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Past structural racism and present home prices

Robert W. Wassmer

California State University, Sacramento

ABSTRACT

The widely acknowledged rating system of the Federal Homeowners' Loan Corporation (HOLC) was a relative measure of pre-1940 racist practices in residential real estate activities in large United States central cities. It was not an assessment that guided HOLC or later Federal Housing Administration (FHA) mortgage lending practices. The research question examined here is whether a similar home in different HOLC-rated neighborhoods in the City of Sacramento (California) sold for a different price eight decades after receiving its HOLC grade. A hedonic regression result shows that homes in the two forms of lower-rated neighborhoods sold for about 13% less than those in the two forms of higher-rated neighborhoods. A Blinder-Oaxaca decomposition breaks down the average selling price difference of $195,000 between a home sold in HOLC green/blue compared to yellow/red rated neighborhoods. A third of this difference in home prices, which is not due to home characteristics, represents a starting measure of the legacy of discriminatory housing practices. The remaining two-thirds of the difference could be due to variations in current home characteristics also influenced by Pre-1940s discriminatory housing practices. These findings are relevant to understanding the contribution of past structural racism in the housing market to present inequalities.

KEYWORDS

Redlining; home price; structural racism

Introduction

To aid homeowners experiencing foreclosure during the United States (U.S.) Great Depression, the Federal Homeowner's Loan Corporation (HOLC) purchased selected mortgages. It then reissued them with a lower interest rate, an extended repayment schedule, and amortization (Hillier, 2003).[1] HOLC created appraisal maps for 249 U.S. central cities in the late 1930s (Appel & Nickerson, 2016). These color-coded maps identified neighborhoods by the "perceived" risk of default determined by HOLC-selected real estate agents and mortgage lenders. This process resulted in the "riskiest" neighborhoods receiving a red (or "D") designation.

In comparison, the "safest" neighborhoods received a green (or "A") rating. Almost exclusively, HOLC reserved the green and blue (second safest or "B") designations for all White neighborhoods. HOLC was also more likely to designate a segregated neighborhood bordering an integrated neighborhood as yellow (second riskiest or "C"). A primary factor in "redlining" a neighborhood was the presence of non-White residents.[2] Figure 1 offers an example of this categorization from the HOLC-issued map for the City of Sacramento in 1938.

This study focuses on Sacramento because it represents, in many ways, a mid-size city in the western U.S. By mid-size, I refer to its 1940 population of about one hundred thousand and 2020 population of just over a half million. Today, the HOLC "greenlined" neighborhoods in the southwest (Land Park) and northeast (East Sacramento) corners of Sacramento still contain the most affluent households and the highest-priced homes per square foot. Sacramento's HOLC map

CONTACT Robert W. Wassmer rwassme@csus.edu Department of Public Policy and Administration, California State University, Sacramento 95819, CA, USA.

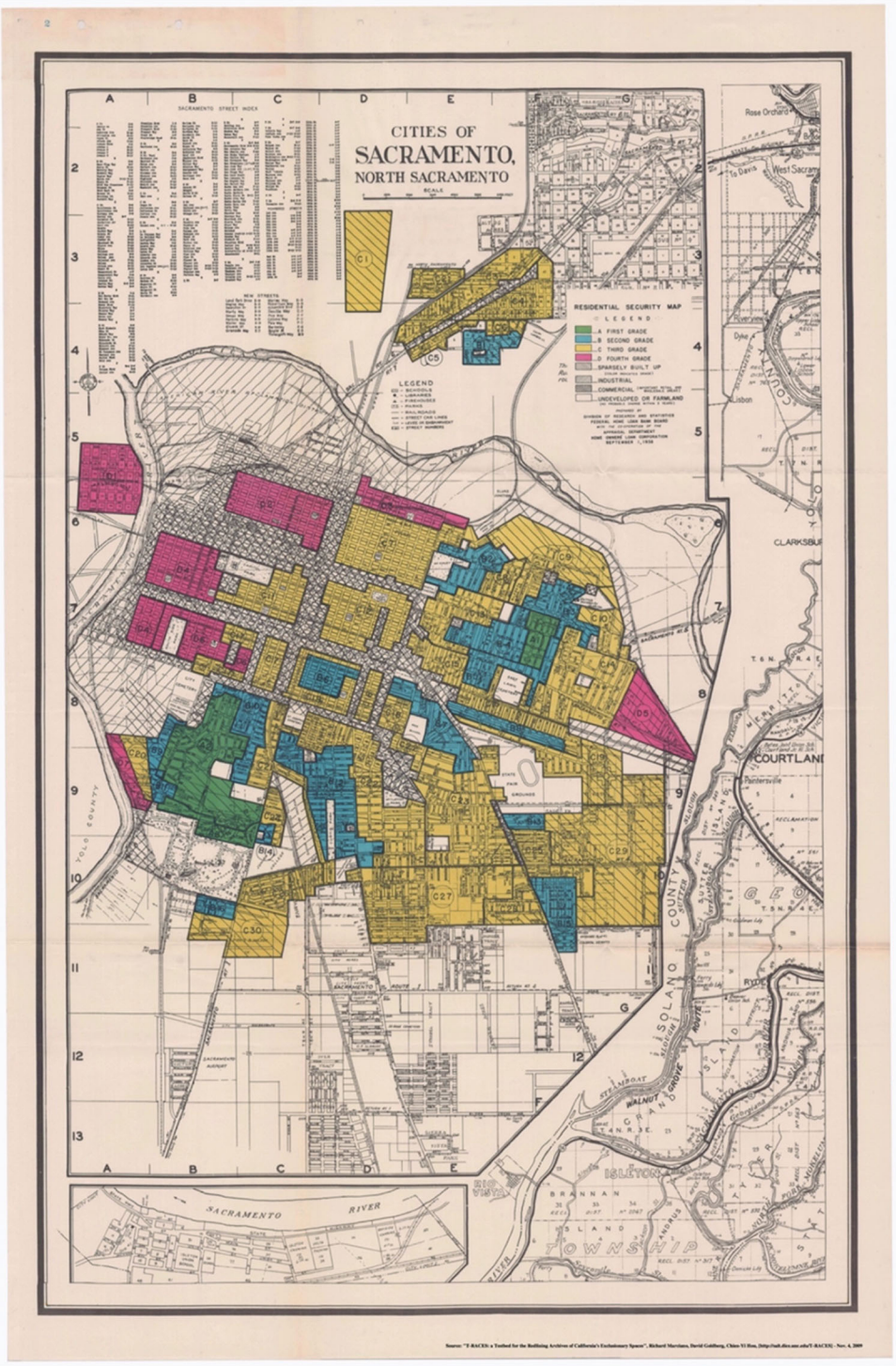

Figure 1. Federal HOLC residential "security" map for Sacramento. Note: This map and similar ones for other United States cities at Nelson et al. (2021) in geocoded and PDF formats.

redlined the "West End" on the city's western side and centered on the map in Figure 1. During the decade that followed this redlining, residential property in Sacramento City experienced a 46% increase in value, while the West End decreased by 30% (Hernandez, 2009). Dingemans (1979) notes in his study of the West End (or "Old City" as he designated it) that the prevalence of public complaints regarding the inability to get mortgage loans increased in the decade after the HOLC drew its Sacramento map. The late 1950s saw the demolishment of many of the residences in the West End and a redlined area just north of it known as "Japan Town" as part of the widespread federal encouragement of redevelopment.

The HOLC grading system of the late 1930s consisted of four categories from green (relatively safest or "A" grade) to red (relatively riskiest or "D" grade) based upon the previous effects of persistent structural racism in the housing market observed in some neighborhoods more than others. The consequences observed in the lower-graded neighborhoods of such racism were undesirable outcomes like greater poverty, more deteriorated housing, higher crime rates, lower-quality schools, and other neighborhood dis-amenities. As documented later in this paper, such an interpretation of the HOLC grading system differs from their conventional interpretation. The popular press often points to HOLC maps as setting off a chain of structural racism in home mortgage lending. Still, HOLC designations in a particular U.S. central city offer the value of categorizing by neighborhood the relative severity of historical racism before 1940.

This study looks for a correlation between the result of the Federal Home Loan Bank Board (FHLBB) request for the Federal Homeowner's Loan Corporation (HOLC) staff to survey local realtors and lenders to create maps representing real estate risk levels in U.S. central cities, and present home values within those neighborhoods. Though HOLC maps are widely presumed to influence current housing and other outcomes for the cities drawn, only a few studies have formally confirmed this relationship and, equally important, its magnitude. At the core of this paper is two forms of regression analyses that use as dependent variables the price of nearly 400 homes sold in Sacramento City in late 2019 and early 2020, accounting for their location within a previous HOLC designation. The focus is on determining how the current sales price of a home, holding measurable characteristics constant, is affected by its HOLC-designated location. This impact may come from both the outcomes of structural racism at the time HOLC offered its assessment and from further occurrences that placed the price-appreciation rate of different HOLC-graded neighborhoods on different paths. For example, a path of lower appreciation for a red or yellowlined neighborhood could be due to less government-directed community investment, blockbusting, and general disinvestment by private entities. In addition, home characteristics in lower-graded HOLC neighborhoods could also vary due to less ability for a cash-out refinance for home improvements, lower expected returns on home improvements, or greater non-owner occupation.

Consider that in 2016 the net worth of the average White-headed household ($171,000) in the U.S. was nearly 10 times greater than that of the average Black-headed household ($17,150; McIntosh et al., 2020). Since homeownership in the United States is the most used method of accumulating wealth, the racial wealth gap between Black and White Americans is related to Black/White differences in the homeownership rate. White households are far more likely to own their homes, which also have higher values and more accumulated equity, than Black households. Over 70% of White households have owned their homes since the mid-1990s, while less than half of Black households owned homes in early 2020 (Tanzi, 2020). These disparities in Black and White housing outcomes and consequential wealth outcomes may trace back to long-rooted institutionally racist practices in private and public housing policy (Perry & Harshbarger, 2019). This study offers evidence for that possibility.[3]

I next offer a discussion of recent work that has clarified the role of HOLC maps in accounting for structural racism in U.S. central city housing markets. Section 3 summarizes the methods and results of previous studies that have attempted a similar analysis. Section 4 describes the model used here as a basis for both the hedonic regression analysis and Blinder-Oaxaca decomposition. While Section 5 is devoted to describing the data used for the analysis. Section 6 builds off this base and offers the results of several different regression models to validate the robustness of my empirical findings. The

concluding Section 7 summarizes this study's result that past structural racism influences present home prices and the implications for policy actions moving forward.

HOLC maps represent structural racism in U.S. city housing markets before 1940

Through the widely read books, *The Crabgrass Frontier* and *The Color of Law*, Jackson (1985, pp. 190–218) and Rothstein, 2017, pp. 63–64) relied upon the HOLC maps created in the late 1930s as "smoking gun" evidence of a federally sanctioned housing policy that institutionalized racism.[4] Aaronson et al. (2021b) test this theory using geocoded HOLC maps from 149 U.S. central cities merged with post-1940 Census tract and block data. They report a negative influence on housing-related measures such as values, rents, homeownership, or occupancy rates as geographic designation varied from a higher to lower HOLC location grade. Using advanced boundary design and propensity score methods, they also find a higher percentage of Black Americans on the "D" side of a HOLC "C/D" boundary and more significant adverse effects on various housing measures on the "C" side of a "C/B" boundary. Aaronson, Hartley, and Mazumder offer these detected effects as evidence supporting the widely held belief that lenders used the location of a house on a HOLC map to determine the terms of a mortgage offered for it or even to grant the mortgage at all.

