



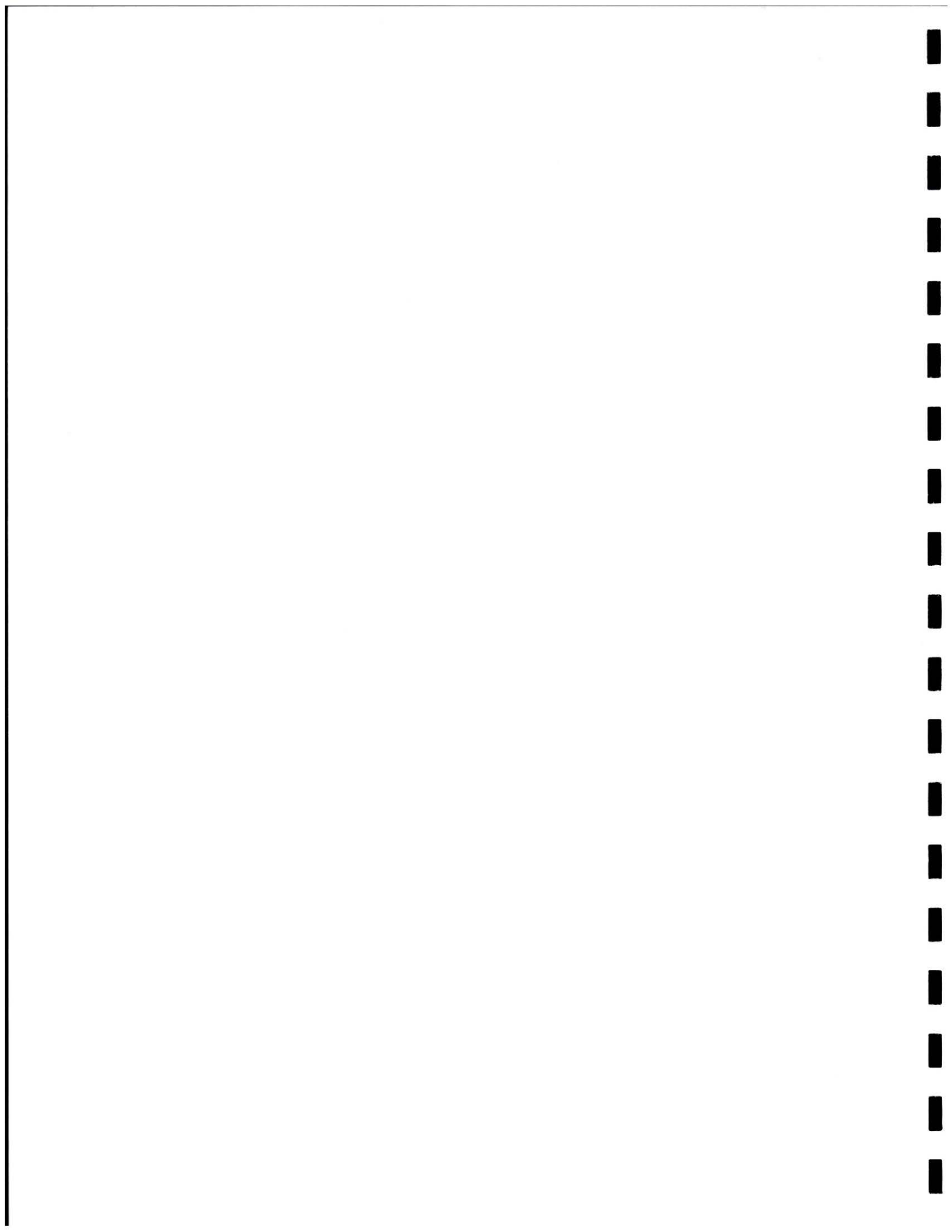
The Case for a New Rail Vision



Stewart Chesler

LA Metro

August 23, 2023



The Case for a New Rail Vision
By Stewart Chesler, Metro Service Development – August 2023

INTRODUCTION

The time has come to create a new Vision for Metro’s Rail System. The current vision is dated and starting to break down given the changing travel patterns of Los Angeles, deficiencies in the current system, challenges facing many current projects in development, and resource constraints. Our rail system needs to be flexible, affordable, and resilient. A new rail vision will make this possible by allowing us to reassess current and future trends; address ongoing issues and constraints; and better integrate and execute existing plans. *In essence, what we need is a Rail NextGen!*

Possible rail system vision improvements and project changes include:

- Upgrade the Arcadia Substation, enabling the option to run five-minute service on both A and E Lines, especially during the Los Angeles 2028 Olympics.
- Add rail interlocks between Union Station and Pasadena along the A Line. This would enable rail service to recover more quickly in case of service disruption and allow this rail section to conform to 10-minute frequency single tracking design guidelines per the Metro Design Criteria.
- Add a rail siding between Degnan and 7th Ave along E Line. This would enable Game Time trippers along the E Line.
- Implement core capacity improvements in Washington and Flower corridors in downtown Los Angeles.
 - Expand the Flower St Junction throughput capacity by either installing a faster switch or grade separating the junction
 - Eliminate street crossings by closing selected minor streets
 - Give more traffic signal timing priority for train service
 - Add another platform for Pico Station
- Re-envision the East San Fernando Valley rail service:
 - Convert the project to tram service and terminate the north end at Pacoima **or**
 - Use low-floor vehicles and eliminate two stations
 - Consider using “off-wire” rail cars
- Truncate the A Line in the San Gabriel Valley at Pomona.
- Reconsider at-grade rail service for either Whittier or Beverly Bl for Eastside Phase II
- Re-envision West Santa Ana Branch (WSAB) rail service:
 - Multiple Unit Service (Battery Electric or Hydrogen Fuel Cell) via WSAB right-of-way (ROW), San Pedro Rail Subdivision ROW, LOSSAN¹ corridor (aka West Bank), Link USA project to Union Station **or**
 - Extend the WSAB Line from Slauson Station to Union Station via Long Beach Bl rail ROW, east on the Harbor Subdivision, north on the LOSSAN corridor (aka West Bank), Link USA project to Union Station **or**
 - Run S-Bahn service between Union and Slauson Stations via the same ROW above using multiple unit service and then have patrons transfer to and from the WSAB Phase I at Slauson Station.
 - Consider using “Off-Wire” rail cars at least along a portion of the route.

¹ Los Angeles – San Diego – San Luis Obispo Rail Corridor

- Convert the Crenshaw North extension to tram service along La Brea Av between Wilshire Bl and Hollywood or as a loop between La Brea Av, Hollywood Bl, Fairfax Av, and Pico Bl.

These ideas are very preliminary. Some of these are being evaluated now by different departments in Metro while others require much further study. A discussion of these ideas is provided in the **Appendix (pg. 12)**.

Why a New Vision?

Metro’s current rail vision and planning dates to the passage of Proposition A in 1980. Metro has been operating rail service since the opening of the Blue (now A) Line in July 1990. Over the last 32 years, the system has grown to four light rail lines, two heavy rail lines with seven projects under construction,² and even more under development. Like with anything else, nothing is ever truly static. Issues are impacting our rail system and future development in profound ways.

Shifting Travel Patterns and Changing Urban Structure

Travel patterns are shifting due to the COVID-19 pandemic and the changing urban structure of Los Angeles. Rail ridership is still down 41% on weekdays, 29% on Saturdays, and 25% on Sundays³ from the beginning of the COVID-19 pandemic in February 2020. This is probably due to three reasons. First, many office workers are either working hybrid work weeks or working at home. This is exclusively evident from the fact that citywide office building vacancy is 21%⁴, downtown Los Angeles office vacancy is 28%⁵ and weekday office building use is down 40%⁶ compared to pre-COVID conditions. Meanwhile, all paid work-from-home trips have leveled off at 30% compared to 5% before COVID.⁷ The fact that rail ridership is down to a much lesser extent on weekends is more indicative of this. While the story on this is still being written, the Southern California Association of Governments (SCAG) believes that working from home will stabilize at 22% in 2024 and then gradually increase to 25% by 2050.⁸ At the same time, non-work travel during the day has increased due to the greater ability of people working from home to run errands, attend medical appointments, etc.

