



# **Last Chance Grade**

## **Economic Impact of US-101 Closure**

*A Regional Impact Analysis*

*California Department of Transportation*

*District 1*

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## EXECUTIVE SUMMARY

Last Chance Grade (LCG) is a 3.5mile segment of roadway along United States Highway 101 (US-101), and serves as an arterial gateway for people and businesses located along California’s North Coast. Perched above the Pacific Ocean and located amongst redwood forests, this roadway segment is geologically unstable and prone to landslides and slip outs. **Table 1** summarizes the expected loss of commerce and jobs in the region because of a closure of US-101 at LCG in both directions for a full year. The loss of economic activity estimates below include Curry County in Oregon and Del Norte and Humboldt Counties in California, respectively.

**Table 1: Last Chance Grade Closure - Regional Impact Summary**

| Type of Impact      |                |
|---------------------|----------------|
| Business Output     | -\$456 million |
| Value Added         | -\$237 million |
| Labor Income        | -\$145 million |
| Job Loss            | -3,800 jobs    |
| Travel Costs        | -\$236 million |
| Forgone Trips Costs | -\$417 million |

In 2017 alone, the Federal Highway Administration (FHWA) provided \$27.6 million for construction repairs at LCG because of movement and deformation of the roadway.<sup>1</sup> Roadway deterioration has accelerated within the last decade, requiring monthly pavement repairs when heavy rainfall occurs. **Figure 1** illustrates recurring costs due to constant pavement repairs.

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<sup>1</sup> Caltrans. (2017). Storm Damage and Repairs. Caltrans District 1. Retrieved February 28, 2018 from [http://www.lastchancegrade.com/files/managed/Document/272/LCG\\_Storm\\_Damage\\_Repair.pdf](http://www.lastchancegrade.com/files/managed/Document/272/LCG_Storm_Damage_Repair.pdf)

**Figure 1. Recurring Damage Along Last Chance Grade<sup>2</sup>**



There is strong local interest in averting lane closures along this segment due to the associated economic and social impacts. Residents and businesses lack travel options within this rural, isolated region along the North Coast. This report analyzes potential costs to motorists and the regional economy (Curry County in Oregon and Del Norte and Humboldt Counties in California) if LCG were closed for a full year. In 2015, the California Department of Transportation’s (Caltrans) Transportation Economic Analysis Branch (formerly known as the Economic Analysis Branch) conducted an economic impact analysis in Del Norte County, entitled “Last Chance Grade Economic Impact of US-101 Closure.” In addition to performing an economic analysis to explore the effects of a closure, the intent of this effort was to create community awareness and build interest among regional stakeholders regarding the repair of LCG. This report expands upon the initial Del Norte analysis by including Curry County in Oregon and Humboldt County in California to formulate a regional assessment, recognizing that these economies rely on LCG for mobility and business purposes.

<sup>2</sup> Cohen, S. (2016). Last Chance Grade Community Town Hall. Caltrans District 1. Retrieved on March 4, 2018 from [http://www.lastchancegrade.com/files/managed/Document/213/lcg\\_psr\\_final\\_s-part5.pdf](http://www.lastchancegrade.com/files/managed/Document/213/lcg_psr_final_s-part5.pdf)

Del Norte County is primarily home to an array of industries: natural resources, manufacturing, tourism and hospitality, social services, and government. One of the primary attractions in the area is the Jedediah Smith Redwoods State Park near Crescent City, which generates the majority of seasonal tourism. The Elk Valley Casino in Crescent City and the Lucky 7 Casino and Hotel in nearby Smith River are also popular leisure and entertainment destinations for visitors. A closure at LCG would require northbound travelers to detour to an alternate route by traveling east along California State Route 299 (SR-299), north on Interstate 5 (I-5), west on California State Route 199 (SR-199), and west on California State Route 197 (SR-197). A detour for traffic going southbound on US-101 would follow the same routes in reverse order.

This detour would generate an extra 320 miles traveled and an extra six hours of travel time from Brookings, Oregon to Arcata, California. The additional distance is estimated to increase travel costs by \$236 million per year. This estimate includes vehicle operations and maintenance, freight, shipping, safety and pollution costs, and losses in travel time and reliability and tourism revenue. Emissions generated from the closure would result in a cost of \$14 million per year due to motorists taking an alternate route. In addition, expected job loss due to increased transportation costs, decreased competitiveness, and necessary changes in supply chain operations is estimated to be nearly 2,700 direct jobs and over 3,800 total jobs, resulting in losses of approximately \$145 million in labor income and \$456 million in business sales. Anticipated costs and losses are supported by interviews that were conducted with businesses in leisure and hospitality (restaurants, hotels, casinos, and retail), agriculture, manufacturing, and government institutions. Included in this report is an outline of the region's economy, the methodology of analysis, and the potential impacts of a closure.

## BACKGROUND

US-101 at LCG is the main arterial route for coastal travelers and businesses, connecting motorists to multiple destinations, such as: Port Orford, Gold Beach, Brookings, Medford, Crescent City, Arcata, Fortuna, and the Port of Oakland. As a follow-up to a Caltrans report from 2015 entitled, “Last Chance Grade Economic Impact of US-101 Closure,” this three-county analysis explores the potential economic impacts to Del Norte, Humboldt, and Curry Counties as a region resulting from a yearlong closure. US-101 at LCG is a conventional two- to four-lane rural highway, located between Wilson Creek and Crescent City in Del Norte County at postmile 12.0 to 15.5, where recurring landslides have been taking place for decades.<sup>3</sup> **Figure 2** illustrates the regional boundary of this analysis.

**Figure 2. Area of Regional Economic Impact Analysis**

### Last Chance Grade Regional Impact Analysis *US-101*



<sup>3</sup> Caltrans District 1. (2016). Last Chance Grade Project Study Report. California Department of Transportation. Retrieved Sept. 16 from [http://www.lastchancegrade.com/files/managed/Document/208/lcg\\_psr\\_final\\_s.pdf](http://www.lastchancegrade.com/files/managed/Document/208/lcg_psr_final_s.pdf)

### *Initial Analysis Compared to Regional Analysis*

An economic impact analysis was conducted on Del Norte County (2015) to examine the potential effects of a yearlong closure at LCG. The analysis involved reviewing sketch-level travel data and interviewing local constituents. Caltrans determined it would be beneficial to expand upon this initial analysis to explore how a closure at LCG would affect the regional economy, as coastal communities deem US-101 their primary gateway. Caltrans collaborated with the Economic Development Research (EDR) Group to assist with this analysis. The collaboration resulted in refinements to the methodology and expanded the analysis to include regional travel and business conditions. In addition, the analysis includes additional data sources: forecasted travel conditions, additional interviews to refine impact assumptions, and an assessment of non-traveler (foregone) trips costs. Consequently, results from this regional analysis are distinctly different from the 2015 study. Specific changes to the methodology are presented in Appendix I.

