Chapter 1 Proposed Project

1.1 Introduction

The California Department of Transportation (Caltrans) in partnership with Shasta, Trinity, and Humboldt Counties proposes to improve the Buckhorn Grade portion of State Route 299. The project is located in Trinity and Shasta Counties from 2.0 miles west of the Shasta-Trinity County line to the boundary of the Whiskeytown-Shasta Trinity National Recreation Area. The total length of the project is 9.6 miles. Figures 1-1 and 1-2 show project location and vicinity maps.

The project proposes to improve the safety and efficiency of the highway by improving the roadway geometrics, increasing sight distance, providing standard shoulders, improving passing opportunities, and upgrading the superelevation transitions to current standards.

This project was initially authorized in the 2002/2003 Federal Statewide Transportation Improvement Program, and is currently programmed for completion of the project report and environmental document. Future funding is expected to come from a combination of programs including the State Transportation Improvement Program, Regional Transportation Improvement Program, State Highway Operation and Protection Program, High Priority Projects, and possible transportation bond funds.

The magnitude of the Buckhorn Grade Improvement Project will require the project to be built in constructable and fundable segments. These individual segments will be constructed independently, but together will eventually complete the ultimate project. Funding will be sought for construction of individual segments based on the operational priority (level of need) and funding availability.

Several projects are currently proposed or are being constructed on State Route 299 within the Buckhorn Grade Improvement Project limits, all within Shasta County. Three of these projects are proposed to conform to the ultimate Buckhorn Grade Improvement Project alignment including the Top of Buckhorn, the Yankee Gulch, and the Middle of Buckhorn projects. The Top of Buckhorn Project is located at the summit of Buckhorn Grade from PM 0.0 to 0.6 and is currently under construction. The Yankee Gulch Project is located from PM 6.8 to 7.6 and is also currently under

construction. The Middle of Buckhorn Project is located from PM 3.0 to 4.3 and construction is scheduled to begin in 2011.

Three additional projects are proposed on State Route 299 within the Buckhorn Grade Improvement Project limits: the Bottom of Buckhorn, the Trail Gulch, and the Water Gulch projects. Due to funding constraints and the rugged terrain, these projects will not conform to the ultimate alignment of the Buckhorn Grade Improvement Project, but will improve operations and safety until this project is constructed. The Bottom of Buckhorn Project is located from PM 5.4 to 5.8 and is currently under construction. This project will realign a series of deficient curves on the existing alignment. The Trail Gulch Project is located from PM 4.8 to 5.0 and is proposed for construction in 2010. The Water Gulch Project is located from PM 4.5 to 4.8 and is proposed for construction in 2011. These two projects propose operational improvements that would widen the roadway to allow for truck off-tracking and improve safety.

1.2 Purpose and Need

1.2.1 Purpose

The purpose of this project is to:

- Improve interregional travel.
- Improve safety and traffic operations of the Buckhorn Grade portion of State Route 299.
- Provide improved access between U.S. Highway 101 and Interstate 5 for Surface Transportation Assistance Act trucks and recreational vehicles.

1.2.2 Need

The need to provide a safe, reliable, and efficient facility on State Route 299 has long been recognized. Attempts to improve the Buckhorn Grade section have been ongoing since construction of the original alignment was completed in 1931. State Route 299 operates as a rural, principal arterial with a limited number of local road intersections and is the main east-west route available between Interstate 5 in the northern Sacramento Valley and U.S. Highway 101 on the northwest coast. In addition, State Route 299 is a major interregional truck route in Shasta, Trinity, and Humboldt Counties.

The existing two-lane undivided highway has lane widths varying from 11 to 16 feet and paved shoulder widths varying from 0 to 10 feet. Four short, uphill passing lanes occur within the project limits. Within the project area, the design speed ranges from 25 to 45 mph and the alignment consists almost entirely of 200-foot radius or smaller compound curves. There are 53 curves with radii as small as 160 feet and several sharp turns in the upper 5.5-mile segment. There are nine curves with posted speeds of 30 mph or less on Buckhorn Grade. With the exception of Buckhorn Grade, there are only four curves in the 120 miles between Arcata and Redding with posted speed limits of less than 30 mph.

Safety

Accident rates for State Route 299 were calculated for a five-year period from October 2001 to September 2006 and were compared to the statewide average using accident data from the Traffic Accident Surveillance and Analysis System. These results are summarized in Table 1.1. As the table indicates, the actual total accident rate for this section of State Route 299 is 2.5 times higher than the average rate for similar facilities on the state highway system. Accidents are generally scattered throughout the project limits.

Table 1.1 Accident Information

Location	Total Number of Accidents	Actual Accident Rate (acc/mvm)			Average Accident Rate (acc/mvm)			Times Statewide Average
		F	F+I	TOTAL	F	F+I	TOTAL	
PM 0.0/0.6	20	0.229	3.21	4.59	0.035	0.76	1.51	3.0
PM 0.6/1.4	12	0.00	0.69	2.07	0.037	0.88	1.75	1.2
PM 1.4/2.2	22	0.00	1.38	3.79	0.036	0.81	1.61	2.4
PM 2.2/3.0	10	0.00	0.52	1.72	0.034	0.70	1.42	1.2
PM 3.0/4.3	54	0.00	2.33	5.72	0.036	0.80	1.60	3.6
PM 4.3/6.0	74	0.081	2.35	6.00	0.037	0.88	1.75	3.4
PM 6.0/6.2*	2	0.00*	0.14*	0.27*	0.019*	0.44*	0.875*	0.3
PM 6.2/6.4*	10	0.00*	0.55*	1.37*	0.019*	0.44*	0.875*	1.6
PM 6.4/6.6*	3	0.00*	0.27*	0.41*	0.019*	0.44*	0.875*	0.5
PM 6.6/7.0*	5	0.00*	0.44*	0.68*	0.019*	0.44*	0.875*	0.8
PM 7.0/7.6	19	0.00	2.29	4.36	0.037	0.88	1.75	2.5
PM 0.0/7.6	231	0.036	1.78	4.19	0.036	0.83	1.66	2.5

*acc/mvm=accidents per million vehicle miles, *acc/mv=accidents per million vehicles, F=fatal, F+I = fatal + injury*
Accident data from October 1, 2001 to September 30, 2006

Traffic

The annual average daily traffic for State Route 299 in the project area is 3,850 vehicles per day (2006 Traffic Volumes on California State Highways). Truck traffic makes up 13 percent of the average daily traffic for this section of the highway (2005 Annual Average Daily Truck Traffic on the California State Highway System). The Caltrans District 2 Traffic Management Unit prepared the project's forecasted traffic volumes for the years 2012, 2022, and 2032 as summarized in Table 1.2.

