Appendix G

Social Vulnerability Assessment

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Introduction

The objective of this study is to assess the social vulnerability of the City of Alameda to natural hazards such as flooding, reduced air quality, extreme heat, drought, and earthquakes. Social vulnerability can be defined as "the ways individuals, households and neighborhoods may be disproportionately harmed by a hazard" (Nutters, 2012, p. 5). Distinct from the physical vulnerabilities of assets like roads, infrastructure, and the built environment, social vulnerability focuses on the social and economic factors of individuals and communities that affect an individual's ability to prepare for, respond to, and recover from a natural hazard.

Each of these elements is influenced by factors such as race, age, income, historic patterns of exclusion, and government policy and implementation. For instance, families living in low-income neighborhoods during 2017's Hurricane Harvey were historically segregated to a part of the city that was racially homogenous and the most flood-prone. These communities were hit hardest by the storm and, because they had less disposable income, could not relocate or recover as easily as their more affluent neighbors (Krause & Reeves, 2017). This proves to be a pattern across the states, in the case of Hurricane Katrina, and beyond.

When thinking about sensitivity, seniors, children, and people with cardiovascular or chronic respiratory diseases are most susceptible to wildfire smoke (Allen, Cooley, Heberger, & Moore, 2012, p. 8). Although climate change impacts everyone, the intensity of the effects and ability of impacted individuals to respond are influenced by pre-established social variables. Social vulnerability is important to consider as it draws our attention to communities that will bear the heaviest burden in the face of climate change. By considering these communities, we can create the most effective strategies for adaptation and mitigation efforts.

Table G-1. Social Vulnerability Indicators and Measurement Index

Populations or Households That Are:	Measure	70th Percentile Rate	90th Percentile Rate
Renters	% renter-occupied households	58%	81%
Under 5	% people under 5	7%	10%
Very Low-Income	% people under 200% poverty rate; % households with income less than 50% of area median income	30%; 35%	50%; 52%
Not U.S. Citizens	% people not U.S. citizens	17%	26%
Without a Vehicle	% households without a vehicle	9%	22%
People with Disability	% households with one or more persons with a disability	26%	35%
Single-Parent Families	% single-parent families	11%	21%
Communities of Color	% people of color	70%	91%
65 and Over Living Alone	% households with one or more people 65 years and over	11%	19%
Limited English Proficiency	% limited English speaking household	11%	21%

Populations or Households That Are:	Measure	70th Percentile Rate	90th Percentile Rate
Without a High School Degree	% people 25 years and older without a high school degree	15%	30%
Severely Housing Cost Burdened	% renter-occupied households spending greater than 50% income on housing; % owner-occupied households spending greater than 50% income on housing	32% ; 20%	47% ; 33%

The City of Alameda's *Climate Action and Resiliency Plan* (CARP) applies a social vulnerability index, a block group's compounded vulnerability, to better inform strategies to boost community resilience to climate change impacts. The index is based on social vulnerability indicators determined by the San Francisco Bay Conservation and Development Commission (BCDC) Adapting to Rising Tides (ART) Program. BCDC consulted with an advisory committee comprising community members and working professionals to choose indicators that are measurable, publicly accessible, and relevant in a Bay Area context, and that capture heightened vulnerability. A more detailed description of the indicators used in this report can be accessed through the ART Program (Community Indicators for Flood Risk User Guide) and Housing and Community Risk Multiple Hazard Risk Assessment on the Association of Bay Area Governments (ABAG) website. Data for these indicators come from the American Community Survey five-year estimates and were compiled by ABAG. The metric used in this assessment is a block group, which is a census unit that is between 600 and 3,000 people. This assessment analyzes individual indicators as well as their compounded impact. Table G-1 shows the individual indicators, the measure used to represent them, and the threshold for vulnerability.

Social Vulnerability in Alameda, General Trends

Social vulnerability indicators are viewed at the census block group level. For each indicator, each block group in Alameda is ranked relative to all other block groups in the nine-county Bay Area region. To take the indicator for "percentage of households that are renters" as an example, a block group in the 70th percentile for the renter indicator has a higher percentage of renters than 70 percent of block groups in the Bay Area. A block group in the 90th percentile for the renter indicator has a higher percentage of renters than 90 percent of block groups in the Bay Area.

Individual indicators are useful for gaining a better sense of demographic patterns. For example, residents with limited English proficiency will need access to multilingual communication and educational resources. Knowing where these communities are concentrated and what services are nearby can adequately address this barrier. Figure G-1 shows a general picture of characteristics that occur in the 70th and 90th percentile in Alameda. Since it can cannot be determined whether one indicator contributes more to vulnerability than another, viewing indicators in conjunction provides a more accurate picture of social vulnerability. In addition to analyzing social vulnerability indicators individually and two to three at a time, this assessment uses a social vulnerability index to examine the cumulative effect of all indicators at once. Table G-2 describes how the social vulnerability index is determined.

Table G-2. Social Vulnerability Index

Social Vulnerability Level	Number of Indicators
Highest	8 or more in the 70th percentile 6 or more in the 90th percentile
High	6 to 7 in the 70th percentile 4 to 5 in the 90th percentile
Moderate	4 to 5 in the 70th percentile 3 in the 90th percentile
Low	Does not meet any of the above criteria

