

**Mayor**  
Lois Wynne  
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**Public Works  
Planning Services**

711 W. Cinnamon Drive  
Lemoore, CA 93245  
Phone (559) 924-6704  
Fax (559) 924-6708

## Staff Report

ITEM SS-2

**To:** Lemoore City Council

**From:** Judy Holwell, Project Manager 

**Date:** June 26, 2015 **Meeting Date:** July 7, 2015

**Subject:** Bush Street Infrastructure at Highway 41 – Draft Concept

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### Discussion

Previously, to accommodate full buildout on the West Side, up to eight lanes were proposed for Bush Street under Highway 41. That design was proposed prior to the downturned economy, and prior to Council abandoning Bush Street west of Marsh Drive. That abandonment eliminated all development west of Marsh Drive, including 233 housing units that had been approved as part of the Victory Village project. As you know, staff has been working with Caltrans to improve the Bush Street undercrossing, and I am pleased to share with you the attached draft concept from Caltrans for a Diverging Diamond Interchange (DDI).

The CrisCom Company was very instrumental in setting up a meeting with Caltrans District 6 Director, Sharri Bender Ehlert, and her staff. Caltrans listened to our concerns about the Bush Street undercrossing and future development at Hanford-Armona Road. During the meeting, Director Bender Ehlert suggested the new concept. The DDI has been constructed in many other states throughout the US. However, as of yet, none have been constructed in California. Attached is a map which shows DDI locations and information on the DDI being an award-winning innovation. Additionally, the U.S. Department of Transportation produced a video of a DDI which can be viewed at the following link: <https://www.youtube.com/watch?v=eLAWwI3EtN4>

A follow up conference call with Caltrans led to the question as to whether or not this type of design could even work at our location, so Caltrans staff agreed to prepare a sort of “back of the napkin” draft design. The design is not based on any traffic volumes, but it shows how the configuration might work. This concept may decrease the cost of traffic improvements on the West Side, because the movement of vehicles through the underpass is quicker, and therefore can accommodate greater traffic volumes with less lanes. The movement is also safer, which is an added benefit.

We wanted to bring this item to you as soon as possible to share the design with you and also to gauge your interest in moving forward with the next step, which has a cost involved. Before going any further, a traffic study is required and will likely cost \$10,000 to \$20,000. It will be the first step in what will eventually need to be done, which is a Project Study Report (PSR), costing \$150,000 or more.

It is the City's policy that development pays for itself. However, until we know the extent of the improvements needed on the West Side, we will not know the costs. Currently, our West Side traffic impact fees are based on the 2010 West Side Streets & Thoroughfares Impact Fee Study prepared by Colgan Consulting. The traffic impact fee for Regional Commercial property is \$113,693 per acre. This fee includes traffic infrastructure for the entire West Side at full buildout. Staff is looking at ways to reduce these fees so that development will be more inclined to locate here, especially retail development, which will increase revenue to the City's General Fund. We believe that the DDI may make a large enough difference in the infrastructure costs that the traffic impact fees may be significantly lower than our recently adopted Impact Fee Schedule.

Council has chosen to invest in retail attraction and having sites that are shovel ready is paramount to landing a project. The more we do ahead of time, such as having studies complete and knowing how much fees cost, the better it will be for future development.