### *The Region's Economy*

The region (Curry, Del Norte, and Humboldt Counties) is home to approximately 186,000 residents<sup>4</sup> and employs close to 60,000 people (2016). A majority of the labor force works in industries such as government, retail trade, hospitality and tourism, health care, social services, manufacturing, education, and agriculture.<sup>5</sup> Each county is known for specific niche industries; for example, Humboldt County is home to Humboldt State University (education), Del Norte County is home to Pelican Bay State Prison and tourism (redwoods, parks, gaming, and art), and Curry County is home to agriculture goods (blueberries, Easter lilies, Oregon myrtlewood, and cedar) and serves as a retirement community. Roughly, 16% of the population in Del Norte and Humboldt Counties are 65 years and over.<sup>6</sup> In comparison, 32% of the population in Curry County is 65 years and over. **Table 2** reflects 2015 employment totals for each county by industry.

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<sup>4</sup> US Census Bureau. (n.d.). QuickFacts – Curry County, Oregon. US Census Bureau. Retrieved on Feb. 2, 2018 from <https://www.census.gov/quickfacts/fact/table/humboldtcountycalifornia,delnortecountycalifornia,currycountyoregon/PST045217>

<sup>5</sup> US Bureau of Labor Statistics. (2015). Quarterly Census of Employment and Wages Location Quotient Calculator, Oregon Statewide – Curry County, Oregon. US Bureau of Labor Statistics. Retrieved on Feb. 10, 2017 from [https://data.bls.gov/location\\_quotient/ControllerServlet](https://data.bls.gov/location_quotient/ControllerServlet)

<sup>6</sup> US Census (n.d.). Quick Facts - Humboldt County, California; Del Norte County, California; Curry County, Oregon. US Census. Retrieved on Feb. 2, 2018 from



**Table 2. 2015 County Employment for Select Industries (rounded to nearest hundred)<sup>7</sup>**

| Employment Industry                      | Humboldt      | Del Norte     | Curry         | Industry % of Total Regional Jobs |
|--|---------------|---------------|---------------|-----------------------------------|
| <b>Total Jobs</b>                        | <b>70,521</b> | <b>10,639</b> | <b>10,143</b> | 100%                              |
| Health Care and Social Assistance        | 9,171         | 1,550         | 1,724         | 14%                               |
| Retail Trade                             | 8,896         | 1169          | 1307          | 12%                               |
| Public Administration                    | 12,564        | 3,649         | 1085          | 19%                               |
| Educational Services                     | 718           | 955           | 710           | 3%                                |
| Accommodation and Food Services          | 5,666         | 955           | 1,220         | 9%                                |
| Manufacturing                            | 2,926         | 132           | 718           | 4%                                |
| Construction                             | 4,382         | 337           | 658           | 6%                                |
| Agriculture, Forestry, Fishing & Hunting | 1,334         | 366           | 304           | 2%                                |
| Arts, Entertainment, and Recreation      | 2,026         | 551           | 219           | 3%                                |
| Transportation and Warehousing           | 1,375.2       | 132           | 169           | 2%                                |
| Other Professional Services              | 7,968         | 828           | 1,271         | 11%                               |
| All Other Job Industries                 | 13,495        | 15            | 757           | 16%                               |

*US-101 Connects Communities*

US-101 serves as a vital coastal gateway for local, regional, and visiting travelers—running through California, Oregon, and Washington—because of the lack of alternate routes. The distance between Brookings, Oregon and Arcata, California is a little over 100 miles. US-101 allows businesses to import or export goods and provides residents access to employment opportunities outside of the region. Even though LCG is designated as a large interstate truck route per the Surface Transportation Assistance Act (STAA)<sup>8</sup>, some businesses choose to send smaller trucks through LCG instead of shipping goods by way of larger commercial trucks on I-5.

<sup>7</sup>US Bureau of Economic Analysis. (n.d.). CA 25N Total Full-time and Part-time Employment by NAICS Industry. United States Department of Commerce. Retrieved on April 4, 2018 from <https://tinyurl.com/ybxcno9>.

Note: BEA employment data was used, but in some instances, key industries were missing data. Thus, a proportional rate was used from the US Census's On the Map to estimate missing employment figures for some industries. The On the Map data (2015) applied was Job Count by NAICS Industry Sector – All Jobs, retrieved Feb. 21, 2018 from <https://onthemap.ces.census.gov/>.

<sup>8</sup> DKS Associates Transportation Solutions. (2012). Memorandum – US 101 Corridor Plan Task 3.1 – Review Adopted Plans, Rules and Regulations

## ROAD CLOSURE TRAFFIC IMPACTS

A major landslide or slip out at LCG could close all lanes for a significant amount of time, segregating communities within the region and affecting the economy. The preferred detour route adds 320 miles, or six-plus hours of travel time from Brookings, OR to Arcata, CA. A hypothetical sketch-level travel scenario of the detour was developed to compare against existing travel and economic conditions to estimate the net impact of a closure to the region. The following sections outline existing travel patterns and closure conditions.

### *Current Conditions*

Approximately 3 million vehicles<sup>9</sup>, including 300,000 trucks<sup>10</sup>, crossed the US-101 California-Oregon state line in 2016. US-101 between Brookings, OR and Arcata, CA, is a scenic route that travels past towns, houses, and businesses (see **Figure 3**). Two primary arterial roadways intersect this 100-mile stretch: US-199 near Crescent City, and SR-299 near Arcata. The speed limit on this segment is generally 55 miles per hour, and the highway designation along this segment varies between a two-lane conventional highway, expressway, and a four-lane freeway<sup>11</sup>. Vehicle speeds average 50 miles per hour over this 100-mile stretch during non-peak times; at this speed, it takes travelers approximately two hours to travel from Brookings to Arcata. By comparison, the average travel speed is approximately 45 MPH during commute (peak travel) times.

Based on Caltrans annual traffic count publication, it is estimated that an annual average daily traffic of 6,100 vehicles pass through LCG. Of these 6,100 vehicles (5,193 cars and 907 trucks), Caltrans District 1 estimates that approximately 360 annual average daily vehicles traveled across the California-Oregon border in 2010 to the City of Arcata in Humboldt County using LCG. This estimate was increased to 610 annual average daily vehicles in 2016. **Table 3** summarizes these 6,100 vehicles for 2016 travel conditions to estimate traveler and regional impacts. These vehicle estimates indicate the daily volume of traffic that are subjected to potential active landslides.

