Albuquerque Rapid Rail

A Preliminary Proposal

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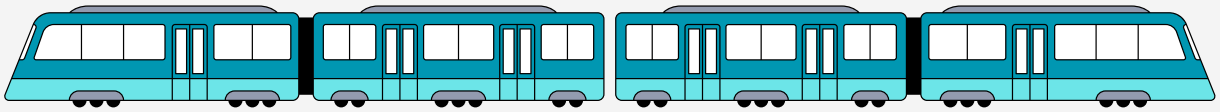


Introduction

As Albuquerque's metro area grows and changes, its transportation options have mostly remained the same. The vast majority of trips are still made by car, often with only one occupant. As Albuquerque prepares for the future, new ideas will be necessary to mitigate the effects of climate change, rein in sprawl, and promote better, more connected neighborhoods.

Transportation officials and groups across the mid-region have studied attitudes toward transit and densification extensively. The results have been clear: Burqueños want more options for getting around. They want to be closer to jobs, errands, and amenities. They are clamoring for better service and higher frequencies on our city's bus routes. Yet limited funding and scope have led to plans that ration service and make tradeoffs. As Albuquerque grapples with pedestrian deaths and dangerous roadways, some projects move in the wrong direction and away from Vision Zero.

There is an opportunity to completely rethink how Albuquerque moves, changes, and grows. **Rapid rail would be a transformative new option that could completely change our city's future.** Its construction has never been more feasible, with new financing options and expert infrastructure firms looking for projects. Through innovative public partnerships, economic and direct financial returns could be realized for New Mexico, making our rail infrastructure work for us.

Instead of outsourcing infrastructure projects to private firms or leaving taxpayers holding the bag, Albuquerque has a chance to engage firms in the public trust, and avoid the major headaches and pitfalls that plague other rail projects. There are reams of evidence and real world examples to inform better decision making in the future and ensure a project's success from conception to construction.

Where We Are Today

The Albuquerque Metropolitan Area, as defined by the Census, is forecast to **grow to over 1 million people** by 2030 - just five years away. Half of all New Mexicans will live in the corridor spanning from Albuquerque to Santa Fe. Albuquerque's metro area population stands at 924,000, according to the most recent American Community Survey (ACS) data.

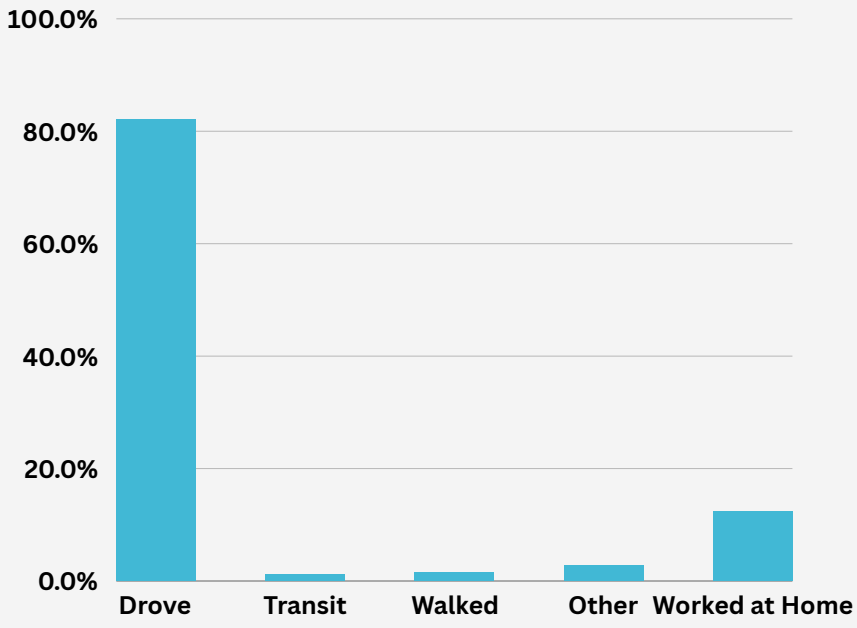
In 2023, **82 percent of commuters drove to work** either alone (72.4 percent) or in a carpool (9.7 percent) [Figure 1].

Just **1 percent took public transportation**, and another 1.6 percent chose to walk.

12.4 percent of people worked from home, down 34 percent from 2021 as people have returned to in-person work and the commuting that comes with it.

These figures come as no surprise - Albuquerque and its surrounding communities are designed for car travel - but what does this urban design really cost?

Figure 1: Albuquerque Commute Mode, 2023

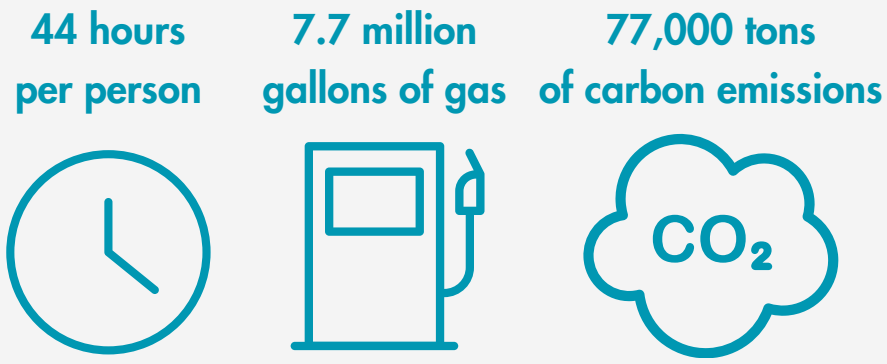


Time, Fuel, and Human Costs

According to Texas A&M University's most recent 2023 Urban Mobility Report, the average Burqueño spent **44 hours** stuck in traffic in 2022 - nearly two days. Citywide, that amounts to **19.4 million hours of delay**, **7.7 million gallons of wasted gas**, and **77,000 tons (182 million pounds) of excess carbon emissions.**

From 2000 to 2022, the number of hours the average Albuquerque commuter spent in traffic **went up by 22 percent.**

This increasing congestion comes even as we have built more and wider roads in hope of reducing trip times for drivers.



Data: https://mobility.tamu.edu/umr/congestion-data/

In its *Connections 2040* Metropolitan Transportation Plan, the Mid-Region Metropolitan Planning Organization (MRMPO) points out:

> **"The growing congestion on our river crossings and the major roads that lead to them, particularly during peak commute times, is a source of frustration particularly for residents who live and work on separate sides of the Rio Grande" (p 77).**

Roadways like Coors Boulevard, Unser Boulevard, Paseo del Norte, and Rio Bravo are all cited by MRMPO as experiencing regular and significant congestion. MRMPO models potential effects from expanding some of these roadways, and concludes:

> **"In the Target Scenario, more vehicle travel occurs in places that have excess capacity; in other words, roadways that have the ability to absorb additional traffic are the roadways that gains [sic] traffic." (p 117)**

This largely follows the concept of "induced demand" which has been tested in the real world, and repeatedly demonstrates that building more and wider roads encourages driving, which in turn increases congestion. In MRMPO's expansion scenarios, all city river crossings are still "**over capacity**" or "**severely congested**" by 2040.

In its *Long Term Strategic Vision*, the Rio Metro Regional Transit District (RMRTD) also warns that car-centered infrastructure is not a long-term fix:

> **"Constructing additional lanes and wider bridges will likely be cost-prohibitive, while only addressing the congestion problems for the short-term. Consequently, mass transit presents itself as a more cost effective solution." (p 11)**

RMRTD goes on to note:

> **"In fact, the preliminary modeling of preferred and alternative scenarios …suggests that significant investment in increased transit service will be required to avoid capital costs for roadway and bridge expansions that the region cannot afford." (p 16)**

Deaths

Beyond the capital and economic costs of our current car-centric system, Albuquerque is faced with the devastating human cost of lost lives on our streets - and the numbers paint a dire picture. Pedestrian deaths across the United States are at their highest in 40 years. The Governors Highway Safety Association estimates **7,508 pedestrians were killed by cars in 2022.**

For the seventh year in a row, **New Mexico was the most dangerous state for pedestrians**, with **93 people killed.** In 2021, Albuquerque was the fourth most dangerous city for pedestrians according to the National Highway Traffic Safety Administration (NHTSA), and the worst for cities with populations between 500,000 and 1 million. Albuquerque ranks 2nd in annual pedestrian deaths per 100,000 according to Smart Growth America.

356 New Mexicans were killed inside vehicles in crashes in 2021, at a rate of 22.7 per 100,000 population - the fourth highest in the country.

The City of Albuquerque acknowledges this painful reality in their most recent *Vision Zero Year in Review* for 2023, and they estimate **66 pedestrians were killed by cars in 2022.**

While the City notes that it is making progress, and high-risk corridors are being addressed, the report also stresses the **lack of funding and staff capacity** to make Vision Zero a reality by 2040.

Even as multiple innovations are tested to reach Vision Zero, one of the most basic and fundamental ways to prevent pedestrian deaths is to get cars off the road and get people onto transit, bikes, and safe paths.

Lack of Choice in Transport

MRMPO helpfully compares different sets of responses received to their transportation questionnaire at two separate times: 2013-14 and 2018-19, totaling 2,000 respondents. They found consistent answers across years - people want walkable, urban, mixed-use neighborhoods with good transit access and amenities.

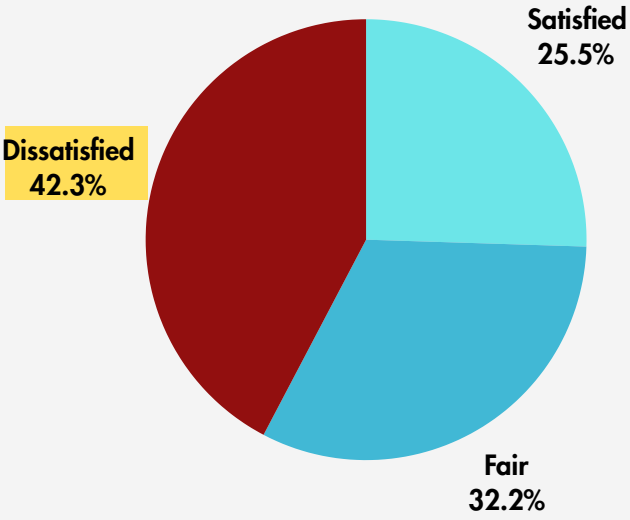
On transport, MRMPO found that a plurality of respondents are dissatisfied with the current system (Fig. 2):

> **"Only one in four people felt that the transportation options met their needs, with a full 42 percent saying that it did not meet their needs. When compared with the previous questionnaire, responses indicate a growing level of dissatisfaction that is strongest among young adults." (p 67)**

MRMPO also found that providing more transport options is the most likely way to get people to use them, and that young adults are a driver of this desire.

> **"If we provide more convenient, connected, and safe transportation options, we may find that we have an advantage in attracting and retaining young professionals to the region." (p 68)**

Figure 2: Satisfaction With Transportation System, 2018



Data: MRMPO 2040 Connections Questionnaire, 2018

A Quick Case Study

It's easy to test whether Albuquerque's current transport options are adequate.

Let's choose two commonly visited places - the Owl Café on Eubank Boulevard, and Balloon Fiesta Park, a major tourist destination. This is the kind of day you might spend with friends or loved ones.

Driving there is simple enough, **totaling about 20 minutes** (without traffic).

However, **getting there on public transit takes over two hours.** Google and *Transit*, two major navigation tools, return unreasonable travel times for these two destinations, involving hour-long walks on either end.

Walking entails a nearly four-hour journey, and biking takes an hour.

These two locations were chosen at random for their general popularity among locals. Under our current system on a weekday morning, **there is no reasonable transport option besides driving.** This is an unfortunate reality across much of Albuquerque.

