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Built for Dementia: Urban Design Analysis for Dementia-Friendly Communities

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Built for Dementia

Urban Design Analysis for Dementia-Friendly Communities

A Planning Report Presented to The Faculty of the Department of Urban and
Regional Planning

San Jose State University

In partial fulfillment of the requirements for the degree
Master of Urban Planning

Jason Su
Spring 2013

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Introduction

2011 was a pivotal year for demographic shifts in the United States, where the first wave of the Baby Boomer generation reaches age 65. The population of the country has been aging, and this specific year marks the designation of the largest generation in the country to also become the oldest.

Reaching this point is a cause for celebration. Advancements in health care and healthful living have extended the life expectancy of the general population, which allows for continued community engagement and sharing of wisdom and life experiences. In 1900, the life expectancy was about 47 years.¹ This rose to 70 in 1960 and 78 in 2010.² Increased longevity is truly a great achievement of human civilization, though it comes with its own issues.

Our contemporary cities, which have grown in conjunction with the prosperity of life expectancy, has remained unchanged since its development. Much of our present American cities developed their form in the post-World War II era of the 1950's and 1960's, in the midst of suburbanization and urban renewal. The development of acres of single-family homes and the demolition of neighborhoods for the creation of freeways suited the demands for the population at the time. Yet the model for city building has not evolved from World War II development patterns until recently with the conception of New Urbanism communities: walkable, transit friendly, dense, and mixed places where people are able to reach destinations without a car and feel the sense of community through proximity. The majority of housing and commercial developments still subscribe to development formulas decades old, yet with the aging of the American population, these past formulas are increasingly becoming obstacles that hinder the mobility and quality of life of our older adults.

Elder-friendly community policies is not enough if it does not include the full spectrum of ailments older adults are more prone to suffer through. Many existing policies center around only accessibility and safety, with particular focus on mobility issues - increasing walkability and reducing slipping hazards. The assumption of these policies is that all older adults will have the benefit of healthy aging, having the physical and economic support that allows for comfortable and supportive advancement into their years. This assumption is dangerous as it leaves many living with chronic illnesses ignored. Chronic illnesses such as dementia, do not discriminate in infliction. There are ways to reduce the probability of getting dementia, but there is no way to prevent it. Elder-friendly community policies should reflect and address complicated facets of aging: deteriorating health, chronic diseases, and the need for community access, affordable housing, and medical services for not just those who are aging healthfully.

The degree to which a city should be involved in matters of elder care vary depending on region and political biases; however, the form of the city should not become a prison for any member of the community. While providing direct services for older adults and persons with dementia is key to increasing the quality of life and integrity for our older citizens; at a minimum, the form and navigation of a city should be open and available to all members, regardless of their age or ability status.

The research presented addresses the question - how prepared are Bay Area city downtowns in providing safety, accessibility, and wayfinding for those living with dementia? The cities selected are Palo Alto in Santa Clara County, San Leandro in Alameda County, and Walnut Creek, also in Contra Costa County.

¹ Department of Demography, University of California, Berkeley, Life expectancy 1900-1998.

² World Bank, 2012.

These cities are found to have the largest percentage of persons over 65 in cities with a population greater than 50,000.³

There are three objectives to the research:

- To evaluate the dementia-readiness of Bay Area cities as the population of older adults continues to rise.
- To provide findings and policy recommendations for planners and decision-makers to utilize when implementing dementia-friendly policies.
- Critique current conventional planning practices with the needs of older adults and persons with dementia, and contribute to the greater body of knowledge.

With the findings, the research aims to provide a sound and critical analysis of current planning methods and the preparation of cities for the coming wave of persons with dementia. In order to ensure that some of our most vulnerable populations have the quality of life they deserve into their advancing years and to maintain the safety of these populations and the greater community, dementia-friendly policies need to be an objective in elder-friendly communities.

Relevance and background

Dementia is a chronic, degenerative disease that impacts mental capacity, reaction, memory, and motor functions. The disease causes the deterioration of the brain, and with it, the ability to do various functions that may require sequential steps or complex planning. Eventually, persons with dementia would lose control of even the most basic functions such as swallowing and breathing, leading to death. If not the degenerative impacts of brain atrophy, the physical enfeeblement and difficulty in retaining daily hygienic and healthful habits makes them more susceptible to other diseases.⁴

THE DISABLING EFFECTS OF DEMENTIA

In the later stages of the disease, advanced care is necessary to ensure the health and safety of persons with dementia. However, often those with dementia are institutionalized prematurely because of the lack of assistance required for them to maintain their engagement with the greater community. In order to allow the opportunity for persons with dementia to remain safely in their homes for as long as possible and remain connected with their communities, changes in how cities are planned and designed are necessary to factor in wayfinding, accessibility, and safety concerns that address the issues associated with dementia.

There are various forms of dementia, but the most common ones are Alzheimer's disease (the most prevalent), vascular dementia, dementia with Lewy bodies, mixed dementia, and frontotemporal lobar degeneration. Though many symptoms overlap, each has specific characteristics that distinguish themselves from one another. These distinct characteristics also complicate the definition of dementia-friendliness, which would entail memory loss, behavioral changes, movement rigidity, lack of social boundaries, and hallucinations. Table 1 shows the type and description of the most common forms of dementia.

³ 2010 United States Census

⁴ Alzheimer's Association. 2012 Alzheimer's disease facts and figures. Alzheimer's and Dementia: The Journal of the Alzheimer's Association. March 2012; 8:131–168.
http://www.alz.org/alzheimers_disease_facts_and_figures.asp#quickfacts (accessed August 1, 2012).

Table 1: Common types of dementia and their symptoms

Type of Dementia	Description
Alzheimer's disease	The most common form of dementia, accounting for 60 to 80 percent patient cases. Alzheimer's disease is linked to memory loss, depression, impaired judgment, disorientation, and difficulty in speaking and walking. Loss of memory is often one of the early symptoms.
Vascular dementia	Early signs are commonly impaired judgment or the ability to organize and make plans.
Dementia with Lewy bodies (DLB)	Many of the symptoms are common with Alzheimer's disease; however, persons with DLB are more likely to experience hallucinations, sleep disturbances, rigid muscles, and physical movements that resemble Parkinson's disease.
Mixed dementia	Having more than one type of dementia. This type of dementia is more common than previously considered.
Parkinson's disease	Movement problems are a common symptom of Parkinson's disease. As it progresses, the patient experiences dementia symptoms similar to Alzheimer's disease and dementia with Lewy bodies.
Frontotemporal lobar degeneration (FTLD)	Common symptoms include personality and behavioral changes, and difficulty using language. Lack of empathy, judgment, and inhibition are also symptoms.

Source: Alzheimer's Association. 2012 Alzheimer's disease facts and figures.

DEMENTIA ON THE COMMUNITY

As the baby boomer generation continues to age, and the demography of our communities become older, our cities and communities needs to start reflecting the priorities and needs of our elder generation. According to the United States Census, 13.3 percent of the nation's population is over age 65.⁵ Counting just Alzheimer's disease alone, there are 5.2 million Americans living with the disease currently. The figures increase with the addition of other forms of dementia. As these rates begin to rise with an aging population, steps need to be made to ensure that the cities these individuals live in are dementia-friendly and prepared for the coming wave of persons with dementia.

⁵ United States Census, USA Quick Facts, <http://quickfacts.census.gov/qfd/states/00000.html> (accessed September 10, 2012).

The United States Census also reveals that 29 percent of individuals aged 65 or older live alone.⁶ This figure estimates to 11.3 million people. If you apply the rate of Alzheimer's disease to the population that lives alone, about 1.4 million people are living alone with Alzheimer's disease. Though this figure may be lower due to the need for advanced care in later stages of dementia, it still highlights the urgency of planning communities for dementia. An estimate of half of all persons with dementia never get diagnosed.⁷ With so many older adults developing the disease, many of whom may never have it diagnosed, the necessity for dementia-friendly communities becomes to ensure that as many people are safe and living dignified lives for as long as possible.

Quality of life also entails the integrity of the built form in how it interacts with individuals. By building and planning for those who are most able-bodied, the discourse between planning for the majority and planning for those in need begin to increase.⁸ Sign placements and counter levels that disregard the slouching position of other adults or eye-level of those in wheelchairs further reinforces the inequality in "able-bodied"-ness in our communities.

SITE SELECTION

The research will be focusing on medium-sized cities with populations of 50,000 or greater. Through that, the population of older adults (age 65 or older), the percentage of populations of older adults, and the median age is ranked to determine the cities most appropriate for the study. Using previous research that determined age as the greatest factor in dementia development, these cities theoretically have higher amounts of persons with dementia than others. Table 2 ranks the top six cities determined through this calculation. The top three cities will be the ones to study: Walnut Creek, Palo Alto, and San Leandro. Figure 1 shows the location of each of the cities in context to the Bay Area.

Table 2: Population of the Bay Area over the age of 65+

County	City	Total Population	Number of people age 65+	Percentage	Median Age
Contra Costa	Walnut Creek	64,173	17,065	26.6%	47.9
Santa Clara	Palo Alto	64,403	11,006	17.1%	41.9
Alameda	San Leandro	84,950	11,683	13.8%	39.3
San Mateo	San Mateo	97,207	13,980	14.4%	38.9
San Francisco	San Francisco	805,235	109,842	13.6%	38.5
San Mateo	Daly City	101,123	13,623	13.5%	38.3
Source: 2010 United States Census					

⁶ United States Census, USA Quick Facts, <http://quickfacts.census.gov/qfd/states/00000.html> (accessed September 10, 2012).

⁷ Alzheimer's Association. 2012 Alzheimer's disease facts and figures. Alzheimer's and Dementia: The Journal of the Alzheimer's Association. March 2012; 8:131-168.
http://www.alz.org/alzheimers_disease_facts_and_figures.asp#quickfacts (accessed August 1, 2012).

⁸ Tim Blackman, Lynne Mitchell, Elizabeth Burton, Mike Jenks, Maria Parsons, Shibu Raman, and Katie Williams, "The Accessibility of Public Spaces for People with Dementia: a new priority for the 'open city'," Disability & Society 18, no. 3: 357 [2003].

CITY BACKGROUND

In addition to having the highest median age for cities with a population of 50,000 and over, there are other benefits of choosing Walnut Creek, San Leandro, and Palo Alto. Figure 1 shows the context of each city to the greater Bay Area. The cities are distributed through the region, each in a different county: Contra Costa, Alameda, and Santa Clara. This would provide findings with a geographical distribution and varying urban forms and infrastructure investments.

