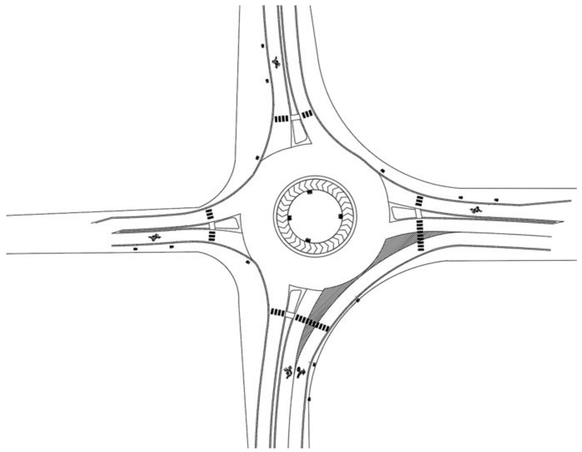
Old U.S. 27 and Baker Rd. Roundabout

Ryan Kafer, Dustin Huffer, Grant Patrick, & Riley Garling
Civil Engineering
Advisors: Professor T.J. Murphy

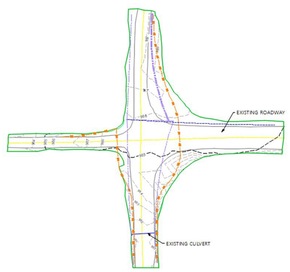
General

I&M Engineering has designed a roundabout to replace a four-way stop at the intersection of Old U.S. 27 and Baker Road, near Lake George. The roundabout will accommodate heavy truck traffic coming from the highway.



Data Collection & Analysis

I&M Engineering conducted a GPS survey and gathered traffic data using traffic counters.
The survey was used to create a base map as the foundation for the roundabout design. The survey points included existing pavement, utilities and the elevations -throughout the project site.



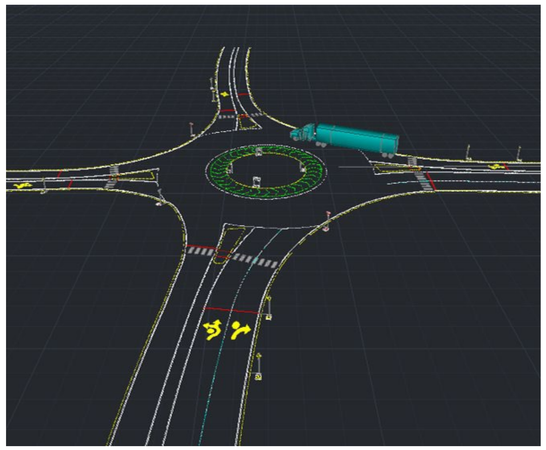
Due to the high traffic volume of the intersection, we wanted to conduct a traffic count. We placed traffic counters on all 4 legs of the intersection and collected the following data, and determined average annual daily truck traffic values.

Table 1.1.1: Traffic Data Analysis Results

	ADT	% of Trucks	AADT	AADTT
East Leg	2419	42	2448	1020
South Leg	4467	45	4521	2051
North Leg	1670	12	1690	196
West Leg	533	15	540	81

Geometric Design

The roundabout was designed based on the Federal Highway Administration's "Roundabouts: An Informational Guide 2010." The proposed roundabout classifies as a rural, single lane roundabout. Civil3D (2022) was used to draw the plans for this project. The roundabout building feature was used to build the roundabout and the four legs. A WB-67 was used as the design vehicle for this project. The vehicle tracking extension for Civil3D was used to ensure the design vehicle could navigate the roundabout.



Pavement Design

I&M Engineering used a software called ME-PD to calculate the required cross-section of the roadway and truck apron.
We compared 2 alternative cross-sections, the first being a full-depth HMA and the second being a composite cross-section. Table 3.3.1 indicates the required depths for both cross-sections.

