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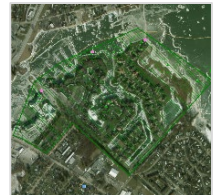
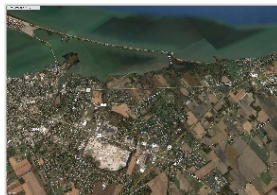
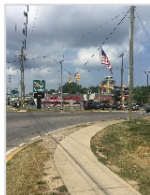
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US 6 Corridor Study (PID 105803)

Feasibility Study

November 22, 2019

Final Report



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Executive Summary

This Feasibility Study was prepared for the US 6 Corridor Study project in Erie County, Ohio, following the Ohio Department of Transportation's (ODOT) Project Development Process (PDP). The purpose of this study was to increase the efficiency of the US 6 corridor, enhance safety and improve multi-modal transportation options. This report includes a summary of the existing conditions in the study corridor, provides an analysis of these conditions, and presents proposed alternatives to mitigate the roadway, safety and operational concerns throughout the study area.

TranSystems was retained by the Erie Regional Planning Commission (ERPC) to analyze the conditions on Cleveland Road (US 6) from Sycamore Line (US 250) in the City of Sandusky to Rye Beach Road in the City of Huron and along Rye Beach Road to just south of the SR 2 interchange. Existing conditions related to the roadway, railroad, culverts, bridges, signage, geotechnical considerations, utilities, way-finding, multi-modal connections, public transit, and environmental concerns were analyzed throughout this corridor. Additionally, traffic volume data collection and crash analyses were conducted. Stakeholder and public meetings were held throughout the process to present findings and gather feedback to develop and refine the feasible alternatives. Based upon the provided information and evaluations, specific alternatives have been proposed and recommended for advancement. Since the US 6 project culminates with a feasibility study, further refinement will be necessary to support the advancement of individual projects through the preliminary and final design phases of project development.

A list of the potential alternatives, along with a brief description and planning level cost estimates, is shown in the following table. Alternatives in bold text represent the recommended alternatives. It is important to note that final decisions regarding the recommended alternatives and project implementation reside with the respective project sponsors.

Roadway Alternatives and Planning Level Cost Estimates

Alternative	Description	Construction Costs (in 2024 dollars)	ROW/Utility Costs	Society Safety Benefit
A	Signal modernization, removal of unwarranted signals, pavement restriping, removal of reversible lane, and add EB right turn lane on US 6 at Remington Avenue intersection in the City of Sandusky.	\$1,530,000	\$145,000	N/A
A1	Butler Street remains open with a signal upgrade (includes total pavement replacement).	\$2,940,000	\$0	N/A
A2	Butler Street closed with a cul-de-sac and signal removed.	\$90,000	\$5,000	\$1,360,000
B1	Construction of modern roundabout at Cedar Point Drive intersection (eastern alignment).	\$1,400,000	\$510,000	\$863,500
B2	Construction of modern roundabout at Cedar Point Drive intersection (western alignment).	\$1,380,000	\$535,000	\$863,500
C1	Construction of modern roundabout at Perkins Avenue intersection.	\$2,290,000	\$250,000	\$917,000
C2	Perkins Avenue at-grade intersection realignment.	\$4,390,000	\$360,000	\$157,800
C3	Perkins Avenue grade separation over railroad tracks.	\$12,700,000	\$960,000	\$157,800
D1	Construction of modern roundabout at Camp Road intersection.	\$2,920,000	\$130,000	\$3,020,100
D2	Widen US 6 at Camp Road intersection, add EB and WB left turn lanes and EB right turn lane on US 6 (maintain existing stop control on Camp Road).	\$1,950,000	\$720,000	\$987,300
E	Widen US 6 between Camp Road and Rye Beach Road, add center turn lane throughout and add WB right turn lane at Sawmill Creek Drive.	\$2,390,000	\$160,000	\$1,606,400
F1	Construction of modern roundabouts along Rye Beach Road at US 6 intersection and SR 2 interchange (EB and WB ramps).	\$4,030,000	\$380,000	\$1,234,400
F2	Signal upgrades and pavement restriping along Rye Beach Road from US 6 to Sawmill Parkway.	\$990,000	\$0	N/A

The alternatives recommended to be carried forward to the next step are:

- ▶ Alternative A – Signal and roadway improvements in the City of Sandusky
 - Alternative A2 – Butler Street closure (*final decision to be made by the City of Sandusky*)
- ▶ Alternative B1 – Cedar Point Drive roundabout (eastern alignment)
- ▶ Alternative C1 – Perkins Avenue roundabout
- ▶ Alternative D1 – Camp Road roundabout
- ▶ Alternative E – Sawmill Creek Drive improvements and US 6 widening
- ▶ Alternative F1 – Rye Beach Road roundabouts

While each of the proposed alternatives presented above can be advanced independently (with the exception of the A-series of alternatives), the proximity and elements of certain options lend themselves to be grouped with an adjacent improvement, as indicated below.

- ▶ Alternatives A and A2 (or A1) – Alternative A must also incorporate either sub-alternate A1 or A2. The Butler Street project should be completed with the signal upgrades/removals in the City of Sandusky to ensure the signal at Butler Street is properly accounted for when the rest of the identified signals/intersections along US 6 in Sandusky are upgraded.
- ▶ Alternatives D1 (or D2) and E – Because Alternative E includes widening of US 6 up to Camp Road, these alternatives can be implemented together so that the widening work can seamlessly tie into the Camp Road intersection improvements. This combination of improvements also lends itself to the incorporation of the recommended access management changes in this area.

In addition to the recommended roadway improvements described above, a series of independent active transportation enhancements are recommended to improve sidewalk connectivity to and along US 6, as well as to provide a multi-use path between Sandusky and Huron. These are shown in the table below along with planning level cost estimates. Additionally, accommodations for the transit stops in the study corridor should be considered, including the addition of bus shelters and bus pull-out stops.

Other Alternatives and Planning Level Cost Estimates

Description	Construction Costs (in 2024 dollars)	ROW/Utility Costs	Society Safety Benefit
Multi-use path along the north side of US 6 from E. Shoreway Drive to Rye Beach Road.	\$1,090,000	\$160,000	N/A
Modal connection along the north side of US 6 from Cedar Point Drive to E. Shoreway Drive in the City of Sandusky (bike path or sidewalk to be determined).	\$645,000	\$5,000	N/A
Complete select sidewalk connections along US 6 in the City of Sandusky.	\$365,000	\$80,000	N/A
Multimodal connection along the east side of Rye Beach Road in the City of Huron (bike path or sidewalk to be determined).	\$85,000	\$5,000	N/A



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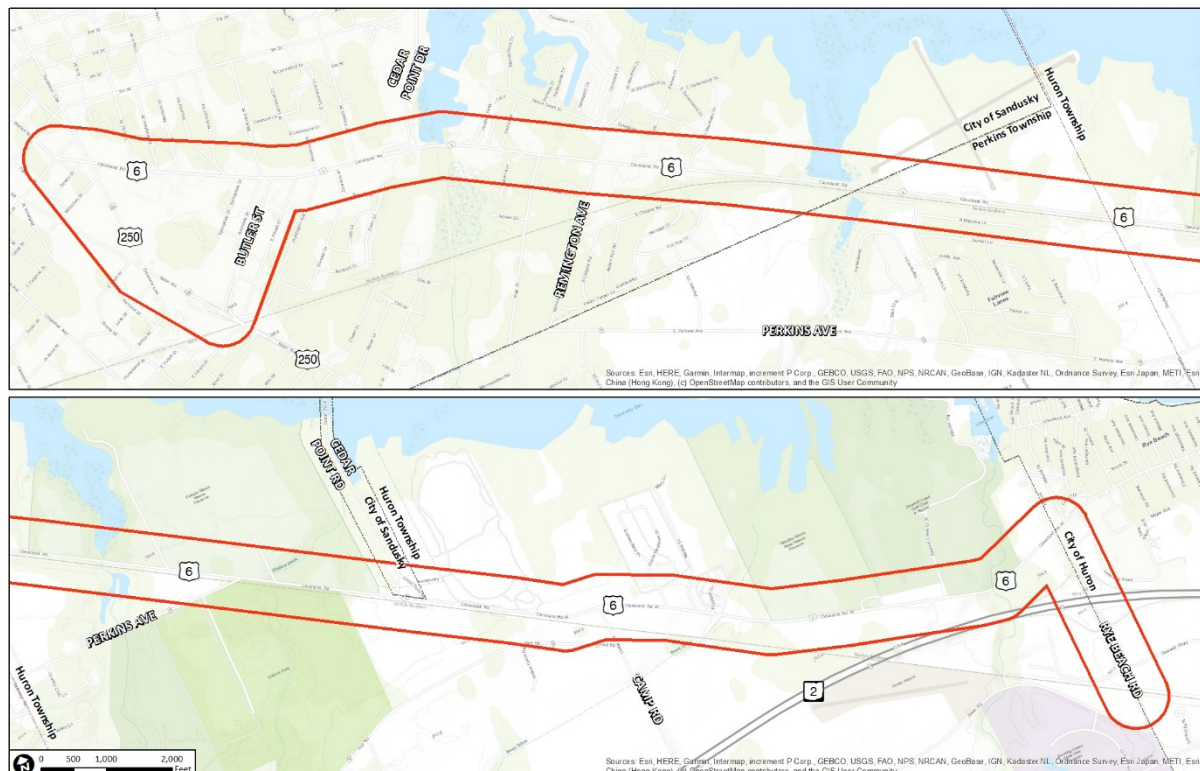
Appendix O – Proposed Alternatives

Project Background

TranSystems has been retained by the Erie Regional Planning Commission (ERPC) to analyze traffic operations, safety concerns, and multi-modal connectivity in the tourist-oriented area of Cleveland Road (US 6) near the lakefront and Cedar Point attractions (amusement park and Sports Force Parks) in the City of Sandusky, City of Huron, Perkins Township, and Huron Township in Erie County, Ohio. The study area map is shown in **Figure I**. The scope of work items for the ERI-US 6 Corridor Study (PID 105803) follows the Ohio Department of Transportation's (ODOT) Project Development Process (PDP). This feasibility study summarizes the data collection, technical studies and stakeholder/public involvement process undertaken, along with the identification of potential safety and multimodal mobility improvement recommendations.

As shown on **Figure I**, the study area consists of multiple road segments and jurisdictions (City of Sandusky, Perkins Township, City of Huron, and Huron Township). The approximate 6.3-mile primary road segment of Cleveland Road (US 6) extends from Sycamore Line (US 250) to Rye Beach Road, and along Rye Beach Road to just south of the Norfolk Southern (NS) Railway including the US 2 interchange and the Sawmill Parkway intersection. This study also includes Butler Street in the City of Sandusky from Milan Road (US 250) to Cleveland Road (US 6). Existing and future conditions were evaluated to determine the need for multi-modal transportation improvements along this corridor, including motorized vehicles (both personal and commercial), transit (bus), bicyclists and pedestrians. In addition to gathering site-specific data such as traffic counts and the location of environmental features, the technical studies performed built upon prior studies completed for new traffic generators such as Sports Force Parks at Cedar Point Sports Center, Phase 2 as well as active transportation enhancements for new and extended pathways.

Figure I: Study Area Map



Purpose and Need

The purpose of the project is to increase the efficiency of the transportation corridor, increase safety, and to improve multi-modal transportation options. The Cleveland Road corridor is a US Highway serving through traffic, a local arterial serving residential and commercial development, and is subject to significant seasonal traffic demand related to Cedar Point and Sports Force Parks at Cedar Point Sports Center. An added complication is a Norfolk Southern (NS) railroad line running immediately parallel to US 6 on the south side, which creates queuing problems along US 6 (vehicles waiting to turn south from US 6). This combined demand exceeds the capacity of the corridor at select locations and causes congestion and safety issues. Therefore, the identified needs forming the basis of this purpose and need statement are travel demand, congestion and safety.

Existing Studies

A number of previous transportation studies were made available for review from ERPC. These studies include but are not limited to the 2040 Long Range Transportation Plan, Cedar Fair/Sports Force Parks traffic studies, 2014 Bicycle and Pedestrian Plan, Huron and Perkins School Travel Plans (STP), Erie County Coordinated Transportation Plan, and Sandusky Bay Pathway. In particular, these studies were used to identify recommendations for active transportation connections that can be incorporated into the ERI-US 6 Corridor Study in conjunction with potential future roadway and infrastructure improvement projects. These plans and recommendations helped in creating a more comprehensive network of sidewalks, trails and other pathways. In addition to considering previous transportation planning studies, the ERI-US 6 Corridor Study has accounted for other planned and ongoing developments such as Cedar Fair Sports Park, Phase 2 Draft Traffic Impact Analysis and the Mucci Farms greenhouse development at the intersection of Rye Beach Road and Bogart Road.

Existing Conditions

Functional Classification and Posted Speed

A summary of the posted speeds and functional classifications of the existing roads encompassed within this project can be found in **Table 1**. Roadway functional classifications were determined using ODOT's Functional Classification Maps and ODOT TIMS as shown on **Figure 2**.

Figure 2: ODOT Functional Classification Map

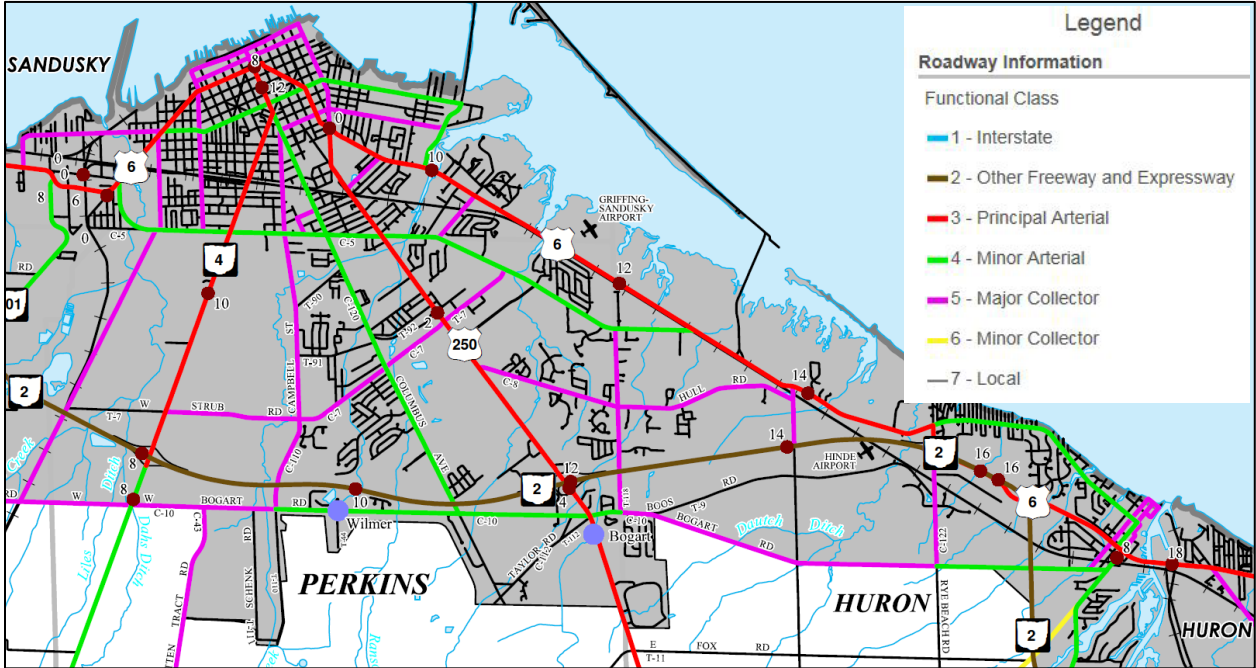
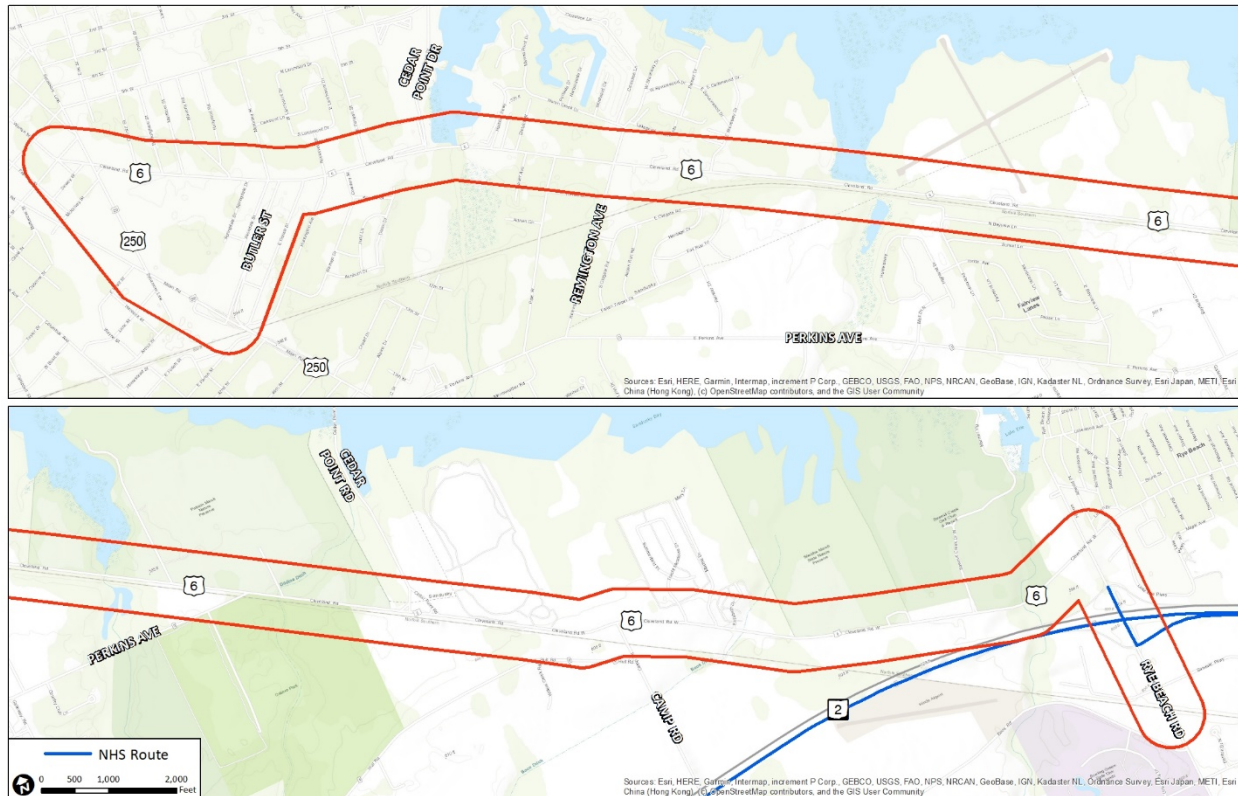


Table 1: Roadway Classifications

Roadway Classifications		
Road Name	Posted Speed (MPH)	Functional Classification
Cleveland Rd (US 6)	35 - 55	Urban Principal Arterial
Sycamore Line (US 250)	35	Urban Principal Arterial
Milan Rd (US 250)	35	Urban Principal Arterial
Rye Beach Road (from Cleveland Rd to SR 2 EB ramps)	35 - 50	Urban Principal Arterial
Rye Beach Road (from SR 2 EB ramps to Bogart Rd)	35 - 50	Urban Major Collector
Cedar Point Rd	35	Urban Local
Avondale / McKinley St	25	Urban Local
SR 2	70	Freeway / Expressway
Butler St	25	Major Collector
Cowdery St	25	Urban Local
Cedar Point Dr (Causeway)	35	Urban Minor Arterial
Harbour Pkwy	25	Urban Local
Remington Ave	25	Major Collector (s/o US 6); Urban Local (n/o US 6)
Pipe St	25	Urban Local
Perkins Ave	25	Urban Minor Arterial
Camp Rd	45	Urban Major Collector
Sawmill Pkwy	25	Urban Local

Part of the study corridor is also on the National Highway System (NHS). This occurs at the eastern end of the corridor along Rye Beach Road and at its interchange with SR 2, as shown in **Figure 3**.