Second, the cost and lack of housing and low-rent business space push lower-income people and businesses out of the urban core to outlying communities like Fontana. Lower-income people are still the foundation for transit demand including rail service and their market shrinkage impacts core demand. This trend has been taking place since 2012⁹. Third, Los Angeles lost two percent¹⁰ of its population in 2021 possibly due to a combination of these two factors mentioned above. Lastly, rail ridership is also being hurt due to the increase in crime, homelessness, and lack of cleanliness. Addressing these issues first is paramount before we can expect more choice riders to come back. Fortunately, these concerns are starting to abate with the support of Metro’s Homelessness Program, Metro Ambassador Program, new

² K Line Segment D, Airport Metro Connection Station, Foothill Extension to Pomona, Division 20 expansion and turnback and D Line Extensions 1, 2 and 3.

³ Based on average weekday ridership as of May 2023.

⁴ Barbara Murray, [commercialsearch.com](https://www.commercialsearch.com), May 27, 2022.

⁵ Ibid.

⁶ Los Angeles Times, June 11, 2023.

⁷ Working From Research Project, November 2022.

⁸ Work from Home Data Analysis and Baseline Projection, Hsi-Hwa Hu, SCAG, April 2023.

⁹ Los Angeles Times and conversations with UCLA urban planning professors.

¹⁰ American Community Survey

security protocols, and cleaning efforts. **In summary, travel patterns and the urban structure have changed significantly and will remain so into the foreseeable future.**

Limited Resources

It has always been a challenge to retain enough resources to properly operate and maintain Metro's burgeoning rail system. Much of this is because project planning and funding initiatives tend to underestimate the operating and maintenance costs while ignoring long-term life cycle costs. While funding initiatives contain operation and maintenance (O&M) funds, they are often inadequate and cause the problem to grow as the system ages and grows larger over time. This issue has become more poignant during the last few years due to increasing homelessness, security costs, additional cleaning, and other expenses due to the COVID-19 pandemic.

Finally, there are funding challenges to build many of the future rail projects Metro and others committed to. These include the East San Fernando Valley (ESFV), West Santa Ana Branch (WSAB), Eastside Phase 2, and the Montclair Extension. There are many reasons for this including unanticipated costs and requirements and unusually high construction inflation. Significant steps are being taken to address some of this like advance utility relocation for the East San Fernando Valley Line, pursuing the P3 project delivery for the West Santa Ana Branch and the progressive design-build delivery for the East San Fernando Valley Line, the Early Intervention Team (EIT) Process, but these measures are not enough. Perhaps the answer lies in revisiting the scope of these projects.

Lack of Clarity Due to Related but Overlapping Guiding Agency Documents

Currently, Metro maintains no less than eight documents relating to the planning, design, and operation of Metro's rail system. While they are related and overlap each other, their authors do not necessarily coordinate, or better yet, collaborate with each other. These include:

- Metro Rail Design Criteria from Program Management
- Project Management Plan from Program Management
- Long- and Short- Range Transportation Plans from Countywide Planning
- Vision 28 from the Office of Extraordinary Innovation
- Transit Service Policy from Operations
- Rail Fleet Management Plan from Operations
- Customer Service Plan from the Office of Customer Service
- Three Year Financial Plans from the Office of Management and Budget

This is problematic in several ways. First, it creates confusion if there are differences or even conflicts between one or more documents. Take for example the operating standards contained in Transit Service and Metro Rail Design Criteria. For years they were different service standards until Metro's Operation Liaison section was able to rewrite Chapter 10, the Operations Chapter in the Metro Rail Design Criteria to refer to the Transit Service Policy for guidance in 2019.

Then because there are so many different documents, each department tends to focus on just the document they produce while often not being aware of the other requirements and goals stated in the other departmental documents. This often leads to project suboptimization and missteps during project development and construction. Sometimes, these issues can be rectified towards the end of the project.

However, in other situations, the resolution must wait until after construction. When this happens, it is often at great expense for Metro, usually to the operating budget, for example, the traction power substations provided to the Pasadena portion of the A Line.

Not only do these documents often not refer to each other, but they also do not adequately relate the importance of each department's role in the development and implementation of each rail project and system in totality. Taken as a whole, these important plans need to be better coordinated to provide a cohesive, integrated narrative and vision.

The Existing Vision

The existing vision consists of a set of loosely connected lines with downtown Los Angeles as its primary focus, dating back to the passage of Proposition A in 1980. **Lines are planned on a project-by-project basis.** As a result:

- Minimal consideration of the bigger picture and integration of the rest of the transit system is given.
- Long-term life cycle costs and operating requirements are not considered carefully since they are not well understood.
- Project capital costs often exceed the initial funding made available.
- Current vision lacks a compelling narrative and clear expectations.

Opportunities

While Metro is facing challenges with its rail system, there are good opportunities Metro can take advantage of now towards creating a new vision. These include correcting past missteps, LA28 Olympics, Rail Integration Plan, Short Range Transportation Plan, and building on the legacy of the NextGen Bus Plan.

Past Missteps

As mentioned earlier, missteps were made in developing Metro's rail system. Notable ones include under-designing the Arcadia traction power substation and the train throughput capacity of the Flower St Junction. Together they prevent the ability to run five-minute service of both the A and E Lines which could be needed for the LA28 Olympics and in the future.¹¹ Meanwhile, the two-car train limitation and lack of power traction substations on the C and K Lines will limit Metro's ability to accommodate future demand with the addition of Crenshaw North.¹² Design decisions such as these have limiting implications on future service levels, resulting in retrofits addressed being far more expensive than the initial construction cost would have been. Creating a new Vision presents a unique opportunity to correct missteps such as these and prevent future ones.

¹¹ Efforts to address these efficiencies now being explored by Jacobs Engineering for possible LA28 Olympics funding and implementation.

¹² Recently Metro obtained State grant funds for expanding remaining C Line Stations to accommodate three car trains and adding back in the two traction power substations that were valued engineered from the Crenshaw Rail Extension Project. Unfortunately, this grant does not include funds to fill in missing traction substation while upgrading the existing ones which are also essential.

LA28 Olympics

As the LA28 Olympics approaches, significant funds will become available from State and Federal resources to improve transportation, particularly rail transit service. These funds can be used to pay for badly needed upgrades and projects that will increase the capacity, flexibility, and resiliency for both Olympic-related demand and the future in general. Projects best suited for these funds are those that can be built prior to the Olympics without being too expensive such as rail sidings, interlocks, platform extensions, traction power substation upgrades, and station improvements. These projects tend to be logistical in nature and would add significant flexibility and resilience to existing services. Metro has already put together an initial list which is being evaluated by Jacobs Engineering. Since both the International Olympic Committee and the LA28 Olympic are relying on Metro's rail system to be the backbone of Olympics events access, all eyes will be on Metro's rail service. So, it is important to take full advantage of this opportunity.

Rail Integration Plan

Countywide Planning is currently developing a plan to better integrate three Metrolink Stations with the rest of Metro's transit system with a state grant. These include Van Nuys, Downtown Burbank, and Norwalk Stations. One of the items being considered is extending C Line to the Norwalk Metrolink Station.¹³ The Rail Vision Plan should expand on this work to better reflect the potential to coordinate these two different and complementary rail systems especially since the consultants are already in place to assist.¹⁴

Short-Range Transportation Plan

Countywide Planning is also undergoing an update to the Short-Range Transportation Plan. This plan will be used to help further develop and implement the first decade of the current Long Range Transportation Plan. More importantly, the information contained in this plan is used to update the five-year Regional Transportation Improvements Plan critical for making projects eligible for State and Federal Funds. **An updated Rail Vision Plan would be an extraordinarily valuable building block to support this update effort and consequently, the next Long Range Transportation Plan update.**

NextGen Bus Study

The NextGen Bus Study used new and innovative data, tools, and analytics for market analysis and redesigning the bus network, particularly with the resource constraints on hand. One example is the transit propensity index used for accessing a given area's potential for using transit. Another is making use of cell phone data in conjunction with TAP transit data for analyzing existing and near-term travel patterns and congested corridors. Lastly is the community engagement process used for the effort. Creating a new rail vision can take advantage of these tools, data, techniques, and lessons learned while building off the success of a reimagined bus system.

¹³ Measure M calls for this project to open in 2052.

¹⁴ Currently, the same consultant team is redoing the rail vision and long-range plan for Philadelphia's Commuter Rail System.

Metro's Lessons-Learned Program

Six years ago, Metro initiated a lessons-learned program. The program allows Metro to learn from past successes as well as mistakes and from best practices from other transit agencies. This type of process can be an important input to a new rail vision. It could help enhance while improving procedures for implementation, periodic reassessment, and fostering cross-agency collaboration. A list of lessons learned regarding Metro's Rail Vision and implementation is listed at the end of the Appendix.

