussion would allow individuals to make better judgments about the trade-offs offered in the third part of the survey.

The second section was a prioritization exercise. Residents were asked to prioritize six spatial categories: Yard Space, Available Space, Vegetation, Neighborhood Space, Boundaries and Privacy. This was followed by a prioritization of three to four site design elements under each of the spatial categories.

The trade-off portion of the survey was developed to understand resident's values and what they would be willing to compromise if two elements they valued were in direct competition with each other. The three categories for the trade-off questions are based on three aspects of site design: open space, building type and parking. It is my assessment based on the reviewed sustainable guideline list that these aspects are often the most manipulated to create a "sustainable design." For this reason it is necessary to understand where people are willing to make sacrifices.

Behavioral observational studies were completed over multiple days of the week and hours of the day in September through December to ensure that various uses were captured. As I would walk through the development, I would note who was outside, behavioral traces and physical conditions of homes i.e. clotheslines or hoses in front yards.

To evaluate the overlap between ecological and social aspects of design, I chose to use a composite list in order to ascertain the most complete list of sustainable elements from various sources including Alameda County Waste Management, LEED, New Jersey Sustainable Site Design, Environmental Building News and the previously discussed literature. The guidelines are discussed in terms of community and site issues. The resources include sections on material selection, site selection, lighting, plumbing and construction practices. Although, these are all critical areas of sustainability, only those specifically related to residential site design issues were included in this list, addressing:

Community Design Issues: to provide a context which would facilitate a cohesive community.

Stormwater Management: to increase natural evaporation, infiltration and transpiration while increasing permeability. There should be no net increase in rate and quantity of runoff.

Site layout and selection: to decrease land consumption, utilize existing infrastructure including transportation and stormwater, as well as provide open space.

Landscaping to Reduce Heat Island: to decrease the radiant heat from material of low reflectivity which increases the ambient air temperature (resulting in an increased need for air-conditioning).

Water Efficiency: to reduce overall water consumption and utilize climate resources.

Energy and Atmosphere: to reduce energy consumption and utilize natural resources.

INTERSECTION OF ECOLOGICAL AND SOCIAL ASPECTS OF DESIGN

Can these ecological guidelines coexist with the user preference? The answers are "yes," "no" and "maybe."

Yes: The ecological guidelines do not conflict with the conditions stipulated by the user preferences.

No: The ecological guidelines conflict with the conditions stipulated by the user preferences and the two cannot coexist without radical compromise.

Maybe: This is essentially a conditional yes. The ecological guidelines can be implemented but only with a bias towards

the user preferences as guidelines for design. Without the homeowner buy in the design would not be successful.

By comparing the data conclusions to the sustainable site design guidelines previously outlined the consistencies and inconsistencies can be identified. The results of the data present architects and designers with sets of dilemmas. There are three examples of the data presented here addressing the public and private concept, parking and open space. The findings and the implications will illustrate the spatial tradeoffs.

Public and Private Concept

The idea of public versus private space is not new. Not surprisingly, there is a strong preference for private spaces, boundaries and general privacy. Ecological design parameters strive to economize land use and decrease square footage to reduce the overall impervious area, increase building efficiency and promote community. These efforts can impinge on privacy, private space and boundaries needed for successful utilization of outdoor spaces.

In both the ranking of the spatial concepts and the site design elements, the private spaces were the most important (See Tables 2 and 3). For example, under neighborhood space which included common space for kids, parking on the street, physically separated houses and community gardens: physically separated houses was the most important use of neighborhood space. The fenced in backyard was the most important type of personal yard space. Interestingly, there is a higher preference in Jingletown where the density is higher.

Connecting to the neighborhood and designing for pedestrian and bicycle access, though good in theory, are incompatible with the user preferences, particularly in depressed neighborhoods where the need for security is higher. These two conditions require a design that integrates the site into the neighborhood through a physical connection. As a result of the design intent, both developments have been affected by access by the neighborhood through the site and have sought alternative solutions. For example, there must be a minimum boundary between semi public and private and a clear strong boundary between public and semi-public/private because design creates the perception of public or private which in turn affects behavior.

