

PRELIMINARY ALTERNATIVES REPORT

DES NUMBER: 1902709

CONTRACT: B-42876

US 41 GRADE SEPARATED PEDESTRIAN CROSSING



PROJECT LOCATION: THE EXISTING CROSSING AT THE INTERSECTION OF US 41  
AND WASHINGTON AVENUE T-6-S, R-10-W, KNIGHT TOWNSHIP, VANDERBURGH  
COUNTY, INDIANA

REFERENCE POST: 2+90

PREPARED BY: ERICA HAAS, P.E., HNTB

DATE: OCTOBER 2, 2020

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## **Attachments**

Attachment A – Project Location Map

Attachment B – Project Coordination Meeting Minutes

Attachment C – Photographs

Attachment D – Call Application Report Project (Mini Scope)

Attachment E – Traffic Safety Analysis and Design Criteria

Attachment F – Alternatives Location Diagram

Attachment G – Cost Comparison

## **1.0 PURPOSE AND NEED**

The need for this project is a growing potential for incidents between pedestrian/bicycle traffic and vehicles at the intersection of US 41 and Washington Avenue as pedestrian/bicycle traffic increases. Currently, pedestrian and bicycle traffic are using the at-grade crossing at the signalized intersection. An Abbreviated Engineering Review for Traffic Safety was completed by WSP in 2019 and is included in Attachment E. The study concluded that a grade separated crossing was warranted at this location. Additionally, Bosse High School, the City of Evansville, and local neighborhood groups have expressed desire for a grade separated crossing.

The purpose of this project is to reduce the potential for pedestrian conflicts with traffic at the intersection by providing a grade separated crossing.

This report will determine the most appropriate location and structure configuration for the US 41 grade separated pedestrian crossing. Two alternative structures will be investigated; a below grade tunnel and a pedestrian bridge. A subsequent report will be used to make a final determination on structure type and scope.

## **2.0 PROJECT LOCATION**

This project is located on US 41 at the intersection of Washington Avenue in Knight Township, Vanderburgh County, within INDOT's Vincennes District. For a map of the project location, see Attachment A.

## **3.0 EXISTING CONDITIONS**

### **3.1 *Existing Intersection***

US 41 is an urban principal arterial and is part of the US National Highway System (NHS). Within the project limits, US 41 includes four 12 foot through lanes and two turning lanes of varying width. Washington Avenue is an urban minor arterial, not on the NHS, and includes four through lanes and a turning lane at the intersection.

The High-Rail Pedestrian Trail runs along the west side of US 41 within the project limits and connects to the sidewalks on the north and south side of Washington Avenue.

### **3.2 Preliminary Traffic Crash Data Analysis**

According to the Abbreviated Engineering Review for Traffic Safety (see Attachment E), the 2018 AADT along US 41 was 27,902 vehicles per day, and along Washington Avenue was 12,463 vehicles per day. The speed limit along US 41 is 40 mph (reduced to 30 mph in school zone). The speed limit along Washington Avenue is 30 mph (reduced to 20 mph in school zone). Updated traffic information will be requested for a future submittal.

Collision and traffic data are provided in Attachment E. These reports show 137 vehicular collisions occurring over a period of five years, 2014-2018, 44 of which resulted in injury. During this same period, one bicyclist crash was recorded, although numerous near misses involving both pedestrians and bicyclists were noted.

### **3.3 Existing Utilities**

There are overhead utility lines running across US 41 approximately 175 feet north of the intersection, and approximately 175 feet south of the intersection. Overhead utility lines also run parallel to US 41 on both the east and west sides and cross Washington Avenue on the west side of the intersection. There is an existing buried concrete pipe running from the median to the east shoulder across the northbound lanes just north of the intersection. A second buried concrete pipe runs from the median to the west shoulder across the southbound lanes approximately 300 feet north of the intersection.

## **4.0 FIELD CHECK AND COORDINATION**

The project team visited the site for a project kick-off. Additionally, the project team had a coordination meeting with Bosse High School to understand the needs of students as they move around this intersection. See Attachment B for meeting minutes from those meetings. See Attachment C for photographs of the existing intersection and surrounding area.

## **5.0 FUTURE CONSIDERATIONS**

Potential future intersection improvements include conversion of the intersection to a Reduced Conflict Intersection (RCI). For the purpose of determining preliminary alternatives, the RCI is assumed to be a Median U-Turn with a location assumed to be 700 feet north and south of the

intersection. No additional plans for expansion are noted in the current Statewide Transportation Improvement Program (STIP) 2020-2024.

## **6.0 ALTERNATIVES AND RECOMMENDATIONS**

A grade separated crossing is warranted at this location based on the safety concerns for pedestrian and bicycle traffic at the intersection. This crossing falls under new construction design criteria per Indiana Design Manual (IDM) 40-6.01(01) and uses IDM Figure 53-6 for vertical clearance. See Attachment E for IDM Figure 53-6.

In order to encourage use of the proposed pedestrian crossing, removal of the existing crosswalk markings and pedestrian refuge at US 41 north of Washington Avenue is proposed as part of this project. The use of bollards, fence, or other methods of blocking the existing crosswalk location will be considered further during project development.

### **6.1 Preliminary Location Alternatives**

The alternates explored in this report are based on the recommendations of the Call Application Report Project prepared by INDOT in December 2019. The report recommends a grade separated crossing to provide for pedestrian traffic crossing US 41. Two alternative structure configurations were considered, a below ground tunnel and a pedestrian bridge. Both options were considered at four locations within the project area; at East Chandler Avenue, at East Powell Avenue, at East Blackford Avenue, and the north side of the intersection of US 41 and Washington Avenue. Each location was analyzed for the following key factors.

#### Key Factors

Key factors considered for each alternate are discussed below and are in no particular order. Please refer to Table 6-1 below for Summary of Key Factors at Investigated Locations.

- A. Right of way impacts  
Right of way acquisition will increase the overall cost of the project. Right of way impacts will be minimized as much as possible.
  
- B. Utility impacts  
Utility impacts are expected with all alternates, however relocations will be minimized where possible.

C. Convenience and frequency of use

Initial project coordination has identified the students of Bosse High School as a significant portion of the pedestrians that will be served by this crossing. Due to the location of Bosse High School on the north side of Washington Avenue as well as information from Bosse High School stating that most students walk on the north side of Washington Avenue, only crossing north of the intersection were explored. Additionally, it has been noted that pedestrian access to Bosse High School is traditionally through an entrance in the SE corner of the school.

D. Safety

Safety concerns such as visibility and lighting were considered at all locations.

E. Impacts on future intersection improvements

As noted in a previous section, there is the potential for a future Reduced Conflict Intersection project that would place a Median U-Turn north of the intersection. The location of this U-Turn is assumed to be 700’ north of the intersection of US 41 and Washington Avenue. Therefore, obstructions to a vehicle’s line of sight or interference with construction of this U-Turn have been considered.

**Table 6-1: Summary of Key Factors at Investigated Locations**

Location		A: Right-of-Way Impacts	B: Utility Impacts	C: Convenience & Frequency of Use	D: Safety	E: Impacts on Future Intersection Improvements
East Chandler Avenue	Bridge	✓	✓	✗	✗	✓
	Tunnel	✓	✓	✗	✗	✗
East Powell Avenue	Bridge	✗	✓	✗	✗	✓
	Tunnel	✗	✓	✗	✗	✗
East Blackford Avenue	<sup>1</sup> Bridge	✗	✓	✗	✓	✓
	<sup>1</sup> Tunnel	✗	✗	✗	✓	✓
Washington Avenue	<sup>1</sup> Bridge	✗	✓	✓	✓	✓
	<sup>2</sup> Tunnel	N/A	N/A	N/A	N/A	N/A

Note: A ✓ indicates that a key factor was considered a positive, or unaffected by the location/structure configuration.

An “✗” indicates that a key factor was negatively impacted by the location/structure configuration.

<sup>1</sup> This option was evaluated as a Final Alternate, see discussion below.

<sup>2</sup> This option was eliminated for constructability concerns, see further discussion under “Washington Avenue” below.

### East Chandler Avenue

At East Chandler Avenue, either structure type (tunnel or bridge) would be constructed perpendicular across US 41. For the tunnel option, a ramp would be constructed along the sidewalk of East Chandler Avenue, on both the east and west sides of US 41. This configuration would not lead to easy access from the High-Rail Pedestrian Trail as pedestrians would need to travel west along Chandler from the trail to reach the ramp entrance. For the bridge option, the ramps up could be configured in a smaller footprint and provide a tie in closer to the High-Rail Trail. East of US 41, the south lane of Chandler Avenue could be used for either the bridge or tunnel ramp. An alley would be required to provide access from South Harlan Avenue to the residence off the north side of Chandler Avenue.

This location would require pedestrian/bicycle traffic traveling along Washington Avenue to travel approximately 950 feet north in order to safely cross the intersection, a diversion of approximately 1900 feet compared to existing conditions. On the east side of US 41, students would utilize Chandler Avenue and College Hwy to access the Bosse High School entrance on the north side of campus along Powell Avenue. Non-student pedestrians would need to continue east to Lodge Avenue which can be taken south to Washington Avenue. The existing sidewalks along these routes are in fair condition, but there is little existing lighting along the route.

A crossing at this location would be located approximately 250 feet north of the potential future median U-turn location. If a two-span bridge option was selected, there is potential for a median pier to be a sight obstruction to the traffic in the U-turn.

Due to this location being a significant distance from the intersection (Factor C), the fair existing condition and lighting of the existing facilities the structure would tie into (Factor D), and the bridge option being a likely obstruction for the future U-Turn (Factor E), this location option was eliminated.

### East Powell Avenue

Bosse High School has an athletic field on the east side of US 41 at East Powell Avenue. A tunnel crossing at this location would be able to extend under the existing field with access ramps along East Powell to the east and west of US 41. To span the field, a tunnel option here would need to be almost 3 times longer than in other locations, significantly increasing cost. A bridge option at this location could be positioned to allow for access ramps to the south of the existing athletic field. This location would be within Bosse High School property, and modifications would need to be made to provide sidewalk connections to the public portion of East Powell Avenue, as well as adding fencing to separate the public access from Bosse High School Property. A bridge crossing at this location would be located very close to the potential future median U-turn location.



If a two-span bridge option was selected, the bridge pier would be in conflict with the median U-turn.

Due to poor lighting and limited public visibility, there are trespassing concerns with directing pedestrian traffic to East Powell Avenue behind the Bosse High School football field. Additionally, this route requires pedestrians and bicyclists from Washington Avenue to travel an extra 600 feet north to safely cross the intersection (a total diversion of 1200 feet compared to existing conditions). Due to right-of-way and property impacts (Factor A), negative impact to convenience (Factor C), safety and lighting concerns (Factor D), and the bridge option being an obstruction for future U-turn (Factor E), this location option was eliminated.

#### East Blackford Avenue

Crossing options at East Blackford Avenue have similar impacts to those discussed at East Powell Avenue, but the crossing would be closer to the existing crosswalk at Washington Avenue. The diversion length at this location would be approximately 200 feet north of the intersection, a total additional length of only 400 feet compared to existing conditions. This leads to an increase in user convenience for this location, as well as eliminating the conflict of a bridge pier with potential future median U-turn location.

On the east side of US 41 at East Blackford Avenue, Bosse High School has an existing parking lot that is used for school bus storage, football parking, and marching band practice. To avoid conflict with this space and provide connection to existing sidewalk facilities, the structure options at this location would include a perpendicular crossing of US 41 with ramps that turn to the south and proceed along the west side of the parking lot. New sidewalk is required to connect the ramps to the existing sidewalk along Washington Avenue. Minor right-of-way impacts to the school property are possible based on final design. The tunnel option at this location would also impact the existing buried concrete pipe, requiring utility relocations.

Although utility impacts to the underground concrete pipe are anticipated for the tunnel option (Factor B), due to reduced right-of-way and property impacts compared to Powell Avenue (Factor A), reduced negative impact to convenience compared to Chandler and Powell Avenue (Factor C), eliminated safety and lighting concerns (Factor D), and eliminated bridge obstruction for future U-turn (Factor E), this location was evaluated as a final alternative for both bridge and tunnel alternatives.

#### Washington Avenue

The length and configuration of ramps required to access a tunnel at Washington Avenue would either require the ramps to turn north resulting in a similar impact to convenience as the Blackford

crossing location, or would block vehicular access to Evansville Family Dentistry and the gas station/McDonald's to the east and west of US 41 if ramps parallel to Washington Avenue were used. For this reason, a tunnel alternative at this location was eliminated.

To provide room for ramps and ramp access, a pedestrian bridge at Washington Avenue would be placed approximately 175 feet north of the existing crosswalk. Based on existing right of way information, additional right-of-way is required to place the landing and ramps on the west side of US 41. On the east side of US 41, a small portion of additional sidewalk would be required to tie the ramps into the existing sidewalk along Washington Avenue.

Although right-of-way impacts are anticipated (Factor A), this location provides the highest level of convenience (Factor C) due to the minimal change from existing pedestrian patterns. There are no additional safety concerns to note (Factor D), and this location would not impact future intersection improvement (Factor E). Due to these reasons, this location was evaluated as a final alternative for a bridge crossing.

## **6.2 Description of Final Alternates**

The following alternatives were investigated in detail:

- Alternate 1 – Pedestrian Tunnel at Blackford Avenue
- Alternate 2 – Pedestrian Bridge at Blackford Avenue
- Alternate 3 – Pedestrian Bridge at Washington Avenue

The no build alternative was also considered, but this alternative does not meet the overall purpose and need of the project. Leaving the intersection with no grade separated crossing for pedestrians and bicyclists would result in continued accidents at the intersection and not provide an adequate crossing for students traveling to and from Bosse High School. Therefore, the no build alternative was eliminated from further consideration.

See Attachment G for Cost Comparisons. See Attachment F for an Alternatives Location Diagram.

## **6.3 Alternate 1 – Pedestrian Tunnel at Blackford Avenue**

Alternate 1 consists of a below grade pedestrian tunnel crossing US 41 at Blackford Avenue.

An entrance/exit ramp will be required to transition the grade from the existing roadway elevation down approximately 14 feet on both sides of the tunnel. On the west side along Blackford Avenue, this ramp could be placed parallel along the street. On the east side, this entrance would turn to the

south and be placed parallel to US 41, letting out to connect with the existing sidewalk along Washington Avenue.

Construction of the tunnel option will require a pump system for drainage. The mechanical components of the pump system will require on-going maintenance to ensure they are functioning throughout the life of the structure. Initial cost for the pump system is included in the lump sum drainage cost of this Alternate.

Traffic on US 41 during construction would be maintained using a crossover, and the tunnel would be constructed in two phases.

Previous community coordination conducted by INDOT identified some general safety concerns with the use of a tunnel. Visibility into the tunnel structure is limited which is a safety concern. Additionally, buried structures are harder for local police to patrol. The cost estimate for this alternate includes lighting throughout the tunnel to help reduce, but not eliminate, safety concerns.

#### **6.4 *Alternate 2 – Pedestrian Bridge at Blackford Avenue***

Alternate 2 consists of a pedestrian bridge crossing US 41 at Blackford Avenue.

An entrance/exit ramp will be required to transition the grade from the existing roadway elevation up to the elevation of the bridge. Given right of way restrictions, a 3-run ramp would be most feasible due to the small footprint. Along the west side of US 41, this ramp could be placed parallel along US 41, and connect to the existing pedestrian trail. On the east side, this entrance would be placed parallel to US 41, and would run south, to connect to the sidewalks along Washington Avenue. Lighting for the pedestrian walkway has been included in the estimate.

A pre-fabricated truss bridge is anticipated, therefore construction over US 41 would be limited to placing the bridge once the ramps and end bents, and pier (if applicable) are in place. A temporary closure of US 41 would be utilized to place the bridge.

#### **6.5 *Alternate 3 – Pedestrian Bridge at Washington Avenue***

Alternate 3 consists of a pedestrian bridge crossing US 41 at just north of Washington Avenue.

