Impact of Innovative Financing Tools on the Production of In-fill Housing and Reduction in Vehicle Miles Traveled

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Abstract

This white paper examines the relative potential of three housing finance programs: an employer-assisted housing (EAH) partnership program in the form of a construction grant, a loan loss guarantee program (LGP), and a pre-development revolving loan fund (PDRLF) to support construction of infill housing in California, particularly focusing on transit-oriented developments (TODs), in order to advance State of California (hereafter referred to as State) policy goals including reducing vehicle miles traveled (VMT) and providing affordable housing. It includes a literature review, case studies, and interviews with developers, policy experts, and program administrators to highlight key features, models, opportunities, and challenges of these programs, and assess the feasibility of the programs' end-user adoption in California.

The paper also estimates the relative housing production potential and VMT reduction from a hypothetical $100 million State investment in each program, including by leveraging additional private funds. An order of magnitude analysis, where a factor of 10 equals one order of magnitude, is used to ascertain each program's relative housing production and VMT reduction potential. The paper uses existing VMT reduction models to estimate VMT reduction resulting from each program relative to a baseline of a regional comparator—a single-family house affordable to a household earning median income for that region.

Findings indicate that all three housing finance programs—PDRLF, LGP, and EAH—support a similar number of housing units and VMT reduction, that is, the housing units and VMT reduction vary by less than a factor of 10 across the three programs. The EAH program, while valuable, is harder to implement. EAH projects are often not eligible for federal housing assistance because they violate fair housing requirements. So, any support for EAH should be robust enough to obviate the need for such federal assistance. Additionally, the State may have to expand the existing carve-outs (such as those for farmworker and school employees' housing) to allow local and State funding for EAH—a politically challenging task.

From an equity perspective, both PDRLF and LGPs can be very beneficial for small developers that are often led by BIPOC and minority community members. Many such developers are mission-driven organizations, such as churches, that know the local community's housing needs well and are able to provide housing for hard-to-reach populations. On the other hand, EAH programs can be critical to build workforce housing. The programs need to serve low-income, minority, and underserved communities proactively. For that, they need to be flexible. For example, they could allow rolling applications and not impose onerous requirements on the applicants and assistance recipients. Furthermore, they could assume a secondary lien position, choose local and regional organizations—such as housing trusts and Community Development Financial Institutions (CDFIs) to implement the program—and take into account local and regional variations, including real estate market conditions. Finally, they could reach diverse pools of real estate developer and lenders, and provide technical assistance to the developer-applicant.

The State can play a crucial role by funding and recapitalizing the loan and guarantee pools, offering technical assistance, and providing incentives for leveraging these programs.

The paper concludes that further research is needed for PDRLFs, LGPs, and EAHPs due to their comparable housing and VMT outcomes, from an order of magnitude perspective. That is, the VMT reductions achieved and housing units supported do not vary by more than a factor of 10. The paper emphasizes the importance of serving low-income, minority, and underserved communities. Future work should refine methodologies, collect primary data, and run regional VMT models to obtain detailed estimates of housing assistance and VMT reduction, considering post-COVID changes in household type, location preferences, and travel behaviors.

Executive Summary

Background

The provision of affordable housing in infill areas, including projects such as transit-oriented developments (TODs), meets two State objectives of reducing per capita vehicle miles traveled (VMT) and providing affordable housing (Boarnet et al., 2017; Hymel, 2014). However, given the high land values and construction costs, affordable housing needs deep subsidies in California, and the need is vast. More than a third of California households are housing cost burdened (that is, housing expenditures comprise more than 30% of their household income) and as per the latest (2023-2031) regional housing needs allocation, there is a need to develop 2.5 million housing units statewide, of which a little over one million need to be affordable to low- and very low-income households (CA HCD, 2022).

This white paper explores innovative ways to fund affordable infill housing, including, but not limited to, higher-density housing close to transit. Moreover, since public funds are not likely enough to meet statewide housing production goals and needs, tools that leverage private funds are desirable. Specifically, the paper examines the relative housing production and VMT reduction potential of the following three housing finance programs that the State could employ to help boost infill housing: an employer-assisted housing (EAH) partnership program, a loan loss guarantee program (LGP), and a pre-development revolving loan fund (PDRLF). These three tools were identified for analysis from prior conversations over many years among State policymakers and housing practitioners (for example, developers, lenders, and affordable housing advocates) about the various hurdles to affordable infill housing development and their potential solutions. All three were selected in part because of their potential to offer high impact for relatively low up-front investment from the State. These efficiencies are particularly attractive in times of State budget deficit.

Objectives and Methods

The specific objectives of this white paper are as follows:

a) Identify and discuss the key features, models, opportunities, and challenges associated with an EAH partnership program, a LGP, and a PDRLF;
b) Conduct a comparative estimate of the magnitude of housing units produced from a hypothetical $100 million State investment in each of these programs, including by leveraging additional private funds;
c) Explore the feasibility of end-user adoption of these three housing programs to produce affordable housing in California; and
d) Estimate the likely relative scale of VMT reduction resulting from each financing program. Note that the scale of VMT reduction is relative to a baseline of a regional comparator—a single-family house affordable to a household earning median income for that region.

To meet objectives b) and d), we conducted an order of magnitude analysis, where a factor of 10 equals one order of magnitude, to ascertain each program's relative housing production and VMT reduction potential.

To meet objectives a) and c), we conducted an in-depth review of the literature, including academic journals, industry reports, and government publications. We complemented the

literature review with several case studies to provide practical insights into each program's implementation and conducted semi-structured interviews with key stakeholders such as housing developers, policy experts, and program administrators. These interviews gathered qualitative data on practical challenges, opportunities, and the feasibility of implementing these programs in California. Finally, to further meet objective c), we interviewed real estate developers (especially small new minority developers) and experts to assess the feasibility of end-user adoption of these housing finance tools. Among others, we looked for information about the feasibility of these tools to support infill housing that meets local needs, how the state and federal governments can support these tools, the types of legislative changes that might be needed to increase the chances of tools' adoption, and the kinds of factors that enhance or impede the tools' adoption.

We developed several prototypes of the three housing programs and gathered data on the dollar amount of the per housing unit assistance that needs to be provided by each of the three housing finance programs for each of the 10 US Census regions of California to estimate the total number of units that can be supported through a hypothetical $100 million investment in each of the programs. Finally, we reviewed several existing VMT calculation models and employed four of them to estimate the total VMT reduction potential of these programs.

Results

This white paper has three key findings. First, the number of housing units supported and VMT reduction realized is similar from an order of magnitude perspective when using PDRLF, LGP, and EAH. Second, the EAH program is challenging to implement. EAH projects are often not eligible for federal housing assistance because they violate fair housing requirements. So, any support for EAH should be robust enough to obviate the need for such federal assistance. Additionally, the State may have to expand the existing carve-outs (such as those for farmworker and school employees' housing) to allow local and State funding for EAH—a politically challenging task. However, it is a very valuable funding source because while the other programs are just one among the several sources of affordable housing assistance, EAH has the potential to be a major new source of housing assistance. Finally, from an equity perspective, both PDRLF and LGPs can be very beneficial for small developers that are often led by BIPOC and minority community members. Many such developers are mission-driven organizations, such as churches, that know the local community's housing needs well and are able to provide housing for hard to reach populations. On the other hand, EAH programs can be critical to build workforce housing..

Conclusion

All three housing finance programs, PDRLF, LGP, and EAH, merit further research because they support similar amounts of housing units and lead to similar VMT reductions. That is, the VMT reductions achieved and housing units supported do not vary by more than a factor of 10. Furthermore, the programs need to serve low-income, minority, and underserved communities proactively. For that, they need to be flexible; for example, allow rolling applications and not impose onerous requirements on the applicants and assistance recipients, assume secondary lien positions, choose local and regional organizations such as housing trusts and community development financial institutions (CDFIs) to implement the program, and take into account local and regional variations, including real estate market conditions; reach diverse pools of real estate developer and lenders; and provide technical assistance to the developer-applicant. The State government has a critical role to play. It can help fund and recapitalize the loan (for

PDRFL) and guarantee (for LGP) pool, award grants to support EAHPs, and provide technical assistance to the program applicants and incentives for leveraging these programs—for example, incentivize households to reduce the number of personal vehicles and encourage small developers to leverage loan guarantees to strike a better bargain with the large developers when working with them to develop housing projects.

Finally, this white paper conducted an order of magnitude analysis. Future work could refine the methodologies developed in this paper, collect primary data, and run regional VMT models to arrive at finer-grained estimates of housing assistance and VMT reduction, considering the post-COVID household location choices and travel behavior. Work on the more precise estimation of VMT with post-COVID data that aims explicitly at estimating the change in VMT resulting from housing type/location choice is especially important. VMT is complex to measure and estimate, and the scope of this work is limited to VMT estimation using existing models found in the literature that were developed with varied assumptions and objectives.

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Chapter 1. Introduction

The provision of affordable housing in infill areas, including projects such as transit-oriented developments (TODs), meets the dual State of California (hereafter referred to as State) objectives of reducing per capita vehicle miles traveled (VMT) and providing affordable housing (Boarnet et al., 2017; Hymel, 2014). However, given the high land values and construction costs, affordable housing needs deep subsidies in California, and the need is vast. More than a third of California households are housing cost burdened (that is, housing expenditures comprise more than 30% of their household income), and although various national, state, and local programs fund affordable housing, the need is greater than available funding. As per the latest (2023-2031) regional housing needs allocation, there is a need to develop 2.5 million housing units statewide, of which little over one million need to be affordable to low- and very low-income households (CA HCD, 2022).

This white paper explores innovative ways to fund affordable infill housing, including, but not limited to, higher-density housing close to transit. Moreover, since public funds are not likely to be enough, tools that leverage private funds are desirable. Specifically, the paper examines the relative housing production and VMT reduction potential of the following three housing finance tools that the State could employ to help boost infill housing: an employer-assisted housing (EAH) partnership program; a loan loss guarantee program (LGP); and a pre-development revolving loan fund (PDRLF).

Through EAH programs, employers seek to provide affordable homeownership or rental housing to their employees. These programs can be demand- or supply-side programs, or a mix of these approaches. The demand-side programs that promote homeownership financially assist employees with closing costs, down payment assistance, below-market interest mortgages, loan guarantees, or forgivable second loans. On the rental side, EAH programs can offer assistance in finding and securing rental housing and/or provide financial assistance with security deposit and rental costs. The supply side EAHPs add to the housing stock through tools such as the guaranteed purchase of housing units from developers, land donation or sale for a reduced price, participation in land banks, contributions to loan pools, construction financing or guarantees, government grants, low-income housing tax credit (LIHTC) investment, donation of services (for example, engineering, architectural, accounting and legal services), master lease agreements, and housing advocacy. These programs are more likely to be employed in areas with tight real estate markets where the demand side approaches could worsen housing affordability further or when the supply of higher quality housing is used as part of a broader neighborhood revitalization strategy (Fischer et al., 2021; Gunderson, 2007; HWF and MPC, 2007; Local Housing Solutions, n.d.; NPHS, 2017; Pill, 2000; PolicyLink, 2007; Schwartz and Hoffman, 1990; Sturtevant, 2019; Treuhaft, 2007). Since this white paper focuses on finding ways to support housing supply, the rest of the paper focuses on the supply side EAHPs.

In a real estate LGP, a guarantor partially or fully guarantees a real estate project's construction and/or permanent loan, thereby reducing several real estate development risks for lenders. These risks include market risk (softening of real estate market), credit risk (loans to low credit borrowers), leverage risk (loans made to borrowers with high loan-to-value ratios), and project

risk (a project type that is unfamiliar to and perceived by traditional lenders as new or risky, such as a mixed-use TOD with low/no parking requirement).

A PDRLF helps affordable housing developers obtain high-risk and difficult-to-access capital to conduct essential pre-development activities before they can approach lenders or government agencies for financial support. These activities include site identification, site control, legal fees, financial applications (such as tax credit applications), market feasibility analysis, and building design and permits. Predevelopment activities impact project feasibility. While essential to the development process, predevelopment activities are difficult to finance due to the chance that the project will not come to fruition. The risk increases if the real estate product type is new for the market (for example, a mixed-used TOD) or the site needs in-depth due diligence (for example, a brownfield infill site). Because risk-averse lenders are typically reluctant to lend for pre-development activities, many projects get delayed or are not funded at all; hence the utility of a pre-development revolving loan fund.

1.1 Research Objectives

The specific objectives of this white paper are as follows:

a. Identify and discuss the key features, models, opportunities, and challenges associated with an EAH partnership program, a LGP, and a PDRLF;
b. Conduct a comparative estimate of the magnitude of housing units produced from a hypothetical $100 million State investment in each of these programs, including by leveraging additional private funds;
c. Explore the feasibility of end-user adoption of these three housing programs to produce affordable housing in California; and
d. Estimate the likely relative scale of VMT reduction resulting from each financing program. Note that the scale of VMT reduction is relative to a baseline of a regional comparator—a single-family house affordable to a household earning median income for that region.

1.2 Study Methodology

The estimation techniques developed for meeting objectives b) and d) develop rough, not precise, estimates to support a "first cut" look at these programs' relative feasibility of supporting the production of affordable housing and reduction of VMT with the expectation that detailed feasibility analysis would be conducted if one or more of these tools are considered worthy of future investigation. Therefore, we conducted an order of magnitude analysis, where a factor of 10 equals one order of magnitude, to ascertain each program's relative housing production and VMT reduction potential.

Specifically, we implemented a two-step methodology to meet objectives a) through c).

1.2.1: Step 1: Literature Review, Case Studies, and Interviews for Objectives a) and c)

We conducted an in-depth review of literature, including academic journals, industry reports, government publications, and case studies, to develop a deeper understanding of each program, including the key desired features, target beneficiaries, existing models, and design/implementation nuances; and research the opportunities and challenges for implementing each program in California, especially those related to the likelihood of the programs' adoption and their ability to increase the supply of affordable infill housing. We especially focused on how equity can be enhanced in the design and implementation of these programs.

Complementing the literature review, we developed several case studies to provide practical insights into each program's implementation and conducted semi-structured interviews with key stakeholders such as housing developers, policy experts, and program administrators. These interviews gathered qualitative data on practical challenges, opportunities, and the feasibility of implementing these programs in California.

Finally, to further meet objective c), we interviewed real estate developers (especially small new minority developers) and experts to assess the feasibility of end-user adoption of these housing finance tools. Among others, we looked for information about the feasibility of these tools to support infill housing that meets local needs, how the state and federal governments can support these tools, the types of legislative changes that might be needed to increase the chances of these tools' adoption, and the kinds of factors that enhance or impede the tools' adoption (for example, EAH programs are likely to be effective when the local real estate market is so tight that it impedes employee recruitment and retention; and small, minority developers are more likely to benefit from PDRLF and LGP compared to large developers).

We undertook Steps 2 and 3 to meet objectives b) and d).

1.2.2: Step 2: Prototype Development

We assumed that PDRLF-and LGP-supported housing would be developed in infill locations in areas zoned for higher residential densities, often in or close to downtowns and transit stations. Therefore, we used cities' general plans and zoning maps to identify infill locations in or close to the downtown of a major city in each region (for example, San Luis Obispo for the Central Coast Region) zoned for high-density residential or mixed uses and within ½ mile (preferably ¼ mile) of a transit station. Many were actual sites where affordable housing was developed, for example, Legacy Square Apartments in downtown Santa Ana in the Orange County Region. Such locations were identified for each of the State's ten regions (the regions are as per the US Census). For the EAH, the place of employment is assumed to be located in a suburban location, often right outside the downtown, because this where most of the large employers were located for the case study infill sites. For example, Santa Ana High School is located at the periphery of downtown Santa Ana. The employee housing is assumed to be located at a 3-mile distance from the place of employment.

Other key assumptions included the geographic distribution of a hypothetical $100 million State investment based on the proportion of the region's population share, types of income levels served based on information obtained from interviews with developers, and loan terms, interest

rates, land costs, and donation/lease scenarios through literature review and expert interviews. Our real estate consultant provided crucial insights, validated our assumptions, assisted in refining the prototypes, and ensured the accuracy of the financial estimates and loan terms.

We also used data from recently funded LIHTC projects to estimate per acre land costs, per square foot residential construction costs, construction type, and project density for the PDRLF-, and LGP-supported housing in each of the 10 California regions.

Finally, based on advice from real estate developers, experts, and the study's real estate consultant, we developed two prototypes each for PDRFL- and LPG-supported housing and one for EAH.

For the PDRLF-supported housing, the two prototypes are a) a PDRLF that funds all predevelopment activities except land acquisition, and b) a PDRLF that also funds land acquisition. Our case studies and literature review showed that these two types of PDRLF programs are most in use. For LGP, too, we developed two prototypes: a) loan guarantee for permanent financing covering a 10-year term, and b) 50% of the loan guarantee pool covers construction for five years, and the remaining 50% guarantees permanent financing for ten years. These prototypes were suggested by real estate developers and the study's real estate consultant.

Finally, the State support for EAH was assumed to be in the form of a construction grant given during the first year of project initiation. Real estate developers suggested the need for a simple EAH assistance, such as a grant. Furthermore, they noted that a long-term soft loan (for example a residual receipts loan with repayment required only if the borrower is able to cover operating expenses and other debt service) works similarly to a grant. Finally, many forms of EAH assistance, such as below-market loans and state tax credits, needed to be converted to a grant-equivalent for estimating their potential to support EAH anyway.

1.2.3: Step 3: Housing Production and VMT Reduction Estimation

Next, we gathered data on the dollar amount of the per-housing-unit assistance that needs to be provided by each of the three housing finance programs for each of the 10 U.S. Census regions of California to estimate the total number of units that can be supported through a hypothetical $100 million investment in each of the programs over a 30-year period. Chapter 3 provides detailed calculations for the number of housing units supported through each housing program prototype.

Finally, we reviewed several existing VMT calculation models and employed them to estimate these programs' total VMT reduction potential for each of these ten regions. Specifically, these models include those developed for estimating household-level VMT using California data and data from other parts of North America and a tool developed by Fehr and Peers using location-based data (VMT+). Then, these models were applied to estimate the VMT reduction potential of the three housing finance programs. For this, the per-household VMT produced by a regional comparator house and the infill housing prototype developed using PDLRF and LGP were identified to estimate and compare VMT reductions. The regional comparators were selected to be in a neighborhood of single-family homes, representing a base case scenario where the single-family houses affordable to a household earning median income for that region are expected to

develop without any incentives and/or subsidies. These locations are often at the periphery of the urbanized areas. The infill prototypes were selected as infill sites in zones of higher density and closer to downtown; many are TODs (a few are not because the transit service does not exist or the infill sites are more than half a mile from a transit station). For the EAH program, the "infill" housing was located within a certain distance (3 miles each way trip) of the employer for one of the adult household members (a household of three with two employed adults is assumed). The employer was assumed to be located in a suburban location, often right outside the downtown.

The per-household annual VMT reduction was annualized and then multiplied by the number of housing units supported by each tool for each region over 30 years. These 30-year total VMT reductions were compared across the three housing programs to assess the comparative VMT reduction potential of the three housing finance programs.

