

---

# CITY OF SANTA CLARA CREEK TRAIL NETWORK EXPANSION FEASIBILITY STUDY

Evaluating:  
CALABAZAS CREEK CORRIDOR  
HETCH HETCHY CORRIDOR  
SARATOGA CREEK CORRIDOR



Prepared for:  
**City of Santa Clara**  
Department of Public Works



Prepared by:  
Sokale Environmental Planning  
Hill Associates  
Hexagon Transportation  
Cotton, Shires and Associates

November 2013

---

---

# CITY OF SANTA CLARA CREEK TRAIL NETWORK EXPANSION FEASIBILITY STUDY

Evaluating:

**CALABAZAS CREEK CORRIDOR  
HETCH HETCHY CORRIDOR  
SARATOGA CREEK CORRIDOR**

**NOVEMBER 2013**

Prepared for:

**City of Santa Clara  
Department of Public Works**

Prepared by:

**Sokale Environmental Planning**  
Hill Associates  
Hexagon Transportation  
Cotton, Shires and Associates

# AGENCY ACKNOWLEDGEMENTS AND CONSULTANTS

---

## CITY OF SANTA CLARA CITY COUNCIL

Jamie L. Matthews, Mayor  
Pat Kolstad, Vice Mayor  
Debi Davis  
Lisa M. Gillmor  
Patricia Mahan  
Jerry Marsalli  
Teresa O'Neill

Will Kennedy, Councilmember 2004-2012  
Jamie McLeod, Councilmember 2004-2012  
Kevin Moore, Councilmember 2004-2012

## CITY OF SANTA CLARA STAFF

Julio J. Fuentes, City Manager  
Rajeev Batra, Director of Public Works Department  
Dennis Ng, Traffic Engineer  
Benison Tran, Senior Civil Engineer

Jennifer Sparacino, City Manager 1987-2012

## LEAD CONSULTANT

**Sokale Environmental Planning**  
Newark, California

Jana Sokale, Principal Planner

## SUBCONSULTANTS

**Hill Associates**  
**Landscape Architects**  
Aptos, California

Bruce Hill, Principal Landscape Architect  
Dominic Lopez, Landscape Architect

**Hexagon Transportation Consultants**  
**Transportation Planners and Traffic Engineers**  
San Jose, California

Gary Black, President  
Ralph Garcia, Associate

**Cotton Shires and Associates**  
**Consulting Engineers and Geologists**  
Los Gatos, California

Ted Sayre, Principal Engineering Geologist  
David Schrier, Principal Geotechnical Engineer  
Jason Nichols, Senior Staff Engineering Geologist

# TABLE OF CONTENTS

<b>EXECUTIVE SUMMARY</b> .....	<b>i</b>		
<b>CHAPTER 1 – PURPOSE AND BENEFITS</b> .....	<b>1</b>	<b>CHAPTER 3 – SITE ANALYSIS AND</b>	
Purpose .....	2	<b>CONCEPTUAL TRAIL ALIGNMENTS</b> .....	<b>29</b>
Regional Setting .....	2	Trail Design.....	30
Bicycle and Pedestrian Network Goals and Policies .....	3	Class I Bikeways.....	30
Feasibility Study Goals .....	4	Engineered Structures.....	30
Study Methodology .....	5	<b>CALABAZAS CREEK CORRIDOR</b> .....	<b>32</b>
Outreach to Agencies .....	5	Study Corridor Overview .....	32
Community Meetings .....	5	Section 1 – SF Bay Trail to Highway 101 .....	32
Benefits and Significance .....	6	Location and Ownership .....	32
Inclusion in Regional Plans .....	6	Site Analysis Summary .....	35
Recreation Benefits .....	6	Creek Character, Plant Communities and Wildlife	35
Connections to Regional Trails and Parks .....	8	Conceptual Trail Alignments .....	36
Connections to City Parks, Recreation Facilities		Next Steps .....	39
and Attractions .....	8	Section 2 – Highway 101 to Monroe Street .....	41
Transportation Benefits .....	8	Location and Ownership .....	41
Environmental Benefits .....	8	Site Analysis Summary .....	41
Enhancement of Natural Resources .....	8	Creek Character, Plant Communities and Wildlife	41
Improved Air Quality .....	8	Conceptual Trail Alignments .....	42
		Next Steps .....	48
		Section 3 – Monroe Street to Lochinvar Avenue .....	49
<b>CHAPTER 2 – FEASIBILITY CRITERIA</b> .....	<b>11</b>	Location and Ownership .....	49
Land Availability .....	12	Site Analysis Summary .....	49
Habitat Sensitivity.....	14	Creek Character, Plant Communities and Wildlife	49
Habitats along Calabazas Creek Corridor .....	14	Conceptual Trail Alignments .....	50
Habitats along Saratoga Creek Corridor .....	15	Next Steps .....	53
Habitats along the Hetch Hetchy Corridor .....	16	<b>HETCH HETCHY CORRIDOR</b> .....	<b>54</b>
Special Status Species .....	17	Study Corridor Overview .....	54
Roadway Bridges and Creek Crossings .....	18	Ulistac Natural Area to Calabazas Creek Trail .....	54
Bridge Types Accommodating an In-Channel .....	21	Location and Ownership .....	54
Trail Underpass		Site Analysis Summary .....	57
Bridge Types Requiring Alternate Trail Solutions .....	24	Corridor Character, Plant Communities and Wildlife	57
On-Street Crossings .....	27	Conceptual Trail Alignments .....	57
		Next Steps .....	64

# TABLE OF CONTENTS

---

**SARATOGA CREEK CORRIDOR..... 65**  
 Study Corridor Overview..... 65  
 Section 1 – Monroe Street to El Camino Real ..... 65  
   Location and Ownership ..... 65  
   Site Analysis Summary ..... 69  
   Creek Character, Plant Communities and Wildlife 69  
   Conceptual Trail Alignments ..... 70  
   Next Steps ..... 70

Section 2 – El Camino Real to Forbes Avenue..... 71  
   Location and Ownership ..... 71  
   Site Analysis Summary ..... 71  
   Creek Character, Plant Communities and Wildlife 71  
   Conceptual Trail Alignments ..... 72  
   Next Steps ..... 77

**CHAPTER 4 – BUDGET ESTIMATES ..... 79**  
 Budget Assumptions ..... 79  
 Budget Estimate Summary ..... 79  
 Preliminary Cost Estimate – Calabazas Creek Corridor 80  
 Preliminary Cost Estimate – Hetch Hetchy Corridor ... 82  
 Preliminary Cost Estimate – Saratoga Creek Corridor.. 83

**CHAPTER 5 – REFERENCES ..... 85**  
 Agencies Contacted ..... 85  
 Bibliography ..... 86

**MAPS**

Map 1 – Study Area Map..... 2  
 Map 2 – Calabazas Creek Land Availability and..... 33  
   Underpass Feasibility Map  
 Map 3 – Calabazas Creek – Section 1: SF Bay Trail to..... 34  
   Highway 101 Conceptual Trail Alignments Map  
 Map 4 – Calabazas Creek – Section 2: Highway 101 to..... 43  
   Monroe Street Conceptual Trail Alignments Map  
 Map 5 – Calabazas Creek – Section 3: Monroe Street to..... 51  
   Benton Street Conceptual Trail Alignments Map  
 Map 6 – Hetch Hetchy Land Availability and Crossing..... 55  
   Feasibility Map  
 Map 7 – Hetch Hetchy Corridor: Ulistac Natural Area to... 56  
   Calabazas Creek Trail Conceptual Trail  
   Alignments Map  
 Map 8 – Saratoga Creek Land Availability and..... 67  
   Underpass Feasibility Map  
 Map 9 – Saratoga Creek – Section 1: Monroe Street to..... 68  
   El Camino Real Conceptual Trail Alignments Map  
 Map 10 – Saratoga Creek – Section 2: El Camino Real to..... 73  
   Forbes Avenue Conceptual Trail Alignments Map

**ILLUSTRATIONS**

Illustration 1 – Highway 101 Pedestrian Overcrossing..... 40  
   adjacent to Calabazas Creek  
 Illustration 2 – Kifer Road Trail Underpass Concept..... 45  
 Illustration 3 – View from the Bridge Deck on the..... 81  
   Highway 101 Pedestrian Overcrossing

# TABLE OF CONTENTS

**FIGURES**

<p>Figure 1 – Bicycle and Pedestrian Network ..... 3 Goals and Policies</p> <p>Figure 2 – Feasibility Study Goals ..... 4</p> <p>Figure 3 – Summary of Parks, Schools and Attractions..... 7 by Corridor</p> <p>Figure 4 – 1995 Santa Clara Countywide Trails ..... 13 Master Plan Definitions</p> <p>Figure 5 – Wildlife Species with the Potential to Occur .... 17 within the Three Study Corridors</p> <p>Figure 6 – Summary of Grade-Separated Crossing ..... 19 Feasibility along Calabazas Creek</p> <p>Figure 7 – Summary of Grade-Separated Crossing ..... 20 Feasibility along Saratoga Creek</p> <p>Figure 8 – TFVS Bridge Accommodating a ..... 21 Grade-Separated Trail Underpass</p> <p>Figure 9 – TFNS Bridge Accommodating a ..... 22 Grade-Separated Trail Underpass</p> <p>Figure 10 – TANS Bridge Accommodating a ..... 23 Grade-Separated Trail Underpass</p> <p>Figure 11 – BOXC Bridge Requiring an ..... 24 Alternate Trail Routing Solution</p> <p>Figure 12 – VAVS Bridge Requiring an ..... 25 Alternate Trail Routing Solution</p> <p>Figure 13 – VANS Bridge Requiring an ..... 26 Alternate Trail Routing Solution</p> <p>Figure 14 – Summary of Calabazas Creek Corridor ..... 37 Feasibility Findings</p> <p>Figure 15 – Highway 101 Pedestrian Overcrossing ..... 38 Plan View</p> <p>Figure 16 – Central Expressway Pedestrian Overcrossing... 44 Plan View</p> <p>Figure 17 – Caltrain Tunnel Plan View ..... 47</p> <p>Figure 18 – Monroe Street Pedestrian and Bicycle ..... 48 Improvements</p>	<p>Figure 19 – Calabazas Boulevard Bicycle and Pedestrian .... 52 Improvements at Georgetown Place</p> <p>Figure 20 – Summary of Hetch Hetchy Corridor ..... 58 Feasibility Findings</p> <p>Figure 21 – Lick Mill Boulevard Bicycle and Pedestrian ..... 59 Improvements at Ulistac Natural Area</p> <p>Figure 22 – Utility Constraints at Lafayette Street ..... 61 and UPRR Corridor</p> <p>Figure 23 – Old Glory Lane Bicycle and Pedestrian ..... 62 Improvements between Great America Parkway and Old Ironsides Drive</p> <p>Figure 24 – Patrick Henry Drive Crossing Improvements.... 63</p> <p>Figure 25 – Summary of Saratoga Creek Corridor ..... 66 Feasibility Findings</p> <p>Figure 26 – Typical Trail Underpass Design to a Tapered.... 75 Abutment Bridge (TANS) Structure Similar to Kiely Boulevard</p> <p>Figure 27 – Calabazas Creek Trail ..... 80 Construction Budget Estimate</p> <p>Figure 28 – Hetch Hetchy Trail ..... 82 Construction Budget Estimate</p> <p>Figure 29 – Saratoga Creek Trail ..... 83 Construction Budget Estimate</p>
--	--

**This page is intentionally left blank.**

This report explores the potential for expanding the off-street trail system within the City of Santa Clara (City). The study evaluates three corridors to determine the feasibility of constructing creek trails along Calabazas Creek, Saratoga Creek and the Hetch Hetchy corridor (Three Corridors). This study was identified as a priority project supporting the “Green Initiative” included in the *Santa Clara City Council Principles and Priorities* (September, 2009). This work builds upon City’s successful development of the San Tomas Aquino/Saratoga Creek Trail and implementation of numerous projects to improve the existing on-street bicycle transportation system.