However, Blumgart (2021) summarizes evidence to question the current conventional wisdom of HOLC maps as a guide for mortgage decisions after their creation. The Federal Home Loan Bank Board (FHLBB) asked HOLC's staff to survey local realtors and lenders and create maps representing real estate risk levels by neighborhood in U.S. central cities. Hillier (2003) documents that HOLC offered its mortgages to about a million homeowners between 1933 and 1936 and that HOLC did not practice redlining in its mortgage approval process. The structural practice of denying mortgages to houses in "high-risk" neighborhoods predated HOLC lending and the later created HOLC maps. She contends that the HOLC maps of the late 1930s only reflect previous racial prejudice that had resulted in a widely accepted stigmatization of specific neighborhoods by local realtors and mortgage lenders. HOLC offered most of its mortgage loans to homes in the worst "C" and "D" graded areas. Hillier offers solid evidence that HOLC maps did not directly influence the well-documented redlining of home mortgage offers practiced by the Federal Housing Authority (FHA). HOLC maps could not have swayed private lenders from the early 1930s to the late 1960s because they did not have access to them. Using Philadelphia data, she confirms that 1938 to 1950 patterns for residential mortgages did not vary systematically by a property's HOLC designation made before 1940.

In two recent papers, P.V. Fishback et al. (2021a), and P. v. Fishback et al. (2021b), offer evidence confirming Hillier's (2003) findings. P.V. Fishback et al. (2021a) offer evidence documenting FHA's decades-long practice of not insuring mortgages in neighborhoods where most Black Americans lived, which predated the drawing of HOLC maps and continued after their creation. Instead, FHA utilized its specific redlining methodology and maps in a manner wholly unrelated to the construction of HOLC maps or FHA's observation of them. P.V. Fishback et al. (2021a) geolocate houses in the cities of Baltimore (Maryland), Peoria (Illinois), and Greensboro (North Carolina) that were granted HOLC-backed mortgages from 1933 to 1936 and FHA-backed mortgages from 1935 to 1940 to the respective city's late 1930s HOLC map. The widely observed HOLC maps had little relationship to the geographic distribution of home mortgages granted under the HOLC or FHA loan programs. Furthermore, an analysis of the characteristics of the borrowers for both types of federal government-backed mortgages shows that FHA loans were far more likely to go to high-value homes and high-income borrowers. While HOLC loans were equally likely to go to homes of differing values and borrowers of varying income and occupations.

P. v. Fishback et al. (2021b) employ an empirical analysis of data drawn from nine of the ten largest U.S. central cities in the 1930s. They found that HOLC map designations explain only between four and 20% of the 1930 or 1940 concentration of Black Americans in these cities, concluding that disadvantage and discrimination previous to the drawing of HOLC maps had already pushed them into distressed neighborhoods. There is no question that the FHA, independent of the HOLC process,

created redlined mortgage risk maps for major U.S. metro areas. Then why are HOLC maps used to illustrate the concept of redlining and not FHA maps? The unfortunate answer is that the FHA maps were purposefully destroyed in the late 1960s when the Federal Housing Authority faced two federal lawsuits for racial discrimination in its mortgage lending. Xu (2021) uses the only FHA map found to investigate the locational effects of FHA redlining on Chicago Census tracts compared to similar possible influences indicated by Chicago's HOLC map. Comparing the periods of 1940 to 1980 and 1980 to 2010, Xu documents that the FHA detected effects of redlining on home values, homeownership, and segregation are far more apparent than the largely non-detected effects of potential HOLC redlining.

Based on the previous evidence, the appropriate takeaway on HOLC maps is that they were not used to explicitly direct HOLC mortgage financing, nor even the later discriminatory mortgage practices of the FHA or private lenders. Instead, they represent a grading in the late 1930s for some U.S. central cities by local real estate agents and bankers of their perceived relative risk of lending in different neighborhoods. In interpreting these HOLC grades, remember they are a product of past discrimination in a central city's housing market, and the racist attitudes among the appraisers asked to come up with these grades. Such attitudes are evident in supporting documents contained in the appendix that indicate a neighborhood received a lower grade just because of the presence of nonwhites.

As so appropriately called out by Hill (2017), the characterization of whole neighborhoods as desirable to undesirable for home mortgage lending, mainly based on the racial and ethnic characteristics of its residents, did not start with the widely-know HOLC illustrations, nor did it end with it. As noted by P. v. Fishback et al. (2021b) and Xu (2021), the Federal Housing Authority (FHA) used its distinct form of redlining before the creation of HOLC maps and into the 1960s when public outcry caused them to destroy the visual evidence of such for all but the City of Chicago. And as Hill summarizes, the roots of HOLC maps trace back to the 1920s and 1930s of "bluelining" neighborhoods for door-to-door salespeople where higher sales were expected based on race/ethnicity. Evidence of these practices continued into the later 20th century, with major retailers and grocery stores refusing to serve specific central city neighborhoods. Furthermore, the more recent past has featured mortgage lenders "reverse redlining" through the offering of sub-prime mortgages. Hill also calls out the "tech-inspired spatial racism" of crowd-sourced apps designed to help potential investors identify neighborhoods based on the contributors' perceptions of "safety." This research aims to utilize a historical artifact of structurally racist practices to tease out their correlation with the measurable outcome of market housing value nearly 90 years later.

Literature review

HOLC categorizations and housing outcomes

Through the research of others, I have established that the Home Owner's Loan Corporation (HOLC) late 1930s categorization of lending risk within major U.S. cities is an assessment of the outcomes at the time of previous structural racism. Others have studied the impact of HOLC categorization on generating undesirable neighborhood-based outcomes. The result of such outcomes is a capitalization into lower home values. A few, therefore, have directly studied the influence of HOLC ratings on the self-reported average expected home sales price or other real-estate-related outcomes measured at the aggregate level of the Census tract. In this review, I first survey this direct approach to housing outcomes. Then I summarize studies that look for the more indirect effect of HOLC rating on neighborhood-specific outcomes that could also alter home values.

Using a regression discontinuity design, Appel and Nickerson (2016) report that 1990 self-reported average home prices at the Census tract level were about 5% less for neighborhoods with a lower HOLC rating than an adjacent area with a higher HOLC rating. In their regression analysis, the authors use aggregate housing data by Census tract from buffer areas (approximately 250–1,000

meters) around HOLC boundaries of different ratings. They report that observed HOLC borders had no correspondence with Census tracts or political wards, and housing characteristics in their designated buffer areas varied "smoothly" across HOLC borders. Appel and Nickerson suggest that these observations rule out causation by confounding factors. Furthermore, they find that lower-classified HOLC neighborhoods have fewer owner-occupied and more vacant homes.

Krimmel's (2018) difference-in-differences regression approach to understanding the long-term impacts of HOLC categorizations offers another investigation to consider. He designates Census tracts with red-designated HOLC neighborhoods as the treatment group, and adjacent Census tracts with neighborhoods graded more favorably as yellow as the control group. The "parallel trend" assumption is that the change in housing price outcomes over time in the treatment and control Census tracts would be no different without distinguishing between red and yellow. Krimmel first shows little difference between HOLC red and yellow areas between 1930 and 1940 regarding neighborhood quality measures such as housing stock characteristics, population density, and homeownership rate. But he does document for 1940 that nine in 10 Black Americans lived in a HOLC redlined Census tract. Between 1940 and 1970, HOLC red relative to HOLC yellow Census tracts experienced significant declines (approximately 20%) in housing supply and population density. Concurrently, homeownership rates and the racial composition of these areas remained stable. Between 1970 and 2010, Krimmel reports that red relative to yellow Census tracts experienced persistent reductions in housing supply and population density.

Appel and Nickerson's (2016) and Krimmel's (2018) regression-based studies use measures of self-reported, aggregate average expected home values in a Census tract. In contrast, the regression-based study here uses market-transaction home prices. The benefit is the accuracy derived from the market value of a property and not a homeowner's perception of such. Self-reported property value may be affected by individual biases related to own experiences from residing in a neighborhood that has experienced more or less structural racism in its housing market. Also, using unique home values allows for better control of the specific home's characteristics that influence its price. A problem with this approach is that selection bias may exist from the sold homes not representative of all homes. Such potential bias is worth noting but not likely, and thus I proceed with this data approach.

HOLC categorization and other neighborhood outcomes

Researchers have also investigated the influence of HOLC designation on neighborhood outcomes unrelated to real estate. The following summary of these studies offers evidence that the pre-1940 HOLC rating assigned to a neighborhood may influence its present value through various outcomes that are likely detrimental to the sales price of a home. These outcomes include a low HOLC rating correlated with lower contemporary measures of green space, tree cover, socioeconomic measures of residents, later-in-life outcomes for youth, K-12 public school funding and academic outcomes, and health outcomes (including more cancer, tuberculosis, adverse birth outcomes, and greater gun violence).

Nardone et al. (2021) found in a propensity score matching study of 3,727 Census tracts from over a hundred U.S. metropolitan areas that neighborhoods with lower HOLC grades are associated with less current green space. Locke et al. (2021) determined if HOLC categorizations correlate with a neighborhood's current tree canopy. The researchers assemble land cover data from 11 sources covering 188 formerly HOLC-rated neighborhoods in 37 cities across 16 states. Using several analyses of variance tests, they find that areas formerly rated "D" have about half the tree canopy coverage as areas that were formerly rated "A."

Furthermore, Aaronson et al. (2021a) investigate the connection between previous HOLC redlining and the current socioeconomic status (family structures, labor market outcomes, incarceration rates, and credit scores) in neighborhoods experiencing it. They use data derived from the Opportunity Atlas and the Federal Reserve Bank of New York's Consumer Credit Panel and employ a differencing regression strategy to compare people living in one-quarter mile zones on different sides of HOLC boundaries. Their findings suggest that residence as a child on the lower-graded side of a HOLC

border exerts a sizable negative effect on the life chances of cohorts born several decades after the HOLC designation. For example, they find that growing up on the "D" side of a "D/C" border resulted in a household income at age 29 that is 2.2 percentiles lower compared to growing up on the "C" side.

Other studies focus on determining a connection between living in a previously rated HOLC-redlined neighborhood and adverse health outcomes. McClure et al. (2019) look at 2008 to 2013 survey results from 1,471 Detroit Neighborhood Health Study respondents. After controlling for age, gender, and educational attainment, residents were more likely to rate their overall health negatively if they lived in formerly redlined areas. Similarly, after controlling for age, sex/gender, and race/ethnicity, Krieger et al. (2020) uncovered a greater risk for a late-stage diagnosis of cervical, breast, lung, and colorectal cancers associated with living in a formerly redlined area. Their finding holds for a separate sample of redlined areas distinguished as redeveloped and home to higher socioeconomic status residents.

Nardone et al. (2020b) use CalEnviroScreen data to identify that residents in formerly redlined neighborhoods in eight major California cities were two to four times more likely to visit the emergency department due to asthma. They also uncover significant increases in diesel exhaust particle emissions, the percentage of residents living in poverty, and the number of Black American and Hispanic populations as the HOLC map grade worsened. Huggins (2017) notes a positive correlation between neighborhood outbreaks of tuberculosis in Austin, Texas, residents with the area's previous HOLC rating. Krieger et al. (2020) accounted for socio-demographic characteristics in linking a higher likelihood of preterm birth to residing in a formerly HOLC-redlined area from over a half-million births in New York City between 2013 and 2017. Matoba et al. (2019) found a similar result using data from over 33,000 Black mothers in Chicago from 1989 to 1991. Nardone et al. (2020a) investigate the relationship between adverse birth outcomes and HOLC rating in a propensity score matching study using data from Los Angeles, Oakland, and San Francisco from 2006 to 2015. Lower gestational age and perinatal mortality correlated positively with living in HOLC "C" and "D" areas compared to "A."

