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Metro

REVISED
PLANNING AND PROGRAMMING COMMITTEE
NOVEMBER 15, 2006

SUBJECT: ROUTE 710 TUNNEL TECHNICAL FEASIBILTY ASSESSMENT

ACTION: RECEIVE AND FILE

RECOMMENDATION

Receive and file the attached Route 710 Tunnel Technical Feasibility Assessment report including compendium of public comments and responses. (***Revised*** Attachment A)

ISSUE

In early June 2006, Staff completed the feasibility assessment of a tunnel alternative to extend the 710 Freeway from its current terminus at Valley Boulevard in Los Angeles to I-210 in Pasadena. As part of the Route 710 Tunnel Technical Feasibility Assessment process, staff conducted and completed an extensive public outreach effort. The public outreach process included two public meetings, and presentations at local city council meetings, San Gabriel Valley Council of Governments (SGVCOG) meetings and other community organizations. Staff obtained public comments through these meetings, as well as via email and mail.

BACKGROUND

Over the past year, Metro staff, in coordination with its consultant team, conducted a feasibility assessment of a bored or mined tunnel to extend the Route 710 from its terminus at Valley Boulevard in Los Angeles to I-210 in Pasadena. This assessment has been performed in conjunction with technical staff from Caltrans, SCAG, and the Cities of Alhambra, La Canada Flintridge, Los Angeles, Pasadena, San Marino and South Pasadena. Representatives from these affected agencies formed the Route 710 Tunnel Technical Feasibility Assessment's Working Group (Working Group).

The technical feasibility of the tunnel concept was analyzed from physical, environmental and financial perspectives. Generally, the Assessment concluded that the tunnel concept is feasible from the physical and environmental perspectives. Potential environmental impacts were identified, however the Assessment concluded that the severity of these impacts could be minimized, eliminated or mitigated. No insurmountable environmental issues were identified that would preclude further consideration of the tunnel alternative. These findings are preliminary since the technical feasibility assessment was not intended to serve as an Environmental Impact Statement/Report. More extensive environmental studies are necessary to advance the tunnel concept.

The technical feasibility assessment considered a myriad of tunnel alternatives with construction costs ranging from approximately $2.3 billion to $3.6 billion (2006 dollars). These cost estimates do not include design, right-of-way and Huntington Drive Interchange costs.

As part of the Assessment, staff conducted an extensive public outreach process in order to inform the communities of the assessment findings and obtain their feedback. Staff held two public information meetings – one in Pasadena and the other in the El Sereno community. Both meetings were well attended and generated many constructive comments. Staff also presented the assessment findings to individual local city councils at their meetings and members of the SGVCOG at its Transportation Committee and Governing Board meetings. In addition, staff was invited to present the assessment findings at several other organizations such as SCAG, Arroyo Verdugo Cities Sub-region and Los Angeles Community Redevelopment Agency's Eastside Adelante Project Area Committee. Most of these agencies/organizations provided their comments at the meetings as well as in writing through formal correspondences. In particular, the cities of La Canada Flintridge, Pasadena and South Pasadena provided detailed comments and concerns regarding the Assessment. The SGVCOG and the cities of Alhambra and San Marino have passed resolutions expressing their general concurrence with the findings of the Assessment and support for further study of a tunnel alternative.

Staff has complied a compendium of comments received and has provided responses to those that require clarification and within the scope of the Assessment. Many of the comments received concern potential environmental impacts including air quality, ventilation building and portal location and aesthetics, air cleaning technologies, traffic impacts both on adjacent freeways and local arterials, cost, funding and safety. Many other comments received were outside of the Assessment scope, however they merit a closer look in future studies. The compendium of comments and staff responses are attached to the Assessment report as Appendices I and II respectively.

NEXT STEPS

Staff will forward the Assessment report including compendium of comments and responses to Caltrans for its consideration in future studies. As the owner and operator of state highways, Caltrans will most likely be the lead agency for the next phase of study including environmental studies/tunnel alternatives analysis. Currently, $2.4 million in Federal's Safe, Accountable, Flexible, Efficient Transportation Equity Act – A Legacy for Users (SAFETEA-LU) funds has been earmarked for additional studies to close the Route 710 gap. In addition, Caltrans has identified state fund to match the SAFETEA-LU earmark. Metro staff will actively participate in and provide assistance to any future studies that will advance the tunnel concept.

ATTACHMENT A:

Route 710 Tunnel Technical Feasibility Assessment Report
(Including: Appendix I – Compendium of Comments; and
Appendix II – Responses)
REVISED: Appendix I – Public Comments (Pages 1-10)

Prepared By: Linda Hui, Project Manager, San Gabriel Valley Area Team
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Carol Inge
Chief Planning Officer

Roger Snoble
Chief Executive Officer

ATTACHMENT A

Route 710 Tunnel Technical Feasibility Assessment Report

Including Compendium of Comments and Response

Submitted to:

Metro

Los Angeles County Metropolitan Transportation Authority
One Gateway Plaza
Los Angeles, CA 90012

Submitted by:

PARSONS BRINCKERHOFF

100 YEARS

November 15, 2006

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ES 1.0 Executive Summary

ES 1.1 Project Background

The Interstate 710 (I-710) "Long Beach" freeway serves as a major north-south link in the Los Angeles County transportation network. The freeway is an extensively traveled facility and its level of service has deteriorated as congestion and demand grow within the corridor. This facility currently extends from its southern terminus in the City of Long Beach to Valley Boulevard, just north of the Interstate 10 (I-10) "San Bernardino" freeway near the boundary between Cities of Los Angeles and Alhambra. Beyond this northern terminus is a 4.5 mile gap in the Route 710 until the freeway resumes at Del Mar Boulevard, in the City of Pasadena, where it extends 0.6 miles to the north --- to its junction with the Interstate 210 (I-210) "Foothill" freeway.

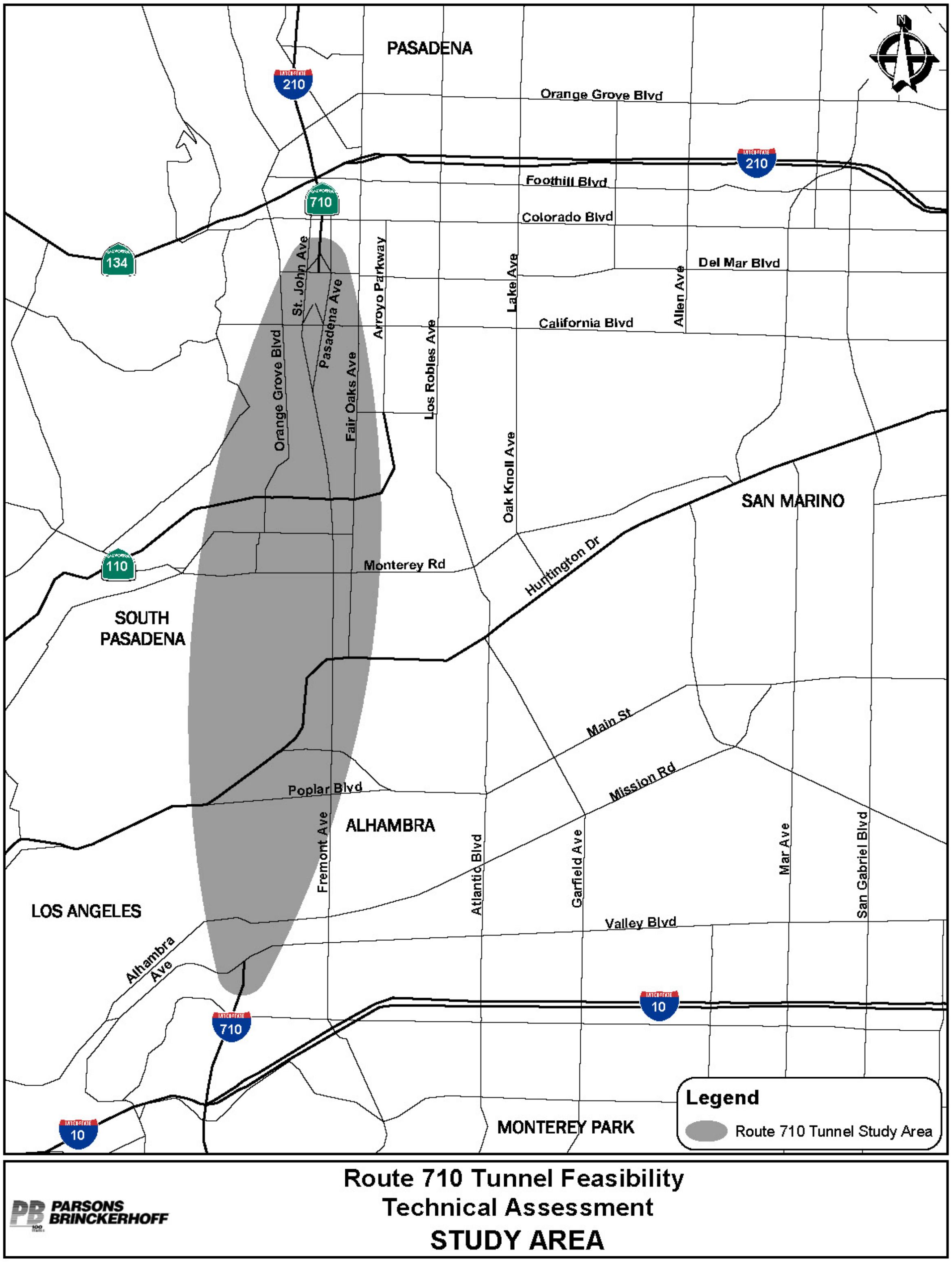
The California Department of Transportation (Caltrans), Federal Highway Administration (FHWA), the Southern California Association of Governments (SCAG) and the Los Angeles County Metropolitan Transportation Authority (MTA) support the completion of Route 710 to relieve regional and local traffic congestion and to enhance regional air quality. Consequently, SCAG has included this project in its Regional Transportation Plan (RTP) since 1989 and in its Regional Transportation Improvement Plan (RTIP) since 1991.

Over the past forty years, alternative concepts have been proposed and evaluated to complete the I-710 freeway and close the 4.5 mile gap in the corridor. To date, none of the previously proposed and evaluated alternatives has been successful in satisfying the regional mobility needs and community/ environmental concerns. These alternatives were traditional "surface" freeway alternatives through the communities of Los Angeles, South Pasadena and Pasadena. All alternatives considered traversed through highly developed urbanized neighborhoods and required a substantial volume of right-of-way along the alignments. Many members of the community were concerned with the impact of these "right-of-way" intensive "surface" alternatives and consequently, opposed to the extension of the Route 710 freeway. In response to this reaction and to lessen the potential impact of completing the Route 710 freeway, a tunnel concept was proposed for assessment as a potential option to the surface alternatives.

ES 1.2 Tunnel Technical Feasibility Assessment

The MTA, in conjunction with Caltrans, has taken the initiative to conduct this technical assessment to evaluate the feasibility of constructing a tunnel to complete Route 710 freeway between Valley Boulevard and Del Mar Boulevard. Recent advances in tunnel construction technologies appear to give merit to completing the Route 710 corridor using a tunnel. This technical feasibility assessment is intended to ascertain whether the tunnel concept is physically, environmentally and financially viable, as well as resulting in congestion relief, and worthy of more comprehensive evaluation and technical consideration. A map of the Route 710 Tunnel Study Area is shown in Figure ES-1.

Figure ES 1Study Area Map



The intent of the assessment is to determine the feasibility of completing this freeway gap by tunneling underground. Specifically, this evaluation is principally focused on deep subterranean bored or mined tunnel construction methods instead of the more environmentally intrusive shallow trench excavation or “cut-and-cover” tunnel methods. The purposes of this feasibility study were to:

- Determine if a tunnel is technically, operationally and financially feasible;
- Identify preliminary potential physical, environmental, and financial impacts to neighboring communities;
- Validate the concept of a bored tunnel(s); and
- Develop a preliminary project scope and cost estimates.

Although this assessment has examined a variety of issues related to a tunnel, it was by no means intended to be comprehensive nor exhaustive in scope. The purpose of this assessment is to serve as a technical foundation to allow decision-makers sufficient information to determine what appropriate actions should be initiated regarding the tunnel option.

ES 1.3 Tunnel Technical Feasibility Assessment – Findings

Based upon the technical feasibility assessment, the tunnel concept appears physically and environmentally feasible. The technical feasibility assessment considered a range of tunnel alternatives and features with the construction cost ranging from approximately $2.3 billion to $3.6 billion (2006 dollars). As part of financial strategies, a number of potential fund sources including federal, state, local and toll revenues were explored. Based on these preliminary findings, it is determined that the tunnel concept is technically viable and warranted to be advanced for more comprehensive and detailed evaluations to validate the findings of this assessment.

ES 1.4 Physical Feasibility

One of the primary purposes of this assessment was to evaluate the viability and suitability of implementing a tunnel through the Route 710 Gap based on current engineering and construction practices. This assessment was performed in consideration of the suitability of the geotechnical, geologic, hydrological, seismic conditions and the ability of the tunnel concept to satisfy traffic demand, highway standards, ventilation requirements, and other safety criteria.

The subsections below provide a brief discussion of some of the major physical elements that led to the conclusion that the tunnel option is physically feasible.

ES 1.4.1 Tunneling Technologies

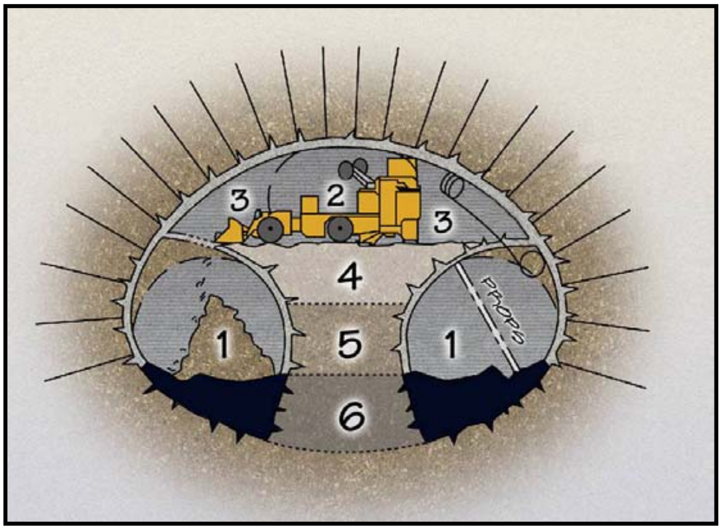
Over the past thirty years, significant advancements have been made in the field of tunnel construction. Current tunnel construction practices and methods have seen tunnels constructed with interior dimensions approaching the fifty-foot threshold. The traffic modeling and forecasting results of this technical assessment indicate that tunnels of this magnitude will be necessary to accommodate the anticipated traffic demand along the Route 710 corridor.

This technical assessment focused on deep tunneling as the primary construction method for the tunnel scenario. The two types of excavation methods were examined including the Tunnel Boring Machine (TBM) method and the Sequential Excavation Method (SEM) technique. The TBM method uses a large mechanized excavator to bore the full diameter opening while the SEM technique uses smaller equipment to excavate several small diameter shafts or drifts to construct the full tunnel opening. See Figures ES 2 and ES 3 and Section 4 of this report for further descriptions of these techniques. Both of these construction methods are routinely used in the tunneling industry depending on the geologic conditions, length of the tunnel, cross-sections, project schedule, and various other considerations. It is anticipated that the use of surface trenching or "cut-and-cover" tunnel construction method will be limited to the shallower transition areas near the tunnel portals.

For the Route 710 tunnel concept, both the TBM and SEM construction techniques are considered valid for the anticipated conditions along the corridor and the size needed to accommodate the anticipated traffic demand.

Figure ES-2 Tunnel Boring Machine – Madrid, Spain

Figure ES-3 Sequential Excavation Method of Construction



ES 1.4.2 Physical Characteristics

Based upon the limited existing geologic and geotechnical information and the exploratory drilling program conducted for this feasibility assessment, the physical ground properties are considered to be suitable for tunneling in the study area. Although the conditions appear favorable for tunneling, there are several subsurface challenges that need to be quantified including location of the seismic faults and depth of the groundwater. Consequently, significant additional subsurface investigation is needed to more fully characterize the subsurface conditions.

ES 1.4.3 Traffic Demand

As a result of the traffic modeling and analysis, it was determined that the 2030 forecast demand along this proposed section of the Route 710 freeway would require four lanes of traffic in each direction to provide an acceptable level of service. As described above in Section ES 1.4.1, current tunneling technologies are capable of constructing tunnels of the size warranted to accommodate the anticipated traffic demand. Consequently, it will be necessary to construct a minimum of two tunnels to meet the anticipated two-way demand along the corridor.

In general, the traffic modeling revealed that the completion of the Route 710 would result in a re-distribution of traffic within the regional area surrounding the gap. Many trips that now use local arterials will use the Route 710 tunnel and some trips on adjacent freeways will transfer to the Route 710 freeway. Except for freeway segments at the two ends of the tunnel, the re-distribution of trips throughout the study area has generally positive impacts on arterial network and the surrounding freeways.

ES 1.5 Environmental Feasibility

The focus of the preliminary environmental assessment was to identify and address the potential tunnel issues and impacts -- impacts associated with both the construction and operation of a major highway tunnel -- to the adjacent and surrounding communities and the local environment within the study area. And, finally to determine if any of these issues or constraints will preclude additional consideration of the tunnel concept to complete the Route 710 freeway.

From the environmental perspective, the tunnel concept appears to be viable and feasible. Environmental impacts to the following resources may occur: noise, air quality, historic properties, aesthetics, archaeology, hazardous waste, soil disposal, and storm water. However the impacts or the severity of the impacts can be minimized, eliminated or mitigated using proven measures and techniques. Based upon this preliminary environmental assessment, no insurmountable environmental issues have been identified that would preclude further consideration of the tunnel alternative.

If a decision is made to advance the tunnel concept, more comprehensive consideration would be needed to further identify and quantify the potential environmental impacts of this concept within the Study Area and in close regional proximity of the corridor.

ES 1.6 Financial Feasibility

The funding sources and financial scenarios considered in this report provide a starting point for development of a financial plan for the project, should the tunnel concept be advanced. The Route 710 gap closure is a project of regional significance. This technical assessment examined a myriad of tunnel alternatives that would provide four-lanes of traffic per direction. The construction cost estimates for these alternatives were prepared with the estimates ranging from approximately $2.3 billion to $3.6 billion (2006 dollars). A cost estimate of $3 billion (2006 dollars) was used for the purposes of identifying potential funding sources and developing financial strategies to reflect the range of tunnel alternatives considered.

As part of this technical assessment, several potential financial strategies were developed that considered various federal, state, regional, and local funding sources. These sources included traditional funding sources and non-traditional sources such as bonds leveraged from anticipated toll revenues. Using these revenue sources and assumptions on the level of contribution from each source, seven preliminary financial scenarios were developed -- including four scenarios that contained toll based financing.

ES 1.7 Conclusion

It is the conclusion of this technical feasibility assessment that the tunnel concept to complete the Route 710 freeway is feasible from the physical perspective. Further, since the anticipated environmental issues or impacts can be eliminated, minimized or mitigated by proven methods, the concept also appears to be environmentally feasible. Although, the determination of the financial feasibility is dependent on several external factors, it is warranted that the tunnel concept be advanced to the next more detailed stage to further validate the findings of this assessment and to determine whether the tunnel concept can ultimately serve as the alternative to complete the Route 710 freeway.

1.0 Introduction

1.1 Project Background

The Interstate 710 (I-710) "Long Beach" freeway serves as a major north-south link in the Los Angeles County transportation network. The freeway is an extensively traveled facility and its level of service has deteriorated as congestion and demand grow within the corridor. This facility was developed as one of the early freeways in the Los Angeles basin and it currently extends from its southern terminus in the City of Long Beach to Valley Boulevard, just north of Interstate 10 (I-10) "San Bernardino" freeway in the cities of Los Angeles and Alhambra. Beyond this northern terminus is a 4.5 mile gap in the Route 710. At Del Mar Boulevard, in the City of Pasadena, the I-710 freeway resumes and extends north 0.6 miles to its junction with the Interstate 210 (I-210) "Foothill" freeway.

The California Department of Transportation (Caltrans), Federal Highway Administration (FHWA), the Southern California Association of Governments (SCAG) and the Los Angeles County Metropolitan Transportation Authority (MTA) each supports the completion of Route 710 to relieve regional and local traffic congestion and to enhance regional air quality. Consequently, SCAG has included this project in its Regional Transportation Plan (RTP) since 1989 and in its Regional Transportation Improvement Plan (RTIP) since 1991. Over the past forty years, alternative concepts have been proposed and evaluated to complete the Route 710 freeway. To date, none of the previously proposed and evaluated alternatives has been successful in satisfying both regional mobility needs and community/environmental concerns.

The MTA has taken the initiative to conduct this study to evaluate the constructing of a tunnel to complete Route 710 and to close the missing segment between Valley Boulevard and Del Mar Boulevard. Recent advances in tunnel construction technologies may be applicable to the Route 710 tunnel concept in the determination of this concept's physical, environmental and financial viability.

In April 2005, the MTA retained the firm of Parsons Brinckerhoff (PB) as the engineering consultant to perform the Route 710 Tunnel Feasibility Technical Assessment to determine whether it would be prudent to initiate further and more comprehensive evaluations of a tunnel alternative to complete Route 710.

1.2 Project History

The **first Draft Environmental Impact Statement (DEIS)** was circulated in 1975, which included draft and supplemental environmental documents relating to an at-grade solution to provide closure of the 'Gap.'

The **SR-710 Final Environmental Impact Statement**, Volumes I and II, (FHWA and Caltrans) **was issued in 1992** providing the final environmental document within the official Federal and State environmental processes. This FEIS summarized previous environmental documents from the first DEIS of 1975 and updates to all of the environmental resources and their impacts within the project area.

The **Route 710 Meridian Variation Enhancement and Mitigation Advisory Committee** produced a **Final Report in 1993,** which summarized the main environmental issues and included mitigation recommendations to advance the project and obtain a Record of Decision (ROD) for the at-grade "Meridian Route". A summary of the public comments is also included in the Final Report.

Another 1993 report provided **Caltrans's Recommendations** for the Route 710 Meridian Variation Enhancement and Mitigation Advisory Committee. In this report, it was concluded that the proposed Meridian Variation alternative would have significant impacts in all the local communities, but that impacts and required mitigation measures would vary for each city. The affected local communities were skeptical of the implementation of the mitigation measures recommended in both the FEIS and the report. Recommendations of the report were to reduce the footprint of the alternative, to ban trucks on the proposed facility, and thus reduce environmental impacts associated with the project.

In **1996, Caltrans District 7** produced the **Route 710, 'Model Evaluation of the City of South Pasadena's Multi - Mode Low Build Proposal**. In this document, general trends were observed in terms of expected traffic volume reductions of 10 per cent to 50 per cent to the major streets in the area, with a freeway gap closure. This modeling effort did not specifically address the issue of truck traffic.

The next main development was the **1998 FHWA Record of Decision**, which selected a modified version of the Meridian Variation Alternative as described in the FEIS. This version was named the **'Depressed Meridian Variation Alternative Reduced with Shift'** design variation. This modified version was selected to reduce overall impacts of the project by reducing the highway width, including sections of depressed alignment below ground level in residential areas, providing short sections of cut-and-cover tunnel, making an alignment shift to avoid the Short Line Villa Tract Historic District, and making a commitment to further depress the highway in the El Sereno area of the City of Los Angeles and in South Pasadena.

Also in **1998, Caltrans District 7** produced the document entitled **'Questions and Answers and Preliminary Design Plans'**. Topics covered included: the purpose of the project; benefits of closing the gap; adverse impacts; air quality; proposed ways to decrease environmental impacts; project cost and funding source; a brief summary of lawsuits filed from March 1973 to June 1998; a proposed "Low-Build" Plan; and suggested 'next steps.' It also provided a colorized strip map showing project features such as the connector ramp or auxiliary lanes, bridge, new street connection, busway / HOV lane, shoulder and historic resources.

In **1999, a Motion for Preliminary Injunction** was heard by Judge Dean D. Pregerson of the **U.S. District Court** Central District of California. Judge Pregerson granted in part and denying in part the Plaintiff's complaints regarding the extension of the 710 Freeway. The plaintiffs were the City of South Pasadena, the National Trust for Historic Preservation, the Sierra Club, the California Preservation Foundation, the Los Angeles Conservancy, Pasadena Heritage, the South Pasadena Preservation Foundation, and the South Pasadena Unified School District. The defendants were the United States Secretary of Transportation, the Federal Highway Administrator, the Federal Highway Administration (FHWA), the Director of the California Department of Transportation, and Caltrans.

This Complaint sought a preliminary injunction preventing future planning and monetary expenditures, and imposed certain requirements on the defendants. The court determined that a preliminary injunction was appropriate and ruled that the defendants would be prohibited from specific actions to extend the 710 Freeway and further actions regarding the disposition of right-of-way related to the proposed 710 Freeway. This court order granted and denied elements of the plaintiffs' motion for the preliminary injunction, and this injunction remains in effect today.

1.3 MTA Team

The sponsor of this tunnel technical feasibility assessment is MTA, Transportation and Implementation (Planning) Division. A study team consisting of staff from the MTA's San Gabriel Valley Team was charged with the project management, project guidance and oversight, and the outreach efforts relating to this Feasibility Assessment. It was also assigned responsibility for execution of the feasibility study, providing direction to the study team, and principal review of the study products.

Additionally, the MTA study team was responsible, along with its consultant, for coordinating the study with other public agencies including Caltrans, SCAG, and affected local jurisdictions.

1.4 MTA Tunnel Advisory Panel

During the study, the team was also advised by the MTA internal Tunnel Advisory Panel (TAP), which is comprised of the following recognized underground experts:

- Dr. Dan Eisenstein, Professor Emeritus of Civil Engineering, University of Alberta
- Dr. Geoffrey Martin, Professor of Civil Engineering, University of Southern California

TAP was consulted throughout the study to review previous related reports and to advise on tunneling and geotechnical aspects of the study deliverables including the Technical Memoranda and Final Report.

1.5 MTA Working Group

In addition to the MTA Study Team, TAP, and the Consultant Team, another important committee of project stakeholders to this feasibility assessment was the Working Group which included technical staff representatives from Caltrans, SCAG and the cities of Alhambra, La Canada Flintridge, Los Angeles, Pasadena, San Marino, and South Pasadena.

The MTA study team has met on an approximately monthly basis with the Working Group to obtain the Working Group's input on the development of all tasks of the feasibility assessment.

1.6 Study Goals and Objectives

The intent of the assessment is to determine the feasibility of completing this freeway gap by tunneling. Specifically, this evaluation has principally focused on mined tunneling construction methods rather than more environmentally intrusive 'cut-and-cover' tunneling methods. The purposes of this feasibility study were to:

- Determine if a tunnel is technically, operationally and financially feasible;
- Identify preliminary potential physical, environmental and financial impacts to neighboring communities;
- Validate the concepts for a mined tunnel(s); and
- Develop a more refined project scope and cost estimates.

Although this assessment has examined a variety of issues related to a tunneled gap closure, it is by no means intended to be comprehensive and exhaustive in scope. The objective has been to determine whether a tunnel solution would be feasible and worthy of further consideration so that the responsible agency(ies) may determine the next appropriate actions needed for closure of the Route 710 Gap in accordance with local, state and federal project development guidelines.

The study tasks included examination of world tunneling achievements, identification of examples of similar completed tunnels, examination of available local geological information, a review of possible tunneling technologies, initial traffic modeling, and identification of feasible tunnel configurations and alignment to be used as the basis of the initial feasibility assessment. With these assumptions it was then possible to examine potential environmental issues that would need to be addressed and to identify potential aesthetic solutions to illustrate possible concepts for mitigating visual impacts of tunnel structures. Rough order of magnitude costs and financial analysis were included to allow an assessment of project feasibility.

2.0 Summary of Large Highway Tunnels Domestic and International

For background on similar tunnel projects, this chapter provides a summary of large diameter (two to three lanes each direction) vehicular tunnels from around the world. The tunnels reviewed represent many of the world's most recent large diameter road tunnels that feature state-of-the-art construction methods, equipment, and operational concepts.

In general, these tunnels are in urban environments and are either complete, under construction, or in planning phases. Technologies used and lessons learned from these projects may be applicable to the proposed Route 710 Tunnel.

In addition, MTA's Tunnel Advisory Panel (TAP), in its February 2005[1] report on Tunneling Feasibility, identified over 40 roadway tunnels world-wide.

For this feasibility study task, tunnel projects were selected as being of particular interest due to tunnel size, urban environments, tunneling technology used, traffic volumes, and operational practice. These projects include:

- A-86 Malmaison, France
- SMART, Kuala Lumpur, Malaysia
- Westersschelde, Netherlands
- 4th Tube Elbe River, Hamburg, Germany (and Lefortovo Tunnel, Moscow)
- M30, Madrid, Spain
- Mrazovka Highway, Prague, Czechoslovakia
- Dublin Port Tunnel, Ireland
- Mt. Baker Ridge, Seattle, Washington
- Melbourne City Link, Melbourne, Australia
- Caldecott Tunnel, Oakland, California
- Hsuehshan (also known as Pinglin), Taiwan

Of these similar tunnels, the three considered most comparable are presented for this report: the A-86, M30, and Mount Baker Ridge projects. These tunnels have similar intended function of a multi-lane highway, in an urbanized setting and their cross section and configuration requirements also have some similarities. More information on tunnels' physical characteristics, construction methods, configuration (single or multiple tunnels, number of lanes), fire/life safety elements, and operational information (single or joint use tunnel, mixed traffic or "auto-only" use) follow.

[1] Eisenstein, Dan and Geoffrey Martin, MTA Tunnel Advisory Panel, "Report on Tunneling Feasibility: Preliminary Geological and Geotechnical Evaluation and Review of Associated Tunneling Technologies, February, 2005

2.1 A-86 Tunnel, Malmaison, France

The A-86 tunnel project is a large diameter highway tunnel currently under construction near Paris, France in the town of Malmaison.

This tunnel is under construction as of May 2006 by the French government, in association with the Cofiroute Company under a Design-Build-Operate contract. Two separate tunnels have been planned. The first (east) tunnel, which is projected to be completed for revenue service in 2007, is a stacked, two-level roadway configuration and is approximately six miles in length, with a large diameter planned to carry truck traffic and may be completed at a later stage. This tunnel is considered comparable to the Route 710 tunnel project due to its size, configuration and function as a multi-lane highway in a suburban, environmentally sensitive area. Figure 2-1 illustrates its proposed stacked two-lane configuration.

This project extends the existing A-86 motorway to complete the final link of the outer ring road around greater Paris. It passes under areas of forest, parkland, historic sites and residential areas. Environmental restrictions were the driving force behind the tunnel section. The tunnels will be toll financed. The east tunnel will be 6.2 miles long, for light vehicles only. The second (west) tunnel will be 4.7 miles long and will include heavy vehicles and trucks.

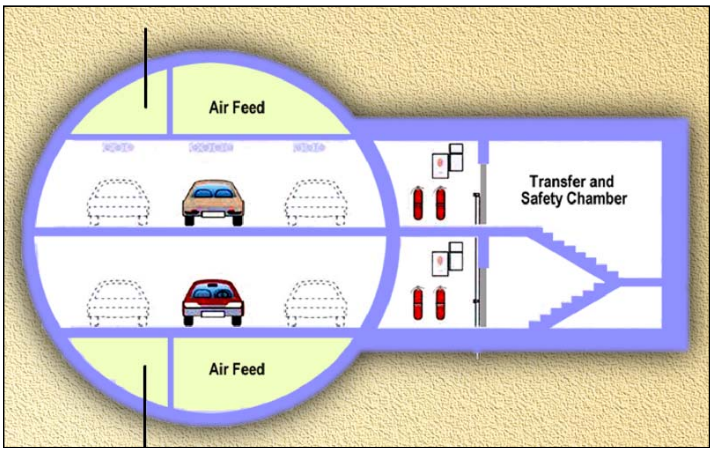


Figure 2-1 A86 Tunnel Schematic Tunnel Cross Section

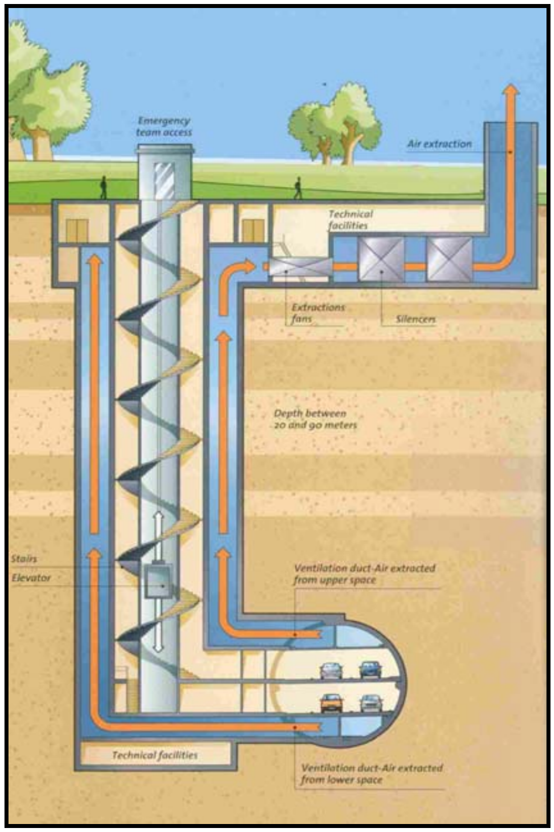


Figure 2-2 Schematic of A-86 Tunnel and Emergency Exit Shaft

The tunnel's inside diameter of 34 ft. allows an internal height of 8.4 ft per level. This clearance allows vehicles of 6.6 ft. or less to enter the tunnel, thus accommodating most private and small commercial vehicles in France. Each traffic level is sealed and independent, with its own ventilation system. There are two traffic lanes and one emergency lane in each direction.

Geologic conditions at the location are variable including sands, limestones, and clays with variable groundwater conditions. The tunnel is being constructed using a Tunnel Boring Machine (TBM) with pressure-face capability. The TBM operation modes adjust for soil conditions and can be changed from Earth Pressure Balance (EPB) to Slurry to "open" in rock conditions. The lining consists of pre-cast concrete segments. Chapter 4 provides more information on tunneling technology.

Ventilation and safety features will include a full transverse ventilation system and an incident detection system. The DIVA (Instant Detection of Stationary Vehicles) system uses a system of cameras at 330 ft. spacing and a central control system to monitor for problems. Twenty-four hour surveillance is also to be provided by security agents who will patrol and assist users.

Refuge bays are provided at 650 ft spacing. The bays can be sealed and pressurized to house up to 100 people each, and would also allow the people to keep in contact with the central tunnel monitoring station. Each bay has a stairway connecting to the upper or lower tunnel levels for evacuation. Exit shafts to the surface (Figure 2-2) are spaced on the average of approximately 3,300 ft.

Smoke extraction systems are sized for large accidents involving light vehicles. Smoke release hatches are provided at minimum 1,300 ft. spacing. Drivers upstream of the fire are protected from smoke through smoke venting and directional blowing of fresh air to the venting shaft. A fire suppression system will be installed that automatically activates in event of fire by releasing water through a misting network. This system was tested under simulated conditions (real tunnel fire in similar tunnel configuration) at a test facility in Switzerland.

2.2 M30 Project Madrid, Spain

The M30 motorway in Madrid, Spain is at the center of a major urban renewal project and serves as the city's inner ring road. As of 2004, congestion on the existing road was considered a "barrier" to traffic movement in the urban area. Project objectives were to refurbish the existing roadway and to re-route major sections through tunnels under the city to allow existing paved surface areas to be restored to green spaces and new housing. The project has 15 separate sections and four regions. The South By-Pass twin tunnel portion is 2.2 miles in length and the tunnel has a 50-ft outside diameter. The project is currently under construction by the Spanish government and tunneling for the first bore of the large diameter road will be completed in mid-2006. The project has two tunnels providing three traffic lanes in each direction, on single level road decks.

This tunnel now has the distinction of being driven using the largest Earth Pressure Balance TBM. Geologic conditions consist of clays and sandy clays typical of the Madrid area. The tunnel lining is prefabricated concrete, bolted, gasketed segments each 28 inches thick and 6.5 feet in length. Features of this tunnel include inspection and escape routes from under the roadways (Figure 2-3), as well as gas detection (CO, NO_2) and alarms, and fire suppression systems.

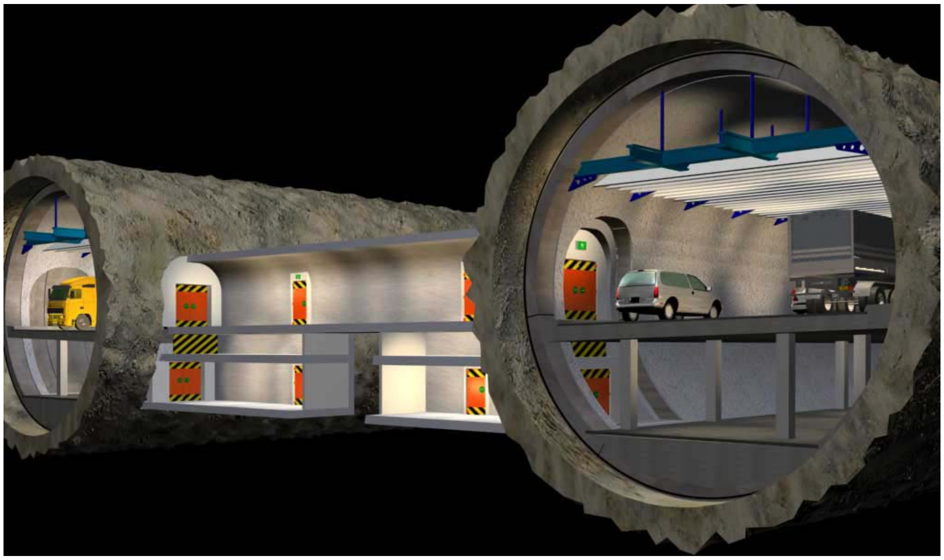


Figure 2-3 Rendering of M 30 Tunnel cross section with cross passages between tunnels for emergency use.

2.3 Mt. Baker Ridge Tunnel, Seattle, Washington

This highway tunnel connects western Seattle through Mount Baker Ridge and onto a bridge structure over Puget Sound. It was completed in 1986, is 1500 feet long, and provided five additional traffic lanes, on 2 levels, built alongside the original 1940s tunnel. The large diameter tunnel, as opposed to several smaller tunnels, was "mandated" by public input to reduce effects on the overlying residential area and to reduce required rights of way. The tunnel supplemented an existing tunnel constructed decades earlier. An innovative "stacked drift" method of construction was used in which a tunnel lining consisting of 24 individual concrete-filled drifts were constructed to form the initial tunnel lining, followed by removal of the soil core (Figures 2.4 and 2.5). The tunnel diameter is about 87 ft. in outside diameter, with two and three lanes of traffic on the upper and lower levels respectively. Traffic on the lower level is reversible for commute directions. A bike path enters the tunnel at the upper most level.

The west approach to the Mount Baker Ridge Tunnel includes a cut and cover section and the ventilation structures. This cut and cover area was later incorporated for use as parkland (Figure 2.6). Additional safety features of this relatively short tunnel include an automatic fire detection and foam suppression system.

The 'stacked drift' construction method used was well suited to the shallow, soft soils found along that alignment to achieve the large spans required for the traffic cells. The method is relatively slow but adequate for this short length of tunnel. It would not be appropriate when compared to other methods for a much longer, relatively deep tunnel in soft rock conditions anticipated on the Route 710 alignment.

Figure 2-4 East Portal – Shows Approach Structure and Reversible Lanes Below

Figure 2-5 Traditional Rendering of Mt. Baker Ridge Tunnel Showing Stacked Drift Construction Concept, Bike Lane at Tunnel Crown

Figure 2-6 Park and Vent Structures above west approach cut and cover section

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3.0 Geotechnical Evaluation

Evaluation of tunneling feasibility requires information of sub-surface geologic and groundwater conditions. This chapter provides background from previous studies and some new investigation for this feasibility study.

3.1 Regional Geology and Tectonics

The Los Angeles region lies along the boundary of the Western Transverse Mountain Ranges on the north and the Peninsular Ranges on the south. The region is characterized by northerly trending hills and valleys on the south and east-west trending hills and valleys on the north. The Los Angeles region is an area of active geological deformation (tectonics) and earthquakes. Presently the site region is in regional crustal compression oriented in a north-northeast direction as determined from geological structure, earthquakes, and both land and space geodetic surveys. The region is contracting at about 0.19 to 0.35 in/year. The boundaries between the mountains and the valleys are generally coincident with geological earthquake faults.

Except for a few marginal zones, the geologic structure of the San Gabriel basin is characterized by relatively flat-lying, late-Quaternary (between 700,000 years ago and the present day) strata overlying folded Pliocene to Miocene-age strata (29 million up to 1.8 million years ago). The central part of the basin is a deep trough that rises abruptly due to faulting and folding at the Sierra Madre fault zone (Figure 3-1 illustrates regional faults).

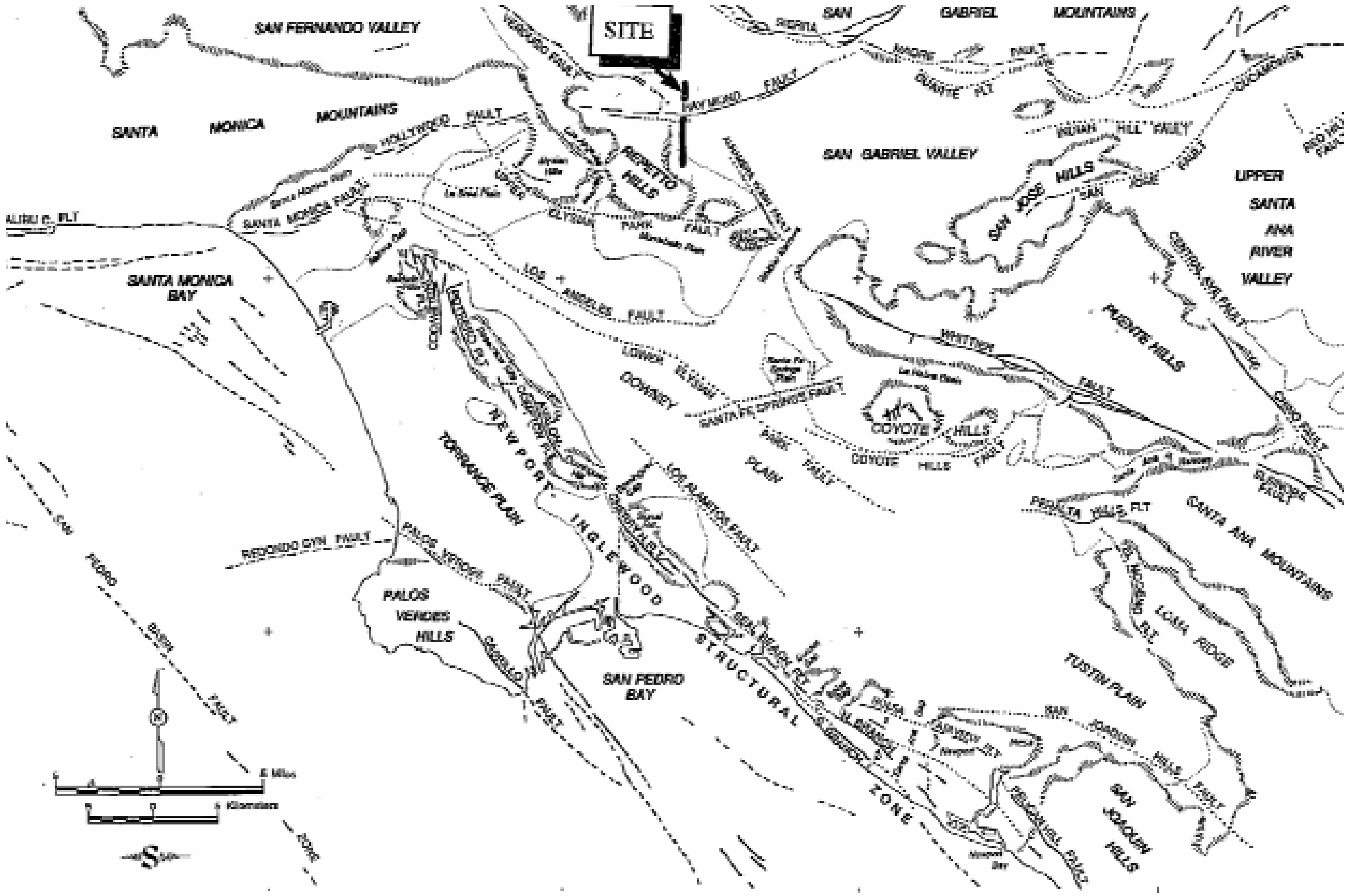
The bulk of seismotectonic activity in the San Gabriel Basin region during Quaternary time appears to have occurred along the Sierra Madre, Hollywood, and Whittier faults which border the more prominent uplifts in the Los Angeles Basin. The Raymond Hill fault (also referred to as the Raymond fault) had activity but probably at a lesser rate. If these characteristics can be applied basin wide, the greatest tectonic activity within late Pleistocene time has occurred primarily in proximity to the major surface faults such as the Santa Monica-Hollywood, Newport Inglewood Structural Zone, Whittier, and Sierra Madre faults. The subsurface thrust faults within the region have not been active enough to create similar prominent uplifts, and only a few (e.g. Santa Fe Springs) have even subtle recognizable surface expression.

3.2 Site Geology

The tunnel study assumed initial alignments lie within a corridor along the western margin of the San Gabriel Basin which constitutes a broad southerly sloping plain within the transition zone between the Western Transverse Ranges and the Peninsular Ranges. The northern reach of the route corridor (north of the Raymond Hill fault) is commonly referred to as the Raymond Basin. The San Gabriel/Raymond Basin(s) is bordered on the north by the San Gabriel Mountains, on the west by the Repetto Hills, on the south by the Puente Hills, on the east by the San Jose Hills.

The basin floor comprises broad alluvial fans, gently sloping to the south-southeast, overlying folded sedimentary rocks in the southern part of the alignment corridor and crystalline basement rocks in the northern part. Most of the route is characterized by flat ground or subtle small

Figure 3-1 Regional Physiography and Active Faults



rounded rises, but several higher hills occur just west of the alignment corridor. Elevations along the assumed study alignments range from about 820 feet in the north to about 420 feet in the south for an elevation change of about 400 feet. The highest elevation along the route corridor is at Raymond Hill which rises to an elevation of about 830 feet. Outcrops of folded bedrock occur locally as small hills and knolls along the alignment corridor and in the Repetto Hills to the west.

3.3 Stratigraphy and Structure

The stratigraphy and the structure of the site vicinity are presented on a longitudinal profile along tunnel study corridor in Figures 3.2 through 3.5. From the San Bernardino Freeway (I-10) north to the concealed extension of the York Boulevard fault (at Mission Street), the stratigraphy consists generally of thinly-bedded Tertiary (about 67 to 2 million years old) shale and siltstone of the Puente (Monterey) Formation unconformably overlain by Quaternary (less than 10,000 years) alluvium. It should be noted that different investigators have assigned different names to the same formations. Generally speaking, the Monterey and the Puente formations (noted on the profile) are very similar rocks of about the same age and, for engineering purposes, can be considered the same lithologic unit.

3.3.1 Crystalline Basement Rock

Along the assumed tunnel study profile, basement rock has the potential to be encountered only from north of the Eagle Rock fault near Glenarm Street to the Foothill and Ventura freeways. Basement rock will likely consist of Cretaceous quartz diorite: (geologic map symbol **qd),** a massive, non-gneissoid quartz diorite; and (**gqd),** and massive to gneissoid quartz diorite, which locally includes unmapped biotite-rich gneiss.

There is little subsurface information on these rocks locally. While crystalline basement rock has been encountered in a few water well borings located north of the Eagle Rock fault, the geological logging for those borings was generalized and is of limited usefulness. A previous boring by Caltrans (boring ES-3) and an EMI boring (06-2), placed for this project, located further south, encountered granodiorite basement rock at a depth of about 150 ft. The rock, described as mostly soft and weathered to highly weathered, may not be typical of basement rock north of the Eagle Rock fault. The nearest surface exposures are in Arroyo Seco about a kilometer to the west of the route corridor.

3.3.2 Topanga Formation

The Topanga Formation, of middle and/or late Miocene age (10 to 20 million years ago) unconformably overlies crystalline basement rock. Along the assumed tunnel profile it would be encountered north the Raymond Hill fault zone to the Eagle Rock fault. Along this reach, the Topanga Formation is found at or very near surface to an estimated 3,000 ft depth (Dibblee, 1989). The formation is subdivided into three units: (**Ttqdc),** a gray to brown, crudely bedded conglomerate and breccia, all composed of biotite hornblende quartz diorite in semi-friable sandstone matrix, very similar in appearance to granodiorite; **(Ttsc),** a light gray to brown, semi-friable sandstone, and interbedded brown sandy to silty shale, semi- siliceous shale, and pebble-conglomerate of quartz diorite detrius; and (**Ttqdb),** a gray to brown breccia, massive to vaguely bedded, composed of angular detritus and a few rounded cobbles and boulders, all of biotite hornblende quartz diorite.

Figure 3-2 Geotechnical Profile 1

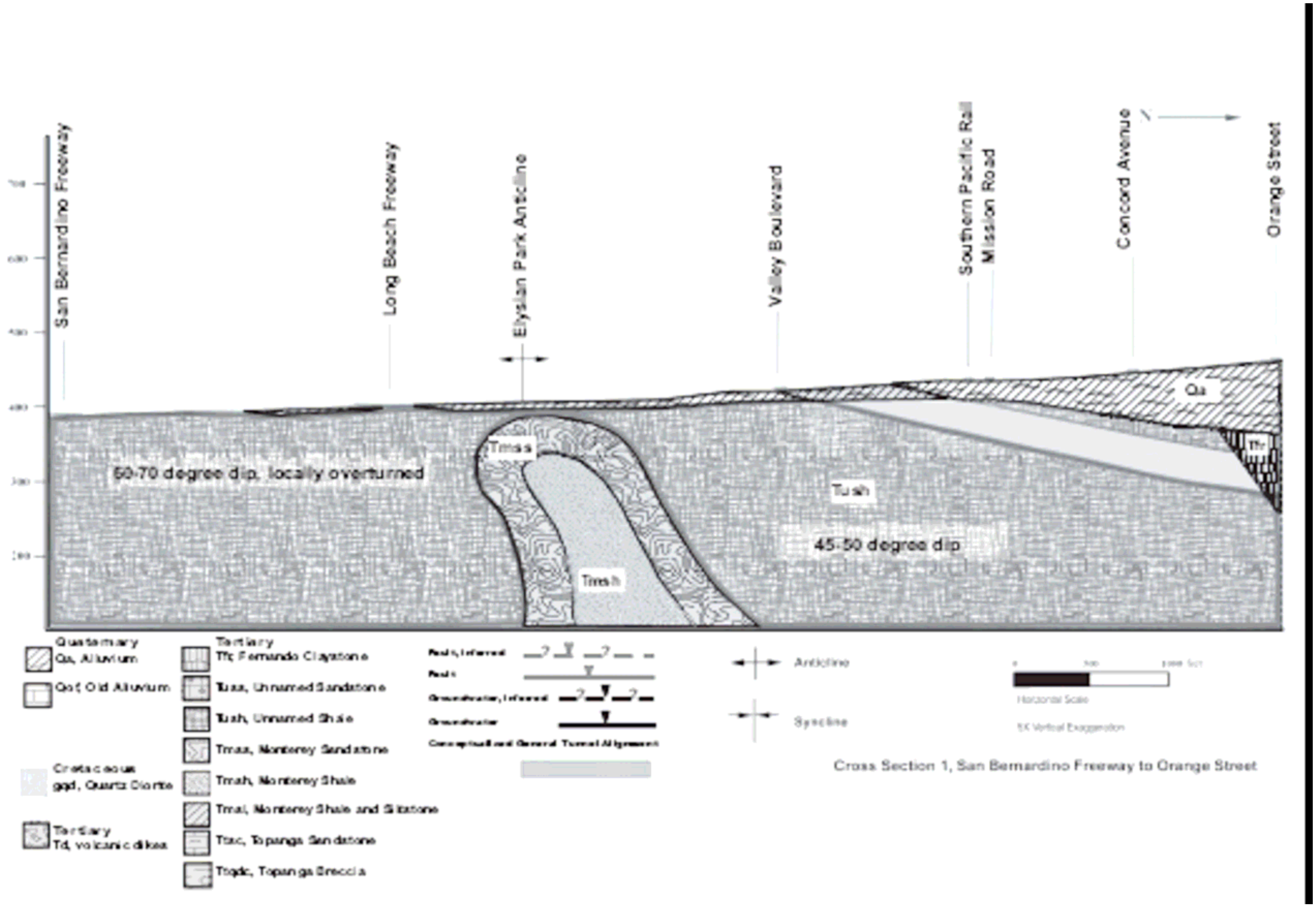


Figure 3-3 Geotechnical Profile 2

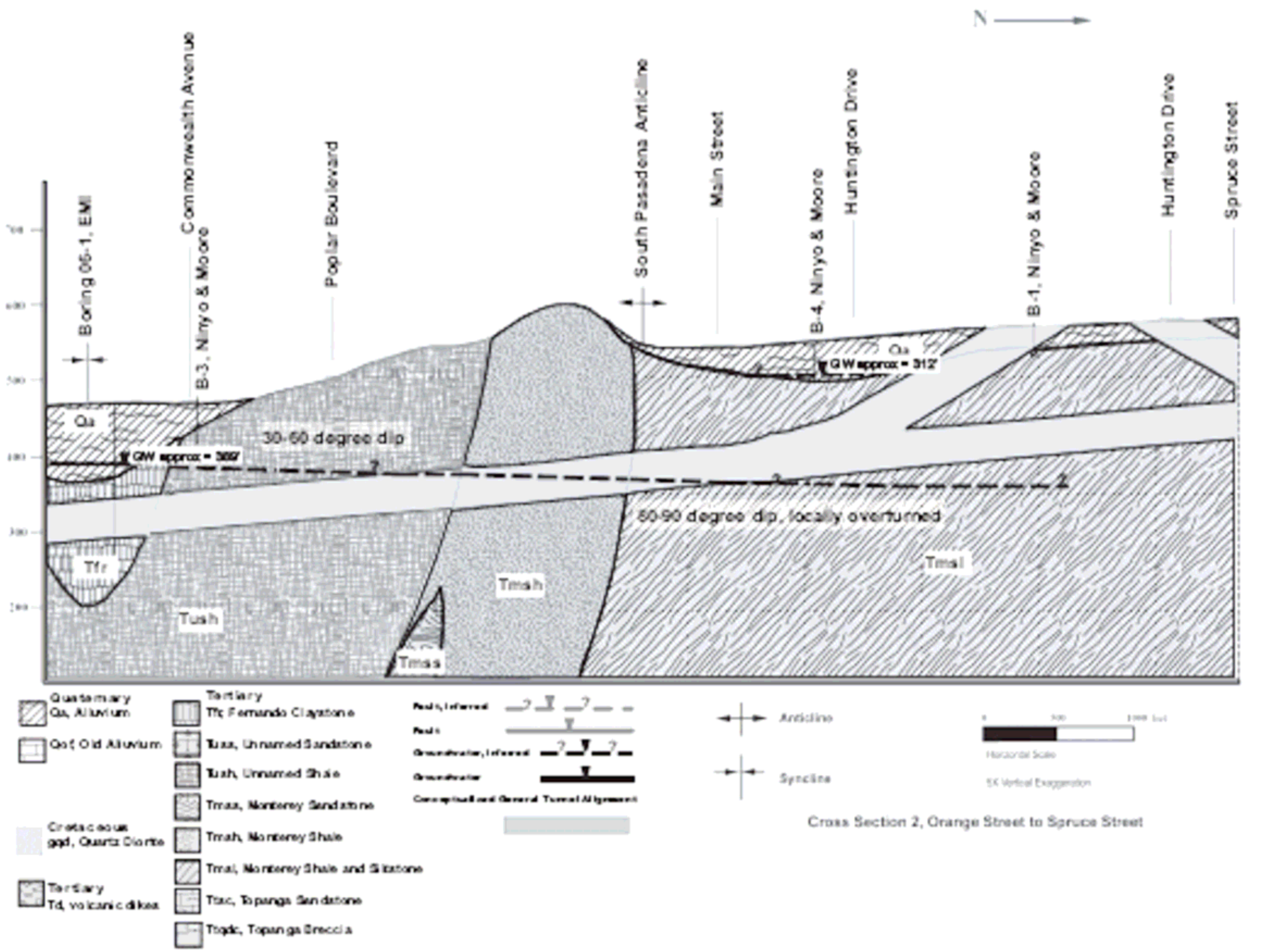


Figure 3-4 Geotechnical Profile 3

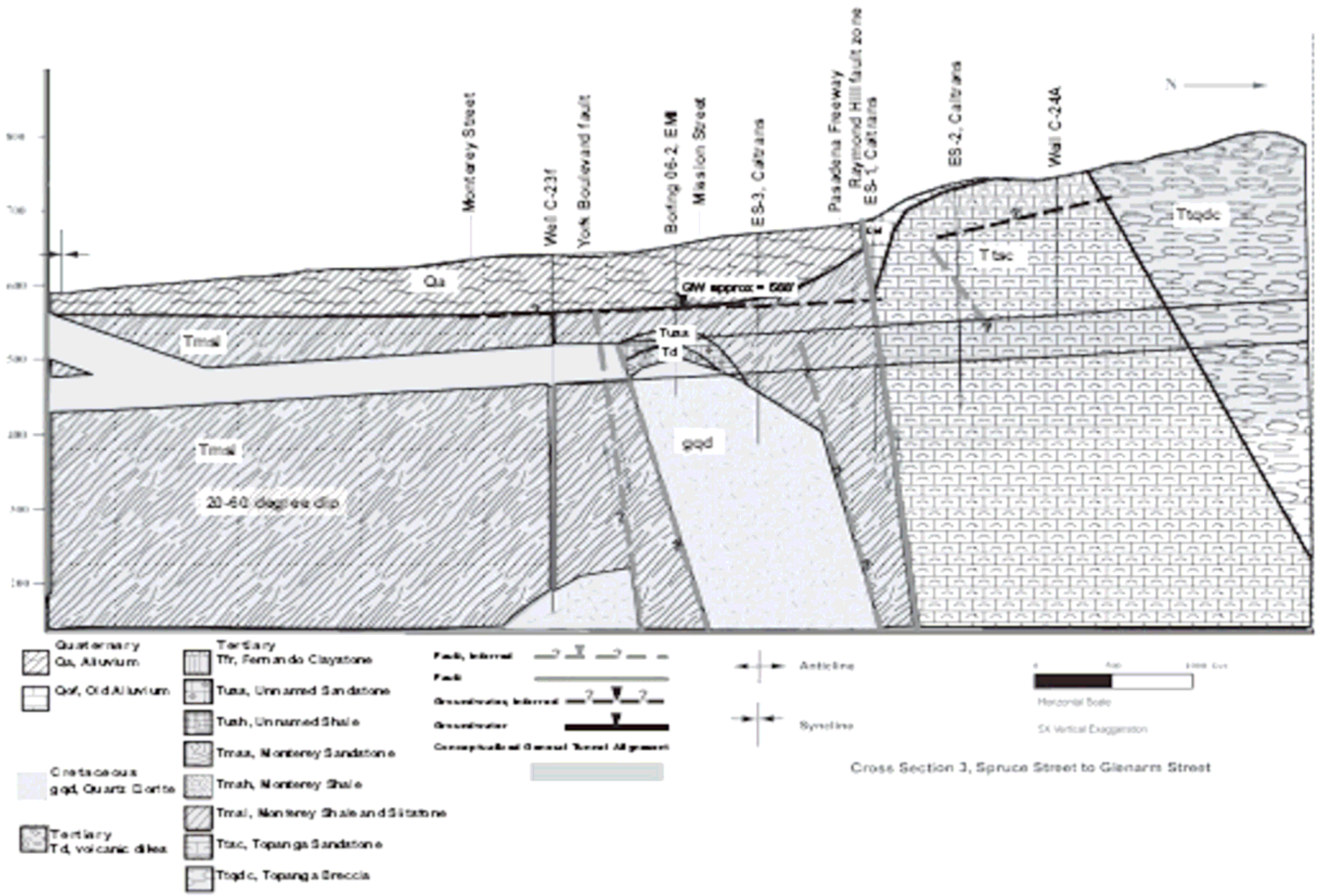
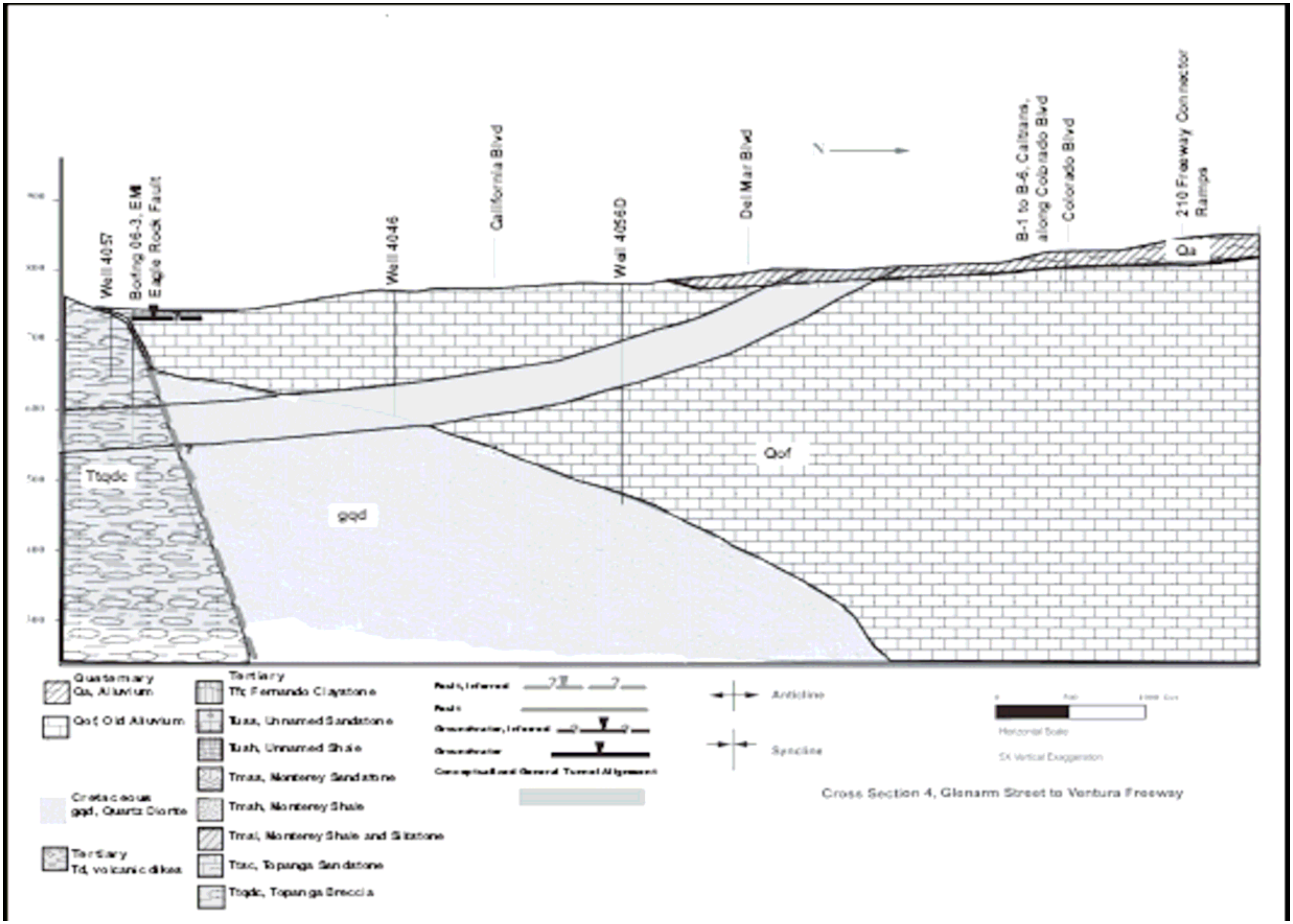


Figure 3-5 Geotechnical Profile 4



3.3.3 Monterey/Puente Formation

The Monterey/Puente Formation will be encountered between approximately Hellman Avenue to Valley Boulevard and from Hampton Terrace to the York Boulevard fault (Mission Street) along the study profile (Figures 3.2 to 3.5). As stated previously, the Monterey and Puente formations have been shown interchangeably on various maps. These formations are very similar in characteristics, and therefore no attempt was made to distinguish between them for tunneling characterization. The Monterey/Puente Formation is a marine deposit of middle- to late-Miocene age and conformably overlies and the Topanga Formation. The Monterey/Puente Formation is subdivided into three units: (**Tmsh**), a white-weathering, thin-bedded, platy, siliceous shale which is locally porcelaneous and silty; (**Tmss**), a tan to light gray, semi-friable, arkosic sandstone which includes some interbedded silty shale; and (**Tmsl**), a gray, micaceous silty shale and siltstone. Tmsl rocks are considered by Lamar (1970) to be part of the Topanga Formation.

3.3.4 Unnamed Shale

The late-Miocene-age marine “unnamed” shale of Dibblee is referred to as a member of the Puente Formation by others (e.g. Lamar, 1970). Along the study profile this material would be encountered between the San Bernardino Freeway to Hellman Avenue and Valley Boulevard to Hampton Terrace. The shale is subdivided into two units: (**Tush**), a gray to light-brown, thinly bedded, silty clay shale, locally containing scattered large calcareous nodules; in places the subunit contains thin interbeds of fine-grained sandstone; the lower part locally contains thin lenses of light tan, platy, semi-siliceous or diatomaceous shale; (**Tuss**) consists of light gray to tan, semi-friable, sandstone with thin interbeds of silty shale.

3.3.5 Fernando Formation

The Fernando Formation includes over three thousand ft thickness of Pliocene siltstone, sandstone, pebbly sandstone, and conglomerate. The formation is generally soft, poorly indurated, and friable. The formation is most extensive just south of the assumed route corridor, but would be encountered for a short section between Concord and Commonwealth Avenues. The geotechnical properties of this formation are not greatly different than the Monterey/Puente rocks.

3.3.6 Quaternary Alluvium

Surficial sediments unconformably overlie bedrock along the flat-lying ground surface of assumed tunnel corridor. While depth of alluvium is not well-known throughout the project area, south of the Eagle Rock fault, based on previous borings it is not believed to exceed about 100 ft in thickness and is likely much less over most of the area. Except near the tunnel portals where the tunnel depth is shallow, it is unlikely that deposits will be encountered along tunnel profile. Quaternary alluvium is divided into the following subunits: **(Qa)**, unconsolidated Holocene floodplain deposits of silt, sand and gravel; (**Qg**), Holocene stream channel deposits of gravel, sand and silt; and **(Qof)**, Pleistocene alluvial fan gravel and sand.

3.4 Faults

As described in Section 3.1 of this chapter, the area has undergone active geologic deformation. Active faults in proximity of, or crossing the corridor, will influence tunnel design for ground shaking and displacements during earthquakes. The following summarizes the known faults which could impact the seismic criteria for tunnel design.

3.4.1 Sierra Madre Fault

The Sierra Madre fault is one of the major faults in the Los Angeles region and lies along the southern margin of the San Gabriel Mountains and along the northern edge of the San Fernando Valley and the San Gabriel Valley. The fault zone is very complex and over much of its length comprises several sub-parallel branches. The fault may also be divided into segments along length with somewhat different rupture characteristics and histories. For example, the Raymond Hill fault, which crosses the Study area, intersects the Sierra Madre fault in the Sierra Madre area and aligns with similar faults (Clamshell-Sawpit faults) north of the Sierra Madre fault, thus suggesting a fundamental discontinuity in the Sierra Madre fault. About 12.4 miles of the westernmost part of the Sierra Madre fault ruptured during the 1971 San Fernando earthquake (moment magnitude, $M_w = 6.7$).

3.4.2 Santa Monica-Hollywood Fault System

One of the major faults in the Los Angeles Basin is the frontal fault system along the southern edge of the Santa Monica Mountains, separating Mesozoic-age plutonic and metamorphic rocks from Tertiary sedimentary rocks. The fault system consists of the Santa Monica and Hollywood faults and smaller segments such as the Malibu and Potrero faults. The Santa Monica Mountains rise abruptly to 1600-2000 ft above the Los Angeles Basin floor and are indicative of a large vertical component of faulting as well as a left-lateral component.

There have been no large historical earthquakes associated with the Santa Monica-Hollywood fault system, but geological studies (e.g. Crook and Proctor, 1992; Drumm, 1992; Dolan et al, 2000) have documented late-Quaternary faulting. Although it seems certain that the fault system is one of the major active features in the Los Angeles Basin, success at determining slip rates and recurrence intervals has been limited. The most recent surface rupture on the Hollywood fault appears to have occurred 6,000 to 9,000 years ago (Dolan et al., 2000).

The Metro Rail Red Line has driven a tunnel through the Hollywood segment of the fault system. The tunneling and boring program found the plutonic rocks of the Santa Monica Mountains uplifted and thrust over 262 to 328 ft. of alluvium and colluvium (Guptill et al, 1997).

3.4.3 Raymond Hill Fault

One of the major faults along the project study corridor is the Raymond Hill fault or as commonly referred to, the Raymond fault. The Raymond Hill fault is about 16 miles long and extends approximately east-west through the communities of San Marino, Arcadia, and South Pasadena. The fault zone crosses the Study area in the vicinity of the Pasadena Freeway, where the freeway is oriented East-West.

The Raymond Hill fault is characterized by left-lateral oblique reverse slip. This fault dips at about 75 degrees to the north. The rate of slip is between 0.003 and 0.008 in/yr. The fault has been considered by some geoscientists to be interconnected with the Hollywood fault because they have similar trends and similar types of displacement. However, the disparity between recurrence intervals and the age of latest surface rupture suggests they are discrete features. The Caltrans seismic map considers Raymond Hill fault as part of the Malibu Coast-Santa Monica-Hollywood-Raymond fault system (MMR) and is assigned an earthquake magnitude of 7.5.

The most recent major rupture occurred in Holocene time, about 1,000 to 2,000 years ago (Weaver and Dolan, 2000). From paleoseismic and trenching studies of the slip rate of the Raymond Hill fault, there is geological evidence of at least eight surface-rupturing events along this fault in the last 40,000 years. At least five surface ruptures occurred in the past 40,000 years. However, four of these events occurred between 31,500 and 41,500 years ago (Weaver and Dolan, 2000). This indicates that surface ruptures occur over very irregular intervals and may be more random than systematic.

3.4.4 York Boulevard Fault

The York Boulevard fault trends east-west through Repetto Hills. Very little is known about the fault and it is not believed to be active. In the central part of the fault, Pliocene-age rocks are inferred to be faulted against basement rocks. The vertical separation would be more than 10,006 ft. (Lamar, 1970). The slip rate is unknown. The fault is projected across the assumed corridor by Dibblee (1989) and is shown as a subsurface fault south of the Raymond Hill fault on Figure 3.3.

3.4.5 Eagle Rock Fault

The Eagle Rock fault trends southeasterly for about 11 miles from the southwestern flank of the Verdugo Hills across the southern part of Pasadena (Figure 3.5). The fault appears to be a northerly dipping thrust fault. Very little is known about the fault. The slip rate is probably on the order of less than 0.003 in/yr (Wesnousky, 1986). The fault may be interconnected with the Verdugo fault to the northwest. The fault extends toward the projection of the Alhambra Wash fault but no evidence of any connection has ever been suggested.

3.5 Local Seismicity

The southern Los Angeles area is well known to be seismically active. In the project Study area, two small but locally significant earthquakes occurred in the Pasadena region in 1988 and 1991.

The 1988 earthquake had a magnitude of 4.9 (M_W) and may have occurred on the Raymond Hill fault at a depth of about 10 miles. (Jones et al, 1990). The 1991 earthquake had a magnitude of 5.8 (M_W) and occurred at a depth of about 7 miles. below the San Gabriel Mountains.

A number of regional faults are capable of producing ground shaking at the project site. A number of earthquakes of moderate to major magnitude have occurred in the Southern California are in the last 73 years. The earliest of these was the magnitude 6.4 (M_W) Long Beach earthquake, with an epicenter over 35 miles to the south-southeast of the study area. More recently, the magnitude 6.7 (M_W), Northridge earthquake (1994) caused moderate shaking in the project area.

Design of tunnels for ground shaking would need to consider regional seismicity and the latest fault models.

3.6 Structure Along Tunnel Study Alignment

Along the tunnel project study area, the bedrock units are folded into a series of synclines and anticlines and broken by at least three, possibly four, major faults. The complex structure of the project study site is a result of large-scale regional tectonics, including the oblique contraction of the Los Angeles Basin through a combination of strike-slip and thrust faulting near-surface and at depth.

Strike of bedding throughout the project study site is generally southeast-northwest to east-west. From the San Bernadino Freeway north to approximately Valley Boulevard is the Elysian Park anticline. The axis of the northwest-trending anticline is positioned approximately at Hellman Avenue. Oskin, et. al (2000) estimated the contraction rate of the Elysian Park anticline to be 0.02-0.04 in./yr. South of Hellman Avenue, beds are steeply dipping to the south to locally overturned. North of Hellman Avenue, beds dip moderately to steeply to the northeast into a syncline structure centered approximately at Orange Street.

From Orange Street north to approximately Main Street, bedding dips moderately to steeply to the south-southwest. Near Main Street, bedding generally becomes very steep to locally overturned.

Between Main Street and Alhambra Road is the axis of a very tight fold within the bedrock. The southern arm of a syncline is defined by moderately to locally steeply dipping beds from approximately Alhambra Road north to Spruce Street, the syncline axis. Beds of the northern arm of this syncline dip moderately to the south and are cut by the York Boulevard fault near Mission Street.

The York Boulevard fault, whose surface trace is concealed and assumed to cross the tunnel study corridor near Mission Street, and the nearby Raymond Hill fault zone, crossing the corridor at the Pasadena Freeway, are believed to have similar orientation, striking east-west and steeply north-dipping (approximately 75^{o}). Between the two faults is a wide zone of localized, high-angle shearing and deformation.

In Caltrans boring ES-2, located between Raymond Hill and Pasadena Freeway, at a depth of 160 ft., a potential fault dipping 65^{o} was identified. No information on strike or dip of this unnamed potential fault has been found, nor is there any evidence from other sources to suggest that this feature is a major fault. Boring log descriptions of units above and below this fault suggest that perhaps Topanga Formation sandstone has been thrust over micaceous siltstone of the Monterey Formation. Based on bedding orientation and the orientation of the nearby Raymond Hill fault, the unnamed fault may dip to the north.

Between the unnamed ES-2 fault and the Eagle Rock fault just north of Glenarm Street, the massive to poorly bedded Topanga Formation is generally moderately to steeply dipping to the northeast. Lamar (1970) maps a fault through the northern part of the hill.

The Eagle Rock fault is projected to assumed corridor just north of Glenarm Street. Orientation of the fault is not well-defined, but is presumed to dip 60-75^{o}NE. Other regional maps also project the San Rafael fault through the area into the same area as the Eagle Rock fault.

3.7 Site Exploration and Testing in 2006

Little geotechnical and geological information is presently available to a sufficient depth in the vicinity of the study corridor. In 2005, Metro conducted a tunneling feasibility study, including a geotechnical study to characterize subsurface conditions using existing data and published mapping. In January 2006, the geotechnical engineering firm Earth Mechanics Inc. (EMI), of the MTA consultant team, conducted a limited field investigation consisting of three soil and rock borings drilled along a corridor about 4.5 miles long that confirmed expected conditions and provided additional essential but still limited geotechnical and geological information. The investigation is described in detail in EMI's Technical Data Report (2006), with a summary provided below.

3.7.1 Field Exploration for Feasibility Study

A limited field investigation was also conducted by EMI consisting of three new exploratory soil and rock borings drilled to depths of 201 to 204 ft. The borings were drilled in the cities of Alhambra, South Pasadena, and Pasadena. The borehole locations (designated 06-1 to 06-3, respectively) are shown on Figures 3-2 to 3-5. Borehole locations were selected based on geological considerations to be studied, right-of-way, site accessibility, and workspace and time restrictions.

3.7.2 Testing

A suite of laboratory classification and strength tests and microscopic petrographic analysis were conducted to determine the soil and rock characteristics, corrosion and slaking potentials, and derive initial engineering properties with particular focus on the materials in the vicinity of the tunnel bores.

3.7.2.1 Soil Properties

The soil alluvium encountered in the three borings predominantly consists of granular soils comprising fine to medium-grained, medium to very dense sands with varying amounts of silts and gravels. In boreholes 06-1 and 06-2, the soils transitioned to weathered bedrock and consisted of very stiff to hard clays with sand. The soil thickness decreased from about 160 ft in the south boring 06-1, to 90 ft in boring 06-2, to about 70 ft the north boring 06-3.

The characteristics of Quaternary alluvium in the northern part of the corridor has been shown by numerous other holes drilled for the Metro Gold Line light rail (Law/Crandall, 1993). Typical materials encountered were sand, silt, clay and gravel mixtures. Gravel in the alluvium comprised about 10 to 20 percent of volume and large cobbles and boulders in the 9.8 to 11.8 inch size were commonly encountered. The alluvium consists of unconsolidated poorly sorted sand and gravel. Recent alluvium has Standard Penetration Test (SPT) blowcounts of approximately 20 to 30 blows per ft, indicating medium density, and old alluvium shows much higher blowcounts in the range of 50 to over 70 blows per ft., indicating very dense material.

Based on one soil sample from each of the three recent borings, the soils did not classify as corrosive to bare metals and concrete in contact with the soils. Environmental laboratory testing of soil cuttings for the purpose of proper disposal did not reveal contaminated or hazardous substances.

3.7.2.2 Rock properties

The crystalline basement rock is essentially coarse-grained, highly weathered granodiorite. However, slow coring time during exploratory drilling suggests much harder rock and thus variable tunneling conditions relative to other sedimentary geologic formations encountered within the project area. Hard quartz veins scattered within the granodiorite may pose additional tunneling challenges.

The Topanga Formation consists of a sandstone member and a conglomerate and conglomeratic sandstone member. The sandstone member of Topanga Formation is well bedded fine to coarse-grained sandstone with discontinuous seams of carbonized wood and lignite coal. Bedding ranges from about 0.03 inches in thickness for the fine-grained sandstone strata to a maximum thickness of 9.84 ft for the coarse-grained strata. Interbedded are conglomeratic sandstone beds that contain boulders up to 3.2 ft in diameter. Conglomerates and conglomeratic sandstone are irregularly interbedded massive to well-bedded strata. Rock sizes range from 2.9 inches to large boulders of 3.2 ft in diameter.

Monterey/Puente Formation ranges from dull white or light gray, low-density, diatomaceous shale to hard, resistant well-bedded tan to gray siliceous shale. The diatomaceous shale tends to readily part along plane of stratification and has a high slaking potential. Furthermore when submerged underwater, the diatomaceous shale absorbs water and disintegrates into silty clay.

Most of the rock materials recovered from the project investigation were relatively soft and unfractured. Point load test and unconfined compressive strength results showed generally weak rock except for some of the finer grained sandstones and the resistant pebbles and cobbles within the conglomerates of the Topanga Formation. Both the Topanga formation and the crystalline igneous rock were generally highly weathered and soft, and failed immediately upon applying little pressure (less than 100 psi). Most of the samples of Topanga formation and crystalline basement rock (diorite) had relatively low unconfined compressive strengths (1,000-2,000 psi) and few samples had moderate strengths (5,000 to 8,000 psi). These results appear to be representative of generally soft and weak rock in the middle and northern part of the assumed tunnel corridor containing a few zones of stronger and harder rocks. The diorite and granite pebbles and cobbles within the Topanga conglomerate had high strengths (17,500 and 31,500 psi). Some of the pebbles and cobbles within the conglomerate are hard and unweathered, but are held in a weak and soft sandstone matrix. Such materials can probably be excavated relatively easily.

Previous experience by EMI in the general vicinity also provided a general characterization of the materials likely to be encountered in a tunnel. The bedrock (Monterey/Puente Formation) encountered in boreholes in the Elysian Hills-Mt. Washington part of the Elysian Hills anticline area, a short distance west of the assumed alignment corridor, consisted of thin to massive sandstone beds and thin-bedded to laminated claystone, siltstone, and shale. These rocks are similar to those cropping out in the adjacent hills.

The sandstones in the Elysian Hills-Mt. Washington area are gray to dark gray, ranging from fine- to coarse-grained but predominantly medium grained, and generally soft and friable. Most of these do not have any cementation and can be disaggregated by finger pressure. However, occasional (<1 percent) beds of light gray sandstone are hard to very hard due to cementation by calcite. The thickness of the sandstone beds recovered in the core drilling ranged from laminae (<0.39 in. thick) inter-bedded with thin claystone and siltstone to beds about 3.2 ft thick. The adjacent outcrops in the Elysian Hills indicate that thicker beds on the order of 4.9 to 6.5 ft thick may also occur.

Fine-grained materials such as claystone, siltstone, and shale occurred as thin beds in the Elysian Hills-Mt. Washington area and are generally soft to moderately soft and calcareous. These are generally various shades of gray and grayish brown to black. Bedding thicknesses range from paper-thin laminae to a few inches (commonly 1.1 to 1.5 inches). These fine-grained materials are more commonly cemented by calcium carbonate than the sandstones but still comprise weak rock, breaking under manual pressure or with light hammer blows.

Both the sandstones and the fine-grained beds are weathered and oxidized in approximately the upper 6.5 to 9.8 ft. Below about 9.8 ft depth they are fresh and unoxidized. The rocks are generally moderately to slightly fractured. Joint frequency is generally moderate (~1 per 0.98 ft), but intensely fractured zones (3-4 fractures per 0.98 ft) were encountered in every boring. Bedding-plane joints are common in the fine-grained materials. Joints are generally tight and clean. Joint roughness ranges from smooth to rough with the smooth joints most commonly occurring as bedding-plane joints in the shale and claystone. No rigorous statistical joint analysis was conducted, but joint orientation seemed to cover the entire range of dips from horizontal to vertical (i.e. random).

Another drilling site along Soto Street just west of the southern part of the project area is on the south limb of the east-west trending Elysian Park anticline that projects to the southern part of the corridor. The borings were drilled in the Miocene-age Monterey/Puente Formation. These materials were soft rock, commonly altered to clay in borings where the material is in a constantly moist state such that it is difficult to distinguish the weathered rock from firm sandy alluvium. The sandstones generally are fine-to-medium-grained with a significant component of silt (10 to 40 percent). Where these same materials are exposed at the surface, they dry out and become soft rock. The sandstones are largely uncemented and friable, and appear more similar to sand than to sandstone. Rarely, borings encountered hard, cemented sandstone beds that were impermeable, and could not be penetrated by the hollow stem auger.

Environmental laboratory testing of rock cuttings for the purpose of proper disposal did not reveal contaminated or hazardous substances.

3.8 Groundwater

Limited information is available on groundwater at depth within the project site. The California Geological Survey map shows the highest historical water level. However, it can be assumed that ground water withdrawal has lowered ground water levels throughout the region.

In the EMI boring 06-1, groundwater was measured at 66 ft depth, shallower than anticipated based on historical groundwater levels. In EMI boring 06-2, groundwater was measured at 82 ft depth. In EMI boring 06-3, it appears that the boring was impermeable and an accurate groundwater level could not be measured.

In 1999, Ninyo & Moore placed borings for Caltrans during the winter and encountered groundwater between approximately 32.8-45.9 ft depth, near the boundary between Quaternary alluvium and bedrock. It is likely that this was only perched groundwater, having accumulated above a relatively impermeable soil layer. Of the Caltrans borings, drilled during the summer of that year, only one encountered any groundwater, at a depth of 32.8 ft and was noted to be likely perched.

The California Geological Survey seismic hazard reports for the Pasadena and Los Angeles Quadrangles include generalized maps of the historically highest groundwater levels and borelog data locations. On these maps, the only bore log data from locations within the Route 710 project area are near Concord Avenue in the southern half of the project site and Glenarm Street in the northern half. Historically highest groundwater elevations at those locations are shown to be more than 200 ft below surface and 39.3 ft depth respectively. As Glenarm Street is near the axis of a large syncline filled with poorly consolidated alluvium, it is unclear if the groundwater elevation there represents the elevation of perched groundwater or of the regional aquifer.

Groundwater levels within the Raymond Hill fault zone historically were much higher than present and the fault zone is a barrier to ground water movement Marshes and artesian wells occurred at several localities along the trace of the fault and are said to have provided water for Native Americans and early settlers and missionaries. Groundwater in the Raymond Basin, north of Raymond Hill, is indicated by two Los Angeles county wells. These wells indicated water at a level of 164 to 173 ft. below ground surface in 1974 and 1999. These depths are about 9.8-19.6 ft. lower than was documented in the 1930s by (Conkling et al, 1934).

3.9 Subsurface Gas

The Route 710 tunnel study area would not pass through any known operating or abandoned oil or gas fields or identified methane zones. The nearest active oil fields, the Boyle Heights and Union Station oil fields, lie approximately 2.9 and 4.1 miles southwest of the southern end of the assumed tunnel study corridor. No known tar or oil seeps occur along tunnel study area. However, discontinuous seams of lignite coal have been found within the Topanga Sandstone and occurrences of methane and natural gas have been noted throughout the Los Angeles Basin. Therefore, it should be considered possible that the tunnel may encounter gassy conditions south of the Eagle Rock fault. North of the Eagle Rock fault, it is not anticipated that the tunnel will encounter gassy conditions, as it will pass through quartz diorite and Quaternary alluvium.

3.10 Feasibility for Tunneling

The ground conditions encountered in the 2006 drilling program generally confirmed the expected conditions at the drill locations. The current knowledge of ground conditions indicates that tunneling is feasible, given the cross sections studied. Present subsurface information is still too limited and additional investigation is necessary to fully characterize soil, rock and groundwater conditions for the entire corridor. The nature of the crystalline basement rock underlying the northern part of the corridor is still largely unverified. Future borings in the northern part should sample this rock and include at least one angled borehole to intercept the Eagle Rock fault to characterize the nature (age, orientation, etc) of the contact. Several angled borings will be necessary to characterize the nature of the folding, faulting, and the wide variety of rock types in the central area. One unexpected rock type was volcanic rock encountered in Boring 06-2 at a depth of about 142 to 152 ft depth.

A large part of the southern part of the corridor will be Fernando formation which is a stiff silty clay/soft claystone. Much of the remainder of the southern corridor is expected to consist of the Monterey formation which generally comprises soft rock of siltstone, claystone, shale, and sandstone. The engineering properties of the Monterey unit are unverified within the corridor but similar materials have been encountered in several tunnels in the Los Angeles region and it has been found to be suitable for tunneling. Future drilling will be needed to verify the engineering properties of the rock mass.