The New Rail Vision

The new rail vision should achieve the following goals:

- Clear expectations
- Cohesive narrative
- Address ongoing issues
- Long-term financial stability
- Link and unify related rail system documents
- Inform the Early Intervention Process

Clear expectations include initial knowledge of what the travel markets and anticipated usage are, design options, durability over time, current and future operating requirements, integration with the rest of the transportation system, and the limits on how the system can grow. These need to be communicated clearly both internally across the agency and externally to both the public and the Board. It also means addressing ongoing issues like past missteps and points of failure, service inequities, changing travel patterns and resource limitations concerning funding, operator shortages, and so forth. Additionally, it means finding ways to live within our means even if it means scaling back plans for growth and being more flexible in how service is designed and delivered. Finally, all the rail-related design, planning, and policy documents need to be linked and unified. Once in place, it will inform the Early Intervention Team Process. Doing this will ensure the goals and ambitions of the new rail vision will be carried out and provide a firm footing for the Early Intervention Team Process. We did this with the Bus System, so why not with the Rail System? **We need a Rail NextGen!**

Questions to Ask

In creating a new rail vision, Metro should ask itself the following questions:

- How do we want people to use the system?
- What travel markets does Metro want to serve?
- What rail design philosophy should Metro pursue?
- What is the general system-level design elements and specifications?
- What are the operational requirements?
- How does Metro want to integrate each rail into each other and the rest of the transportation system?
- What are the short- and long-term operating plans for service?
- What are the resources needed for sustained long-term operation?
- How can Metro deal with technological change?
- How can Metro improve the project control process?

- How can Metro deal with failure management?
- What is our approach to asset management?

Answering these questions would provide both the framework for creating a new vision and a common point of understanding of what Metro needs to achieve with its rail system. The answers to these questions will impact each of Metro's departments differently depending on their contribution to rail system development and service delivery. Below elaborates on some topics raised by these questions.

Rail System Design Philosophy

The design philosophy, though not explicitly stated, allow for only two kinds of rail lines to be built – traditional heavy rail (Rapid Transit/Metro) and heavy light rail ("Metro light"). Only allowing the construction of these two types of rail service precludes the ability to build other kinds of rail lines like tram service and off-wire light rail which may be more appropriate and cheaper for certain corridors.

System Level Design Elements and Specifications

General system-level design elements and specifications refer to general parameters Metro would want all its projects to comply with. Examples include ensuring that all light rail lines and heavy rail lines be designed to operate 5-minute/3 car service and 6-minute/6 car peak service respectively, having two elevators for the multilevel station, standardized station boxes design for underground stations and the "kit of parts approach" in general for integrated systemwide design solutions. Metro has made great strides in this over the years, but there is always room for improvement.

Operational Requirements

Operational requirements refer to a wider range of items to ensure a smooth, reliable, and efficient operation for its customers. Sample items include ensuring there are enough cross-overs for repairs, emergencies, and train turnaround movements at the terminals, sidings for gap trains and trippers, platforms for operator relief transfers, adequate junction throughput capacity and speed, adequate train storage at the terminals, ensuring more than one point of entry into the train yards, sufficient substation power capacity, procuring materials for easy cleaning, maintenance, graffiti resistance, easy to use station wayfinding, building in flexibility for future expansion, etc. These requirements are not always well understood, and their importance is understated especially during the "value engineering" phase of the design process. Stressing the importance of this upfront to everyone in a unified manner as part a of clear vision will go a long way toward rectifying this.

Transit Integration

Transit integration refers to how well the different rail lines connect and feed into one another, as well as the interface between the rest of the transportation including buses, taxis /TNC¹⁵, bicycles, cars, walking, and scooters. It is important to have a clear understanding from the start as to how rail lines are to connect and interface with one another. This impacts both the current operation of the system and the ability to accommodate future growth. Lacking this understanding can lead decision-makers and planners to falsely assume that lines can just be attached and/or extended with no consequence. Take for example the A Line: The A Line is 48.5 miles long with 44 stations making it one of the longer light rail lines in the county,

¹⁵ TNC – Transportation Network Companies

if not the longest. Then the extension to Pomona and Montclair will extend the A Line to 60 miles and add six more stations. Long lines like these require more than one operator to complete a run and make it more vulnerable to service reliability issues, especially since many of the stations are at grade and there is a lack of train throughput capacity at Flower St Junction. Is this something Metro wants to continue to promote?

Another aspect of transit integration is the interface between rail lines and other modes of access. This is particularly important since rail serves as the backbone of our transit system with the intention of everything else feeding into it. The interface includes not only bus service, but also drive access, walking, bicycling, micro-transit, taxis/TNC, etc. This means ensuring formal places for passenger pickup and drop off, an adequate number of secure spaces for bicycles, good wayfinding, and passenger information, convenient and enough spaces for bus transfer and layover, and adequate facilities for bus operators. These items are crucial for a seamless and efficient transit system for customers. While this may sound obvious but is often overlooked and discounted during the design process, especially when projects begin to run over budget.

Short- and Long-Term Operating Plans

Being knowledgeable about the short- and long-term operating plan is crucial too. Currently, during the planning and environmental clearance stage of development, the project is analyzed using the design headway and train consists for the horizon year. It makes sense to do this, but it also leaves people to believe that demand warrants this level of service especially when the project opens which is often many years earlier and the resources are not automatically there to support it. The rail vehicle procurements and grants are obtained based on this assumption which is not necessarily warranted or true. This also impacts the sizing of the rail yards. Consequently, it is important to have a clear understanding upfront of what the expected short- and long-term operating plans are, and the resources needed to support them.

Resources for Sustained Long Term Operation

Another important question is understanding what the resources are for sustained operation over the long haul. This has not been well understood in the past which leads to rail fleets not receiving their mid-life overhauls, deferred maintenance, major state-of-good-repair projects, and upgrades not being programmed in the long-range plan, unanticipated needs for more security, etc. In addition to these traditional issues, Metro is also facing new challenges stemming from the COVID-19 pandemic, increased homelessness, operator shortages, and climate change. It is easy to forget that building a rail line is not just a one-time expenditure, it is a lifelong commitment ensuring that service will always be there for our customers. While our understanding is improving after operating rail service for 32 years and a better state of good repair and customer service culture, our understanding is still not complete and uniformly recognized throughout the agency.

Technological Change

Having a process in place for responding to technological change is critical. When Metro started building its rail system in the 1980s, who would have anticipated the advent of TNC, the internet, smartphones, social media, vehicle power systems, propulsion, etc.? Technology is always changing and accelerates as it becomes more sophisticated. Having a more formal process or at least a framework would allow Metro to become more nimble, flexible, and resilient to change.

Project Control

Over the years, Metro encountered great success in building some projects on time and within budgets like the G Line and Eastside Extension but encountered troubles with others like Crenshaw and the Division 20 expansion. This suggests that there are issues with project control that need improvement. A greater understanding of this would improve design and construction practices in the future.

Failure Management

Finally, having at least a framework for dealing with failure management will allow Metro a greater ability to deal with uncertainty and become more resilient in the future. This also supports the Systems Approach and Strategic Thinking Theme identified in Countywide Planning's 2018 Lessons Learned in Mobility Corridor Project Delivery Report.¹⁶

Asset Management

Asset management deals with how to maintain our rail systems assets like the rail vehicles and tracks once they enter revenue service. There are various ways of approaching this depending on the type of asset involved and resource availability such as parts, skilled personnel, and operating funds. How assets are maintained over time has a big impact over time with future service delivery and expenditures. It will also influence future projects for improving system performance. The Federal Transit Agency recognizes this and now requires every Transit Operator to maintain a Transit Asset Management Program (TAM). A review of Metro's general approach to asset management and the integration of the Metro TAM's program with Operations would be helpful.

Rail Vision Revisioning Process

One recommendation for creating a new vision is to convene a cross-agency task force, like the one used for the COVID-19 Recovery Plan and the current Early Intervention Team led by DCEO Sharon Gookin. This would consist of representatives from the major departments to be chaired and managed by the DCEO or Chief of Staff Office. Before convening the task force, a charter should be developed outlining the goals and objectives, topics to be explored, deliverables, duration, organization, membership, and how it plans to interact with the rest of the agency, the public, and the Board. Members of the task force would be limited to no more than 15 people. Taskforce duration can be under one year. Between 9-12 months is recommended but can be longer if necessary. The meeting would be bi-monthly, with most of the work happening in three or four subgroups.