Also found were two studies seeking to understand a connection between a HOLC historical redlining of a neighborhood and present gun violence. Benns et al. (2020) conduct a binomial regression using data from 1,307 gunshot victims residing in 310 neighborhoods in Jefferson County, Kentucky, from 2012 to 2018. Controlling race and poverty in their analyses, they report that the rate of gunshot victims living in a formerly redlined zone is five times higher than in formerly greenlined zones and double the rate of those living in blue-lined zones. A similar study by Jacoby et al. (2018) leverages data on firearm assaults and violent crimes collected by the Philadelphia Police Department between 2013 and 2014. They analyze over 400 Census tracts and find an eightfold greater incidence of gun violence in former HOLC redlined areas. While Lukes and Cleveland (2021) use several difference-of-means analyses using geospatial and demographic data from the National Center for Education studies and student achievement data obtained from the Stanford Education Data Archive. They overlay HOLC maps with the locations of current districts and schools using GIS mapping and find that those in HOLC "D" neighborhoods receive less funding per student and lower K-12 standardized test scores.

It is highly appropriate to raise the concern of "racial essentialism" conveyed through studies that correlate poor neighborhood health outcomes with HOLC redlining. Since, in many cases, neighborhoods previously subject to low HOLC categorizations are more likely to contain higher percentages of Black residents. I think this intent is uncertain when reading the motivations offered for these studies. Instead, the authors describe their research as an empirical attempt to tease out the influence of the HOLC grading system on later undesirable health outcomes observed in neighborhoods receiving a lower grade. Perhaps the solution to mitigate the critique of racial essentialism is a greater focus on the intermediate neighborhood outcomes that combine to generate the dependent variables used in these studies instead of the more direct correlations attempted with HOLC grades. Whether studies that correlate poor neighborhood health outcomes with previously assigned low HOLC grades intend it, it is still reasonable to accuse them of facilitating thoughts that pathologize nonwhiteness. Thus, it is

appropriate to consider this concern when considering the previous findings on health outcomes (and even other neighborhood effects).

The literature paints a picture of adverse outcomes correlated to the pre-1940s structural racism captured by the HOLC rating system. Such racism relegated Black Americans to specific neighborhoods, and the residents of these neighborhoods and homes have continued to face the negative consequences. Only a few studies (Appel & Nickerson, 2016; Krimmel, 2018) have directly measured the influence of these categorizations on housing-related outcomes. Still, these are at a geographic level and not a house-specific level.

Model and data

Does a similar home in a different HOLC-graded neighborhood sell for a different price 80 years after the neighborhood received its grade? This is the question that this research seeks to answer through a hedonic regression and Blinder-Oaxaca decomposition that controls for other factors expected to determine a house price. The previous discussion established that the HOLC rating system is a relative measure of the impact of previous to 1940 structurally racist practices in real estate sales, mortgages, zoning, and government-provided amenity and dis-amenity placement in U.S. central cities. A "D" grade represents neighborhoods most subject to such practices, and an "A" grade the least. The hypothesis examined here is that the pre-1940 forces captured by these grades still affect the sales prices of houses in HOLC-graded neighborhoods. In addition, a magnification of the HOLC-rating effects may occur due to the location-specific/housing characteristics changes they helped induce and other structurally racist practices in a city's geographic housing markets correlated with the earlier HOLC ratings.

Before getting into the specifics of the regression methodologies used, it is essential to clarify the basis of the HOLC rating assigned to a neighborhood in Sacramento City in 1938. I do this in Table 1 by drawing upon the summaries offered for each HOLC neighborhood by Nelson et al. (2021). Note the clear distinctions in the characteristics of foreign-born, Black, and relief-receiving families in the three A-graded neighborhoods (best) compared to the seven D-graded neighborhoods. Also, look to whether homes included deed restrictions and covenants designed to restrict resale to only Whites and some relevant remarks drawn from the reporting forms for each neighborhood completed by the HOLC evaluators. In the present, the language used is genuinely cringe-worthy but repeated here to drive home the point that the racial and ethnic composition of a neighborhood and whether practices were in place to preserve current "White Neighborhoods" were drivers of whether a neighborhood granted the highest or lowest rating. For the HOLC ratings assigned throughout the country, Greer (2013) also makes this point through qualitative evidence and regression analysis of a dependent variable set equal to one, two, three, or four for respective red-to-green designated neighborhoods. Controlling for other factors cited on HOLC evaluation sheets, he finds that a 10-percentage-point increase in the percentage of residents identified as Black in a HOLC zone lowers its ranking by about 0.7 on the one-point scale used.

Unfortunately, specificity in the percentage of Black residents in a HOLC-graded neighborhood is not available for Sacramento (note the near absence of reported values in the Black families column in Table 2). However, the first supplement to the U.S. Census is available, which includes an accounting of 1940 housing characteristics in selected central cities and reported specifically upon Sacramento's nearly 1,200 designated block groups.[5] Relevant to the issue examined here, these block groups exhibit an average percentage of households identifying as nonwhite of about 4%, with a standard deviation of just over twelve. The high standard deviation (relative to the mean) results from 95% of Sacramento's Census blocks in 1940 having zero nonwhite families, with less than 3% of the block groups containing a nonwhite majority. A simple regression utilizing the log of average monthly rent paid for rental housing in a Census block as the dependent variable reveals that reported actual (used for rental properties) and calculated (based on homeowner-reported values) rent fell by about 10% ($p = 0.0009$) for every 10-percentage point increase in nonwhites.[6] This finding illustrates how little integration

Table 1. Information from written evaluation sheets submitted by HOLC evaluators in support of neighborhoods given Green (A—highest) or Red (D—lowest) grades.

Grade/ Neighborhood	Foreign Born Families	Black Families	Relief Families	Deed Protected	Relevant "Remarks" on "NS Form 8" (Area Description completed by HOLC Evaluators)*
A or Green (highest)					
A1—East Sacramento	None	None	None	Yes	*in addition to having deed restrictions, it is zoned single-family residences. Is a high degree of homogeneity . . .*
A2—Swanston Park & Land Park Terrace	None	None	None	Yes	*[H]omogeneity of social and income levels is fair to good.*
A3—College Tract and Land Park Tract	None	None	None	Yes	*[H]as adequate deed restrictions and is zoned single-family residential.*
D or Red (lowest)					
D1—Washington in Yolo County**	30%	None	Many	NA	*The particular hazard is "racial"; 30% of the population is foreign, including Orientals, Mexicans, and low-class Italians.*
D2—Old City	50%	Few	Many	No	*[W]ithout deed restrictions . . . Italians predominate, but with a sprinkling of Mexicans, Negros, and Orientals.*
D3—Old City	Few	None	NA	Minimal	*Subversive races a definite hazard. An area without deed restrictions . . . with the exception of the extreme eastern portion.*
D4—Old City	75%	10%	Many	No	*[M]elting pot . . . [C]ontains the principal Japanese colony and the greatest concentration of Negros in the city. [No] deed restrictions.*
D5—(Unnamed)	None	None	Few	No	*[N]o deed restrictions, and zoning permits 2-family residences . . . [H]owever, improvements consist of . . . old and obsolete [dwellings].*
D6—Old City	30% — 40%	2%	Many	No	*Is the "bon ton" Oriental and Negro residential district in the city. Many diverse influences, from a mortgage standpoint . . .*
D7—West End Bath Tract	50%	None	Few	NA	*Infiltration of Orientals, slowly occurring.*

*All information available at Nelson et al. (2021).

**House sales data from this HOLC area is not included in the analyses performed here because it is currently part of the City of West Sacramento. It is offered here as another example of the mind-set of Sacramento-area HOLC evaluators who put together their ratings for Sacramento in 1938.

existed in Sacramento in 1940 and the negative correlation of what occurred with the value of housing property (without controlling for housing characteristics).

As noted below in equation (1), to begin an examination of the influence of a house located in a late 1930s HOLC-graded neighborhood on 2019–2020 house prices, I offer a model of the broad factors (neighborhood, home, and selling characteristics) expected to influence the selling price of a home.

$$\text{Home Selling Price}_i = f(\text{Neighborhood Characteristics}_i, \text{Home Characteristics}_i, \text{Selling Characteristics}_i) \quad (1)$$

where,

$$\text{Neighborhood Characteristics}_i = f(\left[\text{HOLC A Category Dummy}_i\right], \text{HOLC B Category Dummy}_i, \text{HOLC C Category Dummy}_i, \text{HOLC D Category Dummy}_i, [\text{Sacramento City SD Dummy}_i], \text{Natomas SD Dummy}_i, \text{San Juan SD Dummy}_i, \text{Twin Rivers SD Dummy}_i, \text{Folsom Cordova SD Dummy}_i, \text{Group of Relevant Zip Code Dummies}) \quad (2)$$

Table 2. Descriptive statistics for full sample of HOLC-Rated neighborhoods.

Variable Name	Mean	Std Deviation	Minimum	Maximum
Dependent Variable				
Selling Price	517,334	331,355	104,000	3,800,000
Neighborhood Characteristics				
[HOLC A Category Dummy]	0.034	0.182	0	1
HOLC B Category Dummy	0.191	0.394	0	1
HOLC C Category Dummy	0.720	0.449	0	1
HOLC D Category Dummy	0.054	0.226	0	1
HOLC C/D Category Dummy	0.774	0.419	0	1
[Sacramento City SD Dummy]	0.948	0.221	0	1
Natomas SD Dummy	0.002	0.046	0	1
San Juan SD Dummy	0.004	0.066	0	1
Twin Rivers SD Dummy	0.045	0.207	0	1
Zip Code 95811 Dummy	0.034	0.182	0	1
Zip Code 95814 Dummy	0.026	0.159	0	1
Zip Code 95815 Dummy	0.047	0.331	0	1
Zip Code 95816 Dummy	0.125	0.163	0	1
Zip Code 95817 Dummy	0.159	0.366	0	1
Zip Code 95818 Dummy	0.161	0.368	0	1
[Zip Code 95819 Dummy]	0.159	0.366	0	1
Zip Code 95820 Dummy	0.230	0.421	0	1
Zip Code 95821 Dummy	0.002	0.046	0	1
Zip Code 95822 Dummy	0.041	0.198	0	1
Zip Code 95833 Dummy	0.015	0.121	0	1
Home Characteristics				
Primary Home Sq Feet Thousands	1.417	0.606	0.532	5.51
Second Home Sq Feet Thousands	0.008	0.070	0	0.900
Years Old	71.8	30.5	0	166
Lot Square Feet Thousands	6.07	5.19	0	90.7
Bedrooms	2.73	0.850	0	6
Full Bathrooms	1.62	0.713	1	5
Half Bathrooms	0.187	0.390	0	1
Fireplace Number	0.602	0.652	0	5
Pool Dummy	0.0753	0.3934	0	1
Condominium Dummy	0.041	0.198	0	1
Halfplex Dummy	0.002	0.046	0	1
Raised Foundation Dummy	0.710	0.454	0	1
No Central AC Dummy	0.170	0.376	0	1
Roof Composite Dummy	0.856	0.352	0	1
CC&R Present Dummy	0.727	0.446	0	1
HOA Present Dummy	0.071	0.257	0	1
HOA Dues	30.2	175.4	0	2,510
One Story Dummy	0.763	0.425	0	1
Selling Characteristics				
Days on the Market	37.3	47.7	4	416
August Sale Dummy	0.039	0.267	0	1
September Sale Dummy	0.161	0.283	0	1
October Sale Dummy	0.217	0.277	0	1
November Sale Dummy	0.176	0.281	0	1
December Sale Dummy	0.196	0.287	0	1
January Sale Dummy	0.133	0.271	0	1
[February Sale Dummy]	0.077	0.267	0	1