A similar ramp to Alternate 2 would be utilized for Alternate 3. Along the west side of US 41, this ramp could be placed parallel along US 41, and connect to the existing pedestrian trail. On the east

side, this entrance would be placed at a skew and connect using a sidewalk to the existing sidewalks running parallel to Washington Avenue. Lighting for the pedestrian walkway has been included in the estimate.

A pre-fabricated truss bridge is anticipated, therefore construction over US 41 would be limited to placing the bridge once the ramps and end bents, and pier (if applicable) are in place. A temporary closure of US 41 would be utilized to place the bridge.

## **6.6 Preliminary Cost**

**Table 6-2: Summary of Construction Costs**

<b>Alternate</b>	<b>Cost Estimate</b>	<b>Percent Higher Than Low Alternate</b>
Alternate 1: Pedestrian Tunnel at Blackford Avenue	\$4,307,500	8%
Alternate 2: Pedestrian Bridge at Blackford Avenue	\$3,993,750	3%
Alternate 3: Pedestrian Bridge at Washington Avenue	\$3,980,000	-

## **6.7 Recommended Alternate**

Considering the project key factors and the comparative cost, Alternate 3: a pedestrian bridge at Washington Avenue, is the preferred alternate. A more detailed analysis of structure characteristics including structure type, span arrangement, and ramp layout will be evaluated in a future report.

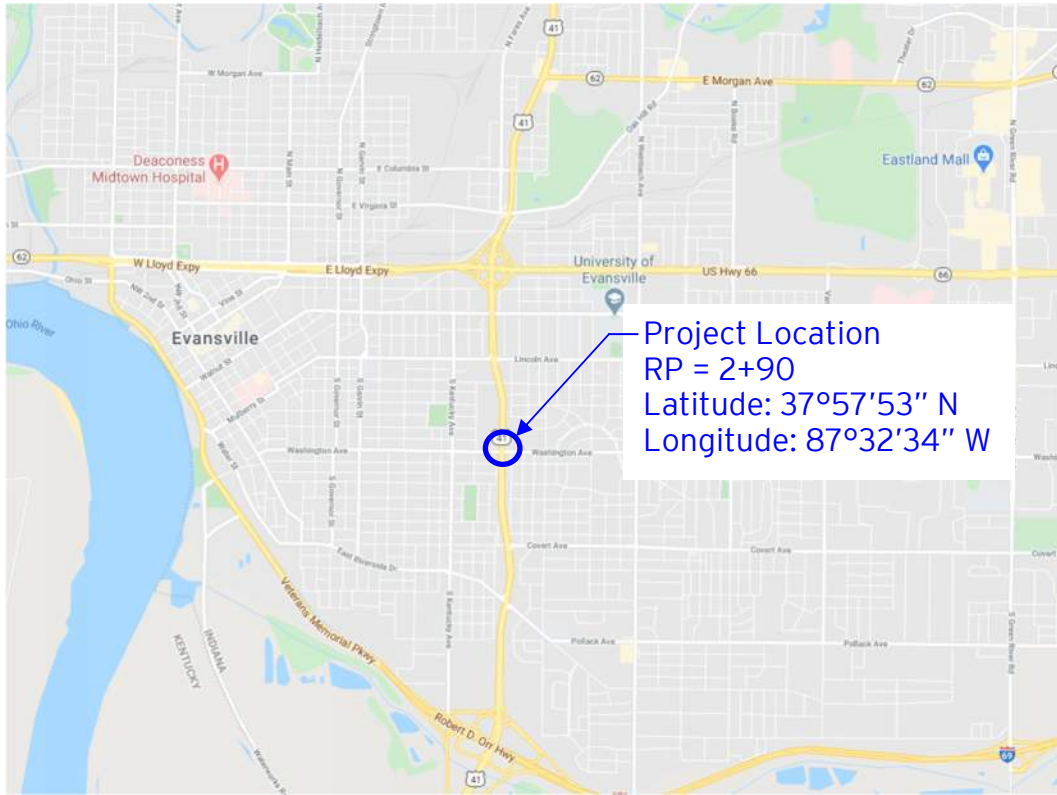
**Attachment A**

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**Project Location Map**

**US 41 PEDESTRIAN CROSSING**  
**DES 1902709—Preliminary Alternatives Report**

**Project Location Map**  
**US 41 Pedestrian Crossing**  
**DES 1902709**



**Attachment B**

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**Project Coordination Meeting Minutes**



Date/Time: July 22, 2020 @ 10:30 a.m.  
Project: US 41 Pedestrian Crossing – DES 1902709  
HNTB Job No. 74055-DS-080  
Location: Project Site – US 41 and Washington Ave. Evansville, IN  
Attendees: Troy Arnold – INDOT PM, Jason Heile – INDOT Bridge Asset Engineer, Terry Bough – INDOT Vincennes District Traffic, Dan Thatcher – HNTB, Erica Haas – HNTB

An on-site meeting was held to get an initial view of the project location and confirm initial project steps. The notes below represent the conversation amongst the attendees.

- The project will be primarily funded by the state with a contribution from the City of Evansville.
- Some prior outreach with Bosse High School and local law enforcement was conducted during the initial scoping study for the project. Troy will provide contact information for the Bosse HS principal for a conversation on student use considerations.
- Previous conversations between INDOT, the City, and Bosse HS have considered both tunnel and bridge options. HNTB will investigate both as part of the Preliminary Alternatives Analysis. Some concerns with a tunnel structure have been raised such as providing adequate lighting and visibility, patrolling concerns from local law enforcement, utility impacts, and drainage concerns. These will be evaluated further in the Preliminary Alternatives Analysis.
- There are multiple possible locations for the proposed grade separation. With student use as a primary goal, locations that provide useful access to and from Bosse HS will be prioritized.
- Chandler Ave. – this location appears to have an empty lot west of US 41 and the trail on the north side of Chandler Ave. This property may have been acquired as part of the trail construction and could allow room for structure access. On the east side of US 41, Chandler Ave. includes an existing sidewalk and a dead-end street that may allow room for structure access.
- Powell Ave. – a crossing at this location would land within school property, a conversation with Bosse HS will be needed to determine if this would be a feasible possibility. Changes to existing school sidewalks and fencing would be needed to provide pedestrian access to the existing sidewalks along Powell Ave. east of US 41.
- Washington Ave. – if a bridge option were selected at this location, traffic lights could be mounted to the bridge to provide visibility to both northbound and southbound traffic.
- HNTB will obtain survey and investigate RW at all potential crossing locations.
- If a bridge option is selected and a pier is required in the median of US 41, a potential future RCI should be considered to ensure there is space and visibility provided for the median movement.
- HNTB will provide a Preliminary Alternatives Report prior to the Abbreviated Engineer's Report to narrow down project location and grade separation options.



Date/Time: July 29, 2020 @ 11:00 a.m.  
Project: US 41 Pedestrian Crossing – DES 1902709  
HNTB Job No. 74055-DS-080  
Location: Microsoft Teams  
Attendees: Aaron Huff – Bosse High School Principal, Troy Arnold – INDOT PM  
Dan Thatcher – HNTB, Erica Haas – HNTB

A coordination meeting was held to gain a better understanding of the access needs of the Bosse High School students related to the proposed grade separated pedestrian crossing of US 41. The notes below represent the conversation amongst the attendees.

- Bosse High School has a high percentage of students that walk or bike to school. For about 770 kids, they only use 5 busses.
- Most students need to cross US 41 to get from their homes to the school. Based on school district lines, about 40% of those commuters would be from north of Washington Street, 60% from south of Washington Street. Anecdotally, more seem to come from the north.
- In addition to coming to and from school, students also cross US 41 to come to school events/games or practices in the evenings or during the summer.
- The school campus is not open during the school day, however students do tend to cross US 41 to head to McDonalds, CVS, or the gas station before evening practices or games.
- A crossing guard is currently used for the morning and afternoon commute across US 41.
- Students who walk or bike enter the school from Door #1 near the SE corner of the school.
- Busses drop off students along Powell Ave. on the north side of the school. Athletes and students who drive to school also enter on the north side of the building.
- The parking lot west of the football field and north of the dentist office is used for band practice, parking for football games, and summer bus storage. The school is open to using some space at the southern end of this parking lot to facilitate a bridge or tunnel if needed.
- There is an existing walkway along the NW corner of the football field that could be used to direct pedestrians to Powell Ave. The school would need to adjust some fencing to make that work.
- Aaron expressed some concern over students reverting to the existing crosswalk if the new crossing was not convenient. A tunnel may be the most “convenient option,” but there are visibility safety concerns. EPD has also expressed concern over patrolling a tunnel.
- Locking up access to the future bridge or tunnel has been discussed as an option.
- Powell Avenue is not well lit, providing some safety concerns at night if pedestrian traffic crossing US 41 was directed to Powell.
- Aaron expressed some concern with directing pedestrian traffic to Powell Ave. since the north end is the area most susceptible to those sneaking onto the football field.

**Attachment C**

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**Photographs**

**US 41 PEDESTRIAN CROSSING**  
**DES 1902709—Preliminary Alternatives Report**

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Photo 1: Intersection of US 41 and Washington Avenue, looking southwest



Photo 2: Intersection of US 41 and Washington Avenue, looking southeast



**US 41 PEDESTRIAN CROSSING**  
**DES 1902709—Preliminary Alternatives Report**

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Photo 3: US 41 north of Washington Avenue, looking north



Photo 4: Pedestrian trail west of US 41

**Attachment D**

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**Call Application Report Project (Mini Scope)**

## Call Application Report Project ( Mini Scope)

Updat

Date:	12/03/2019		Work Type:	Other Type Project (Miscellaneous)		Score:
Proposed FY:	2023		Work Category:	Other Project Type		<b>100</b>
DES:	1902709					
Enter NBI #:	NA	<i>(or NA)</i>				
Existing Structure	NA		Structure Type			
District	Viincennes		County	Vanderburgh <a href="#">County Map</a>		
Sub	Evansville		Route	US 41		
Description	US 41 Pedestrian Walk at Washington Ave.					RP: 2
Location:						Offset: 0.9
Route Over						Latitude 37.96459
Route Under	US 41					Longitude -87.54287
						<a href="#">NBI Map</a>
Year Built			Inspection Date	N/A		
Year Reconst.			Operational Tons	N/A		
Struct. Length			Operational Tons Value	N/A		
Deck Width			Unofficial Suff Rating	N/A		
Area			Deck Wear Surface	N/A		
Road Width			Condition of Deck	N/A		
Lanes Over			Condition of Super Structure	N/A		
Lanes Under	4		Condition of Sub Structure	N/A		
Max Length Span			Scour	N/A		
No of Spans						

# of records for this NBI: 0, (0 with Des No)

						ADT	ADT Year

# of NBI Records within:	<input style="width: 90%;" type="text"/>	Miles	0 Records
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# of Projects within:	<input style="width: 90%;" type="text"/>	Miles	0 Projects <i>( 0 Awarded, 0 Others )</i>			
FY	Awarded	To Let	Call	Prop.	Prov.	CN \$

**Intent/ Purpose Of Project (Initial Statement Of Essential Project Purpose:**

**NBI :NA**

The purpose and need for this project is to reduce the potential for pedestrian conflicts with US 41 traffic by providing a grade separated crossing.

**Completed Full Scope:**

**Own It: Alternatives**

**Preliminary Alternatives That Are Contemplated (Analyzed) With Costs:**

A grade separated crossing is the preliminary alternative to provide for pedestrian traffic crossing US 41. There is a significant amount of pedestrian and bicycle traffic at this location due to the close proximity of Bosse High School. The newly completed pedestrian trail along US 41 at this location may also contribute to the pedestrian traffic. Currently, pedestrians are using the at-grade crossing with pedestrian signals at the US 41 and Washington Avenue signalized intersection. There have been some incidents associated with pedestrian or bicycle conflicts with vehicles in this vicinity. The following items should be considered during design and development:

1. An alternatives analysis shall be completed for the most suitable grade separated crossing. A bridge and tunnel shall be considered in the analysis.
2. The alternatives analysis shall also include an evaluation of the most suitable location for the crossing.
3. It shall be assumed that two stakeholder meetings will be necessary during the course of project development. Additional meetings could still be required.
4. All necessary surveying, environmental document preparation, permitting, design, and utility coordination shall be included in the development process.
5. Lighting shall be considered in the design.
6. All ancillary items associated with the different alternative treatments need to be considered during the design process.
7. The environmental document could become complicated for this project. At a minimum, a CE 2 document is anticipated, but a CE 4 is likely to be required. Additionally, a full section 106/Section 4(f) and phase 2 assessment is anticipated.

**Consequences If No Action Is Taken (Do Nothing Alternative Is Selected):**

If no action is taken, the potential for pedestrian and bicycle conflicts with traffic along US 41 will not be reduced and could increase if pedestrian and bicycle traffic become more prevalent along the new pedestrian trail.

**Secondary Considerations Or Goals With Costs:**

[Empty box for secondary considerations or goals with costs]

*Attach extra sheets as necessary to fully describe the alternatives.*

**Will Further Analysis/Assessment be required beyond this form?**

**Solve it: Project Recommendations and Costs**

**NBI: NA**

**Quantifiable Primary Goal(S) Of Project (What Are We Purchasing Such As Condition, Service Life, LOS, Or CRF):**

**Potential design exceptions and open roads ideas**

In the spirit of "Open Roads", the new bridge shall achieve all minimum standards as well as desirable standards where significant added value is demonstrated. The designer shall incorporate the concepts of corridor uniformity and driver expectation into their design. The new bridge is expected to have a service life of 75 + years.

**Maintenance of Traffic (MOT)**

**Describe feasible and preferred MOT for the project.**

**Can Road be Closed to Traffic?**

**No**

**MOT Schemes**

Phased - Lane Closure

With the exception of short term temporary lane closures, traffic along US 41 will need to be maintained during construction.

Estimated Total Project Costs:	Amount	COMMENTS
Right of Way Purchase (RW1):	\$175,000.00	ROW acquisition is anticipated (potential relocation)
Right of Way Services (RW2):		
Preliminary Engineering 1 (PE1):	\$600,000.00	
Preliminary Engineering 2 (PE2):		
Maintenance of Traffic:		
Railroad PE (RR1):		NA
Railroad PE (RR2):		NA
Environmental Study:		Associated costs for a CE 4 are included in the PE Cost above
Utilities PE (UT1):		
Utilities CN (UT2):	\$80,000.00	Utility conflicts are anticipated
Construction (CN):	\$4,160,000.00	
Construction Engineering (CE):		
Relinquishment Payment (RQP):		
Other Considerations:		
	\$5,015,000.00	

**Miscellaneous Notes**

Anticipated Number Of Construction Seasons To Complete(1, 2 Or 3 Seasons):

1

Anticipated Number Of Years To Complete Design (1, 2 Or 3 Fiscal Years):

3

Tree Clearing

Fish

Bats

Historical

CE Type

CE 4

**Call History** trees fish spans and bats and other envir CE type

**CE**

Pictures

Location Map:

Crash History:

Spreadsheets (calcs):

Asset Team Scoring Sheet:

Pathway Data:

Solution Schematic:

Engineer Assessment:

Mobility History:

Cost Calculations:

Bridge/Culvert Inspection Report:

**Additional Comments**

**Other items relevant to the project not specifically listed elsewhere.**

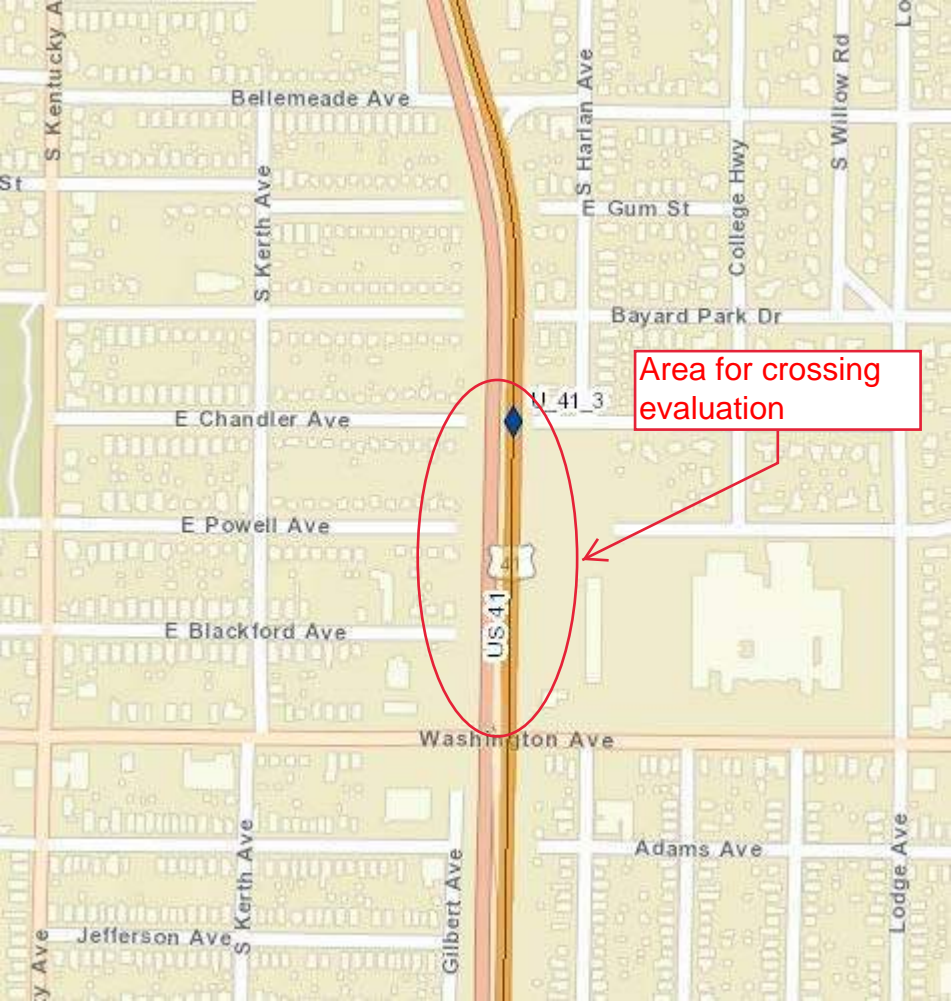
An Abbreviated Engineering Review for Traffic Safety is attached for this location that includes some recommendations for the grade separated crossing. Some preliminary locations have also been considered and are attached, but should not influence the overall evaluation for the preferred location or crossing type.