A joint peer review panel consisting of members from APTA/UITP¹⁷ can be created to provide expert advice. Funding for public and Board engagement, additional data and analytics if needed, and peer review committee can be secured through either Federal Transit Administration (FTA) 5307 Urbanized Area Funds, State discretionary grants, Overall Work Plan Assistance from the SCAG, and/or local transportation sales tax administrative funds. The remainder would be staff time. Engagement with the Board and the public will be through Metro's Community Engagement process. After the work of the task force is completed, a smaller or less senior group can be convened for implementation and updates.

¹⁶ *Lessons Learn in Mobility Corridor Project Delivery*, Countywide Planning, December 2018.

¹⁷ APTA is the American Public Transportation Association. UITP is the International Association of Public Transport.

The result of the Revisioning Task Force would be a document outlining recommendations for how Metro will provide service for now and into the future, improve and expand the system over time, and a framework for conducting business ranging from project development to implementation as well as being able to respond to change. Once adopted by the Metro’s Board, the rail vision document will be used to guide updates to the various planning, policy, and design documents pertaining to Metro’s Rail system and to serve as a backdrop to the Early Intervention Team process.

Sample Taskforce Membership Makeup

A sample Taskforce membership roster could be as follows:

• DCEO/Chief of Staff Office:	one representative	(Chairperson)
• Countywide Planning:	two representatives	
• Program Management:	two representatives	
• Operations:	two representatives	
• Office of Extraordinary Innovation:	one representative	
• Transit Asset Management:	one representative	
• Communication and Marketing:	one representative	
• Office of Management and Budget:	one representative	
• Customer Experience:	one representative	
• <u>Office of Race and Equity:</u>	<u>one representative</u>	
Total	13 representatives	

Next Steps

The next steps include establishing the revisioning process framework, forming and convening the cross-agency task force, establishing a charter for the task force, approaching APTA and UITP for participating in a joint Peer Review Committee, and obtaining the funding where necessary, especially for the Board and public engagement.

Summary

In summary, the current rail vision is dated. Therefore, a new rail system vision is needed, **A Rail NextGen!** A new rail vision would allow Metro to:

- Respond to emerging travel patterns
- A better understanding of current and future operational requirements
- Consider long-term life cycle costs and durability
- Strategically target future investments
- Outline clear internal and external expectations
- Unify related and overlapping policy, planning, and design documents
- Take advantage of existing and near-future opportunities
- Better inform the Early Intervention Team process

To create a New Rail Vision, Metro should convene a Cross-Agency Rail Revisioning Task Force:

- Originate from the DCEO or Chief of Staff Office

- Form Task Force and devise a Charter
- Setup a joint APTA/UITP Peer Review Committee for expert input
- Limit task force membership to 15 people
- Keep the duration to a maximum of 12 months
- Solicit Board and community input
- Issue Report with recommendations

Most of the task force work will just be staff time. If necessary, apply for FTA 5307 Urbanized Area Funds, State discretionary grants, and/or utilized Local Sales Tax Administrative funds to pay for any additional community engagement, the Peer Review Panel, and analytical work. After Metro Board approval or coinsurance, use the new Rail Vision Report as the basis for updating the various interrelated rail planning, policy, and documents and as the backdrop for the Early Intervention Team effort.

Appendix

This appendix contains the following sections:

- A. Potential Rail System Vision Improvements and Project Changes
- B. Current Areas Supporting Rail Service and the Existing Vision
- C. 2045 Areas Supporting Rail Service and the Existing Vision
- D. Existing vision with Central Business District-like areas.
- E. Pacific Electric System vs. Areas Qualifying for Rail Service
- F. 1980 Proposition A Rail Vision
- G. Current Rail Vision
- H. Lessons Learned

Appendix A: Potential Rail System Vision Improvements and Project Changes

There are a host of modifications and changes that can be done with our existing rail system and future extension projects. Here are some potential ones that come to mind:

Logistical Improvements

Upgrade the Arcadia Traction Power Substation

This would allow Metro the option of operating five-minute service on A and E Lines as demand grows in the future and for the LA28 Olympics. This is being explored by Jacobs Engineering for the LA28 Olympics.

Add A Line Interlocks Between Union Station and Pasadena

Adding in interlocks between Union Station and Pasadena along the A Line would enable rail service to recover more quickly in case of service disruption and allow this rail section to conform to 10-minute frequency single tracking criteria per the Metro Rail Design Criteria, Metro's standard for doing repair work, and emergency bypass service. Doing this is particularly important given that the A Line is already 48.5 miles long and will increase to 60 miles by 2025 with the Foothill Pomona Extension. Currently, the spacing between the Baker and Museum interlocks is 2.6 miles and the spacing between the Indiana and Del Mar interlocks is around 2.5 miles which is too long. Currently, Jacobs Engineering is exploring inserting one by the Lincoln Cypress Station and another by Robles Ave between Memorial Park and Lake Ave Stations due to the sharp curve that is there. Building both interlocks would be ideal.

Degnan Ave Siding

Adding a sliding between Degnan Ave and 7th Ave would allow Metro to run trippers along the E Line for major events occurring at USC and Exposition Park. It would prove especially useful for the Olympics. Jacobs Engineering is currently exploring this option for the LA28 Olympics.

Washington/Flower Core Capacity Improvements

A and E Line rail service is very slow and suffers from reliability issues due to the many grades crossing and the under-design of the Flower St Junction. Past studies suggest one or more of the following actions for improvement:

- Expand the Flower St Junction throughput capacity by either installing a faster switch or grade separating the junction
- Eliminating street crossings by closing selected minor streets
- Giving more traffic signal timing priority for train service

Expanding the Flower St Junction capacity will be an expensive project. Ideally, it should be grade separated.¹⁸ Alternatively, a much modest solution is installing a faster switch and smoothing out the junction curvature. But this solution would not be as effective and would require taking a corner of LA Trade Tech since the faster switch requires more space. According to a 2017 Metro-sponsored study, a

¹⁸ According to Bruce Shelburne, the former head of Metro Rail Transportation, believes this is the only viable and reliable alternative.

grade-separated junction could cost between \$156 million to \$2 billion or more depending on the option selected and whether to place the Pico Station and parts of Washington Bl. underground.

Closing off selected minor streets and prioritizing more traffic signal timing to transit would be very effective and inexpensive in speeding up transit service. However, LADOT would be very reluctant to do this since it will have adverse impacts to cross vehicle traffic. Jacobs Engineering is currently exploring all the options for the LA28 Olympics.

Adding another platform for Pico Station across the street would be very useful as well especially during the Olympics. There are two potential options. One is adding a platform south of Pico Bl for special events. This would allow for split platform operation, the ability to accommodate an extra train, and expand passenger capacity. The other option would be adding a platform north of the existing platform on Flower St. But doing this would require closing off 12th St. If this is done, then 12th St between Flower and Figueroa Sts can be turned into a pedestrian mall which would benefit the area. Implementing this option will allow for more passenger capacity, and another passenger ramp and would be operational daily. However, it would not be able to accommodate another train and would be more expensive to construct. Both options are currently being evaluated by Jacobs Engineering for LA28 Olympics.

Non-Revenue Revenue Turnback Operations To/From E Line to East Los Angeles from Div. 21.

The Regional Connector Operations and Maintenance plan states that “Trains operating between Midway Yard (Division 21) and the E Line to East LA must execute a turnback move at one of the following Regional Connector trunk-interlockings: Little Tokyo/Arts District, Historic Broadway, 7th/Metro North. Depending on the time to change direction, this turnback move can cause delays and result in uneven line and trunk headways.” The Plan suggests that the long-term mitigation for this is to “consider installing holding signals on the south end of the Little Tokyo/Arts District Station adds a platform traffic zone to the signal systems, therefore, reducing the impact of turning trains on the rest of the system. Also, consider adding a diamond crossover east of the Alameda Junction interlocking which will facilitate turnback moves from both platform tracks.”¹⁹

Improvements for Running Express Service

Right now, Metro cannot operate express service on any of its rail lines. A lot of this can be accomplished by building sidings at strategic locations and if necessary, expanding selected stations. Doing things like this is common with commuter, passenger, and freight service. Take for example the A Line between Long Beach and DTLA. This can be accomplished by building a third track between Willow and Washington and then expanding to three track platforms at the 7th/Metro, Washington, Willow, and Willowbrook/Rosa Parks Stations.