Note: Data from 465 home sales in Sacramento City neighborhoods between August 2019 and February 2020, but only if HOLC categorized the home's neighborhood HOLC in 1938.

$$\text{Home Characteristics}_i = f(\text{Primary Home Square Footage}_i, \text{Secondary Home Square Footage}_i, \text{Years Old}_i, \text{Lot Square Footage Thousands}_i, \text{Bedrooms}_i, \text{Full Bathrooms}_i, \text{Half Bathrooms}_i, \text{Fireplace Number}_i, \text{Pool Dummy}_i, \text{Condominium Dummy}_i, \text{Halfplex Dummy}_i, \text{Raised Foundation Dummy}_i, \text{No Central AC Dummy}_i, \text{Roof Composite Dummy}_i, \text{CC\&R Dummy}_i, \text{HOA Dummy}_i, \text{HOA Dues}_i, \text{One Story Dummy}_i) \quad (3)$$

$$\text{Selling Characteristics}_i = f(\text{Days on the Market}_i, \text{August Sale Dummy}_i, \text{September Sale Dummy}_i, \text{October Sale Dummy}_i, \text{November Sale Dummy}_i, \text{December Sale Dummy}_i, \text{January Sale Dummy}_i, [\text{February Sale Dummy}_i]).[7] \quad (4)$$

Inclusion in the REALTOR Multiple Listing Service (MLS) data collected for homes in the City of Sacramento constrains the variables' chosen to account for the three broad causal factors: neighborhood, home, and selling characteristics. Thus, neighborhood characteristics include the school district of the assigned public high school and the zip code of the house. Home characteristics include structure, lot, restriction, association, and age. Finally, an accounting of the temporal characteristics of the sale process of a house includes days on the market and the month sold.

The data for this analysis starts with all single-family home sales in the City of Sacramento between August 2019 and February 2020. Geographic information system analysis located the homes within one of the four HOLC-graded neighborhoods geocoded by Nelson et al. (2021), finding that 465 fit this criterion. The sample for analysis only includes the houses in neighborhoods subject to HOLC's 1938 categorization. Table 2 contains the descriptive statistics for all variables from these 465 observations.

In Table 3, you can compare the mean values for all variables based on a home's location by HOLC designation in 1938. A clear distinction that emerges is the drop in average selling price from the highest-rated category of greenlined ("A"), to bluelined ("B"), to yellowlined ("C"). On average, home prices in late 2019 were higher in the redlined neighborhoods ("D"). But as noted before, these neighborhoods were subject to extensive redevelopment. Without controlling for the characteristics of the homes that remain there, it is impossible to tease out the effect of this HOLC "D" categorization. In support of this, note that the mean age of a home in Sacramento's redlined neighborhoods at 56 years was far less than the age in the other categorized neighborhoods that varied between 70 and 80. Thus, it is essential to use regression analysis to capture the longstanding influence of a home's location in a specific level of HOLC-categorized neighborhood. The results of doing so are next.

Results

This paper's hedonic regression results indicate that homes in previously yellow or redlined neighborhoods sold for less than a similar home in a previously blue or greenlined neighborhood in the City of Sacramento. This statistically significant influence exists even after controlling for housing and neighborhood characteristics. The finding of this correlation offers evidence regarding contemporary discussions of the contribution of structural racism to presently observed inequalities by race that are specifically prevalent in U.S. outcomes related to housing.

I first offer a hedonic regression analysis in which the dependent variable is in natural log form. Thus, in Table 4, a statistically significant ($p < 0.10$) regression coefficient multiplied by 100 represents the expected percentage change in a home's price from a one-unit change in a respective dependent variable. The first column of results confirms that a home in a HOLC "C" (yellowlined) neighborhood or "D" (redlined) neighborhood respectively sold for 15.1 and 19.4% less than if that home's location was instead a HOLC "A" neighborhood. Only looking at differences between "A/B" and "C/D" categorizations in the second column of results shows that homes in a HOLC "C" or "D" neighborhood sold for 13.3% less. Confidence in this regression analysis results comes from the expected high

Table 3. Descriptive statistics by category of HOLC-Rated neighborhood.

Variable Name	Mean HOLC A	Mean HOLC B	Mean HOLC C	Mean HOLC D	Mean HOLC A or B	Mean HOLC C or D
Dependent Variable						
Selling Price	750,479	687,984	451,063	648,639	697,506	464,783***
Neighborhood Characteristics						
Sac City SD Dummy	1	0.944	0.944	1	0.952	0.947
Natomas SD Dummy	0	0	0.003	0	0.010	0.003
San Juan SD Dummy	0	0.011	0.003	0	0.038	0.003
Twin Rivers SD Dummy	0	0.045	0.051	0	0.161	0.047
Zip Code 95811 Dummy	0	0	0.027	0.280	0	0.044***
Zip Code 95814 Dummy	0	0	0.009	0.360	0	0.033***
Zip Code 95815 Dummy	0	0.045	0.054	0	0.038	0.050
Zip Code 95816 Dummy	0	0.202	0.116	0.040	0.171	0.111
Zip Code 95817 Dummy	0	0.101	0.194	0	0.086	0.181***
Zip Code 95818 Dummy	0.813	0.360	0.072	0.240	0.428	0.083***
Zip Code 95819 Dummy	0.187	0.157	0.165	0.080	0.162	0.158
Zip Code 95820 Dummy	0	0.101	0.293	0	0.086	0.272***
Zip Code 95821 Dummy	0	0	0.003	0	0	0.003
Zip Code 95822 Dummy	0	0.034	0.048	0	0.029	0.044
Zip Code 95833 Dummy	0	0	0.021	0	0	0.019***
Home Characteristics						
Primary Home Sq Feet Thousands	1,417.1	1,656.6	1,337.0	1,437.2	1,667.8	1,344.0***
Second Home Sq Feet Thousands	0	18.0	5.7	0	15.2	5.3
Years Old	78.2	80.6	70.3	56.0	80.2	69.3***
Lot Square Feet Thousands	0.069	0.060	0.060	0.060	0.062	0.060
Bedrooms	2.88	2.80	2.74	2.32	2.81	2.71
Full Bathrooms	1.69	1.67	1.59	1.68	1.67	1.60
Half Bathrooms	0.313	0.180	0.158	0.520	0.200	0.183
Fireplace Number	0.875	0.652	0.531	0.320	0.895	0.516***
Pool Dummy	0.125	0.090	0.057	0.240	0.095	0.069
Condominium Dummy	0	0	0.027	0.40	0	0.053***
Halfplex Dummy	0	0	0.003	0	0	0.003
Raised Foundation Dummy	0.813	0.854	0.684	0.480	0.848	0.669***
No Central AC Dummy	0.125	0.124	0.188	0.120	0.124	0.183
Roof Composite Dummy	0.688	0.831	0.890	0.600	0.810	0.869
CC&R Present Dummy	0.875	0.719	0.722	0.720	0.743	0.722
HOA Present Dummy	0	0.045	0.054	0.507	0.038	0.081***
HOA Dues	0	4.29	15.61	338.08	3.64	38.00***
One Story Dummy	0.813	0.697	0.785	0.680	0.714	0.778
Selling Characteristics						
Days on the Market	34.6	42.76	35.04	49.28	41.51	36.03
August Sale Dummy	0	0.056	0.039	0	0.047	0.036
September Sale Dummy	0.188	0.169	0.158	0.160	0.171	0.158
October Sale Dummy	0.188	0.169	0.233	0.200	0.171	0.231
November Sale Dummy	0.15	0.180	0.170	0.280	0.171	0.178
December Sale Dummy	0.438	0.202	0.185	0.160	0.238	0.183
January Sale Dummy	0	0.157	0.128	0.200	0.133	0.133
February Sale Dummy	0.063	0.067	0.087	0	0.067	0.081
Observations	16	89	335	25	105	360

Data from 2,801 home sales in Sacramento City neighborhoods between August 2019 and February 2020, but only if HOLC categorized the home's neighborhood in 1938.
*** indicates a statistically-significant difference ($p < 0.01$) between A/B and C/D groups.

R-squared values usually exhibited in a hedonic housing price regression, and the signs on the other included explanatory variables matching *a priori* expectations. The high variance inflation factor (VIF) for the HOLC "B" Category Dummy, recorded in Table 5, indicates that the statistical insignificance of location in a bluelined neighborhood may be due to multicollinearity. Even if this is the case, the detected effect of 2.4% lower is relatively tiny compared to the effects for the two more negatively categorized areas.

Table 4. Regression results using log home selling price as dependent variable.

Variable	All Homes Controlling for all HOLC Categories	All Homes Controlling for A/B and C/D HOLC Categories	Only Homes in HOLC A/B Categories	Only Homes in Holc C/D Categories
Neighborhood Characteristics				
HOLC B Category Dummy	−0.024	–	−0.046	
HOLC C Category Dummy	−0.151***	–	–	0.049
HOLC D Category Dummy^	−0.194***	–	–	–
HOLC C/D Category Dummy	–	−0.133***	–	–
San Juan SD Dummy	0.006	0.003	0.122**	−0.360***
Twin Rivers SD Dummy^^	−0.111***	−0.112***	−0.573***	−0.169***
Zip Code 95811 Dummy	−0.034	−0.053	–	−0.025
Zip Code 95814 Dummy	−0.225***	−0.255***	–	−0.240***
Zip Code 95815 Dummy	−0.750***	−0.748***	–	−0.752***
Zip Code 95816 Dummy	−0.082***	−0.083***	−0.088*	−0.064**
Zip Code 95817 Dummy	−0.427***	−0.426***	−0.235***	−0.457***
Zip Code 95818 Dummy	−0.160***	−0.161***	−0.126**	−0.155***
Zip Code 95820 Dummy	−0.604***	−0.603***	−0.471***	−0.618***
Zip Code 95821 Dummy	−0.374***	−0.372***	–	–
Zip Code 95822 Dummy	−0.370***	−0.370***	−0.190***	−0.398***
Zip Code 95833 Dummy^^^	−0.573***	−0.571***	–	−0.545***
Home Characteristics				
Primary Home Sq Feet Thou	0.262***	0.261***	0.469***	0.207***
Second Home Sq Feet Thou	−0.0091	−0.0097	−0.272	0.157
Years Old	−0.0003	−0.0003	−0.001	−0.0001
Lot Square Feet Thou	0.012***	0.012***	−0.002	0.013***
Bedrooms	−0.033**	−0.032*	−0.094***	−0.019
Full Bathrooms	0.093***	0.093***	0.108**	0.083**
Half Bathrooms	0.133***	0.132***	0.106***	0.139***
Fireplace Number	0.027	0.028	−0.037	0.053
Pool Dummy	0.092***	0.093***	−0.098	0.115***
Halfplex Dummy	−0.347***	−0.341***	–	−0.371***
Condominium Dummy	0.021	0.023	–	0.025
Raised Foundation Dummy	0.042***	0.042***	−0.002	0.032
No Central AC Dummy	−0.204***	−0.204***	−0.113*	−0.208***
Roof Composite Dummy	−0.088***	−0.090***	−0.071	−0.099**
CC&R Present Dummy	−0.049***	−0.047***	−0.0003	−0.060***
HOA Present Dummy	−0.251***	−0.248***	−0.328	−0.255***
HOA Dues	0.0004***	0.0004***	−0.001	0.0004***
One Story Dummy	0.009	0.009	0.034	
Selling Characteristics				
Days on the Market	−0.0005**	−0.0005**	−0.0004**	−0.0007*
August Sale Dummy	−0.046	−0.048	0.159	−0.150*
September Sale Dummy	−0.040	−0.042	0.044	−0.079*
October Sale Dummy	−0.058**	−0.059**	0.035	−0.080**
November Sale Dummy	−0.004	−0.006	0.029	−0.027
December Sale Dummy	−0.047	−0.047	−0.0003	−0.067
January Sale Dummy^^^^	−0.017	−0.020	0.00009	−0.027
Constant	13.10***	13.08***	13.02***	13.00***
Observations	465	465	105	360
R-Squared	0.856	0.856	0.919	0.838

^ HOLC A Category Dummy is base, ^^ Sacramento City SD Dummy is base, ^^^ Zip Code 95819 Dummy is base, and ^^^^ February Sale Dummy is base.

