



PROJECT STUDY REPORT

Permanent Restoration

01-DN-101 PM 12.0/15.5

EA 01-0F280K/EFIS

0115000099

Program Code 20.XX.201.131

June 2016

Last Chance Grade



Project Location

On Route 101 in Del Norte County, 10 miles south of Crescent City from PM 12 - 15.5

Del Norte County

101

I have reviewed the right of way information contained in this Project Study Report and the R/W Data Sheet attached hereto, and find the data to be complete, and accurate:

[Signature]
Karen E. Hawkins
Assistant Chief, North Region Right of Way

Approval Recommended:

[Signature]
Sebastian Cohen
Project Manager

[Signature]
Brad Mettam
District Program Manager

Approved By:

[Signature]
CHARLES C. FIELDER
District Director

[Date]
Date

This Project Study Report has been prepared under the direction of the following registered engineer. The registered civil engineer attests to the technical information contained herein and the engineering data upon which recommendations, conclusions, and decisions are based.



JEFFREY L. PIMENTEL, P.E.
REGISTERED CIVIL ENGINEER

6/30/16
Date



1. INTRODUCTION

Project Description:

The District 1 Advance Planning Unit has prepared this Project Study Report (PSR) for a Permanent Restoration Project (201.131). The project is located on a segment of US Highway 101 (US 101) known as Last Chance Grade (LCG), which is in southern Del Norte County, between Wilson Creek and Crescent City (PM 12.0 – 15.5). See Attachment A for a Location Map.

This PSR proposes seven alternatives in response to landslides and roadway failures at LCG, which have caused damage for decades. Six of the seven proposed alternatives would include realignment of US 101 with the goal of avoiding the unstable portions of LCG. One of the proposed alternatives to maintain the existing roadway on its current alignment does not meet the purpose and need of the project, but is included to provide a baseline for comparison. The realignment Alternatives (A1, A2, C3, C4, C5 and F) vary between 1 mile and 14 miles in length. A detailed description of each alternative is included in Section 6 of this PSR.

Project Limits	01-DN-101 PM 12.0/15.5	
Number of Alternatives	7 (Including Maintain Existing/No Build)	
Programmable Project Alternative	Alternative C5	
Capital Outlay Support	\$141,790,000	
	Current Cost Estimate (2016):	Escalated Cost Estimate (2031):
Capital Outlay Construction	\$957,253,000	\$1,603,733,000
Capital Outlay Right-of-Way	\$44,900,000	\$89,516,000
Funding Source	20.XX.201.131	
Funding Year	2031	
Type of Facility	Conventional 2-lane rural highway	
Number of Structures	13 bridges and 1 tunnel	
SHOPP Project Output	1 Location	
Anticipated Environmental Determination or Document	EIR/EIS (CEQA/NEPA)	
Legal Description	On Route 101 in Del Norte County, 10 miles south of Crescent City from PM 12.0 – 15.5	
Project Development Category	Category 1	

A project report will serve as approval of the “selected” alternative. Additional studies are needed to determine which of the proposed alternatives will best meet the purpose and need of the project. The alternative recommended for programming has not been identified as preferred in a CEQA/NEPA document or as superior or preferred in any other regard.

Alternative C5 is recommended for programming project cost only, for the following reasons. This alternative is the longest bypass alternative, and much of its alignment and associated structures are common to all alternatives, with the exception of Alternative F. As such, it has the second highest estimated cost and is sufficient to fund Alternatives A1, A2, C3, C4, and C5, as well as 94% of Alternative F. Alternative F is still a serious option, having unique advantages, such as minimum environmental impact and fewer overall long-term maintenance needs. It likely also has a greater risk of being found infeasible due to geologic conditions. Cost estimates are based on the best current information and the relative position between Alternatives F and C5 may change. This project is currently proposed to be amended into the 2016 State Highway Operation

and Protection Program (SHOPP) and funded in the 2031/32 fiscal year through the 201.131 Permanent Restoration Program. The 2016 Construction and Right of Way capital costs are \$957.3 million and \$44.9 million respectively for a total Capital Cost of \$1,002.2 million. Capital costs greatly exceed the programming capacity for the California Department of Transportation 201.131 Permanent Restoration Program, thus a special allocation will be required from FHWA's Federal Emergency Response program or other applicable federal funding.

2. BACKGROUND

Existing Facility:

US 101 between PM 12.0 to 15.5 (LCG) is classified as conventional rural two to four lane highway. Beginning at the southern project limits along US 101 at Wilson Creek Road the roadway transitions from two to four lanes and begins ascending on a 6.3% grade. At PM 13.3 there is a scenic overlook, and the roadway is reduced to three lanes (two northbound lanes and one southbound lane), which exists until PM 14.2 where the roadway is reduced to two lanes. Within the project limits there are intermittent flat areas that span 300 feet to 500 feet along with segments where the roadway grade reaches slopes as high as 7.5%. The average grade of US 101 within the project limits is 5.2% from Wilson Creek Bridge to PM 15.5; however, US 101 within the project limits exhibits slope undulations throughout due to slide movement. The horizontal alignment is curvilinear, with tangents up to 700 feet in length. Horizontal curve radii varies between 300 feet to 1,200 feet. At PM 15.5, US 101 shifts east away from the coast and begins a 1400 foot long tangent section continuing at a 6% grade through dense redwood forest. In order to keep US 101 open to the traveling public there are a series of existing retaining walls within the project limits supporting the existing roadway. Existing roadway and retaining wall locations are shown in Attachment B.

Since a 2010 Federally Declared Storm event, US 101 at LCG has experienced continued movement and deformation resulting in five federal Emergency Repair (ER) approved Damage Assessment Forms (DAFs). These DAFs appropriated a total of \$20 million in ER funds for three Emergency Opening contracts and two Permanent Restoration (PR) projects at three locations. The work associated with these projects is considered temporary due to the deep-seated nature of the landslide. A summary of these actions follow:

Disaster No.	DAF	EO (Executive Order)	PR
11-3	CEP-CT01-001-0		\$ 3,146,000
11-3	CEP-CT01-002-0		\$ 3,898,000
12-3	CEP-CT01-002-0	\$ 630,000	
12-3	CEP-CT01-012-0	\$ 1,260,000	\$4,200,000
12-3	CEP-CT01-013-0	\$ 6,850,000	

As a result of storm damage and increased landslide activity and emergency response efforts, Caltrans installed a surface monitoring network and multiple slope indicators and has measured movement of LCG since July, 2012. Current subsurface investigations reveal that the landslide complex is failing as deep as 260' with multiple nesting shallower landslides. Since October of 2014, roadway deformation has accelerated at a much faster rate than previously experienced at the grade. Subsurface boring data at the area of greatest roadway deformation reflects movement occurring at approximate depths of 100', 75', 40' and 35'. Recent photography also indicates ocean erosion at the bluff base is contributing to instability.