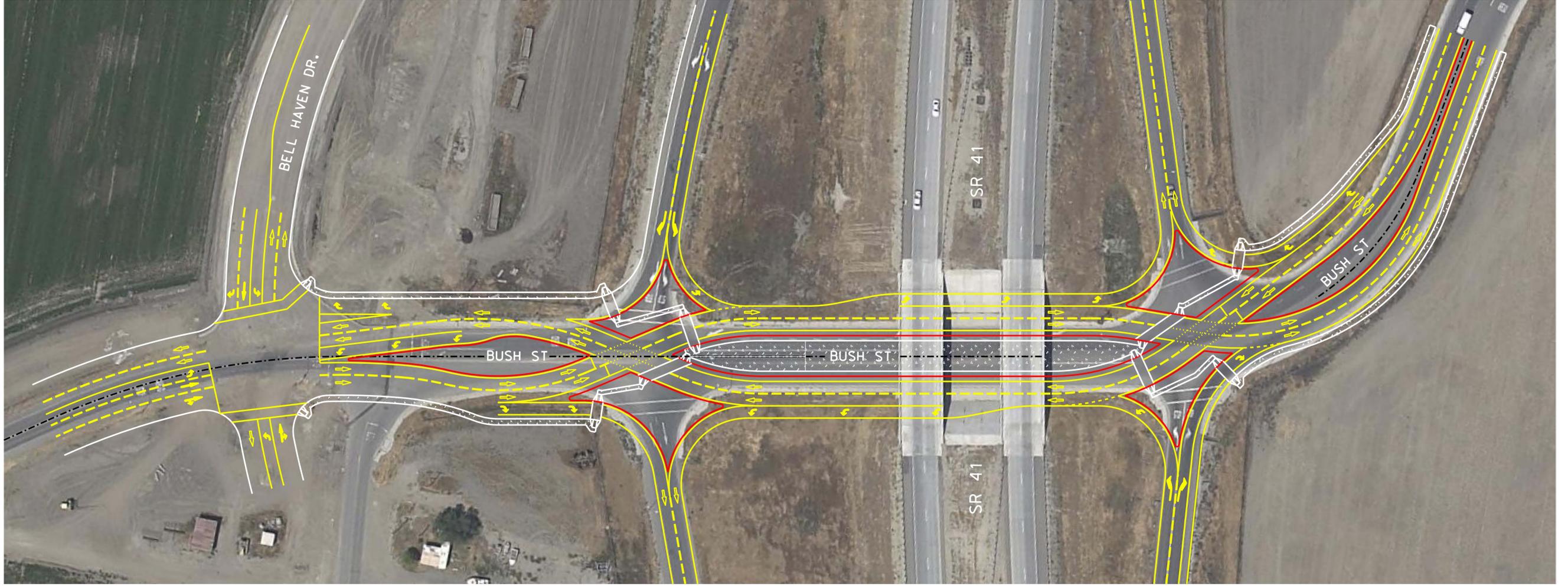
Since our fee schedule is based on a pricier model, Council may want to spend a little money up front and proceed with a traffic study. If Council agrees, staff will return with a proposal for your review and approval at an upcoming meeting, which will include the cost of the study. Any amount expended on studies can be included in the West Side traffic impact fees, which will be reimbursed over time when developers pay those fees. Additionally, the traffic study is needed in order to determine whether the DDI will work at that location.

**Budget Impact**

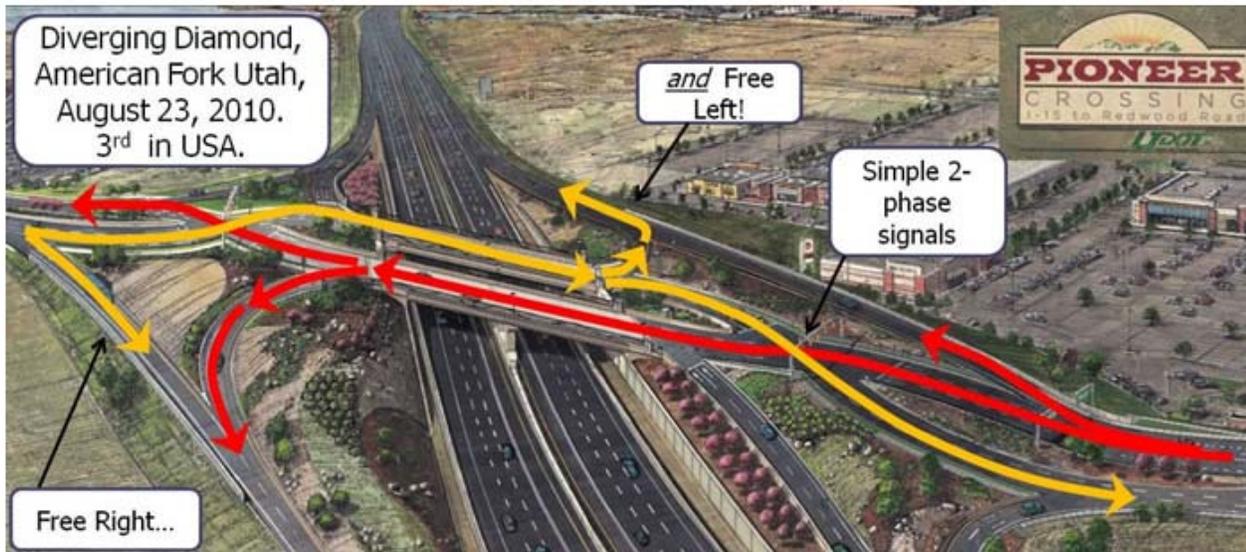
None at this time.

**Recommendation**

Council should direct staff to bring back a proposal for a traffic study for Bush Street at Highway 41.







*Diagram of Movements in a Diverging Diamond Interchange*

## Why are interchange areas always so congested?

Freeway interchanges can be a nightmare. Even if you're not planning to get on the freeway, simply crossing it can take forever at peak periods. Part of the cause is that signals at each ramp on a traditional Diamond Interchange must have left-turn arrows, which introduces inefficiency.