Figure 3: National Highway System



Roadway

The existing roadway network consists of primarily Cleveland Road (US 6), Rye Beach Road, Sycamore Line/Milan Road/US 250, and Butler Street.

Cleveland Road (US 6)

The overall study length of Cleveland Road (US 6) is approximately 6.3 miles and runs east-west in the study area. US 6 is a two-lane roadway, curb and gutter section between Sycamore Line and Butler Street with a center turn lane or two-way left turn lane. Between Butler Street and Cedar Point Drive, US 6 is a four-lane undivided roadway with curb and gutter. Additionally, reversible lanes are present on US 6 within this segment between Butler Street and East Parish Street, with changeable lane uses on eastbound US 6 at the Cedar Point Drive intersection. From Cedar Point Drive to Pipe Street, US 6 narrows down to a three-lane undivided section with two westbound lanes and one eastbound lane. The curbed section ends just east of Harbour Parkway and becomes an open drainage section. From Pipe Street to Sawmill Creek Drive, US 6 is mainly a two-lane segment with 12-foot lanes and a variable-width shoulder (includes 2- to 4-foot (+/-) wide paved section) with open drainage. There are existing turn lanes on US 6 at Remington Avenue, Sports Force Parks driveway, and Cedar Point Road. Just east of Sawmill Creek Drive, US 6 transitions from a two-lane section to a five-lane roadway with a two-way left turn lane and curb

and gutter installation to the west leg of Rye Beach Road. Existing pavement markings are generally in fair to poor condition.

Existing sidewalk is present along Cleveland Road (US 6) within the project limits on the north side from Sycamore Line to Harbour Parkway. In addition, sidewalks exist on the south side from Sycamore Line to the business drive just west of Huntington Avenue. A gap section (without sidewalks) exists on the south side from Huntington Drive to the existing bridge at Castaway Bay. Existing sidewalk reemerges on the south side at the Castaway Bay bridge and continues east, terminating at Remington Avenue. The existing sidewalks are in good condition. It is important to note that a pedestrian bridge is located on the north side of Cleveland Road (US 6) at Castaway Bay just east of Cedar Point Drive. The pedestrian bridge is slightly offset and runs parallel to the existing structure carrying US 6 traffic. No sidewalks are present from east of Remington Avenue to Rye Beach Road along the US 6 study area.

On Cleveland Road (US 6), the posted speed limit is 35 miles per hour (MPH) between Sycamore Line and Sandusky Corporation Line. East of the Sandusky Corporation Line to Camp Road, the posted speed on US 6 is 55 MPH to Camp Road. Between Camp Road and Rye Beach Road the speed limit is 45 MPH.

Rye Beach Road

The overall study length of Rye Beach Road is approximately 0.5 mile. Rye Beach runs north and south on the eastern end of the study corridor. A diamond interchange is present at SR 2 and to the south is an at-grade Norfolk Southern (NS) railroad crossing that intersects with Rye Beach Road. US 6 runs concurrent with Rye Beach Road south of Cleveland Road to SR 2, and continues east on SR 2 beyond the study limits. The roadway is split between jurisdictions: the east side is in the City of Huron; the west side is in Huron Township, with the portion south of the SR 2 ramps falling in Erie County's jurisdiction. There appears to be fairly new pavement due to improvements from the railroad crossing and north to the interchange. This segment is a four-lane curb and gutter section with a center turn lane or two-way left turn lane. In the limits of the interchange, Rye Beach Road is a three-lane segment with wide shoulders to potentially accommodate future lane use. North of the SR 2 westbound ramps to US 6, Rye Beach Road is an uncurbed four-lane undivided roadway. Existing pavement markings are generally in fair condition.

Existing sidewalk is present along Rye Beach Road within the project limits on the east side from University Drive East (south of NS RR crossing) at the Bowling Green State University (BGSU) Firelands Campus entrance to the SR 2 eastbound ramp (south leg of the intersection). In the uncurbed section south of the NS tracks, the sidewalk is located approximately 27 feet from the edge of the traveled way. In the curb and gutter section, north of the NS tracks, the sidewalk is adjacent to a tree lawn strip that varies from 7 feet to 18 feet in width. The existing sidewalks in this segment are in fairly new to good condition. Sidewalk is not present from north of the SR 2 eastbound ramp intersection to Cleveland Road (US 6).

The speed limit on the City of Huron side of the road (the east side) is 35 MPH through the entire limit from US 6 to Bogart Road. The speed limit on the Huron Township side (west side) is 45 MPH from US 6 to BGSU Campus south of the NS railroad tracks and then increases to 50 MPH.

Butler Street

The overall study length of Butler Street is approximately 0.5 mile. Butler Street runs north and south within the City of Sandusky on the western end of the study corridor, tying into Lake Shore Avenue at the jug handle signalized intersection with Milan Road (US 250). It is primarily a three-lane roadway where the center lane can be reversed for northbound flow in the morning and southbound flow in the evening. This reversible lane configuration allows for two inbound lanes during park opening at Cedar Point and two outbound lanes later in the day as traffic exits the park. The roadway consists of concrete pavement

in a curb and gutter section. From field observation, the concrete pavement is in poor condition due to deterioration at the pavement joints. Also, there is a line of sight constraint at the north end under the US 250 overpass. The posted speed limit in this segment is 35 MPH. Existing pavement markings are generally in poor condition.

Existing sidewalk is present along Butler Street within the project limits on the east side from Williams Alley running north to Cleveland Road (US 6). The sidewalk is adjacent to a tree lawn strip varying from 0 feet to 2 feet in width. Also, there is a portion of existing sidewalk along the left side retaining wall of the US 250 exit ramp to Butler Road north. Sidewalk is missing from the end of the walk (adjacent to the retaining wall) to Williams Alley on the east side of Butler Street. The existing sidewalks are in fair condition.

Butler Street is unique due to the existing reversible lanes used to direct traffic in and out of Cedar Point. Overhead LED lane control signs and other traffic control devices are in place for the reverse flow operation. Butler Street was evaluated to determine the feasibility of eliminating the existing reversible lanes or potentially eliminating its connection with US 6 altogether. Current traffic patterns entering and exiting Cedar Point during peak hours were evaluated to determine the justification for reversible lanes. This study also considered rerouting of traffic off of Butler Street to test its closure and the associated traffic impact to the existing road network.

According to the ODOT Location & Design Manual (L&D), Volume 1, Section 402.4, Reversible Lanes guidelines: “a reversible lane is a lane on which the direction of traffic flow can be changed to utilize maximum roadway capacity during peak demand periods. Reverse-flow operation on undivided streets generally is justified where 65 percent or more of the traffic moves in one direction during peak periods, where the remaining lanes are adequate for the lighter flow period when there is continuity in the route and width of the street, where there is no median and where left turn and parking can be restricted. Reverse flow operations require special signing and additional control devices”.

Sycamore Line/Milan Road/US 250

The overall study length of Sycamore Line/Milan Road/US 250 is approximately 0.5 mile. Sycamore Line/Milan Road/US 250 runs north and south on western end of the study corridor. It is primarily a four-lane undivided roadway with turn lanes. The roadway consists of concrete pavement in a curbed section. From field observation, the concrete pavement is in poor condition due to deterioration at the pavement joints. US 250 runs along Milan Road and jogs north to Sycamore Line. The posted speed limit in this segment is 35 MPH. Existing pavement markings are generally in poor condition.

Existing sidewalk is present along Milan Road (US 250) within the project limits on the east and west sides from Sycamore Line to Butler Street near the jug handle. The sidewalk is adjacent to a tree lawn strip varying in width from 2 feet to 8 feet. The existing sidewalks are in fair condition, however, there are portions of fairly new sidewalk and curb ramps at the intersection of Sycamore Line and Milan Road (US 250).

Sidewalk exists along Sycamore Line (US 250) within the project limits on the east side and the west side from Cleveland Road (US 6) and runs south to Milan Road (US 250). There are no tree lawn strips in the section except at the southeast corner of US 6. The existing sidewalks are in poor condition, however, there are portions of fairly new sidewalk and curb ramps at the intersection of Sycamore Line (US 250) and Cleveland Road (US 6).

Existing Signal Timings and Coordination

Existing signal timings were provided by the City of Sandusky and City of Huron for current year analyses. The timings were evaluated in the study for operational improvements by means of signal optimization of cycle lengths and phasing adjustments. Eight (8) signalized intersections are present along Cleveland Road (US 6) and two (2) along US 250/Milan Road/Sycamore Line. Most of the signals along US 6 in the western end are set up on a 2-phase and 4-phase operation. US 6 at Avondale Street, Butler Street, Cowdery Street and Cedar Point Drive are part of a closed loop system according to the signal timing reports. Based on information provided by the City of Sandusky, the only coordinated signals within the City of Sandusky are along Cedar Point Drive/Cleveland Road (US 6)/Butler Street and the signal on Milan Road (US 250) where Butler Street ties into Milan Road. This system starts at Cedar Point Drive and 1st Street to the north of the study area and ends at the Milan Road/Butler Street intersection. This coordination also includes the overhead lane control on Butler Street for the reversible lane use. During a field visit conducted in July 16, 2018, radio antennae and spread spectrum devices were visible on top of the signal poles at the intersection of Cleveland Road (US 6) and Cowdery Street. The City of Sandusky did not indicate that this intersection was currently coordinated.

Three (3) signalized intersections exist along Rye Beach at US 6, SR 2 westbound ramps, and SR 2 eastbound ramps. These traffic signals are owned by the City of Huron and maintained by Signal Services. All three traffic signals are coordinated and connected via hard wire interconnect to the master controller located at the US 6/Rye Beach Road intersection. The northbound and southbound movements on Rye Beach are currently set to recall for the mainline. Also, vehicular detection utilizes video cameras and all controllers at the three intersections are Econolite Model ASC/2S-2100, cabinet Type TSI based on timing reports.

The existing signal timings have been used to establish a baseline for current year (2018) operations at the signalized intersections. As part of the alternatives (mitigation) phase of this study, refinements to timing and phasing were evaluated to address identified operational inefficiencies.

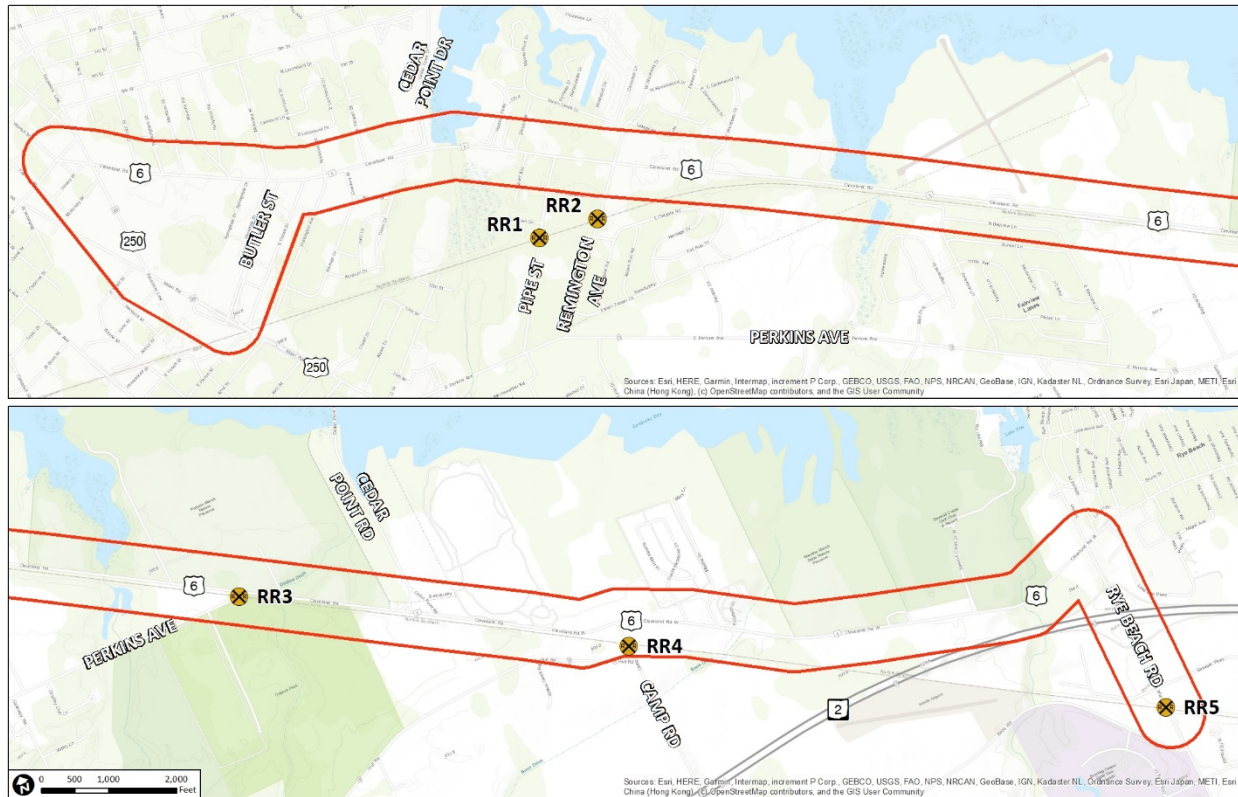
Railroad

Norfolk Southern (NS) Railway Company primarily runs parallel to US 6 along the corridor. More specifically, NS alignment runs parallel near the Sandusky Corporation Line to Camp Road, approximately 50 feet from the edge of US 6 travel way. From just east of Camp Road, US 6 deviates away from the NS tracks approximately 350 feet and beyond from the edge of the US 6 travel way.

According to ODOT Transportation Information Mapping Systems (TIMS) web-mapping tools, five (5) at-grade railroad crossings are in the vicinity of the project that were considered for evaluation since they are in direct impact or influence to the intersections under study. Refer to **Figure 4** for the NS railroad alignment and crossings around the study area. The five at-grade crossings in the vicinity are:

- ▶ RR1 – Pipe Street (U.S. DOT Grade Crossing ID No. 524064K)
- ▶ RR2 – Remington Avenue (U.S. DOT Grade Crossing ID No. 524063D)
- ▶ RR3 – US 6 & Perkins Avenue (U.S. DOT Grade Crossing ID No. 524062W)
- ▶ RR4 – US 6 & Camp Road (U.S. DOT Grade Crossing ID No. 524061P)
- ▶ RR5 – Rye Beach Road (U.S. DOT Grade Crossing ID No. 524059N)
 - One (1) fatality on 11/23/2015 per Railroad Accident/Incident No. 118331

Figure 4: NS Railroad Alignment



Culvert Inventory

Based on ODOT TIMS information, there are approximately twelve (12) existing culverts within the study area ranging in size. A press release announced by ODOT on Friday, July 13, 2018, stated that ODOT plans to replace a deficient culvert (ERI-US6-13.19) along US 6 between Perkins Avenue and Cedar Point Road near Sandusky, Ohio. Construction of this project was completed in Spring 2019. Refer to [Appendix A](#) for details showing the culvert locations obtained from the TIMS mapping portal.

Bridges

The following structure information was obtained from ODOT TIMS for the study area. These structures may include large culverts as well as short and long span bridges. The following structure numbers or identifications are:

- ▶ SFN 2201666 (on US 6 just east of Cedar Point Drive)
- ▶ SFN 2203189 and 2203248 (on Milan Road/US 250 at Butler Street)
- ▶ SFN 2201674 (on US 6 just west of Perkins Road)
- ▶ SFN 2201739 (on US 6 just east of Sawmill Creek Drive)
- ▶ SFN 2201836 (on Rye Beach Road at SR 2)

Refer to [Appendix A](#) for details.

Existing Sign Inventory

A field review was conducted on July 16, 2018 to inventory existing traffic control signage along the study area. A schematic was developed based on these field observations to depict all relevant existing ground mounted and overhead signs. See [Appendix B](#) for sign illustrations along the study corridor.

Preliminary Geotechnical

Soils located throughout the study area have been found to be composed of loam, fine sand, loamy fine sand and clay loam. The loam and clay loam soils can be found predominately in the western portion of the study area near the urbanized area. Soils with sand and fine sand can be found in the eastern portion of the study area within the undeveloped and marsh areas.

Utility Coordination

Utility coordination and correspondence was initiated in early August 2018 by contacting the Ohio Utilities Protection Service (OUPS) to request utility information for the study area. A series of OUPS ticket requests were processed and preliminary information obtained as a result.

Existing utility ownership within the study area consists of Buckeye Broadband, Centurylink, Columbia Gas (NiSource), Erie County Department of Environmental Services, ODOT (Lighting), City of Sandusky (Water, Sanitary and Storm), Ohio Edison (First Energy), and Windstream (Fiber Optic). Although utilities are present, it does not necessarily indicate that the utilities will be disturbed nor have conflicts with potential improvement projects.

An OUPS Ticket was requested to identify existing utilities for both above and below ground facilities. Generally, the locations are requested along the roadway within the study area encompassing areas of fifty (50) feet on both sides of the roadway measured from the edge of pavement. It may also include an entire intersection to extents up to a certain distance from an intersection. For example, 450 feet south of Rye Beach Road and Sawmill Parkway. The following list contains the OUPS ticket number and general vicinity of the area of concern:

- ▶ A821803011-00A - Rye Beach Road from Cleveland Road to Sawmill Parkway and RR
- ▶ B821801372-00B - Cleveland Road from Rye Beach Road to Tracht Meadows Drive
- ▶ B821801399-00B - Cleveland Road from Tracht Meadows Drive to Camp Road and Camp Road
- ▶ B821801409-00B - Cleveland Road from Camp Road to Perkins Avenue and along Perkins Avenue just 600 feet from the intersection of Cleveland Road
- ▶ B821801451-00B - Cleveland Road from Perkins Avenue to Remington Avenue
- ▶ B821801496-00B - Cleveland Road from Remington Avenue to Butler Street
- ▶ B821801519-00B - Cleveland Road from Butler Street to Sycamore Line
- ▶ B821801541-00B - Sycamore Line from Cleveland Road to Milan Road
- ▶ B821801584-00B - Milan Road from Sycamore Line to 42nd Street

Refer to [Appendix C](#) for a detailed utility summary of the existing utilities, location and ownership within the project study area. This existing utility information was used to determine impacts and potential constraints and cost implications in various areas of the alternatives during the development of recommendations for the feasibility study.

