SANDAG

PURPLE LINE CONCEPTUAL PLANNING STUDY

STUDY REPORT

FINAL
DECEMBER 2024

Prepared by

HNTB

401 B Street, Suite 301
San Diego, CA 92101

Executive Summary

SANDAG

Purple Line Conceptual Planning Study

EXECUTIVE SUMMARY

DECEMBER 2024

Free Language Assistance | Ayuda gratuita con el idioma | Libreng Tulong sa Wika | Hỗ trợ ngôn ngữ miễn phí
免費語言協助 | 免费语言协助 | مساعدة ترجمة مجانية | 무료 언어 지원 | کمک زبان رایگان | 無料の言語支援 | Бесплатная языковая помощь
Assistência linguística gratuita | मुफ़्त भाषा सहायता | Assistance linguistique gratuite | ជំនួយភាសាឥតគិតថ្លៃ
ఉచిత భాషా సహాయం | ภาษาช่วยเหลือด้านพาสาฟรี | Kaalmada Luqadda ee Bilaashka ah | Безкоштовна мовна допомога

SANDAG.org/LanguageAssistance | 619.699.1900

Contents

Executive Summary

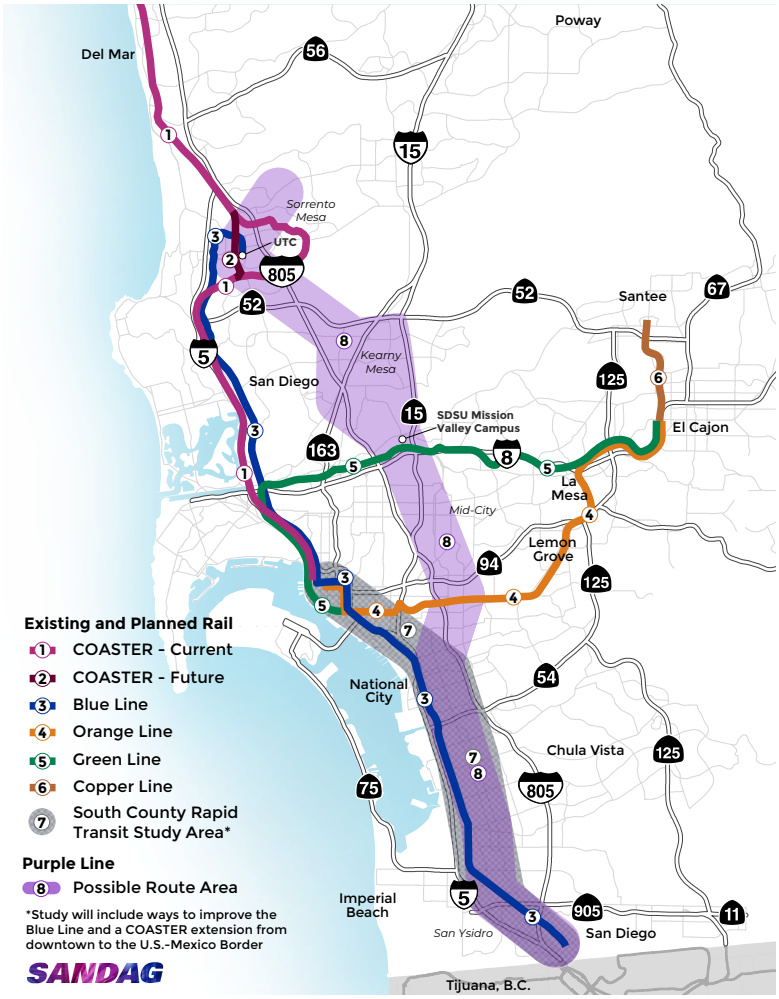
Project Introduction

The Purple Line is envisioned as a high-capacity transit line from San Ysidro to Sorrento Mesa via Chula Vista, National City, City Heights, Mission Valley, Kearny Mesa, and University City. The idea for the Purple Line comes from many years of community advocacy and planning, which are documented in the San Diego Association of Governments' (SANDAG) *2021 Regional Plan* and *South Bay to Sorrento Comprehensive Multimodal Corridor Plan*.

By connecting several densely populated communities as well as multiple major employment centers, the Purple Line would provide high-capacity, reliable, and equitable transit service to residents, employees, and visitors throughout San Diego and South Bay. The Purple Line would directly serve several social equity focus populations, connecting residents to jobs, education, healthcare, and other community resources. It would also connect to the three principal Trolley lines, COASTER commuter rail, and dozens of *Rapid* and local bus routes.

This *Purple Line Conceptual Planning Study* evaluates the potential of constructing and operating high-capacity rail service in the northern portion of the corridor between the City of National City and Sorrento Mesa in the City of San Diego. While there are many modes that could provide high-capacity transit service, this study is the first dedicated solely to evaluating this regionally significant project as a heavy rail transit line.[1] The Purple Line corridor is presented in Figure 1, reflecting both the northern segment that is the focus of this study and the southern segment that will be evaluated as part of a separate study.

Figure 1. Project Study Area



Projects of similar scope and scale as the Purple Line require the dedicated efforts of many people and agencies to come to fruition. This report provides an overview of the process and anticipated timeline the Purple Line will need to advance through before it can open for revenue service.

Summary of Stakeholder Coordination and Outreach

The Purple Line has gained community support along its corridor since its introduction in SANDAG's *2021 Regional Plan* and evaluation during the *South Bay to Sorrento Comprehensive Multimodal Corridor Plan*. This *Purple Line Conceptual Planning Study* marks the first step towards making it a major transit project.

Public participation and stakeholder engagement are crucial for future phases. Stakeholder engagement during this phase of the Purple Line included coordinating with community-based organizations along the corridor and establishing a Project Development Team.

1 The Federal Transit Administration defines heavy rail as an electric railway with the capacity for a heavy volume of traffic. It is characterized by high-speed and rapid acceleration passenger rail cars operating as single- or multi-car trains on fixed rails separated from other vehicular and pedestrian traffic with sophisticated signaling and high-platform loading. Typical metros, such as the LA Metro, and subway systems are examples of this.

Four community-based organizations along the Purple Line corridor — Environmental Health Coalition, City Heights Community Development Corporation, Urban Collaborative Project, and SBCS — supported public engagement through the following activities:

- Provided feedback on project messaging and materials.
- Hosted two pop-up events each targeting the communities they serve.
- Promoted engagement opportunities to their members, ally organizations, and other contacts via email, social media, and word of mouth.
- Reported on participation and promotional reach for engagement opportunities.

The Project Development Team included staff from relevant municipalities, transit and transportation agencies, and other partners. Project Development Team meetings were convened at targeted periods during this study to communicate study progress and solicit input on findings. Outcomes helped inform alignment development and potential station and operations and maintenance facility locations, and the team helped identify additional multimodal connections or land use development opportunities.

Public Meeting and Survey Findings

The public meeting input and survey responses revealed the following:

- Over 60 percent of respondents live in the corridor. Approximately 35 to 55 percent of respondents work, shop, or recreate in the corridor.
- The most visited areas include UTC, Kearny Mesa, National City, Chula Vista, and SDSU Mission Valley.
- Most people either drive or take transit to places within the study area. Others either walk, bike, or use rideshare services (e.g., Uber, Lyft).
- Over 90 percent of respondents use public transit at least a few times a year. Over 25 percent use transit daily or almost daily.

Purple Line Concepts

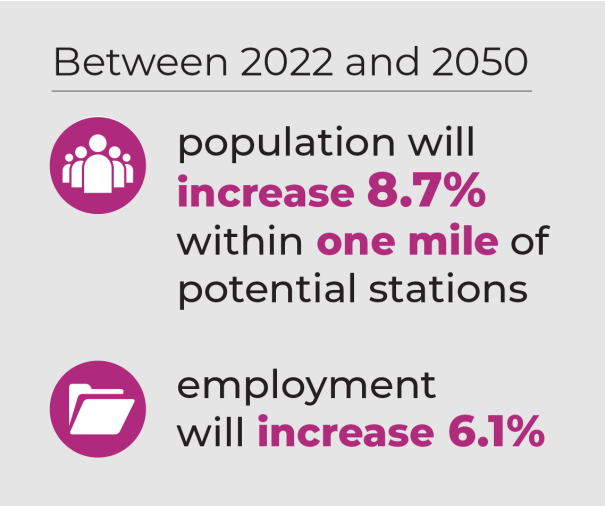
Stations

Station identification is an essential early step in the planning process and when establishing planning and design parameters. Preliminary station locations were identified as part of the *2021 Regional Plan and South Bay to Sorrento Comprehensive Multimodal Corridor Plan* planning processes. These were informed by residential and employment activity, planned land use, and public and stakeholder input. Projected growth within one mile of potential stations is presented in Figure 2.

This *Purple Line Conceptual Planning Study* refined these locations through coordination among the Project Development Team. Stations were chosen based on their proximity to residential and commercial development, transit connections, ridership potential, and ability to advance regional sustainability and equity goals. Station locations helped inform the development of planning and design parameters.

Some stations were removed or added, including the removal of Birdland Station and the addition of alternate station locations in Kearny Mesa, Sorrento Mesa, and SDSU Mission Valley. Further planning to finalize station locations will occur in the next phase of the planning process.

Figure 2. Projected Growth by 2050



The stations evaluated in this study include the following:

- National City Station Option A (8th Street Trolley Station)
- National City Station Option B (Highland Avenue/Plaza Boulevard)
- Euclid Avenue Trolley Station
- City Heights Station Option A (University Avenue)
- City Heights Station Option B (El Cajon Boulevard)
- SDSU Mission Valley Station Option A (Stadium Station)
- SDSU Mission Valley Station Option B (near I-15)
- Kearny Mesa Station Option A (Ruffin Road/Clairemont Mesa Boulevard)
- Kearny Mesa Station Option B (Convoy Street/Clairemont Mesa Boulevard)
- UTC Transit Center Station
- Sorrento Mesa Station Option A (Barnes Canyon Road)
- Sorrento Mesa Station Option B (Mira Mesa Boulevard)

Figure 3 demonstrates these potential station locations and alignment concepts.

Figure 3. Potential Purple Line Stations and Alignment Configurations

Alignments

Alignment concepts were developed to connect preliminarily identified stations using the planning and design parameters described in the Planning and Design Parameters section. The concepts were evaluated to determine how well each one would help achieve the goal of fast service from National City to Sorrento Mesa. Such a goal would require (1) concepts that follow the most direct line between stations as possible and (2) significant portions of the route to be underground.

One full alignment from the City of National City to Sorrento Mesa in the City of San Diego was developed. A series of alignment segments were also developed along the corridor that could be combined with the full alignment and/or other segments to create an alternative alignment. The effectiveness of each alternative would need to be evaluated in future studies.

Operations and Maintenance Facilities

An operations and maintenance facility is needed to store and conduct various types of maintenance on train sets. Potential operations and maintenance facility sites were selected based on one or more of the following: (1) zoning of the site, (2) ownership of the site, (3) proximity to the corridor, (4) topography of the site, and (5) size and shape of the site.

Alignment Concept and Station Analysis

Alignment concepts and station and support facility locations were used to (1) identify minimum operable segments, (2) develop preliminary ridership projections, (3) estimate capital costs, and (4) evaluate development potential and multimodal connections within proximity of identified station locations. It is important to note that alignment concepts and potential station and support facility locations are subject to change as the Purple Line advances through project development, a process that will include stakeholder and public input.

Minimum Operable Segments

Projects of the scope and scale of the Purple Line are not typically built as one large single undertaking. Instead, sponsor agencies generally start by developing a section of the corridor, known as the minimum operable segment. It is important that the minimum operable segment have independent utility to be competitive for funding and provide benefit as a standalone project should future phases be delayed.

Different minimum operable segments were identified and evaluated to determine whether they could provide viable service along a portion of the Purple Line. Based on existing and projected population and employment density, the location of employment centers, and traffic patterns, three minimum operable segments were identified:

- **Minimum Operable Segment 1: National City to SDSU Mission Valley Campus (9.1 miles)**
  Ridership modeling showed relatively strong demand among the stations between National City and SDSU Mission Valley. As such, this minimum operable segment was identified. It tests the effect of not providing direct service to key employment centers in Kearny Mesa, UTC, and Sorrento Mesa.
- **Minimum Operable Segment 2: National City to UTC Transit Center Station (19.3 miles)**
  This minimum operable segment assesses the effect of not providing direct service to Sorrento Mesa.
- **Minimum Operable Segment 3: Euclid Avenue to UTC Transit Center Station (15.6 miles)**
  This minimum operable segment assesses the effect of not providing direct service to National City, the Blue Line Trolley in the South Bay, or Sorrento Mesa. This minimum operable segment would allow the most flexibility for future planning efforts that would evaluate how the Los Angeles-San Diego-San Luis Obispo corridor could be extended to San Ysidro, and how that service could complement and connect to Blue Line and/or Purple Line service between National City and the Mexican border.

Projected ridership on each minimum operable segment is summarized in Table 1. During subsequent phases of Purple Line development, these minimum operable segment options may be further refined to reflect the findings from the alternatives analysis and associated environmental studies. At the completion of project development, a preferred minimum operable segment will be chosen to enter final design.

Planning and Design Parameters

A key goal of this *Purple Line Conceptual Planning Study* is to determine the feasibility of constructing and operating the Purple Line using technology that allows for faster service than the current light rail system in San Diego County. As such, the following planning and design parameters were identified to guide the development of Purple Line route alignment concepts, potential ridership, capital costs, and system requirements. These parameters could be refined in future phases of study.

Planning Parameters

Design Speed
A target maximum design speed of 85 miles per hour (mph) with an 80-mph maximum operating speed was assumed. A design speed of 85 mph was selected based on identified average station spacing, curvatures along the alignment, and diminishing returns that a faster technology would offer because the vehicles would not be able to reach these speeds for numerous segments of the alignment.

Vehicle Technology
The higher-speed requirement would most likely be met by using a heavy rail transit or metro system powered by a third rail. An example of heavy rail is LA Metro, as presented in Figure 4.

Figure 4. LA Metro Heavy Rail

Source: KTLA, 2024

Alignment Plan and Profile Development
All guideway alignment and station profiles assumed full grade separation with no at-grade vehicle or pedestrian crossings. Building on the identified station locations, horizontal and vertical alignments were developed with adequate sections of straight track near stations.

Headways
This *Purple Line Conceptual Planning Study* assumes the Purple Line would be designed for 10-minute headways, as noted in the *2021 Regional Plan*. However, further development of the Purple Line may determine different headways — the time interval between train arrivals — are appropriate. Headways will influence the number of vehicles, land area required for an operations and maintenance facility, and ridership.

Design Parameters

Underground Guideways and Tunneling
For this study, twin-bore tunnels are assumed with a nominal 20-foot outer diameter. This would be sufficient to fit an emergency walkway, third rail, and the dynamic envelope of the vehicle. Track centers would be about 45 feet apart, allowing for a 30-foot-wide center platform at aerial and underground stations.

Aerial Guideways
Aerial guideways would be 35 feet wide to support the tracks, third rails, emergency walkways, and a signal and communication system. Tracks would mostly have a 15-foot-wide separation, with a 45 foot-wide separation at stations to accommodate a 30-foot-wide platform.

Station Requirements
Platforms for aerial stations are assumed to be 450 feet long, and a mezzanine level would be needed for stations in the median of major streets. Underground station boxes are assumed to be 1,000 feet long by 60 feet wide to accommodate 450-foot-long stations, constructed by cut and cover at a depth of between 35 feet and 110 feet. Station entrances would be constructed at grade with escalators, elevators, and stairs providing access to the station concourse and platform.

Each station is assumed to include double crossovers — track sections that allow trains to cross from one track to another. Terminal stations are assumed to have two double crossovers.

Storage Tracks
Storage tracks are assumed to be provided beyond the terminal station double crossovers. They are designed to be 500 feet long.

Traction Power
A third rail power transmission system would likely be used for this transit line. It is assumed that each station would have a substation and others would be sited between stations at a spacing of approximately 5,000 feet. Substations would also be required at the operations and maintenance facility and potentially along the lead track connecting to it.

Engineering Summary

This study confirms the engineering feasibility of underground and aerial guideway and station concepts based on known information. Some concepts may be determined to have a fatal flaw in subsequent phases of study. Coordination and outreach with the public, community groups, stakeholders, and agency partners during the next phase of project development will help determine how the identified concepts can effectively serve regional goals and community needs.

Ridership Summary

To model potential ridership, alignment concepts were grouped into a series of scenarios that were coded into the Federal Transit Administration's Simplified Trips-on-Project Software model. Existing transit ridership and regional growth forecasts developed for San Diego County are just a few of the model inputs. These scenarios tested how well the Purple Line would perform under the full alignment concept, with the addition or omission of select stations, or with a change in operating speed. Based on the estimates developed for this study, between 23,200 and 25,800 passengers could be expected to use the full Purple Line alignment between National City and Sorrento Mesa each day in 2050. Table 1 demonstrates ridership estimates for 2029 for the full alignment and the three minimum operable segments.

Table 1. 2029 Ridership Estimates for the Full Alignment and Minimum Operable Segments

Purple Line Ridership by Scenario (2029)				
Total Scenario Ridership	**Full Alignment**	**Minimum Operable Segment 1: National City to SDSU Mission Valley Campus**	**Minimum Operable Segment 2: National City to UTC Transit Center Station**	**Minimum Operable Segment 3: Euclid Avenue Trolley Station to UTC Transit Center Station**
Total Ridership	**25,700 - 29,100**	**15,800 - 18,600**	**26,100 - 28,800**	**14,500 - 16,800**

While land use plans allow for notable population and employment growth near potential Purple Line stations, the latest regional growth forecast developed for San Diego County projects minimal growth both regionwide and within proximity to these potential station areas as presented in Figure 2. This, coupled with other significant transit investment planned for the Purple Line corridor, may collectively limit the Purple Line ridership projected in this study. These phenomena are likely why Purple Line ridership for the full alignment is forecasted to be higher in 2029 than in 2050. Further analysis is required to determine how these elements may influence the overall effectiveness and utilization of the Purple Line.

It is important to note that there are significant transit investments planned between National City and San Ysidro, including an extension of the Purple Line to San Ysidro via Chula Vista. A more comprehensive understanding of potential Purple Line ridership south of National City is critical to understanding overall Purple Line feasibility and performance.

Cost Estimate Summary

Cost estimates were prepared for two concepts that would serve all stations (except only one station each in Sorrento Mesa and City Heights): one that would be primarily in a tunnel and another that would include aerial guideways where feasible. The total cost of the project would range from about $20,700 million (aerial guideways where feasible) to $27,170 million (primarily in a tunnel). A summary of capital costs is provided in Table 2. Costs (both capital and operations and maintenance) should be developed and compared for the Purple Line as a variety of transit modes (e.g., light rail) as part of an Alternatives Analysis.