Table 1.2 Forecasted Traffic Volumes

Year	Average Daily Traffic	Peak Hour
2012	4900	630
2022	5400	700
2032	6000	750

Although traffic volumes on this segment of State Route 299 are low, congestion is a problem. The steep terrain and curvilinear alignment impede the smooth flow of traffic, especially for trucks and recreational vehicles, through this section of highway. Non-standard geometrics, limited passing opportunities, non-standard sight distance, poor driver comfort, absence of emergency parking areas, and limited chain on/off areas contribute to the constraints on drivers.

The long delays associated with traffic accidents and routine maintenance operations result in an increased consumption of fuel and increased user costs. Non-standard geometrics increase the potential for hazardous material spills. In addition, the narrow roadway compels California legal trucks to encroach into opposing lanes of traffic at spot locations when negotiating tight curves. The frequent closures and traffic delays contribute to unreliable east to west travel.

Truck transportation plays an essential role in the movement of goods and services to Trinity, Humboldt, and Del Norte Counties. The largest truck class, the Surface Transportation Assistance Act truck, is not allowed on this portion of State Route 299 due to the nonstandard alignment. The exclusion of Surface Transportation Assistance Act trucks from this portion of the highway has created barriers to effective movement of goods and services to Trinity, Humboldt, and Del Norte Counties.

The proposed Buckhorn Grade Improvement Project would not, by itself, allow Surface Transportation Assistance Act trucks to use State Route 299 between

Redding and Eureka. There are six remaining locations requiring widening, which will allow Surface Transportation Assistance Act truck access on State Route 299. One project is currently under construction. Two projects that will improve two of these locations are currently being designed and are scheduled for construction in 2010 and 2011. It is anticipated that the remaining three locations will be improved to allow Surface Transportation Assistance Act truck access prior to construction of the Buckhorn Grade Improvement Project.

Caltrans has recently proposed a project on U.S. Highway 101 near Richardson Grove State Park that would allow Surface Transportation Assistance Act truck access from the south to Humboldt County. In addition, improvements are being proposed on State Route 197 and U.S. Highway 199 in Del Norte County to allow Surface Transportation Assistance Act truck access from the northeast to Humboldt County.

1.3 Alternatives

The following design alternatives were developed to achieve the project purpose and need while avoiding or minimizing environmental impacts: Alternative BH4, Alternative BH5, Alternative BH6, and Alternative BH12.

The project is located in Trinity and Shasta Counties from 2.0 miles west of the Shasta-Trinity County line to the boundary of the Whiskeytown-Shasta-Trinity National Recreation Area. Although the official project limits extend into Trinity County (PM 70.2/72.2), construction will occur only on the Buckhorn Grade portion of State Route 299, which is located entirely within Shasta County (PM 0.0/R7.6). Construction activities in Trinity County will be limited to the placement of signs and traffic control.

1.3.1 Build Alternatives

The project proposes to correct existing deficiencies by providing standard roadway and shoulder widths, a new alignment with a 45-mph design speed, 8 percent maximum sustained grade, passing/climbing lanes, and improved superelevation rates and transition distance. Typical cross-sections for both the uphill climbing lanes and the downhill passing lanes are shown in Figures 1-3 and 1-4. The project will also provide rock catchment and snow storage areas, and will maximize sun exposure on the new alignment to reduce maintenance costs and snow and ice related accidents. Shade on the roadway exacerbates icy conditions. Maximizing the solar exposure on

the new alignment will minimize the resources required by Caltrans maintenance crews to remove snow and ice from the roadway.

The new project will improve State Route 299 between U.S. Highway 101 and Interstate 5 for Surface Transportation Assistance Act trucks and provide improved access for recreational activities in the area. Embankments and cut slopes will be designed to minimize erosion and promote revegetation wherever feasible.

The project will provide a roadway that is reliable, meets the needs and expectations of drivers, and provides for swift and economic movement of goods. The improved geometrics will reduce the number of accidents, as well as road closures due to accidents, weather, and maintenance activities.

The four alternatives developed for the project generally follow the existing alignment. They consist of design speed variations and all four alternatives share a common alignment at both the beginning and end of the project. Design features of each alternative are summarized in Table 1.3.

Table 1.3 Design Features of Alternatives

Alternative	Design Speed	Cut Slope Ratio	Fill Slope Ratio (H:V*)	Max Grade	Volume of Earthwork (millions of CY)
Existing	25	0.5:1 to 1.5:1	1:1 to 2:1	6%	---
BH4	40	0.75:1	1.5:1	8%	3.6
BH5	50**	0.75:1	1.5:1	8%	5.0
BH6	50**	1.5:1	1.5:1	8%	6.3
BH12	45**	0.75:1	1.5:1	7.7%	3.4

** H:V = horizontal:vertical ratio, **with one 40-mph curve*

Common Design Features of the Build Alternatives

All alternatives will require substantial realignment of the existing alignment. Retaining walls, bridges, box culverts, and possibly viaducts could be included as part of the final design of the individual segments. Embankment slopes in decomposed granite soils will be constructed with a slope ratio of 1.5:1. As the fill is constructed, erosion control blankets will be embedded with exposed flaps that overlap the next layer of embedded blankets to prevent surface erosion. All alternatives, with the exception of BH6, will have cut slopes constructed at a slope ratio of 0.75:1. Alternative BH6 proposes a flatter cut slope ratio of 1.5:1. The project will include

large volumes of earthwork, with totals ranging from 2.9 to 5.1 million cubic yards. Additional work will include highway drainage, erosion control, roadside safety features, and other miscellaneous work.