3.11 Additional Exploration and Testing

The geotechnical evaluation presented above is based on very limited subsurface information in the project area. Borings 06-1 and 06-2 drilled for this feasibility study have largely confirmed anticipated ground conditions and provide some basic soil/bedrock contacts and geotechnical engineering information as well as groundwater data in the vicinity of the boreholes. Additional investigation and studies will be required to better define key geotechnical, geological and seismological features of the project area. Present groundwater information is insufficient and additional groundwater measurements using piezometer installations will be required prior to any tunnel design and construction.

Considerable additional work may be required to characterize the York Boulevard, Raymond, and Eagle Rock faults and to develop the complex rock formation relationships near the fault zones. In the northern area in Pasadena, the geology and configuration of the Eagle Rock fault is not well understood. However, the abrupt changes between Borehole 06-3 and previous borings by Law/Crandall (1993) a short distance to the north suggest that there is a fault in the area as shown on published geological maps (e.g. Dibblee, 1989b). Future investigations should include angled borings to delineate and characterize the Eagle Rock fault and to characterize subsurface materials, particularly the crystalline basement rocks in the northern block. Such work should include determination of the extents and range of sizes of cobbles and boulders of which some fragments were found in the borings. In addition, the alluvial soils overlying the basement and the depth of soil/rock contacts and groundwater levels need further characterization for more detailed design. Recent boring 06-3 did not pass through a fault, suggesting that the fault is dipping northerly. Future borings should include at least one angled borehole to intercept the fault so the nature of the contact and its rate of activity can be characterized.

(References: A full list of references has been included in the Study Geotechnical Assessment Technical Memorandum).

4.0 Tunneling Technologies

4.1 Introduction

Feasible tunneling methods were evaluated considering the size of the Route 710 Tunnel cross-section, alignment of the tunnel, geologic and groundwater conditions, possible impacts on the adjacent structures and community, compatibility with final ground support, safety, and economy. This chapter reviews potential tunneling methods applicable to the tunnel as well as other associated underground structures such as shafts and cross-passages. It also addresses the ventilation requirements and identifies the technology assessed most appropriate to the conditions.

Tunnel cross-section requirements developed in this study range from about 38 feet to 57 feet diameter. A minimum of two tunnels (northbound and southbound traffic) would be required for the traffic volumes predicted. The sections required to meet traffic capacity requirements are discussed in Chapter 6. The options considered for tunnel configuration and alignment could be achieved by various construction methods given the cross-sectional area of the tunnel, length, and the ground conditions (described in Chapter 3).

4.2 Tunnel Conditions and Requirements

4.2.1 Horizontal Alignment and Controls

The alignment of the twin or multiple tunnels would be controlled by such factors as traffic requirements, minimum highway curvature for the vehicle design speeds, and geometric constraints for the connections to the existing freeways and existing right-of-way. For a tunnel of the size required, the smallest curve radius that a Tunnel Boring Machine (TBM) can negotiate would be in the range of 1,000 feet. This would be one of the design criteria used to layout the horizontal alignment and is well within the horizontal curvature on the example alignment considered in determining feasibility under this study.

Twin or multiple tunnels would need to maintain a minimum horizontal separation of approximately one tunnel diameter along the alignment (about 50 feet) to prevent overstressing of the central rock or soil pillar due to redistribution of ground loads around the tunnels as they are excavated.

4.2.2 Vertical Alignment and Controls

The vertical alignment of the tunnel would be controlled by the approach elevations, highway standards for vertical curves, and the requirement to maintain sufficient cover over the crown. The vertical alignment establishes the tunnel cover and the hydrostatic pressure to be considered in the design, construction feasibility, and planning. Other considerations would be possible shaft locations and the presence of any interchange at Huntington Drive.

For this study, an effort was made to maximize the cover over the tunnel crown to reduce the potential for surface settlement and impacts on existing structures. A minimum cover of two tunnel diameters or 100 feet (assuming a 50 ft excavated diameter) was selected for the feasibility analysis. At the portals, where the roadway would approach the tunnels, shallower cover will likely be necessary for the transition into the assumed nominal 100 feet depth of cover of the main tunnel.

4.2.3 Tunnel Cross Sectional Requirements

Figure 6-1, in Chapter 6, schematically illustrates cross sections assumed to accommodate four-lane tunnels in each direction, including allowance for shoulders and walkways – either to full highway standards or reduced standards. Depending on the final requirements for the cross section, the minimum excavated round tunnel diameter varies from about 38 to 57 feet, and in the oval or horseshoe-shaped tunnels spans of up to approximately 72 feet would be needed. The larger excavations would therefore need to exceed the size of the most recently constructed tunnels described in Chapter 2, but are comparable to the size of the M30 TBM-driven tunnels being constructed in Madrid, Spain, which has a 50 ft excavated diameter. For all of the sections studied, the excavated TBM tunnel diameter is over 38 ft and would be considered very large for a tunnel bored using current technology.

The excavated tunnel diameter has assumed about two feet of lining thickness for the structural support of the tunnel. The final thickness would be determined during more detailed design phases. Further discussion of tunnel lining and its installation is presented in this chapter.

4.2.4 Cross-passages and Shafts

The cross-passages between tunnels are smaller diameter tunnels, linking from one main tunnel to the other and perhaps 20 ft in diameter. They would allow movement from one tunnel to the other to provide safe refuge from any incident in a tunnel tube. These additional cross tunnels would be driven using SEM methods (refer to 4.2.6.2), after the main tunnel has been excavated and lined. The assumption at this stage is that these would be at approximately 600 feet intervals along each tunnel in line with current practice and NFPA guidelines. (A closer spacing of 500 feet has been assumed for the options A2, B2 and C2 as there are 4 lanes of traffic and therefore more potential occupants to pass through the cross passage in this case.) In addition, safety refuges may also be formed into the walls of the main tunnels to provide space for refuge and emergency equipment.

4.2.5 Geologic and Groundwater Conditions

Geologic conditions are of primary importance in planning tunnel construction methods. In tunneling terms, geology is generally termed “hard” or “soft” ground, for rock or soil conditions respectively. Design of the tunneling equipment, mining methods, and the ground support will be inter-related with the ground and groundwater conditions. For the Route 710 tunnel alignment, anticipated geologic conditions are summarized in Chapter 3, which includes an initial schematic geological profile based upon the limited currently available ground information.

Conditions anticipated include relatively soft rock (‘hard ground’), such as shales, sandstones, siltstones, and conglomerates, as well as alluvial soils (‘soft ground’) from more recent deposition. Groundwater conditions are not well defined at this point, but are not anticipated to be more than about 90 ft above the tunnel invert.

4.3 Tunneling Methods

In tunneling, it is critical that the face of the tunnel excavation and its full perimeter are tightly controlled to minimize ground losses, soil movement toward the tunnel shield and movements of the overlying ground and ground surface. For these reasons, the primary underground construction methods to be considered for the Route 710 Tunnel would be Pressure Face Tunnel Boring Machines. Other methods, such as the Sequential Excavation Method (SEM) may also prove effective, and warrant consideration for non-circular cross sections or short reaches for cross-passages and adits (due to the additional construction flexibility offered). At the portal sections, localized cut-and-cover methods might be required due to the minimal cover where the tunnel rises to the ground surface for the entrance.

4.3.1 Tunnel Boring Machines

Based on the current limited data on geologic and groundwater conditions, the anticipated ground conditions could include a wide range of conditions, including hard rock, soft rock conditions, uncemented gravels and conglomerates and alluvial deposits. In the alluvium, soft and broken rock, the tunnel may encounter ground that ravels, runs, and flows depending on soil type and groundwater conditions. The need to minimize potential adverse effects of tunneling, and especially the need to minimize ground losses at the tunnel face, would require specialized methods to be employed for the tunnel construction. Some of the alternative mechanized and pressurized face machines currently employed for construction of tunnels in poor soils and under groundwater pressures are described below.

Figure 4-1 ECIS Project EPB Machine Being Assembled

Metro Goldline Eastside Extension TBMs at Manufacturing Plant (above)

Pressure Face Tunnel Boring Machines

Pressure face machines (PFM), developed in Europe and Japan, maintain face stability and minimize ground losses by maintaining a positive pressure on the tunnel face in front of a pressurized bulkhead while the tunnel workers remain in free air (atmospheric pressure) within the machine but behind the bulkhead. The amount of ground excavated is controlled by means of a screw conveyor or a mechanical displacement pump.

Within the general term of PFMs, tunneling machines generally conform to two soft ground excavation principles or methods: the slurry face machine (SFM), and the earth--pressure balance machine (EPB). Several notable examples of uses of both of these technologies outside of the United States have been in Milan (EPB), Cairo (SFM), Madrid (EPB), Lyon (EPB), the Channel Tunnel (EPB), and several undersea tunnels in Japan (EPB, SFM). Locally, EPB machines were recently used to complete the 15.5 ft diameter East Central Interceptor Sewer and North East Interceptor Sewer (ECIS and NEIS) tunnels for the City of Los Angeles. The ECIS tunnels were completed in the fall of 2004 and the NEIS project is nearly completed. For the 21.5 ft diameter transit tunnels of the Los Angeles Metro Goldline Eastside Extension, two EPB TBMs have been fabricated and tunneling began in early 2006. (Figure 4-1)

Earth Pressure Balance Tunnel Boring Machines

In a classical Earth Pressure Balance system, the cutting wheel operates within a chamber filled entirely with excavated ground. Face pressure is controlled by balancing the rate of advance of the shield with the rate of discharge of the excavated material through the screw conveyor. Figure 4-2 shows an EPB TBM cross-section and the pressure chamber and screw conveyor system. Material excavated through the cutter-head in an EPB system may need no treatment and emerges from the conveyor as a thick paste or ribbon that is emptied into waiting train (or a conveyor) for transport. Typical practice for EPB tunneling also includes the addition of bentonite, foams, and/or other conditioners into the pressure chamber and within the screw conveyor. The purposes of conditioning are to improve workability, modify permeability, improve the plasticity and reduce friction. EPB machines generally have been considered more appropriate in fine-grained (clay, silt and fine sand) material. While operating in stable ground, the pressure face mode may not be used.

EPBs have also been fitted with cutting discs to excavate through rock materials (including cobbles and boulders). Where geology changes along the tunnel alignment, as would be the case along the Route 710 tunnels, the cutting tools can be changed to some extent from the inside of the pressure chamber to suit the ground conditions encountered.

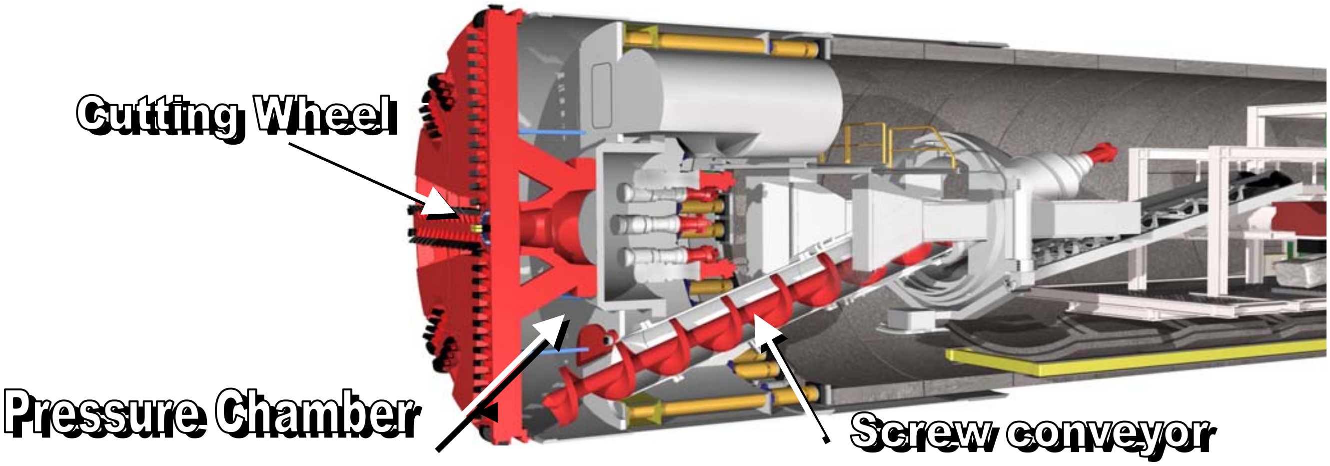


Figure 4-2 Section through Earth Pressure Balance TBM

Slurry Face Tunnel Boring Machines

The principle of the Slurry Face Machines (SFM) is to fill the excavation chamber with a mixture of soil cuttings and bentonite slurry fluid. This mixture provides the necessary ground support. Using the slurry return pipeline, the mixture of excavated material and slurry is taken to a separation plant where solids are removed and the treated slurry is returned to the heading. With the slurry system, face support and ground movements into and around the tunnel shield are controlled by maintaining a hydraulic pressure in the slurry that is equal to or slightly greater than the prevailing earth (soil and water) pressure. Figures 4-3 And 4.4 illustrate SFMs. Historically, SFMs have been considered more appropriate in coarse-grained (sands and cobbles) soil material. SFMs are currently being used in Portland, Oregon, for the Westside CSO project, and have also been ordered for Portland's Eastside CSO project. Similar to an EPB TBM, cutting tools for the SFM can be made interchangeable such that they can be adapted for ground conditions.

A "hybrid" TBM has been developed to be modified from EPB to SFM, and has been used where ground and groundwater conditions change dramatically along the alignment. For example, the A-86 highway tunnel in Paris, (referenced in chapter 2), is being constructed using the hybrid machine. Where conditions changed from soft rock to flowing sands, the EPB was changed to SFM within in the tunnel, over a period of about six weeks.

Figure 4-3 Slurry TBM (spoil material pumped out in slurry)

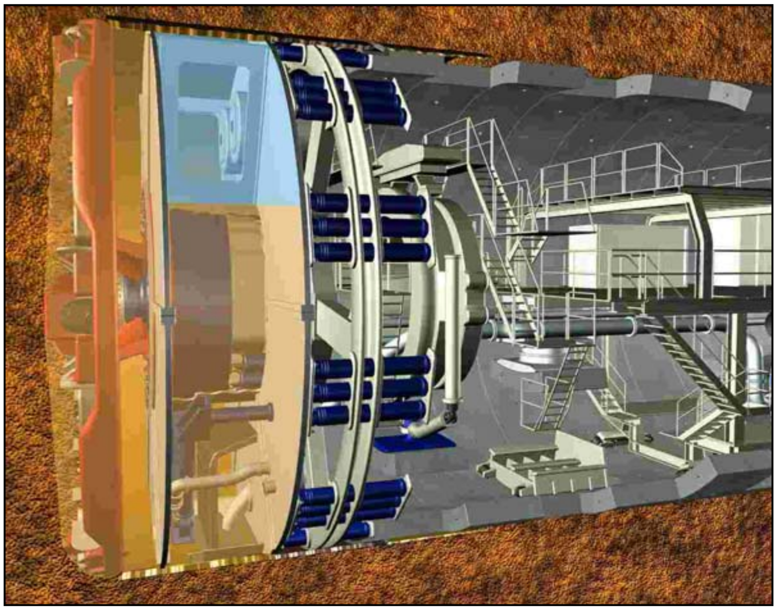
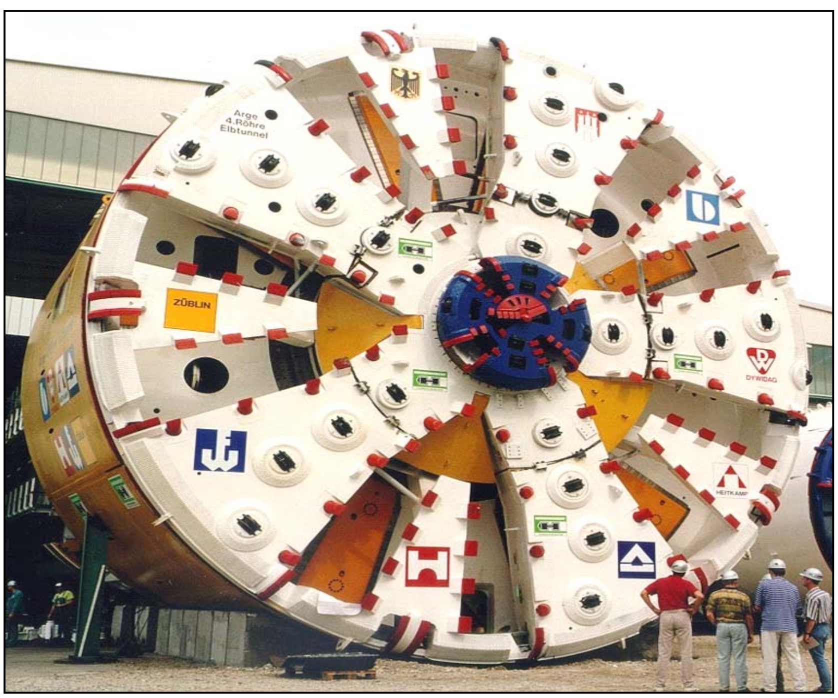


Figure 4-4 Slurry Face TBM used for the4th Tube, Elbe River Tunnel, Hamburg, Germany



Tunneling Cycle

Tunnel construction using either type of Pressure Face Machine (PFM) is a cyclic process consisting of advancing the tunneling shield into the ground, removal of the displaced ground into the shield and extraction of that ground (muck) from the pressure chamber with the screw conveyor or slurry system, and erection of pre-cast concrete tunnel lining segments. (Tunnel lining is further described below). The shield is propelled forwards by a series of hydraulic jacks mounted in the rear of the shield and reacting against the tunnel lining ring.

After the segmental lining is erected and fully bolted, the machine advances, and the annular space between the lining and the excavated perimeter is filled with grout through the tail skin and/or grout holes in the segmental lining. A special set of seals or brushes prevents the grout from flowing towards the shield and inundating the cutterhead. The segments themselves are bolted together and provided with gaskets to provide watertight joints.

Final TBM Selection

Much more investigation of the tunneling conditions likely to be encountered is required before a decision on the most suitable excavation method can be made. It is typically the contractor, after evaluation of all the geotechnical data, overall project economics, and its preferred means and methods of tunnel support, who has the final recommendation for selection of the tunneling method, and for the design, operation, and choice of the tunnel excavation system.

Groundwater Control – TBM Tunnels

Dewatering is not required in tunnel construction that uses a mechanized, pressure-face TBM to counterbalance the hydrostatic pressure and stabilize the soils. The Route 710 Tunnel will be under a head of up to approximately three bars pressure in some locations with a significant difference (approximately one bar or 290 pounds per square foot) across the face of the large diameter tunnel boring machine. These pressures must be accounted for in the design of the TBM bearings, seals, and all other machine systems, components, and auxiliary equipment. Relatively speaking, the groundwater pressure for the 710 tunnels would not be considered high.

Figure 4-5 Precast Segmental lining for A-86 Tunnel, France

Tunnel Ground Support

Behind the TBM a support system is required to maintain the safety and stability of the opening during construction and for the service life of the structure. The most practical lining system consists of a system of pre-cast concrete segments assembled within the TBM shield. Figure 4.5 shows a photo of a bolted segmental tunnel lining. These pre-cast segments serve as the final tunnel lining and are designed, fabricated, and installed with tight tolerances. Specially constructed rubber gaskets provided along the sides of each segment can essentially eliminate water inflows. Used with the PFMs, tunneling can be accomplished under water without the need for prior de-watering.

4.3.2 Sequential Excavation Methods

Recognizing the inherent variability of geologic conditions and variable tunnel cross-sections methods have been developed to approach tunneling so that the method of excavation and support can be varied to suit conditions as they are actually encountered.

One of these methods is the Sequential Excavation Method (SEM). The term may also be used interchangeably with “NATM” (New Austrian Tunneling Method) or simply, “mined” tunnels. The method is founded on careful observations of the ground response to excavation using instrumentation and visual inspection. This allows timely adjustments in excavation and support details in response to these observations. Typical SEM excavation sequences are shown in Figures 4.6 and 4.7.

This method may not be appropriate for very large openings in relatively soft ground. For example, any ramp intersections for an underground interchange at Huntington Drive – along with the wide mined tunnel option would require a mined span in soft rock of over 100 ft. This appears to be too large to accomplish using SEM.

Generally, SEM is applied for large non-circular tunnels in soft ground where the stability of the opening requires that support be applied rapidly, or for short tunnels where fabricating a machine is not economically practical. SEM usually involves a combination of the following components:

- Heading and bench or multi-drift excavation – Figure 4.6 illustrates numbered drifts for excavation sequence with dowel and shotcrete support around the perimeter;
- Excavation by mechanical means, sometimes with blasting in hard rock. Mechanical means often include roadheaders, or demolition hammers;
- Initial ground support usually consisting of rock reinforcement and shotcrete (sprayed on concrete) installed within minutes after the rock is excavated;
- Forepoling or spiling (placement of closely spaced rows of drilled or driven pipes and grouted dowels around the tunnel perimeter); may be added;
- Stabilizing the face temporarily, using shotcrete;
- Ground improvement using grouting, freezing or dewatering as necessary;
- Extensive use of monitoring to ascertain the stability and rate of convergence of the opening; and
- Importance of instantly changing mix of components as indicated by measurements and observations.

Variations on sequential methods would include techniques such as the “stacked drift” method where the tunnel perimeter lining is placed ahead of the excavation using a series of smaller tunnels in a ring shape (Figure 2-5). This method is generally more appropriate for relatively short lengths of tunnel in soft ground.

Figure 4-6 Typical SEM Excavation Sequence – with Dowels Around Circumference

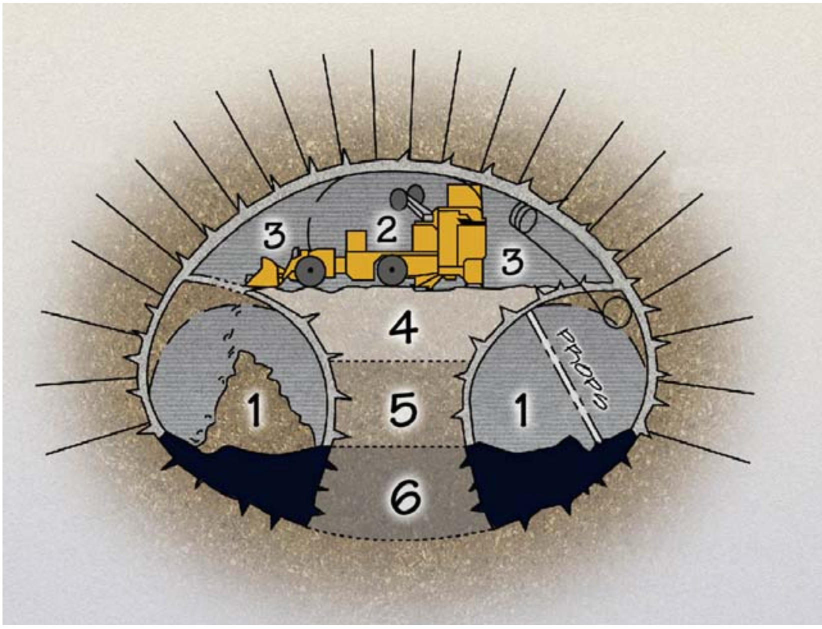


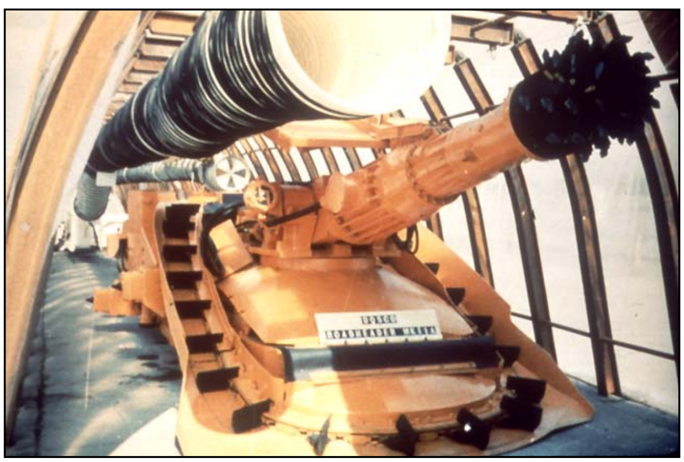
Figure 4-7 SEM Construction

Left – SEM Portal Excavation, Right – Tunnel Drifts Excavated Using SEM

The tunnel section is developed in a staged series of smaller headings in a defined and controlled pattern and work sequence. The smaller headings allow excavation and support of smaller portions of the tunnel ground, thus providing greater control of movements and the ability to support the ground more quickly. The final lining usually consists of additional shotcrete or cast-in-place concrete, often with a waterproofing membrane between the initial ground support and the final lining. Excavation equipment used in SEM construction includes roadheaders in softer rock conditions such as those present in the study area. (Figure 4-8 shows a roadheader). Progress, or rate of advance, for large SEM tunnels may be considerably slower than for a mechanically (TBM) excavated tunnel. In some cases the rate of advance may be offset by adding headings (tunneling from more than one face), and a very short lead time to start tunneling (as a TBM does not need to be fabricated).

A fundamental element of the SEM method is its extensive reliance on instrumentation and monitoring for immediate feedback during construction to determine the time rate and magnitude of ground movements both around the lining perimeter and, especially for shallower tunnels, at the ground surface. Through deformation monitoring, an assessment can be made about the stability of the opening and the adequacy of the installed support elements. If the deformation and/or loads are increasing then additional support and/or modified heading operations are implemented immediately to stop the deformations. The final lining is placed only after the instrumentation shows that ground movements have stopped. SEM requires careful execution especially in weak or poor ground and is generally performed by crews that are well experienced in this work.

Figure 4-8 Roadheader for Tunnel Mining



4.3.3 Fault Crossings

Faulted ground would be considered for additional investigation, both for potentially active fault characterization, as well as for blocky (less stable) tunneling conditions. The major fault crossing along the alignment is the Raymond Hill Fault. As described in Chapter 3, the fault has been characterized as having a left-lateral oblique reverse slip. This fault dips at about 75 degrees to the north. Between the York Boulevard and Raymond Hill Faults is an approximately 500-m wide zone of localized, high-angle shearing and deformation. Ground is expected to be ranging from highly fractured to crushed with seams of clay gouge. While additional study is required to characterize the fault in the location of the Route 710 tunnel crossing, feasible construction methods for a fault crossing could include SEM using multiple drifts and specialized support, such as ground treatment through grouting, or TBM driven tunnels.

The Los Angeles Metro Red Line tunnels were constructed through the Santa Monica Fault zone. Geotechnical investigations for these tunnels were conducted to characterize the rock mass along the alignment and such major fault structures as the Hollywood and Benedict Canyon Faults. As a result of the investigations, the tunnel was characterized on the basis of ground conditions and divided into reaches with different initial ground support systems. Initial support varied from rock bolt support to steel ribs. Seismic design for the Santa Monica Fault crossing included an oversized, mined tunnel section to facilitate repair in the event of fault displacement. The mined section was constructed using SEM with shotcrete (sprayed-on concrete) and steel lattice girders as finial support.

4.3.4 Underground Ventilation Buildings and Shafts

Deep excavation construction methods may be used for underground ventilation buildings at the portal areas and mid-point, and for any shaft construction. For these structures, the excavation's initial support systems could include reinforced concrete drilled-in-place piles, soldier piles and lagging, and tied-back excavations. Initial support allows support of the ground while soil is removed from the interior excavation. Final support includes the concrete slabs, walls, and walkways.

Current information for the Route 710 portal areas indicates that the portal areas are above the groundwater table. However, conditions are not well defined. If water is present at these or other cut and cover or open cut structures, de-watering may be required to temporarily lower the groundwater level below the excavation depth or to an impermeable soil layer. Dry excavations facilitate installation of the piles, improved soil stability, and reduced pressure. Groundwater is pumped from wells installed around the perimeter of the excavation. At the completion of the structure, pumping is discontinued and groundwater levels are allowed to return to their natural levels.

To install piles and lagging for support of the excavations, it is generally necessary to auger out the holes for the placement of the piles. This pre-drilling of holes is necessary to eliminate pile driving and reduce project noise and vibration levels that would otherwise occur with pile driving. The equipment required for installation of the soldier piles includes drill rigs, concrete trucks, cranes, and dump trucks. After installation of soldier piles the contractor would proceed with installation of excavation bracing and lagging.

As an alternative to dewatering, soldier piles and lagging, impermeable walls such as slurry walls or closely spaced pile may be constructed to provide a groundwater barrier. Often these structures are incorporated into the final structure.

4.3.5 Hauling of Soil

The methods of removing the spoil materials for hauling away from the job site is a generally a choice made by the contractor, but may also be subject to conditions stated in the environmental documents. For tunnel operations, much is removed at the portal areas using hoppers and/or conveyors and generally trucked to a disposal area. For cut and cover construction, a typical operation would be for bulldozers and/or overhead loaders to move the material to a central pickup point or several such points, where a clam shell bucket from a crane or a vertical or diagonal conveyor belt can hoist the material and place it into waiting trucks or a loading hopper.

4.3.6 Protection of Adjacent Structures

Geologic conditions for portions of the alignment are sands, clays and gravels. As described above, during tunneling, some ground loss will occur, producing surface settlement. The amount of settlement measured at the surface will be a function of the tunnel depth, size, tunneling equipment and techniques, and geology. To reduce surface settlement and the potential for ground loss and soil instability (sloughing, caving) at the tunnel face, pressure-face TBMs and pre-cast, bolted, gasketed lining systems would likely be employed. In combination with the face pressure, grout is installed immediately behind the TBM between the installed precast concrete liners (tunnel rings) and the ground. The pressure-face TBM can tunnel below the groundwater table without requiring dewatering or lowering of the groundwater table.

During design of the project, buildings and other structures along the alignment would be evaluated considering the local geology, their proximity to the tunnel or open cut section and the tunneling methods to be employed. In some cases additional settlement mitigation could be recommended. All buildings within the tunnel's potential zone of influence would be initially surveyed and then monitored during tunneling to verify that ground movements do not exceed allowable limits.

Where conditions warrant, for example, where shallow tunnels are closer to the surface and directly below sensitive structures or utilities, additional methods to reduce settlement could be specified. These could include:

Permeation grouting to improve the ground prior to tunneling: Chemical (sodium silicate) or cement grouts are injected into the ground to fill voids between soil particles – typically sandy soils - and provide greater strength and stand-up time for the soil. This grout can be placed through pipes from the surface before the tunnel reaches the grouted area, from pits or shafts adjacent to the grouted area, or in some instances from the tunnel face. In this latter case, the tunneling machine must be appropriately equipped with drills and valves and must be stopped for a period of time to drill grout placement pipes, install grout, and allow the grout to set. The permeation grouting method has been used successfully for the Metro Red Line in instances where the tunnel passed under potentially sensitive or important structures such as the US 101 Freeway (at three locations: Downtown, Hollywood and at Universal City).

Compaction grouting as the tunnel is excavated: This method involves injection of a stiff "grout," typically sand with small amounts of cement, above the tunnel crown as the tunnel advances. The grout densifies soil above the tunnel crown and replaces some of the lost ground, and thereby prevents settlement from propagating to the surface. This method was successfully used in several instances for the Metro Red Line project in the downtown Los Angeles area.

Compensation Grouting: Compensation grouting involves carefully controlled injection of grout between underground excavations and structures requiring protection from settlements. For tunnel applications, the pipes for grouting are installed above the intended tunnel position, in advance of tunneling. A key component in controlling compensation grouting is careful monitoring of both structure and ground movements to allow the timing and quantities of injected grout to be optimized. Grout injection can take place before, during, and after tunneling activity by reusing the same grout pipes.

Underpinning: Underpinning involves re-supporting the structure's foundation on ground that will not be influenced by the tunneling. This may not be feasible where the structure is directly over a large tunnel.

4.3.7 Instrumentation and Monitoring

As part of the measures for protecting buildings, structures and utilities from the effects of tunneling, instrumentation to monitor ground movements and settlements would be employed. The geotechnical monitoring will establish:

- Baseline conditions prior to tunneling or start of open cut excavations.
- Ground movements and building settlements caused by each tunnel as it approaches and passes under beyond each monitoring station or facility
- Ground movements and building settlements caused by open-cut excavation as it proceeds downwards and until the final structure is completed.
- Confirmation that settlement effects due to construction has stabilized.

To establish a baseline for assessment of actual damage resulting from tunnel construction, pre-construction surveys of all private and public structures, including utilities would be conducted. These surveys would include a visual record of cracks and other pre-existing signs of distress or damage. After tunneling has passed, structures would be re-inspected for any damage and the extent of damage caused by tunneling or surface excavation would be assessed.

4.3.8 Summary

Given the numerous types of structures (main tunnels, cross-passages, shafts, portals, and adits) and limited current knowledge of variations in ground conditions, a number of feasible methods, described above are currently available for the project. Depending on the final tunnel diameter, a bored tunnel, as opposed to one constructed using SEM, may not be feasible today if the excavated diameter is greater than about 56 feet. Final selection of means and methods would entail final geotechnical investigations and tunnel design and economic analysis, and consideration of continuing advances in tunneling technology. During future phases of project development the project team can analyze the project geology and functional tunneling requirements and analyze available alternatives for consideration. This project would take place in the future and it is anticipated that technology advances would allow even larger diameter tunnels to be considered.

4.4 Tunnel Ventilation

Ventilation is required to maintain a safe, comfortable environment during normal operation of the road tunnel, with several factors considered:

- Safe levels of vehicle-emitted pollutants such as carbon monoxide (CO) and oxides of nitrogen (NOx) must be maintained.
- Visibility must be maintained for safe driving.
- A tenable environment must be maintained for motorists escaping a fire emergency.
- Temperatures must be maintained at acceptable levels.

In short tunnels, the air pushed through the tunnel as a result of vehicular movement (piston-effect) is sufficient to maintain safe levels of contaminants. Fresh air is brought in through the entrance portal and contaminated air is forced out through the exit portal. During congested traffic conditions the piston-effect may not be sufficient. Tunnel ventilation must then be employed to maintain a safe tunnel environment.

One of the main functions of a tunnel ventilation system is to provide a means for controlling smoke and heat movement during a fire emergency. In the case of a fire in a tunnel serving unidirectional traffic, it may be assumed for a limited access highway that the traffic ahead of the fire would proceed to the exit portal and the traffic behind the fire will come to a stop. Therefore, the ventilation system would be operated to force the smoke and hot gases in the direction of the empty tunnel. Thus, a clear and safe environment behind the fire is provided for evacuating people and fire fighter access to the incident. The ventilation system accomplishes this objective by preventing the development of a smoke backlayer, so that occupants of the halted vehicles may then escape back down the tunnel away from the fire, without being engulfed by the smoke backlayer. Backlayering is the movement of smoke and heated gases back over the vehicles stopped behind the fire in the presence of a controlled longitudinal airflow attempting to push the heat and smoke away from the stopped vehicles.

4.4.1 Ventilation System Types

Tunnel ventilation methods are categorized as either natural or mechanical systems. Natural systems rely on the piston-effect of moving vehicles, external wind, and temperature and pressure differentials between the portals to generate airflow through the tunnel. Mechanical systems use fans to generate airflow. There are several types of mechanical systems which are typically classified as longitudinal, semi-transverse or transverse.

Longitudinal systems have air introduced to a tunnel or removed from a tunnel at a limited number of points, such as at portals or at ventilation shafts. A popular example of this type of system employs ceiling-mounted jet fans (Figure 4.9) to produce the required airflow through the tunnel. Longitudinal systems are typically used in tunnels with unidirectional traffic to take advantage of the vehicle piston effect.

Semi-Transverse systems use an air duct to either supply or remove air uniformly along the length of a tunnel. The supply system is the more widely used type, since it provides more uniform dilution of pollutants throughout a tunnel. In this configuration, reversible fans are typically used to provide for smoke exhaust.

Transverse systems use both a supply and an exhaust air duct to uniformly distribute air to and from a tunnel. Typically, air is supplied low near the roadway level to promote the rapid dilution of the vehicle-emitted pollutants. Air is exhausted along the tunnel ceiling which is advantageous for exhausting hot smoke in the event of a vehicle fire.

For this study, a longitudinal ventilation system was considered as the Route 710 tunnel will serve uni-directional traffic and a longitudinal system should keep ventilation costs at a minimum, while maintaining adequate ventilation.

4.4.2 Air Cleaning Technology

Though air cleaning technology is currently in use in a few road tunnels around the world, air cleaning is still an emerging technology and has not been used in any tunnel in the United States. Vehicular emissions are typically dispersed into the atmosphere through high ventilation exhaust stacks, if required. It is important to note that California emission controls are among the most stringent in the world and continue to be improved to provide better ambient air quality throughout the region. Air cleaning systems have recently been introduced to try to address particular air quality problems in tunnels where vehicle fleets and emissions are very different from California, and these are to date largely unproven in operation. Use of air cleaning technologies would require acceptance by the Federal Highway Administration (FHWA) as well as the South Coast Air Quality Management District (SCAQMD).

Figure 4-9 Longitudinal Ventilation with Jet Fans

Air cleaning systems have been used for removing particular emission contaminants, but they do not clean all polluting elements. Currently the only established technology for air cleaning is electrostatic precipitation. Electrostatic Precipitators (ESP) have been used in some other countries around the world and have been shown to be an efficient and viable technology for cleansing air of Particulate Matter (PM). They have been developed to remove dust and PM arising from the high level of diesel emissions in the vehicle fleet. They were developed in Japan for example, where diesel vehicles comprised some 40 per cent of the vehicle fleet. In

Scandinavia, they were introduced to clean tunnel air of high levels of dust that arose due to the use of studded winter tires which broke down the asphalt surfaces within tunnel leading to visibility problems. In Australia, they are currently being considered, where public concern over emissions resulted in their use on some recent tunnels again with a higher proportion of diesel vehicles in the tunnels.

However, in many cases ESPs have been found not to be in use or only used in certain conditions. The power required to operate the ESP's is very significant and may require additional generation capacity to be developed elsewhere to meet the power demand (estimated at 50-60 kW of power). The ESP installations have significant space requirements that may not be easily accommodated. Also the ESP give rise to a disposal issue for the wash solutions used to clean the precipitator plates and require additional environmental controls for handling the contaminants. Even if the next steps of the tunnel concept proceed today, the Route 710 tunnel would probably not be open to traffic for at least another 15 years and the design of the ventilation system would need to take account of the anticipated improvements in local vehicle exhaust emissions and applicable changes in air quality standards along with any technological advances that may occur in 'scrubber' systems over that time. Nevertheless, since ESPs have some beneficial effects and is an emerging technology, it is warranted that future stages of the project include additional studies of existing ESP system and the like.

4.4.3 Tunnel Alternatives

For this initial ventilation analysis, the tunnel has been assumed to be approximately four miles long with four lanes of unidirectional traffic in each direction. The ventilation requirements for the nine different tunnel alternatives to be identified in Chapter 6 were initially evaluated to assess feasibility. The tunnel cross section for each alternative is shown in Figure 6.1.

4.4.4 Criteria

The following relevant in-tunnel criteria relating to different factors used in ventilation design, were used for this initial analysis:

- Carbon Monoxide: Environmental Protection Agency/Federal Highway Administration (EPA/FHWA) criteria require that CO levels not to exceed 120 ppm.
- Nitrogen Oxides: World Road Congress (PIARC) criteria require that NOx levels not to exceed 10 ppm.
- Visibility: Visibility shall be maintained so that a light beam passing through 328 feet shall have greater than 50 percent of the emitting intensity. Visibility is also related to light extinction. These are again PIARC criteria.
- Heat: Vehicles generate heat. In long road tunnels the heat buildup in the tunnel may result in an extremely uncomfortable environment and that in an extreme case may be hazardous to the tunnel users. The National Fire Protection Association, NFPA 130 "Standard for Fixed Guideway Transit and Passenger Rail Systems 2003 Edition" publishes guideline criteria. For this study, a peak temperature of 95°F (Ambient + 5°F) was used.

- Fire Emergency: During a fire emergency the direction of smoke movement should be controlled by preventing "back-layering". The air velocity required to prevent back-layering is call the "critical velocity". The critical velocity varies dependant upon tunnel cross-sectional area, height and grade, and fire heat release rate. The critical velocity equations are presented in NFPA 502.
- Air Velocity: NFPA 502 requires that the longitudinal air velocity in the tunnel must not exceed 2200 fpm during emergency conditions. Excessive tunnel air velocities may produce extreme equipment power requirements for normal operations and should be avoided.
- Particulate Matter: There are no PM requirements specific to tunnel emissions and short term exposures experienced by tunnel users. Since the exposure time to PM10 and PM2.5 is minimal and there are no published short-term standards for PM10 (or the intent to publish such standards), this criterion is considered to be of no concern within the tunnel. The World Road Congress (PIARC) has published a methodology that relates visibility levels to PM10. Therefore this methodology was used in the analysis. Outside of the tunnel, atmospheric dispersion aided by ventilation stacks will manage concentrations of PM to appropriate levels.
- Toxic air pollutants, also called air toxics, are those pollutants that cause or may cause cancer or other serious health effects. Diesel Particulate Matter (DPM) has been identified as a Toxic Air Contaminant (TAC) by the California Air Resources Board (CARB) and DPM is considered a TAC under California's air toxics program. DPM is a complex mixture of thousands of gases and fine particles (commonly known as soot) that contains more than 40 toxic air contaminants. These include many known or suspected cancer-causing substances, such as benzene, arsenic, formaldehyde, and nickel. For TAC, cancer risk thresholds, rather than emission burdens, are used to determine the significance of a project impact. The cancer risk threshold according to CARB is measured by continuous exposure over a 70-year period. Therefore, in-tunnel exposures are not of concern within the tunnel, but the resulting concentrations outside the tunnel would require investigation.

Should the tunnel be built, tunnel monitoring may be required for PM10, PM2.5 and DPM may be required to examine the degree of the emissions from the tunnel portals and the mid-point ventilation stack(s). The ventilation stacks will require design that considers the portal and stack concentrations with respect to ambient concentrations and allows these to be reduced to acceptable levels, so that they are not a concern. A full dispersion analysis would be required, and this would include consideration of local wind, climate and topographical effects.

4.4.5 Analysis Approach

The initial feasibility analysis followed these steps with the assumption of a longitudinally ventilated tunnel:

- Using the entire length of the tunnel, the air velocities required to meet criteria were determined.

- If the air velocities determined for the tunnel length were excessive, the air velocities required to meet criteria for a 12,000-ft long tunnel was determined. 12,000 ft was selected due to the uncertainty in the location of a mid-tunnel ventilation building.
- If the air velocities determined for a 12,000-ft long tunnel were excessive, the air velocities required to meet criteria for a 6,000-ft long tunnel was determined.
- Once ventilation requirements were determined, the ventilation building required to house ventilation equipment was sized.

This approach was used for each of the nine tunnel cross-section alternatives.

4.4.6 Analysis

The analysis covered the airflow requirements for CO, NOx, Visibility, Heat, Fire Emergencies and Velocity criteria. Analysis results for each of these criteria are summarized below. With respect to velocity criteria, each of the contaminants requires a volume of airflow for control and the airflow translates to air velocities depending on the tunnel cross-sectional area.

Emissions and fuel usage data is based on a design year of 2015 and is taken from the California Air Resources Board (CARB) program EMFAC, which is an On Road Emissions Inventory Model that presents data specific to California highways.

The typical passenger car unit (pcu) represents an average car that uses the tunnel. Emissions estimates and other vehicle properties such as pcu length were based on the following traffic blend:

87.8% Light Duty Automobiles
4.0% Light Duty Trucks
1.1% Medium Duty Trucks
7.1% Heavy Duty Trucks

For the purposes of this analysis, the typical passenger car unit (pcu) was assumed to be bumper to bumper throughout the tunnel.

The following conclusions can be made with respect to the ventilation analysis:

- Tunnel heating is a significant ventilation issue. Tunnel temperature must be monitored and mechanical ventilation sized accordingly. The severity of tunnel heat is directly dependent upon the actual tunnel usage once it is in operation. In reviewing the simulations with respect to heat, it is evident that larger cross-sections are more conducive to maintaining lower ventilation air velocities. Based on this analysis, Alternatives C1, C2 and C3, which have the smallest diameters (see Chapter 6 for descriptions of alternatives, would likely need significant control of traffic volumes.
- CO and NOx are not significant ventilation issues in this case, due to low vehicle emission reports from EMFAC 2002.

- Visibility must be monitored, but the predicted airflows required to maintain visibility are minimal, and are unlikely to control the design solution.
- Critical Velocity must be met during fire conditions. The airflows required to control smoke “back-layering” represent the absolute minimum ventilation requirement and ranged between 590 and 678 fpm in this initial analysis.
- Air velocities can be maintained under 1000 fpm, except for the instance of tunnel heating.

4.4.7 Ventilation Installation

The ventilation analysis showed that a mid-tunnel exchange of air is required. Therefore a mid-tunnel ventilation building is needed with air ducts to the tunnel below to facilitate the removal of contaminated air and the introduction of fresh air. The mid-tunnel shaft connection to the tunnel should be within 1500 feet of the tunnel mid-point. The mid-tunnel ventilation building could be offset from the centerline of the tunnel. This would require lateral shafts connecting the building to the tunnel. If the site for a mid-tunnel ventilation building is environmentally sensitive or mechanically warranted, this could result in more than one ventilation building being required at appropriate locations along the alignment.

A longitudinal ventilation concept using Saccardo Nozzles is proposed for this tunnel. In this ventilation concept, air is directed toward the exit portal with sufficient force and velocity to generate a longitudinal airflow in the tunnel. All the supply air is delivered to the roadway through a large slot in the ceiling or in the tunnel walls. The longitudinal airflow would also push smoke and heat toward the exit portal, thus providing protection to motorists stopped behind the fire incident. A schematic of how a Saccardo Nozzle system works at the portal is shown in Figure 4-10. In addition, a schematic of how a Saccardo Nozzle system works at any mid-tunnel location is shown in Figure 4-11. These indicate an arrangement for the single deck tunnel options and it could be modified for a double deck configuration also.

A Saccardo Nozzle longitudinal ventilation system should not require the use of mechanical ventilation equipment in the tunnel. Thus the fans, electrical equipment and other appurtenances required to run the tunnel ventilation system are located in a ventilation building where maintenance can be accomplished without interrupting traffic flow.

The ventilation building may be placed entirely underground except for the ventilation stack. At this stage, without a dispersion analysis, the exhaust stack is estimated at 100 feet height above ground. The analysis would be required during future stages of the project, once the tunnel location and traffic data were more precisely known.

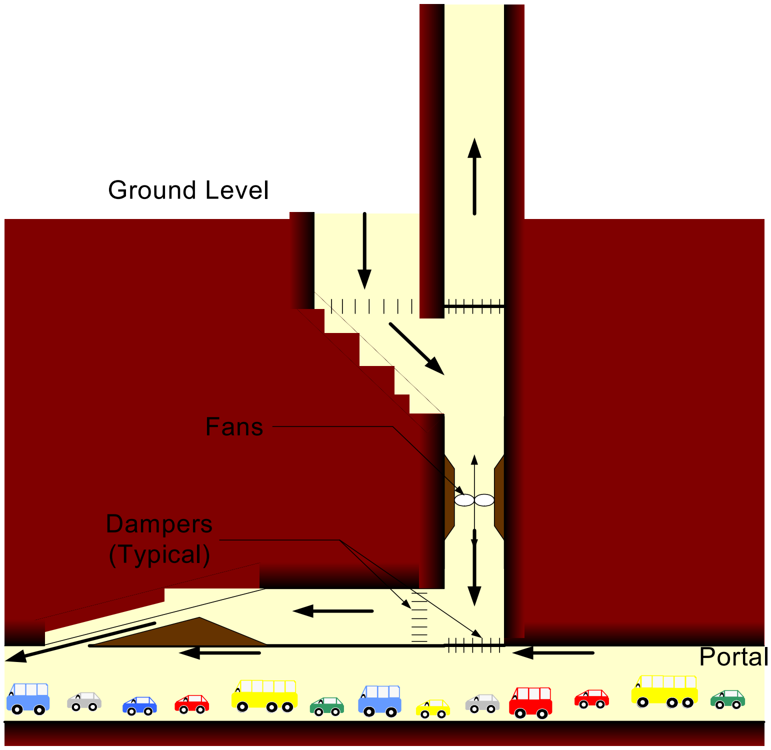


Figure 4-10 Example of a Portal Building Ventilation Arrangement for Longitudinal Ventilation using a Saccardo Nozzle

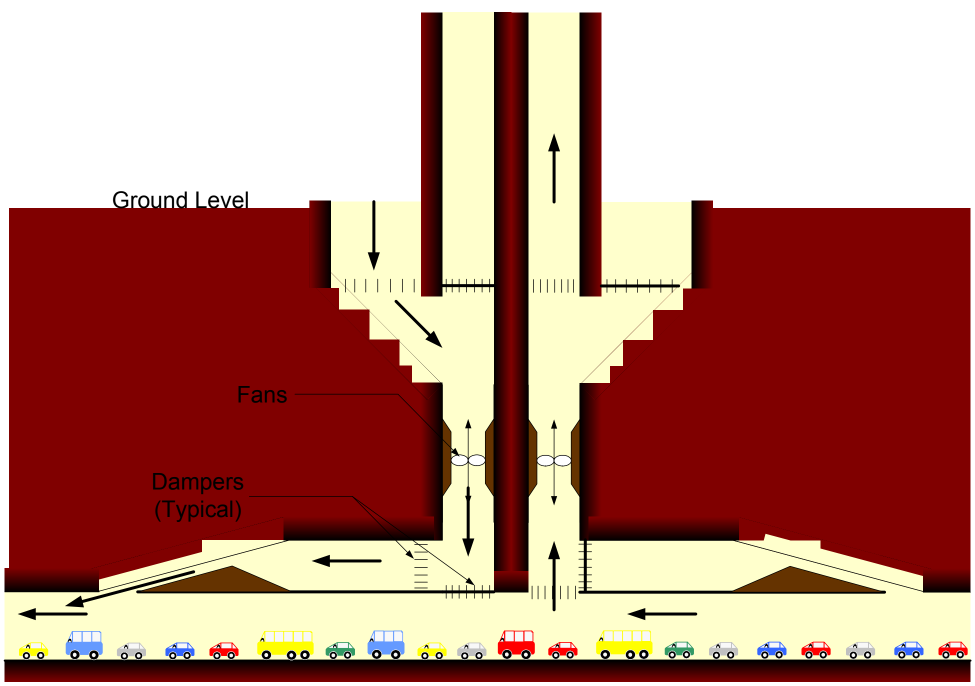


Figure 4-11 Example of a Mid-Tunnel Ventilation Arrangement for Longitudinal Ventilation using a Saccardo Nozzle

5.0 Traffic Modeling / Traffic Analysis

5.1 Introduction

The traffic analysis associated with the Route 710 Tunnel Feasibility Technical Assessment had the following objectives:

- To ascertain the adequacy of the three- and four-lane per direction tunnel alternatives to accommodate projected traffic conditions, and
- To understand the changes in traffic patterns expected on the arterial streets and freeways in the vicinity of the proposed Route 710 tunnel.

The Southern California Association of Governments (SCAG) Year 2030 Transportation Model was used to forecast traffic volumes associated with the alternatives.

5.2 Scope and Limitations of the Traffic Analysis

Commensurate with the conceptual nature of the feasibility study, the traffic analysis is intended to provide rough order of magnitude (ROM) estimates and preliminary guidance regarding the adequacy of the tunnel alternatives to accommodate anticipated traffic volumes.

The traffic analysis is also intended to provide an overview of changes in traffic pattern associated with the Route 710 tunnel that can be expected on freeway segments and arterial streets.

The traffic analysis performed at this conceptual stage is not intended to be a detailed travel demand forecasting effort, or a traffic/transportation impact analysis typically performed during the environmental phase of projects.

5.3 Scenarios Analyzed

Table 5-1 summarizes the scenarios included in the traffic analysis. The 2030 Baseline traffic volumes without the gap closure were obtained from the Model. Six tunnel alternatives were modeled to compare against the Baseline forecast.

Table 5-1 Route 710 Gap Closure Alternatives Analyzed

Gap Closure Configuration	With Huntington Drive Interchange (HDI)		Without Huntington Drive Interchange (HDI)	
	With Trucks	No Trucks	With Trucks	No Trucks
3 lanes / dir	Scenario 2	Scenario 4	Scenario 3	Scenario 5
4 lanes / dir	Scenario 6		Scenario 7	

Scenarios 2 through 5 assume gap closure alternatives with twin one-way tunnels with 3 lanes in each direction. Scenarios 6 and 7 assume twin one-way tunnels with 4 lanes in each direction. The following variations were analyzed between these scenarios:

- Scenarios 2, 4 and 6 assume an interchange at Huntington Drive; Scenarios 3, 5 and 7 are analyzed without the interchange.
- Scenarios 2, 3, 6 and 7 assume both auto and truck traffic will be permitted to use the tunnel; Scenarios 4 and 5 are analyzed with auto-traffic only.

5.4 Route 710 Tunnel Traffic Volume Forecast

Automobile and truck traffic volume forecasts for each scenario were obtained from the SCAG 2030 Model. For the purposes of capacity analysis, a Passenger Car Equivalency factor of 2.5 was used to convert truck-volumes to Passenger Car Equivalents (PCE). The analyses presented in this report are in terms of PCE. Auto and Truck traffic volumes are presented in tables in the Appendix.

5.4.1 2030 Average Daily Traffic (ADT) Volumes

For scenarios that include the Huntington Drive Interchange, traffic volumes in the segment south of the Interchange are projected to be up to 35% higher than those in the segment to the north of the interchange. This observation reflects a significant need to augment the capacity of arterial roads in the vicinity of the interchange. The southern segment ADT volumes vary between 75,000 PCE for the 3-lane Scenario 5, and 113,500 for the 4-lane Scenario 6.

Figure 5-1 illustrates and summarizes the ADT volumes by gap-closure segment and direction for the six tunnel scenarios.

5.4.2 2030 AM Peak Hour Traffic Volumes

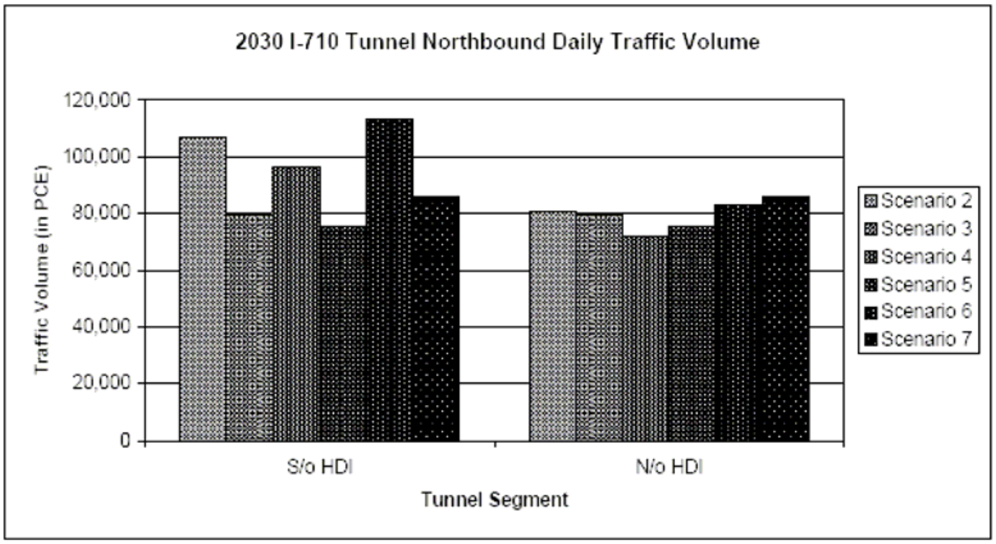
During the AM peak hour, southbound traffic volumes are significantly higher than northbound traffic volumes. In the southbound direction, AM peak hour traffic volumes vary from 6,500

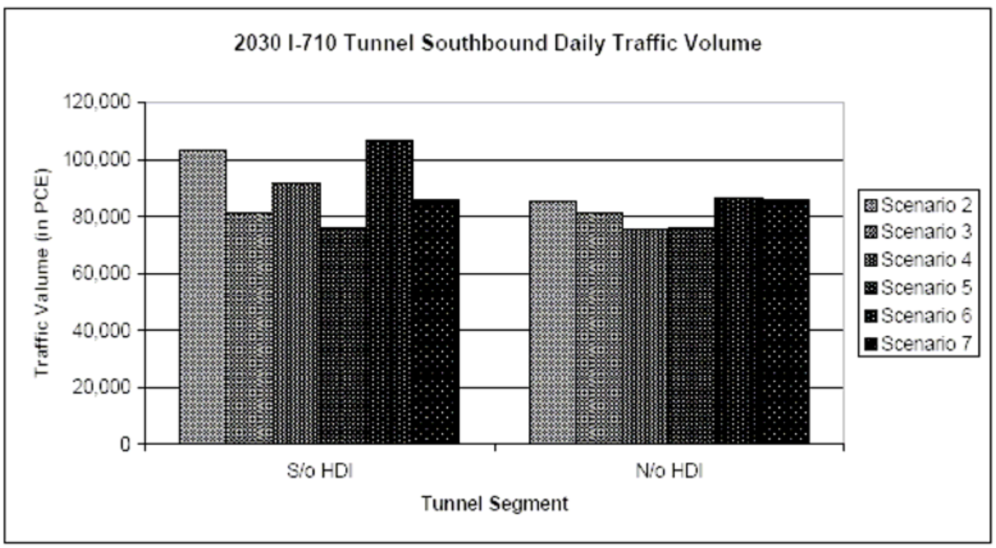
Figure 5-1 2030 Route 710 Tunnel Average Daily Traffic (in PCE)

2030 ROUTE 710 TUNNEL AVERAGE DAILY TRAFFIC (in PCE)

	Northbound		Southbound	
	S/o HDI	N/o HDI	S/o HDI	N/o HDI
Scenario 2	106,760	80,650	103,390	85,260
Scenario 3	79,750	79,750	81,220	81,220
Scenario 4	96,600	71,810	91,560	75,730
Scenario 5	75,240	75,240	75,850	75,850
Scenario 6	113,440	82,730	106,850	86,370
Scenario 7	86,220	86,220	86,220	86,220

HDI = Huntington Drive Interchange





PCE for the 3-lane Scenario without trucks and Huntington Drive Interchange, to 9,000 PCE for the 4-lane Scenario 6 with trucks and with the interchange.

Figure 5-2 illustrates and summarizes the AM peak hour volumes by gap-closure segment and direction for the six scenarios.

5.4.3 2030 PM Peak Hour Traffic Volumes

Northbound traffic volumes are higher than southbound volumes during the PM peak hour, and vary from 6,400 PCE for the 3-lane Scenario 5 to 9,750 PCE for the 4-lane Scenario 6. Figure 5-3 illustrates and summarizes the PM peak hour volumes by gap-closure segment and direction for the 6 scenarios.

5.5 Gap-Closure Capacity Analysis

The ability of the gap-closure segments to accommodate peak-hour/peak-direction traffic was analyzed for each scenario. The analysis was conducted for the PM peak hour, since it was projected to be more critical than the AM peak hour. In the scenarios where the Huntington Drive Interchange was incorporated, the traffic volumes in the southern segment (between the south portal and Huntington Drive) were found to govern the capacity needs for those cases. A value of 2,300 PCE per hour per lane was used as the Level of Service (LOS) E capacity. A 10% peaking factor was applied to the average peak hour volumes to reflect peaks within the peak period.

Figure 5-4 illustrates and summarizes the volume-to-capacity (v/c) ratios projected for the PM peak hour traffic volumes under each scenario.

In the peak (northbound) direction, the gap closure is projected to operate at LOS F with v/c ratios exceeding 1.0 for all scenarios except Scenario 7 which is projected to operate at LOS D. More specifically, the scenarios with the Huntington Drive Interchange are projected to operate at poorer levels of service than the scenarios without the interchange.

5.6 Comparison of Alternative Scenarios

Figure 5-5 illustrates and summarizes the results of the comparison of gap closure traffic volumes for 3-lane and 4-lane alternatives, with and without the Huntington Drive Interchange. Each alternative is further analyzed with and without trucks.

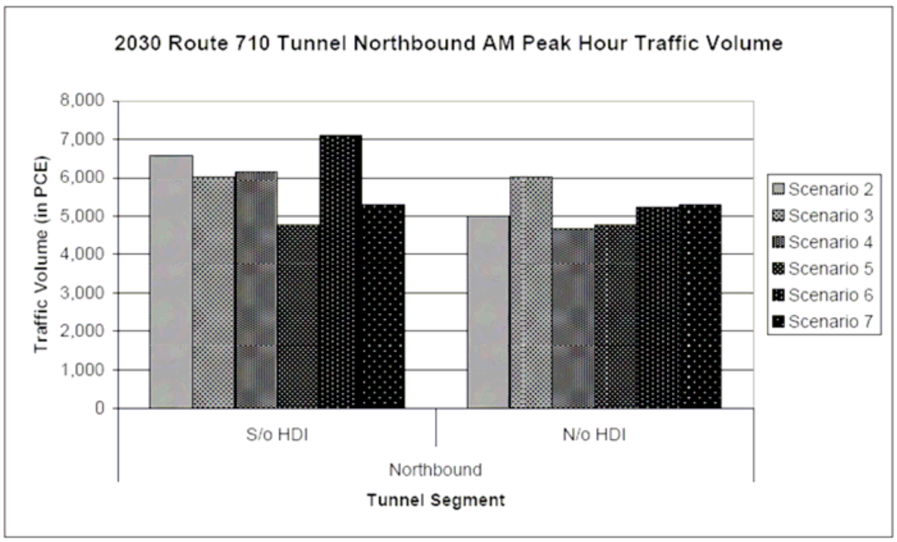
Scenarios 2 and 6 were compared to understand the effect of adding a lane in each direction for the “with Huntington Drive Interchange” alternatives. While the 4-lane Scenario would attract approximately 1,000 PCE more than the 3-lane Scenario during the PM peak hour, there would be an overall improvement in level of service through the tunnel with the 4-lane configuration.

Figure 5-2 2030 Route 710 Tunnel AM Peak Hour Traffic (in PCE)

2030 ROUTE 710 TUNNEL AM PEAK HOUR TRAFFIC (in PCE)

	Northbound		Southbound	
	S/o HDI	N/o HDI	S/o HDI	N/o HDI
Scenario 2	6,590	5,010	8,360	6,610
Scenario 3	6,010	6,010	7,800	7,800
Scenario 4	6,160	4,680	7,980	6,270
Scenario 5	4,760	4,760	6,410	6,410
Scenario 6	7,090	5,240	9,060	6,980
Scenario 7	5,300	5,300	7,330	7,330

HDI = Huntington Drive Interchange



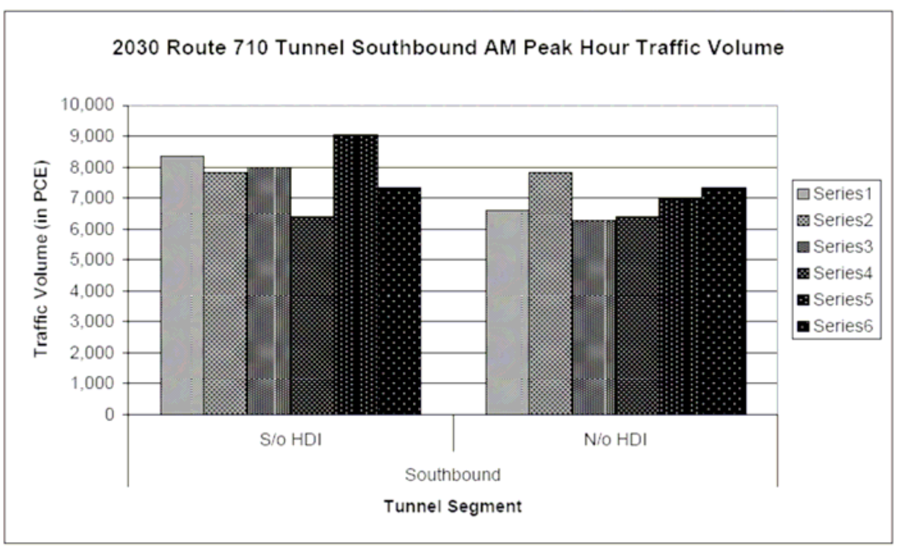
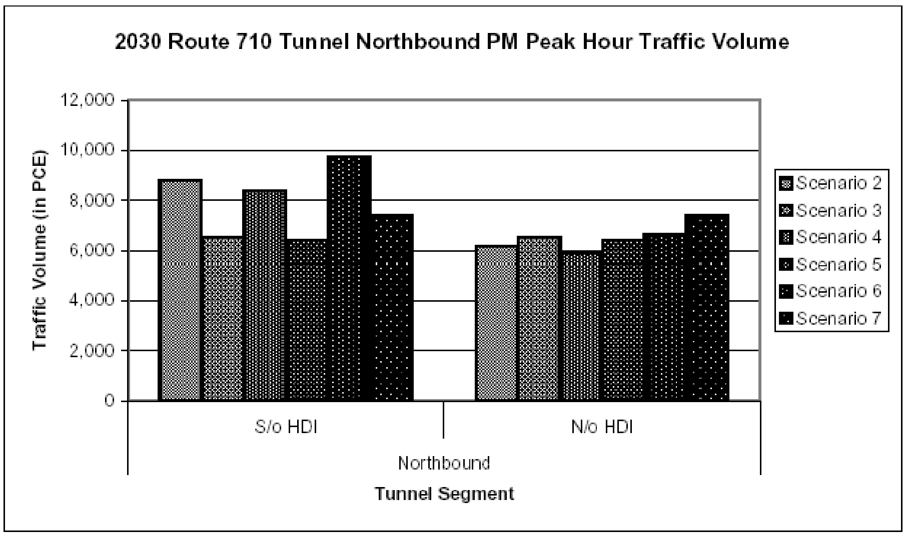


Figure 5-3 2030 Route 710 Tunnel PM Peak Hour Traffic (in PCE)

2030 ROUTE 710 TUNNEL PM PEAK HOUR TRAFFIC (in PCE)

	Northbound		Southbound	
	S/o HDI	N/o HDI	S/o HDI	N/o HDI
Scenario 2	8,780	6,200	6,500	5,390
Scenario 3	6,520	6,520	5,520	5,520
Scenario 4	8,400	5,870	6,240	5,210
Scenario 5	6,390	6,390	5,190	5,190
Scenario 6	9,750	6,650	7,060	5,700
Scenario 7	7,410	7,410	5,810	5,810

HDI = Huntington Drive Interchange



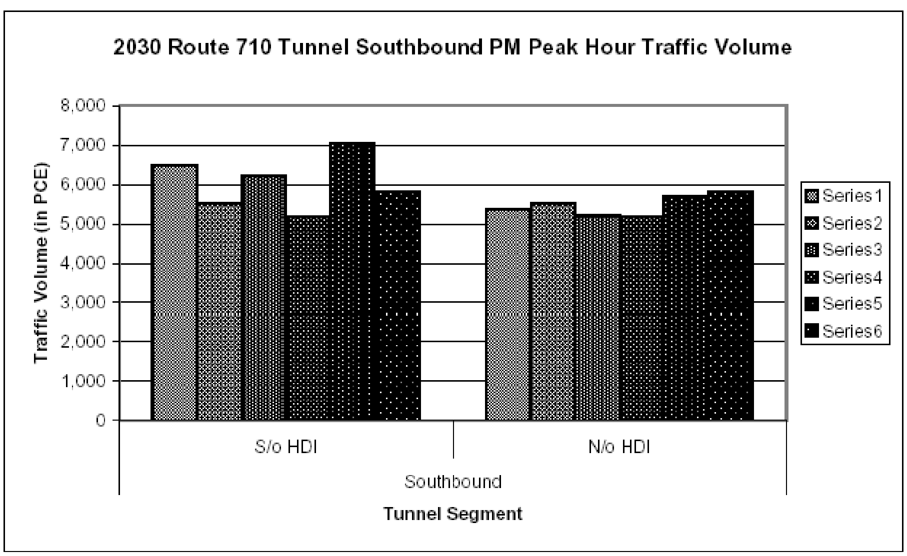


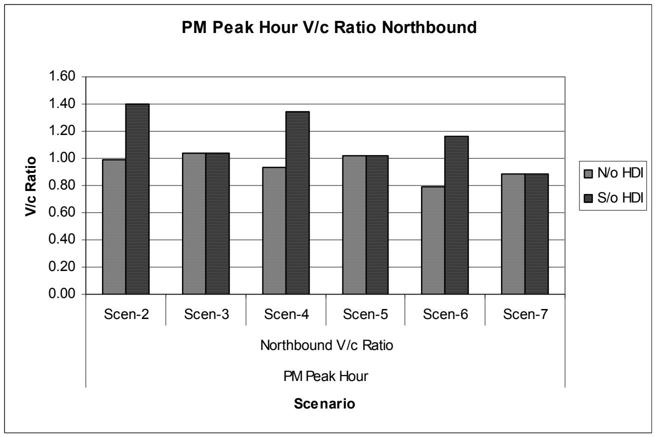
Figure 5-4 Route 710 Tunnel Configuration Scenarios

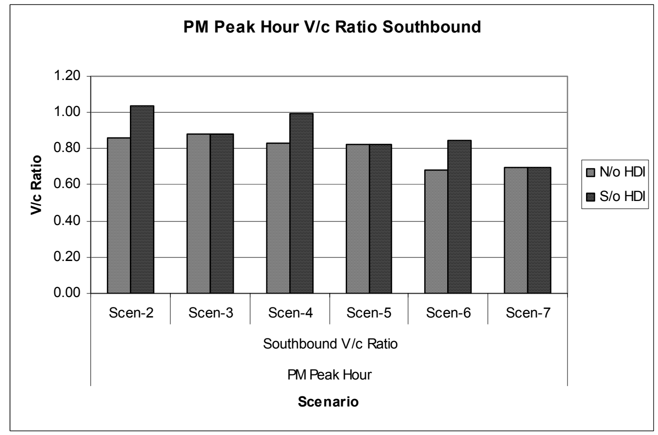
		PM Peak Hour					
		Northbound Volume					
		Scen-2	Scen-3	Scen-4	Scen-5	Scen-6	Scen-7
N/o HDI	PCE/ln	2,275	2,391	2,153	2,342	1,828	2,037
S/o HDI	PCE/ln	3,219	2,391	3,080	2,342	2,681	2,037

		PM Peak Hour					
		Northbound V/c Ratio					
		Scen-2	Scen-3	Scen-4	Scen-5	Scen-6	Scen-7
N/o HDI	V/c	0.99	1.04	0.94	1.02	0.79	0.89
S/o HDI	V/c	1.40	1.04	1.34	1.02	1.17	0.89

		PM Peak Hour					
		Southbound Volume					
		Scen-2	Scen-3	Scen-4	Scen-5	Scen-6	Scen-7
N/o HDI	PCE/ln	1,976	2,025	1,910	1,901	1,569	1,599
S/o HDI	PCE/ln	2,384	2,025	2,287	1,901	1,942	1,599

		PM Peak Hour					
		Southbound V/c Ratio					
		Scen-2	Scen-3	Scen-4	Scen-5	Scen-6	Scen-7
N/o HDI	V/c	0.86	0.88	0.83	0.83	0.68	0.70
S/o HDI	V/c	1.04	0.88	0.99	0.83	0.84	0.70





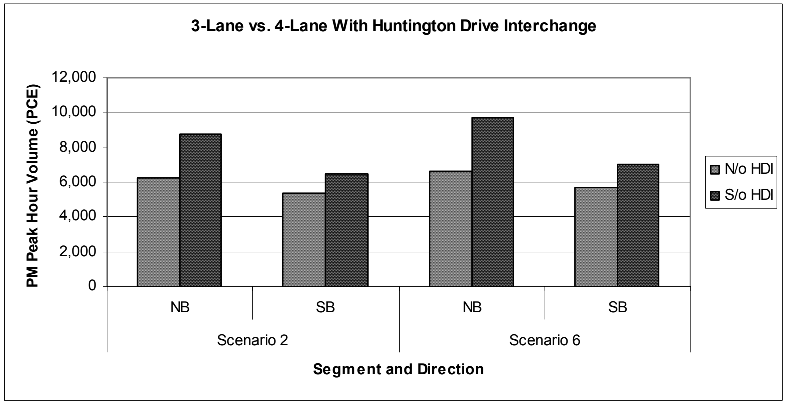
		PM Peak Hour					
		Northbound					
		Scen-2	Scen-3	Scen-4	Scen-5	Scen-6	Scen-7
		3	3	3	3	4	4
N/o HDI	Auto	4,739	4,987	5,871	6,386	5,212	5,781
	Truck	586	614	0	0	574	650
	PCE	6,204	6,522	5,871	6,386	6,647	7,406
S/o HDI	Auto	7,121	4,987	8,400	6,386	8,095	5,781
	Truck	663	614	0	0	662	650
	PCE	8,779	6,522	8,400	6,386	9,750	7,406

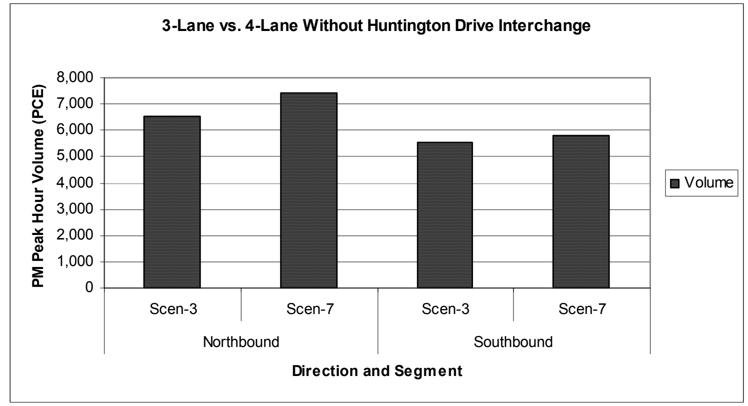
		PM Peak Hour					
		Southbound					
		Scen-2	Scen-3	Scen-4	Scen-5	Scen-6	Scen-7
		3	3	3	3	4	4
N/o HDI	Auto	4,147	4,029	5,209	5,185	4,396	4,312
	Truck	497	597	0	0	523	601
	PCE	5,390	5,522	5,209	5,185	5,704	5,815
S/o HDI	Auto	5,160	4,029	6,238	5,185	5,639	4,312
	Truck	537	597	0	0	569	601
	PCE	6,503	5,522	6,238	5,185	7,062	5,815

Figure 5-5 Comparison of Scenarios

	Scenario 2		Scenario 6	
	NB	SB	NB	SB
N/o HDI	6,204	5,390	6,647	5,704
S/o HDI	8,779	6,503	9,750	7,062

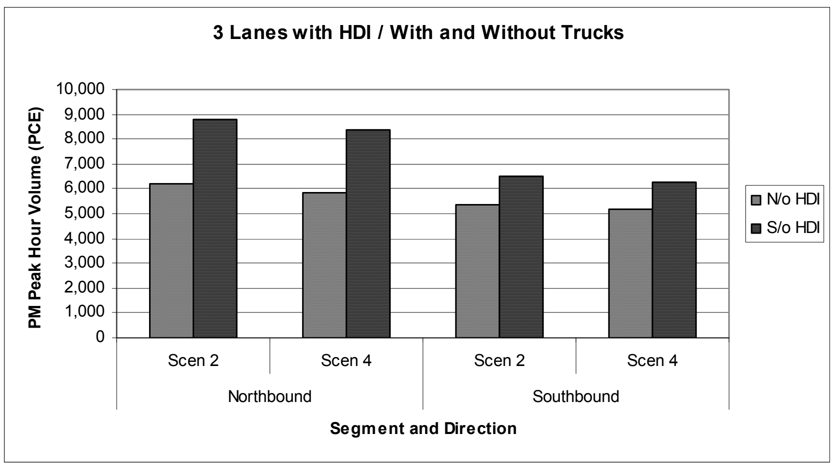
	Northbound		Southbound	
	Scen-3	Scen-7	Scen-3	Scen-7
Volume	6,522	7,406	5,522	5,815

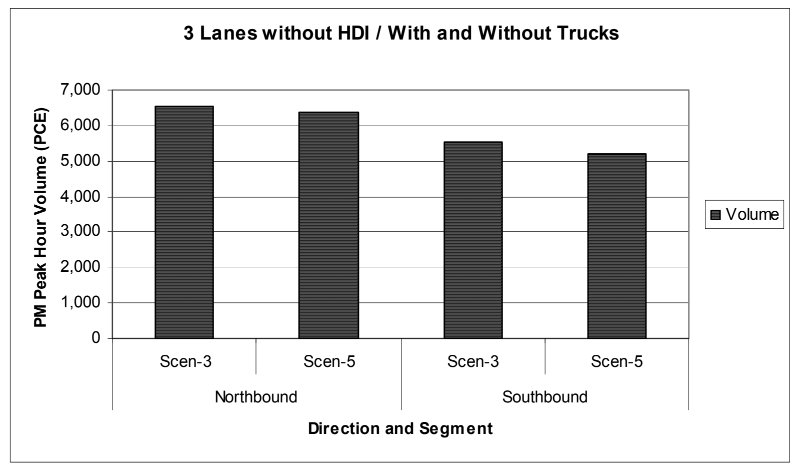




	Northbound		Southbound	
	Scen 2	Scen 4	Scen 2	Scen 4
N/o HDI	6,204	5,871	5,390	5,209
S/o HDI	8,779	8,400	6,503	6,238

	Northbound		Southbound	
	Scen-3	Scen-5	Scen-3	Scen-5
Volume	6,522	6,386	5,522	5,185





Scenarios 2 and 4 were compared to understand the effect of excluding truck-traffic from the tunnel for the “with Huntington Drive Interchange”. A reduction of approximately 600 PCE is projected during the PM peak hour, in the scenario with autos only.

Scenarios 3 and 7 were compared to understand the effect of adding a lane in each direction for the “without Huntington Drive Interchange” alternatives. The 4-lane Scenario 7 is projected to carry approximately 900 PCE per hour more than the 3-lane Scenario 3. Scenarios 7 and 3 are projected to operate with v/c ratios of 0.89 and 1.04 respectively.

Scenarios 3 and 5 were compared to understand the effect of excluding truck-traffic from alternatives “without the Huntington Drive Interchange”. The auto-only Scenario 5 is projected to operate at v/c ratio of 1.02, and carry 900 PCE per hour less than Scenario 3 which includes truck-traffic.

5.7 Changes in Freeway and Arterial Street Traffic Volumes

Traffic from freeways and arterial streets is expected to be diverted to the gap-closure. Changes in freeway and arterial street traffic volumes were analyzed for specific scenarios relative to the 2030 Base Condition without the gap-closure. General traffic pattern shifts / changes were observed from the regional travel demand forecasting model results.

5.7.1 Freeway Traffic Volume Changes

Scenarios 2 and 6 were compared with the Base Condition to observe the changes in traffic volumes on Freeways for the 3-lane and 4-lane alternatives with the Huntington Drive Interchange. Figure 5-6 illustrates and summarizes the changes in freeway traffic volumes for Scenarios 2 and 6 relative to the 2030 Base Condition.

It is seen that traffic volumes at all freeway segments analyzed, except two, would decrease with the tunnel alternatives relative to the Year 2030 Base Condition. Traffic volumes on freeway segments at the two ends of the tunnel are projected to increase. On Route 710 at the southern end of the gap closure the increase would be approximately 2,000 PCE per hour, and on Interstate 210 West / North at the northern end of the tunnel the increase would be approximately 2,500 PCE per hour in the peak direction. The latter represents an increase in traffic volume of 7% over the Year 2030 Base Condition estimates.

5.7.2 Arterial Street Traffic Volume Changes

Traffic volumes on arterial streets for the 4-lane Scenarios 6 and 7 were compared with the Year 2030 Base Condition traffic volumes to observe traffic volume changes as a result of the gap-closure alternatives.

Figure 5-6 Freeway Traffic Pattern Changes from 2030 Base

	NB / EB		SB / WB	
	Scen-2	Scen-6	Scen-2	Scen-6
I-5 s/o US 134	-622	38	66	189
SR 110 s/o Orange Grove	-273	-247	-77	-70
SR 2 n/o US 134	-590	-490	-677	-683
SR 2 s/o US 134	-560	-465	-749	-739
I-605 n/o I-105	-90	-11	-65	110
I-210 at Allen Av	-66	-550	-754	-264
I-210 n/o US 134	2,540	2,504	1,901	2,036
I-710 s/o I-10	1,931	1,978	640	680
I-10 at Herbert Avenue	-466	-261	121	106
I-10 e/o Atlantic Boulevard	-486	-455	-633	-631

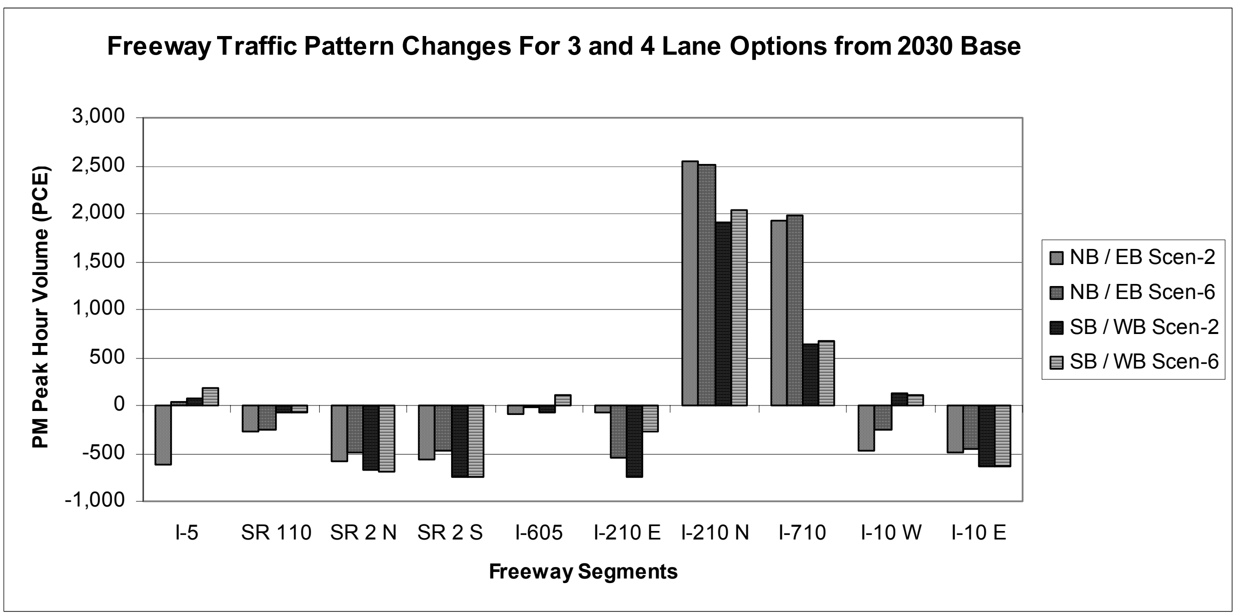


Figure 5-7 illustrates the Year 2030 Base AM and PM peak hour traffic volumes on several arterial street segments in the vicinity of the tunnel. Traffic volumes vary from approximately 2,500 to 3,000 PCE in the peak direction during the PM peak hour on Fremont Avenue immediately north of Valley Boulevard, to approximately 1,000 to 1,200 PCE per hour on Atlantic Boulevard and Garfield Avenue.

Figure 5-8 illustrates the changes in traffic volumes on arterial street segments for Scenarios 6 and 7 relative to the Year 2030 Base Condition. These scenarios were selected for comparison, since the former incorporates the Huntington Drive Interchange, and the latter does not. The following groups of streets are represented by the three charts in the illustration:

- Street segments that are in the immediate vicinity of the southern end of the proposed tunnel (includes Los Robles Avenue and Oak Knoll Avenue from Group 3 below)
- Huntington Drive segments
- Street segments north of Huntington Drive

It is seen that traffic volumes for both gap-closure scenarios generally decrease on all arterial streets segments at the southern end of the tunnel, including the Route 710 on-and off-ramps at Valley Boulevard, Valley Boulevard itself, Fremont Avenue, Atlantic Boulevard and Garfield Boulevard. The decrease is greater for Scenario 6 which includes the Huntington Drive Interchange, than for Scenario 7 which does not. This is to be expected, since the Huntington Drive Interchange would provide an additional opportunity for vehicles to exit and enter the proposed tunnel.

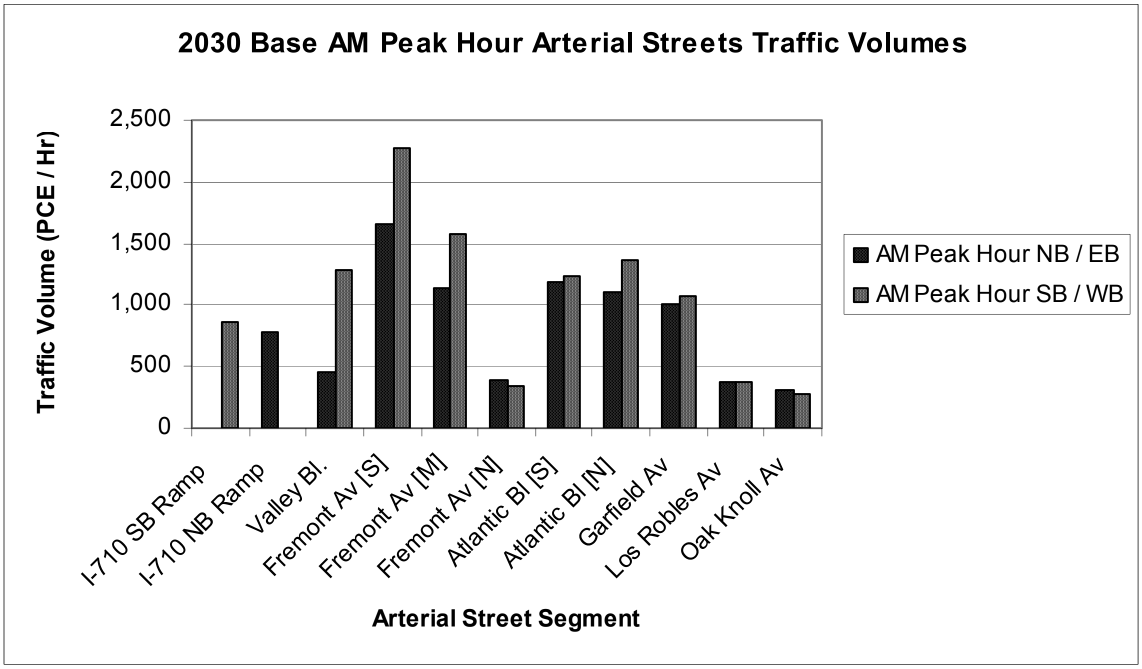
Relative to the Base Condition, traffic volumes increase on Huntington Drive west of Fremont Avenue for Scenario 6 which includes the Huntington Drive Interchange. Traffic volumes on Huntington Drive decrease for Scenario 7 relative to the Base Condition. This pattern reflects longer trips using the tunnel in the Scenario without the Huntington Drive Interchange.