Table 2. Capital Cost Estimates for Lower and Higher Cost Alignment Concepts

Item	Projected Capital Cost (millions)*	
	Lower Cost (Aerial + Tunnel)	**Higher Cost (Tunnel)**
Revenue Service Guideway and Stations	$18,720	$23,410
Operations/Maintenance Facility and Lead Track	$1,350	$3,130
Vehicles	$630	$630
Total	**$20,700**	**$27,170**

* Costs are in 2024 dollars and do not include the cost of real estate, finance charges for the project, or escalation to year-of-expenditure costs. These additional costs will be developed in future phases of project development when a detailed project schedule, financing plan, and right-of-way limits have been identified.

Conclusion

The study has determined that a high-speed, high-capacity transit service is possible in the Purple Line corridor. As the Purple Line advances, further work needs to be done to balance cost, performance, and other priorities to determine the appropriate service type and other characteristics (e.g., aerial or below grade, station locations, etc.). When determining which alignment concepts are advanced for further analysis, tradeoffs and key takeaways should be considered for both the aerial and tunnel concepts identified to date. Many decisions related to mode, potential alignments, termini, station locations, and vertical configurations will need to be resolved pending additional engineering analysis, environmental considerations, and community and stakeholder input.

Project Implementation Process

This *Purple Line Conceptual Planning Study* is the initial step of a complex process by which major transit capital investments are conceived, vetted through studies of alternatives, environmentally cleared, designed, financed, constructed, and eventually opened for revenue service.

After conceptual planning, the next step of Project Planning, usually referred to as an Alternatives Analysis, is where the Purpose of and Need for a project and the general study corridor limits are identified. Through multiple rounds of development and screening, alternatives are evaluated at progressively greater levels of detail leading to the selection of a Locally Preferred Alternative. Following the conclusion of initial planning and the Alternatives Analysis, the project advances through environmental review and approval.

Once the Locally Preferred Alternative is cleared through the federal and state environmental processes and preliminary engineering is complete, the projects would enter the engineering and design phase. This phase includes decisions about project phasing and delivery methods, the development of baseline budgets, and the completion of final design.

The final stage is the actual construction of the project and all testing required to open for revenue service.

Major multibillion dollar rail transit projects are high-risk, complex undertakings involving numerous parties and varied interests. The entire process typically takes roughly 15 to 20 years for projects that are 8-15 miles long. An example timeline is presented in Figure 5. Minimum operable segments identified at this time and which will require further analysis range from 9.1 miles to 19.3 miles. The full alignments for which capital costs were developed are both more than 22 miles.

Figure 5. Example Implementation Timeline

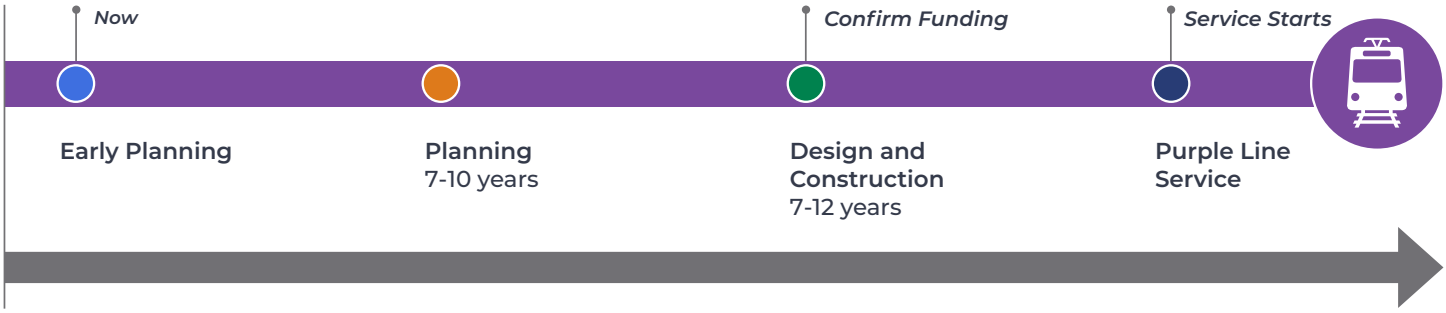


Table of Contents

Figures

Tables

Attachments

*Attachments can be requested from **purpleline@sandag.org***

Acronyms and Abbreviations

Acronym/Abbreviation	Definition
AA	Alternatives Analysis
Caltrans	California Department of Transportation
CEQA	California Environmental Quality Act
CIG	Capital Investment Grants
CMCP	Comprehensive Multimodal Corridor Plan
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
FTA	Federal Transit Administration
I	Interstate
LOSSAN	Los Angeles-San Diego-San Luis Obispo
LPA	Locally Preferred Alternative
LRT	Light Rail Transit
MOS	Minimum Operable Segment
mph	miles per hour
MTS	San Diego Metropolitan Transit System
NCTD	North County Transit District
NEPA	National Environmental Policy Act of 1970
PD	Project Development
PDT	Project Development Team
PEL	Planning and Environmental Linkages
PRP	Peer Review Panel
ROW	right-of-way
SANDAG	San Diego Association of Governments
SCC	Standard Cost Categories
SDSU	San Diego State University
STOPS	Simplified Trips-on-Project Software
UTC	University Town Center

1.0 Introduction

This *Purple Line Conceptual Planning Study* was undertaken to evaluate the feasibility of the Purple Line at a conceptual level. It is the first study dedicated solely to evaluating this regionally significant project as a heavy rail[1] transit line. Findings from the analysis will be used to inform the overall development of the project.

A Project Development Team (PDT) comprised of San Diego Association of Governments (SANDAG) staff in addition to representatives from transit and transportation agencies, municipalities, and other stakeholders was convened at the onset of the study to inform the development of alignment concepts, station and operations and maintenance (OMF) locations, and other features important to the communities they represent along the Purple Line corridor. Some but limited public engagement was conducted during this early phase; public engagement will increase significantly during future phases of project development.

Projects of similar scope and scale as the Purple Line require the dedicated efforts of many people and agencies to come to fruition. They also take time. This report provides an overview of the process and anticipated timeline the Purple Line will need to advance through before it can open for revenue service.

This report also provides an overview of the alignment concepts and station and OMF locations being evaluated at this time. It is important to note that these are subject to change as the Purple Line advances through project development, a process that will include stakeholder and public input. These alignment concepts and station and OMF locations were used to (1) identify a minimum operable segment (MOS), (2) develop preliminary ridership projections, (3) estimate capital costs, and (4) evaluate development potential and multimodal connections within proximity to identified station locations.

This report serves as a high-level overview of the various elements mentioned above. Additional detail is provided in the accompanying attachments.

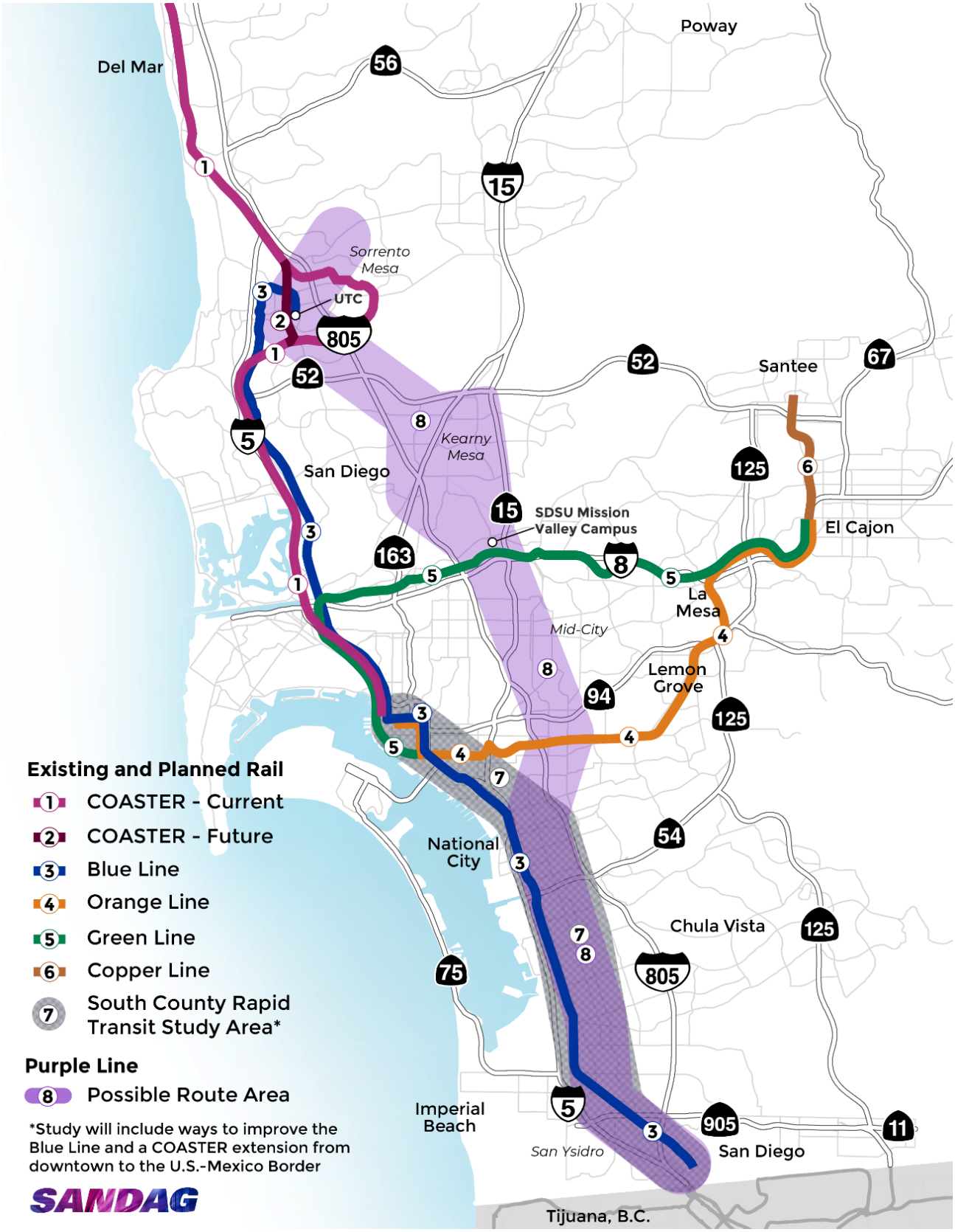
1.1 Project Description

The Purple Line is envisioned as a high-capacity transit[2] line from San Ysidro to Sorrento Mesa via Chula Vista, National City, City Heights, Mission Valley, Kearny Mesa, and University City (see Figure 1-1). The idea for the Purple Line comes from many years of community advocacy and planning, which are documented in the San Diego Association of Governments' (SANDAG) *2021 Regional Plan* and *South Bay to Sorrento Comprehensive Multimodal Corridor Plan* (CMCP).

[1] The Federal Transit Administration defines heavy rail as an electric railway with the capacity for a heavy volume of traffic. It is characterized by high speed and rapid acceleration passenger rail cars operating singly or in multi-car trains on fixed rails separated from other vehicular and foot traffic with sophisticated signaling and high platform loading. Typical metros, such as LA Metro, and subways are examples of this.
[2] High-capacity transit is defined as service that significantly improves the speed, frequency, and quality of service for users.

*This concept has two termini stations at the north end (UTC and Sorrento Mesa). Alternate trains would serve each station.

Figure 1-1. Purple Line Corridor



As included in the *Regional Plan*, the Purple Line would generally serve the Interstate (I) 805 corridor, the dominant north-south connection through the center of the urban San Diego region. It would directly serve several social equity focus populations, connecting residents to jobs, education, healthcare, and other community resources.

By connecting several densely populated communities as well as multiple major employment centers, the Purple Line would provide high-capacity, reliable, and equitable transit service to residents, employees, and visitors throughout San Diego and South Bay. The Purple Line would connect to the three principal Trolley lines, COASTER commuter rail, and dozens of *Rapid* and local bus routes, thereby expanding the reach and effectiveness of the regional transit network by offering a high-quality, sustainable mobility alternative to the congested I-805 and Blue Line corridors.

The new transit line would serve strategic locations in residential and employment centers that were identified based on existing conditions and in consultation with stakeholder partners as well as technology advancements that would help expedite service times. The Purple Line would be the backbone of a convenient, reliable, equitable, and healthy transportation system for the region. It would also interface with active transportation networks, Transit Priority Areas,[3] and other technological system improvements as recommended in the *South Bay to Sorrento CMCP* and *2025 Draft Regional Plan Initial Concept* to enhance network benefits and seamless travel. The inclusion of the Purple Line in the regional mobility network is a key strategy for facilitating seamless travel via alternative modes and could play a key role in reducing regional greenhouse gas emissions.

This *Purple Line Conceptual Planning Study* evaluates the potential of constructing and operating high-capacity rail service in the northern portion of the corridor between National City to Sorrento Mesa. The Purple Line evaluated as part of this study would run from National City to Sorrento Mesa via Southeast San Diego, City Heights, Mission Valley, Kearny Mesa, and University City.

SANDAG will soon initiate a separate planning effort to focus on the southern portion from San Ysidro to National City. That study will look at the relationship between several planned or proposed improvements in the South Bay, including the Purple Line, Blue Line Trolley, and extending Los Angeles – San Diego – San Luis Obispo (LOSSAN) corridor services, which includes the COASTER and Amtrak *Pacific Surfliner,* to the border. The State Rail Plan calls for service improvements to the U.S.-Mexico border, and that study will evaluate the interface between and among them. This soon to be initiated study as well as this *Purple Line Conceptual Planning Study* strategically position both corridors for federal grant programs and other funding opportunities. In conjunction with these studies, SANDAG is set to initiate planning for *Rapid* 688, a bus route that would provide connections from the international border to UTC Transit Center Station in the near term.

1.2 Project Background and Need

Improving transportation options and increasing transportation choice between the South Bay and Sorrento Mesa has been a high priority of communities in the corridor for several

[3] Transit Priority Areas are defined as areas within a ½ mile of a major transit stop that is existing or planned. Zoning and developer incentives encourage and support higher-density development within these areas.

years. The southern segment of the corridor being evaluated as part of this study is home to diverse and long-standing communities, many of which consist of social equity focus populations. The northern segment of the corridor being evaluated as part of this study includes several employment centers, educational opportunities, and medical facilities. Given the high-density residential, employment, and commercial development in the corridor and a lack of alternative routes, it suffers from some of the worst traffic congestion in the region. Providing a reliable, high-speed transit service in this corridor would connect residents to jobs, education, healthcare, and other community resources and provide an opportunity to avoid driving and traffic congestion.

As mentioned, the Purple Line was identified as a priority project in the *2021 Regional Plan* and the *South Bay to Sorrento CMCP*. The *2021 Regional Plan* serves as the long-range vision for moving people efficiently, equitability, and sustainably across the region. The *South Bay to Sorrento CMCP* built upon the work of the *2021 Regional Plan* to provide more specificity for projects, programs, and policies guiding multimodal investment along this regionally important corridor. Extensive public outreach conducted as part of both planning efforts reiterated and confirmed the need for the Purple Line.

1.3 Study Area

The study area for this *Purple Line Conceptual Planning Study* includes the area from approximately the Blue Line Trolley's 8th Street Station in the City of National City to Sorrento Mesa in the City of San Diego (see Figure 1-1). As described, the objective of the Purple Line is to connect communities generally along the I-805 corridor, including the City of National City and Southeast San Diego, City Heights, Mission Valley, Kearny Mesa, University City, and Sorrento Mesa in the City of San Diego. The study area is inclusive of these communities, and the analysis that follows considers how the Purple Line would fit within them.

1.4 Relationship to Other Projects

The Purple Line could interface with or be affected by the following planning efforts. Coordination between staff and sponsor agencies is ongoing.

- **Blue Line Trolley Improvements.** SANDAG will assess improvements to enhance Blue Line Trolley travel times, frequency, and safety, potentially including express service, between San Ysidro and downtown San Diego. Improvements could impact the Purple Line should the Purple Line alignment begin at the 8th Street Station.
- **LOSSAN to Border Study.** SANDAG will explore extending COASTER and/or Amtrak service from downtown San Diego to San Ysidro to support the vision of the California State Rail Plan. The Purple Line's design in National City should align with this study to avoid conflicts with planned services.
- **Euclid Avenue Grade Separation.** The San Diego Metropolitan Transit System (MTS) is evaluating options to grade separate the Orange Line Trolley tracks with Euclid Avenue. The Purple Line's design in this area should be coordinated with this project to avoid conflicts.
- ***Rapid* 688 Conceptual Planning.** *Rapid* 688, a planned bus rapid transit service from San Ysidro to University Town Center (UTC) Transit Center Station, would parallel the

Purple Line at various points. *Rapid* 688 is viewed as a near-term transit solution that would precede the Purple Line because it serves many of the same areas.

- **Miramar Tunnels Alternatives Analysis Report.** This study, completed in 2023, identified two long-term routing options for the LOSSAN corridor under University City, one of which includes an underground station within proximity to UTC Transit Center Station. The Purple Line's design in this area would be coordinated with the realignment of the LOSSAN corridor to ensure easy transfers and avoid conflicts.
- **Transit Priority Treatments on Arterial Roadways.** Several *Rapid* routes throughout the Purple Line corridor could be enhanced with transit priority treatments. This includes Mira Mesa Boulevard in Sorrento Mesa (*Rapid* 237 and 238) and Clairemont Mesa Boulevard in Kearny Mesa (*Rapid* 120, 207, 228, 243, 295, 484, 630, 649, and 880). The design of aerial Purple Line infrastructure along arterial roadways would be designed to avoid conflicts with planned transit priority improvements.

2.0 Project Implementation Process

This *Purple Line Conceptual Planning Study* is the initial step of a complex process by which major transit capital investments are conceived, vetted through studies of alternatives, environmentally cleared, designed, financed, constructed, and eventually opened for revenue service. A high-level summary of the four primary steps by which transit projects are advanced and associated key activities within each step are presented in Figure 2-1 and described in greater detail below. Next steps that are likely to be undertaken to advance the Purple Line are described in Attachment A.

2.1 Project Planning

Major transit investments begin with a conceptual planning phase, which is intended to complete enough conceptual planning and high-level design to validate a concept in terms of defining the purpose of the investment, the general corridor alignment, station and OMF needs and locations, and technology options. They often include (1) a high-level environmental review to identify major issues, impacts, or potential fatal flaws that could make a concept(s) challenging or very costly to gain approvals, (2) initial forecasts of ridership potential, and (3) capital cost estimates. They usually take a year or more to complete, include some level of public outreach and stakeholder consultation, and sometimes are undertaken in multiple stages or parallel studies, which in this instance may include additional studies of transit in the South Bay.