Slope recommendations for the project were developed with input from Caltrans maintenance and landscape staff, the Trinity County Department of Transportation, and the Bureau of Land Management. The majority of these sources agree that steeper cut slope ratios require less costly maintenance over the long term. Successful revegetation of these steep slopes is unlikely; however, recent studies conducted on Buckhorn Grade indicate that successful revegetation of flatter cut slopes is limited at best. In addition, these studies have not demonstrated that adequate plant growth can be established quickly to prevent erosion. There has been some success revegetating decomposed granite; however, the techniques used are expensive to construct, require labor-intensive maintenance, and are not cost effective for a 7-mile long project.

Features common to all "build" alternatives are:

- Improved horizontal and vertical alignments.
- 12-foot lanes in each direction with alternating uphill truck climbing lanes and downhill passing lanes.
- Standard shoulder widths: 4 feet adjacent to passing/climbing lane, 8 feet adjacent to single lane.
- Improved superelevation rates and transition lengths.
- Improved sight distance.
- Surface Transportation Assistance Act truck accessibility.

Unique Features of the Build Alternatives

Alternative BH4

Alternative BH4 (Figure 1-5) has a design speed of 40 mph and is a 5.03-mile segment within the project limits with a maximum grade of 8 percent for approximately 1.5 miles. Earthwork for this alternative totals approximately 3.6 million cubic yards and will disturb an area of approximately 103 acres.

Alternative BH5

Alternative BH5 (Figure 1-6) is a 4.8-mile segment within the project limits with a maximum grade of 8 percent for approximately 2.3 miles. The design speed for this

alternative is 50 mph; however, there is one 40-mph curve approximately 3.3 miles from the summit at Water and Trail Gulches. Earthwork for this alternative totals approximately 5 million cubic yards and would disturb an area of 114 acres. The western end of this alternative would be difficult to construct in segments due to the difference in elevations between the proposed alignment and the existing profile.

Alternative BH6

Alternative BH6 (Figure 1-7) is a 4.9-mile segment within the project limits with a maximum grade of 8 percent for approximately 2.5 miles. The design speed for this alternative is 50 mph; however, there is one 40-mph curve approximately 3.3 miles from the summit at Water and Trail Gulches. Earthwork for this alternative totals approximately 6.3 million cubic yards and would disturb an area of 147 acres.

Alternative BH12

Alternative BH12 (Figure 1-8) is a 5.11-mile segment within the project limits with a maximum grade of 7.7 percent for approximately 2.0 miles. The design speed for this alternative is 45 mph; however, there is one 40-mph curve approximately 1.8 miles from the summit. Earthwork for this alternative totals approximately 3.4 million cubic yards and will disturb an area of 101 acres.