MRMPO summarizes the problem:

> **"…Having access to transit, services, and jobs closer to home is important to people. This is also critical to low-income populations and people who lack dependable travel options. The costs associated with long work commutes, both in vehicle costs and in travel time, can be substantial particularly for the most vulnerable in our workforce." (p 66)**

Burqueños and New Mexicans throughout the region deserve transportation choices that are fast, frequent, and reliable. Options beyond the personal vehicle are especially important for increasing equity and opportunity for low-income, young, elderly, and disabled residents, as well as our many visitors from around the world.

Albuquerque Rapid Transit

In the face of legal challenges, political upheaval, a change in mayoral administrations, faulty buses that required replacing, and launch delays, the Albuquerque Rapid Transit (ART) line began serving Central Avenue and the Uptown loop in late 2019. ART represents true bus-rapid-transit (BRT), with dedicated lanes, level boarding, sheltered stops and passenger information screens.

Despite the effects of the COVID pandemic, ART achieved over **1.1 million riders in its first year** of operation in 2020. **Ridership on the line doubled to 2.2 million riders** in 2023, the most recent full calendar year, according to the Federal Transit Administration's (FTA) National Transit Database (NTD). This ridership comes even as regular local bus service faces cuts and over 100 bus driver positions were vacant in 2022.

2.2 million
trips in 2023

6th busiest
BRT line

60 percent
reduction in deaths/injuries

ART is now the **6th busiest BRT line in the entire country**, putting Albuquerque ahead of cities like Houston, Richmond, and Cleveland.

Changes to the structure of Central Avenue have also led to better safety since ART opened. Research from the University of New Mexico showed a **60 percent reduction in injuries and deaths along the ART corridor** in its first year of operation.

ART has also spurred new, dense, transit-oriented development (TOD). Still, the bus fleet used in the corridor runs on traditional diesel, as the original electric buses were not functional. This fact highlights some of the limitations and challenges of BRT if cities want reliable carbon-free transport.

The development of ART in its final form was fraught and protracted, with ideas for mass transit along Central Avenue being proposed as far back as the 2000s - nearly two decades ago.

Before the corridor became the BRT network it is today, there were **proposals to place a streetcar, tram, or even light rail along Central Avenue instead.** Over time, these plans were pared down and altered - but the promise of rail as a game-changing transport mode remains unfulfilled for Albuquerque.

As the climate warms, sprawl worsens, and our roads become more congested, with pedestrians and drivers alike suffering the consequences of car crashes, rapid rail emerges yet again as an obvious solution. The time has come for its serious consideration.

"Light Rail" Proposed in Past

In February 2003, then-mayor Martin Chávez announced plans to build a light rail system in Albuquerque. Two lines were proposed - one along Central Avenue, and another utilizing existing rail corridors and serving downtown attractions and the Sunport. Mayor Chávez pegged the cost at $700 million ($1.2 billion adjusted for inflation). Groundbreaking was planned for 2006. The mayor and transit department also announced "super express" buses to run along Central in the meantime.

Three years later, the plan reemerged in the media as the "modern streetcar." Downgraded from light rail, the same Central Avenue route was proposed, at a cost of $120 million ($202 million inflation-adjusted) for a four mile stretch from Old Town to Nob Hill.

At the time, the Rail Runner Express was set to enter service. The streetcar project was forecast to break ground by 2007 and open by 2010, complementing the success of the commuter rail championed by the late governor, Bill Richardson.

HDR, a major infrastructure consultant, was brought in and produced a 43-slide presentation complete with alignment concepts, renderings, ridership estimates, and ideas for transit-oriented development. The modern streetcar project was never realized.

With the election of former-mayor Richard Berry in 2009, the project was reoriented toward its current form as BRT, **opening nearly 20 years after mass transit was originally proposed for Central Avenue.**

COURTESY/CITY OF ALBUQUERQUE TRANSIT DEPARTMENT

Pictured is a simulation of a modern streetcar system operating on Central Avenue, near the Hiland Theater, west of San Mateo. Mayor Martin Chávez hopes to have such a system operating in the city in a few years.

MASS TRANSIT SPRINT

City pursues funds to have rail system running in under four years

Article published in the Albuquerque Journal: February 10, 2006.

A Vision for True Rapid Rail in Albuquerque

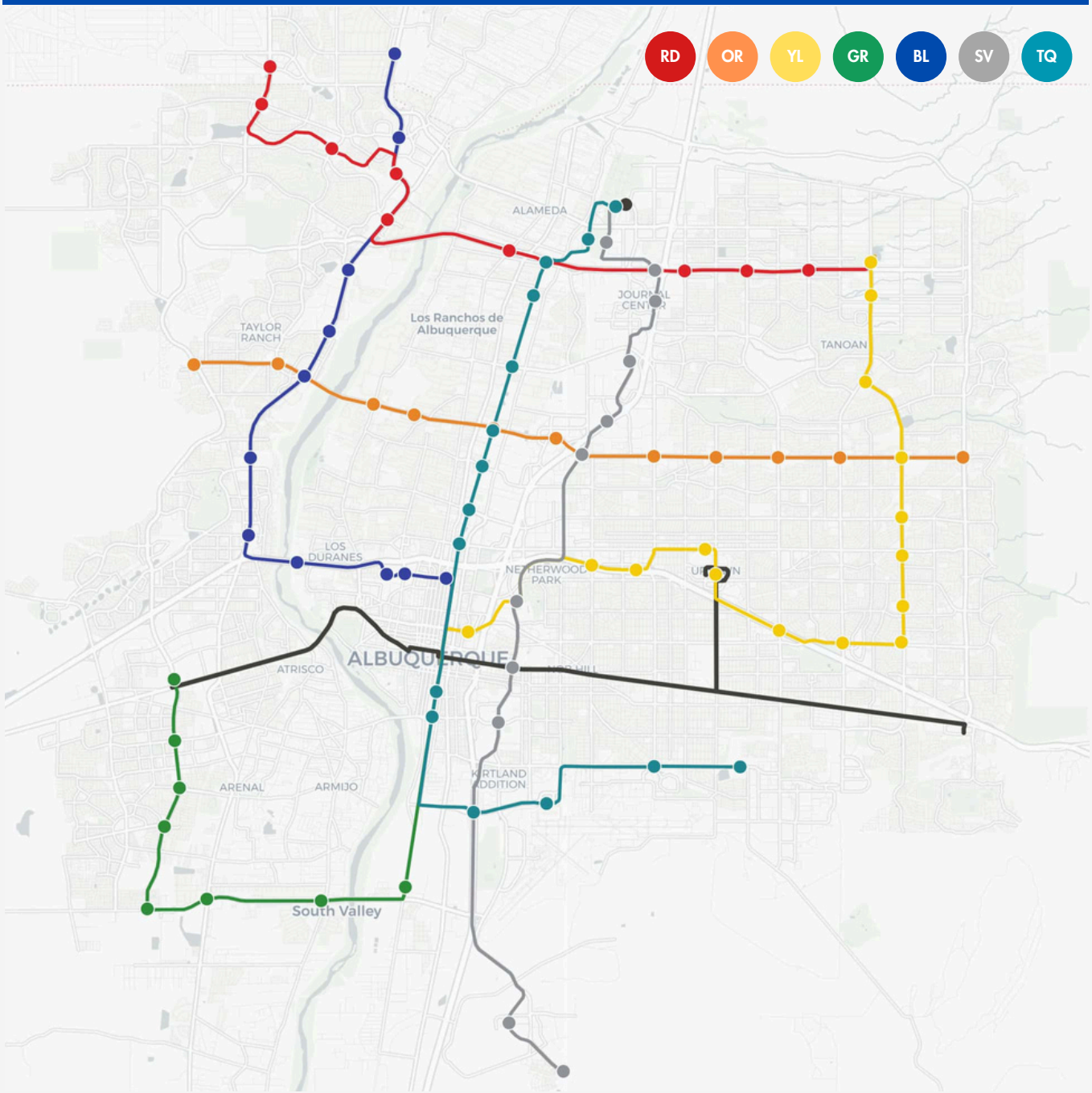
A comprehensive, citywide rapid rail network - which **here is understood to be "light metro,"** would transform the way Burqueños get around. **Fast, frequent, and reliable rail** can be a transport mode truly competitive and even preferable to the personal vehicle. People can use it to commute, see friends and family, do their shopping, attend sporting events, get to school, and more. A truly comprehensive rail network **connects the places people want to go.**

This rail proposal consists of **seven lines** (Turquoise, Red, Orange, Yellow, Green, Blue, and Silver) **and 70 stations, totaling a 103-mile network operating in fully dedicated right-of-way (ROW)** (For operational details, see "Best Practices for Albuquerque" on p. 20). Two streetcar lines and connections to ART are also proposed. Most lines connect to the Rail Runner Express (NMRX). Two lines connect to the Sunport.

Not all lines on this network converge on downtown - instead, several lines connect neighborhoods across the city, which better reflects the travel patterns of many commuters and shortens trip times.

Every line intersects with another line, easing transfers and accessing more of the network from any one starting point. See the simplified network map (Fig. 3) on Page 6. Each line is further detailed below.

Figure 3: Albuquerque Elevated Rail Network



Map created by the author using online mapping tool MapHub:
https://maphub.net/BenjABQ/benjabq-albuquerque-elevated-rail

Turquoise

Route: Albuquerque International Sunport to Balloon Fiesta Park

The **Turquoise line is the backbone of the system,** running mostly in the existing rail alignment used by NMRX and freight rail. Beginning at the Sunport terminal, the line follows Sunport Boulevard before turning into the rail ROW and continuing North via downtown.

There are **16 stations on the Turquoise line**, including the Alvarado Transportation Center, the Montaño NMRX station, and the Los Ranchos/Journal Center NMRX station. Major cross-street stops include Avenida Cesar Chavez, Menaul Boulevard, Osuna Road, and Paseo del Norte.

The Turquoise line connects to every other line on the network, feeding into downtown and providing an immediate mode of transport to NMRX riders from both Santa Fe and Belen.

The Turquoise line terminates at Balloon Fiesta Park, which **could alleviate huge traffic jams that occur annually during the International Balloon Fiesta** in October.

This site will also be home to the future New Mexico United Stadium - another opportunity to provide an alternative to congested roads in the area.

16.8 mi / 27.0 km

16 Stations

Connections:

RR RD OR YL GR BL SV

Red

Route: Presbyterian Rust Medical Center to Altamonte

The Red line also serves as an option for NMRX riders, and is **one of the major cross-town lines** linking neighborhoods across the Albuquerque metro.

There are **12 stations on the Red line,** including Cottonwood Mall and the Los Ranchos/Journal Center NMRX station. Major cross-street stops include Coors Boulevard, I-25, Wyoming Boulevard, Eubank Boulevard, and Tramway Boulevard.

The Red line runs along the length of **Paseo del Norte, an arterial boulevard and river crossing that experiences heavy car traffic** and was listed by MRMPO as likely to be "severely congested" by 2040. Where the Red line does not run along the Paseo ROW, it aligns to Coors Boulevard, the Calabacillas arroyo, and Unser Boulevard before terminating at the Presbyterian Rust Medical Center at its Western end.

13.9 mi / 22.4 km

12 Stations

Connections:

RR YL BL SV TQ

MRMPO identified both Coors and Paseo as "priority investment transit mode share" corridors, following the Metropolitan Transportation Board's **goal that transit make up 20 percent of trips by 2040.** Currently, **Coors has a peak transit mode share of 2.1 percent, and Paseo del Norte has no transit service.**

Orange

Route: Petroglyph National Monument Headquarters **to** Tramway Boulevard

The Orange line runs along the length of Montaño Road and Montgomery Boulevard, another arterial and river crossing. **It is the second cross-town line** that does not funnel riders directly into downtown.

There are 14 stations on the Orange line, including the Montaño NMRX station. Major cross-street stops include Coors, San Mateo Boulevard, Louisiana Boulevard, Wyoming, and Juan Tabo Boulevard.