Table 3 shows the demographic figures of each of the cities. In addition to having high proportional amounts of persons age 65 and older, they also have a significant population of those age 45 to 64. This population is also susceptible to dementia, though at a lower probability.⁹ Furthermore, this population is the segment that is thinking about retirement and looking to invest in a permanent home.

Table 3: Demographic figures of Palo Alto, San Leandro, and Walnut Creek

	Palo Alto	San Leandro	Walnut Creek
Population	64,403	84,950	64,173
Age			
0-44	35,379	49,488	64,173
45-64	18,018	23,779	17,653
65+	11,006	11,683	17,065
Households			
Total housing units	26,493	30,717	30,443
Average household size	2.41	2.74	2.08
Average family size	3.04	3.36	2.79
Race			
White	41,359	31,946	50,487
Black or African American	1,197	10,437	1,035
American Indian and Alaska Native	121	669	155
Asian	17,461	25,206	8,027
Native Hawaiian and Other Pacific Islander	142	642	125
Some Other Race	1,426	11,295	1,624
Two or More Races	2,697	4,755	2,720
Hispanic or Latino (of any race)	3,974	23,237	5,540

Source: United States Census 2010.

The racial composition of Palo Alto and Walnut Creek have large populations of whites and Asians. San Leandro is diverse, with additional significant population segments of blacks or African Americans and Other Race. The average household and family size is greatest in San Leandro and lowest in Walnut Creek: which is both the highest percentage of whites of all three cities indicated, and has the highest median age.

⁹ Alzheimer's Association. 2012 Alzheimer's disease facts and figures. Alzheimer's and Dementia: The Journal of the Alzheimer's Association. March 2012; 8:131–168.
http://www.alz.org/alzheimers_disease_facts_and_figures.asp#quickfacts (accessed August 1, 2012).

Location of the three cities in the Bay Area

Figure 1: Context of the three selected cities to the Bay Area

STUDY AREAS

The segments of the study area are Main Street in Walnut Creek, University Avenue in Palo Alto, and 14th Street in San Leandro. Table 4 shows the length of each of the study segments.

Table 4: Length of study segments

City	San Leandro	Palo Alto	Walnut Creek
Length of study area	0.5 miles	0.5 miles	0.3 miles

Figure 2: Storefront in downtown San Leandro

14th Street in historic downtown San Leandro stretches half a mile between Chumalia Street and Thorton Street. It is the only segment where the city hall is not within the study area. The boundary is also breached by the San Leandro Creek. Neighboring uses include light industrial, civic buildings, and a hospice care facility.

Figure 3: Storefronts in downtown Palo Alto

The half-mile length of University Drive in Palo Alto stretches from Webster Street to Alma Street and the Palo Alto Caltrain Station. Beyond the immediate limits of University Drive is a retirement community and office and residential uses.

Figure 4: Storefronts in downtown Walnut Creek

The measured extent of Main Street is within the historic portion of their downtown, as a large shopping mall has been developed just south of the downtown district. The limits are punctuated by Civic Drive and Mount Diablo St. The entire length of the study area is 0.3 miles, shorter than the other two sites.

Boundary and Study Area of Downtown Walnut Creek

Figure 5: Boundary and study area of downtown Walnut Creek

Boundary and Study Area of Downtown Palo Alto

Figure 6: Boundary and study area of downtown Palo Alto

Boundary and Study Area of Downtown San Leandro

Figure 7: Boundary and study area of downtown San Leandro

Definitions

To begin the analysis of research, the rubric and definitions of terms will be given based on the review of literature on urban design features most pertinent to dementia-friendly communities. Looking at wayfinding, accessibility, and safety, the research aims to measure the degree of accommodations available in the select Bay Area cities.

- *Wayfinding* is the apparent or inert aspect of the built form that aids in navigation and legibility.
- *Accessibility* is the ability for individuals with dementia to perform activities of daily living through pedestrian access.
- *Safety* is the ability for those living with dementia to be able to navigate without harm to themselves or others.

WAYFINDING

The definition of wayfinding varies in both use and application. The seminal work by Lynch coins wayfinding as legibility, where the orientation and sense of spatial connection is based on the appropriate series of design elements: nodes, districts, paths, edges, and landmarks, that form a mental map of navigation.¹⁰ Passini et al. categorizes wayfinding into three processes: developing a navigation plan, performing appropriate actions at the right time, and processing observations that serve to inform the first two processes.¹¹ Abu-Obeid and Abu-Safieh measured the degree of wayfinding by asking participants to recall various features in their computer simulation study.¹² Mitchell, Burton, and Raman measured wayfinding by having subjects recall notable urban elements that trigger specific spatial orientation.¹³ These studies show that conventionally, wayfinding requires a construction of a mental map to navigate through an area, allowing the ability to develop a spatial orientation due to past and expected landmarks and urban forms. However, persons with dementia develop mental impairments that increase in severity with the progression of the disease. Dementia makes it more difficult to strategize and connect more complex series of steps, such as those required for wayfinding and the creation of a mental map. Marquardt's review of previous studies concludes that for persons with dementia should require no new or additional skills.¹⁴

ACCESSIBILITY

Accessibility may be measured based on the ease of movement and access of destinations. The literature review notes many definitions of accessibility. Clarke and George note that compact communities with a variety of land uses, pedestrian-friendly design, and population density provides the basis for an accessible community.¹⁵ These findings align closely with the those of the Local Government Association and Innovations in Dementia, which note the physical environment and local services as a measure of

¹⁰ Kevin Lynch, *The Image of the City*, [MIT Press 1960].

¹¹ Romedi Passini, Constant Rainville, Nicolas Marchand, and Yves Joannette, *Wayfinding and Dementia: Some Research Findings and a New Look at Design*, *Journal of Architectural and Planning Research* 15 no 2 133-151 [Summer 1998].

¹² Natheer Abu-Obeid, Shaden Abu-Safieh, "The Effect of the Angle between Navigation Paths and Transitional Spaces on Spatial Knowledge," *Journal of Architectural and Planning Research* 27:1 [Spring 2010].

¹³ Lynne Mitchell, Elizabeth Burton, and Shibu Raman, "Dementia-friendly Cities: Designing Intelligible Neighbourhoods for Life," *Journal of Urban Design* 9 Issue 1, 89-101, 13p [February 2004].

¹⁴ Gesine Marquardt, "Wayfinding for People With Dementia: A Review of the Role of Architectural Design." *Health Environments Research & Design Journal (HERD)* 4, no. 2: 75-90. [2011].

¹⁵ Philippa Clarke and Linda K. George, "The Role of the Built Environment in the Disablement Process," *American Journal of Public Health* 95 no. 11 [November 2005].

accessibility.¹⁶ Accessibility is also connected with definitions of mobility. Differing from previously mentioned findings on the amenities of the environment, Paez et al. defines accessibility in the framework of available health care as "travel impedance between patient location and the locations where care is delivered."¹⁷ Lynott, McAuley, and McCutcheon connects the relation between the built environment and senior travel patterns.¹⁸ While definitions of accessibility vary between the stock of density and facilities in an environment and the travel patterns and obstacles from one destination to another, the overall theme of distance connection and fluidity of movement persists. For the purposes of the research, accessibility will be measured in the degree of walkability, urban form, and the mix of land uses present that offer availability of services.

SAFETY

There are two specific measures of safety that need to be addressed regarding dementia-friendly communities. The first is physical safety, which addresses the construction of the built form that aids older adults and those with disabilities ease of navigation through the urban environment. The second is cognitive safety, which addresses the frustration, anxiety, hallucination, and potential violent behavior due to confusion or fear in being unable to orient themselves or process the signals in the built environment. The literature review will address both.

Research on design elements that concern safety often remark on the types of materials used in the construction of streets and gardens. The case study performed by Furness and Moriarty on the wander garden in Charlecote Park in the United Kingdom recommends design features such as level ground for older adults who may shuffle their feet when walking, raising planting beds for seating, and floor materials that reduce glare.¹⁹ The World Health Organization's report also recommended "age-friendly" pavement that reduces slipping and glare.²⁰ The findings by York in review of literature further recommends lighting, resting gardens, and ways to communicate for help if an older adult has fallen or harmed her or himself.²¹ However, some of York's recommendations call for an investment of upkeep. Regarding the streetscape, Santanano's findings from rehabilitation observations and general population surveys recommend specific curb cuts and pedestrian refuge areas at street intersections.²² These recommendations are common in complete streets and new urbanism lexicon on the recommended built form of cities and streets.

Safety for persons with dementia and those around them may also be facilitated through urban design features that would reduce agitation. Lai and Arthur's review of literature shows that wandering, which may be a coping mechanism for expression, attempts and spatial reorientation, or a perceived purpose of movement by the person with dementia that may not reflect their actual situation, may be managed with

¹⁶ Local Government Association and Innovations in Dementia, "Developing dementia-friendly communities," (accessed July 21, 2012).

¹⁷ Antonio Paez et al., Accessibility to health care facilities in Montreal Island: an application of relative accessibility indicators from the perspective of senior and non-senior residents, *International Journal of Health Geographics*, 9:52 [2012].

¹⁸ Jana Lynott, William J. McAuley, and Megan McCutcheon, "Getting Out and About: The Relationship Between Urban Form and Senior Travel Patterns," *Journal of Housing for the Elderly* 23:390-402 [2009].

¹⁹ Furness, Sally and Jo Moriarty. "Designing a garden for people with dementia - in a public space." *Dementia* 5. no. 1 139-143. [February 2006].

²⁰ World Health Organization. "Global Age-friendly Cities: A Guide." WHO Press. 12-19 [2007].

²¹ York, Sherril L. "Residential design and outdoor area accessibility." *NeuroRehabilitation* 25 201-208 [2009].

²² Santanano, William A., Jack M. Gurainik, Richard J. Jackson, Richard A. Marottol, Elizabeth A. Phelan, and Thomas R. Prohaska. "Mobility and Aging: New Directions for Public Health Action." *American Journal of Public Health* 102 no. 8. 1506-1515 [August 2012].

environmental design elements that increase their legibility and safety.²³ The research by Furness and Moriarty and by Detweiler et al. mention the beneficial and calming effects of being in the outdoors for persons with dementia.²⁴ Additionally, Detweiler et al. found through a study of 34 male subjects in a care facility over the course of 12 months that the freedom to access and use the wander garden showed significant changes in the amount of violent and inappropriate behavior witnessed.²⁵ It is important to note that though neither Furness and Moriarty and Detweiler's research had a control group to compare such findings to, their findings and those of Lai and Arthur provide insight to managing a difficult behavior in persons with dementia²⁶ by providing safe avenues for exposure to the outdoor environment.