Figure 1-1 Project Vicinity Map

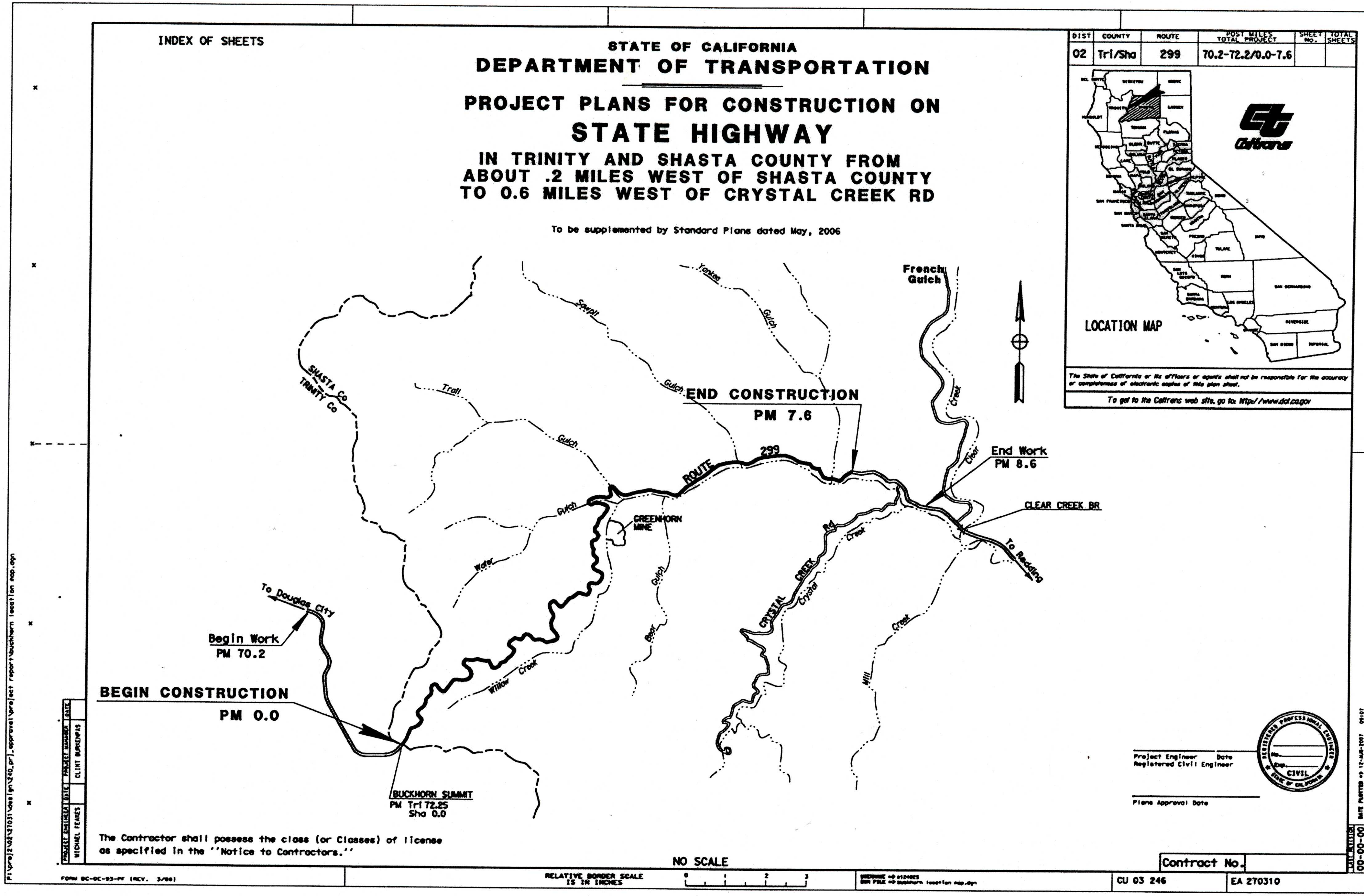

Figure 1-2 Project Location Map

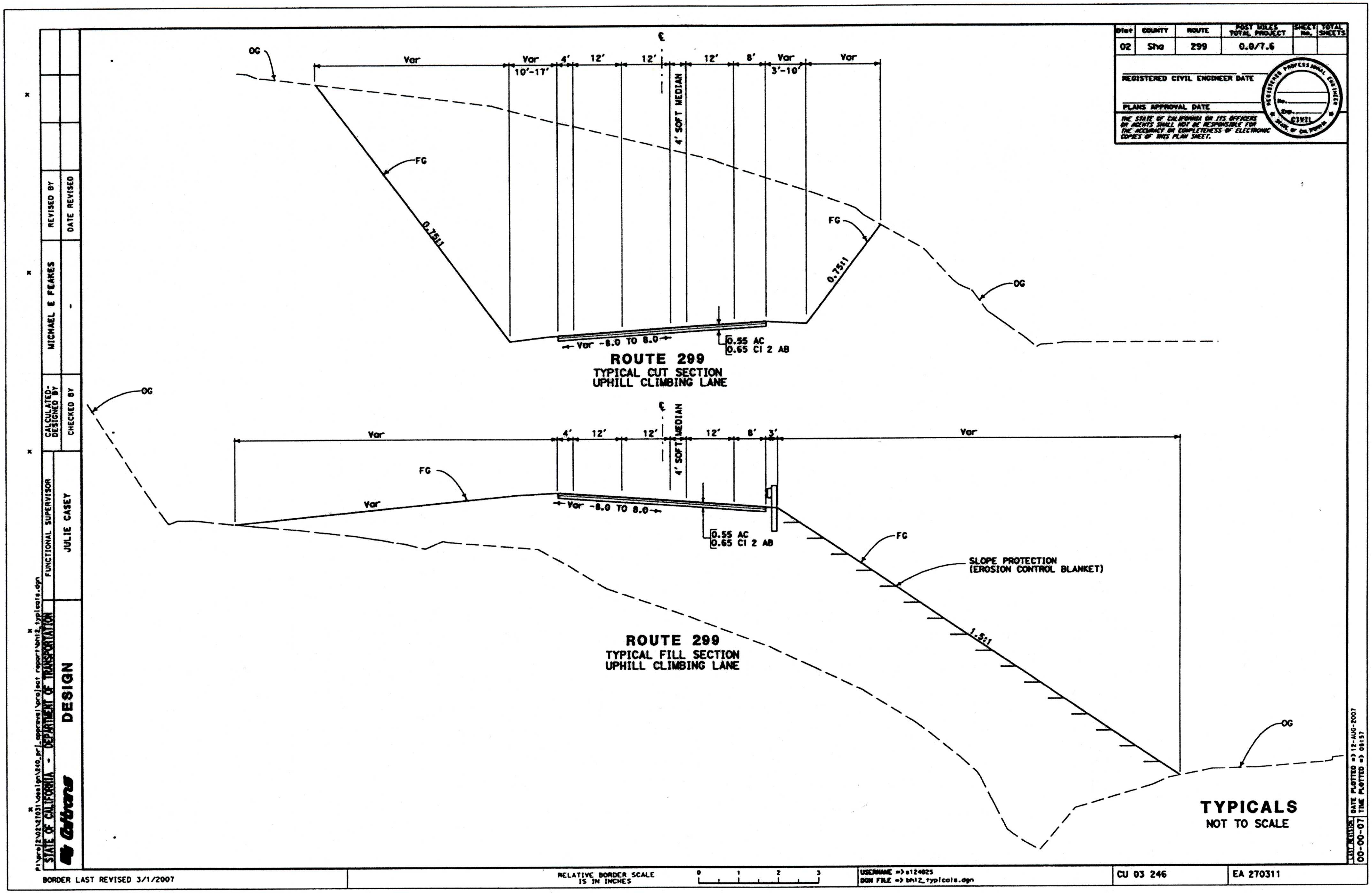

Figure 1-3 Typical Cross Sections

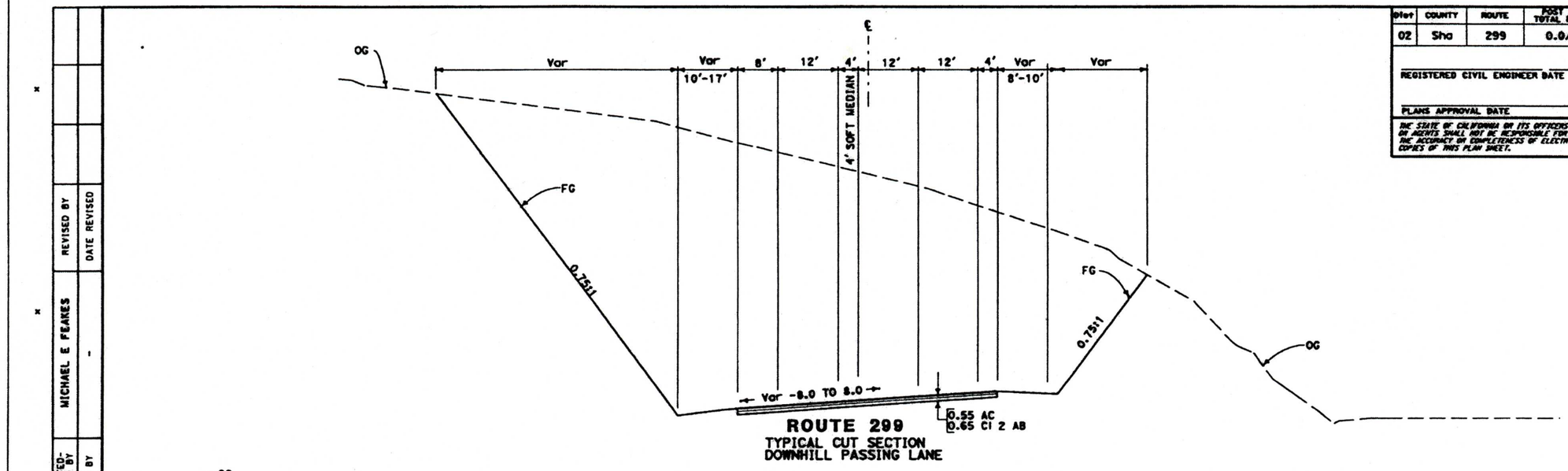

Figure 1-4 Typical Cross Sections

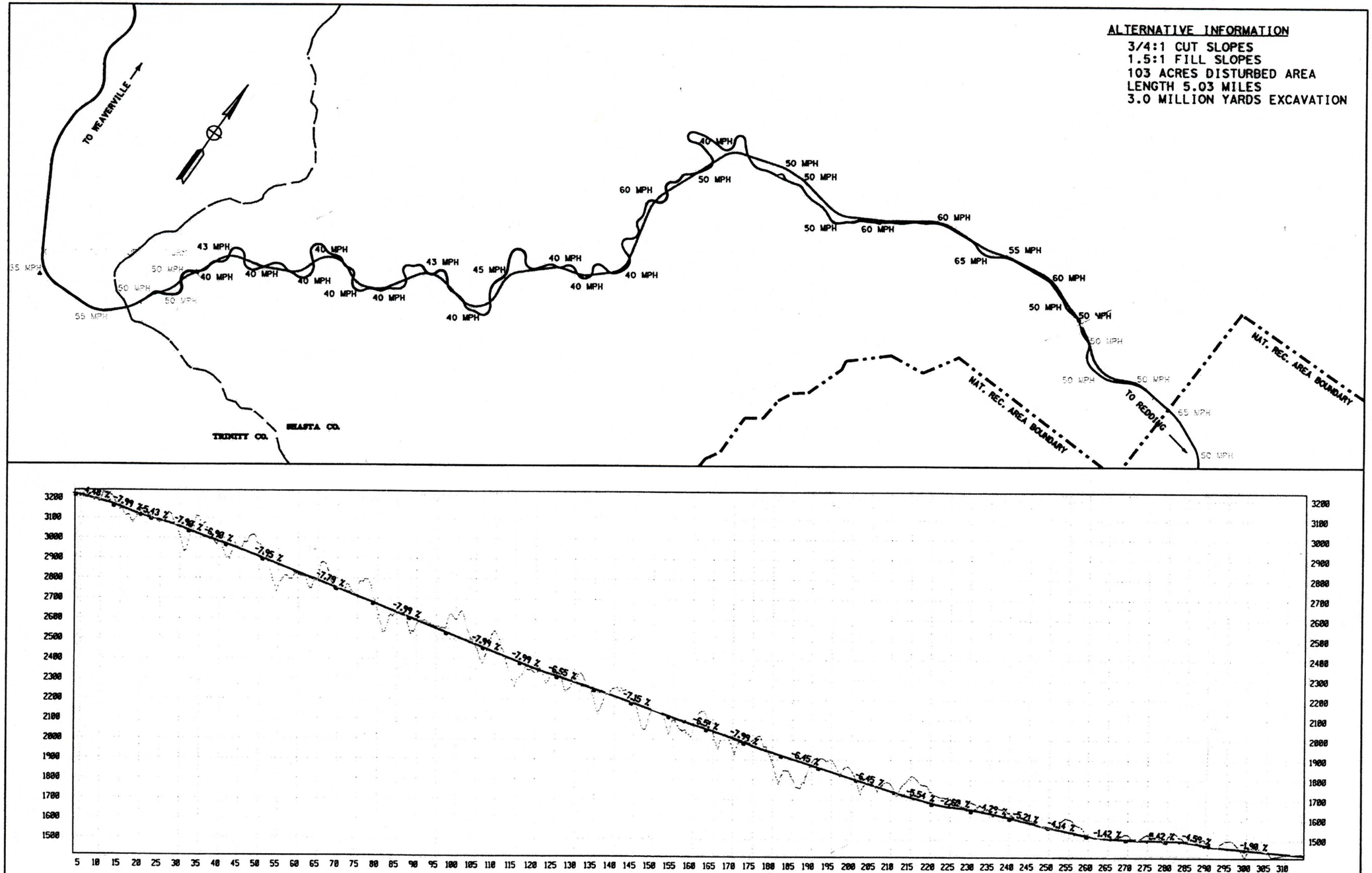

Figure 1-5 Alternative BH4

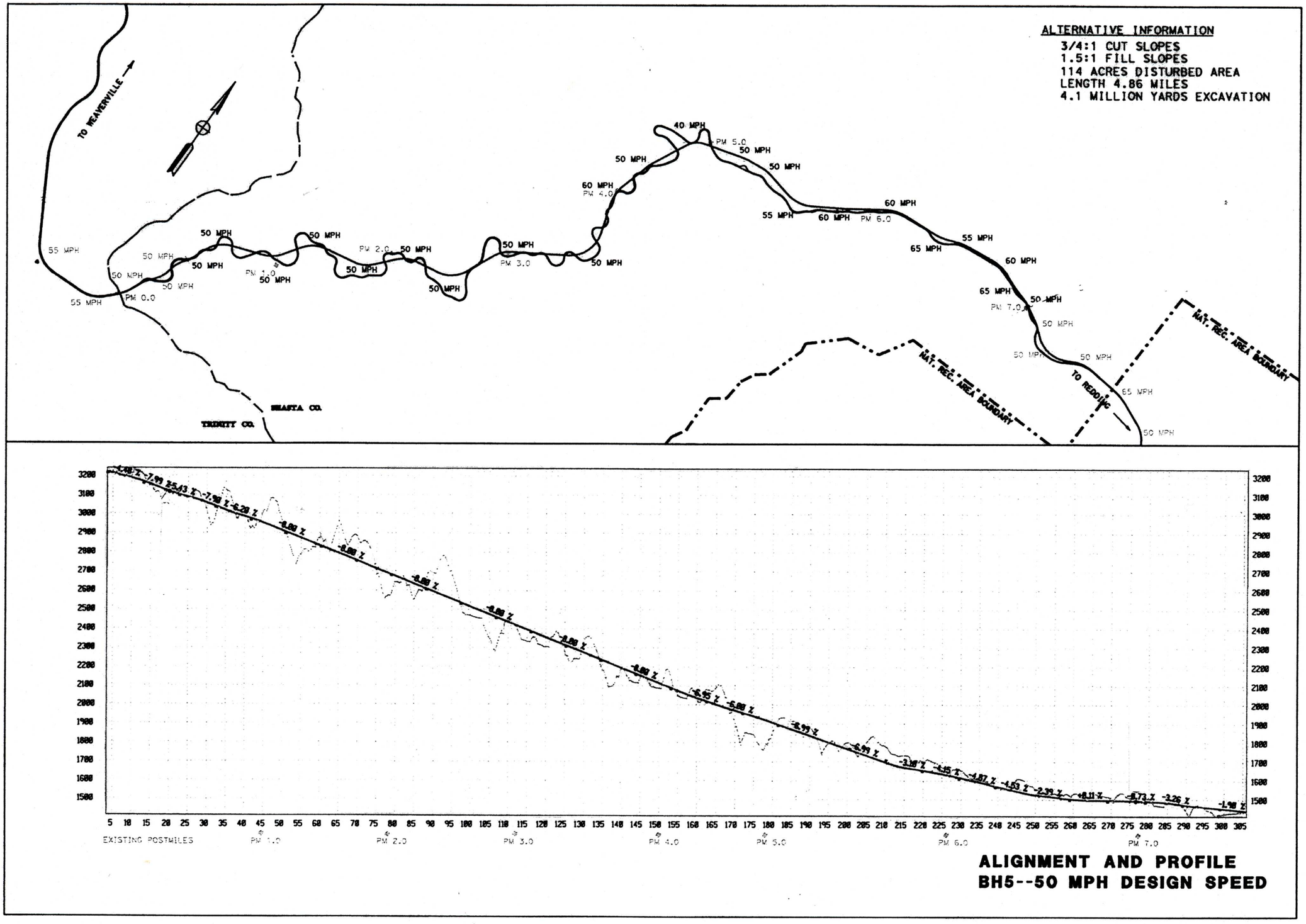

Figure 1-6 Alternative BH5

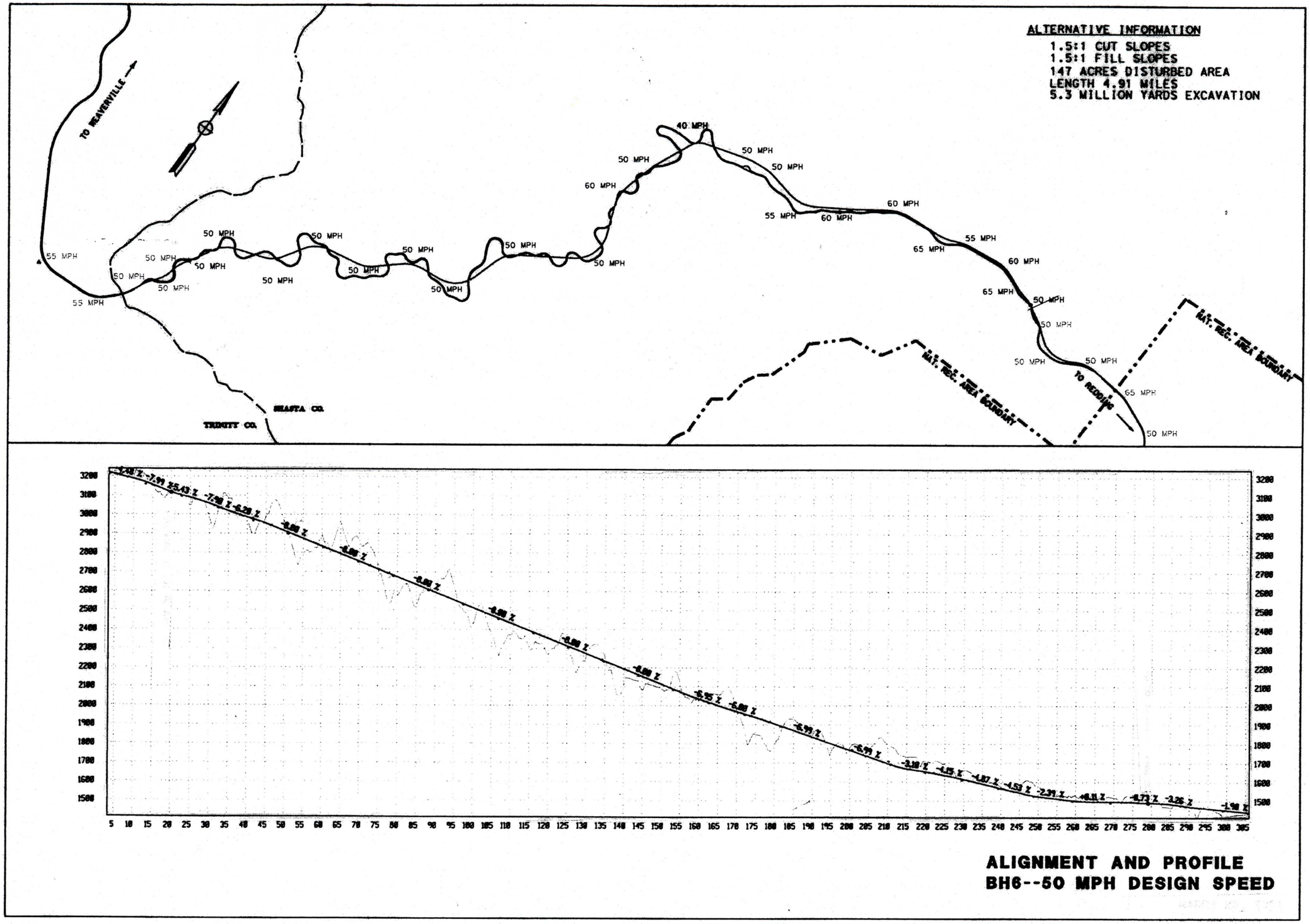

Figure 1-7 Alternative BH6

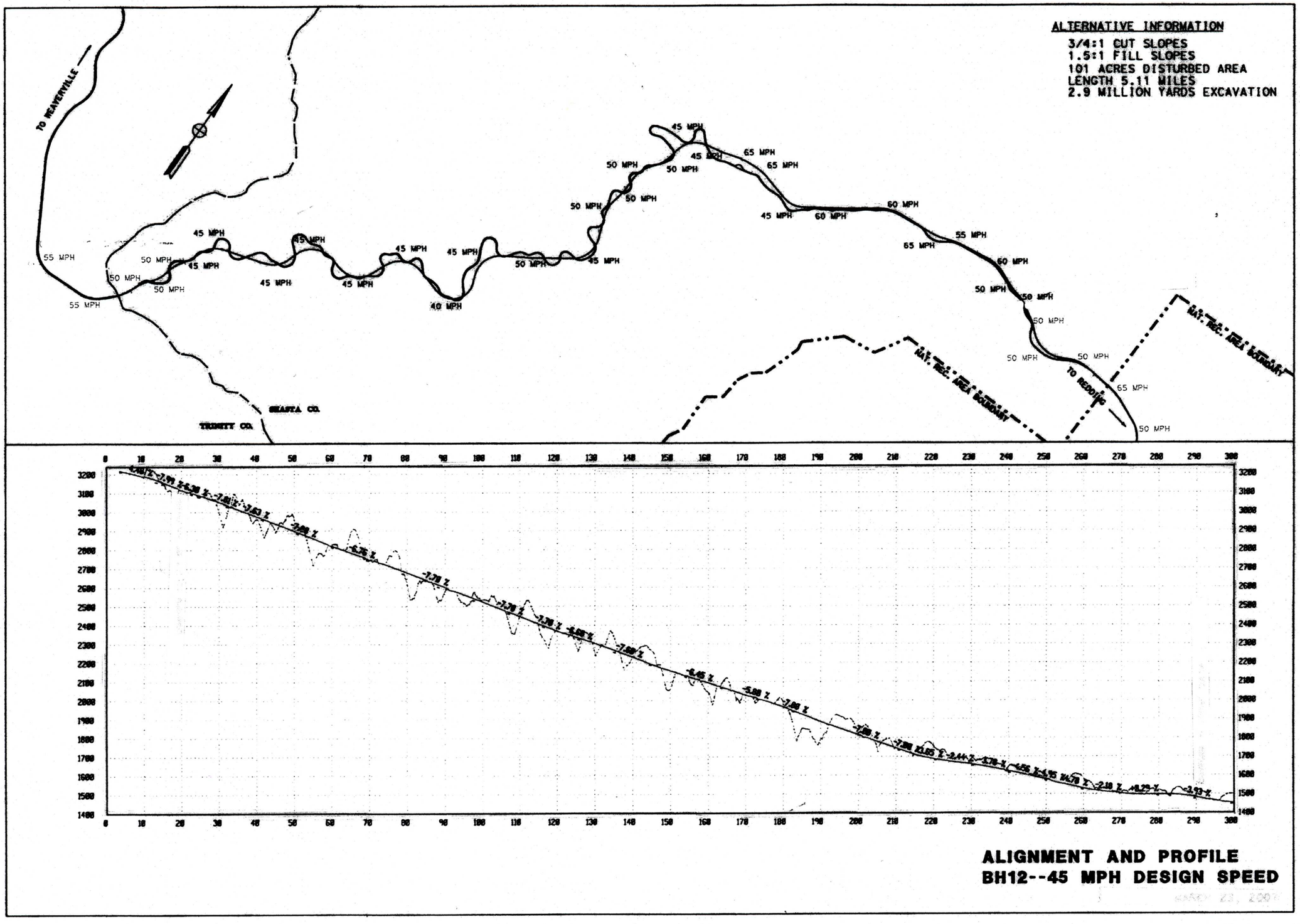

Figure 1-8 Alternative BH12

1.3.2 Comparison of Alternatives

While the four "build" alternatives provide the features stated above, they vary in design speed. The lower design speeds typically follow the terrain more closely and result in a longer