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<sup>9</sup> Caltrans' Division of Traffic Operations. (n.d.) 2016 Traffic Volumes (for ALL vehicles on CA State Highways). Caltrans. Retrieved on Feb. 12, 2017 from <http://www.dot.ca.gov/trafficops/census/volumes2016/Route101.html>

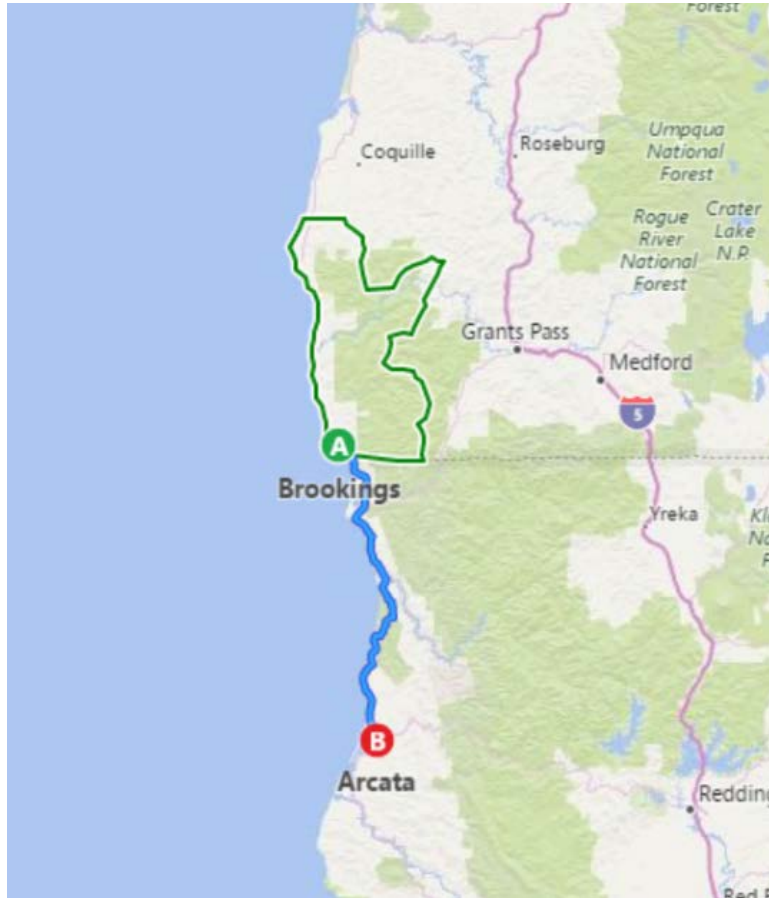
<sup>10</sup> Caltrans' Division of Traffic Operations. (n.d.) 2016 Truck Traffic Annual Average Daily Truck Traffic. Retrieved on Feb. 12, 2015 from [http://www.dot.ca.gov/trafficops/census/docs/2016\\_aadt\\_truck.pdf](http://www.dot.ca.gov/trafficops/census/docs/2016_aadt_truck.pdf)

<sup>11</sup> Caltrans (2002). Route Concept Report—Route 101 Corridor. Caltrans. Retrieved on Nov. 10, 2016 from [http://www.dot.ca.gov/dist1/planning/regional-system/tcr/rcr\\_101.pdf](http://www.dot.ca.gov/dist1/planning/regional-system/tcr/rcr_101.pdf).

**Table 3. Annual Vehicle Miles Traveled Between Brookings, OR to Arcata, CA (rounded to nearest thousand)<sup>12</sup>**

|                    | Annual Trips | Annual Vehicle Miles Traveled (VMT) Via US-101 |
|--------------------|--------------|--|
| Passenger Vehicles | 189,500      | 151,636,000                                    |
| Commercial Trucks  | 331,000      | 30,457,000                                     |

**Figure 3. Normal/Current Condition Route<sup>13</sup>**



Trucks traveling through LCG between Curry County and the City of Arcata account for nearly 15% of the average annual daily travel (AADT).<sup>14</sup> US-101 is the most direct route into and out of the region, serving as the main corridor for businesses to access the towns of Smith River, Klamath, Crescent City, Arcata, Eureka, and other southern destinations. This analysis assumes all travelers would use the defined detour route.

<sup>12</sup> Note: Annual Travel is based on multiplying passenger daily trips of 5,193 and truck daily trips of 907 by 365 days. Annual passenger vehicle miles traveled is based on internal distance of 80 miles per trip multiplied by annual trips, or pass through distance of 200 miles multiplied by annual trips. Truck annual vehicle miles traveled is based on internal distance of 80 miles multiplied by annual trips and pass through distance of 80 miles multiplied by annual trips.

<sup>13</sup> Google Maps. (2017). Brookings, OR 97415 to Arcata, California. Google. Retrieved on July 7, 2017 from [goo.gl/9xMdas](http://goo.gl/9xMdas)

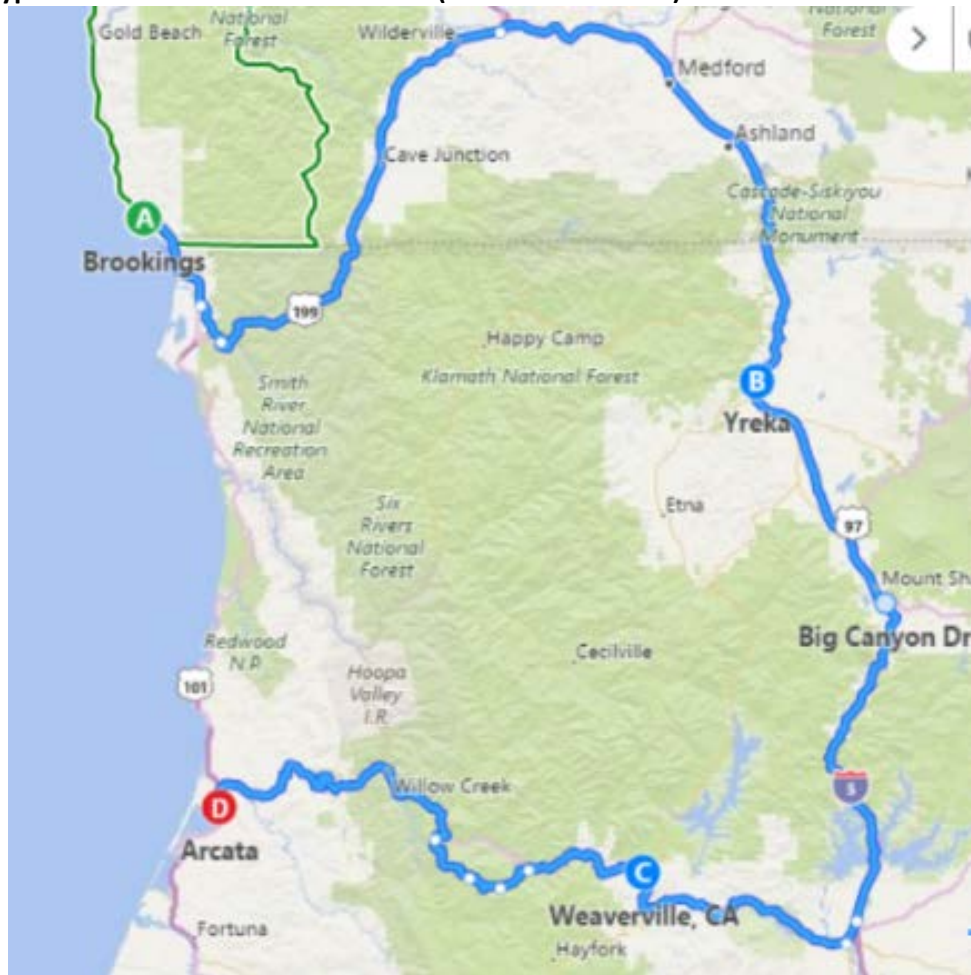
<sup>14</sup> Caltrans' Division of Traffic Operations. (2016) 2016 Truck Traffic Annual Average Daily Truck Traffic. Retrieved on Feb. 12, 2018 from <http://www.dot.ca.gov/trafficops/census/docs/2016Truck.xls>

### *Detour Route Travel Conditions*

If LCG were closed, it is assumed that a significant number of travelers would forego their plans to visit the region. A detour adds an additional 320 miles and six hours for travelers if US-101 is not accessible. This traversed alternate route is depicted in **Figure 4**. A detour route involves traveling down I-5 from Medford to take SR-96. However, this route is not available year-round because SR-96 is more likely to close because of weather conditions.

