Memorandum

To: Joel Carrasco, Petra Falcon, Krista Shepherd
From: Center for Neighborhood Technology and Scott Bernstein
Date: May 21, 2020
Re: Equitable Transit-Oriented Development (eTOD) Infrastructure for the Phoenix South Central Avenue Light Rail Transit Corridor

Executive Summary

The City of Phoenix and stakeholders in the future of the South Central Corridor face a challenge—a modern light rail transit line will be extended from downtown to Baseline Road. There is a stated interest in making what results a form of development without displacement. There are also some funds available for mobility enhancements from the T2050 receipts and considerable social capital evidenced by the enthusiasm and creativity at the public engagement meetings and the rejection of efforts to rescind the commitment.

Meeting these goals will require improving the public realm and the infrastructure needed to support improvements in current Corridor community conditions, the completion of an incomplete street network and associated infrastructure for water distribution, sanitary sewer and stormwater management, and new types of infrastructure necessary to achieve community goals and adopted policies for health, safety, quality of life, and pedestrian and non-motorized transportation character.

In the Land Strategies memorandum, the team addressed options for organizing around and financing these requirements in ways that can be conducted under current authority within the State of Arizona. In this memorandum we extend that analysis, calculate an estimated cost for making these investments, examine how those costs might be met, and make the following recommendations—

- Include a line item for infrastructure improvements in the South Central Corridor;
- Establish a commitment and a schedule to take advantage of available funds from regional and state agencies;
- Adopt organizational formation strategies addressed in the Land Strategies memorandum;
- Create and use a combination of an engaged stakeholder convening and expert opinion to design and launch a special district and a pre-development fund;
- Explore strategies that enhance the capacity of non-governmental agencies to support TOD Policy goals within the Corridor, and
- Develop and secure staffing resources and specific assignments for supporting these efforts.

In a very real sense, it's the ability of a Corridor of equitable TOD villages that both matches the official policies, the stated aspirations of community leaders in numerous interviews and public engagement sessions, and the further ability to demonstrate aggregate improved economic and environmental performance that can make Corridor investments attractive not only to the City of Phoenix, but to regional, utility, and State agencies, and to social investors committed to a greener and more inclusive economy. The South Central Corridor represents that kind of opportunity, and in that sense we offer the following recommendations to the City.

Contents

Current Practice Nationally

eTOD in the South Central Corridor will require extensive infrastructure installations and upgrades to create the walkable, transit-oriented neighborhoods that the community envisions. Infrastructure needs include water, sewer, electric, internet, lighting, stormwater (including green infrastructure), heat island mitigation (including trees), as well as a suite of transportation infrastructure elements: pedestrian, bicycle, bus shelters, electric vehicle charging, curb access for rideshare and deliveries, and streets—including street grid infill.

The variety of infrastructure required for eTOD has generated a series of unique financing and implementation arrangements around the country to enable development. The U.S. EPA categorizes the types of infrastructure financing tools as follows:

- "**Direct fees**, including user and utility fees and congestion pricing.
- **Debt tools**, including private debt, bond financing, and federal and state infrastructure debt mechanisms.
- **Credit assistance**, including federal and state credit assistance tools and the Transportation Infrastructure Finance and Innovation Act (TIFIA).
- **Equity**, including public-private partnerships and infrastructure investment funds.
- **Value capture**, including developer fees and exactions, special districts, tax increment financing, and joint development.
- **Grants and other philanthropic sources**, including federal transportation and community and economic development grants and foundation grants and investments.
- **Emerging tools**, including structured funds, land banks, redfields to greenfields, and a national infrastructure bank." [1]

Case Studies of Best Practices

Chicago Sustainable Development Policy (CSDP) Handbook

Context & Background: The CSDP promotes incorporation of sustainable elements in buildings receiving financial assistance or special approvals from the City. The policy was revised in 2017 to broaden sustainability goals to promote health, economic and environmental benefits. This policy complements earlier policies that "fast tracked" building permits for projects achieving LEED certification. Points are awarded and projects scored against Policy goals, see spreadsheet at https://www.chicago.gov/content/dam/city/depts/dcd/Projects/Draftpolicy_12_5_2016.pdf.

Design/program: All planned developments, projects receiving TIF funds greater than $1million, and affordable, multi-family housing projects (5+ units) receiving specified types of financial assistance must adhere to a point system to meet the requirements. New construction is scored on a scale of 0-100 and renovations from 0-25. The project characteristics dictate selection of strategies that include health, energy, stormwater, landscapes, green roofs, water, transportation, solid waste, workforce and wildlife

[1] U.S. "EPA Infrastructure Financing Options for Transit-Oriented Development Infrastructure Financing Options for Transit-Oriented Development," (January 2013). https://www.epa.gov/sites/production/files/2014-02/documents/infrastructure_financing_options_for_transit-oriented_development.pdf

strategies. While certification is not required, projects could apply for LEED, Green Globes, Living Building Challenge, Enterprise Green Communities or PassiveHouse building certifications.

Outcomes/Impact: As of 2013, 500 projects (180 million square feet) were LEED certified and the City has over 5.6 million square feet of green roofs across 500 projects.

Comment—This scoring tool is similar in concept to what was used by WSP in evaluating priorities for the use of T2050 funds including in the August 2019 South Mountain Neighborhoods Projected Conditions Plan

Sun Valley Ecodistrict, Denver, CO

Context & Background: Sun Valley, a historically industrial area in Denver and the city's poorest neighborhood is slated to be Denver's cultural and entertainment hub due to its proximity to downtown. The West Line light rail line which opened in 2013 has heightened the neighborhood's desirability. Sun Valley's housing stock is comprised of 94% subsidized housing, only 5% of homes are owner-occupied and is home to the city's most vulnerable populations with median incomes under $10,000.[2]

Design/program: Sun Valley EcoDistrict Trust (SVED)[3] was created to implement district-scale solutions, monitor progress and keep track of successes. The non-profit entity operates as a separate entity but in collaboration with Denver Housing Authority (DHA) and City of Denver. DHA's $240 million project will replace the 333 public housing units, add 202 moderate-income and 215 market-rate housing units. The SVED is constructing a multi-use 30,000 square feet office building that will house community engagement spaces, non-profits and for-profit entities. The EcoDistrict will generate 30% of its energy needs, reduce water consumption by 20%, and provide free wi-fi to residents.

Financing: DHA received $30 million through HUD's Choice Neighborhood implementation grant. An EPA grant has helped to fund energy and planning in the area. The SVED building is financed through impact financing—a tool in which investors accept a return that is lower or slower than market rate, because the project also creates social benefits. Infrastructure improvements, including realignment of streets to better connect to the downtown and a riverside park are being funded by general operating bonds.

Outcomes/Impact: Anticipated outcomes include watershed restoration, community gardens, 15-20% reduction in energy and water consumption, preservation of 333 public-housing units to create 750 affordable housing units in the district, economic development via job creation and linking local residents to jobs.

Comment—Several of the key actors supporting the SVED ensured that the project benefitted from Denver's evolving equitable TOD network of supporters, such as Ismael Guerrero, executive director of the Denver public housing authority, and city planner Curt Upton, formerly project manager for Reinvent Phoenix in the City of Phoenix department of planning and development.

[2] https://www.westword.com/news/sun-valley-one-of-denvers-oldest-and-poorest-areas-could-be-the-next-big-thing-9981911

[3] http://ecodistricts.org/wp-content/uploads/2017/08/ed-case-study-sved-FINAL-august-3-2017.pdf

Ecodistricts.org Certified

Ecodistricts.org is a national organization dedicated to achieving place-based inclusively planned and governed redevelopment that results in "greener" and more efficient use of resources. Their conferences have generated intense interest among hundreds of communities, such as the planned Verde redevelopment in Portland OR, a representative of which made a presentation to the communities and agencies involved in the South Central Corridor projects held at The Sagrado / Centro de Paz on May 2, 2019.

The organization provides direct technical assistance for ecodistrict planning, and has both a protocol and a certification system, analogous to those used in LEED-rated buildings, applied to neighborhoods

Case study materials for other certified Ecodistricts are posted at https://ecodistricts.org/case-studies-stories-from-the-neighborhood/

eTOD Case Studies from Around the Country

An overview presentation prepared by the eTOD laboratory, supported by Enterprise Community Partners and CNT is at https://etod.cnt.org/CNT_eTOD_Presentation_Web.pdf. Case study materials for the following intentionally planned eTOD initiatives is at these addresses:

- Seattle, Capitol Hill Station
  WWW.SOUNDTRANSIT.ORG/CAPITOLHILLTOD | HTTPS://CAPITOLHILLHOUSING.ORG/
- San Jose, The Gish Apartments
  WWW.GISHAPARTMENTS.ORG/ | HTTP://WWW.FIRSTHOUSING.COM/
- Minneapolis – St. Paul, 2700 University
  HTTP://FLCO.COM/COMPANY-PROPERTIES/2700-UNIVERSITY/
- Pittsburgh, The Century Building
  WWW.CENTURYON7TH.COM/
- Philadelphia, Paseo Verde
  WWW.PASEOVERDEAPTS.COM/ | HTTP://CASESTUDIES.ULI.ORG/PASEO-VERDE/
- Brooklyn, Livonia Commons
  WWW.DUNNDEV.COM/L3/LIVONIA.HTML
- Boston, Dudley Village
  HTTP://BIT.LY/1A6ZOTX | WWW.CITYOFBOSTON.GOV/NEWS/DEFAULT.ASPX?ID=4316

Current Authority for eTOD Infrastructure Options

TOD Policies

Phoenix has TOD policies adopted in amendments to the Phoenix TOD Strategy Policy Framework by resolutions on April 20 2016 and April 4 2018, at https://www.phoenix.gov/villagessite/Documents/pdd_pz_pdf_00380.pdf and marked "Revised January 3 2019" in the copy published at this URL. Several key items include:

TOD District Planning Objectives:

"• Develop a community-based vision for change and preservation that maximizes resident benefits and city-wide sustainability. • Create an attractive investment environment by providing a streamlined development process and other incentives for sustainable TOD. • **Inform smart decision-making by identifying strategic priority interventions that simultaneously advance multiple community-defined goals. These "Solution Multipliers" include infrastructure, urban-living amenities**, affordable housing and other investments. • Coordinate resources to guide incremental changes that synergistically leverage one another and build on existing assets and previous progress."