## SPUIs improved efficiency! ...at a price.

The now popular Single-Point Urban Interchange, or SPUI, was a big operational improvement over the Diamond because it uses just one signal in the center, rather than two for each ramp. But the SPUI itself uses a four-phase signal with left-turn arrows, where the most efficient signals have just two phases. And because the signal must be in the center, ramps must approach the center diagonally, which requires larger bridge decks and wider spans - greatly increasing the cost of a SPUI relative to a Diamond.

## DDI's: Safe, Efficient, Low Cost!

The Diverging Diamond is based on the idea that if you can eliminate the need for left-turn arrows, then signals will have maximum efficiency, fewer conflict points, and be able to serve more traffic with better safety and less congestion.

In this diagram of the USA's third DDI, recently opened in Utah, notice the orange stream where a free-right peels off to the south as at a normal diamond interchange. Then the EB stream crosses over to the left side, making it possible to also make a "free left" to get on the freeway going North. Remaining traffic, just trying to cross the freeway, then crosses back to the normal side of road. The free lefts can greatly reduce congestion, increase capacity and reduce conflict points. It is also easy to convert existing diamonds to DDI's, which means their benefits can often be achieved at a very low cost. Every situation is different, and DDIs will not be right everywhere, but could they be right for you?



*Flows that are part of the Eastbound stream, vs. those that are part of the Westbound stream*



## Where did this idea come from?

Three Diverging Diamonds have existed in France for over twenty years, with the first built in Versailles in the 1970's. The original inventors are unknown to us at this time. But in July 2003, Mr. Gilbert Chlewicki authored a paper titled "*New Interchange and Intersection Designs: The Synchronized Split-Phasing Intersection and the Diverging Diamond Interchange*", and presented it to the 2nd Urban Street Symposium in Anaheim, California. Dr. Joe Bared, a PhD and PE with FHWA, attended the presentation and was impressed enough to study the idea more and sponsor research. As Chlewicki and Bared's research became "discovered," a few state DOTs got serious about finding an opportunity to build one.

## And the first is?...

After a few false starts, one that fell prey to fears over the safety of an unproven design, and another that was simply delayed by lack of funding, the first DDI outside of France was opened at I-44 and Hwy 13 on June 21, 2009 in Springfield, Missouri. The project cost just \$3.2-million, because they were able to utilize the same bridge from the previous diamond interchange.

*One of the first three Diverging Diamonds, probably built in 1980's or 1990's - Paris, France*

MoDOT then opened the second DDI about a year later on July 12, 2010 at US-60 and National Avenue, also in Springfield. The Utah DOT opened the third on August 23, 2010 at I-15 and Main St. in American Fork. The 4th opened Oct 17, 2010 in St. Louis at I-270 and Dorsett Rd, and the 5th opened in Alcoa, Tennessee at US 129 and Bessemer St. Both Utah and Missouri have at least one more currently under construction.

## How well are they working?

Mr. Don Saiko, MoDOT Project Manager, reports that in survey's conducted after opening, 97% of respondents believe the projects made the area seem safer, 95% believe it is less congested, and 87% believe it is easier to drive than it was before. Mr. Saiko also notes that crash data collected in the first six months suggest a 50% overall reduction. Fear that drivers would be confused and make mistakes in moving to the "wrong side of the road" have proven unfounded. Having driven this one in Utah, good channeling and signage make the transition very natural. You can hardly tell that anything unusual is happening. Hooray that DOTs across the country are finally taking this concept seriously!

## Where can I learn more?

DDIs and other Alternative Intersections and Interchanges can all be found at [www.alternativeintersections.org](http://www.alternativeintersections.org), where you can search for every Alternative Intersection that exists or has been planned anywhere in the world (or at least those that our members are aware of). This site dedicated to DDIs, as well as [www.alternativeintersections.org](http://www.alternativeintersections.org), are sponsored by [www.metroanalytics.com](http://www.metroanalytics.com).

## Links

Mr. Gilbert Chlewicki has a very comprehensive site dedicated to the DDI at [www.divergingdiamond.com](http://www.divergingdiamond.com), where he also offers to provide presentations and consulting services.

FHWA's Joe Bared has for years sponsored groundbreaking research on a number of Alternative Intersections. FHWA's latest findings on the DDI and other concepts, can be found at:

<http://www.fhwa.dot.gov/publications/research/safety/09060/>

[Missouri's Experience with a Diverging Diamond Interchange - Lessons Learned](#)



*First Diverging Diamond Interchange in the USA  
Opened June 21, 2009 at I-44 & Hwy 13,  
Springfield, Missouri. Photo courtesy of MoDOT.*

*First Diverging Diamond built in USA in  
Springfield, Missouri at I-44 & Hwy 13.  
Opened in June 2009. Converted an  
existing diamond at a cost of \$3.2 million.*