As of 2016, traffic conditions on the detour route consist of approximately 4,450 annual average daily vehicles traveling on SR-199, of which 660 vehicles were trucks ranging from two to five-plus axles. Approximately 5,800 vehicles traveled on SR-299 between Blue Lake Road in Humboldt County and Rock Creek Road in Shasta County, of which 740 vehicles were trucks.<sup>15</sup>

**Figure 4. Hypothetical Road Closure Condition (Alternate Scenario) Route<sup>16</sup>**



<sup>15</sup> ibid

<sup>16</sup> Google Maps. (2017). Brookings to Arcata. Google. Retrieved on July 7, 2017 from [goo.gl/wXuGFz](http://goo.gl/wXuGFz)

## **METHODOLOGY AND ASSUMPTIONS**

Caltrans used an array of noted sources to develop estimates of regional trips, miles traveled, origins and destinations, and speed by vehicle type for the following two scenarios: (1) current conditions, and (2) a closure of US-101 along LCG. These travel characteristics were used as the primary inputs for this analysis. Caltrans used the Transportation Economic Development Impact System (TREDIS) to estimate changes in travel costs due to a net increase in vehicle trips, miles traveled, and hours traveled associated with a detour. This economic assessment includes cost estimates associated with additional trip planning (reliability), travel time, vehicle operating costs, and safety. To identify expected job loss based on industry sensitivities to restricted customer and delivery access, Caltrans and the EDR Group applied a modeling-based approach complemented by a series of interviews with businesses in the region. Adjustments were incorporated for overlaps identified between modeling assumptions and interview responses. Caltrans used TREDIS to estimate how anticipated job loss would result in reduced output and income. This regional perspective includes additional losses associated with supplier purchases (indirect), and employee spending (induced).

Caltrans estimated initial job loss (direct) using a combination of data sources, including: industry profiles, economic development reports, and business interviews. Additional details on the applied methodology are presented in the section, “Expected Job Loss Due to US-101 Closure.” Supplier purchase effects (indirect) include a decline in raw materials and intermediate input purchasing made by regional suppliers. Employee spending effects (induced) reflect the reduction in income, thus, a decrease in purchasing power for households on traditional categories, such as entertainment, leisure activities, and retail shopping. Combining these impact types (direct, indirect, and induced) provides an estimate of total expected job, income, and sales loss likely to occur in the event of a yearlong closure. Regional constituents, businesses, and the California and Oregon Departments of Transportation were consulted in the development of input assumptions used in the TREDIS model.

Given the strong presence of recreational, leisure, and entertainment-oriented industries with seasonal fluctuations, Caltrans assumed that 90% of passenger car trips will be forgone—if the closure lasts a year—because of the length and duration of the detour. This assumption indicates seasonal visitors are likely to choose alternative destinations in California, rather than endure the extended detour to visit the redwood forests and casinos in the Crescent City. For truck trips, Caltrans assumed a 50% trip

reduction—if the closure lasts a year--due to projected business impacts in Del Norte County, and applied this reduction to the following variables:

- Jobs lost in primary industries, such as: leisure and hospitality, agriculture, manufacturing and government, are projected to result in a significant loss in truck trips;
- Sales lost due to constrained access are projected to result in a moderate loss in truck trips;
- Re-direction of supplier procurement are projected to result in a loss in truck trips; and
- Continued operations for some businesses, despite increase in transportation costs.

Below is a summary of sources and assumptions applied to estimate travel costs and economic impacts:

#### General Roadway Conditions

- Roadway closure duration: one year
- Road Type: conventional rural highway
- Lanes (both ways): segment varies from two to four
- Route distance from Brookings, OR to Arcata, CA: 102 miles (current condition) to 420 miles (closure condition)

#### Caltrans Division of Traffic Operations Traffic Count

- o Travel occurring along Last Chance Grade: 6,100 average annual daily traffic (two directional)
- o Truck split ratio: 15%

#### Cal-B/C<sup>17</sup> and TREDIS Parameters and Model Setup

- o Average vehicle occupancy: 2.8 persons per vehicle for visitor travel, and one person per vehicle for commercial trucks
- o Value of time per hour: \$13.65 for auto and \$31.40 for commercial
- o Operation costs per vehicle: \$0.303 for auto and \$0.418 for commercial
- o Average fuel consumption gallons/mile -
  - Free flow: \$0.156 for trucks and \$0.463 for cars
  - Congestion: \$0.219 for trucks and \$1.863 for cars

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<sup>17</sup> HDR, Inc. (2017). California Life-Cycle Benefit/Cost analysis Model (Cal-B/C) Technical Supplement to User's Guide Volume 4. Caltrans. Retrieved on March 26, 2018 from [http://www.dot.ca.gov/hq/tpp/offices/eab/benefit\\_cost/files/Cal-BCTechSupplementVol4v4.pdf](http://www.dot.ca.gov/hq/tpp/offices/eab/benefit_cost/files/Cal-BCTechSupplementVol4v4.pdf)

- Average fuel consumption gallons/hour (congestion or idle): \$9.844 for trucks and \$1.863 for cars
- Affected travel region: Curry, Del Norte, and Humboldt Counties
- Excise tax rates -
  - Federal: \$0.184 for gasoline and \$0.244 for diesel
  - State: \$0.417 for gasoline and \$0.36 for diesel
- “Contingent Development” impacts -
  - Applied a 90% direct negative job impact rate to industries heavily reliant on trucking for supply chain operations or heavily reliant on tourism
  - Applied a 10% direct negative job impact rate to social service industry
  - Adjustments were made to specific industries based on interview findings

#### Road Closure Travel and Economic Characteristics

- All vehicles end their trip at, come from, or pass through Brookings, OR or Arcata, CA
- Travelers would have to travel an additional 320 miles to reach Arcata from Brookings (420 detour miles traveled, minus 102 current condition miles traveled)
- Travelers would travel an additional 381 minutes, or 6 hours and 21 minutes (512 detour minutes traveled, minus 131 minutes current condition miles traveled)
- Average travel speed for passenger cars and truck: 50 MPH for both US-101 and detour routes
- Detour travel speed limit is higher than the current condition scenario
- Economic and travel closure impacts are based on TREDIS estimates