Rail Corridor Changes

East San Fernando Valley Rail Line

The East San Fernando Valley Rail Line is a 9.2-mile long, 14-station light rail project running in the at-grade, semi-exclusive right-of-way between the Metro G Line and Sylmar Metrolink Station via Van Nuys

¹⁹ Task Order 8, Metro Regional Connector Systemwide Operations and Maintenance Plan, Rev 2, SECOTRANS, March 1, 2023, page 72.

Bl and the Valley Subdivision rail right-of-way. The project will be built in two phases – Phase I from G Line to Van Nuys Bl/San Fernando Rd in Pacoima (6.7 miles, 11 stations) and Phase II from Pacoima to Sylmar Metrolink Station (2.5 miles, 3 stations).

This project faces at least two major challenges – costs and travel speed. The cost to build Phase I is estimated to be \$3.635 billion and Metro is seeking up to \$908.75 million from FTA’s Expedited Project Delivery (EPD) Pilot Program.²⁰ Even with these funds, the project is still projected to require additional funds. Meanwhile, Phase II remains unfunded. Phase I operating speed is projected to be only 12.5 mph which is significantly lower than 22 miles per hour speeds for the current A and E Lines. This is primarily due to too many at-grade street intersections and stations.²¹

Instead of pursuing the current project, the alternative would be to convert the project to a streetcar/tram line and terminate it in Pacoima. Given the built environment, frequent stops, and projected travel speeds, streetcar/tram service would fit in well in this corridor. Concerning costs, streetcar/tram service is significantly cheaper to build and operate because they are lighter, utilizes low floor passenger loading cars, and can use less sophisticated train control. Since the cars are lighter, the tracks need less strength which in turn requires shallower street excavations and less impact on existing utilities. Moreover, streetcars/trams are better at negotiating tight turns, are safe in high pedestrian areas, can operate in mixed-flow traffic, and share the same stops as buses if necessary. Since the cars are low floor, means just low floor platforms are needed, which are much cheaper to build and maintain. Using an “off-the-shelf” rail car would also save a lot of money both in purchasing the cars and maintaining them since parts would be more readily available particularly after the cars have been in service for many years. Using different railcars from the rest of the light rail system will not be an issue since the line will be isolated from the rest of the system and is using its own maintenance yard. Finally, the entire line can be erected in much less time since there is less to excavate and build, less property taken, and fewer utilities to relocate.

Alternatively, Metro can save significant money by eliminating two stations and using off-the-shelf low-floor rail cars and platforms. Eliminating two stations will significantly speed up service and allow the line to conform with Metro’s stop spacing policy.

Lastly, another way to significantly save money is to consider using rail vehicles employing “off-wire” power distribution systems instead of using overhead catenary systems. Using such vehicles could significantly reduce infrastructure costs while making the transit corridor more aesthetically pleasing. There are two types of systems. One utilizes a ground contact system (GCS) utilizing a type of embedded “third rail” while the other utilizes an onboard energy storage system (OESS) via supercapacitors, batteries, or both and can be recharged in various ways. GCS systems have higher capital costs and tend to be more effective with alignments having significant uphill grades. OESS systems are more practical when using full-size light rail vehicles or long streetcars due to their weight and space requirements. They also require higher maintenance costs. As of 2018, the typical OESS lifespan ranged from five to eight years.

These systems were first developed in Europe and now starting to spread to the United States. One example is the Tempe Streetcar operated by Valley Metro, Arizona It utilizes a hybrid 70% low-floor streetcar vehicle employing both OCS and an OESS onboard battery storage system. The vehicle is the NXT

²⁰ Project Profile in FTA’s FY23 Annual Report on Funding Recommendations.

²¹ The planned average station spacing is 0.6 miles compared to the desired spacing of one mile between stations per Metro’s Transit Service Policy.

Streetcar built by the Brookville Equipment Corporation in the United States. Metro's Program Management Department is currently exploring the off-wire option for this corridor.

Montclair Extension

The Montclair Extension is a 3.1-mile, 2-station extension of the A Line. Unfortunately, it is being extended into low-density areas and will compete with the San Bernardino Metrolink Line of which Metro funds the Los Angeles County portion of it. Furthermore, the project is still lacking all the funds to complete it. Instead, consider supporting either San Bernardino County Transportation Authority's proposal for Diesel Multiple Unit (DMU) proposals for linking the two counties or Metrolink's proposal for enhancing service on the San Bernardino Metrolink Line.

Eastside Phase II

The plan to extend service to the border of Whittier is very expensive and does not have the land use patterns to support ridership beyond downtown Commerce. Meanwhile, the proposal to sink the line below ground in Commerce does not make sense. Instead, it would be better to reconsider at-grade options for either Whittier or Beverly Bl. Land use patterns along these corridors are much more supportive,²² and making it fully at-grade would help significantly pull the project back within budget. Furthermore, extending E Line along either Whittier or Beverly allows for much straighter rail line operation which will result in faster travel speeds and better reliability.

West Santa Ana Branch

This proposal calls for building a 19-mile light rail line between the City of Artesia and Union Station via the West Santa Ana Branch rail right-of-way, A Line rail right-of-way, and Alameda St. The project is slated to be built in two phases with the first phase going between the City of Artesia and Slauson A-Line Station. Revenue service is now anticipated to start in 2033 and is dependent upon obtaining an FTA New Starts Grant and using P3 to expedite project delivery.

According to the Project's New Starts Project Profile, Phase I is estimated to cost around \$5 billion, perhaps much higher according to unreleased estimates. Much of this is due to having to relocate active freight lines, add a new station to C Line, and build numerous aerial segments. Even if a New Starts Grant and access to private capital are available, this project is just too expensive.

However, there are some alternatives. One is to operate service between the City of Artesia and Union Station via West Santa Ana Branch, San Pedro Subdivision, Los Angeles Subdivision, River West Bank, and then to Union Station using the through tracks being built by the Link US project using self-propelled passenger rail cars can be linked together (multiple units). This type of service has been around for decades and can operate on the same tracks as freight and passenger rail service such as Amtrak if they are Federal Railroad Administration (FRA) rated. They are powered either by diesel fuel (DMU)²³, electricity (EMU)²⁴, or hydrogen fuel cell. EMUs can be powered externally with either overhead wires or a third rail or with a rechargeable battery/supercapacitor (BEMU).

²² SCAG's Year 2045 forecast produced for the 2020 Regional Transportation Plan strongly supports this.

²³ DMU – Diesel Multiple Unit.

²⁴ EMU – Electrical Multiple Unit.

This alternative calls for either using a BEMU or hydrogen fuel cell-powered train. The main advantages of using BEMU or hydrogen fuel cells are that they use clean energy, and they don't require expensive overhead catenaries or a third rail for power. The downside means another vehicle type for the Rail Fleet Services to maintain unless the service is delivered by a third party. Also, none of these vehicles are being used in the United States yet. BEMU trains have been around for years and are used throughout Europe and Japan. Their travel range between charges is 186-373 miles which is more than sufficient for transit service. Hydrogen fuel cell-powered trains are a new technology and are now being offered by manufacturers such as Cummins, Ballard, and Alstom. Countries like Poland are starting to use them. This technology is about to be tested on the Arrow Commuter Rail Line between San Bernardino and Redlands using locomotives designed by Stadler.

Possible station locations for the northern portion include Slauson Ave, Leonis Bl., 7th St, 4th St, and Union Station.

The primary challenge facing this alternative would be the San Pedro Subdivision due to its narrow right-of-way and occasional freight use.²⁵ Past studies recommended building an aerial system on portions of it. It also may be possible to run service sharing the existing track and perhaps building in some siding where possible to allow for more train passing and station stops. Pursuing this option requires the vehicles to be compatible with freight traffic. Recent efforts by Federal Rail Administration have relaxed the vehicle requirements over the year making this option cheaper and more realistic. Doing this will make the service more like an S-Bahn or commuter rail service with less frequency than a typical light rail line. Overall, any version of this alternative should substantially be cheaper to build and operate, particularly if the project is sharing the track with existing freight service. The last one is probably doable with funds identified to date and can be built and implemented in a timelier manner.

Another alternative²⁶ would be to continue pursuing WSAB LRT Phase I and then extend north to Union Station using the existing Long Beach BI Right-of-Way (ROW) in a double track configuration segregated at-grade from the current A Line service. The existing Long Beach BI ROW has four tracks that are all Metro owned. Two tracks are currently leased to Union Pacific for limited freight service. WSAB North trains would operate on those tracks in a temporal separation arrangement from freight rail service.