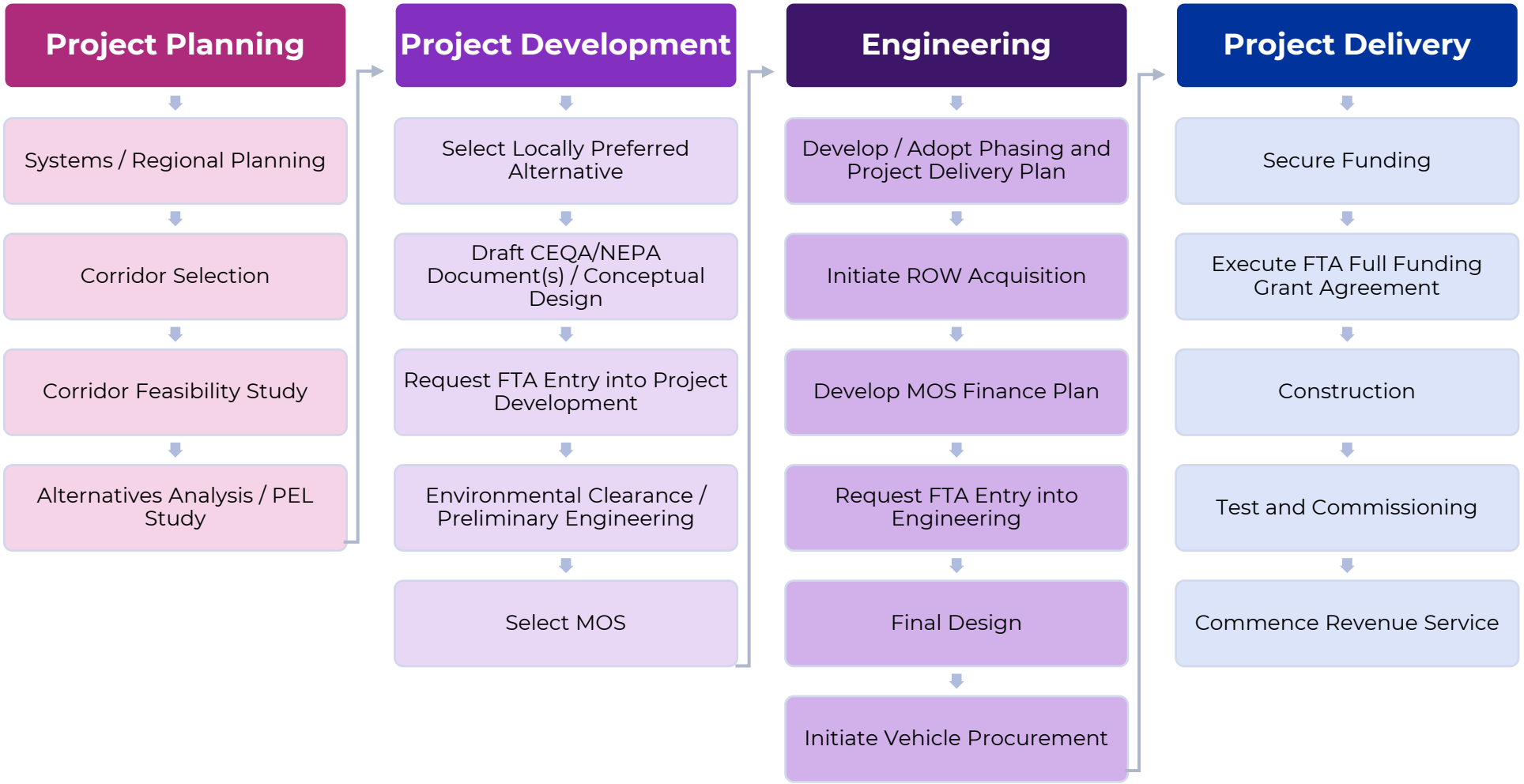
The next step of Project Planning, usually referred to as an Alternatives Analysis (AA), is where the Purpose of and Need for a project and the general study corridor limits are identified. Through multiple rounds of development and screening, alternatives are evaluated at progressively greater levels of detail leading to the selection of a Locally Preferred Alternative (LPA). The AA also includes a robust public and stakeholder engagement process.

The process incorporates some high-level environmental analysis of the alternatives to gain a better understanding of any highly sensitive issues in the study area. This may include sensitive habitats, water features, archaeological resources, and protected populations, among others. In recent years, the process has included the development of a Planning and Environmental Linkages (PEL) study, which is either incorporated in the AA or as a separate standalone document (see Section 3.2).

2.2 Project Development

Following the conclusion of initial planning and the AA, there are two major steps in Project Development. The first step includes the initiation of the formal environmental review and approval process. In California, this includes both the federal National Environmental Policy Act (NEPA) and state California Environmental Quality Act (CEQA) requirements. For most major rail investments, both a NEPA-compliant Environmental Impact Statement (EIS) and a CEQA-compliant Environmental Impact Report (EIR) are prepared. To support preparation of these documents, the LPA and any other alternatives being evaluated are progressed through Advanced Conceptual Engineering (roughly 15 percent design) to help better understand potential project-induced impacts. Agency coordination is initiated during this step. This step concludes with the public release of the Draft EIS and separately a Draft EIR.

Figure 2-1. Project Implementation Process



During the second step of Project Development, project sponsors respond to comments on the draft environmental documents, perform additional studies and analyses, and modify the LPA as may be warranted. This step also completes the environmental approval process and includes the issuance of the Final EIS and the Record of Decision for NEPA and the Final EIR and Notice of Determination for CEQA. This step also incorporates the completion of Preliminary Engineering for the LPA. Projects that are candidates for Federal Transit Administration (FTA) Capital Investment Grants (CIG) with a capital cost of greater than $400 million must also complete a series of other requirements as a part of Project Development (see Section 3.1).

2.3 Engineering

Once the LPA is cleared through the federal and state environmental processes and preliminary engineering is complete, projects enter the engineering and design phase. This phase includes decisions about project phasing and delivery methods, the development of baseline budgets, and the completion of final design. Once baseline budgets are established, a finance plan strategy is developed. Right-of-way (ROW) acquisition and vehicle procurement is initiated during this stage. Based on the finance strategy and baseline budget, both local and federal funding are secured prior to the Project Delivery phase.

2.4 Project Delivery

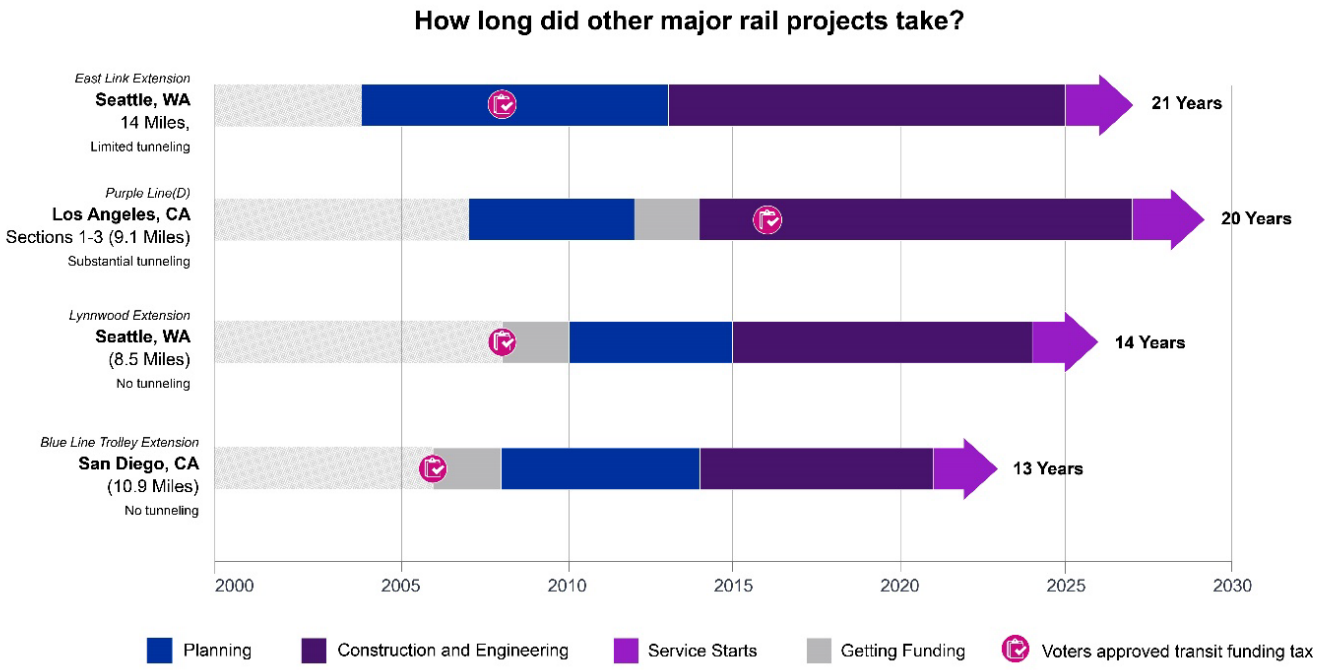
The final stage is the actual construction of the project in addition to the delivery and testing of vehicles and all systems components. Once construction is complete and all systems elements installed, integrated testing occurs, including simulated operations without passengers. Once complete, the project is opened for revenue service.

2.4.1 Duration

Major multibillion dollar rail transit projects are high-risk, complex undertakings involving many parties and varied interests. Because they take a long time to develop, as long as 20 years or more from conceptual study initiation until they open to serve passengers, they often are impacted by changes in political leadership and unanticipated issues at all levels from local communities through the federal government. Funding availability as well as the frequently needed local ballot measures also adds uncertainty to the process. As a result, it is hard to accurately predict the duration of the entire undertaking.

Figure 2-2 provides a sense of the timelines for other recent major rail projects in Los Angeles and Seattle. Also shown is the timeline for the recently completed Blue Line Extension. As demonstrated, the entire process typically takes roughly 15 years to 20 years, and there is significant variability in the steps towards implementation. The greatest uncertainty generally falls in the timing of the Project Development phase and, in particular, environmental clearance. Delays in this phase most often are associated with local decision making and funding. With some exceptions, once projects clear Project Development and enter final design, timelines are more predictable.

Figure 2-2. Recent Major Transit Investment Timelines



3.0 Project Development Considerations

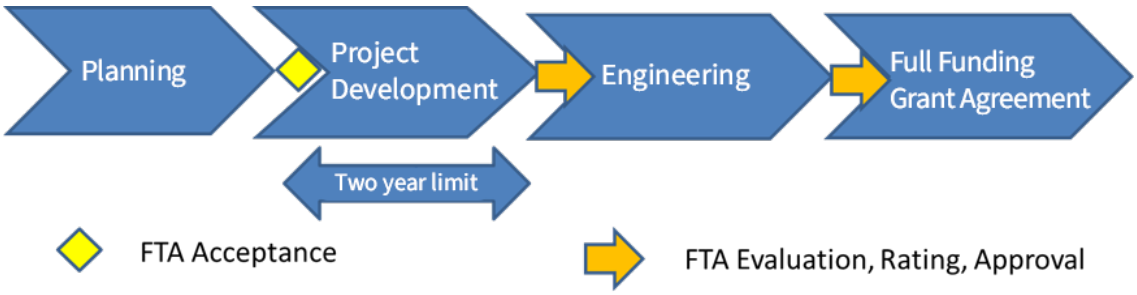
Projects of similar scope and scale as the Purple Line have many considerations that need to be made at the earliest stages of project development and through construction to ensure not only effective and efficient project delivery but also that the project meets stated objectives with support from stakeholders and affected communities while minimizing potential impacts.

The following provides an overview of the grant process that SANDAG is anticipated to pursue to help fund implementation. It also summarizes community, environmental, and regulatory considerations that will need to be factored into the decision-making process.

3.1 Capital Improvement Grant Program Process

Because of the scope and scale of the Purple Line, a grant under the FTA's CIG program is assumed to be necessary to construct the Purple Line. The CIG program is FTA's largest discretionary grant program, currently authorized at $4.6 billion per year. Federal law has a long-established, multi-step, multi-approval process for the planning and development of candidate CIG projects of the size of the Purple Line (see Figure 3-1). These steps are closely aligned with the project implementation process described in the previous chapter.

Figure 3-1. Planning and Development Process of Candidate CIG Projects



Source: FTA, 2024.

The path to CIG funding, which concludes with the execution of a multi-year Full Funding Grant Agreement, is a complex one that requires (1) a significant investment of agency staff and financial resources and (2) the early development of a strategy and schedule to meet all statutory, regulatory, and FTA policy requirements.

The first step in the process where FTA takes any formal action is called Project Development (PD), which covers all Project Development activities described above. In addition, project sponsors must complete and submit specific documentation to FTA to advance.

- **Project justification criteria.** FTA evaluates and rates candidate CIG projects against six justification criteria – (1) mobility improvements, (2) environmental benefits, (3) cost effectiveness, (4) land use, (5) congestion relief, and (6) economic development. It should be noted that the first four of these criteria are based on a travel demand forecast whose methodology and results must be approved by FTA.

- **Local financial commitment criteria.** This is generally satisfied by the preparation of a 20-year systemwide capital and operating financial plan. The plan must provide evidence that at least 30 percent of the total non-CIG share of project costs is secured. CIG matches above 40 percent make projects more competitive in the grant process.

- **Project Design.** Completion of at least 30 percent design, although a higher level of design is recommended, as noted below.

- **Technical and Management Capacity.** Evidence of the project sponsor's technical and management capacity to advance the project into the Engineering phase of the CIG process. This is determined by an FTA Project Management Oversight Contractor's assessment of the sponsor's project management plan, project organization and staffing plan, and other plans and procedures that demonstrate how the project would effectively and efficiently be delivered.

FTA's acceptance of a project's entry into PD follows the completion of the planning process described above and the selection of an LPA to carry into NEPA. The two most critical requirements for acceptance into PD include (1) the development of a cost estimate for the completion of the activities presented above as well as evidence of a local funding commitment to cover these costs and (2) a schedule that demonstrates that all PD activities can be completed within two years.

Meeting these requirements within two years for a complex project such as the Purple Line is very difficult. Therefore, sponsors of similar projects typically delay the start of the two-year PD clock until well after the initiation of the NEPA process, often until the preparation of the final EIS.

Projects that complete PD requirements and achieve an overall rating of medium or higher for the justification and financial criteria are approved by FTA to enter Engineering. Engineering is a critical milestone as it establishes the maximum level of CIG funding that FTA will commit in a future Full Funding Grant Agreement. For that reason, many CIG project sponsors will seek to advance design well past 30 percent during PD to minimize the risk of future cost increases, as any such increase must be borne by the sponsor.

It is during Engineering that the sponsoring agency (1) finalizes the project scope, schedule, and budget, (2) executes all critical third-party agreements, (3) updates its management plans, procedures, and project organization to cover the construction of the project, and (4) secures the local match. Once complete and FTA reconfirms a medium or higher rating for project justification and local financial commitment, the project is eligible for a CIG Full Funding Grant Agreement if funding has been made available by Congress.

3.2 Environmental Documentation and Clearance

Environmental clearance under NEPA and CEQA are necessary milestones for the PD phase. As described above, an EIS under NEPA and EIR under CEQA are the anticipated classes of action for the Purple Line. Recent federal requirements under the Final Rule published by the Council on Environmental Quality on July 1, 2024, limit completion of an EIS to two years from issuance of the Notice of Intent with a page limit of 150 pages or 300 pages for projects with extraordinary complexity. As there is no required timeline from the planning phase of the project to the issuance of the Notice of Intent, the work done prior to this issuance is

critical to ensuring the NEPA schedule is met. A robust AA or PEL process, including coordination with resource agencies and stakeholders to identify major topics of concern, should be started prior to the issuance of the Notice of Intent. FTA may also require SANDAG to complete its new readiness requirements for approval to enter PD and initiate NEPA.

Environmental clearance under CEQA does not have timelines or page limits. Therefore, to meet the NEPA requirements, the CEQA process can be initiated first with the Notice of Preparation for the EIR. By overlapping the publication of the Notice of Preparation and initiating CEQA scoping during the AA or PEL process, public input is gathered to properly scope the EIR and identify the LPA, which would serve as the Proposed Project Alternative in the CEQA document.

3.2.1 Planning and Environmental Linkages

PEL is a planning phase process that allows information, analysis, and decisions made prior to initiation of the formal NEPA process to be used or relied upon during environmental review. The PEL process can be used to support the planning phase by defining the Purpose of and Need for a project or screening alternatives. Using the PEL process can minimize potential duplication between the planning and NEPA processes, which can lead to more efficient project delivery.

3.3 Community Considerations

The primary objective of the Purple Line is to connect residents to jobs, education, healthcare, and other community resources via high-capacity transit. While the intended objective of the Purple Line is to bring benefits to the communities it serves, the analysis must also consider how communities, and particularly social equity focus populations who have borne a disproportionate share of adverse impacts associated with past transportation investment and long been underrepresented in the transportation decision-making process, would be affected by the Purple Line both during construction and operation. This consideration will be critical to the success of the Purple Line and towards building trust with communities that have struggled to regain their footing since past transportation investment isolated, segregated, and fragmented neighborhoods, such as City Heights.

Diverse communities along the Purple Line corridor have expressed their support for the Purple Line. It will be essential to engage these communities to make sure that community concerns are known at the earliest stages of the decision-making process, that benefits and potential impacts are understood, and that mitigation measures are identified, if needed. Adjacent to the Purple Line corridor, potential impacts (either permanent or temporary) may include acquisition or relocation, noise, vibration, air quality emissions, traffic detours, and impacted access to community resources, including open space and recreational areas. To the extent feasible, all Purple Line concepts that are advanced for further evaluation will be designed to avoid or minimize impacts to adjacent communities, particularly social equity focus populations.

3.4 Environmental Considerations

NEPA and CEQA documents that would need to be developed for the Purple Line would evaluate the full suite of environmental topic areas for the alternatives advanced to the PD

phase. Although there are dozens of environmental topics that would need to be analyzed, the following have the potential to result in significant time delays, regulatory challenges, public opposition, or additional costs that could be incurred. It should be noted that potential impacts to resource areas have not been assessed in detail and no determination, if any, has been made at this time.

Several of the considerations identified below require avoidance or minimization alternatives to be considered if potential impacts are identified. As such, it is critical to identify such impacts prior to further refinement of the alignment concepts so those that cannot avoid, minimize, or mitigate such an impact are not advanced.

3.4.1 Section 4(f) and 6(f)

Under Section 4(f) of the U.S. Department of Transportation Act of 1966, publicly owned parks, recreational areas, wildlife/waterfowl refuges, and historic properties are protected, and use of these resources requires evaluation of avoidance alternatives. If the alignment concepts for the Purple Line were to use a resource protected under Section 4(f), a determination would need to be made that there is no prudent or feasible alternative to avoid or minimize the impact, and concurrence would be needed by those with official jurisdiction over the resource. Recreational space adjacent to the San Diego River in Mission Valley, among other locations, would need to be evaluated in relation to Purple Line alignments to make a determination. Section 6(f) protects properties acquired or developed with Land and Water Conservation Funds. Under the Land and Water Conservation Funds Act, if there is a conversion of a Section 6(f) resource (in whole or in part) to a non-recreational use, replacement of the property is required.

3.4.2 Section 106

Properties considered eligible for listing or listed in the National Register of Historic Places require consultation with the Station Historic Preservation Office for review and concurrence on potential effects of a project. Listed properties within proximity to the Purple Line alignment are located in the City of National City and Kensington and Mission Valley neighborhoods in the City of San Diego. Subsequent phases of project development may identify additional properties for consideration, including those that are eligible and which are afforded the same protections as listed properties. The extent of potential impacts to these resources, if any, has not been determined at this time.