The Orange line provides a cross-town option for riders between the Yellow and Red lines.

Montgomery and Montaño are two more corridors marked as "priority investments" for transit, under MTB's goal for 20 percent transit mode share by 2040. **Currently, peak transit mode share is 4.7 percent on Montgomery and 3.1 percent on Montaño.**

12.7 mi / 20.5 km

14 Stations

Connections:

RR YL BL SV TQ

Yellow

Route: Alvarado Transportation Center/Downtown to Altamonte

The Yellow line runs along Juan Tabo Boulevard before turning onto Lomas, then uses the I-40 ROW and Louisiana Boulevard. Its final stretch uses the North Channel Arroyo before returning to Lomas, terminating downtown in the existing rail ROW. **The Yellow line connects to every other line.**

There are 17 stations on the Yellow line, including Eldorado and Manzano High Schools, Los Altos Park, Uptown, Coronado Center, and UNM North Campus. **The line also connects to ART in Uptown and Downtown.**

MTB has identified Lomas, Louisiana, and I-40 as "priority investments" for transit, under MTB's goal for 20 percent transit mode share by 2040. **Currently, peak transit mode share is 10.6 percent on Lomas and 8.4 percent on Louisiana.**

The Yellow line, along with several other lines, uses unique alignments, including ROW provided by arroyos. **Using these pathways mitigates the need to acquire significant land, and lowers construction costs.** The Yellow line also takes advantage of I-40 and the significant space provided by Juan Tabo Boulevard.

16.5 mi / 26.6 km

17 Stations

Connections:

RR RD OR GR BL SV TQ

Note: While alignments that take advantage of interstates can lower construction costs significantly, **they should be avoided where possible to maximize rider comfort and station accessibility.** While this network uses I-25 and I-40 in several places, care was taken to minimize the duration and number of station stops in this ROW.

Green

Route: Alvarado Transportation Center/Downtown to Central & Unser Transit Center

The Green line runs in the existing rail ROW South from Downtown before turning to align with Rio Bravo Boulevard and Dennis Chavez Boulevard. It then turns onto Unser Boulevard before terminating at Central Avenue and the Unser Transit Center in conjunction with ART.

There are 11 stations on the Green line, including the Rail Yards Market, Avenida Cesar Chavez and the National Hispanic Cultural Center, and the Bernalillo County/ Sunport NMRX station. Major cross-street stops include Isleta Boulevard, Coors, and Unser.

MTB has identified Coors and Unser as "priority investments" for transit, under MTB's goal for 20 percent transit mode share by 2040.

The Green line connects historic and majority-minority neighborhoods like Barelas and the South Valley to fast, frequent, and reliable transit. NMRX connections also provide options for riders traveling to or from Belen and Santa Fe.

11.8 mi / 19.0 km

11 Stations

Connections:

RR YL BL TQ

Blue

Route: Alvarado Transportation Center/Downtown to Intel

The Blue line runs aligned with Coors Boulevard for a significant part of its length, before turning onto I-40 to cross the river. It then leaves the interstate and follows existing underused rail ROW across 12th and 4th Streets, finally aligning with the NMRX ROW to terminate downtown.

There are 14 stations on the Blue line, including the Intel campus, Cottonwood Mall (where it interlines with the Red line), St. Pius High School, and Sawmill. Major cross-street stops include Montaño, Eagle Ranch Road, and 12th Street.

MTB has identified Coors and Montaño as "priority investments" for transit, under MTB's goal for 20 percent transit mode share by 2040. **Currently, average transit mode share is 1.1 percent on Coors and 2.8 percent on Montaño.**

14.1 mi / 22.6 km

14 Stations

Connections:

RR RD OR YL GR TQ

The Blue line also has two important connections to potential streetcar lines. One line runs along the alignment of the existing novelty train connecting the BioPark and Zoo, with stops at parks giving access to the bosque in between. The second line runs at street level from Sawmill Market through Old Town Plaza and back, with stops at the museums and Tiguex Park.

These connections provide an opportunity to create a pleasant localized transit option for tourists and families, and raise the possibility of pedestrianizing Old Town plaza to remove car traffic and promote the historic nature of the area.

The alignment of the Blue line is challenged by the City's Rail Trail project, which will pedestrianize the stretch of rail ROW between Aspen Avenue and the existing NMRX corridor. The Rail Trail project is an admirable step forward in adding multi-use trails and dedicated bike infrastructure in Albuquerque, but it would be prudent to retain a level of ROW for future rail use. As Amtrak has experienced during its recent expansion plans, "rails-to-trails" projects have created significant challenges. **Once a railway has been converted into a trail, it is unlikely it will ever be changed back.**

Silver

Route: Mesa del Sol **to** Balloon Fiesta Park

The Silver line is the second major North-South line. It is also a cross-town line that avoids downtown. The line runs along University Boulevard before meeting the Turquoise line, then follows I-25 and an arroyo channel north to return to University Boulevard. It then follows the North Channel arroyo until it re-encounters I-25, before diverting to Jefferson Street and another arroyo channel to meet the Turquoise line again before terminating at Balloon Fiesta Park.

There are 13 stations on the Silver line, including the Isleta Ampitheater, Isotopes Park and the Pit, UNM, North Campus, and the Albuquerque Journal. Major cross-street stops include Paseo del Norte, Montgomery, Central Avenue, and Avenida Cesar Chavez.

MTB has identified Jefferson as a "priority investment" for transit, under MTB's goal for 20 percent transit mode share by 2040. **Currently, peak transit mode share is 1.1 percent on Jefferson.**

17.4 mi / 28.0 km

13 Stations

Connections:

RD OR YL TQ

The Silver line is the only line without a direct NMRX connection. It allows North-South riders an option that skips downtown while hitting major attractions like sports stadiums and UNM and CNM, with connections to ART at Central Avenue. **The Silver line's Jefferson-aligned segment also runs through a series of hotel districts that will make the line useful for visitors, especially during the International Balloon Fiesta.**

Cost: A Barrier to Construction

Building large-scale public transit is expensive. It is especially expensive in the United States, where rail projects like New York's 2nd Avenue Subway experienced **cost premiums ranging from 25 to 50 percent above other countries.** Marco Chitti et al. dive into these costs in the 2023 *Transit Costs Project* from NYU's Marron Institute.

Chitti et al. describe three primary factors that explain soaring project costs in the U.S., which is the sixth most expensive country in the world for rapid transit infrastructure. The three factors, as described, are ***physical structures, labor, and procurement/soft costs*** (Chitti et al. p 13).

Physical structures tend to add to costs through complicated design (particularly at stations) that is not standardized, redundancies, and oversized structures. Labor tends to add costs through overstaffing both in management and construction roles. Procurement/soft costs increase the price tag when design phases are rushed and agencies lack internal capacity, thus turning to expensive consultants.

The authors warn against the desire to privatize risk and poor communication between agencies and private contractors, leading to delays that require thousands more work-hours, further raising costs. In Europe, many countries have built up teams of public-sector consultants for expertise on new builds - **by removing the incentive to maximize bid levels and by hiring dedicated staff who work in the public's interest, costs can be more effectively managed.**

The authors also emphasize careful early design and planning before committing to construction or buildout timelines - borrowing a phrase, **it is important to "think slow, act fast"** (Chitti et al. p 27). Being careful when planning ensures construction can move along at a rapid pace and avoid delays - because **delays cost money.**

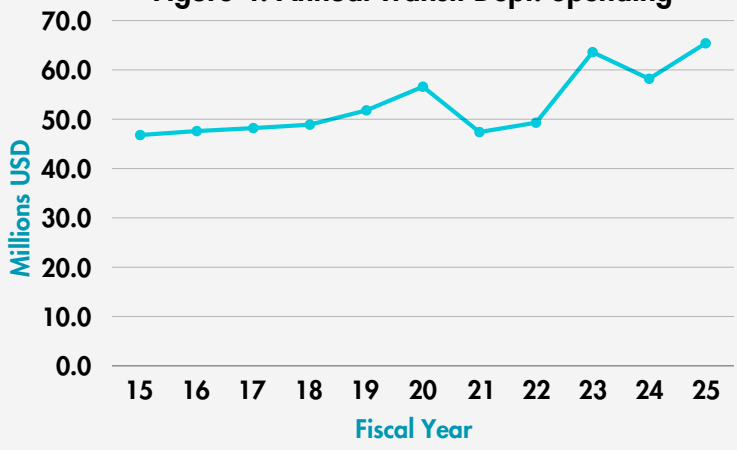
A lack of expertise can increase costs for new builds, especially in areas that have not built rail before or have not expanded their network in a long time. Most state DOTs and transit departments are fairly familiar with building roads and parking. **This knowledge base allows costs to be kept down and projects to be completed quickly.** Rail, on the other hand, has fewer projects and a shallower well of knowledge.

Limited Budget, Limited Capacity

Albuquerque's proposed FY 2025 Transit Department Operating Fund is $65.4 million, an increase of 12.4 percent from FY 2024. ABQ RIDE made cuts to bus service in late 2022 due to **a shortage of approximately 106 motorcoach operators** (bus drivers). Staff shortages and service cuts pose problems for the health of any transit network. **Less service hurts ridership,** reducing economies of scale and making transit funding harder to justify. ABQ RIDE, Albuquerque's transit operator, is navigating recovery from the COVID-19 pandemic, hiring more staff, renewing bus routes, and transitioning its fleet to zero-emission vehicles by 2040.

Since FY 2015, the City has allocated an average of $53 million annually to the Transit Department. MRMPO adopted the goal of 20 percent transit mode share on major city corridors by 2040 - just 15 years away. In 2022, **1 percent** of all commutes were made on transit. **The department accounts for 4.7 percent of the FY 2025 budget.** In order to achieve the goals set forth for transit in Albuquerque, a major shift must take place.

Figure 4: Annual Transit Dept. Spending



To realize MRMPO's 2040 vision where ABQ RIDE operates 233 vehicles on a BRT-focused network, they forecast an $89 million annual operating cost - **an increase of 36 percent over today's budget.** Using more up-to-date 2022 numbers from NTD, operating costs are $109 million - **a 66 percent budget increase.** This number assumes annual operating costs (including wages) stay the same through 2040.

With limited municipal budgets, outside investment is becoming a more popular option for major projects. As Chitti et al. demonstrate in the *Transit Costs Project*, however, private interests can sometimes derail, rather than deliver, major infrastructure. The need has arisen for partners that have a vested public interest and the assets and expertise to fill in the gaps. **In Canada, one major player has arisen as the number one infrastructure investor worldwide - and is making a major foray into building some projects itself.**

CDPQ: A Brief Overview of a Canadian Innovation

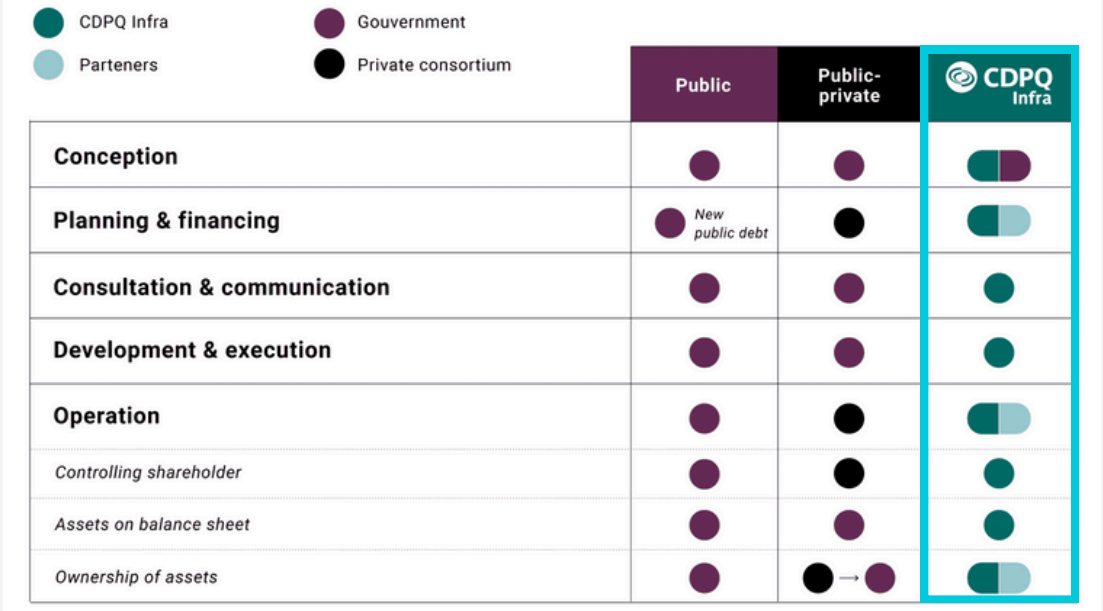
The Canadian **Caisse de dépôt et placement du Québec (CDPQ)** manages the funds in the public pension plan created by the Québecois government. CDPQ was created through legislation to be the manager of this investment portfolio, which in June 2024 was valued at approximately **$452 billion CAD ($326 billion USD)**.

