Waterfront Red Car Line Expansion Feasibility Report

Final Report

Prepared For

Port of Los Angeles

THE PORT OF LOS ANGELES

425 S. Palos Verdes St
San Pedro, CA | 90733

September 2009

Prepared By

WILSON & COMPANY
ENGINEERS & ARCHITECTS

701 B St | Suite 1220
San Diego, CA | 92101

Feasibility Assessment Report
Waterfront Red Car Line Expansion Feasibility Study
Final Report

September 2009

Project # 06-100-611-00

Prepared For:

Port of Los Angeles
425 S. Palos Verdes Street
P.O. Box 15
San Pedro, CA 90733-0151

Prepared By

WILSON & COMPANY
ENGINEERS & ARCHITECTS

701 B Street, Suite 1220
San Diego, CA 92101
Phone: 619-330-5200

TABLE OF CONTENTS

APPENDICES

Volume 1:

TASK 1: WRCL Expansion Feasibility Assessment

LIST OF TABLES

LIST OF FIGURES

Executive Summary

WATERFRONT RED CAR LINE EXPANISION FEASIBILITY STUDY EXECUTIVE SUMMARY

E.1 Overview

The existing 1.5 mile Waterfront Red Car Line was created in 2003 by adapting an existing freight rail line to accommodate streetcar operations. Although it connects only a portion of the waterfront's many attractions, the initial line has demonstrated the viability of the concept of using a vintage streetcar to link together the area's key activity centers. Currently operating on only a part time basis, the Red Car line has been extremely well received by the local community, continues to draw significant tourist ridership (averaging 100,000 riders annually), and has evolved into a recognizable waterfront icon.

Based upon the success of the existing Red Car line, along with new opportunities associated with the redevelopment of the San Pedro and Wilmington waterfronts, the Port of Los Angeles (POLA) initiated the *Waterfront Red Car Line Expansion Feasibility Study* to examine in detail the various options for expanding the Red Car line and provide recommendations based upon benefits, feasibility, and overall costs. A consultant team worked closely with Port staff over the course of the study, and met with other city agencies and transit providers to examine shared opportunities. The project team also visited similar streetcar operations across the country to learn about their successes and challenges.

The feasibility study was conducted in two phases:

Phase 1: An initial study of seven (7) potential Red Car extensions serving both the San Pedro and Wilmington waterfronts, including assessment of purpose and need, ridership potential, engineering requirements and preliminary capital/operating costs.

Phase 2: Conceptual design of alignment extensions specifically serving the San Pedro Waterfront consistent with the San Pedro Waterfront Project EIR. Proposed extensions serving Downtown San Pedro, North Gaffey, and Wilmington were not studied further in Phase 2.

Figure E-1 displays the waterfront study area and the seven (7) potential extensions/realignments examined as a part of the *Waterfront Red Car Line Expansion Feasibility Study*:

- Harbor Boulevard/Sampson Way Realignment: a 1.6 mile rebuild/realignment of the existing line in conjunction with the realignment of Sampson Way roadway
- Cabrillo Beach/Marina Extension: a 1.5 mile extension to Cabrillo Beach
- Downtown San Pedro Extension: a 0.5 to 1.4 mile extension into downtown San Pedro
- Outer Harbor/Cruise Ship Terminal Extension: a 0.75 mile spur to the proposed new cruise ship terminal at the Outer Harbor/Berth 46 area
- City Dock No. 1 Extension: a 0.6 mile spur south from the Ports O' Call area to the City Dock No. 1 area and the historic Warehouse One

- North Gaffey Street Extension: a 0.75 mile spur into Northwest San Pedro
- Wilmington Extension: a 3.0 mile extension north along John S. Gibson and Harry Bridges Boulevards in Wilmington.

The above Red Car extensions were evaluated and refined based on their ability to link key destinations, facilitate adjacent development, enhance public transportation and local circulation, encourage business investment and maximize Red Car ridership.

E.2 Purpose and Need Assessment

Along with detailed engineering, operational, and cost considerations, a set of goals for the Red Car expansion program provided the basis for assessment of feasibility, benefits, and impacts associated with the proposed Red Car line extensions:

- Serve as a goodwill ambassador for the Port of Los Angles and the waterfront communities, businesses, and attractions.
- Provide safe, reliable, enjoyable and environmentally friendly transportation for the thousands who visit the San Pedro and Wilmington waterfronts each year.
- Enhance local as well as regional access to the waterfront communities, businesses and attractions.
- Play a leading role in revitalizing the local business economy and enhancing the image of the waterfront as a tourist destination.
- Provide an essential element in implementing the San Pedro and Wilmington Waterfront Master Plans.

SOURCE: Wilson & Company, Inc, Engineers & Architects; March 2009

THE PORT OF LOS ANGELES

WILSON & COMPANY ENGINEERS & ARCHITECTS

Waterfront Red Car Line Expansion Feasibility Report

Figure E-1
Proposed Red Car Line Extensions

A *purpose and need assessment* was conducted for each of the proposed Red Car extensions to assess the ability to accomplish the above goals. This assessment also assisted in establishing preliminary service and design requirements associated with each of the proposed extensions.

The assessment concluded that the expansion of the Red Car can play a significant and prominent role in the Port's efforts to create a world class waterfront with a variety of tourist and visitor venues, as evidenced by the following:

- The Harbor Boulevard/ Sampson Way Realignment will provide enhanced access to the redeveloped San Pedro waterfront and the revitalized Ports O' Call area.
- The Cabrillo Beach/Marina Extension will connect the redeveloped San Pedro Waterfront area with the beach and marine facilities.
- The Downtown San Pedro Extension provides the opportunity to enhance linkages between other forms of public transit, in addition to downtown commercial and parking facilities, and the redeveloped waterfront.
- The Outer Harbor/Cruise Ship Terminal Extension will provide expanded travel options for both cruise ship passengers and employees.
- The City Dock No. 1 Extension provides an opportunity to link the waterfront with new redevelopment proposals focusing on Warehouse One and the former Westway Terminal site.
- The North Gaffey Street Extension will enhance linkages between various commercial and residential areas and the redeveloped waterfront
- The Wilmington Extension will enhance the linkages between the San Pedro and Wilmington communities and synergize redevelopment opportunities along the entire waterfront area.

Future Red Car operating along Via Cabrillo Marina

San Pedro Waterfront

E.3 Engineering Analyses and Capital Costs

A preferred preliminary alignment has been identified for each of the proposed extensions, as detailed in the respective sections of this report. For a number of the extensions, additional conceptual engineering assessments have detailed alignment locations, utility impacts and refined cost estimates. Several of the preferred alignments are based on the existence of major adjacent projects that are now in the planning and design stages. For example, the improvement of Harbor Boulevard and realignment of Sampson Way along the waterfront will create major new roadway and other infrastructure elements that present an ideal opportunity to incorporate the expanded Red Car system.

Key design assumptions governing the future expansion of the Red Car system include:

- Line-of-sight operating practice with relatively slow system speeds (< 30 mph).
- No shared use track (freight service abandoned in San Pedro). Some shared right-of-way (separate Red Car and freight tracks on same right-of-way) and limited crossings of Red Car track over freight sidings on the Wilmington extension.
- Elimination of crossing gates at roadway crossings off of shared right-of-way, with traffic signals used instead.
- Central "spine" of system (largely within or adjacent to newly constructed street right-of-way) would be double tracked, with emphasis on attractive, sustainable "green" right-of-way. Other branches of system would be single tracked, with passing tracks provided at key locations.
- Different type of vintage streetcar vehicle to be used, better suited to the new operating environment with updated braking and control systems. The vehicle is capable of boarding at street level and achieves ADA compliance using an on-board wheelchair lift.
- High-level platforms replaced with simple low-platform stations.

The costs of constructing and operating the various Red Car extensions will vary, as will the engineering challenges that will need to be addressed during design and construction. Preliminary

capital cost estimates were prepared for each of the proposed Red Car extensions, based on industry experience on similar projects and conclusions to date regarding the engineering and design requirements of the various extensions. The cost estimates, as shown in **Table E.1**, include a planning level contingency factor, reflecting the fact that the extensions have not undergone detailed design. Overall, the estimated capital costs and associated costs for operating and maintaining the system are in line with other systems built across the country in recent years.

Table E.1 - Red Car Line Extensions
Preliminary Capital Cost Estimates (2009 $'s)

Line Extension	Length (mi)	Capital Cost [1]
Harbor Blvd./Sampson Way Realignment	1.54	$ 26.35 M
Cabrillo Beach/Marina	1.38	$ 22.43 M
Downtown San Pedro	1.40	$ 18.37 M
Outer Harbor	0.83	$ 14.33 M
City Dock No. 1	0.71	$ 9.14 M
North Gaffey	0.75	$ 6.88 M
Wilmington	3.00	$ 44.26 M

[1] Includes factors for Engineering and CM (20%) and Contingency (30%) *Source: Wilson & Company, February 2009*

Operation and Maintenance (O&M) costs are largely a factor of labor and system operating time. Typically, approximately two-thirds of O&M costs are associated with the labor requirements of operating the system. Thus the size of the crew required to operate a vehicle is a significant cost factor as system operating hours grow beyond the part-time operations which are presently in place. Non-labor costs include the two principle elements of electric power and consumables related to the amount of operations, as well as insurance and security.

A cost of approximately $5.9 Million per annum was estimated for operation of the full build-out Red Car system with 20-minutes headways on all branches and 6.5 to 10-minute headways on the system "spine." A cost of approximately $2.9 Million per annum was estimated for the operation of the mid-range (Phase 2) expansion. These costs ranges compare favorably with other U.S. vintage trolley and modern streetcar systems.

E.4 Red Car Vehicle and Station Types

The Red Car line presently uses a fleet of two replica vintage streetcars (cars 500 and 501) and one restored original car (Car 1058). In addition to facilitating ADA access, the high-floor car design was also seen as being more compatible with the shared use freight corridor that existed when the line was built.

Existing high-floor replica Red Car vehicle

Based upon the need for seamless integration into both street and pedestrian environments, it is recommended that the expansion of the Red Car system incorporate a different type of replica vintage streetcar. The new vehicle would incorporate updated braking and control systems better suited to the new operating environment,

and would board passengers at street level. ADA compliance would be achieved using an on-board wheelchair lift. Future stations will incorporate low platforms more compatible with surrounding land uses and less costly to construct. The new vehicle and station type will eliminate the need for the high-level platforms currently in use, and provide the following benefits:

- Low platform stations are significantly lower in cost, take less room, and have less visual impact.
- The use of low platforms/street level boarding opens up the ability to incorporate in-street alignments where appropriate, such as in the downtown area.
- The use of low platforms/street level boarding increases operational flexibility by enabling the use of temporary stops during special events.
- Use of a vehicle type suitable for one-person operation will be an important factor in managing the costs of an expanded system.

Proposed replica Red Car vehicle - boards from street level

- Use of an "off the shelf" design will yield lower vehicle capital costs and shorter delivery time. The "Red Car" theme can still be retained, based on the fact that Pacific Electric operated steel-bodied streetcars very similar to the type of replica trolleys now being produced.
- A steel-bodied replica car with updated braking and control systems will be better suited to the new operating environment, and will offer lower maintenance costs.

E.5 Operating Assessment

In comparison to other vintage streetcar operations around the country, the current Red Car operation is relatively small. Operating an average of 4.6 days per week, the existing system was open for approximately 1,950 hours in 2006. The expanded system under study could ultimately increase to a seven day a week operation, open 4,700 hours annually.

To best fulfill its role of providing waterfront access while supporting and complementing waterfront development, the Red Car will need to be seamlessly integrated into the waterfront's street and pedestrian environments and be friendly and convenient to use. With freight service in San Pedro due to end in the near future, the need to rely upon the existing freight right-of-ways will also end. The realities of this changing environment offer a number of opportunities for operating an expanded Red Car system.

While full system build-out would occur over an extended time period driven by adjacent development, the project team was tasked with taking a long-range (20-year plus) view of what the system could evolve into. A set of alternative Red Car system operating scenarios were identified and evaluated with the objective of recommending a preliminary operating concept as the system context for subsequent Red Car expansion planning and conceptual design activities.

These evaluations concluded with a recommended System Operating Concept, including four (4) operating lines as follows:

1. Wilmington to Cabrillo Beach/Marina (6.2 miles)
2. North Gaffey Street to Outer Harbor (3.7 miles)
3. Downtown San Pedro to Ports O'Call (2.4 miles)
4. Ports O' Call to City Dock No. 1 Spur (0.6 miles)

With full build-out of the system, the various lines would be operated 12 to 18 hours a day, seven days a week, at an average service frequency of 20 minutes. The "spine" of the system along Harbor Boulevard/Sampson Way would have service frequencies in the order of 6 to 10 minutes. A minimum of seventeen vehicles (14 plus 3 spares), would be required to serve the full system build-out. A phasing plan was also developed to reflect near-term priorities and support development of the San Pedro Waterfront Project EIR.

E.6 Red Car Ridership

The existing Red Car operation has carried an average of 100,000 passengers per year over its five year history, with significantly larger passenger numbers on weekends and during waterfront special events. During the 2007 Lobster Festival for example, the line carried 10,496 passengers over a two day period.

Expanding this service to seven lines (9.7 miles) operating 12 to 18 hours a day, seven days a week will significantly expand the ridership base. In addition, growth and redevelopment activity along the San Pedro and Wilmington waterfronts as well as within the respective communities and downtown areas will also significantly increase the base of trips that potentially could be served via the Red Car. A connection to existing local transit services via a new hub in downtown San Pedro could further grow the ridership base.

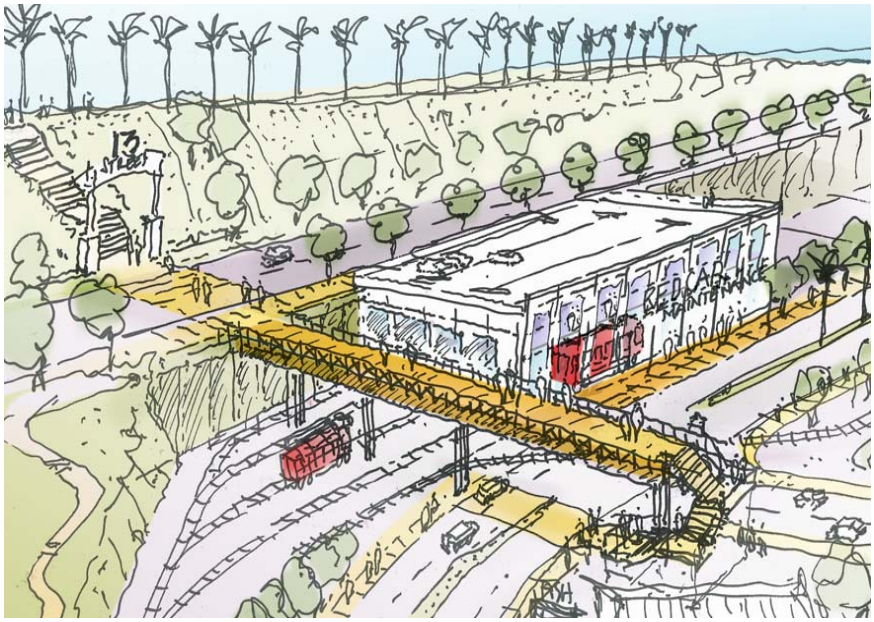
It is estimated that the mid-range system expansion (3.75 miles) with operations seven days a week would serve approximately 500,000 riders annually within a period of five years. The full build-out of the 9.7 mile system could ultimately serve 1.25 million passengers annually.

E.7 New Red Car Maintenance and Museum Facilities

Maintenance Facility: A new Red Car Maintenance Facility is crucial to any expansion of the current system and should be located in a manner centrally accessible to the balance of the system. The existing Red Car maintenance facility/operations base is on a very small site and was constructed for temporary use, and as such is poorly suited for expansion. The current Red Car fleet consists of three vehicles, while the expanded system could ultimately require 17 or more vehicles. An expanded system will also be accompanied by a demand for more space to accommodate employee and administrative functions.

A number of candidate sites in the San Pedro/Wilmington waterfront area were reviewed to determine the most viable location(s) for a new Red Car Maintenance Facility. A location within the SP Yard site was ranked the highest based on system accessibility/location, ability to be implemented near-term, and compatibility with existing and planned waterfront attractions.

Capital cost requirements for full build-out of a 17,000 square foot Red Car Maintenance Facility are estimated at $8.87 Million, with options for a smaller facility for future phasing.



Proposed Maintenance Facility at south end of San Pedro Yard site. Pedestrian Bridge in foreground.

Museum Facility: The concept of a Red Car Museum has been suggested to both convey the history of the Pacific Electric Red Car and its role in shaping the San Pedro and Wilmington communities, as well as providing additional opportunities to synergistically promote waterfront redevelopment by linking with other historic resources.

A number of options are available for locating a 10,000 square foot Red Car Museum**.** A SP Yard north end option was ranked the highest based upon adjacency to the existing San Pedro museum district and the Red Car line.

The Wilmington museum site has an historic tie-in to the Pacific Electric "Red Cars"

However, a suitable site is also available in Wilmington (within or adjacent to the existing Bekins Warehouse), providing additional opportunities to encourage visitation to the area and extend/expand development potential. Both locations are viable alternatives, and the Port will make a final determination at the appropriate time.

Capital cost requirements for the Red Car Museum are estimated at $3.44 Million.

Wilmington Museum option showing addition to west side of Bekins Warehouse building

E.8 Implementation Program

Consistent with and in support of the San Pedro and Wilmington waterfront redevelopment programs, it is recommended that the Port initiate a phased approach toward implementation of the expanded Red Car system. The initial phasing of extensions should focus both on serving existing waterfront activity centers and supporting the near-term waterfront master planning activities. Follow-on phases should focus on expanding service to the redeveloped San Pedro and Wilmington waterfronts, and as such would likely be triggered by specific redevelopment activity. The phasing must also facilitate the transition from operation in a shared use freight corridor into a more typical urban streetcar environment. By constructing the lines which do not have any interaction with freight railroad corridors first (i.e. the San Pedro extensions), the regulatory process would be greatly simplified, thereby facilitating project implementation.

Compared with the other potential Red Car extensions, a downtown extension of the Red Car will require additional planning studies to identify and refine the various alignment alternatives, operating options, and station requirements. The Red Car extension to downtown San Pedro is not within Port jurisdiction and has not been included as part of the San Pedro Waterfront Project. Initially, in order to justify the expenditure of Port funds on a downtown San Pedro extension of the Red Car, it will be necessary to demonstrate the appropriate nexus to the waterfront and related Port objectives. A greater degree of interagency coordination will be required, including coordination with the San Pedro Community Plan Update, Community Redevelopment Agency (CRA) and other downtown stakeholders. The emergence of a strong project proponent or champion, be it an agency or individual, will also be important to implementing the downtown extension.

The implementation program displayed in **Figure E-2** has been prepared to illustrate a potential phasing scheme tied to the respective waterfront redevelopment programs.

Table E.2 summarizes capital costs and annual operational and maintenance costs associated with the proposed Red Car implementation program. The amount of revenue realized from operations will be a function of the overall implementation strategy, fare structure and ridership. For planning purposes, a target of recovering 20-25% of operating expenses through farebox and special operation revenues would be reasonable given a significant percentage of free operations in support of waterfront special events. Advertising and sponsorships present additional revenue opportunities.

SOURCE: Wilson & Company, Inc, Engineers & Architects; February 2009

THE PORT OF LOS ANGELES

WILSON & COMPANY ENGINEERS & ARCHITECTS

Waterfront Red Car Line Extension Feasibility Report

Figure E-2
WRCL Phased System Expansion

Table E.2
Red Car Implementation Program
Capital and O & M Costs (2009 $'s)

Phase 1 Expansion (Immediate/Near Term)	
Capital Costs	**Cost**
Line Extensions	
Harbor Boulevard/Sampson Way Realignment (1.54 miles)	$ 26.35 M
1 New Vehicle @ $1.25 M; Modification to 2 existing vehicles @ <$1.25 M	$ 3.75 M
Capital Costs for Phase One	**$ 30.10 M**
Downtown San Pedro Alignment Studies	**$ 0.75 M**
Total System Operation & Maintenance Costs (Annual)	**$ 1.80 M**
Phase 2 Expansion (Mid-Range)	
Capital Costs	**Cost**
Line Extensions	
Cabrillo Beach/Marina Extension (1.38 miles)	$ 22.43 M
Outer Harbor Extension (0.83 miles)	$ 14.33 M
5 Vehicles @ $1.25 M each (8 Vehicles Total)	$ 6.25 M
New Maintenance Facility	$ 8.87 M
Museum Facility	$ 3.44 M
Capital Costs for Phase 2	**$ 55.32 M**
Total System Operation & Maintenance Costs (Annual)	**$ 2.90 M**
Phase 3 Expansion (Long-Range)	
Capital Costs	**Cost**
Line Extensions	
North Gaffey Extension (0.75 miles)	$ 6.88 M
City Dock No. 1 Extension (0.71 miles)	$ 9.14 M
Wilmington Extension (3.0 miles)	$ 44.26 M
Downtown San Pedro Extension (0.5 to 1.5 miles)	$ 18.37 M
9 Additional Vehicles @ $ 1.25 M each (17 Vehicles total)	$ 11.25 M
Capital Costs for Phase 3	**$ 89.90 M**
Total System Operation & Maintenance Costs (Annual)	**$ 5.90 M**
Total Capital Costs (Phases 1-3)	**$ 175.32 M**

Source: Wilson & Company, February 2009

While the proposed program is shown as comprising three (3) phases – Immediate/Near Term, Mid-Range, and Long Range – other staging options and variations are possible. It is recognized that the Port will want to maintain the flexibility to modify and implement the Red Car expansion program in response to funding availability and actual on the ground redevelopment activity.

E.9 Conclusions

The overall conclusion of this feasibility study is that an expanded Red Car system is technically feasible and can serve an important transit circulator function within the San Pedro and Wilmington waterfront areas. Vintage trolleys/streetcars are recognized throughout the country for their ability to create pedestrian friendly environments and support redevelopment activity, and can accomplish the same for the San Pedro and Wilmington waterfronts. The Red Car provides an exciting opportunity to build something that will serve as a unique tourist venue while at the same time providing a viable form of transportation serving the many and varied waterfront activity centers.

By providing a seamless transportation linkage between key activity centers, the Red Car can greatly enhance public access, helping maximize the Port's significant investments in infrastructure and public facilities along the waterfronts. The expanded Red Car system can also help stimulate public-private partnerships for development adjacent to the newly constructed infrastructure, and reduce traffic congestion by facilitating a "park once" philosophy.

Challenges to be met include project funding, and in the case of extensions away from Port property, establishing a clear waterfront nexus to satisfy State Lands Commission restrictions on Port expenditures.

Coordination with other waterfront infrastructure projects will be important. A significant portion of the Red Car "spine" could be constructed in conjunction with implementation of proposed new roadway alignments, resulting in significant cost savings. Additionally, connections to other local and regional transit facilities serving the waterfront communities will be particularly valuable in securing both regional and federal funding for the Red Car extensions.

Enlisting project champions and building partnerships with other local agencies and civic/business organizations will also be important, and can be valuable sources of both civic and financial support.

Red Car at the San Pedro Slip

1.0 Introduction

1.0 INTRODUCTION

The Port of Los Angeles (POLA) initiated the Waterfront Red Car Line (WRCL) Expansion Feasibility Study to examine in detail the various options for expanding the Red Car line and provide recommendations based upon benefits, feasibility, and overall costs. The study evaluations were accomplished in two phases, including an initial overall system evaluation and feasibility analysis of all proposed extensions serving the San Pedro and Wilmington waterfronts, followed by additional conceptual design activities focused specifically on the proposed extensions and supporting infrastructure serving the San Pedro waterfront. Conduct of the later work enabled coordination with development of the Environmental Impact Report (EIR) for the San Pedro Waterfront Project.

This report, the WRCL Expansion Feasibility Assessment Report, provides an assessment of Red Car expansion options, associated costs, operating and engineering issues, alignment alternatives, ridership potential and benefits relating to the ongoing waterfront redevelopment program. The report concludes with recommendations for a phased Red Car expansion program supportive of and consistent with other waterfront development activities.

1.1 Report Purpose

The primary purpose of the WRCL Expansion Feasibility Report is to document the evaluation of various potential line extensions as the basis for development of an overall approach to expanding the Red Car system. Key objectives associated with preparation of this report include the following:

- Document potential line extensions.
- Summarize overall Red Car line expansion goals and specific service objectives associated with each of the potential line extensions.
- Identify and detail alignment options, station requirements, and supporting infrastructure.
- Document the operating and engineering issues associated with each of the potential line extensions.
- Summarize the relationship of each of the line extensions with waterfront redevelopment efforts and associated ridership potential.
- Document key issues and related considerations which could affect implementation.
- Provide planning level cost estimates for both capital investments and on-going operation and maintenance of an expanded Red Car system.
- Provide POLA with a conceptual development program for expansion of the Red Car system for further consideration.

1.2 Study Background

The existing Red Car line vintage trolley service provides a transportation link for thousands of visitors to the San Pedro waterfront each year. The existing line consists of four stations along a 1.5 mile route adjacent to Harbor Boulevard. The Port is currently preparing development plans for the waterfront areas that envision the possibility of the Red Car becoming part of an integrated

inter-modal transportation system throughout the waterfronts of both San Pedro and Wilmington.

The existing Red Car opened in July of 2003 following a 4-year design and construction period. The line was created by adapting an existing rail line to accommodate trolley operations. By virtue of its waterfront location, the existing Red Car line connects several of the area's key attractions. The Red Car line has been extremely well received by the community, and is successfully fulfilling its mission of being a goodwill ambassador for the Port.

POLA has identified the following seven (7) potential extensions/realignments for study as a part of the WRCL Expansion Feasibility Study:

- Harbor Boulevard/Sampson Way Realignment: a 1.6 mile rebuild/realignment of the existing Red Car line.
- Cabrillo Beach/Marina Extension: a 1.5 mile extension south from 22nd Street to Cabrillo Beach.
- Downtown San Pedro Extension: a 0.5 to 1.4 mile spur or loop extension into downtown San Pedro.
- Outer Harbor/Cruise Ship Terminal Extension: a 0.75 mile spur south from 22nd Street to a proposed new cruise ship terminal at the Outer Harbor/Berth 46 area.
- City Dock No. 1 Extension: a 0.6 mile spur south from the Ports O' Call area to City Dock No. 1 and Warehouse One.
- North Gaffey Street Extension: a 0.75 mile spur along North Gaffey Street to Westmont Drive.
- Wilmington Extension: a 3.0 mile extension north along John S. Gibson and Harry Bridges Boulevards in Wilmington.

Figure 1-1 displays the waterfront study area and the various line extensions under study. As documented in this report, these extensions were evaluated and refined based on their ability to link key destinations, facilitate adjacent development, enhance public transportation and local circulation, encourage business investment and maximize Red Car ridership. As noted previously, after preliminary evaluations, four (4) of the extensions noted above were selected for further more detailed engineering assessments, with the objective of supporting the San Pedro Waterfront Project EIR. These included the following:

1. Harbor Boulevard/Sampson Way Realignment
2. Cabrillo Beach/Marina Extension
3. Outer Harbor/Cruise Ship Terminal Extension
4. City Dock No. 1 Extension

1.3 Red Car Goals and Objectives

A set of goals and objectives were established to assist in defining the overall vision for the Red Car expansion program. These goals and objectives were also used in developing and evaluating alignment options and service alternatives for the expansion of the Red Car line.

SOURCE: Wilson & Company, Inc, Engineers & Architects; March 2009

THE PORT OF LOS ANGELES

WILSON & COMPANY ENGINEERS & ARCHITECTS

Waterfront Red Car Line Expansion Feasibility Report

Figure 1-1
Proposed Red Car Line Extensions

Goals

- Serve as a goodwill ambassador for the Port of Los Angeles and the waterfront communities, businesses, and attractions.
- Provide safe, reliable, enjoyable and environmentally friendly transportation for the thousands who visit the waterfront each year.
- Enhance local as well as regional access to the waterfront communities, businesses and attractions.
- Play a leading role in revitalizing the local business economy and enhancing the image of the waterfront as a tourist destination.
- Provide an essential element in implementing the San Pedro and Wilmington Waterfront Master Plans.

Objectives

- Link together and create a "seamless interface" of the harbor area's attractions, public spaces, the downtown and surrounding communities in a unique and historic manner.
- Provide transportation with a pace of travel that allows riders to enjoy the ride and scenery, with stops frequent enough to encourage people to explore local sites and attractions.
- Serve as an attraction in its own right, capitalizing on the nostalgia for the famous Red Cars that helped shape the Los Angeles region.
- Efficiently and safely move moderately large numbers of people between attractions, cruise ship terminals and parking areas within the waterfront.
- Play a primary role in implementing an overall inter-modal transportation strategy for the waterfront including the Red Car, water taxi, bus shuttle services and parking facilities.
- Provide enhanced connectivity to regional transit services including a future San Pedro transit center, the Harbor Transitway, local and express bus routes, and related park-and-ride facilities.
- Serve as a collector/ distributor system for regional transportation facilities serving the waterfront.

1.4 Report Organization

Following this introduction, this report is organized as follows:

Chapter 2.0 Overview Of Existing Red Car Operations - provides an overview of the existing Red Car operation, including the results of a recently conducted survey of existing riders.

Chapter 3.0 Waterfront Activity Centers and Master Planning - provides an overview of the San Pedro and Wilmington waterfronts, including existing and planned attractions and activity centers. This section also provides a description of on-going waterfront redevelopment activities.

Chapter 4.0 Purpose and Need Assessment - summarizes the key findings of the purpose and need assessment, including service objectives, support of waterfront redevelopment activities and ridership potential.

Chapter 5.0 Engineering Analyses and Capital Costs - discusses engineering issues and provides estimates of the capital costs associated with construction of the various line extensions.

Chapter 6.0 New Maintenance and Museum Facilities - documents conceptual design considerations relating to a new Red Car Maintenance Facility and a potential Red Car Museum.

Chapter 7.0 Station Concepts - documents preliminary concepts for stations to be built along the various Red Car extensions.

Chapter 8.0 Red Car Vehicles - summarizes the recommended street car vehicle type and associated requirements.

Chapter 9.0 Red Car Systems Operating Assessment - provides an overview of a possible operating scenario for full build-out of the Red Car system along with associated operating and maintenance cost estimates.

Chapter 10.0 Traffic Interface Approach - documents the recommended Red Car interface with the local roadway system, including traffic and train controls at the various at-grade crossings.

Chapter 11.0 Conceptual Implementation Program - illustrates a potential implementation program for expansion of the Red Car system.

Chapter 12.0 Funding Opportunities - describes various funding programs and opportunities for consideration by POLA.

Chapter 13.0 Regional Interface Opportunities - documents other existing and planned transit services in the San Pedro and Wilmington communities and assesses opportunities for coordination and potential joint development efforts associated with expansion of the Red Car system.

Chapter 14.0 Summary of Key Findings and Conclusions - provides a brief summary of the report with the focus on the more significant findings and conclusions.

A separate Appendix document **(Appendix Volumes 1 and 2)** has been prepared to supplement the WRCL Expansion Feasibility Report and includes variety of supporting technical documentation, as referenced throughout this report.

2.0 Overview of Existing Operations

2.0 OVERVIEW OF EXISTING RED CAR OPERATIONS

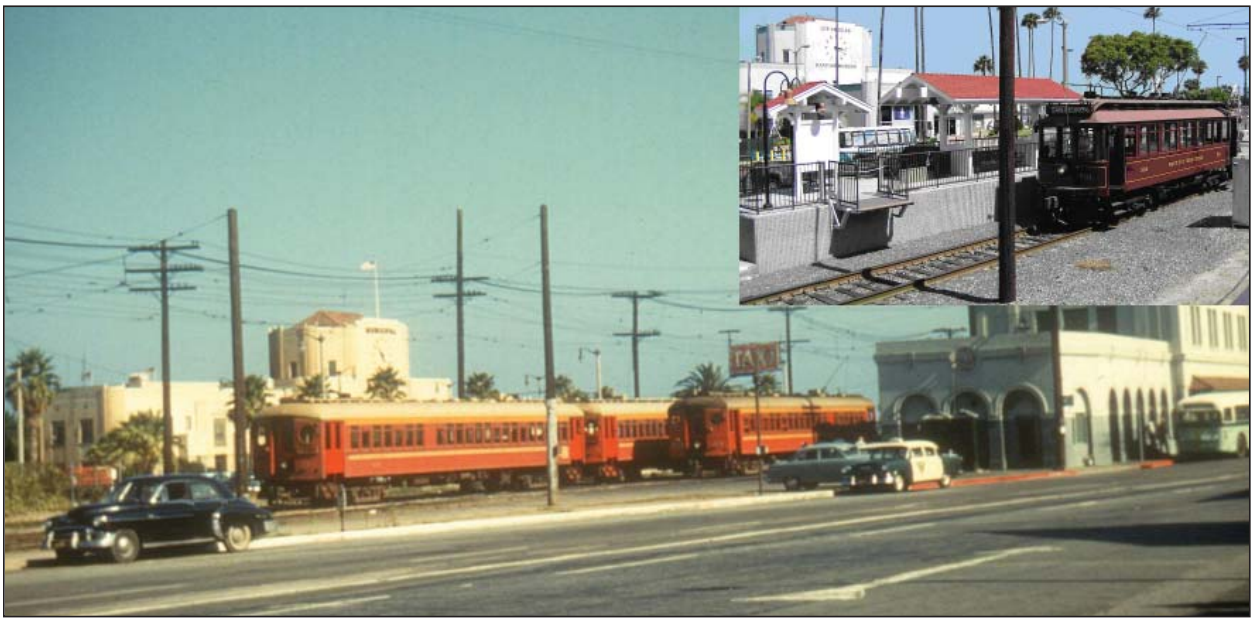
The existing 1.5 mile WRCL opened in July of 2003 following a four-year design and construction period. The line was created by adapting an existing rail line to accommodate trolley operations. The line operates entirely on POLA right-of-way and shares the tracks with rail freight operations, but with temporal separation. (Freight service is scheduled to end in 2009)

Figure 2-1 illustrates the current Red Car operation. As shown, the line is on a north-south alignment that parallels Harbor Boulevard from a station at Harbor Boulevard/Swinford Street, adjacent to the World Cruise Center, to 22nd/ Miner Streets. There are a total of four ADA-Compliant high-platform stations. The line is single track with a short passing siding located immediately north of the 6th Street station. From the 22nd Street/Miner Street station a shuttle bus provides a connection to Cabrillo Beach, stopping on demand at 22nd Street Landing and the Marina Hotel en route.

A direct suspension overhead contact system (OCS) provides 600 volts DC for trolley operations. There are three gated roadway/rail grade crossings along the line. A pedestrian crossing, equipped with flashers, was recently completed at O'Farrell Street.

With completion of the new water feature at Swinford Street, the Red Car line operating hours were modified to run from 10 AM to 6 PM Fridays through Sundays. Service can optionally be provided on "extra" days when cruise ships are in port outside of the regular schedule, and during special events. Fare is one dollar for an all-day pass, although the system typically offers free rides during special events.

Present operations provide scheduled service on twenty minute headways in each direction throughout the day. End to end running time is scheduled at 13 minutes including two intermediate stops. Two cars operate over the line during normal operation. Five minute layovers are scheduled at the south end of the line, with ten minutes scheduled at the north end. Schedules are posted on the passenger information boards at the stations.



Until 1958, the "Red Cars" of the Pacific Electric connected the port with destinations throughout the L.A. region

SOURCE: Wilson & Company, Inc, Engineers & Architects; February 2009

THE PORT OF LOS ANGELES

WILSON & COMPANY ENGINEERS & ARCHITECTS

Waterfront Red Car Line Extension Feasibility Report

Figure 2-1
Current Red Car Line and Stations
(All Existing Red Car Track is Shared Use)

Table 2.1 summarizes ridership data on the existing Red Car operation through 2008. Ridership has grown 20 % between the first full year of operation (2004) and the most recent (2008). As shown, a total of 85,102 passenger boardings were recorded during the first year of operation, 95,543 in the second, 102,169 in the third year, 93,718 in the fourth, and 106,170 in the fifth.

Table 2.1
POLA Waterfront Red Car Line
Ridership Summary 7/23/03 - 12/31/08

Day of Week	Total Days Operated	Total Boardings	Total Tickets Sold	Average Daily Boardings	High	Low
Regular Operating Days						
Friday	255	79,507	17,702	312	990	59
Saturday	242	105,326	28,832	435	1,717	99
Sunday	248	125,793	34,870	507	2,851	63
Monday	272	72,569	16,778	267	884	30
Total	**1,018**	**383,194**	**98,182**	**380**		
Extra Operating Days (Tuesday through Thursday)						
Tuesday	48	6,730	1,842	140	673	27
Wednesday	50	7,018	1,558	140	584	1
Thursday	41	5,334	1,272	130	999	14
Total	**139**	**19,082**	**4,702**	**137**		
Special Event and other "Free" days						
Week Day						
Monday	9	4,628		514	2,009	156
Tuesday	3	700		233	417	60
Wednesday	3	148		49	74	23
Thursday	5	1,686		337	1,226	78
Friday	25	16,787		671	3,080	121
Total	**45**	**23,949**		**532**		
Weekend						
Saturday	39	70,013		1,795	6,514	133
Sunday	31	55,030		1,775	5,089	150
Total	**70**	**125,043**		**1,786**		
Grand Total:	**1,271**	**551,268**	**102,918**	**434**		

Source: Port of Los Angeles, May 2009

As part of the current study, a survey of existing Red Car riders was conducted over the summer of 2007 with the intent of better understanding existing ridership characteristics, including trip purpose and associated utilization patterns. **Table 2.2** provides a summary of the ridership survey results.

Table 2.2
Waterfront Red Car Line
Ridership Survey Summary

1	Which of the following best describes you/your party?	Number	Percent
	Cruise Ship Member	37	8.5%
	Cruise Ship Passenger	70	16.1%
	Visitor	83	19.0%
	San Pedro/Wilmington Resident	103	23.6%
	Tourist	132	30.3%
	Work in San Pedro	11	2.5%
	Total	**436**	
2	**Is this your fist time riding the Red Car?**	**Number**	**Percent**
	Yes	257	57.9%
	No	187	42.1%
	Total	**444**	
3	**Why are you riding the Red Car today?**	**Number**	**Percent**
	Parking Shuttle	14	3.2%
	Personal Interest	144	33.0%
	Sight Seeing	245	56.2%
	Waterfront Transportation	33	7.6%
	Total	**436**	
4	**What other local attractions do you plan on visiting?**	**Number**	**Percent**
	Cabrillo Beach/Aquarium	142	20.4%
	Downtown San Pedro	111	15.9%
	Lane Victory	30	4.3%
	Local Restaurants	159	22.8%
	Maritime Museum	94	13.5%
	Ports O' Call Village	161	23.1%
	Total	**697**	
5	**How likely would you ride the Red Car to other Waterfront destinations?**	**Number**	**Percent**
	Not likely	15	3.5%
	Somewhat likely	57	13.2%
	Very likely	360	83.3%
	Total	**432**	

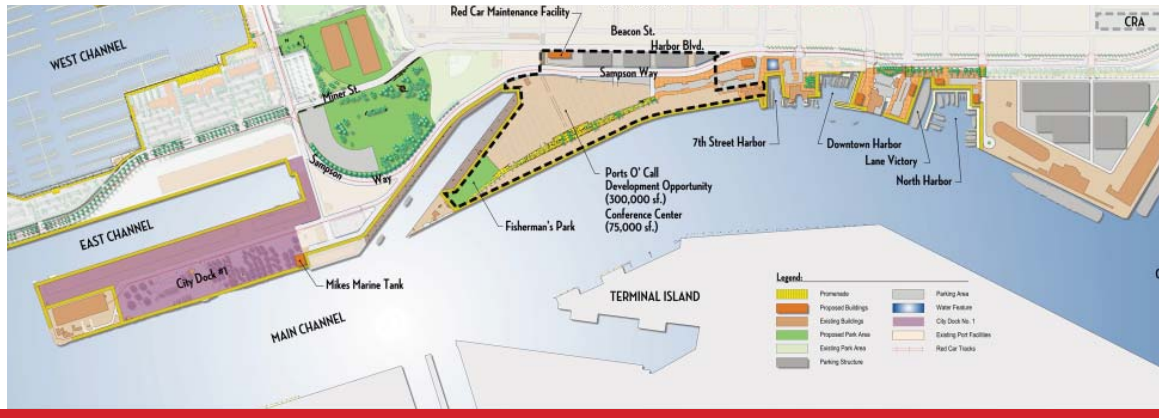
Source: Wilson & Company, August 2007

Key results from the ridership survey include:

- Approximately 25 percent of the existing ridership is associated with the cruise ship industry, as either crew members or passengers.
- Approximately 42 percent of the riders indicated that they had previously ridden the Red Car.

- Over 90 percent reported their primary purpose as sight-seeing/tourism/personal interest, with less than 10 percent replying use of the Red Car as a mode of transportation.
- The Port's O' Call Village was identified most frequently as a local attraction to be visited (23 percent), followed closely by local restaurants and Cabrillo Beach/Aquarium.
- Over 80 percent indicated that they would be very likely to ride the Red Car to other waterfront destinations.

Overall, the Red Car line has been extremely well received by the local community, continues to draw significant tourist ridership, and has evolved into a recognizable icon of the San Pedro waterfront.



3.0 Waterfront Activity Centers and Master Planning

3.0 WATERFRONT ACTIVITY CENTERS AND MASTER PLANNING

The various activity centers along the San Pedro and Wilmington waterfronts attract approximately two million visitors each year. **Figure 3-1** illustrates the many activity centers in the POLA/San Pedro/Wilmington vicinity.

The existing activity centers, as well as those planned for and redeveloped in the future, provide the background and context for an expanded Red Car operation. The ability to serve these activity centers in a convenient, friendly, and effective manner will determine both the feasibility and ultimately the success of the expanded Red Car system.

The following sections describe the many waterfront activity centers, as well as the future vision as portrayed by ongoing waterfront master planning activities in both San Pedro and Wilmington.

3.1 San Pedro Waterfront

The San Pedro community occupies 11.4 square miles on the west side of the Port's Main Channel. It had an estimated 80,300 residents in 2005 – reflecting an increase of over five percent from 2000 census figures. Multi-family residential and commercial uses are located along San Pedro's interface with POLA. The community's historic downtown district is home to various commercial, institutional, and residential uses.

Key Features/Activity Centers

Downtown San Pedro

San Pedro's historic downtown straddles 6th Street, which runs east-west from Gaffey Street almost all the way to the water's edge. The district is home to activities of varying nature. City Hall, as well as several offices – Northrop Grumman, for example – are located in the downtown area. There are numerous hotels and restaurants, in addition to historic structures like the Arcade Building and Warner Grand Theater. Center Street and Pacific Avenue divide the 6th Street corridor with more residential inland and increasingly commercial land uses toward the waterfront. Recently, there has been a growing trend toward residential loft development, with the 116-unit Centre Street Lofts, the 318-unit Vue building, and the 89-unit Bank Lofts developments as notable examples.

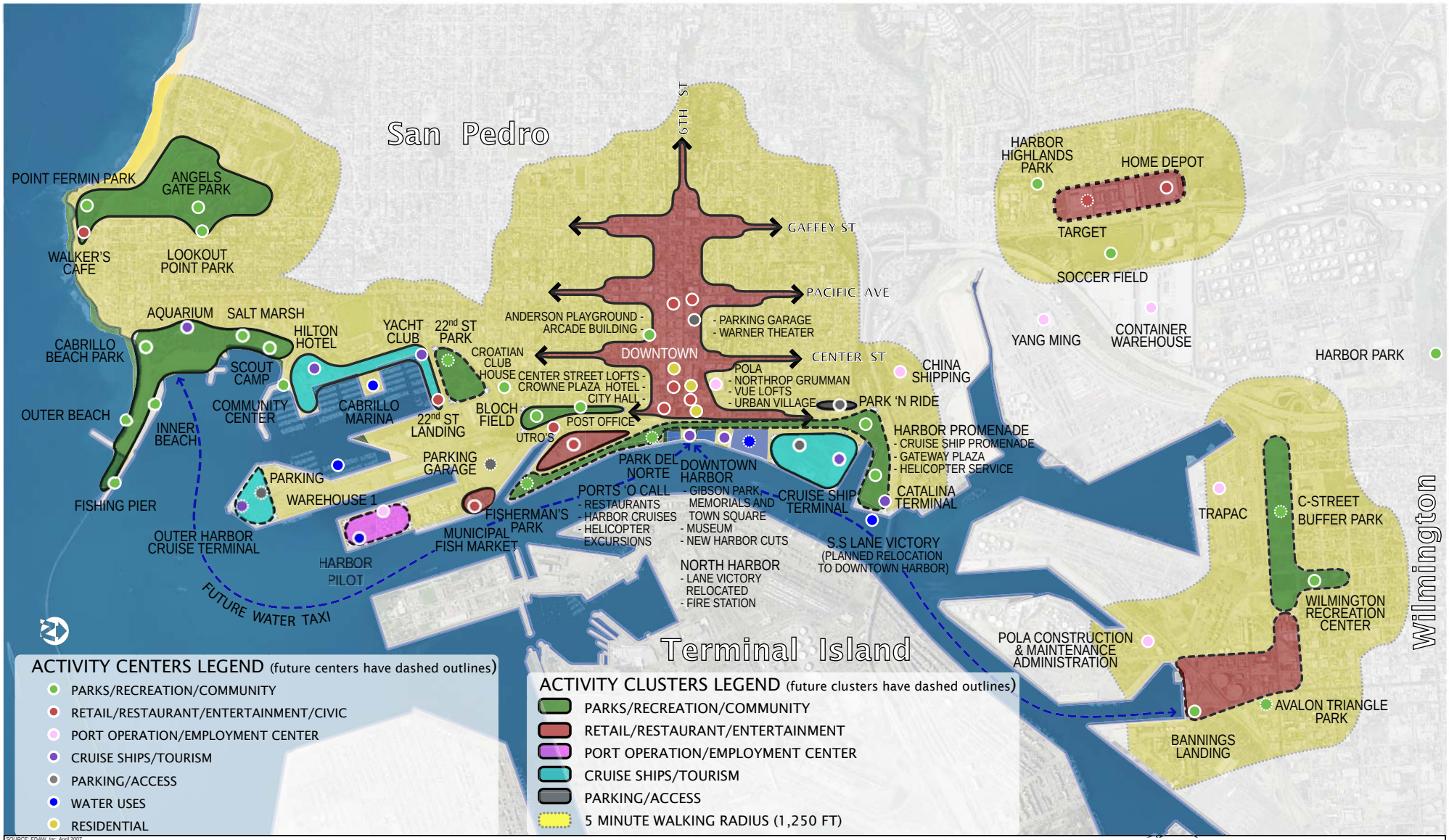
Angel's Gate

Point Fermin Park, Lookout Point Park and Angel's Gate Park are located on a bluff overlooking the Pacific, at the southern tip of San Pedro. They form a quiet and isolated environment with incredible ocean views. Angel's Gate Park is home to art studios and several youth organizations.

Cabrillo Beach

Located at the base of Angel's Gate's bluffs, the Cabrillo Beach Recreational Complex is spread over 370 acres. The beach is a popular destination for swimming, fishing and boating. The Bathhouse was originally built in 1932 for the Los Angeles Olympics, designated a historic landmark in 1989, and restored and opened to the public in 2002.

Cabrillo Beach Youth Waterfront Sports Center provides camping opportunities along the waterfront and the Cabrillo Marine Aquarium focuses on conservation of the marine life of Southern California. It is estimated that several thousand people visit the facilities at Cabrillo Beach each week, with summer visitation being much higher. Aquarium visitation is highest during the school months.



THE PORT OF LOS ANGELES
WILSON & COMPANY ENGINEERS & ARCHITECTS

Waterfront Red Car Line Expansion Feasibility Report

Figure 3-1
Port of LA Vicinity Activity Centers

Cabrillo Marina

The 1,100 slip Cabrillo Marina is located just north of Cabrillo Beach. Associated with the Marina are the Doubletree Hotel, as well as a conference center, retail outlets, restaurants, and public walkways. Design is moving forward on a major expansion program known as Cabrillo Marina Phase II.

Ports O' Call

Operating since 1963, Ports O' Call is a seaside village which is home to numerous well-known eateries such as the San Pedro Fish Market, the Crusty Crab and the Ports O' Call restaurants, as well as the annual Lobster Festival. Ports O' Call is also the embarkation point for harbor cruises and helicopter rides. The long-term goals for Ports O' Call envision a revitalized commercial center with approximately 187,500 square feet of shops and marketplace restaurants, reconfigured with a waterfront promenade providing extensive views of the waterfront.

World Cruise Center

The World Cruise Center is located at Berths 91/92 and 93, just south of Vincent Thomas Bridge. The facility can berth two modern cruise ships simultaneously. Currently there are approximately four to five cruise ships departing from the terminal on a weekly basis. During 2006, approximately 1,200,000 passengers passed through the terminal. The Catalina Express also provides service from this facility. A second cruise terminal is proposed at Berth 46 in the Outer Harbor to better accommodate the newest generation of larger cruise ships.

Waterfront Gateway

This mile-long project adjacent to the World Cruise Center includes the Cruise Ship and Harbor Boulevard pedestrian promenades, as well a dramatic new entry plaza and its signature water feature.

The new Waterfront Gateway and its signature water feature is one of the many new projects presently underway along the San Pedro waterfront.

S.S. Lane Victory

This national historic landmark is a 10,000 ton, World War II cargo ship that still sails, offering cruises around Catalina Island six times a year. It is operated as a floating museum by a volunteer crew of the U.S. Merchant Marine Veterans of WWII. Currently anchored below the Vincent Thomas Bridge, it is open daily for visitors. It is proposed to relocate the vessel's home to a new berth adjacent to the Maritime Museum.

Los Angeles Maritime Museum

The LA Maritime Museum is situated at the foot of 6th Street, and is the largest maritime museum in California. The Museum is located in the 1941 Municipal Ferry Terminal, now on the National Register of Historic Places.