The accelerated movement has required Caltrans Maintenance to fill and level scarps in the roadway surface with pavement as they develop. The paving is needed on average at least once a

month. The scarps that appear are typically between 2 and 4 inches across with depths ranging from a few inches to many feet with voids developing under the roadway surface.

In 2016, Caltrans issued two additional Emergency Projects for \$4 million to temporarily address the safety issue that has developed due to the accelerated movement. The emergency contract installed a GPS monitoring and notification system and performed roadway repairs.

US 101 at LCG has been moving westward and downward progressively in response to storm events since the roadway was constructed. Since the roadway right of way was purchased the road has moved 50 feet horizontally with portions of the roadway now outside Caltrans right of way. The significance of this movement is that the roadway has moved to a position where it is now at the edge of the bluffs that are subject to active coastal erosion. In addition, US 101 passes through Redwood National and State Parks, a designated World Heritage Site. Constructing a route around the slide has the potential to affect an iconic old growth redwood forest and to remove old growth trees that are protected in these state and national parks. Caltrans cannot construct a full retreat away from the eroding bluffs into the hillside without the potential removal of between 275 and 542 old growth redwood trees. At the rates of movement currently being experienced, it is likely that at least a small retreat will be necessary to keep US 101 open to the traveling public while a more permanent solution can be developed. Keeping the roadway on its current alignment is not a fiscally feasible option given a landslide complex that is over a mile long and at its deepest 260' deep.

Since the March 2012 storm event, there has been an increase in appeals from the public and elected officials to Caltrans to address the instability and progressive loss of the roadway. Caltrans initiated an Engineered Feasibility Study (EFS) to address the public's concerns and determine and define feasible alternatives. The EFS, completed in June 2015, provides seven alternatives ranging in cost from \$300 million to \$1.2 billion dollars (Year-of-Construction dollars). In addition, Caltrans prepared an Economic Impact Study to determine if a project would be economically justifiable. The Economic Impact Study concluded that a project costing up to \$1 billion (2015 dollars) would be a sound investment for the State of California (Appendix E). The PID delivery has been accelerated to be delivered July 2016. At that time, Caltrans would like to pursue Federal ER funds to environmentally clear, design and construct a roadway relocation at Last Chance Grade.

The costs to Caltrans and the FHWA ER Program for emergency repairs associated with maintaining US 101 at LCG are expected to escalate as retreats and repairs become more difficult. The ultimate risk of not relocating US 101 away from Last Chance Grade is complete loss of the roadway and the continuity of coastal US 101. The alternate route would increase travel distance up to 320 miles.

3. PURPOSE AND NEED STATEMENT

Purpose:

The purpose of this project is to develop a permanent solution to the instability and potential roadway failure at LCG. The project will consider alternatives that provide a more reliable connection, reduce maintenance costs and protect the economy, natural resources, and cultural landscapes.

Need:

Landslides and road failures at LCG have been an ongoing problem for decades. A geologic study in 2000 conducted for Caltrans by the California Geological Survey mapped over 200 historical and active landslides (both deep-seated and shallow) within the corridor between Wilson Creek and

Crescent City. Over the years, Caltrans has conducted a considerable number of construction projects and maintenance activities in the LCG area in order to keep the roadway open. Since 1981, landslide mitigation projects, including retaining walls, drainage improvements, and roadway repairs have cost over \$54 million (\$33 million Emergency Response Projects, \$21 million Non-Emergency Response Projects). A long-term sustainable solution at LCG is needed for many reasons, including the following:

- Economic ramifications of a long-term failure and closure;
- Risk of delay/detour to traveling public;
- Increasing maintenance and emergency project costs; and
- Increase in frequency and severity of large storm events caused by climate change

4. DEFICIENCIES

The segment of US 101 known as LCG, as well as US 101 north to Hamilton Road, was constructed in 1937. LCG has a history of geologic instability, including deep seated landslides and slipouts, which presents a long-term challenge with roadway stability and maintenance costs. Surveys conducted by Caltrans have shown the landslides have shifted the roadway centerline by over 50 feet horizontally from the original roadway centerline constructed in 1937.

The following sections describe the importance of beginning the process to study and environmentally clear a realignment of Route 101 at this location. Contributing to the sense of urgency for a realignment project are the accelerating movement of the roadway, toe erosion impacts to the nested landslides, frequency of repairs, lack of geometric resiliency, and increasing risk to and concerns of the traveling public.

Instability

Since the 1970s, the number of projects required to keep the roadway open, and the associated cost have increased due to roadway movement. Between 1981 and 2012, a total of \$36.2 million was spent on emergency and repair projects, with \$29.3 million spent between 1997 and 2012. The trend of increased maintenance, emergency projects and capital expenditures has continued to the present time.

The roadway traverses two large landslides: the LCG Landslide (PM 14.85-15.34) and the Wilson Creek Wall Landslide (PM 14.39-14.85). The LCG Landslide and Wilson Creek Wall Landslides are within a Franciscan Complex Broken Formation. The Broken Formation consists mainly of thickly bedded sandstone with siltstone and shale interbeds. The massive and hard sandstone blocks, bounded by weak sheared zones, leads to steep slopes and slides of large intact blocks of rock. South of the Wilson Creek Wall Landslide the roadway traverses a large active earthflow within a Franciscan Melange.

The LCG Landslide is composed of two major landslides, the Southern LCG Slide (PM 14.85–15.2) and the Northern LCG Landslide (PM 15.2–15.34). The SLCG slide is between 125–260 feet deep and approximately 1500 feet wide at roadway elevation. The NLCG Landslide is between 125-160 feet deep and is approximately 700 feet wide at roadway elevation. A more active and faster moving shallow (approximately 40 feet deep) landslide exists within the limits of the Northern LCG Landslide. The rate of movement at the Northern LCG Slide is two times that of the Southern LCG Slide. Slide movement monitoring between July 2012 and April 2015 measured a vertical movement of 2.59 feet, and a horizontal movement of 3.26 feet. This movement has resulted in visible damage to retaining walls at the Northern LCG and Southern LCG slide interface resulting in Emergency Opening projects. Also contributing to the slide movement is tidal erosion at the toe of the Wilson Creek Bluffs.