**NOTE: Appropriate environmental and assessment process need to be followed.**

**Report Prepared By and Approved By**

Report Prepared By and Approved By	Title:	Signature
Prepared by: David Reamer	District Safety Asset Engineer	<i>David Reamer</i>
Prepared by: Duane Decker	District Scoping Manager	<i>Duane Decker</i>
Reviewed by: Khalil Dughaiash	System Asset Manager	<i>Khalil D Dughaiash</i>





Area for crossing evaluation



## INDOT VINCENNES DISTRICT

# Preliminary R/W Review Memo:

TO: Duane Decker, Scoping Manager

Vincennes District

FROM: Jason Brown, RW Specialist

Vincennes District

Date: 11/25/2019

Re: Right of Way Report, US 41, RP 2.83, Pedestrian facility construction

### **US 41**

--- This portion of US 41 was constructed by Project U-36(20). The Limited Access Right of Way was acquired by Warranty Deeds and Condemnation Causes. Additional r/w was purchased by Project NH-017-2(19).

***In conclusion*** – INDOT does have what appears to be good title to the r/w.

The Right of Way information review and the sampled acquisition documents to the project were based on information from internal / INDOT files for internal use only. The sole purpose of this Memo is to aid in scoping this location for a project. This Memo does not preclude the designer from executing existing r/w research to determine the State's r/w during project development.

Due to the supplied concepts of a pedestrian facility, it is estimated that an average 3 parcels would cost approximately \$175,000.00.

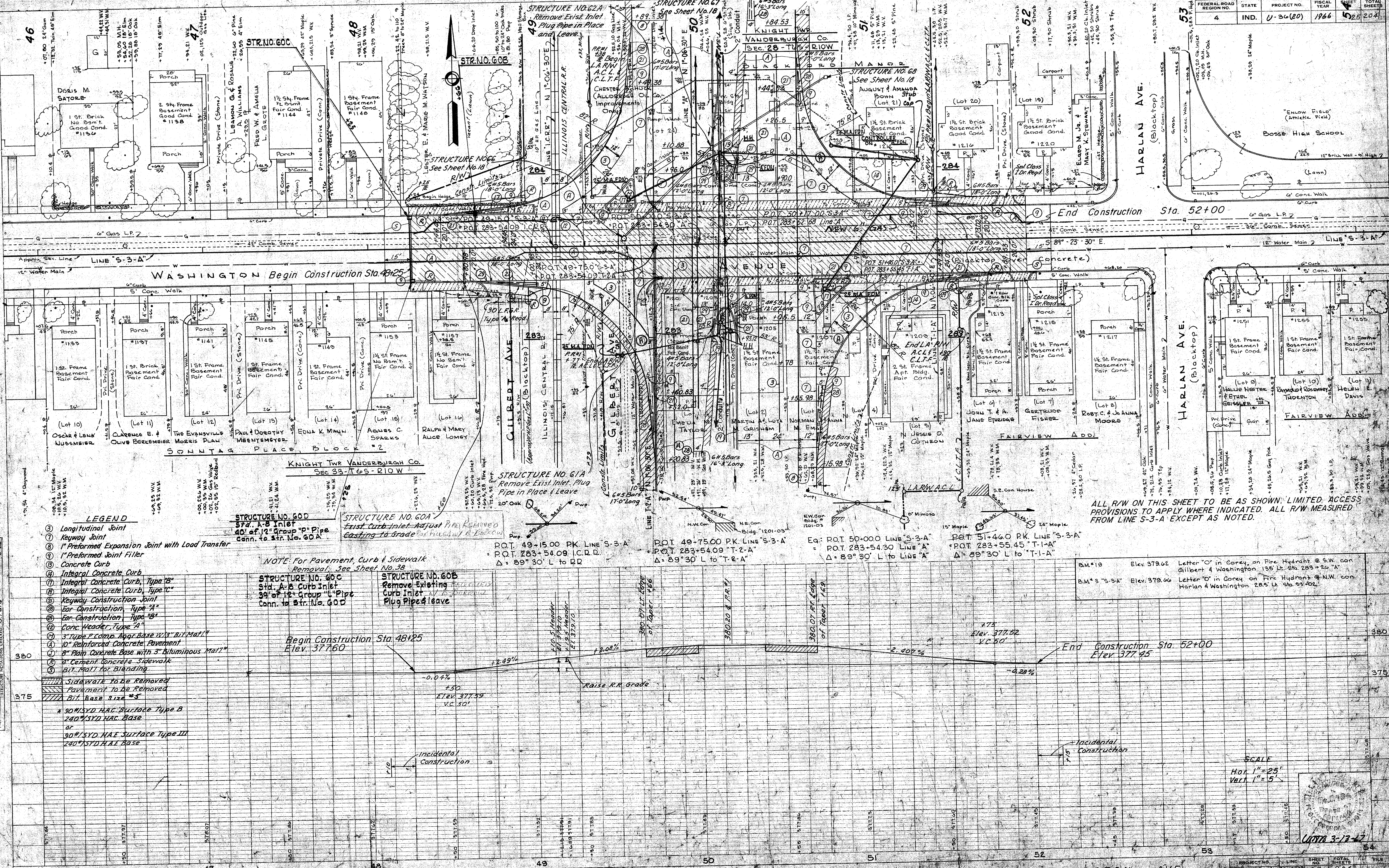
Plan sheets are attached to this review for the above two mentioned projects.



REV 7-28-70 Conduit				
FEDERAL ROAD REGION NO.	STATE	PROJECT NO.	FISCAL YEAR	TOTAL SHEETS
4	IND.	U-24(20)	1966	204

PLAN  
NOTE BOOK ALIGNMENT SHEET  
NO. 8958 T. E. OF WAY-CHECKED  
DATE 7-24-70

PROFILE  
NOTE BOOK GRADES CHECKED  
NO. 8958 L. STRUCTURE NOTATIONS CHECKED  
DATE 7-24-70



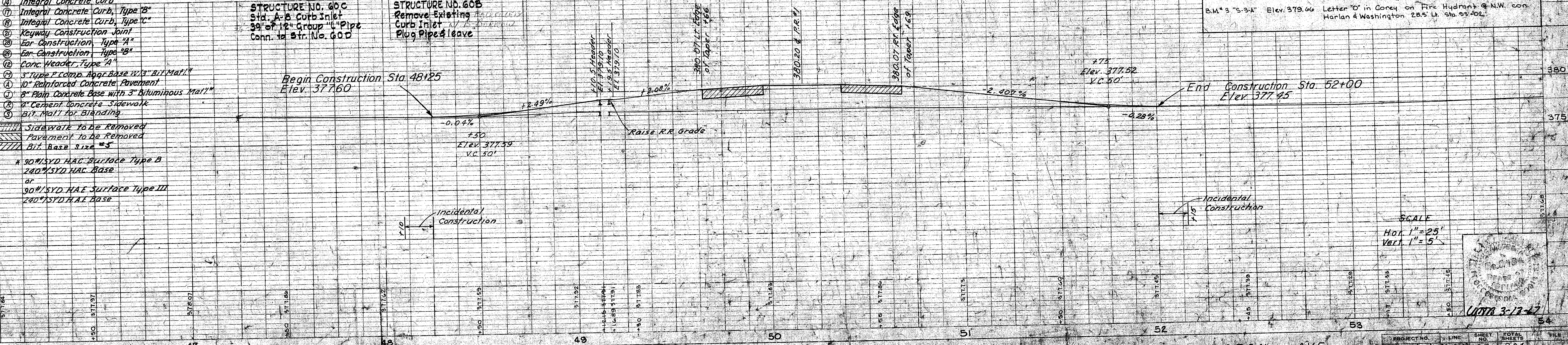
- LEGEND**
- ① Longitudinal Joint
  - ② Keyway Joint
  - ③ Preformed Expansion Joint with Load Transfer
  - ④ Preformed Joint Filler
  - ⑤ Concrete Curb
  - ⑥ Integral Concrete Curb
  - ⑦ Integral Concrete Curb, Type "B"
  - ⑧ Integral Concrete Curb, Type "C"
  - ⑨ Keyway Construction Joint
  - ⑩ For Construction, Type "A"
  - ⑪ For Construction, Type "B"
  - ⑫ Conc. Header, Type "A"
  - ⑬ 3" Type "C" Comp. Aggr. Base w/ 3" Bit Mat. 1"
  - ⑭ 10" Reinforced Concrete Pavement
  - ⑮ 8" Plain Concrete Base with 3" Bituminous Mat. 1"
  - ⑯ 2" Cement Concrete Sidewalk
  - ⑰ Bit. Mat. for Branding
  - ⑱ Sidewalk to be Removed
  - ⑲ Pavement to be Removed
  - ⑳ Bit. Base Size #5
  - ㉑ 30% SYD HAC Surface Type B
  - ㉒ 240% SYD HAC Base
  - ㉓ 30% SYD HAC Surface Type III
  - ㉔ 240% SYD HAC Base

**NOTE:** For Pavement, Curb & Sidewalk Removal, See Sheet No. 38

STRUCTURE NO. 60C  
Std. A-B Curb Inlet  
39" of 12" Group "P" Pipe  
Conn. to Str. No. 60D

STRUCTURE NO. 60B  
Remove Existing  
Curb Inlet  
Plug Pipe & Leave

ALL R/W ON THIS SHEET TO BE AS SHOWN. LIMITED ACCESS PROVISIONS TO APPLY WHERE INDICATED. ALL R/W MEASURED FROM LINE S-3-A EXCEPT AS NOTED.



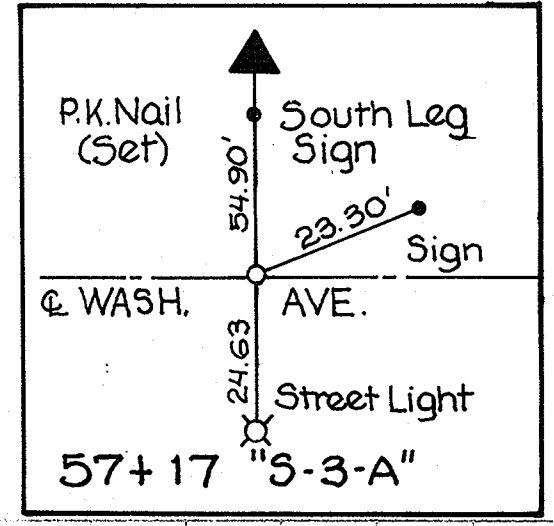
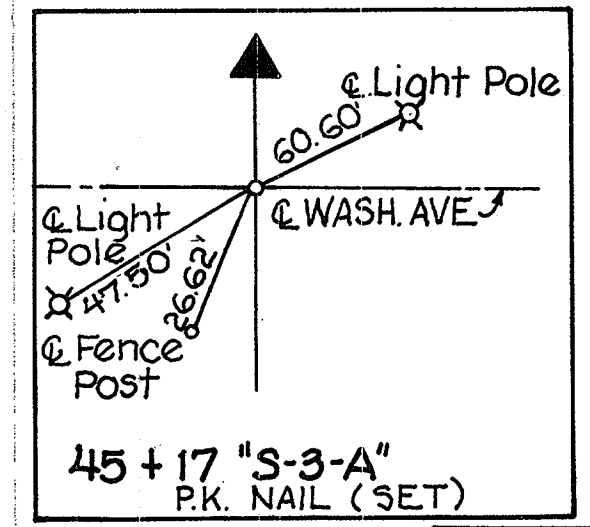
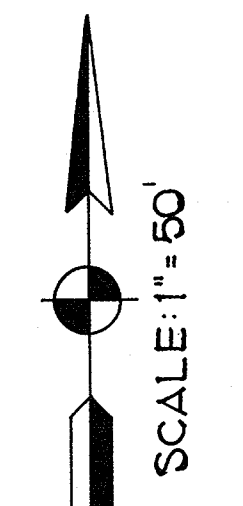
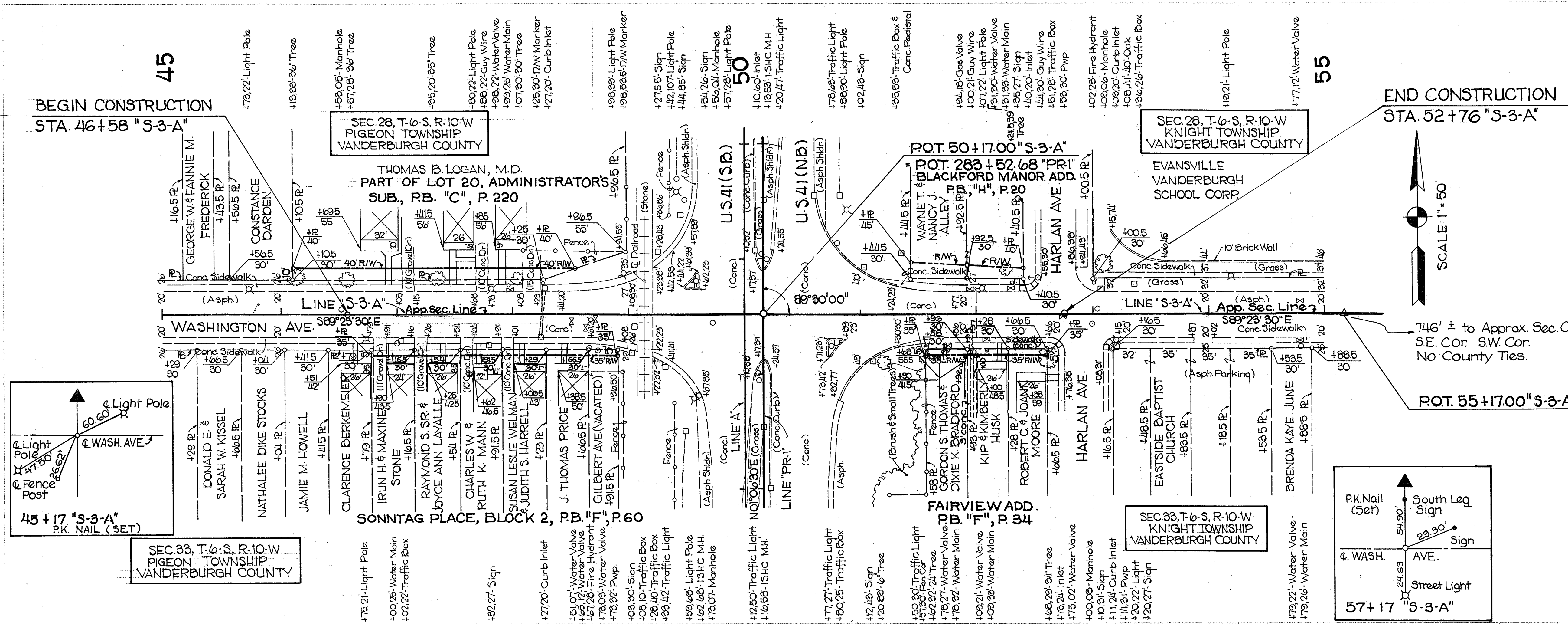
SCALE  
Hor. 1" = 25'  
Vert. 1" = 5'