At 105th, one pedestrian gate was eliminated at installation by both the neighborhood and the residents and a gate through to the school was welded shut eliminating its function. At Jingletown, the residents are designing out this intentional condition by placing gates across the publicly designed sidewalks. The public access directly conflicts with the gradations of public to private. The design intent was to have public access adjacent to semi private areas, which lead to private yards with 4-foot fences and an open entryway (See

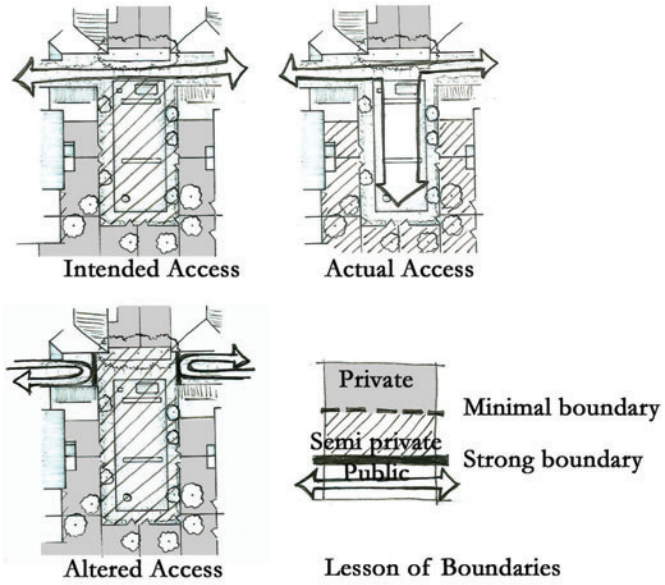

Figure 7. The intended connection to the neighborhood had unintended consequences which led the community to seek a solution requiring strong boundaries between public and semi-private.

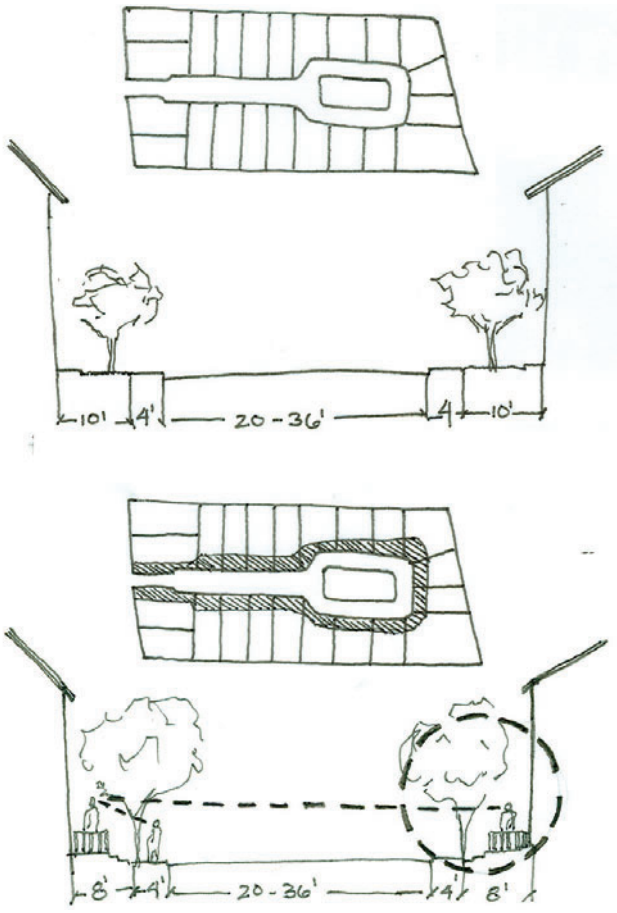

Figure 8. Seventeen of twenty families surveyed use their porch regularly. This regular activity creates places for a casual interaction and surveillance in the public space.

Figure 7). The result was public access to common areas, transforming private yards to public. The residents' solution was to eliminate through traffic by installing locked gates across the "public" sidewalk. Previously, they had all extended the 4-foot backyard fences to 6-7 feet and installed gates between the backyard and common space. These actions restored intended safety and use of the semi public and private areas. This conflicts with the original intent of integration and creating a more cumbersome utilization of common space as well as reducing intended sunlight and ventilation of homes and supervision of the common areas.

Successful use of space and development of community requires a priority for privacy. If a development is private, including a private street, then public access through the site is inconsistent with the residents' understanding of their ownership and maintenance of the development. Juxtaposing a public access way next to a private common area for the development invites a violation of privacy and a misuse of space.

Parking

User's value parking both on the street and off street while designers would like to reduce parking to increase density and use of public transit, reduce impervious areas and promote alternative behavior. Providing adequate parking is a highly contentious issue because designers and users may define adequate differently. Having enough parking, both private and street, is highly valued by residents and if possible they are willing to create more to fit needs.

The driveway – a flexible flat space- can support 14 different activities. It is second in the frequency of activities, which take place there- it is not just for a car. It is more important than larger backyards and outdoor storage areas. This is not to say that driveways are the only option.

66% of the residents would be willing to park in a common lot, whereas 33% said they would never give up their driveway. This tells me there is some flexibility in the design but the definition of adequate is not consistent between users and designers.