During the financial crisis, CDPQ noted that their investments in infrastructure were stable and offered consistent returns. This led to the creation of their own in-house infrastructure subsidiary, CDPQ Infra, staffed with experts in the field. In the words of CDPQ Infra, beyond simply investing in an infrastructure portfolio, they:

> **"[act] as investor and, simultaneously, as principal contractor…CDPQ Infra ensures the realization of a transportation project from A to Z, from planning to completion, including consultants and financing."**

In Québec and Canada at-large, CDPQ has established itself as a premier contractor and investment firm for infrastructure. The innovative model they promote can be framed as a "public-public-partnership, where CDPQ - as an independent entity - can reduce financing risk for major infrastructure projects, while still maintaining the public trust and returning investment gains for the public's benefit (in this case, the pensions of Quebecers). Figure 5 shows CDPQ's basic model in comparison to more traditional public or public-private projects:

Figure 5: CDPQ's Partnership Structure



Graphic created by CDPQ Infra: https://www.cdpqinfra.com/en/news/articles/cdpq-infra-a-better-understanding-of-the-model

Additionally, projects they finance can include partnerships with municipal, state/provincial, and national governments, which then enjoy a percentage of the return generated by the completed project. In Montreal, where CDPQ is headquartered, a new transit project that will effectively double the size of the city's rapid rail network provides an example of this model at work.

The REM in Montreal

The **Réseau express métropolitain (REM)** is a 67-kilometer/**42-mile, 26-station, fully automated** "light metro" network currently under construction in Montréal. By comparison, the entire current Montréal métro totals 71 km/44 mi. The initial segment, from the Brossard suburb to Central Station, opened to the public in July 2023 (see map in Figure 6). The project was originally proposed in 2016 by CDPQ, and went from groundbreaking to initial service in just over five years - a rapid timeline by North American standards.

Figure 6: The REM System and Current Operations

Map created by Metropolitan Express Network: https://rem.info/fr/actualites/la-vraie-facture-du-rem

CDPQ entered several partnerships to make the REM a reality, including with the local and regional transit agencies STM and ARTM, the governments of Montréal, Québec, and Canada, and a consortium of contractors and design firms.

CDPQ provides the bulk of financing for the roughly C$8 billion cost of the project, and the model is structured so that any additional project costs are absorbed by CDPQ, rather than public agencies. This coverage ensures the project continues construction, minimizing downtime that may otherwise be spent closing funding gaps.

The REM was created out of a request for a connection to Montréal's airport and neighborhoods under-served by transit. Trains will run **20 hours per-day, seven days per-week**, carrying up to **600 passengers per train** at rush hour. Stations are fully accessible and equipped with heating, air conditioning, WiFi, and screen doors to protect passengers from the elements and tracks.

The REM combines best practices with reliable technologies to create a fully driverless, automated metro system that runs tight frequencies and will keep thousands of cars off of Montréal's roads. Automated light metro technology has famously been used on Vancouver, Canada's *SkyTrain* since the 1980s. In the United States, the technology is most often found in major airports, where "people-movers" transport passengers. The line at Denver International Airport is so precise that arrival headways are counted by the second.

Financing the REM

CDPQ is the main investor in the REM, and its principal contractor. The financial agreement for the REM project is made up of several partners, as shown in Figure 7:

- **CDPQ** initially invested C$3.2 billion, which has grown to around **C$4.65 billion** from cost increases like COVID related supply chain issues and rehabilitation of a major railway tunnel. Per the agreement, **all cost increases have been absorbed by CDPQ.**
- The **government of Québec**, which requested the initial project proposal, invested **C$1.283 billion**.
- The **Canadian federal government** also invested **C$1.283 billion**.
- **Hydro-Québec**, the main utility provider for the region, invested **C$295 million** for electrification of the REM network.

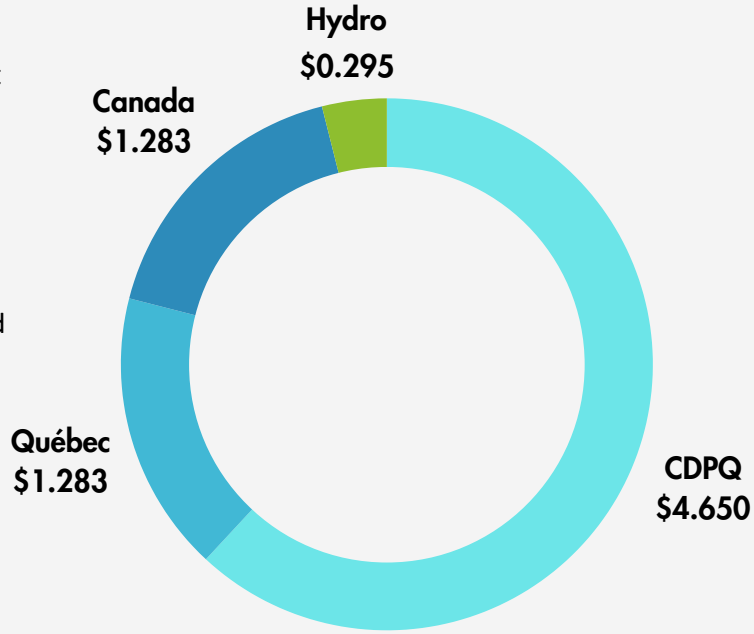


Figure 7: REM Funding Share

All initial investment amounts for these external partners have remained fixed - meaning that taxpayers are protected from cost increases that inevitably happen during major infrastructure projects. This is one of the most beneficial aspects of the REM's unique financing structure.

CDPQ also worked with these partners on important details early in the planning process. A governing committee was created and tasked with holding regular meetings. Roles and division of responsibilities between CDPQ, the government, and created committees were clearly defined. This kind of early organization is essential to avoid cost increases and schedule delays later in the project process.

CDPQ's Expected Investment Return

CDPQ is charged with gaining a return for Quebecers' pensions in all its investments, and the REM is no different. Their general **return threshold is 8 percent**, and the REM has an **anticipated rate of return between 8 and 9 percent**. Its partners in the Québecois and Canadian federal government also expect a return on their investments from the REM, which has been set at **3.7 percent.**

These returns are realized through the financial benefits expected from ridership on the system, like fares, as well as from "transportation dues" zones set up in ranges anywhere from 500 meters to 1 km of REM stations. These taxes are levied on both new and significant reconstruction of buildings in the zone, for the benefit of being located close to public transit. These dues and REM fares, which are paid to the ARTM, are then passed to CDPQ until it realizes its 8 percent return threshold. From there, they are additionally passed to the government until its 3.7 percent threshold is reached. From there, financial benefits flow to CDPQ and the government on a roughly 51/49 percent basis.

The rate of payment by ARTM to CDPQ is on a per-passenger-km (PPK) basis. This rate is expected to be **between C$0.69 and C$0.72 PPK**. By comparison, ARTM's current conglomerate of services which the REM will replace has a PPK cost of C$0.66, which does not fully cover their current expenditures to run these services. CDPQ's cost PPK is all-inclusive, and is "an increase of 2 to 4% of the ARTM's budget, assuming constant ridership" *(CDPQ Infra)*.

Another important note is that **as ridership increases, PPK costs go down,** reaching parity with fare prices at 140% of expected ridership. This incentivizes ARTM to get as many riders as possible on the REM. CDPQ is also incentivized to build the best system possible, as more passengers means more returns to its portfolio.

This structure has benefits for the public trust in the long term. First, riders on the REM are essentially paying into their own retirement every time they board a train, as CDPQ earns back its investment. The government and ARTM are the arbiters of financial benefits in the long run. Riders and taxpayers do not have to worry about their fares and taxes being funneled into private coffers, while their infrastructure is owned by profit-seeking firms. Instead, they directly benefit Canadian society.

A partnership with CDPQ could be transformational for the prospect of completing such a rail network here in Albuquerque, unlocking both significant investment and expertise from a trusted firm that makes prudent choices. The necessity of protecting Quebecers' pensions means CDPQ invests carefully and structures its investments to maximize returns. There is something to be learned from this practice, and through partnerships, **New Mexicans could see financial benefits as well.**

Financing and Costs for Albuquerque

Constructing an entirely new rail system for Albuquerque would be costly - but how costly? Peer cities in the Mountain West provide insight. **Here, costs for rail networks in Denver, Colorado, and Salt Lake City, Utah, will be used as examples,** and compared to the United States as a whole. In its 2015 *Long-Term Strategy*, RMRTD identifies Denver and Salt Lake as "aspirational peers" for transit, referencing an accompanying white paper. Research conducted by Renaissance Planning Group explains:

> **"All are Western regions that have similar post-WWII development patterns and are largely dependent on the automobile as the primary regional transportation mode." (p 5)**

While Salt Lake and Denver have **significantly higher metro-area populations than Albuquerque** (1.2 million and 2.9 million compared to 924,000, respectively), **ABQ RIDE's service area is nearly as dense as Salt Lake and twice as dense as Denver.** RMRTD, with a much wider service area, serves nearly the same density as Denver. It should be noted that the densities of both Salt Lake and Denver have likely increased since 2014, when this white paper was published.

DEN: 2.9 million residents

SLC: 1.2 million residents

ABQ: 924,000 residents

Salt Lake's Utah Transit Authority (UTA) achieved 3 times the number of transit trips as Albuquerque, and Denver's Regional Transit District (RTD) achieved 2.5 times as many trips. **These regions also invest much more in their transit systems than Albuquerque, up to $125 more per-person**, according to the white paper.

Both Salt Lake and Denver have light rail networks to complement their bus and commuter rail lines. These light rail networks provide helpful insights for what such a system in Albuquerque could, should, and should not look like, as well as cost estimates.

Salt Lake: TRAX

Built in anticipation of the 2002 Winter Olympics, Salt Lake's TRAX light rail system opened its first segment in 1999. Today, **the system is approximately 42.5 miles in length with 50 stations,** with its most recent expansions opening in 2011, 2013, and a reconnection to the rebuilt airport in 2021.

TRAX runs entirely at-grade and in alignment with many roads throughout Salt Lake, including alignments in center medians. As a result, it encounters 203 grade crossings. Frequencies are every 15 minutes across most of the network.

TRAX averaged a **construction cost of $67.1 million per-mile** adjusted for inflation, according to 2021 data from the Eno Center for Transportation. This is less than half the U.S. average for light rail at $136.8 million per-mile, adjusted for inflation.

Denver: RTD

Denver's light rail network began service in 1994. Today, **the system is approximately 60.1 miles in length with 57 stations,** not including the A Line commuter rail serving Denver International Airport, which entered service in 2016. The most recent expansions added approximately 13 miles in 2020.

