Final

Nevada Stateline-to-Stateline Bikeway Project Feasibility Study Report

Tahoe Regional Planning Agency
Tahoe Transportation District

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TAHOE REGIONAL PLANNING AGENCY
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June 2011

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Prepared for:

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June 2011

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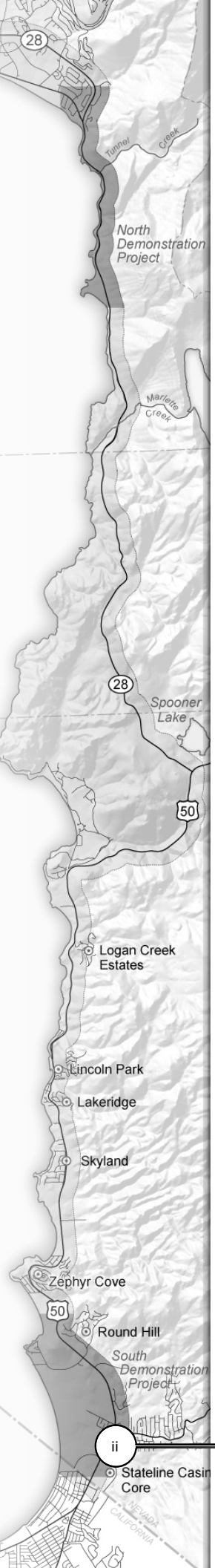

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1 INTRODUCTION

The east shore of Lake Tahoe contains some of the most scenic landscapes in the Lake Tahoe Basin and hosts many popular recreation destinations. Bicycle and transit facilities are absent or limited in much of this area; however, with the only access widely available to the public being by automobile. Paved off-highway parking is also limited, which leads to parking, safety, and environmental problems associated with casual parking on the highway margins. The absence of a bicycle facility on the east shore is considered a key missing piece of the Basin's bicycle network.

The Nevada Stateline-to-Stateline Bikeway is a joint proposal of local, state, and federal agencies with responsibilities on the Nevada side of the Lake Tahoe Basin. The sponsoring agencies are Douglas County, Washoe County, Carson City, Incline Village General Improvement District (IVGID), Tahoe Transportation District (TTD), Nevada Division of State Parks (State Parks), Nevada Division of State Lands, Tahoe Regional Planning Agency (TRPA), and U.S. Forest Service (USFS). The Nevada Department of Transportation (NDOT) and the Washoe Tribe are partnering entities. A "Working Group" has been formed to oversee the Bikeway project; it consists of the staff from the sponsoring and partnering agencies/organizations that are helping to direct the project planning, environmental review, and design.

The overall vision for the Nevada Stateline-to-Stateline Bikeway Project (Bikeway) established by the Working Group is to complete the Nevada portion of a premier separated bikeway circling Lake Tahoe that connects communities, enhances recreational opportunities, expands transportation choices, and promotes the enjoyment of the Tahoe Basin.

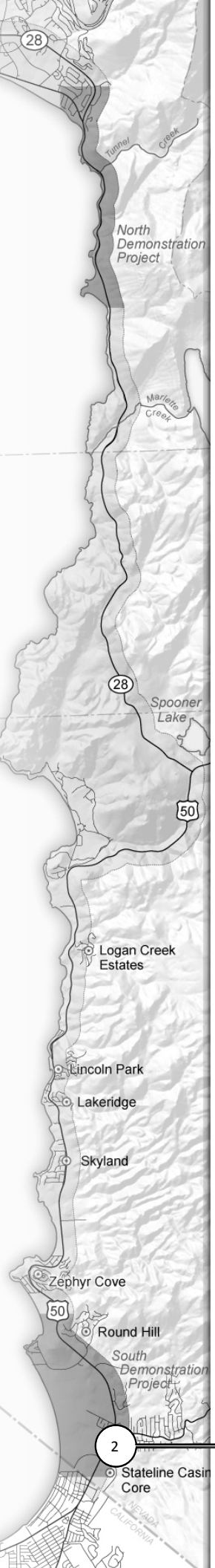
The Bikeway study area contains many siting challenges, many of which are related to the stunning natural setting of the lake margin. These challenges include several areas of rugged topography and stream crossings, narrow highway cross-sections at certain locations, potential need for new highway crossings, and urban traffic issues in areas such as Stateline on the south shore. Connection to existing or planned bicycle facilities will also be important in Kingsbury, Round Hill, Incline Village, Crystal Bay, and elsewhere, which can create other routing and highway crossing challenges to ensure good linkages.

1.1 PURPOSE AND INTENT OF THIS DOCUMENT

This report serves as the final planning-level document for the Bikeway, and incorporates the information developed in previous evaluations and reports. Project-level design activities, environmental review and documentation, and permitting processes for individual segments of the Bikeway are related but future efforts that are needed for the eventual construction of the project.

Portions of the Bikeway corridor between Crystal Bay and Incline Village either have usable facilities in place (e.g., within Incline Village), have been addressed by another agency (e.g., the Crystal Bay area by NDOT), or are subject to site-specific planning that will include bicycle facilities (e.g., redevelopment planning of the casino area at the northern state line). This phase of the project development also includes alignment analysis, project designs, and project-level environmental review documents for a north and a south demonstration project (each demonstration project is about 3 miles in length—the North Demonstration Project area extends from Incline Village to Sand Harbor and the South Demonstration Project extends from Round Hill Pines Beach to the south shore casino area.) The study area for this Feasibility Study includes the entire project corridor; however, detailed analysis of alternative alignments is focused on the area between Sand Harbor and Round Hill Pines Beach.

The organization of this document closely parallels the process followed in developing and evaluating alternative alignments for the Bikeway. The first step in the process, following reconnaissance of the project



corridor, was to develop a vision for the Bikeway and define the objectives and guiding principles for design of the Bikeway. The next step was to divide the project corridor into segments and describe the existing conditions for each segment. The final steps were to develop alignment alternatives for each of the segments and to evaluate the alternatives to determine the most feasible alignment for the Bikeway. The development of alternatives was guided by a set of desired design parameters, a Geographic Information System (GIS)-based suitability model, and an analysis of opportunities and constraints for Bikeway development.

1.1.1 PURPOSE AND NEED FOR THE BIKEWAY

The purpose of the Bikeway is to provide non-auto transportation opportunities that link recreation areas, community centers, transportation facilities, and neighborhoods in the Bikeway corridor to enhance recreational access and broaden transportation choices for residents and visitors to the Tahoe Basin. Separated bicycle facilities are not available along most of the Nevada side of Lake Tahoe. The Bikeway would provide a spectacular recreation opportunity to link public beaches and coves along the picturesque east shore. These popular recreation areas along the east shore are generally accessed by automobile. Paved parking is limited and the high parking demand in these areas leads to shoulder parking and related erosion problems. Providing bicycle links to east shore beaches and recreation areas is an important step toward reducing vehicle and parking impacts, improving the multi-modal options available to residents and visitors, improving safety, and providing an unparalleled bicycle recreation experience.

The current bikeways in the Basin are extremely popular and public surveys show that expansion of the system around the entire lake is desired. A well-planned bikeway is needed on the Nevada side of the Lake to alleviate negative environmental impacts created by current use along the east shore and to provide improved access to recreational facilities.

1.1.2 GUIDING PRINCIPLES AND OBJECTIVES

The working group developed the following 15 principles for guiding Bikeway design:

1. Identify and provide convenient buildable connections to communities, public facilities, public lands, the lakeshore, and open space.
2. Establish separated Bikeway alignments wherever feasible.
3. Serve both recreation and commuter needs, with recreation needs receiving first priority where choices must be made.
4. Support the protection, restoration, and sustainability of natural and cultural resources.
5. Anticipate future growth in the surrounding communities in Nevada and California.
6. Provide for a variety of bicycle and pedestrian uses on the Bikeway, while recognizing and managing potential conflicts.
7. Provide adequate public and private support facilities.
8. Remain sensitive to the cultural resources and traditions of the Washoe Tribe.
9. Design the Bikeway to create social and economic benefits.
10. Provide interpretive opportunities along the Bikeway for natural, cultural, and historic resources.
11. Minimize the number of at-grade crossings on State Route (SR) 28 and U. S. Highway 50 (U.S. 50).
12. Provide connections to existing or new trails to recreation areas, transportation facilities, and community centers along the Bikeway.

13. Where appropriate, enhance and use existing disturbed areas, such as old logging and fire access roads, and take advantage of joint parking opportunities, such as at school sites.
14. Include opportunities for ADA [Americans with Disability Act] accessibility.
15. Provide visitor amenities, such as rest areas and vistas, to make the Bikeway an enjoyable experience.

In addition to the guiding principles, the working group identified 10 objectives for the Bikeway:

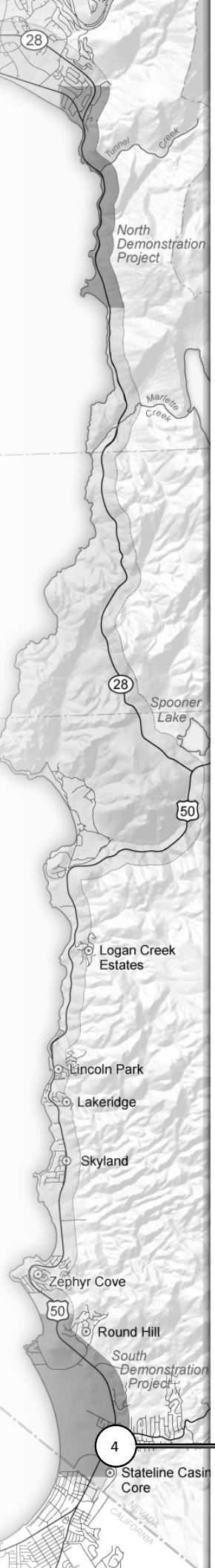
1. Identify feasible bikeway alignments on the Nevada side of Lake Tahoe from the north Stateline to the south Stateline that will connect to adjacent California bikeways.
2. Complete two demonstration bikeway projects, one at the south end of the Lake (connecting the casino core to Nevada Beach and Round Hill Pines Beach) and one at the north end of the Lake (connecting Incline Village to Sand Harbor, with connections to Hidden Beach and Memorial Point).
3. Complete long-term maintenance, resource management, and operations plans for Bikeway segments prior to construction.
4. Establish partnerships for operations and maintenance for each segment prior to approval of construction.
5. Encourage the shift in travel demand for East Shore recreation areas from driving to bicycling, walking, and transit.
6. Respect the Washoe community by involving them in determining ways to protect and interpret Washoe cultural, historic, and natural resources values.
7. Maximize funding source opportunities for timely project implementation and for long-term operation.
8. Provide opportunities for existing local businesses to participate in the process so they can help enhance the visitor experience on, and access to, the Bikeway.
9. Coordinate Bikeway decisions with the recommendations in the East Shore Access Plan and consider other alternative transportation choices.
10. Coordinate with appropriate agencies to incorporate the Bikeway in new development plans and avoid conflicts with road and highway projects.

1.2 PROJECT SCOPE

1.2.1 GEOGRAPHIC AREA (ENTIRE STUDY CORRIDOR)

The project is located along the east shore of Lake Tahoe in Nevada. Lake Tahoe is situated on the border between California and Nevada in the Sierra Nevada at an altitude of about 6,225 feet above sea level. The project area extends from the Nevada state line in Crystal Bay in the north to Stateline, Nevada in the south. The project area can be characterized by four primary sections (presented north to south), with the central corridor further divided into six segments. These sections/segments include:

- Crystal Bay to Incline Village, the location of several existing and planned bicycle facilities;
- Incline Village to Sand Harbor, site of the proposed North Demonstration Project;
- Central Corridor from Sand Harbor to Round Hill Pines Beach, divided into the following six segments:
- Segment A: Sand Harbor to USFS Parking Lot at Secret Harbor Trailhead
- Segment B: USFS Parking Lot at Secret Harbor Trailhead to Skunk Harbor Access Road
- Segment C: Skunk Harbor Access Road to Glenbrook Entrance
- Segment D: Glenbrook Entrance to Cave Rock Drive



- Segment E: Cave Rock Drive to Zephyr Cove
- Segment F: Zephyr Cove to Round Hill Pines Beach Entrance; and
- Round Hill Pines to Stateline, site of the proposed South Demonstration Project.

Because the area from Crystal Bay to Incline Village already supports numerous existing or planned bicycle facilities, and the north and south demonstration projects will undergo independent detailed design and environmental review, this report focuses on the central area between Sand Harbor and Round Hill Pines Beach in the south, a distance of approximately 17 miles, where bicycle facilities are lacking. Much of the project area is undeveloped and characterized by steep rugged terrain that rises dramatically from isolated beaches. Major highways include SR 28 from Incline Village to Spooner Lake, U.S. 50 from Spooner Lake to Stateline, and SR 207 heading east from U.S. 50. The mountains on the east side of SR 28 and U.S. 50 drain to the Lake through steep canyons at several locations. The following section provides a description of the geographical setting of the project area in more detail by segment.

Crystal Bay to Incline Village (Planned and existing facilities)

Length: 2.7 miles

Jurisdictions: Washoe County, USFS, and NDOT

Portions of the corridor between Crystal Bay and Incline Village either have usable facilities in place (i.e., within Incline Village), have been addressed by another agency (i.e., the Crystal Bay area by NDOT), or are subject to site-specific planning that will include bicycle facilities (i.e., redevelopment planning of the casino area at the northern Stateline).

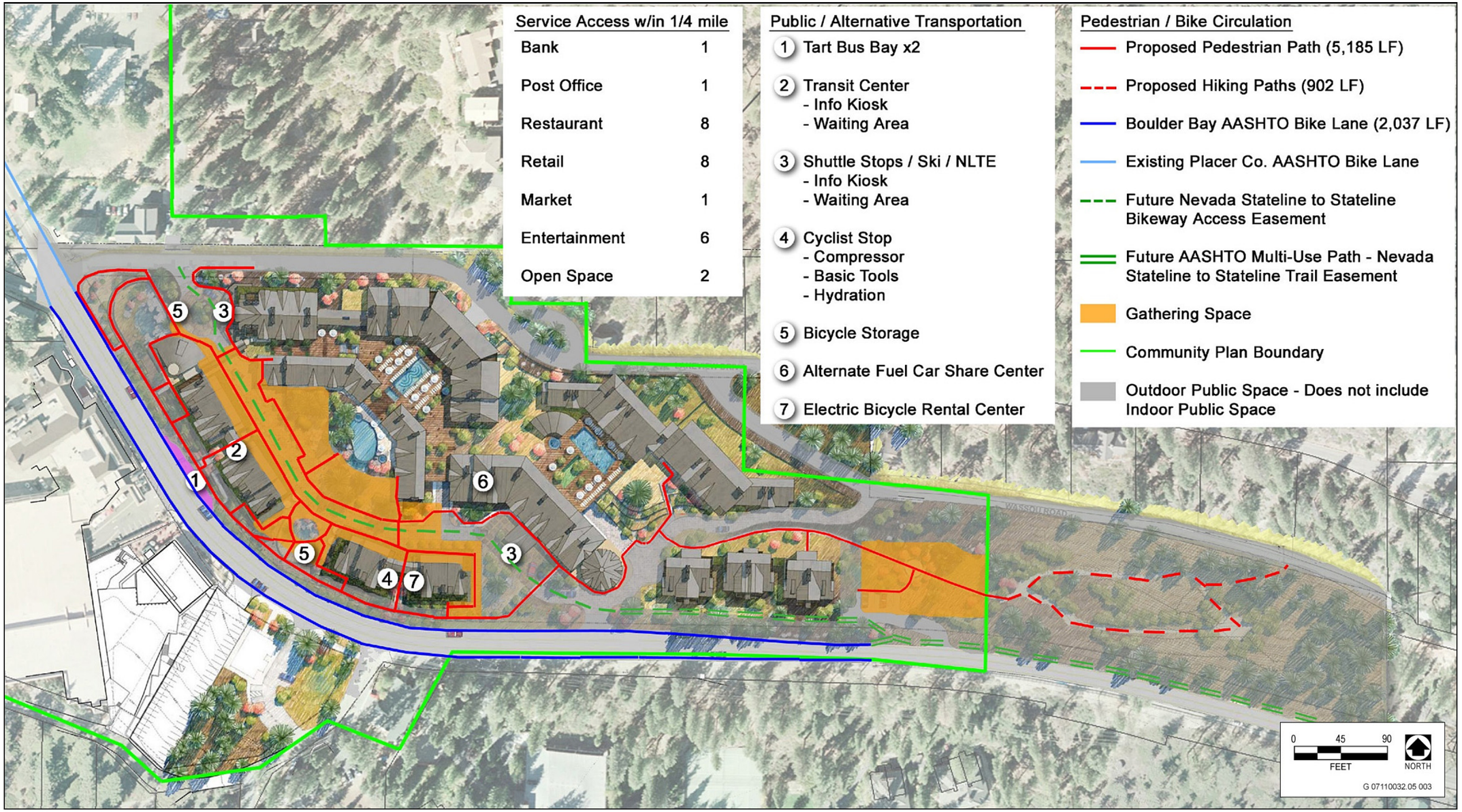
The beginning of the Bikeway in Crystal Bay would pass through the proposed development of Boulder Bay. Plans for this development show the easement for the Bikeway passing through the development on Boulder Way (Exhibit 1) then paralleling SR 28 on the north side of the highway (TRPA 2009a). Between Boulder Bay and Mt. Rose Highway (SR 431), NDOT plans show the Bikeway closely following SR 28 on the north side of the highway (Exhibits 2 and 3). There is an existing separated bike path on the south side of Lakeshore Boulevard between the intersection with SR 28 west of SR 431 in the west and the intersection with SR 28 near Rocky Point in the east.

Incline Village to Sand Harbor (North Demonstration Project)

Length: 2.7 miles

Jurisdictions: Washoe County, State Parks, USFS, and NDOT

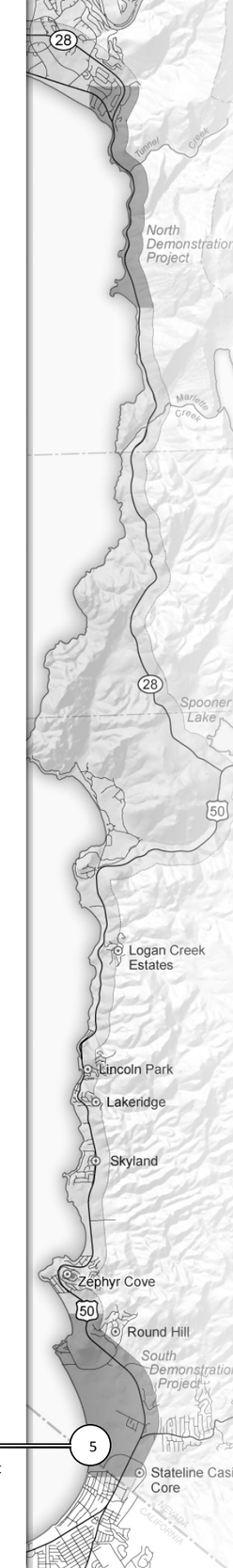
This segment of the Bikeway represents the North Demonstration Project area. The terrain rises rapidly on the east of SR 28, beginning immediately south of Incline Village, and drops sharply toward the Lake on the west side of the highway. Significant geographic features along this segment include Tunnel Creek and Bonpland Creek, both of which extend through steep-walled canyons into Lake Tahoe. Existing facilities along this segment include Hidden Beach, a popular east shore destination; Memorial Point, a vista point with a parking lot and restrooms; and Lake Tahoe-Nevada State Park at Sand Harbor, which has beaches, boat launch facilities, several parking lots, restrooms, and a concessionaire facility.



Source: Hauge Brueck Associates

Boulder Bay Proposed Project Pedestrian and Bike System

Exhibit 1



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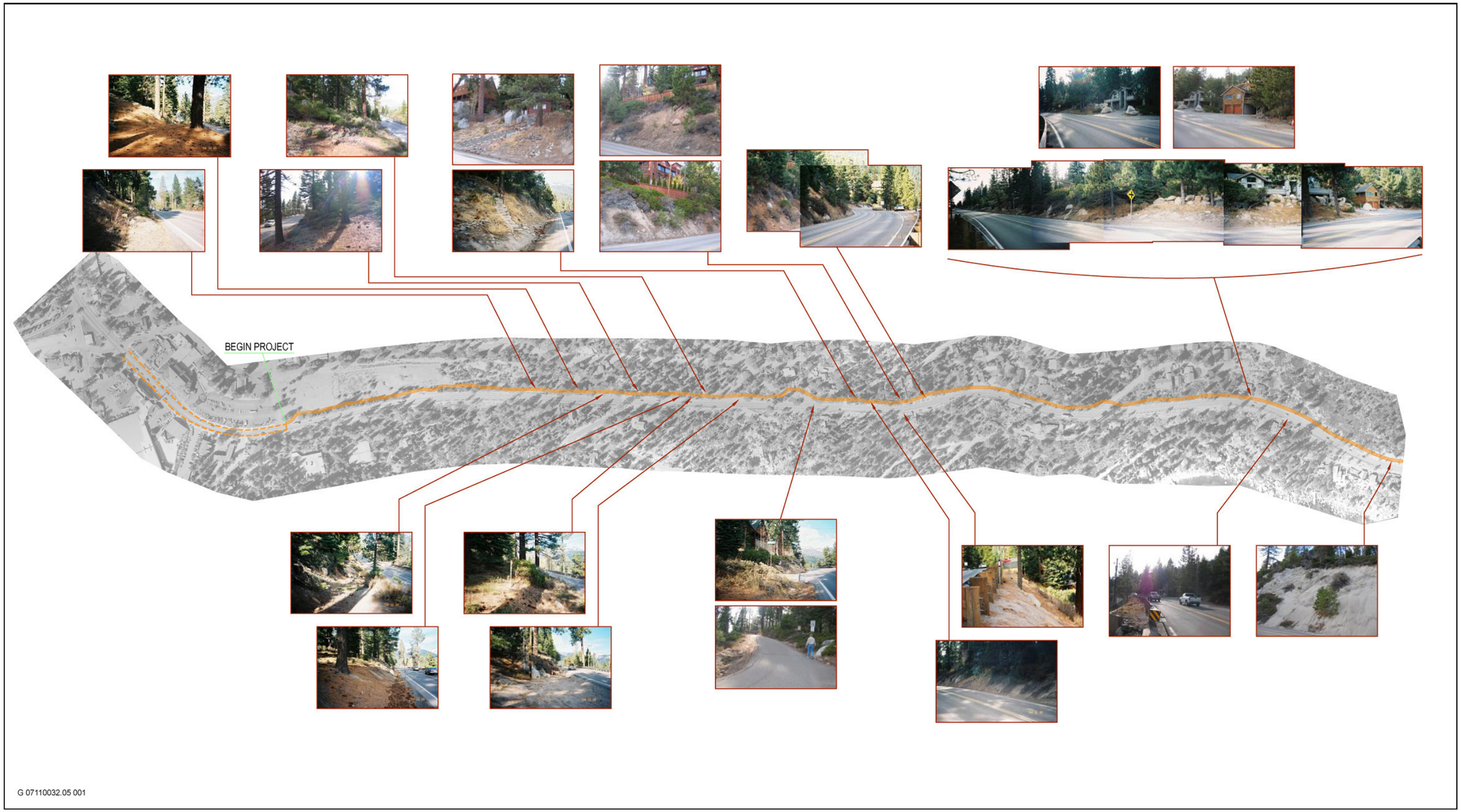
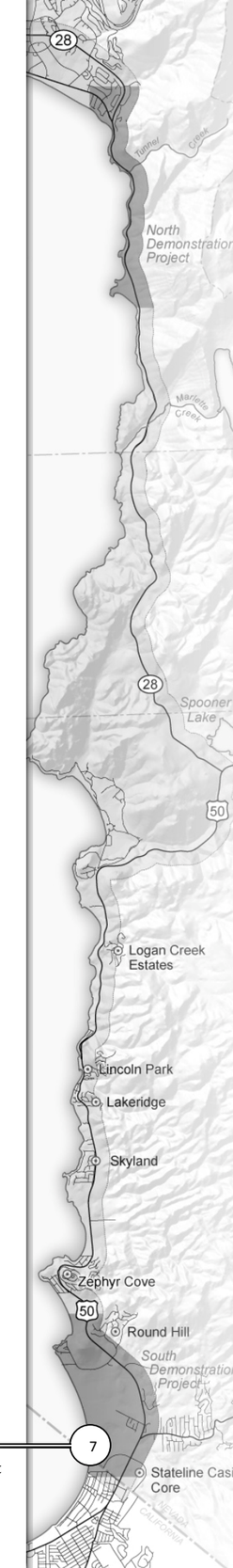


Source: Wood Rodgers

SR 28 Bike Path

Exhibit 2



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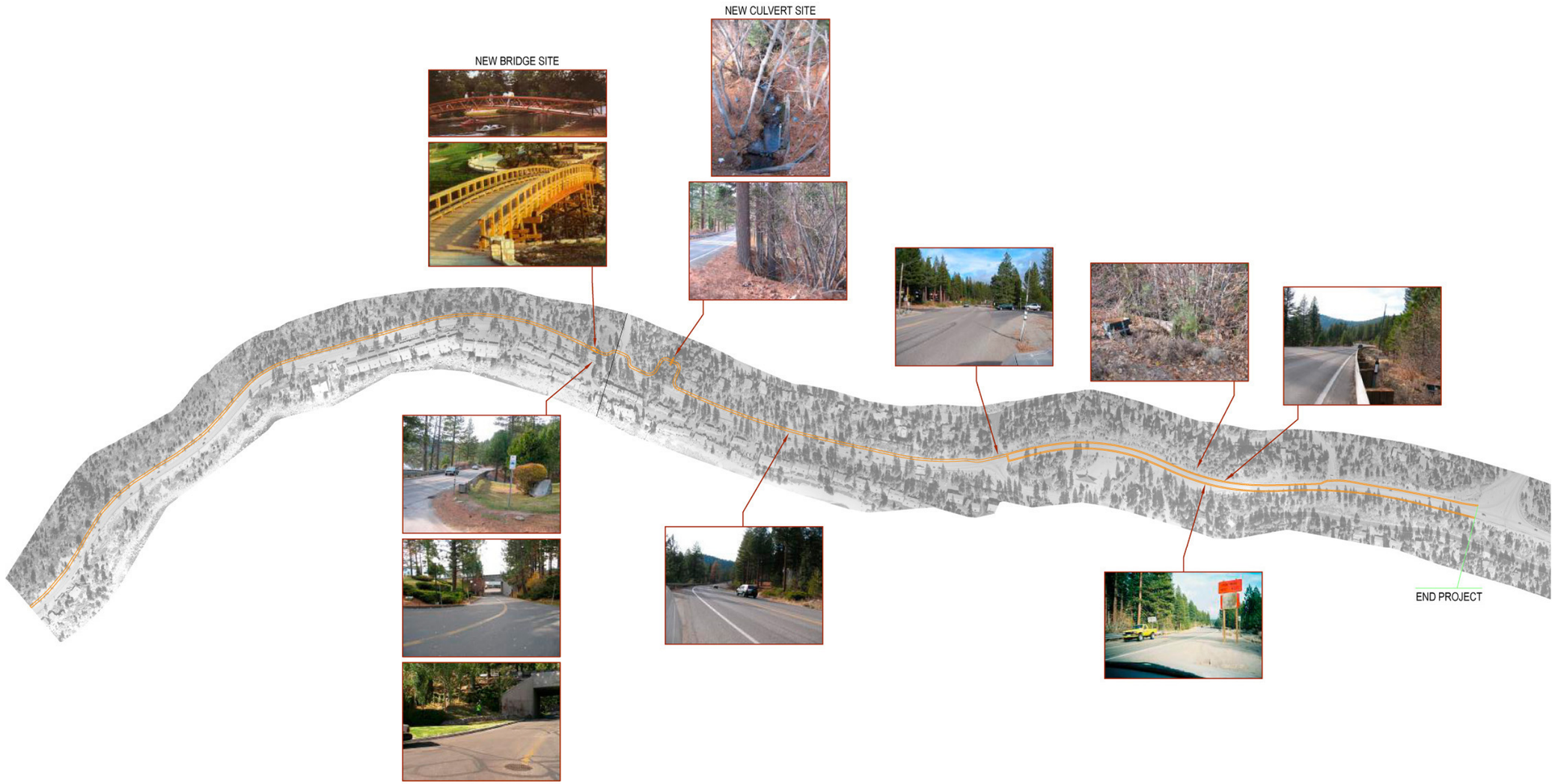
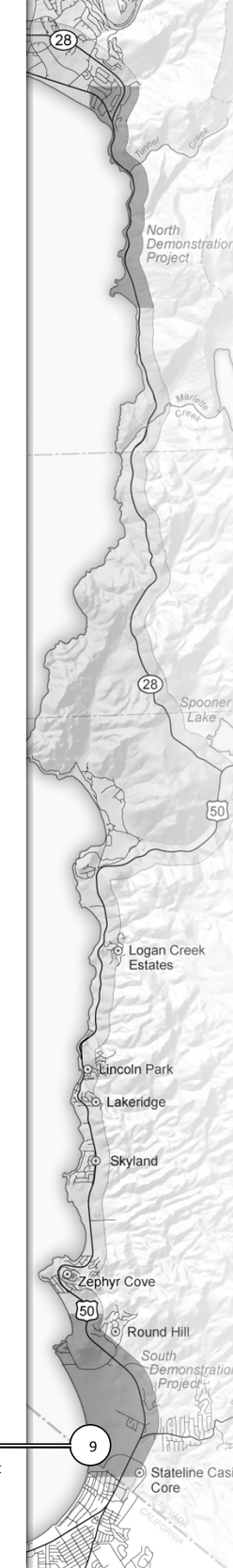


Source: Wood Rodgers

SR 28 Bike Path

Exhibit 3



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Sand Harbor to USFS Parking Lot at Secret Harbor Trailhead (Segment A)

Length: 2.8 miles

Jurisdictions: Washoe County, Carson City, State Parks, USFS, and NDOT

From Sand Harbor southwards, State Parks and National Forest System (NFS) lands managed by the Lake Tahoe Basin Management Unit (LTBMU) are located on either side of the Bikeway for approximately 1.3 miles. Further south, private property (Thunderbird Lodge) is located on the west side of the highway until the crossing of Marlette Creek (which forms the southeastern boundary of the Thunderbird Lodge property, and runs from Marlette Lake to Lake Tahoe). At the Marlette Creek crossing, there is a USFS access gate to Chimney Creek Beach and a loop trail to the beach and back to SR 28. Chimney Creek Beach is a popular beach and hiking opportunity at Marlette Creek's terminus at Lake Tahoe. Two parking lots are located in the vicinity; one on the east side of SR 28 opposite the Marlette Creek Trail access point, and another on the west side of SR 28 a quarter of a mile to the south. Most of the existing public access facilities are on the west side of SR 28.

Continuing south from Sand Harbor, the terrain is very steep, rising from the Lake approximately 2,000 feet to Herlan Peak and Marlette Peak. South of Marlette Creek to Secret Harbor, the terrain is characterized by rolling hills that are somewhat steeper on the east side of SR 28.

USFS Parking Lot at Secret Harbor Trailhead to Skunk Harbor Access Road (Segment B)

Length: 3.0 miles

Jurisdictions: Carson City, USFS, and NDOT

This segment of the Bikeway is located on NFS lands from Marlette Creek to the northern end of Slaughterhouse Canyon. Secret Harbor has a small parking lot and restroom facilities at the trailhead that leads to the harbor. Existing trails to the beach at Secret Harbor serve as USFS maintenance roads. A maintenance road serves as an access to three private parcels south of Secret Beach.

Continuing south from Secret Harbor, the terrain remains steep until Secret Harbor Creek. Where SR 28 crosses Secret Harbor Creek, the terrain levels on the east side of SR 28 until reaching the gated NFS road that provides access to Skunk Harbor and Slaughterhouse Canyon Road.

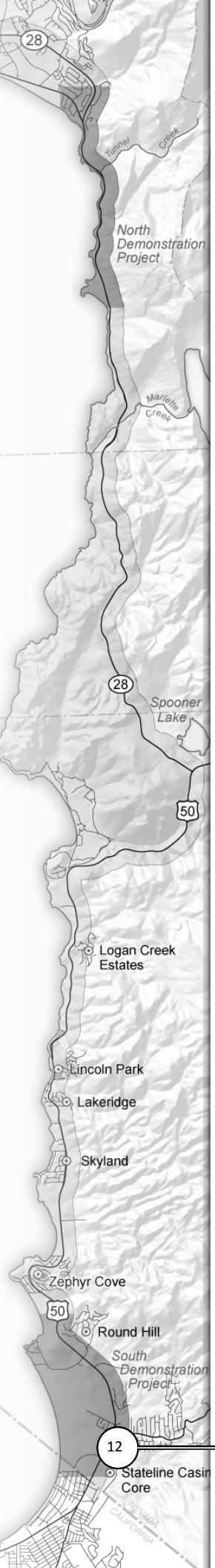
Skunk Harbor Access Road to Glenbrook Entrance (Segment C)

Length: 3.0 miles

Jurisdictions: Carson City, Douglas County, USFS, and NDOT

This segment of the Bikeway allows for three distinct alignment choices to address the challenges of private property (Glenbrook) and steep terrain. Slaughterhouse Canyon runs generally north-south from Skunk Harbor to Glenbrook Bay on the east side of the steep hills that form the peninsula known as Deadman Point. Prey Meadows is located at the north end of canyon. To the east of Slaughterhouse Canyon, the terrain is characterized by steep hills until reaching a meadow on the east side of SR 28 approximately 1 mile prior to the junction with U.S. 50 (Spooner Junction).

Between Spooner Junction and the entrance to Glenbrook, the terrain is dominated by steep hills surrounding the canyon formed by Glenbrook Creek, which generally runs east to west, draining into Lake Tahoe at Glenbrook Bay. Prominent peaks in this area include Captain Pomin Rock east of Glenbrook, and Shakespeare Point and South Point, which form a canyon south of Glenbrook. Lake Tahoe-Nevada State Park at Spooner is popular for its fishing, wildlife, and wildflowers; it also serves as a starting point for many



backcountry trails. This park has parking, restrooms, picnic areas, rustic backcountry cabins, and hiking trails. The terrain on the west side of U.S. 50, south of Shakespeare Point, is characterized by more gentle slopes leading to Lake Tahoe, whereas the terrain on the east side of U.S. 50 remains steep and rugged.

Glenbrook Entrance to Cave Rock Drive (Segment D)

Length: 2.4 miles

Jurisdictions: Douglas County, State Parks, USFS, and NDOT

This segment of the Bikeway includes more subdivisions and private homes that front onto Lake Tahoe than previous segments. At the entrance to Glenbrook, U.S. 50 is bounded on both sides by private property. NDOT right-of-way markers are located down slope from the highway on the west side. The embankments are steep, and in several places there are guard rails and retaining structures. There are also drainage structures within the NDOT right-of-way that would need to be crossed; some of these appear to be recently constructed.

Seven private driveways on the west side of U.S. 50 would have to be crossed by the bike path; some of these are steeply ramped parallel to U.S. 50 with restricted sightlines that could present safety concerns.

South of Logan Shoals, the terrain continues to be characterized by steep hills to Cave Rock, a promontory that extends into Lake Tahoe. Cave Rock has spiritual significance to the Washoe Tribe. Until U.S. 50 was widened, traffic was diverted around the rock on a bridge-like structure above Lake Tahoe. On the north side of Cave Rock, existing right-of-way next to the Lake is very limited. On the south side of Cave Rock, U.S. 50 descends steeply. A State Parks boat launch is located to the south of Cave Rock on the west side of U.S. 50. Public facilities and parking are available at Lake Tahoe-Nevada State Park at Cave Rock.

Cave Rock Drive to Zephyr Cove (Segment E)

Length: 2.4 miles

Jurisdictions: Douglas County, State Parks, USFS, and NDOT

This segment of the Bikeway consists of 1.5 miles of private property fronting onto the west side of U.S. 50 (Skyland and Lakeridge neighborhoods). Most of the roads that parallel U.S. 50 on the west side within these subdivisions are public roads. It may be possible to acquire easements at the ends of these streets and link them into a bikeway that would consist of a bike lane in these sections. NFS lands are adjacent to the south end of the Skyland subdivision and continue to the south.

South of Cave Rock, the terrain gradually levels near the shoreline. East of U.S. 50 the terrain is characterized by steep east-to-west trending ridges with creeks that drain into Lake Tahoe.

Zephyr Cove to Round Hill Pines Beach Entrance (Segment F)

Length: 2.0 miles

Jurisdictions: Douglas County, State Parks, USFS, and NDOT

This segment of the Bikeway is characterized by NFS lands on the northern and southern ends, with predominantly private lands in the Zephyr Cove subdivision in the middle. The Presbyterian Conference Center is located on the west side of U.S. 50 in the middle of the curve at Zephyr Point. Steep terrain and private property limit alignment opportunities on the east side of U.S. 50. Concessionaire facilities are available at Zephyr Cove and Round Hill Pines Beach.

Hills at Zephyr Point and Elk Point frame a flatter area around Marla Bay.

Round Hill Pines to Stateline (South Demonstration Project)

Length: 3.2 miles

Jurisdictions: Douglas County, State Parks, USFS, and NDOT

This segment of the Bikeway represents the proposed South Demonstration Project area. Located in Douglas County, this segment begins approximately 0.3 mile north of the entrance to Round Hill Pines Beach and ends on Lake Parkway at the Nevada/California border in the south shore casino core. This segment would be entirely on the west side of U.S. 50 and is approximately 3.2 miles long, of which approximately 2.2 miles is proposed on NFS lands.

South of Round Hill Pines, the terrain is relatively flat all the way to the Nevada/California border.

1.2.2 EXISTING CONDITIONS (FROM INCLINE VILLAGE TO STATELINE)

Because the area between Crystal Bay and Incline Village has either existing or planned bicycle facilities, the study area for the following discussion of existing conditions is the area between Incline Village and Stateline, Nevada, where no existing trails exist.

Land Use

Lands at the north and south ends of the study area (Incline Village to Stateline) are generally privately owned residential (ranging from multi-family to lower-density, single-family homes) or commercial areas. In Incline Village and near the casino core, much of the beach access is privately controlled. Bikeway development along these areas is constrained by this private property and development.

Most of the land between Incline Village and Spooner Summit is undeveloped open space managed by the USFS and State Parks. The Lake Tahoe-Nevada State Park Development Plan, which is anticipated to be updated in the next several years, includes a recommendation to construct a bicycle and pedestrian trail between Incline Village and the Spooner Lake area. Between Spooner Junction (the intersection of SR 28 and U.S. 50) and SR 207 (Kingsbury Grade) the lands adjacent to U.S. 50 are mostly privately owned residences, residential developments, or NFS lands managed by the LTBMU.

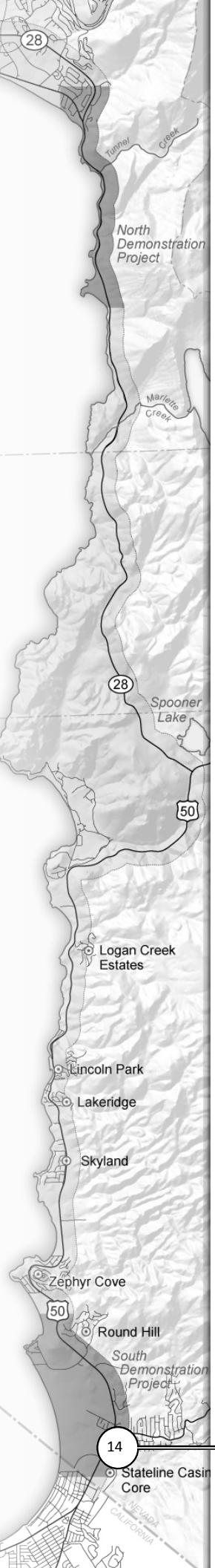
Commercial/mixed use areas are concentrated along the southern end of this section of U.S. 50 at Zephyr Cove, Elks Point Road, and between Kahle Drive and the casino core.

Land Ownership

USFS manages the majority of the publicly owned lands along the east shore of Lake Tahoe; most of the NFS lands are south of Sand Harbor. State Parks, the other major public land owner, manages the land along the shoreline and extending approximately 4 miles to the east from just north of Tunnel Creek to approximately 0.5 mile south of Sand Harbor. State Parks also manages land between Marlette Lake and Spooner Lake generally following North Canyon Road and extending west into Prey Meadows near Slaughterhouse Canyon; at Lake Tahoe-Nevada State Park at Cave Rock; and at Van Sickle Bi-State Park.

NDOT owns the right-of-way (including the roadway and shoulders) along the SR 28, U.S. 50, and SR 207 corridors. Washoe and Douglas Counties own the right-of-way on public roads that are not under the jurisdiction of NDOT.

Private property within the study area is primarily owned by individual, residential property owners with parcels ranging in size from less than 1 acre to greater than 40 acres. Other entities with private property holdings include the Thunderbird Lodge Preservation Society, Elks Point Country Club, Edgewood Golf Course, Glenbrook Homeowners Association (HOA), and several smaller HOAs.



Privately owned lands are located throughout the study area, but are more prevalent south of the SR 28/U.S. 50 junction.