PROJECT NO.	LINE	SHEET NO.	TOTAL SHEETS
U-24(20)	S-3-A	25	204

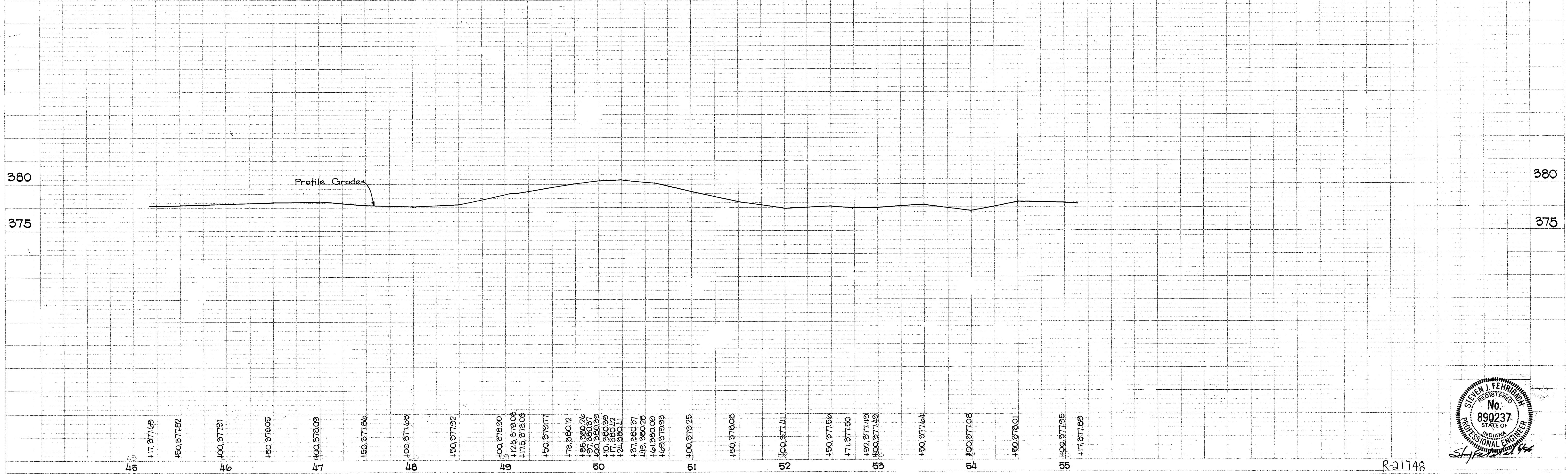


PLAN  
 CHECKED BY: [Signature]  
 DATE: 11/16/95  
 DRAWN BY: [Signature]  
 DATE: 11/16/95



ALL R/W ON THIS SHEET TO BE AS SHOWN. ALL R/W ON THIS SHEET TAKEN FROM LINE "S-3-A".

PROFILE  
 CHECKED BY: [Signature]  
 DATE: 11/16/95  
 DRAWN BY: [Signature]  
 DATE: 11/16/95



**Attachment E**

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**Traffic Safety Analysis and Design Criteria**

## ABBREVIATED ENGINEERING REVIEW FOR TRAFFIC SAFETY

\* Revised by INDOT Office of Traffic Safety (January 10, 2013)

Date:	7/31/2019
Des. No.:	n/a

**Reviewer Information:**

Primary Author: Ericka Miller, PE, PTOE	Agency: for INDOT Office of Traffic Safety
Phone Numbers: 317-972-4519	Email Address: <a href="mailto:Ericka.Miller@wsp.com">Ericka.Miller@wsp.com</a>

**Purpose of Review:**

WSP was hired by INDOT to study several high-crash locations throughout the state, identify existing safety issues, and recommend improvements to remedy those deficiencies. Improvements might range from lower-cost maintenance items, such as signage and pavement markings, to higher-cost capital improvements, such as reconstruction or added travel lanes, where necessary. This form is suitable for Level 1 review. Of the three available levels of engineering review, this represents the least refined, lowest intensity degree of analysis, development of essential project intent (outline of certified course of action), scoring and process documentation.

**Project Location:**

Intersection: US 41 & Washington	District: Vincennes	City: Evansville	County: Vanderburgh
RP Start:	RP End:	Lat & Long: 37.962770° -87.542922°	Inside Urban Area Boundary: <input checked="" type="radio"/> Yes <input type="radio"/> No
MPO: Evansville MPO	Project Type:		

Location: US 41 & Washington Avenue  
 The intersection is located along US 41 in Evansville, IN, approximately 1.0 mi south of the intersection of US 41 & SR 66 / SR 62 (the Lloyd Expressway). See attached Site Location Map, Page 3.

**Existing Conditions:**

See attached Collision Diagram on Page 7 with aerial image. Within the study area, US 41 is classified as an Other Principal Arterial, and Washington Avenue is classified as a Minor Arterial. At the signalized study intersection, the northbound and southbound approaches of US 41 each consist of one left-turn lane (slotted), two through lanes, and one right-turn lane; directional traffic on the northbound and southbound approaches is separated by grass medians of varying width. The eastbound and westbound approaches of Washington Avenue each consist of one left-turn lane, one through lane, and one shared through/right-turn lane (no medians). Northbound and southbound left-turns at the intersection are permitted/protected with flashing yellow arrow (FYA) signal heads, and eastbound and westbound left-turns at the intersection are permitted only. There are existing signal backplates on all signal heads at the intersection, and street lighting is present. Continental crosswalks are present across the north and west legs, with a pedestrian refuge island on the north leg. The posted speed limit along US 41 is 40mph (30mph school zone), and the posted speed limit along Washington Avenue is 30mph (20mph school zone on the east leg). Land uses at the intersection are primarily commercial, with a gas station and McDonald's on the northwest corner, a dentistry office on the northeast corner, and a CVS on the southwest corner. The southeast corner is residential. It should be noted that Bosse High School is located northeast of the study intersection. During the field check on 05/01/19, the following issues were identified:

- Northbound and southbound rear end crash patterns; northbound, southbound, and eastbound left-turn crash patterns
- Long pedestrian crossing across the north leg (long exposure time)
  - 195 pedestrians crossed the north leg in 24-hr count (Monday, February 4th to Tuesday, February 5th, 2019)
  - 1 bicyclist crash and 0 pedestrian crashes during 5-year study period
  - Existing turning radii allow for eastbound left-turn and westbound right-turn high speed turns across pedestrian crossing
  - Public concern about pedestrian safety and near misses
- Faded and non-standard pavement markings on the eastbound and westbound approaches
- Missing lane designation arrow in southbound right-turn lane
- Slight rutting in pavement on northbound approach

**Traffic Operations:**

a) Mobility/Congestion Performance: According to available traffic count data on INDOT's Traffic Count Database System (TCDS), the 2018 AADT along US 41 north of the study intersection was 27,902, and the 2018 AADT along Washington Avenue east of the study intersection was 12,463. Using 2019 turn count data and signal timings provided by the INDOT Vincennes District, a capacity analysis was conducted for the intersection using Synchro software. The analysis shows that the intersection operates at LOS C during both the AM and PM peak hours. During the AM peak hour, all movements operate at LOS D or better, excluding the eastbound left-turn, which operates at LOS F. During the PM peak hour, all movements operate at LOS D or better, excluding the eastbound and westbound left-turns, which operate at LOS E. During the AM peak hour, the 95% queue for the eastbound left-turn (131') exceeds available storage of 125'. During the PM peak hour, the 95% queue for the westbound left-turn (82') exceeds available storage of 65'.

b) Safety Performance: According to available crash data, there were 137 crashes at the study intersection from Jan-1 2014 to Dec-31 2018, 44 of which resulted in injury (thirteen of those were incapacitating injury crashes). Of the 137 crashes, approximately 46% were 'rear end', approximately 23% were 'left turn', and approximately 14% were 'same direction sideswipe'. Using HAT 3.0 software, the Index of Crash Frequency ( $I_{CF}$ ) for the study intersection was found to be 2.49, and the Index of Crash Cost ( $I_{CC}$ ) for the study intersection was found to be 4.20. According to The Hazard Elimination Program-Manual on Improving Safety of Indiana Road Intersections and Sections, if the  $I_{CF}$  and  $I_{CC}$  values for a location are both greater than 2, the location is a "high crash" location. Therefore, based on the available crash data, the study intersection is considered a "high crash" location. See attached Crash Summary, Pages 8-10.



**Alternatives and Recommendations**

The "do-nothing" alternative was considered and rejected, as it does not improve safety at the study location. Based on the data summarized herein, and the current conditions at the study location, the following improvements are recommended:

**Short-Term (Protected Pedestrian Phase Across North Leg)**

- Install flashing yellow arrow (FYA) signal heads for eastbound and westbound left-turns
  - Implement protected/permitted phasing for eastbound/westbound left-turns
  - Program the signal so that the permitted phase for the eastbound left-turn is eliminated when there is a pedestrian activation
- Install 5-section signal heads for the southbound, eastbound and northbound right-turns to provide right-turn overlap
- Re-stripe westbound approach so that it consists of 1 left-turn lane, 1 through lane, and 1 right-turn lane
  - The westbound right-turn lane is necessary to create a dedicated westbound right-turn phase to eliminate conflicts with pedestrians crossing the north leg
- Install a 3-section signal head for westbound right-turns to provide protected only right-turn phasing
  - When there is a pedestrian activation, the westbound right-turn would be restricted; otherwise, the westbound right-turn would run concurrently with the westbound through and southbound left-turn (overlap)
- Re-time pedestrian flashing-don't-walk phase to provide full width crossing of 43 seconds
- Install signage prohibiting right-turn on red for the southbound right-turn, to eliminate the conflict for pedestrians crossing the north leg
  - See attached phase diagrams on Page 11 that show concurrent conflicting movements (existing and proposed)

**Long-Term Option – Convert to Median U-Turn (MUT) Intersection**

- Reconfigure intersection as a Median U-Turn (MUT) intersection; this will eliminate left-turns at the intersection and force motorists to utilize signalized U-turn access points on US 41 (see attached schematic on Page 12)
  - Decrease turning radii on the northeast and northwest corners, as much as possible while meeting INDOT standards
  - Construct pedestrian refuge islands in larger medians
  - Paint/install continental crosswalks across all legs
  - Consider a corridor-wide treatment at similar signalized intersections between I-69 to the south and the Lloyd Expressway to the north

**Long-Term Option – Pedestrian Tunnel or Bridge**

Construct pedestrian tunnel or bridge across US 41 north of Washington Avenue. Potential alignments should consider the fact that Bosse High School students access the school from the north. This option would include:

- Removal of pedestrian infrastructure that facilitates crossing US 41
- Installation of FYA signal heads for east/west left-turns to allow for protected/permitted phasing
- Installation of 5-section heads for right-turns in all directions to provide right-turn overlap phasing
- Refresh striping, stop bars and pavement markings as needed

**Costs Estimate(s) for Proposed Safety Improvement Project**

	<b>Short-Term</b>	<b>Long-Term (MUT)</b>	<b>Pedestrian Overpass</b>	<b>Pedestrian Underpass</b>
<b>Preliminary Engineering</b>	\$ 16,000.00	\$ 194,000.00	\$ 784,000.00	\$ 833,000.00
<b>Site Preparation</b>	\$ -	\$ -	\$ 55,000.00	\$ 55,000.00
<b>Construction</b>	\$ 52,000.00	\$ 1,075,000.00	\$ 3,916,000.00	\$ 4,161,000.00
<b>Total</b>	\$ 68,000.00	\$ 1,269,000.00	\$ 4,755,000.00	\$ 5,049,000.00

**Project Score: (for INDOT use)**

	0	Safety Program Score = <input type="text" value="#REF!"/>
	0	
	0	
	0	
	0	
	0	

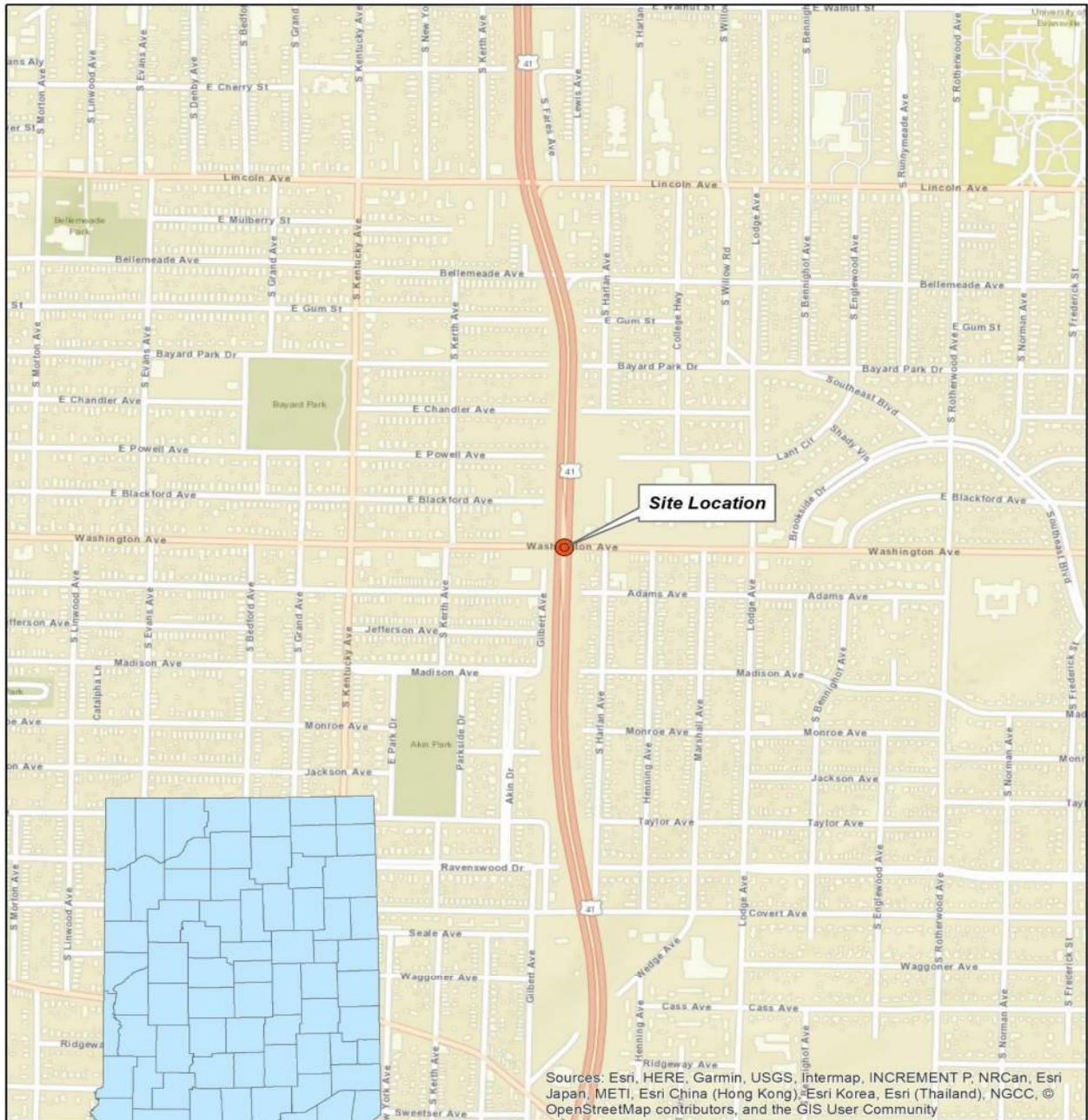
**Miscellaneous Notes:**

A field check was conducted for this location on 05/01/19; the following people were present - Chris Gentry, Jared Peterson, Troy Arnold, Khalil Dughaihsh & David Reamer (INDOT Vincennes District), Tom Ford (INDOT Central Office), Steve Schaefer & Brent Schmitt (City of Evansville), and Ericka Miller, Matt Duffy & Amir Mafarjeh (WSP). An input meeting was held at the Evansville Public Library on 06/26/19; the following people were present - Rusty Fowler, Jared Peterson, Troy Arnold, Duane Decker, Khalil Dughaihsh, Terry Bough, David Reamer, & William Dong (INDOT Vincennes District), Tom Ford & Mike Holowaty (INDOT Central Office), Brent Schmitt (City of Evansville), Paul Kirby & Jacob Taylor (Evansville PD), Gregory Fleck (EVSC PD), Aaron Huff (EVSC Bosse Principal), Steven Scheller (EVSC), Laura Lamb (EMPO), Todd Ringle (ISP), and Ericka Miller, Matt Duffy & Amir Mafarjeh (WSP).

