

# NISKANEN C E N T E R

## PHILADELPHIA REGIONAL RAIL:

### Population density and SEPTA's fiscal crisis

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January 2025

### Key takeaways

- The fiscal challenges facing SEPTA underscore the need to boost ridership and revenue wherever possible. However, several of SEPTA's regional rail stations have lower nearby populations than is generally considered optimal.
- This challenge also represents an opportunity for the City of Philadelphia to create new housing options that increase density, grow the population, and improve residents' access to jobs and opportunity.
- A key opportunity is in the station areas of the Chestnut Hill and Germantown neighborhoods, which currently have population densities of around 7,800 people per square mile in the surrounding half-mile radius, well below the optimal threshold of around 10,000.
- Policymakers could consider density-boosting options including light-touch density, transit-oriented development, or zoning overlays to unlock this opportunity.

## Introduction

The term “mass transit” historically conveys the idea of scale—large systems designed to serve many people and connect major destinations in densely populated urban areas. Traditionally, new transit networks are built to serve the highest concentrations of people and jobs, aiming to achieve the ridership levels necessary to justify substantial capital investments. Even in cases where transit infrastructure precedes population growth, rapid transit development often follows, provided that the conditions support it.<sup>1</sup>

The symbiotic relationship between public transit and density is intuitively understood but rarely quantified. This study does this by examining the relationship between residential density and the Southeastern Pennsylvania Transportation Authority’s (SEPTA) regional rail system. SEPTA operates as a hybrid between traditional commuter trains, like New York’s Metro North Railroad,<sup>2</sup> and rapid transit systems, such as the Chicago ‘L,’<sup>3</sup> combining features of both types.

To assess residential density, we measured the population per square mile of census tracts within 0.5 miles of a regional rail station. This approach helps identify areas along Philadelphia’s SEPTA regional rail system that could benefit from increased residential housing density. Additionally, this enables us to see where the City of Philadelphia could reasonably encourage more residential development without unduly straining existing transportation infrastructure like roads and highways, since those new residents would be more likely to utilize nearby public transit.

## Philadelphia, a history of people and transportation

Philadelphia, a bustling metropolis on the East Coast of the United States, has historically benefited from its inland location at the confluence of the Delaware and Schuylkill Rivers. This strategic location has provided access to both land and sea trade while offering protection from severe coastal storms. Over the centuries, its residents have recognized and capitalized on this advantage, optimizing transportation networks from the time of Native Americans to the present day.

Studies of Native American trails show that the area now known as Philadelphia was a natural crossroads, with trails following and connecting the region’s inland waterways.<sup>4</sup> By the 1700s and 1800s, Philadelphia had firmly established itself as an industrial and trading hub, aided by its access to waterways and landside transportation networks.

Ground transportation in the 19th and 20th centuries evolved from private turnpikes to railroads and public highways. During this period, Philadelphia was primarily served by two railroad networks. The larger Pennsylvania Railroad connected the city to New York, Washington, and Pittsburgh. Meanwhile, the smaller Reading Railroad connected to coal-producing regions of eastern Pennsylvania and parts of New Jersey.

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1. Don Friedman, Construction History: Grandeur, April 15, 2020. <https://oldstructures.com/2020/04/15/construction-history-grandeur/>

2. Metropolitan Transportation Authority, Metro North Railroad system map, January 31, 2023, accessed December 13, 2024. <https://new.mta.info/map/5351>

3. Chicago Transit Authority, ‘L’ (rail) system map, July, 2024, accessed December 13, 2024. [https://www.transitchicago.com/assets/1/6/ctamap\\_Lsystem.png](https://www.transitchicago.com/assets/1/6/ctamap_Lsystem.png)

4. Matthew A. Zimmerman, Trails (Indian), in the *Encyclopedia of Greater Philadelphia*, (Rutgers University, 2016), accessed December 13, 2024. <https://philadelphiaencyclopedia.org/essays/trails-indian/#essay>

## Intercity and regional railroads in Philadelphia

Philadelphia was traditionally served by the Pennsylvania and Reading Railroads. In addition to their main line intercity services, both railroads operated short-haul and commuter trains connecting suburban passengers with Philadelphia's "Center City." The railroads operated largely overlapping commuter trains into separate terminals in Center City.

Like many railroads around the country, Philadelphia's primary rail links suffered financially after the end of World War II.<sup>5</sup> The Pennsylvania Railroad merged with the New York Central System in 1968 to form the Penn Central Transportation Company.<sup>6</sup> The combined network was often redundant, and the Penn Central filed for bankruptcy in 1970 after two years of unprofitable operations.<sup>7</sup> At the same time, the Reading Railroad filed for bankruptcy in 1971 following a downturn in freight traffic and regional coal production.<sup>8</sup> With these and several other northeastern railroads simultaneously in financial distress, Congress intervened, establishing a public company to consolidate and manage the failing railroads serving the northeastern United States.

In 1976, Conrail began operations carrying freight and local passengers throughout the northeast.<sup>9</sup> In Philadelphia, Conrail absorbed the former Pennsylvania and Reading commuter train operations, operating the duplicative networks into two separate terminals that were mere blocks apart from each other.<sup>10</sup>

The Pennsylvania legislature established the Southeastern Pennsylvania Transportation Authority (SEPTA) in 1963. The agency soon began coordinating and subsidizing existing commuter train services operated by the Pennsylvania and Reading railroads.<sup>11</sup> This purchase-of-service relationship continued through each railroad's bankruptcy and into Conrail's operations. Recognizing the inefficiencies of maintaining separate but parallel commuter networks, SEPTA initiated plans to modernize and integrate the system.

