SANTA CRUZ–LOS GATOS RAIL CORRIDOR FEASIBILITY STUDY

DRAFT FINAL REPORT

Prepared for

The Joint Policy Board

(Santa Clara County Transit District, the Santa Cruz County Regional Transportation Commission, and the Santa Cruz Metropolitan Transit District)

Prepared by

De Leuw, Cather & Company

In association with:
Arthur Bauer & Associates
Barton-Aschman Associates, Inc.
Engineering Science, Inc.
Moore Iacofano Goltsman
Woodward Clyde Consultants

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I INTRODUCTION

A. BACKGROUND

For several years there has been an interest in exploring the feasibility of instituting a modern passenger rail service alternative to the automobile in the Route 17 Corridor between Santa Cruz and the San Jose-Los Gatos area. This interest stems from the increasing traffic volumes and pressing safety issues on Route 17. In general, primary weekday commutes are to Silicon Valley worksites while weekend traffic is recreational and coast-bound out of the San Francisco Bay and San Joaquin Valley areas. Route 17, a four-lane highway, has already reached its theoretical peak-hour traffic volume capacity. Its steep grades, tight curves, and low sight distance characteristics create a facility with considerable safety concerns. All of these factors lead to congestion and delays, conditions frequently experienced by Route 17 travelers. The current Route 17 travel conditions, the existence of rail service between Santa Cruz and Felton, and a remnant of an abandoned rail line through the Santa Cruz Mountains suggests to many that passenger service could be readily instituted in the Corridor as a means of improving mobility between Santa Cruz and Santa Clara Counties.

In 1977, Caltrans conducted an initial reconnaissance, which explored the feasibility of rail service between Santa Cruz and San Jose in the Route 17 Corridor. The Santa Cruz County Board of Supervisors at that time expressed that an "over-the-hill" rail connection between Santa Cruz and Santa Clara Counties would be inconsistent with planning objectives of Santa Cruz County. However, the circumstances affecting the feasibility of instituting services have changed in the 17 years since Caltrans' study. Among the changes are definitive land use policies in Santa Cruz County, the commitment in Santa Clara County to construct the Vasona Light Rail Corridor from downtown San Jose to Route 85 in Los Gatos, and the increased flexibility and innovation in transportation funding. The 1994 General Plan and Local Coastal Program for Santa Cruz County establishes policy to support rail planning studies in the Santa Cruz-to-Los Gatos Corridor. Moreover, this Study is identified as an action element in the Fixed Guide-way/Rail Program of the Draft 1994 Santa Cruz County Regional Transportation Plan and a potential project in Santa Clara County's T2010 Rail Plan.

B. PURPOSE OF THE STUDY

The purpose of the Santa Cruz-Los Gatos Rail Feasibility Study is to assess, at the conceptual level, the feasibility of providing passenger rail service in the Route 17 Corridor between Santa Cruz and Los Gatos. It is intended to provide preliminary technical information from which it will be possible for the study's Joint Policy Board (JPB) to determine whether or not to proceed to the next phase of the project. The consultants retained to conduct the Study are not expected

to recommend a course of action to the JPB. That determination is exclusively the province of the JPB. If the JPB concludes that the project should progress, the next phase would be a more detailed engineering, economic and environmental analysis and a thorough comparison of rail service and other major transportation investment options in the Route 17 Corridor.

C. STUDY PROCESS

1. Introduction

The process established for the Santa Cruz-Los Gatos Rail Feasibility Study is very inclusive. An organizational structure that includes a policy board, comprised primarily of elected officials, provides guidance and direction to the study. A Technical Advisory Committee consisting of technical and key managerial staff from the participating public agencies in the Corridor review all documents prior to being considered by the policy board.

2. Joint Policy Board

The Study's eight-member Joint Policy Board (JPB) was established to oversee the Study, provide policy direction to the Study, and determine if any subsequent actions should be taken. Membership of the Joint Policy Board includes representatives from the Santa Cruz Metropolitan Transit District, the Santa Cruz County Regional Transportation Commission, and elected officials from the Santa Cruz County Board of Supervisors and from the cities of Scotts Valley and Santa Cruz. The Santa Clara County members include two county supervisors who are also members of the Santa Clara County Transit District, a city council member representing the Town of Los Gatos, and a representative of the Santa Clara County unincorporated area. Ex-officio members of the JPB include staff from the U.S. House of Representatives (15th and 17th Congressional Districts), staff from the California State Senate (11th and 15th Districts), staff from the California State Assembly (24th and 27th Districts), and a Deputy District Director from Caltrans District 4.

3. Technical Advisory Committee

Each agency which has a representative on the Joint Policy Board also has a key manager or a member of its staff participating on the Study's Technical Advisory Committee (TAC). The role of the TAC is to meet with the consultants on a monthly basis to review the status of the work in progress and any preliminary documents before they are forwarded to the JPB. The TAC also ensures that the methodologies being used by the consultants for the required analyses conform with accepted standards.

The Joint Policy Board and the Technical Advisory Committee meet monthly to review the status of the work and to provide comments on the project. It should also be pointed out that both the Policy Board's and the TAC's meetings conform with the opening meeting laws that local governments are expected to meet under state law.

4. Public Workshops

A requirement of the approved work program is that public workshops be held at specific points during the Study. To date, two workshops have been held. These workshops, held in Los Gatos and Scotts Valley, had as their objective to secure the public's response to the possibility of rail

transit through the Santa Cruz-Los Gatos Corridor, to possible alignment options, and to familiarize the public with the Study's objectives. The workshop format, a profile of the attendees, and a summary of the public comments are contained in the *Community Workshop and Open House Summary Report,* by Moore Iacofano Goltsman, June 1994.

One additional public workshop will be held to secure public reaction to the Draft Final Report.

D. STRUCTURE OF THE WORK PROGRAM

The work program is designed to develop, through a series of tasks, the information needed for the Joint Policy Board to determine preliminary project feasibility and to make a decision as to whether the next level of analysis is warranted. To this end, several steps were followed during the course of the study, including developing alternative conceptual alignments, estimating patronage, conducting an environmental scan, developing capital and operating cost estimates, assessing the availability of funding for implementing the project, and conducting public meetings.

E. GOALS AND OBJECTIVES

At the outset of the Study, an overall study goal and a list of accompanying task goals were established.

1. Study Goal

Assess at conceptual level the feasibility of providing passenger rail service in the Route 17 Corridor between Santa Cruz and Los Gatos.

2. Study Task Goals

a. Provide an opportunity for the public to express their interests or concerns regarding potential rail service between Santa Cruz and Los Gatos.

b. Determine the potential near-term patronage demand for rail transportation (both work trip and recreational trip) between Santa Cruz and Los Gatos/San Jose.

c. Define a feasible rail system including alignment concepts between Santa Cruz and Los Gatos, potential station locations, and technology. This rail system concept should be consistent with local transportation plans and land-use policies, and proposed plans for rail service between University of California Santa Cruz (UCSC) and Watsonville, and between Los Gatos and San Jose.

d. Identify environmental issues, impacts that should be either avoided or minimized, and potential impacts that cannot be reasonably avoided.

e. Estimate at concept level the capital and operating costs for a potential passenger rail system between Santa Cruz and Los Gatos.

f. Identify parallel bus service cost reductions and other savings associated with implementing passenger rail service between Santa Cruz and Los Gatos.

g. Identify potential operating revenues and capital and operating funding sources.

h. Set forth cost effectiveness and advantages and disadvantages of a potential rail line between Santa Cruz and Los Gatos.

i. Complete a report that contains findings and conclusions regarding project feasibility.

II CORRIDOR INVENTORY

A. INTRODUCTION

1. Purpose of Corridor Inventory

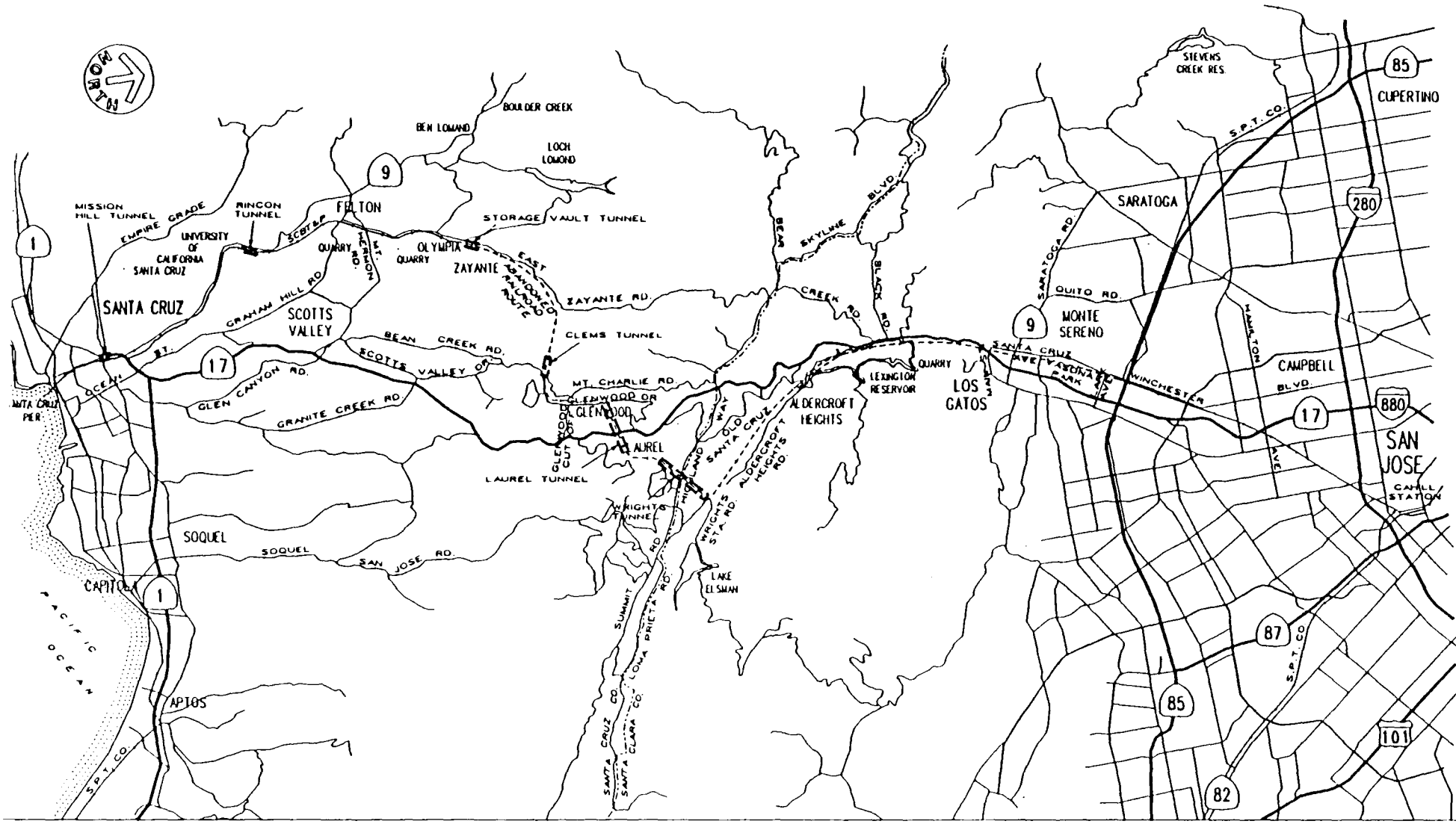
The purpose of this Corridor Inventory is to document the general existing conditions and characteristics of the Study area, shown in Figure 1. The Study area is defined as an area encompassing the Route 17 and the Historic Railroad Corridors between the City of Santa Cruz in Santa Cruz County and the Town of Los Gatos in Santa Clara County. The inventory contains information relevant to potential passenger rail transit concepts that are being considered at this feasibility study stage. To provide an historic perspective of the transportation routes within the Study area, a brief Corridor history follows.

2. Corridor History[1]

Since the founding of San Jose in the 1770s and Santa Cruz in the late 1790s, early transportation routes following the Ohlone Indian trails developed between these two cities. In 1791, the El Camino Real opened along an Ohlone trail between Mission Santa Cruz and Mission Santa Clara. Primitive dirt roads were built to connect the early logging camps in the Santa Cruz Mountains until improved dirt roads were built, some as toll roads, in the mid-1800s. By 1858, the new toll roads, including the Santa Cruz Turnpike along Mountain Charlie Road and the Santa Cruz Gap Turnpike along the Old Santa Cruz Highway, shortened stage travel to a one-day trip between San Jose and Santa Cruz. In the 1860s, the Santa Clara Turnpike from Soquel to the Summit and the Felton-to-Saratoga Turnpike were also built as toll roads. After the creation of the State Department of Highways in 1897 and the passage of the State Highway Act in 1909, a paved state roadway system that included the route through the Santa Cruz Mountains was planned. The Glenwood Highway, a paved road between Los Gatos and Santa Cruz, was completed in 1915 and upgraded in 1921. Construction of the modern four-lane State Highway No. 5, the Stockton-Oakland-Santa Cruz Highway, began in 1934. The route was renamed Route 17 and was opened in 1940.

The opening of the narrow gauge railroad from Oakland to Santa Cruz was accomplished by Comstock businessman James G. Fair in the late 1870s. First operated by the South Pacific Coast Railroad, the San Jose-to-Santa Cruz route was sold to the Southern Pacific Railroad in 1887. The "over-the-hill" railroad connected San Jose, Los Gatos, Wright's, Laurel, Glenwood,

[1]Historical information provided by William Wulf, Los Gatos Historian, 1994.



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ONE KILOMETER = .6 MILE

SANTA CRUZ - LOS GATOS RAIL FEASIBILITY STUDY FIGURE 1

STUDY AREA

De Leuw, Cather & Co. September 20, 1994

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Olympia, Felton, Rincon, and Santa Cruz. The line carried passengers, lumber, freight, and agricultural products. The railroad track and Wright's Tunnel were damaged in the 1906 earthquake. The tunnel was repaired, and the complete track was converted from narrow gauge to standard gauge by 1909. Commerce flourished in the Santa Cruz Mountains as San Francisco area development expanded. As a result, additional railroad branch lines opened, primarily to haul lumber through San Lorenzo Valley, Newell Creek Valley (Loch Lomond), and Aptos Creek Valley.

A booming lumber freight business led to increased passenger service, bringing varying levels of service in the 70-mile rail link between San Francisco and Santa Cruz during the early 1900s with as many as three trains a day in 1927. With the advent of the automobile and roadway improvements, the "over-the-hill" railroad declined and was finally discontinued in 1940, and Wright's and Laurel Tunnels were closed at the beginning of World War II. However, a "Suntan Special" continued to provide excursions from San Jose via Watsonville to Santa Cruz and Felton after World War II to about 1960.

In 1982, Santa Cruz, Big Trees & Pacific Railway purchased the Santa Cruz-to-Olympia line from Southern Pacific. After 40 years of laying dormant, passenger rail excursions were restored to the Santa Cruz-to-Olympia line in 1986.

Since the decline of the lumber industry, the opening of Route 17, and the closure of railroad service in the Santa Cruz Mountains, the mountain towns along the Historic Railroad route changed over time to rural residential settlements. The towns of Wright's, Alma, and Lexington became extinct, with Alma and Lexington eventually being covered by the Lexington Reservoir.

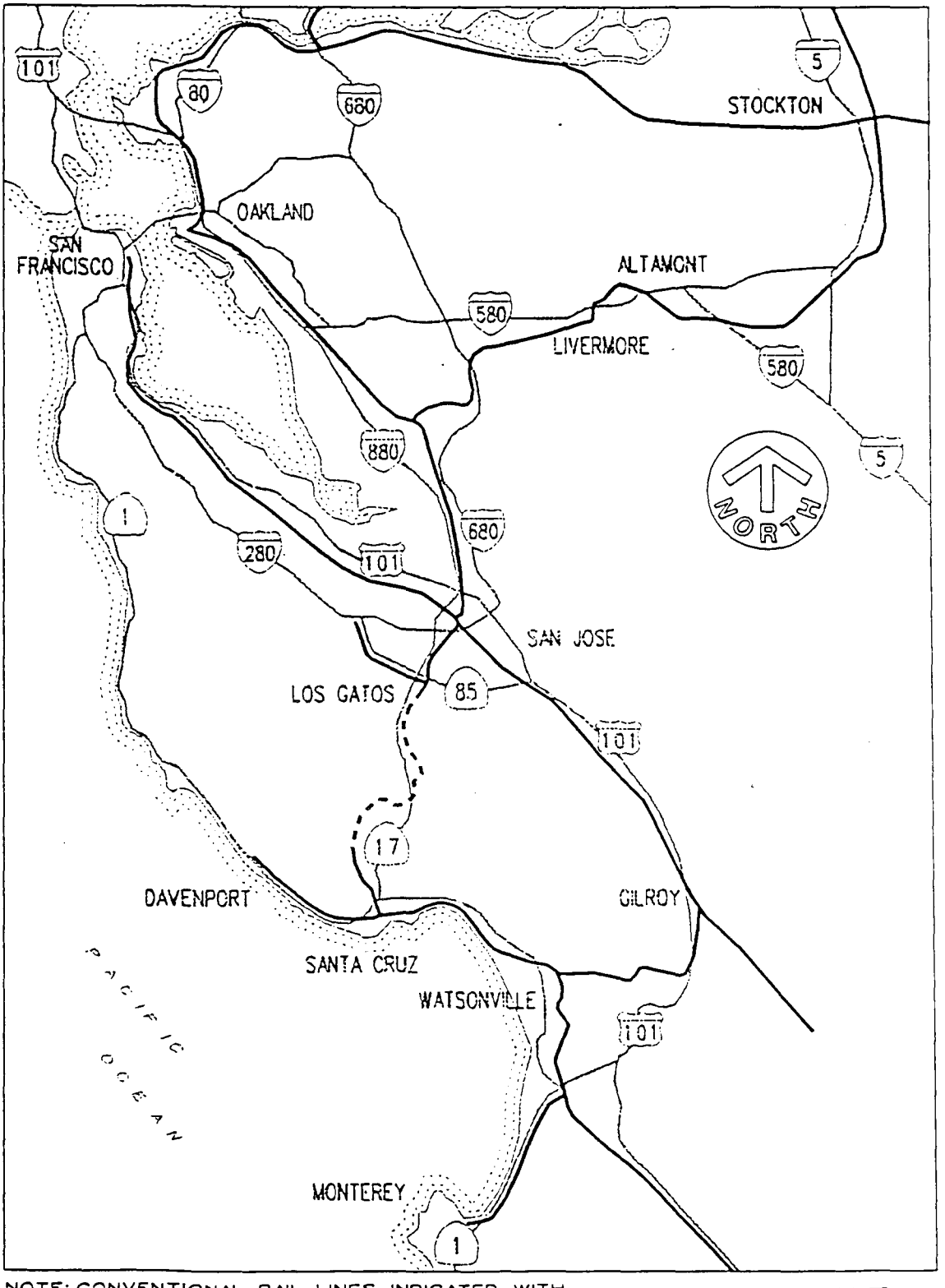
3. Regional Rail Network

Passenger railroads have served Northern California since the mid-1800s. Today, the Northern California Greater Bay Area offers a diverse range of passenger rail transit service including intercity and interstate Amtrak service, the Peninsula Corridor Joint Powers Board (CalTrain) service, BART's heavy rail system, San Francisco's MUNI light rail transit, and Santa Clara County's light rail transit. Expansion plans for these existing systems are being implemented, and plans for new rail transit service such as the Watsonville-Santa Cruz-University of California fixed guideway and others are proceeding. In addition, hundreds of miles of branch lines and other railroad rights-of-way exist in the San Francisco Bay Area that could provide opportunities for potential future passenger rail service. Figure 2 identifies existing major regional conventional rail routes.

B. DESCRIPTION OF EXISTING CONDITIONS

1. Corridor Setting

This section summarizes the physical setting within the Study area in Santa Cruz and Santa Clara Counties. The environment that could be affected by a potential Santa Cruz-to-Los Gatos rail line is identified in more detail in the Environmental Scan, which is contained in Chapter VIII and Appendix A of this report. Concentrations of residences and employment, and recreational



NOTE: CONVENTIONAL RAIL LINES INDICATED WITH HEAVY LINE. NOT ALL RAIL LINES SHOWN. BART, SF MUNI, SANTA CLARA COUNTY LRT NOT SHOWN. THE ABONDONED ROUTE IS SHOWN AS DASHED LINE.

FIGURE 2

SANTA CRUZ - LOS GATOS RAIL FEASIBILITY STUDY
REGIONAL RAIL NETWORK

De Leuw, Cather & Co.

August 10, 1994

destinations that form the basis of a potential intercounty passenger rail market are identified in Chapter III, Patronage.

The physical environment of the Study area is among the most beautiful and diverse in California. An abundance and variety of natural resources, streams, and wildlife are found within the Santa Cruz-to-Los Gatos area. The topography is varied in character, containing such features as natural beaches, alluvial coastal plains, and coastal terraces; the forested Santa Cruz Mountains; and the broad, fertile Santa Clara Valley. The Santa Cruz Mountains along the western edge of Santa Clara County include rolling grasslands and oak-studded foothills, steep slopes covered with brush and mixed hardwoods, and some areas of dense redwoods and Douglas fir. The central California coast location and the region's topographic features contribute to the Mediterranean climate of Santa Cruz and Santa Clara Counties.

Due to the climate, the variety of landscape types, the natural resources present, and accessibility to national and international markets, the region contains a diverse economic base which includes visitor serving and service industries, entertainment, agriculture, ranching, computer product design, and manufacturing. Other economic activities include quarrying, forestry, wood products, vineyards, fishing, and light manufacturing. With a spectacular coastline, accessible beaches, and wooded mountains all in proximity to several northern California metropolitan areas, the region is an important vacation and recreation area. Within the Study area are several state and local parks, open space, and beaches, including Henry Cowell Redwoods State Park, Lexington Reservoir County Park, and Vasona Lake County Park. Monterey Bay Area industries, such as the Monterey Bay National Marine Sanctuary, marine-related industries, and tourist attractions, also contribute to the visitor and economic activity in the region.

The region boasts its cultural attractions and educational institutions. Educational institutions serving the area include Cabrillo Community College and the Santa Cruz campus of the University of California, located in Santa Cruz County, and San Jose City College, San Jose State University, Santa Clara University, Stanford University, Mission College, Evergreen Valley College, Foothill Community College, and De Anza Community College in Santa Clara County. In addition, many other educational establishments serve the area.

Major state highways in the Study area include Highway 1 which leads along the coast from San Francisco south to the cities of Santa Cruz, Capitola, and Watsonville and then on to Monterey. Highway 9 traverses Santa Cruz County from the City of Santa Cruz through the rural villages of Felton, Ben Lomond and Boulder Creek, and then into Saratoga and Los Gatos. Route 17, starting in Santa Cruz, crosses the Santa Cruz Mountains into Santa Clara County passing through the City of Scotts Valley, Town of Los Gatos, and San Jose. The Southern Pacific Railroad presently provides freight service to the Pajaro Valley and Davenport along the coast of Santa Cruz County. The Santa Cruz, Big Trees & Pacific Railway operates passenger and freight service between Santa Cruz and Olympia in the San Lorenzo Valley and the Zayante Valley.

Urban concentrations of development within the Study area are located within the incorporated cities of Santa Cruz, Scotts Valley, and the Town of Los Gatos. Unincorporated communities of importance to this Study include Paradise Park, Felton, Olympia, Zayante, Glenwood, Laurel, the Summit, Redwood Estates, Chemeketa Park, and Aldercroft Heights.

2. Historic Railroad Route

The Historic Railroad that served freight customers and passengers for nearly 50 years connected the communities of Santa Cruz, Rincon, Felton, Olympia, Glenwood, Laurel, Wright's, Alma, and Los Gatos. Today, track is still serviceable along an eight-mile route between the Boardwalk at the Santa Cruz waterfront and a point just north of Olympia in the Zayante Valley as indicated in Figure 1. Near the Boardwalk, track connects the Watsonville-to-Davenport branch line, which is owned and operated by the Southern Pacific Transportation Company. The Santa Cruz-to-Olympia railroad right-of-way is owned and maintained by the Santa Cruz, Big Trees & Pacific Railway. On a relatively flat grade, the tracks extend northward from the waterfront parallel to and between Chestnut Street and Washington Street until Laurel Street. Less than a quarter-mile north of the Boardwalk on Washington Street is the site of the old Santa Cruz Union Station. The station building still stands and has been used as a restaurant. A rail yard lies west of the station; parking lots exist between the tracks and Washington Street. From Laurel Street to Mission Street, the tracks, set in the pavement, run in the middle of Chestnut Street through historic residential Santa Cruz.

Heading northward on a relatively flat grade, the track passes through Mission Hill Tunnel, traverses a mixed-use residential, commercial, and industrial district; crosses Route 1 at grade and ascends as it follows a winding alignment adjacent to Route 9 in the San Lorenzo River Valley. Grades steepen as the track enters Pogonip Open Space Preserve and become as steep as 3.5 percent in Henry Cowell Redwoods State Park. The track follows a winding alignment through the park and around the damaged Rincon Tunnel, crosses the San Lorenzo River, and enters Felton at the Santa Cruz, Big Trees & Pacific Railway yard and maintenance facility immediately south of Graham Hill Road. Heading northward the track crosses Graham Hill Road, veering east of the San Lorenzo River, and trailing Zayante Creek. The track continues northward, crosses Zayante Creek, passes beneath Mount Hermon Road, crosses the creek again, and extends past Olympia Station Road to its terminus just south of Zayante.

The condition of the roadbed and track are satisfactory from the Boardwalk to Mission Hill Tunnel. The roadbed in Mission Hill Tunnel is in poor condition. Between the Mission Hill Tunnel and Felton, the roadbed and track condition ranges from marginal to satisfactory. The roadbed and track condition is barely marginal from Felton to the terminus of the track north of Olympia. Single track is in place along the majority of the route with either passing sidings or suitable space for passing sidings at a few locations.

The old rail grade is observable along much of its alignment through the Santa Cruz Mountains between Zayante and Lexington Reservoir. Through Zayante, the abandoned railroad embankment is used as a trail, and a roadway for a short reach. Some of the abandoned route is overgrown. The alignment is interrupted at the former railroad tunnel, currently owned by Filesafe, a storage vault service. From Zayante at an elevation of 525 feet, the alignment climbs slowly and continues northward, then gradually turns eastward as it departs the Zayante Creek Valley and follows Mountain Charlie Gulch until it reaches the Glenwood (Clems) Tunnel at an elevation of 788 feet.

From an east-west alignment, the abandoned rail grade turns southward into the Glenwood (Clems) Tunnel. After exiting the Glenwood (Clems) Tunnel, the abandoned rail roadbed parallels Glenwood Drive where it runs eastward for a short distance, then on a northerly route

crossing driveways and passing through several private properties until it reaches the former site of the Glenwood station and yard. This site is located within private property north of the Glenwood Cut-Off and adjacent to a roadside historic marker. From this site, the abandoned rail alignment enters the Bean Creek ravine, then turns sharply eastward and enters the Laurel Tunnel at an elevation of 885 feet as it passes beneath Glenwood Drive. Within the Laurel Tunnel, the railroad gradually climbs to its highest elevation along the entire route of 910 feet at the tunnel's north portal. An historic marker identifies the former location of the Laurel railroad station a few hundred feet east of the Laurel Tunnel's north portal. The old rail alignment heads eastward from the tunnel along a path to Laurel Road, then follows a gravel driveway, which is the old railroad roadbed. This driveway provides access to several dwellings. The Historic Railroad alignment turns northward adjacent to the driveway and along the edge of a deep ravine above Burns Creek. The remnants of a side-hill trestle can be observed. The driveway terminates at a residence, and the dilapidated trestle heads northward across Burns Creek toward heavily wooded private property.

The Historic Railroad alignment crosses private property as it approaches the south portal of Wright's Tunnel at an elevation of 899 feet. Through Wright's Tunnel, the roadbed crosses the county line beneath the ridge of the Santa Cruz Mountains at an elevation of 903 feet and exits the north portal at an elevation of 899 feet. At the north portal of Wright's Tunnel is a massive concrete headwall in deteriorated condition. Water drains from the slope through the cracked concrete wall and from the earth-plugged tunnel into a shallow stream. A relatively flat, clear terrace, the former site of Wright's Station and downtown Wright's, exists for several hundred feet northeast of the tunnel until Los Gatos Creek. The historic route crosses Los Gatos Creek; the old piers remain. From this point, just north of the Wright's Station Road bridge that crosses Los Gatos Creek, the historic alignment continues behind fencing and locked gates, down a 1.5 percent grade along Los Gatos Creek through the watershed owned by the San Jose Water Company. The historic route's roadbed is used as an access road in some locations. The historic route crosses Los Gatos Creek several times. The former bridge piers are still standing at some locations. The alignment passes below the communities of Chemeketa Park and Aldercroft Heights and crosses Aldercroft Heights Road twice before exiting its two-mile reach through San Jose Water Company property. The historic alignment continues northward along Los Gatos Creek from the intersection of Aldercroft Heights Road and Alma Bridge Road and into Lexington Reservoir. The old alignment, now inundated by the reservoir, generally followed the west side of the former Los Gatos creekbed into the former town of Alma. The historic alignment is buried beneath the Lexington Reservoir Dam today; however, it appears along the recreational trail below the dam in Los Gatos Creek Canyon.

The Historic Railroad alignment veers away from Los Gatos Creek and crosses Route 17 at the southbound freeway on-ramp south of Santa Cruz Avenue in Los Gatos. The historic alignment crosses historic downtown Los Gatos, following a route parallel with and between Winchester Boulevard and University Avenue northward until the route is immediately adjacent to Winchester Boulevard at Lark Avenue. Parking lots, Town Plaza Park, the post office, and other commercial and residential buildings now occupy the old rail route through Los Gatos. Roadbed and track exist today on the historic alignment from a point 1,000 feet north of Lark Avenue northward along the Vasona Corridor to downtown San Jose. The Southern Pacific Transportation Company hauls freight from the Permanente Quarry located west of Cupertino to San Jose via the Vasona Corridor, which is owned by the Southern Pacific Transportation Company. It is

noted that the Peninsula Corridor Joint Powers Board has an option to purchase the Vasona Corridor.

In summary, the Historic Railroad alignment extends 27 miles across mountainous terrain between Santa Cruz and Los Gatos. Its maximum grade is 3.5 percent and its highest elevation is 910 feet. Its tightest curvature is 12.5 degrees on a 458-foot radius.

3. Route 17

An inventory of Route 17 between Los Gatos and Santa Cruz is presented to provide an understanding of this existing highway corridor, which is being considered as an alignment alternative for a potential passenger rail transit system. As part of the Route 17 Corridor inventory, the Route 1 Corridor between Route 17 and the Historic Railroad alignment just west of River Street is examined as a possible connection to the existing rail route through downtown Santa Cruz. Furthermore, an inventory is provided for conditions between Route 17 and Winchester Boulevard in the vicinity of the Route 85 Corridor in Los Gatos to allow assessment of potential rail connection options between Route 17 and the Vasona LRT Corridor. The roadway corridors of Route 1, Route 17, and Route 85 are owned and maintained by Caltrans.

Route 17, commonly referred to as Highway 17, is the major transportation link, serving as many as 65,000 vehicular trips per day, between Santa Cruz and Santa Clara County. The highway has a minimum of four lanes (two lanes in each direction). The freeway on the north end between I-280 and the new Route 85 Interchange has additional lanes. Between I-280 and the Lexington Reservoir Dam, just south of Los Gatos, Route 17 is a divided freeway.

Starting at the south end of the highway corridor, Route 1 is a four-lane expressway with an at-grade railroad crossing at the Santa Cruz, Big Trees & Pacific Railway line, and with an at-grade intersection at River Street. Route 1, heading in an east-west direction through Santa Cruz, is a divided four-lane freeway east of the San Lorenzo River Bridge. Between the San Lorenzo River and the Route 17/Ocean Street Interchange, the freeway median is 22 feet wide with a safety barrier. Caltrans plans to upgrade the Route 17/Route 1 Interchange by replacing loop ramps with directional ramps. Land uses along Route 1 include residential, commercial, industrial, and recreational. The San Lorenzo River Corridor and a cemetery occupy the area between River Street and Ocean Street. The highway corridor between Santa Cruz and San Jose continues northbound from Route 1 on Route 17 over the Santa Cruz Mountains. From Route 1 to Granite Creek Road, Route 17 is a divided freeway with a median that varies in width from a minimum of 6 feet to a maximum of 36 feet. The roadway steepens to a maximum grade of 6 percent south of Mount Hermon Road. Through Scotts Valley, the maximum grade is 3.4 percent.

Route 17 is an expressway between the Granite Creek Road/Scotts Valley Drive Interchange in Scotts Valley and Lexington Reservoir in Santa Clara County. This expressway segment provides direct access to local cross streets with turnouts for left turns off of Route 17. For left-turn access onto Route 17 from the cross streets, vehicles must cross two lanes of opposing traffic, often with limited site distance, before entering a short merge lane. Through the higher elevations of the Santa Cruz Mountains, generally between Laurel Road and Old Santa Cruz Highway at the south end of Lexington Reservoir, the alignment has frequent turns, grades are steep, and medians are narrow. The maximum grade between Laurel Road and the Glenwood

Cut-Off is 6.5 percent. Between the Glenwood Cut-Off and the Summit, the maximum grade is 8 percent. The highest point of Route 17 is 1,800 feet at Pachen Pass on the Summit. A grade-separated interchange exists at Route 17 and Summit Road. Route 17 grades on the Santa Clara side of the Summit also reach as high as 7 and 8 percent. The curvature through the mountainous terrain is often as low as a 500-foot radius. Portions of Route 17 through the mountains are on either a sidehill structure or retained fill.

Soon a new grade-separated interchange will be constructed at Bear Creek Road next to Lexington Reservoir. This interchange will include a frontage road on the east side of Route 17 between Old Santa Cruz Highway and Bear Creek Road, and a frontage road on the west side of Route 17 between Bear Creek Road and Montevina Road.

The Lexington Reservoir Dam is located where the Los Gatos Creek Valley becomes a canyon. The Route 17 right-of-way is very limited in this area with the dam and a water treatment facility on the east and steep slopes on the west. The freeway steepens to an 8 percent grade through the narrow canyon below the Lexington Reservoir Dam. South of Main Street in Los Gatos the grade is 5 percent. The southbound and northbound lanes are separated in elevation in some areas along the steep west slope of the Los Gatos Creek canyon, south of Main Street. At most areas in this canyon, the median, which includes a safety barrier, is only six feet wide.

Route 17 follows Los Gatos Creek at an elevation below developed areas of downtown Los Gatos. Overcrossings exist at Main Street, a pedestrian overcrossing, the Saratoga Avenue Interchange, Blossom Hill Road, and the Lark Avenue Interchange. Through Los Gatos, the freeway median varies in width from a minimum of six feet at Main Street to a maximum of 32 feet north of Lark Avenue. The highway traverses some slightly rolling terrain from downtown Los Gatos to Route 85; however, the grades are not steep. The Vasona Lake County Park and a residential neighborhood occupy property west of Route 17 at the north end of Los Gatos. Neighborhoods generally occupy the areas east of Route 17 as it extends through the Town of Los Gatos.

The Route 85/Route 17 Interchange complex, which opened in October 1994, provides connections between Route 85 and Route 17. From Route 17 heading west for one-half mile, Route 85 crosses Oka Road and Los Gatos Creek, then reaches the Winchester Avenue and Vasona Light Rail Corridor overcrossings. Route 85 is a six-lane freeway with approximately 150 feet of right-of-way and a 50-foot median, including shoulders.

The total length of the Santa Cruz-to-Los Gatos Route 17 Corridor, including the rail line segment from the Santa Cruz Boardwalk to Route 1 and the Route 1 segment from the rail line to Route 17, is approximately 24 miles. This also includes the Route 85 link to the Vasona Light Rail Corridor.

4. Scotts Valley Route

Scotts Valley is a municipality located north of Santa Cruz along the Route 17 Corridor within the lower elevations of the Santa Cruz Mountains. The Scotts Valley area contains hillsides and creek valleys. The valley floor is developed with residential settlements, commercial properties, and quarry operations.

A potential rail segment alternative through Scotts Valley follows northwestward along Mount Hermon Road from Route 17. The east end of Mount Hermon Road is a busy four-lane arterial with signalized intersections at Glen Canyon Road and Scotts Valley Drive. The potential alignment segment continues northwestward through the old Scotts Valley Airport, across Bean Creek and Lockhart Gulch Road, and either across or through the hill north of the community of Mount Hermon to the Historic Railroad route at Olympia.

5. Corridor Geology[2]

The Study area comprises a variety of topography, geological formations, and geological hazards including landslides, mudflows, and active faults. In some areas, slopes are susceptible to shallow landslides due to saturation of the ground during the annual rainy season. Deep landslides and mudflows triggered by unusually heavy storms, such as those that occurred during the winters of 1982 and 1983, can block transportation corridors for extensive periods of time before they are removed. At that time, mudflows occurred adjacent to a two-mile stretch of Route 17, starting about one mile north of Scotts Valley. Major earthquakes, such as the Loma Prieta earthquake of 1989, can trigger shallow slides on steep slopes and cuts can reactivate dormant landslides. Numerous landslides occurred in the Summit Road area of the Santa Cruz Mountains during the earthquake of October 17, 1989, and one of those slides caused Route 17 to be closed for an extended period of time.

Near the county line, the Historic Railroad route and Route 17 cross the San Andreas fault, which caused extensive deformation of Wright's Tunnel when it ruptured during the San Francisco earthquake of 1906. The Historic Railroad route also crosses the Zayante fault at the Glenwood (Clems) Tunnel, which may be active, but which is substantially less important than the San Andreas fault in terms of its potential for damage. The Historic Railroad route traverses an area in which petroleum was discovered during the 1800s. Methane gas and oil seeps, possibly associated with the area's petroleum resources, were encountered during construction of the existing railroad tunnels.

A description of the geologic conditions traversed by the Historic Railroad route and a glossary are provided in Appendix B. Descriptions of each tunnel's current physical status follow.

6. Historic Railroad Tunnels[3]

The Historic Railroad route includes a total of six tunnels with an overall tunnel length of 14,400 feet. The tunnels, located in plan on Figure 1, are summarized in Table 1 in a south-to-north sequence. These tunnels were originally built to accommodate single, narrow-gauge tracks. Limited widening was carried out to accommodate an upgrading to standard gauge tracks following the 1906 earthquake.

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[2]Woodward-Clyde Consultants, July 1994.

[3]Ibid.