Fire Station 112

Situated north of the Maritime Museum, Fire Station 112 originally housed Fireboat 2, the Ralph J. Scott, which is a national historic landmark. The facility now houses POLA's current generation of fireboat, with a new facility planned adjacent to the Maritime Museum to house the Ralph J. Scott.

San Pedro Waterfront Project

The San Pedro Waterfront Project recognizes that San Pedro's waterfront is its most valuable asset. It focuses on balancing the needs of water-based recreation, education, entertainment, transportation, and commerce. The Promenade, an uninterrupted 8.7 mile public walkway along the water's edge, is the defining element of the project, extending from the Vincent Thomas Bridge to the federal breakwater. This promenade will facilitate public access to various activity centers and recreational activities along the waterfront. A series of waterfront parks and public open spaces will punctuate the length of the Promenade to provide a variety of authentic waterfront experiences.

The San Pedro Waterfront Project envisions the Red Car as the primary mode of transportation linking important waterfront activity centers. **Figure 3-2** displays the proposed project. Key components of the project include:

- Expansion of the existing Red Car as the transit backbone serving the waterfront;
- A continuous promenade that will integrate areas along the waterfront;
- Convenient parking areas and structures that encourage visitors to park once and experience the waterfront in a pedestrian-friendly environment.

The Draft Environmental Impact Report (EIR) for the San Pedro Waterfront Project was prepared and released for public review in July 2008. Following public review and comment, a final EIR is scheduled for possible certification in the later part of 2009.

3.2 Wilmington Waterfront

The Wilmington community, with over 53,000 residents, occupies 10 square miles just north of San Pedro and the Port. Almost all of Wilmington's land that is adjacent to the Port is dedicated to industrial uses. Residential uses are found a block north of Harry Bridges Boulevard, which serves as a clear boundary between the community and the Port.

Key Features/Activity Centers

Banning's Landing

In 1996, POLA built the 10,000-square-foot Banning's Landing Community Center as a "window on the water." The center supports cultural and educational activities through its folk arts program and overall sponsorship of the arts. The City of Los Angeles Cultural Affairs Department operates the center in association with the Friends of Banning's Landing.

SOURCE: GAFCon, Sept 2005

THE PORT OF LOS ANGELES
WILSON & COMPANY ENGINEERS & ARCHITECTS

Waterfront Red Car Line Expansion Study

Figure 3-2
San Pedro Waterfront Project

Wilmington Recreation Center

The Recreation Center is located just north of C Street at its intersection with Neptune Avenue. It is operated by the City of Los Angeles Department of Park and Recreation and provides a multitude of recreational facilities including baseball diamonds, gymnasium facilities, and soccer fields. It also houses a Senior Citizen Center and also focuses on neighborhood youth development.

Bayview and Neptune Fields

Bayview Field includes 3.5 acres of grass fields bounded by Harry Bridges Boulevard, "C" Street, Neptune Avenue and Bayview Avenue. It is available for public use as a recreation facility and is just across the street from Neptune Field, another Port community-related development.

Avalon Triangle Park

This park is the first in a series of projects identified in the community's conceptual plan for development of the Wilmington Waterfront. The park includes a central lawn area, jogging pathway, picnic benches and a plaza.

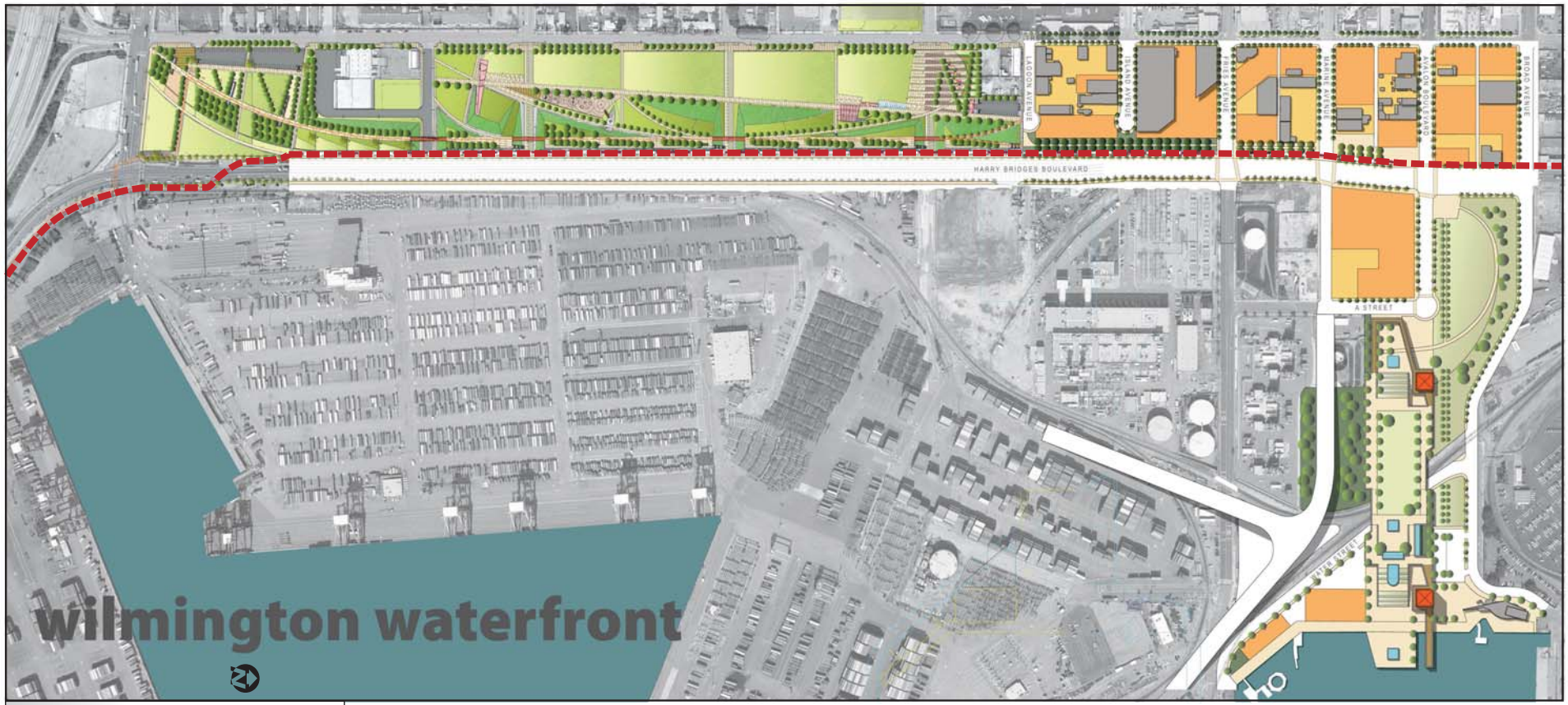
Wilmington Waterfront Development Program

The *Wilmington Waterfront Development Program* project area extends from the Vincent Thomas Bridge on the west, along Front Street, Pacific Avenue, John S. Gibson Boulevard, Harry Bridges Boulevard, Anaheim Street, and Henry Ford Avenue, to the Leeward Bay Marina on the east. The Program's focus is on a 59-acre area directly adjacent to the Wilmington community between Figueroa Street and Broad Avenue and between C Street and Banning's Landing. **Figure 3-3** displays the Master Plan concept.

Key objectives of the program include the creation of a community amenity that provides regional linkages, separates Wilmington from POLA operations, increases economic opportunity, and connects Wilmington with its historic waterfront. Features of the program include:

- The continuation of the California Coastal Trail, a region-serving multi-use pathway, from San Pedro through Wilmington to Leeward Bay Marina. Other regional linkage improvements include extension of the Red Car from San Pedro to Avalon Boulevard in Wilmington;
- An approximately 30-acre open space buffer extending from Figueroa Street to Lagoon Avenue, between C Street and Harry Bridges Boulevard, with play areas, plazas and public art;
- A gateway to Wilmington's waterfront at Avalon Boulevard and Harry Bridges Boulevard, featuring a park, plazas, signage and limited street-front retail;
- An enhanced public realm connecting the Wilmington community to the waterfront, including a series of interconnected parks, plazas, a wide landscaped bridge and a promenade with event spaces, overlooks, piers and public art; and
- Commercial and industrial development opportunities in the area between Lagoon Avenue and Broad Avenue, consistent with existing uses and providing jobs and amenities for the Wilmington community.

The *WRCL System Purpose and Need Assessment (Wilson & Company, July 2007* - **Appendix 1-1***)* provides additional details about both the San Pedro and Wilmington waterfronts.



LEGEND

Proposed Red Car Alignment

SOURCE: GAFCon, Sept 2005

THE PORT OF LOS ANGELES

WILSON & COMPANY ENGINEERS & ARCHITECTS

Waterfront Red Car Line Expansion Study

Figure 3-3
Wilmington Master Plan Concept

4.0 Purpose and Need Assessment

4.0 PURPOSE AND NEED ASSESSMENT

Improving access to the waterfront and providing support to on-going POLA and City of Los Angeles redevelopment efforts have been identified as important roles for an expanded Red Car system. Recent waterfront planning and redevelopment activities all acknowledged the Red Car as a key component of enhancing and improving access along the waterfront. In addition, the benefits of implementing the proposed Red Car extensions need to be considered within the context of the San Pedro Waterfront Project, the Wilmington Waterfront Development Program, and related activities of the Community Redevelopment Agency (CRA).

This chapter provides an overview of the purpose and need associated with each of the proposed Red Car extensions, as documented in the *WRCL System Purpose and Need Assessment (Wilson & Company, July 2007* - **Appendix 1-1***).* Service objectives and findings relative to compatibility with and support of waterfront development activities are presented for each of the extensions, followed by an assessment of ridership potential.

A *purpose and need assessment* was conducted of each of the proposed Red Car extensions with the objective of identifying key issues and associated benefits. This assessment also assisted in establishing preliminary service and design requirements associated with each of the proposed extensions. **Figure 4-1** displays the various Red Car extensions under consideration.

4.1 Service Objectives and Support of Waterfront Development

Harbor Boulevard/Sampson Way Realignment

Service Objectives

The Harbor Boulevard/Sampson Way realignment will enhance public access to the waterfront by providing improved connections to activity centers and locations presently being served by the Red Car. The realignment will also further the overall waterfront development plan by integrating with the realignment of Sampson Way, providing direct connectivity between the Red Car and an improved Ports O'Call Village and SP Slip area. Key service objectives for this extension include:

- Enhance public access to the waterfront
- Provide improved connections to activity centers presently being served
- Enhanced alignment (e.g. Grand Boulevard concept) in conjunction with Sampson Way realignment
- Serve as the "spine" of an expanded Red Car system

Compatibility with Waterfront Redevelopment Activities

The Harbor Boulevard/Sampson Way realignment would be strongly supportive of overall waterfront redevelopment activities, as evidenced by the following:

- The Red Car and an improved roadway alignment are viewed as critical components of overall redevelopment plans
- Key part of the initial POLA investment in revitalizing the Ports O' Call Village
- Realignment would improve waterfront access by bringing the Red Car closer to key activity centers and enhancing system capacity

LEGEND

Potential Red Car Extension

Proposed Red Car Station

WILMINGTON EXTENSION

Harry Bridges Boulevard

John S. Gibson Boulevard

NORTH GAFFEY EXTENSION

Gaffey Street

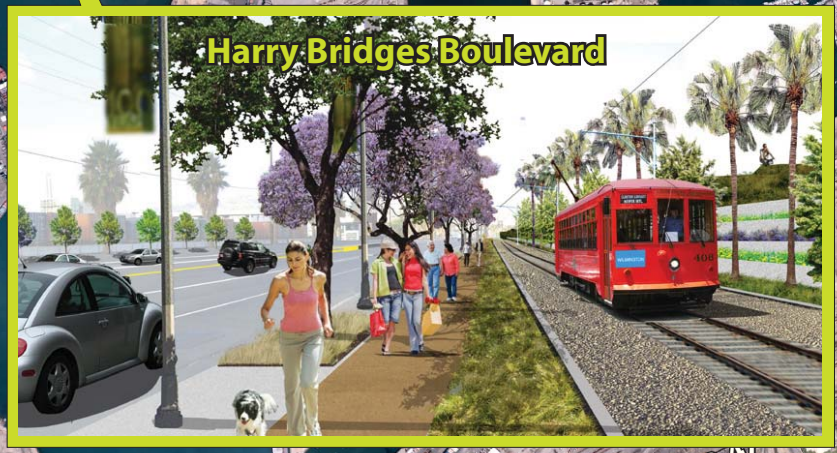
110

Front Street

Vincent Thomas Bridge

SR-47

Harry Bridges Boulevard



W. Summerland Avenue

1st Street

5th Street

8th Street

Gaffey Street

Pacific Avenue

Mesa Street

Harbor Boulevard

DOWNTOWN EXTENSION

SAMPSON WAY REALIGNMENT

HARBOR BLVD.

7th Street

22nd Street

CITY DOCK NO. 1 EXT.

City Dock No.1

OUTER HARBOR

CABRILLO BEACH/MARINA EXTENSION

Via Cabrillo Marina

SOURCE: Wilson & Company, Inc, Engineers & Architects; October 2007

THE PORT OF LOS ANGELES

WILSON & COMPANY ENGINEERS & ARCHITECTS

Waterfront Red Car Line Expansion Study

Figure 4-1
Study Area and
Proposed Red Car Line Extensions

Cabrillo Beach/Marina Extension

Service Objectives

The purpose of the Cabrillo Beach/Marina Red Car extension is to enhance public access to the waterfront by providing direct connections to several highly visited beach and marina destinations. Other than the present Red Car line and the connecting bus shuttle, there is no public transportation along the southern half of the San Pedro waterfront. Key service objectives include:

- Enhance public access to the waterfront
- Provide direct connections to key beach and marina destinations
- Provide alternative access to the popular Cabrillo Beach attractions, helping to reduce automobile traffic and peak parking demands
- Encourage "park once" philosophy and pedestrian use of promenade

Compatibility with Waterfront Redevelopment Activities

A key objective of the *San Pedro Waterfront Project* is to increase public access to the waterfront. The Plan identifies the 22nd Street/Marina District and the Beach District as major opportunities for redevelopment and enhanced public access. The Cabrillo Beach/Marina extension would be strongly supportive of overall waterfront redevelopment activities, as summarized below:

- Extension will facilitate and support enhanced access to the beach, marina and associated venues
- Provides waterfront transportation and connectivity with planned Promenade

Downtown San Pedro Extension

Service Objectives

The purpose of the Downtown San Pedro Red Car extension is to create a stronger and more integrated linkage between the downtown and waterfront areas. It also is intended to provide more options for downtown and waterfront visitors in terms of parking, transit connections, and access to other activity centers. Key service objectives associated with the Downtown San Pedro extension include:

- Enhance access to the waterfront and Port facilities for people that live, do business, and visit the downtown area
- Provide additional travel options for downtown and waterfront visitors in terms of parking and transit connections (i.e. connecting to a transit center)
- Encourage and facilitate increased tourist visitation to the downtown and waterfront areas
- Promote the "park once" philosophy for both waterfront and downtown visitors

The Los Angeles City Planning Department has initiated an update of the *San Pedro Community Plan.* As a complementary and more focused activity, the City Planning Department is also conducting the *Downtown San Pedro Design Study*. The City Planning Department has identified the need for new mixed-use developments combining residential and commercial uses, public parking structures, cultural venues, and a full-service grocery store as essential catalysts for downtown revitalization. This study is reviewing current and proposed downtown land uses and in

conjunction with the Community Redevelopment Agency (CRA), is identifying opportunities for revitalization through redevelopment and related community enhancement activities.

In addition, the CRA and the Metropolitan Transit Authority (MTA) completed a study in 1999 identifying the need to establish a downtown San Pedro transit center, titled the *Downtown San Pedro Transit Hub Mixed Use Development Study*. The facility is envisioned to provide a focal point for San Pedro area transit users and visitors from the greater Los Angeles area and would facilitate the transfer between local circulator services, regional bus routes and commuter services. Establishment of a transit center serving the San Pedro area was also recommended in the *South Bay & Gateway Transit Restructuring Study* co-funded by the MTA and LADOT, since this area is a terminus of eight regionally significant bus routes.

The *Downtown San Pedro Transit Hub Mixed Use Development Study* discusses the Port's plans to redevelop the San Pedro waterfront and recognizes the opportunities a regional hub transit center would provide in linking incoming visitors with a Red Car line extension that would shuttle visitors to various destinations along the waterfront. By promoting a central location for regional transit connections, the transit center could help promote downtown and waterfront redevelopment by facilitating regional as well as local access.

A transit center and new parking facilities coupled with a downtown San Pedro Red Car line extension would also facilitate the movement of visitors, cruise ship passengers, residents and Port employees between downtown and waterfront hotels, restaurants, businesses, attractions and waterfront events and festivals. (i.e. Lobster Festival, Tall Ship Festival, Rail Festival).

The Transit Center in Kenosha, Wisconsin provides riders with an easy connection between bus lines and the downtown streetercar

Downtown revitalization can therefore result in establishment of a new transit center and new and enhanced parking facilities, enabling shared parking opportunities for visitors to access the waterfront via an expanded Red Car system.

Compatibility with Waterfront Redevelopment Activities

The Tidelands Grant and Public Trust Doctrine requires that POLA use the properties in the Harbor District and funds from the use of those properties for purposes of promoting maritime commerce, navigation and fishery. The use of these resources must also be beneficial both regionally and statewide, not just locally. In order to justify the expenditure of POLA funds on a downtown San Pedro extension of the Red Car, it will be necessary to demonstrate the appropriate nexus with maritime commerce, navigation and fishery, as well as demonstrating regional and statewide benefits.

Demonstrating this nexus becomes more difficult where the Red Car extension would not be in the Harbor District. Whether a Red Car extension between the downtown and waterfront area, coupled with new parking facilities and/or a transit center in the downtown area, would provide

the necessary nexus and benefit has yet to be fully assessed. Further studies and reviews by appropriate parties will be required before such a determination can be made. Because there may not be sufficient nexus, POLA fund may not be available or may otherwise be limited for this extension. Nevertheless, other sources of funding may be available and are discussed in Section 12.0.

In summary, linking the downtown area and the waterfront via the Red Car would support overall waterfront redevelopment activities by accomplishing the following:

- Providing a means to bring people that live, do business, and visit downtown to the waterfront
- Providing linkages to additional parking facilities in the downtown area for waterfront activities. This would lessen the demand for parking structures and reduce traffic along the waterfront, thus making the waterfront more pedestrian-friendly.
- Providing a link to a downtown transit center which would facilitate the movement of visitors and local residents to the waterfront.
- Encouraging the growth of additional visitor support businesses (e.g., restaurants, gifts)
- Encouraging the growth of additional support businesses for waterfront businesses (e.g., supplies, postage, professional services, and government services)
- Connecting the waterfront to other transportation modes
- Reducing congestion by encouraging and supporting a "park once" philosophy

Outer Harbor/Cruise Ship Terminal Extension

Service Objectives

The Outer Harbor extension would provide access to the proposed Outer Harbor Cruise Ship Terminal and Park, proposed boat launch and youth boating facility, as well as Fire Station 110 and the expanded Cabrillo Marina and associated development. Key service objectives include:

- Serve as a shuttle service for cruise ship passengers between off-site parking facilities (existing World Cruise Center, Caltrans Park-and-Ride, and/or Sampson Way/Signal Street) and the proposed Outer Harbor Cruise Ship Terminal
- Provide access to shopping/retail/restaurant facilities for cruise ship passengers and crew before and after a cruise
- Provide access to the proposed Outer Harbor Park, and expanded Cabrillo Marina and associated developments

Compatibility with Waterfront Redevelopment Activities

For the Outer Harbor/Warehouse District, the *San Pedro Waterfront Project* identifies significant opportunities to create a district with restored warehouses, new museums and cultural uses with a connecting promenade. Included along the Outer Harbor Peninsula would be an expanded marina, promenade, and a new cruise ship terminal. Supportive features associated with expansions of the Red Car include the following:

- Encourages and promotes non-vehicular access to the Outer Harbor area
- Strongly supportive of growing and enhancing the economic vitality of the cruise ship

operations

- Enhanced public access to the planned Outer Harbor park

City Dock No. 1 Extension

Service Objectives

The primary purpose of the City Dock No. 1 Red Car extension is to provide access to future redevelopment within the Warehouse District along Signal Street. Key service objectives include:

- Provide access to Warehouse One as a potential future site of the Red Car Museum facility or other adaptive reuse
- Provide access to future development (e.g. proposed marine research facilities, art exhibition space or trade exposition building) and parking structures in the Warehouse/City Dock No. 1 District

Compatibility with Waterfront Redevelopment Activities

The degree to which the City Dock No. 1 extension would support waterfront development activities is dependent upon the time frame for the conversion of the various properties in the Warehouse District. A Red Car extension could be a key ingredient in attracting private investment for adaptive reuse of the historic warehouse buildings and the present Westway Terminal site that now dominate Signal Street. Issues relating to the role of the Red Car in redevelopment of this area are summarized below:

- Timetable for Red Car extension is dependent upon the future use of the existing industrial sites along Signal Street.
- A Red Car extension could help catalyze redevelopment.
- Possible location for a Red Car Museum
- Could provide primary means of public access to this area

North Gaffey Extension

Service Objectives

The North Gaffey Extension would serve adjacent commercial and residential projects along the line. Key service objectives include:

- Enhance waterfront access and connectivity between the waterfront activity centers and the neighborhood commercial, recreational and residential land uses along the North Gaffey corridor
- Provide additional and convenient travel options for the Northwest San Pedro community
- Provide access to potential future remote parking locations

Compatibility with Waterfront Redevelopment Activities

The degree to which the North Gaffey extension would support waterfront development activities is dependent upon the type of development that occurs along this line in the future. The supporting role of the Red Car is summarized below:

- Highly dependent upon type and extent of redevelopment activity along the North Gaffey corridor
- Supports connecting the Northwest San Pedro community to the San Pedro and Wilmington waterfronts
- Possible remote parking opportunities and transit interface would enhance waterfront access

Wilmington Extension

Service Objectives

The purpose of the Wilmington extension is to link the communities of San Pedro and Wilmington together with a convenient and environmentally friendly mode of transportation. Key service objectives associated with this line extension include:

- Enhance access to and within both communities and their respective waterfront areas. Provide a linkage between the activity centers in San Pedro and Wilmington.
- Provide additional and convenient travel options for the Wilmington community
- Provide linkages to other regional transit modes and facilities

Compatibility with Waterfront Redevelopment Activities

The Red Car would support the *Wilmington Waterfront Development Program* and associated redevelopment activities by providing an attractive and environmental friendly mode of transportation along the planned "Buffer" and could support future retail/commercial development of the eastern portion. The Wilmington redevelopment program envisions the Red Car as an important regional transportation linkage between Wilmington and San Pedro, as summarized below:

- The *Wilmington Waterfront Development Program* identifies right-of-way for future Red Car alignment
- Provides interface with planned pedestrian facilities, including the California Coastal Trail
- Key means of access in and along the planned Wilmington buffer area
- Facilitates enhanced access between Wilmington community and the San Pedro waterfront

4.2 Ridership Potential

Ultimately, the extent of ridership will determine the viability and success of an expanded Red Car system. This section evaluates the ridership potential of the individual line extensions. The evaluations were conducted on a comparative basis, relative to each other and required consideration of the likely magnitude of patrons served, the number and type of activity centers served, and interface with the Red Car system as a whole. Based upon an assessment of each of these factors, a relative rating of high, medium and low was applied to each extension. **Table 4.1** summarizes the ratings and the basis for estimating the ridership potential associated with each of the Red

Car extensions. An actual quantitative estimate of ridership for an expanded Red Car system based upon ridership on other similar systems is provided in *Chapter 9.0* as part of the overall system operating assessment.

Table 4.1
Ridership Potential

Extension	Relative Ranking	Comments
1. Harbor Boulevard/Sampson Way Realignment	High	● Realignment of existing operation ● Access to Ports O' Call and Downtown Harbor ● Will serve as system "spine" with access to all Red Car destinations
2. Cabrillo Beach/Marina Extension	High	● Existing shuttle service ● Access to Cabrillo Beach/Aquarium ● High summer visitation ● Linkage with other waterfront activity centers ● Avoidance of traffic congestion/parking shortages
3. Downtown Extension	High	● Linkage with waterfront and downtown businesses/ residents ● Travel by downtown residents and waterfront visitors ● Cruise ship related travel- passengers /crew members ● Potential parking linkages ● Interconnections to/from other modes
4. Outer Harbor/Cruise Ship Terminal Extension	Non- Cruise Ship Patrons – Low Cruise Ship Patrons – High	● Dependent upon attractions/venues for non-cruise ship patrons ● Dependent upon cruise ship activity and off-site parking locations ● Challenging logistics
5. City Dock No. 1 Extension	Low-Medium	● Limited attractions in near-term timeframe ● Future use of City Dock No. 1 is undetermined
6. North Gaffey Extension	Low- Medium	● Expanded retail opportunities for downtown residents ● Proposed retail is not transit supportive ● Limited access to adjacent residential areas ● Potential off-site parking facilities
7. Wilmington Extension	Low - Medium	● Limited activity centers ● Open space nature of Buffer ● Possible special events ● Access for local residents ● Relatively long travel times ● Linkages with other transit services

Source: Wilson & Company, August 2007

As shown in the table, the Harbor Boulevard /Sampson Way, Cabrillo Beach/Marina, and Downtown San Pedro extensions were all rated high due to a high level of access and service to the various waterfront and downtown activity centers and visitor attractions.

The ridership potential associated with the Wilmington and North Gaffey extensions was rated lower than many of the other extensions due to limited access to a fewer number of existing and planned activity centers along the extensions. It is understood that this could change over time based upon the type and extent of redevelopment activity, planned connections with other transportation modes, and related considerations.

5.0 Engineering Analysis and Capital Costs

5.0 ENGINEERING ANALYSES AND CAPITAL COSTS

This chapter describes each of the proposed line extensions and examines engineering feasibility issues. A preferred preliminary alignment is identified based on the consultant team's work to date and input from Port staff. As noted previously, the preferred alignments along the San Pedro waterfront are based on subsequent more detailed conceptual engineering studies and coordination activities with other of major adjacent projects which are now in the planning and design stages. These projects will create major new roadway and other infrastructure elements that present an ideal opportunity to incorporate alignments for the expanded Red Car system.

Preliminary capital cost estimates are also presented based on the respective preliminary alignments. The preliminary cost estimates are based on industry experience on similar projects; alignment, trackway and related infrastructure requirements; and conclusions consistent with the preliminary conceptual design. This pre-design estimate includes a planning level of contingency, reflecting the fact that the project still requires further detailed design at this stage.

The appearance of the Red Car right-of-way can be enhanced significantly with "green" turf-track construction, commonly used in Europe.

Generally, the contingency factor applied to costing the project will vary inversely to the level of design detail; as the design progresses, the contingency percentage will be reduced as additional detail is included in the estimate. For the extensions located along the San Pedro waterfront, the alignments and related cost estimates are somewhat more refined based upon the alignment plan and profile work completed in support of the San Pedro Waterfront EIR.

Design Variables

At this preliminary stage of concept design, there are a number of design variables which potentially will influence the alignments and overall magnitude of project costs. (It should also be noted that all plans need to be submitted to the California Public Utilities Commission for approval):

- **Alignment location -** In general, off-street alignments including existing rail right-of-way can be constructed at a significantly lower cost than in-street alignments. In general, it is assumed that no purchase of property will be required. Some property exchanges with City of Los Angeles could occur where right-of-way is not on POLA property. Although subsequent detailed design work may change/refine the alignment, a preferred concept has been assumed based on discussions with POLA staff and work on the project to date.
- **Adjacent roadway and other civil projects -** A significant portion of the Red Car "spine"

along Harbor Boulevard and Sampson Way could be constructed in conjunction with implementation of proposed new roadway alignments. The degree to which adjacent civil improvements needed for the Red Car could or would be incorporated into these projects is yet to be determined. For costing purposes, it was assumed that design efforts for the Red Car and adjacent roadway projects are effectively coordinated and result in significant cost savings for the Red Car project by allowing required key improvements to be incorporated into the roadway project design.

The existing Ports O'Call station

- **Relocation/protection of utilities–**Although utility impacts on existing railroad right-of-way are generally presumed to be lower than those associated with in-street alignments, some right-of-way sections have limited room for additional tracks, and hence will have the potential to impact above ground structures. Additionally, several of the proposed line extensions will be located off of existing railroad right-of-way. In general, it was assumed that utility impacts would be minimal where former rail right-of-way is used in San Pedro. Moderate to heavy utility impacts were assumed on other extensions. A more detailed cataloging of the existing utilities was conducted on each of the extensions located along the San Pedro waterfront (**Appendix 2-8**: *Preliminary Utilities Report*)**.**
- **Landscaping -** POLA is planning several pedestrian enhancements adjacent to the proposed Red Car extensions, including major extensions of the waterfront promenade. The development of the pre-design cost estimate assumed an emphasis on an attractive, sustainable "green" Red Car right-of-way, although the division between Red Car related improvements and adjacent landscaping has yet to be fully determined. The initial assumption is that planning for the pedestrian enhancement projects will allow for the Red Car right-of-way and that additional improvements outside the rail right-of-way would generally be attributed to the adjacent projects.
- **Impacts on adjacent freight railroad track -** Impacts on adjacent freight railroad track could occur in locations where the Red Car alignment shares right-of-way with freight railroad operations (i.e. North Gaffey and Wilmington). More detailed alignment studies along with a better understanding of adjacent freight railway infrastructure projects will be required to detail these impacts and refine the preliminary cost estimate on these extensions.

Based upon consideration of these design variables, a number of basic design assumptions were made to support the alignment planning and costing at this phase:

- Line-of-sight operating practice with relatively slow system speed (<30 mph). No block occupancy or cab control signaling.
- No shared use track (freight service to be completely abandoned in San Pedro). Some shared right-of-way (separate Red Car and freight tracks on the same right-of-way) and limited crossings of Red Car track over freight sidings on the Wilmington extension.

- Minimal use of crossing gates at roadway crossings off of shared right-of-way, with traffic signals used instead. (**Chapter 10** and **Appendix A-1:** *Red Car Traffic Circulation Report***)**
- Central "spine" of system (largely within or adjacent to newly constructed street right-of-way) would be double tracked, with emphasis on attractive, sustainable "green" right-of-way. Other branches of system would be single tracked.
- Different type of replica vintage streetcar vehicle to be used: A steel-bodied car with updated braking and control systems, better suited to the new operating environment. Cars would also be capable of one-person operation. (**Chapter 8.0:** *Red Car Vehicle Types*)
- Existing replica vehicles would be modified with improved steps for boarding from street level. Car 1058 would be retained for special operations/museum display.
- All four existing high platform stations would be removed. New stations would be a simple low-level configuration with waiting shelter/bench, signage, and train arrival LED display. More elaborate stations would be provided adjacent to major activity centers where higher passenger volumes are anticipated. Where warranted for passenger convenience, stop spacing would be relatively close (1,100-1,500 feet), with the understanding that vehicles stop only on demand. Wherever practical, stops/ stations would be long enough to accommodate two cars. All end-of-line stations would be two tracks with center platform and appropriate cross-over arrangement. (**Chapter 7.0:** *Station Concepts*)
- 600 VDC operating voltage, direct suspension OCS (minimal visual clutter). Decorative steel OCS poles would be used throughout the system, except possibly along sections of the Wilmington and North Gaffey lines. (**Appendix A-6:** *Traction Power Requirements*)
- High resistance (earth isolated) traction power system, 0.75 mile average substation spacing, no parallel feeders or underground conduits, welded rail, and vehicles with low auxiliary load (no air conditioning). The isolated track structure will minimize POLA exposure to potential claims of underground utility degradation due to stray current losses from the Red Car system.

The following sections review the preferred alignments, associated engineering issues, and capital cost requirements associated with the proposed Red Car extensions.

5.1 Harbor Boulevard/Sampson Way Realignment

The approximately 1.5 mile Harbor Boulevard/Sampson Way realignment would relocate the existing Red Car line consistent with the proposed San Pedro Waterfront Project, wherein the present day Sampson Way would be replaced with a new roadway between 7th Street and 22nd Street. In addition to displacing a significant portion of the existing Red Car line, the proposed new roadway would also displace the existing Ports O' Call and 22nd Street stations.

This realignment has been viewed as a key opportunity to implement the Red Car line in the context of the "Grand Boulevard" envisioned in the San Pedro Waterfront Master Plan, creating the "spine" of an expanded Red Car system. **Figure 5-1** depicts the proposed Harbor Boulevard/ Sampson Way realignment of the existing Red Car line.

The majority of the Harbor Boulevard/Sampson Way realignment would be new construction in new right-of-way, with some use of the existing railroad right-of-way along Harbor Boulevard. Stations would be located in the same general areas as the existing stations, with additional stations proposed to link directly with a proposed parking structure near the SP Slip and a mid-point station serving the Harbor Boulevard Promenade.

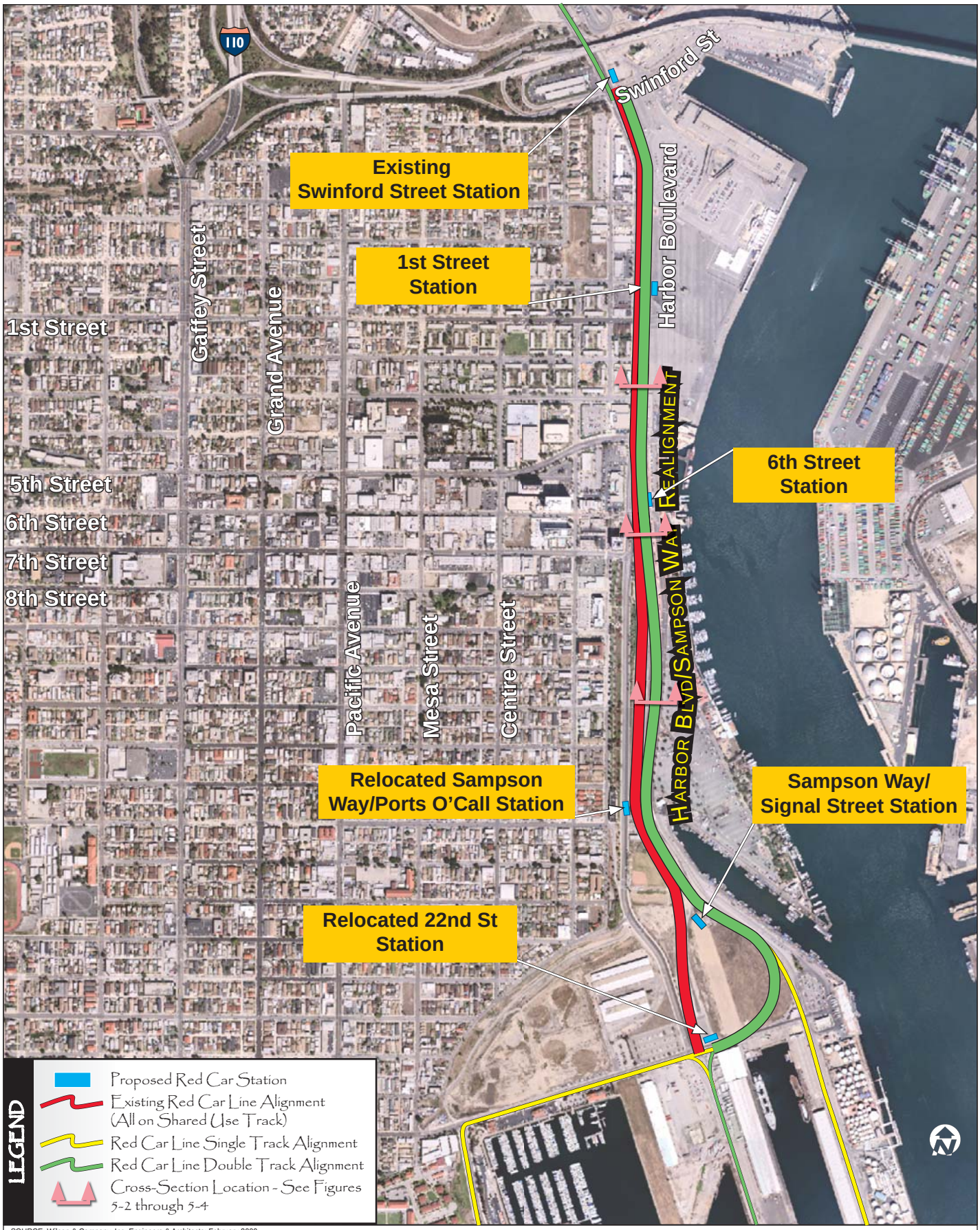
Existing Red Car along Harbor Boulevard, near O'Farrell Street. The Red Car would remain on the existing railroad right-of-way at this location, but would be double-tracked.

Six (6) station locations have been identified along the Harbor Boulevard/Sampson Way Realignment:

Swinford Street: This existing station presently serves as the northern terminus of the Red Car line. It is located adjacent to the World Cruise Center and Waterfront Gateway, and thus has the potential to handle a high volume of passengers. The existing station would be replaced and relocated in order to accommodate a second track.

1st Street: This station would provide a mid-point connection to the Harbor Boulevard section of the promenade and the proposed north harbor cut.

6th Street: The 6th Street station is existing and would continue to serve the downtown Harbor area and its large cluster of existing and planned attractions. Depending on the alignment, the station would be located adjacent to Harbor Boulevard or within the enhanced plaza area (See alignment discussion below.)



SOURCE: Wilson & Company, Inc, Engineers & Architects; February 2009

THE PORT OF LOS ANGELES

WILSON & COMPANY ENGINEERS & ARCHITECTS

Waterfront Red Car Line Expansion
Feasibility Report

Figure 5-1
Harbor Boulevard/
Sampson Way Realignment

Ports O' Call: The existing station will be relocated in conjunction with the realignment of Sampson Way. This station serves the Ports O' Call Village development and Fisherman's Park as well as the historic SP Slip which is the base of operations for the area's commercial fisherman. Nearby, a major pedestrian access improvement is planned in the form of a pedestrian bridge from the bluffs at 13th Street. In addition, as discussed in the next chapter, the SP Yard is the recommended location for the new Red Car Maintenance Facility and possibly the museum as well. This station will provide access to these new facilities.

Sampson Way/Signal Street: This station would provide access to a proposed parking structure at this location, and also serve as a transfer point to the City Dock No. 1 extension.

22nd Street/Miner Street: This existing station presently serves as the southern terminus of the existing Red Car line where passengers can transfer to a shuttle bus to continue to 22nd Street Landing and the Cabrillo Beach area. This station would also be relocated with the Sampson Way realignment project, its precise location and configuration to be determined based upon the plan for the relocated roadway. The new station could also serve as a major transfer point to the Outer Harbor extension, as well as providing convenient access to the north end of the Cabrillo Marina Phase II.

Preferred Alignment

The Harbor Boulevard/Sampson Way realignment would create the "spine" of the new Red Car system between Swinford Street and 22nd Street. For evaluation purposes, the realignment can be divided into two segments at 7th Street:

1. The 0.8 mile northern segment between Swinford and 7th Streets would utilize the existing rail right-of-way along Harbor Boulevard in the downtown area.

2. The 0.9 mile southern segment between 7th and 22nd Streets would be located within the newly established Sampson Way corridor.

For the northern segment, the current preferred alignment would include new double track constructed as "open" ballasted track on the existing railroad right-of-way between Swinford and 5th Streets.

South of 3rd Street, earlier studies had assumed the alignment would transition to the median of Harbor Boulevard as shown in the adjacent figure. In a similar manner, for the southern segment between 7th and 22nd Streets, it was assumed that the alignment would continue within the median of the new Sampson Way.

Earlier option showing Red Car in median of Harbor Boulevard

However, due to various right-of-way constraints, the current alignment concept is for the Red Car to continue along the east side of

Harbor Boulevard, and transition to the east side of the new Sampson Way.

South of 5th Street, two (2) options have been identified and evaluated for the Red Car alignment:

1. Within Harbor Boulevard
2. Within Plaza Area

The alignment within Harbor Boulevard would be single track, while the alignment within the Plaza area would be double track. In the vicinity of Ports O'Call, the alignment would transition from the east side of Sampson Way to the west side of Sampson Way, and proceed south to the terminus at 22nd Street.

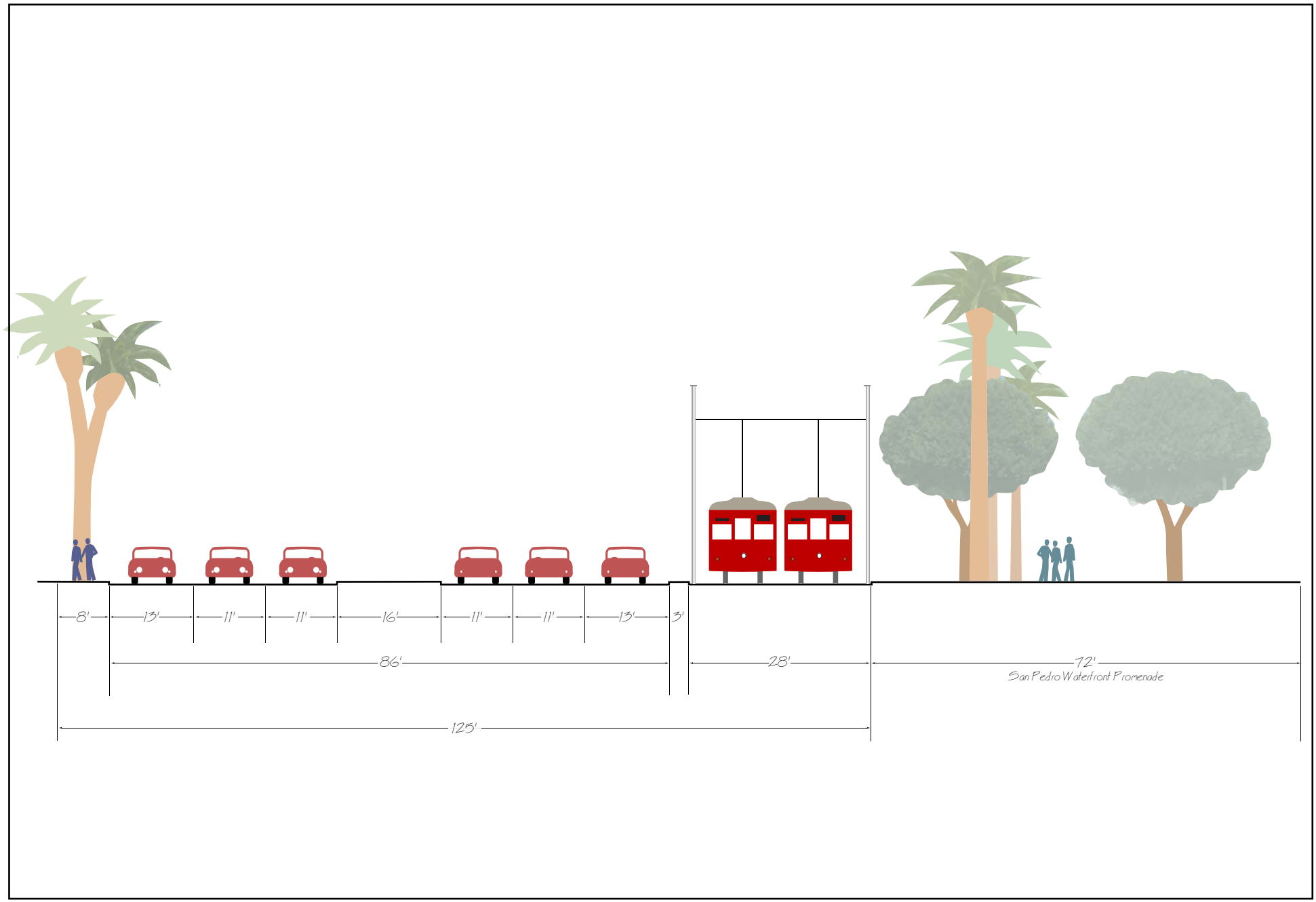
Figure 5-2 shows a cross-section of Harbor Boulevard, south of 3rd Street, with rebuilt double-track Red Car realignment on the existing railroad right-of-way. **Figure 5-3A** shows the option and cross section of Harbor Boulevard, south of 6th Street, with exclusive Red Car right-of-way within the existing Harbor Boulevard. **Figure 5-3B** displays the cross-section of Harbor Boulevard with the Red Car located within the redeveloped waterfront plaza area. **Figure 5-4** shows a cross-section of the planned Sampson Way, south of 7th Street, with the Red Car operating along the east side.

Engineering and Implementation Considerations

The major engineering and implementation consideration for the Harbor Boulevard/Sampson Way Red Car realignment will be coordination with the design and construction of the new Sampson Way and Harbor Boulevard roadway projects. As part of the San Pedro Waterfront Project, the present day Sampson Way would be replaced with a new street between 7th and 22nd Streets, with the street widened to two lanes in each direction with a center median of up to 48 feet in width (incorporating 8 to 10 foot landscaping zones on either side of tracks where space is available). Because the new roadway will displace some sections of the existing Red Car alignment, including the existing Ports O' Call and 22nd Street stations, a concurrent Red Car alignment and roadway design effort has been initiated. A coordinated design effort would likely reduce the costs of both projects, and will facilitate construction phasing enabling the Red Car service to be maintained during the roadway construction.

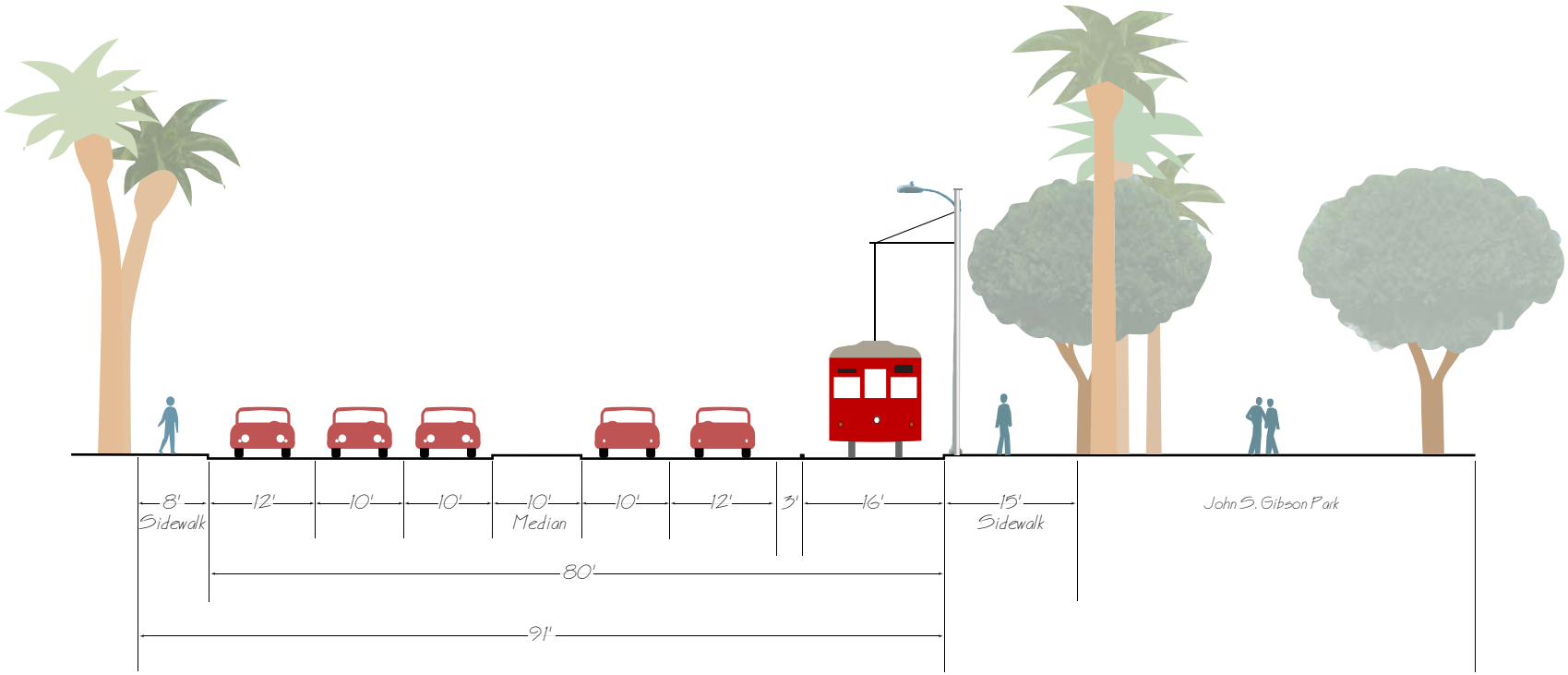
Other issues to be considered during the design and implementation of this extension include:

- Double-tracking the "spine" of the Red Car system along Harbor Boulevard and Sampson Way will be required to accommodate future growth and keep pace with service demands generated by special events and cruise ship linkages.
- The design of the roadway transition between Harbor Boulevard and Sampson Way at 7th Street will need to provide curvature and gradients suitable for Red Car operation.
- Coordination will need to occur with pedestrian access and promenade improvements being implemented in the same corridor, including the 13th Street pedestrian bridge.
- Coordination will also need to occur with Ports O' Call parking and entrance improvements, and retail expansion projects.