The geologic instability in the area is often exacerbated by storm events. Two federally declared storm events in 2011 and 2012 required emergency projects to maintain the highway alignment for the traveling public. The 2011 storm event resulted in three slipouts along the roadway, closing the southbound shoulder, and requiring resurfacing of the roadway and the extension of an existing retaining wall. The 2012 storm event resulted in a new slipout and accelerated an existing slipout from the prior year. This storm required an emergency soil nail wall to prevent further loss of the roadway. The LCG Engineered Feasibility Study completed in June 2015 provides additional information on slide movements and storm damage emergency relief projects at this location.

The size, depth, and instability of the known slide planes, combined with the erosion of the bluffs, make maintaining the roadway alignment difficult, extremely costly, and is expected to continue. Movement at Last Chance Grade has continued to accelerate.

During the last 80 years, the roadway at this location has moved 50-feet outward as a result of the deep-seated landslide and surf erosion at the toe of the slope. This historic continuous movement equates to a rate of approximately 7.5 inches per year; however, the recent rate of movement at this location averages approximately 17 inches per year. This accelerated landslide movement in combination with surf erosion limits extending up to the outboard edge of the roadway result in a loss of the routes resiliency in the event of rainfall events. In the near future, this loss of resiliency is predicted to result in a roadway failure requiring an emergency contract to construct a large roadway retreat or realignment of the roadway around the landslide. The retreat is unlikely to be a supported alternative given the associated removal of up to 200 old growth redwood trees.

Existing Geometrics

From PM 12.0 to PM 12.3, Route 101 consists of two 12' southbound lanes, a 4' separation with two double yellow delineations, and two 12' northbound lanes. Left shoulders vary from 2' to 8' and right shoulders vary from 4' to 8'. Between PM 12.3 and PM 14.4, the roadway consists of one 12' southbound lane and two 12' northbound lanes with no center separation. Left shoulders vary from 2' to 8' and right shoulders vary from 4' to 8'. From PM 14.4 to PM 14.8 the roadway consists of one 12' northbound and one 12' southbound lane and left and right shoulders that vary from 0' to 3'.

From PM 14.8 to PM 15.5, the roadway was constructed with 12' left (SB) and right (NB) lanes, an 8' left shoulder, and a 4' right shoulder. Subsequent embankment loss (and placement of temporary k-rail) has reduced the existing roadway width.

Structures

At the current time, retaining walls at the NLCG and SLCG slide interface show deformation and cracking. A permanent restoration projects is scheduled to begin construction in 2016 under the Emergency Repair Program. One is a Soil Nail Wall at PM 15.1, which is needed to repair a failure of a portion of the roadway shoulder and loss of embankment fill beneath it. The other is a Soldier Pile Tieback Wall at PM 15.0, which replaces an existing soil nail wall to regain roadway shoulder. Other future projects in the Last Chance Grade area are identified in the following section.

Vehicle Traffic Data

The current and forecasted traffic data is listed in the table below. The data was provided in a memorandum from the Office of Travel Forecasting and Modeling on December 7th, 2015.

Year	Annual ADT	Peak Hour		
Base (2014)	4,200	640	Directional %	60
Current (2015)	4,210	640	DH Truck %	8.0
2031	4,410	670	10-yr. TI	9.0
2041	4,540	690	20-yr. TI	9.5
2051	4,670	710		

Collision Data

A collision analysis dated February 2, 2016 for the most recent 3-year period (01/01/2011 to 12/31/2013) was prepared by the District 1 Office of Traffic Safety for the segments of US 101 between the tie-in locations of each of the six realignment alternatives, as well as, all segments combined. The intent of analyzing in segments was to allow for comparison of the potential safety benefits of the various alternatives.

Segment 1: DN 101 PM 13.4/14.24

This highway segment is between the southern tie-in location common to Alternatives A1, A2, C3, C4, and C5 and the southern tie-in location of Alternative F. It has an actual total collision rate and actual fatal + injury collision rate that are less than the statewide average for similar facilities. There were no fatal collisions. TASAS Table B collision rates are summarized as follows:

TASAS Table B Collision Rates for DN 101 PM 13.4/14.24					
Actual (MV)			State Average (MV)		
Fatal	F+I	Total	Fatal	F+I	Total
0.000	0.25	0.51	0.028	0.48	1.05

Of the 2 reported collisions, 1 resulted in injury and 1 resulted in property damage only (PDO). Primary collision factors (PCF) were Improper Turn and Speeding. Types of collisions (TOC) were Hit Object and Overturn. Both collisions occurred in the northbound direction of travel.

Segment 2: DN 101 PM 14.24/15.62

This highway segment is between the southern tie-in location of Alternative F and the northern tie-in location of Alternative A1. It has an actual total collision rate and actual fatal + injury collision rate that are less than the statewide average for similar facilities. There were no fatal collisions. TASAS Table B collision rates are summarized as follows:

TASAS Table B Collision Rates for DN 101 PM 14.24/15.62					
Actual (MV)			State Average (MV)		
Fatal	F+I	Total	Fatal	F+I	Total
0.000	0.35	1.30	0.033	0.74	1.49

Of the 15 reported collisions, 4 resulted in injury and 11 were PDO. PCF were Speeding (9 of 15), Improper Turn (5 of 15), and Unknown (1 of 15). TOC were Hit Object (10 of 15), Rear End (4 of 15), and Head-On (1 of 15). The majority of the collisions occurred in the northbound direction of travel (12 of 15) and in wet roadway conditions (10 of 15). Dark conditions existed in 5 of 15 collisions.

Segment 3: DN 101 PM 15.62/15.92

This highway segment is between the northern tie-in location of Alternative F and the northern tie-in of Alternative A2. It has an actual total collision rate and actual fatal + injury collision rate that

are less than the statewide average for similar facilities. There were no fatal collisions. TASAS Table B collision rates are summarized as follows:

TASAS Table B Collision Rates for DN 101 PM 15.62/15.92					
Actual (MV)			State Average (MV)		
Fatal	F+I	Total	Fatal	F+I	Total
0.000	0.00	0.21	0.016	0.31	0.64

The one reported collision was PDO under wet roadway conditions in the northbound direction. The PCF was Speeding and the TOC was Rear End.