Cedar Point Considerations

Way-finding to Cedar Point Park

Based on input from the public, stakeholders, and Cedar Point, this study acknowledges the dynamic nature of trip-making that occurs as a result of the heavy reliance motorists have on GPS devices and cellphone navigational applications. As travel routes are based on shortest distance, no longer does US-250 carry the vast majority of traffic to the Park - it is coming in from all directions. These directions include using residential streets and a known concern of using the Cedar Point Chaussee (Intersection #16 – Cleveland Road (US 6) & Cedar Point Road (Inbound)). As noted in an email from the Police Chief/Director of Security Operations at Cedar Point Amusement Park/Resort, drivers are being directed to Cedar Point Road (Chaussee) instead of the Cedar Point Drive which is the intended main roadway leading into the Park. ODOT District 3 is aware of the issue, particularly in Perkins Township and has been looking at ways to alleviate the concern. In 2016, additional signage was installed and Perkins Township contacted Garmin and Google to have them adjust their routes to avoid using these local residential streets. Unfortunately, as the companies release their mapping updates, the routes are reset. Portable changeable message boards (PCMS) have been implemented during the busier weekends although it is not feasible to have them out there all summer long. A noticeable shift in travel patterns was detected in the traffic data showing that more traffic is using SR 2 rather than US 250 as a means of ingress and egress to the Park. In addition, current signing along US 6 for Cedar Point have two ‘↑ Cedar Point’ for westbound traffic approaching Cedar Point Road. It was suggested that the sign farthest east could be relocated to the grass median/island at Cedar Point Road for better advanced notice to drivers to proceed on to US 6 versus making a right turn at Cedar Point Road (Chaussee). ODOT has also suggested that the park look into scanning capabilities/devices such as EZ-Pass for quicker entrance and to reduce delay/queues into the park.

Parking Considerations and Needs Analysis

It should be noted that congestion along US 6 could partially be the result of excessive queuing as Cedar Point customers are concentrated into a single parking location adjacent the Park entrance. During peak park patronage, queuing from cars waiting to pay for parking, or even the lack of ample parking, can result in congestion both entering the Causeway and on nearby approach roadways. Consideration should be given to look at opportunities to use either existing, underutilized parking lots in the region or to create new, off-site parking areas near freeway interchanges and by providing transportation to the Park via bus or other modes of mass transit as a way to reduce automobile or “single point” congestion near the park entrance. Priority signal control could be implemented for transit vehicles to improve speed and efficiency when transporting patrons from remote parking areas to Cedar Point. As an example, there is a large supply of parking at the Firelands branch of Bowling Green University near the SR 2/Rye Beach Road interchange that could be expanded for this purpose on busy weekends when the campus is not as busy. A regional parking strategy is not part of this Study and a separate parking needs assessment could be considered in cooperation with Cedar Point.

Alternate Modes of Transportation

As the ERI-US 6 Corridor Study is a multi-modal study incorporating motorized and non-motorized modes, in addition to passenger and commercial vehicle traffic, a number of other means of existing travel modes are present through the study corridor. Sidewalks and multi-use/shared use paths exist throughout

the corridor, and a bus system operates in the City of Sandusky and Perkins Township. These alternative means of travel are further discussed in the following sections.

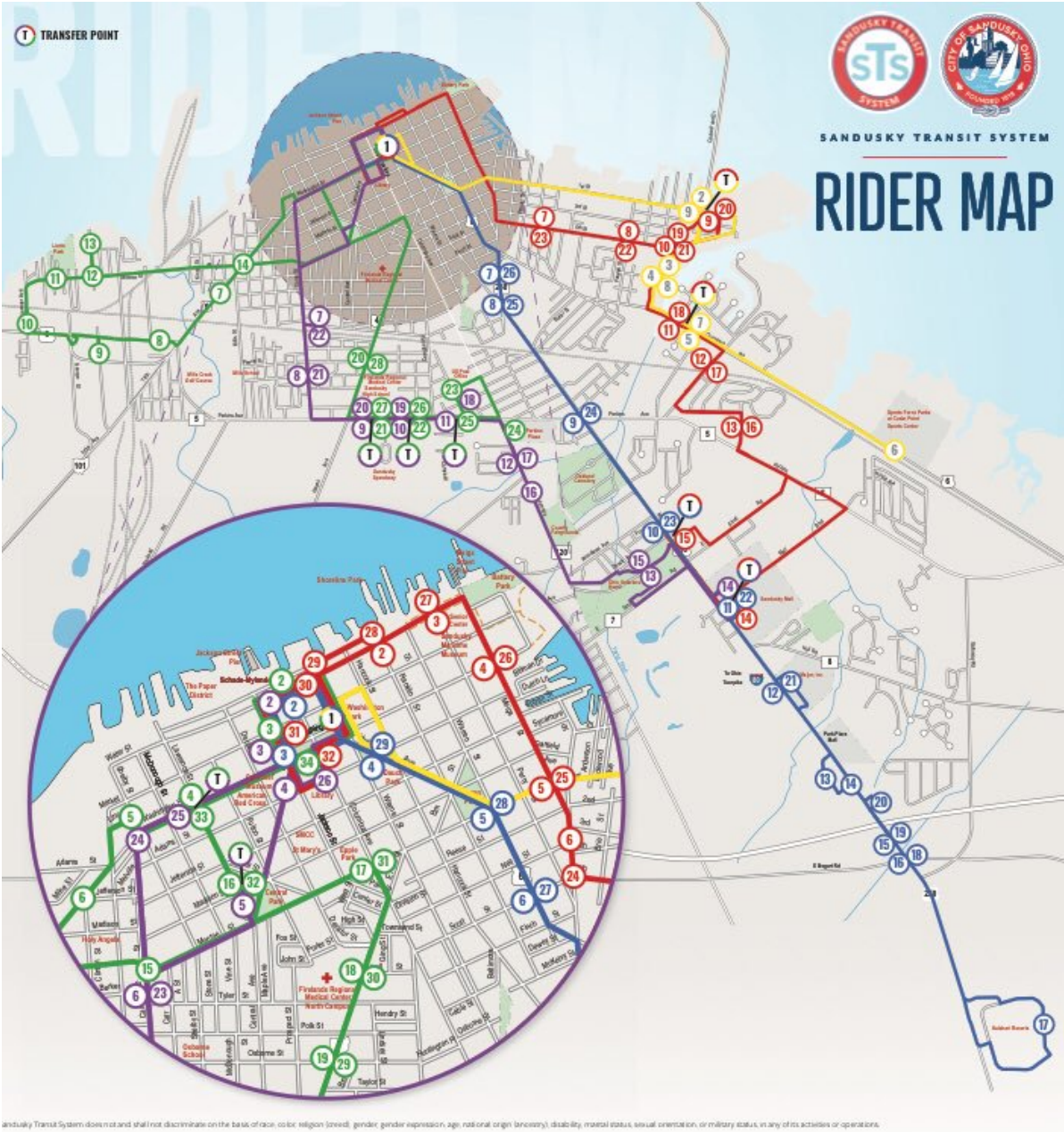
Multi-modal Opportunities

This study evaluated current and existing sidewalks and multi-use/shared use paths for connectivity based on public involvement and stakeholder feedback, previous studies, and direction from ERPC and ODOT. Other studies considered include but are not limited to the “Sandusky Bay Pathway” and ERPC’s “2014 Bicycle and Pedestrian Plan Update”, “Sidewalk Inventory Project (Revised: November 2013)”, and the 2040 Long Term Transportation Plan (July 2015). The City of Sandusky is currently working on a project that would add a multi-use path connecting Cedar Point Drive to Heron Creek Drive and continuing southeast to US 6. There is the potential to carry this multi-modal connection throughout the study corridor, along US 6 between the Cities of Sandusky and Huron. As an alternative to providing this connection adjacent to US 6, a northerly alignment traversing along the lakefront has been mentioned and would ultimately be a decision to be made by the local jurisdictions. Based on social media feedback received by the City of Sandusky, there is a desire by the public for the City to provide pedestrian connectivity along US 6 from Remington Avenue east to the Sports Force complex. This feasibility study reflects recommended connections to existing, planned or proposed sidewalks and multi-use paths to improve multimodal connections both to/from and along the US 6 and Rye Beach Road corridors.

Transit and Bus Routes

The transit service in the City of Sandusky area is known as the Sandusky Transit System (STS). The Sandusky-Perkins Area Ride Connection (SPARC) program is also in the area and operates some of the transit routes with STS. According to STS route information (shown in the transit map in **Figure 5**), the Red Line travels along Cedar Point Drive, US 6, and Remington Road in the study area. The Yellow Line also travels through the study area along Cedar Point Drive and US 6, providing service to the Sports Force complex. The Blue Line services the area along Milan Road/Sycamore Line (US 250). STS routes are not impacted by any of the proposed alternatives developed for this study; the preferred alternatives, and subsequent maintenance of traffic (MOT) plans during future construction phases, should account for the routes along US 6.

Figure 5: STS transit route and stops



Data Collection

Traffic Counts

As part of the data collection activities for this study, peak hour intersection turning movement and 24-hour link counts were performed at key locations within the study area. The traffic counting program gathered weekday and weekend data including special event/tournament activities at Sports Force Parks starting in late May 2018 (after Memorial Day). Initial counts were collected through June followed by supplemental counts undertaken in August, which allowed for traffic volume comparisons to account for

seasonal fluctuations throughout the summer tourist season. The intersection turning movement counts (TMC) were taken from 9:00 AM – 12:00 PM and 2:00 – 6:00 PM at the following study area intersections:

Signalized

- ▶ 1 – Cleveland Road (US 6) & Sycamore Line
- ▶ 2 – Cleveland Road (US 6) & Avondale Street/McKinley Street
- ▶ 3 – Cleveland Road (US 6) & Butler Street
- ▶ 4 – Milan Road (US 250) & Butler Street
- ▶ 5 – Cleveland Road (US 6) & Cowdery Street
- ▶ 6 – Cleveland Road (US 6) & Cedar Point Drive
- ▶ 7 – Cleveland Road (US 6) & Harbour Parkway
- ▶ 8 – Cleveland Road (US 6) & Remington Avenue
- ▶ 9 – Cleveland Road (US 6) & Rye Beach Road
- ▶ 10 – Rye Beach Road & SR 2 VWB Ramps
- ▶ 11 – Rye Beach Road & SR 2 EB Ramps
- ▶ 12 – Sycamore Line (US 250) & Milan Road

Unsignalized (Stop-Controlled)

- ▶ 13 – Cleveland Road (US 6) & Pipe Street
- ▶ 14 – Rye Beach Road & Sawmill Parkway
- ▶ 15 – Cleveland Road (US 6) & Perkins Avenue
- ▶ 16 – Cleveland Road (US 6) & Cedar Point Road
- ▶ 17 – Cleveland Road (US 6) & Camp Road

For general locations of the overall study intersections see **Figure 6**. For a closer view of the signalized and unsignalized two-way stop-controlled (TWSC) study intersections see **Figure 7** for the west half and see **Figure 8** for the east half of the study area. Refer to [Appendix D](#) for detailed TMC information and output reports.

Figure 6: Overall Study Intersections

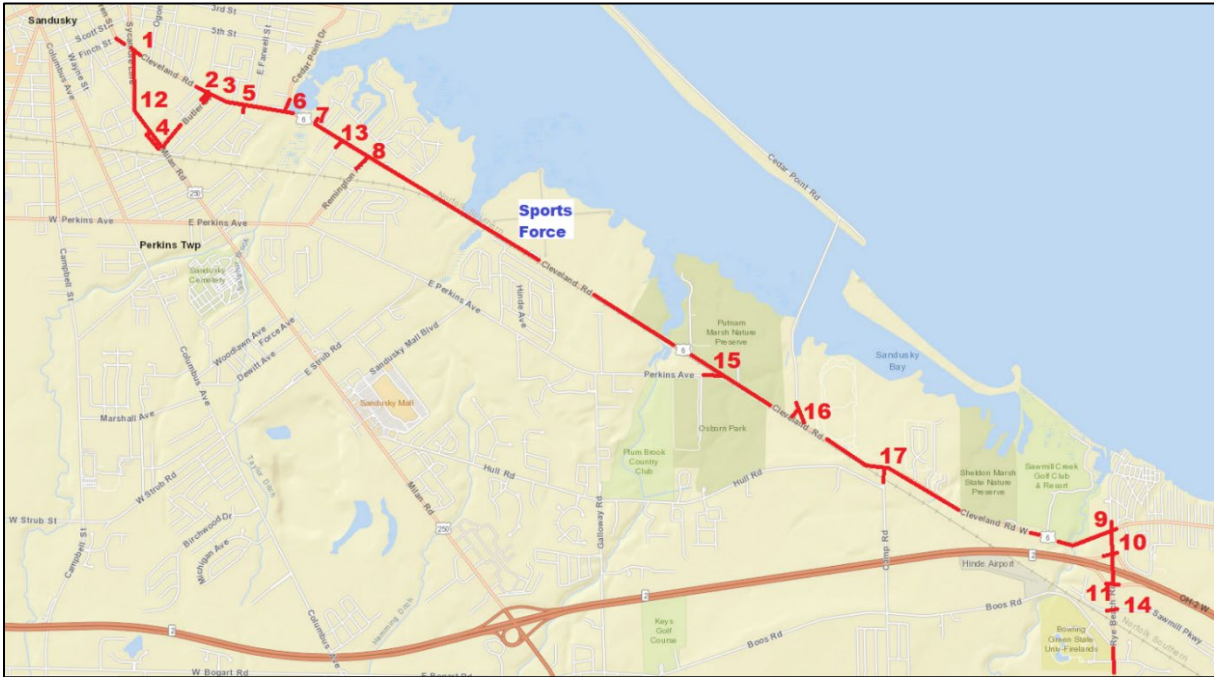


Figure 7: Study Intersections (West Half)



Figure 8: Study Intersections (East Half)



The 24-hour link counts were performed at five (5) locations along US 6 to obtain vehicle classification, volume and speed data. The link counts were set up on a typical weekday (Thursday 5/31/2018, Tuesday 6/5/2018, and Thursday 6/7/2018) and supplemented with weekend counts taken on three different weekends (beginning Saturday 6/2/2018, Saturday 6/9/2018, and Saturday 6/16/2018). The locations of the link counts are as illustrated on **Figure 9**. The link counts were performed along Cleveland Road (US 6) at:

- ▶ Link 1 - US 6 EB/WB Between Farwell Street and Cedar Point Drive
- ▶ Link 2 - US 6 EB/WB Between Shoreway Drive and Sports Force Parks
- ▶ Link 3 - US 6 EB/WB Between Sports Force Parks and Perkins Avenue
- ▶ Link 4 - US 6 EB/WB Between Cedar Point Road and Camp Road
- ▶ Link 5 - US 6 EB/WB Between Sawmill Creek Drive and Rye Beach Road

Refer to [Appendix E](#) for detailed link count information and output reports.

Figure 9: Link Count (24-hr) Locations



Although counts were performed on weekdays and weekends, it was concluded that the emphasis of the study's technical analysis would be on weekday operations. Based on a review of the turning movement and link count summary, weekday traffic levels were found to be similar to the first two weekend counts (June 2nd and June 9th). In an effort to examine the influences of both tourist-oriented traffic and regularly recurring local commuter traffic, it was determined that the study's focus on traffic operations would be centered on weekday AM and PM peak periods where both types of trip-making overlap as opposed to weekend traffic which does not exhibit the same peaking trends and time periods observed throughout the weekdays.

Speed Data

Speed data was obtained from the 24-hour link counts on Cleveland Road (US 6) within the study area and output reports indicated that the 85th percentile speed was consistent with the posted speed limits within a 5 mph variance. A slight increase in speed was detected as vehicles travel in and out of the Sandusky Corporation limit at the western edge of the Sports Force Parks complex.

Traffic Volume Development

Based on the 2018 traffic counts, weekday AM and PM peak hours were identified for the study corridor. In addition, the existing traffic counts were used to determine truck percentages at each of the intersections identified for in-depth evaluation. The following sections describe the process of developing

future traffic projections for the opening and design years of 2023 and 2043, respectively. This process resulted in the planning-level traffic volumes used in the No Build capacity analyses.

System Peak Hours

Two (2) separate weekday peak hours (AM and PM) were identified along the project study corridor:

- ▶ AM Peak Hour: 9:45 am - 10:45 am
- ▶ PM Peak Hour: 4:30 pm - 5:30 pm

Weekday peak periods were determined by adding volumes from each intersection to determine the overall corridor peak times. The peak clock hours were based on the highest four consecutive 15-minute interval traffic volumes for all study intersections combined. The AM peak hour is later than the traditional AM commuter peak due to the heavy influence of incoming Cedar Point traffic around the 10:00 AM park opening time, whereas the PM peak represents the typical late afternoon or early evening peak period as exiting Cedar Point traffic is less concentrated throughout the evening hours.

Truck Percentage

The peak hour truck percentages were taken from the intersection counts. **Table 2** summarizes the peak hour truck percentages for the study intersections. Intersections 1 through 12 are signalized while locations 13 through 17 are unsignalized. The truck percentages are reflected in the intersection capacity analyses.

Table 2: Peak Hour Truck Percentage

Intersection Name	Truck Percentages		
	INT #	Peak Hr	Truck %
US 6 @ Sycamore Line	1	9:45 AM	4
		4:30 PM	2
US 6 @ Avondale/McKinley	2	9:45 AM	4
		4:30 PM	2
US 6 @ Butler St	3	9:45 AM	5
		4:30 PM	2
US 250 (Milan Rd) Butler St	4	9:45 AM	6
		4:30 PM	2
US 6 @ Cowdery St	5	9:45 AM	5
		4:30 PM	2
US 6 @ Cedar Point Dr	6	9:45 AM	7
		4:30 PM	2
US 6 @ Harbour Pkwy	7	9:45 AM	6
		4:30 PM	2
US 6 @ Remington Ave	8	9:45 AM	5
		4:30 PM	2
US 6 @ Rye Beach Rd	9	9:45 AM	4
		4:30 PM	2
Rye Beach Rd @ SR 2 WB Ramps	10	9:45 AM	5
		4:30 PM	2
Rye Beach Rd @ SR 2 EB Ramps	11	9:45 AM	9
		4:30 PM	4
US 250 (Milan Rd) Sycamore Line	12	9:45 AM	3
		4:30 PM	2
US 6 @ Pipe St	13	9:45 AM	3
		4:30 PM	2
Rye Beach Rd @ Sawmill Pkwy	14	9:45 AM	12
		4:30 PM	7
US 6 @ Perkins Ave	15	9:45 AM	3
		4:30 PM	2
US 6 @ Cedar Point Rd (In)	16	9:45 AM	3
		4:30 PM	2
US 6 @ Camp Rd	17	9:45 AM	3
		4:30 PM	2

Background Growth

An annual linear growth rate of 0.5 percent was provided by ERPC. This rate was applied to the 2018 traffic counts to project the 2023 opening year and 2043 design year background traffic volumes.