The study areas include the entire length of each of the three corridors within the City limits. The Calabazas Creek study area begins at the junction with San Francisco Bay Trail and extends just past the City limits to Lochinvar Avenue in City of Sunnyvale (Sunnyvale). The Hetch Hetchy corridor begins at Ulistac Natural Area on the banks of the Guadalupe River and extends west to a developed segment of the Calabazas Creek Trail, which includes a pedestrian/bicycle bridge that spans the creek to provide access to the John W. Christian Greenbelt in Sunnyvale. The Saratoga Creek study area extends from the confluence with San Tomas

Aquino Creek at Monroe Street south to Pruneridge Avenue.

This report analyzes the benefits and significance of the off-street trail facilities to the community, examines the feasibility of building bicycle and pedestrian trails along the Three Corridors and provides budget estimates for designing and constructing the trails. The report documents the public recreation, transportation and environmental benefits of each trail corridor. The study evaluates the feasibility of constructing the trails by establishing criteria to measure land availability, habitat sensitivity, bridges and on-street crossings. The report indicates potential trail alignments and conceptual engineering solutions to constrained crossings for each of the corridors.

The report excludes detailed site analyses and associated environmental review documents, which are appropriate for a master plan. The report provides a comprehensive review of the trail feasibility within the three corridors. A master plan report must expand upon the work initiated in this study by conducting detailed site investigations to identify precise locations for trail underpasses, overcrossings, tunnels, footbridges, staging areas, access points from local businesses and neighborhoods and

habitat restoration elements to complement the trail user experience.

This feasibility report consists of five chapters. An introductory page precedes each chapter and describes the specific content available to the reader.

Chapter 1 – Purpose and Benefits details the goals, describes the study area, summarizes the study methodology and public involvement and highlights the significance of each corridor to the community.

Chapter 2 – Feasibility Criteria defines the criteria used to evaluate the corridors to determine the potential for developing trails.

Chapter 3 – Site Analysis reports the findings of the feasibility investigation and proposed preliminary trail alignments within each of the corridors.

Chapter 4 – Budget Estimates provides capital improvement project estimates for all major trail crossing structures, surfacing, native plant landscaping and site amenities necessary for budgeting purposes.

Chapter 5 – References identifies persons, reports and literature cited in the preparation of the feasibility report.

# EXECUTIVE SUMMARY

---

**This page is intentionally left blank.**

# CHAPTER 1 – PURPOSE AND BENEFITS

This feasibility study investigated the potential to develop bicycle and pedestrian creek trails along approximately 5.75 miles of Calabazas Creek Corridor, 3.25 miles of Saratoga Creek Corridor and 1.75 miles of the Hetch Hetchy corridor. The Saratoga Creek corridor connects with the existing San Tomas Aquino Creek Trail at the confluence of the two creeks located at Monroe Street. The San Tomas Creek Trail extends approximately four miles to the San Francisco Bay Trail just north of Highway 237. The study furthers the Santa Clara Bicycle and Pedestrian Network Goals and Policies adopted as part of the 2010-2035 Santa Clara General Plan. These goals and policies encourage the development of a bicycle and pedestrian network that supports the use of alternative modes of transportation.

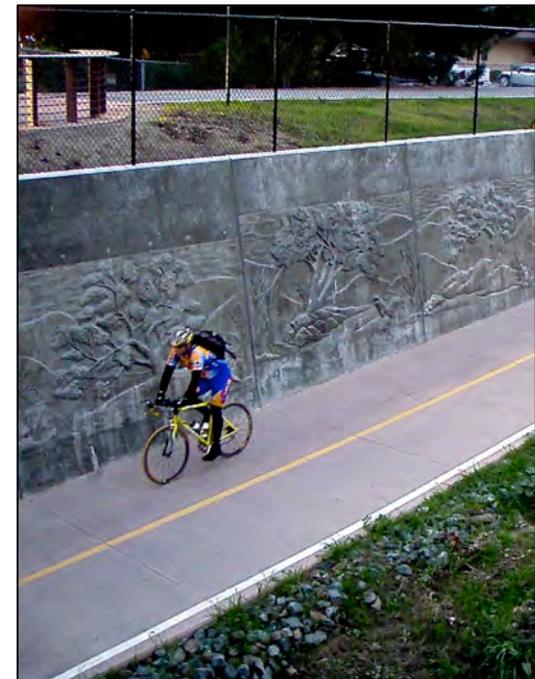
Chapter 1 explains the purpose of conducting the study, introduces the Three Corridors, highlights the project goals and describes the study methodology and public outreach effort. This chapter details the benefits and significance of the trail corridors to the community. The recreation, transportation and environmental benefits of expanding the creek trail network are presented in this chapter. Goals were established to guide the assessment of the Three Corridors and selection of potential trail alignments.

The trails are intended to provide recreation and alternative transportation benefits to residents, students and local employees. The development of the creek trails is also intended to provide an opportunity to enhance the corridor habitats for wildlife and as a scenic open space for trail users.

The Three Corridors collectively connect Santa Clara neighborhoods to twelve city parks, four regional recreation facilities, ten K-12 schools and Mission College. The trails will link to the San Francisco Bay Trail providing access to regional open space lands and parks ringing the bayfront. The routes provide direct access to the Great America Train Station serving the Capital Corridor and Altamont Commuter Express (ACE) trains. The Old Ironsides and Reamwood Light Rail Stations are located on the routes. A short spur trail could serve the Caltrain Lawrence Station.

The feasibility study is the first step in the creek trail planning process. The next steps in creek trail planning will be the preparation of a creek trail master plan that will be evaluated under the California Environmental Quality Act (CEQA). The findings in this feasibility study will provide significant background documentation for this comprehensive creek trail

master plan. The entire master plan process will provide opportunities for public input. All of these planning and environmental review efforts will include opportunities for public involvement in shaping the future expansion of City of Santa Clara's creek trail system.



*The Saratoga Creek Trail may connect with the existing San Tomas Aquino Creek Trail.*

# CHAPTER 1 – PURPOSE AND BENEFITS

## PURPOSE

This feasibility study investigates the potential for developing trails along Three Corridors in City of Santa Clara. The creek trails would implement one portion of the City's Bicycle and Pedestrian Network that is intended to provide connections between neighborhoods, employment centers, schools, recreation sites and transit facilities. A fully developed bicycle and pedestrian network will offer viable alternatives to the automobile resulting in fewer car trips, reduced greenhouse gas emissions and options for recreation that support community health.

## REGIONAL SETTING

The City of Santa Clara is situated on the southern end of San Francisco Bay. The city limits are defined by the Guadalupe River to the east and Calabazas Creek to the west. The San Tomas Aquino/Saratoga Creek drainage flows through the heart of the community. These three watersheds are unique natural resources that flow to South San Francisco Bay. The Hetch Hetchy aqueduct, which brings water from the Sierra Nevada, enters the City from the east and extends west passing beneath all three of the local streams. The Hetch Hetchy corridor offers north-south routes while the Hetch Hetchy corridor provides an east-west connector route.

The communities of Sunnyvale, Cupertino and San Jose border Santa Clara.

The area evaluated in this feasibility report includes the entire length of each of the Three Corridors within the City. All of the corridors are narrow slivers of the landscape confined by adjacent development. The Calabazas Creek corridor extends approximately 5.75 miles. The Hetch Hetchy corridor runs 1.75 miles. Saratoga Creek extends south approximately 3.25 miles from the confluence with San Tomas Aquino Creek from which the trail extends north to connect with the San Francisco Bay Trail (See Map 1 – Study Area Map).

All three of the trail corridors under study are included in the 1995 Santa Clara Countywide Trails Master Plan (County of Santa Clara, 1995). The entire length of Saratoga Creek and the Hetch Hetchy corridor within Santa Clara are included in this regional trail plan. A portion of Calabazas Creek from the San Francisco Bay Trail to the Hetch Hetchy corridor is also included in the plan. Most connector trail routes included in the regional trail plan were derived from city trail plans in existence when the 1995 Santa Clara Countywide Trails Master Plan was adopted. The countywide trail plan includes three definitions of trail types: regional, sub-regional and connector trails. All three

routes under study are considered connector trails that link urban areas to the countywide regional and sub-regional trail network.



Map 1 – Study Area Map

## **BICYCLE AND PEDESTRIAN NETWORK GOALS AND POLICIES**

The feasibility study is guided by the Santa Clara Bicycle and Pedestrian Network Goals and Policies adopted as part of the 2010-2035 General Plan. "Santa Clara's Mobility and Transportation goals and policies support connected networks that facilitates pedestrian, bicycle and vehicular movement throughout the City" (Santa Clara, 2010, pp. 1-17). Development of any of the three corridors evaluated in this study will implement a number of the Bicycle and Pedestrian Network Goals and Policies (See Figure 1 - Bicycle and Pedestrian Network Goals and Policies). The corridors offer opportunities for developing creek trails that are separated from automobile traffic. These types of bicycling facilities support all bicycling abilities and may therefore encourage an increase in bicycling and walking.

## **BICYCLE AND PEDESTRIAN NETWORK GOALS AND POLICIES**

Goal 1 - Pedestrian and bicycle connections that are accessible throughout the City to all segments of the populations.

Goal 2 - A bicycle and pedestrian network that provides links from neighborhoods to public amenities and destinations.

Goal 3 - Walking and bicycling as alternatives to driving to reduce vehicle commute and non-commute trips and to improve community health.

Policy 1 - Provide a comprehensive, integrated bicycle and pedestrian network that is accessible for all community members.