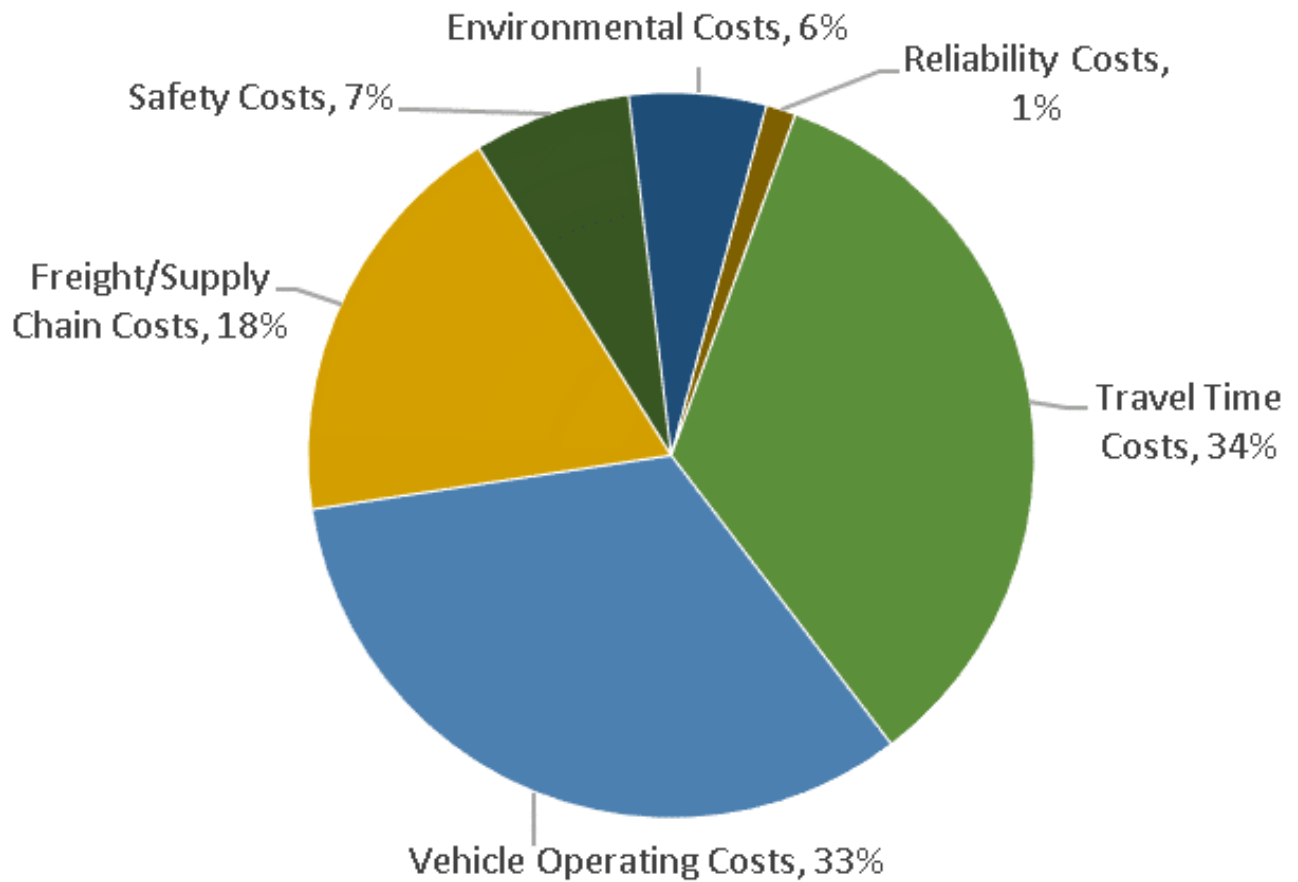
## TRAVEL COSTS AND ECONOMIC IMPACTS FROM US-101 CLOSURE

After exploring LCG travel patterns and the regional economy, travel costs and economic impacts were estimated using TREDIS. This section highlights potential traveler costs and economic impacts.

### *Cost to Travelers*

The designated detour route requires an increase in 127 million annual miles and 2.5 million in vehicle hours traveled because of the rural nature of the primary segment. The total cost of taking the detour, including vehicle operating costs, additional travel time, reduced reliability, increased emissions and decreased safety, amounts to a net difference of \$236 million per year. The percentage share of these cost categories are shown in **Figure 5**. Overall, travelers using the detour will experience an additional cost of \$562,000 per day in travel time and vehicle operation costs for both cars and trucks, as illustrated in **Table 4**.

**Figure 5. Additional Costs Associated with Detour Route**





**Table 4. Average Daily Traveler Cost Impacts**

| <b>AADT</b>   | <b>6,100</b>           |
|---|------------------------|
| Passenger Auto  | 5,200                  |
| Commercial Trucks   | 900                    |
| <b>Additional Travel Time/Passenger per Vehicle (hours)</b>             | <b>4.67 (280 mins)</b> |
| <b>Additional Travel Time/Truck per Vehicle (hours)</b>                 | <b>5.78 (347 mins)</b> |
| <b>Additional Miles on Alternate Route per Vehicle</b>                  | <b>320</b>             |
| <b>Additional Travel Costs (aggregate) per Day (time and operating)</b> | <b>\$562,000</b>       |
| Additional Travel Costs Per Trip: Passenger Auto                        | \$40                   |
| Additional Travel Costs per Trip: Commercial Trucks                     | \$430                  |

*Environmental Costs*

Emissions are projected to increase substantially as a byproduct of the 320-mile increase in travel per vehicle, and is estimated to be valued at approximately \$14.4 million in additional environmental costs.

Table 5 reflects these additional costs by pollutant type.

**Table 5. Monetized Environmental Costs (rounded to nearest thousand)**

| <i>Mode</i>  | <i>Emissions</i> |             |          |           |             | <i>Total</i> |
|--------------|------------------|-------------|----------|-----------|-------------|--------------|
|              | VOC              | NOX         | SOX      | PM        | CO2         |              |
| <i>Auto</i>  | \$232,000        | \$2,112,000 | \$0      | \$100,000 | \$3,748,000 | \$6,193,000  |
| <i>Truck</i> | \$18,000         | \$4,700,000 | \$12,000 | \$890,000 | \$2,588,000 | \$8,208,000  |
| <i>Total</i> | \$250,000        | \$6,812,000 | \$12,000 | \$990,000 | \$6,336,000 | \$14,401,000 |

*Costs Associated with Forgone Trips*

The assumption of a 90% reduction in passenger car trips and a 50% reduction in truck trips reflects expected travel responses due to additional costs imposed by the detour; therefore, associated costs such as vehicle operation expenses are not incurred by travelers because trips no longer take place. However, these cost reductions, technically, should not be considered a benefit despite trips being foregone because it is the reason travel has stopped. Higher costs associated with the detour should be considered a disbenefit or loss because travelers are no longer traveling as planned. The EDR Group estimated the total cost increase for forgone trips and then multiplying this value by 0.5 to quantify the disbenefit. This follows a similar methodology used to estimate consumer surplus benefits (change in costs \* number of new trips \* 0.5), however, it is important to note that this approach was applied to estimate disbenefits of forgone travel instead of a consumer surplus gains. The EDR Group estimates a disbenefit of \$417 million to travelers using this approach. This conservative value represents half the costs incurred by travelers and businesses if they were required to take the detour. Although this example is hypothetical, it assigns a value that can be used for analysis and consideration.