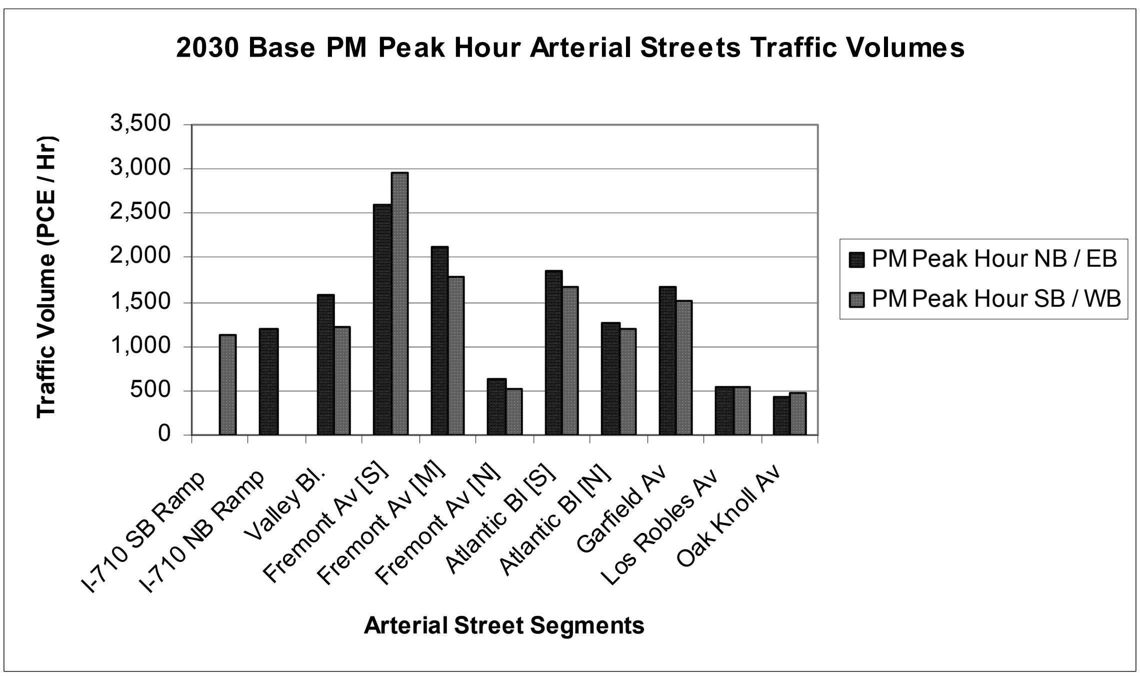
Generally, traffic volumes on arterial street segments north of Huntington Drive are projected to decrease with the gap-closure alternatives. In particular, significant reductions in projected traffic volumes are observed at Pasadena Avenue and St. John Avenue at California Boulevard. Reductions in traffic volumes are also observed on Fair Oaks Avenue and California Boulevard.

5.7.3 Arterial Streets Volume-to-Capacity Ratios

Figure 5-9 illustrates the PM Peak Hour volume-to-capacity ratios on arterial street segments for the Year 2030 Base Condition and Gap-Closure Scenario 7. This scenario does not include the Huntington Drive Interchange, and consequently all street segments are projected to operate at better levels of service relative to the Base Condition. The arterial street volume-to-capacity ratios were calculated using a capacity of 900 PCE / hour / lane.

Figure 5-7 2030 BASE AM and PM Peak Hour Arterial Streets Traffic Volumes





I-710 SB Ramps at Valley Bl	Fremont Av [M] n/o C'wealth	Garfield Av n/o Huntington Dr
I-710 NB Ramps at Valley Bl	Fremont Av [N] n/o Huntington	Los Robles Av n/o Huntington
Valley Bl v/o Fremont Av	Atlantic Bl [S] n/o Valley Bl	Oak Knoll Av n/o Huntington
Fremont Av [S] n/o Valley Bl	Atlantic Bl [N] n/o Main St	

Figure 5-8 2030 Traffic Pattern Changes – Scenario 6 and 7 vs. Base Arterials Streets

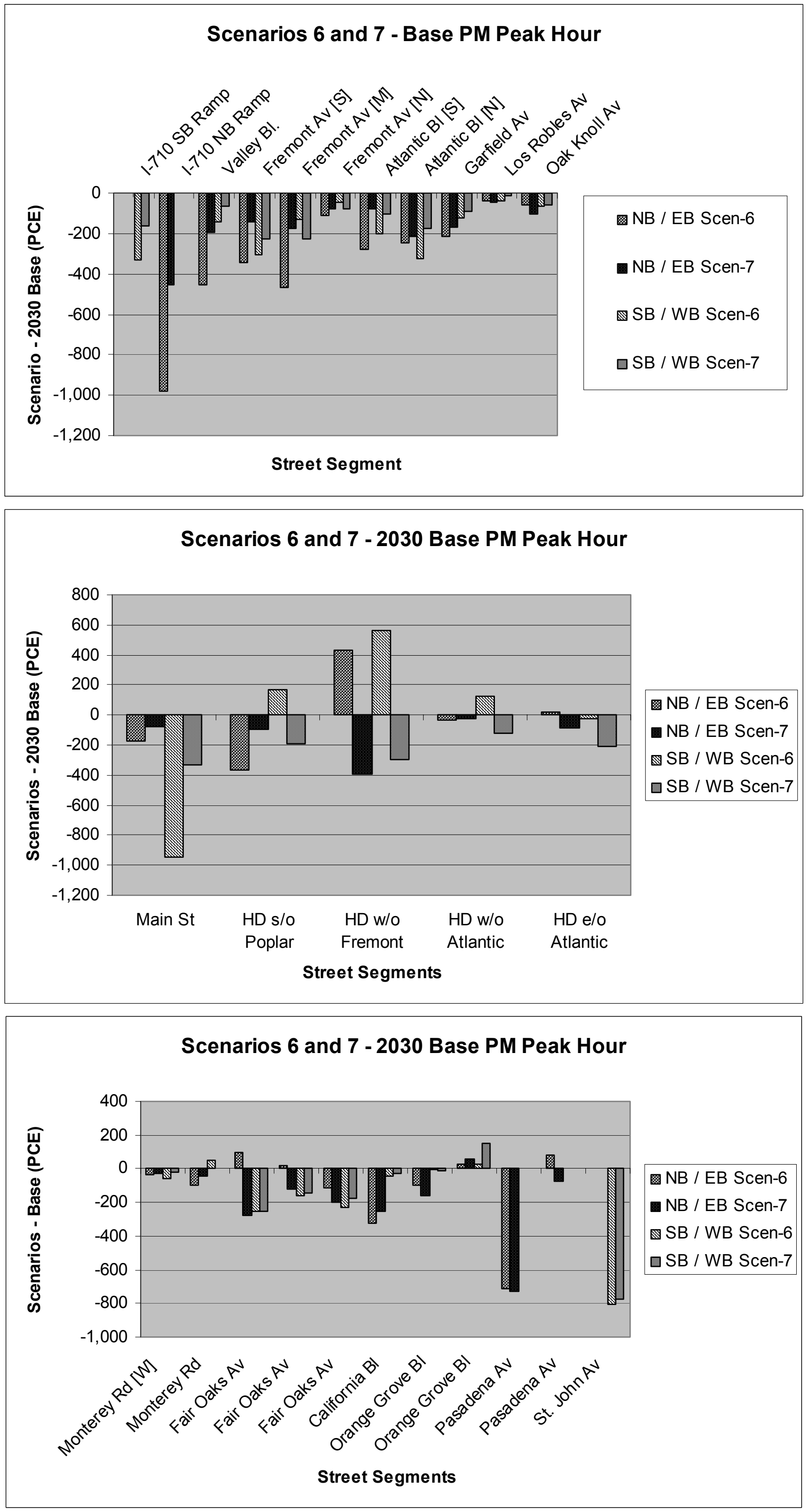
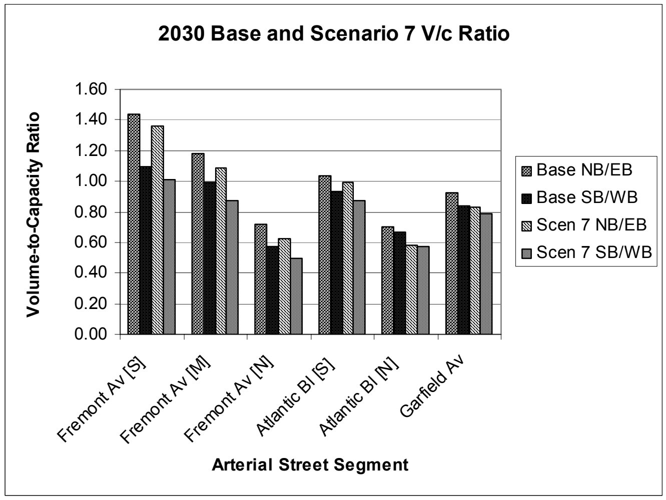
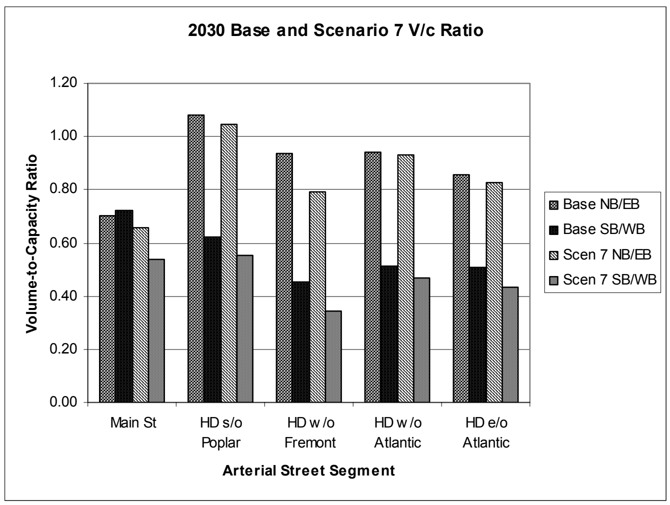
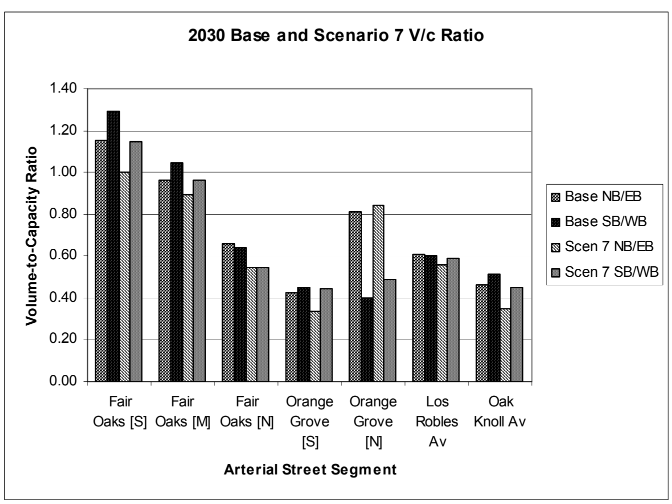


Figure 5-9 2030Volume to Capacity Ratios







5.8 Traffic Analysis Conclusions

This traffic analysis is intended to provide rough order of magnitude (ROM) estimates and preliminary guidance regarding the adequacy of the number of lanes to accommodate anticipated tunnel traffic volumes. An overview of changes in traffic patterns expected on freeway segments and arterial streets associated with the proposed tunnel alternatives is presented. The traffic analysis performed at this conceptual stage is not intended to be a detailed travel demand forecasting exercise, or a traffic / transportation impact analysis typically performed during the environmental phase of projects.

The major findings of the analysis are presented below:

- The capacity of the 3-lane / direction gap-closure alternatives would not be adequate to accommodate projected 2030 traffic volumes.
- The 3-lane alternatives without the Huntington Drive Interchange performed better than those with the interchange.
- The 3-lane alternatives that excluded truck-traffic performed better than those that included truck-traffic.
- The 4-lane alternatives performed better than comparable 3-lane alternatives.
- Among the 4-lane alternatives, the Scenario without the Huntington Drive Interchange performed better relative to that with the interchange.
- Except for freeway segments at the two ends of the proposed tunnel, where traffic volumes are projected to increase relative to the 2030 Base Condition, traffic volumes generally decreased on freeway segments as a result of the gap-closure.
- Traffic volumes generally decrease on arterial streets in its vicinity as a result of the gap-closure.
- The southerly segment of the gap-closure scenario with the Huntington Drive Interchange is projected to accommodate significantly higher traffic volumes than the northerly segment.
- Traffic exiting at the Huntington Drive Interchange would generate the need to significantly increase arterial street capacity.

Based on the findings described above, the 4-lanes per direction alternative without the Huntington Drive Interchange is projected to perform best relative to all other alternatives analyzed.

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6.0 Tunnel Configuration and Alignment

6.1 Introduction

The study has addressed the physical feasibility of engineering a tunnel solution to complete the gap in the Southern California regional highway network along the Route 710 corridor. At grade and shallow tunnel solutions have been considered in the past and were found to be problematic as issues arose regarding the land requirements, noise and other environmental and community concerns that would result from an at-grade solution.

It would appear that a tunnel might offer a solution by channeling the Route 710 traffic below the surface streets and communities; the Route 710 tunnel feasibility study has addressed the main issues relating to the viability of an underground solution by examining the engineering, traffic, environmental and financial aspects of a tunnel option. **The study examined issues that would affect the feasibility of the tunnel solution and identified major issues that would be involved in developing the project any further. It has not investigated or selected alignments and solutions nor has it assessed the level of impacts that would result from completion and operation of a tunnel project. These issues would need to be addressed as part of a subsequent extensive process for Route Selection, Preliminary Engineering, Environmental Assessment, and Community Involvement process.**

6.2 Engineering Considerations

A number of engineering factors must be considered in selecting the tunnel alignment and configuration to be assumed to establish tunnel feasibility and viability. This chapter addresses the physical size and alignment requirements considered in the optional tunnel configurations. There are other issues regarding environmental, community and land use issues that could also influence the alignment and these are discussed in other chapters of this report.

6.2.1 Geotechnical

The study tasks covered in Chapter 3 focused on the subsurface ground conditions based upon available geological data and supplemented with a minor geotechnical exploration program consisting of drilling three deep exploratory boreholes along the study corridor.

The study area for the potential tunnel alignments is quite large being over 4 miles long and 2 miles wide, and with the tunnel likely to be as deep as 300 feet below the surface. The necessary subsurface data to enable full design would require much more extensive subsurface exploration program to augment the geotechnical information that is available at this time.

The currently available geotechnical information indicate that tunneling conditions are favorable with predominantly soft sedimentary rock and reasonable water conditions that could be overcome using general tunnel construction methods. There are fault zones and potential for seismic activity along the corridor. However it is not an unusual condition for transportation tunnels in the Los Angeles basin and there are strategies to address this situation during the design and construction.

6.2.2 Traffic

Traffic modeling has been performed to evaluate the regional network and general impacts on local arterial roads due to the closing the Route 710 gap. This is reported in Chapter 5 entitled Travel Modeling and Forecasts.

The modeling analysis has been based upon alternative tunnel concepts with consideration of options with 3 or 4 lanes provided in each direction; as well as options with and without truck traffic through the tunnel. The option of including a new interchange with the east-west arterial at Huntington Drive has also been examined and it has been found that this proposal would increase traffic demand along the Route 710 tunnel lanes, as well as on Huntington Drive, as a result of additional trips accessing Route 710 via this route. This would also indicate that additional lanes along portions of Huntington Drive would be required, to cope with this additional traffic.

The general conclusions reached are that there would be a demand for 4 traffic lanes in each direction to meet year 2030 projected traffic conditions and that this facility could accommodate truck traffic along the corridor.

6.2.3 Tunnel Construction Technology

Chapter 2 has discussed Tunneling Technologies and examined similar completed tunnel projects worldwide, along with currently available tunnel engineering methods and technologies that might be applicable to the Route 710 tunnel concepts.

This document concluded that two tunneling construction methods are appropriate for further consideration for the Route 710 tunnel. These methods include Tunnel Boring Machines (TBM) and Sequential Excavation Method (SEM). TBMs are currently in operation for tunnels up to 50 feet in diameter. SEM is suitable for 4-lane tunnel cross-sections. Cut-and-cover methods for tunneling have been discounted, as they would involve significant disruption at the surface both during construction and in the future when the large areas of land on top of the tunnels were to be redeveloped.

6.3 Tunnel Configuration

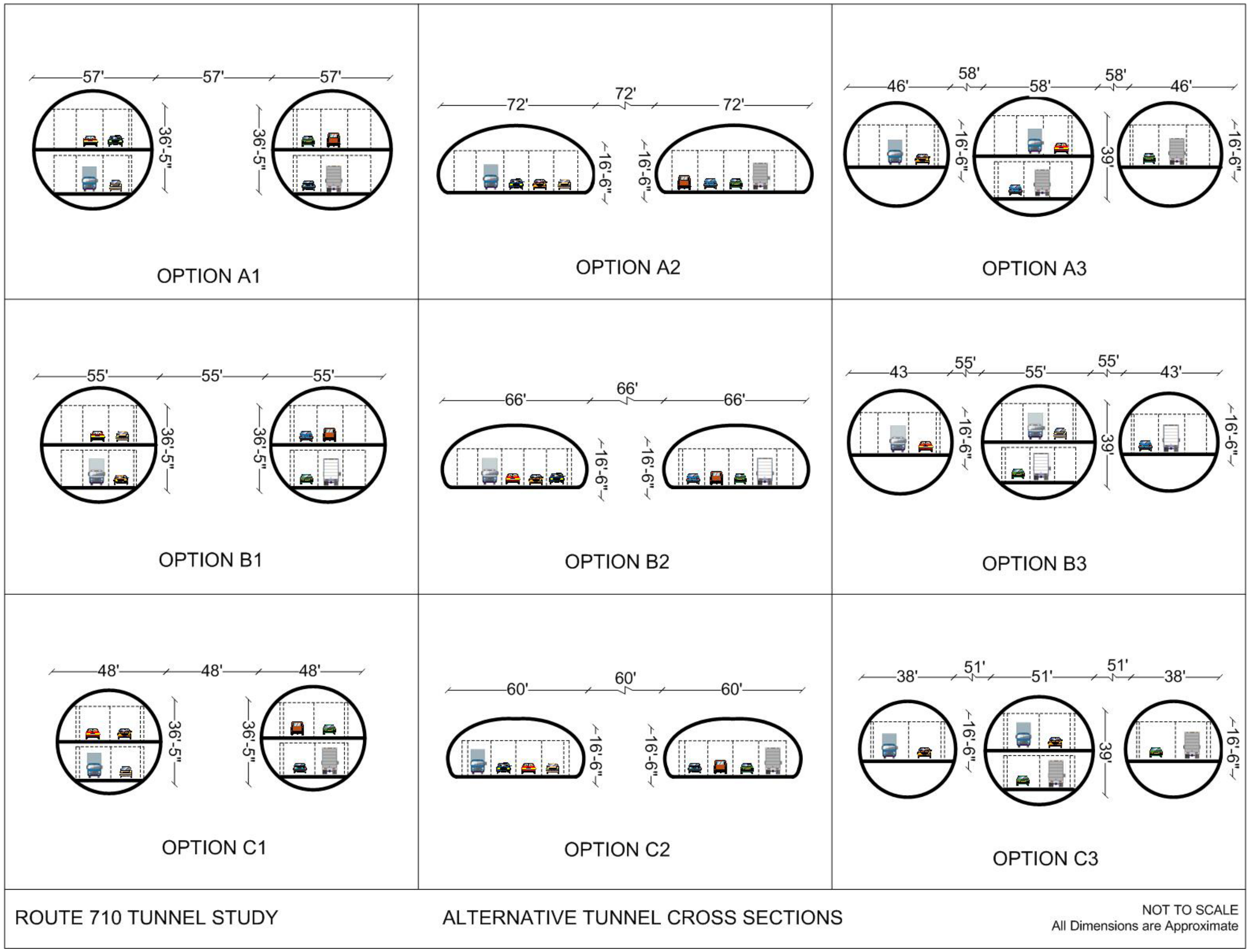
The study has considered a number of tunnel and cross-section arrangements to meet the indicated requirement for 4-lanes capacity in each direction to provide an acceptable level of service through the tunnel. Various tunnel cross-sections have been evaluated and considered to achieve this level of performance. The alternatives are summarized in the nine cross-section options illustrated in Figure 6.1.

A large number of cross-sections were considered during the study, all aimed at maximizing the usable space within the cross section to allow passage of trucks and all other traffic, while maintaining roadway standards. The cross sections would also need to accommodate spaces for ventilation, signage, walkways, access to cross passages, and all other facilities required for tunnel systems such as lighting, fire equipment and various control, detection and surveillance. These would need to be considered in more detail at future stages of development.

The nine sections considered in this report are preliminary and could all be further examined to reconfigure lanes and clearances to meet particular traffic needs, whilst maximizing usable space.

Accommodating four lanes requires a large tunnel cross-section, larger than any yet constructed in the United States by mining methods for a long tunnel, other than shallow cut-and-cover construction. The tunnel would therefore require state-of-the-art tunneling techniques and equipments.

Figure *6-1* Cross Section Matrix



6.3.1 Cross-section A1

Cross-section option A1 considers two Tunnel Boring Machine (TBM)-driven tunnels, each about 57 feet in diameter, which is larger than the largest tunneling machine constructed to date of approximately 50 feet in diameter. From discussions with TBM manufacturers, it is anticipated that larger diameters (60 feet) will become possible within the industry over the next decade. This tunnel option requires a double deck configuration of lanes with each level having two full standard 12-foot wide traffic lanes, a continuous 10-foot wide shoulder on the right side, and a two-foot wide inside shoulder. This configuration provides four mixed traffic lanes in one direction and a total of eight traffic lanes for the two tunnels. Full vertical clearance of 16’ 6” is provided at each level. In addition, the lower deck level has been assumed to have an additional 3’ 6” above lanes, to allow for location of signage and other tunnel systems equipment. On the upper deck, space for signage can be provided above the lanes attached to the curved ceiling at that level. The upper roadway slabs have an assumed thickness of 2’ 6”.

This option also provides space at each side for walkways to be used by maintenance staff and drivers if there is an incident in the tunnel. National Fire Protection Association’s (NFPA), the governing national organization, regulations require cross-passage connections to allow escape of tunnel users to a place of safe refuge, in this case the opposite parallel tunnel. At this stage, these cross-passages are proposed at 600-foot intervals along the alignment for this tunnel configuration. They would be provided at each deck level connecting to the corresponding deck level in the opposite tunnel.

6.3.2 Cross-section A2

This cross-section option indicates two mined tunnels, constructed using the Sequential Excavation Method (SEM), each with a 72 foot width providing four full standard 12-foot wide traffic lanes, a continuous 10-foot wide right side shoulder, and a two-foot wide inside shoulder on a single level. Side walkways would again be provided with cross passages to the opposite tunnel. Spacing of these cross passages is proposed at 500 feet spacing along the alignment, closer than that for option A1, to reflect the need to evacuate larger numbers of persons using four 4 lanes of traffic on a single level to the safe refuge.

Vertical clearance of at least 16’6” is provided with adequate additional space for signage and other equipment above the lanes.
Additional detailed geotechnical and structural engineering will be needed to determine whether the subsurface soil conditions along the gap corridor is well suited for this cross-section.

6.3.3 Cross-section A3

This cross-section option provides eight lanes of traffic using a three tunnel configuration with outer tunnels each providing two lanes in one direction and a double deck center tunnel with two lanes on each level, with one deck serving each direction.

The center tunnel was assumed to be around 58 feet in diameter again just above the current state of the art for TBM constructed tunnels but likely feasible in the timeframe of this project development. The outer tunnels, also assumed to be TBM driven have a diameter of approximately 47 feet. Modifications to these 3 tunnel configurations and sections could be examined further as part of any future project development.

The traffic lanes would all be 12-foot wide with 10-foot wide right shoulders and two-foot wide inside shoulders; and with space for walkways, 16’6” vertical clearance, and space above the lanes for signage and other systems equipment.

In this case, pedestrian cross passages would be needed from both decks of the center tunnel to the outer tunnels at 600 feet spacing along the alignment.

6.3.4 Cross-sections B1, B2, and B3

Cross-section options B1, B2, and B3 have the same general configuration as the full-standard options A1, A2, and A3 respectively, but with the incorporation of reduced design standards in these cross-section options.

From the study of worldwide and domestic tunnels (see Chapter 2), it is typical practice for lengthy tunnels to implement features that comply with full standards and other features with “reduced” standards as an economic measure. However these design decisions must be made carefully to maintain the integrity of the design such that public safety is not compromised. The adoption of “reduced” standard design features must be weighed carefully to balance public safety against capital investment. For the Route 710 tunnel alternatives, the roadway geometrics provide long tangent section and large radii curves, which yield very favorable conditions for the motorists with generous sight distances. Due to these favorable geometric conditions, it is reasonable to give consideration to some reduced standard roadway features for these tunnel cross-sections.

In the cases of cross-sections B1, B2 and B3, initial informal discussions with Caltrans has indicated that they would consider the use of traffic lanes with reduced width as can be seen on many urban freeways. In the light of these discussions, a set of options with 11-foot wide lanes and a single 12-foot wide ‘truck’ lane maintained in each direction, has been used to modify options A1, A2, and A3. Also the right-side shoulders have been reduced from 10 feet wide to 8 feet wide. These cross-section options maintain the inside shoulder width of 2 feet. Vertical clearances, walkway and cross-passage provisions remain as before.

The standard reduction results in reduced tunnel dimensions that may reflect significant reductions in mined volumes and may realize valuable cost advantages.

6.3.5 Cross-sections C1, C2, and C3

Cross-section options C1, C2, and C3 adopt further reduction in cross–section standards to reflect those found in modern major highway tunnels in other parts of the world. Standards remain the same as those used in options B1, B2 and B3, but with the right side margin reduced further, from 8 feet to 2 feet. Vertical clearances, and walkway and cross-passage provisions remain as before.

These standards have been used successfully in other long, high volume highway tunnels, when used in conjunction with close monitoring and control of traffic using systems such as CCTV and variable message signs to deal with incidents and changed traffic conditions within the tunnel environment.

6.4 Alignment

Many factors will need to be considered in any subsequent determination and selection of a tunnel alignment. Obviously the traffic demand will have to be met, as well as air quality concerns. The tunnel would have to be constructed to minimize impacts on the local area in terms of noise, visual, severance of local streets, community and neighborhood and to avoid impacts on the historic districts and buildings that are of both local and national value.

The alignment must be selected to avoid potentially impacting particularly sensitive land uses such as schools, hospitals, etc.

The alignment design will need to meet safety requirements in terms of highway alignment standards to allow for safe traffic operations and permit emergency access and egress in the event of any incidents within the tunnel.

6.4.1 Three Typical Alignments

For the purpose of this initial study, specific alternatives have not been assessed for selection of a preferred alignment. A wide study corridor with three typical alignments was considered so that feasibility could be established, and approximate costs and potential issues that might require mitigation could be identified.

The “No-Build” option needs to be considered in the decision to proceed with this project. Without the ‘710 Gap’ completion, there would be further increases in local traffic in the Pasadena, South Pasadena, El Sereno (Los Angeles), Alhambra and San Marino areas, with further extensions to the peak traffic periods and increasing subsequent deterioration in noise levels, vibration, air quality, and pedestrian and traffic safety. This would also lead to new provisions to widen the main arterials, increase the capacity of intersections, and introduce further traffic control and management measures to channel traffic and attempt to avoid impacts to the largely residential neighborhoods of the corridor. Regionally, it would perpetuate congestion on the already overloaded local freeway network such as the I-5, SR-2, SR-134 and I-210 corridors, with resultant capacity and widening issues, further air quality deterioration and noise issues impacting journey times and the surrounding communities beyond the study corridor.

Three representative tunnel alignments were evaluated to identify the range of costs, ability to accommodate a potential interchange along Huntington Drive and ventilation buildings, and other issues relevant to the feasibility of a tunnel solution. Figure 2 provides an illustration of the three generalized alignments that were considered.

Alignment A would follow a corridor approximately along the previously proposed Meridian at-grade alignment, with the advantage of passing under property previously acquired by Caltrans for highway development. It also gives a fairly direct route, thereby shortening the tunnel, which would become just over 4 miles in length (21,160 feet).

The alignment assumes gentle horizontal curves of over 10,000 feet radius to allow good visibility and speed standards; vertical grades from 1.95 % to 3% at the steepest rise up to the north portal are also assumed. The tunnel would pass mainly under residential land uses.

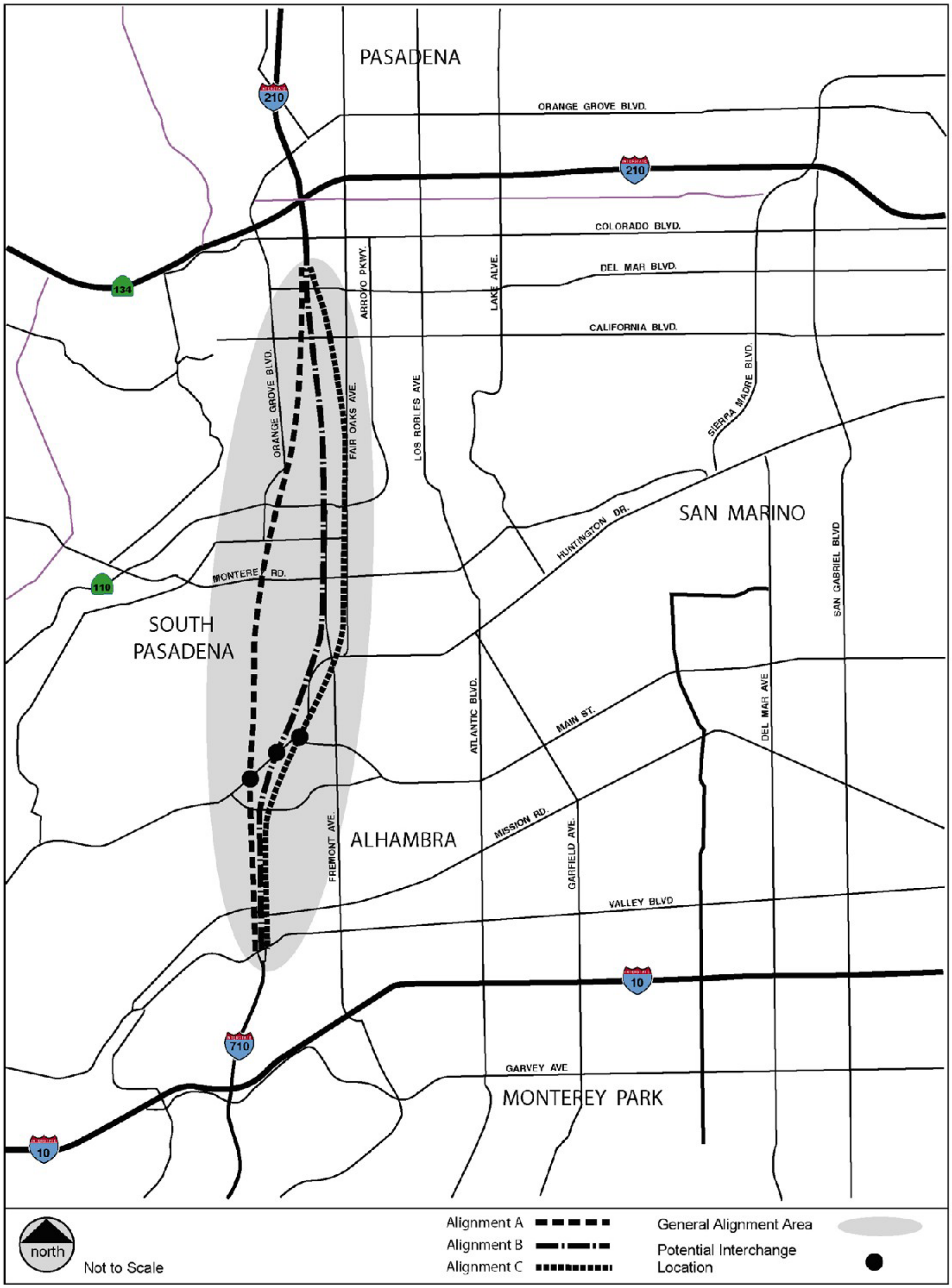
Alignment B would follow a slightly longer alignment at 4.05 miles (21,390 feet) and would pass around the existing Fremont Avenue corridor and would require horizontal radii of between approximately 8,000 and 20,000 feet, with a similar profile grade range. The grades employed would range between 1.20% and 2.89%. This alignment would pass under mainly residential and some commercial land uses.

Alignment C would be further east, passing along the Huntington Drive and Fair Oaks Avenue corridor with a length of 4.12 miles (21,740 feet). The grades employed would range between 1.30% and 3.55%. This tunnel would pass under a mix of residential and commercial land uses.

Alternative horizontal tunnel alignments within the study corridor are representative of the likely range of alignments that may be subsequently evaluated. These initial example alignments assumed uniform geological conditions based on the information reported in Chapter 3.

The ends of the alignment are defined laterally by the locations of the termination of the I-710 freeway at Valley Boulevard in the south and the resumption of the I-710 freeway at Del Mar Boulevard in the north. Most of the intervening land along the representative alignments is residential or commercial properties, which have proved to be unsuitable for at-grade solutions in the past and therefore the possible tunnel solution has been assumed to extend for much of the gap.

Figure 6-2 Alignment Map



6.4.2 Portal Locations

Locations for the portals could not be selected as part of this initial study but assumptions were made in order to assess potential impacts and identify approximate costs. In later stages of a tunnel project extensive investigation of site conditions would be required to determine the portal locations. These would include geotechnical, environmental, and traffic considerations relating to the approaches, local road layout, and sites of ventilation and other tunnel related structures.

Southern Portal
The southern portal location has been assumed in the same place for all three representative alignments in an industrial area just north of Mission Road. Much of this land was previously acquired by Caltrans and it provides a suitable site for location of the deep tunnel portal excavation. From the termination of the current I-710 pavement, the profile of the new highway would continue downward to pass under Valley Boulevard, the double-tracks of the Union Pacific Railroad and Mission Road to the point where the southern portal would be located south of Concord Avenue. This would require construction of new bridges to carry Valley Boulevard, the railroad, and Mission Road over the extension of Route 710 at the southern approach to the tunnel. A new bridge would also allow for the realignment of Mission Road where it currently has a sharp reverse curve alignment bending at the boundary between the Cities of Alhambra and Los Angeles.

It is assumed that the portal construction would involve a large excavation approximately 90 feet deep to allow for 50-foot diameter tunnels for cross-section options A1 and A3, and around 70-foot diameter tunnels for cross-section option A2. It is envisioned that an extensive landscape berm and planting would be necessary to provide good screening of the visual impacts from this element of the tunnel during construction and operation stages. Noise barriers may also need to be incorporated into the site to counter adverse local noise impacts. The land required for this portal would be largely within the industrial land that has already been acquired by Caltrans and a few, if any, additional lots in the area.

Northern Portal
The northern portal is assumed to be situated at the termination of the existing portion of the Route 710 ‘stub’ just north of California Boulevard. Again most of the land at this location has been previously acquired by Caltrans, and the depth of the portal excavation would be similar to that for the southern portal. The portal would be connected a little further north to the existing roadway at Del Mar Boulevard.

Once more, the use of landscaping and barriers would relieve many of the visual and noise impacts of the portal area from the surrounding residential and commercial areas. The land required for this portal would be largely within the open undeveloped areas and residential land that have already been acquired by Caltrans and a few, if any, additional lots in the area.

6.5 Profiles

In profile, the topography generally falls from the north down to the south. At this initial stage the assumption has been made that the tunnel would nominally be aligned to provide some 100 feet of cover over the top of the tunnel structure. The profile would follow the surface except at the portal approaches where steeper grades would be needed to achieve adequate cover. The preliminary tunnel profiles provide a continuous roadway grade between 1.2% and 3.55% depending on the alternative alignment. It appears from a physical perspective that an alignment can be identified that will accommodate a profile grade of 2% to 2.5%. A profile assumed at this stage is indicated in Figure 6-3.

6.5.1 Cross-passages and Refuges

Cross-passages are typically constructed in long tunnels to provide access to the adjacent tunnel. National Fire Prevention Association (NFPA) 130 guidelines recommend cross-passages between parallel tunnels to allow safe refuge from smoke and haze, and to allow occupants to pass to the safety of the parallel tunnel. These cross-passages are expected to be smaller diameter tunnels, perhaps 20 ft in diameter, and driven from one main tunnel to the other.

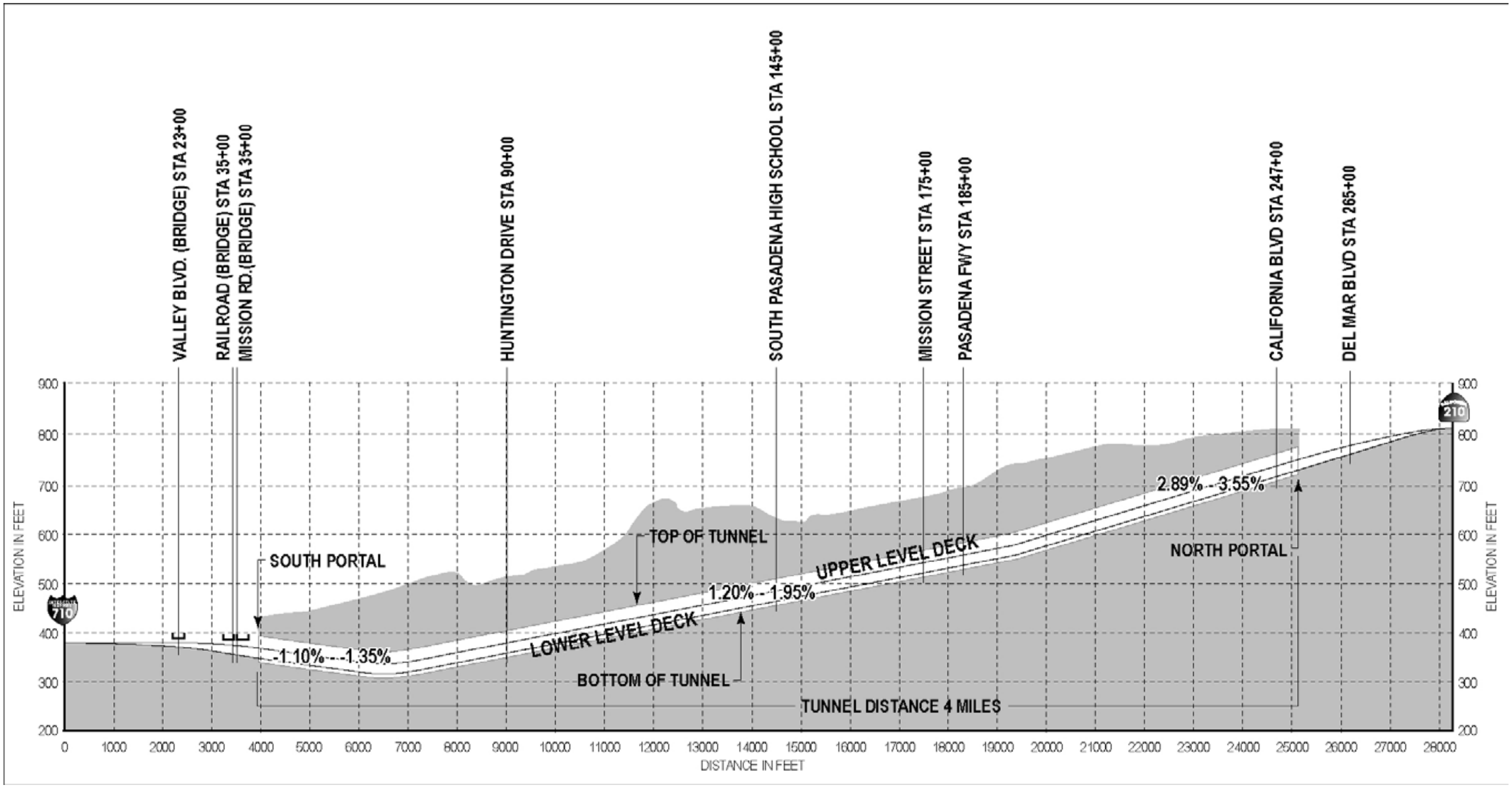
Safety refuges may also be provided to contain emergency equipment and a safe breathing environment for relatively short periods of time. Cross-passage and refuge spacing and functions would be subject to final design criteria developed during final design.

6.5.2 Shafts for Access and Ventilation

A minimum of one mid-tunnel shaft will be required for the tunnel ventilation building, which could also include emergency access. The final number, function, and locations of shafts would be the subject of a future full analysis of ventilation requirements, but initial analysis indicates that a single mid-point ventilation building would be able to adequately serve this tunnel. This is explained in more detail late in this chapter. The final depth and dimensions of the shaft will be established based on the ventilation requirements for the number of traffic lanes, tunnel vertical alignment, and cross sectional area. Connecting tunnels (also called “adits”) to the shaft(s) would be designed and constructed using similar construction methods to the cross-passages. Further shafts, if necessary, may also be designed to provide multiple functions during construction as well as accessing the tunnel for emergencies and for operations and maintenance of the facility.

If the Huntington Drive interchange is adopted, then emergency evacuation to the parallel tunnel would not be possible and the ramp tunnels would require access shafts to the surface at intervals along their length.

Figure 6-3 Typical Profile



6.6 Tunnel Ventilation System Facilities

The initial review of tunnel ventilation requirements is included in Chapter 4 and this aspect has some influence on tunnel configuration and alignment.

Location of the ventilation buildings will require extensive investigation. Suitable sites will be required within the existing mainly residential and commercial areas somewhere near the mid-point of the tunnels. Selection of this surface site will have an important influence on the chosen alignment, as it is desirable to locate the building over or nearby the tunnel.

The ventilation buildings would be required near the Northern and Southern Portals and at one mid point location (possibly two mid-point locations) and suitable sites would need to be identified. The selected mid-point location(s) would impact the alignment although it is feasible to locate the ventilation structure reasonably offset from the main line of the tunnel with additional tunnels/shafts and at additional cost.

The two portal ventilation buildings would need to be at or immediately outside to the portal entrance and it appears that sufficient space could be available at the currently assumed sites.

The ventilation scheme involved in each case is assumed to be a longitudinal type, which introduces air flow into the tunnel at the portals and creates a longitudinal stream of air within the roadway and exhausts to the opposite portal. For these tunnel configurations it is anticipated that the longitudinal ventilation will be accomplished employing Saccardo Nozzles at the portals and one or two intermediate points along the tunnel. (See Figures 4.9 and 4.10) These nozzles are specially designed to create high velocity air flow. These chambers would then be connected to fan buildings used to house an array of fans that would control air flows under particular circumstances, varying from normal operation to air flows required in response to particular situations such as fire and smoke control in the tunnel. It is therefore desirable that the ventilation building is close to the tunnels and located above the two tunnels, if local site constraints allow.

This type of system is unlikely to require fan installation within the tunnel cross-section. This option is space efficient and lends itself well in the single-deck or double-deck tunnel cross-sections. The double-deck tunnel configuration has limited space for mechanical features as compared to single level cross-section and use of Saccardo Nozzles to longitudinally ventilate the tunnel is practical.

The fans could be housed in ventilation buildings largely located below ground with a stack above the surface to disperse exhaust air from the tunnel and with separate intakes to direct fresh air into the tunnel. Selecting the location for the stacks requires extensive investigation to determine local effects governing dispersions and other environmental and land use considerations.

6.7 Tunnel Approaches

A portion of the freeway outside of the tunnels would need to be re-constructed to transition Route 710 from a surface freeway into a subterranean facility. On the southern end of the gap, the Route 710 freeway would be extended northward beyond its current terminal at Valley Boulevard. The freeway profile would need to be lowered to go under Valley Boulevard, the Union Pacific Railroad tracks, Mission Road and ultimately match the grade entering the portal. On the northern end, the profile of the freeway near California Boulevard may need to be lowered as the roadway approaches the northern portal. For this approach it may be possible to avoid impacting the existing bridge at Del Mar Boulevard, but this would require more detailed examination at a future stage.

An additional feature common to each of the tunnel alternatives with the stacked roadway configuration (cross-section options A1, B1 and C1) is the need for the freeway to be split from a single at-grade level into two vertically separated levels so that two lanes of traffic enter the upper and lower levels of the stacked tunnels. In advance of the tunnel portals, the freeway will split horizontally into two two-lane roadways, then these roadways will transition vertically and horizontally until the roadways are directly above/below each other as they enter the tunnel. Upon exiting the stacked tunnel, the stacked roadways will transition back into a four-lane freeway on a single plane. These tunnel approach roads would fall outside each portal. This vertical separation would require structural ramps/underpass retaining wall structures outside of the portals.

In the case of the cross-section options A2, B2, C2, a wider single level approach may be required. All cross-section options may require retaining walls at the portal areas. In all cases, the available land would be largely adequate with the use of retaining walls.

6.8 Tunnel Construction Requirements

Normally, construction work areas might have some influence on alignment, but in this case the available areas in the existing right-of-way near each portal offer suitable work areas for establishing muck handling facilities for off-site disposal, and for assembling and dismantling of the tunneling equipment such as the TBMs.

Mid-point access to the tunnels has not been considered necessary at this early stage. Should this be required, a suitable surface site at the head of a shaft would likely be difficult to locate, given the largely residential nature of the local cities. However potential sites do exist within the study area and if needed they may also influence tunnel alignment. Construction activity would still be required to construct the mid-point ventilation building(s) and stack.

Disposal of tunnel spoil material has at this stage been assumed to be via the existing 710 and 210 freeways using the direct access available. The possibility of utilizing the Union Pacific railroad near the southern portal could also be investigated further, and it appears possible that additional rail sidings and loading facilities could be temporarily introduced at this location.

6.9 Tunnel Operational Requirements

The reduced standard tunnel options can potentially reduce costs and help tunnel viability. It is possible in the tunnel environment to adopt closer monitoring and control systems to improve safety and therefore allow some reduction in standards without loss of safety.

Other tunnel properties have successfully employed measures such as the control or prohibition of lane changes inside the tunnel, and the use of CCTV and lane monitors to enforce these measures. Control systems such as variable message signs are adaptable to a number of circumstances and used to indicate lane closures, changeable speed restrictions, and other information and these can be of great value in directing tunnel users safely. Good surveillance systems can also reduce hazards by allowing rapid response to incidents. Such systems along with firm enforcement of tunnel regulations can allow the more efficient use of space and reduction in normal external highway standards such as lane and shoulder widths.

With modern technology it is also possible to house the control and administration center either on the tunnel site or at a more remote location, depending upon available land. In this case, it is possible that operational facilities, such as traffic control, maintenance, staff facilities, and breakdown services, can all be based at the portal areas.

At this stage it is anticipated that the following safety provisions could be considered for inclusion in the project:

- The operator could monitor traffic approaching entering the tunnel to divert vehicles and trucks assessed to be carrying hazardous materials, or oversized or dangerous loads, for example. In some properties vehicle restrictions are imposed to reduce the risk of incidents or certain vehicles are segregated to be escorted through the tunnel or their use of the tunnel may be restricted to certain times.
- Lane controls could be considered to prohibit lane changes within the tunnel to reduce accident risk and the use of truck-only lanes could also be considered
- Lateral walkways would be provided on one or both sides of the traffic lanes to allow operations staff and pedestrians in emergency situations, to pass along the tunnel out of the traffic lanes. These would be raised above the roadway level and link to the cross passages.
- Tunnel Cross passages have been assumed at 600 feet intervals along the tunnel. These would allow tunnel users to evacuate one tunnel to a safe place of refuge in the adjacent parallel tunnel, in the event of an incident. This could be monitored and controlled by the operations center. It would also allow access by operator and emergency personnel to an incident. The passages would include special entry doors and ventilation systems to prevent movement of smoke along the escape paths.
- In the case of any ramp tunnels for the interchange options a shaft would be required to the surface at the same intervals along the ramp tunnels, to allow at escape route and entry to the tunnel by the operator and emergency personnel.

- Fire detection and smoke monitoring equipment could be included to assist the operator in controlling a fire within the tunnel. The ventilation systems would also be designed to control smoke in a fire situation and provide a safe path to evacuate the affected area of the tunnel.
- Tunnel sprinklers, fire deluge systems and extinguishers would be considered as appropriate to assist in control of fire and smoke within the tunnel, and these would be monitored at some central control point
- CCTV systems could also assist the operator in monitoring normal operations and extraordinary incidents
- Changeable message signs could be included to assist in the control of vehicles and lane management and also to direct users to the egress points in the event of an incident
- User assistance telephones would be included at intervals along the walkways to allow tunnel users to contact the control center. Public Address systems could also be considered if appropriate to give advice to users during incidents within the tunnel
- Niches could also be included at points along the tunnel to house emergency equipment and allow another point of refuge.
- Emergency lighting could be included to provide light in the event of a failure in the main tunnel lighting system
- Breakdown recovery vehicles would be available on a 24/7 basis to assist tunnel users as required.

6.10 Huntington Drive Interchange

The possible need for an interchange would influence the alignment of the main tunnel. For the purposes of this feasibility study, we assumed the mainline tunnel profile would remain deep instead of raising the tunnel profile closer to the surface to accommodate the potential interchange. The advantage of keeping the tunnel deep is that the mainline tunnel could be constructed by TBM or SEM techniques. As previously noted, this minimizes the areas that may otherwise be subjected to construction by cut-and-cover methods which increase the degree of surface impact.

Chapter 3 discussed the inclusion of an interchange for non-truck traffic somewhere along Huntington Drive. The analysis concluded that the interchange would attract additional trips to the tunnel route and increase traffic on Huntington Drive and other local arterials, requiring additional lanes and intersection modifications to increase their capacity.

The feasibility of an interchange at Huntington Drive has been investigated and found to be possible in engineering terms for the three typical alignments. The interchange could be free-flow or signalized and serve all four directions including to and from the north, and to and from the south. Each ramp would involve open cut sections near the surface as they left Huntington Drive, transitioning to short sections of cut and cover tunnel before entering the main ramp tunnels that will likely use Sequential Excavation Method (SEM) excavation (each ramp assumed to be two lanes wide with shoulders).

At the surface, the interchange would require additional right-of-way acquisition. The layout of the interchange would be dependent upon the final identified traffic requirements and Caltrans' required standards.

The addition of the interchange would also impact the ventilation system for the tunnel, which would become essentially two additional tunnels from this perspective with the further addition of four separate ramp tunnels. This would involve the addition of probably two ventilation buildings and stacks to be located somewhere near the two merge zones where the ramps meet the main tunnels. The ventilation system with an interchange would be more complex and require detailed assessment before confirming the exact requirements. Potential sites for ventilation buildings and stacks would be one of the subjects of a detailed alternative analysis at a later stage aimed at minimizing the impacts involved.

Where the ramps merge with the main tunnel, extensive underground caverns would become necessary. In the case of cross-section option A1, breaking out the main TBM driven tunnel's concrete lining and extending the tunnel sequentially to form a chamber of over 80 feet span, would be required to merge as one lane to enter the main line tunnel. As this cross-section has two traffic decks, it has been assumed that the merge would be on the upper level and for autos only. In this case, the traffic and signage design would need to permit traffic to access required lanes to allow that movement with safety and convenience.

The ramp tunnels would also require emergency access/egress shafts at 600 feet intervals with small surface rooms to house the stairwells and possibly elevators. Finding suitable locations for these shafts would also influence the ramp alignment.

It is concluded that construction of this merge cavern is likely feasible using currently available tunneling techniques. It may prove more cost effective to combine this merge chamber with the additional ventilation buildings, within a deep structure within open cut, constructed from the surface. It would require more detailed investigation at a later stage.

In the case of the SEM mined main tunnel (cross-section option A2), the addition of the merge would require an increase to the main tunnel to around 100 feet span, which is outside currently anticipated advances in tunnel engineering. However this might similarly be constructed in conjunction with the additional ventilation buildings, and could be investigated further once more detailed knowledge of the ground conditions became available.

Similarly, the cross-section option B2 with a span requirement of around 110 feet is outside currently anticipated advances in tunnel engineering. Cross-section option C2 with a span of 100 feet may fall nearer to the limit of current excavation limits in the anticipated ground conditions,

For the cross-section option 3, the outer 2-lane tunnels would accommodate the ramp tunnels. The stacked center tunnel would not have access to the interchange. Similarly, cross-section options B3 and C3 would also offer more easily achieved interchange with the outer 2-lane tunnels.

If it is decided that the interchange would be required, then these aspects will require more investigation in detail.

7.0 Architectural Renderings

Consideration has been given to developing some initial architectural design concepts for the surface project elements to explore typical treatments that might be considered in developing architectural designs at some later stage of development of the project.

A survey of tunnel design features from around the world revealed a variety of approaches to designs of surface elements such as portals and ventilation buildings. It revealed a range of designs that demonstrated regional styles and a wide range of project budgets devoted to these elements. This has produced designs that vary from utilitarian, industrial style buildings and structures to others that attempt to minimize impacts or incorporate landscape and textural elements.

The Type A, "Portal Wall" dominant options shown in Figure 7.1, is taken from completed tunnels in Europe, Asia, Australia and the USA. Many are characterized by bold, "high tech", typically curvilinear forms expressive of their function and the materials from which they are constructed. Some incorporate landscape elements to soften and conceal ventilation and spaces to house other functional tunnel related systems.

Combined with their large scale, these forms are associated with dramatic architectural statements, dominating their surroundings. There is some variation between tunnels that are funded by public funds and others that have adopted more dramatic forms and cladding styles for privately funded operators under franchise agreements, particularly in Asia.

For the Route 710 tunnel the portals would be located in densely developed residential and commercial areas and at this stage the renderings produced attempt to demonstrate typical concepts that might initiate thinking to the possible range of designs that might be suitable for portals and various tunnel related buildings that would be required. For this project, Type B – "Landscape" dominant options shown in Figure 7.2, in contrast, defer to and blend with their surroundings. Prototypes for these are abundant in southern California, where our climate has inspired and facilitated the creation and development of architectural styles, fully integrating buildings and vegetation into unique "context sensitive" designs.

The project area is particularly abundant in examples of these styles, most notably the "Arroyo Craftsman" traditions originating in the early 20th century and carried forward into contemporary work in the surrounding communities, and work inspired by the work of the architectural master F. L. Wright, also originating in the early 20th century, and carried forward in contemporary work. Both of these styles make use of architectural scale, massing, surface material, texture and color to blend with their surrounding landforms, native oak and sycamore habitats, and introduced Mediterranean landscape styles, characterized by skyline eucalyptus trees and a wide array of subtropical flowering plants.

It is intended that the initial ideas shown here would serve as a catalyst to a far wider examination of designs for the portals, ventilation and other tunnel operational facilities that would be required if the project progresses. This "Context Sensitive Design" approach is illustrated in the accompanying renderings.

7.1 Portals

7.1.1 Type A Portal Wall Dominant Options

The Type A options are characterized by bold, "high tech", curvilinear forms expressive of their function and the materials used. Some incorporate landscape elements to soften and conceal ventilation and spaces to house other functional tunnel related systems. These forms are associated with large scale, dramatic architectural statements, dominating their surroundings.

Figure 7.1 Tunnel Portal Prototype Images

7.1.2 Type B Landscape Dominant Options

"Landscape" dominant options defer to and blend with their surroundings in Southern California, where our climate has inspired and facilitated the creation and development of architectural styles, and fully integrate buildings and vegetation into unique "context sensitive" designs.

Figure 7-1 Landscape Prototype Images

7.1.3 Portal Renderings

Figure 7-2 Portal Option 1

This sketch illustrates a view of simple arched portals in a landscape dominant context.

Figure 7-3 Portal Option 2

This sketch also illustrates a view of portals in a landscape dominant context, structurally integrating the portal with the surrounding landforms by incorporating vertically and horizontally stepped portal headwall elements.

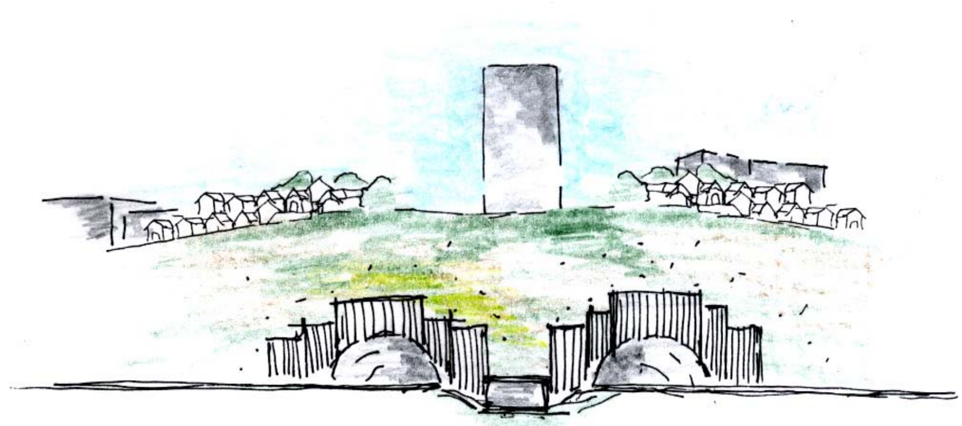


Figure 7-4 Portal Option 3

This sketch illustrates a further integration of portal headwall elements and the surrounding landscape by adding plantings to the stepped portal terraces.

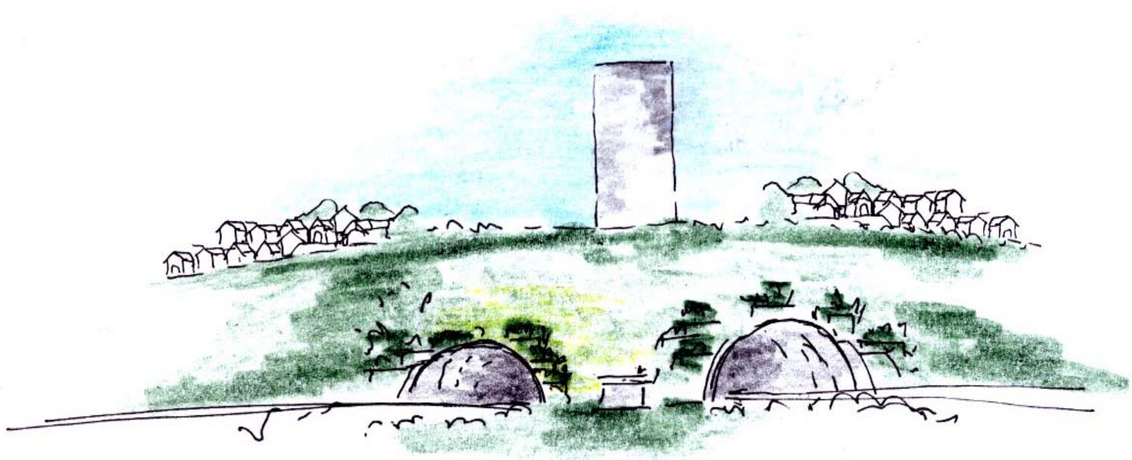


Figure 7-5 Portal Option 4

This sketch illustrates a landscape dominant arch portal design, with stepped elements

Figure 7-6 Portal Option 5

This sketch illustrates a landscape dominant "hybrid" arch and stepped planted terrace design, maximizing integration of structures, surrounding landforms, and planting.

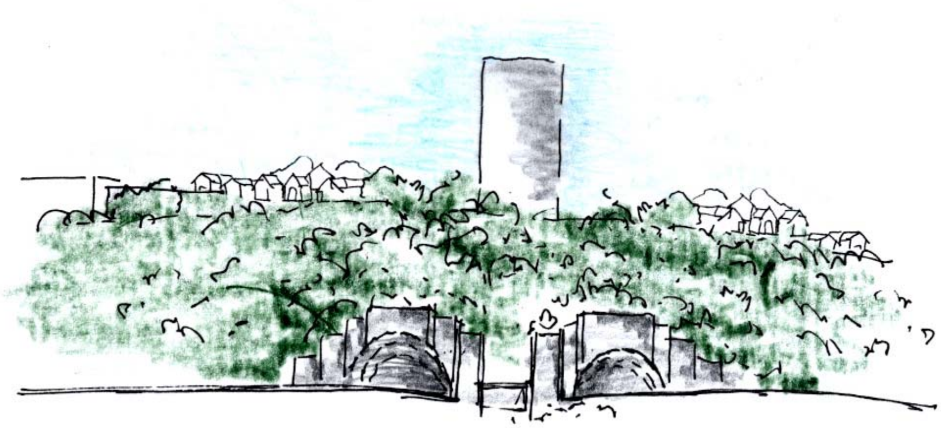


Figure 7-7 Portal Option 6

This sketch illustrates a landscape dominant integration of the Tunnel Portal Roadway Approach with its surroundings through landform and planting design.

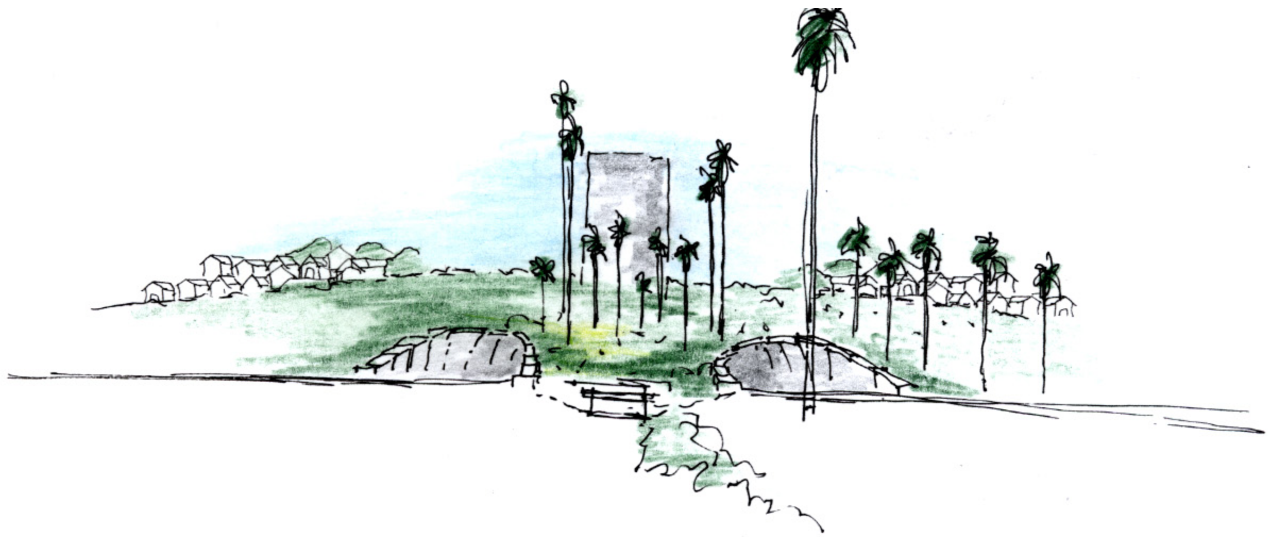


Figure 7-8 Tunnel Roadway Approach

This sketch illustrates a landscape dominant integration of the Tunnel Portal Roadway Approach with its surroundings through landform and planting design.

Tunnel Ventilation Structures

Figure 7-9 Ventilation Tower Profile 1

This Sketch illustrates a typical above ground cross section of a tunnel ventilation structure, showing relative heights of surrounding trees planted a varying distances from the structure, and human scale figures. Skyline palms, eucalyptus and conifers can equal or exceed the 100 foot height of the tower, and massed plantings of local native trees such as Live Oaks can screen sight lines from surrounding properties.

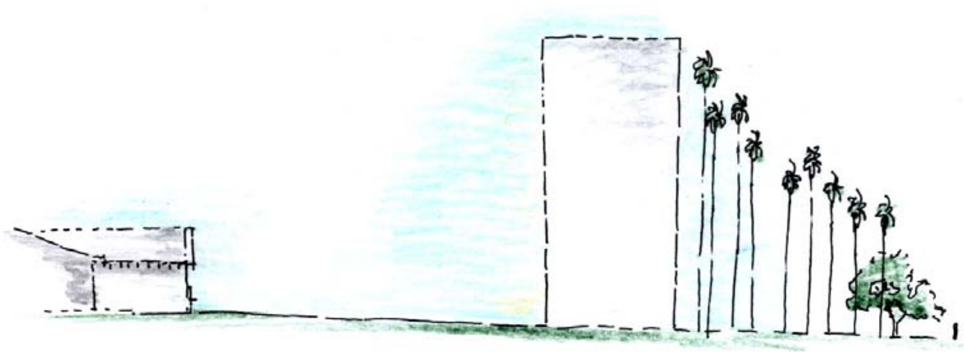


Figure 7-10 Ventilation Tower Profile 2

This sketch illustrates an example of a ventilation tower blended into the local landscape context through a veil of screen tree planting and architectural detail compatible within an historic context of Mediterranean architectural style. In this example, scale of architectural design detail elements is used to further integrate the tower into the surrounding environment.

Figure 7-11 Ventilation Tower Profile 3

As in the example shown in Figure 10, this sketch illustrates an example of a ventilation tower blended into the local landscape context through a veil of screen tree planting and architectural detail. In this example, the prototype is derived from the late 19th and early 20th century water towers common in the area.

Figure 7-12 Ventilation Tower Profile 4

This sketch illustrates in both plan and elevation views, how planting of trees of varying types and heights at varying distances from a tower will screen views from surrounding locations.

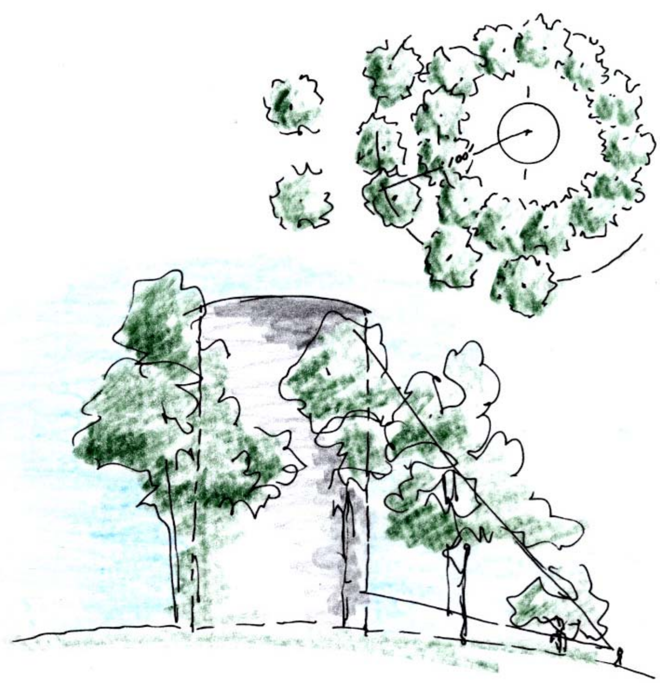


Figure 7-13 Ventilation Tower Profile 5

This sketch illustrates a more developed example of a ventilation tower blended into the local landscape context through a veil of screen tree planting and architectural detail. In this example, the prototype is derived from the late 19th and early 20th century water towers and incorporates craftsman style detailing and a clock element.

Figure 7-14 Ventilation Tower Profile 6

This sketch also illustrates a more developed example of a ventilation tower blended into the local landscape context through a veil of screen tree planting and architectural detail. In this example, the prototype is influenced by the landscape inspired approach developed by the early 20th Century architectural master F. L. Wright, and carried forward in contemporary work.

Figure 7-15 Ventilation Tower Landscape Feature

This image illustrates the potential of dense massing of Washington Palms to provide screening of tower and other infrastructure elements.

Figure 7-16 Ventilation Tower w/ Cross Section

This sketch illustrates the relative scale and relationships of tunnel, ventilation infrastructure and tower elements.

Ventilation infrastructure and towers are located at near the portals at each end of the tunnel, and at a location near the tunnel midpoint. Only the ventilation tower element would extend above ground at each location.

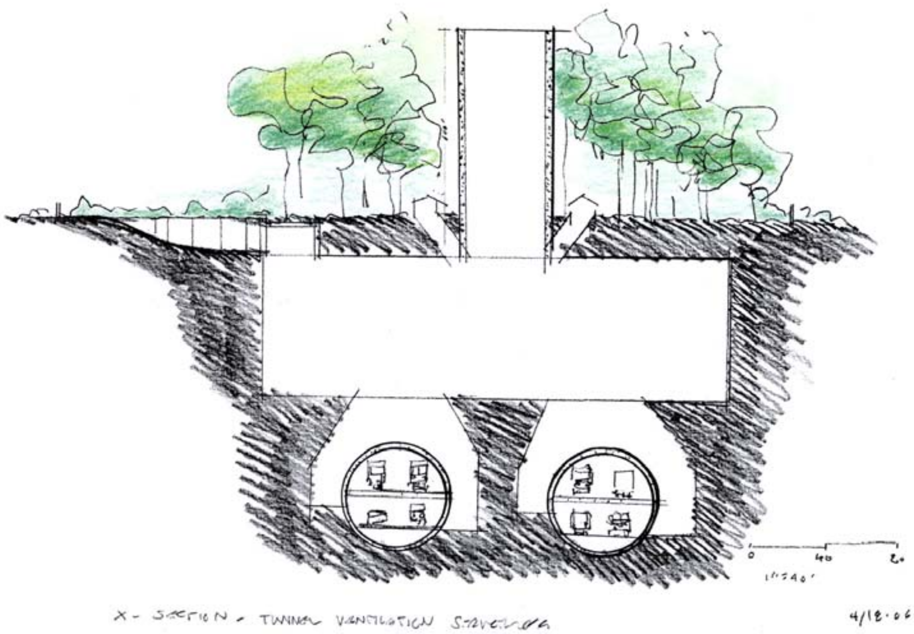
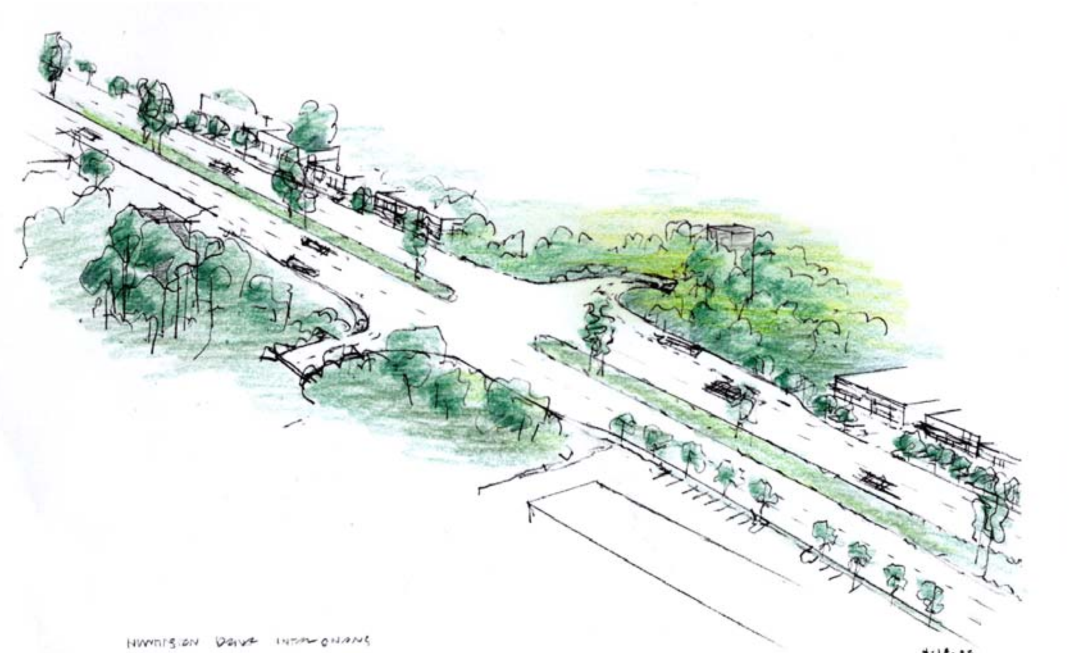


Figure 7-17 Ventilation Tower- Bird's Eye View

This sketch illustrates a bird's eye view of a typical ventilation tower.



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8.0 Preliminary Environmental Analysis

8.1 Introduction

The preliminary environmental analysis under this study has not sought to provide an environmental document. This chapter summarizes the preliminary level of environmental analysis based upon early assumptions of the project description to support the feasibility study and to identify any potential key issues associated with the feasibility of any tunnel alternative to complete the Route 710 'gap'. If it is decided to explore a tunnel option in more detail, then the subsequent changes in project description, alignments, or environmental laws would require a more detailed evaluation of the issues raised under this initial study, with formulation of a comprehensive mitigation strategy.

Preliminary Environmental Analysis for the conceptual Route 710 tunnel alternatives has considered the existing conditions, the environmental constraints, the potential impacts that could occur within the immediate Route 710 tunnel study area and also regionally, and suggested typical mitigation measures , all of which would require further examination if the tunnel option is more fully investigated.

8.2 Existing Conditions

The following subsections provide a review of the different environmental resources that are in the project study area.

8.2.1 Noise

Within most of the project study area are residential streets which provide a quiet environment.
Noise-sensitive residential uses in the vicinity of the project study area include mixed residential and industrial near the southern portal located north of Valley Boulevard, residential areas near the potential interchange at Huntington Drive, and a mixture of residential and commercial near the northern portal. Currently, motor vehicles and trains are the two major noise sources in the project study area. Impacts to the regional network beyond the study area and mitigations in regional context may need to be considered in future studies.

8.2.2 Air Quality

The project study area is located in Los Angeles County, within the South Coast Air Basin (SCAB), which is governed by the South Coast Air Quality Management District (SCAQMD). The Clean Air Act (CAA) defines National Ambient Air Quality Standards (NAAQS) for six criteria pollutants that have adverse effects on human health. The South Coast Air Basin (SCAB) is designated as non-attainment for carbon monoxide (CO), particulate matter smaller than ten microns (PM_{10}) and fine particulate matter smaller than two and one-half microns ($PM_{2.5}$), and both the 1-hour and 8-hour ozone (O_3) standards because the area exceeds the

established limits. The State of California, as permitted by the Clean Air Act, has also established California Ambient Air Quality Standards (CAAQS), which are generally stricter than the federal standards. The SCAB is designated as non-attainment for PM_{10} and $PM_{2.5}$, and ozone and is designated as unclassified for hydrogen sulfide and visibility reducing particles.
The project study area is located in a non-attainment area that frequently exceeds national ambient air quality standards. The SCAQMD monitors air quality in the general project area at the Pasadena South Wilson Avenue monitoring station. According to the most recent data for this station, 2005 hourly O_3 levels exceeded the national standard on two days and CO was within the national standard during 2005. PM_{10} and $PM_{2.5}$ are not monitored at this station but are monitored at the City of Los Angeles North Main Street station. The 2005 $PM_{2.5}$ levels exceeded the national standard on two days. PM_{10} was within the national standard in 2005.

The air pollutants to consider for analysis of this project study include CO, PM_{10}, $PM_{2.5}$, and diesel particulate matter (DPM). Particulate matter from diesel-fueled engines has been identified as a toxic air contaminant (TAC) by the California Air Resources Board (CARB) and DPM is considered a TAC under California's air toxics program. These air pollutants could be compared with the applicable national ambient air quality standards (for CO and PM_{10}), and CARB guideline values (for DPM).

8.2.3 Land Use

The project study area traverses the Cities of Los Angeles, Alhambra, South Pasadena and Pasadena in the San Gabriel Valley. It is located in an urban city context with land uses consisting of single and multi-family residential, public facilities, open space, industrial manufacturing, and general commercial uses. Within the City of Los Angeles, the project study area is located in the North East Los Angeles Area Community Plan and the neighborhoods of El Sereno and Monterey Hills. Land use adjacent to the southern portal location is mostly industrial with some residential; whereas land use adjacent to the northern portal location is a mix of residential and some commercial. Generally, land use along the alignment would be residential, with mixed commercial and retail along sections of the main corridors such as Huntington Drive, Fremont Avenue and Fair Oaks Avenue, and some areas with educational and community uses.

8.2.4 Historic Properties

The project study area has a rich cultural history. Modern cultural history of Los Angeles dates to the establishment of the pueblo (town) in 1781 by a Spanish Expedition. A number of historic structures or districts are listed or eligible for listing on the National Register of Historic Places. These include the following:

- Arroyo Seco Parkway, Pasadena Freeway
- Short Line Villa Tract Historic District, Los Angeles (El Sereno)
- South of Mission Historic District, South Pasadena
- South Pasadena Historic Business District, South Pasadena
- North of Mission Historic District, South Pasadena

- Oak Lawn District, South Pasadena
- Pasadena Avenue Historic District, South Pasadena
- Markham Place Historic District, Pasadena

Due to the established age of the area, structures that are over 50 years old may need to be analyzed to determine if they may be eligible for listing on the National Register of Historic Places. In addition, the Section 4 (f) related to parkland and recreational land uses is discussed in 8.2.8.

8.2.5 Archeological Impacts

The cities of Los Angeles, Alhambra, South Pasadena and Pasadena have a rich history and culture with remnant evidence of native habitation prior to the arrival of the Europeans. The city of Pasadena falls within the Gabrielino territory and South Pasadena has served as a gateway to travel and commerce for aboriginal peoples. Pre-historic archaeological sites have been identified within the cities of Los Angeles and Pasadena.

8.2.6 Hazardous Materials/Waste

There are some facilities within the project study area that handle, use, and/or store hazardous materials and/or waste. Sources of hazardous materials/waste include any potential leakage from hazardous waste sources (such as an underground storage tank at a gas station), which may leach into the adjacent soil and/or groundwater. Other potential sources located within the study area include older homes (such as lead based paint and asbestos) and traffic striping.

8.2.7 Storm Water and Drainage

The project study area is located within the Los Angeles River Watershed over four basins: the Laguna Channel, Alhambra Wash, Arroyo Seco Channel and the Alhambra Avenue Drainage (a land area of over 834 square miles).

Three main types of water sources that would need to be considered during design of the tunnel include: groundwater seepage into the tunnel, storm water discharge during rain events, and maintenance of the tunnel (cleaning). Shallow borings, conducted in 1999 all encountered groundwater between approximately 10-14 m depth during the winter, near the boundary between Quaternary alluvium and bedrock. The tunnel drainage system would be needed for the collection and discharge of groundwater seepage and water used to clean and maintain the interior of the tunnel to a sanitary sewer, and run-off to storm water drains.

8.2.8 Parklands and Recreational Facilities

Section 4(f) of the federal Department of Transportation Act of 1966 prohibits use of any publicly owned land from a public park, recreation area, wildlife refuge, or historic sites unless there is no feasible and prudent alternative to the use of such land or the project includes measures to minimize harm.

The Federal Highway Administration released a "Revised FHWA Section 4(f) Policy Paper" on March 2, 2005, which included the revised guidance that tunneling under the above mentioned land would be subject to the requirements of Section 4(f) if one of the following three circumstances occurs:

- Disturbs any archaeological sites on or eligible for the National Register of Historic Places which warrant preservation in place
- Causes disruption which would permanently harm the purposes for which the park, recreation, wildlife or waterfowl refuge was established
- Substantially impairs the historic values of the historic site.

A number of parks and recreational facilities are located within the project study area. Further investigation is needed in future phases of the project to determine whether Section 4(f) will apply. Local parks and recreational sites in the vicinity include the following:

- Sierra Vista School Playground, Los Angeles (El Sereno)
- South Pasadena High School Playing Field, South Pasadena
- South Pasadena Library Grounds, South Pasadena
- Orange Grove Park, South Pasadena
- El Centro School Playground, South Pasadena
- Singer Park, Pasadena

8.3 Environmental Constraints

Environmental constraints that might impact the feasibility of the tunnel alignment are discussed below.

8.3.1 Location of Portals

Identifying the portal locations would be a critical decision with the potential to have a number of different environmental impacts. These impacts include those from traffic noise, air quality levels, and visual impacts.

Traffic Noise

At the tunnel portals, there is a potential to increase traffic noise because of the hard sound reflective surfaces of the tunnel portal that would amplify the traffic noise. The project can be designed to control and minimize traffic noise by using sound absorptive finishes and treatments at the tunnel portal surfaces. The landscape and site formations would need to integrate identified noise mitigation within the constructed features and landscape design after a full environmental analysis.

Air Quality Levels

At the entrance or exit of the tunnel, there is a potential for concentrations of air pollutants, such as carbon monoxide and Diesel Particulate Matter, PM 2.5.

Air emitted from a tunnel may form a plume of pollutants discharged by vehicles using the tunnel leading to emissions that could reduce air quality locally, include the emissions from the following sources:

- Emissions exhausted out of the tunnel portal and tunnel portal mechanical ventilation fan buildings
- Emissions from the vehicles traveling on roadways immediately downstream of or approaching the portals
- Emissions from the traffic on the nearby street network
- Background levels appropriate for the area

Visual Impacts

The portals and the approach highway would present new physical structures within the existing visual environment. Such visual constraints would require integration into the surrounding community. In particular the use of context sensitive design would need to be considered within residential areas which are usually “small-scale” in design and include pedestrian oriented features and facilities such as landscaped setbacks and tree-lined avenues. The visual mitigations could include landscape berms and banks and plantings. Some initial examples are included in Chapter 7 to serve as starting point for future study.

8.3.2 Ventilation Buildings and Shafts

The operation and maintenance of the ventilation buildings and shafts have a potential for environmental impacts.

Noise

The tunnel will require ventilation fans that would be operated during normal conditions to provide continuous ventilation to the tunnel and to control smoke during emergency conditions. Under normal operating conditions and testing conditions the fan noise would be subject to the requirements of the local or county noise ordinance. They are not subject to any noise level limits when operated during an emergency. To control fan noise, the design of the ventilation system should allow adequate space for sound attenuators both on the intake and discharge sides of the ventilation fans.

Air Quality Levels

Ventilation stacks above ground would help to discharge and disperse air pollutants from within the tunnel. The potential constraint is the location of the ventilation shaft relative to sensitive receivers and the height of the shaft to adequately disperse and reduce pollutant concentrations of CO, PM_{10}, and Diesel Particulate Matter.

At the ventilation shaft, there is a potential for concentrations of air pollutants on nearby receptors (both ground level and elevated) and the downwash effects from the nearby buildings. Therefore, the location of the ventilation shaft potentially has significant impacts on the adjacent land uses (e.g., residential buildings, parks, industrial, etc.).

As the tunnel ventilation system will “concentrate” the vehicle emissions over the length of the tunnel, the design should consider the location and height of discharge to achieve a maximized atmospheric dispersion.

A number of highway tunnels around the world have included Electrostatic Precipitators (ESPs) or “Scrubbers” to address problems related to particulate matter. Scrubber systems only remove Particulate Matter and thus ESP technology only addresses part of the emissions picture. The use of Scrubbers in other countries is the result of circumstances that do not exist in the United States such as a high percentage of diesel vehicles in the vehicular fleet or roadway dust created by studded tires pulverizing the road surface.

Visual Impacts

Ventilation buildings and shafts would introduce physical structures within the existing visual environment. It is anticipated that a ventilation building and vent shaft will be located at both portals and near the mid-point of the proposed tunnel. The ventilation building near the portals would be integrated with the portals or in close proximity to the portals. The vent shafts are anticipated to be required at around 100 feet high, about 10 stories above the nearest sensitive receptor. This major vertical feature could represent a significant visual component that may be out-of-character with other structures in the area. The use of context sensitive design would be needed to integrate the ventilation buildings into the surrounding visual environment, primarily developed with 1- to 2-story structures.

8.3.3 Construction Related

Environmental impacts may occur during the construction of the tunnel.

At Surface Activities

On the ground surface, construction related constraints include noise and particulate matter coming from the operation of diesel powered equipment for the portal and ventilation building construction. Another constraint is the on-going construction operations at the staging areas. Noise and vibration levels may occur during construction at sensitive receivers along the project alignment, especially at the portals, ventilation building(s), and potentially at any interchange with Huntington Drive. To support underground tunneling, some surface activities could require 24-hour continuous operations such as removing tunnel spoils and temporary ventilation systems.

Below Ground Activities

Below the ground surface, construction related constraints include those related to the tunnel excavation. Two primary methods of subsurface excavation have been considered as part of this technical feasibility assessment. These methods are Tunnel Boring Machine (TBM) and Sequential Excavation Method (SEM), which are described in Chapter 4. Both methods will create ground-borne noise and ground-borne vibration associated with underground construction activities. These disturbances may be perceptible at the surface; however, they are limited to the duration of the local excavation activity. Another constraint could be the method chosen to remove the tunnel spoils during excavation either rubber tired vehicle or a steel wheel and rail muck train.

8.4 Potential Impacts that Could Occur and Typical Mitigation Measures

This section describes the typical environmental impacts that may occur and the typical types of mitigation that could be used to avoid, minimize or mitigate those impacts.

8.4.1 Noise

During Construction

Temporary noise barriers can be used to reduce construction noise levels from equipment operating at the surface. Consideration should be given to determine whether permanent noise barriers should be implemented initially if they provide the appropriate level of mitigation of future operation noise as well as construction activity noise. Construction activities during nighttime hours will be subject to noise level limits based on the existing ambient levels. No significant impacts are expected.

During Operation

Noise impacts during the actual operation of the tunnel are not anticipated to be above established noise thresholds as methods can be utilized to minimize noise levels. Soundwalls and sound absorptive treatments would be used at the portals to decrease the extent of noise emanating from the portal areas.

Sound attenuators for ventilation fans and tunnel portal jet fans would be used to reduce noise levels to the areas around the ventilation buildings to meet the level permitted by the local noise ordinance. The ventilation fan buildings have been assumed to be located beneath ground level to reduce impacts.

Additional traffic that would be circulated to surrounding roadways (I-10, SR 134 and I-210) beyond the study area would not result in any increased noise at these locations. The maximum traffic noise would occur at roadway capacity (1950 vehicles/lane/hour) operating at a free flow condition of Level of Service (69 miles per hour). Additional traffic volumes exceeding capacity on these regional roadways would reduce travel speed effectively reducing noise levels. If further analysis of the traffic increases shows an increase in noise impacts on surrounding roadways in the network, noise mitigation measures can be explored in detail during the environmental/design stages of the project.

8.4.2 Air Quality

During Construction

Typically, project related construction impacts would be localized, and predominant emissions would be nitrogen dioxide, carbon monoxide, sulfur oxides, and diesel particulate matter from diesel powered construction equipment; carbon monoxide emissions from worker vehicles, and PM_{10} or dust emissions from vehicles traveling on unpaved surfaces, or as a result of grading and other earthmoving activities.

There could be substantial PM_{10} emissions associated with excavation and tunneling activities (grading, excavation, creation of storage piles, loading of material onto haul trucks, etc.).

Implementing a fugitive dust program that could include measures such as site wetting and other controls would minimize impacts of construction. Maintenance of construction equipment emissions control systems could also be implemented to reduce construction impacts. It is anticipated that the application of these standard measures would reduce construction related air quality impacts to below a level of significance.

During Operation

Potential impacts of the vehicular emissions would be generated within the proposed tunnel and would be released to the atmosphere through the tunnel's two portals and the ventilation stacks. CO, $PM_{2.5}$, $PM_{10,}$ and DPM are pollutants of concern for this analysis. Particulate matter and diesel particulate matter would be considered because of the diesel vehicles that may travel through the tunnel.

The significance of localized project impacts depends on whether predicted CO, $PM_{2.5}$ and PM_{10} levels in the vicinity of the portals would be above or below the NAAQS and whether the projected increases in DPM near the tunnel portals would be above or below the SCAQMD's significant impact threshold.