WSAB North trains will stop at a reconfigured Washington Station on the existing Long Beach BI ROW. The reconfigured station will allow for a four-track and two to three-platform station layouts. WSAB North trains would proceed north on the existing tracks to a junction at Washington Bl and Long Beach BI. The junction would be designed as a half Grand Union, to allow the current A Line service, having two tracks to proceed northbound from Washington Station on the A Line ROW to westbound on Washington Bl to San Pedro Station. WSAB North trains would proceed northbound from Washington Station to the half Grand Union junction and turn eastbound on two tracks into the existing Harbor Subdivision North ROW, located adjacent to the Long Beach BI ROW. An additional WSAB North Station can be constructed east of the half Grand Union to allow for bus transfer connections to the bus line operating on Washington Bl. This additional station would complement the service already provided at San Pedro Station for the A Line.

The WSAB North trains would then proceed east on the Harbor Subdivision North ROW to connect with the LOSSAN corridor ROW (aka West Bank) south of the Amtrak Operations and Maintenance Facility.

²⁵ Union Pacific operates on average one to two trips per weekday.

²⁶ As proposed by Anthony Loui, Metro Service Development.

WSAB North trains would then proceed north on the LOSSAN/West Bank and use the new trackage constructed for Link US to connect to Union Station. An intermediate station can be constructed on the LOSSAN/West Bank with an overhead concourse to connect to the proposed 6th St Arts District Station to connect to D Line (Purple) trains.

The above concept assumes no or minimal grade separation. There may be a transition from the at-grade tracks on Harbor Subdivision North to connect to LOSSAN/West Bank. You can use DMU, or hydrogen-powered vehicles in a low-floor configuration to operate in an S-Bahn style service. An example of the vehicles to be used for this service is the Stadler Flirt DMU and ZEMU vehicles used for Arrow service. The service assumes cab signal operations in an all-exclusive fixed guideway from LAX Union Station to Slauson Station. A variation of this alternative would be to run S-Bahn service between Union Station and Slauson Station using DUM/ZEMU and then have patrons transfer to/from WSAB Phase I Line. Frequencies can be wide as 12 minutes on this segment.

Finally, another way to re-envision the proposed service is to consider employing rail vehicles using “off-wire” technology at least part of the way. This could potentially yield significant savings in infrastructure costs while making the corridor more aesthetic. Please see the discussion under East San Fernando Valley Rail Line for more details.

Crenshaw North

Crenshaw North is a proposal to extend the K Line north to Hollywood Bl perhaps even to the Hollywood Bowl. Three alignments are under consideration with the shortest and most direct route via La Brea Ave. All three are proposed to be underground. Per Measure M, this project is not slated to open until 2047 and allocated \$2.240 billion (\$2015) towards it. However, the project will cost at least \$4.4 Billion (\$2017) for the La Brea alignment according to the Alternative Analysis Study, and probably more since the project will now be completely underground. This project needs significantly more funds especially if supporters want the early implementation of it. Another challenge facing the project is the K and C Line would probably need to be upgraded to support three-car service before the construction of Crenshaw North which is not programmed in the 2020 Long Range Transportation Plan. Upgrades include adding more power substations, extending the platforms at four stations, and maybe even expanding the train flow capacity of the Aviation Station. These upgrades alone will cost billions of dollars.

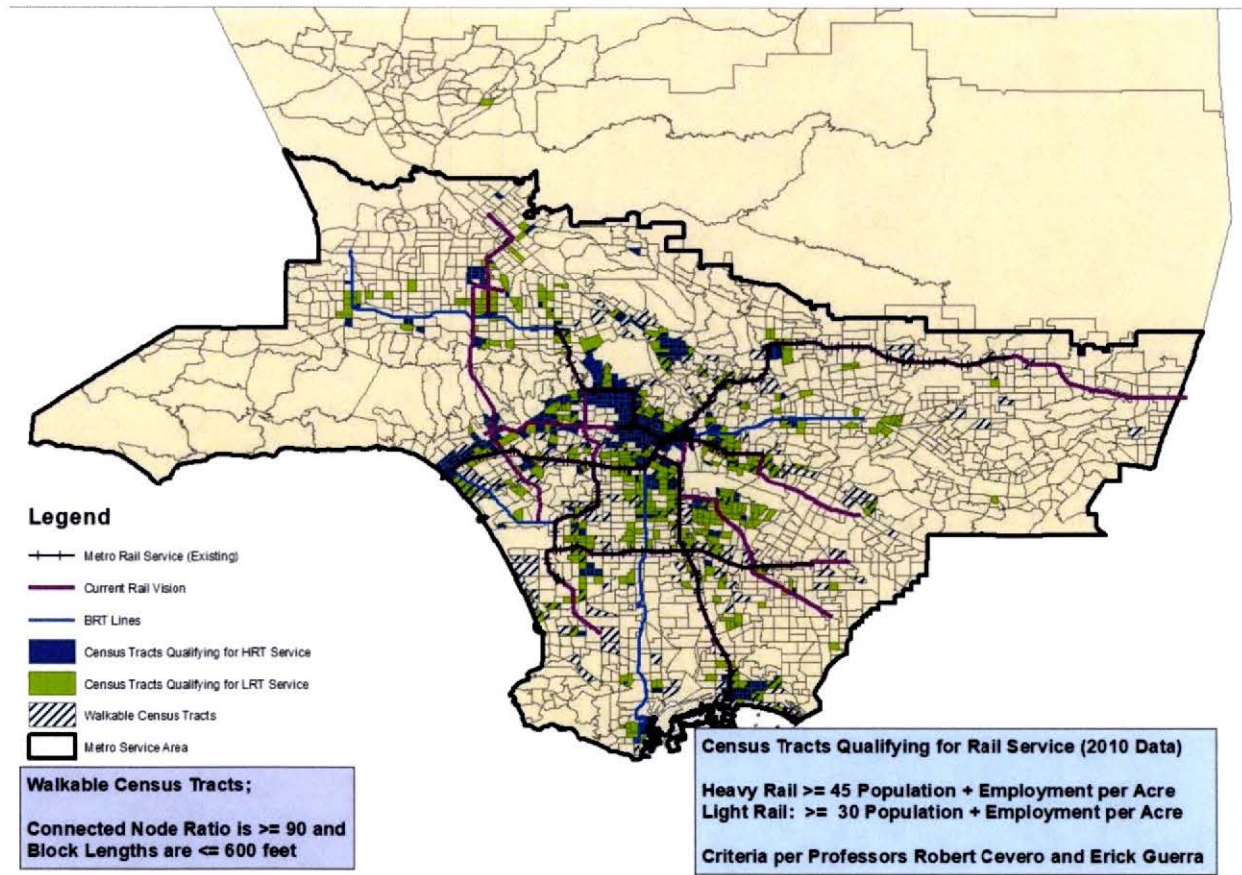
An alternative would be to convert the project to a streetcar/tram service like the proposal for the East San Fernando Valley Project along La Brea Ave. La Brea Ave is part of the City of Los Angeles Transit Enhanced Street Network and offers the shortest and straightest path to Hollywood and the Hollywood Bowl. It also offers the best rail supporting densities and land use patterns while still serving West Hollywood. The project should be at least between the La Brea D Line Station and the Hollywood/Highland B Line Station. It might be possible to extend it to the north end of the K Line at Crenshaw/Exposition but would have to contend with negotiating under the I-10 Freeway overpass which could be an issue. If clearance for the catenaries is an issue, then perhaps a trench can be built just for that one location or use a railcar that operates on batteries for a short distance. This scenario may also require taking the parking lanes which may be all right since La Brea is a part of the City’s Transit Enhanced Network. The groundwork for such a project is being laid now with the La Brea Ave Bus Lane project being built between Olympic and Sunset Bl.

A variation of this version is creating an entire loop via La Brea, Pico, Fairfax, and Hollywood Bl All these streets are a part of the City’s Enhanced Transit Network. While more expensive to build and operate, it

would give the people of the area more of what they want while still being cheaper than extending the K Line underground to Hollywood. It would also avoid having to negotiate the Santa Monica Freeway. But even under this scenario, it will be difficult to obtain funds to expedite building it, especially given the severe funding shortfalls facing other projects ahead of this one.



Appendix B: Current Areas Supporting Rail Service and the Existing Visions.