### *Expected Job Loss Due to US-101 Closure*

Economic losses associated with an increase in transportation costs require a more detailed analysis given that expected job loss is primarily due to a decline in competitiveness and changes in the supply chain and business operations. Important considerations in this analysis include:

- Most visitors come from outside the Crescent City area. A loss in passenger car trips would reduce the number of customers visiting the area and would negatively affect the leisure and hospitality industries;
- Truck-reliant businesses, associated with markets outside of the region, would lose the ability to compete and absorb travel cost increases; and
- Constrained access would disrupt and alter business operations and supply chains.

Caltrans and the EDR Group conducted a series of interviews with businesses knowledgeable of the region's economy to validate the assumed assumptions. Interview findings were synthesized with assumptions regarding industry sensitivities to reflect the impact of a closure.

Businesses that rely heavily on trucks to ship and receive goods and commodities face an increase in transportation costs, resulting in decreased profits, or weakened financial resilience as the burden of a detour is absorbed. This additional cost may affect a business's ability pass along transportation costs onto consumers. Some regional businesses must keep their prices for goods or commodities relatively fixed to remain competitive in markets that exist outside of the region. Thus, a business must absorb additional transportation costs instead of sharing the burden with consumers. This is especially true for the region's agriculture (dairy and eggs) and horticultural commodity markets.

The detour would affect the supply chain network, such as the frequency of pick-ups and deliveries, production cycles, and business operations. For example, responses from interviews indicated that crab harvesting would be significantly affected because there is a limited transportation-life for live crabs after they are extracted from the ocean. Similarly, the California Department of Food and Agriculture follows the federal governments Grade "A" Pasteurized Milk Ordinance that requires milk storage/holding tanks to be emptied at least every 72-hours when being transported.<sup>18</sup> Furthermore, cheese production schedules are further constrained when also accounting for the length of the detour and federally mandated truck driving hours of operation. Reductions in logistical flexibility and access to

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<sup>18</sup> Agacer, R. (June 2018). "Re: Farm tank milk." Email with Anne Quilter from the California Department of Food and Agriculture.

intermodal centers would also affect access to customers and delivery deadlines. Manufacturing companies with daily deliveries from Federal Express voiced concerns about limited pick-up and delivery schedules from integrated carriers via Oregon. This would hamper their ability to receive inputs to production and delivery of time-sensitive products. To reflect these findings, a 90% reduction was applied to employment associated with industries reliant on commercial trucks for inputs to production or for final delivery of goods. Affected industries include:

- Crop farming
- Dairy and milk production
- Commercial fishing
- Manufacturing (cheese, wine, wood products, metal coatings)
- Wholesale trade

The area around Crescent City is a popular tourist destination. Visitors travel from all over to see the famous redwood forests and to participate in a variety of recreational and entertainment activities. A reduction in visitors would significantly affect sales in the accommodations, retail, restaurant, casino, leisure and hospitality, and art industries. Given the strong reliance on seasonal visitors, a yearlong drop in sales would likely force many businesses in these industries to close or significantly reduce staff and operations. To reflect these expected impacts, the following was assumed:

- Applied a 90% reduction in employment associated with industries reliant on tourism. The primary industries determined to be affected are:
  - Retail
  - Art galleries and independent artists
  - Gambling and casinos
  - Amusement, recreation and sightseeing
  - Hotels and accommodations
  - Restaurants

A closure would also limit access to private and government services. Interviews with government organizations indicate existing contracts with California suppliers would likely be temporarily re-directed to Oregon contractors (not located in Curry, OR) because of travel cost increases. New contracts out of state would create a “leakage” of expenditures and result in a loss to the regional economy. To reflect these impacts, the following assumption were assumed:

- Applied a 10% reduction in employment associated with industries reliant on social services. The primary industries determined to be affected are:
  - Services (social, repair, and personal)
  - State government (non-education)

Table 6 presents the anticipated job loss most affected by a road closure at LCG, by select industries.

**Table 6. Expected Industry Job Loss Associated with US-101 Closure**

| <i>Industry</i>                   | <i>Job Loss</i> |
|-----------------------------------|-----------------|
| <i>Retail</i>                     | 785             |
| <i>Restaurants</i>                | 665             |
| <i>Wholesale Trade</i>            | 189             |
| <i>Accommodations</i>             | 160             |
| <i>Agriculture &amp; Forestry</i> | 153             |
| <i>Commercial Fishing</i>         | 120             |
| <i>Gambling/Casinos</i>           | 108             |
| <i>Services</i>                   | 107             |
| <i>Government</i>                 | 105             |
| <i>Amusement &amp; Recreation</i> | 80              |
| <i>Crop Farming</i>               | 52              |
| <i>Cheese Manufacturing</i>       | 42              |
| <i>Artists &amp; Writers</i>      | 42              |
| <i>Dairy and Milk Production</i>  | 41              |
| <i>Wood Products</i>              | 18              |
| <i>Metal Coating</i>              | 14              |
| <i>Wineries</i>                   | 10              |
| <i>Total</i>                      | 2,692           |

Negative impacts associated with these industries are not limited to initial job loss (direct effect). Businesses within these industries also purchase goods and services from other suppliers (indirect effects) in Del Norte, Humboldt, and Curry Counties. In addition, workers and suppliers that currently spend their income on household expenditures (induced effects) will be without a job or suffer loss in income, as a result of decreased purchases. Adding these “multiplier effects” results in an estimated loss of over 3,800 jobs, \$477 million in business sales, and \$142 million in labor income, as shown in **Table 7**.

**Table 7. Total Economic Impact Loss to the Region from Closure of US-101**

| Industry                                  | Business Output (\$M's) | Value Added (\$M's) | Jobs         | Labor Income (\$M's) |
|---|-------------------------|---------------------|--------------|----------------------|
| Retail Trade                              | \$73                    | \$48                | 899          | \$30                 |
| Restaurants & Drinking Establishments     | \$41                    | \$22                | 769          | \$17                 |
| Arts, Entertainment & Recreation          | \$20                    | \$9                 | 247          | \$5                  |
| Health Care and Social Assistance         | \$17                    | \$10                | 229          | \$9                  |
| Wholesale Trade                           | \$47                    | \$27                | 226          | \$13                 |
| Lodging                                   | \$12                    | \$6                 | 161          | \$4                  |
| Support for Agriculture & Forestry        | \$15                    | \$12                | 149          | \$12                 |
| Government (Public Administration)        | \$16                    | \$11                | 129          | \$11                 |
| Real Estate, Rental & Leasing             | \$28                    | \$17                | 124          | \$3                  |
| Fishing and Related                       | \$14                    | \$12                | 120          | \$3                  |
| Other Services                            | \$6                     | \$5                 | 99           | \$3                  |
| Professional, Scientific & Technical      | \$8                     | \$4                 | 91           | \$3                  |
| Animal Production                         | \$45                    | \$25                | 85           | \$11                 |
| Business Services (Admin, Support, Waste) | \$4                     | \$2                 | 77           | \$2                  |
| Crop Production                           | \$5                     | \$3                 | 60           | \$2                  |
| Finance & Insurance                       | \$9                     | \$5                 | 52           | \$3                  |
| Food Manufacturing                        | \$43                    | \$4                 | 43           | \$3                  |
| Truck Transportation                      | \$5                     | \$1                 | 38           | \$1                  |
| Scenic & Sightseeing Transport Support    | \$5                     | \$2                 | 36           | \$2                  |
| All Others                                | \$43                    | \$14                | 192          | \$10                 |
| <b>Total</b>                              | <b>\$456</b>            | <b>\$237</b>        | <b>3,826</b> | <b>\$145</b>         |

*Expected Job Gains Due to US-101 Closure*

Although the closure would create jobs losses in the region, there are potential positive economic impacts to industries associated with increased travel costs. Additional travel distance will likely increase vehicle operating costs associated with auto maintenance (including repairs and tires), fuel (gas stations), insurance, and leasing/financing (mileage limits). These additional expenses drive increased revenues for industries supporting vehicle use, as shown in **Table 8**. The net result is an increase of 80 jobs, \$13 million in business sales, and an additional \$4.2 million in labor income.