Table 1
Summary of Tunnels Along Abandoned Rail Corridor

Tunnel Name(s)	Approx. Length (ft.)	Comments
Mission Hill	900	North portal is at Station 4177+46 (stationing based on old Southern Pacific stationing starting at Mission Street in San Francisco); south portal is at 4186+43. Built in 1886, this is the only tunnel along the rail route that does not conform with the 17-foot wide by 22-foot high standard cross-section adopted by the Southern Pacific during their conversion to standard gauge rail following the 1906 earthquake. The tunnel is fully supported with 12-inch by 12-inch timber bents on 4-foot centers, with timber lagging and timber struts. Rock conditions exposed along bluffs that parallel the tunnel alignment to the east indicate claystones and siltstones. Inside width is 15 feet; height above top of existing rail ranges from 18 feet 1 inch at the north portal to 18 feet 6 inches at the south portal. Tunnel follows a 0.045 grade; several bents were replaced recently in vicinity of the north third point in the tunnel; the ballast is badly fouled from fine soil that has pumped upward into the ballast, which has caused clogging and ponding of groundwater. There used to be a storm sewer pipe that provided drainage away from the south portal, but this drainage pipe was severed and plugged during rework in vicinity of the former Cherry Street depot. Ground cover ranges from 4 feet above the south portal to a maximum of about 25 feet. The older timbers have an asbestos spray covering, which the railroad used as a fire-resistant covering. Some older timbers are deteriorated.
Rincon	340	Tunnel burned on January 22, 1993. The fire was started by either campers in the tunnel taking refuge from heavy rains, or due to welding repairs. Creosoted tunnel timbers had been smoldering for several days. During the heavy rains, a 100-foot tall pine tree lost its berth and slid down the hill. The ground above the tunnel collapsed, the tree slid into the tunnel, and the improved oxygen and flammable wood quickly increased the rate of burning. Prior to the fire, there had been ongoing instability of the hillside, which mandated continued maintenance of the tunnel. Heavy rains regularly caused problems at the south portal. In 1889, 1905, and 1906, Southern Pacific resorted to the shoo-fly around the tunnel. About six months prior to the 1993 fire, repair work was done at the north portal, and a 40-foot portal barrel was added to the tunnel. Highway 9 runs directly over the tunnel, at an overlook site called Inspiration Point. Instability of the roadway also required major structural repairs, which were completed in 1993. A new tunnel about 550 feet long would

Tunnel Name(s)	Approx. Length (ft.)	Comments
Rincon (Cont.)		be required to bypass the old tunnel. In light of the ongoing slope instability, it would appear easier to mine a new tunnel rather than rehabilitate the old tunnel. History of landslide activity in nearby Coon Gulch.
Storage Vault (Filesafe)	240	North portal is at Station 3710+33; the south portal is at 3712+74.5. Tunnel is concrete lined throughout, with 17-foot wide by 22-foot high dimensions; has concrete drains at base of each sidewall. After the railroad line was closed in the 1940s, Southern Pacific used the tunnel for storage; they sold it to Western States Atomic Storage Vault, which was eventually acquired by Filesafe. It is understood that the tunnel is in good structural condition because of its ongoing use as a storage facility. Located near Felton off of Zayante Road. Sharp curve along tunnel alignment could be avoided by excavating approximately 850 feet of new tunnel further into the sandstone mountainside.
Glenwood (Clems)	910	North portal is at Station 3529+27; south portal is at 3538+37. Built in 1876, the tunnel had been timber-supported throughout its entire length, with 50-foot concrete-lined sections at both portals; all timber has since been removed. Except for a small area of rockfall about one-third of the distance in from the south portal, rock consists of competent sandstones and shales throughout the tunnel. At the north portal, a section was detonated, and remains sealed. At the south portal, the tunnel is accessible through an eroded portion of the backfill sealing that portal; there is a 6-inch box drain at the base of each sidewall; a drainage culvert at the south portal draws water draining from the box drains. Water is pumped from this culvert into a small water tank, which is tapped and used as a water source. Tunnel was used as source for clay bricks during late 1880s. The tunnel has collapsed and sinkholes exist above the north portal; tunnel is crossed by Zayante fault zone. Concrete portals are approximately 17 feet wide and 22 feet high. Interior areas of the tunnel where timber has been removed likely have a greater clearance width and height.
Laurel	5,790	North portal is at Station 3402+36; south portal is at 3460+29. Glenwood Road makes a 90 degree turn over the south portal of the tunnel. The rail elevation at the south portal is 885 feet. The entire tunnel is timber-supported, except for a 50-foot concrete-lined reach at the south portal, and a 75-foot concrete-lined reach at the north portal. A 6-inch square concrete box drain exists at the base of each

Tunnel Name(s)	Approx. Length (ft.)	Comments
Laurel (Cont.)		sidewall. Limited retimbering was performed following the 1906 earthquake; all of the timber was replaced in 1937. Highest elevation of the rail crossing through the mountains is at north (Laurel) portal (Elevation 910 feet). Tunnel was closed in 1940 and portals were sealed by Southern Pacific in 1941 to prevent access. Local residents indicate that the tunnel has been used for conveying spring water to the community of Laurel since 1948. Slide problems and partial tunnel collapse occurred at the north (Laurel) portal. Inside clearance is approximately 17 feet wide by 22 feet high.
Wright's (Summit)	6,210	North portal is at Station 3295 + 24 (stationing based on old Southern Pacific stationing southward from Mission Street in San Francisco); south portal is Station 3357 + 31. Both portals are at Elevation 899 feet; along a vertical curve, tunnel crosses ridge of Santa Cruz Mountains at Elevation 903 feet. The tunnel is concrete-lined for 173 feet in from the north portal, and for 627 feet in from the south portal. The San Andreas fault crosses the tunnel about 400 feet in from the north portal, along a timber-supported reach. In between the two concrete portal "caps," the majority of the tunnel is timber-lined, except for 7 reaches of concrete lining totalling 763 feet in length. All internal reaches of concrete lining contain brick in the arch. During construction, there were two locations of major gas (methane) explosion and fire: one 200-foot reach about 2,300 feet in from the north portal, and another 200-foot reach about 2,800 feet in from the north portal. Tunnel was opened in May 1880. Inside clearance is approximately 17 feet wide by 22 feet high; tunnel was offset 4 to 5 feet during 1906 quake; repairs were made and tunnel reopened in 1909. South portal squeezed and buckled due to lateral compression during 1989 quake. The tunnels were sealed by Southern Pacific in 1941 by pulling timbers just beyond the limits of the concrete-lined portal sections. Following the Loma Prieta earthquake in 1989, a geological team conducted a site inspection and feasibility study to evaluate the possibility of mining through the rubble pile at the north portal in order to evaluate the effects of the 1989 event on the tunnel. A plan for opening the tunnel for inspection and analysis was completed, but never implemented.

Source: Woodward Clyde Consultants, July 1994.

III PATRONAGE[4]

A. SUMMARY

A preliminary study of the ridership potential for a possible rail line between Santa Cruz County and Santa Clara County was conducted. The study assumes the general residential, employment, and travel characteristics that exist today will exist at the time a potential Santa Cruz-to-Los Gatos rail line opens. Hence, no particular planning horizon year is identified for this study. It is concluded at this preliminary stage that approximately 4,400 total daily boardings could be expected if the rail line was constructed. Approximately 75 percent (3,400) of these boardings would be made by about 1,700 daily commuters traveling between residences in Santa Cruz County and employment sites or colleges and universities in Santa Clara County. It is also forecasted that if the rail service was available, 1,000 or more daily recreational trips would be made using the rail line during off-peak periods of time. It is expected that the ridership level would grow over time as the public becomes aware of the new rail service and as more employers and transit organizations provide direct feeder shuttles between rail stations and work sites.

The forecast is primarily based on a survey, conducted for this study, that sampled major employers to determine the number of their employees residing within zip codes areas. Colleges were also surveyed to ascertain the number of students and employees within zip code areas. The survey results were then used in conjunction with other available information on travel through the Route 17 Corridor to evaluate the potential demand for a possible rail transportation service between the two counties.

The study of the existing travel demand through the Route 17 Corridor found that there are approximately 100,000 daily person-trips being made (total in both directions) and that the largest individual market for possible rail system riders would be the 35,400 commuter trips made by Santa Cruz County residents to and from jobs or schools located in Santa Clara County. The second largest market for rail system riders would be approximately 28,000 average daily recreational trips made through the corridor. The recreational market could represent the greatest opportunity for future ridership growth on the rail system.

Other findings concerning the existing travel demand include the fact that the current bus service carries around 675 daily passengers and that there are about 3,500 daily truck trips made over Route 17. It is also concluded that, regardless of whether the rail system is constructed, further

[4]Barton-Aschman Associates, September 1994.

traffic volume increases over Route 17 will be possible because of the residual roadway capacity available during the off-peak hours. Use of this off-peak capacity will tend to continue spreading the morning and evening peak periods over longer periods of time. It is observed that a potential "over-the-hill" rail transit operation would capture less than five percent of the total daily person-trips on Route 17, which is consistent with the rate of transit usage in Santa Clara County. It is estimated that nearly 15 percent of the vehicular traffic during peak commute periods will change mode to rail transit if "over-the-hill" rail service is implemented.

B. INTRODUCTION

A preliminary assessment of the ridership potential on the Santa Cruz-Los Gatos rail line was conducted. This chapter documents the analysis methodology, assumptions, and findings. The following section presents the results of the general market research conducted in the early stages of this analysis and provides an overview of existing traffic volumes and present day travel demand in the Route 17 Corridor between Santa Clara and Santa Cruz Counties. Traffic on Route 17 has three primary components: automobile, bus, and truck. Automobile travel includes single-occupant automobiles, carpools, and vanpools. A profile of traffic characteristics is provided by mode of travel and by trip purpose.

A review of the rail service concept is presented in Section D. Feeder and distribution transit service requirements, service frequency and time of day needs are discussed. An important consideration in planning the rail service concept is the availability of intermodal transfers and connections to other rail, bus, and air passenger services in both Santa Clara and Santa Cruz Counties. The requirements for intermodal connections are also presented.

Assumptions used in producing the ridership forecasts are documented in Section E. Examples of automobile trip times for home-to-work journeys and potential rail transit trip times for home-to-work journeys are presented in Section E for comparison purposes. Patronage forecasts were developed following a "bottom-up" approach in which large employers, community colleges, and universities were surveyed to determine commute patterns of employees and students. The survey methodology and results are summarized. Finally, preliminary ridership forecasts are presented for the existing commuter and recreational demand.

C. EXISTING TRAVEL DEMAND IN ROUTE 17 CORRIDOR

The corridor that would be served by the Santa Cruz-Los Gatos rail system is currently served by State Route 17 and bus transit service on Route 17. The existing travel demand in this corridor is described with traffic volumes from traffic counts, the vehicle mix (automobile, bus, and truck), and trip purposes served by the corridor.

1. Traffic Count Data on Route 17

The primary commute route "over-the-hill" between Santa Cruz and Santa Clara Counties is State Route 17, a four-lane divided highway with steep grades and sharp curves. According to the State of California Department of Transportation (Caltrans) annual traffic volumes publications, the average daily traffic volumes on Route 17 have increased significantly over the past decade. In 1983 the average traffic volume on Route 17 south of Bear Creek Road was 53,000 vehicles per day. By 1993 the average daily traffic volume on this segment had

increased by 23 percent to 65,000 vehicles per day. The peak-hour volume has also grown at a similar rate increasing from 6,400 vehicles in 1982 to 8,200 vehicles in 1993.

Figure 3 presents the growth in daily and peak-hour traffic volumes on Route 17 between 1983 and 1993. Between 1983 and 1987, the traffic volumes on Route 17 grew at a fast pace with an average increase of 7.1 percent per year. From 1987 to 1988, traffic volumes on Route 17 decreased significantly by almost nine percent. In the past five years, volumes on Route 17 have been relatively stable. The existing peak-hour traffic volumes are near the theoretical capacity of a four-lane highway. Unless improvements are constructed that increase the capacity of Route 17, future traffic growth will result in a "spreading" of the peak periods or will be limited to off-peak periods.

Figure 4 presents the hourly variation in traffic volumes on Route 17 by direction. The peak hour for northbound traffic occurs between 6:00 and 7:00 AM. The hour between 4:00 and 5:00 PM has the greatest number of southbound trips. The peak-direction peak-hour volumes comprise about ten percent of the corresponding directional daily traffic volumes on Route 17.

Traffic volumes on Route 17 are greatly influenced by recreational travel, especially vehicles destined to the coastal areas. In fact, the highest traffic volumes often occur during the weekends. Traffic counts from April 1992 at the Granite Creek Road Interchange show that the average daily traffic on Route 17 was 22 percent greater on weekends than during the mid-week. Thus, seasonal, weekend, recreational average daily traffic volumes are on the order of 80,000 vehicles per day.

2. Profile of Traffic Characteristics

Traffic on Route 17 has three primary components: automobile, bus, and truck. Automobile travel includes single-occupant automobiles, carpools and vanpools.

Automobile Traffic: According to the *1993 Transportation Monitoring Report for Santa Cruz County*, the average vehicle occupancy for the peak direction on Route 17 was 1.22 persons per vehicle during the AM peak period and 1.36 persons per vehicle during the PM peak period. This is notably higher than the average vehicle occupancy for Santa Clara County resident workers (1.08 persons per vehicle) reported in the Metropolitan Transportation Commission's Working Paper #2 entitled *Bay Area Travel and Mobility Characteristics—1990 Census.* The relatively high vehicle occupancy ratio on Route 17 is probably due to the above-average trip distances for commuters on this route and the difficult highway conditions (steep grades, sharp curves, and low sight distance).

The Santa Cruz County Share-A-Ride program provides carpool/vanpool matching services for commuters traveling throughout Santa Cruz County. Currently about 45 vanpools operate daily round trips to and from Santa Clara County over Route 17. Because many carpools are formed without assistance from Share-A-Ride, the number of carpools on Route 17 is unknown. However, based on the existing daily traffic volumes, the average vehicle occupancy on Route 17, and an assumed average carpool occupancy of 2.2 persons per vehicle, carpools are estimated to account for approximately 9,000 round trips (18,000 one-way trips) per day on Route 17.

Figure 3

Average Traffic Volumes on Route 17

South of Bear Creek Road

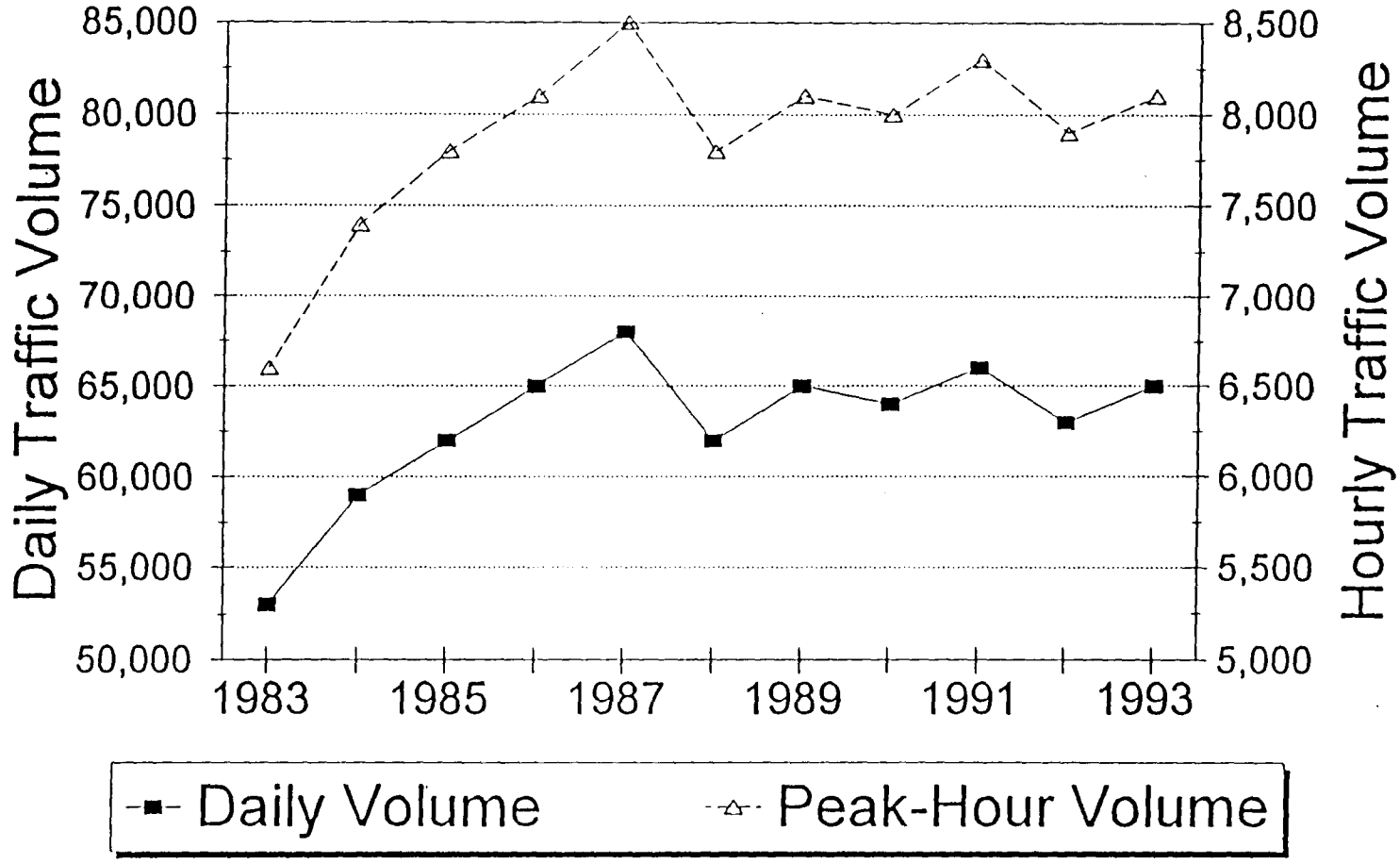
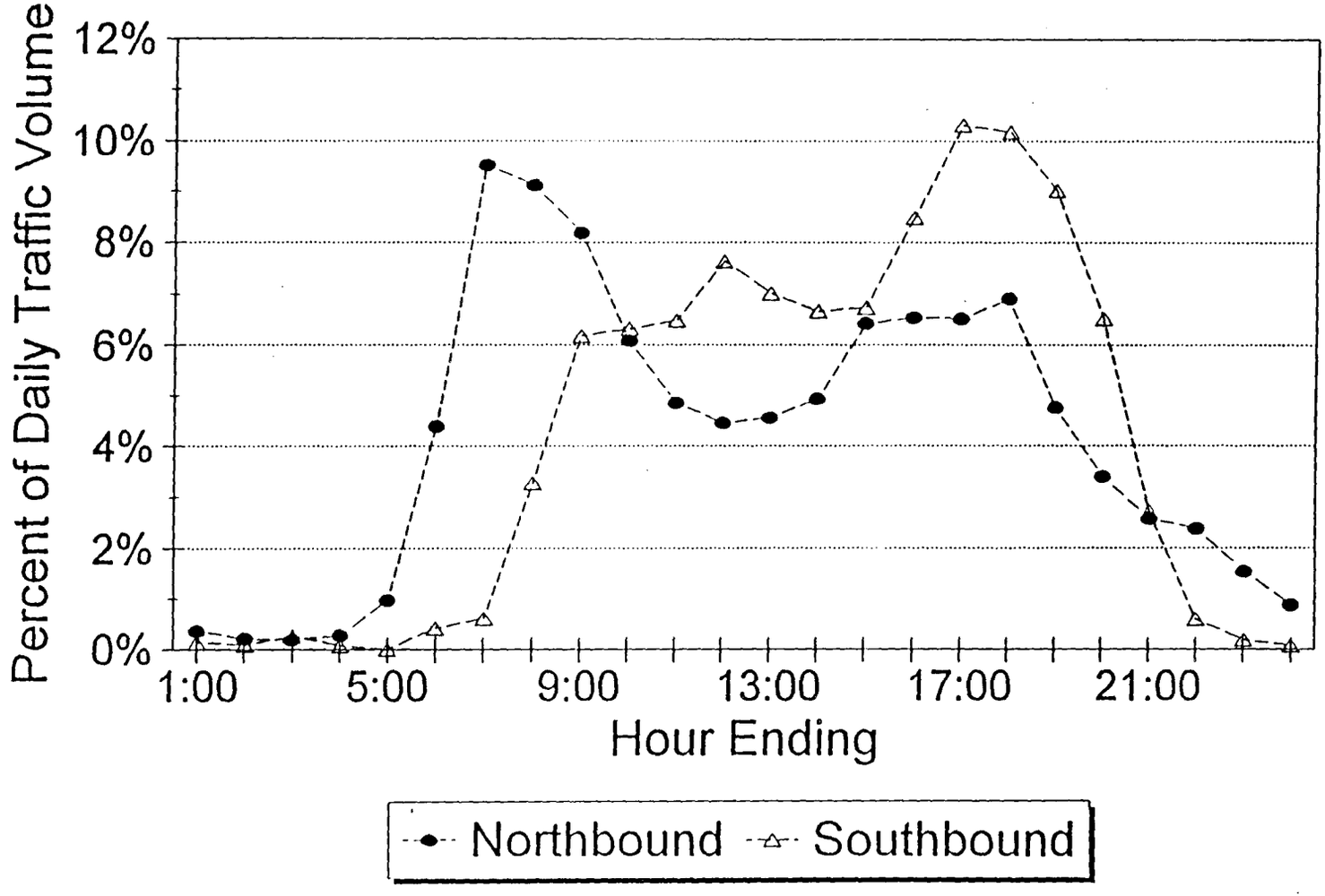


Figure 4

Hourly Traffic Volumes on Route 17

South of Granite Creek Road



Buses: In a joint effort, the Santa Clara County Transportation Agency (TA) and the Santa Cruz Metropolitan Transit District (SCMTD) provide express bus service on Route 17. The express bus service operates 24 daily round trips between the hours of 4:40 AM and 11:20 PM Monday through Friday. Buses operate every 15 minutes during commute hours and every hour during other times. No service is provided on Saturdays, Sundays, and holidays. Buses begin and end at the Dominican Hospital at Highway 1 and Soquel Drive in Santa Cruz, making stops at the Pasatiempo Inn in Santa Cruz and the King's Village Park & Ride lot in Scotts Valley. Off-peak trips begin and end at the King's Village Park & Ride Lot. In downtown San Jose, buses serve key transfer points between Bird and San Carlos and San Fernando and Third, including the San Jose Cahill (CalTrain/Amtrak) Station, the Transit Mall, and San Jose State University. According to the Santa Clara County Transportation Agency, the Route 17 express bus service has an average of 675 total passenger boardings per day. The fare schedule is presented in Table 2.

Table 2
Route 17 Express Bus Service Fares

	Regular[1] (5-64 years)	Senior/Disabled[2] (9:30am-2:30pm)
Cash Single Ride	$2.25	$1.00
Day Pass		
Hwy 17 Issued Day Pass	$4.50	$4.50
with SCMTD Day Pass	$3.50	$3.50
with TA Day Pass	$3.50	$3.50
with CalTrain Monthly Ticket & Peninsula Pass Sticker	$2.50	$2.50
Hwy 17 Monthly Pass	$65.00	$65.00

[1] Children under five years old accompanied by a fare-paying passenger ride free.
[2] During commute periods (before 9:30 am and after 2:30 pm) seniors and the disabled pay the regular fare.

Source: Santa Clara County Transportation Agency and Santa Cruz Metropolitan Transit District printed schedule dated January 26, 1994.

Additionally, Amtrak offers limited non-stop bus service between the San Jose Cahill (CalTrain/Amtrak) Station and downtown Santa Cruz. The bus service is available to anyone—not only CalTrain/Amtrak passengers. The buses make 12 round trips between Santa Cruz and San Jose each day with varying headways. The fare schedule is presented in Table 3.

Table 3
Amtrak Santa Cruz-San Jose Bus Service Fares

	Regular (16-61 yrs)	Senior (62 years and older)	Children[1] (6-15 yrs)
Cash-One Way	$5.00	$4.25	$2.50
Cash-Two Way	$8.00	$6.80	$4.00
with Amtrak Through Ticket	$0	$0	$0

[1] Discounted rate applied for children traveling with an adult. Children five years old and younger ride free.

Source: Amtrak printed schedule effective May 1, 1994.

Truck Traffic: Route 17 carries most of the freight traffic to and from Santa Cruz County via truck. A notable segment of the commodity movement on Route 17 is truck traffic generated by several large quarries in Santa Cruz County. Trucks loaded with sand and gravel slow to a crawl on the steep uphill grades. This has a significant effect on the roadway capacity, especially when one sand truck tries to pass another. According to the 1992 Caltrans Annual Report on Truck Volumes, Route 17 carries an average of approximately 3,520 one-way truck trips per day.

Vehicle Mix: The vehicle mix on Route 17 is presented in Table 4. While multiple-occupant vehicles comprise approximately 28 percent of the daily vehicle trips on Route 17, they account for approximately 43 percent of the daily person trips.

Table 4
Vehicle Mix on Route 17 South of Bear Creek Road

Vehicle Type	Daily Traffic Volume (One-way trips)	
Single-Occupant Automobile	43,318	66.7%
Carpool	18,000	27.7%
Vanpool	90	0.1%
Trucks	3,520	5.4%
Buses	72	0.1%
Total	65,000	100.0%

Source: Barton-Aschman Associates, Inc.

3. Travel on Route 17 by Trip Purpose

The previous sections describe the volume of traffic on Route 17; this section describes why people are traveling on this route, also known as their trip purpose. Work-related trips are a major source of weekday travel between Santa Cruz and Santa Clara Counties. Another major purpose for travel in the Route 17 Corridor is related to recreation. Other trips include shopping trips, trips to school, and personal business trips.

Work Trips: According to the 1990 Census, approximately 20,200 workers commute from residences in Santa Cruz County to jobs in the San Francisco Bay Area. Approximately 17,700 of these commuters (88 percent) are bound for jobs in Santa Clara County. In the reverse direction, approximately 4,300 workers commute from residences in the San Francisco Bay Area to jobs in Santa Cruz County. Santa Clara County residents account for 81 percent of these trips with 3,500 commuters to Santa Cruz County. Considering both directions of travel, work trips account for a total of approximately 24,500 round trips or 49,000 one-way trips per day in the Route 17 Corridor.

Recreational Trips: Recreational travel is generally greatest during the summer months and on weekends. Major recreational destinations within Santa Cruz County include the Santa Cruz Beach Boardwalk, numerous small wineries located in the Santa Cruz Mountains, municipal and state beaches, and state parks and campgrounds. In addition, recreational destinations in Monterey and San Benito Counties, such as the Monterey Bay Aquarium, 17-Mile Drive, Monterey area beaches, and the Laguna Seca Recreation Area among others, also attract trips through the Route 17 Corridor. Limited information is available to describe the recreational trips using the Route 17 Corridor.

According to the Santa Cruz Seaside Company, which owns and operates the Santa Cruz Beach Boardwalk, this seaside amusement park attracts approximately three million visitors per year. Average daily attendance figures are not available. The park is open daily from Memorial Day through Labor Day and on weekends and holidays year-round. The Boardwalk is most popular during the summer months when schools are not in session. A visitor survey conducted during the summer of 1993 found that about one half (48%) of the visitors surveyed were from the San Francisco Bay Area. The large majority of visitors (98%) use private automobiles when traveling to and from the park. A small number of overnight visitors walked to the park from a nearby hotel. The average size of a party attending the Boardwalk is estimated to be 3.7 persons. Based on this limited information, it is estimated that the Boardwalk may generate approximately 2,500 one-way vehicle trips from the San Francisco Bay Area on an average summer mid-week day, and as many as 6,000 one-way vehicle trips from the San Francisco Bay Area on a summer Saturday.

State recreation areas are also a major generator of recreational trips in the Santa Cruz area. Attendance figures provided by the California State Parks and Recreation Department show that state parks and beaches in the Santa Cruz District Coastal Sector had a total annual attendance of approximately five million visitors during the 1991/92 fiscal year. The coastal sector units in order of decreasing attendance include Seacliff, Twin Lakes, Natural Bridges, Sunset, New Brighton, Manresa, and Wilder Ranch State Parks. No information is available regarding the origins of these state park visitors, their mode of travel, or the routes used by visitors to these

recreation areas. Assuming similar travel characteristics as the Santa Cruz Beach Boardwalk, it is estimated that the state recreation areas generate roughly 5,000 one-way vehicle trips through the Route 17 Corridor.

The Roaring Camp & Big Trees Railroad and the Santa Cruz, Big Trees & Pacific (SCBT&P) Railway are other recreational attractions in Santa Cruz County. These attractions are operated by the Santa Cruz, Big Trees & Pacific Railway Company, and provide some indication of the existing demand for recreational train travel within the general Study area. SCBT&P estimates its patronage in 1994 to be approximately 30,000 passengers for the broad-gauge Suntan Special and Redwood Express services between Felton and Santa Cruz during 100 days of operation. The adult fare is $14. The narrow-gauge service, which operates nearly daily, carries an estimated 250,000 annual passengers and has an adult fare of $11. The total demand is approximately 1,000 passengers per operating day for the combined operations. An average patronage over 360 days in one year is 780 people per day.

Recreational destinations in the San Francisco Bay Area also attract trips over Route 17 from the Santa Cruz area. Major recreational traffic generators in Santa Clara County include the San Jose Arena, Paramount's Great America, Raging Waters, Shoreline Amphitheater, the Children's Discovery Museum, the Winchester Mystery House, and many more. Recreational attractions in other San Francisco Bay Area counties also draw visitors from Santa Cruz County.

Other Trips: In addition to work and recreational trips, trips are also related to school, shopping, personal business, and other purposes. Major airports in the San Francisco Bay Area also draw traffic from the Santa Cruz area. The 1990 MTC air passenger survey found that San Francisco, Oakland, and San Jose International Airports serve an average of 115,200 enplaning and deplaning air passengers per day. About 2.4 percent of the air party's trips originated outside the nine-county San Francisco Bay Area. Santa Cruz and Monterey Counties contributed 35.9 percent of the trips originating outside the San Francisco Bay Area. Therefore, the three major commercial airports in the San Francisco Bay Area attract an average of about 1,000 air passengers per day from Santa Cruz and Monterey Counties. Based on the ground transportation mode split and the average air party size, it is estimated that travel to and from airports accounts for about 700 one-way vehicle trips per day on Route 17.

Trip Purpose Summary: Although the information describing non-work related travel on Route 17 is limited, the magnitude of non-work trips can be estimated based on the existing traffic volumes on Route 17 and the trips generated by known trip purposes. Table 5 presents a breakdown of the travel on Route 17 by trip purpose. About 61 percent of the traffic on Route 17 is related to work trips.

Table 5
Route 17 Travel by Trip Purpose

Trip Purpose	Daily Person Trips: Subtotal by Direction of Travel	Daily Person Trips: Total by Trip Purpose	Daily Vehicle Trips
Work		49,000	39,800
Santa Cruz to Santa Clara County	35,400		
Santa Cruz to Other SF Bay Area	5,000		
Santa Clara to Santa Cruz County	7,000		
Other SF Bay Area to Santa Cruz County	1,600		
Recreation[1]		27,700	7,500
SF Bay Area to Santa Cruz Beach Boardwalk	9,200		
SF Bay Area to Santa Cruz Parks/Beaches	18,500		
Travel to/from SF Bay Area Airports		1,000	700
Other Recreation, School, Shopping, Personal Business		20,900	17,000
Total		98,600	65,000

[1] Recreational travel is greatest during the summer months and on weekends.

Source: Barton-Aschman Associates, Inc.

D. SERVICE CONCEPT CONCLUSIONS

The analysis of existing travel demand in the Route 17 Corridor suggests several conclusions regarding the service concept that should be considered in assessing the feasibility of this particular rail service. These conclusions are discussed in the following sections.

1. Service Orientation

The service will need to be primarily oriented to serve commuter trips traveling in the Santa Cruz County to Santa Clara County direction. This service priority corresponds to the largest identified ridership market. Secondary consideration should be given to serving the Santa Clara County to Santa Cruz County commute trips. The secondary market could be served when the primary demand increases to the point where return trips are warranted in order to reuse the equipment for additional Santa Cruz County to Santa Clara County travel. Minor trip volumes could also be expected for the intra-Santa Cruz County and intra-Santa Clara County trips.

2. Service Frequency and Time of Day Needs

Because of the large spread of trip start times, it will be desirable to have several morning departures from Santa Cruz County. Likewise, several evening departures from Santa Clara County should be provided to allow the riders some scheduling flexibility for the return trips.

Midday recreational travel should be served using some portion of the equipment required for serving commuter travel. The most likely concept will involve providing a train or trains departing from Santa Clara County some time after the arrival of the last commuter train. The midday trains would go to Santa Cruz County, allow the passengers to depart the train and spend a few hours in Santa Cruz for recreational or other purposes, and then reboard the train in either an afternoon or evening trip back to Santa Clara County. The return trip would be timed to permit the train to be used as one of the regular commuter trains; passenger cars could added or removed as required to serve the midday demand. In addition, a midday nonwork-related trip could originate in Santa Cruz and arrive in San Jose before noon. Patrons could return to Santa Cruz County on either an afternoon or evening commuter train.

A great deal of flexibility in serving the midday recreational and other purpose markets will be possible. For example, if demand is low, then recreational excursion trains can be operated only on designated days (i.e. Tuesdays and Thursdays, or Monday-Wednesday-Friday, or only on weekends, etc.); or if demand is higher than expected, then additional cars can be added to the train or additional trains can make midday runs, particularly during the summer months. In general, because the existing travel data suggest that the daily commute demand will be higher than the daily recreational demand, the equipment necessary to serve the recreational demand will be available for use as needed.

3. Feeder and Distribution Needs

Traditional transit services, such as bus or rail transit services, work best when many trip origins and destinations exist along a transit line. However, the proposed Santa Cruz County to Santa Clara County rail service does not traverse densely populated areas or many major employment sites. This means that for the service to be attractive connections will have to be provided to both residential and employment sites. Conventional park-and-ride lots would be desirable at morning origin stations and some kind of transit shuttle to and from employment sites should be provided at the destination stations.

The destination-end shuttle services could be provided by a variety of entities, including the county transit agencies, private entrepreneurs, employers, or groups of employees with similar destinations. Each of these potential providers will have some advantages and disadvantages with respect to being able to provide good shuttle services and it is very likely that a mix of these providers will eventually evolve to provide the necessary connecting services. Direct, non-stop shuttle service between the destination station and the employment sites will be a key factor in the mode choice decisions that will be made by prospective rail system users.

4. Intermodal Connection Requirements

It will also be very desirable to ensure that the rail service is planned to facilitate intermodal transfers and connections to other rail, bus and air passenger services in both Santa Clara

County and Santa Cruz County. The highest priority connections would be to the Vasona Light Rail Corridor, the De Anza Light Rail Corridor (Route 85), CalTrain service at San Jose's Cahill Station, and Metro Center and the Fixed Guideway Service in Santa Cruz County.

These connections will be particularly important to the growth of recreational rail travel through the Corridor and to the growth of commuter travel to employment sites that do not provide some kind of connecting shuttle services or that do not have a large number of employees who live in Santa Cruz County.

E. RIDERSHIP ESTIMATES

The ridership forecasts are dependant upon several key assumptions. If conditions differ significantly from these assumptions, the number of rail patrons may be greater or less than projected.

1. Ridership Forecasting Assumptions

The first assumption is that the existing commute behavior within the Route 17 Corridor will remain the same. The excess job supply that currently exists in San Francisco Bay Area is projected to persist in the foreseeable future, attracting commuters from outside the region. In particular, Route 17 will continue to be a major gateway for commuters traveling to jobs in Santa Clara County from residences in the Santa Cruz area. The Santa Cruz area is viewed by many as a desirable residential environment for several reasons:

- development is less dense with rural characteristics in many areas,
- cultural activities and entertainment are available,
- wooded mountains and a spectacular coastline are accessible,
- nearby beaches and parks provide a wealth of recreation opportunities, and
- travel times to jobs in Santa Clara County are feasible for commuters.

Due to the projected future jobs/housing imbalance in Santa Clara County and the desirability of housing in the Santa Cruz area, the current trend of importing workers to Santa Clara County from the Santa Cruz area is expected to continue.

For the purposes of preliminary patronage forecasting, an assumption related to the first assumption is that Santa Cruz County population, land uses, and travel demand will remain essentially same as they are now. It is noted, however, that approximately 7,200 new housing units are needed to accommodate growth in Santa Cruz County through 1995, based on State of California Department of Finance estimates.[5] This reflects an annual population increase of approximately 1.35 percent per year.[6] Hence, it is likely that travel demand in the Route 17 Corridor would continue to grow.

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[5]1994 General Plan and Local Coastal Program for the County of Santa Cruz, May 24, 1994.

[6]Ibid.

Another assumption inherent in the ridership forecast is the continued existence of large employers. Since large companies employ multiple Route 17 commuters at one site and thereby facilitate feeder transit service to and from work sites, the rail patronage is dependent upon the continued presence of large employers/employment sites.

Supporting feeder and distribution transit services are another key factor that will influence the ridership on the Santa Cruz-Los Gatos rail line. It is assumed, generally, that effective, limited-stop, connecting transit services will be provided at rail stations so that door-to-door travel times using the rail line are competitive with other modes of travel. The connecting transit services could be provided by county transit agencies—possibly in the form of express bus service to large business parks, civic centers, major colleges and universities, and other sites with concentrations of Route 17 commuters. Additionally, large private employers may choose to provide direct shuttle service between rail stations and work sites. Private shuttle/van services may also evolve to fulfill demands for unique distribution and feeder services.

To facilitate commuters in accessing rail transit service, park-and-ride facilities will be needed at rail stations in both Santa Clara and Santa Cruz County, since relatively few people live within walking distance of the rail stations. Furthermore, the added time associated with using feeder transit service from the home to the rail station make it infeasible for most of the commuters. Therefore, it is anticipated that the majority of the rail patrons will drive from their homes to the rail stations. Some will walk, or use a bicycle, or be dropped off, or use transit. It is assumed that adequate park-and-ride facilities will be provided so that parking at rail stations will not be a constraint.

Concerning travel time, this Study has assumed that the potential rail service will need to offer total door-to-door travel times that will be viewed as competitive with the auto commute travel times. Because of the highly variable auto trip times through the Route 17 Corridor that are caused by traffic accidents, construction and other maintenance activities; a competitive rail system trip time may be as much as 30 minutes longer than a comparable drive time. The reason a longer trip time will likely be perceived as competitive is that the rail service will be viewed as a more reliable method of commuting than driving on Route 17. In general, the time spent in the rail vehicle will be perceived as having more utility for productive work or relaxation than the comparable time spent driving an automobile through the Route 17 Corridor. Commuter travel times by automobile are compared with estimated travel times for commuters using rail transit in Section E.2, following. These time comparisons show that a significant portion of the potential market could commute to work from home within 30 minutes of a similar trip by automobile. In addition, a rail service may be viewed as a safer alternative to driving. Between January 1991 and December 1993, Caltrans reports that a total of 2,334 accidents, causing 17 fatalities and 779 injuries, occurred on Route 17 between Santa Cruz and Los Gatos.[7] This averages to nearly 778 accidents per year, or more than two per day.

The fare charged riders on the Santa Cruz-Los Gatos rail line is assumed to be competitive with the user costs for other modes of travel. A comprehensive study to determine a competitive fare rate for rail service between Santa Cruz and Los Gatos has not been completed. Nor have

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[7]Caltrans TASAS Table B, District 4, Selective Accident Rate for Route 17, September 1994.

studies been conducted to evaluate the sensitivity of the potential rail market to varying fare levels. Such issues are appropriate to address in future stages of the project. The ridership forecasts prepared for this initial feasibility analysis are based on the general assumption that the fare charged for rail service will not be prohibitively expensive. Specific fares are addressed in Chapter XI.

Lastly, it is assumed that intermodal connections will be provided allowing rail passengers to access existing and planned future transit services. While some commuters may find that rail travel with connections to conventional transit services may be too slow compared to other modes of travel, intermodal connections are vital to serve recreational and other nonwork travelers. For example, a family in San Francisco could travel to the Santa Cruz Beach Boardwalk via rail transit if the proper connections are provided between CalTrain and the Santa Cruz County-Santa Clara County rail line. In the opposite direction, the appropriate intermodal connections could allow youths in Scotts Valley to travel to the Great America amusement park in Santa Clara using the Santa Cruz-Los Gatos rail line and connecting to the Guadalupe light rail line. In addition to CalTrain and the Guadalupe light rail line, intermodal connections should allow access to the bus services operated by both the Santa Clara County Transportation Agency and the Santa Cruz Metropolitan Transit District, future light rail extensions in Santa Clara County, including specifically the Vasona Light Rail, and the proposed Santa Cruz fixed guideway transit system.