If air pollutant levels were found to exceed these standards and thresholds, then the following potential mitigation measures would be considered:

- Raising the height of the ventilation shafts to increase atmospheric dispersion.

- Relocate ventilation shafts away from areas of sensitive land use.
- Revise the ventilation system to minimize the discharge at the portals.
- Modify the ventilation system at the portal to increase dispersion.

8.4.3 Historic Properties

During Construction

It is not anticipated that the Route 710 Tunnel project would require loss or removal of any historic structures. Potential impacts to historic properties could occur in relation to ground vibration and settlement during the excavation of the tunnel under historic properties and/or historic districts. This potential impact would be greater with shallower tunnel depths occurring near the portal locations.

It is anticipated that the ventilation structures could be located such that they avoid impact to historic structures. However, if Huntington Drive interchange were included this might pose more constraints due to its close proximity to the historic districts. If it were decided to proceed with an interchange at Huntington Drive, more vibration impact may occur at the Short Line Villa Tract Historic District.

The potential ground vibration impact would be temporary in nature as the tunnel boring machine passed underneath the historic property and/or historic district. Different construction techniques and building protection can be utilized to protect and minimize vibration and settlement to these structures.

No impacts on historic properties are anticipated beyond the actual tunnel corridor.

During Operation

The operation of rubber-tired vehicles within the tunnel would result in imperceptible ground vibration levels to the historic properties above. No impacts would be expected.

8.4.4 Aesthetics

The tunnel portal structures and ventilation buildings and shafts are large-scale structures that could have a major visual and aesthetic impact on the surrounding communities. Aesthetic treatments to the structures themselves, such as decorative architectural features and incorporation of art can be included in the design of the tunnel and associated structures to decrease their visual impacts and increase the aesthetics of their design. Softscape treatments such as landscape buffers, vegetated slopes and walls, and the conversion of remnant parcels into neighborhood parks can help blend the structures into the surrounding area, enhance the overall aesthetics of the surrounding area, and minimize visual impacts.

Architectural and urban designs for the portal structures, ventilation shafts, and surrounding areas should consider context sensitive design; visual quality; safety and operational requirements; security through environmental design; appropriate lighting; architectural treatments; and landscape interfaces. Workshops can be used to address key design issues with stakeholders. A focused community outreach and design process can help establish consensus on key design issues. A comprehensive landscape plan can be developed for integration of the physical structures into the surrounding community. The plan could incorporate features that meet the goals for aesthetic character and design for the area as established by the community's goals.

Some initial examples of portal and ventilation stack treatments are provided in Chapter 7 to indicate some potential mitigation ideas.

8.4.5 Archeological Impacts

Archaeological sites are not anticipated to be found within the project area.

8.4.6 Hazardous Materials and Waste

If hazardous materials are encountered during Geological boring activities, the cuttings would be properly disposed and the boring would be backfilled with bentonite grout. Any structures that would be demolished as part of construction will also undergo an evaluation for the presence of hazardous materials prior to demolition, in accordance with the Expedited Site Assessment (ESA) process.

Because dewatering activities may be necessitated by the proposed project, groundwater analyses will need to be performed, prior to issuance of the National Pollution Discharge Elimination System (NPDES) dewatering permit, to determine the type and extent of any hazardous materials/waste contamination.

8.4.7 Disposal of Soil During Construction

Another environmental impact relates to the disposal of soil during construction. Using trucks to haul soil to a landfill or other disposal site(s) via the freeway system would also have noise, air quality, and traffic impacts along the haul route. If the Union Pacific railroad spur is used (near the southern portal location) to remove the soil, the associated environmental impacts may be reduced.

8.4.8 Storm Water Impacts

Best management practices (BMPs) would be implemented during construction for storm water pollution control, in accordance with the National Pollutant Discharge Elimination System (NPDES). The project would need to comply with all Regional Water Quality Control Board's water quality standards and waste discharge requirements and Caltrans Statewide NPDES Storm Water requirements.

The proposed project would not create long-term demand for water. The demand for water during construction would be limited. The proposed project would not include any activities that would have long-term effects on local water sources; therefore, additional contribution of runoff water would not exceed the capacity of existing or planned storm water drainage systems, provide substantial additional sources of polluted runoff, or degrade water quality.

Some issues that may have significant impacts and will be studied at a later project phase include the following:

- Water quality standards or waste discharge requirements
- Depletion of groundwater supplies or interference with groundwater recharge or a lowering of the local groundwater table level
- Alteration of the existing drainage pattern of the site or area, which could result in erosion or siltation or increase the rate or amount of surface runoff which could result in flooding on- or off-site
- Creation or contribution to runoff water which could exceed the capacity of existing or planned storm water drainage systems or provide additional sources of polluted runoff
- Impacts on the physical, chemical, or biological qualities of water quality

8.5 Summary

From the environmental perspective, the proposal to complete the Route 710 gap in the freeway system via a highway tunnel appears viable and feasible. The environmental impacts to the following resources may occur: noise, air quality, historic properties, aesthetics, archaeology, hazardous waste, soil disposal, and storm water impacts. However the severity of these impacts can be minimized, eliminated or mitigated. Based upon this preliminary environmental assessment, no insurmountable environmental impacts have been identified that would preclude further consideration of the tunnel alternative. However, it is recommended that additional detailed evaluations and analyses be conducted to determine the tunnel alternative including alignment, features and amenities that would be the most environmentally suited to the community and the Route 710 corridor.

The main environmental constraints to the tunnel concept are associated with the portal locations, the ventilation shafts, and the potential interchange at Huntington Drive. During subsequent environmental evaluation or additional conceptual planning for the tunnel alternatives, more detailed evaluations are warranted to identify the most appropriate strategies to minimize, eliminate or mitigate these impacts. It will be prudent to include an active public participation program to review concepts and provide feedback of the various project proposals.

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9.0 Cost Analysis and Schedule

9.1 Introduction

A critical element in the determination of the feasibility of the tunnel alternative to close the Route 710 gap is the cost estimate. This study has included development of "Rough Order of Magnitude" (ROM) construction cost estimates for the tunnel construction alternatives. These cost estimates are commensurate with the conceptual level of design that has been developed for the purpose of this study. The estimates are based on a series of assumptions that are described in this Chapter. Given the very limited project definition at this stage, the assumptions are based on knowledge of similar constructed projects and the approach taken to construct those projects in terms of construction equipment, approach to excavation and disposal of spoil material and number of working faces, for example. If it is decided to pursue the project further then a more detailed costing evaluation will be necessary to identify options in the approach to construction and sensitivity of cost to changes in this approach.

The cost of the tunnel alternatives vary depending on the following options and elements:

- cross-sections (full standard versus reduced standard),
- configuration (single level, stacked dual level, two tunnels, three tunnels),
- length of the tunnel, based upon the three representative horizontal alignments.

Cost will also vary significantly with and without the option of a fully directional interchange at Huntington Drive. Other cost elements considered and included in these cost estimates include: major civil and structural features, tunnel finishes, support buildings to house tunnel ventilation equipment, control and operations buildings, roadway approaches leading into/out of the tunnel portals and new bridges and walls. Also included are the cross-passages between the tunnels for emergency access, and other emergency access/egress facilities and various tunnel electrical and mechanical systems.

Estimates of required right-of-way acquisition are not included. Much of the land that would be required to construct the portals is already under State ownership and very few new acquisitions, if any, appear necessary. The mid point ventilation buildings would require some land and ultimate selection of a site would need to consider the land impact and cost of any new acquisitions that are necessary. Other surface facilities such as the tunnel access entry buildings would be limited in size and may be possible within existing public right-of-way. The optional interchange at Huntington Drive has potentially greater right-of-way impacts and this can be investigated further if that option is adopted, when the location selection would consider state owned lots and impacts on local property.

Preliminary estimates of Operations and Maintenance costs have been estimated based upon similar costs at other highway tunnels within the USA.

The cost estimates are intended to establish the broad range of costs to construct the representative options so far considered and to help evaluate the financial viability of a tunnel concept versus other gap closure alternatives or other regional transportation priorities. Since there has been no decision up to this point to pursue the Route 710 tunnel option beyond this technical feasibility assessment, it is premature to speculate on the timing of construction. Consequently, these cost estimates are presented in fiscal year 2006 dollars and they have not been inflated to any future year of construction.

9.2 Methodology

9.2.1 Study Alignment and Main Tunnel Elements

This technical feasibility assessment has determined that the tunnel requires four lanes of traffic in each direction to provide an acceptable level of service in the year 2030. Thus, tunnel cost estimates in this document provide for four traffic lanes in each direction. Additionally, nine alternative tunnel cross-sections, as shown in Figure 6-1, were presented to represent the range of cross-sections for consideration. These nine alternative cross-sections were generated to reflect minor variations of three general tunnel configurations. The study has also considered three different representative horizontal alignment corridors, as shown in Figure 6.2 in Chapter 6 of this report.

Figure 6.1 represents a cross-section matrix showing the nine cross-section options developed for this study. As described above, these nine alternatives were derived from three general tunnel cross-sections. These general cross-sections are denoted as the “A” series of alternatives. Option A1’s cross-section features twin two-level tunnels with two lanes on each deck. The Option A1 alternative would be constructed using a Tunnel Boring Machine (TBM). Option A2’s cross-section provides twin single level four lane mined tunnels (constructed by SEM). The third general cross-section is Option A3, which provides the four lanes in each direction using three TBM constructed tunnels. The two outer tunnels are identical and provide for two lanes of traffic on a single level while the center tunnel is a larger diameter, two-level tunnel with two lanes of one-way traffic on each level. These general cross-sections were then modified to marginally reduce shoulder width and lane widths in corresponding Options B1,B2 and B3; and then modified again too minimize shoulder widths to get a fully reduced section to represent the lower end of the cost range in options C1, C2 and C3. Costs for each have been identified.

The representative horizontal alignments considered to get a range of costs are summarized in Figure 6-2 in Chapter 6 of this report. Alignment A approximately follows the previous surface Meridian alignment, Alignment B follows approximately along the line of Fremont, and Alignment C partially follows the Fair Oaks alignment. These alternative alignments yield tunnel lengths of approximately 21,163, 21,387 and 21738 feet respectively (that is between 4 to 4.1 miles).

One of the objectives of this feasibility assessment is to consider the feasibility of providing an interchange between the tunnel and Huntington Drive. Cost estimates for adding a fully directional (four ramps) arterial interchange to each of the nine alternative cross-sections described above have also been developed. The tunnels were assumed to maintain a profile grade and depth approximately 100 feet below the surface and the ramps to and from Huntington Drive would connect the surface into the tunnel at depth. The interchange concept adds significant complexity to tunnel construction particularly where the ramps merge and diverge with the main tunnels, resulting in large cavern construction, which for some options, is judged beyond current capability in tunnel technology. Besides the complexity of these ramp/mainline tunnel confluence areas, the distance of the ramps are lengthy (over 1000 ft.) and each ramp represents essentially another individual tunnel. Consequently, a fully directional interchange will add another four smaller diameter tunnels to the cost estimates. The cost of a fully directional interchange has been estimated as additional optional feature for each tunnel alternative.

Tunnel Ventilation systems have been assessed for each case and the civil and structural works required for buildings and the underground excavation assumed necessary for those buildings has a significant cost, and this cost has also been assessed.

9.2.2 Tunnel Excavation Comparison

Two main tunnel excavation methods and technologies have been considered for the development of the construction cost estimates. They are mining by Tunnel Boring Machine (TBM) and by Sequential Excavation Method (SEM). For cost estimation purposes, two base estimates have been made using Alignment B and cross-section options A1 and A2 to examine cost of TBM and SEM methods respectively. These two cross-section options form the baseline construction estimates.

For the remaining cross-section options, costs were "scaled" for the other diameters based on data obtained for large soft ground tunnels in the United States. These factors are not to be considered precise, as data is limited for very large tunnels. Rather, the scaled estimates would indicate a non-linear proportional changes related to the tunnel diameter. Items included in the scaling included the tunnels and elements of the portals.

9.2.3 Other Tunnel Cost Elements

Other project elements considered in estimating the construction cost include the following:

- Ventilation System. The cost of a longitudinal ventilation system using Saccardo Nozzles is proposed for these tunnel alternatives. The cost estimate for this type of ventilation system includes the electrical and mechanical controls and other equipment associated with this system and noise attenuation systems. These costs have been assessed based on recent installation of similar equipment on comparable major highway tunnels and are included in the Mechanical & Electrical (M&E) systems costs.
- Other tunnel M&E systems, including Closed Circuit Television (CCTV) surveillance system, variable message signs, fire detection and suppression systems, air quality and visibility monitoring systems, HVAC for all ancillary spaces, lighting and lighting

controls, over-height vehicle detectors, OCC equipment, alarms including fire, security, intrusion, communications systems including telephones, power including emergency.

- Ventilation Structures at each of the two portals. These would be built immediately outside the TBM driven portal and possibly designed within the portal landscape and grading scheme.
- An underground mid-point ventilation building with ventilation stack is included to house fans and noise attenuators and damping systems to control flow of inlet and exhaust air.
- An allowance for Finishes within the tunnels such as paving, striping and wall cladding systems.
- Administration and Operations building assumed at the Southern Portal.
- Tunnel approach roads, including the approach ramps to channel traffic into the upper and lower levels in those options (A1, A3, B1, B3, C1, and C3) where some lanes are 'stacked' within the tunnel.
- New and replacement bridges to carry local street and railroad tracks over the tunnel approach roads at Valley Boulevard, Mission Road and for the railroad at the southern end of the project.

The ROM Cost Estimates based on the assumptions detailed above is summarized in Table 9-1. The costs are in Year 2006 dollars and the Table compares costs for each alignment and cross-section option considered. The additional cost of adding a fully directional (four ramps) interchange at Huntington Drive is also estimated along with the cost of additional buildings to house ventilation equipment.

9.3 Assumed Construction Schedule and Sequencing

As a basis for the tunnel estimate, the following assumptions were made on how the construction might proceed.

The main assumptions made for estimation of Option A1 along Alignment B - with four ramps and a combined mid-tunnel ventilation building over both main tunnels - are as follows:

- This option was estimated to require a nine year construction schedule, with tunneling works over three shifts per day, and five days per week. It was assumed that durations of 84 days to assemble and start TBM, and 45 days to remove and dis-assemble at the end of the drive, would be required.

- Portal construction would proceed with two shifts per day, five days per weeks, requiring a 17-month construction and excavation period, after an initial three months for mobilization and site preparation.

- It was assumed that two TBMs would need to be driven concurrently, one from north portal for one tunnel, and one from south portal for the other tunnel. Average production was assumed at 25 linear feet per day, based on a three shift per day operation. Work was initially assumed for five days per week, with a one maintenance shift on Saturday.
- In the anticipated fault zone area, after completion of the main tunnel TBM drive, it would be necessary to remove 1,500 ft of tunnel segment liners (for each bore) to allow

the over excavation though the faulted area and special construction of this zone before completion of new lining segments

- For the possible Huntington Drive option, it was assumed that all four ramps would be constructed, each with portion of open cut near the surface where it meets Huntington Drive and the remainder constructed by roadheader driven tunneling, including the tie-in to the main tunnel.
- A duration of 16 months was assumed to construct the upper roadway deck and lower roadway invert.
- It was assumed that an eighteen-month duration would be required to finish the permanent portal work, including construction of the concrete invert and walls, before construction of the portal ventilation buildings.
- For the Mid Tunnel Ventilation Building:
    - Slurry wall support was assumed for the excavation
    - The Excavation would be braced during soil excavation
    - To connect down to the tunnel, it was assumed that installation of raise-bore shafts for fan vertical shafts would be required and that the schedule for this activity would not commence until the tunnel was driven past this location to allow for installation of the raise-bore head.
    - Construction of the exhaust stack and air intakes above ground, and completion of the M&E installation and above ground access and landscape elements would conclude the ventilation building main construction activity
- A 15 per cent Design Contingency was added to the fiscal year 2006 construction cost at the direction of MTA.
- Cost Estimates are at base year of 2006 and do not include escalation to the mid-point of construction
- The initial schedule is included as Figure 9-1 and 9-2.

For the SEM excavated tunnel in Option A2, again along Alignment B, the assumptions also include the following key points:

- Estimate included a longer 11.5-year construction schedule, for this method with tunnel cavern excavation works needing four roadheader spreads at one time, five days per week.
- In this case the Portal Construction has again been assumed to proceed with two shifts per day.
- Roadheader mined excavation was assumed for mining the tunnel.
- After the tunnel construction, at the assumed fault zone, removal of some 1,500 ft of tunnel wall (for each bore) would be made before performing the over excavation for the seismic section.

- Concrete operations for the final lining, waterproofing and road deck would proceed from four headings.
- Cost does not include escalation to the mid-point of construction
- Schedule for the SEM option is outlined in Figure 9-2

For the optional Tunnel Interchange at Huntington Drive

For Interchange Ramp Construction:

- A delayed start was assumed, to allow for the TBM drive to go past the intersection, before it would be possible to mine the tie-in to the main tunnel;
- Open Cut was assumed at the Ramp portal areas alongside and connecting to the existing Huntington Drive;
- Roadheader mined excavation was assumed for mining the majority of the ramp tunnel lengths;
- Cast in place liner was assumed for lining these tunnels

Items Not Included in the Estimates.

The following is a list of items that are not included in the estimates:

- Toll collection systems and toll plaza facilities;
- Electrostatic precipitators;
- Right-of-way or any land-related costs;
- Reconstruction and improvement of additional local streets or distributor roads, including Huntington Drive;
- Utility Relocations;
- Soundwalls;
- Survey and Subsidence Remedial Work.

Figure 9-1 Schedule For TBM Construction

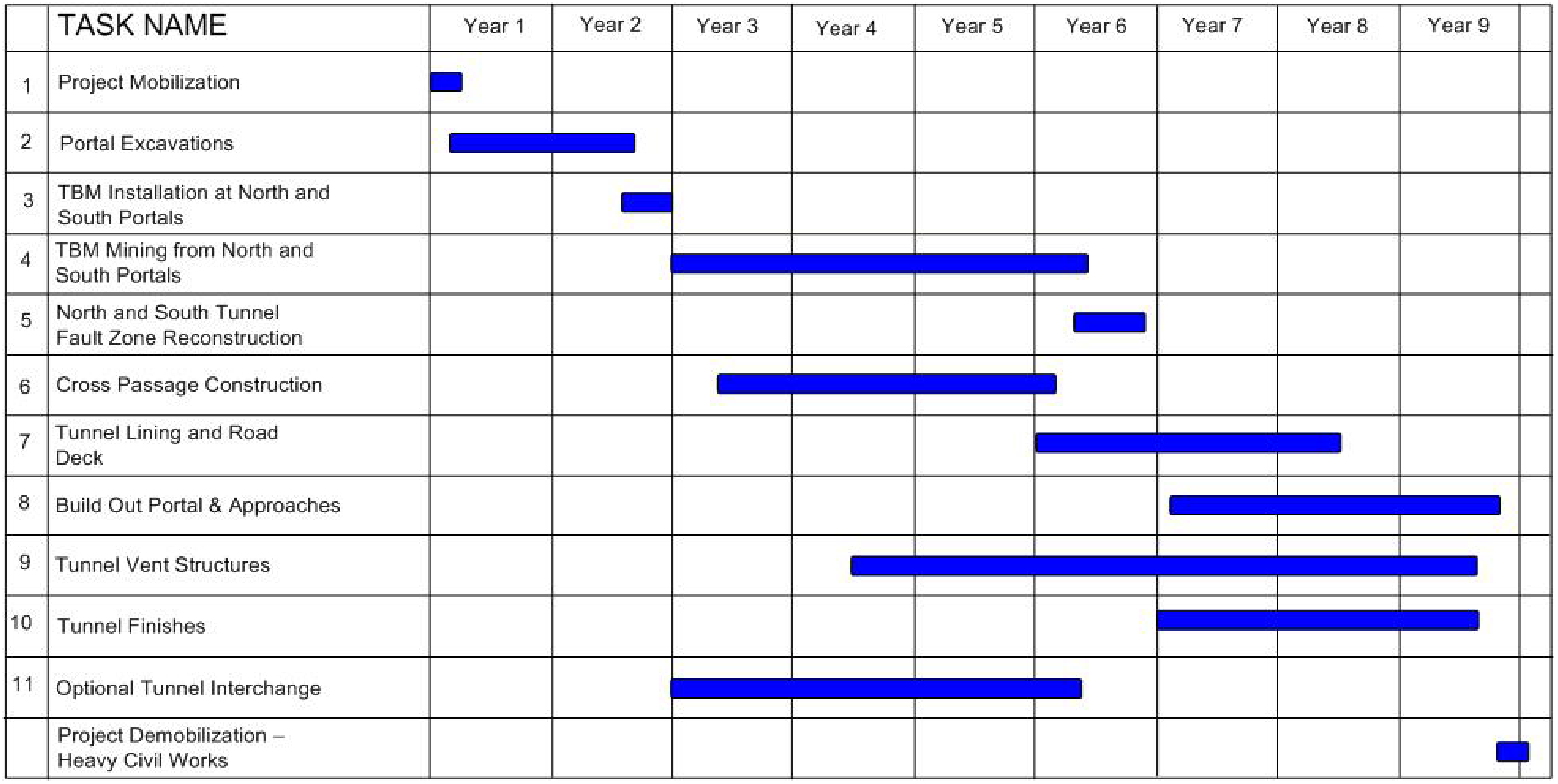
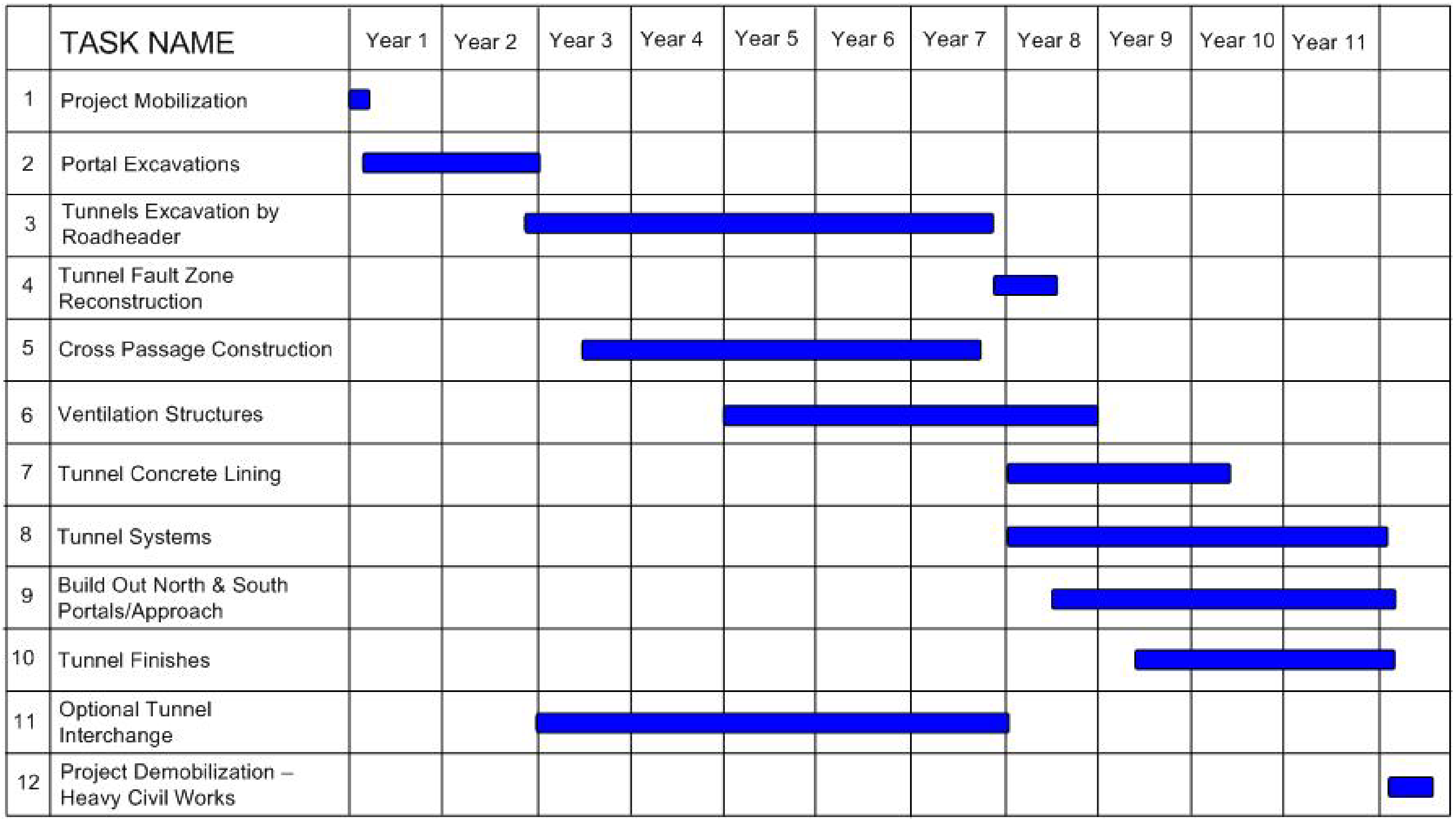


Figure 9-2 Schedule For SEM Construction



9.4 Operations and Maintenance

Operations and Maintenance (O&M) costs were based on actual and estimated road tunnel operating costs in other regions of the country. The estimate is based on the costs of O&M for much shorter (~4,000-5,000 ft) tunnels. However, the longer the tunnel, the lower per lane foot cost for some O&M costs, such as cleaning, safety patrols, traffic management etc.

Annual O&M costs were estimated to be approximately $200.00 per lane foot. When applied to eight lanes over 21,000 ft, the annual operating costs are estimated to be $33,600,000. The annual O&M costs include energy, personnel and equipment costs.

9.5 Summary of Cost Estimate

Table 9.1 Summarizes the Rough Order of Magnitude Construction Cost for all nine alternatives. These figures are construction cost estimates and do not include land costs and other items described in 9.4 above. The cost is in Year 2006 dollars with no escalation.

The estimated sums have been based on assumptions outlined in this chapter and if the actual approach to construction is different then it could impact construction costs. For example, if the number of TBMs used increased from the assumed 2 to 4 then this could change overall advance rates but this would need to be offset against the additional cost of 2 more TBMs. Much more detailed analysis of such aspects would be needed at a later stage of project definition.

It is also important to note that although the Year 2006 estimate for the TBM options (e.g. A1) appears close to the SEM options (e.g. A2), the construction schedule for SEM would be considerably longer resulting in higher actual cost for the SEM options.

In the use of either method the controlling factor on production rates may be governed by the rate at which excavated material may be removed from the site. Given the likely restriction on working hours, the volume of material translated into size of the handling facility and the numbers of trucks required to haul the material from the site, then the feasible disposal rate may determine the rate of excavation that is possible. Again, more detailed examination would be necessary as the project constraints became better defined.

The estimates are the preliminary and give a Rough Order of Magnitude for the construction cost.

Table 9-1 Estimate of ROM Construction Costs

Cross Section Option	Construction Estimate Total without interchange (Year 2006 $Million - 15% contingency)	*Construction Estimate Total with Interchange (Year 2006 $ Million - with 15% contingency)*
Meridian Alignment A		
A1	2,875	*4,166*
A2	2,882	*4,173*
A3	3,585	*4,876*
B1	2,860	*4,152*
B2	2,542	*3,833*
B3	3,460	*4,752*
C1	2,377	*3,669*
C2	2,282	*3,573*
C3	3,195	*4,486*
Fremont Alignment B		
A1	2,891	*4,183*
A2	2,900	*4,192*
A3	3,605	*4,897*
B1	2,875	*4,166*
B2	2,556	*3,848*
B3	3,479	*4,770*
C1	2,389	*3,680*
C2	2,294	*3,586*
C3	3,210	*4,501*
Fair Oaks Alignment C		
A1	2,919	*4,210*
A2	2,930	*4,222*
A3	3,639	*4,930*
B1	2,900	*4,192*
B2	2,582	*3,873*
B3	3,509	*4,800*
C1	2,409	*3,701*
C2	2,316	*3,608*
C3	3,235	*4,526*

10.0 Potential Funding

10.1 Purpose of Financial Strategy Report

The purpose of the report was to assist the LACMTA in identifying potential funding sources and funding scenarios for the future implementation of a Tunnel Alternative. This Financial Strategy Report provides a starting point for the development of the project's financial plan and, if it proceeds through the state and federal environmental and project implementation processes, completion of a comprehensive financial plan will be required. Additionally, since the initial order of magnitude construction cost estimate for the tunnel is $3 billion (2006 dollars), the project would fall under the FHWA Mega Project classification which requires the development of a comprehensive financial plan, with annual updates on actual cost and revenue performance in comparison to initial estimates as well as updated estimates of future year obligations and expenditures, cost and revenue trends, current and potential funding shortfalls and the financial adjustments necessary to assure completion of the project.

10.2 Potential Funding Sources

Potential federal, state, regional, and local funding sources that could all be considered to finance the Route 710 Tunnel. As shown in Tables 10.1 and 10.2, over 25 federal, state, regional, and local funding sources were identified and screened to a more promising list of 14 potential funding sources.

10.2.1 Federal Sources

The project is addressing issues of national and regional significance and should be considered a strong candidate for receipt of federal funding. Potential Federal Funding sources are summarized in Table 10.1 and discussed in detail in the Financial Strategy Report prepared under the Study.

Table 10-1:
Potential Federal Funding Sources for the Route 710 Tunnel Project

FEDERAL SOURCES (Range 0%-48% of total funding)	DESCRIPTION	ADVANCED FOR CONSIDERATION
DEPARTMENT OF TRANSPORTATION - FEDERAL HIGHWAY ADMINISTRATION		
High Priority Project Earmark (Demo Funds)	Provides designated funding for specific projects identified in SAFETEA-LU. Total in LA County: $234.2 million for 158 projects, ranging from $12.4 million (ACE) to $12.8 thousand. Total in federal program: $15 billion. Includes $2.4 million for study of 710 Tunnel Alternative.	X
Projects of National and Regional Significance	Discretionary program. Provides funding for high cost projects of national or regional significance. Projects selected by competitive evaluation process based on ability to generate national economic benefits, reduce congestion, improve safety, leverage non-federal funding, stability of financial plan, use of new technology, and maintain/protect the environment. LA County: $225 million for 2 projects ($125 mil ACE; $100	X

	mill Gerald Desmond Bridge). Total in federal program: $1.8 billion.	
National Corridor Infrastructure Program	Discretionary program. Provides funding for construction of corridors of national significance to promote economic growth and international or interregional trade. Competitive selection process based on criteria including: extent to which corridor links two existing segments of the interstate system; facilitates major mobility, economic growth, development in area underserved by highway investment, significant commercial traffic; reduce commercial or other travel time through a major freight corridor. Total in LA County: $100 million for 1 project (I-405 HOV Lane). Total in federal program: $1.95 billion.	X
Interstate Maintenance (IM) Program	Discretionary program. Provides for the on-going work necessary to preserve and improve Interstate highways. This includes funding for resurfacing, restoring, rehabilitating and reconstructing (4R) most routes on the Interstate System. For FY 06, seven projects named in California with funding levels ranging from $750,000 to $1 million.	X
Highway Bridge Program	Discretionary Program. Provides funding to enable States to improve the condition of their highway bridges through replacement, rehabilitation, and systematic preventive maintenance.	
Federal "Core" Programs: Surface Transportation Program (STP) National Highway System (NHS) Highway Safety Improvements	Funds are distributed through the STIP and SHOPP. For STIP, 75 percent of funds are programmed at discretion of the MPOs (e.g.-LACMTA) in RIP and 25 percent by Caltrans in IIP. Of these, 88.53% are federal. Total in LA County: STIP: $904.1 million; IIP: $152 million.	(see STIP and IIP. Programmed at discretion of LACMTA and Caltrans, respectively)
Congestion Mitigation and Air Quality (CMAQ)	For projects that improve air quality and reduce congestion. Funds are programmed by LACMTA for bus/rail capital, highway (HOV,TSM, Fwy, and Call projects), bus/rail operations (first 3 yrs of start-up). Total in LA County: $824 million.	X (Programmed at discretion of LACMTA)
Transportation, Community, and System Preservation (TCSP) Program	Competitive program with funds earmarked for projects that integrate transportation, community, system preservation, and the environment. Limited levels of funding total and by project.	(minimal funding)
Transportation Enhancement Activities	For bicycle, pedestrian, transit, landscaping, public art, or historic projects linked to transportation. Limited levels of funding (generally under $5 million) are available per project.	
Transportation Infrastructure Finance and Innovation Act (TIFIA)	Provides 3 forms of credit assistance - loans, loan guarantees, and standby lines of credit - to projects of national or regional significance exceeding $50.00 million in cost. Federal share cannot exceed 33%. Credit must be supported in whole or in part by user charges or other dedicated non-federal sources. Must be repaid within 35 years of project's substantial completion.	X
DEPARTMENT OF TRANSPORTATION - FEDERAL TRANSIT ADMINISTRATION		
Section 5307 Urbanized Area Formula Funds	Provides transit capital and operating assistance to urbanized areas. No or limited funding expected to be available for transit-related project components.	
Section 5309 Discretionary Capital Funds	Discretionary program. Provides capital assistance for new or extensions to fixed guideways, fixed guideway modernization, and bus/bus related facilities. Could potentially be pursued if transit guideway were part of the project.	

DEPARTMENT OF DEFENSE		
Military Construction Funds	Projects earmarked for funding in the annual Military Construction Appropriations bill and/or in the DOD's Future Years Defense Program (FYDP) for safety, health, environmental, and military utility. Could potentially be tied to 710 as link between the Ports and inland logistical bases.	

Source: Sharon Greene & Associates, May 2006.

10.2.2 State Sources

Four state funding sources were considered as potential funding sources: the Interregional Improvement Program component of the State Transportation Improvement Program (STIP), Grant Anticipation Revenue Vehicle (GARVEE) bonds, proceeds from potential future State infrastructure bonding, and proceeds from the sale of excess right-of-way previously acquired for the Route 710 Gap Closure at-grade alternative. Descriptions of these programs are in Table 10.2 below.

Table 10-2:
Potential State, User Fee, Regional and Local Funding Sources
for the Route 710 Tunnel Project

STATE, USER FEE, REGIONAL, AND LOCAL SOURCES	DESCRIPTION	ADVANCED FOR CONSIDERATION
STATE SOURCES **(Range 12%-20% of Total Funding)**		
State Transportation Improvement Program: Interregional Improvement Program (Cash)	25 percent of the federal and state funds in the State Highway Account funds are prioritized and programmed by Caltrans for projects of regional significance. These funds are programmed in the Interregional Transportation Improvement Program (IIP) component of the State Transportation Improvement Program (STIP).	X
STIP: Grant Anticipation Revenue Bonds (GARVEES)	Federal grant revenue anticipation bond proceeds pledged to projects. Annual debt service programmed in the STIP, with source from IIP (or RIP) funds.	X
Future State Bond Program or "Traffic Congestion Relief Program II"	Transportation program funded with future State bonds or future State funding initiative adopted by State Legislature	X
Sale of Parcels Previously Acquired (Excess Right of Way)	Special legislation required to apply funds from ROW sales to the 710 Gap Closure Project.	X
USER FEES/TOLLS **(0%-50% of Total Funding)**		

User Fees/Tolls (HOT lanes, truck lanes, general purpose traffic within larger 710 Corridor).	While used in many areas of the country, enabling legislation is required to authorize use of fees/tolls for individual highway projects within the State of California. Tolls could provide a mechanism to generate revenue, moderate traffic demand, and/or provide incentive to use particular facilities. Tolling could be part of an overall funding strategy with toll revenues providing part of a larger revenue stream pledged for debt repayment. Facility could be designed, built, and/or operated as public, private, or public-private partnership. SAFETEA-LU offers States broader ability to use tolling on a pilot, or demonstration, basis to finance Interstate construction and reconstruction, promote efficiency in the use of highways, and support congestion reduction. Of particular relevance is the Interstate System Construction Pilot Program, which authorizes up to 3 toll pilot facilities on the Interstate System for the purpose of constructing new Interstate highways. Criteria include: tolling must be the most efficient and economical way to finance the project, but it doesn't have to be the only way. Automatic toll collection is required.	X
Regional Freight Fees	If part of larger goods movement network, could potentially be part of any program funded through container fees or other freight fee program.	
REGIONAL SOURCES **(Range 28% - 50% of Total Funding)**		
State Transportation Improvement Program: Regional Improvement Program (Cash)	75 percent of the federal and state funds in the State Highway Account funds are prioritized and programmed by regional agencies (such as LACMTA). These funds are programmed in the Regional Transportation Improvement Program (RIP) component of the State Transportation Improvement Program (STIP).	X
STIP: Grant Anticipation Revenue Bonds (GARVEES)	Federal grant revenue anticipation bond proceeds pledged to projects. Annual debt service programmed in the STIP	X
Proposition C Funding	Potentially eligible for funds under Prop C 25% Transit-related Street and Highway Improvements.	X
Future County Sales Tax	Project could be designated to receive funding under an interim multimodal countywide sales tax in the future.	X
LOCAL SOURCES		
Transportation Impact Fee (for Annual Debt Service)	Creation of Transportation Impact Fee, with fees pledged for payment of annual debt service	
Tax Increment Financing (for Annual Debt Service)	Creation of Tax Increment Finance District, with tax increments pledged for payment of annual debt service	

Source: Sharon Greene & Associates, May 2006.

10.2.3 Proceeds from the Sale of Previously Acquired Right-of-Way

Description

In preparation for the proposed at-grade alternative for the Route 710 Gap Closure, Caltrans had acquired approximately 700 parcels. While the specific alignment of a potential Route 710 Tunnel is yet to be developed, it is anticipated that a majority of these parcels would no longer be required. The excess parcels could potentially be sold and the revenue potentially be used for the Route 710 Tunnel project.

Policy Considerations

Existing State legislation precludes sale of the existing State-owned Route 710 right-of-way at fair market value. State legislation may also preclude proceeds being used for a specific project.

Thus, new State legislation would be required in order to sell excess right-of-way at fair market value and apply the proceeds from the sale to the Route 710 Tunnel project.

Revenue Potential

Based on current value, the proceeds from selling Caltrans' owned excess right-of-way in the amount of approximately $500 million could be generated. The revenue potential provided is dependent on the magnitude of the value and the legal status of applying this value to the Route 710 Tunnel project.

10.2.4 Tolling

Description

Bonds leveraged from anticipated toll revenue could potentially be a component of the funding and financing proposed. However, since cost data and traffic forecasts are only conceptual at this time, the toll revenue and bonding potential described below should only be considered as order of magnitude estimates. A number of assumptions which were used to generate order of magnitude toll revenue estimates are described in the Study's Financial Report.

Based on these assumptions, Table 10-3 (autos only use tunnel) and Table 10-4 (autos and trucks use tunnel) provide a range of potential toll revenue and level of bonding estimates. At this point of project development, the study team considers these ranges to be the maximum percent of total construction costs from toll revenue bonds that are feasible to include in the funding scenarios analysis in 10.3.

Table 10-3:
Order of Magnitude Toll Revenue and Level of Bonding Estimate – Autos Only
(2006 dollars)

Assumptions	Toll Revenue Scenario 1	Toll Revenue Scenario 2	Toll Revenue Scenario 3	Toll Revenue Scenario 4
Estimated Weekday Total Traffic	183,170	183,170	183,170	183,170
Estimated Truck Volumes	0	0	0	0
Estimated Auto Diversion Rate	20%	25%	30%	35%
Annualization Factor	320	320	320	320
Toll Rate - Auto	$3.00	$4.00	$5.00	$6.00
O&M Cost	$28,000,000	$28,000,000	$28,000,000	$28,000,000
Debt Coverage Level	1.5	1.5	1.5	1.5
Estimated Annual Tunnel Traffic				
Annualized Auto Traffic	46,891,392	43,960,680	41,029,968	38,099,256
Estimated Tunnel Revenues				
Annual Auto Revenue	$140,674,176	$175,842,720	$205,149,840	$228,595,536
Estimated O&M Costs				
Annual O&M Cost Estimate	$28,000,000	$28,000,000	$28,000,000	$28,000,000
Estimated Net Revenue				

Annual Net Revenue Estimate	$112,674,176	$147,842,720	$177,149,840	$200,595,536
Available for Bonding (Coverage Rate 1.5)	$75,116,117	$98,561,813	$118,099,893	$133,730,357
Issue Bonds (13 times Available for Bonding)	$976,509,525	$1,281,303,573	$1,535,298,613	$1,738,494,645
Percent of Total Project ($3 billion)	32.55%	42.71%	51.18%	57.95%
Additional Cost to Project (Interest on Bonds)	$1,095,142,893	$1,436,965,504	$1,721,817,679	$1,949,699,420

Source: Sharon Greene and Associates, May 2006.

Table 10-4:
Order of Magnitude Toll Revenue and Level of Bonding Estimate–Autos and Trucks
(2006 dollars)

Assumptions	**Toll Revenue Scenario 1**	**Toll Revenue Scenario 2**	**Toll Revenue Scenario 3**	**Toll Revenue Scenario 4**
Estimated Weekday Total Traffic	169,581	169,581	169,581	169,581
Estimated Truck Volumes	17,853	17,853	17,853	17,853
Estimated Auto Diversion Rate	20%	25%	30%	35%
Estimated Truck Diversion Rate	25%	30%	35%	40%
Annualization Factor	320	320	320	320
Toll Rate - Auto	$3.00	$4.00	$5.00	$6.00
Toll Rate - Trucks	$4.00	$5.00	$6.00	$7.00
O&M Cost	$33,000,000	$33,000,000	$33,000,000	$33,000,000
Debt Coverage Level	1.5	1.5	1.5	1.5
Estimated Annual Tunnel Traffic				
Annualized Auto Traffic	38,842,240	36,414,600	33,986,960	31,559,320
Annualized Truck Traffic	4,284,720	3,999,072	3,713,424	3,427,776
Estimated Tunnel Revenues				
Annual Auto Revenue	$116,526,720	$145,658,400	$169,934,800	$189,355,920
Annual Truck Revenue	$17,138,880	$19,995,360	$22,280,544	$23,994,432
Total Annual Revenue	$133,665,600	$165,653,760	$192,215,344	$213,350,352
Estimated O&M Costs				
Annual O&M Cost Estimate	$33,000,000	$33,000,000	$33,000,000	$33,000,000
Estimated Net Revenue				
Annual Net Revenue Estimate	$100,665,600	$132,653,760	$159,215,344	$180,350,352
Available for Bonding (Coverage Rate 1.5)	$67,110,400	$88,435,840	$106,143,563	$120,233,568
Issue Bonds (13 times Available for Bonding)	$872,435,200	$1,149,665,920	$1,379,866,315	$1,563,036,384
Percent of Total Project ($3 billion)	29.08%	38.32%	46.00%	52.10%
Additional Cost to Project (Interest on Bonds)	$411,789,479	$737,670,488	$1,019,444,979	$1,166,440,977

Source: Sharon Greene and Associates, May 2006.

Also Tables 10-5 (autos only use tunnel) and 10-6 (autos and trucks use tunnel) provide additional estimates of the potential percent of the total construction costs from toll revenue bond based on variations in the toll rate and the diversion rate.

Table 10-5:
Estimated Percent of Total Construction Cost Paid by Toll Revenue Bonds – Autos Only

Diversion Rate	$2 Toll	$3Toll	$4 Toll	$5Toll	$6 Toll	$7 Toll
15%	21%	35%	49%	64%	78%	93%
20%	19%	33%	46%	60%	73%	87%
25%	17%	30%	43%	55%	68%	81%
30%	16%	27%	39%	51%	63%	75%
35%	14%	25%	36%	47%	58%	69%
40%	12%	22%	33%	43%	53%	63%

=Maximum potential share of project funding considered reasonable

Source: Sharon Greene and Associates, May 2006.

Table 10-4:
Estimated Percent of Total Construction Cost Paid by Toll Revenue Bonds – Autos and Trucks

Diversion Rate *	$2 Auto / $3 Truck	$3 Auto / $4 Truck	$4 Auto/ $5 Truck	$5 Auto / $6 Truck	$6 Auto / $7 Truck	$7 Auto/ $8 Truck
15%A / 25%T	18%	31%	44%	58%	71%	84%
20%A / 30%T	16%	29%	41%	54%	66%	78%
25%A / 35%T	15%	26%	38%	50%	62%	73%
30%A / 40%T	13%	24%	35%	46%	56%	67%
35%A / 45%T	11%	21%	31%	42%	52%	62%
40%A / 50%T	10%	19%	28%	38%	47%	56%

* %of Autos / % of Trucks Diverted

=Maximum potential share of project funding considered reasonable

Source: Sharon Greene and Associates, May 2006.

Policy Considerations

In addition to the toll revenue generation and level of bonding potential associated with tolling, there are several risk factors that must be considered with respect to inclusion of tolling in the financial strategy for the project including model input risk, event/political risk, ramp-up risk, and construction risk. The Financial Report has described examples of recent toll projects and highlighted the types of risk experienced.

Based on those examples, it is anticipated that future projects will be required to provide more detailed analysis and justification of assumptions for the cost and revenue estimates that are submitted as part of their request for bond funding.

Bond funding will likely not be available until the construction is nearly completed or completed. Based on the project examples above, the bond market is much less likely to finance projects until the detailed construction costs and revenue estimates are available. This would include items like the final concrete and steel costs since these construction components costs can fluctuate greatly and there is no futures market for either component. Additionally, as a financial strategy, it is more advantageous to wait until the toll revenue will be generated so the agency will not have to capitalize interest on bonds while waiting for revenue service to start.

Revenue Potential

With consideration to the assumptions and risk factors, tolling could potentially play a role in the funding and financing of a project.

- Total annual net revenue generated from tolls (total annual revenue *minus* estimated annual O&M costs) was estimated to range from $100 million to $200 million. As shown in the tables above, the level of annual revenue generated would be dependent on a number of factors – including the magnitude of the toll charged and the extent to which potential users diverted to alternate free routes.
- As the toll charge increased, the diversion rate to alternate free routes was also assumed to increase. Trucks were assumed to have a higher elasticity with respect to toll rates, with higher diversion rates than other vehicular traffic. Thus, higher tolls were assumed to result in fewer trips being made on the facility. As a key goal of the project is to provide regional and local transportation benefits, it would be necessary to resolve the conflicting objectives of maximizing toll revenue generation and maximizing facility usage.
- As a cursory estimate of the share of construction cost that could be funded through tolls, this analysis indicated that tolling could potentially fund up to 50 percent of the construction cost. There are strong caveats to this statement, on both the cost side and the revenue side, including the lack of a real project cost estimate or phasing plan; and exclusion of key cost elements including real and inflationary impacts on construction costs over time, financing costs, and transaction costs; and the cursory estimation of toll revenues in the absence of real projections.
- As demonstrated by the examples, there is a high level of risk associated with financing start-up toll projects. To offset some of the risks, high coverage ratios, double-barreled revenue commitments, and bond insurance would likely be required.

10.3 Screening of Sources

The following provides a brief description of several programs that were identified as potential funding sources for the Route 710 Tunnel project, however, at this time they were not carried forward into the financial strategies analysis.

- **Federal Sources:**
    - Transportation, Community, and System Preservation Program (TCSP) is intended to address the relationships among transportation, community, and system preservation plans and practices and identify private sector-based initiatives to improve those relationships. Due to this programs limited total funding level and limited funding levels available for individual projects, it was not included in the financial strategies analysis.

- Transportation Enhancement Activities program is intended for bicycle, transit, landscaping, public art, or historic projects linked to transportation. On a per project basis, limited funding (less than $5 million) is available and therefore was not included in the financial strategies analysis.
- FTA Section 5307 Urbanized Area Formula Funds Program provides transit capital and operating assistance to urbanized areas. For the Route 710 Tunnel, no or limited funding is expected to be available for transit-related project components.
- FTA Section 5309 Discretionary Funds Program provides capital assistance for new or extensions to fixed guideways, fixed guideway modernization, and bus/bus related facilities. If a transit guideway is included in the design of the Route 710 Tunnel this program could potentially be pursued. However, at this stage of project development the Section 5309 program was not included in the financial strategies analysis.
- Department of Defense (DOD) Military Construction Funds are Congressional earmarks in the annual Military Construction Appropriations bill and/or in the DOD's Future Years Defense Program for safety, health, environmental, and military utility. This program could be re-evaluated in the future due to the improved connection between the Ports and inland logistical bases provided by the Route 710 Tunnel.

- **Regional/Local Sources**: Transportation impact fees and tax increment financing programs have been successfully used around the country on major public projects. However, since this is an early phase of project development it is not appropriate to include these two sources as part of this Financial Strategies Report. However, in the future if the project moves forward and additional engineering and cost details evolve, these approaches could be re-evaluated for potential inclusion as a component of the Financial Plan.

10.4 Financial Scenarios

Seven preliminary financial scenarios were developed based on the funding sources identified in Section 10.2. Each financial scenario places different levels of emphasis on federal, state, regional/local and toll revenue bond funding contributions. Three scenarios assumed the project would not include toll revenue bond proceeds as a funding source and four scenarios assumed the project would include toll revenue bond proceeds. Table 10-7 summarizes the ranges of potential federal, state, regional/local and toll revenue bond funding comprising the seven scenarios. The target percentages and equivalent funding contributions shown in the following assume a working construction cost estimate of $3.0 billion (2006 dollars). However, depending on which construction scenario is chosen and when construction begins, the $3 billion (2006 dollar) order of magnitude construction cost estimate is projected to be in the range of $4.3 to $5.5 billion year of expenditure dollars. At this stage of project development, it is assumed that revenue from the sources identified in the following sections would grow at the same rate of inflation as the construction costs. As a result the target percent shares from the different funding sources would be maintained as shown in the figures below. Finally, for the purpose of this analysis, the cost curves for the seven financial scenarios reflect the 11.5 year construction schedule of Construction Scenario 2 described in the study's Financial Strategy Report.

Table 10-5:
Levels of Federal, State, Regional/Local and Toll Revenue Funding Comprising the Financial Scenarios (2006 dollars)

Funding Sources	Percent Range	Funding Range
Federal Contribution	0 Percent to 48 Percent	$0.0 to $1.4 billion
State Contribution	12 Percent to 20 Percent	$360 million to $600 million
Regional/Local Contribution	28 Percent to 58 Percent	$840 million to $1.74 billion
Toll Revenue[1]	0 Percent to 50 Percent	$0 million to $1.5 billion

Note: [1] For this analysis it was assumed that the toll rates and diversion percentages would support the the level of bonding assumed in the four scenarios that include toll revenue bond proceeds as a source.

Source: Sharon Greene & Associates, May 2006.

Table 10-8 and Figure 10-1 summarize the levels of federal, state, and regional/local funding comprising the three financial scenarios that do not include tolling.

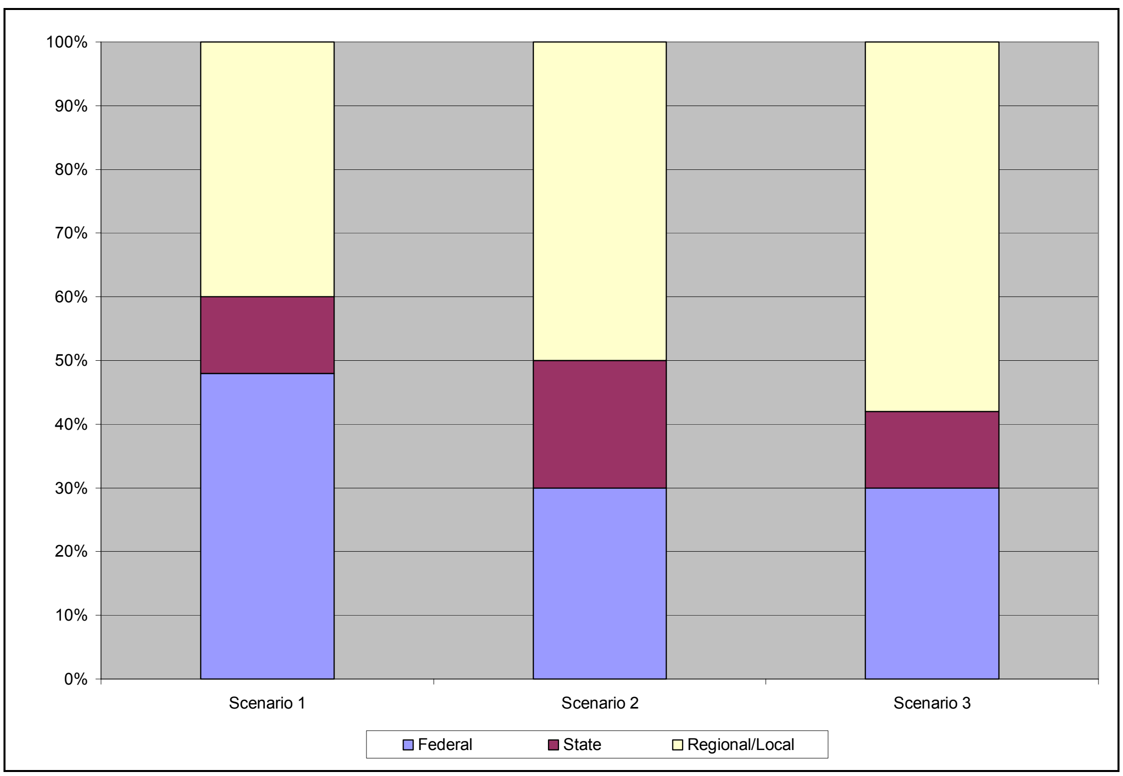
Table 10-6:

Preliminary Route 710 Tunnel Financial Scenarios - No Toll Revenue Bonds
(2006 dollars)

	SCENARIOS WITHOUT TOLLING					
	SCENARIO 1: (48-12-40-0)		SCENARIO 2: (30-20-50-0)		SCENARIO 3: (30-12-58-0)	
CONTRIBUTOR	% Share	$ Share	% Share	$ Share	% Share	$ Share
FEDERAL (range: 30%-48%) *FHWA Core Programs* *FHWA Earmarks* *TIFIA* *Tolling Programs*	48%	$1,440,000,000	30%	$900,000,000	30%	$900,000,000
STATE (range: 12%-20%) *STIP:IRTP* *STIP-GARVEE Bonds* *Future State Bond Program*	12%	$360,000,000	20%	$600,000,000	12%	$360,000,000
REGIONAL/LOCAL (range: 40% - 58%) *STIP: RTIP* *STIP: GARVEE Bonds* *Proposition C Funding* *Future County Sales Tax*	40%	$1,200,000,000	50%	$1,500,000,000	58%	$1,740,000,000
TOTAL	100%	$3,000,000,000	100%	$3,000,000,000	100%	$3,000,000,000

Source: Sharon Greene & Associates, May, 2006.

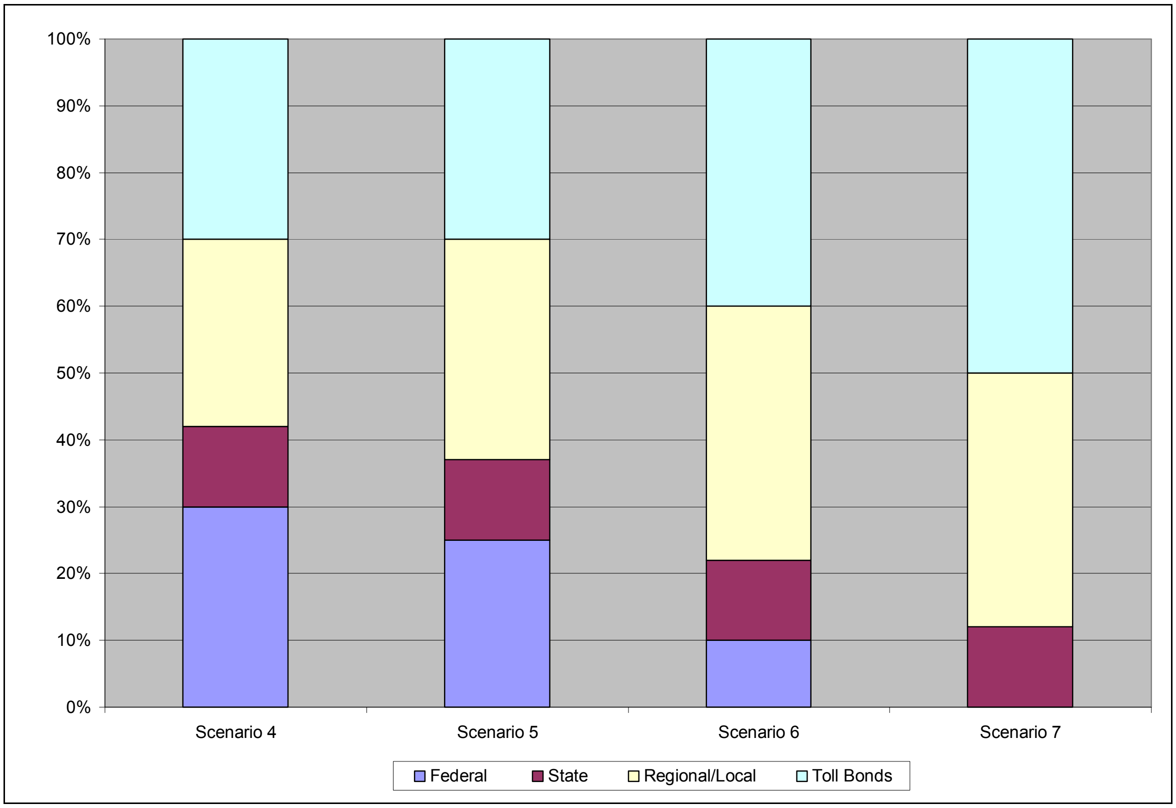
Figure 10-1:
Composition of Proposed Revenues – No Toll Revenue Bond Scenarios



Source: Sharon Greene & Associates, May 2006

Table 10-9 and Figure 10-2 summarize the levels of federal, state, regional/local, and toll revenue bond funding comprising the four financial scenarios that do include tolling. The seven scenarios are described in more detail following the tables.

Figure 10-2:
Composition of Proposed Revenues – Toll Revenue Bond Scenarios



Source: Sharon Greene & Associates, May 2006

Table 10-7:
Preliminary Route 710 Tunnel Financial Scenarios – Includes Toll Revenue Bonds
(2006 dollars)

	SCENARIOS WITH TOLLING							
	SCENARIO 4: (30-12-28-30)		SCENARIO 5: (25-12-33-30)		SCENARIO 6: (10-12-38-40)		SCENARIO 7: (0-12-38-50)	
CONTRIBUTOR	**% Share**	**$ Share**	**% Share**	**$ Share**	**% Share**	**$ Share**	**% Share**	**$ Share**
FEDERAL (range: 0% - 30%)	**30%**	**$900,000,000**	**25%**	**$750,000,000**	**10%**	**$300,000,000**	**0%**	**$0**
FHWA Core Programs *FHWA Earmarks* *TIFIA* *Tolling Programs*								
STATE (12% all scenarios)	**12%**	**$360,000,000**	**12%**	**$360,000,000**	**12%**	**$360,000,000**	**12%**	**$360,000,000**
STIP:IRTP *STIP-GARVEE Bonds* *Future State Bond Program*								
REGIONAL/LOCAL (range: 28% - 38%)	**28%**	**$840,000,000**	**33%**	**$990,000,000**	**38%**	**$1,140,000,000**	**38%**	**$1,140,000,000**
STIP: RTIP *STIP: GARVEE Bonds* *Proposition C Funding* *Future County Sales Tax*								
TOLL BONDS (range: 30% - 50%)	**30%**	**$900,000,000**	**30%**	**$900,000,000**	**40%**	**$1,200,000,000**	**50%**	**$1,500,000,000**
Bonds								
TOTAL	**100%**	**$3,000,000,000**	**100%**	**$3,000,000,000**	**100%**	**$3,000,000,000**	**100%**	**$3,000,000,000**

Source: Sharon Greene & Associates, May, 2006.

10.5 Financial Scenarios Without Tolling

Based on discussions with LACMTA staff, three financial scenarios were developed that do not include funding from toll revenue bonds. As a starting point, the following were assumed to be the maximum feasible levels of participation from the funding sources:

- Federal: not to exceed 30 percent of total project funding from earmarked federal sources due to the competition with other national and regionally significant projects in the region and the impact of earmarked funding on MTA's STIP-RIP share;
- State: up to 12 percent of total project funding based on maximizing MTA's potential share of the Urban ITIP program using GARVEE bonds; and
- Regional/Local: up to 40 percent of total project funding based on the need to fund other regional and local projects in the RTIP.

In order to develop financial scenarios that would achieve the level of funding required, one or more of the feasible levels of participation would be exceeded. For example, if the state and regional/local funding shares remain within the feasible limit, then the federal funding share would exceed its maximum feasible level. At this point of project development, of the three financial scenarios without tolling, Scenarios 2 and 3 would be considered feasible only if new funding sources were implemented at the state and regional levels.

10.5.1 Scenario 1

Description

Financial Scenario 1 assumes the largest federal share, with 48 percent of project funding from earmarked federal sources. The remaining 52 percent in matching funds is assumed to be derived from a state match of 12 percent, and a regional/local match of 40 percent.

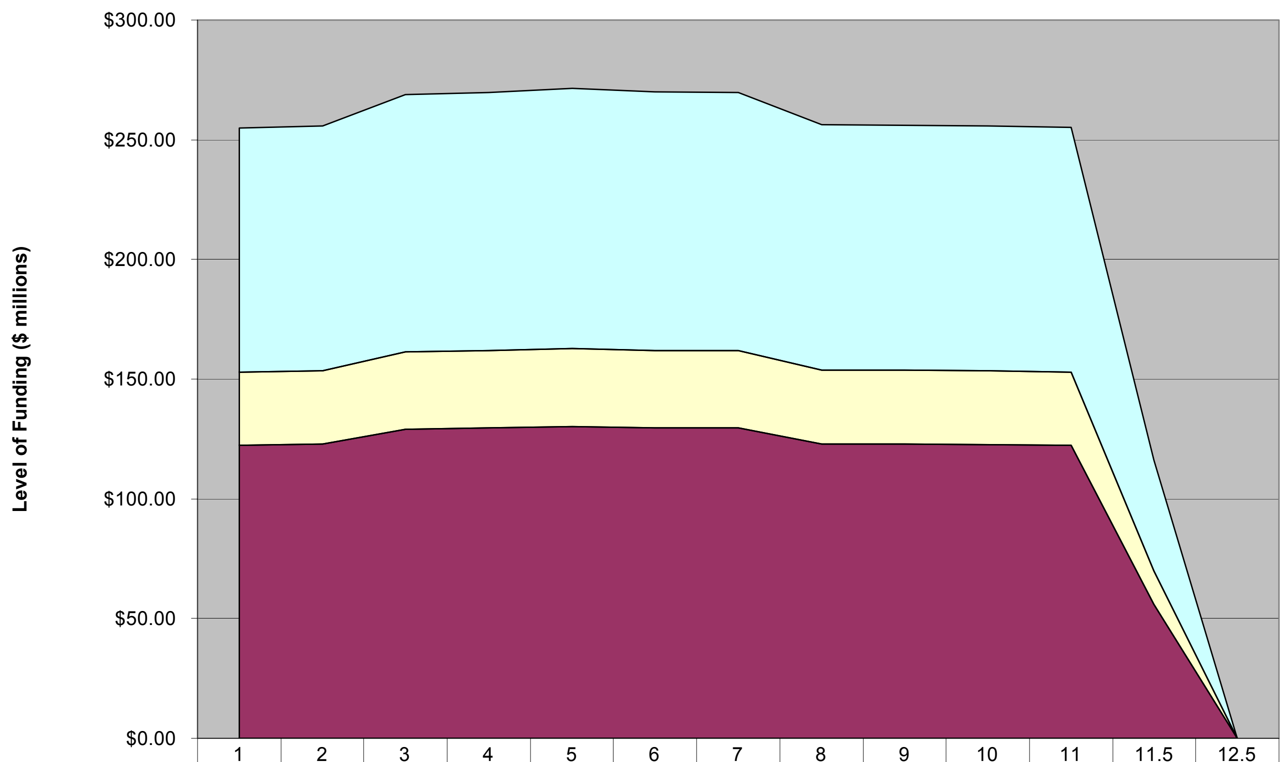
Policy Considerations

This scenario meets the state and regional/local feasible funding limits but exceeds the range considered reasonable for federal earmarked funding by 18 percent. Due to the competition for federal funds from other projects and the impact on MTA's county STIP share, it is unlikely that the Route 710 Tunnel would be able to achieve this level of federal funding.

Revenue Potential

Figure 10-3 illustrates the annual levels of funding that would be required over the Route 710 Tunnel's twelve year planning, design and construction period assumed for this analysis.

Figure 10-3
Scenario 1: (48% Federal, 12% State, 40% Regional/Local)
Capital Funding Required, by Year (2006 Dollars)



	1	2	3	4	5	6	7	8	9	10	11	11.5	12.5
Regional/Local	$101.96	$102.34	$107.52	$107.89	$108.59	$108.03	$107.91	$102.52	$102.43	$102.26	$102.03	$46.53	$-
State	$30.59	$30.70	$32.25	$32.37	$32.58	$32.41	$32.37	$30.76	$30.73	$30.68	$30.61	$13.96	$-
Federal	$122.35	$122.81	$129.02	$129.47	$130.31	$129.64	$129.49	$123.03	$122.92	$122.71	$122.43	$55.83	$-

Source: Sharon Greene & Associates, May 2006.

10.5.2 Scenario 2

Description

Financial Scenario 2 assumes a federal match of 30 percent, a state match of 20 percent and a regional/local match of 50 percent.

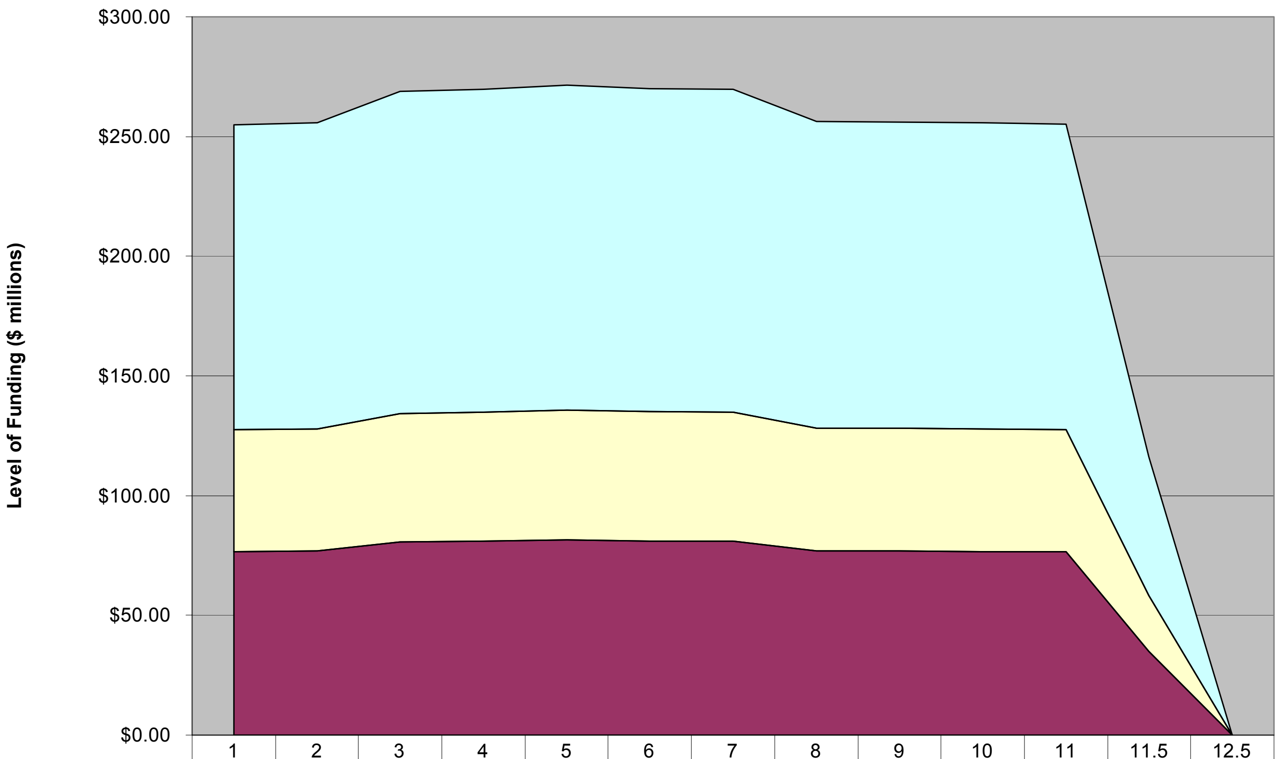
Policy Considerations

This scenario is within the feasible federal funding limit but exceeds the state limit by 8 percent and the regional/local limit by 10 percent. However, this scenario could be considered a feasible option if new funding sources became available at the state and the region/local level.

Revenue Potential

Figure 10-4 illustrates the annual levels of funding that would be required over the Route 710 Tunnel's twelve year planning, design and construction period assumed for this analysis.

Figure 10-4
Scenario 2: (30% Federal, 20% State, 50% Regional/Local)
Capital Funding Required, by Year (2006 Dollars)



	1	2	3	4	5	6	7	8	9	10	11	11.5	12.5
Regional/Local	$127.45	$127.93	$134.39	$134.87	$135.74	$135.04	$134.88	$128.15	$128.04	$127.83	$127.53	$58.16	$-
State	$50.98	$51.17	$53.76	$53.95	$54.29	$54.01	$53.95	$51.26	$51.21	$51.13	$51.01	$23.26	$-
Federal	$76.47	$76.76	$80.64	$80.92	$81.44	$81.02	$80.93	$76.89	$76.82	$76.70	$76.52	$34.89	$-

Source: Sharon Greene & Associates, May 2006.

10.5.3 Scenario 3

Description

Financial Scenario 3 assumes a federal match of 30 percent, a state match of 12 percent and a regional/local match of 58 percent.

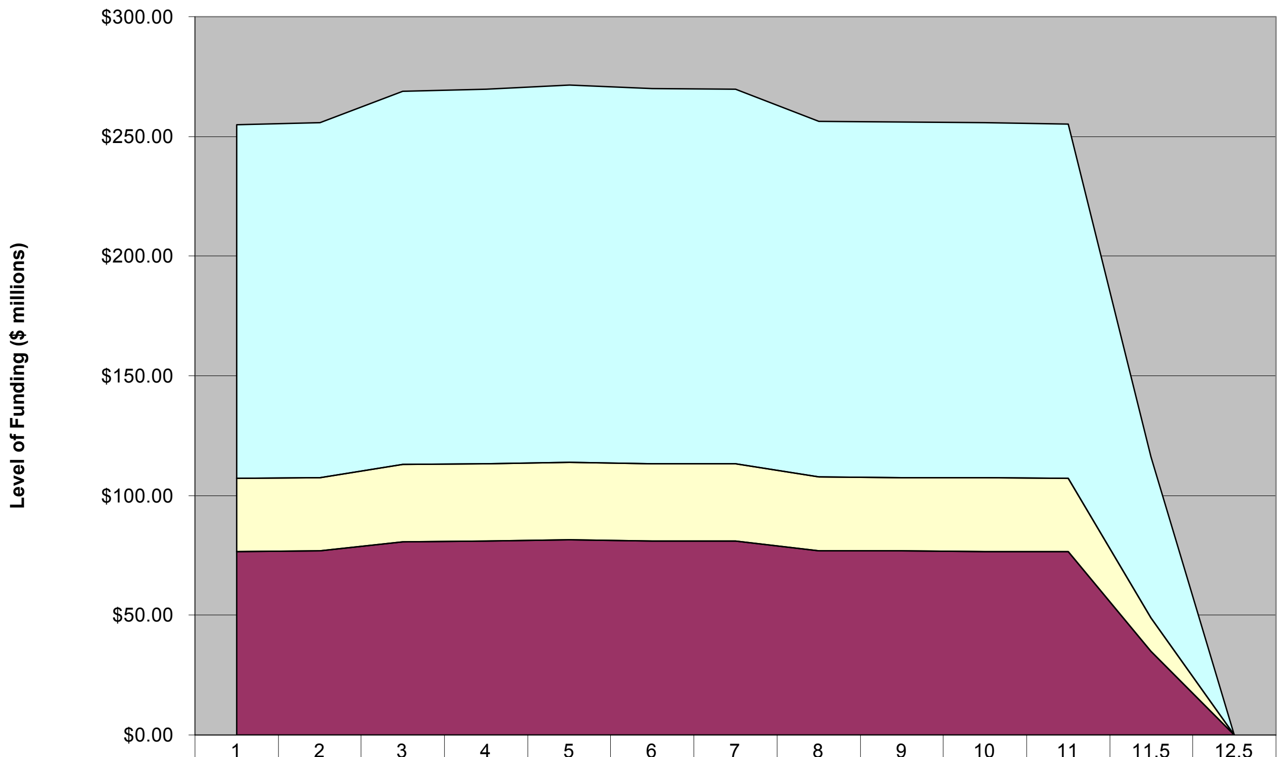
Policy Considerations

This scenario meets the federal and state feasible funding limits but exceeds the regional/local limit by 18 percent. However, this scenario could be considered a feasible option if a new funding source became available at the region/local level.

Revenue Potential

Figure 10-5 illustrates the annual levels of funding that would be required over the Route 710 Tunnel's twelve year planning, design and construction period assumed for this analysis.

Figure 10-5
Scenario 3: (30% Federal, 12% State, 58% Regional/Local)
Capital Funding Required, by Year (2006 Dollars)



	1	2	3	4	5	6	7	8	9	10	11	11.5	12.5
Regional/Local	$147.84	$148.40	$155.90	$156.45	$157.45	$156.64	$156.46	$148.66	$148.52	$148.28	$147.94	$67.46	$-
State	$30.59	$30.70	$32.25	$32.37	$32.58	$32.41	$32.37	$30.76	$30.73	$30.68	$30.61	$13.96	$-
Federal	$76.47	$76.76	$80.64	$80.92	$81.44	$81.02	$80.93	$76.89	$76.82	$76.70	$76.52	$34.89	$-

Source: Sharon Greene & Associates, May 2006.

10.6 Scenarios with Tolling

Based on discussions with LACMTA staff, four scenarios were developed that incorporated user fees (toll revenue bond proceeds) as a fourth funding source. The percent of the total construction cost from toll revenue bond proceeds ranged from 30 to 50 percent. This range allowed for a variety of ways to keep federal, state and regional/local participation within the feasible levels (30 percent, 12 percent, and 40 percent respectively).

10.6.1 Scenario 4

Description

Financial Scenario 4 assumes a federal participation of 30 percent, a State match of 12 percent, a Regional/Local match of 28 percent, and toll revenue bond proceeds of 30 percent. Funding from the toll revenue bonds would be used during the last 4.5 years of the project construction period.

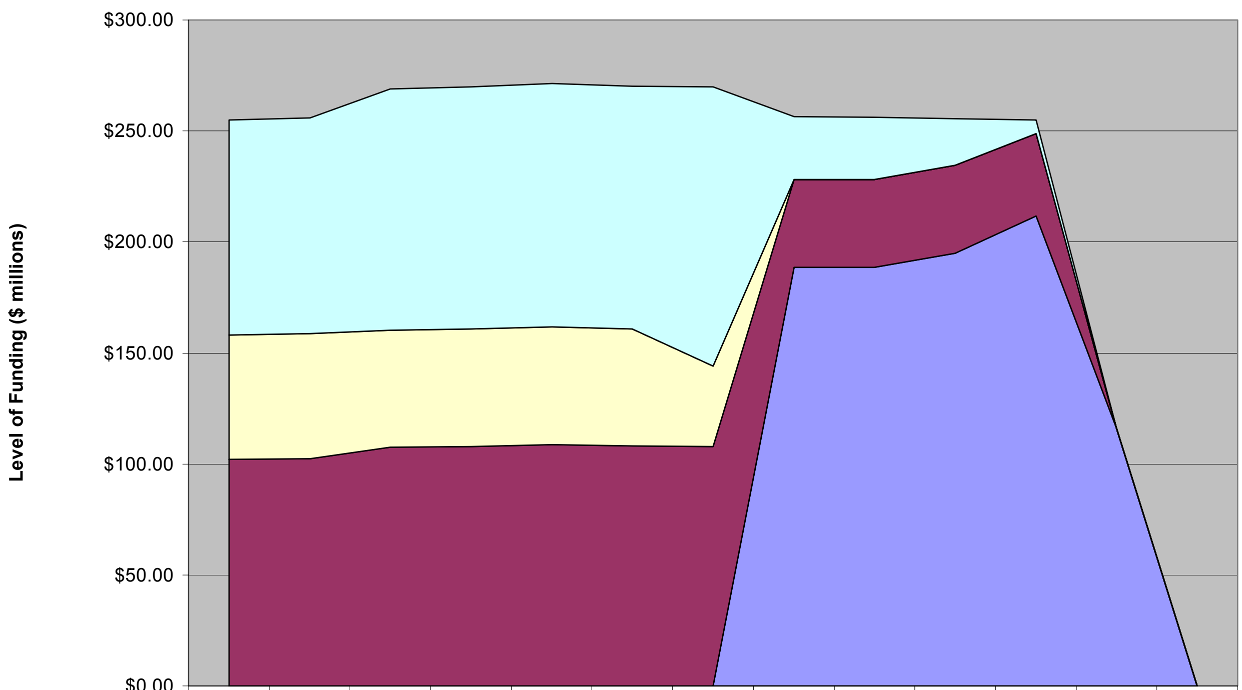
Policy Considerations

Of the four financial scenarios with toll revenue bonds, the objective of this scenario is to maximize federal funding, while minimizing reliance on tolling and on regional/local funding.

Revenue Potential

Figure 10-6 illustrates the annual levels of funding that would be required over the Route 710 Tunnel's twelve year planning, design and construction period assumed for this analysis.

Figure 10-6
Scenario 4: (30% Federal, 12% State, 28% Regional/Local, 30% Toll Revenue Bonds)
Capital Funding Required, by Year (2006 Dollars)



	1	2	3	4	5	6	7	8	9	10	11	11.5	12.5
Regional/Local	$96.86	$97.23	$108.60	$108.98	$109.69	$109.23	$125.76	$28.09	$28.01	$21.24	$6.32	$0.00	$0.00
State	$56.08	$56.29	$52.67	$52.86	$53.19	$52.82	$36.10	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Federal	$101.96	$102.34	$107.52	$107.89	$108.59	$108.03	$107.91	$39.68	$39.61	$39.48	$36.99	$0.00	$0.00
Toll Bonds	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$188.53	$188.46	$194.93	$211.77	$116.32	$0.00

Source: Sharon Greene & Associates, May 2006.

10.6.2 Scenario 5

Description

Financial Scenario 5 would reduce federal participation to 25 percent, maintain State participation at 12 percent, slightly increase the Regional/Local participation to 33 percent, and maintain toll revenue bond proceeds at 30 percent. Funding from the toll revenue bonds would be used during the last 4.5 years of the project construction period.

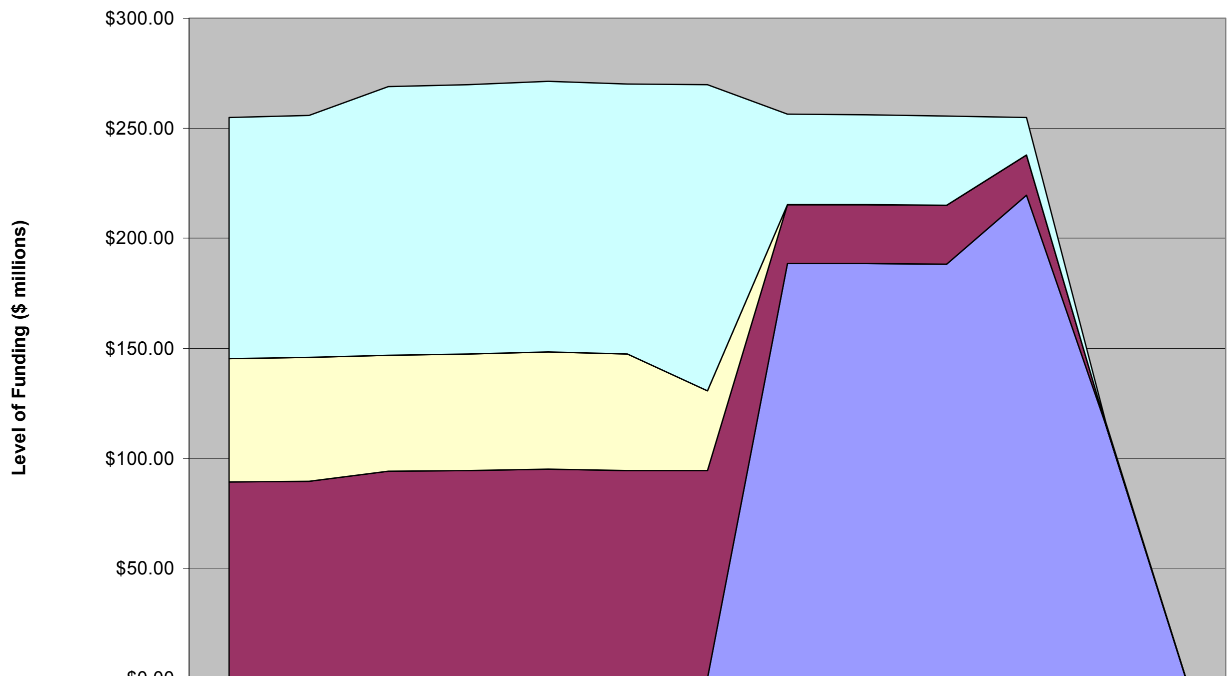
Policy Considerations

The objective of this scenario is to illustrate the impact of a reduction in the level of federal funding participation from 30 percent to 25 percent, and the associated increase in the level of regional/local funding. The increased regional/local level (33 percent) is within the maximum feasible limit (40 percent) for this funding source.

Revenue Potential

Figure 10-7 illustrates the annual levels of funding that would be required over the Route 710 Tunnel's twelve year planning, design and construction period assumed for this analysis.

Figure 10-7
Scenario 5: (25% Federal, 12% State, 33% Regional/Local, 30% Toll Revenue Bonds)
Capital Funding Required, by Year (2006 Dollars)



	1	2	3	4	5	6	7	8	9	10	11	11.5	12.5
Regional/Local	$109.60	$110.02	$122.04	$122.47	$123.26	$122.73	$139.25	$40.91	$40.81	$40.62	$17.11	$1.17	$0.00
State	$56.08	$56.29	$52.67	$52.86	$53.19	$52.82	$36.10	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Federal	$89.21	$89.55	$94.08	$94.41	$95.02	$94.53	$94.42	$26.86	$26.81	$26.70	$18.43	$0.00	$0.00
Toll Bonds	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$188.53	$188.46	$188.33	$219.54	$115.15	$0.00

Source: Sharon Greene & Associates, May 2006.

10.6.3 Scenario 6

Description

Financial Scenario 6 would further reduce funding from federal earmarked sources to 10 percent, maintain State participation at 12 percent, increase the Regional/Local match to 38 percent, and increase toll revenue bond participation to 40 percent. Funding from the toll revenue bond proceeds would be used during the last 5 years of the project construction period.

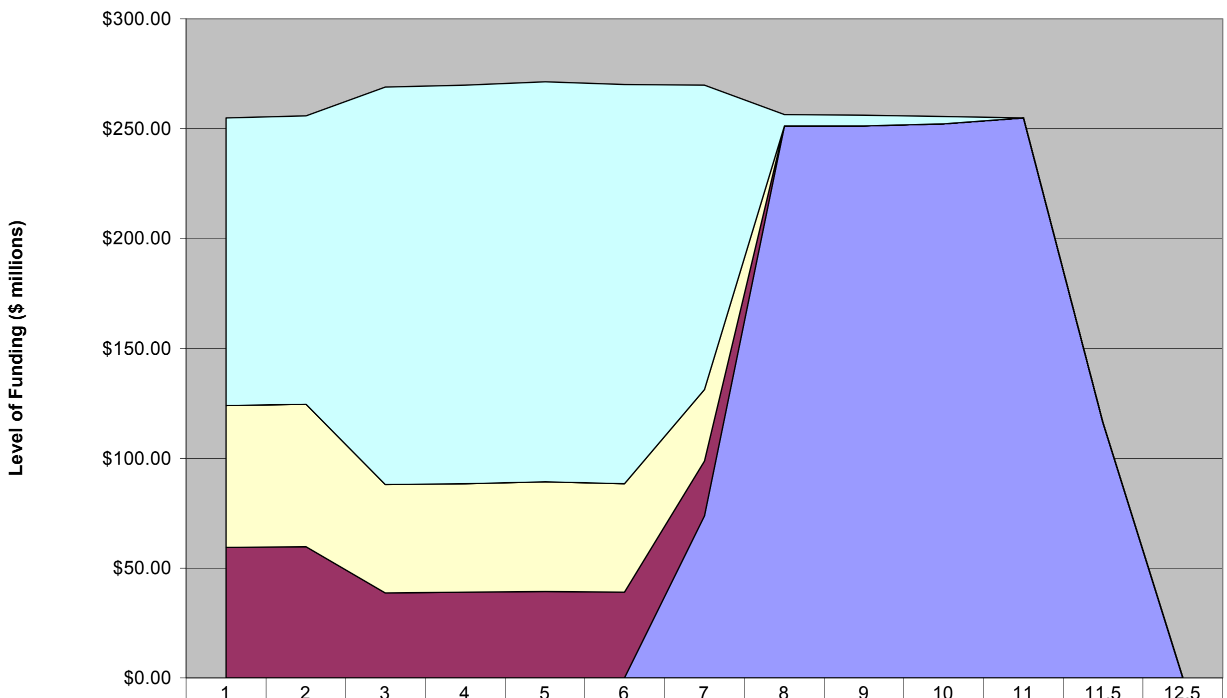
Policy Considerations

This scenario further reduces the level of federal funding participation and increases the level of regional/local funding and toll revenue bond proceeds by the same amount. The increased regional/local level (38 percent) is within the maximum feasible limit (40 percent) for this funding source.

Revenue Potential

Figure 10-8 illustrates the annual levels of funding that would be required over the Route 710 Tunnel's twelve year planning, design and construction period assumed for this analysis.

Figure 10-8
Scenario 6: (10% Federal, 12% State, 38% Regional/Local, 40% Toll Revenue Bonds)
Capital Funding Required, by Year (2006 Dollars)



	1	2	3	4	5	6	7	8	9	10	11	11.5	12.5
Regional/Local	$130.85	$131.34	$180.86	$181.37	$182.30	$181.75	$138.48	$4.90	$4.78	$3.37	$0.00	$0.00	$0.00
State	$64.57	$64.82	$49.19	$49.43	$49.87	$49.42	$32.68	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Federal	$59.47	$59.70	$38.74	$38.93	$39.29	$38.91	$24.96	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Toll Bonds	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$73.64	$251.41	$251.29	$252.28	$255.06	$116.32	$0.00

Source: Sharon Greene & Associates, May 2006.

10.6.4 Scenario 7

Description

Financial Scenario 7 assumes no funding from federal earmarked sources, maintains State participation at 12 percent, maintains the Regional/Local match at 38 percent, and increases toll revenue bond participation to 50 percent. Funding from the toll revenue bond proceeds would be used during the last 6 years of the project construction period.