In the case of Jingletown the development originally had 1.4 parking spaces per unit. By eliminating visitor parking and renting the spaces to residents it has been raised to 1.7 and paving the north end of the site to create even more parking is under consideration.

Parking is reduced when developments are built in proximity to transit and designed for more pedestrian and bicycle

	Combined		105th		Jingletown	
Yard Space	**156**	228*	**96**	120*	**58**	108*
private backyard	**65**	152	**65**	60	**68**	54
front yard	50		50		45	
front porch / stoop	46		46		31	
having side yards	39		39		34	
Privacy	**146**	228	**77**	102	**72**	108
visual privacy from street	**120**	152	**63**	60	**59**	
protection from noisy street	99		44		51	
visual privacy from neighbors	82		50		37	
protection from hearing neighbors	67		43		33	
Boundaries	**132**	228	**66**	120	**66**	54
between adjacent houses	**85**	152	**50**	60	**38**	
between common and private space	75		34		43	
between street and house	68		36		27	
Available Space	**123**	228	**77**	120	**46**	108
parking in your own driveway	**92**	152	**46**	60	**45**	54
outdoor storage area	75		44		33	
larger yards	60		30		29	
Neighborhood Space	**103**	228	**61**	120	**46**	108
physically separated houses	**110**	152	**56**	60	**52**	54
common areas for kids	105		60		45	
parking on the street	98		53		46	
community garden	67		31		37	
Vegetation	**99**	228	**55**	120	**39**	108
plants / gardens in front yard	**120**	152	**62**	60	**57**	54
trees near house / window	101		53		44	
trees in neighborhood	95		47		46	
plants / gardens in neighbor's yard	67		38		36	

*represents highest possible score of Importance Index

Table 2. A table was created from the ranking section to understand the cumulative importance of each of the spatial concepts and site design elements.

access and mixed use. The ultimate ecological goal to reduce impermeable surfaces conflicts with parking needs of users. Incorporating permeable paving is the technological solution that does not conflict with conventional design and user preferences, in theory. Economics, aesthetics and product performance influence whether or not this is a viable solution. Under these circumstances, I think it is critical to understand this relationship to ensure a more ecological design- not a less ecological design once we are gone.

In my thesis, I have laid out some approaches that are both compatible, like tandem driveways, and less compatible, like car share programs, with the survey results. For this population, access to transit and higher density are not resulting in alternative behavior but alternative design. In an effort to provide more ecological development, do designers fulfill the will of users and provide more parking than required by code as the profession looks to reduce required parking spaces? Or should design and ecological goals dictate the form of parking? With the complexity of variables, it is essential to consider and weigh the particular social and ecological values. Mitigation of the less desirable characteristics of parking may be the best approach.

Open Space

While open space is valued, it must be modified by the word "private," either for the resident or for the development. Without this security, places like fronts of houses, backyards and common areas remain unused. While, designers and developers look to maximize open space, minimize built form for density and storm water management, residents are paving their backyards to make them usable.

Private backyards was the most important space with the highest intensity and diversity of use of backyard- 79% said it was the most important on the lot where paved surfaces are valued for use. Some residents named it the most important in the neighborhood.

Front porches not patios are used more than front yards. The front porch is social space where 90% of the 105th residents sit on the front porch everyday where as only 33% of Jingletown residents ever use the front yard or front patio. In minimizing street widths to provide possibilities for social interaction and reduce impervious area while increasing density, it is essential that buffers be maintained. Without the buffers of an acceptable setback or an elevated porch, the front will be less inhabited, negating possibilities of social interaction. Too narrow a frontage forces residents to the back negating social intercourse, yet the feel of a narrower street has been shown to be more appealing to residents. The ecological goals of narrowing street width and decreasing setbacks which reduce resident's boundaries can be successfully achieved knowing that the front yard functions as a boundary and an aesthetic and the porch functions as a boundary and social space. The design should include just enough front yard to plant something, an elevated porch to create privacy and boundary and a social arena for casual interaction, achieving both ecological, social and community goals.

Conceptually, decreasing impermeable areas and increasing open space are complementary goals. Several conditions make these two parallel ideas less compatible. First, unplanned paved areas produce unplanned increases in volumes of runoff. In the tour, 85% of the residents have either paved their yard or are planning to pave their backyard. The typically small spaces of the backyard are valuable for the diversity of activities, which can occur on the paved surface. Second, built out spaces are used actively. The active use of porches makes them a more appealing community benefiting design than front yards.