The Section 106 review process, and final finding of effect determination, can add substantial time and coordination efforts on a project. Negotiations are required to avoid, minimize, or mitigate any adverse effects on a historic property. Under Section 106, federal agencies must also consult with any tribe that attaches religious and cultural significance to historic properties that might be affected by the undertaking.

3.4.3 Environmentally Sensitive Habitats and Listed Species

Under Section 7 of the Endangered Species Act, federal agencies are required to ensure their actions are not likely to jeopardize endangered or threatened species (listed species) or adversely modify designated critical habitat for listed species. The Purple Line corridor includes critical habitat, and the potential for listed species exists. Consultation with U.S. Fish

and Wildlife Service under Section 7 would be required to evaluate potential impacts and consider alternative actions that could minimize potential effects.

3.4.4 Wetlands and Waters

Section 404 of the Clean Water Act regulates discharge of dredged or fill materials into waters of the United States, including wetlands. Individual permits under Section 404 are typically required for large projects likely to have a substantial impact on the environment. Any activity requiring an individual permit under Section 404 of the Clean Water Act must undergo an analysis of alternatives to identify the least environmentally damaging practicable alternative. Compensatory mitigation would be required to offset unavoidable adverse impacts, which can be costly depending on the ratio imposed by the U.S. Army Corps of Engineers, the availability of credits at applicable mitigation banks, or feasibility of in-lieu fee programs or permittee-responsible mitigation.

3.4.5 Noise and Vibration

During both construction and operation, noise and vibration impacts at sensitive receptors, such as schools, residences, and medical facilities could result. Historic resources could also be affected. This may be associated with alignment concepts and/or OMF siting. Modeling would be needed to test potential increases resulting from the Purple Line. Coordination would be needed to evaluate the extent of potential impacts on adjacent communities.

3.4.6 Visual and Aesthetics

Visual impacts from operation of the Purple Line would result mainly from aerial structures that have the potential to disrupt existing visual character or scenic viewpoints. This could also include OMF siting.

3.4.7 Geological Features

Geological features include groundwater, fault lines, soil types, and rock deposits, among others. As part of this *Purple Line Conceptual Planning Study*, a desktop study of the Purple Line corridor to identify probable subsurface conditions and potential geologic hazards was conducted. Findings, which are presented in Attachment B, would need to be considered as the Purple Line continues to advance because they have the potential to impact project design and construction methods.

3.5 Regulatory Considerations

The future design of the Purple Line would require coordination with local, state, and federal agencies. Under NEPA, coordination is needed with cooperating and participating agencies, while CEQA requires coordination with responsible and trustee agencies. The lead agencies under NEPA and CEQA will have discretionary approval authority over the project.

The Purple Line would need to adhere to various state and federal laws, executive orders, and policies, including the (1) protection of parks and recreational resources (Section 4(f)), (2) consideration of impacts on environmental justice and social equity populations, (3) protection of historic, archaeological, and tribal cultural resources, and (4) compliance with design standards, such as those for Accessible Design.

As the Purple Line advances, a comprehensive list of applicable laws, executive orders, and policies, along with coordination timelines, would be developed. Environmental documents would comply with both state and federal requirements, with SANDAG and FTA likely serving as lead agencies for state and federal environmental clearance, respectively.

The following identifies state and federal agencies that are anticipated to require coordination based on this initial phase of the Purple Line:

- U.S. Fish and Wildlife Service
- U.S. Environmental Protection Agency
- California Department of Fish and Wildlife
- Regional Water Quality Control Board
- U.S. Army Corps of Engineers
- California Coastal Commission
- State Historic Preservation Office
- Federal Aviation Administration
- California Department of Transportation (Caltrans)
- California Public Utilities Commission
- Cities and San Diego County

The extent of coordination with the above agencies would vary based on the alignment concepts advanced.

4.0 Public Participation and Stakeholder Engagement

The concept of the Purple Line as heavy rail was first introduced, and garnered support from communities along the corridor, as part of SANDAG's *2021 Regional Plan*. This was reiterated during the *South Bay to Sorrento CMCP* planning process. This *Purple Line Conceptual Planning Study* is the first step in a long process specifically intended to make the most significant transit infrastructure project in the San Diego region a reality. Public participation and stakeholder engagement will be integral parts of all subsequent phases of project development. As such, efforts undertaken in this phase of the planning process were focused on developing messaging and informational materials to be used in subsequent phases and conducting some initial engagement activities.

Goals for public participation and stakeholder engagement in this early phase included:

- Developing a series of communication materials.
- Engaging and informing stakeholders and the public about the Purple Line, the overall planning process, anticipated timeline, and milestones for projects of such significant scope and scale.
- Building on existing and fostering new relationships with stakeholders, particularly social equity focus populations, along the corridor.

During this initial phase of the planning process, a PDT was convened, a series of pop-up events hosted by Community-Based Organizations (CBOs), community partners, and SANDAG were conducted, a webinar was hosted by SANDAG, and an online survey and mapping activity were administered. Findings were used to inform project development at this early phase and will be used to ensure that future engagement efforts are meaningful and inclusive.

4.1 Stakeholder Engagement

Stakeholder engagement during this phase of the Purple Line included coordination with CBOs along the corridor and the convening of the PDT.

4.1.1 Community-Based Organization Engagement

Four CBOs along the Purple Line corridor were engaged to ensure the effectiveness of the messaging developed given the range of communities it was designed to engage and to leverage their relationship with communities, particularly social equity focus populations, to help disseminate project-related information and availability of engagement opportunities. CBOs engaged as part of this Purple Line study include the Environmental Health Coalition, City Heights Community Development Corporation, Urban Collaborative Project, and SBCS (formerly South Bay Community Services). Collaboration with other community partners such as Caltrans and Casa Familiar allowed for additional pop-ups and presentations to reach a larger audience in the study area. Additional CBOs may be leveraged as the Purple Line advances. During this initial phase, CBOs conducted the following:

- Provided feedback on project messaging and materials.
- Hosted two feedback collection events targeting the communities they serve.
- Incorporated opportunities for the project team to present on the project at standing CBO meetings and asked for community input.
- Promoted engagement opportunities to their members, ally organizations, and other contacts via email, social media, and word of mouth.
- Reported on participation and promotional reach for the abovementioned engagement opportunities.

4.1.2 Project Development Team

At project onset, the project team worked with SANDAG to convene a PDT representative of the different relevant municipalities, transit and transportation agencies, and other partners. Over the course of this *Purple Line Conceptual Planning Study*, there were five PDT meetings. It is anticipated that the PDT would continue to meet as the Purple Line advances through the decision-making process. Other representatives and subject-matter experts are anticipated to participate in future meetings as needed.

PDT meetings were convened at targeted periods during this current study to share new findings since the meeting prior and solicit input. Each meeting included a presentation and open dialogue. Outcomes helped inform alignment development, the siting of potential stations and OMFs, and identification of additional multimodal connections or land use development potential. Participants provided invaluable information as to how the Purple Line would likely benefit and/or impact the communities in which they would be sited. Additional meetings included an overview of ridership potential and anticipated costs.

4.2 Public Participation

At this early phase, public participation included (1) a virtual public meeting, (2) 11 pop-up events and community presentations, two hosted by each of the four CBOs mentioned above and three by SANDAG and community partners, and (3) an online survey and mapping activity. The objective of this engagement was to inform the community about future transit service (including the Purple Line and the *Rapid* 688 route planned in the same corridor) and discuss popular destinations within the study area from San Ysidro to Sorrento Mesa. Individual engagement opportunities are described below.

During the virtual public meeting, pop-up events, and community presentations, participants were asked the same questions as included in the online survey. Questions focused on participants' connection to the Purple Line corridor, their travel behavior, and key destinations to be served by the Purple Line. A summary of the feedback received during outreach opportunities is included in Section 4.2.3 and Section 4.2.4 and provided in Attachment C.

4.2.1 Virtual Public Meeting

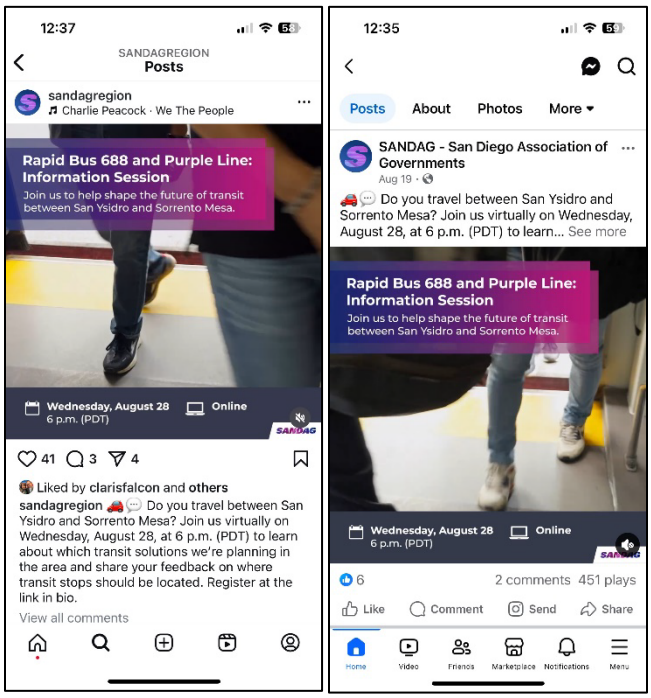
The virtual public meeting was promoted on social media and through the CBOs (see Figure 4-1). The meeting was hosted via Zoom, and more than 120 people attended. Throughout the

meeting, several live polls were conducted, the results of which are summarized in Section 4.2.3 and Section 4.2.4 and included in Attachment C.

In addition, nearly 70 questions were asked of the project team, with the following key themes:

- Service frequency and connections to other regional transit services (e.g. Trolley, COASTER, etc.)
- Connections to CBX, Otay Mesa, and south of National City
- Travel times
- Above or below grade alignments
- Anticipated construction duration

Figure 4-1. Social Media Advertising the Virtual Public Meeting



Note: Instagram at left and Facebook at right.

4.2.2 Pop-Up Events

A total of 11 pop-up events and community presentations were hosted in September and October 2024 within social-equity-focus neighborhoods in the study area. The goal of these pop-ups was to provide an analog version of the online survey to community members without as much widespread access to technology. As mentioned, eight were hosted by the four CBOs engaged to help reach social equity focus populations and three were hosted by SANDAG with some help from community partners. The date, host, location, and number of people engaged is provided in Table 4-1.

At each of these events, project information was shared. Participants were shown a map with identified activity centers and were asked to share additional destinations of importance

along the corridor as well as the same travel behavior and demographic information the online survey-takers provided in the form of a paper survey. They were also encouraged to take the online survey and share it with others in their community. Materials were made available in English, Spanish, and Vietnamese. The responses from this mapping activity and paper survey were databased by staff and incorporated into the online survey results discussed below.

Table 4-1. Pop-up Event Detail

Date/Time	Host	Event Name	Location	People Engaged (#)
9/19/24 5:30 p.m. – 6:30 p.m.	City Heights Community Development Corporation	City Heights Community Development Corporation Transportation & Housing Meeting	City Heights	25
10/3/24 10:00 a.m. – 12:30 p.m.		Pop-up near food distribution		90
9/25/24 5:00 p.m. – 6:30 p.m.	Environmental Health Coalition	Environmental Health Coalition National City Community Action Team Meeting	National City	25
10/7/24 3:00 p.m. – 5:30 p.m.		Transit Pop-up		70
9/11/24 2:00 p.m. – 4:30 p.m.	SBCS	SBCS Food Distribution	Chula Vista	100
9/25/24 8:30 a.m. – 9:30 a.m.		SBCS Resident Leadership Academy Meeting		25
9/12/24 5:30 p.m. – 7:00 p.m.	Urban Collaborative Project	Urban Collaborative Project Transportation Team Meeting	Zoom	20
9/29/24 9:00 a.m. – 12:00 p.m.		Urban Collaborative Project Coffee Pop-up	Southeastern San Diego	30
10/1/24 3:00 p.m. –5:30 p.m.	SANDAG	Transit Pop-up	San Ysidro	85

Date/Time	Host	Event Name	Location	People Engaged (#)
10/8/24 4:00 p.m. –7:30 p.m.		Casa Familiar Transportation Meeting		44
10/12/24 10:00 a.m. – 12:30 p.m.		California Department of Transportation (Caltrans) Reconnecting Communities Event	Southeastern San Diego	80
			Total People Engaged (#)	**594**

4.2.3 Online Survey Findings

The following provides a summary of survey responses received during both the virtual public meeting, the online survey, and in-person input collection. The online survey was made available from August 28 through October 14, 2024. In addition to being promoted during the pop-up events, SANDAG and the abovementioned CBOs used various social media platforms (including paid Instagram and Facebook ads in English and Spanish) to promote it, along with an alert embedded in the PRONTO app (the app the public uses to plan public transit trips in the San Diego region) targeted at transit users within the study area.

A total of 1,167 survey responses were received online. This is in addition to the 120+ people who participated in the virtual public meeting and provided responses to the survey questions asked during that time. Overall, engagement efforts at this early stage in the planning process confirmed that there is still strong interest and support for more robust transit service in the Purple Line corridor. Key takeaways from this engagement includes the following:

- Respondents were asked what their connection to the study area is. More than 66 percent of the survey respondents live in the Purple Line corridor. Of these, 54 percent were from South County, 14 percent from UTC/Sorrento Mesa, 10 percent from College Area/Kensington/Talmadge, nine percent from Southeastern San Diego, seven percent from City Heights, four percent from Kearny Mesa/Serra Mesa, and two percent from Mission Valley.
- The key destinations that people would like to reach include the employment centers along the corridor, including Kearny Mesa, National City, University City, and Sorrento Mesa.
- Most survey respondents and those who participated in the virtual public meeting drive to reach destinations in the study area.
- Frequent service and connections to other regional transit services are important for future transit service in the corridor.

- Travel times would need to be competitive with driving for people to use transit service.

4.2.4 Mapping Activity Findings

In addition to the above, the mapping exercise identified popular activity centers along the Purple Line corridor and asked participants if there were other destinations that should be considered. Nearly 60 percent of respondents said that most key destinations were included while approximately 42 percent provided additional destinations for consideration. The following identifies the top ten zip codes where additional key destinations for consideration were identified by participants. Additional detail is provided in Attachment C.

- 92123 (Kearny Mesa): 82 posts
- 91950 (National City): 60 posts
- 91910 (Chula Vista): 53 posts
- 92122 (University City): 43 posts
- 92121 (Sorrento Valley): 37 posts
- 91910 (Downtown Chula Vista): 29 posts
- 92123 (Serra Mesa): 21 posts
- 92108 (Mission Valley East): 19 posts
- 92111 (Clairemont Mesa East): 15 posts
- 92113 (Mountain View): 14 posts

5.0 Planning Parameters

One of the key goals of this *Purple Line Conceptual Planning Study* was to determine the feasibility of constructing and operating the Purple Line using technology that allows for faster service than the current light rail system in San Diego County. As such, a series of planning and design parameters to guide the development of Purple Line route alignment concepts, potential ridership, capital costs, and system requirements were developed. These are summarized below and described in greater detail in Attachment D.

5.1 Station Location Identification

Station identification is an essential early step in the planning process and when establishing planning and design parameters. Preliminary station locations were identified as part of the *2021 Regional Plan* and *South Bay to Sorrento CMCP* planning processes. The identification of preliminary station locations was informed by existing residential and employment activity, planned land use as identified through a review of relevant municipal plans and coordination with stakeholder partners, and public engagement conducted as part of the abovementioned planning processes.

At the onset of this *Purple Line Conceptual Planning Study*, initial planning activities and ongoing coordination between SANDAG, municipal partners, transit providers, and other stakeholders resulted in a refined station list. These stations were identified because of their location to existing and planned development, connections to existing transit, potential to generate ridership, and ability to advance regional sustainability and equity goals. Stations identified at this time are presented in Figure 5-1. Existing (as of 2022) and projected population and employment within a ½ mile of potential stations as retrieved from SANDAG's Series 15 is presented in Table 5-2. It should be noted that Series 15 population and employment projections are based on existing conditions numbers and may not, at this time, fully account for planned land use as identified in recently completed community plans. As a result, planned land use as identified in these plans may anticipate higher population and employment numbers than Series 15 currently accounts for.

During efforts to refine the station list, some previously identified stations were removed and others were added. This includes the removal of a potential Birdland Station and addition of alternate station locations in Kearny Mesa, Sorrento Mesa, and SDSU Mission Valley. The stations presented in Table 5-2 have been used for preliminary analysis; however, further planning to finalize station locations is still needed. This would be conducted during the next phase of the planning process.

Figure 5-1. Purple Line Potential Station Locations and Alignment Concepts Map

Table 5-1. Existing and Projected Population and Employment within a ½ Mile of Potential Stations

Station	Population		Employment	
	2022	2050	2022	2050
National City Station Option A (8th Street Trolley Station)	1,500	3,100	5,900	6,500
National City Station Option B (Highland Avenue/Plaza Boulevard)	7,000	6,900	3,700	4,400
Euclid Avenue Trolley Station	5,700	5,900	1,800	2,100
City Heights Station Option A (University Avenue)	14,300	17,200	4,100	6,000
City Heights Station Option B (El Cajon Boulevard)	13,300	15,300	4,000	6,400
SDSU Mission Valley Station Option A (Green Line Stadium Station)	400	1,500	5,600	5,700
SDSU Mission Valley Station Option B (near I-15)	2,900	3,400	3,100	3,200
Kearny Mesa Station Option A (Ruffin Road/Clairemont Mesa Boulevard)	1,500	1,400	18,000	18,200
Kearny Mesa Station Option B (Convoy Street/Clairemont Mesa Boulevard)	0	1,200	12,700	13,100
UTC Transit Center Station	9,700	9,400	13,400	13,900
Sorrento Mesa Station Option A (Barnes Canyon Road)	0	0	16,700	16,900
Sorrento Mesa Station Option B (Mira Mesa Boulevard)	0	0	15,300	15,500

5.2 Route Concept Planning Parameters

The following provides an overview of the design criteria used to inform development of the various alignment concepts.

5.2.1 Design Speed

A design speed evaluation was performed based on identified average station spacing, curvatures along the alignment, and diminishing returns that a faster technology offers because the vehicles would not be able to reach these speeds between stations for many segments of the alignment. It is noted that for a train at rest at a station with tangent tracks ahead, it would take more than one mile to accelerate to 80 mph and then decelerate back down to rest.

Based on this finding, a target maximum design speed of 85 miles per hour (mph) with an 80-mph maximum operating speed was studied. Although the Purple Line would be grade-separated, there would be horizontal curves between and at the approach to the stations. As such, it would not be possible to design all curves for 85-mph or higher speeds.