alignment, flatter profile grade, and less disturbed area. In addition, the lower design speeds allow for more flexibility in tying into the existing alignment for segmented phases of construction.

After the public circulation period, all comments were considered, and Caltrans selected a preferred alternative and made the final determination of the project's effect on the environment. In accordance with the California Environmental Quality Act, Caltrans certified that the project complied with the Act, prepared findings for all significant impacts identified, prepared a Statement of Overriding Considerations for impacts that would not be mitigated below a level of significance, and certified that the Findings and Statement of Overriding Considerations had been considered prior to project approval. Caltrans then filed a Notice of Determination with the State Clearinghouse that identified whether the project would have significant impacts, whether mitigation measures were included as conditions of project approval, whether findings were made, and whether a Statement of Overriding Considerations was adopted. Similarly, Caltrans, as delegated by the Federal Highway Administration, determined that the project, which is subject to the National Environmental Policy Act, did not significantly impact the environment and issued a Finding of No Significant Impact in accordance with the National Environmental Policy Act.

1.3.3 Identification of a Preferred Alternative

The Buckhorn Grade Improvement Project's development team has identified Alternative BH12 as the preferred alternative. This recommendation was approved by the Buckhorn Grade Improvement Project's management team on July 8, 2009. This alternative meets the purpose and need of this project. As proposed, the construction of the preferred alternative will include the following improvements:

- improved horizontal and vertical geometrics,
- 12-feet traffic lane in each direction,
- an alternating uphill truck climbing lane and downhill passing lane with ,
- standard paved shoulders (4-feet adjacent to passing/climbing lane, 8-feet adjacent to single lane),

- 4-feet soft median in passing/climbing lane areas,
- increased sight distance, and
- improved superelevation rates and transition lengths.