## Pivoting from commuter trains to regional rail

The Pennsylvania and Reading commuter train networks terminated at separate stations in Center City, but stub-end terminals are inherently less efficient than thru stations.<sup>12</sup> Connecting these two terminals offered the potential to improve efficiency across the entire network, facilitating seamless trips beyond the two legacy terminals.<sup>13</sup>

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5. Phillip Shabecoff, Collapse of Penn Central reflects ills of railroads, *New York Times*, February 11, 1973. <https://www.nytimes.com/1973/02/11/archives/collapse-of-penn-central-reflects-ills-of-railroads-collapse-of.html>

6. George Drury, Penn Central history remembered, *Trains Magazine*, May 1, 2023, accessed December 13, 2024. <https://www.trains.com/ctr/railroads/fallen-flags/penn-central-history-remembered/>

7. Shabecoff, Collapse of Penn Central.

8. Alexander R. Hammer, Reading Co. files bankruptcy petition, *New York Times*, November 24, 1971. <https://www.nytimes.com/1971/11/24/archives/reading-co-files-bankruptcy-petition-railroad-in-request-for.html#:~:text=Earlier%20this%20month%2C%20the%20Reading,&0>

9. Consolidated Rail Corporation, Brief history of Consolidated Rail Corporation, accessed December 13, 2024. <https://conrail.com/about-conrail/history/>

10. John Hepp, Commuter Trains, in the *Encyclopedia of Greater Philadelphia*, (Rutgers University, 2012), accessed December 13, 2024. <https://philadelphiaencyclopedia.org/essays/commuter-trains/#essay>

11. Ibid.

12. Jarrett Walker, Arrival by train: how end-stations differ from through-stations, *Human Transit*, October 8, 2009, accessed December 13, 2024. <https://humantransit.org/2009/10/arrival-by-train-how-endstations-differ-from-throughstations.html>

13. Alon Levy, Who through-running is for, *Pedestrian Observations*, November 24, 2022, accessed December 13, 2024. <https://pedestrianobservations.com/2022/11/24/who-through-running-is-for/>

The earliest thru-running plans appeared in Philadelphia's 1960 comprehensive plan, and contractors broke ground on the Center City Commuter Connection (CCCC), a 1.7 mile tunnel project, in 1978.<sup>14</sup> The CCCC tunnel fully opened in 1984, allowing commuter trains on the former Pennsylvania and Reading railroad networks to run through Center City and for passengers to access destinations beyond their traditional terminal.

The opening of the CCCC not only expanded passengers' access to more destinations but also enabled SEPTA to achieve considerable operational savings. A Transportation Research Board (TRB) report found that on one combined route, the number of trains needed declined 53% compared to the legacy operating pattern. Train-miles declined 5.5%, reflecting the near-identical service coverage, and crew-hours declined 22%. TRB estimated passenger utility improvements would net the agency 13,000 to 18,000 extra rail trips each weekday, and 10,000 fewer automobile trips to Center City each weekday.<sup>15</sup>

SEPTA's operating model for this service is no longer the traditional commuter train model, where trains mostly carry office-worker passengers into the city in the morning and out in the evening. Instead, thru-running trains made as many reverse-commute trips as traditional peak direction trips. This regional-rail service pattern is useful to a broader range of passengers who travel to a broader range of destinations within and outside Center City. The contemporary TRB report highlights opportunities for working-class passengers to access jobs in adjacent suburbs after SEPTA unified the legacy networks. Before CCCC, reverse commuters would need to make transfers from commuter trains, to the subway, and onto the other network's commuter train, adding time, uncertainty, and expense to the journey.<sup>16</sup>

## International peer example

SEPTA's regional rail network, a hybrid between a commuter train and rapid transit, is not the first attempt to serve local passengers traveling a medium distance. The Berlin S-Bahn set the pattern for this type of service in the early 20th century. On this type of service, the network and the trains share several key features that distinguish them from traditional intercity rail or rapid transit systems.

On this network, multiple branches converge on a smaller number of tunnels that run through the central city. The entire system is electrified, allowing trains to operate in downtown tunnels without producing smoke or exhaust. Within the tunnel, stations are spaced closer together than on other parts of the network, though still farther apart than typical subway or tram stops. Frequent train arrivals are achieved through interlining services from multiple routes. The electric trains typically utilize multiple powered cars per train to improve acceleration compared to locomotive-hauled trains, and doors automatically open onto level platforms to speed passenger loading and unloading, resembling metro and subway systems.<sup>17</sup>

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14. Harry Kyriakodis, Single most transformative investment? The commuter rail tunnel, now turning 30, Hidden City, November 7, 2014, accessed December 13, 2024. <https://hiddencityphila.org/2014/11/single-most-transformative-investment-the-commuter-rail-tunnel-now-turning-30/>; Thomas Hine, Today, light at the start of the tunnel, Philadelphia Inquirer, June 22, 1978. <https://www.newspapers.com/article/the-philadelphia-inquirer/129015962/>

15. E. L. Tennyson, Philadelphia Center City commuter railroad connection, in *Transportation Research Record*, No. 760, 1980. <https://onlinepubs.trb.org/Onlinepubs/trr/1980/760/760-002.pdf>

16. Ibid

17. Alon Levy, EMUs versus locomotives, Pedestrian Observations, August 11, 2011, accessed December 16, 2024. <https://pedestrianobservations.com/2011/08/11/emus-versus-locomotives/>

Today, Berlin's S-Bahn system carries 1.5 million passengers each weekday across 16 lines.<sup>18</sup> The system connects Berlin's city-proper with most of the larger Berlin/Brandenburg metropolitan region. As part of the local transportation network, the S-Bahn complements Berlin's U-Bahn subway, buses, and trams that serve the shortest trips, and the Deutsche Bahn intercity and high speed trains that connect to other parts of the country.