Because green open space is so appealing aesthetically and ecologically, it is critical that its design is thoughtfully developed within user parameters to prevent green deserts or future non-ecological modifications. With the diverse possibilities of site layout, the level of activity should inform the size of different areas to satisfy use and increase casual interaction (See Figure 9). The designer is again faced with the dilemma of creating paved surfaces, which users desire more for usable space. The actual use of space can allow the designer to manage the

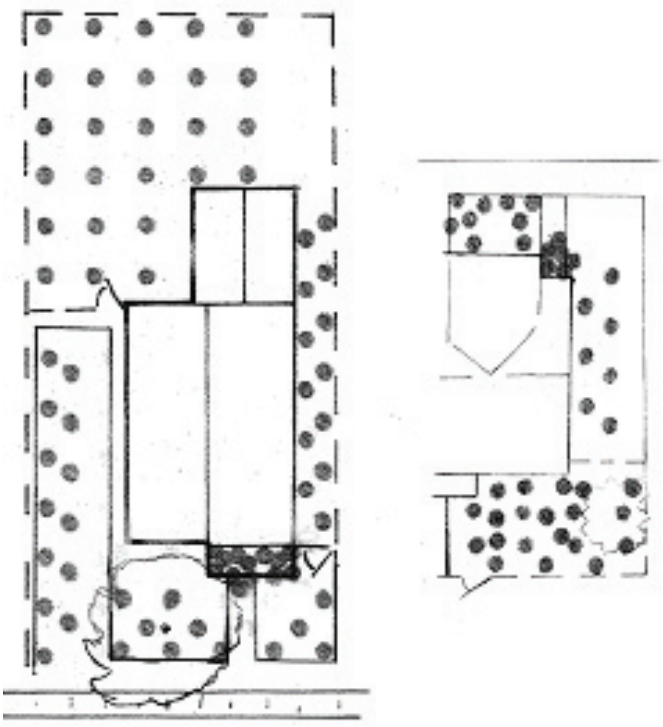

Figure 9. The number of activities is proportionally similar for each site. This data in conjunction with the types of activities can be used as a guide to determine which spaces to minimize and maximize.

site layout to accommodate user preferences and ecological goals and mitigate increased built areas.

An observation: The Design and Alteration

The 105th Avenue development, which was of the least design risk is also the least altered. On the other hand, Jingletown residents are altering the site in fundamental ways that do not align with the designer's intent or the ecological guidelines. The parking that was reduced is being increased. Second, the intentional accessibility through the site, which reduced the privacy, security and usability of the interior common areas has been eliminated. Third, the backyard fences designed for supervision and connection to the common space and light and ventilation to homes have been altered for privacy by raising the fence height and installing gates.

How do alternative development practices become acceptable and unaltered? Architects and designers can use this data to think about site design more critically in its physical form.

The results and discussion presented here provide a better understanding of this relationship in order to consider site design more critically. The ability to address the intersection of user preferences and sustainable development guidelines fall into three categories, First, technological solutions such as pervious concrete, fulfill ecological demands without explicitly requiring alternative behavior or living conditions or site design. Second, education of ecological and financial benefits can result in a voluntary adoption of ecological alternatives. Third, subtle spatial solutions responding to the users needs can result in both a socially and ecologically responsible design.

These possibilities and conditions present a set of dilemmas to design professionals, which we are required to address in order to complete a successful design. As professionals looking to create more sustainable developments- which are by definition environmentally and socially responsible, our understanding of these possibilities and conditions will allow site designs to be altered in a thoughtful manner in order to accommodate sustainable goals. By anticipating the needs of the end user by social and economic demographics, we can avoid future alterations of the site that would be sustainably and ecologically detrimental.

Additionally, affordable housing does not function in a market demand condition, which typically allows for a best fit of buyer to home. This makes it more critical to understand the social implications of design. This also raises the issue of different income levels. A complimentary extension of this research would be to survey middle-income development where there is a market demand condition. It would be effective to understand the possibilities in these developments as well. Additional research based on the survey instrument should include more detailed questions, which have explicit ecological goals. This would include a deeper understanding of the three ways I found to address this intersection: technological, educational and spatial solutions.

	Combined		105th		Jingletown	
Personal yard space	total activities	total number of mentions	total activities	total number of mentions	total activities	total number of mentions
backyard	29	261	25	119	19	101
front porch	17	94	13	46	6	16
driveway	14	97	12	45	6	33
front yard	13	89	11	35	8	34
side yards	6	39	6	23	na	na
fence / edge	5	49	3	4	5	10
Neighborhood space						
street	12	90	6	28	5	11
sidewalk	10	89	9	38	8	45
neighbor's front yard	9	71	11	53	10	47
common area	9	69	6	34	6	31
small common area	8	57	na	na	8	37
edge / gate to neighborhood	5	51	11	53	10	47
neighbor's driveway	5	47	5	9	4	16
neighbor's porches	4	30	4	14	1	1

Table 3. Additionally, I compiled the number of activities and frequency from the tour section of the survey.