The map above gives an initial indication of where rail service can be supported today based on density thresholds developed by Professors Robert Cervero and Erick Guerra and walkability based on criteria developed by the author. In 2011, Professors Cervero and Guerra examined all the rail systems in the United States. They found that the combined density of population and employment should be about 30 individuals per gross acre for light rail service and 45 individuals per gross acre for heavy rail service around a $\frac{1}{4}$ mile of the station. If these conditions are met, then the service would be in the top quarter of effective rail investments in the United States.²⁷

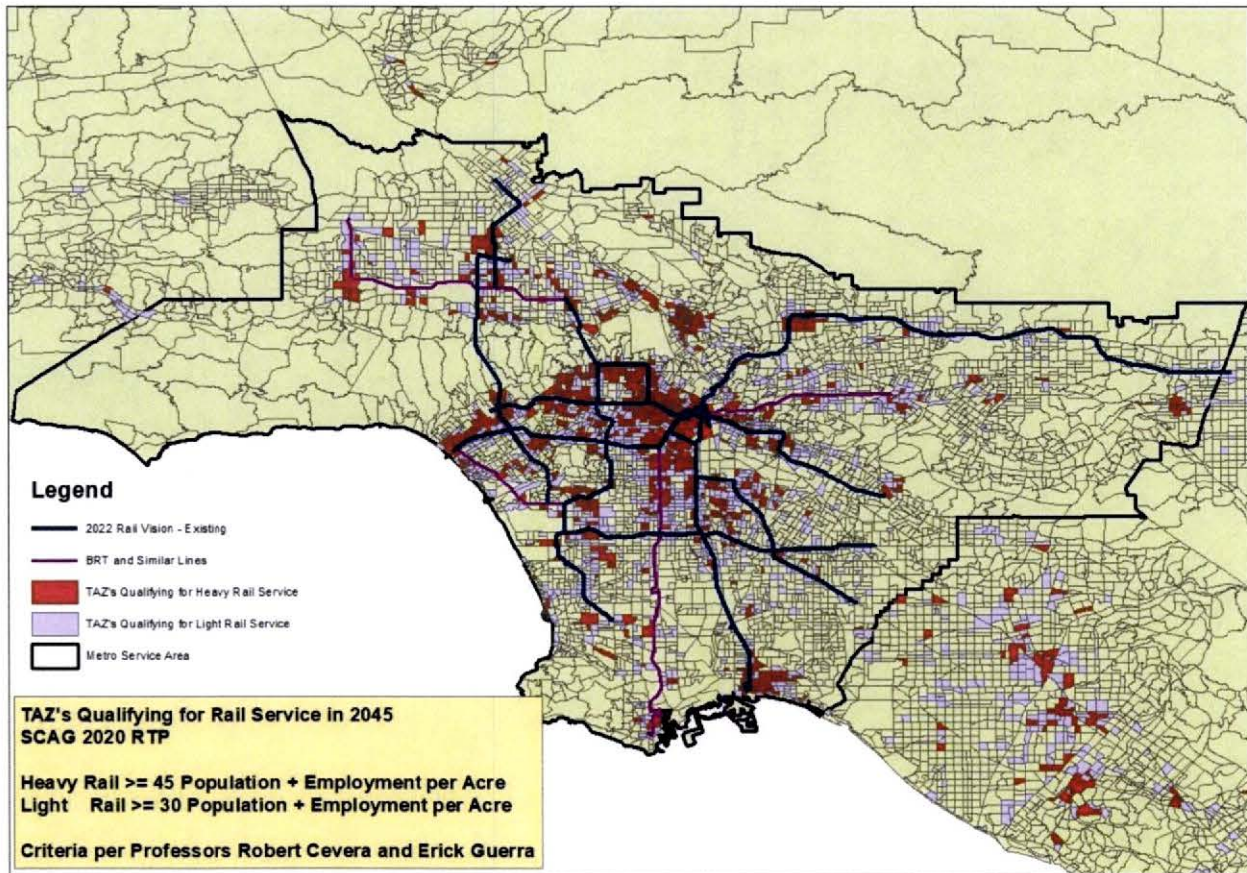
Most transit users' access and egress rail via walking either directly to the station or via bus transfer. Given this, the ability to easily walk to and from either the rail station or bus transfer stop is essential. If the access/egress area is not walkable, then potential transit users, particularly choice riders, will be reluctant to use transit service especially if driving and bicycling are not an option. Based on research conducted by the author, he found that the best indicator for walkability is using a combination of the connected node ratio and average block lengths.²⁸ Essentially, if the ratio of non-dead-end street intersections compared to the total number of intersections is greater than 0.90 and if the average block length is no longer than

²⁷ Cervero, Robert and Erick Guerra. *Urban Densities and Transit: A Multi-dimensional Perspective*. UC Berkeley Center for Future Urban Transport. 2011.

²⁸ There are other walkability measures, but they tend to focus more on secondary characteristics like shade, landscaping, sidewalk widths, etc. Obtaining detailed information on these types of details can be hard to come by and proprietary on a street network basis.

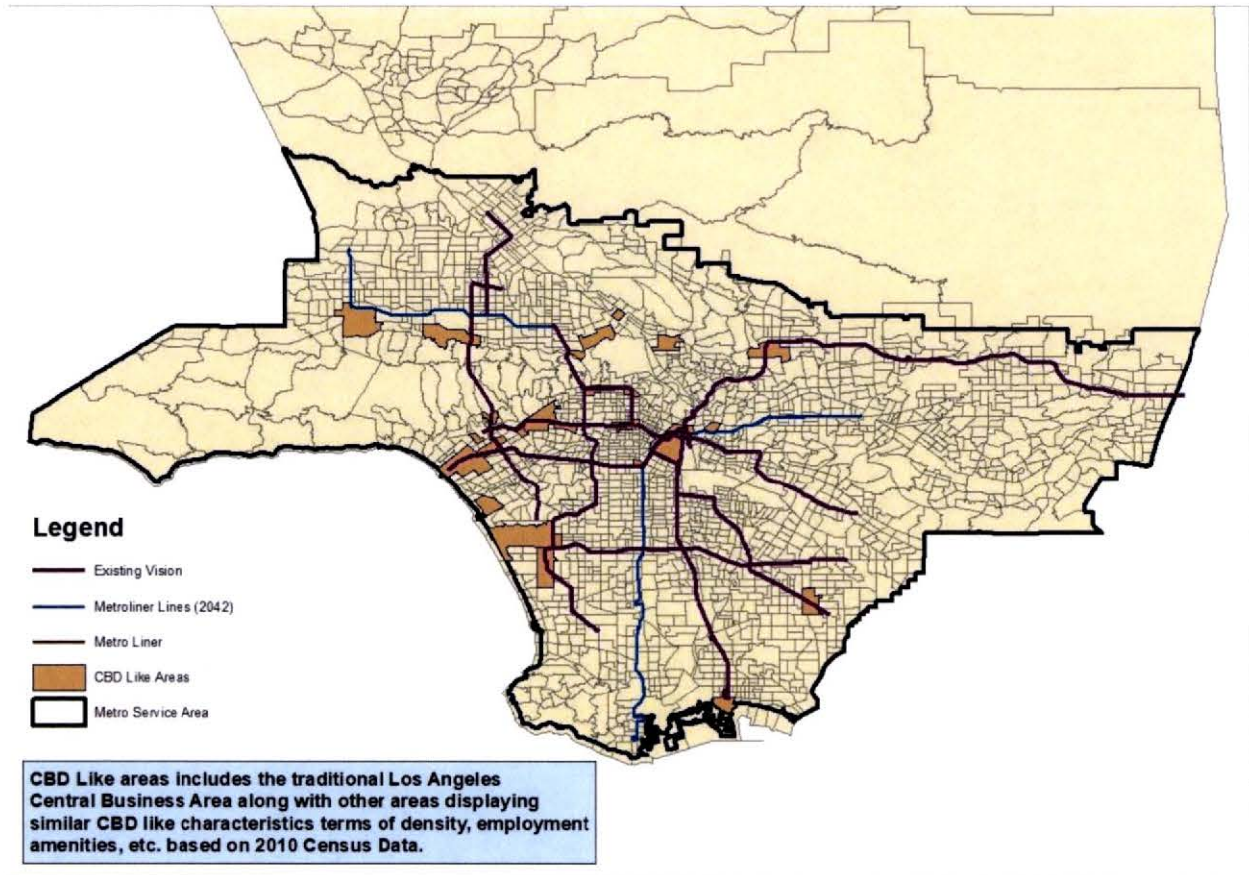
600 feet, then the area is walkable. Based on this measure, not many census tracts in Metro's Service area are walkable. Fortunately, the majority tend to be in the denser areas that can support rail service.