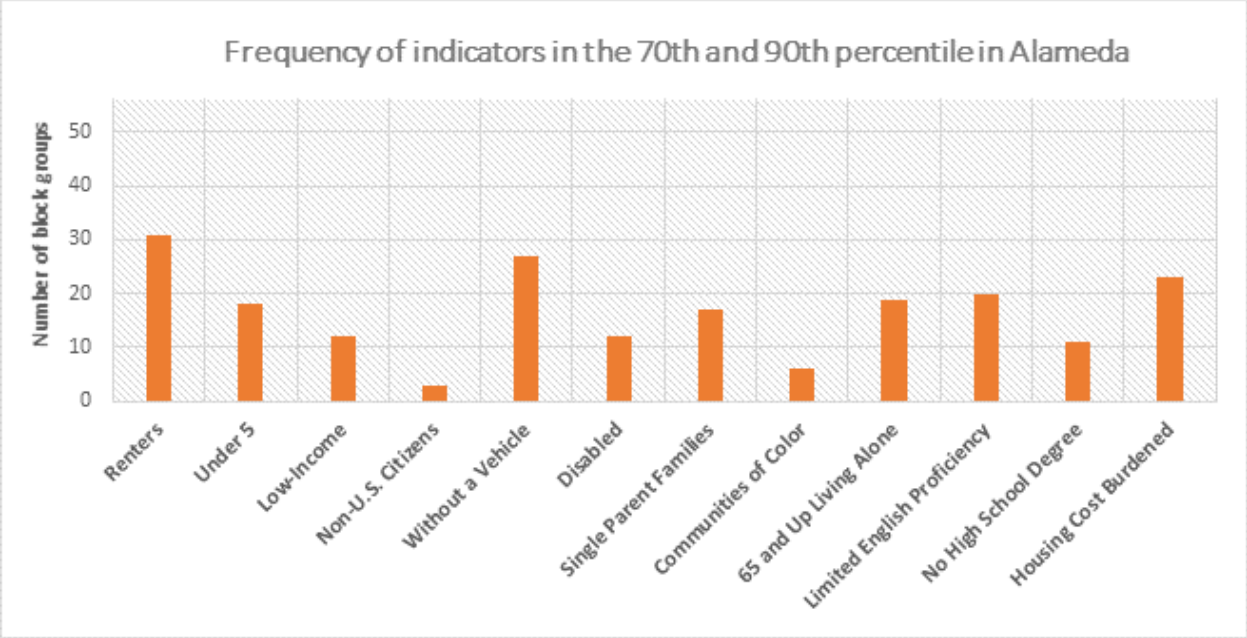

Figure G-1. Individual indicators in 70th and 90th percentile in the City of Alameda.

Renters

Significantly, nearly half of all residents in Alameda are renters. Renters have less autonomy over housing upgrades and typically do not have insurance in the case of flooding, earthquakes, and other hazards, making them much more susceptible to instability during climate disasters (Brechwald, Goodfriend, Kroll, & Lowe, 2015, p. 19). The maps below illustrate that the renter population is spread throughout the city. When overlain with the low-income indicator, however, we see that low-income renters become concentrated west of Constitution Way, near Alameda Landing, and in parts of the Downtown Alameda business district. This is significant, as low-income renters have the additional stressor of poverty on top of stressors driven by climate change. Low-income renters face challenges in preparing for and responding to climate change impacts due to the financial burdens of insurance costs, relocation costs, and recovery costs. Low-income renters are especially at risk of displacement due to damaged housing (Brechwald, Goodfriend, Kroll, & Lowe, 2015, p. 17). Coordinated efforts to provide renters with temporary housing and assist them during post-disaster relocation and recovery will be essential to promoting resilience and mitigating displacement.

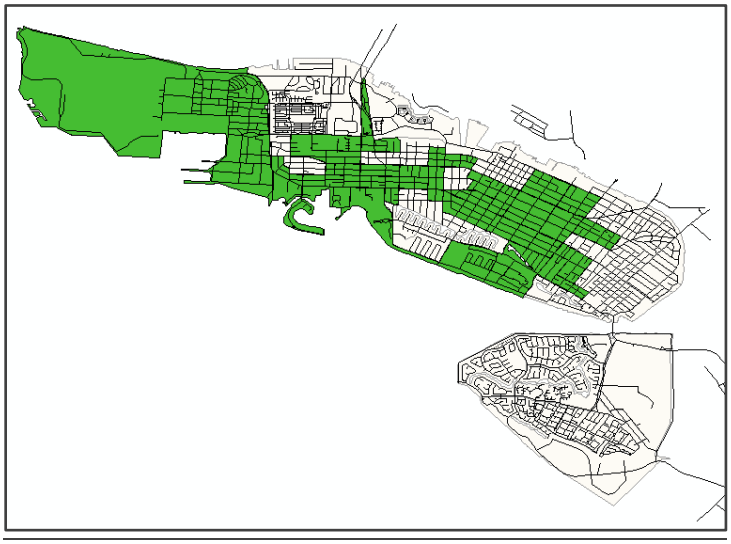

Figure G-2. Renters (green).

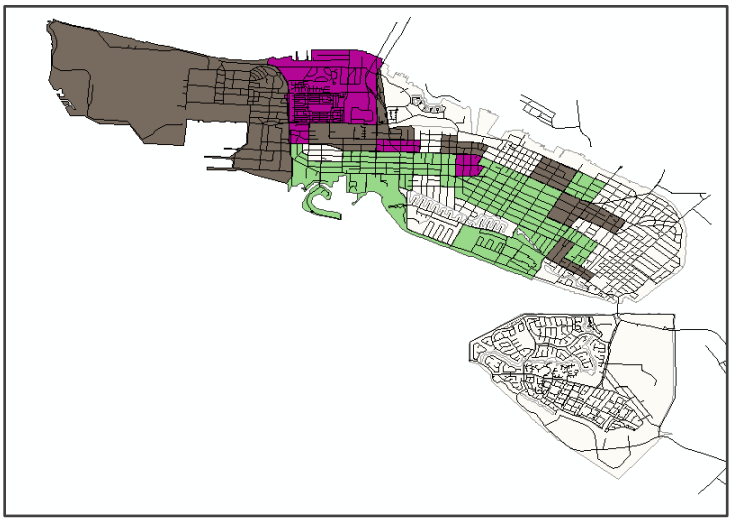

Figure G-3. Renters (green); very low-income (purple); renters x very low-income (gray).

Households Without a Vehicle/Transit-Dependent

Many households in Alameda are transit-dependent. This means that many households do not have a vehicle and rely on the bus, shuttles, car-share services, or other modes of transportation to reach a destination. In Alameda, more than 10 percent of households in most parts of the city do not have a car, making them dependent on the bus, walking, or other modes of transportation. The parts of Alameda that have higher rates of car ownership include Bay Farm Island, the East End, Ballena Bay, and South Shore.

Transit dependence can make it harder for economically strained households to respond in times of emergency, and insufficient transit options then make transportation an accessibility issue. Lack of mobility inhibits one's quality of life and productivity and also makes it harder to respond in emergency situations (Federal Transit Administration, 2013, p. 72). When the individuals who are transit-dependent are children, seniors, disabled residents, and low-income residents, these impacts can be more extreme. Transportation resilience would ensure services are accessible and reliable under all circumstances, particularly for the vulnerable populations mentioned above.

Transit dependence can make one increasingly vulnerable when high transportation costs are combined with high housing costs. The average combined housing and transportation costs for an individual in the United States is 60 percent of monthly income (Federal Transit Administration, 2013, p. 14). Given that in Alameda around 33 percent of households spend over half their income on housing, that 60 percent for housing and transportation costs could be even higher (U.S. Census Bureau, 2016). Expanding on this nexus between income and vulnerability, the average American spends around 18 percent of their income on transportation costs, while the average American in a low-income bracket spends around 33 percent (Federal Transit Administration, 2013, p. 14).