*Indicates statistical significance from zero in a two-tailed test at *** $p < 0.01$, ** $p < 0.05$, and* $p < 0.10$. Based upon standard errors clustered by zip code.

The previous regression analyses indicate that the current selling price of a home in Sacramento City correlates with the "desirability" of offering a home mortgage, as reported by HOLC evaluators over 80 years earlier. To best interpret this correlation, also understand that the early 20th century structural racism in housing markets captured in HOLC ratings could manifest itself in the form of less-desired characteristics of a 2019–2020 home or its neighborhood in a lower-ranked 1938 HOLC zone. The hedonic regression analyses using home sales price as the dependent variable do include measures of home and neighborhood quality differences. If these explanatory variables fully capture

Table 5. VIF values greater than 2.5 from all HOLC categories regression in Table 2.

Variable Name	VIF	Variable Name	VIF
Neighborhood Characteristics		*House Characteristics*	
HOLC B Category Dummy*	6.00	HOA Present Dummy	4.13
HOLC C Category Dummy	7.80	HOA Dues	2.97
HOLC D Category Dummy	3.31	Condominium Dummy*	3.97
Twin Rivers SD Dummy	3.86	*Selling Characteristics*	
Zip Code 95814 Dummy	2.76	September Sale Dummy*	2.75
Zip Code 95815 Dummy	3.54	October Sale Dummy	3.15
House Characteristics		November Sale Dummy*	2.85
Primary Home Squ Feet	5.24	December Sale Dummy*	3.00
Full Bathrooms	3.10	January Sale Dummy*	2.52

* Indicates an explanatory variable not statistically significant in Table 2 and exhibits a variance inflation factor (VIF) greater than 2.5. Such a high VIF points to the possibility of statistical insignificance due to multicollinearity.

all HOLC-rating effects in the present, then the HOLC measures included in the regressions would exert no statistically-significant influence on current home prices. Such a finding would not absolve the influence of HOLC ratings because they could have worked through a reduction in the included home and neighborhood quality measures in the regression. But since the HOLC measures exert statistically significant influences on current home prices in the expected directions, the appropriate takeaway is that their effect is working through housing quality and neighborhood effects not picked up through the available measures used here. Thus, the magnitude of the HOLC regression coefficients in Table 4 may only offer lower-end measures of the effects of HOLC ratings on current prices.

Furthermore, it is wrong to consider that the detected lower home price effects of being in a "C/D" rated HOLC neighborhood relative to an "A/B" is only due to the pre-1940s structural racism in Sacramento City housing markets captured by HOLC. If post-1940s housing market discrimination existed and related geographically to earlier discrimination, the HOLC regression coefficients capture both influences. Earlier portions of this paper have shown that both statements are likely factual.

The first two columns of regression results in Table 4 utilize the entire sample of housing sales in all HOLC zones and includes explanatory variables representing home characteristics, neighborhood characteristics, and dummy variables for two ways of accounting for the HOLC classifications. As described in the literature review, this method has been used previously and is what many would consider appropriate to isolate the influence of HOLC. But as Bonnal et al. (2013) point out, it is only appropriate if the non-HOLC explanatory variables in the regression have the same effects for the high HOLC ("A/B" group) and low HOLC ("C/D"). As a test of this assumption, the last two columns of regression results in Table 4 only utilize home sales from the "A/B" or "C/D" HOLC categories. The vast differences in regression coefficients for a specific explanatory variable across these two samples confirm that the requirement is not satisfied.

Under the assumption of a well-specified model of the primary causes of home price differences, but that these causes of home price differences differ in "A/B" rather than a "C/D" HOLC-rated neighborhoods, the Blinder-Oaxaca Decomposition serves as a better way of measuring the loss in a home's value in a red or yellow-lined neighborhood. Such a decomposition indicates the portion when both groups receive the same treatment but have different characteristics (the "explained" component) and the portion that occurs because one group is more favorably treated ("A/B") than the other ("C/D") given the same characteristics (the "unexplained" component). The unexplained component is often considered a measure of "discrimination" because of its implication of unequal outcomes, in this case, the sales price of a home, due to location in a low-rated HOLC zone compared to a high-rated one. But as explained later, the research design used here to tease out the correlation between past HOLC ratings and the current home price only partially accounts for this.

As Jann (2008) suggests, the STATA derivation of the Blinder-Oaxaca Decomposition reported here employs the regression coefficients from a pooled model that includes the grouping variable as

reference coefficients. The top of Table 6 offers the derived values that explain a home's location in an "A/B" compared to a "C/D" HOLC categorization on the difference in the natural log of current home prices. The natural log values of 13.32 ($611,360) and 12.94 ($416,779) indicate the respective mean predicted home values from this sample for the late 2019 and early 2020 homes from a respective "A/B" or "C/D" neighborhood. The Blinder-Oaxaca decomposition breaks down the natural log predicted difference of 0.383 ($194,581). About two thirds of this difference is due to the measured characteristics of homes in the two types of neighborhoods. The remaining one third is due to "unexplained" factors. A portion of this unaccounted difference in home prices in red and yellowlined neighborhoods is perhaps the legacy of the discriminatory housing practices prevalent in Sacramento neighborhoods. After controlling for the neighborhood, home, and selling characteristics included as explanatory variables in the regression analysis, there is still an unexplained difference of about $200,000 less in lower-rated than higher-rated HOLC zones. As explained earlier, this difference could also be due to an incomplete specification of all the factors that drive differences between home prices.

The impact of discriminating racist practices in Sacramento City's housing market, as correlated with the 1938 HOLC rating for a home's neighborhood, is also likely captured by some "A/B" to "C/D" differences in the neighborhood, home, and selling characteristics generated by such racism. For example, lower-rated HOLC neighborhoods are more likely to be in zip codes 95811, 95814, 95817, 95820, and 95833—while less likely to be in zip code 95818. And as Table 3 indicates, houses in these lower-rated HOLC neighborhoods are more likely to be smaller in size, built more recently, a condominium, not have a raised foundation, and belong to a homeowners association with higher dues. These differences fall into the "explained" part of the decomposition. Still, the mean differences between the high and low HOLC may result from the structural racism in Sacramento City housing markets after HOLC ratings. These findings are essential information on how geographically targeted structural racism in the housing market could translate into lower home prices for housing properties experiencing it. The last column of regression results in Table 3 indicates this because characteristics of a home that reduce its value are more likely in "C/D" than "A/B" HOLC neighborhoods

The lower portion of Table 6 also summarizes each explanatory variable's contribution to the unexplained portion in the column labeled as such. Square footage is the most significant contributor to a similar home in a red and yellowlined neighborhood selling for less. A thousand-foot increase in this measure yielded a 41.0% increase in the unexplained negative difference of a similar home's sales price if its lot was in a green or bluelined neighborhood. In comparison, a thousand-foot increase in lot size correlates with an 8.2% increase in this unexplained difference. In addition, if the home is subject to any current covenants, conditions, and restrictions (CCRs), the same unexplained differences rise on average by 4.6%.

Similarly, the Blinder-Oaxaca Decomposition indicates that a home selling in August or October, as compared to February, correlates with a respective 1.4 and 2.3% larger unexplained variation. Alternatively, an additional bedroom reduced the unexplained difference by nearly 20%. The unexplained positive difference between similar homes in an "A/B" neighborhood compared to a "C/D" neighborhood fell 7.4% if a fireplace is present and 1.9% for the presence of a pool.

Conclusion

The increased attention paid to the color-coded maps produced by the U.S. Federal Homeowners' Loan Corporation (HOLC) in the late 1930s offers the genesis of this research. These maps, represented earlier in Figure 1 for the City of Sacramento, are widely perceived by policymakers and even the general public as an appalling representation of the structural racism practiced in the U.S. regarding housing and other neighborhood policies biased against persons of color, especially Black Americans. Instead, previous research indicates that the maps of HOLC reflect the then-contemporary opinions of real estate and mortgage lending professionals about the relative "safety" of mortgage lending in specific neighborhoods in a central city. The drawn lines did not represent the lending activity of HOLC during the Great Depression. They also did not correlate well with FHA-

Table 6. Blinder-Oaxaca decomposition regression using log home selling price as dependent variable.

Variable	Coefficient	Percentage of Difference
Overall		
HOLC A/B Group	13.32***	
HOLC C/D Group	12.94***	
Difference	0.383***	
Explained	0.250***	65.3%
Unexplained	0.133***	34.7%
Variable	*Explained*	*Unexplained*
Neighborhood Characteristics		
San Juan SD Dummy	0.00002	0.002
Twin Rivers SD Dummy^^	0.001	−0.015
Zip Code 95811 Dummy	0.002	−0.0003
Zip Code 95814 Dummy	0.009	−0.0006
Zip Code 95815 Dummy	0.009	0.029
Zip Code 95816 Dummy	−0.005	−0.003
Zip Code 95817 Dummy	0.040	0.021
Zip Code 95818 Dummy	−0.055*	0.019
Zip Code 95820 Dummy	0.112	0.014
Zip Code 95821 Dummy	0.001	−0.001
Zip Code 95822 Dummy	0.006	0.006
Zip Code 95833 Dummy^^^	0.011	−0.0006
Home Characteristics		
Primary Home Sq Feet Thou	0.084***	0.410***
Second Home Sq Feet Thou	−0.0001	−0.005
Years Old	−0.003	−0.114
Lot Square Feet Thou	0.001	0.082**
Bedrooms	−0.003	−0.199***
Full Bathrooms	0.007	0.042
Half Bathrooms	0.002	−0.005**
Fireplace Number	0.010	−0.074**
Pool Dummy	0.002	−0.019***
Halfplex Dummy	0.0009	0.00006
Condominium Dummy	−0.001	−0.00008
Raised Foundation Dummy	0.007*	−0.035
No Central AC Dummy	0.012	0.012
Roof Composite Dummy	0.005	0.015
CC&R Present Dummy	−0.010	0.046*
HOA Present Dummy	0.011	−0.001
HOA Dues	−0.013	−0.009
One Story Dummy	−0.0006	−0.042
Selling Characteristics		
Days on the Market	−0.003	0.011
August Sale Dummy	−0.0005	0.014*
September Sale Dummy	−0.0005	0.021
October Sale Dummy	0.0035*	0.022*
November Sale Dummy	0.00004	0.010
December Sale Dummy	−0.003	0.016
January Sale Dummy^^^^	0.000	0.003
Constant	–	−0.060

^ HOLC A Category Dummy is base, ^^ Sacramento City SD Dummy is base, ^^^ Zip Code 95819 Dummy is base, and ^^^^ February Sale Dummy is base.

