

## 2005 National Roundabout Conference Case Study: Blue Lake Roundabout (Humboldt County, California)

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### *Specific Topic Area Options*

- integrating into existing road systems
- design
- low speed to high speed
- use by large vehicles
- construction techniques

### *Preferred Presentation Option*

Primary presentation media will be a PowerPoint display of intersection photos showing before conditions, construction phasing, and the completed intersection as well as a short video of lumber vehicles negotiating the roundabout. The submitted paper will provide a narrative of the history of the project and accompanying photos.

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### **Introduction**

The intersection of Blue Lake Boulevard/Chartin Way in the County of Humboldt, California, is controlled by a modern roundabout, which opened in August of 2002. The intersection serves as the gateway to the City of Blue Lake, a small rural community about 8 miles east of Humboldt Bay, and a transitional point between the town and the freeway interchange. The intersection also serves as the primary access point for an Indian Casino facility which funded the installation of the roundabout. This paper provides a narrative of the project initiation, public review process, design issues, construction phasing and outcome of the project. An accompanying PowerPoint presentation provides photos of each stage of the project.

### **Project Initiation**

The Town of Blue Lake is located in Humboldt County, in coastal Northern California. Primary access to the town of Blue Lake is provided by the State Route (S.R.) 299 freeway which runs east from the U.S. 101 freeway, the primary north south regional highway in coastal California. Blue Lake is approximately eight miles east of Arcata which is located near the U.S. 101/State Route 299 interchange and is home to Humboldt State University.

Blue Lake Boulevard is a rural two-lane road providing access between the S.R. 299 freeway interchange and the community of Blue Lake. Blue Lake Boulevard was previously S.R. 299 before completion of the freeway. The roadway is approximately 36 feet wide in the study area with one travel lane and a shoulder in each direction. The roadway does not include curb, gutter, or sidewalks. Blue Lake Boulevard is uncontrolled through the study intersections while the minor street side street approaches are controlled

by stop signs. The street serves the community of Blue Lake traffic as well as truck traffic to and from the Simpson Lumber Mill to the east of Blue Lake. Access to the core of Blue Lake is provided off of Blue Lake Boulevard between the S.R. 299 interchange and the Simpson Lumber Mill.

In 2000, the Blue Lake Rancheria tribe proposed a casino on their Rancheria that lies within the community of Blue Lake. Access to the Rancheria is provided via Chartin Road, a minor collector road that intersects Blue Lake Boulevard between the S.R. 299 interchange and the core of the town. The casino project was proposed to consist of a 44,500 square foot facility with approximately 100 employees working at the site. Some public events such as a boxing matches and concerts, which would attract a larger-than-normal crowd compared with average daily conditions, were also anticipated.

A traffic study was completed to determine the potential traffic impacts that would be caused by the Indian Casino. The study found that the stop-controlled Chartin Road approach to Blue Lake Boulevard would be expected to deteriorate to a LOS D in the future with the Casino during peak periods. Traffic signal warrants revealed that a traffic signal along with separate turn lanes would be required within approximately five to ten years depending on traffic growth. Also, at the time of public events, traffic conditions at the intersections of Blue Lake Boulevard/Chartin Road and Chartin Road/Blue Lake Rancheria entrance were expected to be more congested during brief periods before and after events. In order to more quickly disperse traffic at the time of special events, it was recommended that trained traffic control personnel be provided by the Rancheria at the intersections of Blue Lake Boulevard/Chartin Road.

The report also suggested a modern roundabout as an alternative mitigation to a traffic signal at the intersection of Blue Lake Boulevard/Chartin Road. Given the higher speeds by truck traffic on Blue Lake Boulevard, the roundabout was thought to adequately serve traffic while also acting as a traffic-calming element for other traffic entering the Blue Lake community. The modern roundabout would also preclude the need for yearly maintenance and electricity costs associated with a signalized intersection. If a roundabout was to be the selected mitigation, no additional turn lane improvements would be required, however, the roundabout would need to be designed to accommodate the truck traffic that passes through the intersection. A single-lane roundabout at this intersection was expected to operate with a LOS A under future conditions with the casino.

Existing Conditions photos are shown on Slides 1 through 10.

### **Public Review Process**

The public hearing process in Blue Lake focused on the intersection of Blue Lake Boulevard/Chartin Road. The Rancheria offered the community improvements to the intersections either in the form of a traffic signal or a roundabout. The community was concerned less about the casino traffic and more about existing truck and high speed through traffic on Blue Lake Boulevard, since the casino traffic was more oriented to/from the freeway and was thought not to impact the core of the community. The general feeling of the community was that a traffic signal would encourage even higher speeds on Blue Lake Boulevard at it enters the community.