Major residential communities and/or subdivisions in the southern portion of the study area include Glenbrook, Logan Creek Estates, Cave Rock, Lakeridge, Skyland, Zephyr Cove, Marla Bay, Zephyr Heights, Round Hill Village, Lake Village, Kingsbury, and Stateline.

As of August 2010, three planned private developments on the south end of the study area are in various stages of the planning, design, and environmental review process:

- The Beach Club on Lake Tahoe Project, which would replace an existing mobile home community with a private, gated condominium complex with a swim and beach club, is located near the shoreline in Stateline; this project was approved by TRPA in August 2008.
- The Sierra Colina Village Project is a proposed multi-family residential development in Stateline that includes plans for bicycle trail linkages to recreational, commercial, and residential areas on the east side of U.S. 50. The environmental document was certified in June 2009 and the project was subsequently approved by the TRPA Governing Board.
- The proposed Edgewood Hotel and Golf Course Realignment Project in Stateline is undergoing environmental review.

Recreation

Many formal and informal recreational facilities and resources exist on the east shore of Lake Tahoe. The shoreline has numerous beaches and boating areas that are popular summer lake destinations, and the mountains to the east offer hiking and mountain biking trails. Currently, only a few of these facilities have designated parking lots, which has led to a considerable amount of illegal on-street parking along SR 28 that has contributed to increased erosion and degradation of the roadway shoulders. A more detailed description of existing recreational facilities is provided in Section 2, Existing and Planned Bicycle and Pedestrian Infrastructure.

Traffic, Transit, and Safety

Signalized Crossings and Pedestrian Crosswalks

Six signalized crossings (at Zephyr Cove, Elks Point Road, Kahle Drive, SR 207, Lake Parkway, and Stateline Avenue) and three pedestrian crosswalks (at Lyons Avenue, Lakeridge Drive, and Marla Bay) are located within the study area.

Parking Facilities

There are approximately 1,653 off-highway parking spaces and 449 on-highway shoulder parking spaces along U.S. 50 and SR 28. The distribution of designated parking facilities is shown in Table 1.

Public Transit

Improving transit access to the Bikeway is another key solution to the parking limitations in the study area. Transit access would allow visitors to use the Bikeway in one direction and take a bus back to their vehicle or hotel. It would also facilitate the use of off-site parking lots, ferrying people back and forth to the Bikeway at different locations.

Tahoe Area Regional Transit (TART) serves the northern and western shores of Lake Tahoe between Incline Village and Sugar Pine Point, California; it provides connections to the northernmost part of the Bikeway from surrounding areas and is operated by Placer County.

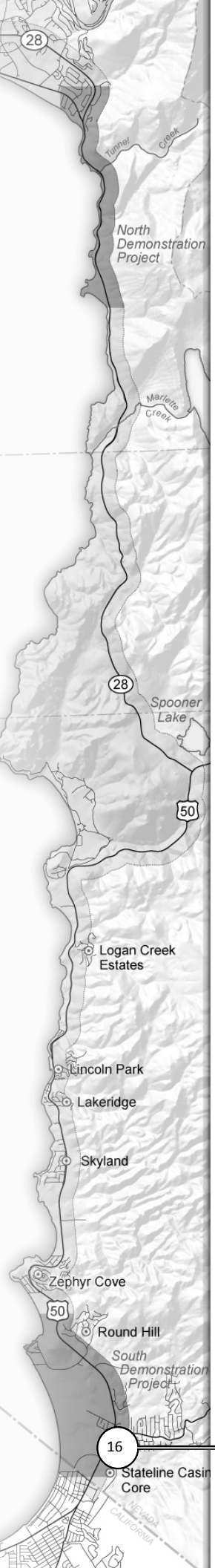
Table 1
Location and Quantity of Parking

Off-Highway Parking Areas	
Location	**Number of Spaces**
Memorial Point	20[2]
Lake Tahoe Nevada State Park at Sand Harbor	512[3]
East Shore Beach Trailhead Secret Harbor/Chimney Creek	51[3, 4]
NSP and NDOT East and West Lots at Spooner Lake	58[1]
Juncture SR 28 & U.S. 50	50[3]
Lake Tahoe Nevada State Park at Cave Rock	63[3]
Zephyr Cove Marina/Resort	240[3]
Round Hill Pines Beach/Marina	120[3]
Nevada Beach at Elks Point Drive	179[2]
Lam Watah Trailhead	10[2]
Kahle Community Park and Center	200[3]
Edgewood Golf Course	150[3]
On-Highway Shoulder Parking Areas	
Location	**Number of Spaces**
SR 28 north of Lakeshore Boulevard	15[2]
North of Memorial Point	28[1]
Memorial Point to Sand Harbor/Scenic Overlook	4[1]
Sand Harbor to 1 mile South of Secret Harbor	96[1]
1 mile South of Secret Harbor to just S. of Skunk Harbor	118[1]
Skunk Harbor	16[1]
Scenic Overlook	18[4]
Washoe/Carson City line to just North of Secret Harbor	134[1]
Logan Shoals Vista Point	20[3]

Notes:
1 Source: Tahoe Regional Planning Agency. (January 5, 2001). Draft East Shore Access Plan. Zephyr Cove, NV. Prepared by Harding ESE, Carson City, NV.
2 Source: Site visit conducted by Alta Planning + Design on September 16 and 17, 2008.
3 Source: GIS layers provided by TRPA and USFS dated 2008.
4 Source: TRPA annual counts, Spooner Lake to Incline Village, 2008. Weighted weekly average from Saturday and Wednesday data.

BlueGO is comprised of bus routes that are operated by the City of South Lake Tahoe, several casinos, Heavenly Mountain Resort, and Douglas County. BlueGO's demand-responsive services provide connections to Douglas County, and a flexible route (the Nifty 50 Trolley) serves Zephyr Cove. All of the buses are equipped with racks for two bicycles, and drivers may allow additional bicycles inside the bus at their discretion.

In addition to these public transit options, Flume Trail Mountain Bikes operates a private shuttle between Spooner Lake, the Tunnel Creek Station, and Tahoe Meadows Rim Trailhead off of the Mt. Rose Highway (SR 431). This service is used regularly, but requires a minimum of four passengers and is relatively expensive as a public transit option.



Topography and Engineering

North of Spooner Junction, the topography is characterized by the steep Carson Range located in close proximity to Lake Tahoe. There is little development between Incline Village and Spooner Summit, allowing for more flexibility in determining the best alignment for the Bikeway. South of Spooner Summit, the Carson Range ridgeline is located further to the east of the Lake than its northern counterpart, creating much shallower slopes and fewer topographic constraints. Development, however, is more pronounced in this reach. Potential alignment options may be limited to narrow corridors of public land, roadway easements, and right-of-way located in patchy areas along Lake Tahoe; along the U.S. 50 corridor; and east of U.S. 50 above Lake Tahoe on NFS land.

2 EXISTING AND PLANNED BICYCLE AND PEDESTRIAN INFRASTRUCTURE

2.1 EXISTING FACILITIES

In Nevada, bicycle planning is guided by the standards established by the American Association of State Highway and Transportation Officials (AASHTO). The AASHTO guidelines identify several categories of bicycle facilities. The most basic and common facility is a “shared roadway,” in which bicyclists share the roadway with other vehicles. In some locations, bicycle route signs are used to indicate a “signed shared roadway” to provide continuity to other bicycle facilities or designate preferred routes through high-demand corridors. A “bike lane” or “bicycle lane” includes pavement markings and signage and is intended to delineate the right-of-way assigned to bicycles and motorists. Lastly, a shared-use path is a facility that is physically separated from motorized traffic by an open space or barrier and either within the highway right-of-way or within an independent right-of-way. This is similar to a Caltrans Class I bike path. Shared-use paths may be used by pedestrians, skaters, wheelchair users, joggers, and other non-motorized users (AASHTO 1999). In addition to AASHTO standards, Appendix A of the Lake Tahoe Bicycle and Pedestrian Plan provides recommendations for bike path design and maintenance that are applicable to the Bikeway. These standards are consistent with the AASHTO standards (TRPA and TMPO 2010)

2.1.1 BICYCLE FACILITIES

While there are numerous bicycle facilities within the Tahoe Basin, very few are located within the feasibility study area. Most shared-use paths are concentrated in the communities of Tahoe City and Incline Village in the north shore and the City of South Lake Tahoe in the south shore. On the west shore, there is an existing Class 1/shared-use path that extends from Sugar Pine Point State Park through Tahoe City, and north to Squaw Valley. In the south shore area, there is a 3.5-mile section of Class I bike path that extends from 15th Street in South Lake Tahoe, through Camp Richardson, and north to Spring Creek Road. There are many other smaller separated paths located in the communities of Stateline, Nevada and Meyers and Kings Beach, California. The two major gaps in the system are connections along the east shore of Lake Tahoe (which the Bikeway project will address) and a connection around the Emerald Bay area on the west shore in California.

There are a considerable number of bicycle lanes and routes in the communities around the Lake, particularly in South Lake Tahoe, Meyers, and Incline Village. South Lake Tahoe and Meyers have bicycle lanes on six of the 11 major roadways in these communities. An 8-mile, continuous bicycle lane is located along Pioneer Trail, between Meyers and Stateline. There is also a 3.5-mile continuous bicycle lane along SR 28 in Incline Village. The California Department of Transportation (Caltrans) is currently leading an effort to provide bicycle lanes or shoulder widening on all major highways on the California side of the Lake. Two

bicycle lane and shoulder projects, on SR 28 from Dollar Hill to Kings Beach in the north shore, and on SR 89 from Meyers to the El Dorado/Alpine County line in the south shore, were under construction in spring 2010.

A system of shared-use paths and bicycle routes connects the South Tahoe "Y" to Stateline with the exception of two gaps in the system. These two gaps include a section along the Lake from El Dorado Beach to Ski Run Boulevard, and a section along Harrison Avenue. The City of South Lake Tahoe is undertaking a project to construct a shared-use path on the section between El Dorado Beach and Ski Run Boulevard, which is currently undergoing environmental review.

Table 2 displays the miles of existing bicycle and pedestrian facilities by jurisdiction and class in the region.

Table 2
Miles of Existing Bicycle and Pedestrian Facilities

Jurisdiction	Class I / Shared-use Path	Class II / Bike Lane	Class III / Bike Route	Sidewalk	Total
El Dorado County, CA	9	7	4	0	20
City of South Lake Tahoe	8	8	9	4	29
Placer County, CA	14	2	2	1	19
Douglas County, NV	2	0.1	1	1	4.1
Washoe County, NV	10	4	7	6	27
Carson City, NV	0	0	0	0	0
Total	**43**	**21.1**	**23**	**12**	**99.1**
Source: TRPA and TMPO 2010:36					

2.1.2 SIDEWALKS

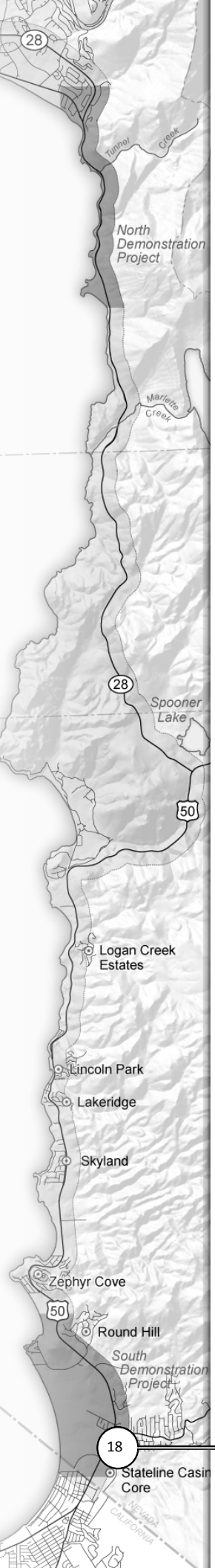
Most of the major pedestrian facilities in the Basin are shared-use paths that are used by both bicyclists and pedestrians. Some communities in the Basin, such as South Lake Tahoe, Incline Village, and Tahoe City have sidewalk systems in addition to existing shared-use paths. There are some significant gaps in the sidewalk network in South Lake Tahoe and Kings Beach, both of which have high volumes of pedestrians. Sidewalk projects are currently planned along portions of U.S. 50 in South Lake Tahoe and on SR 28 through Kings Beach (TRPA and TMPO 2010:37).

2.1.3 EXISTING SUPPORT FACILITIES

Adequate support facilities are a critical part of any bike path system. Bicycle and pedestrian support facilities include things such as bicycle racks, bicycle lockers, restrooms, and shower facilities. Without support facilities, bicycling and walking are likely to be more limited activities. Some public facilities (e.g., schools, libraries, transit stations, and recreation centers) in the Basin have some form of bicycle rack. Designated bicycle parking is also provided at some government buildings, office buildings, retail centers, public spaces, and parks (TRPA and TMPO 2010:36).

2.2 PLANNED RECREATION INFRASTRUCTURE

This section summarizes Section 7, "Proposed Network," of the Draft Lake Tahoe Region Bicycle and Pedestrian Plan 2010 (Bicycle and Pedestrian Plan) (TRPA and TMPO 2010).



The Bicycle and Pedestrian Plan for the Tahoe Basin includes a total of 166 miles of new bicycle and pedestrian shared-use paths, bicycle lanes, bicycle routes, and sidewalks; as well as 97 miles of non-standard facilities (see Table 3).

Table 3
Miles of Proposed Bicycle and Pedestrian Facilities

Jurisdiction	Shared-Use Path	Bike Lane	Bike Route	Sidewalk	Other[1]	Total
El Dorado County, CA	22	9	14	0	39	84
City of South Lake Tahoe	8	10	8	7	0.1	33.1
Placer County, CA	16	15	1	4	28	64
Douglas County, NV	14	1	1	2	15	33
Washoe County, NV	12	12	0	6	10	40
Carson City, NV	4	0	0	0	5	9
Total	**76**	**47**	**24**	**19**	**97.1**	**263.1**

Note:
[1] Includes Tahoe Scenic Bike Loop, Shoulder Widening, and Bicycle Ferry.
Source: TRPA and TMPO 2010:76

2.2.1 PROPOSED SHARED-USE PATHS, BICYCLE LANES, AND BICYCLE ROUTES

The proposed system continues the focus on providing a strong, off-street network of shared-use paths, connecting neighborhoods with commercial centers and recreation destinations. In addition to the Bikeway, planned shared-use paths depicted in the Bicycle and Pedestrian Plan in the vicinity of the east shore include a section of path along SR 431, several path sections north of SR 28 between Tahoe City and SR 267, a path from Meyers to Kingsbury Grade, El Dorado Beach to Ski Run Boulevard, and a short segment from Kingsbury Grade to Elk Point Road along U.S. 50.

2.2.3 PROPOSED SIDEWALKS

The majority of new sidewalks in the vicinity of the Bikeway are located in South Lake Tahoe, Incline Village, and Kings Beach. Sidewalks in South Lake Tahoe will be constructed in conjunction with a Caltrans water quality project. In Kings Beach, new sidewalks along SR 28 are planned to be constructed as part of the upcoming commercial core improvement project.

2.2.4 PROPOSED SUPPORT FACILITIES

The Bicycle and Pedestrian Plan calls for specific types and amounts of bicycle parking, lockers, and showers to be included in all new development. If appropriate, TRPA Code of Ordinances language will be adopted related to bicycle parking when the Regional Plan is adopted. The City of South Lake Tahoe, in collaboration with the Lake Tahoe Bicycle Coalition, is instituting a new program to distribute bicycle racks to businesses that need them.

2.2.5 PROPOSED INTER-REGIONAL AND MULTI-MODAL BICYCLE CONNECTIONS

Connectivity is a key concern in the development of bicycle and pedestrian plans. Inter-regional connections included in the Bicycle and Pedestrian Plan include a proposed shared-use path (the Northstar Trail) connecting Kings Beach to Northstar and the Martis Valley, and a shared-use path over SR 431 connecting Incline Village to Reno. Other inter-regional connections are proposed using Class II bicycle lanes.

3 OPPORTUNITIES AND CONSTRAINTS

3.1 BACKGROUND INFORMATION

This section includes a brief summary of the opportunities and constraints associated with the Bikeway project (from the north starting at Incline Village to the south at the Stateline casino core). The information in this section is derived from Chapter 3, "Opportunities and Constraints," of the *Nevada Stateline-to-Stateline Bikeway Project Opportunities and Constraints Evaluation Report* (TRPA 2009b). The full Opportunities and Constraints Report is available on the project website at http://www.nvtahoebikeway.com. Because the area between Crystal Bay and Incline Village already has existing bike paths or plans for bike paths, this section focuses on the area between Incline Village and Stateline, Nevada.

3.2 KEY OPPORTUNITIES AND CONSTRAINTS

3.2.1 LAND COVERAGE REQUIREMENTS

Land capability and coverage in the Lake Tahoe Basin is managed primarily by TRPA. Land capability and coverage provisions are found in Chapter 20, "Land Coverage Standards," of the TRPA Code of Ordinances.

Since February 10, 1972, the land capability classification system known as the "Bailey System" (*Land-Capability Classification of the Lake Tahoe Basin, California-Nevada: A Guide for Planning* [USFS and TRPA 1974]) has been used to evaluate applications that request either additional land coverage on existing developed lots or building permits for new development. The Bailey System was developed as an erosion-control technique to mitigate the deleterious effects on stream systems and water quality that result from excessive land coverage. The Bailey System restricts the amount of impervious land coverage on all parcels and generally prohibits new land coverage in areas classified as a stream environment zone (SEZ).

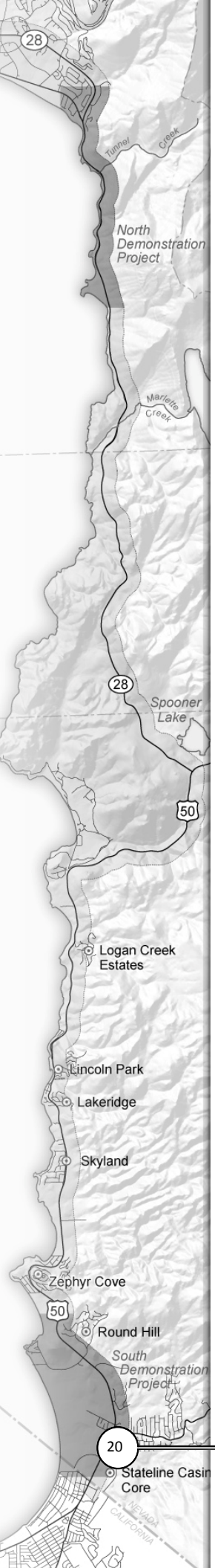
Land capability is defined as "the level of use an area can tolerate without sustaining permanent (environmental) damage through erosion and other causes" (USFS and TRPA 1974). The Bailey System uses land capability district (LCD) classes ranging from 1 to 7, which assign a percentage of land coverage allowable in the designated LCD area (Table 4).

Table 4
TRPA Base Land Coverage Requirements

Land Capability District	Allowable Base Land Coverage
1a, 1b, 1c	1%
2	1%
3	5%
4	20%
5	25%
6, 7	30%

Public Service projects may exceed the amounts presented in Table 4 if necessary to achieve project objectives. Existing approved coverage can be removed and reused on the same parcel or a new project parcel subject to mitigation requirements. Additionally, if coverage is retired on another parcel, that retired coverage can be transferred to the parcel of the new project. The difficulty in assessing available coverage for the Bikeway lies in defining the parcel area, so that allowable coverage can be calculated.

It is important, therefore, to identify existing road alignments and trail systems that can be used for the Bikeway, or possibly abandoned and restored in favor of the Bikeway. Creation of a new alignment without retiring an existing road or trail alignment would create additional coverage transfers needs, which could be



difficult to locate in sparsely developed hydrologic transfer areas (HTA). Making use of existing parking facilities along the route to minimize additional parking improvements is also important.

Opportunities

Use of existing trails for Bikeway alignments, such as Tunnel Creek Road, trails from SR 28 to Secret Harbor, Slaughterhouse Canyon Road, and the informal trail system in Rabe Meadow, would provide opportunities to use existing coverage and minimize the need for new disturbance for trail construction.

Constraints

Coverage constraints include large areas with no existing road or trail alignments that could be used or abandoned in favor of potential alignments. Areas of low land capability or sensitive lands (SEZs, floodplains, creek crossings) are constraining because of the additional coverage restrictions placed upon those lands.

Development within floodplains is regulated under Chapter 28, "Natural Hazards," of the TRPA Code of Ordinances. TRPA generally prohibits development within floodplains unless certain conditions are met (Section 28.3). Because the Bikeway would cross several creeks, consideration must be given to the types of facilities that might need to be placed within a floodplain.

3.2.2 LAND USE PLANNING

Opportunities

Opportunities related to land use include locations where bicycling and hiking are permissible uses, as per most of the Plan Area Statements (PAS) located within the study area; where existing community and regional plans recommend bicycle facilities in the study area; where designated recreational uses (especially those with scenic natural areas) would benefit by trail connections; and areas that are currently in the planning process or that will be shortly, which could provide an opportunity to encourage development of the Bikeway.

Constraints

Most land use constraints are related to private land ownership located adjacent to or within the study area. Existing private development limits public access to certain areas and beaches. Many of the residential PASs specifically state that the area should continue to be residential, thus maintaining the neighborhood's existing character; a shared-use path could be considered out of character with a particular neighborhood. Some PASs specifically exclude bicycling and hiking trails as permissible uses. On NFS lands, mountain bicycling is restricted; this stance may be reconsidered by the responsible agencies along certain trail segments to maximize the desired trail connectivity.

3.2.3 PROPERTY OWNERSHIP

Opportunities

Use of public lands for the Bikeway would provide an opportunity to avoid or reduce the need to acquire private property, thus potentially reducing the project's cost. The greatest opportunities for use of public lands would come from the three major public landowners: USFS, State Parks, and NDOT. Use of County roads and NDOT right-of-ways may also provide an opportunity to minimize the need to acquire new right-of-way from private parcels.

Planned developments at Sierra Colina Village and Edgewood Golf Course in Stateline include plans for bicycle trail linkages, and public beach access and a pedestrian loop system, respectively. The Edgewood

project is undergoing environmental review, during which time it is important to try to incorporate Bikeway connections to the trail systems, if feasible.

Constraints

The primary constraint related to property ownership is the potential limitation of the trail alignment in the southern part of the study area. Several residential subdivisions are located along U.S. 50, and, in some locations, private lands flank both sides of the highway; a separated, shared-use path may not be feasible in these subdivisions. In other locations, the right-of-way needed to construct a shared-use path may exceed the NDOT right-of-way, necessitating the acquisition of private property.

While the use of public lands would minimize the need for private property acquisitions, public lands do not come without their own constraints. The primary concerns raised by public agencies with east shore land management responsibilities regarding use of their property for the Bikeway have been: (1) limited parking, funds, and staff to support visitation resulting from additional bicycle access; (2) existing recreation facilities that are at or above capacity; (3) conflicts with existing or planned recreation uses; (4) consistency with agency plans, goals, and objectives; and (5) long-term maintenance responsibilities.

3.2.4 RECREATION

Opportunities

The Bikeway would provide an opportunity to improve non-motorized access to east shore beaches, parks, and recreation areas, which could reduce vehicular congestion at these facilities. In locations where existing recreational facilities are operating at capacity, the Bikeway should be designed, to the extent feasible, to reduce vehicle use by providing connections to existing bicycle paths and trails. Use of these existing trails would also minimize construction costs and new disturbance. The Bikeway should provide connections to existing bicycle and pedestrian facilities, including sidewalks, pedestrian trails, and shared-use paths.

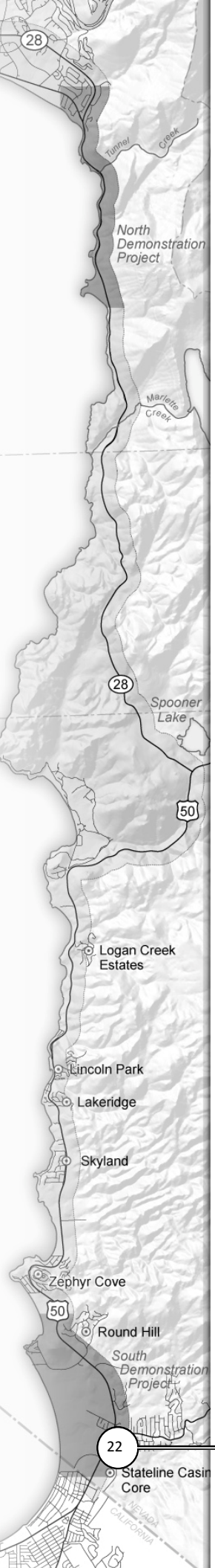
Constraints

The Bikeway has the potential to increase demand on State Parks and USFS recreation facilities that are already at capacity during peak days. The potential increase in demand could diminish the desired user experience, adversely affect sensitive resources, and require additional facilities and new patrol and maintenance staffing, for which additional funding has not been identified. The Bikeway will require regular maintenance of the trail surface as well as routine trash collection and restroom servicing, particularly in areas where trail users cannot access existing facilities.

3.2.5 TRAFFIC, TRANSIT, AND SAFETY

Opportunities

Existing signalized and pedestrian crossings, public and private parking, and transit services available in the study area would provide a good baseline for the Bikeway project. Approximately 2,090 legal parking spaces are currently available in the study area (including off-highway parking lots and highway shoulder parking areas). Additionally, 45 new spaces were identified in the *East Shore Access Plan*, and additional parking could be provided at the intersection of SR 28 and U.S. 50. Further, Bikeway users could be encouraged to access the trail directly from South Lake Tahoe or Incline Village, or via a more remote parking lot. In terms of private parking, Bikeway users could potentially use existing parking within the Spooner Lake Management Unit of Lake Tahoe-Nevada State Park. This may also support a concessionaire's bicycle rental or other business in the area. The parking garage at Kahle/Kingsbury Transit Center provides an opportunity for a staging location for South Shore Bikeway users.



There are three transit center locations in the study area: the Tunnel Creek Shuttle Station at the north end of Tunnel Creek Road (used by Flume Trail Mountain Bikes), the Tahoe Transportation Center in Stateline across from Kahle Drive, and the Heavenly Village Transit Center in South Lake Tahoe near Heavenly Village. Existing BlueGo bus routes are located along SR 207 and U.S. 50; all of the BlueGo buses are equipped with racks for two bicycles, and drivers may allow additional bicycles inside the bus at their discretion. Additionally, the Nifty 50 Trolley, the former STAGE, and BusPlus services exist along this portion of U.S. 50. If transit service were extended along the Bikeway project corridor, key locations for providing transit service to serve Bikeway users would include Sand Harbor, the Chimney Creek/Secret Harbor trailhead, Spooner Lake, and the juncture of SR 28 and U.S. 50.

Constraints

Constraining factors related to traffic, transit, and safety along the study area include at-grade crossings, undercrossings, and overcrossings of SR 28, depending on the geographic conditions at each crossing; each of these methods comes with benefits and drawbacks. There is a shortage of existing parking facilities (particularly for the additional visitors who would come specifically to enjoy the Bikeway) and limited space for parking expansion. If the Spooner Lake parking area were opened for Bikeway access, it would constrain space for current park users; additional usage would also increase demand and may require increased staffing. The parking problem is compounded by the lack of transit facilities along the route (particularly SR 28), which would provide an alternative to parking at popular trailheads. Safety concerns are associated with using and accessing the Bikeway, and protecting the safety and privacy of neighboring residents.

3.2.6 NATURAL RESOURCES

Opportunities

Aspen stands provide distinct and valuable wildlife habitat and have scenic and cultural values as well. Although aspen stands are sensitive resources and project constraints, and trail alignments should avoid disturbing these resources, trail alignments could be located near these stands to take advantage of their scenic opportunities. Through restoration treatments, conifer encroachment can be reduced, and opportunities for expansion of aspen stands can be created. This would not be a primary opportunity used to select a trail alignment; however it could provide an accessory benefit.

Potential wildlife viewing areas would be an accessory benefit to trail construction and could provide trail users with locations to view common and special status wildlife species in their native habitats. Locations identified include Memorial Point, Secret Harbor, Prey Meadows, and Spooner Lake. Each of these locations could provide quality wildlife viewing opportunities.

Constraints

Tahoe yellow cress is a candidate for listing by the United States Fish and Wildlife Service (USFWS) and is a TRPA special-interest species. Tahoe yellow cress is endemic to beach and dune habitats along Lake Tahoe. Because new trail alignments would not be constructed in beach and dune areas, Tahoe yellow cress is unlikely to be directly affected by project implementation. However, increased access to beaches by recreational users is of potential concern as it could lead to indirect impacts on this species.

All of the mapped aspen stands are located within SEZ boundaries. These stands are considered sensitive resources and project constraints due to their high biological value, unique ecological functions, and regulatory protection; they are also protected by TRPA as deciduous “habitats of special significance.”

Streams and SEZs also provide habitat for numerous common and sensitive plant and animal species, and are protected. Impacts to riparian vegetation and aquatic habitat can be avoided and minimized through

alignment selection and project design. Any remaining potential disturbance or degradation to a stream or SEZ would need to be mitigated through enhancement or restoration. Appropriate restoration actions, methods, locations, and amount should be developed based on the types and magnitude of project impacts on SEZs, as well as site-specific and watershed-level opportunities and constraints for SEZ enhancement. Also, focused pre-construction surveys for sensitive plant and animal species associated with streams and riparian zones may be required to avoid impacts on these species or develop appropriate measures to mitigate potential impacts.

There are 29 osprey nest sites and 12 northern goshawk nest sites located within the study area. Osprey and northern goshawk are designated as sensitive by USFS and as a special-interest species by TRPA. Osprey and northern goshawk nest sites are protected by the TRPA W-1 threshold standard, and "perching trees and nesting sites shall not be physically disturbed, nor shall the habitat within a disturbance zone be manipulated in any manner, unless needed to enhance habitat quality." Final design and construction of the Bikeway would need to avoid removal of osprey or northern goshawk nest sites. The TRPA-designated disturbance zone (buffer) around osprey nests is a 0.25-mile radius around the nest and the northern goshawk buffer is 0.5-mile around the nest. A non-degradation standard within the buffer zone applies to all osprey and northern goshawk nest sites regardless of recent occupancy, unless the nest tree is confirmed to no longer exist. Current disturbance levels, proximity of nest location to existing roads, topography, and other travel and usage factors could influence whether trail construction would be an additional degradation of habitat beyond existing conditions. If Bikeway construction or use could result in impacts on these species, mitigation measures to ensure non-degradation would need to be developed and implemented.

Cheatgrass and other invasive or noxious weeds are present in the Basin and construction activities have the potential to spread these species. Measures to control the spread of noxious weeds have been developed for the South Demonstration Project and are discussed in detail in the environmental assessment being prepared for that project.

3.2.7 CULTURAL RESOURCES

Opportunities

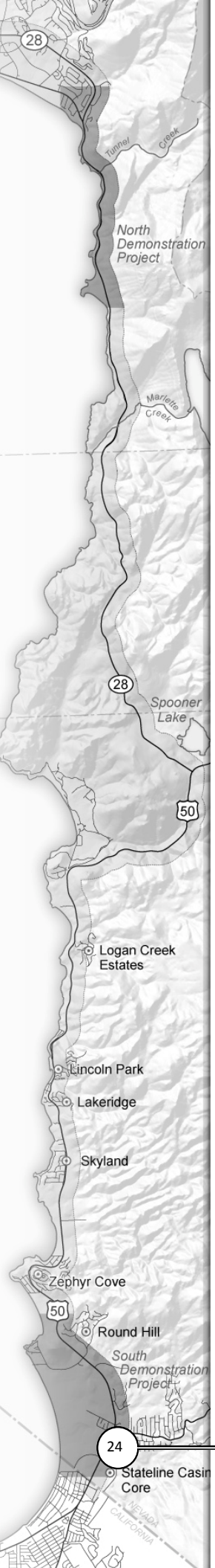
Several opportunities exist for interpretation and education related to Tahoe Basin prehistory and history. Information kiosks or interpretive displays could be included in the project to provide visitors with an enriched appreciation for the land use strategies employed by the Washoe and also the varied historic events that have shaped the culture and landscape of the Lake Tahoe Basin.

Regarding the Washoe, numerous locations may be used for interpretative displays that depict one or both of the following:

- Land use strategies of the Washoe prior to historic contact; and/or
- Washoe values and ideology and the importance of Lake Tahoe.

Numerous historic-era interpretative opportunities exist within the study area. Locations reflect major historic themes within the Basin and consist of the following:

- Early historic-era settlement and transportation in the vicinity of Glenbrook, Spooner Summit, Zephyr Cove, Round Hill, and Rabe Meadow.
- The contribution that the resources of Lake Tahoe played in the development of Comstock mining particularly the development of massive water development and delivery systems and the lumbering industry, which supplied milled lumber and cordwood for the mines and miners.



- The role the Lincoln Highway provided as a link between the east and west coasts of the United States.
- The development of large estates and resorts, particularly the Whittell Estate, Newhall Estate, and Round Hill Pines Resort, and one formerly located at Glenbrook.

Constraints

The Washoe Tribe has expressed concerns about two specific locations within the project area – tribal conveyance lands located in the vicinity of Skunk Harbor and direct and indirect effects that may further compromise Cave Rock. At both locations they have requested that the Bikeway avoid both direct and indirect impacts. Acknowledging that the Bikeway would need to pass through Cave Rock, they have recommended passive traffic control measures along U.S. 50 that would avoid additional impacts on this spiritually important location, while allowing the project to move forward.

3.2.8 SCENIC RESOURCES

Opportunities

Travel units that are in attainment of scenic thresholds represent areas where scenic quality is high to very high. Similarly, scenic resources with high scenic quality ratings represent the most outstanding views or the most scenic features found within the opportunities and constraints study area. These areas offer outstanding opportunities for the Bikeway, as alignments through these areas would allow users to take advantage of the best scenery the east shore area has to offer.

Constraints

Travel units with the highest travel route ratings and scenic resources with the highest scenic quality ratings often have little or no evidence of man-made development. This condition contributes to their high scenic quality, yet makes them sensitive to scenic quality degradation as man-made features are introduced in these areas, particularly if the new development is readily visible from major roads, Lake Tahoe, or within the visual context of certain scenic resources. This is particularly true throughout the predominantly natural-appearing area between Sand Harbor and Glenbrook. In areas like these, the future Bikeway should be planned and constructed in ways that minimize its visual presence.

Of the 34 scenic resources with high scenic quality ratings that are within the study area, Cave Rock offers one of the most challenging scenic constraints to the future Bikeway. This is because Cave Rock is such a highly visible and well known scenic feature. At the same time, Cave Rock exhibits clear evidence of man's activities, both past and present. While the scenic appeal of Cave Rock remains very high, its appearance cannot be considered pristine. Therefore, it is likely that some means can be found to overcome the scenic constraint that Cave Rock represents.

In all cases, project design measures would need to be incorporated to protect scenic quality in these travel units and for these scenic resources to the extent practicable.

3.2.9 TOPOGRAPHY, FLOODPLAINS, AND ENGINEERING

Opportunities

Existing roads and trails are often situated in areas with gradual slopes and offer opportunities to reduce construction costs, minimize or reduce environmental impacts, and minimize the need for new disturbance. In some locations along SR 28 between Tunnel Creek Road and Rocky Point, the road shoulders are used for parking to access beaches in this area. This illegal parking results in erosion and water quality problems. Constructing the Bikeway adjacent to the road in these locations would eliminate this parking and design features related to stormwater control would lead to improved water quality in these areas.

Opportunities in relation to cross slope would generally be limited to identifying corridors of shallow cross slope or identifying areas, such as existing road cuts, where structural modifications would be minimized.

Constraints

In the northern half of the study area, if the Bikeway were located parallel to the lakeshore, significant cross slopes in the range of 10% to over 50% would need to be addressed or avoided. Although it would be possible to design the Bikeway to accommodate cross slopes such as these, it would be very expensive. In areas where SR 28 is in close proximity to the shoreline, an alignment on the lake side of the highway presents particularly difficult design challenges.

Rock outcroppings pose another constraint to potential bike trail alignments. From a design and constructability standpoint, rock outcroppings are usually associated with abrupt changes in grade and excavation in these areas is problematic. From a permitting standpoint, TRPA typically does not allow any disturbance of rock outcroppings.

Areas of dense tree canopy are considered constraints because of the higher potential for conflicts with old-growth trees. Wetland and stream crossings require disturbance of sensitive habitat and should be avoided to the extent feasible.

4 TRAIL SUITABILITY MODELING

4.1 METHODS

4.1.1 PURPOSE OF THE MODEL

GIS technology was used to develop a model for suitability to evaluate trail alignment options within the established trail suitability model study area. The purpose of the model is to determine how suitable trail development is in all parts of the study area. The model output was used to help identify and document the most suitable options for trail alignments, and provide a single visual depiction of the most and least suitable locations for trail alignments. The study area for this modeling effort extends from Incline Village in the north to the Stateline casino core in the south.

The results of the modeling effort show a complex landscape with many constraints. GIS was used to model for suitability by overlaying spatial data with a resulting rated score used to illustrate relative suitability. The model does not predict the best alignment for the trail, but rather equally applies the suitability criteria across the study area.

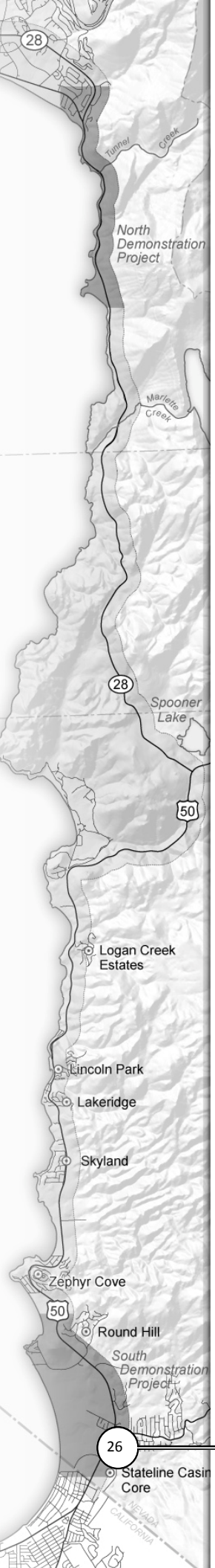
4.1.2 MODEL CRITERIA

The criteria used in the model are constraints used to identify areas least suitable for trail development and use. The criteria used in the model included:

- Physical resources including topography and hydrology.
- Natural resources including sensitive species such as Tahoe yellow cress, northern goshawk, osprey, and willow flycatcher.
- Land use including Washoe tribal land, privately owned parcels, planned developments, and high volume roadways such as U.S. 50, SR 28, and SR 207.

4.1.3 GIS METHODS

ArcGIS-ArcInfo software was used to create the trail suitability model. ArcGIS includes a tool named Model Builder, which allows a model to be designed as a flow chart with inputs, processes, and outputs. The inputs



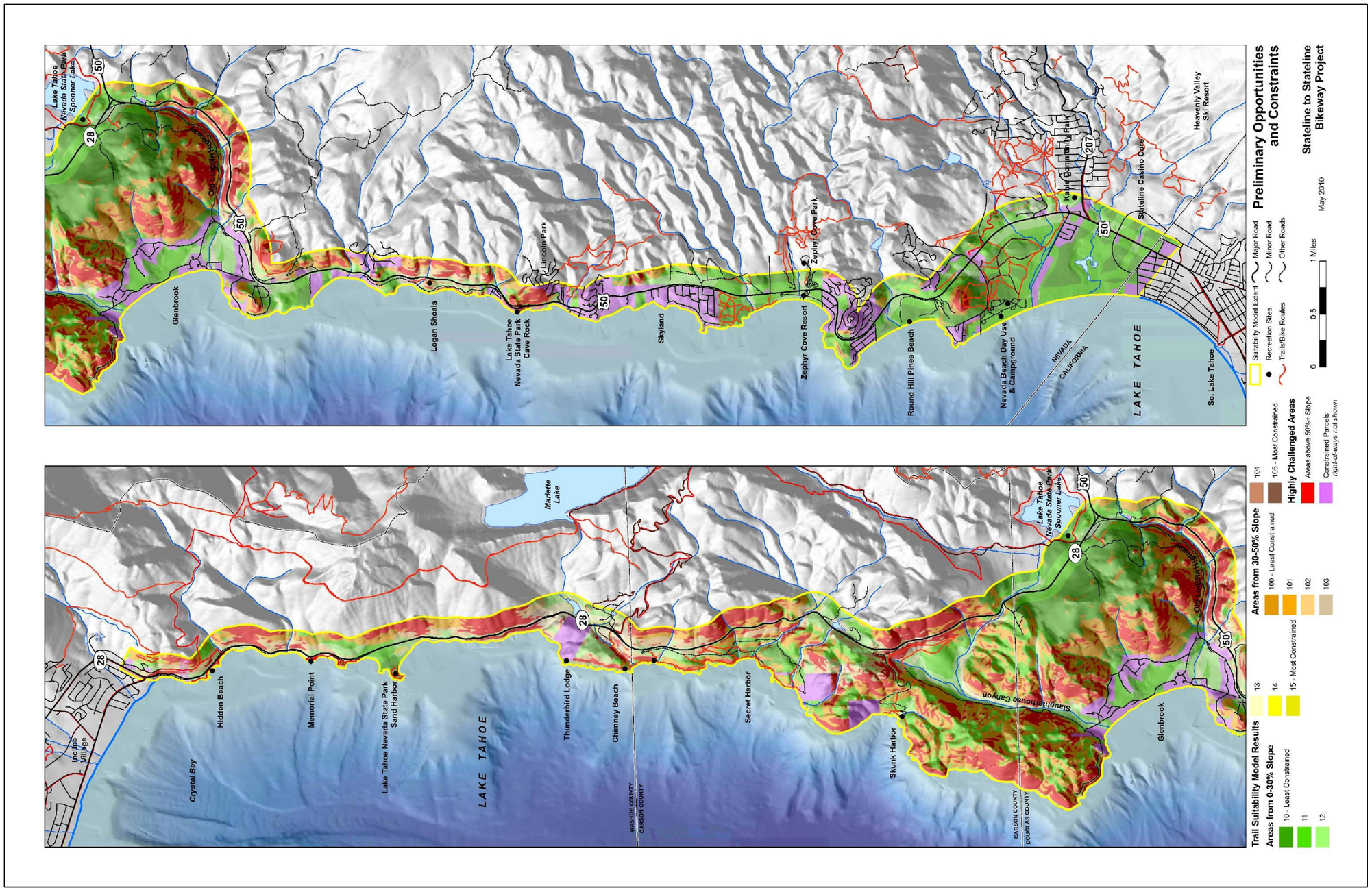
are spatial data, such as streams or osprey nesting sites. The processes are commands or functions that tell the software how to modify or use the input data, such as to buffer a sensitive resource by a specific distance. The outputs are either intermediate data that is then overlaid with other data, or the final suitability dataset that provides subareas and their scores. Each subarea not only has a suitability score but also attributes that define what resources were added together to create the score. For example, if each sensitive resource is given a score of 1, a subarea would have a score of 2 if the attributes show that it is adjacent to a water resource and contains a sensitive bird nest. The attributes also show what slope category the subarea falls within.