Seasonal Adjustment Factor

In an effort to capture the higher summer season traffic along US 6 (while these seasonal destinations are in highest demand), the initial traffic counting program for the US 6 Corridor Study did not commence until after the Memorial Day holiday (May 28, 2018). Traffic counts were collected in late May and June with supplemental spots counts performed in August 2018 for comparative purposes. In addition, ODOT provided Streetlight Data from 2017, which was also used in this peak season data evaluation process.

Cedar Point has a substantial influence on the overall traffic levels, particularly around the park's 10:00 AM opening time. Through the gathering of supplemental data during the month of August when Cedar Point has operating hours extending into the late evening, a heavier concentration of traffic was observed during the morning peak period, presumably reflecting park patrons taking advantage of the park not closing until 11:00 PM on weekdays versus the 8:00 PM and 10:00 PM closing time earlier in the summer. However, because the amusement park is open later into the evening, the departing traffic demand is spread out over an extended period of hours rather than being concentrated into a one- or two-hour window as noticed around park opening. Using the May/June traffic data as a baseline, after considering the higher volume of AM peak hour traffic recorded in August it was determined that a 20% seasonal adjustment factor should be applied to the initial AM peak hour counts throughout the entirety of the study area. A comparison of the PM traffic count data concluded that the overall traffic demand was very similar throughout the summer so seasonal factoring of the PM peak hour traffic volumes was not recommended.

Existing 2018 Traffic Conditions

The 2018 turning movement counts have been designated as the existing year volumes for the technical analyses in this report. These volumes were extracted from the existing year turning movements and a 20% seasonal adjustment factor applied only to the AM peak hour to create a base condition for adding background traffic growth as well as new site-related trips. The existing year 2018 turning movement volumes and base condition are shown in **Figure 10**, **Figure 11**, and **Figure 12**. The traffic volumes at the study intersections are presented in these figures using a series of three schematic drawings that move from the west to the east along US 6 to Rye Beach Road. (Note that all AM peak hour volumes in these figures contain the 20% seasonal adjustment factor.)

Figure 10: 2018 AM / PM Peak Hour Traffic Volume (Sheet 1 of 3)

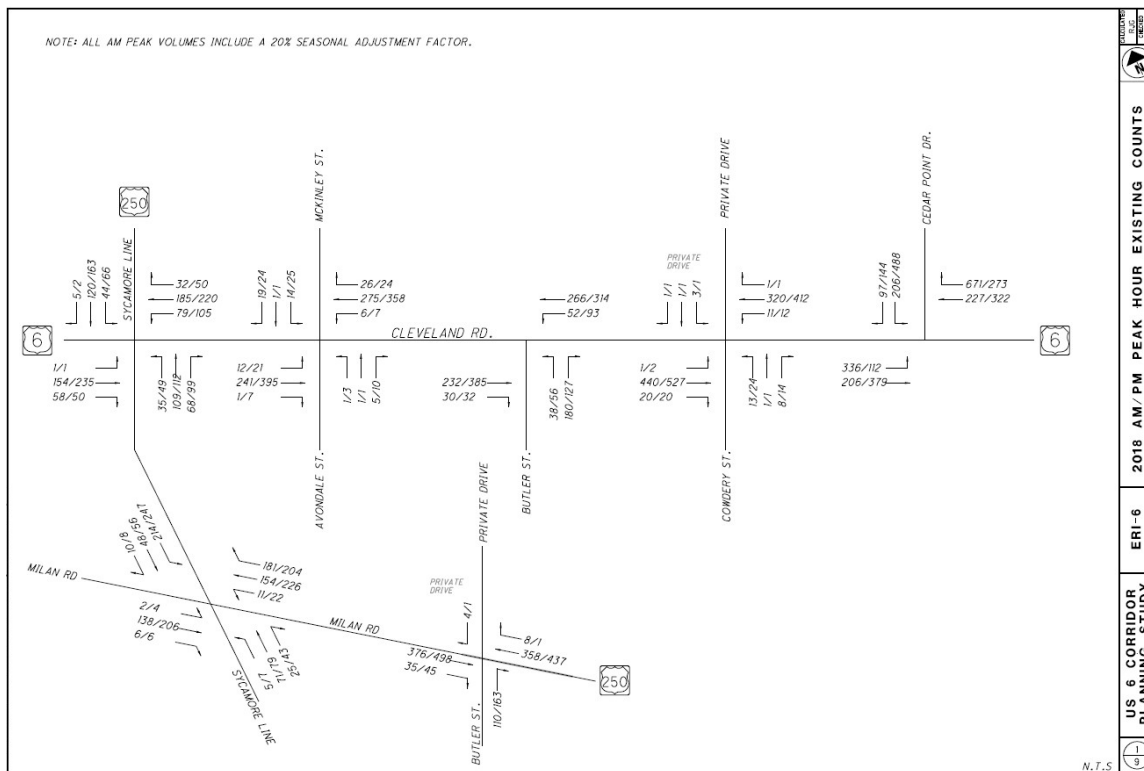


Figure 11: 2018 AM / PM Peak Hour Traffic Volume (Sheet 2 of 3)

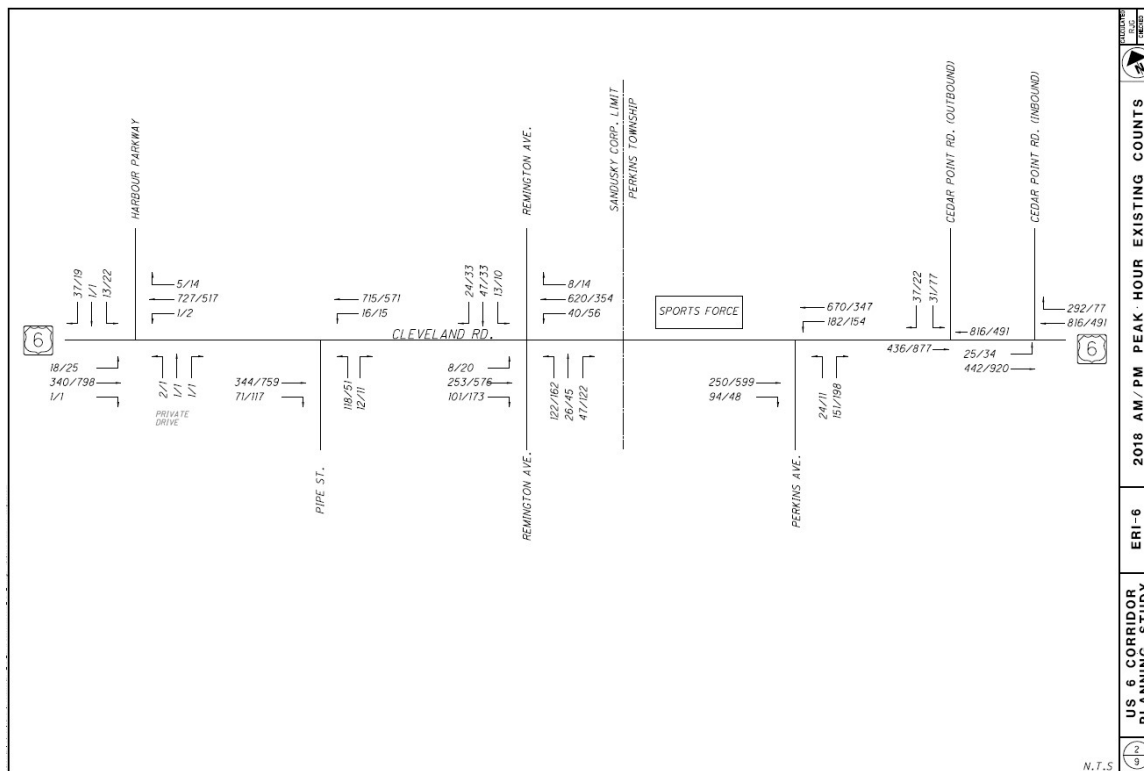
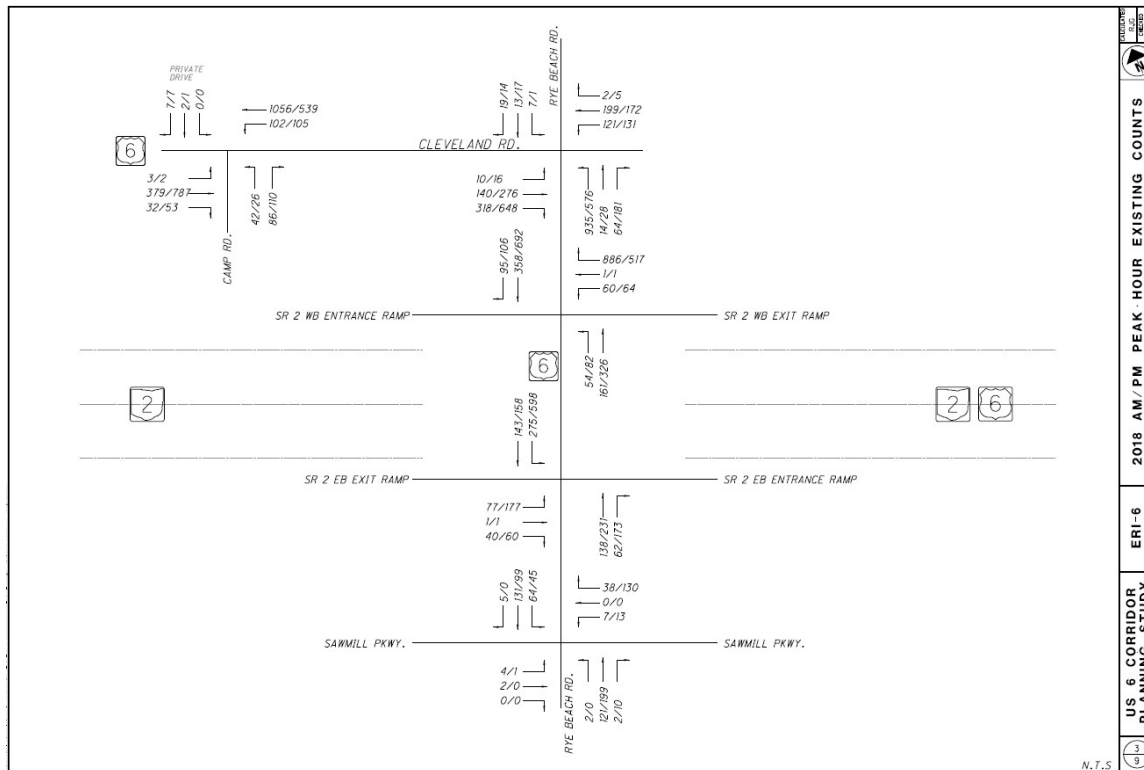


Figure 12: 2018 AM / PM Peak Hour Traffic Volume (Sheet 3 of 3)



Opening Year 2023 and Design Year 2043 No Build Conditions

The annual linear growth rate of 0.5% was applied to the base condition (2018 AM and PM peak hour traffic volumes) and projected out five (5) years to develop Opening Year 2023 No Build Conditions and twenty-five (25) years from existing base condition to develop the Design Year 2043 No Build Conditions.

Site Generated Traffic Volumes

The vehicle trips generated from site developments around the study area have been considered. These developments are the Sports Force Phase 2 and Mucci Farms sites. At the time of preparing the planning level traffic projections, ERPC provided a draft version of the study for the Cedar Point Sports Park Phase 2 Traffic Impact Analysis (TIA) dated April 2018. See [Appendix F](#) for conceptual site plan. The TIA provided site traffic information that was extracted for inclusion in the future PM peak traffic forecasts. The trips assumed for analysis entering and exiting Sports Force were approximately 225 to 275 vehicles. On weekdays, the site will only generate traffic during the PM peak period.

Traffic associated with the new Mucci Farms development located south of the study area at the intersection of Rye Beach Road and Bogart Road was found to be negligible during the AM and PM peak hours and therefore was not added to the existing traffic counts. The Sports Force Parks Phase 2 traffic volumes were added onto the background traffic volumes and carried through the study corridor for the 2023 and 2043 No Build PM peak hour conditions.

Figure 13, Figure 14, and Figure 15 show the planning level traffic for opening year (2023) and **Figure 16, Figure 17, and Figure 18** show the planning level traffic for design year (2043) No Build traffic

volumes at these locations for the AM and PM hours. (Note that all AM peak hour volumes in these figures contain the 20% seasonal adjustment factor.) See [Appendix G](#) for the planning level traffic volumes.

Figure 13: 2023 AM / PM Peak Hour Traffic Volume (Sheet 1 of 3)

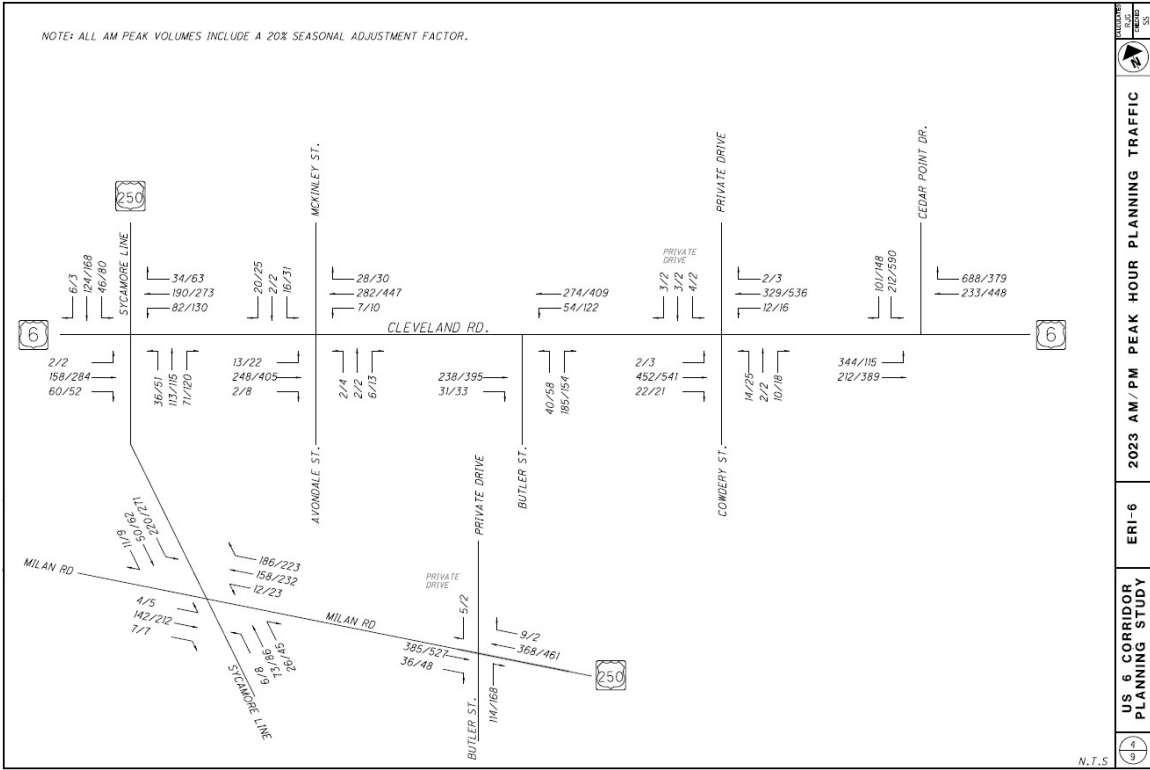


Figure 14: 2023 AM / PM Peak Hour Traffic Volume (Sheet 2 of 3)

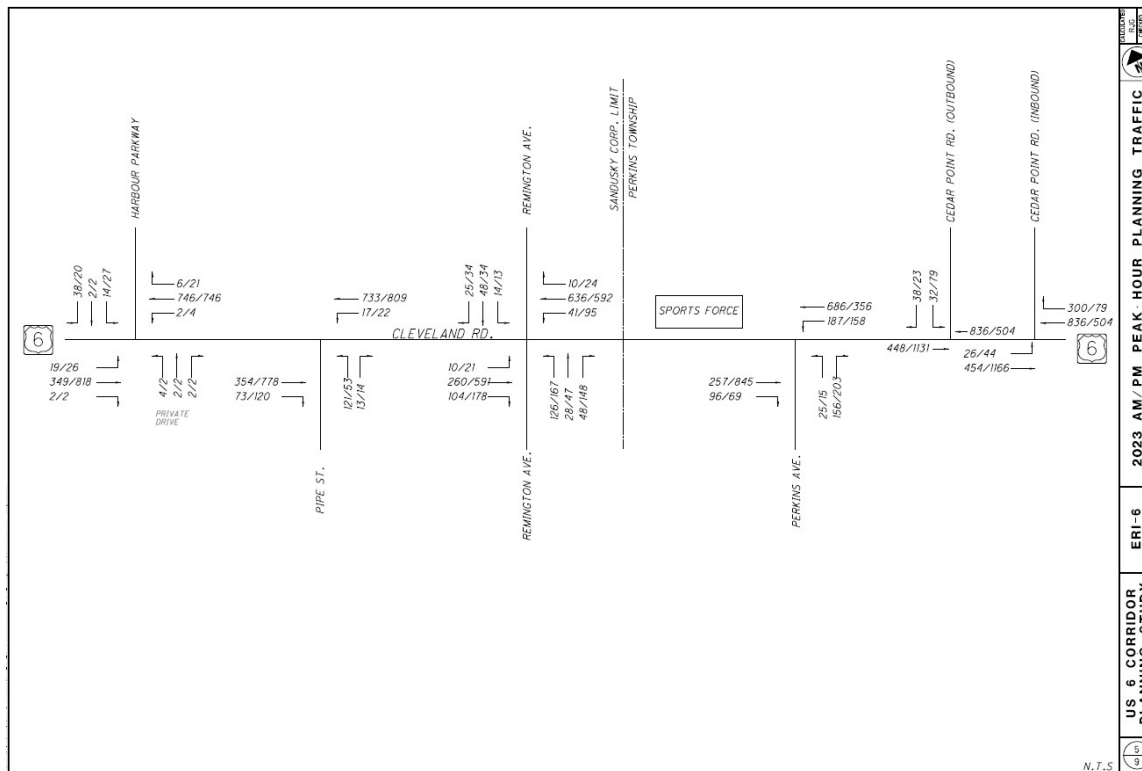


Figure 15: 2023 AM / PM Peak Hour Traffic Volume (Sheet 3 of 3)