It should be noted that the City of Arcata, located where U.S. 101 and State Route 299 meet, is a community which had established use of roundabouts five to six years prior. The community, one of the first in the Country where the Green Party held the majority of City Council seats, had previously set policy not to allow traffic signals in the Community. Therefore, a number of all-way stop controlled intersections in Arcata were converted to roundabouts. (In late 2004, Arcata became will be the first

community in California to have a full roundabout freeway interchange.) Since Blue Lake residents were familiar with roundabouts through Arcata's experience, a significant public education process was not needed in Blue Lake. The residents ultimately supported the roundabout over the traffic signal due to its potential for slowing truck traffic.

## Design Process

There were two primary issues that needed to be addressed in the design process: need for additional right-of-way and need to accommodate lumber mill vehicles.

Blue Lake Boulevard parallels S.R. 299. The interchange with S.R. 299 is located at the far western end of the town. The Chartin Road intersection is located 600 to 700 feet east of the interchange. Primary access to the Blue Lake's core is located approximately 800 feet east of the Chartin Road. The Simpson Lumber Mill is located within a mile east of the Town of Blue Lake.

Since there was a continuous hillside located on the north side of Blue Lake Boulevard, the roundabout would need to be shifted to the south which required an additional right-of-way take. Since neither corner was developed, the City acquired one of the corner properties which then dictated placement of the 100-foot diameter roundabout.

The intersection of Blue Lake Boulevard/Chartin Road is traversed by mill vehicles on an hourly basis throughout the day. Not only does the intersection serve trucks loaded with cut trees bound for the mill and cut lumber leaving the mill, it also serves "extended low-bed lumber vehicles" which deliver forest work site vehicles between the mill and the work sites. These vehicles can be extended to approximately 80 feet with some sections raised only 6 inches off the ground.

Since there was no need for mill traffic to travel on Chartin Road, all mill truck traffic was expected to be traveling through the intersection on Blue Lake Boulevard. The only expected truck traffic turning onto Chartin Road was food delivery service vehicles to the casino.

Initial sizing and design of the roundabout was based on early *AutoTurn* simulations of the truck turns and the extended low-bed lumber vehicle which dictated design of the roundabout. Following the simulation and initial design, the Mill was contacted to set up a field test of the extended vehicle. The design team and the Mill representatives met at Mill site with an extended low bed vehicle set up with the longest configuration used in the field. The design engineers and road construction crew set up the roundabout geometrics using construction cones. The outer edge of the truck apron was marked with paint while the outer edge of the center landscaping was simulated with the cones. The test resulted in the shifting of the entry geometrics and the interior landscaping by two feet.

The extended low bed vehicles also dictated the engineering of the truck apron. The weight of the vehicle required structural steel installed within the apron. Because of the shallow rise of the vehicle, the truck apron needed to have a very shallow vertical rise compared with the standard 2-3 inch rise. Because the apron would be very shallow to the pavement, the apron needed color and texture that differentiated from the pavement. A cobbled pattern with 2-3 inch curved depressions was stamped to create a rumbling effect to vehicles traveling on the truck apron. Also, the apron and approach and departure lanes needed to have a consistent elevation from one end to the other so that the center of the vehicle would not scrape while the front end was on the departure lane and the back of the vehicles was still entering.

Field Test photos are shown on Slides 11 through 23.

### **Construction Phasing**

Construction phasing of the roundabout included in the following steps, which are depicted in Slides 24 through 54.

1. A paved driving surface was constructed on the acquired corner lot continuous with the Blue Lake Boulevard frontage. The south leg of the intersection, which is the Chartin Road access to the Rancheria, was closed during this phase. Other access was available.
2. The east-west Blue Lake Boulevard was diverted onto the new paved surface while the truck apron and center circle location was barricaded. The north leg of Chartin Road was closed at this phase. Access to the local industrial business on north Chartin Road was diverted to a secondary access to the east.
3. Following completion of the truck apron and the northern, eastern and western splitter islands, the westbound traffic was moved into the standard roundabout entry and exit with the northern Chartin Road access opened. In order to accommodate the eastbound traffic, a temporary driving surface was created over the truck apron. This temporary surface was created by placing canvas over the roadway and apron. Asphalt pavement was then laid over the canvas.
4. During the next phase, traffic traveled on the temporary surface, construction was completed on the southern leg and splitter island.

### **Current Operation**

Since its opening in August of 2002, there have been no reported collisions at the intersection. Early field evidence at the roundabout indicated that eastbound traffic destined for the core of Blue Lake from the State Route 299 freeway was entering the roundabout at a higher speed than appropriate, requiring traffic to reduce their speed abruptly leaving skid marks. This skidding phenomenon seems to have subsided as drivers became more familiar with the roundabout.

Anecdotal discussions with officials from Blue Lake, the County of Humboldt and Caltrans indicated that the roundabout to be a success because it 1) serves access needs of the casino, 2) accommodates lumber trucks and 3) acts as a traffic calming element for traffic entering the town.

Completed roundabout photos are shown in Slides 55 through 117.