4.2 RESULTS

Topography is a major challenge for development of the Bikeway. For this reason, the suitability scores that were generated have been grouped by the category of slope they fall within. This created a three-tier ranking system:

- Tier 1: Areas within 0-30% slope
- Tier 2: Areas within 30-50% slope
- Tier 3: Areas above 50% or more slope

The suitability modeling results are depicted in Exhibit 4.



Source: AECOM, 2010

Preliminary Opportunities and Constraints

Exhibit 4

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5 ALTERNATIVES DEVELOPMENT

5.1 DEFINITION OF ALTERNATIVES

As was noted above, for the purposes of this Feasibility Study, the approximately 17-mile central stretch of the Bikeway corridor between Sand Harbor and Round Hill Pines Beach was divided into six segments. These trail segments were defined in a manner that makes sense for analysis and definition of alternatives for this portion of the Bikeway and that may translate easily into construction phases later, for instance, from one logical destination to the next.

Within each of these six segments three alignment alternatives were identified and presented to the public at workshops held on July 16, 2009 at TRPA's offices in Stateline and on July 23, 2009 at the Chateau in Incline Village. These alignments were then refined based on public comment and input. The refined alignments were then evaluated against a set of general evaluation criteria related to the project's goal and objectives and regulatory or constraints-related factors. Evaluation criteria consider relative benefits, costs, achievement of objectives, and potential adverse effects on the environment. Draft criteria were presented to the Working Group for review, comment, and refinement prior to completing the draft evaluation (EDAW 2009). The draft evaluation was presented to stakeholder groups at a meeting on November 18, 2009 at the Aspen Grove Building located at 960 Lakeshore Boulevard in Incline Village, Nevada. From this alternatives evaluation process and input received at the stakeholder meeting, a most highly rated alternative alignment for the Nevada Stateline-to-Stateline Bikeway was developed for the area between Sand Harbor and Round Hill Pines Beach by constructing a decision matrix that scored the alignments by established criteria. In some segments, a hybrid alignment consisting of portions of the three proposed alignment alternatives was suggested and carried forward into the final evaluation phase. The determination of a recommended or preferred alternative will take place after additional public input is received on this Feasibility Study.

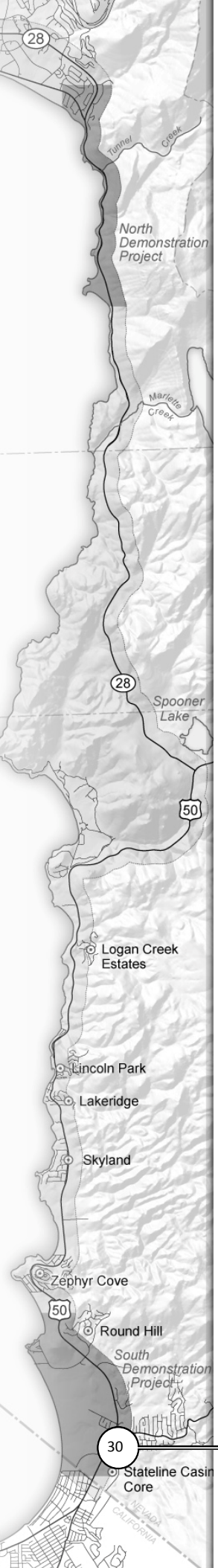
The following sections describe the alternative alignments within each of the six project segments. Maps depicting each of the alternatives are provided at the end of this section.

5.2.1 SEGMENT A OF CENTRAL CORRIDOR: SAND HARBOR TO USFS PARKING LOT AT SECRET HARBOR TRAILHEAD

Alignment A1. Alignment A1 follows SR 28 on the west side of the roadway within the existing right-of-way for approximately 7,500 feet, then deviates to the west on a loop around a hill to the east of Thunderbird Lodge and follows contours approximately 200 to 400 feet west of SR 28 to about 1,200 feet north of the USFS parking lot at the trailhead to Secret Harbor. At this point the trail deviates to the west, descending toward the Lake and passing approximately 400 feet west of the USFS parking lot.

Alignment A2. This alternative is identical to Alignment A1 with the exception that at a point about 1,200 feet north of the USFS trailhead parking lot, the trail continues to follow contours approximately 200 feet west of SR 28 until it reaches the USFS parking lot.

Alignment A3. The Alignment A3 route would closely follow SR 28 on the uphill (east) side to a point approximately 4,700 feet from the USFS parking lot at the trailhead to Secret Harbor, where it would cross under the highway to avoid a goshawk protected activity center (PAC). From here it would closely follow SR 28 on the west side to the parking lot. An option to Alignment A3 is to follow the Alignment A1 alignment on the west side of SR 28 from Sand Harbor to the point where Alignment A1 deviates to the west. At this point the trail would continue to closely follow SR 28 on the west side all the way to the USFS parking lot.



Alignment A4 (Hybrid). A proposed hybrid alignment follows Alignments A1 and A2 to a point just before these alignments divert to the west away from SR 28 and continues to parallel the highway to the parking lot at Secret Harbor, essentially paralleling the west side of SR 28 the entire way. A variation of this hybrid alignment would reconnect with Alignment A2 approximately 3,000 feet north of the USFS parking lot rather than following the highway.

5.2.2 SEGMENT B OF CENTRAL CORRIDOR: USFS PARKING LOT AT SECRET HARBOR TRAILHEAD TO SKUNK HARBOR ACCESS ROAD

Alignment B1. This route is a continuation of Alignment A1 and follows the shoreline south to about 1,000 feet north of Secret Harbor where it deviates to the east, climbing slightly to connect with an existing dirt road. The trail follows the dirt road to its end above Secret Harbor then follows contours and switchbacks around the west side of several hills through a privately owned 40-acre parcel between Secret Harbor and Skunk Harbor. The trail connects to a NFS road and hiking trail that leads to Skunk Harbor from SR 28. The trail follows the dirt road for several hundred feet before deviating to the south to follow an existing dirt road recently improved by the USFS for fuels management access and continues toward Slaughterhouse Canyon.

Alignment B2. This route closely follows SR 28 south from the USFS parking lot at the Secret Harbor trailhead, and then deviates to the west to follow an existing dirt road for approximately 7,000 feet. At this point, there are several options. The trail can continue on the dirt road connecting to Alignment B1, or follow contours and switchbacks through the hills between Secret Harbor and Skunk Harbor. The westernmost options would traverse three private parcels south of Secret Harbor. The easternmost option would avoid this parcel. At approximately 1,200 feet south of the private parcel, the trail would connect with the Alignment B1 alignment to the southern end of Segment B.

Alignment B3. This route closely follows SR 28 on the west side of the roadway for the entire length of Segment B, making use of the existing highway right of way to the greatest extent possible.

During the Stakeholder workshop, it was suggested by several people that a hybrid alignment be considered that would use the existing dirt road in the northern portion of this segment (Alignment B2) and then connect back with Alignment B3 about one mile north of the connection with Segment C. This concept was dismissed from further analysis, however, because the transition from Alignment B2 to B3 would require an excessively long stretch of steep grade in excess of 5%.

5.2.3 SEGMENT C OF CENTRAL CORRIDOR: SKUNK HARBOR ACCESS ROAD TO GLENBROOK ENTRANCE

Alignment C1. This route is a continuation of Alignment B1 and follows an existing NFS road through Lower Prey Meadows and Slaughterhouse Canyon to the Glenbrook community. The trail follows existing roads through Glenbrook to the entrance gate on U.S. 50.

Alignment C2. This alternative follows a more easterly route through Lower Prey Meadows and Slaughterhouse Canyon, then deviates to the east with two options. One option avoids the developed part of Glenbrook, but traverses some portions of private property before connecting with the Old Lincoln Highway. The other option is located farther uphill and to the east, avoiding private property in this area before connecting to the Old Lincoln Highway. Both options follow the Old Lincoln Highway to the west where they enter the Glenbrook community and follow existing roads to the entrance gate on U.S. 50.

Alignment C3. This route closely follows SR 28 on the west side of the roadway with an option to cross SR 28 near Spooner Lake to access parking and other facilities there. Another option is to spur off of the Alignment

B1/B2 alignment and follow contours to the west of SR 28. At Spooner Junction, the alignment follows the Old Lincoln Highway until it does a switchback to cross Glenbrook Creek and climb back to U.S. 50. The alignment closely follows U.S. 50 until it reaches an existing tunnel under the highway. From here there are two options. One crosses under the highway and closely follows U.S. 50 on the east side. The other option continues on the west side of U.S. 50 to the entrance to Glenbrook.

Alignment C4 (Hybrid). There are many possible hybrids with Segment C. The hybrid that is scored best (i.e., fewest constraints) on the evaluation worksheet follows the upper (eastern) Alignment C2 option (avoiding Glenbrook) to the Old Lincoln Highway, then joins Alignment C3 to go down the Old Lincoln Highway, cross Glenbrook Creek, and then along U.S. 50 all on the north/west side of the highway (no crossing to the south/east side in the existing tunnel). This would provide an alignment that does not cross private property but also does not just parallel SR 28/U.S. 50 the whole way, and avoids the steepest part of Old Lincoln Highway.

5.2.4 SEGMENT D OF CENTRAL CORRIDOR: GLENBROOK ENTRANCE TO CAVE ROCK DRIVE

Alignment D1. This alternative parallels U.S. 50 on the west side, providing 200- to 400-foot separation from the highway for the majority of the segment. Near Logan Shoals, the alignment follows an existing trail on NFS land for approximately 4,300 feet. Approaching Cave Rock the trail gets closer to U.S. 50 in order to avoid private property. Several options have been explored for getting past Cave Rock, including:

- An alignment along the historical highway that wrapped around the west side of Cave Rock.
- A new tunnel or wider tunnels.
- Shared tunnel options including a dedicated lane during certain times, a dedicated tunnel for pedestrians and bicycles, and a signalized tunnel.
- A route around the east side of Cave Rock on existing trails.
- To minimize additional disturbance to Cave Rock, in response to the concerns for its spiritual significance expressed by the Washoe Tribe, the shared tunnel options are considered the most appropriate for Alignment D1.

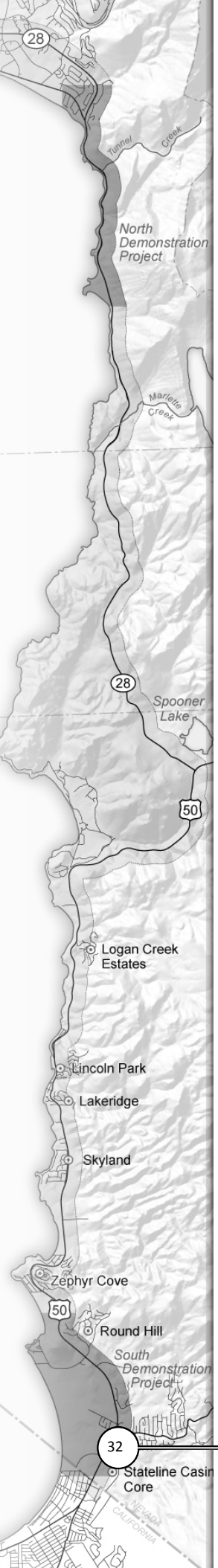
Alignment D2. This route is similar to Alignment D1 with the exception that it is aligned more closely to U.S. 50 in order to utilize NDOT right-of-way. This alignment provides a more gradual climb from the Logan Shoals trail. The shared tunnel options at Cave Rock are the most appropriate for this alternative.

Alignment D3. Alignment D3 is a continuation of the eastern option of Alignment C3. This route closely follows U.S. 50 on the east side of the roadway with an option to cross U.S. 50 and join the Alignment D1/D2 alignment at approximately 1,000 feet north of Cave Rock. This alternative requires a steep section of trail to get around Cave Rock on the east side, then gradually descends to connect with Cave Rock Drive and U.S. 50.

Alignment D4 (Hybrid). The hybrid alignment follows Alignment D3 south on the east side of U.S. 50 to the crossing just north of Cave Rock. Then instead of following Alignment D3 over Cave Rock, it crosses west over U.S. 50 and joins Alignments D1 and D2.

5.2.5 SEGMENT E OF CENTRAL CORRIDOR: CAVE ROCK DRIVE TO ZEPHYR COVE

Alignment E1. This alternative closely follows U.S. 50 on the west side for approximately 2,000 feet before deviating to the west to follow existing roads through the Skyland subdivision. South of Skyland, the trail traverses through NFS lands to Zephyr Cove Beach.



Alignment E2. This route closely follows U.S. 50 on the west side past Skyland, at which point it deviates slightly to the west through NFS lands maintaining approximately 200 feet of separation from the highway until reaching Zephyr Cove Beach.

Alignment E3. This route is a continuation of Alignment D3 located on the east side of U.S. 50. This alternative closely follows U.S. 50 for about 4,700 feet before deviating to the east onto NFS land and increasing separation from the highway to about 200 feet. Just south of Lakeridge, there are options to deviate west sooner and climb around private property, or to cross U.S. 50 and join Alignment E2. Approximately 4,000 feet north of Zephyr Cove the alignment gets closer to U.S. 50 to avoid the private development at Warrior Way. An at-grade crossing would be provided at the entrance to Zephyr Cove Beach, which is an existing traffic signal-controlled intersection.

Alignment E4 (Hybrid). The hybrid alignment follows Alignment E2 to a point north of Skyland and then crosses U.S. 50 to follow the Alignment E3 alignment to Zephyr Cove Beach.

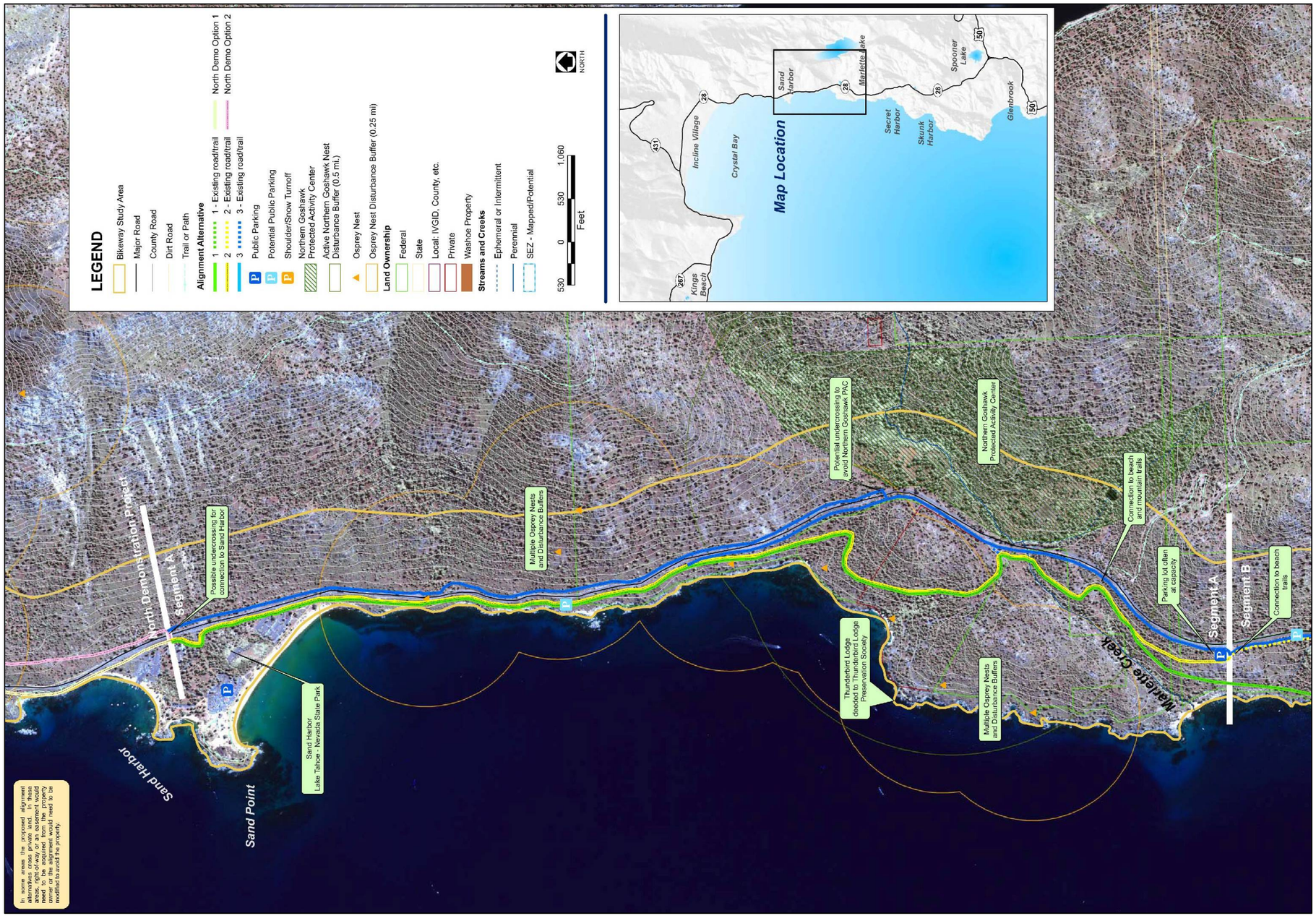
5.2.6 SEGMENT F OF CENTRAL CORRIDOR: ZEPHYR COVE TO ROUND HILL PINES BEACH ENTRANCE

Alignment F1. This alternative follows Lincoln Street through Zephyr Cove Beach and Zephyr Cove subdivision before closely following U.S. 50 on the west side around the curve at Zephyr Point. After passing the Presbyterian Conference Center the trail deviates to the west to follow roads through the Zephyr Cove subdivision. After passing through the subdivision, the trail crosses a privately owned meadow and veers back to the east to reconnect with the west side of U.S. 50, which it follows to the Round Hill Pines Beach entrance.

Alignment F2. This alternative is identical to Alternative F1 until passing the Presbyterian Conference Center, at which point it deviates from the highway only slightly before closely following U.S. 50 to the Round Hill Pines Beach entrance.

Alignment F3. This route follows U.S. 50 closely on the east side of the highway all the way to the Round Hill Pines Beach entrance.

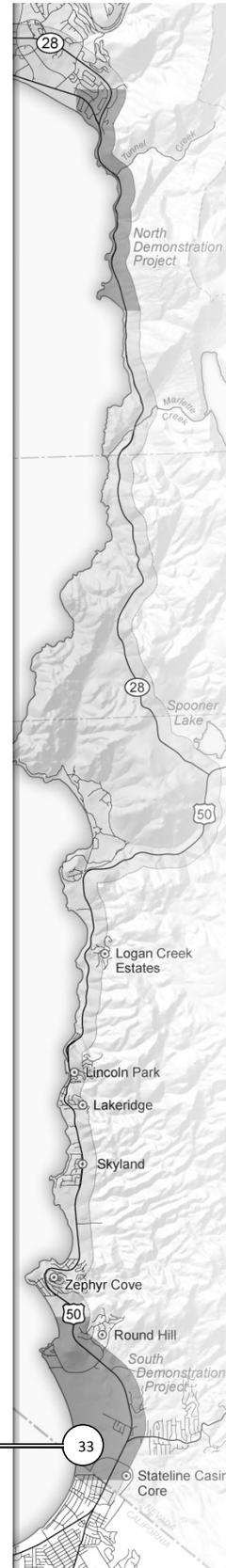
There was no hybrid alignment identified for Segment F.

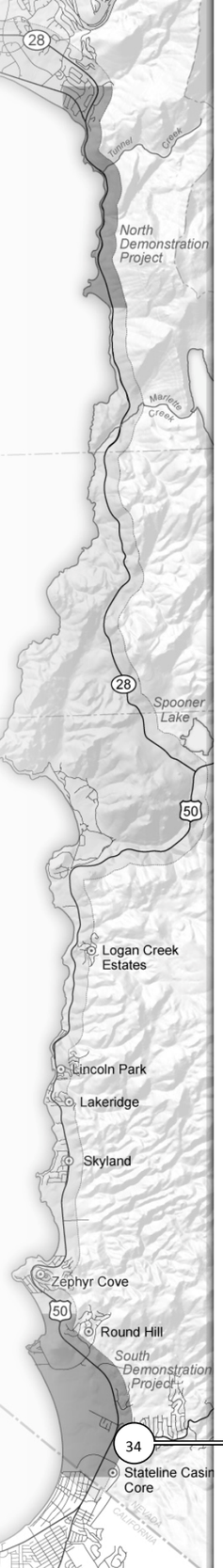


Source: EDAW 2009, TRPA 2009, USFS 2008, NV State Parks 2008, Aerial Image: IKONOS 2004

Segment A

Exhibit 5





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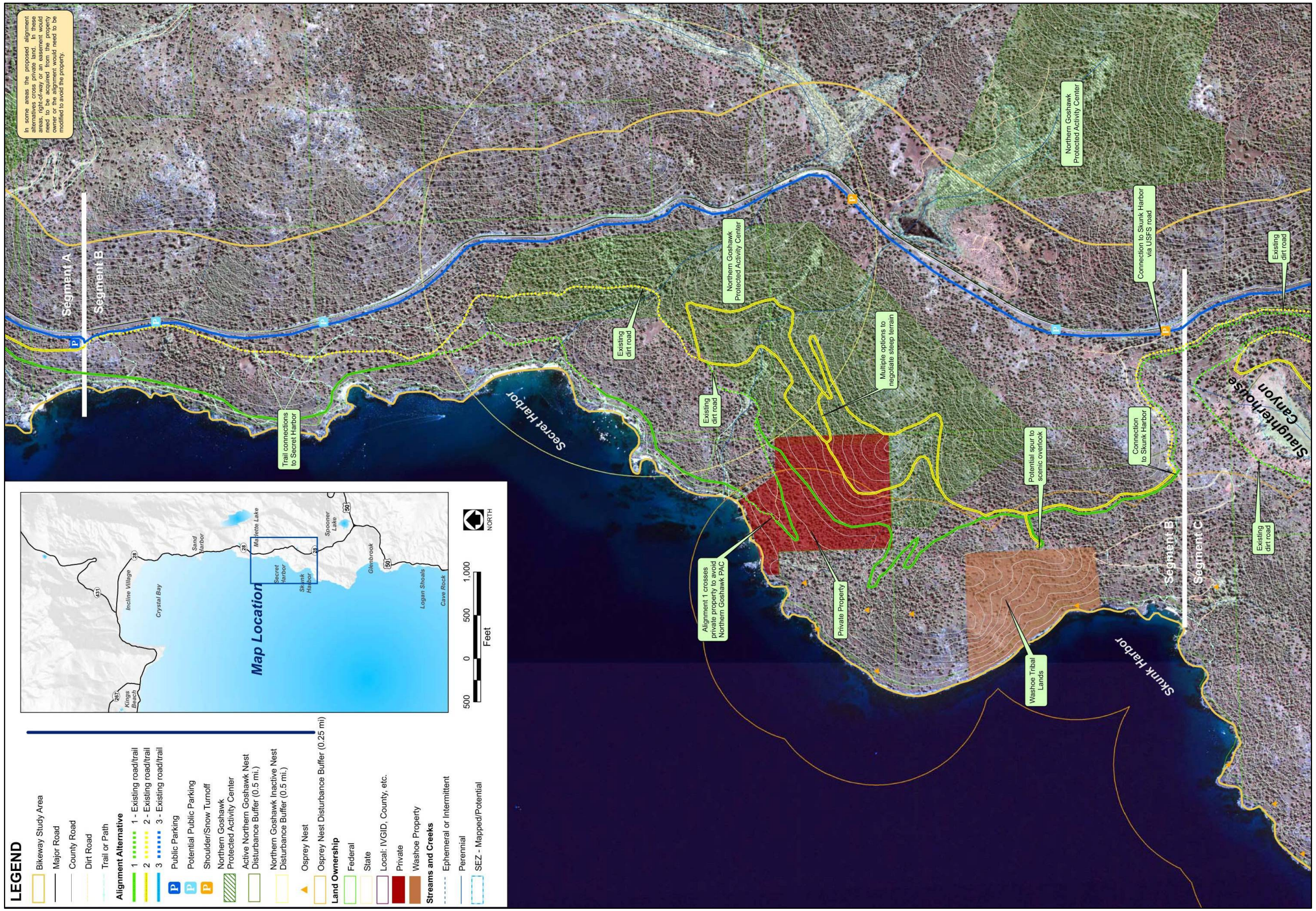
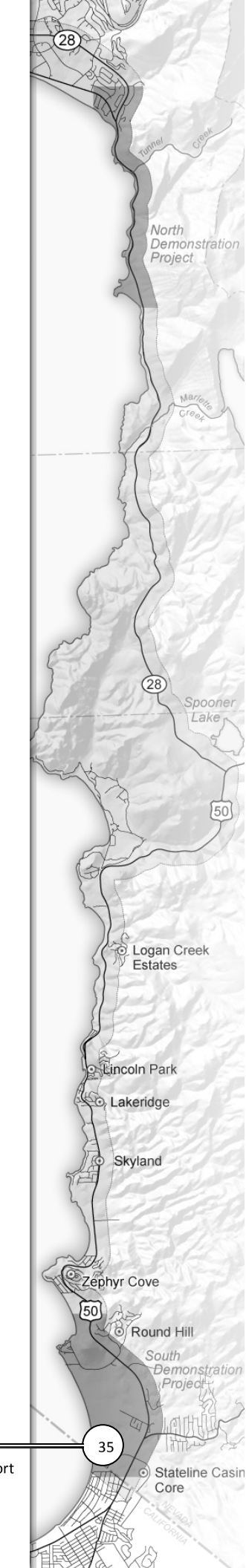
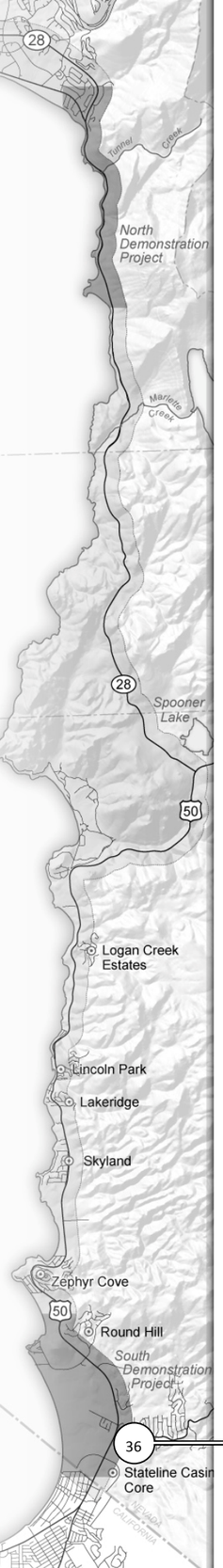


Source: EDAW 2009, TRPA 2009, USFS 2008, NV State Parks 2008, Aerial Image: IKONOS 2004

Segment B

Exhibit 6





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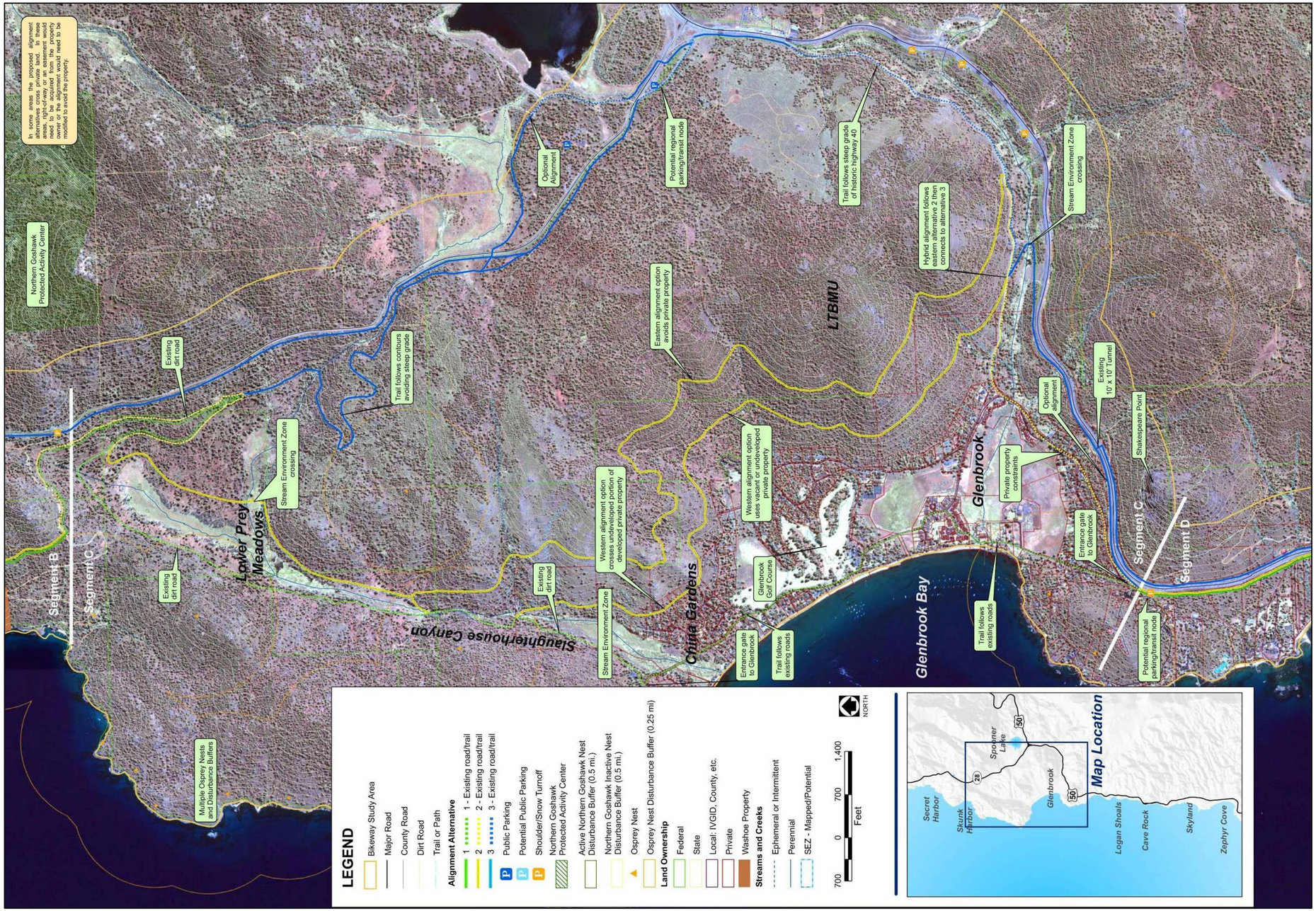
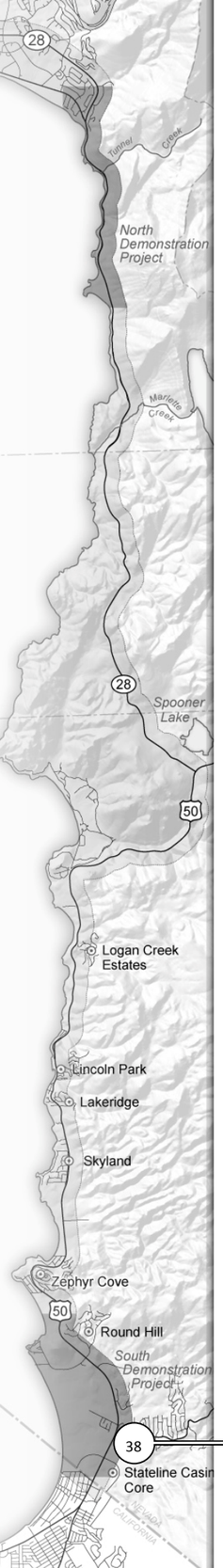


Source: EDAW 2009, TRPA 2009, USFS 2008, NV State Parks 2008, Aerial Image: IKONOS 2004

Segment C

Exhibit 7



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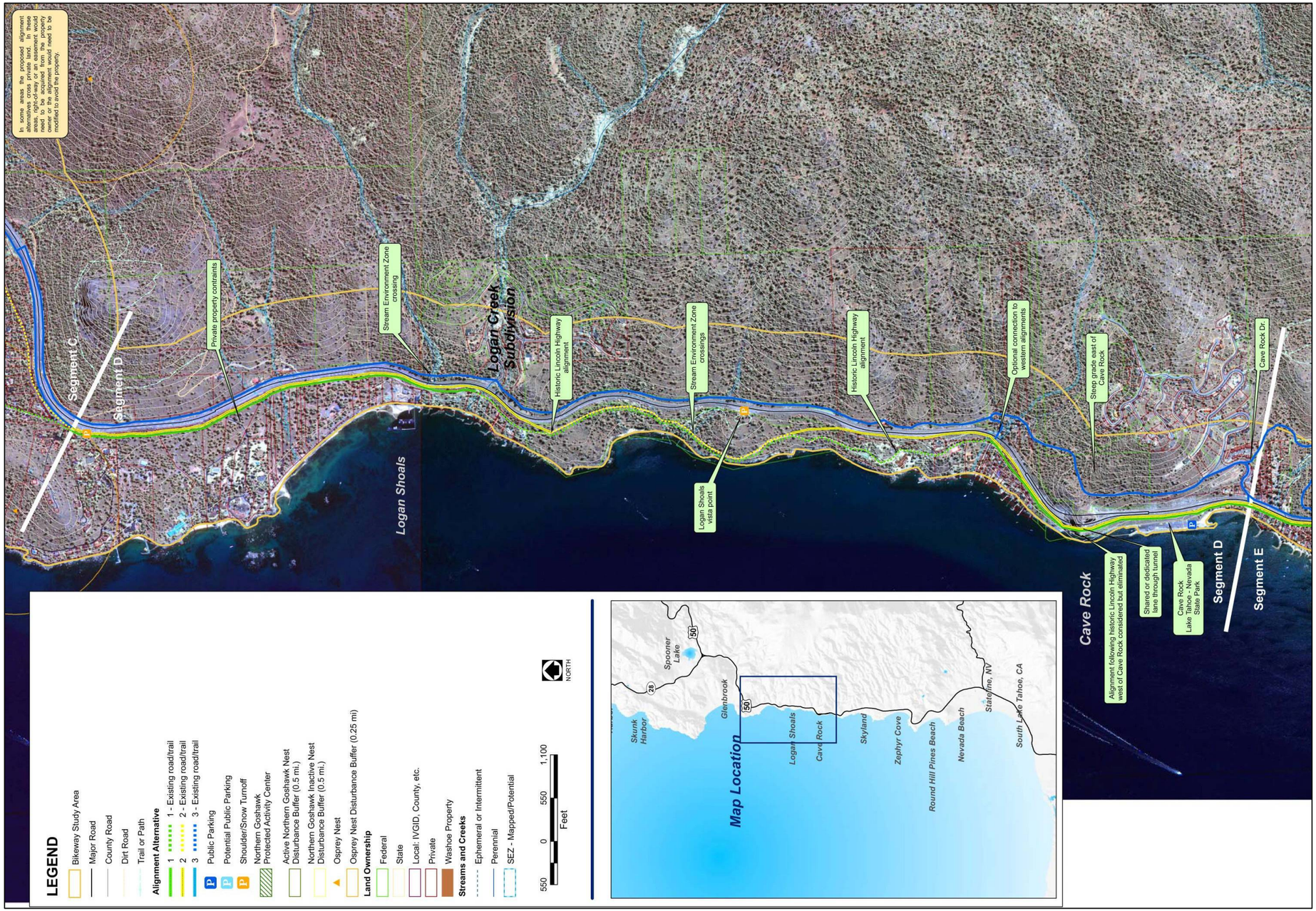
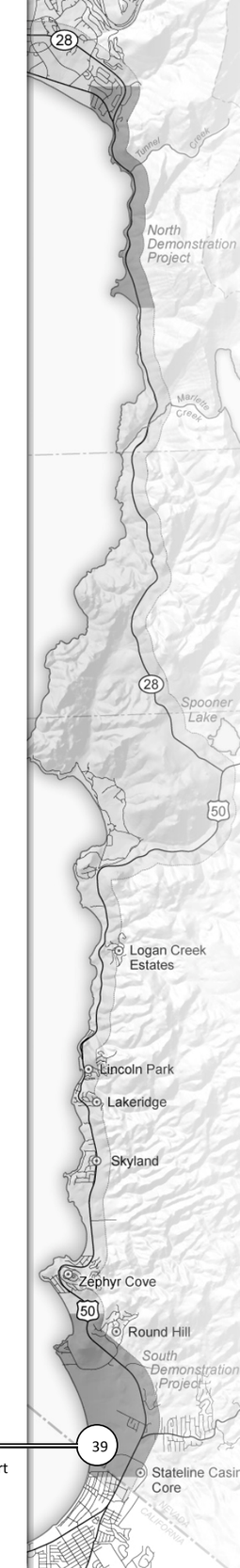
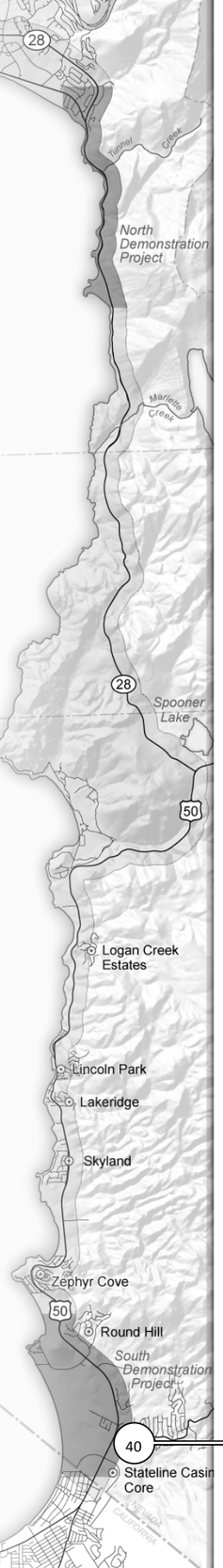


Source: EDAW 2009, TRPA 2009, USFS 2008, NV State Parks 2008, Aerial Image: IKONOS 2004