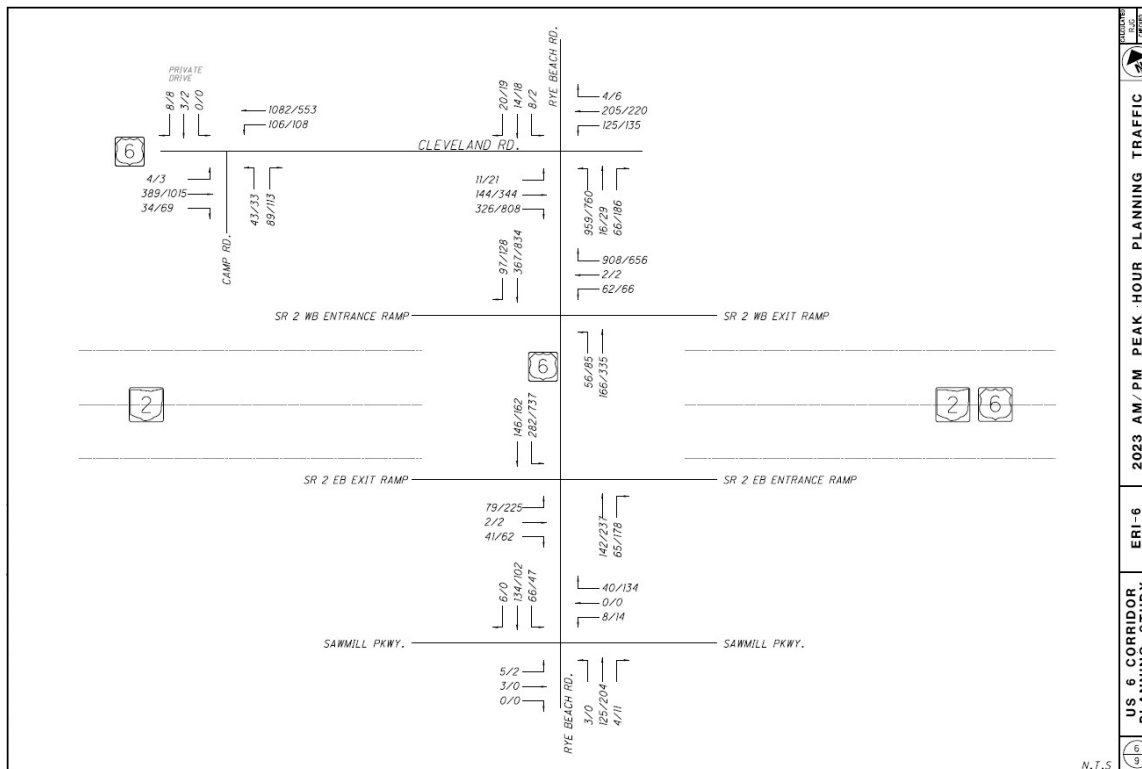


Figure 16: 2043 AM / PM Peak Hour Traffic Volume (Sheet 1 of 3)

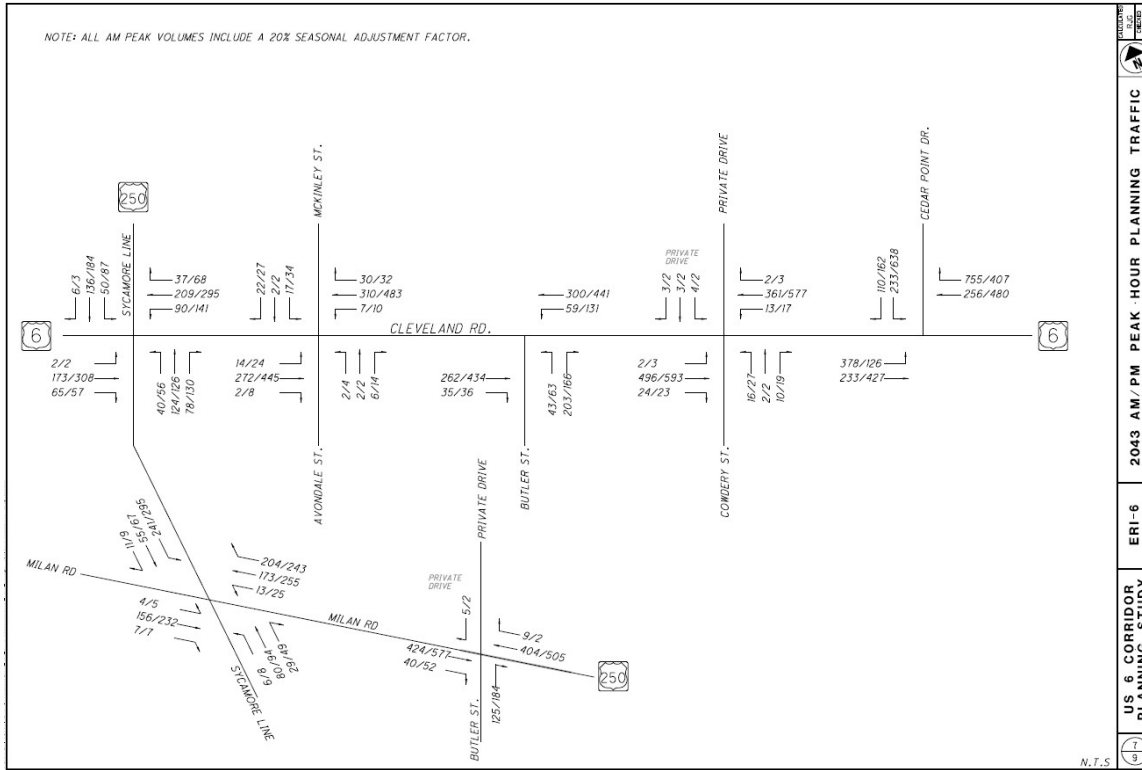


Figure 17: 2043 AM / PM Peak Hour Traffic Volume (Sheet 2 of 3)

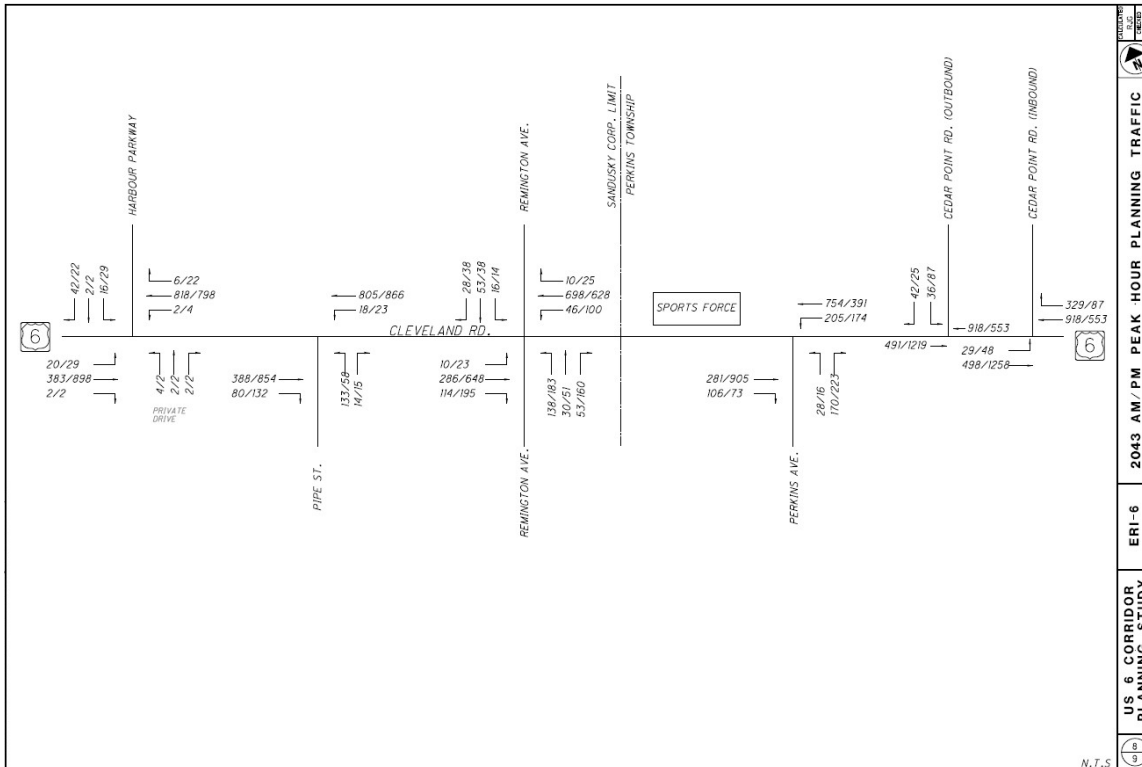
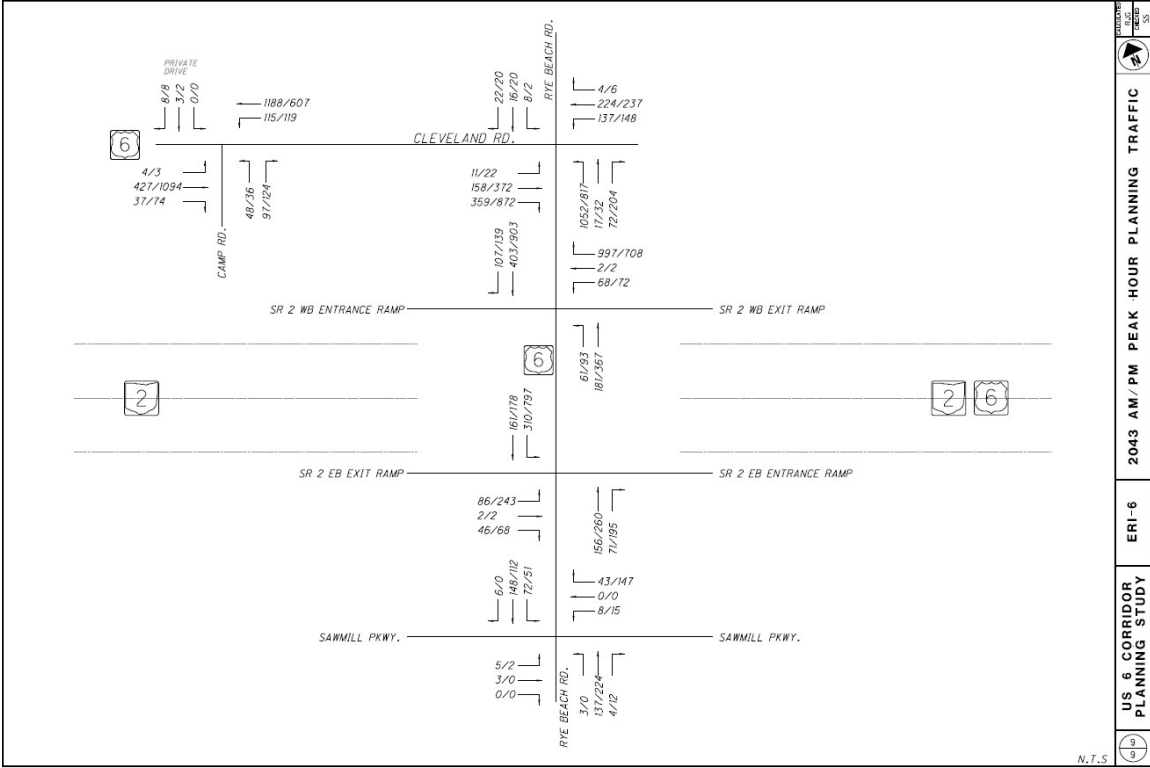


Figure 18: 2043 AM / PM Peak Hour Traffic Volume (Sheet 3 of 3)



Crash Analysis

Crash data from 2015 to 2017 along US 6 within the project limits (Sycamore Line to Rye Beach Road) were obtained from ODOT’s GIS Crash Analysis Tool (GCAT) database. Crash data along Rye Beach Road from US 6 to the NS Railroad crossing south of the SR 2 interchange, and along US 250 from US 6 to Butler Street were also included in the analysis. There are a few additional crashes along Rye Beach Road that were not captured by the GCAT data base. Information on these crashes was obtained from the Ohio Department of Public Safety (ODPS) Electronic Crash System and included in the analysis.

Table 3: 2015 – 2017 Total Number of Crashes Summary by Location

Location		Year			
		2015	2016	2017	Total
US 6	at Sycamore Line	4	3	2	9
	btwn Sycamore Line and McKinley St	6	6	5	17
	at McKinley St	1	0	1	2
	at Butler St	2	6	1	9
	at Parish St	0	1	2	3
	at Roosevelt St / Huntington Ave	2	3	3	8
	at Cowdery St	0	2	2	4
	btwn Cowdery St and Cedar Point Dr	2	4	2	8
	at Cedar Point Dr	6	6	4	16
	btwn Cedar Point Dr and Harbour Parkway	2	4	5	11
	at Harbour Parkway	3	2	2	7
	btwn Harbour Parkway and Remington Ave	5	0	4	9
	at Remington Ave	5	9	2	16
	btwn Remington Ave and Perkins Ave	2	7	6	15
	at Perkins Ave	6	3	12	21
	btwn Perkins Ave and Cedar Point Rd	1	1	0	2
	at Cedar Point Rd	3	1	1	5
	btwn Cedar Point Rd and Camp Rd	1	1	0	2
	at Camp Rd	2	4	4	10
	btwn Camp Rd and Sawmill Creek Dr	5	12	8	25
at Sawmill Creek Dr	4	3	1	8	
btwn Sawmill Creek Dr and Rye Beach Rd	6	4	4	14	
at Rye Beach Rd	6	2	2	10	
Rye Beach Rd	btwn Cleveland Rd and SR 2	0	0	3	3
	at SR 2 WB Ramps	3	2	7	12
	at SR 2 EB Ramps	1	3	3	7
	btwn SR 2 EB Ramps and Sawmill Parkway	1	0	0	1
	at Sawmill Parkway	1	0	1	2
	at Railroad Crossing	1	0	0	1
US 250 (Milan Rd)	at Ramp to Butler St	3	2	2	7
	at Ramp from Butler St	1	1	1	3
	btwn Butler St Ramp and Sycamore Line	1	2	0	3
	at Sycamore Line	2	3	1	6
	Butler St btwn US 6 and Milan Rd	1	2	1	4
	Sycamore Line btwn US 6 and Milan Rd	1	0	2	3
	Ramp from Butler St to US 250 (Milan Rd)	1	0	0	1
Total	Total	91	99	94	284

Table 3 summarizes all crashes that occurred within the project study area during the three-year period by location, excluding animal-related crashes. A total of 284 crashes were reported within the study area from 2015 to 2017. **Table 4** further categorizes these crashes by severity, road condition, crash type, and time of day. About 40% of the total crashes were rear-end. There were about 15% fixed object type of crashes, and approximately 21% were either angle or left turn types. The high percentage of rear end crashes suggests stopped or slowing traffic which is directly related to known congestion problems along

US 6 within the study area. Other than the congestion problem, the west end of the corridor also has a high driveway/side street density, the rear-end crashes might also be potentially associated with access control problems in this area. About 22% of the total crashes occurred on wet or icy/snowy pavements; and 26% of the total crashes occurred at night time. In general, street lighting is present along US 6 within the City of Sandusky while the rural section is mostly unlit. Intermittent lighting exists along Rye Beach Road as well. One fatality occurred at the railroad crossing on Rye Beach Road, and about 26% of all crashes involved bodily injury.

Table 4: Summary of 2015-2017 Study Area Crash Data

Year	Severity			Road Condition					Type										Time of Day		Total	
	Injury	Fatal	Property Damage	Dry	Wet	Snow	Ice	Other	Backing	Rear End	Fixed Object	Side Swipe	Angle	Head On	Right Turns	Left Turns	Parked veh	Pedestrian	Other	Day		Night
2015	19	1	71	74	11	5	1	0	1	41	17	12	5	0	3	5	2	2	3	66	25	91
2016	23	0	76	79	11	2	7	0	3	37	12	13	11	1	7	11	2	0	2	69	30	99
2017	33	0	61	68	20	3	2	1	1	37	13	8	12	1	5	14	1	1	1	76	18	94
Total	75	1	208	221	42	10	10	1	5	115	42	33	28	2	15	30	5	3	6	211	73	284

Based on the crash history aggregated in the above tables, each individual location with five or more reported crashes during the three year study period was separated out for further examination and more in-depth analysis.

Table 5 summarizes the crashes at the intersection of US 6 and Sycamore Line. A total of nine crashes occurred at the intersection in the three-year period. Four of the nine crashes were rear-end, and three were fixed object. The rear-end crashes occurred on all approaches; no specific patterns were found. Rear-end crashes are a common leading crash type at a signal controlled intersection. However, the fixed object type of crashes consists of 33% of the crashes at this intersection. Of the fixed object crashes, one involved left turn and struck a utility pole, and two struck signals. However, the existing condition changed during the three year study period, the intersection and the traffic signal was redesigned. It is likely the contributing factors to the crashes might be already improved. About 22% of the total crashes occurred on wet or icy pavements; and 33% of the total crashes occurred at night time. Lighting is presented on all approaches of this intersection. No injuries were involved in the crashes at this location. Access management solutions were proposed at this location of US 6 as shown in the exhibits displayed at the second public meeting in July 2019. The solutions included driveway closures and driveway conversions to a right in/right out (RIRO) configuration near Sycamore Line and US 6 at the Brick Oven Bistro business. See **Figure 19** for illustration.

Table 5: Summary of 2015-2017 Crash Data – US 6 at Sycamore Line

Year	Severity			Road Condition					Type										Time of Day		Total	
	Injury	Fatal	Property Damage	Dry	Wet	Snow	Ice	Other	Backing	Rear End	Fixed Object	Side Swipe	Angle	Head On	Right Turns	Left Turns	Parked veh	Pedestrian	Other	Day		Night
2015	0	0	4	3	0	1	0	0	0	2	1	0	0	0	0	1	0	0	0	2	2	4
2016	0	0	3	3	0	0	0	0	0	1	1	0	0	0	0	0	1	0	0	2	1	3
2017	0	0	2	1	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	2	0	2
Total	0	0	9	7	1	1	0	0	0	4	3	0	0	0	0	1	1	0	0	6	3	9

Figure 19: Access Management – US 6 at Sycamore Line



Table 6 summarizes the crashes on US 6 between Sycamore Line and McKinley Street/Avondale Street. A total of 17 crashes occurred during the three-year period. About 24% of the total crashes were rear-end, 35% were either angle or left-turn type, and approximately 12% involve side swipe. The rear-end crashes are mostly due to vehicles frequently slowing down to turn into driveways and side streets, and the high percentage of angle and left turn type of crashes is also related to the density of the access along the road. Access control measures are likely to help reduce rear-end and angle/left turn type of crashes. About 18% of the total crashes occurred on wet or icy pavements; and 12% of the total crashes occurred at night time. While there were no fatalities, about 24% of crashes involved bodily injury. Access management solutions were proposed along this segment of US 6 as shown in the exhibits displayed at the second public meeting in July 2019. The solutions included driveway closures and driveway conversions to a right in/right out (RIRO) configuration near Sycamore Line and US 6 at the Brick Oven Bistro business. Also converting existing commercial drives to a two-way standard commercial drive per ODOT design at the east end of this segment. The east drive at the Marathon gas station was also recommended to be reduced to a standard commercial drive width. Three driveway closures at unoccupied businesses are proposed and two driveway closures at CMT Financial and Fades & More are proposed due to existing multiple accesses. See **Figure 20** for illustration.