The housing production numbers are combined with the per household VMT reduction relative to a baseline of a regional comparator—a single-family house affordable to a household earning median income for that region. The relative VMT impact of various housing developments is estimated using robust statistical models as well as an off-the-shelf tool, VMT+, developed by Fehr and Peers using Streetlight data. While VMT+ tool is not capable of looking at household characteristics such as income or vehicle ownership, it still has the utility of being more readily applicable by practitioners. Output from these models/tools is an estimate of the VMT reduced for a single household in each of the 10 regions of the state relative to the same HH living in the regional comparator housing. Note that the household is a synthetic household based on the median demographic characteristics of each of the 10 regions. Income and vehicle-ownership sensitivity of per household VMT reduction is also analyzed. The per household VMT reduction for the synthetic household is then scaled based on the number of housing units produced.

Chapter 2. Literature Review

The literature review is divided into two sections. Section 1 reviews literature related to the three housing finance programs, focusing on the need for the programs, their features, how equity is considered in their design and implementation, the role various levels of governments play, and the programs' pros and cons. Although this section primarily focuses on housing-related use of these tools, LGPs to support small businesses are reviewed as well given their extensive use and potential to provide insights for housing-focused LGPs.

Section 2 focuses on the literature relevant to household VMT as a function of five D variables, i.e., Density, Design, Diversity of Land Use, Destination Accessibility, and Distance to Transit. We examined the elasticity of different variables to VMT reported in the literature and then used the findings from the literature to identify the most appropriate approach to estimate VMT reduction resulting from a household moving from a suburban location to another location where the housing is financed by one of the three financing programs in question.

2.1 Literature Review: LGPs, EAHPs, and PDRLs

2.1.1: Loan Guarantee Programs (LGPs)

2.1.1.1: Need for LGPs

Market failure, specifically the inability of the private sector to allocate loans efficiently, provides the economic basis for public sector-sponsored lending or LGPs. The failure occurs due to a few reasons. Information asymmetry—when the borrowers know more about their projects than the lenders—leaves lenders unable to assess the loan risk accurately. This is likely to happen in the case of infill affordable housing projects undertaken by small, local, community-based developers, where the lenders may have less knowledge about the project compared to the real estate developers. This inability causes adverse selection and moral hazard problems. Adverse selection results when, even though the borrowers are willing to pay a high interest rate, banks are unwilling to lend due to their perception of the riskiness of the project. Moral hazard occurs when the high interest rate leads borrowers to undertake more risky projects (the interest rate a borrower pays impacts their investment decision). Thus, credit demand exceeds supply because the lenders ration the credit, that is, do not lend even when borrowers are willing to pay the prevailing market interest for that project class (Camino and Cardone, 1999; Craig et al., 2005; Li, 1998; Orzechowski, 2020). Second, if lenders monopolize financial markets, they can influence interest rates (Haynes, 1996).

Several factors may reduce credit rationing, including strong relationships between lenders and borrowers (Berger and Udell, 1995; Petersen and Rajan, 1994) and borrowers obtaining multiple products from the lenders—for example, checking and savings accounts (Petersen and Rajan, 1994).

Loan guarantees reduce credit rationing in three ways. First, by protecting the lenders against loan defaults, the guarantees increase the lenders' expected return on these loans and address the adverse selection problem. Second, to the extent the loan guarantees reduce the loans' interest rate, they reduce the moral hazard problem. Furthermore, not guaranteeing 100% of the loan also

reduces the moral hazard problem because the borrowers are responsible for repaying a part of the loan, so they have less incentive to undertake risky projects. Finally, the guarantees provide a way for borrowers to build relationships with lenders, thereby addressing the information asymmetry problem (Bradshaw, 2002; Craig et al., 2005).

2.1.1.2: Small Business-focused LGPs: Key Features

LGPs have been extensively used to support small businesses and are likely to provide important insights for structuring a housing-focused LGP. Therefore, this section briefly reviews several small business-focused LGPs. First, Small Business Administration (SBA) has three LGPs—7(a), 504(a), and Microloan. Under the standard 7(a) program, the SBA guarantees up to 85% of the loan up to a maximum loan amount of $5 million and a maximum guarantee of 75% of the loan amount (Craig et al., 2005; Orzechowski, 2020; SBA, n.d.). Under the 504(a) program, SBA guarantees long-term loans for economic development activities. A 504(a) eligible project must have at least 10% equity and up to 50% financing from a private lender. The remaining up to 40% is a loan from a certified development company (CDC)—a non-profit corporation set up for economic development. SBA 100% guarantees this CDC loan (Craig et al., 2005).

SBA loan guarantees enable lenders to make loans to borrowers who otherwise may not obtain loans from traditional lenders (Orzechowski, 2020). Lenders are divided into three categories—regular, certified, and preferred—based on the level of authority granted to them. SBA reviews the entire loan application and makes the final loan decision in the case of regular lenders. Certified lenders can determine applicants' creditworthiness and eligibility, but SBA reviews all loan documents and makes the final decision. SBA grants preferred lenders all the powers—to review loan documents, determine eligibility, and make the final decision (GAO, 2000).

Second, California State Small Business Loan Guarantee Program (SBLGP), was established by the State in 1968 by funding a trust fund as a guarantee pool. The trust fund totaled $33.7 million in 1997, and the program can leverage it 4:1, meaning it can guarantee loans up to $130 million at any one time. California Infrastructure and Economic Development Bank (IBank) administers the program through non-profit financial development corporations spread in rural and urban areas of the state (previously, the California Trade and Commerce Agency administered the program). These corporations work with local banks. They identify and evaluate the loan applications rejected by the banks to see if the banks can make these loans with the support of loan guarantees. They also provide technical assistance to borrowers to strengthen their loan applications. The program actively seeks to increase investment in low to moderate-income communities.

The program guarantees 100% of the amount for micro-loans (up to $25,000) and 90% of other loans with a maximum amount of $350,000, with an average of 75% of the loan guaranteed. The average term of the guarantee is three years, with a maximum of 7 years. The loan interest rate is negotiated between the borrower and the lender and is usually the market rate. Finally, the loan origination fee equals 2% of the loan, in addition to the $250 documentation fee. This fee helps ensure that only serious borrowers apply for the guarantee.

Third, the U.S. Department of Treasury awards funds to state governments through its State Small Business Credit Initiative (SSBCI) program. The funds can be used for various activities

that expand access to credit to small businesses in underserved areas, including through loan guarantees. For example, in its latest round of funding, California received $1.1 billion, of which $390 million would be allocated to loan guarantees, $472 million to collateral, $200 million to several venture capital programs that will invest in small businesses, and $118 million to a capital access program to cover loan losses (Padilla, 2022).

The program requires state governments to provide plans for increasing credit access to low and moderate-income communities, minority communities, other underserved communities, and women- and minority-owned businesses. An evaluation of several states' SSBCI-funded programs points to the following best practices to reach underserved communities: thorough and systematic outreach to organizations active in underserved communities; an exclusive focus on underserved communities, which gives the program clear recognizability with the borrowers and lenders; building or tapping into existing, geographically dispersed networks to market and distribute the products; provide technical assistance to borrowers; choose program administrators that have a strong history of serving underserved communities with multiple programs; require contracting agencies to achieve specific outputs related to serving underserved communities; and no/low minimum loan amounts and overall flexibility (U.S. Department of the Treasury, 2014).

2.1.1.3: Housing-focused LGPs: Key Features

This section reviews a couple of federal housing-focused LGPs and those administered by other entities such as philanthropic organizations and housing trust funds.

Federal LGP: HUD Section 108: The U.S. Department of Housing and Urban Development's (HUD) Section 108 LGP is a part of HUD's Community Development Block Grant (CDBG) Program. The Section 108 LGP aims to promote local economic development and neighborhood revitalization and guarantees loans that meet the objectives of the CDBG program—benefit low- to moderate-income people, remove/prevent blight, and fulfill other new or urgent community development needs (Prunella et al., 2016). The projects must meet CDBG's citizen participation requirements for the Section 108-supported portion of the project. For example, before applying for the loan, the applicant needs to make the draft application available for public comment, hold at least one public hearing, and address any comments received. The public participation process must conform to the citizen participation plan created by the applicant-jurisdiction, which in turn, must comply with the participation plan required in the HUD consolidated planning process (Jaroscak, 2022).

How the Section 108 LGP Works: HUD guarantees loans that private lenders give to a local or state government. Specifically, loan-receiving communities issue debentures to cover the cost of the loan. For CDBG-entitled communities, HUD guarantees loans up to five times the annual CDBG entitlement. These jurisdictions often pledge other revenue streams, such as the project revenues, their full faith and credit, or other grant funds to show repayment capacity should future CDBG funds be eliminated or reduced (Prunella et al., 2016; Prunella et al., 2014).

Federal LGP: Capital Magnet Fund (CMF): CMF awards grants to attract private investment into housing projects for households under 120% Area Median Income (AMI), with at least 51% should be below 80% AMI. CMF grants can be used to guarantee loans, fund loan loss reserves, capitalize revolving loan funds and housing trust funds, and make loans. A minimum of 70% of

the funds must go to affordable housing, with the other 30% for related economic development activities. Eligible recipients include CDFIs and housing-related non-profit organizations. Each recipient can receive up to 15% of all CMF funds each year. All funds should be committed within two years and completed within five (CDFI Fund, 2022; Kudlowitz, 2019).

Philanthropic and Other Organizations' LGPs: Examples of philanthropic organizations using their balance sheets to guarantee loans include an 80-acre, $1 billion redevelopment project in east Baltimore that received various funds, including a $20 million Section 108 loan and another $15 million loan guaranteed by the Annie E. Casey Foundation (Davis et al., 2006).

The Casey Foundation is also joining a consortium of guarantors that include eight other foundations (Kresge Foundation, the California Endowment, Chan Zuckerburg Initiative, Jessie Ball duPont Fund, Phillips Foundation, Seattle Foundation, Gary Community Investments, and Weingart Foundation), one non-profit lender (Virginia Community Capital) and a health system (CommonSpirit Health) to commit $31 million to create the Community Investment Guarantee Pool. This pool will guarantee projects deemed risky by traditional lenders. These projects would include small businesses, affordable housing developments, and climate change mitigation initiatives (Mission Investors Exchange, n.d.).

Indeed, a 2017 study sponsored by Kresge Foundation found that philanthropic organizations are interested in guaranteeing loans but may not have the required administrative and technical capacity and skills. This guaranty pool aims to address this barrier since a separate entity—Locus Impact Investing (a subsidiary of Virginia Community Capital)—will manage the Community Investment Guarantee Pool (Mission Investors Exchange, n.d.).

In addition to federal and state governments and philanthropic organizations, other entities also guarantee loans. For example, the city of Austin Housing Trust Fund uses some of its funds to guarantee home improvement loans for low-income residents (Myerson, 2003).

2.1.1.4: Pros and Cons of LGPs

Bradshaw (2002) notes that LGPs help borrowers who are in the middle tier of loan worthiness. Top-tier borrowers have good credit and collateral, a solid business plan or profitability, and will qualify for a bank loan. Middle-tier borrowers, due to one or more factors (for example, inadequate collateral or a risky project), would not qualify for a bank loan. Lowest-tier borrowers have poor or no credit history, no collateral, and poor business plans or prospects for profitability.

Reflecting on the popularity of government-guaranteed loan guarantees, Li (1998) opines that since the government only has to incur funds if the borrower defaults on a private loan, they are an attractive financial instrument to adopt. Furthermore, guarantees reach a broader set of borrowers than loans, making them more equitable and fairer than loans.

2.1.2: Pre-development Revolving Loan Fund (PDRLF)

2.1.2.1 Need for PDRLFs

PDRLFs are critical for producing, preserving, and rehabilitating housing because they fill a niche—high-risk funding for predevelopment activities—that is often neglected by traditional lenders and banks (Benjamin, Rubin and Zielenbach, 2004; Jenkens, Carder and Maher, 2004). They are especially important for non-profits with little real estate experience and/or capital (Navarro and Goodwin, 2002) and for non-profit affordable housing developers with significant experience but little upfront capital to fund predevelopment activities. They are also attractive because they are self-capitalizing (Mikesell and Wallace, 1996).

2.1.2.2 Key insights from RLFs that Fund Businesses and Housing

Organizational structure: State governments or regional and local jurisdictions can institute and run RLFs themselves, such as the Minnesota Economic Recovery Fund run by the state's Department of Trade and Economic Development (Stinson and Lubov, 1992), Bay Area Transit-Oriented Affordable Housing Fund set up and seeded by the Metropolitan Transportation Commission (NHC, 2017), the Santa Cruz Affordable Housing Trust Fund operated by the City of Santa Cruz, CA (City of Santa Cruz, n.d.; City of Santa Cruz, 2020), and even these RLFs often pool funds donated by public and private sector agencies. For example, the Metropolitan Transportation Commission, the regional transportation agency of the San Francisco Bay Area region of northern California, seeded the Bay Area Transit Oriented Development (TOD) fund. Several financial institutions and philanthropic organizations also contributed (NHC, 2017). Alternatively, jurisdictions can partner with other institutions, such as banks or community development financial institutions (CDFI), to issue and monitor the loans (Local Housing Solutions, n.d.). For example, L.A. County Housing Innovation Fund II (LACHIF II) has three lending partners (LACDA, n.d.). In many cases, RLFs are set up and run by non-profits or are part of a more extensive suite of financial assistance provided. For example, the Arizona Housing Trust Fund provides a range of grants and loans, including assistance for predevelopment activities (Hall, Linker and Shay, 2001).

Revolving Loan versus Grant: While loans do not reduce the "eligible basis" for the federal LIHTC program, grants do. Eligible basis is the component of a project cost that is used to calculate the amount of tax credits that can be awarded to a housing project under the LIHTC program. Moreover, revolving loans can stretch subsidy dollars further than grants (Local Housing Solutions, n.d.) because while loan repayments sustain the loan pool loan, grants deplete the funding pool permanently. The predevelopment loans are usually repaid when construction financing closes and can be rolled into a construction loan, making up a very small proportion of the total loan on a per-dwelling unit basis (Engel et al., 2021).

Below Market versus Market Interest Rate: The below-market interest rate enables developers to pass on interest savings to the end users—renters or buyers. Such savings are critical when providing affordable housing (Local Housing Solutions, n.d.). They enable small businesses to sustain and grow (CFDA 2010). Hence, RLFs often charge below-market interest rates (Stinson and Lubov, 1992).

However, low interest rates slow fund replenishment and growth, increasing the time in which funds can revolve (Stinson and Lubov, 1992). The low interest rate can shrink the capital base of an RLF, making it unsustainable and in need of periodic capital infusion. The decline can be swift during periods of high inflation (Mikesell and Wallace, 1996). Since predevelopment loans are a small proportion of the total project loan, the low interest rate may not significantly impact the total project cost. Indeed, studies on RLFs for small businesses show that access to funds and flexibility in loan terms is more important to borrowers than below-market interest rates (CDFA, n.d.).

Lien Position: Loans made through RLFs often assume a subordinate position. While this position increases their default risk, it incentivizes private lender participation, increasing the RLF's leverage. For example, Arlington County, VA's Affordable Housing Investment Fund assumes a junior/subordinate position. However, applicants must leverage other funding sources and keep housing units affordable for a minimum of 30 years, preferably 60 years (Local Housing Solution, n.d.).

Eligible Uses: The RLFs for businesses typically fund operating expenses, land and building acquisition, new construction and building renovations, landscaping, and other improvements, and machinery, equipment, and tools (CDFA, n.d.). However, housing-focused RLFs often disallow using the funds for operating expenses, such as staff, but allows them for land and building acquisition, new construction and renovations, landscaping, and other improvements.

Loan Term: RLFs for small businesses vary by use of funds—for example, 3 to 5 years for working capital and up to 10 years for machinery and equipment (CDFA, n.d.). Loans for housing vary by use too, with land acquisition loans varying from 6 months to 6-8 years and average about two years for other predevelopment activities (NHC, 2017).

Loan Amount: Loan amounts for small businesses vary from small ($1,000 to $10,000), to mid-size ($25,000 to $75,000), to large ($100,000 to $250,000 and up). Larger loans typically require matching loans from private lenders (CDFA, n.d.). Loans made by housing RLFs also vary significantly, for example, from a few hundred thousand dollars to a few million dollars (HTFSBC, 2021; NHC, 2017; Luque et al., 2019).

Interest Rates: While many RLFs prescribe an interest rate or a range of rates (Local Housing Solutions, n.d.), many allow the rates and the associated terms and conditions to vary by lending partner, such as the New York State Revolving Loan Fund Round 2 (ESD, n.d.).

Methods for Calculating Below-market Interest Rate: Many RLFs simply prescribe a very low interest rate; for example, Florida's Predevelopment Loan Program sets it at 1% (NHC, 2017) and Oakland, CA's Predevelopment Loan and Grant Program at 3% (City of Oakland, 2022); or a range, for example, 1% to 4% (Local Housing Solutions, n.d.). Others peg their rates to a specific percent below the prime rate; for example, Washington State's Land Acquisition Program sets it at 0.6% below prime, and McKinney Act Loans in Washington D.C. are set at 2% below prime (NHC, 2017). Other RLFs are consortia of lenders where each lender follows its own method of determining below-market rates. Housing Trust of Santa Barbara County's Revolving Loan Fund for Affordable Housing is one such example (NHC, 2017).

Target Loan Recipients: RLFs for small businesses often have specific target loan recipients, such as a population demographic, geography, or specific communities (for example, distressed communities) (CDFA, 2010; Lawhorn, 2020). For example, New York State Revolving Loan Fund Round 2 prioritizes new companies, under-banked areas, and minority-owned small businesses (ESD, n.d.).

Range of Lending Sources and Tools: Small business RLFs often have various loan products they can tailor to meet applicants' needs. Lenders often include federal agencies, state governments and local, community foundations, and public and private sector entities (CDFA, 2010).

Eligibility Criteria: Eligibility is primarily influenced by an RLF's mission and objectives and any conditions imposed by the agency operating the RLF or its lending partners. For example, several RLFs have been created to support affordable housing, such as the Santa Cruz Affordable Housing Trust Fund (City of Santa Cruz, 2020). Moreover, the City of Orem, UT, has a matching requirement—$2 of private financing for every $1 loan (Gudmundson, 2020). Further restrictions may come with the funding source. For example, federal HOME funds may have a matching requirement or cap housing rents or sale prices (Local Housing Solutions, n.d.).

Flexibility: Flexibility is a significant advantage of RLFs (CDFA, 2010). The literature calls for flexible federal investment because many federal funding tools are restrictive, targeting specific industries and geographies. Therefore, broader and more flexible federal investment is needed to help communities leverage resources and strengths (CDFA, 2010). Similarly, for housing, several federal funds such as CDBG and HOME come with their set of restrictions. Therefore, there is a need for a more flexible funding source. Furthermore, once the federal investment in an RLF has revolved, that is, the loan has been re-paid, federal requirements and restrictions should be removed for further lending (CDFA, 2010).