5.2.2 Vehicle Technology

Table 5-2 provides summary characteristics for a range of existing vehicle technologies that could be considered for the Purple Line. Examples range from conventional Light Rail Transit (LRT) through higher speed electrified and automated systems found in other North American cities. Although a vehicle technology has not been selected at this time, the higher-speed requirement noted above would most likely be met by using a Heavy Rail Transit or Metro system powered by a third rail.

5.2.3 Alignment Plan and Profile Development

Through coordination with stakeholder partners, station locations were determined prior to the development of alignment concepts. All guideway alignment and station profiles assumed full grade separation with no at-grade vehicle or pedestrian crossings. Once the general location of the stations was identified, horizontal and vertical alignments were developed with adequate tangent lengths at stations.

Table 5-2. Summary Characteristics of Example Vehicle Technologies for the Purple Line

Rail Technology Alternative	Conventional LRT	Heavy Rail Transit	Automated Rapid Transit	Electrified Multiple Unit Commuter Rail	Locomotive Hauled Commuter Rail (Electric)	Zero-Emissions Multiple Unit Commuter Rail
Photo						
Photo credit	*Planetizen*	*KTLA*	*Railway Gazette*	*Railway Track and Structures*	*Trains Magazine*	*San Bernadino County Transit Authority*
Example	MTS Trolley	Los Angeles Metro B/D lines	Vancouver SkyTrain	Caltrain	New Jersey Transit	Arrow
ROW	Shared or exclusive	Exclusive only (fully grade separated)	Exclusive only (fully grade separated)	Exclusive (some grade crossings)	Exclusive (some grade crossings)	Exclusive (some grade crossings)
Design speed	50-65 mph	55-80 mph	56 mph	79 mph	80-125 mph	49 mph
Power Source	Overhead Catenary	Third Rail or Hybrid (Mixed Third Rail and Overhead Catenary)	Third Rail	Overhead Catenary	Overhead Catenary and Third Rail	Hydrogen and Battery
Typical grade	0-4 percent	0-5 percent	0-6 percent	0-3.5 percent	percent – 2.5 percent	0-3 percent
Typical train set/length	1-4-car trains	4-10-car trains	2-6-car trains	4-6-car trains	8-12-car trains	2-car trains
Typical Passenger Capacity*	Roughly 200-800	810-2,200	480	400-1,200	600-1,500	108

*Commuter rail typically has more seats and less standing area that urban transit so capacity per train set may be lower.

5.2.4 Train Sets and Headways

The Purple Line is assumed to be designed for 10-minute headways as noted in the *2021 Regional Plan*. However, further development of the Purple Line and future modeling may determine different headways are appropriate. Headways would influence the number of vehicles for the corridor and minimum acreage required for an OMF. Headways would also influence ridership along the corridor.

For purposes of station siting and vehicle fleet estimation, a conservative peak period of six-car train sets with 75-foot-long cars was assumed. In subsequent phases of project development, the number of cars per train set may be adjusted to meet the ridership demand.

5.2.5 Grade Separation

The Purple Line is assumed to be fully grade separated in exclusive ROW to maximize speed, safety, and reliability. Tunnels and underground station depths were selected to avoid potential impacts to existing subterranean infrastructure while minimizing station depths to reduce costs and enhance passenger access. Aerial guideway concepts were developed to provide adequate vertical clearance to existing highways and transit facilities.

5.3 Alignment Design Parameters

Once a vehicle technology is selected, a set of design guidelines for that technology would have to be developed. For this current study, a set of general design parameters have been used to guide the basis for development of the various alignment concepts.

5.3.1 Tunnel Size and Horizontal Alignment

For this study, twin bore tunnels are assumed with a nominal 20-foot outer diameter, although other concepts such as large bore single diameter tunnels may be worth exploring in subsequent studies. This twin bore 20-foot diameter tunnel would be sufficient to fit an emergency walkway, third rail, and the dynamic envelope of the vehicle. Track centers would be about 43 feet apart, allowing for a 30-foot-wide center platform at aerial and underground stations. The platform width would have to be confirmed in subsequent phases of project development based on exiting capacity and passenger load. However, the 30-foot-wide platform would be adequate to accommodate elevators, escalators, and stairs in the middle of platform and allow adequate standing room and clearance to the platform edge.

A minimum radius of 1,000 feet has been used to allow for ease of tunnel boring operations. Although tunnel boring machines can maneuver through smaller radii, the 1,000-foot radius is a conservative assumption at this early phase of project development. Where a smaller radius is used, it is assumed that a cut-and-cover construction method would be used.

5.3.2 Aerial Guideway Widths and Horizontal Alignment

Similar to the region's existing Trolley light rail system, an aerial guideway would accommodate both tracks. As such, the aerial guideway would have a smaller footprint than

tunnels, and a width of 35 feet would be adequate to support the third rails, emergency walkways, and signal and communication system. Tracks would have 15-foot separation, but the track centers would widen to 43 feet at stations to accommodate the 30-foot-wide platform.

Aerial guideways would have to navigate through existing public ROW and may require horizontal curve radii that are smaller than 1,000 feet. Hence, speeds along aerial guideways may be lower than those in tunnels. Because the horizontal curvature of an aerial guideway is not dependent on construction equipment (as is the case for a TBM in tunnel construction), the minimum radius would be determined by ROW constraints and the required design speed through the curve.

5.3.3 Special Trackwork

Special trackwork for both aerial and tunnel segments would consist of double crossovers – track sections that allow trains to cross from one track to another – at each station. Terminus stations would have two double crossovers. The length of double crossovers would depend on the desired speed through the crossover. For the current study, it is assumed that each double crossover would be approximately 500-feet long.

5.3.4 Storage Tracks

Storage tracks would be provided beyond the terminal station double crossovers. They would be designed to be 500 feet long. Future coordination with the Purple Line's selected operator may indicate that additional storage track at other locations is also required. A storage track near the mid-point of the alignment would allow for faster removal of a broken-down train from the main tracks.

5.3.5 Traction Power

As noted, a third rail power transmission system would likely be used for this transit line. It is assumed that each station would have a substation, and other substations would be sited between stations at a spacing of approximately 5,000 feet. Substations would also be required at the OMF and potentially along the lead track connecting to the OMF.

5.3.6 Transition Structures

With a mix of aerial, at-grade, and tunnel alignments, three types of transition structures would be required as follows:

- **Aerial to at-grade (retained fill) structures.** These structures would be required in locations where the guideway would transition from an aerial structure to at grade. Depending on topography, these structures can vary in length and create a barrier for roadway connections.
- **At-grade to tunnel (retained cut & tunnel portal) structures.** These structures would be required in locations where the guideway transitions from at grade to below grade via a tunnel. Depending on topography, these structures would vary in length and create a barrier for roadway connections.

- **Aerial to tunnel (retained fill and retained cut & tunnel portal) structures.** These structures would be required in locations where the guideway transitions from aerial to below grade via a tunnel. Such structures are a combination of the transition structures mentioned above.

5.4 Station Requirements

Although conceptual station plans have not been developed as part of this current study, some station features were assumed to assist in development of cost estimates and length of tangent alignment at stations. These features as well as the identification of station locations are described below. There are no at-grade stations identified for the Purple Line at this time.

5.4.1 Aerial Stations

Aerial stations would have 30-foot-wide center platforms, and the guideway would be about 60-feet wide. Platform length would be 450 feet. Using a center platform would avoid the need to cross the tracks where the third rail would be located. Where a ground level plaza below the platform is not feasible, as is the case for aerial stations in the median of major streets, a mezzanine level would be needed. Access to the mezzanine would be provided by vertical circulation elements on the sides of the street. From the mezzanine, vertical circulation elements would provide access to the center platform.

5.4.2 Underground Stations

Station boxes were assumed to be cut and cover and vary in depth of between 35 feet and 110 feet below grade. Station entrances would be constructed at grade with escalators, elevators, and stairs providing access to the station concourse and platform. Station boxes would be about 60-feet wide and 1,000-feet long. This length would accommodate the 450-foot-long platform and the double crossover.

5.5 Minimum Operable Segment Identification

Projects of the scope and scale of the Purple Line are not typically built as one large single undertaking. The costs and complexity are simply beyond most region's resources and capabilities to do as a single project. Instead, sponsor agencies generally start by developing a section of the corridor. This is known as the MOS, which is usually chosen to include the core segment of the corridor, providing service to sufficient origins and destinations and key transfer points to generate significant ridership. It is important that the MOS have independent utility to be competitive for funding and provide benefit as a standalone project should future phases be delayed. In the case of the Purple Line, the MOS would also need to include an OMF because existing facilities in the region do not have the capacity to store and maintain a fleet of new rail vehicles. In addition, should the Purple Line be a different technology type than existing rail service found in the region, as anticipated, it would not be compatible with existing tracks or OMFs.

5.6 Operations and Maintenance Facilities

For this current study, various potential OMF sites were identified. The layout of those advanced for further consideration would be conducted during the next phase of project development. The following guidelines were used in selection of potential OMF sites.

5.6.1 Operations and Maintenance Facility Size Consideration

Considering the desired peak headways of 10 minutes, and for the purpose of estimating the number of vehicles and the sizing of OMF facility, six-car train sets have been assumed. Using the estimated travel time between stations, 30 seconds dwell time at intermediate stations and 10-minute turnaround time at terminal stations, the cycle time for each train set would be 1 hour, 12 minutes. Using this cycle time,72 vehicles would be required to operate the Purple Line. The estimated OMF size requirement to accommodate the storage and maintenance of 72 vehicles is between 35 acres to 50 acres.

In estimating the required number of vehicles, it was estimated that during peak hour, 48 vehicles would be needed to run six-car train sets at 10-minute headways. It was also assumed that a ready train (six-car train sets) and an additional maintenance train should be available at all times, making for a total of 60 cars needed during peak hours. A 20 percent spare vehicle requirement (12 vehicles) was then added to the total, resulting in the total vehicle count of 72.

5.6.2 Location Criteria

Site selection for potential OMFs was performed using visual observation rather than conceptual site layout for each selected site. As a result, screening of these sites has not been performed. Each selected site has advantages and disadvantages, and some sites may ultimately only comply with one or a few of the site selection criteria. Ultimately, the OMF(s) should be as close as practical to the alignment to reduce costs associated with a longer connection.

OMF sites identified at this time were selected based on one or more of the following: (1) zoning of the site, (2) ownership of the site, (3) proximity to the corridor, (4) topography of the site, and (5) size and shape of the site.

For this current phase of study, it is assumed that the selected OMF site would be at grade. A grade separated OMF may be identified in subsequent phases of project development but would have a significantly higher construction cost. It may be possible to offset some of the cost of a grade separated OMF by constructing a deck and mixed-use development above, particularly when considering potential OMF locations in denser, more urbanized portions of the corridor where available land of the size needed to accommodate an OMF could be challenging.

This study conducted a high-level assessment of OMF requirements and identification of potential OMF sites based on the design parameters and the characteristics described above. As the Purple Line continues to evolve, more analysis will be needed to determine specific OMF requirements and potential land use, noise, visual, and light impacts to communities, including social equity focus populations, within proximity to potential OMF sites. Coordination with municipal partners will also be needed to confirm future zoning and land use goals for individual sites. These impacts should be evaluated in subsequent phases of study. It should be noted that engagement with affected communities on this topic has not been conducted at this time.

6.0 Alignment Concepts

After the station locations were identified, an initial set of alignment concepts connecting the City of National City to Sorrento Mesa in the City of San Diego were developed. The portion of the Purple Line south of the City of National City will be evaluated as part of a separate, forthcoming study.

Concepts were further refined, and some removed from further considered, based on input received during coordination meetings with reviewers from the cities of National City and San Diego, Caltrans, MTS, North County Transit District (NCTD), and SDSU. This resulted in a refined set of concepts that includes both (1) a main alignment connecting the stations from the City of National City to Sorrento Mesa and (2) various alternate routes for some portions of the main alignment. Both tunnel and aerial alignments were evaluated.

The following provides an overview of the alignment concepts and potential station and OMF locations identified to date. It should be noted that additional analysis was conducted to evaluate the connection between UTC Transit Center Station and Sorrento Mesa.

In addition to those concepts described below, the analysis includes UTC Transit Center Station serving as the northern terminus of the Purple Line, alternating service between UTC Transit Center Station and Sorrento Mesa, or a skyway connection between the two (see Attachment E).

As described in Section 9.2, cost estimates were developed for the combination of concepts that represent those with the greatest amount of tunneling and the greatest amount of aerial structures. The primarily underground concept would have an end-to-end travel time of 26 minutes and nine seconds from National City to Sorrento Mesa. The combination of concepts with the most aerial structures would include a split termini at UTC Transit Center Station and Sorrento Mesa. The end-to-end travel time from National City to UTC Transit Center Station would be 27 minutes and 15 seconds. The end-to-end travel time from National City to Sorrento Mesa, which would not include a stop at UTC Transit Center Station, would be 28 minutes and 22 seconds.

The information below is arranged by geographic area to demonstrate how the various alignment, station, and OMF options would interface with the communities in which they would be sited (see Figure 6-1). It should be noted the evaluation of impacts considered the project's final condition and does not include temporary impacts associated with construction activities. Additional analysis in subsequent phases of project development would be needed to fully assess anticipated benefits and potential impacts to communities in which the Purple Line and associated facilities would be sited, both during construction and operation. The track plans and associated memorandum developed to support the route alignments and potential station and OMF locations identified to date are included in Attachment D. High-level findings of the tunnel and aerial concepts are presented at the end of this chapter. National City to Euclid Avenue Trolley Station

The following describes alignment concepts, stations, and OMFs located in the abovementioned segment.

6.1.1 Alignment Concepts

These concepts are the southernmost ones evaluated as part of this current study. Both alignment concepts would be below grade and connect to Euclid Avenue Trolley Station in the north. Either concept could be extended to the south to serve Chula Vista and San Ysidro. Additional detail is provided below.

Concept 1

Concept 1 would span the entire Purple Line corridor and serve as the backbone for the other concepts being evaluated. In this segment, this alignment concept would be tunneled and subsequently result in the fewest impacts to land use, noise, light, and vibration, among others. It would also be able to operate at higher speeds than some of the other concepts evaluated. It would begin at National City Station Option A, where it could provide a connection to the existing Blue Line Trolley at the 8th Street Transit Center and both potential OMF sites within this segment.

A tight curve and consideration of existing infrastructure would be required to extend this alignment concept to the south from the 8th Street Transit Center. Alternatively, and as part of an extension south, a wye track could be implemented near National City Station Option B. This would facilitate either operating split service with some trains terminating at 8th Street (National City Station Option A) and other trains continuing south towards San Ysidro or abandoning National City Station Option A when implementing a future phase of the Purple Line.

From National City, the alignment would continue east under 8th Street, providing the opportunity for a second station in National City (National City Station Option B).

Concept 2

Concept 2 has been conceptualized as an approximately 2.4-mile underground alignment, running from a point underneath Highland Avenue south of 8th Street in the City of National City and connecting to Concept 1 near the existing Euclid Avenue Trolley Station. Concept 2 was developed to provide an alternate southern terminus that would allow for future expansion of the Purple Line south to San Ysidro via central National City and western Chula Vista, east of the existing Blue Line corridor. This segment is entirely underground due to the high-density urban environment. Similar to Concept 1, it would be able to operate at higher speeds than some other concepts because of its below-grade nature.

6.1.2 Stations

The two potential National City stations are located within this segment. Additional detail is provided below.

National City Station Option A *(8th Street Trolley Station)*

This underground station, which would be served by Concept 1, would provide a connection to the existing Blue Line Trolley at the 8th Street Transit Center. There is

considerable employment within a ½ mile of the potential station, largely concentrated on Naval Base San Diego. Residential activity is more limited. Naval Base San Diego is anticipated to add a considerable number of new personnel in the coming years, which has the potential to increase Purple Line ridership. Higher-density mixed-use development is anticipated east of I-5; improvements to the pedestrian and bicycle networks could support increased ridership at this station.

National City Station Option B *(Highland Avenue/Plaza Boulevard)*

This underground station would either be located on 8th Street, east of its intersection with Highland Avenue, or could be located directly along Highland Avenue, south of its intersection with 8th Street. This is dependent, in part, on the selected alignment concept. The potential station could be served by Concept 1 and/or Concept 2.

Either configuration would serve activity centers in National City. However, the configuration along Highland Avenue would more easily facilitate a southern extension to activity centers in Chula Vista and San Ysidro. Planned land use along 8th Street and Highland Avenue within proximity to National City Station Option B includes a considerable increase in high-density mixed-use development.

Figure 6-1. Alignment Concepts and Potential Station and OMF Locations

6.1.3 Operations and Maintenance Facilities

At this time, two potential OMFs have been identified in this segment. Both would be accessible via Concept 1 but not Concept 2. Given the proximity of the potential sites to existing residential and commercial activity, impacts to land use and from noise, light, and vibration, among others would need to be fully evaluated in subsequent phases of project development. Additional detail is provided below.

OMF Option A

OMF Option A would be an approximately 49-acre site in the area is bound by Civic Center Drive to the north, Bay Marina Drive to the south, I-5 to the east, and existing freight rail to the west. It would be in an area that is currently zoned for industrial use. Portions of the area have existing commercial operations. While the area is almost exclusively zoned for industrial use, there are a few blocks zoned for mixed-use commercial and residential.

OMF Option B

OMF Option B would be an approximately 56-acre site in the area roughly bound by South 32nd Street to the north, Southall Street to the south, Harbor Drive to the east, and both Surface Navy Boulevard and Cummings Road to the west. This potential OMF would span the cities of San Diego and National City in an area currently zoned for industrial and military use. As a portion of this facility would impact U.S. Navy property, coordination with the U.S. Navy would be required to determine if advancing this OMF is feasible.

Given that OMF Option B would be further from commercial and residential use, it is anticipated that potential noise and light impacts would be less than those of National City Option A.

6.2 Euclid Avenue Trolley Station to City Heights

The following describes alignment concepts, stations, and OMFs located in the abovementioned segment.

6.2.1 Alignment Concepts

At this time, only one concept has been identified for this segment. It is part of Concept 1 and includes the area between the Euclid Avenue Trolley Station and City Heights. This segment would be tunneled because of the dense urban fabric, limited ROW, and topography. The relatively straight and tunneled nature of the alignment would facilitate higher operating speeds than other segments of the corridor.

6.2.2 Stations

There are three potential stations in this segment – one in the Encanto neighborhood and two in City Heights. The Encanto station, which would be sited at the Euclid Avenue Trolley Station, could connect to either of the City Heights station options. Additional detail is provided below.

Euclid Avenue Trolley Station

It is anticipated that the potential Purple Line station would be sited within proximity to the existing Euclid Avenue Trolley Station. This would be an underground station. Siting the potential Purple Line station in this location would not only offer benefits to those living and working within proximity to the station but would also offer transfer opportunities to existing and potential users to a variety of transit services at the Euclid Avenue Trolley Station, including the Orange Line Trolley.

City Heights Station Option A *(University Avenue)*

City Heights Station Option A would be an underground station that is approximately sited at the intersection of Fairmount and University Avenues. There is considerable residential activity within proximity to the potential station in addition to commercial, medical, civic, educational, and recreational uses. It is assumed that the southern entrance portals would be on University Avenue so the northern portals would be closer to El Cajon Boulevard, thereby shortening the distance for people wishing to access the station from the north.