Like TRAX, **RTD runs almost entirely at-grade,** with some elevated sections. **Large portions of the network are aligned to major interstates** in the city, including I-25 and I-85. This can reduce construction costs substantially, but has significant drawbacks detailed in "Best Practices for Albuquerque" on page 20. Frequencies range from 15 minutes to hourly, depending on the line.

RTD averaged a **construction cost of $72.6 million per-mile** adjusted for inflation according to data from Aevez et al. and Eno. This is also significantly lower than the U.S. average cost for at-grade light rail construction.

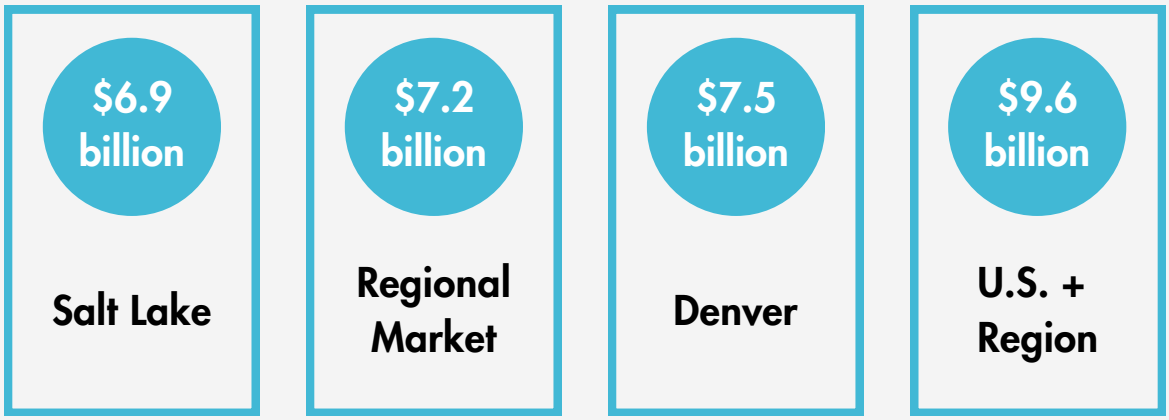
A Range of Possible Cost Outcomes

Given that there are several data points from which to extract cost estimates, and given the uncertainty of a final cost for an above-ground light metro network for Albuquerque, the following estimates should be taken as just that - estimates. They are based on real transportation and cost data from western cities with similar profiles. There are a vast range of factors that can influence cost outcomes, as Chitti et al. and Aevez et al. detail in their publications.

Therefore, four separate cost profiles are given: Salt Lake, Denver, "Regional Market," wherein Salt Lake and Denver are averaged, and both regions averaged with the U.S. at-large. Costs are shown in Figure 8. **Cost per-mile for each region and average of regions was multiplied by the 104-mile fully realized light metro network suggested for Albuquerque.**

These estimates are an especially rough approximation, as the Albuquerque network would be almost entirely elevated on viaducts. This construction method is far less expensive than tunneling, but more expensive than at-grade. Solid data for per-mile costs of elevated rail were not readily available in cited documents, likely because there are almost no examples of new rail networks being built this way in the United States.

Figure 8: Cost Estimates Based on Peer Cities & U.S.



Cost averages calculated from cost per-mile for at-grade light rail in each city or average of cities. Costs are $67.1 million p/m in Salt Lake, $72.6 million p/m in Denver, and $136.8 million p/m in U.S. Amounts are in 2023 dollars.

Clearly, **there is a large range in potential costs, from a low of $6.9 billion for the Salt Lake profile to a high of $9.6 billion for the U.S./Region average.** These vast ranges emphasize the need for careful study and planning to determine an informed and detailed cost estimate for Albuquerque. This is also where a request for **partnership with CDPQ has merit - their ability to calculate planning and costs can ultimately determine whether a project makes financial sense and is worth pursuing.**

New Mexican Financing Partners

Given the very limited budget of Albuquerque's transit department and the necessity of finding partners to work with CDPQ and handle a portion of financing, we must look to sources within New Mexico. Two significant options emerge: **The Land Grant Permanent Fund (LGPF) and the Public Employees Retirement Association of New Mexico (PERA).** Both of these funds are primed to act as investors in a major infrastructure project for our state, as they oversee significant portfolios worth tens of billions of dollars. Much like CDPQ, PERA is tasked with growing the pensions of New Mexico's retirees. LGPF is managed by the New Mexico State Investment Council (SIC), which describes itself as follows:

> **"The SIC is the fiduciary for its client – the State of New Mexico and its citizens. Its investment model emphasizes a portfolio comprised largely of diversified performance-oriented assets."**

Both PERA and SIC are investment teams staffed with experts and tasked with growing their investment values in a prudent and forward-thinking manner. For PERA, protecting and growing public employees' retirements is the goal. For SIC, it is ensuring the longevity of its respective funds and reinvesting in New Mexico.

These goals, as expected, are largely in-line with the goals of CDPQ:

> **"...The mission of the Caisse de dépôt et placement du Québec (CDPQ) is to make Quebecers' savings grow. This is the very foundation that underlies all of its investments."**

According to SIC, their permanent funds have earned 8 percent annually on average over the last decade, and **total assets in the LGPF were estimated at $25.2 billion in FY 2022.** The most recent publicly available report from August 2024 values LGPF net assets at **$32.4 billion.** This makes LGPF the **third largest sovereign wealth fund in the country.**

Since the Early Childhood Education and Care Fund was created in FY 2021 with an initial investment of $300 million, **its valuation has grown by more than 27 times, to $8.3 billion** in August 2024. Clearly, SIC is helmed by capable fund managers with the expertise to make prudent investments.

PERA's most recent publicly available annual financial report for FY 2023 values their total assets at $16.6 billion. **Their long-term target return is 7.25 percent**, slightly lower than CDPQ's threshold of 8 percent and SIC's 10-year average of 8 percent.

PERA invests in a diversified scope of assets, and despite a difficult market in 2022, they note that one asset class stood above the rest. Real assets, which are "intended to serve as a hedge against inflation," (p 124) did not experience losses during 2022. PERA explains:

> **"This portfolio was the only asset class that generated a positive return for the fiscal year, generating a sizeable [sic] 15.56% and exceeding its Policy benchmark by 12.67%...This return also holds significance, not only to PERA's Fund, but also in the context of national peers." (p 124)**

Empirical research supports the stability of real assets. In their 2023 publication "Pension Fund Investments in Infrastructure," Carlo et al. explore the viability of infrastructure as a stable asset class that generates high returns. Studying a dataset of 782 pension funds, Carlo et al. found that U.S. funds are less likely to invest in infrastructure (p 5). However, their analysis shows that infrastructure provided the second highest rate of return of any asset class from 2007-2018 (the most recent year available).

On average, **infrastructure experienced a 10.1 percent net return.** Between 2013 and 2018, net returns were 11.5 percent. Carlo et al. also found that infrastructure investments suffer less volatility than other assets. They conclude:

> **"...the increase in infrastructure allocations seems to be justified from a risk/return perspective, and pension funds with no infrastructure exposure should consider investing in this alternative asset class." (p 15)**

CDPQ realized this fact more than 15 years ago, and has since grown to be the world's largest international investor in infrastructure, with C$54.6 billion in infrastructure assets totaling 13.6 percent of their portfolio. **Since 2008, CDPQ has nearly doubled their asset value, from C$220.4 billion to C$424.2 billion ($312.2 billion USD).**

CDPQ's large assets and expertise led to the creation of the Infra subsidiary, a move that tracks with Carlo et al in determining whether to manage such investments internally or externally:

> **"…only big pension funds have the resources and expertise to have an in-house infrastructure management team." (p 6)**

Thus, firms like PERA and SIC may do better at investing with external management - in this case, with CDPQ as a partner. Carlo et al. refer to similar structures as **"co-investments."** PERA and SIC, investing directly in the rail network, leave the management of construction and operation to CDPQ - with all three funds then receiving returns, similar to the structure created to finance the REM in Montreal.

In Canada, the federal government also invested in the REM project. This report does not assume federal funding for such a project would be guaranteed, but **there are new grant programs available through FTA for rapid rail that could further help offset the cost of construction** - furthermore, unlike Canada, such funding would not have payback requirements.

Conceptual Financing Share

For Albuquerque's rail system, an investment partnership could look like **Figure 9**. Investments are in USD.

- **CDPQ,** as principal investor and builder, invests **$5.5 billion.** Ideally, the agreement would be structured to ensure any cost increases are absorbed by CDPQ.
- **SIC,** through the **LGPF,** invests **$2.5 billion.**
- **PERA** invests **$1.0 billion.**
- **The Public Service Company of New Mexico (PNM)**, the state's largest utility provider, invests **$300 million** for electrification of the network.

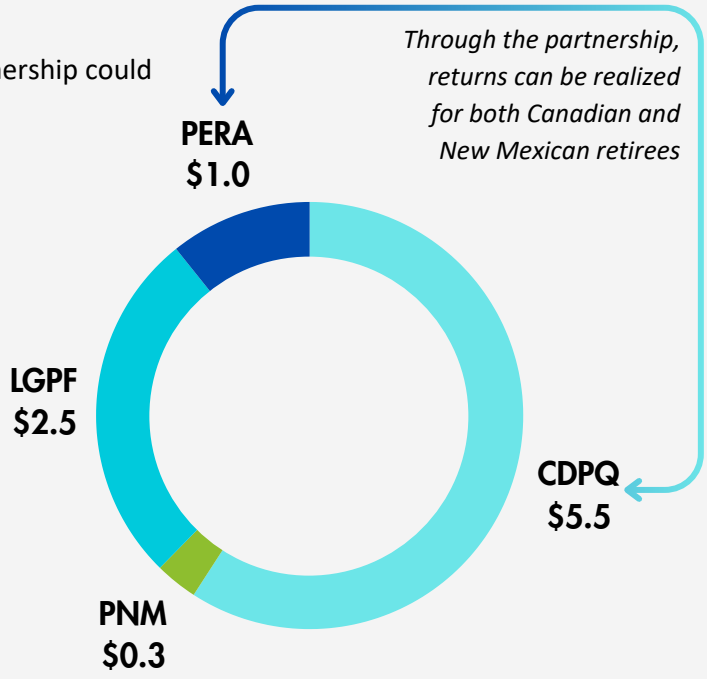


Figure 9: ABQ Light Metro Funding Share

The total funding amount above totals $9.3 billion - lower than the high-end cost estimate of $9.6 billion, but higher than the other three estimates. Again, these investment ratios are hypothetical, based mostly on each firm's relative size and assets. A majority of the funding (and thus, return percentage) goes to CDPQ, as they will not only be an investor, but the builder and operator of the light metro system. Essentially, this partnership aims to duplicate that created for the REM, using institutions that New Mexicans understand and are familiar with.

PNM reported net earnings of $152.6 million in the nine months ending September 30, 2023. From the company's financial statements, it is unclear whether a $300 million investment would be feasible at once, suggesting it may need to contribute a lesser amount or through multiple rounds.