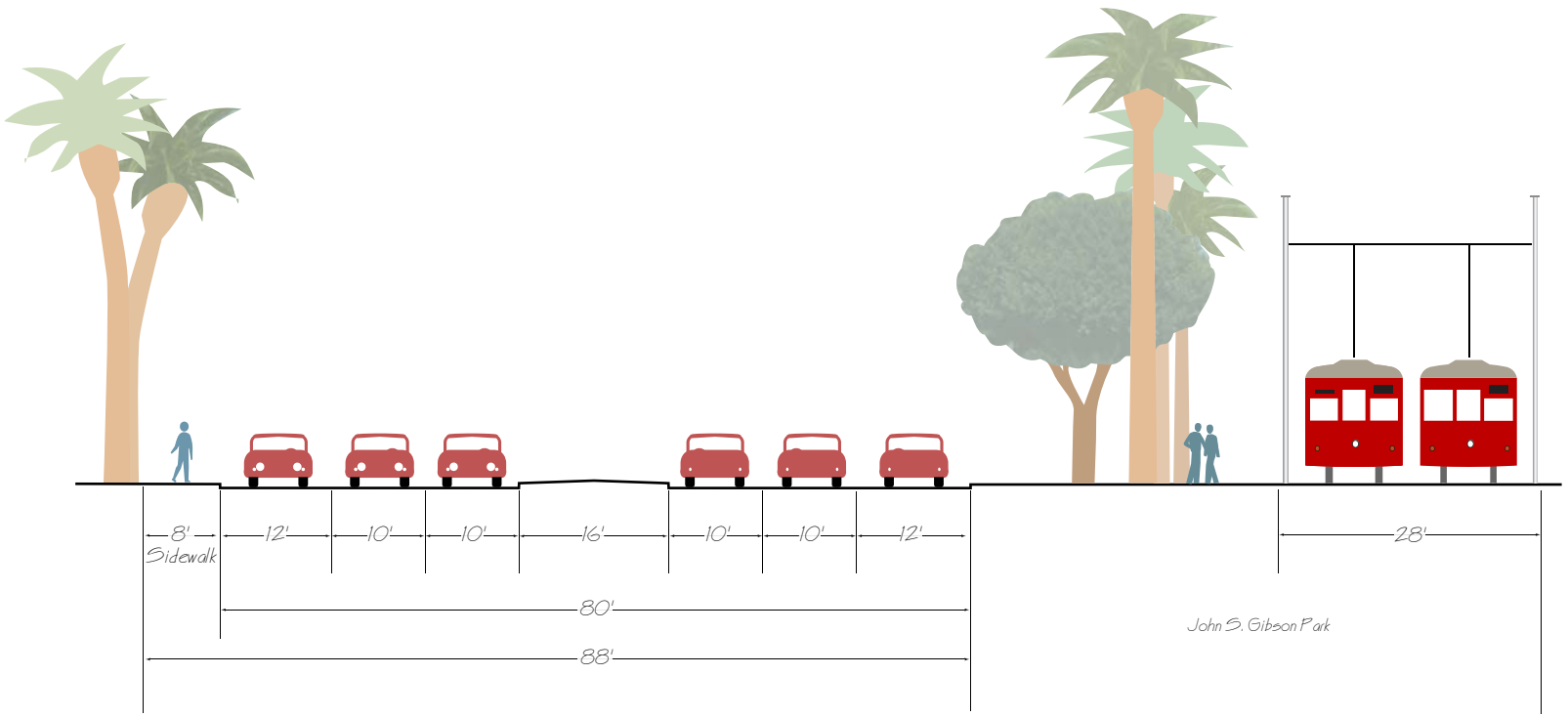
SOURCE: Wilson & Company, Inc, Engineers & Architects; February 2009

Figure 5-2
Harbor Boulevard Cross-Section, South of Third Street
Harbor Boulevard/Sampson Way Realignment



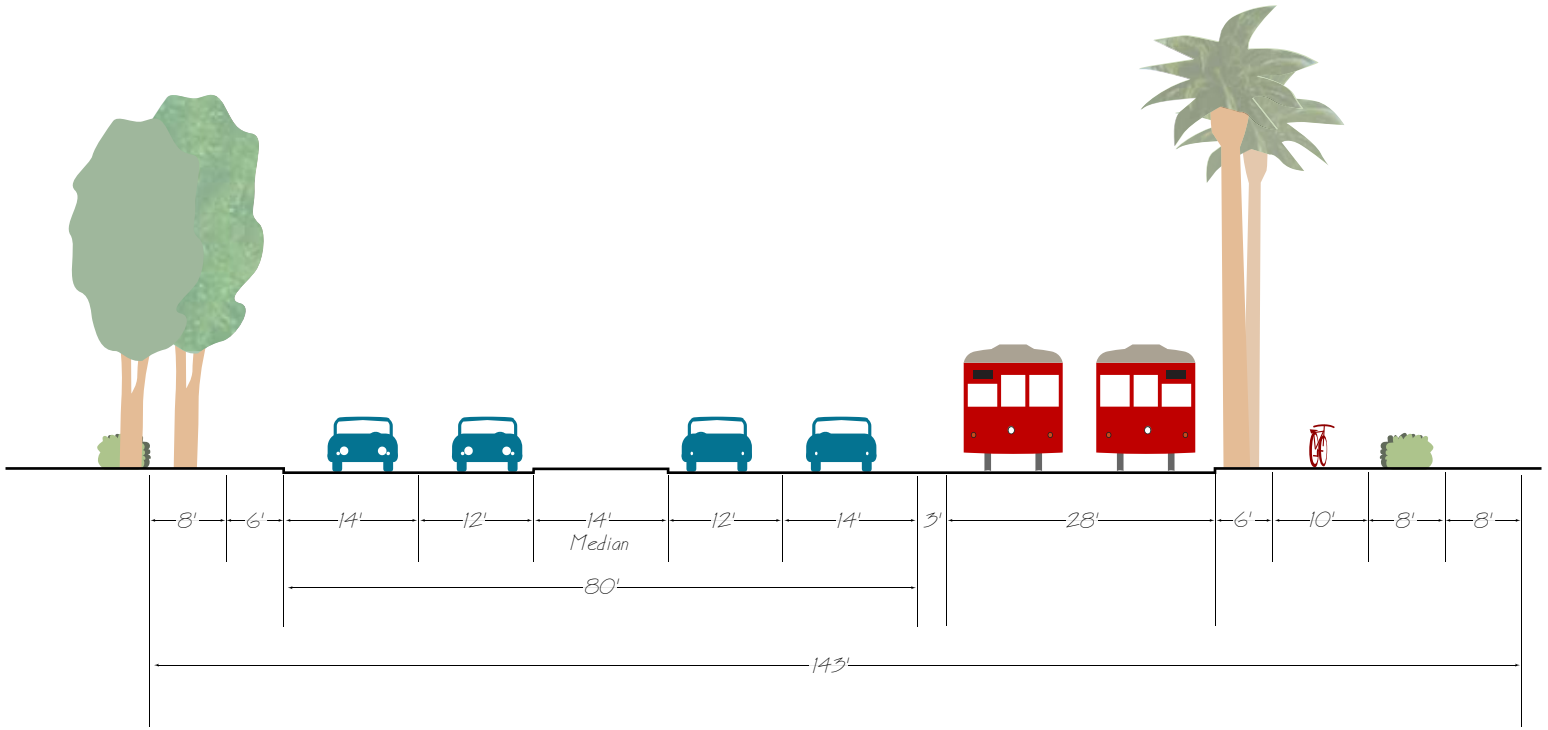
SOURCE: Wilson & Company, Inc, Engineers & Architects; March 2009

Figure 5-3A
Option A: Harbor Boulevard Alignment
Harbor Boulevard Cross-Section, between 6th & 7th Streets
Harbor Boulevard/Sampson Way Realignment



SOURCE: Wilson & Company, Inc, Engineers & Architects; February 2009

Figure 5-3B
Option B: Plaza Alignment
Harbor Boulevard Cross-Section, between 6th & 7th Streets
Harbor Boulevard/Sampson Way Realignment



SOURCE: Wilson & Company, Inc, Engineers & Architects; February 2009

Figure 5-4
Cross-Section of Sampson Way, South of Nagoya Way
Harbor Boulevard/Sampson Way Realignment

- As discussed in the next chapter, the SP Yard area is the recommended location for the new Red Car line Maintenance Facility. Suitable connecting trackage will need to be included in the roadway and track designs.
- Coordination will also need to occur with the addition of new parking facilities in the SP Yard and SP Slip areas.
- The area of 22nd/Miner Streets will be a Red Car line junction point, requiring additional trackage and a station arrangement suitable for transfers and terminating a shuttle car operation. A wye track arrangement should be incorporated to facilitate operational flexibility and turning of cars to equalize wheel wear.

A more detailed review of alignment alternatives and related engineering issues is provided in the *WRCL System Purpose & Need Assessment Report (Wilson & Company; June 2007, Section 4.1* - **Appendix 1-1***)*. Plan and Profile Sheets for the preferred Harbor Boulevard/Sampson Way alignment are included in **Appendix 2-3**.

Capital Cost Requirements

Table 5.1 provides a summary of the key capital cost elements associated with the Harbor Boulevard/Sampson Way Red Car realignment. Detailed cost summary sheets are provided in **Appendix 2-4.**

Table 5.1
Capital Cost Estimate (2009 $'s)
Harbor Boulevard/Sampson Way Red Car Realignment

Cost Elements	North Segment 7th – Swinford		South Segment 22nd – 7th Streets (Sampson Way)
	Harbor Boulevard Option	Plaza Option	
Trackwork	$ 2.62 M	$ 2.88 M	$ 3.07 M
Traction Power/OCS	$ 2.61 M	$ 3.27 M	$ 3.13 M
Stations	$ 0.55 M	$ 0.63 M	$ 0.65 M
Traffic Interface/Crossing Protection	$ 0.54 M	$ 0.53 M	$ 0.45 M
Utility Protection/Relocation	$ 0.15 M	$ 0.21 M	$ 1.31 M
Road Modifications/Adjacent Improvements	Note 1	Note 1	Note 1
Additional Infrastructure Requirements	$ 1.0 M/Note 2	N/A	N/A
30% Contingency[3]	$ 2.35 M	$ 2.36 M	$ 2.70 M
Construction Subtotal[3]	$ 10.20 M	$ 10.24 M	$ 11.72 M
20% Engineering & CM[3]	$ 2.04 M	$ 2.05 M	$ 2.34 M
Total[3]	**$ 12.24 M**	**$ 12.29 M**	**$ 14.06 M**

Source: Wilson & Company, March 2009

Note 1: Cost of roadway modifications/adjacent civil improvements for Swinford to 22nd St. realignment has been attributed to adjacent roadway realignment based on concurrent design/construction.
Note 2: Lumpsum cost to protect/relocate 1,000` of Navy fuel lines.
Note 3: Includes 5% escalation: 2007 to 2009 base.

5.2 Cabrillo Beach/Marina Extension

The proposed Cabrillo Beach/Marina extension would extend the Red Car service 1.5 miles from the present southern terminus at 22nd and Miner Streets, west along 22nd Street, and then south alongside Via Cabrillo Marina and Shoshonean Way, terminating at Cabrillo Beach.

Figure 5-5 depicts the proposed extension and associated station locations. Until 2009, POLA operated a shuttle bus service from the 22nd Street/Marina Red Car station to the Cabrillo Beach area along a similar route as this proposed Red Car extension. The line would be all new construction off of existing rail right-of-way. Four (4) station locations have been identified along the Cabrillo Beach/Marina Extension:

22nd Street Landing: This station would accommodate existing and proposed marina activities including restaurant and sport fishing operations, as well as the Cabrillo Marina Phase II expansion.

South view along Via Cabrillo; the Red Car Line would operate within existing sidewalk alignment.

22nd Street/Cabrillo Marina: This station would be located at the southern "Gateway" to POLA and would serve the Cabrillo Marina, Holiday Harbor/Fleitz Marina, Cabrillo Yacht Club, and the residents along Crescent Avenue and Fort MacArthur. The Metro/MTA 446 bus route is accessible via Pacific Avenue, a 1,000 foot walk to the west.

Cabrillo Marina Hotel: This station would serve the Marina Hotel and adjacent office building/conference center, Cabrillo Marina, the proposed parking structure for Cabrillo Beach, and the Cabrillo Beach Youth Waterfront Sports Center.

Aquarium/Beach: The aquarium station is the proposed terminus for the Cabrillo Beach Extension, serving the Cabrillo Marine Aquarium, the salt marsh, the beaches, the boat launch, Bath House and Fishing Pier. Two terminus station options have been identified at this location:

1. Directly north of the Aquarium itself, utilizing a portion of the existing employee parking lot.

2. South of the Aquarium/beach public parking lot, within the roadway circle open area between the Aquarium and the Bath House.

Preferred Alignment

The identified alignment for the Cabrillo Beach/Marina extension would be side-running, single track on the north side of 22nd Street. The 22nd Street segment would include one passing siding, located at the 22nd Street Landing station. The line would climb the grade up to the Via Cabrillo intersection on a shallow fill that will allow for a uniform 4-percent grade.

Along Via Cabrillo, a side-running single track alignment is preferred in a landscaped track right-of-way. A passing siding would also be included within this segment. The alignment would continue as single track side running along Shoshonean Road and then accessing the

SOURCE: Wilson & Company, Inc, Engineers & Architects; February 2009

THE PORT OF LOS ANGELES

WILSON & COMPANY ENGINEERS & ARCHITECTS

Waterfront Red Car Line Extension Feasibility Report

Figure 5-5
Cabrillo Beach/ Marina Extension

line terminus station at the Aquarium.

Figure 5-6 shows the cross-section of Via Cabrillo with the Red Car located adjacent to the west side of the roadway. **Figure 5-7** displays a cross-section of Shoshonean Road with the Red Car also adjacent to the west side of the roadway.

Other alignment alternatives which were examined for this extension included:

- Crescent Avenue bluff alignment
- Alignment partly within the 22nd Street Landing parcel
- Median alignment on Via Cabrillo
- In-street running on Shoshonean Road

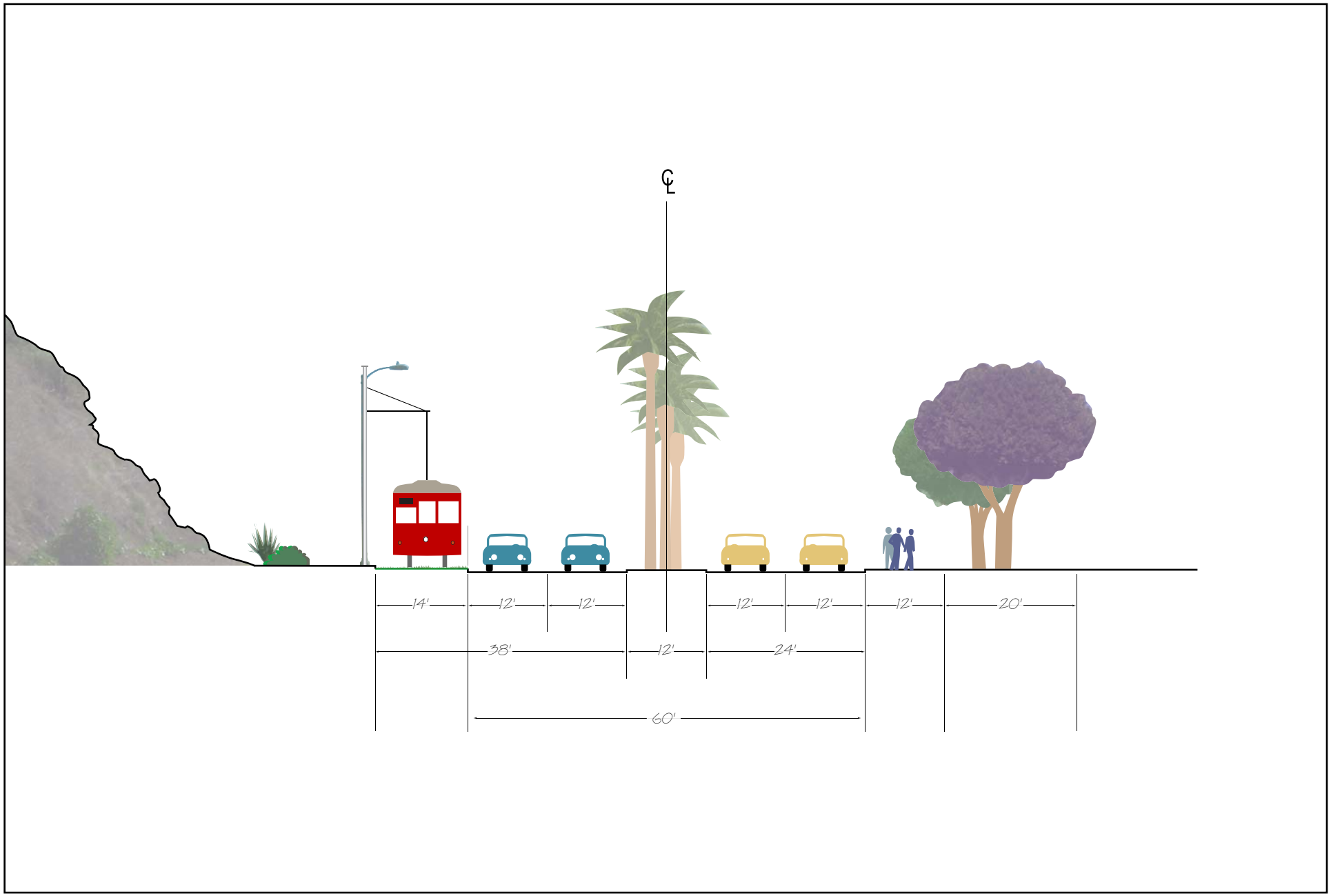
Slope stabilization project impact on Shoshonean Road corridor; August 2007

Existing 22nd Street/Via Cabrillo intersection. The Red Car alignment would be on a fill along the north side of 22nd Street (left side of picture)

Engineering and Implementation Considerations

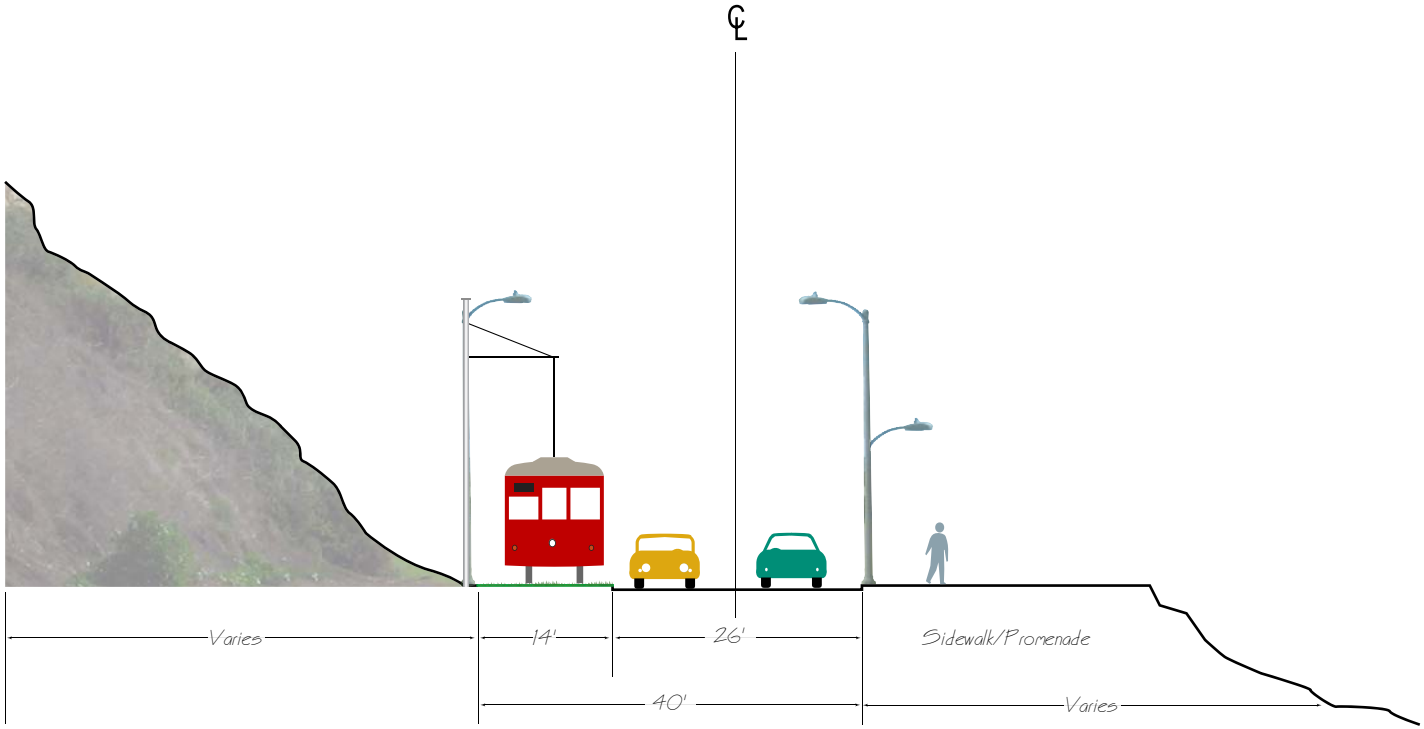
The major implementation considerations for the Cabrillo Beach/Marina Extension center around identifying a suitable alignment and right-of-way location. The geography of this area presents a major hill to climb at 22nd and Via Cabrillo, and the relatively narrow Shoshonean Road corridor has been narrowed even further by a major slope stabilization project undertaken by the adjacent Air Force housing facility at Ft. MacArthur. Primary engineering issues related to this alignment include:

- The geography of this extension presents numerous right-of-way constraints, limiting options for double track and passing sidings.
- The Air Force slope stabilization project above Shoshonean Road has significantly narrowed available off-street right-of-way.
- The 22nd Street/Via Cabrillo Marina intersection will require significant reconstruction in order to accommodate an intersecting rail line while still accommodating vehicular turn movements.
- An initial design guideline of a maximum grade of 4 percent has been established for the alignment along 22nd Street (with 6 percent as the absolute maximum) for the Red Car line. This will require a fill type structure to be constructed on the north side of the street to accommodate the track. The Red Car alignment in this vicinity will also impact the parking area and driveways for the 22nd Street Park.
- Implementing the terminus station at the Aquarium/Beach could require modification of the layout of either or both of the employee and public parking lots.



SOURCE: Wilson & Company, Inc, Engineers & Architects; February 2009

Figure 5-6
Via Cabrillo Marina Cross-Section
Between West 22nd Street & Watchorn Walk
Cabrillo Beach Extension



SOURCE: Wilson & Company, Inc, Engineers & Architects; February 2009

Figure 5-7
Shoshonean Road Cross-Section
South of Youth Waterfront Sports Center
Cabrillo Beach Extension

- Coordination will need to occur with pedestrian access and promenade improvements being implemented in this corridor.

Details of the various alignment alternatives and related engineering issues for the Cabrillo Beach/ Marina extension are provided in the *WRCL System Purpose & Need Assessment Report (Wilson & Company; June 2007, Section 4.2* - **Appendix 1-1***)*. Plan and Profile Sheets for the preferred alignment for the Cabrillo Beach/Marina Extension are included in **Appendix 2-3**.

Red Car along west side of Via Cabrillo

Red Car Station adjacent to Cabrillo Aquarium

Capital Cost Requirements

Table 5.2 provide a summary of the key capital cost elements associated with the Cabrillo Beach/ Marina Red Car extension. Detailed cost summary sheets are provided in **Appendix 2-4.**

Table 5.2
Capital Cost Estimate (2009 $'s)
Cabrillo Beach/Marina Extension

Cost Elements	Cost	
	Beach Terminus	Aquarium Terminus
Trackwork	$ 3.51 M	$ 3.27 M
Traction Power/OCS	$ 3.26 M	$ 3.04 M
Stations	$ 0.70 M	$ 0.70 M
Traffic Interface/Crossing Protection/Roadway Mods	$ 1.53 M	$ 1.42 M
Utility Protection/Relocation	$ 2.19 M	$ 2.03 M
Additional Infrastructure Requirements[1]	$ 2.50 M	$ 2.50 M
30% Contingency[2]	$ 4.31 M	$ 4.08 M
Construction Subtotal[2]	$ 18.69 M	$ 17.69 M
20% Engineering & CM[2]	$ 3.74 M	$ 3.54 M
Total[2]	**$ 22.43 M**	**$ 21.23 M**

Source: Wilson & Company, March 2009

Note 1: Cost allowance to cover retaining wall work on Via Cabrillo, fill/structure/modifications at 22nd/Via Cabrillo intersection, modifications at Shoshonean/Via Cabrillo intersection, and modifications to existing Cabrillo Beach parking lot.

Note 2: Includes 5% escalation: 2007 to 2009 base.

5.3 Downtown San Pedro Extension

The Downtown San Pedro extension would bring the Red Car directly into the heart of Downtown San Pedro. Downtown offers some key opportunities to link directly with other transportation services, parking resources, and the growing cluster of new residential developments.

Additional planning studies and stakeholder input are needed to identify and refine the various alignment alternatives, operating options, and station requirements. Consequently, the alignment presented in this section is very preliminary, but does serve to surface the various issues involved.

While the exact number and location of stations will be determined based on further studies and the identification of a preferred route alignment, previous studies have identified a preference for stops spaced approximately every two blocks. This stop spacing would be well matched to the densely developed downtown area, and maximize rider convenience. Key cross-streets served via potential stations would include:

- Palos Verdes Street
- Centre Street
- Mesa Street

Downtown San Pedro, 7th Street at Centre. View to the east, new condominiums at left.

Alignment Options

The Red Car extension in downtown San Pedro would be all new construction off of existing rail and POLA owned right-of-way. There are no available options for off-street right-of-way, and consequently this extension would have to be constructed entirely as an in-street operation. A wide variety of alignments are possible, including either a spur type operation or a loop concept. The preliminary single-track loop alignment using 5th and 7th Streets (developed in previous studies by POLA) was used as a starting point and the basis for establishing an order-of-magnitude cost. This alignment is illustrated in **Figure 5-8** along with its associated station locations. **Figure 5-9** displays a cross-section of 5th Street with the Red Car operating in mixed traffic.

Further study and stakeholder input will be required to identify and refine a preferred alignment, with consideration of the following:

- Coverage in the downtown area, including:
  - Walking distance
  - Potential economic benefit
  - Access to activity centers and parking
  - Ease of transfers between a downtown line and the rest of the Red Car system
- Physical space for the extension

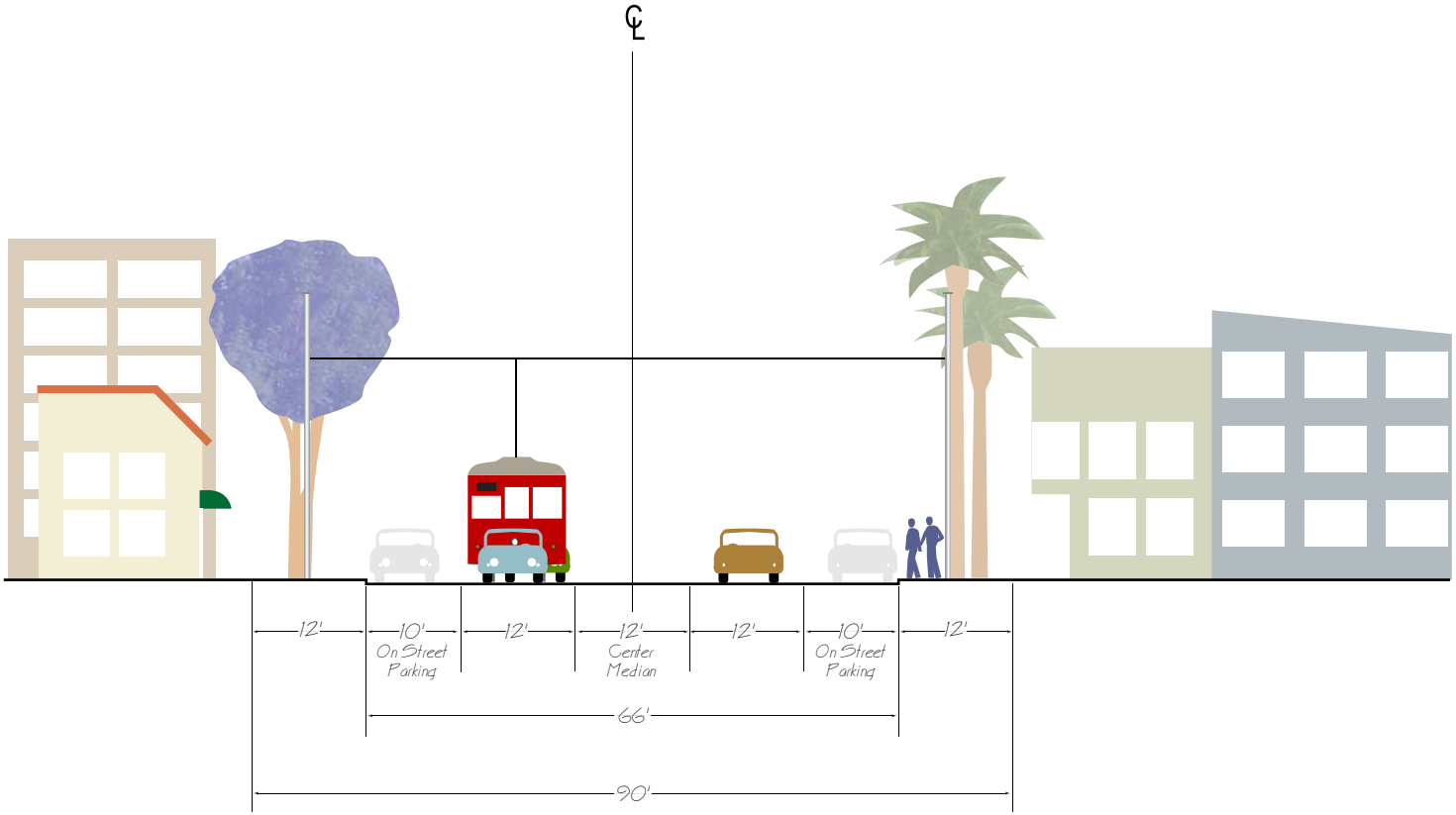
SOURCE: Wilson & Company, Inc, Engineers & Architects; October 2007

THE PORT OF LOS ANGELES

WILSON & COMPANY ENGINEERS & ARCHITECTS

Waterfront Red Car Line Expansion Study

Figure 5-8
Downtown San Pedro Extension



SOURCE: Wilson & Company, Inc, Engineers & Architects; Sept 2007

Figure 5-9
Fifth Street Cross-Section, Between Centre and Mesa Streets;
Downtown Extension

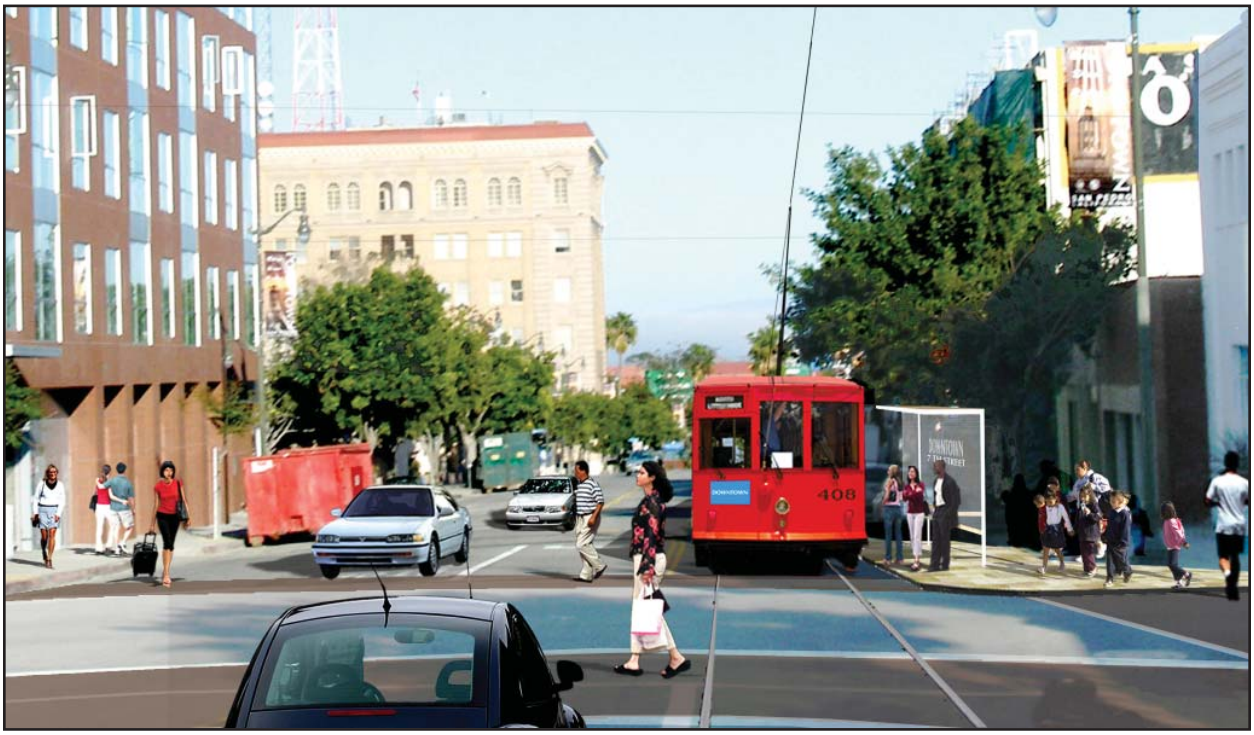
- Station locations
- Traffic and pedestrian conflicts
- Access by pedestrians (including ADA access) and those making transfers to/from other modes
- Location of existing/future parking facilities
- Location of existing/future transit services/ terminals

To assist in addressing the above issues in subsequent studies, a draft scope of work titled *Downtown San Pedro Extension - Proposed Scope of Work Approval/Alignment Studies* is included as **Appendix 1-4**.

Additional alignment details associated with the Downtown San Pedro extension are provided in the *WRCL System Purpose & Need Assessment Report (Wilson & Company; June 2007, Section 4.3* - **Appendix 1-1***).*

Engineering and Implementation Considerations

Compared with the other extensions being considered, a Downtown San Pedro Red Car extension will require additional planning studies to identify and refine the various alignment alternatives, operating options and station requirements. Because the Downtown extension would not be on POLA property, a greater level of interagency and stakeholder coordination will be required. The design of the Downtown San Pedro extension will also need to conform to the *Design Standards and Guidelines for the Pacific Corridor Redevelopment Project*, prepared by the CRA in June 2005.



Red Car operating in mixed traffic along 7th Street

Overlaying the Red Car into the relatively dense urban environment of the downtown area will also bring additional engineering challenges not as prevalent in some of the other proposed line extensions. Because any Red Car alignment in the downtown area is likely to be closer to buildings, cross more intersections and driveways, intersect more underground utilities, and generally have more constraints, the implementation phases will likely be more complex.

In general, running within the street environment will bring increased traffic conflicts that will require appropriate, location-specific design mitigations to ensure overall safety. In loop type operations, for example, turn movements could be required across multiple lanes of traffic and the extension would also have to cross Harbor Boulevard. Both of these examples would impact traffic lane geometrics and require the appropriate level of traffic signalization interface.

Capital Cost Requirements

Table 5.3 provides a summary of the key capital cost elements associated with the Downtown San Pedro Red Car extension. Detailed cost summary sheets are provided in **Appendix 2-4.**

Table 5.3
Capital Cost Estimate (2009 $'s)
Downtown San Pedro Extension

Cost Elements	Cost
Trackwork	$ 2.91 M
Traction Power/OCS	$ 1.91 M
Stations	$ 0.45 M
Traffic Interface/Crossing Protection/Roadway Mods	$ 2.31 M
Utility Protection/Relocation	$ 2.65 M
Additional Infrastructure Requirements[1]	$ 1.00 M
30% Contingency[2]	$ 3.53 M
Construction Subtotal[2]	$15.33 M
20% Engineering & CM[2]	$ 3.06 M
Total[2]	**$ 18.37 M**

Source: Wilson & Company, March 2009

Note 1:Cost of intersection signalization modifications.
Note 2: Includes 5% escalation: 2007 to 2009 base.

5.4 Outer Harbor/Cruise Ship Terminal Extension

This proposed extension would extend the Red Car service 0.83 miles south from the present southern terminus at 22nd and Miner Streets, within a realigned Miner Street. The proposed Outer Harbor/Cruise Ship Terminal extension and associated station locations are shown in **Figure 5-10**.

Stations are proposed at three (3) general locations:

Outer Harbor Station: This station would serve the Berth 46 Cruise Ship Terminal and the proposed Outer Harbor Park.

Marina Mid-Point Station: The mid-point station would be in the vicinity of Watchorn Basin to accommodate access to Cabrillo Marina Phase II as well as providing an additional connection to the promenade.

Marina North Station: A northern station would provide access to the proposed Signal/Sampson Way parking structure and a transfer point to other Red Car routes. (Note that this station would be shared with the Cabrillo Beach extension)

Preferred Alignment

The Outer Harbor extension would be spur within the median of a newly realigned Miner Street. The line would be all new construction in conjunction with new street alignments.

The adjacent Cabrillo Marina Phase II project incorporates a new design for Miner Street and the Outer Harbor Promenade extension. The new street design provides for ongoing operation of the large existing fruit warehouse operation at Berths 54-55, and then curves east to parallel the water's edge towards the end of the peninsula.

The preferred Red Car alignment for the Outer Harbor extension is double track landscaped "turf track" within the median of the new Miner Street, placing the Red Car in the context of the "Grand Boulevard" envisioned in the *San Pedro Waterfront Master Plan.* Depending on the layout of the new Cruise Terminal, the alignment might possibly shift to side-running as it nears the Cruise Terminal. Double tracking will provide additional capacity that could be required to serve peak demands at the cruise terminal. **Figure 5-11** displays a cross-section of the future Miner Street with the Red Car in the median.

Engineering and Implementation Considerations

Implementation of the Outer Harbor spur will be dependent upon the new roadway alignment created along the peninsula, plans for the new Cruise Terminal and the Outer Harbor Park, as well as the ongoing Cabrillo Marina Phase II project. Designing the Red Car extension, roadway and new terminal together provides an opportunity to maximize convenient access to the terminal, avoiding the need for a long walk or bus connection as is presently the case at the existing Cruise Terminal.

Other issues relating to the engineering and implementation of this extension include:

- The future of the SSA Fruit Terminal operation should be considered for its impacts on Red Car operation (e.g.: truck traffic).

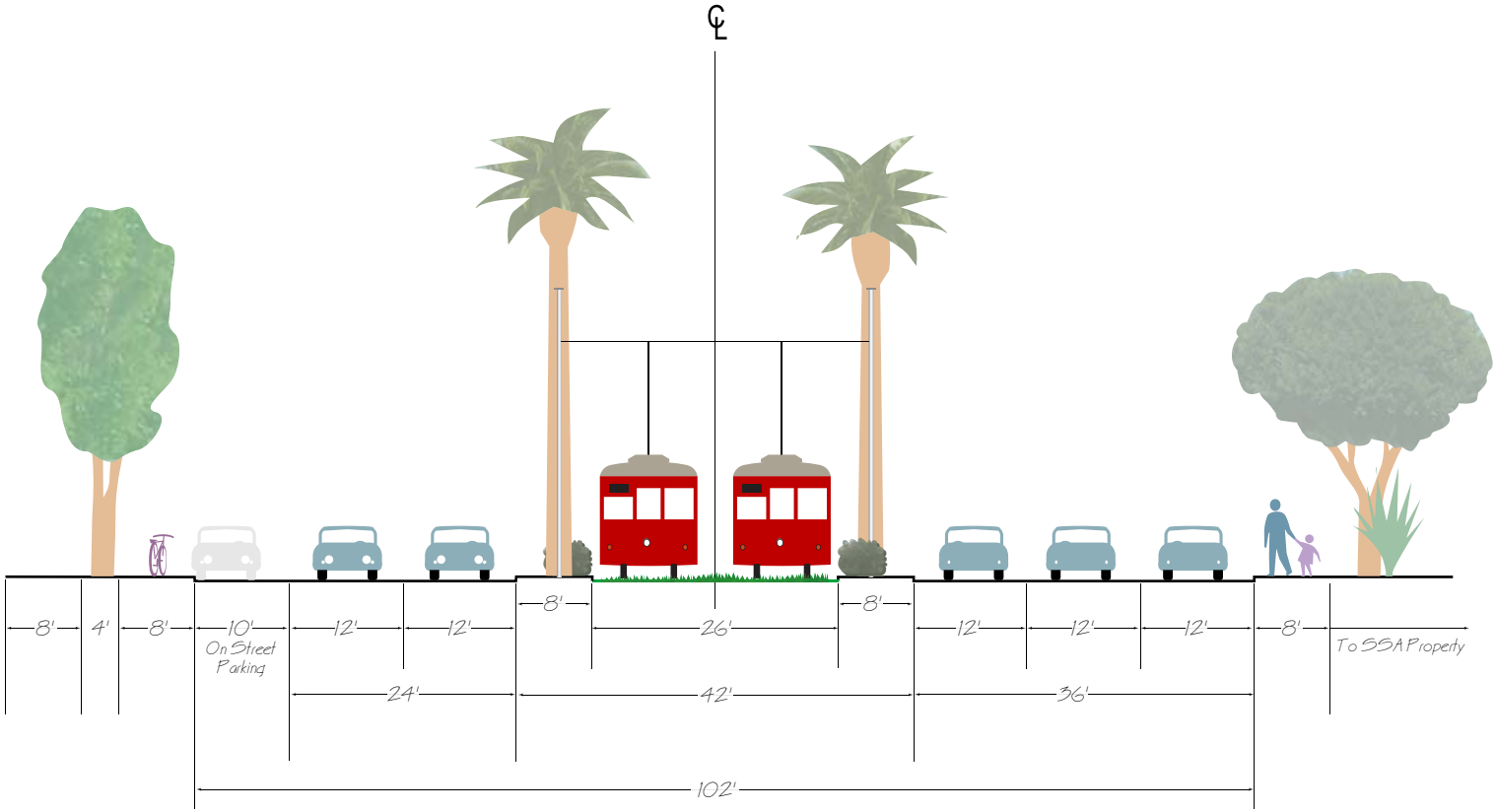
SOURCE: Wilson & Company, Inc, Engineers & Architects; February 2009

THE PORT OF LOS ANGELES

WILSON & COMPANY ENGINEERS & ARCHITECTS

Waterfront Red Car Line Extension Feasibility Report

Figure 5-10
Outer Harbor/Cruise Terminal Extension



SOURCE: Wilson & Company, Inc, Engineers & Architects; February 2009

Figure 5-11
Cross-Section of Miner Street
Outer Harbor/Cruise Ship Terminal Extension

- The road/rail intersection at 22nd/Miner /Sampson Way will be a critical design component of the Red Car system expansion. A wye track arrangement should be incorporated to facilitate operational flexibility and turning of cars to equalize wheel wear. Additional details are provided in the section covering the Harbor Boulevard /Sampson Way Realignment.
- To facilitate possible shuttle operations to and from the terminal, the track arrangement at the turn back station should allow for a shuttle car to be able to operate into the station and reverse direction without blocking the main line.

Additional alignment details and associated engineering issues for the Outer Harbor/Cruise Ship Terminal extension are provided in the *WRCL System Purpose & Need Assessment (Wilson & Company; June 2007, Section 4.4* - **Appendix 1-1***)*. Plan and Profile Sheets for the preferred alignment for the Outer Harbor/Cruise Ship Terminal extension are included in **Appendix 2-3**.

Capital Cost Requirements

Table 5.4 provides a summary of the key capital cost elements associated with the Outer Harbor/ Cruise Ship Terminal Red Car extension. Detailed cost summary sheets are provided in **Appendix 2-4**.

Table 5.4
Capital Cost Estimate (2009 $'s)
Outer Harbor/Cruise Ship Terminal Extension

Cost Elements	Cost
Trackwork	$ 3.34 M
Traction Power/OCS	$ 3.45 M
Stations	$ 0.63 M
Traffic Interface/Crossing Protection/Roadway Mods	$ 0.84 M
Utility Protection/Relocation	$ 0.50 M
Road Modifications/Adjacent Improvements	Note 1
Additional Infrastructure Requirements	N/A
30% Contingency[2]	$ 2.76 M
Construction Subtotal[2]	$ 11.94 M
20% Engineering & CM[2]	$ 2.39 M
Total[2]	**$14.33 M**

Source: Wilson & Company, March 2009

Note 1: Cost of roadway modification/adjacent civil improvements for Outer Harbor extension has been attributed to adjacent roadway realignments based on concurrent design/construction
Note 2: Includes 5% escalation: 2007 to 2009 base.

5.5 City Dock No. 1 Extension

This proposed extension would extend Red Car service 0.71 miles south from the S.P. Slip area, south along Sampson Way and Signal Street to the City Dock No. 1 area. The City Dock No. 1 extension and associated stations are illustrated in **Figure 5-12**. Rail freight service to Westway Terminal and Crescent Warehouses (located along Signal Street south of 22nd Street), while presently in place, are planned to be discontinued. This provides the opportunity to plan the City Dock No. 1 extension separately from freight operations.

Signal Street, view south at 22nd Street. Freight railroad tracks at right.

Three (3) station locations have been identified along the City Dock No. 1 Extension:

Signal Street/22nd Street: This station would serve the Municipal Fish Market, Canetti's Restaurant, future businesses along 22nd Street and the waterfront, and future adaptive reuse of the historic warehouses along Signal Street.

Mid-Point Station: This station would be located mid-way between the Signal Street/22nd Street station and the Warehouse One station. With adaptive reuse of the existing Signal Street warehouses and the redevelopment of the Westway site, this station would also provide the opportunity to integrate the Red Car with future redevelopment activity.

Warehouse One Station: This station would be located near the southern tip of the peninsula at Warehouse One. It would serve Warehouse One, POLA Pilots Station, the proposed new pier and marina, and any proposed development in the existing warehouses at Berths 58 – 60. Previous studies have identified an option to route the Red Car operation directly into Warehouse One, taking advantage of the existing loading docks to serve as a high-level platform.

The south end of Signal Street is dominated by the historic Warehouse One building.

Preferred Alignment

The preferred alignment for the City Dock No. 1 extension would be single-track from the shared Sampson Way/Signal Street Red Car station just north of Signal Street, crossing the realigned Sampson Way to the east side of Signal Street and continuing to Warehouse One.

SOURCE: Wilson & Company, Inc, Engineers & Architects; February 2009

THE PORT OF LOS ANGELES

WILSON & COMPANY ENGINEERS & ARCHITECTS

Waterfront Red Car Line Extension Feasibility Report

Figure 5-12
City Dock No. 1 Extension

Sampson Way currently intersects 22nd Street at the northern terminus of Signal Street. Under future conditions, Sampson Way will be re-aligned to connect with 22nd Street approximately 300 feet southwest of the existing intersection alignment. With this realignment, a new Sampson Way/ Signal Street three-legged intersection will be constructed. The single track Red Car alignment would cross the north leg (Sampson Way) of the new intersection (requiring signalization) and continue south along the east side of Signal Street. Track north of 22nd Street would be constucted as "turf track". Track south of 22nd Street would be constucted as paved or ballasted track.

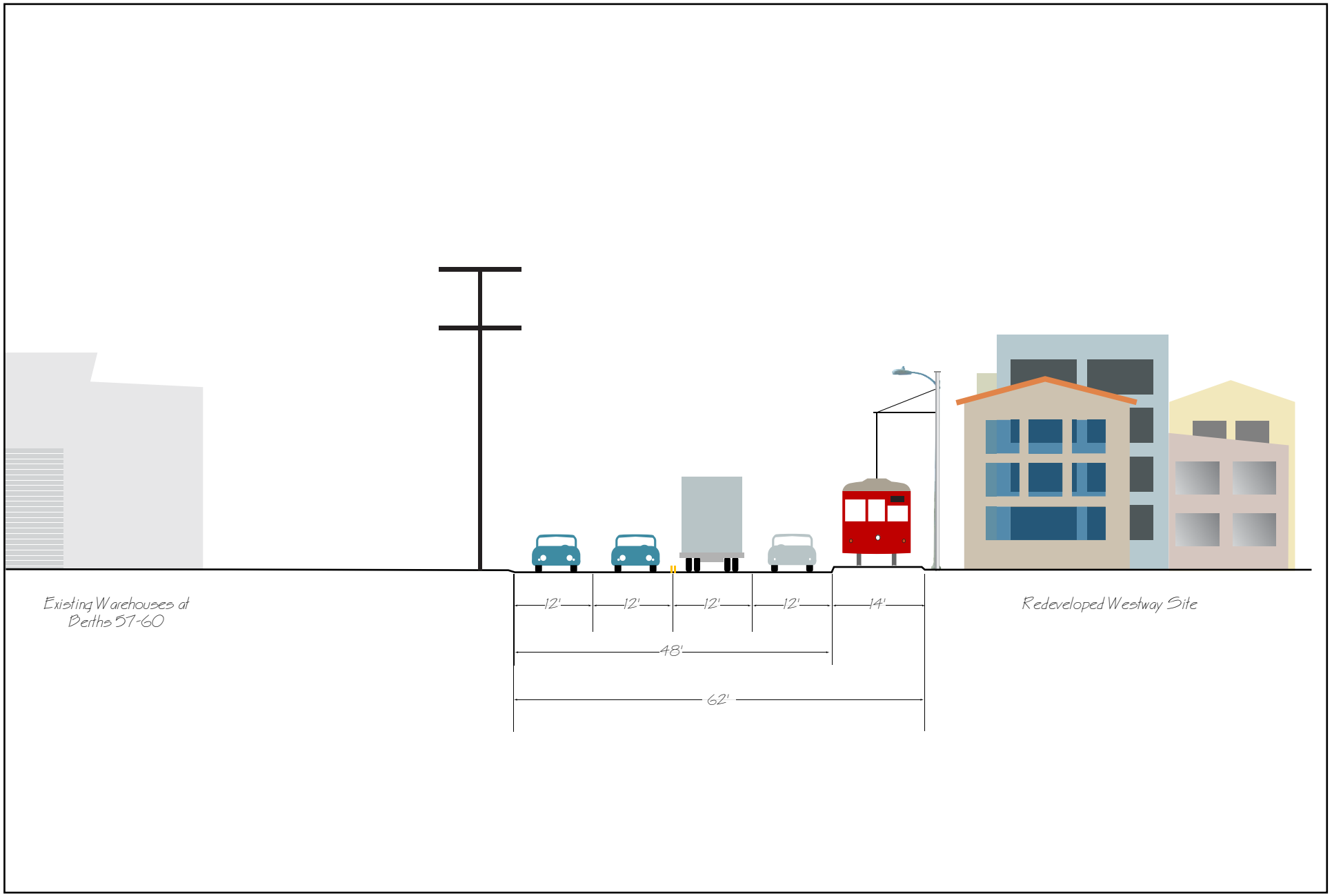
This alignment would keep the Red Car out of the traffic lanes, while permitting the line to be built as single track (bi-directional running on a single track is not practical in traffic lanes). Prior to reaching Warehouse One, the line would swing over towards the center loading dock of Warehouse One (which historically featured rail access), and run directly into a new station inside the building. **Figure 5-13** displays the cross-section of Signal Street with the Red Car operating along the east side.