City Heights Station Option B *(El Cajon Boulevard)*

City Heights Station Option B would be sited a few blocks north of City Heights Station Option A at the Fairmount Avenue and El Cajon Boulevard intersection. It is assumed that the northern entrance portals would be on El Cajon Boulevard so the southern entrance portals would be closer to University Avenue, thereby shortening the distance for people wishing to access the station from the south.

Because of their proximity, both potential City Heights station options demonstrate many of the same land use, population, and employment characteristics. This would also be true for the overall design of the potential station. The preferred station location would be determined through stakeholder and public engagement conducted as part of the ongoing *Mid-City Communities Plan* and in subsequent phases of the Purple Line.

6.2.3 Operations and Maintenance Facilities

At this time, no OMFs have been identified in this segment.

6.3 SDSU Mission Valley

The following describes alignment concepts, stations, and OMFs located in the abovementioned segment.

6.3.1 Alignment Concepts

There are numerous alignment concepts that have been developed at this time that could connect City Heights to the SDSU Mission Valley campus. The topography in and adjacent to Mission Valley, the location of the existing Green Line, and the presence of other infrastructure, primarily I-8 and I-15, make a rail connection to the SDSU Mission

Valley campus and existing Green Line Trolley station more challenging than other segments along the Purple Line corridor. Additional detail is provided below.

Concept 1

In this segment, Concept 1 would continue underground from City Heights until just south of I-8, where it would become aerial. The alignment would cross over I-8, go over the existing Green Line (with an aerial connection to the Green Line Stadium Station), and then run along Innovation Parkway. Because this segment would be the most direct route across Mission Valley, it would allow higher operating speeds than other concepts in this segment (see Table 6-1).

Table 6-1. Mission Valley Alternatives Travel Times

Concept	Travel Time from City Heights Station Option A to Kearny Mesa Station Option B (minutes:seconds)
1	8:06
1+3	9:47
1+4	9:53
1+5	8:38

SDSU has expressed concern about potential visual, noise, privacy, and connectivity impacts associated with an alignment running along Innovation Way.

Concept 3

Concept 3 would be a 3.4-mile segment running north along Fairmount Avenue from a point south of El Cajon Boulevard to the SDSU Mission Valley campus. It would begin underneath Fairmount Avenue, eventually transitioning to an aerial structure along the west side of Fairmount Avenue, north of Meade Avenue. Once above grade, the alignment would roughly follow the Fairmount Avenue corridor, descending towards Mission Valley. It would gradually turn westward near the Fairmount Avenue and Montezuma Road interchange, paralleling I-8, and eventually turn north to connect to Concept 1 at SDSU Mission Valley Station Option A. This more circuitous route to Mission Valley would result in longer travel times through this area.

Concept 3 could have some visual, vibration, and noise impacts along the aerial portions of the alignment within proximity to Fairmount Avenue. Land use impacts along Concept 3 along Fairmount Avenue may occur where it transitions from tunnel to aerial, along Concept 3, south of Camino Del Rio South, and along the SDSU Mission Valley River Park.

Concept 4

Concept 4 would be a 2.4-mile segment that provides an alternate route to serve the SDSU Mission Valley campus. It would begin from a point along Concept 1 underneath I-

15, eventually transitioning to an aerial structure south of I-8 and Camino Del Rio South. It would then continue north across I-8, just west of I-15, and eventually curves to the west and runs parallel to the Green Line to SDSU Mission Valley Station Option A. West of the station, Concept 4 would cross over the Green Line, eventually looping around the western side of the SDSU Mission Valley campus via River Park Road and Friars Road.

Concept 4 would transition from aerial to tunnel at a point near the Friars Road and Mission Village Drive interchange. Once underground, Concept 4 would connect to Concept 1 just north of the tunnel portal. This alignment avoids Innovation Parkway; however, the tight curves along the western edge of the SDSU Mission Valley campus would require trains to operate at speeds below 30 mph.

Some visual, vibration, and noise impacts along aerial portions in Mission Valley may result under Concept 4. The aerial guideway in Mission Valley would need to be high to maintain minimum vertical clearance over local roadways, I-8, and the Green Line. Trains traveling through the tight curves around the perimeter of SDSU Mission Valley campus would likely produce wheel squeal, which may be audible from nearby areas. There is recreational and some limited residential activity in this area.

Land use impacts may occur along Concept 4 both north and south of I-8, and just west of River Park Road on the western side of the SDSU Mission Valley campus. Impacts to SDSU Mission Valley River Park may also occur with Concept 4.

Concept 5

Concept 5 has been conceptualized as an approximately one-mile-long segment that crosses the eastern edge of SDSU Mission Valley campus. It begins from a point along Concept 1 underneath I-15, eventually transitioning to an aerial structure south of I-8 and Camino Del Rio South. It would continue north across I-8, just west of I-15, before heading in a northwest direction towards Friars Road. Concept 5 transitions into a tunnel near the Friars Road and Mission Village interchange. Once underground, Concept 5 would connect to Concept 6 just north of the tunnel portal.

Some visual and noise impacts along aerial portions in Mission Valley may result under Concept 5. Similar to Concept 4, the aerial guideway in Mission Valley would need to be high to maintain minimum vertical clearance over local roadways, I-8, and the Green Line. Also, trains traveling through the tight curves around the perimeter of SDSU Mission Valley campus would likely produce wheel squeal, which may be audible from nearby areas. Residential areas are located on the east side of I-15 at which point noise and visual impacts would be limited. Planned residential developments on the east side of the SDSU Mission Valley campus would likely be subject to greater noise and visual impacts. Vibration impacts could occur in this area as well.

Land use impacts may occur along Concept 5 both north and south of I-8. Impacts to the SDSU Mission Valley River Park may also occur.

6.3.2 Stations

At this time, two potential stations have been identified in this segment. Additional detail is provided below.

SDSU Mission Valley Station Option A *(Green Line Stadium Station)*

SDSU Mission Valley Station Option A would be sited near the existing Green Line Trolley Stadium Station. Siting the potential Purple Line station in this location would facilitate seamless transfers to existing and planned transit service as well as centralized access to the new SDSU Mission Valley campus.

The potential station could be served by Concept 1 or Concept 4 (this analysis assumes Concept 3 would connect back to Concept 1 just prior to reaching the SDSU Mission Valley campus). As described in Attachment D, both an aerial and tunnel station to connect in this general location have been identified at this time. However, an aerial connection would shorten the transfer distance to the Green Line Stadium Station.

SDSU Mission Valley Station Option B *(near I-15)*

SDSU Mission Valley Station Option B would be sited east of SDSU Mission Valley Station Option A and just northwest of the I-8 and I-15 interchange. The potential station is within the 100-year floodplain so special consideration (and associated permits) would be required to advance this option.

Relocation of the existing Green Line Stadium Station closer to I-15 to provide a direct connection to Purple Line would not be feasible because the section of existing Green Line near I-15 is designed to clear the 50-year design storm event, but not the 100-year storm event. Relocation of the station closer to I-15 would then place the station below the 100-year flood elevation. Additionally, the wider footprint of the station as compared to the viaduct may adversely impact the 100-year flood elevation, causing a rise in the flood elevation.

The potential station location further from the center of the SDSU Mission Valley campus could adversely affect ridership potential because of the distance users would likely need to travel to access the potential station. Low-density residential areas just to the east of the I-15 corridor would be better served by this potential station option. The user experience may be degraded by waiting for trains adjacent to I-15 and the associated noise and air quality impacts that would result. This potential station would be served by Concept 5.

6.3.3 Operations and Maintenance Facilities

At this time, no OMFs have been identified in this segment.

6.4 Mission Valley (Friars Road) to Kearny Mesa

The following describes alignment concepts, stations, and OMFs located in the abovementioned segment.

6.4.1 Alignment Concepts

Alignment concepts for this segment would be either tunnel and/or aerial. Additional detail is provided below.

Concept 1

Concept 1 would re-enter a tunnel on the northern side of Mission Valley. From there, it would continue northwest and ultimately run below Clairemont Mesa Boulevard. This concept could serve Kearny Mesa Station Option B but not Kearny Mesa Station Option A. Because this concept would be tunneled, limited impacts would be anticipated. The concept would avoid going under the Montgomery-Gibbs Executive Airport.

Concept 6

Concept 6 would be a 3.9-mile-long segment that provides the most direct connection between the SDSU Mission Valley campus and Kearny Mesa. It would begin in Mission Valley above Innovation Parkway and run north until transitioning into a tunnel north of the Friars Road and Mission Village Drive interchange. It would continue to Kearny Mesa where it would connect back to Concept 1 underneath Clairemont Mesa Boulevard, just west of SR 163. This concept would require coordination with the City of San Diego and the Federal Aviation Administration to confirm its feasibility as it would travel underneath Montgomery-Gibbs Executive Airport. Like Concept 1, it could serve Kearny Mesa Station Option B but not Kearny Mesa Station Option A. Because this concept would be tunneled, limited impacts would be anticipated.

Concept 7

Concept 7 has been conceptualized as a 3.7-mile underground segment that would provide service to a second station in Kearny Mesa (Kearny Mesa Station Option A). It would begin at a point underneath the southern end of Daly Center Drive and run north, adjacent to Murphy Canyon Road, until curving west underneath Clairemont Mesa Boulevard, reconnecting with Concept 1 west of SR 163. The depth of the tunnel would avoid critical infrastructure at the Kaiser Permanent medical facilities, south of Clairemont Mesa Boulevard at Ruffin Road. Concept 7 would be anticipated to have minimal visual, noise, and land use impacts due to its underground design.

Concept 8

Concept 8 would be a 12.4-mile alignment that would mostly have an aerial configuration from its connection to Concept 1 around Friars Road to a terminus in Sorrento Mesa. North of Friars Road, Concept 8 would run in a generally north-south direction, paralleling I-15, until turning west along Clairemont Mesa Boulevard through Kearny Mesa. Concept 8 includes several relatively tight curves that would require trains to travel at or below 30 mph, including in the vicinity of I-15 and Clairemont Mesa Boulevard interchange.

Concept 8 would be anticipated to have the highest amount of visual, vibration, and noise impacts due to its primarily aerial design. The aerial guideway may create visual impacts to residents and business owners, as well as visual impacts along arterial corridors in

Kearny Mesa. Land use impacts are anticipated to be minimal as Concept 8 is almost entirely within the public and Caltrans ROW.

6.4.2 Stations

Two potential stations in this segment have been identified, both along Clairemont Mesa Boulevard. Depending on the concept advanced, both stations could be implemented. Additional detail is provided below.

Kearny Mesa Station Option A *(Ruffin Road/Clairemont Mesa Boulevard)*

Kearny Mesa Station Option A would be located near the intersection of Clairemont Mesa Boulevard and Ruffin Road. The station could be underground or aerial, depending on the alignment configuration. The potential station could be served by Concept 7 or Concept 8.

Currently, there is considerable economic activity and little residential activity in this area. The recently completed *Kearny Mesa Community Plan* has identified this area for significant mixed-use growth in the coming years.

Kearny Mesa Station Option B *(Convoy Street/Clairemont Mesa Boulevard)*

The second potential station location on Clairemont Mesa Boulevard would be sited at its intersection with Convoy Street. This station site was identified due to its proximity to the commercial and entertainment uses and the planned mixed-use urban village along the Convoy Street corridor. Like Station Option A, this station could be aerial or underground depending on the alignment configuration. This potential station could be served by any of the four alignment concepts in this segment.

A station in this location would provide access to the Convoy Pan Asian Cultural District and activities within as well as commercial activity on Clairemont Mesa Boulevard. Like Kearny Mesa Station Option A, the recently completed *Kearny Mesa Community Plan* also identified this area for considerable growth in the coming years.

6.4.3 Operations and Maintenance Facilities

At this time, no OMFs have been identified in this segment.

6.5 Kearny Mesa to UTC Transit Center Station

The following describes alignment concepts, stations, and OMFs located in the abovementioned segment.

6.5.1 Alignment Concepts

Three alignment concepts within this segment have been identified at this time. One would be aerial and another would be tunneled. The third alignment concept would also be aerial and allow for a split termini between UTC Transit Center Station and Sorrento Mesa. Additional detail is provided below.

Concept 1

From Kearny Mesa, Concept 1 would run under and east of I-805. It would then go under I-805 and residential and commercial areas in the University area. It would then travel north to a potential station at UTC Transit Center. Because the alignment would be below ground, it would be designed with minimal curves to improve travel times. A direct transfer to the Blue Line Trolley would be provided. Limited impacts would be anticipated.

Concept 8

Continuing from Kearny Mesa, Concept 8 would turn north and parallel I-805 from Kearny Mesa through Sorrento Valley. Along I-805, the alignment would cross San Clemente Canyon, Rose Canyon, and Carroll Canyon. Additional analysis to determine structural and seismic requirements would need to be evaluated in subsequent phases of study. These requirements have the potential to impact ROW requirements, costs, and environmental resources.

Most of the segment would be straight, allowing for faster travel times. Noise impacts would likely be minimal. There could be some visual and vibration impacts because of the concept's aerial design. Land use impacts would be minimal as Concept 8 is almost entirely within the public and Caltrans ROW.

Concept 9

Concept 9 would be a 1.7-mile-long aerial alignment that separates from Concept 8 to provide service to UTC Transit Center Station via La Jolla Village Drive. It could be used to directly serve UTC or in a split termini configuration where alternating trains serve UTC Transit Center Station and Sorrento Mesa. This concept would likely not allow for continuous service from the south through UTC Transit Center Station to Sorrento Mesa due to the complexity of train operations through a wye junction needed to serve both stations.

Visual, vibration, and noise impacts would be anticipated along Concept 9 as the guideway would be located within proximity to nearby residential and commercial activity. Land use impacts would likely be minimal as Concept 9 would be sited within the public ROW.

6.5.2 Stations

There would be one station in this segment. Depending on the concept advanced, a station at UTC Transit Center Station could either be aerial or underground. In an underground configuration along Genesee Avenue, an underground station would be located within proximity to the UTC Transit Center Station.

The Purple Line could also be located on an aerial guideway along La Jolla Village Drive, with the station located within proximity to Genesee Avenue. Under this alignment, a station co-located at UTC Transit Center Station may be infeasible; however, an elevated walkway could potentially provide a connection between the Purple Line station and UTC Transit Center Station. The aerial station would likely be closer to the Blue Line's

Executive Drive Station. The most feasible option for providing a relatively short connection from the Purple Line to the Blue Line would be to site the Purple Line station east of and adjacent to Genesee Avenue.

A related planning effort, the 2023 *Miramar Alternatives Analysis Report*, identifies two alternate routing options of the LOSSAN corridor underneath the University City area. One of these routing options – the UTC Alignment – would include an underground station near the existing UTC Transit Center Station. Future design of a Purple Line UTC Transit Center Station should be done in coordination with future design of the LOSSAN corridor. Coordination should include consideration as to how to provide an easy transfer between LOSSAN and the Purple Line via aerial or tunnel alignment and also to ensure that the design of one corridor does not preclude implementation of the other.

Because of existing land use patterns and some of the highest concentration of jobs in the region, UTC Transit Center Station is one of the most transit rich with some of the highest ridership in the system. The introduction of the Blue Line Trolley in 2021 has continued to help increase ridership numbers at the station. The potential Purple Line station would be sited within proximity to existing transit service, both trolley and bus, to support seamless transfers. The introduction of a potential Purple Line station in this location would provide enhanced access to employment opportunities for people living along the corridor and improved transfer opportunities for people continuing beyond UTC Transit Center Station.

6.5.3 Operations and Maintenance Facilities

At this time, two potential OMFs have been identified in this segment. Additional detail is provided below.

OMF Option C

OMF Option C would be an approximately 67-acre site in Kearny Mesa in the western portion of the area roughly bound by Clairemont Mesa Boulevard to the north, Balboa Avenue to the south, Ruffner Street to the east, and I-805 to the west. It is the largest of the identified OMFs. This OMF site could connect to Concepts 1 (tunnel configuration) and 8 (aerial configuration). To improve operations, the lead yard track could connect to both northbound and southbound tracks (wye connection). This site would require 1.1 miles of lead track.

The use of this site would for an OMF would have impacts to existing industrial and commercial uses and would require coordination with Caltrans due to its proximity to I-805. Noise and light impacts to adjacent industrial land uses in Kearny Mesa and residential land use west of I-805 may also occur with this option.

OMF Option E

OMF Option E would be an approximately 56-acre site located in an industrial zone between Marine Corps Air Station Miramar and Miramar Road, east of the existing LOSSAN corridor. At 3.5 miles, this site would have the longest yard lead track – track

connecting from the Purple Line to the OMF and exclusive of track within the OMF – connection from Concept 1. The lead track connection from Concept 8 would be much shorter at approximately 1.5 miles. Based on its location, this site is anticipated to have few impacts to adjacent communities. However, impacts to commercial activity may occur. This site could also be accessed via the LOSSAN corridor and serve as an OMF for COASTER commuter rail or Amtrak *Pacific Surfliner* trains.

6.6 UTC Transit Center Station to Sorrento Mesa

The following describes alignment concepts, stations, and OMFs located in the abovementioned segment.

6.6.1 Alignment Concepts

There are two alignment concepts in this segment. One would be aerial and the other would be tunneled. Additional detail is provided below.

Concept 1

Concept 1 would continue underground until arriving at the last station along the Purple Line corridor in Sorrento Mesa. Because of topography, the alignment concept would become aerial to traverse Sorrento Valley. It would then become tunnel again, go under I-805 until meeting Sorrento Mesa Station Option A at Barnes Canyon Road. Because of the underground nature of the alignment, limited impacts would result. Evaluation of potential impacts to environmental resources within proximity to Sorrento Valley would be required.

Concept 8

In an aerial configuration, Concept 8 would continue to run parallel to I-805. After crossing Carroll Canyon, Concept 8 would then turn east and run along Mira Mesa Boulevard to a terminus around Lusk Boulevard in Sorrento Mesa. This would include a relatively tight curve to the east and could result in wheel squeal. The structure height at Carroll Canyon would be constrained by the steep grade along Mira Mesa Boulevard. Similar to Concept 1, evaluation of potential impacts to environmental resources within proximity to Carroll Canyon would be required.

6.6.2 Stations

Two potential stations have been identified in this segment – one aerial and one underground. Additional detail is provided below.

Sorrento Mesa Station Option A *(Barnes Canyon Road)*

Concept 1 would have an underground station below Barnes Canyon Road. A station at this location would be more centrally located to the employment center in Sorrento Mesa, including the Qualcomm campus, than Sorrento Mesa Station Option B. The recently completed *Mira Mesa Community Plan* identifies this area for considerable employment growth in the coming years. It also identifies the need to introduce

improvements to the pedestrian network, including within superblocks, to support such movements and planned commercial activity.

