APPENDIX A

US 31 Crash and Safety Information

	Crashes per mile rate calculation per https://safety.fhwa.dot.gov/local_rural/training/fhwasa1109/app_c.cfm R = C ÷ (N x L) R = Crashes per mile for the road segment expressed as crashes per each 1 mile of roadway per year. C = Total number of crashes in the study period. N = Number of years of data. L = Length of the roadway segment in miles.	2018-2020 crash data
	US 31 Corridor Statistics	
	(Info. from February 2017 CHA Existing Conditions report; years 2014-2016)	
	C = 152	C = 296
	N = 3	N = 3
Hamilton Carrets	<u>L = 8.5</u>	<u>L = 8.5</u>
Hamilton County	R = 5.96 C = 244	R = 11.61
	N = 3	
	L = 11.7	
Tipton County	R = 6.95	11.61 is 67 % higher than Tipton County 2014-2016 rate
ripton county	C = 16	11.01 is 6776 migher than ripton county 2014 2010 rate
	N = 3	
	<u>L = 0.8</u>	
Howard County	R = 6.67	11.61 is 74% higher than Howard County 2014-2016 rate
<i>'</i>	C = 567	
	N = 3	
	<u>L = 30.4</u>	
Miami County	R = 6.22	11.61 is 87% higher than Howard County 2014-2016 rate
	C = 218	
	N = 3	
	<u>L = 14.2</u>	
Fulton County	R = 5.12	11.61 is 127% higher than Howard County 2014-2016 rate
	C = 321	
	N = 3	
	<u>L = 12.6</u>	
Marshall County	R = 8.49	11.61 is 37% higher than Howard County 2014-2016 rate

US 31Limited Access Hamilton County Des. No. 1900096



June 2021

US 31 Crash and Safety Analysis



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INTRODUCTION

INDOT proposes to convert US 31 into a limited access highway between SR 38 and 286th Street in Hamilton County. Several previous studies have been completed regarding the capacity and safety of the corridor, including evaluating the impacts of converting the corridor to limited access. This report will assess the crash information along the US 31 corridor from SR 38 to 296th Street in Hamilton County and address the safety concerns and notable impacts of future improvements. The intersections at 236th Street and 296th Street are included in this study area but are not included as part of the proposed project. Proposed improvements at 236th Street are being completed as an independent project and 296th Street is north of the project termini.

EXISTING CONDITION DESCRIPTION

EXISTING CONDITION

The study area is from the intersection of SR 38 with US 31 to the intersection of 296th street with US 31 in the Hamilton County, Indiana. It is an 8.5-mile Principal Arterial Roadway segment with an Average Annual Daily Traffic (AADT) Volume of 26580 Vehicles Per Day (vpd) in 2020. The posted speed limit is 60 mph throughout the segment.

Along the study section of US 31 there are a total of 11 roadways intersecting with US 31: One signalized intersection exists at 236th Street and ten additional unsignalized intersections exist within the study limits. Table 1 summarizes the existing intersections along the corridor.

Intersecting Roadway	Existing Intersection Treatment
216th Street	Unsignalized Intersection
226th Street	Unsignalized Intersection
236th Street	Signalized Intersection
241st Street	Unsignalized Intersection
246th Street	Unsignalized Intersection
256th Street	Unsignalized Intersection
266th Street	Unsignalized Intersection
276th Street	Unsignalized Intersection
281st Street	Unsignalized Intersection
286th Street	Unsignalized Intersection
296th Street	Unsignalized Intersection

There are also several residential and commercial properties with direct access onto US 31. This includes two gas stations, five commercial properties and twenty-seven residences.

LAND USE

The majority of the study area is agricultural in use with several residential properties. Gas stations are present at 216th street and 236th Street, which generally serve the passing motorists and generate minimal additional traffic. 226th Street has several commercial properties in the area. Reynolds Farm Equipment is located at the 276th Street intersection and Beck's Hybrids east of US 31 on 276th Street.

SAFETY INFORMATION

CRASH INFORMATION

Corridor safety is one of the key factors being considered. INDOT conducted a US 31 Corridor Study, Existing Conditions Report in February 2017, in which a 3-year historical crash data from 2014 to 2016 along US 31 was reviewed. The results of that study are referenced within this report. In 2021, crash data analysis was updated for this segment of US 31 and included the crash data for the three years period from 2018-2020.

It is assumed that crashes that were reported within 1,000 feet of an intersection were influenced by the intersection. 1,000 feet was used since most auxiliary left and right-turn lanes on US 31 are approximately 500-600 feet in length. Another 500 feet is allotted on the approaches for vehicles changing lanes to get into the turn lanes or to pass vehicles slowing down to turn at the intersection. A summary of the Crash Data from the 2014-2016 and 2018-2020 study periods for the segment can be found in Table 2. For the 2018-2020 time period, the crash data was also filtered to include only those accidents that occurred within 1000 feet of an intersection and a summary is also included in Table 2.

Between the two study periods the total number of reported crashes increased from 152 crashes to 296 crashes, which equates to an increase of 95%. During the 2018-2020 a total of 198 of the reported crashes, or 67%, occurred within 1000 ft of an intersection.

Table 2 - Crash S	Summary for	Hamilton	County
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	No. of Cars	No. of Trailers	No. of Injuries	No. of Fatalities	No. of Deer	No. of Crashes
2014-2016	244	21	53	0	34	152
2018-2020	534	43	57	3	33	296
2018-2020 crashes within 1000 ft of an intersection	366	27	36	0	21	198
	Vehicle	es/Crash	Injuries/ Crash	Fatalities /Crash	Deer/ Crash	
2014-2016	1.	.74	0.35	0	0.22	
2018-2020	1.95		0.19	0.01	0.11	
2018-2020 crashes within 1000 ft of an intersection	1.79 1.79		0.18	0	0.11	

A summary of the crash types and frequencies for the 2018-2020 study period is provided in Table 3. Crash types more commonly associated with rural highways include crashes involving deer, driving too fast for weather conditions, unsafe speeds, and running off the road. Table 4 summarizes these accident types and shows that 26% of the reported crashes resulted from these causes associated with rural highways. Crash types more commonly associated with intersections include failing to yield the right of way, disregarding a traffic signal or sign, and following too closely. Table 5 summarizes these accident types and shows that 44% of all the reported

crashes, and 50% of those within 1000 feet of an intersection resulted from these common causes associated with intersections.

Table 3 - Most Frequent Crash Types in Hamilton County

Type of Crash	2018-2020
Following too closely	86
Failure to yield right of way	43
Unsafe lane movement	39
Animal/Object in roadway	37
Ran off road right	27
Speed too fast for weather conditions	10
Unsafe Backing	9
Improper turning	8
Driver distracted	6
Improper lane usage	5
Improper passing	3
Driver asleep or fatigued	3
Disregard signal/ red sign	2
Unsafe speed	2
Overcorrecting/oversteering	2

Table 4 - Frequency of Accidents Commonly Associated with Rural Roadways

Type of Crash	2018-2020
Animal/Object in roadway	37
Ran off road right	27
Speed too fast for weather conditions	10
Unsafe speed	2
Total for these Causes	76
Percent of Total Accidents	26%

Table 5 - Frequency of Accidents Commonly Associated with Intersections

Type of Crash	2018-2020	2018-2020 crashes within 1000 ft of an intersection
Following too closely	86	64
Failure to yield right of way	43	34
Disregard signal/ red sign	2	2
Total for these Causes	131	100
Percent of Total Accidents	44%	50%

ROADHAT ANALYSIS

A RoadHat Analysis was completed using RoadHat 4D software. This analysis compares road segments or intersections to crash frequencies and crash costs collected on all Indiana Roads. The RoadHat analysis was completed for the existing corridor between SR 38 and 296th Street using the intersections as midpoints of the segments.

The RoadHat analysis uses facility types, traffic volumes and crash data as input to yield two measures – the index of crash frequency (Icf) and the index of crash cost (Icc). The Icf and Icc quantify the volume and severity of crashes at a given location. A value above zero indicates a concern – values above 1.0 indicate serious safety concerns. INDOT categorizes a high crash location as a location that has at least one index (Icf or Icc) of 2.0 or higher. Table 6 summarizes the results of the RoadHat analysis and shows that there are four locations in the study area that satisfy INDOT's high crash location criteria: 216th Street, 226th Street, 256th Street and 266th Street.