In Alameda, residents on the West End are in a particularly vulnerable place, as the only bus line that serves them is the 96. This lack of service becomes an accessibility issue as public transit offers access to work, shopping, and school. Access to only one bus line limits transit options and can push individuals to rely on alternative transportation services such as car-shares. However, low-income, transit-reliant residents in areas serviced by one bus line like on the West End might find alternative modes of transportation such as car-shares a less reliable option. A Pew Research Center study states that "about one-third of American adults do not have a smartphone [and many of them tend to be] poorer and older" (Pacific Standard Staff, 2016). A different study conducted by the American Public Transportation Association "surveyed frequent ride-sharing users in seven cities [and] found the average household income of those users was about $91,000" (Pacific Standard Staff, 2016). One strategy for reducing the burden on households with high combined transportation and housing costs is to build and expand transit lines near affordable housing. This could help alleviate the stresses of transit-reliant individuals while simultaneously designing solutions to reduce earthquake and flood risks (Brechwald, Goodfriend, Kroll, & Lowe, 2015, p. 22).

People with disabilities who are transit-dependent can face additional accessibility challenges. In the United States, "adults with disabilities are twice as likely as those without disabilities to have inadequate transportation (31 percent vs. 13 percent)" (American Association of People with Disabilities, n.d.). Alameda offers a number of transportation services, including a free shuttle service designed for seniors and disabled riders that functions three days a week at hourly intervals, a reduced taxi ride program that transports riders home after a medical appointment, and East Bay Paratransit. Still, paratransit users in many cities similarly feel that "problems with service quality and capacity limitations" inhibit their mobility (American Association of People with Disabilities, n.d.). In the case of emergency and evacuation

situations, residents with disabilities who frequently use or rely on these services will be highly vulnerable due to the above factors.

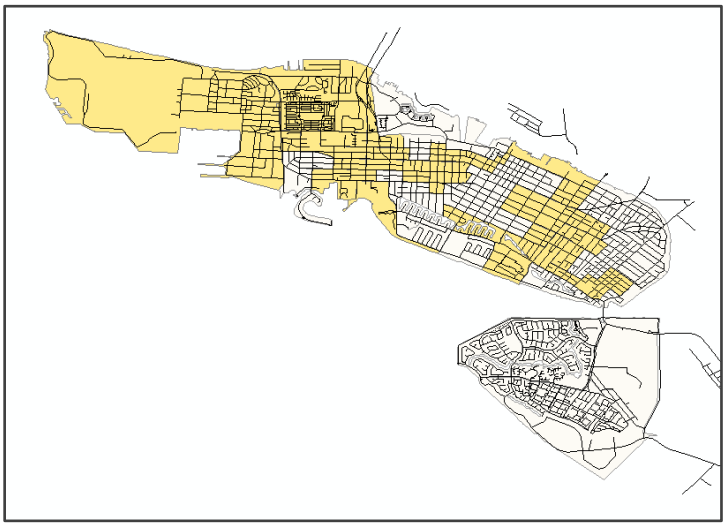

Figure G-4. Transit-dependent (yellow).

Figure G-5. Transit-dependent (yellow); low-income (purple); transit-dependent x low-income (orange).

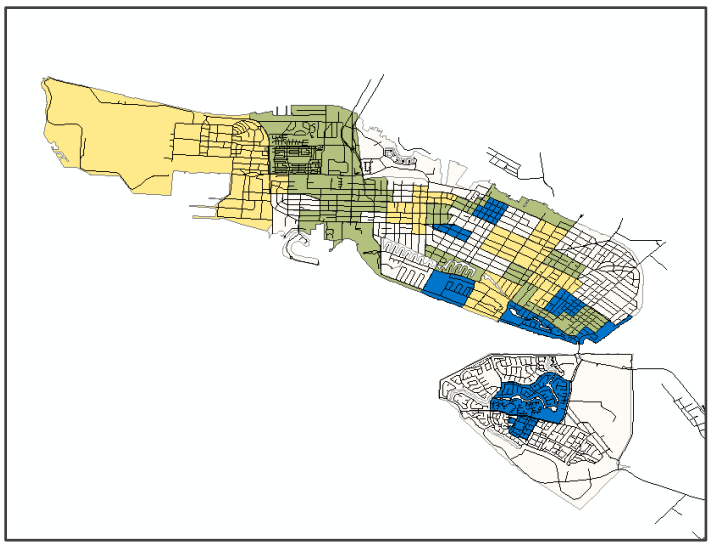

Figure G-6. Transit-dependent (yellow); housing cost burdened (blue); transit-dependent x housing cost burdened (green).

Housing Cost Burdened

Households spending more than 50 percent of their income on housing are considered housing cost burdened. Many Alamedans fall into this category. Housing cost burdened block groups are concentrated on the West End, between Main Street and Constitution Way in central Alameda, and along Shoreline Drive and Clement Avenue in eastern Alameda. Lack of affordable housing can exacerbate the number of residents who become displaced after a natural disaster. If units are lost during a disaster, housing costs can rise, making the remaining housing stock even more difficult to afford (Brechwald, Goodfriend, Kroll, & Lowe, 2015, p.17). For example, in the weeks following the 2017 Sonoma County fires, “median monthly rent… jumped 35 percent to $3,224, in response to new demand from displaced residents” (Miller, 2017). These steep price increases prompted cities in Sonoma County to center affordable housing and tenant protection in rebuilding efforts (Miller, 2017).

In Figure G-8, block groups with a high percentage of housing cost burdened households are overlain with the indicator for low-income to further analyze the vulnerability of the block groups. Low-income households that spend more than half their income on housing live mostly near Alameda Landing, along Lincoln Avenue and Park Street. Due to limited resources and added stressors, these low-income households will face more challenges in adapting to climate impacts than higher-income households that also spend more than half their paycheck on housing. Stable housing is important for community resilience, and high housing costs can decrease an individual’s ability to adapt to a climate impact like flooding. Ensuring an ample supply of affordable housing in Alameda can mitigate displacement after disasters and increase a household’s economic ability to prepare for natural hazards. It will be important to consider affordable housing as an adaptation strategy that contributes to individual and community resilience.