Loan Fund Committee: Literature advises against relying on an organization's board of elected officials as the loan committee (CDFA, 2010). Stinson and Lubov (1992) found that the default rate was 14% when elected officials or their appointees were involved and 8% when the loans were evaluated by RLF's staff, banks, or a combination of the two.

Furthermore, the committee members should come from diverse backgrounds (for example, accountants, lawyers, and educators) and have independent decision-making (CDFA, 2020). In another example, the City of Orem, UT, has created two loan committees—one of the representatives from the business community and the other of city employees. Both committees need to approve the loan (Gudmundson, 1996).

Availability of Initial Capital is the Biggest Barrier: A study of nearly 100 RLFs found that the availability of initial capital is the most significant barrier to forming them and that this capital frequently came from federal and state governments (Stinson and Lubov, 1992).

RLFs at the Multi-city or Regional Level rather than Local: Stinson and Lubov (1992) found that RLFs set up by small cities to promote economic development in Minnesota often struggled. While some RLFs ran out of capital to lend, others had unspent capital due to a lack of demand.

To enable RLFs' stability and efficient use of funds, RLFs can be set up at the regional level or by consortia of cities in non-metro areas.

Need to Recapitalize: Since RLFs are replenished by the borrower's periodic payments, the replenishment rate is often slow. A high loan loss rate and a below-market interest rate may further slow the replenishment rate, requiring a periodic infusion of capital (Stinson and Lubov, 1992).

2.1.2.3 Key Features of PDRLFs

PDRLFs Exist in Many Forms at State, Regional, and Local Levels: First, they exist as stand-alone RLFs that only fund housing-related predevelopment activities. Many exclusively focus on land or site acquisition. Examples of such stand-alone PDRLFs at the state level include the Connecticut State Department of Housing Predevelopment Loan Program (State of Connecticut, 2022), the Delaware State Housing Authority's Housing Development Fund, the Florida Housing Finance Corporation's Predevelopment Loan Program, Oregon's Predevelopment Loan Program, and Washington's Land Acquisition Program (NHC, 2017). Regional examples include MTC's Bay Area TOD Housing Fund and Denver Regional TOD Fund. Both focus on site acquisition (NHC, 2017). Examples at the local level include the New York City Acquisition Fund, Oakland, CA's Predevelopment Loan Program, Washington D.C.'s Site Acquisition Funding Initiative, D.C. Housing Finance Agency's McKinney Act Loans, and Charlotte, NC, South Corridor Land Acquisition Fund (NHC, 2017).

Second, they are part of larger housing-focused RLFs, which fund various activities such as housing construction, acquisition, and rehabilitation. Examples of such RLFs include Los Angeles County Housing Innovation Fund II (LACDA, n.d.), Monterey Bay Housing Trust (HTSV, n.d.), Housing Trust of Silicon Valley (HTSV), Santa Cruz Affordable Housing Trust Fund (City of Santa Cruz, n.d.; City of Santa Cruz, 2020), Arlington County, VA's Affordable Housing Investment Fund, Mississippi's Affordable Housing Development Fund, New Mexico Mortgage Finance Authority's Primero Loan Program, and North Carolina's Supportive Housing Development Program (NHC, 2017).

Third, RLFs that fund many community development activities include housing. For example, the Community Economic Development Corporation (CEDAC), a CDFI created by the Commonwealth of Massachusetts, funds many community development activities, provides technical assistance, as well as offers housing predevelopment loans (NHC, 2017). Others include Cennaire (Luque et al., 2019) and Bay Area Transit-Oriented Affordable Housing Fund (TOAH, n.d.), which lends for various activities such as community facilities financing, predevelopment loans, short-term loans, and permanent financing and loan syndication.

A nationwide review of PDRLFs reveals various program structures based on fund availability and program objectives. Programs vary by requirements such as eligible expenses, housing types, target income groups, loan terms, interest rates, and loan-to-value (LTV) ratios. For example, the State of Connecticut Pre-development Loan Fund makes 0%, 24-month loans for predevelopment activities associated with construction, rehabilitation, and renovation of housing that primarily cater to 25%-60% AMI households (NLIHC, 2021). Loans from the L.A. County

Housing Innovation Fund II (LACHIF II) can finance the acquisition and predevelopment costs (LACDA, 2021).

2.1.3: Employer Assisted Housing Programs (EAHPs)

2.1.3.1 Evolution and Barriers

The evolution of EAHPs can be traced to the company and mill towns of the late 1800s. However, greater transportation mobility of the ensuing decades allowed employees to live farther away from their places of employment. However, in recent decades, tight housing markets have renewed interest in EAH. This interest has manifested itself in the form of housing-related services provided by non-profits and CDCs to local employers; EAH becoming a HOME-eligible activity; labor unions negotiating for employee housing assistance; and Fannie Mae offering a mortgage product that permitted employers to contribute toward down payment assistance, closing costs, or monthly mortgages (HWF and MPC, 2007; Pill, 2000).

Despite this renewed interest, the EAHPs have yet to gain widespread popularity. First, employers' interest in EAHPs waxes and wanes with economic and real estate cycles. Second, employers may be unable to quantify the benefits of EAHPs accurately. This inability is often because they may not know the employees' exact housing needs and the cost of providing housing benefits (the latter especially when compared to well-defined health and retirement benefits); may be unable to link EAH with employee recruitment and retention directly; may view retention and recruitment difficulties as transportation, not housing, problems (leading them to offer transportation solutions such as van-pooling and transit passes); employers may not have the expertise to provide EAHPs, especially the supply-side programs, which are more complex, risky, and resource and time intensive, and require higher levels of real estate development competency than the demand-side programs; employers may view housing as a larger problem they are not equipped to address; unlike health and retirement expenses, housing costs vary by housing type, location, and time, which makes housing benefits challenging to assess. Finally, the tax consequences of EAH programs for employers and employees may be unclear (Fischer et al., 2021; Pill, 2020).

Some of these barriers are highlighted in a survey of 14 major employers in the Los Angeles region in California. For example, while the employers agreed that the high cost of housing was a barrier to recruiting and retaining employees, they noted this as a problem only for recruiting workers from outside the region. Furthermore, they were primarily concerned about recruiting high performers rather than employees overall. Finally, while the employers agreed that workforce housing could be an effective solution, they did not believe they could provide it at the scale necessary because they lacked the resources (for example, no excess land to develop housing) (Bostic, 2017).

To reduce some barriers, such as administrative burden and costs, employers often partner with third parties to develop and manage EAHPs (HWF and MPC, 2007). Furthermore, they may form a limited or general partnership to spread the risk or form a group/consortium with other employers and non-profit and public sector entities to realize economies of scale (Pill, 2020).

2.1.3.2 Benefits of EAHPs for Employers

Several advantages of EAHPs for employers include recruiting and retaining employees, reducing employees' commute time, reducing employee absenteeism and increasing their retention rate, an opportunity to improve community relations and build stronger communities through employees' participation in local economies, and the potential for creating vibrant neighborhoods that are good for business. Retaining employees gains additional significance for low-wage sectors such as retail, where turnover is high and costly. For example, an employee's replacement cost could be 25% to 50% of their annual wage (Dever et al., 2014; Fischer et al., 2021; HWF & MPC, 2007; Networks Northwest, 2015; NPHS, 2017, Pill 2000; Treuhaft, 2007). Finally, EAHPs could be financially more effective than wage increases (Ambrosio, 2022).

2.1.3.3 Matching EAHP Objectives with its Design

EAHPs can be designed to match the desired program benefits/objectives—employee recruitment and retention, neighborhood revitalization, and improving community relations. For example, housing assistance, such as rental assistance or employee housing, should be immediately available to employees upon hire for recruiting purposes. To retain employees, the value of the housing benefits should grow over time, and/or the benefit should only begin after employees have been with the employer for a certain period (for example, eligibility for housing starts after three years of employment).

EAHPs that aim to revitalize a neighborhood could target housing assistance to specific neighborhoods that are often adjacent to the place of employment. For example, Howard University focuses its EAHP on the LeDroit Park neighborhood of Washington, D.C. Moreover, housing assistance can be extended to community members (in addition to the employees) to improve community relations. EAHPs could be extended to existing and local non-employee residents to mitigate the gentrification and displacement impact of EAHPs. Furthermore, EAHPs can be restricted to low-income employees, excluding their middle- and high-income colleagues.

Moreover, employers could partner with the local community to share oversight responsibilities to ensure EAHPs do not lead to displacement or other adverse impacts (PolicyLink, 2007). Finally, EAHP can be designed to meet more than one objective. For example, employee recruitment and community relations-related objectives can be met by providing affordable rental housing to both employees and community members (Pill, 2020).

2.1.3.4 Role of Anchor Institutions, especially Educational and Medical Institutions

Anchor institutions are geographically fixed and have often existed for a long time, although some can be new—for example, University of California, Merced. Often, these are educational and medical institutions (eds and meds) that have trouble recruiting and retaining employees because either their employees have transferable skills (for example, school teachers and nurses can find jobs in multiple schools and hospitals), or the institutions employ essential workers that should be able to reach their place of employment quickly in emergency situations (such as medical staff) but they are unable to find affordable housing near their places of employment (Lazarovic, Paton and Bornstein, 2016). Hence these anchors institutions are likely to provide EAH.

Eds and meds that have existed for a long time are often located in what were once thriving city centers but are now inner-city locations that have experienced disinvestment, population decrease, and an overall decline in the post-World War II period (Rose, Lee and Rubin, n.d.). Furthermore, they often have a checkered history with their surrounding community, dating back several decades when these institutions expanded or tried to expand into the adjoining neighborhoods without consulting the community members. These efforts led to inequities, community backlash, and distrust that future EAHPs need to overcome (Schildt and Rubin, 2015).

On a positive note, eds and meds' large employment base and economic impact could catalyze inner-city revitalization (Dever et al., 2014; PolicyLink, 2007). Furthermore, they often drive innovation and have a social mission (Schildt and Rubin, 2015). Finally, many by themselves or as part of a consortium have invested in EAHPs, often as one component of a broader neighborhood revitalization strategy; an example is the Case Western Reserve University's Greater Circle Living Initiative that includes $750,000 in EAH investment (Rose, Lee and Rubin, n.d.).

2.1.3.5 Role of Government

At the local and regional levels, the government can help communities develop a list of non-profit organizations that can manage EAHPs, establish, fund, and manage housing trust funds, provide tax credits (Burnett, Khadduri and Lindemayer, 2008), help employers design EAHPs and manage them on their behalf, and provide matching grants to employers (Treuhaft, 2007).

Additionally, state governments can play a direct role in funding EAH. For example, they could provide tax credits to employers who develop EAH; or establish, fund, and manage housing trust funds. Trust funds can be funded in various ways, such as through matching funds, tax credits, direct grants, or loans. Several examples exist, including the State of Florida's $50 million support for EAHPs, where the development team includes a developer, an elected official, and an employer. In addition, Connecticut created an EAH Revolving Loan Fund in 1994 to provide business tax credits in lieu of employer contributions to the revolving loan fund. Similarly, Illinois provides a 50% tax credit to employers making qualified, affordable housing investments. The State of Minnesota contributed to the Greater Minnesota Housing Fund through the Minnesota Housing Finance Agency. This state contribution, along with the contributions from local employers such as the Mayo Clinic, helped produce around 800 affordable homes in the Rochester, MN area that are a mix of single-family and multi-family units (Burnett, Khadduri and Lindemayer, 2008; PolicyLink, 2007).

Moreover, under the New Hampshire Community Development Investment Program (CDIP), businesses receive 75% state tax credits for investments made in community projects. These projects include housing, homeless shelters, community centers, and museums (Fischer et al., 2021). While this program is not EAH-specific, it could be used for it. Finally, the State of Pennsylvania's Neighborhood Partnership Program provides 70% tax credits to employers. In return, employers commit a minimum $50,000/annum for five years toward neighborhood revitalization efforts in partnership with community-based organizations. This program has helped develop or rehabilitate more than 1,600 houses, trained or provided jobs to over 4,000

Philadelphia residents, and located 61 businesses and 270 jobs in distressed neighborhoods (Treuhaft, 2007).

At the federal level, Fannie Mae helps employers create an EAH plan and, through its network of lenders, provides a customizable mortgage loan product to employees (Burnett, Khadduri and Lindemayer, 2008). Additionally, several educational institutions have partnered with Fannie Mae for their EAHPs. Most are demand-side programs where Fannie Mae makes home-buying affordable, often through a low-interest customized loan product (for example, Case Western University, Ohio State University, and Tulane University). However, Fannie Mae has helped develop new housing in a few cases. For example, Fannie Mae partnered with Howard University to rehabilitate 28 houses and construct 17. The university provided the land and served as the partnership's connection to the community. Fannie Mae provided the development expertise, funded the project, and provided mortgage finance assistance to homebuyers (Hoereth, Packnett and Perry, 2007).

Furthermore, federal housing and community development funding programs such as HOME and CDBG Program could be used toward EAH programs. So that fair housing laws are not violated, these programs typically limit the criteria that could be employed to select residents. However, certain exceptions might exist. For example, HOME might allow targeting teachers, police officers, and first responders. Similarly, employers could buy land using CDBG funds and construct houses using other funding sources. Moreover, in New Hampshire, employers can contribute towards housing development and then apply for low-income housing tax credits. Because of the direct subsidy provided for the development, employers could negotiate the number of housing units reserved for their employees, the units' cost, and the affordability period (Fischer et al., 2021).

Finally, the literature also points to as yet unsuccessful efforts at the federal level to pass legislation that would provide a 50% tax credit to employers for investment in EAHPs, specifically HR 1850, which was introduced in the House of Representatives in 2007 (Choi, 2008; Congress. Gov, 2022; Treuhaft, 2007). A similar Bill, AB 2999, was introduced in the California legislature in 2018 (Bonta, 2018). Moreover, a task force constituted in Arizona to identify ways to create affordable housing identified providing a tax benefit for EAH as one of its five key suggestions (Gunderson, 2007). Finally, the literature calls for legislative action to make housing benefits tax-exempt at the federal level, like health benefits (PolicyLink, 2007).

2.2 Literature Review - VMT Estimation

A key to understanding VMT, including in the context of housing locations, is that VMT depends on trip frequency, trip lengths, and mode choice. "Trip frequency is primarily a function of socioeconomic characteristics of travelers and secondarily a function of the built environment; trip length is primarily a function of the built environment and secondarily of socioeconomic characteristics; and mode choice depends on both, though probably more on socioeconomics" (Ewing et al., 2015).

Ewing and Cervero (2010) conducted a meta-analysis of the literature, examining the relationship between the built environment and travel mode (and VMT). It was a comprehensive review of literature available on the subject through the end of 2009. The meta-analysis found

that VMT is most strongly related to measures of accessibility to destinations or the ease of access to trip attractions. The research showed that urban form alters travel patterns and the propensity to use active transportation modes, which may reduce VMT within a planning area. More recently, Stevens (2017) posted the question, "Does Compact Development Make People Drive Less?" and noted that the estimated elasticity values describing land use variables' effect on VMT, while statistically significant, are small and therefore do not appear to have much influence on driving (Stevens, 2017).

Characteristics of the built environment that affect travel demand, i.e., the five "Ds," include density, diversity, destination accessibility, design, and distance to transit. In the literature, measures of these Ds are used as independent variables. Density as an independent variable may be, for example, measured as household density or population density. Diversity may be measured as an entropy index (land-use mix) or jobs-housing balance. An evaluation of the density of mixed-use parcels may also be used as an independent variable of diversity. Design as an independent variable is measured as intersection density, street density, or the percentage of 4-way intersections. Destination accessibility is measured as job accessibility by auto, job accessibility by transit, or distance to downtown. Variables may also take into consideration commute time for auto and transit. Distance to transit is measured by distance to the nearest stop. This may also include stop density (Cervero and Kockelman, 1997; Cervero et al., 2009; Ewing and Cervero, 2010).

2.2.1 Affordable Housing and VMT

The study by Ewing et al. (2018), using multivariate analysis and data for 157 large U.S. urbanized areas demonstrated that while density is correlated with per capita VMT, it only accounts for a small portion of the difference in per capita VMT across the urbanized areas. It was stated that variables, including personal income, are more significant and have greater elasticities (Ewing et al., 2018). Elasticity is the ratio of the percent change in one variable associated with the percent change in another variable. Elasticity measurements are used in models predicting individual behavior and typically do not rely on aggregate data (Ewing and Cervero, 2010). Given that personal household income has an impact on VMT, it follows that affordable housing that allows lower-income households to live in more infill areas would affect VMT. Relevant studies that addressed this issue are described in the subsection below.

2.2.2 Significant Reductions in Vehicle Trips with Lower Income Groups and Increased Urbanization

The findings from Ewing et al. (2018) also indicate a need for more differentiation of affordable and market-rate housing in the development review process. The VMT impact of household income is critical for our study since the focus is on affordable, infill housing. However, a key finding from San Diego's Affordable Housing and VMT Reduction Report was that VMT itself might not be the final criterion for the success of housing developments based on the five D variables mentioned before. The analysis in San Diego reveals that extremely low-income households that earn up to 30% of the AMI drive 12.9 miles less per day than a median-income household. A high-income household drives 6,800 more miles per year than an otherwise similar, extremely low-income household (San Diego County, 2016).

Lower-income households have a much lower VMT. Therefore, to the extent that they can move into affordable infill housing, that might not necessarily result in VMT reduction even as their household travel options are greatly expanded, and costs lowered. This outcome is still desirable even with a lack of net VMT reduction. Furthermore, since lower-income households are more likely to live near transit, own fewer cars, live in smaller units, and live in larger buildings, affordable housing near transit is a more efficient use of space with lower per-unit costs compared to market-rate housing (San Diego County, 2016).

Households with a low vehicle ownership rate have a lower percentage of miles traveled by personal automobile as the residential density in the home forecast analysis zone increases. It is important to note that this effect changes vehicle ownership rates. A study from the Central Puget Sound region shows that for a household with two vehicles, the impact of residential density almost fades away. If an additional car is added to the household, the effect of residential density on the percentage of miles traveled by vehicles gets reversed (Pang and Zhang, 2019). Among the subset of households that use transit, the number of transit trips increases with household sizes but declines with employment and household income (Ewing et al., 2015).

Accounting for the five D variables in housing development, especially in combination with each other, offers many benefits to the residents beyond the VMT reduction. Having location-efficient places characterized by high accessibility to destinations, will make residents take shorter trips using transit, walking, or biking (Newmark and Haas, 2015). While lower-income households have previously been seen to be more likely to live in transit-rich neighborhoods, with the incorporation of diversified land uses and more connected street networks, low-income families now have more access to other amenities (San Diego County, 2016).

2.2.3 Concluding Remarks

VMT is a combination of trip length, trip frequency, and mode choice, all three of which in turn, depend on a combination of household and built environment characteristics. Therefore, estimating the VMT effect of new housing development is a complex issue. The measurement is further complicated because land use characteristics in a region are correlated. If a neighborhood is dense, that neighborhood is also likely to have mixed land use with a well-connected transit service available (Choi and Paterson, 2019). Overall, jointly addressing various five D variables in combination might have the most potential for reducing VMT. For example, land use diversity or design features alone do not produce a significant VMT reduction, but the interaction of the two with density may significantly impact VMT (Choi and Paterson, 2019).