The two systems have much in common. Like SEPTA's regional rail network, the S-Bahn system was assembled over time from legacy railroads and originally featured steam locomotives. Electrification work began in the late 1920s, around the same time as Philadelphia's commuter network. Both networks run largely above ground outside the central city, but utilize tunnels and interlining in the densest parts of the city. Both networks suffered from labor strikes around the same time (in Berlin in 1980 and SEPTA in 1983).<sup>19</sup>

Despite their similarities, the two systems also have important distinctions. Unlike SEPTA's regional rail network, the Berlin S-Bahn, like other public infrastructure in the Berlin area, suffered heavy damage during World War II and operated as a divided network during the Cold War. Additionally, whereas SEPTA regional rail uses a single downtown tunnel, the Berlin S-Bahn has one main tunnel through the downtown area, one above grade crosstown line, and one loop around the central area.

## Population density and transit

It's difficult to operate a viable mass transit system without supportive land uses and adequate population density that provides enough fare paying passengers to justify the cost of building and operating the system. Different transit modes have different cost requirements for construction and operation, and therefore different population density benchmarks to best match the transit tool to the job.

Using station area population density is one of the most common ways to determine suitability for different transit modes. In his book *Trains, Buses, People: An Opinionated Atlas of U.S. Transit*, Christof Spieler aggregates research from across the transportation field to establish three critical benchmarks for population densities within 0.5 miles of transit stations that predict transit's success.<sup>20</sup>

Basic bus service becomes viable at population densities of around 3,000 people per square mile, a level commonly found in many older American communities built before the automobile era. Many modern suburbs also exceed this density, though their land-use patterns can make walking to and from bus stops more challenging.<sup>21</sup>

When density rises above around 10,000 people per square mile, transit ridership and utility rise significantly. More frequent bus service and basic rail services are practical at this density. Successful light rail

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18. S-Bahn Berlin GmbH, S-Bahn Berlin at a glance, December 31, 2023, accessed December 16, 2024. <https://sbahn.berlin/en/about-us/company-profile/s-bahn-berlin-at-a-glance/>

19. S-Bahn Berlin GmbH, History of S-Bahn Berlin, accessed December 16, 2024. [https://sbahn.berlin/en/about-us/company-profile/history-of-s-bahn-berlin/#:~:text=Strike%20in%20the%20West,not%20voluntarily%20return%20to%20work.](https://sbahn.berlin/en/about-us/company-profile/history-of-s-bahn-berlin/#:~:text=Strike%20in%20the%20West,not%20voluntarily%20return%20to%20work.;); William Robbins, 12 commuter rail unions strike in Philadelphia, New York Times, March 15, 1983. <https://www.nytimes.com/1983/03/15/us/12-commuter-rail-unions-strike-in-philadelphia.html>

20. Christof Spieler, *Trains, Buses, People: an Opinionated Atlas of U.S. Transit*, (Island Press, 2020). <https://www.trainsbusespeople.org/>

21. Leah Binkovitz, Excerpt: many cities have transit, how many have good transit?, Urban Edge, Kinder Institute for Urban Research, Rice University, November 13, 2018, accessed December 16, 2024. <https://kinder.rice.edu/urbanedge/excerpt-many-cities-have-transit-how-many-have-good-transit>

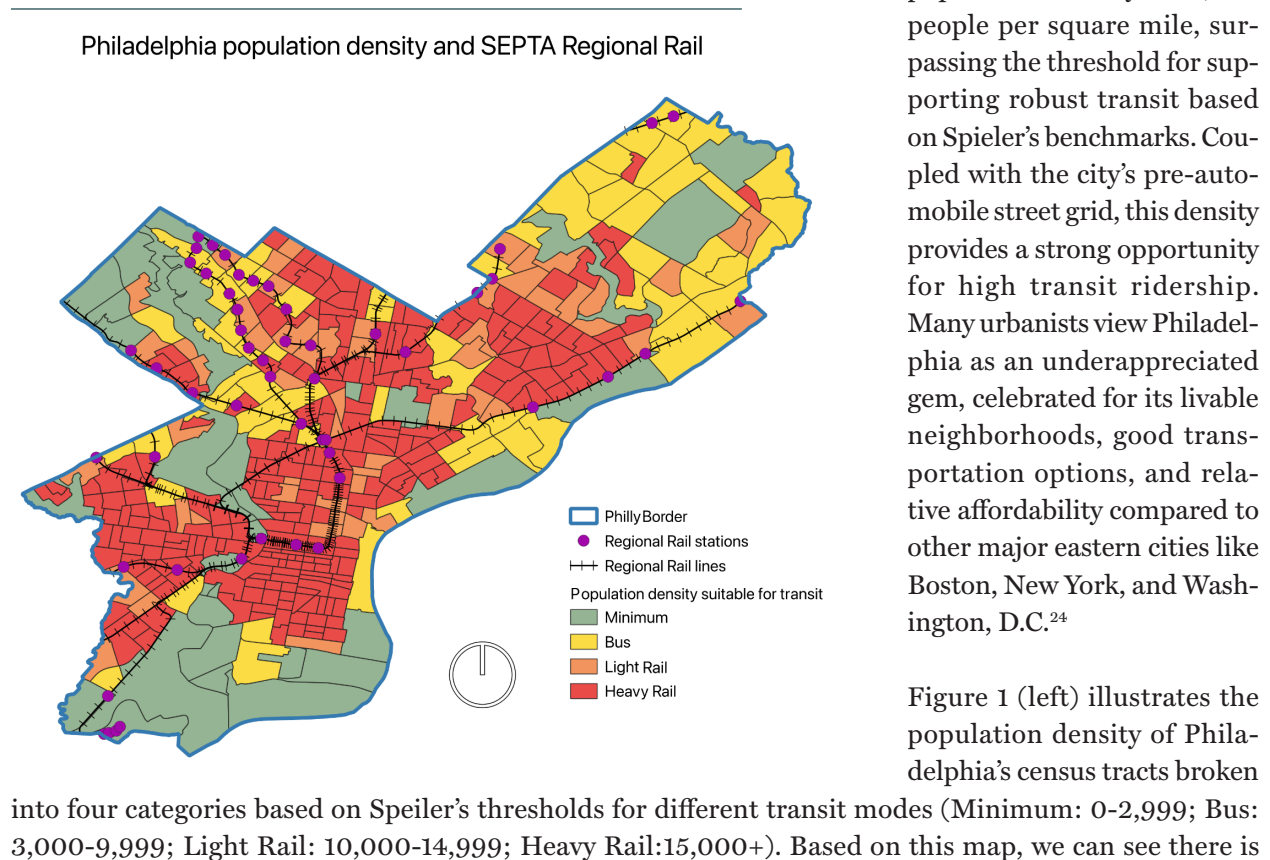
(LRT) systems in cities like Boston, Buffalo, and Houston serve areas around this density. Here, the greater concentration of origins and destinations generates more trips, while factors like automobile traffic and parking costs encourage a shift to transit.<sup>22</sup>