Methodology

The synthesis of available research has many contradicting arguments. While some reports speak of the merits of a deformed grid layout to highlight places for orientation,²⁷ others mention the need to reduce the number of decisions needed.²⁸ The inclusion of wayfinding assistance and notable landmarks²⁹ counter to the need to make places that reduce anxiety and agitation due to misinterpretation of features or frustration in being unable to decipher the signage.³⁰ The need for more accessible places require a degree of density, yet density makes wayfinding more difficult and adds to social anxiety for persons with dementia, whom may have difficulty in comprehending the additional environmental stimulation. Density is especially compounded in the Bay Area, as the region is expected to grow by two million.³¹ Dementia-friendly policies complicate present convention on city form and design and the needs of coming regional changes. Integrating the various needs will be necessary to accommodate for the changing demographic populations.

The current research on the interaction between the built form and dementia have been sourced from architecture, landscape architecture, interior architecture, and elder care journals. There has been research on optimal design of retirement homes,³² wander gardens,³³ and other advanced care

²³ Lai, Claudia K., and David Arthur. Wandering Behaviour in People with Dementia. *Journal of Advanced Nursing*. 44, no. 2: 173 [2003].

²⁴ Furness, Sally and Jo Moriarty. "Designing a garden for people with dementia - in a public space." *Dementia* 5, no. 1 139-143. [February 2006]., Detweiler, Mark B., Pamela F. Murphy, Laura C. Myers, and Kye Y. Kim. "Does a Wander Garden Influence Inappropriate Behavior in Dementia Residents?" *American Journal of Alzheimer's Disease and Other Dementias* 23, No 1 31-45 [February/March 2008].

²⁵ Detweiler, Mark B., Pamela F. Murphy, Laura C. Myers, and Kye Y. Kim. "Does a Wander Garden Influence Inappropriate Behavior in Dementia Residents?" *American Journal of Alzheimer's Disease and Other Dementias* 23, No 1 31-45 [February/March 2008].

²⁶ Lai, Claudia K., and David Arthur. Wandering Behaviour in People with Dementia. *Journal of Advanced Nursing*. 44, no. 2: 173 [2003].

²⁷ Lynne Mitchell, Elizabeth Burton and Shibu Raman, "Dementia-friendly Cities: Designing Intelligible Neighbourhoods for Life," *Journal of Urban Design*, Vol. 9 Issue 1, p89-101, 13p [February 2004].

²⁸ Zhe Wang, and Mardelle McCuskey Shepley, "Site-level Environmental Support of Active Behavior and Fall Prevention for Seniors," *Seniors Housing and Care Journal* 16, no 1: 97[2008]. Marquardt, Gesine and Peter Schmieg. "Dementia-Friendly Architecture: Environments That Facilitate Wayfinding in Nursing Homes." *American Journal of Alzheimer's Disease and Other Dementias* 24 no. 4 333-340 [2009].

²⁹ Lynne Mitchell, Elizabeth Burton and Shibu Raman, "Dementia-friendly Cities: Designing Intelligible Neighbourhoods for Life," *Journal of Urban Design*, Vol. 9 Issue 1, p89-101, 13p [February 2004].

³⁰ Gesine Marquardt, "Wayfinding for People With Dementia: A Review of the Role of Architectural Design," *Health Environments Research & Design Journal (HERD)* 4 no. 2: 75-90[2011].

³¹ Plan Bay Area, http://www.onebayarea.org/plan_bay_area/about.htm (accessed October 13, 2012).

³² Doris Milke et al., "Behavioral Mapping of Residents' Activity in Five Residential Style Care Centers for Elderly Persons Diagnosed with Dementia: Small Differences in Sites Can Affect Behaviors," *Journal of Housing for the Elderly* 23 no 4, [2009].

facilities. However, the focus has been on the advanced stages of dementia, where the subjects under observation are no longer able to care for themselves.³⁴ There is a lack of research on persons with early-stage dementia and urban design, where the types of support for persons with dementia are different. The role of this project, thus, is to add to the needed body of research on dementia and the built form to provide findings and recommendations to planners and policy makers on best ways to navigate a coming wave of persons with dementia.

LITERATURE REVIEW OF PRECEDENT METHODS

There has been much energy behind the measurement and quantification of urban form. A descriptive and statistical analysis of feature quantities such as block lengths, lot sizes, intersections, and land use mix has been utilized in computing the measure of sprawl. These methods by Song and Knaap, additionally, may be used to compare multiple neighborhoods.³⁵ Using Lynott, McAuley, and McCutcheon's findings of increased accessibility in urban and town environments,³⁶ quantified measures that identify an area as compact would yield similar findings. Tsai has used models that rate service distribution to density to quantify sprawl and population spread - which is useful in identifying the number and degree of clustering in persons and activity.³⁷ The application of GIS to measure intensity and location of spatial features such as sidewalks and public spaces has also been used. Talen notes the benefits of this through observations of both land use intensity and diversity through the mapping findings.³⁸ All mentioned methods share the trend of using variables such as street features and land uses to find activity intensity, where greater figures indicate a more urban landscape, and thus, a more accessible environment. This research will use a combination of the mentioned methodologies to measure the suitability of commercial downtown corridors in Palo Alto, San Leandro, and Walnut Creek.

Other path study methodologies include the interview and observation of subjects through a predetermined area. Milke et al., Hong and Song, and Koutsoklenis and Papadopoulos used such methods with varying degrees of interaction with their subjects on the ability of persons with dementia to navigate through their neighborhood.³⁹ Applications of navigation studies in computer-generated areas have also been conducted. In a study where college-age students were asked to recreate the map of the virtually traverse path, Abu-Obeid and Abu-Safieh's findings show that the greater initial preparation of an

³³ Furness, Sally and Jo Moriarty. "Designing a garden for people with dementia - in a public space." *Dementia* 5. no. 1 139-143. [February 2006].

³⁴ Gesine Marquardt, "Wayfinding for People With Dementia: A Review of the Role of Architectural Design," *Health Environments Research & Design Journal (HERD)* 4, no 2: 75-90, 2011.

³⁵ Yan Song and Gerrit-Jan Knaap, "Measuring Urban Form: Is Portland Winning the War on Sprawl?" *Journal of American Planning Association*, 70 no. 2 210 - 225 [2004].

³⁶ Jana Lynott, William J. McAuley, and Megan McCutcheon, "Getting Out and About: The Relationship Between Urban Form and Senior Travel Patterns," *Journal of Housing for the Elderly* 23:390-402 [2009].

³⁷ Yu-Hsin Tsai, "Quantifying Urban Form: Compactness versus 'Sprawl'," *Urban Studies*, 42 no. 1 141-161 [January 2005].

³⁸ Emily Talen, "Evaluating Good Urban Form in an Inner-City Neighborhood: An Empirical Application," *Journal of Architectural and Planning Research*, 22 no. 3 204-228 [Autumn 2005].

³⁹ Doris Milke, Charles Beck, Stefani Danes, and James Leask, "Behavioral Mapping of Residents' Activity in Five Residential Style Care Centers for Elderly Persons Diagnosed with Dementia: Small Differences in Sites Can Affect Behaviors," *Journal of Housing for the Elderly* 23 No 4, 2009. Gwi-Ryung Son Hong, and Jun-Ah Song, Relationship Between Familiar Environment and Wandering Behaviour Among Korean Elders with Dementia, *Journal of Clinical Nursing*. 18, no. 9: 1365, 2009. Athanasios Koutsoklenis and Konstantinos Papadopoulos, "Olfactory Cues Used for Wayfinding in Urban Environments by Individuals with Visual Impairment," *Journal Of Visual Impairment & Blindness* 105, no. 10: 692-702, 2011. Athanasios Koutsoklenis and Konstantinos Papadopoulos, "Auditory Cues Used for Wayfinding in Urban Environments by Individuals with Visual Impairments," *Journal Of Visual Impairment & Blindness* 105, no. 10: 703-714, 2011.

oncoming environment change better secures orientation⁴⁰ and the composition of one's aerial mental map.⁴¹ Though this research will not include interaction with the public, the methods of Milke et al., Hong and Song, and Koustsoklenis and Papadopoulos will be integrated into the observational data collection portion of the research.

Various audit instruments have been used to evaluate the inventory and features of the built environment, notably in the streetscape. The Irvine-Minnesota Inventory focuses on the analysis and quantification of the built environment targeted at its encouragement of physical activity through a series of objective and subjective queries.⁴² The Pedestrian Environment Data Scan (PEDS) instrument also measures the built environment with specific regard to a walker's experience of the streetscape for safety, and street design features.⁴³ Both the Irvine-Minnesota Inventory and the PEDS instrument have a strong focus on the pedestrian realm of transportation, though the former expands the definition of physical activity in travel to bicyclists. Additionally, the Irvine-Minnesota Inventory prompts a wider range of factors including the pleasurability and attractiveness of the streetscape, as well as perceptions of safety, with the PEDS tool - specific to pedestrians, uses a more objective criteria of auditing street features.

The audit tool used in data gathering will be based on the PEDS tool with significant contributions of the Irvine-Minnesota Inventory in measuring the more subjective features of the attractiveness and perception of safety of a street. To facilitate the recording of street features that aid in wayfinding and dementia, additional tools were analyzed to supplement the baseline structure provided by the aforementioned inventory instruments. The Neighborhood Wayfinding Assessment Pocket Guide analyzes street features with particular focus on mobility of older adults and persons with disabilities, and the availability, placement, and accessibility of signage and wayfinding guides.⁴⁴ The guide records navigation and comprehension, as well as the protection from traffic and the elements. This addition to the Irvine-Minnesota Inventory and PEDS instrument encompasses the needs of pedestrians experiencing symptoms of dementia. The Checklist of Characteristics of Dementia-friendly Neighbourhoods provides overarching themes to question selection and the structure of the developed audit tool. While the Checklist and Wayfinding Assessment both address orientation and legibility of a city, the macro-application of the Checklists themes note design features similar to Lynch's themes of edges, paths, and landmarks.⁴⁵ However, the Checklist lacks addressing disorientation moments experienced by persons with dementia, and the need to reduce the amount of decision-making when navigating through an urban environment.

Based on the review of precedent methods, specific measures for dementia-friendly urban forms will use varying analysis. Accessibility will be measured on the internal circulation and street design rubric as determined by Song and Knaap, particularly intersection connectivity, block sizes, and parcel density to blocks. Safety will be observed through the PEDS inspired portion of the street audit, as well as

⁴⁰ Natheer Abu-Obeid and Shaden Abu-Safieh, "The Effect of the Angle between Navigation Paths and Transitional Spaces on Spatial Knowledge," *Journal of Architectural and Planning Research* 27:1 [Spring 2010].