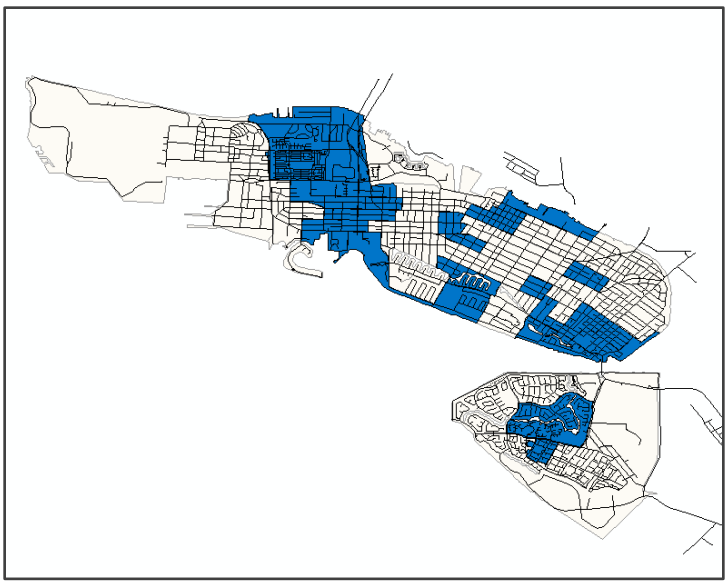

Figure G-7. Housing cost burdened (blue).

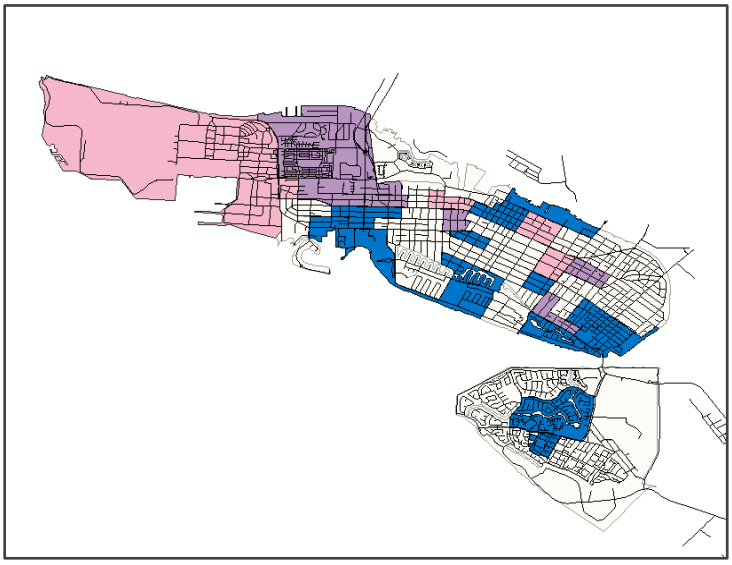

Figure G-8. Housing cost burdened (blue); very low-income (pink); housing cost burdened x very low-income (purple).

Limited English-Language Proficiency

Block groups with significant numbers of limited English-language-proficient households are more concentrated in Alameda Landing, along Buena Vista and Clement Avenues, in South Shore, along Broadway, and on parts of Bay Farm Island and Eastshore. In those block groups, 1 to 4 percent speak Spanish, 1 to 14 percent speak Chinese, 1 to 4 percent speak Vietnamese, and 0 to 4 percent speak Tagalog. Lack of communication and miscommunication make neighborhoods with higher concentrations of non-English speakers highly vulnerable to climate hazards because they may not receive important information about preparing for and responding to disaster events. Many of these residents are immigrants, refugees, and communities of color who are often left out of conversations or are hesitant to engage because of the language barrier and not feeling welcome (Nelson, Spokane, Ross, & Deng, 2015, p. 51). In the case of emergencies and disaster response situations, people who are most vulnerable are often impacted the most, and families with limited English can become overwhelmed if they were never spoken to about how to respond in an emergency.

In Alameda, there is a larger percentage of Chinese speakers overall, meaning that communications materials should prioritize translation into Chinese (though outreach and communications efforts should always offer translations in the four non-English languages) and conduct targeted outreach to these areas. Translated communications builds trust and enhances the reach of public information. Working with community organizations and services that reach non-English speakers to disseminate information can help the City move toward building community resilience while working collaboratively with residents (Nutters, 2012, p. 22).

Figure G-9. Limited English-language proficiency (brown).

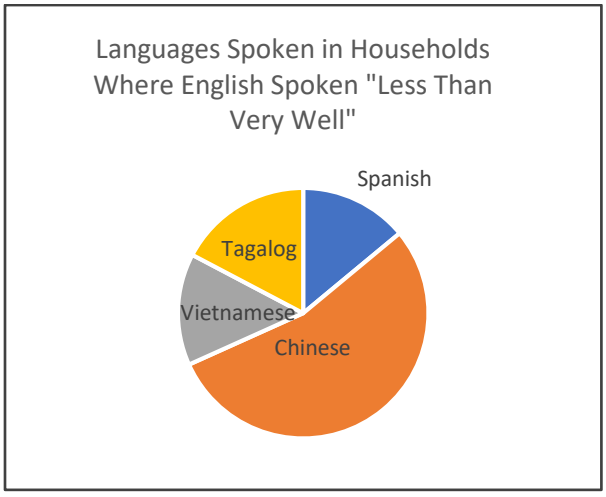

Figure G-10. The above pie chart calculates languages for all non-English-proficient households in Alameda, not just households in highly vulnerable block groups.

Social Vulnerability Index

The social vulnerability index is used in the CARP to identify the best strategies for the populations most vulnerable to climate change. Alameda contains 57 census block groups, and 14 of those read as having high or highest vulnerability. The compounded vulnerability of each block group directs our attention to areas that need more targeted community resilience strategies. This level of analysis is key for developing the most effective and holistic climate change adaptation strategies and policies.

The social vulnerability index (Figure G-11) captures concentrated populations of vulnerability, though it is important to note that there are highly vulnerable people in the low and moderate vulnerability block groups. People experiencing homelessness also need to be considered. While they cannot be physically "mapped" by block group, adaptation strategies should consider how they will receive emergency communications and how they will be sheltered. Proper, safe housing for all is an adaptation and resilience strategy. Planning strategies should always consider these vulnerable populations in adaptation efforts.