As discussed previously (Stevens, 2017), individually, elasticity estimates of built environment variables did not show considerable effects. Instead, the five D variables, in combination with each other, offer a greater opportunity to reduce VMT. Therefore, the relative VMT impact of various housing developments is best estimated using robust statistical models that account for these factors. It will help us more reliably estimate the relative scale of VMT reduction for the housing development spurred by the funding mechanism(s) of interest in contrast with a regional comparator. In conclusion, the scope of work requires use of VMT estimation models that jointly account for five D variables including household characteristics such as income and vehicle ownership. The team examined five such models that are described in the Methodology Section.

Chapter 3. Housing Production and VMT Calculation Methodology

This chapter first reviews the housing units supported statewide by each of the three housing finance programs. Detailed calculations are shown for one region (Superior California) and summary tables are provided for all 10 regions. Finally, the chapter details the VMT reduction likely to occur due to the housing units produced.

3.1 Housing Units Supported

3.1.1 PDRLF

As mentioned previously, we developed two prototypes for PDLRF's support for infill affordable housing: a) PDRLF that supports all predevelopment activities excluding land costs, and b) a PDRLF that supports all predevelopment activities including land costs. Below, we illustrate the housing production methodology using the Superior California region as an example (see Table 3.1).

Table 3.1: Number of housing units supported through a PDRLF program in Superior California Region

Prototype 1: Total units minus land supported by PDRLF		
Loan term	5 yr	Source: Developer interviews
Interest rate	2%	Source: Real estate consultant who advised using a fixed, BMR, rate rather than a variable rate pegged to a moving index, such as consumer price index
Predevelopment as % of project cost	6%	plus land; Source: developer interviews
PDRLF leverage factor	2	Assumes developers leverage state PDRLF funds with others--regional/local/philanthropic
PDRLF loan pool	$8,345,684	Same proportion as the region's population as a proportion of CA pop.
Total PDRLF pool, including leverage factor	$16,691,367	
Land cost/acre (Infill)	$5,000,000	Source: Developer interviews for Sacramento
Units/acre	61	Source: Selected Projects worksheet off of LIHTC database
Land cost/unit	$81,967	
Avg resi project cost/unit	$500,000	Source: Selected Projects worksheet off of LIHTC database
Avg resi project cost/unit minus land	$418,033	
PDRLF per unit minus land	$25,082	
Prototype 1: Total units supported by PDRLF	**665**	
Prototype 2: Total units + land supported by PDRLF		

PDRFL needed to support 61 units project on 1 acre of land	
PDRLF/unit for land	$81,967
PDRLF/unit for the construction cost of each unit	$25,082
PDRL/unit for land + unit	$107,049
Prototype 2: Total units + land supported by PDRLF	**156**

3.1.1.1 Prototype 1: Total Units Minus Land Supported by PDRLF

The first prototype, "Total Units Minus Land Supported by PDRLF," assumes a loan term of five years, as indicated by developer interviews. The interest rate for these loans is set at a below-market rate 2%, a figure validated by our real estate consultant. According to the developer interviews, the pre-development cost, excluding land, is considered to be 6% of the total project cost. A leverage factor of 2 is supported by our literature review, which assumes that State funding for PDRLF will leverage other federal, regional, local, or philanthropic funds.

To calculate the PDRLF loan pool for this region, we first used the 2020 Decennial Census to calculate the region's population (3,299,735) as a proportion of the total population of California (39,538,223), which is 8.345684%. We then applied this percentage to the statewide investment of $100 million to arrive at an allocation of $8,345,684 for this region. With the leverage factor applied, this amount doubles to a total PDRLF pool of $16,691,367. Next, since many regions comprise several counties; for example, Superior California comprises 17 counties (Butte, Colusa, El Dorado, Glenn, Lassen, Modoc, Nevada, Placer, Plumas, Sacramento, Shasta, Sierra, Siskiyou, Sutter, Tehama, Yolo, and Yuba), we focused on the most urbanized county, Sacramento County, within Superior California, and the central city within the county that is likely to support infill affordable housing close to transit. In the case of Superior California, it is downtown Sacramento. After that, interviews with developers revealed an approximate land cost of $500,000 per acre in downtown Sacramento. Next, we reviewed the LIHTC database that provides details of recent housing projects funded through LIHTC funding and found that such projects had an average density of 61 units per acre in and around downtown Sacramento. Thus, we arrived at a land cost per unit of $81,967 in this area.

Further analysis of the LIHTC database provided the average residential project cost per unit for this region as $500,000. When excluding land costs, this figure drops to $418,033. To determine the PDRLF amount per unit, we calculated 6% of the average residential project cost per unit minus land, arriving at $25,082. As mentioned earlier, developer interviews suggested that the pre-development cost, excluding land, is approximately 6% of the total project cost. Therefore, with a total PDRLF pool of $16,691,367 for the superior California region, the program can support approximately 665 units without including land costs.

3.1.1.2 Prototype 2: Total Units Plus Land Supported by PDRLF

In the second prototype, "Total Units Plus Land Supported by PDRLF," we again used the land cost per acre of $500,000 for the Sacramento region, with an average density of 61 units per acre. This results in a land cost per unit of $81,967. For a project of 61 units on one acre, the PDRLF

needed includes both the land cost per unit ($81,967) and the average residential project cost per unit excluding land ($25,082), totaling $107,049 per unit. With a total PDRLF pool of $16,691,367, this scenario can support 156 units, including land costs.

It is assumed that the PDRLF pool will experience an annual loss of 2% due to a combination of inflation and bad loans (assuming 3% inflation and 1% bad loans, offset by a 2% interest gain, resulting in a net erosion of 2%).

Table 3.2: Number of housing units supported over 30 years through a PDRLF program in Superior California Region

Period (in years)	Loan Pool in constant dollar terms	Units (Prototype 1)	Cumulative Units (Prototype 1)	Units (Prototype 2)	Cumulative Units (Prototype 2)
1 to 5	$16,691,367	665	665	156	156
6 to 10	$15,087,674	602	1267	141	297
11 to 15	$13,638,062	544	1811	127	424
16 to 20	$12,327,728	491	2302	115	539
26 to 30	$11,143,290	444	**2747**	104	**644**
Total units produced under Prototype 1 over 30 years	2747				
Total units produced under Prototype 2 over 30 years	644				
Percentage of pool exhausted	33%				

Table 3.2 provides the calculations for the number of housing units that can be supported using a PDRLF program in the Superior California region. Specifically, over a 30-year period, the total PDRLF pool of $16,691,367 diminishes at an annual loss of 2% with a revolution period of five years derived from developer interviews (the case studies predevelopment loans are typically for two to three years; however, interviewees noted the needs for a longer, 5-year, term in California due to the often-lengthy permitting period). The PDRLF pool supports 665 units under Option 1 and 156 units under Option 2 in the first five years. After the first five years, the PDRLF pool diminished to $15,087,674, supporting 602 units under Option 1 and 141 units under Option 2. Similarly, the pool diminishes to $11,143,290 at the end of year 25, which reduces the units supported to 444 under Option 1 and 104 under Option 2. Under Option 1, a total of 2,747 units can be produced in Superior California, while under Option 2, a total of 644 units can be produced, with 33% of the loan pool exhausted over a 30-year period. Similar calculations were performed for all ten regions of California to estimate the housing units that can be supported through PDRLF over 30 years, with and without land costs (see Tables 3.7 and 3.8).

3.1.2 LGP

For LGP too, we developed two prototypes: a) loan guarantee for permanent financing covering a 10-year term, and b) 50% of the loan guarantee pool covers construction financing for 5 years, and the remaining 50% guarantees permanent financing for 10 years.

3.1.2.1 Prototype 1: LGP for a 10-Year Term and Only for Permanent Financing

Table 3.3: Number of housing units supported through LGP in Superior California Region under Prototype 1

Prototype 1: LGP for a 10-yr term and only for perm financing		
LGP leverage factor	5	Assumes total loan guarantees equal five times the guarantee pool--based on literature
LGP Pool	$8,345,684	Same proportion as the region's population as a proportion of CA pop.
Total loan guarantees	$41,728,418	
Avg resi project cost/unit	$500,000	Source: Selected Projects worksheet off of LIHTC database
Proportion of debt to project cost	30%	Source: LIHTC database; Real Estate Consultant
% of debt to be guaranteed	90%	Literature on small business loan guarantees suggests not guaranteeing 100% of a loan
Per unit loan to be guaranteed	$135,000	
Total units supported through LGP	**309**	

Under Prototype 1, the LGP is designed to support permanent financing over a 10-year term. Based on the literature, the leverage factor is assumed to be five times the guarantee pool—meaning loans five times the guarantee pool can be guaranteed. For the Superior California region, the LGP loan pool is calculated based on the region's population proportion relative to the total population of California, resulting in an allocation of $8,345,684. With a leverage factor of 5, this allocation guarantees a total loan amount of $41,728,418.

Our analysis of the LIHTC database determined the average residential project cost per unit in this region to be $500,000. The proportion of debt to project cost is considered to be 30%, a figure validated by our real estate consultant. Assuming the LGP guarantees 90% of the debt (literature suggests not guaranteeing 100% of the loan to disincentivize risky behavior), the per unit loan to be guaranteed is $135,000. Consequently, the LGP loan pool of $41,728,418 for the Superior California region can support approximately 309 units. See Table 3.3.

3.1.2.2 Prototype 2: LGP for 50% Construction and 50% Permanent Financing

Table 3.4: Number of housing units supported through LGP in Superior California Region under Prototype 2

Prototype 2: LGP for 1/2 construction and 1/2 perm financing		
LGP for a construction loan: 5 years		
LGP leverage factor	5	Assumes total loan guarantees equal five times the guarantee pool--based on literature
LGP Pool	$4,172,842	Same proportion as the region's population as a proportion of CA pop.
Total loan guarantees	$20,864,209	

Avg resi project cost/unit	$500,000	Source: Selected Projects worksheet off of LIHTC database
Proportion of debt to project cost	80%	Source: Real Estate Consultant
% of debt to be guaranteed	90%	Literature on small business loan guarantees suggests not guaranteeing 100% of a loan
Per unit loan to be guaranteed	$360,000	
Total units supported through LGP for construction loan	58	units
LGP for permanent financing: 10 years		
LGP leverage factor	5	Assumes total loan guarantees equal five times the guarantee pool--based on literature
LGP Pool	$4,172,842	Same proportion as the region's population as a proportion of CA pop.
Total loan guarantees	$20,864,209	
Avg residential project cost/unit	$500,000	Source: Selected Projects worksheet off of LIHTC database
Proportion of debt to project cost	30%	Source: St. Anton Ascent project in Sacramento- as per LIHTC database; Real Estate Consultant
% of debt to be guaranteed	90%	Literature on small business loan guarantees suggests not guaranteeing 100% of a loan
Per unit loan to be guaranteed	$135,000	
Total units supported through LGP for perm loan	155	

Under Prototype 2, the LGP supports both construction and permanent financing, each constituting 50% of the guarantee pool. The leverage factor remains five times the guarantee pool. The LGP loan pool for the Superior California region, calculated through the region's population proportion relative to the state's total population, is $8,345,684. This pool is divided equally for construction and permanent financing guarantees, resulting in $20,864,209 allocated to each.

From our LIHTC database analysis, the average residential project cost per unit in this region is $500,000. The debt proportion to project cost is considered to be 80% for construction loans and 30% for permanent financing, as advised by our real estate consultant. We assume that the LGP will guarantee 90% of the debt. Thus, the per unit loan to be guaranteed is $360,000 (90% of 80% of $500,000) for construction financing and $135,000 (90% of 30% of $500,000) for permanent financing. Therefore, the LGP loan pool of $20,864,209 for construction financing can support 58 units, while the same amount for permanent financing can support 155 units.

It is assumed that the LGP pool will lose 3.5% of its value each year due to inflation and bad loans (assuming 3% inflation and 1% loss due to bad loans, with the LGP guaranteeing 50% of the loan amount, resulting in a net loss of 3.5%). See Table 3.4 for the calculations.

Table 3.5: Number of housing units supported over 30 years through LGP in Superior California Region

Number of units supported over a 30-yr period				
	Period (in years)	**Total Loan Guarantee Pool in constant dollar terms**	**Units**	**Cumulative Units**
Prototype 1				
	1 to 10	$41,728,418	309	309
	11 to 20	$29,221,672	216	526
	21 to 30	$20,463,419	152	677
Prototype 2: construction loan				
	1 to 5	$20,864,209	58	58
	6 to 10	$17,459,769	48	106
	11 to 15	$14,610,836	41	147
	16 to 20	$12,226,767	34	181
	21 to 25	$10,231,709	28	209
	26 to 30	$8,562,188	24	233
Prototype 2: perm loan				
	1 to 10	$20,864,209	155	155
	11 to 20	$14,610,836	108	263
	21 to 30	$10,231,709	76	339
Total units supported under Prototype 1 over 30 years	677			
Total units supported under Prototype 2 over 30 years	572			
Percentage of pool exhausted: Prototype 1	51%			
Percentage of pool exhausted: Prototype 2: 1/2 construction loan	59%			
Percentage of pool exhausted: Prototype 2: 1/2 permanent loan	51%			

As shown in Table 3.5, over 30 years, the total LGP pool of $41,728,418 for permanent financing under Prototype 1 reduces at an annual loss of 3.5% with a revolution period of ten years (real estate developer and expert interviews suggested a 10-yr guarantee period for permanent financing because the cash flow typically stabilizes within this period). The LGP pool supports 309 units under Prototype 1 in the first ten years. After the first ten years, the LGP pool will reduce to $29,221,672, supporting 216 units. It will further decrease to $20,463,419 in the last ten years, supporting 152 units. Therefore, under Prototype 1, a total of 677 units can be produced, with 60% of the loan pool exhausted.

Similarly, under Prototype 2, 50% of the LGP pool of $41,728,418 supports construction financing, and the remaining 50% supports permanent financing. Each of the $20,864,209 LGP pools reduces at an annual loss of 3.5% with a revolution period of five years for construction financing and ten years for permanent financing. The pool for construction financing will decrease to $17,459,769 at the end of the first five years, supporting 58 units during this period. At the end of 25 years, the pool will decrease to $8,562,188, supporting 24 units. Thus, a total of 233 units can be produced through construction financing under Prototype 2.

Similarly, the pool for permanent financing will decrease to $14,610,836 at the end of the first ten years, supporting 155 units during this period, and to $10,231,709 at the end of 20 years, supporting 108 units. In the years 20 to 30, it supports 76 units. Thus, a total of 339 units can be supported through permanent financing. Thus, 572 units can be supported under Prototype 2, (211 units by guaranteeing construction loan and 314 by guaranteeing permanent loan) with 59% of the loan pool exhausted over the same period. Similar calculations were performed for all ten regions of California to estimate the housing units that can be supported through both prototypes under the LGP over 30 years (see Tables 3.7 and 3.8 for the totals for each region).

3.1.3 EAH

Table 3.6: Number of housing units supported through EAH in Superior California Region

EAH: Region 1: Superior CA		
EAH support in the form of a construction grant		
AMI Served by market-rate housing	70%	Source: Calculations based off of US Census
AMI of Sacramento-Roseville-Folsom MSA	$75,533	Source: ACS 2020 5-yr estimate
Target AMI	50%	20% less than the AMI served by market-rate housing or 60%, whichever is less; Developer Interviews
EAH leverage factor	2	Assumes employers would be able to leverage other funding sources
EAH Pool	$8,345,684	Same proportion as the region's population as a proportion of CA pop.
Total EAH pool, including leverage factor	$16,691,367	
70% AMI in $	$52,873.10	
50% AMI in $	$37,766.50	
Income diff between 50% and 70% AMI	$15,107	
Annual subsidy needed: 30% of income diff between 70% and 50% AMI	$4,532	per unit
Monthly subsidy needed: 30% of income diff between 70% and 50% AMI	$378	per unit
Subsidy needed/unit	$70,000	assumes 30-yr loan at 5%
Total units subsidized by EAH	**238**	

For EAH, we considered support in the form of a construction grant. Discussions with developers suggested that long-term soft loans and grants are very similar in nature.

Furthermore, other forms of EAH assistance, such as tax credits, would also need to be converted to grant equivalent for analysis purposes.

For the Sacramento region of Superior California, the AMI served by market-rate housing is assumed to be 70% (that is, households earning 70% of AMI can afford market-rate rental housing) based on insights gathered from developer interviews. The AMI for the Sacramento-Roseville-Folsom Metropolitan Statistical Area (MSA) is $75,533. The target AMI for the EAH program is considered to be 50%, which is 20% lower than the AMI served by market-rate housing or 60%, whichever is less, as suggested through developer interviews. The EAH program assumes employers can leverage additional funding sources, with an EAH leverage factor of 2, and provides support in the form of construction grants.

The EAH pool for the Superior California region is calculated based on the region's population proportion relative to the total population of California, resulting in an allocation of $8,345,684. With a leverage factor of 2, the total EAH pool is $16,691,368.

According to the US Census, 70% of the AMI for the region is $52,873, and 50% of the AMI is $37,767. The income difference between 70% and 50% AMI is $15,107. The annual subsidy needed is calculated as 30% of this income difference because it is assumed that a household should not spend more than 30% of gross income toward housing costs, amounting to $4,532 per unit. The required monthly subsidy is $378 per unit. Consequently, the total subsidy needed per unit is $63,000. Thus, the EAH pool of $16,691,368 can subsidize approximately 265 units in the Superior California region. See Table 3.6 for the calculations.

Similar calculations were carried out for all ten regions of California to determine the housing units that can be supported through the EAH program.

3.1.4 Units Supported by Each Program for Each California Region

We calculated the number of housing units supported by each program for each of the ten regions of California over 30 years assuming $100 million in each of the three programs statewide (see Table 3.7). Table 3.8 provides cumulative statewide numbers and the percent of the investment pool exhausted for each program after 30 years. As the table shows, PDRLF can support 25,740 units under prototype 1 (only non-land pre-development costs funded) and 9,449 units with land and other pre-development costs financed over 30 years. LGP can support 6,760 units by guaranteeing only permanent loans and 5,708 units by guaranteeing half construction and half permanent loans. On the other hand, EAH can support 2,383 units through a one-time grant.