Table 3.3.1: Pavement Layer Thicknesses

Full-Depth Pavement	Composite Pavement
165 lb/yd^2 HMA Surface, 9.5 mm	165 lb/yd^2 HMA Surface, 9.5 mm
275 lb/yd^2 HMA Intermediate, 19.0 mm	275 lb/yd^2 HMA Intermediate, 19.0 mm
330 lb/yd^2 HMA Base, 19.0 mm	10 in. Compacted Aggregate, No. 53

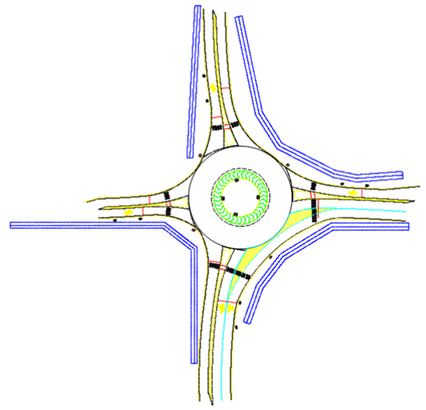
We ultimately chose the composite cross-section because it was the most cost-effective option. Table 3.3.2 shows the cost estimates for the pavement alternatives

Table 3.3.2: Pavement Costs

	Full Depth	Composite
HMA Surface	$27,584.75	$27,584.75
HMA Intermediate	$37,219.97	$27,219.97
HMA Base	$49,632.80	-
Compacted Aggregate, NO. 53	-	$17,034.90
Tack Coat	$3,890.52	$1,945.26
Total	$118,328.06	$83,784.89

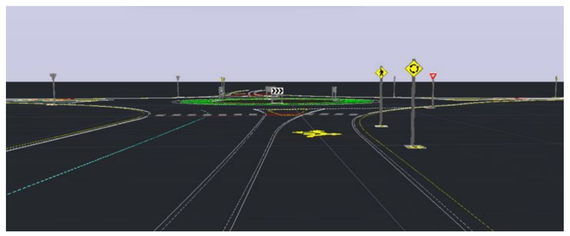
Hydraulics & Hydrology

I&M Engineering developed a drainage plan for the site, to ensure that the stormwater runoff doesn't build up in the roadway. We utilized local ordinances to determine the design storm, intensity, and required volume of storage.
The drainage area was split into 4 quadrants, with each splitter island having its own drainage area.
I&M Engineering utilized rock storage and swales to collect and store the runoff.



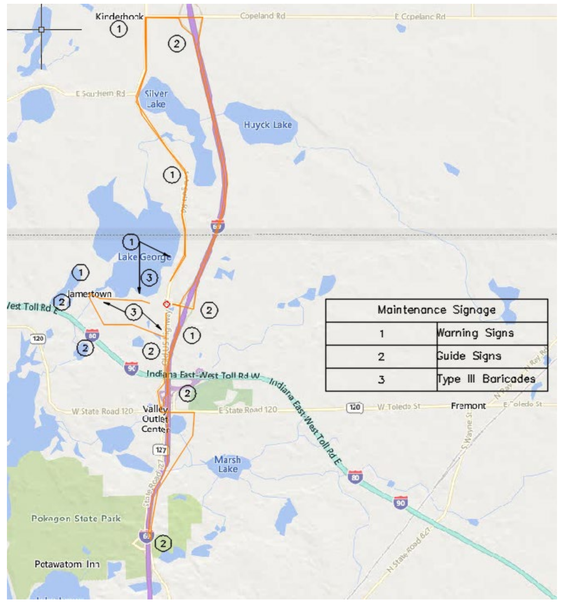
Traffic Design & Landscaping

I&M Engineering specified appropriate signs to warn motorists of the upcoming roundabout and to help guide them through it. Brick-colored concrete will be used for the truck apron. A proposed boat sculpture will be in the center island as well as river rock in the center island and splitter islands. These aspects will help deter pedestrians and motorists from using the center island.



Maintenance of Traffic

I&M Engineering determined that a complete closure is needed for the intersection. Detour routes will be used to reroute the public around the construction zone. The standards from INDOT Chapter 503: Maintenance of Traffic were used for the traffic maintenance.



Budget

For the cost of the roundabout, I&M Engineering used the INDOT Price Summary to gather prices for all construction costs and materials. We also added a 10% contingency that would allow for any unforeseen costs to be covered. The grand total of the roundabout came to be $552,642.87.

Table 8.1.1: Cost Estimate

Construction Engineering	$37,848.67
Construction Materials	$438,083.99
Contingency	$50,240.26
Grand Total	$552,642.87