Table 6 - US 31 Corridor Crash Information 2018-2020 RoadHat Results

Commont	ament AADT Existina			Crashes (Number of People)				RoadHat Results
Segment Location	2020	Existing Condition	Fatal	Injury	Property Damage Only	Total Crashes	lcf	lcc
216th Street	27538	Two-way Stop	0	5 (7)	29	34	2.97	-0.15
226th Street	27538	Two-way Stop	0	4 (7)	22	26	2.17	-0.29
236th Street	27538	Signalized Intersection	0	8 (11)	88	96	1.95	-0.40
241st Street	27538	One-way Stop	0	0	14	14	1.41	-0.56
246th Street	27194	One-way Stop	0	1 (2)	10	11	0.96	-0.46
256th Street	27194	Two-way Stop	0	7 (11)	23	30	2.60	-0.01
266th Street	26670	Two-way Stop	1 (2)	5 (7)	19	25	2.11	0.29
276th Street	26111	Two-way Stop	0	2 (4)	15	17	1.22	-0.50
281st Street	26111	One-way Stop	0	1 (1)	8	9	0.67	-0.47
286th Street	26111	Two-way Stop	0	2 (7)	15	17	1.22	-0.50
296th Street	25536	Two-way Stop	1 (1)	0	16	17	1.25	-0.10

PROPOSED PROJECT IMPROVEMENTS

As a result of the high rate of accidents that are occurring along the corridor, specifically near intersections, INDOT proposes to convert the section of US 31 from SR 38 to 286th Street to a limited access corridor. This will include conversion of the intersecting roadway to either interchanges, bridges, or cul-de-sacs as well as the removal or all private and commercial driveway access points onto US 31. Table 7 summarizes the preliminary proposed treatment at the intersections.

Table 7 - US 31 Corridor Proposed Interse

Intersecting Roadway	Proposed Intersection Treatment
216th Street	Cul-de-sacs
226th Street	Overpass
236th Street	Interchange *
241st Street	Cul-de-sac
246th Street	Cul-de-sac
256th Street	Cul-de-sacs
266th Street	Overpass
276th Street	Interchange
281st Street	Cul-de-sac
286th Street	Northern project termini- remove median crossover only

^{*} Not included as part of proposed project

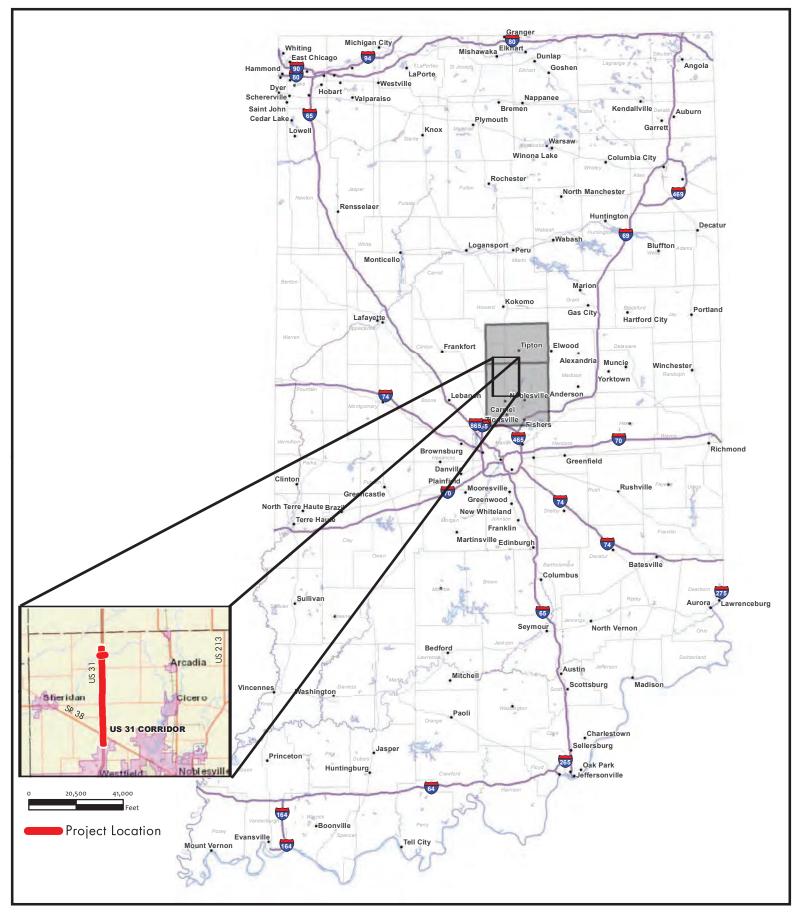
Intersections are planned points of conflict in roadway systems. The Federal Highway Administrations studies have indicated that 25% of traffic fatalities and roughly 50% of traffic injuries are attributed to intersections. By creating a Limited Access Corridor by removing intersections, the number of potential conflict points will be reduced, and it is expected that the frequency and severity of accidents will be reduced.

As noted previously, 67% of the reported accidents have occurred within the influence zone of an intersection (within 1000 feet of on intersection) and 44% of the accidents along the corridor were caused by following too closely, failing to yield the right-of-way and disregarding a traffic signal/sign which are the types of causes most commonly associated with intersections.

The removal of the existing intersections and private and commercial driveways along the US 31 will improve safety along US 31 by reducing the number of potential conflict points along the corridor. It is anticipated that a crash reduction of up to 40% can be anticipated because of the proposed changes.

APPENDIX B

Project Maps and Exhibits



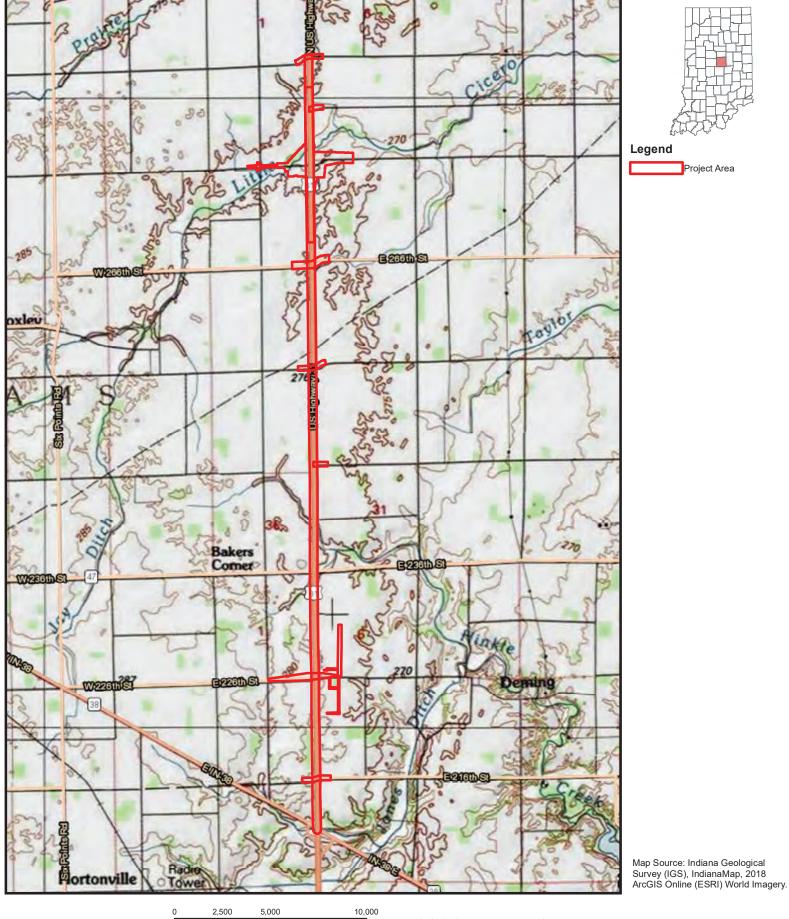




State Map

US 31 Corridor from SR 38 to 286th Street Hamilton County, Indiana Des. Nos. 1900096, et. al.