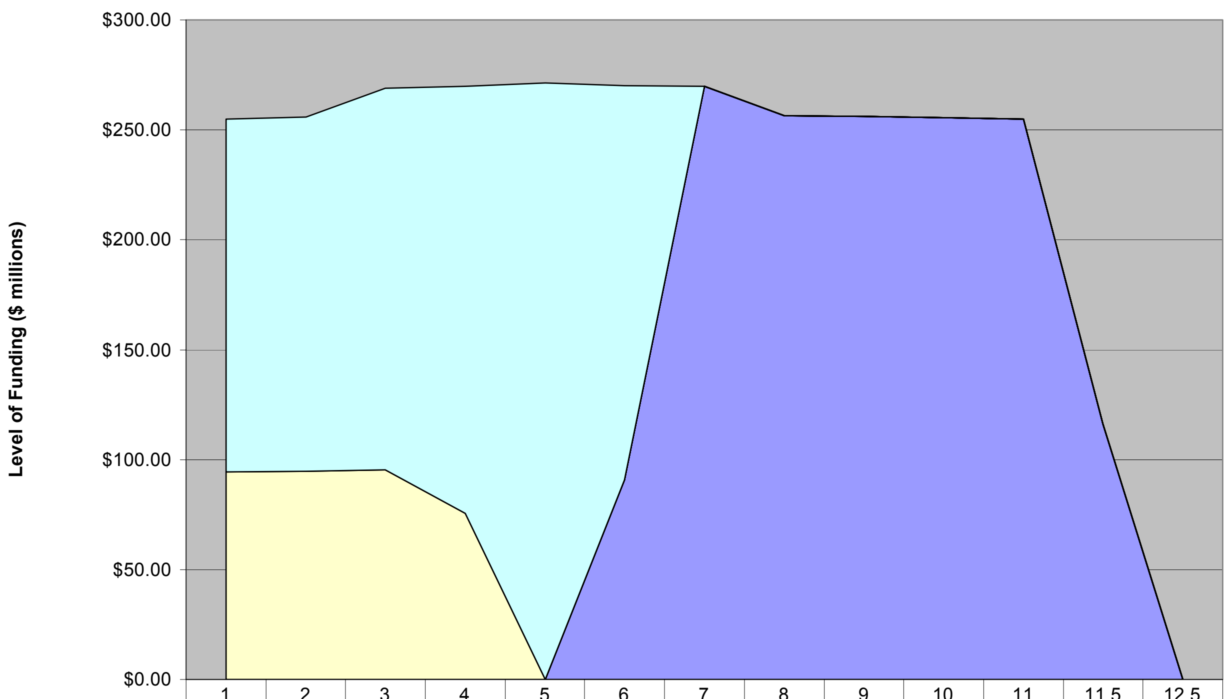
Policy Considerations

To compensate for the assumption of no federal participation in the project, the level of construction costs covered by toll revenue bonds would be increased to 50 percent. Based on the information available at this time, this level of funding from toll revenue bond proceeds is considered the maximum feasible level of participation for this funding source.

Revenue Potential

Figure 10-9 illustrates the annual levels of funding that would be required over the Route 710 Tunnel's twelve year planning, design and construction period assumed for this analysis.

Figure 10-9
Scenario 7: (0% Federal, 12% State, 38% Regional/Local, 50% Toll Revenue Bonds)
Capital Funding Required, by Year (2006 Dollars)



	1	2	3	4	5	6	7	8	9	10	11	11.5	12.5
Regional/Local	$160.58	$161.19	$173.36	$194.14	$271.47	$179.27	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
State	$94.31	$94.67	$95.43	$75.59	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Federal	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Toll Bonds	$0.00	$0.00	$0.00	$0.00	$0.00	$90.81	$269.76	$256.31	$256.08	$255.66	$255.07	$116.32	$0.00

Source: Sharon Greene & Associates, May 2006.

10.7 Next Steps

The funding sources and financial scenarios considered in this report provide a starting point for development of a financial plan for the Project. Implementation of the project will require a significant investment from a variety of federal, state, regional and local funding programs. At this point of project development and as described in this report, there are a number of funding programs and several financing scenarios available to consider as the project moves forward. However, it will be important for LACMTA, Caltrans, and SCAG to continue to work with local, state and federal officials to demonstrate the significance of the project and to make the case in order to be competitive for future funding.

Additionally, as the project proceeds through the state and federal environmental and project implementation processes, completion of a comprehensive financial plan, that includes construction costs and project costs associated with the environmental documentation, preliminary and final design, construction management, insurance, and agencies/force account oversight and staff, will be required component.

Finally, consideration should also be given to potential institutional arrangements that could facilitate implementation of the project. Such institutional arrangements could include formation of a special-purpose Joint Powers Authority (JPA) to design, build, finance, and potentially operate and maintain the Route 710 Tunnel. An overview of key issues associated with the formation of Joint Powers Authority has been discussed in the Study's Financial Analysis Report.

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11.0 Feasibility Assessment Conclusions

11.1 Introduction

Over the past year, the Metropolitan transportation Authority (MTA) study team, in coordination with its consultant, has been conducting a feasibility assessment of a bored or mined tunnel to complete the Route 710 Gap. This assessment has been performed in close coordination with the technical staff from the state, regional and local agencies affected by the tunnel concept. Representatives from these affected agencies formed the Route 710 Tunnel technical feasibility assessment's Working Group and provided technical input throughout the study.

The purpose of the Route 710 Tunnel Technical Feasibility Assessment was to determine whether a bored or mined tunnel alternative is viable and practical; and to determine whether additional actions or studies should be undertaken to advance this concept further. The technical feasibility of the tunnel concept was addressed from the Physical, Environmental and Financial perspectives.

The conclusions and the findings of this feasibility study are summarized below.

11.2 Physical Feasibility

The primary purpose of the tunnel feasibility assessment from the physical perspective is to assess the viability and suitability of implementing a tunnel through the Route 710 Gap based on current engineering and construction practices. This assessment was performed, in consideration, with the suitability of the geotechnical, geologic, hydrological, seismic conditions and the ability of the tunnel concepts to satisfy traffic demand, highway and geometric standards, ventilation requirements, and other safety criteria.

Although this tunnel feasibility assessment is broad in nature, based upon the technical evaluations and analyses conducted for this study, it appears that a tunnel alternative is a viable concept to close the Route 710 Gap from the physical perspective. However, more comprehensive and detailed evaluations will be necessary to develop strategies and methods to effectively address specific elements related to overall feasibility of the tunnel concept.

The following is a brief summary of the physical elements and considerations that led to the general conclusion that the tunnel concept is feasible and valid from the physical aspects.

11.2.1 Traffic Considerations

From the traffic modeling and analysis effort, alternative tunnel scenarios were considered including options that provided three or four lanes of traffic in each direction and scenarios with and without the inclusion of a fully directional interchange at Huntington Drive. This feasibility assessment addressed the potential implication of adding an interchange connecting traffic along Huntington Drive and the tunnel. For this interchange, the analysis evaluated the provision of a full service interchange with four on- and off-ramps serving both northbound and southbound tunnel directions. Additionally, the analysis considered traffic with and without large trucks permitted to use the tunnel. The traffic forecasting and analysis considered alternative operational tunnel scenarios with the following options: a) three and four lane per directions; b) mixed use traffic (all vehicular types) and restricted traffic excluding truck use in the tunnel; and c) with and without an interchange at Huntington Drive.

For the detailed traffic results, refer to Chapter 5 entitled Traffic Modeling/Traffic Analysis. The traffic analysis concluded that the tunnel would require four lanes in each direction to adequately serve the anticipated future 2030 traffic demand. The tunnel scenario that included four lanes of traffic in each direction without the Huntington Drive interchange proved to have sufficient capacity to maintain an acceptable Level of Service (LOS) “E” in the forecast year of 2030. For highways, a typical measure of its operating characteristics or performance along a segment of the facility is Level of Service. LOS is a qualitative description of the freeway’s ability to accommodate peak period traffic in terms of the maneuverability and delay. The LOS ratings range from LOS “A” (free-flow conditions) to LOS “F” (considerable to severe congestion or “stop-and-go” conditions). LOS “E” has been established as the minimum acceptable threshold for facilities in the Los Angeles regional area.

Tunnel scenarios with three lanes per direction with or without the Huntington Drive interchange were determined to yield an unacceptable level of service and motorists will experience severely congested conditions during the peak periods, and so the three lane tunnel options were discarded due to their inability to adequately meet the future traffic volumes. Additionally the four-lane tunnel scenario with the Huntington Drive interchange would result in additional constraints since a segment of the northbound tunnel, between the southern portal and the interchange, would still experience LOS “F” operations during the afternoon peak period.

Although the inclusion of an interchange should remain an option in future study, this technical feasibility assessment focused its evaluation of tunnel concepts on the options that provided four lanes of traffic in each direction without the interchange at Huntington Drive. As discussed in Chapter 6, “Tunnel Configuration and Alignment”, nine representative tunnel cross-sections were considered and evaluated as part of this assessment. Each of these alternatives provided four lanes of traffic in each direction in either two or three tunnels depending on the tunnel configuration. All tunnel concepts that provided four lanes of traffic in both directions without the interchange were determined to provide an adequate capacity to meet the anticipated traffic demand while maintaining traffic operations at LOS “E” or better.

The comparison of the scenarios with and without truck traffic concluded that the tunnel traffic operations would only be marginally improved by imposing the restriction on trucks using the Route 710 tunnel. Although tunnel traffic operational performance improved comparing the “Truck-restricted” scenarios compared to the mixed vehicular use scenarios, the improvement did result in a significant improvement in performance. In no comparisons did the anticipated traffic performance improve to the next better level of service classification by restricting truck use through the tunnel. Although the restriction on truck use appears to have some operational benefit and may have some environmental benefit, it should be noted that the restriction may preclude potential funding sources available for "Goods Movement" or other programs. The inclusion of truck traffic would affect tunnel configuration, cost, financial, environmental, and operational

The effect of the Route 710 tunnel alternatives on the adjacent freeway and arterial network was evaluated and determined that, generally, the completion of the Route 710 gap has a neutral or beneficial traffic impact on most adjacent freeways and arterials in proximity to the study area. Currently in the absence of a continuous Route 710 freeway through the El Sereno area of Los Angeles, Alhambra, South Pasadena and Pasadena, motorists use a variety of routes to get from one end of the gap to the other. Some of motorists use the adjacent freeway network or arterial streets to traverse the Gap. The analysis of the traffic model data comparing the tunnel scenarios to the Base Case condition without the closure of the gap revealed that a continuous Route 710 would cause a re-distribution of trips through study area.

On the freeway network in the vicinity of the study area, the tunnel alternatives resulted generally in a slight reduction or minimal change in traffic volumes during the peak periods as compared to the Base Case condition. However, the freeways, I-210 and I-10, on either end of the Route 710 tunnel will experience a growth in traffic volumes as compared to the Base Case. This increased traffic is directly attributable to trips that are attracted to the continuous link provided by the tunnel concept.

Along the I-210 Foothill freeway north of the US 134 Ventura Freeway, the peak hour traffic will increase between 1,900 to 2,500 vehicles per hour. This increased traffic volume is equivalent to approximately the hourly capacity of one freeway lane. Similarly Route 710 south of the I-10 San Bernardino Freeway, the traffic volumes of the tunnel concept is greater than the Base Case by roughly 600 to 2,000 vehicles during the peak hour. The likely impact of this added traffic is that it will degrade the level of service along these freeway segments.

The impact of the tunnel scenarios to the arterial street network is generally positive as compared to the Base Case. It is seen that traffic volumes for all tunnel scenarios generally decrease on all arterial streets segments at the southern end of the tunnel, including the Route 710 on-and off-ramps at Valley Boulevard, Valley Boulevard itself, Fremont Avenue, Atlantic Boulevard and Garfield Avenue. The decrease is also greater for the scenarios which include the Huntington Drive Interchange. This is to be expected, since the Huntington Drive interchange would provide an additional opportunity for vehicles to exit and enter the proposed tunnel.

Traffic volumes increase, however, on Huntington Drive west of Fremont Avenue for the scenarios that include the Huntington Drive Interchange, reflecting the longer trips using the tunnel without the interchange.

Generally, traffic volumes on arterial street segments north of Huntington Drive are projected to decrease with the gap-closure alternatives. In particular, significant reductions in projected traffic volumes are observed at Pasadena Avenue and St. John Avenue at California Boulevard. Reductions in traffic volumes are also observed on Fair Oaks Avenue and California Boulevard.

Based on the above discussion, from a traffic engineering perspective, it was determined that the four-lane tunnel concepts were feasible due to the following factors:

11.2.2 Geologic and Geotechnical Considerations

The study tasks covered in Chapter 3 focused on the subsurface ground conditions based upon available geological data and supplemented with a minor geotechnical exploration program consisting of drilling three deep exploratory boreholes along the study corridor.

The study area for the potential tunnel alignments is quite large being over four miles long and two miles wide, and with the tunnel possibly as deep as 300 feet below the surface. The necessary data to enable full design would require much more extensive subsurface exploration program to augment the limited geotechnical information that is available at this time.

The currently available geotechnical information indicates that the subsurface conditions are favorable for tunneling. Soil conditions anticipated include predominantly soft sedimentary rocks – shales, sandstones, siltstones, and conglomerates and alluvial soils. These geologic and geotechnical conditions beneath the study area appear to have physical properties that are well suited for bored or mined tunneling.

Groundwater conditions are not well defined at this point but the recent field borings encountered groundwater at measured depths of 66 feet and 82 feet below the surface. Previous borings have encountered groundwater at depths shallower than 50 feet. The depth of the groundwater throughout the study area is not known and supplemental investigations are needed to fully characterize the conditions. However based on this limited information on the groundwater, the tunnel invert, or bottom of the interior floor of the tunnel, should be well below the groundwater.

The Los Angeles basin is a known area of active geologic deformation and seismic activity. Active seismic faults in the proximity of or crossing the potential corridor will influence the tunnel design for ground movement, shaking and displacement, during earthquakes. These conditions are not unusual and can be found throughout California, and numerous underground transportation facilities have been implemented in Los Angeles and San Francisco with similar seismic conditions. There are a number of identified faults that may influence the tunnel alignment; however, the most significant seismic fault to be considered is the Raymond Hill fault or as commonly referred to as the Raymond fault. Additional studies will be needed to better characterize the Raymond fault, but it represents conditions similar to the Metro Red Line subway tunnel that was driven through the Santa Monica-Hollywood fault system.

The study corridor would not pass through any known operating or abandoned oil or gas fields or identified methane zones. No known tar or oil seeps occur along tunnel study corridor. However, discontinuous seams of lignite coal have been found within the Topanga Sandstone and occurrences of methane and natural gas have been noted throughout the Los Angeles Basin. Therefore, it should be considered possible that the tunnel may encounter gassy conditions south of the Eagle Rock fault. North of the Eagle Rock fault, it is not anticipated that the tunnel will encounter gassy conditions. Should gassy subsurface conditions be encountered, a number of mitigation measures have been developed to overcome this on other underground projects.

In summary based upon the limited existing geologic and geotechnical information and the exploratory drilling program conducted for this feasibility assessment, the ground conditions are favorable for tunneling. From a geologic and geotechnical evaluation, the physical ground properties are considered to be suitable for tunneling in the study area. However, significant additional subsurface investigation is needed to more fully characterize the conditions.

11.2.3 Tunnel Technology

To provide four-lanes of traffic in a single bored or mined tunnel will push the Route 710 tunnel concepts to the forefront of modern tunnel technology. However, there are a number of recent or active highway tunnel projects that lend credibility to physical feasibility of this concept. During research and discussion with industry experts, it is considered within the realm of reality that a Tunnel Boring Machine (TBM) may approach an outside diameter in the 55 to 56 feet range in the near future. This study considered four-lane bored tunnel alternatives with outside diameters ranging from 48 feet to 57 feet. Also considered were four-lane mined tunnel alternatives with outside diameters ranging from 60 feet to 72 feet.

In Chapter 2, Summary of Large Highway Tunnels - Domestic and International, there are a number of highway tunnels in urban settings that have attributes similar to the concepts for the Route 710 tunnel. The tunnels reviewed represent many of the world's most recent large diameter highway tunnels that feature state-of-the-art construction methods, equipment and operational concepts.

Three tunnels have particular relevance to the Route 710 tunnel concepts and these are the A-86 Motorway in Paris, France, the M30 Motorway in Madrid, Spain and the Mount Baker Ridge Tunnel in Seattle, Washington. The A-86 Motorway in Paris is located in an urban or suburban environment and includes a 6.2 mile long auto-only two-level (stacked roadway) tunnel. The tunnel will provide a total of six lanes of traffic (each travel lane is roughly 9.2 feet in width); three lanes of one-way traffic per level in this stacked configuration. The A-86 Motorway tunnel is being constructed using Tunnel Boring Machine (TBM) excavation method. The M30 Motorway in Madrid is at the center of a major urban renewal project and serves as the city's inner ring road. This project is currently under construction using the world's largest TBM. The South By Pass portion of this ring road includes a 2.2 mile segment of bored twin 50 feet diameter tunnels carrying three lanes of traffic per tunnel. The M30 Motorway shares many characteristics with some of the Route 710 tunnel concepts. Finally, the Mt. Baker Ridge tunnel along I-90 in Seattle, Washington is an example of a tunnel that used innovative construction technique to construct a stacked, double deck roadway tunnel. This Seattle tunnel provides for one-way traffic through a five-lane double deck stacked tunnel cross-section (three lanes on the top level and two lanes below).

Each of the above described tunnels has selected specific physical attributes similar to the tunnel alternatives considered by this assessment. These physical attributes and features include tunnels in congested and environmentally sensitive urban settings, large diameter highway tunnels, double-deck stacked roadway configurations and large diameter TBM excavated tunnels (A-86 and M30 tunnels). In the determination of the physical feasibility of the Route 710 tunnel concepts these tunnels, along with other large highway tunnels, current and emerging tunnel technologies and construction methods were all considered. Some of the key factors evaluated as part of the potential applicable tunnel technologies are briefly described below. For a complete description of all factors considered by this assessment refer to Chapter 4 Tunnel Technologies.

11.2.3.1 Horizontal Alignment

The alignment of the tunnel alternatives will be controlled by traffic flow requirements, minimum highway curvature for the vehicle design speeds and geometric constraints for the connections to the existing freeways and existing right-of-way. For a tunnel of the size required, the smallest curve radius that a Tunnel Boring Machine (TBM) can negotiate would be in the range of 1,000 feet. This would be one of the design criteria used to layout the horizontal alignment and is well within the horizontal curvature of the example alignments considered in determining feasibility under this study.
Twin or multiple tunnels would need to maintain a minimum horizontal separation of approximately one tunnel diameter along the alignment to prevent overstressing of the central rock or soil pillar due to redistribution of ground loads around the tunnels as they are excavated.

11.2.3.2 Vertical Alignment

The vertical alignment of the tunnel would also be controlled by the approach elevations, highway standards for vertical curves, and the requirement to maintain sufficient cover over the crown of the tunnel. The vertical alignment establishes the tunnel cover and the hydrostatic pressure to be considered in the design, construction feasibility and planning. Other considerations would be possible ventilation shaft locations and any need for a potential interchange at Huntington Drive.

For this study, an effort was made to maximize the cover over the tunnel crown to reduce the potential for surface settlement and impacts on existing structures. A minimum cover of two tunnel diameters or 100 feet (assuming a 50 feet excavated diameter) has been selected for the feasibility analysis. At the tunnel entrances where the ramps approach the tunnel portals, shallow cover will be necessary for the transition into the assumed nominal 100-feet depth of cover of the main alignment.

11.2.3.3 Tunnel Cross-Sectional Requirements

In Chapter 6 Tunnel Configuration and Alignment, Figure 6.1 schematically illustrates cross sections assumed to accommodate four-lane tunnels in each direction, including allowance for shoulders and walkways – either to full highway standards or reduced standards. Depending on the final requirements for the cross section, the minimum excavated TBM diameter could vary from about 38 to 57 feet, and in the Sequentially Excavated Method (SEM) tunnels could span up to approximately 72. The larger TBM cross-sections would therefore need to exceed the size of the most recently constructed tunnels described in Chapter 2, but is comparable with the size of the M30 tunnel being constructed in Madrid, Spain, which has a 50 feet excavated diameter. Currently, the M30 tunnel is being constructed with the largest diameter tunnel boring machine used to date. Many tunneling industry authorities believe that a larger diameter TBM approaching the mid-50 feet will be feasible in the future. Consequently, the TBM excavated alternatives under consideration are within the range of current tunnel technology or emerging advancement in the field. However, the Route 710 cross-section that has a 57 feet diameter and complies with full highway standards which may need to be narrowed slightly to be compatible with the future technological limits.

11.2.3.4 Tunneling Methods

Tunnel construction methods sequences, equipment, and systems must be selected considering tunnel size and function, cost and schedule and the full range of geologic and hydrologic conditions, possible impacts on the adjacent structures, compatibility with final ground support, safety, and economy. This assessment focused on tunnel construction by two primary methods, Tunnel Boring Machine (TBM) and Sequential Excavation Method (SEM) approaches. Extensive or lengthy use of the Cut-and-Cover method of tunnel construction was not considered due to the potential significant disruption to the surface improvements and right-of-way requirements. However it is conceivable that even with primary tunnel construction using the TBM or SEM methods, limited segments near the portals – where the depth of the tunnel is shallower – may require the use of cut-and-cover methods.

It is critical that the face of the tunnel excavation and its full perimeter are tightly controlled to minimize ground losses (soil movement toward the tunnel shield) and movements of the overlying ground and ground surface. For these reasons, the primary underground construction methods to be considered for the 710 Tunnel would be Pressure Face Tunnel Boring Machines. Other methods, such as the Sequential Excavation Method (SEM) may also prove effective, and warrant consideration for non-circular cross sections or short reaches for cross-passages and adits (due to the additional construction flexibility offered).

11.2.3.5 Fault Crossings

Seismic faults and conditions are not unusual and can be found throughout California and numerous underground transportation facilities have been constructed in the Los Angeles metropolitan area. The major fault crossing within the study area is the Raymond Hill fault. Ground is expected to vary between highly fractured to crushed with seams of clay gouge.

MTA's Metro Red Line tunnels were constructed through the Santa Monica Fault zone. Seismic design for the Santa Monica Fault crossing included an oversized, mined tunnel section to facilitate repair in the event of fault displacement. The mined section was constructed using SEM with shotcrete and lattice girders as final support.

While additional study is required to characterize the fault in the location of the Route 710 tunnel crossing, feasible construction methods for a fault crossing could include SEM using multiple drifts and specialized support, such as ground treatment through grouting, or TBM driven tunnels with specially reinforced segments. The means and methods for the Route 710 tunnel to cross the Raymond Hill fault is area that warrant more comprehensive analysis to ensure public safety is maximized.

11.3 Environmental Feasibility

The preliminary environmental analysis conducted for this study was intended to address the likely and potential issues and impacts related to construction and operation of a major highway tunnel upon the adjacent and affected communities and the environment. It was not intended to provide the level of detail of evaluations contained in an environmental document. The focus of the preliminary environmental assessment is to address the potential tunnel issues and impacts to the environment within the study area and to identify any issues or constraints that will preclude additional consideration of the tunnel concept to close the Route 710 Gap.

For more complete discussions regarding the Preliminary Environmental Analysis refer to Chapter 8 of this report. This section summarizes the preliminary level of environmental analysis based upon early assumptions of the project description to support the feasibility study and to identify any potential key issues associated with the feasibility of any tunnel alternative to complete the Route 710 freeway. If it were decided to explore a tunnel option in more detail then the subsequent refinements in project description, alignments, or environmental laws would require a more detailed evaluation of the issues raised under this initial study, with formulation of a comprehensive mitigation strategy.

The Preliminary Environmental Analysis for the conceptual Route 710 tunnel alternatives has considered the existing conditions, the environmental constraints, the potential impacts that could occur, and suggested typical mitigation measures for further examination.

From the environmental perspective, the proposal to complete the Route 710 gap in the freeway system via a highway tunnel appears viable and feasible. The environmental impacts to the following resources may occur: noise, air quality, historic properties, aesthetics, archaeology, hazardous waste, soil disposal, and storm water impacts. However the severity of these impacts can be minimized, eliminated or mitigated. Based upon this preliminary environmental assessment, no insurmountable environmental issues have been identified that would preclude further consideration of the tunnel alternative. However, it is recommended that additional detailed evaluations and analyses be conducted to determine the tunnel alternative including alignment, features and amenities that would be the most environmentally suited to the community and the Route 710 corridor.

The main environmental constraints to the tunnel concept relate to the portal locations, the ventilation shafts, and the potential interchange at Huntington Drive.

During subsequent environmental evaluation or additional conceptual planning for the tunnel alternatives, more detailed evaluations are warranted to identify the most appropriate strategies to minimize, eliminate or mitigate these impacts. It will be necessary to include an active public participation program to review concepts and provide feedback of the various project proposals.

11.3.1 Potential Impacts and Mitigation Measures

This section describes the typical environmental impacts that may occur and the typical types of mitigation that could be used to avoid, minimize or mitigate those impacts.

11.3.1.1 Noise

During Construction

Temporary noise barriers can be used to reduce construction noise levels from equipment operating at the surface. Consideration should be given to determine whether permanent noise barriers should be implemented initially if they provide the appropriate level of mitigation of construction activity noise. Construction activities during nighttime and/or weekend hours will be subject to noise level limits based on the existing ambient levels. No significant impacts are expected.

During Operation

Noise impacts during the actual operation of the tunnel are not anticipated to be above established noise thresholds as methods can be utilized to minimize noise levels. Soundwalls and sound absorptive treatments would be used at the portals to decrease the extent of noise emanating from the portal areas.

Sound attenuators for ventilation fans and tunnel portal jet fans would be used to reduce noise levels to the areas around the ventilation buildings to meet the level permitted by the local noise ordinance. The ventilation fan buildings have been assumed to be located beneath ground level to reduce impacts.

Additional traffic that would be circulated to surrounding roadways (I-10, SR 134 and I-210) would not result in any increased noise at these locations. The maximum traffic noise would occur at roadway capacity (1950 vehicles/lane/hour) operating at a free flow condition of Level of Service (69 miles per hour). Additional traffic volumes exceeding capacity on these roadways would reduce travel speed effectively reducing noise levels.

11.3.1.2 Air Quality

During Construction

Typically, project related construction impacts would be localized, and predominant emissions would be nitrogen dioxide, carbon monoxide, sulfur oxides, and diesel particulate matter from diesel powered construction equipment; carbon monoxide emissions from worker vehicles, and PM_{10} or dust emissions from vehicles traveling on unpaved surfaces, or as the result of grading and other earthmoving activities.

There could be substantial PM_{10} emissions associated with excavation and tunneling activities (grading, excavation, creation of storage piles, loading of material onto haul trucks, etc.). Implementing a fugitive dust program that could include measures such as site wetting and other controls would minimize impacts of construction. Maintenance of construction equipment emissions control systems could also be implemented to reduce construction impacts. Application of these standard measures would reduce construction related air quality impacts to below a level of significance.

During Operation

Potential impacts of the vehicular emissions would be generated within the proposed tunnel and would be released to the atmosphere through the tunnel's two portals and the ventilation stacks. CO, $PM_{10,}$ and DPM are pollutants of concern for this analysis. Particulate matter and diesel particulate matter would be considered because of the diesel vehicles that may travel through the tunnel.

The significance of localized project impacts depends on whether predicted CO and PM_{10} levels in the vicinity of the portals would be above or below the NAAQS and whether the projected increases in DPM near the tunnel portals would be above or below the SCAQMD's significant impact threshold.

If air pollutant levels would be found to exceed these standards and thresholds, then the following potential mitigation measures could be considered:

- Raising the height of the ventilation shafts to increase atmospheric dispersion.
- Relocate ventilation shafts away from areas of residential land use.
- Revise the ventilation system to minimize the discharge at the portals.
- Modify the ventilation system at the portal to increase dispersion.

11.3.1.3 Historic Properties

During Construction

Potential impacts to historic properties would occur in relation to ground vibration and settlement during the excavation of the tunnel under historic properties and/or historic districts. This potential impact would be greater with shallower tunnel depths occurring near the portal locations.
If it were decided to proceed with an interchange at Huntington Drive more vibration impact may occur at the Short Line Villa Tract Historic District.
The potential ground vibration impact would be temporary in nature as the tunnel boring machine passed underneath the historic property and/or historic district. Different construction techniques and building protection can be utilized to protect and minimize vibration and settlement to these structures.

During Operation

The operation of rubber tired vehicles within the tunnel would result in imperceptible ground vibration levels to the historic properties above. No impacts would be expected.

The tunnel portal structures and ventilation buildings and shafts are large-scale structures that could have a major visual and aesthetic impact on the surrounding communities. Aesthetic treatments to the structures themselves, such as decorative architectural features and incorporation of art can be included in the design of the tunnel and associated structures to decrease their visual impacts and increase the aesthetics of their design. Softscape treatments such as landscape buffers, vegetated slopes and walls, and the conversion of remnant parcels into neighborhood parks can help blend the structures into the surrounding area, enhance the overall aesthetics of the surrounding area, and minimize visual impacts.

Architectural and urban designs for the portal structures, ventilation shafts, and surrounding areas should consider context sensitive design; visual quality; safety and operational requirements; security through environmental design; appropriate lighting; architectural treatments; and landscape interfaces. Workshops can be used to address key design issues with stakeholders. A focused community outreach and design process can help establish consensus on key design issues. A comprehensive landscape plan can be developed for integration of the physical structures into the surrounding community. The plan could incorporate features that meet the goals for aesthetic character and design for the area as established by the community's goals.

Some initial examples of portal and ventilation stack treatments are provided in Chapter 7 to indicate some potential mitigation ideas.

11.3.1.4 Archeological Impacts

Archaeological sites are not anticipated to be found within the project area.

11.3.1.5 Hazardous Materials/Waste

If hazardous materials are encountered during Geological boring activities, the cuttings would be properly disposed and the boring would be backfilled with bentonite grout. Any structures that would be demolished as part of construction will also undergo an evaluation for the presence of hazardous materials prior to demolition, in accordance with the ESA process.

Because dewatering activities may be necessitated by the proposed project, groundwater analyses will need to be performed, prior to issuance of the National Pollution Discharge Elimination System (NPDES) dewatering permit, to determine the type and extent of any hazardous materials/waste contamination.

11.3.1.6 Disposal of Soil During Construction

Another environmental impact relates to the disposal of soil during construction. Using trucks to haul soil to a landfill or other disposal site(s) via the freeway system would also have noise, air quality, and traffic impacts along the haul route. If the Union Pacific railroad spur (near the southern portal location) is used to remove the soil, the associated environmental impacts may be reduced.

11.3.1.7 Storm Water Impacts

Best management practices (BMPs) would be implemented during construction for stormwater pollution control, in accordance with the National Pollutant Discharge Elimination System (NPDES). The project would need to comply with all Regional Water Quality Control Board's water quality standards and waste discharge requirements and Caltrans Statewide NPDES Storm Water requirements.

The proposed project would not create long-term demand for water and demand for water during construction would be limited. The proposed project would not include any activities that would have long-term effects on local water sources; therefore, additional contribution of runoff water would not exceed the capacity of existing or planned stormwater drainage systems, provide substantial additional sources of polluted runoff, or degrade water quality.

Some issues that may have significant impacts and will be studied at a later project phase include the following:

- Water quality standards or waste discharge requirements
- Depletion of groundwater supplies or interference with groundwater recharge or a lowering of the local groundwater table level
- Alteration of the existing drainage pattern of the site or area, which could result in erosion or siltation or increase the rate or amount of surface runoff which could result in flooding on- or off-site
- Creation or contribution to runoff water which could exceed the capacity of existing or planned storm water drainage systems or provide additional sources of polluted runoff
- Impacts on the physical, chemical, or biological qualities of water quality

11.4 Financial Feasibility

11.4.1 Financial Feasibility

The Route 710 Gap Closure is a project of regional significance. Should the freeway be completed by a four-lane per direction tunnel alternative, this facility will be one of the biggest and longest highway tunnels in the Western Hemisphere. The technical feasibility assessment considered a myriad of tunnel alternatives and optional physical features with costs ranging from approximately $2.3 billion to $3.6 billion (2006 dollars). A "representative" tunnel cost estimate of $3 billion (2006 dollars) was used for the purposes of identifying potential funding sources and developing financial strategies to reflect the range of tunnel alternatives considered.

11.4.2 Financial Strategy

The purpose of developing financial strategies is to assist the Los Angeles County Metropolitan Transportation Authority (MTA) in identifying potential funding sources and funding scenarios for the future implementation of a Tunnel Alternative for the Route 710 Gap Closure.

This Financial Strategy Report provides a starting point for the development of the project's financial plan. As the Route 710 Tunnel project proceeds through the state and federal environmental and project implementation processes, completion of a comprehensive financial plan will be required. Additionally, since the initial order of magnitude construction cost estimate for the tunnel is $3 billion (2006 dollars), the Route 710 Tunnel project would fall under the Federal Highway Administration's (FHWA) Mega Project classification which requires the development of a comprehensive financial plan. Under the FHWA Mega Projects Financial Plan process, project sponsors must submit an Initial Financial Plan that provides information on the immediate and longer term financial implications resulting from implementing the project. Project sponsors must then submit annual updates of the Financial Plan to provide information on actual cost and revenue performance in comparison to initial estimates as well as to update estimates of future year obligations and expenditures. The annual updates provide information on cost and revenue trends, current and potential funding shortfalls and the financial adjustments necessary to assure completion of the project.

The purpose and need for the Route 710 Gap Closure tunnel alternative provides the basis for identifying potential revenue sources related to accomplishing specific goals and objectives required to enhance mobility and connectivity for people and goods, improve environmental quality, and increase safety and security.

11.4.3 Financial Strategy Development

The financial strategy development process is based on achieving federal, state, regional, and local coordination to identify and secure the financial resources needed to resolve the transportation issues that residents, workers, and visitors to the region experience daily. The process of identifying potential financial strategies for the Route 710 Tunnel began by first defining the magnitude of capital costs. For the purposes of this financial strategy report for the Route 710 tunnel concept, this report uses the current order of magnitude cost estimate of $3 billion (2006 dollars) to be a representative cost of the tunnel alternatives considered. The technical feasibility assessment considered a myriad of tunnel alternatives and optional physical features with costs ranging from approximately $2.3 billion to $3.6 billion (2006 dollars). This $3 billion tunnel cost estimate is reflective of a tunnel alternative with features that may be deemed acceptable and was selected as a representative cost estimate for the development of the financial strategy report.

Additionally it is important to note that the $3 billion estimate reflects construction related costs only. Should additional evaluations of the tunnel concept be performed, supplemental efforts should be undertaken to refine the cost estimates and construction methods. Currently, cost estimates have not been developed for the project's land acquisitions, environmental documentation, preliminary and final design, construction management, insurance, and agencies/force account oversight and staff. Further as a result of the significant construction cost of the Huntington Drive interchange, this optional feature is not included in the $3 billion cost estimate.

Also, the $3 billion construction cost estimate, as well as revenue estimates from federal, state, regional/local, and user fee sources, all reflect current year/un-inflated dollars (2006 dollars). Two preliminary construction scenarios, each with two starting dates, are being evaluated for the Route 710 Tunnel. The start dates of 2015 and 2023 are assumptions made for the purpose of financial strategies development.

- Construction Scenario 1: TBM – 9 years to complete construction.
- Construction Scenario 2: SEM – 11.5 years to complete construction.

Based on these two scenarios, the $3 billion (2006 dollar) order of magnitude construction cost estimate is projected to be in the range of $4.3 to $5.4 billion year of expenditure dollars for Construction Scenario 1 and in the range of $4.4 to $5.5 billion year of expenditure dollars for Construction Scenario 2. At this time, it is assumed that the revenue from the potential funding sources identified in this report would grow at the same rate of inflation as the construction costs.

Based on the $3 billion (2006 dollars) estimate, a three step process was then used to evaluate, screen, and refine possible funding sources and financial strategies which included: 1) identifying and screening a long list of potential federal, state, regional, and local funding sources; 2) identifying and analyzing potential funding and financing scenarios; and 3) preparing this financial strategies report.

Following the development of the order of magnitude construction cost estimate, potential funding sources, both conventional and innovative, were identified and screened in conjunction with the Study Team and Working Group. The screened funding sources remaining for consideration were then combined into four potential funding strategies. Each financial strategy places different levels of emphasis on the relative share of funding to be provided at the federal, state, regional, and local levels and with regard to the potential for tolling.

11.4.4 Potential Funding Sources

The array of potential funding sources for the Route 710 Tunnel include federal, state, regional, and local funding sources that could be considered by the MTA and Caltrans. As shown in Tables 1 and 2 of Chapter 10, over 25 federal, state, regional, and local funding sources were identified and screened to a more promising list of 14 potential funding sources. The potential funding sources that were carried forward in the financial scenarios analysis are described in greater detail in the sections below.

11.4.4.1 Federal Sources

The anticipated Purpose and Need of the Route 710 Gap Closure addresses issues of national and regional significance related to: improving air quality; providing a connection to balance the existing transportation system; linking a major port with inland goods movement, and improving the connection to critical national defense facilities. For addressing these issues, the Route 710 Tunnel should be considered a strong candidate for receipt of federal funding.

The following U.S. Department of Transportation, Federal Highway Administration (U.S. DOT, FHWA) programs were considered as potential funding sources for the Route 710 Tunnel. Federal funding programs are divided into four categories:

1) "Core" programs which are formula based meaning each state receives a certain percentage of available funds based on measures such as population, lane-miles of Federal-aid highways, total vehicle-miles traveled on those Federal-aid highways, estimated contributions to the highway account of the highway trust fund; or lane miles. Core programs include:
    i) National Highway System

ii) Surface Transportation Program
iii) Congestion Mitigation and Air Quality Program
iv) Highway Safety Improvements

2) Discretionary programs which the overall dollar amount for the program is authorized by Congress and funding is provided either in the form of earmarks or the FHWA decided which projects get the funds based on evaluations. Discretionary programs include:
   i) High Priority Project Earmark
   ii) Projects of National and Regional Significance
   iii) National Corridor Infrastructure Improvement Program
   iv) Transportation Improvement Projects
   v) Freight Intermodal Distribution Pilot Grant Program
   vi) Interstate Maintenance Program
   vii) Bridge Program

11.4.4.2 State Sources

Four state funding sources were considered as potential funding sources for the Route 710 Tunnel: the Interregional Improvement Program component of the State Transportation Improvement Program (STIP), Grant Anticipation Revenue Vehicle (GARVEE) bonds, proceeds from potential future State infrastructure bonding, and proceeds from the sale of excess right-of-way previously acquired for the Route 710 Gap Closure at-grade alternative. Descriptions and analysis of these programs are provided in Chapter 10.

11.4.4.3 Regional/Local Sources

Four regional sources were considered as potential funding sources for the Route 710 Tunnel: 1) the STIP Regional Improvement Program (funds distributed to the regional agencies from the State); 2) MTA Call for Projects which allocates discretionary funds to regionally significant projects; 3) Proposition C 25 Percent Funds which provides for transit-related improvements to freeways and state highways; and 4) Future County Sales Tax which would allow MTA to institute an additional transactions and use tax at the rate of 0.5% for 6 1/2 years or less.

11.4.4.4 Tolling

A financial strategy that merits consideration for funding a portion of the Route 710 Tunnel is toll revenues. Bonds leveraged from anticipated toll revenue could potentially be a component of the funding and financing proposed for the Route 710 Tunnel.

11.4.5 Financial Scenarios

Seven preliminary financial scenarios were developed based on the funding sources identified in Chapter 10, Section 2. Each financial scenario places different levels of emphasis on federal, state, regional/local and toll revenue bond funding contributions. Three scenarios assumed the project would not include toll revenue bond proceeds as a funding source and four scenarios assumed the project would include toll revenue bond proceeds. Table 9 summarizes the ranges of potential federal, state, regional/local and toll revenue bond funding comprising the seven scenarios. The target percentages and equivalent funding contributions shown in the following assume a working construction cost estimate of $3.0 billion (2006 dollars). However, as stated earlier depending on which construction scenario is chosen and when construction begins, the $3 billion (2006 dollar) order of magnitude construction cost estimate is projected to be in the range of $4.3 to $5.5 billion year of expenditure dollars. At this stage of project development, it is assumed that revenue from the sources identified in the following sections would grow at the same rate of inflation as the construction costs. As a result the target percent shares from the different funding sources would be maintained as shown in the figures below. Finally, for the purpose of this analysis, the cost curves for the seven financial scenarios reflect the 11.5 year construction schedule of Construction Scenario 2 described in Chapter 10, Section 1.2.

11.5 Summary

11.5.1 Summary Points

- Traffic analysis indicates that 4 lanes would be required in each direction, with or without Trucks included.
- The possibility of an interchange at Huntington Drive would further attract traffic in the Gap and on Huntington Drive itself
- Traffic modeling reveals that generally, the completion of the Route 710 freeway would benefit and relieve traffic impacts on some adjacent freeways and arterials in proximity to the study area.
- Geologic conditions appear favorable to construct a tunneled solution
- Feasible Tunnel configurations, within current technology are possible
- Identified Environmental issues associated with construction and operation of the main tunnel are initially assessed to be solvable. However, more issues arise in the event that an interchange at Huntington Drive is included.
- Construction Cost Estimates in the region of $3 billion make this a major infrastructure improvement, which would require special funding initiatives.
- The preliminary technical findings indicate that a tunnel is a viable solution and warrants to be advanced to the next more comprehensive and detailed evaluations.

APPENDIX I
Compendium of Comments

Compendium of Comments

INTRODUCTION

In early June 2006, the Route 710 Tunnel Technical Feasibility Assessment (Assessment) report was completed. Although it is not a legal requirement of a feasibility assessment process, Metro conducted an extensive public outreach effort in order to inform the communities of the assessment findings and obtain their feedback. Metro held two public information meetings – one in Pasadena and the other in the El Sereno community – as well as presenting the assessment findings to the city councils of cities of Alhambra, La Canada Flintridge, Pasadena, San Marino and South Pasadena at their meetings, and to the San Gabriel Valley Council of Governments (SGVCOG) at their Transportation Committee and Governing Board meetings. In addition, Metro was invited to present the assessment findings at several organizations including Arroyo Verdugo Cities Sub-Region Steering Committee, Glendale City Council, Los Angeles Community Redevelopment Agency's Eastside Adelante Project Area Committee, and Southern California Association of Governments (SCAG).

Most of the agencies, organizations and public members provided their comments and concerns at the meetings as well as in writing through formal correspondence and/or email. In particular, the cities of La Canada Flintridge, Pasadena and South Pasadena provided detailed comments and concerns regarding the Assessment. The SGVCOG and the cities of Alhambra and San Marino passed resolutions expressing their general concurrence with the assessment findings and support for further study of a tunnel concept.

Metro compiled a compendium of all comments received (Appendix I). Comments received through comment cards at public meetings were transferred verbatim onto a table titled Public Comments in Appendix I. Comments expressed verbally at meetings were paraphrased and included in the Public Comments table.

Metro's responses to comments that require clarification and are within the scope of the Assessment are included in Appendix II.

Thursday, June 22, 2006

RTE 710 Tunnel Study Community Meeting

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Thursday, June 22, 2006

RTE710 Tunnel Study Community Meeting

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20	LEE WARNOCK	AATCA MOTT MACDONALD	SAN DIEGO	92107
21	ERNIE ARNOLD	South Pasadena	1502 Fremont Ave	SP 91030
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23	Lilian Myers	City of South Pasadena	1414 Mission St. South Pasadena 91030	
24	ERIC DIETRICH	CALTRANS	100 S. MAIN ST	
25	BEN SALVATY	SAN MARINO	2943 Monterey Road, San Marino 91108	
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26	John Scott	Former Pasadena Resident	PO Box 512141	LA, CA 90051
27	VAL MARQUEZ	LA CHES ~~[illegible]~~	3118 Lowell	
28	SAL. VILLA	E.L.A Resident	748 CLELA AV.	LA CA 90022
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Thursday, June 22, 2006

RTE-710 Tunnel Study Community Meeting

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33	Tom Nuckols	"	"	"
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35	MIKE McKENNA	" "	"	"
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38	John Alderson	City of San Marino	2200 Huntington San Marino, Ca 91108	
39	RUBEN MARES	PROPERTY OWNER	5343 NAVARRO ST.	L.A. 90032
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41	Murray Levy	SO PAS	1141 Pine St #	S.P
42	GARY PETERSON	PARSONS	100 W. WALNUT ST.	PASADENA 91124
43	Sally Kilby	S PAS	CITY CLERK 1414	Mission SPas 91030
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Thursday, June 22, 2006

RTE 710 Tunnel Study Community Meeting

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47	Cortney Fields	Star News	911 Colorado Blvd	
48	Sharon Chen	Rep. Adam Schiff	35 S Raymond Ave. #205 Pasadena CA 91105	
49	Jean Guccione	LA Times	202 W. 1ST ST LA CA 90012	
50	Erin Chen	Chinese Daily News		

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Thursday, June 22, 2006

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53	Marco Ruano		840 Cynthia Ave	L.A., CA 90065
54	George S. Irwin	OmniRail	457 Schooner Way	Seal Beach 90740
55	Pamela Marquez	Concerned Neighbors of El Sereno	3118 Lowell Ave LA 90032	pamand.val@yahoo.com

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Thursday, June 22, 2006

RTE710 Tunnel Study Community Meeting

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59	Leland Johnson	Pasadena	266 Palmetto Dr.	Pas 91105
60	Michael Gomez	South Pasadena	1107 Fair Oaks #412	SPAS 91030
61	Kelly Ewing Toledo	710 Concerned citizen	303 S. Armel Dr. Covina	Covina CA 91722
62	Lynn Turner	So Pasadena	1622 Bushnell	So. Pas 91030
63	Charles Chlupak	Citizen	266 S. GI	Pasadena 91101

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Thursday, June 22, 2006

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68	Laura Olhasso	Councilmember La Cañada	~~[illegible]~~	
69	Pat Turner	So. Pas Home Owner	1622 Bushnell Ave.	91030
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Thursday, June 22, 2006

RTE710 Tunnel Study Community Meeting

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76	Wenling Li		625 Mound	South Pasadena
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82	Alice Wiggins-Tolbert	Parsons Brinckerhoff	444 S. Flower	LA 90071
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Thursday, June 22, 2006

RTE710 Tunnel Study Community Meeting

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July 2[illegible], 2006

RTE710 Tunnel Study Community Meeting

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RT E710 Tunnel Study Community Meeting

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July 25, 2006

R710 Tunnel Study Community Meeting

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July 2[illegible], 2006
RTE710 Tunnel Study Community Meeting

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[illegible]	El Sereno	Lombardy / Easter		
Frank Cardenas	City of South Pasadena	451 Prospect Circle, South Pas	626.441.3792	frank@frankcardenas.com
Erma Martinez	Sereno	2824 Bullard Ave., LA.	323-225-3677	
Joe Rivera	The Voice	5522 Templeton St	323 221-5270	jrivera@prodigy.net

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July 25, 2006

~~RTE~~ 710 Tunnel Study Community Meeting

Elected Officials

Name	Affiliation	Address	Telephone	Email
Henry Lo	Senator Romero	149 S. Mednik Ave suite 202 LA CA 90022	(323) 881-0100	henry.lo@sen.ca.gov
Doug Failing	Caltrans	100 S Main Street, LA	(213) 897-0362	—
BORJA LEON	MAYOR OF LA	200 N. SPRING ST, LA	(213) 978-3061	
Ricardo Monroy	CD 14	—	—	—
DAN FARKAS	SEN. DIST 22	617 S. OLIVE ST, Rm 170	(213) 612-9566	Daniel.Farkas@sen.ca.gov
Julianne Hines	Assem. Carol Liu	215 N. Marengo Ave #115 Pasadena 91101		julianne.hines@asm.ca.gov

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REVISED

Route 710 Tunnel Technical Feasibility Assessment - Public Comments

#	Source	Date	By	Residence/ Affiliation	Comments
	GENERAL				
1	Public Meeting, Pasadena	22-Jun-06	Preston Rose	South Pasadena	Why close the gap at all?
2	Public Meeting, Pasadena	22-Jun-06	Diana Stoney	South Pasadena	1) The San Gabriel Valley water table serves many cities. During the construction phase, will you be pumping out the aquifer? 2) Given the starting congested level of this extension, what is the projected time before the tunnels reach capacity? 3) Have you read what was contracted for in the construction of the Gold Line through So. Pas. and what was delivered on the cheap. Checkout the cargo container power station at the Pas. Ave/Monterey Rd. that could be mitigated with architecture and/or landscaping.
3	Public Meeting, Pasadena	22-Jun-06	Ing Jones	Altadena	1) How soon will you get the money to start the construction? 2) What the community need to do to support the project?
4	Public Meeting, Pasadena	22-Jun-06	David Czamanske	South Pasadena	Why did not consider tunneling father to the east - under San Marino, Rosemead, and San Gabriel for example - residents in these communities complain about no freeway connection, and they would benefit from a tunnel farther east!
5	Public Meeting, Pasadena	22-Jun-06	David Maxwell	Bakersfield	How can I acquire a copy of the complete study and a copy of the PowerPoint presentation?
6	South Pasadena CC Meeting	28-Jun-06	Ernest Arnold	South Pasadena	Study designed to build along Meridian Route is a "non-start" project. Cost is too low. Premise is flawed because of the location.
7	South Pasadena CC Meeting	28-Jun-06	Dain Glad	South Pasadena	No 710 until issues are settled
8	South Pasadena CC Meeting	28-Jun-06	Kay Findley	South Pasadena	Believe in greater good that the tunnel would offer: traffic improvement and air quality improvement for the region
9	South Pasadena CC Meeting	28-Jun-06	Eric Olson	South Pasadena	What will be the determining factors for route selection?
10	South Pasadena CC Meeting	28-Jun-06	Diana Stoney	South Pasadena	"Caltrans will not design until you sign" Who will pay to monitor the cameras? Subsurface rights: "I own my mineral rights. They go down 500 feet." Dewatering. If this council signs, it will be recalled.
11	South Pasadena CC Meeting	28-Jun-06	Mary Ferrero	South Pasadena	Keep So. Pas a small town place. Where would the $ come from? Put it to a vote.
12	San Marino CC Meeting	12-Jul-06	Councilmember	San Marino	What needs to happen to move forward with the project? What's preventing the project to move forward?
13	SGVCOG Governing Board Meeting	20-Jul-06	Board Member		People need to make decision. Bite the bullet and do the right thing.
14	SGVCOG Governing Board Meeting	20-Jul-06	Paul Talbot	Alhambra	The 710 extension has made great progress with the tunnel assessment. Congratulate COG for addressing the issues and supporting to move forward.

****Note: This comment was added. The repetition of this number is intentional in order to be consistent with the comment number and corresponding response in Appendix II.***

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Route 710 Tunnel Technical Feasibility Assessment - Public Comments

	Source	Date	By	Residence/ Affiliation	Comments
15	SGVCOG Governing Board Meeting	20-Jul-06	Nat Reed	710 Coalition	The survey conducted by 710 Coalition showed that no cities in SGV oppose the tunnel. The survey result for South Pasadena is split 50/50.
16	SGVCOG Governing Board Meeting	20-Jul-06	Mary Ann Parada	South Pasadena	Nat Reed's survey is skew. AQMD PM in I-710...
17	SGVCOG Governing Board Meeting	20-Jul-06	Joanne Nuckols	South Pasadena	710 is not an interstate. Ventilation stack in South Pasadena will be 100' tall, which will have severe environmental impact. SGV needs to think about priority. There aren't enough funds to go around to all projects.
18	Alhambra CC Meeting		Councilmember	Alhambra	What are the next steps? Will this report be shelved?
19	Public Meeting, El Sereno	25-Jul-06	Carmen D. Nieminen	Los Angeles	Bad planning-go to Alhambra Pasadena leave el Sereno alone. We don't want to pay more taxes.
20	Public Meeting, El Sereno	25-Jul-06	Michael McGuire	El Sereno	1)What is the cost from 210 to 710 freeway? 2) Interested in negative impact results of EIR. 3) Who will build?
21	Public Meeting, El Sereno	25-Jul-06	Natalie Amper	Los Angeles	Boston Tunnel is currently having issues so why is this idea even being entertained? I do not want a tunnel/connector road or a freeway coming through my front yard. Do not destroy our beautiful, historical community of El Sereno.
22	Pasadena CC Meeting	14-Aug-06	Representative	Pasadena Heritage	Great concern over: 1) ventilation stacks in Pasadena; 2) not sure scrubbers will work; more traffic will be channeled to Pasadena; 3) what will be the cost when construct. 4) Is benefit worth the dollars spent?
23	Pasadena CC Meeting	14-Aug-06	Don Jones	Pasadena	View of the tunnel concept has changed. Tunnel may be an alternative and is supportive of the Assessment.
24	Email	18-Jul-06	Joe Pink	Alhambra	As a resident of Alhambra I would like to voice my support for an extension of the 710 freeway. I feel this would help greatly reduce local traffic on Valley between the 710 terminus and Freemont, as well as on Freemont form the 10 Northward. Both of these streets are very congested during peak travel times. I also feel that a way to get to the major retail/shopping area of Old Town & Paseo Colorado and the outdoor offerings of the Angels National Forest that does not burden local streets is a benefit to all.
24*	**La Canada Flintridge CC Meeting**	**5-Sep-06**	**Councilmember**	**La Canada Flintridge**	**A study based on the EIR/EIS that the Fed objected is not valid.**
24*	**La Canada Flintridge CC Meeting**	**5-Sep-06**	**Councilmember**	**La Canada Flintridge**	**La Canada Flintridge is not mentioned in the report in terms of impacts.**
24*	**La Canada Flintridge CC Meeting**	**5-Sep-06**	**Councilmember**	**La Canada Flintridge**	**When open, the tunnel will operate at full capacity -- failure from the beginning. Is it worth spending $3 Billion on the project?**
24*	**La Canada Flintridge CC Meeting**	**5-Sep-06**	**Councilmember**	**La Canada Flintridge**	**The study is not adequate enough to make (political) decisions. The study assumes tunnel is an easy process.**
24*	**La Canada Flintridge CC Meeting**	**5-Sep-06**	**Councilmember**	**La Canada Flintridge**	**It seemed that the study was done to support predetermined conclusions.**

***Note: This comment was added. The repetition of this number is intentional in order to be consistent with the comment number and corresponding response in Appendix II.**

Route 710 Tunnel Technical Feasibility Assessment - Public Comments

	Source	Date	By	Residence/ Affiliation	Comments
	STUDY SCOPE				
25	Public Meeting, Pasadena	22-Jun-06	Ernest Arnold	South Pasadena	When the tunnel study was proposed, we were told 1) there was no predetermined route, 2) the tunnel can go anywhere - why are the only alternatives through the middle of So. Pasadena?
26	South Pasadena CC Meeting	28-Jun-06	John Turk	South Pasadena	Concerned that environmental consultants not here to answer questions. Have to think about people. Subsurface right: "I own my property". Terrorism. Scrubbers.
27	South Pasadena CC Meeting	28-Jun-06	Glen Duncan	South Pasadena	How many times has PB found a project to be infeasible? Preliminary env. Report was worthless.
28	Pasadena CC Meeting	14-Aug-06	Councilmember	Pasadena	What's next step? Who will be the lead?
	TRAFFIC - LOCAL IMPACTS				
29	Public Meeting, Pasadena	22-Jun-06	Lynn H Turner	South Pasadena	With no Huntington Dr. Interchange, So. Pas bound and Alhambra bound traffic would use surface streets as they do now. What % of current traffic on 710 is that 'local' traffic & what % would be thru traffic. With no Huntington Drive Interchange, how much better would the local traffic be?
30	Public Meeting, Pasadena	22-Jun-06	Peter A. Orona	Los Angeles	Hoe does the construction of the 710 tunnel affect the completion of the Valley Blvd.-Alhambra Connector Rd. project? Does it delay the Connector Rd. project? Does it stop the Connector Rd.?
31	South Pasadena CC Meeting	28-Jun-06	Peter Orona	Los Angeles	AB1617 construction delays. Don't build Valley Blvd. Connector or 710 tunnel (?)
32	SGVCOG TC	6-Jul-06	Mayor Bogaard	Pasadena	Any indications on how the gap closure will impact I-210?
33	San Marino CC Meeting	12-Jul-06	Councilmember	San Marino	How much surface traffic will be removed?
34	Public Meeting, El Sereno	25-Jul-06	Diana Stoney	South Pasadena	1). What are the projected traffic impacts on Valley Blvd., Mission Rd., and Fremont Ave. if the 710 tunnels are built? 2)Who owns the "special order" boring machines after the project is complete? Who buys them? Where does cut and cover end and boring begin on the southern end?
35	Public Meeting, El Sereno	25-Jul-06	Mary Ann Parada	South Pasadena	Can the tunnels be accessed by surface streets at Valley Blvd. Or Mission Road from Cal State LA and Alhambra? Will the muck be trucked out or put on trains from the south portal-24 hours a day for 10 years?
36	Public Meeting, El Sereno	25-Jul-06	Hope M. Guzman	Los Angeles	If the traffic on Huntington Dr. will increase-why?
37	Pasadena CC Meeting	14-Aug-06	Councilmember	Pasadena	So much traffic on the freeways as of now. If more traffic results from the tunnel, it will spill over to local arterials.
38	Pasadena CC Meeting	14-Aug-06	Representative	Pasadena Heritage	Great concern over: 1) ventilation stacks in Pasadena; 2) not sure scrubbers will work; more traffic will be channeled to Pasadena; 3) what will be the cost when construct. 4) Is benefit worth the dollars spent?

****Note: This comment was added. The repetition of this number is intentional in order to be consistent with the comment number and corresponding response in Appendix II.***

Route 710 Tunnel Technical Feasibility Assessment - Public Comments

	Source	Date	By	Residence/ Affiliation	Comments
39	Email	18-Jul-06	Jeffrey Hamilton	Glendale (City Staff)	Has an analysis been prepared that documents the likely increase in traffic on the on the 134, and on the 210 west of the 710, once the gap connector is complete? If so, can you please provide me with a copy of that analysis or put me in touch with the agency that has the document?
40	LA CRA's Adelante Project Area Committee (El Sereno, Boyle Heights)	29-Aug-06	Committee's Motion		Additionally, that no off-ramp be built on Huntington Drive, which will only further devastate the surrounding communities mentioned in item 1. We further ask that MTA correct and revise its current study with this change prior to being submitted into the EIR.
40*	**La Canada Flintridge CC Meeting**	**5-Sep-06**	**Councilmember**	**La Canada Flintridge**	**Traffic overflow will bisect the neighborhoods.**
	TRAFFIC CAPACITY				
41	Public Meeting, Pasadena	22-Jun-06	Mary Ann Parada	South Pasadena	With the exception of the historic Arroyo Seco Parkway, virtually every freeway in So. Cal. Has been widened, or is scheduled to be widened. When the tunnels reach capacity, will this freeway be widened by "double-decking" the tunnel with a surface freeway?
42	Public Meeting, Pasadena	22-Jun-06	Diana Stoney	South Pasadena	1) The San Gabriel Valley water table serves many cities. During the construction phase, will you be pumping out the aquifer? 2) Given the starting congested level of this extension, what is the projected time before the tunnels reach capacity? 3) Have you read what was contracted for in the construction of the Gold Line through So. Pas. and what was delivered on the cheap. Checkout the cargo container power station at the Pas. Ave/Monterey Rd. that could be mitigated with architecture and/or landscaping.
43	Public Meeting, Pasadena	22-Jun-06	Joseph Burrougus	Los Angeles	Will one of the four lanes be an HOV lane (similar to 105 Century Freeway)?
44	South Pasadena CC Meeting	28-Jun-06	Mary Ann Parada	South Pasadena	Projected volume of traffic in 2030? What would LOS be?
45	SGVCOG Governing Board Meeting	20-Jul-06	Board Member		Are reversible lanes considered? This may allow to reduce required lanes.
46	Public Meeting, El Sereno	25-Jul-06	Hugo Garcia (Presiden	El Sereno	1) What are the preliminary figures on loss of housing stock throughout the Route, I.e. El Sereno, South Pasadena, Pasadena. I've heard a projection of 200 homes in El Sereno. 2) Has an alternative interchange been considered other than Huntington Drive. If not, why not?
47	Public Meeting, El Sereno	25-Jul-06	Rev. Manuel Chacon	Los Angeles	What year is the start date? The increase in cars and people will be a new bottleneck-must be 4 lanes in each direction.
48	Glendale CC Meeting	15-Aug-06	Councilmember	Glendale	The 3-tunnel option was discussed at SCAG. Can mid-tunnel be funded by private company to be used for truck traffic? Is the 3-tunnel option dismissed?

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Route 710 Tunnel Technical Feasibility Assessment - Public Comments

	Source	Date	By	Residence/ Affiliation	Comments
	TRAFFIC - TRUCKS				
49	San Marino CC Meeting	12-Jul-06	Councilmember	San Marino	When will the decision of whether to allow trucks in tunnel be made?
50	Public Meeting, El Sereno	25-Jul-06	(no name given)	(no city given)	Will commercial trucks be allowed to use the tunnel from ports of Long Beach to Wal Marts and other big box retail (Costco)?
51	Public Meeting, El Sereno	25-Jul-06	Kathy Stephenson	Alhambra	Where will the trucks go if they don't use the tunnels? Why is a Hunt Drive exit considered at all?
52	Glendale CC Meeting	15-Aug-06	Councilmember	Glendale	Increased in truck traffic is a main concern.
	CONSTRUCTION				
53	Public Meeting, Pasadena	22-Jun-06	Diana Stoney	South Pasadena	1) The San Gabriel Valley water table serves many cities. During the construction phase, will you be pumping out the aquifer? 2) Given the starting congested level of this extension, what is the projected time before the tunnels reach capacity? 3) Have you read what was contracted for in the construction of the Gold Line through So. Pas. and what was delivered on the cheap. Checkout the cargo container power station at the Pas. Ave/Monterey Rd. that could be mitigated with architecture and/or landscaping.
54	Public Meeting, Pasadena	22-Jun-06	Waynna Kato	South Pasadena	Problem pending/possible 8.0 earthquake. We can't get earthquake insurance. How/who pays for maintenance. How much will they be?
55	South Pasadena CC Meeting	28-Jun-06	Jaime Brownlee	South Pasadena	Driving from both directions?
56	Public Meeting, El Sereno	25-Jul-06	Diana Stoney	South Pasadena	1) What are the projected traffic impacts on Valley Blvd., Mission Rd., and Fremont Ave. if the 710 tunnels are built?2) Who owns the "special order" boring machines after the project is complete? Who buys them? Where does cut and cover end and boring begin on the southern end?
57	Public Meeting, El Sereno	25-Jul-06	Alex Almeida	Los Angeles	When does the project start?
58	Public Meeting, El Sereno	25-Jul-06	Edmundo and Juanita	Los Angeles	Dates when this will start?
59	Public Meeting, El Sereno	25-Jul-06	(no name given)	(no city given)	The project will require the delivery of heavy equipment, disruption of traffic, damage to the street curbs-how will MTA compensate? Will a fund be set aside for public safety enhancements?
	GEOLOGY				
60	Public Meeting, Pasadena	22-Jun-06	Richard Henderson	Pasadena	1) Would building south of California Blvd. Near portal need to be demolished? 2) Would there be potential settlement problems near portal but not directly above (e.g. 1/2 block away). Area near north portals is well-populated residential? 3) What safeguards for potential terrorism risks in tunnels?
61	Public Meeting, Pasadena	22-Jun-06	Jamie Brownlee	South Pasadena	Risk Assessment: Raymond Hill Fault is an active fault trace - 1985 movement caused one death in Pasadena. Tunnels go right through the Fault trace.

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Route 710 Tunnel Technical Feasibility Assessment - Public Comments

	Source	Date	By	Residence/ Affiliation	Comments
62	South Pasadena CC Meeting	28-Jun-06	Lawrence McHargue	South Pasadena	Special reinforcement @ fault
63	South Pasadena CC Meeting	28-Jun-06	Linda Krausen	South Pasadena	1). geotech drilling - 100+ feet? 2)Tiny micro-organisms impacted. 3)Scrubbers falling to cost cutting. 4)Security - bombs in trucks.
64	South Pasadena CC Meeting	28-Jun-06	Diana Stoney	South Pasadena	"Caltrans will not design until you sign" Who will pay to monitor the cameras? Subsurface rights: "I own my mineral rights. They go down 500 feet." Dewatering. If this council signs, it will be recalled.
65	San Marino CC Meeting	12-Jul-06	Councilmember	San Marino	When crossing Pasadena Way, how deep is the tunnel?
	SAFETY				
66	Public Meeting, Pasadena	22-Jun-06	Richard Henderson	Pasadena	1) Would building south of California Blvd. Near portal need to be demolished? 2) Would there be potential settlement problems near portal but not directly above (e.g. 1/2 block away). Area near north portals is well-populated residential? 3) What safeguards for potential terrorism risks in tunnels?
67	Public Meeting, Pasadena	22-Jun-06	A Hylawd	South Pasadena	What is the distance between emergency portals & what is lateral distance from main tunnels?
68	Public Meeting, Pasadena	22-Jun-06	Murray Levy	South Pasadena	What safety concerns happened in Europe?
69	South Pasadena CC Meeting	28-Jun-06	Jim Maier	South Pasadena	Terrorism - how will it be handled?
70	South Pasadena CC Meeting	28-Jun-06	Linda Krausen	South Pasadena	1). geotech drilling - 100+ feet? 2)Tiny micro-organisms impacted. 3)Scrubbers falling to cost cutting. 4)Security - bombs in trucks.
71	Glendale CC Meeting	15-Aug-06	Councilmember	Glendale	How will people be evacuated in case of emergency?
71*	**La Canada Flintridge CC Meeting**	**12-Sep-06**	**Councilmember**	**La Canada Flintridge**	**Study should take into account safety and terrorism concerns.**
	VENTILATION BUILDINGS AND STACKS				
72	Public Meeting, Pasadena	22-Jun-06	Tom Nuckols	South Pasadena	Please elaborate on cut&cover location at portals in Pasadena & Los Angeles, and vent tower locations near portals.
73	Public Meeting, Pasadena	22-Jun-06	Joanne Nuckols	South Pasadena	Report states vent bldgs located in industrial areas. Mid point vent bldg located at So. Pasadena high school surrounded by residential. Please elaborate on location of mid point bldg.
74	Public Meeting, Pasadena	22-Jun-06	Leland Johnson	Pasadena	1) Traffic congestion and noise of trucks hauling dirt out and trucks hauling concrete liner in? 2) Distance between ventilation shafts to surface?
75	South Pasadena CC Meeting	28-Jun-06	Joanne Nuckols	South Pasadena	Created a map with 1/2 mile radius around midpoint. Correcting the surface solution history, etc. in report
76	South Pasadena CC Meeting	28-Jun-06	Linda Krausen	South Pasadena	1). geotech drilling - 100+ feet? 2)Tiny micro-organisms impacted. 3)Scrubbers falling to cost cutting. 4)Security - bombs in trucks.

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Route 710 Tunnel Technical Feasibility Assessment - Public Comments

	Source	Date	By	Residence/ Affiliation	Comments
77	SGVCOG Governing Board Meeting	20-Jul-06	Joanne Nuckols	South Pasadena	710 is not an interstate. Ventilation stack in South Pasadena will be 100' tall, which will have severe environmental impact. SGV needs to think about priority. There aren't enough funds to go around to all projects.
78	Alhambra CC Meeting	24-Jul-06	Councilmember	Alhambra	Can ventilation stacks be modified to allow for scrubbers in the future when technology gets improved?
79	Public Meeting, El Sereno	25-Jul-06	Sac Vidavrri	(no city given)	Where would the stacks be located. How many? Why are the portals on the south side not started at the 710-10 intersection?
80	Pasadena CC Meeting	14-Aug-06	Representative	Pasadena Heritage	Great concern over: 1) ventilation stacks in Pasadena; not sure scrubbers will work; 2) more traffic will be channeled to Pasadena; 3) what will be the cost when construct. 4) Is benefit worth the dollars spent?
81	Email	29-Jun-06	John Heller	South Pasadena	There will always be opposition in our town to the extension of the 710 freeway. With the release of the latest feasibility study and the first two public meetings, opposition is mobilizing around the mid-bore exhaust air tower. If it meets the technical needs of ventilating the bores, may I suggest using the mid tower as an air intake rather than an exhaust? This eliminates opposition based on dirty air emissions in South Pasadena and cuts operation costs by focusing particulate waste at two rather than three pick-up locations.
	PORTALS / APPROACHES				
82	Public Meeting, Pasadena	22-Jun-06	Richard Henderson	Pasadena	1) Would building south of California Blvd. Near portal need to be demolished? 2) Would there be potential settlement problems near portal but not directly above (e.g. 1/2 block away). Area near north portals is well-populated residential? 3) What safeguards for potential terrorism risks in tunnels?
83	Public Meeting, Pasadena	22-Jun-06	Tom Nuckols	South Pasadena	Please elaborate on cut&cover location at portals in Pasadena & Los Angeles, and vent tower locations near portals.
84	Public Meeting, Pasadena	22-Jun-06	Val Marquez	Los Angeles	Southern Portal: mainly residential, you stated most of the property is already acquired. Concord: how much of a radius will be needed, and how will residents within a few blocks be affected?
85	South Pasadena CC Meeting	28-Jun-06	Marie Salas	Los Angeles	How many portals/Vent buildings in El Sereno? How many homes & families will be displaced?
86	Alhambra CC Meeting	24-Jul-06	Councilmember	Alhambra	Where will the portal be located? South or north of mission?
87	Alhambra CC Meeting	24-Jul-06	Councilmember	Alhambra	Can open space be allowed at the approaches?
88	Alhambra CC Meeting	24-Jul-06	Public member	Alhambra	Communities near the portals will be impacted during construction. Can the southern portal be moved down to south of Valley to lessen the impacts?
89	Pasadena CC Meeting	14-Aug-06	Councilmember	Pasadena	Will the end of the tunnel (portal approach) be reconfigured in ways that will alter 134/210 interchange?
90	Pasadena CC Meeting	14-Aug-06	Councilmember	Pasadena	Cover freeway approach to California

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Route 710 Tunnel Technical Feasibility Assessment - Public Comments

	Source	Date	By	Residence/ Affiliation	Comments
91	LA CRA's Adelante Project Area Committee (El Sereno, Boyle Heights)	29-Aug-06	Committee's Motion		That the MTA corrects or revises its plan to ensure that the location of the Southern portal be placed south of Valley where it does not affect the residential communities of El Sereno, Emery Park. In addition, that MTA corrects and revises its current study of the portal location, so that it does not go in the Environmental Report as is.
	AIR QUALITY				
92	South Pasadena CC Meeting	28-Jun-06	Clarice Knapp	South Pasadena	Dispersion of emissions from LA found in Grand Canyon.
93	Public Meeting, El Sereno	25-Jul-06	Rosemarie Ibanez	Los Angeles	1) How are you going to address community outreach? 2) Can you guarantee that all environmental issues will be addressed? 3) How many homes will be directly impacted by the portal, vent, and staging area? 4) How will increased traffic and pollution at the portal entrances be mitigated? 5) Will trucks be banned from tunnel since the USC health study indicates they are main contributors to health concerns?
94	Email	12-Jul-06	Christopher Kost		PP slide states that "Reducing Congestion and Increasing Average Travel Speed would improve Regional Air Quality." To me it's obvious that expanding the overall freeway capacity in L.A. will increase emissions in the long run. The common "induced traffic" reasoning is as follows: increase in capacity > lower travel times > increase in length or number of trips > increase in emissions. Why don't you expect this to occur in the case of the 710 gap?
95	LA CRA's Adelante Project Area Committee (El Sereno, Boyle Heights)	29-Aug-06	Committee's Motion		A better solution needs to be devised for dispersion of the pollution portals and vents instead of scrubbers to protect our residents - even at an additional cost. Again this needs to be designed and changed prior to submission to the EIR.
95	La Canada Flintridge CC Meeting	5-Sep-06	Councilmember	La Canada Flintridge	Truck use in the tunnel will increase diesel particulate matter. There are 12 schools in the area.
	TOLLING				
96	Public Meeting, El Sereno	25-Jul-06	(no name given)	(no city given)	Will there be any toll charges for Pasadena residents?
	OPERATIONS				
97	South Pasadena CC Meeting	28-Jun-06	Richard Schneider	South Pasadena	Future repair of tunnel & impact on traffic; trees - how long would it take to grow?
98	South Pasadena CC Meeting	28-Jun-06	Diana Stoney	South Pasadena	"Caltrans will not design until you sign" Who will pay to monitor the cameras? Subsurface rights: "I own my mineral rights. They go down 500 feet." Dewatering. If this council signs, it will be recalled.

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Route 710 Tunnel Technical Feasibility Assessment - Public Comments

	Source	Date	By	Residence/ Affiliation	Comments
	COST				
99	Public Meeting, El Sereno	25-Jul-06	Michael McGuire	El Sereno	1)What is the cost from 210 to 710 freeway? 2) Interested in negative impact results of EIR. 3) Who will build?
100	Pasadena CC Meeting	14-Aug-06	Representative	Pasadena Heritage	Great concern over: 1) ventilation stacks in Pasadena; 2) not sure scrubbers will work; more traffic will be channeled to Pasadena; 3) what will be the cost when construct. 4) Is benefit worth the dollars spent?
100*	**La Canada Flintridge CC Meeting**	**5-Sep-06**	**Councilmember**	**La Canada Flintridge**	**Design, ROW costs are not included. Why did the study conclude that it's financial feasible?**
	PROJECT FINANCE				
101	SGVCOG Governing Board Meeting	20-Jul-06	Board Member		Where will the funds to build the tunnel be coming from?
	ENVIRONMENTAL FEASIBILITY				
102	Public Meeting, Pasadena	22-Jun-06	Pamela Marques	Los Angeles	What studies steps will be taken to protect nearby residents from pollutants generated by construction?
103	Public Meeting, Pasadena	22-Jun-06	Leland Johnson	Pasadena	1) Traffic congestion and noise of trucks hauling dirt out and trucks hauling concrete liner in? 2) Distance between ventilation shafts to surface?
104	SGVCOG TC	6-Jul-06	Mayor Bogaard	Pasadena	EIR/EIS? Env. Process needs to meet State & Federal requirements?
105	SGVCOG Governing Board Meeting	20-Jul-06	Board Member		The tunnel is physically feasible. However, in term of environmental, it is premature to state that it's environmentally feasible. The COG's letter should be changed to reflect the environmental concerns.
106	SGVCOG Governing Board Meeting	20-Jul-06	Board Member		Tunnel option may be more environmentally beneficial in comparison to surface/local route.
107	SGVCOG Governing Board Meeting	20-Jul-06	Mark Alexander	La Canada Flintridge	There are potential impacts on La Canada Flintridge, including truck traffic, congestion, environmental and noise. Does not agree with the concluding of the assessment report regarding the environmental feasibility.
108	Public Meeting, El Sereno	25-Jul-06	Michael McGuire	El Sereno	1)What is the cost from 210 to 710 freeway? 2) Interested in negative impact results of EIR. 3) Who will build?
109	Public Meeting, El Sereno	25-Jul-06	Rosemarie Ibanez	Los Angeles	1) How are you going to address community outreach? 2) Can you guarantee that all environmental issues will be addressed? 3) How many homes will be directly impacted by the portal, vent, and staging area? 4) How will increased traffic and pollution at the portal entrances be mitigated? 5) Will trucks be banned from tunnel since the USC health study indicates they are main contributors to health concerns?
110	Pasadena CC Meeting	14-Aug-06	Councilmember	Pasadena	Will a full blown EIR/S including surrounding areas be done?
110*	**La Canada Flintridge CC Meeting**	**5-Sep-06**	**Councilmember**	**La Canada Flintridge**	**Noise is a major concern. Soundwall as mitigation measure.**

Note: This comment was added. The repetition of this number is intentional in order to be consistent with the comment number and corresponding response in Appendix II.

Route 710 Tunnel Technical Feasibility Assessment - Public Comments

	Source	Date	By	Residence/ Affiliation	Comments
	PROPERTY				
111	South Pasadena CC Meeting	28-Jun-06	Marie Salas	Los Angeles	How many portals/Vent buildings in El Sereno? How many homes & families will be displaced?
112	South Pasadena CC Meeting	28-Jun-06	Don Jones	Los Angeles (El Sereno)	The number of total homes acquired by Caltrans is inconsistent. Which is it, 454, 518 or 700?
113	South Pasadena CC Meeting	28-Jun-06	Sherri Glaros	South Pasadena	Caltrans' property - AB1617
114	Public Meeting, El Sereno	25-Jul-06	Joanne Nuckols	South Pasadena	The drawing "napkin" states 200-280 property takes-has this changed at all with feasibility assessment? Are most of the "takes" in El Sereno at So. Portal? How much more added to "$4.3 --> $5.3 billion year of expenditure dollars" (p. 10-133) for items listed on page 9-119 such as right of way, utility relocation, soundwalls, ESP's, etc?
115	Public Meeting, El Sereno	25-Jul-06	(no name given)	(no city given)	How many homes and businesses will need to be relocated in order to accommodate the Huntington Drive interchange? How will MTA compensate?
116	Public Meeting, El Sereno	25-Jul-06	Hugo Garcia (Presiden	El Sereno	1) What are the preliminary figures on loss of housing stock throughout the Route, I.e. El Sereno, South Pasadena, Pasadena. I've heard a projection of 200 homes in El Sereno. 2) Has an alternative interchange been considered other than Huntington Drive. If not, why not?
117	Public Meeting, El Sereno	25-Jul-06	Linda Rodriguez	Los Angeles	What does it mean that additional properties would be acquired to create a buffer or set-back?
118	Public Meeting, El Sereno	25-Jul-06	(no name given)	(no city given)	If homeowners or renters decide to move out of the community due to the construction, will MTA compensate for the relocation?
119	Public Meeting, El Sereno	25-Jul-06	Rosemarie Ibanez	Los Angeles	1) How are you going to address community outreach? 2) Can you guarantee that all environmental issues will be addressed? 3) How many homes will be directly impacted by the portal, vent, and staging area? 4) How will increased traffic and pollution at the portal entrances be mitigated? 5) Will trucks be banned from tunnel since the USC health study indicates they are main contributors to health concerns?
120	Public Meeting, El Sereno	25-Jul-06	Don Jones	Pasadena	Point of entry for the tunnel impacts the community of El Sereno in a disproportionate manner. Maps of Parsons indicates a cut and cover to Stockbridge St. and according to them over 200 homes are taken.
121	Glendale CC Meeting	15-Aug-06	Councilmember	Glendale	What will be the range of study area in EIR/S? Impacts of the tunnel will be wider than the corridor itself.

****Note: This comment was added. The repetition of this number is intentional in order to be consistent with the comment number and corresponding response in Appendix II.***

PETER A. ORONA
5472 Allen St
LA, Calif. 90032

Major Engineering Tunnel-Road Operations

As a member of the El Sereno Community, I am appreciative for MTA's abilities to seek a viable alternative to their obligated 2003-2004 Valley Blvd.-Alhambra Ave. Connector Road Project. Several gracious MTA, federal, state, and local representatives have made tremendous progress toward studying a tunnel concept that may save many families from being displaced along the Meridian Corridor. Unfortunately, there are many deterrents that prevent our hard working civil-urban planners from resolving a spatial disconnect that has prevented Los Angeles County from meeting it's commercial potential. Is there an answer to our traffic problems? I do not know. Is the Valley Blvd. Grade Separation Bridge the answer? Maybe. Will the Connector Road adversely affect the 6,800 people who constitute El Sereno's diverse community? Today, many environmental studies, and afflicted human beings demonstrate the ramifications that current urban transportation creates. Again, I plead that you take our community into consideration when dealing with these monumental decisions, and incorporate the human risk factor into your cost-benefit analysis as it pertains to our plight. Here are some more inquisitive questions: How did the community around the 2 Frwy recently resolve their extension problem? What were the engineers' rationales for not previously extending the 710 Frwy to Mission/Alhambra Ave.? Does the Head Chair of LACMTA have the ultimate authority to stop the Valley Blvd.-Alhambra Connector Rd. Project? Can anyone provide information on studies done to measure simultaneously Particulate Matter contamination emanating at both the Valley Blvd. off ramp, and the intersection of Alhambra Ave./Lowell (i.e., same seasons/day/hour)? When will the EIR for the Valley Connector Road be available? In regards to the 710 Tunnel concept: Where will the tunnel portals begin? Allen? Concord? Valley Blvd.? Will a tunnel entrance near Mission/Alhambra Ave. necessitate an off-ramp? Can Valley Fever plague the construction of the 710 Tunnel? Can we construct a safer tunnel than The Big Dig in Boston? Allow us to breathe easier, and longer with our faces to the sun. Don't build the Valley Connector Road. Don't build a surface freeway. Don't build the 710 Tunnel. Reform transportation funding to encourage safety, health, and ecological protection. Don't allow El Sereno's epitaph to read: **Sacrificed for their lack of potential.**

From: Hui, Linda
Sent: Wednesday, July 05, 2006 4:35 PM
To: 'john.heller@sbcglobal.net'
Subject: RE: I-710 Major Corridor Study/Tunnel feasibility
Mr. Heller,
Your comment has been noted. Thank you.

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Linda Hui
Transportation Planning Manager
San Gabriel Valley Area Team
Metropolitan Transportation Authority
(213) 922-3019
(213) 922-6353 FAX
huil@metro.net

-----Original Message-----
From: Morales, Ernest
Sent: Wednesday, July 05, 2006 4:29 PM
To: Hui, Linda
Cc: 'john.heller@sbcglobal.net'
Subject: FW: I-710 Major Corridor Study/Tunnel feasibility

Linda:

Received this message from Mr. Heller. As project manager for the I-710 tunnel project, I am forwarding it for your information and use.

Ernest

From: John Heller [mailto:john.heller@sbcglobal.net]
Sent: Thursday, June 29, 2006 11:47 AM
To: Morales, Ernest
Subject: I-710 Major Corridor Study/Tunnel feasibility

Ernest Morales, I-710 Project Manager

Dear Sir:

There will always be opposition in our town to the extension of the 710 freeway. With the release of the latest feasibility study and the first two public meetings, opposition is mobilizing around the mid-bore exhaust air tower.

If it meets the technical needs of ventilating the bores, may I suggest using the mid tower as an air intake rather than an exhaust? This eliminates opposition based on dirty air emissions in South Pasadena and cuts operation costs by focusing particulate waste at two rather than three pick-up locations

Your's is the only contact email I could find related to I-710 improvements, if the tunnel study is not in your purview perhaps you could do me the favor of forwarding my note to someone on that team?

Thank you,

John Heller, Architect
5065 Collis Ave
South Pasadena CA 91030-4003
323-982-9553
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

From: Christopher Kost [chriskost@gmail.com]
Sent: Wednesday, July 12, 2006 3:51 PM
To: 710Tunnel
Subject: question about emissions

Hello again,

I went through the slides from the June 22 presentation, and I was surprised to see the following claim on page 57:

"Reducing Congestion and Increasing Average Travel Speed would improve Regional Air Quality."

To me it's obvious that expanding the overall freeway capacity in L.A. will increase emissions in the long run. The common "induced traffic" reasoning is as follows:

increase in capacity > lower travel times > increase in length or number of trips > increase in emissions

Why don't you expect this to occur in the case of the 710 gap?

chris

From: 710Tunnel
Sent: Tuesday, July 18, 2006 11:40 AM
To: 'Joe Pink'
Subject: RE: 710 Tunnel Extension

Thank you for your comment supporting the 710 Tunnel. Your comment is noted and will be included in the addendum to the full assessment report.

-----Original Message-----
From: Joe Pink [mailto:JPink@ArcheonGroup.com]
Sent: Tuesday, July 18, 2006 11:38 AM
To: 710Tunnel
Subject: 710 Tunnel Extension

As a resident of Alhambra I would like to voice my support for an extension of the 710 freeway. I feel this would help greatly reduce local traffic on Valley between the 710 terminus and Freemont, as well as on Freemont form the 10 Northward. Both of these streets are very congested during peak travel times.

I also feel that a way to get to the major retail/shopping area of Old Town & Paseo Colorado and the outdoor offerings of the Angels National Forest that does not burden local streets is a benefit to all.

Joe Pink
Project Manager
Archeon Group
3250 Wilshire Blvd. 4th Floor
Los Angeles, CA 90010
T: 213-380-3886
F: 213-380-3898

Hui, Linda

From: Mindy Stein [steins5@sbcglobal.net]

Sent: Sunday, September 10, 2006 11:01 PM

To: 710tunnel@mta.net

Subject: 710 tunnel

We think the 710 Freeway extension would be a disaster for La Canada residents and visitor in terms of air pollution, noise pollution and freeway congestion.

San Gabriel Valley Council of Governments

3452 East Foothill, Suite 810, Pasadena, California 91107-3142 Phone: (626) 564-9702 FAX: (626) 564-1116 E-Mail SGV@sgvcog.org

RECEIVED
2006 AUG 16 AM 10 10
OFFICE OF THE CEO

July 21, 2006

Mr. Roger Snoble
Chief Executive Officer, Metro
One Gateway Plaza
Los Angeles, CA 91701

Dear Mr. Snoble:

RE: Route 710 Tunnel Technical Feasibility Assessment

The San Gabriel Valley Council of Governments wishes to thank you and the Metro Board for the leadership you have demonstrated in completing the long awaited Route 710 Tunnel Feasibility Assessment. Both the SGVCOG Transportation Committee and SGVCOG Governing Board reviewed the presentation by your consultants and have concluded that the 710 tunnel (between Valley & Del Mar) may be a viable alternative. The report indicates that the tunnel may be physically and environmentally feasible based upon newer tunneling technologies evaluated around the world. Further, the report concludes that there were no environmental issues identified that might not be mitigated.

The SGVCOG offers the following comments:

- We support the recommendation that the tunnel boring machine and sequential excavation methods are valid tunneling techniques in the project area.
- We support the recommendation to conduct further limited testing boring in potentially geologically significant areas of the project area to a 204 foot level (page 3-25, Section 3.71).
- We understand the finding that no contaminated or hazardous soils were found nor was there oil or gas methane fields identified that would preclude proceeding with the tunnel alternative (Page 3-26).
- We support the recommendation of a tunnel depth to 100' (Page 4-32) based upon the tunnel experts recommendations.
- We support the recommendation to include four lanes in each direction (allowing trucks) without the Huntington Drive Interchange based upon impacts to local community impacts found in Chapter 5 and summarized on page 66.
- We support the recommendation to conduct preliminary design work on the portal entrances, ventilation shafts, and power station requirements to support the

ventilation system in order to minimize, eliminate or mitigate these impacts to residents in the project area (page 112).

- Upon completion of the public participation process, we support Metro and Caltrans preparing the appropriate NEPA/CEQA environmental documents for to the 710 Environmental Impact Report including the tunnel as a feasible alternative. Further, the appropriate NEPA/CEQA environmental document for the 710 Gap Closure would include addressing the necessary testing, design and mitigation actions recommended in the tunnel feasibility assessment.