**Attachments:**

Site Location Map, Page 3	MUT Schematic, Page 12
Photographs, Pages 4-6	Cost Estimates, Pages 13-16
Collision Diagram, Page 7	
Crash Summary, Pages 8-10	
Phase Diagrams, Page 11	

Site Location Map



Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, © OpenStreetMap contributors, and the GIS User Community

US 41 at Washington Avenue  
 Vanderburgh County  
 Evansville, IN





Photographs



Washington Ave Looking East, West of US 41



Washington Ave Looking West, West of US 41



Pavement Markings in Northbound Right-Turn Lane



Northbound US 41 Looking South, North of Washington Ave



Southbound US 41 Looking North, South of Washington Ave



Southbound US 41 Looking South, North of Washington Ave

Photographs, continued



Washington Ave Looking East, East of US 41



Westbound Washington Ave Looking West, East of US 41



North Leg Crosswalk Looking East



North Leg Crosswalk Looking West



Pavement Markings in Southbound Left-Turn Lane



Multi-Use Path Along the West Side of US 41, Looking South



Photographs, continued



Crosswalk Across the West Leg



Northbound US 41 Looking North, South of Washington Ave



Fallen Pedestrian Crossing Sign on the SE Corner



Pedestrians Crossing North Leg Crosswalk



Multi-Use Path Along the West Side of US 41, Looking North

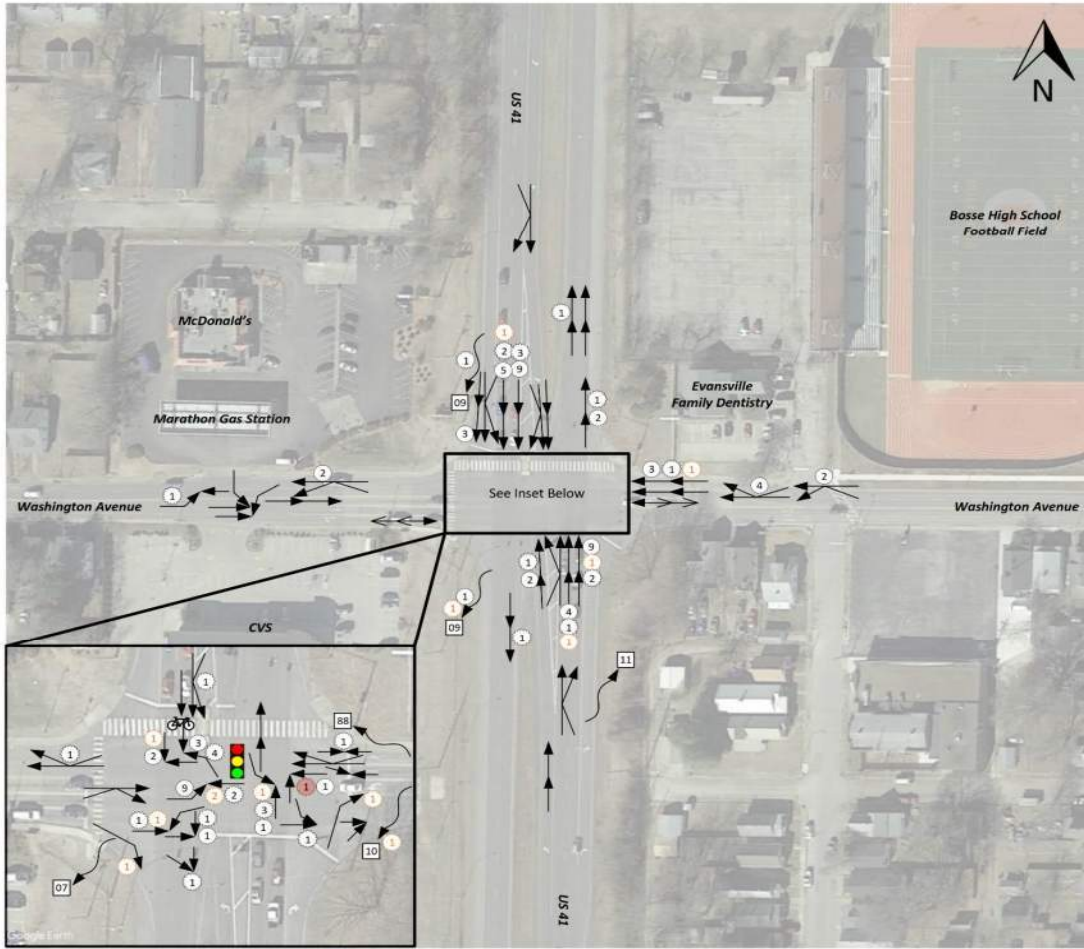


Westbound Washington Ave R3-5L, East of US 41

DIAGRAM OF COLLISION REPORTS

Washington Avenue & US 41

Study Period: 1/1/2014 to 12/31/2018 Location: 3  
 District: Vincennes County: Vanderburgh City/Town: Evansville  
 Analyst: ARM QC: MJD Date: 04/10/2019



Aerial imagery provided by Google Earth

YEAR	REPORTS
2014	25
2015	20
2016	27
2017	26
2018	33
TOTAL	131

**NOTES**  
 1) Crashes with determinable location are shown in diagram. Crash total may not match ARIES database.  
 2) Crashes on diagram do not represent exact crash locations; they are approximated based on available information.  
 3) Diagram not to scale.

- Object Symbols**
- MOVING VEHICLE
  - ↪ TURNING VEHICLE
  - ↩ BACKING VEHICLE
  - ↪↩ OUT OF CONTROL
  - ▭ PARKED VEHICLE
  - 🚶 PEDESTRIAN
  - 🚲 BICYCLE
  - 🐾 ANIMAL
  - 🗑️ DEBRIS IN ROADWAY
  - 🚦 SIGNALIZED INTERSECTION
  - 📦 FIXED OBJECT (See table for # codes)

- 🔴 FATAL CRASH
- 🟡 INJURY CRASH – INCAPACITATING
- 🟠 INJURY CRASH – NONINCAPACITATING
- 🟢 PDO CRASHES (IF > 1)

- 🚦 SIGNALIZED INTERSECTION
- 📦 FIXED OBJECT (See table for # codes)

- Collision Symbols**
- ↔ REAR END
  - ↔ HEAD ON
  - ↔ OVERTAKING / CUT-OFF
  - ↔ SIDESWIPE – SAME
  - ↔ SIDESWIPE – OPPOSITE
  - ↔ RIGHT ANGLE
  - ↔ LEFT TURN
  - ↔ OVERTURNED

- Fixed Object Codes**
- 01 – BRIDGE or OVERPASS
  - 02 – BUILDING
  - 03 – CULVERT or DITCH
  - 04 – CURB
  - 05 – GUARDRAIL or BARRIER
  - 06 – EMBANKMENT
  - 07 – FENCE
  - 08 – TRAFFIC POLE
  - 09 – UTILITY POLE
  - 10 – SIGN
  - 11 – TREE / SHRUB
  - 12 – CONSTRUCTION BARRIER
  - 13 – CRASH ATTENUATOR
  - 88 – OTHER
  - 99 – UNKNOWN

Crash Summary

Summary below based on crash data from ARIES 2014-2018.

Overall Summary	
Total Number of Crashes	137
Number of People Killed	2
Number of People Injured	80
Number of Property Damage Only Crashes	92
Number of Fatal Crashes	1
Number of Incapacitating Injury Crashes	13
Number of Non-Incapacitating Injury Crashes	31

Summary of Manner of Collision		
Crash Type	Number of Crashes	Percentage
Rear End	63	46%
Right Angle	8	6%
Left Turn	31	23%
Same Direction Sideswipe	19	14%
Ran Off Road	7	5%
Right Turn	4	3%
Other	1	1%
Backing Crash	2	1%
Head On	2	1%
<b>Grand Total</b>	<b>137</b>	<b>100%</b>

Summary of Injury Crashes		
Crash Type	Number of Injury Crashes	Number of People Injured
Rear End	17	35
Right Angle	3	4
Left Turn	16	30
Same Direction Sideswipe	2	2
Ran Off Road	3	3
Right Turn	3	5
Other	0	0
Backing Crash	0	0
Head On	1	1
<b>Grand Total</b>	<b>45</b>	<b>80</b>

Summary of Light Conditions		
Time of Day	Number of Crashes	Percentage
DARK (LIGHTED)	39	28%
DAYLIGHT	98	72%
<b>Grand Total</b>	<b>137</b>	<b>100%</b>

Crash Summary

Summary below based on crash data from ARIES 2014-2018.

Summary of Primary Factors		
Primary Factor	Number of Crashes	Percentage
FAILURE TO YIELD RIGHT OF WAY	34	25%
FOLLOWING TOO CLOSELY	59	43%
IMPROPER LANE USAGE	12	9%
DISREGARD SIGNAL/REG SIGN	7	5%
OTHER (DRIVER) - EXPLAIN IN NARRATIVE	6	4%
DRIVER DISTRACTED - EXPLAIN IN NARRATIVE	2	1%
RAN OFF ROAD RIGHT	4	3%
UNSAFE SPEED	3	2%
IMPROPER TURNING	3	2%
UNSAFE BACKING	2	1%
LEFT OF CENTER	2	1%
SPEED TOO FAST FOR WEATHER CONDITIONS	1	1%
OVERCORRECTING/OVERSTEERING	2	1%
<b>Grand Total</b>	<b>137</b>	<b>100%</b>

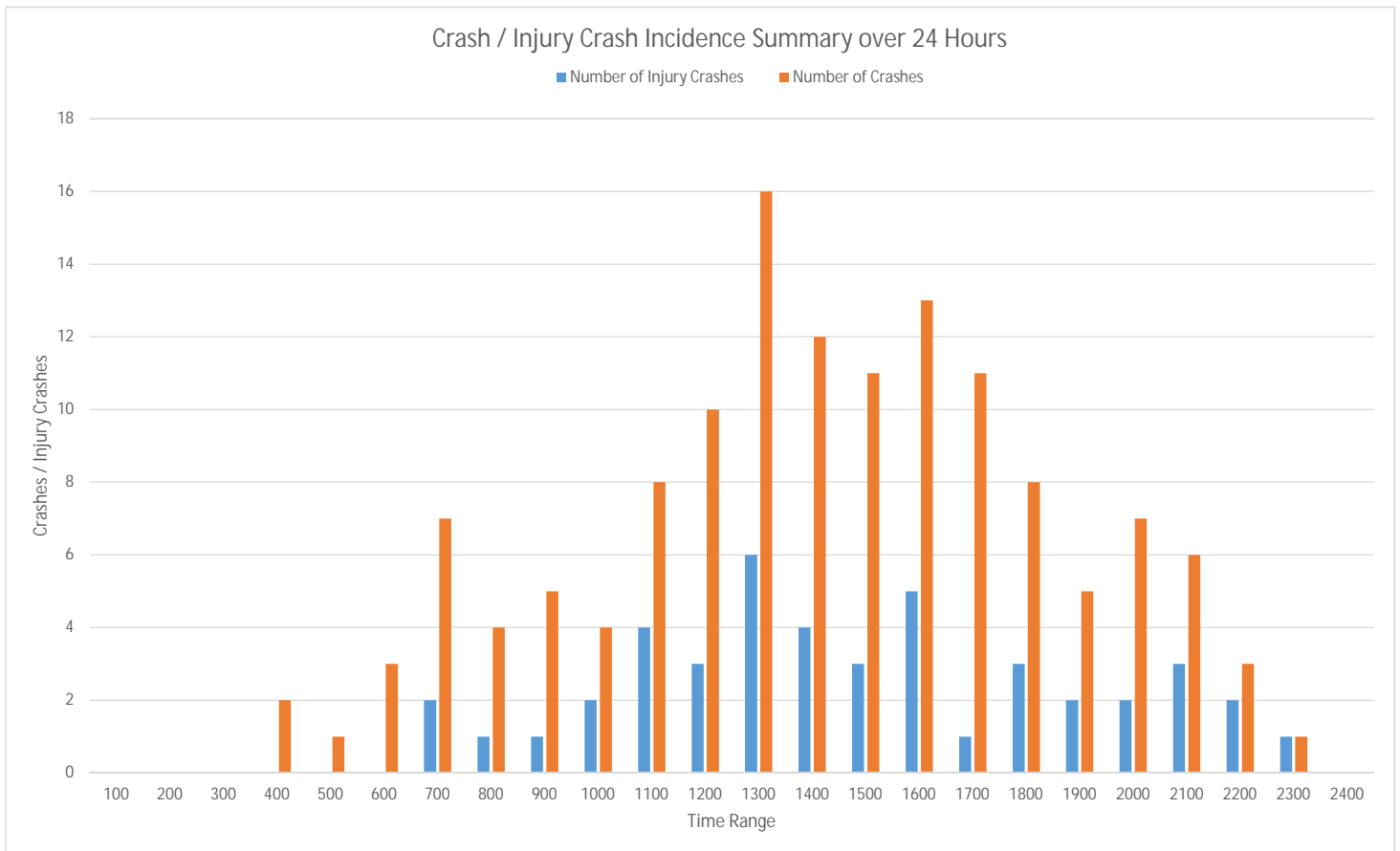
Summary of Weather Condition				
Type of Collision	CLEAR	CLOUDY	RAIN	Grand Total
Rear End	42	12	9	63
Right Angle	7	1		8
Same Direction Sideswipe	14	3	2	19
Left Turn	26	2	3	31
Ran Off Road	3	2	2	7
Other	1			1
Backing Crash	2			2
Right Turn	2	1	1	4
Head On	1	1		2
<b>Grand Total</b>	<b>98</b>	<b>22</b>	<b>17</b>	<b>137</b>

Summary of Pavement Condition			
Type of Collision	DRY	WET	Grand Total
Rear End	51	12	63
Right Angle	8		8
Same Direction Sideswipe	17	2	19
Left Turn	27	4	31
Ran Off Road	5	2	7
Other	1		1
Backing Crash	2		2
Right Turn	3	1	4
Head On	2		2
<b>Grand Total</b>	<b>116</b>	<b>21</b>	<b>137</b>

### Crash Summary

Summary below based on crash data from ARIES 2014-2018.