Policies:

"F.1 **Support pedestrian-oriented design standards**, short block subdivision standards, bicycle parking standards and **Complete Street standards** in order to improve walkability and bikeability. F.2 Encourage transit-supportive land uses, such as dense residential, office and retail destinations in order to boost ridership and fare recovery. F.3 Limit auto-oriented land uses and excessive parking, **support shared and paid parking** and encourage bike and car share programs in order to manage vehicular traffic. F.4 Integrate new development into the existing context through measures such as stepping down building heights, modulating building massing, **enhancing landscaping**, preserving setback consistency and carefully locating windows, service entrances, refuse containers, lighting and ventilation. Support mixed income neighborhoods to help ensure TOD benefits are attainable for all residents. F.6 Support the City's Tree and Shade Master plan goal of 25 percent tree canopy coverage. F.7 **Support the integration of Green Infrastructure stormwater management practices into street and open space designs on public and private property**. F.8 **Support the development and enhancement of public open spaces**. F.9 Provide incentives, such as increased entitlement and expedited permitting, for Green Construction, **Green Infrastructure**, Historic Preservation, Mixed-Income Housing and Adaptive Reuse."

"G.1 Use the Priority Investment Scorecard to evaluate and compare the location and type of investments, both within districts and across multiple districts. Higher scoring projects, including those implemented by **Capital Improvement Programs**, Housing Programs, Grants, and Economic Development Incentives should be prioritized over lower scoring projects."

Capital Improvements Program

The team reviewed the 2019-2024 five-year, $7 Billion Capital Improvement Program adopted by the City Council June 19, 2019, including both maps and project lists. There are no specific projects included within the South Central Corridor. There are relatively minor items for citywide expenditure on bicycling, and on modernization of streetscape standards. Tree planting and maintenance is the apparent responsibility of the Streets department; no separate budget for that was included (although there is a

citywide standard aimed at boosting tree shade coverage to 25 percent of land area and another standard to increase surface permeability). Of the total budget, $3.6 Billion is for Street, Wastewater and Water capital improvements, with roughly 60 percent going for Streets. There is a separate budget item for parks.

The team also reviewed the recently posted (in March) Draft 2020-2025 Capital Improvements Program; this does include a noticeable increase of roughly $1 Billion for transit, but again there is no separate budget category for TOD improvements nor for items intended to meet the goals listed from the TOD Framework within the South Central Corridor.

T2050 Allocations for "Street Improvements"

The team also reviewed the T2050 Mobility area plans, which are intended to guide investment of the $2.3 Billion allocated for Street Maintenance (50 percent), Major Street Projects (30 percent), Mobility Improvements (15 percent) and Technology Enhancements (such as signalization for vehicles and pedestrians, 5 percent). Some illustrative projects were identified for Mobility Area 1, "South Downtown," with cost estimates, an area of 0.9 square miles; some illustrative project types (such as bus shelters with improved shading, pedestrian amenities to improve safety) were identified for Mobility Area 10, " South Mountain Neighborhoods," an area of 5.5 square miles, but not specified or priced in the first version of these plans, labeled "existing conditions."

In the subsequent versions, labeled "Proposed Conditions," specific projects are identified in broad categories such as Sidewalks and ADA Compliance and cost estimates provided. These estimates along with other sources were used in the section below on infrastructure costing to analyze a range of costs likely to be incurred for completing street networks and for enhancing these to the TOD Framework planning standards.

Council Actions on Related Supporting Policies

Complete Streets

Over the past two years, the City Council considered two actions that could strengthen the commitment to a more livable set of communities and to meeting the performance goals specified in the TOD Strategic Policy Framework.

The first is the approval of a Complete Streets Policy, and the second is the approval of a commitment and set of time-sensitive goals to safety known as Vision Zero. Nationally, standards have been set to address the design of Complete Streets by professional associations, including the Institute for Transportation Engineers and the National Association of City Transportation Officials, and by advocacy groups under the banner of the National Complete Streets Coalition, which tracks and rates the quality of such commitments.

The City created a citizens advisory commission in 2014 to recommend standards, and the Council adopted a Complete Streets Policy in 2017 at https://www.phoenix.gov/streetssite/MediaAssets/Adopted%20Complete%20Streets%20Policy%20-%20June%2028,%202017.pdf. The Council's Transportation committee declined to accept a

recommended set of standards in June of 2018, leading to the resignation of a majority of commission members; while the City makes available the Complete Streets Guide published by the Maricopa Association of Governments in 2011 at https://www.phoenix.gov/streetssite/Documents/MAG-Complete-Streets-Guide-December-2010.pdf and adopted a set of Complete Streets Design Guidelines on October 17, 2018 at https://www.phoenix.gov/streetssite/Documents/CSDG_FINAL_CC_APPROVED.pdf, commitments to use of capital improvements funds for these purposes are generally not evident in either the 2019-2024 Capital Improvements Program nor in the T2050 Mobility Area Plans.

Several elements of the complete streets policy, including walkability, safety and green infrastructure for stormwater management and urban heat island mitigation, are explicitly addressed in the policy and in plans adopted around the country and within the region; nearby, the city of Scottsdale AZ's Complete Streets Policy was adopted in 2008.

Vision Zero

The idea of cities adopting policies to "zero out" deaths from vehicle and vehicle-pedestrian crashes gained momentum within the last few years; a set of commitments and standards to setting a date by which this could happen and methods for achieving it is tracked globally and domestically by the Vision Zero Network and these are presented along with case studies at https://visionzeronetwork.org/.

Phoenix has gained the unenviable reputation as possibly the most dangerous U.S. city for pedestrians in studies conducted over the past three decades called the Mean Streets series, published originally by the Surface Transportation Policy Project and more recently by Smart Growth America, renamed Dangerous by Design. This is undoubtedly why safer streets and a more "walkable urban environment" consistently ranked at or near the top of community priorities indicated in prior community and area plans, and recently in the South Central TOD household surveys and community engagement meetings.

On April 23, 2019, the Council voted against directing city staff city staff to assemble a framework of recommendations for reaching the goal of eliminating pedestrian deaths, citing concerns that Vision Zero would lead to lowering of traffic speeds thereby increasing congestion.

Nearby, the city of Tempe adopted a Vision Zero Plan in May of 2019.

Use of local taxes and fees to support infrastructure investment

Infrastructure is composed of networks of long-lived assets. Borrowing against future value in a targeted area that is likely to result from development or redevelopment, known as Tax Increment Financing, is a well-established method of "bringing forward" likely tax yield, whether the tax is levied on property value, income, or sales (*aka* transactions privilege tax in Arizona). The Arizona legislature uniquely prohibits the general use of TIF for targeted area purposes; it does allow it for particular projects or districts but only by specific project-limited action of the legislature itself.[4]

[4] By act of the legislature, TIF districts were created and are used for the Tempe Town Lake area, and the Tucson Rio Nuevo District. Report by Shannon Scutari to Parsons Brinckerhoff for Valley Metro, September 20 2012. Our team reviewed the current text of Arizona Revised Statutes for this report.

By contrast, state statutes are supportive of the creation of special service districts which can levy fees or taxes on area property owners and activities; but these generate revenue on a pay as you go basis, and therefore are of more value to program operations and to modest improvements in the public realm than to capital investments. See the Land Strategies memorandum for a more complete explanation.