Other alignment alternatives examined included:

- Alignment along west side of Signal Street in the existing rail right of way.
- New center median in Signal Street
- Combination of median and side running

Engineering and Implementation Considerations

The primary issue confronting implementation of the City Dock No. 1 extension is the scope and schedule for redevelopment of the adjacent warehouses and the pending cleanup and reuse of the Westway Terminal site. If the Signal Street warehouses remain in commercial use, agreement must be reached with the tenants concerning trucks at the loading docks paralleling Signal Street. The current warehouse operations routinely block the railroad tracks during the daytime hours.



SOURCE: Wilson & Company, Inc, Engineers & Architects; March 2009

Figure 5-13
Signal Street Cross-Section; South of 22nd Street
City Dock No. 1 Extension

Identified engineering and implementation issues include:

- The future of the various warehouse operations on Signal Street should consider the potential for impacts on Red Car operation.
- While Warehouse One has been ruled out as a site for the Red Car maintenance facility, it remains a potential option for the Red Car museum.

Details of the alignment alternatives and related engineering issues for the City Dock No. 1 extension are provided in the *WRCL System Purpose & Need Assessment Report (Wilson & Company; June 2007, Section 4.5* - **Appendix 1-1***)*. Plan and Profile Sheets for the preferred City Dock No. 1 Red Car extension are included in **Appendix 2-3**.

Capital Cost Requirements

Table 5.5 provides a summary of the key capital cost elements associated with the City Dock No. 1 Red Car extension. Detailed cost summary sheets are provided in **Appendix 2-4**.

Table 5.5
Capital Cost Estimate (2009 $'s)
City Dock No. 1 Extension

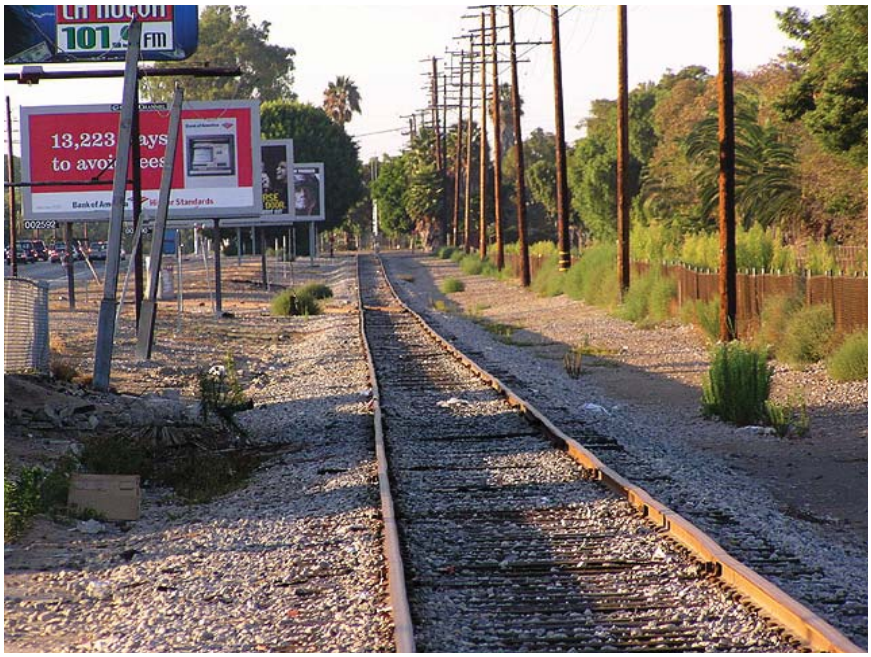
Cost Elements	Cost
Trackwork	$ 1.99 M
Traction Power/OCS	$ 1.56 M
Stations	$ 0.23 M
Traffic Interface/Crossing Protection/Roadway Mods	$ 0.68 M
Utility Protection/Relocation	$ 1.13 M
Additional Infrastructure Requirements	N/A
30% Contingency[1]	$ 1.76 M
Construction Subtotal[1]	$ 7.62 M
20% Engineering & CM[1]	$ 1.52 M
Total[1]	**$ 9.14 M**

Source: Wilson & Company, March 2009

Note 1: Includes 5% escalation: 2007 to 2009 base.

5.6 North Gaffey Extension

The proposed 0.75 mile North Gaffey extension would use existing rail right-of-way for a northward Red Car extension to serve adjacent commercial and residential developments, including the Target retail store, Highland Park Estates residential development, an existing The Home Depot, and the "Field of Dreams" soccer field. On an historical note, the existing North Gaffey rail line was part of the old Pacific Electric Railway San Pedro via Torrance Line. **Figure 5-14** depicts the proposed alignment and station locations for the North Gaffey extension. Three (3) station locations have been identified along the North Gaffey extension, indluding :



Existing North Gaffey Street right-of-way (view north towards Capitol Dr.)

Pacific Avenue/Channel Street: This station would be the southern end of the North Gaffey spur. The station would serve the adjacent community west of the 110 Freeway and serve as a transfer point to the Wilmington extension.

North Gaffey/Capitol Drive:
A mid-point station at Gaffey Street and Capitol Drive would serve the adjacent Barrywood neighborhood, the proposed Target retail store, and the proposed Highland Park Estates residential development.

North Gaffey/Westmont : The northern terminal of the line would be located at Gaffey Street and Westmont Street. It would provide access to the adjacent Field of Dreams soccer field and the Home Depot store, and potentially nearby residential neighborhoods within reasonable walk distances.

Preferred Alignment

The preferred alignment would be new single track constructed on the existing railroad right-of-way, paralleling the existing freight track on its west side. Construction would be open (ballasted) track. Compared with shared use of the existing freight track, this alignment offers the benefit of eliminating the need for temporal separation and the accompanying complexities and ongoing operating expense of a formal Shared Use agreement.

Figure 5-15 displays a cross-section of North Gaffey Street with the Red Car operating in the adjacent rail right-of-way.

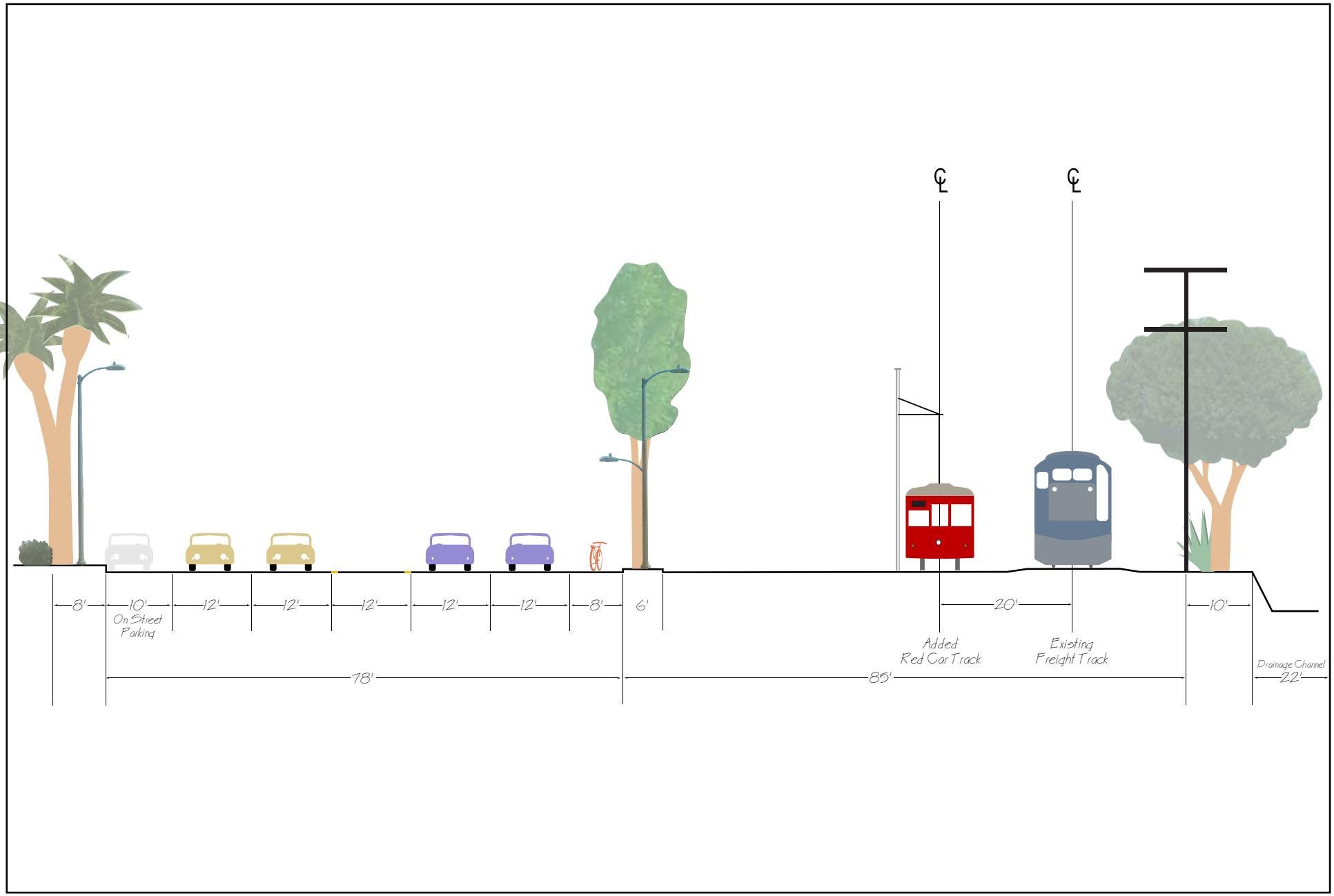
SOURCE: Wilson & Company, Inc, Engineers & Architects; February 2009

THE PORT OF LOS ANGELES

WILSON & COMPANY ENGINEERS & ARCHITECTS

Waterfront Red Car Line Extension Feasibility Report

Figure 5-14
North Gaffey Street Extension



SOURCE: Wilson & Company, Inc, Engineers & Architects; October 2007

Figure 5-15
North Gaffey Street Cross-Section, at West Capitol Drive
North Gaffey Street Extension

Engineering and Implementation Considerations

Engineering and implementation issues for the North Gaffey extension include physical constraints along the segment between the John S. Gibson Boulevard/Channel Street intersection and the proposed end of line station at Westmont Street. Engineering issues associated with for the segment between the existing Swinford Street station and Channel Street are addressed in the following section which covers the proposed Wilmington extension.

The existing rail right-of-way paralleling North Gaffey Street (jointly owned by POLA/Port of Long Beach) is approximately 85-feet wide, and thus provides sufficient additional room to add a separate track for the Red Car line. Due to the availability of the rail right-of-way and low freight traffic volume on the existing track, implementing a North Gaffey Street Red Car extension could be a fairly low cost opportunity to serve the surrounding community. Other engineering and implementation issues relating to this extension include:

- Planning for the Red Car alignment would need to be coordinated with the North Gaffey Beautification Project.
- Modifications would be required to the existing grade crossing at Channel/Pacific and a new crossing required at Catun Street.
- Additional study would be required to clarify right-of-way issues (jointly owned by POLA and POLB) and utility impacts.
- Additional study would be required to clarify the insurance and other operating cost impacts of operating the Red Car Line on a shared (with freight rail operations) right-of-way.

A more detailed review of alignment alternatives and related engineering issues is provided in the *WRCL System Purpose & Need Assessment* (*Wilson & Company; June 2007, Section 4.6* - **Appendix 1-1**).

Capital Cost Requirements

Table 5.6 provides a summary of the key capital cost elements associated with the North Gaffey Red Car extension. Detailed cost summary sheets are provided in **Appendix 2-4**.

Table 5.6
Capital Cost Estimate (2009 $'s)
North Gaffey Extension

Cost Elements	Cost
Trackwork	$ 1.06 M
Traction Power/OCS	$ 1.56 M
Stations	$ 0.30 M
Traffic Interface/Crossing Protection/Roadway Mods	$ 0.82 M
Utility Protection/Relocation	$ 0.46 M
Additional Infrastructure Requirements	N/A
30% Contingency[1]	$ 1.32 M
Construction Subtotal[1]	$ 5.73 M
20% Engineering & CM[1]	$ 1.15 M
Total[1 & 2]	**$ 6.88 M**

Source: Wilson & Company, March 2009

Note 1 - Include 5% escalation: 2007 to 2009 base
Note 2 - Total does not include cost of line segment between Swinford Street and Channel/Pacific. See Wilmington Extension cost table (Table 5.7)

5.7 Wilmington Extension

The proposed 3.0 mile Wilmington extension would provide Red Car service between the communities of San Pedro and Wilmington. Historically, the Red Cars of the Pacific Electric traveled between San Pedro and Wilmington over two routes. The main route utilized a bridge over the turning basin in the vicinity of the present day Cruise Ship Terminal. The bridge was damaged and removed in the 1950s, and subsequent expansions of the adjacent POLA facilities make re-creation of this route infeasible. The other rail route followed a longer land routing around the West Basin and remains intact today, although on a modified alignment. Formerly known as the "West Basin Line", this route is a heavily traveled freight railroad corridor paralleled by streets with heavy truck volumes.

Figure 5-16 depicts the proposed Wilmington extension alignment and associated station locations. Four (4) station locations have been identified along the Wilmington extension:

John S. Gibson Boulevard with existing 12 foot median. (Looking North)

Channel Street/Pacific Avenue: This station would serve the adjacent community west of the 110 Freeway and serve as a transfer point to the North Gaffey extension.

Harry Bridges Boulevard/King Street:

This station would provide access to the Wilmington buffer park and serve the adjacent residential areas north of the buffer.

Harry Bridges Boulevard/Fries Street: This station would provide access to the eastern end of the Wilmington Buffer Park, and potentially the site of a future Red Car Museum.

Harry Bridges Boulevard/Avalon Boulevard: This station would serve as the northern terminus of the line, serving the adjacent commercial/industrial district and the future Wilmington Waterfront Gateway on Avalon Boulevard. A potential connection to a bus shuttle serving the Avalon corridor and Banning's Landing would be made at this station.

Preferred Alignment

Although there is existing railroad track for the entire length of the proposed Wilmington extension, this track is very heavily utilized by freight trains (primarily container trains servicing the West Basin Intermodal Yard). The intensive use of the existing rail right-of-way north of the intersection of Front/Pacific would make shared use track impractical beyond this point. Several significant roadway, freight rail, and public open space infrastructure projects are also underway along the corridor that influence the preferred alignment.

The preferred alignment for the southern segment of the Wilmington extension, between Swinford and Channel Streets, would be double-track open (ballasted) track within POLA rail right-of-way.

SOURCE: Wilson & Company, Inc, Engineers & Architects; February 2009

THE PORT OF LOS ANGELES

WILSON & COMPANY ENGINEERS & ARCHITECTS

Waterfront Red Car Line Extension Feasibility Report

Figure 5-16
Wilmington Extension

The double track anticipates a North Gaffey spur that joins the line at Channel Street, and assumes use of the existing rail right-of-way behind Knoll Hill. Double tracking also serves as a substitute for a passing siding that would be needed along this section if the line were single track.

North of Channel Street, the preferred alignment would be single track open (ballasted) track on the existing railroad right-of-way on the east side of John S. Gibson Boulevard. Previous studies have also suggested the possibility of extending the California Coastal Trail along this same corridor, with a bike path and multi-use trail. Placing the Red Car alignment and/or the trail on the eastern roadway edge would require the existing Gibson Boulevard median to be narrowed, and lanes shifted to the west.

Existing rail right-of-way along John S. Gibson Blvd.

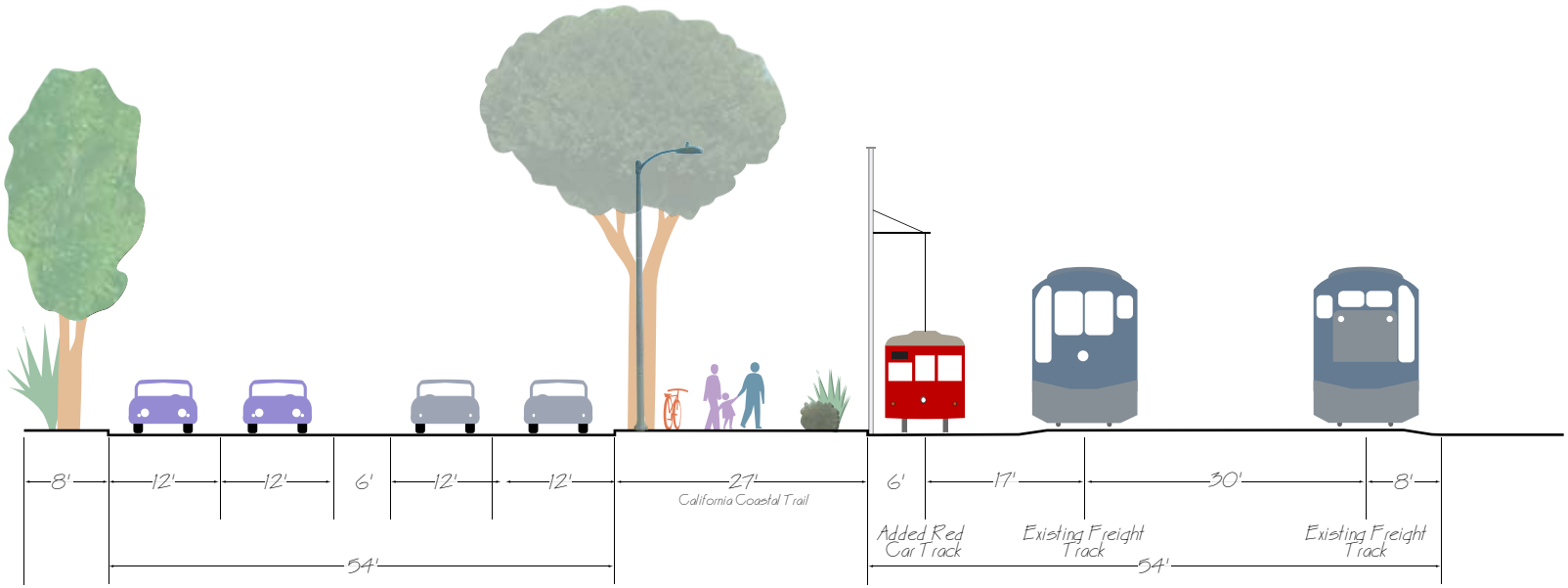
At the northern end of the Gibson Boulevard segment, a number of factors combine to constrain the space available for the Red Car. The existing roadway narrows considerably, with the 110 Freeway retaining wall situated directly on its western edge. The "C" Street Ramps project will also reconfigure Gibson Boulevard in this area, and an additional freight track is to be added to the railroad right-of-way as part of the Pier "A" Capacity Expansion project. In order to add a Red Car track in this constrained area, it will be necessary to shift the existing freight tracks east into the terminal area.

Within the Harry Bridges Boulevard corridor, the line would continue within the existing railroad right-of-way (south side of street) and then cross to the north side of the street at a signalized intersection at King Street. East of King Street, the single track line would continue in a dedicated landscaped right-of-way along the edge of the new Wilmington Buffer. Open (ballasted) track construction would be used. East of Lagoon Avenue, the line would continue as side-running along a landscaped corridor on the north side of Harry Bridges Boulevard, terminating at Avalon Boulevard.

Figure 5-17 displays a cross-section of John S. Gibson Boulevard with the Red Car operating within the rail right-of-way along the east side of the roadway. **Figure 5-18** shows the Red Car operating along the north side of Harry Bridges Boulevard at the narrowest point of the roadway. **Figure 5-19** shows the Red Car operating within the proposed Wilmington Buffer Park.

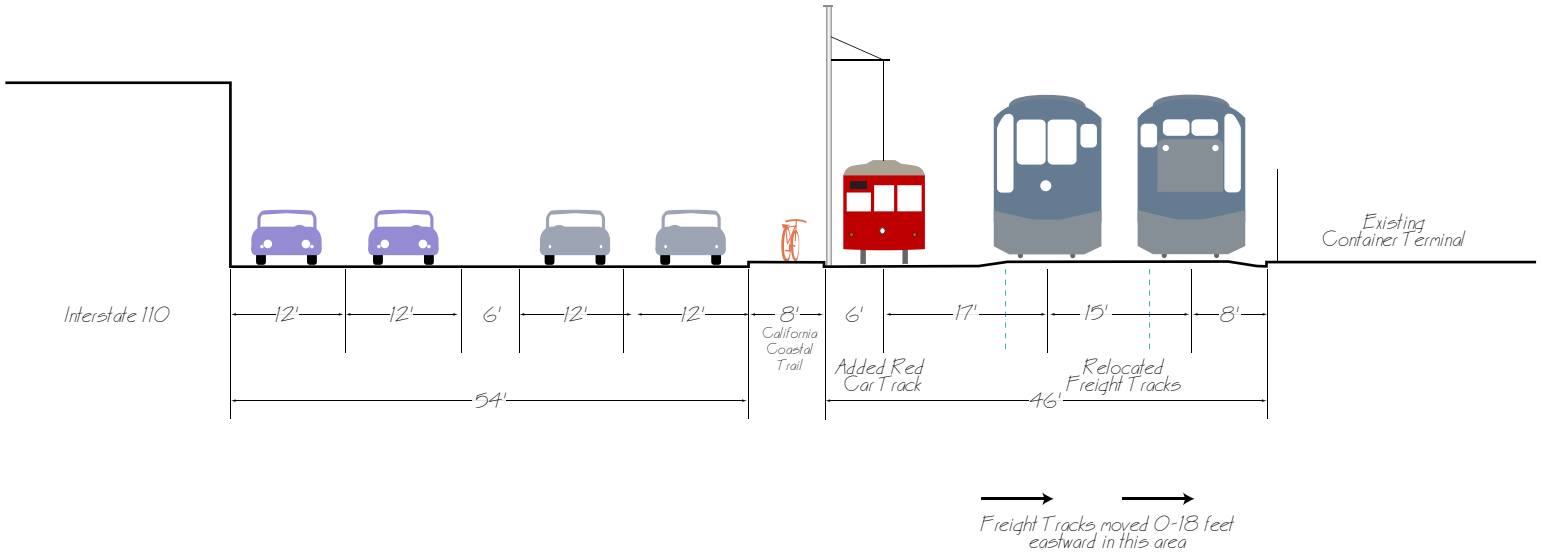
Other alignment alternatives examined include:

- New right-of-way along east side of Front Street for southern segment (Swinford Street to Pacific Avenue)
- Center median alignment within John S. Gibson Boulevard
- Aerial flyover of Harry Bridges Boulevard at Figueroa Street



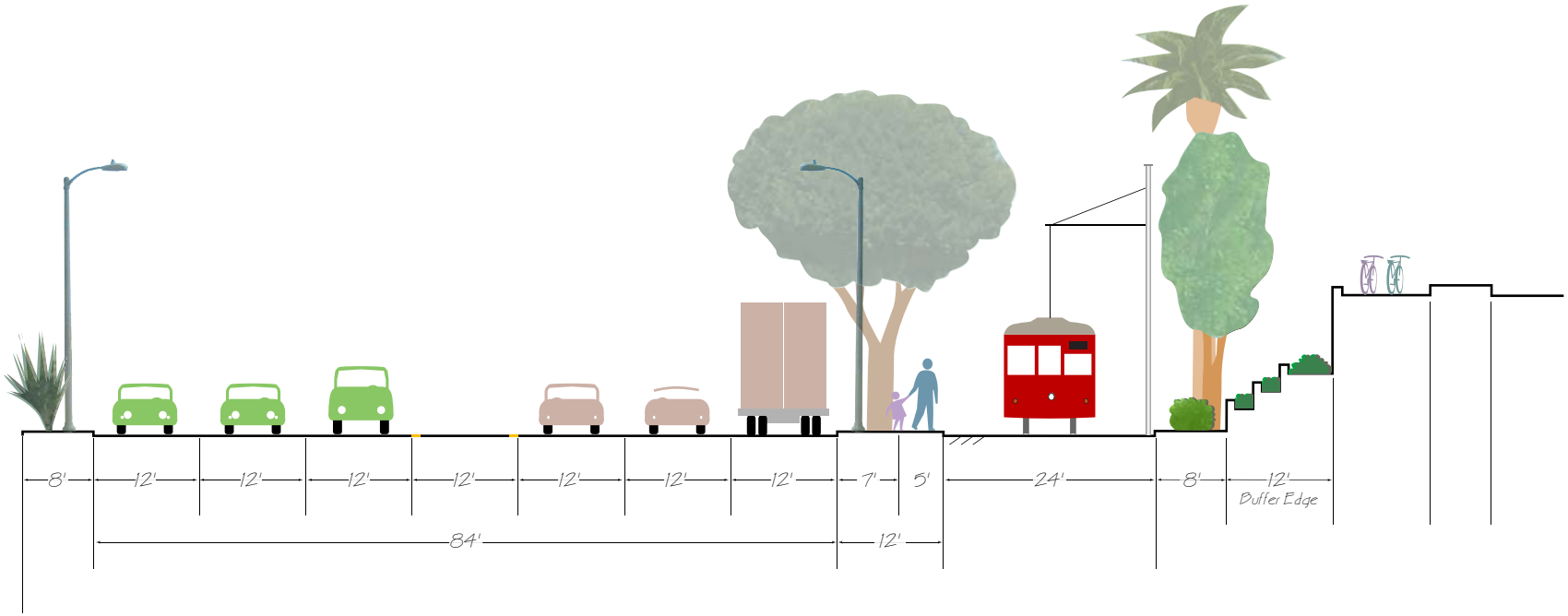
SOURCE: Wilson & Company, Inc, Engineers & Architects; October 2007

Figure 5-17
John S. Gibson Boulevard Cross-Section
Wilmington Extension



SOURCE: Wilson & Company, Inc, Engineers & Architects; October 2007

Figure 5-18
John S. Gibson Boulevard (Narrowest Point) Cross-Section
Wilmington Extension



SOURCE: Wilson & Company, Inc, Engineers & Architects; October 2007

Figure 5-19
Harry Bridges Boulevard Cross-Section,
between Wilmington Bl and Gulf Ave; Wilmington Extension

Engineering and Implementation Considerations

Compared to the other proposed Red Car extensions, the Wilmington extension probably has greatest number of issues and associated challenges in terms of planning and engineering activities. In addition to being one of the most densely utilized transportation corridors in the Port, the route the Red Car would need to traverse is in the midst of major infrastructure upgrades, most of which entered planning prior to the advent of the Wilmington Red Car extension proposal. Proceeding north from the end of the existing Red Car line, these projects include:

1. 110 Freeway/SR-47 interchange improvements, including potential new ramps for access to China Shipping
2. John S. Gibson Ramps improvement project at Yang Ming Terminal entrance
3. New rail crossovers at Yang Ming to allow increased use of existing track on the east side of John S. Gibson Boulevard
4. C Street Ramps project
5. Wilmington Buffer construction
6. Pier "A" Yard replacement and capacity improvement project, adding a second track along Harry Bridges Boulevard and into the Yang Ming yard entrance
7. Harry Bridges Boulevard widening project
8. Wilmington Waterfront Development Program

A Red Car extension to Wilmington would therefore need to take into account coordination with these projects, as well as the impacts of overlaying an additional rail alignment into the corridor.

Other related issues include:

- Potential for a Red Car Museum to be located within or adjacent to the Bekins Warehouse at Fries Avenue and Harry Bridges Boulevard.
- Further study would be required to clarify right-of-way issues (jointly owned by POLA and POLB) and determine alignment impacts on existing utilities
- Several existing railroad crossings would require major crossing protection modifications
- The location and design of the Red Car crossing of Harry Bridges Boulevard
- Red Car service to Wilmington would require two crossings with existing freight sidings. Implementing these crossings will require further study and coordination with the Federal Railroad Administration (FRA) and California Public Utilities Commission (CPUC).
- Additional study would be required to clarify the insurance and other operating cost impacts of operation on a shared right-of-way and of the freight spur crossings.
- The north end of John S. Gibson Boulevard narrows down significantly before it reaches Harry Bridges Boulevard. This "bottleneck" is further constrained by the presence of the Tosco Oil Refinery spur and projects to construct the new "C" Street freeway ramps and add an additional freight track to the Yang Ming terminal leads.
- Additional study would be required to clarify impacts on existing trackage associated with placing the Red Car in the Port rail right-of-way. At a minimum, tracks would need to be relocated around the Yang Ming Terminal entrance in order to accommodate the Red Car track in this narrow section. Further study would also be required to determine whether additional physical separation of parallel tracks (beyond standard CPUC GO-26D requirements) would be required.
- Adding Red Car service to the John S. Gibson Boulevard corridor would require shifting traffic lanes and relocating the existing pedestrian sidewalks and bike paths on the east side of the street.

A more detailed review of alignment alternatives and related engineering issues is provided in the *WRCL System Purpose & Need Assessment (Wilson & Company; June 2007, Section 4.7 -* **Appendix 1-1***)*.

Capital Cost Requirements

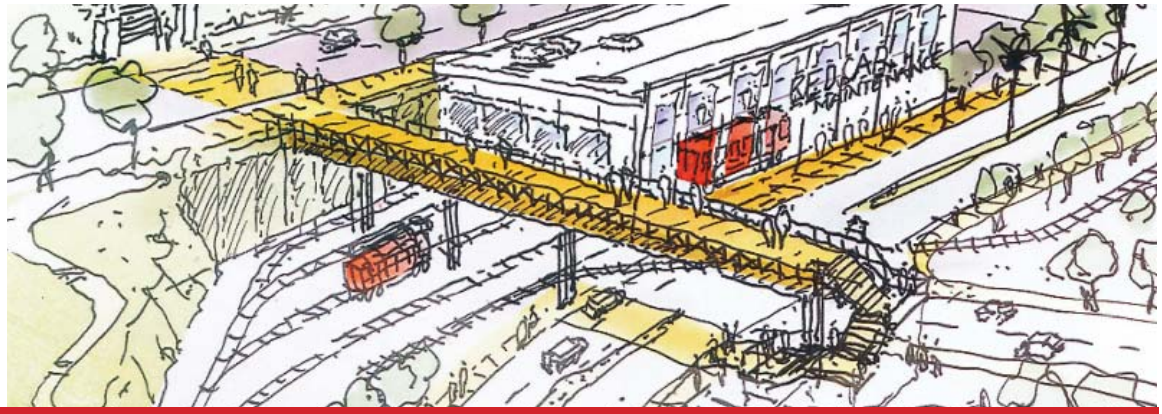
Table 5.7 provides a summary of the key capital cost elements associated with the Wilmington Red Car extension. Detailed cost summary sheets are provided in **Appendix 2-4**.

Table 5.7
Capital Cost Estimate (2009 $'s)
Wilmington Extension

Cost Elements	Swinford to Front/ Pacific Segment	Wilmington Segment	Total
Trackwork	$ 1.65 M	$ 3.41 M	$ 5.06 M
Traction Power/OCS	$ 2.01 M	$ 4.65 M	$ 6.66 M
Stations	$ 0.08 M	$ 0.55 M	$ 0.63 M
Traffic Interface/Crossing Protection/ Roadway Mods	$ 0.30 M	$ 2.72 M	$ 3.02 M
Utility Protection/Relocation	$ 0.40 M	$ 7.25 M	$ 7.65 M
Additional/Infrastructure Requirements[1]	N/A	$ 4.00 M	$ 4.00 M
30% Contingency[2]	$ 1.40 M	$ 7.11 M	$ 8.51 M
Construction Subtotal[2]	$ 6.07 M	$ 30.81 M	$ 36.88 M
20% Engineering & CM[2]	$ 1.21 M	$ 6.16 M	$ 7.37 M
Total[2]	**$ 7.28 M**	**$ 36.98 M**	**$ 44.26 M**

Source: Wilson & Company March 2009

Note 1: Cost allowance to cover relocation/modifications to existing freight trackage/roadway infrastructure, and related impacts on adjacent terminal. Excludes any potential ROW acquisitions.
Note 2: Include 5% escalation: 2007 to 2009 base



6.0 New Maintenance and Museum Facilities

6.0 NEW MAINTENANCE AND MUSEUM FACILITIES

Among the primary elements of the expanded Red Car system are proposals for an enhanced maintenance/operations base for the system (hereafter referred to as the "maintenance facility"). Also proposed is a Red Car Museum to provide a public venue for interpretive displays and exhibits on the history of Pacific Electric Red Cars and their role in connecting the Port and the San Pedro/ Wilmington communities with the greater Los Angeles region.

6.1 New Red Car Maintenance Facility

Four candidate sites in the San Pedro/Wilmington waterfront area were evaluated to determine the most viable location(s) for the new Red Car maintenance facility, and additionally a Red Car Museum:

1. San Pedro - San Pedro Rail Yard (SP Yard)
2. San Pedro - SP Slip
3. San Pedro - Warehouse One
4. Wilmington - Fries Street and Bridges Boulevard

Both location and operational factors associated with the respective sites were examined, including:

- Location/Space
- Accessibility
- Implementation
- Compatibility with Port Activities
- Synergy/Adjacent Development Potential
- Relative Cost

Existing Red Car Maintenance Facility. This temporary facility consists of a large tent and outdoor inspection pit, with office trailers and storage containers.

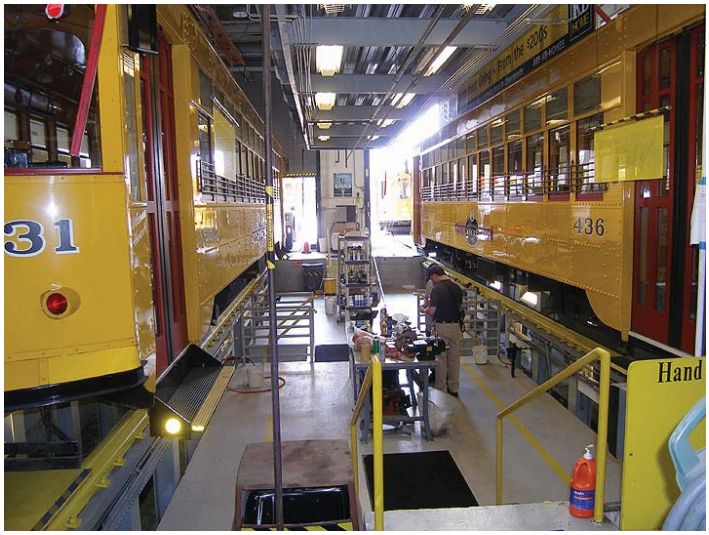
Appendices 4-1 through **4-3** document the results of a number of studies focused specifically on the Warehouse One site, including geotechnical, structural, and capital costing reports. *The WRCL Maintenance Facility and Museum Site Assessment Report* (**Appendix 4-4**) documents the detailed site assessments of the four candidate sites, and recommends the SP Slip as the preferred location for the new Red Car maintenance facility.

As part of Phase 2 of the Red Car Expansion Feasibility Study, the consultant team worked with POLA staff to develop more detailed facility drawings and preliminary renderings for the preferred site. The process also included review of the Design Criteria and facility drawings with POLA's contract operator/maintainer for the Red Car, Herzog Transit Services. Their input was subsequently incorporated in the form of an alternative shop layout, which is presented in the *Red Car Maintenance Facility Conceptual Development Report*, included as **Appendix 4-5**.

Facility Requirements

The existing Red Car maintenance facility/operations base is a temporary facility on approximately one-half acre of land. The facility consists of a 30 x 165 foot tent covering a single track (providing room for all three of the line's current railcars), an outdoor inspection pit, two office trailers, and eight storage containers. A small amount of outdoor storage space is also provided for extra line and track materials, but given the short length of the line, the need for stored materials has not been significant. Two office trailers provide staff office space and a shipping container houses parts.

The existing facility was constructed in an improvised fashion for temporary use, and as such is poorly suited for expansion. The current Red Car fleet consists of three vehicles, while the expanded system could ultimately require 17 or more vehicles. An expanded system will also be accompanied by a demand for more space to accommodate employee and administrative functions. As presently configured, the existing site can only accommodate one additional car, the outdoor inspection pit is unusable during periods of extended rain, and the facility has no fire protection system to protect the Port's investment in vehicles and tooling. The location of the existing facility is also in conflict with plans to relocate the Red Car line into the realigned Sampson Way corridor.



Interior of vintage trolley system Maintenance Facility in Tampa, Florida

A new Red Car maintenance facility would need to serve the following functions:

- Vehicle inspection, maintenance and repair
- Vehicle storage
- Vehicle cleaning
- Parts and equipment storage
- Employee base
- Administrative offices
- Central control/dispatch

10,000 s.f. Maintenance Facility built for Tacoma, Washington streetcar system, 2003

Recommended Maintenance Facility Site

The SP Yard site was ranked highest of the four evaluated locations for a maintenance facility site based on system accessibility/location, ability to be implemented near-term, and compatibility

with existing and planned waterfront attractions. **Figure 6-1** displays the preferred SP Yard location for the new Red Car Maintenance Facility.

From a system operations standpoint, the Warehouse One and Wilmington sites are poorly located as a potential maintenance/operation base, and would result in higher operating costs due to increased non-revenue mileage. These two sites would also require major new rail line extensions to be built prior to the facility coming on line. Additionally, the Warehouse One site would entail a major adaptive reuse project involving an historic building and related site preparations. By contrast, the SP Yard site is located in the central part of the system, and the site would be available in the near term.

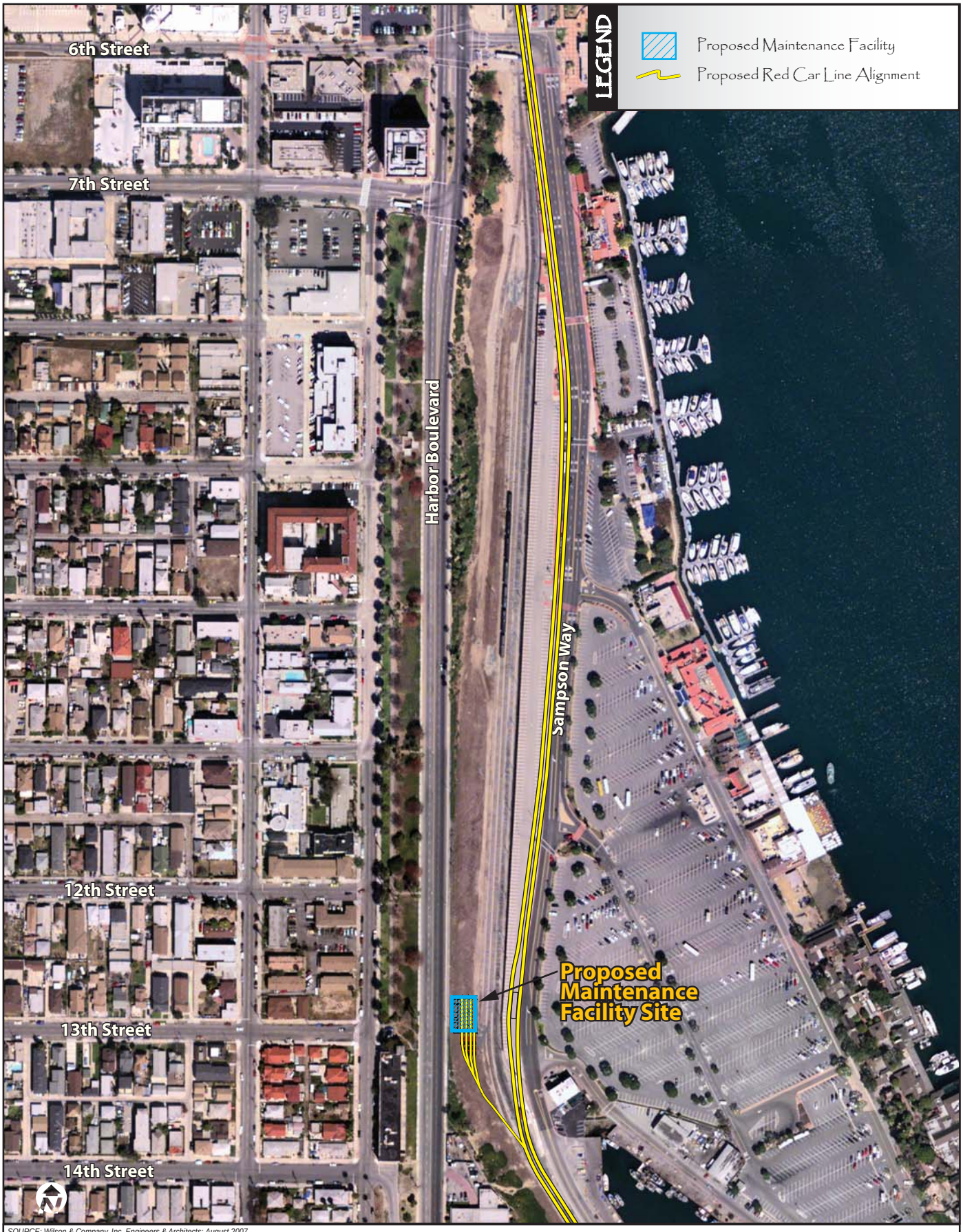
Interior of the Electric City Trolley Museum, Scranton PA, a comparably sized example of a small railway-themed exhibit space.

Facility Size and Layout

The proposed size of the new Maintenance Facility is based on several factors. These include site characteristics, the number of vehicles to be accommodated (both presently and considering future expansion), the type of vehicles used, and the range of work to be performed in-house versus sent out to specialized contractors.

The present Red Car vehicles include an original wooden Red Car, and two modern replicas that have a wooden superstructure on a steel frame. In both cases, the cars have wooden exteriors and contain a large amount of varnished interior woodwork. In the case of the two replica cars, an "open air" section is also incorporated that has no windows, and there are only gates (as opposed to doors) in the doorways. In order to protect the woodwork and minimize maintenance costs, the existing car types both require indoor storage, particularly in the waterfront's salt-air environment.

The types of heritage streetcar vehicles being considered for future Red Car operations utilize steel bodies and a fully enclosed design. While they would still incorporate wooden elements in their interiors, an enclosed steel-bodied car is generally better suited to outdoor storage than a wooden one. Indoor storage will, however, prolong the life of finishes on any vehicle. This conceptual design thus assumes the retention of the line's existing cars that require indoor storage, and that future rolling stock will be steel-bodied replica heritage cars that can be stored outdoors if necessary. The design further assumes that given the relatively small size of the fleet, wheel truing and complete repainting of cars will be sent out to other contractors / facilities. A wheel truing machine and paint booth are thus not included in the design.



SOURCE: Wilson & Company, Inc, Engineers & Architects; August 2007

THE PORT OF LOS ANGELES

WILSON & COMPANY ENGINEERS & ARCHITECTS

Waterfront Red Car Line Expansion Study

Figure 6-1
Proposed Red Car Maintenance Facilility Location at San Pedro Yard

Another design consideration affecting facility size is the potential future use of a modern streetcar vehicle. Although not contemplated at this time, the future use of a different vehicle type should not be precluded. In general, the choice of vehicle will not impact the overall facility size, but rather its proportions and layout. The aspects of vehicle design that will impact maintenance facility layout are primarily vehicle length and equipment layout. Most heritage streetcars are single-unit cars between 40 and 48 feet in length, while modern streetcars are articulated vehicles at typically about 66 feet in length. The overall length of the building should thus be a multiple of this longer length so as not to preclude two modern streetcar vehicles stored on the same track end-to-end.

An example of a split-level facility specifically designed for servicing low-floor vehicles, Portland, Oregon. This type of design is based on the use of vehicles which have the majority of their propulsion and auxiliary components on the vehicle roof. By contrast, heritage streetcar vehicles have the majority of their equipment under the vehicle floor.

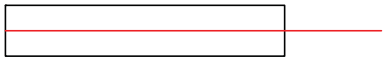
It is also important to note that "low-floor" modern streetcar vehicles have the majority of their propulsion and auxiliary equipment installed on the roof, as opposed to underneath the vehicle. This means that in a facility servicing low-floor cars, there must be some means for maintenance workers to conveniently access the vehicle roof. This can be accomplished in one of two ways, either by designing the building around work areas primarily located on a second level, or by adding elevated work platforms and access stairways between tracks. For the Red Car maintenance facility, the main criteria would be to not preclude the future addition of the elevated work platforms by keeping track centers fairly generous (approximately 20 feet).

To help provide a reference point for determining indoor space requirements, a national review of maintenance facilities at peer systems was conducted. The survey was limited to smaller facilities, as appropriate for a streetcar system or small light rail extension. The results of this survey are presented in **Figure 6-2**, showing the floor plans for a variety of different facilities and their capacity. The building footprints range from the current temporary Red Car "Tent" at 4,950 s.f., to the LA Metro Gold Line facility at 24,360 s.f. Some simple calculations were then performed based on the number of vehicles that could be accommodated in the facility. At this broad level of study, square footage devoted to office space was not segregated out, and the entire building footprint was used in the calculation.

In cases such as Seattle where wooden vehicles are used, indoor space is provided for all vehicles at 1,660 s.f. per vehicle. The 10,800 s.f. facility in Kenosha Wisconsin presently houses 6 vehicles at 1,800 s.f. per vehicle, but is designed to accommodate 8 cars at 1,350 s.f. per car. In cases such as the Metro Gold Line LRV shop in Los Angeles, there is no indoor vehicle storage, and only cars undergoing inspection and repairs are indoors. The proposed 17,600 s.f. full build out of the Red

SURVEY OF SMALL STREETCAR / LIGHT RAIL MAINTENANCE FACILITIES
REV 8/7/07 RAILWAY PRESERVATION RESOURCES

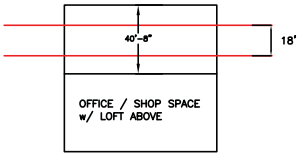
POLA TEMPORARY TENT 30' x 165'
4,950 SF 1 TRACK 3 CARS



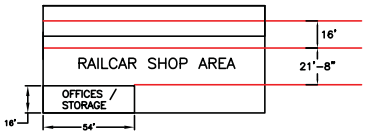
RED LINES INDICATE TRACKS

SCALE = NONE

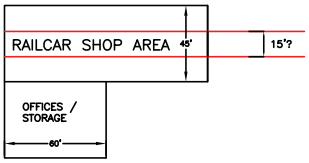
PORTLAND STREETCAR
90' x 87' 7,830 SF FOOTPRINT
2 STORY BUILDING
2 TRACKS 2 CARS



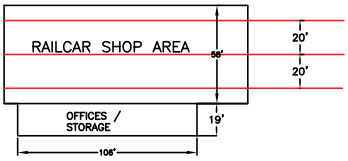
SEATTLE TROLLEY 63' x 131'
8,300 SF 3 TRACKS 5 CARS



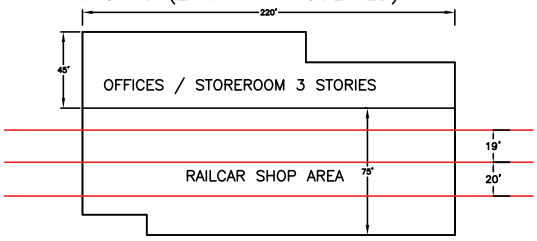
LITTLE ROCK 90' x 120'
8,100 SF 2 TRACKS 3–4 CARS



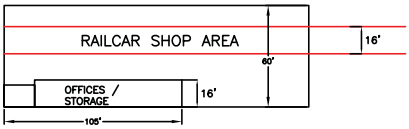
TACOMA STREETCAR 58' x 144' + SIDE
10,350 SF 3 TRACKS
3 CARS (2–UNIT ARTICULATED)



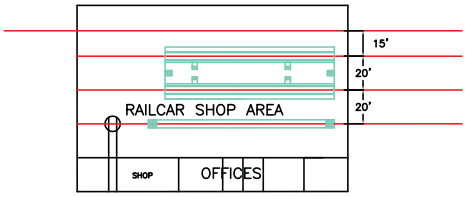
LAMTA GOLD LINE 120' x 220'
24,360 SF FOOTPRINT 3 TRACKS
3 STORY BUILDING
6 CARS (2–UNIT ARTICULATED)



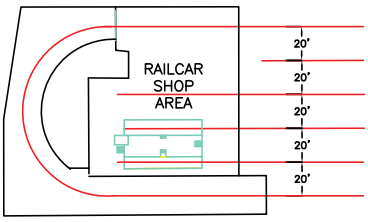
KENOSHA 60' x 180'
10,800 SF 2 TRACKS 6 CARS (8 MAX)



POLA PROPOSED 110' x 160'
17,600 SF (plus museum space)
12 CARS / 4 TRACKS



TAMPA 123' x 139'
17,100 SF FOOTPRINT
8 CARS. 3 STORY BUILDING



SOURCE: Railway Preservation Resources; August 2007

Car maintenance facility would provide approximately 1,466 s.f. per car for each of the 12 cars. The initial 12,040 s.f. facility has room for seven cars at 1,620 s.f. per car. Expansion beyond 12 cars assumes outdoor storage of some portion of the fleet.

The Red Car Maintenance Facility layout is based on the use of a pre-engineered steel building with an architecturally designed façade. Site constraints also influence the design, and a narrower rectangular shaped building fits the site better than a wider building. The south end of the site narrows down considerably as it nears 13th Street. For this reason, the facility should be located as far north as possible, consistent with compatibility with adjacent land uses. The design is also intended to be phased, with an initial build out footprint of 12,040 s.f. and a full build out footprint of 17,600 s.f.

The proposed site is also located immediately below a high retaining wall. This condition persists through much of the SP Yard site, and may be utilized in future to accommodate multi-level parking structures, with entrances at both street levels. The rendering for the proposed facility shows parking incorporated on top of the building, although this is strictly a conceptual illustration intended to highlight the opportunities associated with the multi-level site geography.

An example of a traditional facility outfitted with a platform to service roof components, Tacoma, Washington. If at some point in the future it were desired to utilize low-floor modern streetcars on the Red Car Line, the proposed facility could be retrofitted with similar roof-level platforms.

The site geography could also be used to advantage for incorporating a vehicle wash-down track. One of the maintenance challenges reported by the current contract operator / maintainer is the difficulty in washing the wooden exteriors of the current cars in direct sunlight. A shaded area is desired to make washing more effective. This is accommodated in the proposed site plan by including a wash track as a run-around track on the west side of the building. Located between the west building wall and the Harbor Boulevard retaining wall, this track would be naturally shaded.