⁴¹ Romedi Passini, Constant Rainville, Nicolas Marchand, and Yves Joanette, Wayfinding and Dementia: Some Research Findings and a New Look at Design, *Journal of Architectural and Planning Research* 15 no 2 133-151 [Summer 1998].

⁴² Kristen Day, Marlon Boarnet, Mariela Alfonzo, Ann Forsyth, "Irvine-Minnesota Inventory," NSW Centers for Physical Activity and Health. University of California, Irvine.

⁴³ Kelly J. Clifton, Pedestrian Environmental Data Scan (PEDS), Active Living Research sponsored Session, Annual Conference of the Environmental Design Research Association, Atlanta, GA, May 4-7, 2006.

⁴⁴ Easter Seals Project, Neighborhood Wayfinding Assessment Pocket Guide , <http://www.projectaction.org/>.

⁴⁵ Kevin Lynch, "The Image of the City," [MIT 1960].

observational data through photography and field notes. Wayfinding would look at street forms through ArcGIS-produced figure ground maps and data derived from the Irvine-Minnesota Inventory and Neighborhood Wayfinding Assessment Pocket Guide queries.

ASSUMPTIONS

There are a few necessary assumptions to be made prior to the analysis of the research.

1. *The research is only looking at the needs of those with dementia over the age of 65.*
Though early-onset dementia may affect people in their forties and fifties, people age 65 or older are most susceptible to developing dementia.
2. *Pedestrian travel will be the primary focus of the research.*
As using transit and driving become increasingly difficult for both older adults and persons with dementia, to encompass dementia-friendly policies, pedestrian travel modes will be the focus of the research.
3. *There is an understanding that at a certain stage of dementia, advanced care is required.*
Dementia-friendly policies are necessary to prevent premature institutionalization of persons with dementia, who may not need the extent of advanced care offered by residential care facilities and nursing homes. This would enable persons with dementia to remain in their homes and engaged in the community for as long as possible, before the toll of the disease forces the need for institutionalization.
4. *Downtowns are the commercial heart and places to fulfill activities of daily living.*
For the purposes of this study, there is an assumption that the downtowns play a key role in meeting activities of daily living, maintaining social bonds, and acting as the community center of the city.

DATA GATHERING AND CALCULATION PROCEDURES

The methods of the research will fall into three steps that would encompass the macro, micro, and social structure that determines the human interface with design.

Map generation

The analysis of the street layout will derive from the creation of street-form maps through ArcGIS. These maps will be used to calculate the number of intersections and cul-de-sacs, block perimeters, and parcel density per block. A figure ground map will also be compiled to observe the urban pattern of the city centered around the downtown study area. This process aims to look at the macro-level urban design features of the cities.

Objectives

1. Determine the urban street form: gridiron, windy, significant cul-de-sacs.
2. Calculate the Intersection Connectivity Ratio, which is found by dividing the number of intersections with the sum of the number of intersections and the number of cul-de-sacs in the half-mile buffer. The greater the ratio, the higher the internal connectivity.⁴⁶

⁴⁶ Yan Song and Gerrit-Jan Knaap, "Measuring Urban Form: Is Portland Winning the War on Sprawl?" *Journal of American Planning Association*, 70 no. 2 210 - 225 [2004].

Street audits

The street audits will be a combination of comparisons of counts, percentages, and descriptive statistics of each segment and intersection audited in the determined study area.. This will be used to draw conclusions on which main streets are most prepared for those living with dementia and where each corridor needs improvement.

The synthesized street audit will be conducted on both sides of a street segment and intersection. The path traversed will follow traffic flow. Street segments will remain as is to account for the differences per side. The intersection data will be merged, with any limitation on one side being the dominant entry for the whole intersection. Thus, if one side of the intersection is safe to cross while the other is unsafe, the intersection will be coded as unsafe.

Observational data collection

The observational and ethnographic research will be conducted through general observations and the collection of field notes and photographs. These will account for unanticipated features of the street not addressed in the maps or audit.

Findings

INTERSECTION CONNECTIVITY

Using the formulas derives by Song and Knaap, intersection connectivity will calculated through the following formula:

$$\frac{\text{Number of intersections}}{(\text{Number of intersections} + \text{Number of cul-de-sacs})}$$

Table 5 shows the intersection connectivity of all three cities. The spatial expression of the findings are found in Figure 8, Figure 9, and Figure 10.

Table 5: Intersection connectivity per city

City	Intersections	Cul-de-Sacs	Connectivity
Walnut Creek	98	27	0.78
San Leandro	169	26	0.87
Palo Alto	158	0	1.00

These findings show that Palo Alto, with no cul-de-sacs within a half-mile radius of University Ave in their downtown district, has the highest intersection connectivity with 158 points. Though San Leandro and Walnut Creek have a similar number of cul-de-sacs within the half-mile buffer, the greater number of intersections in San Leandro increases their internal connectivity.

Intersections and Cul-de-Sacs: Half-Mile Radius of the Study Area

Figure 8: Intersections and cul-de-sacs within half-mile radius of the Walnut Creek study area

Intersections within the Half-Mile Radius of the Study Area

Figure 9: Intersections and cul-de-sacs within half-mile radius of the Palo Alto study area

Intersections and Cul-de-Sacs: Half-Mile Radius of the Study Area

Figure 10: Intersections and cul-de-sacs within half-mile radius of the San Leandro study area

Cleanliness, articulation, and architectural interest

An aspect of accessibility is the pleasure of walking. The argument of legibility and aesthetics comes into greater contention where the urban form brings enjoyment to the pedestrian experience.⁴⁷ Based on the findings, specific highlight places where trees, protection from elements, details, and aesthetic interest contribute to a lively corridor.⁴⁸

		Palo Alto		San Leandro		Walnut Creek	
		Count	Percent	Count	Percent	Count	Percent
Overall cleanliness	Good (3)	18	90%	9	75%	9	90%
	Fair (2)	2	10%	3	25%	1	10%
	Poor (1)	0	0%	0	0%	0	0%
	Mean	2.9		2.75		2.9	
	Standard deviation	0.31		0.45		0.32	
Articulation of buildings	High (3)	4	20%	1	8%	4	40%
	Some (2)	12	60%	5	42%	5	50%
	Little or none (1)	4	20%	6	50%	1	10%
	Mean	2		1.6		2.3	
	Standard deviation	0.65		0.67		0.67	
Architectural interest	Interesting (3)	5	25%	1	8%	5	50%
	Somewhat interesting (2)	11	55%	5	42%	4	40%
	Uninteresting (1)	4	20%	6	50%	1	10%
	Mean	2.05		1.6		2.4	
	Standard deviation	0.69		0.67		0.7	

Across the board, the overall cleanliness of all three streets are high, with the mean score at 2.75 or higher (out of 3 for a "Good" rating of cleanliness.) While all three downtown corridors provide a pleasurable walking experience in terms of cleanliness, Palo Alto and Walnut Creek surpass San Leandro in average score (2.9 to 2.75.) Looking at the articulation of buildings and architectural interest of the buildings, the scores rank Walnut Creek as the highest, with a score of 2.3 and 2.4 out of 3 respectively. Palo Alto follows, then San Leandro in both articulation and architectural interest.

LEVEL OF STREET USE BY TRANSPORTATION MODE

The level of street use is an important factor of safety, both in terms of collision possibilities, and the reduction in the perception of safety due to an increase in the amount of pedestrians. Table 6 shows the mean of the level of street use per mode in the three cities.

⁴⁷ Nigel Taylor, "Legibility and Aesthetics in Urban Design," Journal of Urban Design 14, No. 2 189-202 [May 2009].

⁴⁸ Allan B. Jacobs, "Great Streets," The MIT Press, 1995.

Table 6 Level of street use by transportation method

		Palo Alto	San Leandro	Walnut Creek
Pedestrian	Mean	3.7	2.8	3.8
	Standard deviation	1.2	1.1	1.3
Bicyclist	Mean	1.0	0.8	0.2
	Standard deviation	1.6	1.2	0.6
Motor vehicle	Mean	4.4	4.9	4.5
	Standard deviation	0.7	0.3	0.5
Transit	Mean	0.0	2.3	1.8
	Standard deviation	0.0	1.8	1.5
Scores are ranked out of 0 to 5, 0 being none, 1 being low, and 5 being high use.				

Findings show that pedestrian activity is above average in Palo Alto and Walnut Creek (3.7 and 3.8 respectively), and below average in San Leandro (2.8.) All three cities have low bicyclist usage in their main downtown corridor, with Palo Alto being the highest of the three cities. Observations in the field indicate that additional signage was used to further mediate the use of bikes on University Ave in Palo Alto, noted in Figure 11. The use of motor vehicles were universally high. However, San Leandro has ranked the highest of the three, though there were generally four or more lanes along 14th Street. No transit services were provided on University Ave in downtown Palo Alto, though the end of the corridor to Alma Ave is the Palo Alto Caltrain Station. San Leandro has both buses and paratransit, and Walnut Creek runs a free shuttle service to and from the Walnut Creek BART station.

Figure 11: Bike mediation signs in downtown Palo Alto

STREET AMENITIES

As the primary commercial corridor of the downtown district, the study areas overall have a high level of street amenities. Figure 12 indicates the percentage of street amenities present in the street segments of the study area. As there were no phone booths, public restrooms, vending machines or drinking fountains in any of the corridors, their results were omitted.

Figure 12: Percentage of street amenities in the study areas

All three cities share high percentages in garbage cans and street trees, and a similar percentage ranking in public seating at around 60 percent. Palo Alto has the greatest percentage of newspaper vending machines of all three cities, and street segments along Main St. in Walnut Creek has the highest percentage of street landscaping.

Figure 13: Street landscaping in San Leandro

Figure 14: Decorative public seating in Walnut Creek

PAVING AND GLARE

Paving type and glare aid in mediating the amount of glare on the surface, the potential slipping hazard, and guide pedestrians along the walkway. Figure 15 indicates the percentage of their sidewalks which have the following pavement types. Segments may have more than one pavement type.

Figure 15: Percentage of paving types on the study area sidewalks

Most of Palo Alto's sidewalks are paved with concrete or brick or stone. San Leandro's paving is concentrated in concrete and tile types. Walnut Creek has the greatest variety in sidewalk materials: concrete, brick or stone, and paved gravel.

Table 7: Pavement glare, path condition, and decorative paving

	Percentage of pavement glare	Path condition*	Decorative paving
Palo Alto	55%	3.0	85%
San Leandro	25%	2.7	33%
Walnut Creek	70%	2.6	50%

Path condition ranked between 1 to 3, with 3 being in good condition.