Table 3.7: Total housing units supported through each housing finance tool over 30 Years for each region

California Region	**PDRLF**		**LGP**		**EAH**
	Prototype 1	Prototype 2	Prototype 1	Prototype 2	
Region 1: Superior	2747	644	677	572	238
Region 2: North Coast	287	219	83	70	19
Region 3: San Francisco Bay	3683	899	916	773	381

Area					
Region 4: Northern San Joaquin Valley	1866	1024	524	443	185
Region 5: Central Coast	1905	334	438	370	163
Region 6: Southern San Joaquin Valley	2155	752	572	483	245
Region7: Inland Empire	3173	1119	843	712	364
Region 8: Los Angeles County	5129	2062	1388	1172	473
Region 9: Orange County	2572	890	681	575	151
Region 10: San Diego-Imperial	2223	1506	637	538	164

Table 3.8: Total housing units supported through each housing finance tool over 30 Years and the percent of pool exhausted after 30 Years

Tool	Prototype	Units supported over 30 years	Units supported per year	Percent of pool exhausted	
PDRLF	1: only non-land predevelopment costs	25,740	858	33%	
	2: land + all other predevelopment costs	9,449	315	33%	
LGP	1: only permanent loan guaranteed	6,760	225	51%	
	2: 50% each of construction and permanent loan guaranteed	5,708	190	59%	51%
EAH		2,383	79	100%	

3.2 VMT Reduction Calculation

VMT is a combination of trip length, trip frequency, and mode choice, all of which depend on a combination of household and built environment characteristics. Therefore, estimating the VMT effect of new housing development is a complex issue. The measurement is further complicated because land use characteristics in a region are correlated. If a neighborhood is dense, that neighborhood is also likely to have mixed land use with a well-connected transit service available (Choi and Paterson, 2019). Overall, models that jointly address various five D variables in combination may most precisely estimate household-level VMT. Therefore, the relative VMT impact of various housing developments is best estimated using robust statistical models that account for these factors. This section describes the methodology implemented to estimate the relative scale of VMT reduction for the housing development spurred by the three housing finance programs in contrast with regional comparator single-family housing that may have organically developed without such programs. This section is organized as follows: first, the details of the key models/tools from the literature used for this work are described. These include robust models for household VMT developed using California data and data from other parts of North America as well as a tool developed by Fehr and Peers using location-based data (VMT+). Then these models are applied to assess the per household VMT reduction for each of the 10 regions of California due to the housing units supported by each of the three housing finance programs. The sensitivity of these results to the household income and vehicle ownership change

is also explored. The per household VMT reduction provides the basis for estimating aggregate VMT reduction.

3.2.1 Key Models/Studies Applied

3.2.1.1 DeWeese and El-Geneidy (2020)

DeWeese and El-Geneidy utilize a two-step hurdle approach, which is a statistical method used to analyze situations where there are two separate decisions involved. The first step used a multilevel logistic regression specification to model whether a household drove at all. In the second step, the VMT for households that had non-zero miles driven was modeled using multilevel linear regression models. Both the logistic and linear models had individuals nested within households and households within census tracts (DeWeese and El-Geneidy, 2020). Household characteristics included in the model were household income, number of preschoolers, school-age children, adults, and vehicles in the household. The data used in their study is from the Montreal region of Canada. Applying the model from this study for the synthetic household living in various California regions yielded daily household VMT estimates that were consistently lower than those provided by other studies. For example, the estimate for the median household VMT at 100% AMI for a Los Angeles region household living in regional comparator housing was estimated to be about a third of those obtained using Chatman et al. (2019) estimates that used data specific to the Los Angeles region.

3.2.1.2 Song et al. (2016)

In Song et al. (2016), SEM (Structural Equation Modeling) was employed to examine the interactions between the built environment, vehicle usage, transport CO-2 emissions, vehicle type choice, and socioeconomic and demographic characteristics. SEM is a technique used to analyze and explain complex relationships between different variables in the form of an interconnected web of cause-and-effect relationships. The web consists of observed variables that are measured directly and latent variables that cannot be measured directly but are inferred from observed variables. The relationships between these variables are described using the measurement model (relationship between observed variables and latent variables) and structural model (relationship between latent variables). The socioeconomic and demographic variables included in Song et al. (2016) were gender, age, household size, number of household bicycles, number of household vehicles, number of children in household, household income, employment status, obtention of a valid driver's license, transit pass, and level of education completed. The relationship between socioeconomic and demographic characteristics and VMT suggested that people with higher incomes and larger household sizes are more dependent on automobiles (Song et al., 2016). The data used in their study is from the Boston region. Applying the model from this study to the synthetic household living in various California regions also yielded daily household VMT estimates that were consistently lower than those provided by other studies. For example, the estimate for the median household VMT at 100% AMI for a Los Angeles area household living in regional comparator housing was estimated to be about 40% lower than those obtained using Chatman et al. (2019) estimates that used data specific to the Los Angeles region.

3.2.1.3 Boarnet et al. (2020)

Boarnet et al. (2020) focused on how income and proximity to rail transit jointly influence household travel behavior and specifically modeled how VMT varies with income and rail transit access by neighborhood type. The work used data from four large metropolitan areas in California, Los Angeles, San Francisco Bay Area (Bay Area), San Diego, and Sacramento. The study used a Tobit model for VMT specification to reduce bias from households who did not take any trips during the survey period. The Tobit model, also called a censored regression model, is useful where there is left- or right-censoring in the dependent variable. It is appropriate for modeling VMT since VMT is non-negative, that is, left censored. The income levels are combined into four groupings: lower-income (<$25,000), lower-middle-income ($25,000–$50,000), middle-income ($50,000–$100,000), and upper-income (>$100,000), and these levels may be too coarse (especially, above $100k) to address the question of income sensitivity. Furthermore, given that they include a nominal variable to describe one of the four California regions they modeled, this model is likely less robust for regions outside of those four metropolitan areas.

3.2.1.4 Chatman et al. (2019)

Chatman et al. (2019) also used Tobit regression to estimate the average daily household VMT. The study focused on applying model findings to study the impacts of gentrification in neighborhoods near rail stations on VMT. They found that moving higher-income households near rail stations is accompanied by population densification and not displacement and likely leads to decreases in auto use. However, if more displacement (rather than densification) occurs, the estimated VMT benefit may decline or disappear.

While Chatman et al. (2019) do not directly include vehicle ownership, they use income and income squared in the model, thereby addressing the sensitivity of VMT to household income directly. They also include specific models for the two largest metropolitan areas in California (Los Angeles and San Francisco Bay area) and may, therefore, be the most preferred models for those two regions.

3.2.1.5 Fehr and Peers VMT+ tool

The VMT+ tool was developed as an alternative to travel demand models so that developers, planners, and policymakers can get granular VMT estimates. The tool is intended to help communities fulfill SB 743 requirements by having a more precise estimate of the VMT. SB 743, a 2013 law[1], prompted the update to CEQA Guidelines to allow better measurement of transportation-related environmental impacts of any given project. As a result, agencies analyzing the transportation impacts of new projects must examine the VMT generated by the projects instead of traditionally used automobile delay related measures.

The VMT+ tool uses LBS (location-based data) that offers certain advantages, including tracking of whole trips, and a large sample size that covers 365 days a year rather than one day as is typical of a travel diary survey. While LBS has issues related to sampling biases and privacy

[1]More details on SB 743 may be found at: https://opr.ca.gov/ceqa/sb-743/faq.html#what-is

restrictions, the VMT+ tool offers universal applicability across California regions. It can also be more readily applied to estimate VMT associated with all home-based trips and home-based work trips per employee for each census block group. In this way, the tool is different than the four models described above and does not account for household characteristics. Therefore, one cannot assess the sensitivity of the VMT estimate on factors such as vehicle ownership or household income.

For this analysis, the VMT+ tool is used in two ways:

- The tool serves as one of the five models for estimating VMT reduction resulting from a household moving from a suburban single-family house to housing developed using the three financing programs.
- Also, because VMT+ provides both home-based VMT per resident as well as home-based work VMT per worker, they are used to estimate the proportion of VMT of a household that is work-related VMT. This proportion is based on the city location and is specifically helpful in estimating the VMT reduction due to the EAH programs.

3.2.2 Model Application Summary

Table 3.9 provides a quick summary of the key strengths and weaknesses of each of the five modeling tools described above.

Table 3.9: Comparison of tools/models

Model/tool	Key strengths	Weakness	Applicable for California region(s)
DeWeese and El-Geneidy	A robust statistical model; may work well to estimate % reduction in VMT	Data from one metro region outside CA (Montreal region in Canada)	All regions
Song et al.	Most robust statistical model; may work well to estimate % reduction in VMT	Data from one metro region outside CA (Boston region); Complicated to apply to get VMT estimates	All regions
Boarnet et al.	Tobit Model using CA data from four major metro areas; accounts for changes in vehicle ownership	Coarse income levels; includes a nominal variable to identify one of the four metro areas of CA, therefore, likely robust for these four major metro areas.	Los Angeles (and Orange County), San Francisco Bay Area, San Diego, and Sacramento metropolitan areas
Chatman et al. (2019)	Tobit Model using CA data from four major metro areas; Specific income levels	Data used are from four metro areas; no direct effect of vehicle ownership; specific Models for LA and Bay area.	All regions (even though data used are from Los Angeles (and Orange County), San Francisco Bay Area, San Diego, and Sacramento metropolitan areas.
VMT+ from Fehr and Peers	Universal applicability; readily applied	Biases of LBS data sources; no household-level information, so cannot	All regions

As noted in Table 3.9, the models from the literature that used outside California data may be used to estimate relative VMT reductions for all California regions, but their absolute VMT estimates may not be reliable. This may also be the case for Chatman et al. (2019), which may be applied to all California regions, but the absolute VMT estimates may not be reliable given they only used data from the four largest metro areas. The other California-based study, Boarnet et al. cannot be used in regions outside of the four largest metro areas because it includes a nominal variable defining the location to be in one of the four metro areas. Based on these constraints, Table 3.10 lists each of the 10 California census regions and provides tools/models we recommend for this application.

Table 3.10: Tools/models recommended for each region

Region Name	Counties in the Region	Models Recommended
Region 1: Superior	Region 1: Butte, Colusa, El Dorado, Glenn, Lassen, Modoc, Nevada, Placer, Plumas, Sacramento, Shasta, Sierra, Siskiyou, Sutter, Tehama, Yolo, Yuba	DeWeese and El-Geneidy/VMT+/Chatman et al. (2019)
Region 2: North Coast	Region 2: Del Norte, Humboldt, Lake, Mendocino, Napa, Sonoma, Trinity	DeWeese and El-Geneidy/Chatman et al. (2019)/VMT+
Region 3: San Francisco Bay Area	Region 3: Alameda, Contra Costa, Marin, San Francisco, San Mateo, Santa Clara, Solano	DeWeese and El-Geneidy/VMT+/Chatman et al. (2019) (most preferred) /Boarnet et al.
Region 4: Northern San Joaquin Valley	Region 4: Alpine, Amador, Calaveras, Madera, Mariposa, Merced, Mono, San Joaquin, Stanislaus, Tuolumne	DeWeese and El-Geneidy/VMT+/Chatman et al. (2019)
Region 5: Central Coast	Region 5: Counties: Monterey, San Benito, San Luis Obispo, Santa Barbara, Santa Cruz, Ventura	DeWeese and El-Geneidy/VMT+/Chatman et al. (2019)
Region 6: Southern San Joaquin Valley	Region 6: Fresno, Inyo, Kern, Kings, Tulare	DeWeese and El-Geneidy/VMT+/Chatman et al. (2019)
Region 7: Inland Empire	Region 7: Riverside, San Bernardino	DeWeese and El-Geneidy/VMT+/Chatman et al. (2019)

Region 8: Los Angeles County	Region 8: Los Angeles	DeWeese and El-Geneidy/VMT+/Chatman et al. (2019) (most preferred) /Boarnet et al.
Region 9: Orange County	Region 9: Orange	DeWeese and El-Geneidy/VMT+/Chatman et al. (2019) (most preferred) /Boarnet et al.
Region 10: San Diego – Imperial	Region 10: Imperial, San Diego	DeWeese and El-Geneidy/VMT+/Chatman et al. (2019)/Boarnet et al.

Note that we do not recommend using Song et al. for any region, even though statistically, it is the most robust model. Given that Song et al. used a Structural Equation Model (SEM), applying their approach for this study required estimating the latent variables (those that are not measurable directly) using the measured independent variables. Given that studies applying the SEM approach often do not report coefficients of all measurement models that relate measured variables to latent variables, it is challenging to apply the previously developed model to new data. Despite the potential underestimation of household VMT, we recommend applying DeWeese and El-Geneidy for all regions of California over Song et al. due to its ease of application by practitioners. It will allow a relative comparison between different California regions.

Also, note that models by DeWeese and El-Geneidy, Chatman et al. (2019), and the VMT+ tool may be applied for all 10 regions of California. Among these, Chatman et al. (2019) can provide information on the income sensitivity of the VMT reduction at different income levels. For the major metro areas (i.e., Regions 1, 3, 8, 9, and 10), we recommend four different models. For regions 3, 8, and 9, the Chatman et al. (2019) model is most preferred because the study developed specific models for the metro areas in these regions. Chatman et al. (2019) and Boarnet et al. also explicitly address proximity to transit in their models so for infill locations that may be considered TODs in major metro areas either model may be used to estimate VMT reduction. Chatman et al. (2019) may be applied in all regions of California.

3.2.3 Location Selection

For each region, at least one regional comparator, one infill prototype, and one parcel for EAH housing development were identified to estimate and compare VMT reductions based on the built environment of the household's census block group (CBG), or a larger geographic area. The regional comparators were selected to be in a neighborhood of single-family homes, representing a base case scenario where the single-family housing development affordable to a household earning median income for that region is expected to take place in the absence of any incentives and/or subsidies. The infill prototypes were selected as infill sites in zones of higher density and closer to downtown, many are TODs (a few are not because either the transit service does not exist, or the infill sites are more than half a mile from a transit station). For the EAH program, the 'infill' housing was located within a certain distance (3 miles each way trip) of the employer

for one of the household employees. The employer was assumed to be located in a suburban location, often right outside the downtown.

3.2.4 Synthetic Household Characteristics

For each region of the state, corresponding census data was used to define a synthetic household that provided the values for household-level independent variables used in the models described above (see Table 3.11). These variables included, for example, income level, vehicle ownership, number of persons in the household, and number of employees in the household, among others. The characteristics assigned to the synthetic household are based on the characteristics of the median household in the region. For example, 37 years is the median age of the head of the household, $70,684 is the median household income, and 2.75 is the median household size for Region 1. For education, the 50th percentile household falls under the "Some College" category. Typically, these values were based on the Combined Statistical Area (CSA) for the location of the regional comparator housing location. If there was no CSA defined for a region, the numbers for the MSA, the next largest geography, were used. For example, for the San Francisco Bay Area, the San Jose-San Francisco-Oakland CSA was used. The 2017 National Household Travel Survey (NHTS)—California Add-On provided by the National Renewable Energy Laboratory (NREL) was used as supplementary data for other household-level variables, including the number of workers.

Table 3.11: Synthetic household variables for each California region

Household Variable	**Region 1 (Superior California)**	**Region 2 (North Coast)**	**Region 3 (San Francisco Bay area)**	**Region 4 (Northern San Joaquin Valley)**	**Region 5 (Central Coast)**	**Region 6 (Southern San Joaquin Valley)**	**Region 7 (Los Angeles County)**	**Region 8 (Orange County)**	**Region 9 (Orange County)**	**Region 10 (San Diego-Imperial)**
Age of head of household	37 years	46 years	38 years	31 years	39 years	38 years	34 years	36 years	36 years	35 years
Education	Some college	Some college	Some college	Some college	Some college	Some college	Some college	Some college	Some college	Some college
Household income	$70,684	$49,254	$128,091	$49,254	$77,948	$57,109	$57,109	$71,358	$94,441	$82,426
Number of household workers	1	1	1	1	1	1	1	1	1	1
Number of household vehicles	2	2	2	2	2	2	2	2	2	2
Number of household members	2.75	2.40	2.77	3.30	2.51	3.16	3.28	3.02	3.02	2.87

3.2.5 Household-level VMT Reduction

This analysis is not the primary output for this research given that we are interested in aggregate VMT reduction. However, household-level helps address the question of the tradeoff between the dual goals of VMT reduction and equity. Here, we demonstrate the percentage of VMT reduction using the all-state model from Chatman et al. (2019). The tables provide results corresponding to the infill location that is applicable for the PDRLF/LGP financing tool, as well as the location near potential employers corresponding to the EAH tool. The percentage reduction in VMT is estimated based on the VMT the same household would have generated living in the regional comparator location.

Table 3.12: Percent VMT reduction per household for the infill location versus the comparator location for each *region, by different area median income (AMI) level (based on Chatman et al.*, 2019 *and PDRLF/LGP housing methodologies*)

	Region 1: Superior	**Region 2: North Coast**	**Region 3: San Francisco Bay Area**	**Region 4: Northern San Joaquin Valley**	**Region 5: Central Coast**	**Region 6: Southern San Joaquin Valley**	**Region 7: Inland Empire**	**Region 8: Los Angeles County**	**Region 9: Orange County**	**Region 10: San Diego - Imperial**
100% AMI	28.34%	2.62%	33.82%	0.37%	10.00%	1.46%	25.51%	12.94%	27.09%	26.32%
80% AMI	29.01%	2.91%	34.16%	0.39%	11.06%	1.59%	25.99%	13.68%	27.19%	26.59%
50% AMI	31.06%	3.53%	36.68%	0.45%	13.71%	1.85%	27.29%	15.52%	28.41%	27.96%

Table 3.13: Percent VMT reduction per household for the infill location versus the comparator location for each region, by different area median income (AMI) levels (based on Chatman et al., 2019 and EAH housing methodology)

	Region 1: Superior	**Region 2: North Coast**	**Region 3: San Francisco Bay Area**	**Region 4: Northern San Joaquin Valley**	**Region 5: Central Coast**	**Region 6: Southern San Joaquin Valley**	**Region 7: Inland Empire**	**Region 8: Los Angeles County**	**Region 9: Orange County**	**Region 10: San Diego - Imperial**
100% AMI	33.44%	6.82%	40.97%	13.86%	10.63%	13.29%	30.75%	20.00%	36.08%	34.16%
80% AMI	32.74%	5.24%	40.43%	13.15%	9.24%	12.42%	30.09%	18.93%	35.20%	33.27%
50% AMI	31.50%	1.77%	40.12%	11.73%	5.75%	10.58%	28.90%	16.54%	33.82%	31.76%

Since these outputs are based on the same model from Chatman et al. (2019) using data from California, they provide a basis for comparing different regions. At all income levels, the major metro areas have the highest % reduction in VMT, while more rural regions (for example, North Coast, Northern San Joaquin Valley, and Southern San Joaquin Valley) have a lower % VMT reduction. Finally, in the major metro areas, lower-income households (50% AMI) show a moderately large % of VMT reduction.