2. Comparison of Rail and Automobile Commuter Travel Times

Travel times for various conceptual rail transit alternatives have been estimated in Chapter VI for the alignments and technologies presented in Chapters IV and V, respectively. Table 6 presents the difference in travel time between rail and auto modes for trips from various communities in Santa Cruz County to Los Gatos and San Jose in Santa Clara County. Assuming a direct shuttle is provided for rail patrons, the portion of the trip between Los Gatos/San Jose and the work site/school is traveled via automobile by both rail commuters and Route 17 automobile commuters. Therefore, travel in Santa Clara County beyond Los Gatos or San Jose was not included in the calculations.

The rail travel time is dependent upon the rail technology and alignment concept that is selected. The estimated rail travel times presented here assume light rail transit service is used on the Historic Alignment Concept described in Chapter IX.

The total travel time for rail patrons is comprised of four segments: drive time from home to rail station, transfer time from auto to rail, travel time on the rail line, and transfer time from rail to direct work/school shuttle. The drive access times to rail are based on the median travel times between locations in Santa Cruz County as reported in the Census journey-to-work travel time data.[8] A five-minute penalty is added to both ends of the rail trip to account for the time associated with transferring between auto and rail modes. The travel time on the rail line is from the prototype timetable presented in Table 15 of this report. The travel time for commuters in private automobiles is also taken from the Census journey-to-work median travel time data.

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[8]Association of Monterey Bay Area Governments (AMBAG) Census Transportation Planning Package, 1990.

Table 6
Comparison of Rail Versus Automobile Travel Times

	Travel Time Via Light Rail on Historic Alignment (Minutes)					Travel Time Via Automobile (Minutes)	
	Drive to Rail[a]	Transfer[b]	Travel on Rail[c]	Transfer[b]	Total	Total[a]	Time Savings
To Los Gatos from:							
Aptos	16	5	41	5	67	35	32
Ben Lomond	10	5	30	5	50	45	5
Boulder Creek	20	5	30	5	60	40	20
Capitola	11	5	41	5	62	40	22
Felton	2	5	30	5	42	40	2
Santa Cruz	10	5	45	5	65	30	35
Scotts Valley	10	5	30	5	50	25	25
Soquel	15	5	41	5	66	35	31
Watsonville	30	5	41	5	81	45	36
						Average	**28**
To San Jose (Cahill) from:							
Aptos	16	5	56	5	82	55	27
Ben Lomond	10	5	45	5	65	50	15
Boulder Creek	20	5	45	5	75	60	15
Capitola	11	5	56	5	77	45	32
Felton	2	5	45	5	57	45	12
Santa Cruz	10	5	60	5	80	43	37
Scotts Valley	10	5	45	5	65	44	21
Soquel	15	5	56	5	81	45	36
Watsonville	30	5	56	5	96	50	46
						Average	**30**

[a]Source: 1990 Census Journey-to-Work median travel time. Drive time is to nearest rail station; refer to Table 11.
[b]Barton-Aschman estimate.
[c]Table 15.

Travel by automobile on Route 17 is projected to be faster on the average than travel by rail between all communities in Santa Cruz County and Los Gatos/San Jose. The time savings range between 2 and 46 minutes. The time savings calculated for each community in Santa Cruz County was weighted by the community's rail market share to determine a weighted average time savings. Compared to the estimated rail travel times, a trip from Santa Cruz County to Los Gatos and San Jose via private automobile would result in a time savings of 28 and 30 minutes, respectively. Because the calculated average time savings of 28 to 30 minutes are based on median travel times, it can be assumed that rail travel times are within 30 minutes of automobile travel times for at least one-half the commuters from Santa Cruz County for which a direct work/school shuttle is provided.

3. Initial Demand Forecasts

Ridership forecasts developed for the Santa Cruz-Los Gatos Rail line followed a "bottom-up" approach. Unlike traditional modeling approaches or extrapolations based on census data, surveys of large employers, community colleges, and universities were used to specifically identify the Route 17 commuters that could be effectively served by the Santa Cruz-Los Gatos Rail line.

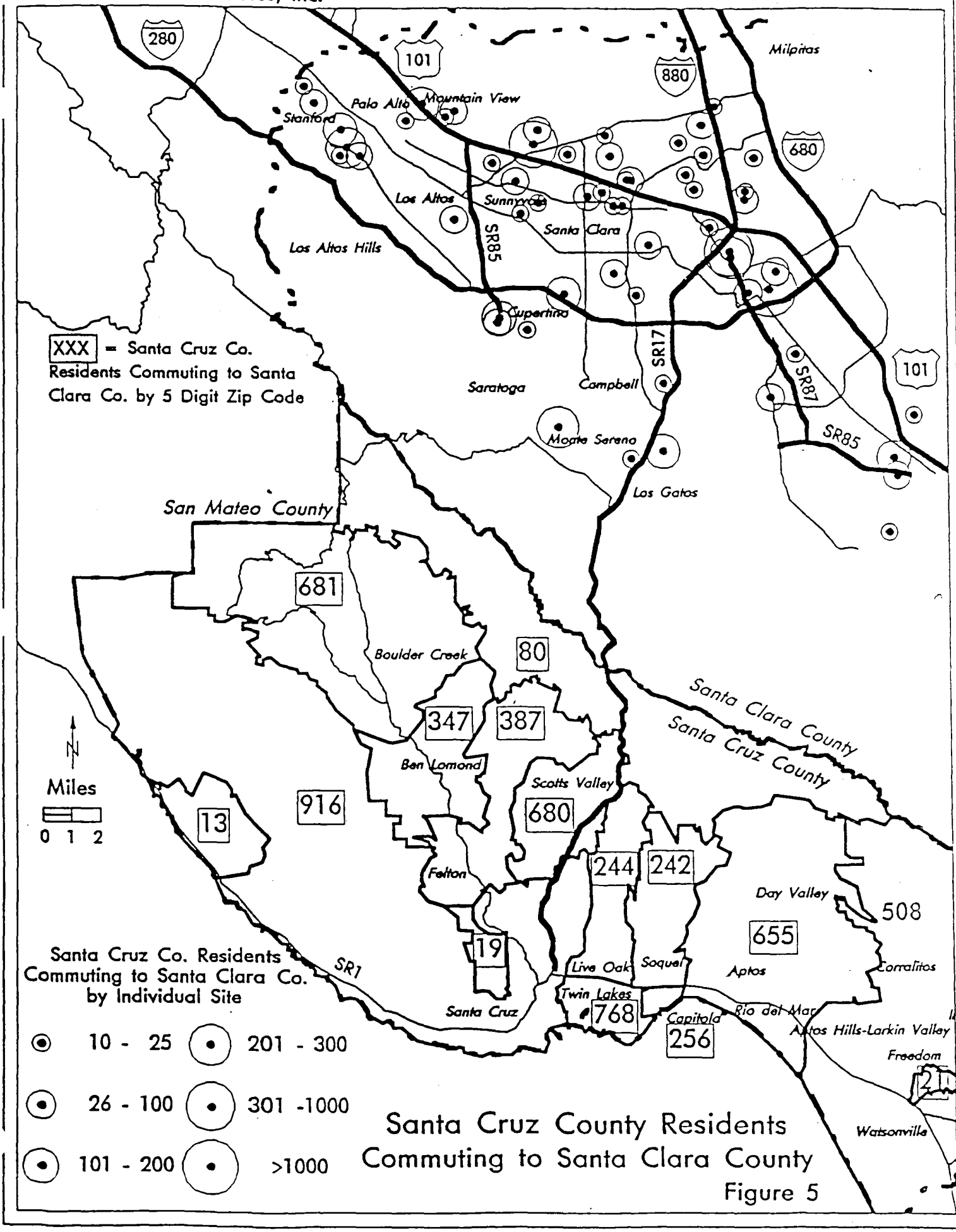
The potential market for the new rail line is assumed to be essentially commuters in groups of ten or more per site that may be easily served by some type of feeder transit service that transports rail passengers directly to and from their work/school sites. Although commuters who are employed by small firms may choose rail transit, it is believed that commutes to large employers and to college campuses represent the largest potential rail market. Patronage forecasts for trips other than work, school, and recreational were not determined in this preliminary Study. It is assumed at this stage of the study that the magnitude of these other-purpose trips will not be significant. Furthermore, these other-purpose trips could probably be served by the rail transit fleet and operation described in this Study.

Survey Methodology: Barton-Aschman researched the major employers in both Santa Clara and Santa Cruz Counties and identified approximately 550 firms (420 in Santa Clara County and 130 in Santa Cruz County) with 100 or more employees. Large employers were specifically targeted in the survey because they are most likely to have sufficient "over-the-hill" commuters to justify feeder transit service to and from the work site. The employers were mailed a copy of a letter requesting a tally of their employees by residential zip code. Whenever possible, the letter was addressed by name to the transportation coordinator contact at each employer and advance telephone contacts were made. These contacts were generally very favorably received and at times yielded the requested information immediately.

Letter requests were also mailed to colleges and universities in both counties. The schools were asked to provide the information for both employees and students.

In order to obtain a high response rate, follow-up telephone contacts were made with major employers and schools who did not respond to the letter requests. A total of 159 employers and 4 schools responded to the survey—a response rate of nearly 30 percent. The survey results were entered into a computerized database that is linked to digital maps of Santa Clara and Santa Cruz Counties.

Santa Clara County Employer Survey Results: In Santa Clara County, 129 employers responded to the survey representing a total estimated work force of 165,700 people. The survey identified approximately 4,270 employees (2.6 percent) in Santa Clara County who commute from the Santa Cruz area. These commuters represent nearly one quarter of the 17,700 commuters from Santa Cruz County to Santa Clara County identified in the 1990 Census. Approximately 4,020 (94 percent) of these "over-the-hill" commuters were found to be working for employers with 10 or more employees living in Santa Cruz County. The locations of the Santa Clara County work sites with 10 or more Route 17 commuters are illustrated on Figure 5. The exhibit also shows the distribution of employee residences by zip code within Santa Cruz County for these work sites. Given the high percentage of "over-the-hill" commuters found in the



Santa Cruz County Residents Commuting to Santa Clara County

Figure 5

survey that work at sites that could be served by feeder transit, the survey appears to have been successfully targeted at sites with potential rail patrons.

The 4,020 servable "over-the-hill" commuters are only a portion of the potential market for rail service in the Route 17 Corridor. In order to estimate the full magnitude of the potential commuter rail market for all of Santa Clara County, the survey results were expanded to account for Santa Clara County employers who did not respond to the survey.

Based on the surveyed percentage of Santa Clara County employees who commute from the Santa Cruz area (2.6 percent), any employer with approximately 400 or more employees probably has ten or more "over-the-hill" commuters. About 63 employers who did not respond to the survey meet this criteria. The total work force at these employers is estimated to be 70,200 people. The number of "over-the-hill" commuters at these sites was calculated to be approximately 1,820 employees. Therefore, the total potential rail market for commuters to Santa Clara County jobs is estimated to be 5,840 people. Table 7 presents a summary of the survey results for Santa Clara County employers.

Table 7
Santa Clara County Employer Survey Results

Number of Employer Surveys Mailed	421	
Number of Employers Who Responded	129	(31%)
Total Work Force	165,700	
Total "Over-the-Hill" Commuters	4,270	(2.6%)
Rail Servable "Over-the-Hill" Commuters	4,020	(94%)
Number of Employers Who Did Not Respond	292	
Major Employers (> =400 employees)	63	
Total Work Force at Major Employers	70,200	
Rail Servable "Over-the-Hill" Commuters	1,820	
Potential Rail Patrons Residing in Santa Cruz County and Working in Santa Clara County	5,840*	

* The potential rail market is approximately 33% of the total number of commuters from Santa Cruz County to Santa Clara County.

Source: Barton-Aschman Associates, Inc.

The potential rail market is about one-third of the total number of commuters from Santa Cruz County to Santa Clara County. The remaining commuters from Santa Cruz to Santa Clara County, approximately 11,860 persons according to the 1990 Census, are not categorized as

potential patrons for rail service due to difficulties in providing cost-effective and timely feeder transit service to and from small, scattered work sites. Therefore, none from this group of commuters was included in the patronage estimate, although it is conceivable that some from this group would use the rail service.

Santa Clara County Educational Institution Survey Results: Three schools in Santa Clara County—Mission College, Evergreen Valley College, and San Jose State University—provided residence zip codes for students. About 1,500 students (3.1 percent) of a total enrollment of 48,100 students were found to commute to these schools from the Santa Cruz area. Due to the concentration of these students at a limited number of sites; as with work trips, all of the students who commute to these schools from the Santa Cruz area are potentially rail patrons. The distribution of student residences by zip code within Santa Cruz County are included on Figure 5.

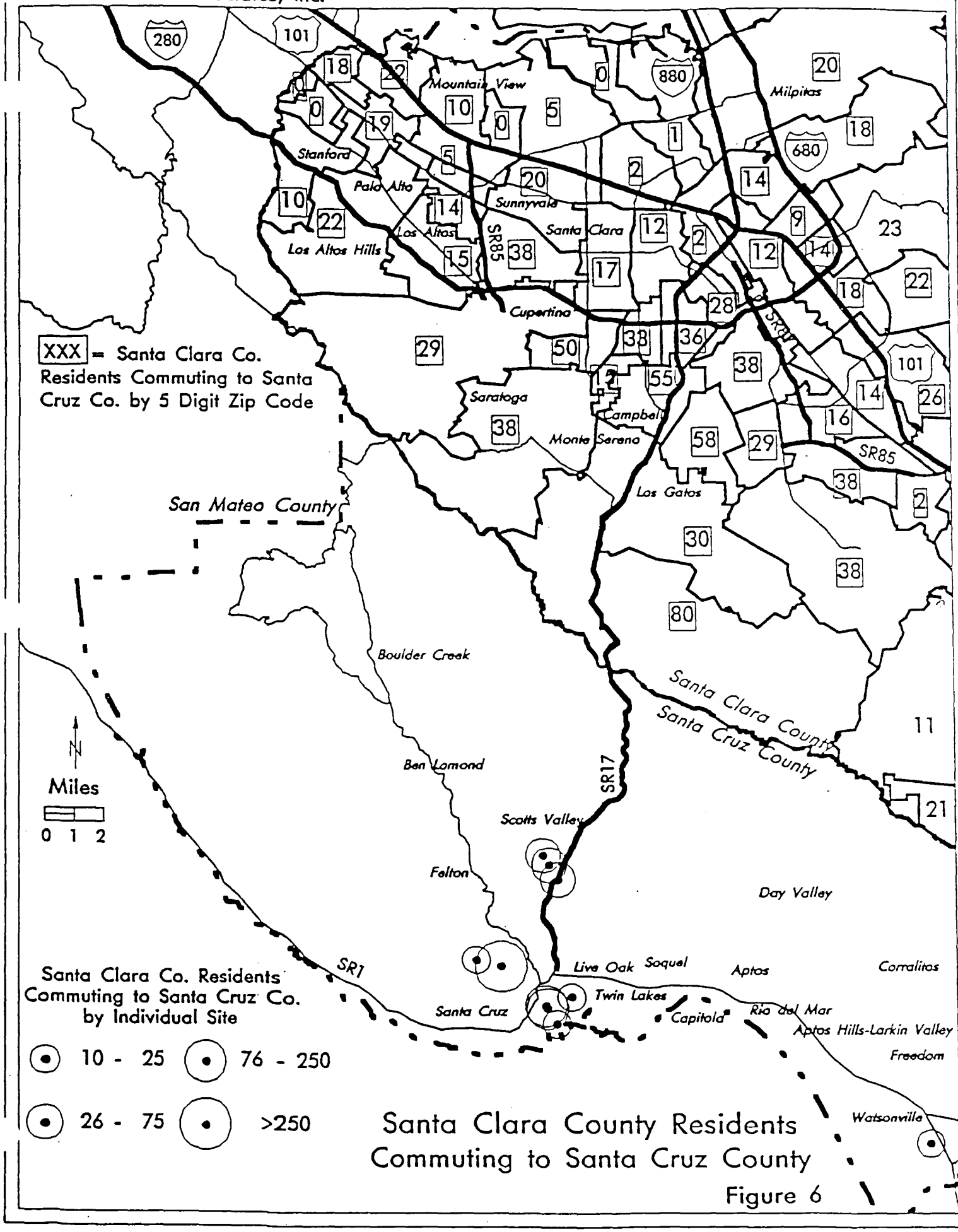
Many colleges and universities did not provide the requested student residence data. Additional "over-the-hill" commuters are likely at Foothill Community College, De Anza Community College, San Jose City College, and Stanford University. The number of "over-the-hill" commuters at these schools cannot be estimated based on the survey results because the total enrollment at these schools was not provided.

Santa Cruz County Employer Survey Results: In Santa Cruz County 30 employers responded to the survey representing a total estimated work force of 8,200 people. The survey identified approximately 620 employees (7.6 percent) in Santa Cruz County who commute from Santa Clara County. Approximately 560 (90 percent) of these "over-the-hill" commuters identified in the survey were found to be working for employers with 10 or more employees who live in Santa Clara County. The servable "over-the-hill" commuters represent approximately 16 percent of the 3,500 commuters from Santa Clara County to Santa Cruz County identified in the 1990 Census. The locations of the work sites with 10 or more Route 17 commuters are illustrated on Figure 6. The exhibit also shows the distribution of employee residences by zip code within Santa Clara County for these work sites. Table 8 presents a summary of the survey results for Santa Cruz County employers.

In addition to the potential rail patrons found in the survey of Santa Cruz County employers, there are likely many other servable "over-the-hill" commuters who work at employers that did not respond to the survey. However, the estimate of the potential rail market for commuters from Santa Clara County to Santa Cruz County cannot be expanded beyond the survey results because the necessary employment data are not available.

In the fall of 1993, the Santa Cruz Area Transportation Management Agency (TMA) conducted a survey of Santa Cruz County employers with 50 or more employees. The TMA survey had a higher response rate than the survey recently conducted by Barton-Aschman. A total work force of approximately 31,400 employees are represented in the TMA survey. About 1,000 of the employees who responded to the TMA survey reside in Santa Clara County. Due to concerns regarding employer confidentiality, only summary statistics from the TMA survey have been released. The number of "over-the-hill" commuters that work at sites with ten or more commuters from Santa Clara County cannot be determined from the summary statistics provided.

Barton-Aschman Associates, Inc.



Santa Clara County Residents Commuting to Santa Cruz County

Figure 6

Table 8
Santa Cruz County Employer Survey Results

Number of Employer Surveys Mailed	130	
Number of Employers Who Responded	30	(23%)
Total Work Force	8,200	
Total "Over-the-Hill" Commuters	620	(7.6%)
Rail Servable "Over-the-Hill" Commuters	560	(90%)
Potential Rail Patrons Residing in Santa Clara County and Working in Santa Cruz County	560*	

* The potential rail market is approximately 16% of the total number of commuters from Santa Clara County to Santa Cruz County.

Source: Barton-Aschman Associates, Inc.

Some general conclusions can be deduced from the results of the two surveys. First, the magnitude of the potential rail market for commuters who travel from residences in Santa Clara County to jobs in Santa Cruz County is relatively small compared to the potential market in the opposite direction. This is not a surprising finding given the directional travel demands exhibited on Route 17. Santa Cruz County has many fewer large employers than Santa Clara County, and since potential rail patrons are concentrated at large work sites, the potential rail market for commuters to jobs in Santa Cruz County is proportionately small. Second, although the TMA employer survey represented about four times as many employees as the Barton-Aschman survey, the number of commuters from Santa Clara County identified in the TMA survey is less than twice that identified by Barton-Aschman. This indicates that the Barton-Aschman surveys were quite effective in identifying potential rail patrons by targeting large employers. It is believed that the potential rail market associated with small employers is relatively minor and that the addition of this market to the potential market identified in this Study would not significantly change the overall forecast.

Santa Cruz County Educational Institution Survey Results: The University of California at Santa Cruz provided residence data for the approximately 10,200 students enrolled in the fall quarter in 1993. About 520 students (5.1 percent) were found to commute from Santa Clara County. Of all the Santa Cruz County employers who responded to the survey, the University of Santa Cruz has by far the most "over-the-hill" commuters. Considering both employees and students, this site has a total of about 580 commuters from Santa Clara County—more than the combined total of all other Santa Cruz County employers who responded to the survey. Given adequate feeder/distribution transit service between the university and the rail stations, these "over-the-hill" commuters to UC Santa Cruz are a significant segment of the potential rail market. The location of UC Santa Cruz and the distribution of student residences by zip code within Santa Clara County are shown on Figure 6.

Other colleges within Santa Cruz County, such as Cabrillo College, are also likely to have students who commute from Santa Clara County. Because survey data were not provided, the total enrollment and number of "over-the-hill" commuters at these other colleges in Santa Cruz County are unknown.

Potential Rail Market Associated with Work/School Trips: In total, the Santa Cruz-Los Gatos rail line has the potential to serve approximately 8,420 commuters to work and school per day. The large majority of the work/school trips are expected to be commuters traveling from residences in Santa Cruz County to jobs/schools in Santa Clara County. Table 9 presents a summary of the potential rail patrons by trip purpose and direction of travel.

Table 9
Potential Santa Cruz-Los Gatos Commuter Rail Patronage

	Trip Purpose		
Morning Commute Direction	Work	School	Total
Santa Cruz to Santa Clara	5,840	1,500	7,340
Santa Clara to Santa Cruz	560	520	1,080
Total	6,400	2,020	8,420

Source: Barton-Aschman Associates, Inc.

Potential Rail Passenger Market Associated With Recreational Trips: The analysis of existing travel demand in the corridor revealed that the largest potential market for rail passengers would be commuter trips. The market for recreational travel was also deduced to be significant in size, but probably difficult to serve because of dispersed origins, destinations and trip departure times. The need to be transporting various pieces of recreational equipment such as beach chairs, surfboards, bicycles and other sporting goods/clothes may also deter some potential recreational rail passengers although many of these transportation needs could be easily accommodated by the rail service with proper planning and support.

An important conclusion that stems from the size of the work and school ridership projection is that the recreational demand will probably not affect the need for railroad equipment; preliminary findings indicate that the equipment needed for daily commuter travel is large enough to support a fairly large midday recreational demand in addition to serving the commuter demands. It should also be recognized that, in general, the recreational travel will occur during the off-peak time periods and on weekends. This means that a substantial equipment reserve will nearly always be available for use in serving off-peak and weekend recreational and other nonwork travel. This should be true regardless of whether light rail or commuter rail is selected for use.

In comparison to the information on work and school travel demand within the Corridor, very little information was found during this Study that would help quantify the existing or the potential market for recreational travel through the Corridor. Budget limitations for this phase of work precluded conducting surveys to acquire more specific information on this market.

Although no documentation was found for projecting the proportion of the recreational market that could be captured by a hypothetical "over-the-hill" rail service, the patronage associated with the Santa Cruz, Big Trees & Pacific Railway Company operations, including narrow-gauge operations, suggests that as many as 1,000 people per operating day are currently interested in excursion train trips through the Santa Cruz Mountains. As discussed above, this volume of midday recreational riders could easily be served with the equipment required to serve the projected daily commuter demand. Moreover, it is probable that the recreational patronage market can be developed into a much larger share of the total rail patronage through the Route 17 Corridor. Even if this demand doubled or tripled in size, the equipment used to serve the weekday commuter trips would also be adequate for serving the recreational travel demand through the Corridor.

Santa Cruz-Los Gatos Rail Line Ridership Forecasts: The Santa Cruz-Los Gatos rail line will capture a portion of the potential market identified by the surveys plus trips for other trip purposes. It is expected that the capture rate will be relatively low at first and increase over time as the public becomes aware of the new rail service and as more employers provide direct feeder transit shuttles between rail stations and work sites. When rail service begins, it is estimated that approximately 20 percent of the servable Route 17 commuters may be diverted to rail transit service. A 20-percent capture rate could be obtained if each potential rail patron used rail transit one day per week or if one of every four potential rail patrons used rail transit four days a week. Based on the potential market identified by the survey of employers and schools, a total of approximately 1,680 patrons which yield 3,360 boardings per day could be expected shortly after rail service is introduced.

The number of average daily recreational riders is projected to be approximately 500 which yield 1,000 boardings per day on an average weekday. This number of boardings would be expected to rise as the service becomes better known and more familiar to potential recreational travelers. Weekend ridership, particularly during the summer, could be substantially higher, and easily served given the availability of either light rail or commuter rail cars on weekends.

Therefore, it is projected that the Santa Cruz-Los Gatos rail line would attract approximately 4,360 total daily boardings during the first few years of operation. Table 10 shows how the ridership forecasts were developed based on the potential commuter rail patrons identified in the employer survey, the assumed capture rate, and the estimated recreational rail travel demand.

Ridership Growth: The projected patronage described in this report is a function of the quality of rail service provided, and to some extent, the quality of alternative modes of travel between Santa Cruz and Santa Clara Counties. Factors affecting the perceived quality of rail service were described in Section D, "Service Concept Conclusions," and include the frequency and timing of rail trips, the availability of parking at rail stations, the opportunities for

Table 10
Preliminary Daily Ridership Forecasts

Potential Commuter Rail Patrons[1]	8,420
Estimated Capture Rate[2]	20%
Projected Commuter Rail Patrons[3]	1,680
Projected Commuter Rail Boardings (one-way trips)	3,360
Projected Recreational Boardings[4]	1,000
Total Projected Boardings	**4,360**

1 Based on commuter trips associated with work and school. Taken from Table 9.

2 The capture rate is estimated to be approximately 20% of servable commuters when rail service begins. The capture rate is expected to increase over time as the public becomes aware of the rail transit service option and as additional supporting feeder and distribution transit services are developed.

3 Based on the data in Table 9, the number of Santa Cruz County-to-Santa Clara County commuters is 1,465, and the number of Santa Clara County-to-Santa Cruz County commuters is 215.

4 The recreational ridership is expected to grow as the public becomes aware of the service and could be significantly higher during weekends, particularly during the summer.

Source: Barton-Aschman Associates.

intermodal transfers, and the availability of direct, non-stop shuttle services between rail stations and major employer sites, colleges, and universities. Future increases or decreases in the number of commuters that use rail transit service to and from work are expected to be representative of a higher or lower rail capture rate caused by a change in the quality of rail service provided and less a result of an increase or decrease in the size of the potential commuter rail market.

The recreational market represents the greatest opportunity for future ridership growth on the Santa Cruz–Los Gatos rail system. The magnitude of recreational travel on Route 17 during peak summer weekends is currently limited by the highway capacity. A latent demand for recreational travel between the San Francisco Bay and San Joaquin Valley areas and Santa Cruz County exists such that if additional capacity were provided in the form of improvements to Route 17 or the construction of rail transit service, the recreational travel market could swell to fill the available capacity. Furthermore, the rail system may attract a number of patrons who ride to experience the trip by rail through the Santa Cruz Mountains as a round-trip excursion.

It is observed that a potential "over-the-hill" rail transit operation would capture less than five percent (4.5 percent) of the total daily person trips on Route 17, which is consistent with the rate of transit usage in Santa Clara County. It is estimated that 730 patrons will board "over-the-hill" rail transit in Santa Cruz County during the morning peak-hour commute. Assuming 1.22 riders per automobile, there could be as much as a 600-vehicle reduction during the peak-hour

southbound morning commute. This relates to an estimated 15 percent change in mode from automobile to rail transit during the peak hour. While the rail line would primarily serve commuters during a two-hour window of time, the effects on Route 17 traffic would be spread over a four- to five-hour commute period. Some commuters may change from auto travel during nonpeak periods to rail travel during the peak hour. Additionally, some auto commuters who had traveled during nonpeak periods in order to avoid congestion on Route 17 may alter their trip start time to within the peak hour once rail service is introduced in the Corridor. Therefore, the net difference in the northbound traffic volume on Route 17 during the morning peak hour is likely to be somewhat less than 15 percent.

IV RAIL ALIGNMENT CONCEPTS

A. INTRODUCTION

This chapter identifies the alternative alignment concepts that were developed during the course of the Study for the purpose of feasibility assessment. Background on site conditions is provided in Chapter II, "Corridor Inventory." Technologies and rail operations associated with the alignment concepts are presented in Chapters V and VI. Chapter VII addresses additional engineering considerations and assumptions. Environmental studies are summarized in Chapter VIII and Appendix A.

Rail alignment concepts were identified and developed in consideration of the following goals:

- Enhance access and mobility between Santa Cruz and Santa Clara Counties.
- Provide a desirable passenger service for commuters, recreational travelers, and other patrons.
- Connect with existing and planned transit services.
- Serve either conventional commuter rail or light rail technologies.
- Allow for the conceptual rail system to be upgraded in the future.
- Be consistent with regional rail transit plans.
- Be consistent with Santa Clara County, Santa Cruz County, and local general plans.
- Be compatible with Route 17, Route 85, and Route 1 plans, including the future Route 17 interchange at the Lexington Reservoir and the planned interchange modifications at Route 17 and Route 1 in Santa Cruz.
- Avoid or minimize significant environmental impacts and impacts that cannot be mitigated.
- Be compatible with site conditions and constraints including topography, geology, hydrology, parklands, woodlands, transportation routes, rural settings, and urban land uses.

- Provide for public interests and concerns.

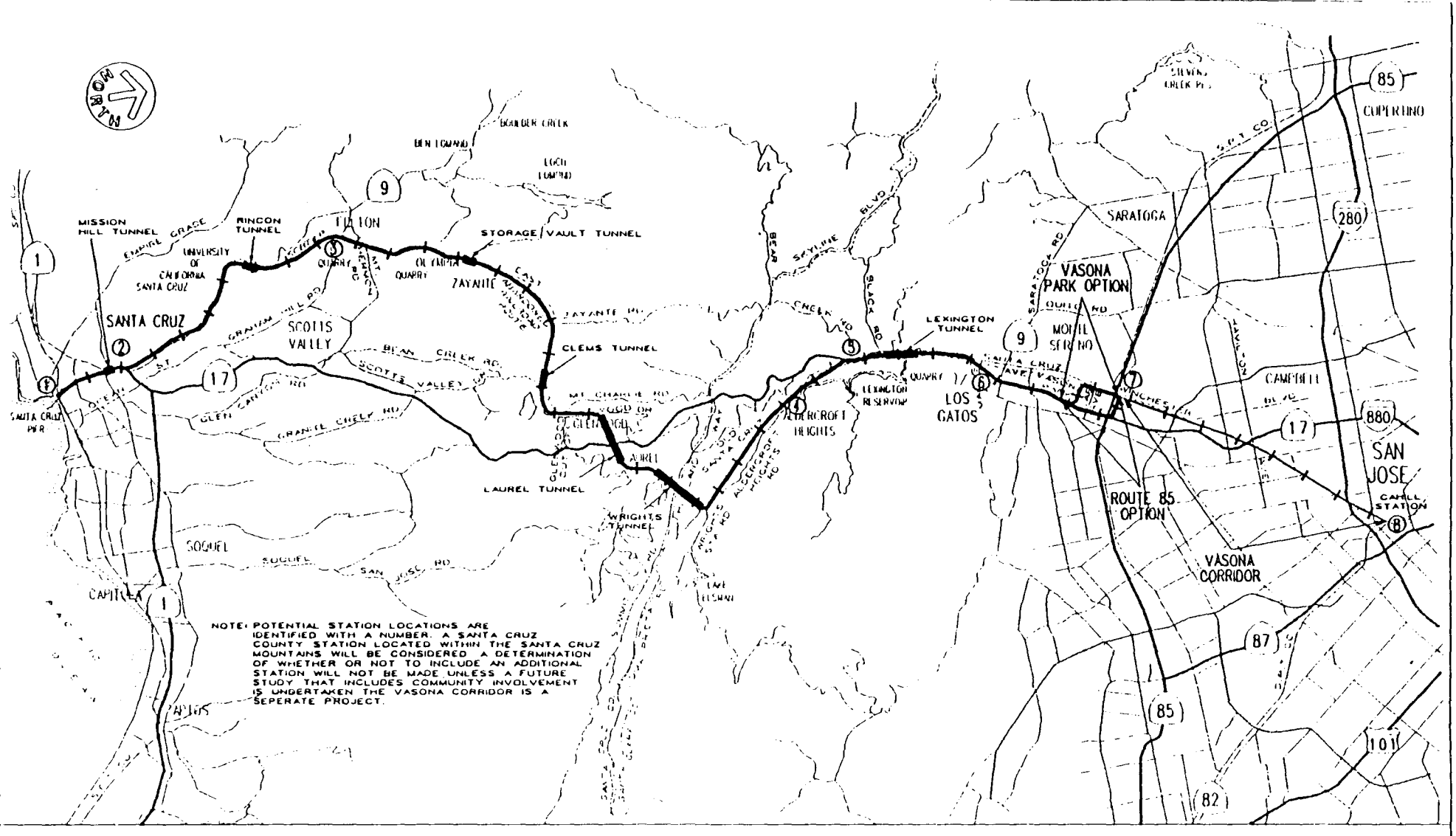
- Minimize capital and annual costs.

A review of site conditions, and engineering studies and an environmental scan were conducted to assist in the identification of conceptual rail alignment alternatives. Engineering studies included the identification of potential rail alignments and the establishment of horizontal and vertical geometric feasibility. The nature of the Study permitted only a limited assessment of local, site-specific considerations. The major engineering, construction, environmental, and rail service considerations, however, were assessed and are discussed in this and the following chapters. Additional systemwide engineering considerations and assumptions, including parking lot capacities and maintenance facility assumptions, are presented in Chapter VII.

Based on the engineering studies and in consideration of the above goals, three alternative alignment concepts were developed. They are identified as Concept 1—Historic Corridor; Concept 2—Historic and Scotts Valley Corridor; and Concept 3—Route 17 Corridor. Each alternative has a common southern terminus at the existing Southern Pacific railroad branch line near the Santa Cruz waterfront, and a common southern line segment along the existing Santa Cruz, Big Trees & Pacific line between the Santa Cruz waterfront and Route 1. Each alternative also has a common northern terminus at Vasona Junction, which connects with the Vasona Rail Corridor located at Winchester Boulevard and Route 85 in Los Gatos, and a common northern segment between the Lexington Reservoir and the Vasona Junction. Within this northern line segment in Los Gatos, each alignment concept has two alternative means of connecting with the Vasona Junction: either via the Vasona Lake County Park and University Avenue or via the Route 17/Route 85 Interchange and Route 85. The alignment concept alternatives, including station concepts, are described in the following sections. Descriptions are generally presented by starting at the south end and proceeding to the north end. Other alternative alignment variations that were identified, but not evaluated, are discussed at the end of this chapter.

B. ALIGNMENT CONCEPT 1—HISTORIC CORRIDOR

The Concept 1 alignment is shown in Figure 7. The Historic Corridor originates near the Santa Cruz waterfront in the vicinity of Beach Street and Washington Street. It follows the existing Santa Cruz, Big Trees & Pacific Railway from Santa Cruz to Olympia as described in Chapter II. Concept 1 generally follows the Historic Railroad alignment through the Santa Cruz Mountains between Olympia in Santa Cruz County and Aldercroft Heights in Santa Clara County as described in Chapter II. The Historic Corridor uses five existing tunnels: Mission Hill, Storage Vault (Filesafe), Glenwood (Clems), Laurel, and Wright's. The Rincon Tunnel would be replaced with a new tunnel. From Aldercroft Heights, the Concept 1 alignment follows the southeastern shoreline of Lexington Reservoir for a short distance, then crosses the southern end of the Lexington Reservoir on a new viaduct (long aerial structure). The alignment continues southward along the western shoreline of the Lexington Reservoir to a new tunnel, identified as the Lexington Tunnel, near the Lexington Reservoir Dam. From this new tunnel, Concept 1 is aligned between Route 17 and Los Gatos Creek on a new viaduct until it reaches Main Street in Los Gatos. The alignment continues northward on a new viaduct to the existing pedestrian overcrossing where the alignment descends to grade level following the Route 17 median to the Vasona Lake County Park.



SANTA CRUZ - LOS GATOS RAIL FEASIBILITY STUDY **FIGURE 7**

ALIGNMENT CONCEPT 1 - HISTORIC

De Leuw, Cather & Co. September 20, 1994

As discussed in the introduction to this chapter, two Route 17-to-Vasona Junction connection alternatives in Los Gatos are presented. The first option, via Vasona Lake County Park, follows the service road at the north end of the park, crosses the Vasona Lake Dam, follows University Avenue, crosses Lark Avenue near Winchester Boulevard, and connects with the Vasona Corridor at Route 85. The second option, via Route 85, follows Route 17 through the Route 17/Route 85 Interchange and follows Route 85 to the Vasona Junction when it connects with the Vasona Corridor.

Station locations and concepts are presented in Table 11.

C. ALIGNMENT CONCEPT 2—HISTORIC AND SCOTTS VALLEY CORRIDOR

Concept 2, shown in Figure 8, originates near the Santa Cruz waterfront and follows the existing Santa Cruz, Big Trees & Pacific Railway to Route 1. Concept 2 then follows the south side of Route 1 on a new viaduct over the San Lorenzo River, over Ocean Street, and over the Route 1/Route 17 Interchange. The alignment is between Route 1 and Felker Street from the San Lorenzo River to Ocean Street. This conceptual rail alignment is compatible with the planned Route 1/Route 17 Interchange modifications. Concept 2 follows the Route 17 Corridor until Mount Hermon Road in Scotts Valley where it follows Mount Hermon Road to Kings Village Road. From this point, the alignment generally parallels Mount Hermon Road through the abandoned Scotts Valley Airport, then continues northwestward across Bean Creek and Lockhart Gulch Road on a new structure. Concept 2 then passes through a new tunnel, identified as the Scotts Valley Tunnel, in the vicinity of the Lonestar Sand Quarry. The Concept 2 alignment connects to the existing Santa Cruz, Big Trees & Pacific Railway in Olympia.

The alignment for Concept 2 north of Olympia matches the alignment of Concept 1. The Concept 2 alignment uses five existing tunnels (Mission Hill, Storage Vault, Glenwood, Laurel, and Wright's) and two new tunnels (Scotts Valley and Lexington). As discussed in the Concept 1 description, two optional alignments for connecting the rail corridor in Los Gatos on Route 17 to the Vasona Junction are identified.

Station locations and concepts are presented in Table 12.