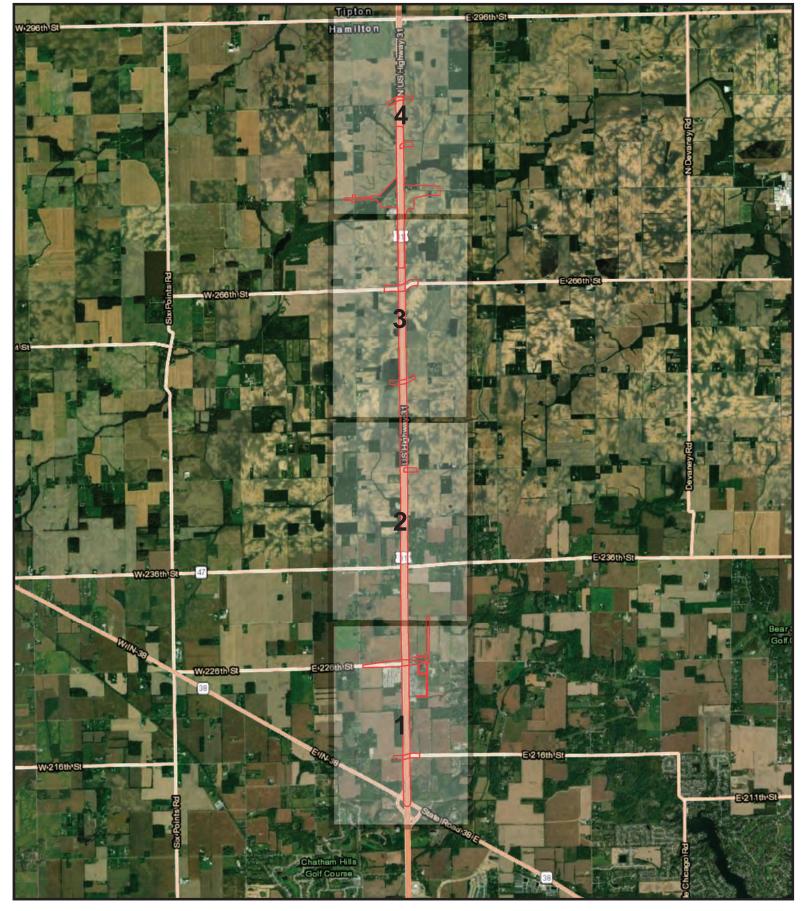
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USGS Quadrangle Overall Map