Segment 4: DN 101 PM 15.92/19.81

This highway segment is between the northern tie-in for Alternative A2 and the northern tie-in for Alternative C3. It has an actual total collision rate that is 1.1 times the statewide average for similar facilities. The actual fatal + injury collision rate is 1.4 times the statewide average for similar facilities. The actual fatal collision rate is 5.5 times the statewide average for similar facilities. TASAS Table B collision rates are summarized as follows:

TASAS Table B Collision Rates for DN 101 15.92/19.81					
Actual (MV)			State Average (MV)		
Fatal	F+I	Total	Fatal	F+I	Total
0.159	0.69	1.22	0.029	0.51	1.11

Of the reported 23 collisions, 3 resulted in fatality, 10 resulted in injury, and 10 were PDO. PCF were Improper Turn (12 of 23), Speeding (6 of 23), Other Than Driver (2 of 23), Influence of Alcohol (1 of 23), Failure to Yield (1 of 23), and Other Violations (1 of 23). TOC were Hit Object (17 of 23), Overturn (2 of 23), Head-On (1 of 23), Sideswipe (1 of 23), Broadside (1 of 23), and Other (1 of 23).

Segment 5: DN 101 PM 19.81/20.82

This highway segment is between the northern tie-ins of Alternative C3 and Alternative C4. It has an actual total collision rate and actual fatal + injury collision rate that are less than the statewide average for similar facilities. There were no fatal collisions. TASAS Table B collision rates are summarized as follows:

TASAS Table B Collision Rates for DN 101 PM 19.81/20.82					
Actual (MV)			State Average (MV)		
Fatal	F+I	Total	Fatal	F+I	Total
0.000	0.40	0.60	0.031	0.61	1.26

Of the reported 3 collisions, 2 resulted in injury and 1 was PDO. PCF were Improper Turn, Speeding, and Other Than Driver. TOC were Rear End, Hit Object, and Overturn.

Segment 6: DN 101 PM 20.82/22.73

This highway segment is between the northern tie-ins for Alternative C3 and Alternative C5. It has an actual total collision rate that is 4.1 times the statewide average similar facilities. The actual fatal + injury collision rate is 4.5 times the statewide average for similar facilities. There were no fatal collisions. TASAS Table B collision rates are summarized as follows:

TASAS Table B Collision Rates for DN 101 PM 20.82/22.73					
Actual (MV)			State Average (MV)		
Fatal	F+I	Total	Fatal	F+I	Total
0.000	2.18	4.37	0.028	0.48	1.05

Of the reported 42 collisions, 21 resulted in Injury and 21 were PDO. PCF were Speeding (31 of 42), Improper Turn (5 of 42), Other Violations (3 of 42), Influence of Alcohol (1 of 42), Improper Driving (1 of 42), and Other Than Driver (1 of 42). The majority of collisions occurred under wet roadway conditions (33 of 42).

Segment 7: DN 101 PM 13.4/22.73

This highway segment encompasses the entire project limits and is between the southernmost and the northernmost tie-in locations of all proposed alternatives. The actual total collision rate is 1.6 times the statewide average similar facilities. The actual fatal + injury collision rate is 1.6 times the statewide average for similar facilities. There actual fatal collision rate is 2.2 times the statewide average for similar facilities. TASAS Table B collision rates are summarized as follows:

TASAS Table B Collision Rates for DN 101 PM 13.4/22.73					
Actual (MV)			State Average (MV)		
Fatal	F+I	Total	Fatal	F+I	Total
0.066	0.91	1.91	0.030	0.55	1.17

Of the reported 86 collisions, 3 resulted in fatality, 38 resulted in injury, and 45 were PDO. PCF were Speeding (49 of 86), Improper Turn (24 of 86), Other Violations (4 of 86), Other Than Driver (4 of 86), Influence of Alcohol (2 of 86), Failure to Yield (1 of 86), Improper Driving (1 of 42), and Unknown (1 of 86). TOC were Hit Object (58 of 86), Rear End (10 of 86), Overtake (8 of 86), Head-On (3 of 86), Sideswipe (2 of 86), Broadside (2 of 86), and Other (2 of 86).

5. CORRIDOR AND SYSTEM COORDINATION

In District 1, Route 101 is the primary north-south transportation corridor, the most important route, and the economic lifeline of the north coast. Route 101 traverses the entire length of District 1, including the counties of Mendocino, Humboldt, and Del Norte. It is a principle arterial serving interregional and interstate traffic, with relatively high volumes of truck and tourist traffic. Route 101 is of interregional and interstate significance and is designated as a Priority Interregional Highway in the 2015 State Interregional Transportation Strategic Plan. The route serves other modes of transportation including port access at Humboldt Bay and Crescent City Harbor, and commercial airport access to the California Redwood Coast - Humboldt County Airport. It is the principle route for the movement of goods into and out of the region and to recreational areas including Redwood National Park and twelve State Parks.

The Concept for Route 101, from Big Lagoon in Humboldt County through Crescent City in Del Norte County, is to maintain the existing facilities, including realignment if necessary to avoid unstable areas. The project alternatives are consistent with the current route concept.

The following future projects are scheduled for the area in or near Last Chance Grade:

EA (EFIS #)	DN-101 Post Mile	Project Name	Program Year	Approve Contract	Accept Contract
01-0B27U4 (01 1500 0111)	14.9-15.3	Repair Storm Damage (Last Chance Slips)	2016	5/27/16	6/01/17
01-0B280 (01 1200 0112)	17.4-17.4	Reconstruct Roadway (Log Crossing Repair)	2016	7/13/16	12/01/17
01-0B290 (01 1200 0113)	21.7-22.9	Construct Soldier Pile Wall (Hamilton 2 Retaining Wall)	2016	7/18/16	11/01/17
01-0B300 (01 1200 0116)	22.0-22.0	Stabilize Roadway (South Hamilton Slipout)	2015	10/14/15	12/31/16
01-49350 (01 1500 0116)	12.94-21.23	Reconstruct Drainage - 11 Locations (DN 101 Reconstruct Drainage)	2018	7/15/18	11/01/19
01-0G210 (01 1600 0137)	21.23-21.23	Permanent Restoration at Cushing Creek	K-Phase	5/24/22	12/22/23

Complete Streets

Caltrans' Complete Streets Directive promotes a multimodal transportation system that safely accommodates bicyclists, pedestrians, transit and vehicular users. This portion of US 101 is part of the Pacific Coast Bike Route and provides access to the California Coastal Trail (CCT). This project will improve utility for vehicles, and bicyclists, by increasing shoulder width and sight distance. Design consideration will be given to improving access and safety for pedestrians utilizing the CCT and other park facilities, once an alternative route has been selected.