Sorrento Mesa Station Option B *(Mira Mesa Boulevard)*

This station would be an aerial station in the median of Mira Mesa Boulevard, near Lusk Boulevard, and would connect to Concept 8. The station has similar characteristics as Sorrento Mesa Station Option A because of their proximity; however, it is a bit further from nearby employment. Similar to Concept 1 in this segment, improvements to the pedestrian network would be needed to help increase Purple Line ridership.

6.6.3 Operations and Maintenance Facilities

One potential OMF has been identified in this segment (OMF Option D). It could be accessed via Concept 1 but not Concept 8. It would be an approximately 56-acre site in Sorrento Valley in the area roughly bound by I-5 to the northwest, undeveloped area to the southeast, Sorrento Valley Road to the northeast, and Roselle Street to the southwest. The site would be located at the bottom of a large escarpment that separates Sorrento Valley from University City.

Development of this site, or expanding the size of the site, would likely require cutting into the adjacent hillside and constructing a tall retaining wall, which could substantially increase the cost of developing the site. Construction of OMF Option D and the OMF connector track near the proposed junction with Concept 1 may require modifications to the design of the UTC Alignment identified in the *Miramar Alternatives Analysis Report*.

This OMF would be sited away from residential areas. However, impacts to existing commercial land use would likely result.

6.7 Aerial and Tunnel Alignment Considerations

The following considerations were identified during the development of alignment concepts.

Aerial Alignment

- There are some segments where an aerial alignment was developed and appears feasible north of approximately Mission Valley. Further consideration and study are warranted. Farther south in areas such as National City, Southeastern San Diego, and City Heights, opportunities for an aerial alignment were evaluated but were found to be challenging because of limited ROW and dense urban fabric. There may be opportunities to ascend out of a tunnel to an aerial alignment. However, aerial segments in these areas may be relatively short in length, and cost savings would be limited.
- Aerial guideways would result in marginally longer alignments because they would generally have to follow existing public ROW. This would affect overall travel times, compared to underground alignments.
- The existing urban context and built environment would require an aerial alignment to have tight curves to reduce property impacts, which would slow design speeds.

Operating speeds could be as low as 30 mph in locations where the use of available ROW requires "S" shaped curves.

- An aerial alignment may require more property takes and residential and business displacements than a tunnel option.
- An aerial alignment could be operational in a shorter timeframe than a tunnel alignment.
- Greater visibility of operational trains could help attract additional ridership.
- An aerial alignment would have greater noise and visual impacts than a tunnel alignment. While many of these impacts could be mitigated by features such as sound walls, integration of large aerial guideway and station structures into existing built urban environments is always challenging.

Tunnel Alignment

- There are some segments such as through National City, Southeastern San Diego, and City Heights where a below grade solution is most likely the only option because of existing densities and limited public (e.g., transportation) ROW.
- An underground guideway would allow more flexibility to meet desired design speeds and, subsequently, project goals.
- An underground guideway could be constructed below existing development with only minor impacts during construction.
- Based on current alignments and information available at this time, underground construction of guideway and stations would cost approximately $2,840 million more than a tunneled and aerial configuration and take longer to become operational.
- An underground alignment carries more risk than above ground construction because of potential changes in geology, hydrogeology, gases, hazardous materials, and undocumented manmade features.

7.0 Station Area Land Use and Multimodal Connections

Critical to the success of any transit project is the provision of convenient and high-quality multimodal options that increase and enhance access to the service. Across the San Diego region, SANDAG, transit providers, municipalities, and many other partners have been upgrading existing and constructing new multimodal connections and adjusting policies to support changes in mode shift, to reduce vehicle miles traveled and greenhouse gas emissions to meet sustainability goals, and to advance equity and equality among all those who call this region home.

For this *Purple Line Conceptual Planning Study*, the project team reviewed planning documents and SANDAG's *2025 Draft Regional Plan Initial Concept* to identify existing and planned multimodal connections, land use patterns, and activity centers. The project team used this information to identify (1) potential adjustments to these planned networks and/or additional opportunities to close network gaps to support first- and last-mile connections to Purple Line stations and (2) development potential within proximity to Purple Line stations to further advance sustainability goals, increase housing options for all, and increase densities to not only meet goals of walkable, livable communities, which would subsequently make the Purple Line more competitive for funding, and support Purple Line ridership.

Because the Purple Line was also included in SANDAG's *2021 Regional Plan*, community-led planning efforts that have been undertaken since the plan was completed have considered potential Purple Line station locations when identifying multimodal improvements and areas of concentrated higher density development. As such, some additional multimodal connection opportunities or adjustments to planned networks were identified as part of this analysis. This includes limited adjustments to the existing and planned bus network, planned bicycle network, and on-demand transit service. It is anticipated that municipalities would continue to make improvements to the pedestrian network as currently identified and work with SANDAG and developers to support a high-quality pedestrian environment surrounding potential Purple Line stations.

As municipal partners work to meet equity and sustainability goals, they continue to create opportunities for increased densities and livable, walkable neighborhoods anchored by transit through changes in zoning and robust community-led planning processes to create a shared vision for their communities. The mechanisms are in place around some potential Purple Line stations and opportunities exist around others to induce and maximize high-density mixed-use development to further support municipal and regional goals. SANDAG will continue to work with municipal partners and other stakeholders to maximize development around potential Purple Line stations.

Additional information about multimodal connections and development potential around identified stations is provided in Attachment F.

8.0 Ridership Forecasts

Ridership forecasts for the Purple Line between the City of National City and Sorrento Mesa in the City of San Diego were developed using the FTA's Simplified Trips-on-Project Software (STOPS) model. STOPS is a standalone ridership model created by FTA specifically for evaluating CIG candidate transit projects. It is similar to a conventional four-step model that evaluates zone-to-zone travel markets based on socioeconomic characteristics and the existing transit network.

STOPS produces base year average weekday ridership forecasts for CIG mobility, congestion relief, and cost effectiveness criteria and quantifies the projected change in daily automobile person miles traveled resulting from implementation of the proposed project. STOPS has been calibrated and validated using actual ridership data on transit systems including bus rapid transit, LRT, heavy rail transit, and commuter rail across the country.

The STOPS model often produces varying estimates of potential transit ridership when compared to regional travel demand forecast models like SANDAG's activity-based model because of the intrinsic differences between the models. STOPS is designed to only estimate transit ridership where regional models are designed to focus on all modes within a region.

8.1 Model Scenarios

The following summarizes each of the model scenario characteristics, including Purple Line routing characteristics and forecast years. A detailed description of characteristics for each scenario is included in Attachment G.

The Purple Line would follow Concept 1+7 as described in Attachment D. Each STOPS model scenario is summarized in Table 8-1.

Analysis years 2029 and 2050 were used to compare the implementation of the Purple Line on the existing transit network against the implementation of the Purple Line on the 2050 transit network as outlined in SANDAG's *2025 Draft Regional Plan Initial Concept*.

Analysis year 2029 was used because FTA requires 'Existing Conditions' model runs to utilize the most recently available socioeconomic and transit network data. In the San Diego region, this is 2023 data. However, because the Purple Line would not be formally submitted to FTA for a few years, the project team elected to use 2029 as the analysis year to better align with the project timeline and CIG application, and to capture scheduled development particularly at SDSU Mission Valley. Inputs for analysis year 2029 include SANDAG's Series 15 socioeconomic data (2029) and the existing (2023) transit network.

Analysis year 2050 was used, as the Purple Line is expected to begin revenue service between 2040 and 2050. Scenarios evaluated in the year 2050 use SANDAG's Series 15 socioeconomic data (2050) as well as the full potential transit network as included in the *2025 Draft Regional Plan Initial Concept*. Additional details on the 2050 transit network can be found in Attachment G. Due to the significant variation in base transit networks between analysis years 2029 and 2050, and the influence that transit network service levels can have

Table 8-1. Purple Line Stations by STOPS Model Scenario

Scenario Grouping	Scenario Name	Purpose	Stations Included*										
			National City Station Option A (8th Street)	National City Station Option B (Highland Avenue/Plaza Boulevard)	Euclid Avenue Trolley Station	Federal & Euclid Station	City Heights Option A (southern portal connecting to University Avenue)	SDSU Mission Valley Station Option A (Green Line Stadium Station)	SDSU Mission Valley Station Option B (near I-15)	Kearny Mesa Station Option A (Ruffin Road/Clairemont Mesa Boulevard)	Kearny Mesa Station Option B (Convoy Street/Clairemont Mesa Boulevard)	UTC Transit Center Station	Sorrento Mesa Station Option A
2029 Full Alignment Scenarios	2029 Initial Build (Full Alignment)	Tests the full ridership potential of the Purple Line between National City and Sorrento Mesa, assuming the existing (2023) mobility network and 2029 socioeconomic characteristics.	■	■	■		■	■		■	■	■	■
	2029 Full Alignment – LRT Speed	Models the implications of operating service along the entire corridor of the 2029 Initial Build (Full Alignment) between National City and Sorrento Mesa at slower LRT average speeds.	■	■	■		■	■		■	■	■	■
	2029 Full Alignment – Federal & Euclid Station	Assesses the effect of providing direct service to the nearby commercial and residential activity near the intersection of Federal Boulevard and Euclid Avenue.	■	■	■	■	■	■		■	■	■	■
	2029 Full Alignment – One Kearny Mesa Station Option	Evaluates the 2029 Initial Build (Full Alignment) with a single station in Kearny Mesa.	■	■	■		■	■			■	■	■
2029 MOS Scenarios	2029 MOS Option 1 – National City to SDSU Mission Valley Campus	Assesses the effect of not providing direct service to key employment and activity centers in Kearny Mesa, UTC Transit Center Station, and Sorrento Mesa.	■	■	■		■	■					
	2029 MOS Option 2 – National City to UTC Transit Center Station	Models service between National City and UTC Transit Center Station. Assesses the effect of not providing direct service to Sorrento Mesa.	■	■	■		■	■		■	■	■	
	2029 MOS Option 3 – Euclid Avenue Trolley Station to UTC Transit Center Station	Assesses the effect of not providing direct service to National City or the Blue Line Trolley in South Bay.			■		■	■		■	■	■	
2050 Full Alignment Scenarios	2050 Initial Build (Full Alignment)	Tests the full ridership potential of the Purple Line between National City and Sorrento Mesa, assuming 2050 mobility network and socioeconomic characteristics.	■	■	■		■	■		■	■	■	■
	2050 Full Alignment – One National City Station	Shows the effect of not connecting to the Blue Line Trolley in National City at the 8th Street Transit Center.		■	■		■	■		■	■	■	■
	2050 Full Alignment – SDSU Mission Valley Station Option B	Assesses the effect of a longer transfer to the Green Line Stadium Station and a longer path of travel to the center of the SDSU Mission Valley campus.	■	■	■		■		■	■	■	■	■

*Ridership forecasts for Sorrento Mesa Station Option B were not developed as part of this study.

on Purple Line ridership, it is not recommended to compare the ridership results between analysis years.

8.2 Methodology

The following section documents the data inputs that were employed in the development of the STOPS model for the Purple Line from the southern terminus in the City of National City to the northern terminus in Sorrento Mesa in the City of San Diego. A detailed overview of the methodology used to calibrate the STOPS model for Purple Line application and estimate Purple Line ridership is included in Attachment G.

Model Setup. The latest version of STOPS (version 2.52) was used for this assessment. The incremental application of STOPS model was calibrated to 2023 existing conditions using MTS and NCTD average weekday ridership by stop and route from Fall 2023. The SANDAG On-Board Passenger Survey conducted in 2023 was utilized to develop the transit trip tables utilized in the model.

Census Journey to Work Data. The most current available Census Journey to Work data from FTA was applied for use in the STOPS model. This is the 2012-2016 American Community Survey data set. The corresponding American Community Survey zone structure and data for California was also used. Those zones that fell outside of the SANDAG model area were excluded. Remaining zones were split in proximity to the regional transit corridors to provide a refined estimation of the market and access at these locations.

SANDAG Model Data. The model utilized existing and projected demographic data and highway travel times provided by SANDAG. Series 14 socioeconomic data for the year 2016 and Series 15 estimates for 2022 and projections for 2029, 2035, 2040, and 2050 were utilized in the ridership analysis.

MTS and NCTD Data. The following existing system data from both MTS and NCTD was used to develop the model calibration:

- Fall 2023 average weekday ridership by stop and by route
- Transit timetables in General Transit Feed Specification format from Fall 2023
- Park and ride locations
- Fare policy

Current Year Existing and No-Build Network. The project team utilized MTS and NCTD General Transit Feed Specification files for 2023 to represent the current year network. These files were also used to develop the STOPS stations shapefile in the STOPS program. The current year network also represents the current year No-Build network.

Peer Review Panel. A SANDAG Peer Review Panel (PRP) is a group of internal and external subject-matter experts convened by SANDAG to review various projects and processes. These panels are integral to ensuring the accuracy and reliability of data, methodologies, and assumptions used in SANDAG's projects. For this current study, a PRP was convened to ensure the methodology used to develop and calibrate the STOPS model was appropriate. Both the model development and calibration methodologies were modified based on input received from the PRP.

8.3 Model Outputs

The STOPS model generated a comprehensive set of outputs for projected Purple Line ridership. These outputs include daily boardings, mode of access, systemwide ridership, congestion relief, reduction in vehicle miles traveled, and transportation system user benefits such as new transit trips. These metrics provide a detailed understanding of the Purple Line's impact on the transit system and potential benefits to communities across the region.

Table 8-2 through Table 8-4 summarize the daily boardings for each model scenario. Table 8-5 summarizes station mode of access. A more in-depth analysis and additional results are included in Attachment G.

Table 8-2. Daily Purple Line Boardings by Station (2029 Full Alignment Scenarios)

Purple Line Station Ridership by Scenario*				
Station	**2029 Initial Build (Full Alignment)**	**2029 Full Alignment – LRT Speed**	**2029 Full Alignment – Federal & Euclid Station**	**2029 Full Alignment – One Kearny Mesa Station Option**
Sorrento Mesa Station Option A (Barnes Canyon Road)	400 - 500	400 - 400	400 - 500	500 - 500
UTC Transit Center Station	3,800 - 4,000	2,000 - 2,200	3,800 - 4,000	3,700 - 3,900
Kearny Mesa Station Option B (Convoy Street/Clairemont Mesa Boulevard)	1,100 - 1,500	700 - 1,000	1,100 - 1,500	1,100 - 1,500
Kearny Mesa Station Option A (Ruffin Road/Clairemont Mesa Boulevard)	800 - 800	500 - 600	700 - 800	-
SDSU Mission Valley Station Option A (Green Line Stadium Station)	3,000 - 3,200	2,400 - 2,700	3,100 - 3,300	2,700 - 2,900
City Heights Station Option A (University Avenue)	4,100 - 5,100	3,200 - 4,100	4,000 - 5,100	4,100 - 5,100
Euclid Avenue & Federal Boulevard Station	-	-	1000 - 1300	-
Euclid Avenue Trolley Station	5,200 - 5,700	4,000 - 4,500	5,400 - 5,900	5,100 - 5,500
National City Station Option B (Highland Avenue/Plaza Boulevard)	3,200 - 4,000	2,800 - 3,600	3,200 - 4,000	3,300 - 4,100
National City Station Option A (8th Street)	4,100 - 4,300	3,100 - 3,400	3,900 - 4,100	3,900 - 4,100
Total	**25,700 - 29,100**	**19,100 - 22,500**	**26,600 - 30,500**	**24,400 - 27,600**

*Results are rounded to the nearest 100.

Table 8-3. Daily Purple Line Boardings by Station (2029 Full Alignment and MOS Scenarios)

Purple Line Station Ridership by Scenario*				
Station	**2029 Initial Build (Full Alignment)**	**2029 MOS Option 1 – National City to SDSU Mission Valley Campus**	**2029 MOS Option 2 – National City to UTC Transit Center Station**	**2029 MOS Option 3 – Euclid Avenue Trolley Station to UTC Transit Center Station**
Sorrento Mesa Station Option A (Barnes Canyon Road)	400 - 500	-	-	-
UTC Transit Center Station	3,800 - 4,000	-	4,100 - 4,100	3,300 - 3,400
Kearny Mesa Station Option B (Convoy Street/Clairemont Mesa Boulevard)	1,100 - 1,500	-	1,100 - 1,400	1,000 - 1,300
Kearny Mesa Station Option A (Ruffin Road/Clairemont Mesa Boulevard)	800 - 800	-	800 - 800	700 - 800
SDSU Mission Valley Station Option A (Green Line Stadium Station)	3,000 - 3,200	2,600 - 2,800	2,800 - 2,900	1,800 - 2,000
City Heights Station Option A (University Avenue)	4,100 - 5,100	3,400 - 4,500	4,200 - 5,200	3,100 - 4,000
Euclid Avenue Trolley Station	5,200 - 5,700	3,800 - 4,300	5,500 - 5,800	4,600 - 5,300
National City Station Option B (Highland Avenue/Plaza Boulevard)	3,200 - 4,000	2,900 - 3,800	3,200 - 4,000	-
National City Station Option A (8th Street)	4,100 - 4,300	3,100 - 3,200	4,400 - 4,600	-
Total	**25,700 - 29,100**	**15,800 - 18,600**	**26,100 - 28,800**	**14,500 - 16,800**

*Results are rounded to the nearest 100.

Table 8-4. Daily Purple Line Boardings by Station (2050 Full Alignment Scenarios)

Purple Line Station Ridership by Scenario*			
Station	**2050 Initial Build (Full Alignment)**	**2050 Full Alignment – One National City Station**	**2050 Full Alignment – SDSU Mission Valley Station Option B**
Sorrento Mesa Station Option A (Barnes Canyon Road)	400 - 400	400 - 400	400 - 400
UTC Transit Center Station	3,100 - 3,300	3,400 - 3,500	3,400 - 3,600
Kearny Mesa Station Option B (Convoy Street/Clairemont Mesa Boulevard)	800 - 1,100	800 - 1,000	1,000 - 1,200
Kearny Mesa Station Option A (Ruffin Road/Clairemont Mesa Boulevard)	700 - 700	500 - 600	700 - 700
SDSU Mission Valley Station Option B (near I-15)	-	-	1,300 - 1,400
SDSU Mission Valley Station Option A (Green Line Stadium Station)	2,800 - 3,000	2,500 - 2,700	-
City Heights Station Option A (University Avenue)	4,100 - 5,000	3,900 - 4,800	4,000 - 4,800
Euclid Avenue Trolley Station	5,400 - 5,800	5,300 - 5,800	5,300 - 5,700
National City Station Option B (Highland Avenue/Plaza Boulevard)	2,600 - 3,100	2,400 - 2,800	2,400 - 3,000
National City Station Option A (8th Street)	3,300 - 3,400	-	3,200 - 3,300
Total	**23,200 - 25,800**	**19,200 - 21,600**	**21,700 - 24,100**

*Results are rounded to the nearest 100.