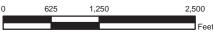


Aerial Project Area Map



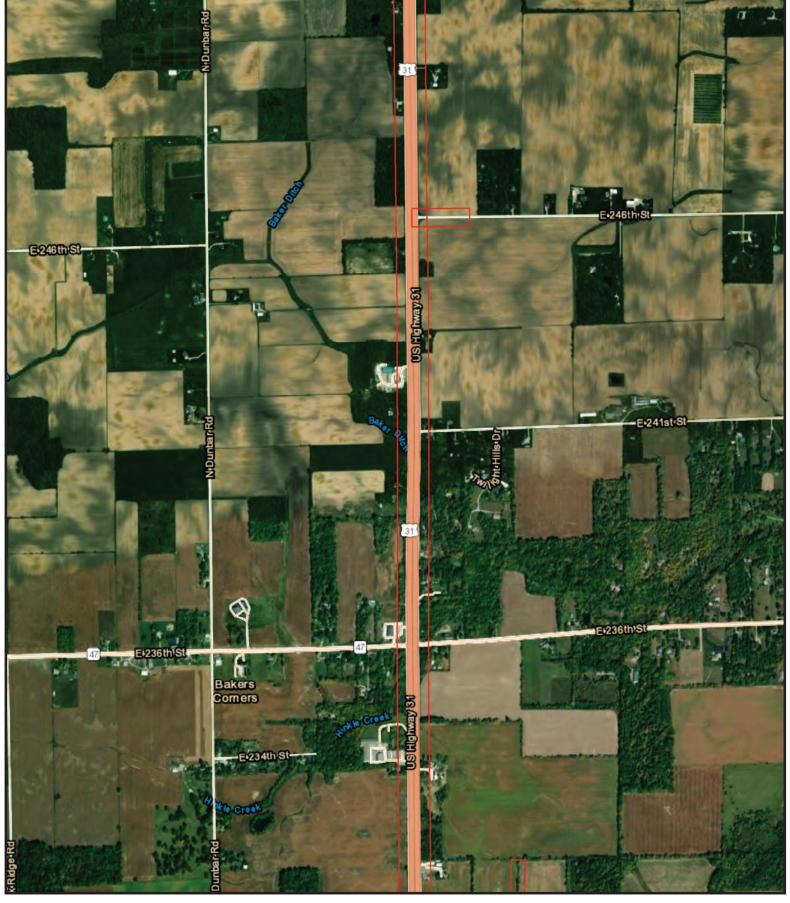


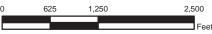






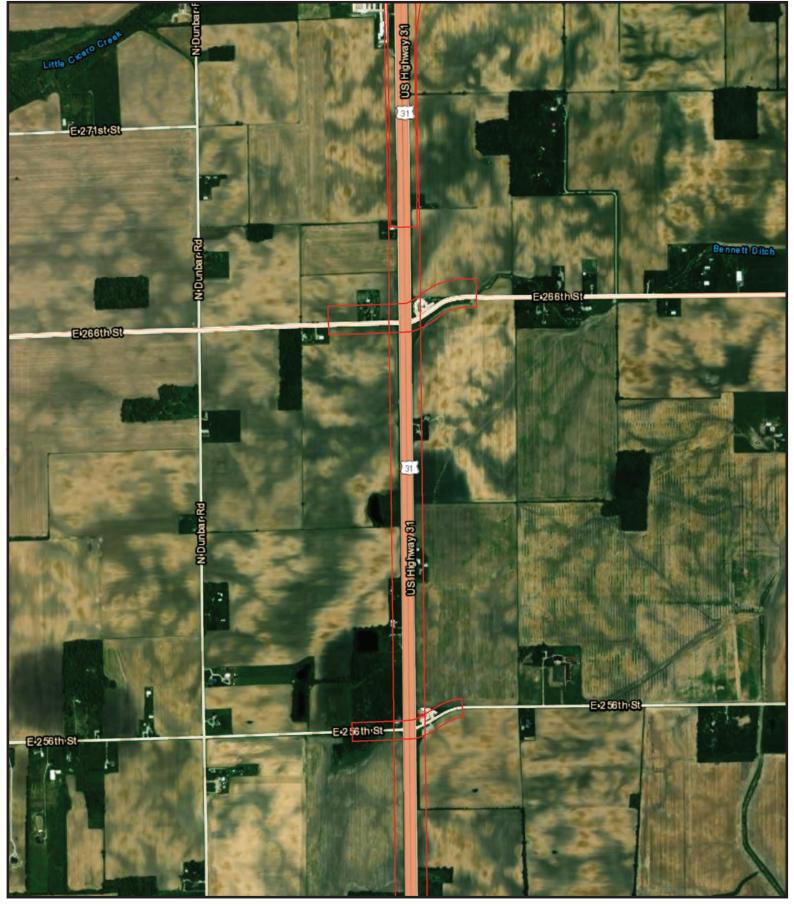








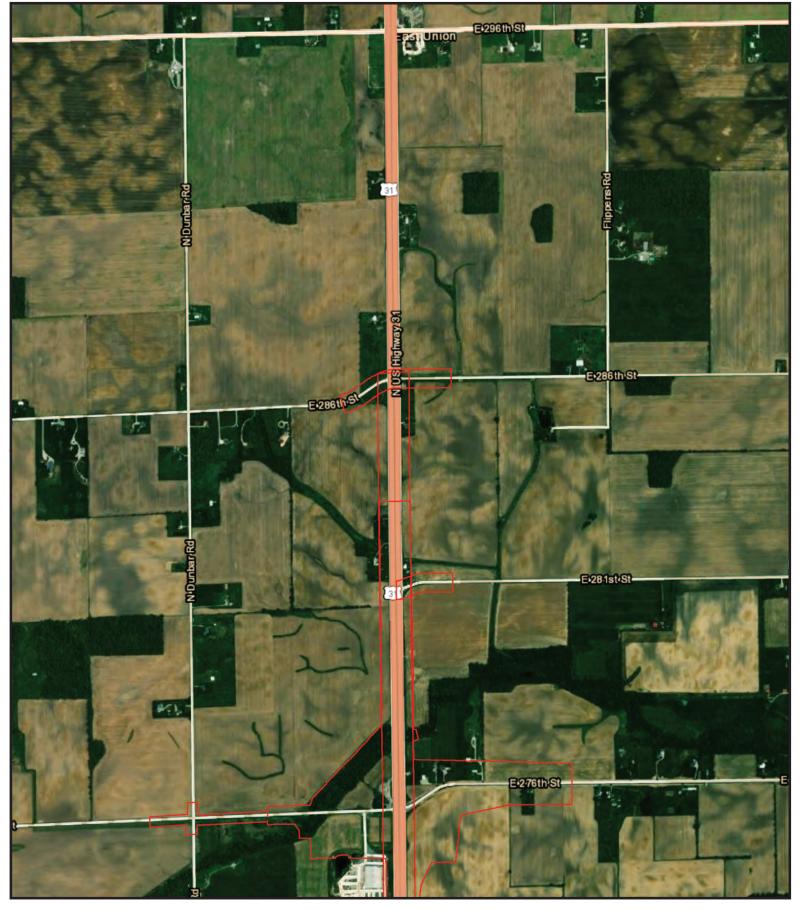








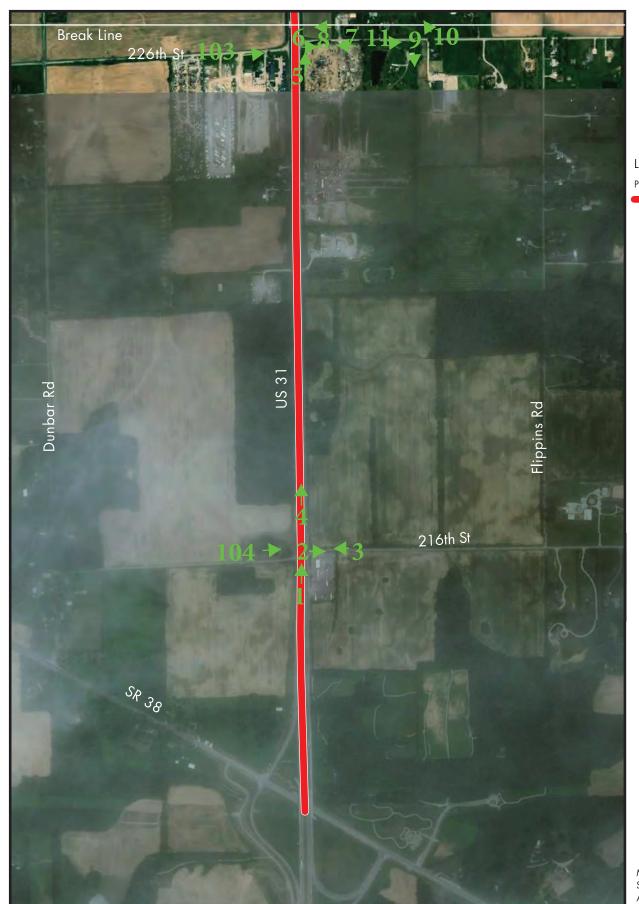
Project Area







Project Area





Legend Project Area

Photo Points

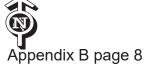


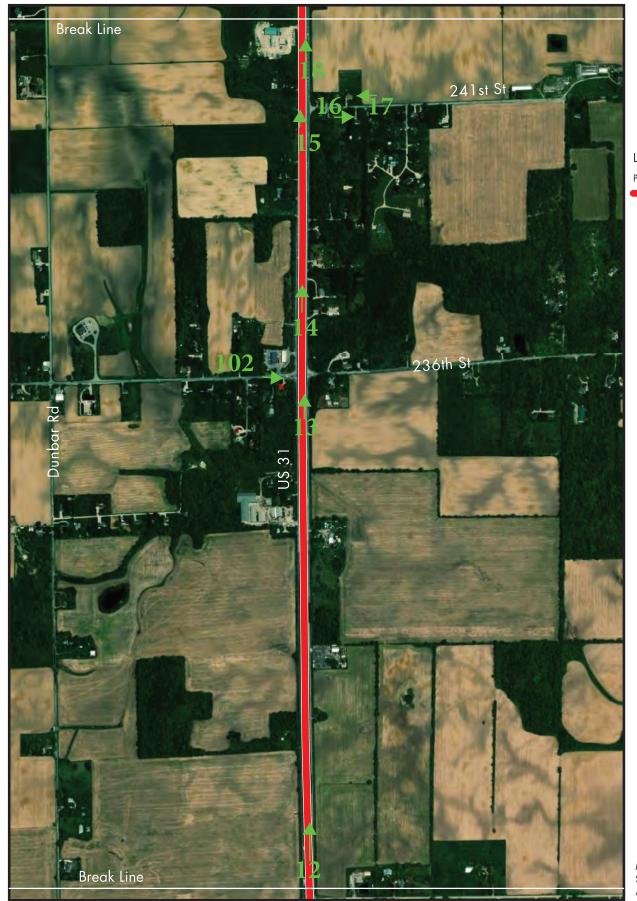
Map Source: Indiana Geological Survey (IGS), IndianaMap, 2019 ArcGIS Online (ESRI) World Imagery.













Legend Project Area



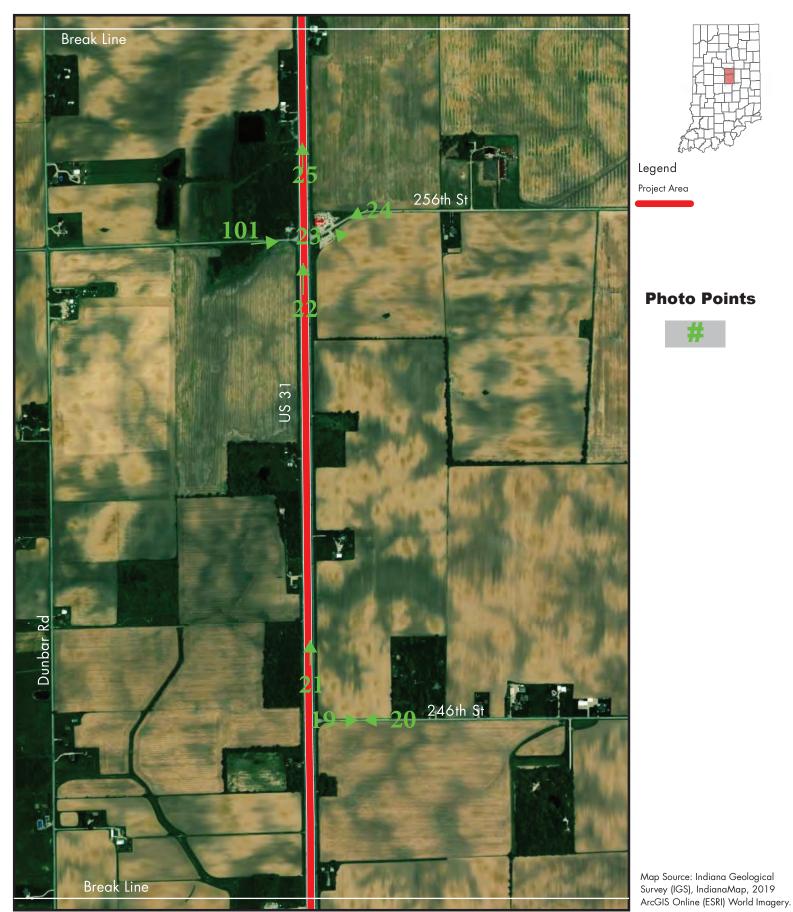
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Aerial Map 2