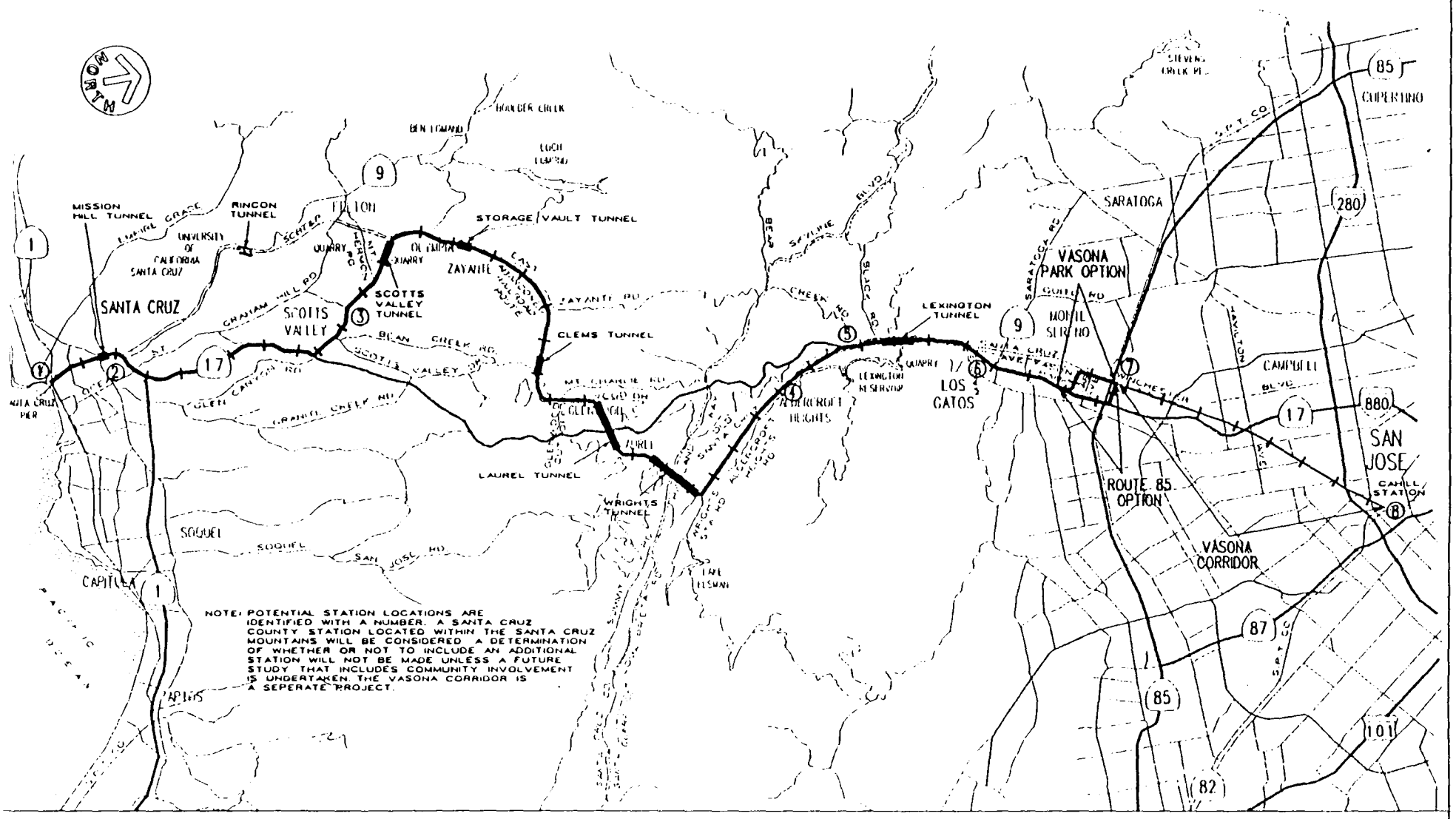
D. ALIGNMENT CONCEPT 3—ROUTE 17 CORRIDOR

Concept 3, identified as the Route 17 Corridor, is presented in Figure 9. As noted earlier, the south segment of Concept 3 matches Concepts 1 and 2. It originates near the Santa Cruz waterfront and follows the existing Santa Cruz, Big Trees & Pacific Railway to Route 1. Concept 3, like Concept 2, then follows the south side of Route 1 on a new viaduct over the San Lorenzo River and over Ocean Street. The alignment is between Route 1 and Felker Street from the San Lorenzo River to Ocean Street. The conceptual alignment crosses over the Route 1/Route 17 Interchange on a viaduct, and enters the Route 17 Corridor. This conceptual rail alignment is compatible with the planned Route 1/Route 17 Interchange modifications.

The Concept 3 alignment enters the Route 17 median at-grade north of the Route 1/Route 17 Interchange. From this point to Mount Hermon Road in Scotts Valley, Concept 3 is aligned along in the median of Route 17. The conceptual alignment continues within the Route 17 median from Mount Hermon Road to Granite Creek Road in Santa Cruz County. The alignment crosses

Table 11
Initial Station Locations
Alternative Concept 1—Historic

Station No.	Station Name	Station Location	Area Served	Station Concept
1	Santa Cruz	Washington St. Extension, Historic Santa Cruz Union Station	Downtown Santa Cruz, Waterfront, and Boardwalk	Parking. Rail vehicle storage yard. Connections with potential Davenport-Santa Cruz rail service, and future Santa Cruz-Watsonville rail service. Shuttle connections.
2	Harvey West	Cotton St. near Route 1 west of River St.	Route 1 Corridor, UCSC, and Downtown Santa Cruz	Parking, Kiss 'n' Ride, Shuttle and Transit connections. Connection with future UCSC-Santa Cruz rail service.
.3	Felton	Graham Hill Rd. at Roaring Camp and Big Trees	Felton, San Lorenzo Valley, Zayente Valley, Scotts Valley	Parking, Kiss 'n' Ride, Shuttle connections.
4	Aldercroft Heights	Aldercroft Heights Rd. at Alma Bridge Rd.	Aldercroft Heights, Chemeketa Park	Minimum Parking.
5	Lexington Reservoir	Route 17 near Bear Creek Rd.	Santa Clara County, Lexington Reservoir area, Aldercroft Heights	Parking, Kiss 'n' Ride, Shuttle connections.
6	Los Gatos	Route 17 near Main St.	Downtown Los Gatos	No new parking. Aerial structure between Main St. and the pedestrian overcrossing. Shuttle connections.
7	Vasona Junction	Winchester Blvd. at Route 85	Santa Clara County, San Francisco Bay Area	Station developed as part of Vasona LRT Project. Parking, Kiss 'n' Ride, Shuttle connections. Connection with Vasona Corridor to Cahill Station, San Jose.
8	Cahill, San Jose	Cahill St., San Jose	Downtown San Jose, San Francisco Bay Area	Existing station. Parking, Kiss 'n' Ride, Storage yard, Shuttle connections. Connections with CalTrain, Amtrak, bus transit, and LRT service.



SANTA CRUZ - LOS GATOS RAIL FEASIBILITY STUDY **FIGURE 8**

ALIGNMENT CONCEPT 2 - HISTORIC/SCOTTS VALLEY

De Leuw, Cather & Co. September 20, 1994

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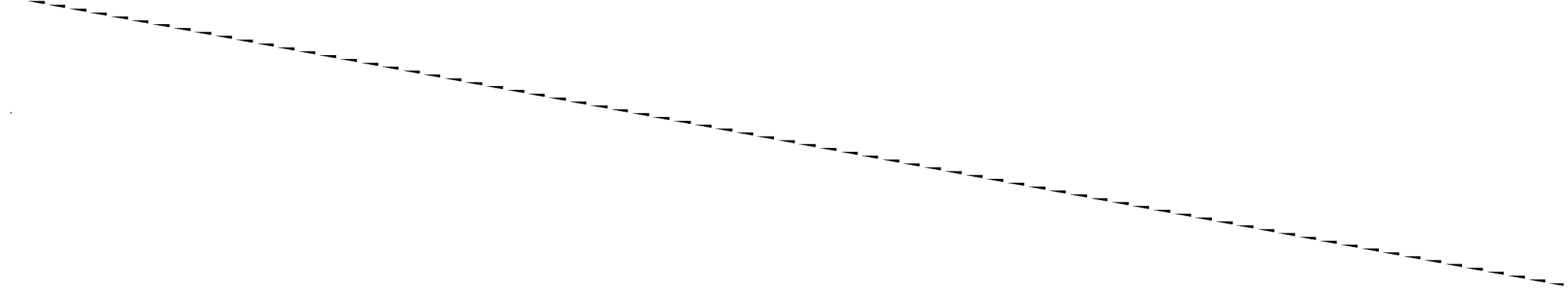
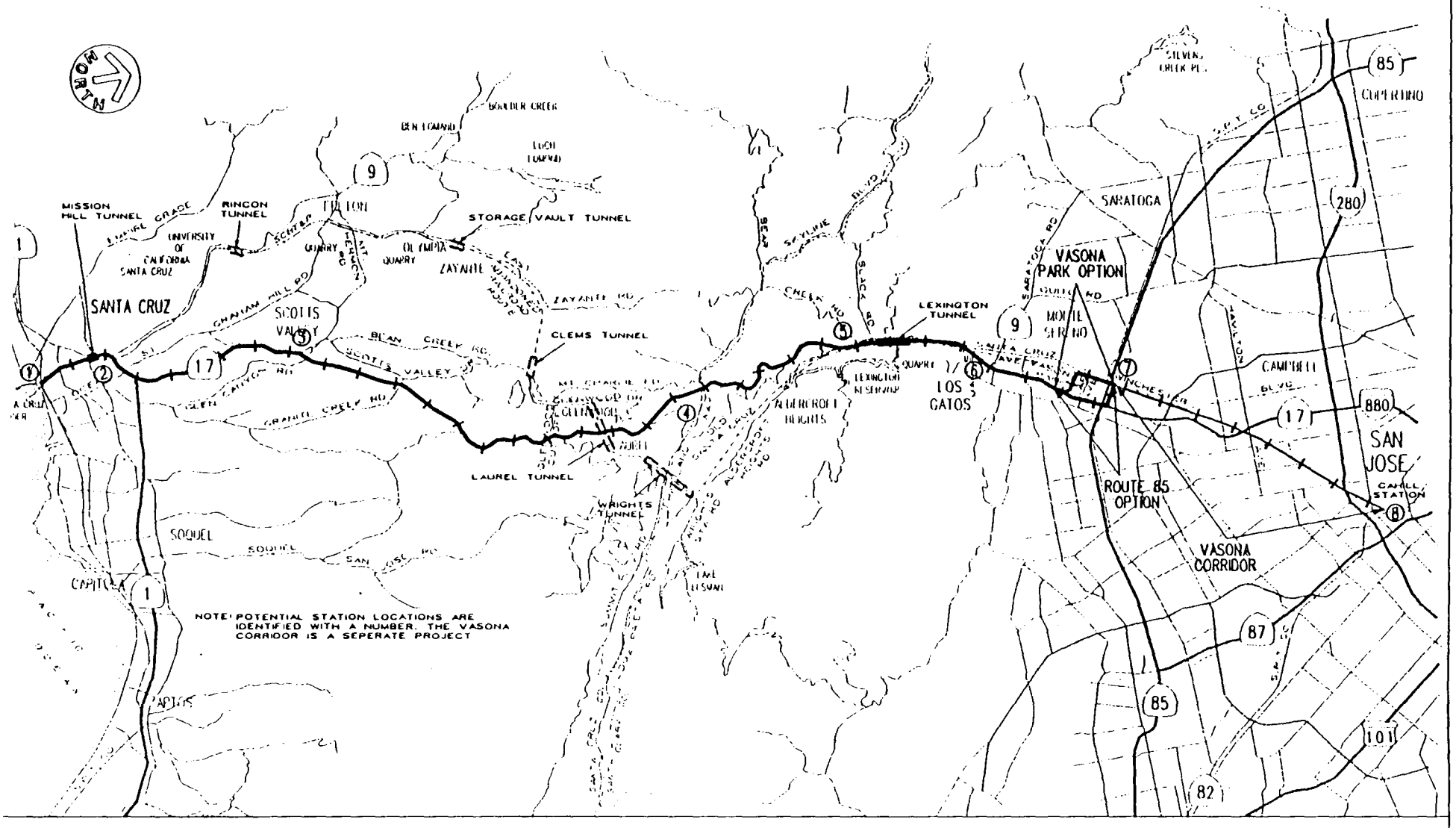
Table 12
Initial Station Locations
Alternative Concept 2—Historic and Scotts Valley

Station No.	Station Name	Station Location	Area Served	Station Concept
1	Santa Cruz	Washington St. Ext., Historic Santa Cruz Union Station	Downtown Santa Cruz, Waterfront, and Boardwalk	Parking. Rail vehicle storage yard. Connections with potential Davenport-Santa Cruz rail service, and future Santa Cruz-Watsonville rail service. Shuttle connections.
2	Harvey West	Felker St. near Route 1 west of Ocean St.	Route 1 Corridor, UCSC, and Downtown Santa Cruz	Parking, Kiss 'n' Ride, Shuttle and Transit connections. Connection with future UCSC-Santa Cruz rail service.
3	Scotts Valley	Mt. Hermon Rd. west of Kings Village Rd.	Scotts Valley, Felton	Parking, Kiss 'n' Ride, Shuttle and Transit connections. Part of planned transit center.
4	Aldercroft Heights	Aldercroft Heights Rd. at Alma Bridge Rd.	Aldercroft Heights, Chemeketa Park	Minimum Parking.
5	Lexington Reservoir	Route 17 near Bear Creek Rd.	Santa Clara County, Lexington Reservoir area, Aldercroft Heights	Parking, Kiss 'n' Ride, Shuttle connections.
6	Los Gatos	Route 17 near Main St.	Downtown Los Gatos	No new parking. Aerial structure between Main St. and the pedestrian overcrossing. Shuttle connections.
7	Vasona Junction	Winchester Blvd. at Route 85	Santa Clara County, San Francisco Bay Area	Station developed as part of Vasona LRT Project. Parking, Kiss 'n' Ride, Shuttle connections. Connection with Vasona Corridor to Cahill Station, San Jose.
8	Cahill, San Jose	Cahill St., San Jose	Downtown San Jose, San Francisco Bay Area	Existing station. Parking, Kiss 'n' Ride, Storage yard, Shuttle connections. Connections with CalTrain, Amtrak, bus transit, and LRT service.





SANTA CRUZ - LOS GATOS RAIL FEASIBILITY STUDY **FIGURE 9**

ALIGNMENT CONCEPT 3 - ROUTE 17

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over southbound Route 17 lanes on a structure and is located on the west side of Route 17at-grade to the summit. The alignment is depressed in a new short subway below the Summit Road Interchange. The Concept 3 alignment continues into Santa Clara County down the west side of Route 17 to the vicinity of Bear Creek Road at the Lexington Reservoir. At this location, the conceptual alignment is depressed in another new subway to carry the rail line from the west side to the east side of Route 17. The Route 17 Corridor through the Santa Cruz Mountains is also described in Chapter II. From the Lexington Reservoir to the Vasona Junction, Concept 3 is the same as described in Concepts 1 and 2.

The Concept 3 alignment uses one new major tunnel, the Lexington Reservoir Tunnel, and two new short subways, one at the summit and one near Bear Creek Road. As discussed in the Concept 1 description, two alternative alignments for connecting the rail corridor in Los Gatos from Route 17 to the Vasona Junction are identified.

Station locations and concepts are presented in Table 13.

E. ALIGNMENTS CONSIDERED BUT NOT EVALUATED

1. Overview

Many alternative alignments and subalignments are possible within the Study area. The principal alignments identified as Concepts 1, 2, and 3 and several alternative subalignments, or line segments, were identified as possible candidate alignments. Many of these line segments were considered, but not selected for engineering, operations, and environmental evaluation in this Study. Line segments that were set aside for the purposes of this Study are not necessarily withdrawn from further consideration if the project advances to the next phase of planning. The line segments considered but not selected for evaluation are listed and discussed below.

2. Northside of Route 1 in Santa Cruz

This segment is an alternative to the subalignment between the Historic Railroad at Route 1 and the Route 1/Route 17 Interchange for Concepts 2 and 3. This alignment segment follows the north side of Route 1 instead of the south side as presented in Concepts 2 and 3. This alternative is expected to have less visual impacts and residential displacement impacts than the alignment south of Route 1. However, because of conflicts with the existing cemetery on the north side of Route 1 east of the San Lorenzo River, this alternative is set aside for the purposes of this Study.

3. Scotts Valley Drive

As a possible subalignment to Concept 3, the Route 17 Corridor alternative, a Scotts Valley Drive segment was considered. This segment begins on Mount Hermon at Route 17 and extends through Scotts Valley along Scotts Valley Drive and enters Route 17 at the north end of Scotts Valley. This segment, probably suitable only for light rail technology, could provide an opportunity for local rail transit service through Scotts Valley. Because the Scotts Valley Drive segment is considered to have a higher cost than the Route 17 segment through Scotts Valley, which is part of Concept 3, and since Concept 3 already provides a Scotts Valley Station, the Scotts Valley Drive segment is set aside for the purposes of this Study.

Table 13
Initial Station Locations
Alternative Concept 3—Route 17

Station No.	Station Name	Station Location	Area Served	Station Concept
1	Santa Cruz	Washington St. Extension., Historic Santa Cruz Union Station	Downtown Santa Cruz, Waterfront, and Boardwalk	Parking. Rail vehicle storage yard. Connections with potential Davenport-Santa Cruz rail service, and future Santa Cruz-Watsonville rail service. Shuttle connections.
2	Harvey West	Felker St. near Route 1 west of Ocean St.	Route 1 Corridor, UCSC, and Downtown Santa Cruz	Parking, Kiss 'n' Ride, Shuttle and Transit connections. Connection with future UCSC-Santa Cruz rail service.
3	Scotts Valley	Route 17 near Mt. Hermon Rd.	Scotts Valley, Granite Creek Rd., Mt. Hermon Rd.	Parking, Kiss 'n' Ride, Shuttle connections.
4	Summit	Route 17 at Summit	Summit, Santa Cruz County	Minimal Parking, Kiss 'n' Ride. Shuttle connection.
5	Lexington Reservoir	Route 17 near Bear Creek Rd.	Santa Clara County, Lexington Reservoir area, Aldercroft Heights	Parking, Kiss 'n' Ride, Shuttle connections.
6	Los Gatos	Route 17 near Main St.	Downtown Los Gatos	No new parking. Aerial structure between Main St. and the pedestrian overcrossing. Shuttle connections.
7	Vasona Junction	Winchester Blvd. at Route 85	Santa Clara County, San Francisco Bay Area	Station developed as part of Vasona LRT Project. Parking, Kiss 'n' Ride, Shuttle connections. Connection with Vasona Corridor to Cahill Station, San Jose.
8	Cahill, San Jose	Cahill St., San Jose	Downtown San Jose, San Francisco Bay Area	Existing station. Parking, Kiss 'n' Ride, Storage yard, Shuttle connections. Connections with CalTrain, Amtrak, bus transit, and LRT service.

4. Bean Creek from Scotts Valley to Glenwood

The Bean Creek segment was considered as a subalignment to Concept 2. The Bean Creek segment would begin either at Scotts Valley Drive or at Mount Hermon Road and follow Bean Creek Valley, generally along Bean Creek Road, to Glenwood Drive where it joins the Historic Railroad alignment. At this point, the alignment becomes the route described for Concepts 1 and 2. The Bean Creek segment shortens the overall alignment length. However, because of considerable environmental constraints, it appears at this early study stage that the paralleling Route 17 and Historic Corridor alternatives are more viable. Hence, the Bean Creek segment is set aside at this feasibility study stage.

5. Downtown Los Gatos

This segment begins at the south end of Los Gatos on Route 17 and traverses downtown Los Gatos, generally along the Historic Railroad alignment as described in Chapter II. This alignment follows Santa Cruz Avenue for several blocks, then traverses existing parking lots between Santa Cruz Avenue and University Avenue until reaching Vasona Park. From Blossom Hill Road to Lark Avenue, the alignment follows University Avenue on the west side of Vasona Park. From Lark Avenue, the alignment extends northwestward to Winchester Boulevard and the Vasona Corridor. This concept is probably suitable only for light rail technology.

The Town of Los Gatos, at this preliminary stage, rejected the downtown Los Gatos line segment due to potential socioeconomic, property, traffic, and other impacts. The Town favors the Route 17 Corridor alternative through Los Gatos and the Vasona Junction connection options of either via the north end of Vasona Park or via the Route 85 Corridor.

6. Route 17 from Route 85 to Hamilton Avenue

This segment, an alternative means of connecting Route 17 to the Vasona Corridor begins on Route 17 in Los Gatos at Route 85 and extends north within the Route 17 median and joins the Vasona Corridor via a structure just south of Hamilton Avenue in the City of Campbell.

Because this three-mile reach of Route 17 parallels the Vasona Corridor, and because it is not expected to provide as high a level of service benefits associated with connecting the Santa Cruz-Los Gatos line with the Vasona Corridor at the Vasona Junction Station, the Route 85-to-Hamilton Avenue segment was set aside and not evaluated in this Study.

7. Lark Avenue in Los Gatos

This segment, an alternative means of connecting Route 17 to the Vasona Junction, begins on Route 17 in Los Gatos at the Lark Avenue Interchange and extends westward along Lark Avenue to Winchester Boulevard where it turns to the north to join the Vasona Corridor. The concept is probably suitable only for light rail technology.

The Town of Los Gatos, at this preliminary stage, rejected this segment due to potential socioeconomic, property, and visual impacts. The Town favors Vasona Junction connection options of either via the north end of Vasona Park or via the Route 85 Corridor.

V RAIL TECHNOLOGY ALTERNATIVES

A. INTRODUCTION

Several passenger rail technology alternatives exist in current operational applications. Four technologies have been considered for the Santa Cruz-to-Los Gatos rail service. These four are light rail transit (LRT), heavy rail transit (metro rail), commuter rail, and self-propelled rail cars. General characteristics are described in the following paragraphs. Several types of each mode are in operation in urban areas in the United States and worldwide.

B. LIGHT RAIL

Light rail transit (LRT) consists of individually electrically-propelled vehicles which can be joined together and operated as a train by one operator, though it is not possible to walk from one car to another. The term "light rail" refers to the relatively low, or light, volumes of passenger capacity that this mode can provide, rather than to the weight of the vehicles, which are indeed lighter than conventional passenger railroad equipment, or to the weight of the rails upon which the trains operate. Light rail transit has the ability to operate in three basic modes: On exclusive right-of-way similar to a railroad; in the medians of streets, separated by barriers or curbs; or in mixed flow, sharing lanes with vehicular traffic. Because of this flexibility, light rail transit tends to be less expensive than other modes which may require grade separations. Light rail transit is a modern version of trolley cars and electric interurban railroads which were popular in the first half of this century, and which allowed the urban expansion of American cities. Modern LRT systems tend to follow available linear rights-of-way, such as railroads, freeway medians or arterial streets, in order to minimize right-of-way disruptions and impacts on adjacent areas. However, the LRT systems usually acquire and pay for their right-of-way, even if it is acquired from another public agency.

Where LRTs run on exclusive rights-of-way, they are usually signaled. Crossings of streets and highways at grade are protected with normal railroad-type crossing signals and gates, providing priority to the trains. Where LRT runs in the medians of streets or in mixed traffic, various signal interface strategies are possible to provide safe operation for all traffic while at the same time providing priority to rail traffic. Maximum speeds for LRT operation are established by the California Public Utilities Commission (CPUC), and are a function of the configuration of the guideway. Where maximum speeds are relatively low, train operation is frequently unsignaled and based on line of sight, i.e. similar to the operation of automobiles or buses where the train operator can safely stop within the available sight distance. The CPUC requires light rail vehicles to be equipped with at least three separate and independent braking systems. LRT

train lengths are often limited by intersection spacing in urban areas and by station platform lengths.

Electric power is supplied to the vehicles by means of overhead wires, sometimes called a catenary, which is supported by poles. Power is usually supplied at 600 or 750 volts. The power enters the cars through a flexible roof-mounted arm called a pantograph. The running rails provide the path for the return current.

Examples of light rail transit systems are the Guadalupe Corridor in Santa Clara County, Sacramento RT, San Francisco Muni, and Portland's Tri-Met.

C. HEAVY RAIL

The term heavy rail was conceived to distinguish this mode from light rail, which often runs in streets, while heavy rail runs on exclusive trackways. A more common term for this mode is metro rail or rail rapid transit. Heavy rail systems operating on their own exclusive trackways (not connected to the national freight or intercity passenger rail network) are exempt from federal regulations, but are subject to the regulations of the California Public Utilities Commission.

Heavy rail transit consists of individual electrically-powered vehicles coupled together and operated as a unit by a single operator. Electric power can be provided either by an overhead contact system, similar to light rail transit, or by an electric third rail, located at track level, which supplies power to the vehicles via a collector shoe which is mounted to the vehicle trucks and slides along the third rail. Third rail electrification, though more expensive than overhead power supply, requires lower overhead clearance, and thus reduces subway and tunnel costs. As most of the urban heavy rail transit systems in the United States have extensive underground segments, third rail electrification is the usual mode.

Overhead electrification allows trains to operate similar to a conventional railroad, that is, on exclusive right-of-way with grade crossings. The right-of-way might be fenced. Although there is no regulation or law requiring it, third rail-powered systems would most likely need to be fully grade-separated and fenced to prevent accidental contact with the third rail. For the Santa Cruz-Los Gatos Corridor, either mode is possible, as the existing tunnels have sufficient clearance for overhead-electric supplied vehicles. A third-rail powered system would be more expensive than an overhead-powered system.

Heavy rail transit systems, usually have higher operating speeds than light rail systems. They may have sophisticated train control signal systems, including automatic train stop and speed control which allows the trains to operate on close headways (time interval between trains) of 90 seconds or shorter. These high speeds and close headways allow heavy rail transit to have high passenger capacity. Maximum train lengths are constrained only by platform lengths, and tend to be about 700 feet. Examples of heavy rail systems (third-rail powered) include BART in the San Francisco Area, WMATA in Washington, D.C. and the Red Line in Los Angeles.

D. COMMUTER RAIL

Commuter rail operates on the rights-of-way of existing or former freight railroads. Commuter rail equipment is compatible with and similar to intercity passenger trains run by Amtrak. Signal

systems vary but, in general, the systems provide for train separation but without positive overrides of train operator failure. Frequencies of commuter train operation vary, but 30 to 45 minutes between peak period trains is not uncommon. Generally, commuter rail operations extend over 35- to 90-mile distances. Trains are powered by either diesel-electric locomotives or electricity. Both catenary and third rail systems are used.

Freight services connected to the national freight railroad system are frequently provided on the same tracks as the commuter service. This relationship with the national system brings the requirement to comply with various federal regulations promulgated by the Federal Railroad Administration (FRA) and vehicles must comply with more rigorous strength requirements. The operations are under the purview of the federal railroad laws, including the Railway Labor Act, the Railroad Unemployment and Insurance Acts, and the Federal Employer Liability Act. Commuter rail systems generally provide moderate capacity and cover wide geographic areas, consistent with the freight railroads networks. Examples of commuter rail systems include the San Francisco CalTrain Peninsula Commute Service, the Los Angeles Metrolink system, and the Chicago-area METRA system.

E. SELF-PROPELLED RAIL CAR

Self-propelled diesel-powered rail cars are passenger coaches, each with a self-contained diesel engine capable of being coupled together and operated as a train. Use of this technology is common in Europe, and the cars are often called DMUs (diesel multiple units). North America has made minimal use of this technology. In the waning days of railroad intercity passenger service, some railroads used rail diesel cars (RDCs) as a lower-cost alternative to locomotive-hauled trains. Some of the vehicles are still used in certain applications today.

In spite of the current minimal use of DMUs, the DMU alternative is frequently identified as an appropriate solution for lines where ridership does not warrant higher capacity solutions. The DMU has an acceleration advantage with its multiple-powered axles, as compared to a locomotive-hauled train. Also, the DMU does not require a traction electrification system. A recent detailed simulation evaluation of diesel-propelled and electrically-propelled passenger cars was performed for North County Transit District for the Oceanside-Escondido line. This line has maximum grades of 2.2 percent and maximum curvature of 10 degrees. The results of that study showed that the DMUs had slightly longer trip times, about two percent, and had a significantly lower energy cost, one-third less, based on the then-current local costs of electricity and diesel fuel. DMUs are in use in Galveston, Texas, constructed to look like old trolley cars. Although the rail diesel cars which were used in North America were compatible with conventional railroad equipment, the equipment currently used in other countries is not. Therefore, the connectivity of this technology with CalTrain would need to be studied if this mode were selected for further study. In any case, the operation of such units would require the approval of the CPUC. It is not clear that these diesel units have the independent brake systems that permit light rail vehicles to be operated by a single operator. Thus, issues of operating economics and safety would have to be addressed.

F. TECHNOLOGIES SELECTED FOR EVALUATION

For the purposes of this Study, two alternative technologies will be evaluated as part of the rail concept alternatives: the light rail technology and the commuter rail technology. Each of these

rail technologies offers the possibility of connecting with and being integral to one of the existing rail operations in Santa Clara County that use either the light rail or commuter rail technology. Both technologies are already supported by established operating and maintenance facilities and personnel.

VI RAIL OPERATIONS

A. OPERATING CONCEPT

This chapter presents the basic operational concept that was developed as part of this Study. The same concept is applicable for both the light rail and commuter rail technologies. Sufficient sets of equipment will lay over at the Santa Cruz end of the route to provide the required number of morning work-oriented commute trips from Santa Cruz County to Santa Clara County. Only inspections, cleaning, and light maintenance would be performed at the Santa Cruz yard facility. Major maintenance would be performed at the appropriate light rail (existing or planned Santa Clara County Light Rail Yard) or commuter rail (planned Pullman Way Facility or other) maintenance facility in the San Jose area. See Chapter VII, "Engineering Concepts and Assumptions," regarding maintenance facility assumptions used for cost-estimating purposes.

Train operations personnel for commuter trips would report for duty at Santa Cruz. After the morning peak service is completed, the equipment would be either stored at the appropriate San Jose-area layover facility or used to provide day trips for recreational patrons. For the afternoon peak service from Santa Clara County to Santa Cruz County, the equipment would operate from the midday layover facility. The majority of the train operations personnel would go off duty at Santa Cruz. Midday trips could be made with this same equipment, or with similar light rail or commuter rail equipment and train operations personnel. Any heavy maintenance would be scheduled during the midday at the appropriate major maintenance facility. The midday layover facility could occur at or close to the major maintenance facility. The ability to exchange equipment of the Santa Cruz service with equipment used in other San Jose-based services, such as the Peninsula Commuter CalTrain or the Santa Clara County Light Rail, would tend to reduce the requirement for spare equipment sets.

The number of sets of equipment required for weekday service, and the amount of required storage space at the Santa Cruz end of the line, is dependent on the anticipated ridership, on the frequencies operated, and on the spacing of auxiliary tracks for meeting trains. As estimated in Chapter III, the initial estimated total daily commuter ridership is 4,400 boardings, of which only a small percent is expected to be "reverse commute"; i.e., from Santa Clara County to Santa Cruz County. The initial requirement is to provide service for 1,680 commuting passengers and 500 recreational passengers each day. Because of the travel time and distance, a seat should be provided for each passenger.

B. POTENTIAL FLEET REQUIREMENT

1. Light Rail Transit

As presented in Chapter III, the initial estimated AM commuter trips are 1,465 northbound from Santa Cruz County to Santa Clara County and 215 southbound from Santa Clara County to Santa Cruz County. Assuming a seat is made available to each passenger, about 20 light rail vehicles, each seating 75 persons, would need to depart Santa Cruz on each weekday morning. Further, about three light rail vehicles would need to be dispatched from Santa Clara County on each weekday morning. Since light rail would operate on the Vasona Corridor, and the Vasona Corridor is planned to have 270-foot (three car lengths) station platforms, three car trains are appropriate. It is estimated that 20-minute headways will be required to meet the demand. Therefore, seven train trips (3 light rail vehicles per train) originating in Santa Cruz, and one 3-vehicle train originating in Santa Clara County, would represent the morning commuter operation. Since the morning Santa Clara County-to-Santa Cruz train can easily be scheduled for reuse for one of the morning Santa Cruz-to-Santa Clara County trips, only 21 light rail vehicles are required. A few passing sidings would also be needed. If, as suggested in the ridership analysis, the market capture rate were to increase, a vehicle fleet increase and headway reduction would be required. An increased level of service may also require either a double-tracked light rail system so that many of the vehicles could be used for more than one trip in the AM and PM peak periods or a larger facility in Santa Cruz to support a fleet of light rail vehicles.

2. Commuter Rail

The requirement for the number of commuter rail vehicles is also based on the AM commuter demand. The "California Car" developed under the requirements of Proposition 116 has a seating capacity of 146. Meeting the AM seating demand requires about ten cars dispatched from Santa Cruz and two cars dispatched from Santa Clara County. To make trains uniform in size, for the purposes of this Study, four 3-car trains would be required. Scheduling of four AM commuter train departures from Santa Cruz and one AM commuter train departure from Santa Clara County could be accomplished. This requires headways of 30 to 60 minutes. For these headways, a few passing sidings are required to allow trains to meet, allowing reverse peak commuting. If a significant patronage market increase were to occur, more trains, more passing sidings, and shorter headways would be required.

C. PROTOTYPE TIMETABLES

Prototypical timetables for the light rail and commuter rail technologies for each of the applicable alignment alternatives were developed and are presented in Tables 14 and 15. These schedules are considered conceptual and reflect the amount of information available at this stage of development. No advanced computer simulations were used. A simple operating schedule algorithm was developed based on reviews of the historic Southern Pacific Santa Cruz-San Francisco Timetables, the current Peninsula Joint Powers Board CalTrain Timetables, operating characteristics for light rail and commuter rail technologies, and the conceptual alignments developed for each alternative. Departure times at stations of origin can be easily adjusted as long as the headways and sequence of train departures at both the north and south ends of the line remain about the same. A review of the conceptual operating plans for the Vasona LRT

Table 14
Prototype Timetable*
Commuter Rail Technology

NORTHBOUND

Mile	Station	Daily	Mon-Fri	Mon-Fri	Daily	Daily	Daily
Concept 1 - Historic							
0.0	Santa Cruz	06:05 AM	06:35 AM	07:05 AM	07:35 AM	03:05 PM	05:45 PM
1.4	Harvey West	06:08 AM	06:38 AM	07:08 AM	07:38 AM	03:08 PM	05:48 PM
6.6	Felton	06:21 AM	06:51 AM	07:21 AM	07:51 AM	03:21 PM	06:01 PM
19.7	Aldercroft Heights	06:49 AM			08:19 AM	03:49 PM	06:29 PM
21.6	Lexington Reservoir	06:54 AM		07:52 AM	08:24 AM	03:54 PM	06:34 PM
23.9	Los Gatos	06:59 AM	07:24 AM	07:57 AM	08:29 AM	03:59 PM	06:39 PM
27.2	Vasona Junction	07:06 AM	07:31 AM	08:04 AM	08:36 AM	04:06 PM	06:46 PM
33.1	Cahill	07:19 AM	07:44 AM	08:17 AM	08:49 AM	04:19 PM	06:59 PM
Concept 2 - Historic/Scotts Valley							
0.0	Santa Cruz	06:05 AM	06:35 AM	07:05 AM	07:35 AM	03:05 PM	05:45 PM
1.8	Harvey West	06:10 AM	06:40 AM	07:10 AM	07:40 AM	03:10 PM	05:50 PM
6.7	Scotts Valley	06:21 AM	06:51 AM	07:21 AM	07:51 AM	03:21 PM	06:01 PM
20.3	Aldercroft Heights	06:50 AM			08:20 AM	03:50 PM	06:30 PM
22.2	Lexington Reservoir	06:54 AM		07:53 AM	08:24 AM	03:54 PM	06:34 PM
24.5	Los Gatos	06:59 AM	07:25 AM	07:58 AM	08:29 AM	03:59 PM	06:39 PM
27.8	Vasona Junction	07:07 AM	07:32 AM	08:05 AM	08:37 AM	04:07 PM	06:47 PM
33.7	Cahill	07:20 AM	07:45 AM	08:18 AM	08:50 AM	04:20 PM	07:00 PM

SOUTHBOUND

Mile	Station	Mon-Fri	Daily	Daily	Mon-Fri	Daily	Daily
Concept 1 - Historic							
0.0	Cahill	06:00 AM	10:00 AM	04:00 PM	04:30 PM	05:00 PM	05:30 PM
5.9	Vasona Junction	06:13 AM	10:13 AM	04:13 PM	04:43 PM	05:13 PM	05:43 PM
9.2	Los Gatos	06:21 AM	10:21 AM	04:21 PM	04:51 PM	05:21 PM	05:51 PM
11.5	Lexington Reservoir	06:26 AM	10:26 AM	04:26 PM		05:26 PM	05:56 PM
13.4	Aldercroft Heights	06:30 AM	10:30 AM	04:30 PM		05:30 PM	
26.5	Felton	06:58 AM	10:58 AM	04:58 PM	05:25 PM	05:58 PM	06:27 PM
31.7	Harvey West	07:12 AM	11:12 AM	05:12 PM	05:39 PM	06:12 PM	06:41 PM
33.1	Santa Cruz	07:15 AM	11:15 AM	05:15 PM	05:42 PM	06:15 PM	06:44 PM
Concept 2 - Historic/Scotts Valley							
0.0	Cahill	06:00 AM	10:00 AM	04:00 PM	04:30 PM	05:00 PM	05:30 PM
5.9	Vasona Junction	06:13 AM	10:13 AM	04:13 PM	04:43 PM	05:13 PM	05:43 PM
9.2	Los Gatos	06:21 AM	10:21 AM	04:21 PM	04:51 PM	05:21 PM	05:51 PM
11.5	Lexington Reservoir	06:26 AM	10:26 AM	04:26 PM		05:26 PM	05:56 PM
13.4	Aldercroft Heights	06:30 AM	10:30 AM	04:30 PM		05:30 PM	
27.0	Scotts Valley	06:59 AM	10:59 AM	04:59 PM	05:29 PM	05:59 PM	06:29 PM
31.9	Harvey West	07:10 AM	11:10 AM	05:10 PM	05:40 PM	06:10 PM	06:40 PM
33.7	Santa Cruz	07:16 AM	11:16 AM	05:16 PM	05:46 PM	06:16 PM	06:46 PM

*Prototypical timetables for study purposes only.