Walnut Creek has the highest percentage of paving with a glare, which is caused by either a polished surface or uninterrupted light color that reflects light. The paving on San Leandro is slightly darker and less polished, fracturing the light and having less instances of glare. The lack of use of brick or stone paving is less of a factor than the actual composition of the pavement. Palo Alto and Walnut Creek scored high in terms of overall percentage of pavement glare.

The path condition of the sidewalk is high for all cities, with Palo Alto having the most consistent quality. Palo Alto also has a high degree of decorative paving, mostly due to brick trim along a concrete path. While San Leandro has the least decorative paving, their pavement is advisable for persons with dementia in terms of the reduction in glare and possible disorientation factors associated with it. As Walnut Creek has the highest percentage of pavement with glare and the lowest average in paving condition, consideration is necessary to address their pedestrian facilities for persons with dementia.

Figure 16: Brickwork paving in Palo Alto

Figure 17: Brickwork glass creates glare in Walnut Creek

PATH OBSTRUCTIONS

One of the greatest dangers to persons with dementia pedestrians are path obstructions. The universal danger of path obstructions also extends the rest of the population, not just to persons with dementia or older adults. Figure 18 indicates the percentage of how often specific path obstructions occur per length of the study area.

Figure 18: Percentage of path obstruction per study area

For Palo Alto, the greatest sources of path obstructions are from private signage (35%), private seating (30%), and "other" (40%) - which is a combination of street construction and bike parking. This is due to

private facilities pouring into the public right-of-way, or an inconsistent arrangement of street furniture that forces pedestrians to meander through. 25 percent of their segments have no obstructions.

San Leandro faces different, but less, obstacles. Landscaping is an obstruction to 25 percent of the segments, and "other" makes up 42 percent - which ranges from a bus stop, intensive driveway use, abrupt sidewalk path, and an open shop door that crosses into the pedestrian right-of-way. However, 50 percent of 14th Street in San Leandro has no path obstructions. Though still low, it ranks the highest of the three cities.

Concerning Main St in Walnut Creek, any of the present sidewalk obstructions make up at least 20 percent of the segments: trees, landscaping, garbage cans, private seating, public seating, private seating, and "other" - including private decor and utility boxes. None of Walnut Creek's segments are free of obstructions.

SAFETY AND CONVENIENCE OF CROSSING INTERSECTIONS

Looking at the degree of safety and convenience of crossing for someone able-bodied and someone with dementia, the following results were found in Figure 19.

Figure 19: Safety and convenience in intersection crossing for able-bodied and persons with dementia

Most intersections in all three cities are safe and convenience to cross for an able-bodied person. The degree of safety and convenience is increasingly variable when perceiving the intersection for a person with dementia. Looking at the intersection, visual timing, differentiated paving, the time between crossings, and the overall legibility of navigating through the intersection is observed.

Palo Alto ranks the lowest in safety (27%) and convenience (27%) for persons with dementia in crossing intersections. Often, there are no signal times or signal buttons at the intersections. Nor are there audio warnings present. Thus, there is often no advance warning of when the intersection lights will change.

The intersections of San Leandro have more amenities that aid in crossing intersections. The percentage of intersections that are safe and convenient to cross is 67 percent and 83 percent respectively. The

presence of signal buttons and extended crossing times increase the score of safety for persons with dementia. However, the greater lengths of travel and the volume and intensity of cars may cause disorientation and moments of distraction that may impede the process of crossing the intersection.

Walnut Creek has the highest scores of safety (100%) and convenience (67%) in intersection crossing for persons with dementia. Many of Walnut Creek's intersections are short, a two-lane arterial, with differentiated paving and a signalized countdown to determine the amount of time remaining to cross the intersection.

DEGREE OF NETWORKS AND DISTORTIONS IN THE STREET LAYOUT

The street form is helpful in determining the internal connectivity of an area based off the layout of the roads.⁴⁹ However, with regards to wayfinding, a deformed grid-layout is important for orientation and connection of pathways and the creation of a mental map.⁵⁰ Additionally, a deformed grid provides a greater view of upcoming turns that allow persons with dementia greater time to process the next decision,⁵¹ and reinforce a hierarchy of streets.⁵²

Looking at Walnut Creek's figure-ground map in Figure 20, the urban form lacks a complete grid pattern, with many cul-de-sacs per intersection. Points of interest are the corners that define the downtown area, and the deformed intersections that exist in each. These points provide a greater view for someone approaching the intersection and provides opportunities for non-conventional landmarks and reminders that a person may use to navigate the cityscape. Within the downtown area is a more traditional street grid, but immediate leaving the district, the overall connectivity of the streets are reduced.

Figure 21 shows the figure-ground map of Palo Alto, which is a traditional street-grid pattern with short blocks and many intersections. Short blocks and connectivity are importance aspects of a dementia-friendly community; however, if purely looking at the figure-ground form of the district within the half-mile buffer of the study area, there is a greater reliance of innate landmarks, open spaces, and points of interest and triangulation⁵³ necessary to improve wayfinding for all populations, not just persons with dementia. Not shown is the innate hierarchy of streets that is present on University Ave, more expressed through the intensity of uses than on the actual form.

The street form of San Leandro, as seen in Figure 22, shows the collision of two street grids to the east and west of 14th Street. The point of contact between the two grids creates the best condition of the buffer zone in terms of wayfinding for persons with dementia on the macro-level. The irregular points of connection create distinct intersection places and unique triangulation features and differentiate on intersection from another. Not seen in the figure ground map is also the presence of open spaces near the contact point of the two grids that further aid in the wayfinding of the area. As streets radiate out from the study area, they migrate to a traditional street-grid pattern, with similar strengths and weaknesses as the urban form of Palo Alto. North of the study area, the presence of cul-de-sacs increase, reducing internal connectivity.

⁴⁹ Yan Song and Gerrit-Jan Knaap, "Measuring Urban Form: Is Portland Winning the War on Sprawl?" *Journal of American Planning Association*, 70 no. 2 210 - 225 [2004].

⁵⁰ Lynne Mitchell, "Breaking New Ground: The Quest for Dementia Friendly Communities," *Housing LIN* [June 2012].

⁵¹ Natheer Abu-Obeid and Shaden Abu-Safieh, "The Effect of the Angle between Navigation Paths and Transitional Spaces on Spatial Knowledge," *Journal of Architectural and Planning Research* 27:1 [Spring 2010].

⁵² Mitchell, 2012.

⁵³ William H. Whyte, "The Social Life of Small Urban Spaces," *Projects for Public Spaces Inc.*, 2001.

Half-Mile Radius from Study Area of Downtown Walnut Creek

- Half-mile buffer
- Downtown Boundary
- BART Station
- City Boundary
- Study Area
- Rail

0 0.125 0.25 0.5 Miles

Source: Contra Costa County, Mapping Information Center, <http://www.comap.us>

Figure 20: Figure ground map of downtown Walnut Creek

Half-Mile Radius from Study Area of Downtown Palo Alto

Figure 21: Figure ground map of downtown Palo Alto

Half-Mile Radius from Study Area of Downtown San Leandro

Half-mile buffer Study Area Downtown Area BART Station Rail

Source: Alameda County, Geospatial Data Files, MTC Bay Area Transit Geodatabase

Figure 22: Figure ground map of downtown San Leandro

WAYFINDING SIGNAGE

In addition to the innate wayfinding guide from the built form of the urban grid, street features on the micro-level aid in wayfinding. Various wayfinding features exist in varying degrees in the three cities, as seen in Figure 23.

Figure 23: Wayfinding features on the study areas

The City of Palo Alto is the most consistent in their wayfinding and orientation guides. The majority of their street segments have directional signs (80%), present location signs (95%), and neighborhood identity banners (95%). These features highlight the gateway into the downtown district. Of these three, the directional signs serve the greatest role in wayfinding by directing pedestrians and drivers to civic locations and parking. Points of open space help differentiate the traditional grid pattern of Palo Alto.

San Leandro is more inconsistent with their wayfinding. The highest marked wayfinding features are directional signs (17%), landmarks (33%), open/green space (42%), and neighborhood identity banners (25%). 14th Street has a concentration of historic buildings that, for persons with dementia whom have a long tenure of residency in San Leandro, would benefit from. As previously mentioned, there are more segments with open spaces, due to the contact point of two grid patterns. The maps in San Leandro are large and at eye-level, which is not found in the other observed cities. However, 33 percent of San Leandro's street segments have no wayfinding guides.

Landmarks (30%), open spaces (50%), neighborhood identity banners (100%), and "other" (40%) contribute to the overall wayfinding features the greatest in Walnut Creek. Landmarks along Walnut Creek include fountains, civic buildings, and a clock tower to provide points of orientation and legibility. Half of all street segments have open or green space, which is often an extended seating area or, as previously mentioned in the built form fabric, due to the deformed grid intersections that create

interesting spaces. The orientation maps are part of the bus stops, and are rather small. Figure 24 shows various examples of present wayfinding guides.

The large bus route maps in San Leandro also act as wayfinding guides.

These maps in Walnut Creek are used to indicate retail establishments are helpful for orientation.

Wayfinding signage in Palo Alto guide pedestrians to activities of daily living.

Figure 24: Various wayfinding guides in San Leandro, Walnut Creek, and Palo Alto

STOCK OF HISTORIC APPEARING BUILDINGS AND PUBLIC ART

The role of historic buildings or architecturally historic appearing buildings for persons with dementia is that these structures offer innate wayfinding guides for navigation. Public art and historic buildings, particularly if the individual with dementia has lived in the neighborhood for a long time, help provide informal benchmarks in distances to locations and cues to make turns.

Table 8 indicates the counts and percentages of segments with public art. Proportionally, Walnut Creek has a higher concentration of public art, seen in their decorative sculptures, fountains, and playful installation of seating. Palo Alto and San Leandro have much less. The former has a few public art pieces in plazas and decorative installations embedded into the pavement. San Leandro only has one segment with public art, within one of their open spaces.

Table 8: Street segments with public art

City	With public art	No public art	Percentage with public art
San Leandro	1	11	8%
Walnut Creek	5	5	50%
Palo Alto	3	17	15%

Historic buildings serve various functions for persons with dementia. For those who have lived in the area for a long period, historic buildings have helped identify the street and the community, creating a sense of place with it. Furthermore, the buildings themselves are often architecturally interesting and distinct, and serve as landmarks for wayfinding. Historic buildings have often already set the standard for the function of a building, such as the civic commercial architectural character of an old bank. However, the street audit included historic appearing buildings as well, with the assumption that using more familiar architecture would reduce anxiety of environmental changes for persons with dementia.

Looking at the findings in Table 9, the percentage of historic or historic appearing architecture in both Walnut Creek and San Leandro are high relatively, at 50 percent and 42 percent respectively. Only 20 percent of Palo Alto's street segments contain historic or historic appearing buildings.