Segment D

Exhibit 8





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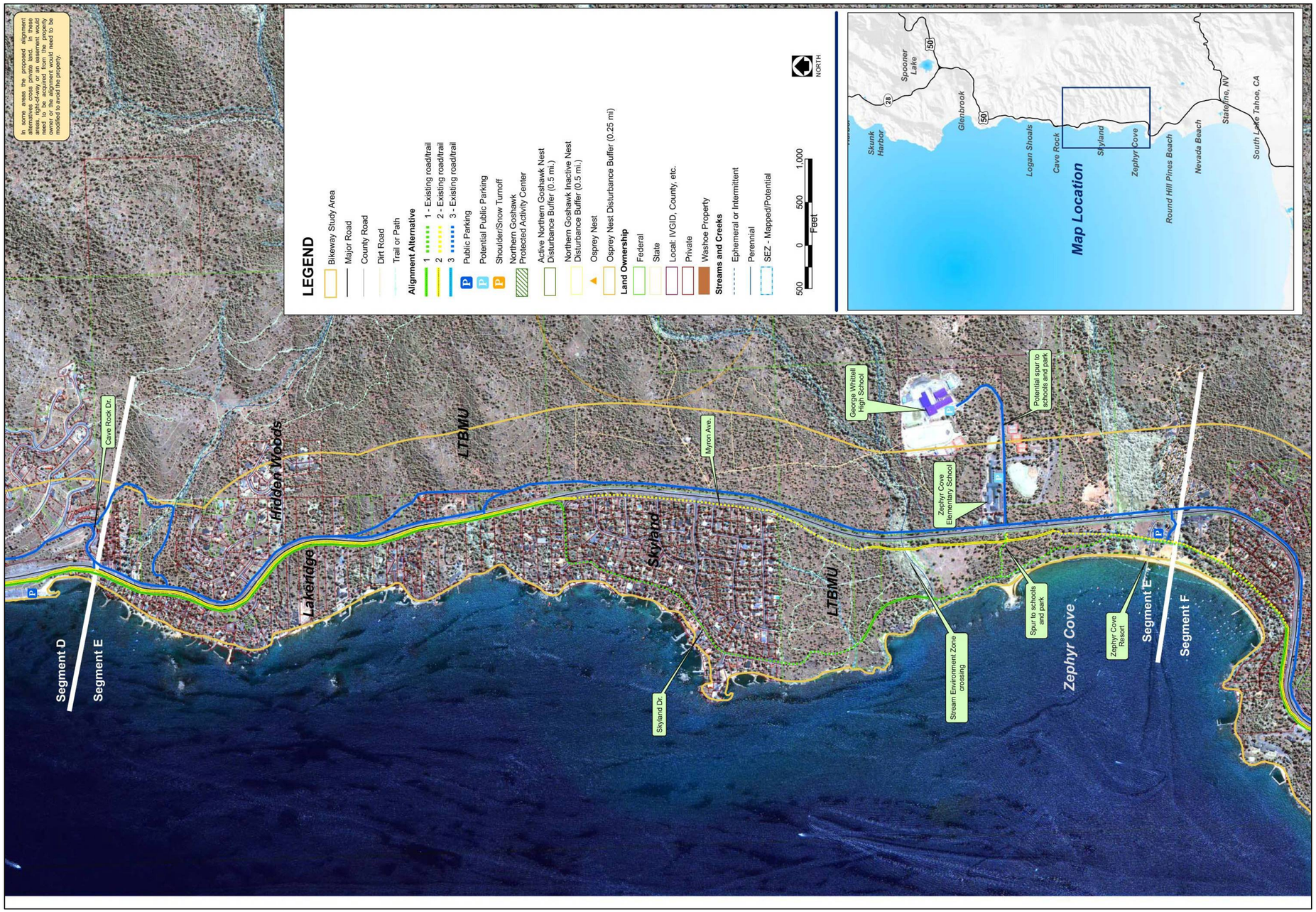
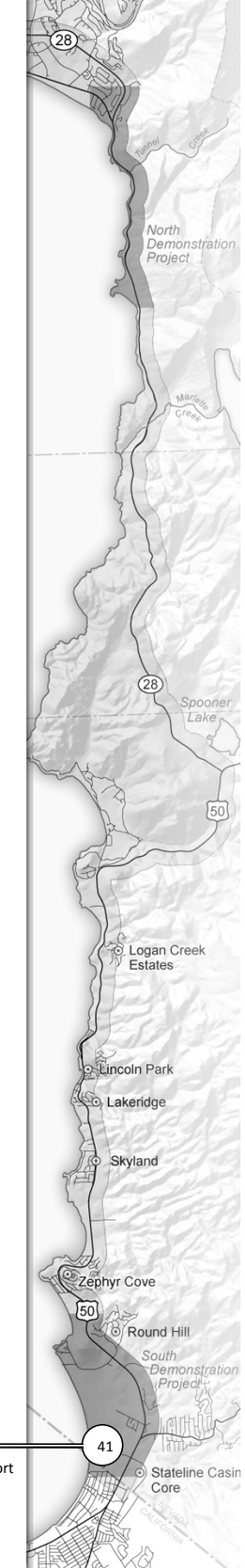
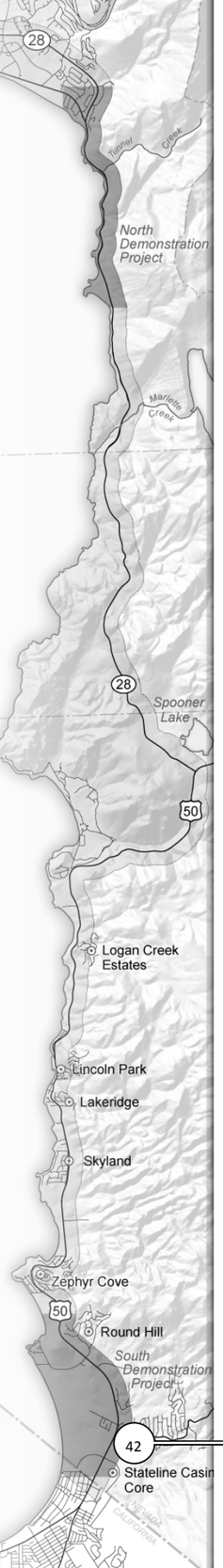


Source: EDAW 2009, TRPA 2009, USFS 2008, NV State Parks 2008, Aerial Image: IKONOS 2004

Segment E

Exhibit 9





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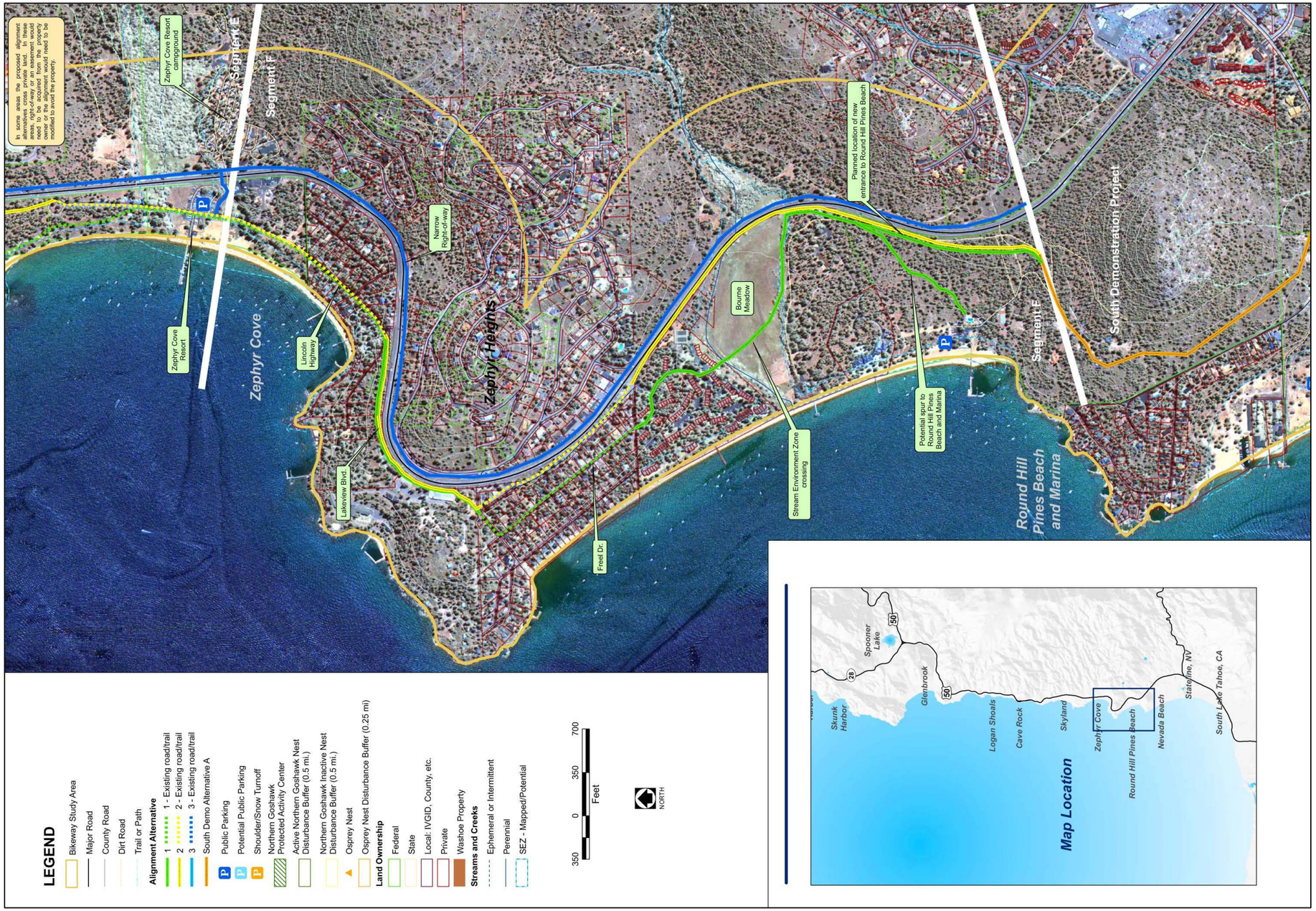
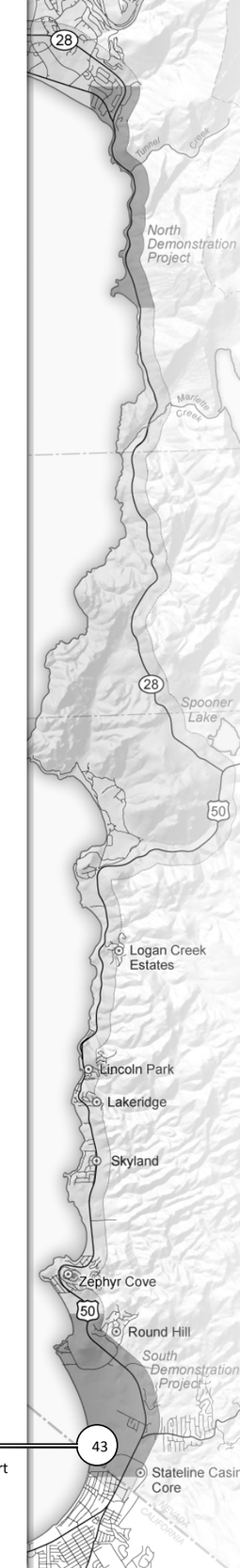
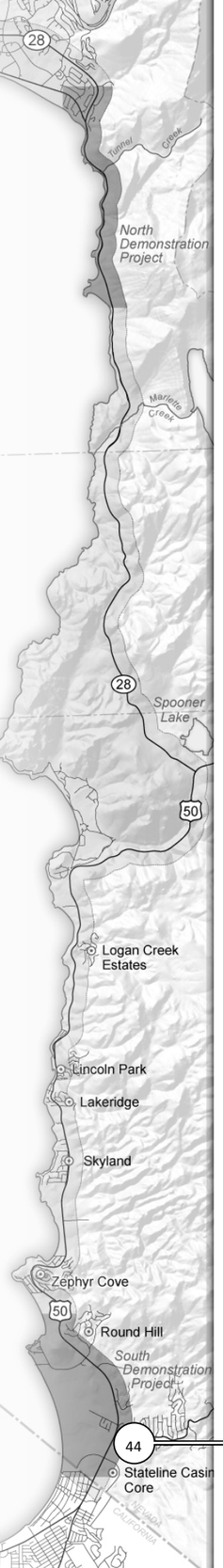


Source: EDAW 2009, TRPA 2009, USFS 2008, NV State Parks 2008, Aerial Image: IKONOS 2004

Segment F

Exhibit 10





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6 TRAIL USAGE

6.1 METHODS

As the final alignment for the central Bikeway segments between the two demonstration projects has not been determined, a quantitative use model for these segments is challenging and would provide incomplete information. Therefore, this section presents a qualitative discussion of the expected use levels for the Bikeway, focusing on factors that would impact potential use of the facility. The analysis assumes baseline trail conditions (a shared-use path with minimal grade) with anticipated use from the neighboring population and visitors that are staying close to the segment. Adjustment factors are used to increase or decrease expected use from the baseline level. For example, key destinations such as Sand Harbor would attract more use than the expected baseline, while substantial grades would reduce overall use. The adjustment factors are discussed in detail below.

6.1.1 ADJUSTMENT FACTORS

Trail usage adjustments are based on specific trail characteristics that are anticipated to increase or decrease trail usage on the "ideal" trail. These adjustment factors are applied for the following trail categories: class, grade, continuity, maintenance, recreational value, destinations, access, and congestion. The adjustment factors for each category are estimated as increasing, decreasing, or not affecting expected use on each section and are applied separately for bicyclists and pedestrians and for each type of trail user (resident, visitor, and drive-to-trail users).

Class

The class (separated Class I shared-use path or Class II on-street bikeway) of the proposed facility will have a significant impact on anticipated use and user types. In areas on the Bikeway where it is not feasible or practical to construct a separated shared-use path, bike lane sections may be recommended. Reductions in trail usage for these segments are discussed under the continuity section, as this analysis otherwise assumes a shared-use path facility throughout the central project corridor.

Grade

Some potential users are dissuaded by grades, particularly visitors and drive-to-trail users. Mostly flat sections with short segments of grades of less than 4 percent can be considered to increase use. Sections with a moderate grade (between 4 and 8 percent) are likely to have a neutral impact. Sections with steep grades (above 8 percent) and longer elevation changes (greater than 300 feet) can be assumed to significantly decrease use, particularly for visitors and drive-to-trail users.

Continuity

Trail continuity evaluates whether the alignment is broken by driveways or cross-streets, as well as whether the shared-use path becomes an on-street bikeway facility. Segments with many existing driveway crossings (i.e., more than 4 per mile) are likely to be less attractive to potential users, particularly visitors and drive-to-trail users. Higher volume traffic encountered at crossings also reduces anticipated trail use.

Maintenance

Maintenance issues may occur on the trail such as degrading pavement condition and the presence of sand or debris that can gather on the trail. As the Bikeway would be a newly constructed facility, it is assumed that the pavement would be in excellent condition and that the trail would be properly maintained

Therefore, no adjustments in trail usage for maintenance issues were applied for any segment of the Bikeway in this analysis.

Recreational Value

Bikeway segments located along an especially scenic corridor such as lakefront, river front, or dense woods are considered to have the highest recreational value and are likely to experience the highest levels of use by all user types. Sections through urbanized areas or adjacent to busy roadways are considered to have a lower recreational value and are subject to a reduction in usage estimates varying by user type, with users driving to the trail subject to the greatest reduction. However, sections through urbanized areas are likely to have the highest use by residents for commuting or utilitarian purposes.

Destinations

Several of the Bikeway sections provide an alternative route to a popular destination, such as Sand Harbor or Zephyr Cove. These sections are likely to experience higher levels of use, particularly by non-drive-to-trail visitors and residents. By contrast, sections in the middle of the study corridor provide fewer connections to key destinations and users are likely to travel these sections as part of a longer trip.

Access

Another consideration for trail use is how users access the trail; sections that are closer to urban centers or hotels where trips originate are likely to experience higher use than sections that must be access via another trail section. In particular, sections with less parking availability deter drive-to-trail use and are expected to have significantly less use than well-connected sections or those with substantial parking. The analysis also considers population along the trail within with the catchment area based on observed average one-way trip lengths (2.4 miles for bicycle trips and 1.5 miles for walking trips) in the Tahoe Region.

Congestion

Trail congestion relies on the “Shared Off-street Path” Level of Service (LOS) methodology, which is based on the number of passing events that occur during the peak hour of trail use. A passing event is defined as either passing a bicycle/pedestrian traveling in the opposite direction or overtaking another bicycle/pedestrian traveling in the same direction. Lower reduction factors are applied to visitors, who are more likely to use the trail regardless of congestion levels.

6.1.2 QUALITATIVE USAGE ANALYSIS

The qualitative usage analysis for the Bikeway reflects existing demand factors (resident population, visitor population, presence of bicycle/pedestrian activity generators, etc.) as well as the following adjustment categories as they pertain to each trail segment. Factors described above for which no adjustments would be made are not included in the discussion.

- Grade
- Facility Continuity
- Recreational Value
- Destinations
- Access
- Trail Congestion

This discussion of Bikeway usage is disaggregated into the following nine segments for analysis purposes:

- Crystal Bay to Incline Village
- Incline Village to Sand Harbor (North Demonstration Project)
- Sand Harbor to USFS parking lot at Secret Harbor Trailhead (Segment A)
- Secret Harbor Trailhead to Skunk Harbor Access Road (Segment B)
- Skunk Harbor Access Road to Glenbrook entrance (Segment C)
- Glenbrook Entrance to Cave Rock Drive (Segment D)
- Cave Rock Drive to Zephyr Cove (Segment E)
- Zephyr Cove to Round Hill Pines Beach (Segment F)
- Round Hill Pines Beach to Stateline Casino Core (South Demonstration Project)

Table 5 provides a summary of how each adjustment factor is likely to impact anticipated use of the Bikeway. In the table, a "+" indicates that a factor would increase user demand over the baseline for the segment. A "0" indicates that the factor has a neutral impact, while a "-" indicates that the factor would reduce user demand.

Crystal Bay to Incline Village

This is a relatively developed segment of the overall Bikeway corridor. TRPA data indicate that the population within a half-mile distance of the corridor in the summer totals approximately 4,420 residents plus 4,401 visitors. Currently, bicyclists traveling around this portion of the lake must ride on the narrow shoulder of SR 28 alongside vehicular traffic between Crystal Bay and the west side of Incline Village. There is an existing separated bike path adjacent to Lakeshore Boulevard that provides an east-west connection through Incline Village. Construction of a separated shared-use facility between Crystal Bay and the existing bike path would increase the potential use of this corridor.

- Grade: The usage of a bike trail on this corridor would be limited by the steep terrain; traveling south, the trail would drop approximately 160 feet, resulting in sustained grades of 5-6 percent for over a half-mile. While "switchback" alignments may be possible to reduce the grade, this would substantially lengthen the trail, similarly reducing anticipated use.
- Continuity: The recommended alignment between Crystal Bay and SR 431 is a shared-use path alongside SR 28. Few streets or driveways cross the trail. This would have a positive effect on usage.
- Recreational Value: The land adjacent to SR 28 is private property and it is assumed that the alignment of the Bikeway would closely follow SR 28, which decreases the recreational value of the section.
- Destinations: Potential use would be augmented by the presence of resident and visitor activity centers on both ends of the trail segment: Crystal Bay on the southwest end and the Incline Village commercial and visitor core area (accessible by existing trails) on the northeast end.
- Access: This section of trail has many user generators, including the Boulder Bay proposed development in Crystal Bay as well as residents and overnight guests staying or living in Crystal Bay that would use this trail segment for either recreational or purpose trips to and from Incline Village.
- Congestion: Due to the high levels of visitors and residents, it is anticipated that use of this segment would be reduced by congestion, particularly during weekends. Drive-to-trail users are likely to avoid this section in lieu of less-congested sections.

Table 5
Qualitative Demand Analysis Overview

		Grade	Continuity	Recreational Value	Destinations	Access	Congestion	Expected User Types [1]
Crystal Bay to Incline Village		–	+	–	+	+	–	R, V
North Demonstration Project		–	+	+	+	+	–	V, D
Segment A	A1	o	o	+	+	o	o	V, D
	A2	o	o	+	+	+	o	V, D
	A3	–	o	o	+	o	o	V, D
	A4	–	o	o	+	o	o	V, D
Segment B	B1	-	-	+	o	-	o	V, D
	B2	-	-	+	o	-	o	V, D
	B3	o	o	o	o	o	o	V, D
Segment C	C1	o	–	+	o	-	o	V
	C2	–	o	+	o	-	o	V
	C3	o	o	-	+	+	o	V, D
	C4	–	o	+	o	-	o	V
Segment D	D1	o	o	-	o	o	o	D
	D2	o	o	-	o	o	o	D
	D3	–	o	o	o	o	o	D, R
	D4	o	o	-	o	o	o	D, R
Segment E	E1	o	-	-	+	o	-	R, V, D
	E2	o	o	-	o	o	-	R, V, D
	E3	o	o	-	o	o	o	R, V, D
	E4	o	o	-	o	o	o	R, V, D
Segment F	F1	o	-	-	o	+	-	R, V, D
	F2	o	-	-	o	+	-	R, V, D
	F3	o	o	-	+	o	-	R, V, D

R = Residents, V = Visitors, D = Drive to trail users
Source: Alta Planning + Design

Incline Village to Sand Harbor (North Demonstration Project)

The Incline Village to Sand Harbor section of the Bikeway is proposed as the "North Demonstration Project." This segment would create a logical extension of the existing Lakeshore Boulevard shared-use facility, although the trail would begin slightly to the north of the SR 28/Lakeshore Boulevard intersection. There are two proposed alignments for the North Demonstration Project: Option 1 is adjacent to SR 28 on the mountain side between the north end of Tunnel Creek Road and Tunnel Creek, where it crosses the highway and continues to Sand Harbor on the lake side of the highway. Option 2 follows the alignment of Tunnel Creek Road for approximately two-thirds of a mile, then descends and crosses Tunnel Creek, after which it follows SR 28 on the mountain side and crosses SR 28 at Sand Harbor.

- Grade: Steep grades on either option would deter some users from this section of trail.
- Continuity: SR 28 through this area is not a designated bicycle route. The roadway is narrow and congested during the summer, and therefore eliminates all but the most experienced bicyclists. Both alignment options would be shared-use paths with few crossings, although the crossing at Sand Harbor may become particularly congested.
- Recreational Value: As a continuation of the already highly used Lakeshore Boulevard trail along a very scenic corridor, the North Demonstration Project would see high usage.
- Destinations: The North Demonstration Project would provide access by recreation users to Sand Harbor and other nearby beaches such as Hidden Beach, as well as to serve trips made solely for the biking or walking experience along this very scenic corridor. The segment north of Tunnel Creek would also see use by Flume Trail users accessing the backcountry via Tunnel Creek Road. Another potential use is for relatively short trips between parking at the north end of the segment and the various coves and boulder swimming areas along the corridor. This use would be greater for Option 1 (immediately adjacent to the hillside) than for Option 2 (further east and up the hillside). Due to the long distance to other residences or employment centers to the south, very few – if any – regular bicycling commuters would be expected to use this segment.
- Access: Sand Harbor is a popular and crowded recreation site, currently subject to parking limitations. In addition, the only land access is SR 28. The proposed North Demonstration Project would provide alternative access to Sand Harbor, which would be particularly desirable when parking is full. Parking for this segment is available but frequently full at Memorial Point as well as Sand Harbor and on-street parking is available on SR 28 north of Lakeshore Boulevard.
- Congestion: This segment is expected to receive high use, particularly when use of Sand Harbor is high. However, trail users that may otherwise be deterred from choosing the bicycle transportation mode due to grades, trail continuity, trail recreational value, and trail congestion may put up with less than ideal conditions to access Sand Harbor.

Segment A: Sand Harbor to Secret Harbor Trailhead

As previously described, there are three proposed alignment alternatives for this segment, all beginning at Sand Harbor adjacent to SR 28. Alignments A1 and A2 begin on the lake side of SR 28; Alternative 3 begins on the mountain side of SR 28. A hybrid alternative (A4) was also proposed that follows the Alignment A1/A2 route and connects to the western Alignment A3 option and follows that to the Secret Harbor Trailhead.

- Grade: The terrain is very steep from Sand Harbor to Marlette Creek, and characterized by rolling hills that are somewhat steeper on the east side of SR 28 (Alignment A3), therefore the use estimate would be reduced for Alignment A3 and the hybrid Alignment A4.
- Continuity: All identified options for this section would be shared-use paths separated from the roadway. Few crossings or driveways would disrupt the trail experience. No adjustments would be made to the baseline for continuity.
- Recreational Value: This corridor traverses State Parks and National Forest System (NFS) land, increasing anticipated use due to the scenic nature of the environs along Alignment A1 and A2. Alignments A3 and A4 are located along the road and are likely to not experience an increase over the baseline for recreational value.
- Destinations: Destinations along this segment include Thunderbird Lodge and the Chimney Creek Beach hiking trail access, which would somewhat increase anticipated use for all alignments.

- Access: As this section of the trail is not located in the vicinity of any residences or lodging, use would be limited to either persons accessing it via trail segments to the north and south, or to persons driving to the facility. Given the average trip length for the Region, the long travel distance from the nearest residential/lodging areas (in Incline Village) indicates that most users coming from the north would choose not to continue south to Segment A. The greatest potential for trail use consists of persons that would wish to access the trail by driving and parking for specific recreational opportunities in the area. Parking lots located in the vicinity include one at the Marlette Creek Trail access point (accessible via Alignments A1 and A2) and another on the west side of SR 28 a quarter of a mile to the south (accessible via Alignments A2, A3, and A4). Since Alignment A2 provides two parking opportunities, usage would be increased for that alignment only. Parking is already heavily used by beach goers, with little available for additional trail user parking.
- Congestion: This segment of trail is unlikely to be congested, as the majority of users would be residents or visitors who drive to the trail, rather than continuing from the north. No changes would be made to the baseline for any of the alignments.

Segment B: Secret Harbor Trailhead to Skunk Harbor Access

The three proposed alignment alternatives for Segment B are basically continuations of the three alignments proposed for Segment A. Alignment B1 generally follows as closely as possible to the shoreline of Lake Tahoe, Alignment B2 passes through the forest along the hillside between the shoreline and SR 28, while Alternative 3 is adjacent to the western edge of SR 28. Alignments B1 and B2 overlap for the southernmost half-mile of Segment B.

- Grade: South of Secret Harbor, the terrain remains steep until Secret Harbor Creek. Where SR 28 crosses Secret Harbor Creek, the terrain levels on the east side of SR 28 until reaching the gated NFS road that provides access to Skunk Harbor and Slaughterhouse Canyon Road. Alignments B1 and B2 have steep slopes, reducing the use estimate. Alignment B3 has fewer grade issues parallel to SR 28 and no adjustments would be made to the use estimate.
- Continuity: Alignments B1 and B2 would have a reduced usage because these alignment are along a NFS road to Skunk Harbor that would be shared with motor vehicles. Alignment B3 is close to the road, but on a separated path with few crossings or driveways to disrupt the experience. No adjustments would be made to the estimate for Alignment B3.
- Recreational Value: This corridor is located on NFS land, increasing anticipated use on Alignments B1 and B2 due to the scenic nature of the area. Alignment B3 is located alongside SR 28, and would not experience an increase for recreational value.
- Destinations: All alignments connect to the Secret Harbor and Skunk Harbor trailheads, which are the only destinations along this segment. There would be no adjustment of anticipated use for any of the alignments.
- Access: The majority of potential demand for use of Segment B would be generated by persons wishing to drive to a trailhead either within the segment or within a few miles of the segment. As a result, actual use on busy summer days would be largely constrained by parking availability, unless significant new parking areas were provided, decreasing the estimated usage for Alignments B1 and B2. Alignment B3 has potential for shoulder parking opportunities, and the estimate would not be decreased for that alignment.

- Congestion: This segment of trail is unlikely to be congested, as the majority of users would be residents or visitors who drive to the trail, rather than continuing from the north. There would be no adjustment for congestion for any of the alignments.

Segment C: Skunk Harbor Access to Glenbrook Entrance

Segment C continues with the three alternative alignments from Segment B. The final alignment selection would have a substantial impact on the potential trail usage: Alignments C1 and C2 would provide a unique experience to traverse Slaughterhouse Canyon. Alignment C1 would pass very near the shoreline in the community of Glenbrook, which is not accessible to the general public by car. On the other hand, Alignment C3 would closely follow SR 28 and U.S. 50, and would also provide access to the Spooner Lake area. A hybrid alignment that follows portions of Alignments C2 and C3 was also considered for this segment.

- Grade: Alignments C1 and C3 have less steep slopes than other alternatives through this section, and no reductions would be taken. Alignments C2 and C4 are quite steep and use is likely to decrease for these alignments.
- Continuity: Alignment C1 uses an existing road through the Glenbrook community, reducing the estimate. No adjustments would be made to Alignments C2 and C4, which would be separated facilities with a street crossing at the Glenbrook access road. Alignment C3 would be located in close proximity to SR 28 and U.S. 50 on a shared-use path with few road or driveway crossings. No adjustments would be made to the estimate for Alignment C3.
- Recreational Value: Alignments C1, C2, and C4 are located in the scenic Slaughterhouse Canyon, increasing use based on recreational value. Alignment C3 is located alongside SR 28 and U.S. 50, reducing recreational value for this alignment.
- Destinations: Alignment C1 would pass through the Glenbrook community, and may receive some use from residents. Alignments C1, C2, and C4 would connect to Prey Meadow and Slaughterhouse Canyon. Alignment C3 would provide access to Lake Tahoe-Nevada State Park at Spooner Lake and the Flume Trail. Due to the relative importance of Spooner Lake and the Flume Trail, the use estimate would increase significantly more for Alignment C3 over the others, which are likely to have minimal adjustments due to destinations.
- Access: Parking availability would significantly impact potential use of this trail segment. Alignment C3 would have greater parking availability than the other alternatives, as it would be easily accessible by the existing parking around Spooner Junction. However, if additional trailhead parking were to be provided near the U.S. 50/Glenbrook Drive intersection, it would be heavily used by trail users (particularly for Alignment C1). One specific “drive-to-trail” user group that would tend to access the trail in this segment is cyclists and pedestrians driving up U.S. 50 from the Carson City area. With an estimated current population of 58,200 persons in the urbanized area, there would be a large potential “market” of trail users accessing this trail segment by parking along U.S. 50 by the Skunk Harbor access roadway, by the Glenshire Road intersection, or near Spooner Summit (the latter under Alignment C3 only). Based on access to parking, the use estimate for Alternative C3 would increase over the baseline, while the estimates for the other alignments would decrease.
- Congestion: This segment of trail is unlikely to be congested, as the majority of users would be residents or visitors who drive to the trail, rather than continuing from the north. No adjustment to usage would be made for any of the alignments.

Segment D: Glenbrook Entrance to Cave Rock Drive

The three alignment alternatives generally retain their established characteristics through this segment: Alignment D1 is located on the lake side of U.S. 50, as close to the shoreline as possible, Alignment D2 is located on the lake side of and adjacent to U.S. 50, and Alignment D3 is located adjacent to the mountain side of U.S. 50. A hybrid alignment following Alignment D3 to Cave Rock and then crossing under U.S. 50 to join Alignments D1 and D2 was also considered for Segment D. The final alignment and the grades and driveway crossings associated with Segment D would affect trail usage.

- Grade: This section would pass through areas of steep topography, particularly south of Logan Shoals and at Cave Rock. The use estimate for Alignment D3 would be reduced due to steep slopes south of Cave Rock, while the other alignments would be unaffected.
- Continuity: All alignments would be separated facilities, with the potential for a shared tunnel at Cave Rock. Alignments D1 and D2 would cross several access points for private parcels, many of which are steeply ramped parallel to U.S. 50 with restricted sightlines. Alignments D3 and D4 are separated facilities that cross the Logan Creek entrance road and one other road. However, these crossings are unlikely to significantly impact use and no reductions would be taken over the baseline.
- Recreational Value: All alignments would have spectacular views. However, all alignments pass through private residential areas. Alignments D1, D2, and D4 would include a shared or separated lane through the tunnel at Cave Rock, reducing recreational value. Alignment D3 is located adjacent to U.S. 50, but would not require passing through the tunnel, and the use estimate would not be adjusted for this alternative.
- Destinations: Development and associated population along this trail segment is relatively low: TRPA estimates a total resident population of only 170 and a visitor population on a peak summer day of 267 persons. There are relatively few recreational or commercial activity centers, and little access to Lake Tahoe other than the boat ramp near Cave Rock. While this portion of Lake Tahoe-Nevada State Park includes a small beach area, overall it is not a strong attraction for recreational non-motorized trips. The use estimate would not be adjusted over the baseline for any of the alignments.
- Access: The Cave Rock boat ramp area, accessible by Alignments D1, D2, and D4, has limited parking, much of which is typically in use and not available to trail users. Alignments D1 and D2 also connect to a potential regional parking/transit node south of Glenbrook, while Alignment D3 connects to a potential parking lot south of Logan Shoals. No adjustments would be made to any alternatives related to the minimal parking capacity along any route in Segment D.
- Congestion: This segment of trail is unlikely to be congested, as the majority of users would be residents or visitors who drive to the trail and few destinations are located along this segment. No changes would be made to the baseline for any alternative.

Segment E: Cave Rock Drive to Zephyr Cove

For the northern half of Segment E, all three alignments would be located adjacent to U.S. 50, with Alignments E1 and E2 on the lake side and Alignment E3 on the mountain side. Approximately one mile south of the northern terminus of Segment E, Alignment E1 veers further to the west, closer to the Lake, routed along public local roadways in the Skyland neighborhood. The hybrid alignment (E4) considered for Segment E follows Alignment E2 until just north of the Skyland subdivision, then crosses U.S. 50 to join Alignment E3.

- Grade: South of Cave Rock, the terrain gradually levels near the shoreline. East of U.S. 50 the terrain is characterized by steep east-to-west trending ridges with creeks that drain into Lake Tahoe. A spur bike

trail along Warrior Way would connect Zephyr Cove Elementary School, Zephyr Cove County Park, and George Whittell High School with the Bikeway. The grade for this spur trail along Warrior Way is approximately 5 percent, extending for just over one third-mile, which would only minimally impact potential trail usage. Grade changes would not affect use of any alternative through this segment.

- Continuity: Alignments E2 and E3 are dedicated shared-use path facilities, while Alignment E1 would be partially on-street along roads in the Skyland neighborhood. Several roads cross all alignments. The use estimate for Alignment E1 would be reduced, while the other alignments would not be adjusted.
- Recreational Value: All alignments pass through private residential areas and are alongside U.S. 50, which would reduce recreational value of the trail.
- Destinations: This trail segment has a relatively high population compared with other East Shore segments, consisting of an estimated 607 residents and 454 visitors. The majority of the resident population is in subdivisions such as Lakeridge, Hidden Woods, and Skyland in the northern portion of the segment. The key activity generator in this segment is Zephyr Cove Resort (including the associated campground) – day and overnight visitors to the resort would constitute a substantial proportion of users. In addition, George Whittell High School and Zephyr Cove Elementary School are located at the northern end of Zephyr Cove. However, opportunities for bicycling or walking to these schools along the Bikeway would be modest due to the lack of residential areas within a half-mile (these schools serve the entirety of the Tahoe Basin portion of Douglas County), and because the subdivisions to the north are on the opposite side of U.S. 50. With the only protected crossing of four-lane U.S. 50 at the Zephyr Cove Resort signal, students from these subdivisions would either need to cross U.S. 50 at an unprotected location or travel the additional 0.7 miles (round-trip) to access the signal and a safe highway crossing. Alignment E1 connects directly to the Zephyr Cove Resort, while a potential spur would connect Alignments E2, E3 and the hybrid. Given the large attractor of the Resort, all alternatives would receive higher-than-baseline use estimates, but the proximity of Alignment E1 to the resort would give that alignment the largest increase.
- Access: Zephyr Cove Resort provides parking opportunities and is likely to generate some trips, although parking for trail users is limited. Additional parking for all alignments could be provided at the two schools. Alignments E1 and E2 would connect to Zephyr Cove Resort parking, while Alignments E3 and the hybrid would connect to potential parking at George Whittell High School and a potential spur would connect them to the parking at the Resort. However, the parking at Zephyr Cove Resort is generally full in the summertime and no adjustment would be made to any alternative through this section.
- Congestion: While this section is likely to receive higher use than the middle sections of the Bikeway, it is unlikely that congestion would be a substantial concern except during weekends in the summertime. Congestion would be relatively higher on Alignments E1 and E2, as those options are more likely to be used for short trips by Zephyr Cove Resort visitors, and the use estimate would be reduced over the baseline for those alternatives.

Segment F: Zephyr Cove to Roundhill Pines Beach

Segment F connects the Bikeway to the South Demonstration Project, which would provide a connection between the Stateline casino core and Zephyr Cove Beach. Consistent with Bikeway segments to the north, there are three proposed alignment alternatives. Alignments F1 and F2 are the same for the northern third of Segment F, following local roadways in a Zephyr Cove subdivision on the lake side of U.S. 50. As U.S. 50 loops around Zephyr Heights, Alignment F1 follows Freel Drive and Alignment F2 returns to being adjacent

to U.S. 50 on the lake side. Alignment F3 is located adjacent to U.S. 50 on the mountain side. There was no hybrid alignment considered for Segment F.

- Grade: This segment of the Bikeway is relatively flat. No adjustments would be made for the grade criterion.
- Continuity: Alignment F1 and parts of Alignment F2 follow local roadways in a Zephyr Cove subdivision, reducing potential usage. Alignment F3 and parts of Alignment F2 are located on a shared-use path.
- Recreational Value: Alignment F3 and parts of Alignment F2 are located adjacent to U.S. 50, while Alignment F1 and parts of Alignment F2 are in a residential area. These factors would decrease the recreational value for all alternatives.
- Destinations: Population along this segment is relatively low, estimated to equal 478 residents and 931 visitors on a peak summer day. The majority of the total population is in the Zephyr Heights area east of U.S. 50. The key activity center within the corridor is Round Hill Pines Beach and Marina. Zephyr Cove Resort lies just to the north of the corridor, and Round Hill Square shopping area lies just to the south. In addition to through cyclists and pedestrians, use would be generated by residents and overnight visitors staying in the corridor accessing Zephyr Cove to the north as well as Round Hill Pines Beach and the Round Hill Square shopping area to the south. As the majority of population in Segment F is east of U.S. 50, and as the highway forms a significant barrier to non-motorized crossings, use generated within this corridor would be higher for Alignment F3 (situated on the east side of the highway) than for Alignments F1 and F2.
- Access: The use estimate for Alignments F1 and F2 would be increased due to parking located at Round Hill Pines Beach. On all alternatives, users are likely to continue north from the South Demonstration Project.
- Congestion: Due to the easy access and significant trip generators, this section is anticipated to have congestion on all alignments to a point that would deter some of the trips that would otherwise occur.

Round Hill Pines Beach to Stateline, Nevada (South Demonstration Project)

The South Demonstration Project is the first portion of the Bikeway that is planned for construction. The South Demonstration Project is currently undergoing environmental review. A quantitative use model was prepared for the South Demonstration Project for the environmental analysis of project impacts. That analysis will be available for review when the environmental document is released to the public. Because of its location near the casino core and the scenic nature of the proposed trail, the South Demonstration Project portion of the Bikeway is expected to experience high rates of usage.

Discussion of Cumulative Use of Entire Completed Trail

While this qualitative trail use analysis focuses on individual segments of the Bikeway, usage on any one segment would also depend to a significant degree on whether the trail as a whole is completed. In particular, completion of the Bikeway between Stateline and Incline Village would provide a recreational amenity that would have few peers across Nevada, California, or the western U.S. as a whole. Just as the Rubicon Trail draws four-wheeler enthusiasts and the Flume Trail draws mountain biking enthusiasts, a completed Bikeway could be expected to draw new recreational bicyclists from long distances simply to ride this unique facility. While a specific use figure would depend on public awareness and marketing as well as the final alignment, it can be expected based on use levels at other Tahoe facilities and the relatively high attractiveness of a completed Bikeway facility, that this additional usage associated with completion of the facility from Stateline to Incline Village could total several hundred users on a peak summer day.

7 EVALUATION OF ALTERNATIVES

7.1 DEFINITION OF EVALUATION CRITERIA

The criteria selected for evaluating alternative alignments were developed from several sources including the project vision, goals, and objectives; desired design parameters; and the opportunities and constraints report. The evaluation criteria reflect the characteristics of the Bikeway that have been identified by the Working Group and project stakeholders during the planning process as being critical to the success of the project. A set of 20 criteria were selected for evaluation. The 20 criteria were grouped into three categories to facilitate selection of the most highly rated alternative alignment for each of the six project segments within the central corridor (i.e., between the proposed North and South Demonstration Projects. The three categories are user experience, environmental constraints, and cost and constructability.

7.1.1 USER EXPERIENCE

The category of user experience included the following six evaluation criteria:

Consistency with the vision for the Bikeway. The vision for the Bikeway is a premier, separated shared-use path. This criterion addresses three issues: premier, shared use, and separated. "Premier" relates to the quality of the users' experience. "Shared-use" relates to the ability of the trail to accommodate a mix of users. "Separated" relates to the trail's distance from highways.

Safety, security, and liability. It is important for Bikeway users to have a safe and secure experience on the trail. This criterion compares the alternatives in terms of conformity to state and federal design standards (e.g., AASHTO and ADA), emergency access, ability for users to exit the trail, and minimizing roadway and driveway crossings.

Bikeway and community connections. One of the key objectives of the Bikeway is to provide access to community, commercial, recreational, and transportation facilities. This criterion compares the degree to which the alternatives provide these connections and are accessible to multiple users.

Natural, historic, and cultural interpretive opportunities. The Tahoe Basin has a rich history of Native American and European settlement and is home to some of the world's most spectacular natural wonders. This criterion compares the degree to which the alternative alignments provide interpretive opportunities for these resources.

Scenic opportunities. Lake Tahoe and its surroundings provide scenic vistas of unparalleled beauty. The Bikeway alignments are assessed relative to how well they would provide opportunities for users to experience these vistas without hindering other Bikeway users.