Adjacent land use for the remaining portions of the SP Yard site have not yet been determined, pending an overall development plan for the Ports O' Call area. One scenario under consideration is to use the yard site for parking, freeing up portions of the existing Ports O' Call parking lot for development. The proposed Red Car Maintenance Facility would be a base for between 10 and 40 employees (staggered in shifts), depending on the degree to which the Red Car operation is expanded. Employee parking options for the facility include a dedicated parking lot, rooftop

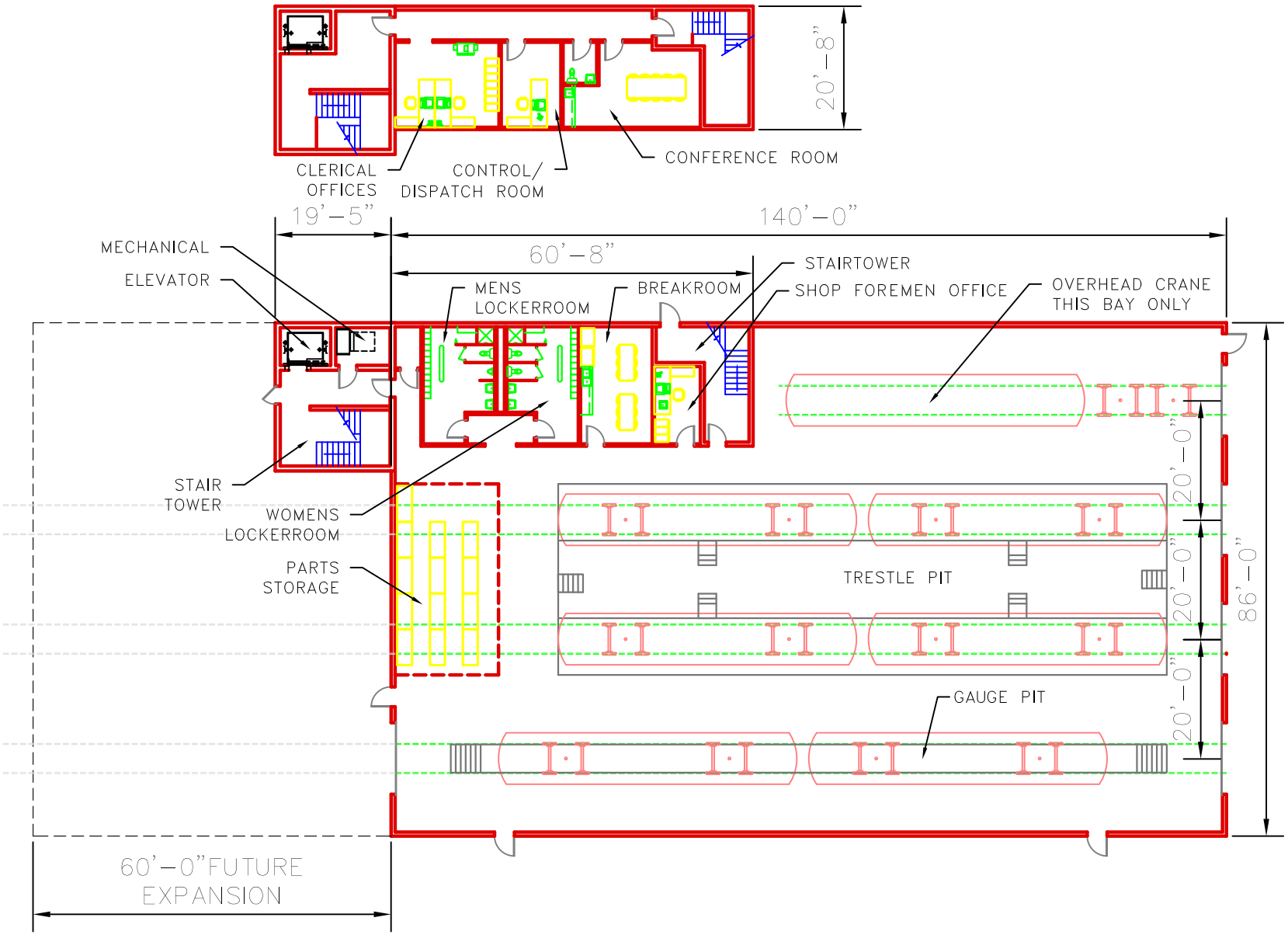
parking, use of adjacent parking not associated with this project, and a combination of one of the preceding options with parking on the yard tracks.

Roadway access to the facility would be from Sampson Way at 13th Street. This is already a three-way intersection, and adding a fourth leg to the intersection could simplify traffic control requirements. As noted in the accompanying Design Criteria, it will be necessary for the facility to be accessible to large trucks, as well as to have its yard area fenced. The yard and access trackage would be constructed with paved track, permitting vehicular traffic to pass over all track areas. There would also be a fire road between the building's west wall and the Harbor Boulevard retaining wall. As noted earlier, this roadway would also contain a run-around track configured for use as a wash track. The accompanying aerial view of the streetcar maintenance facility in Tampa Florida illustrates many of these same concepts including the use of paving over the yard space and a fenced perimeter.

An example of how a streetcar shop can be fit into an urban environment, Tampa, Florida. Note that the entire yard and related access trackage is paved, allowing vehicles to easily move over the streetcar trackage. The yard area immediately in front of the building is also fenced. Employee parking is accommodated with both on-street parking and parking within the yard area. The facility has a 17,100 s.f. footprint, almost identical in overall size to the proposed Red Car facility

Facility Costs

In order to estimate costs for the new Red Car maintenance facility, conceptual plans for both the intial phase (12,040 sf) and full build-out (17,600 sf) were prepared, as displayed in **Figures 6-3A and 6-3B**. The concept at build-out envisions a pre-fabricated metal building with an architecturally designed street façade. The building would be capable of housing 12 vehicles on four tracks, with a small storage yard located in front that could store additional vehicles. Most of the specialized equipment needed to outfit the new facility is already owned by POLA and in use at the present temporary facility.



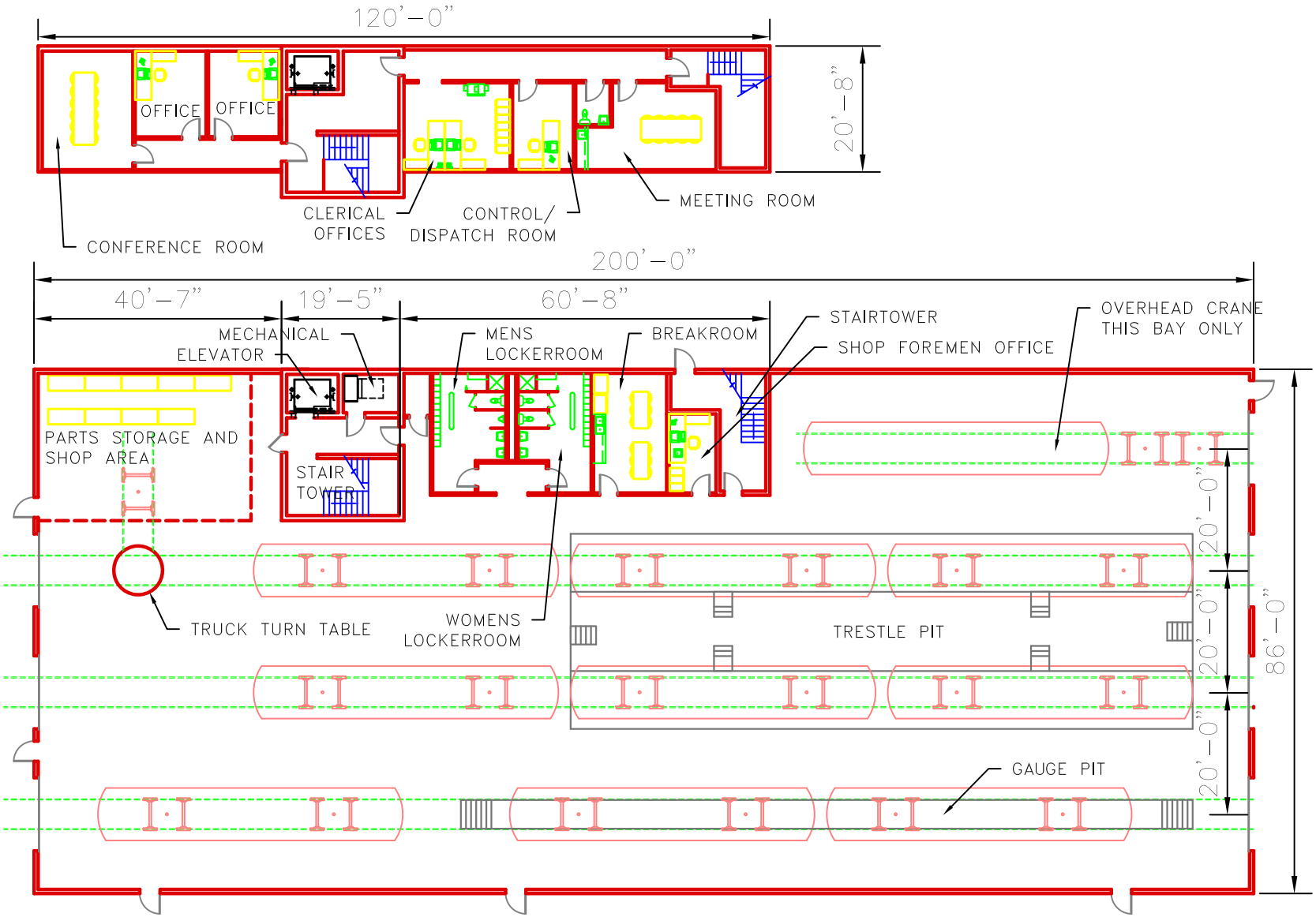
SOURCE: TranSystems, May 2009

THE PORT OF LOS ANGELES

WILSON & COMPANY ENGINEERS & ARCHITECTS

Waterfront Red Car Line Expansion Feasibility Report

Figure 6-3A
Proposed Red Car Maintenance Facility Concept
Phase 1 (12,040 S.F.)



SOURCE: TranSystems, May 2009

THE PORT OF LOS ANGELES

WILSON & COMPANY ENGINEERS & ARCHITECTS

Waterfront Red Car Line Expansion Feasibility Report

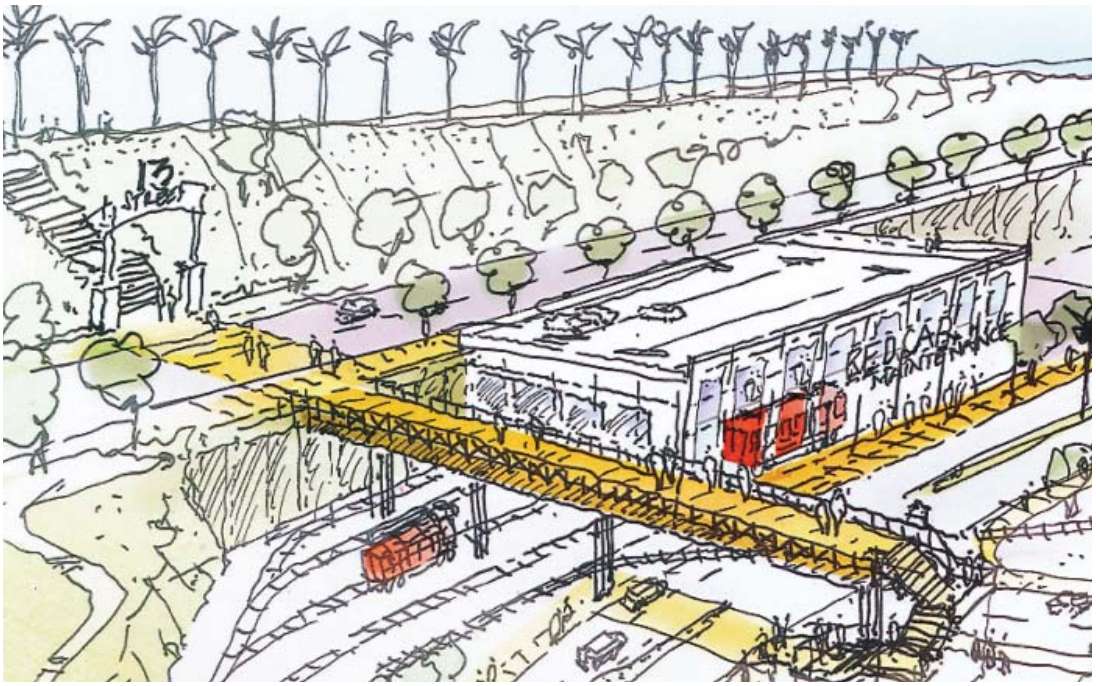
Figure 6-3B
Proposed Red Car Maintenance Facility Concept Buildout (17,600 S.F.)

Estimated capital costs for the proposed Red Car maintenance facility are presented in **Table 6.1**. More detailed costing sheets are provided in the *Red Car Maintenance Facility Conceptual Development Report*, which is included as **Appendix 4-5**.

Table 6.1
Estimate Capital Cost for WRCL Maintenance Facility (2009 $'s)

Program Component	Full Build Out Cost	Partial Build Out Cost	Notes
Maintenance Facility Building	$ 4.33 M	$ 2.96 M	Full build out = 17,600 sf @$246/sf Partial build out = 12,040 sf @ $246/sf
Site Work	$3.07 M	$2.50 M	Includes yard track/traction power
20% Engineering & CM	$1.48 M	$1.09 M	
Maintenance Facility Expansion	**$8.87 M**	**$6.55 M**	

Source: O'Connor Construction Management



Proposed Maintenance Facility at south end of San Pedro Yard site.
Pedestrian Bridge in foreground.

Next Steps

The timetable for implementation of the new Red Car Maintenance Facility will be influenced by various factors including the schedule for adjacent waterfront development and related environmental work. The Sampson Way roadway realignment project will bring major changes to the SP Yard site, and will include realignment of the existing Red Car Line within this area. Regardless of the implementation schedule for the maintenance facility, it will be important to include consideration of the future facility (initial first phase 12,040 sf facility) in the project planning for the Sampson Way roadway realignment project, particularly with regard to the intersection at Sampson Way and 13th Street and the required access trackage.

Street-level rendering of the proposed facility

The San Pedro Waterfront Project EIR includes the proposed maintenance facility, and should the EIR be certified and the project approved by the Board of Harbor Commissioners, further study leading to detailed design and construction of the facility could proceed. The complete *Red Car Maintenance Facility Conceptual Development Report*, included as **Appendix 4-5,** contains detailed design criteria which can be used as the basis for developing an RFP for final design.

6.2 Red Car Museum Facility

As part of the expansion of the Waterfront Red Car Line, it is proposed to construct a museum facility that would present some of the history behind the "Red Cars". The broad focus of the museum would be the history of the *Pacific Electric Railway,* including its role in connecting the Port and the San Pedro/Wilmington communities with the greater Los Angeles region. Displays and exhibits would be designed with flexibility in mind. A significant portion of the exhibits would be rotating, offering the option for a multi-purpose space that could be programmed for a variety of educational uses, including broader themes such as the role of transportation port-wide and its impact on the nation's economy.

The *Red Car Museum Conceptual Development Report* is included as **Appendix 4-6.**

Historical Context

The Pacific Electric Railway (PE) was America's largest interurban electric railway system, blanketing the Los Angeles region with more than 1,000 miles of rail lines. The origins of the system date back to 1895 and the opening of the region's first electric interurban line connecting Los Angeles with Pasadena. In 1901, Henry Huntington formed the Pacific Electric, sparking an

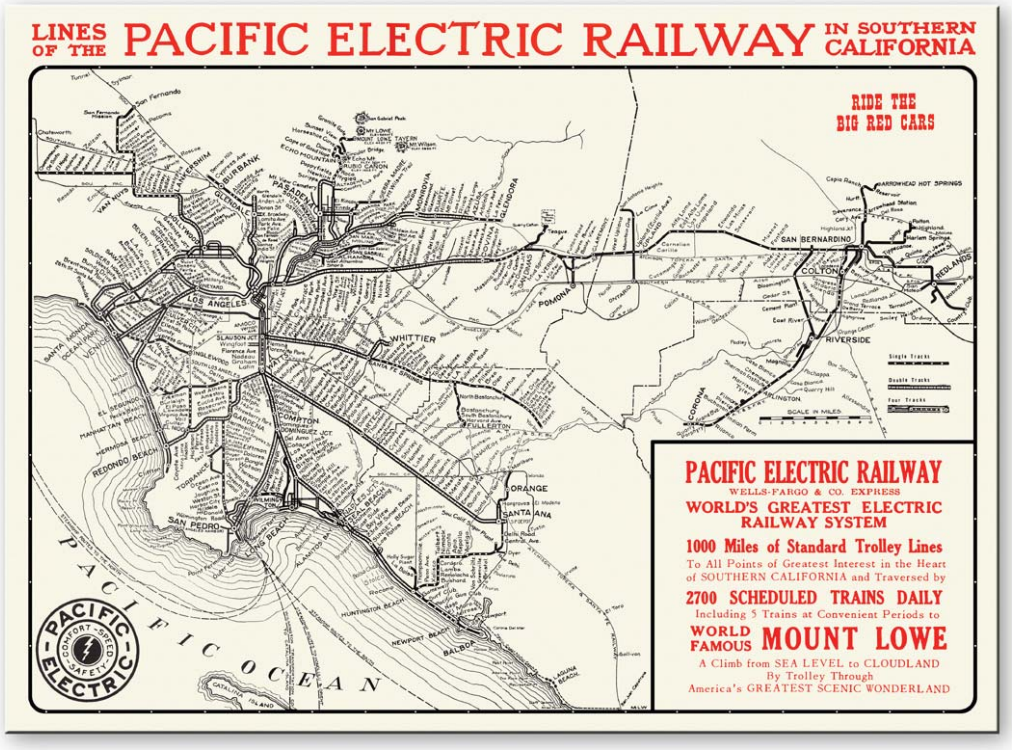
intense period of interurban expansion and a battle with the Southern Pacific (SP) railroad for control of the region's electric railways. Huntington sold his interests in the PE to the SP in 1910, and the "Great Merger" of 1911 consolidated almost all of the region's interurban lines under SP control. In exchange for his interest in the PE, Huntington gained complete control of Los Angeles' local streetcar system, the Los Angeles Railway.

By 1914, more than 1,600 PE trains entered or left Los Angeles daily over the system's four operating districts. The system reached its peak in the mid-Twenties, after which it began a slow decline, halted temporarily by the traffic boom brought on by World War II, and then declining precipitously in the postwar years. In 1953, PE's remaining passenger operations were sold to transit operator Metropolitan Coach Lines, who in turn sold the remaining lines to the Los Angeles Metropolitan Transit Authority in 1958. The last remnant of PE's vast passenger operation, the line to Long Beach, was abandoned in 1961. The PE also operated a significant freight business, which the SP continued to operate following the end of passenger operations. Beginning in the early 1990s, electric rail transit began returning to the region in the form of a modern "light rail" and subway system. Some of today's "new" routes utilize the rights-of-way of the former PE system.

The Wilmington museum site has an historic tie-in to the Pacific electric "Red Cars" Above: Bekin Warehouse building circa 1947 and Below: in 2007

PE's San Pedro depot at 6th Street occupied the site between the present day Red Car Line tracks and Harbor Blvd. from 1920 until 1961. As a potential resource for architectural design elements, the Port has obtained a set of building plans for this building from the *Orange Empire Railway Museum*. In addition to the plans, several original decorative architectural elements from the original building survive today at the museum and in private collections. A photograph and sample drawing sheets follow.

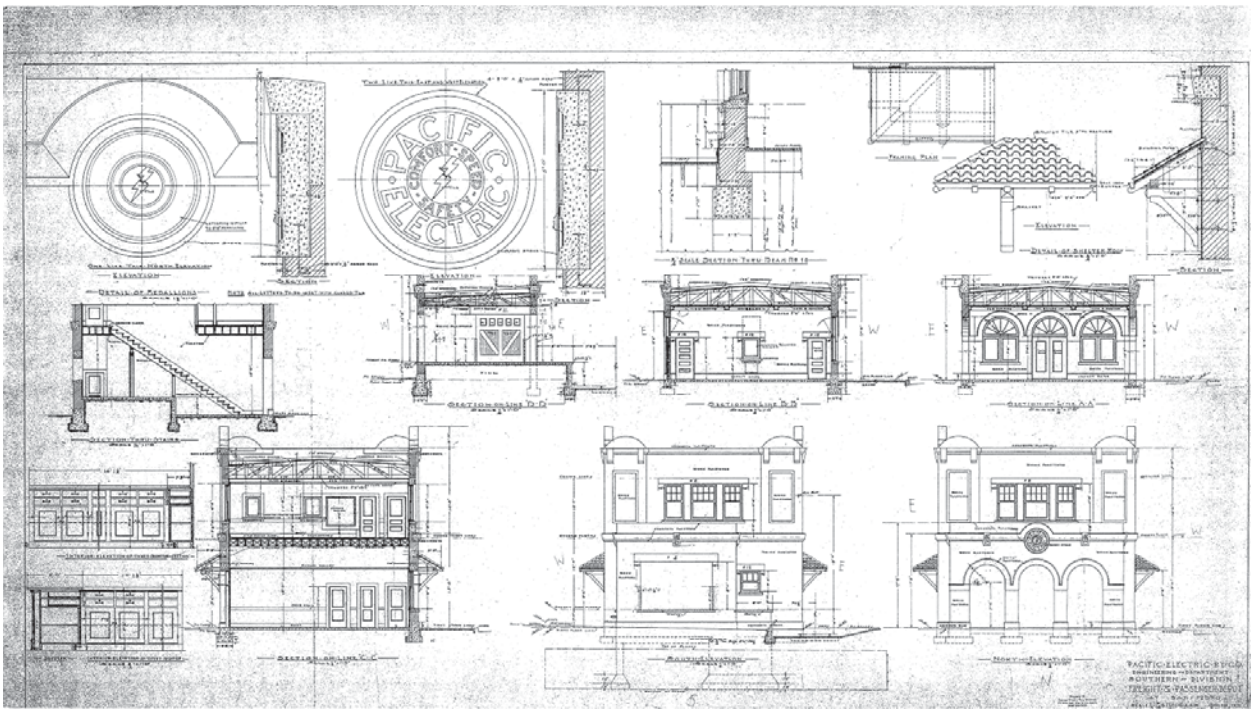
The PE's station in Wilmington was located at Avalon Boulevard, just south of "D" Street. The PE right-of-way cut diagonally through Wilmington, crossing "B" Street (today's Harry Bridges Boulevard) just west of Fries Avenue. A section of the right-of-way remains intact today in the vicinity of Bridges Boulevard, passing the historic Bekins Warehouse building at Fries and Bridges.



Pacific Electric "Red Car" system circa 1925

San Pedro Pacific Electric depot, circa 1947.
San Pedro City Hall in background. Photo from OERM Collection

Opened in 2003, the Waterfront Red Car Line recreates a portion of the Pacific Electric "Red Car" system in San Pedro and Wilmington. This 1957 view shows the Pacific Electric depot in relation to the Ferry Terminal Building, which today is the Los Angeles Maritime Museum. Don Brown photo, OERM Collection.



Pacific Electric San Pedro Depot drawings- OERM Collection

Pacific Electric right-of-way in Wilmington, Bekins Warehouse building in background.

Defining the Red Car Museum

The International Council of Museums (ICOM) defines a *museum* as: **"**A non-profitmaking, permanent institution in the service of society and of its development, and open to the public, which acquires, conserves, researches, communicates and exhibits, for purposes of study, education and enjoyment, material evidence of people and their environment."

While delving further into the definition of a museum is beyond the scope of this document, we can examine what the core functions of the proposed Red Car museum might be. This will allow further work to start developing a more cohesive vision for the museum, including the development of a mission statement and a collecting focus.

What a Red Car Museum Could Be:

- A series of interpretive exhibits that will supplement the ride on the Waterfront Red Car Line by presenting the history behind the role of rail transportation in the Harbor in general, and the Pacific Electric story in particular. The museum would help visitors understand why the Red Car was important in the growth of the Harbor and the greater Los Angeles area, and how efficient transportation is the key to so many aspects of daily life.
- A museum that is relatively modest in scale, capable of being operated by a small staff, possibly including volunteer docents. It could also use Harbor Department graphics and construction resources for developing displays.
- A display space that can be used for multiple purposes, including temporary exhibits on other facets of Harbor Department history. Rotating exhibits would be utilized in order to offer something fresh for repeat visitors.

What a Red Car Museum Should Not Be:

- A railway museum with a large collection of artifacts and railcars, and a large staff. Instead, the Port's Red Car museum can draw on a partnership with organizations such as the *Orange Empire Railway Museum* (which *is* a large railway museum with a large collection of artifacts and railcars) and private collectors to display artifacts on a rotating basis.

By partnering with other area museums and collectors, the Port would minimize certain administrative aspects and largely remove itself from the business of active collecting of artifacts. Instead, the focus of the museum would be on creating an outstanding display space. Its location along the Red Car Line would further enhance the display space by providing a unique and educational context (an operating historic electric railway in an urban setting, utilizing parts of an original Red Car right-of-way).

The possibility also exists to host "guest" historic streetcars, displaying and occasionally operating them on the Red Car Line for special events. This was done in 2004 for the line's one year anniversary celebration, when an historic streetcar visited from the *Orange Empire Railway Museum*. The visiting streetcar went through the necessary safety certification process with the *California Public Utility Commission* and then provided rides to the public during the weekend celebration. This concept could be repeated in the future, with "guest" cars visiting one at a time, typically for an extended time period.

Exhibit Concepts

Creating an exhibit plan will begin by establishing an overall theme, or the "big story" behind the museum and its collections. A detailed exhibit plan would then be developed as part of future work and would coordinate input from stakeholders and potential exhibit partners.

In order to generate initial discussion, the following section presents an overview of some possible exhibit concepts for the Red Car Museum, and the range of different exhibit types that might be utilized. The Appendix also includes case studies covering two museums of similar size and scope. As noted, the actual development of exhibits would be driven by an overall exhibit plan developed specifically for the Red Car Museum.

In general, museum exhibits are typically a combination of passive (e.g.: flat panel graphics and display cases) and active (computer station, touch screens and other hands-on interactives). The "Red Car" subject matter lends itself well to incorporating original objects into the exhibits, particularly those which help tell the human stories behind the railroad. In addition to presenting objects to see and touch, having a docent present to interact with visitors will further help the exhibits come to life.

For initial discussion purposes, display concepts that might be considered include:

- An area for visitors to watch a short introductory video that presents the "big story" behind the museum.
- Maps showing the routes of the Pacific Electric and the region's other railroads, typically displayed on wall space. The maps provide an opportunity for visitors to examine the Red Car routes relative to their own communities or other areas of the region with which they are familiar.

- Large artifacts (original objects); up to and including a full size historic streetcar. Owing to space limitations, the selection of large artifacts must be done thoughtfully, and limits placed on their number.
- Rider and employee stories, collected and displayed via various means including photographic displays and video kiosks . These human stories are a critical element in presenting the Red Car story.

Some sample exhibit forms:

- Display cases of various sizes/configurations; displaying artifacts ranging from uniforms on mannequins to smaller artifacts commonly associated with a trip on the "Red Cars"
- Interactive displays, including some displays specifically designed for children; things to do and touch.
- Photographs, displayed in various sizes on both wall spaces and free standing exhibit panels. Photographs would be selected in support of specific exhibit themes.
- Free standing display panels, which can be combined to form a themed exhibit

The Museum Store or "Gift Shop" provides a retail sales element and can also double as the reception area where tickets are purchased and questions answered. Electric City Trolley Museum, Scranton PA.

A small "theatre" area provides visitors with a concise introduction to the subject matter and prepares them for "the rest of the story". This is one of several theatre areas at the Heinz History Center in Pittsburgh.

Maps are a frequently utilized tool to help visitors find a personal connection to a particular story. This series of large wall maps at the Heinz History Center introduces the story of Pittsburgh's many ethnic neighborhoods. Heinz History Center, Pittsburgh PA.

An example of a simple, low-cost display covering an historic site or area, in this case a famous railroad facility. The exhibit is mounted directly on an inside wall and dresses up an otherwise plain corner of the facility. Railroad Museum of Pennsylvania, Strasburg PA.

Interactive displays are an important element in engaging younger visitors, who learn by doing, not by being talked at. This display at the Shore Line Trolley Museum in Connecticut introduces the concept of an electric generator by allowing the user to create the electrical energy needed to move the model trolley.

Large artifacts can be an effective way to provoke a visitor's attention; this full-size railcar has an impressive presence inside the building. This large open space around it also doubles in a variety of roles, serving as a meeting room or (as seen here) a temporary exhibit space. The Port's 1058 Red Car would make an equally inviting display; having enough room to step back and look at / photograph such a large artifact is also an important design consideration. Electric City Trolley Museum in Scranton, PA.

Small artifacts help tell the story- this display of Pacific Electric memorabilia provides an excellent example of the type of smaller displays that would be relevant in the Red Car Museum.

This Mt. Lowe themed exhibit was part of a Red Car-themed temporary exhibit at the Pasadena Historical Society in 2003. A group of collectors loaned the historical society an interesting collection of artifacts relating to the main theme, which were then arranged in a display along with related graphics and photographs.

This "memories station" encourages visitors to leave behind their own stories of the exhibit's theme, in this case Heinz condiments. Heinz History Center, Pittsburgh PA.

Stories can be communicated in a multitude of ways- from a captioned photograph to a video kiosk that plays a short video "on demand". The stories of riding the Red Cars and their role in shaping the Harbor area could be presented in a variety of captivating ways.

Potential Locations and Design Concepts

The Red Car Expansion Feasibility Study examined potential locations for the Red Car Museum in both San Pedro and Wilmington. Of the locations studied, all sites would provide relative benefits, with the SP Yard north-end option ranked highest based on adjacency to the existing San Pedro museum district and the Red Car line, as well as its proximity to the waterfront and related activity centers.

While the SP Yard site has the advantage of adjacency to the existing San Pedro museum district, locating the facility in either Wilmington or Warehouse One would offer the ability to encourage visitation to those areas, extend/expand development potential, and tie in with other historic resources. Both of these sites also feature historic buildings that could be adaptively reused as part of the museum. Although these sites are not presently on the Red Car system, extensions to these locations are under active consideration. Interim rail access for exhibits is also possible using existing freight track connections.

For the San Pedro Yard site, two locations are possible. The museum could be co-located with the proposed Red Car Maintenance Facility at the south end of the site, or located at the north end near the other downtown museums. Development of more detailed site plans within the San Pedro Yard site is dependent on the design of the Sampson Way relocation project, which in turn will influence the location of the proposed maintenance facility.

The Wilmington site at Fries Avenue & Harry Bridges Boulevard (see **Figure 6-4)** is better defined at this time, because the planned adjacent projects are not bringing major roadway changes. As seen in the accompanying figures, three possible options have been identified at the site. Option One is a 10,000 s.f. stand-alone building located on the triangular parcel of open land. Options Two and Three involve adaptive reuse of the historic Bekins Warehouse building. Option Two takes a less-invasive approach and adds an addition on the west side of the building, and would also utilize space inside the building. Option Three would be a major reconfiguration of the building, adding a large opening and extending a track inside the existing building shell. These options are illustrated in the accompanying renderings.

The historic Bekins Building, former Red Car right-of-way in foreground (behind fence).

View south from the roof of the Bekins Building, former Red Car right-of-way cutting diagonally across in the foreground.

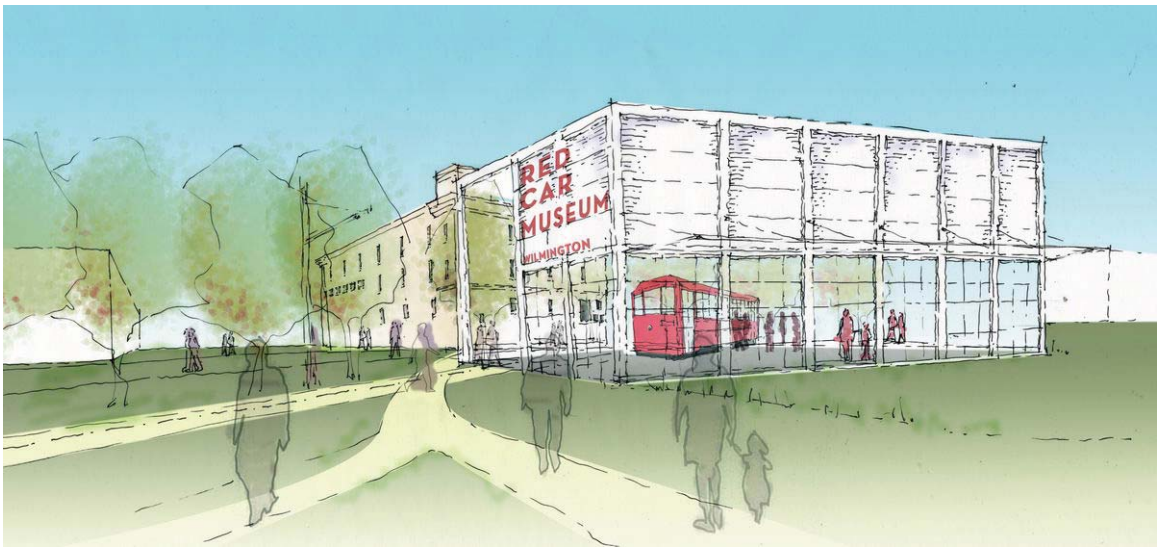
SOURCE: Wilson & Company, Inc, Engineers & Architects; February 2009

THE PORT OF LOS ANGELES

WILSON & COMPANY ENGINEERS & ARCHITECTS

Waterfront Red Car Line Extension Feasibility Report

Figure 6-4
Potential Wilmington Museum Sites



Wilmington Museum Option One, 10,000 s.f. stand-alone building on vacant parcel. Note Bekins Warehouse building in background.

Wilmington Museum Option Two, addition to west side of the Bekins Warehouse building, utilizing the empty lot on the building's west side.

Wilmington Museum Option Three, a major reconfiguration of the Bekins Building, creating a new opening in the building exterior to allow a track to be placed inside.

Museum Facility Cost Estimate

For the proposed Red Car museum, a 10,000 square foot stand-alone building was assumed. At any of the sites, the building would be arranged to accommodate rail access for a full-size vintage trolley, such as Red Car 1058. Major physical components of the museum facility would include:

- Exhibit space, including a large open space which could accommodate a full size historic trolley. A permanent rail connection to the facility is thus desirable.
- Classroom space. The large open exhibit space could double as the classroom.
- A gift shop located at or near the public entrance, arranged so that store staff can also greet visitors / sell tickets as required.
- A dedicated room for artifact storage/display preparation
- A small staff office and break room
- Public restrooms

Estimated costs for the proposed museum facility are presented in **Table 6.2**. A more detailed cost estimate is provided in *Red Car Museum Conceptual Development Report* included as **Appendix 4-6**.

Table 6.2
Museum Facility Cost Estimate (2009 $'s)

Program Component	Cost	Notes
Museum Facility	$2.63 M	10,000 sf. @ $263/sf
Site Work	$0.23 M	
20% Engineering & CM	$0.57 M	
Museum Facility Total	**$ 3.44 M**	

Source: O'Connor Construction Management, September 2007

Partnership Concepts

The Red Car museum presents an ideal opportunity to form a public-private partnership. The Port's support could create the museum and guarantee its permanence, while its private and non-profit partners could provide artifacts for display and make possible its educational activities.

Based on other successful collaborations, a couple of models to be explored further include the following, each of which is discussed below:

- Partnership with a new non-profit "friends of the museum" group
- Partnership with other San Pedro / Wilmington heritage attractions
- Partnership with other Southern California museums / historical societies / collectors
- Partnership with local schools

Partnership with a new non-profit "Friends of the Museum" group

Qualified non-profits can offer a tax incentive to contributors, and are also a good vehicle for organizing volunteer programs. "Friends of the Museum" groups have been formed throughout the country to provide additional resources to museums operated by governmental agencies. They've become an important element in developing funding and cultivating volunteers for the organizations they support. They also serve in a general advocacy role for their respective museums.

A typical example would be the *Friends of the North Carolina Maritime Museum*, whose mission statement is: "The purposes of the Friends are to assist, promote and enhance the programs and functions of the North Carolina Maritime Museum through contributions of labor, technical skills, services, equipment or money."

Partnership with other San Pedro/Wilmington heritage attractions

The San Pedro / Wilmington area has a number of well-established heritage attractions, many of whom are already engaged with the Port at a variety of levels. Examples include the *Banning Residence Museum* in Wilmington and the *Los Angeles Maritime Museum* in San Pedro, both of which are operated by the City of Los Angeles Parks and Recreation Department.

The *Banning Residence Museum* preserves the Banning Residence in Wilmington and tells the story of Banning's role in developing the harbor and its many forms of transportation. The museum is currently creating a permanent exhibit on transportation called "Steam and Steel." This exhibit will trace the transportation evolution of the Harbor area, the importance of rail to the growth of the ports, and the role of the ports in establishing Los Angeles as a major city. A "Friends of the Banning Museum" non-profit serves in a supporting role.

The *Los Angeles Maritime Museum* is located in the historic Ferry Terminal Building on the San Pedro waterfront, immediately adjacent to the Red Car Line. It is the West Coast's largest maritime museum and plays a prominent role in the San Pedro waterfront. The Port, the Maritime Museum, and the non-profit LA Maritime Institute have worked closely together on special events such as the "Tall Ships" gatherings, and on special projects such as the construction of two replica brigantines at the museum during 2000-2002.

Partnerships with these and other local heritage attractions can further demonstrate the Port's commitment to creating development that enriches the culture and quality of life in surrounding communities. Opportunities to explore include joint marketing of multiple heritage attractions, such as the sale of a common ticket for access to multiple venues, as well as joint educational programs. Where attractions are located along the Red Car Line itself, it can be used as the connecting transportation. Special events with multiple participants are also possible.

Partnership with other Southern California museums/historical societies/collectors

Another basis for partnership would be to bring together the collectors (both museums and private) with the display space (the Red Car Museum). As noted elsewhere in the report, the Red Car Museum would be an outstanding venue for the display of artifacts relating to the Red Car system and other relevant local history topics. A great number of artifacts relating to the system have been preserved, but display opportunities in Los Angeles are limited. The Red Car Museum would be a fairly high-profile display venue, and would thus provide excellent public exposure for exhibit partners.

Partnership with local schools

In general, the Red Car Museum concept could also fit well with the Port's other ongoing education and public outreach programs. Coupled with a suitable educational curricula, the Red Car Museum would make an outstanding addition to the list of potential destinations for school and other youth groups visiting the Port.

A Red Car Museum would also make an excellent venue for a cooperative effort with *California Operation Lifesaver*. Operation Lifesaver is a national non-profit educational organization that seeks to reduce collisions, injuries and fatalities at America's highway-rail grade crossings and on the railroad rights-of-way. California Operation Lifesaver offers a comprehensive "Train Awareness Program" which includes safety presentations in schools and community groups.

7.0 Station Concepts

7.0 RED CAR STATION CONCEPTS

Because they are used by all patrons, stations (aka "stops") are a primary focus of the Red Car Line. Stations must be easily understood, friendly, and efficient for passengers and employees. Unlike the high-platform stations on the existing line, it is recommended that all future stations should be low-platform, configured for boarding via vehicle steps.

The Red Car Expansion Feasibility Study process has determined that low-platform stations offer significant benefits over the high-platform type stations presently in use. These benefits are summarized as follows:

- Low platform stations are significantly lower in cost, take less room, and have less visual impact. The ADA ramp required for high-level platforms is especially consumptive of space and the use of low-level platforms would minimize right-of-way requirements at the station locations.
- The use of low platforms/street level boarding opens up the ability to incorporate in-street alignments where appropriate, such as in the downtown San Pedro area. Use of high-level platforms in the downtown area would be very challenging.
- The use of low platforms/street level boarding also increases operational flexibility by enabling the use of temporary stops during special events or service interruptions.

The purpose of this chapter is to develop requirements for new Red Car stations, serving as a guideline for further design development in future work. Plans, elevations and perspective drawings included in this chapter are intended to communicate the conceptual design goals and intent rather than promote a particular design. Subsequent design development work will include further evaluation of alternative design options and consider input from the community.

7.1 Station Locations

In general, streetcar stops are typically spaced every 1,000 to 2,000 feet. Like transit buses, streetcars usually do not stop unless there are passengers wishing to board or disembark, so closely spaced stations do not necessarily hamper schedule speed. As a rule of thumb, a ¼ mile interval (1,320 feet) allows reasonable walking access to all stations.

Within a generally defined station location, the final location will be a function of various factors including rail alignment, passenger safety, space constraints, convenient access to adjacent attractions, and adjacent traffic patterns and controls.

Table 7.1 identifies preliminary station locations and configurations based upon the alignment studies for the San Pedro Red Car extensions. **Appendix 2-11** contains the *Red Car Station Concepts Report* which examines specific key locations along the proposed alignments, including example renderings.

Table 7.1 Preliminary Station Locations / Configurations

Harbor / Sampson Realignment			
Station Location	**# of Tracks**	**Platform Arrangement**	**Notes**
Swinford St.	Double track	Center	Terminus, major activity center
1st Street	Double track	Center	
Downtown	Double track	Split Platforms	
Ports O' Call	Double track	Split Platforms	Major activity center
Signal St	Double track	Center	Potential transfer station
22nd St.	Double track	Center	Potential transfer station
Cabrillo Beach Extension			
Station Location	**# of Tracks**	**Platform Arrangement**	**Notes**
22nd St. Landing	Double track	Center	Located at passing siding
22nd / Via Cabrillo	Double track	Center	Located at passing siding
Marina Hotel	Single track	Side Platform	
Youth Camp	Single track	Side Platform	
Beach	Double track	Center	Terminus, major activity center
Outer Harbor Extension			
Station Location	**# of Tracks**	**Platform Arrangement**	**Notes**
Mid-point / Marina	Double track	Center	
Cruise Ship Terminal	Double track	Center	Terminus, major activity center
City Dock One Extension			
Station Location	**# of Tracks**	**Platform Arrangement**	**Notes**
Mid-point / Signal St.	Single track	Side Platform	
Warehouse One	Single track	Side Platform	Terminus (may be within Warehouse One)

7.2 Station Design

The Red Car Design Criteria Manual provides a complete set of information on station design. The basic design goals are stated as follows:

- Make the WRCL safe, secure, friendly, fun and accessible to all, including the disabled.
- Keep stations simple, but provide key passenger amenities including shelter, protection from vehicular traffic, seating and easily understand transit information.
- Consider inter-modal transfer wherever applicable.

- Consider impacts of future expansion of station facilities, as well as the impact of very large passenger volumes during special events, during design.
- Develop a family of station parts and furniture that are interchangeable yet allow for the individual character of each district within the master development plan.
- Develop systems that use maintainable materials and minimize life cycle costs.
- Include opportunities for public art.

Station design for the Red Car system will range from simple and more rudimentary at stop locations with relatively low-traffic to more elaborate stops at terminals adjacent to major activity centers. In all cases, the stations will be relatively basic given that the Red Car is a streetcar type service using single-car operation.

Chapter 5 in the Red Car Design Criteria establishes minimum sizes for all station platforms. At high-traffic locations, the station platform will be long enough to fully berth two cars, but in all cases will be long enough to at least berth one car plus the front doorway of a following car. These basic concepts are illustrated below in **Figure 7-1**.

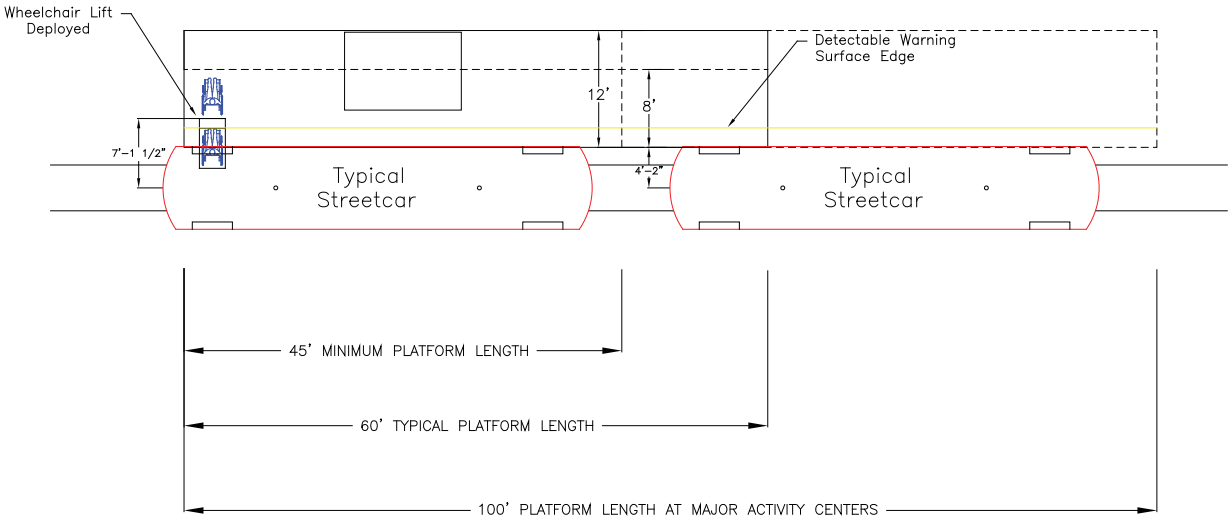


Figure 7-1, Station layout, plan view

The manner in which the vehicle will interface with the platform is also a critical design issue. Platform height and setback from the track are thus established in the Design Criteria, based on the use of a replica heritage trolley. The recommended platform setback is also compatible with a Portland-type modern streetcar vehicle, although use of such a vehicle would also entail adding a slightly higher section to a portion of the platform in order to accommodate level boarding. This concept is illustrated in **Figure 7-2**.

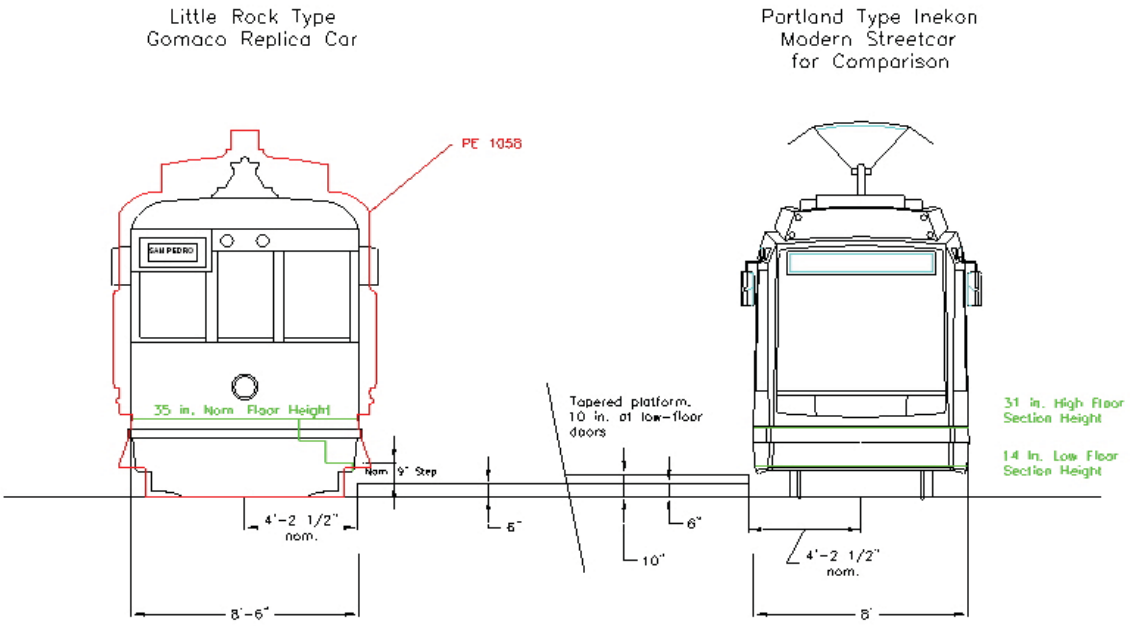


Figure 7-2 Station Layout, Cross-Section. Replica historic streetcar at left, with outline of historic Red Car 1058 superimposed. Modern Streetcar vehicle shown at right for comparison.

Most stations will have a single platform, although it may be desirable to split the station into two platforms (inbound and outbound) at certain locations in order to save right-of-way width or provide for better crowd flow. The basic station configurations are illustrated in **Figure 7-3** on the following page.

It is recommended that ADA access be accommodated by wheelchair lifts onboard the vehicles. The lift is capable of adapting to varying platform heights, and other than the room needed for the lift to deploy, there are no associated special requirements for the station platform. ADA access options are covered in greater detail in Chapter 8 of this report (Vehicle Types). Note that in other alternatives for ADA access, such as the mini high block platform, the station will typically require more space due to the requirement for a ramp to reach the high platform area.

Boarding a streetcar from a sidewalk platform in Little Rock Arkansas. ADA access is provided by an on-board wheelchair lift which deploys on demand.

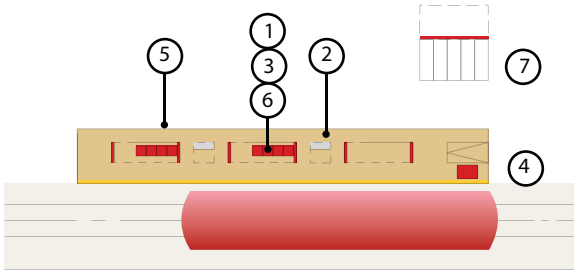
Streetcar stop with mini high-block and ramp, San Francisco, California. Streetcar is stopped at regular boarding area in this picture, and would pull up to ramp to board wheelchairs.