Policy 2 - Provide a system of pedestrian and bicycle friendly facilities that supports the use of alternative travel modes and connects to activity centers as well as residential, office and mixed-use developments.

Policy 3 - Link City pedestrian and bicycle circulation to existing and planned regional networks.

Policy 6 - Require new development to connect individual sites with existing and planned bicycle and pedestrian facilities, as well as with on-site and neighborhood amenities/services, to promote alternative modes of transportation.

Policy 9 - Encourage pedestrian- and bicycle-oriented amenities, such as bicycle racks, benches, signalized mid-block crosswalks, and bus benches or enclosures.

Policy 11 - Provide pedestrian crossings that are well marked using measures, such as audio/visual warnings, bulb-outs and median refuges, to improve safety.

Policy 12 - Include pedestrian and bicycle facilities when making improvements or modification to railroad crossings, grade separations, interchanges and freeways.

*Figure 1 – Bicycle and Pedestrian Network Goals and Policies (Santa Clara, 2010, pp. 5-100 – 5-101).*

## FEASIBILITY STUDY GOALS

The feasibility study goals include coordination with all jurisdictions and encourage public participation in the planning process. As a result, the preliminary trail alignments have been presented to diverse audiences and will continue to be evaluated during the public review of the feasibility report (See Figure 2 - Feasibility Study Goals).



*The Santa Clara Valley Water District levee northwest of Central Expressway may provide opportunity for a trail.*

## FEASIBILITY STUDY GOALS

- ◆ Identify preliminary trail alignment alternatives that maximize the use of public and quasi-public lands and minimize encroachment on private property.
- ◆ Plan preliminary trail alignments that strengthen the pedestrian and bicycle network by connecting to regional routes, alternative travel modes and activity centers.
- ◆ Preserve and restore the natural environment of the creek corridors for the enjoyment of trail users and as habitat for wildlife.
- ◆ Identify trail alignments that maximize year-round use.
- ◆ Enhance the trail corridors by planting locally native vegetation and including trail amenities such as drinking water, benches and signage.
- ◆ Plan trails that are easy to maintain.
- ◆ Provide trail alignments along the creek corridors that provide opportunities for passive recreation and alternative transportation.
- ◆ Design trail alignments that integrate as many public facilities (schools, parks, transportation systems and open space preserves, etc.) as possible.
- ◆ Maximize linkages to other trail systems and trail segments.
- ◆ Develop trail alignments that coordinate the goals and needs of all public agencies.
- ◆ Engage the community in the trail planning process.
- ◆ Seek opportunities for collaboration and partnership projects.

*Figure 2 – Feasibility Study Goals*

# CHAPTER 1 – PURPOSE AND BENEFITS

---

## STUDY METHODOLOGY

Background information pertinent to the three study areas was reviewed in an effort to become familiar with the projects and processes that created the existing opportunities and constraints present along corridors. Significant time was spent directly observing field conditions. Site visits were conducted to assess corridor feasibility and gather additional data needed to refine conceptual engineering solutions to constrained areas. During the fieldwork, information was gathered on constraints to creek trail development including land availability, roadway and creek crossings, habitat sensitivity and institutional issues associated with land managing agencies. Preliminary trail alignment alternatives were identified and presented to the agencies with jurisdiction along corridors and adjacent lands. Conceptual engineering solutions to constrained areas of the corridors were further evaluated and brought forward for preliminary discussions with impacted agencies including Santa Clara Valley Water District (SCVWD), San Mateo County Transit District (SMCTD), administrative body for Caltrain, Pacific Gas and Electric Company (PG&E) and the City of Sunnyvale. Future outreach will also be necessary with Caltrans, Santa Clara County Roads and Airports

Department, Mission College and Wilcox High School as the preliminary trail alignments are further investigated in the master plan phase.

The Calabazas Creek Corridor was divided into three segments and Saratoga Creek Corridor into two segments to facilitate the presentation of the feasibility findings. Hetch Hetchy Corridor is presented as a single segment. The segments vary by size and begin and end at natural termini that are likely to be used in developing future construction phasing limits. The six study segments include:

- ◆ Calabazas Creek Corridor–Section 1  
SF Bay Trail to Highway 101
- ◆ Calabazas Creek Corridor–Section 2  
Highway 101 to Monroe Street
- ◆ Calabazas Creek Corridor–Section 3  
Monroe Street to Lochinvar Avenue
- ◆ Hetch Hetchy Corridor – Ulistac  
Natural Area to Calabazas Creek
- ◆ Saratoga Creek Corridor – Section 1  
Monroe Staging Area to El Camino  
Real
- ◆ Saratoga Creek Corridor – Section 2  
El Camino Real to Forbes Avenue

## OUTREACH TO AGENCIES

The trail feasibility study began in June 2010 with technical evaluations of various site conditions. These feasibility investigations included assessments of the biological resources, the geotechnical and engineering constraints associated with the stream banks and roadway bridges and the traffic engineering issues associated with at-grade roadway crossings. The technical investigations required input from agencies with ownership or jurisdiction along the three study corridors. Technical meetings were held with SCVWD, SMCTD, the administrative body for Caltrain, PG&E and Sunnyvale. The results of these technical assessments are applied throughout this report.

## COMMUNITY MEETINGS

Santa Clara hosted two community meetings to gather input on the preliminary findings and potential trail alignments. The first meeting was held at the Central Park Library and was intended to attract area residents. The second meeting was held at the Santa Clara Convention Center and was targeted to attract business and industry representatives. Comments and suggestions from meeting participants were addressed during the meeting, researched and responded to in meeting minutes and incorporated into this report.

# CHAPTER 1 – PURPOSE AND BENEFITS

---

## **BENEFITS AND SIGNIFICANCE**

The 2010-2035 Santa Clara General Plan identifies all three areas evaluated for the potential to accommodate bicycle and pedestrian trails as corridors for future study in the Bicycle and Pedestrian Network Diagram (Santa Clara, 2010, pp. 5-93). The creek corridors offer north-south routes while the Hetch Hetchy corridor provides an east-west route linking the Guadalupe River Parkway, San Tomas Aquino/Saratoga Creek Trail and Calabazas Creek Trail. The Three Corridors offer the potential to expand off-street routes through the City. Typically, these off-street facilities provide easy routes that accommodate the widest range of bicycling abilities. These off-street trails include grade-separated crossings that minimize cross traffic with automobiles and provide pleasant bicycling and walking experiences. All three corridors will enhance walkability, support bicycling and provide places within the City to experience the natural environment.

The corridors under study collectively connect Santa Clara neighborhoods to twelve city parks, four regional recreation facilities, ten K-12 schools and Mission College. The trail will link to the San Francisco Bay Trail

providing access to other open space and regional parks ringing the bayfront. The routes provide direct access to Great America Train Station serving the Capital Corridor and Altamont Commuter Express (ACE) trains. The Old Ironsides and Reamwood Light Rail Stations are located on the routes. A short spur trail could serve the Caltrain Lawrence Station (*See Figure 3 – Summary of Parks, Schools and Attractions by Corridor*).

## **INCLUSION IN REGIONAL PLANS**

Saratoga Creek was first identified as a streamside corridor of regional significance more than 30 years ago and was included in the Parks, Trails and Scenic Highways Element of the Santa Clara County General Plan (Santa Clara County, 1980). This creek has more recently been considered a stream corridor of importance and is identified as a connector trail in the 1995 Santa Clara Countywide Trails Master Plan. The entire length of the San Tomas Aquino/Saratoga Creek Trail is considered a connector trail (Route C-5). The Hetch Hetchy corridor is included in this regional trail plan (Route C-4). The portion of Calabazas Creek extending from the San Francisco Bay Trail to the Hetch

Hetchy corridor is also included in the regional trail plan (Route C-3).

The San Tomas Aquino/Saratoga Creek Trail is recognized regionally by the Association of Bay Area Governments (ABAG) as a connector trail to the San Francisco Bay Trail Plan (ABAG, 1989). The inclusion of these trail corridors in many regional and local plans further points to the significance these recreation and transportation routes will play as a part of Santa Clara's bicycle and pedestrian network.

## **RECREATION BENEFITS**

The Three Corridors will make a significant contribution toward expanding the walking and bicycling opportunities in the City of Santa Clara. Residents and employees will benefit from improved pedestrian and bicycle access to parks and open spaces and new opportunities to walk and bicycle to work and school along the corridors. The trails will provide convenient locations throughout the city for fitness activities and for meeting neighbors. The open space land along the creek corridors will offer opportunities for wildlife viewing, photography and other forms of nature exploration and relaxation.

# CHAPTER 1 – PURPOSE AND BENEFITS

<b>SUMMARY OF PARKS, SCHOOLS AND ATTRACTIONS BY CORRIDOR</b>			
	<b>Calabazas Creek</b>	<b>Hetch Hetchy</b>	<b>Saratoga Creek</b>
<b>City Parks and Natural Areas</b>	Earl Carmichael Park John W. Christian Greenbelt Machado Park	John W. Christian Greenbelt Lick Mill Park Ulistac Natural Area	Bowers Park Central Park Homeridge Park Lou Vierra Ball Field Maywood Park Santa Clara Teen Center and Skate Park
<b>Regional Parks and Trails</b>	Sunnyvale Baylands Park Twin Creeks Sports Complex San Francisco Bay Trail	Guadalupe River Parkway Calabazas Creek Trail	Via the San Tomas Aquino Creek Trail: Alviso County Park Don Edwards San Francisco Bay National Wildlife Refuge San Francisco Bay Trail
<b>Schools</b>	Briarwood Elementary Challenger School Delphi Pomeroy Elementary Santa Clara High School Wilcox High School Mission College	Mission College	Bowers Elementary School Cabrillo Middle School Milliken Elementary School Sutter Elementary School
<b>Transit Corridors</b>	Caltrain - Lawrence Station VTA Light Rail - Reamwood Station VTA Bus - El Camino Real BRT	Capital Corridor and ACE Trains - Great America Station VTA Light Rail - Old Ironsides Station	VTA Bus - El Camino Real BRT
<b>Recreation Attractions</b>	AMC Mercado Theatres	49ers Stadium Great America Theme Park Santa Clara Golf and Tennis Club Santa Clara Youth Soccer Park	International Swim Center Lawn Bowling Santa Clara Library Tennis Centers

Figure 3 – Summary of Parks, Schools and Attractions by Corridor

# CHAPTER 1 – PURPOSE AND BENEFITS

---

## **CONNECTIONS TO REGIONAL TRAILS AND PARKS**

The Calabazas Creek and the San Tomas Aquino/Saratoga Creek corridors extend into residential neighborhoods. The Hetch Hetchy corridor links with neighborhoods in the northeast portion of Santa Clara including the more recently constructed Rivermark Development. These corridors will provide residents with routes separated from automobile traffic that extend to the San Francisco Bay Trail. The Bay Trail provides access to open space lands, athletic facilities, interpretive centers and trails at Sunnyvale Baylands Park, Twin Creeks, Alviso County Park and Don Edwards National Wildlife Refuge.