***Indicates statistical significance from zero in a two-tailed test at $p < 0.01$, ** $p < 0.05$, and * $p < 0.10$. Based upon the use of robust regression coefficient standard errors clustered by zip code.

backed mortgage lending until the late 1960s, which are also appropriately labeled as racist in their redlining practices. Even with this understanding, there is value in knowing the pre-1940 perceived risk, which is well established as racist, in determining mortgage lending in a neighborhood. For clear examples of why this characterization of bigotry is apt, see the language cited in reports produced by HOLC evaluators in the appendix.

The empirical test undergone here is whether similar homes in different HOLC-graded neighborhoods sell for a different price in the City of Sacramento 80 years after the neighborhood received its grade. Reported here are detectable long-term effects of the structural racism in the late 1930s in Sacramento City housing sales, mortgages, zoning, and government location of amenities and disamenities in specific neighborhoods. Specifically, over a 13% lower home-price penalty exists for a current sale in a HOLC red or yellowlined neighborhood than a green or bluelined one. The Blinder-Oaxaca decomposition, furthermore, indicates that one third of the current average home price difference of nearly $195,000 is due to unexplained factors not accounted for in the regression model—the legacy of the bigoted practices captured in the HOLC maps offering a reasonable explanation for this.

An empirical accounting of past racism in housing and neighborhood practices is vital because the world is grappling with the realities of racial inequities created and perpetuated by government systems. This study adds to the previous documentation offered by Appel and Nickerson (2016), Aaronson et al. (2021a, 2021b) that 1990 home prices at the Census tract level were, on average, about 5% lower for neighborhoods with a lower HOLC rating relative to an adjacent area with a higher HOLC rating. Such findings offer empirical confirmation that unequal Black-White outcomes in generational wealth observed in the United States today continue to be observed, at least partly due to different starting points attributable to past injustices. This wealth divide occurred due to systematized housing discrimination that prevented Black and other nonwhite Americans from purchasing and acquiring wealth through home equity.

This work is among a few regression-based studies that attempted to isolate this influence. Thus, it adds to the necessary evidence to support public policies designed to build the wealth of Persons of Color whose descendants endured the worst of such racist policies. See "Big Ideas for Racial Equity"[8] for policies often promoted to at least offer partial compensation for the racial wealth and opportunity gaps present in the U.S. These ideas include a 21st century homestead act, baby bonds, education finance reform, ending the war on drugs, financial assistance to entrepreneurs of color, voting rights, free college, guaranteed jobs, workforce investment, and universal health coverage. In addition, it is relevant to consider this study's findings as justification for the further curbing of the ability of local jurisdictions to keep affordable housing out of communities and neighborhoods with the primary interest in doing so through laws, regulation, zoning, and practices meant to preserve the higher residential property values documented here due to past practices (Wassmer & Williams, 2021). Such a curtailment would offer clear benefits to those groups more severely impacted by the structural racism present in previous U.S. private and public housing policies.

The evidence offered here could prove valuable to the national discussion on the desirability of reparations in a direct form to the ancestors of those whose families have lost wealth due to structurally racist and geographically targeted housing practices. In a more indirect form, it is also worth considering the ideas put forth by Rashad (2020) in a call for more conscious "reparative planning." Such planning attempts to offset the economic costs to homeowners of "racial planning" by recognizing the baseline of perpetuating White advantage and property wealth accumulation through traditional planning practices.

Finally, I want to reflect critically on the importance of recognizing the reductionist nature of representing the redlining practices of HOLC through only geographically-coded dichotomous variables and then determining effects through traditional regression analysis. The null hypothesis in such an investigation is "no impact," which mistakenly implies the possibility that structural racism was not harmful, even when we know that it was and still is. Thus, I conclude this research with a call for others to continue to utilize historical data on the clear presence of structural racism in the U.S. through the methods used here. But even more importantly, consider asking different antiracist questions evaluated with different research methodologies.

Notes

1. Amortization, which builds into the monthly payment a reduction in principal and not just interest, is widely used now in residential loans, but not then. A family selling an amortized home loan keeps its equity and thus such a process offers a clear incentive to maintain and further improve an owned home as a way to build wealth.
2. See the Appendix for assessments completed for a sample of Sacramento neighborhoods with one each from a greenlined ("least risk"), bluelined, yellowlined, and redlined ("most risk") designation. Pay particular attention to the comments under "detrimental influences" and "clarifying remarks" for the clear use of the race and ethnicity of residents to make these determinations.
3. Moreover, the practice of covenants in home deeds that prohibited the owner from selling to non-Whites was standard in many White neighborhoods at the same time as the previously described HOLC practices, and even encouraged and implicitly enforced in the Realtor Code of Ethics until the 1970s (McCranie, 2014). These racially restrictive covenants became an integral part of the federal government's discriminatory housing practices as they proved to be successful in segregating neighborhoods and stabilizing the property values of White families (National Association of Realtors, 2018). Of interest to the data examined here, Hernandez (2009) documents that such racial covenants in home deeds were far more likely in Sacramento's green and bluelined neighborhoods.
4. Consider a July 25, 2021 episode of the popular HBO program *Last Week Tonight* with John Oliver that declared HOLC maps as the basis for guiding that agency's decision on home mortgage loan approvals.
5. The *Housing Supplement to the First Series Housing Bulletin for California Sacramento Block Statistics* of the 16th Census of the U.S. 1940 is available at https://catalog.hathitrust.org/Record/003913944.
6. I also repeated this analysis using 2020 data from Sacramento City Census tracts based upon the American Community Survey gathered between 2015 and 2020 for owner reported price paid for their home and the percentage of residents not reporting White-alone as their race/ethnicity. It is interesting to note the differences from the similar 1940 data. More recently the mean percentage nonwhite residents in Sacramento City tracts is 61.5% with a standard deviation of 20.2, and minimum of 21.3% and a maximum of 91.2. Running the simple regression utilizing the log of average sales price for owner-occupied homes as the dependent variable reveals that this reported value now fell by the larger 20% ($p = 0.0009$) for every 10-percentage point increase in nonwhites. Integration is now far greater across Sacramento City neighborhoods, but average neighborhood home prices are more negatively correlated with percentage nonwhite in a neighborhood. For those interested in the current degree of diversity in the entire Sacramento Region look to https://www.sacog.org/sites/main/files/file-attachments/demographic_snapshot.pdf?1622148023.
7. Note that the base category in an included set of dummy variables is in "[]."
8. Available at the website https://www.unumfund.org/policy/big-ideas-for-racial-equity.

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About the author

Robert W. Wassmer is Professor and Vice Chairperson of the Department of Public Policy and Administration at California State University, Sacramento. He is also an Associate Editor of the academic journal Economic Development Quarterly and has previously published in the related areas of local development incentives, urban sprawl, housing foreclosure, housing short-term rentals, and the causes and consequences of a lack of housing affordability.

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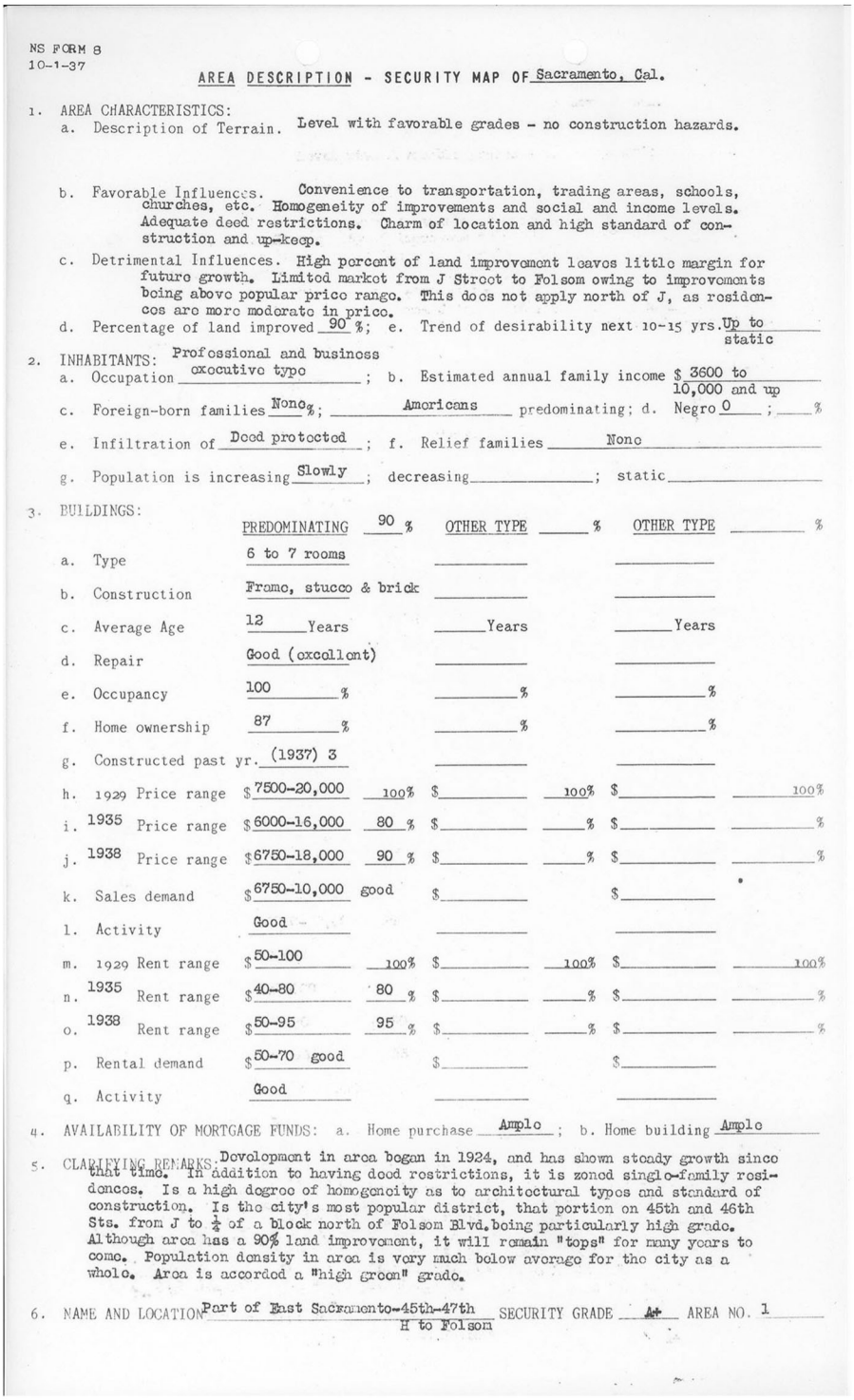
Appendix



NS FORM 8
10-1-37

AREA DESCRIPTION - SECURITY MAP OF Sacramento, Cal.