Table 15
Prototype Timetable*
Light Rail Technology

NORTHBOUND

Mile	Station	Mon-Fri	Mon-Fri	Daily	Mon-Fri	Mon-Fri	Daily	Mon-Fri	Daily	Daily
Concept 1 - Historic										
0.0	Santa Cruz	05:45 AM	06:05 AM	06:25 AM	06:45 AM	07:05 AM	07:25 AM	07:45 AM	02:45 PM	05:25 PM
1.4	Harvey West	05:48 AM	06:08 AM	06:28 AM	06:48 AM	07:08 AM	07:28 AM	07:48 AM	02:48 PM	05:28 PM
6.6	Felton	06:00 AM	06:20 AM	06:40 AM	07:00 AM	07:20 AM	07:40 AM	08:00 AM	03:00 PM	05:40 PM
19.7	Aldercroft Heights		06:44 AM			07:44 AM	08:04 AM		03:24 PM	06:04 PM
21.6	Lexington Reservoir	06:25 AM		07:06 AM			08:07 AM		03:27 PM	06:07 PM
23.9	Los Gatos	06:29 AM	06:50 AM	07:11 AM	07:25 AM	07:51 AM	08:12 AM	08:29 AM	03:29 PM	06:09 PM
27.2	Vasona Junction	06:35 AM	06:56 AM	07:17 AM	07:31 AM	07:57 AM	08:18 AM	08:35 AM	03:35 PM	06:15 PM
33.1	Cahill	06:46 AM	07:07 AM	07:28 AM	07:42 AM	08:08 AM	08:29 AM	08:46 AM	03:46 PM	06:26 PM
Concept 2 - Historic/Scotts Valley										
0.0	Santa Cruz	05:45 AM	06:05 AM	06:25 AM	06:45 AM	07:05 AM	07:25 AM	07:45 AM	02:45 PM	05:30 PM
1.8	Harvey West	05:49 AM	06:09 AM	06:29 AM	06:49 AM	07:09 AM	07:29 AM	07:49 AM	02:49 PM	05:34 PM
6.7	Scotts Valley	05:58 AM	06:18 AM	06:38 AM	06:58 AM	07:18 AM	07:38 AM	07:58 AM	02:58 PM	05:43 PM
20.3	Aldercroft Heights		06:43 AM			07:43 AM	08:03 AM	08:23 AM	03:23 PM	06:08 PM
22.2	Lexington Reservoir	06:25 AM		07:06 AM		07:46 AM	08:06 AM	08:26 AM	03:26 PM	06:11 PM
24.5	Los Gatos	06:30 AM	06:51 AM	07:11 AM	07:28 AM	07:51 AM	08:11 AM	08:31 AM	03:31 PM	06:16 PM
27.8	Vasona Junction	06:36 AM	06:57 AM	07:17 AM	07:34 AM	07:57 AM	08:17 AM	08:37 AM	03:37 PM	06:22 PM
33.7	Cahill	06:47 AM	07:08 AM	07:28 AM	07:45 AM	08:08 AM	08:28 AM	08:48 AM	03:48 PM	06:33 PM
Concept 3 - Route 17										
0.0	Santa Cruz	05:45 AM	06:05 AM	06:25 AM	06:45 AM	07:05 AM	07:25 AM	07:45 AM	02:45 PM	05:15 PM
1.8	Harvey West	05:49 AM	06:09 AM	06:29 AM	06:49 AM	07:09 AM	07:29 AM	07:49 AM	02:49 PM	05:19 PM
5.3	Scotts Valley	05:55 AM	06:15 AM	06:35 AM	06:55 AM	07:15 AM	07:35 AM	07:55 AM	02:55 PM	05:25 PM
14.4	Summit		06:32 AM			07:32 AM	07:52 AM	08:12 AM	03:12 PM	05:42 PM
18.2	Lexington Reservoir	06:18 AM		06:59 AM		07:39 AM	07:59 AM	08:19 AM	03:19 PM	05:49 PM
20.5	Los Gatos	06:22 AM	06:42 AM	07:03 AM	07:20 AM	07:43 AM	08:03 AM	08:23 AM	03:23 PM	05:53 PM
23.8	Vasona Junction	06:28 AM	06:48 AM	07:09 AM	07:26 AM	07:49 AM	08:09 AM	08:29 AM	03:29 PM	05:59 PM
29.7	Cahill	06:39 AM	06:59 AM	07:20 AM	07:37 AM	08:00 AM	08:20 AM	08:40 AM	03:40 PM	06:10 PM

SOUTHBOUND

Mile	Station	Mon-Fri	Daily	Daily	Mon-Fri	Mon-Fri	Daily	Mon-Fri	Daily	Daily
Concept 1 - Historic										
0.0	Cahill	06:00 AM	10:00 AM	04:00 PM	04:20 PM	04:40 PM	05:00 PM	05:20 PM	05:40 PM	06:00 PM
5.9	Vasona Junction	06:11 AM	10:11 AM	04:11 PM	04:31 PM	04:51 PM	05:11 PM	05:31 PM	05:51 PM	06:11 PM
9.2	Los Gatos	06:18 AM	10:18 AM	04:18 PM	04:38 PM	04:58 PM	05:18 PM	05:38 PM	05:58 PM	06:18 PM
11.5	Lexington Reservoir	06:22 AM	10:22 AM	04:22 PM			05:22 PM			06:22 PM
13.4	Aldercroft Heights		10:23 AM		04:43 PM		05:23 PM	05:43 PM		06:23 PM
26.5	Felton	06:47 AM	10:47 AM	04:47 PM	05:07 PM	05:27 PM	05:47 PM	06:07 PM	06:27 PM	06:47 PM
31.7	Harvey West	07:00 AM	11:00 AM	05:00 PM	05:20 PM	05:40 PM	06:00 PM	06:20 PM	06:40 PM	07:00 PM
33.1	Santa Cruz	07:04 AM	11:04 AM	05:04 PM	05:24 PM	05:44 PM	06:04 PM	06:24 PM	06:44 PM	07:04 PM
Concept 2 - Historic/Scotts Valley										
0.0	Cahill	06:00 AM	10:00 AM	04:00 PM	04:20 PM	04:40 PM	05:00 PM	05:20 PM	05:40 PM	06:00 PM
5.9	Vasona Junction	06:10 AM	10:10 AM	04:10 PM	04:30 PM	04:50 PM	05:10 PM	05:30 PM	05:50 PM	06:10 PM
9.2	Los Gatos	06:16 AM	10:16 AM	04:16 PM	04:36 PM	04:56 PM	05:16 PM	05:36 PM	05:56 PM	06:16 PM
11.5	Lexington Reservoir	06:21 AM	10:21 AM	04:21 PM			05:21 PM			06:21 PM
13.4	Aldercroft Heights		10:23 AM		04:43 PM		05:23 PM	05:43 PM		06:23 PM
27.0	Scotts Valley	06:47 AM	10:47 AM	04:47 PM	05:07 PM	05:27 PM	05:47 PM	06:07 PM	06:27 PM	06:47 PM
31.9	Harvey West	06:55 AM	10:55 AM	04:55 PM	05:15 PM	05:35 PM	05:55 PM	06:15 PM	06:35 PM	06:55 PM
33.7	Santa Cruz	06:59 AM	10:59 AM	04:59 PM	05:19 PM	05:39 PM	05:59 PM	06:19 PM	06:39 PM	06:59 PM
Concept 3 - Route 17										
0.0	Cahill	06:00 AM	10:00 AM	04:00 PM	04:20 PM	04:40 PM	05:00 PM	05:20 PM	05:40 PM	06:00 PM
5.9	Vasona Junction	06:11 AM	10:11 AM	04:11 PM	04:31 PM	04:51 PM	05:11 PM	05:31 PM	05:51 PM	06:11 PM
9.2	Los Gatos	06:17 AM	10:17 AM	04:17 PM	04:37 PM	04:57 PM	05:17 PM	05:37 PM	05:57 PM	06:17 PM
11.5	Lexington Reservoir	06:22 AM	10:22 AM	04:22 PM			05:22 PM			06:22 PM
15.3	Summit		10:28 AM		04:48 PM		05:28 PM	05:48 PM		06:28 PM
24.4	Scotts Valley	06:43 AM	10:44 AM	04:44 PM	05:04 PM	05:24 PM	05:44 PM	06:04 PM	06:24 PM	06:44 PM
27.9	Harvey West	06:48 AM	10:49 AM	04:49 PM	05:09 PM	05:29 PM	05:49 PM	06:09 PM	06:29 PM	06:49 PM
29.7	Santa Cruz	06:52 AM	10:53 AM	04:53 PM	05:13 PM	05:33 PM	05:53 PM	06:13 PM	06:33 PM	06:53 PM

*Prototypical timetables for study purposes only.

Corridor was conducted and is addressed in Section D, "Connectivity Issues." However, a detailed analysis of integrating the operation of rail service between Santa Cruz and San Jose with the planned Vasona Corridor service was not performed.

An assumed ridership level associated with each station formed the basis for station stops. Sufficient commuter trains are scheduled to handle the projected ridership in the "primary-commute" and "reverse-commute" directions. Additional midday trains are scheduled for recreational and other-purpose trips.

D. CONNECTIVITY ISSUES

For the Santa Cruz-to-Los Gatos passenger rail service to be successful, it must provide convenient connections to other transit services. It is desirable that connections allow customers to reach their final destinations efficiently in the morning and in the afternoon. If light rail is chosen as the technology, the alignment will merge with the Vasona Light Rail Corridor at the Vasona Junction. From that point, the light rail may operate to a further destination on the Santa Clara County Light Rail system, or the trains can terminate at Vasona Junction. In either event, complete connectivity with the Santa Clara County Light Rail system is possible, and changes in the future would be possible with minimal disruption. For example, it could initially be decided to terminate the Santa Cruz-to-Los Gatos line at the Vasona Junction. Later, depending on demand, some, or all, of the trains could be operated through to the Guadalupe Corridor.

Potential Santa Clara County connections to the planned Tasman Corridor, De Anza Corridor (Route 85), Sunnyvale-Cupertino Corridor, Capitol Corridor, and Downtown-Evergreen Corridor can also be considered. The connection with the Cahill Station in downtown San Jose will provide intermodal service for both commuters and recreational travelers using Amtrak and the Peninsula Commute (CalTrain) Service.

If commuter rail is the selected technology, then the most likely connection is at Cahill Station. The plans for the Vasona Light Rail (*Revised Draft—Conceptual Engineering Report*, Korve Engineering, May 3, 1994) call for a gauntlet track along the length of the corridor. A gauntlet track is essentially a separate track for freight trains and LRT trains. However, the two sets of rails share the same cross ties, and only one train can occupy the combined track at any point. This separate track is required because freight trains (and conventional passenger railroad trains) are wider than and require greater clearance to platforms than light rail vehicles. This gauntlet track could be used by the commuter rail trains to access Cahill Station. The clearance from the platforms to the freight portion of the gauntlet track precludes use of the light rail station platforms by commuter rail cars. The gauntlet track runs on the southbound track for approximately five miles. While a northbound commuter rail train is using this track, no southbound light rail may operate. Use of this gauntlet track for commuter rail trains may present some additional institutional problems which are discussed in Section E.

The frequency of trains also defines the need for passing sidings, or segments of double track, which allows trains to meet and pass each other. In general, at this point in operations planning, it is assumed that sidings are provided at approximately five-mile intervals. Time for station stops at each station is provided in the one-way trip times.

Only interior car cleaning and light maintenance would be done at the Santa Cruz-area storage facility. All other cleaning and maintenance would be completed at either the existing, although possibly expanded, or new maintenance facilities.

E. INSTITUTIONAL ISSUES

Light rail and commuter rail generally operate under a different set of regulations, oversight agencies, and labor laws. Regulatory oversight for light rail in California is the responsibility of the California Public Utilities Commission (CPUC). Federal laws or regulations specifically covering light rail operations include American with Disabilities Act (ADA) requirements and the Federal Employers Liability Act.

Commuter Rail, on the other hand, is subject to a series of national requirements stemming from the historical link between commuter rail and the national railroad system. Operational oversight is provided by the Federal Railroad Administration (FRA), governing such diverse issues as working times for train crews, vehicle crashworthiness, track maintenance, and signal system testing and reporting. Additionally, the Railway Labor Act, the Railroad Unemployment Insurance Act, and the Railroad Retirement Act impose certain national labor requirements and taxes that are specific to the railroad industry. The Federal Employers Liability Act provides a procedure for resolving issues covered by Workmen's Compensation. The CPUC has authority over clearances, grade crossings, and grade separations.

Since light rail will be operating on the Vasona Corridor, the use of conventional rail technology (commuter trains) on the same line would create the potential for operational and institutional conflicts. Section F, below, addresses some of these issues.

F. RAILROAD FREIGHT ISSUES

Freight service is neither being considered nor evaluated under this Feasibility Study. Considerable analysis would be needed to adequately assess the operations, capital and maintenance costs, and environmental and community impacts associated with rail freight along a potential Santa Cruz-to-Los Gatos Rail Corridor.

At both ends of the conceptual Santa Cruz-Los Gatos Rail Corridor, however, freight railroad operations already exist. On the Santa Cruz end, the Santa Cruz, Big Trees, and Pacific Railway is a common carrier providing a very low volume of freight service. On the Los Gatos end, Southern Pacific provides freight service from the Permanente Quarry near Cupertino to San Jose along the existing track on the Vasona Corridor. In general, it has been held that when transit-type passenger services are operated on tracks that are part of the "national freight system," they are subject to the purview of the agencies and regulations that govern railroads. Both existing freight railroads are subject to Interstate Commerce Commission (ICC) and Federal Railroad Administration (FRA) regulations. Both railroads are also subject to a set of four labor-related laws that govern many aspects of their business. These laws are the Railway Labor Act (RLA), the Railroad Retirement Act (RRA), the Federal Employers Liability Act (FELA), and the Railroad Unemployment Insurance Act (RUIA).

The effect of ICC jurisdiction on design, construction, and day-to-day operations directly is minimal. On the other hand, being subject to the Interstate Commerce Act may make a

passenger operation subject to some or all of the group of four railway labor laws. The effect of the regulations and labor laws that apply to freight rail service on a potential passenger rail service between Santa Cruz and Los Gatos is not evaluated in this Study.

Joint use of track refers to the sharing of the tracks by passenger equipment with conventional freight trains. Only conventional passenger rail technology, including diesel rail cars, has been generally considered compatible with freight equipment and therefore permitted to operate concurrently with freight. Light rail transit operates on the same tracks as freight on the San Diego Trolley and the Baltimore Central Light Rail Line. But, freight operations are restricted to nighttime hours when light rail service is shut down. Current FRA regulations do not specifically address these operations. Current FRA policy requires that "positive separation" be maintained between light rail and freight trains. This is currently interpreted to mean separate windows of time in which each operates. If railroad freight service is allowed on a Santa Cruz-Los Gatos rail line, then that freight service will, in all likelihood, be part of the national freight system and be federally regulated.

VII ENGINEERING CONCEPTS AND ASSUMPTIONS

A. GENERAL

Conceptual rail system engineering concepts and assumptions are presented in this chapter. These concepts and assumptions, together with the rail alignment concepts and operations plan, form a basis for environmental evaluation and cost estimating. The concepts and assumptions are subject to refinement or modification under future studies, should this project be advanced to a future planning stage.

B. ALIGNMENT, TRACKAGE, AND ROADBED

- As indicated in Chapter IV, the three principal conceptual rail alignments, Concept 1–Historic, Concept 2–Historic and Scotts Valley, and Concept 3–Route 17, are the alignment alternatives under consideration.

- For all concepts, no mainline track improvements would be required in the existing railroad segment in Chestnut Street south of Mission Hill Tunnel.

- For Concept 1, from the south end of Mission Hill Tunnel to Olympia, existing track would be replaced.

- For Concepts 2 and 3, from the south end of Mission Hill Tunnel to Route 1, existing track would be replaced.

- For all concepts, the mainline would be single track. Sufficient passing sidings would be provided to serve the operations plan presented in Chapter VI.

- For Concepts 1 and 2, minor earthwork and grading would be performed to restore the Historic Railroad roadbed. In some areas, major earthwork, such as along the west shore of Lexington Reservoir, would be performed to provide embankments.

- For all concepts, the alignment would be located in a subway, the Lexington Tunnel, underneath Route 17, from the vicinity of Black Road to the Los Gatos Creek Canyon north of the Lexington Reservoir Dam.

- For all concepts, the Route 17 freeway median would be widened in Los Gatos, between the downtown pedestrian bridge and the vicinity of Lark Avenue.

- For Concepts 2 and 3, Route 17 would be widened in most areas between Route 1 in Santa Cruz and Mount Hermon Road in Scotts Valley to provide a widened median.

- For Concept 2, Mount Hermon Road in Scotts Valley would be widened between Route 17 and Kings Village Road. Earthwork and grading would also be performed along the Scotts Valley alignment through the abandoned airport property.

- For Concept 3, where the rail alignment would be in the Route 17 median from Mount Hermon Road to Granite Creek Road, most of this freeway reach would be widened.

- For Concept 3, the rail alignment between Santa's Village Road in Santa Cruz County and Bear Creek Road in Santa Clara County would be located on the west side of Route 17. Major earthwork, including the placement of embankments and installation of retaining walls, would be performed. The alignment would be depressed in a short subway below the Summit Road Interchange. The alignment would be depressed in another subway to carry the rail line from the west side to the east side of Route 17 in the vicinity of Bear Creek Road at the Lexington Reservoir.

C. STRUCTURES

- For Concept 1, existing timber and steel trestles located between Route 1 in Santa Cruz and Olympia would be repaired and strengthened.

- For Concepts 1 and 2, new bridges would be provided north of Olympia at all creek crossings.

- For Concepts 1 and 2, a viaduct (long aerial structure) would carry the rail system across the southern end of Lexington Reservoir from the southeast end of the reservoir to a point north of the Alma Fire Station on the west side of the reservoir.

- For all concepts, a viaduct would be provided in the Los Gatos Creek Canyon parallel with and between Route 17 and Los Gatos Creek from the north end of the new Lexington Tunnel to Main Street in Los Gatos.

- For all concepts, based on preliminary input from the Town of Los Gatos, the existing Main Street overcrossing of Route 17 would be modified to accommodate the rail viaduct and an at-grade (Main Street grade) crossing. For all concepts, the Los Gatos Station would be built on a structure between Main Street and the pedestrian bridge over Route 17.

- For all concepts, the rail would be elevated on a viaduct from Main Street, Los Gatos, to the Route 17 median just north of the pedestrian overcrossing.

- For all concepts, the existing Saratoga Avenue and Blossom Hill Road bridges that overcross Route 17 in Los Gatos would be reconstructed.

- For all conceptual alignments using light rail technology and the Route 85 subalignment, an existing unused Route 85/Route 17 Interchange highway tunnel constructed for a possible future ramp would be used. This tunnel would be modified to accommodate the light rail and would not be used for a future northbound Route 17 to westbound Route 85 connector ramp.

A new viaduct would carry the light rail from the northwest end of the tunnel along Route 85 to the Vasona Junction.

- For all conceptual alignments using commuter rail technology and the Route 85 subalignment, a viaduct would carry the rail line from a point south of Lark Avenue, northward, over the Lark Avenue overcrossing. The viaduct would then pass over southbound Route 17 into the Route 85 Corridor westbound, and over Route 85 to the Vasona Junction.

- For all concepts using the Vasona Park subalignment, an aerial structure would carry the rail line out of the Route 17 median, over southbound Route 17, and into the north end of Vasona Park. An additional viaduct would be provided across the Vasona Lake Dam to University Avenue.

- For Concepts 2 and 3, in the vicinity of Route 1 in Santa Cruz, a continuous viaduct would be provided between the San Lorenzo River and Route 17. Adjacent to and south of Route 1, the viaduct would cross the San Lorenzo River and Ocean Street. The aerial structure would then carry the rail line over the Route 1/Route 17 Interchange to the west side of Route 17 where the structure would continue over the southbound lanes of Route 17 into the median of Route 17. The aerial structure alignment would be compatible with the planned Caltrans modifications to the Route 1/Route 17 Interchange.

- For Concepts 2 and 3, north of Santa Cruz, the El Rancho Drive overcrossing of Route 17 would be reconstructed. The existing La Madrona Drive and Sims Road undercrossings of Route 17 would be reinforced for commuter rail loadings.

- For Concept 2, in Scotts Valley, an aerial structure would be provided to carry the rail line from the median of Route 17 to Mount Hermon Road. A bridge over Bean Creek and Lockhart Gulch Road would be provided.

- For Concept 3, in Scotts Valley, the existing Mount Hermon Road and Granite Creek Road overcrossings would be reconstructed. A pedestrian bridge for the Scotts Valley Station would be provided. At Santa's Village Road an aerial structure would be provided to carry the rail line from the median of Route 17 to the west side of Route 17.

D. TUNNELS AND SUBWAYS

- Tunnel clearance envelopes follow:

  Commuter Rail: 20 feet high x 16.5 feet wide.
  Light Rail: 15 feet high x 13.5 feet wide.

- One of the reusable tunnels (Storage Vault) would require removal of the existing storage facility and restoration of the property to a tunnel. See the right-of-way assumptions regarding the relocation of the Filesafe storage facility.

- A summary of the tunnels is provided in Table 16.

Table 16
Summary of Tunnel Construction

Tunnel Name	Approx. Length (Ft.)	Alignment Alternatives	Construction Assumption
Mission Hill	900	1, 2, 3	Rehabilitate existing tunnel structure. Install new steel ribs and lagging support, rock bolts, and concrete lining.
Rincon	550	1	Abandon existing tunnel. Excavate new tunnel using the drill-and-blast method. Install steel ribs and lagging support, rock bolts, and concrete lining.
Storage Vault	240	1, 2	Relocate existing storage facility (Filesafe). Restore existing tunnel. Perform no major structural rehabilitation.
Glenwood	910	1, 2	Rehabilitate existing tunnel structure. Install new steel ribs and lagging support, rock bolts, and concrete lining.
Laurel	5,790	1, 2	Rehabilitate existing tunnel structure. Install new steel ribs and lagging support, rock bolts, and concrete lining.
Wright's	6,210	1, 2	Rehabilitate existing tunnel structure. Install new steel ribs and lagging support, rock bolts, and concrete lining.
Scotts Valley	1,700	2	Excavate a new tunnel using the drill-and-blast method. Install steel ribs and lagging support, rock bolts, and concrete lining.
Lexington	3,200	1, 2, 3	Excavate a new tunnel using the drill-and-blast method. Install steel ribs and lagging support, rock bolts, and concrete lining.
Subway at Summit	1,000	3	Excavate a new subway using the cut-and-cover method. Construct concrete box structure.
Subway at Bear Creek Road	1,000	3	Excavate a new subway using the cut-and-cover method. Construct concrete box structure.

Source: Woodward Clyde Consultants and De Leuw, Cather & Company.

E. LOCAL STREET IMPROVEMENTS

- For all concepts, street improvements associated with stations, parking lots, at-grade rail crossings, and at-grade, in-street rail alignments would be provided. Local street improvement costs, however, are not estimated separately and are considered to fall within the contingency estimate.

- For all concepts, traffic signal installations and modifications would be provided to coordinate with rail transit signals and controls. These costs, however, are not estimated separately and are considered to fall within the contingency estimate.

F. STATIONS

- Stations will be located and defined as shown in Chapter IV.

- All stations except for the Vasona Junction and San Jose Cahill Stations will be new and constructed as part of this project.

- For all stations, shuttle and bus stop areas will be provided. However, it is assumed the shuttle services are provided by others as discussed in Chapter III.

G. PARKING

Parking space estimates are presented in Table 17. Parking demand is based on first, assigning an estimated morning patronage to each station and, second, calculating an estimated portion of that patronage that will require parking spaces. For all stations, except the Vasona Junction and Cahill Stations, it is estimated that 75 percent of the morning boardings at that station require a parking space. The 75-percent factor is considered conservative, but reasonable for concept-level estimating purposes. For comparison, based on mode arrival studies conducted by BART, as an example, approximately 57 percent of the morning patrons require a parking space at the Concord Station.[8] This includes consideration of car pools. Based on mode arrival studies by the Santa Clara County Transportation Agency, 56 percent of the morning LRT patrons require a parking space at the Tamien Station and 51 percent require a parking space at the Capitol Station.[9] In addition, in a study for the Peninsula Corridor Joint Powers Board, it was found that an average of 41 percent of the patrons arrive at stations by vehicles requiring parking.[10]

At the Vasona Junction Station, a 50-percent factor was used since a large number of the Vasona Junction boardings are estimated to be either transfers from the Vasona Light Rail Corridor or recreational trips involving a greater proportion of car pooling than the commuter

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[8]1992 Passenger Profile Survey Summary Report, BART, May 1993.

[9]LRT Park-n-Ride Survey Summary, Santa Clara County Transportation Agency, May 1994.

[10]CalTrain Market Demand Study (Draft), July 1994.

Table 17
Station Parking Assumptions

Station No.	Station Name	Station Location	Parking Spaces			Area
			Alignment Concept 1– Historic	Alignment Concept 2– Historic/Scotts Valley	Alignment Concept 3– Route 17	Acreage for Station and Parking
1.	Santa Cruz	Washington St. Ext., Historic Santa Cruz, Union Station	150 new	150 new	150 new	3.0
2.	Harvey West	Cotton St. near Route 1 west of River St.	900 new	N/A	N/A	10.5
2.	Harvey West	Felker St. near Route 1 west of Ocean St.	N/A	900 new	900 new	10.5
3.	Felton	Graham Hill Rd. at Roaring Camp and Big Trees	225 new	N/A	N/A	3.8
3.	Scotts Valley	Mt. Hermon Rd. west of Kings Village Rd.	N/A	225 new	N/A	3.8
3.	Scotts Valley	Route 17 near Mt. Hermon Rd.	N/A	N/A	225 new	3.8
4.	Aldercroft Heights	Aldercroft Heights at Alma Bridge Rd.	8 new	8 new	8 new	0.5
4.	Summit	Route 17 at Summit	N/A	N/A	20 new	0.5
5.	Lexington Reservoir	Route 17 near Bear Creek Rd.	150 new	150 new	150 new	2.2
6.	Los Gatos	Route 17 near Main St.	0 additional	0 additional	0 additional	0.0
7.	Vasona Junction	Winchester Blvd. at Route 85	150 additional	150 additional	150 additional	1.7
8.	Cahill, San Jose	Cahill St., San Jose	50 additional	50 additional	50 additional	0.6

trips. At Cahill Station, a 25-percent factor was used since a large number of the Cahill boardings are estimated to be recreational (if arriving by automobile, patrons are usually in groups of two or more), and the majority of the boardings are estimated to be arriving by transit, including CalTrain, Amtrak, and bus.

H. TECHNOLOGY AND SYSTEMS

- As indicated in Chapter V, either light rail or conventional commuter rail will be the technology utilized.

- Concepts 1 and 2 can use either light rail or conventional commuter rail.

- New rolling stock including 4 locomotives and 14 passenger cars for the conventional commuter rail alternative and 24 light rail vehicles for the light rail alternative will be purchased. This includes spare equipment.

I. OPERATIONS MAINTENANCE, AND STORAGE FACILITIES

- For either technology, light rail or commuter rail, end-of-line facilities, in addition to the station and parking lot, would be located at the Santa Cruz Station area. Storage tracks for extra trains, a maintenance and inspection shed, and a building for operators and maintenance workers would be provided. For the diesel locomotive (commuter rail) technology alternative, it is assumed auxiliary power would be provided.

- For the commuter rail technology, it is assumed that this project would either expand existing facilities (such as the planned Pullman Way Maintenance Facility), or provide new facilities to accommodate a Santa Cruz-Los Gatos/San Jose commuter rail operation.

- For the light rail technology, it is assumed that the existing Santa Clara County Light Rail Maintenance Yard would have reached its capacity. Therefore, a new light rail maintenance facility would be provided to accommodate a Santa Cruz-Los Gatos light rail extension.

J. RIGHT-OF-WAY

- For all concepts, the project would acquire and pay for property for stations, parking areas, storage yards, and expanded or new maintenance facilities.

- For all concepts, between the Santa Cruz Station and Route 1, the project would acquire and pay for right-of-way for the rail mainline and sidings except for the Chestnut Street segment, which would remain a public street.

- Acquisition would involve either purchase of right-of-way or obtaining an easement in areas such as between Wright's Tunnel and Aldercroft, presently owned by the San Jose Water Company. The unit right-of-way costs used for this Study are the same for either type of right-of-way acquisition.

- For Concepts 2 and 3, line segments east of River Street in Santa Cruz and north of Route 1 along Route 17 to Los Gatos, the project would purchase the right-of-way for either freeway widenings or the side-running rail mainline and sidings.

- For all concepts, between Los Gatos and Vasona Park, the project would purchase right-of-way for freeway widenings. For the Vasona Park option, right-of-way would be purchased for rail mainline and sidings. For the Route 85 option, right-of-way would be acquired for the rail mainline.

- For Concepts 2 and 3, the Storage Vault Tunnel, presently owned by Filesafe, would be acquired. The project would be responsible for and would pay for relocating Filesafe to another facility.

- For all concepts, the costs of relocating a relatively small number of residences are considered to be part of the contingency estimate.

VIII ENVIRONMENTAL SCAN

A. INTRODUCTION

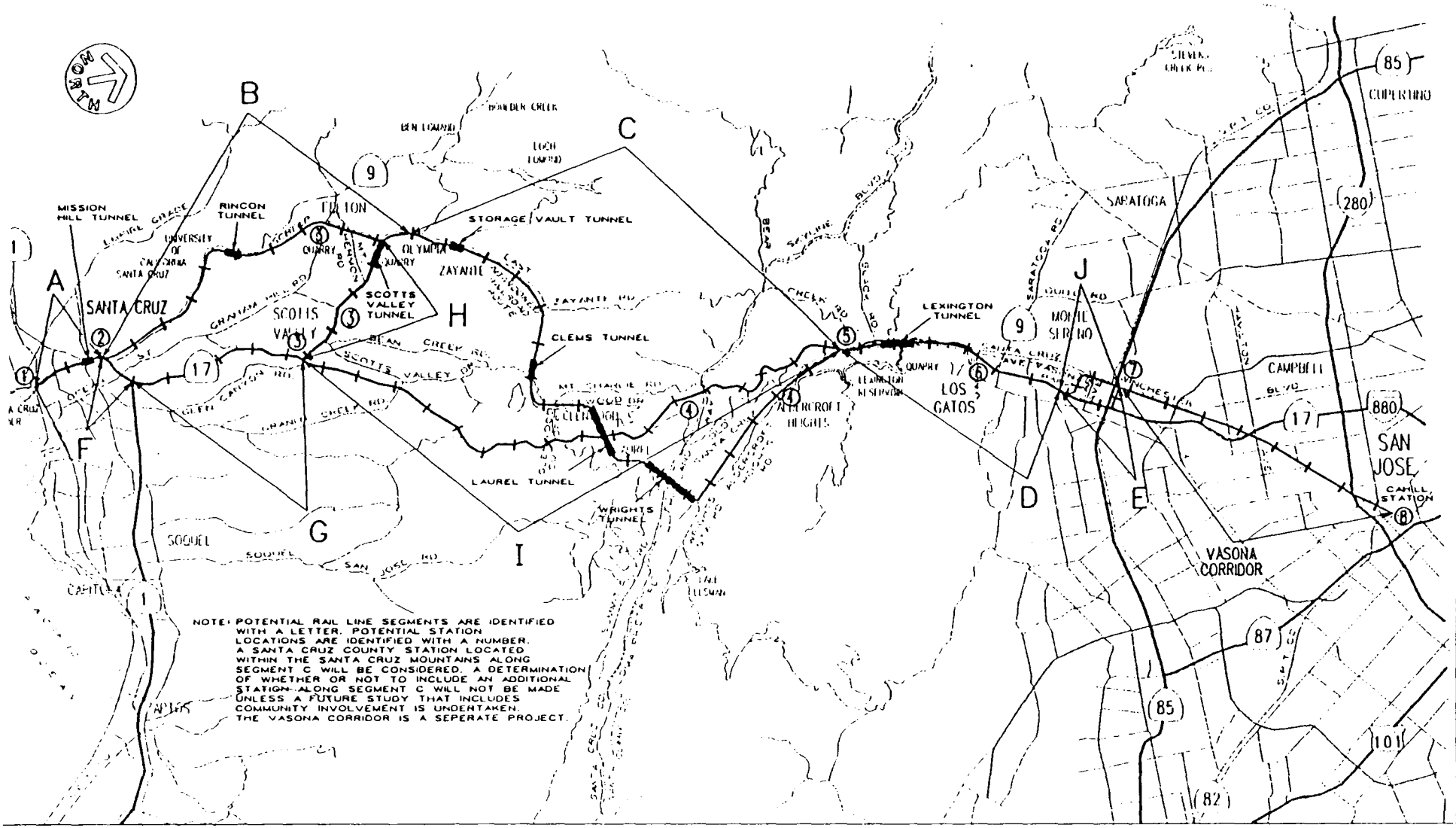
An environmental scan was conducted to identify potential physical and natural environmental and socioeconomic impacts of Concept 1–Historic Corridor, Concept 2–Historic and Scotts Valley Corridor, and Concept 3–Route 17 Corridor. The scan was performed using both CEQA and NEPA guidelines. Initial findings of the scan informed alignment and station location decisions. For purposes of analysis, light rail and diesel-electric commuter rail technologies were assumed for the Historic Corridor and the Historic and Scotts Valley Corridor, and light rail technology was assumed for the Route 17 Corridor.

The environmental scan results indicate that restoration of passenger rail service in the Historic Corridor creates potential for increased noise levels at sensitive receptors, changes to the existing visual and neighborhood environments and impacts to riparian areas and water quality. Noise levels, however, would be expected to be considerably lower with the light rail technology than with the commuter rail (diesel-electric) technology. Potential impacts of the Route 17 Corridor would also include noise, visual and community sensitivity, and water quality. Geologic and seismic impacts and displacements of businesses and residences at station sites are concerns for each alignment. Although none of the potential impacts identified appear to make the concepts studied infeasible, additional detailed research would be required to document potential impacts and define mitigation measures which could reduce impacts to less than significant levels.

Sources used in preparation of the scan were published reports by County and local planning agencies, inventories of resources in the project area (e.g., California Natural Diversity Database) and information gained from community workshops and local officials. Findings are summarized in this section by alignment segments and potential station locations. More detailed documentation is presented for each impact category in the Environmental Significance Checklist in Appendix C..

Conceptual alignments were presented in Figures 7, 8, and 9. Figure 10 is a composite of all alignments with each segment identified with a letter and each station with a number. Alignment alternatives consist of segment components as defined below:

- Concept 1–Historic: Segments A, B, C, D, and E or J.
- Concept 2–Historical and Scotts Valley: Segments A, F, G, H, C, D, and E or J.
- Concept 3–Route 17: Segments A, F, G, I, D, and E or J.



NOTE: POTENTIAL RAIL LINE SEGMENTS ARE IDENTIFIED WITH A LETTER. POTENTIAL STATION LOCATIONS ARE IDENTIFIED WITH A NUMBER. A SANTA CRUZ COUNTY STATION LOCATED WITHIN THE SANTA CRUZ MOUNTAINS ALONG SEGMENT C WILL BE CONSIDERED. A DETERMINATION OF WHETHER OR NOT TO INCLUDE AN ADDITIONAL STATION ALONG SEGMENT C WILL NOT BE MADE UNLESS A FUTURE STUDY THAT INCLUDES COMMUNITY INVOLVEMENT IS UNDERTAKEN. THE VASONA CORRIDOR IS A SEPERATE PROJECT.

MILES 0 0.5 1 2 3 4 5 MILES
KILOMETERS 0 1 2 3 4 5 6 7 8 KILOMETERS
ONE KILOMETER = ⅝ MILE

SANTA CRUZ - LOS GATOS RAIL FEASIBILITY STUDY **FIGURE 10**

CONCEPTUAL ALIGNMENT SEGMENTS AND STATIONS

De Leuw, Cather & Co. September 20, 1994

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B. SUMMARY OF ENVIRONMENTAL ISSUES BY SEGMENT

Segment A: This segment is within the City of Santa Cruz. Primary issues could be urban in nature, because the project would use the existing, operating railroad. Changes would be increased frequency of trains on the existing tracks, and under the light rail scenario, the visual changes associated with the overhead electrification system. Issues of traffic impacts would center around the placement of a station proximate to Route 1 and access/egress issues related to the reuse of the former railroad station at the south end of the line.

Segment B: Segment B uses the existing, operating railroad alignment. Segment B has issues related to urban development, in particular, the presence of residential neighborhoods and industrial/business development along the alignment immediately north of Route 1. The alignment through the Henry Cowell Redwoods State Park would remain within the existing railroad right-of-way, avoiding direct Section 4(f) of the Department of Transportation Act impacts to public parkland (future assessment of constructive use impacts might be required under federal environmental review).

Segment C: Segment C uses the existing railroad right-of-way northward to Olympia and continues along the abandoned railroad right-of-way until it reaches the Lexington Reservoir. Potential for noise, visual change and access impacts exist in the Olympia and Zayante communities. Because the alignment runs along Zayante Creek north of Mount Hermon Road, potential for impacts to the streamside riparian vegetation and the animal species, particularly steelhead trout which are known to inhabit the stream are raised. Other special status species which are associated with the riparian communities are red-legged frog, yellow-legged frog, and California tiger salamander.

The Glenwood community is located within Segment C. The alignment could affect residential properties in this area, possibly requiring displacement of structures. Issues of change in access, visual change, and noise impacts would require assessment.

There is also potential for impacts to residences in the Laurel community. Impacts which would require evaluation are water resources, noise, visual change, and loss of access to residences which use the former railroad right-of-way as an access road. In this location, and others such as Olympia Station and Wright's Station, the potential for significant historic period archaeological deposits would require research. Potential for prehistoric archaeological deposits along the former rail roadbed is diminished somewhat due to the grading and other construction activities required to construct the original railroad. Riparian corridors, particularly along Los Gatos Creek, remain sensitive areas which would require detailed prehistoric archaeological investigation.

The Wright's Station area would have issues of riparian corridor impacts, including concern for water quality. Any project-related impacts to water quality would affect surrounding habitat and the quality of the water supply for which the creek is a source.

Northward from Wright's Station the alignment would pass through the riparian corridor associated with Los Gatos Creek, raising the concerns noted above. The alignment would be near residences in the Aldercroft Heights and Chemeketa Park communities, but potential for impacts would be ameliorated by the configuration of the alignment in the stream valley at an

elevation lower than these communities. As the alignment moves northward toward Lexington Reservoir, the residences along the reservoir would experience a change in visual setting resulting from the placement of the alignment on the east side of the reservoir, on the opposite side of the watercourse from the residences. This alignment has been proposed because it provides the maximum possible separation from the residences, reducing the potential for noise and visual impact.

The primary concerns related to the alignment along the Lexington Reservoir are water quality and potential for U.S. Army Corps of Engineers Section 404 permitting requirements for placement of fill in waters of the U.S. This permitting requirement would apply to all portions of the alignment where natural streamcourses exist, including the San Lorenzo River in Santa Cruz, Zayante Creek, Los Gatos Creek and Lexington Reservoir.

Segment D: Issues of Section 404 impacts at Lexington Reservoir and the portion of Los Gatos Creek would need to be investigated. The potential Section 4(f) issues of conflicting with the hike/bike trial along Los Gatos Creek downstream of the Lexington Dam would require assessment. The remainder of this segment is in urban development. Issues would be primarily related to visual impacts of placing the alignment within and adjacent to the Route 17 Right-of-Way and creation of an at-grade crossing at Main Street in Los Gatos.

Segment E: This segment would have limited direct impacts due to its placement in the existing Routes 17 and 85 corridors.

Segment F: Segment F would provide a connection between the existing alignment from the Santa Cruz Union Station to the Route 1 Corridor. Transitioning from the railroad right-of-way into the Route 1 Corridor would require displacement of businesses and residences along Felker Street between the San Lorenzo River and Ocean Street. Water quality issues and Section 404 permitting requirements would need to be assessed for the bridging of the alignment over the San Lorenzo River. Some impacts to Section 404-protected wetland areas might also occur at this location.

Segment G: This alignment would create potential for impacts related to the cuts and fills needed to widen Route 17 to add the rail alignment. Primary concerns would be visual change to roadway users related to cuts into the hillsides. Terrestrial habitats affected would include Upland Redwood Forest, Mixed Evergreen Forest and Northern Coastal Scrub.

Segment H: Most of this segment would be placed along side the existing street right-of-way of Mt. Hermon Road. Adjacent land uses are primarily strip commercial development. Environmental issues would be related to change in access to adjacent development. The westernmost portion of Segment H, between Scotts Valley and Olympia, crosses marine sand deposits that support sensitive habitats: Northern Maritime Chaparral and Maritime Coast Range Ponderosa Pine Forrest. However, because the alignment would be in tunnel through part of the sand deposit area, potential for impacts would be minimized.

Segment I: This segment represents an expansion of the existing Route 17 Right-of-Way and would have impacts similar to those discussed for Segment G.

Segment J: This alignment would create potential for visual and noise impacts to the residential community adjacent to Vasona Park. Placement of the rail alignment within the park would create a Section 4(f) effect. Water quality, wetlands and waters of the U.S. issues could result from the alignment's crossing of the lake.

C. SUMMARY OF STATION SITE CONCERNS

Station 1 (All concepts): Impacts to be addressed related to this station would be access/egress. The existence of the old station structure on an existing railroad and the existence of parking areas minimize impact potential.

Station 2 (All concepts): A station in this location will be a high use commuter station, requiring substantial land area to accommodate parking and park-and-ride facilities. As a result, displacements of business and residential properties are likely to be required. For Concept 1, a station location on the west side of the San Lorenzo River, accessed by River Street, would require displacement of businesses either near Portrero Street or near Cottonwood Street at River Street adjacent to Route 1. For Concepts 2 and 3, the station location between Route 1 and Felker Street, between the San Lorenzo River and Ocean Street, is a promising location; however, residential property displacements would result. Sites on the north side of the highway have been eliminated from consideration to avoid impacts to the cemetery.

Station 3 (Concept 1): This station would serve the Felton area and would also serve Scotts Valley commuters accessing the station via Lockwood and Graham Hill Roads. The station site used for planning is the existing terminus of the Santa Cruz, Big Trees & Pacific yard and station. A station on the west side of this site would place it at some distance from residential development to the northeast.