Table 3.14: Absolute daily VMT reduction per household for the infill location versus the comparator location for each region, by different area median income (AMI) levels (based on Chatman et al., 2019 and PDRLF/LGP housing methodologies)

	Region 1: Superior	**Region 2: North Coast**	**Region 3: San Francisco Bay Area**	**Region 4: Northern San Joaquin Valley**	**Region 5: Central Coast**	**Region 6: Southern San Joaquin Valley**	**Region 7: Inland Empire**	**Region 8: Los Angeles County**	**Region 9: Orange County**	**Region 10: San Diego - Imperial**
100% AMI	11.34	0.76	14.82	0.15	3.49	0.58	10.75	5.85	12.83	11.54
80% AMI	10.59	0.76	13.95	0.15	3.49	0.58	10.15	5.67	11.83	10.66
50% AMI	9.46	0.76	12.65	0.15	3.49	0.58	9.24	5.39	10.33	9.35

Table 3.15: Absolute daily VMT reduction per household for the infill location versus the comparator location for each region, by different area median income (AMI) levels (based on Chatman et al., 2019 and EAH housing methodology 3 miles one way from work location)

	Region 1: Superior	**Region 2: North Coast**	**Region 3: San Francisco Bay Area**	**Region 4: Northern San Joaquin Valley**	**Region 5: Central Coast**	**Region 6: Southern San Joaquin Valley**	**Region 7: Inland Empire**	**Region 8: Los Angeles County**	**Region 9: Orange County**	**Region 10: San Diego - Imperial**
100% AMI	13.38	1.99	17.96	5.57	3.71	5.30	12.96	9.04	17.09	14.97
80% AMI	11.95	1.38	16.51	4.91	2.92	4.56	11.74	7.84	15.32	13.34
50% AMI	9.60	0.38	13.83	3.83	1.47	3.34	9.78	5.74	12.30	10.63

Table 3.16: Percent daily VMT reduction per household for the infill location versus the comparator location for each region (based on VMT+ tool)

	Region 1: Superior	**Region 2: North Coast**	**Region 3: San Francisc**	**Region 4: Norther**	**Region 5: Central**	**Region 6: Southern San**	**Region 7: Inland Empire**	**Region 8: Los Angeles**	**Region 9: Orange**	**Region 10: San Diego - Imperial**

			o Bay Area	n San Joaquin Valley	Coast	Joaquin Valley		County	County	
PDRLF/ LGP	33.07%	7.86%	48.51%	9.89%	47.53%	32.17%	6.17%	43.24%	51.17%	37.39%
EAH 3 miles one way	22.58%	22.45%	47.36%	55.87%	28.91%	57.69%	22.92%	40.26%	56.60%	31.46%

Table 3.17: Absolute daily VMT reduction per household for the infill location versus the comparator location for each region (based on VMT+ tool)

	Region 1: Superior	Region 2: North Coast	Region 3: San Francisco Bay Area	Region 4: Northern San Joaquin Valley	Region 5: Central Coast	Region 6: Southern San Joaquin Valley	Region 7: Inland Empire	Region 8: Los Angeles County	Region 9: Orange County	Region 10: San Diego - Imperial
PDRLF/ LGP	24.90	5.40	48.90	8.40	37.50	24.90	4.20	38.40	45.90	26.70
EAH 3 miles one way	17.00	15.42	52.03	47.43	12.98	44.65	15.61	33.02	50.77	22.46

Tables 3.14 and 3.15 show absolute VMT reduction for the infill locations (applicable for PDRLF and LGP) and locations within 3 miles of the employment location (applicable for EAH). Tables 3.16 (% reduction per household) and 3.17 (absolute reduction per household) show the information for both financing tools using the VMT+ tool.

As mentioned previously, the literature shows the VMT reduction effects are enhanced if there is a corresponding reduction in vehicle ownership. Since the Chatman et al. (2019) model did not account for vehicle ownership, we demonstrate the combined effect of ownership using the output from another model based on California data, which is Boarnet et al. (2020). For all regions where the Boarnet model may be applied, one observes meaningfully higher VMT reduction for households when the household relocates and goes from owning 2 vehicles to owning just 1 vehicle compared to the reduction observed when the household is in infill housing but retains two vehicles.

Table 3.18: Percent daily VMT reduction per household for the infill location versus the comparator location for major metropolitan regions of California (based on Boarnet et al., 2020)

	Orange County region	Los Angeles region	Sacramento region	San Diego region
100% AMI (no vehicle ownership change)	37.36%	57.20%	21.99%	6.33%

100% AMI (change to 1-vehicle owned)	52.52%	73.49%	39.68%	25.19%
80% AMI (no vehicle ownership change)	37.36%	57.20%	21.99%	6.33%
80% AMI (change to 1-vehicle owned)	52.52%	73.49%	39.68%	25.19%
50% AMI (no vehicle ownership change)	36.46%	54.99%	30.51%	5.35%
50% AMI (change to 1-vehicle owned)	52.95%	72.87%	50.10%	26.41%

Note that one of the drawbacks of the Boarnet model is that it may not be applied to all regions of the state, given that the model includes a dummy variable identifying one of the major metro areas. However, it illustrates the importance of discouraging vehicle ownership, particularly for a household moving to an infill location. In the next section, these household level VMT reductions are aggregated based on the total housing units produced/supported by each housing financing program.

Table 3.19: Comparison of estimates from different modeling tools by regions

	Average Reduction for Major Metro Regions (1, 3, 8, 9, 10)	**Average reduction for Non-major metro Regions (2, 4, 5, 6, 7)**
VMT+		
PDRLF/LGP	37.0	16.1
EAH 3 miles one way	35.1	27.2
Chatman et al. (2019)		
PDRLF/LGP	11.3	3.1
EAH 3 miles one way	14.5	5.9

VMT+ generally estimates higher VMT for a 3-person household and the corresponding estimate for reduction in household VMT reduction is also higher. Table 3.19 shows two VMT reduction estimates from the VMT+ tool and Chatman et al. (2019). Each estimate is an average of the estimates over five regions. The first average is obtained by averaging major metro regions (1, 3, 8, 9, and 10) while the other is obtained over regions that do not consist of the largest metro areas of the state (2, 4, 5, 6, 7). Note that since VMT+ only primarily accounts for location (based on CBG), it likely overestimates the reduction due to changing the location from suburban to infill especially in major metro areas where the infill locations are likely to be denser and more transit rich. By not accounting for household characteristics, the reduction estimate may also be affected by selection bias discussed by Ewing et al. (2015). A household likely to walk more in their original location is more likely to choose walkable/transit-rich neighborhoods and therefore the reduction in VMT due to the change in location may not be as high as what it would appear to be if one only examines the average household VMT of the respective location (for example, based on CBG). It is possible that this bias of the tool VMT+ is what makes the infill location housing developed by PDRLF/LGP more competitive with EAH especially in metro areas as shown in the table above. In the next chapter, we have scaled these household-level reductions based on the number of housing units supported by each of the three financing tools.

Chapter 4: Results and Discussion

4.1 Housing

Building upon the regional and total housing production numbers reported in the previous chapter (see Tables 3.7 and 3.8), this chapter first reflects on the comparative ability of the three housing finance programs to support affordable housing in California. Next, it distills the findings from the literature, the case studies, and the developer and expert interviews regarding the challenges to implementing the three programs, ways to enhance equity in designing and implementing the tools, and how state and federal governments can support them. The section concludes by reporting the comparative utility of the programs from the perspective of end-user adoption.

4.1.1. Results: Housing Units Supported

Table 3.8, in the previous chapter, provides the aggregate number of units supported statewide over 30 years by $100 million State investment in each program (and its sub-variants). The following are noteworthy. First, the PDRLF Prototype 1 supports the highest number of housing units (25,740). EAH supports the least number of units (2,383), more than ten times less. However, since PDRLF's Prototype 1 only supports non-land-related predevelopment costs, a more reasonable comparison between the programs is between PDRLF Prototype 2 (that funds both land and non-land-related predevelopment costs) and the rest of the programs. Thus, excluding PDRLF Prototype 1, the other non-EAH options (PDRLF Prototype 2 and LGP Prototypes 1 and 2) support about two (the LGP Prototype 2 supports 5,708 units) to four times (PDRLF Prototype 2 supports 9,449 units) more units than EAH—not an order of magnitude difference (see Table 3.8). When examined by each region, this proportion is less than 10 for each region, except for the North Coast region where the proportion is 11.5, mainly because the market only supports 100% AMI, while the target AMI for EAH is 60% AMI, leading to a high per unit subsidy requirement for EAH.

Finally, Table 3.7 shows that the number of units supported by EAH is the lowest among all the options in each region, and the comparative magnitude of units supported by the other three options—PDRLF Prototype 2 and LGP Prototypes 1 and 2—vary only a little (by a factor of one to three).

Table 4.1: Housing units supported by PDRLF Prototype 2, and LGP Prototypes 1 and 2 as a proportion of units supported by EAH

Region Name	PDRLF Prototype 2	LGP Prototype 1	LGP Prototype 2
Region 1: Superior	2.7	2.8	2.4
Region 2: North Coast	11.5	4.4	3.7
Region 3: San Francisco Bay Area	2.4	2.4	2.0

Region 4: Northern San Joaquin Valley	5.5	2.8	2.4
Region 5: Central Coast	2.0	2.7	2.3
Region 6: Southern San Joaquin Valley	3.1	2.3	2.0
Region 7: Inland Empire	3.1	2.3	2.0
Region 8: Los Angeles County	4.4	2.9	2.5
Region 9: Orange County	5.9	4.5	3.8
Region 10: San Diego – Imperial	9.2	3.9	3.3

Furthermore, while PDRLF and LGP are just one tool in the multi-layered financing of affordable housing in California, State support for EAH has the potential to bring a new, much-needed funding source to workforce housing (if it does not replace existing public subsidies), especially in areas with very tight housing supply and high demand.

Moreover, the proportion of the State investment remaining at the end of 30 years varies significantly. The EAH will exhaust the entire 100% investment (it is assumed that the entire investment will be disbursed in the form of a construction grant by year 5). On the other extreme, PDRLF only exhausts 33% of the investment, and LGP Prototypes 1 and 2, 51% and 59%, respectively. Therefore, PDRLF and LGP stretch the public dollars the most.

4.1.2 Housing Finance Tools: Challenges to Implementing the Programs

4.1.2.1 LGP

Literature, case studies, and developer and expert interviews identify the following challenges to implementing an LGP and potential ways to overcome them. First, LGP could promote risky behavior, especially if the entire loan is guaranteed. Thus, the literature suggests guaranteeing less than 100% of the loan, which is especially important given the need for flexible loan terms. Second, while large philanthropic organizations, given their substantial balance sheets, are uniquely poised to guarantee loans, they may not have the technical and administrative capacity to institute and implement an LGP. Therefore, rather than instituting their own LGP, they can form a consortium that includes an investment advisory firm (Mission Investors Exchange, n.d.). Third, insights from LGPs for small business loans highlight challenges in reaching a diverse applicant pool. Interviewees note the need to be flexible, for example, not having a very high minimum loan amount to be guaranteed, actively recruiting lenders, and increasing the guarantee pool as solutions. Fourth, the staff of the Annie E. Casey Foundation notes that it is challenging to make a but-for-case, that is, show that but-for the LGP, traditional lenders would not have lent. Fifth, put together a structure that is reasonable and doesn't overly constrain philanthropic organizations' work but also doesn't unduly expose it to risk. The final challenge is ensuring all partners are on the same page around risk.

4.1.2.2 PDRLF

The two major challenges highlighted in the literature—the availability of initial capital and the need to periodically recapitalize the loan fund (Stinson and Lubov, 1992) highlight the critical role state and federal governments could play in funding PDRLFs. PDRLF administrators note additional challenges, including the inexperience of applicants (many are mission-driven organizations, such as churches, with little knowledge of real estate development); and the need for a larger loan pool to meet unmet needs.

4.1.2.3 EAH

During the interviews, the EAHP administrators highlighted many challenges noted in the literature. For example, employers may not know the employees' exact housing needs. For instance, among the EAHP case studies reviewed for this white paper, Run Hill Ridge and Hatteras Teacher Housing, and Williams-Baldwin Teacher's Campus were primarily designed and developed as per the design imposed by the North Carolina State Employers' Credit Union. Similarly, there is no record of employee or community engagement for Sage Park apartments and Selma Community housing. Furthermore, one interviewee noted the need to educate and motivate employers so that they realize the value of EAH. Finally, employers may not have the expertise to provide EAH programs, especially the supply-side programs, which are more complex, risky, resource and time-intensive and require higher levels of real estate development competency than the demand-side programs. Therefore, an interviewee noted the need to develop a simple EAHP. For example, state governments can help set up such programs where the employers can contribute to an EAH fund in lieu of states providing tax credits or provide a single capital grant similar to the EAH prototype employed in this paper.

Additionally, program administrators note several challenges that are not discussed in the literature. These include difficulty managing and maintaining the projects. This challenge usually arises because the funds and expertise needed to undertake these tasks are underestimated, perhaps because employers (such as school districts) are not in the business of managing housing projects. Therefore, the program administrators highlight the need to work with partners or experts knowledgeable about constructing and maintaining housing projects and set aside a large enough sinking fund for the housing's operations and maintenance. Other challenges include finding appropriate sites that are walkable and close to services while low in price; assembling construction financing; making sure that the units fit employees' needs; the need to pay the prevailing wage for construction *as well as* maintenance (hence the need to find a financing source that does not require using prevailing wages); the long time taken to secure entitlements and permits because the land is not zoned for residential (for example, school district land); and a lack of readily available financing (hence the need for state support and a funding stream that employers can tap year-round, unlike the twice-a-year applications for LIHTC funds).

4.1.3 Housing Finance Tools: Ways to Enhance Equity

4.1.3.1 LGP

The interviews with LGP administrators and the literature on small-business- and housing-focused LGPs note several ways to enhance equity—achieve a broad geographical reach covering both urban and rural areas; administer the program through a network for non-profit financial development corporations that have links with local banks; require program

administrators to provide plans for increasing credit access to low- and moderate-income communities, minority communities, other underserved communities, and women- and minority-owned businesses; exclusively focus on underserved communities, which gives the program clear recognizability with the lenders and borrowers; provide technical assistance to borrowers; choose program administrators that have a strong history of serving underserved communities with multiple programs; require contracting agencies to meet specific outputs related to serving underserved communities; and no low/minimum loan amount to guarantee (Padilla, 2022; US Department of the Treasury, 2014).

Interviews with the LGP administrators provide additional insights. For example, the Annie E. Casey Foundation guarantees loans aligned with its mission of serving families with children, low-income people, families of color, and young adults disconnected from school, work, and families. SBA allows credit unions to apply to become SBA-guaranteed lenders and non-profit lenders to participate in their community-managed program.

4.1.3.2 PDRLF

Literature on RLFs and PDRLFs highlights three important ways to enhance equity—charge below-market interest, assume a subordinate lien position that incentivizes private lender participation, and fund projects that serve low-income and underserved communities (Stinson and Lubov, 1992; Local Housing Solution, n.d.; NLIHC, 2021).

The program administrators' interviews support the above findings and provide additional insights. First, they focus on low-income households. For example, Oakland requires at least 20% of rental units, respectively, to be affordable to households at or under 30% AMI, and Florida requires at least 30% of rental units to be affordable to households at or below 50% AMI and 50% of owner-occupied units to be affordable at or below 80% AMI. LACHIF II requires all the units to be affordable at or below 60% AMI. Second, they strive to serve diverse population groups. For example, interviewees noted that Connecticut encourages geographical distribution, including a mix of urban, suburban, and rural areas. Housing Trust of Santa Barbara County reaches out to different groups like social service groups, homeless providers, and nonprofits. They do so through workshops, a notice of funding, and attending quarterly meetings of the Joint County-Cities Affordable Housing Task Force, and Oakland is planning on proactively reaching out to BIPOC developers. Third, they engage communities. For example, Oakland requires applicants to show proof of community support and outreach in their predevelopment loan application. Fourth, they make the program more effective for small emerging developers and BIPOC developers by allowing a higher administrative allowance and opening applications to emerging for-profit developers.

4.1.3.3. EAH

The program administrators noted that they considered equity in four primary ways. First, they provided below-market-rate housing that was affordable to employees. Second, they offered appropriate housing for the target employees with a mix of unit sizes. Third, in a few cases, they involved the community by presenting the project in public settings where the community had opportunities to offer input. Fourth, they imposed term restrictions on the renters so that those on

the wait list have a chance to rent the units. In most cases, however, the employees or other stakeholders were not consulted while designing and implementing the projects.

4.1.4 Housing Finance Tools: How State and Federal Governments Can Help

4.1.4.1 LGP

The literature details several small-business and housing-focused LGPs. These include SBA's LGP, the US Department of Treasury's SSBCI program, HUD's Section 108 program, and the CMF at the federal level; and California's SBLGP at the state level. The existence of these programs highlights the key role federal and state governments can play in guaranteeing loans.

Interviews with LGP administrators provide additional insights. For example, Anew America Community Corporation (a technical assistance provider) highlights program flexibility, especially by guaranteeing smaller loans and giving more flexibility to program administrators to help reach diverse communities.

The Annie E. Casey Foundation suggests a capital structure where the government takes a lien position subordinate to philanthropic organizations. SBLGP staff highlight the government's role in replenishing the loan guarantee pool, removing restrictions such as a prohibition on prepayment penalties/fees. Finally, SBA's staff highlights the importance of enhancing borrowers' understanding of standard operating procedures of lending, for example, the need for personal guarantees in case of sole proprietorship.

4.1.4.2 PDRLF

Several literature and case study findings underscore the importance of state and federal governments in funding PDRLFs. For example, the seed funding came from the state governments in the case of Connecticut and Florida's predevelopment programs, and the LACHIF II program administrator highlighted the continuing need to recapitalize PDRLFs. This need to recapitalize the fund primarily emanates from money losing value over time due to inflation and the ever-increasing need to fund affordable housing, and not from non-payment of a loan.

Finally, the program administrators note the role of federal and state governments, positing that the governments should provide large grants or low-interest loans with sufficient monitoring to local trust funds and non-profits without a complex application process and let the housing trust funds and non-profits determine their lending priorities based on local needs. The need for such flexible, low-touch assistance is also highlighted in the literature. Moreover, such funds should not be contingent on obtaining environmental clearances and entitlements. Furthermore, community engagement should be an eligible predevelopment activity so that it can be prescribed more. Finally, developers should be able to use these funds for capacity building, support staff, and operations. As noted in the Literature Review, precedent exists because operations are an eligible expense for small business-focused RLFs. However, funding operating expenses through predevelopment loans is more challenging in the field of housing because many operating expenses are not usually rolled into a construction loan. Therefore, such expenses (community engagement, capacity building, operations) need to be creatively built into

the categories eligible for construction loans. For example, developers could hire consultants to engage in community engagement, thereby expensing it under consultant fees.

4.1.4.3 EAH

At the local and regional levels, the government can help communities develop a list of non-profit organizations that can manage EAHPs; establish, fund, and manage housing trust funds; provide tax credits (Burnett, Khadduri and Lindemayer, 2008); help employers design EAHPs and manage them on the employer's behalf; and provide matching grants to employers (Treuhaft, 2007).

Additionally, state governments can play a direct role in funding EAH. For example, they could provide tax credits to employers who develop EAH; or establish, fund, and manage housing trust funds. Trust funds can be funded in various ways, such as through matching funds, tax credits, direct grants, or loans. Several examples exist, including the State of Florida's $50 million support for EAHPs, where the development team includes a developer, an elected official, and an employer. In addition, Connecticut created an EAH Revolving Loan Fund in 1994 to provide business tax credits in lieu of employer contributions to the revolving loan fund.