Summary of Time of Day		
Time of Day	Number of Crashes	Percentage
AM PEAK	11	8%
OFF PEAK	102	74%
PM PEAK	24	18%
<b>Grand Total</b>	<b>137</b>	<b>100%</b>

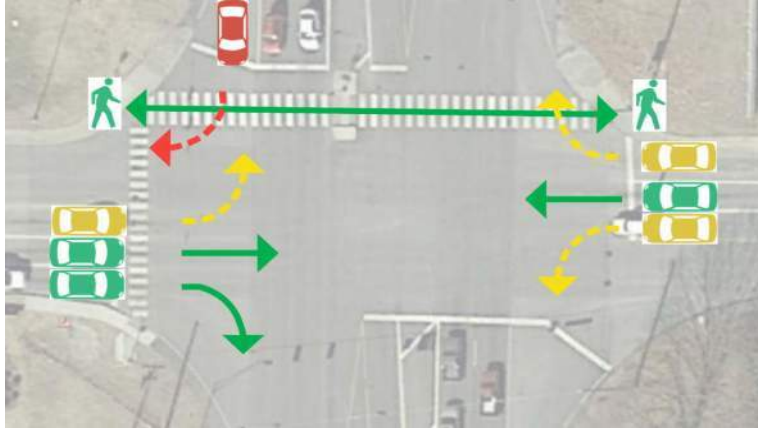




Phase Diagrams, Short-Term Recommendation

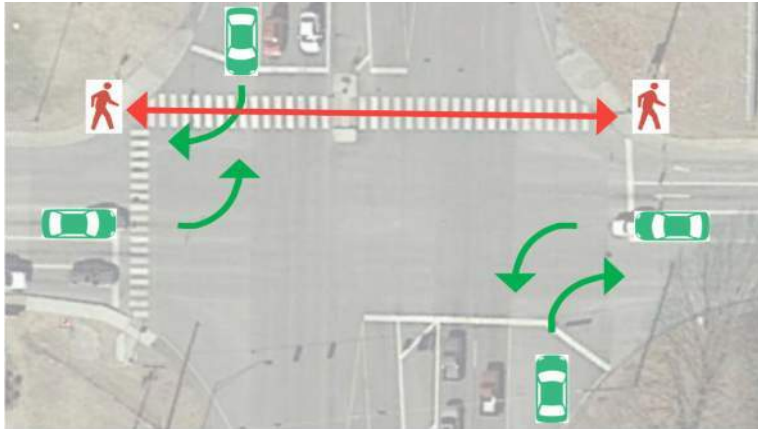
Existing

Phase 2 - eastbound/westbound left-turn, through, right turn, southbound right-turn-on-red; pedestrian phase across US 41

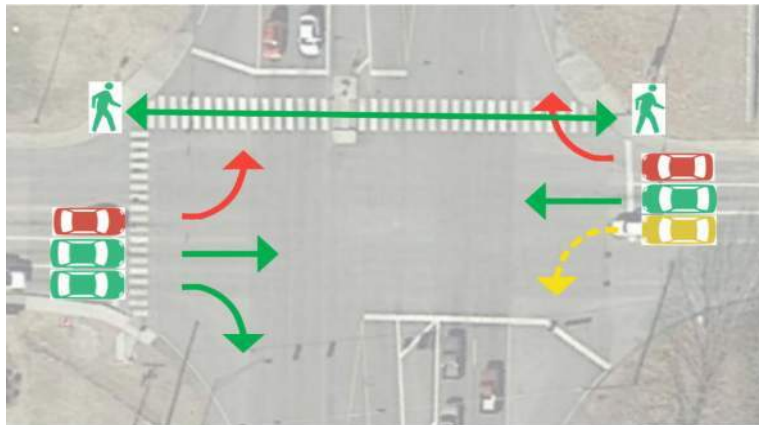


Proposed

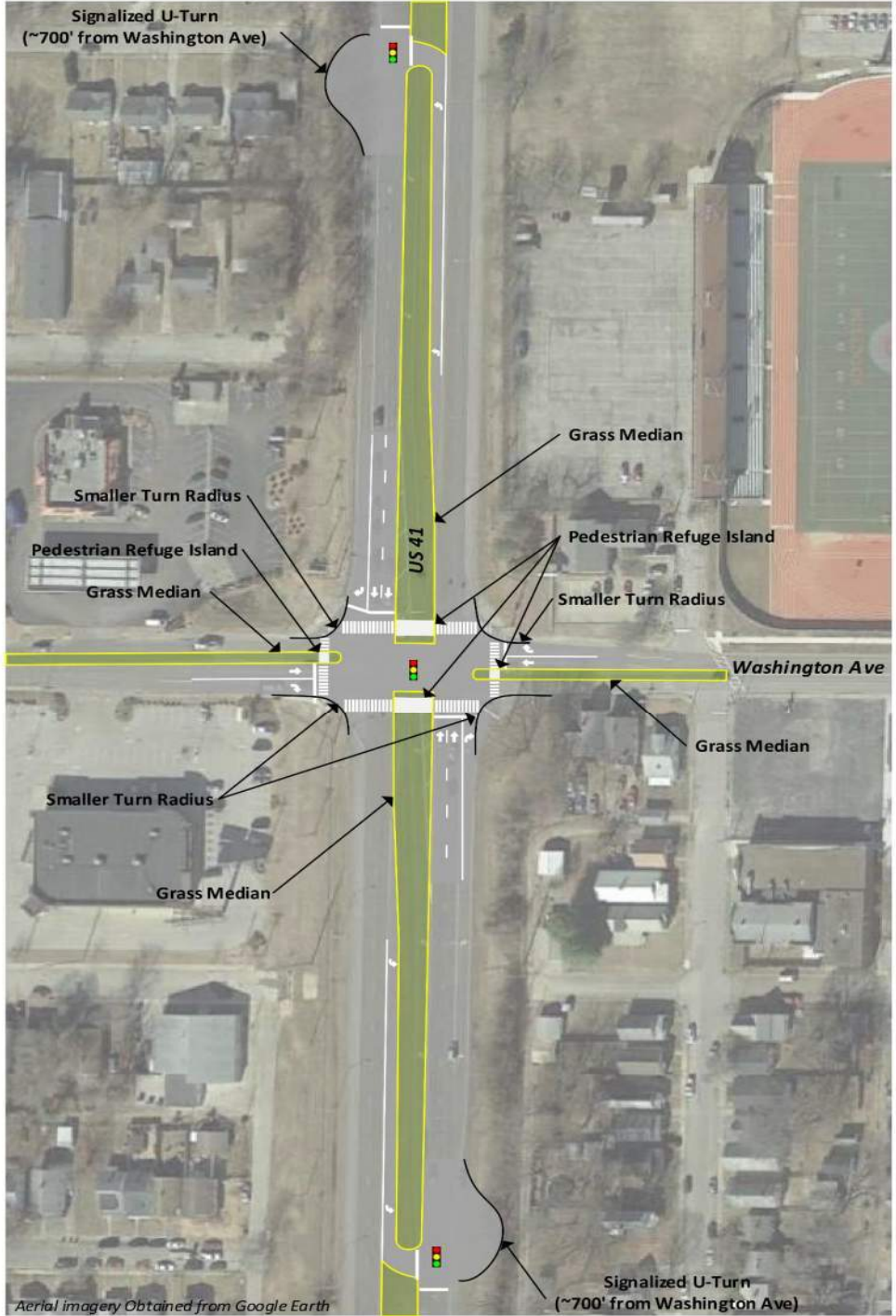
Phase 1 - eastbound/westbound left-turns run simultaneously with northbound/southbound right-turns



Phase 2 - eastbound/westbound through, eastbound left-turn and westbound right-turn are restricted; pedestrian phase across US 41







*Aerial imagery Obtained from Google Earth*

US 41 & Washington Ave

**Conceptual Schematic:**  
Median U-Turn (MUT)

District: Vincennes  
 County: Vanderburgh  
 City/Town: Evansville

**PRELIMINARY COST ESTIMATE**  
**US 41 at Washington Ave. - Short Term (Vanderburgh County)**

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	AMOUNT
1	Mobilization and Demobilization (15%)	1	LSUM	\$4,300.00	\$4,300.00
2	Construction Engineering (5%)	1	LSUM	\$1,400.00	\$1,400.00
3	Clearing Right of Way (5%)	1	LSUM	\$1,400.00	\$1,400.00
4	Signal Head Removal	5	EACH	\$150.00	\$750.00
5	3 Section Traffic Signal Heads w/ Backplates, LED	1	EACH	\$1,000.00	\$1,000.00
6	4 Section Traffic Signal Heads w/ Backplates, LED	2	EACH	\$1,250.00	\$2,500.00
7	5 Section Signal Heads w/ Backplates LED	3	EACH	\$1,400.00	\$4,200.00
8	Traffic Signal Modification/Installation	1	LSUM	\$8,000.00	\$8,000.00
9	Signing	1	LSUM	\$6,000.00	\$6,000.00
10	Pavement Markings	1	LSUM	\$6,500.00	\$6,500.00
11	Maintaining Traffic (15%)	1	LSUM	\$4,300.00	\$4,300.00
<b>CONSTRUCTION SUBTOTAL</b>					<b>\$40,350.00</b>
<i>ROUNDED CONSTRUCTION SUBTOTAL</i>					<i>\$41,000.00</i>
<i>CONSTRUCTION CONTINGENCY (25%)</i>					<i>\$11,000.00</i>
<b>CONSTRUCTION TOTAL</b>					<b>USE \$52,000.00</b>
<b>PRELIMINARY ENGINEERING ESTIMATE (30%)</b>					<b>USE \$16,000.00</b>
<b>OVERALL PROJECT TOTAL</b>					<b>\$68,000.00</b>

This Cost Estimate makes the following assumptions:

1. Thermoplastic Pavement Markings estimated for all approaches
2. Signal timing review and adjustments are not included in this estimate
3. Police enforcement is not included in this estimate
4. Unit price estimates based on stand-alone project
5. Quantities are based off conceptual layout and not actual design
6. Assumed no reimbursable utility relocations
7. Estimate assumes reuse of existing signal cabinet, controller, and existing service point

**PRELIMINARY COST ESTIMATE**  
**US 41 at Washington Ave. - Long Term MUT (Vanderburgh County)**

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	AMOUNT
1	Mobilization and Demobilization (5%)	1	LSUM	\$31,800.00	\$31,800.00
2	Construction Engineering (3%)	1	LSUM	\$19,100.00	\$19,100.00
3	Clearing Right of Way (2%)	1	LSUM	\$12,700.00	\$12,700.00
4	Common Excavation	2700	CYS	\$12.00	\$32,400.00
5	Borrow	1500	CYS	\$20.00	\$30,000.00
6	Surface Milling	11700	SYS	\$2.00	\$23,400.00
7	HMA Surface	1200	TON	\$125.00	\$150,000.00
8	HMA Intermediate	230	TON	\$110.00	\$25,300.00
9	HMA Base	1020	TON	\$80.00	\$81,576.00
10	Subgrade Treatment	2400	SYS	\$15.00	\$36,000.00
11	Curb Removal	400	LFT	\$10.00	\$4,000.00
12	Curb, Concrete, All Types	400	LFT	\$27.00	\$10,800.00
13	Pavement Markings, All Types	1	LSUM	\$13,000.00	\$13,000.00
14	Traffic Signal Head Removal	10	EACH	\$100.00	\$1,000.00
15	Traffic Signal Heads w/ Backplates, LED	12	EACH	\$950.00	\$11,400.00
16	Traffic Signal Conduit, Wiring, and Cable Duct	1	LSUM	\$8,000.00	\$8,000.00
17	Median U-Turn Traffic Signal Installation	2	EACH	\$50,000.00	\$100,000.00
18	Street Lighting	1	LSUM	\$80,000.00	\$80,000.00
19	Mulched Seeding & Topsoil	3000	SYS	\$5.00	\$15,000.00
20	Signing	1	LSUM	\$15,000.00	\$15,000.00
21	Drainage Modifications (15%)	1	LSUM	\$95,500.00	\$95,500.00
22	Maintaining Traffic (10%)	1	LSUM	\$63,700.00	\$63,700.00
<b>CONSTRUCTION SUBTOTAL</b>					<b>\$859,676.00</b>
<i>ROUNDED CONSTRUCTION SUBTOTAL</i>					<i>\$860,000.00</i>
<i>CONSTRUCTION CONTINGENCY (25%)</i>					<i>\$215,000.00</i>
<b>CONSTRUCTION TOTAL</b>					<b>USE \$1,075,000.00</b>
<b>PRELIMINARY ENGINEERING ESTIMATE (18%)</b>					<b>USE \$194,000.00</b>
<b>OVERALL PROJECT TOTAL</b>					<b>\$1,269,000.00</b>

This Cost Estimate makes the following assumptions:

1. Thermoplastic Pavement Markings estimated for all approaches
2. Signal timing review and adjustments are not included in this estimate
3. Police enforcement is not included in this estimate
4. Unit price estimates based on stand-alone project
5. Quantities are based off conceptual layout and not actual design
6. Assumed no reimbursable utility relocations
7. Estimate assumes reuse of existing signal cabinet, controller, and existing service point
8. Estimate assumes surface milling and HMA resurface for the entire project limits



**PRELIMINARY COST ESTIMATE**  
**US 41 at Washington Ave. (Vanderburgh County) - PEDESTRIAN OVERPASS**

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	AMOUNT
1	Mobilization and Demobilization (5%)	1	LSUM	\$146,900.00	\$146,900.00
2	Construction Engineering (2%)	1	LSUM	\$58,800.00	\$58,800.00
3	Clearing Right of Way (2%)	1	LSUM	\$58,800.00	\$58,800.00
4	Earthwork	2400	CYS	\$30.00	\$72,000.00
5	Prefabricated Pedestrian Bridge	1960	SFT	\$240.00	\$470,400.00
6	Access Ramp (2 total ramps)	12460	SFT	\$175.00	\$2,180,500.00
7	Lighting Relocation/Installation	1	LSUM	\$35,000.00	\$35,000.00
8	Trail/Sidewalk, Additional	560	SYS	\$50.00	\$28,000.00
9	Mulched Seeding	1	LSUM	\$40,000.00	\$40,000.00
10	Drainage Items (4%)	1	LSUM	\$113,000.00	\$113,000.00
11	Maintaining Traffic (2%)	1	LSUM	\$58,800.00	\$58,800.00
<i>CONSTRUCTION SUBTOTAL</i>					\$3,262,200.00
<i>ROUNDED CONSTRUCTION SUBTOTAL</i>					\$3,263,000.00
<i>CONSTRUCTION CONTINGENCY (20%)</i>					\$653,000.00
<b>CONSTRUCTION TOTAL</b>					<i>USE</i> <b>\$3,916,000.00</b>
	Right-of-Way Acquisition	1.00	LSUM	\$20,000	\$20,000.00
	Utilities	1.00	LSUM	\$35,000	\$35,000.00
<b>TOTAL</b>					\$55,000.00
<b>SITE PREPARATION TOTAL</b>					<i>USE</i> <b>\$55,000.00</b>
<b>PRELIMINARY ENGINEERING ESTIMATE (20%)</b>					<i>USE</i> <b>\$784,000.00</b>
<b>OVERALL PROJECT TOTAL</b>					<b>\$4,755,000.00</b>

This Cost Estimate makes the following assumptions:

1. Assumes prefabricated single span structure over US 41 on CIP concrete abutments
2. Assumes prefabricated approach ramp structures on CIP concrete supports
3. Unit price estimates based on stand-alone project
4. Quantities are based off conceptual layout and not actual design