The SGVCOG Governing Board has previously transmitted to Metro and the Board that the 710 Gap Closure project is one of the highest priority congestion relief projects in the valley and requested that the project be funded in the financially constrained portion of the LRTP. Given that the recently completed tunnel assessment has concluded that the project may be physically and environmentally feasible, we believe it is still appropriate for environmental, engineering and construction funds be included in the LRTP. This conclusion is further validated by your recent staff analysis included in the LRTP indicating that the 710 gap closure has the potential to be the highest performing project in the 30 year plan. Your staff analysis indicated that over 750,000 hours of congestion delay would be eliminated annually. Clearly, our 31 cities, businesses, and residents would be one of the primary beneficiaries of the elimination of this critical congestion chokepoint in our Valley.

We sincerely appreciate your leadership in bringing together a viable path forward to complete this key transportation infrastructure project. Please feel free to contact me or Mr. Nicholas Conway, SGVCOG Executive Director, at 626/564-9702 should you have any questions.

Sincerely,

Carol Herrera

Carol Herrera
President
Mayor, Diamond Bar

City of San Marino

Office of the City Clerk

CAROL A. ROBB, MMC
City Clerk

August 31, 2006

Shahrzad Amiri
Los Angeles County Metropolitan Transportation Authority
One Gateway Plaza
Mail Stop 99-22-8
Los Angeles, California 90012

RE: ENDORSEMENT OF 710 TUNNEL TECHNICAL FEASIBILITY ASSESSMENT

Dear Ms. Amiri:

Please find enclosed a copy of City of San Marino Resolution No. R-06-21 in which the City Council endorsed the 710 Tunnel Technical Feasibility Assessment.

If you should have any questions, please do not hesitate to contact City Manager Matthew Ballantyne at (626) 300-0718. If I can be of assistance, please call me at (626) 300-0705.

Sincerely,

Carol A. Robb

Carol A. Robb, MMC
City Clerk
City of San Marino

a:\word00\clerk\710tunnel.083106

RESOLUTION NO. R-06-21

RESOLUTION OF THE CITY COUNCIL OF THE CITY OF SAN MARINO, CALIFORNIA, ENDORSING THE 710 TUNNEL TECHNICAL FEASIBILITY ASSESSMENT

WHEREAS, the Interstate 710 Freeway serves as a major north-south link in the Los Angeles County transportation network; and

WHEREAS, over the past forty (40) years, alternatives have been proposed and evaluated to complete the 710 freeway and close the 4.5 mile gap in the corridor; and

WHEREAS, the California Department of Transportation (Caltrans), Federal Highway Administration (FHWA), the Southern California Association of Governments (SCAG), Los Angeles Metropolitan Transit Authority (MTA), the San Gabriel Valley Council of Governments (SGVCOG), support the completion of the 710 freeway to relieve regional and local traffic congestion and enhance air quality; and

WHEREAS, the MTA and Caltrans has taken the initiative to conduct a technical assessment to evaluate the feasibility of constructing a tunnel to complete the 710 freeway between Valley Boulevard and Del Mar Boulevard; and

WHEREAS, the 710 Tunnel Technical Feasibility Assessment Report has determined the tunnel concept is technically viable, meriting a comprehensive study that will advance the construction of the 710 tunnel project.

NOW, THEREFORE, BE IT RESOLVED that the City Council of the City of San Marino, California as follows:

SECTION 1. Supports the completion of the Interstate 710 Freeway; and

SECTION 2. Supports the findings of the 710 Tunnel Technical Feasibility Assessment Report prepared by Parsons Brinckerhoff and sponsored by the MTA and Caltrans; and

SECTION 3. Opposes the Huntington Drive off ramp option as part of the tunnel project which was not studied in depth and may compromise the feasibility of the project due to economic and environmental factors; and

SECTION 4. Supports the MTA and Caltrans efforts to advance to the next stage of the tunnel assessment to further validate its findings and pursue the completion of the 710 freeway. This includes preparing a supplemental amendment to the 710 gap closure environmental impact report that adds the tunnel as a physically and environmentally feasible alternative.

PASSED, APPROVED, AND ADOPTED this 28th day of July, 2006.

Matthew J. Lin M.D.

MATTHEW LIN, M.D., MAYOR

ATTEST:

Carol A. Robb

CAROL A. ROBB, MMC
CITY CLERK

I HEREBY CERTIFY that the foregoing Resolution No. R-06-21 adopted by the City Council of the City of San Marino at an Adjourned Regular Meeting of the City Council held on the 28th day of July, 2006, by the following vote:

AYES	:	COUNCILMEMBERS BAYLE, BROWN, FILUTZE, VICE MAYOR TWIST, AND MAYOR LIN.
NOES	:	NONE.
ABSENT	:	NONE.

Carol A. Robb

CAROL A. ROBB, MMC
CITY CLERK

Hui, Linda

From: Aguilar, Elaine [EAguilar@ci.glendale.ca.us]
Sent: Wednesday, September 13, 2006 12:31 PM
To: 710Tunnel
Subject: Comments
Importance: High

Attached is a copy of the letter submitted by the Arroyo Verdugo Cities regarding the 710 Tunnel Feasibility Study.

Please send me your fax number so the signed letter can also be faxed.

Elaine I. Aguilar
Assistant to the City Manager
Management Services
(818) 548-4844

Arroyo Verdugo Cities

613 East Broadway, Suite 200 Glendale, CA 91206-4391 818.548.4844 fax: 818.547.6740 e-mail: [illegible]

August 21, 2006

County of Los Angeles
Metropolitan Transportation Authority
Board of Directors
One Gateway Plaza
Los Angeles, CA 90012

The Steering Committee of the Arroyo Verdugo Cities Subregion, representing the Cities of Burbank, Glendale, La Cañada Flintridge, Pasadena and South Pasadena, has reviewed the recently completed Route 710 Tunnel Technical Feasibility Assessment Report, and wishes to provide the following comments and concerns for your consideration.

While the Cities have not all taken positions concerning the Study, or of the potential construction and completion of the tunnel, there is agreement that a number of environmental issues have not yet been addressed. In the absence of any analysis of these potential environmental impacts having been completed as part of the Study, the Committee believes that it is important at this time to document these several areas of concern so that they may be considered in a future study.

1. It is a concern that the Study's area of focus only includes the "project study area" of Los Angeles, Alhambra and South Pasadena, and that the Study does not address the potential impacts of the project on the other surrounding communities. For example, the cities of La Cañada Flintridge and Pasadena have several schools adjacent to the freeways. The determination of whether the tunnel is feasible should consider such environmental factors as the impact of additional traffic on children's health. The impacts on all of the communities within the entire region must be considered as a part of the feasibility, not just in the immediate vicinity of the tunnel route.

2. The study should consider how the tunnel will affect goods movement in the region; i.e., whether the tunnel is expected to provide a strategic link in that system, and in what manner if that is so.

3. It is unclear within the scope of this study whether trucks would be permitted to use the tunnel. A decision needs to be made so that future analyses are able to fully address this issue.

4. In order to mitigate additional freeway noise the use of sound-reducing paving material should be considered, and the incorporation of soundwalls where they meet the Caltrans standards must be a "given" if the tunnel is to be completed.

5. The issue of increased levels of VOCs, diesel emissions, and other microparticles should be addressed, along with all other air quality impacts.

6. The potential of encountering methane gases, and the use of specific methods to detect gases during construction, need to be studied.

7. The utmost in precautionary procedures must be incorporated into the project to protect the public during construction activities.

8. The 2004 SCAG Draft RTP and the Final RTP regarding the tunnel appear to be different. A map was originally included showed the regional traffic impact of constructing the tunnel and closing the "710 gap." It is a concern that this map was not included in the Final RTP. If this is the case, the Committee would like to know why this was done.

9. The issue of traffic safety should be further addressed in order to better understand the feasibility of the tunnel. The traffic safety issues pertain not only to operations within the tunnel, but also to general freeway operations in the Arroyo Verdugo Subregion that may be affected by increased traffic caused by the gap closure.

These comments are respectfully submitted to the MTA Board, with the request that the Board ask staff to further address these issues and respond back to the Subregion.

On behalf of the Arroyo-Verdugo Subregion, your consideration of our request is appreciated.

Sincerely,

Gregory Brown
Vice Chair

Hui, Linda

From: Robin Milligan [robin@ncbmw.com]
Sent: Thursday, September 14, 2006 11:57 AM
To: 710Tunnel
Subject: 710 tunnel

Hi,

I think it is a bad idea. The 210 is already over crowded with too many cars and **DANGEROUS TRUCKS!!!!!!!!!**

I have been driving from La Canada to Alhambra, 5 days a week for the past 16 years and every day it is more crowded!!!!

The trucks are really out of control. They speed, travel in packs and are very dangerous. I think tunnel will make traffic worse

and the noise will be even worse than it is now. I don't believe the sound walls (if ever built) will take care of the problem.

Please stop the tunnel now!!!!!

Thank you.

the partnership
San Gabriel Valley Economic Partnership

September 15, 2006

Mr. Roger Snoble
Chief Executive Office
Metro
One Gateway Plaza
Los Angeles, CA 91701

RE: Route 710 Tunnel Technical Feasibility Assessment

Dear Mr. Snoble,

I am writing you on behalf of the San Gabriel Valley Economic Partnership to offer our strong support for the findings of your Route 710 Tunnel Technical Feasibility Assessment. I would like to thank you, your Board, and your staff for your leadership in completing this feasibility study. Having reviewed this study, we believe that it demonstrates that new technologies make it environmentally and physically feasible to complete the I-710 gap using a tunnel, and that there are no impacts of this project that cannot be mitigated.

We believe that the use of four lanes in each direction is critical in order to provide minimal levels of service to those using the tunnel. In this vein, we agree with the recommendation that a Huntington Drive Interchange not be included within the project.

The San Gabriel Valley Economic Partnership has long believed that the Gap Closure project is one of the three highest priority projects in the San Gabriel Valley. As identified by MTA staff analysis, the Gap Closure will provide more freeway traffic congestion relief than any other project in Los Angeles County. In the San Gabriel Valley, our peak travel times will grind to a halt without this project.

Given these developments, the findings of the feasibility study, and the importance of the project, we urge that the funds for the environmental review, engineering, and construction of the Gap Closure be included in MTA's new Long Range Transportation Plan. Although this project carries a large price tag, it will eliminate over 750,000 hours of congestion annually, making it cost competitive with the other LRTP proposed projects when measured by cost efficiency.

We appreciate your leadership in advancing this key project, and hope to continue to be a partner in the future in advancing its completion.

Sincerely,

William Carney

William Carney
President & CEO

4900 Rivergrade Road, Suite A310
Irwindale, California 91706
Phone (626) 856-3400 Fax (626) 856-5115
www.valleyconnect.com

Hui, Linda

From: POrona1060@aol.com
Sent: Wednesday, September 27, 2006 7:12 PM
To: 710Tunnel
Cc: webcenter@niehs.nih.gov; councilmember.reyes@council.lacity.org; councilmember.cardenas@council.lacity.org; councilmember.parks@council.lacity.org; councilmember.padilla@council.lacity.org; councilmember.labonge@council.lacity.org; councilmember.zine@council.lacity.org; councilmember.greuel@council.lacity.org; councilmember.perry@council.lacity.org; councilmember.wesson@council.lacity.org; councilmember.rosendahl@council.lacity.org; councilmember.smith@council.lacity.org; councilmember.huizar@council.lacity.org; councilmember.hahn@council.lacity.org
Subject: 710 TUNNEL EIR SUBMITTED QUESTIONS

Peter A. Orona
5472 Allan St.
Los Angeles, CA 90032
September 16, 2006

710 Tunnel EIR Questions, Request, & Concerns

The following inquiries, request, and concerns have been generated in order to ensure the health and welfare of my community. To all Federal, State, County, and Local governments who profess accountability when maintaining modern commercial productivity, it is your duty to find a balance between an individual's right to exist, and urbanization. Anything short of this is a travesty of the democratic process, and an abatement of our humanity. We did not choose to live near a freeway, or connector road. What is being proposed is an increase in traffic, toxins, and noise. Freeway pollution and noise increase the risk of developing asthma, cancer, hearing loss, and stress related diseases. Those of us who live in this neighborhood can only look forward to a future filled with illness. Let us create and develop our communities with resources to truly improve the standard of living for those of us that live in them. Let them continue to be a tax base, to provide education and services, to be a source of livelihood. Nurture our communities so they can thrive; please do not destroy what others fail to see, a proud and viable community. Do not subject our children to pollution, as it will prevent them from becoming our righteous leaders. For those who are, Thou shall be.

As elected officials, it is your responsibility in making sure that our community is not abused. Our community is holding you accountable. As honorable civil servants of our community, we respectfully request the following items be addressed rigorously, and competently.

1. Provide a number estimate of traffic that will move from the beginning southern part of the proposed 710 Tunnel to the exit in Pasadena. The number should include projected number of cars, commercial trucks, and other vehicles. Will truck traffic in the tunnel be limited?
2. What formulas/strategies are being used to measure risk acceptability in relation to the 710 Tunnel? Provide all information on how safety, and risk assessments of the proposed 710 Tunnel figure into human and environmental degradation within the affected local communities? How many additional lives will be lost prematurely due to the 710 Tunnel pollution and traffic

accidents? What are all the cost-benefit ratios? Is the risk of implementing the 710 Tunnel not greater than the level of pollution output currently used in modes of transportation?

3. Describe the potential biohazards that both tunnel construction, and usage bring.

4. Provide all information on any and all environmental studies, or reports that have been done and completed near, and around the proposed 710 Tunnel. Indicate what efforts have been made to provide this information to the community.

5. Provide information on studies done to measure simultaneously Particulate Matter contamination emanating at both portals (i.e., same weather/seasons/day/hour). How will the Air Quality Descriptor for PM 2.5 and PM10 be articulated in relation to the 710 Tunnel? Will PM 2.5 and PM 10 particles be eliminated in the process of being scrubbed? What contaminants will be left over and breathed by citizens? Where will the tunnel portals begin? Allen? Concord? Valley Blvd.? Del Mar? How will mitigation measures be addressed at the portal entrances, and tower sites when the technology to control pollution is not proven, or does not exist? How would authorities mitigate the noise pollution during the construction?

6. How is the construction company going to prevent Valley Fever from affecting people when digging, and clearing soil debris? Will there be limited hours of construction?

7. Provide any tangent plans that are being considered in conjunction to the 710 Tunnel in order to mitigate LA County traffic problems.

8. How much green space will be needed to offset the pollution that will be generated by the 710 Tunnel? How many fully mature trees will be needed to absorb vehicle exhaust emanating from both the portals, and scrubber towers?

9. How will the 710 Tunnel benefit the community of El Sereno? How many scrubber towers will be located in El Sereno, and what will be their locations? How many Construction staging areas will be located in El Sereno, and what are the locations of the staging areas?

10. How many tons of waste will a "scrubber tower" hold prior to maintenance? Can a "scrubber tower" implode? If a "scrubber tower" fails or is destroyed, is there a back-up system, or replacement procedure in place?

11. What kind of security will merit monitoring the entire 710 Tunnel facilities? How will terrorist concerns be addressed? What will be done to safeguard the occupants in, and around the 710 Tunnel?

12. How will you recapture, and recycle water from any tunnel excavation encounters? Will authorities monitor noise levels, and pollution levels during construction? If levels exceed allowed limits, or the community's concern will they halt work for the day?

13. After tunnel construction and cost, how many years will it take to break even? When will L. A. County start making its profits?

14. Will authorities shut down the tunnel when too many hazardous PM2.5 and PM10 particles are detected on any given day?

15. How much smog will the 710 Tunnel's portals, and scrubber towers contribute to the local existing pollution?

16. Will authorities compensate the community, and individuals for any illnesses related to PM2.5 and PM10 particles that would have originated from the 710 Tunnel site? Will they be given health insurance, or monetary benefits?

17. Will MTA provide medical experts to begin a comprehensive health study

around the local communities that will be affected by the 710 Tunnel? Will an unbiased environmental overseer be hired to protect, and monitor the community's health and safety concerns during, and after construction?

18. How much will a toll road system cost to implement, and maintain?

19. Are current modes of production changing to prevent the harmful effects of pollution? Provide information that the Market Place will create alternative-affordable modes of transportation, and fuels by the time the 710 Tunnel is completed?

20. What are the current local industry hazardous emissions around the proposed 710 Tunnel? How can these materials interact with the new air pollution that the 710 Tunnel will bring? How will they mitigate truck pollution during construction? Where will all the trucks for hauling out debris be parked? How many trucks will be used to haul away dirt? Where will the excavated dirt be dumped? Again, can the dirt contain Valley Fever materials? Will the train system be used to haul out construction debris? How do authorities intend to mitigate, or address the noise problem caused by the train during the day, and night?

21. How many tons of air pollution will the proposed scrubbers capture? How often will the proposed scrubbers need to be cleaned? Provide low and high estimates.

22. How comprehensive and exhaustive will the 710 Tunnel EIR study be?

23. Will the 710 Tunnel engineers learn from all the errors that previous tunnel mishaps demonstrate? For example, people living around tunnel portals in Australia are suffering, and dying. The Big Dig in Boston is a fiasco. Will an independent panel of environmental experts review the 710 Tunnel EIR? Will a contact telephone number for all agencies, and government officials be provided to voice concerns and complaints during construction?

24. How many people concerned about the 710 Tunnel have read ADVICE & PLANNING by Martin H. Krieger?

CITY OF SOUTH PASADENA
OFFICE OF THE CITY MANAGER
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October 9, 2006

Mr. Roger Snoble
Chief Executive Officer
Los Angeles County Metropolitan Transportation Authority
One Gateway Plaza
Los Angeles, CA 90071

Dear Mr. Snoble:

On behalf of the City Council and residents of the City of South Pasadena, enclosed please find four copies of the final Report (the "SAC Report") of the South Pasadena Special Advisory Committee on the MTA Route 710 Tunnel Technical Feasibility Assessment Report (the "Tunnel Feasibility Report").

The Special Advisory Committee ("SAC") was commissioned by our City Council at my request this past June, to fairly and impartially review the MTA's Tunnel Feasibility Report in detail and report on the extent to which it represented, in their view, the kind of sound research that our City Council agreed not to oppose in June 2003 (following a presentation by yourself, Doug Failing and Mark Pisano).

Our SAC was comprised of various individuals possessing technical expertise in the fields of engineering (including tunnel design, civil engineering, and groundwater), transportation, and public construction law. Our SAC included a former executive director of the Southern California Association of Governments, a professor associated with the Norman Minetta Transportation Institute, a former space program engineer with the Jet Propulsion Laboratory, an esteemed groundwater expert with specific knowledge of the greater San Gabriel Valley/Arroyo Verdugo basin, an engineer with DMJM who has worked on other tunnel projects, and a former chief of staff of the MTA. Each SAC member is highly regarded in their respective fields, is a resident of the City, and dedicated numerous hours over the course of three months reading the Tunnel Feasibility Report and considering its findings, declarations and implications. Suffice it to say, our City Council is indebted to the work of the SAC and its very thorough and thoughtful work product.

In addition, our City retained Dr. Gary Brierley and Brierley Associates (well known experts in the tunneling industry) to assist the SAC with its work. We know that both the MTA and Parsons Brinkerhoff are familiar with Dr. Brierley, and respect his professional background and technical knowledge and expertise in the field. Dr. Brierley's assistance was invaluable in assisting the SAC with its work, and assuring that the SAC was provided with the technical knowledge and background necessary to fairly analyze the MTA's Tunnel Feasibility Report.

As you will note, the SAC made three principal findings and conclusions with respect to the Tunnel Feasibility Report, and made numerous other insightful observations with respect to any further public evaluation of a tunnel alternative. The SAC findings and conclusions have been unanimously adopted by the City Council. The ultimate conclusions of the SAC may be summarized briefly as follows.

The Tunnel Feasibility Report first concluded that "the tunnel concept appears physically and environmentally feasible." The SAC agreed that the technical capability exists to make this proposed tunnel alternative physically feasible.

However, the SAC did not agree with the conclusion that the tunnel was environmentally feasible. The MTA's Report indicates that environmental "impacts or the severity of the impacts can be minimized, eliminated or mitigated using proven measures and techniques. Based upon this preliminary environmental assessment, no insurmountable environmental issues have been identified that would preclude further consideration of the tunnel alternative."

The SAC concluded however that the exhaustive environmental assessments necessary for a project of this magnitude have not yet been undertaken, and the numerous potential environmental impacts have not yet been ascertained or analyzed. Thus, Parsons Brinkerhoff's conclusions in this regard are premature and unsupported.

We believe many other cities have (or will) also take exception to these unsubstantiated conclusions.

The Tunnel Feasibility Report next concluded that a tunnel was financially feasible. Our Special Advisory Committee concluded that it could not agree with the Report's determination at this time due to the fact that the Report's discussion of financial feasibility was conceptual at best. The SAC also questioned the various cost estimates of construction contained in the Report in light of unknown groundwater and other physical conditions.

The question of whether such a project, with such an impressive array of unknowns in the area of environmental impacts, and, therefore, consequent mitigations, is financially feasible is an extremely speculative query, according to the SAC.

In light of these findings, the City Council unanimously shares the SAC's conclusion that the question of "...whether a tunnel is truly feasible remains an open question in the absence of a much more thorough investigation of a host of geotechnical and constructability issues posed by such an undertaking."

Our City Council unanimously adopted the Report of the Special Advisory Committee as the City of South Pasadena's official response to the MTA's Technical Feasibility Assessment Report. However, it was requested that I point out (lest the background section of the SAC Report be misconstrued) that the current terminus of the 710 Freeway is in Los Angeles – not Alhambra, and that South Pasadena has historically been opposed to any extension of the 710 Freeway through South Pasadena, not just a surface route extension (this is our City's official position unless and until modified or changed by the City Council).

We appreciate the opportunity to share our official views with you and your staff concerning the Tunnel Feasibility Report. I believe that our City took an extremely fair and unbiased look at the Report, and that the credentials of the Special Advisory Committee should cause the MTA and others to give great weight to the SAC's Report.

The City's official position on a possible tunnel extension is to not oppose sound research. We respectfully submit that sound research into the environmental implications of a 710 tunnel extension, and possible mitigations thereto, still awaits us all. Our City remains committed to doing its part to ensure that any future research on the matter be, for the benefit of all concerned, sound. It is with this aim that we respectfully submit the enclosed.

Sincerely,

PHILIP C. PUTNAM
Mayor

PCP/eh

CC: Carol Inge, Chief Planning Officer
Shahrzad Amiri, Director San Gabriel Valley Area Team
Lynda Bybee, Deputy Executive Officer, Community Relations

Special Advisory Committee

Report to City Council on the MTA Route 710 Tunnel Technical Feasibility Assessment Report

Committee Members:

- Ray Remy, Chair
- Joseph Birman, PhD.
- Frank Cardenas, Vice Chair
- Daniel Evans
- Robert Joe
- Ignacio Roman
- Beatrice Siev

Consultants:

- Gary Brierley, PhD., P.E., Brierley Associates
  Underground Design and Construction Specialist

- Michael Gonzalez
  Consultant to the Committee

September 11, 2006

City of
South Pasadena
CALIFORNIA

City of South Pasadena
Special Advisory Committee
on the
MTA Route 710 Tunnel
Technical Feasibility Assessment Report

I. Background

The controversy over whether, where, and how to complete the approximately 4.5 mile extension to the State Route 710 Long Beach Freeway from Los Angeles and Alhambra to the Interstate 210 Foothill Freeway in Pasadena has united City Councils and residents of the City of South Pasadena (the "City") for over 40 years in opposition to the dividing of their community. This fight has pitched Cities and public entities against one another for over a generation. During this time the City has been forced to devote significant resources to the freeway controversy that could have been spent on infrastructure improvements or other quality-of-life issues.In the interim, regional traffic congestion has worsened and streets in Alhambra, Los Angeles, Pasadena, and South Pasadena have been overloaded on a daily basis. And while the region's housing needs have increased tremendously, over 500 homes have been owned and managed by the California Department of Transportation ("Caltrans"), an agency not in the business of proper home stewardship, thus limiting the region's ability to expand affordable housing and home ownership opportunities.

South Pasadena's Historic Opposition to a Surface Extension

In 1959, the State of California adopted its Master Plan of Freeways and Expressways and extended the planned Route 7 (now the SR-710 and the I-710) from its original Long Beach to Huntington Drive destination, northward to the Foothill Freeway. In 1960, the cities of Alhambra, Los Angeles, Pasadena, and South Pasadena were notified by the state of alternatives being studied to determine the exact path of the planned freeway.

In November of 1964, the California Highway Commission officially adopted the "Meridian Route" as the freeway alignment. Within a month, the City requested reconsideration of the adopted route. In February of 1965, the segment of the Long Beach SR-7 Freeway between Route 10 (now I-10) and Valley Boulevard was opened. Since that time, completion of the freeway segment between Valley Boulevard in Alhambra and Del Mar Boulevard in Pasadena has been the subject of numerous administrative proceedings, court actions, and legislative initiatives. In 1973, after the passage of both the National Environmental Protection Act (NEPA) and the California Environmental Quality Act (CEQA), the City sought and was granted an injunction prohibiting Caltrans from constructing the extension project until an environmental impact statement was properly completed. Because of disagreements between the state and federal bureaucracies regarding route selection, the injunction was not lifted until 1998, after the issuance of the Record of Decision (ROD) – the agreement that committed the federal government to fund a large portion of the project – by the federal Department of Transportation (DOT).

On July 19, 1999 United States District Court Judge Pregerson issued a preliminary injunction in *City of South Pasadena v. Slater,* 56 F.Supp.2d 1106 (C.D.Cal. 1999) enjoining defendants Caltrans, et al., from proceeding with the 710 Freeway Project. Judge Pregerson's lengthy opinion set forth numerous, substantial violations of federal law that would have to be cured to complete the project, including violations of the Clean Air Act, NEPA and other statutes. No attempt has been made by the defendants to satisfy the violations found by Judge Pregerson; to the contrary, essentially agreeing with the Court, the Federal Highway Administration in December 2003 withdrew its funding commitment for the project, and Caltrans in June 2004 withdrew its environmental fundings and 1994 route adoption.

The Tunnel Alternative

In late 2002, Caltrans, in consultation with the Federal Highway Administration (FHWA), determined that consideration was appropriate of a tunnel, or series of tunnel segments, as an alternative to a surface extension along the 710 corridor. During this time-period, planners from both the Southern California Association of Governments ("SCAG") and the Los Angeles County Metropolitan Transportation Authority ("MTA") recognized the potential air-quality benefits a tunnel alternative posed to the region, as exhaust from the approximately 300,000 cars passing through new tunnel segments could be subjected to a highly sophisticated ventilation system and possibly "scrubbed" prior to release above ground, a process that could leave the air quality in the region considerably cleaner than would be the case with the current surface configuration. Over the next year, representatives from Caltrans, SCAG, and the MTA met publicly with various city councils along the corridor to present this alternative concept, along with its associated benefits, and to recommend further study of a tunnel alternative. In June 2003, the South Pasadena City Council voted "not to oppose a sound study" of the tunnel alternative.

In 2004 the MTA selected a team of outside consultants, led by the engineering firm Parsons, Brinkerhoff, Quade & Douglas (PB), to conduct a feasibility analysis of the tunnel approach. As more fully described below, the limited purpose of the analysis was to: a) determine if a tunnel is technically, operationally, and financially feasible; b) describe the preliminary potential physical, environmental, financial, and social impacts to neighboring communities; c) validate the concept of a deep-bore tunnel; and d) develop a more refined project scope and cost. After several months of delay, the MTA's Route 710 Tunnel Technical Feasibility Assessment Report (the "MTA Study" or "Study") was finally issued in June, 2006.

The Special Advisory Committee

In response to the MTA Study, and in an effort to dedicate ample time and analysis to its review, the Mayor and City Council appointed seven individuals to a Special Advisory Committee ("SAC" or "Committee") on the subject, composed of South Pasadena residents. These individuals each bring specialized experience to this effort. Among the Committee's ranks are a professor of geotechnical sciences, a civil engineer with underground construction experience, an aerospace engineer with long-standing ties to the effort to resist the surface freeway, three members of the City's Transportation Commission each with many years of experience in planning and oversight of large-scale public works projects, and a life-long resident of the City who is currently a professor of transportation policy.

The City has provided professional support to this committee in the form of Dr. Gary Brierley, a civil engineer with over 40 years of experience in the design and construction of tunnels. Also supporting the Committee was Mr. Michael Gonzalez, an attorney and former MTA executive in its construction department.

The members of the Special Advisory Committee are as follows:

Ray Remy, Chair
Mr. Remy is a 43-year resident and the Vice-Chairman of the South Pasadena Transportation Commission. His extensive experience in public policy includes service as Deputy Mayor for the City of Los Angeles, an executive with the State Economic Development Department and sixteen years as a Board Member of both the Los Angeles County Transportation Commission and the MTA.

Frank Cardenas, Vice-chair
A five-year resident of South Pasadena, Mr. Cardenas is an attorney and the owner of a management consulting and construction management services firm. Frank was previously Chief of Staff at the MTA and the Vice-President of the City of Los Angeles Board of Public Works, and he currently serves as the chair of the South Pasadena Transportation Commission. He is a graduate of the University of Southern California and Harvard Law School.

Dr. Joseph Birman
Dr. Birman, a geologist specializing in ground water exploration and environmental applications, has practiced from his consulting firm in South Pasadena for more than three decades. Formerly a professor at Occidental College, he received his Masters Degree from Caltech and his PhD. from UCLA. Most of his work has been throughout California and the western United States. Growing up in New England he thought New Jersey was a western state.

Daniel Evans
A resident in or adjacent to South Pasadena since the age of two, Daniel Evans is a graduate of South Pasadena-San Marino High School. His career as an international business lawyer includes experience with international tunnel construction projects. Mr. Evans also is a professor at the San Jose State University College of Business, and a research scholar at the SJSU Mineta Transportation Institute.

Robert Joe
Mr. Joe has lived in South Pasadena for over 30 years. His career experience includes 30 years with the Army Corp of Engineers and service for the last six years as an executive with the Metropolitan Water District of Southern California. He also serves on the Transportation Commission and the Design Advisory Group in South Pasadena.

Ignacio Roman
Mr. Roman is a practicing civil engineer with over ten years experience in the design and construction of major transportation infrastructure projects, including highway, light rail, and tunnel. He received his B.S. degree in Civil Engineering from UCLA and his M.S. in Environmental Engineering from UC Berkeley.

Beatrice Siev
Ms. Siev is a long term resident of South Pasadena. She is an accomplished electrical engineer with significant civil engineering experience. Her distinguished career accomplishments include work as an aerospace engineer on several space programs at both the Jet Propulsion Lab (JPL) and Caltech.

A brief background of the City's consultants is as follows:

Dr. Gary Brierley
Dr. Brierley is the principal of the Denver-based geotechnical consulting firm Brierley Associates specializing in tunnel development. He has over 40 years' experience in the design and construction of underground structures and has worked on tunnel projects throughout the United States and around the world. In the Los Angeles area, Brierley Associates has worked on several subway and water tunnel projects.

Michael Gonzalez
Mr. Gonzalez is an attorney with substantial experience in public construction law. As Special Assistant to the Chief Executive Officer, Michael commissioned and oversaw several high-profile forensic investigations into the causes of certain construction problems which arose from the MTA's Metrorail subway project.

II. Charge of the Committee

As established and authorized by the vote of the City's Mayor and City Council, the mission and purpose of the SAC is to "carefully review, discuss, and assess the MTA

Tunnel Feasibility Study and report to the Council its determination as to whether the building of a tunnel to complete the 710 is feasible. If the SAC determines such is the case, it should make observations relative to the soundness of the MTA study and identify any errors of fact or omission therein contained. The SAC shall identify potential areas of concern that the City should carefully monitor, in the event that the requisite authorities deem that subsequent studies of this issue are warranted." (SAC Meeting June 29, 2006).

It is important to note that the Committee did not view as part of its responsibility the requirement to either recommend support or opposition to the concept of a tunnel. Rather, the Committee's scope of review was limited to an unbiased, fair and impartial analysis of the MTA Study only. We did not reflect upon any other transportation proposal, past or present, whether or not related to a 710 extension, nor did we assess possible future impacts to the City related to the absence of any actions designed to reduce north/south surface congestion within the area covered by the MTA Study.

III. Description of the SAC Meeting Process

The SAC has worked to ensure meaningful public education and participation in its review of the MTA Study. To this end, the City made certain that all three meetings of the SAC were held in public settings and in compliance with all public meeting laws. To promote civic participation, the City encouraged coverage of the SAC and its meeting dates, times and locations by the local press.

The general format for each meeting revolved around a detailed chapter-by-chapter briefing to the SAC of the MTA Study by the City's consultants. Each Committee member was then invited to ask questions of fellow SAC members or the City's consultants on any issues discussed in, or in some cases omitted from, the involved chapters. Once these issues were addressed, members of the audience were invited to ask any questions they might have about the topics. There was never a time limit placed on such audience questions and, in many instances, the City's consultants either directly answered any questions posed by audience members or provided further information on issues of concern. A detailed set of minutes of each SAC meeting is included as Appendix Item A attached to this Report.

IV. Committee's Response to the MTA Study

Finding 1. Technical – MTA Study Finding

> "Based upon the technical feasibility assessment, the tunnel concept appears physically and environmentally feasible. The technical feasibility assessment considered a range of tunnel alternatives and features with the construction cost ranging from approximately $2.3 billion to $3.6 billion (2006 dollars). As part of financial strategies, a number of potential fund sources including federal, state,

local and toll revenues were explored. Based on these preliminary findings, it is determined that the tunnel concept is technically viable and warranted to be advanced for more comprehensive and detailed evaluations to validate the findings of this assessment." (MTA Study, Executive Summary, Section ES 1.3).

Finding 1. Technical – SAC Committee Opinion

The Committee agrees that the technical capability exists to make this proposed tunnel alternative feasible.

Finding 2. Environmental – MTA Study Finding

> "From the environmental perspective, the tunnel concept appears to be viable and feasible. Environmental impacts to the following resources may occur: noise, air quality, historic properties, aesthetics, archaeology, hazardous waste, soil disposal, and storm water. However the impacts or the severity of the impacts can be minimized, eliminated or mitigated using proven measures and techniques. Based upon this preliminary environmental assessment, no insurmountable environmental issues have been identified that would preclude further consideration of the tunnel alternative. " (MTA Study, Executive Summary, Section ES 1.5).

Finding 2. Environmental – SAC Committee Opinion

The Committee cannot concur with the finding that environmental impacts to the project can be adequately minimized, eliminated or mitigated. The exhaustive environmental assessments necessary for a project of this magnitude have not yet been undertaken, and the numerous impacts have not yet been ascertained or analyzed.

Finding 3. Financial – MTA Study Finding

> "The Route 710 gap closure is a project of regional significance. This technical assessment examined a myriad of tunnel alternatives that would provide four-lanes of traffic per direction. The construction cost estimates for these alternatives were prepared with the estimates ranging from approximately \$2.3 billion to \$3.6 billion (2006 dollars). A cost estimate of \$3 billion (2006 dollars) was used for the purposes of identifying potential funding sources and developing financial strategies to reflect the range of tunnel alternatives considered. As part of this technical assessment, several potential financial strategies were developed that considered various federal, state, regional, and local funding sources. These sources included traditional funding sources and non-traditional sources such as bonds leveraged from anticipated toll revenues. Using these revenue sources and assumptions on the level of contribution from each source, seven preliminary financial scenarios were developed -- including four scenarios that contained toll based financing. "(MTA Study, Executive Summary, Section ES 1.6).

Finding 3. Financial – SAC Committee Opinion

The Committee cannot agree with the Study's determination that this tunnel project is financially feasible at this time. In fact, the Study's discussion of financial feasibility is conceptual at best. While the Committee agrees that a proposed tunnel project might be a candidate to receive funding from a variety of sources, we suggest that any determination regarding the financial feasibility of such an alternative cannot be made until a regional, constrained budget has been developed which includes this project.

A. Committee's Opinion on the Study's Conclusion Regarding Feasibility

The Study's intent was described thusly;

> "The intent of the assessment is to determine the feasibility of completing this freeway gap by tunneling underground. Specifically, this evaluation is principally focused on deep subterranean bored or mined tunnel construction methods instead of the more environmentally intrusive shallow trench excavation or "cut-and-cover" tunnel methods... <u>Although this assessment has examined a variety of issues related to a tunnel, it was by no means intended to be comprehensive nor exhaustive in scope.</u> The purpose of this assessment is to serve as a technical foundation to allow decision-makers sufficient information to determine what appropriate actions should be initiated regarding the tunnel option." (Emphasis added.) (MTA Study, Executive Summary, Section ES 1.2).

We agree with the MTA Study insofar at it admits to not claim to be, nor do we believe it was scoped to be, either comprehensive or exhaustive. While we do not contend that a finding of feasibility can only be predicated upon analysis which is comprehensive and exhaustive, we do believe that a project as significant as that at issue here, one which is without precedent in the United States, or even the world (according to the City's tunnel consultant, Dr. Brierley) must surely be subjected to more rigorous analysis than is inherent in the MTA Study. Put another way, the limitations of this MTA Study made it impossible to provide the exhaustive answers necessary to adequately assess this proposal.

The Committee is of the opinion that the MTA Study, by its own terms, does not provide sufficient information upon which to responsibly determine the feasibility of extending the 710 freeway via an underground tunnel. As the MTA Study states, only three new borings were completed in direct support of it -- far too few to provide anything approaching the kind of comprehensive subterranean analysis that would be required for any responsible determination regarding the feasibility of such a significant effort. In short, while the Committee, as previously stated, believes that the technology exists to, in concept, construct this tunnel alternative, the question of whether a tunnel is environmentally and fiscally feasible remains open in the absence of a much more thorough investigation of various geotechnical and constructability issues posed by such an undertaking. The Committee acknowledges that the Study seeks to answer, or at least speak to, a number of questions beyond just technical feasibility. The nature of these various questions posed by the Study are revealed in the Study's description of its four main purposes, which were to:

1. Determine if a tunnel is technically, operationally and financially feasible;
2. Identify preliminary potential physical, environmental, and financial impacts to neighboring communities;
3. Validate the concept of a bored tunnel(s); and
4. Develop a preliminary project scope and cost estimates.

The design and limitations of this MTA Study do not appear conducive to developing the type of exhaustive answers necessary to adequately assess this proposed alternative.

B. Committee Observations by Chapter

In furtherance of the Committee's charge, the following serves as a chapter by chapter commentary on both the MTA Study's contents and its omissions.

Chapter One – Background

For reasons explored below, the Committee is of the opinion that the MTA Study in general appears to be more of a conceptual document as opposed to a "feasibility assessment." We note here the importance of recognizing that the extension of the Long Beach Freeway from Valley Boulevard to California Boulevard has never been designated as part of the Interstate Highway System. Rather, its official Caltrans designation to date is simply State Route (SR) 710.

Chapter Two – Summary of Large Highway Tunnels

Chapter 2 of the MTA Study describes tunnels of "comparable" cross section and length around the world and attempts to create the impression that the 710 tunnel is not altogether different than other tunneling projects. This characterization, however, is rather misleading. Most highway tunnels around the world provide for two lanes of traffic in each direction. A few tunnels in the world provide for three lanes of traffic with almost none having four lanes except for projects in urban areas that have been built by cut and cover technology. If the 710 tunnel is built with four lanes of traffic in both directions for a total length of over four miles, then it is fair to say that nothing comparable to this project exists anywhere in the world. This statement is not to suggest that the 710 tunnel is not possible; but rather to indicate that this is a project of grand proportions. In essence, the 710 tunnel would be the equivalent of building a structure the size in diameter of a subway station for a total length of over four miles.

Simply taking the basic, assumed dimensions of the tunnel segment alone, not including underground construction relating to portals, vent shafts, fault protection and cross-connections, the total displacement and excavation of earth for a 710 tunnel would amount to approximately 6 million cubic yards of bulk material (approximately 4 million cubic yards of material in-place). Without question, this would truly be a substantial, and perhaps unprecedented, undertaking. Thus, Chapter 2 of the MTA Study does well to suggest that tunnels of smaller magnitude have been successfully built elsewhere, but it adds little if anything toward an analysis of the feasibility of building the kind of 4.5 mile-long, 60-ft. diameter tunnel that is at issue here.

Chapter Three – Geotechnical Evaluation

Chapter 3 of the MTA Study discusses subsurface conditions along the study area and concludes that these ground conditions would be "favorable" for tunneling. The Committee finds this claim to be a highly optimistic conclusion which is not supported by the relative paucity of information about our existing subsurface conditions. The Committee does not suggest that, as a factual matter, the underground conditions are not favorable, we simply suggest that any assertion of favorability or lack thereof cannot be made responsibly on the basis of the rather limited data relied upon in the MTA Study. We do suggest, however, that the authors of any subsequent in-depth analysis of the existing subsurface conditions along this corridor, should such analysis be warranted, coordinate their work with California Integrated Seismic Network. Information on this organization is attached as Appendix Item B.

In general, the tunnel alignment can be characterized as consisting of three reaches as outlined below:

> **Reach 1** – From the south portal to York Boulevard for a total distance of approximately two miles - This ground consists mostly of sedimentary bedrock (shale, sandstone, claystone, etc.) and is shown as being located above the regional ground water table. If further investigation proves this assumption true, then the Committee agrees that this reach of the project would be favorable for tunneling. These ground types have been tunneled with success in the Los Angeles area and would respond positively to the types of tunneling equipment and procedures described in the MTA Study.
>
> **Reach 2** – From York Boulevard to Arlington Drive (ironically directly below the City) for a total distance of one mile. This reach of the project is located in a zone of faults which can be subject to movement during earthquakes; and which may have caused water to rise to elevations considerably above the level of the proposed tunnel. At this point in time, based on available information, this ground could only be described as difficult for tunneling; especially for a project of the size that is being contemplated. Not only would this ground be difficult to very difficult to control at specific faults, but the ground by its very nature is highly variable and would provide the tunneling contractor(s) with a continuously changing environment of challenges.
>
> In addition to construction risks, some or all of these faults are subject to movement during earthquakes and, as described in the MTA Study, would require

an oversized opening to allow for these movements. In the report, a total distance of 1,500 ft is provided for this purpose. However, until further study this 1,500 ft allowance could only be characterized as a guess. Based on equally valid assumptions, an argument could be made that a total distance of almost one mile would need to be oversized resulting in a substantial increase in cost.

With time, the subsurface investigation for this more challenging reach of the project would require much detailed geological and geophysical investigation and a great many test borings to characterize and analyze the types of formations, faulting, and ground water conditions. In fact a good argument could be advanced that this entire reach of the project should be investigated with a pilot tunnel, both to obtain adequate subsurface information for design and construction and to begin draining the ground of any perched or highly pervious ground water prior to the start of large scale tunneling.

Reach 3 - From Arlington Drive to the north portal for a total distance of approximately one mile. This ground consists of weak "granite" extending into alluvium. In general, tunneling equipment that would be used on this project should penetrate this ground without difficulty. The rock is highly weathered and easy to excavate and the alluvium is dense and relatively stable as a tunneling medium. A potential problem is that water can easily penetrate the highly fractured rock that characterizes the weak granitic bedrock as well as overlying alluvium. Until disproved, the granitic bedrock in this area should be considered a possible aquifer rather than a dry perching structure. If true, an extensive program of construction dewatering might be needed in this area depending on the method of tunneling ultimately selected.

Chapter Four – Tunneling Technologies

Chapter 4 of the MTA Study discusses tunneling technology and concentrates on either very large tunnel boring machines (TBM) or building the tunnel in segments using sequential excavation. Using a TBM for this project is highly problematic for the following reasons:

1. The excavated diameter of this tunnel would be on the order of 60 ft or more and no machine presently exists that can excavate a tunnel to those dimensions. The MTA Study is based on the assumption that by the time this tunnel is ready for construction such a large machine will be available.

2. As stated in our comments about ground conditions, Reach 2 of this tunnel consists of faulted ground with high water table. It is simply not possible, at this time, to assume that a very large TBM will be able to penetrate this ground without massive amounts of ground improvement and/or ground stabilization. If the TBM becomes stuck in this ground for any reason, then the cost to restart the

machine could be dramatic. To minimize this risk, large volumes of ground improvement would be required which is also time consuming and costly.

3. The single large TBM tunnel will require traffic to be divided into upper and lower levels of two lanes each. Such a configuration will greatly complicate entrance and exit configurations, will complicate rescue operations, and will add greatly to the complexity of proposed ventilation solutions. The design of this tunnel will be difficult and, as with any significant subterranean undertaking, subject to unanticipated problems.

4. As stated in the Study, it will be necessary to over-excavate portions of the tunnel in fault zones to allow room for possible ground movements during earthquakes. It would be extremely difficult and very expensive to demolish and reconstruct portions of a completed TBM tunnel. The lining as installed by the TBM would be very thick and by definition the demolition would take place in the worst ground conditions on the project. The MTA Study assumes that such activity will be required for 1,500 ft, but the need for greater lengths is possible, if not probable. There is no way, at this time, and based on available information, to estimate how much this would cost.

The sequential excavation method (SEM) may be better suited for this project if fault zone problems prove to be more difficult than foreseen. Sequential excavation allows modifications when unforeseen difficult conditions, such as fault zones, are encountered. Furthermore, the final tunnel would have four lanes all at one level, and both rescue operations and ventilation procedures would be easier to design and implement. In other words, the SEM would appear to be better suited to the apparent underground conditions at issue here. As is shown in the MTA Study, however, the SEM is an inherently slow and expensive method of construction. To build the tunnel in this manner would, in all probability, cost more than was assumed in the MTA Study.

Interestingly, the City's consultants have suggested that there might be a third option to build such a tunnel which is not discussed in the MTA Study; one which combines elements of the two aforementioned construction strategies. There is a set of photos on page 4-40 of the MTA Study that shows tunnels excavated by the SEM which are almost always built utilizing two large side drifts; i.e. Drifts 1 in Figure 4-7. These drifts would be the size of subway tunnels for this project and could be readily excavated using existing TBM's not altogether different than those currently being used in East Los Angeles on the MTA's Gold Line Eastside Extension Project. As the TBM's approach the fault zones, the distance between the two drifts could be increased to allow for the extra space needed for ground movement during earthquakes. In addition, the final tunnel would have all four lanes on one level which facilitates traffic flow, rescue operations, and ventilation. Once the TBM tunnels are built (Drift 1) then the remainder of the soil/rock between the tunnels could be removed using sequential excavation. The Committee suggests that, should additional tunnel project analysis be pursued, this third option for tunnel construction be seriously considered as a design option.

Chapter Five – Traffic Modeling/Traffic Analysis

Chapter 5 of the MTA Study discusses current and future traffic patterns on surface streets within the study area. All future traffic usage assumptions are based on the SCAG traffic model. The Committee notes that there have been several questions relative to the validity of SCAG's traffic model upon which future surface street traffic estimates have been based. Nevertheless, the Committee also recognizes that the viability of all other regional transportation projects must, for funding purposes, be evaluated against this particular model, regardless of any perceived or actual flaws it may contain.

Chapter Six – Tunnel Configuration and Alignment

Chapter 6 of the MTA Study discusses three major topics: tunnel alignment, the Huntington interchange, and tunnel ventilation. Each topic will be commented upon separately.

Tunnel Alignment

Three different horizontal tunnel alignments were discussed in the MTA Study. From the point of view of cost, tunnel feasibility, ground conditions, and all other tunneling related variables, there is very little difference associated with these alignments. In general, almost any north/south corridor could be chosen for the 710 tunnel with little to no impact on ultimate feasibility. Most often, these decisions are made for reasons other than tunnel design or construction. The Committee notes that of the limited alignment options developed for purposes of this MTA Study, the Fair Oaks alignment appears to affect fewer private homes within the City than either the Meridian or Fremont alignments.

The Huntington Interchange

The MTA Study states that the main tunnel will be on the order of 100 ft below ground surface in the vicinity of Huntington Drive. This depth of cover is reasonable for such a large tunnel, but it also greatly complicates the possibility of making a connection back to the surface at Huntington Drive. The cost estimate suggests that an interchange at Huntington Drive would cost more than one billion (Year 2006) dollars and we agree with that order of magnitude estimate. Based on the high costs, difficult configuration, extensive impact on the neighborhood, and limited benefit, the Committee concludes that the Huntington Interchange is not feasible.

Tunnel Ventilation

There are two basic methods for ventilating highway tunnels; transverse ventilation and longitudinal ventilation. Historically, almost all highway tunnels in the United States have been built with transverse ventilation which requires a very large tunnel cross section to accommodate the inlet and outlet air plenums at the invert and the crown of the tunnel. Recent research in the United States and highway design standards in Europe suggest, however, that longitudinal ventilation methods are acceptable for highway tunnels under certain circumstances. It is also a fact that both automobiles and trucks are being designed to ever more stringent requirements to improve air quality with resulting benefits for the design of ventilation systems. For instance, tunnels designed in the United States in the 1960's and 1970's for transverse ventilation would be feasible today with longitudinal methods at substantial savings.

Despite all of the above, it is still not obvious that the 710 tunnels could be designed for longitudinal ventilation, especially for the northbound tunnel which goes uphill at a 2 percent grade. The MTA Study suggests that only one ventilation tower will be required near the midpoint of the tunnel, but that is also highly unlikely. At least two and possibly three intermediate towers would be required to make allowances for traffic being backed up into the tunnels and/or for emergency situations. It appears that additional detailed design investigations will be required for a 710 tunnel with a probability that the cost for the project ventilation will increase.

Any community within which a ventilation stack would be located would incur additional costs, i.e. specialized emergency services training and equipment for tunnel emergency situations. A question remaining to be answered is, to what extent would additional city services be needed and how would they be paid for?

Chapter Seven – Architectural Renderings

Chapter 7 of the MTA Study addresses the type of potential design mitigation approaches that can be undertaken in an attempt to minimize the impact upon communities affected by placement of tunnel portals and/or ventilation towers. The Committee notes that funds for either land acquisition or design offsets have not been included in any cost estimates developed in this MTA Study.

The Committee suggests that, should the decision to develop more comprehensive cost estimates be undertaken, the City strive to ensure that adequate funds be included in the project budget to attempt to mitigate the effects of the presence of both tunnel portals and ventilation towers, regardless of whatever jurisdictions are ultimately selected for such placement. The project budget should also contain adequate land acquisition estimates to ensure meaningful mitigation.

The Committee further notes that, regardless of the amount expended on mitigation, the proposed ventilation towers appear to be grossly out of scale with any other buildings in this City or any surrounding neighborhoods.

Chapter Eight – Preliminary Environmental Analysis

The Committee is deeply concerned that this Chapter 8 of the MTA Study does not provide enough information in this area for the Committee to responsibly comment upon.

For example, the MTA Study does not contain adequate discussion of effects of the presence of a series of ventilation stacks on the surrounding communities. Nor does it adequately address the issue of community impacts, either during construction or operation.

The MTA Study highlights the following environmental considerations and suggests that they can be mitigated:

Noise	Archeological Impacts
Air Quality	Hazardous Materials
Land Use	Drainage
Historic Properties	Parklands

While such a statement may prove true from a South Pasadena perspective -- since the vast majority of work (90% or more) will take place at the tunnel portals which are located outside of the City's boundaries – it is nonetheless premature to state that this is, in fact, an exhaustive list of potential environmental issues or that any suggested mitigations would be acceptable to an impacted community. For example, if one or more ventilation towers are located in South Pasadena, the environmental considerations for such impacts would be subject to review by town officials, and, as reflected by many of the public comments received by the Committee, a substantial amount of information regarding the environmental and health impacts of a ventilation tower would have to be assembled, disseminated and scrutinized.

In addition, there is very little discussion in the MTA Study about community impact issues such as the hauling and disposal of tunnel spoil, noise mitigation, and work restrictions that could be placed on construction activities. These considerations can be important during negotiations to build the project and can add significantly to both the cost and the time for construction. Clearly, considerable additional study is required prior to stating that environmental and/or community impact considerations can be mitigated within the proposed budget for the work.

Chapter Nine – Cost Analysis and Schedule

Chapter 9 of the MTA Study discusses cost and schedule for the project. In general, the MTA Study estimates that this project will cost approximately $3.0 billion and take 10 years to construct. Although it was not possible to provide a detailed analysis of those items within the scope of work for this assignment, we offer the following observations.

Great care must be exercised in reading this chapter with respect to what is included in the estimate and what is excluded. For instance, the Study's estimate is based on the following assumptions:

- 2006 dollars – no allowance for escalation even though this project will not be built for at least 10 years.
- Very limited information about ground conditions, especially with respect to the heavily faulted portion of the project.
- Very limited information about the need and/or the cost to address both environmental and/or community impact requirements. These items can add substantial cost to a project during the negotiation phase of project implementation.
- Very simplistic and probably inadequate assumptions about the cost to ventilate these very large and long tunnels, especially for the northbound tunnel which has an uphill grade.
- No cost for Huntington Drive Interchange is contained in the $3.0 billion dollar estimate.
- No cost of electrostatic precipitators
- No cost for land acquisition
- No cost for project design
- No cost for construction management
- No cost for toll facilities of any kind (if it is decided to include toll facilities as part of the financial package).
- Allowance for only 1,500 ft of tunnel over-excavation for fault movements. This number could be low.
- Allowance for only a 15 percent design contingency. This number is low for the current state of available information relative to a very large project. Allowances of 30 percent to as much as 50 percent would not be unreasonable for design contingency.

As stated above, we have not performed a detailed analysis of cost or schedule for this project, and contingencies for some or all of these items might be buried in unit cost allowances input into the Study's numbers. In general, however, the cost estimate given in the MTA Study seems low and would be the number actually paid to a contractor for construction activities. Those cost allowances excluded from the estimate could easily be worth $1 billion dollars or more; all sums being subject to escalation. Clearly, more detailed cost and schedule estimates would be necessary to arrive at a responsible determination that such a project is financially feasible. Such further analysis would have to be predicated on much more definite design assumptions (especially for ground conditions, environmental/community impact mitigation costs, and ventilation scenarios) before a final decision could be made concerning the efficacy and wisdom of such a project.

Chapter Ten – Potential Funding

While the Committee agrees that many of the identified funding sources in this Chapter 10 may ultimately present possible funding opportunities, the ability of the project to access any of these sources is, at this point in time, an inherently speculative matter. It is therefore extremely difficult for the Committee to comment upon the feasibility of securing funding for a project of this magnitude.

V. Conclusion

For the reasons cited above, the Committee is of the opinion that the MTA Study demonstrates that the technical concept of a tunnel is feasible. However, the Study does not provide sufficient information upon which to responsibly determine the environmental and financial feasibility of extending the 710 freeway via an underground tunnel. We firmly believe that whether a tunnel is truly feasible remains an open question in the absence of a much more thorough investigation of a host of geotechnical and constructability issues posed by such an undertaking. Indeed, we suggest that the question of whether a tunnel is truly feasible here is a question that can only be answered after a series of other questions are resolved. One of the issues of concern frequently commented upon by interested residents is the "bait and switch" scenario referred to in the letter to the Committee drafted by the City's longstanding SR-710 Counsel Antonio Rossmann and read into the record by Mr. Steven Friedman. A copy of this letter is attached as Appendix Item C.

Our City Council has taken the position to not oppose sound research into the possible application of a tunnel project. We suggest that such sound research has not yet been completed. We leave to our elected leaders the question of whether to support or oppose any future effort designed to constitute such sound research. Should further analysis toward a tunnel project ensue, we feel it imperative, based on our study of what appears to be known about the implications of a tunnel project, to recommend to our City Council that it pursue with diligence answers to the many questions we feel arise from the possibility a tunnel.

VI. Appendix

A. Special Advisory Committee Meeting Minutes
   June 29, 2006
   July 27, 2006
   August 24, 2006

B. California Integrated Seismic Network Information

C. Rossmann and Moore, LLP letter dated July 27, 2006

CITY OF SOUTH PASADENA

710 Tunnel Feasibility Study Assessment

Special Advisory Committee

Amended Minutes

June 29, 2006

1. **Call to Order:** At 6:40 p.m. by Chairman Ray Remy.

Members Present: Chairman Ray Remy, Joseph Birman, Frank Cardenas, Daniel Evans, Robert Joe, and Beatrice Siev.

Members Absent: Ignacio Ramon

City Officials/Staff: Mayor, Philip C. Putnam
Transportation Manager, Hal Suetsugu

Consultant: Michael Gonzalez, Frank Cardenas and Associates
Gary Brierley, Ph.D., Brierley Associates

2. **Introduction:**

Chairman Remy thanked the audience and others for attending, and explained that public comments would be welcome during the meeting. He also had each member of the committee introduce him/her self to the audience.

Each member of the Committee introduced himself.

Beatrice Siev: Resident of South Pasadena, and also an electrical engineer with civil engineering experience. Career experience includes work at the Jet Propulsion Lab (JPL) and Caltech on several space programs.

Robert Joe: Lived in South Pasadena at least 33-years. Career experience includes 30 years with the Army Corp of Engineers, and my last 6 years have been with the Metropolitan Water District of Southern California. Also serves on the Transportation Commission and the Design Advisory Group in South Pasadena.

Ray Remy: A 43-year resident and Vice-Chairman of the South Pasadena Transportation Commission. Career experience includes Deputy Mayor for the City of Los Angeles, the State Economic Development Department, plus 16 years serving with the Los Angeles County Transportation Commission and the MTA.

Daniel Evans: Resident of South Pasadena since two years old and graduated from South Pasadena-San Marino High School. Career experience includes international business lawyer and international construction project manager. For several years, Mr. Evans has been a part-time professor and a research scholar at the Mineta Transportation Institute in San Jose State University.

Frank Cardenas: Resident for only 5.5 years, career experience includes administrative and human resources experience with the LA County MTA, an attorney with practice in the field of municipal, public contract, and construction law, served on the Los Angeles Board of Public Works and serve as Chairman of the City's Transportation Commission.

Joseph Birman: A geologist and owns a geological consulting firm on Mission Street that specializes in ground-water exploration and development – for 45 years. Primary contribution to the committee will be related to ground water and the geology that controls ground water. Also was a past faculty member at Occidental College.

Dr. Gary Brierley: Firm in Denver, Colorado specializes in tunnel development, and 40 years' experience in engineering. Specializing in tunnel projects, Mr. Brierley has worked on tunnel projects throughout the United States and in foreign countries. In the Los Angeles area, Brierley Associates worked on several subway projects and the water supply projects.

Chairman Remy explained that the discussion tonight will be concerned with the first four chapters of the TFS report.

3. Election of Vice Chair

Chairman Remy proposed that the Committee elect a vice chair to preside over meetings in the event of his absence. Member Robert Joe nominated Frank Cardenas due to Mr. Cardenas' transportation agency experience. After the motion was seconded by Member Daniel Evans, the Committee voted unanimously to elect Mr. Cardenas Vice Chairman.

4. Purpose & Background of the MTA Tunnel Feasibility Study:

Vice Chair Frank Cardenas described the purpose of the Tunnel Feasibility Study (hereinafter TFS), including the stated views of the MTA and Caltrans.

In 2003, Douglas Failing, Director of Caltrans, Mark Pisano, Executive Director of SCAG, and Roger Snoble, CEO of the LA County MTA visited cities in the area to discuss the possible study of a tunnel for the extension of the 710 freeway. The three asked the cities to participate in the study, which would be funded by the MTA. The South Pasadena City Council voted unanimously to not oppose sound research to determine the feasibility of a tunnel.

By April, 2005, the MTA retained the engineering firm of Parsons-Brinckerhoff (PBQD) plus several subcontractors to conduct the feasibility study. The MTA held about 10 or 11 monthly working group meetings at which PBQD briefed the cities, MTA, Caltrans, and SCAG on their progress. The City of South Pasadena retained Mr. Cardenas to attend the MTA working group meetings and to keep the City informed. 2006.

Mayor Putnam requested the formation of an advisory committee, comprised of local residents with transportation and/or technical knowledge to review the TFS on behalf of the City Council.

5. **Mission or Purpose of the Special Advisory Committee:**

Chairman Remy explained that Committee was established and authorized by both the Mayor and the City Council; and that the mission and purpose of the Committee is to carefully review, discuss, and assess the TFS and report to the City Council whether the tunnel extension of the 710 freeway is feasible. If the Committee finding is affirmative, it should make observations as to the soundness of the study. The Committee is specifically charged to uncover issues, omissions of fact, and factual errors in the TFS (See Attachment). Moreover, it should identify any areas of concern that the City should carefully monitor if a Phase 2 study is authorized. The Committee was not formed to say Yes or No to the tunnel proposal or to decide the next step.

Chairman Remy added that the Committee will attach to its report any issues or questions that it feels should be discussed if the City finds that a tunnel is feasible (at least in concept). The City, for instance, should continue to request that SCAG remove from its plans any surface routes for the 710 freeway extension.

The Committee wants to hear from the public regarding issues that should be sent to the City Council in the event that the City agrees with the affirmative finding of the TFS and the appropriate agencies to authorize a Phase 2 study.

Public Comments:

Anthony Palazzola asked Vice Chair Cardenas if the MTA's final report contained anything that would nullify the TFS. Mr. Cardenas replied that the TFS is not fatally flawed, but the information is not technical and it did not have engineering details.

Don Jones, a resident of Pasadena and member of its own Design Advisory Group (DAG) noted: If the cities ask for a tunnel, than they will get a tunnel; it is axiomatic. There are other modalities that could have been studied and that could be used. The study should have examined more options than a tunnel.

6. **Summary Presentation of the Tunnel Feasibility Study Report:**

Mr. Gonzalez (MG) presented a summary of the report while tunnel expert and consultant **Dr. Brierley (Dr. B)** added explanatory comments.

MG: The purpose of the study was to assess the technical, operational, and financial feasibility of an extension of the 710 Freeway via tunnel. In addition, the study was intended to identify the physical, environmental, financial, and social impacts of a tunnel.

Dr. B: Tonight, we will focus on the technical feasibility of a tunnel.

MG: The study examined a narrow swath of land; not a particular route.

Dr. B: The technical feasibility of a tunnel is not affected much by the particular route, since the geological features run east to west – perpendicular to the prospective tunnel. Therefore, on any route, the tunnel will encounter the same geological conditions.

Dr. B: Also, 100 feet of cover over the tunnel is ostensibly reasonable [making any route reasonable].

MG: The study examined (1) the [traffic volume] adequacy of 3 or 4 lanes in each direction, with and without trucks; (2) an interchange (ramps to and from the surface streets) at Huntington Drive; and (3) the effects on the existing 710 freeway, other adjacent freeways, and on local arteries.

Dr. B: A tunnel large enough to accommodate 4 lanes is very large; in fact, unprecedented, the largest in the world. Tunnels are usually only 2 lanes in width. Allowing trucks in the tunnel requires a much larger diameter. The length of 4 miles is also unprecedented; long tunnels are usually for train traffic and usually have a small diameter.

MG: The study found that future traffic volume would require 4 lanes in both directions, that the impact of allowing trucks in the tunnel was low, and that a tunnel would result in some improvement on adjacent freeways and local arteries.

Horizontal Alignment Considerations

Dr. B: Smooth curves would be required. The tunnel will require ventilation at each portal and one vent near the mid-point of the tunnel – which occurs in South Pasadena. The four portals (two at each end of the tunnel) will not be in South Pasadena; thus, 95% of the construction activity will not be in South Pasadena. The mid-way ventilation shaft would be similar in appearance to an 8 to 10-story building.

Vertical Alignment

Dr. B: According to the geology, the vertical alignment of the tunnel will be reasonable; however, the railroad track at the south end of the tunnel will mean a steep dive to get below the track. The tunnel can be accommodated at 100 feet underground, and will follow the slope from south to north. PBQD considered digging north and south simultaneously; but that approach is not popular. Tunnelers prefer uphill construction because any water encountered will flow [down and] away from the boring and other equipment [instead of pooling ahead of the equipment], and the muck/dirt can be hauled out downhill instead of fighting gravity to haul it uphill.

Types of Tunnels & Methods of Tunneling Considered in the Study

Dr. B: Only a few types of tunnels were feasible in his opinion: Option A1, consisting of two circular tunnels, and Option A2, a semi-oval tunnel. The circular tunnels have large surface area and volume, but construction is faster, thus less expensive. The semi-oval tunnel has less surface area, but requires sequential excavation, which is slower than a tunnel boring machine.

The small tunnels of Option C are not likely to be funded by the Federal government. Options 3 (A, B, and C) are all too expensive because they require 3 tunnels.

The list of excavation methods presented in the report is complete: Tunnel Boring Machine (TBM), Cut and Cover, and Sequential Excavation (SEM). The tunnel boring machine method is generally preferred because it is faster, but the optimal method depends on the geology. More study is required before selecting a method in this case.

If TMB is used, the tunnel lining will be 3 feet thick, which is very thick and strong. The floor for traffic is also 57 feet across – which is quite wide for a tunnel. If SEM is used, a smaller excavation will be required. The cost compared to the TMB method is not apparent at this point.

The SEM is less efficient, but more effective because the ground/earth is stabilized in stages. First, one tunnel is excavated, then a second, and then the area between them is excavated. Since no boring machine is used, lots of machinery is needed to move the earth.

SEQ and a road-header machine can be used to make the cross-passages for safety.

Local Geology & Effect on Tunneling

Dr. B: The south mile of the tunnel will be under Alhambra, the next two miles under South Pasadena, and the north mile will be under Pasadena. Rock in this area is soft and easy to excavate. Under South Pasadena, the rock consists of shales and sandstone. It will be easy to tunnel through the rock as long as it is above the water table. Water affects the behavior of the earth/dirt and increase the cost of excavation. The water table is below the bottom/floor of the tunnel (i.e. below the invert) until the Raymond Hill Fault (closer to Pasadena). Three test bores were drilled for the study, but another 30 to 40 are needed for preliminary decisions, then 100 more for actual excavation.

In Pasadena, the tunnel will rise and exit/surface through soil, not rock. The rock below Pasadena is decomposed granite; easy to excavate.

Digging through the Raymond Hill Fault is speculative; no one knows at this point the extent of the dangers and difficulties. The fault is capable of movement, thus, engineers must anticipate movement during design and excavation so the finished tunnel will survive.

Dr. B: I agree with the TFS conclusion and its caveats regarding faults, water levels, water pressures, and feasibility.

Earth-Pressure

Dr. B: During excavation, the interior of the tunnel can be coated with sections of pre-cast lining and interior supports can be erected. With the TBM, all steps are done with one machine, which is efficient. There are six manufacturers of tunnel boring machines. The biggest is only 50-feet in diameter, but a larger one will probably be built before excavation of the tunnel could begin. Larger machines require more energy to run. It takes an enormous amount of energy to turn a large boring head.

Cross-Passages for Safety

Dr. B: In general, tunnels are very safe for traffic, because there is no cross-traffic or pedestrian traffic. There are also very few lane changes because all there are no exits along the length of a tunnel. Cross-passages will be excavated to enable the occupants of vehicles to exit the tunnel(s) on foot if necessary.

Huntington Drive Interchange

Dr. B: I have not studied this option, but the depth of the tunnel [100 feet] makes such an interchange (tunnels to and from the surface street) very expensive. The cost ($1 billion) versus benefits do not support such an idea.

Member Birman Regarding Ground Water

Member Birman: There is hard rock in this area, not a lot, but some. Water may or may not be below the tunnel. Since there are very few wells and information on water levels in the area. One record from 1928 for a well at Glenarm indicates that water was 88 to 100 feet below the surface. Since the City of South Pasadena does not pump/use local groundwater, the level might have risen, but droughts would lower the water table.

The local faults act as dams, so water rises by each fault. If we remove the surface, we are likely to find many more faults.

Questions & Answers

Chairman Remy to Dr. Brierley (Dr. B): In that this would be the biggest tunnel, is it feasible to build a tunnel of its size? Also, are there any errors of fact or omissions in the TFS?

Dr. B: The tunnel is feasible, especially with a delay of 8 years for design, etceteras, because a larger boring machine will surely be available by then. An increase in size of the tunnel boring machine is feasible. A few years ago, the largest was 40-feet, now it is 50-feet.

Tunneling by the SEM is feasible here. As for errors or omissions in the report: I would have expressed some points differently, but it has no fatal flaws. It is complete and reasonable; however, it is very general, a study of the concept only. The study was not even sufficient to be a preliminary study [for any actual tunnel].

Member Evans: You are comfortable that a 58-foot tunnel boring machine will be built?

Dr. B: 100% confident, but if not, the Sequential Excavation Method will work.

Vice Chair Cardenas: The MTA and its consultants don't live on the potential tunnel routes. Would you live above the TBM or SEM [methods]?

Dr. B: The tunnel boring machine will make some noise; 24 hours a day, at least 5 days a week... It makes a low-frequency rumbling noise that cannot be dampened or blocked. Those directly above the machine will hear a low rumbling for about a week. People living over the tunnel will wake up and think that a train is going by. The sound will get louder, but then will get softer. The noise will move with the boring machine and last about a week [for any one home].

There will be a lot of noise at the two portals in Alhambra and Pasadena, because the activity is at ground-level. The sinking of the ventilation shafts will also be noisy; equivalent to building a ten-story building, but that noise will be limited to 7 am to 4 pm on weekdays.

When completed, the noise of traffic in the tunnel will be very low, probably not a problem. It is very rare that the noise from a tunnel rises above the background noise above ground-level. About 100-feet of dirt will insulate the tunnel. Very few complain about traffic noise.

Vibration could be more of a problem than noise; however, it is intermittent. People above subways sometimes complain about noise, but they are disturbed by vibration.

Member Joe: Since this is the longest and biggest passenger vehicle tunnel in the world, are there aspects [of design and engineering] where research and development is still needed? Perhaps the double-decking or the ventilation tower?

Dr. B: More design effort is needed, but the tunnel is feasible and can be done. Tunnel building has advanced greatly in the last 20 years.

Member Birman: Given the formations we observed in the field, how fast can the tunneling machine bore in this area?

Dr. B: Sam Tso said they were pursuing 20 to 25 feet per day, but that is very low and conservative. Since the rock is soft, boring the tunnel will not determine the progress. Dirt removal and the need to line the tunnel will control progress. As tunneling crews learn the geology and equipment, their speed increases during tunnel excavation. Since this tunnel will be 4 miles in length, the speed that comes with increased knowledge and familiarity will be applied for quite a distance, resulting in a very cost-effective production [tunneling] phase.

Member Siev: Is feasibility limited to physical and technical factors? Cost and the limit of only two portals are also issues.

Chairman Remy: Yes. Your concerns about other factors should be attached to our report to the City Council, but our first job is to consider the physical and technical feasibility. Elected officials should decide whether further study is warranted.

Member Joe: The MTA's statement of purpose for the TFS included physical, financial, and environmental feasibility, but the final report has not addressed all three areas adequately.

Chairman Remy: It is not an Environmental Impact Report. We can attach our concerns about other issues to our report to the City Council.

Member Evans: All local are concerned about earthquake damage to the proposed tunnel. Does the final report address earthquake dangers, and are you comfortable with this issue?

Dr. B: Where a fault crosses the tunnel, a larger chamber must be excavated and filled with 2 to 3 feet of frangible material to allow movement. If an earthquake does not sheer the tunnel, the earthquake will cause no damage. Tunnels are very stable in earthquakes, except at faults that move. Each fault must be studied and the risk of movement assessed. Building a larger chamber is very expensive with the Tunnel Boring Method because the lining that is automatically placed needs to be removed. However, the chambers are very easy to construct if the Sequential Excavation Method is used to create the tunnel.

Vice Chair Cardenas: Is there a chance of an unknown fault [causing damage]? Page 325 of the report refers to an unnamed potential fault, and Joseph Birman claimed that there could be a network of faults in the area. How can we protect the tunnel from unknown faults, and how will cost increase with each additional fault that is discovered?

Dr. B: More test borings (angled to cross any faults), more seismic testing, more mapping, and more analysis [will be performed to locate the faults]. This is routinely done for subways and water pipe projects. The exploration is not perfect; some surprises will be found during the excavation, but we can locate most faults [in advance]. About 200 test borings would typically be done.

7. **Proposed SAC Work Plan**

The second meeting will cover chapters 5 through 14 of the report. Public comments will be accepted at that meeting. At the third meeting, the Committee will review their work/notes and comments, and discuss the draft of their report to the City Council. A report will then be drafted for the City Council.

8. **SAC Meeting Schedule**

The second meeting will be held on July 27th; the third will be on August 24th.

9. **Questions from the Public**

Chairman Remy asked the public to hold general comments until the Committee's third meeting, but invited the public to ask specific questions on items on the agenda at this meeting.

A. **Linda, Grevelia Street, asked:**

1. Will residents hear traffic below our homes?
2. How can feasibility be assessed without the 200 or 100 necessary test borings?
3. Will excavation harm the environment and trees above it? What about water pollution and toxins surfacing?

   Dr. B: At a depth of 100 feet below ground-level, the tunnel will not damage the vegetation above.
4. What about security? Couldn't large vehicles could carry explosives into the tunnel and harm our City?

B. **Leonard Rush, 1115 Glendon Way, South Pasadena; asked:**

1. What is done with the excavated dirt? How many truck loads will it take?
2. Is the concrete available (given the tight supplies these days)?
3. What is the feasibility of the proposed venting?
4. Does the mid-way ventilation shaft need to be in the middle of the route?

C. **Don Jones, 225 Madeline Drive, Pasadena; Geotechnical Committee Chairman for DAG (Pasadena), noted that:**

1. The report does not discuss the ~~aqueous??~~ Alquest Priolo liquefaction legislation – there is no mention at all regarding liquefaction.
2. There is no mention that South Pasadena has been designated as part of the ~~aqueous??~~ Alquest Priolo liquefaction zone. If the city did not give notice regarding the liquefaction zone, it would be 100% liable for ?? – thus, the omission is significant.
3. Page 328 of the report refers to test borings, but those borings were done for a different project, not a tunnel. They were done to determine if a slope was stable enough to support cut and cover construction. The borings are not applicable to the feasibility of the tunnel.
4. The Raymond Hill Fault is related to the Northridge Fault, and is capable of creating an earthquake with a magnitude of 7.5 on the Richter Scale. Such an earthquake could result in 7 meters of movement. The report has no discussion regarding the impact on the tunnel by an earthquake of 7.0 to 8.0 magnitude; yet such a quake is possible.
5. The tunnel could tap the aquifer in the vicinity of the Raymond Hill Fault.

Vice Chair Cardenas interjected: Is the study regarding the connection between the Raymond Hill Fault and the Northridge Fault available? **Member Jones:** Yes.

Member Birman noted that the California Integrated Seismic Network (of geologists) studies faults; their reports could be useful for the Committee. He submitted a memo or report from the Network to the Committee Chair. Member Birman also stated that while there are many identified or unlocated faults buried below the city, most are not equal to the Raymond Hill Fault.

Dr. B: We will be boring below the liquefaction zone. As for tapping the aquifer: water cannot flow along the tunnel since any space that is created along the exterior surface of the tunnel walls will be filled with grout.

D. **Jamie Broanlee, 806 Prospect, South Pasadena; had questions and information:**

1. If the proposed interchange at Huntington Drive was different, for instance, parallel to the tunnel instead of perpendicular, or more vertical, would your opinion of it change?

   Dr. B: No, because the cost-benefit ratio will not justify the interchange.
2. If you go to the east of the fault, there is a sag pond at Lacey Park, which used to be Lacey Lake. If you go farther east on the fault trace, you come to a well. To the west, you have the Arroyo, which is lower, with water flowing out that way.
3. The Raymond Hill Fault was last active in 1985 and killed a man in Pasadena. In a trench just to the east of us, they found that the fault generated 11 inches of horizontal movement for each inch of vertical movement.
4. Would the ventilation tower be similar to the power plant cooling tower in Pasadena? Sometimes we can smell the fumes here in South Pasadena.

Dr. B: It would be similar, but the cooling towers are not 80-feet high. Water vapor leaves the towers; I don't know how you could smell water vapor. However, the ventilation tower would be 80-feet or more.

5. What about vibration from the tunnel or the boring machine? A freight train used to cause cracks in my house.

   Dr. B: There will be rumbling noise, but it moves through the ground quite easily, so you won't hear it. But the vibration from the machine will not cause your house to fall down; it's not that kind of vibration. You will not feel the vibration.

6. For safety, how will emergency crews access the tunnel?
   Dr. B: a dedicated crew of emergency responders for tunnel would be created.

Vice Chairman Cardenas: There will never be sufficient time for all questions, but the public can send us questions by email. Mr. Suetsugu: we can establish a Website, then we can forward your questions to the Committee. [See item 10 below for details.]

E. Janet Ervin, 801 Meridian Avenue, South Pasadena asked:

1. What percentage of <u>average total</u> tunnel cost is typically for ~~excavation~~ <u>construction</u>?

   Dr. B: I can't answer that question because this tunnel does not follow the general or typical pattern. The $3 billion could be for excavation only; other costs could require another $1 billion. This tunnel is so unusual that the total and excavation costs are difficult to estimate.

2. Are the cross tunnels intended to enable people to escape on foot?

   Dr. B: Yes, like an escape hatch on an airplane; people can escape without having to go all the way to the end of the tunnel. The theory is that tunnels can be made to be 100% safe because it is almost impossible that both tunnels would be damaged simultaneously.

3. If two boring machines can be used, and if there are disadvantages to working downhill, why not have both boring machines start at the south end and work uphill – since we need two tunnels?

   Dr. B: I think that they want to divide the work between two portals, so that all the trucks, concrete, noise, etceteras are not at one location. They might be worried that all that work would overload one location.

4. Will the sequential excavation method mean that work is done on a 24-hour basis?

   Dr. B: Yes, the digging and removal of muck will be 24-hours. That means that during the night, there will be noise from trucks carrying muck. However, the noise of trucks will not be heard when trucks are within the portal because sound barriers will first be built around the portals. When trucks are outside the portal, they will be on the freeway. In this instance, the portal will be at a freeway – the best site possible for a portal!

F. Bob Siev, Fairview Avenue, South Pasadena; noted:

1. Feasibility is a weak word. What about the vent and the pollution from the tunnel? Is it feasible to live under the ventilation outflow?

2. Fifty years of studies show that freeways harm the health of children.

3. Earthquake deaths numbered only 30 to 50 persons; thus, the earthquake dangers are small compared to the other dangers.

4. Will any investor take the risk of financing the tunnel?

G. Kim Arnal, 2025 Marengo Avenue, South Pasadena; asked:

1. Are the three test boring done sufficient to assess the tunnel's feasibility?

   Dr. B: Many tunnels have been built in the deposits [geology] in this area, thus, we have lots of information about the deposits. There are also many outcroppings of rock that can be examined. However, more bore testing will be needed before actual construction.

2. Which method of excavation will cause less disturbance above-ground?

   Any effects will be minimal, and there is no significant difference between the methods. The tunnel boring machine will create a low rumble below one's home for about one week. The construction of the ventilation shaft will be equivalent to construction of a ten-story building.

3. If several additional earthquake faults are found, is the tunnel still feasible?

   Dr. B: During excavation, concern about water and other issues could potentially increase excavation costs so much that the financially feasibility is decreased, even though the tunnel itself could still be feasible. Seven meters of movement on the one [Raymond Hill] fault will be expensive [to accommodate].

   Chairman Remy: These are very thoughtful questions.
   Dr. B: There is a lot of input here that should be included in your report.

H. Mary Ann Parada, 1710 Ramona Avenue, South Pasadena; noted that:

1. After the 1987 earthquake in Whittier, Dr. Jane Hutton from South Pasadena who worked at Caltech told us that the Elysian Park Fault started at the [Y?? Gillette??] Crescent and Meridian, but this was not addressed in the Caltrans EIR because the Whittier quake happened after the EIR.

I. Joanne Nuckols, 1531 Ramona Avenue, South Pasadena; had comments & questions.

1. Regarding approval of the management plan by Parsons-Brinckerhoff: The Caltrans literature review omitted our [the South Pasadena] Low-Build Multi-Mode Alternative study.

2. Also, a chart of major cut-and-cover at the southern portal in El Sereno that will require "property takes". I think in the original proposal, they referred to 200 property takes. This chart was omitted from the final report – I think because it would be a hot button. I want to leave this for somebody to review.

3. If we can send a man to the moon in the 1960s, I think we can build a tunnel. But the number of houses to be taken is a question that needs to be addressed. Also, the lack of information in the report will require another report.

4. The 710 freeway is NOT an "interstate" freeway. Throughout the report, they refer to it as an "interstate" – even though we have tried to inform them of the error. This is a major

mistake in the report because it indicates they don't even understand the basics of this project.

5. The 710 freeway goes through El Sereno about one-half block from Alhambra, but not through Alhambra.
6. What is the lifespan of the grout that would surround the exterior of a tunnel?

   Dr. B: Grout is a cementacious material that will last as long as the tunnel. Grout will fill any gap between the tunnel walls (over one-foot thick) and the exterior dirt or rock.
7. The ventilation building will be 100-feet tall; yet our water tower is only 79-feet tall.

   Dr. B: The ventilation building will be similar to an 8 to 10-story building.
8. Has a good site been found for the ventilation tower?

   Dr. B: No. A major research and design effort is needed for that.
9. But the ventilation affects feasibility!

   Dr. B: The ventilation tower's output will be similar to the fumes from traffic waiting at a signal for several phases, but the tower will diffuse the fumes.

J. Tim Boatman, 665 Forest Avenue, South Pasadena; asked:

1. Will the proposed ventilation be adequate for rush-hour traffic?
2. What volume or percentage of the fumes / air pollution will South Pasadena receive?

   Dr. B: The ventilation tower will discharge one-half of the air in the tunnel. It will also send new air into the tunnel.
3. Does the report discuss the volume of pollution?

K. Gus Highland, South Pasadena; commented:

Thank you for the meeting and for the respect that you have shown for public concerns.

Comments by Committee Members:

Member Birman: We appreciate Dr. Brierley's quick assessment and many answers today. Thank you for the meeting and for the respect that you have shown for public concerns.

Member Evens agreed.

Vice Chair Cardenas: Will the California Integrated Seismic Network do mapping that will be useful? Is Member Birman familiar with the consortium?

Member Joe: I want to know if the costs have been discussed sufficiently in the report. The questions about cost seem to be significant.

Member Siev: I think that the Tunnel Feasibility Study would be better titled "Tunnel Concept Study". Without geological data, we cannot calculate the costs and feasibility of a tunnel; we can only comment on the concept of a tunnel.

Chairman Remy noted that several issues needed to be attached to the Committee's report to the City Council: earthquake faults, earthquakes, the water table, soil quality, the size of the machines, ventilation, and also errors and omissions in the study.

10. **Other Business**
Chairman Remy announced that additional comments or questions could be sent to the Committee via the City's Transportation Manager, Hal Suetsugu - by emailing Mr. Suetsugu from the City's Webpage.

11. **Adjournment** at 10:00 p.m. by Chairman Remy.

Approved
Chairman Remy

8-24-06
Date

Attachment

City of South Pasadena
Special Advisory Committee

Charge of the Committee

As established and authorized by the vote of the Mayor and City Council of the City of South Pasadena, the Mission and Purpose of the Special Advisory Committee (SAC) is to carefully review, discuss, and assess the MTA Tunnel Feasibility Study and report to the Council its determination as to whether the building of a tunnel to complete the 710 is feasible. If the SAC determines such is the case, it should make observations relative to the soundness of the MTA study and identify any errors of fact or omission therein contained. The SAC shall identify potential areas of concern that the City should carefully monitor, in the event that the responsible authorities deem that subsequent studies of this issue are warranted.

CITY OF SOUTH PASADENA

710 Tunnel Feasibility Study Assessment

Special Advisory Committee

Minutes

July 27, 2006

1.	**Call to Order:**	At 6:50 p.m. by Chairman Ray Remy.
	Members Present:	Chairman Ray Remy, Joseph Birman, Frank Cardenas, Robert Joe, Beatrice Siev, Ignacio Ramón
	Members Absent:	Daniel Evans
	City Officials/Staff:	City Manager, Lilian Myers Transportation Manager, Hal Suetsugu
	Consultants:	Gary Brierley, Ph.D., tunnel expert and owner of Brierley Associates, consultant to the City of South Pasadena Staff Consultant, Michael Gonzalez, Planning Commissioner, Steve Friedman

2. **Introductions:**

Chairman Remy thanked the audience and others for attending, recognized the City Manager, fellow and former Transportation Commission members, two or three other City residents, and introduced Mr. Ignacio Ramón.

He also explained that public comments would be welcome during the meeting after the overview provided by Michael Gonzales and Dr. Brierley.

Ignacio Ramón: Resident of South Pasadena, a practicing civil engineer with the firm of DMJM Harris, joined the Committee after an absence from the first meeting.

Chairman Remy explained that tonight's meeting would be concerned with the chapters five through nine of the Tunnel Feasibility Study report.

3. **Approval of Minutes**

Chairman Remy asked for any additions, corrections, or changes to the minutes for the first meeting, dated June 29, 2006. None were proposed; thus, the Committee voted unanimously to approve the minutes.

4. Chair's Remarks

Chairman Remy explained that an overview of chapters five through nine would be provided by Mr. Gonzales, with explanations and comments provided by Dr. Brierley. The next step would be a discussion of each chapter, followed by a period for public comments after each chapter.

During this meeting, as with the first meeting, the Committee would identify the salient points and the issues that "rise to the top" for submitting to the City Council. During the third and final meeting, the remaining chapters would be explored and the Committee would draft its report for the City Council.

Chairman Remy stated that at the presentation of their report to the City Council, all of the Committee members could be present if they had a different or additional perspective to provide to the Council, and that the public could also provide comments to the City Council.

5. Summary Presentation, Tunnel Feasibility Study, Chapters 5-9

M. Gonzales presented the MTA Summary Briefing, in slide-show format. His commentary was from the Summary Briefing – not a reflection of his or the City's opinions.

Dr. Brierley, the City's consultant on tunnels, provided explanatory comments and his expert opinion.

Alignment

M. Gonzales: The study was not based on a particular alignment, but considered a wide swath of land that roughly followed the Meridian Alignment.

Dr. Brierley (Dr. B) stated that the east-west alignment did not have much affect on the tunnel's feasibility, since the geologic conditions differed from north to south, not east to west.

Traffic

M.Gonzales: The Study's traffic modeling analysis was based on the SCAG model for the year 2030 and that three issues were studied: the adequacy of 3 or 4 traffic lanes, the feasibility with and without an interchange at Huntington Drive, and the tunnel's affects on the 710 freeway, other adjacent freeways, and local arterials.

Dr. Brierley: The study concluded that 3 lanes in each direction were not adequate, that truck traffic did not significantly degrade the freeway operations, and the tunnel did not have significant adverse affects on nearby freeways and arterials, except for a short section near each portal, which will not be in South Pasadena.

Horizontal Alignment Considerations

Dr. Brierley: The portals will be outside the City of South Pasadena, which was beneficial for the City during both construction and operation phases of the tunnel. The central ventilation tower planned would be inside South Pasadena.

Vertical Alignment Considerations

Dr. Brierley: The proposed 100-foot depth of the tunnel is very adequate and a generous allowance. The tunnel will be in rock, not soil, except for the ramp in Pasadena. The central air tower would be in the City.

Alternative Cross-Sections

Of the many configurations considered, only two ovals or two large circles were found viable. The two tunnels will very large; equivalent to one-half the volume of the Metro subway excavation.