User friendliness. The Bikeway should be accessible to multiple users such as bicyclists of varying skills/interests, walkers, joggers, in-line skaters, and people in wheelchairs. The trail should serve the needs of both commuters and recreational users, minimize slopes in excess of 5%, and provide ample opportunities for resting (including facilities such as water fountains, restrooms, etc.).

7.1.2 ENVIRONMENTAL CONSTRAINTS

The following seven criteria were used to evaluate the issues relating to environmental constraints:

Scenic impacts. Protecting the scenic attributes of Lake Tahoe and its environs is a high priority for the Working Group and all those who care about this beautiful place. The Bikeway alignment should minimize impacts on scenic resources including views from the Lake and the surrounding roadways.

Biological resources. This criterion evaluates how well the alternatives avoid impacts on sensitive wildlife and plant species found along the eastern shore of Lake Tahoe.

Cultural resources. The Tahoe Basin is rich in cultural resources, particularly those associated with the Washoe Tribe. The Bikeway alignment should be sensitive to the resources and traditions of the Washoe Tribe and avoid impacts on other known cultural resources.

Hydrology and water quality. The Bikeway alignment should minimize effects on natural hydrologic flow paths and subsurface water and minimize stream crossings and use of SEZs.

Beneficial Effects. The Bikeway has the potential to provide accessory benefits to the environment, such as contributing to the resolution of existing erosion and parking problems.

Tree removal. To the extent possible, the Bikeway alignment should minimize the need for tree removal.

Permitability and community acceptance. The Bikeway alignment should be consistent with agency environmental permitting requirements and minimize potential adverse effects on private property.

7.1.3 COST AND CONSTRUCTABILITY

The category of cost and constructability included the following seven evaluation criteria:

Grading/cut and fill. Construction on cross-slopes requires cut and fill to create a level path. This is both expensive and may require retaining walls and leave visible cuts on hillsides. The Bikeway alignment should minimize the need for cut and fill.

Private property acquisition. The Bikeway alignment should minimize the need for private property acquisition and provide an easement wide enough to accommodate the 14-foot bicycle path cross-section with adequate room to avoid trees, rock outcrops, and other sensitive resources..

Separated roadway crossings. Undercrossings and overcrossing are expensive to construct and maintain and often do not meet accessibility goals because they require steep slopes or stairs. They should be avoided to the extent possible in the final alignment selection.

Length of trail. Trail length affects both the cost of the trail and the accessibility of the trail to more casual users. Trail length should be kept to a minimum while still meeting other Bikeway objectives.

Use of existing roads and trails. There are many opportunities for the Bikeway to take advantage of existing coverage, higher capability lands, existing disturbed areas such as logging and fire access roads, and existing parking facilities. Using these resources will minimize the need for new grading, etc., resulting in fewer potential water quality impacts and coverage transfer costs.

Maintenance. The Bikeway should be easy and inexpensive to maintain. Shorter alignments and those with more level slopes would generally result in lower long-term maintenance needs and costs.

Retaining walls or bridge structures. Costly engineering solutions such as retaining walls and bridge structures should be avoided to reduce construction costs.

7.2 EVALUATION OF ALTERNATIVES

The consultant team prepared an initial scoring of the criteria listed in Section 7.1 above using the alternatives evaluation worksheets in Appendix A to populate the Alternatives Evaluation Matrix in Appendix B. The total score for each category was determined by multiplying the raw score from the worksheet for each criterion in the category by the weight assigned to that criteria and summing the total for all criteria in the category. These ratings were used by the stakeholders and Working Group to evaluate the alternative

alignments and select the most highly rated alternative within each segment. The alternative alignments and most highly rated alignments are depicted in Maps 1 through 4 at the end of this section. The most highly rated alternative is depicted as a dotted line on these maps. The following sections provide a summary of the results of the evaluation process.

7.2.1 SEGMENT A: SAND HARBOR TO USFS PARKING LOT AT SECRET HARBOR TRAILHEAD

The alignment alternatives in the northern part of the study area are constrained primarily by topography and biological resources, specifically osprey and goshawk nesting sites. Under TRPA code, known osprey nesting sites are afforded a ¼-mile buffer and goshawk nesting sites are afforded a ½-mile buffer. Nearly the entire study area between Sand Harbor and Geo Whittell Road near the entrance to Thunderbird Lodge is within an osprey disturbance buffer. While it may be possible to mitigate for effects on osprey and goshawk, there is currently no proven approach for achieving this mitigation, so the most feasible strategy for locating the Bikeway is to place it close to an existing disturbed area, such as SR 28. For purposes of this discussion, the disturbance zone is the width of the corridor adjacent to the roadway within which the Bikeway could be located without causing an increase in disturbance to osprey or goshawk nests or perches. The width of the corridor would vary depending on factors such as intervening topography and vegetation and should be determined through coordination with TRPA and the USFS prior to beginning detailed design of the Bikeway.

The steep terrain in this area will in some instances require relatively expensive construction methods to provide separation from the roadway while avoiding scenic impacts from either the Lake or the roadway. Having the Bikeway close to the roadway would not necessarily provide the highest quality user experience; however, the alignment on the west side of SR 28 would provide spectacular views of the Lake and surrounding mountains for the northern half of Segment A. The southern half of Segment A is constrained by several osprey disturbance buffers between SR 28 and the Lake and a goshawk PAC on the east side of SR 28. In addition, the Thunderbird Lodge Preservation Society, the organization that is responsible for protecting the resources at the Thunderbird Lodge, has expressed concern about the Bikeway being located in close proximity to their property. For these reasons, the most feasible route for the Bikeway on the southern half of Segment A is an alignment that stays within the disturbance zone of SR 28 on the west side of the roadway. The user experience on this part of the Bikeway will be dominated by views of the surrounding forest.

The most highly rated alignment for Segment A, Hybrid Alignment A4 terminates at a small parking lot on NFS land at the trailhead that leads to Secret Harbor. This parking lot is often at capacity during the summer season and would need to be enlarged or other nearby parking would need to be provided to accommodate Bikeway users. There are restroom facilities at this lot.

Table 6 provides a summary of the total score for each of the criteria categories for the four alternatives in Segment A. A composite rating and an overall ranking were determined after considering input from the Working Group and stakeholders. The composite rating is the sum of the weighted ratings for each of the three categories.

Hybrid Alignment A4 was the most highly rated alignment alternative in Segment A. The user experience on this alignment is degraded by the close proximity of the highway; however, unlike Alignment A3 no highway crossings are required. This alternative reduces environmental constraints related to the osprey nests by remaining in existing disturbed areas and is less expensive to build than the other alternatives because of its shorter length and lack of separated highway crossings.

Table 6
Summary of Alternatives Evaluation Ratings for Segment A

Alternative Alignment	Evaluation Criteria				
	User Experience	Environmental Constraints	Cost and Constructability	Composite Rating	Overall Ranking
Alignment A1	19.6	24.5	18.5	62.6	4
Alignment A2	20.4	24.5	18.5	63.4	3
Alignment A3	15.7	36.2	16.5	68.3	2
Hybrid Alignment A4	18.4	38.7	20.5	77.5	1

Rating Color Codes

First	Second	Third	Fourth

Notes:
Maximum Rating by Category:
User Experience = 30
Environmental Constraints = 55
Cost and Constructability = 35
Maximum possible composite rating for a "perfect" trail is 120 points.

Alignment A3 is close to SR 28 on the east side of the highway for the first two-thirds of the trail and then crosses SR 28 to parallel it to the parking lot at Secret Harbor. This alignment provides a similarly degraded user experience as Alignment A4 but would also require two highway crossings to provide access to public facilities, resulting in a lower rating than the hybrid alternative.

Alignment A2 scored well in user experience and cost and constructability, but poorly in environmental constraints. This alternative deviates to the west away from SR 28 near Thunderbird Lodge, providing users with views of Lake Tahoe and the opportunity to travel through undeveloped forest; however, it passes close to several osprey nesting sites and within the associated disturbance buffers of these sensitive resources.

Alignment A1 is similar to Alignment A2 with the exception that the user experience is degraded by not having a rest stop at the southern end. It also traverses steep grades at the southern end of the segment. Additionally, this alignment would not connect to the most highly rated alignment in Segment B.

REPRESENTATIVE PHOTOS OF SEGMENT A

Photo 1. View toward SR 28 from the beach at Sand Harbor

Photo 2. Illegal parking at Sand Harbor Lake Tahoe-Nevada State Park

Photo 3. SR 28 South of Sand Harbor

Photo 4. View of Thunderbird Lodge from Lake Tahoe

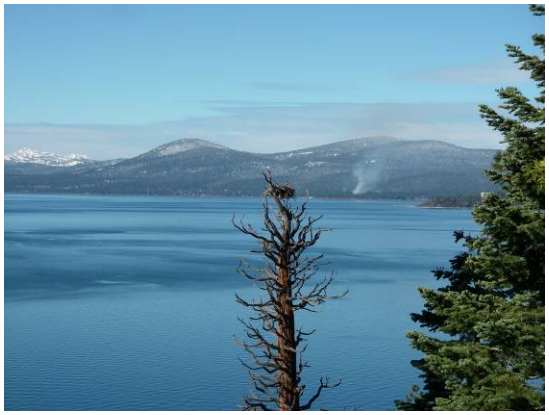


Photo 5. Osprey nest on east shore of Lake Tahoe

Photo 6. Beach at Secret Harbor

7.2.2 SEGMENT B: USFS PARKING LOT AT SECRET HARBOR TRAILHEAD TO SKUNK HARBOR ACCESS ROAD

Similar to Segment A, Segment B is constrained by steep cross-slopes, osprey and northern goshawk buffers, and northern goshawk PACs. In addition, there are large private landholdings south of Secret Harbor and an area of Washoe Tribal land on the north side of Skunk Harbor. Both the private landowners and the Washoe Tribe have expressed concerns about the Bikeway going through or in close proximity to their property.

Because of the steep terrain on the west side of SR 28 in the area south of Secret Harbor, a trail through this area would require numerous switchbacks in order to avoid private property. Even though a trail in this area would be on the lake side of the hills, views of the Lake would be limited due to the intervening vegetation and grades would be quite steep. In addition, much of the trail would be within a northern goshawk PAC. For these reasons, the most highly rated alignment in Segment B, Alignment B3, is one that follows SR 28. An alignment on the west side of the highway would be preferable because it would avoid the need for road crossings and minimize the need for cut and fill on the steep northern part of the segment.

Table 7 provides a summary of the total score for each of the criteria categories for the three alternatives in Segment B.

Table 7
Summary of Alternatives Evaluation Ratings for Segment B

Alternative Alignment	Evaluation Criteria				
	User Experience	Environmental Constraints	Cost and Constructability	Composite Rating	Overall Ranking
Alignment B1	19.2	27.8	14.8	61.9	3
Alignment B2	19.4	32.2	16.7	68.2	2
Alignment B3	15.1	43.2	24.0	82.3	1

Rating Color Codes		
First	Second	Third

Notes:
Maximum Rating by Category:
User Experience = 30
Environmental Constraints = 55
Cost and Constructability = 35
Maximum possible composite rating for a "perfect" trail is 120 points.

Alignment B3 was the most highly rated alignment alternative in Segment B, with a substantially higher rating that the other options in this area. Alignment B3 is close to SR 28 on the west side of the highway for the entire segment. This alternative would avoid environmental impacts related to osprey and goshawk because of its proximity to the highway and existing disturbance, and would be shorter and easier to construct than the other two alternatives; however, the user experience would be degraded by the proximity to SR 28 and the lack of views of Lake Tahoe.

Alignment B2 would provide an excellent user experience and would require fewer switchbacks than Alignment B1 to maintain slopes below 5 percent. Alignment B2 passes through a goshawk PAC and through the outer edge of two osprey disturbance buffers. Alignment B2 has several options for negotiating steep terrain – all of which have similar impacts cost and constructability. One of the options passes through three private parcels, another major constraint to the constructability of Alignment B2.

Alignment B1 scored well in user experience and environmental constraints because it would provide the user with excellent views of Lake Tahoe and undeveloped forest and it avoids the goshawk PAC. It does, however, pass through two osprey disturbance buffers. Alignment B1 scored poorly in cost and constructability because of its length and steep cross-slopes and because it would require an easement from private property owners, which would be difficult to obtain.

REPRESENTATIVE PHOTOS OF SEGMENT B

Photo 7. Access road to private property near Secret Harbor

Photo 8. Existing Trail (soft coverage) near Secret Harbor

Photo 9. Remnants of flume north of Secret Harbor r

Photo 10. View from trail overlooking Secret Harbor

Photo 11. Parking along SR 28 near the trail to Sand Harbor

Photo 12. View from trail south of Chimney Beach

7.2.3 SEGMENT C: SKUNK HARBOR ACCESS ROAD TO GLENBROOK ENTRANCE

Segment C is constrained primarily by the location of the gated community of Glenbrook and the steep terrain between SR 28 and Lake Tahoe. In addition, there are several osprey buffers in the vicinity of Slaughterhouse Canyon. While the most direct and most scenic route would follow Slaughterhouse Canyon to Glenbrook, the difficulty of getting through or around Glenbrook makes the alignment alternatives in this area relatively infeasible. Because Glenbrook is a gated community, it would likely be difficult to get consensus on placing a public bikeway through the community. An uphill alignment that avoids the private property in Glenbrook would have to negotiate steep cross-slopes, would be considerably longer than other options, and would be much more expensive to construct than an alignment that follows SR 28 and U.S. 50.

The most highly rated alignment for Segment C, Alignment C3, continues south from the Skunk Harbor access road on the west side of SR 28. Where terrain permits, the alignment meanders away from the roadway to provide an enhanced user experience. There is an option to include a loop to Spooner Lake where there is potential for additional parking and a regional transit center. Inclusion of this loop would require two crossings of SR 28. This loop would enter the park through the main entrance and fee booth on the east side of SR 28. Additional parking is available on the southwest corner of Spooner Junction. From Spooner Junction, the alignment follows the Old Lincoln Highway, taking advantage of existing coverage, to the gate at Glenbrook. The alignment then crosses Glenbrook Creek and follows U.S. 50 within the NDOT right-of-way to the entrance gate to Glenbrook. The crossing at Glenbrook Creek would require two sharp curves, steep slopes, and a bridge over the creek. There is a limited amount of parking available outside the Glenbrook gate; however, this is often filled by employees that park outside the gate and walk or carpool into Glenbrook. With some improvement, this parking area could be used as a regional parking/transit node.

Table 8 provides a summary of the total score for each of the criteria categories for the four alternatives in Segment C.

Table 8
Summary of Alternatives Evaluation Ratings for Segment C

Alternative Alignment	Evaluation Criteria				
	User Experience	Environmental Constraints	Cost and Constructability	Composite Rating	Overall Rating
Alignment C1	19.9	32.3	26.0	78.2	3
Alignment C2	18.6	33.8	12.5	65.1	4
Alignment C3	21.3	45.3	25.5	92.1	1
Hybrid Alignment C4	21.7	42.7	14.2	78.5	2

Rating Color Codes

First	Second	Third	Fourth

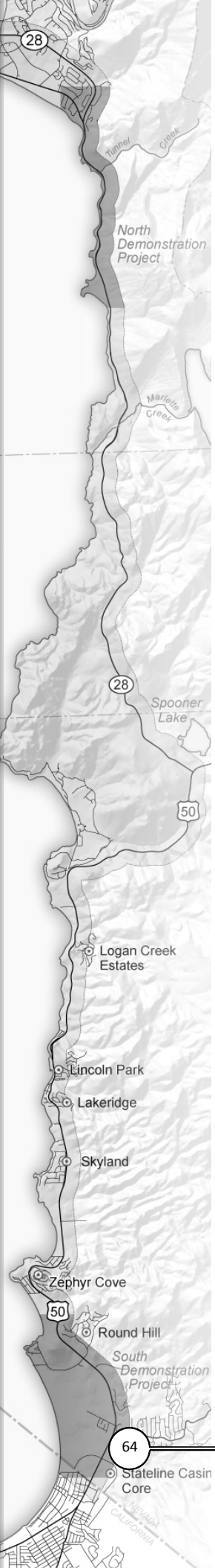
Note: Maximum Rating by Category:
User Experience = 30
Environmental Constraints = 55
Cost and Constructability = 35
Maximum possible composite rating for a “perfect” trail is 120 points.

Alignment C3 was the most highly rated alignment alternative in Segment C. Alignment C3 parallels SR 28 to Spooner Junction with an option to loop close to existing facilities at Spooner Lake through the Lake Tahoe Nevada State Park main entrance and fee booth. From Spooner Junction the alignment follows the Old

Lincoln Highway toward Glenbrook. This section of the trail has a relatively steep grade for most of its length, reducing the rating for user experience. As the trail approaches Glenbrook it gets very close to U.S. 50 to avoid private property. An easement through unused portions of private parcels in Glenbrook further from the highway would improve the user experience in this area.

Hybrid Alignment C4 would follow Alignment C2 to avoid private property and then connect with Alignment C3 on the north side of U.S. 50. This alignment provides a good user experience and avoids private property, but has limited connectivity. Cost and constructability was scored low because of the trail's length, steep side-slopes in the portion that follows Alignment C2.

Alignment C1 scored low in user experience because it lacked scenic and interpretive opportunities and provided limited connections to other local and regional trails and bike paths. It received a low environmental constraints score primarily because it would require the use of local roads through the gated Glenbrook community and also passes through two osprey disturbance buffers. Alignment C2 provides a slightly better user experience than Alignment C1 and does not require traversing the Glenbrook community; however, it does require the acquisition of easements across private property in Glenbrook. The upper (eastern) option requires less easement than the lower (western option). Cost and constructability was scored low because of the trail's length, steep side-slopes, and the need to acquire private property.



SEGMENT C: SKUNK HARBOR ACCESS ROAD TO GLENBROOK ENTRANCE

Photo 13. Road to Skunk Harbor from beginning of Segment C

Photo 14. View south from beginning of Segment C

Photo 15. View over Slaughterhouse Canyon

Photo 16. Spooner Meadow

Photo 17. View looking west down Old Highway 50 (north of Glenbrook Creek and U.S. 50)

Photo 18. Gate at Glenbrook on Old Lincoln Highway

7.2.4 SEGMENT D: GLENBROOK ENTRANCE TO CAVE ROCK DRIVE

In the northern part of Segment D, private property on both sides of U.S. 50 near Logan Shoals limits alignment alternatives to a narrow strip of land adjacent to the highway. There is a segment of the Old Lincoln Highway south of the Logan Shoals subdivision on NFS land that has been converted into a hiking trail. This trail provides an opportunity to take advantage of existing coverage while also providing excellent views of the Lake and Cave Rock. Alignment D2, the most highly rated alignment in Segment D, avoids the private property in Logan Shoals by staying close to the highway, then drops down from the roadway to follow the Old Lincoln Highway alignment until it approaches private property to the south, at which point it climbs back to the highway, which it follows closely to Cave Rock. As mentioned in Section 5.2.4 above, several options have been explored for getting past Cave Rock, the most appropriate being the shared tunnel options considering the spiritual significance of the site to the Washoe.

Table 9 provides a summary of the total score for each of the criteria categories for the four alternatives in Segment D.

Table 9
Summary of Alternatives Evaluation Ratings for Segment D

Alternative Alignment	Evaluation Criteria				
	User Experience	Environmental Constraints	Cost and Constructability	Composite Rating	Overall Ranking
Alignment D1	23.3	35.0	21.3	79.6	2
Alignment D2	23.3	37.2	22.3	82.8	1
Alignment D3	16.2	30.2	19.2	65.5	4
Hybrid Alignment D4	16.1	42.2	16.2	74.4	3

Rating Color Codes			
First	Second	Third	Fourth

Notes:
Maximum Rating by Category:
User Experience = 30
Environmental Constraints = 55
Cost and Constructability = 35
Maximum possible composite rating for a "perfect" trail is 120 points.

Alignment D2 was the most highly rated alignment alternative in Segment D. Alignment D2 provides an excellent user experience because it takes advantage of an existing picturesque scenic trail on the Old Lincoln Highway alignment between two private parcels south of Logan Shoals. This alignment is similar to Alignment D1 except that it does not require as many easements on private property, making it more acceptable to the community, easier to permit, and less expensive to construct.

Alignment D1 provides an excellent user experience because it takes greater advantage of the scenic trail on the Old Lincoln Highway than alignment D2, however it requires more easements on private property than Alignment D2. Alignment D1 scored lower in environmental constraints because of its proximity to the residences of Logan Shoals. Alignment D1 would be relatively inexpensive to construct and maintain.

Hybrid Alignment D4 has a degraded user experience due to its proximity to U.S. 50, but has the advantage of connecting to the State Park at Cave Rock. This alternative avoids numerous private parcels on the west side of U.S. 50. The alignment requires an undercrossing of U.S. 50, which would be expensive to construct and could require cyclists and other trail users to use stairs.

Alignment D3 would remain in close proximity to U.S. 50 and would have limited vista opportunities. This alternative avoids having to share the Cave Rock tunnel with automobile traffic, but requires transitioning steep grades to get around Cave Rock to the east.

SEGMENT D: GLENBROOK ENTRANCE TO CAVE ROCK DRIVE

Photo 19. View looking north from Old Lincoln Highway near Logan Shoals

Photo 20. View looking south from Old Lincoln Highway near Logan Shoals

Photo 21. West side of U.S. 50 north of Cave Rock

Photo 22. Looking for a way around Cave Rock off of Winding Way

Photo 23. View looking south of remnants of the Old Lincoln Highway on Cave Rock

Photo 24. Boat launch at Cave Rock

7.2.5 SEGMENT E: CAVE ROCK DRIVE TO ZEPHYR COVE

The residential subdivisions of Hidden Woods, Lakeridge, and Skyland constrain all alignments in the northern part of Segment E to being close to the highway. Once south of the subdivisions, the proposed alignments pass through NFS land until reaching Zephyr Cove Beach. Alignment E2 was the most highly rated alignment in Segment E, primarily because it avoids private property by staying close to U.S. 50 until reaching the Skyland subdivision, then following a frontage road until reaching NFS land. On NFS land, Alignment E2 follows an existing dirt trail with views of the Lake through the forest. Although there is more open space on the east side of U.S. 50 in this segment, it would require two road crossings to access the east side of the highway and connect to the most highly rated alignments to the north and south, which are on the west side of the highway.

Alignment E2 would provide a connection between the subdivisions in the north and the high school, elementary school, county park, and beach to the south. This alignment would require a road crossing to access the schools and park on the east side of U.S. 50. Constructing a spur trail to connect to these facilities would improve access for school children as well and providing additional parking in this heavily visited area

Table 10 provides a summary of the total score from the alternatives evaluation matrix for each of the criteria categories for the four alternatives in Segment E.

Table 10
Summary of Alternatives Evaluation Ratings for Segment E

Alternative Alignment	Evaluation Criteria				
	User Experience	Environmental Constraints	Cost and Constructability	Composite Rating	Overall Ranking
Alignment E1	22.0	38.2	21.0	81.1	3
Alignment E2	21.2	38.2	24.0	83.3	1
Alignment E3	20.1	40.5	21.8	82.4	2
Hybrid Alignment E4	19.5	35.5	16.8	71.8	4

Rating Color Codes

First	Second	Third	Fourth

Notes:
Maximum Rating by Category:
User Experience = 30
Environmental Constraints = 55
Cost and Constructability = 35
Maximum possible composite rating for a "perfect" trail is 120 points.

Alignment E2 was the most highly rated alignment alternative in Segment E, although the overall rankings of Alignments E1 and E3 were very close. Alignment E2 uses surface streets in Skyland and would intrude into that neighborhood, but to a lesser extent than Alignment E1. Alignment E2 provides a relatively direct route and uses existing paved roads in Skyland and would, therefore, be less costly to construct than the other alternatives.

Alignment E3 is close to U.S. 50 on the east side of the highway for the entire segment with some options to deviate to the east to avoid private property and the need to cross driveways. This alternative would avoid intrusion into Lakeridge and Skyland, but would require crossing U.S. 50 at Zephyr Cove to access the beach and connect with Alignments F1 and F2 in Segment F. This alignment scored lower in cost and constructability because of its length and the fact that it does not use as much existing coverage as the other alignments.

Alignment E1 closely follows U.S. 50 from Cave Rock Drive to Skyland, where it deviates to the west on Myron Avenue and then to the south on Skyland Drive. Although this alternative gains separation from U.S. 50 at the north end of the Skyland subdivision, the user experience would be degraded by the need to reduce speeds, negotiate two 90-degree turns, and cross in front of numerous driveways in Skyland subdivision. As with Alignment E2, this alternative scored lower in environmental constraints primarily because of its effects on private property in the Skyland neighborhood. Alignment E1 scored lower than Alignment E2 in cost and constructability because of its greater length and the need to acquire easements across private property.

Hybrid Alignment E4 was rated the lowest in all three evaluation categories. It would intrude into the Lakeridge neighborhood, but would cross U.S. 50 north of Skyland to avoid that subdivision. Because the crossing would be an undercrossing, it would be expensive and would degrade the user experience. This alternative would also require a second U.S. 50 crossing at Zephyr Cove to provide access to the beach and to connect with Alignments F1 and F2.

SEGMENT E: CAVE ROCK DRIVE TO ZEPHYR COVE

Photo 25. Steep grade on Cave Rock Drive

Photo 26. View south from Cave Rock boat launch facility

Photo 27. Multiple driveways and roads on east side of U.S. 50 south of Cave Rock

Photo 28. Existing trail at Zephyr Cove on west side of U.S. 50

Photo 29. View of Lake Tahoe from trail at Zephyr Cove

Photo 30. Potential connections to local schools and recreation near Zephyr Cove

7.2.6 SEGMENT F: ZEPHYR COVE TO ROUND HILL PINES BEACH ENTRANCE

The area south of Zephyr Cove is highly developed on both sides of U.S. 50. Private property and steep terrain restrict alignment options in the northern half of this segment to being near the highway or on residential streets. An expansive SEZ associated with McFaul Creek and private property holdings limit alignment options in the southern half of Segment F. The most highly rated alternative in this segment is Alignment F2, which follows residential streets south of Zephyr Cove Beach, connecting with U.S. 50 and following it closely around the curve at Zephyr Heights before deviating to the west to follow a frontage road until just north of Bourne Meadow. From this point the alignment remains close to U.S. 50 to avoid private property and minimize impacts on the SEZ before connecting with the South Demonstration Project near Round Hill Pines Beach.

Table 11 provides a summary of the total score from the alternatives evaluation matrix for each of the criteria categories for the three alternatives in Segment F.

Table 11
Summary of Alternatives Evaluation Ratings for Segment F

Alternative Alignment	Evaluation Criteria				
	User Experience	Environmental Constraints	Cost and Constructability	Composite Rating	Overall Ranking
Alignment F1	20.3	31.5	19.0	70.8	2
Alignment F2	20.4	36.8	20.3	77.6	1
Alignment F3	16.6	39.0	13.3	68.9	3

Rating Color Codes		
First	Second	Third

Notes:
Maximum Rating by Category:
User Experience = 30
Environmental Constraints = 55
Cost and Constructability = 35

Alignment F2 was the most highly rated alignment alternative in Segment F. Alternative F2 would provide a direct route between Zephyr Cove and Round Hill, but easement widths would be constrained around the curve in Zephyr Cove by private property and steep terrain. The user experience and cost and constructability of this alternative were comparable to Alignment F1, but Alignment F2 has a higher rating under environmental constraints because it avoids a sensitive stream crossing.

Alignment F1 uses local roads through subdivisions to avoid U.S. 50, but crosses a wide (SEZ) area on a privately owned parcel just north of Round Hill. Alignment F1 has a degraded user experience because it crosses in front of many driveways. Alignment F1 would cross through the Zephyr Cove neighborhood, potentially raising compatibility issues, which also reduced its environmental constraints score relative to the other alignments in Segment F.

Alternative Alignment F3 is close to SR 28 on the east side of the highway for the entire segment. This alternative would require some right-of-way acquisition on the south side of Zephyr Heights and would include a crossing of U.S. 50 to connect to the South Demonstration Project, lowering its rating for costs and constructibility. User experience would be degraded by proximity to U.S. 50 and its distance from the Lake.

REPRESENTATIVE PHOTOS OF SEGMENT F

Photo 31. Old Lincoln Highway south of Zephyr Cove Beach

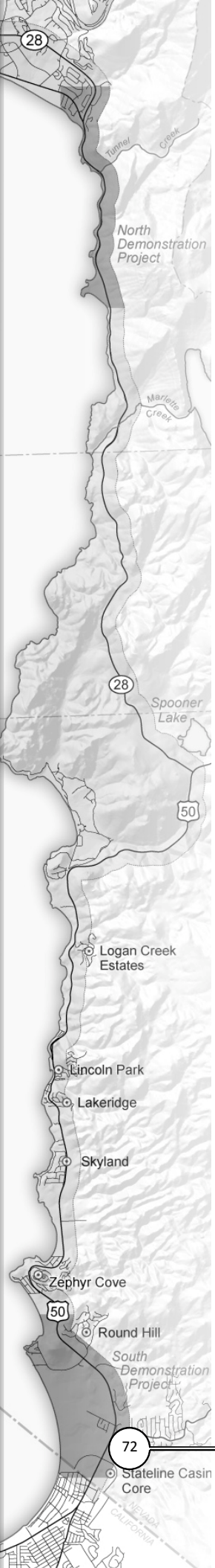
Photo 32. Existing path south of Zephyr Cove Beach

Photo 33. Constrained right-of-way on U.S. 50 south of Zephyr Cove Beach

Photo 34. Steep slope on lake side of U.S. 50 near Zephyr Cove Beach

Photo 35. Wide SEZ north of Round Hill

Photo 36. Zephyr Cove Beach



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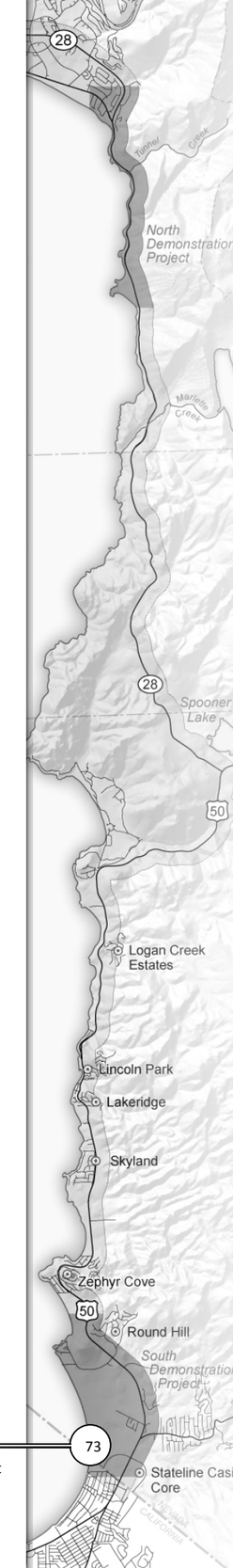
Source: AECOM 2010

Map 1

Exhibit 11



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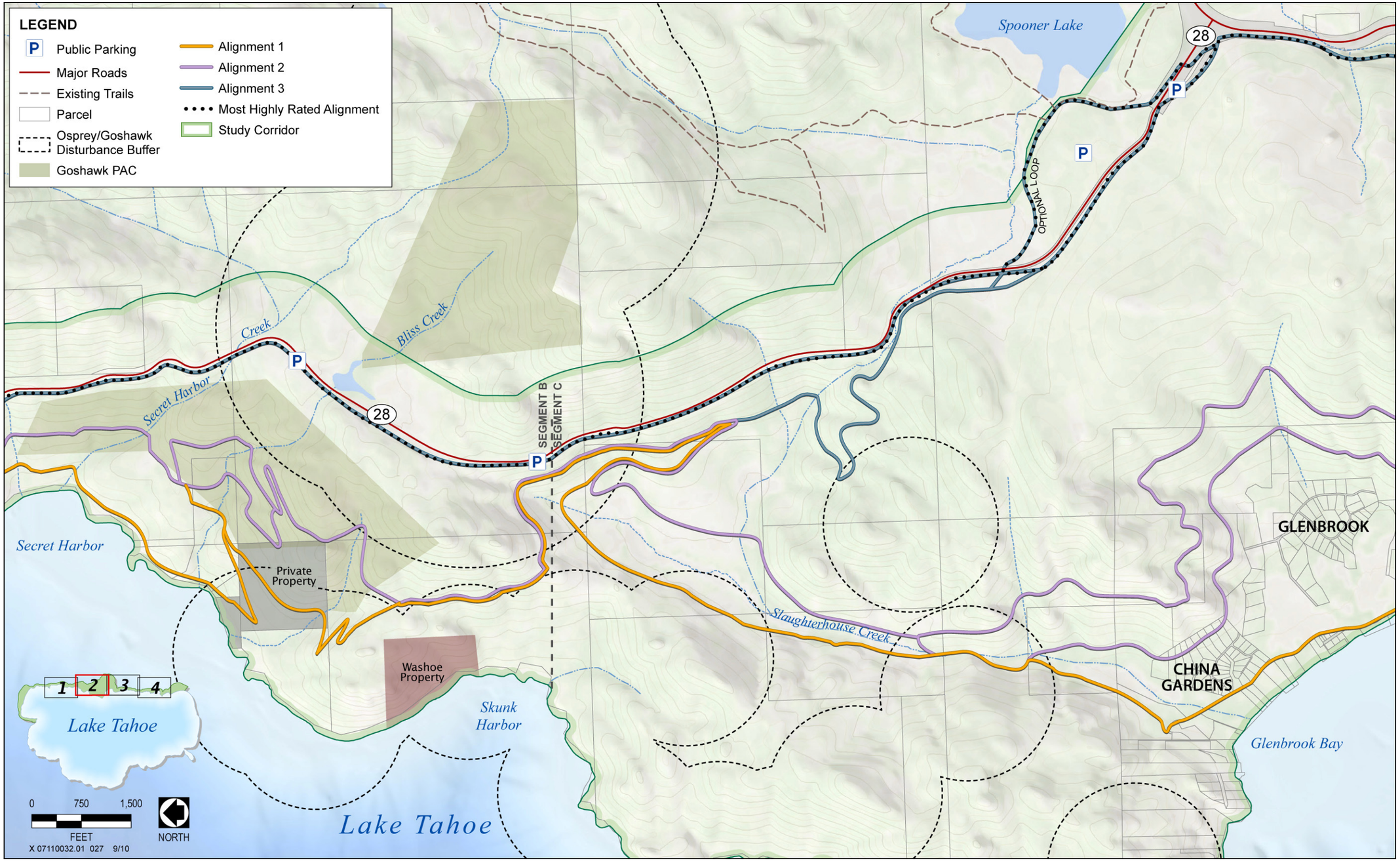

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Map 2

Exhibit 12

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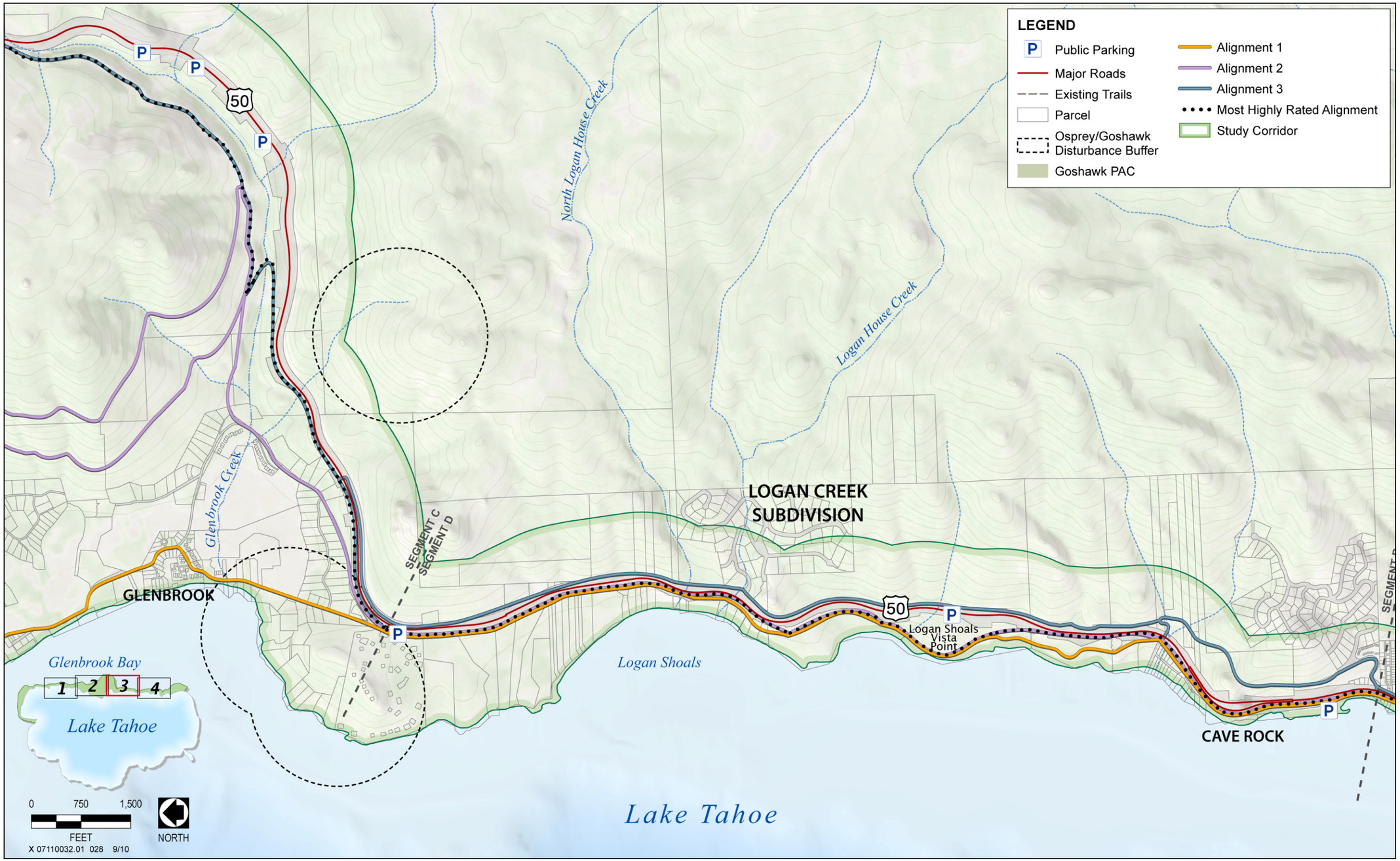
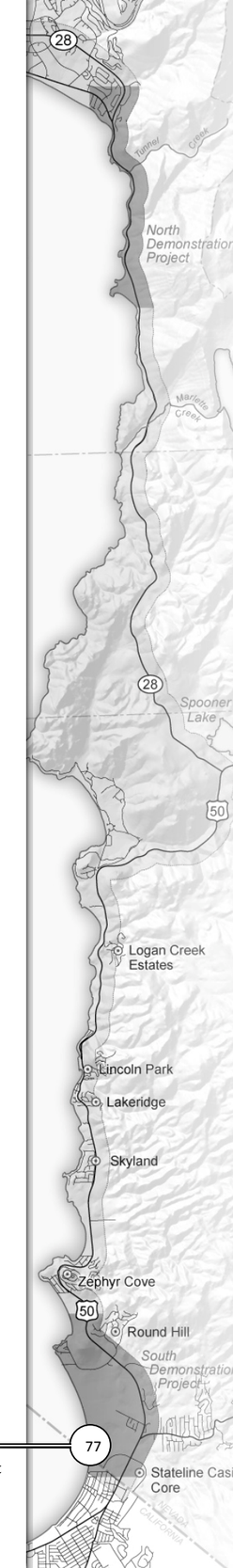


Source: AECOM 2010

Map 3

Exhibit 13



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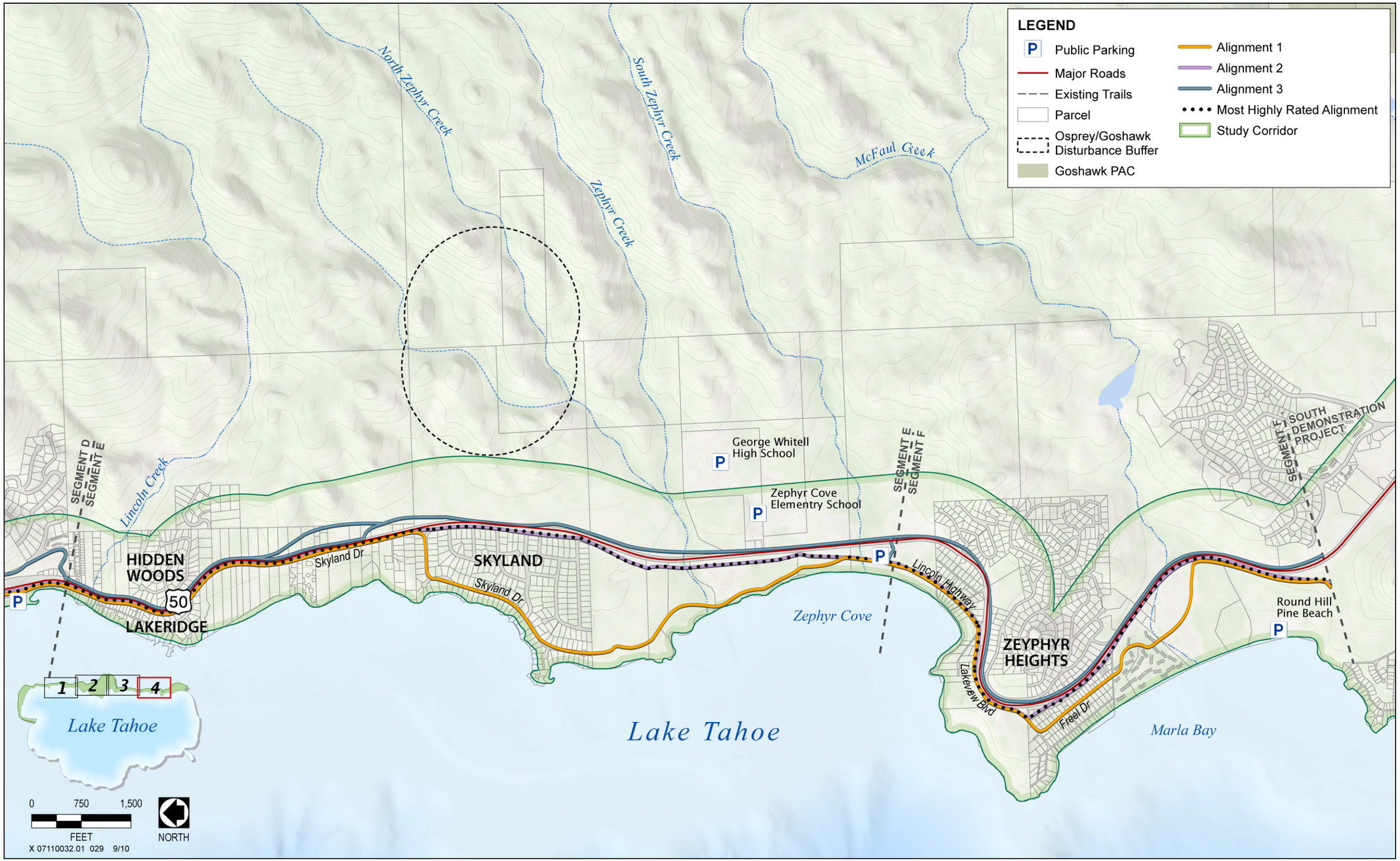
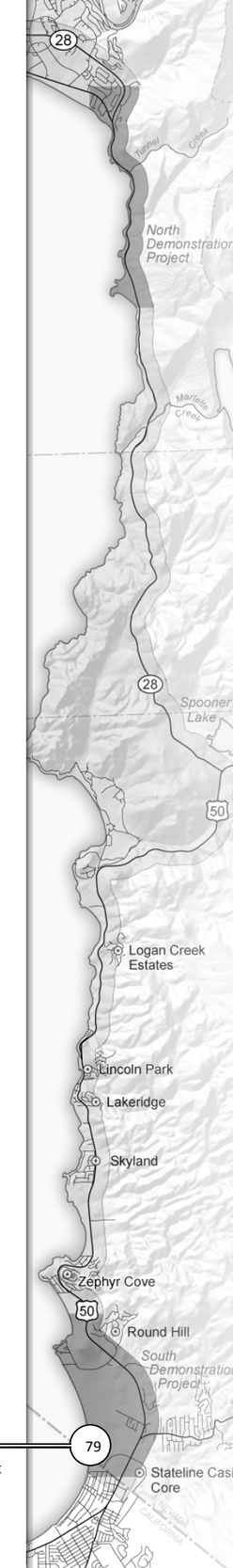


Source: AECOM 2010

Map 4

Exhibit 14



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8 COST ESTIMATE AND PHASING

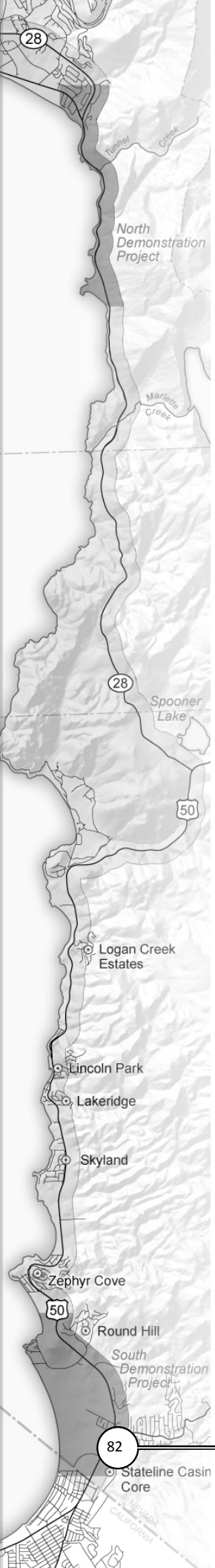
Table 12 provides a rough order-of-magnitude estimate of the cost to construct the most highly rated alternative alignment in each segment, as well as the suggested order in which the segments should be constructed. Because the alignments have only been developed at a conceptual level on 1" = 400' scale, it is not possible to prepare an accurate cost estimate for the Bikeway. The estimates in Table 12 are based on factors such as segment length, the need for complex engineering solutions, cut and fill quantities, tree removal and support facilities such as restrooms and parking. For purposes of this estimate, it was assumed that no private property would need to be acquired. A detailed breakout of the cost estimates for each section and for the overall Bikeway is included in Appendix C.