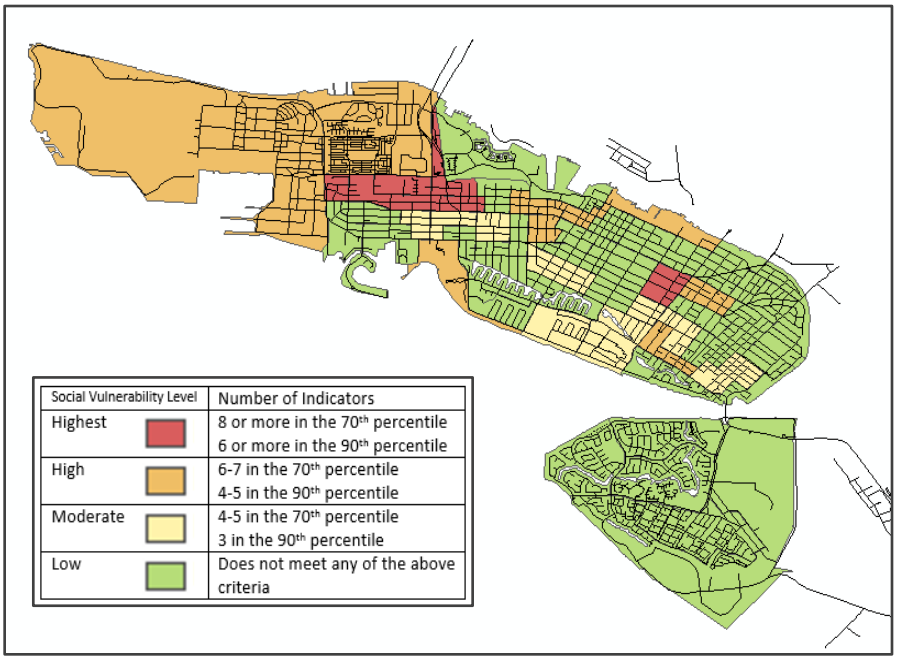

Figure G-11. Social vulnerability index in Alameda.

Block Group Level

Figure G-12 captures the block groups with highest vulnerability. Within these 14 block groups, an inventory of community assets and bus lines was taken (Table G-3), which can be used to inform outreach practices and gaps in equitable greenhouse gas and adaptation strategies. Here, assets are defined as sites and places residents might frequent, receive information, or congregate in search of community. These include schools, places of worship, parks, community centers, childcare centers, community gardens, libraries, and recreational centers.

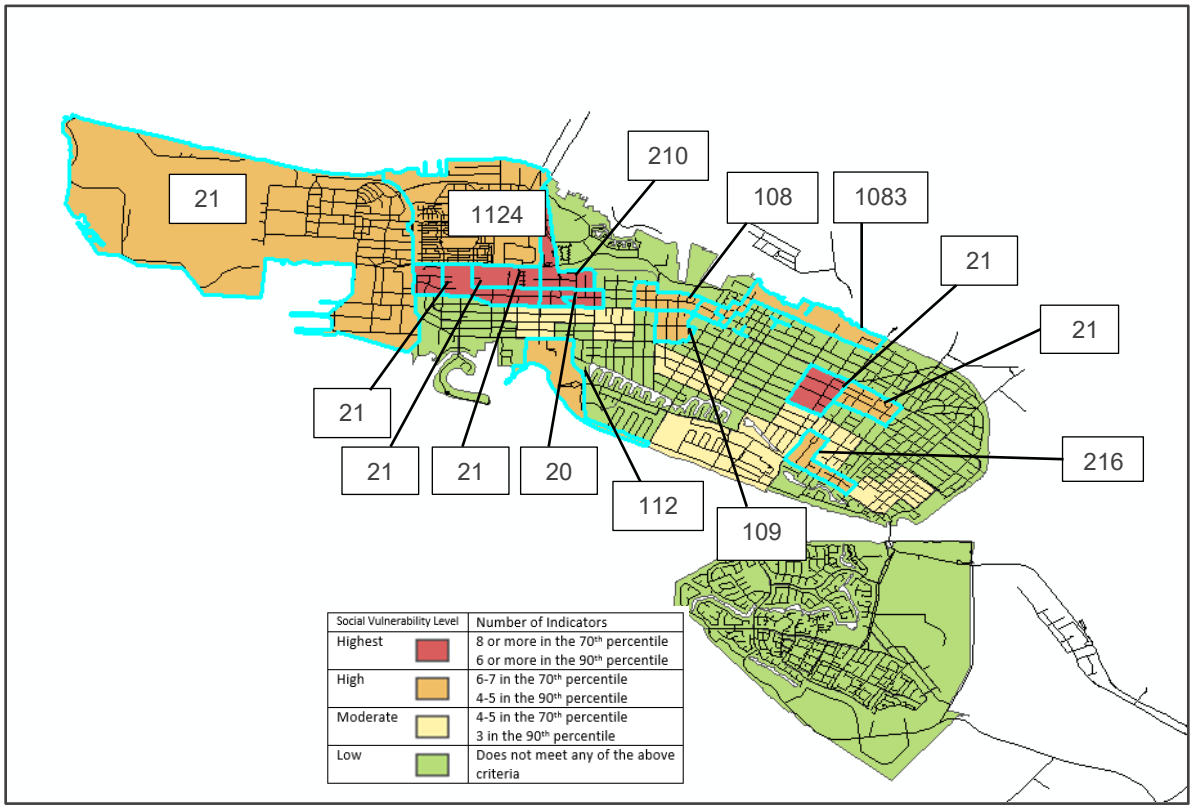

Figure G-12. Social vulnerability index in Alameda distinguishing highly vulnerable block groups.

Table G-3. Block Group Inventory

Object ID	Bordering Streets	Indicators in 70th or 90th Percentile	Assets Within or in Adjacent* Block Group	Bus Lines Within
217	Main St	Renters, low-income, without a vehicle, people with disability, single-parent households	Changing Gears Bike Shop, Ploughshares Nursery, Farm2Market community garden and event space, Alameda Point Collaborative Career Center, Encinal High School*	96
1124	Main St, Ralph Appezzato Memorial Pkwy, Webster St	Under 5, low-income, without a vehicle, 65 and over living alone, limited English proficiency, severely housing cost burdened	Ruby Bridges Elementary School, College of Alameda, Island High School	96
213	Main St, Ralph Appezzato Memorial Pkwy, 3rd St, Pacific Ave	Low-income, not U.S. citizens, without a vehicle, people with disability, single-parent households, communities of color, limited English proficiency, without a high school degree	Kiddie Kampus Co-Op Nursery	96
212	Ralph Appezzato Memorial Pkwy, 3rd St, Pacific Ave, Marshall Way, Lincoln Ave, Webster St, Buena Vista Ave, Poggi Ave	Renters, low-income, not U.S. citizens, without a vehicle, people with disability, single-parent households, communities of color, limited English proficiency, without a high school degree, severely housing cost burdened	Nea Community Learning Center, The Academy of Alameda Elementary School, Woodstock Park, Longfellow Park,* Boys and Girls Club, Alameda Adult School	631, 663, 96
211	Ralph Appezzato Memorial Pkwy, Webster St, Poggi Ave, Buena Vista Ave	Renters, under 5, low-income, not U.S. citizens, without a vehicle, single-parent households, without a high school degree, severely housing cost burdened	N/A	20, 314, 51A, 851, O, W
210	Webster St, Constitution Way, 9th St, Buena Vista Ave, Stewart Ct	Renters, low-income, without a vehicle, people with disability, communities of color, 65 and over living alone, limited English proficiency, without a high school degree, severely housing cost burdened	N/A	19, 20, 314, 51A, 851, O, W, 96
209	Webster St, Lincoln Ave, Wood St, Buena Vista Ave	Low-income, without a vehicle, people with disability, single-parent households, communities of color, limited English proficiency, without a high school degree, severely housing cost burdened	N/A	