Similarly, Illinois provides a 50% tax credit to employers making qualified, affordable housing investments. Finally, the State of Minnesota contributed to the Greater Minnesota Housing Fund through the Minnesota Housing Finance Agency. This state contribution, along with the contributions from local employers such as the Mayo Clinic, helped produce around 800 affordable homes in the Rochester, MN, area, a mix of single-family and multi-family units (Burnett, Khadduri and Lindemayer, 2008; PolicyLink, 2007).

Moreover, under the New Hampshire Community Development Investment Program (CDIP), businesses receive 75% state tax credits for investments made in community projects. These projects include housing, homeless shelters, community centers, and museums (Fischer et al. 2021). While this program is not EAH-specific, it could be used for it.

Finally, the State of Pennsylvania's Neighborhood Partnership Program provides 70% tax credits to employers. In return, employers commit a minimum of $50,000/annum for five years toward neighborhood revitalization efforts in partnership with community-based organizations. This program has helped develop or rehabilitate more than 1,600 houses, trained or provided jobs to over 4,000 Philadelphia residents, and located 61 businesses and 270 jobs in distressed neighborhoods (Treuhaft, 2007).

At the federal level, Fannie Mae helps employers create an EAH plan and, through its network of lenders, provides a customizable mortgage loan product to employees (Burnett, Khadduri and Lindemayer, 2008). Additionally, several educational institutions have partnered with Fannie Mae for their EAHPs. Most are demand-side programs where Fannie Mae makes home-buying affordable, often through a low-interest customized loan product (for example, Case Western University, Ohio State University, and Tulane University). However, Fannie Mae has helped develop new housing in a few cases. For example, Fannie Mae partnered with Howard University to rehabilitate 28 houses and construct 17. The university provided the land and served as the partnership's connection to the community. Fannie Mae provided the development

expertise, funded the project, and provided mortgage finance assistance to homebuyers (Hoereth, Packnett and Perry, 2007).

Furthermore, the federal housing and community development funding programs such as HOME and the Community Development Block Grant (CDBG) Program could be used toward EAH programs. To ensure fair housing laws are not violated, these programs typically limit the criteria employed to select inhabitants. However, certain exceptions might exist. For example, HOME might allow targeting teachers, police officers, and first responders.

Similarly, employers could buy land using CDBG funds and construct houses using other funding sources. Moreover, in New Hampshire, employers can contribute towards housing development and then apply for low-income housing tax credits. Because of the direct subsidy provided for the development, employers could negotiate the number of housing units reserved for their employees, the units' cost, and the affordability period (Fischer et al., 2021)

Finally, the literature also points to as yet unsuccessful efforts at the federal level to pass legislation that would provide a 50% tax credit to employers for investment in EAHPs, specifically HR 1850, which was introduced in the House of Representatives in 2007 (Choi, 2008; Congress. Gov, 2022; Treuhaft, 2007). A similar Bill, AB 2999, was introduced in the California legislature in 2018 (Bonta, 2018). Moreover, a task force constituted in Arizona to identify ways to create affordable housing identified providing a tax benefit for EAH as one of its five key suggestions (Gunderson, 2007). Finally, the literature calls for legislative action to make housing benefits tax-exempt at the federal level, like health benefits (PolicyLink, 2007).

EAH program administrators echo the literature's call for instituting a state-level housing tax credit program and providing employers with the expertise to develop EAH. Furthermore, they note that states could help by providing low-cost, flexible, and easily accessible funding; incentivizing the developers and the employers to work together, for example, by including some requirements for a local employer match in the funding criteria; pass legislation that speeds up the construction by providing density bonuses, zoning change flexibility, encourage modular construction by tying up with the modular manufacturers to reduce cost (for example, material and on-site labor costs) and time (governments can place a bulk order for such units); and make permitting and entitlement process easier by something similar to a transit-oriented zone where the employer-owned land has that type of designation, with the benefit of streamlining the environment review process. Such lands could be the excess employer-owned land (for example, excess school district land) designated for EAH development or land purchased by an employer for an EAH development.

4.2 End-user Adoption of LGP, PDRLF, and EAH

In addition to the program administrators interviewed for case study programs (their views are noted in the preceding sections of this chapter), several small, medium, and large real estate developers spread over the state, and housing financial and technical assistance providers and those engaged in research, policy, and advocacy were interviewed to assess the utility of the three housing finance programs, specifically focusing on the critical adoption challenges in California, and ways to address them.

4.2.1. LGP Could Be Very Useful for Small Developers, Likely to Be Useful for Medium-sized, and in Some Cases, Large Developers

Overall, the interviewees note that LGPs will likely be primarily valuable for small developers often led by BIPOC and minority community members. These developers usually partner with medium- or large-sized developers to construct housing projects and typically get a share of the developer fee in return. Loan guarantees could help them strike a better bargain with the larger developers.

Medium and large developers typically use their balance sheets to guarantee loans. However, often, the total loans they take exceed their balance sheet. Usually, the lenders do not take a close look at all the loans for which the developers pledge their balance sheets. But, if they do decide to, then LPGs could also be useful for medium-sized developers. One large developer noted the usefulness of LGP for them, citing an example where the state's financial assistance proved inadequate due to an increase in construction loan rates. The interviewee suggested that a loan guarantee could have helped in such a case.

4.2.2 Useful to Guarantee Both Construction and Permanent Loan

All the interviewees suggested guaranteeing both construction and permanent loans. However, many agreed that construction loans can be very risky, so past efforts to garner state guarantees have been unsuccessful.

4.2.3 PDRLF Useful for All Developers

Developers of all sizes highlighted the usefulness of PDRLFs, barring one who noted that predevelopment loans were already available to them. Those who supported PDRLF pointed to a high degree of uncertainty at the predevelopment stage, hence the utility of one go-to funding source. Interviewees also stressed the importance of flexible loans. Among others, the state-led PDRLF can be longer term (5-6 years) compared to most of the existing 2-3-year-term loans, have rolling application deadlines, not require developers to have construction and permanent financing secured (most lenders require this), not require onerous real estate development experience requirement for applicants, and set and periodically update maximum loan amounts based on the regional housing market (for example, a $10 million land acquisition loan may not be enough for regions with robust real estate markets, such as the San Francisco Bay Area).

Finally, interviewees suggested implementing the PDRLF program through regional-level organizations, such as CDFIs and housing trusts, which are knowledgeable about the local and regional housing markets and are closely connected with the developer community.

4.2.4 Program Flexibility is Important

Across all the programs, interviewees stressed the importance of flexible programs with minimal strings attached. In addition to the PDRLF-related suggestions in the previous sub-section, other suggestions are as follows: a simple EAHP (for example, a state credit for providing EAH), minimal reporting requirements for the EAH grant recipients, the ability for philanthropic organizations and other donors to contribute to a large EAH pool, and no prevailing wage requirements for constructing and maintaining projects.

4.2.5 Funding Should Not Replace Existing Housing Assistance Funds

Across the board, the interviewees stressed the importance of these housing finance programs not replacing existing housing assistance funds.

4.2.6 EAH Could be Difficult to Implement without Significant Legislative Support and Funding

The interviewees expressed strong support for a robust State investment in EAH. They pointed out that since EAH projects are often not eligible for federal housing assistance (the federal LIHTC funds were pointed out) because they violate fair housing requirements, any support for EAH should be robust enough to obviate the need for such federal assistance.

Additionally, they pointed to existing State carve-outs for farm workers and school district employees' housing that allow these housing projects to receive local and State financial assistance even while restricting occupancy to their employees. Without such carve-outs, such housing projects would violate fair housing requirements. Interviewees highlighted the need to expand this carve-out to include all employee-provided housing—a potentially politically challenging task that, given limited funding, would likely take away resources from other low-income, minority, and underserved communities. Hence, to the extent possible, EAH should be funded through "new" housing funds.

4.2.7 Strong Support for PDRLF, Followed Closely by LGP

When asked to prioritize the three housing finance programs, interviewees expressed strong support for PDRLF, closely followed by LGP. There were significant implementation-related concerns about the EAHPs, given the need to potentially create a more conducive legal framework. Furthermore, from an equity perspective, PDRLF is very likely to benefit small and emerging real estate developers, followed by LGP and EAHP.

4.3 VMT Results

The VMT impact of various housing developments is estimated as follows: first, using robust statistical models, as well as the VMT+ tool, VMT reductions at the household level are estimated. The reduction is measured relative to a household living in a typical suburban regional comparator location (i.e., market-rate single-family housing likely to be produced without public subsidies). The VMT reduction for each household is then aggregated based on the number of housing units produced by each program.

Note that the measurement as well as estimation of VMT is complex. In this paper, we used multiple existing models from the literature, each with varying sets of assumptions. A more accurate assessment will require future modeling efforts specifically tailored to address the question of VMT and affordable housing. The percentage of VMT reduction for each household and the importance of income and vehicle ownership in these reductions are discussed in the previous chapter.

The analysis describes the total VMT reduction at the aggregate level. In all, the following reductions are noteworthy:

- Base effect, VMT reduction for the median household for the region, shown in Table 4.2, living in the infill housing compared to them living in regional comparator location.
- Income effect, VMT reduction if the household has 80% and 50% of AMI.
- Vehicle ownership effect, VMT reduction due to household becoming a 1-vehicle household from the base scenario of being a 2-vehicle household.

First, these results are described based on the most preferred model for each region of California. Then, the VMT reduction is estimated based on the VMT+ tool, which is most readily applied by practitioners for the base case scenario. Note, however, that the VMT+ tool only accounts for the change in location. The drawback is that the tool does not account for any household characteristics (i.e., income or vehicle ownership status). Therefore, equity or vehicle ownership impacts cannot be explored using this tool. Further note that while PDRLF and LGP financing programs are based on the same infill location, the location used as "infill" for EAH is 3 miles away from the employment location.

For most regions of the state, the highest aggregate VMT reduction is achieved through PDRLF Prototype 1. However, as mentioned previously, PDRLF Prototype 1 only supports non-land-related predevelopment activities. Therefore, a more reasonable comparison between the programs is between PDRLF Prototype 2 (that funds both land and non-land-related predevelopment costs) and the rest of the programs. Thus, excluding PDRLF Prototype 1, the other non-EAH options—PDRLF Prototype 2 and LGP Prototypes 1 and 2, and EAH—support about two to nine times more units than EAH—not an order of magnitude difference (see Table 4.1). One exception is the North Coast region where the proportion is 11.5, largely because the market only supports 100% AMI while the target AMI for EAH is 60%AMI, leading to a high per unit subsidy requirement.

Table 4.2: Aggregate VMT reduction (in 100,000 VMT) for each of the housing finance programs—using the most appropriate model for the corresponding region—100% AMI, 2 vehicles owned (no-change in vehicle ownership status)

Financing Program	**Region 1: Superior**	**Region 2: North Coast**	**Region 3: San Francisco Bay Area**	**Region 4: Northern San Joaquin Valley**	**Region 5: Central Coast**	**Region 6: Southern San Joaquin Valley**	**Region 7: Inland Empire**	**Region 8: Los Angeles County**	**Region 9: Orange County**	**Region 10: San Diego - Imperial**
Model Applied	DeWeese & El-Geneidy, 2020	DeWeese & El-Geneidy, 2020	Chatman et al. (2019) (region-specific)	DeWeese & El-Geneidy, 2020	DeWeese & El-Geneidy, 2020	DeWeese & El-Geneidy, 2020	DeWeese & El-Geneidy, 2020	Chatman et al. (2019) (region-specific)	Chatman et al. (2019)	Chatman et al. (2019)
PDRLF Prototype 1	1,352.63	31.69	2,988.68	305.29	319.36	440.86	157.55	3,145.99	1,928.07	1,498.69
PDRLF Prototype 2	316.92	24.15	729.32	167.58	56.04	235.11	55.56	1,265.09	666.91	1,015.06
LGP Prototype 1	465.17	12.8	1,036.66	119.68	102.47	249.19	58.38	1,188.07	712.27	599.33

LGP Prototype 2: Perm Loan	376.45	10.36	838.93	96.85	82.93	201.66	47.24	961.46	576.41	485.02
EAH (3-mile each way trip to work)	176.07	2.38	756.01	37.74	26.16	109.19	33.07	1,181.62	281.99	269.51

Table 4.3: Aggregate VMT reduction (in 100,000 VMT) for each of the housing finance programs—using the most appropriate model for the corresponding region—100% AMI, ownership status changed to 1 vehicle owned

Financing Program	**Region 1: Superior**	**Region 2: North Coast**	**Region 3: San Francisco Bay Area**	**Region 4: Northern San Joaquin Valley**	**Region 5: Central Coast**	**Region 6: Southern San Joaquin Valley**	**Region 7: Inland Empire**	**Region 8: Los Angeles County**	**Region 9: Orange County**	**Region 10: San Diego - Imperial**
Model Applied	DeWeese & El-Geneidy, 2020	DeWeese & El-Geneidy, 2020	Chatman et al. (2019) (region-specific)	DeWeese & El-Geneidy, 2020	DeWeese & El-Geneidy, 2020	DeWeese & El-Geneidy, 2020	DeWeese & El-Geneidy, 2020	Chatman et al. (2019) (region-specific)	Chatman et al. (2019)	Chatman et al. (2019)
PDRLF Prototype 1	1,432.85	44.94	2,988.68	380.53	383.9	750.42	311.4	3,145.99	1,928.07	1,498.69
PDRLF Prototype 2	335.72	34.24	729.32	208.87	67.36	261.92	109.82	1,265.09	666.91	1,015.06
LGP Prototype 1	492.76	18.15	1,036.66	149.17	123.18	277.61	115.38	1,188.07	712.27	599.33
LGP Prototype 2: Perm Loan	398.78	14.68	838.93	120.72	99.69	224.66	93.38	961.46	576.41	485.02
EAH (3-mile each way trip to work)	185.87	3.65	756.01	48.5	33.9	121.69	57.99	1,181.62	281.99	269.51

Table 4.4: Aggregate VMT reduction (in 100,000 VMT) for each of the housing finance programs—using the most appropriate model for the corresponding region—80% AMI, 2 vehicles owned

Financing Program	**Region 1: Superior**	**Region 2: North Coast**	**Region 3: San Francisco Bay Area**	**Region 4: Northern San Joaquin Valley**	**Region 5: Central Coast**	**Region 6: Southern San Joaquin Valley**	**Region 7: Inland Empire**	**Region 8: Los Angeles County**	**Region 9: Orange County**	**Region 10: San Diego - Imperial**
Model Applied	DeWeese & El-Geneidy, 2020	DeWeese & El-Geneidy, 2020	Chatman et al. (2019) (region-specific)	DeWeese & El-Geneidy, 2020	DeWeese & El-Geneidy, 2020	DeWeese & El-Geneidy, 2020	DeWeese & El-Geneidy, 2020	Chatman et al. (2019) (region-specific)	Chatman et al. (2019)	Chatman et al. (2019)
PDRLF Prototype 1	1,352.63	27.83	2,663.78	267.13	319.36	590.51	157.55	3,205.91	1,777.80	1,384.41

PDRLF Prototype 2	316.92	21.21	650.04	146.63	56.04	206.1	55.56	1,289.19	614.93	937.65
LGP Prototype 1	465.17	11.24	923.96	104.72	102.47	218.45	58.39	1,210.70	656.75	553.63
LGP Prototype 2: Perm Loan	376.45	9.09	747.73	84.74	82.93	176.79	47.24	979.78	531.49	448.03
EAH (3-mile each way trip to work)	176.07	0.99	732.33	22.21	26.16	81.52	33.07	1,078.66	252.68	240.16

Table 4.5: Aggregate VMT reduction (in 100,000 VMT) for each of the housing finance schemes—using the most appropriate model for the corresponding region—80% AMI, 1 vehicle owned

Financing Program	**Region 1: Superior**	**Region 2: North Coast**	**Region 3: San Francisco Bay Area**	**Region 4: Northern San Joaquin Valley**	**Region 5: Central Coast**	**Region 6: Southern San Joaquin Valley**	**Region 7: Inland Empire**	**Region 8: Los Angeles County**	**Region 9: Orange County**	**Region 10: San Diego - Imperial**
Model Applied	DeWeese & El-Geneidy, 2020	DeWeese & El-Geneidy, 2020	Chatman et al. (2019) (region-specific)	DeWeese & El-Geneidy, 2020	DeWeese & El-Geneidy, 2020	DeWeese & El-Geneidy, 2020	DeWeese & El-Geneidy, 2020	Chatman et al. (2019) (region-specific)	Chatman et al. (2019)	Chatman et al. (2019)
PDRLF Prototype 1	1,432.85	39.40	2,663.78	333.64	383.90	658.50	311.40	3,205.91	1,777.80	1,384.41
PDRLF Prototype 2	335.72	30.03	650.04	183.14	67.36	229.84	109.82	1,289.19	614.93	937.65
LGP Prototype 1	402.76	15.91	923.96	130.79	123.18	243.60	115.38	1,210.70	656.75	553.63
LGP Prototype 2: Perm Loan	398.78	12.88	747.73	105.84	99.69	197.14	93.38	979.78	531.49	448.03
EAH (3-mile each way trip to work)	185.87	2.11	732.33	31.56	33.90	92.58	57.99	1,078.66	252.68	240.16

Table 4.6: Aggregate VMT reduction (in 100,000 VMT) for each of the housing finance schemes—using the most appropriate model for the corresponding region—50% AMI, 2 vehicles owned

Financing Program	**Region 1: Superior**	**Region 2: North Coast**	**Region 3: San Francisco Bay Area**	**Region 4: Northern San Joaquin Valley**	**Region 5: Central Coast**	**Region 6: Southern San Joaquin Valley**	**Region 7: Inland Empire**	**Region 8: Los Angeles County**	**Region 9: Orange County**	**Region 10: San Diego - Imperial**

Model Applied	DeWeese & El-Geneidy, 2020	DeWeese & El-Geneidy, 2020	Chatman et al. (2019) (region-specific)	DeWeese & El-Geneidy, 2020	DeWeese & El-Geneidy, 2020	DeWeese & El-Geneidy, 2020	DeWeese & El-Geneidy, 2020	Chatman et al. (2019) (region-specific)	Chatman et al. (2019)	Chatman et al. (2019)
PDRLF Prototype 1	1,185.75	27.83	2,177.50	267.13	280.42	590.51	139.02	3,295.80	1,552.38	1,214.28
PDRLF Prototype 2	277.83	21.21	531.37	146.63	49.20	206.10	49.03	1,325.33	536.96	822.42
LGP Prototype 1	407.78	11.24	755.29	104.72	89.98	218.45	51.51	1,244.64	573.48	485.59
LGP Prototype 2: Perm Loan	330.01	9.10	611.23	84.74	72.81	176.79	41.68	1,007.25	464.10	392.97
EAH (3-mile each way trip to work)	140.52	0.99	616.91	22.21	13.25	81.52	8.06	916.41	202.85	191.32

Table 4.7: Aggregate VMT reduction (in 100,000 VMT) for each of the housing finance programs—using the most appropriate model for the corresponding region—50% AMI, 1 vehicle owned

Financing Program	**Region 1: Superior**	**Region 2: North Coast**	**Region 3: San Francisco Bay Area**	**Region 4: Northern San Joaquin Valley**	**Region 5: Central Coast**	**Region 6: Southern San Joaquin Valley**	**Region 7: Inland Empire**	**Region 8: Los Angeles County**	**Region 9: Orange County**	**Region 10: San Diego - Imperial**
Model Applied	DeWeese & El-Geneidy, 2020	DeWeese & El-Geneidy, 2020	Chatman et al. (2019) (region-specific)	DeWeese & El-Geneidy, 2020	DeWeese & El-Geneidy, 2020	DeWeese & El-Geneidy, 2020	DeWeese & El-Geneidy, 2020	Chatman et al. (2019) (region-specific)	Chatman et al. (2019)	Chatman et al. (2019)
PDRLF Prototype 1	1,254.75	39.40	2,177.50	333.64	336.05	658.50	272.48	3,295.80	1,552.38	1,214.28
PDRLF Prototype 2	293.99	30.03	531.37	183.14	58.96	229.84	96.09	1,325.33	536.96	822.42
LGP Prototype 1	431.51	15.91	755.29	130.79	107.83	243.60	100.96	1,244.64	573.48	485.59
LGP Prototype 2	349.21	12.88	611.23	105.84	87.26	197.14	781.70	1,007.25	464.10	392.97
EAH (3-mile each way trip to work)	149.15	2.11	616.91	31.56	20.18	92.58	29.99	916.41	202.85	191.32

These trends are broadly similar with PDRLF Prototype 1 being significantly higher than other financing tools even when the variation in income and reduction in the number of vehicles owned are analyzed (Tables 4.2 through 4.7). The rest of the options lead to VMT reductions that are comparable to each other. It is worth noting that in regions where the land cost is among the lowest (for example, North Coast), PDRLF Prototype 1 has a more comparable VMT reduction.