Table 8-5. Purple Line Station Mode of Access (2029 and 2050 Full Alignment Scenarios)

Station	Station Mode of Access (%)							
	2029 Initial Build (Full Alignment)				2050 Initial Build (Full Alignment)			
	Walk	Kiss & Ride	Park & Ride	Transfer	Walk	Kiss & Ride	Park & Ride	Transfer
Sorrento Mesa Station Option A (Barnes Canyon Road)	50	10	< 5	40	70	< 5	< 5	30
UTC Transit Center Station	35	5	5	60	35	5	5	60
Kearny Mesa Station Option B (Convoy Street/Clairemont Mesa Boulevard)	45	< 5	< 5	55	50	< 5	< 5	50
Kearny Mesa Station Option A (Ruffin Road/Clairemont Mesa Boulevard)	25	< 5	< 5	75	30	< 5	< 5	70
SDSU Mission Valley Station Option A (Green Line Stadium Station)	5	< 5	< 5	90	5	< 5	< 5	95
City Heights Station Option A (University Avenue)	70	5	< 5	25	80	5	< 5	15
Euclid Avenue Trolley Station	30	10	20	45	35	5	15	45
National City Station Option B (Highland Avenue/Plaza Boulevard)	75	< 5	< 5	25	85	< 5	< 5	15
National City Station Option A (8th Street)	5	10	10	75	5	10	10	75
Total	**35**	**5**	**5**	**50**	**40**	**5**	**5**	**50**

8.4 Model Findings

Despite the notable planned growth near Purple Line stations, the Series 15 growth forecast indicates limited increases in population and employment in these areas. This suggests that while the areas around Purple Line stations are poised for development, the overall growth may not be as substantial as anticipated in prior planning efforts.

Additionally, significant transit investments, such as *Rapid* 688, Blue Line Trolley improvements, and extension of COASTER service, are planned for the Purple Line corridor. Further analysis is needed to determine how these elements would influence the overall effectiveness and utilization of the Purple Line. Additional findings are included below.

It is important to note that this current study evaluates the feasibility of Purple Line service between the City of National City and Sorrento Mesa in the City of San Diego. However, the full build-out of the Purple Line as identified in the *2021 Regional Plan* extends south to San Ysidro and east to Otay Mesa. These extensions, along with connections to the Blue Line and LOSSAN service, will be evaluated separately.

8.4.1 National City Station Options

Both station locations in the City of National City would attract a significant and similar number of riders. Removing the direct connection to the Blue Line Trolley at 8th Street significantly reduces Purple Line ridership. Further analysis is needed to understand the relationship with the Blue Line Trolley connection at 8th Street and determine improvements to ensure the Purple Line captures significant ridership to and from the South Bay region and the U.S.-Mexico border transit centers at San Ysidro and Otay Mesa.

8.4.2 Euclid Avenue Station Options

Ridership modeling highlights the importance of the Orange Line connection at Euclid Avenue Trolley Station, a top three Purple Line station by boardings. The additional station at Federal Boulevard and Euclid Avenue shows low overall utilization (~1,000 boardings/day) but high walk-up use (over 80 percent). This local access increase may attract new riders more effectively than high transfer numbers. The station's low ridership is due to limited population, employment, and transit services, but significant growth and *Rapid* 625 service with 10-minute headways are planned, likely boosting projected ridership.

8.4.3 City Heights Station

As shown in Table 8-2 through Table 8-4, City Heights Station Option A is projected to have some of the highest ridership along the Purple Line. This is likely due to the high level of population and employment near the station, high walkability, and presence of numerous existing and planned transit services near the station.

8.4.4 SDSU Mission Valley Station Options

The distance between the southern edge of the SDSU Mission Valley Station Option B platform and the eastern edge of the existing Green Line station is approximately 1,500 feet, and the actual travel distance would likely be longer given that passengers would board or alight trains closer to the midpoint of each station platform. Ridership differences between the two options highlight the importance of a shorter, more convenient transfer with the

existing Green Line Stadium Station at the SDSU Mission Valley campus. Ridership at SDSU Mission Valley Station Option A (Green Line Stadium Station) is nearly double that of Option B (near I-15). The relatively small increase in population and employment in Series 15 results in an understatement of full potential 2050 ridership. This discrepancy is due to differences between SANDAG Series 15 projections and the *SDSU Mission Valley Campus EIR*.

8.4.5 Kearny Mesa Station Options

Both Kearny Mesa station options show low ridership due to low population and employment density and low projected growth near the stations. Without significant increases in population and employment, ridership is likely to remain low. Increased transit service on *Rapid* and local buses may capture some ridership that would otherwise use the Purple Line.

8.4.6 Sorrento Mesa Station Option A (Barnes Canyon Road)

Though notable population and employment growth are planned for Sorrento Mesa, Series 15 projections show relatively low growth within proximity to the station. Sorrento Mesa Station Option A shows low ridership due to low population density and lack of a central location suitable for high-capacity transit. Most access to Purple Line stations is via transfers from other transit services, with walking as the second highest mode. The low number of connecting transit services and the unfriendly pedestrian environment likely contribute to the low ridership.

8.4.7 Impact of Transit Speeds

As noted in Section 5.1.1, the Purple Line would be designed to achieve a maximum operating speed of 80 mph. This would result in an average operating speed of 50 mph, as trains would need to accelerate and decelerate when approaching and departing stations and going around some horizontal curves.

To understand how ridership could be impacted by average speeds like those on the existing Trolley system, one Purple Line scenario was modeled using average speeds of 30 mph. Ridership modeling shows a noticeable impact when reducing the average speed from 50 mph to 30 mph, with a forecast loss of approximately 22 percent – 26 percent. While this reduces boardings, subsequent phases of project development may determine that the reduction in riders is justified by significant cost savings from using lower-cost light rail technology. The operating agency may also benefit from having maintenance and operational knowledge from the existing Trolley network.

Lower average speeds usually coincide with closer station spacing. Although station spacing was consistent between alternatives for this analysis, additional stations could be served with a reduced speed line. While this could potentially increase ridership beyond modeled results, longer end-to-end travel times may cause a reduction in ridership as travelers could elect to use other modes of transportation to make trips. The effect of an increased number of stations and end-to-end travel times should be evaluated in future phases of study.

8.4.8 Minimum Operable Segment Scenarios

The National City to UTC Transit Center Station scenario shows similar ridership to the full corridor because only the segment to Sorrento Mesa is removed. The results indicate low

ridership potential for extending the line from UTC Transit Center Station to Sorrento Mesa based on current population and employment projections. Although this scenario shows approximately one percent higher ridership than the full corridor scenario, these values should be viewed as equal due to STOPS' margin of error and minor variability in timepoint coding between scenarios.

The other two MOS scenarios show similar ridership levels, with the National City to SDSU Mission Valley MOS scenario having roughly 1,000 more daily boardings than the Euclid Avenue Trolley Station to UTC Transit Center Station MOS scenario. It is worth noting that with ridership exceeding 60 percent of the full corridor scenario boardings, the National City to SDSU Mission Valley MOS scenario would serve the majority of project demand.

Both scenarios demonstrate the ridership impacts of reducing the Purple Line's extent. Predictably, scenarios that do not serve major population and employment centers in the UTC and National City areas show decreased projected boardings.

9.0 Project Phasing and Preliminary Cost Estimates

The following describes the process by which the three MOSs were identified, potential project phasing, and preliminary capital cost estimates for the two alignment concepts that would include the most tunnel and the most aerial infrastructure.

9.1 Minimum Operable Segment and Project Phasing

This *Purple Line Conceptual Planning Study* identified alignment concepts along the Purple Line corridor under analysis at this time. Based on existing and projected population and employment density, the location of employment centers, and traffic patterns, three MOS alternatives have been identified for the Purple Line.

- **MOS 1: National City to SDSU Mission Valley campus** (9.1 miles). This was identified because initial ridership modeling for the full build (2029 and 2050) showed a relatively strong demand among the stations between National City and SDSU Mission Valley. This MOS also tests the effect of not providing direct service to key employment centers in Kearny Mesa, UTC Transit Center Station, and Sorrento Mesa.
- **MOS 2: National City to UTC Transit Center Station** (19.3 miles). While this MOS provides service to employment centers in Kearny Mesa and UTC, it assesses the effect of not providing direct service to Sorrento Mesa.
- **MOS 3: Euclid Avenue to UTC Transit Center Station** (15.6 miles). This option assesses the effect of not providing direct service to National City, the Blue Line Trolley in the South Bay, or Sorrento Mesa. This MOS would allow the most flexibility for future planning efforts that will evaluate how the LOSSAN corridor could be extended to San Ysidro, and how that service could complement and connect to Blue Line and/or Purple Line service between National City and the international border.

During subsequent phases of Purple Line development, these MOS alternatives may be further refined to reflect the findings from the AA and associated environmental studies. At the completion of Project Development, a preferred MOS should be chosen to enter final design.

Typical of the MOS approach was the development of the D Line in Los Angeles. The MOS-1 from Union Station to Westlake/MacArthur Park Station opened in 1993, followed by a second phase between Westlake/MacArthur Park Station and Wilshire/Western in 2006. Three more phases are in various stages of development and will eventually extend the line to Westwood by 2027.

9.1.1 Operating Plan

As the MOS alternatives are further refined, separate operating plans would need to be developed and used to update ridership forecasts in addition to estimates of costs and system support facility requirements.

9.1.2 Project Phasing

As discussed above, development of a project of the scale of the Purple Line would require phasing over multiple years. In addition to the identification of a preferred first segment, a complete Phasing Plan should be developed by the end of Project Development. This phasing plan should include a financial plan that identifies available local, state, and federal funds to support each stage of development.

Another key decision will be how to approach environmental clearance. Some agencies choose to clear the entire project along with the MOS while others elect to only clear the MOS and rely on a separate and later environmental process for subsequent phases. The latter approach makes most sense if the timing and funding of segments beyond the MOS are highly uncertain and there is a risk that enough time could pass that the environmental work beyond the MOS becomes outdated.

9.2 Preliminary Cost Estimates

At this early stage, capital cost assessments are used to provide a low and high range of capital costs to implement a proposed project. Capital cost estimates were developed for the Purple Line using a methodology that is structured to comply with FTA's Standard Cost Categories (SCC) for Capital Projects. Cost estimates were developed consistent with the current planning level of concept development with the objective of producing a high-level, rough order-of-magnitude, comparative conceptual range of capital costs that will be used to inform the overall findings of this current study and subsequent phases of project development. More information on the methodology used to develop capital cost estimates is included in Attachment H.

Cost estimates were prepared for the following two concepts. This combination of concepts represents those with the greatest amount of tunneling and the greatest amount of aerial structures. A summary of each concept's characteristics is included in Table 9-1. More detail on conceptual design characteristics is included in Attachment D.

- **Concept 1+7.** This concept would have the highest cost of all concepts evaluated because it is primarily in a tunnel and would serve all potential station areas along the corridor.
- **Concept 1+3+8+9.** This concept would have the lowest cost of all concepts that would serve all station areas due to its primarily aerial alignment.

Projected capital costs for the above two concepts in 2024 dollars are presented in Table 9-2 through Table 9-5. The capital cost presented in these tables do not include the cost of real estate and finance charges for the project. It also does not include escalation and year-of-expenditure cost. These additional costs will be developed in future phases of the project development when a detailed project schedule, financing plan, and right-of-way limits have been identified. Table 9-2 shows costs associated with construction without the maintenance facility and lead track to the maintenance facility. Table 9-3 and Table 9-4 show the cost of maintenance facility and acquisition of vehicles, respectively. Table 9-5 shows the overall cost of the project including maintenance facility and vehicles, but again, it excludes the cost of real estate and finance charges. Detailed cost estimates, and the assumptions used to develop them, for each concept are included in Attachment H.

These cost estimates are to be used solely to compare the relative cost of Concept 1+7 to Concept 1+3+8+9 and should not be used to estimate costs of other rail systems.

Each MOS will have a unique capital cost. In order to compare the cost for the two concepts, a single estimate for MOS has been used for both concepts. Cost estimates for identified MOS should be developed in future phases of study.

The total cost of the project would range from about $20,700 million (aerial guideways where feasible) to $27,170 million (mostly underground configuration).

Table 9-1. Summary of Evaluated Concepts

Characteristic	Concept 1+3+8+9 (Lower Cost)	Concept 1+7 (Higher Cost)
Routing Characteristics	National City to Sorrento Mesa. Aerial from City Heights to Sorrento Mesa.*	National City to Sorrento Mesa. Nearly all underground.
Number of Stations	9	9
Total Alignment Length (mi)	24.54	22.66
Underground	7.69	21.53
Aerial	15.98	1.13
At-Grade	0.87	0.00
Yard Track Length (miles)	1.74	3.79

*This concept has two termini stations at the north end (UTC and Sorrento Mesa). Alternate trains would serve each station.

Table 9-2. Projected Capital Costs without OMFs, ROW, Vehicles, or Finance Charges

Item	Projected Capital Cost (2024$) (millions)	
	Lower Cost (Concept 1+3+8+9)	Higher Cost (Concept 1+7)
10. Guideway & Track Elements	$4,880	$6,400
20. Stations, Stops, Terminals, and Intermodal	$1,990	$2,650
30. Support Facilities: Yards, Shops, and Administrative Buildings	See Table 9-3	See Table 9-3
40. Sitework & Special Conditions	$2,810	$3,660
50. Systems	$1,670	$1,480
Subtotal (SCC 10 – SCC 50)	**$11,350**	**$14,190**
60. ROW, Land, Existing Improvements	Not Available	Not Available
70. Vehicles	See Table 9-4	See Table 9-4
80. Professional Services	$5,220	$6,530
90. Unallocated Contingency	$2,150	$2,690
100. Finance Charges	Not Available	Not Available
Subtotal (SCC 10 – SCC 90)	**$18,720**	**$23,410**

Table 9-3. Projected Capital Cost for SCC 30: OMF and Lead Track

Item	Projected Capital Cost (2024$) (millions)	
	Lower Cost (Concept 1+3+8+9)	Higher Cost (Concept 1+7)
SCC 30		
Yard Lead Track	$120	$810
Support Facilities: Yards, Shops, and Administrative Buildings	$390	$390
Site Work & Special Conditions	$180	$430
Systems	$130	$270
Subtotal (SCC 30)	**$820**	**$1,900**
80. Professional Services	$380	$870
90. Unallocated Contingency	$150	$360
Subtotal	**$1,350**	**$3,130**

Table 9-4. Projected Capital Cost for Vehicles

Item	Projected Capital Cost (2024$) (millions)	
	Lower Cost (Concept 1+3+8+9)	Higher Cost (Concept 1+7)
70. Vehicles	$560	$560
90. Unallocated Contingency	$70	$70
Subtotal	**$630**	**$630**

Table 9-5. Projected Overall Capital Cost without ROW and Finance Charges

Item	Projected Capital Cost (2024$) (millions)	
	Lower Cost (Concept 1+3+8+9)	Higher Cost (Concept 1+7)
10-50 Construction Cost	$12,170	$16,090
60. ROW, Land, Existing Improvements	Not Available	Not Available
70. Vehicles	$560	$560
80. Professional Services	$5,600	$7,400
90. Unallocated Contingency	$2,370	$3,120
100. Finance Charges	Not Available	Not Available
Subtotal	**$20,700**	**$27,170**

Rough order-of-magnitude cost estimates were also prepared for the National City to SDSU Mission Valley MOS and for the segment between UTC and Sorrento Mesa. Costs were developed for the National City to SDSU Mission Valley MOS because of the relatively strong ridership potential along that portion of the Purple Line alignment. Costs were developed for the UTC to Sorrento Mesa segment because preliminary ridership results showed relatively low demand to and from Sorrento Mesa.

The cost for the segment from National City to SDSU Mission Valley is estimated to be approximately $12,006 million. Additionally, approximately $419 million would be needed for a yard track to connect this MOS to OMF Option A in National City.

The cost for the segment from UTC to Sorrento Mesa is estimated to be approximately $3,087 million. Costs for a yard track would not be needed, as this portion of the Purple Line would not be constructed as a standalone segment.

Like the costs presented in Table 9-2 through Table 9-5, costs for the National City to SDSU Mission Valley and UTC to Sorrento Mesa segments do not include the cost of real estate and finance charges. They also do not include escalation and year-of-expenditure cost.

10.0 Future Considerations

The main objectives of this current study were to determine the feasibility of the Purple Line concept from National City to Sorrento Mesa based on available information, and to determine what would need to be done to advance the project. The study addressed the following elements of feasibility, and key considerations for each are described in additional detail in the sections below.

- Engineering feasibility of conceptual alignments and generalized station locations.
- Development of preliminary ridership forecasts to inform future alternative considerations.
- Estimation of construction costs and implementation timelines.

10.1 Engineering

The alignments developed for this current study validate the engineering feasibility for both underground and aerial guideway and station concepts. Subsequent phases of project development will assess these concepts in more detail, including their performance, impacts, and costs. Though feasible from a design standpoint in this early stage, it is possible that some of the alignment concepts could be determined to have a fatal flaw in subsequent phases of study. Additionally, coordination and outreach with the public, community groups, stakeholders, and agency partners during the next phase of project development will help determine support for identified concepts.

A key first step in subsequent phases of Project Development will be to refine the high-level design criteria based on ridership and cost estimates to determine the appropriate range of vehicle technology and performance. The San Diego region currently has three rail technologies, including conventional LRT that serves the existing Blue, Green, Orange, and Copper Lines, COASTER/*Pacific Surfliner* diesel-locomotives, and SPRINTER diesel multiple units. A decision to move to a fully grade separated technology for the Purple Line allows consideration of a range of higher speed and higher performing modes but also brings added costs. These trade-offs need to be considered as part of the next phase of study.

As the Purple Line moves through the planning process to an LPA, further work needs to be done to consider the balance among cost, performance, and impacts to determine the appropriate combination of aerial and below grade alignments. In addition, there may be limited opportunities for an at-grade configuration in reserved ROW. When determining which alignment concepts are advanced for further analysis, there are tradeoffs and key takeaways that must be considered for both the aerial and tunnel concepts identified to date.

10.2 Ridership

Ridership forecasts performed for this study evaluated potential demand between National City and Sorrento Mesa. Despite the notable planned growth near Purple Line stations, the Series 15 growth forecast indicates limited increases in population and employment in these areas. This suggests that while the areas around Purple Line stations are poised for

development, the overall growth may not be as substantial as anticipated in prior planning efforts.

Additionally, significant transit investments are planned for the Purple Line corridor. These factors may collectively limit the Purple Line's ridership. Further analysis is required to determine how these elements influence the overall effectiveness and utilization of the Purple Line.

It is important to note there are significant transit investments planned between National City and San Ysidro, including an extension of the Purple Line to San Ysidro via Chula Vista. A more comprehensive understanding of potential Purple Line ridership south of National City is critical to understanding overall Purple Line feasibility.

10.3 Capital Cost Estimates

Capital costs were developed based information known about the potential Purple Line at the time this study was conducted. As noted, identified costs are exclusive of real estate and finance charges. Capital cost estimates that include these items should be developed in future phases of project development once more information about the potential construction timeline is known.

Operations and maintenance costs should be developed in subsequent phases of study once more information about technology, staffing levels, and a detailed operating plan have been developed. Both capital and operations and maintenance costs should be developed for other modes (e.g., light rail) that are evaluated as part of an alternatives analysis.