The cost to electrify the network is uncertain. Different power systems have different costs. Overhead catenary, which powers the REM, is more expensive than third-rail technology, which powers the *SkyTrain*. The cost comes out to C$6.7 million ($4.9 million USD) per-mile on the REM. For Albuquerque and PNM's $300 million investment, **the budget is $2.9 million per-mile, assuming less expensive third-rail is used.**

By partnering with CDPQ, PERA can open up an entirely new asset class in which it is not yet invested, and which Carlo et al. show is a stable generator of substantial net returns. Moreover, PERA and SIC can achieve the same benefits for New Mexicans that the REM provides for Quebecers. **When someone rides the rails in Albuquerque, they will contribute to New Mexico's public retirement and wealth funds.**

This also has important implications for SIC and LGPF. The sovereign wealth funds SIC manages are described as **"a critical resource and a source of pride for New Mexicans."** Economic development is listed by SIC as one of the main purposes of such funds. By investing in one of the largest infrastructure projects in Albuquerque's history, **SIC will also be investing in the future well-being and economic growth of the state's mid-region, where half of all New Mexicans live.**

Federal Funds & Assistance

Figure 9's funding ratio omits federal grant funding. There is another opportunity to defray the cost of a new rail system for Albuquerque thanks to the Infrastructure Investment and Jobs Act (IIJA). IIJA provides advance appropriations to the **Capital Investment Grants (CIG) program** through FY 2026, **totaling $4.6 billion annually.** According to the FTA, projects supported by the program include:

> **"fixed guideway investments including new and expanded rapid rail, commuter rail, light rail, streetcars, bus rapid transit, and ferries…"**

Guidelines under IIJA require a rigorous project review process, as is typical for most federal funding. For new starts, CIG applies to projects costing at least $400 million and which are seeking funding of $150 million or more. Maximum financial contributions to a new start project by CIG are 60 percent.

CIG is not the only program available. FTA outlines the **Expedited Project Delivery (EPD) Program,** which also applies to fixed guideway transit systems, to accelerate construction and opening of new projects. According to FTA, **EPD "encourages innovative partnerships and funding so projects can be completed more quickly."** Additionally, FTA provides grants to plan for transit-oriented development (TOD) in conjunction with projects under CIG. FTA is also providing **$6.3 billion annually to its Urbanized Area Formula Funding program** - another avenue for funding transit projects for areas with 50,000 or more inhabitants.

IIJA created many more opportunities for developing new transit projects. **However, it is also important to note that federal funding comes with significant strings attached,** including Environmental Impact Statements, grant compliance requirements, Buy America requirements, and the discretion of the federal government to withhold funding if it feels requirements are not being satisfactorily met.

One of the most important first steps in the project realization project is convening local governments, agencies, and state actors who can get on the same page and gather more information, before presenting a request to CDPQ for consideration. A specific project proposal need not be the central tenet of such a request - the REM began as a request to CDPQ from Montreal to study an airport connection for its transit system. **Today, it is the largest transit expansion in Montreal since the 1960s, and one of the largest underway in Canada.** Albuquerque may receive an altered idea from the firm, if it ultimately decides after its own review that a partnership makes financial sense.

Best Practices for Albuquerque

There are many ways to construct a transit network, and a few key decisions can make or break its effectiveness, frequency, cost, ridership, and more. **It is not enough that an area is simply "served" by transit.** If that service is low quality or unreliable, few people will use it as their mode of first-choice. Fortunately, transit systems across the world and over decades of time have many lessons to teach us about what does and does not work.

For this proposal, which emulates both the REM and the *SkyTrain's* technology, some choices matter for the sake of operating the system at all. No single transit system is the answer to every transportation need, but there is a clear hierarchy of service, the top of which is almost always rail. Below, based again on systems in cities like Salt Lake, Denver, Montreal, Vancouver, and here in Albuquerque, we can gather a list of best practices - and learn what to avoid.

Full Grade Separation

One of the best ways to ensure a transit system is *fast*, and therefore more *frequent*, is by fully separating it from other modes, and particularly from automobiles. Most light rail, BRT, and streetcar systems in the United States run in mixed traffic or dedicated lanes at street level. TRAX in Salt Lake is such a system. **Over its 42.5 mile length, it encounters 203 grade crossings.** Operating in mixed traffic often slows down these rail systems for safety reasons, leading to longer headways and slower journeys. This damages the competitiveness of the system compared to driving. It also necessitates the use of train operators, increasing operating costs and inviting human error.

Safety is still a major concern, even at reduced speeds. Encounters with intersections pose a danger to drivers, pedestrians, and riders, even when trains have signaling priority, barricades, and warnings. For example, pedestrians and drivers have been killed or injured by TRAX trains several times in 2023 alone. NTD estimates **at least 55 people have been killed by TRAX trains since 2002, including 25 suicides.** Judging from media reports, this is an undercount - **at least three pedestrian deaths were reported in local news between 2022 and 2023.** According to the Bureau of Transportation Statistics (BTS), **at least 223 people have been killed at light rail grade crossings since 2000.**

The dangers of at-grade systems are not limited to rail. The ART BRT system in Albuquerque has been in at least **33 collisions** since entering service in 2019, **including hitting five pedestrians and killing one.** There have been 120 passenger injuries on ART, including 84 people "walking or leaving," according to NTD. Local news outlet *KOB 4* concluded in 2022 that **92 percent of all ART collisions occur from motorists entering the ART ROW.**

The choice to operate rapid transit systems at-grade or in mixed traffic is a **choice to guarantee deaths and injuries** from collisions, and to reduce service reliability, frequency, and speed. While construction costs may be lower, operation costs increase, and human lives also have inherent worth. **If Vision Zero is to be achieved, at-grade mass transit poses a major obstacle.**

Automation

One of the best ways to make a rail system *fast*, *frequent* and *reliable* is through automation. This technology, known as Automatic Train Operation (ATO) or Fully Automated Operation (FAO), is used around the world, notably on Vancouver's *SkyTrain* since the 1980s and on Montreal's REM. It is also used at a small scale in airports for "people movers." In Albuquerque, the proposal is for "automated light metro," emulating the Canadian systems. There is no train operator onboard, and trains are controlled through software and a central communication hub monitored by staff.

This technology achieves extraordinary safety and reliability. The International Association of Public Transport (UITP) estimates that automated metros enjoy **reliability rates between 99.1 and 99.9 percent.** UITP also estimates zero deaths have occurred on automated metros in the 35 years leading up to 2019. Definitions vary, but under BTS data, 7 deaths have occurred on automated guideway systems since 2007 (this includes airports and monorails). Zero deaths occurred at grade crossings, because FAO systems do not have them.

Automated light metro is also frequent, fast, and flexible. **UITP estimates headways can be just 60 to 90 seconds between trains.** Headways can be easily adjusted through software, making FAO a "turnkey system." When more trains are needed during peak hours or special events, demand can be met quickly. Vancouver's *SkyTrain* operates **headways as low as two minutes** during peak hours, and Montreal's **REM operates peak headways of three-and-a-half minutes.**

Operating costs are also reduced, as automation removes the need for dedicated train operators on every vehicle. UITP estimates automated light metro **costs 15 to 30 percent less to operate** than manual systems. Automation also saves energy, as trains can be run more efficiently with shorter dwell times, with savings as high as 15 percent, according to UITP.

Frequency

One of the major determinants of whether people will choose transit over driving is its time-competitiveness and convenience. *Frequency* is an essential component of competitiveness, and can make or break transit's *reliability*. **People should be able to arrive at stations without worrying when the next train will show up.** When headways are quick and predictable enough, transit becomes a mode travelers can rely on, increasing its attractiveness over driving. This represents part of the *push* and *pull* method of getting people to use public transportation. People are pulled to transit when they do not have to think twice about their trip time.

Unfortunately, Albuquerque's current system is not reliable. **The average headway across all 21 bus routes operated by ABQ RIDE is 40 minutes.** This is untenable for commuters, who will be significantly late to work if they miss even one bus on their route. It also makes the system very difficult to rely on for travel throughout the day. Trips must be meticulously planned to avoid long wait times when trying to go distances of only a few miles.

Poor reliability is not unique to Albuquerque or to buses. Denver's RTD light rail has headways as long as 30 minutes to 1 hour, making it just as difficult to rely on and encouraging driving. As MRMPO highlighted in its *Connections 2040* plan, many of Albuquerque's major arteries are severely congested and will remain so. This provides an opportunity for frequent mass transit to be an attractive alternative to sitting in traffic.

Station Location

Stations on transit networks can have large variations in ridership depending on their location and accessibility. **The most important basic consideration when designing a transit network is to locate stations and stops near places people want to go.** Restaurants, entertainment, hospitals, grocery stores, schools, universities, major employment centers, nightlife, and tourist attractions are just a few examples.

In the proposed map for Albuquerque's rail system, attempts were made to locate stations near these activity centers, as detailed under each line description on pages 7 to 10. **Locations included malls, high schools, hospitals, airports, event venues, universities, sports stadiums, and business districts.** Connections to other modes and to regional rail were also prioritized. These are, of course, based on anecdotal knowledge of where people tend to gather in Albuquerque from lived experience. More detailed planning may yield other prime locations for stations.

It is also important to consider where to ***avoid*** placing stations, and how to maximize land use around stations (under "Transit-Oriented Development" on page 23). As referenced in the description of the Yellow line on page 8, building transit in highway ROW may save construction costs, but sacrifices accessibility and rider comfort. Denver's RTD light rail offers an example.

Several of RTD's lines follow highway alignments, including the E, H, and R lines. Southmoor Station is located beside I-25, and **only accessible via a pedestrian underpass beneath 10 lanes of highway traffic**, placing the entrance nearly 200 feet away from the platform. This is despite the neighborhood of single family homes directly adjacent to the station, which is inaccessible from the platform.

Nine Mile Station is located in the median of Highway 225 and sits between six lanes of traffic, also only accessible via pedestrian underpass. **There are no buildings within at least 1,000 feet of the station,** and the highway was widened when the rail line was built.

Sacrificing valuable catchment areas around stations to car infrastructure guarantees lower ridership. After all, why should one take the train if there is nothing there once you arrive? This is also true of stations with excessive park-n-ride infrastructure, a problem visible on RTD. Every station except one on the E and H lines is built as a park-n-ride, with over 6,600 parking spaces. Valuable land adjacent to stations is given to cars, which encourages driving.

Transit-Oriented Development

The World Bank defines transit-oriented development (TOD) as:

> **"...a planning and design strategy that consists in promoting urban development that is compact, mixed-use, pedestrian- and bicycle-friendly, and closely integrated with mass transit by clustering jobs, housing, services, and amenities around public transport stations."**

Along with station location, TOD can ensure that ridership on public transit is boosted through placemaking - building neighborhoods and nodes of activity around stations will encourage their usefulness as places people want to go.

MRMPO's questionnaires yield illuminating answers about residents' attitudes toward housing. **70 percent of respondents desired to live in an urban area or semi-urban area.** Just 11.9 percent desired to live in a suburban area (Figure 10). According to MRMPO:

> **"Twice as many people desire to live in an urban environment than already do...Far fewer people desire to live in a suburban area than currently do." (p 66)**

This result was true across age groups, and desire to live in urban areas is replicated by other surveys cited by MRMPO.

> **"…residents and homebuyers across different age groups desire walkable, mixed-use neighborhoods with access to jobs and entertainment, even in rural and suburban areas where people enjoy small town centers." (p 66)**

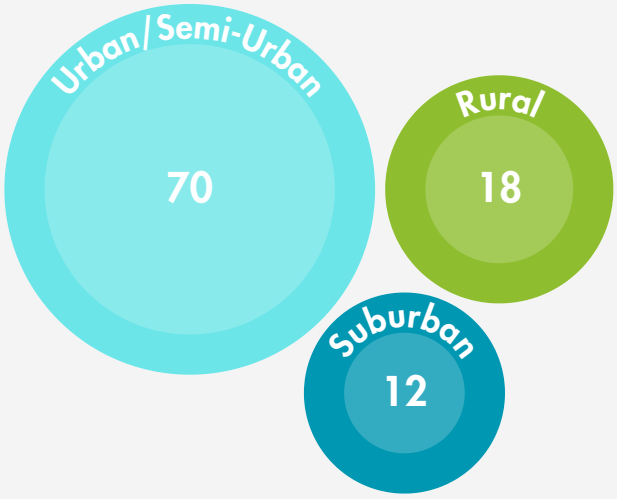


Figure 10: Desired Housing Location (Percent), 2018
Data: MRMPO 2040 Connections Questionnaire

Connections 2040 also explores the problem of unequal job growth on the east and west sides of the Rio Grande. The overrepresentation of housing compared to job opportunities on the West Side contributes to long commutes across the river and worsening congestion. More job development on the West Side is one solution suggested by MRMPO, providing another opportunity for densification around rail stations.