**Table 8: Positively Benefited Industries from Closure of US-101**

| <b>Industry</b>                   | <b>Business Output<br/>(\$M's)</b> | <b>Value Added<br/>(\$M's)</b> | <b>Jobs</b> | <b>Labor Income<br/>(\$M's)</b> |
|-----------------------------------|------------------------------------|--------------------------------|-------------|---------------------------------|
| Automotive repair and maintenance | \$2.99                             | \$2.19                         | 35          | \$1.63                          |
| Financing/leasing                 | \$3.44                             | \$2.27                         | 17          | \$0.85                          |
| Insurance                         | \$6.75                             | \$2.99                         | 28          | \$1.75                          |
| <b>Total</b>                      | <b>\$13.15</b>                     | <b>\$7.44</b>                  | <b>80</b>   | <b>\$4.22</b>                   |

## **LOCAL CONSTITUENT INTERVIEWS**

Estimated travel costs and economic losses demonstrate how a closure would affect travelers and the regional economy. Representatives from public and private entities within the region and the California and Oregon Departments of Transportation were contacted to assess qualitative impacts. Regional constituents believe a yearlong closure would be “devastating,” “terrible news,” and would result in a “severe negative economic impact,” especially for the agriculture and tourism industries. For some regional businesses, US-101 serves as a gateway for exporting goods and attracting clientele to and from Fortuna, Watsonville, the Port of Oakland, and as far away as Los Angeles, San Diego, and Arizona.

Based on interviews conducted, a yearlong closure of LCG would directly affect the local agriculture and forestry sectors. One agriculture business believes that if LCG closed for more than a year, their markets south of the roadway closure—accounting for 40% of the firm’s sales—could be lost. Another business shares this same sentiment, stating that 50% of their firm’s sales occur in regions south of LCG. Businesses would be at a disadvantage because of increased transportation costs and untimely deliveries, compared to competitors unaffected by the closure. Interviews with agricultural businesses located in Curry County revealed that some supplies are purchased in Oregon and others in California. Those who purchase supplies in California indicate their purchases are expected to grow in the future and would be directly affected by a closure. Overall, these interviews suggest a closure would hinder the ability of the agricultural and forestry industries to serve large portions of clientele located south of LCG and significantly restrict access to suppliers.

The highway closure would likely have a strong impact on the tourism industry, deterring visitors from the region. During normal conditions, this coastal region attracts many visitors to the region because of its abundance of natural resources and recreational activities. A local restaurant indicated that some patrons travel using US-101 from southern California, and even as far as Arizona. Another tourism-related business, located on the border of Curry and Josephine counties along US-199, reported that a closure would hurt his business because approximately 50% of his southern based clients use US-101 instead of I-5. The interviewee believes some patrons traveling along US-101 would still come up via I-5 to patronize his business, but the detour would likely reduce their available funds and remaining free time to stay and enjoy the area.

A road closure would also effect the social service industry. Among the three hospitals located in Humboldt County (Mad River, Saint Joseph, and Redwood Memorial), only a small portion of patients reside in Del Norte and Trinity. These patients accounted for nearly 2% of discharges in 2004,

representing \$35 million in health care impacts, \$17 million in labor income, and 366 jobs.<sup>19</sup> Based on an interview with a regional blood bank, a US-101 closure would not result in staff changes, owing to existing blood supply contracts. However, a closure would require the blood bank to adapt its business operations by increasing blood inventories at partner hospitals, lowering frequency of deliveries, increasing reliance on staff deliveries or couriers, and depleting cash reserves because of increased transportation costs. Restricted access associated with a road closure would also put lives at risk for those who need blood transfusions during surgeries.

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<sup>19</sup> CED/SBDC Partnership, California State University, Chico. (2006). Economic Impact Report Health Care in Humboldt County, California. Revised in 2007. Retrieved on March 2, 2018 from <https://www.stjoehumboldt.org/documents/HumboldtHealthcareEconomicImpactReport.pdf>.



## **LIMITATIONS OF THE ANALYSIS**

Travel characteristics were developed based on published documents, consultation with regional public and private entities, and the California and Oregon Departments of Transportation. Select interviewees were targeted and feedback may not apply to all constituents or businesses located in the region.

However, interviews were intended to represent a varied sample of the population.

Travel characteristic estimates could be improved through further observations or a larger survey of regional residents, businesses, and visitors. The current condition and potential road closure scenarios are based on dated travel data, or sketch-level forecasting estimates. Moreover, the assumption that LCG is closed for a year—a worst-case scenario—may not be an accurate reflection of how long it would take to repair the road. The severity of the landslide would affect the amount of time needed to repair the highway. Thus, detailed and current travel data and a more refined closure timeframe may improve the robustness of regional travel cost and economic impact estimates, as opposed to relying on assumptions to derive regional travel characteristics.

A complete closure of LCG would likely impact the northern California and southern Oregon coastal region. The counties most affected by a closure would be Curry, Del Norte, and Humboldt. For simplicity, assumptions were made based on regional annualized averages. However, travel and economic characteristics may vary depending on the season. For example, the impact on tourism activities depends on the season, e.g., recreational fishing, whale watching, or camping. Thus, accounting for seasonal adjustments may better reflect actual and predicted travel conditions and implications to the regional economy.

Finally, it is important to note that this analysis centers on analyzing potential travel and economic impacts from a yearlong closure. The analysis is limited in its ability to assess all benefits and costs associated with a road closure. For example, the analysis does not assess the amount of resources needed to repair the roadway through funding sources such as bonds or loans, nor does it account for opportunity costs where money could be used for other purposes or needs. Other economic methodologies could be applied to gain further insight of associated benefits and costs of a closure.

## **CONCLUSION**

The lack of a viable alternate route for US-101 in this rural coastal region creates a burden for travelers by increasing the driving distance and travel time in the event of a closure at LCG. As a result, travelers and businesses that depend on this road as the gateway for regional mobility will experience higher transportation costs and a loss of economic opportunity. An overall loss of sales is expected because a detour creates difficulties for businesses to reach their clientele base and vice versa.