Table 12
Cost Estimate and Phasing Approach

Trail Segment	Segment Length (ft)	Estimated Cost ($)	Suggested Phasing Order	Reason
A	14,600	14,700,000	5	Extends system south from Sand Harbor to Secret Harbor trailhead.
B	14,500	16,100,000	6	Extends system south from Secret Harbor trailhead to Skunk Harbor access road.
C1	13,500	15,800,000	7	Connects north and south legs.
C2	15,200	12,400,000	4	Extends system north to Spooner Junction and regional parking hub.
D	17,600	15,000,000	3	Extends system north to Glenbrook. Commuter options.
E	13,700	11,000,000	2	Extends system north to Cave Rock. Commuter options. Second cheapest segment.
F	8,500	6,000,000	1	Extends system north to Zephyr Cove from South Demo Project. Commuter options. Cheapest Segment.
TOTALS	**97,600**	**91,000,000**		

Note: Segment C is divided into two construction segments. Segment C1 extends from the Skunk Harbor access road to Spooner Junction and Segment C2 extends from Spooner Junction to the Glenbrook entrance gate.

Due to the high usage anticipated for the southern part of the Bikeway, it is recommended that the first segments to be constructed extend the Bikeway north from the South Demonstration Project to Spooner Junction. Because the southern part of the study area has the greatest amount of development and therefore population, developing the southern part of the system first would benefit commuters traveling between Stateline and residences to the north. The North Demonstration Project will provide a connection between Incline Village and Sand Harbor State Park. The segments between Sand Harbor and Spooner Junction would provide connections to Secret Harbor and Skunk Harbor and would serve a limited number of recreational users, so they would be a lower priority for construction.



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APPENDIX A

Alternatives Evaluation Worksheets

Draft Alternatives Evaluation Worksheet
Segment A

Evaluation Criteria	Alignment Alternative				Assumptions/Notes
	A1	A2	A3	A4 (Hybrid)	
User Experience					
Consistent with Vision for the Bikeway					
Does the alternative provide a premier shared-use separated bikeway? This question addresses three issues: premier, shared use, and separated. Premier relates to the quality of the experience. Shared use relates to the ability of the trail to accommodate a mix of users. Separated relates to the trail's distance from highways.	4	4	2	2	Evaluation criteria are rated based on the following scale: 1 - The alternative does not meet the criterion 2 - The alternative minimally meets the criterion 3 - The alternative partially meets the criterion 4 - The alternative mostly meets the criterion 5 - The alternative fully meets the criterion
	Alternatives A1 & A2 are very similar until the very southern part where they split. Alternatives A1 & A2 provide an excellent view of Lake Tahoe and vistas throughout the trails' length. Alternative A3 is close to the road the entire length of the trail. Alternative A4 is similar to Alternative A3.				
Safety, Security, and Liability					
Does the alternative conform to state and federal trail design standards and guidelines (width, grade, curvature, design speed)?	3	4	4	4	
	Alternatives A1 & A2 deviate in curvature. Alternative A3 deviates in grade. Alternative A1 rated slightly lower because of steepness of very southern end.				
Does the alternative provide regular points of access for police, fire, and emergency medical services vehicles to facilitate emergency movement of persons on and off the path? Motor vehicle access should be provided at least every 3 miles.	5	5	5	5	
	Access provided for all alignments.				
Does the alternative avoid physical barriers such as sections with high walls, undercrossings or fencing on both sides that would prevent a user from exiting the trail in the instance of a flat tire or a threat to personal safety?	5	5	4	5	Assumes that crossing on Alternative A3 would be grade separated.
	No high walls or undercrossings.		Possibly one undercrossing.	No high walls or undercrossings.	
Does the alternative avoid the need for at-grade road crossings on U.S. 50 and SR 28?	5	5	5	5	Assumes that crossing on Alternative A3 would be grade separated.
	No at-grade crossings required.				
Does the alternative minimize the number of other roadway and driveway crossings?	5	4	4	4	Thunderbird Lodge has very low traffic.
	All Alternatives cross the entrance road to Thunderbird Lodge and Alternatives A2, A3, and A4 cross the parking lot at Secret Harbor.				
Bikeway and Community Connections					
Does the alternative provide regular, simple-to-use connections to existing and planned transportation systems such as local streets, bus and waterborne transit facilities, and sidewalks?	1	1	1	1	Focus is on transportation systems.
	Low scores due to lack of available facilities to connect to. There are potential transit stops at Sand Harbor, Secret Harbor and Thunderbird Lodge. There is discussion ongoing regarding transit on the east shore.				
Does the alternative connect directly to existing or planned community and recreational facilities such as schools, community centers, recreational trail systems, other bicycle trails, open spaces, beaches, and parks, taking into account desired levels of visitation and environmental carrying capacities?	2	2	2	2	Low scores because there are few possible connections.
	All alternatives connect to the beach either directly or from the Secret Harbor parking lot.				
Does the alternative connect directly to existing and planned residential, commercial, and institutional developments?	1	1	1	1	
	No development in this area.				

Draft Alternatives Evaluation Worksheet
Segment A

Evaluation Criteria	Alignment Alternative				Assumptions/Notes
	A1	A2	A3	A4 (Hybrid)	
User Experience - Continued					
Does the alternative provide opportunities for adequate and convenient parking for trail users?	1	2	2	2	There are parking facilities at both ends of the trail. The parking lots are generally at capacity during the peak summer season. There is potential to develop parking at the entrance to Thunderbird Lodge.
	Does not connect to the parking node at Secret Harbor parking lot	Connects to parking node at Secret Harbor parking lot.			
Natural, Historic, and Cultural Interpretive Opportunities					
Does the alternative connect to locations that can provide appropriate interpretation of natural, cultural, and historic resources so that they may be interpreted through signage? These areas should be accommodated by trailheads, wayside stops, and/or other facilities.	2	2	2	2	Few opportunities along this section of the trail.
	Opportunities at Thunderbird Lodge and Marlette Creek.				
Does the alternative take advantage of opportunities for re-use of historic transportation routes or historic sites?	1	1	1	1	
	No historic transportation routes or sites.				
Scenic Opportunities					
Does the alternative provide the opportunity at scenic vista points to allow users to remove themselves from the main flow of traffic and stop to appreciate the view, and should, therefore, be provided at rest areas, wayside stops, trailheads, or other similar Bikeway facilities?	4	4	3	3	
	Opportunities along entire trail except in limited area near south end.		Vista points are limited in section of trail along SR28.		
Does the alternative provide opportunities to experience scenic vistas while riding or walking by routing the Bikeway through areas that contain views of Lake Tahoe?	4	4	3	3	
	Great views until the trail goes through the saddle near Thunderbird Lodge.		Views are limited in section of trail along SR28.		
User Friendly					
Does the alternative serve commuter needs?	3	4	5	5	
	Relatively direct route for commuting but deviates from roadway through hills near Thunderbird Lodge.		Most direct route between endpoints, however not much need for commute route.	Direct route with no undercrossing required	
Does the alternative serve recreation needs?	5	5	4	4	
	Excellent recreational trail along entire length.		Southern section along roadway not a good recreational experience.		
Does the alternative minimize grades in excess of 5%?	2	3	3	3	
	Steep grade on southern end and at various places along route.	Some areas with steep slopes.	May be areas along road that are steeper than 5%.		

Draft Alternatives Evaluation Worksheet
Segment A

Evaluation Criteria	Alignment Alternative				Assumptions/Notes
	A1	A2	A3	A4 (Hybrid)	
User Experience - Continued					
Does the alternative provide the opportunity for rest areas at least every 7 miles? Rest areas are formal locations for bicyclists and pedestrians to stop for a variety of reasons. Rest areas should contain restrooms, drinking water, trash/recycling receptacles, picnic areas, shade trees or structures, and signage.	4	5	5	5	
	Trail bypasses rest stop at Secret Harbor parking lot.	Rest stops at Sand Harbor and Secret Harbor.			
Does the alternative provide accessibility for full multiple users such as: bicyclists, walkers, joggers, in-line skaters, people in motorized and non-motorized wheelchairs? For example, no stairs or on-road segments.	5	5	1	5	
	Trails are fully accessible to all users.		Stairs requird at the undercrossing.	Fully accessible to all users.	

Draft Alternatives Evaluation Worksheet
Segment A

Evaluation Criteria	Alignment Alternative				Assumptions/Notes
	A1	A2	A3	A4 (Hybrid)	
Environmental Constraints					
Scenic Impacts					
Does the alternative avoid the need for the removal or disturbance of visually significant rock outcroppings and the need for removal of boulders, where feasible?	3	3	3	3	Need to develop more detailed designs to get more specifics.
	All Alternatives will potentially be affected by rock outcrops.				
Does the alternative minimize negative scenic impacts on shoreline travel units (views from the lake.)?	2	2	2	2	
	Views from the lake all similarly affected.				
Does the alternative minimize negative scenic impacts on roadway travel units around Lake Tahoe?	4	4	3	3	
	Views from the highway are the same to the point where Alternatives A1 & A2 split to the west. At that point Alternatives A1 & A2 are no longer visible from the road.				
Biological Resources					
Does the alternative avoid negative impacts to wildlife resources, including, but not limited to, habitat for: spotted owl, northern goshawk, golden eagle, bald eagle, American marten, osprey, and willow flycatcher?	2	2	2	3	
	Within osprey disturbance zone. Alternative A3 more so in the north and Alternatives A1 & A2 more so in the south.			Alternative A4 is farthest from osprey in the north and in disturbed area near SR 28 in the south.	
Does the alternative avoid negative impacts on protected plant species and sensitive habitat?	5	5	5	5	
	All Alternatives avoid the goshawk PAC. No other sensitive plant species or habitat is present.				
Cultural Resources					
Is the alternative sensitive to the cultural resources and traditions of the Washoe Tribe?	5	5	5	5	
	No sensitive Washoe resources.				
Does the alternative avoid negative impacts to known cultural resources?	5	5	5	5	
	No evaluated resources would be affected.				
Hydrology and Water Quality					
Does the alternative minimize disruption of natural hydrologic flow paths and subsurface water?	5	5	5	5	Undercrossing on Alternative A3 is at a saddle and should be well above the water table.
	No disruption of hydrology.				
Does the alternative minimize use of Stream Environment Zones (SEZs)?	5	5	5	5	
	All Alternatives minimize use of SEZ.				
Does the alternative minimize the impact of creek crossings?	5	5	5	5	
	All Alternatives have the same number of creek crossings and similar impacts on creeks.				
Beneficial Effects					
Does the alternative provide accessory benefits such as solving a parking or erosion problem,	1	1	1	1	Possible solution to roadside parking in conjunction with

Draft Alternatives Evaluation Worksheet
Segment A

Evaluation Criteria	Alignment Alternative				Assumptions/Notes
	A1	A2	A3	A4 (Hybrid)	
improving access for fire suppression?	No clear accessory benefits.				provision of regional parking nodes and transit.
Environmental Constraints - Continued					
Tree Removal					
Does the alternative minimize tree removal?	2	2	2	2	
	Similar impact for all Alternatives. Lots of new trail in forested areas.				
Permitability and Community Acceptance.					
Is the alternative consistent with agency permitting requirements?	1	1	2	3	
	Osprey nests are a more serious problem for Alternatives A1 & A2 in the southern part of the alignment. Alternatives A3 and A4 are closer to the road and in a disturbed area in the south.				
Does the alternative have the potential to adversely affect private property?	5	5	5	5	
	No adverse impact on private property for any of the alternatives.				

Draft Alternatives Evaluation Worksheet
Segment A

Evaluation Criteria	Alignment Alternative				Assumptions/Notes
	A1	A2	A3	A4 (Hybrid)	
Cost and Constructability					
Grading/Cut & Fill					
Does the alternative minimize the need for cut and fill that would require retaining walls or create visible cuts on hillsides?	1	1	1	1	
	Very steep cross slopes on both sides of the highway. Considerable cut and fill and retaining walls required for all alternatives.				
Private Property Acquisition					
Does the alternative avoid the need to acquire private property?	4	4	4	4	
	Easement will be required from the Thunderbird Lodge for all alternatives.				
Does the alternative allow for adequate easements? Where necessary, easements for Bikeway development should be at least 40 feet wide to allow for adequate space within the easement to accommodate the typical 14-foot cross-section (Bikeway plus shoulders) in terrain that may contain trees, boulders, sensitive habitat, steep sideslopes, etc?	5	5	5	5	
	No significant physical constraints on easement width for any alternatives.				
Separated Roadway Crossings					
Does the alternative require undercrossings on SR 28 or U.S. 50?	5	5	1	5	Use of the hybrid Alternative A4 would not require an undercrossing.
	No undercrossing required.		One undercrossing of SR 28.	No undercrossing required.	
Length of Trail					
How long is the trail relative to other alternative alignments?	4	4	5	5	
	Alternatives 1 and 2 slightly longer than 3 & 4.				
Use of Existing Roads and Trails					
Does the alternative utilize areas of existing coverage and higher capability lands (land capability districts 4 through 7) where feasible to minimize water quality impacts and coverage transfer costs?	1	1	1	1	
	All on class 1a land.				
Does the alternative enhance and use existing disturbed area, such as old logging and fire access roads.	1	1	1	1	
	None existing disturbed area is available for use.				
Does the alternative take advantage of joint parking opportunities, such as at school sites?	1	1	1	1	This could also be measured as the cost for providing parking for bikeway users.
	None available.				
Maintenance					
Is the alternative easy to maintain?	1	1	2	2	Side slopes will increase the amount of debris falling on the trail. Remoteness of access.
	1 & 2 are slightly longer.				
Retaining Walls or Bridge Structures					
Does the alternative require costly engineering solutions such as retaining walls and bridge structures?	2	2	2	2	
	All need bridge over Marlette Creek and retaining walls to deal with steep side slopes.				

Draft Alternatives Evaluation Worksheet
Segment B

Evaluation Criteria	Alignment Alternative			Assumptions/Notes
	B1 (Green)	B2 (Yellow)	B3 (Blue)	
User Experience				
Consistent with Vision for the Bikeway				
Does the alternative provide a premier shared-use separated bikeway?	4	4	2	Evaluation criteria are rated based on the following scale: 1 - The alternative does not meet the criterion 2 - The alternative minimally meets the criterion 3 - The alternative partially meets the criterion 4 - The alternative mostly meets the criterion 5 - The alternative fully meets the criterion
	Alignments use NFS road to Skunk Harbor; potential conflicts w/ traffic, not separated.		Very close to road along the entire length.	
Safety, Security, and Liability				
Does the alternative conform to state and federal trail design standards and guidelines (width, grade, curvature, design speed)?	1	2	3	Alternative B1 over 5% grade N of trail connection to Secret Harbor, through private property, S of private property, N of connection to Skunk Harbor. Alternative B2 over 5% grade N of goshawk PAC, several times through PAC (both options), N of connection to Skunk Harbor. Alternative B3 over 5% N + S of where SR28 curves to SW and N of Skunk Harbor road. Both Alternative B1 & B2 require radii <100'.
	Steep slopes and narrow turn radii on switchbacks; Alternative B1 is slightly worse, best is the western options of Alternative B2 (fewest switchbacks).		Parallel to SR 28 has fewer grade issues, doesn't require switchbacks.	
Does the alternative provide regular points of access for police, fire, and emergency medical services vehicles to facilitate emergency movement of persons on and off the path? Motor vehicle access should be provided at least every 3 miles.	5	5	5	
	NFS road to Secret Harbor at north end.		Parallels SR 28.	
Does the alternative avoid physical barriers such as sections with high walls, undercrossings or fencing on both sides that would prevent a user from exiting the trail in the instance of a flat tire or a threat to personal safety?	5	5	5	
	No high walls or undercrossings.			
Does the alternative avoid the need for at-grade road crossings on U.S. 50 and SR 28?	5	5	5	
	No at-grade crossings.			
Does the alternative minimize the number of other roadway and driveway crossings?	5	5	5	
	All Alternatives cross dirt road to private property, NFS roads, with minimal traffic.			

Draft Alternatives Evaluation Worksheet
Segment B

Evaluation Criteria	Alignment Alternative			Assumptions/Notes
	B1 (Green)	B2 (Yellow)	B3 (Blue)	
User Experience - Continued				
Bikeway and Community Connections				
Does the alternative provide regular, simple-to-use connections to existing and planned transportation systems such as local streets, bus and waterborne transit facilities, and sidewalks?	2	2	2	
	All Alternatives connect to Secret Harbor and Skunk Harbor trails. Low scores due to lack of available facilities to connect to.			
Does the alternative connect directly to existing or planned community and recreational facilities such as schools, community centers, recreational trail systems, other bicycle trails, open spaces, beaches, and parks, taking into account desired levels of visitation and environmental carrying capacities?	1	1	1	
	Low scores due to lack of available facilities to connect to.			
Does the alternative connect directly to existing and planned residential, commercial, and institutional developments?	1	1	1	
	No development in this area.			
Does the alternative provide opportunities for adequate and convenient parking for trail users?	1	1	3	
	No parking in this area.		Connects to several potential or shoulder parking opportunities.	
Natural, Historic, and Cultural Interpretive Opportunities				
Does the alternative connect to locations that can provide appropriate interpretation of natural, cultural, and historic resources so that they may be interpreted through signage? These areas should be accommodated by trailheads, wayside stops, and/or other facilities.	2	2	1	
	Potential spur to scenic overlook/Washoe tribal lands.		No interpretive opportunities.	
Does the alternative take advantage of opportunities for re-use of historic transportation routes or historic sites?	1	1	1	
	No historic transportation routes or sites.			
Scenic Opportunities				
Does the alternative provide the opportunity at scenic vista points to allow users to remove themselves from the main flow of traffic and stop to appreciate the view, and should, therefore, be provided at rest areas, wayside stops, trailheads, or other similar Bikeway facilities?	5	5	2	
	Potential spur to scenic overlook/Washoe tribal lands.		Opportunities limited adjacent to SR 28.	

Draft Alternatives Evaluation Worksheet
Segment B

Evaluation Criteria	Alignment Alternative			Assumptions/Notes
	B1 (Green)	B2 (Yellow)	B3 (Blue)	
Does the alternative provide opportunities to experience scenic vistas while riding or walking by routing the Bikeway through areas that contain views of Lake Tahoe?	5	5	2	
	Potential spur to scenic overlook/Washoe tribal lands.		Views are limited adjacent to SR 28.	
User Friendly				
Does the alternative serve commuter needs?	3	3	5	
	Alternatives are forced to switchback to decrease grade. Deviation from SR 28 increases length of corridor.		Most direct route between endpoints, however not much need for commute route.	
Does the alternative serve recreation needs?	4	4	2	
	Excellent recreational trail along entire length, except for steep grades and tight curves.		Entire alignment along roadway not a good recreational experience.	
Does the alternative minimize grades in excess of 5%?	1	1	3	
	Both Alternatives traverse areas with steep slopes.		Slopes along SR 28 are less steep.	
Does the alternative provide the opportunity for rest areas at least every 7 miles? Rest areas are formal locations for bicyclists and pedestrians to stop for a variety of reasons. Rest areas should contain restrooms, drinking water, trash/recycling receptacles, picnic areas, shade trees or structures, and signage.	3	5	5	
	Rest stop at Sand Harbor.	Rest stops at Secret Harbor.		
Does the alternative provide accessibility for full multiple users such as: bicyclists, walkers, joggers, in-line skaters, people in motorized and non-motorized wheelchairs? For example, no stairs or on-road segments.	5	5	5	
	Fully accessible to all users, with steep slopes.			

Draft Alternatives Evaluation Worksheet
Segment B

Evaluation Criteria	Alignment Alternative			Assumptions/Notes
	B1 (Green)	B2 (Yellow)	B3 (Blue)	
Environmental Constraints				
Scenic Impacts				
Does the alternative avoid the need for the removal or disturbance of visually significant rock outcroppings and the need for removal of boulders, where feasible?	3	3	3	
	All alternatives would potentially be affected by rock outcrops.			
Does the alternative minimize negative scenic impacts on shoreline travel units (views from the lake.)?	2	4	5	
	Alternative B1 is closer to the shoreline and more visible from the lake.	Farther upland than Alternative B1 but northern portion is visible from the lake.	Stays by the road and would not be visible from the lake.	
Does the alternative minimize negative scenic impacts on roadway travel units around Lake Tahoe?	5	4	3	
	Separated and not visible from SR 28.	~0.4 mile of northern portion of the alignment would be visible from SR 28.	Visible from the road for the entire length of the trail however views of the lake are blocked by trees so the trail would not impact views of the lake from SR 28.	
Biological Resources				
Does the alternative avoid negative impacts to wildlife resources, including, but not limited to, habitat for: spotted owl, northern goshawk, golden eagle, bald eagle, American marten, osprey, and willow flycatcher?	3	2	4	
	Avoids goshawk PAC but goes through goshawk and osprey buffers.	Meanders through goshawk PAC and buffer and goes through the eastern edge of osprey buffer.	Within goshawk buffer but in disturbed area next to SR 28.	
Does the alternative avoid negative impacts on protected plant species and sensitive habitat?	5	5	5	
	No known sensitive plant species or habitat are present.			

Draft Alternatives Evaluation Worksheet
Segment B

Evaluation Criteria	Alignment Alternative			Assumptions/Notes
	B1 (Green)	B2 (Yellow)	B3 (Blue)	
Environmental Constraints - Continued				
Cultural Resources				
Is the alternative sensitive to the cultural resources and traditions of the Washoe Tribe?	5	5	5	
	All alternatives avoid Washoe tribal lands near Skunk Harbor.			
Does the alternative avoid negative impacts to known cultural resources?	5	5	5	
	No evaluated resources would be affected.			
Hydrology and Water Quality				
Does the alternative minimize disruption of natural hydrologic flow paths and subsurface water?	5	5	5	
	No disruption of hydrology.			
Does the alternative minimize use of Stream Environment Zones (SEZs)?	5	5	5	
	All alternatives minimize use of SEZ.			
Does the alternative minimize the impact of creek crossings?	5	5	5	
	All alternatives have the same number of creek crossings and similar impacts on creeks.			
Beneficial Effects				
Does the alternative provide accessory benefits such as solving a parking or erosion problem, improving access for fire suppression?	3	3	1	
	Improved access to remote areas for fire suppression.		No clear beneficial effects.	
Tree Removal				
Does the alternative minimize tree removal?	2	2	2	
	Similar impact for all alternatives.			

Draft Alternatives Evaluation Worksheet
Segment B

Evaluation Criteria	Alignment Alternative			Assumptions/Notes
	B1 (Green)	B2 (Yellow)	B3 (Blue)	
Environmental Constraints - Continued				
Permitability and Community Acceptance.				
Is the alternative consistent with agency permitting requirements?	3	2	4	
	Passes through goshawk and osprey disturbance zones.	Goshawk PAC, goshawk and osprey disturbance zones.	Passes through goshawk disturbance zone but adjacent to roadway.	
Does the alternative have the potential to adversely affect private property?	4	4	5	
	The segment is in an unpopulated area; therefore adverse effects on private property are unlikely.			

Draft Alternatives Evaluation Worksheet
Segment B

Evaluation Criteria	Alignment Alternative			Assumptions/Notes
	B1 (Green)	B2 (Yellow)	B3 (Blue)	
Cost and Constructability				
Grading/Cut & Fill				
Does the alternative minimize the need for cut and fill that would require retaining walls or create visible cuts on hillsides?	1	1	2	
	Very steep cross slopes and lots of cut and fill required for all alternatives. Slightly less for Alternative B3.			
Private Property Acquisition				
Does the alternative avoid the need to acquire private property?	2	5	5	
	Alternative B1 requires an easement from two property owners, one of which has expressed an unwillingness to consider any easements. Alternative B2 would also require an easement if the selected option crosses private property (unlikely, as noted above); however another option for Alternative B2 crosses only public lands.			
Does the alternative allow for adequate easements? Where necessary, easements for Bikeway development should be at least 40 feet wide to allow for adequate space within the easement to accommodate the typical 14-foot cross-section (Bikeway plus shoulders) in terrain that may contain trees, boulders, sensitive habitat, steep sideslopes, etc?	5	5	5	
	No significant physical constraints on easement width for any alternative.			
Separated Roadway Crossings				
Does the alternative require undercrossings on SR 28 or U.S. 50?	5	5	5	
	No undercrossing required.			
Length of Trail				
How long is the trail relative to other alternative alignments?	2	2	5	
	Alternatives B1 and B2 are significantly longer than Alternative B3.			

Draft Alternatives Evaluation Worksheet
Segment B

Evaluation Criteria	Alignment Alternative			Assumptions/Notes
	B1 (Green)	B2 (Yellow)	B3 (Blue)	
Cost and Constructability - Continued				
Use of Existing Roads and Trails				
Does the alternative utilize areas of existing coverage and higher capability lands (land capability districts 4 through 7) where feasible to minimize water quality impacts and coverage transfer costs?	1	1	1	
	All on class 1a land.			
Does the alternative enhance and use existing disturbed area, such as old logging and fire access roads.	2	3	1	
	Alignments B1 and B2 use portions of existing access and logging roads.			
Does the alternative take advantage of joint parking opportunities, such as at school sites?	1	1	1	
	None available.			
Maintenance				
Is the alternative easy to maintain?	1	1	3	
	Alternatives B1 and B2 are significantly longer than Alternative B3.			
Retaining Walls or Bridge Structures				
Does the alternative require costly engineering solutions such as retaining walls and bridge structures?	1	1	3	
	Alternatives B1 and B2 require two more creek crossings and more walls than Alternative B3.			

Draft Alternatives Evaluation Worksheet
Segment C

Evaluation Criteria	Alignment Alternative				Assumptions/Notes
	C1 (Green)	C2 (Yellow west alignment)	C3 (Blue – eastern alignment)	Hybrid (Yellow east alignment/connects with blue NW of Glenbrook)	
User Experience					
Consistent with Vision for the Bikeway					
Does the alternative provide a premier shared-use separated bikeway?	3	4	3	4	Evaluation criteria are rated based on the following scale: 1 - The alternative does not meet the criterion 2 - The alternative minimally meets the criterion 3 - The alternative partially meets the criterion 4 - The alternative mostly meets the criterion 5 - The alternative fully meets the criterion Alts C1, C2 and hybrid use existing dirt road – not separated facilities
	Alternative C1 uses existing road through Glenbrook.	Mostly separated, some slopes.	Close to road along the entire length.	Mostly separated, some slopes.	
Safety, Security, and Liability					
Does the alternative conform to state and federal trail design standards and guidelines (width, grade, curvature, design speed)?	5	1	3	2	Alternative C1 does not exceed 5% grade. Alternative C2 over 5% grade: at creek in Lower Prey Meadows, through undeveloped portion of Glenbrook properties, steep climb to avoid Glenbrook, tight curve at junction with Old Highway 40, steep descent to E of Glenbrook. Alternative C3 over 5% grade: optional alignment at N end of segment, lengthy steep section on historic Highway 40, tight curve where it crosses to U.S. 50 and steep climb to U.S. 50, sections of U.S. 50 steep. Alternative C3' exceeds 5% south of split for over 2,000', tight switchback where it meets Alternative C1 and where it crosses to U.S. 50, steep climb to U.S. 50, sections of U.S. 50 steep.
	Less steep slopes, no switchbacks.	Steep slopes to avoid Glenbrook, tight switchbacks.	Parallel to SR 28 has less grade issues, steep descent along old Highway 40, tight switchbacks.	Less steep than Alternative C2, steep descent along old Highway 40, several tight switchbacks.	
Does the alternative provide regular points of access for police, fire, and emergency medical services vehicles to facilitate emergency movement of persons on and off the path? Motor vehicle access should be provided at least every 3 miles.	5	5	5	5	
	Use existing road at north end, connect at Glenbrook.		Parallels SR 28.	Use existing road at north end, connect at Glenbrook.	
Does the alternative avoid physical barriers such as sections with high walls, undercrossings or fencing on both sides that would prevent a user from exiting the trail in the instance of a flat tire or a threat to personal safety?	5	5	4	5	The option for Alternative C3 that would connect to Spooner lake parking lots would require two crossings
	No high walls or undercrossings.		Two locations for potential undercrossings.	No high walls or undercrossings.	

Draft Alternatives Evaluation Worksheet
Segment C

Evaluation Criteria	Alignment Alternative				Assumptions/Notes
	C1 (Green)	C2 (Yellow west alignment)	C3 (Blue – eastern alignment)	Hybrid (Yellow east alignment/connects with blue NW of Glenbrook)	
User Experience - Continued					
Does the alternative avoid the need for at-grade road crossings on U.S. 50 and SR 28?	5	5	5	5	The option for Alternative C3 that would connect to Spooner lake parking lots would require two crossings
	No at-grade crossings.				
Does the alternative minimize the number of other roadway and driveway crossings?	2	3	3	4	All alternatives cross entrance gate to Glenbrook
	Several driveways through Glenbrook.	May cross driveways through Glenbrook.	Trail users may cross SR 28 to access parking if option is not provided.	No major roadway/driveway crossings.	
Bikeway and Community Connections					
Does the alternative provide regular, simple-to-use connections to existing and planned transportation systems such as local streets, bus and waterborne transit facilities, and sidewalks?	2	2	3	1	Potential future transit stop at Spooner Creek/ SR28 and U.S. 50 junction.
	Connect to Glenbook roads.	Connect to Glenbook roads.	Connect to Flume Trail shuttle.	No connections.	
Does the alternative connect directly to existing or planned community and recreational facilities such as schools, community centers, recreational trail systems, other bicycle trails, open spaces, beaches, and parks, taking into account desired levels of visitation and environmental carrying capacities?	2	2	5	2	
	Connects to Prey Meadow/ Slaughterhouse Canyon.		Connects to Flume Trail, Spooner Lake.	Connects to Prey Meadow/ Slaughterhouse Canyon.	
Does the alternative connect directly to existing and planned residential, commercial, and institutional developments?	5	5	5	5	Alts C1andC2 connect through Glenbrook, but others provide good access by connecting to the community's driveway
	All alignments connect to Glenbrook driveway.				
Does the alternative provide opportunities for adequate and convenient parking for trail users?	1	1	5	1	
	No parking in this area.		Connects to several shoulder parking	No parking in this area.	

Draft Alternatives Evaluation Worksheet
Segment C

Evaluation Criteria	Alignment Alternative				Assumptions/Notes
	C1 (Green)	C2 (Yellow west alignment)	C3 (Blue – eastern alignment)	Hybrid (Yellow east alignment/connects with blue NW of Glenbrook)	
			opportunities and Forest Service lots at Spooner Lake.		
User Experience - Continued					
Natural, Historic, and Cultural Interpretive Opportunities					
Does the alternative connect to locations that can provide appropriate interpretation of natural, cultural, and historic resources so that they may be interpreted through signage? These areas should be accommodated by trailheads, wayside stops, and/or other facilities.	4	4	5	4	
	Slaughterhouse Canyon/Prey Meadow		Spooner Lake, Old Lincoln Highway	Slaughterhouse Canyon/ Prey Meadow, Old Lincoln Highway	
Does the alternative take advantage of opportunities for re-use of historic transportation routes or historic sites?	1	1	5	5	
	No historic transportation routes or sites		Old Highway40	Old Lincoln Highway	
Scenic Opportunities					
Does the alternative provide the opportunity at scenic vista points to allow users to remove themselves from the main flow of traffic and stop to appreciate the view, and should, therefore, be provided at rest areas, wayside stops, trailheads, or other similar Bikeway facilities?	1	1	2	2	
	No scenic vista opportunities		Potential opportunity at Old Lincoln Highway		
Does the alternative provide opportunities to experience scenic vistas while riding or walking by routing the Bikeway through areas that contain views of Lake Tahoe?	3	3	4	4	
	No scenic vista opportunities; Slaughterhouse Canyon scenic area		Potential along Old Lincoln Highway; Spooner Lake/ Slaughterhouse Canyon scenic areas		
User Friendly					
Does the alternative serve commuter needs?	5	4	4	4	
	Most direct route, however not much need for commute route	Slightly indirect due to switchbacks		Direct route to Spooner Lake	

Draft Alternatives Evaluation Worksheet
Segment C

Evaluation Criteria	Alignment Alternative				Assumptions/Notes
	C1 (Green)	C2 (Yellow west alignment)	C3 (Blue – eastern alignment)	Hybrid (Yellow east alignment/connects with blue NW of Glenbrook)	
User Experience - Continued					
Does the alternative serve recreation needs?	3	4	2	3	
	Excellent recreational trail until shared street in Glenbrook.	Steep slopes, connection past Glenbrook.	Entire alignment along roadway not a good recreational experience.	Part of alignment along roadway.	
Does the alternative minimize grades in excess of 5%?	5	1	2	3	
	Slaughterhouse Canyon minimizes slopes.		Steep slopes on Old Lincoln Highway.		
Does the alternative provide the opportunity for rest areas at least every 7 miles? Rest areas are formal locations for bicyclists and pedestrians to stop for a variety of reasons. Rest areas should contain restrooms, drinking water, trash/recycling receptacles, picnic areas, shade trees or structures, and signage.	1	1	5	3	
	No rest area opportunity.		Spooner Lake USFS lots and future SR28/U.S. 50 lot.	Potential connection to future SR28/U.S. 50 lot.	
Does the alternative provide accessibility for full multiple users such as: bicyclists, walkers, joggers, in-line skaters, people in motorized and non-motorized wheelchairs? For example, no stairs or on-road segments.	5	5	4	5	Alternative C3 option for parking lot access would require 2 crossings of SR 28
	Fully accessible to all users, with steep slopes.				

Draft Alternatives Evaluation Worksheet
Segment C

Evaluation Criteria	Alignment Alternative				Assumptions/Notes
	C1 (Green)	C2 (Yellow west alignment)	C3 (Blue – eastern alignment)	Hybrid (Yellow east alignment/connects with blue NW of Glenbrook)	
Environmental Constraints					
Scenic Impacts					
Does the alternative avoid the need for the removal or disturbance of visually significant rock outcroppings and the need for removal of boulders, where feasible?	3	3	3	3	
	All alternatives would potentially be affected by rock outcrops.				
Does the alternative minimize negative scenic impacts on shoreline travel units (views from the lake.)?	5	5	5	5	
	All alternatives would generally not be visible from the lake.				
Does the alternative minimize negative scenic impacts on roadway travel units around Lake Tahoe?	5	5	3	4	
	Separated and not visible from SR 28 and U.S. 50.	Separated and not visible from SR 28 and U.S. 50.	Visible from the road for more than half the length of the trail however views of the lake would not be impacted by the trail. A combination of west and east options would reduce the impact but lengthen the trail.	Similar to Alternative C3 except separated from SR 28 for the first ~1,500 feet of trail.	
Biological Resources					
Does the alternative avoid negative impacts to wildlife resources, including, but not limited to, habitat for: spotted owl, northern goshawk, golden eagle, bald eagle, American marten, osprey, and willow flycatcher?	2	3	5	5	
	Passes through two osprey disturbance buffers.	Passes through one osprey disturbance buffer.	Avoids all PACs and disturbance buffers.	Avoids all PACs and disturbance buffers.	

Draft Alternatives Evaluation Worksheet
Segment C

Evaluation Criteria	Alignment Alternative				Assumptions/Notes
	C1 (Green)	C2 (Yellow west alignment)	C3 (Blue – eastern alignment)	Hybrid (Yellow east alignment/connects with blue NW of Glenbrook)	
Environmental Constraints - Continued					
Does the alternative avoid negative impacts on protected plant species and sensitive habitat?	5	5	5	5	
	No know sensitive plant species or habitats are present.				
Cultural Resources					
Is the alternative sensitive to the cultural resources and traditions of the Washoe Tribe?	5	5	5	5	
	No known Washoe sensitive resources.				
Does the alternative avoid negative impacts to known cultural resources?	5	5	3	3	
	No evaluated resources would be affected.		Utilizes the Old Lincoln Highway.		
Hydrology and Water Quality					
Does the alternative minimize disruption of natural hydrologic flow paths and subsurface water?	5	5	5	5	
	No disruption of hydrology.				
Does the alternative minimize use of Stream Environment Zones (SEZs)?	5	2	3	3	
	Follows existing roads through west side of Slaughterhouse Canyon and through Glenbrook.	Requires crossing SEZs associated with streams flowing from the east into Slaughterhouse Canyon.	Both east and west options pass through SEZ along SR 28 near Spooner Junction. Crosses SEZ associated with Glenbrook Creek.	Both east and west options pass through SEZ along SR 28 near Spooner Junction. Crosses SEZ associated with Glenbrook Creek.	