Use of Development Impact Fees

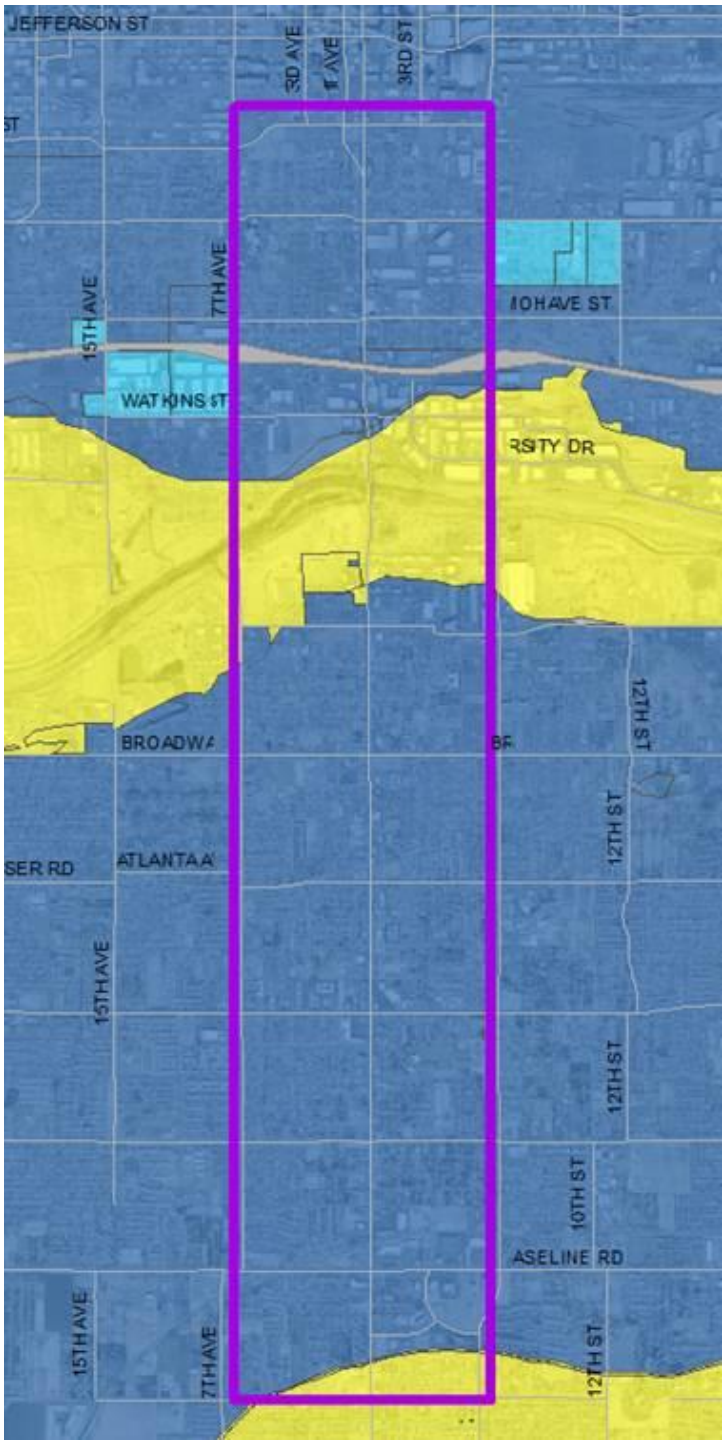
The City Phoenix can levy Development Impact Fees (DIFs) on new development. These fees have been justified as representing the incremental or marginal costs associated with servicing land using public resources. In theory, such fees could be levied to generate revenue sufficient to amortize City investments in civil infrastructure (water supply, sanitary waste, stormwater management, roads, and associated costs for enhancements such as for pedestrian safety and urban heat island mitigation). Recent analysis suggests that doubling residential density from 4.4 to 8.9 households per acre could result in substantial investment savings for providing such services; see section below for analysis of this proposition with regard to civil infrastructure investment in the South Central Corridor.[5]

The City of Phoenix has generally limited the use of these fees to newly developing areas; an exception is fees levied for water resources acquisition.[6] Newly developing areas are identified as being in the northern or southern impact areas, all of which are outside of the South Central TOD corridor (see https://www.phoenix.gov/pddsite/Documents/PZ/pdd_pz_pdf_00547.pdf for most recent analysis). Fees recommended typically amount to a total of $15,000 per "EDU" or equivalent demand unit, a method of equalizing fees per area of building and functional population served. This indicates the level of fee charged may be below the marginal cost of investment required to provide the services required, which include in the case of Phoenix (a) fire protection + police + parks + library, (b) major arterial streets, (c) drainage, (d) water, (e) wastewater, and (f) water resources acquisition. Additional services or hookup fees may be charged by utilities for energy (e.g. Arizona Public Service, Salt River Project and Southwest Gas) and telecommunications (many providers) services.

For category (f), water resources acquisition, the basis for levying a fee is the availability of water from the Salt and Verde rivers; known as "on project" water, areas for which are identified in the map below. "Off project water" must come from other sources, ranging from the Colorado River to groundwater. The overwhelming majority of property in the South Central Corridor is within the "blue" area, or "on project," for which it is estimated that no additional water resources will be needed from 2020-2029 and therefore the fee is set at zero; within the yellow areas near the fee is set at $583 per EDU.

[5] Analysis of data provided by the Capital Area Regional Planning Commission in Madison WI for 29 developments of varying intensity across identical infrastructure requirements based on multiple bids received. For a projected growth of 4,000 households in Dane County WI, the result lowered the total infrastructure investment from $161 Million to $102 Million, dropping the per-household investment required from $40,000 to $25,000, respectively.
[6] Adam Miller to Joel Carrasco, April 30, 2020

Figure 1: Water resources acquisition areas in the Corridor



The practice of not charging DIFs has certain equity implications. Areas which are currently underserved or have experienced deferred maintenance lack a basis on which reliable funding for infrastructure upgrades or innovations can be acquired. Were a fee to be charged, its amortized cost would almost

certainly be passed on to occupants and other service users. For illustration only, suppose that the full cost of improved infrastructure to complete gaps in the street network and service the transportation, water supply, sanitary sewer and stormwater management needs in the full Corridor is $100 Million. Applying a DIF levied only on residential customers using today's population of 6,449 households, would mean $15,511 if paid all at once; if financed with no interest charged, the monthly per household fee would be $43; if the City borrowed that money and paid a 4 percent interest rate passed on to each household, the monthly fee would rise to $71. If the full cost of meeting all goals stipulated in the TOD Policy increased the funding needed to $200 Million, those monthly fee levels per household would rise to $86 and $142 per month, respectively.

For much of the current population, those fees could be seen as prohibitive. And, indeed, it would not make sense for the existing residents to bear the burden of this investment alone as infrastructure investment would create benefits for the entire city and region, including businesses and institutions. Furthermore, if investment is needed for infrastructure in areas that have been historically under-resourced, identifying alternative funding and financing arrangements is essential to meeting equity goals. To be clear, for all of these reasons and more we are not recommending a fee of this kind be applied to existing residents in the corridor.

Costs could be significantly lowered by reducing the demand for transportation capacity, building to higher densities which would lower the per-unit costs, or by substituting technology—e.g. walking, bicycling and transit use lower the average vehicle ownership and vehicle-miles traveled rates; meeting stormwater needs by increasing surface permeability and restoring tree canopy lowers the need for storm sewers, and so forth.

Lacking a dedicated fee which could be applied to accelerated infrastructure upgrade hampers the rate at which improvement can be made. Phoenix plans to address some of these needs by using available funds augmented by bond borrowing and sales tax levy for the T2050 initiative; as noted elsewhere, we could not locate any commitments in the current capital improvement program for the use of these funds targeted to the Corridor communities in the 2019 to 2024 and 2020 – 2025 periods.

This report explores additional sources of funding available to support the infrastructure financing needs in the Corridor communities, below.

Using Predevelopment Funds to Fill the Gap--Reinvent Phoenix Gateway District Eco-District Model

During Reinvent Phoenix, from 2013 to 2014, a study team of CNT, Placemakers and DPZ was asked to identify a method of supporting necessary infrastructure buildout in the absence of TIF authority.

The team identified the practice of using what's known as a predevelopment fund to provide additional, off-balance sheet capital funding from socially screened funding sources, that has been used successfully in other cities to support the development of affordable housing near transit. The model was developed by the Center for Transit Oriented Development in conjunction with the Low Income Investment Fund and applied in the San Francisco Bay Area to support the development of individual buildings within walking distance of transit. In that case, the Transit Oriented Affordable Housing or TOAH fund was tasked with financing the acquisition of land and improvements and holding the property for up to 7 years, deemed necessary because of the long lead time needed to acquire, entitle, develop and rent-up such property. As rent-up is achieved the investment is repaid and the capital revolves to be made available for additional projects. Similar funds have been developed in Denver, Seattle, Los Angeles and Boston.

For the Gateway District, the team used the TOAH Fund as a model, and designed an approach with the following elements:

- A predevelopment fund would be created, the Walkable Urbanism Fund or WUF, which can invest in necessary public realm/infrastructure improvements. The funders would be the various agencies (there could be as many as 12 different departments or agencies plus utilities) who currently provide such services, plus foundations, large lenders with Community Reinvestment Act interests, and/or community development financial institutions. The two benefits the Fund would provide are coordination, and willingness to invest in innovations- e.g. green infrastructure to offset or reduce stormwater costs, energy efficiency and shade to offset air conditioning costs, and so forth. The fund would assemble necessary capital and specify desired infrastructure services.

- An operating entity would be created to provide the energy, water, drainage, waste, local street and last-mile-connection transportation services, acting as a service corporation on behalf of existing providers and providing new value-added services (e.g. mobility as a service, bundling both transit and shared use mobility services in a single package) as these become available, and pricing these services to maximize resident and institutional affordability and sustainability.