Station 4 (Concepts 1 and 2): The Aldercroft Heights Station would serve the communities of Aldercroft Heights and Chemeketa Park and would be located in the vicinity of the Aldercroft Heights Road and Alma Bridge Road intersection. It would have a small footprint given the limited parking demand. However, proximity of the alignment to Los Gatos Creek creates concerns for water quality, habitat loss and potential for impacts to species of concern. No residences are located immediately adjacent to the intersection, therefore potential for impacts such as noise and visual are limited. Concerns for traffic safety for access and egress to the station site are raised by the geometry and sight distance of the existing intersection and access roads.

Station 5 (All concepts): The Lexington Reservoir Station would have a large footprint to accommodate projected parking demand. The station is assumed to be sited between the existing Route 17 and the reservoir, raising issues of water quality, placing of fill in waters of the U.S. and visual impacts. Access/egress from Route 17 is assumed to be improved from the existing condition by the interchange project currently under construction.

Station 6 (All concepts): The Los Gatos Station would serve as an access station into the town center of Los Gatos. The station would be on structure at the level of existing Main Street. Primary issues would be visual impact and noise. Avoidance and minimization of impacts to the adjacent trail will be an issue for the station as well as the alignment.

Station 7 (All concepts): Impacts at the Vasona Station would be limited to the need to expand the parking area at the planned Vasona Junction Station.

Station 8 (All concepts): Potential for impacts at the Cahill Station would be limited to the addition of parking at an existing station remote from the alignments.

Station 3 (Concept 2): The Scotts Valley Station would be designed as an expansion of the planned transit center. It would be located on vacant land proximate to the Mount Hermon Road commercial corridor. The site is near sensitive habitats occurring in marine sands deposits, but does not appear to be directly sited in these habitats (the site was previously developed as an airport).

Station 3 (Concept 3): This station would be located in the median of Route 17 north of the Mount Hermon Road off-ramp overpass, and likely north of Glen Canyon Road. Passenger access and parking could be provided via Subridge Drive, just to the west of Route 17. There would be elevators and a pedestrian bridge over the southbound lanes of Route 17 to a parking lot at a wide graded open area.

Station 4 (Concept 3): The Summit Station of the Route 17 alignment would serve as a transfer or drop-off (kiss n' ride) station. The location for this transfer point would be at the existing Route 17/Summit Interchange which is a known access point from/to Route 17 and the surrounding communities. Development of the station would likely require acquisition of private property. There would likely be substantial cuts into slopes to accommodate the station footprint.

IX COST ESTIMATES

A. INTRODUCTION

Both capital and operating costs have been estimated for the Santa Cruz-Los Gatos rail line and are described in this chapter. Cost estimates are based on the conceptual alignments, technologies, operations, and assumptions presented in earlier chapters. If the project progresses to the next stage of planning, estimates will be refined.

As described earlier in Chapter IV, two basic corridors were studied and divided into three discrete alignment concepts for evaluation: Concept 1–the Historic Corridor, Concept 2–the Historic and Scotts Valley Corridor, and Concept 3–the Route 17 Corridor.

Concept 1–the Historic alignment consists of the existing Santa Cruz, Big Trees, & Pacific Railway (SCBT&P) tracks from Santa Cruz to Olympia, plus new tracks following the abandoned railroad roadbed to Aldercroft Heights, and then along the west side of Lexington Reservoir to the vicinity of Bear Creek Road. North of this point, the Historic and Route 17 alignments are the same. From Lexington Reservoir to the north end of Los Gatos, the Historic alignment follows Route 17.

Concept 2–the Historic and Scotts Valley alignment follows the existing SCBT&P tracks to Route 1. The alignment traverses Route 1 to Route 17, then follows Route 17 to Scotts Valley. The alignment departs Route 17 and follows Mount Hermon Road and joins the Historic alignment in Olympia.

Concept 3–the Route 17 alignment follows the existing SCBT&P tracks to Route 1. The alignment traverses Route 1 east to Route 17, then follows an alignment along Route 17 from Santa Cruz to a point north of Los Gatos.

In addition, the costs of segments E and J (alternative connections from Route 17 to the existing Southern Pacific tracks at the Vasona Junction) were compared, with the less expensive alternative used to develop a lower range of total costs and the more expensive alternative used for the higher range of total costs for each alignment.

Two types of rail technology were evaluated as part of this Feasibility Study: light rail and conventional (or commuter) rail. It is noted that for Concept 3–the Route 17 alignment, only the light rail technology alternative is deemed reasonable. Hence, only the light rail technology is used for Concept 3. In taking into account the three alignment concepts and the two types of rail technology, a range of cost estimates was developed resulting in five different capital cost

alternatives. Contingencies, reflecting the preliminary level of this Study, and implementation (administration, planning, and engineering) costs were then added to estimate the final range of costs for each alternative. Table 18 shown below summarizes the capital costs for the five alternatives evaluated in this Study.

Operating and maintenance costs were estimated based on the operating plans discussed in Chapter VI.

Table 18
Capital Cost Alternatives

1a.	Historic Concept using light rail technology.
1b.	Historic Concept using commuter rail technology.
2a.	Historic and Scotts Valley Concept using light rail technology.
2b.	Historic and Scotts Valley Concept using commuter rail technology.
3.	Route 17 Concept using light rail technology.*

*Based on engineering issues, the use of commuter rail technology on the Route 17 alignment was deemed inappropriate.

B. CAPITAL COST COMPONENTS

Capital costs consist of three basic components: segment costs, system costs, and add-on costs (contingencies, environmental, and implementation costs). A brief description of each of these major cost components is described below.

1. Segment Costs

Segment costs are associated with items that are specific to the location and configuration of the alignment, such as track, earthwork, roadwork, structures, right-of-way, and grade crossings. The capital cost estimates were developed by quantifying the cost items by segment using a methodology known as composite costing. Composite costs were developed for many of the repetitive cost items. With composite costing, the costs of the individual items included in a typical section are added together to develop a unit cost representing all the elements in that section. The total cost of the segment for which the typical section applies is determined by multiplying the unit cost of that section by the length of the section. For example, the composite cost of a single foot of track (a track foot) would include the rails, rail hardware, ties, ballast, and other common elements. Non-recurring costs, such as the individual structure and tunnel costs, are added to the composite costs to determine the total cost of each segment. The total cost

of track in any segment can thus be easily calculated and compared to the costs of other segments. The items included in each of these composite costs are listed in Table 19.

Table 19
Composite Cost Elements

Category	Elements
Track	Track (rails and hardware; ties, ballast)
Roadbed	Earthwork, including subballast Retaining Walls Minor Drainage Structures
Structures	Railroad Bridges and Aerial Structures Highway Bridges Subways Tunnels
Right-of-Way	Property Acquisition or Easement
Grade Crossings	Road Crossing Panels Grade Crossing Signals
Electrification	Overhead Contact System Traction Power Substations
Other	Street Modifications Parking Lots
System Costs	Rolling Stock (locomotives and cars) Stations Train Control Signals Communications Operations and Maintenance Facilities

2. System Costs

System costs were developed for cost items that are required for operation of the entire corridor and are not attributable to any one segment. These items include rolling stock, station construction, operations and maintenance facilities, train controls, communications, and fare collection.

3. Contingencies, Environmental, and Implementation Costs

Contingencies were included in the cost estimating process to account for uncertainties in construction items, right-of-way acquisition needs, and vehicle procurement. Costs associated with environmental mitigation and project scope changes have also been included. Implementation costs were then added to account for the cost of such project activities as

environmental planning, engineering, design, and construction management. The contingency percentages and the items they are applied to, environmental mitigation and scope change assumptions, and project implementation cost assumptions are presented in Table 20. These add-on cost assumptions are based on professional judgment and are similar to cost assumptions used by the Santa Clara County Transportation Agency.

Table 20
Contingencies

Item/Activity	Cost Basis
Contingencies	
Construction	15% low; 50% high of construction items
Right-of-Way	0% low; 30% of right-of-way costs
Equipment	0% low; 30% of equipment procurement cost
Environmental Mitigation and Scope Changes	
Construction	3% to 15%, depending on route
Right-of-Way	0% to 5%, depending on route
Project Implementation Costs	
Conceptual Planning	3% of estimated construction cost
Preliminary Engineering	3% of estimated construction cost
Program Management	6% of estimated construction, procurement, and right-of-way cost
Detail Design	15% of estimated construction cost
Construction Management	8% of estimated construction cost

C. CAPITAL COST ESTIMATES

A range of capital cost estimates for each alternative is provided in Table 21. Costs are expressed in terms of 1994 dollars. Total capital costs for light rail transit (LRT) technology range between $401.5 million for Concept 1-the Historic alignment to as high as $646.2 million for Concept 2-the Historic and Scotts Valley alignment. For the two alternatives relying on commuter railroad (RR) technology, total capital costs range from $370.3 million for Concept 1–the Historic alignment to $613.7 million for Concept 2– the Historic and Scotts Valley alignment.

D. OPERATING AND MAINTENANCE COSTS

Operating and maintenance (O&M) costs have been estimated for the Santa Cruz-Los Gatos rail corridor based on the operations plan described in Chapter VII and the patronage forecasts presented in Chapter III.

Table 21
Range of Capital Costs by Alternative ($ Millions)

Alternative/ Cost Component	1a–Historic Alignment, LRT[1]	1b–Historic Alignment, RR	2a–Historic/ Scotts Valley Alignment, LRT[1]	2b–Historic/ Scotts Valley Alignment, RR	3–Route 17 Alignment, LRT[1]
Construction	$145.5 to $152.0	$142.7 to $150.3	$172.4 to $178.8	$170.9 to $178.6	$176.8 to $183.2
Right-of-Way[2]	85.2 to 85.8	85.8 to 86.2	102.9 to 103.5	103.5 to 103.9	66.4 to 67.0
Equipment	62.4	38.0	62.4	38.0	62.4
Contingency/ Environmental	29.1 to 147.3	28.5 to 139.3	34.5 to 170.9	34.2 to 163.9	31.8 to 148.7
Project Implementation	78.7 to 112.0	75.8 to 109.2	92.7 to 131.2	90.5 to 129.3	91.2 to 126.6
Total Cost	$401.5 to $558.9	$370.9 to $523.0	$465.5 to $646.2	$437.1 to $613.7	$429.2 to $587.3

[1]The lower total cost is based on an alignment variation that requires the higher right-of-way cost.
[2]Unit prices for real estate furnished by Appraisal Research Corporation, September 1994.

Initial estimates of annual operations costs were developed using the data in the *National Transit Summaries and Trends,* part of FTA's Section 15 Annual Report. Data for 1992 was used, and inflated by four percent each year to yield a 1994 operating cost in 1994 dollars. For each technology, light rail and commuter rail, the statistical data for the Santa Cruz-Los Gatos alignments and prospective operations were compared with the reported data on existing operations. To the extent possible, the proposed operations were matched with peer operations, and the operating costs of the peers were deemed to be representative of the costs of the proposed operation. Since both light rail and commuter rail services are provided in San Jose now, it is reasonable to assume that a future operation of either technology would be an extension of the existing service, and hence have similar costs. In addition, the annual operating costs include a capital replacement fund (CRF) cost factor based on a 30-year equipment replacement cycle. The CRF assumes an initial equipment cost of $62.4 million (with annual CRF contributions of $2.6 million) for Concepts 1a, 2a, and 3. The initial equipment cost for Concepts 1b and 2b is $38 million (with annual CRF contributions of $1.6 million). Annual operating and maintenance cost estimates are shown in Table 22 in the next chapter.

X FUNDING SOURCES AND INSTITUTIONAL ISSUES[11]

A. INTRODUCTION

As described in Chapter IX, the costs associated in the planning, engineering, and construction of rail service between Santa Cruz and Los Gatos have a range from $370.9 million to $646.2 million, depending on the alignment and type of rail technology used. Operating costs also vary, ranging between $6.4 million and $9.6 million per year. Once the rail system is built and operational, it is anticipated to initially carry 4,400 passengers per day at a one-way fare of $4.50 per passenger between Santa Cruz and Los Gatos. This fare is comparable to travel on the Peninsula Commute Service (CalTrain) between San Jose and downtown San Francisco.

With this as background, this section of the report describes existing and potential funding sources for the development and operation of the passenger rail service. Specific issues discussed include (a) the current availability of capital and operating revenues from traditional local, regional, state and federal sources, and (b) the availability of funding from potential new funding sources such as the enactment of a local dedicated sales tax, the use of highway tolls to fund the passenger rail service, and congestion pricing.

B. EXISTING SOURCES OF FUNDING

As part of the analysis, a number of local, regional, state and federal funding sources have been identified. Each of these funding sources have a variety of characteristics. Some are discretionary and may only be obtained through a competitive process. Others are stable and their use may be determined locally or perhaps in partnership with the Association of Monterey Bay Governments, the Metropolitan Transportation Commission, or the Santa Cruz County Regional Transportation Commission. For example, revenue made available through an annual appropriations process and allocated on the basis of a competitive ranking would be the least reliable for planning purposes. On the other hand, revenues raised locally as well as prioritized and allocated by a local agency would be among the most predictable funding sources.

While under normal circumstances funding can fluctuate depending on the authorization and appropriations process, the recent downturn in the state's economy has significantly increased the uncertainty associated with transportation funding. The decline in gas tax revenues, voter rejection of Proposition 156 (a $1 billion rail bond measure), Proposition 1A (a $2 billion earthquake seismic repair measure), Proposition 181 (a $1 billion rail bond measure), and less

[11]Arthur Bauer & Associates, Inc.

than full funding of transportation programs from the federal government, have resulted in a $5 billion shortfall in the State Transportation Improvement Program (STIP). While there may be an effort next year in the state legislature to increase state transportation funding, it is assumed that the existing sources of revenue described in this section will remain committed in supporting existing transit services and expenditure priorities in the two counties.

1. Local Revenue Sources

Both Santa Clara and Santa Cruz Counties rely heavily on local revenue sources to fund their existing transit services. Based on our review, we have identified several sources including farebox revenues, Transportation Development Act revenues and local sales tax measures.

Farebox Revenues

Farebox revenues are paid by system riders and support the system's annual operating and maintenance costs. For comparison purposes, farebox revenues were calculated based on a range of one-way fares of $1.75 (for CalTrain travel between Gilroy and the Blossom Hill Station), $2.25 (for CalTrain travel between Gilroy and downtown San Jose), and $4.50 (for CalTrain travel between San Jose and downtown San Francisco). These potential fares were in turn multiplied by anticipated daily boardings (4,360) which again were multiplied by a conservative estimate of 300 days of service per year. For example, a one-way fare of $1.75 would generate approximately $2.3 million per year in farebox revenue ($1.75 x 4,360 boardings x 300 days). Using this methodology, farebox revenues would range between $2.3 million and $5.9 million depending on the one-way fare cost.

As shown in Table 22, when farebox revenues are compared against estimated operating costs, the farebox recovery ratio varies between 24 and 33 percent for service at $1.75 per one-way trip depending on the type of technology. Conversely, for service at $4.50 per one-way trip, the farebox recovery ratio is much better, ranging between 61 and 92 percent, again depending on the type of technology.

Transportation Development Act

Transportation Development Act (TDA) revenues are based on a one-quarter percent local sales tax. Although TDA funds are derived from a locally imposed sales tax, state law prescribes their use in great detail. TDA monies are used for transit capital and operating support. During Fiscal Year (FY) 1994, the Santa Cruz County Regional Transportation Commission allocated a total of $4.4 million, with 75 percent of the funds being used by the Santa Cruz Metropolitan Transit District and the remainder being allocated for local projects and programs. Estimates prepared by the Santa Cruz County Regional Transportation Commission indicate that TDA funding will remain constant during the next several years, totaling $4.9 million between FY 1994 and FY 1996.

For Santa Clara County, TDA funding in FY 1994 totaled approximately $48.1 million. The Metropolitan Transportation Commission (MTC) estimates that the county will receive $51.6 million in FY 1995 and $54.4 million in FY 1996 in TDA funding.

Table 22
Estimated Operating Costs, Passenger Fares, and Farebox Recovery Ratios by Alignment Alternative

Alternative/ Fare Options	1a–Historic Alignment LRT	1b–Historic Alignment RR	2a–Historic/ Scotts Valley Alignment LRT	2b–Historic/ Scotts Valley Alignment RR	3–Route 17 Alignment LRT
Estimated Operating Costs[1]	$6.9M to $8.4M	$8.8M to $9.3M	$6.9M to $8.4M	$8.8M to $9.6M	$6.4M to $7.9M
OPTION A					
One-Way Fare[2]	$4.50	$4.50	$4.50	$4.50	$4.50
Operating Revenues[3]	5.9M	5.9M	5.9M	5.9M	5.9M
Farebox Recovery[4]	85% to 70%	67% to 63%	85% to 70%	67% to 61%	$92% to 75%
OPTION B					
One-Way Fare[5]	$2.25	$2.25	$2.25	$2.25	$2.25
Operating Revenues	2.9M	2.9M	2.9M	2.9M	2.9M
Farebox Recovery	42% to 34%	33% to 31%	42% to 34%	33% to 30%	45% to 37%
OPTION C					
One-Way Fare[6]	$1.75	$1.75	$1.75	$1.75	$1.75
Operating Revenues	2.3M	2.3M	2.3M	2.3M	2.3M
Farebox Recovery	33% to 27%	26% to 25%	33% to 27%	26% to 24%	36% to 29%

[1] Includes a capital replacement fund (CRF) cost factor based on a 30-year equipment replacement cycle, 6% annual interest earnings and a 4% inflation rate. The CRF assumes an initial equipment cost of $62.4 million (with annual CRF contributions of $2.6 million) for Alternatives 1a, 2a, and 3. The initial equipment cost for Alternatives 1b and 2b is estimated at $38 million (with annual CRF contributions of $1.6 million).

[2] Represents one-way fare between San Jose and downtown San Francisco.

[3] Revenues determined by multiplying one-way fare by annual number of passenger boardings (e.g., 4,360 boardings/day x 300 days/year x $4.50).

[4] Calculated by dividing operating revenues by operating costs.

[5] Represents one-way fare between Gilroy and downtown San Jose.

[6] Represents one-way fare between Gilroy and Blossom Hill

Source: Arthur Bauer & Associates

Sales Tax Programs

In 1979, voters in Santa Cruz County increased the local sales tax by one-half cent to provide financial support to the Santa Cruz Metropolitan Transit District. This tax will continue in perpetuity and in FY 1993 generated approximately $9.5 million for transit service in the county. Similarly, Santa Clara County voters in 1976 also voted to increase the local sales tax by one-half cent to support the County Transit District. In FY 1993, this measure generated approximately $90.8 million.

Estimates developed by the Santa Cruz County Regional Transportation Commission estimate that sales tax revenues will increase slightly to $10.0 million per year for the three year period

between FY 1994 and FY 1996. For Santa Clara County, the Metropolitan Transportation Commission estimates that sales tax revenues used to support the County Transit District will range between $98.2 and $110.7 million during the same time period.

2. Regional Revenue Sources

Air pollution control districts around the state have the authority to increase motor vehicle registration fees up to $4 per vehicle to fund air pollution improvement programs and projects. Since air pollution tends to be more acute in urbanized areas and because there is, in general, more competition for funding, the legislature has adopted several legislative measures creating vehicle registration fee programs. For the two counties in the Los Gatos-Santa Cruz County Corridor, two state statutes govern the assessment, collection and distribution of funds.

AB 2766 (Santa Cruz County)

Under AB 2766 (Sher, 1990) counties were granted authority to impose a $2-to-$4 per vehicle fee for funding air quality improvement programs. Under this statute, the Monterey Bay Unified Air Pollution Control District has imposed a $4-per vehicle fee to fund emission reduction programs within its three county jurisdiction. The three counties include Monterey, Santa Cruz and San Benito Counties. It is estimated that the $4 fee generates approximately $2 million per year. These funds are distributed on a discretionary basis; however, for the last few years, approximately half of the funds have been distributed to the three counties while the remaining 50% has been used by the Air District. During FY 94-95, Santa Cruz County's allocation totaled $546,960.

Projects eligible for funding include local feeder bus or shuttle service to rail or ferry stations; purchase or lease of clean fuel vehicles; measures for promoting rail-bus integration (e.g., ticket vending machines); congestion pricing projects; and trip reduction programs.

AB 434 Counties (Bay Area Counties)

Under AB 434 adopted by the legislature in 1991, the Bay Area Air Quality Management District is authorized to impose a motor vehicle registration surcharge of up to $4. This fee generates approximately $17 million per year for the nine Bay Area counties.

Under state law, the Air District must allocate 40 percent of the funds to each county congestion management agency (CMA) based upon the county's proportionate share of the fee-paid vehicle program. Under this allocation, Santa Clara County receives approximately $1.7 million per year. The remaining 60 percent is discretionary and administered by the Air District. However, jurisdictions may only submit their applications to either the county CMA or to the air district but not both agencies.

3. State Funding

Four sources of state funding have been identified: Proposition 116 funds, Flexible Congestion Relief funds, State Transit Assistance funds, and Transit Capital Improvement funds. Each funding source is described below.

Proposition 116

In June 1990, California voters approved Proposition 116, the Clean Air and Transportation Improvement Act of 1990, which authorizes the state to issue nearly $2 billion in general obligation bonds for rail projects in specific geographic areas throughout the state. Under the measure, $11 million is set aside for Santa Cruz County for establishing intercity passenger rail service between the City of Santa Cruz and the City of Watsonville, and for other rail projects within Santa Cruz County which "facilitate recreational, commuter, intercity and intercounty travel." There is no financial match requirement for the Santa Cruz-Watsonville rail service. However, a dollar-for-dollar match requirement does exist for other Proposition 116-funded rail projects in the county.

In Santa Clara County, $47 million is available, of which $12.5 million has been programmed and approved for the CalTrain Gilroy Extension, $29 million for the Tasman Corridor, and $5.5 million which is currently unprogrammed.

Flexible Congestion Relief Funds

Flexible Congestion Relief (FCR) funds are part of the funding program authorized by Proposition 111, adopted by state voters in June 1990. The funds can be used on state highways, local arterials, or for rail transit. Federal funds can be used as a match for this program. Each county is guaranteed a minimum allocation with additional funds available in competition with other areas. FCR funds are allocated every two years through the State Transportation Improvement Program (STIP). If a county is an Article XIX County, which includes both Santa Clara and Santa Cruz Counties, FCR funds can be used for rail capital outlays. However, this is a very competitive process where proposed projects must go through a local and regional prioritizing process and ultimately be included in the STIP.

In Santa Cruz County, the FY 1992-99 FCR program remains primarily oriented to highways. Approximately $40 million of state funds are programmed in the County through FY 1999, all but $200,000 in roadway projects. For Santa Clara County, the Metropolitan Transportation Commission estimates that the County will receive approximately $247.0 million between FY 1993 and FY 1999, again with nearly all this money devoted to highway construction.

State Transit Assistance Funds

The State Transit Assistance (STA) program provides state funds for transit assistance. Funds for the program are derived from a variety of sources: (1) revenues from a portion of the sales tax on the first 9 cents of the motor vehicle fuel tax; (2) sales tax revenues from all diesel fuel sales; and (3) all sales tax revenues on the 9 cent gas tax authorized by Proposition 111.

Funds are allocated to all regional metropolitan planning agencies by the legislature based on relative population to the entire state. On an annual basis, the MPO allocates 30 percent of the total funds available to the region directly to transit operations for either operating or capital uses, while it retains the remaining 70 percent for allocating on a regional basis for capital or operating purposes to projects and services of a regional significance. Based on current estimates, Santa Cruz County expects to receive approximately $483,000 per year between FY

1994 and FY 1996, while Santa Clara County hopes to receive a total of $9.9 million during the same time period.

Transit Capital Improvement Program

The Transit Capital Improvement (TCI) program provides for funding mass transit services throughout the state and is also funded from gas tax revenues. These revenues go to the Transportation Planning & Development (TP&D) account which is a special fund available only for transportation purposes. Specific projects eligible for transit and intercity rail funding with TCI funds include, among other things, the acquisition of railroad right-of-way, the development of mass transit guideways, the purchase of rolling stock, and the construction of intermodal transfer stations serving various transportation modes. No formal match ratio is established for intercity rail projects, although the CTC gives higher priority to intercity rail projects with local matching resources.

According to the 1994 Regional Transportation Plan prepared by the Santa Cruz County Regional Transportation Commission, Santa Cruz County hopes to receive $500,000 in FY 1994, $2.2 million in FY 1995, and $1.3 million in FY 1996. According to staff at the Santa Clara County Transportation Agency, the County does not anticipate receiving any TCI funding during the same three year period.

4. Federal Funding

For the purpose of this Study, there are four sources of federal funding for transportation projects. These sources include the Federal Transit Administration (FTA) Section 3 program, the FTA Section 9 program, and the Surface Transportation and the Congestion Mitigation and Air Quality programs under the Intermodal Surface Transportation Efficiency Act (ISTEA).

FTA Section 3 Program

The FTA Section 3 Discretionary and Formula Grant program provides for the construction of new rail projects (new starts), the improvement and maintenance of existing rail and other fixed guideway systems, and the rehabilitation of bus systems.

New Start funds are used for funding new bus and rail systems and the expansion of existing systems. These funds are earmarked by Congress prior to the development of appropriation legislation. Match ratios for these funds are negotiable on a case-by-case basis, and vary between 33 and 80%. To date, only three urbanized areas under 1 million in population (Jacksonville, Salt Lake City, and Honolulu) have received New Start funds since 1984, and none under a population of 500,000.

Rail modernization funding is available to modernize and rehabilitate fixed-guideway systems, including rail, trolley coach and busways. These funds are geared towards older transit systems more than seven years old. Bus Capital funds are available for the acquisition of buses, the construction of maintenance facilities, and other bus-related equipment needs.

Under the Section 3 program, the Santa Cruz Metropolitan Transit District anticipates receiving $4.12 million per year between FY 1994 and FY 1996 for bus and bus-related facilities. The

Santa Clara County Transit District, which has a significantly larger bus and rail development program, expects to receive between $3.0 and $3.4 million during the same period under the Section 3 rail modernization program. In addition, the Santa Cruz County Regional Transportation Commission has been working with local congressional representatives to have Section 3 funds earmarked in legislation for the Watsonville Junction-Santa Cruz-UCSC Corridor. Santa Clara County has also been successful in obtaining congressional approval for the allocation of $240 million in Section 3 New Starts funding for the Tasman Corridor project beginning in FY 1994.

FTA Section 9 Program

The FTA Section 9 Program provides capital and operating funds to urbanized areas (50,000 or more in population). It is noted that these funds are usually used for rail vehicles, buses, paratransit, and for improving passenger facilities. Funding used for the purchase of capital equipment is available on an 80% federal/20% local match, while operating funds are made available on a 50% federal/50% local matching basis.

Between FY 1994 and FY 1996, Santa Cruz County anticipates receiving approximately $1.0 million per year in Section 9 funding, while Santa Clara County expects to receive between $16.5 and $18.0 million of these funds during the same time period.

Surface Transportation Program

Surface Transportation Program (STP) funds can be used for any transportation project that receives planning and endorsement from appropriate state agencies, such as Caltrans, or the local metropolitan planning organization, such as MTC. This source of ISTEA funding is the most flexible source of monies for either transit or highway projects. STP funds may be applied to transit projects that are eligible for assistance under the Federal Transit Act. Projects eligible for funding include transit facility construction and improvements (both bus and rail), the purchase of rolling stock (buses), highway modifications designed to accommodate new transit modes, carpool projects, rail transit corridor parking and technology transfer programs.

Under this program, Santa Cruz County anticipates receiving approximately $1.9 million annually between FY 1994 and FY 1996. For Santa Clara County, the Metropolitan Transportation Commission estimates that the County will receive between $10.3 and $10.8 million per year between FY 1994 and FY 1996.

Congestion Mitigation and Air Quality Program

Congestion Mitigation and Air Quality Program (CMAQ) funds are for transportation projects in air quality non-attainment areas for ozone and carbon monoxide. These funds may be used for transit-related projects and, under limited circumstances, for operating assistance.

Funds under these two programs are allocated to the local metropolitan transportation planning organization, based on a population formula. A public agency seeking funding must submit an application for these funds on an annual basis. The application is then reviewed by the MPO in conjunction with other applications from local agencies and jurisdictions. Local matching funds are required at an 80/20 federal/local ratio.

Santa Cruz County's apportionment of CMAQ funds is estimated at $844,000 per year between FY 1994 and FY 1996. Santa Clara County anticipates receiving between $5.6 million annually during the same time period.

Table 23, Stability and Purpose of Existing Funding Sources, reflects the degree of predictability and competitiveness associated with each source of funding now received by the two counties. This table also shows how each source of funding is used (capital or operating expenditures).

Table 23
Stability and Purpose of Existing Funding Sources

	Predictable (P)/ Unpredictable (UP)	Competitive (C)/ Noncompetitive (NC)	Purpose: Capital (C) Operating (O)
Local Revenue Sources			
TDA			
Santa Clara	P	NC	C/O
Santa Cruz	P	NC	C/O
Sales Tax			
Santa Clara County Transit District	P	NC	O
Santa Cruz Metropolitan Transit District	P	NC	O
State Regional Revenue Sources			
Motor Vehicle Registration Fees			
AB 2766 – Santa Cruz County	P	C	C
AB 434 – Santa Clara County	P	C	C
Federal Regional Revenue Sources			
Surface Transportation	P	C	
Congestion Mitigation & Air Quality	P	C	
State Revenue Sources			
Proposition 116	P	NC	C
Flexible Congestion Relief Funds	UP	C	C
State Transit Assistance Funds	UP	NC	C/O
Transit Capital Improvement Program	UP	C	C
Federal Revenue Sources			
FTA Section 3 New Starts Funding	P	NC	C
FTA Section 9 Funding	P	NC	C/O

C. POTENTIAL NEW SOURCES OF FUNDING

The development and operation of the Santa Cruz-Los Gatos passenger rail service will need to rely on new sources of funding. Described below are three potential new sources: an additional local dedicated sales tax, the use of toll road revenues, and congestion pricing.

1. Additional Local Dedicated Sales Tax

As noted earlier, voters in both Santa Cruz and Santa Clara Counties have increased the local sales tax by one-half cent to fund transit service in their respective counties. An additional half-cent sales tax increase was approved for a limited period of time by voters in Santa Cruz County to fund repair work associated with the Loma Prieta Earthquake. However, a measure on the November 1994 ballot to allocate one-quarter cent of the sales tax for library purposes once the earthquake tax sunsets failed to win voter approval.

A number of California counties have chosen to increase the local sales tax to provide funding for transportation projects. For example, San Mateo County imposes a one-half cent increase to fund its transit services (San Mateo County Transit) and a one-half cent increase dedicated to funding both highway and CalTrain construction projects (the Measure A program). If a similar sales tax program were adopted in Santa Cruz County, it could, based on 1993 revenues, potentially provide up to $9.5 million per year for use by the Santa Cruz Metropolitan Transit District.

In November 1992, Santa Clara County voters chose to establish a sales tax program to fund a new set of transportation improvements. This new program, which would begin in 1995, represents a $3.5 billion commitment to financially support the development and operation of an extensive intra-county rail transit system over the next 20 years. The Santa Cruz-Los Gatos rail Corridor was not included as part of the program.

Soon after the election, however, a taxpayers group filed suit challenging the validity of the sales tax, arguing that the measure required a two-thirds affirmative vote, as specified under Proposition 13, rather than a simple majority. In a decision by the California Court of Appeals, the court ruled that the sales tax measure is unconstitutional and is thereby invalid. County officials have filed an appeal with the California Supreme Court which is to issue a decision early in 1995. If the lower court decision is upheld on appeal, Santa Clara County will find it extremely difficult to fund its planned rail system.

Should Measure A be ruled invalid by the Supreme Court, it would likely require a state constitutional amendment to permit local sales taxes for transportation. It is also unlikely that Santa Clara County officials would choose to reprioritize projects currently included in the Measure A program.

2. Toll Facilities

Prior to the 1950's, tolls had been a traditional way of financing the construction, operation, and maintenance of highway facilities in the United States. Then with the passage of the Federal-Aid Highway Act of 1956, a large network of federally-funded interstate highways were built across the country. In general, this trend of "free highway construction" continued until the early 1980's

when state and local jurisdictions began confronting the problem of declining transportation revenues and the need for expanding and maintaining the highway system. During this recent period, toll road projects were initiated in Virginia, Florida, and Texas. In 1989, the California Legislature passed AB 680, which authorized the construction of four privately-funded demonstration toll road projects around the state. One of these projects, State Route 91 in Orange County, is now under construction in southern California.

The use of tolls has several advantages. First, for new facilities, it provides a relatively stable source of ongoing revenue which can be used to leverage the debt needed for project construction. Once debt obligations are repaid, the continuing source of revenue can be used for facility maintenance or for some other transportation-related expense. The use of tolls also promotes the concept that people who use the facility pay for its construction, operation, and maintenance. However, a major disadvantage to toll financing is the need to repay the interest costs associated with borrowing funds.

One way to provide needed capital and operating funds for the Santa Cruz-Los Gatos rail service would be the construction of a toll facility on Route 17. Under ISTEA, the restraints against using tolls on interstate highways was lifted and federal agencies are now encouraged to support toll roads and their financing. In addition, there is precedent in using highway tolls to fund transit. For example, the Tri-Borough Bridge Authority in New York provides toll bridge revenues which are used to support the city's subway and bus system.

A conceptual funding scheme based on the conversion of Route 17 to a toll road facility and in turn using the tolls to support the construction of the potential rail service has been developed. (This is similar to a conceptual proposal evaluated by MTC in 1987.) Assuming that a one-directional toll booth facility is built on Route 17 between Lexington Reservoir and the county line, it is reasonable that this location would capture a high percentage of the longest trips, requiring those vehicles who benefit the most to pay the toll.

Development of the conceptual funding scheme includes the following financial assumptions:[12]

- Total capital costs would be between $370.9 million and $646.2 million. This includes costs associated with track and station construction, signalization, and purchase of rail equipment ($370.9 million for commuter rail technology on the Concept 1-Historic alignment to $646.2 million for LRT technology on the Concept 2-Historic and Scotts Valley alignment), construction of the toll plaza ($2 million), and $1 million in highway improvements to Route 17.

- A minimal one-way toll of 25 cents is used. However the toll has been adjusted upward to 30 cents per vehicle to account for truck traffic which would pay a higher toll.

- Revenue bonds would be issued by a public agency, such as the Joint Policy Board (JPB), for a period of 30 years at an interest rate of 7.0%.

- The cost of issuing the bonds would be 2.5% of the issuance.

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[12]Rausher Pierce Refsnes, Inc., October 1994.

- All costs are in 1994 dollars and are not escalated for inflation.

Using these assumptions, Table 24 compares the associated costs that would result in issuing bonds to finance construction of the rail service. As shown in the table, capital construction plus financing costs would range between $1.2 billion and $2.1 billion over 30 years. Annual debt service would also range between $39.9 million and $69.3 million depending on the alignment and type of rail technology used. However, for highway tolls to approach covering annual debt service costs, the tolls would be expensive, ranging between a one-way cost of $4.72 to $8.20. On a per mileage basis, this would cost between $0.13 per mile ($4.72 ÷ driving a roundtrip distance of 36 miles) with conventional rail technology with Concept 1-Historic alignment to $0.23 per mile ($8.20 ÷ driving a roundtrip distance of 36 miles) for LRT technology with Concept 2-Historic and Scotts Valley alignment.

Presumably, tolls at this high level could provide a strong disincentive to Route 17 travel by automobile, thereby reducing Route 17 traffic congestion.

Table 24
Comparison of Capital Financing Costs

Low Range Capital Cost (Concept 1–Historic Alignment, RR Technology)		High Range Capital Cost (Concept 2–Historic Alignment, LRT Technology)	
Rail System Cost	$370.9 Million	Rail System Cost	$646.2 Million
Highway Improvements	1.0 Million	Highway Improvements	1.0 Million
Toll Plaza Cost	2.0 Million	Toll Plaza Cost	2.0 Million
Coverage Ratio, Debt Service Reserve Fund, etc.	110.4 Million	Coverage Ratio, Debt Service Reserve Fund, etc.	191.4 Million
Total Capital Cost	$484.3 Million	Total Capital Cost	$840.6 Million
Total Principal	$484.3 Million	Total Principal	$840.6 Million
Total Interest	$700.7 Million	Total Interest	$1,216.3 Million
Total Debt Service	$1,185.0 Million	Total Debt Service	$2,056.9 Million
Annual Debt Service	$39.9 Million	Annual Debt Service	$69.3 Million
Annual One-Direction Vehicle Trips	8,450,000	Annual One-Direction Vehicle Trips	8,450,000
Annual Tolls @ $0.30	$2,535,000	Annual Tolls @ $0.30	$2,535,000
One-Way Toll Needed to Repay Annual Debt Service	$4.72	One-Way Toll Needed to Repay Annual Debt Service	$8.20

Source: Arthur Bauer & Associates Inc. and Rauscher Pierce Refsnes, Inc.

3. Congestion Pricing

Another funding option that should be considered is the use of congestion pricing. Congestion pricing involves the imposition of a fee or toll on travel during peak hour commute periods, particularly for people traveling to and from work. The purpose in using this pricing mechanism is two fold. First, depending on the amount of the fee or toll, the use of congestion pricing can help encourage use of other available modes of transportation, such as carpooling, using the bus, or riding the train, thereby reducing automobile travel and highway congestion. Second, because the impact on the transportation system is greater during peak hour travel, higher costs associated with this travel can be recovered from peak hour users rather than from other system users traveling during non-peak travel periods.

In adopting ISTEA, Congress expressed interest in the congestion pricing concept and authorized the Department of Transportation to establish a congestion pricing pilot program. Under the statute, the agency may fund as many as five congestion pricing projects around the country, with the federal government providing up to 80 percent of the funding. Under this program, MTC submitted a proposal to the Federal Highway Administration to initiate a congestion pricing demonstration project using the San Francisco-Oakland Bay Bridge. In September 1993, MTC was awarded a $1.5 million grant to evaluate the concept. The proposal calls for replacing the existing, fixed $1 toll for westbound auto trips into San Francisco with variable tolls. Non-carpools would pay a higher toll to cross the bridge during congested morning and afternoon commute hours, while carpools and vanpools of three or more occupants, as well as buses, would continue to travel across the bridge for free. Should the concept provide to be feasible, MTC would then need to request authority from the California Legislature to implement a variable toll structure beginning in early 1996.

Should the congestion pricing demonstration program be continued when ISTEA is reauthorized in 1997, Route 17 could be a candidate for a demonstration project if funding is available.

D. POTENTIAL FUNDING STRATEGY

In developing rail service between Santa Cruz and Los Gatos, it will be necessary to develop new funding sources to finance the capital and ongoing operating costs of the service. In addition, even if the California Supreme Court should uphold Santa Clara County's Measure A program, Santa Clara County will have little flexibility in providing funding for the rail system.

However, there are several potential funding opportunities for the service, such as the development of a dedicated sales tax program in Santa Cruz County, the use of tolls, and congestion pricing. Each of these funding options will require further analysis and refinement as part of a more comprehensive study of the proposed rail service. However, our preliminary analysis suggests that while a toll program will require changes in state and federal law, tolls revenues could potentially provide sufficient revenues to cover capital costs associated with the system. Once these capital costs were paid, tolls could then be used to cover annual operating expenses.

It can also be argued that because Route 17 is an interregional corridor, the state should participate by providing funding for transportation improvements.