## **CONNECTIONS TO CITY PARKS, RECREATION FACILITIES AND ATTRACTIONS**

The Three Corridors will provide children and families with access to twelve city parks and natural areas within ¼ mile of the routes. The trails will provide direct access to the City's Teen Center and Skate Park, Santa Clara Youth Soccer Park, Santa Clara Golf & Tennis Club and International Swim Center. The trails will link to Great America Theme Park, AMC Mercado 20 Movie Theatre and the City's Convention Center and Stadium.

## **TRANSPORTATION BENEFITS**

The Three Corridors will enhance and expand the alternative transportation opportunities for residents, students and employees. The routes will connect with all four passenger rail lines serving the South Bay. Alternative commute options will also be expanded through connections to the Santa Clara Valley Transportation Authority (VTA) bus routes. All VTA buses are now equipped with bicycle racks. This will facilitate bus-bike trips to and from work and school. The corridors will also offer more opportunities for Safe Routes to Schools by linking with ten K-12 schools and Mission College.

The transportation benefits afforded by the trails must be balanced with need to preserve creekside habitat values. Transportation grant funding often requires that trail facilities be available to the public 24 hours per day. This operational requirement directly conflicts with the habitat values of the creekside environment by potentially triggering a need for nighttime lighting. This conflict should be addressed in all grant applications and creekside habitats should not be required to provide nighttime lighting along the length of the trail.

## **ENVIRONMENTAL BENEFITS**

The environmental conditions along the corridors should be enhanced by the development of the trails. Trail projects provide opportunities to restore habitat resources and decrease the dependency on the automobile as a primary form of local transportation. The construction of the trails should include the installation of native plants to increase the habitat available for wildlife and to create an inviting place in which to recreate and commute on foot and by bicycle.

## **ENHANCEMENT OF NATURAL RESOURCES**

The creek corridors offer those rare locations within the built environment where riparian and wetland habitats can be preserved and enhanced for wildlife and offer human visitors a connection to the natural world. The trail projects may also inspire residents, local employees and government staff to work together to enhance the corridors through the installation of native shrubs and trees on all lands that lie directly adjacent to the creek. The addition of indigenous flora would enhance the integrity and biodiversity of Santa Clara creek corridors. All trail construction projects should include a habitat enhancement component that includes native plant

# CHAPTER 1 – PURPOSE AND BENEFITS

---

landscaping, irrigation, maintenance and monitoring to ensure that the goal of enhancing the creek corridors is being achieved simultaneously with the development of the trail.

## IMPROVED AIR QUALITY

Motor vehicles are responsible for the roughly 75% of all trips in the Bay Area. Walking and bicycling transportation trips eliminate auto emissions, gasoline pumping or oil refining releases and produce zero carbon dioxide or other greenhouse gases that contribute to the global warming problem. The expansion of the trail network may encourage more individuals to walk and bicycle to work sites, schools and shops. According to the 1995 Nationwide Personal Transportation Study, 40% of all trips are two miles or less, and two-thirds are five miles or less. One-third of Bay Area employees live within five miles of their worksites. Bicycles are a convenient means of transportation for these short and medium distance trips. Short motor vehicle trips are a

significant source of emissions due to the "cold start" problem. There is a higher rate of emissions during the first few miles of driving because the catalytic converter does not function well when first started.

The corridors could eliminate auto trips by providing convenient routes for students traveling to ten K-12 schools and Mission College. The connection to the bus lines will facilitate intermodal commuting to those sites located a greater distance from the trails. Elimination of even short auto trips (dropping the children at school, picking up the mail, getting milk at the local grocery store) through the use of the trail and/or bus system will help to improve air quality.

The Bay Area Air Quality Management District (BAAQMD) suggests that the construction of an efficient bicycle and pedestrian circulation system can decrease the dependence on the automobile by 2%. The development of bicycle and pedestrian facilities is often recommended as one strategy to

mitigate the air quality impacts of large-scale development projects (BAAQMD, 2005). BAAQMD in cooperation with the Metropolitan Transportation Commission (MTC) and Association of Bay Area Governments (ABAG) has established Transportation Control Measures (TCM) as part of a broad strategy to make progress toward meeting State ozone standards. These TCMs will also help to reduce greenhouse gas emissions. In Particular,

- ◆ TCM 5 – Improved Access to Rail and Ferries
- ◆ TCM 9 – Improve Bicycle Access and Facilities
- ◆ TCM 10 – Youth Transport
- ◆ TCM 19 – Improve Pedestrian Access and Facilities

will be implemented with the construction of these trails (BAAQMD, 2005, pp. D-15 – D-19, D-27 – D-32, D-64 – D-66).

**This page is intentionally left blank.**

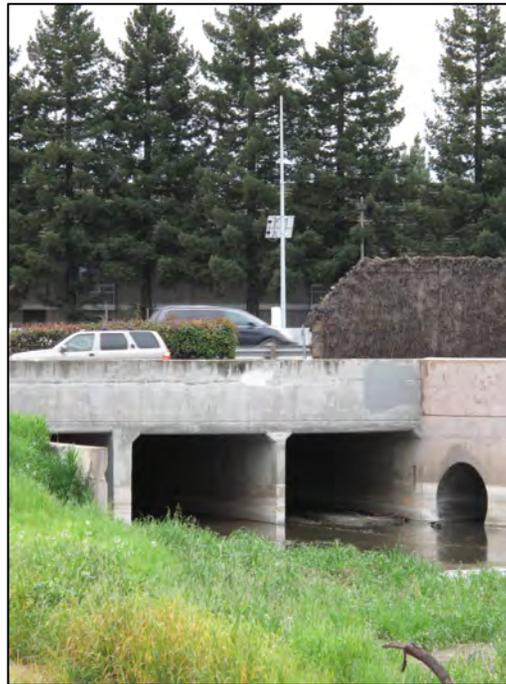
## CHAPTER 2 – FEASIBILITY CRITERIA

This chapter describes the criteria used to evaluate the feasibility of developing trails adjacent to Calabazas and Saratoga Creeks and along the Hetch Hetchy corridor. Land availability, habitat sensitivity, roadway and creek crossings and on-street routes and crossings were reviewed to determine the opportunities and constraints to trail development. The results of these site analyses were then used to develop the preliminary trail alignments described in Chapter 3.

Land availability explored property ownership and land use and compared this information to the land needed to construct a trail. The amount of land necessary to develop a trail was based upon various trail design guidelines and the operations and maintenance requirements of the Santa Clara Valley Water District (SCVWD). The guidelines used to determine adequate trail width included the Caltrans Highway Design Manual: Chapter 1000 (California Department of Transportation, 2012) and the Santa Clara Countywide Trails Master Plan - Design and Management Guidelines (County of Santa Clara, 1995).

The habitat sensitivity of the two creek corridors was evaluated through field surveys and a review of the federal and state listed species that have the potential to occur in the area. Previous

mitigation projects and preservation efforts undertaken along the channels were also evaluated for implications to trail development. The type and quality of the habitats along the creek corridors are summarized in this chapter.



*Calabazas Creek flowing beneath Highway 101 and Mission College Boulevard.*

Existing roadway bridges were individually evaluated for the potential to create in-channel underpasses that would maintain the trail alignment within the corridor. In-channel

underpasses allow the trail alignment to be grade-separated from roadway automobile traffic. The bridge structures are categorized according to the ability to accommodate a trail underpass suitable for year-round pedestrian and bicycle passage. A few high volume roadways could not accommodate trail underpasses. In these areas, the potential for pedestrian/bicycle overcrossings was explored. Conceptual engineering solutions for retrofitting the bridges to support underpasses and developing overcrossings are detailed in this chapter. These design concepts are integrated into the preliminary trail alignments described in Chapter 3.

In areas where the trail could not be aligned along the creek due to lack of land availability, sensitive habitat, constrained roadway crossings or other factors, an on-street alignment is proposed to connect segments of the trail. The criteria for evaluating on-street routes are explained in the chapter.

## CHAPTER 2 – FEASIBILITY CRITERIA

---

### LAND AVAILABILITY

The intent of this study was to evaluate the feasibility of developing the creek trails on existing public lands or on lands that are subject to discretionary development approvals. The land along the creek corridors is primarily owned by the SCVWD and the City. The Hetch Hetchy corridor is owned by the San Francisco Public Utilities Commission (SFPUC), which is a public agency of the City and County of San Francisco. Other public or quasi-public agencies control additional parcels of land along these corridors. These agencies include California Department of Transportation (Caltrans), Santa Clara County Roads & Airports Department (County Roads), Peninsula Corridor Joint Powers Board and Union Pacific Railroad. In general, the creek trail alignments are proposed within these public and quasi-public lands.

Santa Clara has been working to implement a long-range strategy for enhancing walkability and expanding and improving the bicycle facility network. This undertaking has included negotiations with property owners seeking discretionary development approvals. The resulting development agreements have required the dedication of land for open space preservation and public

trail access in designated corridors. This study proposes creek trails on private property subject to development agreements.

Trail design guidelines were reviewed to determine if sufficient public land existed to accommodate construction of the trails. Guidelines established by the Caltrans and the Santa Clara County Parks and Recreation Department (County Parks) were used to determine the land availability requirement. Caltrans defines three types of trail facilities each with specific trail dimensions. Class I Bike Paths are located off-street and Class II Bike Lanes and Class III Bike Routes are located within the roadway right-of-way. A Class I Bicycle Pathway serves the exclusive use of pedestrians and bicyclists and is defined as a right-of-way completely separated from motor vehicle street and highway traffic (Caltrans, Highway Design Manual: Chapter 1000, 2009). The minimum trail width for a Class I Bicycle Pathway is 8 feet with minimum 2-foot shoulders on each side of the trail.

All three of the trail corridors under study are included in the Santa Clara Countywide Trails Master Plan (County of Santa Clara, 1995). The entire length of Saratoga Creek and the Hetch Hetchy corridor within the City of Santa Clara are in this regional plan.

The portion of Calabazas Creek from the San Francisco Bay Trail to the Hetch Hetchy corridor is included in the plan. It should be noted that most connector trail routes were derived from City trail plans in existence when the countywide plan was adopted. The Santa Clara Countywide Trails Master Plan also includes three definitions of trail types. They include regional, sub-regional and connector trails. These definitions specify the purposes served by the various trail types. All three routes under study are considered connector trails that link urban areas to the countywide regional and sub-regional trail network (*See Figure 4*).