The team priced the investment needed for the higher density occupancy intended from redevelopment in a 2 square mile area spanning half mile buffers around the 38th Street-Gateway College and 44th Street – Skytrain-Airport stations; designed necessary inter-investor agreements, and demonstrated the relative savings from alternative methods of procuring capital

A similarly creative approach was recommended in the past to finance redevelopment in downtown Albuquerque including the area surrounding the multi-modal station providing both Amtrak and mass transportation services. Costs to redevelop included significant investment in improving an unmovable train viaduct, among other unique infrastructure; advisors recognized that whereas venture capitalists needed their funds back quickly and therefore charged very high carrying costs, local government only

needed to show returns over some period reasonably equal to the initial useful life of an investment, and foundations and other social investors fit somewhere in between. The financing of the costs of development in that case involved all three types of investors, who got their return on investment according to their degree of “patience,” which made the financing feasible.

Regional, State and National Policies and Funding Sources That Support Investments in TOD-infrastructure

Transportation and Air Quality

The South Central Neighborhood Transit Health Impact Assessment conducted from 2013 to 2015 identified unhealthy air, as measured by concentrations of Ozone and PM2.5 (ultrafine particulate matter) in the corridor. The standards for healthful concentrations of these are established by the Clean Air Act Amendments of 1990; the Phoenix Metropolitan Area has consistently experienced concentrations above these limits; most recently the area has formally exceeded the 2015 standard for Ozone and the State of Arizona Department of Environmental Quality and the Maricopa Division of Air Quality will be filing a plan, due in September of 2020, to achieve health standards and must demonstrate an accountable pathway to achieve "attainment" within a short period of time.

The law requires that States take action to reduce transportation emissions through use of lower emissions vehicles and fuels; and specifically requires commitments to additionally using "transportation control measures" that could reduce the use of motorized vehicles, including enhancements to public transportation, efforts to encourage employee commuting by means other than motorized vehicles, and by strategies such as improved land uses that reduce motorized trips and motorized vehicle-miles traveled.

Phoenix has committed to improved public transportation, and half of T2050 funds are committed to increasing the number and frequency of bus route services and to other mobility improvements.

The Maricopa Association of Governments has sub-allocated considerable authority under federal transportation law to enhance transportation services for meeting air quality objectives, and through a consultative process with the public and with Arizona DOT to "flex" the use of dollars apportioned for highway uses into uses that shift transportation into non-motorized modes. It also specifically allocates funds for a Congestion Mitigation and Air Quality program that can be dedicated to this purpose.

Funds have been allocated in past years to support a control measure, the Trip Reduction Program, to support this objective.

Other major cities nationally have made use of these provisions to more aggressively support environmental, livability and quality of life objectives, as has the city of Tempe nearby. The Metropolitan Planning Organizations (MPOs, of which MAG is the designated organization for the Phoenix metropolitan region) have aggressively and creatively identified and allocated funds for TOD planning and related capital investments. Examples include without being limited to:

- Livable Centers Initiative, Atlanta Regional Commission, borrows against a portion of future federal apportionments from the Highway Trust Fund and future matching commitments.
- Livable Communities Initiative, Metropolitan Transportation Commission of the Bay Area, subsidizes increments of subsidy for infill development in proportion to travel demand reduction using CNT's Housing + Transportation Affordability Index; also used a portion of their federal funding to help capitalize the Transit Oriented Affordable Housing fund and used that to successfully challenge local foundations and banks to match their $10 million investment with an additional $40 Million.

- Local Technical Assistance Program, Chicago Metropolitan Agency on Planning, provides funding for planning assistance and related capital improvements; originally funded with a HUD Sustainable Communities Grant, CMAP has chosen to keep funding this popular program with available apportioned funds and to consider the resulting plans when selecting projects for inclusion in their Transportation Improvement Program and their Long Range Transportation Plan.

Reading the current 2019-2020 MAG Transportation Improvement Program, there was a statement that "MAG received no applications in FY 2019 for bicycle and pedestrian…projects." (FY 2019 TIP, page 120). That TIP did allocate funds for planning and investment in conjunction with the approved Tempe Streetcar, and to help pay for the SC TOD Corridor Plan; but does not have a program category for "transit oriented development" on a continuing basis similar to those cited here for other major cities.

Highway Trust Fund dollars are awarded by apportionment formula annually to Arizona DOT, subject to obligation limits set by the Treasury and Congress. Those funds are channeled into block grant categories, some of which is directly "sub-allocated" to "urban" areas through Metropolitan Planning Organizations. Those funds are can be spent with "funding flexibility," approximately 50 percent of the total received through such categories can be spent either on the targeted purpose, such as highway construction and maintenance, or on other categories, such as mass transportation or activities that reduce travel, know as travel demand management.

Local shares of public transportation investments in Phoenix are supported by two sales taxes. The P400 tax was approved in 2005 and expires in 2025, and the T2050 tax was approved in 2016. Phoenix Mayor Gallego has pushed for early re-authorization of a tax to replace the P400 tax, and that can be considered an opportunity to specifically authorize projects that improve the public realm in transit station areas and also help improve air quality and lower traffic risks and the cost of living.

While as mentioned Phoenix cannot use TIF financing against anticipated receipts from local or State taxation, that prohibition does not apply to anticipated future apportionments of federal dollars awarded by formula approved by Congress. "Guaranteed Anticipated Revenue Bonds" are commonly used by State DOTs such as AzDOT to advance-fund the costs of highway construction, and by airport operators to do the same against anticipated federal funds for airport capital improvements. Similarly using what's known as HUD Section 108 Loan Guarantees, a recipient of Community Development Block Grant funds, known as an entitlement community, can borrow against future CDBG apportionments. For example, Cook County IL created a fund to support transit-oriented and cargo-oriented development using $30 Million of Section 108 guarantees, and used these funds to accelerate redevelopment surrounding transit stations and intermodal freight terminals in older and lower income parts of the county.

Given the federal requirements for an improved State air quality plan, and the need to affordably finance infrastructure in South Central, we recommend the City explore this strategy with MAG, with the Maricopa County Air Quality Division and Arizona Department of Environmental Quality, and with AzDOT.

Stormwater Management

A series of guidance documents issued by USEPA strongly encourages states and local governments to allocate resources for the use of green infrastructure to manage stormwater.

During Reinvent Phoenix, a series of goals were set for stormwater management that are incorporated into TOD District Plans.

Provision of shading and of flooding protection were top priorities identified by corridor residents during the SC TOD planning including in resident surveys and in community engagement activities.

The need for these is identified in the condition assessment reports of the T2050 Mobility Area plans.

The City has a Stormwater Management Program, and the activities listed on its home page can be characterized as focused on "gray" infrastructure initiatives, and with compliance activities to address federal and state requirements. https://www.phoenix.gov/waterservices/envservices/stormwater-program/overview. Phoenix does require on-site retention of the runoff from a 100-year, 2-hour storm.

A review of opportunities and barriers for utilizing green infrastructure was conducted in 2012 at https://www.epa.gov/sites/production/files/2015-10/documents/phoenix_gi_evaluation.pdf. The evaluation done jointly with national consultants and local staff and provides an in-depth review of barriers including those included in city codes and policies to utilizing green infrastructure effectively.

The State of Arizona operates a State Revolving Fund for Clean Water, which receives annual appropriations of funds from USEPA that can be used to meet the goals of the Clean Water Act. USEPA encourages the use of such funds for green infrastructure and for meeting the needs of "economically disadvantaged communities," in both cases allowing States to provide economic incentives for these purposes- e.g. this is styled as a "loan fund," but loan terms can be made more favorable for these purposes. Examples of such State Funds from around the country and their application to green infrastructure for stormwater management are included in a recent review at https://www.cnt.org/publications/increasing-funding-and-financing-options-for-sustainable-stormwater-management .

An example of a "best practitioner city" is Philadelphia PA. The program there is supported by its capital improvement plan with annual appropriations supported by fees levied in proportion to property area runoff, and by property taxes, and the overall program is supplemented by funds received from the State of Pennsylvania's Revolving Loan Fund.

The use of trees as green infrastructure to mitigate urban heat island effects was identified as a priority in the SCNT Health Impact Assessment. A challenge is that simply planting younger trees might take decades to achieve shade. An alternative is to relocate mature trees that otherwise are at risk of being destroyed by development or as part of regular public forest maintenance.

- In Louisville KY, the Green Heart program was established by the University of Louisville Medical School to demonstrate the measured health benefits of restored tree canopy in six targeted lower-income, minority communities.[7] It's financed by the National Institutes of Health and a

[7] Source (1) personal interview conducted by Scott Bernstein with University of Louisville Medical School project co-directors Aruni Bathnagar and Ted Smith, Dept. of Cardiology; (2) project web site

partnership with The Nature Conservancy, and is currently in the process of procuring and relocated over 1,500 mature trees to the target areas, thereby accelerating tree canopy restoration and delivering stormwater management and urban heat island benefits within a very short period of time; the medical school staff is training volunteers whose health is being monitored now and in the future post-installation.

- The city of Perth, Australia has established a "tree bank" policy, in which property owners and developers engaged in development and redevelopment must replace mature trees with other mature trees through relocation; the cities of Santa Monica and Los Angeles have stated intent to adopt such a policy in the near future.