Object ID	Bordering Streets	Indicators in 70th or 90th Percentile	Assets Within or in Adjacent* Block Group	Bus Lines Within
1122	Central Ave, Westline Dr, Shoreline Dr, Grand St, McKay Ave	Renters, without a vehicle, people with disability, single-parent households, 65 and over living alone, severely housing cost burdened	Washington Park, Crown Memorial State Beach, Alameda Free Library-West End Branch,* Blue Moon Learning Center	20, 631, 663, W
1083	Clement Ave, Park St, Grand St, Eagle Ave, Hibbard St, Buena Vista Ave, Stanton St, Lincoln Ave, Mintrum St	Without a vehicle, people with disability, single-parent households, limited English proficiency, without a high school degree, severely housing cost burdened	Frank Bette Center for the Arts	19
1084	Buena Vista Ave, Lincoln Ave, St Charles St, Stanton St, Lincoln Ave	Renters, low-income, without a vehicle, single-parent households, limited English proficiency, without a high school degree	Bay Eagle Community Garden, Littlejohn Park	19
1099	Stanton St, Sherman St, Lincoln Ave, Cottage St	Low-income, without a vehicle, single-parent households, limited English proficiency, without a high school degree, severely housing cost burdened	Mastick Senior Center,* Franklin Park Pool,* Franklin Park,* Fuzzy Caterpillar Preschool*	314, 51A, 851, O
214	Park St, Lincoln Ave, Encinal Ave, Walnut St	Renters, under 5, low-income, without a vehicle, single-parent households, communities of color, 65 and over living alone, limited English proficiency, without a high school degree	Alameda High School, Alameda Christian School,* The Child Unique Montessori School,* Alameda Free Library*	631
215	Park St, Central Ave, Encinal Ave, Versailles Ave	Renters, low-income, without a vehicle, 65 and over living alone, without a high school degree, severely housing cost burdened	Edison Elementary School,* Downtown Alameda Business District, Bay Area Music Project-Alameda	631, 663, O, OX
216	San Jose Ave, Park St, Regent St, Calhoun St, Mound St, Otis Dr,	Renters, under 5, low-income, without a vehicle, 65 and over living alone, limited English proficiency, severely housing cost burdened	Jackson Park, Frank Otis Elementary School,* Krusi Park,* St Philip Neri School,* Otis Preschool,* Luna's Montessori Bilingual School,* Bay Language Academy,* Alameda School of Music*	21, 314, 356, W

*asset is located in adjacent block group

Climate-Specific Vulnerabilities

The social vulnerability index can show how populations will be impacted differently in climate events. In this section, sea level rise and contaminated lands are highlighted because these hazards are geographically situated, whereas hazards like wildfire smoke, drought, and heat will be distributed across the city.

Sea Level Rise and Flooding

Alameda's geography as an island makes it especially vulnerable to sea level rise and flooding. Figure G-13 captures sea level rise at 36 inches, which is projected to significantly impact residents living on Bay Farm Island, at Alameda Point, and near Alameda Landing. Flooding can force people out of their homes, "as even short duration flooding can undermine building structures or create unsafe living conditions due to mold growth and contamination," making community resilience harder to attain (Brechwald, Goodfriend, Kroll, & Lowe, 2015, pg. 8). Flood risk at 36 inches of sea level rise shows how the most vulnerable are often impacted first. During a 100-year storm event under these same conditions, a larger portion of the city faces flood risk, yet the implications of sea level rise on western Alameda residents in highly vulnerable block groups remain. Those who are most vulnerable will have greater difficulty responding if preventative actions such as the aforementioned strategies (e.g., climate-resilient housing) and safe, affordable housing are not implemented. Table G-4 and Table G-5 identify household characteristics that appear in the 70th or 90th percentile of the block groups that will be directly impacted by water inundation in the two respective scenarios.

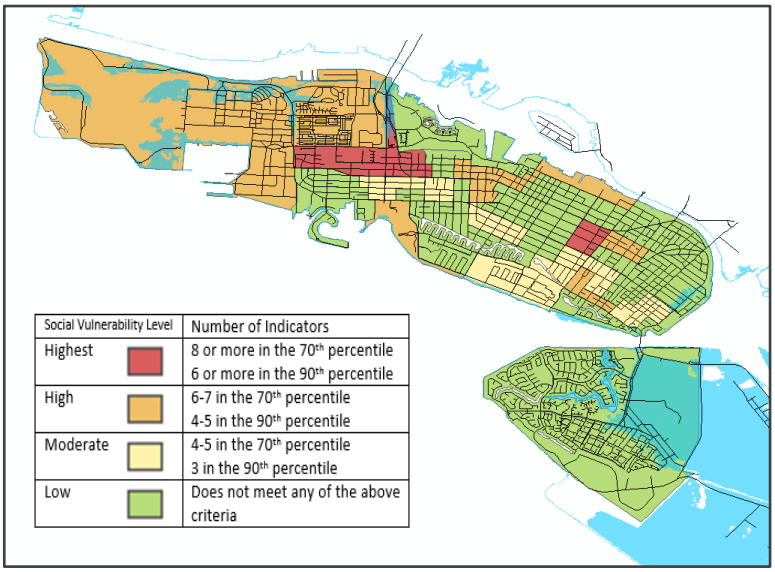

Figure G-13. Blue indicates water inundation, or flooding, at 36 inches of sea level rise.