Context Sensitive Solutions

The project is adjacent to Redwood National and State Parks, which are designated as a World Heritage Site and an International Biosphere Site. The project is also located within the ancestral territories of four federally recognized tribes, the Yurok Tribe, Elk Valley Rancheria, Tolowa Dee-ni' Nation and Resighini Rancheria. Park representatives and tribal members have participated in the selection and development of the project alternatives and will provide additional future consultation.

Sea Level Rise and Climate Change

Last Chance Grade is highly susceptible to the impacts of sea level rise and climate change. The alternatives developed result in facilities that have greater resiliency to the effects of sea level rise and climate change. For more information see EFS Section 9.1 under "Sea Level Rise and Climate Change".

6. ALTERNATIVES

Fourteen alternative alignments were studied for this project and eight have been eliminated from further study. This PSR consists of seven alternatives and includes one alternative to maintain the existing alignment (referred to as the No Build alternative). All build alternatives propose a two-lane highway with an intermittent truck-climbing/passing lane. Each lane would be 12 feet wide, with 8 foot shoulders (10 foot shoulders in tunnels). There are three proposed roadway widths among the six proposed build alternatives: 40 feet (12 foot lanes, 8 foot shoulders), 44 feet (12 foot lanes, 10 foot shoulders in tunnels) and 52 feet (12 foot lanes, 8 foot shoulders and a 12 foot truck-climbing/passing lane). For alternatives in old-growth redwood forests, shoulders may be as narrow as four feet, and a viaduct will likely be proposed to reduce impacts to old-growth redwoods. All alternatives were developed with vertical grades not to exceed 7%, a design speed of 55 mph, a minimum horizontal curve radius of 1,000 feet (with minor exceptions, where noted),

and superelevation rates that meet current design standards. At this phase in the project cut slopes of 1.5:1 (H:V) were assumed, with fill slopes that vary between 1.5:1 to 2:1 (flatter fill slopes were assumed in locations where the terrain would allow additional fill placement). At the present time, no special facilities, such as a vista point or rest area, are identified for any of the project alternatives. However, the existing overlook at PM 13.2 will remain functional. Determination of which portions of the existing alignment will be used or restored will need to be evaluated in an additional planning effort with State and National Parks and the community, and will depend on the alternative selected for construction. The current cost estimate does not account for restoration of the bypassed existing alignment. Layouts & Profiles, Typical Cross Sections are included as Attachments B and C, respectively.

6A. Viable Alternatives

Alternative A1 (PM 13.47 to PM 15.56): Rudisill Road to LCG Tunnel

This alternative departs US 101 with an 850 foot radius horizontal curve at Rudisill Road (PM 13.47) and enters Redwood National Park (RNP) at an elevation of 380 feet. The alignment crosses the California Coastal Trail (CCT), exits RNP after 500 feet, and gains approximately 900 feet of elevation as it climbs the back side of the LCG hill. Connectivity to the CCT will need to be reestablished, possibly with an undercrossing where the fill prism is shallow and narrow. At 2.3 miles along the alignment it heads west and utilizes a 125 foot high bridge (Bridge 1a) over an ephemeral tributary of Wilson Creek, and enters a tunnel (Tunnel 1) before reaching the eastern boundary of Del Norte Coast Redwoods State Park. Tunnel 1 is 2,425 feet long with a 2.6% grade and a northern portal near US 101 at PM 15.56. The alignment ties back into US 101 on a 900 foot radius horizontal curve. The alignment is 3.2 miles in length and eliminates a 2.1 mile long segment of existing US 101.

Alternative A1 Summary				
Length (miles)	Roadway Cost (2016)	Structure Cost (2016)	Right of Way Cost (2016)	Total Capital Cost (2016)
3.2	\$189,214,000	\$464,472,000	\$17,919,000	\$671,605,000

Alternative A2 (PM 13.47 to PM 15.92): Rudisill Road to Damnation Trailhead

Alternative A2 is common to Alternative A1 for the initial 2.3 miles of the alignment, where the alignment then continues northeast from mile 2.3 and enters a large cut section before crossing an ephemeral tributary of Wilson Creek on a proposed 115 foot high bridge (Bridge 2a). The alignment continues on a side-hill ascent through a small cut, and enters a 1,100 foot long bridge with a 7% grade (Bridge 2b) just prior to Del Norte Coast Redwoods State Park's eastern boundary and then passes through old growth forest. The alignment reconnects with existing US 101 within 450 feet of the viaduct at PM 15.92, prior to the Damnation Creek Trailhead pull-out. The alignment is also 3.2 miles in length and eliminates a 2.5 mile long segment of existing US 101.

Alternative A2 Summary				
Length (miles)	Roadway Cost (2016)	Structure Cost (2016)	Right of Way Cost (2016)	Total Capital Cost (2016)
3.2	\$170,744,000	\$26,677,000	\$42,392,000	\$239,813,000

Alternative F (PM 14.24 to PM 15.56): Full Tunnel

Alternative F proposes a complete tunnel option to realign US 101. The alternative departs US 101 at PM 14.24 with a northeast bearing in order to go behind the landslide failure planes. The

alignment extends 750 feet before entering the southern tunnel portal (Tunnel 2) at an elevation of approximately 610 feet. The tunnel maintains a grade of 4% until reaching its northern portal at an elevation of approximately 840 feet. Upon leaving the northern portal, the alignment extends approximately 450 feet while ascending at a grade of 5.6% before reconnecting to existing US 101 at PM 15.56. The proposed tunnel is 5,600 feet in length and would generate approximately 200,000 cubic yards of excess excavation material. In the event a location near the alignment cannot be identified, an off-site location will need to be found. The alignment is 1.3 miles in length and eliminates a 1.3 mile segment of US 101. The tunnel's feasibility has not yet been proven, and is complicated by the fact that it passes between the boundary separating the Franciscan Complex Broken Formation and the Melange. Extensive geotechnical studies will be needed to determine if this is a viable alternative.