Appendix C: 2045 Areas Supporting Rail Service and the Existing Vision



This shows the current rail version overlaid with 2045 population and employment density conditions per SCAG's 2045 Forecast travel analysis zones (TAZs) produced for their 2020 Regional Transportation Plan using pre-COVID data. Not surprisingly, the forecast reinforces and enhances the existing density patterns that can support rail service.

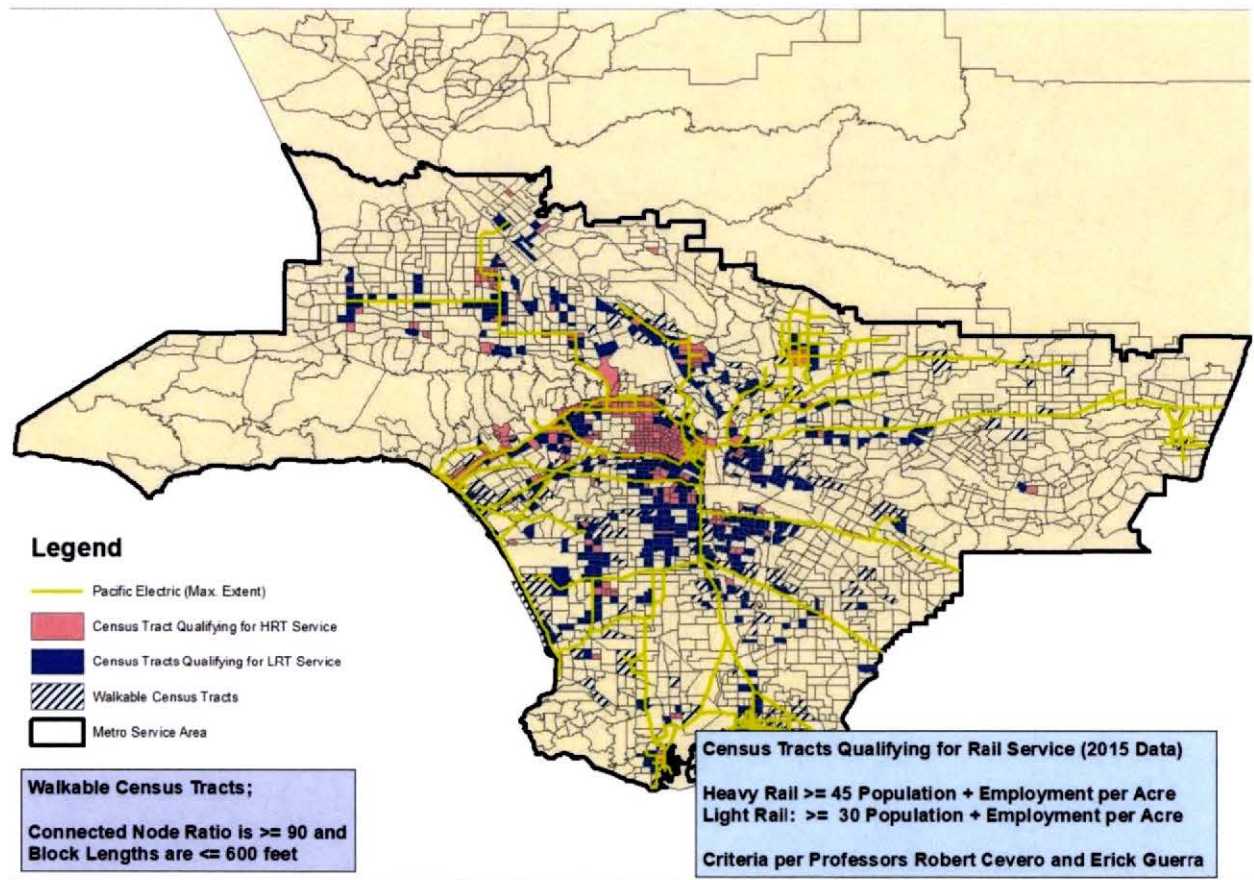
Appendix D: Existing Vision with Central Business District-Like Areas



It is important to link rail lines to major destination areas, particularly large central business districts. Historically the focus has been on the Downtown Los Angeles Central Business District, but other areas in Los Angeles function like a central business district.²⁹ Take for example the combined area around Beverly Hills and West Hollywood. They have just as many jobs as Downtown Los Angeles which is astounding. Most of them tend to cluster around Santa Monica/Wilshire Bl corridors, Ventura Bl., and Freeway corridors, and Lincoln Bl. Not surprisingly, much of this corresponds to the areas that are dense enough to support rail service in the maps above.

²⁹ This based on analysis performed by the author. The analysis looked at both residential density, employment density, number of tall buildings and land use patterns.

Appendix E: Pacific Electric System vs. Areas Qualifying for Rail Service



Finally, this map shows the Census Tracts qualifying for transit services overlaid with the maximum extents of the former Pacific Electric System. As one can see, many of the former lines fall quite nicely over these areas, particularly on the Westside and the San Fernando Valley. This is no surprise given that the densest areas tend to be the areas that originally developed along the original rail lines such as the Pacific Electric Lines. So, a good start for finding new corridors for rail development and/or improving on existing ones would be looking at corridors formerly served by the former Pacific Electric System, particularly on the Westside and the San Fernando Valley.

Appendix F: 1980 Proposition A Rail Rapid Transit Vision



Metro's current rail vision was originally based on this schematic produced for the 1980 Proposition A half-cent transit sales tax measure which passed. The segment from Long Beach to what became the Green Line was at the insistence of Supervisor Kenneth Hahn who wanted to resurrect a version of the old Pacific Electric Long Beach Line to Downtown Los Angeles. Eventually, this became the Blue (A) Line. Meanwhile, the segment between Downtown Los Angeles and the San Diego Freeway corridor and the segment between Wilshire Bl to the San Fernando Valley via Hollywood was at the insistence of Los Angeles Mayor Tom Bradley. These corridors eventually became the B (Red) and D (Purple) Lines. Additionally, the segment from Norwalk to San Diego Freeway Corridor was a mitigation measure for the I-105 Freeway and eventually became the Green (now C) Line. Finally, the rest of the vision was offered by Rich Richmond, a senior Los Angeles Transportation Commission executive at the time. It appears to be loosely based on a combination of the old Pacific Electric System and previous proposals by Los Angeles County Supervisor Baxter Ward.³⁰

³⁰ The whole story behind this is detailed in Ethan N. Elkind's book, *Railtown: The Fight for the Los Angeles Metro Rail and the Future of the City*, 2014.

Appendix G: Current Rail Vision



Source: 2023 Rail Fleet Management Plan

This represents the current rail vision as specified by Metro’s 2020 Long Range Transportation Plan.

Appendix H: Lessons Learned

These are lessons learned based on 31 years of observation, experience, and research:

- **Visions are critical for guiding Metro's Missions. They must be:**
 - Clear and well understood
 - Comprehensive, holistic, and forward-looking
 - Communicated both internally and externally
 - Updated and revisited periodically
- **Interrelated policy, planning, and design documents must be:**
 - Talk to each other in a unified, and consistent manner
- **Planning and Design**
 - Metro Rail Design Criteria need to be flexible
 - Short- and long-term operating requirements need to be well understood at the beginning of planning
 - The relationship and interconnections of the project to the rest of the system need to be established at the beginning of planning
 - Should consider the long-term life cycle costs of the project as the project moves forward.
 - Focus on the transit user first, not other considerations
 - Corridor and mode selection should be based on a detailed study of existing and projected travel markets
 - Rail system elements and vehicles should be standardized as much as possible
 - Value Engineering should not be performed in a vacuum:
 - Operations should be included in the evaluation and decision-making process
 - Both long-term life cycle cost, operating requirements, and transit of the customer should be considered
 - Be mindful of the customer
- **Project Management Plan**
 - Should reflect the life cycle of the project, not just the development building of the project
 - *Planning Phase* should include Program Management and Operations
 - *Design and Construction Phase* should include Planning and Operations
 - Feedback loops with all the relevant departments should be included
 - Locally funded projects should have the same level of oversight and controls as federally funded projects.