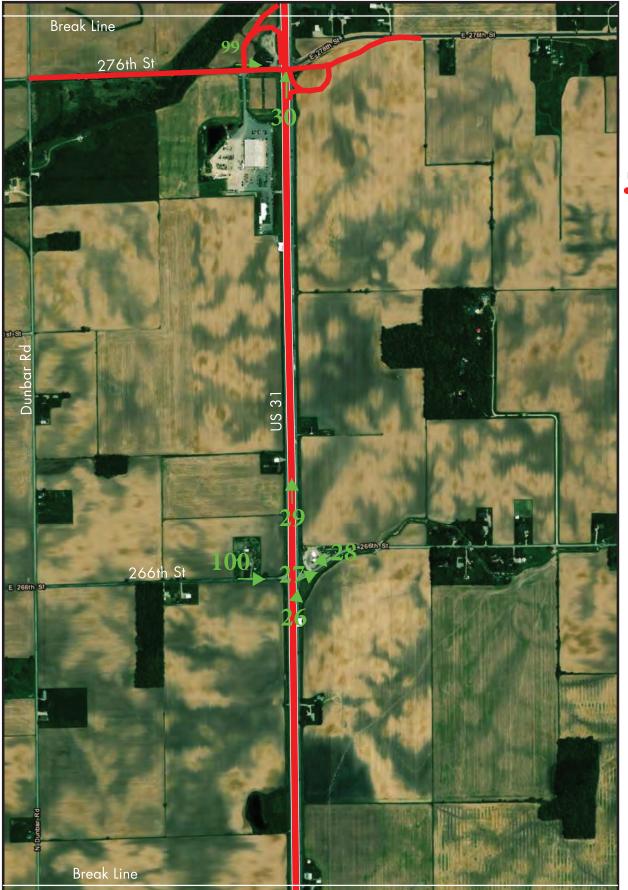




Aerial Map 3









Legend Project Area



Map Source: Indiana Geological Survey (IGS), IndianaMap, 2019 ArcGIS Online (ESRI) World Imagery.



Aerial Map 4









Legend Project Area



Map Source: Indiana Geological Survey (IGS), IndianaMap, 2019 ArcGIS Online (ESRI) World Imagery.



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Aerial Map 5







Legend Project Area



Map Source: Indiana Geological Survey (IGS), IndianaMap, 2019 ArcGIS Online (ESRI) World Imagery.



Aerial Map 6





Photo 1: Looking north along US 31 towards 216th Street



Photo 3. Looking west along 216th Street towards US 31



Photo 2. Looking east along 216th Street from US 31



Photo 4. Looking north along US 31 north of 216th Street





Photo 5: Looking north along US 31 towards 226th Street



Photo 7: Looking west along 226th Street towards US 31



Photo 6: Looking east along 226th Street from US 31



Photo 8: Looking west along 226th Street across US 31



Photo 9: Looking south from 226th Street along potential future frontage road alignment



Photo 11: Looking east along 226th Street east of US 31



Photo 10: Looking northwest from 226th Street at area of potential future access drive for existing commercial business



