

# Basis of Design

**Project Title:** SR 548 - Kickerville Rd Intersection Improvement

**PIN:** 154813B

**Date:** 5/4/2016

**Basis of Design Phase**  
(Identify the current project phase)

Planning	
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Scoping	
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Design	X
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## Planning Document Summary

- WCOG Regional Transportation Plan – 2007
- Whatcom County Comprehensive Plan –1997
  - o The intersection of SR 548 and Kickerville is located within a rural designation and is Zoned R5A.
  - o The project location is also located near the Cherry Point Industrial (LII, HII) Urban Growth Area to the south, and the Birch Bay Urban Growth Area to the northwest.
  - o The County is currently updating the Whatcom County Comprehensive Plan. It is anticipated that the County Council will adopt the plan by July of 2016.
- WSDOT State Rail Plan – 2013
- I-5 / 274 Interchange Justification Report – 2009
- Gateway Pacific Terminal at Cherry Point Proposal – US Army Corps of Engineer, State Department of Ecology and Whatcom County are conducting a coordinated environmental review under the Federal NEPA and State SEPA procedures.

## General Project Information

<b>Route Information:</b>	<b>SR</b>	<b>NHS (Y/N)</b>	<b>Functional Class</b>	<b>Current Posted Speed</b>	<b>Truck %</b>	
	548	No	Rural Collector	50mph	12.67%	
<b>Project Information:</b>	<b>Begin MP</b>	<b>End MP</b>	<b>Sub-Program</b>	<b>County</b>	I2 - Safety	
	4.81	5.05	I-2	Whatcom		
	<b>Current ADT</b>	<b>Within City?</b>	<b>Current Listed Access</b>	<b>Current Planned Access</b>		
	5200 (2015 yr)	No	M/A Class 2	M/A Class 2		
<b>Future and Related Projects:</b>	No known future projects at this location. A chip seal will be in the general area preceding this project, but will not be in the project limits.					
<b>Important Project History or Background Information</b> (Optional: information that will help understand why the preferred alternative was chosen)	This project began with funding from BP's Cherry Point refinery to address right turns from South Kickerville to SR 548 as BP increases use at the entrance to the refinery served by Kickerville. Upon analyzing the crash data it was found that there was a larger than normal amount of fatal and all injury crashes than is typical for this type of intersection. State safety funds were added to address this problem by installing a right sized roundabout once it was shown that the proposed right turn widening would not be the proper countermeasure for this problem.					

## Section 1) Project Needs

**Note for I-2 Safety Projects:** If a Crash Analysis Report already exists, some of the information required in this section may already be covered in the report. See the Basis of Design Instructions for more details.

<p><b>List the project's BASELINE NEED(S). Include the performance metrics that will be used to evaluate alternatives and the performance targets for those metrics.</b></p>	<p>The SR 548 / Kickerville Intersection is prioritized on WSDOT's Intersection Accident Location (IAL) array. From January 2009 to December 2013 (5 years), there were 8 crashes that are categorized under the fatal any all injury type. There have been more fatal and all injury crashes than is typical for this type of intersection.</p> <p><b>Metric:</b> Number of fatal and all injury crashes per year (cpy)  <b>Target:</b> Reduce fatal and all injury crashes (cpy) by 89%. Target value determined using the Crash Modification Factor (ID 4700) from AASHTO's database.</p> <p>The selected CMF was for a High Speed Minor Road Stop Controlled Rural Intersection to a Single Lane Roundabout, which was equivalent to 11% of the crashes per year after the roundabout is installed. The observed and predicted average crash frequency for fatal and all injury collisions were 1.6 cpy and 0.176 cpy, respectively. (Refer to Section 4 for alternatives discussion)</p>		
<p><b>List the project's CONTEXTUAL NEED(S). Include the performance metrics that will be used to evaluate alternatives. List performance targets for the metrics, if applicable.</b></p>	<p>Congestion during shift change at the refinery hinders WB-67 vehicles making a right turn from NB Kickerville to EB SR 548 without encroaching on WB SR 548 traffic. This existing condition has a LOS D.</p> <p><b>Metric:</b> Level Of Service (LOS)  <b>Target:</b> LOS A for the south leg of Kickerville and WB-67s performing the turn from NB to EB SR 548.</p>		
<p><b>Has a Contributing Factors Analysis been completed? If so, list any major findings that are useful in more specifically understanding the project need(s).</b></p>	<p><b>Safety:</b>          One of the main contributors to crashes at this location is the lack of spacing between vehicles on SR 548 going through this intersection causing drivers turning left to not wait for proper gaps to enter the roadway. Congestion during shift change at the refinery provides a steady stream of vehicles traveling EB on SR 548, which limits the number of safe merging opportunities presented to vehicles on Kickerville Rd.</p> <p>Another contributing factor to the intersection's collision rate is the lack of room to turn within the intersection's current configuration; WB-67's are forced to intrude into oncoming WB SR 548 traffic while turning from NB Kickerville to EB SR 548.</p> <p><b>Mobility:</b>          Congestion is caused during the shift change at the refinery that provides a steady stream of vehicles traveling EB on SR 548 with little or no gaps between vehicles.</p> <p>Both Contributing Factors are mobility and safety concerns and are addressed in the design of the roundabout intersection.</p>		
<p><b>Has a crash diagnosis (i.e. Crash Analysis Report) been completed? (Yes or No)</b></p>	<table border="1" style="width: 100%;"> <tr> <td style="width: 15%; text-align: center;">Yes</td> <td>SR 548 Kickerville Road Compact Roundabout - June 2014. CAR was revised in March 2016 to reflect a single lane roundabout.</td> </tr> </table>	Yes	SR 548 Kickerville Road Compact Roundabout - June 2014. CAR was revised in March 2016 to reflect a single lane roundabout.
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## Section 2) Context