As noted earlier in this chapter, the existing funding sources are fully committed. Unless there is an extremely broad consensus, it is unlikely that the existing revenue sources will be shifted to the Route 17 Corridor rail program. Therefore, existing revenues provided under current statutes or funding authorizations will not be considered. However, three new funding mechanisms were identified: an additional local sales tax, tolls, and congestion pricing. For this feasibility analysis, a funding strategy which relies on an additional local sales tax in either county to fund this project is not explored. Also, the concept of congestion pricing is not analyzed in detail in this Study. It is noted, however, that the Federal Highway Administration is funding study grants to determine the possible feasibility of congestion pricing in a corridor.

The use of tolls opens the opportunity to fund the project as a public-private joint venture. One possible strategy would be to secure public funding for half the cost of the project and obtain the remaining funding through the issuance of debt with toll revenues being pledged to retire the debt.

Since the Route 17 Corridor is an interregional corridor where major highway improvements are unlikely to occur, an argument can be made that the state has an obligation to participate in funding the rail improvements which will accommodate some of the growth in traffic. Article XIX of the state constitution permits State Highway Account funds to be used for this purpose. With changes in federal law, it may be possible to bundle federal funding with state revenues to assist in the financing. Tolls would be used to fund the remaining half of the revenues. If tolls were to cover only 50 percent of the project's cost, the charge to motorist would be reduced to a less costly rate ranging from $2.36 to $4.10, depending on the alternative.

A private firm would be retained to secure the financing and to design, build, and operate the project. This is similar in some respects to the concept used by Caltrans in the AB 680 program. However, the AB 680 projects do not rely on public funding.

Admittedly, this concept would require refinement in subsequent studies. However, it presents an option that in a competitive funding environment may be able to bring the project to where it can compete for funding.

Finally, it should be pointed out that the Route 17 Corridor is not the only interregional corridor in the state where transportation improvements are needed. Two other corridors include the Altamont Pass Corridor on I-580 between Alameda and San Joaquin Counties and the Highway 101 Corridor between Santa Barbara and Ventura Counties. Currently, state law does not explicitly recognize multimodal interregional corridors or gateway corridors that link two regions. Consequently, it may be possible in future legislation to establish a funding program for corridors of this type.

E. INSTITUTIONAL ISSUES ASSOCIATED WITH THE ROUTE 17 CORRIDOR

The aspect of the Route 17 Corridor that is significant from an institutional perspective is that it is an interregional highway corridor. It is not included entirely in either the area of jurisdiction of the Metropolitan Transportation Commission, or in the jurisdiction of the Santa Cruz County Regional Transportation Commission.

Three important trends are occurring which form the institutional framework that must be worked in or around if a rail program is to be implemented in the Route 17 Corridor. The first trend has been the emergence over the last several years of countywide transportation sales tax programs. The focus of these programs have been high priority local highway and transit projects. Regardless of the Supreme Court's decisions in the Santa Clara County sales tax case, it is likely the sales tax programs will continue even if a constitutional amendment must first be enacted. A second trend is reflected in state policy enacted in 1989 which assigned greater planning and programming responsibility to regional transportation planning agencies. All indications suggest that this trend will continue. A final trend is that federal law is mirroring California law by strengthening, with the enactment of ISTEA in 1991, the metropolitan planning organization's role in carrying out federal planning and programming responsibilities. Both the state and federal government have created revenue streams which support the expanded regional responsibilities. Certainly, if an interregional corridor's transportation problems are impacting mobility in a region, the corridor will become a regional priority. However, this is likely to occur only after other exclusively regional priorities are met.

Within this local and regional context, the institutional advocacy for interregional corridorwide improvements, such as the construction of a rail facility which this Study examines, will in most instances rest with special organizations similar to the Joint Policy Board and with Caltrans.

1. Caltrans' Charter to Address Highway Capacity Constraints with Rail Solutions Limited

Because of the interregional nature of travel in the Route 17 Corridor, Caltrans is the transportation agency that has clearly defined responsibility to address the corridor's transportation problems. Moreover, state law has created a category of funding the Interregional Highway Program to finance improvements on eligible highways. Route 17 between Santa Cruz and San Jose is designated in statute as being eligible for receiving funding from this program. Caltrans' charter, however, is generally to build and operate the state highway system. Its rail responsibilities are limited to contracting for intercity passenger rail service from Amtrak in defined corridors. The development of interregional commuter rail service is outside the department's current responsibility. Should Caltrans recognize that rail service in the Route 17 Corridor would address the long-term capacity constraints that will be encountered with the existing highway, state law would have to establish an institutional structure to implement the project and funding would have to be provided.

2. An Interregional Organization is Required

If Caltrans is unable to address the full range of transportation options for the corridor, an institution will have to be created which can plan and advocate service alternatives and secure funding. However, it will need to be crafted in a fashion that recognizes Caltrans' responsibility as owner/operator of the corridor's highway system. This is an especially complex issue since all three alignment concepts rely in part on using some or all of the Route 17 and Route 85 right-of-way, both of which are owned and operated by Caltrans. Certainly, there is experience in working with Caltrans to develop rail projects that use state highway medians. BART's original system and the expansion currently under construction used segments of state highways.

There are at least four distinct tasks that must be conducted to implement rail service. The task are as follows:

- Develop facility and service plans.
- Organize funding for the project, including representing the project before funding organizations such as the regional agencies, the California Transportation Commission, the legislature, and Congress.
- Construct the project.
- Operate and maintain the service and the facility.

The Joint Policy Board (JPB) is at the initial phase in the evolution of an institution to oversee the development and operations of a passenger rail service between Santa Cruz and Los Gatos in the Route7 Corridor. The JPB is an accepted paradigm for conducting an intergovernmental planning project, which is the nature of the Santa Cruz-Los Gatos Rail Corridor Feasibility Study. The JPB was established under the terms and conditions of a memorandum of understanding (MOU) between the Santa Cruz County Regional Transportation Commission, the Santa Clara County Transit District, and the Santa Cruz Metropolitan Transit District. Two conditions are identified governing the term of the MOU. First, it continues in full force for six months after the acceptance of the Feasibility Study by the JPB. Second, it can be extended by the parties to the agreement for an agreed upon period of time, but the MOU cannot be operational after June 1996 unless the three parties to the agreement consent to extend the MOU.

The responsibility for actually determining whether development of a rail program should proceed can rest with the JPB. However, when considering the type of agency to actually manage the construction and operations of a rail facility, several options are available. One option would be to create a joint exercise of powers agency. This would require the MOU establishing the JPB to be replaced by a joint exercise of powers agreement which would transform the JPB into an operating governmental agency. This would allow the assignment of a range of governmental powers held in common by each of the signatories to the joint powers agency. The responsibilities of the new agency would have to be carefully delineated so that it can organize the funding and manage overall program development and service operations. Another option would be to create a statutory agency with the authority to develop transportation facilities in the Route 17 Corridor. A third alternative would be to organize the agency around the type of funding selected to construct and operate the project. This is especially appropriate if toll financing is found to be appropriate. The joint powers agency could then be a toll agency.

In regard to operating service, there are at least three options available. First, the agency could operate the service itself. Second, it could contract with either of the two transit agencies currently providing service in Santa Cruz County and in Santa Clara County. Finally, the operations could be contracted out to a service provider. This would necessitate an agreement of the Santa Clara County transit operator, as the service would operate over its tracks from Los Gatos to San Jose.

XI FINDINGS AND CONCLUSIONS

A. INTRODUCTION

The overall study goal was to assess at a conceptual level the feasibility of providing passenger rail service in the Route 17 Corridor between Santa Cruz and Los Gatos. To accomplish this goal, the Santa Cruz-Los Gatos Rail Corridor Feasibility Study assessed, at a conceptual stage, the patronage market, potential rail alignments, rail technologies, passenger rail operations, environmental impacts, costs, and sources of funding. The public provided input to the Study at community workshops, and the Joint Policy Board (JPB) and Technical Advisory Committee (TA) provided policy direction and oversight.

Three potential rail alignment concepts were identified for evaluation and are shown in Figures 7, 8, and 9 in Chapter IX. The alignments are Concept 1–Historic Corridor, Concept 2–Historic and Scotts Valley Corridor, and Concept 3–Route 17 Corridor. The southern terminus of all of these alignments connects with the existing Southern Pacific Transportation Company railroad line near the Santa Cruz Boardwalk. The northern terminus for all alignments connects with the Vasona Corridor in Los Gatos. These connections allow the Santa Cruz-Los Gatos Corridor to link with the Santa Clara County's light rail system and the regional and national rail network.

This chapter presents a summary of the Study's findings and conclusions regarding the implications of developing rail service along each of the corridor concepts identified above. Also provided are discussions on institutional arrangements and funding strategies that could be employed if the JPB chooses to advance the planning of a major transportation investment in the Santa Cruz-Los Gatos Corridor.

B. TRAVEL MARKET AND PATRONAGE FORECAST

Route 17 and bus transit service on Route 17 currently serve travel demand along the Santa Cruz-to-Los Gatos Corridor. The 1993 average daily traffic volume on Route 17 in Santa Cruz County is 65,000 vehicles per day associated with 98,600 person-trips per day. The peak-hour traffic volume is approximately 8,200 vehicles. Of the 98,600 daily person-trips, about 35,400 are work trips for people living in Santa Cruz County and working in Santa Clara County. About 7,000 trips are for people living in Santa Clara County and working in Santa Cruz County. About 27,700 trips are for people living in the San Francisco Bay Area and traveling to Santa Cruz beaches, parks, and the boardwalk. The remaining trips are for other purposes. The preliminary travel market analysis concluded that, initially, 4,400 daily boardings could be expected if a rail transit service is instituted between Santa Cruz and Los Gatos. About 3,400 or 75 percent of the boardings would be work and school trips with about 80 percent of these trips originating in

Santa Cruz County bound for Santa Clara County's employment and educational centers. About 1,000 daily boardings would be recreational travelers during the off-peak travel hours.

Based on the preliminary patronage estimates, rail transit would capture approximately 4.5 percent of the estimated total number of person-trips on Route 17, a rate which is consistent with the overall average rate of transit usage in Santa Clara County. Potential conversion of Route 17 traffic from an automobile mode to rail transit mode is estimated at 3,600 vehicles per day. During the morning northbound peak commute, approximately 730 people, which corresponds to 600 vehicles, or less than 15 percent of the northbound peak-hour traffic, are estimated to change mode from automobile to rail transit.

Future increases or decreases in the number of rail transit patrons will be a function of the quality of the rail service and the quality of alternative competing modes of travel. Factors affecting the perceived quality of rail service include the frequency and timing of rail trips, the availability of parking at rail stations, the convenience of intermodal transfers, and the availability of direct, non-stop shuttle services between rail stations and major employment sites, colleges, universities, airports, and recreational destinations.

It is expected that the number of boardings would grow as service becomes better known, as the public becomes more familiar with intermodal connections, and as direct shuttle services expand. The recreational market represents the greatest opportunity for future ridership growth on a Santa Cruz-to-Los Gatos/San Jose rail system.

C. SERVICE REQUIREMENTS

Twenty-one light rail vehicles operating in three-car trains would be required to meet the initial estimated demand. The three-car trains would conform with the platform lengths for the future Vasona Light Rail Corridor. Seven light rail trains could operate at 20 minute headways during the two-hour commute period. The commuter rail alternatives would require eleven cars operating as either two six-car trains, three four-car trains or four three-car trains. For the purposes of developing a conceptual timetable and capital and operating cost estimates, four trains are assumed. These trains would operate at 30 minute headways.

The success of the rail service depends on the quality of connectivity to the mass transportation system in Santa Clara County and to the trip destinations in Santa Cruz and Santa Clara Counties. Under both the light rail and commuter rail options, shuttle buses will be needed at Santa Clara County stations to transport people to and from their trip destinations. It is assumed that shuttle services would be provided mainly by employers and partially by other private and public transit providers. From the perspective of the user, shuttle services must be timed to be at each station when the trains arrive in the morning and be at each work site before trains depart in the afternoon. Connectivity is further facilitated by integrating the service into the planned light rail service operating over the Vasona Corridor and the service proposed in the long-term in the Route 85 Corridor.

D. LIGHT RAIL VERSUS COMMUTER RAIL TECHNOLOGY

Light rail transit and commuter rail were identified as candidate technologies for the Santa Cruz-Los Gatos Corridor. Both are conventional rail technologies and both operate within the Santa

Clara County end of the Corridor. It was found that light rail is a more flexible technology than the commuter rail technology. A light rail system can be constructed and operated in the three alternative corridors: Historic, Historic and Scotts Valley, and Route 17. Moreover, the light rail technology could be readily integrated into the Santa Clara County light rail network when the Vasona Light Rail Corridor is constructed between San Jose and Los Gatos at the Winchester Boulevard crossing of Route 85.

Commuter rail is limited to Concept 1-the Historic alignment, and Concept 2-the Historic and Scotts Valley alignment. The grades and curvatures associated with Concept 3-the Route 17 alignment are such that commuter rail could not operate effectively. A commuter rail service could connect with Peninsula Corridor CalTrain commuter service at the Cahill Station in downtown San Jose via the Vasona Line. However, the ability of commuter rail to operate on the Vasona Corridor is problematic due to safety concerns and the technical issues pertaining to station design. To begin with, the commuter rail service could not readily use the Vasona stations because the station platforms would be configured for light rail vehicles. This means commuter rail would require a special rail car access design with unique equipment either on the rail cars or on the station platform. Alternatively, the commuter rail could operate without stopping between Los Gatos and downtown San Jose. Second, the commuter rail service could not operate on the Vasona Corridor during the time light rail transit is operating because of the safety rules governing the joint use of rail facilities by conventional commuter rail equipment and light rail transit equipment. The regulations governing joint operations such as this are promulgated and enforced by the Federal Railroad Administration. Both issues would be subject to more detailed study should the Joint Policy Board decide to proceed to the next level of analysis.

In terms of capital cost, for the same operational capacity on the Santa Cruz-Los Gatos Corridor, light rail equipment is more expensive than commuter rail equipment. Also, an electrical system is required for light rail transit. The total cost of commuter rail for Concept 1-the Historic alignment ranges between $370.9 and $523.0 million. The total capital cost of light rail for the same alignment is estimated to range between $401.5 and $558.9 million. A similar difference was found for Concept 2-the Historic and Scotts Valley alignment where light rail's cost is estimated to range from $465.5 to $646.2 million compared to a range of $437.1 to $613.7 million for commuter rail.

Another important measure for comparing the two technologies is the total travel time. In regard to commuter rail, the running time between Santa Cruz and Vasona Junction on the Concept 1-the Historic alignment is 61 minutes. The same conceptual alignment is traversed by light rail service in 53 minutes, assuming all station stops are included. There is a similar difference when service is provided on the Concept 2 alignment. The best travel time is achieved with Concept 3 (Route 17 alignment), which is traversed from Santa Cruz to Vasona Junction in about 44 minutes with a light rail service.

E. ENVIRONMENTAL IMPACT

The environmental scan concludes that none of the alternative concepts create impacts that would prevent the development of rail service in the Santa Cruz-to-Los Gatos Corridor. The scan, however, did identify a number of potential environmental impacts including potential impacts to stream crossings, floodplain encroachment, water supplies, wetlands and riparian

vegetation, parklands, and neighborhoods. Other potential impacts identified include traffic in the vicinity of stations and grade crossings, displacement of residences and businesses, noise, and visual intrusion. All of these potential impacts are addressed in Chapter VIII and in Appendix C. Additional detailed research is required to document potential impacts and define mitigation measures which could reduce impacts to less than significant levels.

In regard to the unique characteristics of the two rail technologies, the environmental scan points out that light rail technology would have less of a noise impact than the commuter rail technology. From a visual impact standpoint, the light rail technology introduces an overhead catenary system. However, due to geometric requirements, the commuter rail technology would require a much more visually intrusive structure in the Route 17/Route 85 Interchange area than the tunnel proposed for the light rail technology.

F. CAPITAL AND OPERATING COST ESTIMATES

Both capital and operating costs were estimated for passenger rail systems for each alignment alternative and applicable technology. Capital cost estimates include the cost of construction, right-of-way, equipment, contingencies, environmental mitigation, and project implementation. Annual operating cost estimates include the costs of operations, maintenance, and equipment replacement.

The Historic Corridor Concept using commuter rail technology has the lowest estimated capital cost, which ranges from $370.9 million to $523.0 million. The Historic and Scotts Valley Corridor Concept using the light rail technology has the highest estimated capital cost, which ranges from $465.5 million to $646.2 million. The annual operating cost for the Route 17 Corridor Concept is estimated to be from $6.4 to $7.9 million, which is the lowest among all alternatives. The highest annual operating cost is between $8.8 and $9.6 million for the Historic and Scotts Valley Corridor Concept using commuter rail.

G. COMPARISON OF RAIL TRANSIT ALTERNATIVES

Table 25 compares the alignment length, travel times, the capital and operating costs, operating revenues, and farebox recoveries for each alternative.

H. COST EFFECTIVENESS

For many years, both the State of California and the federal government have used cost-effectiveness measures to gauge the efficiency and productivity of transit system investments. On the state level, the Transportation Development Act sets forth in statute specific performance indicators that transit systems must meet to continue receiving state funding assistance. For example, state law requires that within three years from the time service is initiated, a commuter rail system must receive 40 percent of its operating revenues via the farebox.

On the federal level, Congress and the Federal Transit Administration (FTA) have also prescribed cost-effectiveness measures for transit systems. A major revision to these measures occurred in 1991 with congressional passage of ISTEA. In funding new discretionary grants for major transit capital improvements projects, the FTA now requires a project be "justified, based

Table 25
Comparison of Rail Transit Alternatives
($ Millions)

Alignment Alternative	1a - Historic Alignment LRT	1b - Historic Alignment RR	2a - Historic/ Scotts Valley Alignment LRT	2b - Historic/ Scotts Valley Alignment RR	3 - Route 17 Alignment LRT
Corridor Length Santa Cruz-Vasona Junction	27.2 miles	27.2 miles	27.8 miles	27.8 miles	24.5 miles
Travel Time Santa Cruz-Vasona Junction[1]	53 minutes	61 minutes	52 minutes	62 minutes	44 minutes
Capital Cost[2]	$401.5 to $558.9	$370.9 to $523.0	$465.5 to $646.2	$437.1 to $613.7	$429.2 to $587.3
Operating Cost[2]	$6.9 to $8.4	$8.8 to $9.3	$6.9 to $8.4	$8.8 to $9.6	$6.4 to $7.9
Operating Revenue[3]	$5.9	$5.9	$5.9	$5.9	$5.9
Farebox Recovery[3]	85% to 70%	67% to 63%	85% to 70%	67% to 61%	92% to 75%

[1]Assumes stops at all stations. Times are less for express service.
[2]Based on 1994 dollars.
[3]Assumes a one-way fare of $4.50.

on a comprehensive review of its mobility improvements, environmental benefits, cost-effectiveness, and operating efficiencies." This language was included in the statute because Congress believed that the Alternatives Analysis of proposed rail projects was too narrowly construing the benefits of the projects.

In response to these new planning requirements, the FTA has modified its evaluation process to require that all major transit and highway capacity projects be subjected to a Major Investment Study (or Major Transportation Investment Analysis) before the project is included in local transportation plans or transportation improvement programs. The FTA advises project sponsors to conduct a comprehensive benefits-cost analysis that compares alternatives, considers public opinion, and evaluates direct and indirect benefits.

The FTA has recently prepared a policy paper suggesting changes in the way major transit capital projects (often referred to as New Start projects) are evaluated. Entitled *Revised Measures for Assessing Major Investments: A Discussion Draft,* the September 1994 FTA document discusses the need to broaden the evaluation criteria, giving more emphasis to the

social and environmental benefits achieved through investment rather than primarily focusing on cost-effectiveness measures. With this in mind, the FTA paper suggests use of a Social Cost Benefit Analysis (SCBA) that, if adopted by the agency, would require proposed New Start projects be compared against alternatives, including a Transportation System Management (TSM) alternative, and justified using the following appraisal measures:

- **Cost-effectiveness,** based on the total incremental cost per incremental transit passenger trip.

- **Mobility improvements,** based on the projected aggregate value of travel time savings per year anticipated from the new investment.

- **Operating efficiencies,** based on changes in the operating cost per vehicle service hour, passengers per vehicle service hour, and passenger miles per vehicle service hour.

- **Environmental benefits,** based on the value of the forecast change in criteria pollutant emissions and in greenhouse gas emissions, and the forecast change in the consumption of fuels (i.e., energy consumption).

- **Transit supportive existing land use policies and future patterns,** based on the degree to which local land use policies are likely to foster transit supportive land use.

While this type of cost-benefit analysis was not required as part of this feasibility study, it would be appropriate to use this type of evaluation in a subsequent, more comprehensive study of transportation alternatives for the Route 17 Corridor.

Benefits associated with the implementation of a Santa Cruz-to-Los Gatos rail service were not quantified in this Study. However, it is possible that improved mobility between Santa Cruz and Santa Clara Counties, benefits to the environment including air quality and energy consumption, traffic reductions on Route 17, and economic benefits could result. These among other potential benefits need to be analyzed for each alternative (No-Build, TSM, rail transit, bus transit expansion, and Route 17 expansion) during a Major Investment Study.

Due to the limited scope and resources for this Study, an analysis of potential "over-the-hill" bus service reductions was not performed. However, it is believed that the existing bus service between Santa Cruz and the San Jose area is likely to continue serving its current market competitively and that only a small number of riders, possibly some of those traveling to and from either downtown San Jose or the Cahill Station in San Jose, may choose rail service over the existing bus service. Overall, it is unlikely that the conceptual rail service with the alignments, station stops, and operating plan presented in this report would lead to significant reductions in "over-the-hill" bus service savings.

I. FUNDING SOURCES

All existing local, state, and federal sources of capital and operating funds are fully committed to other projects. A potential new source of capital funds would be a toll facility on Route 17. Tolls ranging from $4.72 to $8.20 that would be charged to each vehicle for travel in one direction would be required to pay for the full cost of borrowing funds to implement a rail project.

Another funding alternative is the use of congestion pricing in Santa Cruz and Santa Clara Counties. Should the congestion pricing demonstration program be continued when ISTEA is reauthorized in 1997, the Route 17 Corridor could be proposed to MTC as a demonstration project.

The most promising source of operating funds is the farebox revenue generated from the rail system riders. Assuming a one-way fare of $4.50, an annual revenue of $5.9 million would be generated. This would cover between 61 and 92 percent of annual operating costs, depending on the alternative. Other sources of rail transit assistance would have to be identified to cover the operating costs that are not paid by farebox revenues.

Since the Corridor is an interregional corridor, it can be argued that the state has a responsibility to ensure that funding is provided to meet the future travel demand in the Corridor. The Route 17 Corridor is not the only interregional corridor under the jurisdiction of more than one agency in California. The state may have to define a funding category for financing the projects required by interregional corridors.

J. INSTITUTIONAL STRUCTURE AND FUNDING STRUCTURE

After considering the findings of this Study, should the Joint Policy Board decide to pursue the subsequent phases of project development, an institutional arrangement will have to evolve and a sound funding structure for construction and operations will have to be developed. There are three institutional elements that must be considered. The first is the structure for conducting the studies necessary to determine the preferred transportation alternative. The second is an organizational structure for overseeing the design and construction of the facility and its ultimate operations. The third element is creating a funding structure for financing the project's construction and ongoing operations.

For purposes of placing the Route 17 Corridor into context, it can be classified as an inter-regional corridor. As such, it falls in a "no man's land" with neither a local nor a regional agency assuming full responsibility for defining the improvements required in the Corridor. Caltrans has primary responsible for planning highway improvements for Route 17, but it is not authorized to develop rail service alternatives of the type analyzed in this Study for accommodating the Corridor's growth traffic. The institutional context for determining how the Route 17 Corridor should be improved is unclear. With the institutional framework ill defined, a readily definable funding structure does not exist.

1. The Current Joint Policy Board Could Commission the Next Phase of Studies

The Joint Policy Board overseeing this Study has given the Corridor more attention than any other organization. The board is an ad hoc organization capable of overseeing further studies and advocating a program of improvements if the parties who agreed to create the board agree to extend the board's term and scope. Responsibility for actually commissioning the construction of a facility remains to be determined. This is an especially complex issue since all three alignment concepts rely in part on using some or all of the Route 17 right-of-way which is the responsibility of Caltrans. It is likely that an institutional structure to actually implement a program of this sort would involve the participation of the agencies that currently comprise the

Joint Policy Board as well as significant policy and program participation by Caltrans. This level of state participation has been achieved in Santa Clara County's Measure A program and has been achieved in the original development of BART, where tracks were aligned in the median of Route 24, and in the current BART expansion program where the medians of Route 4 and I-580 are being used for BART tracks.

2. A Need would Exist for An Organization to Design, Construct and Operate Rail should the Passenger Rail Service be Implemented

While the current institutional arrangement with some enhancement could be used to determine the preferred transportation facilities and services for the Corridor, a more formal agency, created either by statute or through the use of the joint exercise of powers agreement, would have to be empowered to enter into contracts and ensure the construction of the facility. At that point it would be necessary to determine who would be responsible for operating the service and maintaining the equipment and track. Several options would have to be considered, including contracting with either the Santa Cruz County Metropolitan Transit District or the Santa Clara County Transit District.

3. Securing Funding for Route 17 Corridor Improvements

Perhaps the most difficult issue associated with developing the type of rail service examined in this Study is securing funding for its construction and operation. One innovative possibility is the use of tolls which was analyzed in Chapter X. To institute a toll program would require changes in state and federal law. However, in light of the options that are available, this may be seen in the future as a reasonable approach to enhancing the Corridor's capacity. Because the Corridor is an interregional corridor, it can be argued that the state has a responsibility to ensure that funding is provided to meet the future travel demand in the Corridor. The Route 17 Corridor is not the only interregional corridor under the jurisdiction of more than one agency in California. Two examples of such corridors are the Altamont Pass Corridor between San Joaquin County and Alameda County, and the Route 101 Corridor between Santa Barbara County and Ventura County. The state may have to define a funding category for financing the projects required by interregional corridors.

In regard to the Route 17 Corridor, a funding program of the type needed will likely require statutory changes and the adroit programming strategies involving the cooperation of the California Transportation Commission, the Association of Monterey Bay Governments, and the Metropolitan Transportation Commission.

K. OTHER TRANSPORTATION ALTERNATIVES

This Study was commissioned to specifically address the feasibility of passenger rail service in the Santa Cruz-Los Gatos Corridor. The scope and resources of the Study did not allow the evaluation of other alternative means of addressing mobility between Santa Cruz County and Santa Clara County. Before proceeding to an advanced level of planning and engineering for a major transportation investment, the viable options need to be considered and evaluated. In addition to rail transit, other potential alternatives are identified below.

1. No-Build

This alternative would maintain Route 17 in its present form, except for various safety improvements that are being implemented and interchange improvements planned at Route 1 and at Lexington Reservoir.

2. Expanded Bus Service

This alternative would consist of adding bus service along the Route 17 Corridor. If bus transit can capture a similar patronage market as rail transit, approximately 40 to 50 additional buses would be required. Bus service could provide flexibility in establishing origin and destination points. The scope of an expanded bus transit alternative could range from adding buses onto the existing road system and Route 17 to adding buses and providing a dedicated high-occupancy vehicle lane for buses and carpools on Route 17.

3. Increasing the Capacity of Route 17

The scope of this alternative could range from widening Route 17 to constructing a new highway on an alignment above or below the existing highway. The two parallel alignments would operate as essentially a one-way couplet.

4. Transportation System Management

A Transportation System Management (TSM) alternative is a low-capital investment alternative which seeks to maximize the efficiency of the existing transportation system through operational improvements and other changes in service which can be accomplished without large expenditures in capital.

5. Congesting Pricing

This alternative would include the installation of a toll facility on Route 17. A fee or toll would be imposed on vehicular travel during peak-hour commute and recreational traffic periods. Tolls can be varied by time of day to regulate the use of road space. This pricing mechanism can help encourage use of other available modes of travel and can generate revenue for transportation improvements.

L. NEXT STEPS

The Joint Policy Board (JPB) and its parent organizations (Santa Clara County Transit District, Santa Cruz County Regional Transportation Commission, and the Santa Cruz Metropolitan Transit District) will consider how to proceed after completion of this Study. Three alternative courses of action related to addressing the Santa Cruz-to-Los Gatos Transportation Corridor are identified below.

1. Maintain Status Quo

This alternative would maintain the status quo in terms of institutional arrangements and responsibilities involving the Route 17 Corridor. The term of the JPB could be allowed to expire.

Caltrans would maintain lead-agency responsibilities over the Route 17 Corridor. Route 17 highway safety and improvement projects currently planned would proceed. Santa Cruz County and Santa Clara County would continue to address transportation issues and implement programmed transportation improvements within their respective jurisdictions.

2. Conduct Route 17 Transportation Corridor Studies

This alternative would involve additional joint studies. Santa Clara and Santa Cruz Counties would assume a role with Caltrans in identifying objectives for the Route 17 Transportation Corridor and potential transportation improvement alternatives for meeting those objectives. A study of each alternative, similar in scope to this Feasibility Study, would be performed and a comparison analysis would be conducted.

One of the alternatives should be the No-Build alternative in order to document the present and potential future conditions of travel on Route 17. Other alternatives could include an expanded bus transit alternative, an expanded highway capacity alternative, and a Transportation System Management (TSM) alternative. In addition, issues the JPB determines to require further study for the rail transit alternative could be addressed. Ultimately, all of the alternatives would be compared. After completing the study of various alternatives, a Major Investment Study (MIS) could then proceed.

3. Conduct a Major Investment Study

Similar to Alternative 2 above, the two counties would assume a role with Caltrans in identifying objectives for the Route 17 Transportation Corridor and potential transportation improvement alternatives for meeting those objectives. The alternatives could include the No-Build alternative, the rail transit alternative, an expanded bus alternative, an expanded highway capacity alternative, and a TSM alternative. Instead of conducting a feasibility-level study as described in Alternative 2, a Major Investment Study (MIS) complying with ISTEA and Federal Transit Administration (FTA) requirements would be conducted.

An MIS is a comprehensive analysis of the major transportation investment alternatives. A detailed travel demand and patronage analysis, an environmental assessment, a determination of mobility and environmental benefits, public involvement, and an analysis of cost-effectiveness and operating efficiencies would be performed. The MIS would arrive at a consensus on design concept and scope (a small set of alternatives). An MIS can be performed in conjunction with an environmental document. Under this approach, the MIS would lead to identification of a project-specific Preferred Alternative. An MIS must be completed before a specific major transportation project is included in local transportation plans or Transportation Improvement Programs and before a project qualifies for state and federal funding.

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Appendix A
GEOLOGIC CONDITIONS ALONG HISTORIC RAILROAD ROUTE[1]

Mission Hill Tunnel
Bedrock exposed at the south portal of the Mission Tunnel is a low-density siltstone or claystone mapped as Purisima Formation. Bedrock exposed at the north portal is a similar-appearing siltstone or claystone mapped as Santa Cruz Mudstone. An overhang has developed in the western wall of the southern portal cut. This overhang probably will collapse eventually, potentially cause a minor, easily removed blockage on the tracks. The railroad ties evidently were placed directly on bedrock in the tunnel floor. This rock has deteriorated to mud due to the presence of moisture. Mud "volcanoes" have been produced locally in the tunnel floor, presumably due to a pumping action produced by trains passing through the tunnel. This condition may gradually worsen as deterioration of the weak bedrock continues, eventually leading to a possible need to restore the tunnel floor.

Mission Hill Tunnel to Rincon Tunnel
The railroad traverses alluvial sediments after leaving the Mission Tunnel. After reaching the vicinity of the San Lorenzo River, it traverses an area of exposed granitic rock and pelitic schist. Where deeply weathered, these geologic units are prone to sliding when saturated by heavy rainfall.

Rincon Tunnel
The Rincon Tunnel is located entirely in weathered rock mapped as schist. A "shoo-fly" has been constructed around this tunnel, which was closed because of fire damage. The stability of the slope through which this tunnel passes may be marginal.

Rincon Tunnel to Storage Vault (Filesafe) Tunnel
The railroad continues to traverse schist and granodiorite as it passes through Henry Cowell Redwoods State Park before reaching an alluvial valley south of Felton. The route leaves the valley in the vicinity of Mount Hermon, where it begins to traverse a series of folded sedimentary rocks of Tertiary geologic age. These rocks tend to be prone to sliding as a result of seismically-induced strong ground motion and/or saturation from heavy rainfall. The greatest susceptibility to sliding occurs in deeply weathered materials and in bedrock with adversely oriented planes of weakness such as bedding planes, joints, and shears.

Storage Vault (Filesafe) Tunnel
The Storage Vault Tunnel appears to be located in siltstone or mudstone of the Monterey Formation.

Storage Vault to Glenwood (Clems) Tunnel
The route successively traverses Monterey Formation and Santa Margarita Sandstone along Zayante Creek. The route also traverses Lompico Sandstone and sandstone and mudstone

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[1]Woodward-Clyde Consultants, July 1994.

members of the Butano Sandstone. The Monterey Formation and the Butano Mudstone probably are more prone to slope failure than are the sandstones.

Glenwood (Clems) Tunnel
Bedrock exposed at the Glenwood end of this tunnel consists of a friable sandstone member of the Butano Sandstone, which is mapped as being strongly folded and deformed in this general vicinity. The dip of the bedding and prominent joints where observed at the tunnel portal is steep, in the estimated range of 65 degrees to 80 degrees. The strong deformation that bedrock in this area has undergone may contribute to local instability, possibly including blockage of the portal areas, in the event of a strong local earthquake or ground saturation. The potentially active Zayante fault zone crosses the Glenwood (Clems) Tunnel.

Glenwood (Clems) Tunnel to Laurel Tunnel
After leaving the Butano Sandstone and turning northward beyond the Glenwood (Clems) Tunnel, the route traverses Santa Cruz Mudstone and Purisima Formation for short distances. Steep natural and artificial (cut) slopes could fail as a result of strong, seismically-induced ground shaking and/or saturation by heavy rainfall, with the Santa Cruz Mudstone perhaps having the higher potential for slope failure.

Laurel Tunnel
The Laurel Tunnel traverses a series of folded sedimentary rocks of Tertiary geologic age. From south to north, these are: Purisima Formation, Santa Cruz Mudstone, Lambert Shale, and Vaqueros Sandstone. The bedding of these various units is steeply-dipping to overturned. Bedrock exposed at both ends of the Laurel Tunnel consists of a similar-appearing thinly-bedded, friable sandstone. Water was issuing from both ends of the tunnel at the time of the field reconnaissance. Landslide problems reportedly have been associated with this tunnel.

Laurel Tunnel to Wright's (Summit) Tunnel
The route enters an area underlain by the Rice's Mudstone member of the San Lorenzo Formation a short distance beyond the north portal of the Laurel Tunnel. It subsequently traverses Twobar Shale and Butano Sandstone before reaching the south portal of the Wright's (Summit) Tunnel. Steep natural and artificial (cut) slopes could fail as a result of strong, seismically-induced ground shaking and/or saturation by heavy rainfall.

Wright's (Summit) Tunnel
The southern portal of the Wright's (Summit) Tunnel is located in Butano Mudstone. The exposed bedrock at the northern end of the tunnel is part of the Franciscan Assemblage. The Wright's (Summit) Tunnel crosses the Butano fault and the San Andreas fault zone. The tracks were offset nearly 5 feet across the San Andreas fault, and the tunnel was deformed over a distance of more than 4,000 feet, at the time of the San Francisco earthquake of 1906. Comparable offsets and deformation could occur in the event of a future great earthquake on the San Andreas fault in the project region.

Wright's Station to Los Gatos
The route continues to traverse bedrock of the Franciscan Assemblage beyond the northern end of the Wright's (Summit) Tunnel, along the eastern side of Los Gatos Creek north of Wright's Station and on the western side of Lexington Reservoir. Cut slopes and natural slopes steeper

than 15 degrees are potentially unstable during strong earthquakes, such as may originate on the nearby San Andreas fault.

Adjacent to Los Gatos Creek, bedrock is mantled with unconsolidated alluvial and colluvial (slope wash) deposits. Where saturated, some of these materials may liquefy during strong earthquakes, with consequent lateral movement or differential settlement of fills placed on them.

Glossary
Geologic Units Traversed by the Historic Railroad Route

Geologic Unit	Description
Butano Sandstone	This geologic unit includes a yellowish gray, medium-bedded to massive, fine- to medium-grained arkosic sandstone with thin interbeds of olive gray siltstone and shale. It is at least 700 feet thick. The Butano Sandstone is of upper, middle and lower Eocene geologic age. It has been subdivided into several subunits including those described below.
Butano Mudstone	This subunit underlies the Butano sandstone and consists of a dark gray, thinly-bedded, nodular mudstone interbedded with arkosic sandstone.
Unnamed Sandstone	A thickly-bedded to massive, fine- to coarse-grained arkosic sandstone member of the Butano Sandstone is exposed along Soquel Creek.
Unnamed Sandstone	A very thickly-bedded to massive, light gray, medium- to coarse-grained arkosic sandstone member of the Butano Sandstone, with thick to very thick interbeds of sandy pebble conglomerate containing granitic boulders up to 3 feet long, crops out south of the Zayante fault. It is as much as 3,000 feet thick in this area where it rests unconformably on Salinean basement rocks.
Franciscan Assemblage	The Franciscan Assemblage is made up of a diverse array of rock types that were brought together in a subduction (fault) zone. Although the most prominent rock types are sandstone and shale, the Franciscan Assemblage contains hard masses of chert, limestone, altered basalt (greenstone), and metamorphosed schist. As a result of the mode of origin of the assemblage, essentially all boundaries between rock types consist of shears. Serpentine has been intruded into the Franciscan Assemblage at numerous locations, also producing sheared contacts. Due to its mode of formation as an alteration product of ultrabasic igneous rock and to its emplacement as a semiplastic mass, the serpentine commonly is pervasively sheared internally. These geologic conditions present potentially difficult and unpredictable tunneling conditions, possibly including natural gas and running ground.
Lompico Sandstone	The Lompico Sandstone is thickly bedded to massive, yellowish gray, fine to medium grained, arkosic and locally calcareous. A thick coquina bed crops out within this unit along Vinehill Road and in the Blackburn Gulch area. The Lompico Sandstone is of middle Miocene geologic age, and is unconformable on older units. The thickness reaches about 250 feet.

Geologic Unit	Description
Monterey Formation	The Monterey Formation is made up of a thin- to medium-bedded, brownish black to pale yellowish brown micaceous siltstone and subsiliceous organic mudstone. It is of middle Miocene geologic age. The thickness reaches about 380 feet.
Purisima Formation	This weakly-consolidated, thickly-bedded to massive, fine- to medium-grained, yellowish gray sandstone, which contains interbeds of tuffaceous and diatomaceous siltstone, reportedly reaches a thickness as great as 2,700 feet in along the Glenwood syncline. It is of Pliocene geologic age.
Quartz Diorite	Granitic rock of Middle Cretaceous age, locally consisting principally of quartz diorite, crops out in the vicinity of the Rincon Tunnel and elsewhere between Santa Cruz and Felton. It constitutes part of the Salinian basement rock of the Santa Cruz Mountains, and probably was emplaced between 95 and 120 million years ago. Where deeply weathered, it is prone to sliding when saturated by heavy rainfall.
San Lorenzo Formation	The San Lorenzo Formation is of Oligocene and upper Eocene geologic age and is made up of shale, mudstone, and sandstone. It has been subdivided into two members in part of the project area as described below.
Rices Mudstone Member	The upper part of the Rices Mudstone Member of the San Lorenzo Formation is a light gray nodular mudstone, and the lower part is a massive, fine-grained, glauconitic and arkosic sandstone. It is as much as 1,800 feet thick.
Twobar Shale Member	The Twobar Shale Member of the San Lorenzo Formation is a thinly-bedded and laminated olive gray shale with very thin lenses and laminae of very fine arkosic sandstone. It is as much as 450 feet thick along Laurel Creek.
Santa Cruz Mudstone	This geologic unit consists of a medium-bedded and faintly laminated, pale yellowish brown siliceous organic mudstone. It is of late Miocene geologic age.
Santa Margarita Sandstone	This geologic unit is very thick-bedded, yellowish gray to white, medium- to fine-grained, friable, and arkosic. It is of late Miocene geologic age. The thickness is in the range of 7 feet to 80 feet.
Schist	Pelitic schist, believed to be of Cretaceous or older geologic age, crops out in the vicinity of the Rincon Tunnel and elsewhere along the route between Santa Cruz and Felton.
Vaqueros Sandstone	This geologic unit consists of a thickly-bedded to massive, yellowish gray, fine- to coarse-grained, arkosic to glauconitic sandstone. It is of Oligocene geologic age. The thickness reaches about 2,700 feet.
Zayante Sandstone	The Zayante Sandstone includes thickly- to very thickly-bedded, poorly-sorted reddish muddy sandstone, greenish sandy siltstone, and cobble conglomerate. It locally intertongues with the Vaqueros Sandstone. The Zayante Sandstone is of lower Miocene and Oligocene geologic age.