Photo 12: Looking north along US 31 north of 226th Street





Photo 13: Looking north along US 31 towards 236th Street



Photo 15: Looking north along US 31 towards 241st Street



Photo 14: Looking north along US 31 north of 236th Street



Photo 16: Looking east along 241st Street from US 31



Photo 17: Looking west along 241st Street towards US 31



Photo 19: Looking east along 246th Street from US 31



Photo 18: Looking north along US 31 north of 241st Street



Photo 20: Looking west along 246th Street towards US 31



Photo 21: Looking north along US 31 north of 246th Street



Photo 23: Looking east along 256th Street from just east of US 31



Photo 22: Looking north along US 31 towards 256th Street



Photo 24: Looking west along 256th Street towards US 31



Photo 25: Looking north along US 31 north of 256th Street



Photo 27: Looking east along 266th Street from just east of US 31



Photo 26: Looking north along US 31 towards 266th Street



Photo 28: Looking west along 266th Street towards US 31





Photo 29: Looking north along US 31 north of 266th Street



Photo 31: Looking north along US 31 from north of 276th Street



Photo 30: Looking north along US 31 towards 276th Street



Photo 32: Looking north US 31 towards 281st Street



Photo 33: Looking east along 281st Street from US 31



Photo 35: Looking north along US 31 north of 281st Street



Photo 34: Looking west along CR 281st Street towards US 31



Photo 36: Looking north along US 31 towards 286th Street



Photo 97:Looking east along County Line Road at US 31



Photo 99:Looking east along 276th Street towards US 31



Photo 98: Looking east along 286th Street towards US 31



Photo 100: Looking east along 266th Street towards US 31



Photo 101: Looking east along 256th Street towards US 31



Photo 103: Looking east along 226th Street towards US 31

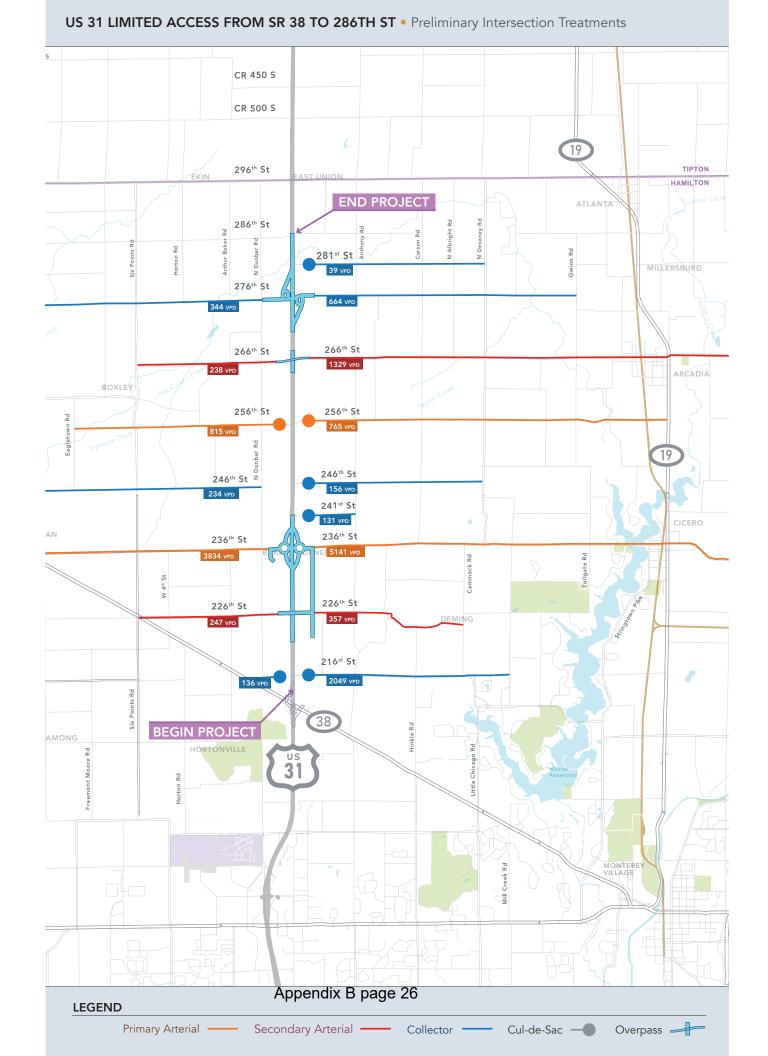


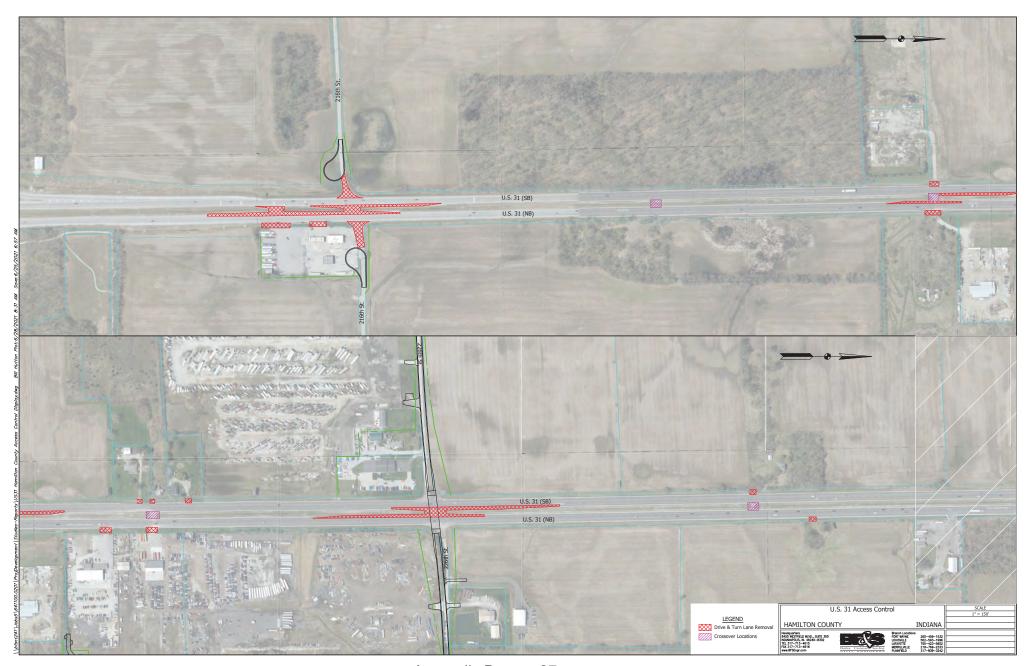
Photo 102: Looking east along 236th Street towards US 31



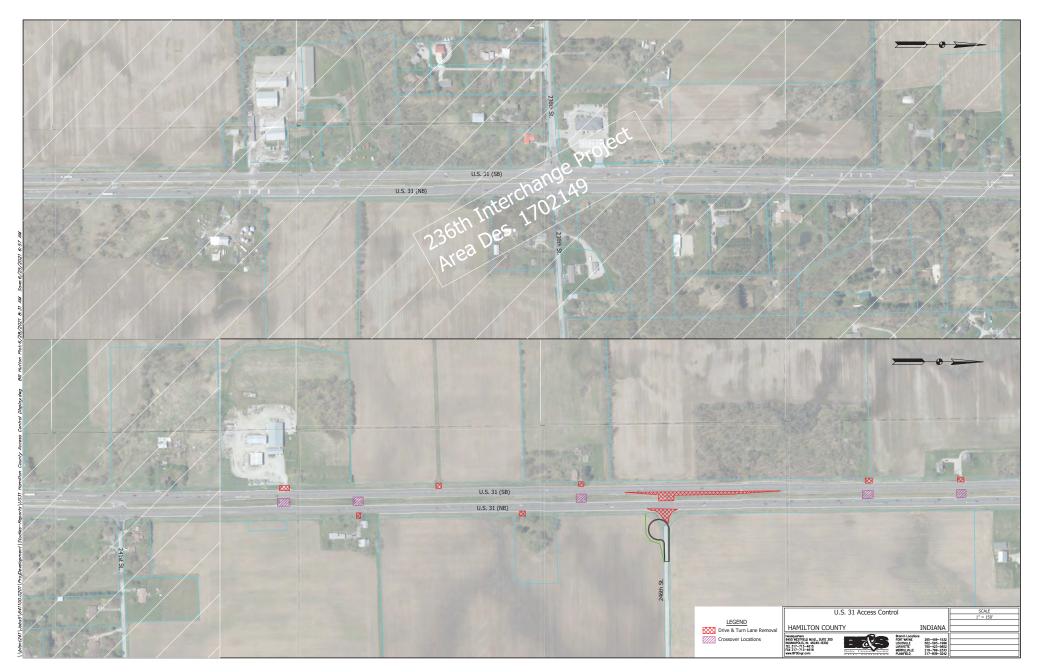
Photo 104: Looking east along 216th Street towards US 31



