



## CASE STUDY



# In Southern California, Roundabouts are the Designers Choice

## TORUS helps a multi-million dollar development project get complex intersections just right

*By Chris Johns, Transoft Solutions*

Turn east from the I-5 at Oceanside into the hills of Southern California and you'll find the proposed location for a unique multi-use development project. The Lilac Hills Ranch project is a proposed, mixed-use, pedestrian oriented sustainable community set on 608 acres. When completed in 2015, there will be 1,746 residential units along with retail spaces, community centers, parks and protected wetland habitat areas to enhance the livability of the area.

The vast tract of land will be connected by a network of roadways designed to accommodate pedestrians, cyclists and vehicles at reduced speeds. The Accretive Group of San Diego planned the community with pedestrian safety high on their priority list. To achieve this, Randy Goodson, Simon Malk and their colleague Jon Rilling needed traffic calming features that fit with the overall design of the project and roundabouts were one feature that came to mind.

"Accretive places strong importance on providing a safe, pedestrian-friendly neighborhood and town center," said Malk. "Roundabouts were considered from day one because of their numerous safety and traffic control benefits."

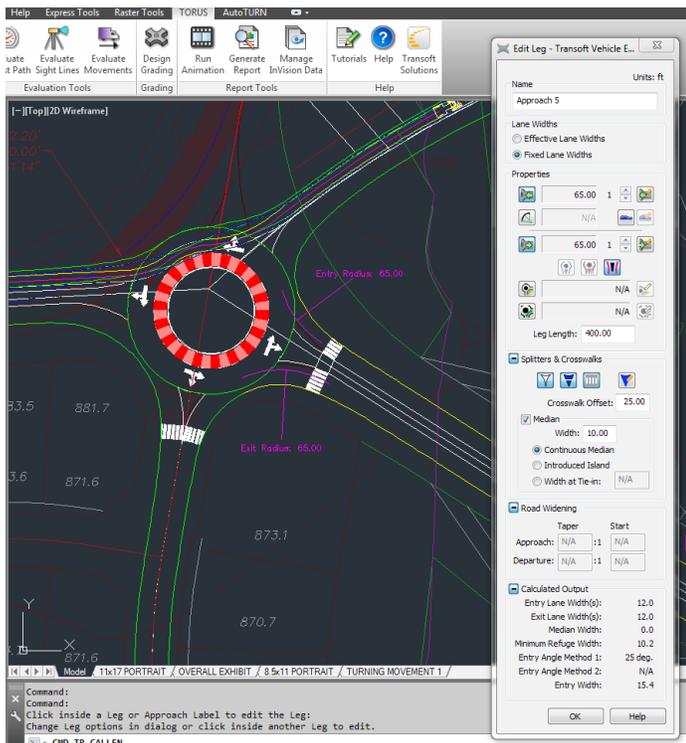
Landmark Consulting was the engineering firm chosen to help Accretive bring their plans to reality. Rebecca Ferguson, one of the lead engineers on the project, knows the topography of

Northern San Diego County well and she knew there would be some challenges in getting the design of the roundabouts to work for all the stakeholders.

"We have to navigate around these sensitive biological open spaces," said Ferguson. "In doing that, it creates some awkward intersections. We're trying to reduce the impact as much as possible. In order to accommodate those areas, we've found that roundabouts seem to be the best alternative intersection treatment to make that possible. The developer is a big fan of roundabouts because of the traffic calming effects and the ability to make the landscaping look really nice."

For a project of this size and complexity, Ferguson had to ensure all of her designs would meet the building standards set by the County of San Diego. She began researching software solutions that could help her with roundabout design and finally landed on TORUS from Transoft Solutions. The staff at the Department of Planning and Development in the County of San Diego weren't very familiar with roundabout design at the time and purchased a copy of TORUS themselves to help with the approval process. The county asked for a peer review of Ferguson's design and there was some head-scratching at the meetings.

"Roundabouts are a new concept for Southern California," said



With legs that are greater or less than 90 degrees, designers can still accommodate vehicles entering the roundabout from four different directions. Lane width and entry/exit radii still meet NCHRP 762 standards.

Ferguson. “It’s not like there are no roundabouts in San Diego at all, but this is definitely a new concept. It’s a relatively new thing for the county as well, and they are definitely open to it. They understand the benefits of roundabouts and they are excited about it and we’re going through the peer review process soon so the designs can meet their approval.”

Powered by the trusted AutoTURN engine, TORUS uses the patent pending Vehicle Envelope Method of design to generate roundabout geometry with vehicle swept paths. This approach allows for real-time, interactive designing and dynamically updates any changes made to the entire roundabout layout. Ferguson went through a few iterations and found a design that met FHWA standards and developed some reports that would help the staff at the county understand her approach.

“I wanted to make sure that the county was going to be okay with what we were doing and the fact that we were using TORUS,” recalled Ferguson. “I submitted the reports that TORUS generates to the county and submitted some exhibits with our designs and they seem okay with them.”

A four-way stop or signaled intersection is one of the typical methods of handling traffic volumes in new developments across North America. The Lilac Hills Ranch project is far from typical and a roundabout provides a viable alternative for controlling traffic speeds while keeping the designs within the overall project framework. The wetlands which are integral to the area meant that several iterations were needed to make the design seamless for the topography.

“Even though we’re in tentative map stage and we could go anywhere we want with the design, we still have to connect to

existing roads outside our development,” said Ferguson. “We also have to be respectful and mindful of the biological open spaces. That does restrict our ability of where we place the right-of-way, even though we have free reign to put it where ever we want. The existing topography and the existing wetlands and the connections to the existing roads forces our hand on that.”