Draft Alternatives Evaluation Worksheet
Segment C

Evaluation Criteria	Alignment Alternative				Assumptions/Notes
	C1 (Green)	C2 (Yellow west alignment)	C3 (Blue – eastern alignment)	Hybrid (Yellow east alignment/connects with blue NW of Glenbrook)	
Environmental Constraints - Continued					
Does the alternative minimize the impact of creek crossings?	5	2	3	3	
	Crosses streams on existing roads.	Requires 4 stream crossings that other alts avoid.	Requires a new bridge across Glenbrook Creek.	Requires a new bridge across Glenbrook Creek.	
Beneficial Effects					
Does the alternative provide accessory benefits such as solving a parking or erosion problem, improving access for fire suppression?	3	3	1	1	
	No clear beneficial effects.	Improved access to remote areas for fire suppression.	No clear beneficial effects.	No clear beneficial effects.	
Tree Removal					
Does the alternative minimize tree removal?	2	2	2		
	Similar impact for all alts.				
Permitability and Community Acceptance.					
Is the alternative consistent with agency permitting requirements?	2	3	5	5	
	Goes through osprey disturbance zones.	Goes through osprey disturbance zones.	Avoids sensitive species and habitat.	Avoids sensitive species and habitat.	
Is there a low risk of community objection to the alternative?	1	2	5	5	
	Probable objection from Glenbrook community.	Probable objection from Glenbrook community but less impact on community than Alternative C1.	Avoids Glenbrook so low risk of objection. Option to cross under U.S. 50 likely to be favored.	Avoids Glenbrook so low risk of objection. Option to cross under U.S. 50 likely to be favored.	

Draft Alternatives Evaluation Worksheet
Segment C

Evaluation Criteria	Alignment Alternative				Assumptions/Notes
	C1 (Green)	C2 (Yellow west alignment)	C3 (Blue – eastern alignment)	Hybrid (Yellow east alignment/connects with blue NW of Glenbrook)	
Cost and Constructability					
Grading/Cut and Fill					
Does the alternative minimize the need for cut and fill that would require retaining walls or create visible cuts on hillsides?	4	1	3	1	
	Alternative C2 has significantly more steep cross slopes and cut and fill required than Alternatives C1 andC 3.				
Does the alternative avoid the need to acquire private property?	1	1	4	4	
	Alternatives C1 and C2 (west) require easements from multiple Glenbrook property owners, and joint use of Glenbrook private roads. Glenbrook property owners are unlikely to agree to this. Alternative C2 (east) combined with Alignment 3 at the crossing of Glenbrook Creek would avoid private property in Glenbrook: however, the alignment would provide a better user experience if a small portion of the undeveloped sections of a few Glenbrook lots adjacent to U.S. 50 were used.				
Does the alternative allow for adequate easements? Where necessary, easements for Bikeway development should be at least 40 feet wide to allow for adequate space within the easement to accommodate the typical 14-foot cross-section (Bikeway plus shoulders) in terrain that may contain trees, boulders, sensitive habitat, steep sideslopes, etc?	1	2	3	3	
	Alternatives C1 and C2 (west) require joint use of Glenbrook private roads which are narrow. Alignment 3 will have to be squeezed into available U.S. 50 ROW unless easements can be obtained from a few Glenbrook property owners.				
Separated Roadway Crossings					
Does the alternative require undercrossings on SR 28 or U.S. 50?	5	5	3	1	
	No undercrossing required on Alternatives C1 and C2. If the option to connect Alignment 3 to Spooner Lake State Park is used, then two crossings of SR 28 would be required. High groundwater and SEZ may require that these crossings be surface crossings. However, if the connection is not made, Alignment 3 would not require highway crossings.				
Length of Trail					
How long is the trail relative to other alternative alignments?	5	1	4	1	

Draft Alternatives Evaluation Worksheet
Segment C

Evaluation Criteria	Alignment Alternative				Assumptions/Notes
	C1 (Green)	C2 (Yellow west alignment)	C3 (Blue – eastern alignment)	Hybrid (Yellow east alignment/connects with blue NW of Glenbrook)	
	Alternative C1 is approx. 2,000-ft shorter than Alternative C3, and about 12,000-ft shorter than Alternative C2.				

Draft Alternatives Evaluation Worksheet
Segment C

Evaluation Criteria	Alignment Alternative				Assumptions/Notes
	C1 (Green)	C2 (Yellow west alignment)	C3 (Blue – eastern alignment)	Hybrid (Yellow east alignment/connects with blue NW of Glenbrook)	
Cost and Constructability - Continued					
Use of Existing Roads and Trails					
Does the alternative utilize areas of existing coverage and higher capability lands (land capability districts 4 through 7) where feasible to minimize water quality impacts and coverage transfer costs?	3	2	2	2	
Does the alternative enhance and use existing disturbed area, such as old logging and fire access roads.	4	3	2	2	
	Alternatives C1 and C2 use portions of existing access and logging roads. Alignment 3 uses part of Old Highway40.				
Does the alternative take advantage of joint parking opportunities, such as at school sites?	1	1	5	1	
	Alignment 3 would utilize the existing parking area at Spooner Junction for a regional parking node.				
Maintenance					
Is the alternative easy to maintain?	4	1	4	1	
	Alternative C2 is significantly longer and more remote than Alternatives 1 and 3.				
Retaining Walls or Bridge Structures					
Does the alternative require costly engineering solutions such as retaining walls and bridge structures?	4	1	3	1	
	Alternative C2 requires two more creek crossings and more walls than Alternatives 1 and 3.				

Draft Alternatives Evaluation Worksheet
Segment D

Evaluation Criteria	Alignment Alternative				Assumptions/Notes
	D1 (Green)	D2 (Yellow)	D3 (Blue)	Hybrid	
User Experience					
Consistent with Vision for the Bikeway					
Does the alternative provide a premier shared-use separated bikeway?	4	3	2	3	Evaluation criteria are rated based on the following scale: 1 - The alternative does not meet the criterion 2 - The alternative minimally meets the criterion 3 - The alternative partially meets the criterion 4 - The alternative mostly meets the criterion 5 - The alternative fully meets the criterion
	Separated from U.S. 50, may require retaining wall/structure.	Closer to U.S. 50, may require retaining wall/structure.	East side of U.S. 50, may require retaining wall/structure, steep slopes at Cave Rock.	Similar to Alternative D3 without steep slopes at Cave Rock.	
Safety, Security, and Liability					
Does the alternative conform to state and federal trail design standards and guidelines (width, grade, curvature, design speed)?	5	5	4	5	Assumes adequate width (10') available
	No issues with trail guidelines and standards.		Steep slopes south of Cave Rock.	No issues with trail guidelines and standards.	
Does the alternative provide regular points of access for police, fire, and emergency medical services vehicles to facilitate emergency movement of persons on and off the path? Motor vehicle access should be provided at least every 3 miles.	5	5	5	5	
	All alternatives parallel U.S. 50.				
Does the alternative avoid physical barriers such as sections with high walls, undercrossings or fencing on both sides that would prevent a user from exiting the trail in the instance of a flat tire or a threat to personal safety?	2	2	4	2	
	Preferred alternative of shared tunnel at Cave Rock.		Potential for retaining wall.	Preferred alternative of shared tunnel at Cave Rock.	
Does the alternative avoid the need for at-grade road crossings on U.S. 50 and SR 28?	5	5	5	3	Assumes grade change at Cave Rock too steep for volunteer trails to the parking lot where trail users may be tempted to cross U.S. 50 just south of Cave Rock from Alternative D3. Alternative D3 also has potential need for crossing south of Glenbrook at regional parking/transit node.
	No at-grade crossings.		May require at-grade crossing of U.S. 50 north of Cave Rock if water table precludes undercrossing.		
Does the alternative minimize the number of other roadway and driveway crossings?	2	2	3	3	[Rank reduced because of the number of crossings. Need to consider volumes though]
	Crosses 10 driveways/access roads, some with poor sight lines.		Crosses 2 streets, including Logan Creek driveway.		

Draft Alternatives Evaluation Worksheet
Segment D

Evaluation Criteria	Alignment Alternative				Assumptions/Notes
	D1 (Green)	D2 (Yellow)	D3 (Blue)	Hybrid	
User Experience - Continued					
Bikeway and Community Connections					
Does the alternative provide regular, simple-to-use connections to existing and planned transportation systems such as local streets, bus and waterborne transit facilities, and sidewalks?	2	2	3	1	
	Connect to potential regional parking/transit node south of Glenbrook.		Connects to Cave Rock Dr.	No connection to regional transit node or Cave Rock Dr.	
Does the alternative connect directly to existing or planned community and recreational facilities such as schools, community centers, recreational trail systems, other bicycle trails, open spaces, beaches, and parks, taking into account desired levels of visitation and environmental carrying capacities?	3	3	1	2	
	Connects to Logan Shoals, Cave Rock NSP.		No connections.	Connects to Cave Rock NSP.	
Does the alternative connect directly to existing and planned residential, commercial, and institutional developments?	2	2	3	2	
	Connects to Logan Shoals.		Connects to Logan Creek subdivision and Cave Rock Dr.	Connects to Logan Creek subdivision.	
Does the alternative provide opportunities for adequate and convenient parking for trail users?	3	3	2	2	
	Connect to potential regional parking/transit node south of Glenbrook and parking south of Cave Rock.		Potential parking south of Logan Shoals.	Connects to parking south of Cave Rock.	
Natural, Historic, and Cultural Interpretive Opportunities					
Does the alternative connect to locations that can provide appropriate interpretation of natural, cultural, and historic resources so that they may be interpreted through signage? These areas should be accommodated by trailheads, wayside stops, and/or other facilities.	4	4	3	3	Assumes available space for interpretive/vista point at Cave Rock
	Logan Shoals, Cave Rock, Old Lincoln Highway.		Cave Rock.	Cave Rock.	
Does the alternative take advantage of opportunities for re-use of historic transportation routes or historic sites?	5	5	1	1	
	Old Lincoln Highway.		No historic transportation routes or sites.		

Draft Alternatives Evaluation Worksheet
Segment D

Evaluation Criteria	Alignment Alternative				Assumptions/Notes
	D1 (Green)	D2 (Yellow)	D3 (Blue)	Hybrid	
User Experience - Continued					
Scenic Opportunities					
Does the alternative provide the opportunity at scenic vista points to allow users to remove themselves from the main flow of traffic and stop to appreciate the view, and should, therefore, be provided at rest areas, wayside stops, trailheads, or other similar Bikeway facilities?	4	4	5	3	Assumes available space for interpretive/vista point at Cave Rock
	Spectacular views; availability of vista points undetermined.		Spectacular views from Cave Rock and Cave Rock Dr.	Spectacular view at Cave Rock.	
Does the alternative provide opportunities to experience scenic vistas while riding or walking by routing the Bikeway through areas that contain views of Lake Tahoe?	4	4	4	3	[NH comment on D1, D2 and D3-reverse scores?]
	Spectacular views along the length, except in Cave Rock tunnel.		U.S. 50 may block/diminish views.	U.S. 50 and Cave Rock tunnel may block/ diminish views.	
User Friendly					
Does the alternative serve commuter needs?	4	5	2	4	
	Meanders away from U.S. 50 in places.	Most direct option.	Detour around Cave Rock not desirable for commuters.	Nearly direct, but requires crossing U.S. 50	
Does the alternative serve recreation needs?	4	3	2	3	
	Tunnel may be detractor, also Alternative D2 alignment closer to U.S. 50.		Steep slopes, few connections to parking or interpretive sites.	Few connections other than to Cave Rock NSP.	
Does the alternative minimize grades in excess of 5%?	5	5	3	5	
	Both Alternative D1 and 2 parallel U.S. 50 – minimize grades as much as possible.		Steep slopes to get around Cave Rock.	Parallels U.S. 50.	

Draft Alternatives Evaluation Worksheet
Segment D

Evaluation Criteria	Alignment Alternative				Assumptions/Notes
	D1 (Green)	D2 (Yellow)	D3 (Blue)	Hybrid	
User Experience - Continued					
Does the alternative provide the opportunity for rest areas at least every 7 miles? Rest areas are formal locations for bicyclists and pedestrians to stop for a variety of reasons. Rest areas should contain restrooms, drinking water, trash/recycling receptacles, picnic areas, shade trees or structures, and signage.	5	5	1	5	Comment from NH on D3-Didn't we think we could accomplish this for all alternatives?
	Cave Rock NSP		No rest area available (closest at SR28/U.S. 50 junction).	Cave Rock NSP	
Does the alternative provide accessibility for full multiple users such as: bicyclists, walkers, joggers, in-line skaters, people in motorized and non-motorized wheelchairs? For example, no stairs or on-road segments.	5	5	4	4	
	Good access, no crossings or steep slopes.		Steep slopes, fewer access points.	Crossing north of tunnel.	

Draft Alternatives Evaluation Worksheet
Segment D

Evaluation Criteria	Alignment Alternative				Assumptions/Notes
	D1 (Green)	D2 (Yellow)	D3 (Blue)	Hybrid	
Environmental Constraints					
Scenic Impacts					
Does the alternative avoid the need for the removal or disturbance of visually significant rock outcroppings and the need for removal of boulders, where feasible?	3	3	3	3	
	With the exception of Cave Rock, there are no major mapped rock outcrop areas along Segment D. All alternatives would potentially be affected to a similar degree by dispersed rock outcrops.				
Does the alternative minimize negative scenic impacts on shoreline travel units (views from the lake)?	4	4	5	5	
	All alternatives would generally not be visible from the lake due to their distance from the lake, intervening vegetation, and proximity to U.S. 50. Alternatives D1 and D2 would be visible from the lake in the vicinity of Logan Shoals where they would follow the Old Lincoln Highway.				
Does the alternative minimize negative scenic impacts on roadway travel units around Lake Tahoe?	4	3	2	2	All of the alternatives are close to U.S. 50 for a significant portion of the segment due to private property constraints. The east side of the highway is generally characterized by steeply sloping terrain.
	Portions of trail would be visible from U.S. 50 for much of the segment but effect on views of the lake would be small. The diversion to the west near Logan Shoals would not be visible from U.S. 50.	Identical to Alternative D2 without the diversion at Logan Shoals.	Would require considerable cuts into the slope and retaining walls on the east side of U.S. 50.	Identical to Alternative D3 between Glenbrook and Cave Rock. Would require considerable cuts into the slopes and retaining walls on the east side of U.S. 50.	
Biological Resources					
Does the alternative avoid negative impacts to wildlife resources, including, but not limited to, habitat for: spotted owl, northern goshawk, golden eagle, bald eagle, American marten, osprey, and willow flycatcher?	5	5	5	5	
	No sensitive species or habitat impacts along this segment for any of the alternatives.				
Does the alternative avoid negative impacts on protected plant species and sensitive habitat?	5	5	5	5	NH comment-There is I think one drainage (SEZ) crossing trail and would not require structures / walk. Consider rank
	No known sensitive plant species or habitats are present.				

Draft Alternatives Evaluation Worksheet
Segment D

Evaluation Criteria	Alignment Alternative				Assumptions/Notes
	D1 (Green)	D2 (Yellow)	D3 (Blue)	Hybrid	
Environmental Constraints - Continued					
Cultural Resources					
Is the alternative sensitive to the cultural resources and traditions of the Washoe Tribe?	5	5	3	5	Alternatives 1 and 2 would use the existing tunnel (s) to pass through Cave Rock. Alternative D3 would pass Cave Rock on the uphill side to the west.
	None of the alternatives would require expanding existing tunnels or otherwise directly or indirectly impact Cave Rock. The Washoe Tribe has expressed a preference for using passive traffic controls within the existing U.S. 50 tunnels rather than going around Cave Rock to the east or west.				
Does the alternative avoid negative impacts to known cultural resources?	5	5	2	5	NH comment-modifications in tunnel (e.g., lights) aren't acceptable.
	No evaluated resources would be affected.	Direct access to the top of cave rock is problematic within the buffer area for NRHP designation.		No evaluated resources would be affected.	
Hydrology and Water Quality					
Does the alternative minimize disruption of natural hydrologic flow paths and subsurface water?	5	5	5	5	
	No disruption of hydrology.			The hybrid would require a crossing of U.S. 50 north of Cave Rock. This may be an area of high ground water.	
Does the alternative minimize use of Stream Environment Zones (SEZs)?	5	5	5	5	
	Similar impact for all alternatives.				
Does the alternative minimize the impact of creek crossings?	5	5	5	5	NH comment- Drainage? Actually couple of creeks. How do these rank.
	Similar impact for all alternatives.				
Beneficial Effects					
Does the alternative provide accessory benefits such as solving a parking or erosion problem, or	3	3	3	3	NH comment-secondary egress?

Draft Alternatives Evaluation Worksheet
Segment D

Evaluation Criteria	Alignment Alternative				Assumptions/Notes
	D1 (Green)	D2 (Yellow)	D3 (Blue)	Hybrid	
improving access for fire suppression?	No clear beneficial effects.				

Draft Alternatives Evaluation Worksheet
Segment D

Evaluation Criteria	Alignment Alternative				Assumptions/Notes
	D1 (Green)	D2 (Yellow)	D3 (Blue)	Hybrid	
Environmental Constraints - Continued					
Tree Removal					
Does the alternative minimize tree removal?	4	4	2	4	
	Similar impact for all alternatives with the exception of Alternative D3 in the area just north of Cave Rock where new trail would be required to meet grade standards.				
Permitability and Community Acceptance.					
Is the alternative consistent with agency permitting requirements?	3	3	5	3	
	Alternatives D1 and D2 would require routing bicycles through a tunnel, possibly using a dedicated lane or signalization through Cave Rock to achieve project objectives. NDOT may object.		No significant permitting obstacles.	Same as Alternatives 1and 2. The Hybrid alternative would require an undercrossing of U.S. 50 north of Cave Rock.	
Does the alternative have the potential to adversely affect private property?	1	2	3	4	
	Crosses 10 entrances to private property on west side of U.S. 50.	Crosses 10 entrances to private property on west side of U.S. 50 but somewhat more acceptable than Alternative D1 because it stays closer to the road in Logan Shoals area.	Crosses 5 entrances to private property on east side of U.S. 50 near Cave Rock—-both north and south sides.	Crosses 4 entrances to private property on east side of U.S. 50 near Cave Rock—only on north side.	

Draft Alternatives Evaluation Worksheet
Segment D

Evaluation Criteria	Alignment Alternative				Assumptions/Notes
	D1 (Green)	D2 (Yellow)	D3 (Blue)	Hybrid	
Cost and Constructability					
Grading/Cut and Fill					
Does the alternative minimize the need for cut and fill that would require retaining walls or create visible cuts on hillsides?	3	3	1	1	
	Alternative D3 has more steep cross slopes and cut and fill required than Alternatives 1 and 2.				
Private Property Acquisition					
Does the alternative avoid the need to acquire private property?	1	2	3	3	
	All alternatives would likely require some private property easement. Alternative D1 requires the most and Alternative D3 the least.				
Does the alternative allow for adequate easements? Where necessary, easements for Bikeway development should be at least 40 feet wide to allow for adequate space within the easement to accommodate the typical 14-foot cross-section (Bikeway plus shoulders) in terrain that may contain trees, boulders, sensitive habitat, steep sideslopes, etc?	1	2	2	2	
	Easement widths would be a problem in this segment because of private property, U.S. 50, and building constraints. [NH comment, structure? Or constructability?]				
Separated Roadway Crossings					
Does the alternative require undercrossings on SR 28 or U.S. 50?	5	5	5	1	
	No undercrossing required on Alternatives 1 and 2. If the option to connect Alternative D3 to 1 and 2 north of Cave Rock is used, then one crossing of U.S. 50 would be required. High groundwater and SEZ may require that this crossing be a surface crossing. However, if the connection is not made, Alternative D3 would not require a highway crossing.				
Length of Trail					
How long is the trail relative to other alternative alignments?	4	4	4	4	
	All alternatives are approximately the same length.				
Use of Existing Roads and Trails					
Does the alternative utilize areas of existing coverage and higher capability lands (land capability districts 4 through 7) where feasible to minimize water quality impacts and coverage transfer costs?	2	2	2	2	
	Similar impact for all alternatives.				

Draft Alternatives Evaluation Worksheet
Segment D

Evaluation Criteria	Alignment Alternative				Assumptions/Notes
	D1 (Green)	D2 (Yellow)	D3 (Blue)	Hybrid	
Cost and Constructability - Continued					
Does the alternative enhance and use existing disturbed area, such as old logging and fire access roads.	3	3	2	2	
	All alternatives use portions of existing access roads. Alternatives 1 and 2 use part of Old Highway 40.				
Does the alternative take advantage of joint parking opportunities, such as at school sites?	1	1	1	1	
	There is current off-shoulder parking just south of the entrance to Glenbrook, but it is not an existing developed parking area. There is current parking at Cave Rock Boat Launch, however it is over capacity during the summer months when the trail would receive the heaviest use.				
Maintenance					
Is the alternative easy to maintain?	4	4	3	4	
	Section of Alternative D3 that goes over Cave Rock would be harder to maintain than the other sections.				
Retaining Walls or Bridge Structures					
Does the alternative require costly engineering solutions such as retaining walls and bridge structures?	2	2	2	2	
	All alternatives would require retaining walls. Alternatives 1 and 2 on the approaches to the Cave Rock tunnel and Alternative D3 going over Cave Rock.				

Draft Alternatives Evaluation Worksheet
Segment E

Evaluation Criteria	Alignment Alternative				Assumptions/Notes
	1 (Green)	**2 (Yellow)**	**3 (Blue)**	**Hybrid**	
User Experience					
Consistent with Vision for the Bikeway					
Does the alternative provide a premier shared-use separated bikeway?	3	4	3	3	Evaluation criteria are rated based on the following scale: 1 - The alternative does not meet the criterion 2 - The alternative minimally meets the criterion 3 - The alternative partially meets the criterion 4 - The alternative mostly meets the criterion 5 - The alternative fully meets the criterion
	Close to U.S. 50 at north & south ends, includes on-street alignment at Skyland.	Close to U.S. 50, Lakeside.	Close to U.S. 50.	Close to U.S. 50.	
Safety, Security, and Liability					
Does the alternative conform to state and federal trail design standards and guidelines (width, grade, curvature, design speed)?	5	5	5	5	Assumes adequate width (10') available
	No issues with trail guidelines & standards.				
Does the alternative provide regular points of access for police, fire, and emergency medical services vehicles to facilitate emergency movement of persons on and off the path? Motor vehicle access should be provided at least every 3 miles.	5	5	5	5	
	All alternatives parallel U.S. 50 in places, cross several streets that provide access.				
Does the alternative avoid physical barriers such as sections with high walls, undercrossings or fencing on both sides that would prevent a user from exiting the trail in the instance of a flat tire or a threat to personal safety?	5	5	5	3	
	No undercrosssings or other structures.		Requires undercrossing of Highway 50 north of Skyland.		
Does the alternative avoid the need for at-grade road crossings on U.S. 50 and SR 28?s	5	5	4	5	
	No at-grade crossings.		Potential at-grade crossing to access Zephyr Cove parking.	Potential at-grade crossing at elementary school would use existing flashing signal.	
Does the alternative minimize the number of other roadway and driveway crossings?	2	3	4	3	
	Skyland on-street section crosses many driveways.	Several crossings of driveways and major streets.	Fewer street/ driveway crossings than other	Several crossings of driveways and major streets.	

Draft Alternatives Evaluation Worksheet
Segment E

Evaluation Criteria	Alignment Alternative				Assumptions/Notes
	1 (Green)	2 (Yellow)	3 (Blue)	Hybrid	
			Alternatives.		

Draft Alternatives Evaluation Worksheet
Segment E

Evaluation Criteria	Alignment Alternative				Assumptions/Notes
	1 (Green)	**2 (Yellow)**	**3 (Blue)**	**Hybrid**	
User Experience - Continued					
Bikeway and Community Connections					
Does the alternative provide regular, simple-to-use connections to existing and planned transportation systems such as local streets, bus and waterborne transit facilities, and sidewalks?	3	3	5	3	Potential crossing to Zephyr Cove Elementary from Alternatives E2 and E3
	Connect to streets in Skyland.		Connects to streets in Hidden Woods, Zephyr Cove, and to Zephyr Cove Elementary.	Connects to streets in Zephyr Cove, Skyland.	
Does the alternative connect directly to existing or planned community and recreational facilities such as schools, community centers, recreational trail systems, other bicycle trails, open spaces, beaches, and parks, taking into account desired levels of visitation and environmental carrying capacities?	3	3	5	5	
	Connects to Zephyr Cove Resort.		Connections to Zephyr Cove schools, potential spur to Zephyr Cove Resort.		
Does the alternative connect directly to existing and planned residential, commercial, and institutional developments?	4	4	5	4	
	Connects to Lakeridge, Skyland, Zephyr Cove Resort.		Connects to Hidden Woods, Zephyr Cove.	Connects to Zephyr Cove.	
Does the alternative provide opportunities for adequate and convenient parking for trail users?	4	4	5	5	
	Connect to Zephyr Cove Resort parking.		Connects to potential parking lot at George Whittell High School, potential spur to Zephyr Cove Resort.		
Natural, Historic, and Cultural Interpretive Opportunities					
Does the alternative connect to locations that can provide appropriate interpretation of natural, cultural, and historic resources so that they may be interpreted through signage? These areas should be accommodated by trailheads, wayside stops, and/or other facilities.	1	1	1	1	Assumes available space for interpretive/vista point at Cave Rock
	No good interpretation opportunities.				
Does the alternative take advantage of opportunities for re-use of historic transportation routes or historic sites?	1	1	1	1	
	No historic transportation routes or sites.	Would use Old Lincoln Highway.		No historic transportation routes or sites.	

Draft Alternatives Evaluation Worksheet
Segment E

Evaluation Criteria	Alignment Alternative				Assumptions/Notes
	1 (Green)	**2 (Yellow)**	**3 (Blue)**	**Hybrid**	
User Experience - Continued					
Scenic Opportunities					
Does the alternative provide the opportunity at scenic vista points to allow users to remove themselves from the main flow of traffic and stop to appreciate the view, and should, therefore, be provided at rest areas, wayside stops, trailheads, or other similar Bikeway facilities?	3	3	3	3	Assumes available space for interpretive/vista point at Cave Rock
	No particular scenic vistas				
Does the alternative provide opportunities to experience scenic vistas while riding or walking by routing the Bikeway through areas that contain views of Lake Tahoe?	3	3	3	3	
	No particular scenic vistas; Alternative E1 is closer to lake but unlikely to have views due to houses.				
User Friendly					
Does the alternative serve commuter needs?	3	4	5	5	
	Segment on Skyland circuitous, may require speed reduction.	Direct route.	Direct route, offers connections to important destinations.		
Does the alternative serve recreation needs?	5	4	3	3	
	Comfortable alignment.	Close to roadway.	Close to roadway, less direct access to Zephyr Cove Resort/parking.		
Does the alternative minimize grades in excess of 5%?	5	5	5	5	
	All alternatives less than 5% grade.				
Does the alternative provide the opportunity for rest areas at least every 7 miles? Rest areas are formal locations for bicyclists and pedestrians to stop for a variety of reasons. Rest areas should contain restrooms, drinking water, trash/recycling receptacles, picnic areas, shade trees or structures, and signage.	5	5	4	4	
	Rest area at Zephyr Cove Resort parking lot.		Potential rest area at high school, and/or spur to Zephyr Cove Resort.		
Does the alternative provide accessibility for full multiple users such as: bicyclists, walkers, joggers, in-line skaters, people in motorized and non-motorized wheelchairs? For example, no stairs or on-road segments.	5	5	5	5	
	Good access, no crossings or steep slopes.				

Draft Alternatives Evaluation Worksheet
Segment E

Evaluation Criteria	Alignment Alternative				Assumptions/Notes
	1 (Green)	**2 (Yellow)**	**3 (Blue)**	**Hybrid**	
Environmental Constraints					
Scenic Impacts					
Does the alternative avoid the need for the removal or disturbance of visually significant rock outcroppings and the need for removal of boulders, where feasible?	3	3	3	3	The hybrid follows Alternative E1 & 2 on the west side of U.S. 50 then crosses to the east side near Mehrten Road, then follows Alternative E3. If Alternative E3 were selected for the Segment D, then the hybrid could follow Alternative E3 to Mehrten Road and cross to join Alternatives E1 and E2.
	There are no major mapped rock outcrop areas along Segment D. All alternatives would potentially be affected to a similar degree by dispersed rock outcrops.				
Does the alternative minimize negative scenic impacts on shoreline travel units (views from the lake.)?	5	5	5	5	
	All of the alternatives would be generally not visible from the Lake.				
Does the alternative minimize negative scenic impacts on roadway travel units around Lake Tahoe?	4	4	2	2	
	Scenic impacts of Alternative E1 would be similar to Alternatives E2 and E3 until Myron Road, at which point it deviates to the west through Skyland and would generally not be visible to the end of the segment.	Alternative E2 would be visible from U.S. 50 from Cave Rock until Myron Road. At this point it would no longer be visible from U.S. 50 as it follows Myron Road and joins and existing trail through National Forest System land approximately 80 feet from the roadway and screened by trees.	Alternative 3 would have the greatest impact on roadway travel units as it would intrude on views of undeveloped forest on the east side of U.S. 50 between Mehrten Road and Zephyr Cove.	The hybrid would have similar impacts as Alternative 3.	

Draft Alternatives Evaluation Worksheet
Segment E

Evaluation Criteria	Alignment Alternative				Assumptions/Notes
	1 (Green)	**2 (Yellow)**	**3 (Blue)**	**Hybrid**	
Environmental Constraints - Continued					
Biological Resources					
Does the alternative avoid negative impacts to wildlife resources, including, but not limited to, habitat for: spotted owl, northern goshawk, golden eagle, bald eagle, American marten, osprey, and willow flycatcher?	5	5	5	5	
	No sensitive species or habitat impacts along this segment for any of the alternatives.				
Does the alternative avoid negative impacts on protected plant species and sensitive habitat?	5	5	5	5	
	No known sensitive plant species or habitats are present.				
Cultural Resources					
Is the alternative sensitive to the cultural resources and traditions of the Washoe Tribe?	5	5	5	5	
	No known Washoe Tribe sensitive resources would be affected by any of the alignments.				
Does the alternative avoid negative impacts to known cultural resources?	5	5	5	5	
	No evaluated resources would be affected.				
Hydrology and Water Quality					
Does the alternative minimize disruption of natural hydrologic flow paths and subsurface water?	5	5	5	5	
	No disruption of hydrology.			The hybrid would require a crossing of U.S. 50 at Mehrton Road. This may be an area of high ground water.	
Does the alternative minimize use of Stream Environment Zones (SEZs)?	5	5	5	5	
	Similar impact for all Alternatives.				

Draft Alternatives Evaluation Worksheet
Segment E

Evaluation Criteria	Alignment Alternative				Assumptions/Notes
	1 (Green)	**2 (Yellow)**	**3 (Blue)**	**Hybrid**	
Environmental Constraints - Continued					
Does the alternative minimize the impact of creek crossings?	5	5	5	5	
	Similar impact for all Alternatives.				
Beneficial Effects					
Does the alternative provide accessory benefits such as solving a parking or erosion problem, or improving access for fire suppression?	3	3	3	3	
	No clear beneficial effects				
Tree Removal					
Does the alternative minimize tree removal?	4	4	2	4	
	Similar impact for all Alternatives with the exception of Alternative E3 in the area south of Mehrten Road where new trail would be required through a forested area.				
Permitability and Community Acceptance					
Is the alternative consistent with agency permitting requirements?	3	3	5	3	
	Both Alternative E1 and E2 cross NFS land south of Skyland and generally follow existing trails. Some tree removal may be required.		Visual impacts and tree removal may be difficult to justify if alternatives are available.	Same as Alternatives E1&E2.	
Does the alternative have the potential to adversely affect private property?	1	2	3	2	`
	Alternatives E1 would require use of public roadways through the Skyland subdivision and would cross the entrance to private property on west side of U.S. 50.	Would require similar use of private property as E1, but to a lesser extent. There are houses only on one side of Myron Ave and there is existing disturbance from U.S. 50.	Bikeway would cross the access road to private property on east side of U.S. 50.	Would require similar use of private property as E1, but to a lesser extent. There are houses only on one side of Myron Ave and there is existing disturbance from U.S. 50.	

Draft Alternatives Evaluation Worksheet
Segment E

Evaluation Criteria	Alignment Alternative				Assumptions/Notes
	1 (Green)	**2 (Yellow)**	**3 (Blue)**	**Hybrid**	
Cost and Constructability					
Grading/Cut & Fill					
Does the alternative minimize the need for cut and fill that would require retaining walls or create visible cuts on hillsides?	4	4	3	3	
	Alternative 3 has slightly steeper cross slopes and slightly more cut and fill required than Alternatives E1 and E2.				
Private Property Acquisition					
Does the alternative avoid the need to acquire private property?	1	1	3	3	
	All alternatives would require some private property. Alternatives E1 and E2 require more than Alternative E3.				
Does the alternative allow for adequate easements? Where necessary, easements for Bikeway development should be at least 40 feet wide to allow for adequate space within the easement to accommodate the typical 14-foot cross-section (Bikeway plus shoulders) in terrain that may contain trees, boulders, sensitive habitat, steep sideslopes, etc?	1	2	3	2	
	Easement widths would be a problem in this segment because of private property, U.S. 50, and building constraints.				
Separated Roadway Crossings					
Does the alternative require undercrossings on SR 28 or U.S. 50?	5	5	5	1	
	No undercrossing required on Alternatives E1 and E2. If the option to connect Alternative E3 to E1 and E2 south of Cave Rock or between the Lakeridge and Skyland Subdivisions is used, then one or two crossings of U.S. 50 would be required. High groundwater and SEZ may require that these crossings be surface crossings. However, if the connections are not made, Alternative E3 would not require a highway crossing.				
Length of Trail					
How long is the trail relative to other alternative alignments?	2	5	4	4	
	Alternative E1 is longer than the other alternatives because it goes through the Skyland subdivision on existing streets.				

Draft Alternatives Evaluation Worksheet
Segment E

Evaluation Criteria	Alignment Alternative				Assumptions/Notes
	1 (Green)	**2 (Yellow)**	**3 (Blue)**	**Hybrid**	
Cost and Constructability - Continued					
Use of Existing Roads and Trails					
Does the alternative utilize areas of existing coverage and higher capability lands (land capability districts 4 through 7) where feasible to minimize water quality impacts and coverage transfer costs?	4	3	2	2	
	Alternative E1 uses existing surface streets in the Skyland subdivision.				
Does the alternative enhance and use existing disturbed area, such as old logging and fire access roads.	4	4	1	4	
	Would require widening existing dirt trail through USFS land.	All alternatives use portions of existing roads. Alternatives E1, E2, and E4 use existing surface streets in the Skyland subdivision. Alternatives E2 and E3 use Old Lincoln Highway.			
Does the alternative take advantage of joint parking opportunities, such as at school sites?	2	4	4	5	Ratings assume a crossing to the high school.
	There is current parking at Zephyr Cove Resort, however it is over capacity during the summer months when the trail would receive the heaviest use. Potential parking at high school.				
Maintenance					
Is the alternative easy to maintain?	3	3	2	3	
	Similar for all alternatives, however Alternative E2 does not use existing roads and is further from U.S. 50.				
Retaining Walls or Bridge Structures					
Does the alternative require costly engineering solutions such as retaining walls and bridge structures?	2	2	2	2	
	Proximity to U.S. 50, multiple driveways, and some steep cut slopes and drop offs would require walls and structures.				

Draft Alternatives Evaluation Worksheet
Segment F

Evaluation Criteria	Alignment Alternative			Assumptions/Notes
	F1 (Green)	F2 (Yellow)	F3 (Blue)	
User Experience				
Consistent with Vision for the Bikeway				
Does the alternative provide a premier shared-use separated bikeway?	3	4	3	Evaluation criteria are rated based on the following scale: 1 - The alternative does not meet the criterion 2 - The alternative minimally meets the criterion 3 - The alternative partially meets the criterion 4 - The alternative mostly meets the criterion 5 - The alternative fully meets the criterion
	On-street through Zephyr subdivision.	Close to U.S. 50, lakeside.	Close to U.S. 50.	
Safety, Security, and Liability				
Does the alternative conform to state and federal trail design standards and guidelines (width, grade, curvature, design speed)?	5	5	5	Assumes adequate width (10') available
	No issues with trail guidelines & standards.			
Does the alternative provide regular points of access for police, fire, and emergency medical services vehicles to facilitate emergency movement of persons on and off the path? Motor vehicle access should be provided at least every 3 miles.	5	5	5	
	All alternatives parallel U.S. 50 in places, cross several streets that provide access.			
Does the alternative avoid physical barriers such as sections with high walls, undercrossings or fencing on both sides that would prevent a user from exiting the trail in the instance of a flat tire or a threat to personal safety?	5	5	5	
	No undercrosssings or other structures.			
Does the alternative avoid the need for at-grade road crossings on U.S. 50 and SR 28?s	5	5	4	
	No at-grade crossings.		Potential crossing at Round Hill Pines Beach.	
Does the alternative minimize the number of other roadway and driveway crossings?	2	3	2	
	Zephyr Cove subdivision would pass many driveways and cross streets.	Two road crossings and multiple driveways & streets.	Four road crossings.	

Draft Alternatives Evaluation Worksheet
Segment F

Evaluation Criteria	Alignment Alternative			Assumptions/Notes
	F1 (Green)	F2 (Yellow)	F3 (Blue)	
User Experience - Continued				
Bikeway and Community Connections				
Does the alternative provide regular, simple-to-use connections to existing and planned transportation systems such as local streets, bus and waterborne transit facilities, and sidewalks?	4	4	2	
	Connect to streets in Zephyr Cove, Round Hill Pines Beach & Marina.		Connects to streets in Zephyr Heights.	
Does the alternative connect directly to existing or planned community and recreational facilities such as schools, community centers, recreational trail systems, other bicycle trails, open spaces, beaches, and parks, taking into account desired levels of visitation and environmental carrying capacities?	5	5	3	
	Connect to Presbyterian Conference Center, Round Hill Pines Beach & Marina.		Potential spur to future Round Hill Pines Beach driveway.	
Does the alternative connect directly to existing and planned residential, commercial, and institutional developments?	4	4	3	
	Connects to Zephyr Heights, Round Hill Pines.		Connects to Zephyr Heights.	
Does the alternative provide opportunities for adequate and convenient parking for trail users?	5	5	3	
	Parking at Round Hill Pines Beach.		Potential spur to future Round Hill Pines Beach driveway.	
Natural, Historic, and Cultural Interpretive Opportunities				
Does the alternative connect to locations that can provide appropriate interpretation of natural, cultural, and historic resources so that they may be interpreted through signage? These areas should be accommodated by trailheads, wayside stops, and/or other facilities.	1	1	1	Assumes available space for interpretive/vista point at Cave Rock
	No good interpretation opportunities.			
Does the alternative take advantage of opportunities for re-use of historic transportation routes or historic sites?	1	1	1	
	No historic transportation routes or sites.			

Draft Alternatives Evaluation Worksheet
Segment F

Evaluation Criteria	Alignment Alternative			Assumptions/Notes
	F1 (Green)	F2 (Yellow)	F3 (Blue)	
User Experience - Continued				
Scenic Opportunities				
Does the alternative provide the opportunity at scenic vista points to allow users to remove themselves from the main flow of traffic and stop to appreciate the view, and should, therefore, be provided at rest areas, wayside stops, trailheads, or other similar Bikeway facilities?	2	2	2	Assumes available space for interpretive/vista point at Cave Rock
	No particular scenic vistas.			
Does the alternative provide opportunities to experience scenic vistas while riding or walking by routing the Bikeway through areas that contain views of Lake Tahoe?	3	2	2	
	No particular scenic vistas; Alternative F1 is closer to lake.			
User Friendly				
Does the alternative serve commuter needs?	3	5	5	
	Segment on Freel Dr. may require speed reduction.		Direct route, offers connections to important destinations.	
Does the alternative serve recreation needs?	5	4	3	
	Comfortable alignment.	Close to roadway.	Close to roadway, less direct access to Round Hill Pines Beach /parking.	
Does the alternative minimize grades in excess of 5%?	5	5	5	
	All alternatives less than 5% grade.			
Does the alternative provide the opportunity for rest areas at least every 7 miles? Rest areas are formal locations for bicyclists and pedestrians to stop for a variety of reasons. Rest areas should contain restrooms, drinking water, trash/recycling receptacles, picnic areas, shade trees or structures, and signage.	5	5	4	
	Rest area at Round Hill Pines Beach parking lot.		Potential spur to future Round Hill Pines Beach driveway.	
Does the alternative provide accessibility for full multiple users such as: bicyclists, walkers, joggers, in-line skaters, people in motorized and non-motorized wheelchairs? For example, no stairs or on-road segments.	5	5	5	
	Good access, no crossings or steep slopes.			