Finally, the densest areas in American cities can exceed 15,000 people per square mile. At this level of density, transit achieves its highest ridership, and the highest share of trips are taken outside automobiles. To meet the demand, robust transit systems, such as subways and metro networks, are essential. Surprisingly, this top tier of density is more common than many might expect, appearing in cities like Los Angeles and Houston as well.<sup>23</sup>

## Philadelphia population density and SEPTA regional rail

Established long before the automobile era, Philadelphia developed its urban form primarily before World War II. Thus, the city's design emphasizes pedestrian and transit accessibility, making it conducive to non-automobile travel.

Figure 1. SEPTA Regional Rail lines within the city of Philadelphia. Census tract population densities are shown for the whole city.



Philadelphia has an average population density of 11,936 people per square mile, surpassing the threshold for supporting robust transit based on Spieler's benchmarks. Coupled with the city's pre-automobile street grid, this density provides a strong opportunity for high transit ridership. Many urbanists view Philadelphia as an underappreciated gem, celebrated for its livable neighborhoods, good transportation options, and relative affordability compared to other major eastern cities like Boston, New York, and Washington, D.C.<sup>24</sup>

Figure 1 (left) illustrates the population density of Philadelphia's census tracts broken

into four categories based on Spieler's thresholds for different transit modes (Minimum: 0-2,999; Bus: 3,000-9,999; Light Rail: 10,000-14,999; Heavy Rail: 15,000+). Based on this map, we can see there is

22. Ibid

23. Ibid

24. Alan Fisher, Why Philadelphia's streets are better than other North America Cities, YouTube, uploaded by @alanthefisher, May 12, 2022, accessed December 16, 2024. <https://www.youtube.com/watch?v=JbqNUqdZlwM>

substantial population density extending from South Philly through Center City up to Near Northeast and Olney/Oak Lane. West Philadelphia also represents a dense cluster. Many of the tracts showing minimum densities are primarily parkland, industrial, highways, or the Philadelphia airport and therefore less suitable for development.

Despite Philadelphia's high overall population density, areas immediately around SEPTA regional rail stations surprisingly exhibit 11% lower densities. Within a 0.5-mile radius of these stations, the density averages 10,657 people per square mile, while the city average, which includes many transit-poorer neighborhoods, is closer to 12,000 people per square mile.

**Figure 2. SEPTA Regional Rail lines within the city of Philadelphia. Census tract population densities are shown within 0.5 miles of each regional rail station.**

Philadelphia population density around SEPTA regional rail stations

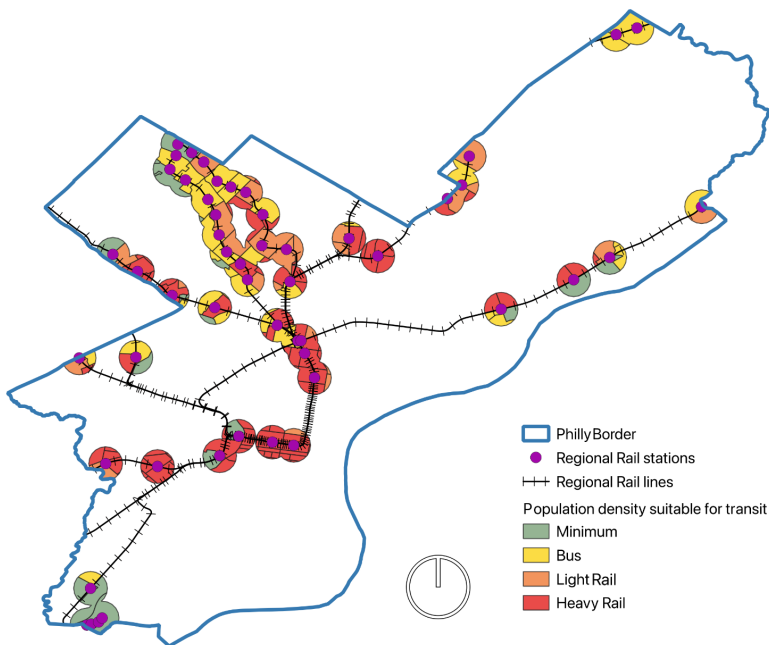


Figure 2 (left) illustrates the same population density thresholds applied only to the census tracts within 0.5 miles of regional rail stations within the city. Looking specifically at station area population densities, some trends emerge. Stations in Center City and West Philadelphia have high population densities nearby, reflecting the overall density of these neighborhoods. Stations in Near Northeast have dense residential on one side, and industrial or highway land uses on the other side, resulting in a bifurcated appearance. Finally, a cluster of stations stands out along the Chestnut Hill East and West lines in the Germantown/Chestnut Hill neighborhoods. These stations, along two parallel lines, are surrounded by low population-densities, particularly near the ends of the lines.