RMRTD also encourages TOD in its *Long Term Strategic Vision.* The plan points out the problematic growth patterns of post-war development in Albuquerque, as the city covers more and more land area:

> **"The cost of providing transportation services becomes increasingly expensive, as vehicles must travel greater distances to serve more sparsely populated areas, away from the city core." (p 24)**

RMRTD's third "Core Theme" is "Strong Transit-Centered Communities," and supporting TOD is one of its "Key Strategies." The success of ART in promoting TOD along Central is also noted by RMRTD.

On the network map for Albuquerque's rail system, **295 sites were identified for potential TOD in areas immediately adjacent to proposed stations and in downtown.** These lots are either empty land, from the most recent satellite imagery available, or current parking lots. While not all of the outlined sites are likely capable of being developed, **a significant percentage of Albuquerque's land is being underutilized,** and should not be overtaken by further single-family development or parking expansions.

Road, Bike, and Bus Design

A new rail system (and new transit mode) provides many opportunities to rethink how Albuquerque's major thoroughfares are designed. It also provides the opportunity to ensure maximum connectivity to every station through bus and bike connections.

Albuquerque's Vision Zero Action Plan outlines key goals for achieving zero traffic deaths by 2040. These include increasing "opportunities for people throughout the city to safely walk, ride a bicycle, use mobility devices, and take transit" (p 5). The goals also include reducing posted speeds and using design principles that promote safety and slower speeds "when designing, building, and reconstructing roads."

The City rightly laments the 66 pedestrians killed by cars in 2022, and affirms that **"all traffic deaths or life-changing injuries in Albuquerque are unacceptable"** (p 4).

However, some decisions are setting Vision Zero back rather than advancing it. **One recently announced project at Paseo del Norte and Unser Boulevard doubles the width of both roads from two lanes to four,** and adds two turn lanes in each direction at their intersection.

While a "multi-use pedestrian and bike trail" is included in the plan, **pedestrians and cyclists will have to cross a 120-foot wide intersection and six lanes of traffic to use it.** Albuquerque's Vision Zero Update says the following:

> **"Roadway redesigns are needed for a true reduction in motorists' speeds. Changing the posted speeds of roads is not an effective strategy to achieve safe speeds if the road is designed for faster speeds." (p 11)**

And:

> **"Wide and fast arterial roads remain as major barriers that limit people's ability to safely and comfortably navigate the city." (p 13)**

Regardless, the City has chosen to widen the road for the sake of increasing vehicle throughput and speed. **This project is the exact opposite of what Vision Zero requires.**

Still, there are areas where Albuquerque is improving, like by expanding its bike infrastructure, for which it recently solicited input. Good bike infrastructure can have a supercharging effect on the reach of transit stations. **A station reaches many more people when it is accessible by bike.**

For example, the Yellow Line's Uptown station reaches about 2,217 residents within half a mile (about a ten minute walk). However, **when that area expands to 1.5 miles** (a ten minute bike ride), **the station reaches 43,641 residents - an increase of more than 19 times.**

The Alvarado Transportation Center, where several lines meet, reaches about 5,716 residents within 0.5 miles, but **37,532 residents within 1.5 miles** - an increase of more than 6 times. The Wyoming/Montgomery Crossing station reaches 3,784 residents within 0.5 miles and **47,284 residents within 1.5 miles** - **an increase of more than 12 times.**

Encouraging cycling with protected bike lanes, bike storage at stations and onboard, new bike sharing programs, and other cycling infrastructure could greatly expand the reach of the rail network for tens of thousands of Burqueños.

Beyond bikes, **Albuquerque's bus service has a significant role to play in maximizing the effectiveness of mass transit, and especially a new rail network.** The City is currently undertaking its *ABQ RIDE Forward* plan to alter ABQ RIDE routes.

Changes to bus routes provide an opportunity to solicit feedback from riders (and non-riders) about how service can be improved. **The proposed service changes will not increase the budget for transit in Albuquerque,** creating trade-offs between coverage and ridership.

The results of the surveys and focus groups conducted for network redesigns are illuminating. Respondents across the board are in favor of more frequent service and greater service hours. They are in favor of more coverage on the West Side and in more capital investments for buses, bikes, and pedestrian infrastructure. When presented with a choice between ridership and coverage, respondents expressed the following:

> **"Numerous people also expressed, in all settings, that the choice between these two positive outcomes should not have to be so stark. In various ways, they argued that if it is not possible to both offer useful frequencies and cover most neighborhoods, then there is not enough service available to meet the City's minimal goals for transit." (p 3)**

The City expresses that high ridership and coverage are "impossible in a budget-neutral redesign." **Why, then, is the redesign required to be budget-neutral?** Such a requirement is at-odds with ridership goals, **the desire expressed by thousands of survey respondents for more transit,** the City's climate pledges, and efforts to reduce congestion.

Taking the bus has a chance to be a hugely beneficial service in Albuquerque, especially with a new rail system in place. The bus can reach places, people, and neighborhoods that a rail system cannot on its own. **Restructuring bus networks to feed into rail stations, expanding service hours and frequency, and having excellent coverage are all possible** if the City is willing to stop rationing and invest in the network.

Ridership

Even after the fraught leadup to ART entering service, the new line more than doubled the ridership of the previous bus service in its first month of operation. **ART now accounts for 49 percent of ridership on the entire ABQ RIDE system, according to NTD.** This contrast is stark - one BRT line is receiving as much ridership as the rest of the city combined. **All available evidence suggests a significant and under-served appetite for transit in Albuquerque.**

Interviews with riders reflect the sentiment expressed in surveys and focus groups. The *Albuquerque Journal* asked riders how they felt about service cuts in late 2023:

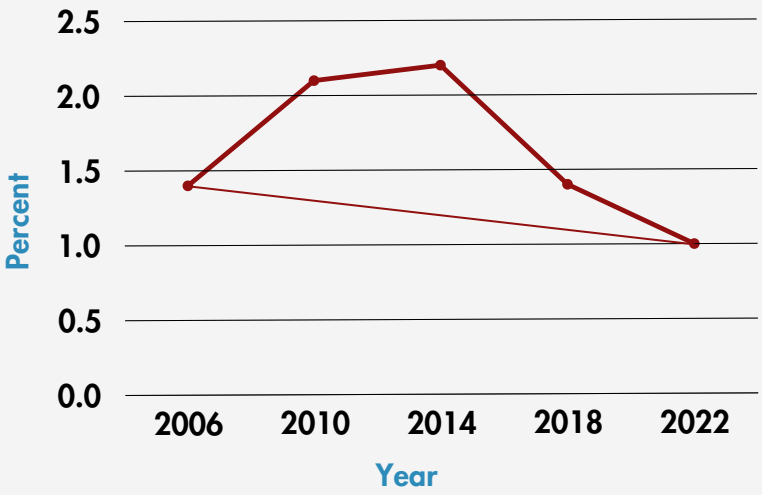
> **"Atlas Hardage…said he anticipates already-packed buses will become more crowded after the changes."**
>
> **"To get to the bank by noon, [Jason] Lolis said, he has to leave three hours early."**

The *Journal* notes that riders believe bus drivers should receive pay increases and better working hours. The City recently touted raising starting wages to $17.65 per hour, or **$36,712 annually if working full time.**

Six years ago, MRMPO adopted the goal of 20 percent transit mode share on major corridors by 2040. Since then, the transit department's budget has seen a net increase of just $6.4 million. **The share of commuters in the metro area who take transit has fallen by 29 percent since 2018.** The pandemic can take some, but not all, blame for this decrease. The City is struggling to fill positions for its *current* fleet, notwithstanding any future expansions of service it must make if it wants to meet its own goals.

Removing the effect of the pandemic, **transit's share of daily commutes in 2018 was the same as it was in 2006 - 1.4 percent.** In the 16 years between 2006 and 2022, transit's share of daily commutes **fell by 29 percent.** This poses serious challenges if MRMPO wants to meet its 20 percent mode share on major corridors in the *next* 16 years heading into 2040. What is clear is that investment in Albuquerque's transit must increase substantially and in real terms. There is no other way to meet MRMPO's goal, or to grow the use and reliability of transit in Albuquerque.

Figure 11: Transit Commute Mode Share (Percent)



Data: American Community Survey 1 Year Estimates, ABQ MSA

That goal provides a helpful window to estimate ridership on a new rail system for Albuquerque. Expanding MRMPO's 20 percent mode share to all weekday commutes will be the standard used for this estimate. While it may seem idealistic, **reducing driving as a commute mode by 20 percent should be a minimum the City strives for if it plans on addressing climate change.**

Transportation is the largest producer of CO2 emissions in the United States, accounting for **1.8 billion metric tons of carbon in 2022,** according to the U.S. Energy Information Administration (EIA). It is a sector ripe for decarbonization, and electric rail transit is one of the least carbon-intensive modes of travel available.

Using data from the American Community Survey, the share of workers who commuted by driving alone in 2022 in the Albuquerque metro area was 313,951. Taking 20 percent of this number and shifting it to the new rail mode, **a rough estimate of annual ridership would be 30.1 million unlinked passenger trips (UPT).** This reflects expanding the 20 percent mode share goal adopted by MRMPO in 2018 to the entire metro.

There are several important mathematical notes. First, this reflects a 20 percent transit mode share using *current data*. The population of the metro area will likely be higher in 2040 than it is today, surpassing one million. This mode share also applies to all transit, rather than just an estimate of rail ridership. MRMPO would be aiming for 30.1 million UPT annually regardless, if its goal is to be met metro-wide.

This percentage and UPT also only reflects commuters. **It does not account for weekend travel, students, retirees, visitors, or other groups.** This fact implies that annual UPT could or should be higher than 30.1 million. For comparison, **ABQ RIDE recorded 13 million UPT in 2012**, the highest ridership year shown in NTD's data. This is just under half of the estimated 30.1 million UPT from commuting alone.

By comparison, Salt Lake's TRAX at-grade light rail system achieved 9.1 million UPT in 2022, and Denver's RTD light rail achieved 10.8 million UPT. Both of these systems run slower, less frequent, and more poorly designed networks than the one proposed for Albuquerque. Denver also has no intercity commuter rail system.

Skyline (HART) in Honolulu

There is one other comparable automated light metro project under construction in the United States today: Honolulu's HART, or *Skyline*, which opened its initial segment for service in mid-2023. Like the REM and the proposed rail network for Albuquerque, HART runs on mostly elevated guideways with totally automated vehicles. Headways are expected to be short at around 5 minutes. **This is where the similarities end.** HART has suffered a series of delays and cost overruns that have pushed the budget to over $12 billion and a full opening date to 2031. At a total network length of just 20 miles, this amounts to $622 million per-mile - an astronomically high number. **By comparison, the REM is forecast to cost $140 million per-mile.**

Noelle Fuji-Oride investigates the reasons for HART's problems in a 2021 report for *Hawaii Business Magazine*. The rail line suffered many of the same pitfalls as other American transit projects laid out by Chitti et al. Fuji-Oride cites "**fiscal waste and poor management,**" "**a lawsuit over the project not completing an archaeological study,**" construction costs in Hawaii, "**contract administration and execution inefficiencies,**" "**cost to relocate utilities,**" and large budget contingencies.

Almost all of these issues are cited by Chitti et al. as problems common to transit projects in the United States. Lack of agency coordination, oversized contingencies, lump-sum contracts, and rushed planning are all directly cited in the *Transit Costs Project*.

A 2019 report from Hawai'i's State Auditor provides greater detail. Delays and change orders were cited as major sources of cost increases as Honolulu and HART awarded contracts too early in the planning process, another mistake warned against by Chitti et al. **Premature contracts and the resultant delays added $354 million to project costs by 2017,** per the audit.