To ensure that these financing tools are analyzed using one universal tool that is readily applied, we used the VMT+ tool. There are a few interesting differences from the modeling results reported thus far.

Table 4.8: Aggregate VMT reduction (in 100,000 VMT) based on Chatman et al. (2019) for each of the housing finance schemes over 30-year period

Financing Program	Region 1: Superior	Region 2: North Coast	Region 3: San Francisco Bay Area	Region 4: Northern San Joaquin Valley	Region 5: Central Coast	Region 6: Southern San Joaquin Valley	Region 7: Inland Empire	Region 8: Los Angeles County	Region 9: Orange County	Region 10: San Diego - Imperial
PDRLF Prototype Option 1 100% AMI	1,820	13	3,189	16	388	73	1,993	1,753	1,928	1,449
PDRLF Prototype Option 1 80% AMI	1,699	13	3,002	16	388	73	1,881	1,699	1,778	1,384
PDRLF Prototype Option 1 50% AMI	1,518	13	2,722	16	388	73	1,713	1,615	1,552	1,214
PDRLF Prototype Option 2 100% AMI	426	10	778	9	68	25	703	705	667	1,015
PDRLF Prototype Option 2 80% AMI	398	10	732	9	68	25	664	683	615	938
PDRLF Prototype Option 2 50% AMI	356	10	664	9	68	25	604	649	537	822
LGP Prototype Option 1 100% AMI	626	5	1,106	6	12	27	738	662	712	599
LGP Prototype Option 1 80% AMI	584	5	1,041	6	12	27	697	642	657	554
LGP Prototype Option 1 50% AMI	522	5	944	6	12	27	635	610	573	486
LGP Prototype Option 2: (total) 100% AMI	506	4	895	5	26	22	597	536	576	485

LGP Prototype Option 2: (total) 80% AMI	473	4	843	5	26	22	564	519	531	448
LGP Prototype Option 2: (total) 50% AMI	422	4	765	5	26	22	514	494	464	393
EAH (3-mile one-way trip to work) 100% AMI	349	4	750	113	66	142	516	469	282	270
EAH (3-mile one-way trip to work) 80% AMI	312	3	690	100	52	122	467	406	253	240
EAH (3-mile one-way trip to work) 50% AMI	251	1	578	78	26	89	390	298	203	191

Table 4.9: Aggregate VMT reduction (in 100,000 VMT) based on VMT+ tool for each of the housing finance schemes over 30-year period

Financing Program	Region 1: Superior	Region 2: North Coast	Region 3: San Francisco Bay Area	Region 4: Northern San Joaquin Valley	Region 5: Central Coast	Region 6: Southern San Joaquin Valley	Region 7: Inland Empire	Region 8: Los Angeles County	Region 9: Orange County	Region 10: San Diego - Imperial
PDRLF Prototype 1	3,995	91	10,522	916	4,173	3,135	779	11,505	6,898	3,468
PDRLF Prototype 2	936	67	2,568	503	732	1,094	275	4,627	2,386	2,349
LGP Prototype 1	1,374	37	3,650	359	1,339	1,160	288	434	2,548	1,387
LGP Prototype 2	1,112	30	2,953	291	1,084	939	233	486	2,062	1,122
EAH (3-mile one-way trip to work)	444	32	1,994	963	231	1,196	621	1,712	838	404

For the most populated regions of the state (Regions 1, 3, 8, 9, and 10), PDRLF Option 1 clearly provides the most VMT reduction since the program does not support land acquisition costs that may be a major part of the cost in these regions. But for the more sparsely populated regions (Region 2, North Coast for example) this difference between PDRLF Option 1 and others is not as high due to lower land costs. None of the financing tools have orders of magnitude higher (by

a factor of 10 or higher) VMT reduction especially when one looks at the financing programs using detailed VMT models (Chatman et al. in Table 4.8), except for the North Coast region that has a factor of 10.

4.4 Combined Housing and VMT Analysis and Findings

When we combine the findings from the housing production and VMT reduction analyses, four key findings emerge. First, from an order of magnitude perspective, all housing schemes lead to similar VMT reductions and support similar numbers of housing units. That is, the VMT reductions achieved and housing units supported do not vary by more than a factor of 10.

Second, PDRLF and LGP help small-to medium-sized developers (PDRLF is likely to help large developers as well).

Third, EAH programs are likely to support fewer units and therefore the program on average has smaller VMT reduction even though VMT reduction in certain regions may be higher. However, the difference either way cannot be characterized as orders of magnitude higher or lower. This smaller difference should also be examined in the context of EAH programs being challenging to implement. EAH projects are often not eligible for federal housing assistance because they violate fair housing requirements. So, any support for EAH should be robust enough to obviate the need for such federal assistance. Additionally, the State may have to expand the existing carve-outs (such as those for farmworker and school employees' housing) to allow local and State funding for EAH—a politically challenging task. However, from an individual project finance perspective, EAH programs are a much more significant housing investment than the other two financing programs. While the other two are just one among several layers of financial support needed to develop infill affordable housing in California, EAH programs have the potential to be a critical new source of public subsidy to build workforce housing.

Finally, given the above two findings, future research could focus on developing finer-grained estimates of housing units supported and VMT reduced by all three housing finance programs—PDRLF, LGP, and EAH.

Chapter 5. Conclusions

The provision of affordable housing in infill areas, including projects such as transit-oriented developments (TODs), meets the twin objectives of reducing per capita vehicle miles traveled (VMT) and providing affordable housing (Boarnet et al., 2017; Hymel, 2014). However, given the high land values and construction costs, affordable housing needs deep subsidies in California; and the need is vast. Over a third of California households are housing cost-burdened (that is, housing expenditures comprise more than 30% of their household income) and as per the latest (2023-2031) regional housing needs allocation, there is a need to develop 2.5 million housing units statewide, of which a little over one million need to be affordable to low- and very low-income households (CA HCD, 2022).

This white paper explores innovative ways to fund affordable infill housing, including, but not limited to, higher-density housing close to transit. Moreover, since public funds are not likely to be enough, tools that leverage private funds are desirable. Specifically, the paper examines the relative housing production and VMT reduction potential of the following three housing finance tools that the State could employ to help boost infill housing: an employer-assisted housing partnership program (EAHPs); a loan loss guarantee program (LGP); and a pre-development revolving loan fund (PDRLF).

EAHPs can facilitate affordable homeownership and rental housing through demand- and supply-side programs or a mix of these approaches. The demand-side programs that promote homeownership financially assist employees with closing costs, down payment assistance, below-market interest mortgages, loan guarantees, or forgivable second loans. On the rental side, EAH programs can offer assistance in finding and securing rental housing and/or provide financial assistance with security deposit and rental costs. The supply-side EAHPs add to the housing stock through tools such as the guaranteed purchase of housing units from developers, land donation or sale for a reduced price, participation in land banks, contributions to loan pools, construction financing or guarantees, government grants, LIHTC investment, donation of services (for example, engineering, architectural, accounting and legal services), master lease agreements, and housing advocacy. These programs are more likely to be employed in areas with tight real estate markets where the demand-side approaches could worsen housing affordability further or when the supply of higher quality housing is used as part of a broader neighborhood revitalization strategy (Fischer et al., 2021; Gunderson, 2007; HWF and MPC, 2007; Local Housing Solutions, n.d.; NPHS, 2017; Pill, 2000; PolicyLink, 2007; Schwartz and Hoffman, 1990; Sturtevant, 2019; Treuhaft, 2007). Since this white paper focuses on finding ways to support housing supply, the paper focuses on the supply-side EAHPs.

A LGP reduces several real estate development risks for lenders by partially or fully guaranteeing loans. These risks include market risk (softening of the real estate market), credit risk (loans to low-credit borrowers), leverage risk (loans made to borrowers with high loan-to-value ratios), and project risk (a new or risky project, such as a mixed-use TOD with low/no parking requirement).

A PDRLF helps affordable housing developers obtain high-risk and difficult-to-access capital to conduct essential pre-development activities before they can approach lenders or government

agencies for financial support. These activities include site identification, site control, legal fees, financial applications (such as tax credit applications), market feasibility analysis, and building design and permits. Predevelopment activities impact project feasibility. While essential to the development process, predevelopment activities are difficult to finance due to the chance that the project will not come to fruition. The risk increases if the real estate product type is new for the market (for example, a mixed-used TOD) or the site needs in-depth due diligence (for example, a brownfield infill site). Because risk-averse lenders are typically reluctant to lend for pre-development activities, many projects get delayed or are not funded at all; hence, the utility of a PDRLF.

5.1 Research Objectives

The specific objectives of this white paper are as follows:
a) Identify and discuss the key features, models, opportunities, and challenges associated with an EAHP, a LGP, and a PDRLF;
b) Conduct a comparative estimate of the magnitude of housing units produced from a hypothetical $100 million State investment in each of these programs, including by leveraging additional private funds;
c) Explore the feasibility of end-user adoption of these three housing programs to produce affordable housing in California; and
d) Estimate the likely relative scale of VMT reduction resulting from each financing program. Note that the scale of VMT reduction is relative to a baseline of a regional comparator—a single-family house affordable to a household earning median income for that region.

5.2 Research Methodology

To meet objectives a) and c), we conducted an in-depth literature review, including a review of academic journals, industry reports, and government publications. We complemented the literature review with several case studies to provide practical insights into each program's implementation and conducted semi-structured interviews with key stakeholders such as housing developers, policy experts, and program administrators. These interviews gathered qualitative data on practical challenges, opportunities, and the feasibility of implementing these programs in California. Finally, to further meet objective c), we interviewed real estate developers (especially small new minority developers) and experts to assess the feasibility of end-user adoption of these housing finance tools. Among others, we looked for information about the feasibility of these tools to support infill housing that meets local needs, how the state and federal governments can support these tools, the types of legislative changes that might be needed to increase the chances of tools' adoption, and the kinds of factors that enhance or impede the tools' adoption.

Based on the advice of program administrators located nationwide, real estate developers and housing experts across California, and this white paper's real estate consultant, we developed several prototypes of the three housing programs. The two prototypes for PDLRF include a) a PDRLF that supports all predevelopment activities, excluding land costs, and b) a PDRLF that supports all predevelopment activities, including land costs. For LGP, too, we developed two prototypes: a) loan guarantee for permanent financing covering a 10-year term, and b) 50% of the loan guarantee pool covers construction for five years, and the remaining 50% guarantees

permanent financing for ten years. Finally, one prototype was developed for the EAH program, wherein we considered support as a construction grant.

Next, we gathered data on the dollar amount of the per-housing-unit assistance that needs to be provided by each of the three housing finance programs for each of the 10 US Census regions of California to estimate the total number of units that can be supported through a hypothetical $100 million investment in each of the programs over a 30-year period.

Finally, we reviewed several existing VMT calculation models and employed them to estimate these programs' total VMT reduction potential for each of these ten regions. Specifically, these models include those developed for estimating household-level VMT using California data and data from other parts of North America and a tool developed by Fehr and Peers using location-based data (VMT+). Then, these models were applied to estimate the VMT reduction potential of the three housing finance programs. For this, the per-household VMT produced by a regional comparator house, the infill housing prototype developed using PDLRF and LGP, and one parcel for EAH housing development were identified to estimate and compare VMT reductions. The regional comparators were selected to be in a neighborhood of single-family homes, representing a base case scenario where the single-family houses affordable to a household earning median income for that region are expected to develop without any incentives and/or subsidies. These locations are often at the periphery of the urbanized areas. The infill prototypes were selected as infill sites in zones of higher density and closer to downtown; many are TODs (a few are not because the transit service does not exist or the infill sites are more than half a mile from a transit station). For the EAH program, the "infill" housing was located within a certain distance (3 miles each way trip) of the employer for one of the adult household members (a household of three with two employed adults is assumed). The employer was assumed to be located in a suburban location, often right outside the downtown.

The per-household annual VMT reduction was annualized and then multiplied by the number of housing units supported by each tool for each region over 30 years. These 30-year total VMT reductions were compared across the three housing programs to assess the comparative VMT reduction potential of the three housing finance programs. This comparison was an order of magnitude analysis, where a factor of 10 equals one order of magnitude, to ascertain each program's relative housing production and VMT reduction potential.

5.3 Results

Four key findings emerge when we combine the findings from the housing production and VMT reduction analyses. First, from an order of magnitude perspective, PRDRLF Prototype 2, LGP Prototypes 1 and 2, and EAH lead to similar VMT reductions and support similar amounts of housing units. That is, the VMT reductions achieved and housing units supported do not vary by more than a factor of 10.

Second, PDRLF and LGP help small-to medium-sized developers (PDRLF is likely to help large developers as well). PDRLF prototype 1 supports the largest number of housing units. Therefore, it also leads to the largest VMT reduction; however, since it does not support land acquisition, it is not comparable to the other prototypes.

Third, EAH programs are likely to support fewer units and lead to somewhat lower VMT reductions on average than the other two financing programs. However, in some regions and based on certain tools (for example, VMT+) they may yield slightly higher VMT reductions as well. However, the aggregate reduction numbers do not differ by orders of magnitude. Additionally, EAH programs could be challenging to implement. EAH projects are often not eligible for federal housing assistance because they violate fair housing requirements. So, any support for EAH should be robust enough to obviate the need for such federal assistance. Additionally, the State may have to expand the existing carve-outs (such as those for farmworker and school employees' housing) to allow local and State funding for EAH—a politically challenging task. However, from an individual project finance perspective, they are a much more valuable housing assistance source than the other two financing programs. While the other two are just one among several layers of financial support needed to develop infill affordable housing in California, EAH programs have the potential to be a critical new source of public subsidy to build workforce housing.

Finally, given the above two findings, future research could focus on developing finer-grained estimates of housing units supported and VMT reduced by all three housing finance programs—PDRLF, LGP, and EAH. A tool that combines the ease of implementation of VMT+, yet still accounts for household characteristics, may also be beneficial.

5.4 Conclusions

All three housing finance programs (PDRLF, LGP, and EAH) merit further research because they support similar amounts of housing units and lead to similar VMT reductions, from an order of magnitude perspective. That is, the VMT reductions achieved and housing units supported do not vary by more than a factor of 10. Furthermore, the programs need to serve low-income, minority, and underserved communities proactively. For that, they need to be flexible; for example, allow rolling applications and not impose onerous requirements on the applicants and assistance recipients, assume a secondary lien position, choose local and regional organizations such as housing trusts and CDFIs to implement the program, and take into account local and regional variations, including real estate market conditions, reach diverse pools of real estate developer and lenders, and provide technical assistance to the developer-applicant. The State has a critical role to play. It can help fund and recapitalize the loan (for PDRFL) and guarantee (for LGP) pool, award construction grants or award tax credits to build employer-assisted housing, and provide technical assistance to the program applicants and incentives for leveraging these programs, for example, incentivize households to reduce the number of personal vehicles and encourage small developers to leverage loan guarantees to strike a better bargain with the large developers when working with them to develop housing projects.

Finally, this white paper conducted an order of magnitude analysis, that is, estimates whether the VMT reductions achieved and housing units supported vary by more than a factor of 10. It is worth repeating that the VMT estimation is a complex question answered here based on existing studies and tools that have varied assumptions. Future work could refine the methodologies developed in this paper, collect primary data, and run regional VMT models to arrive at finer-grained estimates of housing assistance and VMT reduction, considering the post-COVID household location choices and travel behavior.

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Glossary of Terms, Abbreviations, and Symbols

AMI - Area Median Income
BIPOC - Black, Indigenous, and People of Color
BMR – Below Market Rate
CA - California
CBG – Census Block Group
CDBG - Community Development Block Grant
CDC – Community Development Commission
CDFA - Council of Development Finance Agencies
CDFI - Community Development Financial Institutions
CDIP - Community Development Investment Program
CEDAC - Community Economic Development Corporation
CEQA - California Environmental Quality Act
CMF - Capital Magnet Fund
CSA - Combined Statistical Area
EAH - Employer-Assisted Housing
EAHPs - Employer Assisted Housing Programs
ED-RLFs - Economic Development Revolving Loan Funds
HH – House Hold
HOME - Home Investment Partnerships Program
HTFSBC - Housing Trust Fund of Santa Barbara County
HTSV - Housing Trust of Silicon Valley
HUD - Housing and Urban Development
HWF – Home for Working Families
IBank - Infrastructure and Economic Development Bank
L.A. – Los Angeles
LACDA - Los Angeles County Development Authority
LACHIF - L.A. County Housing Innovation Fund
LGP - Loan Guarantee Program
LIHTC - Low-Income Housing Tax Credit
LTV - Loan-to-Value
MN - Minnesota
MSA - Metropolitan Statistical Area
MTC - Metropolitan Transportation Commission
NHC - National Housing Conference
NHTS - National Household Travel Survey
NREL - National Renewable Energy Laboratory
PDRLF – Pre-development Revolving Loan Fund
RLF – Revolving Loan Fund
SBA - Small Business Administration
SBLGP - Small Business Loan Guarantee Program
SSBCI - State Small Business Credit Initiative
TOD - Transit Oriented Development
U.S. – United States
ULI – Urban Land Institute

VMT - Vehicle Miles Traveled