Table 6: Summary of 2015-2017 Crash Data – US 6 between Sycamore Line and McKinley St

Year	Severity			Road Condition						Type										Time of Day		Total
	Injury	Fatal	Property Damage	Dry	Wet	Snow	Ice	Other	Backing	Rear End	Fixed Object	Side Swipe	Angle	Head On	Right Turns	Left Turns	Parked veh	Pedestrian	Unkno wn	Day	Night	
2015	1	0	5	4	0	2	0	0	1	1	1	1	1	0	0	0	1	0	0	4	2	6
2016	1	0	5	5	1	0	0	0	0	1	0	1	1	0	0	3	0	0	0	6	0	6
2017	2	0	3	5	0	0	0	0	0	2	0	0	1	0	1	0	0	0	1	5	0	5
Total	4	0	13	14	1	2	0	0	1	4	1	2	3	0	1	3	1	0	1	15	2	17

Figure 20: Access Management – US 6 between Sycamore Line and McKinley St



Table 7 summarizes the crashes at the intersection of US 6 and Butler Street. A total of nine crashes occurred at the intersection in the three-year period. Three of the total crashes were rear-end, while right turn, left turn and sideswipe types each have two reported crashes. All the turning type of crashes involved eastbound vehicles on US 6 and vehicles turning into and out of Butler Street. This may suggest the signal phasing, clearance time and intersection layout are contributing factors to this crash trend. The Butler Street intersection includes the use of reversible lanes during certain time periods which may also be adding to driver confusion or uncertainty in navigating this intersection. Elimination of the reversible lanes has been recommended as part of this study as a result of the shift in travel patterns. In addition, signal upgrades, optimization, and improved traffic control measures will be implemented. The potential removal of the adjacent existing signal at US 6 and Avondale Street/McKinley Street will also alleviate the congestion or impacts to Butler Street due to its close proximity (approximately 170 feet). Only one crash occurred on wet pavement; and 33% of the total crashes occurred at night time. Lighting is presented only at the southwest quadrant of the intersection. While there were no fatalities, one crash involved bodily injury.

Table 7: Summary of 2015-2017 Crash Data – US 6 at Butler St

Year	Severity			Road Condition						Type										Time of Day		Total	
	Injury	Fatal	Property Damage	Dry	Wet	Snow	Ice	Other	Backing	Rear End	Fixed Object	Side Swipe	Angle	Head On	Right Turns	Left Turns	Parked veh	Pedestrian	Other	Day	Night		
2015	0	0	2	2	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1	1	2
2016	1	0	5	5	1	0	0	0	0	2	0	1	0	0	2	1	0	0	0	4	2	6	
2017	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	1	
Total	1	0	8	8	1	0	0	0	0	3	0	2	0	0	2	2	0	0	0	6	3	9	

Table 8 summarizes the crashes at the intersection of US 6 and Roosevelt Street/Huntington Avenue. This intersection is controlled by stop signs on the side streets. A total of 8 crashes occurred at the intersection in the three-year period. About 75% of the total crashes were either angle or left-turn type. One crash occurred on wet pavement; and one crash occurred at night time. While there were no

fatalities, 50% of crashes involved bodily injury. Access management solutions were proposed at this location as shown in the exhibits presented at the second public meeting held in July 2019. The Shell gas station at US 6 and Roosevelt Street was recommended to be reduced to a standard commercial drive width as well as one drive closure on Roosevelt Street. In addition, one driveway closure at a business which appears to be closed is proposed on the northeast corner of the intersection. See **Figure 21** for illustration.

Table 8: Summary of 2015-2017 Crash Data – US 6 at Roosevelt St / Huntington Ave

Year	Severity			Road Condition						Type										Time of Day			Total
	Injury	Fatal	Property Damage	Dry	Wet	Snow	Ice	Other	Backing	Rear End	Fixed Object	Side Swipe	Angle	Head On	Right Turns	Left Turns	Parked veh	Pedestrian	Other	Day	Night		
2015	0	0	2	2	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	2	0	2	
2016	2	0	1	2	1	0	0	0	1	0	0	0	1	0	0	1	0	0	0	2	1	3	
2017	2	0	1	3	0	0	0	0	0	0	0	0	2	0	0	0	0	1	0	3	0	3	
Total	4	0	4	7	1	0	0	0	1	0	0	0	4	0	0	2	0	1	0	7	1	8	

Figure 21: Access Management – US 6 at Roosevelt St / Huntington Ave



Table 9 summarizes the crashes that occurred on US 6 between Cowdery Street and Cedar Point Drive. A total of 8 crashes occurred during the three-year period. Half of the crashes were side swipe type, and two crashes involved left turns. The section along US 6 between Cowdery Street and Cedar Point Drive does not have a center turning lane, and the driveway density is not as high as the sections west of it. The high number of side swipe crashes may suggest it is necessary to evaluate if adequate lane widths are provided. Lane measurements were investigated and it appears that the lane widths in this segment are

adequate for an urban roadway facility per L&D Volume 1, which range from 11 to 12 feet wide. All crashes within this segment occurred on dry pavement, and 25% of the total crashes occurred at night time. Lighting is presented along US 6 in this section, the night time crashes could just be non-locals unfamiliar with the area leaving Cedar Point after the park closes. While there were no fatalities, about 38% of crashes involved bodily injury. Access management solutions were proposed along this segment of US 6 as presented at the second public meeting in July 2019. Six driveway closures are proposed at businesses which have multiple access points. A potential closure near the Thirsty Pony establishment was identified should a roundabout alternative be selected for intersection improvement at US 6 and Cedar Point Drive. See **Figure 22** for illustration.

Table 9: Summary of 2015-2017 Crash Data – US 6 between Cowdery St and Cedar Point Dr

Year	Severity			Road Condition						Type										Time of Day		Total
	Injury	Fatal	Property Damage	Dry	Wet	Snow	Ice	Other	Backing	Rear End	Fixed Object	Side Swipe	Angle	Head On	Right Turns	Left Turns	Parked veh	Pedestrian	Other	Day	Night	
2015	1	0	1	2	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	2	0	2
2016	1	0	3	4	0	0	0	0	0	0	0	2	0	0	1	1	0	0	0	2	2	4
2017	1	0	1	2	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	2	0	2
Total	3	0	5	8	0	0	0	0	0	1	0	4	0	0	1	2	0	0	0	6	2	8

Figure 22: Access Management – US 6 between Cowdery St and Cedar Point Dr



Table 10 summarizes the crashes at the intersection of US 6 and Cedar Point Drive. A total of 16 crashes occurred at the intersection in the three-year period. About 38% of the total crashes were rear-end, 31% were either angle or left-turn type, and approximately 13% involve right turns. It is not unusual to have

rear-end crashes as the leading type of crashes at a signal controlled intersection. About 38% of the total crashes occurred on wet or icy pavements; and 50% of the total crashes occurred at night time, and all occurred on lighted roadway. While there were no fatalities, about 25% of crashes involved bodily injury.

Table 10: Summary of 2015-2017 Crash Data – US 6 at Cedar Point Dr

Year	Severity			Road Condition						Type										Time of Day		Total
	Injury	Fatal	Property Damage	Dry	Wet	Snow	Ice	Other	Backing	Rear End	Fixed Object	Side Swipe	Angle	Head On	Right Turns	Left Turns	Parked veh	Pedestrian	Other	Day	Night	
2015	2	0	4	3	2	1	0	0	0	3	1	1	1	0	0	0	0	0	0	3	3	6
2016	2	0	4	5	1	0	0	0	0	1	0	0	2	1	1	1	0	0	0	3	3	6
2017	0	0	4	2	2	0	0	0	0	2	0	0	1	0	1	0	0	0	0	2	2	4
Total	4	0	12	10	5	1	0	0	0	6	1	1	4	1	2	1	0	0	8	8	16	

Table 11 summarizes the crashes on US 6 between Cedar Point Drive and Harbour Parkway. A total of 11 crashes occurred during the three-year period. About 45% of the total crashes were rear-end, approximately 27% involve side swipe, and 27% were either angle or left-turn type. One crash occurred on wet pavement, all the others occurred on dry pavement; and one crash occurred at night time. There was one crash that involved bodily injury, and no fatalities. Access management solutions were proposed along this segment of US 6 as shown at the second public meeting in July 2019. Three driveway closures were recommended at Castaway Bay and Amazement (park maintenance) along US 6 due to multiple access points. See **Figure 23** for illustration.

Table 11: Summary of 2015-2017 Crash Data – US 6 between Cedar Point Dr and Harbour Pkwy

Year	Severity			Road Condition						Type										Time of Day		Total
	Injury	Fatal	Property Damage	Dry	Wet	Snow	Ice	Other	Backing	Rear End	Fixed Object	Side Swipe	Angle	Head On	Right Turns	Left Turns	Parked veh	Pedestrian	Other	Day	Night	
2015	0	0	2	2	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	1	1	2
2016	0	0	4	4	0	0	0	0	0	1	0	2	1	0	0	0	0	0	0	4	0	4
2017	1	0	4	4	1	0	0	0	0	3	0	1	0	0	0	1	0	0	0	5	0	5
Total	1	0	10	10	1	0	0	0	0	5	0	3	1	0	0	2	0	0	10	1	11	

Figure 23: Access Management – US 6 between Cedar Point Dr and Harbour Pkwy

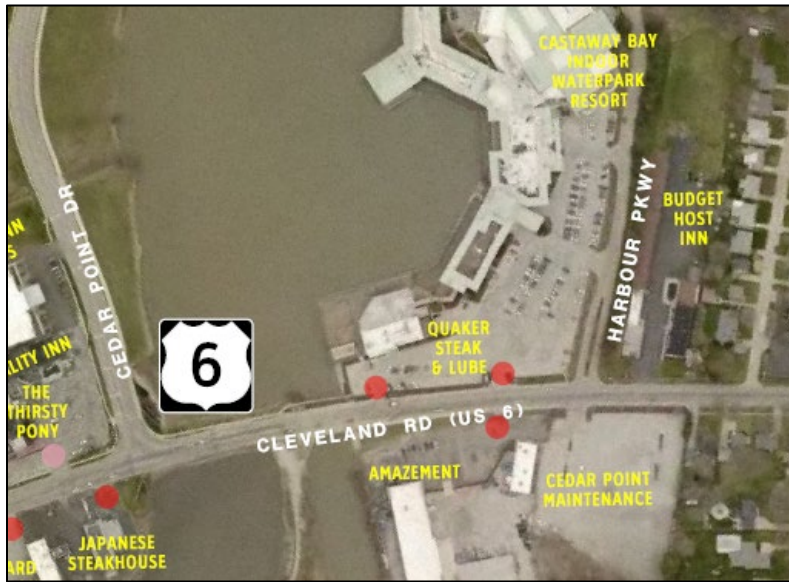


Table 12 summarizes the crashes at the intersection of US 6 and Harbour Parkway. A total of 7 crashes occurred at the intersection in the three-year period. About 71% of the total crashes were rear-end, followed distantly by 29% side swipe type crashes. It is not unusual to have rear-end crashes as the leading type of crashes at a signal controlled intersection. All crashes within this segment occurred on dry pavement; and all occurred during day. There was one crash that involved bodily injury, and no fatalities.

Table 12: Summary of 2015-2017 Crash Data – US 6 at Harbour Pkwy

Year	Severity			Road Condition						Type									Time of Day		Total	
	Injury	Fatal	Property Damage	Dry	Wet	Snow	Ice	Other	Backing	Rear End	Fixed Object	Side Swipe	Angle	Head On	Right Turns	Left Turns	Parked veh	Pedestrian	Other	Day		Night
2015	0	0	3	3	0	0	0	0	0	1	0	2	0	0	0	0	0	0	0	3	0	3
2016	0	0	2	2	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2	0	2
2017	1	0	1	2	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2	0	2
Total	1	0	6	7	0	0	0	0	0	5	0	2	0	0	0	0	0	0	0	7	0	7

Table 13 summarizes the crashes on US 6 between Harbour Parkway and Remington Avenue. A total of 9 crashes occurred during the three-year period. About 56% of the total crashes were rear-end; one crash involved a pedestrian. One crash occurred on wet pavement and all the others occurred on dry pavement; four of the nine crashes occurred at night time, and all occurred on lighted roadway. While there were no fatalities, about 67% of crashes involved bodily injury. Access management solutions were proposed along this segment of US 6 as shown at the second public meeting held in July 2019. One driveway closure at Dawning of Spring business and redefining to standard driveway widths at the greenhouse were recommended. See **Figure 24** for illustration.

Table 13: Summary of 2015-2017 Crash Data – US 6 between Harbour Pkwy and Remington Ave

Year	Severity			Road Condition						Type										Time of Day		Total
	Injury	Fatal	Property Damage	Dry	Wet	Snow	Ice	Other	Backing	Rear End	Fixed Object	Side Swipe	Angle	Head On	Right Turns	Left Turns	Parked veh	Pedestrian	Other	Day	Night	
2015	2	0	3	5	0	0	0	0	0	2	1	0	0	0	1	0	0	1	0	2	3	5
2016	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2017	4	0	0	3	1	0	0	0	0	3	0	1	0	0	0	0	0	0	0	3	1	4
Total	6	0	3	8	1	0	0	0	0	5	1	1	0	0	1	0	0	1	0	5	4	9

Figure 24: Access Management – US 6 between Harbour Pkwy and Remington Ave



Table 14 summarizes the crashes at the intersection of US 6 and Remington Avenue. A total of 16 crashes occurred at the intersection in the three-year period. About 50% of the total crashes were rear-end, 38% were either angle or left-turn type, and there was one crash involving a pedestrian. About 25% of the total crashes occurred on wet or icy pavement; and 25% of the total crashes occurred at night time. While there were no fatalities, about 38% of the crashes involved bodily injury.

Table 14: Summary of 2015-2017 Crash Data – US 6 at Remington Ave

Year	Severity			Road Condition					Type										Time of Day		Total	
	Injury	Fatal	Property Damage	Dry	Wet	Snow	Ice	Other	Backing	Rear End	Fixed Object	Side Swipe	Angle	Head On	Right Turns	Left Turns	Parked veh	Pedestrian	Other	Day		Night
2015	1	0	4	5	0	0	0	0	0	3	0	0	1	0	0	0	0	1	0	4	1	5
2016	4	0	5	6	2	0	1	0	1	4	0	0	2	0	0	2	0	0	0	6	3	9
2017	1	0	1	1	1	0	0	0	0	1	0	0	1	0	0	0	0	0	0	2	0	2
Total	6	0	10	12	3	0	1	0	1	8	0	0	4	0	0	2	0	1	0	12	4	16

Table 15 summarizes the crashes that occurred on US 6 between Remington Avenue and Perkins Avenue. A total of 15 crashes occurred during the three-year period. About 47% of the total crashes were rear-end, and 47% involved fixed objects. A detailed review of the fixed object type crashes revealed there is not one specific object or one type of object being hit in these crashes. However, 67% of the fixed object crashes involved vehicles traveling eastbound, and most of the vehicles stopped at the roadside ditches. 75% of the fixed object crashes involved bodily injury, and 50% on snow or wet pavements. Of all the crashes that occurred at this intersection, 47% of the total crashes occurred on wet or icy pavement; 27% of the crashes occurred at night time. While there were no fatalities, about 40% of the total crashes involved bodily injury. Access management solutions were proposed along this segment of US 6 as shown at the second public meeting in July 2019. Seven driveway closures, three areas for redefining to standard driveway widths, and proposed reconstructed drives (by Landing Park project) were recommended. See **Figure 25** for illustration.

Table 15: Summary of 2015-2017 Crash Data – US 6 between Remington Ave and Perkins Ave

Year	Severity			Road Condition					Type										Time of Day		Total	
	Injury	Fatal	Property Damage	Dry	Wet	Snow	Ice	Other	Backing	Rear End	Fixed Object	Side Swipe	Angle	Head On	Right Turns	Left Turns	Parked veh	Pedestrian	Other	Day		Night
2015	1	0	1	0	0	1	1	0	0	0	2	0	0	0	0	0	0	0	0	1	1	2
2016	4	0	3	4	1	1	1	0	0	3	3	0	0	0	0	1	0	0	0	4	3	7
2017	1	0	5	4	2	0	0	0	0	4	2	0	0	0	0	0	0	0	0	6	0	6
Total	6	0	9	8	3	2	2	0	0	7	7	0	0	0	0	1	0	0	0	11	4	15

Figure 25: Access Management – US 6 between Remington Ave and Perkins Ave

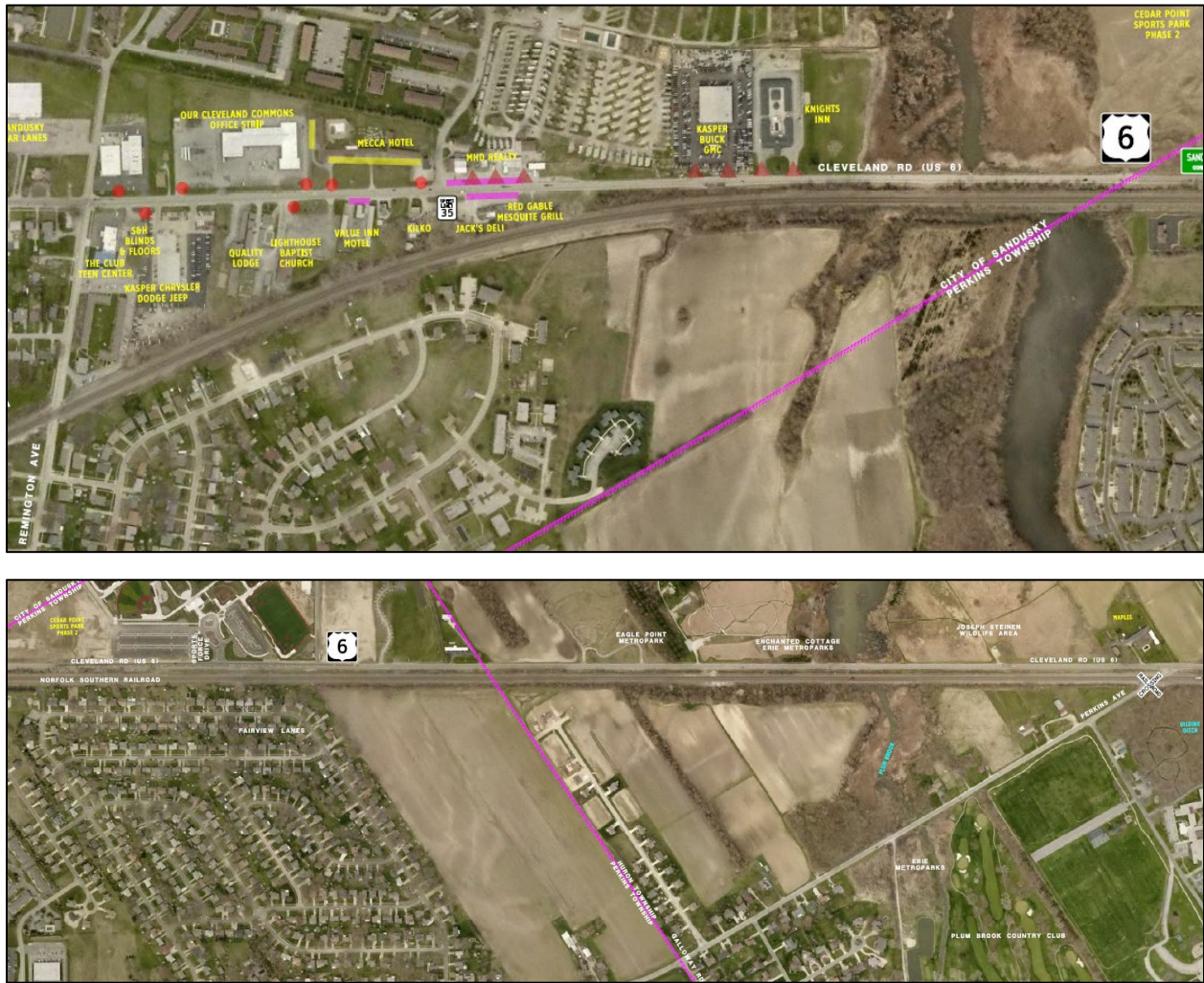


Table 16 summarizes the crashes that occurred at the intersection of US 6 and Perkins Avenue. Total of 21 crashes occurred during the three-year period. About 29% of the total crashes were rear-end, 24% involved fixed objects, and 24% involved right turns. An eastbound right turn lane and a westbound left turn lane were warranted at this location. The installation of a right turn deceleration and left turn lane could potentially help reduce the crashes. A proposed roadway alternative with the added turn lanes was provided as an option for consideration, along with relocating the intersection further from the railroad tracks and installing a roundabout. A detailed review of the fixed object type crashes revealed that there is not one specific object or one type of object getting hit in these crashes. However, 50% of the fixed object crashes did involve making turns at the intersection. Additionally, 50% of the fixed object crashes occurred when the roadway condition was ice/snow/slush along with one crash that occurred during rainy conditions. All these facts suggest the fixed object type crashes at this location are more likely related to the skewed intersecting angle at this location rather than roadside clearance issues. The close proximity to railroad tracks of this intersection, and the grade change immediately south of US 6 on Perkins Avenue due to the nearby tracks, all could contribute to the high number of crashes at this intersection. Of all the crashes at this intersection, 43% occurred on wet or icy pavements; 38% of the crashes occurred at night

time. While there were no fatalities, about 29% of the total crashes involved bodily injury. A proposed roadway alternative was developed to eliminate the substandard intersection skew angle, improve the grade differential and increase the spacing from the railroad.