Alternative BH12 is approximately 5.11 miles in length with a maximum grade of 7.7% for approximately 2.0 miles. The design speed for this alternative is 45 mph; however, there is one 40-mph curve approximately 1.8 miles from the summit. Earthwork for this alternative is approximately 3.4 million cubic yards. The construction of this alternative will disturb an area of 101 acres. It is estimated that project construction, including right of way acquisitions and environmental mitigation, will cost $189.5 million.

The four alternatives studied for the project had similar impacts with regard to land use, visual resource, storm water, and threatened/endangered species impacts. However, the BH12 Alternative had less impact to riparian vegetation, wetlands, waters, and oak woodland resources. This alternative will require the acquisition of 34.3 acres of Timber Production Zone Lands. It is consistent with the county planned land use, but will require the relocation of one residence. The BH12 Alternative would adversely affect one historic property. This alternative will impact 0.38 acre of riparian habitat, 69.3 acres of oak woodlands, and 1.18 acres of jurisdictional wetlands. The impacts of this alternative on endangered and threatened species, including Howell's alkali grass, wolverine, bald eagle, and northern spotted owl, can be avoided or minimized to a less than significant level. The potential for erosion and siltation in downstream waterways can be minimized with Best Management Practices.

Because the Alternative BH12 has a 45-mph design speed, it provides more opportunities for phasing the construction of the project into smaller stand-alone projects. It also allows for a flatter profile, smaller project footprint, and lower overall construction costs.

The PDT also recommended that, as projects are developed and constructed on Buckhorn Grade, any excess material be placed in those areas on the preferred alignment where large fills will be required. These mandatory disposal areas should be identified and environmentally approved early to allow their use while at the same time, streamlining the overall process.

1.3.4 No Build Alternative

The No Build Alternative proposes no modifications to State Route 299 in the project area, other than routine maintenance and the presently planned safety and operational improvement projects on Buckhorn Grade. This alternative would not resolve geometric deficiencies, maintenance issues, or safety concerns on the existing highway. Vehicle use restrictions for Surface Transportation Assistance Act trucks would continue. The identified transportation needs of the area would not be met and would become worse with increasing traffic volumes and new development in Trinity County.

1.3.5 Alternatives Considered but Eliminated From Further Discussion

Caltrans has been studying alternatives to improve the Buckhorn Grade alignment for more than 45 years. In 1959, six alignments were studied with the preferred alignment located north of and adjacent to the existing alignment. In 1968, Caltrans initiated studies of four alignments with 50-mph and 60-mph design speeds, but was unable to complete the studies due to funding constraints. In 1991, a Project Study Report presented 27 alignments, however none were fundable due to low annual average daily traffic and high costs.

Development of the most recent alignment alternatives began in 2000. Initially the study area was 27 square miles. Based on archived documents and alignments from past studies, conventional route selection methods, and engineering judgment, six corridors were developed. As studies progressed from corridors to alignment alternatives, the alternatives were refined to avoid or minimize environmental impacts to the greatest extent possible. Preliminary engineering studies were then developed for nine alignments within the two corridors. Upon completion of these studies, three alignments were chosen for further consideration.

In 2005, the Project Development Team realized that the Buckhorn Grade Improvement Project was not likely to secure adequate funding to allow construction of the entire project in a single phase. This project will require a long-term funding strategy and a phased construction plan. Two of the three remaining alignments failed to meet the need for fundable and constructable segments that conform to the existing alignment with a minimum of interim or “throw-away” work. The Project Development Team members, along with concurrence of the Project Management Team which consisted of Caltrans and local agency representatives, determined that in order for an alignment to work within these constraints it would need to be located

near the existing alignment. Due to funding constraints, all of the alignments were set aside with the exception of this alignment, which was further studied to investigate various design speed alternatives.

Project Phasing

Caltrans has developed a 20-year funding plan, which will allow for phased construction of the Buckhorn Grade Improvement Project. The plan identifies 11 segments within the project limits, which would be constructed over the next 20 years as shown in Table 1.4. It is the goal that each of these segments would be designed to conform to the preferred alternative alignment of the Buckhorn Grade Improvement Project. However, if funding becomes constrained these phased segments may have to conform to less than the proposed project scope, which would still address the safety concerns identified on this route.

Table 1.4 20-Year Funding Plan

Segment	Project Description	Post Miles	Proposed Funding Source	Proposed Construction Year
1	Top of Buckhorn Safety Project	0.0/0.6	SHOPP* Safety HPP** Funds	2008
2	Yankee Gulch Safety Project	6.8/7.6	SHOPP Safety HPP Funds	2009
3	Middle of Buckhorn Safety Project	3.0/4.3	SHOPP Safety HPP Funds	2010
4	Phase 1 Middle of Buckhorn	4.3/6.0	SHOPP 2010 STIP***	2013
5	Unnamed Project	6.0/6.2	SHOPP 2012 STIP	2015
6	Unnamed Project	6.2/6.4	SHOPP 2014 STIP	2017
7	Unnamed Project	6.4/6.6	SHOPP 2016 STIP	2019
8	Unnamed Project	6.6/6.8	SHOPP 2018 STIP	2021
9	Unnamed Project	2.2/3.0	SHOPP 2020 STIP	2023
10	Unnamed Project	1.4/2.2	SHOPP 2022 STIP	2025
11	Unnamed Project	0.6/1.4	SHOPP 2024 STIP	2027

**SHOPP – State Highway Operation and Protection Program*
***HPP – High Priority Projects*
****STIP – State Transportation Improvement Program*

1.4 Permits and Approvals Needed

The permits, reviews, and approvals required for project construction are summarized in Table 1.5.

Table 1.5 Summary of Permits, Reviews, and Approvals

Agency	Permit/Approval
U.S. Fish and Wildlife Service	Section 7 Consultation for Threatened and Endangered Species
U.S. Army Corps of Engineers	Section 404 Permit for filling or dredging waters of the U.S.
California Department of Fish and Game	1602 Agreement for Streambed Alteration
California Regional Water Quality Control Board	Section 401 Water Quality Certification
State Historic Preservation Officer	Memorandum of Agreement for mitigation of adverse effects