Table G-4. Impacted Populations

Impacted Populations
Renters
Low Income
Under 5
65 and Over Living Alone
Single Parent Households
People with a Disability
Households without a Vehicle
Severely Housing Cost Burdened
Without a High School Degree
Communities of Color

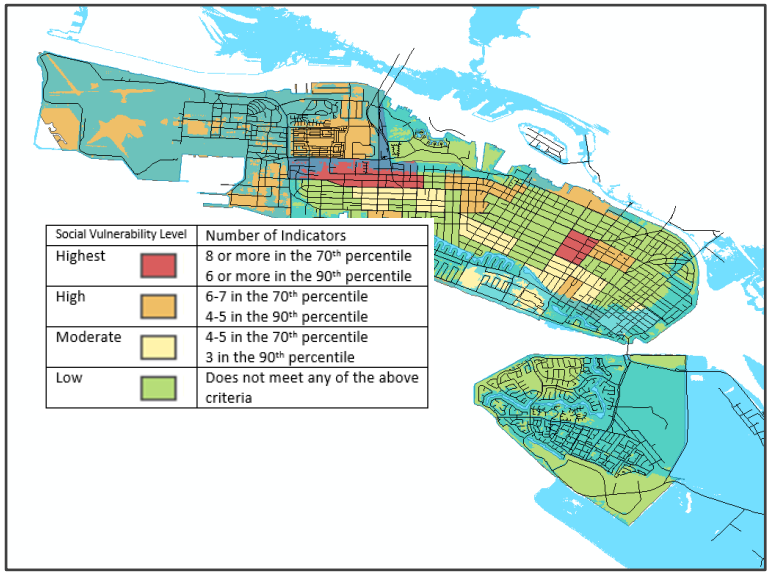

Figure G-14. Blue indicates water inundation, or flooding, during a 100-year storm at 36 inches of sea level rise.

Table G-5. Impacted Populations

Impacted Populations
Renters
Low Income
Under 5
65 and Over Living Alone
Single Parent Households
People with a Disability
Households without a Vehicle
Severely Housing Cost Burdened
Without a High School Degree
Communities of Color
Non-U.S. Citizen

Contaminated Lands and Waste

Figure G-15 captures the block groups that contain cleanup sites at or above the 90th percentile. Cleanup sites are defined by the California Office of Environmental Health Hazard Assessment as places "contaminated with harmful chemicals [that] need to be cleaned up by the property owners or government" (OEHHA, 2019). These contaminants can come from old buildings, toxic spills, the dumping of toxic waste, national defense activities, and pesticides, among many others (U.S. EPA, 2017). Cleanup sites in Alameda are primarily a result of industrial activities that occurred at the Alameda Naval Air Station from 1939 until its closure in 1997. Cleanup of the contaminated sites at Alameda Point are ongoing (Clearwater Revival Company, 1999).

Residents living at Alameda Point, around Alameda Landing, in Marina Village, and along Lincoln Avenue facing the harbor are situated directly in these contamination-vulnerable block groups. The health impacts on people living close to contaminated lands vary by level of contamination but can be acute (e.g., rashes and skin irritation) or chronic (e.g., cancer). Six block groups with high and highest social vulnerability are also the sites of cleanups as identified by the CalEnviroScreen tool (OEHHA, 2018). Future development plans should account for this hazard and current residents should be given full transparency as to their risks and the current process to remove toxins.

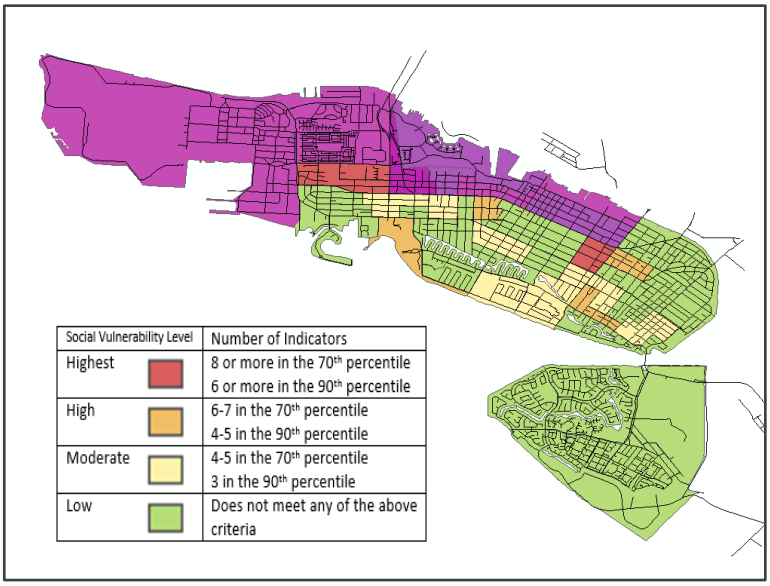

Figure G-15. Purple indicates block groups with number of cleanup sites exceeding the 90th percentile.

In addition to the indicators described above, there are additional social and economic indicators of vulnerability to be aware of. It is important to remember that these are indicators, meant to be used together to identify locations where community members may be at greater risk.

Communities of Color

Of the six total block groups that meet the 70th or 90th percentile for communities of color, five of those are in block groups with high or highest social vulnerability. Across the United States and California, communities of color are disproportionately burdened by several factors contributing to increased vulnerability. According to the Ocean Protection Council, the author of California's official 2018 sea level rise adaptation guidance, "Adaptation strategies should prioritize protection of vulnerable communities and take into consideration social equity and environmental justice" (OPC, 2018, pg. 6). Alameda's planning is in accordance with this state guidance, meaning it is crucial to understand the disparate impacts climate change might have on communities of color. Doing so will ensure further harm is prevented in communities of color. California's Fourth Climate Change Assessment attributes social vulnerability to a combination of personal demographic attributes, the physical environment, and historic underinvestment and marginalization. The uneven distribution of vulnerability to climate impacts can be partly traced to patterns of exclusion in the early 20th century by means of redlining and restrictions on black, Chinese, and other non-white home ownership. Without this awareness and deliberate planning, certain groups and individuals will continue experiencing the impacts of harmful systems. Centering communities of color in climate change adaptation planning bridges equity and environment, a key component of sustainable climate action planning.

Figure G-16. Communities of color (green).

Age

Alameda is a city with a large population of families and seniors. The vulnerabilities to climate-related issues that young children and seniors face will be especially important to consider for climate action planning. Lack of mobility, dependence on others, and health sensitivities make these populations particularly vulnerable.

For children, proper protection and care services should be a focus. Children are more sensitive to their environment as their immune systems are still developing, "leaving their rapidly growing bodies more sensitive to disease and environmental pollutants" (Climate Reality Project, 2018). They spend more time outdoors than adults, meaning they are more directly exposed to poor air quality in wildfire events and extreme heat, which poses another threat as children are less able to regulate their body temperature (U.S. EPA, 2016a, pg. 2). They are also dependent, meaning they are especially vulnerable if they are separated from a caregiver. In Alameda, children under 5 are fairly dispersed throughout the city.