A review of best practices and potential funding strategies recently conducted by CNT is at https://www.cnt.org/publications/increasing-funding-and-financing-options-for-sustainable-stormwater-management. An additional, emergent resource is the use of "impact financing," also known as pay-for-success, in which philanthropic and market-based resources are blended to keep terms reasonable, and calibrated to outcomes such as reduction of runoff-based water pollution and flooding protection. A leader in packaging such opportunities is Quantified Ventures, Inc. which introduced the first such project in 2016 with the District of Columbia. Summaries of that project and similar projects with DC Water, City of Atlanta, City of Baltimore, a national forest at Athens, OH and in Louisiana is at https://www.quantifiedventures.com/blog/what-is-an-environmental-impact-bond

Recently the City of Phoenix Finance Department issued the Green and Sustainability Bond Framework to attract such investments, in February 2020, at https://www.phoenix.gov/sustainabilitysite/Documents/City%20of%20Phoenix%20Green%20and%20Sustainability%20Bond%20Framework%20(Final).pdf

CNT has recently issued guidance for documenting many non-stormwater impacts associated with the type of comprehensive green infrastructure described here, including health, economic, climate and transportation benefits at https://www.cnt.org/sites/default/files/publications/Green%20Values%20Strategy%20Guide.pdfDocumenting these benefits can increase funding and financing opportunities by attracting investments with goals in those additional areas.

Public utilities that provide electrical service are encouraged under various state statutes to invest in urban heat island mitigation as a cost-effective means of reducing peak demand for electricity in warming climates. The Urban Heat Island laboratory at Lawrence Berkeley Laboratories in California works with utilities and communities to help design and calibrate such programs; Tucson Electric Power supports tree initiatives in support of heat island mitigation as an energy efficiency measure. The Arizona Corporation Commission, a state agency, regulates the ability of investor owned utilities including Arizona Public Service to invest in energy efficiency; we found in discussions with community leaders in South Phoenix that the availability of APS's incentive programs for efficient air conditioning and those operated by the Salt River Project, for example, was not well known. APS does spend significant funds on both energy efficiency and on renewable resources, and arguably should and could become a leader in this practice, particularly in communities along the South Central light rail line. The

at https://greenheartlouisville.com/; (3) Nature Conservancy project web site at https://www.nature.org/en-us/about-us/where-we-work/united-states/kentucky/stories-in-kentucky/green-heart-project/

disconnect here may be a function of the service territory boundaries; APS provides some services to greater downtown Phoenix and points north of there; below that boundary the Salt River Project, a form of public utility not regulated by the Commission provides electrical services. The Salt River Project will provide two trees per requesting household, the only requirement is to attend an orientation session on the intended heat island mitigation impact and the proper care and maintenance of these tree species.

The Tree and Shade Master Plan adopted by Council in 2010 represents an important enabling statute; https://www.phoenix.gov/parks/parks/urban-forest/tree-and-shade/ includes a progress dashboard and tree inventory; both of which could be modified to directly focus on the South Central communities. What's currently listed on the home page for the dashboard lists progress toward goals as of 2011; this could be updated. Various pilot green roof and local cooling pilot programs have been conducted in partnership with ASU. https://www.scientificamerican.com/article/how-phoenix-is-working-to-beat-urban-heat/.

Three other potential sources have emerged:

1) Property casualty insurance companies are strategically concerned that climate change has resulted already in a barely tenable situation that will only get worse- climate related events such as floods and heat already account for the largest chunk of payouts. Current underwriting practices do not tie premiums paid to the degree of risk, which in turn is mitigated by the use of re-insurance funds that spread the risk globally (the best known of which is the federal fund, the National Flood Insurance Program backed by Congress; there are many private sector funds too). Both insurers and lenders are showing an increased interest in climate protection, as are debt rating agencies such as Moody's and Standard and Poors and Fitch Ratings. It's likely that financial services industries have a business interest in the stability of their customers' loans and policies and therefore are potential investors in such services as retrofitting of individual properties and potentially in the provision of climate resiliency infrastructure. We're not recommending a particular strategy for the City at this time; because of the tight linkage between insurers and banks, and because of the attention that banks and bank regulators are paying to climate change impacts and resilience, the issue and the opportunity should be closely monitored. A special issue of Community Development Review published by the Federal Reserve Bank of San Francisco (whose territory includes Arizona and lenders operating in Arizona) is devoted to this topic at https://www.frbsf.org/community-development/publications/community-development-investment-review/2019/october/climate-adaptation-and-community-development/

2) It's also likely that the federal government will include provisions in any future "infrastructure" bill to start addressing climate protection issues. This could happen this year or early in the next Congress. Our recommendation here is to make the City's representative in DC, and the Arizona Congressional delegation aware of the City's interest in innovative and responsible infrastructure for the Corridor. Being "shovel ready" with sustainable infrastructure projects tied to a clear community vision is essential to securing competitive federal funds for climate action, job creation, economic recovery and more.

3) Cities and states are increasingly under pressure to increase the ability to operate under stressed conditions, a capacity known as resilience. Such conditions include current and known severe weather patterns, such as extreme heat and flash flooding conditions; and unknown but likely and predictable conditions due to climate change. In addition to urban heat island mitigation, green infrastructure for

stormwater management, tree canopy restoration, and energy efficiency, a robust approach includes a more distributed set of energy resources to ensure continuity of service.

It would be prudent for Phoenix to be ready to articulate its interests in targeted, “greener” infrastructure such as is discussed here for the South Central Corridor. It’s likely that such funding would be awarded competitively, as opposed to simply being apportioned by formula.

A Review of Possible Infrastructure Improvements

To gauge the scale of street infrastructure investment needed to meet the vision for the South Central corridor we conducted an analysis of potential costs.

The seven proposed stops on the light rail extension along S. Central vary in the level of current development. This section addresses the street infrastructure in the area around this extension. The following table shows the characteristics of four planning areas around these stations, which are aggregated to the four planning areas used by Gould Evans in preparing illustrative station plans at the 90 percent design level.

Table 1: Current (2018 ACS Five Year Sample) Population and Households in Study Areas

Area	Population	Households (HHs)	Acres	Household per Acre	Street Miles	Street Miles per HH
Lincoln, Buckeye	3036	1046	694	1.51	24.0	0.023
Audubon	2403	666	769	0.87	13.2	0.020
Broadway Roeser Southern	13006	3465	1,277	2.71	36.2	0.010
Baseline	4693	1272	647	1.97	18.5	0.015
Total	23138	6449	3,387	1.90	91.9	0.014

The map in Figure 2 shows these planning areas relative the seven proposed stations relative to the seven proposed station areas configured within the four illustrative plans provided by Gould Evans. A few observations about these areas.

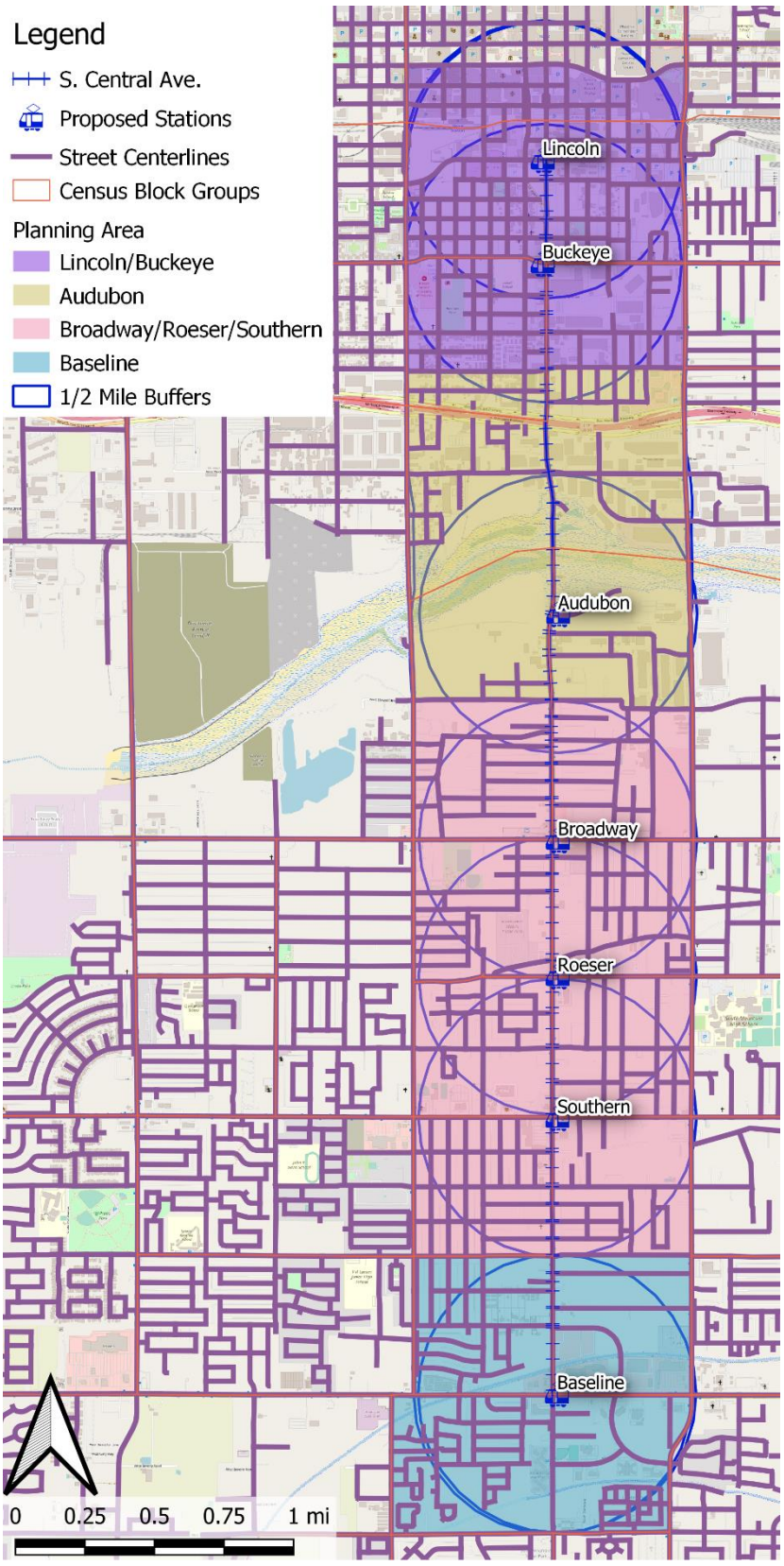
- They do not overlap, therefore, any quantification of variables in each are independent, and thus can be summed
- They do not conform to Census Geographies, neither Block Groups nor Tracts, therefore, to estimate household in each a proportional sum[8] was used
- They contain one, two, and three proposed light rain stations
- They go beyond a simple half mile circular radius around the proposed stations, i.e. the corners are farther than ½ mile from the proposed stations