Subsurface Conditions

M.Gonzales: The Study found that several seismic faults are known, the ground water depth varies, groundwater pressures are not excessive; the geologic conditions appear suitable for the tunnel.

Dr. Brierley: Committee member Joseph Birman has shown me maps of ground water in the area. We don't know anything about the groundwater conditions. This can have a significant impact on the total cost; thus, the total cost is unknown until more test boring is done. Also, in South Pasadena, the faults are covered with soil, thus, there might be more faults that we know about.

Huntington Drive Interchange

M.Gonzales: The 100-foot depth of the tunnel would require very long ramps to create the interchange, which would introduce right-of-way issues and complicate ventilation, even requiring special air vents for the ramps. Significant cut-and-cover construction would be required, and the interchange would increase traffic on Huntington Drive.

Dr. Brierley: The interchange could cost $1 billion. Any backup on the [exit] ramps would adversely affect traffic flow [in the tunnel], and backup in the Tunnel would affect the entrance ramp.

Tunnel Operations

M.Gonzales: There are several feasible methods for maximizing safety.

Dr. Brierley: All of the proposed safety measures are typical. If the air vent is in South Pasadena, the South Pasadena Police and Fire Departments would be involved in emergency operations.

Tunnel Operations – Systems

M.Gonzales: Systems would include fire, air, incident management; exits.

Dr. Brierley: As in an airplane. In an emergency evacuation situation, people would have to walk 600 feet at most to exit the tunnel. The cross-tunnels will be every 600-feet.

Environmental Issues

M.Gonzales: The Study examined a number of environmental concerns, including noise, air quality, historic properties, aesthetics, hazardous waste, soil disposal, storm water discharge. Noise can be mitigated during construction.

Dr. Brierley: All noise will be at the portals. However, noise during construction of the ventilation towers will be similar to construction of a ten-story building. The reduced traffic congestion and increased travel speed with a tunnel should improve regional air quality.

Air quality locally should not be adversely affected if the shaft disperses the exhaust. However, most tunnels have transverse ventilation with an air plenum above and below the traffic. Clean air enters from the bottom, rises through the tunnel, and exits directly above – no need to flow along the tunnel. But such a design is expensive and was needed for older vehicles that had dirtier emissions.

In Europe, tunnel builders have been using longitudinal ventilation, where air flows from a portal to a ventilation tower. This design is based on a uni-direction movement of traffic, which helps to carry the air longitudinally along the tunnel.

The MTA is proposing longitudinal ventilation, a dramatic departure from other tunnels built in the states. Moreover, this tunnel is 4 miles long. Also, one-half of the traffic will be climbing an incline, which produces more dirty emissions than traffic on a level or decline.

It appears that two ventilation towers will be needed; one at one-third and another at two-thirds of the tunnel's length, as opposed to a single tower at the midpoint.

In West Virginia, experiments have been conducted in an abandoned tunnel, including testing of longitudinal ventilation. Based on the test results and the European experience, the MTA decided on longitudinal ventilation.

Air Cleaning Techniques

Dr. Brierley: Tall ventilation towers are typical. None of the towers in the states have scrubbers. Carbon monoxide is the problem, but what people notice are diesel particulates. Vehicle emissions will be lower [with improvements in technology] by the time the tunnel is completed. Electrostatic Precipitators (ESPs) are used in other countries, but they are expensive to maintain, and they remove particulates only, not carbon dioxide or ozone. Also, they are unlikely to be needed when the tunnel is complete, because vehicles will run cleaner.

Historic Properties

M.Gonzales: The Study examined the impact on historic homes and historic districts, and the possible damage from potential ground settling along the tunnel, especially at the portals.

Dr. Brierley: No comments on the Study's findings on those issues.

Aesthetics

M.Gonzales: The Study considered the visual, safety, and security issues of the tunnel.

Dr. Brierley: The ventilation tower will look like a water tower; a ten-story building without windows.

Summary of Environmental Issues

M.Gonzales: The Study concluded that the tunnel appears to be environmentally feasible in part due to the proven methods for mitigating, minimizing, or eliminating environmental impacts.

Huntington Drive Interchange

Traffic on streets near the interchange will increase.

Widening Huntington Drive to handle the increased traffic could affect the character.

An interchange is likely to require additional ventilation.

The cost of interchange will be about $1 billion.

Costs

Dr. Brierley: A lot of issues and costs are not included in the cost estimates. Their cost estimate is only for construction, there is no consideration for costs of land acquisition, toll booths (envisioned in the Study), engineering, ESPs, and the Huntington Drive interchange.

Dr. Brierley: The $2.5 to $2.6 billion that is estimated for construction is in 2006 dollars. It will double in 10 years – and it will take about 10 years before the construction could begin.

Dr. Brierley: There is nothing wrong with the estimate given by the MTA, but one must know the assumptions. A lot of cost-escalation will occur.

Tunnel Boring Method vs. Sequential Excavation Method

The schedule for each method of construction is just an estimate; they are highly speculative, very little science. Know one really knows how long each method will take. TMB could be as much as two years faster than SEM.

Tunnel Concept

Dr. Brierley: I see no insurmountable obstacles, but, this City will surely engage the MTA.

6. **Committee Member Concerns and Questions**

Huntington Drive Interchange

Chairman Remy: Is there any redeeming fact for the interchange, since even the Feasibility Study raised many negatives about the interchange?

Dr. Brierley: None, especially for South Pasadena, for two reasons: The 100-foot depth of the tunnel will require lengthy ramps at the interchange, and the proposed longitudinal ventilation for the tunnel which will be compromised by the long ramps at the interchange. The interchange appears to be a "discard" issue.

Ms. Siev: Why did the MTA consider the interchange at all?

Mr. Cardenas: Is it in someone's interest to have the Huntington Drive interchange?

Dr. Brierley: Someone might have asked the engineers to consider the option.

BS: One reason for the Huntington Drive interchange is to provide a means for the public to exit and enter the tunnel somewhere other than at the extreme ends. The public might be expecting a tunnel with more exits and entry points than the portals four miles apart. Some want to enter in Arcadia and go downtown.

Traffic

R. Joe: Do the conclusions regarding the need for 4 lanes in each direction address the impact on other freeways, such as the 210 and the I-5 freeway?

M.Gonzales: Traffic will be lessened on adjacent freeways except that traffic will increase by 7% to 10% on the 210 Fwy (above the traffic growth estimated by SCAG for the year 2030 without a tunnel).

RJ: If traffic on the 210 will increase 7% within the tunnel, then how will the afternoon jam-up on the 210 Fwy affect the tunnel (traffic)?

M.Gonzales: Northbound traffic in the tunnel will increase in the afternoon, so the 210 will increase in the afternoon. Southbound traffic in the tunnel will increase in the morning, so the 210 traffic will increase in the morning. The model was based on three lanes, which proved to be inadequate for the traffic projected for year 2030. Three lanes are expected to result in gridlock; four lanes of traffic would be described as "heavy", but 4 lanes could affect the ventilation needed for the tunnel.

Comments & Questions re Chapter 5, Modeling

Diana Stoney: The Huntington Drive interchange might have been included in the Study because the surface route plan included the interchange. Thus, it might have been retained to keep Alhambra at the table. It would serve L.A. commuters.

At the Feasibility Study presentations In El Sereno and Pasadena, the MTA admitted the need for a 4th ventilation tower.

Stan Burges (resident?): The volume of traffic plus the grade of the tunnel (ascending) will result in slow northbound speeds. Did the study consider the impact of traffic volume and the grade (up) on the tunnel and adjacent freeways?

Mary Ann Parada, 1710 Ramona Avenue, South Pasadena: At the Los Angeles and San Marino meetings, the MTA said they could ban trucks, yet the report says that the tunnel route will be a major freight corridor. Also federal standards [for truck traffic must be met if federal funds are used.] According to Caltrans, the traffic will be 20% trucks. Also, more truck traffic will arrive from the ports. There will be one-quarter million more vehicles on the route than admitted in the Feasibility report. Congestion moving from downtown to ??

There is no provision for the CSULA students get in and out of the tunnel near the campus. Also, there is no provision for Alhambra residents to access the tunnel or exit in Alhambra; they will still have to drive on Fremont to reach Pasadena.

Janet Ervin, 801 Meridian Avenue, South Pasadena asked:

How will the tunnel traffic exit to the 210 freeway? The back-up in the tunnel caused by the interchange with the 210 will cause anxiety among tunnel drivers, especially in northbound lanes in the afternoon with congestion is especially bad.

Dr. Brierley: The southbound tunnel is less likely to back-up, due to better geometry of the interchange at the portal.

J. Ervin: The tunnel will create a bottleneck [it will not have enough lanes for the 210 freeway traffic], thus, pollution and fumes will result. Without scrubbers and more ventilation towers, we will suffer from increased air pollution.

No distinction was made between commuter traffic and freight traffic. They [MTA and Caltrans] need to maximize use of the Alameda Corridor because the tunnel would be inadequate for commuter traffic even without trucks. It cannot handle goods movement.

Joanne Nuckols, 1531 Ramona Avenue, South Pasadena: The Huntington Drive interchange was included in the first drawing presented in January of 2003. The drawing of the tunnel that Parsons Brinkerhof made fifteen months before the Request for Proposals was issued also showed the Huntington Drive interchange.

Ms. Nukols handed item 1 to Dr. Brierley for his review and records.

San Marino went ballistic due to the increase in east-west traffic. LA's former mayor also was unhappy due to the historic homes that would be taken. But the labor unions and contractors might favor the Huntington Drive interchange.

J. Nukols asked Planning Commissioner Steve Friedman, "Did we challenge SCAG's air quality estimates?

S. Friedman: "No."

J. Nukols: Due to our comments regarding the analysis of our Low Build Alternative, the Federal Highway Administration asked Caltrans to remodel our Low Build Alternative. We should question the modeling. We should have Walter Colash ?? of Gladding-Jackson ?? review the modeling.

Comments & Questions re Chapter 6: Tunnel Configuration & Alignment

R. Joe: At what point will congestion exceed safety or time limits?

Dr. Brierley: With transverse ventilation, there will be no time limit. With the longitudinal ventilation that was studied, air quality will be better than transverse ventilation only if the vehicles are moving. Congestion will block and impede the longitudinal flow of air in the tunnel; resulting in worse air quality than with transverse ventilation.

In my opinion, it is difficult to believe that only one ventilation tower is sufficient, especially on the northbound grade (where vehicles work harder and have more emissions), and especially due to the potential of back-up on the northbound lanes at the 210 freeway. This should be an issue on our report to the City Council. The Colorado Eisenhower tunnel is only 1.3 miles long, yet it was designed with transverse ventilation. In my opinion, they will need two ventilation towers.

Two ventilation towers would mean that the towers would be near the boundaries of the City. So the impact to the City would be fairly nominal, but this should be addressed in your report.

Chairman Remy: Are only two configurations of the nine realistic?

Dr. Brierley: Number 3 is too expensive, and the distribution of traffic into the upper and lower levels would be a nightmare. The flat oval or large circular configurations are the only feasible options. The large circular will force the use of two levels, which will be very unusual and confusing for most drivers, especially the corkscrew ramps at each end.

I think that the flattened oval plus a third construction method are the most practical. The 3rd construction method that I envision would use tunnel boring machines (TBM) to bore two parallel tunnels, while/then the material between the tunnels is excavated manually using the sequential excavation method (SEM) to create an oval tunnel. But the method used will have little impact on South Pasadena.

B. Siev: How will the handicapped exit during an emergency? That is not addressed in the Feasibility Study. Will there be elevators for people in wheelchairs?

Dr. Brierley: Tunnels are inherently safe, but planning for emergencies is needed. People in wheelchairs will be in trouble – just as they are in high-rise buildings during a fire. The Study proposes $33 million for operation each year; a lot of that is for Emergency teams to service the tunnel 24/7, 365 days a year, and for cooperative relationship with any adjacent city's emergency response departments that will be needed.

M.Gonzales: Dr. Brierley's concern is based on one ventilation tower between the portals. His suggestion of two mid-way ventilation towers will increase safety in the tunnel.

M. Parada: We have attended each of the MTA presentations for the Feasibility Study, but only heard of 4 ventilation towers at the Los Angeles and Alhambra meetings. One at 1/3 and one at 2/3's the tunnel's length will result in two smoke stacks in South Pasadena, not just one.

Dr. Brierley: Or none. They could be constructed just outside of the north and south boundaries.

M. Parada: We hear that each stake will require an acre of land for trees, which will destroy historic neighborhoods. Is that acre of trees to hide the blight or to buffer noise?

Dr. Brierley: You won't hear noise due to the volume of the tower. Dirty air will vent from the top of the towers, the velocity will force it up higher where it will dispersed by winds. Lower on the tower, intake vents for fresh air are low velocity. So there is not a lot of noise. The Big Dig towers are quiet, even though they move a lot of air. The tower will be ugly; but not noisy – no more than background traffic noise.

Diana Stoney: The MTA said at the Pasadena meeting that they would isolate and baffle any noise, but at the San Marino meeting, the MTA said they would buffer the noise with land.

Due to the slope, some residents and others will be at the same level as the tower.

Regarding emergency access for the disabled: the Federal government will enforce the ADA, but will the deluge system for fire prevention make escape difficult?

J. Nukols:
The MTA said they needed an acre for each tower for 100-foot trees. They also said that the towers will be situated in industrial areas, but no specific location is cited. We have no industrial areas! The MTA is hiding the ball.

Sydney Australia has tunnels. During traffic back-ups in the tunnels, school kids in buses are overcome by fumes.

The proposed 100-foot height of the tower exceeds our City's building height limit.

No more consideration of 50-foot towers by the MTA?

Dr. Brierley: the portal towers can be shorter, if they do not exhaust any old air.

J. Nukols: You said that they will also exhaust at the portals.

Dr. Brierley: Each direction needs an exhaust tunnel, a 100-foot high tower.

Chairman Remy: We don't know the size of the portal ventilation towers. We need clarification regarding the height of those towers.

J. Nukols: I have talked about tower cleaning with a cut & cover tower maintenance man in Seattle. He said that the tower engineers do not consider maintenance.

M.Gonzales: Incidentally, the MTA has decided that more than one ventilation shaft is needed, but Dr. Brierley independently arrived at that conclusion.

J. Birman: They are light on a statement in chapter 6, page 68, under Section 6.2.1 Geotechnical, the last paragraph: tunnel conditions are favorable with . . . "and reasonable water conditions that could be overcome using generally acceptable ?? construction methods"

I am a little concerned about the statement, "reasonable water conditions" because it seems like . . . I think they did quite a good job in Chapter 3 when summarizing what's known at this time about ground water. So, could their statement "reasonable water conditions" be a little strong? Should we pay attention to that statement?

Dr. Brierley: It is very difficult for them to make conclusions about the water table, since we know <u>very</u> little about it. It appears as though the water table is fairly low near the south half of the tunnel. But in the faulty ground, the water table could be just about anywhere. Then north, there is weathered granite and alluvial soil.

Not much is known, especially near the mid-point and north route. There is very little information regarding the water table, which has a huge impact on the cost of the project. I would agree with you (J. Birman); their comments about the water table are nominal.

Chairman Remy: We hope you will help us, Joe (Birman) with the appropriate language concerning water issues when we draft our report to the City Council.

Comments & Questions re Chapter 7, Aesthetics

J. Nukols: As a designer, I see a 100-foot tower at each portal I the MTA rendition.

Dr. Brierley: Any exhaust tower, even if located at a portal, will be 100 feet tall.

D. Stoney: Landscaping can be destroyed by maintenance crews. Just look at these photographs of the Gold Line tractor [transfer?] station and the Huntington Drive median (she provided photographs).

Comments & Questions re Chapter 8, Environmental Issues

Chairman Remy: Bear in mind that the Feasibility Study did not include an EIR; there was no funding for an EIR with the Study.

Leonard Rusch, 1115 Glendon Way, South Pasadena; asked: How dirty is the air near the ventilation towers for other tunnels? Can it be dispersed?

Dr. Brierley: Only 3 or 4 firms in the nation specialize in tunnels. The tunnel does not generate fumes.

L. Rusch: If there is no wind, how well will the exhaust be dispersed?

Dr. Brierley: The fumes consist of carbon monoxide and nitrous oxide. With a ventilation tower, particles are diffused vertically versus longitudinally along an open freeway. In theory, the emissions will be no worse than with an open freeway.
Tunnels have cleaner air because the traffic flow is smooth, no stop and start traffic. Thus, the same volume of vehicles will produce less fumes in a tunnel than on an open freeway.

L. Rusch: Will more towers possibly be added when the tunnel is operating?

Dr. Brierley: In the Eisenhower tunnel, the traffic emissions are so low that fewer ventilation towers are needed than anticipated. The proposed ventilation plan is reasonable and appropriate, but vertical towers are ugly. I would not want the tower in my backyard.

M.Gonzales: Air quality projected in the MTA Feasibility Study report is based on a mix of vehicles (trucks and passenger vehicles) expected to be on the road in 2015.

L. Rusch: Will they limit the number of vehicles entering the tunnel if air quality is below standard?

M.Gonzales: Projections are based on the vehicle mix envisioned for 2015.

L. Rusch: Are soils going to settle as much in South Pasadena as in Alhambra? And during construction will liquefaction result from vibration?

Dr. Brierley: No, the tunnel will be built in rock. There will be no settling in the soil above.

Ernie Arnold (resident): This chapter is invalid because it draws a conclusion despite the MTA acknowledgement that insufficient study was done.

J. Nukols: The ventilation tower maintenance man in Seattle had several points:
We should watch that air quality requirements are not by-passed by the engineers;
The particulates are a hazardous waste (difficult to dispose of safely);
The CO2 and other pollutants are not collected. They contribute to "pollution by dilution".

E. Arnold: Regarding Mr. G's ?? description of the modeling, the model assumes that the technology for cleaner burning vehicles is in-place. We need a model based on today's standards and on reality.

F. Cardenas: Mr. Arnold's point is good. On a discussion of fuel efficiency over time on NPR FM radio, an expert stated that consumption has decreased very little, but experts had predicted a big decrease in consumption.

F. Cardenas: The Total Maximum Daily Load refers to the number of particulates in ground water, which is very expensive to deal with. Through the construction or operation, how much will our TMDL expenses rise?

M. Parada:
Many residents agree with Dr. Brierley and do want a ventilation tower near their home. Many believe it will decrease their property values. Lower tax revenues will result, which will hurt the City.

One of the ventilation towers will be adjacent to the six-story west wing of the hospital – and its heliport.

The AQMD Advisor reports that ultra fine particulates enter the brain. Along the 710 freeway, the level of ultra fine particulates is so high that the space of a sugar cube holds 1 million particles.

Comments & Questions re Chapter 9, Cost Analysis

Chairman Remy: Not all issues and expenses are included in Chapter 9.

R. Joe: Were the cost estimates accurate for the other tunnel projects? Were change orders needed?

Dr. Brierley: Most tunnels are for waterlines and are fairly predictable to estimate, but mega projects are difficult to estimate for several reasons:

- One-third of the Big Dig ($5 billion) was for environmental and community mitigation that was not anticipated; for a total cost of $15 billion.
- Mega projects are Long-term, which mean that costs can rise unpredictably.
- The $3.5 billion estimated will rise to $8 to $10 billion in ?? years.
- $3.4 billion is reasonable based on the assumptions of the Study, but one must read between the lines to find the assumptions; they omitted many cost elements.

R. Joe: At what point will the tunnel pass a cost-benefit analysis?

Dr. Brierley: Some will conclude that it fails, but big European construction firms will raise the billions needed for construction and will be eager to begin.

F. Cardenas: We have many good reasons to prohibit trucks in the tunnel, but non-residents would disagree because trucks will increase toll revenues.

M. Parada: Is there any money for construction management and for design?

Dr. Brierley: No.

M. Parada: The MTA tunnel consultant, Dr. Eisenstein, said that a tunnel costs about ten times the cost of a cut and cover surface freeway. So this tunnel will cost $10 to $15 billion.

Dr. Brierley: He should not have said that since the rules of thumb do not apply to unusual circumstances, such as this mega-project.

J. Nukols: Roger Snoble of the LA County MTA and Doug Failing of Caltrans said that the tunnel cost was comparable to a cut and cover, plus the tunnel was environmentally superior for South Pasadena. But the Feasibility report uses the $3 billion figure. See the famous Roger Snoble lunch napkin for the notes and a chart. Yet, the report estimates of cost of only $4.3 to $5.5 billion by the time construction begins.

It takes 5 years just to construct a ventilation tower. Even if the tower is built outside our City, that length of construction will have an impact on us.

Mis-information is given to cloud the issue and to create the impression that the tunnel is financially feasible.

It is important for South Pasadena to focus on the cost estimates.

E. Arnold: Cost matters to the City. The higher the cost of the tunnel, the less money for other transportation projects. The lack of money for the Gold Line grade separation and floating vibration hurt South Pasadena.

J. Nukols: Doug Failing of Caltrans said that if the cities decide to proceed, one way is with a joint powers agreement (JPA).

7. Review of Issues Raised

Chairman Remy: We will attempt to capture your concerns and thoughts. We will also attach the minutes for the meetings to our report to the City Council.

We have begun to form a list of issues to raise in our report:

- A range of environmental issues, including the unknown water table depth and the hidden earthquake faults.
- Many questions about the cost estimates.
- The 3rd option for construction raised by Dr. Brierley: combining the TBM and SEM techniques to create an oval, double-wide tunnel.
- The loss of transportation funds for other projects.

We will advise the City Council that it needs to be concerned about issues A through Z if the tunnel study goes forward.

8. Next Steps

Chairman Remy: We will discuss chapters 10, 11, and 12 at the next meeting, and then outline our draft report to the City Council. Our report will require us to agree or disagree with assumptions made in the Tunnel Feasibility Study.

9. Comments & Questions in General

D. Stoney: Several issues are not covered in the Feasibility Study report:

a) The tunnel will require a subsurface easement, which will affect the cost of land acquisition, so they will favor the Meridian route. That will lower property values.

b) The length of the tunnel, being the world's longest, will make it a target for terrorists.

c) It will attract additional traffic; an attractive nuisance.

d) The tunnel will suffer from debris dropped from vehicles, as do all freeways; which will result in lane blockages. The blocked lanes will increase surface street traffic.

e) On opening day, the tunnel's lanes will be close to capacity, so it will need enlargement immediately. The state will choose to augment the tunnel with a surface route, rather than build another tunnel.

J. Ervin: There are several errors in the minutes for the meeting on June 29, 2006.

a) The freeway goes through El Sereno, not Alhambra.

b) I asked Dr. Brierley what percentage of total costs was construction, not excavation. He stated that construction was (on average) three-fourths of the total cost.

c) Also, we should attach the Mayor's cover letter to the MTA dated December 10, 2004.

Planning Commissioner Steve Friedman:

Jan Chatten-Brown and I wrote a letter to the Honorable Members of the Special Advisory Committee with assistance from attorney Antonio Rossman, special counsel to the City of South Pasadena. I would like to summarize the letter.

The Feasibility Study report omits in its project history and background the most relevant fact related to the history: that the federal and state agencies withdrew their approvals for a surface freeway [extension].

Your report to the City Council should include these decisions to withdraw approval, to illustrate that the tunnel is considered by some as an attractive alternative to the surface freeway [extension].

Some residents are concerned that the tunnel is a means to revive a surface freeway route.

If South Pasadena finds the feasibility study to be sound or a tunnel feasible, the City's evaluation will be cited as evidence that the City concedes that a tunnel is needed. The false argument could and probably will be raised that the City now discounts the tunnel's traffic inducement and no longer asserts that a freeway [extension], surface or subsurface, will generate new traffic that will leave the City worse off than no project.

In the City's comments on the Feasibility Study, it should request that the project sponsors clarify that the surface route [extension] is dead alternative. The clarification by project sponsors can be done in one or more ways:

- Removing from regional transportation plans any reliance on, or endorsement of, a surface 710 freeway [extension];
- Committing that they will do nothing to advance the surface freeway [extension] option;
- Removing the surface freeway as an alternative that could receive further study.

The 1998 final EIR and EIS justify removal of the surface freeway [extension]. The 2003 and 2004 project withdrawals likewise acknowledge the extraordinary legal hurdles to any future approval of a surface freeway [extension]. The existing environmental assessments also document the complete lack of community consensus for construction of a surface freeway [extension].

Chairman Remy: We should attach the letter to our report and raise the issues and positions advised by the letter. Its advice is for the City Council, not the Special Advisory Committee.

10. **Other Business** - none

11. **Adjournment:** The meeting was adjourned by Chairman Remy at 9:40 pm. The next meeting will be held at 6:30 pm on August 24, 2006 in the City Council Chambers at 1424 Mission Street, South Pasadena, 91030.

Approved
Chairman Remy

8-24-06
Date

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27 July 2006

Special Advisory Committee on the Route 710 Tunnel Feasibility Report
City of South Pasadena
South Pasadena, CA 91030

Honorable Members of the Committee:

The City has requested that outside legal counsel provide their guidance, if any, to your committee in its evaluation of the Route 710 Tunnel Technical Feasibility Assessment Report (Tunnel Report). This letter provides the collective views of Jan Chatten-Brown, counsel to the city; Steven M. Friedman, co-counsel and counsel to the National Trust for Historic Preservation; and this writer, special counsel to the city; and will be presented by Mr. Friedman.

Our guidance is limited to matters of legal procedure and substance, inasmuch as we do not claim to have, and do not have, any expertise in the technology of tunnel construction or civil engineering generally.

We are concerned that the Tunnel Report omits in its project history and background the most relevant fact of that history: that following Judge Pregerson's injunction in 1999, both the federal and state agencies withdrew their approvals for the freeway. The federal withdrawal, which the Government later characterized as rescission, relied on largely the same legal grounds on which Judge Pregerson had issued his decision. The state withdrawal followed that by the federal government. (These facts are omitted in the relevant background on pages 1-1 to 1-3.)

The Tunnel Report should include these federal and state withdrawals of approvals, because they lay the foundation for and indeed explain the fact that a tunnel is now viewed by some as an attractive alternative. If the tunnel is to be constructively considered by its sponsors and the corridor communities, South Pasadena's apprehensions that the study only exists as pretext to reviving the surface freeway must be recognized and vitiated.

Some citizens of South Pasadena appropriately apprehend that the tunnel study could mask an intention to revive the surface route. Several times in the four decades of the Route 710 project's history, South Pasadena has endorsed alternative solutions, only to find that the City's participation was used to justify reviving the surface freeway proposal. We validate the concerns raised on this score by many of the long-serving "freeway fighters."

If South Pasadena and its citizens are being asked to evaluate the tunnel on its merits, that evaluation will be cited to assert that South Pasadena concedes the need for the tunnel. The false argument could and probably will be raised that South Pasadena now discounts the tunnel's traffic inducement and no longer asserts that a freeway, surface or subsurface, will generate new traffic that leaves the City worse off than no project. It is asking a lot for the City or its constituents to suspend their claims about need and traffic inducement or purported traffic improvement as the cost of cooperating in a tunnel environmental assessment.

In our view, based on decades of collective representation of the City and its allies, the City's comments to the Tunnel Report should stress that the project sponsors must make clear fairly immediately that from here on out, they regard the surface alternative as a dead alternative. This can be accomplished in more than one way. The first would be to remove immediately from regional transportation plans any reliance on or endorsement of a surface 710 freeway. Secondly, the project sponsors and regional agencies could commit right now that in proceeding to evaluate the tunnel, they will do nothing to advance the surface option, but instead will henceforth remove the surface freeway as an alternative receiving further study.

Removal of the surface freeway from further consideration as an alternative is justified on the basis of the environmental assessments completed to date. The 1998 final EIR and EIS amply document the grave environmental impact that the surface freeway would produce, and the 2003 and 2004 project withdrawals likewise acknowledge the extraordinary legal hurdles to any future surface freeway approval. The existing environmental assessments also document the complete lack of any community consensus for surface freeway construction. For all these reasons, compelling evidence today supports a conclusion that the 710 surface freeway can be removed from any further study as a project alternative.

Respectfully submitted,

ANTONIO ROSSMANN
SPECIAL COUNSEL TO THE
CITY OF SOUTH PASADENA

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CITY OF SOUTH PASADENA

710 Tunnel Feasibility Study Assessment

Special Advisory Committee

Minutes

August 24, 2006

1.	**Call to Order:**	At 6:40 p.m. by Chairman Ray Remy.
	Members Present:	Chairman Ray Remy, Members Joseph Birman, Frank Cardenas, Daniel Evans, Robert Joe, Ignacio Roman and Beatrice Siev
	Members Absent:	None
	City Officials/Staff:	Mayor Philip Putnam City Manager, Lilian Myer Transportation Manager, Hal Suetsugu
	Consultants:	Gary Brierley, Ph.D., Brierley Associates, Tunnel Consultant Michael Gonzalez, Lead Staff Consultant

2. **Introductions:**
Chairman Remy thanked the audience and others for attending. Recognized the Mayor, City Manager; and briefly introduced each member of the Committee. He also expressed gratitude to the City Council for providing two consultants, Dr. Gary Brierley and Consultant Michael Gonzalez, who had given the Committee excellent assistance and guidance.

3. **Approval of Minutes**
Chairman Remy proposed that the amended minutes for the first meeting and the minutes for the second meeting be approved unless someone had objections and corrections to offer.

Committee member Joseph Birman requested that his statement on page ten of the minutes for July 27, be amended to read, "I am a little concerned about the statement, "reasonable water conditions" because it seems <u>a little simplistic</u>."

Member Robert Joe moved to approve the minutes as amended, the motion was seconded by Member Beatrice Siev and approved by the Committee.

4. **Chair's Remarks**
Chairman Remy explained that chapters ten and eleven would be reviewed; that the reviews would be brief and cursory, especially for Chapter 10, since it was relatively hypothetical. The reviews would be brief because the Committee needed to focus on choosing the elements that it wants to include in its report. The Committee could be helpful to the City Council and Staff if it could identify the short-comings and faults in the Feasibility Study, and identify the

serious issues. Such points will also be useful if an in-depth EIR was prepared. He emphasized that the Committee would not advise a particular position or action.

Chairman Remy stated that at the presentation of their report to the City Council, all of the Committee members could be present if they had a different or additional perspective to provide to the Council, and that the public could also provide comments to the City Council.

He also explained that public comments would be welcome during the meeting after the overview provided by Michael Gonzalez and Dr. Brierley.

5. Summary Presentation, Tunnel Feasibility Study, Chapters 10 and 11

M. Gonzalez briefly reviewed Chapters 10 and 11 of the Feasibility Study report.
Dr. Brierley, the City's consultant on tunnels, provided explanatory comments and his expert opinion.

Chapter 10- Funding

M. Gonzalez: The chapter discusses the funding that might be available, and describes several different scenarios featuring different funding sources.

He observed that if the project was estimated to cost $3 billion in 2006 dollars, it qualifies as a Mega project, which requires a comprehensive funding plan.

Dr. Brierley (Dr. B) noted that it was very difficult to imagine that the scenarios will be applicable in a few years.

He also observed there was nothing in the chapter to cover the expenses related to collecting tolls. Yet, toll collection, if incorporated, would significantly change the financial situation because the portals would need as many as 8 to 10 lanes for toll collection, and because toll collection requires expenditures for salaries and management.

Chairman Remy: The Feasibility Study does not mention the competition for the funding.

Member Frank Cardenas: The state bond measure for the November ballot will provide bond monies for new and unfunded transportation projects. Will this project be eligible for those bond monies?

M. Gonzalez: Chapter 10 discusses the possibility of future state bond monies, but not the November 2006 bond measure. Also, it is debatable that this project could meet the requirement that a project be underway by 2112 to qualify for November bond money.

Member Beatrice Siev: How can federal money be available when the decision regarding extending the 710 was rescinded?

Chairman Remy: This project is not under a regional or state plan, and is not under federal guidelines; thus, federal funding seems unlikely. The project would need to be modified. It would also need to cross several environmental hurdles to qualify for funding. A monumental task.

Member Daniel Evans: Chapter 10 is highly speculative and does not consider inflation. There is a project to improve the 710 from Long Beach to the railroad yards, to move truck traffic to the Alameda Corridor [from the 710 freeway]. Has Caltrans considered charging a toll on the 710 freeway to trucks only for using the 710 freeway?

Member Robert Joe: What about the additional federal funding that Congressman Adam Schiff has obtained for the 710? The funding maybe $2.4 million or more.

M. Gonzalez: Yes, but the lead agency has not been selected, and the money is seed money for the Environmental Impact Report (EIR).

Member Beatrice Siev: The money is to determine if a tunnel would be sound and feasible.

Chapter 11-
M. Gonzalez: This chapter restates the purpose of the Feasibility Study.

Chairman Remy: Does the audience have any comments on Chapter 11?

Diana Stoney, resident: When we have raised the question of subsurface property easements at the presentations, our concerns were brushed-off. Yet, according to these Assessors' maps for homes and properties above the Metro Red Line, the properties do suffer from easements for the MTA project. [Copies of the Assessors' maps were distributed to the Committee.]

6. **Committee Member Questions** – See above

7. **Next Steps**
Chairman Remy: Any and all are invited to the City Council meeting to add to the findings of this Committee. Those who spoke at our meetings might want to attend the City Council meeting to repeat their concerns.
We will produce a concise document to capture our thoughts and will attach a copy of the minutes for each meeting, the letter read by Planning Commissioner Steve Friedman, and the material from Member Joseph Birman regarding the available expertise. We look for no further work on this project.

8. **Review of Draft Report & Issues Raised**

Technical Feasibility
Chairman Remy: Based on the Study and our review, it seems that the tunnel is *technically* feasible. Does any member disagree?

Member Frank Cardenas: There is not sufficient data to disagree, though, not convinced that the Feasibility Study proves that it is feasible. The authors admit they have limited empirical data as noted by Member Birman regarding water levels. We think it is feasible because tunnels are constructed elsewhere in the world.

Member Beatrice Siev: As an engineer, I cannot comment on feasibility because the Feasibility Study does not provide enough information. That is not a pejorative statement; Parsons-Brinkerhoff produced a fine report given the funding, but they lacked the money for a thorough study.

However, the tunnel is technically feasible, just as it is technically feasible to go to the moon.

Chairman Remy: The machinery is available, but there is more to feasibility than just machinery.

Member Daniel Evans: Anything can be built, but the costs and consequences are another matter. We must address the questions and conditions.

Member Robert Joe: We should qualify the statement that the tunnel is technically feasible. That is a dangerous statement; it could be given more weight than our concerns, such as the cost issues.

Chairman Remy: We can distinguish technology and equipment from other aspects, but I'm not comfortable with Parsons-Brinkerhoff's conclusion that the other problems can be mitigated, especially environmental problems. I share Member Joe's position regarding funding and costs. Is it reasonable to assume that such a project will be funded?

However, I can agree with Parsons-Brinkerhoff's first conclusion about technical feasibility.

Dr. B: In my opinion, if you disagree or say "there is not sufficient information regarding the technical feasibility", we will not be respected for our conclusions regarding the funding, costs, and environmental feasibility.

Chairman Remy: Is it fair to say that we agree with the Parsons-Brinkerhoff conclusion that the tunnel is technically feasible? All concurred.

Environmental Feasibility

Chairman Remy: Parsons-Brinkerhoff says the environmental issues can be mitigated, but I think there are too many questions and not enough information; thus, we cannot concur with the Parsons-Brinkerhoff findings on environmental feasibility.

Member Beatrice Siev: I agree for several reasons:

1. The high cost of the Big Dig was mostly due to environmental problems.

2. A cross-tunnel every 600 feet is not sufficient.

3. The local public will not be served by a tunnel that has access only at distant portals and even then, only from freeway lanes.

4. Mitigating the appearance of the ventilation towers seems doubtful. Where will they get the 100-foot high trees they speak of? They cannot be transplanted-and they take a long time to grow to that height.

5. The Feasibility Study is based on the SCAG traffic models, yet their models do not have a good track record. Any model is only a guess, but SCAG does not actually build freeways or streets, they are only theorists; so reliance on their models has been problematic.

7. Traffic at Valley near the 710 freeway will be worse.

8. The Huntington Hospital is not a desirable place to locate a ventilation tower.

Member Ignacio Roman: As an engineer, I have no problem with the conclusion regarding the engineering and construction feasibility. Our concerns would be addressed in an EIR, the next step.

Dr. B: The chapter on environmental issues includes community impacts, but they are different and should not be in one chapter. The mitigation of community impact issues was 1/3 the cost of the Big Dig, yet the issues and cost are not addressed in the Feasibility Study.

Do you want to comment on the project in general or focus on its impact on South Pasadena? The ventilation towers (more than one will be needed between the portals) will have the biggest impact for South Pasadena, but they will probably be built outside the City limits.

Chairman Remy: Since this Committee is responsible to the City Council, we should focus on City impacts.

Member Frank Cardenas: The Feasibility Study does not address dust, vibration, noise, and the impact on property values at all or adequately. We need an EIR to determine the environmental feasibility and to know the costs of mitigating environmental impacts.

Dr. B: The deeds for property will show an easement, but the affects on resale value is unknown.

Chairman Remy: Parsons-Brinkerhoff ways mitigation of the environmental issues is possible, but many environmental issues were not explored. Until that is done, I cannot say that "all environmental issues can be mitigated." I propose that we do not concur with the conclusion regarding environmental feasibility because we cannot summarily state that all environmental issues can be mitigated.

Member Daniel Evans: I move that we do not concur with Parsons-Brinkerhoff that the tunnel is environmentally feasible. Member BS seconded the motion.

Financial Feasibility

Chairman Remy: The Feasibility Study fails to raise many issues. Until a regional constraining budget is done, we cannot agree with Parsons-Brinkerhoff's conclusion. Also, there are no cost estimates for environmental mitigation, engineering, construction management, and toll collection.

OBSERVATIONS

Chairman Remy: Observations can be culled from the minutes and conversations.

M. Gonzalez: Several suggestions to include in the development of the SAC report:

1. Note that the Feasibility Study was a conceptual study; more information is needed for a true Feasibility Study.
2. This portion of the 710 is a state route, not an interstate freeway.
3. Chapter 2 fails to note that the magnitude of the project is unprecedented due to the huge cross-section and length of the proposed tunnel.
4. The Feasibility Study conclusions are based only on 3 boring holes, not a program of boring.

Ground Conditions

Dr. B: Ground conditions may not be "favorable" for the entire length. At the south end, the low water table would be relatively favorable; but as the tunnel climbs north, conditions maybe not favorable to the north. There is a huge fault zone and the water table may probably be relatively high from York Blvd to the Eagle Rock fault, about one mile. These ground conditions will have a huge impact on the schedule and the costs. They need 25 to 30 borings just in the fault zone to determine the conditions.

Chairman Remy: We should differentiate water table and seismic issues in our discussion.

Dr. B: The potential for earth movement and the construction challenges [cause by the high water table] will each escalate costs. They will prepare for earthquakes by enlarging the diameter of the tunnel and then filling the extra area with lose material. It is a very expensive process and will result in a huge cost increase. The cost estimated in the Feasibility Study could be very low.

Chairman Remy: Is the Committee in agreement that we are concerned about the seismic issues? That a lot more information is needed? [Agreement was indicated.]
Member Joseph Birman: The expertise exists; we could have more information and perform further studies.

Tunneling Methods

Member Frank Cardenas: Could the project begin using a Tunnel Boring Machine of one size, but a larger TBM is needed when unforeseen ground conditions are encountered? Can the size be switched mid-way?

Dr. B: Yes, they could discover mid-way the need to enlarge the tunnel for earthquake preparedness, but a TBM must exit by boring its way through to the other end – it cannot be backed-out of the tunnel. Thus, as the first TBM went through the tunnel, it would lay 3-feet thick lining for a tunnel even where the tunnel needed to be enlarged. Then, the 3-foot thick lining would need to be removed – in the fault zone – where work is already more difficult.

Is 1500 feet enough, and did they allow enough time and money for such work? With the Sequential Excavation Method, discovering bad ground and faults are not a problem. But SEM is slower, and therefore, more expensive. A big decision must be made.

Member Joseph Birman: I think our ground water table is not perched water, but is actually ground water backed-up against the Raymond Hill fault. It will take more boring to know, since the small amount of samples may be damaged when removed from the earth.

Dr. B: In similar conditions of unknown faults and groundwater, a ten-foot diameter pilot tunnel is sometimes bored along the alignment of the tunnel. It is not proper for Parsons-Brinkerhoff to conclude that the ground-water conditions are favorable.

Member Ignacio Roman: The authors of the report would favor having more data.

Chairman Remy: Let's include the portals and the hybrid TBM+SEM process in our report. All concurred.

Chapter 4: Technology

M. Gonzalez: Another issue is whether there will there be sufficient advances in tunneling technology as assumed by Parsons-Brinkerhoff?

Dr. B: The Feasibility Study discusses either TBM or SEM; each has its drawbacks for this project. I would consider the SEM process, but also using small TBMs in the SEM process.

The TBMs would bore parallel tunnels, equivalent to the outside tunnel diameter. The SEM process would remove the material between the two parallel tunnel bores to create a large oval tunnel that could accommodate four lanes. At the fault zone, the TBMs could move outward, to bore tunnels farther apart, [which would create a larger tunnel needed for buffering earth movement]. Before discussing a hybrid method, the Committee should mention the high cost of the non-hybrid methods.

Water

Dr. B: If the water table is high, the cost of construction and on-going operations will increase due to the need to manage the water.

Member Frank Cardenas: Whether or not a hybrid method of tunneling is used, I care only that South Pasadena is involved in decisions, such as those regarding the portals and ventilation towers.

Member Frank Cardenas: Will two smaller TBM's be less noisy and cause less vibration than one large TBM?

Dr. B: The only disturbance will be a low rumbling noise, but only for a week or two.

Ventilation

Dr. B: There are problems with the Feasibility Study regarding the proposed longitudinal ventilation (LV). They decided on LV because Transverse ventilation (TV) requires a plenum above and below the lanes of traffic, which would require a huge tunnel and increase costs greatly. So, the Feasibility Study proposes LV, which is used for two-lane tunnels in Europe (which are not comparable with this tunnel).

At least two ventilation towers will be needed between the portal towers, especially due to the northbound (uphill) incline, which will result in more exhaust fumes.

TV would be better if stacked lanes are used. If traffic is stacked, the load on the ventilation system is doubled. Four lanes over 4 miles will be like 4 lanes over 8 miles (for stacked lanes). Parsons-Brinkerhoff is assuming greater technological capabilities than exist now.

M. Gonzalez: To summarize Dr. Brierley,

1. The scheme with stacked lanes will be difficult to ventilate with LV.
2. LV will be difficult to accomplish in a four-mile tunnel.
3. A mid-way ventilation tower will not be adequate.

Fire Safety

Member Frank Cardenas: What about safety during a fire with LV?

Dr. B: Fumes, smoke, and heat from a fire must follow the tunnel lengthwise if LV is used. Thus, people must be within 600 feet from cross-tunnels to escape during a fire, but such cases are rare, since tunnels are relatively safe. The safety crews above each emergency exit must commit to assist in case of a tunnel emergency.

Chairman Remy: The Feasibility Study did not address the role of South Pasadena in emergencies, nor did it address the expense. These are also issues.

Member Frank Cardenas: These issues could be reviewed by our Police Chief and Fire Chief.

Modeling

Chairman Remy: There is some question regarding the accuracy and validity of the SCAG models, as mentioned by Member Siev.

Member Frank Cardenas: 1. The assumptions, variable, and methods are not known. 2. It is the only model, so it could have large [undetected] errors. 3. Their model is the basis for the argument that the 710 needs to be extended. Therefore, we need independent validation of the model; that is a reasonable request given the cost of the tunnel.

Member Daniel Evans: We need a second opinion.

Member Beatrice Siev: Caltrans does their own modeling; they do not rely on the SCAG models. MTA might also avoid the SCAG models with their own modeling.

Member Ignacio Roman: The City of Carson has challenged SCAG's traffic projections for 2030.

Chairman Remy: We could note that a follow-up study should explore the possibility of an alternative model.

Tunnel Configuration

Huntington Drive Interchange

Chairman Remy: We concluded that the Huntington Drive Interchange was a bad idea.
Member Robert Joe: I agree. We should note that the interchange is not feasible, cost effective, nor practical.

Tunnel Size

M. Gonzalez: Dr. Brierley noted that this tunnel would be equivalent to a four-mile long sub-way station [in diameter].

Ventilation Towers

Member Beatrice Siev: The number of houses to be taken is not reported.

Chairman Remy: We need to know their plans.

Member Beatrice Siev: 1. The Feasibility Study refers to placing the tower in an industrial area. 2. How will pollution be managed?

Member Robert Joe: Ventilation towers will be out-of-scale with South Pasadena structures and aesthetics. Trees will not mitigate.

Environmental Issues

Member Beatrice Siev: The Feasibility Study vaguely shows two roadway entrances to the tunnel in the architect's renderings. Yet, the entrances will be from freeway lanes, not surface streets.

Dr. B: The issues related to construction: light [at night], dust, and working hours/restrictions are not discussed. Restrictions could increase costs. Residents will want to limit the days and hours of construction work.

Dr. B: Another chapter is needed to discuss the community impacts.

Member Robert Joe: We should include the environmental impacts that are secondary or outside of South Pasadena.

Dr. B: Near the portals, there will be lights, cranes, dust, trucks, and noise for a long time; but the impact on South Pasadena will be minimal, except during the construction of the ventilation towers.

M. Gonzalez: The City Council has provided technical support to the Committee via Dr. Brierley. It might be preferred if he limit his efforts to the impacts on South Pasadena.

Dr. B: I am not comfortable reporting how other cities will be affected.

Member Frank Cardenas: Where will the construction trucks go? Will they travel on Fair Oaks?

Dr. B: The trucks with muck will not drive through South Pasadena. In fact, this project has the advantage of good access to the freeways without surface street travel because the portals are adjacent to the freeways. That is good for residents. The only surface street activity in South Pasadena will be for the ventilation tower construction.

If the contractors have a choice, they will start at the south end because they prefer to tunnel uphill. Then the south end portal will have most of the noise, dust, traffic, and the like.

Chairman Remy: The Feasibility Study omits many, many issues. Have we missed any observations to include?

My list includes the following observations:

1. The 710 is not an interstate, but a state route.
2. The study is conceptual, not a Feasibility Study.
3. The project is huge; not just big.
4. Seismic issues and unknown faults are a concern.
5. Water table issues and unknown conditions are concerns.
6. A hybrid TBM+SEM approach is needed.
7. At least two mid-way ventilation towers are needed.
8. Longitudinal ventilation is very problematic.
9. Ventilation of stacked lanes is very problematic.
10. The accuracy and validity of the SCAG model is in question.
11. Cost of the Huntington Drive Interchange make it unfeasible.
12. More information is needed regarding the community impacts, such as historic buildings, aesthetics, and home values.
13. Another chapter for community impact is needed.

14. Public safety issues and the City expenses for safety are not discussed.

Member Daniel Evans: No study can be feasibility if it's not believable. If the bait and switch fear is pervasive, then no project can be considered feasible. We need reassurance that it is not a bait and switch.

Chairman Remy: By attaching and referencing the letter to the City Council, we will address that issue.

Member Robert Joe: Collecting tolls is impractical with the size of the portals presently envisioned.

Dr. B: The portals would need to be widened a great deal, which increases construction costs. Also, collecting tolls increases operating costs by 3 times.

Member Daniel Evans: What if only trucks were charged a toll?

Dr. Brierley: Then the income from tolls would be substantially reduced.

Member Ignacio Roman: The Feasibility Study should acknowledge its expectations for South Pasadena regarding emergency response and the costs.

9. **Public Comment**

Harry Knapp: Several points should be in our report:

1. Cost: Using the MTA numbers given at the meeting in South Pasadena, the Parsons-Brinkerhoff ratio of surface to tunnel costs was six times more to build a tunnel than a surface freeway. So $10 billion in today's' dollars is a more accurate estimate.

2. Surface streets: All but those going all the way to Pasadena will still need to drive on surface streets such as Valley Blvd. and travel through Alhambra and South Pasadena. The tunnel will not serve those from or driving to San Marino, San Gabriel, El Sereno, Alhambra, and South Pasadena.

3. Cost: The $300 million to $400 million company that is located near the end of the 710 freeway in Los Angeles might need to relocate because the construction dust will make their clean room work impossible. Or, their facility might be on land needed for the portal; the state could force them to relocate. Either way, their relocation will be another cost that is not included in the Feasibility Study cost estimate.

Clarice Knapp: Several additional points should be included in our report:

1. The Caltrans documents for the freeway extension reveal that the purpose of the project has changed several times, which suggests that an over-riding need does not exist. The first purpose of the freeway extension was to help revitalize Pasadena's downtown; but their downtown is now a national model for revitalization. The second purpose of the project was to promote economic development in the City of Alhambra. The third reason for the freeway extension is to relieve surface street congestion, although the estimated relief is only 5%.

2. As for relieving surface street congestion (by an estimated 5%), we must consider that local area residents will need to use surface streets to access the portals (or the freeways that access the portals). Locals could actually drive south to reach the freeway that will take them north. This could result in more miles driven on surface streets than without the freeway, and increased congestion on the surface streets that lead to the portals. Obviously, the tunnel will benefit cross-town commuters who are already on the freeways; but will harm local area residents.

3. What exactly does "feasible" mean? Do we have the technology to build a sound tunnel that will be safe for many years? Consider the recent structural problem within the Big Dig. Does "feasibility" include "viability"?

4. Don't forget that the project does not include scrubbers to clean the exhaust.

5. Safety: What about access by fire-fighters to the scene of fires or potential fires?

6. Access is a problem. It will be limited to only 2 portals that are a long distance apart.

7. Funding: The plan to extend the 710 surface route is considered one of the ten most wasteful projects by the Road to Ruin report. When the public learns about the tunnel project, which will cost 8 to 10 times more than a cut and cover freeway, will make us the subject of public anger and ridicule.

8. Vent stacks: During the judge's tour, I heard that the exhaust fumes from the stack will affect everyone; air pollution travels many miles. Today's LA air pollution has been found in the bottom of the Grand Canyon.

9. Ventilation: The surface route had a 1600-foot cut-and-cover section that was self ventilated, but beyond that length, a mechanical ventilation system would be required. The tunnel will be 4 miles in length, yet only passive ventilation is envisioned!

10. Portals: We should consider the impact of the portals on Pasadena and other cities because they linked arms with us to oppose the surface extension of the 710.

Diana Stoney:

1. Seismic issues: The Gillette Hills are constantly moving; plumbing in that area must be installed to accommodate the movement. The Elysian Fault might affect that area.

2. Water issues: Meridian Avenue is the most likely alignment for the tunnel. Yet, Meridian follows a natural water course; thus, water is likely to be present under Meridian Avenue.

3. Tower mitigation: The MTA has changed their story: At the Pasadena meeting, they said the towers could be shortened to 75-feet, but that with a diameter of 60-feet, an acre was needed. In South Pasadena, the MTA said that they could baffle the fan noise. In El Sereno, they said that the fan noise would be buffered by taking more homes near the tower.

4. Environmental issue: Could land settling be a problem?

5. Environmental issue: Due to the incline between South Pasadena and Pasadena, exhaust fumes and particulates from the lower ventilation tower will be at street-level for those to the north [at some distance].

6. Safety: Hazardous material management in the tunnel was not addressed.

6.5. Safety: The Mount Blanc tunnel had a [small] fire that became a blow torch.

7. Surface traffic: When traffic builds-up in the tunnel, the inside air pollution will be bad. Commuters will begin to avoid the tunnel and take our city streets instead. Debris on lanes in the tunnel will also cause congestion, which will also result in commuters choosing our streets similar to today.

8. Capacity: SCAG claims that 4 lanes are needed to handle the expected traffic, but as with all other freeways, the lanes will be filled to capacity on opening day. Other freeways are then widened or double-decked to add more capacity. How will tunnel capacity be increased? They will add lanes on the surface.

Vicky Kirkwood [spelling?]:

1. Safety: Remember the recent ceiling collapse in the Big Dig.

2. My house moves quite a bit [due to earth movement]; so will the tunnel!

Mayor Philip Putnam:

1. Regarding the SCAG model: Comparisons [models] of future traffic with and without truck traffic indicate no difference. Based on the traffic seen on the 710 freeway, it is difficult to conclude that truck traffic will not affect traffic [volume].

2. The mayor of Pasadena commented that they have done nothing [towards responding to the Feasibility Study]. I agree with Dr. Brierley that we cannot review the Feasibility Study on their behalf, but we should consider including the issues related to the portals since Pasadena might not respond.

3. Keep up your effort; make your report interesting and flavorful. The City Council won't have time to rewrite your report.

Councilman Mike Ten:

Please provide bullet points for the effects of the portals (warnings that other cities can use because we care about our neighbors). If we don't think of our neighbors, they will resent that we have only a tunnel [while they suffer from the effects of portals], and if expansion is discussed, they will be motivated to push for a surface freeway.

Pollution standards will rise and technology will improve. Air quality is now better than in the 60's and 70's, but reducing traffic will help [reduce pollution] even more.

Mary Ann Parada:

1. On page 10 [section 133], the cost is stated to be $5.5 billion. That is up from the $3.1 billion in the Feasibility Study. Still, the $5.5 billion excludes engineering, mitigation, tolls, design, and construction management.

2. How much will it cost South Pasadena to provide emergency response services for the tunnel?

3. How long will it take fire fighters and trucks to reach the portals?

4. According to the Feasibility Study, the "auto diversion rate is 20% to 25%". What if that is the amount that traffic will divert from the tunnel to our streets?

5. I have something from the AQMD that says our air quality is worse again, or worse than first thought.

Joanne Nuckols:

1. The Feasibility Study fails to mention that the Interim improvements required by the Record of Decision (ROD). We should point-out that omission.

2. Another major hurdle is that three different types of legislation are needed. That will result in big delays.

3. MTA said that the MTA can give us more time to respond. All we have to do is ask for more time. They have only recently talked with one city, so the process is behind schedule.

4. La Canada wrote a letter to the MTA after the RFP was releases. We should include that letter. It addresses the shortfalls of an incomplete study. We should not waste more time and money on a tunnel. The Feasibility Study raises sufficient issues to make a decision.

5. At the meeting on January 15, 2003, when the preliminary sketch of the tunnel was shared, we were told that the tunnel would cost about the same as a cut-and-cover freeway $1.4 billion.

Chairman Remy: If no one else wants to speak, then the meeting will be adjourned.

10. **Other Business – None.**

11. **Adjournment** - The meeting was adjourned by Chairman Remy at 9:45 pm.

Approved
Chairman Remy

9-11-06
Date

Attachment B

CISN California Integrated Seismic Network

California's Partner to the ANSS Advanced National Seismic System

CGS USGS OES Caltech UC Berkeley

Organization

Mission | Who we are | Governance | Organization | Partnerships

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Earthquake Info

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Mission

The mission of the California Integrated Seismic Network (CISN) is to operate a reliable, modern, statewide system for earthquake monitoring, research, archiving, and distribution of information for the benefit of public safety, emergency response, and loss mitigation. Further, the CISN seeks to mitigate the impact of future earthquakes by collecting, processing, and disseminating critical earthquake information in a timely way.

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Who We Are

Six organizations have collaborated to form the CISN in order to further the goals of earthquake monitoring. The founding members of the CISN include: California Geological Survey, Caltech Seismological Laboratory, Berkeley Seismological Laboratory, USGS Menlo Park, USGS Pasadena, and the California Governor's Office of Emergency Services.

In addition to the core members, several organizations contribute data that enhances the capabilities of the CISN. Contributing members of the CISN include: University of California, Santa Barbara, University of California, San Diego, University of Nevada, Reno, University of Washington, California Department of Water Resources, Lawrence Livermore National Lab, and Pacific Gas and Electric.

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Governance

In November of 2000, the six institutions signed an MOA that describes the CISN organizational goals, products, management, and responsibilities of member organizations. The Steering Committee oversees CISN projects while the external Advisory Committee, representing the interests of structural engineers, seismologists, emergency managers, industry, government, and utilities, provides review. Other important CISN committees include:

- Program Mangement Group: For planning, coordination, and implementation.
- Outreach Committee: To coordinate outreach among the CISN members.

- Strong Motion Working Group: For focus on issues related to strong-motion data.
- Standards Committee: To resolve technical design and implementation issues.

Various documents and reports from the CISN are available, including reports from the Program Management Group; summaries of ANSS activities, documents from the Standards Committee, and other useful materials.

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Organization

To facilitate coordination of activities among institutions, the CISN has formed three management centers:

- **Southern California Management Center:** Caltech/USGS Pasadena
- **Northern California Management Center:** UC Berkeley/USGS Menlo Park
- **Engineering Management Center:** California Geological Survey/USGS National Strong Motion Program

The Northern and Southern California Management Centers operate as twin earthquake processing centers. The Engineering Management Center has the lead responsibility for producing engineering data products. More information about CISN activities is available.

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Partnerships

The Federal Government through the USGS provides funds for seismic monitoring in California both through internal and external programs. These funds are used for core operations of earthquake monitoring in southern and northern California. The USGS office in Menlo Park works with UCB to maintain a comprehensive program in northern California. The USGS office in Pasadena is located on the Caltech campus and the USGS share responsibilities with Caltech in operating the seismic network in southern California. The USGS external program also provides funds to Caltech, UCB, and UCSD for operations and earthquake catalog production. The USGS and NSF fund the Southern California Earthquake Center (SCEC), which in turn provides funding for the Southern California Earthquake Data Center (SCEDC) for TriNet. The USGS through the Advanced National Seismic System (ANSS) funds improvements in seismic instrumentation throughout the state.

The State of California provides core funding for the CGS/CSMIP program. The State, through the University of California at Berkeley, provides core support for the Berkeley Seismological Laboratory, including partial support for the operation of the Berkeley Digital Seismic Network. Recently, the State of California's Office of Emergency Services provided significant funds to increase the capability of the CISN. Funds are being used to support the operation of TriNet in southern California, expand broadband instrumentation throughout northern California, and increased the number of strong motion instruments in urban regions of northern California including the San Francisco Bay area.

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M7.2 earthquake offshore of Northern California

California Integrated Seismic Network
www@cisn.org

W3C HTML 4.01

Part of the Advanced National Seismic System ANSS

Last modified: Sat Feb 4 12:51:32 PST 2006

Attachment C

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27 July 2006

Special Advisory Committee on the Route 710 Tunnel Feasibility Report
City of South Pasadena
South Pasadena, CA 91030

Honorable Members of the Committee:

The City has requested that outside legal counsel provide their guidance, if any, to your committee in its evaluation of the Route 710 Tunnel Technical Feasibility Assessment Report (Tunnel Report). This letter provides the collective views of Jan Chatten-Brown, counsel to the city; Steven M. Friedman, co-counsel and counsel to the National Trust for Historic Preservation; and this writer, special counsel to the city; and will be presented by Mr. Friedman.

Our guidance is limited to matters of legal procedure and substance, inasmuch as we do not claim to have, and do not have, any expertise in the technology of tunnel construction or civil engineering generally.

We are concerned that the Tunnel Report omits in its project history and background the most relevant fact of that history: that following Judge Pregerson's injunction in 1999, both the federal and state agencies withdrew their approvals for the freeway. The federal withdrawal, which the Government later characterized as rescission, relied on largely the same legal grounds on which Judge Pregerson had issued his decision. The state withdrawal followed that by the federal government. (These facts are omitted in the relevant background on pages 1-1 to 1-3.)

The Tunnel Report should include these federal and state withdrawals of approvals, because they lay the foundation for and indeed explain the fact that a tunnel is now viewed by some as an attractive alternative. If the tunnel is to be constructively considered by its sponsors and the corridor communities, South Pasadena's apprehensions that the study only exists as pretext to reviving the surface freeway must be recognized and vitiated.

Some citizens of South Pasadena appropriately apprehend that the tunnel study could mask an intention to revive the surface route. Several times in the four decades of the Route 710 project's history, South Pasadena has endorsed alternative solutions, only to find that the City's participation was used to justify reviving the surface freeway proposal. We validate the concerns raised on this score by many of the long-serving "freeway fighters."

If South Pasadena and its citizens are being asked to evaluate the tunnel on its merits, that evaluation will be cited to assert that South Pasadena concedes the need for the tunnel. The false argument could and probably will be raised that South Pasadena now discounts the tunnel's traffic inducement and no longer asserts that a freeway, surface or subsurface, will generate new traffic that leaves the City worse off than no project. It is asking a lot for the City or its constituents to suspend their claims about need and traffic inducement or purported traffic improvement as the cost of cooperating in a tunnel environmental assessment.

In our view, based on decades of collective representation of the City and its allies, the City's comments to the Tunnel Report should stress that the project sponsors must make clear fairly immediately that from here on out, they regard the surface alternative as a dead alternative. This can be accomplished in more than one way. The first would be to remove immediately from regional transportation plans any reliance on or endorsement of a surface 710 freeway. Secondly, the project sponsors and regional agencies could commit right now that in proceeding to evaluate the tunnel, they will do nothing to advance the surface option, but instead will henceforth remove the surface freeway as an alternative receiving further study.

Removal of the surface freeway from further consideration as an alternative is justified on the basis of the environmental assessments completed to date. The 1998 final EIR and EIS amply document the grave environmental impact that the surface freeway would produce, and the 2003 and 2004 project withdrawals likewise acknowledge the extraordinary legal hurdles to any future surface freeway approval. The existing environmental assessments also document the complete lack of any community consensus for surface freeway construction. For all these reasons, compelling evidence today supports a conclusion that the 710 surface freeway can be removed from any further study as a project alternative.

Respectfully submitted,

ANTONIO ROSSMANN
SPECIAL COUNSEL TO THE
CITY OF SOUTH PASADENA

DEPARTMENT OF TRANSPORTATION

October 12, 2006

Ms. Shahrzad Amiri, Director
Linda Hui, Transportation Planning Manager
San Gabriel Valley Area Team
Metropolitan Transportation Authority
One Gateway Plaza, Mail Stop 99-22-8
Los Angeles, CA 90012-2952

Dear Ms. Amiri and Ms. Hui:

Subject: Pasadena Council Members' Questions/Comments on the Draft Final Report for I-710 Freeway Gap Feasibility Assessment

I would like to thank MTA staff for preparing responses to Council Members' questions and comments on the study and attending the City Council meeting on October 9, 2006 to respond to procedural questions about future studies.

As you observed the discussion at the meeting, the City Council has requested that all its comments including the Mayor's letter be included as part of the record submitted to the MTA Board, and that all comments be included in any future research and study performed for the following phases of the project. The City Council also requested that all Pasadena's comments be forwarded to Caltrans for inclusion in future studies.

Again, we appreciate the opportunity to participate in this productive interagency review process. If you have any questions or would like additional information, please contact me directly at 626-744-6450.

Sincerely,

Joyce Y. Amerson, Director
Department of Transportation

cc: Doug Failing, Director, Caltrans District 7

Attachment

221 East Walnut Street • Suite 210 • Pasadena, CA 91101
www.cityofpasadena.net/trans

ATTACHMENT

Summary of Questions/Comments from Council Members

1) Absent significant re-engineering of the 710/210/134 intersection and reconstruction of that intersection, Pasadena will likely experience a massive influx of traffic on our surface streets caused by drivers seeking ways to get around the already impassable intersection, especially during peak hours. What will Caltrans (or the builder) do to mitigate traffic impacts on surface streets? (Our worst-case scenario is played out daily at the intersection of the 134/101 freeways right now.)

2) The 100 foot ventilation tower is much too massive and out of scale with other structures in the area where it is proposed. Why do they require a tower at the end of the tunnels? It would seem more workable to have the three towers interspersed along the alignment, one 25% of the way, one 50% of the way and one 75% of the way along.

3) Pasadena's portion of the 710 should be completely covered, as well as that under South Pasadena. There's no reason Pasadena should suffer where other communities are not.

4) Truck traffic should be prohibited on the 710 to Pasadena. Truck traffic will contribute significantly to the congestion that will result from the 710 completion, especially if the intersection with the other freeways isn't re-engineered and reconstructed. At the very least, we should insist that truck traffic be absolutely prohibited on the 710/210/134 freeways from 6 a.m. to 9:30 a.m. and from 3:30 p.m. to 7 p.m.

5) Upon completion, what is the projected increase in traffic (both the number of cars and the percentage increase) on the 210 Freeway through northwest Pasadena? The 210 Freeway through East Pasadena?

6) Regarding the above increases, how many cars are expected to exit the freeway and travel on City streets in northwest Pasadena and East Pasadena?

7) Upon completion, what is the projected increase in auto noise along the sound wall-less sections of the 210 Freeway (northwest Pasadena and East Pasadena)?

8) Will tolls be charged?

9) Will peak hour tolls be charged?

10) Will trucks be allowed? If so, what is the projected increase in truck traffic (both the number of trucks and the percentage increase) that travels east 210? North 210?

ATTACHMENT
(Continued)

11) Where will the ventilation towers be located?

12) What are the dimensions of the tower (i.e. height, width, depth)? I recall the height to be 100 feet.

13) Is there anything in the neighborhood of similar dimensions?

14) How is the exhaust that is emitted from the tower treated?

15) What is the status of the 710 study funded by Congressman Schiff?

16) What will be the process going forward for community involvement and outreach?

17) When might there be better financial projections about the cost revenues available for the tunnel?

18) If trucks aren't allowed, do we need the same kind of exhaust towers?

19) The study showed they could be as high as 100' feet – worst case. What's the best case?

20) What if technology changes in the next 10 or 15 years?

21) There's a tunnel under the English Channel – do they have exhaust towers?

22) For the area in Pasadena where there's currently freeways in a cut – is it feasible to cover that?

23) The study comes to the conclusion that the tunnel is environmentally feasible. Is there sufficient information before an EIR is completed to reach that conclusion?

24) See attached letter dated September 12, 2006.

OFFICE OF THE MAYOR

September 12, 2006

TO: Cynthia J. Kurtz, City Manager

FROM: Mayor Bill Bogaard

SUBJECT: Route 710 Tunnel Feasibility Assessment

Introduction

I have now completed my review of the recently issued MTA route 710 Tunnel Feasibility Assessment Report ("Assessment Report"). With apologies for my tardiness, I submit herewith a list of questions (see Attachment 1) for the MTA regarding the report and its future efforts exploring a tunnel solution to the 40-year old question regarding the so-called "710 freeway gap".

My hope is that information in response to these questions will be received from the MTA in the near future, and prior to the time when it might take any further actions in regard to the feasibility, design, and the environmental and engineering evaluation of the project.

Of course, Pasadena is not called upon at this time to express any views for or against the tunnel approach, or even to suggest what any next steps might be. In communicating with the MTA, I hope the position of the Council will be correctly conveyed in all communications to the MTA and Caltrans: that the City of Pasadena does not object to the MTA efforts to determine the feasibility of extending the existing 710 freeway from the Route 10 freeway into the Route 134 and 210 freeways in Pasadena.

Is Feasibility Assessment Complete?

A preliminary observation relates to the scope of the Assessment Report which was, as I recall, estimated to cost over $5.0 million. In this regard, Representative Adam Schiff was approached to seek federal funding for the study and he responded by obtaining an allocation of $2.4 million. But less than $500,000 was expended for the Assessment Report, which was begun earlier than the original schedule and did not address one of the principal conditions that Mr. Schiff had conveyed to the MTA, that the feasibility study for the Route 710 tunnel explore all possible routes, including workability of a connection to Route 2.

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Accordingly, I would hope for an early response from the MTA whether a more extensive preliminary study, which is not limited to the Meridian Corridor, and which more fully explores the issues of design, engineering, environmental impacts, and cost will be conducted as the next step. I am informed that the special advisory committee of the city of South Pasadena—formed to conduct an in-depth study of the assessment report—is of the opinion that in general it appears to be more of a conceptual document than a "feasibility assessment".

The Project is Massive and Unprecedented

The Assessment Report does make clear that a 710 tunnel solution is a project of massive scale. Most highway tunnels around the world provide for two lanes of traffic in each direction. Apparently, a few tunnels provide for three lanes of traffic, with almost none having four lanes, except for projects in urban areas constructed not as tunnels, but pursuant to "cut and cover" technology. If the 710 tunnel is built with four lanes of traffic in both directions over a length of more than four miles, it appears that nothing comparable to the project exists anywhere in the world.

The scale and complexity of the project is evident from certain other information in the Assessment Report. The total displacement and excavation of earth for a 710 tunnel would amount to approximately 6 million cubic yards of bulk material. This appears to be an unprecedented undertaking. In addition, there are significant questions regarding the 100 foot exhaust towers; the interchange facility between the tunnel and the Route 134 and 210 freeways; and the impact of construction activity on west Pasadena once construction might get underway during the next 20 years.

May I ask that the cost estimate in the Assessment Report be very carefully analyzed, both as to the implications of the estimate over time and what portions of the project are not included. It would appear that the current estimate does not come close to reflecting the total funding required.

Regarding the time implications, the estimate is stated in 2006 dollars without allowance for escalation, even though construction will not begin for many years. Very little information is available about ground conditions and the cost to address environmental and community impact requirements. Such factors normally add substantial cost to a project during the lengthy period of project implementation.

As to cost factors not included, these include, based on my understanding, no cost for electrostatic precipitators, land acquisition, project design, construction management, or toll facilities of any kind. The allowance for design contingency is only 15%, a number which is low for the current state of information about a massive and perhaps unprecedented project. I am told that allowance for design contingency of 30% or more would not be unreasonable.

In this regard, I have noted with interest questions about the 710 tunnel solution submitted by other Councilmembers, and want to associate with those thoughtful questions as part of Pasadena's exploration of the tunnel solution at this point in time.

The Implications for Pasadena are Significant and Unprecedented

Apart from questions about the total project, it appears that the tunnel solution creates unprecedented and significant challenges for the City of Pasadena, since the traffic using the facility would necessarily surface in the 710 Freeway corridor above Columbia Boulevard—referred to as the Pasadena portal—and would (i) involve the emission of huge volumes of exhaust in our area from vehicle operation through a mile or more of the tunnel, and (ii) require significant new roadway facilities for the interchange carrying traffic from and to the 710 tunnel to and from the existing Route 134 and 210 freeways.

Obviously, detailed and accurate information about the traffic that would be brought to southwest Pasadena by reason of the new facility should be obtained, evaluated and understood by Pasadena as soon as possible and on an ongoing basis.

There has been a suggestion that a portion of the funding be obtained through toll revenues, and I understand that a toll system at the Pasadena portal of the proposed project would significantly expand the interchange facility from what is otherwise required and perhaps require major land acquisition of Pasadena properties adjacent to the corridor, such as Maranatha High School and Ambassador Auditorium, the Westgate project and Old Pasadena. The implications to Pasadena of accommodating the necessary facilities for a toll revenue system should, I hope, be examined in the near future.

The implications of the 100 foot high exhaust tower in southwest Pasadena needs early and complete attention. It is my impression that while certain "cleansing" of the exhaust is currently feasible, significant pollution would still be emitted on a 24-hour basis. This could dramatically adversely affect the area, including Huntington Medical Center and the concentration of medical offices in the area; the emerging biotech and other business activities in the commercial corridor of south Fair Oaks and south Raymond; the southwest Pasadena residential area; and the Blair High School educational complex, which is moving toward a K-12 scope of activity.

Conclusion

In light of the significant implications to Pasadena, it is my hope that the City will decide to marshal appropriate resources at this time to explore issues mentioned herein and many others that no doubt will be identified as this effort moves forward. Keeping the Council and the community well informed should be identified as a priority, even though the project is highly uncertain and, in any event would not be implemented for many years.

In my effort to review the Assessment Report, I have monitored the work of the special advisory committee of the city of South Pasadena, which has just completed its work. My impression is that the conclusions and findings of the committee's report are credible, and that they deserve careful study on our part as a means of gaining still better understanding of the proposed project. In this regard, I would hope that copies of the report will be obtained for both Council reference and staff review.

I appreciate the opportunity to offer comments on this important subject.

BB:jls

attachment

Bill

September 12, 2006
Attachment 1

MTA Route 710 Tunnel
Technical Feasibility Assessment Report

--------*--------

Questions for Clarification from Pasadena Mayor Bill Bogaard

Preliminary Note: The following questions are intended to elicit information regarding the so-called Route 710 tunnel alternative and the recently completed Feasibility Assessment Report. This information relates to effort to understand what future steps might be appropriate to explore this possible solution to extending the 710 Freeway.

As to each item of information requested, it is my request that information be provided, to the extent practical, along the following lines: (i) a narrative description of the facilities or other subject; metric data such as height, weight, cubic yards, and similar quantitative information; (ii) reference to existing comparable facilities, if any, with information that facilitates an understanding of the extent to which the existing facility is and is not comparable to what is needed or contemplated for the Route 710 tunnel; (iii) reference to (and copies of, if convenient) recent environmental studies of comparable engineering projects, such as the EIRs that have been done in connection with the proposed expansion of the existing Route 710 Freeway south of the Route 10 Freeway; (iv) reference to professional literature describing facilities of the kind that are contemplated for the tunnel, such as the exhaust towers, the technology being used today to operate such facilities.

Question 1: Adequacy of Feasibility Assessment Report

Will additional studies regarding feasibility be completed that are non-route specific, and which involve additional examinations to assist in scoping the design, construction, engineering, environmental, and other issues as well as providing meaningful information regarding total cost. When the idea of a feasibility study was first discussed, I recall the estimated costs exceed $5 million, and the federal funding allocated for such study specified the "non-route specific" condition.

Question 2: Construction Activities

The Assessment Report indicates that the construction of the tunnel requires that construction activity be concentrated at portals instead of being spread along the entire route of, say, a "cut and cover" project. Please describe the construction process that would occur in southwest Pasadena if this project moves forward, indicating numbers of vehicles, hours per day, days per week, and related implications as well as staging areas required to accommodate equipment, remove materials, and construction equipment and supplies. How long would the construction continue?

September 12, 2006
Attachment 1

Question 3: Interchange between Route 710 and Routes 134 and 210

Please describe the facilities that would be needed to accommodate traffic using the 710 tunnel as it exists and enters the Pasadena portal. The number of lanes, the total width of the new construction, associated land acquisition requirements, and the car exhaust to be experienced in the open-air area between the portal and the Routes 134 and 210 freeways.

Question 4: Toll Revenue Facilities

If toll revenues constitute a source of funding for this project, please describe what expansion of the interchange is required to accommodate collection activities, and provide similar information regarding: the size of the resulting facility, the construction period and land acquisition requirements.

Question 5: Exhaust Towers

Please provide a detailed description of the exhaust towers contemplated in the Assessment Report, indicating the size in height and horizontal dimension, the materials involved, and the available mitigation measures to reduce the visual impact of such structures. Is it possible that more than three towers will be required. Please confirm that such a tower will be located in southwest Pasadena. As specifically as possible, please indicate whether such towers will likely be located north of California Blvd. or south of California Blvd.

Question 6: Tower Operation

Please describe existing technology used to "cleanse" the exhaust accommodated by the towers, indicating what polluting materials are present and what portion thereof is reliably removed by existing cleansing capability. Please describe the geographic reach of any pollution that would be disseminated by reason of the exhaust tower.

Question 7: Environmental Studies

At such time as the environmental studies are initiated, will a project description be developed that covers in detail the kind of information requested above related to the interchange, toll collection facilities, the exhaust tower, construction, and the geographic territory included in environmental studies to sure that all environmental implications from the project, both in construction and operation, are taken into account in the conduct of the environmental studies. Will the project description be disseminated to stakeholders such as the City of Pasadena with sufficient time to allow the stakeholders to determine the adequacy of the description.

September 12, 2006
Attachment 1

Question 8: Completeness of Cost Estimate

Please provide an analysis of the cost estimate presented in the Assessment Report, which appears to be incomplete in several respects. Cost factors apparently not included include, based on my understanding, no cost for electrostatic precipitators, land acquisition, project design, construction management, or toll facilities of any kind. The allowance for design contingency is only 15%, a number which is low for the current state of information about a massive and perhaps unprecedented project. I am told that allowance for design contingency of 30% or more would not be unreasonable. Further, a reasonable estimate of inflation seems appropriate, since it is apparently presented in 2006 dollars, and construction would not begin for many years. Very little information is available about ground conditions and the cost to address environmental and community impact requirements. These are significant factors which can not be ignored.

City Council
Gregory C. Brown, Mayor
David A. Spence, Mayor Pro Tem
Stephen A. Del Guercio
Laura Olhasso
Anthony J. Portantino

October 12, 2006

Board of Directors
County of Los Angeles
Metropolitan Transportation Authority
One Gateway Plaza
Los Angeles, CA 90012

Re: City of La Cañada Flintridge Comments and Objections to Route 710 Tunnel Technical Feasibility Assessment Report

Honorable Metro Directors:

I. INTRODUCTION.

The City of La Cañada Flintridge, through its City Council, submits the following preliminary comments and objections to the Route 710 Tunnel Technical Feasibility Assessment Report ("Report"). We reserve the right to submit additional comments and objections.

At our September 5, 2006 City Council Meeting, we received a presentation regarding the Report and the Route 710 Tunnel Gap Closure Proposal ("Project"). That presentation and the Report raised more questions than they answered. It is clear that the Report has failed to adequately investigate the transfer of traffic, noise and air quality impacts that will be caused to communities such as La Cañada Flintridge, South Pasadena, Pasadena, Glendale and Burbank, among others, that are proximate to the 210 and/or 134 Freeways.

The City Council is especially concerned that, as discussed more specifically in this letter, the tunnel, as planned, would open at capacity and with severe congestion. Distressingly, commute times are not expected to improve. To the contrary, any expectation of increased capacity is negated by increased usage. Thus, the project appears to be a multi-billion dollar maintenance of the status quo.

Perhaps more important to the City Council, we do not believe that the environmental considerations can be "minimized, eliminated or mitigated" as claimed in the Report. There is insufficient study and data in the Report to support the claimed reduction or elimination of all environmental impacts. We believe that the Report is misleading and fosters public misconception about the alleged benefits of the project.

Before the Metro Board potentially approves the commencement of preparation of an EIR/EIS for the Project, we urge you first to conduct a proper study in a revised Report which truly analyzes whether the Project is environmentally feasible.

Finally, the City Council questions the accuracy of the Report's conclusion that the Project is financially "feasible" given the many costs (such as environmental mitigation, land acquisition, environmental documentation, preliminary and final design, construction management, insurance and agencies/force account oversight and staff) which are omitted in the cost estimate, already in the billions of dollars. We also question the Report's conclusion that the Project is geotechnically feasible, as only three borings were conducted. These factors, as well as others discussed in this letter, should be examined thoroughly prior to reaching any conclusion that the Project is "feasible."

II. BACKGROUND:

Prior to issuance of the Report, in September 2004, the La Cañada Flintridge City Council identified concerns regarding traffic, noise and air quality (including potential physical impacts on residents, such as from increased risk for cancer and other diseases) as being relevant in the course of your study of a tunnel option and the redistribution of traffic, including potentially heavy truck traffic, that a gap closure would cause. **(Exhibit 1.)**

Notwithstanding La Cañada Flintridge's clear and early concerns in this regard, the Report failed to consider, much less identify or analyze, the significant environmental impacts that the Project would cause to La Cañada Flintridge and surrounding communities.

III. UNSUPPORTED STATEMENTS IN THE REPORT:

Preliminarily, it should be noted that the stated intention of the Report is "To ascertain whether the tunnel concept is physically, environmentally and financially viable, as well as resulting in congestion relief and worthy of more comprehensive evaluation and technical consideration." This question is purportedly answered in the Report as follows: "Based upon the technical feasibility assessment, the tunnel concept appears physically and environmentally feasible." Yet the Report fails to contain a basis for so concluding in that there was a complete omission of any study of the environmental impacts to surrounding communities. Instead, the Report appears to be a "*post hoc* rationalization" for a project to which the agency has already committed. Laurel Heights Improvement Assn. v. Regents of University of California (1988) 47 Cal.3d 376, 394.

The Report announces, as one of its purposes, that it will "identify preliminary potential physical, environmental, and financial impacts to neighboring communities." The Report did not state it would consider only adjacent communities, rather, it refers to an analysis of impacts on neighboring communities. La Cañada Flintridge is a neighbor of the Project.

It was our expectation that some good faith attempt would have been made to analyze the impacts of the Project on this City. However, that did not occur. Since we believe that La Cañada Flintridge and other neighboring cities will be greatly impacted by the Project, we see this as a fatal flaw in the Report. Any conclusions related to the "feasibility" of the Project are unsupported when, as here, the communities that will suffer environmental and other direct impacts from the Project, are not considered at all.

With regard to the alleged environmental feasibility of the Project, the Report makes the following conclusion:

> "From the environmental perspective, the tunnel concept appears to be viable and feasible. Environmental impacts to the following resources may occur: noise, air quality, historic properties, aesthetics, archaeology, hazardous waste, soil disposal, and storm water. However the impacts or the severity of the impacts can be minimized, eliminated or mitigated using proven measures and techniques. Based upon this preliminary environmental assessment, no insurmountable environmental issues have been identified that would preclude further consideration of the tunnel alternative." (P. 8-112)

Given the lack of any meaningful study of the impacts to La Cañada Flintridge and surrounding cities – as conceded by the Parsons-Brinckerhoff representative at the September 5, 2006 presentation -- the City Council believes that this conclusion is unsupported, and that the Report does not fulfill one of its primary goals of identifying "potential physical, environmental, and financial impacts to neighboring communities."

IV. AIR QUALITY IMPACTS AND USC KECK SCHOOL OF MEDICINE CRITICISM OF THE STUDY.

Because there was no attempt to analyze the impacts on La Cañada Flintridge, and because the City Council must protect the health of its children and residents, the City Council asked Dr. Rob McConnell, Professor of Preventative Medicine, and co-investigator of the USC Children's Study, to review the Study.

Dr. McConnell and Ms. Andrea Hricko, Associate Professor of Preventative Medicine, have written a review of the Study. They are both with the USC Keck School of Medicine, Division of Environmental Health. USC agreed to review the study, but did so without compensation in order to remain independent and impartial in their review. The review is attached to this report and it, along with the sources cited in the review, should be considered part of the City's comments on the Study. **(Exhibit 2.)**

The USC review focused on: (1) potential air quality and health impacts; and (2) comments in the Report regarding alleged mitigation strategies. USC is concerned that the Report has devoted approximately three pages of its 164-page report (with an additional 136 pages of figures and tables) to air quality and health impacts resultant from the Project.

Among other conclusions, Dr. McConnell states that:

> "The increase in truck and automobile traffic on the I-210 freeway resulting from the proposed I-710 extension would increase the exposure of surrounding communities to vehicular pollutants that may cause asthma and other respiratory disease."

Dr. McConnell and USC are concerned that the Report focused only on increases in regulated pollutants exceeding the regulatory standard. Supported by empirical research, USC asserts that if this approach is taken, the health impacts on affected communities may be substantially underestimated. They recommend that any increase in regulated pollutants be measured and that the "resultant health effects" of any increase be estimated. They also emphasize that impacts from increases in local traffic-related pollutants should be known. They state that there is an "emerging scientific consensus that residential or school proximity to major traffic corridors is associated with respiratory impairment in children and in adults." (Emphasis added.)

They explain that studies have shown that residential proximity to freeways is associated with increased rates of asthma. Further, the 12-community Southern California study showed that a group of pollutants was associated with slower growth in lung function, which is a strong predictor of "debilitating lung disease and mortality in later life." (Emphasis added.)

Based, in part, on USC's finding of respiratory impairment to school children in proximity to freeways and heavily trafficked arterial roadways, state law now prohibits schools from being built within 500 feet of a freeway with certain levels of traffic. (See S.B. 352.) They also state that the 500-foot measurement can be considered a minimum buffer zone, since there is evidence that health effects may extend further from large freeways.

La Cañada Flintridge is particularly concerned with the fact that many, if not most, of its schools are located within or just outside the 500 foot detrimental health effect zone vis-à-vis the 210 Freeway, and that if the Project were to go forward, thousands of La Cañada Flintridge students from Preschool through Grade 12 would be exposed to dramatically increased air contaminants and pollution, including from vehicles that would be idling on the 210 Freeway. However, this critical issue was never considered in the Report, yet the Report simultaneously and irresponsibly claims that there will be no unmitigable environmental impacts. A map showing the proximity of La Cañada Flintridge schools to the 210 Freeway is attached. **(Exhibit 3.)**

Dr. McConnell and USC also note that the Report's assumption about the alleged ability to mitigate all health impacts is unsupported. In particular, they question the Report's claim that the severity of the air quality impacts can be "minimized, eliminated or mitigated." They further observe that since the health effects have not been accurately identified, proposed mitigation measures similarly cannot have been identified. Logically, the Report's groundless claim of being able to mitigate health impacts is unfounded and betrays the study's bias rather than stating a conclusion based on any facts.

With regard to these important air quality issues, USC has exposed the inadequacy of the Report, both in terms of the goals and standards that the Report sets for itself and, more importantly, in terms of the real life effects on children and adults in surrounding communities.

Dr. McConnell clearly states that the Project will cause significant adverse health effects from the increased truck and automobile traffic on the 210 Freeway. If the Project results in additional pollutants, as the City and USC believe that it will, then La Cañada Flintridge taxpayers would, ultimately, be asked to fund a tunnel that harms the health of their own children.

The City of La Cañada Flintridge fully supports the USC review and requests that its suggested assessments and studies be conducted <u>prior</u> to any further consideration of the Project and tunnel option.

V. <u>THE PROJECT IS DESIGNED FOR FAILURE; IT WILL NOT ALLEVIATE THE TRAFFIC IMPACTS THAT IT CLAIMS TO ADDRESS, AND IT WILL EXACERBATE TRAFFIC IMPACTS IN OTHER AREAS.</u>

By the Report's own admission, the Project, if constructed, would open at Level of Service (LOS) F. This, by Caltrans standards is "the worst...qualitative measure describing operational conditions within a traffic stream." It would have the worst speed and travel time, the worst freedom to maneuver, the worst traffic interruptions, and the worst comfort and convenience. This level of service is also defined as follows in the California General Plan:

> "**Level of Service (LOS) F** - Describes unsatisfactory stop-and-go traffic characterized by "traffic jams" and stoppages of long duration. Vehicles at signalized intersections usually have to wait through one or more signal changes, and "upstream" intersections may be blocked by the long queues."

Unsatisfactory stop-and-go traffic characterized by "traffic jams" and stoppages of long duration already exist in the area where the Project would likely be built.

The City understands that current traffic impacts on jurisdictions such as Alhambra are a concern. In consideration of the fact that, at best, the tunnel would likely open at LOS F, with unsatisfactory stop and go traffic, the burden on Alhambra and surrounding areas will, in fact, not be alleviated. Air quality in Alhambra and surrounding areas may not be improved with LOS F traffic. In addition, the tunnel would cause significant amounts of traffic to go northward onto the 210 Freeway, through Pasadena, Altadena, La Cañada Flintridge, Glendale and other communities. This represents not just a transfer of the burden of traffic, air pollution and resultant disease from one area's children and residents to another, but an approximate doubling of the traffic impact. Billions of dollars of taxpayer funds will be spent to accomplish this.

Further, it is highly unlikely that the level of traffic would improve from LOS F. To the contrary, it is more likely that it would degrade further. With an opening of the Project at LOS F, the brand new Project would be designed for failure. Surely spending billions of dollars on other transportation programs that could actually achieve benefits would be a wiser use of public funds.