Station Configurations

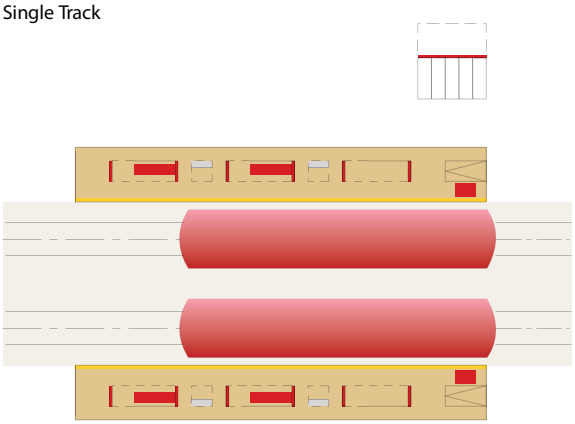
Depending on the size, shape, and surrounding uses of the station area, station design will take on one of the following configurations: side platform (single track), split platform (single or double track), or center platform (double track).

Minimum width for side platform is 6 feet, with 8 feet preferred.
Minimum width for center platforms is 8 feet, with 12 feet preferred.
Minimum platform length is 45 feet with 60 feet preferred. Platforms at terminal stations should be a minimum of 100 feet in length.

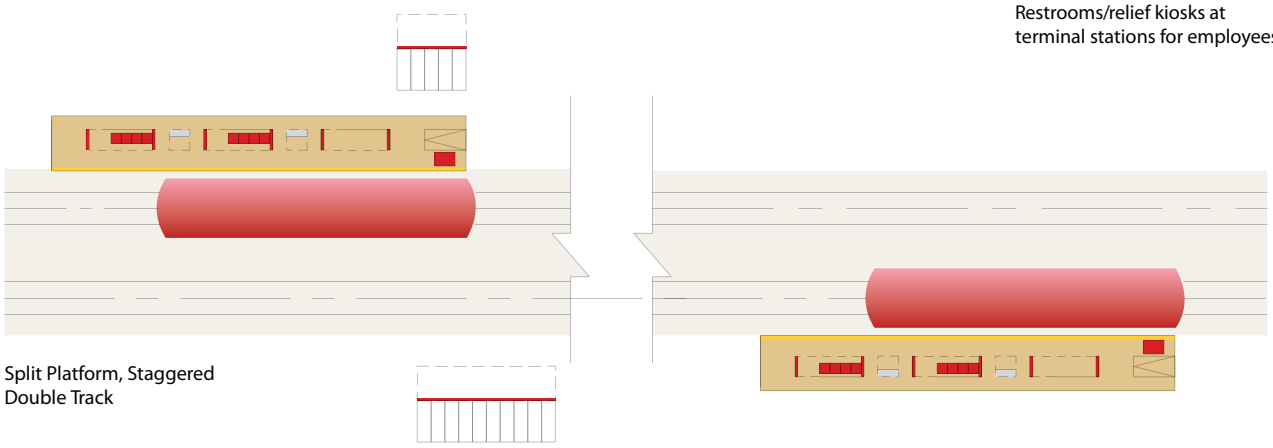
All stations should have a platform height of 6-inches above top-of-rail and a maximum slope of 2 percent.



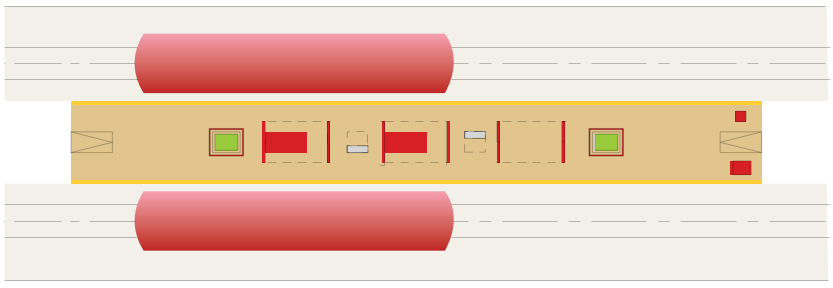
Side Platform
Single Track



Split Platform
Double Track



Split Platform, Staggered
Double Track



Center Platform

Station Elements

1. Lighting
   - Security lighting
2. Other Transit Amenities
   - Trash cans
   - Ticket vending machines
   - Additional seating/leaning posts
   - Drinking fountains
   - Landscape
3. Communication
   - LED real-time train arrival signage
   - Surveillance equipment
   - Emergency alarms
4. Signage
   - Info board with system map and schedules
   - Station Identity Sign
   - Intermodal Transfer Sign
5. Platform
   - Platform paving materials
   - Tactile warning strips
   - Platform height 6 inches above top-of-rail
6. Station Shelter
   - Glazing elements
   - Public art
   - Advertising panels
   - Seating
   - Canopy
   - Area for wheelchairs
7. Adjacent Amenities Outside of Station Platform
   - Overhead contact system (poles on 100 ft on center, typical)
   - One reserved vehicle parking space for supervisory and maintenance personnel
   - Bicycle racks
   - Restrooms/relief kiosks at terminal stations for employees

The placement, orientation, and design of individual stations will vary according to the rail alignment; existing and future vehicular and pedestrian circulation and access; parking; transfer to bus, water taxi, or shuttles; scenic views of landmarks; land use and surrounding activities; protection from adverse weather conditions (rain, sun, wind); lighting; safety and visual access; landscaping; drainage; topography; and soils information.

SOURCE: Wilson & Company, Inc, Engineers & Architects; May 2009

A basic suite of passenger amenities should be provided at each stop, although tailored to the level of traffic at that stop. An overview of these amenities and their relative locations on a platform are provided in **Figure 7-4** on the following page. One passenger amenity that many systems have found to be especially beneficial in improving the system's user-friendliness is a real-time arrival display. Using GPS technology, the system displays the arrival time of the next streetcar and can also be used to communicate other passenger information. These systems can be implemented using cellular technology, and therefore do not require communication cabling over the length of the route.

7.3 Station Design Options

A range of options are possible for the appearance of the Red Car stations. Options include applying a standard theme throughout all Red Car extensions, or theming stations by district, line extension, or other geographic means. In all cases, the basic design goals should prevail, and the station should be easily recognizable as a Red Car streetcar stop. Ultimately, the selected approach will likely be influenced by the overall waterfront development strategy, adjacent projects, and cost.

Given the relatively modest nature of the Red Car station stops, the most significant station element in terms of overall appearance is the shelter. The following photographs present examples of station configurations and shelters found on other streetcar, bus and light rail transit systems and demonstrate a range of possible options for the expanded Red Car system.

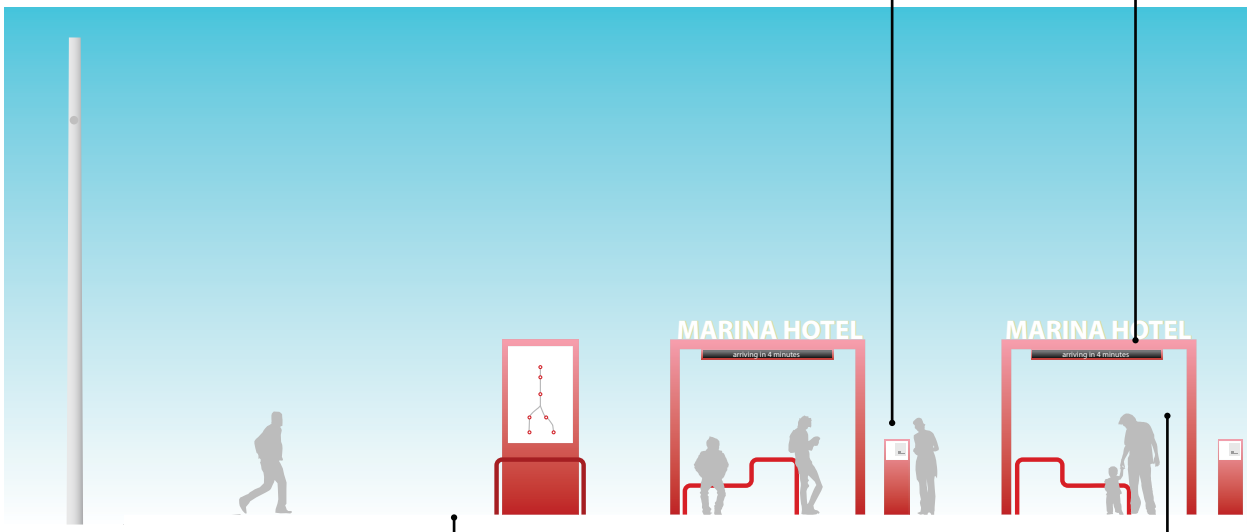
Historically, streetcars simply stopped at corners along their routes and passengers walked to the curb. Sometimes a boarding island was added to the street. Cities such as Toronto continue this tradition today on some lines.

Station Elevations

The design of the station elevations can incorporate a more modern contemporary theme or alternatively be based upon a historical theme consistent with the local context or features of the adjacent site/activity center. The station elevation shown here are illustrative of a more contemporary approach – indicative of the emerging and dynamic nature of the Port itself.

Other Transit Amenities
Trash cans
Ticket vending machines
Additional seating/leaning posts
Drinking fountains
Landscape

Lighting
Security lighting

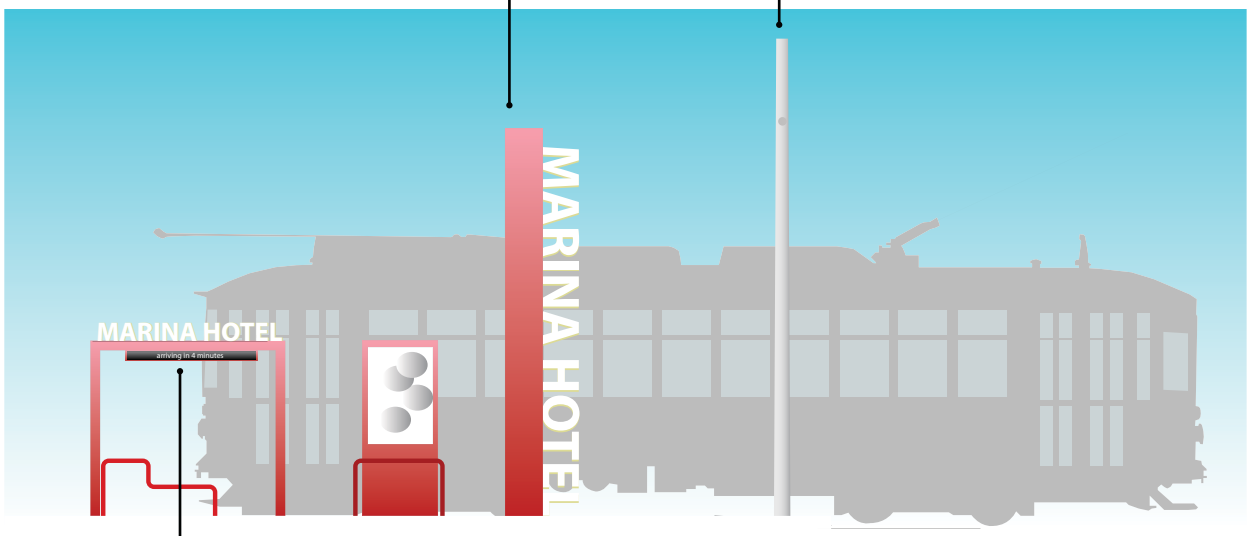


Platform
Platform paving materials
Tactile warning strips
Platform height 6 inches above top-of-rail

Station Shelter
Glazing elements
Public art
Advertising panels
Seating
Canopy

Signage
Info board with system map and schedules
Station Identity Sign
Intermodal Transfer Sign

Adjacent Amenities Outside of Station Platform
Overhead contact System (poles on 100 ft on center, typical)
One reserved vehicle parking space for supervisory and maintenance personnel
Bicycle racks
Restrooms/relief kiosks at terminal stations for employees only



Communication
LED real-time train arrival signage
Surveillance equipment
Emergency alarms

SOURCE: Wilson & Company, Inc, Engineers & Architects; May 2009

Figure 7-4
Station Elevations and Amenities

Many newly constructed streetcar lines utilize "bulb out" platforms at stops. This arrangement places the streetcar track in a traffic lane while preserving on-street parking. In this example from Little Rock Arkansas, the "stop" is configured in a no-frills fashion, with no waiting shelter.

In this example from New Orleans, the basic stop has been supplemented with a modest waiting shelter and bench. Here the double-track streetcar alignment is in a street median.

A more elaborate waiting shelter on the downtown light rail alignment in Portland, Oregon. This shelter incorporates a "heritage" theme that blends well with the adjacent historic district. The shelter is relatively large based on the passenger volumes associated with the multi-car light rail trains.

A view of the same station stop taken from the street. The "platform" is at curb height, blending in with the adjacent sidewalk.

An example of a custom shelter that has been "themed" for the local district it serves. Memphis, Tennessee.

An example of a "modern" shelter, Adelaide, Australia.

Typical streetcar stop, Portland, Oregon. The stop has a shelter, an additional bench, trash can, basic signage, and a real-time arrival sign inside the shelter. Stops on streetcar lines are typically not elaborate- the streetcar tracks make it easy for system users to locate the streetcar route, and with stops closely spaced, they're easy to find.

Streetcar stop with a more elaborate shelter and passenger amenities, Tacoma, Washington. The modern theme of the station fits well with the modern streetcar vehicle in use on this line.

This rendering shows how a station shelter with a "heritage" design might look on the Red Car Line.

This rendering shows a much simpler station shelter within the Downtown San Pedro area. In this crowded urban environment, the station stop is little more than a bus shelter located on a curb "bulb-out." This arrangement preserves on-street parking.

All stations should include adequate graphics to identify them as a streetcar stop, as well as all necessary information about the transit services accessible from that location. These pictures illustrate the type of system map and a real time arrival display in use in Portland, Oregon.

Several of the station on the Tampa streetcar system have a "heritage" look. This station platform shares space on the sidewalk and incorporates a high-block platform and ramp for on-demand ADA access. Normally the streetcar simply stops at the curb.

In summary, it is recommended that as part of the Red Car Line system expansion, the stations be changed from the current high-platform design to a simple low-platform configuration. Basic design concepts for the stations are provided in this chapter and in the accompanying Red Car Design Criteria Manual. **Appendix 2-11** contains the *Red Car Station Concepts Report* which examines specific key locations along the proposed alignments, including example renderings.

The size and capacity of the station will be a function of the level of passenger traffic anticipated at each location, with stations adjacent to major activity centers (including parking resources) designed to accommodate higher passenger volumes. The interface between the vehicle and the station platform is an especially critical design issue, and must be given early consideration in the design process.

A Red Car station should have a distinctive identity so that it is recognizable as part of the streetcar system, but otherwise there are many options for its overall appearance and how it blends into the surrounding waterfront development "district." Station appearance and theming should thus be developed as part of future work, utilizing the guidelines established herein.

8.0 Red Car Vehicle Types

8.0 RED CAR VEHICLES

In addition to stations, the Red Car vehicles will provide one of the rider's primary physical interface with the system. The purpose of this chapter is to develop requirements for additional Red Car historic streetcar vehicles based on the recommended changes in the Red Car operating environment. This chapter also examines regulatory requirements driving equipment design and provides background on the replica historic streetcar marketplace. A conceptual vehicle description including key performance requirements, along with a number of "lessons learned" from other recent replica historic streetcar procurements are also presented. *The Preliminary Vehicle Definition Report* is included as **Appendix 2-10**. The draft *WRCL Design Criteria Manual* (**Appendix 2-1**) also provide pertinent guidance and specifications.

8.1 Background

The Red Car line presently uses a fleet of two replica vintage trolleys (cars 500 and 501) and one restored original car (Car 1058). The larger car 1058 was the first car acquired for the project, and the original plan was to commission the construction of two identical replicas. Initial feedback from prospective bidders suggested that this size of replica was too ambitious a project, and so a smaller car type that would still be compatible with car 1058 was selected. In addition to facilitating ADA access, the high-floor car design was also seen as being more compatible with the shared use freight corridor that currently exists. Although the cars board passengers exclusively at high-level platforms, steps are provided at all doorways for crew and emergency access from ground level.

Existing high-floor replica Red Car vehicle

All three trolleys are a double-ended design. Cars are manually operated and are staffed by a two-person crew. One crew member serves as operator, while the other serves as a conductor, handling all passenger related duties. All crew members are fully trained to serve as both operator and conductor.

The replica vintage trolley railcars 500-501 seat 46 persons, and can accommodate 42 standing passengers. These cars are equipped with standard railroad couplers and are capable of full multiple unit (MU) operation

Proposed replica Red Car vehicle- boards from street level

in two car trains. MU operation can be used to increase capacity during special events, although the present station design cannot berth a two-car train and thus requires two stops to board both cars. The present operating rules limit speeds to a maximum of 20 mph, although the vehicles themselves are capable of higher speeds.

Changes/upgrades to the cars since being placed in service have been of a minor nature, and in general the three cars have performed admirably in the present limited operation. However, the changing operating environment identified for the proposed system expansion suggests that a different type of vintage trolley vehicle would be a better fit for an expanded Red Car system.

8.2 Changes in Operating Environment

To best fulfill its role of supporting and complementing waterfront development through seamless integration into the street and pedestrian environments, it is recommended that a Red Car vehicle capable of boarding passengers at street level be employed. This approach will eliminate the need for the high-level platforms currently in use, and additionally facilitate a change to one-person operation of the vehicles.

Example of an onboard wheelchair lift. When not in use, lift forms stairwell for normal walking entry into car.

Fortunately, the replica vehicle market provides some good "off the shelf" solutions, which will also reduce capital outlay for vehicles while incorporating newer equipment technologies that can also lower maintenance costs. ADA compliance can be achieved by incorporating on-board wheelchair lifts. The Red Car theme can also easily be maintained. Because the Pacific Electric operated such a large and diverse fleet, there is ample historic precedent for the type of vintage trolley vehicles being recommended. The use of low-level platforms also opens up the possibility of having other historic Red Cars "visit" the system.

Table 8.1 summarizes some of the key changes anticipated in the Red Car operating environment.

Table 8.1
Red Car Operating Environment

Existing	Proposed
Short line length (1.5 miles) with 2 intermediate stations	Longer line length (9 miles / phased buildout)
Limited service days/hours	7 days / week operation with expanded service hours
Shared Use track adds FRA regulation to CPUC	No *Shared Use* trackage
All track on semi-exclusive R-O-W, no mixed-traffic operation.	Need to integrate with street and pedestrian environments, including some operations in mixed traffic.
Small number of stations, room is available on R-O-W for large high platforms.	Larger number of stations, limited room available on R-O-W, need for simple stations
Small system with limited operations and staff.	Larger system with greater need to control operating costs

The following points summarize the benefits and cost-savings which support changing the car/station type to street-level boarding:

Low Platform Stations

- Low platform stations are significantly lower in cost, take less room, and have less visual impact. The ADA ramp required for a high-level platform is especially consumptive of space and the use of low-level platforms would minimize right-of-way requirements at the station locations.
- The use of low platforms/street level boarding opens up the ability to incorporate in-street alignments where appropriate, such as in the downtown area. Use of high level platforms in the downtown area would be very challenging.
- The use of low platforms/street level boarding also increases operational flexibility by enabling the use of temporary stops during special events or service interruptions
- At a minimum, each station would be equipped with a waiting shelter, bench, appropriate signage, and train arrival LED display. More elaborate stations could be provided adjacent to major activity centers where higher passenger volumes are anticipated. Stop spacing could be relatively close (1,000 - 2,000 feet), with the

Basic sidewalk station, Tacoma, WA

Existing Red Car operation, typical right-of-way

Proposed Red Car operation, typical right-of-way

understanding that vehicles stop only on-demand. Wherever practical, stops/stations should be long enough to accommodate two cars. All end-of-line stations should be two tracks with center platform and appropriate cross-over arrangement required to reverse direction.

Replica Red Car Vehicles

- Use of a vehicle type suitable for one-person operation will be an important factor in managing the costs of an expanded system. The present vehicle type, while designed to be operated with a two person crew, could be adapted for one-person operation, although it would have some limitations with heavier passenger loadings.
- Use of an "off the shelf" design will yield lower vehicle capital costs and shorter delivery time. The "Red Car" theme can still be retained, based on the fact that Pacific Electric operated steel-bodied streetcars very similar to the type of replica trolleys now being produced.
- A steel-bodied replica car with updated braking and control systems will be better suited to the new operating environment, and will offer lower maintenance costs. Steel bodied cars are also better suited to outdoor storage than the current largely wooden cars.

8.3 General Vehicle Requirements

In response to the changing operating environment, the new type of Red Car vehicle should have characteristics that make it more appropriate for the urban operating environment and its associated hazards. The following guidelines provide a starting point for defining the vehicle:

- Streetcar-type vehicle, optimized for operation in an urban environment. Bumper height and end design appropriate for mixed traffic operation.
- Street level boarding via steps, on-board wheelchair lift. Interior layout and doorway openings optimized to accommodate crowd flow.
- Single-unit operation, double-ended, double-sided
- Minimum 88 passenger capacity (seated and standing)
- One-person operation, doors controlled from the operator's position.
- 600 VDC system voltage. Current collection by trolley pole, with possible future changeover to pantograph not precluded.

- Width 8’6”, length approx 45’
- Heated/Air conditioned vehicle
- Improved performance appropriate to the new operating environment
- Duty cycle: Average run length 3 miles, stop-and- go operation over a 12 to 16 hour period, 7 days/week, with an average headway (peak and off-peak) of 20 minutes.

8.4 ADA and Options for Accommodating Wheelchairs

U.S. transit systems employ a variety of solutions to make transit accessible to all. The 1990 Americans with Disabilities Act (ADA) provides specific accessibility requirements for different types of transit vehicles, and ample marketplace solutions are available for meeting them.

There are four basic approaches to accommodating wheelchair accessibility that are used by rail transit systems:

- Level boarding (high floor and low floor)
- Separate high-block platform
- Wayside lifts
- Vehicle-borne lifts

High-block platform, San Francisco

Operator deploying portable bridge plate to span gap at high-block platform

Surveying the historic streetcar field with regard to wheelchair access, high-block platforms and vehicle-borne lifts are the most widely used solutions. The primary advantage of high-block platforms are their simplicity; their main disadvantage being the requirement for a fairly large footprint. Vehicle-borne lifts offer the advantage of a simpler platform design and greater operational flexibility, with the disadvantage of additional maintenance cost.

In general, vehicle-borne lifts appear to offer the most meaningful advantages for the WRCL, with their increased flexibility and simpler platform design requirements. Another relevant comment heard from other streetcar systems is that it is important to have a uniform approach to ADA access, avoiding a mix of different solutions.

Other ADA Issues

In addition to providing dimensional minimums for doorways, signage requirements, stop request functionality, and other issues related primarily to wheelchair accessibility, ADA also requires that Light Rail Vehicles be equipped with auditory and visual warning signals to alert passengers of closing doors, and a Public Information System for stop announcements.

Vehicle-borne wheelchair lift on San Diego Trolley light rail system

A commonly-applied technology on today's transit vehicles (both bus and rail) is an automatic stop announcement capability, typically implemented with both a pre-recorded audible announcement and small electronic message screens. This approach provides the added benefit of consistently recognizable stop announcements for passengers, while allowing the driver to focus on other duties. It has the further benefit of being another tool to convey general system information (such as schedule changes and other service bulletins) to passengers. The vehicle operator still has the ability to make announcements, as is often appropriate in a tourist-orientated service.

Vehicle-borne wheelchair lift applied to bus

Surveying the transit field with regard to auditory and visual warning signals on doors, most systems have not implemented this feature on single-unit buses or streetcars. This is likely because unlike a multi-car Light Rail train, the majority of boarding and disembarking on a bus or single-unit streetcar takes place through the front door immediately adjacent to, and under direct supervision of the vehicle operator. Bus rear doors are typically treadle or touch actuated. Buses are not required by ADA to have door closing signals, although streetcars are not explicitly classified as either a bus or a light rail vehicle, having characteristics of both. This topic should receive further review in the course of developing specifications for procurement of additional vehicles.

Vehicle-borne wheelchair lift applied to streetcar

8.5 Regulatory Requirements

This section provides an overview of the variety of state and federal regulations that influence rail transit equipment design in California in general, and on the Red Car Line in particular. In working with regulators during the acquisition of new vehicles, it will be important to adequately address the differences between the existing WRCL operation and the planned system expansion, emphasizing the ways in which the vehicle design has been adapted to better suit the operating environment. It will further be important to adequately convey the characteristics of the lower-speed "streetcar" type operation versus that of a longer-distance, higher-speed Light Rail system, the latter being what many local regulatory staff are accustomed to.

State Regulations

- ***CPUC***- All states are required to provide safety oversight of rail transit systems receiving federal funding. California has had a large share of the nation's "new start" rail transit systems, and was among the first states to create a comprehensive new program for regulation of rail transit. The California Public Utilities Commission (CPUC) regulates a variety of "public utilities" ranging from the electric power industry to rail transit and highway / rail grade crossings. CPUC rules are codified in a series of "General Orders" which define specific aspects of infrastructure and regulatory oversight.
- Rail transit vehicle requirements are addressed in General Order (GO) 143-B. The document covers Light Rail transit at a system level, with sections on vehicles detailing numerous performance and equipment criteria. These include required braking rates based on speed classification (Section 4.03). While GO-143-B is fairly comprehensive, some aspects of vehicle design (e.g.: weight) are not covered, so while it forms the starting point for safety certification, other factors must also be addressed in a vehicle procurement. GO-143-B also contains a section covering Historic Streetcars, presenting adjusted criteria based on the streetcar operating environment. GO-143-B defines "Historical Streetcars" as streetcars originally manufactured prior to 1956.
- GO-143-B also addresses vehicle structural requirements. It calls out a requirement for a minimum 2g vehicle buff strength (Section 6.03). It is important to note that most of the current replica historic streetcar or modern streetcar designs do not meet this requirement (the Port's current cars 500-501 *do* meet this requirement). Current designs typically range in the 1 to 1.5 g range for buff strength. Recognizing that the urban streetcar operating environment presents hazards different from a typical high-speed light rail alignment, the rail transit industry is gradually moving away from a "one size fits all" approach to vehicle buff strength. Accordingly, the industry is conducting a significant research effort and opting for a more holistic approach to structural safety. Alternate approaches to the 2g buff strength criteria include taking into consideration vehicle operating speeds, incorporating crash energy management techniques, and designing vehicle front end geometry to also improve safety for automobiles that might be struck by a streetcar in an urban environment. To date, there has been no formal attempts to approach CPUC regarding the possibility of modifying the structural requirements in GO-143-B. However, this may occur at some future date depending on the interest of California rail transit operators in purchasing off-the-shelf European streetcar designs.
- At present, orders for replica heritage streetcars in California should either plan on complying

with the 2g buff strength requirement, or on applying for a waiver based on the achievement of equivalent or improved safety through alternative means (e.g. crash energy management). It should also be noted the CPUC is not likely to apply the adjusted provisions of GO-143-B Section 8, Historical Streetcars, to a replica car (refer to the following section covering CPUC Resolution ST-62). Other than the 2g buff strength issue noted previously, meeting the other requirements of the full GO-143-B should be attainable based on the use of a replica historic streetcar equipped with modern propulsion equipment with dynamic braking and magnetic track brakes.

- ***CPUC Resolution ST-62***, relative to WRCL cars 500-501. Replica cars 500-501 were the first replica historic streetcars constructed for a system in California. While local CPUC staff's original opinion was that the cars would be considered historic streetcars as defined in GO-143-B, it was later determined that the preferred approach would be to apply the full General Order and have POLA seek waivers for areas that a streetcar would not necessarily be compliant with. These waivers were introduced as part of the vehicle safety certification process, and in due course special CPUC Resolution ST-62 was introduced granting POLA the required waivers for cars 500-501.

  It should be noted, however, that Resolution ST-62 conditionally grants these waivers based only on the use of cars 500-501 in the existing alignment / operating environment. Therefore operation of 500-501 in a new operating environment will require an appropriate re-certification process, taking into account any changes to the vehicles in order to better suit the new operating environment.

Federal Regulations

- **Federal Railroad Administration (FRA) -** Due to the shared track operation with rail freight service, the current WRCL system is subject to additional oversight from the Federal Railroad Administration. FRA regulations with regard to passenger equipment are geared exclusively towards "heavy" rail standards (e.g.: the region's Metrolink commuter rail), and is intended to make the equipment compatible with the mainline railroad operating environment, up to and including crashworthiness standards based on a collision with another train. Because rail transit equipment is designed for an entirely different operating environment, it is not designed to meet FRA standards. Therefore, in situations where transit and "heavy rail" equipment desire to share the same tracks, the FRA has strict rules regarding segregating dissimilar equipment into two completely separate operations based on time-of-day (temporal separation).
- In order to begin operations, POLA submitted a formal Shared Use petition to the FRA, codifying how the freight and streetcar operations would be kept separated, including the use of both operating procedures and inspections, as well as physical barriers. As part of this process, a formal temporal separation agreement was arranged with the line's freight operator. The process also involved formally requesting waivers from the FRA equipment regulations for the "non compliant" streetcar vehicles. FRA reviewed the application and ultimately granted relief from numerous regulations and equipment requirements based on achieving equivalent safety through the use of the CPUC regulations. Relief was not granted from compliance with FRA radio requirements and accident / incident reporting procedures.
- With the impending end of freight operations in San Pedro in 2009, the need for a continuing track sharing arrangement will end, and the Red Car Line can be operated as a traditional rail

transit service which is not connected to the General System of Railway Operations. With no operations on shared right-of-way or any connection to the General System, FRA regulation of the Red Car Line would no longer be applicable, and the CPUC would regulate the line as a traditional rail transit operation. At the appropriate time, a meeting with the FRA should be held to advise them of the Port's plans and to confirm their concurrence with these assumptions regarding jurisdiction.

- At such time as the Red Car Line might be extended north of the Vincent Thomas Bridge (North Gaffey and Wilmington extensions), at some locations it would be necessary to share right-of-way (but not trackage) with the Port's rail freight lines, as well as to cross over active freight spurs at possibly two locations. These extensions *would* involve FRA in achieving a common understanding on separation of track centers, and Shared Use procedures for control over the two potential spur crossings on the proposed Wilmington extension.

Other Regulations

- ***APTA Vintage Trolley Equipment Standard***. Subsequent to the introduction and safety-certification of cars 500-501 in 2003, a working committee of the American Public Transportation Association (APTA) created a vehicle equipment safety standard as part of APTA's comprehensive Rail Transit Safety Standards program. Compliance with all APTA Rail Transit Safety Standards and Recommended Practices is voluntary, but the standards do provide critical guidance for agencies by embodying industry "best practice" in their development. The APTA Heritage Trolley Vehicle Equipment Standard was issued in June of 2005 and serves as a detailed "checklist" for any agency procuring streetcars. The Standard provides agencies with practical guidance and helps ensure that safety-related equipment is properly prioritized in the creation of a procurement specification. POLA's present replica cars 500-501 are fully compliant with the Equipment Standard.

8.6 Maintaining the Red Car Heritage Theme

Pacific Electric 100-class car circa 1950

The Pacific Electric Railway (PE) operated passenger service in the Los Angeles region for more than 50 years. Services ranged from heavily travelled lines connecting outlying areas to Downtown Los Angeles, to local streetcar routes within a number of Los Angeles communities and other on-line cities. San Pedro had both an interurban connection to Los Angeles and a local streetcar system operated by PE. Over the 50-year period of PE passenger operations, the company used an extraordinary variety of equipment. There are thus ample choices on which to base a replica heritage car that is both a practical vehicle for the intended service and has a meaningful connection to the system's history.

The PE 530-class suburban cars were selected as the basis for existing replica cars 500-501in 1999 for several reasons. To begin, the Port had recently purchased historic car 1058, and it was desired

to have additional cars that were compatible in terms of floor height, but which were not quite as large. The cars also needed to be generally compatible with the railroad environment, since track was shared with freight. The cars were also fitted with railroad couplers that could be used to tow a dead car should the line's electric power fail. The original floor height of a PE 530 was raised 2.75 inches to make it compatible with car 1058, and doorway threshold extender plates were installed to compensate for the 14 inch difference in width between 1058 and 500-501. Steps were also modified to provide some basic improvement over the original design, although because high platforms were to be used, the steps would only be used for crew access and emergency purposes. Otherwise, the two replica cars were dimensionally almost identical to the original car type, although they did use a welded steel frame in lieu of the wood framing of the original. Trucks and motors were refurbished vintage equipment, while control and airbrake equipment was new or refurbished equipment of relatively modern origin.

For the new WRCL cars, the PE 100-class cars, of which 15 were built in 1930, have a similar appearance and overall dimensions to one of the commonly produced types of replica heritage cars. The PE operated the 100-class cars in local streetcar service in various parts of the system until 1950. The cars can be fitted with wooden "walkover" type seating, wood trim, and other interior decoration appropriate to a historic streetcar.

Simulation depicting Little Rock type replica car with PE heritage paint scheme

8.7 Sources for Replica Cars and Marketplace Background

The following section reviews present-day marketplace options for the purchase of replica historic streetcar vehicles. While all such cars are in essence "custom" orders, there are suppliers ready to build cars, (both the Gomaco Trolley Company and Brookville Equipment could be expected to bid on a replica car procurement), with a few designs having become fairly standard by virtue of their production for multiple customers. In general, the trend is for the vehicles to become more modern "under the hood", while retaining a "classic" heritage appearance. It should also be noted that the designs being produced are for streetcar-type vehicles that are operated with a single person crew and board from a low

Interior of Little Rock type replica car

platform. The Port's high-platform type car with two-person crew has not been adopted by any other lines.

New Orleans Replica car

Recent Market Activity

A total of 69 replica historic streetcars have been built in the US since 1984, 55 of those in the last eleven years. Order quantities are relatively small in comparison to procurements for other types of rail transit vehicles. The largest historic streetcar order in this time period was for 23 vehicles, built "in house" by the New Orleans transit agency in 2002. The agency had a long history of operating and rebuilding streetcars, as well as a sizeable facility in which to do the work, and undertook the assembly of the cars using parts and sub-assemblies supplied by a variety of subcontractors. Trucks and control equipment for the New Orleans project were supplied by the Brookville Equipment Company. The next largest order was for nine cars provided by the Gomaco Trolley Company to HARTLine in Tampa, Florida. It should be noted that to date, Gomaco has built a total of 18 of this same general replica car type for four different cities.

Brookville remanufactured car for Philadelphia

Gomaco Little Rock replica car

In addition to the replica cars, there have been several large orders for remanufactured vintage streetcars, beginning in 1995 with 17 1940s-era PCC type cars for the San Francisco Muni. In 2005, Brookville Equipment remanufactured 18 PCC cars for the Southeastern Pennsylvania Transportation Authority (SEPTA) streetcar operation in Philadelphia. Unlike the San Francisco cars, the Philadelphia project created a small fleet of virtually new vehicles, having had everything but the car frame replaced, including running gear, control, interior and roof.

To date, the larger European and Japanese railcar manufacturers have not made an attempt to enter the U.S. replica streetcar market, and have instead concentrated on supplying the significant demand for modern streetcar

designs from other countries. While the streetcar concept is now experiencing a major resurgence in the U.S., many European cities never abandoned their streetcar networks, and so demand has remained high and designs have continually progressed. Other barriers to the sale of these same modern vehicles in the U.S. have included differing regulatory approaches to crashworthiness and "Buy America" provisions in federally-funded procurements.

Transit vs. Museum Suppliers

Suppliers interested in responding to a replica historic streetcar procurement RFP could generally be expected to fall into two categories, those that serve the transit agency market, and those that serve mainly the railway museum and small-project market. While there is certainly some cross-over between the two markets, the suppliers to the railway museum field are typically very small companies that are not capable of meeting the financial and insurance requirements of a larger public agency procurement. Typically these smaller companies and organizations are a better fit as a supplier of specialized parts and equipment to a larger company accustomed to working with public agency procurements.

Criteria for Pre-Qualification

The following minimum pre-qualification criteria is recommended: that the proposer have a successful history of building replica historic streetcars (not less than 10 in the last five years), or a successful history of substantially remanufacturing a large number of streetcars (not less than 10 in the last five years). "Substantially Remanufacturing" should be clearly defined as a level of work that results in essentially a new car.

8.8 Key Performance Requirements

Based on the examination of the new operating environment, applicable regulations and marketplace options, this section presents key performance criteria to be applied to procurement of additional replica historic streetcars for the expanded WRCL. These performance criteria should serve as the basis for developing a detailed preliminary technical specification.

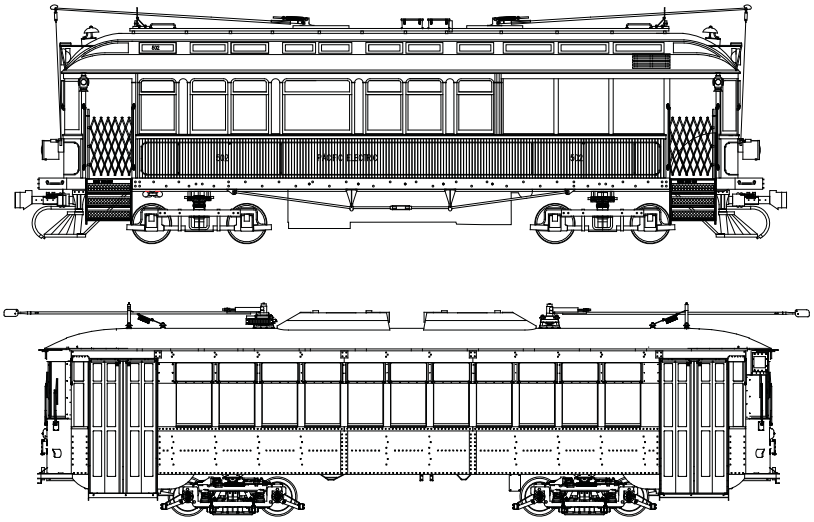
The general concept is to seek a vehicle type which is currently being successfully produced in the marketplace, adding further performance enhancements as required to meet or exceed local safety requirements. In general, the vehicle is optimized for urban streetcar-type operation and the attendant hazards. Major differences between it and the existing Red Car vehicle type include a steel versus wooden body, lower weight, and a greatly improved braking rate. The newer vehicles also have a lower vehicle floor that facilitates boarding from street level or a curb-height platform. The bumper height is also lower, and the full-size railroad couplers and the large opening around them are also gone, providing greater safety if a motor vehicle or pedestrian collision is unavoidable. Vehicle ends are also rounded and free from sharp corners, providing some measure of deflection capability in a collision. **Table 8.2** summarizes the differences between this newer car type and the two existing Red Car replicas.

Table 8.2
Key Differences: Existing and Proposed Red Car Vehicles

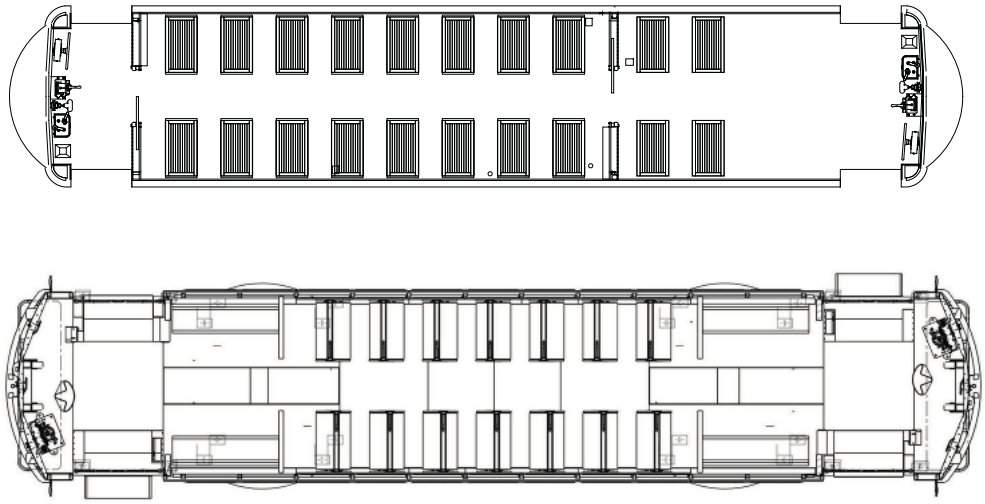
	EXISTING VEHICLE	PROPOSED VEHICLE
Dimensions		
Overall Length	43 feet – 2 inches	44 feet – 1 inch
Length of Passenger Compartment	39 feet – 4 inches	42 feet – 3 inches
Floor Height	46 inches	35 inches
Exterior Width	8 feet - 2 inches	8 feet - 6 inches
Interior Width	7 feet - 5.5 inches	7 feet – 9 inches
Interior Aisle, Minimum Width	24 inches (two bulkhead doorways)	26 inches (no bulkhead doorways)
Carbody Door Type / width	None, gates only Doorway opening: 33 inches	Folding doors Doorway opening: 45 inches
Crew Size	Two-person	One-person
Normal Boarding	Via high platform	Via steps
Wheelchair Boarding	Via high platform	Via lift in vehicle doorway
Floor Height	46 inches	34.5 inches
Bumper Height	46 inches	29 inches
Performance		
Max Braking Rate-Emergency	2.5 mph/sec	5.0 mph/sec
Vehicle Weight	813 kg / m^2	Not to exceed 600 kg / m^2
Passenger Amenities		
Heating	No	Yes
Air Conditioning	No	Yes
Automated Stop Announcements	No	Yes
Equipment		
Brakes	Automatic Air- no track brake	Dynamic w/friction plus track brake
Dynamic Braking	Emergency only	Available for all braking
Trucks	Refurbished	New truck or refurbished
Coupler	Full railroad knuckle coupler	Folding drawbar or drawbar pocket only

Source: Railway Preservation Resources, December 2008

The renderings below provide visual comparisons of the existing and proposed Red Car vehicles.



Side elevation, existing vehicle (top) and proposed new vehicle type



Floor plan, existing vehicle (top) and proposed new vehicle type

New Vehicle Performance Criteria

Basic Vehicle Configuration: double-ended (can be operated from either end), double sided (doors on both sides), single-unit (does not couple into multi-car trains). Steel body, arch roof car based on Pacific Electric "double-truck Birney" (100 class) streetcar. Doors and interior arrangement designed to facilitate efficient crowd flow through car.

- Basic dimensions:
  - Length: 45 to 47.5 feet

- Width: 8.5 feet
- Maximum floor height above TOR: 34.5 inches
- Minimum interior ceiling height above finished floor: 7 feet
- Minimum side door opening width (over opened bi-fold doors): 3 feet 9 inches
- Minimum side door opening height: 7 feet 9 inches
- Maximum height over roof-mounted equipment, trolley poles hooked down, new wheels, AW0 weight: 12 feet 8 inches
- Maximum static suspension deflection, AW0 to AW2 weight, sum of resilient wheel, primary and secondary suspension deflection: TBD
- Maximum bumper height: 2 feet 8 inches

- Acceleration rates and top speed: 2.0 to 3.0 mph / sec, minimum top speed: 35 mph
- Braking rates: Service: max of 2.5 – 3.0 mph/sec. Emergency: 4.5 – 5.0 mph/sec
- Maximum grade: 8%
- Minimum turning radius: 59 feet
- Maximum Weight: 600 kg / m^2 (area= vehicle length x width) for AW0 car
- Power Requirements: TBD
- Structural: Compliant with CPUC requirements
- Safety Features: compliant with APTA Heritage Trolley Vehicle Equipment Standard. Provision to include on-board cameras.
- HVAC: heated / air-conditioned consistent with San Pedro operating environment
- Maintenance / Life Cycle Cost: A steel-bodied car equipped with chopper type control and dynamic braking should require less maintenance than the present wood-bodied car with switched resistor control and friction brakes. By also designing the vehicle for single person operation, operational costs will also be lowered significantly.

8.9 Options for Modifying Existing Cars 500-501

The existing WRCL replica cars 500-501 were built new in 2000-2003. They were designed for operation on the existing shared-use freight rail corridor, sharing the line with restored original car 1058. The 3 foot-10 inch floor height of car 1058 was thus adopted for cars 500-501, with all boarding intended to be from high-level platforms. If the WRCL operating environment is changed as recommended, cars 500-501 will either need to be segregated to shuttle service on a dedicated line where high level platforms can continue to be used, or modified to make them compatible with the new operating environment.

The modifications to be considered for Cars 500-501 fall into two broad categories:

1. Modifications to make them compatible with the new operating environment (more crossings, crossing gates replaced with traffic signal interface, limited fencing, low-level platforms, more pedestrian-intensive environments, eventual introduction of mixed traffic operation).

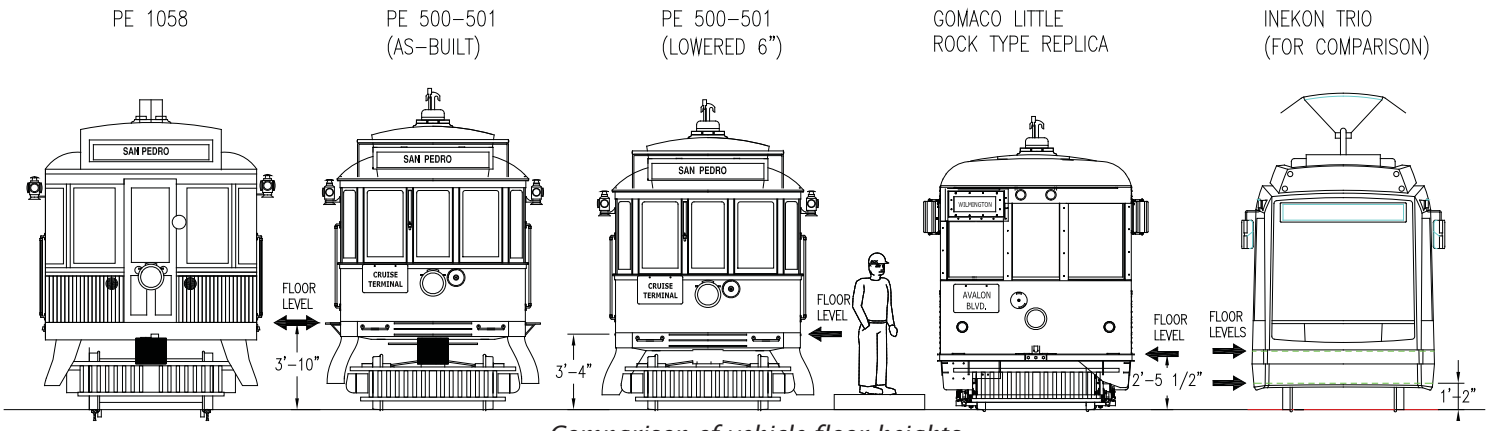
2. Modifications to address issues involving operation of two different car types on the same line.

Of the two categories, it is the new operating environment that is driving the need for most of the modifications. On a related note, the braking system modifications required under category 1 actually address an important part of what will be needed for category 2, as the priority for collision safety is always avoidance. The matrix below provides an initial review of the range of vehicle modifications:

Desired Result	Possible Strategies
Improved braking performance, braking system more suitable for urban operating environment	Lower vehicle weight (difficult to achieve, but not impossible).
	New braking system incorporation magnetic track breaks. (new trucks).
Boarding from low level platforms	New stepwell design (significant modifications to car structure).
	Vehicle-borne wheelchair lift (significant modifications to car structure).
	Lower floor height to make new stepwell more practical (Modify carbody bolsters/trucks to lower floor height up to 6 inches).
Safer front end geometry for urban operating environment	Eliminate existing coupler, maintain towing capability with drawbar pocket or folding coupler design.
	Employ a modern version of safety fender attached to front of vehicle, as was historic practice on Pacific Electric Railway.
	Modify pilot location and construction.
	Add a supplementary bumper at a height compatible with vehicular traffic.
Make anticlimber height compatible with more common streetcar type vehicles	Lower floor height to make new stepwell more practical (Modify carbody bolsters/change trucks to lower floor height up to 6 inches).
	Provide new anticlimber on 500s with extended downward range, have hidden structure in new streetcar vehicles with extended upward range
	Modify existing buffer on 500s to an energy absorbing design.

Passenger Boarding

The figure below illustrates the relative floor heights of the existing Red Car vehicles as well as typical streetcar vehicles from other U.S. cities. Each vehicle is shown relative to a standard 6-inch high (curb height) streetcar platform.



Comparison of vehicle floor heights

As noted, cars 500-501 were designed to have all passenger boarding take place from high-level platforms. Steps are provided for crew and emergency access, but would not be practical for use in regular operations due to their relatively steep pitch. In order to make the cars practical for use with a low-level platform, it would be preferable to both lower the floor height and to change the step design to something more in keeping with contemporary standards.

It would likely be feasible to lower the floor height of cars 500-501 as much as 6 inches from its present 3 feet-10 inch height (the original PE 500-class design had a floor height of 3 feet-7-1/4 inches). Lowering the floor height will require the removal of several bolster shims, and may also require some minor changes to the handbrake rigging.

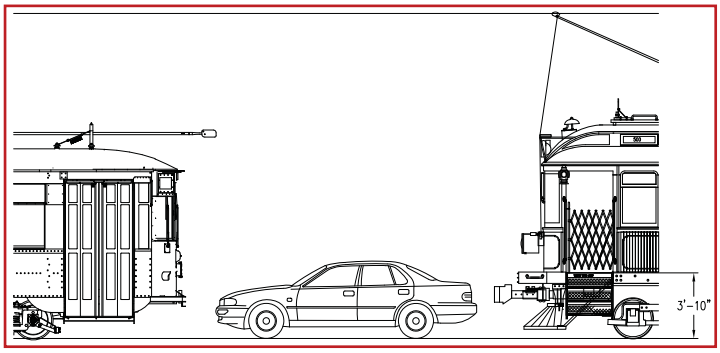
The existing steps, which were loosely patterned on the original car dimensions, have only a very narrow inset into the car frame, relying instead on having the lower step extended out away from the car side. Providing a more passenger-friendly set of steps will involve creating a more gradual and uniform rise in the steps, and initial study suggests that this will require that a new stepwell be cut into the car frame. By allowing the stepwell to take more floor space within the vehicle, the steps can be made more gradual without taking up more space outside the plane of the car sides. Cutting in a new stepwell will require some modifications to the car frame, and will require the relocation of the large electrical junction box at each end of the car.