*Narrow top of bank along Saratoga Creek limits trail potential.*

### SANTA CLARA COUNTY TRAIL DEFINITIONS

**Regional Trail Routes** are those trails of National, State or regional recreation significance. In all cases, Regional trail routes extend beyond the borders of Santa Clara County. Regional Trails are generally envisioned as shared-use trail routes in that they would accommodate a variety of trail users. In some instances, where topography and other physical constraints dictate, separate trails along the same general trail route may be needed to accommodate different users.

**Sub-Regional Trail Routes** are those that in some way:

- ◆ Provide regional recreation and transportation benefits such as providing key links for accessing rail stations, bus routes or park-and-ride facilities;
- ◆ Provide for continuity between cities; generally crossing a city or passing through more than one city; or
- ◆ Provide convenient long-distance trail loop opportunities by directly linking two or more Regional Trail to create an urban trail network.

**Connector Trail Routes** are those that:

- ◆ Form convenient means of access and linkages from urban areas, developed areas, and public lands within the county to the primary trail network of Regional and Sub-Regional Trails.

*Figure 4 – 1995 Santa Clara Countywide Trails Master Plan Definitions (County of Santa Clara, 1995, pp. 40-46).*

Santa Clara County's Trail Easement Dedication Policies and Practices usually require a 25-foot wide easement to accommodate trail development in the urban service areas (County of Santa Clara, 1992). The 25-foot wide easement is intended to include the trail tread, shoulders, privacy setback and habitat enhancements or landscaping. This easement width would be necessary when designing for a multi-use path.

Trail Design Guidelines are included as an appendix to the 1995 Santa Clara Countywide Trails Master Plan. These guidelines suggest "trail tread widths should be determined by the amount and intensity of trail use and field conditions such as topography, vegetation and sensitivity of environmental resources" (County of Santa Clara, 1995, Chapter 5, p. 70). Several of the Trail Design Guidelines have application for evaluating the feasibility of developing trails in the three study corridors. Countywide Trails Master Plan Guideline G-2 – Shared Use Trail – Paved Tread Double Track recommends that a trail serving multiple uses meet an optimum width of 12 feet and provide a hard paved surface to accommodate this multi-use. In situations where uses are limited, tread width is narrowed. Although these guidelines establish very specific tread width and surfacing types, they

## CHAPTER 2 – FEASIBILITY CRITERIA

---

do not set a standard. They are simply one perspective for evaluating the feasibility of trail development. Ultimately, any trail must be designed to accommodate the intended trail use and intensity planned for each study corridor.

In addition to Caltrans and the Santa Clara County recommendations, SCVWD maintains guidelines for maintenance access through the creek corridors. These guidelines recommend a minimum 20 to 22 foot clearance for maintenance vehicle movement along the creek channels. These guidelines are important because in many areas both trail users and maintenance vehicles would likely travel the same pathway.

### HABITAT SENSITIVITY

An assessment of biological resources was conducted to evaluate the habitat sensitivity and the presence of rare, threatened and endangered species throughout the study corridors. The bioassessment included a review of species known to or having the potential to occur within the study corridors based on a search of the California Natural Diversity Database and the California Native Plant Society Inventory within the Milpitas (37121D8) and San Jose West (37121C8) U.S. Geological Service 7.5-Minute

Quadrangles. Field surveys were simultaneously conducted during the land availability assessment of the corridors. The field surveys were conducted to determine the location and extent of habitats.

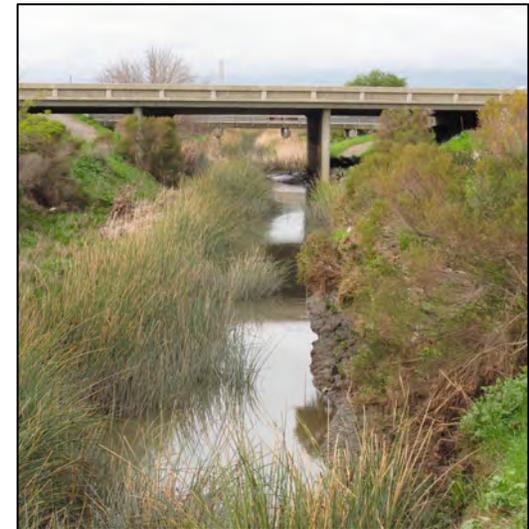
A variety habitat types were found in the three study corridors. The habitats include brackish marsh, freshwater wetlands, in-stream habitat, oak-sycamore riparian forest, ruderal grassland, landscaped parks and schools and residential development. Of these habitat types, the brackish marsh, riparian forest, freshwater wetlands and in-stream habitat are considered sensitive by the resource agencies, either because they support rare species or because the habitats are protected by law.

### HABITATS ALONG CALABAZAS CREEK CORRIDOR

#### Highway 237 to Highway 101 Red Willow Thickets/Brackish Marsh

Calabazas Creek is tidally influenced from Guadalupe Slough to approximately Highway 101. Earthen levees channelize the creek from Highway 101 downstream to Highway 237. The channel bottom is natural gravel and bay mud that supports a brackish marsh comprised of bulrush and cattail species. The channel floodplain hosts red willow thickets

(*Salix laevigata*) that are interspersed with box elder (*Acer negundo*), white alder (*Alnus rhombifolia*), Fremont cottonwood (*Populus fremontii*), blue elderberry (*Sambucus mexicana*) and other willow species (*Salix spp.*). The location of the study area, in the upper end of the tidal range, restricts the range of these plant communities.



*Brackish Marsh at Highway 237.*

### **Highway 101 to Lawrence Expressway Concrete Lined Channel**

Calabazas Creek is a concrete lined channel from Highway 101 upstream to Lawrence Expressway. The concrete prevents vegetation from establishing in the bottom of the channel or on the channel banks. Various tree species have been planted along the SCVWD property line and some of these trees have matured sufficiently to provide some shade to the stream. Calabazas Boulevard travel lanes are split with opposite directions of travel located on either side of Calabazas Creek from Georgetown Place to Pomeroy Avenue. In this section of the creek, a small planting pocket was left on either bank to provide a tree-lined boulevard. The plantings include nonnative eucalyptus trees and oleander shrubs.

### **Lawrence Expressway to Homestead Road Sycamore Riparian Forest with In-stream Freshwater Wetlands**

Upstream of Lawrence Expressway, the creek corridor is wider and unchannelized. The upper banks support California sycamore woodland (Sawyer, 2009). This plant community includes California sycamore (*Platanus racemosa*), Fremont cottonwood (*Populus fremontii*) and a large number of coast live oak (*Quercus agrifolia*) trees. The creek bottom is gravel and

contains patches of in-stream freshwater wetlands.

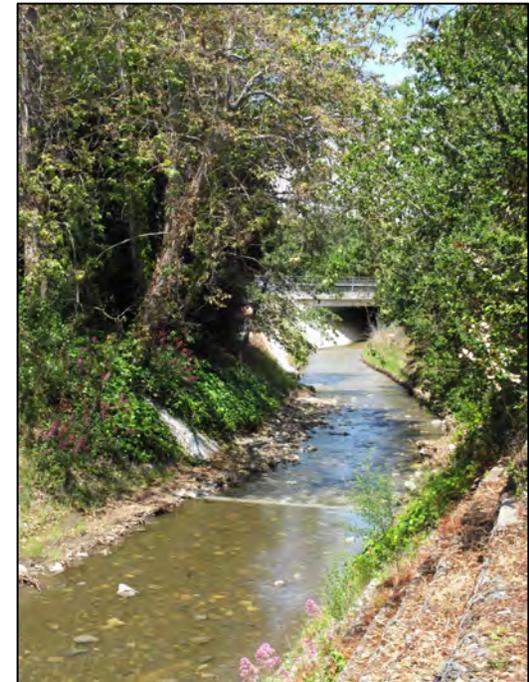
### **HABITATS ALONG SARATOGA CREEK CORRIDOR**

### **Confluence with San Tomas Aquino Creek to Pruneridge Avenue Sycamore Riparian Forest with In-stream Freshwater Wetlands - A SCVWD Vegetation Preserve**

In the 1980's SCVWD undertook a flood control project along Saratoga Creek. This project included widening and armoring of the channel to create additional flood flow capacity. The creek banks were rebuilt using gabions and inset concrete planters. Revegetation efforts were implemented within the inset planters and along the remaining, very narrow top of bank located behind backyard fences. The entire corridor from the confluence with San Tomas Aquino Creek to Pruneridge Avenue was designated "vegetation preserve" or "vegetation enhancement" areas and provided environmental mitigation to offset the flood control project impacts.

Saratoga Creek corridor is characterized by a replanted California sycamore woodland (Sawyer, 2009). This plant community includes California sycamore (*Platanus racemosa*), Fremont cottonwood (*Populus fremontii*), coast live oak

(*Quercus agrifolia*), valley oak (*Quercus lobata*), white alder (*Alnus rhombifolia*), red willow (*Salix laevigata*) and arroyo willow (*Salix lasiolepis*).



*Looking downstream toward Homestead Road from Homeridge Park.*

The corridor receives storm flows and urban runoff. The creek bottom is gravel throughout most of the channel and contains patches of in-stream freshwater wetlands. These isolated wetlands are likely maintained through the year by irrigation water

## CHAPTER 2 – FEASIBILITY CRITERIA

---

that reaches the storm water system and upstream releases by SCVWD for groundwater recharge that flow to the creek. These wetlands and deep in channel pools provide habitat for Pacific chorus frogs and many stream invertebrates.

### **HABITATS ALONG HETCH HETCHY CORRIDOR**

#### **Guadalupe River to Lickmill Blvd. Ulistac Natural Area**

Ulistac Natural Area represents the last open space in the City of Santa Clara. The area was formerly a pear orchard, then a golf course and was later slated for development. The site was preserved in 1997 and community driven restoration efforts have been underway since. The community's goal is to have the site represent many of the habitats that were previously found in Santa Clara. Currently, the site supports a developing oak savannah, live oak woodland, deciduous oak woodland and grassland. The community has plans to restore a wetland, sycamore woodland and riparian woodland.

#### **Lickmill Boulevard to Lafayette Street Landscaped Park**

The Hetch Hetchy right of way functions as part of Lick Mill Park. The park is landscaped with turf grass and ornamental trees. The park provides a



*The Hetch Hetchy corridor is landscaped and integrated into Lick Mill Park.*

green backdrop to the surrounding residential neighborhoods.

#### **Lafayette Street to San Tomas Aquino Creek Trail to Calabazas Creek Trail Ruderal Grassland and Roadways and Parking Lots**

The Hetch Hetchy right of way is undeveloped from Lafayette Street to the levee along San Tomas Aquino Creek. A ruderal grassland of primarily nonnative grasses and forbs grow in this area. The Hetch Hetchy right of way from San Tomas Aquino Creek to Calabazas Creek is covered by roadways and the parking lots associated with the Great America theme park and the technology corporations located in north of Highway 101. No vegetation is present in these areas.