**PRELIMINARY COST ESTIMATE**  
**US 41 at Washington Ave. (Vanderburgh County) - PEDESTRIAN UNDERPASS**

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	AMOUNT
1	Mobilization and Demobilization (5%)	1	LSUM	\$140,900.00	\$140,900.00
2	Construction Engineering (4%)	1	LSUM	\$112,700.00	\$112,700.00
3	Clearing Right of Way (2%)	1	LSUM	\$56,400.00	\$56,400.00
4	Earthwork	8900	CYS	\$30.00	\$267,000.00
5	Structure, Precast Three-sided, 240"x144"	140	LFT	\$3,300.00	\$462,000.00
6	Access Ramp Retaining Walls	14400	SFT	\$100.00	\$1,440,000.00
7	Railing	1200	LFT	\$110.00	\$132,000.00
8	Lighting Relocation/Installation	1	LSUM	\$35,000.00	\$35,000.00
9	Trail/Sidewalk, Additional	1490	SYS	\$50.00	\$74,500.00
10	Mulched Seeding	1	LSUM	\$40,000.00	\$40,000.00
11	Drainage Items (15%)	1	LSUM	\$367,600.00	\$367,600.00
12	Maintaining Traffic (12%)	1	LSUM	\$338,200.00	\$338,200.00
<i>CONSTRUCTION SUBTOTAL</i>					\$3,466,300.00
<i>ROUNDED CONSTRUCTION SUBTOTAL</i>					\$3,467,000.00
<i>CONSTRUCTION CONTINGENCY (20%)</i>					\$694,000.00
<b>CONSTRUCTION TOTAL</b>					<i>USE</i> <b>\$4,161,000.00</b>
<b>PRELIMINARY ENGINEERING ESTIMATE (20%)</b>					<i>USE</i> <b>\$833,000.00</b>
	Right-of-Way Acquisition	1.00	LSUM	\$20,000	\$20,000.00
	Utilities	1.00	LSUM	\$35,000	\$35,000.00
<b>TOTAL</b>					<b>\$55,000.00</b>
<b>SITE PREPARATION TOTAL</b>					<i>USE</i> <b>\$55,000.00</b>
<b>OVERALL PROJECT TOTAL</b>					<b>\$5,049,000.00</b>

This Cost Estimate makes the following assumptions:

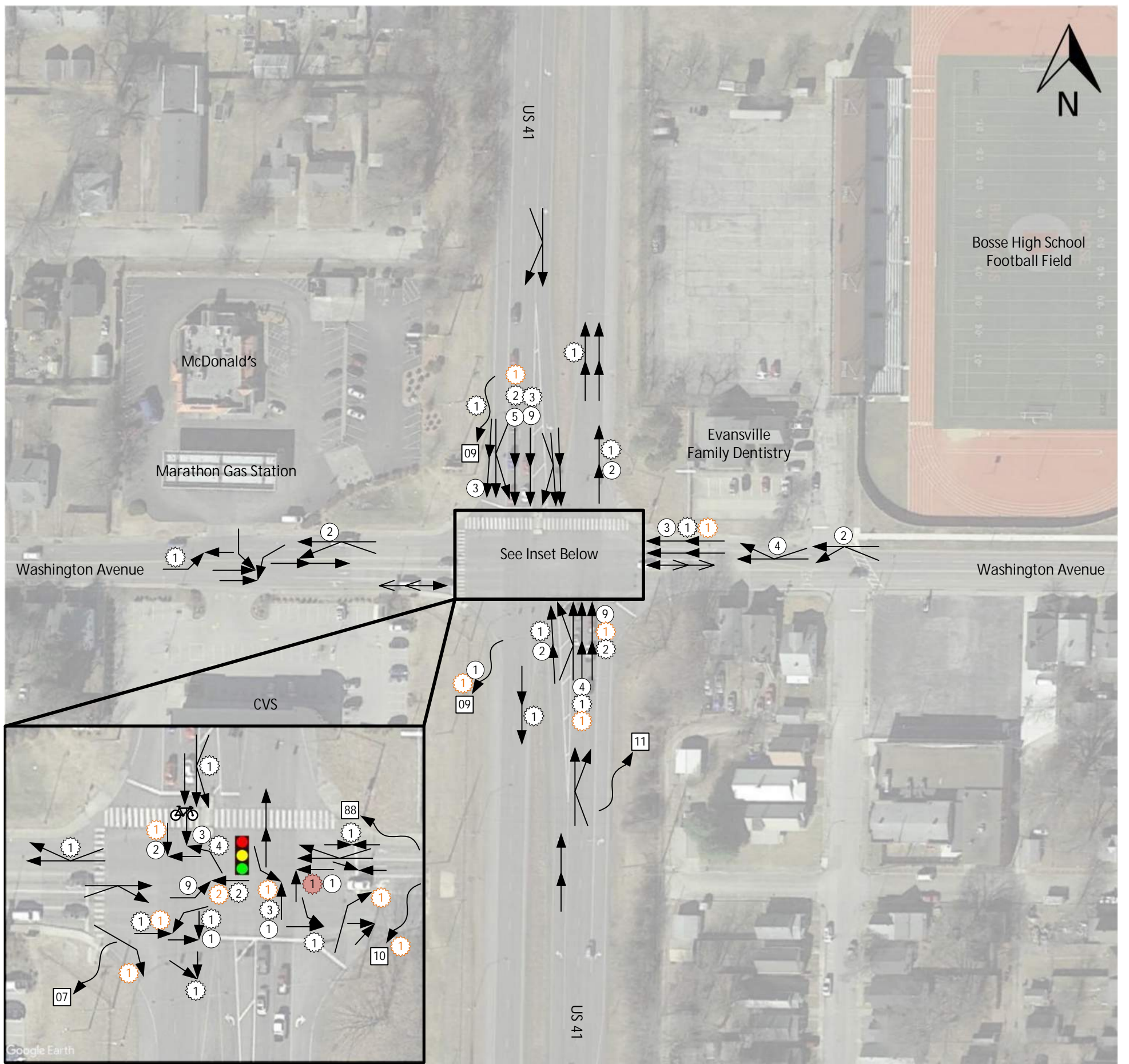
1. Assumes access ramps with retaining wall on both sides and railing along the road and beside the existing trail to the west
2. Assumes prefabricated approach ramp structures on CIP concrete supports
3. Unit price estimates based on stand-alone project
4. 3-sided box will impact all underground utilities. Assumed most utilities will be non-reimbursable relocations.
5. Quantities are based off conceptual layout and not actual design



DIAGRAM OF COLLISION REPORTS

Washington Avenue & US 41

Study Period: 1/1/2014 to 12/31/2018 Location: 3  
 District: Vincennes County: Vanderburgh City/Town: Evansville  
 Analyst: ARM QC: MJD Date: 04/10/2019



Aerial imagery provided by Google Earth

YEAR	REPORTS
2014	25
2015	20
2016	27
2017	26
2018	33
TOTAL	131

NOTES  
 1) Crashes with determinable location are shown in diagram. Crash total may not match ARIES database.  
 2) Crashes on diagram do not represent exact crash locations; they are approximated based on available information.  
 3) Diagram not to scale.

Object Symbols

	MOVING VEHICLE		FATAL CRASH		SIGNALIZED INTERSECTION
	TURNING VEHICLE		INJURY CRASH – INCAPACITATING		FIXED OBJECT (See table for # codes)
	BACKING VEHICLE		INJURY CRASH – NONINCAPACITATING		
	OUT OF CONTROL		PDO CRASHES (IF > 1)		
	PARKED VEHICLE				
	PEDESTRIAN				
	BICYCLE				
	ANIMAL				
	DEBRIS IN ROADWAY				

Collision Symbols

	REAR END
	HEAD ON
	OVERTAKING / CUT-OFF
	SIDESWIPE – SAME
	SIDESWIPE – OPPOSITE
	RIGHT ANGLE
	LEFT TURN
	OVERTURNED

Fixed Object Codes

- 01 – BRIDGE or OVERPASS
- 02 – BUILDING
- 03 – CULVERT or DITCH
- 04 – CURB
- 05 – GUARDRAIL or BARRIER
- 06 – EMBANKMENT
- 07 – FENCE
- 08 – TRAFFIC POLE
- 09 – UTILITY POLE
- 10 – SIGN
- 11 – TREE / SHRUB
- 12 – CONSTRUCTION BARRIER
- 13 – CRASH ATTENUATOR
- 88 – OTHER
- 99 – UNKNOWN

Design Element		Manual Section	Design Value (By Type of Area)				
			Suburban	Intermediate	Built-Up		
Design Controls	Design Forecast Period		40-2.02	20 Years	20 Years	20 Years	
	Design Speed, mph (1)		40-3.0	Curbed: 45-55 Uncurbed: 50-60	Curbed: 40-50 Uncurbed: 50-60	Curbed: 30-35	
	Access Control		40-5.0	Partial Control / None	None	None	
	Level of Service		40-2.0	Des: B; Min: C	Des: C; Min: D	Des: C; Min: D	
	On-Street Parking		45-1.04	None	Optional (2)	Optional (2)	
Cross-Section Elements	Travel Lane	*Width (3)	45-1.01	Curbed: 12 ft Uncurbed: 12 ft	Curbed: Des.: 12 ft; Min.: 11 ft Uncurbed: Des.: 12 ft; Min.: 11 ft	Curbed: Des.: 12 ft; Min.: 10 ft	
		Typical Surface Type (4)	Ch. 304	Asphalt / Concrete	Asphalt / Concrete	Asphalt / Concrete	
	*Curb Offset (5)		45-1.02	2 ft	2 ft	2 ft	
	Shoulder	*Paved Width (6)	45-1.02	Curbed, Rt. Des: 10 ft; Min 2 ft Curbed, Lt. Des: 4 ft; Min 2 ft Uncurbed, Rt.: 10 ft; Lt.: 4 ft	Curbed, Rt. Des: 8 ft; Min 2 ft Curbed, Lt. Des: 4 ft; Min 2 ft Uncurbed, Rt.: 8 ft; Lt.: 4 ft	Right: 6 ft; Left: 4 ft	
		Typical Surface Type (4)	Ch. 304	Asphalt / Concrete	Asphalt / Concrete	Asphalt / Concrete	
	Cross Slope	*Travel Lane (7)	45-1.01	2%	2%	2%	
		Shoulder (7A)	45-1.02	Paved Width ≤ 4 ft: 2%; Paved Width > 4 ft: 4%	Paved Width ≤ 4 ft: 2%; Paved Width > 4 ft: 4%	Paved Width ≤ 4 ft: 2%; Paved Width > 4 ft: 4%	
	Auxiliary Lane	Lane Width	45-1.03	Des: 12 ft; Min: 11 ft	Des: 12 ft; Min: 11 ft	Des: 12 ft; Min: 10 ft	
		Curb Offset (8)		1 ft	1 ft	1 ft	
		Shoulder Width	Des: 10 ft; Min: 2 ft	Des: 8 ft; Min: 2 ft	Des: 6 ft; Min: 2 ft		
		Typical Surface Type (4)	Ch. 304	Asphalt / Concrete	Asphalt / Concrete	Asphalt / Concrete	
	TWLTL Width		46-5.0	Des: 16 ft; Min: 14 ft	Des: 16 ft; Min: 14 ft	Des: 14 ft; Min: 12 ft	
	Parking-Lane Width		45-1.04	N/A	Des: 12 ft; Min: 10 ft (9)	Des: 12 ft; Min: 10 ft (9)	
	Median Width	Depressed	45-2.0	26.5 ft – 50 ft	N/A	N/A	
		Raised Island		Des: 18 ft; Min: 13 ft (10)	Des: 18 ft; Min: 4 ft (10)	Des: 18 ft; Min: 4 ft (10)	
		Flush / Corrugated		Des: 16 ft; Min: 13 ft (10)	Des: 16 ft; Min: 4 ft (10)	Des: 16 ft; Min: 4 ft (10)	
	Sidewalk Width (11)		45-1.06	5 ft with 5-ft Buffer (Des)	5 ft with 5-ft Buffer (Des)	Varies; 6 ft Min	
	Bicycle-Lane Width (12)		51-7.0	Curbed: 5 ft Uncurbed: Shld Width +4 ft	Curbed: 5 ft Uncurbed: Shoulder Width +4 ft	Curbed: 5 ft	
	Clear-Zone Width		49-2.0	(13)	(13)	(13)	
	Typical Curbing Type, where used (14)		45-1.05	Sloping / Vertical	Sloping / Vertical	Sloping / Vertical	
	Side Slopes, Uncurbed (15)	Cut	Foreslope	45-3.0	6:1 (16)	6:1 (16)	N/A
			Ditch Width		4 ft (17)	4 ft (17)	N/A
			Backslope		4:1 for 20 ft; 3:1 Max. to Top (18)	4:1 for 20 ft; 3:1 Max. to Top (18)	N/A
Fill		6:1 to Clear Zone; 3:1 Max. to Toe	6:1 to Clear Zone; 3:1 Max. to Toe	N/A			
Side Slopes, Curbed	Cut, Backslope	45-3.0	(19)	(19)	(19)		
	Fill		12:1 for 12 ft; 3:1 Max. to Toe	12:1 for 12 ft; 3:1 Max. to Toe	12:1 for 12 ft; 3:1 Max. to Toe		
Median Slopes, Depressed		45-2.0	Des: 8:1; Max: 5:1	N/A	N/A		

Des: Desirable. Min: Minimum.

\* Level One controlling criterion, see page 2 of 4

**GEOMETRIC DESIGN CRITERIA FOR URBAN ARTERIAL, 4 OR MORE LANES  
(New Construction or Reconstruction)  
Figure 53-6 (Page 1 of 4)**

Back

Design Element			Manual Section	Design Value (By Type of Area)				
				Suburban	Intermediate	Built-Up		
Bridges	New or Reconstructed Bridge	*Structural Capacity (20)	Ch. 403	HL-93	HL-93	HL-93		
		*Clear-Roadway Width (21)	45-4.01	Uncurbed: Full Paved Approach Width Curbed: Full Approach Curb-to-Curb Width				
	Existing Bridge to Remain in Place	*Structural Capacity	Ch. 72	HS-20	HS-20	HS-20		
		*Clear-Roadway Width	45-4.01	Uncurbed: Travelway Plus 2 ft on Each Side; Curbed: Full Approach Curb-to-Curb Width				
	*Vertical Clearance, Arterial Under (22)	New or Replaced Overpassing Bridge (22a)	44-4.0	16.5 ft	16.5 ft (22b)	16.5 ft (22b)		
		Existing Overpassing Bridge		14 ft	14 ft	14 ft		
Sign Truss / Pedestrian Bridge (22a)		New: 17.5 ft; Existing: 17 ft		New: 17.5ft; Existing: 17 ft	New: 17.5 ft; Existing: 17 ft			
Vertical Clearance, Arterial over Railroad (23)		Ch. 402-6.01	23 ft					
Alignment Elements	Design Speed			30 mph	35 mph	45 mph	50 mph	55 mph
	*Stopping Sight Distance		42-1.0	200 ft	250 ft	360 ft	425 ft	495 ft
	Decision Sight Distance	Speed / Path / Direction Change	42-2.0	U: 620 ft SU: 535 ft	U: 720 ft SU: 625 ft	U: 930 ft SU: 800 ft	U: 1030 ft SU: 890 ft	U: 1135 ft SU: 980 ft
		Stop Maneuver		490 ft	590 ft	800 ft	910 ft	1030 ft
	Intersection Sight Distance, -3% to +3% (28)		46-10.0	P: 355 ft SUT: 450 ft	P: 415 ft SUT: 525 ft	P: 530 ft SUT: 675 ft	P: 665 ft SUT: 825 ft	P: 770 ft SUT: 950 ft
	*Minimum Radius for $e_{max} = 4\% / 6\%$		43-2.0	260 ft / 240 ft (24a)	420 ft / 390 ft (24a)	600 ft / 550 ft (24a)	750 ft (24b)	1000 ft (24b)
	*Superelevation Rate (25)		43-3.0	Up to $e_{max} = 6\%$			$e_{max} = 8\%$	
	*Horizontal Sight Distance		43-4.0	(26)				
	*Vertical Curvature, K-value	Crest	44-3.0	19	29	61	84	114
		Sag		37	49	79	96	115
	*Maximum Grade (27)	Level	44-1.02	8%	7%	6.5%	6%	5.5%
Rolling		9%		8%	7.5%	7%	6.5%	
Minimum Grade		44-1.03	Desirable: 0.5% Minimum: 0.3% (Curbed) 0.0% (Uncurbed)					

U: Urban SU: Suburban.

\* Level One controlling criterion. Except as noted in this chapter, the values shown in AASHTO's *A Policy on Geometric Design of Highways and Streets* (the *Green Book*) may be used as minimum values if they are lower than similar values shown herein. A controlling criterion that does not meet the minimum value is a design exception and is subject to approval. See Section 40-8.0.

These criteria apply to a route either on or off the National Highway System, regardless of funding source.