Beyond the Report's admission that the Project would open at LOS F, the City identifies the following additional defects and omissions in the Report which render its analyses and conclusions fatally flawed. This list is intended to be illustrative, not exhaustive:

1. The Report does not disclose the magnitude and extent of potential traffic impacts caused by the I-710 tunnel. It only shows incremental changes and does not calculate future traffic volumes for adjacent freeway segments that feed and receive traffic from the tunnel.

2. No Level-of Service (LOS) calculations were made for freeway segments outside the local study area. Therefore, the full extent of the tunnel's influence was not disclosed.

3. The Report does not calculate the LOS of interchanges, ramps or intersections, which are the critical points of restriction on traffic flow, or the LOS of freeway lanes. Even if the freeway segments operate below capacity, the connectors and ramps may be over capacity and fail, causing major choke points.

4. The Report underestimates the potential increase in traffic on surrounding freeways by not using the scenario with the highest PM peak hour traffic volumes. (See Figure 5-6 of the Report.)

5. The tunnel alternative has similar traffic effects to a surface-based freeway connection. However, the Report does not identify any additional benefits beyond the tunnel study area.

6. The Report estimates that 183,170 vehicles per day will use the tunnel if restricted to autos only, and 169,581 vehicles will use the tunnel if autos and trucks are allowed. This reduction is due to the larger size and lower performance of trucks that reduce lane capacity and traffic speed. Given the possibility that the tunnel would be used by trucks, the dramatic decrease in speed and commensurate increase in toxic air contaminants should have been analyzed.

7. The Report fails to analyze a 4-lane scenario without trucks.

8. The Report uses a Passenger Car Equivalent (PCE) of 2.5 for every truck when estimating the level-of-service through the tunnel. This means that approximately 26% of the PCE is due to truck traffic, based on the Report's 12% truck percentage. Accordingly, the Report is misleading in terms of the true impact of truck traffic through the tunnel.

9. The Report warns that "the (truck) restriction may preclude potential funding sources available for 'Goods Movement' or other programs" (p. 11-150), revealing a likely bias in favor of using the tunnel for trucks.

10. In all of the feasibility alternatives, the Report allows the inclusion of trucks, both operationally and financially. No limitations in physical shape or dimensions are identified that would prohibit trucks in any of the 3 or 4-lane options. <u>This means that trucks could be allowed through the tunnel at any time after completion of the tunnel.</u>

11. Since air quality is directly related to traffic, the absence of a comprehensive traffic impact analysis precludes any assumptions of improved air quality, which undermines the Report's conclusion that air quality will be improved in any area.

12. The Report makes no comparison of potential environmental impacts with and without trucks in the proposed scenarios. Knowing the difference would greatly influence the decision to preclude trucks in the I-710 tunnel segment.

13. The Report states that construction activities would occur 24 hours a day for up to NINE years. This means that construction related impacts would also occur for the same period.

14. The Report states that "This increased traffic [on the 210 Freeway] is directly attributable to trips that are attracted to the continuous link provided by the tunnel concept." (Pp. 11-150; ES-5.) This means that any adverse impacts in Pasadena, Altadena, La Cañada Flintridge, Glendale and surrounding cities would be a direct result of the Project and must be mitigated by the Project. Yet, contrary to one of the stated goals of the Report these impacts, and whether they can be mitigated, were <u>not</u> studied.

15. The Report states, "Along the I-210 Foothill Freeway north of the US 134 Ventura Freeway, the peak hour will increase between 1,900 to 2,500 vehicles per hour. This increased traffic volume is equivalent to the hourly capacity of one freeway lane . . . . The likely impact of this added traffic is that it will degrade the level of service along these freeway segments." (P. 11-150.) No analysis was provided in the Report of the significant environmental impacts and needed mitigation measures that would be required as a result of adding what we believe may be as much as a 50% increase in traffic to the 210 Freeway. Moreover, we believe that the Report's figures regarding traffic counts and volumes are inaccurate and understated. It also should be noted that the summary language quoted above is inaccurate. In an earlier portion of the report it is clear that the increased traffic count referred to is NOT the amount by which "the peak hour will increase". The actual increase will be much greater. The report actually says that on the "Interstate 210 West / North at the northern end of the tunnel the increase would be approximately 2,500 PCE per hour **<u>in the peak direction</u>**." Therefore, the increase referred to is only a one-way count, not the actual increase in both directions. This once again demonstrates a disturbing "spin" in the Report's text designed to minimize actual adverse impacts.

16. Approximately 10-15% of the traffic volume increases on the 210 Freeway would likely be diesel trucks. Diesel emissions are among the most dangerous types of contaminants, especially to school children.

17. The Report does not discuss the potential impacts of toll booths that would be necessary to collect tolls, such as significant congestion on the freeways that feed the tunnel.

18. We believe that trucks removing dirt excavated from the north portal of the tunnel would most likely use the 210 Freeway through the City. According to the Report, the construction would occur 24 hours-a-day, five days per week, for 9 years. (P. 9-117.) This is an unprecedented undertaking that could have unprecedented impacts on La Cañada Flintridge and surrounding communities. The haul routes were not studied.

19. The Report ignores the significance of north-south intra-state truck travel and its potential impact on the 210 Freeway. The 210 Freeway is the ideal alternate route to the I-5 Freeway to avoid downtown Los Angeles.

20. Projects currently planned to expand truck capacity on the 710 Freeway will encourage more truck traffic through the 710 tunnel and onto the 210 Freeway. The traffic impacts from this increased usage of the 210 Freeway should have been considered.

21. The 2004 SCAG Regional Transportation Plan (RTP) identifies the I-210/SR-134/I-710 freeway as one of the two most congested areas in the southern California region in 2030 with implementation of the 710 gap closure. Without the closure, this interchange will NOT be one of the most congested areas in southern California. (<u>See</u> **Exhibit 4**, copies of color maps showing impacts with and without the Project, which were not included in the final April 2004 Regional Transportation Plan.)

22. <u>Traffic congestion is NOT mentioned as a possible significant impact of the tunnel. Therefore, no impacts or possible mitigation measures were identified for the City or other neighboring communities.</u> (P. ES-6, entire Chapter 8.)

VI. THE REPORT FAILS TO ANALYZE THE SIGNIFICANT AIR QUALITY IMPACTS THAT THE PROJECT WOULD CAUSE.

23. Since the Report fails to include any consideration of air pollution caused by increased traffic and trucks outside the study area, the Report cannot assume that air quality will be improved in neighboring cities. (Pp. 8-109, 11-157.)

24. The Report does not adequately consider localized impacts. The Project creates new pollution sources at the portals and ventilation stacks. Scrubber technology only removes particulates. It is our understanding that current technology does not allow removal of the other very significant and dangerous pollutants which will be concentrated at the locations of vent stacks and tunnel portals.

25. In 1998, the California Air Resources Board ("ARB") identified particulate matter from diesel-fueled engines (Diesel Particulate Matter or "DPM") as a Toxic Air Contaminant ("TAC"). Increases in particulate matter emissions from diesel trucks on the 210 and 134 Freeways through neighboring cities would cause a corresponding increase in the cancer risk along the freeways from exposure to DPM. Yet the Report is silent on this critical issue.

VII. THE REPORT FAILS TO ANALYZE THE SIGNIFICANT NOISE IMPACTS THAT THE PROJECT WOULD CAUSE.

26. The Report claims that there would not be increased noise on surrounding roadways, allegedly because additional traffic will slow down already congested freeways operating at capacity, thereby reducing noise. However, since portions of the 210 and 134 Freeways do not typically operate at capacity, noise impacts to communities adjacent to those freeway segments will significantly increase from the added traffic.

27. The analysis presented in the Report at Section 8.4.1 states: "Additional traffic that would be circulated to surrounding roadways (I-10, SR 134 and I-210) beyond the study area would not result in any increased noise at these locations." (P. 8-109). It is assumed that this conclusion is based on the FHWA/Caltrans noise criteria which are based on the peak hour traffic noise level. However, the statement erroneously assumes that the peak traffic hour volume is greater than the peak noise hour volume and that the percentage of trucks does not change due to the Project.

28. The increased traffic on the 210 Freeway would likely result in a redistribution of traffic and an increase in the CNEL noise levels along the freeway. As congestion increases on a freeway, it has been observed that

the morning commute period begins earlier as people begin their commute earlier to avoid the congestion. This can result in more trips occurring during the nighttime hours (10 P.M. to 7 A.M.). A nighttime trip generates as much noise as 10 daytime trips in the CNEL noise level. This often pushes the peak noise hour earlier and, in some cases, the peak noise hour occurs during the 5 A.M. or 6 A.M. hour. Along uncongested freeways, the peak noise hour occurs typically around 8 A.M. This often results in CNEL noise levels being higher than peak hour noise levels. The Report does not consider this issue.

29. There is no discussion of the potential noise impacts from material export haul trucks and other construction-related traffic during tunnel excavation. We believe that it is likely that a considerable portion of the material export haul trucks would utilize the 210 freeway. tunnel excavation is projected to occur over a multi-year period with 24-hour per day, five day per week operations. Such haul truck activity could result in a significant increase in noise, especially during the late night and early morning hours when background noise levels are low. The Report fails to consider this issue as well.

VIII. ADDITIONAL COMMENTS AND OBJECTIONS TO THE REPORT.

30. None of the cost estimates in the Report include the cost of mitigating any significant adverse impacts. In addition to the lack of funds included for mitigation, no costs have been included for, as stated in the Report: "land acquisition, environmental documentation, preliminary and final design, construction management, insurance and agencies/force account oversight and staff" or any type of toll facilities. Given these factors, the contingency of 15% is substantially inadequate, especially considering the many unknown factors that would significantly increase the cost of the Project. These costs will substantially increase the overall Project cost, possibly making it infeasible from a funding standpoint.

31. The MTA has said, and the Parsons-Brinckerhoff representative at the September 5, 2006 presentation implied, that the Federal Highway Administration ("FHWA") supports the Project. Yet the FHWA is on record as having rejected the prior EIR/EIS for the 710 gap closure and there is no evidence that the FHWA supports the current Project or could do so based upon the deficient and incomplete Report.

32. Mr. Doug Failing, Caltrans District 7 Director, stated at the September 5, 2006 presentation that trucks, if allowed in the tunnel, would not be a significant factor traveling north because the tunnel's grade would present a concern to trucks and, therefore, most trucks would prefer to use or remain on the I-5 Freeway. We respectfully question this statement. Many of the trucks currently using the I-5 Freeway are bound for the Grapevine which has a steeper grade than the tunnel would have.

33. A rail option to and from the ports could alleviate tunnel capacity problems and significantly reduce truck demand. A north/south rail corridor should be considered as an alternative or, at least, as a mitigation measure.

34. The Report bases its conclusion of physical and geotechnical feasibility largely on only three test borings. We question the geotechnical conclusions for a project of this magnitude based upon only three borings.

35. The Report contains broad conclusions that any and all environmental impacts of the Project can be mitigated. However, the issues have not been examined sufficiently to enable such a sweeping conclusion. Equally troubling, Project descriptions are often mischaracterized to try to downplay impacts. For example, the traffic impact on the 210 Freeway north of the proposed tunnel is described as being 2,500 cars per hour in the "peak direction." This minimizes the real increase perhaps by close to half (setting aside for the moment our further concerns about the accuracy of the underlying traffic counts and modeling). The Project is being described as easy to do – that it "only" costs $3 billion and the MTA can simply get that money out of the next infrastructure bond. The public is not being presented with an accurate picture of the Project.

36. There is no consideration of risks associated with terrorism. The tunnel, if built, will be 4.5 miles long with several thousand cars in it at a time. Unfortunately, this would be an attractive target for a potential terrorist attack. But, unlike large buildings in downtown Los Angeles where the trunks of cars are inspected, this will not be possible with the tunnel. The question as to whether the Project can be built and operated safely should have been discussed in the Report.

IX. CONCLUSION.

The Report states that its "objective has been to determine whether a tunnel solution would be feasible and worthy of further consideration so that the responsible agency(ies) may determine the next appropriate actions needed for closure of the Route 710 Gap in accordance with local, state and federal project development guidelines." (P. 1-4.) However, because the MTA did not study the environmental impacts to neighboring communities, including La Cañada Flintridge, South Pasadena, Pasadena, Glendale Altadena, La Crescenta and Burbank, the Report cannot fairly conclude that the Project is environmentally or financially "viable."

The Report fails in its stated purpose of ascertaining whether the tunnel concept is environmentally feasible and worthy of more technical consideration. It has also failed in its stated purpose of serving "as a technical foundation to allow decision-makers sufficient information to determine what appropriate actions should be initiated regarding the tunnel option."

In the absence of critical information regarding significant impacts and needed mitigation measures as identified above, the Report fails in its most basic purpose of serving as the "foundation to allow decision-makers sufficient information to determine what appropriate actions" should be pursued. Indeed, we addressed our environmental concerns two years ago in our September 2004 letter **(Exhibit 1)**, yet they were not considered in the Report. We are concerned that these significant traffic, air quality, human health, and noise issues are not being addressed openly and honestly.

Additionally, the Report's assertions that "the impacts or the severity of the impacts can be minimized, eliminated or mitigated using proven measures and techniques" are unsubstantiated by facts or analysis.

The Report is not a proper basis for the monumental decision to proceed with further studies, at taxpayer expense, on an option for the gap closure that has not been, even on a preliminary basis, shown to be environmentally or financially feasible.

The City Council of La Cañada Flintridge respectfully asserts that the Board does not have sufficient information on which to find that the tunnel option and Project are feasible based upon the information provided in the Report. Therefore, we request that the Board not find that the tunnel option is feasible based upon this Report. At a minimum, the Board should order the preparation of a new Report that performs the studies necessary to make the Report a proper foundation for deciding whether or not to proceed with more costly engineering, environmental or other studies.

Thank you for your consideration of our objections and comments.

Sincerely,
LA CAÑADA FLINTRIDGE CITY COUNCIL

Gregory C. Brown, Mayor

cc: The Honorable David A. Spence, Mayor Pro Tem
The Honorable Stephen A. Del Guercio, Councilmember
The Honorable Laura Olhasso, Councilmember
The Honorable Anthony J. Portantino, Councilmember
Mark R. Alexander, City Manager
Mark W. Steres, City Attorney
Roger Snoble, Chief Executive Officer, Metro
Mark A. Pisano, Executive Director, SCAG
Douglas Failing, Caltrans District 7 Director
The Honorable Mayor, City Councilmembers and the City Manager, City of Glendale
The Honorable Mayor, City Councilmembers and the City Manager, City of South Pasadena
The Honorable Mayor, City Councilmembers and the City Manager, City of Pasadena
The Honorable Mayor, City Councilmembers and the City Manager, City of Burbank
Altadena Town Council
La Crescenta Town Council
Dr. Rob McConnell, M.D., Professor of Preventative Medicine, USC

EXHIBIT 1

LA CAÑADA FLINTRIDGE

City Council

Laura Olhasso, Mayor
Anthony J. Portantino, Mayor Pro Tem
Gregory C. Brown
Stephen A. Del Guercio
David A. Spence

September 28, 2004

Mr. Roger Snoble, CEO
Metropolitan Transit Authority
One Gateway Plaza
Los Angeles, CA 90012-2952

Dear Mr. Snoble:

On behalf of the City Council, this letter reflects our comments on the proposed Route 710 Extension Tunnel Feasibility Technical Assessment Scope of Work as presented by MTA representatives Shahrzad Amiri, David Olivo and Helen Ortiz on September 7, 2004. The City Council was told that we would be allowed to submit comments through September 29, 2004 and would have them considered by MTA in reference to this Scope of Work. The City appreciates both the time spent on the presentation by MTA staff and the opportunity to comment on the Scope of Work and study.

First, let me say that we are disappointed and concerned that the MTA has declined to release the text of the Scope of Work to the City Council so that more in-depth comments could be made. It was our understanding and agreement with the MTA representatives present at the meeting that the City Council would be permitted to sign non-disclosure agreements and then would have the ability to review and comment on the Scope of Work. However, we are now told that this opportunity will not be afforded us. In light of this decision, I will convey the general sentiments as expressed by the City Council at the September 7th meeting:

1. MTA staff represented that this study is not intended, nor technically adequate, to fulfill the legal requirements necessary to assess the environmental impacts of the proposed tunnel. The nature of this study is "preliminary" only and will not examine the potential environmental impacts to La Cañada Flintridge. The City Council is opposed to the study as it is now constituted because any study that contemplates, even on a preliminary basis, the possible construction of infrastructure that might have a deleterious impact on the community is deficient if it does not study the full impacts of the project. The danger of conducting the study in this manner is that even if all of the items you intend to study have positive impacts, you will have failed to study those items and other items in depth that might cause the concept of the 710 Gap Closure, whether tunneled or not, to be stalled. This means that you will have expended funds on a meaningless and incomplete study, only to be compelled to expend more funds in the future if your "preliminary" study suggests that the project should move forward. Similarly, the

study does not analyze the overall costs and benefits of the 710 extension in terms of current conditions, nor does it evaluate the impact of the interim highway improvement measures – all of the foregoing being issues raised by the Federal Highway Administration in its December 17, 2003 letter withdrawing its approval of the 710 extension. Unless this more basic and comprehensive analysis is completed, the tunnel feasibility study is putting the "cart in front of the donkey" and is a waste of taxpayer dollars.

2. The cost of the 710 Gap Closure project is expected to be far beyond the foreseeable funding means of either the Federal and/or State Government. The Environmental Re-evaluation, issued by the FHWA in December 2003, cites "continued uncertainty regarding the financing of this project..." as one of the reasons that an SEIS and new Record of Decision are now required. It is premature to conduct any more studies until funds become available for this very expensive project that lacks benefit to any of the residents of La Cañada Flintridge. The City is strongly opposed to diverting any regional funding for this project, when it is so desperately needed for other transportation-related projects.

3. We have already been told by MTA that the proposed study will not be definitive. The City Council is very concerned that your primary focus -- geotechnical and seismic -- does not adequately address mitigation measures on impacts that will surely affect the residents of La Cañada Flintridge.

4. MTA staff has indicated that only one route (from the I-10 to the I-210) is being studied. We believe that there are other viable alignments for the tunnel in need of study. Any conclusion reached by this study without considering alternative routes will be inconclusive and should not be considered as "definitive." The Federal Highway Administration has concluded that the route you are studying does not have sufficient validation to continue in the environmental planning process. Therefore, it is very necessary to consider other routes, even on a "preliminary" basis.

We request that any study you pursue include, but not be limited to, a complete and thorough analysis (not just a preliminary review) of:

- traffic;
- noise (including the impact with and without trucks);
- air quality (including a review of the potential physical impacts on our residents, and school children, over the long term, e.g. cancer, asthma, emphysema and other diseases);
- real estate values (including a full study of homes potentially impacted by freeway noise; not just homes that are proximate to the freeway.); and
- other alternative routes for the tunnel.

The City Council appreciates the opportunity to input on this very serious matter. We also understand our obligation to protect the health and welfare of our residents, to encourage governmental fiscal responsibility, and to ensure fair, equitable and responsible governance for our constituents. An incomplete study that costs taxpayers large sums of monies, does not arrive at definitive answers to issues that impact our residents and does not consider the equitable distribution of burdens, is flawed and should not be pursued in its inadequate state.

As such, we request that you reconsider your decision to issue the Route 710 Extension Tunnel Feasibility Technical Assessment Scope of Work.

Again, thank you for this opportunity to provide our comments.

Sincerely,

Laura Olhasso
Mayor

cc: City Council, City of La Cañada Flintridge
Mark R. Alexander, City Manager, City of La Cañada Flintridge
Mark W. Steres, City Attorney, City of La Cañada Flintridge
City Council, City of South Pasadena
Gaye Forbes, Acting City Manager, City of South Pasadena
Shahrzad Amiri, MTA
David Olivo, MTA
Helen Ortiz, MTA

EXHIBIT 2

USC
UNIVERSITY
OF SOUTHERN
CALIFORNIA

Keck School of Medicine
University of Southern California

Division of
Environmental Health

Department of
Preventive Medicine

August 23, 2006

To Whom It May Concern:

We have reviewed the Route 710 Tunnel Technical Feasibility Assessment Report (1) by Parsons Brinckerhoff submitted to the MTA (Metro) on June 7, 2006. We (Dr. Rob McConnell and Ms. Andrea Hricko) submit these comments in our roles as professor of preventive medicine and associate professor of preventive medicine, respectively, at the University of Southern California's Keck School of Medicine. Ms. Hricko directs the community outreach and education program of the Southern California Environmental Health Sciences Center. Dr. McConnell is co-investigator in the southern California Children's Health Study, and is a project director in the Children's Environmental Health Center. These large studies of children in California have been designed to assess effects of air pollution on children's respiratory health. They are supported by the National Institutes of Health, the U.S. Environmental Protection Agency, the South Coast Air Quality Management District and the California Air Resources Board. The studies constitute part of a larger collaborative effort involving multiple investigators at USC and UCLA with expertise in exposure assessment, toxicology, and clinical evaluations that have identified new risks of air pollution. This major scientific effort has contributed (and continues to contribute) to the development of new regulatory policy. This preliminary review was conducted in response to a request to our center from the City of La Cañada Flintridge.

We are restricting our comments primarily to the Report's evaluation of the potential air quality and health impacts of the I-710 extension and comments in the report about mitigation strategies. The Report is described as neither "comprehensive nor exhaustive in scope" but is intended to "allow decision-makers sufficient information to determine what appropriate actions should be initiated regarding the tunnel option" (page 3). Nevertheless, it is remarkable that the impact of the proposed project on air quality and health effects combined are dealt with in approximately three pages in this 164-page report with an additional 136 pages of figures and tables. The key health question that the Report suggests should be addressed is whether there will be local increases in regulated pollutants that will exceed the current regulatory standard. This approach, if accepted by decision-makers and other stakeholders in the project, may substantially underestimate the health impact on affected communities. We suggest two important additional questions that are relevant to the health impact of the proposed I-710 extension:

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1) What is the potential impact of increases in regulated pollutants like particulate matter, oxides of nitrogen, and other regulated pollutants, regardless of whether the increases exceed the standards that would constitute a regulatory violation? In non-technical language: Is air quality going to get better or worse as a result of this freeway extension, and what will be the health consequences?

The 12-community southern California Children's Health Study found that a group of pollutants (including fine particulate matter small enough to be inhaled and oxides of nitrogen) was associated with slower growth in lung function and with higher rates of clinically abnormal lung function at the time of high school graduation (2). This effect on children is important for adult health, because lung function is a strong predictor of debilitating lung disease and mortality in later adult life (3). In addition, other recent studies have shown that particulate pollution is associated with increased mortality from cardiovascular disease and lung cancer in adults (4-7). Many of these studies have been done on children and adults breathing the air in southern California. None of them indicates that effects occur only above the current regulatory standard. Therefore, an important step in evaluating the potential impact of the I-710 extension on affected communities would be to estimate the amount that local particulate pollution and NO_2 might be expected to increase above current levels, not just whether the increase would exceed current regulatory standards, as well as what the resultant health effects of this increase would be.

We have not addressed the impact of the project on regional air pollution. Relatively small increases (or decreases) in regional air pollution potentially could have large public health impacts, because the effects could be spread over a much larger population further downwind from the project.

2) What is the impact of increases in local traffic-related pollutants which are not currently regulated?

There is an emerging scientific consensus that residential or school proximity to major traffic corridors is associated with respiratory impairment in children and in adults. Dozens of studies conducted in Europe and Japan over the past 15 years have shown increases in asthma and allergy or decreases in lung function, especially among children, living close to busy roadways (8). Our group at USC has recently published results from two separate groups of children participating in the Children's Health Study, which have found that residential proximity to freeways (9) and to other major roadways (10) were associated with increased rates of asthma. Another large study of schools in northern California found higher rates of asthma in schools close to freeways, even in areas with relatively low levels of regulated pollutants (11). The exact pollutants responsible for these effects have not been identified, although evidence from toxicological studies conducted at UCLA and elsewhere suggests that ultrafine particles present in high concentration in vehicular exhaust, especially diesel emissions from trucks, may play a role in the development of asthma (12). Based on these new scientific findings, there is now state legislation in place requiring that no new schools be built within 500 feet of a freeway with certain levels of traffic (13). This might be considered a minimum buffer zone between the heaviest traffic corridors and schools, as there is evidence that exposure to toxic ultrafine particles and health effects observed in southern California may extend further from large freeways (9, 14).

As yet, there are no regulatory requirements that limit the construction of transportation corridors like the I-710 extension in close proximity to residential areas or to schools. The California school siting legislation, and land use guidelines developed by the State of California's Air Resource Board (15), however, make it clear that there should be at least a 500 foot buffer zone between busy roads and homes/schools. In addition, any increase in traffic on secondary roads feeding the extended I-710 and the increase in truck and automobile traffic on the I-210 freeway resulting from the proposed I-710 extension would increase the exposure of the surrounding communities to vehicular pollutants that may cause asthma and other respiratory disease. There are several schools within 500 feet of the I-210 freeway in La Cañada Flintridge, and the Report notes that there are schools, playgrounds, and residences in close proximity to the proposed route. The impact of the project on traffic volume and proximity to these locations merits careful consideration. Because asthma is the most common chronic disease of children, the health impacts of additional pollutant exposure to this population may be large.

Mitigation of health effects: The Report makes a number of unsubstantiated assumptions concerning the ability to mitigate health impacts of the proposed project. For example, on page 8-112, the Report states that noise and air quality impacts will occur. It goes on to state: "However the severity of these impacts can be minimized, eliminated or mitigated." Because the health effects have not been accurately identified, and the proposed mitigation measures have not been well specified, this conclusion is not supported. Furthermore, the report states on page 8-107 that ventilation shafts have potential for concentrating air pollutants on nearby receptors and that "scrubbers" are sometimes used in other countries as a "result of circumstances that do not exist in the United States such as a high percentage of diesel vehicles in the vehicular fleet". This statement appears to ignore the fact that the I-710 Freeway south of SR-60 has a vehicle fleet that is greater than 20% heavy duty diesel trucks going to and from the ports, compared to an average daily truck percentage of 6 to 13 percent on similar freeways in Los Angeles County (16). Moreover, this 18-mile stretch of freeway is slated to be expanded to accommodate at least a doubling of trucks from the ports by 2020. An unknown number of these trucks will continue north if the I-710 were to be extended via a tunnel, and these numbers are not estimated in the current Route 710 Feasibility Report. A full consideration of available technology to reduce the health impacts from carcinogenic diesel exhaust particulate resulting from big-rig truck traffic is warranted.

In summary, a complete assessment of the potential health impact of the proposed I-710 extension would attempt to estimate, at least qualitatively, the impact on the burden of disease associated with asthma and other respiratory illness, lung function, and perhaps on overall mortality from changes in air quality and traffic.

Sincerely,

Rob McConnell MD

Andrea Hricko

Rob McConnell, MD

Andrea Hricko, MPH

REFERENCES

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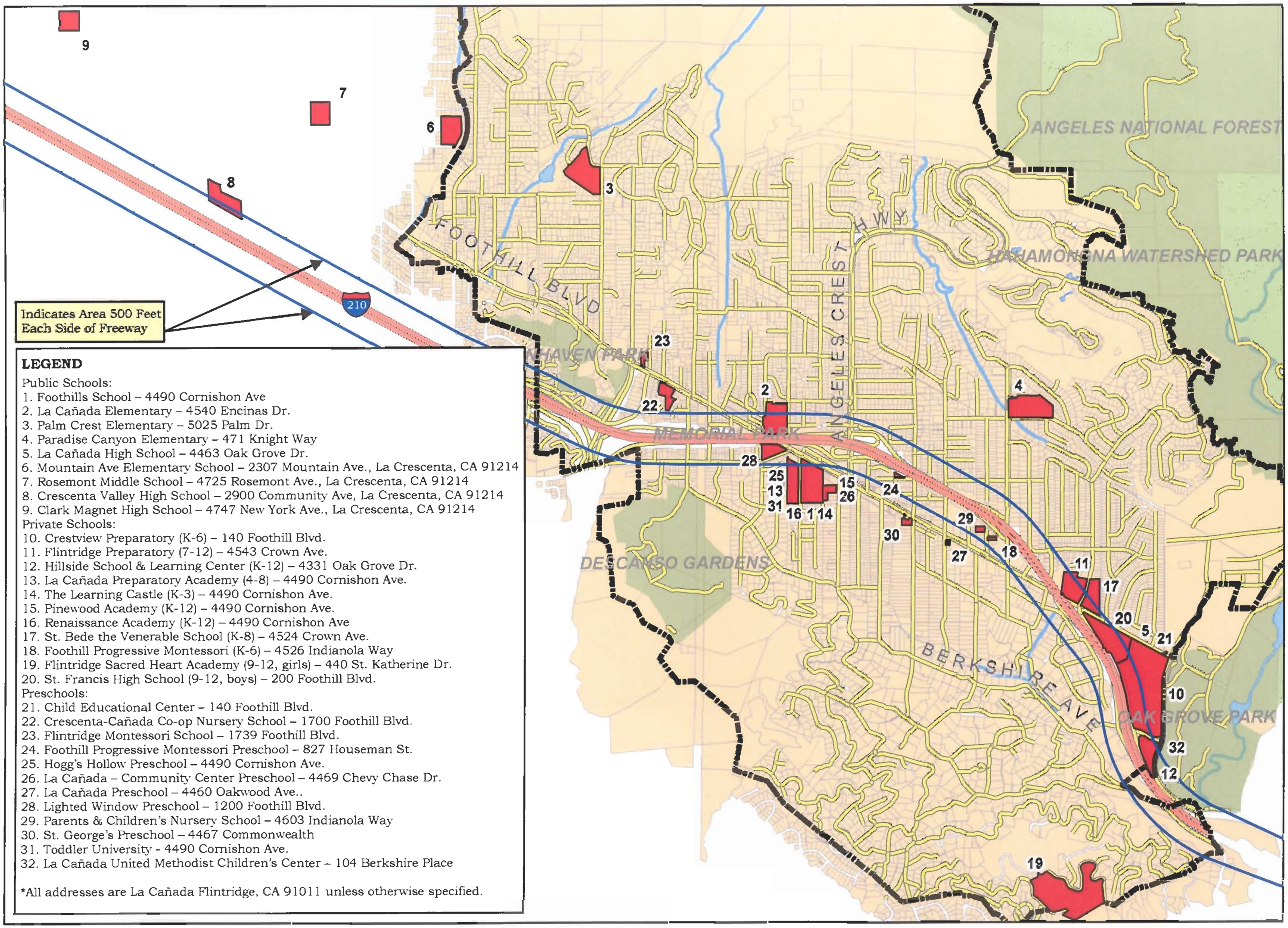
EXHIBIT 3



La Cañada Flintridge Schools

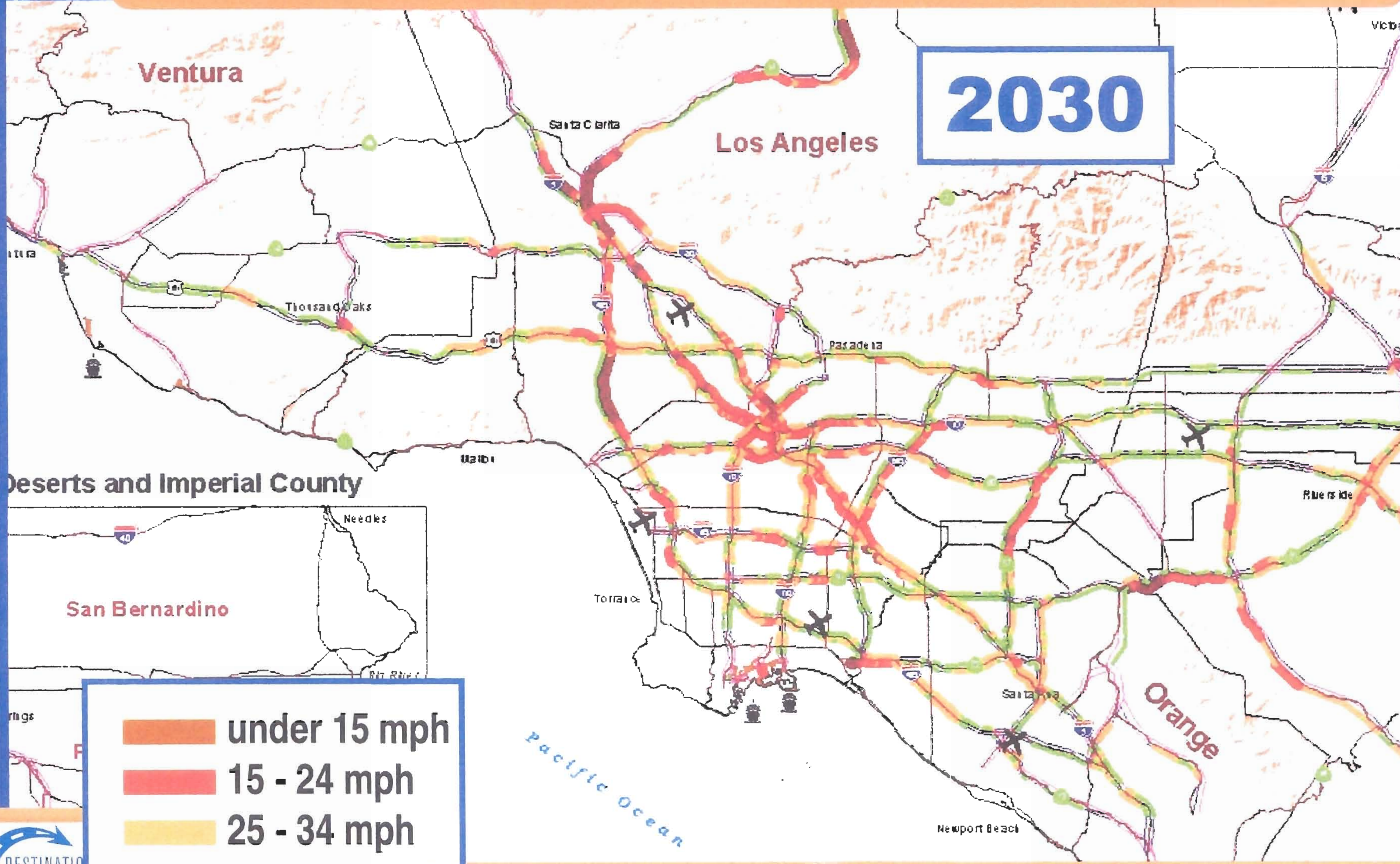
Prepared by the Community Development Department

1" = 1/2 mi

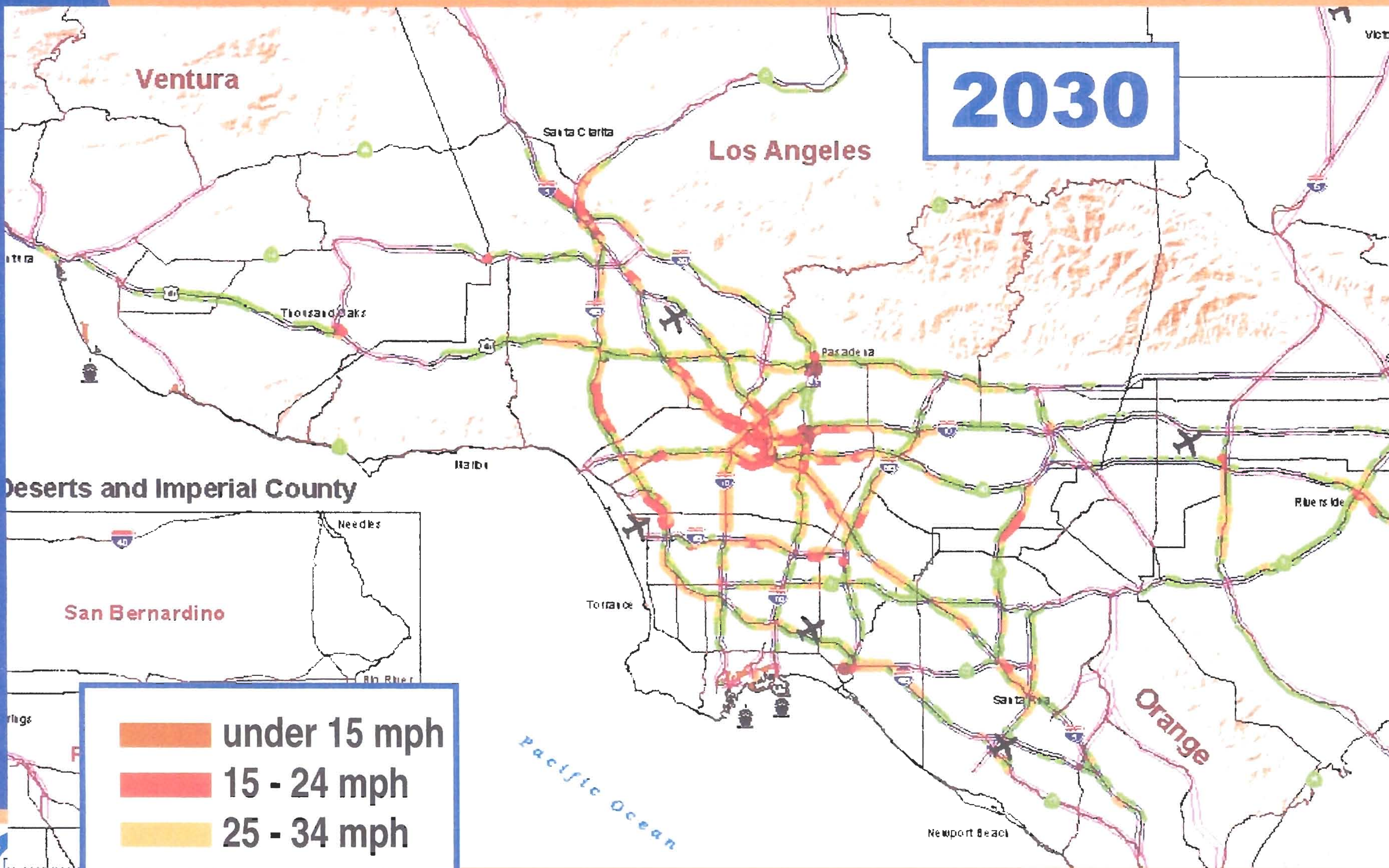
N

EXHIBIT 4

Peak PM Freeway Speed (No Plan)



Peak PM Freeway Speed (With Plan)



The 2004 SCAG Regional Transportation Plan

Concerned Neighbors of El Sereno
Transportation Advisory Committee
MTA Route 710 Tunnel
Technical Feasibility Assessment Report Comments

Concerned Neighbors of El Sereno is a group of residents that advocate on behalf of the community of El Sereno to ensure their welfare and quality of life is preserved and maintained..

Transportation Advisory Committee Members
All members currently reside in the Emery Park neighborhood of El Sereno. The founders of Concerned Neighbors of El Sereno are:

- Sal Vidaurri Jr., Principal Mechanical Design Engineer, 13-year resident
- Val Marquez, Principal, Val's Design Studio, 33-year resident
- Pam Marquez, Retired Banker, 33-year resident

Transportation Committee Objectives
Members will review the project's merits and affects on the impacted communities of Emery Park and Sierra Park in El Sereno.

Community Involvement
The Metropolitan Transportation Authority's initial outreach plan for the feasibility study included holding meetings in the following cities: Alhambra, La Canada Flintridge, Pasadena, San Marino, and South Pasadena. However, it should be duly noted that the residents of Emery Park in Los Angeles initially were not informed about the project until Concerned Neighbors of El Sereno attended the Pasadena meeting and insisted that MTA hold a meeting in the Los Angeles neighborhood that would be most affected by the tunnel.

MTA did little to publicize the meeting and used CNES' limited membership list to send out invitations. Only then did a few residents have an opportunity to attend a meeting to learn about this study. Even though CNES made suggestions about using a nearby location and format of the meeting that would maximize the opportunity for community involvement, MTA decided to hold the meeting at an inconvenient location away from the project's route and in a venue that had little parking available. Additionally, the format of the meeting did not allow for residents to verbalize their concerns for themselves as was promised.

The Proposed Tunnel
CNES recognizes the importance of the project and its effects on current and future transportation needs. Given all of the proposals that have been put forth for the past 45 years to close the gap between the 710 and 210 freeways, the tunnel concept has a potential to be the least intrusive to the community at large and the most amendable to the surrounding cities – if done properly and with the community's best interest foremost in mind.

Concerned Neighbors of El Sereno welcomes the opportunity to respond to the proposal and would like to note the following concerns and suggestions:

- **A tunnel of this scope** (4.5 miles, 60 feet in diameter) **has never been constructed** in the United States. Our understanding is that currently the technology (boring equipment) does not exist to construct a tunnel of this size and distance. How will we know that the technology used on this site will suffice? How will this affect the cost of construction due the cost of purchasing technology that does not exist?
- **The tunnel project in Boston** is plagued with severe design and environmental flaws that has caused death and/or health problems to residents. In the case of the "Big Dig," the project is extremely over budget and behind schedule. Bostonians have had to live with twelve years of construction and the project is still not complete. The estimated timeline for the 710 project is approximately nine to twelve years and the budget is \$2.3-\$3.6 billion in 2006 dollars. How can we be sure that this project will not fall prey to these same problems? What assurance do we have that lessons learned from prior projects will be implemented?
- **The project estimates that six million cubic yards** of bulk material will need to be excavated and displaced. This "unprecedented undertaking" will increase the amount of air and noise pollution and traffic due to an increase in dust and diesel truck exhaust around the portals.
- **The proposed Southern tunnel portal location** will deeply affect the community's health and well-being. The portal location will require the closure of one of the two main entrances from the east to El Sereno forcing traffic through residential streets. The current southern portal location will also require the acquisition of businesses and homes.
- **Other tunnel projects such as in Sydney, Australia** have raised concerns about increases in asthma and cancer rates for the residents near portals.
    - In seven instances between May 2003 and June 2004 emissions from the tunnel were expelled through the entrance and exit to the tunnel, despite a design condition that all emissions must be via the stacks.
    - Mark Curran, of Residents against Polluting Stacks, said preventing emissions from the portals was vital. " If you go to the trouble of building a stack to disperse the emissions and then you blow them out the portal at ground level near houses, you're not doing your job," he said.
- **Provide information on studies from other tunnel projects** measuring simultaneous particulate matter contamination emanation at both portholes.
- **While ventilation towers are planned** at various points to aerate the tunnel, vehicle exhaust from the high volume of cars passing through the portal will be emitted at

street level. There are no plans to filtrate the air around the portals or within the tunnel.

- **The budget for this project includes scrubbers that are currently not able** to filter the air for all contaminants. The budget should cover the proposed cost of a state-of-the-art filtering and ventilation system to allow for clean air.
- **Given that the technology does not currently exist** for this aspect of the project, how was it taken into account when creating the budget? Should tax payers not be able to decide how much money should be spent on a filtration system?
- **While the plan states that emergency exits** will be built every 600 feet, where will they be located and how will they be secured?
- **Currently traffic on the 134 and 210 freeways is gridlocked** during peak hours to Claremont. How is it that increasing traffic to 300,000 cars per day going to alleviate traffic? Are there current traffic studies that conclude that this connection would truly mitigate traffic?

Considering that this construction project could be ongoing for at least 9-12 years or more, it is vital to the affected communities that the construction sites be located in an area that have no street or pedestrian traffic. Project studied must have the same consideration for the L.A. residents as for those in other affected areas, such as the north portal in Pasadena.

CNES hereby recommends that the Southern portal be moved between Valley Boulevard and the 10 Freeway away from any residential neighborhood. This would also eliminate the need to build a bridge for Southern Pacific Rail Lines, Mission Road, and Valley Boulevard and ensure the quality of life for the El Sereno community.

Mayor Antonio Villaraigosa has said we need to preserve open space. If planned properly, this can allow our community to add an additional 20 acres of open space, that can be used as a park. El Sereno has one park and it is located miles away from the Emery Park community.

Councilmember Jose Huizar stated that the preservation and expansion of Open Space in El Sereno is a priority, accordingly Councilmember Huizar will insist the community weigh-in on the final decision of the location of the south portal of the 710 Tunnel study. The placement of the south portal should include the areas south of Valley Blvd. in the 710 FWY Tunnel configurations. The Community's voice will be an essential factor in making a decision that will impact generations of people living and working in El Sereno.

Alhambra, South Pasadena, Adelante Project Area Committee, have all recommended, and Concerned Neighbors of El Sereno concurs that the portal must not be built in the current proposed location, but be moved to a uninhabited area, south of Valley Blvd. and north of the I10 Freeway.

Additionally, it is imperative that the residents of Los Angeles' El Sereno area be treated with the same level of concern and respect as the residents of Pasadena and adjacent cities when projects are planned that affect our community. We have a voice despite our invisible elected officials.

Furthermore, there are only 2 main arteries into El Sereno, Alhambra Avenue and Huntington Drive. It is imperative that there is no disruption to the usage of these arteries to residents and businesses. This will devastate the residential and small business community and shut down the only 2 main arteries for entry from the east into El Sereno.

Although CNES concurs that the tunnel option is the most viable that has been proposed thus far, the MTA study in its present form leaves much to be desired. CNES will at this time state that the technical aspects of the Tunnel Study are potentially feasible and look forward to seeing a more comprehensive study that includes the following:

- Sufficient outreach to the El Sereno Community
- Relocation of the southern porthole with consideration for the El Sereno Community – as was done for Pasadena
- Open space for parks for our community
- Better technology for ventilation scrubbers
- Traffic studies that address the additional traffic funneled to the 134 and 210 freeways
- Address security and emergency exit measures
- And other issues addressed above or known to MTA, CalTrans and not mentioned in this document.

CNES will also reserve formal concurrence to the environmental feasibility of this project, since a task of this magnitude, without the in-depth environmental analysis required, cannot be promoted to the next step. Further, thorough investigations on the community impacts with regards to noise, air, health and overall quality of life issues must be addressed.

Yours truly,

Val Marquez
Concerned Neighbors of El Sereno

RESOLUTION NO. R2M6-35

A RESOLUTION OF THE ALHAMBRA CITY COUNCIL ENDORSING THE 710 TUNNEL TECHNICAL FEASIBILITY ASSESSMENT

WHEREAS, the City of Alhambra strongly supports the expansion and improvement of the Southern California transportation network which, despite important improvements, remains overwhelmed by the majority of regional trips; and,

WHEREAS, the Interstate 710 Freeway serves as a major north-south link in the Los Angeles County transportation network; and,

WHEREAS, all regional transportation agencies have identified the 710 Freeway Gap Closure Project north of Interstate 10 as a critical missing link in the basic Southern California highway network that would deliver nationally and regionally significant highway and arterial street congestion relief and enhance air quality; and,

WHEREAS, the failure to close the 710 gap, which terminates at Valley Boulevard thereby dumping traffic onto Alhambra's streets, continues to endanger the lives and safety of Alhambra's residents, congests our streets, adversely impacts our schools, poses a very real threat to the health, safety and welfare of our residents, especially the children, the ill, and our seniors, and negatively affects our property values; and,

WHEREAS, over the past 40 years alternatives have been proposed and evaluated to complete the 710 freeway and close the 4.5 mile gap in the corridor; and,

WHEREAS, the Los Angeles Metropolitan Transit Authority (MTA) and the California Department of Transportation (Caltrans) have taken the initiative to conduct a technical assessment to evaluate the feasibility of constructing a tunnel to complete the 710 freeway between Valley Boulevard (Alhambra) and Del Mar Boulevard (Pasadena); and,

WHEREAS, such *710 Tunnel Technical Feasibility Assessment Report* has determined the tunnel concept is technically viable and merits a comprehensive study that will advance the construction of the 710 tunnel project;

NOW, THEREFORE, BE IT RESOLVED by the Alhambra City Council that the **CITY OF ALHAMBRA hereby STRONGLY SUPPORTS**

1, The closure of the Interstate 710 Freeway,
2. The findings of the *710 Tunnel Technical Feasibility Assessment Report* prepared by Parsons Brinckerhoff and sponsored by MTA and Caltrans, and

3. The efforts of MTA and Caltrans to advance to the next stage of the tunnel assessment to further validate its findings and pursue the completion of the 710 freeway, which stage includes preparing a supplemental amendment to the 710 gap closure environmental impact report that adds the tunnel as a physically and environmentally feasible alternative; and,

BE IT FURTHER RESOLVED by the Alhambra City Council thast this Council hereby directs the City Clerk to certify to the adoption of this Resolution and to send copies thereof to our Federal and State Legislators, MTA, Caltrans, the Federal Highway Administration (FHWA), the Southern California Association of Governments (SCAG), the San Gabriel Valley Council of Governments (SCGCOG) and the cities of Los Angeles, South Pasadena, San Marino, Pasadena, and Monterey Park.

SIGNED AND APPROVED this 23rd day of October, 2006.

/s/ Mark R. Paulson
MARK R. PAULSON, Mayor

ATTEST:

/s/ Frances A. Moore
FRANCES A. MOORE, City Clerk

I HEREBY CERTIFY that the above and foregoing resolution was duly passed and adopted by the Alhambra City Council at its regular meeting held on the 23rd day of October, 2006, by the following vote, to wit:

AYES: ARGUELLO, YAMAUCHI, PLACIDO, TALBOT, PAULSON
NOES: NONE
ABSENT: NONE

/s/ Frances A. Moore
FRANCES A. MOORE, City Clerk

SOUTHERN CALIFORNIA

ASSOCIATION of GOVERNMENTS

Main Office

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Los Angeles, California

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RESOLUTION NO. 06-478-2
SOUTHERN CALIFORNIA ASSOCIATION OF GOVERNMENTS

RESOLUTION OF SUPPORT FOR CONTINUED STUDY OF TUNNEL OPTIONS TO COMPLETE THE 710 GAP CLOSURE

WHEREAS, the Southern California Association of Governments (SCAG) 2004 Regional Transportation Plan recognizes the need for and includes the Route 710 Gap Closure between Valley Blvd, in the City of Los Angeles and California Blvd. in the City of Pasadena; and

WHEREAS, the Los Angeles County Metropolitan Transportation Authority (LACMTA) recently completed a study that determined that, subject to further analysis through an environmental process, a tunnel is a viable design option for the completion on the 710 Gap Closure; and

WHEREAS, SCAG participated in the study of the 710 Gap Closure tunnel options, along with Caltrans, the City of Alhambra, the City of La Canada-Flintridge, the City of Los Angeles, the City of Pasadena, the City of San Marino, and the City of South Pasadena; and

WHEREAS, all cities in the proposed Route 710 Extension corridor support a sound analysis of the full-bore tunnel option, as an option capable of attaining consensus among the corridor cities, and state and regional transportation agencies; and

WHEREAS, SCAG encourages the use of innovative planning options capable of attaining consensus; and

WHEREAS, SCAG will continue to support and participate in the analysis of the tunnel alternatives as a means of completing the Gap Closure identified in the 2004 Regional Transportation Plan; and

NOW, THEREFORE, BE IT RESOLVED that the Regional Council recognizes the significant technical progress in the 710 Tunnel Feasibility Study and finds and declares that in developing the 2007 Regional Transportation Plan the full-bore tunnel option should be considered in planning the 710 Gap Closure, subject to the appropriate and required environmental review; and

NOW, THEREFORE, BE IT FURTHER RESOLVED that the Executive Director shall present to the Regional Council for consideration such amendments and/or changes to the 2004 and/or subsequent Regional Transportation Plans as may be appropriate to effectuate this Resolution.

RESOLUTION NO. 06-478-2

YVONNE BURKE, President
Supervisor, County of Los Angeles

Mark Pisano, Secretary to Regional Council

Attest:

Legal Counsel

DOCS #125822v1

CITIZENS UNITED TO SAVE SOUTH PASADENA
1502 FREMONT AVENUE
SOUTH PASADENA, CA 91030
PHONE: 626 799-2876 EMAIL: NO710@SBCGLOBAL.NET

Citizens United to Save South Pasadena is a grass-roots organization formed to protect the integrity of South Pasadena and preserve the quality of life here. We oppose the extension of the Long Beach 710 Freeway and actively support solutions to local and regional transportation problems with non-freeway alternatives.

October 24, 2006

To: Carol Inge, Chief Planning Officer, MTA

From: Citizens United to Save South Pasadena

Enclosed is Citizens United to Save South Pasadena's official response to the Route 710 Tunnel Technical Feasibility Assessment Report for inclusion in your final Report.

It is clear that the purpose of the Report was to:

1. Weaken the opposition to the 710 freeway extension;
2. Find the tunnel alternative feasible with or without a factual basis;
3. Provide momentum for policy makers to become invested in the project;
4. Move the process forward before any major obstacles were raised.

The LAMTA wasted taxpayer funds by failing to produce sound research. The Report should have looked at all possible alignments and considered the possibility that the tunnel might not be feasible.

We oppose any further study of a tunnel alternative because of the numerous and substantial surface impacts to all the corridor cities.

Citizens United to Save South Pasadena

1502 Fremont Ave.
South Pasadena, CA 91030
Email: NO710@sbcglobal.net

RECEIVED

SEP 1 1 2006

SOUTH PASADENA
CITY CLERKS OFFICE

September 10, 2006

Honorable Mayor Philip Putnam and City Councilmembers:

Enclosed is Citizens United to Save South Pasadena official response to the Route 710 Tunnel Technical Feasibility Assessment Report.

It is clear that the purpose of the Report was to:

1. Weaken the City's opposition to the 710 Freeway extension;
2. Find the tunnel alternative feasible with or without a factual basis;
3. Provide momentum for policy makers to become invested into the project;
4. Move the process forward before any major obstacles were raised.

The MTA wasted taxpayer funds by failing to produce sound research. It turns out to be only a conceptual report with conclusions drawn with inadequate study. It should have looked at all possible alignments and considered the possibility the tunnel might not be feasible.

The MTA was responsible for funding a legitimate study. Therefore they cannot argue, after the fact, the study did not have the scope or funding to make findings on major impacts.

The pattern of bait and switch is clear. The City of South Pasadena was promised a sound technical feasibility report and was given a concept paper. Citizens United to Save South Pasadena respectfully presents this response with the recommendation that the City withdraws any support for future studies. The time has come to forcefully say "NO".

On behalf of the Executive Board
Citizens United to Save South Pasadena

Diana Stoney

Diana Stoney,
Secretary

cc: Council
CM
[illegible] / Planning / SAC 710 / PW / Trans Comm / [illegible]

Citizens United to Save South Pasadena

1502 Fremont Ave.
South Pasadena, CA 91030
Email: NO710@sbcglobal.net

CREDENTIALS:

Citizens United to Save South Pasadena has the expertise to evaluate the Route 710 Tunnel Technical Feasibility Assessment Report based upon the following experience of its membership:

- Thirty-four years studying and evaluating every Draft/Final Environmental Impact Statement/Report prepared on the 710 freeway extension since 1972;
- Attendance at every 710 mitigation meeting held in 1992-1993;
- Attendance at numerous meetings of California Transportation Commission, California Division of Highways (now Caltrans), Southern California Association of Governments and LA County Transportation Commission (now LA County MTA) since 1964;
- Numerous meetings with local officials, state and federal officials in Sacramento and Washington DC;
- Our membership includes many former mayors and councilmembers of the City of South Pasadena;
- Many members have served multiple terms on the South Pasadena Transportation Commission;
- Attendance at numerous transportation seminars.

MISSION STATEMENT:
Citizens United to Save South Pasadena is a grass-roots organization formed to protect the integrity of South Pasadena and preserve the quality of life here. We oppose the extension of the Long Beach 710 Freeway and actively support solutions to local and regional transportation problems with non-freeway alternatives.

September 10, 2006

CITIZENS UNITED TO SAVE SOUTH PASADENA OFFICIAL RESPONSE TO THE ROUTE 710 TUNNEL TECHNICAL FEASIBILITY ASSESSMENT REPORT

Resolution 6746, Section 2, adopted June 4, 2003:

> "The South Pasadena City Council does not oppose sound research of a bored tunnel alternative to the construction of a surface freeway in a proposed route 710 corridors. The ultimate position of the South Pasadena City Council will depend on the integrity of the research to enable assessment of a bored tunnel alternative's benefits and costs, both social and fiscal, which a bored tunnel alternative might produce; with the proviso that this statement does nothing to compromise the litigation in place, and does not waive any future rights."

Three years later the Route 710 Tunnel Technical Feasibility Assessment Report (the "Report") has been completed and presented for comment. This Report fails every requirement of Resolution 6746 in that it does not provide **sound research**. The research provided in the Report does not have the integrity to enable assessment of a bored tunnel alternative's benefits and costs, both social and fiscal. **The Report fails in every measure of a sound study into the feasibility of a 710 tunnel alternative. The omissions and unsubstantiated conclusions are a gross violation of process with the transparent purpose of reaching a predetermined conclusion of feasibility for the purpose to move the project forward.**

PURPOSE AND NEED: Every freeway project requires a purpose and need assessment. Nowhere does the Report show how building a freeway through a full bore tunnel without ingress or egress for a six mile section could relieve local surface traffic. Nor does it address how adding an additional 300,000 vehicle trips a day through the tunnel would relieve local or regional traffic congestion.

The Record of Decision (ROD) by the Federal Highway Administration for the 1992 Environmental Impact Report (EIR) was withdrawn. The Notice of Determination (NOD), issued by the State of California, was also withdrawn. Currently there is no approved Route 710 project with an Environmental Impact Report/Statement. Therefore, without an approved EIR, the 710 Freeway extension cannot be listed on the Regional Transportation Plan (RTP), which sets priorities for transportation funding over the next 20 years. Currently there is no approved 710 Freeway extension project.

COST: The Draft 1992 Route 710 Environmental Impact Report dismissed a tunnel alternative. California State engineers, as credentialed experts, reported to the Federal Highway Administration that excessive costs rendered the tunnel alternative not feasible.

This conclusion was not addressed in the Report. The Report failed its own criteria, outlined on page 3 of the Executive Summary, by not considering the cost of planning, design, engineering, project management, property acquisition, and on-going operations and maintenance. The cost estimates in the Report range from \$3.6 billion to \$4.6 billion in 2006 dollars to \$5.5 billion in the year of expenditure dollar. This mega project could actually exceed \$10 billion based upon expert testimony related to cost comparisons of a tunnel to a surface freeway.

Construction Costs: The Report makes a statement that the tunnel construction cost will be \$3 billion, but then notes that major cost elements are not included in the estimate. The cost of construction will be impacted by the geological conditions that are encountered, including soil, seismic and water conditions. The report admits that inadequate study has been completed to draw conclusions. The estimated cost of construction is materially flawed.

Planning and Engineering Costs: The Report is presented as a "Technical Feasibility Assessment". This proposed tunnel project is of unprecedented size and complexity. The egregious cost omissions of design, engineering, project management, land acquisition, and environmental mitigation renders the technical feasibility assessment invalid.

The Big Dig was projected to cost \$2.6 billion, finished for \$14.6 billion, but will require additional billions to fix falling ceiling slabs to ensure the safety of motorists. In the wake of the "Big Dig", how can we take seriously a report that excludes these costs in a feasibility assessment of a tunnel with the length, volume, and complexity never before attempted?

Safety Costs: The Report provides no cost assessment for safety and access of first responders. In case of an incident in the tunnel, surface access is only available through the portals or by stairs 150 feet high every 3,300 feet at the venting towers.

The Report states that smoke release hatches are provided at a minimum spacing of every 1300 feet (approximately 28 to 34 hatches). The smoke release hatches will be used to vent smoke/hazardous fumes from the tunnels in case of major incidents.

- On whose properties will these hatches be located?
- What are the costs?
- What are the size and heights?
- What are the construction impacts on the surface?
- What are the costs to the City to prepare an evacuation plan of the impacted residential neighborhoods?
- What are the evacuation costs to the School District?

The American with Disabilities Act is totally ignored; there are no provisions for the disabled. If there are not going to be adequate provisions to reach stranded/disabled motorists in case of hazardous incidents in the tunnel, it would be appropriate to know how cost feasibility is measured in loss of life. Hazardous incidents will occur and are a known risk factor that is not adequately addressed in this assessment.

Operational/Security Costs: The operational costs to maintain a tunnel are different from the costs to maintain a surface freeway. No consideration is given to the on-going cost of operation. The report mentions that the tunnel will be monitored by security cameras, but does not say what the cost will be to monitor the cameras. A tunnel of this size automatically becomes a target for terrorist attack. **While no one should expect published details of how the tunnel would be secured, it is an egregious omission to estimate the costs of the tunnel while ignoring the cost to secure it.** The costs to the City of South Pasadena to meet its responsibility for fire personnel and equipment to respond to incidents are not addressed.

Tax and Property Costs: The financial section of the Report assumes multiple law changes, passage of bonds and the sale of properties, while ignoring the impact on properties and tax revenues. The report does not address the loss of property and tax revenues. The Report does not address the loss of property value caused by subsurface easements or proximity to venting towers and smoke release hatches. The impacts of reduced property tax revenues to the City of South Pasadena will be on-going and could be severe.

Cost of Omissions: Every omission has a cost connected with it:

- Cost of treating and disposing of toxins from water/foam used in fire suppressing.
- Design and construction elements required to address geological issues are not identified.

The only way this Report could come in with such a low cost estimate was to omit major cost components.

ENVIRONMENTAL: The Report claims conclusions without meeting environmental criteria. In the following cases, these conclusions are in direct contradiction to statements in the Report. Although admissions are made that studies in the Report are inadequate, a determination was made that the tunnel would be environmentally feasible.

Geology/Soil: There were only three ground boring samples done for the Report. The study area is in an active seismic zone, with at least two known active fault lines and changing alluvial soil and rock. The Report and experts in follow up statements agreed that because of the geological complexity of the zone, numerous additional ground borings are needed to determine geological feasibility. However the conclusion was drawn that the tunnel is feasible.

Water: The Report states that numerous additional borings are required to determine the exact location and impart of underground water. This is an egregious omission in an area where the water table fluctuates between 68 feet and 120 feet below ground with normal rain fall. No consideration was given to how toxins from water and foam used for fire suppression and fuel spills from accidents would be kept out of the water table. All water-related impacts were not addressed. However the conclusion was drawn that the tunnel is feasible.

Air: The Report excludes the use of scrubbers or other filtering devices in the venting towers. Therefore all particulate matter and gas fumes would be either vented through the towers or retained in the tunnel. **In order to understand the scope of toxins we must realize they are measured in metric tons per day**. These toxins will fall on homes, schools, hospitals, parks and businesses.

False conclusions are drawn for improved air quality. The Report used false premises and outdated modeling to show improved air quality. The data used in the model assumed that improvements of auto emissions in future cars and trucks would be in place by the time the tunnel opened. **Any improvement in auto emissions will improve air quality, with or without the tunnel. The tunnel, therefore, cannot be credited with the improvement**.

Assumptions were made that vehicles would travel at an average of 55 mph, creating less emission than during stop and go driving. First, the connection of the 10 and 210 freeways will add over 300,000 vehicles per day, or 5 times the current vehicle trips in the corridor. All else staying the same, emissions would have to be cut by more than 80% to keep air quality from deteriorating. The 55 mph assumption in the air quality model is in direct contradiction to the conclusion in the traffic models. Traffic models conclude that traffic speeds would range from 35 mph to grid lock (level of service D, E & F) if the 710 extension were ever completed. **No conclusion can be drawn from the model that air quality will be improved.**

Venting Towers: The Report fails to quantify the venting towers that would be required, ranging from three to five. The Report states that the venting towers can be placed in industrial areas. There are no industrial areas within the tunnel corridor through the community of El Sereno, the City of South Pasadena, and the City of Pasadena. The closest "industrial area" is at the southern end of the corridor, where the Report indicates that the segment will be a cut-and-cover as the freeway descends into the portal of the tunnel.

The Report failed to mention that the Huntington Memorial Hospital and Regional Trauma Center are located next to the northern portal. The height of the ten-story towers would exceed the height of the six-story hospital. The locations of more than twenty schools, two libraries and several public parks within a quarter mile of possible venting towers are also ignored in the assessment.

The assumption is made that the venting towers at a height of 100 feet would allow for the gases and particulate matter to disperse before reaching the ground. There is no study of the local topography, atmospheric conditions, air currents and drafts to support that conclusion, yet an environmental conclusion was drawn.

CONSTRUCTION OF VENTING TOWERS: The Report states that construction impacts will be relatively minor because construction takes place 150 feet below ground and the elimination of dirt and muck by trucks will utilize freeways at the southern portal. **The Report ignores the major impact of constructing the venting towers.** The towers require an excavation of almost one acre of land, digging a hole 45 feet in diameter over 100 feet deep to accommodate a vent 34 feet in diameter. There is not consideration for either the cost or impact of building the electrical power sources to

APPENDIX II

Response to Comments

Response to Comments

INTRODUCTION

The purpose of the Route 710 Tunnel Technical Feasibility Assessment is to determine whether a tunnel alternative to complete the Route 710 Gap is viable and practical; and to determine whether additional actions or studies should be undertaken to advance the tunnel concept. The technical feasibility of the tunnel concept was evaluated from physical, environmental and financial perspectives as well as traffic congestion relief. This Assessment process was undertaken as a first step in examining the possibility of using a tunnel alternative to complete this link in the regional strategic highway network. It should be noted that this Assessment was NOT intended to serve as an Environmental Impact Statement/Report.

The Route 710 "Gap" has been historically identified as the corridor between the current terminus at Valley Boulevard in Los Angeles and I-210 in Pasadena. For the purposes of establishing feasibility and approximate costs and identifying potential impacts, a wide study corridor with three typical alignments was considered. No specific alignment was recommended as part of the Assessment. In addition, this Assessment does not preclude subsequent studies from analyzing more alignments and/or different routes/corridors to close the Gap.

Similarly, the portal locations were not selected as part of this Assessment, however, assumptions were made in order to assess approximate costs and identify potential impacts. For illustrative purposes, two portal locations were assumed, one at each terminus, based on configurations of the existing freeway termini, proximity to neighboring residential areas and the state owned property at each terminus. In future studies, various potential sites including the southern portal located south of Valley Boulevard, will need to be identified to meet all environmental, engineering and land requirements.

Again, this Assessment report is not intended to serve as an Environmental Impact Statement/Report. The focus of the environmental aspect of the Assessment was to identify and preliminarily address potential impacts associated with both the construction and operation of a major highway tunnel. In additional, the focus of this preliminary environmental analysis was to determine any of the impacts, issues and/or constraints that would preclude further consideration of the tunnel concept to complete Route 710 freeway.

The Assessment identified the need for ventilation systems which include ventilation buildings and stacks. The preliminary analysis showed that three to four ventilation stacks (one at each portal and one or two along the tunnel) would be necessary to maintain a safe tunnel environment. As part of the ventilation system analysis, existing air cleaning systems were examined for their potential applications to the Route 710 tunnel alternative. Air cleaning systems such as Electrostatic Precipitators (ESP) or scrubbers are being used around the world. ESPs are very effective in reducing Particulate Matter (PM) from the air in tunnels, but do not have much effect on reducing Carbon Monoxide (CO) and Nitrogen Oxides (NOx) levels. However, since ESPs have some beneficial effects and are an emerging technology, it is warranted that future stages of the tunnel alternative include additional studies of existing ESP and other similar technologies. It is important to note that California emission controls are among the most stringent in the world and continue to be so in improving ambient air quality throughout the region. In addition, it is anticipated that there would be improvements in local vehicle exhaust due to more pervasive use of alternative fuels/engines. It is essential to consider all these factors when developing the ventilation systems and air-cleaning systems in future stages of the Route 710 tunnel alternative development.

Although the physical feasibility of a tunnel alternative requires information of the study area's sub-surface geologic and groundwater conditions, it was not the intent of the Assessment to conduct intense explorations. However, as part of the Assessment, information from studies previously done for the area was re-assessed, and some new investigation was performed. The new investigation performed in this Assessment confirmed the findings of previous studies for this area. The Assessment report acknowledged that considerable additional explorations and testing would be required if the tunnel concept advances.

Due to the preliminary nature of the Assessment, it was determined to be prudent to analyze and apply tunneling technologies that are either being used or within reach. Therefore, tunnel cross-section alternatives were developed based on the tested tunneling methods such as Tunnel Boring Machine (TBM) and Sequential Excavation Method (SEM). In addition, the development of tunnel cross-section alternatives was also based on existing technologies such as a 50 foot-diameter TBM, or potential technological advancements within the time the Route 710 tunnel can realistically be constructed. If the tunnel concept proceeds toward preliminary design or further, a much more extensive and broader spectrum of tunneling methods and technologies can be examined.

It is the conclusion of this technical feasibility assessment that the tunnel concept to complete the Route 710 freeway is feasible from the physical perspective. Further, since the anticipated environmental issues or impacts can be addressed by proven methods, the concept also appears to be environmentally feasible. Although, the determination of the financial feasibility is dependent on several factors beyond the scope of the Assessment, it is warranted that the tunnel concept be advanced to the next more detailed stage to further validate the findings of this Assessment and to determine whether the tunnel concept can ultimately serve as the alternative to complete the Route 710 freeway.

Metro acknowledged that due to the preliminary nature of the Assessment, the Assessment report raised many questions and concerns that need to be addressed. Many comments received covered issues that were beyond the focus of this Assessment or the level of detail this Assessment addressed. These comments/concerns will be forwarded to Caltrans for its consideration in any potential future studies.

There were many comments within the scope of this Assessment that Metro felt required some clarification. Metro attempted to respond to these comments. The responses have been organized as follow.

- The comments have been grouped in similar topics
- Each response corresponds to a set of comments from Appendix I.
- A reference to specific comments is listed at the beginning of each response.
- Comment "numbers 1, 2…" refers to the Public Comments list in Appendix I.
- "Letter from …" refers to comments related to specific topics from letters written by named agencies/organizations.

STUDY SCOPE

Comments:

Numbers 25-28; Letters from City of Pasadena, City of La Canada Flintridge, Concerned Neighbors of El Sereno and, San Gabriel Valley Economic Partnership

Response:

This initial study was undertaken using limited funds available. The scope of this initial assessment was to determine whether a tunnel solution could be feasible and what resultant impacts might require solutions. The assessment was not to determine alignments, configurations, land requirements, mitigations or impacts beyond the tunnel corridor, but was to identify typical issues that would come from completing the project and to assess, as far as possible without a defined solution, a rough order of magnitude (ROM) construction cost. This could assist in establishing priorities for moving forward with a better definition of the project through the usual processes and stages necessary for large infrastructure projects. Throughout both the scoping of this study and the course of developing this Assessment Report, designated staff from Metro, Caltrans, SCAG, and the Cities of Alhambra, La Canada Flintridge, Los Angeles, Pasadena, San Marino and South Pasadena who composed the Working Group provided technical assistance and guiding all stages of the assessment process.

The assessment preliminarily identified a number of environmental issues, particularly related to noise, air quality and construction impacts. Based on other similar infrastructure projects, it was concluded that solutions may be possible to all identified issues and that there were no insurmountable issues apparent at the current level of understanding of the project elements. Therefore, the tunnel concept merits further detailed investigation and some ingenuity in defining solutions and mitigating measures to meet prevailing standards. Due to the preliminary nature of the Assessment, a number of elements such as land acquisition and mitigation measures

could not yet be determined with an acceptable level of certainty. Thus, the Assessment developed cost estimates for tunnel construction ONLY.
This assessment was NOT conducted using SAFETEA-LU funding identified by Congressman Schiff. The SAFETEA-LU funds are still available for future development studies. Route 710 Tunnel Technical Feasibility Assessment was initiated prior to the authorization of the SAFETEA-LU and was conducted using solely Metro funding. It is recognized that not all the wide ranging and detailed community concerns can be addressed at this early assessment, and that it is more appropriate to explore these concerns as the definition of the project progresses. The comments received on the Final Assessment Report will greatly assist in subsequent stages of study.

As a necessary future step, additional non-route specific preliminary engineering can proceed as an initial element of the EIR/EIS Scoping and Project Description development. At some point, of course, specific routes would need to be identified for the more detailed environmental studies (EIR/EIS) to proceed. Also, as a general rule, the shortest, most direct route between the north and south termini, would most probably be the least costly, and these were assumed at this initial stage to simplify the task of assessing whether a tunnel might work. Throughout that process a wide-ranging community outreach program would be planned to gauge all community concerns and consider these as the project proceeds. If the project advances, the next step in the process will include further traffic analysis, engineering feasibility study, tunnel systems study and a more detailed assessment of environmental issues.

TRAFFIC-LOCAL IMPACTS

Comments:

Numbers 29-40; Letters from City of Pasadena, City of La Canada Flintridge and Concerned Neighbors of El Sereno

Response:

The future efforts, including the EIR/EIS, will include a detailed traffic impact analysis covering local streets as well as for the 710/210/134 interchange and approach corridors. The appropriate traffic mitigations will be proposed once more definitive information is available. Previous traffic studies on the Route 710 Gap Closure Project have historically indicated overall reductions in surface street traffic in Pasadena, South Pasadena and Alhambra especially on north-south streets.

The Assessment relied on the SCAG Year 2030 Regional model to develop rough order of magnitude traffic forecasts to assess the impacts of the tunnel alternatives on the freeway and arterial networks. The traffic modeling undertaken for the Assessment was intended to focus on the traffic flows in the tunnel link to complete the ‘gap’ and to assess the associated impacts along the adjacent freeways and arterial network. The traffic forecasts for the tunnel alternatives yielded a general reduction in traffic volumes on the adjacent freeways as compared to the No-Build alternative. However with tunnel alternatives completing the gap, additional traffic is attracted to the Route 710 north of the Interstate 10 freeway. Consequently, the Route 710 north and south of the tunnel, is anticipated to experience higher volumes of traffic compared to the No-Build alternative. The traffic forecasts along I-210 north of the Route 710 connection predicts an increase of between 2,000 and 2,500 passenger car equivalents (pce) in the peak direction during the peak hours. This represents an approximately 7% increase over the No-Build alternative. For example, at the I-210 at Allen Avenue (East of Route 710), there would be decreases in the order of zero to 750 pce in the Year 2030 peak flow direction in peak hours. It should be noted that different scenarios were tested based on a number of assumptions that are explained in more detail in the Final Report. However the SCAG model is a regional model and intended for regional uses. A more detailed and focused model related to the regional network and main local arterial roads, including approach corridors, will be necessary to get better predictions of local effects under different scenarios. This examination should be included in any subsequent studies.

It should be understood that as a general practice, traffic planners usually designate peak period traffic in each direction in their forecasts as a more accurate representation of required traffic capacity to deal with those flows.

TRAFFIC CAPACITY

Comments:

Numbers 41-48; Letters from City of La Canada Flintridge and San Gabriel Valley Economic Partnership

Response:

The traffic analysis conducted as part of the tunnel feasibility technical assessment was focused on determining the number of lanes necessary for the tunnel and ascertaining the benefits/impacts of the alternative on the freeway and arterial networks. Based on the traffic analysis, the four-lane/direction tunnel alternative is anticipated to operate at a level of service "E" in the 2030 horizon year. The three-lane/direction tunnel alternatives failed to satisfy the 2030 traffic forecasts. As an element of future studies, traffic evaluations may be conducted to determine the utility of implementing dedicated truck lanes (if trucks are permitted) and/or high occupancy vehicle lanes within the tunnels.

TRAFFIC-TRUCKS

Comments:

Numbers 49-52; Letters from City of Pasadena, City of La Canada Flintridge and Arroyo Verdugo Cities Sub-region Steering Committee

Response:

As part of the Assessment, the study team examined facilities that could accommodate the full spectrum of vehicular traffic including trucks. Consequently, roadway and tunnel facilities were conceived with design criteria that can carry all types of legal vehicles on the roadway. Although each tunnel alternative considered can accommodate all legal vehicles, the option to restrict heavy trucks from using the tunnel is not precluded. Whether to allow truck usage is a policy decision that could be addressed in the future with the involved agencies. The results of other separate Regional Goods Movements investigations covering all modes of transportation to assess volume and routing of such traffic to meet local, regional and national demands may be considered in an effort to determine whether trucks should be allowed. Subsequent decisions on truck routing through the tunnel will have a direct impact on the required tunnel configuration and systems design.

CONSTRUCTION

Comments:

Numbers 50-59; Letters from City of Pasadena, City of La Canada Flintridge, City of South Pasadena, Concerned Neighbors of El Sereno and Arroyo Verdugo Cities Sub-region Steering Committee

Response:

The 710 Tunnel would indeed be a major project. In order to develop a full program cost estimates including right of way, mitigation measures, etc., a specific alignment(s) needs to be selected, some preliminary engineering needs to be conducted, and tunneling method should be determined. It should be emphasized that at this early stage, no decisions have been made on specific alignment or configuration (cross-section) or method of construction of the required tunnels. The primary purpose of the Assessment is to determine whether a tunnel alternative to complete the Rout 710 gap is viable. This Assessment is the first step in examining a tunnel alternative, and not intended to serve as a detailed environmental analysis or preliminary engineering. Therefore, the Assessment focused on ascertaining construction cost estimates ONLY.

The issue of handling and disposal of the large volumes of excavated material from the tunnel construction is recognized as key. The tunneling industry is more and more involved in urban projects and has developed numerous techniques to safely reduce environmental disruption during construction within sensitive locations similar to those prevailing in the "Gap". At this early stage, it was not the focus of the Assessment to determine construction start dates. However, based on the level of available information, a conservative range of construction durations was developed.

Over the past two decades, tremendous technological advancements have been made in the field of underground engineering and construction. Previously, a tunnel of the magnitude under consideration to complete the Route 710 gap would be beyond the realm of reality. However, today there are several major roadway tunnels under development that include an inside diameter of approximately 50 feet. Advancements in tunnel boring machines have enabled large urbanized communities to implement major highway tunnels to augment their transportation networks. Currently there are a number of tunnel projects in the construction phase that are of similar scale to the Route 710 tunnel alternatives including the M30 Motorway in Madrid, Spain and the A-86 in Paris, France. Locally, tunnel projects have dealt successfully with issues of ground settlement, seismic impacts and gas deposits, for example.

Construction of a project of this scale and magnitude will require extensive planning and coordination with the affected agencies, stakeholders and public. A product of an environmental process may include a list of potential restrictions and mitigations that may be mandated during construction. It is likely that the one or both areas outside the tunnel portals will be used for temporary offices, staging, logistics and trucking activities. The excavated materials will be transported to these areas, loaded onto trucks and hauled off-site mainly via direct freeway connections at each end and along defined haul routes, which would reduce impacts to local streets.

GEOLOGY

Comments:

Numbers 60-65; Letters from City of La Canada Flintridge, City of South Pasadena and Arroyo Verdugo Cities Sub-region Steering Committee

Response:

It must be emphasized that at this early stage there is no fixed alignment, profile (depth) or defined portals. From the illustrative alignments considered in the Assessment, it is believed that impacts can largely be confined to property already under Caltrans ownership and avoiding residential lots. However, as the alignment becomes defined and the many complex, sometimes conflicting needs in mitigating impacts are balanced then it will be easier to define specific issues at each location. Risk assessments, constructability and value reviews would be conducted during the course of design. Issues such as local geology, settlement, hydrology, seismicity and potential for gas deposits will all be further examined. It should be noted that recent tunneling in Los Angeles for the Eastside Gold Line extension tunnel has resulted in no ground settlement in soil similar to what has been found in the sub-region.

SAFETY

Comments:

Numbers 66-71; Letters from City of La Canada Flintridge, Concerned Neighbors of El Sereno and Arroyo Verdugo Cities Sub-region Steering Committee

Response:

Safety is a paramount consideration in tunnel design, both for those involved in its construction and the eventual users and neighbors of the facility. The facility will be a manned and monitored facility and in many senses safer than other sections of roadway, with specific control systems and procedures, additional surveillance, policing and specific monitoring of conditions in the interior and approaches to the tunnel. With the onset of a terrorist threat within our country, many targets exist with potential to impact large numbers of people, including this project. The tunnel would therefore be thoroughly examined with appropriate authorities during design, to identify appropriate design and system requirements, procedures and drills to deal with anticipated situations. More common incidents, such as traffic accidents, are also major factors in modern tunnel design. Designers will need to remain updated on the latest developments in fire protection, evacuation measures, monitoring, detection and control systems, operational procedures and management. Tunnel emergency facilities design would include reference to the latest NFPA guidelines and its evacuation rules and to the latest practice in tunnel design throughout the world, where there have been many recent advances due to catastrophic incidents in older European tunnels and greater awareness of health and safety issues and the resultant legislation.

VENTILATION BUILDINGS AND VENTS

Comments:

Numbers 72-81; Letter from City of Pasadena and City of South Pasadena

Response:

As with the tunnel alignment, the related tunnel ventilation building and exact stack locations as well as the detailed design requirements of the ventilation and smoke control systems, cannot be identified at this stage. Initial concepts indicated a requirement of one ventilation building at each portal and at one or two midpoints along the tunnel. The ventilation buildings were envisioned to be underground structures housing ventilation fans and above ground stacks at around 100 feet height to disperse exhaust into the atmosphere, as opposed to at street level, to achieve required levels of air quality at receptors. These stacks would employ context sensitive design to fully integrate with local architectural features and styles. The height would equate to a typical church tower in scale. The use of various filtering and scrubber systems has been introduced at other tunnels to remove certain constituents of the exhaust air. The air cleaning/scrubber systems are emerging technology and their advancement must be monitored for inclusion in the design if the tunnel option is pursued. Location of the buildings will be a key issue, especially given the residential nature of the area. Particular focus will be required on the design of the system itself and the resulting engineering design to locate the tunnel alignment and portals. This Assessment is only a conceptual feasibility assessment and additional comprehensive modeling and analyses will be required to definitively develop the schematic layout of the ventilation system including the size of the ventilation towers. Much more extensive modeling and design will be needed before the exact number, location and size of these facilities can be defined. Similar ventilation structures would be required irrespective of whether trucks are allowed in the tunnel.

The Channel Tunnel between England and France, mentioned in the comments, is a very different type of tunnel. The autos are not allowed to be driven through the tunnel. Autos are freighted through the tunnel on special trains. The tunnel carries these special trains as well as passenger trains and the ventilation systems required are therefore very different.

PORTAL APPROACHES

Comments:

Numbers 82-91; Letters from City of Pasadena and Concerned Neighbors of El Sereno

Response:

This initial Assessment was tasked to examine the feasibility of completing the 'Gap' in the existing highway system and it is not possible to identify exact locations of the portals at this stage. For the purpose of establishing feasibility, two locations were assumed, one at each end of the existing freeway-standard road, outside residential areas and within the property previously acquired by the state. In future studies, various potential locations including the southern portal locating south of Valley Boulevard, will need to be identified to meet all environmental, engineering and land requirements. Addressing the suggestions for added amenities like a cover over the existing freeways was not examined. However, covering a portion of the existing freeway is likely physically feasible, which may present the opportunity to incorporate open space. This could be examined as part of subsequent technical studies.

AIR QUALITY

<u>Comments:</u>

Numbers 92-95; Letters from City of La Canada Flintridge, Concerned Neighbors of El Sereno and Arroyo Verdugo Cities Sub-region Steering Committee

<u>Response:</u>

As an element of subsequent technical studies, the issue of air quality will require extensive analysis and consideration. The ventilation concept described in the feasibility study included mechanical ventilation to collect the vehicular emissions and discharge the pollutants via ventilation shafts located near the portals and one or two ventilation shafts located between the portals. The discharge of the vehicular emissions through the ventilation shafts disperses and reduces the pollutant concentrations to acceptable levels prior to reaching the sensitive receptors. Technological advancements in air quality cleansing or filtering systems will be monitored to determine their potential application to this project. Other types of mitigation measures may also be considered including restrictions of certain vehicles.

NOISE IMPACTS

<u>Comments:</u>

Letters from City of Pasadena, City of La Canada Flintridge and Arroyo Verdugo Cities Sub-region Steering Committee

<u>Response:</u>

A full analysis of noise impacts is not part of an initial feasibility assessment and as such was not part of this assessment scope. This issue is traditionally addressed in detail as part of an Environmental Impact Assessment process.

TOLLING

<u>Comments:</u>

Number 96; Letters from City of Pasadena and City of La Canada Flintridge

<u>Response:</u>

Although a variety of potential funding sources including tolls were considered as a possible funding scenario, no determination has been made regarding the implementation of tolling on Route 710. Modern tolled tunnels would adopt newer automated toll collection systems using electronic scanning to charge regular users without the need to slow vehicles, thus greatly reducing the need for old-style toll collection booths in a 'plaza' to collect cash. The new equipment could feasibly be located within the existing right of way at the tunnel approaches and avoids the need for queuing traffic.

OPERATIONS

Comments:

Numbers 97 and 98

Response:

Detailed operational issues have not been addressed at this conceptual stage but it is clear that such a major element would require special management, including full time monitoring, to manage traffic, monitor tunnel systems and respond to fire, life, and safety issues. There will be an ongoing operating cost for the asset management and operation of the facility and daily staffing requirements.

COMMUNITY OUTREACH

Comment:

Letter form City of Pasadena

Response:

If the tunnel concept were to move forward, Metro will request the lead agency to include community involvement and outreach as part of further studies. Community outreach is a required component of EIR/EIS process.

COST

Comments:

Numbers 99 and 100; Letters from City of Pasadena, City of La Canada Flintridge and Concerned Neighbors of El Sereno

Response:

The cost estimates were prepared based on the information that was available at this stage, thus the cost estimates were focused on the construction costs. The cost estimates have not been presented as “all inclusive” program costs to implement the tunnel since the timing and funding is uncertain and many potential items that may be included are speculative at this juncture. This is the case for many items including the Electrostatic Precipitators and toll facilities; these options may or may not have application to the Route 710 tunnel. Also should the tunnel concept advance further, a horizon year will be established for construction and the total program costs can be escalated to the mid-point of construction. Moreover, in subsequent studies, when it is determined whether the tunnel would be tolled, or trucks would be allowed, appropriate adjustments can be made to cost estimates.

CHANGING TECHNOLOGY

Comment:

Letter for City of Pasadena

Response:

It is expected that relevant technologies would continue to develop and the design process of any tunnel would need to take full account of such advances. These might include advances in the technology for “cleaning” exhaust air from the ventilation systems, including electrostatic precipitators and further development in the tunnel engineering and excavation equipment and techniques such as Tunnel Boring Machine construction.

ENVIRONMENTAL FEASIBILITY

Comments:

Numbers 102-110; Letters from City of Pasadena and City of La Canada Flintridge

Response:

At this stage, it was required to identify potential types of environmental and other impact that might occur if a tunnel solution were to be adopted. It was concluded that the types of anticipated impacts have found solutions based on other projects with similar impacts. However, each project presents a set of unique issues and possible solutions and a full EIR/EIS and public outreach process would be necessary if the tunnel concept proceeds. The Assessment was focused on identification of issues in this study area and it is recognized that changes in traffic will occur as a result of the "Gap" closure. The resulting differences from this shift will be considered in relation to the expected traffic increases that would occur without the closure.

PROPERTY

Comments:

Numbers 111-121; Letter from City of La Canada Flintridge

Response:

One of the advantages of a tunnel solution is that the surface impacts and loss of property to make construction possible is greatly reduced compared to at-grade surface freeways. From the initial assessment, it appears that the location of portals would likely be largely within areas already acquired by the state. It is believed, at this stage, that acquisition of residential homes could be minimized, and this issue would be a major consideration influencing the choice of alignment for any tunnel project.