1. AREA CHARACTERISTICS:
   a. Description of Terrain. Level with favorable grades - no construction hazards.
   b. Favorable Influences. Convenience to transportation, trading areas, schools, churches, etc. Homogeneity of improvements and social and income levels. Adequate deed restrictions. Charm of location and high standard of construction and up-keep.
   c. Detrimental Influences. High percent of land improvement leaves little margin for future growth. Limited market from J Street to Folsom owing to improvements being above popular price range. This does not apply north of J, as residences are more moderate in price.
   d. Percentage of land improved 90 %; e. Trend of desirability next 10-15 yrs. Up to static

2. INHABITANTS:
   a. Occupation Professional and business executive type; b. Estimated annual family income $ 3600 to 10,000 and up
   c. Foreign-born families None %; Americans predominating; d. Negro 0 ; %
   e. Infiltration of Deed protected; f. Relief families None
   g. Population is increasing Slowly; decreasing ; static

3. BUILDINGS:

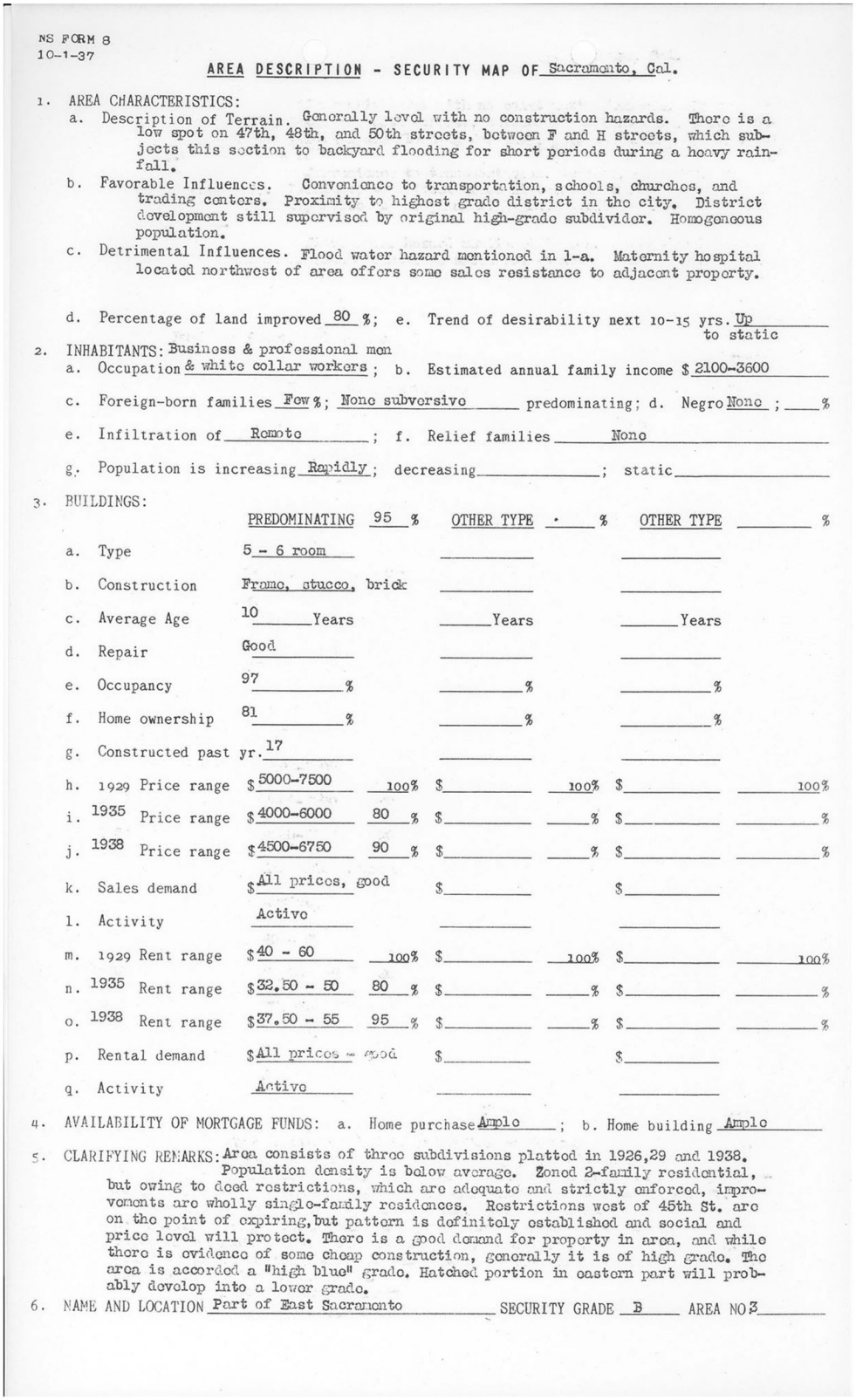
		PREDOMINATING 90 %		OTHER TYPE %		OTHER TYPE %	
a.	Type	6 to 7 rooms					
b.	Construction	Frame, stucco & brick					
c.	Average Age	12 Years		Years		Years	
d.	Repair	Good (excellent)					
e.	Occupancy	100 %		%		%	
f.	Home ownership	87 %		%		%	
g.	Constructed past yr.	(1937) 3					
h.	1929 Price range	$ 7500-20,000	100%	$	100%	$	100%
i.	1935 Price range	$ 6000-16,000	80 %	$	%	$	%
j.	1938 Price range	$ 6750-18,000	90 %	$	%	$	%
k.	Sales demand	$ 6750-10,000 good		$		$	
l.	Activity	Good					
m.	1929 Rent range	$ 50-100	100%	$	100%	$	100%
n.	1935 Rent range	$ 40-80	80 %	$	%	$	%
o.	1938 Rent range	$ 50-95	95 %	$	%	$	%
p.	Rental demand	$ 50-70 good		$		$	
q.	Activity	Good					

4. AVAILABILITY OF MORTGAGE FUNDS: a. Home purchase Ample; b. Home building Ample

5. CLARIFYING REMARKS. Development in area began in 1924, and has shown steady growth since that time. In addition to having deed restrictions, it is zoned single-family residences. Is a high degree of homogeneity as to architectural types and standard of construction. Is the city's most popular district, that portion on 45th and 46th Sts. from J to ½ of a block north of Folsom Blvd. being particularly high grade. Although area has a 90% land improvement, it will remain "tops" for many years to come. Population density in area is very much below average for the city as a whole. Area is accorded a "high green" grade.

6. NAME AND LOCATION Part of East Sacramento-45th-47th H to Folsom SECURITY GRADE A+ AREA NO. 1

Figure A1. Documentation for Green-rated A1 Sacramento Neighborhood. Note: All appendix figures are available at Nelson et al. (2021).



NS FORM 8
10-1-37

AREA DESCRIPTION - SECURITY MAP OF Sacramento, Cal.

1. AREA CHARACTERISTICS:
   a. Description of Terrain. Generally level with no construction hazards. There is a low spot on 47th, 48th, and 50th streets, between F and H streets, which subjects this section to backyard flooding for short periods during a heavy rainfall.
   b. Favorable Influences. Convenience to transportation, schools, churches, and trading centers. Proximity to highest grade district in the city. District development still supervised by original high-grade subdivider. Homogeneous population.
   c. Detrimental Influences. Flood water hazard mentioned in 1-a. Maternity hospital located northwest of area offers some sales resistance to adjacent property.

   d. Percentage of land improved 80 %; e. Trend of desirability next 10-15 yrs. Up to static

2. INHABITANTS: Business & professional men
   a. Occupation & white collar workers; b. Estimated annual family income $ 2100-3600
   c. Foreign-born families Few %; None subversive predominating; d. Negro None ; %
   e. Infiltration of Remote; f. Relief families None
   g. Population is increasing Rapidly; decreasing ; static

3. BUILDINGS:

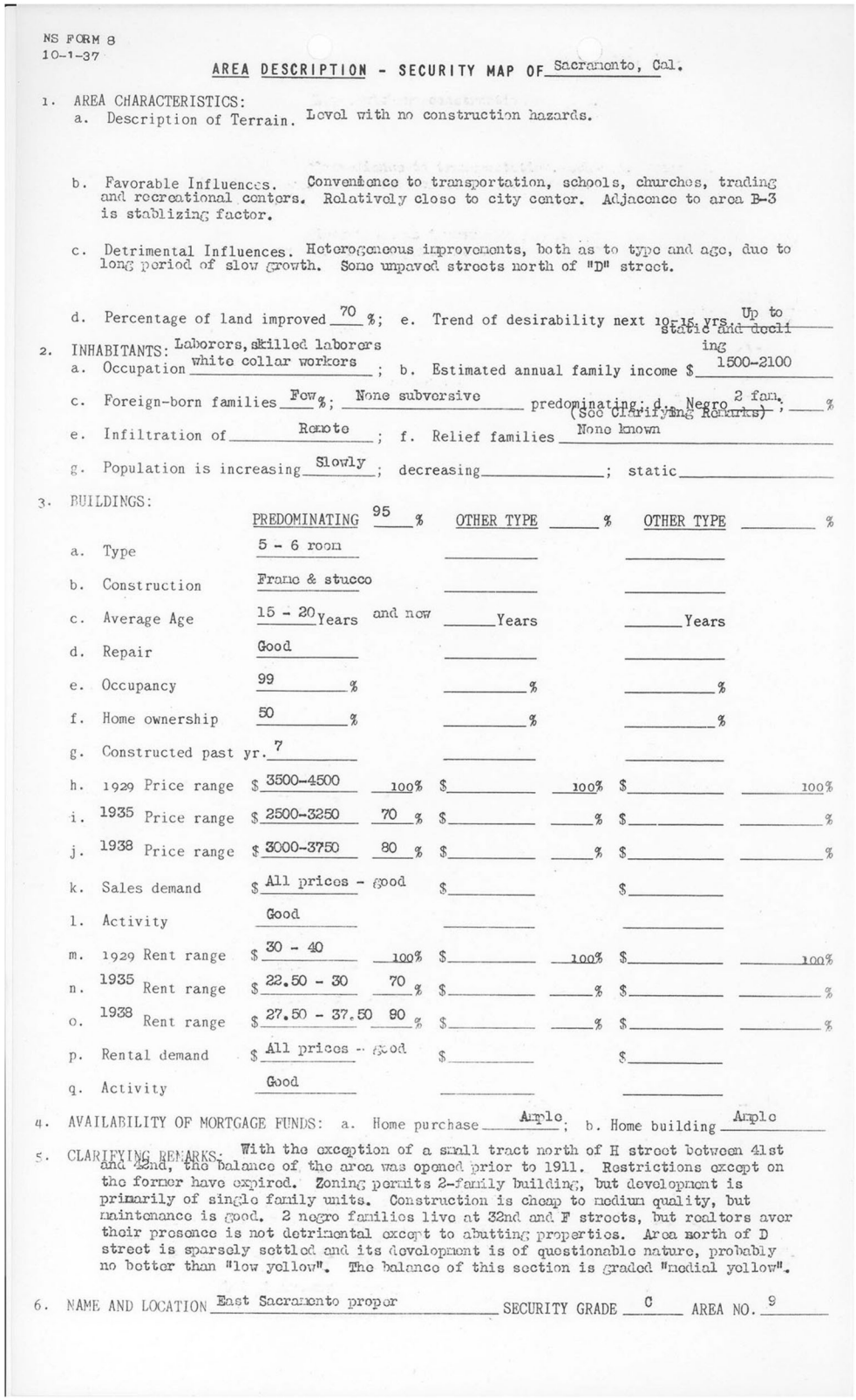
	PREDOMINATING 95 %		OTHER TYPE · %		OTHER TYPE %	
a. Type	5 - 6 room					
b. Construction	Frame, stucco, brick					
c. Average Age	10 Years		Years		Years	
d. Repair	Good					
e. Occupancy	97 %		%		%	
f. Home ownership	81 %		%		%	
g. Constructed past yr.	17					
h. 1929 Price range	$ 5000-7500	100%	$	100%	$	100%
i. 1935 Price range	$ 4000-6000	80 %	$	%	$	%
j. 1938 Price range	$ 4500-6750	90 %	$	%	$	%
k. Sales demand	$ All prices, good		$		$	
l. Activity	Active					
m. 1929 Rent range	$ 40 - 60	100%	$	100%	$	100%
n. 1935 Rent range	$ 32.50 - 50	80 %	$	%	$	%
o. 1938 Rent range	$ 37.50 - 55	95 %	$	%	$	%
p. Rental demand	$ All prices - good		$		$	
q. Activity	Active					

4. AVAILABILITY OF MORTGAGE FUNDS: a. Home purchase Ample; b. Home building Ample

5. CLARIFYING REMARKS: Area consists of three subdivisions platted in 1926,29 and 1938. Population density is below average. Zoned 2-family residential, but owing to deed restrictions, which are adequate and strictly enforced, improvements are wholly single-family residences. Restrictions west of 45th St. are on the point of expiring, but pattern is definitely established and social and price level will protect. There is a good demand for property in area, and while there is evidence of some cheap construction, generally it is of high grade. The area is accorded a "high blue" grade. Hatched portion in eastern part will probably develop into a lower grade.