### Special Status Species

Based upon the field surveys and the review of the databases, 25 special-status animals have been documented within a five-mile radius of the study corridors. Of these, 7 were eliminated from further consideration due to the lack of suitable habitat in the corridors to support the species. Figure 5 identifies the 18 species that are known to occur or have the potential to occur due to potentially suitable habitat for these species.

Rare species documented or expected to occur in the two creek corridors include steelhead trout, western pond turtle, Cooper’s hawk and other birds of prey and various bat species. Species that have the potential to occur in the downstream reaches of Calabazas Creek and the adjacent marshes include the California black rail, clapper rail, northern harrier, saltmarsh common yellowthroat, tri-colored blackbird, salt marsh harvest mouse and the salt marsh wandering shrew. In the remaining open space lands and undeveloped portions of the Hetch Hetchy corridor loggerhead shrike, western burrowing owl and other raptors could be observed.

The most important biological constraints to the trail alignment revolve around these rare species and habitats. The recommendations provided in the biological assessment report are designed to avoid impacts to natural resources and minimize the need for environmental permits.

<b>Wildlife Species with Potential to Occur in the Study Corridors</b>	
Central California Coast Steelhead	<i>Oncorhynchus mykiss</i>
Western Pond Turtle	<i>Actinemys marmorata</i>
American Peregrine Falcon	<i>Falco peregrinus</i>
Double-crested Cormorant	<i>Phalacrocorax auritus</i>
California Black Rail	<i>Laterallus jamaicensis coturniculus</i>
California Clapper Rail	<i>Rallus longirostris obsoletus</i>
Cooper’s Hawk	<i>Accipiter cooperii</i>
Golden Eagle	<i>Aquila chrysaetos</i>
Loggerhead Shrike	<i>Lanius ludovicianus</i>
Northern Harrier	<i>Circus cyaneus</i>
Saltmarsh Common Yellowthroat	<i>Geothlypis trichas sinuosa</i>
Tri-colored Blackbird	<i>Agelaius tricolor</i>
Western Burrowing Owl	<i>Athene cunicularia hypugaea</i>
Western Snowy Plover	<i>Charadrius alexandrinus nivosus</i>
White-tailed Kite	<i>Elanus leucurus</i>
Pallid Bat	<i>Antrozous pallidus</i>
Salt Marsh Harvest Mouse	<i>Reithrodontomys raviventris</i>
Salt Marsh Wandering Shrew	<i>Sorex vagrans halicoetes</i>

Figure 5 – Wildlife species with the potential to occur within the three study corridors.

## CHAPTER 2 – FEASIBILITY CRITERIA

---



*Trail underpass at Tasman Drive on the San Tomas Aquino Creek Trail.*

### **ROADWAY BRIDGES AND CREEK CROSSINGS**

Nineteen roadway bridges span Calabazas Creek and eleven roadway bridges span Saratoga Creek within the study area. Each of these bridges was individually investigated to determine the feasibility of providing a grade-separated crossing that maintained an uninterrupted trail alignment adjacent to the stream corridor. In addition, four pedestrian/bicycle bridges on Calabazas Creek and three on Saratoga Creek were evaluated for use in the trail alignments. The roadway bridges were dimensioned and categorized according to the existing design. A total of six different bridge types were identified. Of these, only three types have the potential to be modified to accommodate an in-channel underpass (see list below). The remaining bridge styles require a different type of grade-separated crossing such as a tunnel or pedestrian overcrossing or the use of an at-grade street crossing to accommodate the trail alignments. A summary of the bridge types and the potential engineering solutions that retain the channel capacity at each crossing conveys the feasibility of maintaining the trail within corridors (See Figures 6 and 7). The 100-year water surface elevations at the potentially feasible underpass crossings were evaluated. Further review of the projected storm releases and water surface elevations at these structures will be required through the creek trail master plan.

### **Bridge Types Accommodating an In-Channel Trail Underpass**

**TFVS** – Tapered to Flat Abutment to Vertical Bridge Support Structure

**TFNS** – Tapered to Flat Abutment to No Interior Support Structure

**TANS** – Tapered Abutment to No Interior Support Structure

### **Bridge Types Requiring Alternative Trail Solutions**

**BOXC** – Typical Box Culvert

**VAVS** – Vertical Abutment with Vertical Wall Structures

**VANS** – Vertical Abutment with No Interior Support Structures

The Hetch Hetchy Corridor crosses San Tomas Aquino Creek and Calabazas Creek. Existing bridges are available to convey trail users across these streams. The Hetch Hetchy Corridor also extends beneath the Union Pacific Railroad lines that serve the ACE and Capital Corridor commuter trains, Lick Mill Boulevard, Lafayette Street, Great America Parkway and several other smaller roadways. Each of these crossings was evaluated in this study.

## CHAPTER 2 – FEASIBILITY CRITERIA

<b>Calabazas Creek Corridor Grade-Separated Crossing Feasibility Summary</b>							
<b>Bridge Name</b>	<b>Bridge Type</b>	<b>Underpass Feasibility</b>	<b>Use Existing In-Channel Underpass</b>	<b>New In-Channel Underpass</b>	<b>New Tunnel</b>	<b>New Overcrossing</b>	<b>New At-Grade Crossing</b>
Highway 237	TFVS	Yes		✓			
Old Mountain View-Alviso Road	TFVP	Yes	✓				
Tasman Drive	TAVS	Yes		✓			
Highway 101	VAVS	No				✓	
Scott Boulevard	TANS	Yes		✓			
Central Expressway	BOXC w/BOW	No				✓	
Kifer Road	TFNS w/BOW	Some		✓			
Caltrain	BOXC w/BOW	No			✓		
Monroe Street	VAVS w/BOW	No					✓
Calabazas Boulevard	BOW	No					✓
Machado Avenue	TANS	Yes					✓
Cabrillo Avenue	VAVS w/BOW	No					✓
Warburton Avenue	VAVS	Yes					✓
Bridge North of El Camino Real	VAVS w/BOW	No					✓
El Camino Real	VANS	No					✓
Pomeroy Avenue	BOXC w/BOW	No					✓
Benton Street	TANS	No					✓
Lawrence Expressway	BOXC w/BOW	No					✓
Lochinvar Avenue	VAVS w/BOW	No					✓

Figure 6 – Summary of Grade-Separated Crossing Feasibility along Calabazas Creek (See Bridge Type abbreviations on Page 18).

## CHAPTER 2 – FEASIBILITY CRITERIA

Saratoga Creek Corridor Grade-Separated Crossing Feasibility Summary							
Bridge Name	Bridge Type	Underpass Feasibility	Use Existing In-Channel Underpass	New In-Channel Underpass	New Tunnel	New Overcrossing	New At-Grade Crossing
Monroe Street	VANS	No					Existing
Cabrillo Avenue	TANS	Some					✓
Warburton Avenue	VANS	No					✓
El Camino Real	VANS	No					✓
Benton Street	TANS	Some					✓
Kiely Boulevard	TANS	Some		✓			
Homestead Road	TANS	Some		✓			
Forbes Avenue	VANS	No					✓
Pruneridge Avenue	VANS	No					✓
Lawrence Expressway On-ramp	BOXC	No					✓
Stevens Creek Boulevard	BOXC	No					✓

Figure 7 – Summary of Grade-Separated Crossing Feasibility along Saratoga Creek (See Bridge Type abbreviations on Page 18).

### BRIDGE TYPES ACCOMMODATING AN IN-CHANNEL TRAIL UNDERPASS

Three bridge types can potentially be modified to accommodate a grade-separated underpass within the creek channel. A sketch of each bridge type identifies the design concept associated with retrofitting these structures to accommodate a creekside trail. The names of the roadways associated with each bridge structure are listed under each of the bridge cross-sections (See Figures 8, 9 and 10). Trail underpasses are anticipated to flood during storm events. Downstream underpasses may also be impacted by the tidal cycle.

#### Tapered to Flat Abutment to Vertical Bridge Support (TFVS) Structures

The tapered abutment to vertical support bridge is found in the downstream reaches of Calabazas Creek at Highway 237, Old Mountain View-Alviso Road and Tasman Drive. All of these bridges have sufficient clearance to support the development of trail underpasses. Much of the grading to create a trail has been completed beneath these structures to provide the SCVWD with maintenance access (See Figure 8). The City of Sunnyvale and the City of Santa Clara have a joint project underway to replace the Old Mountain View-Alviso road bridge. The new design includes a trail underpass.