<p style="text-align: center;"><b>Land Use Context (existing and future)</b></p>	<p>SR 548 is a 14-mile long state highway that connects to the City of Blaine and the City of Ferndale. The state highway has a north to south alignment from Blaine and an east to west alignment from Ferndale. The corridor can be accessed from three different interchanges on I-5. These include from north to south, Mile Post 276 in Blaine, Mile Post 273 south of Blaine, and from Mile Post 270 on the northern boundary of Ferndale. From north to south, SR 548 serves Birch Bay Urban Growth Area / Birch Bay State Park, and from east to west the Cherry Point Industrial Urban Growth Area.</p> <p>The proposed project is located along the east west portion of the corridor at the intersection of SR 548 / Kickerville, approximately 4.86 miles west of I-5. The corridor is a two lane paved road and is designated a "rural collector" under the federal functional classification with posted speeds of 50 mph. The corridor travels through rural residential areas that are dominated by agricultural activities, with scattered large lot residential activities. Summer congestion also results from commuters, mainly from the refineries that create pulses of traffic as crew shifts occur and recreational users, making their way to the state park/ Birch Bay community. Rail traffic also contributes to backups on the corridor. It is anticipated that rail activity may increase in this area, due to the Gateway Pacific/Custer Spur development, and increase demand for rail services. The property is located between the BP Refinery to the north and the INTALCO facility to the south. The BNSF rail spur intersects with SR 548, ¼ mile east of the project location and serves as the primary rail corridor for the Cherry Point Industrial Urban Area.</p> <p>The east west portion of SR 548 from the I-5 Ferndale interchange serves as a T-3 Freight Route, carrying about 2.6 million tons of freight per year on as many as 720 trucks on a daily basis. Trucks constitute about 12 percent of all the traffic on the highway. The average daily traffic volume is about 9,000 ADT. There are several fish passage crossings located along this corridor.</p> <p>There are three prominent land use types in the project location:</p> <ol style="list-style-type: none"> <li>a. Areas east and west, parallel to the SR 548 corridor are located within the Rural (R5A) comprehensive plan designation. This designation allows rural land uses with one dwelling per 5-acres.</li> <li>b. Areas to the south and southwest of the project location are located within the Cherry Point Industrial Urban Growth Area and zoned for heavy industry. The British Petroleum Refinery (BP) has recently expanded its operations, and continued industrial expansion in this area is expected. BP recently funded and constructed a roundabout at SR 548 as it makes a 90 turn north, to improve safety, reduce congestion and make it easier to move large trucks in and out of the their refinery.</li> <li>c. Areas to the northwest of the project location are located within the Birch Bay Urban Growth Area. The Birch Bay community has grown over 69.6% in population since the 2000 census and experiences peak summer travel congestion. Land uses in this designation are primarily residential and recreation activities.</li> </ol> <p>There are no public transit routes along this corridor. However, bicycles and some pedestrian activity does occur along this route.</p>
<p style="text-align: center;"><b>Community Engagement</b></p>	<p>The project team has maintained contact with the BP Cherry Point refinery to coordinate construction timing of the roundabout in order to avoid conflicts with the refinery's shift changes and operations. Communication with the refinery has also helped the project team develop additional contextual needs. In addition, WSDOT's Planning Office in Mt. Baker Area has ongoing communications with Whatcom County regarding this project.</p>
<p style="text-align: center;"><b>Transportation Context (existing and future)</b></p>	<p>In summary users of the system include:</p> <ul style="list-style-type: none"> <li>• Passenger vehicles moving to and from the industrial facilities and Birch Bay recreation area</li> <li>• Trucks (freight) from the BP Refinery and INTALCO facilities</li> <li>• Farm equipment</li> <li>• Bicycles</li> <li>• Pedestrians</li> </ul>
<p style="text-align: center;"><b>Major Environmental Considerations</b> <i>(See the Environmental Review Summary for Details)</i></p>	<p>The intersection has low quality wetlands located along the ditches in all four quadrants, the areas are small enough that mitigation can occur at existing WSDOT sites no matter which alternative is chosen.</p>