Table 9: Street segments with historic or historic appearing buildings

City	With historic	No historic	Percentage with historic
San Leandro	5	7	42%
Walnut Creek	5	5	50%
Palo Alto	4	16	20%

Figure 25 shows various examples of historic or historic-appearing architecture, historic landmarks, and public art in the three cities.

Building design and old establishments create local community identity in Palo Alto.

San Leandro has a high density of historically significant buildings, such as the Masonic Building and Best Building.

The public art in Walnut Creek provides distinct orientation cues.

Figure 25: Examples of historic buildings and public art

Conclusion

The findings of the research show varying degrees of dementia-friendliness of downtowns in Walnut Creek, San Leandro, and Palo Alto. There are specific aspects of each downtown corridor that ranks favorably with dementia-friendliness, yet no downtown corridor of the study sessions have addressed all issues that persons with dementia face in navigating the urban environment. Each city in the case study

and others in the Bay Area and the rest of the country will benefit from the lessons and best practices that arise from the findings.

ACCESSIBILITY

Regarding accessibility, Palo Alto ranks the highest in connectivity due to the perfect grid urban form of their downtown that provides no cul-de-sacs or dead-end paths. Palo Alto also has the lowest median block size that furthers the accessibility and circulation. The figure ground maps indicate that following Palo Alto, Walnut Creek is the next accessible, with San Leandro ranked last of the three. Palo Alto is the only city in the scope of the study that does not have cul-de-sacs and eliminates wasted circulation.

SAFETY

A necessary discussion needs to begin regarding the safety of streets for older adults and persons with dementia. Findings show that many of Walnut Creek's downtown street segments produce glare from the sun and/or have path obstructions: much of it due to the amount and assortment of street features and shifting of the pedestrian pathway. Palo Alto also has a number of street segments that reflect sunlight and host path obstructions; however, a greater amount of it comes from private seating and signage that pours into the public right-of-way.

WAYFINDING

The findings show great variation in wayfinding on both the area form to streetscape level. In the macro level, Walnut Creek has the highest degree of innate wayfinding due to the structure of the urban form with a deformed street grid.

On the street level, each city has their specific concentration of wayfinding tools. Palo Alto has many neighborhood identifying banners and wayfinding signage to activities of daily living, but lack locational maps that orient the user to the greater downtown district scale. San Leandro has a large number of historic landmarks and demarcate the location of the pedestrian to the downtown district, as well as directional arrows to surrounding transit stations. However, though they have various types of wayfinding guides, the concentration of them is sparse overall. Walnut Creek has historic appearing buildings, public art, and transit maps that orient the pedestrian. However, they lack explicit directional signs to activities of daily living. While the scope of the research does not prioritize wayfinding tools, an initiative moving forward in creating dementia-friendly communities would involve the prioritization of wayfinding aids for persons with dementia.

While the structure of the research is separated into the categories of dementia-friendliness, the findings paint a complicated picture of what is necessary to make our communities more suitable for persons with dementia. There needs to be a balance in the types of street amenities provided. A street may be clear and well-paved, reducing any safety hazards. However, if the streets are so unwelcoming and inaccessible, there is no function of the paving. If a grid-iron urban layout is implemented to maximize accessibility in circulation, it may make wayfinding more difficult due to its monotonous pattern. A feature that improves one aspect of dementia-friendliness may hinder another, which complicates the design of a street - where options and space are limited. The interconnectivity of effects of various street form elements requires more strategic planning to find the balance appropriate for persons with dementia.

Next steps

The physical needs of older adults have been studied at higher proportions than the mental changes that comes with chronic diseases such as dementia - which plague the senior population disproportionately. In moving forward, the research conducted in this project would serve to guide development patterns, design guidelines, and infrastructure requirements by addressing the needs of persons with dementia.

POLICY RECOMMENDATIONS

1. Provide wayfinding guides that point to civic destinations and activities of daily living, and to have them at eye-level or lower.
2. Promote urban form that reduces decision-making and increases necessary thinking time.
3. Reduce the need for wasted circulation.
4. Make streets comfortable and energetic, but not overwhelming.
5. Preserve traditional architecture and landmarks that have defined a place for generations.
6. Ensure that the construction of the streetscape also addresses the physical needs of persons with dementia - which would also serve older adults, persons with disabilities, and young children.
7. Advocate the need for complete streets and "road diets" that allocate more right-of-way to pedestrians and features that make walking safer and more pleasant.

The many forms of dementia will often need advanced care, and there is no current cure for the most common forms that affect older adults, such as Alzheimer's disease. However, while the person will still be able to, she or he should have the opportunity and integrity to remain engaged with their communities for as long as safely possible, sharing their wisdom, volunteering their time, watching their children, and continuing the discussion of the needs of older adults and persons with dementia.

The year 2011 marked an important moment in the age categorization and demographic shift in the American population, when the first wave of the baby boomer generation reached retirement age of 65. While the American population has reached longevity milestones, the urban form no longer reflects the needs of their needs, or the needs of many other Americans. Policy makers have begun to support measures that promote elder-friendly communities, to create cities safer and more accessible for older adults. However, they address only the physical needs of this growing population, and overlook the fact that not all older adults age the same way, or have the same needs.

Dementia is and will continue to be on the rise with the aging of the baby boomer population and the extension of the American life expectancy. With this public health epidemic, there is a need to enable persons with dementia to be able to remain as independent and engaged with their communities as safely possible. Part of the solution is to develop dementia-friendly policies that address the specific and unique needs as a complement to elder-friendly policies.

Additionally, we need to understand that urban design best practices are not static. Iterations of the ideal urban form have changed throughout history, and best practices now are subject to changes in population, culture, transportation, climate, economics, and public health. Evolving urban design to the shifting needs of persons with dementia may challenge contemporary practices of New Urbanist grid city

form, but the hope of the researcher is to show that we need to constantly challenge current best-practices as the population we serve changes.

Appendix

A. AUDIT TOOL CODEBOOK

INTERSECTION

Type of segment intersection

This question determines the number of arterials flowing into the intersection. The main distinction is between a T-intersection with three roads, or a four-way intersection. In case of other intersection forms due to increased street crossings or a deformed grid layout, other would be used.

Traffic control (all that apply)

What are the features and conditions that monitor the control of the intersection. If controls differ from one arterial to another, check all that apply.

Type of intersection crosswalk (all that apply)

Indicate the type of painting, paving, or treatment of the crosswalks at the intersection. If there are no crosswalks, indicate none. For clarification, the line that delineates the limit of an automobile, commonly found at a stop sign, is not a crosswalk.

Crossing aids at intersection (all that apply)

Indicate all the crossing aids applicable at the intersection.

- Pedestrian warning sign - pedestrian crossing sign or warning in any form.
- Senior pedestrian warning sign - signage that indicates the presence of seniors, in any form
- Pedestrian signal
- Flashing - blinking warning light
- Countdown - numbered countdown
- None
- Signal button
- Wheel-chair accessible signal button - placement of button below waste level or below three feet.
- Median/traffic island
- Overpass/underpass
- Audible crossing signal - any form of audible warning
- Other _____

If flashing pedestrian signal

Indicate the name of the street and the countdown seconds after the initial walk signal. Do not time the initial walk signal duration.

Street 1 _____ Seconds _____

Street 2 _____ Seconds _____

What type of street signs are posted

Indicate if every street is labeled with a street sign, and if they are observable from the intersection corner in which the street segment begins.

How safe do you think it is to cross?

Based off the intersection controls, speed of vehicular travel, distinction in crossing treatment, and the overall composition of the intersection, and also considering the symptoms, response times, and potential disorientation of persons with dementia rate the degree to which the intersection is safe to cross for an able-minded individual and a person with dementia.

How convenient do you think it is to cross?

Based off the intersection controls, speed of vehicular travel, distinction in crossing treatment, and the overall composition of the intersection, and also considering the symptoms, response times, and potential disorientation of persons with dementia, rate the degree to which the intersection is convenient to cross for an able-minded individual and a person with dementia.

PEDESTRIAN EXPERIENCE

Overall cleanliness

Rate the overall cleanliness of the sidewalk. Poor indicates significant and unavoidable trash, graffiti that significantly detracts from the visual composition, or degradation of facilities. Fair indicates trash, graffiti, or sidewalk/facilities degradation that is noted, but does not hinder the pedestrian experience. Good indicates little to no litter, graffiti, or broken facilities.

Features that provide shade

Indicate if there are arcades, awnings, shade trees, or other sources of shade. Features need not be consistent throughout the entire segment, but should extend to encompass their portion of the adjoining right-of-way.

Articulation in building designs

Indicate the degree to which the facade of the buildings enhance the street with their degree of articulation and accents.

How interesting is the architecture/urban design of this segment?

Indicate whether the facade, articulation, and composition is interesting or visually pleasant. Texture, color, and form also constitute the ranking.

Does the segment have historic appearing buildings?

The buildings do not need to be designated landmarks or be old. Indicate a yes if the appearance of a historic building: architectural details, materials used, etc., contribute to a sense of historic visuality.

Are there any loose/unsupervised/barking dogs on this segment?

Note whether there are unsupervised, unleashed, or barking dogs on this segment.

Is the dominant smell unpleasant?

Indicate if there is a noticeable unpleasant smell along the corridor. This includes from trash, buildings, or car emissions.

How noisy is the segment?

Note the degree of noise in the segment. Loud designation is greater than speaking volume. Somewhat loud equates speaking volume. Not loud indicates noise, but not above speaking volume decibel. Silent designation is little to no noise.

Level of street use

Indicate the concentration and use of the street by various travelers. Except pedestrians, the measure extends beyond the sidewalk of the current segment into the street. This measure does not measure activity of the opposite sidewalk for any mode of travel.

- Pedestrian
- Bicyclist
- Motorists
- Transit

Are there barriers present on this segment?

Indicate if there are any barriers or major features that disrupt the street facade and pattern. Features do not need to intersect the actual street, they may flow over or under. Instances are bridges over creeks, paths under highways, or crossing commuter or heavy rail (but not light rail or street car).

How many stories are most buildings in the segment?

Indicate the average number of stories on the segment.

Presence of extensive blank walls?

Blank walls are categorized by a significant expanse without windows, wall greenery, or articulation. Blank walls with landscaping in front still constitutes as blank walls. Extensive constitutes the approximate length of a storefront, based off the average lengths of neighboring storefronts or buildings.

Presence of extensive parking lots?

Extensive parking lots are abrupts in the street composition with parking. The width of the lot adjoining the street needs to exceed the driveway and one side of parking to be designated extensive.

Presence of a parking garage?