Appendix B
CAPITAL COST ESTIMATES

Table B-1
Capital Cost Estimates
($ Millions)

Item	Alternative Concept[1]				
	1a Historic LRT	1b Historic RR	2a Scotts Valley LRT	2b Scotts Valley RR	3 Route 17 LRT
Construction					
Track	$16.60	$17.45	$18.02	$18.94	$14.86
Roadbed	9.92	4.82	13.45	8.37	39.76
Structures	68.70	84.96	86.45	105.57	63.02
Electrification	16.92	0.00	18.57	0.00	18.21
Crossings	1.65	2.85	1.54	2.66	1.65
Other	3.90	3.78	6.51	6.60	11.41
Signals/Communications	7.00	10.00	7.00	10.00	7.00
Stations	5.25	4.50	5.25	4.50	5.25
Yards & Shops	22.00	22.00	22.00	22.00	22.00
Construction Total	$151.93	$150.36	$178.79	$178.64	$183.16
Right of Way					
Trackway	$55.85	$55.85	$69.86	$69.86	$37.22
Stations & Parking	19.28	19.28	20.96	20.96	19.06
Relocation	1.96	2.96	3.96	4.96	2.00
Yards & Shops	8.10	8.10	8.10	8.10	8.10
Right of Way Total	$85.19	$86.19	$102.88	$103.88	$66.37
Equipment	$62.40	$38.00	$62.40	$38.00	$62.40
Contingency/ Environmental					
Low	$30.39	$30.07	$35.76	$35.73	$32.97
High	$147.29	$139.30	$170.94	$163.87	$148.69
Project Implementation					
Low	$81.78	$79.62	$95.74	$94.26	$94.18
High	$112.04	$109.18	$131.20	$129.28	$126.65
Totals					
Low	$411.68	$384.24	$475.56	$450.50	$439.08
High	$558.84	$523.02	$646.21	$613.67	$587.27

[1]Includes Segment E, Route 17 via Route 85/Route 17 Interchange and Route 85 in Los Gatos.

Table B-2
Capital Cost Estimates
($ Millions)

Item	Alternative Concept[1]				
	1a Historic LRT	1b Historic RR	2a Scotts Valley LRT	2b Scotts Valley RR	3 Route 17 LRT
Construction					
Track	$16.37	$17.24	$17.80	$18.74	$14.63
Roadbed	4.83	4.92	8.36	8.46	34.68
Structures	67.70	76.60	85.45	97.21	62.02
Electrification	16.65	0.00	18.30	0.00	17.95
Crossings	2.20	3.80	2.09	3.61	2.20
Other	3.55	3.60	6.16	6.42	11.06
Signals/Communications	7.00	10.00	7.00	10.00	7.00
Stations	5.25	4.50	5.25	4.50	5.25
Yards & Shops	22.00	22.00	22.00	22.00	22.00
Construction Total	$145.55	$142.66	$172.41	$170.94	$176.78
Right of Way					
Trackway	$56.50	$56.50	$70.51	$70.51	$37.87
Stations & Parking	19.28	19.28	20.96	20.96	19.06
Relocation	1.96	1.96	3.96	3.96	2.00
Yards & Shops	8.10	8.10	8.10	8.10	8.10
Right of Way Total	$85.84	$85.84	$103.53	$103.53	$67.02
Equipment	$62.40	$38.00	$62.40	$38.00	$62.40
Contingency/ Environmental					
Low	$29.11	$28.53	$34.48	$34.19	$31.82
High	$143.37	$134.17	$167.02	$158.75	$145.14
Project Implementation					
Low	$78.76	$75.91	$92.71	$90.54	$91.21
High	$107.88	$104.07	$127.05	$124.17	$122.65
Totals					
Low	$401.66	$370.93	$465.53	$437.20	$429.23
High	$545.04	$504.73	$632.41	$595.38	$573.99

[1]Includes Segment J, Route 17 via Vasona Lake County Park and Winchester Boulevard in Los Gatos.

Table B-3
Right-of-Way Cost Estimates
($ Millions)

	Alertnative Concept[2]									
	1a Historic LRT		1b Historic RR		2a Scotts Valley LRT		2b Scotts Valley RR		3 Route 17 LRT	
Segment[1]	Acres	Cost ($000)	Acres	Cost ($000)	Acres	Cost ($000)	Acres	Cost ($000)	Acres	Cost ($000)
A	16.5	$18,150	16.5	$18,150	16.5	$18,150	16.5	$18,150	16.5	$18,150
B	38.0	$17,100	38.0	$17,100						
C	62.5	$30,085	62.5	$30,085	62.5	$30,085	62.5	$30,085		
D	12.0	$9,600	12.0	$9,600	12.0	$9,600	12.0	$9,600	12.0	$9,600
E	5.0	$3,250	5.0	$4,250	5.0	$3,250	5.0	$4,250	5.0	$3,250
F					6.0	$7,220	6.0	$7,220	6.0	$7,220
G					11.0	$4,950	11.0	$4,950	11.0	$4,950
H					26.0	$22,620	26.0	$22,620		
I									36.0	$16,200
J	0.0	$0	0.0	$0	0.0	$0	0.00	$0	0.0	$0
Maint. Fac.	14.0	$7,000	14.0	$7,000	14.0	$7,000	14.0	$7,000	14.0	$7,000
TOTALS	148.0	$85,185	148.0	$86,185	153.0	$102,875	153.0	$103,875	100.5	$66,370

[1]Refer to Figure 10 for segment locations.

[2]Includes Segment E, Route 17 via Route 85/Route 17 Interchange and Route 85 in Los Gatos.

Table B-4
Right-of-Way Cost Estimates
($ Millions)

	Alertnative Concept[2]									
	1a Historic LRT		1b Historic RR		2a Scotts Valley LRT		2b Scotts Valley RR		3 Route 17 LRT	
Segment[1]	Acres	Cost ($000)	Acres	Cost ($000)	Acres	Cost ($000)	Acres	Cost ($000)	Acres	Cost ($000)
A	16.5	$18,150	16.5	$18,150	16.5	$18,150	16.5	$18,150	16.5	$18,150
B	38.0	$17,100	38.0	$17,100						
C	62.5	$30,085	62.5	$30,085	62.5	$30,085	62.5	$30,085		
D	12.0	$9,600	12.0	$9,600	12.0	$9,600	12.0	$9,600	12.0	$9,600
E	0.0	$0	0.0	$0	0.0	$3,250	0.0	$0	0.0	$0
F					6.0	$7,220	6.0	$7,220	6.0	$7,220
G					11.0	$4,950	11.0	$4,950	11.0	$4,950
H					26.0	$22,620	26.0	$22,620		
I									36.0	$16,200
J	6.0	$3,900	6.0	$3,900	6.0	$3,900	6.0	$3,900	6.0	$3,900
Maint. Fac.	14.0	$7,000	14.0	$7,000	14.0	$7,000	14.0	$7,000	14.0	$7,000
TOTALS	149.0	$85,835	149.0	$85,835	154.0	$103,525	154.0	$103,525	101.5	$67,020

[1]Refer to Figure 10 for segment locations.

[2]Includes Segment J, Route 17 via Vasona Lake County Park and Winchester Boulevard in Los Gatos.

Appendix C
ENVIRONMENTAL SIGNIFICANCE CHECKLIST

An environmental scan was conducted using both CEQA and NEPA criteria. This checklist was used to identify physical, biological, social, and economic factors which might be affected by the Santa Cruz-to-Los Gatos passenger rail service. In many cases, the initial scan clearly indicates the project will not affect a particular item. A "NO" answer in the first column documents this determination. A "MAYBE" answer indicates that additional detailed analysis would be required to determine the potential for impact. A "YES" answer indicates that the potential for significant impact as defined by CEQA would be expected to occur. A "MAYBE" or "YES" answer indicates the potential for significant impact. A determination of significant impact would be required in the environmental document for the project. Use of the term "significiant" as defined under NEPA related to the determination of the type of environmental document appropriate for the project. It has been assumed that an EIS/EIR would be required for the project.

	YES	MAYBE	NO
PHYSICAL. Will the proposal either directly or indirectly:			
1. Appreciably change the topography or ground surface relief features?	✔		
2. Destroy, cover, or modify any unique geologic or physical feature?			✔
3. Result in unstable earth surfaces or increase the exposure of people or property to geological or seismic hazards?	✔		
4. Result in or be affected by soil erosion or siltation (whether by water or wind)?		✔	
5. Result in the increased use of fuel or energy in large amounts or in a wasteful manner?			✔
6. Result in an increase in the rate of use of any natural resource?			✔
7. Result in the substantial depletion of any nonrenewable resource?			✔
8. Violate any published federal, state, or local standards pertaining to hazardous waste, solid waste, or litter control?			✔
9. Modify the channel of a river or stream or the bed of the ocean or any bay, inlet, or lake?	✔		
10. Encroach upon a floodplain or result in or be affected by floodwaters or tidal waves?	✔		
11. Adversely affect the quantity or quality of surface water, groundwater, or public supply water supply?	✔		
12. Result in the use of water in large amounts or in a wasteful manner?			✔
13. Affect wetlands or riparian vegetation?	✔		
14. Violate or be inconsistent with federal, state, or local water quality standards?	✔		
15. Result in changes in air movement, moisture, or temperature, or any climatic conditions?			✔
16. Result in an increase in air pollutant emissions, adverse effects on or deterioration of ambient air quality?			✔
17. Result in the creation of objectionable odors?			✔
18. Violate or be inconsistent with federal, state, or local air standards or control plans?			✔
19. Result in an increase in noise levels or vibration for adjoining areas?	✔		

	YES	MAYBE	NO
20. Result in any federal, state, or local noise criteria being equal or exceeded?		✔	
21. Produce new light, glare, or shadows?		✔	

BIOLOGICAL. Will the proposal result in (either directly or indirectly):			
22. Change in the diversity of species or number of any species of plant (including trees, shrubs, grass, microflora, and aquatic plants)?		✔	
23. Reduction of the numbers of or encroachment upon the critical habitat of any unique, threatened or endangered species of plants?		✔	
24. Introduction of new species of plants into an area, or result in a barrier to the normal replenishment of existing plants?			✔
25. Reduction in acreage of any agricultural crop or commercial timber stand, or affect prime, unique, or other farmland of state or local importance?		✔	
26. Removal or deterioration of existing fish or wildlife habitat?		✔	
27. Change in the diversity of species, or numbers of any species of animals (birds, land animals, including reptiles, fish, and shellfish, benthic organisms, insects, or microfauna)?		✔	
28. Reduction of the numbers of or encroachment upon the critical habitat of any unique, threatened or endangered species of animals?		✔	
29. Introduction of new species of animals into an area, or result in a barrier to the migration or movement of animals?			✔

SOCIAL AND ECONOMIC. Will the proposal directly or indirectly:			
30. Cause disruption of orderly planned development?			✔
31. Be inconsistent with any elements of adopted community plans, policies, goals, or the California Urban Strategy?			✔
32. Be inconsistent with a Coastal Zone Management Plan			✔
33. Affect the location, distribution, density, or growth rate of the human population of an area?		✔	
34. Affect life-styles, or neighborhood character stability?		✔	
35. Affect minority, elderly, handicapped, transit-dependent, or other specific interest group?	✔		
36. Divide or disrupt an established community?	✔		
37. Affect existing housing, require the acquisition of residential improvements, or the displacement of people, or create a demand for additional housing?	✔		
38. Affect employment, industry or commerce, or require the displacement of businesses or farms?	✔		
39. Affect property values or the local tax base?		✔	

	YES	MAYBE	NO
40. Affect any community facilities (including medical, educational, scientific, recreational, or religious institutions, ceremonial sites, or sacred shrines)?			✔
41. Affect public utilities, or police, fire, emergency, or other public services?			✔
42. Have a substantial impact on existing transportation systems or alter present patterns of circulation or movement of people and/or goods?	✔		
43. Generate additional traffic?			✔
44. Affect or be affected by existing parking facilities or result in demand for new parking?	✔		
45. Involve a substantial risk of an explosion or the release of hazardous substances in the event of an accident, or otherwise adversely affect overall safety?			✔
46. Result in alternatives to waterborne, rail, or air traffic?			✔
47. Support large commercial or residential development?			✔
48. Affect a significant archeological or historic site, structure, object, or building?		✔	
49. Affect wild or scenic rivers, or natural landmarks?			✔
50. Affect any scenic resources or result in the obstruction of any scenic vista or view open to the public, or creation of an aesthetically offensive site open to public view?	✔		
51. Result in substantial impacts associated with construction activities (e.g., noise, dust, temporary drainage, traffic detours, and temporary access, etc.)?	✔		
52. Result in the use of any publicly-owned land from a park, recreation area, or wildlife and waterfowl refuge?	✔		

MANDATORY FINDINGS OF SIGNIFICANCE.			
53. Does this project have the potential to substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant, or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?		✔	
54. Does the project have the potential to achieve short-term, to the disadvantage of long-term, environmental goals? (A short-term impact on the environment is one which occurs in a relatively brief, definitive period of time while long-term impacts will endure well into the future.)		N/A	
55. Does the project have environmental effects which are individually limited, but cumulatively considerable? Cumulatively considerable means that the incremental effects of an individual project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects. It includes the effects of other projects which interact with this project, and together, are considerable.		✔	
56. Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?		✔	

Environmental Checklist Comments and Discussion

1. Topography. Changes to the topography would occur with both the Historic alignment and the Route 17 alignment. There would be need for substantial cut and fill with the Route 17 alignment resulting from extension of the right-of-way into the hillsides adjacent to the existing highway to provide rail right-of-way. The Historic Corridor avoids the need for large scale changes to land forms.

For more information concerning issues related to topography, see "Description of Existing Conditions" contained in Chapter II.

Detailed evaluation of potential impacts related to topography, geology, seismicity and erosion requires development of preliminary engineering concepts for the alternatives under study.

2. Geology. Issues related to geology are addressed in "Description of Existing Conditions - Corridor Geology and Geologic Conditions along Historic Railroad Route."

3. Seismicity. Issues related to seismicity are addressed in the sections referenced above.

4. Erosion. Issues related to erosion are addressed under the soils discussion in "Description of Existing Conditions - Corridor Geology and Geologic Conditions along Historic Railroad Route." In addition, there is potential for impacts to water quality along alignment segments adjacent to streamcourses, for example the portions of Segment C along Zayante Creek, Los Gatos Creek and Lexington Reservoir and Segment D at Lexington Reservoir.

5. Energy. The rail project, any of the alignment alternatives, is expected to have a beneficial effect by reducing energy expended by automobiles. There would be expenditure of direct energy to construct improvements for both alignments.

The comparison of energy use and impacts requires preparation of an energy consumption analysis such as the Caltrans Translab HEAP computer model.

6.-7. Natural Resources. The rail project would use various types of construction materials that are readily available and in abundant supply. The savings in energy consumption that are expected to result from project implementation would offset any use of resources during construction.

8. Hazardous Wastes. The project would not be involved in the production, use or transport of hazardous materials. A survey for the presence of hazardous materials along the existing alignments would be required to identify sites listed on federal, state, county or municipal inventories.

9. Channel Crossings. The alignments would cross these channels:

Historic Railroad Alignment:
- San Lorenzo River in Cowell Park

- Zayante Creek north of Mt. Hermon Road
- Los Gatos Creek at Wright's Station and northward
- Hooker Gulch in Aldercroft Heights
- Lexington Reservoir
- Los Gatos Creek in Los Gatos

Scotts Valley Segment:
- Bean Creek

Route 17 Alignment:
- San Lorenzo River in Santa Cruz
- Carbonera Creek at Glen Canyon Road
- Lexington Reservoir near Bear Creek Road
- Los Gatos Creek in Los Gatos

The extent of impacts at these channel crossings would vary based on the need for transverse or longitudinal crossing and the need to place structures in the channel. These impacts would require development of preliminary engineering so that exact areas of impact could be quantified. The Lexington Reservoir and Los Gatos Creek in Los Gatos are sensitive areas. Crossing of the San Lorenzo River in Santa Cruz is an issue of concern for the Route 17 alignment and the longitudinal alignment of the Historic Concept in the riparian areas of Zayante and Los Gatos Creeks are concerns specific to the Historic Concept alignment.

A location hydraulics evaluation and a natural environment study/biological assessment based on preliminary engineering would be needed to define the level of impact of the alignments at the channel crossings.

10. Floodplain Encroachment. Each alignment alternative is likely to infringe on the 100-year floodplain as defined by the Flood Rate Insurance Maps. Executive Order 11899 requires an assessment of the impacts to the beneficial values of the floodplain and documentation of the practicality of avoidance alternatives. Sensitive areas along the Historic Railroad alignment are at the Glenwood entrance to the Laurel Tunnel and along Los Gatos Creek within the San Jose Water Company property.

A Location Hydraulics/Floodplain Evaluation using preliminary engineering drawings would be required to quantify the impacts to floodplains.

11. Water Supply. The Historic alignment would place a rail facility adjacent to portions of Los Gatos Creek which serve as water supply for the San Jose Water Company. This creates potential for impacts to the water supply requiring design of storm water runoff and/or retention facilities to avoid degradation of the water supply. Both alignments would create potential for impacts to the water supply at Lexington Reservoir. There is a possibility that existing water sources or conveyances would be impacted in the Santa Cruz Mountain communities of Glenwood and Laurel.

A water quality assessment would be required to identify potential for impacts which would not be addressed in typical rail system design assumptions.

12. Water Usage. The project would require use of water for construction, maintenance and landscaping. Use of water for these purposes would be within manageable limits for local water suppliers and would not represent excessive use of water.

13. Wetlands and Riparian Vegetation. Riparian corridors exist along both alignments and could be affected by the alignments at the locations listed under response #9. Section 404 and Executive Order 11990 are federal regulations which set avoidance policies for projects potentially affecting wetlands and waters of the U.S. The riparian corridors are habitat for species of concern, both under the Federal Endangered Species Act (Section 7 coordination) and those designated by the California Department of Fish & Game.

Impacts to wetlands would be addressed in a Natural Environment Study/Biological Assessment.

14. Water Quality. See Response #11 above.

15. Climate. The proposed improvements contain no features that would have discernable effects on air movement, moisture, temperature or climatic conditions.

16.-18. Air Quality. Because the project would offer an alternative to single occupant vehicular travel on Route 17 and would provide an efficient means to expand person carrying capacity in the transportation corridor, it is expected to result in improved air quality when compared to a no action alternative. The project is anticipated to result in reduced pollution emissions and have a beneficial long-term effect on air quality in the region in general.

The project is not expected to create any objectionable odors.

A detailed air quality impact analysis would be required as part of the development of an environmental impact statement. Computer modeling of potential carbon monoxide dispersion is generally required for transportation projects. Modeling provides an estimate, based on travel demand forecasts, of the amount of carbon monoxide which the proposed facility would add to the ambient air quality levels. Microscale analysis would be required for locations at which sensitive receptors are located or at sites such as stations where vehicular traffic patterns change substantially as a result of the project. As a federal action, the project would be required to achieve a "conformity determination" as being consistent with the State Implementation Plan and the Regional Transportation Improvement Program.

19.-20. Noise. Each of the alignments would pass through areas at which noise-sensitive receptors exist. Examples of noise sensitive locations are the community of Laurel where the ambient noise level is very low and the introduction of rail service, even assuming relatively quiet technologies such as LRT, will result in substantial changes in the noise environment. Other locations are the Olympia, Zayante and Glenwood communities and portions of the alignments in Santa Cruz (Segment A and portions of Segments B and F) where the frequency of trains on the existing railroad would be increased. With the Historic Railroad alignment, there is potential for noise impacts to the Aldercroft Heights and Chemeketa Park communities, although differences in elevation between the rail alignment and the residences may moderate potential increases. The LRT technology would emit considerably lower noise levels than commuter rail technology.

Quantification of the locations and severity of noise increases and any exceedences of federal, state or local noise criteria would be accomplished by noise modeling based on future year traffic conditions, plan and profile drawings of the alignments and position of the noise sensitive receptors in relation to the alignments.

21. Lighting. Lighting would be required for stations on both alignments. Some safety lighting required along the guideways would introduce light and glare into areas which currently do not have street lighting or prevalent lighting from urban development. This would be the case for portions of the Historic Railroad alignment, particularly in Segment C.

Assessment of lighting/glare impacts would be part of a detailed visual impact analysis based on preliminary engineering drawings.

22.-23. Changes in the Diversity of Species or Number of any Species of Plant (Including Trees, Shrubs, Microflora, and Aquatic Plants) or Reduction of the Numbers of or Encroachment Upon the Critical Habitat of any Unique, Threatened or Endangered Species of Plants. The following major habitat types may be found in the project area: Upland Redwood Forest, Mixed Evergreen Forest, Riparian Forest (primarily White Alder Riparian Forest), Northern Coastal Scrub, Maritime Coast Range Ponderosa Pine Forest, and Northern Maritime Chaparral. A segment-by-segment description of habitats follows (segments are shown on Figure 10).

Segments A, E, F, J and part of H traverse urban areas of Santa Cruz, Los Gatos and Scotts Valley and would have little effect on natural habitats. Street trees and other landscaping could be affected by rail alignments.

The Route 17 alignment (Segments G and I) would require major cuts to create space for a rail line paralleling the highway. Terrestrial habitats affected would include Upland Redwood Forest, Mixed Evergreen Forest, and Northern Coastal Scrub. In Segment D, the alignment would skirt the edge of the Lexington Reservoir, and may require some fill of upper arms of the reservoir which are considered waters of the U.S. Between the reservoir and Los Gatos, the alignment would affect riparian areas along Los Gatos Creek. The rail line would be built on structure, but some removal of riparian trees would be unavoidable.

Because Segment B would use existing track, biological impacts of this portion of alignment would be negligible. The tracks traverse Upland Redwood Forest, where minor tree trimming may be required to ensure adequate clearance, but the existing rail lines are used regularly and could be used for the project without natural environment impacts.

Segment H, between Scotts Valley and Olympia, crosses marine sand deposits that support sensitive habitats: Northern Maritime Chaparral and Maritime Coast Range Ponderosa Pine Forest. The major sand deposit along the alignment would be crossed by a tunnel, which would minimize impacts to vegetation. Species of concern in these habitats should be avoided.

Segment C follows the old rail corridor between Olympia and Los Gatos, and includes several miles of tunnels. From Olympia to Wright's Station the alignment is principally within Upland Redwood Forest. From Wright's Station to Lexington Reservoir the alignment would be within a watershed of the San Jose Water Company, generally following the riparian zone of Los Gatos

Creek. The old rail corridor in this segment has been abandoned for over 50 years, and has partially reverted to natural habitat. In many locations the rail corridor is visible as a path or trail, but trees and other vegetation have significantly encroached on it. While construction of this segment would require vegetation removal, the extent of construction impacts would be reduced because the level grade of the existing corridor would largely eliminate the need for major cut and fill operations. Rehabilitation and use of the old rail tunnels would also help minimize impacts.

The California Natural Diversity Database (CNDDB) was consulted for listings in the project area. The CNDDB listed two sensitive communities in the project area: Northern Maritime Chaparral and Maritime Coast Range Ponderosa Pine Forest. Many of the sensitive plant species listed by the CNDDB occur in these two communities: Santa Cruz wallflower, Bonnie Doon manzanita, Ben Lomond spineflower, Scott's Valley Spineflower, and robust spineflower.

The following plants occur primarily or frequently in serpentine soils: Hamilton thistle, Metcalf Canyon jewelflower, fragrant fritillary, and white-rayed pentachaeta. In addition, serpentine bunchgrass habitats and bay checkerspot butterflies occur in serpentine areas. Refer to "Description of Existing Conditions - Corridor Geology and Geologic Conditions along Historic Railroad Route" for information concerning presence of these soils along the alignments.

24. Introduction of Species. Native, drought-resistant plantings would be used for project landscaping. The project would not create any impairment of plant replenishment beyond existing conditions.

25. Farmlands. The alignments would pass through agricultural and forest lands currently in use. However, because the alignments follow previously developed transportation corridors, no significant impact to agricultural operations would be anticipated.

An assessment of the location of Prime Farmlands, Farmlands of Statewide Importance and farmlands held under Williamson Contracts would be required to quantify the impacts to agricultural operations.

26. Fish or Wildlife Habitat. Sensitive animals of the Northern Maritime Chaparral and Maritime Coast Range Ponderosa Pine Forest include the barbate June beetle and Smiths blue butterfly. Serpentine habitats support bay checkerspot butterflies. Riparian communities could support red-legged frog, yellow-legged frog, and California tiger salamander. The latter require adjacent grassland or grassy understory of valley-foothill woodlands. Impacts could occur to fisheries and amphibians along Los Gatos Creek. Steelhead trout, a species which will soon be listed as threatened or endangered under the federal Endangered Species Act is known to exist in Zayante Creek.

Presence or potential for presence of these species is known by records of previous sightings listed in the CNDDB. A Natural Environment Study, including field surveys and coordination with federal and state resource agencies would be required to complete a biological assessment for the two alignments.

27. Diversity of Species. Potential for impacts to species is addressed in Responses 22, 23 and 26. The project would not be expected to eliminate or influence the diversity of species along the two alignments.

28. Habitat. Refer to Response 23-23.

29. Migration of Species. The proposed project would not have the capacity to introduce new species of animals into the area. The Route 17 alignment which would be incorporated into an expanded highway alignment, would not introduce new barriers to animal migration. The Historic Railroad alignment would use the existing corridor developed for the initial railroad. The lack of train activity along portions of the alignment or the exodus of population from previous settlements may have allowed migration patterns to ignore presence of the alignment. Return of rail service would not introduce a barrier of the scale of Route 17 due to the limited amount of rail service, the limited duration of trains passing along any point on the alignment and the limited paving required for the guideway.

30. Planned Development. No disruptions of planned orderly development have been identified which would result from the project based on review of city and county planning documents. Study of the potential for rail transit service is included in the Santa Cruz County General Plan Transportation Element. The pattern of existing development has been influenced by the presence of the two transportation corridors under study, although a major portion of the rail alignment has ceased to be of use for transportation purposes and has been redeveloped for other uses.

31. California Urban Strategy. The proposed project would address both urban maintenance and preservation of rural communities goals.

32. Coastal Zone Management Plan. Study of transit improvements is addressed in the *City of Santa Cruz General Plan and Local Coastal Program, 1990-2005.*

33. Population. The alignments which are under consideration would serve an established travel corridor between Santa Cruz and Los Gatos. As a component of a regional transit system, linkage would be developed which would provide for transit access from Santa Cruz via the project to the Vasona Light Rail Line with connections to Caltrain at the Cahill Station. Other transit linkages could also be provided through shuttles and ridesharing promotional programs.

The travel demand forecast prepared as part of this feasibility study assumes that the existing jobs/housing imbalance in Santa Clara County and the desirability of housing in the Santa Cruz area will continue in the future and will continue to influence commute patterns. The ridership on the Los Gatos-Santa Cruz alignment is projected to be approximately 4.5 percent of the daily person-trips in the Route 17 Corridor. Less than 15 percent of the peak-hour morning commute trips from Santa Cruz County to Santa Clara County could be diverted to rail transit. It is not likely work trips originating in Santa Cruz County would significantly increase because of the rail line and that the improvements in transportation capacity will not be great enough to change the current factors influencing individual residential location decisions or encourage new developments which would not have been proposed in the absence of the proposed project.

Travel time changes could influence the decision to locate residential or commercial developments in transportation corridors which receive substantial transportation facility improvements. The project is expected to have an estimated travel times typically longer than the average commute time currently experienced by drivers on Route 17. Therefore, the project probably would not be expected to encourage increased distance of home-based work trips.

Detailed assessment of the potential for growth inducement would be conducted as part of the preparation of an environmental impact statement/report. The analysis would consist of a test of the change in travel times to selected residential developments and work centroids in the South Bay Region. Interviews would be conducted with development industry professionals and planners to obtain feedback concern the travel time analysis and to document additional factors which might cause the project to influence development in the project area.

34. Neighborhoods. The alignments would pass through Santa Cruz neighborhoods in Segments A and F and portions of Segments B and G. Changes in Segment A would generally be limited to expanded use of the active rail right-of-way and therefore potential for impacts to neighborhoods would be expected to be limited. Segment F, Route 1 to Route 17, which applies to Concepts 2 and 3, and possible location of station #2 for Concepts 2 and 3 would change the character of the area along Felker Street. This area is a mix of commercial and residential and appears to be transitioning from residential to office/commercial land uses. The project would be consistent with the land use trends in this area. The neighborhoods which abut the southern portion of Segment B also contain a mix of land uses, in addition to some industrial developments. Project-related changes in this area would be expected to be minimal based on the use of the existing railroad right-of-way.

Segment J in Los Gatos would place the rail alignment in a neighborhood which lies between Route 17 and Vasona County Park. Siting of the alignment in this location would place a transportation corridor in the neighborhood and disrupt the neighborhood's orientation towards the park and its lake. This could have a destabilizing effect because the neighborhood would be isolated between two major transportation routes. Additional evaluation would be necessary in an environmental impact statement.

35. Special Populations. Demographic assessment has not been undertaken as part of this feasibility analysis. As part of preparation of an environmental document, demographic analysis would ascertain the potential for relocation, community disruption and access change impacts to special populations.

36. Community Cohesion. Factors influencing community cohesion include a change in the accessibility of residents to established nodes such as neighborhood shopping, schools, houses of worship and recreational sites. Segment C through the Santa Cruz Mountains would place the rail alignment in or near some communities in which the rural nature is of great importance to residents, creating potential for community disruption. In the community of Glenwood, the rail alignment would change access to some residential parcels and possibly require property displacements. In the Laurel area, the rail alignment would require a modification of access to homes along the Historic rail right-of-way. The Aldercroft Heights and Chemeketa Park communities would perceive change in the rural nature of the community but would not have direct property access disruptions. Segment F, Route 1 in Santa Cruz, has potential to negatively impact the existing residential component of the area along Felker Street.

Issues of community cohesion would be documented in a Background Socioeconomic Study as part of preparation of an environmental document

37. Residential Displacement. The potential for residential displacements exists in Segment C for Concepts 1 and 2 at Glenwood, possibly Laurel and in Segment F for Concepts 2 and 3 along Felker Street. For Concept 1, station #2 located along Cottonwood Street could result in residential displacements. It is unlikely residential displacements would be required within Segment A.

A Draft Relocation Impact Report would be prepared as part of detailed environmental assessment to document the residential displacement required for each alternative, the availability of properties suitable for relocation of displaced households, and any impacts to special populations. First, preliminary engineering that defines right-of-way requirements for the guideway, stations, and parking lots needs to be completed.

38. Relocation. See Response #37 above for a discussion of relocation impacts.

39. Property Values/Tax Base. Potential for project-related impacts to the tax base would be created primarily from the displacement of businesses. The project is not expected to require substantial numbers of commercial or industrial enterprises along the alignments and is therefore not expected to have an effect on local tax revenues.

40. Community Facilities. No direct impacts to community facilities are expected to result from the project. A detailed inventory of community facilities would be conducted as part of the preparation of an environmental document and would be reported in the Background Socioeconomic Study.

41. Pubic Services. Police, fire and emergency services would not be expected to be affected by the operation of the transit facility. Delays at rail crossings would not result in significant reduction of response times due to the low number of trains operating on the alignments and the brief duration of the transit vehicles crossing public streets.

42.-43. Traffic and Safety. The project is being considered to address the traffic congestion and safety issues currently experienced on existing Route 17. Traffic operations analyses for the rail alternatives conducted in preparation of an environmental impact statement would focus on the operational and safety issues related to the creation of at-grade railroad crossings, vehicular and pedestrian access to stations and safety along rail alignments. It is expected that a rail transit project would benefit mobility between the two counties.

At-grade Railroad Crossings. The Historic Railroad alignment would retain the use of existing at-grade crossings in Segments A, B and the southern portion of Segment C. Under either of the alternatives, at-grade crossings would be avoided in Segments D and E. At-grade crossings would be required along the Santa Cruz Avenue portion of Segment J and in Laurel on Segment C. Any new at-grade crossings required for the Route 17 alignment or the portion of the Historic Railroad alignment in the northern portion of Segment C would require approval from the California Public Utilities Commission. Existing and new crossings would require improvement of existing crossing safety signage and barricades. Warning devices would be

required in advance of any acceleration lanes onto Route 17 which may be blocked by passing trains.

Vehicular and Pedestrian Access to Stations. Potential station locations are identified in Chapter IX, and shown on Figure 10 and discussed in Chapter VII, Section F, and Chapter VIII of this report. Although site plans have not been developed as part of this feasibility study, each station is assumed to be accessible to patrons arriving by car, bus, shuttle or foot. Stations would be interconnected with existing transit systems, in particular stations #1 and #2 could be interconnected with the Santa Cruz shuttle system and station #7 would be integrated into the Vasona LRT Station. All stations would provide areas for bus loading and unloading, passenger vehicle drop-off (kiss and ride) and would be designed for convenient and safe pedestrian access. Each of the stations would have parking areas, although in some cases the parking would be for service vehicles only. The number of parking spaces estimated to be required at each station is presented on Table 17 in Chapter VII, Section G, of this report.

Vehicular access to stations would change existing traffic patterns proximate to the sites. Potential impacts to the existing transportation system would be increase in traffic on streets adjacent to the station sites, traffic delays which could result from vehicles queuing to turn into the stations or spill over parking on surrounding streets. Station layouts would be designed to minimize the impacts to the existing transportation network. Internal driveways would be provided to allow vehicles accessing the parking or drop-off areas to move from the public streets and onto the station site, minimizing stacking of vehicles on local streets. On-site parking would be provided at most stations to avoid the need for patrons to seek on-street parking sites in areas surrounding the station.

Station #1, Harvey West, is anticipated to have the highest morning peak period boardings, resulting in the greatest access and parking demands. With Concept 1–Historic Corridor, this station would be located in the vicinity of Cottonwood Street to the west of River Street. The station would include a parking lot for approximately 900 cars. The potential station site is immediately adjacent to Route 1, and access points to the station would be limited to Cottonwood Street/River Road. The design of the station would need to provide for storage of entering vehicles during the morning peak to avoid interference with the operation of the Route 1/River Street Interchange. Under the Concept 2–Historic and Scotts Valley Corridor and Concept 3–Route 17 Corridor, the Harvey West Station would be located in the vicinity of Felker Street with primary access from Ocean Street. Design of access from Ocean Street would have Route 1 plus operational concerns similar to those described for the Cottonwood Street location.

Parking demand at other station sites is anticipated to be lower than at the Harvey West Station, with 300 or fewer parking spaces projected. Station #1, Santa Cruz, would use portions of the existing rail storage yard for parking. Sufficient area exists to provide for on-site parking and circulation of autos and transit vehicles. Stations #3, #5, and #7 would expand on existing or planned intermodal and transit facilities, avoiding major changes in access. The design concept of station #3, Felton, would use access points similar to the existing parking lots at the Roaring Camp and Big Trees parking area. Station #5, Lexington Reservoir, would be designed to use access from the interchange now under construction. Station #7, Vasona Junction, would expand the planned parking lot for the Vasona LRT. Station #9, Scotts Valley Transit Center, would be an expansion of the planned transit center accessed by Kings Village Road and

Mt. Hermon Road. Station #10, Scotts Valley, would require placement of access drives onto Mt. Herman Road or the Route 17 access roads.

Safety Along Rail Alignments. Portions of both alignments would be at-grade. In these areas, trains would operate at slow speeds and warning/safety systems would be provided to alert pedestrian and vehicular traffic as trains approach intersections. In the access controlled, higher-speed portions of the alignments, fencing or barricades would be used to restrict access to rail right-of-way.

44. Parking. The primary issue related to parking would be the potential for station-related parking to spill over into adjacent neighborhoods. This would be assessed in the environmental document using refined station demand estimates and detailed conceptual station site plans.

45. Hazardous Materials. No assessment of existing hazardous materials sites has been conducted. Regulatory agency file reviews and field surveys would be conducted as part of preparing the environmental document.

46. Alternatives to Waterborne, Rail, or Air Traffic. A commuter rail service would provide options to existing automobile traffic, but is not proposed as an alternative to movement of freight which currently is transported via ship, railroad or air freight.

47. Development. The project would serve existing and future excess travel demand and stations would serve existing development in Santa Cruz, Scotts Valley and Los Gatos. Should a rail alignment be implemented, it would need to be incorporated into city and county planning processes to ensure that the transit facility can serve desired patterns for future growth and development while maintaining access for existing communities.

48. Cultural Resources. Archival research and field surveys would be needed to identify potential archaeological sites and historic structures along the alignments. Alignments would be placed at or near sites including the former rail station in Santa Cruz (Segment A). The Historic Railroad alignment would use sites which might be determined as historically significant in the context of role of the railroad in development of the region. Sites such as Olympia Station, Wright's Station, Laurel and others would need to be researched to determine their historical significance at the local, state and national level. This assessment would be required as part of an environmental impact assessment.

49. Wild and Scenic Rivers. Both Santa Clara County and Santa Cruz County planning documents set policies for the restoration and preservation of riparian corridors. The Santa Cruz County policy calls for a buffer zone along creeks. The Historic Railroad alignment would cross or parallel streamcourses of Zayante and Los Gatos Creeks. Both the Historic Railroad and Route 17 alignments would be located near Los Gatos Creek as the alignment approaches the Town of Los Gatos. Potential for conflicts with these riparian corridor restoration/preservation policies due to placement of the alignments would need to be assessed based on detailed alignment drawings in a Natural Environment Study.

50. Scenic Resources. Both alignments offer potential for riders' enjoyment of scenic vistas from the transit vehicles. The alignments could also impose on residents' views of open valleys

and mountainscape. Assessment of interruption of views created by the alignments would be conducted as part of the visual impact assessment.

51. Construction Period Impacts. Each alignment alternative would have temporary, construction related impacts at the locations under construction. An assessment of construction period impacts would be conducted as part of the environmental assessment and would focus on air quality, noise impacts and traffic safety and detours.

52. Parklands. Parkland impacts are addressed under Section 4(f) of the Department of Transportation Act. Avoidance alternatives must be sought which avoid use of parklands. If none exist, measures to minimize harm to the park must be identified. Segment B would pass through Cowell Park along existing railroad right-of-way and would not require use of park property. Indirect impacts (constructive use) would not likely occur at this location due to the use of the existing alignment and the limited increase in the number of trains compared to the existing condition.

Segment J would use land in Vasona Lake County Park, causing a direct Section 4(f) effect. Avoidance alternative, such as Segment E, would need to be identified and evaluated in a Section 4(f) Statement to be included in an environmental impact statement.

53-56. The findings listed under these items would be responded to in the environmental document.