## Low ridership presents an opportunity

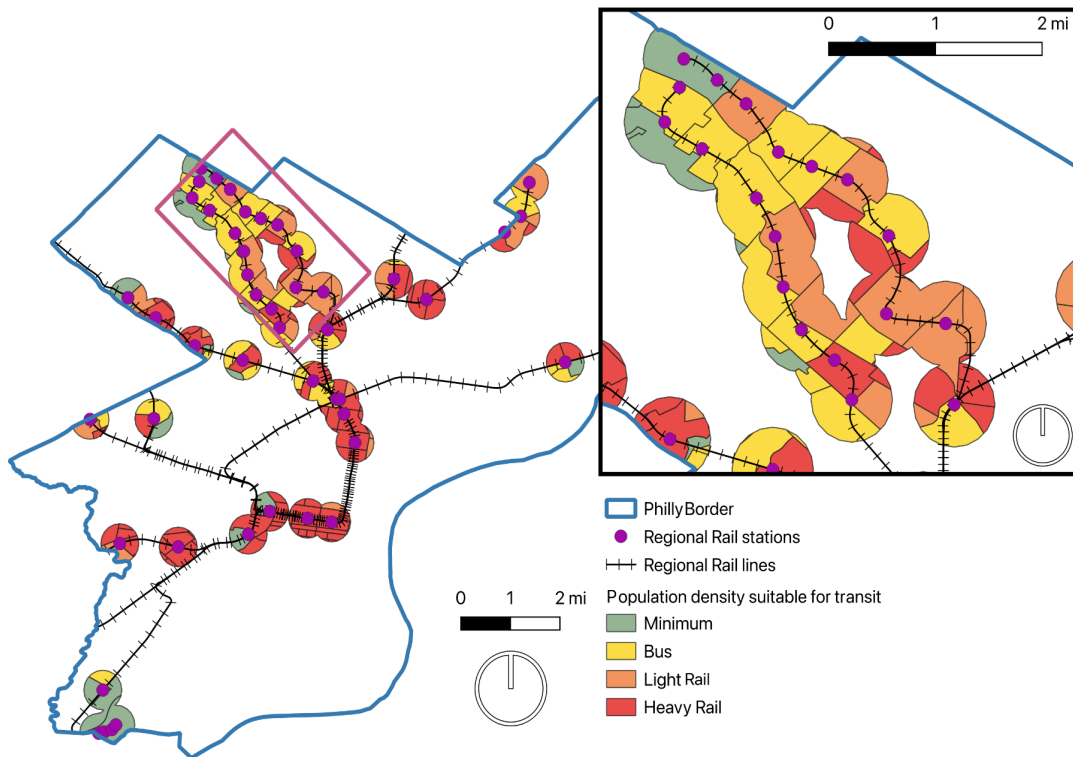
Below average population density near regional rail stations presents both a problem and an opportunity. Below average densities mean valuable fixed infrastructure is going underutilized at a time when SEPTA is struggling to maintain its fiscal situation and considering service cuts, including on the regional rail network, to reduce costs.<sup>25</sup> Regional rail in particular has struggled to regain ridership since the COVID pandemic, registering 61% of its pre-COVID tally as of September 2024, further impairing the agency's fiscal situation in the face of rising costs.<sup>26</sup>

25. Thomas Fitzgerald, SEPTA warns fare hikes, service cuts imminent without more funding, Philadelphia Inquirer, September 19, 2024, accessed December 16, 2024. <https://www.inquirer.com/transportation/septa-warns-state-funding-necessary-20240919.html>

26. Southeastern Pennsylvania Transportation Authority, Ridership: September 2024, October 15, 2024, accessed December 16, 2024. <https://www.septa.org/news/ridership-september-2024/>

Figure 3. Same map as before, but with station areas in the Chestnut Hill/Germantown neighborhoods highlighted. The “Chestnut Hill census tracts”

Philadelphia population density with Chestnut Hill and Germantown station tracts enlarged



However, when the city’s relatively static population is taken into account, an opportunity arises for Philadelphia to build more housing and grow its population—particularly near its regional rail stations—without unduly increasing congestion.<sup>27</sup> In fact, increasing housing supply near this valuable transit network could be a boon to the agency by backfilling fare-paying riders lost to today’s hybrid office era.<sup>28</sup>

The station areas in the Germantown/Chestnut Hill neighborhoods present a particularly promising opportunity (see Figure 3). Population densities here are especially low compared to both the city as a whole and to other neighborhoods on the SEPTA regional rail system. These station areas, highlighted above, have a population density of 7,823 people per square mile; well above what is recommended for basic bus service (3,000 people per square mile), but well below the 10,000 people per square mile tipping point for higher capacity transit modes like SEPTA’s regional rail network.

While SEPTA’s operational health is in question, the future of the two regional rail lines serving this lower-density area is especially endangered. Omitted from SEPTA’s so-called “doomsday map” of services to be

27. Federal Reserve Bank of St. Louis, Resident population in Philadelphia County/City, PA 2010-2023, accessed December 16, 2024. <https://fred.stlouisfed.org/graph/fredgraph.png?g=lzmcS>

28. Alex Armlovich, How hybrid work can be a boon to NYC, New York Daily News, August 3, 2022, accessed December 16, 2024. <https://www.nydailynews.com/2022/08/03/how-hybrid-work-can-be-a-boon-to-nyc/>



maintained in a fiscal emergency,<sup>29</sup> stations along the Chestnut Hill East and West lines could lose service if these lines don't gain ridership.<sup>30</sup> The Chestnut Hill East line ranked 12th, and Chestnut Hill West ranked 11th out of 13 regional rail lines in 2023.<sup>31</sup> Combined, the two routes carried 3,325 passengers per weekday, still in the bottom half of total ridership and riders per route mile.