Any engineer will tell you there is more to roundabout design than making cars go in a circle. Engineers have to determine the roundabout capacity requirements and all roundabout designs must meet NCHRP 672 and FHWA requirements. It was a process that Ferguson learned on the job, but TORUS is user-friendly, so she picked it up quickly.

“I had no experience with TORUS,” says Ferguson. “I had done roundabout designing in Australia, but I hadn’t used software to do it. It was really nice to be able to use something that makes designing a lot easier. I needed to know how to keep the design within the FHWA rules, but also minimize the amount of right-of-way that I’m taking away from the developer. I figured out the iterative process and found that it was very fast. It took me about a day to figure out how to use it.”

For a beginning designer, the user interface of TORUS provides instant feedback on every aspect of the roundabout. With NCHRP 672 guidelines and FHWA standards built-in, engineers can trust the results they see. Using TORUS, design vehicles and movements are defined at the start and geometric elements are dynamically adjusted to accommodate the vehicle swept paths at all stages of the roundabout design.

“I can enter all the approaches and based on the library that I’ve selected, TORUS will generate a list of error codes,” said Ferguson. “The software tells me that a particular approach has a specific issue (an angle is incorrect or an approach width is off). With TORUS doing the calculations for me, I tell the program I want to change from one alignment to another and it takes me three clicks on the mouse. I clear up the error messages I get and I’m done.”

“The hardest part is making sure your library is correct,” Ferguson continued. “There is definitely some judgment that goes into the process—you can’t just blindly let the software do it. You say to yourself ‘If I need to accommodate a WB-50 and

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Rebecca Ferguson

a passenger car, maybe the truck can use some of the truck apron.' I'd say the first 80 percent of the design is plug-and-play and then there's about 20 percent you have to do some tweaking."

Accretive's projects have a small-town feel and strong consideration is given to pedestrians and cyclists in their design. Slower speeds and increasing the amount of right-of-way are just two ways to make people feel comfortable. Using the functionality of TORUS, Ferguson added these wrinkles to her design.

"I have the roundabout set to the approaches that I need and that gives me my right-of-way for the pedestrians leading up to the roundabout," said Ferguson. "The county is adamant that we maintain FHWA standards, so it's nice that TORUS allows me to set the setback of any of the crosswalks. I just plug that in to what the FHWA minimum is and work with that.

She continued, "In addition to pedestrians, we also have to account for cyclists. The county has requested that we use a particular way to manage the cyclists. They have a separate type of ramp that joins up with the pedestrian walkway where we build a widened path for both groups where they navigate through the roundabout. Cyclists have the option to join the pedestrians or to continue with the traffic and go through the roundabout."

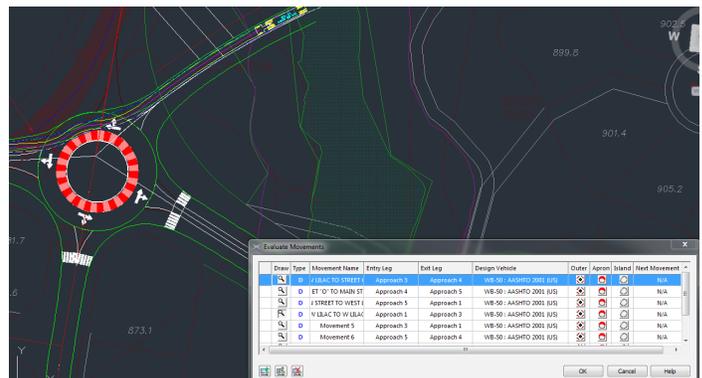
In the 2013 Florida Intersection Design Guide the two most common traffic control devices, the traffic signal and the roundabout are discussed. The report states "research has demonstrated unequivocally that under appropriate conditions, roundabouts are the highest performing traffic control mode in terms of capacity (intersection delay)." This is in contrast to the traffic signal whose basic function is to resolve conflicts between vehicles, cyclists and pedestrians that are competing for time and space at the intersection. Within the framework for this new community, roundabouts were the preferred option.

"In our opinion, it makes it a safer intersection," said Ferguson.

"When you don't have an orthogonal intersection, you can have sight distance issues and all kinds of things that a traditional intersection would face. When you have these odd angles of approaches coming into the roundabout we are proposing, we can have each approach coming in greater or less than 90 degrees. Yet, we feel these are designed to be much safer than a traditional intersection because we can control the way vehicles come into the roundabout."

The relationship between Landmark Consulting and Transoft goes back to the fall of 2012, when Ferguson was researching roundabout software and heard of TORUS. The Lilac Hills Ranch project was starting up and she believed the software could help them. During a trial period, she designed a couple of roundabouts and was sold.

"This is a big project and we are a small firm and we have to be careful about large expenditures," said Ferguson. "TORUS is not cheap software, so we can't afford to buy software that we may end up not using. Margaret Gochngbok was great because she allowed us to extend our free trial. One of my engineers here was using it and she left the company. So I had to start learning the software, which actually happened during our second free trial. We ended up purchasing the software, partly because we loved the software and partly because it was so great working with Margaret. She understood our budget constraints. It was a great experience working with her."



A WB-50 truck is chosen to test the viability of the roundabout. The dialog boxes within TORUS provide the designer with immediate feedback on any changes to any leg of the roundabout.

"I've been an account manager here at Transoft for the past 13 years and I've talked to hundreds of designers and engineers," said Margaret Gochngbok, Account Manager at Transoft. "Once in a while I get to work with someone like Rebecca who is passionate about her work and is more than happy to share what she knows with others. She is easy to talk to and always open to new ideas. I'm glad we could help her on a big project like Lilac Hills Ranch. She's definitely a good partner to have on our side." ■