[8] A proportional sum uses the following formula to aggregate the number of households from the Census Block Groups to the planning area:

$$H = \sum_{i=1}^{n} h_i \times f_i$$

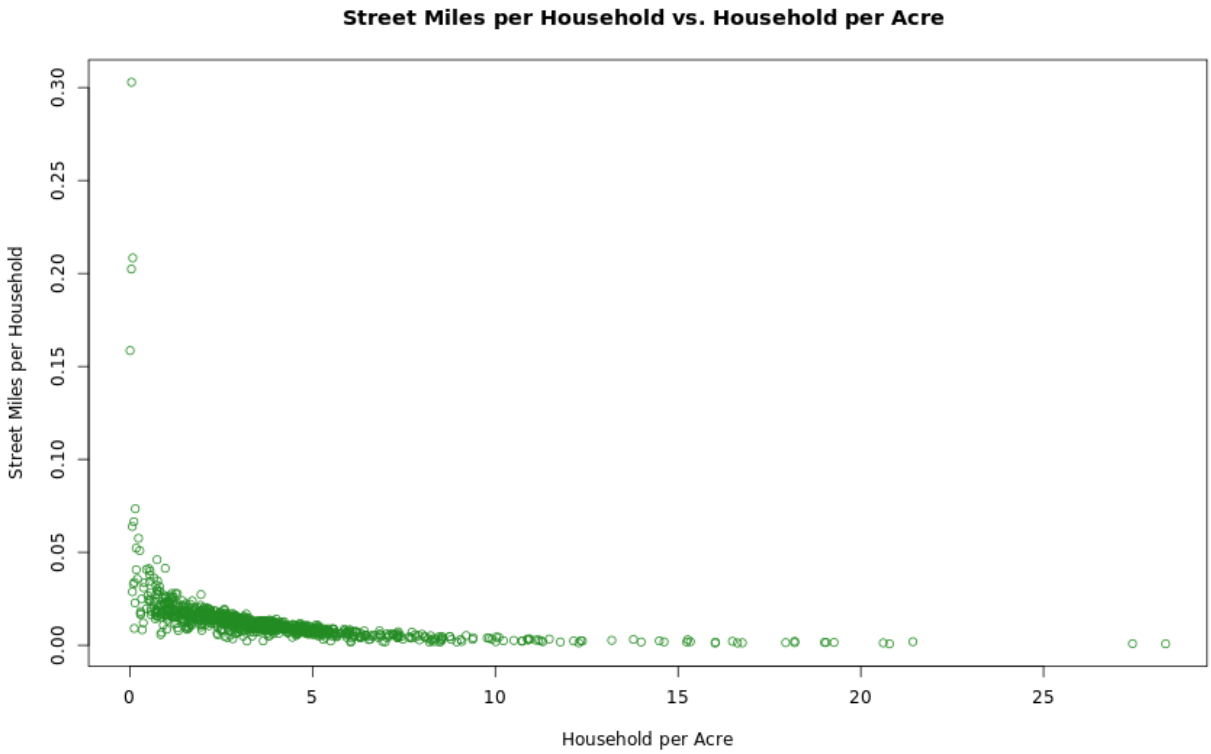
Where H is the estimated number of households in the planning area, n is the number of Census Block Groups that intersect the planning area, h_i is the number of households in the Census Block Group, and f_i is the fraction of land area that forms the intersection of the Census Block Group and the planning area. Note that there is an implicit assumption that the households are evenly distributed across the Census Block Group, which in most cases is not accurate, however, this is the best method to assign households without a finer geography to use to aggregate the Census data.

Figure 2: Map of Planning Areas Along the S Central Ave. Extension



The following graphs shows the relationship of households per acre and average street miles per household for all the Census Block Groups in Phoenix. This is calculated by using the street centerline shape file obtained from the Phoenix Open GIS portal, then calculating the lengths of all the streets that intersect a Block Group, including a 15-foot buffer to allow for mismatch in the Census Tiger Line Block Groups and the Phoenix City street centerlines, and avoiding streets that are Highways, Freeways or Ramps.

Figure 3: Plot of Street Miles per Household vs Household per Acre



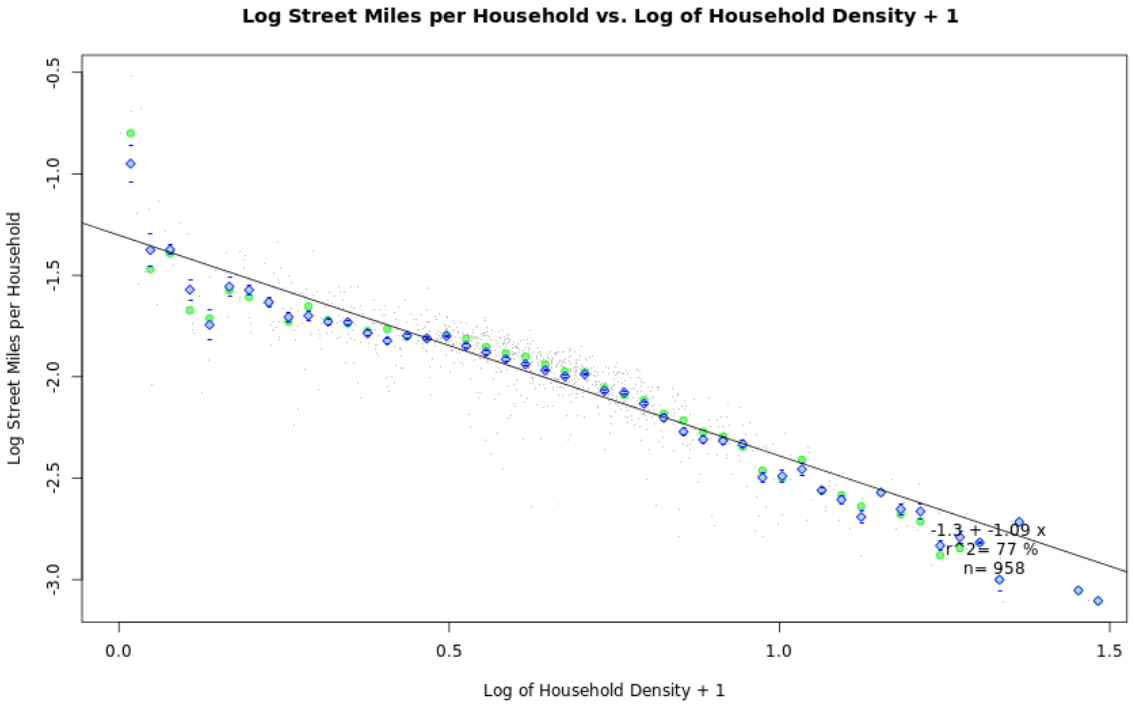
Note that there is a very strong but non-linear relationship between these two variables. In order to derive a formula to represent this relationship the common method used is to transform the variables using logarithmic formulae. In this case by taking the common[9] log for the street miles per household and using the common log of the density plus one[10]. The following graph show the transformed variable with a regression formula that shows the high level of correlation (R^2 = 77%) for the 958 Census Block Groups that are contained in Phoenix[11].

[9] Common log is the logarithm to the base 10

[10] This common transformation, sometimes referred to as "log+1 transformation" is needed since the households per acre have a wide variation that approach zero; the log of zero is equal to negative infinity, therefore not useful in this context.

[11] Census Block Groups that partially intersect Phoenix were eliminated since the street centerline shape file stopped at the city's border. Ones with no households were also eliminated.

Figure 4: Plot[12] of Street Miles per Household vs Household Density using Logarithmic Transformations



The following formula describes this relationship:

$$S = 10^{(m \times \log(D+1)+b)}$$

Where S is "street miles per household," D is "households per acre," m is the slope (-1.09) and b is the intercept (-1.3).

[12] This plot, made in the statistical package R, has several components, the light grey dots represent the values for each Census Block Group, the blue diamond show the mean of these points for 50 bins, the green dot is the median, the small blue lines above and below the diamonds represent the standard deviation within the 50 bins, the line is a representation of the linear regression formula given in the lower left corner.