The designation of a parking garage requires it to be adjacent to the street or separated with open space, parking, or landscaping. Those with buildings between the garage and the street does not constitute the presence of a parking garage.

Are there cul-de-sacs or permanent street closings?

Indicate where there is a presence of cul-de-sacs or street closings with permanent closing features.

Presence of jay-walking?

Jay-walking includes crossing at undesignated segments of the street, and crossing the intersection that is not adherent to the signal.

Do you feel safe walking this segment?

Based off both the traffic conditions, lighting, street activity, enclosure, and elemental exposure, how safe does this segment feel when walking.

Is there a significant presence of abandoned/empty buildings?

The presence of abandoned buildings and empty storefronts that impact the pedestrian experience constitute significant presence.

SIDEWALK

Pedestrian facility

Indicate the type of pedestrian facility present. Sidewalks indicate the presence of a roadway for motorized vehicles. Pedestrian streets are those only for pedestrians, or for pedestrians and bicyclists.

Lighting

Note all the types of lighting features present on the street. Indicate other for features not listed, such as lights on trees or public art installations that provide significant illumination.

Street amenities

Note all the features and amenities present on the street.

Number of street trees

Enter the number of street trees on the public right of way: those on sidewalks, curb extensions, and chicanes, but not on medians.

Path material

Note all the paving materials present on the sidewalk. Indicate the presence of glare if the sidewalk is polished and/or of a light color and not defused. Decorative paving includes murals, borders, mondalas, or any aesthetic paving treatment.

Path condition

Indicate the condition of the pathway in terms of the degree of cracks present and degradation of the paving. Under repair is indicated for the segment if construction is performed on any part of the public right-of-way, but not on adjacent private property. Please note under repair in the notes.

Path obstructions (all that apply)

Note all the features and obstructions present on the pedestrian right-of-way. This is separate from the furnishing and landscape zone and the sidewalk frontage zone.

Buffers between road and path

Indicate any features between the pedestrian right-of-way and the roadway that would provide a sense of protection from motorized vehicles. Do not include street lights and signs unless their presence is of significance to the perception of safety. If so, include them in "Other."

Sidewalk width

Record the sidewalk width into the stated brackets: less than 4, 4 to 8, 8 or greater.

Setback

Record the sidewalk width into the stated brackets: less than 10 feet, 10 to 30 feet, more than 30 feet.

Setback includes landscaping, parking, and empty space, but is differentiate from open space or plazas, which are purposefully placed and accented.

Curb cuts

enter the number of curb cuts on the street segment.

WAYFINDING

Wayfinding for sidewalk

Note all the wayfinding guides present on the street segment. These may be found throughout the street: on the pavement, on street lights, as signs, etc.

Signage for sidewalk

Note all other signage and guides not meant for wayfinding but other purposes (regulatory, caution, or warning signs.)

Is there signage at eye-level or lower?

Indicate whether the majority of signage requires

Level of private signage cover

Determine the amount of signage or storefront advertising present. Signage that pours into the pedestrian right-of-way or is distracting (flags, blinking lights) would indicate higher demarcation.

Does the area present barriers or hazards for walkers who:

Based on the form of the street, level of traffic and congestion, environmental factors, and the overall perspective of convenience, navigation, and safety, determine if there are any factors that may contribute to hazards for the following situations:

- *Use assistive devices (wheelchairs, walkers)* - obstacles placed in the pedestrian right-of-way that make maneuvering difficult. If the right-of-way is less than four feet, it is considered a hazard and barrier.
- *Have visual impairments* - obstacles placed in the pedestrian right-of-way that make maneuvering difficult. Additionally, undescriptive or reflective paving is also a concern.
- *Hard of hearing or deaf* - areas too loud may provide disorientation or lack of warning.
- *Have problems with memory or judgment* - a combination of environmental factors such as the form of the walkway, the level of noise, the amount or intensity of signage, and other factors that increase decision-making need or disorientation and distraction.
- *Tire easily and need to rest* - is there a lack of accessible seating options available? Note only public seating.

Is this segment characterized by having a significant open view of an object or scene that is not on the segment? (view must be prominent)

Indicate whether there is a prominent view from vistas or over lots/buildings that contribute to the pedestrian experience or to orientation.

Is the view of green/open space/nature?

Indicate whether the view is of green space, parks, or nature. This includes hills, woodlands, or coastal areas and oceans.

Are there street vendors?

Is there presence of any vendors, formal or informal, that are selling on the public right-of-way. This includes food carts, food trucks, staffed newsstand kiosks, and other merchants.

Is there public art?

Indicate if there any decorative features or public art on this segment. This includes distinct and decorative features in paving, but not decorative accents to the overall sidewalk. Unique fountain and seating features may also be considered public art.

Are there billboards present?

Note the level of billboards present.

ROAD

Number of lanes

Indicate the number of lanes, including all left-turn lanes but not parking or bike lanes, or medians.

Speed limit

Indicate the speed limit of the street. If none are posted, put N/A.

Crosswalks

Note the treatment of crosswalks within the street segment, not at intersections. Indicate the type of painting, paving, or treatment of the crosswalks at the intersection. If there are no crosswalks, indicate none.

Crosswalk crossing aids on segment

Indicate all the crossing aids applicable within the middle of the street segment.

- Pedestrian warning sign - pedestrian crossing sign or warning in any form.
- Senior pedestrian warning sign - signage that indicates the presence of seniors, in any form
- Pedestrian signal
- Flashing - blinking warning light
- Countdown - numbered countdown
- None
- Signal button
- Wheel-chair accessible signal button - placement of button below waste level or below three feet.
- Median/traffic island
- Overpass/underpass
- Audible crossing signal - any form of audible warning
- Other _____

Is there a bike lane?

Indicate the presence of a bike lane, which minimally requires bike striping on the roadway.

Are people riding on the sidewalk?

Indicate whether there are bicyclists riding their bike on the sidewalk.

Is there a bus stop?

Note if there is a bus stop present. This includes shuttle service and paratransit.

If yes, what amenities are present

Note all amenities of the bus stop.

Are there traffic calming features?

Note all the traffic calming features on the street segment.

To what degree does the segment distort?

Indicate the presence and degree of curve or distortion of the street segment, particularly on the sidewalk being audited.

Slope of street

Indicate the degree of slope, or if there is a slope, of the street segment, particularly on the sidewalk being audited.

LAND USES

Uses in segment (all that apply)

Note all the land uses of the segment on the audited side of the sidewalk.

Are there uses different from those on the first floor? If so, what types?

Indicate if uses above the ground floor differ, and what types exist.

How many of these land uses are present on this segment?

Of the following mentioned, which uses are present on the street segment. The degree of some or high is dependent on the concentration of it over the entire street segment.

B. STREET AUDIT TOOL

Study Area:	Segment number:	North / South	East / West
Day/Date: Time:	Start street:	End street:	
INTERSECTION Type of segment intersection ☐ 3-way ☐ 4-way ☐ Other _____ ☐ No intersections Traffic control (all that apply) ☐ Traffic light ☐ Stop sign ☐ Traffic circle ☐ Yield to pedestrian sign ☐ Other _____ ☐ No control ☐ No intersection Type of intersection crosswalk (all that apply) ☐ One line ☐ Parallel lines ☐ Zebra striping ☐ Different road surface/paving/color ☐ Other _____ ☐ None Crossing aids at intersection (all that apply) ☐ Pedestrian warning sign ☐ Senior pedestrian warning sign ☐ Pedestrian signal ☐ Flashing ☐ Countdown ☐ None ☐ Signal button ☐ Wheel-chair accessible signal button ☐ Median/traffic island ☐ Overpass/underpass ☐ Audible crossing signal ☐ Other _____ If flashing pedestrian signal Street 1 _____ Seconds _____ Street 2 _____ Seconds _____ What type of street signs are posted ☐ All intersecting streets names ☐ One or more street names missing ☐ None Are signs visible from both directions of pedestrian travel? (Y / N) Check for able-minded, underline - PWD How safe do you think it is to cross? ☐ Pretty/very safe ☐ Not very safe/unsafe ☐ NA How convenient do you think it is to cross? ☐ Pretty/very convenient ☐ Not very convenient/inconvenient ☐ NA PEDESTRIAN EXPERIENCE Overall cleanliness ☐ Poor (much litter/graffiti/broken facilities) ☐ Fair (some litter/graffiti/broken facilities) ☐ Good (no litter/graffiti/broken facilities) Describe (if applicable)	Features that provide shade ☐ Arcades ☐ Awnings ☐ Shade trees ☐ Other _____ Articulation in building designs ☐ Little or no ☐ Some ☐ High How interesting is the architecture/urban design of this segment? ☐ Interesting ☐ Somewhat interesting ☐ uninteresting Does the segment have historic appearing buildings? (Y / N) Are there any loose/unsupervised/barking dogs on this segment? (Y / N) Is the dominant smell unpleasant? (Y / N) How noisy is the segment? ☐ Loud ☐ Somewhat loud ☐ Not loud ☐ Silent Level of street use (0 - none, 1 - low, 5 - high) ☐ Pedestrian - (0 1 2 3 4 5) ☐ Bicyclist - (0 1 2 3 4 5) ☐ Motorists - (0 1 2 3 4 5) ☐ Transit - (0 1 2 3 4 5) Are there barriers present on this segment? (highway, rail, river, etc.) (Y / N) ☐ Describe _____ How many stories are most buildings in the segment? _____ Presence of extensive blank walls? (Y / N) Presence of extensive parking lots? (Y / N) Presence of a parking garage? (Y / N) Are there cul-de-sacs or permanent street closings? (Y / N) Presence of jay-walking? (Y / N) Do you feel safe walking this segment? (Y / N) Describe (if applicable) Is there a significant presence of abandoned/empty buildings? (Y / N) Describe (if applicable) SIDEWALK Pedestrian facility ☐ Sidewalk ☐ Pedestrian street ☐ Other _____ Is the pedestrian facility complete? (Y / N) Lighting (all that apply) ☐ Auto-oriented ☐ Pedestrian oriented ☐ Other lighting _____ ☐ None	Street amenities (all that apply) ☐ Public garbage cans ☐ Public benches/seating ☐ Drinking fountain ☐ Newspaper vending machine ☐ Other vending machine ☐ Phone booth ☐ Public restroom ☐ Street trees ☐ Landscaping ☐ Fence/rail ☐ Other _____ ☐ None Number of street trees _____ (amount) Path material (all that apply) ☐ Asphalt ☐ Concrete ☐ Brick/stone ☐ Paved gravel ☐ Other _____ Does the material cause a glare? (Y / N) Is there a presence of unique/decorative paving? (Y / N) Path condition ☐ Poor (many bumps/cracks) ☐ Fair (some bumps/cracks) ☐ Good (very few bumps/cracks) Path obstructions (all that apply) ☐ Poles/signs ☐ Parked cars ☐ Trees ☐ Landscaping ☐ Garbage cans ☐ Private signage ☐ Public seating ☐ Private seating ☐ Other _____ ☐ None Buffers between road and path (all that apply) ☐ Fence ☐ Trees ☐ Landscape ☐ Grass ☐ On-street parking ☐ Other _____ ☐ None Sidewalk width ☐ <4 feet ☐ 4-8 feet ☐ >8 feet Setback (greatest distance on segment) ☐ Less than 10 feet ☐ 10 to 30 feet ☐ More than 30 feet Includes landscaping and parking, but not open space/plaza Curb cuts _____ (amount)	