Approximately 6,100 vehicles pass through LCG daily. In a worst-case scenario, where all lanes are closed at this location, travelers would be detoured through SR-197, US-199, I-5, and SR-299, resulting in 320 miles and over six hours of additional travel. The additional time and vehicle operation costs to travelers would collectively equate to \$236 million per year. The pollutant emissions costs of a closure would equate to roughly \$14 million per year in additional travel. In addition, expected job loss from increased transportation costs, decreased competitiveness, and necessary changes in supply chain operations is estimated to be nearly 2,700 direct jobs and over 3,800 total jobs, including a total loss of over \$145 million in labor income and over \$456 million in business sales. These estimated impacts are concentrated within the leisure, hospitality, agriculture, and manufacturing industries, and certain government institutions. Those interviewed from the agriculture and tourism industries indicated they would be impacted by higher transportation costs, the sheer inability to deliver goods to clients, and patrons simply deciding to forgo a trip to the area. There is uncertainty regarding the long-term implications to businesses, such as a loss of clients and the possibility of visitors substituting the area for a different location.

Based on the interviews conducted, certain businesses would likely be able to absorb a loss of sales for a year, but there may be ramifications such as a loss of clients to competitors. Despite limitations to the analysis, overall results signify that travelers would incur additional costs and businesses would bear a loss of productivity, output, and sales. Thus, this analysis suggests that a closure at LCG would negatively affect the region's economy. In addition, interviewees suggested there could be lasting implications to their market reach and client base even after the roadway reopens.

## Appendix I – Methodology Technical Memo

### DEPARTMENT OF TRANSPORTATION

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*Making Conservation  
a California Way of Life.*

May 10, 2018

**To:** Last Chance Grade Stakeholders

**From:** California Department of Transportation's (Caltrans) Transportation Economics Branch

**Re:** Methodology revisions made to the Last Chance Grade analyses

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Dear stakeholders,

Caltrans' Transportation Economics Branch (TEB), under the guidance of the Economic Development Research Group (EDRG), revisited its applied impact analysis methodology used to estimate the economic implications to Del Norte County (2015) if a segment of US-101 closes due to a landslide. As a follow-up to this analysis, Caltrans' District 1 staff requested that TEB expand upon its assessment and explore the potential economic impacts to Curry, Humboldt, and other areas that would be affected by a Last Chance Grade closure. Simultaneous to District 1's request, TEB executed an economic on-call service contract with EDRG serving as a sub-consultant. TEB saw this as an opportunity to vet its methodology and reassess assumptions used to conduct the Del Norte analysis with EDRG before evaluating regional impacts through the Transportation Economic Development Impact System (TREDIS) model.

It was determined that revisions to the initial methodology were needed to improve the portrayal of travel patterns and economic impacts to the region (the geographical boundary consisting of Curry, Del Norte, and Humboldt). Specifically, focusing on travel characteristics and industry impacts that are "directly" tied to Last Chance Grade at US 101 improved the precision and robustness of the regional analysis. This focal shift in methodology differs from the Del Norte analysis, which assessed all travel occurring within a defined geographical area with sketch level information. Key outcomes of the regional analysis include assessing a cost valuation on trips that would be foregone in the event of a closure and gaining a better understanding of the economy through further outreach efforts with stakeholders. Thus, the regional analysis is not comparable to the published 2015 Del Norte analysis due to differing methodologies. This memo highlights specific adjustments made between the regional and the Del Norte analyses.

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### **Model Version Adjustments**

- Applied latest TREDIS model
  - o Del Norte (2015) analysis utilized TREDIS's Version 4 model – 2012 data year
  - o Revised analysis utilizes TREDIS's Version 5 model – 2014 data year
  - o The outcome was applying current and enhanced data to conduct the analysis
    - Version 5 incorporates updated IMPLAN input-output data compared to dated figures used in Version 4

### **Travel Characteristic Adjustments**

- Model calculations focus on “direct” travel occurring along the Last Chance Grade segment, as opposed to an average applied to all auto and truck movement
  - o Del Norte analysis involved averaging distance, trips, time, vehicle occupancy, and origin-destination by mode for all autos and trucks that travel within, to, from, or through Del Norte County
  - o Revised analysis estimated trips with origins or destinations south of Del Norte or that pass through Last Chance Grade
  - o This analysis concentrated only on trips expected to be directly affected by the detour

The revised methodology improves representation of the expected changes in travel patterns due to the road closure on U.S. 101 as opposed to applying sketch level averages for travel patterns and characteristics conducted in the previous Del Norte analysis

- Altered origin-destination travel pattern assumptions for autos
  - o Del Norte (2015) analysis involved sketch assumptions based on traffic count data, interviews, and publications
  - o Revised analysis by incorporating additional data sources such as the US Census' on the Map and Transearch to refine trip assumptions
  - o Assumptions were refined to solely focus on trips within the three county region that would require passage through Last Chance Grade
- Altered freight-truck travel pattern assumptions
  - o Del Norte (2015) analysis involved sketch assumptions that were solely based on traffic count data
  - o Revised analysis involved the examination of “Transearch” data to inform the formulation of regional freight-truck origin-destination assumptions combined with roadway vehicle counts.
- Forgone trip assumptions and cost estimate
  - o Del Norte analysis applied a 10% reduction of forgone trips (a trip that does not occur) because of the additional costs associated with the detour
    - Cost estimate of forgone travel was not conducted
  - o Revised analysis applied a 90% forgone trip reduction to autos and a 50% forgone trip rate was applied for commercial trucks. This assumption reflects the expected

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- change in travel behavior due to the increased costs associated with the required detour
  - Cost estimate of forgone travel was conducted within TREDIS by assuming 100% of the decrease in trips is attributed to a yearlong closure by utilizing TREDIS’s “induced” feature. This estimate was not included in the original analysis.
    - This feature recognizes that forgone trips occur due to additional costs imposed onto motorists by the detour; therefore, this inconvenience is considered a “dis-benefit” or “loss” because travelers would normally make the trip. This forgone trip cost estimate is based on the following equation:  $\text{foregone trip dis-benefit} = 0.5(\text{change in travel costs} * \# \text{ of new trips})$
  - The change in travel costs in the revised analysis only focused on remaining trips that used the detour, which is a lower value than in previously analysis.
  - Costs associated with foregone trips (non-traveler costs) were estimated at \$417 million, reflecting half of the additional costs travelers would face had they taken the detour route.
- Altered associated transportation rates
  - Del Norte analysis used dated California rates
  - Revised analysis uses current California (California Benefit-Cost Model V. 6.2 values) and national rates (TREDIS default values)
  - The outcome was utilizing rates that more accurately reflect existing conditions

**Reported Results Adjustment**

- Sensitivity analysis
  - Del Norte analysis applied an origin-destination trip percentage variance to all travelers
  - Revised analysis did not apply a sensitivity analysis; therefore, no range of impacts are included in the regional analysis.

The economic impact methodology applied for the original and the regional analyses differ because of these highlighted modifications to assessing travel characteristics and an expanded geographical boundary of analysis, thus, the results cannot be directly compared. TEB and EDRG are confident that the methodology applied for the regional analysis contains more detailed perspectives reflective of the expected outcomes to the region due to a hypothetical yearlong closure of Last Chance Grade.

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