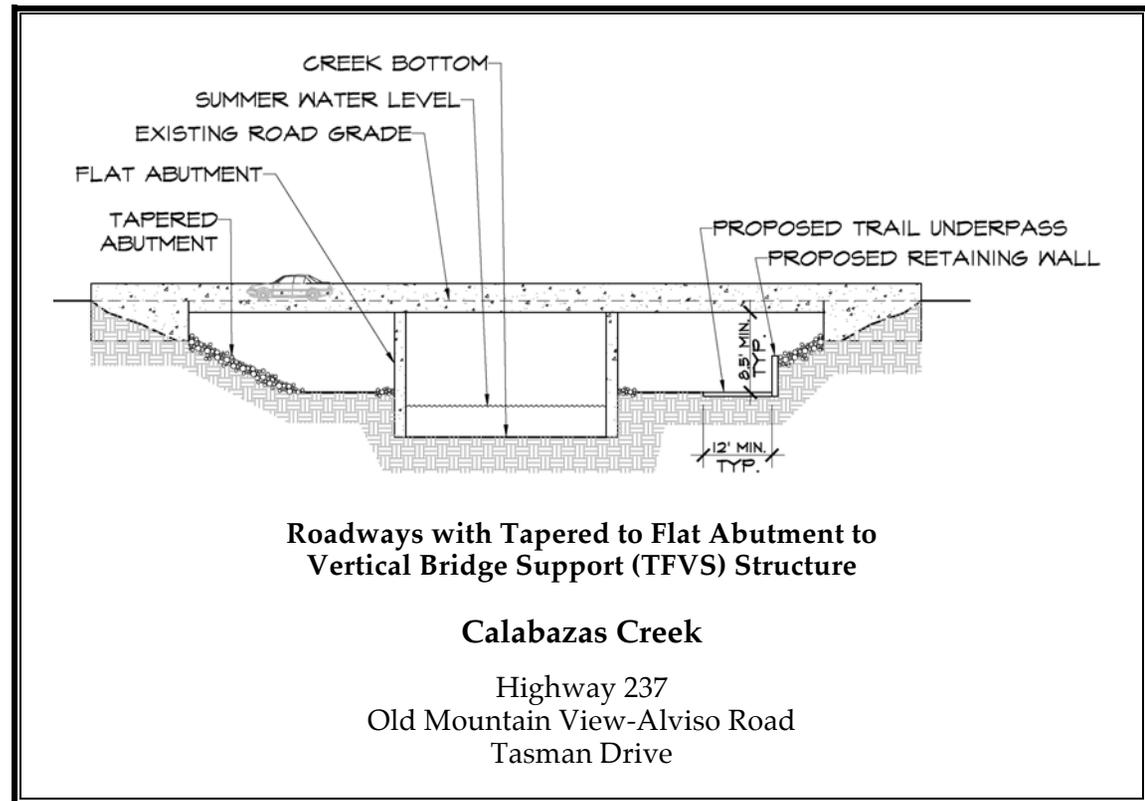
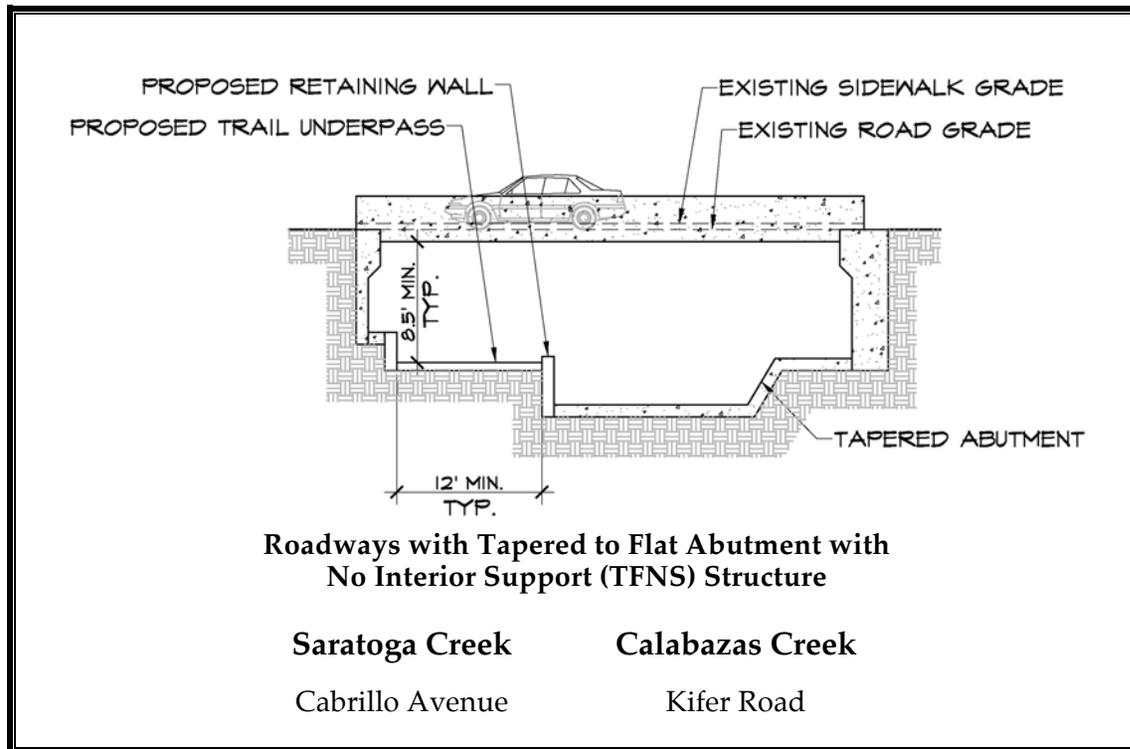


Figure 8 – TFVS Bridge accommodating a grade-separated trail underpass.

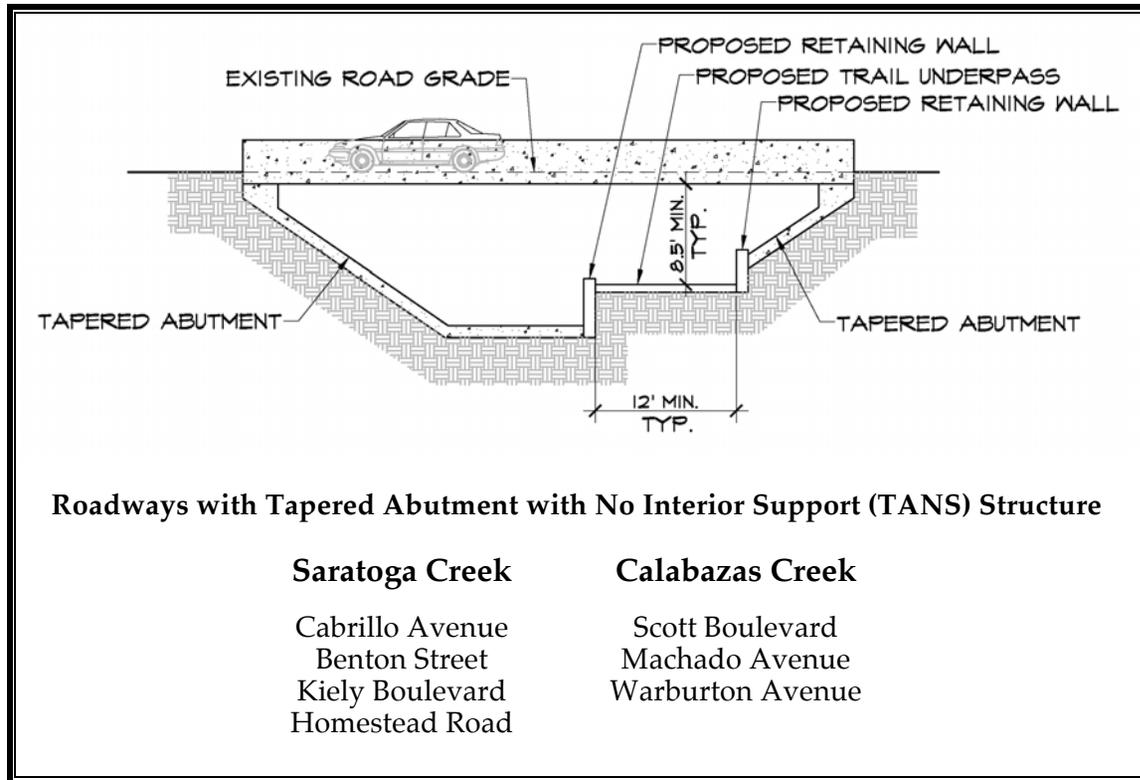
# CHAPTER 2 – FEASIBILITY CRITERIA



## Tapered to Flat Abutment with No Interior Support (TFNS) Structures

The tapered to flat abutment with no interior support bridge is found at Kifer Road spanning Calabazas Creek and Cabrillo Avenue spanning Saratoga Creek. A trail underpass is proposed at Kifer Road although the bridge appears to have been previously retrofitted and is asymmetrical limiting the potential underpass opportunity to the west bank (See Figure 9 and Illustration 2 – Kifer Road Trail Underpass Concept on Page 45). Cabrillo Avenue provides some potential for a trail underpass, but the existing on-street portion of the San Tomas Aquino/Saratoga Creek Trail extends along Cabrillo Avenue reducing the need for a trail underpass. In addition, single-family residences line the corridor downstream of this roadway limiting trail potential.

Figure 9 – TFNS Bridge accommodating a grade-separated trail underpass.



## Tapered Abutment with No Interior Support (TANS) Structures

The tapered abutment with no interior support bridge is found along both Saratoga and Calabazas Creeks. Many of these bridges have limited vertical clearance between the proposed trail and the low flow water level observed during the summer making it possible, but challenging to engineer trail underpasses. Underpasses are proposed at Scott Boulevard along Calabazas Creek and Kiely Boulevard and Homestead Road along Saratoga Creek (See Figure 10). On-street trail routing solutions are proposed in the remaining locations.

Figure 10 – TANS Bridge accommodating a grade-separated trail underpass.

# CHAPTER 2 – FEASIBILITY CRITERIA

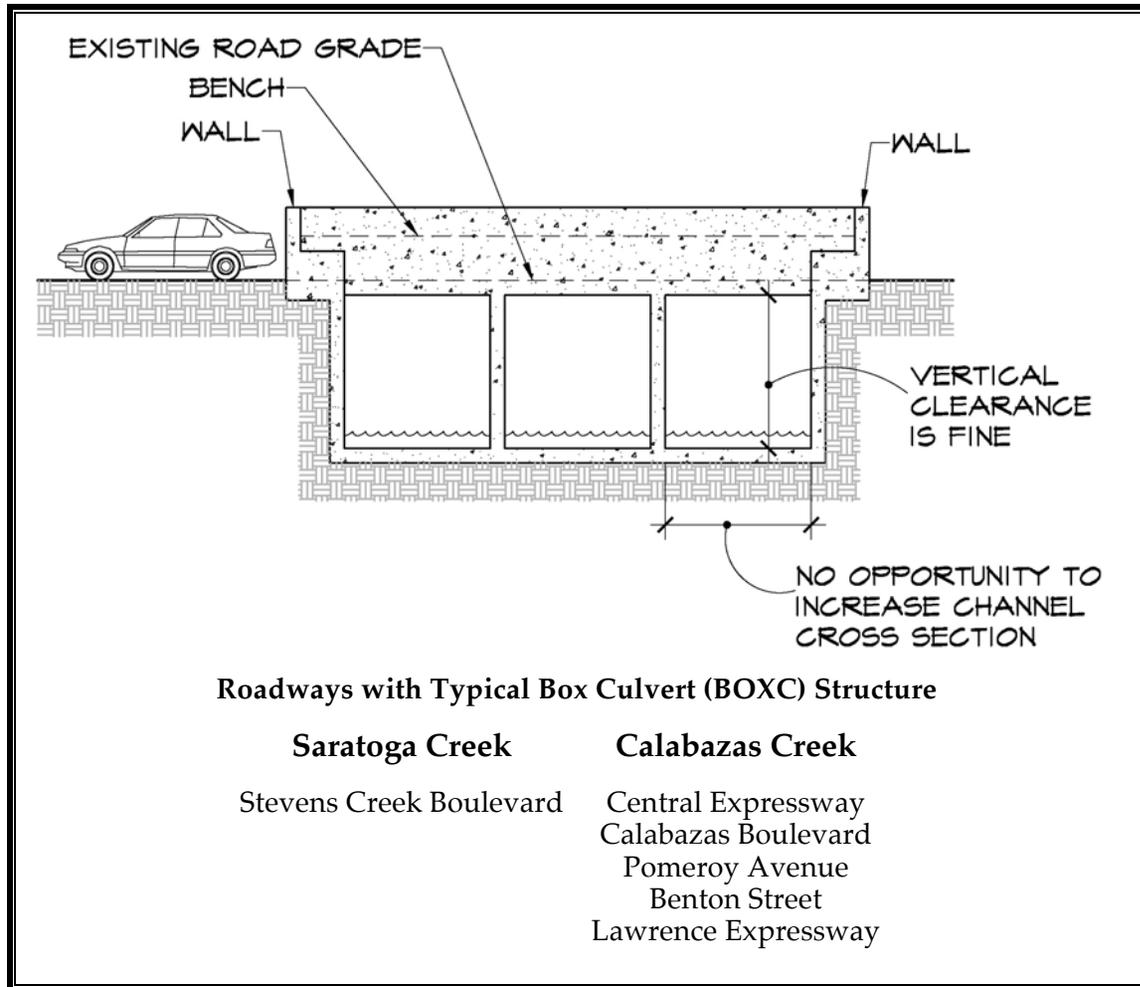


Figure 11 – BOXC Bridge requiring an alternate trail routing solution.