### Section 3) Design Controls

<b>Selected Design Years</b> <i>(and explanation for the selection)</i>	2037 (20 yrs beyond construction year)			
<b>Design Users</b>	Commuter, Commercial (truck), Bicyclists (commuter and recreational), Super Load			
<b>Modal Compatibility</b>	The project will be designed to be compatible with the current Auto/Freight/Bicycle usage along with the projected increase in Freight usage from the south leg of Kickerville to SR 548.			
<b>Modal Priorities</b>	<b>Mode</b>	<b>To be prioritized in design decisions? (Yes or No)</b>	<b>Rank / Priority (1,2,3, etc.)</b>	<b>Notes</b>
	Automobile	Yes	1	
	Transit	No		No transit facilities in project limits
	Freight	Yes	1	
	Pedestrian	No		No pedestrian generators in vicinity
	Bicycle	Yes	3	
	Other	None		
<b>Intersection Design Vehicle</b>	South, East & West Legs: WB-67 Large vehicle traffic is not expected to travel along the north leg of Kickerville, as the vast majority of truck traffic in the area travels south or west to the refinery, and west to I-5			
<b>Terrain Classification</b>	Level			
<b>Selected Access Control</b> <i>(Given the current access density and intersection spacing, is a different access selection warranted? If designing for a future context vision, what is the appropriate level of access needed?)</i>	M/A Class 2. Existing access control was evaluated and no changes are necessary.			
<b>Target Speed</b>	50 MPH (SR 548), 35 MPH (Kickerville)			

### Section 4) Alternatives Analysis

**Note for I-2 Safety Projects:** If a Crash Analysis Report already exists, some of the information required in this section may already be covered in the report. See the Basis of Design Instructions for more details.

	Alternative Name or Description
<b>Alternatives Considered</b>	For I2 safety projects on a IAL list, the solutions have been determined and approved per the Safety Scoping Process. Both CAR and ICA analyzed only the roundabout alternative and no others. Furthermore, DM Chapter 1300.05(1) states that when selected, a single-lane roundabout precludes the comparison of other alternatives. Because of this, it has been determined that developing and comparing alternatives is unnecessary.
<b>Preferred Alternative</b>	Single lane Roundabout - 115' Inscribed Diameter
<b>Attach copies or provide information (title, date, etc.) regarding alternatives analysis, trade-offs comparison, or similar exercises that have been completed for this project, such as an ALTERNATIVES COMPARISON TABLE.</b>	<p>The selection of a single lane roundabout as the preferred alternative precludes the analysis and comparison of other alternatives, thus no comparison table will be provided.</p> <p>The single lane roundabout meets both of the congestion and safety targets specified for the project. Four way stop control at this intersection would significantly increase the congestion at the intersection and could possibly decrease the severity of crashes, though not as much as a roundabout, and would not adequately address the right turn issue. The right turn pocket and acceleration lane would address the right turn problem and possibly reduce congestion, but would not achieve the safety targets for the project. The single lane roundabout was chosen as the preferred alternative due to being the only alternative to positively address all project needs.</p>

### Section 5) Design Element Selection

*For each design element below, identify whether or not the design element is included in the preferred alternative for each alignment or location. You can group alignments into a single location if desired. You may need to add or delete columns.*

Design Element ↓	Alignment #1					
1. Lane	X					
2. Median / Buffer						
3. Shoulder	X					
4. Streetside / Roadside Zone						
5. Pedestrian Facility						
6. Bicycle Facility						
7. Bridges						
8. Horizontal Alignment						
9. Vertical Alignment						
10. Cross Slope						
11. Side Slope	X					
12. Clear Zone	X					
13. Barrier, Guardrail & Rumble Strips						
14. Signals, Illumination, and ITS	X					
15. Signing and Delineation	X					
16. On/Off Connections						
17. Intersection / Ramp Terminal						
18. Road Approaches						
19. Roundabout	X					
20. Access Control	X					

## Approval Signatures

REGION PROJECT ENGINEER	Date
REGION PLANNING MANAGER	Date
REGION ENGINEERING MANAGER	Date
HQ ASSISTANT STATE DESIGN ENGINEER	Date

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11. Side Slope	X					
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14. Signals, Illumination, and ITS	X					
15. Signing and Delineation	X					
16. On/Off Connections						
17. Intersection / Ramp Terminal						
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