Table 16: Summary of 2015-2017 Crash Data – US 6 at Perkins Ave

Year	Severity			Road Condition						Type										Time of Day		Total
	Injury	Fatal	Property Damage	Dry	Wet	Snow	Ice	Slush	Backing	Rear End	Fixed Object	Side Swipe	Angle	Head On	Right Turns	Left Turns	Parked veh	Pedestrian	Other	Day	Night	
2015	2	0	4	5	1	0	0	0	0	2	2	0	0	0	1	0	0	0	1	4	2	6
2016	0	0	3	3	0	0	0	0	0	1	0	0	0	0	2	0	0	0	0	3	0	3
2017	4	0	8	4	3	3	1	1	0	3	3	1	0	0	2	2	1	0	0	6	6	12
Total	6	0	15	12	4	3	1	1	0	6	5	1	0	0	5	2	1	0	1	13	8	21

Table 17 summarizes the crashes at the intersection of US 6 and Camp Road. A total of 10 crashes occurred at the intersection in the three-year period. About 30% of the total crashes were rear-end, 30% were side swipe, and 20% fixed object. Camp Road intersects US 6 on a curve; this may contribute to the high rear-end and side swipe types of crashes. Improving the curvature and sight distance and installing a turn lane might potentially help to reduce these two types of crashes. It should be noted that there is a commercial driveway located right across from Camp Road; the crash data indicated no reported crashes were associated with traffic exiting the existing driveway. About 20% of the total crashes occurred on wet or icy pavements; and 30% of the total crashes occurred at night time. While there were no fatalities, about 30% of the crashes involved bodily injury. A proposed roadway alternative provided recommendations on shifting the north drive at Barnes Nursery to align opposite Camp Road. In addition, an eastbound right turn lane and a westbound left turn lane were warranted at this location. In lieu of adding turn lanes, installation of a roundabout intersection was also evaluated to improve safety, traffic flow and access management.

Table 17: Summary of 2015-2017 Crash Data – US 6 at Camp Rd

Year	Severity			Road Condition						Type										Time of Day		Total
	Injury	Fatal	Property Damage	Dry	Wet	Snow	Ice	Other	Backing	Rear End	Fixed Object	Side Swipe	Angle	Head On	Right Turns	Left Turns	Parked veh	Pedestrian	Other	Day	Night	
2015	1	0	1	2	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	2	0	2
2016	1	0	3	3	0	0	1	0	0	2	0	1	1	0	0	0	0	0	0	3	1	4
2017	1	0	3	3	1	0	0	0	0	1	1	1	0	0	0	1	0	0	0	2	2	4
Total	3	0	7	8	1	0	1	0	0	3	2	3	1	0	0	1	0	0	7	3	10	

Table 18 summarizes the crashes occurred on US 6 between Camp Road and Sawmill Creek Drive. A total of 25 crashes occurred during the three-year period. About 68% of the total crashes were rear-end, and 20% involved fixed objects. This segment along US 6 has a two-lane cross section, one lane in each direction without turning lanes at side street intersections. Installing turning lanes at major intersections along US 6 might help to reduce rear-end type of crashes. Of all the crashes that occurred within this section, 12% occurred on wet or icy pavements; 16% occurred at night time. While there were no fatalities, about 20% of the total crashes involved bodily injury. A proposed roadway alternative based on ECAT analysis provided recommendations on providing a two-way left turn lane (TWLTL) from the east approach at US 6 and Camp Road. Access management solutions were proposed along this segment of US 6 as shown at the second public meeting in July 2019. Three driveway closures, one area for redefining

to standard driveway widths near Barnes Nursery, and converting a residential drive (3113 Cleveland Rd) to standard width were recommended. See **Figure 26** for illustration.

Table 18: Summary of 2015-2017 Crash Data – US 6 between Camp Rd and Sawmill Creek Dr

Year	Severity			Road Condition						Type										Time of Day		Total
	Injury	Fatal	Property Damage	Dry	Wet	Snow	Ice	Other	Backing	Rear End	Fixed Object	Side Swipe	Angle	Head On	Right Turns	Left Turns	Parked veh	Pedestrian	Other	Day	Night	
2015	0	0	5	4	1	0	0	0	0	3	2	0	0	0	0	0	0	0	0	4	1	5
2016	1	0	11	11	0	0	1	0	0	9	3	0	0	0	0	0	0	0	0	9	3	12
2017	4	0	4	7	1	0	0	0	0	5	0	0	0	1	0	2	0	0	0	8	0	8
Total	5	0	20	22	2	0	1	0	0	17	5	0	0	1	0	2	0	0	0	21	4	25

Figure 26: Access Management – US 6 between Camp Rd and Sawmill Creek Dr



Table 19 summarizes the crashes at the intersection of US 6 and Sawmill Creek Drive. A total of 8 crashes occurred at the intersection in the three-year period. Seven crashes were rear-end, and one side swipe. Five of the rear-end crashes occurred on the eastbound approach. If an eastbound exclusive left turn lane is warranted, installing the left turn lane is expected to separate the turning vehicles from through traffic and could potentially reduce rear-end type of crashes. All crashes occurred on dry pavement; one crash occurred at night time. While there were no fatalities, about 25% of the crashes involved bodily injury. A proposed roadway alternative based on ECAT analysis provided recommendations on providing a two-way left turn lane (TWLTL) from the east approach at US 6 and Camp Road, which serves the same function as providing a dedicated left turn at the Sawmill Creek Drive intersection. A proposed roadway alternative was also recommended to upgrade the horizontal curve on US 6 east of Sawmill Creek Drive to current design standards as well as provide adequate intersection and horizontal sight distance.

Table 19: Summary of 2015-2017 Crash Data – US 6 at Sawmill Creek Dr

Year	Severity			Road Condition					Type										Time of Day		Total	
	Injury	Fatal	Property Damage	Dry	Wet	Snow	Ice	Other	Backing	Rear End	Fixed Object	Side Swipe	Angle	Head On	Right Turns	Left Turns	Parked veh	Pedestrian	Other	Day		Night
2015	1	0	3	4	0	0	0	0	0	3	0	1	0	0	0	0	0	0	0	4	0	4
2016	0	0	3	3	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	3	0	3
2017	1	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1
Total	2	0	6	8	0	0	0	0	0	7	0	1	0	0	0	0	0	0	0	7	1	8

Table 20 summarizes the crashes that occurred on US 6 between Sawmill Creek Drive and Rye Beach Road. A total of 14 crashes occurred during the three-year period. About 36% of the total crashes were rear-end, 36% were either angle or left-turn type. About 14% of the total crashes occurred on wet or icy pavements; and 36% of the total crashes occurred at night time. While there were no fatalities, about 29% of crashes involved bodily injury. Access management solutions were proposed along this segment of US 6 as presented at the second public meeting held in July 2019. Five driveway closures were recommended along US 6, including two areas for redefining to standard driveway widths and adding delineators on the south leg of Rye Beach Road near Shell gas station, one other business drive closure, and converting to a two-way standard commercial drive at McDonald's. See **Figure 27** for illustration.

Table 20: Summary of 2015-2017 Crash Data – US 6 between Sawmill Creek Dr and Rye Beach Rd

Year	Severity			Road Condition					Type										Time of Day		Total	
	Injury	Fatal	Property Damage	Dry	Wet	Snow	Ice	Other	Backing	Rear End	Fixed Object	Side Swipe	Angle	Head On	Right Turns	Left Turns	Parked veh	Pedestrian	Unknwn	Day		Night
2015	2	0	4	5	1	0	0	0	0	4	0	1	0	0	0	1	0	0	0	5	1	6
2016	1	0	3	4	0	0	0	0	0	1	1	1	0	0	0	0	0	0	1	2	2	4
2017	1	0	3	3	1	0	0	0	0	0	0	0	1	0	0	3	0	0	0	2	2	4
Total	4	0	10	12	2	0	0	0	0	5	1	2	1	0	0	4	0	0	1	9	5	14

Figure 27: Access Management – US 6 between Sawmill Creek Dr and Rye Beach Rd

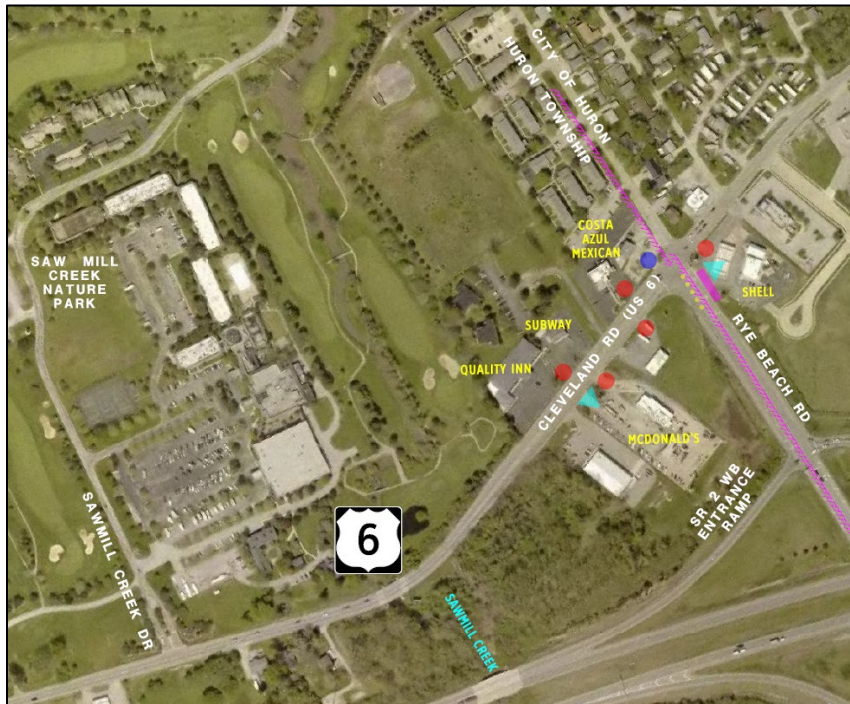


Table 21 summarizes the crashes at the intersection of US 6 and Rye Beach Road. A total of 10 crashes occurred at the intersection in the three-year period. About 60% of the total crashes were rear-end, 20% involved fixed object. About 40% of the total crashes occurred on wet or icy pavements; and 50% of the total crashes occurred at night time. While there were no fatalities, there was one crash involved bodily injury

Table 21: Summary of 2015-2017 Crash Data – US 6 at Rye Beach Rd

Year	Severity			Road Condition						Type										Time of Day		
	Injury	Fatal	Property Damage	Dry	Wet	Snow	Ice	Other	Backing	Rear End	Fixed Object	Side Swipe	Angle	Head On	Right Turns	Left Turns	Parked veh	Pedestrian	Other	Day	Night	Total
2015	1	0	5	4	2	0	0	0	0	5	0	0	0	0	0	1	0	0	0	3	3	6
2016	0	0	2	1	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	2	2
2017	0	0	2	1	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	2	0	2
Total	1	0	9	6	3	1	0	0	0	6	2	1	0	0	0	1	0	0	5	5	10	

Table 22 summarizes the crashes at the intersection of Rye Beach Road and the SR 2 westbound ramps. A total of 12 crashes occurred at the intersection in the three-year period. About 50% of the total crashes were rear-end, 42% were angle type. About 17% of the total crashes occurred on wet or icy pavements; and there was one night time crash. While there were no fatalities, about 50% of the crashes involved bodily injury.

Table 22: Summary of 2015-2017 Crash Data – Rye Beach Rd at SR 2 WB Ramps

Year	Severity			Road Condition						Type										Time of Day		Total
	Injury	Fatal	Property Damage	Dry	Wet	Snow	Ice	Other	Backing	Rear End	Fixed Object	Side Swipe	Angle	Head On	Right Turns	Left Turns	Parked veh	Pedestrian	Other	Day	Night	
2015	1	0	2	3	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	3	0	3
2016	1	0	1	2	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	2	0	2
2017	4	0	3	5	2	0	0	0	0	2	0	0	5	0	0	0	0	0	0	6	1	7
Total	6	0	6	10	2	0	0	0	0	6	0	1	5	0	0	0	0	0	0	11	1	12

Table 23 summarizes the crashes at the intersection of Rye Beach Road and the SR 2 eastbound ramps. A total of 7 crashes occurred at the intersection in the three-year period. About 43% of the total crashes were rear-end, 29% were angle type. About 57% of the total crashes occurred on wet or icy pavements; and 29% of the total crashes occurred at night time. While there were no fatalities, about 43% of the crashes involved bodily injury.

Table 23: Summary of 2015-2017 Crash Data – Rye Beach Rd at SR 2 EB Ramps

Year	Severity			Road Condition						Type										Time of Day		Total
	Injury	Fatal	Property Damage	Dry	Wet	Snow	Ice	Other	Backing	Rear End	Fixed Object	Side Swipe	Angle	Head On	Right Turns	Left Turns	Parked veh	Pedestrian	Other	Day	Night	
2015	0	0	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	1
2016	2	0	1	1	2	0	0	0	0	1	0	0	2	0	0	0	0	0	0	2	1	3
2017	1	0	2	2	1	0	0	0	0	2	1	0	0	0	0	0	0	0	0	2	1	3
Total	3	0	4	3	4	0	0	0	0	3	1	0	2	0	1	0	0	0	0	5	2	7

Table 24 summarizes the crashes at the intersection of US 250 (Milan Road) and the off-ramp to Butler Street. A total of 7 crashes occurred at this location over the three-year period. About 71% of the total crashes involved fixed object, and the remaining 29% were side swipes. Except for a single fixed object crash, all other fixed object crashes involved vehicles traveling north on Milan Road that struck the barricades separating the two northbound lanes at the ramp. About 29% of the total crashes occurred on wet or icy pavements; and 29% of the total crashes occurred at night time. While there were no fatalities, about 43% of the crashes involved bodily injury.

Table 24: Summary of 2015-2017 Crash Data – US 250 (Milan Rd) and Ramp to Butler St

Year	Severity			Road Condition						Type										Time of Day		Total
	Injury	Fatal	Property Damage	Dry	Wet	Snow	Ice	Other	Backing	Rear End	Fixed Object	Side Swipe	Angle	Head On	Right Turns	Left Turns	Parked veh	Pedestrian	Other	Day	Night	
2015	1	0	2	2	1	0	0	0	0	0	2	1	0	0	0	0	0	0	0	2	1	3
2016	1	0	1	1	0	0	1	0	0	0	1	1	0	0	0	0	0	0	0	1	1	2
2017	1	0	1	2	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2	0	2
Total	3	0	4	5	1	0	1	0	0	0	5	2	0	0	0	0	0	0	0	5	2	7

Table 25 summarizes the crashes at the intersection of US 250 (Milan Road) and Sycamore Line. A total of 6 crashes occurred at the intersection in the three-year period. About 50% of the total crashes were rear-end, 33% were side swipe type. One wet pavement crash occurred and one crash took place at night time. While there were no fatalities, there was one crash that involved bodily injury.

Table 25: Summary of 2015-2017 Crash Data – US 250 (Milan Rd) and Sycamore Line

Year	Severity			Road Condition						Type										Time of Day		Total
	Injury	Fatal	Property Damage	Dry	Wet	Snow	Ice	Other	Backing	Rear End	Fixed Object	Side Swipe	Angle	Head On	Right Turns	Left Turns	Parked veh	Pedestrian	Other	Day	Night	
2015	1	0	1	2	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	2	0	2
2016	0	0	3	3	0	0	0	0	0	2	0	0	0	0	1	0	0	0	0	3	0	3
2017	0	0	1	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1
Total	1	0	5	5	1	0	0	0	0	3	0	2	0	0	1	0	0	0	0	5	1	6

Data analysis sheets from ODOT’s CAM tool, which provides summary crash information, and collision diagrams for study intersections are contained in [Appendix H](#).

ECAT Analysis

TranSystems has performed an analysis of the existing US 6 corridor using ODOT’s Economic Crash Analysis Tool (ECAT) software package. The ECAT software evaluates the effectiveness of established countermeasures by applying a reduction factor to the number of calculated expected crashes in the existing condition. This reduction factor can be as simple as a single number or as complex as a formula based on several input values. Furthermore, a single countermeasure may have a different reduction factor value for each of the standard crash types, or it may be the same value applied to all crash types. After the reduction factor is applied for a chosen countermeasure, the proposed expected crash rates are calculated for the built condition, and at the same time ECAT provides a value for the reduction in crashes, which is simply the expected crashes in the existing condition minus the expected crashes in the proposed condition. In order to then calculate an estimated safety benefit to society, the software applies a dollar value to each of the crash types based on national and statewide standards. These dollar amounts are then multiplied by the reduction in crashes for each crash type, summed, and reported as the total safety benefit to society as a dollar amount.

The ECAT analysis utilized the three-year crash history from ODOT’s CAM tool as described in the foregoing safety discussion. For this analysis, where direct 24-hour Average Daily Traffic (ADT) counts were not available, data from neighboring intersections and the US 6 mainline were used. Locations without direct applicability within the ECAT software were not analyzed, i.e., the railroad crossing location. The results of the ECAT analysis show that in general, the US 6 corridor’s expected crash rates are lower than the predicted crash rates for similar sites across the state. The area between Camp Road and Sawmill Creek Drive showed the highest potential for improvement along the corridor, with a 0.4 differential between expected and predicted crash rates. For detailed calculations and results, refer to [Appendix I](#) for the report output. ECAT was also utilized to quantify the predicted benefit to society (in dollars) for each countermeasure considered for implementation. This analysis is based on quantifying the potential reductions in crashes of varying severity for each countermeasure, based on national data on the effectiveness of each countermeasure, and assigning average dollar values to each crash severity designation (again using national data).