Alternative F Summary				
Length (miles)	Roadway Cost (2016)	Structure Cost (2016)	Right of Way Cost (2016)	Total Capital Cost (2016)
1.3	\$69,972,000	\$978,070,000	\$13,585,000	\$1,061,627,000

Alternative C3 (PM 13.47 to PM 19.81): Rudisill Road to South of Mill Creek Access

Alternative C3 is common to Alternatives A1 & A2 for the initial 2.3 miles of the alignment. At mile 2.3 the alignment continues north while remaining east of the Del Norte Coast Redwoods State Park and crosses three ephemeral tributaries of Wilson Creek utilizing two bridges (Bridge C1 & C2). At mile 3.25 the alignment enters the southern portal of a 1,680 foot long tunnel (Tunnel 3) with a 3.9% grade. The tunnel in this alternative is used to avoid a significant cut section through an unavoidable 1100 foot high ridge. From the northern tunnel portal, the alignment continues north for 3,000 feet, crossing one ephemeral tributary of Wilson Creek on a bridge (Bridge C3), then swings to the east to avoid old growth forest within the State Park. Through this section, north of the tunnel, estimated cut and fill lines appear close to the Park boundary. Once survey information is available and design work begun, the alignment and/or profile will be adjusted, as necessary, to avoid direct impact to the Park. The alignment crosses two more ephemeral tributaries of Wilson Creek, turns north, and at mile 4.9, enters previously harvested State Park forest land. At mile 5.4, the alignment extends through a low gap in the ridge while transitioning from the Wilson Creek watershed to the West Branch (WB) Mill Creek / Smith River watershed. The alignment continues northwest crossing a tributary of WB Mill Creek with a bridge (Bridge C4) at mile 6.6. It continues northwest crossing another tributary (no bridge) to mile 6.7. Bridge C4 was added to the alternative after completion of the Advance Planning Study as discussed in Section 14.4. At mile 6.7, at an elevation of approximately 800 feet, the alignment extends northwest and crosses a drainage of WB Mill Creek on a 1,100 foot long bridge (Bridge 3a) before ascending at 6.9% through a large cut. At mile 7.8, the alignment reconnects with existing US 101 at PM 19.81, approximately 0.4 miles south of the Mill Creek Campground Road intersection, at an elevation of 1,100 feet. The alignment is 7.8 miles in length and eliminates a 6.3 mile long segment of existing US 101.

Alternative C3 Summary				
Length (miles)	Roadway Cost (2016)	Structure Cost (2016)	Right of Way Cost (2016)	Total Capital Cost (2016)
7.8	\$358,009,000	\$401,461,000	\$38,087,000	\$797,557,000

Alternative C4 (PM 13.47 to PM 20.82): Rudisill Road to North of Mill Creek Access

Alternative C4 is common to Alternative C3 for the initial 6.7 miles of the alignment. From mile 6.7, Alternative C4 extends northwest and crosses a drainage of WB Mill Creek on a 564 foot long

bridge (Bridge 4a). At mile 7.5, the alignment crosses Mill Creek Campground Road near its midpoint and continues on a long tangent section. A required public connection to the Mill Creek Campground appears to be feasible at this location. The alignment then crosses a drainage of WB Mill Creek on a 150 foot high bridge (Bridge 4b). At mile 7.7, the alignment begins ascending at 5.9% and crosses two more WB Mill Creek drainages (without bridges). At mile 8.6, the alignment reconnects with existing US 101 at PM 20.82. The alignment is 8.6 miles in length and eliminates a 7.4 mile long segment of existing US 101.

Alternative C4 Summary				
Length (miles)	Roadway Cost (2016)	Structure Cost (2016)	Right of Way Cost (2016)	Total Capital Cost (2016)
8.6	\$413,047,000	\$395,591,000	\$38,678,000	\$847,316,000

Alternative C5 (PM 13.47 to PM 22.73): Rudisill Road to Hamilton Road (Alternative Recommended for Programming)

Alternative C5 is common to Alternative C4 for the initial 7.7 miles of the alignment. From mile 7.7, the alignment extends northeast and crosses a tributary of WB Mill Creek (without a bridge) and enters a large side-hill through-cut. At mile 8.0, the alignment crosses a WB Mill Creek tributary with a 94 foot high bridge (Bridge 5b). Upon departure from Bridge 5b, the alignment enters a large through-cut, and at mile 8.4 enters a final decent. At mile 9.4 an ephemeral tributary of WB Mill Creek is crossed by 66' high bridge (Bridge 5c). At mile 9.9, a larger tributary of WB Mill Creek is crossed by a 12' high bridge (Bridge 5d) while the alignment intersects Hamilton Road and extends west. From this point, the alignment follows the general course of Hamilton Road on a relatively flat grade to its intersection with existing US 101 at PM 22.73. Three smaller bridges (Bridge 5e-5g) are anticipated for this last section. The alignment is 11.7 miles in length and eliminates a 9.3 mile segment of existing US 101, including the Cushing Creek area.

Alternative C5 Summary				
Length (miles)	Roadway Cost (2016)	Structure Cost (2016)	Right of Way Cost (2016)	Total Capital Cost (2016)
11.7	\$533,147,000	\$424,106,000	\$44,897,000	\$1,002,150,000

Alternative M (PM 12.0 to PM 15.5): Maintain Existing (No Build)

This alternative will have no planned construction, and US 101 will continue on its existing alignment. Regular maintenance and operations will continue with this alternative, with emergency restoration projects as needed to address changing conditions. Current annual maintenance costs of \$2 million with a projected cost of approximately \$26 million by 2034 (District 1 Climate Change Vulnerability Assessment and Pilot Studies). Engineering solutions such as retaining walls have not been able to provide long-term stability, but will continue to be necessary to provide an adequate highway facility. As the landslides move, the road will require costly repairs and maintenance with potential environmental impacts including old-growth redwood impacts associated with roadway retreats to keep US 101 open. The potential for a slide movement which is deep and large enough could result in a major roadway failure requiring complete closure of the roadway indefinitely. A major roadway failure would have economic impacts and require a significant detour that is outlined in the LCG Engineered Feasibility Study, *9.2.3 Economic Impact Study*.

6B. Rejected Alternatives

The Last Chance Grade Feasibility Study evaluated a total of fourteen build alternatives and eliminated eight from further study. The criteria used for alternative exclusion includes

geotechnical, environmental, engineering, and planning criteria. These alternatives when compared to the viable alternatives provided no unique advantage to necessitate further study. See *Engineered Feasibility Study* (June 2015) for further details.

6C. Other Considerations

Right of Way

The right of way corridor for US 101 in the vicinity of the project is approximately 100 foot wide. When the right of way was originally acquired the roadway was centered within the 100 foot wide right of way corridor. Portions of the roadway have since moved downward toward the ocean resulting in sections of roadway located outside of Caltrans right of way into State and National Parks Right of Way. Right of Way Data Sheets were prepared for each of the six realignment alternatives and are included as Attachments D.