C. STREET AUDIT TOOL CODING

Study Area:	Segment number:	North / South	East / West
Day/Date: Time: INTERSECTION Type of segment intersection o T-intersection [1] o 4-way [2] o Other _____ [3] o No intersections [9] Traffic control (all that apply) o Traffic light [X] o Stop sign [X] o Traffic circle [X] o Yield to pedestrian sign [X] o Other _____ [X] o No control [X] o No intersection [X] Type of intersection crosswalk (all that apply) o One line [X] o Parallel lines [X] o Zebra striping [X] o Different road surface/paving/color [X] o Other _____ [X] o None [X] Crossing aids at intersection (all that apply) o Pedestrian warning sign [X] o Senior pedestrian warning sign [X] o Pedestrian signal [X] o Flashing [X] o Countdown [X] o None [X] o Signal button [X] o Wheel-chair accessible signal button [X] o Median/traffic island [X] o Overpass/underpass [X] o Audible crossing signal [X] o Other _____ [X] If flashing pedestrian signal [enter as input] Street 1 _____ Seconds _____ Street 2 _____ Seconds _____ What type of street signs are posted o All intersecting streets names [1] o One or more street names missing [2] o None [9] Are signs visible from both directions of pedestrian travel? (Y / N) [1/0] Check for able-minded, <u>underline - PWD</u> How safe do you think it is to cross? o Pretty/very safe [1] [1] o Not very safe/unsafe [2] [2] o NA [3] [3] How convenient do you think it is to cross? o Pretty/very convenient [1] [1] o Not very convenient/inconvenient [2] [2] o NA [3] [3] PEDESTRIAN EXPERIENCE Overall cleanliness o Poor (much litter/graffiti/broken facilities) [1] o Fair (some litter/graffiti/broken facilities) [2] o Good (no litter/graffiti/broken facilities) [3] Describe (if applicable)	Features that provide shade o Arcades [X] o Awnings [X] o Shade trees [X] o Other _____ [X] Articulation in building designs o Little or no [1] o Some [2] o High [3] How interesting is the architecture/urban design of this segment? o Interesting [1] o Somewhat interesting [2] o uninteresting [3] Does the segment have historic appearing buildings? (Y / N) [1, 0] Are there any loose/unsupervised/barking dogs on this segment? (Y / N) [1, 0] Is the dominant smell unpleasant? (Y / N) [1, 0] How noisy is the segment? o Loud [1] o Somewhat loud [2] o Not loud [3] o Silent [4] Level of street use (0 - none, 1 - low, 5 - high) [enter as input] o Pedestrian - (0 1 2 3 4 5) o Bicyclist - (0 1 2 3 4 5) o Motorists - (0 1 2 3 4 5) o Transit - (0 1 2 3 4 5) Are there barriers present on this segment? (highway, rail, river, etc.) (Y / N) [1, 0] o Describe _____ How many stories are most buildings in the segment? _____ [enter as input] Presence of extensive blank walls? (Y / N) [1, 0] Presence of extensive parking lots? (Y / N) [1, 0] Presence of a parking garage? (Y / N) [1, 0] Are there cul-de-sacs or permanent street closings? (Y / N) [1, 0] Presence of jay-walking? (Y / N) [1, 0] Do you feel safe walking this segment? (Y / N) [1, 0] Describe (if applicable) Is there a significant presence of abandoned/empty buildings? (Y / N) [1, 0] Describe (if applicable) SIDEWALK Pedestrian facility o Sidewalk [1] o Pedestrian street [2] o Other _____ [3] Is the pedestrian facility complete? (Y / N) [1, 0] Lighting (all that apply) o Auto-oriented [X] o Pedestrian oriented [X] o Other lighting _____ [X] o None [X]	Street amenities (all that apply) o Public garbage cans [X] o Public benches/seating [X] o Drinking fountain [X] o Newspaper vending machine [X] o Other vending machine [X] o Phone booth [X] o Public restroom [X] o Street trees [X] o Landscaping [X] o Fence/rail [X] o Other _____ [X] o None [X] Number of street trees _____ (amount) [enter as input] Path material (all that apply) o Asphalt [X] o Concrete [X] o Brick/stone [X] o Paved gravel [X] o Other _____ [X] Does the material cause a glare? (Y / N) [1, 0] Is there a presence of unique/decorative paving? (Y / N) [1, 0] Path condition o Poor (many bumps/cracks) [1] o Fair (some bumps/cracks) [2] o Good (very few bumps/cracks) [3] Path obstructions (all that apply) o Poles/signs [X] o Parked cars [X] o Trees [X] o Landscaping [X] o Garbage cans [X] o Private signage [X] o Public seating [X] o Private seating [X] o Other _____ [X] o None [X] Buffers between road and path (all that apply) o Fence [X] o Trees [X] o Landscape [X] o Grass [X] o On-street parking [X] o Other _____ [X] o None [X] Sidewalk width o <4 feet [1] o 4-8 feet [2] o >8 feet [3] Setback (greatest distance on segment) o Less than 10 feet [1] o 10 to 30 feet [2] o More than 30 feet [3] Includes landscaping and parking, but not open space/plaza Curb cuts _____ (amount) [enter as input]	

<p>WAYFINDING Wayfinding for sidewalk. (all that apply)</p> <ul style="list-style-type: none"> Directional sign or marker [X] Landmark [X] Open or green space [X] Orientation map/kiosk [X] "You are here"/present location aids [X] Text and icons on signs or pavement (wayfinding) [X] Audio wayfinding aids [X] Neighborhood identifying banner/signage [X] Other [X] No wayfinding aids [X] <p>Signage for sidewalk</p> <ul style="list-style-type: none"> Parking limits signs [X] Speed limit signs [X] Warning/caution signs [X] Text and icons on signs or pavement (other) [X] Regulation signs [X] Construction signs [X] Other [X] No sidewalk signage [X] <p>Is there signage at eye-level or lower? (Y / N) [1, 0]</p> <p>Other signage? [enter as input]</p> <p>Level of private signage cover</p> <ul style="list-style-type: none"> Basic (over shops, in windows) [1] Some (signage into sidewalk) [2] High (intense use of signage) [3] <p>Does the area present barriers or hazards for walkers who: (check all that apply)</p> <ul style="list-style-type: none"> Use assistive devices (wheelchairs, walkers) [X] Have visual impairments [X] Hard of hearing or deaf [X] Have problems with memory or judgment [X] Tire easily and need to rest [X] <p>Is this segment characterized by having a significant open view of an object or scene that is not on the segment? (view must be prominent)</p> <ul style="list-style-type: none"> (Y / N) [1, 0] <p>Is the view of green/open space/nature? (Y / N) [1, 0]</p> <p>Are there street vendors? (Y / N) [1, 0]</p> <p>Is there public art? (Y / N) [1, 0]</p> <p>Are there billboards present?</p> <ul style="list-style-type: none"> Some/a lot [1] Few [2] None [9] 	<p>ROAD Number of lanes [enter as input] (amount)</p> <p>Speed limit [enter as input] (amount)</p> <p>Crosswalks [enter as input] (amount)</p> <ul style="list-style-type: none"> One line [X] Parallel lines [X] Zebra striping [X] Different road surface/paving/color [X] Other [X] None [X] <p>Crosswalk crossing aids on segment (all that apply)</p> <ul style="list-style-type: none"> Pedestrian warning sign [X] Senior pedestrian warning sign [X] Pedestrian signal <ul style="list-style-type: none"> Flashing [X] Countdown [X] Other [X] Signal button [X] Wheel-chair accessible signal button [X] Median/traffic island [X] Overpass/underpass [X] Flashing warning light [X] Audible walk signal [X] Other [X] <p>Is there a bike lane? (Y / N) [1, 0]</p> <p>Are people riding on the sidewalk? (Y / N) [1, 0]</p> <p>Is there a bus stop? (Y / N) [1, 0]</p> <p>If yes, what amenities are present</p> <ul style="list-style-type: none"> Shelter [X] Bench [X] Signage [X] Map [X] Garbage can [X] Other [X] <p>Are there traffic calming features? (all that apply)</p> <ul style="list-style-type: none"> Speed bumps [X] Rumble strips/bumps [X] Curb extensions [X] Chicanes [X] Median/pedestrian refuge [X] On-street parking [X] Other [X] None [X] <p>To what degree does the segment distort?</p> <ul style="list-style-type: none"> Apparent curve [1] Slight curve [2] Straight [3] Other [4] <p>Slope of street (select one)</p> <ul style="list-style-type: none"> Flat [1] Slight slope [2] Steep hill [3] 	<p>LAND USES Uses in segment (all that apply)</p> <ul style="list-style-type: none"> Residential - single [1] Residential - multi [2] Commercial [3] Office [4] School [5] Public space [6] Public/civic (museum, lib, post) [7] Institutional (religious, medical) [8] Industrial [9] Transportation center [10] Vacant [11] <p>Are there uses different from those on the first floor? (Y / N) [1, 0]</p> <ul style="list-style-type: none"> If so, what types <p>How many of these land uses are present on this segment? (0 - none, 1 - some, 2 - high)</p> <ul style="list-style-type: none"> bars/clubs [0, 1, 2] adult uses [0, 1, 2] check cashing/pawn shop/bail bonds [0, 1, 2] liquor stores [0, 1, 2] Other [0, 1, 2] <p>Describe _____</p> <p>How many gathering places are on this segment? (0 - none, 1 - some, 2 - high)</p> <ul style="list-style-type: none"> Restaurants [0, 1, 2] Coffee shops [0, 1, 2] Libraries/bookstores [0, 1, 2] "Corner" store [0, 1, 2] Art galleries/ museums [0, 1, 2] Craft/specialty stores [0, 1, 2] Farmers market [0, 1, 2] Other [0, 1, 2] <p>Describe _____</p> <p>OTHER</p> <p>Weather [enter as input]</p> <p>Temperature [enter as input]</p>
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