## BRIDGE TYPES REQUIRING ALTERNATIVE TRAIL SOLUTIONS

Three bridge types cannot be modified to provide an in-channel trail alignment. A typical cross-section of each bridge type identifies the structural constraints associated with developing an in-channel trail crossing. The names of those roadways associated with each bridge type are referenced under each of the cross-sections (See Figures 11, 12 and 13).

### Typical Box Culvert (BOXC) Structures

Box culvert structures are found along Calabazas Creek and at Stevens Creek Boulevard that spans Saratoga Creek (See Figure 11). Box culverts cannot be modified to accommodate an in-channel underpass due to the design of the culvert. A pedestrian overcrossing is proposed at Central Expressway to provide for a continuous trail alignment connecting to the on-street bicycle facilities at Monroe Street and Calabazas Boulevard (See Figure 16 – Central Expressway Pedestrian Overcrossing Plan View on Page 44). On-street solutions are proposed in the remaining locations.

### Vertical Abutment with Vertical Wall (VAVS) Structures

The vertical abutment with vertical wall support bridge type is found along Calabazas Creek in six locations (See Figure 12). These locations provide no opportunity for maintaining the trail in the corridor using underpasses. An excellent opportunity for a pedestrian overcrossing exists at Highway 101. This crossing solution was investigated and appears feasible (See Illustration 1 – Highway 101 Pedestrian Overcrossing adjacent to Calabazas Creek on Page 40). It will require further consultation with adjacent agencies and additional review in the creek trail master plan. A tunnel is proposed as an alternate crossing solution of Caltrain (See Figure 17 – Caltrain Tunnel Plan View on Page 47). This solution also appears feasible, but will potentially require negotiations with adjacent property owners. This crossing concept will also require additional review in the creek trail master plan. On-street solutions are proposed in the remaining VAVS bridge structure locations.

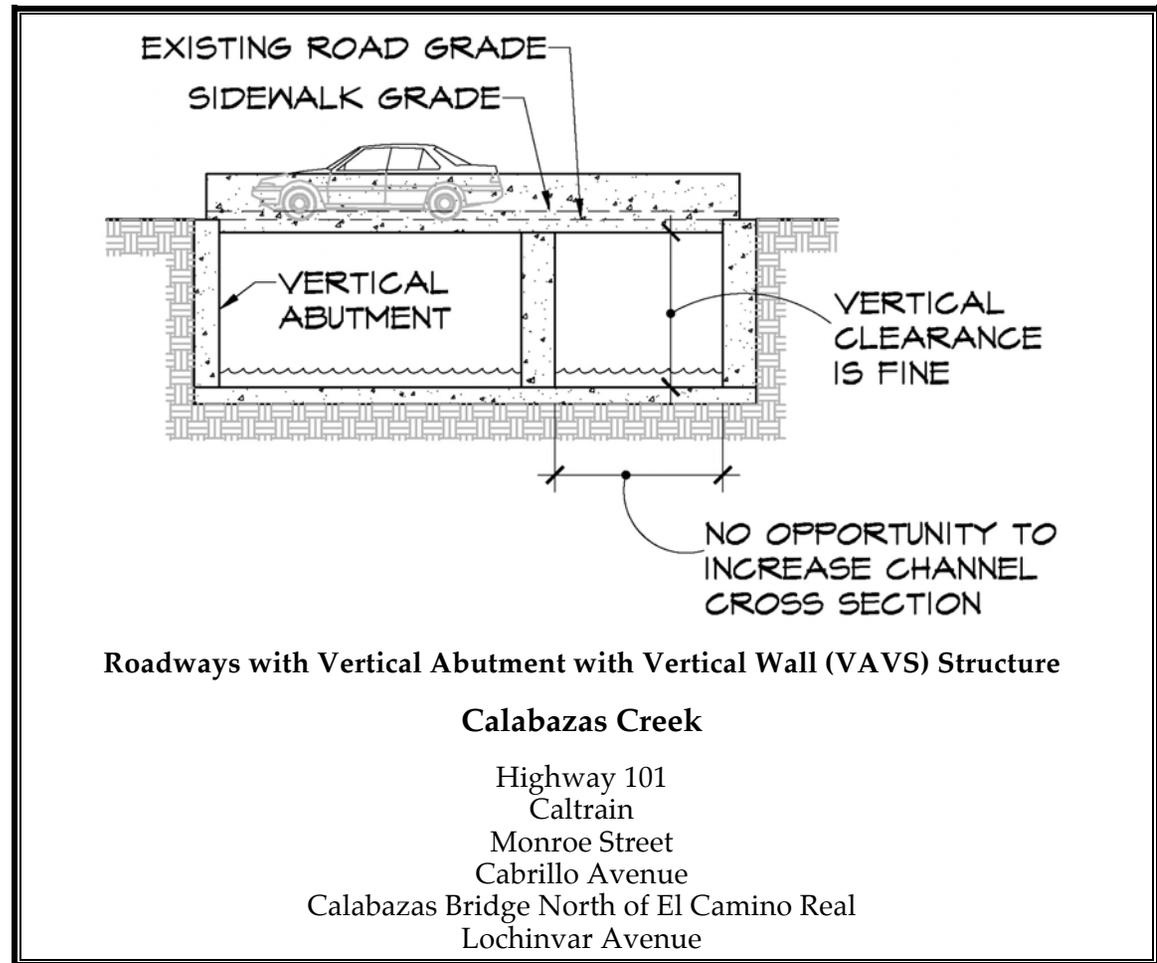


Figure 12 – VAVS Bridge requiring an alternate trail routing solution.

## CHAPTER 2 – FEASIBILITY CRITERIA

### Vertical Abutment with No Interior Support (VANS) Structures

The vertical abutment with no interior support bridge is found along both Saratoga and Calabazas Creeks. Many of these bridges have limited clearance between the proposed trail and the low flow water level observed during the summer. Those bridges located along Saratoga Creek are also within the “vegetation preserve” established by the SCVWD. Any impacts to the “vegetation preserve” would likely require additional mitigation. The feasibility of modifying any of these bridges is limited by these varied constraints. On-street routing solutions are proposed in these locations (See Figure 13).

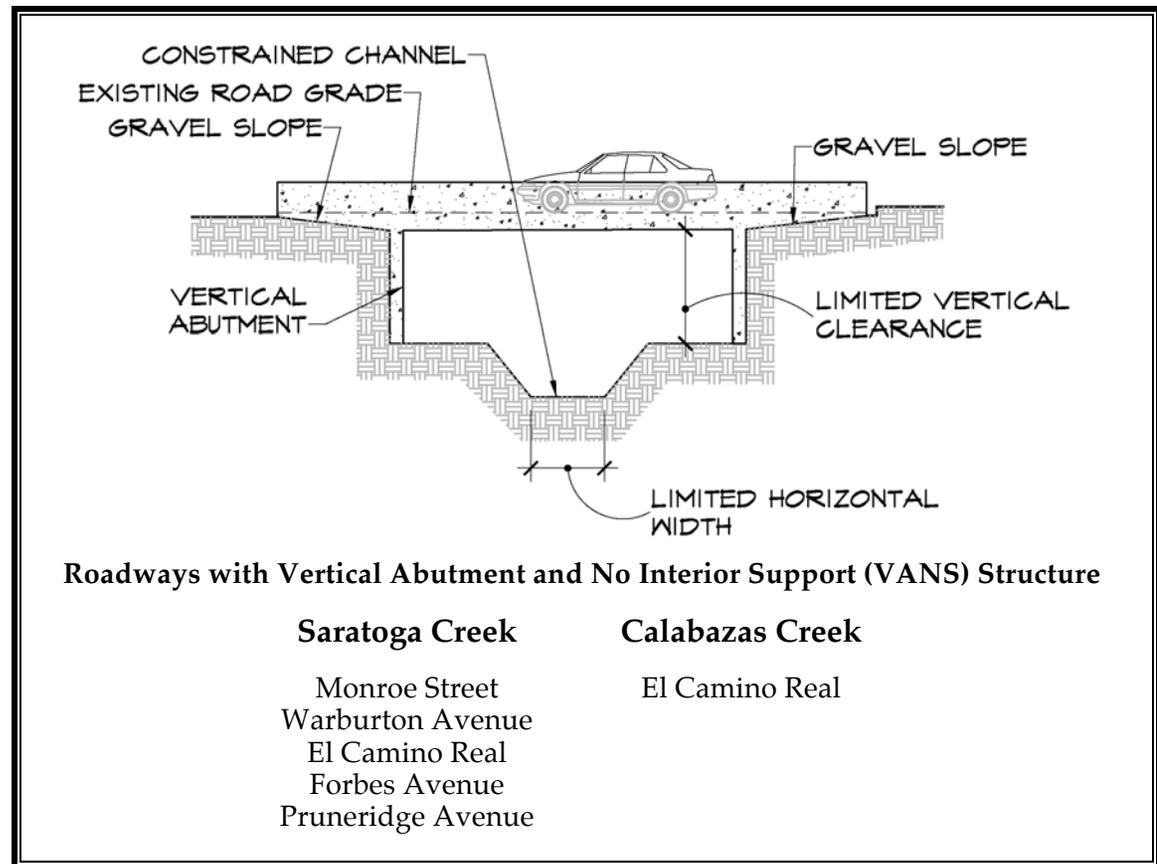


Figure 13 – VANS Bridge requiring an alternate trail routing solution.

### ON-STREET CROSSINGS

An assessment of on-street crossings was conducted to evaluate the feasibility of crossing at-grade in areas where grade separated trail facilities were not feasible. The study evaluated particular intersections along the three study corridors. Several criteria were applied to evaluating on-street crossing solutions. On-street crossing concepts are proposed at several locations to provide continuity along each of the trail corridors. Crossing concepts are described in Chapter 3 for the following locations:

- ◆ Monroe Street to Calabazas Boulevard
- ◆ Calabazas Boulevard from Cabrillo Avenue to Monroe Street
- ◆ Lick Mill Boulevard to Ulistac Natural Area
- ◆ Old Glory Lane between Great America Parkway and Old Ironsides Drive
- ◆ Patrick Henry Drive



*The Calabazas Creek Trail junction with Tasman Drive and Light Rail.*

**This page is intentionally left blank.**