6. NAME AND LOCATION Part of East Sacramento SECURITY GRADE B AREA NO 3

Figure A2. Documentation for Blue-rated B3 Sacramento Neighborhood.



NS FORM 8
10-1-37

AREA DESCRIPTION - SECURITY MAP OF Sacramento, Cal.

1. AREA CHARACTERISTICS:
   a. Description of Terrain. Level with no construction hazards.

   b. Favorable Influences. Convenience to transportation, schools, churches, trading and recreational centers. Relatively close to city center. Adjacence to area B-3 is stablizing factor.

   c. Detrimental Influences. Heterogeneous improvements, both as to type and age, due to long period of slow growth. Some unpaved streets north of "D" street.

   d. Percentage of land improved 70 %; e. Trend of desirability next 10-15 yrs. Up to static and declining

2. INHABITANTS: a. Occupation Laborers, skilled laborers white collar workers; b. Estimated annual family income $ 1500-2100

   c. Foreign-born families Few %; None subversive predominating; d. Negro 2 fam. (See Clarifying Remarks); ___ %

   e. Infiltration of Remote; f. Relief families None known

   g. Population is increasing Slowly; decreasing ___; static ___

3. BUILDINGS:

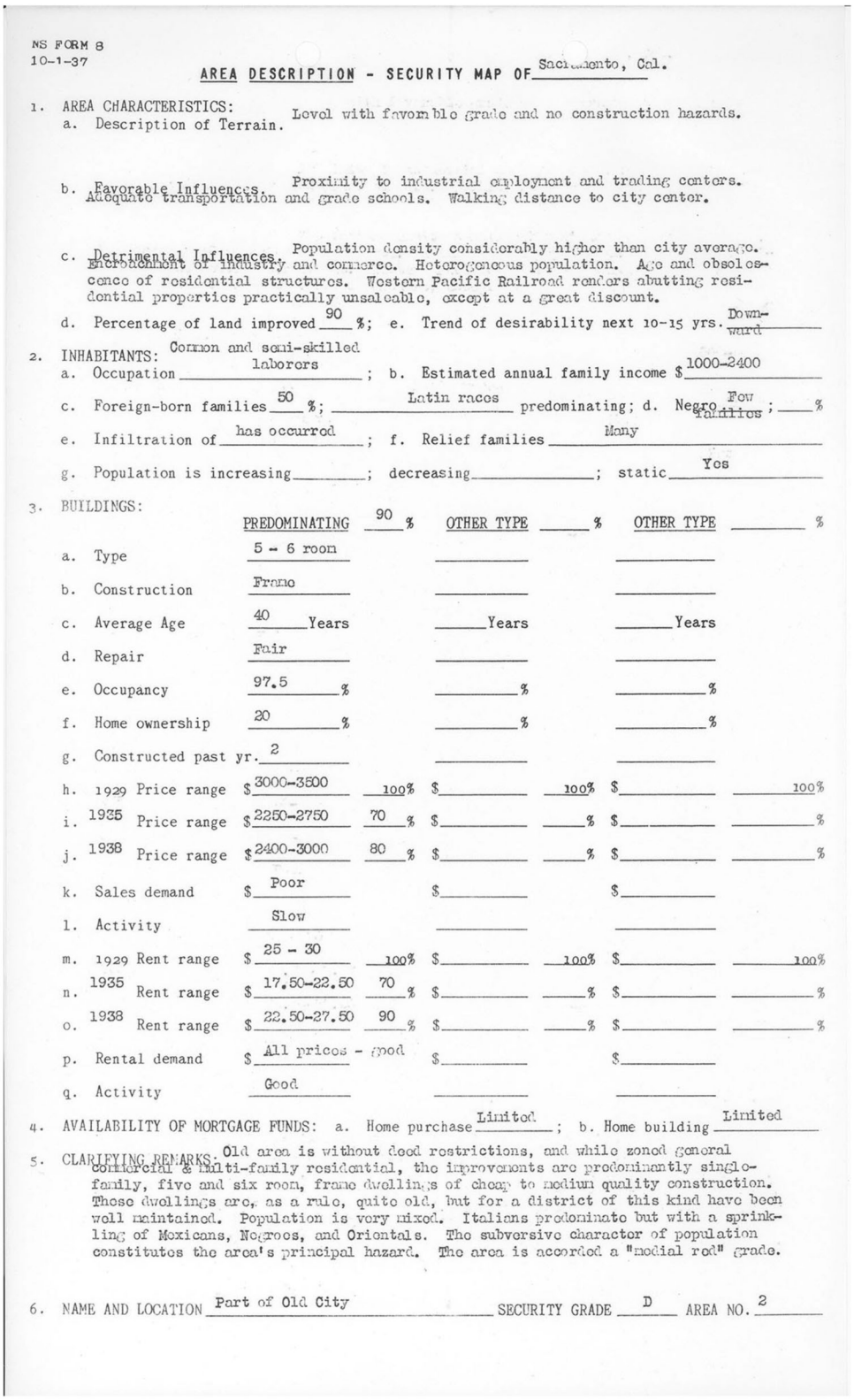
	PREDOMINATING 95 %		OTHER TYPE ___ %		OTHER TYPE ___ %	
a. Type	5 - 6 room					
b. Construction	Frame & stucco					
c. Average Age	15 - 20 Years	and new	___ Years		___ Years	
d. Repair	Good					
e. Occupancy	99 %		___ %		___ %	
f. Home ownership	50 %		___ %		___ %	
g. Constructed past yr.	7					
h. 1929 Price range	$ 3500-4500	100%	$ ___	100%	$ ___	100%
i. 1935 Price range	$ 2500-3250	70 %	$ ___	___ %	$ ___	___ %
j. 1938 Price range	$ 3000-3750	80 %	$ ___	___ %	$ ___	___ %
k. Sales demand	$ All prices - good		$ ___		$ ___	
l. Activity	Good					
m. 1929 Rent range	$ 30 - 40	100%	$ ___	100%	$ ___	100%
n. 1935 Rent range	$ 22.50 - 30	70 %	$ ___	___ %	$ ___	___ %
o. 1938 Rent range	$ 27.50 - 37.50	90 %	$ ___	___ %	$ ___	___ %
p. Rental demand	$ All prices - good		$ ___		$ ___	
q. Activity	Good					

4. AVAILABILITY OF MORTGAGE FUNDS: a. Home purchase Ample; b. Home building Ample

5. CLARIFYING REMARKS: With the exception of a small tract north of H street between 41st and 42nd, the balance of the area was opened prior to 1911. Restrictions except on the former have expired. Zoning permits 2-family building, but development is primarily of single family units. Construction is cheap to medium quality, but maintenance is good. 2 negro families live at 32nd and F streets, but realtors aver their presence is not detrimental except to abutting properties. Area north of D street is sparsely settled and its development is of questionable nature, probably no better than "low yellow". The balance of this section is graded "medial yellow".

6. NAME AND LOCATION East Sacramento proper SECURITY GRADE C AREA NO. 9

Figure A3. Documentation for Yellow-rated C9 Sacramento Neighborhood.



NS FORM 8
10-1-37

AREA DESCRIPTION - SECURITY MAP OF Sacramento, Cal.

1. AREA CHARACTERISTICS:
   a. Description of Terrain. Level with favorable grade and no construction hazards.
   b. Favorable Influences. Proximity to industrial employment and trading centers. Adequate transportation and grade schools. Walking distance to city center.
   c. Detrimental Influences. Population density considerably higher than city average. Encroachment of industry and commerce. Heterogeneous population. Age and obsolescence of residential structures. Western Pacific Railroad renders abutting residential properties practically unsaleable, except at a great discount.
   d. Percentage of land improved 90 %; e. Trend of desirability next 10-15 yrs. Downward

2. INHABITANTS:
   a. Occupation Common and semi-skilled laborers; b. Estimated annual family income $1000-2400
   c. Foreign-born families 50 %; Latin races predominating; d. Negro Few families; ___ %
   e. Infiltration of has occurred; f. Relief families Many
   g. Population is increasing ____; decreasing ____; static Yes

3. BUILDINGS:

	PREDOMINATING 90 %		OTHER TYPE ___ %		OTHER TYPE ___ %	
a. Type	5 - 6 room					
b. Construction	Frame					
c. Average Age	40 Years		___ Years		___ Years	
d. Repair	Fair					
e. Occupancy	97.5 %		___ %		___ %	
f. Home ownership	20 %		___ %		___ %	
g. Constructed past yr.	2					
h. 1929 Price range	$3000-3500	100%	$	100%	$	100%
i. 1935 Price range	$2250-2750	70 %	$	%	$	%
j. 1938 Price range	$2400-3000	80 %	$	%	$	%
k. Sales demand	$ Poor		$		$	
l. Activity	Slow					
m. 1929 Rent range	$ 25 - 30	100%	$	100%	$	100%
n. 1935 Rent range	$ 17.50-22.50	70 %	$	%	$	%
o. 1938 Rent range	$ 22.50-27.50	90 %	$	%	$	%
p. Rental demand	$ All prices - good		$		$	
q. Activity	Good					

4. AVAILABILITY OF MORTGAGE FUNDS: a. Home purchase Limited; b. Home building Limited

5. CLARIFYING REMARKS: Old area is without deed restrictions, and while zoned general commercial & multi-family residential, the improvements are predominantly single-family, five and six room, frame dwellings of cheap to medium quality construction. These dwellings are, as a rule, quite old, but for a district of this kind have been well maintained. Population is very mixed. Italians predominate but with a sprinkling of Mexicans, Negroes, and Orientals. The subversive character of population constitutes the area's principal hazard. The area is accorded a "modial red" grade.

6. NAME AND LOCATION Part of Old City SECURITY GRADE D AREA NO. 2

Figure A4. Documentation for Red-rated D5 Sacramento Neighborhood.