Design Exceptions

Alternatives A1, A2, C3, C4, C5, and F are preliminary designs conforming to current geometric design standards for horizontal curve radius, shoulder width, superelevation, and maximum grade, except for two needed exceptions for horizontal curve radius. Alternatives A1, A2, C3, C4, and C5 have alignments that are common to each other when departing from existing US 101 at PM 13.4. The first two curves on this alignment have radii of 850 feet and 900 feet, respectively (current design standard is 1000 feet). The reduced curve radii would be required to accommodate the alignments to the natural terrain while conforming to existing US 101. Conforming to the natural terrain in these two locations significantly reduces the magnitude of cut / fill as well as the environmental impact to surrounding Park land. In the event design assumptions change upon the availability of additional data, there may be additional design exceptions needed for a selected alternative.

Advance Planning Study

The Division of Engineering Services (DES) Structure Design provided an Advance Planning Study (APS) for each of the proposed alternatives and is included as Attachment E.

Hazardous Waste

A preliminary Initial Site Assessment (ISA) was prepared for this project and is included in the project file. The ISA found that there are no *Hazardous Waste and Substance Site List* (“Cortese List”) sites along the proposed alignments. A “Cortese site” is, however, present at the former mill site east of the project. The only likely hazardous waste issue is the presence of Aerially Deposited Lead at tie-in locations with existing US 101.

Transportation Management Plan

A Transportation Management Plan (TMP) was prepared for this project and is included as Attachment F. The TMP indicates that significant traffic impacts are not anticipated if its recommendations and requirements are incorporated.

Preliminary Hydraulics Report

A Preliminary Drainage Recommendation was prepared by North Region Hydraulics, and is included in the project file. The recommendation indicates that fish passage is addressed by the use of bridges in the project, but that an additional bridge at mile 6.2 along Alternatives C3, C4, and C5 should be included for a tributary of Mill Creek, where stream channel slopes appear suitable for fish habitat (confirmed by fish count data). Project funds were added to cost estimates to account for the additional bridge recommendation, which was not included in the APS completed by DES.

The drainage recommendation provided a cost estimate for drainage items associated with each of the proposed alternatives:

Alternative	Estimated Capital Drainage (Geotechnical)	Estimated Capital Drainage (Hydraulics)	Estimated Capital Drainage (Total)
A1	\$5,493,700	\$5,247,500	\$10,741,000
A2	\$6,673,300	\$4,923,000	\$11,596,000
C3	\$15,603,000	\$11,510,000	\$27,113,000
C4	\$17,087,000	\$16,321,000	\$33,408,000
C5	\$23,229,000	\$17,746,000	\$40,976,000
F	\$500,000	\$370,000	\$870,000

Storm Water Data Report

North Region Office of Engineering Services prepared a Preliminary Storm Water Data Report (SWDR) which is included in the project file. The SWDR recommends Construction Site Best Management Practices (BMPs) costs should be estimated at 1.25% of the total construction cost. As the project is not located within a TMDL watershed, no Treatment BMPs to address TMDLs are required. Permanent Treatment BMPs are expected to be required and must be incorporated into the project to treat new impervious surfaces.

Geotechnical Report

The Office of Geotechnical Design West prepared a Preliminary Geotechnical Report (PGR) and is included as Attachment G. The PGR provides an overview of on-site geotechnical investigation work that will be required during the next phase of the project. It also indicates that the existing alignment, between PM 12.7 and PM 14.4, is located within the limits of an active earth flow. The first several hundred feet of Alternatives A1-A2 and C3-C5 are also located within this earth flow, as is the southern portal and a portion of the tunnel in Alternative F. Options to mitigate the earth flow will need to be evaluated for all alternatives. Additionally, Alternatives A1-A2 and C3-C5 extend through probable mapped dormant mature landslides over the next mile beyond the earth flow.

Materials

District 1 Materials Lab provided a preliminary Materials Recommendation which is included in the project file. The report indicates that as no landform samples are currently available, its recommendations are conservative and based on known or extrapolated data at tie-in points and estimated conditions in the alignment area. A twenty year traffic index from an adjacent project (2015) was used. All structural section alternatives include subgrade enhancement geotextile (SEG) or SEG in conjunction with Bi-axial Geogrid. Underdrains are recommended for the base of all cut slopes.

7. COMMUNITY INVOLVEMENT

During the development of the Last Chance Grade Feasibility Study (completed June 2015) Caltrans partnered with agencies and Tribal Governments with a vested interest and land management responsibilities near US 101 at Last Chance Grade. The partnership consists of Caltrans, California Department of Parks and Recreation, National Park Service, Yurok Tribe, Elk Valley Rancheria, and the Tolowa Dee-ni' Nation (collectively, "the Partners.") The goal of creating the partnership was to study and develop permanent solutions to the instability at Last Chance Grade.

Caltrans and the Partners recognized the need for extensive public participation during the development of this Project Study Report. In March 2016, Caltrans and the Partners hosted three

community town hall meetings to inform the community on the status of the project. The community town hall meetings were held in Crescent City, Klamath and Eureka. A Community Outreach Summary and Public Engagement Plan is included as Attachment H and provides information regarding meeting methodology, format, results, meeting material and public comment.

8. ENVIRONMENTAL DETERMINATION/DOCUMENT

A Preliminary Environmental Assessment Report (PEAR) was prepared for the project and is included as Attachment I. The PEAR identifies the anticipated environmental documents for all alternatives as being an Environmental Impact Report and Environmental Impact Statement under the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA), respectively. The estimated length of time to obtain environmental approval is between 5 and 9 years. This project will require the following permits, agreements, and consultations:

- US Army Corps of Engineers: Section 404 Individual or Nationwide Permit
- North Coast Regional Water Quality Control Board: Section 401 Water Quality Certification
- California Department of Fish and Wildlife:
 - Stream and Lakebed Alteration Agreement (1600)
 - California Endangered Species Act consistency determinations for threatened and endangered species determinations, and other consultations for species listed only by California
- California Coastal Commission: Coastal Development Permit: State and Local jurisdictions. Consolidating permit jurisdiction is possible.
- California Department of Forestry and Fire Protection: Timberland Conversion Permit or Public Utility Right of Way Exemption
- US Fish and Wildlife Service: Endangered Species Act, Consultation for impacts to marbled murrelet, and northern spotted owl
- US National Marine Fisheries Service Endangered Species Act and Essential Fish Habitat: Consultation for impacts to Southern Oregon/Northern California Coast coho Evolutionarily Significant Unit
- State Water Resources Board: Construction General Permit
- Redwood National and State Parks:
 - Section 4(f) Agreement
 - Permit to Enter
 - Transfer of Jurisdiction
- Tribal Consultations
- State Historic Preservation Office Consultation

All proposed alternatives have the potential for impact to environmental resources, including the loss of native habitat and increased impervious surface. During project development extensive cultural and biological surveys will be required. Consultation and coordination with the Partners as well as resource/regulatory agencies will be required throughout project development.