**GEOMETRIC DESIGN CRITERIA FOR URBAN ARTERIAL, 4 OR MORE LANES  
(New Construction or Reconstruction)  
Figure 53-6 (Page 2 of 4)**

Back



- (1) Design Speed. The minimum design speed should equal the minimum value, the anticipated posted speed limit after construction, or the legal speed limit on a non-posted highway. The legal speed limit in an urban district is 30 mph. Based on an engineering study, the design speed may be raised to an absolute maximum of 55 mph.
- (2) On-Street Parking. In general, on-street parking is discouraged.
- (3) Travel-Lane Width. For an arterial on the National Truck Network, the right lane must be 12 ft in width.
- (4) Surface Type. The pavement-type selection will be determined by the INDOT Office of Pavement Engineering.
- (5) Curb Offset. The curb offset (for both left and right sides) should be 2 ft. Vertical curbs introduced intermittently should be offset 2 ft. A continuous curb used along a median or channelizing island may be offset 1 ft.
- (6) Shoulder Width. The value applies to the paved shoulder width. The following will also apply.
  - a. For an uncurbed section, the shoulder is paved to the front face of guardrail. The desirable guardrail offset is 2 ft from the usable shoulder width. See Section 49-4.0 for more information.
  - b. For an uncurbed section, a desirable additional 1 ft of compacted aggregate will be provided.
  - c. For a curbed section, the curb offset is included in the paved shoulder width.
- (7) Cross Slope, Travel Lane. Cross slopes of 1.5% are acceptable for an existing bridge to remain in place.
- (7A) Cross Slope, Shoulder. See Figure 45-1A(1) or Figure 45-1A(2) for more-specific information.
- (8) Curb Offset for Auxiliary Lane. In a curbed section, the offset may be zero.
- (9) Parking Lane. Where a parking lane will be used as a travel lane during peak hours or may be converted to a travel lane in the future, the width should be equal to the travel lane width plus a 1 ft offset to the curb (if present). The cross slope for a parking lane is typically 1% steeper than that of the adjacent travel lane.
- (10) Minimum Median Width. The criteria assume the presence of a mountable curb with a 0 ft curb offset.
- (11) Sidewalk Width. A buffer of less than 2 ft wide is not permitted. If no buffer is provided, the sidewalk width should be 6 ft.
- (12) Bicycle-Lane Width. The value is in addition to the width of a parking lane, if present. See Section 51-7.0 for additional details.
- (13) Clear-Zone Width. The following will apply.
  - a. Facility with Vertical Curbs. The clear-zone width will be measured from the edge of travel lane or will be to the right-of-way line, whichever is less. No clear zone is required where there is 24-h parking.
  - b. Facility with Sloping Curbs or without Curbs. The clear-zone width will vary according to design speed, traffic volume, side slopes, and horizontal curvature.
  - c. Curbed Facility. There should be an appurtenance-free area as measured from the gutter line of a curb.
  - d. Value. See Section 49-2.0 for specific clear-zone-width value.
- (14) Curbing Type. Vertical curbs may only be used with design speed 45 mph or lower.

**GEOMETRIC DESIGN CRITERIA FOR URBAN ARTERIAL, 4 OR MORE LANES**  
**(New Construction or Reconstruction)**  
**Figure 53-6 (Page 3 of 4)**

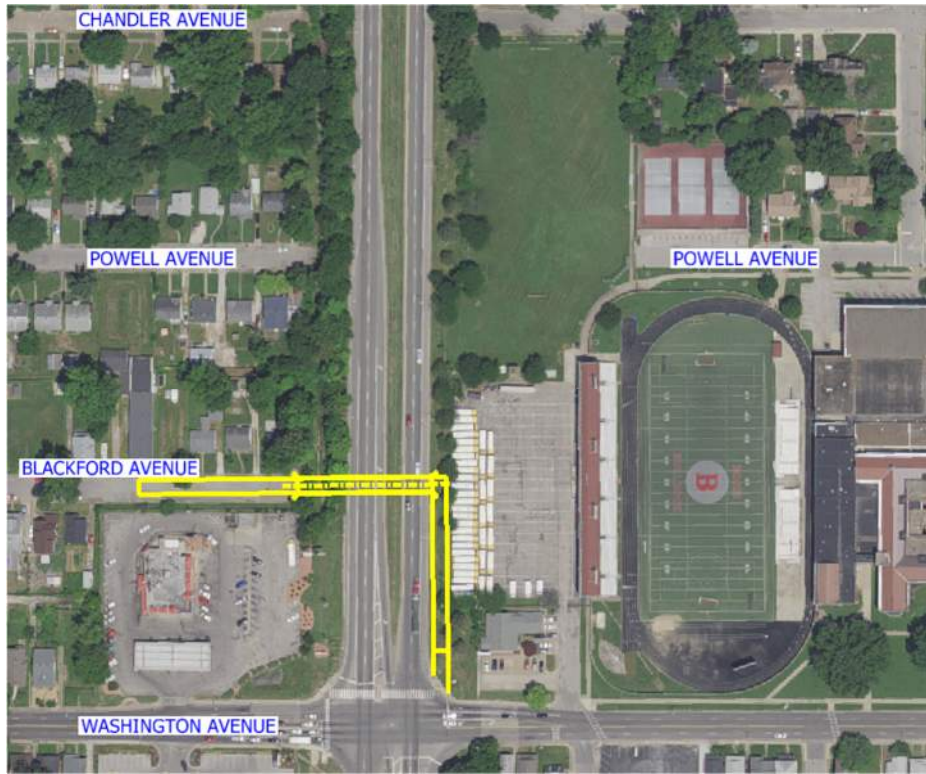
- (15) Side Slope, Uncurbed. Value is for new construction. See Sections 45-3.0 and 45-8.0 for more information. For a reconstruction project, see Section 49-3.0.
- (16) Foreslope. See Sections 49-2.0 and 49-3.0 for the lateral extent of the foreslope in a ditch section.
- (17) Ditch Width. A V-ditch should be used in a rock cut. See Section 45-8.0.
- (18) Backslope. The backslope for a rock cut will vary according to the height of the cut and the geotechnical requirements. See Sections 45-3.02 and 107-6.02 for typical rock-cut sections.
- (19) Side Slope, Curbed, Cut. A shelf or sidewalk will be present immediately behind the curb before the toe of the backslope. The minimum width of a shelf will be 6 ft. Where a sidewalk is present, the toe of the backslope will be 1 ft beyond the edge of sidewalk. See Section 45-3.0 for more information.
- (20) Structural Capacity, New or Reconstructed Bridge. The following will apply.
- A State-highway bridge within 15 mi of a Toll-Road gate must be designed for Toll-Road loading.
  - A bridge on an Extra-Heavy-Duty Highway must be designed for the Michigan Train truck loading configuration.
- (21) Width, New or Reconstructed Bridge. See Section 402-6.02(01) for more information. The bridge clear-roadway width is the algebraic sum of the following:
- the approach traveled way width;
  - the approach usable shoulder width without guardrail; and
  - a bridge-railing offset (see Figure 402-6H).
- (22) Vertical Clearance, Arterial Under Railroad. The following will apply.
- Value includes an additional 6 in. allowance for future pavement overlays.
  - In a highly urbanized area, a minimum clearance of 14 ft may be provided if there is at least one route with a 16 ft clearance.
  - Vertical clearance applies from usable edge to usable edge of shoulders.
- (23) Vertical Clearance, Arterial Over Railroad. See Chapter 402-6.01(03) for additional information on railroad clearance under a highway.
- (24) Minimum Radius. The following will apply:
- Based on  $e_{\max} = 4\%$  or  $6\%$  and low-speed urban street conditions.
  - Based on  $e_{\max} = 8\%$  and open-road conditions.
- (25) Superelevation Rate. See Section 43-3.0 for values of superelevation rate based on design speed and radius. See Section 43-3.0 and the INDOT *Standard Drawings* for information on superelevation requirements.
- (26) Horizontal Sight Distance. For a given design speed, the necessary middle ordinate will be determined by the radius and the sight distance which applies at the site. Sometimes the stopping-sight-distance value for a truck will apply. See the discussion in Section 43-4.0.
- (27) Where adjacent sidewalks are present, the maximum desirable grade is 5%.
- (28) Intersection Sight Distance. For a left turn onto a two-way, 4-lane undivided roadway: P = Passenger car; SUT = single unit truck. See Figure 46-10G for value for a combination truck.

**Attachment F**

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**Alternatives Location Diagram**

US 41 PEDESTRIAN CROSSING  
DES 1902709—Preliminary Alternatives Report



Alternate 1: Tunnel at Blackford Avenue



Alternate 2: Bridge at Blackford Avenue

**US 41 PEDESTRIAN CROSSING  
DES 1902709—Preliminary Alternatives Report**



**Alternate 3: Bridge at Washington Avenue**

**Attachment G**

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**Cost Comparison**



Calculations For	US 41 Pedestrian Crossing - Prelim. Alt. Report	Job No.	74055-DS-080	Sheet No.
Made by	ALM	Date	8/28/2020	
Checked by	ENH	Date	9/15/2020	
Backchecked by	ALM	Date	9/15/2020	



Title: Cost Comparison for Ped. Crossing at US 41

NOTE: Input data is denoted by shading. All other values are calculations performed by the spreadsheet.

**Alternate 1, Tunnel at Blackford Avenue**

Pay Item No.	Item	Unit	Quantity	Unit Price	Total
203-02000	Excavation, Common	CYS	1895	\$34.36	\$65,112.20
206-51230	Excavation, Foundation, Unclassified	CYS	2770	\$54.30	\$150,411.00
211-09268	Structure Backfill, Type 5	CYS	1005.0	\$129.18	\$129,825.90
302-06464	Subbase for PCCP	CYS	293	\$85.91	\$25,171.63
303-01180	Compacted Aggregate, No. 53	TON	299.0	\$92.24	\$27,579.76
401-07321	QC/QA-HMA, 2, 64, Surface, 9.5 mm	TON	33	\$120.00	\$3,960.00
503-12475	Jointed Reinforced Concrete Pavement 10 IN	SYS	293	\$163.00	\$47,759.00
604-06070	Sidewalk, Concrete	SYS	766.0	\$81.73	\$62,605.18
702-92857	Concrete, C, Substructure	CYS	666.7	\$863.66	\$575,802.12
703-06028	Reinforcing Bars	LBS	53336	\$1.21	\$64,536.56
703-06029	Reinforcing Bars, Epoxy Coated	LBS	25200	\$1.30	\$32,760.00
704-51002	Concrete, C, Superstructure	CYS	150.0	\$250.00	\$37,500.00
706-11404	Railing, Steel PF-1	LFT	600	\$65.00	\$39,000.00
706-11602	Railing, Concrete PF-1	CYS	36.9	\$1,800.00	\$66,420.00
714-XXXXX	Structure, Reinforced Concrete, Box Sections, 20.3 FT X 16 FT	LFT	190	\$2,800.00	\$532,000.00
720-XXXXX	Drainage	LS	1	\$330,000.00	\$330,000.00
801-04744	Lighting	LS	1	\$35,000.00	\$35,000.00
	Base Total				\$2,225,443.35
	Est. Cost of Add'l Structural Items			20% of Base Total	\$445,088.67
	Subtotal				\$2,670,532.02
105-06845	Construction Engineering	LS	1	2% of Subtotal	\$53,500.00
110-01001	Mobilization and Demobilization	LS	1	5% of Subtotal	\$133,600.00
201-52370	Clearing Right of Way	LS	1	2% of Subtotal	\$53,500.00
801-06775	Maintaining Traffic	LS	1	20% of Subtotal	\$534,200.00
	SUBTOTAL				\$3,446,000.00
				25% Contingency at Stage 1:	\$861,500
				<b>Alternate 1 Cost Estimate:</b>	<b>\$4,307,500</b>

**Alternate 2, Bridge at Blackford Avenue**

Pay Item No.	Item	Unit	Quantity	Unit Price	Total
206-51230	Excavation, Foundation, Unclassified	CYS	790	\$54.30	\$42,897.00
604-06070	Sidewalk, Concrete	SYS	223	\$81.73	\$18,225.79
609-06257	Reinforced Concrete Bridge Approach, 10 IN.	SYS	12	\$320.50	\$3,846.00
702-51015	Concrete, B, Footings	CYS	432.2	\$515.14	\$222,643.51
702-92857	Concrete, C, Substructure	CYS	478.9	\$2,000.00	\$957,800.00
703-06028	Reinforcing Bars	LBS	34576	\$1.21	\$41,836.96
703-06029	Reinforcing Bars, Epoxy Coated	LBS	52790	\$1.30	\$68,627.00
704-51002	Concrete, C, Superstructure	CYS	19.6	\$2,057.44	\$40,325.82
706-11455	Bridge Railing Pedestrian Fence, Modified	LFT	1326	\$300.00	\$397,800.00
709-51821	Surface Seal	LS	1	\$900.00	\$900.00
711-04845	Bridge Steel Truss Pre-Engineered	LS	1	\$380,000.00	\$380,000.00
801-04744	Lighting	LS	1	\$25,000.00	\$25,000.00
	Base Total				\$2,199,902.08
	Est. Cost of Add'l Structural Items			20% of Base Total	\$439,980.42
	Subtotal				\$2,639,882.50
105-06845	Construction Engineering	LS	1	2% of Subtotal	\$52,800.00
110-01001	Mobilization and Demobilization	LS	1	5% of Subtotal	\$132,000.00
201-52370	Clearing Right of Way	LS	1	2% of Subtotal	\$52,800.00
801-06775	Maintaining Traffic	LS	1	12% of Subtotal	\$316,800.00
	SUBTOTAL				\$3,195,000.00
				25% Contingency at Stage 1:	\$798,750
				<b>Alternate 2 Cost Estimate:</b>	<b>\$3,993,750</b>



Calculations For	US 41 Pedestrian Crossing - Prelim. Alt. Report	Job No.	74055-DS-080	Sheet No.
Made by	ALM	Date	8/28/2020	
Checked by	ENH	Date	9/15/2020	
Backchecked by	ALM	Date	9/15/2020	

Title: Cost Comparison for Ped. Crossing at US 41

NOTE: Input data is denoted by shading. All other values are calculations performed by the spreadsheet.

**Alternate 3, Bridge at Washington Avenue**

Pay Item No.	Item	Unit	Quantity	Unit Price	Total
206-51230	Excavation, Foundation, Unclassified	CYS	790	\$54.30	\$42,897.00
604-06070	Sidewalk, Concrete	SYS	134	\$81.73	\$10,951.82
609-06257	Reinforced Concrete Bridge Approach, 10 IN.	SYS	12	\$320.50	\$3,846.00
702-51015	Concrete, B, Footings	CYS	432.2	\$515.14	\$222,643.51
702-92857	Concrete, C, Substructure	CYS	478.9	\$2,000.00	\$957,800.00
703-06028	Reinforcing Bars	LBS	34576	\$1.21	\$41,836.96
703-06029	Reinforcing Bars, Epoxy Coated	LBS	52790	\$1.30	\$68,627.00
704-51002	Concrete, C, Superstructure	CYS	19.6	\$2,057.44	\$40,325.82
706-11455	Bridge Railing Pedestrian Fence, Modified	LFT	1326	\$300.00	\$397,800.00
709-51821	Surface Seal	LS	1	\$900.00	\$900.00
711-04845	Bridge Steel Truss Pre-Engineered	LS	1	\$380,000.00	\$380,000.00
801-04744	Lighting	LS	1	\$25,000.00	\$25,000.00
	Base Total				\$2,192,628.11
	Est. Cost of Add'l Structural Items			20% of Base Total	\$438,525.62
	Subtotal				\$2,631,153.73
105-06845	Construction Engineering	LS	1	2% of Subtotal	\$52,700.00
110-01001	Mobilization and Demobilization	LS	1	5% of Subtotal	\$131,600.00
201-52370	Clearing Right of Way	LS	1	2% of Subtotal	\$52,700.00
801-06775	Maintaining Traffic	LS	1	12% of Subtotal	\$315,800.00
	SUBTOTAL				\$3,184,000.00

25% Contingency at Stage 1: \$796,000

**Alternate 3 Cost Estimate: \$3,980,000**