Using this relationship, the following table estimates the number of street miles *needed* in each station area to provide the *average* residential streets network for the households that were there in 2018. Note that all planning areas need a higher street density that what currently exists, except for the Lincoln, Buckeye area, in order to have an equitable street grid relative to the average neighborhood in Phoenix. This does not consider the fact that these areas will need to accommodate more people to be considered a TOD. The cost of building one mile of streets in Phoenix was estimated using a cost that was develop in Madison Wisconsin[13] in 2011. An inflation factor and regional factor have been applied to arrive at the cost of $4,299,546/mile. For upgrade costs the cost per mile for putting in new sidewalks, lighting and trees was assumed to be $200,000 per mile and was arrived at by using values from similar projects in Phoenix[14].

Table 2: Estimate of Street Network Increase in the Planning Areas Accounting for the Current Household Population (Scenario 1)

Area	HHs	Street Miles	Street Miles per HH	Upgrade Costs	Model Street Miles per HH	New Street Miles	New Street Cost	Total Cost (Upgrade and New Streets)	Cost per HH
Lincoln, Buckeye	1,046	24.0	0.023	$4,805,060	0.018	-	$-	$4.8M	$4,594
Audubon	666	13.2	0.020	$2,635,784	0.025	3.65	$16M	$18M	$27,551
Broadway Roeser Southern	3,465	36.2	0.010	$7,248,064	0.012	5.19	$22M	$29M	$8,537
Baseline	1,272	18.5	0.015	$3,701,011	0.015	0.92	$4M	$7.7M	$6,031
Total	6,449	91.9	0.014	$18,389,919	0.016	8.82	$42M	$60M	$9,367

[13] See Appendix for more detailed description
[14] Reinventing Phoenix Report

In order to accommodate the expected growth in the planning areas the study team used the 2050 population projection provided by MAG to determine a rate of growth for a slightly larger area and applied that rate to the current number of households. What results is a net growth of 82 percent in the number of households. The team used that growth in determining new street miles needed and associated costs.[15]

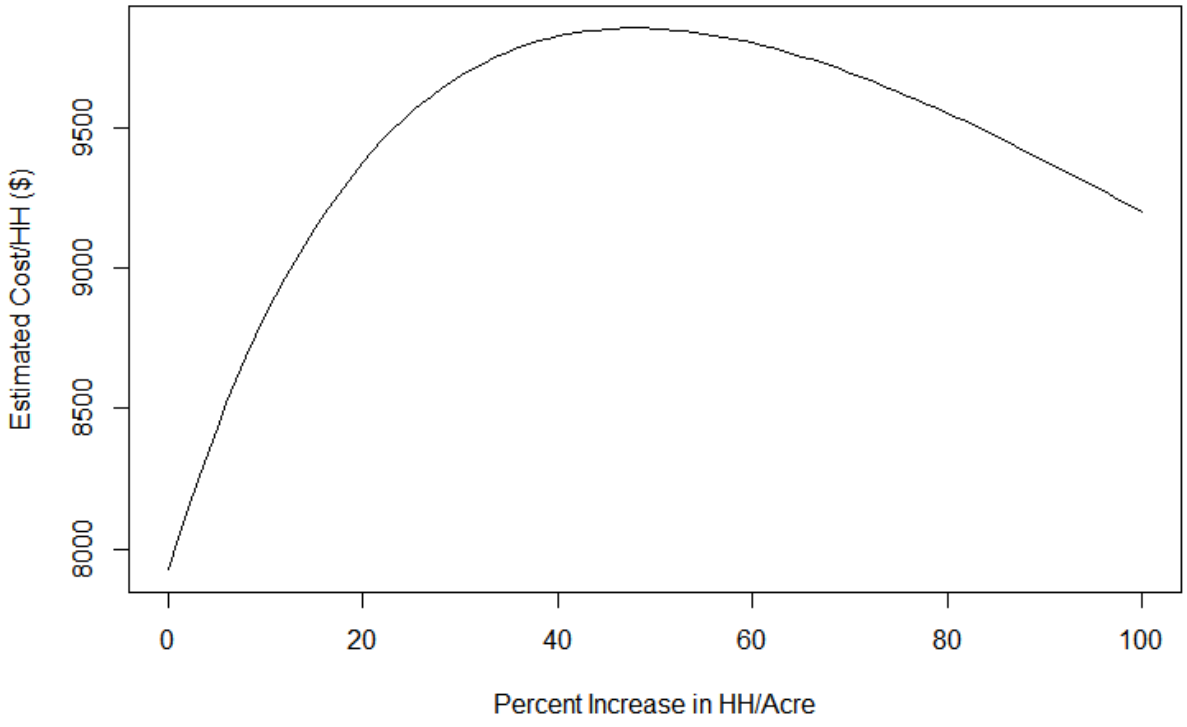
Table 3: Estimate of Street Network Increase in the Planning Areas Accounting for the Household Population Growth Prediction (Scenario 2)

Area	HHs	Street Miles	Street Miles per HH	Upgrade Costs	Model Street Miles per HH	New Street Miles	New Street Cost	Total Cost (Upgrade and New Streets)	Cost per HH
Lincoln, Buckeye	1,904	24.0	0.013	$4,805,060	0.012	-	$-	$4.8M	$2,523
Audubon	1,212	13.2	0.011	$2,635,784	0.018	8.40	$36M	$39M	$31,952
Broadway Roeser Southern	6,308	36.2	0.006	$7,248,064	0.007	9.02	$39M	$46M	$7,296
Baseline	2,316	18.5	0.008	$3,701,011	0.010	3.55	$15M	$19M	$8,193
Total	11,741	91.9	0.008	$18,389,919	0.010	20.97	$90M	$109M	$9,245

Note that as some areas fill in with more households the cost per household for these infrastructure improvements lower for the Lincoln/Buckeye and Broadway/Roeser/Southern planning areas. This trend is complex and non-linear since the scenario includes both adding streets and upgrading current streets to make the areas more walkable and transit user friendly. The following graph shows how the overall costs per household vary with different amounts of growth.

[15] In the reviewed document - 90percent comments.pdf – there were data on households and population in the entire area, that do not conform to the proportional total of household assigned to the sum of the study areas. This is probably related to the fact that the planning areas do not conform to either Census Block Groups or Census Tracts. The estimates used in the tables above are estimated using the 2018 Five Year Sample data for the American Community Survey and proportioned to the planning areas using the fraction of Census Block Group area intersecting each planning area. The MAGs estimate for the number of households in the entire planning area is 8,432 households for 2019 and 15,351 households in 2050 thus 15,351/8,432 = 1.82 or 182%.

Figure 5: Estimated Cost per Household vs Percent of Increase Households for the Entire Planning Area



The costs presented here are estimates, but looking at the scale of investment needed corridor-wide in this way can assist in developing a strategy to meet the area's needs by setting budgetary priorities in programming capital improvements and creating options for financing improvements as discussed elsewhere in this memorandum.

To review, the estimates are that for an investment of $42 Million, the additional 8.82 mile "gap" of necessary streets and associated infrastructure to service the existing population of 6,449 households can be achieved. The estimate to bring the existing streets up to a good walkable level with appropriate trees, sidewalks and lighting would cost $18 Million. Meeting the projected population of 11,741 households increases the "gap" to 22.92 miles of street and the budget needed to construct infrastructure to $90 Million. Thus, to fully build out and upgrade the street network in this corridor would cost $60 Million for the current population or $109 Million to accommodate future growth.

The costs per household drop with the density of households served, however the relationship in this case is not linear: the gaps in each planning area vary, the illustrative plans place buildings to be constructed in areas determined by the public engagement process, and the planning team did not propose eliminating buildings, in order to meet the "development without displacement" proposed policy.

- As a result, for the scenario 1, which illustrates the infrastructure needed to close the "gap" for the current household population, the cost per household is $9,367, with the lowest cost per household in the Baseline planning area at $6,031 and the highest for the Audubon planning

area at $27,551, and the costs for the Broadway, Roeser and Southern planning areas at $8,537, respectively.

- For the scenario 2, which illustrates the infrastructure needed to close the "gap" for the projected household population (current plus projected growth by 2050), the cost per household is slightly lower averaging $9,245, with the lowest cost per household for the Broadway, Roeser and Southern planning areas at $7,296, followed by Baseline at $8,193, and Audubon at $31,952, respectively. As discussed earlier in this memorandum, these per-household figures are meant to be explanatory and we do not recommend that households in the corridor bear the full burden of these infrastructure costs.

Observations and Discussion

The City of Phoenix has adopted plans for the delivery of transit oriented development in the South Central LRT Corridor, secured funds for the delivery of the transit equipment and associated direct transit improvements, survived several well-publicized challenges, and is poised to commence construction and meet its startup service goals.

Successful and equitable TOD requires that the associated redevelopment of the communities surrounding each of the 7 planned station areas also be completed. As stated by Valley Metro general manager Scott Smith in 2018, “we’ve raised over $ 1 Billion to proceed with transit construction, it’s up to the agencies and community leaders in this room to match that with sufficient funds to meet the adopted TOD goals.”

Doing that represents a challenge. There is not a distinct agency charged with such a mission. The mission requires alignment between many City and non-city agencies. The envisioned outcomes are dominated by long-lived assets known generically as “infrastructure,” and the mechanism for funding infrastructure, the Capital Improvements Program (CIP) has yet to allocate funds for this purpose, and for the related enhancement purposes identified in the TOD policy and related policies that address local conditions, quality of life, health, safety and environment.