Examining riders per mile and cost recovery offers another perspective on the opportunity at hand. Using SEPTA's Fiscal Year 2023 data, the combined Chestnut Hill East/West lines carried 123.6 passengers per route mile and recovered 12.8% of their allocated costs. Passengers per mile ranked 9th, and cost recovery ranked 10th among the 12 remaining lines.<sup>32</sup>

**Table 1. SEPTA FY23 data for each regional rail line. Lines sorted by riders per mile.**

Line	Daily ridership	Riders per mile	Fare Revenue	Allocated costs	Cost recovery
Airport	4041	200	\$2,273,693.00	\$17,695,704.00	12.849%
Lansdale/Doylestown	6884	192	\$10,154,284.00	\$43,226,345.00	23.491%
Paoli/Thorndale	7187	190	\$10,295,788.00	\$63,010,140.00	16.340%
Media/Wawa	3244	166	\$3,729,812.00	\$24,339,348.00	15.324%
Warminster	3657	164	\$3,703,843.00	\$20,849,532.00	17.765%
Fox Chase	2001	160	\$1,921,986.00	\$10,435,179.00	18.418%
Manayunk/Norristown	3074	158	\$3,964,264.00	\$19,918,432.00	19.902%
CH - East	1573	129	\$1,123,298.00	\$12,326,908.00	9.113%
Trenton	4507	124	\$7,588,199.00	\$41,399,144.00	18.329%
CH - Combined	3325	124	\$3,079,213.00	\$24,030,224.00	12.814%
CH - West	1752	119	\$1,955,915.00	\$11,703,316.00	16.712%
West Trenton	3613	104	\$5,780,496.00	\$35,902,444.00	16.101%
Wilmington/Newark	3420	83	\$3,785,154.00	\$35,584,118.00	10.637%
Cynwyd	98	16	\$85,800.00	\$853,530.00	10.052%

With unusually low population density, ridership, and cost recovery, this corridor presents an opportunity to grow Philadelphia's housing supply while supporting the city's unique transit resources.

## Room for growth

The specific areas outlined in *Figure 3* are the 10 station areas along the Chestnut Hill East line from Wayne Junction to the Chestnut Hill East terminal and the 9 station areas along the Chestnut Hill West line from Queen Lane to Chestnut Hill West terminal. These "Chestnut Hill" census tracts, which are at least partly

29. Patricia Madej, SEPTA threatens to cut regional rail lines, pull back subway and trolleys in next decade if Harrisburg doesn't boost funds, Philadelphia Inquirer, August 19, 2020, accessed December 16, 2024. <https://archive.is/o9qo5> or <https://www.inquirer.com/transportation/septa-funding-regional-rail-subways-trolleys-turnpike-coronavirus-20200819.html>

30. Tom Beck, SEPTA woes bring new worry for Chestnut Hill West, the Chestnut Hill Local, January 24, 2024, accessed December 16, 2024. <https://www.chestnuthilllocal.com/stories/septa-woes-bring-new-worry-for-chestnut-hill-west.30925>

31. Southeastern Pennsylvania Transportation Authority, SEPTA route statistics 2023, Spring 2023, accessed December 16, 2024. <https://planning.septa.org/wp-content/uploads/2023/09/2023-ROUTE-STATS-WEB-1.pdf>

32. Ibid

within 0.5 miles of these stations, cover 14.4 square miles and are home to 112,792 people.

To drive up population densities of certain census tracts, like Chestnut Hill, to the levels of other station areas or the city average, it is necessary to determine the requisite population increase. This can be achieved by setting up a proportion: (current population / current area) = (target population / target area).

To match the population density of other areas in the city, the population in these census tracts would need to increase 35%,<sup>33</sup> from the current population of 112,792 to 153,467. This is an achievable increase with reasonable land use and other regulatory reforms, and not unreasonable to accommodate since it matches other areas in the city with regional rail service.

With 40,749 more people in these transit-rich neighborhoods, how much more ridership could we expect? Since the Chestnut Hill census tracts represent substantially all of the stations unique to the Chestnut Hill East and West lines, we can consider the two lines together. Moreover, as these lines operate as a single route through the Center City tunnel, any potential reductions or changes to one line would likely affect the other, reinforcing the need to consider their ridership impacts collectively.

A conservative method to estimating new ridership assumes that the new residents will be just as likely to ride the regional rail as the existing ones (even though research suggests they will be even more likely).<sup>34</sup> Using this conservative approach, we can extrapolate the existing mode share for the Chestnut Hill East and West lines but across a larger population (existing population / existing weekday ridership = proposed population / ridership adjustment factor).

Using the assumed mode share, ridership on the combined lines would increase over 35%, from 3,325 to 4,514, as seen in Table 2. Based on pure ridership, the combined Chestnut Hill lines would rank 3rd out of the remaining 12 lines. Riders per mile would rank 4th at 168.2. We can also estimate increases in cost recovery. For cost recovery analysis, the study maintained the existing ratio of zone 1, zone 2, and reduced fares. Total fare revenue was increased in line with projected ridership growth. Allocated costs for the lines remained unchanged, and it was assumed that existing trains could accommodate the increased ridership. Based on these assumptions, cost recovery would rank 6th at 17.4%, up from just 12.8%.

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33. Actual increase is 35.8%, but rounded down to 35% for simplicity.