9. FUNDING /PROGRAMMING

Funding

It has been determined that this project is eligible for Federal-aid funding. This project is proposing special funding through the Federal Emergency Response Program.

Cost Estimates

A large percentage of project cost for all alternatives is the construction of bridges (most are large) and tunnels. All project alternatives, with the exception of Alternative A2, include a tunnel, with lengths of 2,425', 5,600' and 1,680' for Alternatives A1, F, and C3-C5, respectively. The project alternatives have structure costs that range from approximately \$26.7 million for Alternative A2 to \$980 million for Alternative F.

All project alternatives, with the exception of Alternative F, have significant to very large excavation quantities and costs, which range from approximately \$47 million for Alternative A1, to \$288 million for Alternative C5. For all project alternatives, with the exception of Alternative F, it is anticipated that excess excavation material (that which is beyond what is required for fill sections) can be placed along the alternative alignments, especially the first 1.2-mile common portion of the alignments. This material would take the form of permanent and stable engineered fill prisms (terraces) along both sides of the highway. They will need to be tied into the landscape as visually acceptable features that are amenable to revegetation with native species. For Alternative F, off-site disposal is assumed to be necessary for approximately 200,000 cubic yards of excess material from tunnel excavation. An estimated amount of \$5 million has been included for disposal, with the assumption that a disposal site can be found no further than the general Crescent City area. Beneficial use(s) for this material (rock) may be identified at a later time.

The project alternatives have significant right of way purchase and utility relocation costs, which range from approximately \$13.6 million for Alternative F, to \$44.9 million for Alternative C5. High utility relocation costs, especially for the C3 to C5 Alternatives, result from the need to relocate a number of large transmission line towers that run near to and generally parallel to the alignments. Cost estimates for acquisition of private timber production land is also significant for all project alternatives, with the exception of Alternative F. Estimated new right of way acquisition area ranges from approximately 164 acres for Alternative A1, to 581 acres for Alternative C5. The Alternative F estimate is approximately 13 acres.

The current cost estimate does not include funds for removal or restoration of any part of the bypassed highway. After final selection of an alternative for construction in the next project phase, further consultation with the project partners will be needed to determine the scope and cost for this work.

Estimated environmental mitigation costs for all alternatives are very large. All alternatives impact to varying degrees old growth redwood forest within Del Norte Coast Redwoods State Park, a part of Redwood National and State Parks. Mitigation cost estimates (acquisition and construction) vary from \$50.6 million for Alternative F, to \$98.4 million for Alternative C5. The cost estimate for each alternative are included in Attachment J.

10. DELIVERY SCHEDULE

Project Milestones	Project Milestone	Scheduled Delivery Date (Month, Day, Year)
Program Project	M015	01/16/2017
Begin Environmental Document (ED)	M020	09/14/2017
PA & ED	M200	02/16/2026
Right of Way REQTS	M224	08/19/2024
PS&E To DOE	M377	03/15/2029
PROJECT PS&E	M380	04/15/2030
Right of Way Certification	M410	07/01/2030
Ready to List	M460	09/02/2030
HQ Advertise	M480	12/02/2030
Award	M495	04/14/2031
Approve Contract	M500	06/16/2031
Contract Acceptance	M600	10/14/2039
End Project	M800	09/29/2042

A Programming Sheet has been prepared for the project and is included as Attachment K.

11. RISKS

A Level 2 Risk Register has been prepared for the project. A Level 2 Risk register was selected based upon the limited resources available during the Project Initiation Phase. It is recommended that a Level 3 Risk Register be prepared during the future phases of this proposed project. The major possible risks to project completion time schedule, cost, and alternative viability include: existing geology of proposed realignments, sensitivity of natural environment, opposing environmental activism, complicated permitting and mitigation strategies, and tunnel constructability. The Risk Register is included as Attachment L.

12. FHWA COORDINATION

Caltrans has completed many Federal Emergency Relief (ER) Program Projects on Last Chance Grade within the last five years. The two transportation agencies have communicated throughout that period as the roadway continues to fail and movement worsens over time. In June 2015, a Last Chance Grade Issue Paper was submitted to FHWA documenting the need for ER funding for Last Chance Grade. Multiple meetings have since occurred including a visit from FHWA geologists to the site in April 2016. March 2016 resulted in another Federal Disaster Declaration for the County of Del Norte. A new Damage Assessment Form for damage repairs to the roadway and walls along the grade will be submitted to FHWA for approval prior to approval of this document in June.

Caltrans coordination with FHWA during project development and construction is likely to be extensive in a project of this size and scope. Discussions regarding the structure and form this coordination will take have yet to be determined.

PROJECT REVIEWS

Name	Reviewer	Date
Field Review	PDT	7/10/15
Advance Planning	Talitha Hodgson	5/27/16
Project Management	Sebastian Cohen	5/27/16
Environmental	Rosalind Litzky	5/27/16
Program Advisor	Tom Fitzgerald	5/27/16
District Safety Review	Mark Sobota	5/27/16

13. PROJECT PERSONNEL

Name	Title	Phone Number
Jeff Pimentel	Project Engineer	(707) 445-6358
Sebastian Cohen	Project Manager	(707) 441-3979
Talitha Hodgson	Chief, Advance Planning	(707) 441-3969
Kevin Church	Chief, Traffic Operations	(707) 445-6377
David Morgan	Chief, Traffic Safety	(707) 445-6376
Rosalind Litzky	Environmental Senior	(707) 445-5222
Jason Meyer	Environmental Coordinator	(707) 445-6322
Jeremiah Joyner	Senior Right of Way Agent	(707) 445-6424

14. ATTACHMENTS

- A. Project Location Map (1)
- B. Layouts & Profile (8)
- C. Typical Cross Sections (1)
- D. Right of Way Data Sheets (30)
- E. Advance Planning Study (39)
- F. Transportation Management Plan (7)
- G. Preliminary Geotechnical Report (Less Layout Attachments) - April 8, 2016 (6)
- H. Community Outreach Summary & Public Engagement Plan (77)
- I. Preliminary Environmental Assessment Report (23)
- J. Cost Estimates (18)
- K. Programming Sheet (1)
- L. Risk Register (2)