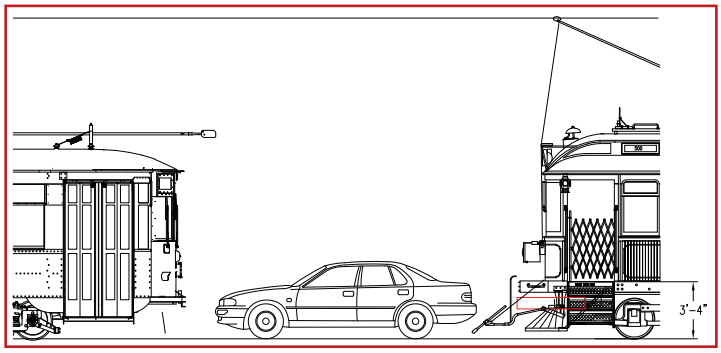
Wheelchair access would need to be accommodated through one of the methods described in Section 4. As noted, vehicle-borne lifts appear to offer the most meaningful advantages for the WRCL, with their increased flexibility and simpler platform design requirements. Additional study is required to determine the most suitable type of lift to apply to cars 500-501. Options range from a lift that uses an existing doorway to one which would use a new doorway added to the car side (similar to the arrangement on the New Orleans replica streetcars).

Other Compatibility Issues

Making cars 500-501 more compatible with an operating environment that is more pedestrian and traffic-intensive will include addressing front end geometry and braking capabilities. The preceding sections of this report addressed the braking rates suitable for this type of operating environment. Whether braking rates can be improved from the cars' current 2.5 mph/sec braking rate with the existing running gear will require further study in future work.

The illustrations below examine some of the issues concerning vehicle front end geometry By providing a comparison of existing 500-501 floor height and end configuration (left-hand illustration) with proposed modified version (right-hand illustration). The modified version has no coupler, lowered floor height, added safety fender, and energy absorbing bumper element below buffer.



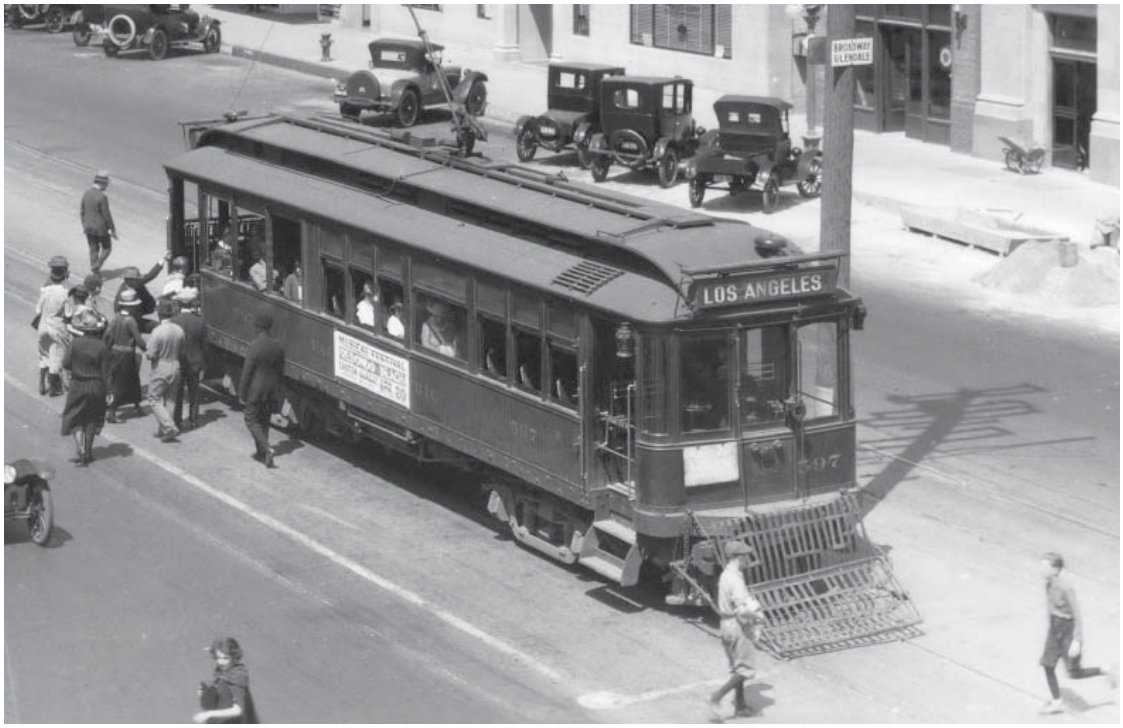


Removing the existing couplers will eliminate a major hazard with regard to vehicular collisions, particularly if some type of energy absorption feature (such as a supplementary bumper under the car's buffer at a height compatible with vehicular traffic) can be incorporated in its place. Pedestrian safety could be further enhanced with the incorporation of a safety fender such as the type originally used by the PE on the 500-class cars. In addition to being an historically accurate addition in terms of its appearance, the safety fender could also be used to hide an added bumper under the buffer.

The above illustrations also include a comparison in bumper heights for a typical automobile, the PE 500 replicas, and a more typical streetcar vehicle. Key compatibility issues to be considered when operating different streetcar vehicle types on the same line include compatible braking rates, compatible bumper and anticlimber heights, as well as vehicle weights and frame strength. There are several streetcar systems in the U.S. that operate dissimilar vehicle types on the same line. Issues addressed by these other systems include compatible anticlimber heights and having either compatible braking rates, and/or operating rules that enforce adequate vehicle separation. In some cases, certain vehicles are also restricted to specific portions of the system.

In summary, making replica cars 500-501 compatible with the new operating environment contemplated for the expanded WRCL system will require some significant modifications. The specific modifications will need to take into account the type of vehicles that will share the line, as well as the specific route characteristics. In terms of other vehicles that might someday share the line, it should be noted that most modern replica streetcars are already designed with a structural

front end shelf in front of the operator's position, anticipating the potential for a collision with a heavy truck, or another rail vehicle with a higher bumper height.



PE 550-class car in service circa 1920s. Note street level boarding and safety fender deployed at front.

8.10 Replica Historic Streetcars: Lessons Learned

Sixty-nine replica historic streetcars have been built in the United Sates since 1984. Building on the traditions of America's streetcar shops of the past, these new vehicles strive to incorporate the classic looks of vintage streetcar designs, with the reliability and durability of a new vehicle. It is important to note that more than half of the replica vehicles built to date have used some percentage of refurbished vintage components, typically trucks, motors, controllers, and some air brake system components. The extent to which refurbished components are used depends on the requirements and budget of the individual customer, and the types of parts the vehicle supplier has access to.

Order quantities are typically small compared to other railcar procurements, but a few basic car types have emerged:

- Rebuilt PCC streetcar (effectively a replica due to almost complete replacement) Note: most are single-ended cars
- Double-truck "Birney" streetcar
- New Orleans "Perley-Thomas" streetcar

New Orleans is notable as being an exception to the use of refurbished parts, opting instead to purchase everything new for its 23 Canal St. replica historic streetcars in 2002, including the trucks and motors. The New Orleans vehicles use modern running gear and controls from US suppliers.

While refurbishing vintage components can help keep vehicle costs down, there are practical limits to its application. Vehicle size and weight presents a limit to the utility of the refurbished running gear presently available, and rebuilding old equipment always has the potential for unwelcomed surprises. In general, the evolving trend for replica historic streetcars is that they are becoming more modern "under the hood", improving performance in the process. The use of modern trucks and control systems also offers lower maintenance costs in exchange for higher up-front cost. Ultimately, budgetary considerations, life-cycle cost analysis, and operational requirements will determine the degree to which refurbished components are or are not appropriate.

The following are some important lessons learned from recent historic streetcar procurements. These issues should be addressed as part of a comprehensive vehicle technical specification that can be used as the basis for advancing a procurement process.

General/Performance

- **Vehicle weight:** excess weight brings multiple penalties, including longer stopping distances, higher energy consumption, and higher track and vehicle maintenance costs. Weight should not exceed 600 kg / m^2 (area calculated as vehicle exterior width x length) for an air conditioned car.
- **Better braking performance**: from max of 2.5 – 3.0 mph/sec now common to 4.5 – 5.0 mph/sec in emergency through incorporation of a magnetic track brake.
- **Lower maintenance for major systems**: at minimum incorporating dynamic braking and a modern control system (chopper or other system advanced beyond switched resistor control).
- **Further safety improvements:** including deadman, low air alarm and interlock, as part of full compliance with APTA Heritage Trolley Vehicle Equipment Standard.
- **Quieter operation:** elimination of rattling parts.
- **Improved materials and workmanship:** further lowering maintenance costs. Modern, more reliable transit-grade components should be used. Use of components not intended for rail transit application must be avoided. All safety-critical components (e.g.: wheels) must be serialized and tracked through the manufacturing process.
- **Technical Specification:** a detailed performance-based technical specification should be developed and made an integral part of the procurement process.
- **Warranty administration:** warranty expectations should be thoroughly detailed in the procurement process, including fleet claim issues, parts availability, delivery times, shipping costs and future price increases. A dispute resolution mechanism should also be built into the process.

Propulsion/Braking

- The vehicle should be capable of towing a similar-type disabled vehicle.
- Traction motors and other propulsion components should be designed for transit application (not other industrial applications).
- If airbrakes are used, brake cylinder and other major airbrake components should be new parts, or parts refurbished to new standards, from an established rail transit equipment supplier. This will also help facilitate a ready supply of parts for component change-out over the life of the vehicle.

- Brake rigging design (including handbrake) should be based on required braking performance, taking into account actual weight of the new vehicle. Supporting engineering calculations should be provided.

Underbody/Equipment Layout

- Placement of major components under the vehicle should take maintenance access into consideration.
- Underbody cables and piping should be supported by clamps made for such purposes, avoiding the use of cable ties as a primary means of support.
- If airbrakes are used, an air dryer function should be incorporated.

Trucks

- Closer attention should be paid to vehicle weight, particularly where refurbished trucks originally designed for a lower body weight are being used. Suspension elements such as springs should be new, and their design based on actual vehicle weight.
- Where refurbished trucks are used, all major wearing parts should be new (eg: springs, wheelsets, roller bearings).
- Because railcars subject bearings to stresses not found in stationary applications, only roller bearings designed for rail transit application should be used.
- Wheel-rail interface is a critical system issue. Wheel profile (and composition if resilient wheel) should be closely coordinated with track design criteria.
- Brake shoe composition / duty cycle should be matched to the streetcar's duty cycle.
- Placement of traction motors within truck should take maintenance access into consideration.
- Where refurbished trucks are used, any modifications made to original truck brake rigging to accommodate magnetic track brakes should have supporting structural engineering calculations.
- Renewable hardened steel brake pins and bushings can dramatically extend the life of truck and carbody brake rigging. Their use should be considered for all brake rigging parts subject to significant wear from normal operation, especially where friction braking is the car's primary braking system.
- Standard railway industry procedures should be followed for all wheel work, including proper installation procedures for tires / wheels. All axles and wheel components should be serialized and press tonnage recorder data maintained for all components. If tires are used, welding must never be used between the hub and tire.
- If new trucks are used, they should be captive with the carbody (lifting carbody lifts trucks unless kingpins are released), without the need for external clamps or straps.
- Vehicle should be designed with lifting pads that do not require any disassembly to access.

Carbody

- Close attention should be paid to proper water-shed of roof and proper sealing to avoid early failure of roof structure. A modern transit-grade roofing material should be used in lieu of canvas covering.

- Cosmetic rivets and all assemblies fitted to vehicle exterior (e.g.: light housings) should be sealed/caulked during installation to avoid rust problems / paint deterioration. For aesthetic reasons, any cosmetic rivet heads should not exceed 5/8 inch diameter.
- Where possible, roof-top trolley pole hook should be located so that it is visible from ground when changing ends. Hook orientation should take into consideration any trolley pole overhang, so that lowered trolley poles on vehicles parked closely together on the same track cannot come into contact with each other.
- Roof-top trolley boards should be designed to accommodate future retrofit of a pantograph.

HVAC

- A/C system and its key components (refrigerant compressor, fans) should be designed for mobile transit application.
- If no A/C, install window shades and fans or other type of forced-air ventilation. Openable windows should be provided in either case.
- Powder-coated aluminum window sash should be used in lieu of wooden sash, and fitted with energy efficient glass. Where air conditioning is used in high humidity environments, consider a means to combat condensation forming on windows, especially on the windshields.

Electrical

- Adequate lightning arrestor protection should be applied to all circuits, especially if hook-down interlock connection is incorporated on trolley poles.

Doors

- The interface between vehicle and station platform is a critical system function. Door / step design should be closely coordinated with station platform design.
- Doors should open full width.
- Door / step cycle time should meet or exceed industry standards for transit buses or streetcars.
- Where folding / retracting steps are used, they should be applied to all doorways.

Interior/Flooring/Seating

- The layout of the vehicle's interior should consider the smooth flow of passengers, considering the impacts of large crowds as well as passengers in wheelchairs and passengers with small children in strollers.
- Internal connections in walkover-type seats should be riveted, not bolted.
- Seat bottoms should be solidly attached to seat frames, not just rest on top of pins. Seat bottoms can be hinged for cleaning access.
- Floor should be thoroughly sealed and incorporate cove molding to prevent water damage. Full durable edge protection should be used on floor around steps and motor traps.
- Transit-quality rubber flooring should be used throughout, ribbed in the aisles, plain elsewhere.
- A suitable number of handles / straps / stanchions should be provided for passengers to hold on to.

Operator's Position/Controls

- The layout of the operator's position should be carefully considered as part of the overall vehicle interior, not just as an after-thought. The layout should facilitate the installation of a comfortable seat for the operator with good passenger flow on and off the car, including past the fare collection / detection location.
- Interior viewport and indicator should be provided on end destination sign assemblies.
- Operator status / warning lights and gauges should be in the operator's immediate field of vision (not hidden in a compartment).
- Based on substantially higher emergency braking rates, an alarm / delay is appropriate for the deadman function

Communication

- Plan the system's Train-to-Wayside Control (TWC) functionality from the outset, avoiding control or other vehicle modifications during system integration.
- Accommodation should be made for camera installation (both interior and forward facing), even if not initially installed.
- Accommodation should be made for automated stop announcement capability (audible and with an LED screen) even if not initially installed.

Appearance

- Incorporating equipment into the design of the body structure is preferable to adding additional structure on the roof to mask equipment.
- Rod-style window guards are preferable to mesh style guards. In either case window guards should be powder coated, not polished brass.
- Polished brass parts are maintenance intensive, and their use should be limited to easily accessible components such as seat back handles.

9.0 Red Car System Operating Assessment

9.0 RED CAR SYSTEM OPERATING ASSESSMENT

This chapter provides an overview of operational issues and related costs associated with an expanded Red Car system. The *WRCL Operating Scenarios Evaluation Report* is included as **Appendix 1-2.**

In comparison to other vintage trolley/streetcar operations around the country, the current Red Car operation is relatively small. Operating an average of 4.6 days per week, the existing system was open for approximately 1,950 hours in 2006. The expanded system under study could ultimately increase to a seven-day a week operation, open 4,700 hours annually.

To best fulfill its role of providing waterfront access while supporting and complementing waterfront development, the Red Car needs to be seamlessly integrated into the waterfront's street and pedestrian environments. The Red Car will need to be flexible, friendly and convenient to use. With freight service in San Pedro due to end in the near future, the need to rely upon the existing freight right-of-ways will end. Additionally, the advent of several concurrent roadway infrastructure projects presents the ideal opportunity to place the Red Car alignments into more optimal locations.

The realities of this changing operating environment are reflected in the key design assumptions listed in the preceding chapters covering engineering and costs, with operating considerations discussed more fully in this chapter.

9.1 Preliminary System Operating Concept

Six alternative operating scenarios were identified and evaluated with the objective of recommending a preliminary operating concept as the system context for subsequent Red Car expansion planning and conceptual design activities. These evaluations, as documented in the *WRCL Operating Scenarios Evaluation Report, Wilson & Company; August 2007 (***Appendix 1-2***)*, concluded with a recommended System Operating Concept, as depicted in **Figure 9-1**.

SOURCE: Wilson & Company, Inc, Engineers & Architects; March 2009

THE PORT OF LOS ANGELES

WILSON & COMPANY ENGINEERS & ARCHITECTS

Waterfront Red Car Line Expansion Feasibility Report

Figure 9-1
Recommended WRCL System Operating Concept

The recommended Red Car operating concept was identified as having the highest ridership potential, and also ranked high on compatibility with waterfront redevelopment activity and efficiency of operations. Key attributes of the recommended Red Car operating concept are summarized below:

Operating Lines

- Wilmington to Cabrillo Beach/ Marina (6.2 Miles)
- North Gaffey Street to Outer Harbor (3.7 Miles)
- Downtown San Pedro to Ports O' Call (2.4 Miles)
- City Dock No. 1 to Ports O' Call spur (0.6 Miles)

Elaborate end-of-line terminal, Tampa, FL

Service Period

7 days per week as follows:

- Monday thru Thursday- 8:00 AM to 8:00 PM
- Friday thru Sunday-8:00 AM to 12:00 AM

Service Frequency

- 6.5 minute headways on southern half of system spine, where three lines are routed together. Provides a capacity of 792 passengers per hour in each direction.
- 10 minute headways on northern half of system spine, where two lines are routed together. Provides a capacity of 528 passengers per hour each direction.
- 20 minute headways on all branches outside of the system spine, providing a capacity of 264 passengers per hour each direction

Average vehicle operating speeds

One-way schedule time over route, including stops, with higher actual vehicle speeds between stops:

- 5 MPH for all segments within Downtown San Pedro
- 7 MPH for all segments except Downtown San Pedro and Wilmington extension between Swinford and King Streets
- 10 MPH for Wilmington segment between Swinford and King Streets

Vehicle Requirements

Table 9.1 summarizes running times and vehicle requirements for each operating line and the recommended WRCL system operating concept as a whole. As shown, a minimum total of fourteen (14) vehicles would be required in addition to three (3) spares, for a total of at least seventeen (17) vehicles.

Table 9.1
Vehicle Requirements
Recommended WRCL System Operating Concept

	End to End Running Time (Minutes)	Cycle Time (Running Time plus 10 Minutes)	Line Miles	Vehicle Requirements – both directions 20 Minute Headways
Wilmington to Cabrillo Beach	45	100	6.2	6
North Gaffey to Outer Harbor	29	60	3.7	4
Downtown to Ports O' Call	20	50	2.4	3
City Dock No.1 Spur	5	20	0.6	1
Vehicle Requirements:			12.9	***14***

Note: Does not include spare vehicles

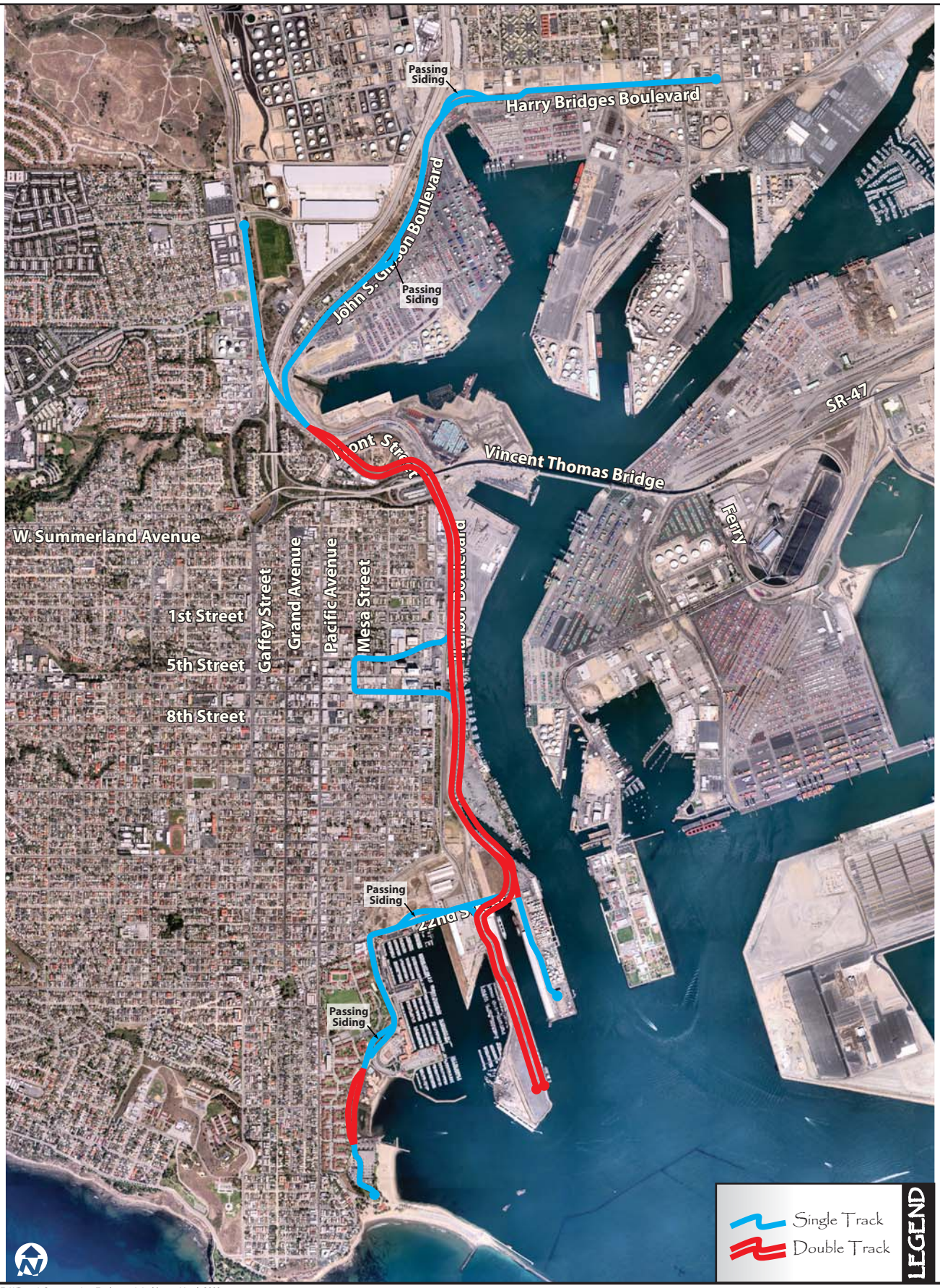
Source: Wilson & Company, July 2007

Track Requirements

As shown in **Figure 9-2**, the system "spine" between Swinford Street and the Outer Harbor would be double track. The extensions to Wilmington and Cabrillo Beach/Marina would be single track with passing sidings. The North Gaffey and City Dock No. 1 extensions could operate as single track without passing sidings, assuming 20-minute headways. The extension into Downtown San Pedro, if implemented as a loop service, would be single track and depending on length, would likely be double track if operated as a spur.

The recommended operating concept, as outlined above, provides the system context for subsequent planning studies and design of the individual extensions. It should be noted that not all extensions will be implemented at the same time, and the operating concept will need to be refined based upon the extensions in operation, station locations, activity centers served, and ridership demands at the time of operation. In addition, it is entirely likely that other operating options will be identified and considered as the conceptual design processes get underway. Other service options could include:

- Segmenting lines into shorter lines based upon the desire to vary services and frequencies. For example, the Wilmington to Cabrillo Beach/Marina line could be operated as two lines, focusing on Downtown San Pedro or Ports O' Call, each with varying levels of service.
- Implementing short turns and/or shuttle operations, rather than exclusively running end-to-end operating service. For example, the North Gaffey to Outer Harbor line could be operated as two separate shuttle lines with a mid-point terminus.
- Seasonal line variations – For example, operation of the Downtown to Ports O' Call line could include having every other train routed to Cabrillo Beach during periods of high demand.



SOURCE: Wilson & Company, Inc, Engineers & Architects; March 2009

THE PORT OF LOS ANGELES

WILSON & COMPANY ENGINEERS & ARCHITECTS

Waterfront Red Car Line Extension Feasibility Report

Figure 9-2
Red Car System
Preliminary Track Requirements

9.2 WRCL System Ridership Projections

Ridership is the most visible indicator of how a transit system is performing. High ridership levels are indicative of a successful and vibrant transit system, serving the mobility needs of its passengers with a high rate of return on the required capital investment.

Ridership projections typically rely upon the use of regional transportation analysis models that calculate ridership on a regional scale based upon population, employment, and travel time savings. The objective of the Red Car system expansion focuses on local, not regional ridership. For this reason, standard transportation models alone are not sensitive enough to use as a basis for forecasting ridership on a system like the Red Car where tourist ridership is a significant component. In the context of an expanded Red Car system, future year ridership estimates also need to consider increased Red Car service levels and the changing nature of the waterfront area itself. The Red Car as an attraction in itself also must be considered.

The Red Car is providing service in an area that until recently has had little demand for transit service of any type. As the Port completes the process of replacing former waterfront industrial sites with a dynamic mix of commercial and recreational uses, the demand for convenient transportation options will likely increase significantly.

An estimated 2.0 million people visit the existing San Pedro and Wilmington waterfront attractions each year, with that number expected to increase in the future as the Port continues the process of waterfront development. In addition to the tourist ridership component, a growing residential component is also developing in Downtown San Pedro.

The existing Red Car operation has carried an average of 100,000 passengers per year over its five year history, operating an average of 4.6 days a week over a 1.5 mile line. The Red Car also attracts significantly larger passenger numbers during waterfront special events. During the 2007 Lobster Festival for example, the line carried 10,496 passengers over a two-day period.

Expanding this service to seven lines (9.7 miles) operating 12 to 18 hours a day, seven days a week will significantly expand the ridership base. In addition, growth and redevelopment activity along the San Pedro and Wilmington waterfronts as well as within the respective communities and downtown areas will also significantly increase the base of trips that potentially could be served via the Red Car. A connection to existing local transit services via a new hub in Downtown San Pedro would further grow the ridership base.

The existing system has handled as many as 10,000 passengers in a weekend

In order to provide an initial ridership forecast for the expanded Red Car system, a comparison was

made with peer systems in other cities. **Table 9.2** shows ridership on other vintage trolley and modern streetcar projects from around the United States. The table also shows the length of the line, number of stations, annual system operating hours and the resulting calculation of number of passengers per system mile.

Table 9.2
Vintage Trolley and Modern Streetcar Ridership (2006)

Line	Year Opened	Length	Stations	Annual Operating Hours	2006 Annual Riders	Average Daily Riders	Average Daily Riders Per Mile
Little Rock	2004	3	14	4,056	121,500	333	111
McKinny Ave Dallas	1989	3.6	20	5,163	223,986	614	170
POLA Waterfront Red Car	2003	1.5	4	1,950	102,512	427	285
Memphis	1993	7	24	5,746	959,000	2,627	375
HARTline Tampa	2002	2.3	10	4,056	379,122	1,039	452
Portland Streetcar	2001	7.2	42	6,357	2,964,576	8,122	1,128
Tacoma Link Streetcar	2003	1.6	5	5,044	885,553	2,426	1,516
San Francisco "F" Line	1988	5.8	Many	7,176	8,000,000	21,918	3,779

Source: Railway Preservation Resources, September 2007

As shown, ridership on the other systems ranges from a high of 3,779 daily passenger boardings per mile on San Francisco's "F" Line to a low of 111 daily passenger boardings per mile in Little Rock. It should be noted that San Francisco has a very established transit system, with the "F" Line serving high densities and volumes of trips along Market Street and the waterfront Embarcadero. The Little Rock system opened fairly recently (2004) in a relatively small metropolitan area and has been steadily building a ridership base as a key component of downtown revitalization. In general, the systems with the highest number of boardings are those which successfully serve multiple markets (e.g. daily commuter, business, recreational and tourism).

Discounting the influence of the highs and lows in the above table, the number of daily passenger boardings per mile on other comparable systems averages about 650. Given the large tourist ridership component for the Red Car line, and the varying development densities along the line, a reasonable ridership number for planning purposes would be in the range of 350-450 daily passengers per mile in the waterfront and downtown areas, with a lower figure in areas removed from the immediate waterfront and downtown areas. It should also be noted that ridership will build over time, with factors such as marketing, connectivity with other transit services, and the extent of redevelopment activity playing critical roles in the rate of this growth.

Table 9.3 applies this average to develop a ridership forecast for the expanded Red Car system. As shown, the ridership forecast for the mid-range (Phase 2) system expansion introduced in Chapter 11 of this report (3.85 mile system, operating 7 days a week) would be approximately 500,000 passengers annually after a period of five years.

Table 9.3
Ridership Projection
Expanded Red Car System

Time Frame	System Mileage	Daily Riders Per Mile	Annual Ridership Projection
Existing	1.5	285	102,500
Initial System Expansion (2013)	3.85	350	500,000
System Buildout (Future)	9.7	350-450	1,250,000

Source: Wilson & Company, July 2007

Build-out of the full 9.7 mile Red Car system, with operations seven days a week, could ultimately serve an estimated 1.25 million passengers annually. More refined ridership numbers will be developed in conjunction with subsequent design efforts. Future Port marketing studies also present an opportunity to study Red Car ridership in the context of local development proposals, providing a more detailed ridership forecast.

9.3 Alternative WRCL Operating Structures

A range of organizational options for operating the expanded Red Car system by the Port of Los Angeles were identified and evaluated. This section highlights the opportunities and constraints associated with each option.

A review of other light rail, vintage trolley and modern streetcar systems around the country generally reveals four basic operating structures:

1. Transit agency, providing service in-house or through a contract operator
2. Transit agency with non-profit "friends of the trolley" support group
3. Small "grass roots" non-profit as owner/operator
4. Non-profit entity as owner or manager, contracting out service to the local transit agency

In the case of using an existing local transit agency to provide the service, it should be noted that in the examples from other cities, the service was either developed directly by the agency or they were selected as the operator because of their role as the provider of transportation services for the metropolitan area, their expertise in operations and maintenance, and/or their use of existing facilities and institutional arrangements. However, their financial overhead and/or union contracts can be a drawback. Their policy boards may also have different priorities than a local entity, such as the Port, who pays for the service.

In the case of the "Non-profit entity," one could be established to manage the system, and they could operate it directly or contract out service delivery. Alternately, a non-profit could simply be contracted to provide the actual service. However, it should also be noted that the non-profit examples from other cities typically have been the catalyst for developing, funding, and/or implementing the

system. Non-profits are also commonly found serving in a "friends of the trolley" role that can be an effective tool for fostering public-private partnerships.

While the Port does not fit directly into any of the above categories, elements from each can be considered in evaluating organizational options for the Red Car line. Three basic options, starting with the current operating model as a baseline are presented below and include:

1. Existing Conditions
2. New POLA Division
3. Outsourced

Red Car crew members wear authentic uniforms, adding to the experience of the ride.

A chart is presented for each of the three options to identify how the various functional responsibilities are covered. Within the chart, the heading entitled *"Red Car – POLA Internal Unit"* represents a new and separate section or department within the Port organization.

The heading entitled *"POLA – Support"* represents existing staff and departments within the Port, including engineering, legal, maintenance, accounting, administration, marketing and other functions.

The heading entitled *"Contract Services"* represents outside consultants, contractors, and providers of specialized services including car operations and maintenance. "Contract Services" (Outside Operator) could be accomplished through any of the following methods:

- For-profit entity (such as the current Red Car operator)
- Non-profit entity
- Existing local transit agency

As these options were evaluated for advantage and disadvantages, it was noted that many variations are possible. In the light of that, the organizational scenarios could be viewed as the "bookends" of what is possible and a range of options for further consideration by the Port.

Option 1 - Existing Conditions

The day-to-day operations are contracted to a qualified third-party transit service provider. Management of the system is accomplished by the Port, but not by staff with transit backgrounds and not in a separate division or operating unit. The Port also provides many of the necessary supporting services such as legal, marketing, contract administration, planning, and engineering. **Table 9.4** summarizes lead and support roles associated with the existing Red Car operations.

Table 9.4
Option 1: Red Car Operating Responsibilities - Existing Conditions

Function	Red Car – POLA Internal Unit	POLA - Support	Contract Services
Management		X	
Car Operations			X
Car Maintenance			X
Track Maintenance			X
Station Maintenance		X	S
Overhead Maintenance			X
Planning		X	
Marketing		X	S
Personnel			X
Accounting		X	S
Legal & Contracts		X	
Engineering		X	
Construction		S	X
Safety Certification & Security		X	S

Key: X = lead; S = support

- **Advantages**:
  - Minimizes Port overhead and personnel in order to operate the Red Car system
  - Uses the Port's expertise in areas that staff has already established
  - Uses an outside provider (and their expertise) to provide ongoing operations that can use their own flexibility as needed (in areas such as personnel, policies, schedules, etc.)
  - Provides a system and relationships that has proven successful at the existing level of operations
  - May be the lowest financial burden on the Port per unit of service
- **Disadvantages**:
  - As the system grows, it may not provide the Port with enough internal expertise and feedback to effectively oversee the Red Car system
  - Has a relatively limited "voice" or "champion" within the Port organization, limiting its ability to get a higher priority treatment for needed items or to play a more effective role in the Waterfront environment
  - Ability to integrate operations and support service for the Red Car system may be limited.

Option 2 – New POLA Red Car Division

Virtually all Red Car functions would be fulfilled by a new Port division or section, led by personnel with prior transit experience. Further internal discussion would be required to determine the degree of independence that this division would have, recognizing that the top-level goal would be one of providing excellent customer service to Red Car patrons. The operational, maintenance and management staff would all be Port employees. Some support services would be embedded in the new Red Car unit so as to maximize the organizational benefits and management oversight. These might include accounting, marketing, planning, and others. **Table 9.5** summarizes the responsibilities associated with this scenario.

Table 9.5
Option 2: Red Car Operating Responsibilities - New POLA Division

Function	Red Car – POLA Internal Unit	POLA - Support	Contract Services
Management	X	S	
Car Operations	X		
Car Maintenance	X		
Track Maintenance	X		
Station Maintenance	X		
Overhead Maintenance	X		
Planning	X		
Marketing	X		
Personnel	X	S	
Accounting	X	S	
Legal & Contracts		X	
Engineering		X	S
Construction			X
Safety Certification & Security	X		

Key: X = lead; S = support

- **Advantages**:
  - Maximizes the Port's expertise and management control over the Red Car operations, and its ability to integrate the system into the overall waterfront development program
  - Maximizes the ability of the Red Car system to have it own "voice" or "champion" within the Port organization, and thereby, enabling it to get higher priority treatment for needed items or to play a more effective role in the new Waterfront environment
  - Provides more internal and direct capabilities to operate and maintain an expanding Red Car system

- Continues to use the Port's expertise in areas that staff has already established such as legal, engineering, and contracts management

o **Disadvantages:**

- Overall function of the Red Car is outside POLA's traditional core business.
- May be a higher financial burden on the Port per unit of service than the existing condition
- May subject the Red Car system to labor issues that impact other areas of the Port operations
- May lack flexibility to make immediate changes or respond to quickly changing conditions

Option 3 – Outsourced:

Virtually all Red Car functions would be turned over to an outside operator under contract. The Port would have less oversight and control than it has presently. None of the operational, maintenance and management staff would be Port employees. The Port would oversee the trolley system through a liaison person or small staff that might be part of an existing division. The outside provider would also provide all support services, including accounting, legal, marketing, planning, and others. **Table 9.6** summarizes the operating responsibilities under this scenario.

Table 9.6
Option 3: Red Car Operating Responsibilities - Outsourced

Function	Red Car – POLA Internal Unit	POLA - Support	Contract Services
Management		S	X
Car Operations			X
Car Maintenance			X
Track Maintenance			X
Station Maintenance			X
Overhead Maintenance			X
Planning			X
Marketing			X
Personnel			X
Accounting		S	X
Legal & Contracts		S	X
Engineering			X
Construction			X
Safety Certification & Security		X	S

Key: X = lead; S = support

- **Advantages:**
  - May be a lower financial burden on the Port per unit of service than establishing a new Red Car division
  - May not subject the Red Car system to labor issues that impact other areas of the Port operations
  - May maximize flexibility to make immediate changes or respond to quickly changing conditions
- **Disadvantages:**
  - Minimizes the Port's expertise and management control over the Red Car operations.
  - Minimizes the ability of the Red Car system to have it own "voice" or "champion" within the Port organization, and thereby, not enabling it to get higher priority treatment for needed items or playing a more effective role in the new Waterfront environment
  - If the provider is part of a larger transit operation, it may be subject to union disputes, financial issues, and other conditions to which the parent organization is subject
  - Provides the least internal and direct capabilities to operate and maintain an expanding trolley system
  - Loss of continuity in the Port's expertise in various trolley areas that the Port staff already has established, such as legal, engineering, and contracts management

The issue of who provides the management team for the Red Car system hinges on the Port's organizational preferences and degree of control that it wishes to maintain. The issue of who provides the operations staff may hinge on cost.

A review of other trolley operations across the nation provides good information, but does not provide directly comparable examples. For example, staring a non-profit organization to manage or operate the system may be challenging. Unless such an organization has been instrumental in the implementation of the system, it may be difficult to bring it to a level where it can take some degree of control. Having a local transit system operate and/or manage the Red Car system may also be challenging due to

Having the right facilities for maintenance is an important factor in controlling costs.

the level of union wages and benefits in these systems. The financial burden may outweigh the organizational benefits or management expertise in these cases.

Overall, a system that provides for additional management control within the Port organization, but keeps the operational and maintenance workers under a qualified for-profit, outside service provider may provide the best option.

9.4 Preliminary Operation & Maintenance (O&M) Costs

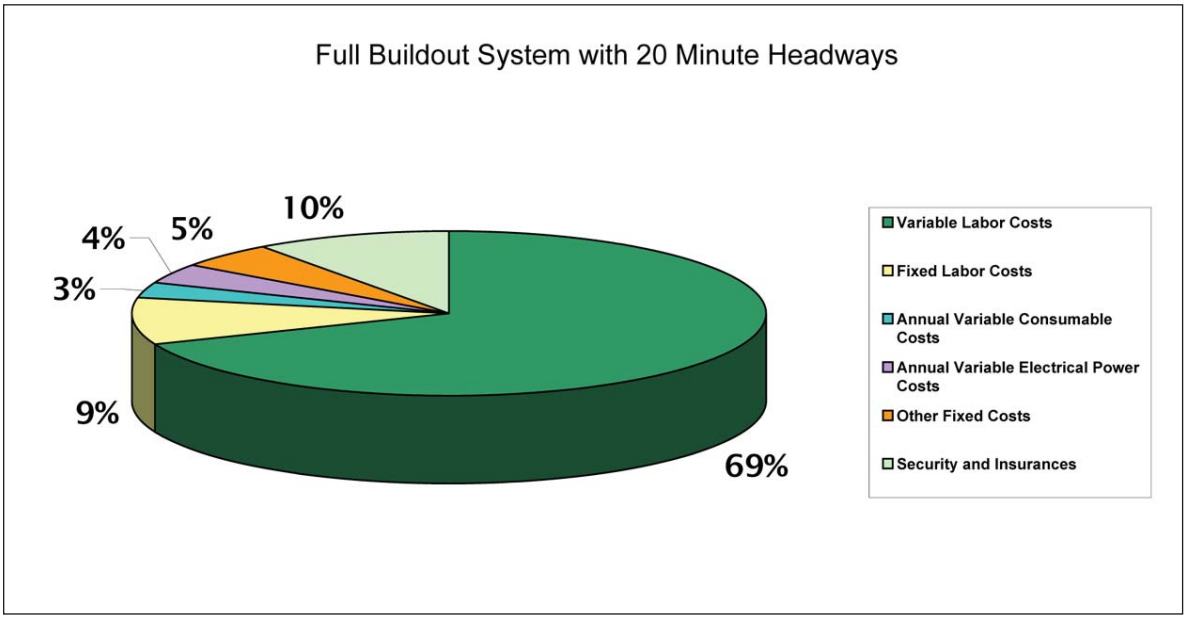
The operation and maintenance costs associated with on expanded WRCL system will be a function of a variety of cost elements centered around labor and operating time. A number of basic assumptions were made for estimating O&M costs at this preliminary phase. The basic operating model assumes that O&M would be contracted to a qualified third-party operator, as is the case with the present Red Car operation. POLA is assumed to provide marketing and other support.

As a City department, POLA would be required to formally assess whether the work of operating the Red Car Line "can be performed more economically or feasibly by independent contractors than by City employees". Because operation of the Red Car Line falls outside the Port's traditional core business, it is generally assumed that the contracted O&M model would provide the lowest total costs to POLA, hence its use in this initial estimate. Future studies will examine operating structures other than contracted O&M in more detail. Key O&M costing assumptions are listed below:

- O&M will be contracted to a third-party operator with POLA providing some support services
- Insurance costs would be part of POLA's overall umbrella of coverages, with a cost allowance of 10% of the total Red Car operating cost included in this estimate to cover the incremental increase in insurance premiums. Further study will be required to determine the appropriate method of segregating incremental insurance costs for the Red Car operation, taking into account the elimination of track sharing with the freight operation.
- Security would be provided by/coordinated through the Port Police. An allowance of $100,000 annually is included in this estimate to cover additional resource requirements.
- There would be no track sharing with freight operations
- One-person crews would be used for all operations
- Replica vintage trolley vehicles of a service-proven design would be used, incorporating modern control and braking systems
- There would be limited operation in mixed-flow street traffic
- All infrastructure would be new

Figure 9-3 identifies the various cost proportions associated with full build-out of the system, assuming a Red Car system operating at 20 minute headways. As shown, approximately 69 percent of the operations and maintenance costs would be due to the labor requirements associated with operating the system. The next largest share of the total, approximately 10 percent, would be security and insurance costs. 9% would be the fixed labor costs associated with management, supervision, and support activities needed regardless of the operating miles, hours or number of vehicles. Variable consumables and traction power (electricity needed to operate the vehicles) would comprise approximately 7 percent. The remaining 5 percent would include other fixed

Figure 9-3
O&M Cost Proportions



consumables including outside professional services, and power for the physical facilities. Each of these cost elements are discussed in more detail in the following sections.

Labor Costs

Labor costs can be divided between fixed and variable costs, the latter being associated directly with the number of revenue service vehicles operated and the number of revenue service hours provided. Wage rates and fringe benefit levels were assumed based on current rates for the existing Red Car system and comparable positions at other U.S. vintage trolley operations.

Variable Labor Costs

The number of operators, mechanics, cleaners and other staff were calculated based on the total number of revenue vehicles, as follows:

- 34 Operators
- 7 Mechanics
- 3 Mechanics Helpers
- 4 Cleaners
- 4 Physical Plant Maintenance Staff

Fixed Labor Costs

Includes all labor costs associated with resources that are generally required regardless of the size of the system and operating hours (beyond an initial growth point). The job positions that make up this category consist of a core management/administrative team:

- General Manager

- Operations Manager
- Maintenance Manager
- Administrative Assistant
- Dispatcher/crew scheduling
- Street Supervisor
- Power/Way/Station Maintenance Leader

It was assumed that POLA would continue to provide support relating to marketing, legal, contractual, and other duties. Dependent on how the proposed Red Car museum is developed, additional positions for the oversight of the museum and gift shop (as appropriate) could be added, but are not included in this preliminary estimate.

Non-Labor Costs

Non-Labor costs include the two principal elements of electrical power (traction power, stations, maintenance facility, museum, and lighting) and consumables (e.g., small parts, cleaning supplies, and related items) that are related to the amount of operations (i.e., vehicles, hours or miles). Costs for electricity and consumables were established based on current rates for the existing Red Car system and levels achieved by similar vintage trolley systems.

Estimate of Annual Operating Costs

Based on a process of combining all of the above elements and stated assumptions, a cost of approximately $5.9 Million per annum was estimated for operation of the full build-out Red Car system with 20-minute headways on all branches (and 6.5 to 10 minute headways on the system "spine".) A cost of aproximately $2.9 Million per annum was estimated for the operation of the mid-range (Phase 2) expanison.

The above cost estimates translate to an average cost of $88.50 per Revenue Service Hour (based on a total of 59,262 Hours) and $14.00 per Revenue Service Mile (based on a total of 385,452 Miles). These cost ranges compare favorably with other U.S. vintage trolley and modern streetcar systems.

10.0 Traffic Interface Approach

10.0 TRAFFIC INTERFACE APPROACH

This chapter documents the recommended Red Car interface with the local roadway system, including traffic and train controls at various at-grade crossings. *The Red Car Traffic Circulation Study Report* is included as **Appendix 2-9**.

The current plans for the San Pedro Waterfront Project include the elimination of rail freight operations south of Swinford Street. This effectively means that the existing WRCL and future streetcar expansions south of Swinford will no longer need to be operated within a shared use environment. As a result of the lower operating speeds and shorter stopping distances of the WRCL streetcar, traffic and pedestrian interface requirements along the line and at the associated grade crossings can be implemented at levels commensurate with the operational characteristics of an urban streetcar type operation.

The following key assumptions provide the foundation for the recommended Red Car traffic interface approach:

General Operations

- The WRCL streetcars will operate on "line of sight." This is a commonly used method of operation for streetcar systems. The streetcars will move with the flow of traffic, operating in the same manner as roadway traffic, obey all traffic control devices and speed limits, and be prepared to stop short of any obstruction. The vehicle will be operated at speed which will allow it to be stopped within half the range of vision of another streetcar, stop signal, and switch not properly lined, track defect or obstruction. Safe separation of streetcars is assured through appropriate speed limits, visual observation of conditions, and operating rules and procedures
- Streetcars will move with traffic, obeying all traffic signals and controls. Speed will not exceed the legal speed of parallel traffic, but not to exceed 30 mph at any location. At signalized intersections, streetcars shall approach at speeds that will permit them to stop short of the point of conflict if the roadway is already occupied.
- The WRCL streetcars will be equipped with a Train to Wayside Communication (TWC) capability. The system will allow the streetcar operator to request specific routings at junction points and interface with traffic signals upon approach to certain intersections. The need for signal priority treatment, if any, will be developed as part of detailed operational analysis in conjunction with roadway design.
- Each WRCL streetcar will be equipped with a gong and a whistle to warn motorists and pedestrians who are in potential conflict. The gong will be used in residential and business districts where speeds are low. Use of whistle will be reserved for locations where the streetcars operate at or above 20 mph, but will be used for emergencies at any location.
- The WRCL streetcars will primarily travel in or semi-exclusive rights-of-way, and in non-exclusive mixed traffic and pedestrian malls.
- Pedestrian and bicycle interaction will be limited to operations within planned pedestrian malls and perpendicular crossings of the tracks at stations, key roadway or promenade links. Walking or riding parallel to the tracks will be restricted as necessary through passive control measures e.g. ballasted tracks.

Traffic Control

- Major roadways - on the high traffic volume roadways of the San Pedro Waterfront Project, including Harbor Boulevard, Sampson Way and 22nd Street, the WRCL streetcars will operate in a manner consistent with the adjacent roadway traffic flow. All crossings of these roadways or adjacent intersection approaches will be signalized and equipped with California MUTCD compliant 2-lens light rail transit signals (vertical = proceed and horizontal = stop) which will be coordinated with the roadway traffic signal. The transit signals will notify the operator of the upcoming signal phase. No crossing gates or crossbucks will be used.
- Passive signage appropriate for streetcar and traffic interface configuration will be provided to inform drivers, bicyclists, and pedestrians of the approach and presence of streetcar vehicles at grade crossings. **Figure 10-1** displays a number of MUTCD compliant traffic control devices relevant to a streetcar operating environment.
- Minor roadways – on the lower traffic volume crossings roadway traffic will be stop controlled yielding to streetcars. A combination of active and passive warning/signing devices will be identified appropriate with the crossing characteristics. No crossing gates or crossbucks will be used.

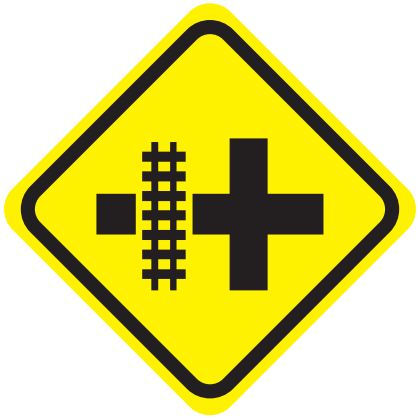
Table 10.1 summaries the recommended improvements at the various Red Car at-grade crossing locations along the four (4) Red Car extensons/ realignments identified for further study in Phase 2 of Red Car Expansion Feasibility Study, in conjunction with the preparation of the San Pedro Waterfront Project EIR.

The four San Pedro extensions include a total of eighteen (18) crossings locations that will require traffic interface treatments. The treatments recommended at each location were based on a qualitative and quantitative evaluation of existing and projected traffic demand and pedestrian activity, the geometric configuration of the intersection/at-grade crossing and how the streetcar crosses each intersection. In general, the higher volume intersections will require traffic and transit signalization, with restricted movements when the streetcar is crossing the intersection. In locations where the streetcar must cross through the center of the intersection, a dedicated signal phase will be required. For low volume intersections, other warning equipment without traffic signalization will be required.

The recommended improvements identified for the at-grade crossing locations will ensure safe operating conditions for the streetcar, motorists and pedestrians. These recommendations will be subject to change as the project evolves further.