34. Marlon Boarnet, et al., Rich versus poor, near versus far from transit: who travels more? (see: Table 2, all incomes), *Transfers Magazine*, Spring 2021, accessed December 16, 2024. <https://transfersmagazine.org/magazine-article/issue-7/rich-versus-poor-near-versus-far-from-transit-who-travels-more/>

**Table 2. SEPTA FY23 data for each regional rail line. Chestnut Hill East (CH - East), Chestnut Hill West (CH - West), and Chestnut Hill Combined (CH - Combined) are modified to show 35.8% increase in ridership and fare revenue compared to FY23 actual. Lines sorted by riders per mile.**

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Airport	4041	200	\$2,273,693.00	\$17,695,704.00	12.849%
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CH - Combined	4515	168	\$4,190,808.89	\$24,030,224.00	17.440%
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Cynwyd	98	16	\$85,800.00	\$853,530.00	10.052%

## Local and agency impacts

Growing population densities near stations on the Chestnut Hill lines would bring tangible benefits to these neighborhoods. Higher ridership would enhance the lines’ fiscal performance, reducing the risk of service cuts during future SEPTA funding challenges. Beyond merely preserving existing service, growing ridership helps prioritize the Chestnut Hill lines for future improvements and better positions the lines for competitive grant funding.

At the agency level, it is unlikely that an extra \$1.1 million in fare revenue would cover a broader funding crisis. Looking at SEPTA’s recently averted 2025 fiscal situation,<sup>35</sup> the agency expected a \$240 million shortfall for the year without additional funding.<sup>36</sup> However, a broader campaign of infill housing development across the city along regional rail and other transit modes would make a substantial impact on SEPTA’s long-term fiscal health, mitigate future funding shortfalls, and improve the agency’s political and economic standing.

## How can Philadelphia increase population density in the targeted areas?

There are several ways to achieve the proposed population density in the relevant station areas, and Philadelphia’s elected officials and professional staff have the flexibility to determine the best approach. Here

35. Marc Levy, Pennsylvania governor taps federal highway aid to help Philadelphia transit system, Associated Press, November 22, 2024, accessed December 16, 2024. <https://apnews.com/article/josh-shapiro-septa-philadelphia-mass-transit-highways-f54a3e48fee-94ad8afede163c878627c>

36. Jack Tomczuk, SEPTA proposes higher fare increase, plans service cuts for 2025, Metro Philadelphia, November 12, 2024, accessed December 16, 2024. <https://metrophiladelphia.com/septa-fare-increase-significant-cuts/>

are a few non-mutually exclusive strategies that the city could consider, along with examples of how similar reforms have worked elsewhere.

### Light touch density

Modest increases in residential density across a wide area can lead to substantial increases in the number of homes without radical changes to the built environment. If half the single family houses become duplexes, that represents a 50% increase in homes and exceeds the proposed population increase by a healthy margin.

Sometimes called *Light Touch Density*<sup>37</sup> or *Missing Middle*,<sup>38</sup> the hypothesis is that building more two-to-ten unit multi-family homes can be achieved without triggering stricter regulations and specialized building trades required for larger developments like high-rise towers. The downside of such an approach is that in places with a lot of procedural friction, it may be harder to win approval for 10 duplexes than for one 20-unit apartment building. Another downside is the slow nature of housing turnover and infill development. Replacing one house with several requires the people in the existing house to move. Recent data shows that only 2.5% of homes change hands in a given year,<sup>39</sup> meaning that new supply will come about slowly under a strategy that requires many homes to be rebuilt to add supply.

Like compound interest, this strategy can be effective if allowed to run for a long time. Palisades Park, New Jersey, shows that communities that allow light touch density or missing middle development with minimal hurdles can grow their housing supply naturally over time where peer cities do not.<sup>40</sup>

### Transit Oriented Development (TOD)

TOD is a development strategy describing individual buildings or projects built within 0.5 miles of a transit station with the idea that trips to or from the development will utilize the local transit infrastructure at a high rate.<sup>41</sup> Unlike light touch density, TOD is more about project siting and orientation than scale. TOD is often approved on a discretionary basis and with special exemptions for requirements like parking minimums in exchange for siting near the transit station; therefore it requires more specialized and sophisticated project management than smaller projects.

The strategy for growing housing supply with TOD is twofold. First, relatively fewer developments need to be approved to add the desired supply, which may deliver more homes sooner. Second, because TOD projects can be denser than Missing Middle or Light Touch Density projects, a greater share of residents can live closer to the transit station and be more likely to ride than people who live further away. One downside for TOD that is reliance on discretionary approvals add uncertainty and delays to the approval process. The discretionary approval risks of TOD are best mitigated by generous by-right zoning near transit; in the

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37. Tobias Peter, Housing abundance with light-touch density, American Enterprise Institute, March 15, 2024, accessed December 16, 2024. <https://www.aei.org/research-products/report/housing-abundance-with-light-touch-density/>

38. Daniel Parolek, Missing Middle Housing, accessed December 16, 2024. <https://missingmiddlehousing.com/>

39. Redfin, Just 2.5% of U.S. homes changed hands this year, the lowest rate in decades, September 30, 2024, accessed December 16, 2024. <https://investors.redfin.com/news-events/press-releases/detail/1183/just-2-5-of-u-s-homes-changed-hands-this-year-the-lowest>

40. Edward Pinto, et al., Light touch density, see Ch. 5 on Palisades Park, NJ, January, 2022, accessed December 16, 2024. <https://www.aei.org/wp-content/uploads/2022/01/Light-Touch-Density-Compiled-FINAL-1.12.2022.pdf>