Draft Alternatives Evaluation Worksheet
Segment F

Evaluation Criteria	Alignment Alternative			Assumptions/Notes
	F1 (Green)	F2 (Yellow)	F3 (Blue)	
Environmental Constraints				
Scenic Impacts				
Does the alternative avoid the need for the removal or disturbance of visually significant rock outcroppings and the need for removal of boulders, where feasible?	3	3	3	
	There are no major mapped rock outcrop areas along Segment F. All alternatives would potentially be affected to a similar degree by dispersed rock outcrops.			
Does the alternative minimize negative scenic impacts on shoreline travel units (views from the lake.)?	5	5	5	
	All of the alternatives would be generally not visible from the Lake.			
Does the alternative minimize negative scenic impacts on roadway travel units around Lake Tahoe?	4	3	2	
	All of the alternatives are visible from U.S. 50 for part of the segment. Alternative F1 uses surface streets over a large portion of the segment so it would be least visible from U.S. 50. Alternative F3 continues on the east side of the highway from Zephyr Cove to the sharp curve around Zephyr Heights, while Alternatives F1 & F2 deviate to the west on local streets.			
Biological Resources				
Does the alternative avoid negative impacts to wildlife resources, including, but not limited to, habitat for: spotted owl, northern goshawk, golden eagle, bald eagle, American marten, osprey, and willow flycatcher?	5	5	5	
	No sensitive species or habitat impacts along this segment for any of the alternatives.			
Does the alternative avoid negative impacts on protected plant species and sensitive habitat?	5	5	5	
	No known sensitive plant species or habitats are present.			

Draft Alternatives Evaluation Worksheet
Segment F

Evaluation Criteria	Alignment Alternative			Assumptions/Notes
	F1 (Green)	F2 (Yellow)	F3 (Blue)	
Environmental Constraints - Continued				
Cultural Resources				
Is the alternative sensitive to the cultural resources and traditions of the Washoe Tribe?	5	5	5	
	No known Washoe Tribe sensitive resources would be affected by any of the alignments.			
Does the alternative avoid negative impacts to known cultural resources?	5	5	5	
	No evaluated resources would be affected.			
Hydrology and Water Quality				
Does the alternative minimize disruption of natural hydrologic flow paths and subsurface water?	5	5	5	
	No disruption of hydrology.		Alternative F3 would require an undercrossing of U.S. 50 in order to connect to the South Demonstration Project.	
Does the alternative minimize use of Stream Environment Zones (SEZs)?	1	5	5	
	Alternative F1 crosses a large area of SEZ on private land after transitioning from local roads south of Zephyr Cove.	Similar impact for Alternatives F2 & F3.		
Does the alternative minimize the impact of creek crossings?	5	5	5	
	Similar impact for all Alternatives.			
Beneficial Effects				
Does the alternative provide accessory benefits such as solving a parking or erosion problem, or improving access for fire suppression?	3	3	3	
	No clear beneficial effects.			

Draft Alternatives Evaluation Worksheet
Segment F

Evaluation Criteria	Alignment Alternative			Assumptions/Notes
	F1 (Green)	F2 (Yellow)	F3 (Blue)	
Environmental Constraints - Continued				
Tree Removal				
Does the alternative minimize tree removal?	4	4	4	
	Similar impact for all Alternatives.			
Permitability and Community Acceptance				
Is the alternative consistent with agency permitting requirements?	3	3	5	
	The SEZ crossing south of Zephyr Cove may be difficult to permit	No major permitting issues.		
Does the alternative have the potential to adversely affect private property?	1	1	2	
	Alternatives F1 & F2 would require use of local roads through residential areas in the Zephyr Cove area.		Trail would cross the access road to development on east side of U.S. 50.	

Draft Alternatives Evaluation Worksheet
Segment F

Evaluation Criteria	Alignment Alternative			Assumptions/Notes
	F1 (Green)	F2 (Yellow)	F3 (Blue)	
Cost and Constructability				
Grading/Cut & Fill				
Does the alternative minimize the need for cut and fill that would require retaining walls or create visible cuts on hillsides?	2	2	1	
	Alternative F3 has existing steep cut slopes adjacent to U.S. 50. Alternatives 1 and 2 have very limited room on the west side of U.S. 50 and would require walls.			
Private Property Acquisition				
Does the alternative avoid the need to acquire private property?	1	1	1	
	All alternatives would require some private property.			
Does the alternative allow for adequate easements? Where necessary, easements for Bikeway development should be at least 40 feet wide to allow for adequate space within the easement to accommodate the typical 14-foot cross-section (Bikeway plus shoulders) in terrain that may contain trees, boulders, sensitive habitat, steep sideslopes, etc?	1	1	1	
	Easement widths would be a problem in this segment because of private property and existing U.S. 50 and building constraints.			
Separated Roadway Crossings				
Does the alternative require undercrossings on SR 28 or U.S. 50?	5	5	1	
	No undercrossing required on Alignments 1 and 2. Alignment 3 would have to cross U.S. 50 to connect to Alternatives 1 and 2 at the north end of the Round Hill Pines Beach parcel.			
Length of Trail				
How long is the trail relative to other alternative alignments?	3	4	4	
	Alternative F1 is slightly longer than the other alternatives.			

Draft Alternatives Evaluation Worksheet
Segment F

Evaluation Criteria	Alignment Alternative			Assumptions/Notes
	F1 (Green)	F2 (Yellow)	F3 (Blue)	
Cost and Constructability - Continued				
Use of Existing Roads and Trails				
Does the alternative utilize areas of existing coverage and higher capability lands (land capability districts 4 through 7) where feasible to minimize water quality impacts and coverage transfer costs?	2	3	2	
	Alternative F1 would cross a wider section of McFaul Creek SEZ. Alternative F3 is on steeper terrain.			
Does the alternative enhance and use existing disturbed area, such as old logging and fire access roads.	3	3	1	
	Alternatives 1 and 2 use portions of existing roads.			
Does the alternative take advantage of joint parking opportunities, such as at school sites?	1	1	1	
Maintenance				
Is the alternative easy to maintain?	3	3	2	
	Alternative F3 is on steeper ground with more likelihood of debris falling on the trail.			
Retaining Walls or Bridge Structures				
Does the alternative require costly engineering solutions such as retaining walls and bridge structures?	2	2	2	
	Proximity to highway, multiple driveways, and existing steep cut slopes and drop offs would require walls and structures. SEZ crossing would require boardwalk.			

APPENDIX B

Alternatives Evaluation Matrix

APPENDIX C. ALTERNATIVE ALIGNMENTS EVALUATION MATRIX

			EVALUATION CRITERIA																							Composite Evaluation and Ranking		
			User Experience							Environmental Constraints							Cost and Constructability											
			Consistent with Vision for the Bikeway	Safety, Security, and Liability	Bikeway and Community Connections	Natural, Historic, and Cultural Interpretive Opportunities	Scenic Opportunities	User Friendly	Total for User Experience	Scenic Impacts	Biological Resources	Cultural Resources	Hydrology & Water Quality	Benefical Effects	Tree Removal	Permitability & Support	Total for Environmental Impacts	Grading / Cut and Fill	Private Property Acquisition	Separated Roadway Crossings	Length of trail	Use of Existing Roads & Trails	Maintenance	Retaining Walls or Bridge Structures	Total for Cost and Constructibility	Total for all criteria	Rank	Alternative Alignment
		Possible Score	5	5	5	5	5	5	30	5	5	5	5	5	5	5	35	5	5	5	5	5	5	5	35	100		
		Weight	1	1	1	1	1	1	Maximum score 30	1	1	1	1	1	1	5	Maximum score 55	1	1	1	1	1	1	1	Maximum score 35	Maximum Score 120		
SEGMENT	A	A1	4.0	4.6	1.3	1.5	4.5	3.8	19.6	3.0	1.0	5.0	5.0	1.0	2.0	1.5	24.5	1.0	4.5	5.0	4.0	1.0	1.0	2.0	18.5	62.6	4	A1
		A2	4.0	4.6	1.5	1.5	4.5	4.3	20.4	3.0	1.0	5.0	5.0	1.0	2.0	1.5	24.5	1.0	4.5	5.0	4.0	1.0	1.0	2.0	18.5	63.4	3	A2
		A3	2.0	4.4	1.5	1.5	3.0	3.3	15.7	2.7	3.0	5.0	5.0	1.0	2.0	3.5	36.2	1.0	4.5	1.0	5.0	1.0	2.0	2.0	16.5	68.3	2	A3
		A4 (Hybrid)	3.0	4.6	1.5	1.5	3.5	4.3	18.4	2.7	3.0	5.0	5.0	1.0	2.0	4.0	38.7	1.0	4.5	5.0	5.0	1.0	2.0	2.0	20.5	77.5	1	A4 (Hybrid)
	B	B1	4.0	4.2	1.3	1.5	5.0	3.3	19.2	3.3	2.0	5.0	5.0	3.0	2.0	1.5	27.8	1.0	3.5	5.0	2.0	1.3	1.0	1.0	14.8	61.9	3	B1
		B2	4.0	4.4	1.3	1.5	5.0	3.3	19.4	3.7	1.0	5.0	5.0	3.0	2.0	2.5	32.2	1.0	5.0	5.0	2.0	1.7	1.0	1.0	16.7	68.2	2	B2
		B3	2.0	4.6	1.8	1.0	2.0	3.8	15.1	3.7	4.0	5.0	5.0	1.0	2.0	4.5	43.2	2.0	5.0	5.0	5.0	1.0	3.0	3.0	24.0	82.3	1	B3
	C	C1	4.0	4.4	2.5	2.5	2.0	4.5	19.9	4.3	3.5	5.0	5.0	3.0	4.0	1.5	32.3	4.0	1.0	5.0	5.0	3.0	4.0	4.0	26.0	78.2	3	C1
		C2	4.0	3.8	2.5	2.5	2.0	4.0	18.8	4.3	4.0	5.0	3.0	3.0	2.0	2.5	33.8	1.0	1.5	5.0	1.0	2.0	1.0	1.0	12.5	65.1	4	C2
		C3	2.0	4.0	4.5	5.0	3.0	2.8	21.3	3.7	5.0	4.0	3.7	1.0	3.0	5.0	45.3	3.0	3.5	5.0	4.0	3.0	4.0	3.0	25.5	92.1	1	C3
		C4 (Hybrid)	4.0	4.2	2.3	4.5	3.0	3.8	21.7	4.0	4.0	4.0	2.7	1.0	2.0	5.0	42.7	1.0	3.5	5.0	1.0	1.7	1.0	1.0	14.2	78.5	2	C4 (Hybrid)
	D	D1	4.0	3.8	2.5	4.5	4.0	4.5	23.3	3.7	5.0	5.0	4.3	3.0	4.0	2.0	35.0	3.0	1.0	5.0	4.0	2.3	4.0	2.0	21.3	79.6	2	D1
		D2	4.0	3.8	2.5	4.5	4.0	4.5	23.3	3.3	5.0	5.0	4.3	3.0	4.0	2.5	37.2	3.0	2.0	5.0	4.0	2.3	4.0	2.0	22.3	82.8	1	D2
		D3	2.0	4.2	2.0	2.0	3.5	2.5	16.2	3.3	5.0	2.5	4.3	3.0	2.0	2.0	30.2	1.0	2.5	5.0	4.0	1.7	3.0	2.0	19.2	65.5	4	D3
		D4 (Hybrid)	2.0	3.6	1.8	2.0	3.0	3.8	16.1	3.3	5.0	5.0	4.3	3.0	4.0	3.5	42.2	1.0	2.5	1.0	4.0	1.7	4.0	2.0	16.2	74.4	3	D4 (Hybrid)
	E	E1	4.0	4.2	4.3	1.0	4.0	4.5	22.0	4.0	5.0	5.0	4.7	3.0	4.0	2.5	38.2	4.0	1.0	5.0	2.0	4.0	3.0	2.0	21.0	81.1	3	E1
		E2	3.0	4.4	4.3	2.0	3.0	4.5	21.2	4.0	5.0	5.0	4.7	3.0	4.0	2.5	38.2	4.0	1.0	5.0	5.0	4.0	3.0	2.0	24.0	83.3	1	E2
		E3	3.0	4.6	4.3	1.0	3.0	4.3	20.1	3.3	5.0	5.0	4.7	3.0	2.0	3.5	40.5	3.0	3.5	5.0	4.0	2.3	2.0	2.0	21.8	82.4	2	E3
		E4 (Hybrid)	3.0	4.2	4.3	1.0	3.0	4.0	19.5	3.3	5.0	5.0	4.7	3.0	2.0	2.5	35.5	3.0	2.5	1.0	4.0	2.3	2.0	2.0	16.8	71.8	4	E4 (Hybrid)
	F	F1	4.0	4.0	4.5	1.0	2.5	4.3	20.3	4.0	5.0	5.0	3.0	3.0	4.0	1.5	31.5	2.0	2.0	5.0	3.0	2.0	3.0	2.0	19.0	70.8	2	F1
		F2	4.0	4.4	4.5	1.0	2.0	4.5	20.4	3.7	5.0	5.0	3.7	3.0	4.0	2.5	36.8	2.0	2.0	5.0	4.0	2.3	3.0	2.0	20.3	77.6	1	F2
		F3	3.0	3.8	2.8	1.0	2.0	4.0	16.6	3.3	5.0	5.0	3.7	3.0	4.0	3.0	39.0	1.0	2.0	1.0	4.0	1.3	2.0	2.0	13.3	68.9	3	F3

1 - The alternative does not meet the criterion
2 - The alternative minimally meets the criterion
3 - The alternative partially meets the criterion
4 - The alternative mostly meets the criterion
5 - The alternative fully meets the criterion

APPENDIX C

Cost Estimates

TAHOE TRANSPORTATION DISTRICT
LAKE TAHOE NEVADA STATELINE BIKEWAY FEASABILITY STUDY, SEGMENTS A-I
PRELIMINARY ENGINEER'S COST ESTIMATE

JN: 6869.001
DATE: 4/13/2010
BY: CLM

Segment A: Sand Harbor to Parking Lot at Secret Harbor Trailhead (14,600LF)

Item No.	Item Description	Units	Estimated Quantity	Unit Price	Amount
1	Temporary Erosion Control (1)	LF	14,600	20	292,000
2	Remove Existing Trees, 6-inch to 12-inch (2)	EA	60	800	48,000
3	Remove Existing Trees, 13-inch to 24-inch	EA	80	2,000	160,000
4	Typical Trail Section A (14-ft wide, 0% to 10% cross slope) (3)	LF	-	110	-
5	Typical Trail Section B (14-ft wide, 11% to 20% cross slope) (3)	LF	3,000	140	420,000
6	Typical Trail Section C (14-ft wide, 21% to 30% cross slope) (3)	LF	3,400	500	1,700,000
7	Typical Trail Section D (14-ft wide, 31% to 50% cross slope) (3)	LF	8,200	1,060	8,692,000
8	Typical Trail Section E (Bike lanes on existing streets) (4)	LF	-	180	-
9	Miscellaneous Landscaping (5)	LS	-		-
10	20' L x 12' W Prefabricated Bridge (6)	EA	-	160,000	-
11	40' L x 12' W Prefabricated Bridge (6)	EA	-	190,000	-
12	60' L x 12' W Prefabricated Bridge (6)	EA	2	220,000	440,000
13	100' L x 12' W Prefabricated Bridge (6)	EA	1	300,000	300,000
14	120' L x 12' W Prefabricated Bridge (6)	EA	-	350,000	-
15	Elevated Structure Deck, Piers and Abutments (7)	LF	-	1,500	-
16	12-ft Wide Boardwalk across Wetland Areas (8)	LF	-	1,000	-
17	PCC K Rail Barrier (9)	LF	6,000	80	480,000
18	At-grade Crossing Control System (10)	EA	-	80,000	-
19	Trailhead parking area (11)	EA	-	200,000	-
20	Restrooms at trailhead parking (12)	EA	-	250,000	-
21	Utility Relocations (13)	LS	-		-
22	Relocate Existing Fence (14)	LF	1,800	60	108,000
23	Remove Large Rocks (15)	LS	1	100,000	100,000
	SUBTOTAL (ROUNDED)				**12,740,000**
	15% CONTINGENCY (ROUNDED)				**1,911,000**
	TOTAL (ROUNDED)				**14,651,000**

NOTES:

1 Based on $20/LF. Assumes fiber rolls on downhill side and orange constr. fence on uphill side. Includes SWPPP.
2 Removal of trees less than 6-inches included in clearing and grubbing.
3 Trail costs include 3" AC on 8" AB, earthwork, clear & grub, reveg, rockery walls, edge drain, filter fabric, split rail fence .
4 Includes street grind & overlay (est. 34' wide pavement @ $5/SF), striping, signs.
5 Replace existing landscaping at driveway entrances.
6 Bridge assumed to be HS-20 loading, golf-course type truss bridge. Includes abutments and wingwalls.
7 Estimate based on 12-ft clear width 50-ft long prefabricated truss spans with concrete deck surface and 54-inch side rails.
Piers estimated based on 4-ft dia, single piers on 50-ft spacing with 4-ft wide x 13-ft long cross beam deck supports;
average below ground depth of 36-ft, and a total concrete volume of 11 cy per pier.
Abutments include 15-ft wide abutment seat and wingwalls. Average concrete volume = 17.0 cy.
8 Assumes synthetic boardwalk on wooden piers.
9 Placed between trail and road when trail is adjacent to Hwy 50 or Hwy 28.
10 Includes user operated flashing signal and advance warning signs.
11 Includes paving for 25 cars, striping, bollards, interpretive signs, benches and kiosks.
12 Assumes four stall unit with water and sewer connections.
13 Includes relocation of underground and overhead utilities.
14 Includes existing fence at Sand Harbor and other locations
15 Includes moving or removing boulders over 5-ft in diameter. Smaller boulders are included in trail costs.

TAHOE TRANSPORTATION DISTRICT
LAKE TAHOE NEVADA STATELINE BIKEWAY FEASABILITY STUDY, SEGMENTS A-I JN: 6869.001
PRELIMINARY ENGINEER'S COST ESTIMATE DATE: 4/13/2010
BY: CLM

Segment B: Parking Lot at Secret Harbor Trailhead to Skunk Harbor Access Road (14,500 LF)

Item No.	Item Description	Units	Estimated Quantity	Unit Price	Amount
1	Temporary Erosion Control (1)	LF	14,500	20	290,000
2	Remove Existing Trees, 6-inch to 12-inch (2)	EA	100	800	80,000
3	Remove Existing Trees, 13-inch to 24-inch	EA	100	2,000	200,000
4	Typical Trail Section A (14-ft wide, 0% to 10% cross slope) (3)	LF	-	110	-
5	Typical Trail Section B (14-ft wide, 11% to 20% cross slope) (3)	LF	1,000	140	140,000
6	Typical Trail Section C (14-ft wide, 21% to 30% cross slope) (3)	LF	4,800	500	2,400,000
7	Typical Trail Section D (14-ft wide, 31% to 50% cross slope) (3)	LF	8,700	1,060	9,222,000
8	Typical Trail Section E (Bike lanes on existing streets) (4)	LF	-	180	-
9	Miscellaneous Landscaping (5)	LS	-		-
10	20' L x 12' W Prefabricated Bridge (6)	EA	-	160,000	-
11	40' L x 12' W Prefabricated Bridge (6)	EA	2	190,000	380,000
12	60' L x 12' W Prefabricated Bridge (6)	EA	-	220,000	-
13	100' L x 12' W Prefabricated Bridge (6)	EA	-	300,000	-
14	120' L x 12' W Prefabricated Bridge (6)	EA	2	350,000	700,000
15	Elevated Structure Deck, Piers and Abutments (7)	LF	-	1,500	-
16	12-ft Wide Boardwalk across Wetland Areas (8)	LF	-	1,000	-
17	PCC K Rail Barrier (9)	LF	6,000	80	480,000
18	At-grade Crossing Control System (10)	EA	-	80,000	-
19	Trailhead parking area (11)	EA	-	200,000	-
20	Restrooms at trailhead parking (12)	EA	-	250,000	-
21	Utility Relocations (13)	LS	-		-
22	Relocate Existing Fence (14)	LF	-	60	-
23	Remove Large Rocks (15)	LS	1	100,000	100,000
	SUBTOTAL (ROUNDED)				**13,992,000**
	15% CONTINGENCY (ROUNDED)				**2,099,000**
	TOTAL (ROUNDED)				**16,091,000**

NOTES:

1 Based on $20/LF. Assumes fiber rolls on downhill side and orange constr. fence on uphill side. Includes SWPPP.
2 Removal of trees less than 6-inches included in clearing and grubbing.
3 Trail costs include 3" AC on 8" AB, earthwork, clear & grub, reveg, rockery walls, edge drain, filter fabric, split rail fence .
4 Includes street grind & overlay (est. 34' wide pavement @ $5/SF), striping, signs.
5 Replace existing landscaping at driveway entrances.
6 Bridge assumed to be HS-20 loading, golf-course type truss bridge. Includes abutments and wingwalls.
7 Estimate based on 12-ft clear width 50-ft long prefabricated truss spans with concrete deck surface and 54-inch side rails.
Piers estimated based on 4-ft dia, single piers on 50-ft spacing with 4-ft wide x 13-ft long cross beam deck supports;
average below ground depth of 36-ft, and a total concrete volume of 11 cy per pier.
Abutments include 15-ft wide abutment seat and wingwalls. Average concrete volume = 17.0 cy.
8 Assumes synthetic boardwalk on wooden piers.
9 Placed between trail and road when trail is adjacent to Hwy 50 or Hwy 28.
10 Includes user operated flashing signal and advance warning signs.
11 Includes paving for 25 cars, striping, bollards, interpretive signs, benches and kiosks.
12 Assumes four stall unit with water and sewer connections.
13 Includes relocation of underground and overhead utilities.
14 Includes existing fence at Sand Harbor and other locations
15 Includes moving or removing boulders over 5-ft in diameter. Smaller boulders are included in trail costs.

TAHOE TRANSPORTATION DISTRICT
LAKE TAHOE NEVADA STATELINE BIKEWAY FEASABILITY STUDY, SEGMENTS A-I
PRELIMINARY ENGINEER'S COST ESTIMATE

JN: 6869.001
DATE: 4/13/2010
BY: CLM

Segment C1: Skunk Harbor Access Road to Spooner Summit (13,500LF)

Item No.	Item Description	Units	Estimated Quantity	Unit Price	Amount
1	Temporary Erosion Control (1)	LF	13,500	20	270,000
2	Remove Existing Trees, 6-inch to 12-inch (2)	EA	120	800	96,000
3	Remove Existing Trees, 13-inch to 24-inch	EA	100	2,000	200,000
4	Typical Trail Section A (14-ft wide, 0% to 10% cross slope) (3)	LF	-	110	-
5	Typical Trail Section B (14-ft wide, 11% to 20% cross slope) (3)	LF	1,000	140	140,000
6	Typical Trail Section C (14-ft wide, 21% to 30% cross slope) (3)	LF	3,500	500	1,750,000
7	Typical Trail Section D (14-ft wide, 31% to 50% cross slope) (3)	LF	9,000	1,060	9,540,000
8	Typical Trail Section E (Bike lanes on existing streets) (4)	LF	-	180	-
9	Miscellaneous Landscaping (5)	LS	-		-
10	20' L x 12' W Prefabricated Bridge (6)	EA	3	160,000	480,000
11	40' L x 12' W Prefabricated Bridge (6)	EA	-	190,000	-
12	60' L x 12' W Prefabricated Bridge (6)	EA	-	220,000	-
13	100' L x 12' W Prefabricated Bridge (6)	EA	-	300,000	-
14	120' L x 12' W Prefabricated Bridge (6)	EA	1	350,000	350,000
15	Elevated Structure Deck, Piers and Abutments (7)	LF	-	1,500	-
16	12-ft Wide Boardwalk across Wetland Areas (8)	LF	-	1,000	-
17	PCC K Rail Barrier (9)	LF	3,000	80	240,000
18	At-grade Crossing Control System (10)	EA	1	80,000	80,000
19	Trailhead parking area (11)	EA	1	200,000	200,000
20	Restrooms at trailhead parking (12)	EA	1	250,000	250,000
21	Utility Relocations (13)	LS	1	60,000	60,000
22	Relocate Existing Fence (14)	LF	-	60	-
23	Remove Large Rocks (15)	LS	1	60,000	60,000
	SUBTOTAL (ROUNDED)				**13,716,000**
	15% CONTINGENCY (ROUNDED)				**2,057,000**
	TOTAL (ROUNDED)				**15,773,000**

NOTES:

1 Based on $20/LF. Assumes fiber rolls on downhill side and orange constr. fence on uphill side. Includes SWPPP.
2 Removal of trees less than 6-inches included in clearing and grubbing.
3 Trail costs include 3" AC on 8" AB, earthwork, clear & grub, reveg, rockery walls, edge drain, filter fabric, split rail fence .
4 Includes street grind & overlay (est. 34' wide pavement @ $5/SF), striping, signs.
5 Replace existing landscaping at driveway entrances.
6 Bridge assumed to be HS-20 loading, golf-course type truss bridge. Includes abutments and wingwalls.
7 Estimate based on 12-ft clear width 50-ft long prefabricated truss spans with concrete deck surface and 54-inch side rails.
Piers estimated based on 4-ft dia, single piers on 50-ft spacing with 4-ft wide x 13-ft long cross beam deck supports;
average below ground depth of 36-ft, and a total concrete volume of 11 cy per pier.
Abutments include 15-ft wide abutment seat and wingwalls. Average concrete volume = 17.0 cy.
8 Assumes synthetic boardwalk on wooden piers.
9 Placed between trail and road when trail is adjacent to Hwy 50 or Hwy 28.
10 Includes user operated flashing signal and advance warning signs.
11 Includes paving for 25 cars, striping, bollards, interpretive signs, benches and kiosks.
12 Assumes four stall unit with water and sewer connections.
13 Includes relocation of underground and overhead utilities.
14 Includes existing fence at Sand Harbor and other locations
15 Includes moving or removing boulders over 5-ft in diameter. Smaller boulders are included in trail costs.

TAHOE TRANSPORTATION DISTRICT
LAKE TAHOE NEVADA STATELINE BIKEWAY FEASABILITY STUDY, SEGMENTS A-I
PRELIMINARY ENGINEER'S COST ESTIMATE

JN: 6869.001
DATE: 4/13/2010
BY: CLM

Segment C2: Spooner Summit to Glenbrook Entrance (15,200LF)

Item No.	Item Description	Units	Estimated Quantity	Unit Price	Amount
1	Temporary Erosion Control (1)	LF	15,200	20	304,000
2	Remove Existing Trees, 6-inch to 12-inch (2)	EA	60	800	48,000
3	Remove Existing Trees, 13-inch to 24-inch	EA	50	2,000	100,000
4	Typical Trail Section A (14-ft wide, 0% to 10% cross slope) (3)	LF	7,200	110	792,000
5	Typical Trail Section B (14-ft wide, 11% to 20% cross slope) (3)	LF	400	140	56,000
6	Typical Trail Section C (14-ft wide, 21% to 30% cross slope) (3)	LF	-	500	-
7	Typical Trail Section D (14-ft wide, 31% to 50% cross slope) (3)	LF	7,600	1,060	8,056,000
8	Typical Trail Section E (Bike lanes on existing streets) (4)	LF	-	180	-
9	Miscellaneous Landscaping (5)	LS	-		-
10	20' L x 12' W Prefabricated Bridge (6)	EA	-	160,000	-
11	40' L x 12' W Prefabricated Bridge (6)	EA	-	190,000	-
12	60' L x 12' W Prefabricated Bridge (6)	EA	2	220,000	440,000
13	100' L x 12' W Prefabricated Bridge (6)	EA	1	300,000	300,000
14	120' L x 12' W Prefabricated Bridge (6)	EA	1	350,000	350,000
15	Elevated Structure Deck, Piers and Abutments (7)	LF	-	1,500	-
16	12-ft Wide Boardwalk across Wetland Areas (8)	LF	-	1,000	-
17	PCC K Rail Barrier (9)	LF	3,000	80	240,000
18	At-grade Crossing Control System (10)	EA	-	80,000	-
19	Trailhead parking area (11)	EA	-	200,000	-
20	Restrooms at trailhead parking (12)	EA	-	250,000	-
21	Utility Relocations (13)	LS	1	50,000	50,000
22	Relocate Existing Fence (14)	LF	200	60	12,000
23	Remove Large Rocks (15)	LS	1	50,000	50,000
	SUBTOTAL (ROUNDED)				**10,798,000**
	15% CONTINGENCY (ROUNDED)				**1,620,000**
	TOTAL (ROUNDED)				**12,418,000**

NOTES:

1 Based on $20/LF. Assumes fiber rolls on downhill side and orange constr. fence on uphill side. Includes SWPPP.
2 Removal of trees less than 6-inches included in clearing and grubbing.
3 Trail costs include 3" AC on 8" AB, earthwork, clear & grub, reveg, rockery walls, edge drain, filter fabric, split rail fence .
4 Includes street grind & overlay (est. 34' wide pavement @ $5/SF), striping, signs.
5 Replace existing landscaping at driveway entrances.
6 Bridge assumed to be HS-20 loading, golf-course type truss bridge. Includes abutments and wingwalls.
7 Estimate based on 12-ft clear width 50-ft long prefabricated truss spans with concrete deck surface and 54-inch side rails.
Piers estimated based on 4-ft dia, single piers on 50-ft spacing with 4-ft wide x 13-ft long cross beam deck supports;
average below ground depth of 36-ft, and a total concrete volume of 11 cy per pier.
Abutments include 15-ft wide abutment seat and wingwalls. Average concrete volume = 17.0 cy.
8 Assumes synthetic boardwalk on wooden piers.
9 Placed between trail and road when trail is adjacent to Hwy 50 or Hwy 28.
10 Includes user operated flashing signal and advance warning signs.
11 Includes paving for 25 cars, striping, bollards, interpretive signs, benches and kiosks.
12 Assumes four stall unit with water and sewer connections.
13 Includes relocation of underground and overhead utilities.
14 Includes existing fence at Sand Harbor and other locations
15 Includes moving or removing boulders over 5-ft in diameter. Smaller boulders are included in trail costs.

TAHOE TRANSPORTATION DISTRICT
LAKE TAHOE NEVADA STATELINE BIKEWAY FEASABILITY STUDY, SEGMENTS A-I
PRELIMINARY ENGINEER'S COST ESTIMATE

JN: 6869.001
DATE: 4/13/2010
BY: CLM

Segment D: Glenbrook Entrance to Cave Rock Drive (17,600LF)

Item No.	Item Description	Units	Estimated Quantity	Unit Price	Amount
1	Temporary Erosion Control (1)	LF	17,600	20	352,000
2	Remove Existing Trees, 6-inch to 12-inch (2)	EA	70	800	56,000
3	Remove Existing Trees, 13-inch to 24-inch	EA	70	2,000	140,000
4	Typical Trail Section A (14-ft wide, 0% to 10% cross slope) (3)	LF	800	110	88,000
5	Typical Trail Section B (14-ft wide, 11% to 20% cross slope) (3)	LF	3,800	140	532,000
6	Typical Trail Section C (14-ft wide, 21% to 30% cross slope) (3)	LF	6,300	500	3,150,000
7	Typical Trail Section D (14-ft wide, 31% to 50% cross slope) (3)	LF	6,700	1,060	7,102,000
8	Typical Trail Section E (Bike lanes on existing streets) (4)	LF	-	180	-
9	Miscellaneous Landscaping (5)	LS	1	100,000	100,000
10	20' L x 12' W Prefabricated Bridge (6)	EA	2	160,000	320,000
11	40' L x 12' W Prefabricated Bridge (6)	EA	-	190,000	-
12	60' L x 12' W Prefabricated Bridge (6)	EA	-	220,000	-
13	100' L x 12' W Prefabricated Bridge (6)	EA	-	300,000	-
14	120' L x 12' W Prefabricated Bridge (6)	EA	-	350,000	-
15	Elevated Structure Deck, Piers and Abutments (7)	LF	-	1,500	-
16	12-ft Wide Boardwalk across Wetland Areas (8)	LF	-	1,000	-
17	PCC K Rail Barrier (9)	LF	9,100	80	728,000
18	At-grade Crossing Control System (10)	EA	-	80,000	-
19	Trailhead parking area (11)	EA	-	200,000	-
20	Restrooms at trailhead parking (12)	EA	-	250,000	-
21	Utility Relocations (13)	LS	1	200,000	200,000
22	Relocate Existing Fence (14)	LF	3,000	60	180,000
23	Remove Large Rocks (15)	LS	1	80,000	80,000
	SUBTOTAL (ROUNDED)				**13,028,000**
	15% CONTINGENCY (ROUNDED)				**1,954,000**
	TOTAL (ROUNDED)				**14,982,000**

NOTES:

1 Based on $20/LF. Assumes fiber rolls on downhill side and orange constr. fence on uphill side. Includes SWPPP.
2 Removal of trees less than 6-inches included in clearing and grubbing.
3 Trail costs include 3" AC on 8" AB, earthwork, clear & grub, reveg, rockery walls, edge drain, filter fabric, split rail fence .
4 Includes street grind & overlay (est. 34' wide pavement @ $5/SF), striping, signs.
5 Replace existing landscaping at driveway entrances.
6 Bridge assumed to be HS-20 loading, golf-course type truss bridge. Includes abutments and wingwalls.
7 Estimate based on 12-ft clear width 50-ft long prefabricated truss spans with concrete deck surface and 54-inch side rails.
Piers estimated based on 4-ft dia, single piers on 50-ft spacing with 4-ft wide x 13-ft long cross beam deck supports;
average below ground depth of 36-ft, and a total concrete volume of 11 cy per pier.
Abutments include 15-ft wide abutment seat and wingwalls. Average concrete volume = 17.0 cy.
8 Assumes synthetic boardwalk on wooden piers.
9 Placed between trail and road when trail is adjacent to Hwy 50 or Hwy 28.
10 Includes user operated flashing signal and advance warning signs.
11 Includes paving for 25 cars, striping, bollards, interpretive signs, benches and kiosks.
12 Assumes four stall unit with water and sewer connections.
13 Includes relocation of underground and overhead utilities.
14 Includes existing fence at Sand Harbor and other locations
15 Includes moving or removing boulders over 5-ft in diameter. Smaller boulders are included in trail costs.

TAHOE TRANSPORTATION DISTRICT
LAKE TAHOE NEVADA STATELINE BIKEWAY FEASABILITY STUDY, SEGMENTS A-I
PRELIMINARY ENGINEER'S COST ESTIMATE

JN: 6869.001
DATE: 4/13/2010
BY: CLM

Segment E: Cave Rock Drive to Zephyr Cove (13,700LF)

Item No.	Item Description	Units	Estimated Quantity	Unit Price	Amount
1	Temporary Erosion Control (1)	LF	13,700	20	274,000
2	Remove Existing Trees, 6-inch to 12-inch (2)	EA	40	800	32,000
3	Remove Existing Trees, 13-inch to 24-inch	EA	40	2,000	80,000
4	Typical Trail Section A (14-ft wide, 0% to 10% cross slope) (3)	LF	700	110	77,000
5	Typical Trail Section B (14-ft wide, 11% to 20% cross slope) (3)	LF	3,100	140	434,000
6	Typical Trail Section C (14-ft wide, 21% to 30% cross slope) (3)	LF	-	500	-
7	Typical Trail Section D (14-ft wide, 31% to 50% cross slope) (3)	LF	4,000	1,060	4,240,000
8	Typical Trail Section E (Bike lanes on existing streets) (4)	LF	4,100	180	738,000
9	Miscellaneous Landscaping (5)	LS	1	300,000	300,000
10	20' L x 12' W Prefabricated Bridge (6)	EA	-	160,000	-
11	40' L x 12' W Prefabricated Bridge (6)	EA	-	190,000	-
12	60' L x 12' W Prefabricated Bridge (6)	EA	-	220,000	-
13	100' L x 12' W Prefabricated Bridge (6)	EA	-	300,000	-
14	120' L x 12' W Prefabricated Bridge (6)	EA	-	350,000	-
15	Elevated Structure Deck, Piers and Abutments (7)	LF	1,500	1,500	2,250,000
16	12-ft Wide Boardwalk across Wetland Areas (8)	LF	300	1,000	300,000
17	PCC K Rail Barrier (9)	LF	4,000	80	320,000
18	At-grade Crossing Control System (10)	EA	-	80,000	-
19	Trailhead parking area (11)	EA	-	200,000	-
20	Restrooms at trailhead parking (12)	EA	-	250,000	-
21	Utility Relocations (13)	LS	1	400,000	400,000
22	Relocate Existing Fence (14)	LF	1,000	60	60,000
23	Remove Large Rocks (15)	LS	1	40,000	40,000
	SUBTOTAL (ROUNDED)				**9,545,000**
	15% CONTINGENCY (ROUNDED)				**1,432,000**
	TOTAL (ROUNDED)				**10,977,000**

NOTES:

1 Based on $20/LF. Assumes fiber rolls on downhill side and orange constr. fence on uphill side. Includes SWPPP.
2 Removal of trees less than 6-inches included in clearing and grubbing.
3 Trail costs include 3" AC on 8" AB, earthwork, clear & grub, reveg, rockery walls, edge drain, filter fabric, split rail fence .
4 Includes street grind & overlay (est. 34' wide pavement @ $5/SF), striping, signs.
5 Replace existing landscaping at driveway entrances.
6 Bridge assumed to be HS-20 loading, golf-course type truss bridge. Includes abutments and wingwalls.
7 Estimate based on 12-ft clear width 50-ft long prefabricated truss spans with concrete deck surface and 54-inch side rails.
Piers estimated based on 4-ft dia, single piers on 50-ft spacing with 4-ft wide x 13-ft long cross beam deck supports;
average below ground depth of 36-ft, and a total concrete volume of 11 cy per pier.
Abutments include 15-ft wide abutment seat and wingwalls. Average concrete volume = 17.0 cy.
8 Assumes synthetic boardwalk on wooden piers.
9 Placed between trail and road when trail is adjacent to Hwy 50 or Hwy 28.
10 Includes user operated flashing signal and advance warning signs.
11 Includes paving for 25 cars, striping, bollards, interpretive signs, benches and kiosks.
12 Assumes four stall unit with water and sewer connections.
13 Includes relocation of underground and overhead utilities.
14 Includes existing fence at Sand Harbor and other locations
15 Includes moving or removing boulders over 5-ft in diameter. Smaller boulders are included in trail costs.

TAHOE TRANSPORTATION DISTRICT
LAKE TAHOE NEVADA STATELINE BIKEWAY FEASABILITY STUDY, SEGMENTS A-I
PRELIMINARY ENGINEER'S COST ESTIMATE

JN: 6869.001
DATE: 4/13/2010
BY: CLM

Segment F: Zephyr Cove to Round Hill Pines (8,500LF)

Item No.	Item Description	Units	Estimated Quantity	Unit Price	Amount
1	Temporary Erosion Control (1)	LF	8,500	20	170,000
2	Remove Existing Trees, 6-inch to 12-inch (2)	EA	20	800	16,000
3	Remove Existing Trees, 13-inch to 24-inch	EA	20	2,000	40,000
4	Typical Trail Section A (14-ft wide, 0% to 10% cross slope) (3)	LF	-	110	-
5	Typical Trail Section B (14-ft wide, 11% to 20% cross slope) (3)	LF	300	140	42,000
6	Typical Trail Section C (14-ft wide, 21% to 30% cross slope) (3)	LF	600	500	300,000
7	Typical Trail Section D (14-ft wide, 31% to 50% cross slope) (3)	LF	2,300	1,060	2,438,000
8	Typical Trail Section E (Bike lanes on existing streets) (4)	LF	4,500	180	810,000
9	Miscellaneous Landscaping (5)	LS	1	200,000	200,000
10	20' L x 12' W Prefabricated Bridge (6)	EA	-	160,000	-
11	40' L x 12' W Prefabricated Bridge (6)	EA	-	190,000	-
12	60' L x 12' W Prefabricated Bridge (6)	EA	-	220,000	-
13	100' L x 12' W Prefabricated Bridge (6)	EA	-	300,000	-
14	120' L x 12' W Prefabricated Bridge (6)	EA	-	350,000	-
15	Elevated Structure Deck, Piers and Abutments (7)	LF	-	1,500	-
16	12-ft Wide Boardwalk across Wetland Areas (8)	LF	800	1,000	800,000
17	PCC K Rail Barrier (9)	LF	1,300	80	104,000
18	At-grade Crossing Control System (10)	EA	-	80,000	-
19	Trailhead parking area (11)	EA	-	200,000	-
20	Restrooms at trailhead parking (12)	EA	-	250,000	-
21	Utility Relocations (13)	LS	1	200,000	200,000
22	Relocate Existing Fence (14)	LF	1,000	60	60,000
23	Remove Large Rocks (15)	LS	1	40,000	40,000
	SUBTOTAL (ROUNDED)				**5,220,000**
	15% CONTINGENCY (ROUNDED)				**783,000**
	TOTAL (ROUNDED)				**6,003,000**

NOTES:

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