Our review estimated the levels of funding likely needed to (a) fill gaps in the current network of streets and related infrastructure, (b) expand those networks to accommodate growth at levels commensurate with the official population projections prepared by the Maricopa Association of Governments, (c) determine the level of additional funding needed for enhancements identified in various studies for these purposes.

In preparing those estimates, we repeat the admonitions given by various city agencies and consulting engineers made consistently in the Reinvent Phoenix program, and in current discussions and documents: these are estimates based on current practice. They do not budget for contingencies, which could run as much as 30 percent; they do not count for variations in these estimated budgets due to competitive or other pressures, which result in a plus or minus 25 percent variation. An internal tracking system or database for the types of costs we have assembled here could help the city in planning and managing such investments going forward on a continuous learning basis.

The cost estimates presented here also do not account for the benefits of decisions yet to be made—in this case, achieving higher densities than shown are very likely to result in significant savings in infrastructure investments; and as enhancements projects, which are currently practiced in a pilot or demonstration mode, are taken to scale, unit costs are likely to drop. In some cases, a more aggressive

schedule of enhancements can offset the requirements for traditional infrastructure—similar to the effect expected by bringing modern light rail to the corridor in terms of reduced automobile ownership and use, green infrastructure and tree canopy restoration designed well will reduce sewer load and improve economic conditions- as one Corridor business leader stated, give us a strategy to keep cool both indoors and outdoors, and the TOD walkability goals will be feasible (interview, Victor Vidales, 2019).

In a very real sense, it's the ability of a Corridor of equitable TOD villages that both matches the official policies, the stated aspirations of community leaders in numerous interviews and public engagement sessions, and the further ability to demonstrate aggregate improved economic and environmental performance that can make Corridor investments attractive not only to the City of Phoenix, but to regional, utility, and State agencies, and to social investors committed to a greener and more inclusive economy.

The South Central Corridor represents that kind of opportunity, and in that sense we offer the following recommendations to the City.

Recommendations for Action

Include a line item for infrastructure improvements in the South Central Corridor.

The City's Draft CIP for 2020-2025 will be included in final form, as currently scheduled for the June 17 action by the City Council[16]. If it is not feasible to include a full capital recommendation at this time, due to the date and due to the current financial pressures on the City from the pandemic, it should still be possible to develop a recommended starter budget for this year's approval based on projects included in the T2050 Projected Conditions recommendations included in the South Downtown Mobility Area 1 and the South Mountain Neighborhoods Mobility Area 10, the latter of which prepared a priority scoring system based on the 2018 TOD Policy Framework, and with the policies included in the draft 2020 Key Corridors Master Plan. This near-term action should be accompanied by actions to include a full capital improvements strategy identified as the South Central Corridor strategy in sufficient time to be included in the 2021-2025 CIP.

Research and establish a schedule to take advantage of available funds from regional and state agencies.

The Maricopa Association of Governments prepares a five-year plan of their own for the region known as the Transportation Improvements Program, which is supplemented by an annual "call for projects." A similar process at the Water Infrastructure Finance Authority which annually updates its list of eligible projects in an Intended Use Plan, and another at the Arizona Department of Environmental Quality to determine eligibility for their allocation of Section 319 USEPA funds for stormwater management, are examples of funding conduits that apparently have not been "enlisted" in the broader, beyond-planning effort to invest in South Central. This recommendation also includes developing or enlisting the capacity to demonstrate that the projects to be programmed in South Central advance the policy goals adopted by these additional agencies and can perform accordingly.

Adopt organizational formation strategies addressed in the Land Strategies memorandum.

Create and use a combination of an engaged stakeholder convening and expert opinion to design and launch a special district and a pre-development fund.

- This recommendation includes using seasoned experts at creating the kinds of institutions and programs recommended. Some of that expertise is available locally, for example the formation of special districts pursuant to Arizona law; specialized expertise, coaching, and technical assistance is available nationally. By designing a specialized engagement for designing financial and governance tools supportive of these infrastructure goals, and including practitioner-analysts, an accelerated implementation strategy should result.

Explore strategies that enhance the capacity of non-governmental agencies to support TOD Policy goals within the Corridor.

- Much as a Community Land Trust could substitute for a public land bank, and Community Development Financial Institutions such as Raza Development provides value-added financial and development services, the development of specialized services to address such opportunities as green infrastructure and tree canopy replacement for a more livable and

[16] https://www.phoenix.gov/calendar/budget/3154

prosperous set of communities, and addressing clean energy and energy efficiency retrofit services for homes and businesses should be strongly considered. The case study from Louisville demonstrates the value of paying attention to both the direct benefits and the co-benefits of a strategy, in this case the "co-benefit" of measured health improvements is paying for the largest accelerated mature tree relocation in America, and large scale mature tree relocation is paying for anticipated and independently verified health improvements.

Develop and secure staffing resources and specific assignments for supporting these efforts.

The nature of these proposals is that an armature or hub be created that coordinates across department and jurisdictional lines, and between the public and private sectors. We believe that the proposals made in this memorandum can be conducted under current authority with no additional actions needed by the legislature. It's the nature of several of these proposals that some form of internal authority for that coordination be created. This could be done administratively from the office of the City Manager, in consultation with the Mayor and Council.

We observe that Phoenix is in competition nationally for various flexible funds from time to time with other cities committed to similar goals; in almost every case the responsibilities we are recommending are specifically delegated to a lead office or program manager, with titles such as "manager for transit oriented development." One advantage of creating a pre-development fund and/or a district for program execution is that multi-agency alignment and participation is required; during Reinvent Phoenix, an Innovative Finance Working Group convened City and regional agencies, and the idea of having a formal structure within which such multi-agency coordination for district-level TOD support could occur was well received.

Appendix – Infrastructure Cost Calculation

Various local and national contractors bid on construction to serve planned developments of different densities to be built in Dane County, the home of Madison WI, said developments being of different densities. Data from 29 projects resulted in hundreds of bids spread among 4 principal types of infrastructure, classified as "streets," "sanitary sewers," "storm sewers," and "water services" were provided to the Capital Area Regional Planning Commission, whose staff used these in working papers used to support sustainable communities planning to benchmark estimated cost impacts per residential unit at varying levels of density. Each of these bids represented construction to be placed in developments alongside streets, and preliminary analysis showed a significant correlation between the length of street needed and the length of the other three services. The bids were analyzed and indexed per length of street for each of the infrastructure types. The base cost for those project bids, all of which were made in 2011, were added up to yield an estimate of $3.6 million total to provide all 4 infrastructure types per mile of street.

For Phoenix, we used several types of analysis to validate the relationship between street length and household density. Nationally, we correlated street length with household density using the method described based on logarithms of each variable for all 6.43 million blocks that have residential occupancy. We also examined the same relationship for all Census blocks in the state of Arizona. Then we examined it for Phoenix to determine that the form of this estimating equation worked equally well for the city's urban geometry.

We then estimated two corrections to the detailed per-mile cost estimates provided from the Dane County bid sample. The first correction is based on inflation; using a calculator provided by the Bureau of Labor Statistics we determined that to provide the same level of purchasing, what cost $3.6 million in 2011 costs $4.1 million today. Then we adjusted for the costs of goods and services within different metropolitan areas, using the Bureau of Economic Analysis's tables for Power Purchasing Parity Multipliers to convert purchasing power in metropolitan Madison-Dane County WI to purchasing power in metropolitan Phoenix, arriving at an adjusted estimate of $4.3 million per mile of street to purchase all 4 types of infrastructure services.

We also examined the cost estimates provided by City of Phoenix departments for various street upgrades, sanitary sewer, and water distribution projects. We did not have available the net household capacities to be serviced by these projects, and so cannot provide per household cost estimates using an identical method; however, where the total project costs and total project length are provided, the costs per mile are within the ranges observed using the 2011 bids.

We also examined the cost estimates provided by City of Phoenix departments for various public realm enhancements, such as bicycle lanes, protected pedestrian crossings, and a canal-scape project. The unit costs of these projects are clear; the ultimate costs of providing such treatments throughout the Corridor's station areas requires knowledge of the number of such projects to be implemented.

To consider the volume of these improvements, we reviewed the following

- The Mobility Area conditions assessments conducted for the T2050 plan for mobility improvements contain the north end of the corridor in Mobility Area 1, from the Warehouse District to the River; and the south end of the corridor from the River to South Mountain Park.[17]
- We also reviewed the 2009 Key Corridors Master Plan, as posted, and the new draft 2020 Key Corridors Master Plan as provided to the Planning Department.
- We also reviewed the 2019-2024 City of Phoenix Capital Improvements Program and the draft CIP for 2020-2025.

All of these documents and plans do set the stage for a consistent basis on which to prioritize infrastructure investments to meet stated community concerns and City policies, including without being limited to adequate connectivity, pedestrian and traffic safety in a multi-modal context, public health and environment, and urban redevelopment that can maximize economic benefits without displacing current populations and businesses.

[17] The current reports made available on the T2050 web site were posted in 2018, and at that time did not include a count of each recommended project type. City staff provided the updated reports which are labeled 'Projected Conditions' dated August 2019 which include cost estimates for potential projects, the report for South Mountain Neighborhoods Mobility Area 10 was used by the study team to estimate mobility enhancements project unit costs.