41. U.S. Department of Transportation, Innovative finance support fact sheet: Transit oriented development, 2018, accessed December 16, 2024. [https://www.fhwa.dot.gov/ipd/pdfs/fact\\_sheets/program\\_value\\_cap\\_transit\\_oriented\\_development.pdf](https://www.fhwa.dot.gov/ipd/pdfs/fact_sheets/program_value_cap_transit_oriented_development.pdf)

extreme, Philadelphia's most permissive by-right zone is CMX-5, allowing almost any non-industrial use at up to skyscraper densities.<sup>42</sup> Mapping by-right zones that permit higher density than any market demand could foreseeably fulfill would guarantee that land markets, not binding growth controls, will set densities near transit. Another risk that is in a tight employment market for construction trades, it might be difficult to attract the specialized workforce at the scale needed for the densest projects.<sup>43</sup>

Arlington, Virginia, provides an effective case study of TOD at scale.<sup>44</sup> As planning for the D.C. Metro system unfolded in the 1960s, officials in Arlington lobbied to locate stations in commercial areas instead of along highway medians as originally planned. Once station areas were finalized, the county modified development rules to encourage “bulls eyes” of dense development right on top of the underground Metro stations. From 1970 to 2020, Arlington's overall population grew by 60,000 residents, or 36.9%, largely due to TOD atop Metro stations.

### Station area zoning overlays

Adjusting existing land use regulations in transit-rich areas can provide a useful tailwind to projects near transit. In Washington, DC, the city zoning code reduces minimum parking requirements by 50% in most zones. The rule<sup>45</sup> applies to projects within 0.5 miles of a Metrorail station, 0.25 miles of a DC Streetcar stop, and 0.25 miles of a high frequency bus route.

Providing parking spaces for residential developments comes with considerable cost. In 2023, the median structured parking space cost \$29,000. However underground spaces added substantial variability, with some spaces costing \$100,000 each.<sup>46</sup> A 2016 study found that rental households spent about \$1,700 per year on parking bundled with their units.<sup>47</sup> Across the country, renters without cars paid \$440 million annually for parking spaces they did not use, contributing to the overall housing affordability problem.

## Conclusion

SEPTA may have recently averted a fiscal crisis thanks to the decision to flex a share of the state's federal highway funding to cover the agency's shortfall until mid 2025.<sup>48</sup> However, it is evident that a structural opportunity exists to backfill ridership lost post-COVID on regional rail. This need is particularly clear in the Chestnut Hill and Germantown neighborhoods.

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42. City of Philadelphia, Philadelphia Zoning Quick Guide, September 2022, accessed December 16th, 2024. [https://www.phila.gov/media/20220909084529/ZONING-QUICK-GUIDE\\_PCPC\\_9\\_9\\_22.pdf](https://www.phila.gov/media/20220909084529/ZONING-QUICK-GUIDE_PCPC_9_9_22.pdf)

43. U.S. Bureau of Labor Statistics, Construction laborers and Helpers: Occupational outlook handbook, August 29, 2024, accessed December 16, 2024. <https://www.bls.gov/ooh/construction-and-extraction/construction-laborers-and-helpers.htm#tab-6>

44. Emily Hamilton, How D.C. densified, Works in Progress, May 23, 2023, accessed December 16, 2024. <https://worksinprogress.co/issue/how-dc-densified/>

45. District of Columbia Municipal Regulations, 11 D.C.M.R. 702.1. <https://online.encodeplus.com/regs/washington-dc/doc-viewer.aspx?secid=865#secid-865>

46. Camille Galdes, et al., In a costly real estate development market, don't overbuild parking: Take advantage of parking reductions for your property, Wells & Associates, June 4, 2024, accessed December 16, 2024. <https://www.wellsandassociates.com/research/dont-overbuild-parking/>

47. C.J. Gabbe and Gregory Pierce, Hidden costs and deadweight losses: Bundled parking and residential rents in the metropolitan United States, August 8, 2016. <https://www.tandfonline.com/doi/abs/10.1080/10511482.2016.1205647>

48. Joe Brandt, SEPTA to receive \$153 million in “flexed” state highway funds, covering budget shortfall, CBS News - Philadelphia, November 22, 2024, accessed December 16, 2024. <https://www.cbsnews.com/philadelphia/news/josh-shapiro-septa-news-conference-today/>

Increasing regional rail ridership through densification near existing station areas will offer significant benefits to both SEPTA and the public. SEPTA gains substantial fare revenue and ridership using its existing infrastructure and equipment, benefitting its fiscal situation. For the public, the benefits include better access to jobs— particularly for working class commuters— more affordable transportation options, an expanded housing supply, and ultimately a reduced need for public transit subsidies in the region.

Looking ahead, Philadelphia’s decision-makers have the opportunity to place the regional rail system on a stronger financial footing while expanding access to opportunity in the city. A range of policy tools are available, allowing leaders to exercise independent judgment about how they envision the city’s growth. At a high level, if regional rail is to thrive, more people need to be allowed to live near it—and the station areas around Chestnut Hill are an excellent place to start.

## About the author

Andrew Justus is a housing policy analyst, who works on urban issues, such as housing, transportation, and infrastructure within the social policy team. Previously, he was an associate attorney at Sullivan & Barros, LLP where he worked with D.C. zoning and land use regulations for residential developments. Justus has also worked at Smart Growth America as a policy associate focusing on Complete Streets, rural development, and intercity passenger rail policy. Justus has received his Masters in Urban and Regional Planning (M.U.R.P.) from the University of Michigan and his J.D. from Western Michigan University’s Thomas M. Cooley Law School.

## Appendix A

	Station area population*	Station areas in sq. miles**	Density per sq. mile	People to add	New density
Chestnut Hill	112,792	14.4	7,833	40,675	10,657
Citywide	582,924	54.7	10,657	NA	NA

\*Station area population describes population living in census tracts at least partially within the 0.5 mile radius around relevant SEPTA regional rail stations.

\*\* Station areas in sq. miles describes the cumulative land area of the 0.5 mile radii around the relevant SEPTA regional rail stations without double counting where the circles overlap.