Like children, elders are more sensitive to poor environmental quality. Pre-existing health conditions can be exacerbated by wildfire smoke and rising temperatures. Educational materials for seniors on how to reduce their risk to such conditions can be an effective resilience strategy. This should be distributed through a number of ways—online media, newspaper, e-mail, landline and cell phone—to adequately meet the needs of older residents. Connecting with local senior centers and senior living centers can also provide a space to distribute information, and they might serve as places for seniors to gather on high heat and poor air days. Mobility is also a point of concern, as some seniors might rely on transportation services. As Alameda is a city with a sizable proportion of people over 65 living alone, preparation and proper education can go a long way.

Figure G-17. Households with children under 5 (gray).

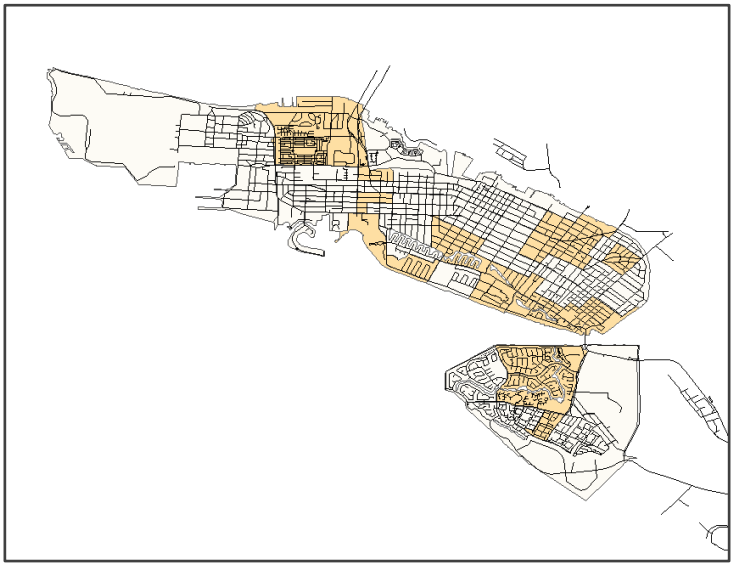

Figure G-18. Seniors over 65 living alone (orange).

People with Disabilities

The disabled community is varied and diverse, though they generally face "barriers in accessing healthcare services and in receiving timely public health or emergency information in an accessible format" (U.S. EPA, 2016b, pg. 2). They also often face added social stressors such as poverty, unemployment, and health conditions. People with disabilities have consistently been hard hit in emergency situations. Thus, it would be essential to "meet demand for wheelchair-accessible transportation," as well as to "maintain adequate supplies of prescription medication[,] access to necessary medical equipment like oxygen, and [proper] evacuation shelters with appropriate facilities, equipment, and trained staff to meet the various needs of people with disabilities" (U.S. EPA, 2016b, pg. 3). Proper health services and informational services will be important when preparing for projected climate change impacts—such as wildfire events, flooding, and heat—and reducing the burden on people with disabilities.

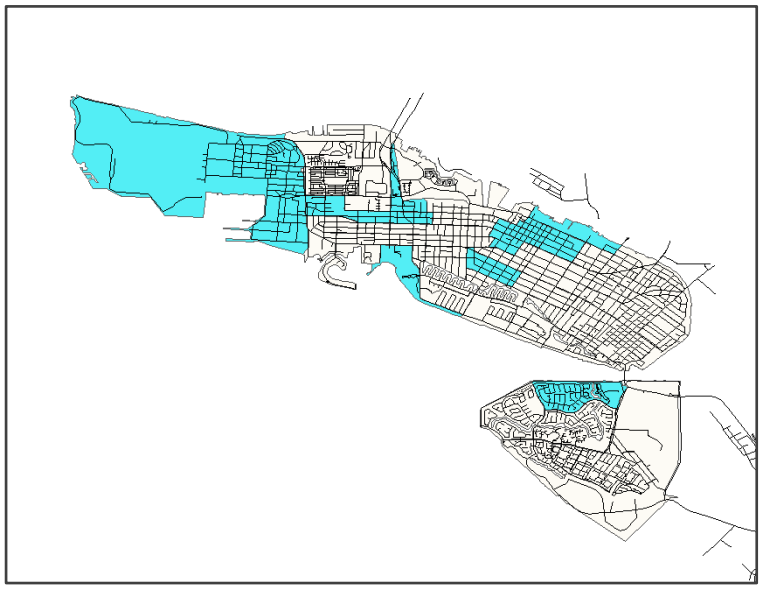

Figure G-19. People with disabilities.

Alamedans Experiencing Homelessness

Combined housing prices and living costs in the Bay Area and consequently, the City of Alameda, have exacerbated the prevalence of families and individuals experiencing homelessness. The City of Alameda's 2018 Homelessness Report emphasizes the importance of physical space to provide services more reliably and accessibly. While unhoused individuals cannot be geographically situated on a map, the best indicator for this is the City of Alameda's Point-in-Time counts, first done in 2015 to quantify the number of homeless Alamedans. A January 2017 count found that there were 204 homeless individuals in the city (COA, 2018). Adequate services for these individuals are important now and can help prevent future harm regarding climate impacts.

Lack of shelter dramatically increases an individual's risk to climate impacts, as constant exposure to disparate weather patterns and flooding becomes a health risk when one does not have immediate shelter. For instance, "cumulative exposure to heat over numerous days can lead to serious health conditions including heat stress, and severe heat stroke" (Hanson-Easey, Every, Tehan, Richardson, & Krackowizer, 2016, p. 7). Inadequate healthcare and medical services further place unhoused individuals

at such risks. Additional stressors such as “higher rates of chronic disease, smoking, respiratory disease, mental illness and substance abuse than the general population” mean that unhoused Alamedans will have a more difficult time adequately responding and adapting to climate threats, considering the additional social barriers impacting their daily lives (Hanson-Easey, Every, Tehan, Richardson, & Krackowizer, 2016, p. 2). Lack of mobility among the homeless population can also increase vulnerability in emergency and flooding situations. Expanding and streamlining services by local means, such as the Homeless Outreach Team, can ensure proper education, awareness and pre-disaster planning. Ultimately, safe and stable housing would help ameliorate many of the risks homeless individuals face.

Summary of Potential Impacts

The social vulnerability assessment adds another layer to climate change vulnerability by considering human impact. A cornerstone of sustainable planning is equity, where the needs of communities who have been continually marginalized are properly addressed. This assessment draws connections between equity and environment and offers the City a chance to build equity into projects and programs. It can inform more tailored greenhouse gas and adaptation strategies that address the disproportionate impacts of climate change hazards on certain residents while promoting resilience and adaptation to climate change.

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