Lack of coordination between agencies led costs for moving utilities to reach $391 million by 2017. A lawsuit that halted construction to complete an archaeological study caused a year of delay. Chitti et al. did not profile HART in the *Transit Costs Project*, but their warnings are almost parallel to the findings of the audit:

> **"...it is critical to avoid rushing the design and spend time on the riskiest elements, such as seismology in earthquake-prone areas, archeology [sic], utilities, and difficult third parties…" (p 27)**

In addition to coordination problems, HART suffered from a lack of transparency, especially as costs began to increase and complexities mounted. According to the audit:

> **"...internal alarms of rising project costs and schedule delays were not shared in a timely manner by HART management with the Board, the Legislature, or the public." (p 26)**

And:

> **"HART's public disclosures of cost and schedule changes did not reflect internal projections of rising costs and delays." (p 28)**

Again, HART committed a cardinal sin which was outlined by the *Transit Costs Project*. Chitti et al. stress that "formal and informal transparency is critical" (p 26) and that "information concerning infrastructure maps, blueprints, itemized costs, and public contracts [should be] available to the public, in easily readable forms" (p 37).

HART represents an almost perfect example of exactly what *not* to do when constructing a major transit network. Nearly every mistake made in Honolulu is well documented in transit circles for scuttling other rail projects. Despite its incredible cost overruns, the system is up and running as of 2023, 12 years after breaking ground in 2011. **Comparably, the REM was first conceived in 2016, then planned, approved, and constructed - also opening in 2023.**

Why Rapid Rail?

A logical question in light of all available evidence is why rapid rail is the answer, as opposed to increased bus service and bus rapid transit. After all, buses are flexible, require less initial capital spending and construction, and are something Albuquerque has already. This is true, but does not take into account key factors, including capacity, operating costs, and sprawl.

There is no better way to move many people *fast* than with rapid rail. As an example, during peak periods on the REM, one train can move 600 passengers. The maximum capacity New Flyer lists for their 60-foot articulated bus is 123 passengers. **At two minute headways, a rapid bus in the style of ART could move 3,690 people per hour, and a rapid rail line could move 18,000.** At ART's current peak headway of around 8 minutes, bus capacity drops to 923 people per hour - 20 times less than an automated rail line. The National Association of City Transportation Officials visualizes capacity differences by transport mode in Figure 12.

To move about 22,000 people per-hour (about 20 percent of hourly drivers from 6:00 AM to 9:00 AM), 180 articulated 60-foot buses would be required, **if each bus is at maximum capacity.** Assuming one bus can complete its route twice an hour, 90 buses would be required - triple the current ART fleet. Spreading these buses evenly across MRMPO's 12 "Priority Network" corridors, frequencies of 7 to 8 minutes are the required bare minimum. Not all 12 routes identified will be BRT, however, necessitating more vehicles.

Figure 12: Capacity per Hour by Mode

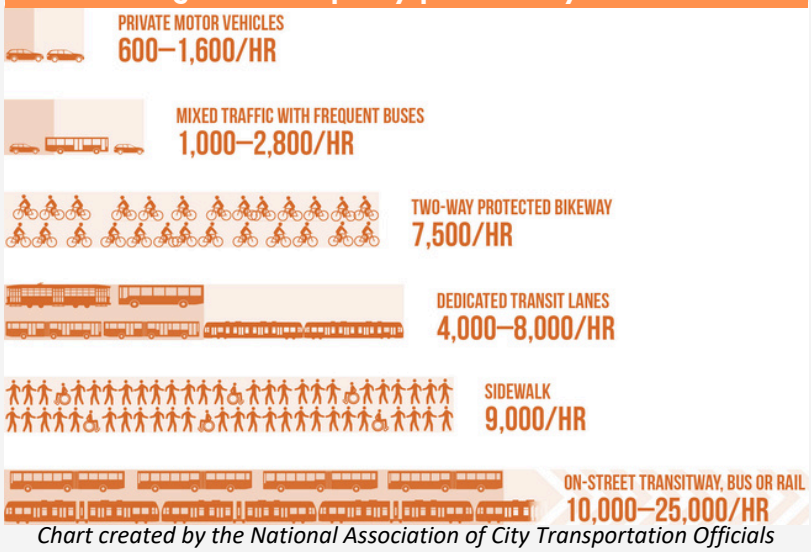


Chart created by the National Association of City Transportation Officials

Even if ABQ RIDE wants to achieve this goal, its most recent proposal to ration existing service suggests it will not be met. Note that these numbers are for *current* population, which will be higher in 2040. Current average headways on ABQ RIDE are 40 minutes. **Put simply, there is a very long way to go if 20 percent mode share is to be achieved with buses alone.**

Operating costs are another important factor. MRMPO's modeled network of 233 vehicles in 2040 can be the example. Using the $109 million annual operating cost calculated under "Limited Budget, Limited Capacity," this network costs $3.3 billion to operate over 30 years. Factoring in the average 12-year lifespan of a bus, replacement costs add another $513 million (though this can be offset with federal subsidies). MRMPO states:

> **"Labor, fuel, maintenance, vehicle replacement and administration are the primary determinants of a transit system's on-going expenses, and, over the long term, can outweigh the capital investments required to introduce new services." (p 167)**

This is another advantage of the automated light metro proposed for Albuquerque. Not only are fuel costs lower from dedicated electrification, but the lack of train operators means labor costs are freed up for other parts of the transit network. Additionally, a rapid rail network is inherently designed to encourage densification. MRMPO also points to the advantages of TOD:

> **"These types of communities can reduce driving by residents up to 85 percent. Allowing dense, mixed use development around transit stations increases the number of potential transit riders as well as destinations that can be easily reached using transit." (p 163)**

It is also important to note that other modes, including buses, rely on car-centered infrastructure, encouraging the same sprawling built environment that Albuquerque cannot afford to maintain, as both MRMPO and RMRTD warn. MRMPO points out the "lifecycle costs" of such projects:

> **"With every roadway expansion project, miles are added to our regional inventory; miles that need to be maintained over time." (p 75)**

RMRTD states:

> **"Constrained local government budgets cannot meet future road and bridge infrastructure needs… Transit can facilitate reduced infrastructure and service costs for local governments." (p 35)**

And:

> **"More compact development patterns are typically more cost-effective to serve than sprawling development patterns." (p 35)**

ABQ RIDE is currently facing this dilemma as it tries to balance between covering as much of Albuquerque as possible, or prioritizing ridership. Riders and potential riders have diverging opinions about which approach to take, and without more funding, ABQ RIDE cannot do both. Reining in sprawl has benefits not just for trip times and for quality of life, but also protects New Mexico's rural communities and natural landscapes from encroachment by ever-expanding suburbs and highways.

There is also a growing hope that electric cars and autonomous vehicles will solve the problem of safety and emissions we face today. **Unfortunately, electric and autonomous cars are still cars, and require all the same infrastructure as fossil fuel vehicles. The goal is not to have a city designed for cars, but one designed around people and their lives.** Fully autonomous vehicles (AVs), which are mentioned by MRMPO as "perhaps the most revolutionary" of transportation options (p 72), are a technology that still does not exist.

AVs have yet to see success on public roads. California recently forced AV company Cruise (which is owned by General Motors) to pull its cars from San Francisco streets after they blocked roads and hit pedestrians. GM announced they will "substantially lower spending" on Cruise in 2024, according to the *New York Times*. Waymo, a competing driverless service, announced three rounds of layoffs in 2023 alone. Tesla is under investigation by the Justice Department after its Autopilot and Full Self-Driving systems caused 17 deaths. **Waiting for AV technology to mature could take years, and timelines for its widespread adoption continue to lengthen.**

Regardless, EVs and AVs will doubtlessly be part of the transport fabric in the future. **Waiting for them to save the day, however, is unwise - especially at the expense of proven technologies** that can and do move many more people while using far less space and resources, and costing their users far less money. It is essential that Albuquerque, like all cities large and small, begin a serious effort to rethink how it moves people from place to place.

The Helsinki Model

A city need not be large to have efficient and effective public transit, cycling infrastructure, or walkability. Helsinki, Finland's capital city, has just 670,000 people in a total urban area of 1.2 million. Yet, it tops the ranking of the 2023 Urban Mobility Readiness Index, a joint venture between U.C. Berkeley and the Oliver Wyman Forum. It ranked higher than large cities known for their transit, including London (11th) and New York (12th). **The report cites the importance of "simple essentials" like cycling lanes, traffic control, and trains.** These basics matter more to the ranking than "technologies still in development," like AVs.

Helsinki was rated best for its comprehensive public transit system and mobility options beyond driving, according to report authors Guillaume Thibault et al:

> **"The Finnish capital boasts car-free zones, large investments in EV charging infrastructure, advanced cycling infrastructure, and an expanding public transit network with new light rail and tram projects."**

Helsinki, of course, enjoys much greater density than Albuquerque (8,129/sq mi versus 3,015/sq mi in the city proper). However, this density is just as likely to be a result of the city's focus on urban mobility as it is to make such mobility more practical. Densification and better walkability can be created and encouraged, just the same as sprawl can be created and encouraged. Dallas, which ranked 46th out of 65 cities studied, has many of the same mobility challenges as Albuquerque. Thibault et al explain:

> **"An emphasis on car infrastructure, a sprawling area, and a lack of car-free zones and bike paths leave residents discouraged from walking or cycling." (p 108)**

Dallas has sprawled to such an extent that the urban area covers 1,781 square miles. Albuquerque covers an urbanized area of 252 square miles. Our ability to subsidize sprawl is limited not only by funding, but by geography. The city is bound by Sandia Pueblo to the north, Isleta Pueblo to the south, the Sandia mountains to the east, and the petroglyphs to the west. Still, **suburbia has begun its encroachment into ancient areas** in Petroglyph National Monument. **This kind of sprawl will be untenable** for maintaining sacred sites and our environment. Albuquerque's growth must change course.

Conclusion

A proposal like this one would radically change the way Albuquerque looks and moves, and that is the point. Cities change and grow, and the world's population is trending ever more urban. If we care to be prepared for the future, then steps need to be taken now. Albuquerque's transit department's mission statement is:

> **"To Be The First Choice in Transportation Services for the Albuquerque Metropolitan Area."**

Their service strategy is to **"provide effective, affordable, and diverse intermodal transportation alternatives to the single occupant vehicle."** These are encouraging sentiments, but the reality of where ABQ RIDE is today is very far away from this goal. **Only through a total reimagining of what transit in Albuquerque should look like can such a goal be realized.**

In this proposal, that reimagining is a new, fast, frequent, and reliable rapid rail system modeled off of the best worldwide practices. To investigate if it would really be possible, one of the first steps is to engage local leaders to act as champions for an approach to CDPQ, who are in the business of making such projects a reality in a way that creates long-term benefits for the public sector.

It is clear what to do and what *not* to do when undertaking these projects. There are mountains of evidence and decades of examples from other projects to inform our decision making. Building a new transit mode for Albuquerque while protecting taxpayer dollars and gaining returns on our investment is a new possibility, thanks to innovative funding models that have emerged in the past decade.

Projects like the REM and HART, cities like Denver and Salt Lake, and illustrative studies from our own professionals all act to inform what should be done. Reports from students and auditors and institutes and industry groups provide countless resources highlighting best practices. **Reforming our transportation system is not a choice.** It is absolutely essential if Albuquerque is to be prepared for a future beset by climate change, population growth, and a clamor for better livability in our cities, large and small.

Groups like RMRTD, MRMPO, and MRCOG all understand core transportation fundamentals, yet for decades these groups have been constrained to working inside a framework where car travel is paramount. With their inherent expertise, transportation professionals in the mid-region have a chance to change that framework and seriously consider bold, new ideas. **Projects are uplifted by their champions,** from civil servants to politicians to the public. With the right partnerships, planning, and implementation, rapid rail could truly be realized, and would change the lives of countless Burqueños and people across New Mexico.

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