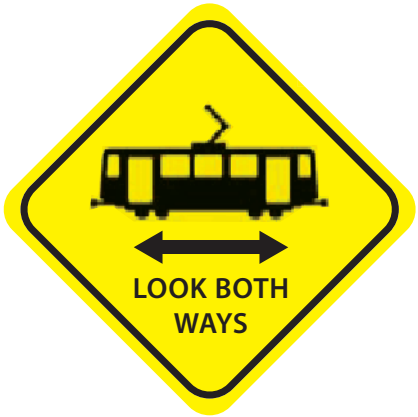
R10-6

W10-1
Advanced
Warning Sign



W10-2
Advanced
Warning Sign

W10-7
Activated
Blank-Out



W82-1

SOURCE: Wilson & Company, Inc, Engineers & Architects; September 2008

Figure 10-1
MUTCD Compliant
Streetcar Traffic Control Devices

Table 10.1
Summary of Recommended WRCL
At-Grade Crossing Improvements
San Pedro Waterfront Extensions

Intersection	Current Control	Proposed Control	Crossing Location	Recommended Improvements
Harbor Boulevard/Sampson Way Realignment				
Harbor Boulevard/ O' Farrell Street Pedestrian Crossing	Signal	Signal	N/A	• There would be no conflicts between the streetcar and vehicular traffic at this location, therefore no improvements are recommended
Harbor Boulevard/ 1St Street	Signal	Signal	East Leg	• Install advanced warning signings • Install two-lens light rail transit signal • Coordinate the traffic signal with the transit signals so that the streetcar will cross the east leg of the intersection with the northbound/southbound through phases along Harbor Boulevard • Install a northbound right-turn red arrow • Restrict westbound right-turns on red.
Harbor Boulevard/ 3rd Street	One-Way EB Stop	Signal	East Leg	• Signalize intersection • Install advanced warning signing • Install two-lens light rail transit signals • Coordinate the traffic signal with the transit signals so that the streetcar will cross the east leg of the intersection with the northbound/southbound through phases along Harbor Boulevard • Install a northbound right-turn red arrow • Restrict westbound right-turns on red.
Harbor Boulevard/ 5th Street	Signal	Signal	East Leg	• Install advanced warning signing • Install two-lens light rail transit signals • Coordinate the traffic signal with the transit signals so that the streetcar will cross the east leg of the intersection with the northbound/southbound through phases along Harbor Boulevard • Install a northbound right-turn red arrow • Restrict westbound right-turns on red.
Harbor Boulevard/ 6th Street	Signal	Signal	East Leg	• Install advanced warning signing • Install two-lens light rail transit signals • Coordinate the traffic signal with the transit signals so that the streetcar will cross the east leg of the intersection with the northbound/southbound through phases along Harbor Boulevard • Install a northbound right-turn red arrow • Restrict westbound right-turns on red.
Harbor Boulevard/ 7th Street	Signal	Signal	N/A	• There would be no conflicts between the streetcar and vehicular traffic at this location, therefore no improvements are recommended
Sampson Way/Nagoya Way (Ports O'Call North Driveway)	All-Way Stop	N/A	East Leg	• Driveway and crossing location recommended to be closed

Table 10.1
Summary of Recommended WRCL
At-Grade Crossing Improvements
San Pedro Waterfront Extensions

Intersection	Current Control	Proposed Control	Crossing Location	Recommended Improvements
Sampson Way/ Ports O' Call Middle Driveway	Three-Way Stop	Signal	East Leg	• Signalize intersection • Install advanced warning signing • Install two-lens light rail transit signals • Coordinate the traffic signal with the transit signals so that the streetcar will cross the east leg of the intersection with the northbound/southbound through phases along Sampson Way • Install a northbound right-turn red arrow • Restrict westbound right-turns on red.
Sampson Way/Ports O' Call South Driveway	All-Way Stop	Signal	Mid Intersection	• Signalize intersection • Install advanced warning signing • Install two-lens light rail transit signals • Coordinate the traffic signal with the transit signals so that the streetcar will get its own crossing phase
Sampson Way/Crescent Avenue	N/A	Signal	West Leg	• Signalize intersection • Install advanced warning signing • Install two-lens light rail transit signals • Coordinate the traffic signal with the transit signals so that the streetcar will cross the west leg of the intersection with the northbound/southbound through phases along Sampson Way • Install a southbound right-turn red arrow • Restrict eastbound right-turns on red.
Cabrillo Beach/Marina Extension				
22nd Street/ Park Driveway	N/A	Signal	North Leg	• Install traffic signal • Install advanced warning signing • Install two-lens light rail transit signals • Coordinate the traffic signal with the transit signals so that the streetcar will cross the north leg of the intersection with the eastbound/westbound through phases along 22nd Street • Install a southbound right-turn red arrow. • Restrict southbound right-turns on red.
22nd Street/Via Cabrillo	Signal	Signal	West Leg	• Install advanced warning signing • Install two-lens light rail transit signals • Coordinate the traffic signal with the transit signals so that the streetcar will cross the west leg of the intersection with the westbound left-turn phase of the signal • Restrict eastbound right-turns on red at the intersection
Shoshonean Road/Aquarium Service Driveway	One-Way SB Stop	One-Way SB Stop	North Leg	• Install a combination of active and passive warning signs

Table 10.1
Summary of Recommended WRCL
At-Grade Crossing Improvements
San Pedro Waterfront Extensions

Intersection	Current Control	Proposed Control	Crossing Location	Recommended Improvements
Outer Harbor/Cruise Ship Terminal Extension				
Miner Street/22nd Street	Signal	Signal	Mid Intersection	• Install advanced warning signing • Install two-lens light rail transit signals • Coordinate the traffic with the transit signals so that the streetcar will cross the north leg of the intersection with the eastbound/ westbound through phases along 22nd Street and the streetcar will get its own phase to cross through the middle of the intersection when accessing the Cruise Ship Terminal Extension • Install a westbound right-turn red arrow
Miner Street/Marina Parking Driveway #1	N/A	One-Way EB Stop	Center Of Roadway	• Signalize Driveways 2 and 5. • Install advanced warning signing • Install two-lens light rail transit signals at the two signalized driveway intersections • Coordinate the traffic signals at Driveways 2 and 5 with the transit signals so that the streetcar will cross though the center of the intersection with the northbound/southbound through signal phases along Miner Street
Miner Street/Marina Parking Driveway #2	N/A	Signal	Center Of Roadway	
Miner Street/Marina Parking Driveway #3	N/A	One-Way EB Stop l	Center Of Roadway	
Miner Street/Marina Parking Driveway #4	N/A	One-Way EB Stop	Center Of Roadway	
Miner Street/Marina Parking Driveway y #5	N/A	Signal	Center Of Roadway	
City Dock No. 1 Extension				
Sampson Way/Signal Street	N/A	Signal	North Leg	• Signalize intersection • Install advanced warning signing • Install two-lens light rail transit signals • Coordinate the traffic signals with the transit signals so that the streetcar will cross the north leg of the intersection with the westbound left-turn phase of the signal • Install on westbound right-turn red arrow • Restrict southbound right-turns on red.
Signal Street/22nd Street	All-Way Stop	All-Way Stop	East Leg	• Install a combination of active and passive warning signs
Signal Street/Signal Place	One-Way WB Stop	All-Way Stop	East Leg	• Install stop signs • Install a combination of active and passive warning signs
Signal Street/Admiral Higbee Way	N/A	NB/SB Stop Sign	Mid Intersection	• Install a combination of active and passive warning signs

Source: Wilson & Company; August 2008

11.0 Conceptual Implementation Program

11.0 CONCEPTUAL IMPLEMENTATION PROGRAM

The Red Car has been identified as a key component of the waterfront redevelopment program, providing opportunities to enhance access to the waterfront and "pedestrian scale" travel linkages between waterfront activity centers. Waterfront master plans envision a variety of new and enhanced venues providing promenades, plazas, entertainment, and educational facilities, with the Red Car as a key feature.

The purpose and need assessment identified key service objectives for each of the proposed extensions, as well as their supportive role in promoting overall waterfront redevelopment. The engineering feasibility assessment shows that while each of the extensions will have a number of design challenges; overall all of the extensions are feasible and can be successfully implemented.

Should POLA decide to proceed with an expansion of the Red Car system, the pace and timing of waterfront redevelopment should logically dictate a strategic approach to implementation of the various Red Car extensions, commensurate with funding and redevelopment activity.

POLA has initiated the EIR process for the San Pedro Waterfront Project which includes the proposed San Pedro Red Car extensions (excluding a Downtown San Pedro extension) as part of the project description. The Wilmington Red Car extension, with a set aside for a Red Car right-of-way, has been included in the Waterfront Redevelopment Project EIR which was certified by the Board of Harbor Commissioners in June 2009. The proposed North Gaffey Red Car extension has not been environmentally assessed as of this time. Additionally, the 2007 buyout of Westway Terminal (the last remaining rail freight customer in San Pedro) will soon provide the opportunity for POLA to abandon all freight trackage in San Pedro. It is recommended that POLA pursue formal abandonment of this trackage, physically disconnecting it from the General System of Railway Operations. In addition to facilitating implementation of several Waterfront projects, formal abandonment would eliminate the additional regulatory burden of a Federal Railroad Administration shared use agreement for the San Pedro Red Car extensions.

Therefore, it is recommended that POLA initiate a phased approach toward implementation of the expanded Red Car system consistent with and in support of the respective waterfront redevelopment programs. The initial phasing of extensions should focus both on serving existing waterfront activity centers and supporting the near-term waterfront master planning activities. Follow-on phases should focus on expanding service to the redeveloped San Pedro and Wilmington waterfronts, and as such would likely be triggered by specific redevelopment activity.

The following implementation program has been prepared to illustrate a potential phasing scheme tied to the respective waterfront redevelopment programs for POLA to consider. While the proposed program is shown as comprising three (3) phases – Immediate/Near Term, Mid-Range, and Longer Range – other staging options and variations are possible. It is recognized that the Port will want to maintain the flexibility to modify and implement the Red Car expansion program in response to funding availability and actual on-the-ground redevelopment activity.

The phasing must also facilitate the transition from operation in a shared use freight corridor into a more typical urban streetcar environment by initially constructing the lines not having any interaction with the freight railroad corridors (i.e. the San Pedro extensions). The resulting regulatory process will be greatly simplified, thereby facilitating project implementation.

Red Car Phase 1 Expansion (Immediate/Near Term Action Program

Service Objectives: Realign the existing Harbor Boulevard/Sampson Way Red Car line as a key element of the enhanced roadway project.

Key Expansion Components: The initial expansion program is structured to realign the existing Red Car line consistent with the on-going Sampson Way project. The proposed Phase 1 program includes the realignment/upgrade of the existing Red Car line as a key element of the realigned Harbor Boulevard and Sampson Way. In addition, it is proposed to initiate the stakeholder/community outreach and coordination efforts to further study the potential expansion into Downtown San Pedro.

Key components of the Phase 1 program include:

- Harbor Boulevard/Sampson Way Realignment
- Downtown San Pedro Extension Alignment Studies (See Appendix)

Figure 11-1 depicts the Phase 1 program resulting in the realignment and enhancement of the existing 1.5 mile Red Car line.

Costs: Capital costs and annual operation and maintenance costs associated with the Red Car Phase 1 expansion program are summarized in **Table 11.1**.

Table 11.1
Red Car Phase 1 Expansion Program
Capital and O&M Costs (2009 $'s)

Capital Costs	Cost
Line Extensions	
Harbor Boulevard/Sampson Way Realignment (1.54 miles)	*$26.35 M*
1 New Vehicle @ $1.25 M each; (Modifications to 2 existing vehicles @<$1.25M)	$3.75 M
Total Capital Costs	**$30.10 M**
Downtown Extension Approval/Alignment Studies	**$0.75 M**
System Operation & Maintenance Costs (Annual)	**$1.80 M**

Source: Wilson & Company, March 2009

SOURCE: Wilson & Company, Inc, Engineers & Architects; February 2009

THE PORT OF LOS ANGELES

WILSON & COMPANY ENGINEERS & ARCHITECTS

Waterfront Red Car Line Extension Feasibility Report

Figure 11-1
Phased System Expansion

Service Objectives: Expand the WRCL system to serve other existing waterfront activity centers, support near-term waterfront master planning activities in San Pedro, and support expansion of cruise ship operations to the Outer Harbor.

Key Expansion Components: The mid-range expansion program is structured to primarily support the San Pedro Waterfront Project and EIR Project Description, with a specific focus on accommodating existing and near-term travel needs/demands/facilities. The proposed Phase 2 program includes the extension of the line to Cabrillo Beach and the Outer Harbor and also includes a new WRCL Maintenance Facility at the SP Yard, and a Red Car Museum at a location in Wilmington.

Key components of the Phase 2 program include:

- Cabrillo Beach/Marina Extension
- Outer Harbor Extension
- New Maintenance Facility at the SP Yard
- New Red Car Museum in Wilmington

Figure 11-1 depicts the recommended Phase 2 program resulting in a 3.85 mile Red Car system.

Costs: Capital costs and annual operational and maintenance costs associated with the Red Car Phase 2 expansion program are summarized in **Table 11.2**.

Table 11.2
Red Car Phase 2 Expansion Program
Capital and O&M Costs (2009 $'s)

Capital Costs	Cost
Line Extensions	
Cabrillo Beach/Marina Extension (1.38 miles)	*$22.43 M*
Outer Harbor Extension (0.83 miles)	*$14.33 M*
New Maintenance Facility	$8.87 M
Museum Facility	$3.44 M
5 Vehicles @ $1.25 M each (8 vehicles total)	$6.25 M
Total Capital Costs	**$55.32M**
System Operation & Maintenance Costs (Annual)	**$2.90 M**

Source: Wilson & Company, March 2009

Service Objectives: The Phase 3 expansion program is structured to support the overall build-out of the Waterfront Red Car system, including on-going development of the San Pedro and Wilmington waterfronts, linkage of Downtown San Pedro with the waterfront, as well as furthering the efforts of the previous expansion alignments.

Key Expansion Components: This phase will support redevelopment activity along the Wilmington waterfront, Northwest San Pedro, City Dock No. 1, and in Downtown San Pedro. The Red Car would provide an important regional transportation linkage between Wilmington and San Pedro. It would further support the Wilmington Waterfront Development Program and associated redevelopment activities by providing an attractive and environmental friendly mode of transportation between the two communities.

It is anticipated that the follow-on studies for extending Red Car service into Downtown San Pedro would continue with EIR/EIS documentation, design and construction. Additionally, it is anticipated that the northern extension along Gaffey Street will be coordinated with the future retail and commercial developments in that area. Additionally, the extension to serve City Dock No. 1 and the Warehouse One area will be coordinated with the adaptive reuse of Warehouse One and redevelopment of the adjacent Westway Terminal site.

Key components of the Red Car Phase 3 expansion program include:

- Wilmington Extension
- Downtown San Pedro Extension
- City Dock No. 1 Extension – triggered by adaptive reuse of Warehouse One, the Signal Street warehouses, and redevelopment of the Westway Terminal site.
- North Gaffey Extension – triggered by redevelopment of supporting commercial land uses along the North Gaffey corridor.

Figure 11-1 illustrates the resulting 9.3 mile Red Car system upon completion of the Phase 3 expansion program.

Costs: Capital and annual operating and maintenance costs for the Phase 3 Red Car system are summarized in **Table 11.3**.

Table 11.3
Red Car Phase 3 Expansion Program
Capital and O&M Costs (2009 $'s)

Capital Costs	Cost
Line Extensions	
North Gaffey Extension (0.75 miles)	*$6.88 M*
City Dock No. 1 Extension (0.71 miles)	*$9.14 M*
Wilmington Extension (3.0 miles)	*$44.26 M*
Downtown San Pedro Extension (0.5 to 1.5 miles)	*$18.37 M*
9 Additional Vehicles @ $ 1.25 M each (17 vehicles total)	$11.25 M
Total Capital Costs	**$89.90 M**
System Operation & Maintenance Costs (Annual)	**$5.90 M**

Source: Wilson & Company, March 2009

12.0 Funding Opportunities

12.0 FUNDING OPPORTUNITIES

POLA constructed the current Red Car line using Port funds, and is also supporting the ongoing operation and maintenance of the line. The following sections explore other potential funding sources for both capital and on-going operations and maintenance of an expanded Red Car system.

12.1 Capital Expenditures

Depending upon how the Port proceeds on implementing an expanded Red Car system, capital cost requirements could range from approximately $85.0 Million in the near-term to $175.0 Million over the longer-term. Given the magnitude of these costs and the potential expanding role of the Red Car as the San Pedro and Wilmington waterfront transit system, the Port will want to investigate funding partnerships with other agencies and potential private developers.

The funding of capital costs requirements can take a number of avenues, both traditional and innovative as follows:

1. Federal Funding Programs
2. Regional Funding Programs
3. Redevelopment Partnerships
4. Private Sector Joint Development
5. Tax Improvement Districts

Red Car operating along the Cabrillo Beach Extension.

Federal Funding Programs

Transportation planning for Los Angeles County at the regional level is the responsibility of the Southern California Association of Governments (SCAG) which is the designated Metropolitan Planning Organization for the six county region, including Imperial, Orange, Riverside, San Bernardino, Ventura, and Los Angeles counties. The Los Angeles County Metropolitan Transportation Authority (Metro), Caltrans, the Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA) all manage several funding programs for implementing and expanding transit systems of various scales. Recommended projects and programs are submitted to SCAG for inclusion in the Regional Transportation Plan (RTP). Only projects and programs included in the RTP are eligible for federal funding.

One key program with the potential to help fund the initial Red Car capital costs would be the Federal Transit Administration (FTA) Small Starts program. The FTA previously provided New Starts program funding to build streetcar projects in New Orleans, Louisiana, Little Rock, Arkansas, Tampa, Florida and Memphis, Tennessee in the late 1980s up to the early 2000s utilizing vintage or heritage streetcars. Portland, Oregon, Tacoma, Washington and Seattle, Washington have built modern streetcars relying on non-New Starts monies. Each of these projects represents lower cost transportation solutions while attracting economic development far exceeds the cost to construct the project. Their success resulted in the introduction of H.R. 1315, the Community Streetcar Development and Revitalization Act, by Congressman Earl Blumenauer in March 2003.

The provisions of H.R. 1315 were folded into the Small Starts program, which was proposed by the Bush Administration, supported by both the House and Senate and included in the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) that was adopted by Congress in August 2005. However, the initial hope that Federal funding would be available for streetcars following the passage of SAFETEA-LU was largely dashed. With the advent of a new administration in Washington, public attention has once again turned to funding streetcar projects.

The Community Streetcar Coalition (of which POLA is a member) has developed the following recommendations for how the 111th Congress and the Obama Administration can change the direction of the Small Starts program and fulfill Congressional. The Coalition has recommended the following changes and is working with members of Congress and the administration on their implementation:

- Adopt a multiple measure approach that provide "comparable but not necessarily equal" consideration to public transit supportive land use, economic development and cost effectiveness.
- Recognize that streetcar projects are not focused on "travel time savings" but do substantially impact land use and economic development by developing flexible weighting of Small Starts projects to allow the intended range of projects to be funded through this program.
- Eliminate the Very Small Starts program, which is not in the current statute, and establish a policy that allow lower cost streetcar projects to advance under the current "exempt" category for projects seeking less than $25 million in Small Starts monies.
- Eliminate the need for a Baseline alternative and use only the No Build alternative as a way to greatly reduce project costs.
- Eliminate the modal bias in the FTA established eligibility requirements for the Small Starts program that favors bus rapid transit projects.

Beyond these initial changes, the Coalition continues to build its case for why there should be federal funding for streetcars, and is also working on the development of a separate program for funding streetcar projects. It is recommended that POLA continue its membership in the Community Streetcar Coalition and have staff keep up to date with related developments.

Regional Funding Programs

Metro is the designated regional Transportation Planning Agency for Los Angeles County with authority to program regional transportation funds in Los Angeles County. Metro is legally authorized to administer the two voter-enacted local sales tax initiatives – Proposition A and Proposition C. These sales taxes flow directly to Metro to be used by Metro or programmed to other agencies.

Metro also prepares the 5-year Los Angeles County Transportation Improvement Program (TIP). A key component of TIP is the Call for Projects program, a competitive process that distributes discretionary capital transportation funds to regionally significant projects. There are eight modal categories that are funded through Metro's Call for Projects program which occurs every other year. The Transit Capital modal category provides funding for transit centers, transit vehicles and transit equipment purchases.

Redevelopment Partnerships

Locally within the San Pedro and Wilmington waterfront area, there are several opportunities outside of traditional funding sources that could be tapped with the objective of forming funding partnerships between the Port and its neighbors. Two key partners that can help further the expansion of the Red Car are the Los Angeles Community Redevelopment Agency (CRA) and the local Chamber of Commerce. These two entities can provide the local leadership and support to foster partnering opportunities between the Port and the redevelopment efforts occurring adjacent to Port properties.

The CRA has two redevelopment program areas that would potentially be served by future Red Car extensions, including the Beacon and Pacific Corridor redevelopment areas. These two areas generally span the area from the intersection of John. S. Gibson Boulevard and Channel Street south to the vicinity of 22nd Street. These two program areas could provide partnering potential

specifically for the extensions into downtown San Pedro, Wilmington, Gaffey Street, and the system spine along Harbor Boulevard. As redevelopment occurs, particularly in these extension areas, there will be opportunities for project developers to sponsor or construct stations or related features of the Red Car expansion. The CRA, as well as the Chamber of Commerce, could also take a lead role in being a Red Car ambassador, providing a non-Port advocate in advancing the Red Car system expansion.

Private Sector Joint Development

Private sector joint development opportunities can be a method to help fund the Red Car extensions especially in areas outside of the Harbor District. Opportunities include downtown San Pedro, Wilmington and along North Gaffey Street as these extensions have adjacency with private non-POLA property.

Within downtown San Pedro, there are several private sector joint development opportunities, including development of stations and off-street parking facilities. Within the Wilmington and North Gaffey extension areas, there are several areas where vacant land is available adjacent to the proposed alignment, offering potential joint development opportunities.

Joint development can be fostered through Transit Oriented Development (TOD) land use policies that encourage and enable transit specific land development and pedestrian connectivity to occur along a transit line, particularly at the stations. Each station has an area of influence – typically within 2,000 feet from the station location. Within that area of influence, typically the pedestrian and bicycle environment is enhanced, the land development density is increased while encouraging a mix of land uses that foster and support reducing the need to travel long distances to shop and run errands.

Tax Improvement Districts

Under this option, assessment districts are formed to provide specific services or benefits to property within the assessment district boundaries. This program enables levy of a special property tax within a designated area and for specifically designated purposes. The tax levy could be applied to all properties or just specific uses. This could be an option for the extension of the Red Car into downtown San Pedro, wherein a special improvement district could be designated, and generated tax revenues used to support the Red Car expansion. It would need to be demonstrated that the Red Car would provide benefits to the district in terms of improving access, reducing parking requirements, and overall support of redevelopment efforts.

12.2 Funding of Operations and Maintenance

Transit systems in general do not collect enough fare box revenue to completely cover operation and maintenance expenses. The country's largest rail transit system, the New York City subway system, collected 67% of its costs in 2002, the highest rate of any US transit provider. Other large rail transit systems ranged between 15% and 61% farebox recovery.

The current Red Car operation only sells one dollar all-day passes, and operates free during all special events, collecting less than 1.5% of its estimated operating expenses. The farebox recovery ratio for the expanded Red Car system will be a function of the overall implementation strategy,

coupled with ridership, fare structure, and the success of partnerships with local hotels, merchants

and attractions to sell Red Car passes. For planning purposes, a 20% farebox recovery ratio would be a reasonable target given a significant percentage of free operations to support waterfront special events.

Currently POLA covers all operating and maintenance expenses associated with the Red Car. Depending upon how the Port proceeds on implementing an expanded Red Car system, annual operating and maintenance costs could range from $2.9 million in the near-term to $5.9 million over the longer-term. Given the magnitude of these costs, POLA should identify and take advantage of opportunities to supplement farebox revenue for an expanded and successful Red Car system. Examples for further consideration include the following:

Tampa, Florida is among the many systems that realize revenue from vehicle advertising

- Advertising & Sponsorships

Station area and vehicle advertising is a commonly employed revenue enhancement for transit operations, and is often a popular way for area merchants to advertise their businesses. Smaller systems often handle advertising "in house" while larger agencies typically contract with national marketing firms to facilitate the sale of advertising. An example of a vintage trolley system in which advertising plays a prominent role is in Tampa. HartLine (the local transit operator) has a dedicated marketing department that continuously reaches out to the Chamber of Commerce, area businesses and residential developments to further the success of the streetcar operation.

- Naming Rights

Several vintage trolley and modern streetcar systems realize significant income through the sale of naming rights. Examples range from company names placed on vehicle exteriors in Portland to the entire system in Tampa being named for a local utility company.

- Passes

Selling "Multi-Day" or "Annual" passes instead of only per-ride fares has the potential to increase ridership, while at the same time encouraging regular use of the system. Many systems sell passes through local partners ranging from area hotels to the Chamber of Commerce. The wealth of cruise/hotel packages sold in San Pedro also presents an excellent opportunity to incorporate Red Car passes.

• Charters & Special Operations

Many systems allow vehicles to be chartered on an hourly basis, providing transportation for private groups to various destinations, or simply a novel setting in which to have private celebrations.

• Fare Validations

A validation program for area visitors to have San Pedro and Wilmington merchants and restaurants to help pay for the Red Car fare through the purchase of goods or services at the waterfront establishments. This concept can provide an additional method to support the "park once" philosophy, while encouraging area businesses to support and invest in the Red Car system.

13.0 Regional Interface Opportunities

13.0 REGIONAL INTERFACE OPPORTUNITIES

An important objective associated with expansion of the Red Car system will be identifying opportunities to connect with other transit projects, thereby enhancing ridership, partnering on project development opportunities, as well as cost sharing. This chapter documents other existing and planned transit services in the San Pedro and Wilmington communities and assesses opportunities for coordination and potential joint development efforts with expansion of the Red Car system.The *WRCL Regional Interface Report* is included as **Appendix 5-1**.

13.1 System Interface Opportunities

Among the various interface opportunities for expansion of the Red Car, coordination with other local and regional transit facilities serving the San Pedro and Wilmington waterfront areas provides key opportunities to improve transit, increase ridership, share development costs, and mutually support common interests.

As discussed in the following sections, the waterfront area and adjacent communities are served by a wide variety of transit services, including local bus routes accessing and circulating within the communities, park-n-ride lots providing parking and access to commuter routes, and a number of express bus routes linking the communities with the broader Los Angeles region.

Existing Waterfront Transit Services

In addition to the Red Car Line, the San Pedro/Wilmington communities are currently served by a variety of Metro/MTA and LADOT transit services. **Figure 13-1** depicts the current transit services in the waterfront area.

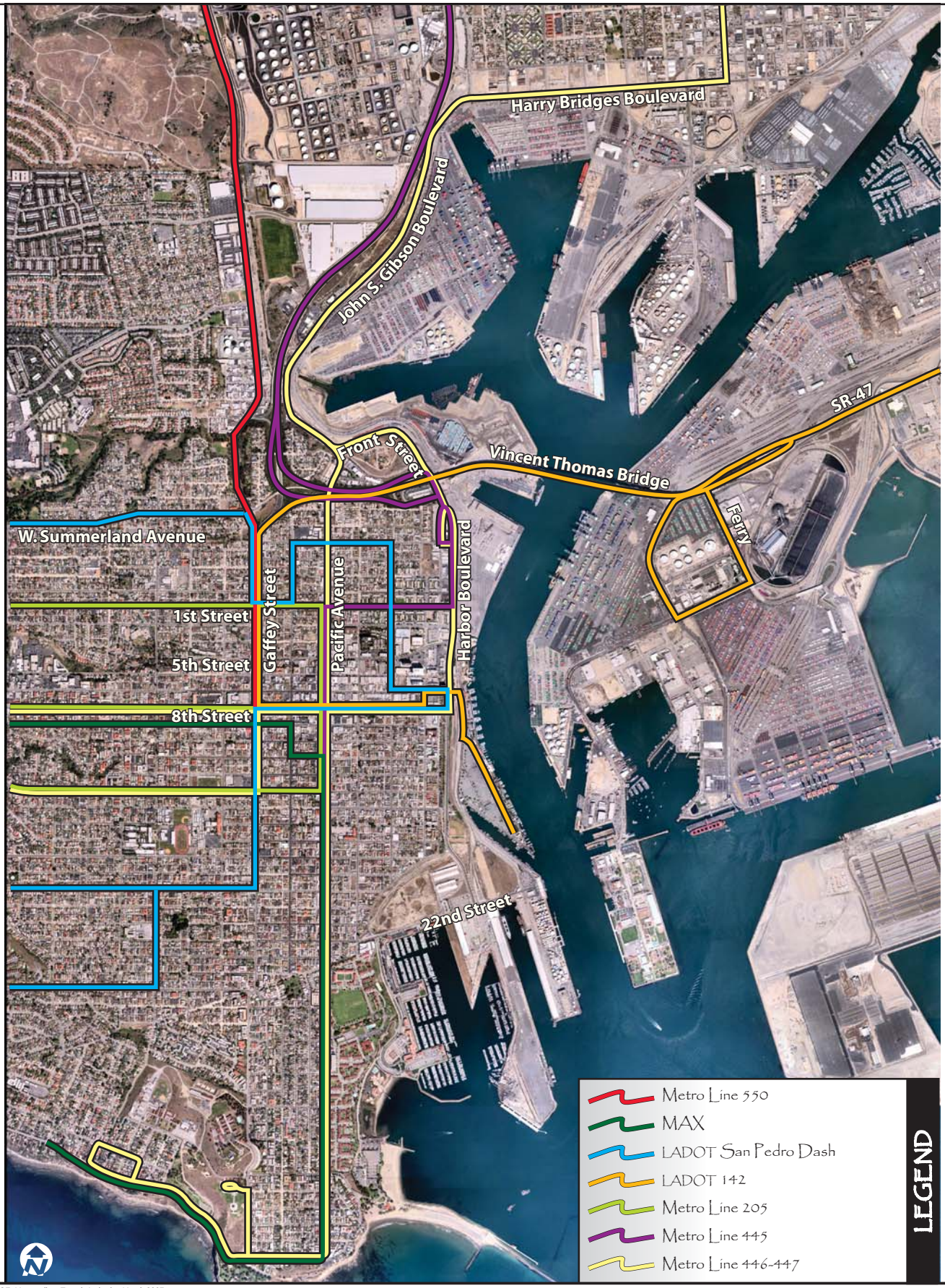
Metro/MTA Services

Metro/MTA operates five routes serving the San Pedro and Wilmington areas, including:

- 205 – Metro Local north/south
- 445 – Express between San Pedro and Union Station
- 446 – Express between San Pedro and Downtown LA/Union Station
- 447 – Express between San Pedro and Downtown LA/Union Station
- 550 – Express between San Pedro and West Hollywood

These routes generally operate with 30 to 60 minute headways, serving San Pedro, Wilmington and the Harbor-Beacon Park-n-Ride.The Harbor Beacon Park-n-Ride provides approximately 200 parking spaces. Currently, less than 10 percent of the parking spaces are occupied on a typical weekday.

Generally, the Metro/MTA routes serve longer trips, circulate within and make a variety of stops within the communities, with connectivity to the regional transit system through Union Station. There is agency interest in removing the larger Metro buses from the narrow San Pedro streets and having DASH service take over some of the local circulation functions.



SOURCE: Metropolitan Transit Authority; March 2007

THE PORT OF LOS ANGELES

WILSON & COMPANY ENGINEERS & ARCHITECTS

Waterfront Red Car Line Expansion Feasibility Report

Figure 13-1
MTA and LADOT Transit Service in San Pedro/ Wilmington Area

LADOT Service

LADOT provides shorter distance Commuter Express and DASH transit service for the San Pedro and Wilmington areas, including:

- Commuter Express 142 – Service between San Pedro, Terminal Island and Long Beach.
- DASH – San Pedro
- DASH – Wilmington

The two DASH lines serve local circulation needs within the San Pedro and Wilmington areas. These routes generally have 15 to 20 minute headways Monday through Friday and 15 to 30 minute headways on Saturday. The DASH – Wilmington does not operate on Sundays. DASH fares are not transferable to MTA transit services.

LADOT completed a city-wide study of all community DASH bus routes in 2005. Among the findings were recommendations for the addition of several new routes, including a second DASH route for San Pedro. In comparison with other planned routes, the route was highly ranked 5, but due to overall budget constraints, lacks funding at the current time.

MAX Service

Municipal Area Express (MAX) operates three bus routes between El Segundo and the San Pedro/ Ranchos Palos Verdes area.

Red Car Local Interface Opportunities

Local interface opportunities for the Red Car include efforts to promote the development of a downtown San Pedro transit center, coordination with other local transit services, efforts to increase parking for both the downtown and waterfront areas, and the on-going update to the local San Pedro Community Plan. Each of these opportunities are discussed in the following sections.

Downtown Transit Center

The downtown San Pedro area has more existing transit services than other parts of the proposed Red Car Line system, providing multiple opportunities to link with other transit service and regional locations. A majority of the routes converge is in the area of 7th and Pacific Streets, with transfer activity occurring between routes.

Plans to redevelop San Pedro's downtown core over the past decade have included a bus transit and mixed-use center with public parking as a key part of the downtown land use mix. In 1999 the CRA and the Metropolitan Transit Authority (MTA) completed a study identifying the need to establish a downtown San Pedro transit center, titled the Downtown San Pedro Transit Hub Mixed Use Development Study. The facility was envisioned to provide a focal point for San Pedro area transit users and visitors from the greater Los Angeles area and intended to facilitate the transfer between local circulator services, regional bus routes and commuter services. Establishment of a transit center serving the San Pedro area was also recommended in the South Bay & Gateway Transit Restructuring Study co-funded by the MTA and LADOT, noting that the area is a terminus of eight regionally significant bus routes.

In recent years, there have been a number of efforts to develop such a transit center in downtown San Pedro. Following a 1999 City of Los Angeles and MTA restructuring study, the Community Redevelopment Agency (CRA) received a grant for $2.5 million in funding from the MTA to

study a San Pedro transit center. CRA focused on a number of alternative sites in downtown San Pedro, but in each case, the project was not constructed due to other property owner interests in developing the properties, and the funding was subsequently reprogrammed.

Other possible transit center locations given previous consideration include the Harbor Beacon Park-n-Ride lot located near the World Cruise Terminal on San Pedro's waterfront (would put it close to the freeway but away from residential streets) and property on the southwest corner of Gaffey and Sepulveda streets near the end of the Harbor (I-110) Freeway.

Expansion of Downtown Parking

Recent development efforts in the San Pedro downtown area have identified additional parking as a necessary ingredient in the redevelopment process. The need for parking structures have been identified in the areas of 5th/Pacific Avenue, 8th/Pacific Avenue, 7th/Harbor Boulevard and at the Harbor Beacon Park-n-Ride. These parking structures could serve both downtown and waterfront visitors, with the Red Car providing the important linkage in between. This could reduce vehicle traffic along the waterfront and encourage more pedestrian access.

San Pedro Community Plan Update

The Los Angeles City Planning Department has initiated an update of the San Pedro Community Plan which will be completed in 2009. As a complementary and more focused activity, the City Planning Department is also conducting the Downtown San Pedro Design Study. The City Planning Department has identified the need for new mixed-use developments combining residential and commercial uses, public parking structures, cultural venues, and a full-service grocery store as essential catalysts for downtown revitalization. This study is reviewing current and proposed downtown land uses and in conjunction with the Community Redevelopment Agency (CRA), is identifying opportunities for revitalization through redevelopment and related community enhancement activities.

Regional Interface Opportunities

Regional interface opportunities include linkages with other regional serving transit corridors and related planning activities underway by the MTA/Metro, including their bi-annual Call For Projects.

MTA/Metro Rail Planning

Metro is the regional planning agency for all of Los Angeles County, with responsibilities for developing and overseeing transportation plans, policies, funding programs, and both short-term and long-range solutions that address the County's mobility needs. The planning and implementation of new rail services throughout the County is conducted via the Metro rail program. A number of corridors are under study for future rail expansion to determine feasibility, alignment, and cost.

One such corridor with potential interface opportunities for the Red Car is the Harbor Subdivision Corridor. The Harbor Subdivision is a freight rail corridor, approximately 26 miles in length, that traverses southwest Los Angeles County from Downtown to Wilmington, via LAX. In the early 1990's, Metro purchased the portion of the corridor between Redondo Junction and Watson Yard, along with several other rail rights-of-way, to further the development of the region's rapid transit system.

Metro is in the process of conducting an Alternatives Analysis (AA) study for the Harbor Subdivision Transit Corridor. The study is examining potential transit service along the Metro-owned Harbor Subdivision. The study's goals include:

- Improving mobility in southwestern Los Angeles County by introducing high-capacity transit service options.
- Enhancing the regional transit network by interconnecting existing and planned rapid transit lines.
- Providing an alternative mode of transportation for commuters currently using the congested I-405 and I-110 corridors.
- Improving transit accessibility for residents of communities along the corridor.
- Encouraging a mode shift to transit, reducing air pollution and greenhouse gas emissions.

The Harbor Subdivision Alternatives Analysis (AA) was initiated in June 2008 and is currently in the process of screening viable alternatives for further more detailed engineering analysis. The study is scheduled to conclude in November 2009.

The Harbor Subdivision AA is evaluating a broad range of alternatives including Bus Rapid Transit (BRT) with dedicated bus lanes, various types of rail technology such as Light Rail Transit (LRT) and commuter rail, as well as "no-build" and Transportation System Management improvements. Through alternatives will generally follow the Harbor Subdivision corridor, potential alignment and improvement options outside the immediate Harbor Subdivision right-of-way are also being studied and include northern, LAX, and southern alignment options. Southern alignment options currently being evaluated include connections with San Pedro, including potential terminus locations at either Normandie/Gaffey/Harbor or the I-110 Freeway/Harbor. At the conclusion of the AA, Metro staff will recommend a course of action to the Metro Board, including possibly proceeding with an environmental document consistent with both federal and state requirements.

Figure 13-2 displays the study area for the Harbor Subdivision Transit Corridor. **Figure 13-3** displays the physical relationship between the Harbor Subdivision corridor and the proposed Wilmington extension of the Red Car and possible options for connecting the two.

Metro Call For Projects

Metro is responsible for allocating discretionary federal, state, and local transportation funds to improve all modes of surface transportation. Metro also prepares the Los Angeles County Transportation Improvement Program (TIP). A key component of the TIP is the Call for Projects program, a competitive process that distributes discretionary capital transportation funds to regionally significant projects.

Every other year (subject to funding availability), Metro accepts Call for Projects applications in seven modal categories. The Transit Capital modal category provides funding for transit centers, transit vehicles and transit equipment purchases. Local jurisdictions, transit operators, and other public agencies are encouraged to submit applications proposing projects for funding. Metro staff ranks eligible projects and present preliminary scores to the agency's Technical Advisory Committee (TAC) and the Board of Directors for review. Upon approval, the TIP is developed and formally transmitted to the regional and state transportation planning agencies. The TIP then becomes part of the five-year program of projects scheduled for implementation in Los Angeles County.

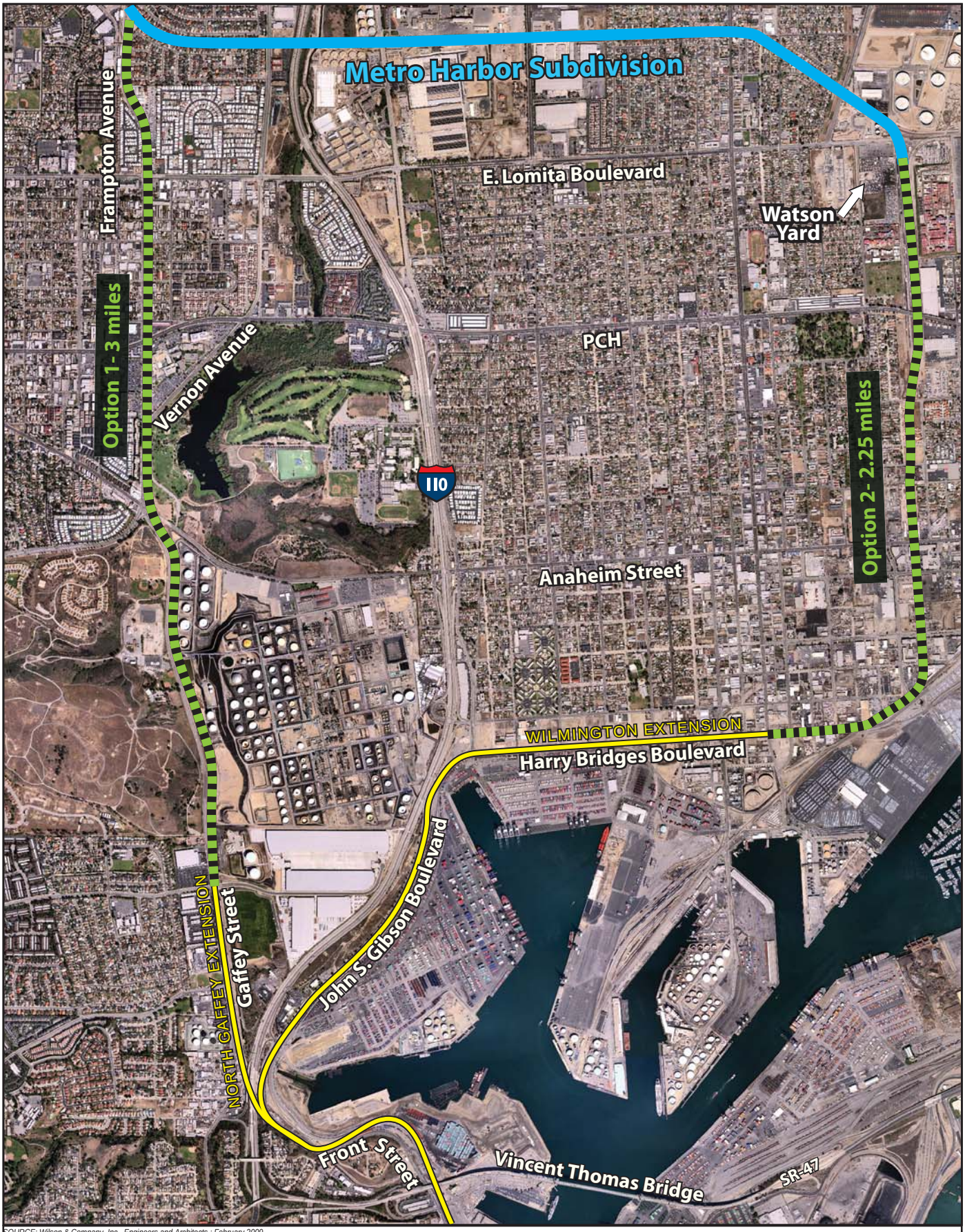
SOURCE: Metropolitan Transit Authority; March 2007

THE PORT OF LOS ANGELES

WILSON & COMPANY ENGINEERS & ARCHITECTS

Waterfront Red Car Line Expansion Feasibility Report

Figure 13-2
Harbor Subdivision
Study Area



SOURCE: Wilson & Company, Inc., Engineers and Architects ; February 2009

THE PORT OF LOS ANGELES

WILSON & COMPANY ENGINEERS & ARCHITECTS

Waterfront Red Car Line Expansion Feasibility Report

Figure 13-3
Potential Long Term Regional Connections

Prior to starting any work on a project, project sponsors are required to either execute a Letter of Agreement (LOA) for projects being funded with State or Federal funds, a Transit LOA, or a Memorandum of Understanding (MOU) for those funded with local sales tax dollars. They include a general description of the project and the specific work elements to be completed, the source of all funds that will be used to complete the project and project's cash flow.

Measure R

Measure R is a recently enacted sales tax increase to fund a wide variety of transportation projects throughout Los Angels County. The measure will rise up to $40 billion over the next 30 years to fund new highway, bus, and rail projects focused on congestion relief throughout the County. Rail projects include expansion of Metro rail and busway systems, acceleration of and improvement of existing rail and bus projects, and connection of Metro Rail to LAX. Other local public transportation projects supported through the measure will expand local bus connectivity, including express bus routes, local bus improvements and community circulators.

13.2 Focus For Future Interface and Coordination Activities

The various planning and design studies associated with the expansion of the Red Car system will require extensive and on-going coordination with other agencies and projects. A number of coordination activities were initiated during the conceptual planning phase of the project and should continue to be the focus for Port staff, as summarized below.

Local and Regional Transit Hub

The Downtown San Pedro Transit Hub Mixed Use Development Study discusses the Port's plans to redevelop the San Pedro waterfront and recognizes the opportunities a regional hub transit center would provide in linking incoming visitors with a Red Car line extension that would shuttle visitors to various destinations along the waterfront. By promoting a central location for regional transit connections, the transit center could help promote downtown and waterfront redevelopment by facilitating regional as well as local access.

Downtown Extension

Compared with the other Red Car extensions being considered, a downtown extension of the Red Car will require additional planning studies to identify and refine the various alignment alternatives, operating options, as well as vehicle types and station requirements. A significant amount of interagency coordination will be required, including coordination with the San Pedro Community Plan Update, CRA, and other downtown stakeholders. Due to the ongoing redevelopment activities in downtown, a Red Car extension also has great potential for partnerships with other public and private entities as the area seeks to the need for additional parking and other transportation related infrastructure improvements. The emergence of a strong project proponent or champion, be it an agency or individual, will also be important to move the project forward.

Waterfront Nexus

The primary implementation consideration for extension of the Red Car into the downtown area is the fact that the majority of the area is not POLA property. POLA is only able to expend Port funds within the Harbor District and/or projects which clearly benefit the Harbor District and related POLA development objectives. In order to justify the expenditure of POLA funds on a downtown San Pedro extension of the Red Car, it will be necessary to demonstrate the appropriate nexus to

the waterfront and related POLA objectives.

Discussions thus far have identified two possible means of establishing this nexus:

1. Red Car service to a downtown transit center
2. Red Car service to downtown parking structures available for waterfront visitors

In general, if a Red Car extension can be coupled with new parking facilities and / or a transit center in the downtown area, this could provide the Port with the necessary nexus to participate in and support implementation of a Red Car extension between the downtown and waterfront areas.

Downtown Redevelopment Activities

An extension of the Red Car Line into the downtown area would ideally provide and encourage a more seamless interface between the waterfront and downtown redevelopment activities. Downtown redevelopment and revitalization efforts have identified the need for public parking structures within the downtown area. In conjunction with the Red Car, these parking structures could promote the "park once" philosophy for both waterfront and downtown visitors.

Recent development efforts in the downtown area have identified additional parking as a necessary ingredient in the redevelopment process. The need for parking structures have been identified in the areas of 5th/Pacific Avenue, 8th/Pacific Avenue, 7th/Harbor Boulevard and at the Harbor Beacon Park-n-Ride. These parking structures could serve both downtown and waterfront visitors, with the Red Car providing the important linkage in between. This could reduce vehicle traffic along the waterfront and encourage more pedestrian access.

A transit center and new parking facilities coupled with a downtown San Pedro Red Car line extension would also facilitate the movement of visitors, cruise ship passengers, residents and Port employees between downtown and waterfront hotels, restaurants, businesses, attractions and waterfront events and festivals. (i.e. Lobster Festival, Tall Ship Festival, Rail Festival). Downtown revitalization and the establishment of a new transit center and new/enhanced parking facilities can foster shared parking opportunities for visitors to access the waterfront via an expanded Red Car system.

Metro/MTA Call For Projects

While the Metro has not offered its Call for Projects program in several years, the agency has re-started the program, providing the opportunity to pursue funding for a variety of facilities in support of an expanded Red Car system. The Port has recently submitted proposals for funding of the Red Car maintenances and museum facilities. Additionally, the downtown transit center and the Downtown Red Car extension are potentially ideal candidates for the program based upon the extent of benefits, variety of stakeholders, along with the aforementioned regional partnering and interface opportunities.

Metro Rail Planning

As noted previously, Metro is conducting the Harbor Subdivision Alternatives Analysis (AA) with the objective of identifying high-capacity regional transit services focused on the I-405 and I-110 corridors. The Red Car provides an ideal opportunity to expand the effectiveness of regional-level transit services by providing a more localized collection and distribution function along the waterfront. The Port should continue to coordinate with Metro in the conduct of this study and promote opportunities to link with the waterfront areas via the Red Car.

14.0 Key Findings, Conclusions, and Recommendations

14.0 SUMMARY OF KEY FINDINGS AND CONCLUSIONS

The Waterfront Red Car Line Expansion Feasibility Study has assessed the feasibility, benefits, and costs associated with extending Red Car service along seven (7) potential corridors serving both the San Pedro and Wilmington waterfronts and adjacent properties. The objective is to provide POLA with a concept program for expanding the system as a key element of the overall waterfront redevelopment program.

This section provides a brief synopsis of the key findings and conclusion of the study, as follows:

1. Along with detailed engineering, operational, and cost considerations, a set of goals for the Red Car expansion programs provided the basis for assessment of feasibility, benefits, and impacts associated with the potential Red Car line extensions. Identified goals include the following:

- Serve as a goodwill ambassador for the POLA and the waterfront communities, businesses, and attractions.
- Provide safe, reliable, enjoyable and environmentally friendly transportation for the thousands who visit the waterfront each year.
- Enhance local as well as regional access to the waterfront communities, businesses and attractions.
- Play a leading role in revitalizing the local business economy by enhancing the image of the waterfront as a tourist destination.
- Provide an essential element in implementing the San Pedro and Wilmington Waterfront Master Plans.

2. While service objectives, role in supporting waterfront redevelopment, and ridership potential will vary between the potential Red Car extensions, all were found to be beneficial in meeting the overall goals of the Red Car expansion program as listed above.

3. The costs of constructing and operating the various Red Car extensions will vary, as will the engineering challenges that will need to be addressed during design and construction. Estimated capital costs and associated costs for operating and maintaining the system would be in line with other systems built across the country in recent years.

4. Seamless integration into the waterfront environment will be necessary, both from an urban design perspective and from the perspective of being easy and convenient to use.

5. System expansion should incorporate replica streetcar vehicles with street level boarding capability. Future stations should incorporate low platforms which will be more compatible with surrounding land uses and less costly to construct.

6. A new Red Car Maintenance Facility is crucial to any expansion of the current system and will be best located in a manner central accessible to the balance of the system. A location in the SP Yard has been identified based upon initial studies.

7. A Red Car Museum provides an excellent opportunity to convey the history of the Pacific Electric Red Car and its role in shaping the San Pedro and Wilmington waterfronts. The Museum also provides an opportunity to synergistically promote waterfront redevelopment by linking with other historical resources.

8. Coordination with other waterfront infrastructure projects will be important. A significant portion of the Red Car "spine" could be constructed in conjunction with implementation of proposed new roadway alignments.

9. Enlisting project champions and building partnerships with other local agencies and civic/ business organizations will also be important, and can be a valuable source of both civic and financial support.

Based upon the *purpose and need assessment* and review of other successful streetcar projects across the country, it is clear that the expansion of the Red Car can play an important role in supporting POLA's efforts to create a world class waterfront with a variety of tourist and visitor venues. The renewed interest in strretcars across the country goes beyond nostalgia for a bygone era; streetcars are recognized for their ability to create pedestrian friendly environments and support redevelopment activity.

In conclusion, the Red Car provides an exciting opportunity to build something that will serve as a unique tourist venue while at the same time providing a viable form of transportation serving the many and varied waterfront activity centers.