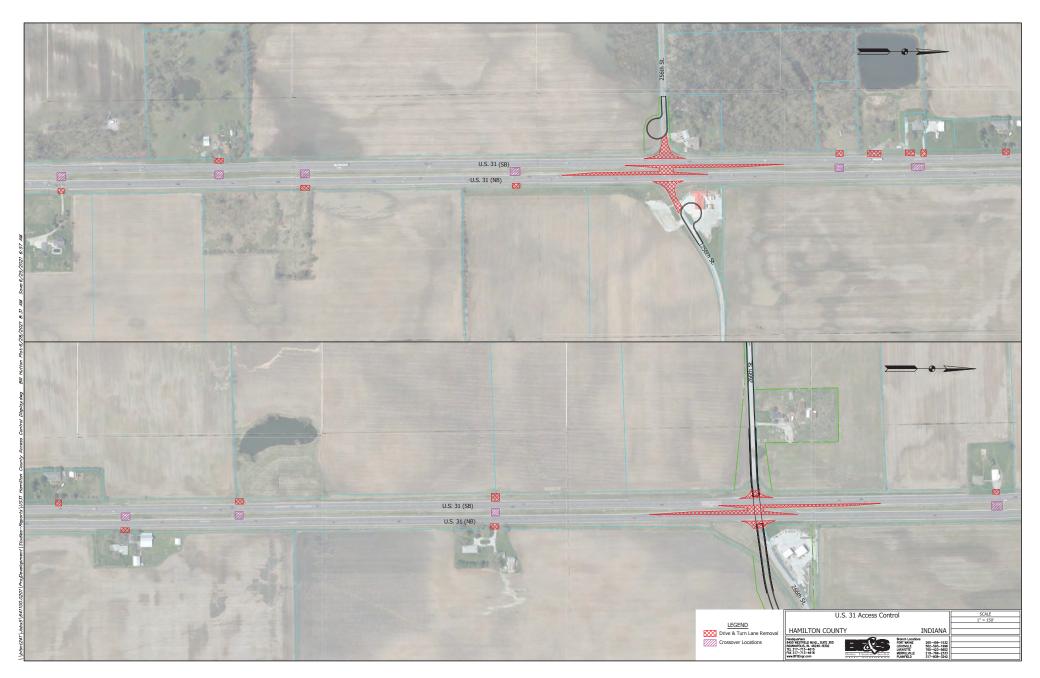




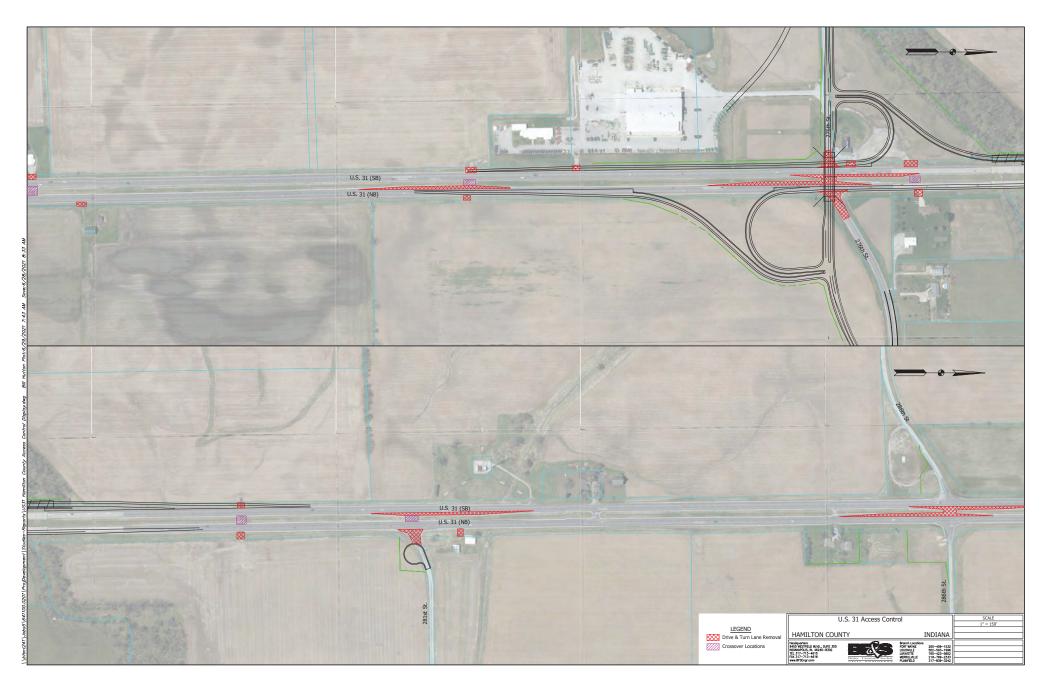
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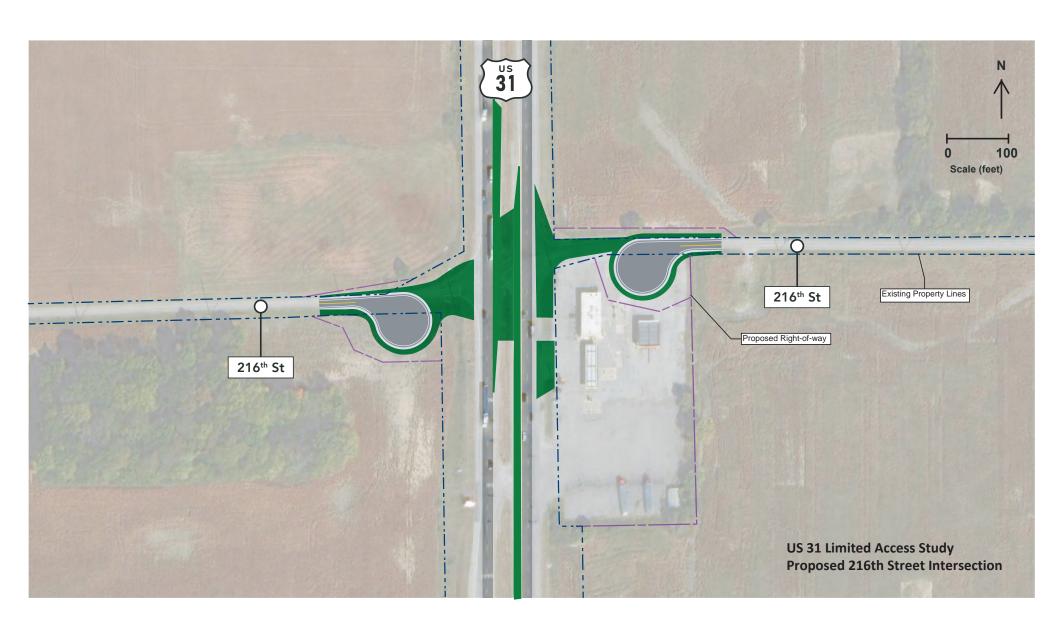
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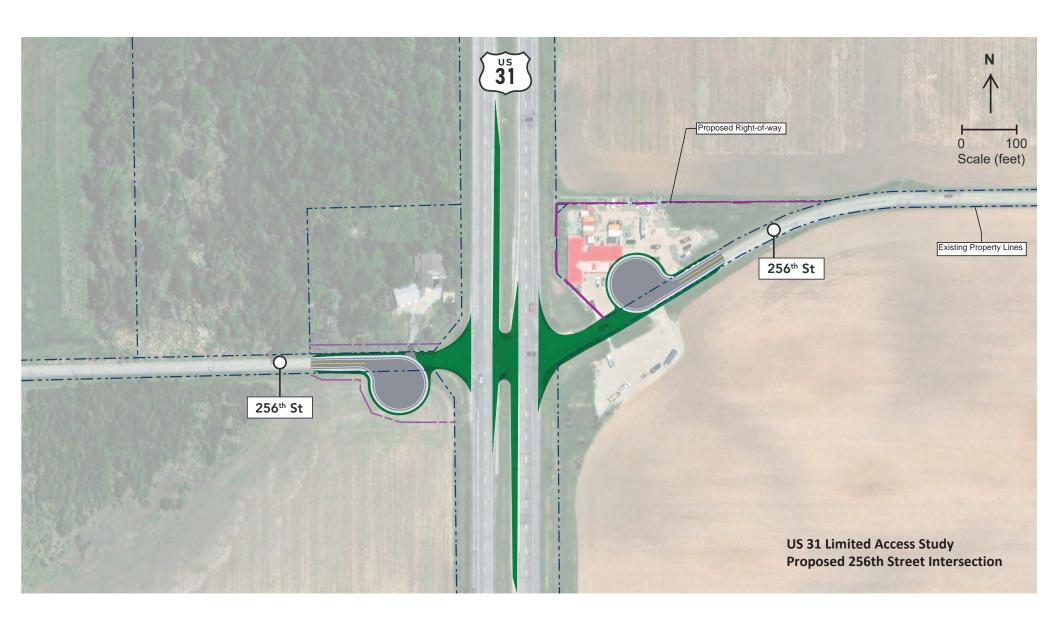


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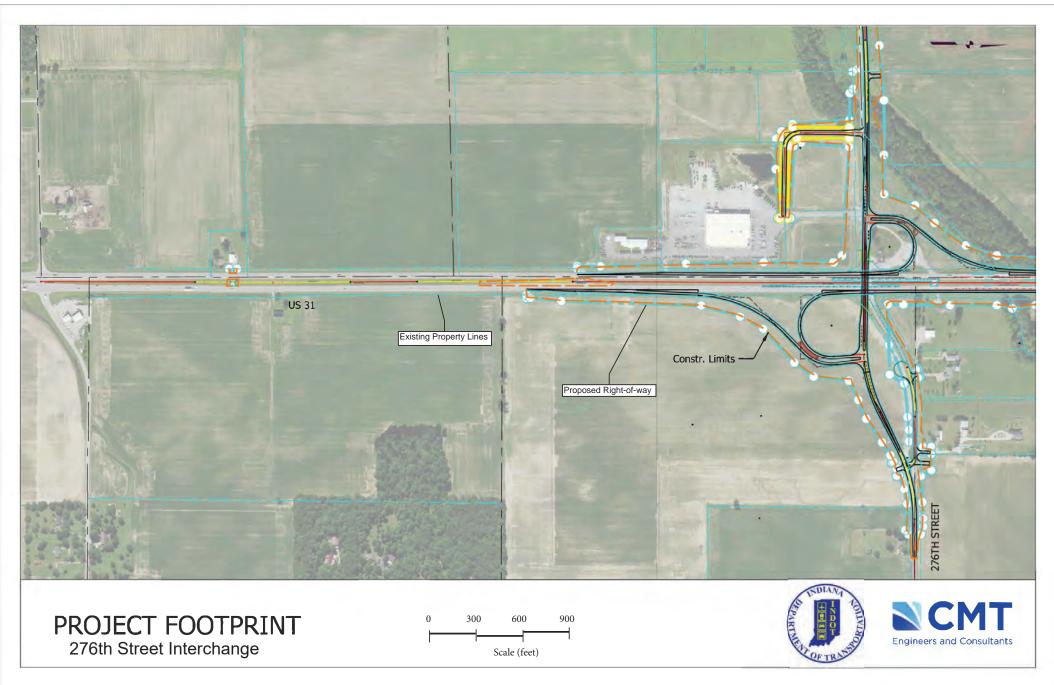
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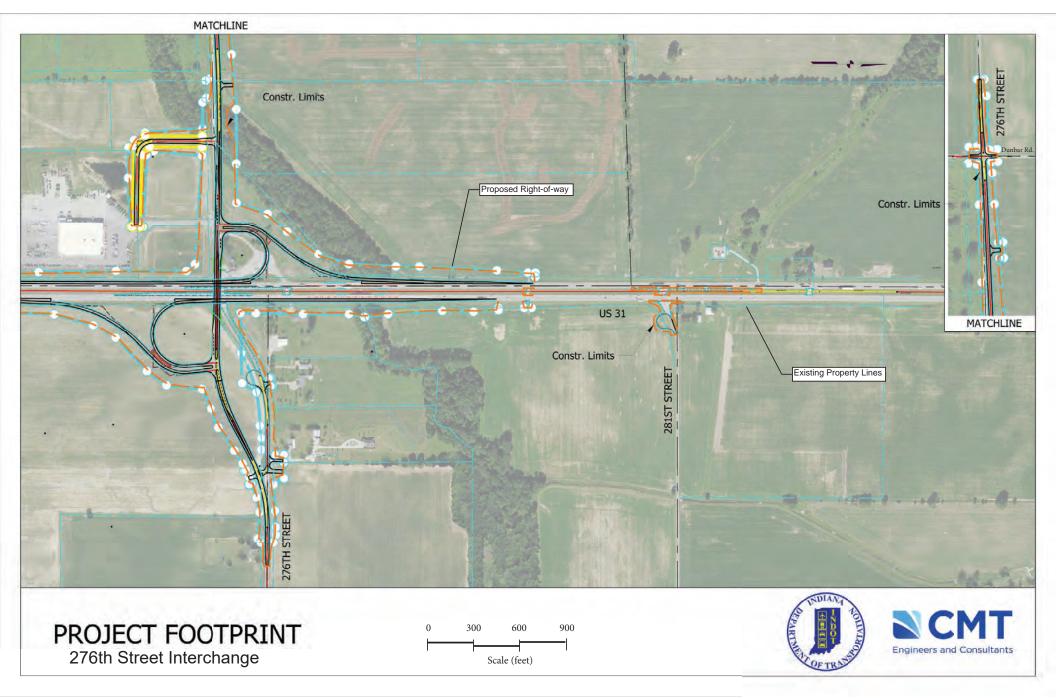




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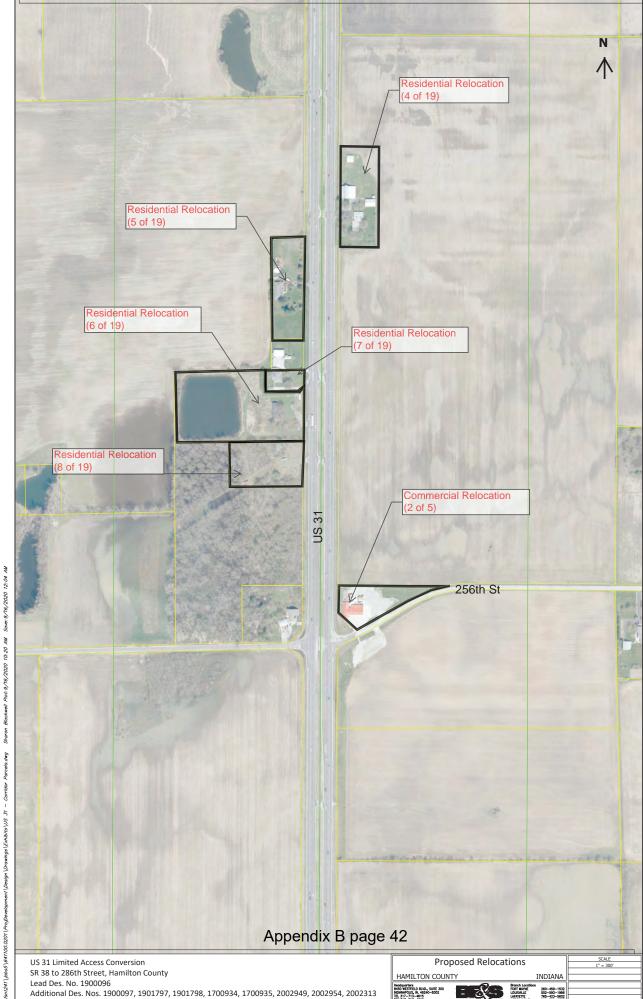


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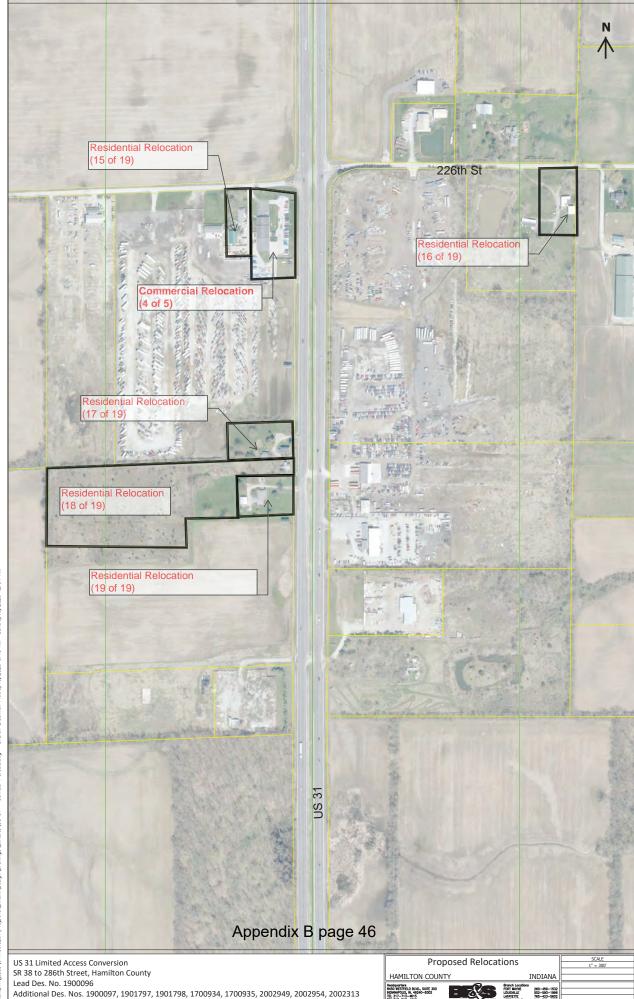






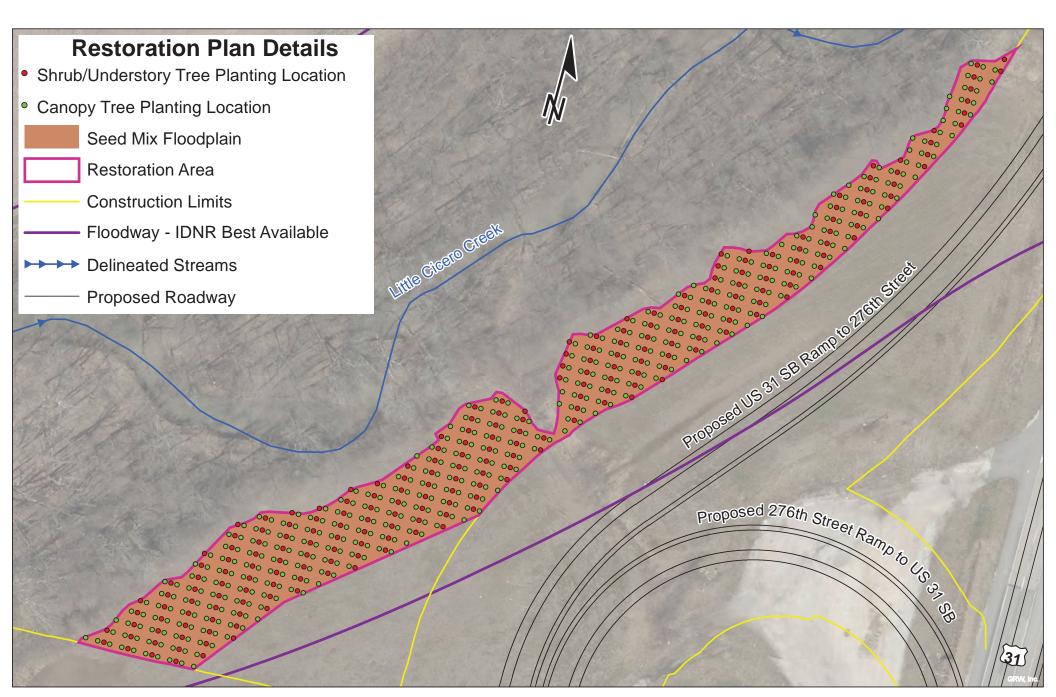












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