Capacity Analysis

Capacity analyses were performed at seventeen (17) locations using the Highway Capacity Manual (HCM) methodologies for the 2018 existing, 2023 No Build, and 2043 No Build year traffic volumes with existing geometry to establish a baseline of traffic operations if no capacity improvements are made. Highway Capacity Software version 7 (HCS 7) was used for the intersection capacity analyses. **Table 26** shows the level of service (LOS) thresholds for the unsignalized and signalized intersections. Intersections

operating below LOS D typically indicates that existing conditions will require further evaluation for improvements. Deficient locations were studied for potential upgrades in the **Alternatives Analysis** section of this report. Refer to [Appendix J](#) for detailed HCS 7 output reports.

Table 26: LOS Criteria for Signalized & Unsignalized Intersections

Level of Service	Unsignalized Intersection	Signalized Intersection
	Delay (Seconds)	Delay (Seconds)
A	≤ 10	≤ 10
B	> 10 – 15	> 10 - 20
C	> 15 - 25	> 20 - 35
D	> 25 - 35	> 35 - 55
E	> 35 - 50	> 55 - 80
F	> 50 or V/C* ratio > 1.00	> 80 or V/C* ratio > 1.00

Source: Transportation Research Board, *Highway Capacity Manual 2010*
 *V/C: Volume to Capacity Ratio

Table 27 summarizes the 2018 existing condition capacity analysis results for the seventeen (17) study intersections. Twelve (12) locations are signalized in the existing condition. Five (5) intersections currently operate under stop sign control. As shown in the table, the key items to note based on the results for 2018 capacity analyses using existing signal timings and phasing are:

- ▶ Traffic operation at the Intersection #9 of Cleveland Road (US 6) and Rye Beach Road currently operates at near failing conditions with overall LOS E, 138.1 second delay, with the eastbound approach of LOS F during PM peak hour.
- ▶ Traffic operation at the Intersection #10 of Cleveland Road (US 6) and SR 2 WB ramps currently operates at LOS D but is noted that the westbound approach is near failing conditions with LOS E in the AM Peak.
- ▶ At the stop-controlled Intersection #13 of Cleveland Road (US 6) and Pipe Street, the northbound approach is LOS E in the PM Peak.
- ▶ Intersection #16 of Cleveland Road (US 6) and Cedar Point Road (outbound), southbound left turning vehicles currently experience excessive delay and operate at LOS F as a result of searching for gaps in PM peak hour of Cleveland Road (US 6) traffic.
- ▶ At Intersection #17 of Cleveland Road (US 6) and Camp Road, northbound approach is LOS F in both the AM and PM Peak hour periods with delays of 218.5 seconds and 85.1 seconds, respectively.

All other intersections operate at an acceptable level of service for 2018.

Table 27: Signalized Intersection LOS Summary – 2018 Existing Conditions

Intersection	Time Period	Movement	Eastbound		Westbound		Northbound		Southbound		Overall	
			Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1 – Cleveland Rd (US 6) & Sycamore Line	AM	Approach	11.2	B	5.2	A	18.9	B	18.5	B	12.6	B
	PM	Approach	14.2	B	6.8	A	18.9	B	18.8	B	13.6	B
2 – Cleveland Rd (US 6) & Avondale / McKinley St	AM	Approach	3.0	A	3.1	A	13.9	B	14.3	B	3.8	A
	PM	Approach	3.8	A	3.9	A	13.5	B	13.9	B	4.6	A
3 – Cleveland Rd (US 6) & Butler St	AM	Approach	10.0	A	7.8	A	23.8	C			12.9	B
	PM	Approach	11.9	B	7.7	A	24.3	C			12.3	B
4 – Milan Rd (US 250) & Butler St	AM	Approach							1.8	A	1.8	A
	PM	Approach							1.8	A	1.8	A
5 – Cleveland Rd (US 6) & Cowdery St	AM	Approach	2.7	A	2.5	A	23.3	C			3.2	A
	PM	Approach	3.0	A	2.9	A	21.9	C			3.7	A
6 – Cleveland Rd (US 6) & Cedar Point Dr	AM	Approach	21.2	C	13.0	B			28.9	C	18.4	B
	PM	Approach	16.8	B	18.8	B			23.1	C	19.8	B
7 – Cleveland Rd (US 6) & Harbour Pkwy	AM	Approach	3.7	A	3.9	A	11.5	B	12.2	B	4.2	A
	PM	Approach	4.8	A	2.6	A	16.4	B	17.1	B	4.4	A
8 – Cleveland Rd (US 6) & Remington Ave	AM	Approach	6.0	A	8.8	A	19.2	B	17.2	B	10.1	B
	PM	Approach	15.9	B	9.1	A	19.2	B	16.4	B	14.9	B
9 – Cleveland Rd (US 6) & Rye Beach Rd	AM	Approach	38.5	D	17.8	B	27.6	C	44.6	D	29.0	C
	PM	Approach	138.1	F	12.1	B	26.9	C	42.1	D	75.6	E*
10 – Rye Beach Rd & SR 2 WB Ramps	AM	Approach			64.9	E	33.1	C	33.1	C	51.8	D^
	PM	Approach			28.4	C	41.9	D*	33.3	C	33.7	C
11 – Rye Beach Rd & SR 2 EB Ramps	AM	Approach	21.4	C			12.6	B	6.7	A	10.7	B
	PM	Approach	31.7	C			21.9	C	12.7	B	18.6	B
12 – Milan Rd (US 250) & Sycamore Line	AM	Approach	10.2	B	10.2	B	18.8	B	18.7	B	13.9	B
	PM	Approach	11.4	B	11.7	B	19.8	B	18.9	B	14.6	B

Note the analysis results shown in the table are from HCS7.

Delay units: seconds per vehicle

* Some movements at LOS F

^ Some movements at LOS E

Table 27b: Stop-controlled Intersection LOS Summary – 2018 Existing Conditions

Intersection	Time Period	Approach / Movement	Eastbound		Westbound		Northbound		Southbound	
			Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
13 – Cleveland Rd (US 6) & Pipe St	AM	Approach					25.4	D		
		LT			8.3	A				
	PM	Approach					36.8	E		
		LT			10.1	B				
14 – Rye Beach Rd & Sawmill Pkwy	AM	Approach	13.7	B	9.8	A				
		LT			12.4	B	7.6	A	7.7	A
		RT			9.3	A				
	PM	Approach	14.3	B	10.6	B	7.4	A	8.0	A
		LT			12.2	B				
		RT			10.4	B				
15 – Cleveland Rd (US 6) & Perkins Ave	AM	Approach					20.0	C		
		LT			8.6	A				
	PM	Approach					25.3	D		
		LT			9.9	A				
16 – Cleveland Rd (US 6) & Cedar Pt Rd (Outbound)	AM	Approach							24.1	C
		LT							32.7	D
		RT							16.9	C
	PM	Approach							54.9	F*
		LT							67.2	F
		RT							11.9	B
16 – Cleveland Rd (US 6) & Cedar Pt Rd (Inbound)	AM	Approach								
		LT	10.0	B						
		RT								
	PM	Approach								
		LT	8.6	A						
		RT								
17 – Cleveland Rd (US 6) & Camp Rd	AM	Approach					218.5	F	32.9	D
		LT	11.1	B	8.6	A				
		RT	0.1	A	2.4	A				
	PM	Approach					85.1	F	18.2	C
		LT	8.6	A	10.7	B				
		RT	0.0	A	2.4	A				

Note the analysis results shown in the table are from HCS7.

Delay units: seconds per vehicle

* Some movements at LOS F

^ Some movements at LOS E

Table 28 provides a summary of the capacity analysis results for the projected years 2023 and 2043 No Build traffic volume condition using the existing lane configurations. These analyses adhered to ODOT's procedures for balancing approach delays so some manual changes to existing timings and cycle lengths were made in an effort to balance north-south delays with east-west delays.

As shown in the table, the key items to note based on the results for 2023 and 2043 No Build capacity analyses are:

- ▶ All signalized intersections meet acceptable LOS (B, C, & D) except at Intersections 9 and 10.
- ▶ Intersection #9, Cleveland Road (US 6) at Rye Beach Road, has a LOS F for the eastbound and northbound approaches in PM peak hour for both 2023 and 2043 No Build with overall delays of 80.2 seconds and 101.8 seconds respectively.
- ▶ Intersection #10, Rye Beach Road and SR 2 Westbound ramps, will be operating poorly in 2023 PM with near failing LOS E overall. Operations further deteriorate in 2043 beginning with AM peak for all movements ranging from LOS E and F. For 2043 PM, all movements are LOS F.
- ▶ Stop-controlled Intersection #13, Cleveland Road (US 6) at Pipe Street, deteriorates in the 2023 PM with LOS F for the northbound approach and in 2043 both AM and PM peaks are LOS E and F.
- ▶ Stop-controlled Intersection #15, Cleveland Road (US 6) at Perkins Street, experiences LOS F for the northbound left turn movements in the PM peak for both 2023 and 2043.
- ▶ Stop-controlled Intersection #16, Cleveland Road (US 6) at Cedar Point Road (Outbound), experiences LOS F for the southbound left turn movements in the PM peak for both 2023 and 2043. Also, in 2043 AM the southbound left movement is at LOS E.
- ▶ Stop-controlled Intersection #17, Cleveland Road (US 6) at Camp Road, experiences excessive delays with LOS F for the northbound approach in both the AM and PM peak. Additionally, the southbound approach in both the AM and PM peaks will be LOS E by the design year.

All other intersections operate at an acceptable level of service for 2023 and 2043 No Build.

Table 28: Signalized Intersection LOS Summary – 2023 and 2043 No Build with Existing Geometry

Intersection	Analysis Year	Time Period	Eastbound		Westbound		Northbound		Southbound		Overall	
			Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1 – Cleveland Rd (US 6) & Sycamore Line	2023 NB	AM	18.7	B	11.2	B	20.6	C	20.6	C	17.1	B
		PM	20.8	C	13.2	B	23.6	C	24.2	C	19.2	B
	2043 NB	AM	19.0	B	11.4	B	21.0	C	20.9	C	17.4	B
		PM	21.3	C	13.6	B	24.0	C	24.7	C	19.7	B
2 – Cleveland Rd (US 6) & Avondale / McKinley St	2023 NB	AM	11.7	B	11.9	B	10.9	B	11.1	B	11.8	B
		PM	12.6	B	13.2	B	12.2	B	12.5	B	12.9	B
	2043 NB	AM	11.9	B	12.2	B	10.9	B	11.1	B	12.0	B
		PM	12.3	B	13.1	B	12.9	B	13.3	B	12.8	B
3 – Cleveland Rd (US 6) & Butler St	2023 NB	AM	27.8	C	22.3	C	25.9	C			25.2	C
		PM	29.3	C	13.4	B	30.7	C			22.3	C
	2043 NB	AM	29.4	C	23.2	C	26.3	C			26.2	C
		PM	30.9	C	14.4	B	30.5	C			23.4	C
4 – Milan Rd (US 250) & Butler St	2023 NB	AM	10.8	B					11.1	B	11.1	B
		PM	11.4	B					11.0	B	11.0	B
	2043 NB	AM	10.8	B					11.2	B	11.2	B
		PM	11.4	B					11.3	B	11.3	B
5 – Cleveland Rd (US 6) & Cowdery St	2023 NB	AM	11.3	B	10.8	B	11.0	B			11.1	B
		PM	11.4	B	11.2	B	11.8	B			11.3	B
	2043 NB	AM	11.5	B	10.9	B	11.0	B			11.3	B
		PM	11.6	B	11.4	B	11.8	B			11.5	B
6 – Cleveland Rd (US 6) & Cedar Point Dr	2023 NB	AM	22.1	C	22.2	C			23.3	C	22.4	C
		PM	28.5	C	28.4	C			29.7	C	28.9	C
	2043 NB	AM	23.1	C	25.5	C			24.0	C	24.5	C
		PM	31.7	C^	37.4	D^			35.6	D	35.2	D
7 – Cleveland Rd (US 6) & Harbour Pkwy	2023 NB	AM	12.1	B	12.6	B	11.5	B	11.9	B	12.4	B
		PM	17.6	B	5.0	A	20.1	C	20.8	C	12.4	B
	2043 NB	AM	12.6	B	13.3	B	11.5	B	11.9	B	13.0	B
		PM	24.5	C	4.7	A	20.9	C	21.7	C	16.2	B
8 – Cleveland Rd (US 6) & Remington Ave	2023 NB	AM	10.6	B	16.5	B	16.6	B	14.9	B	14.8	B
		PM	25.4	C*	18.7	B*	24.0	C	19.6	B	22.8	C
	2043 NB	AM	10.3	B	17.6	B	17.8	B	15.8	B	15.5	B
		PM	39.0	D*	19.9	B*	42.2	D^	20.2	C	32.7	C
9 – Cleveland Rd (US 6) & Rye Beach Rd	2023 NB	AM	44.8	D	26.8	C	45.0	D	44.4	D	41.8	D
		PM	92.7	F	13.8	B	90.9	F	52.6	D	80.2	F*
	2043 NB	AM	48.2	D	26.4	C	48.6	D	47.3	D	44.6	D
		PM	119.5	F	14.1	B	115	F	52.8	D	101.8	F*
10 – Rye Beach Rd & SR 2 WB Ramps	2023 NB	AM	NA	NA	48.8	D	27.3	C	49.9	D	46.2	D
		PM	NA	NA	77.4	E	68.4	E	84.1	F	78.5	E^*
	2043 NB	AM	NA	NA	76.9	E	34.1	C	81.6	F	72.5	E^*
		PM	NA	NA	107.6	F	80.9	F	117.4	F	106.2	F*

Intersection	Analysis Year	Time Period	Eastbound		Westbound		Northbound		Southbound		Overall	
			Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
11 – Rye Beach Rd & SR 2 EB Ramps	2023 NB	AM	20.0	B			18.5	B	14.8	B	16.6	B
		PM	29.2	C			28.7	C	26.5	C*	27.6	C
	2043 NB	AM	20.2	C			18.7	B	15.5	B	17.2	B
		PM	31.6	C			32.2	C	28.2	C*	30.1	C
12 – Milan Rd (US 250) & Sycamore Line	2023 NB	AM	25.1	C	24.6	C	25.3	C	27.1	C	25.6	C
		PM	25.0	C	27.0	C	28.5	C	26.6	C	26.7	C
	2043 NB	AM	25.3	C	25.6	C	25.9	C	27.3	C	26.1	C
		PM	25.6	C	31.3	C	26.2	C	30.9	C	29.5	C

Note the analysis results shown in the table are from HCS7.

Delay units: seconds per vehicle

* Some movements at LOS F

^ Some movements at LOS E

Table 28b: Stop-controlled Intersection LOS Summary – 2023 and 2043 No Build with Existing Geometry

Intersection	Analysis Year / Time Period	Approach / Movement	Eastbound		Westbound		Northbound		Southbound	
			Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
13 - Cleveland Rd (US 6) & Pipe St	2023 AM NB	Approach					27.1	D		
		LT			8.4	A				
	2023 PM NB	Approach					53.5	F		
		LT			10.3	B				
	2043 AM NB	Approach					35.9	E		
		LT			8.5	A				
2043 PM NB	Approach					81.7	F			
	LT			10.8	B					
14 – Rye Beach Rd & Sawmill Pkwy	2023 AM NB	Approach	14.0	B	9.9	A				
		LT			12.6	B	7.6	A	7.7	A
		RT			9.3	A				
	2023 PM NB	Approach	16.4	C	10.9	B				
		LT			12.6	B	7.5	A	7.9	A
		RT			10.7	B				
	2043 AM NB	Approach	14.7	B	10.0	B				
		LT			13.2	B	7.6	A	7.8	A
		RT			9.4	A				
2043 PM NB	Approach	17.8	C	11.2	B					
	LT			13.2	B	7.5	A	8.0	A	
	RT			11.0	B					
15 - Cleveland Rd (US 6) & Perkins Ave	2023 AM NB	Approach					21.5	C		
		LT			8.7	A				
	2023 PM NB	Approach					77.8	F		
		LT			11.9	B				
	2043 AM NB	Approach					29.8	D		
		LT			8.9	A				
2043 PM NB	Approach					146.5	F			
	LT			12.7	B					
16 - Cleveland Rd (US 6) & Cedar Pt Rd (Outbound)	2023 AM NB	Approach							25.3	D
		LT							34.7	D
		RT							17.3	C
	2023 PM NB	Approach							132.7	F*
		LT							167.7	F
		RT							12.1	B
	2043 AM NB	Approach							31.1	D^
		LT							44.8	E
		RT							19.4	C
2043 PM NB	Approach							242.5	F*	
	LT							308.6	F	
	RT							12.7	B	

Intersection	Analysis Year / Time Period	Approach / Movement	Eastbound		Westbound		Northbound		Southbound	
			Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
16 - Cleveland Rd (US 6) & Cedar Pt Rd (Inbound)	2023 AM NB	Approach								
		LT	10.1	B						
	2023 PM NB	Approach								
		LT	8.7	A						
	2043 AM NB	Approach								
		LT	10.6	B						
2043 PM NB	Approach									
	LT	8.9	A							
17 - Cleveland Rd (US 6) & Camp Rd	2023 AM NB	Approach					302.2	F	39.6	E
		LT	11.2	B	8.7	A				
		RT	0.1	A	2.6	A				
	2023 PM NB	Approach					389.3	F	30.4	D
		LT	8.7	A	12.6	B				
		RT	0.1	A	3.7	A				
	2043 AM NB	Approach					1576.9	F	48.4	E
		LT	11.9	B	8.8	A				
		RT	0.1	A	3.7	A				
	2043 PM NB	Approach					753.7	F	40.4	E
		LT	8.9	A	13.6	B				
		RT	0.1	A	5.1	A				

Note the analysis results shown in the table are from HCS7.

Delay units: seconds per vehicle

* Some movements at LOS F

^ Some movements at LOS E

The existing condition and no build capacity analysis results were used to determine which intersections are in need of operational or capacity improvements in order to adequately accommodate the projected future traffic demand. Improvements included refinements to signal timing/phasing, lane additions and potential conversion to a roundabout intersection.

Table 29 provides a summary of the capacity analysis results for the projected year 2043 Build traffic volume condition using the proposed build configurations. The summary information presented in this and the subsequent table reflects findings and recommendations associated with the turn lane warrant analysis conclusions presented later in this report.

Table 29: Signalized Intersection LOS Summary – 2043 Build with Proposed Geometry

Intersection	Analysis Year	Time Period	Eastbound		Westbound		Northbound		Southbound		Overall	
			Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1 – Cleveland Rd (US 6) & Sycamore Line	2043 Build	AM	23.9	C	15.6	B	24.1	C	20.8	C	21.3	C
		PM	34.1	C	21.8	C	23.9	C	22.2	C	25.2	C
2 – Cleveland Rd (US 6) & Avondale / McKinley St	2043 Build	AM	12.7	B	10.3	B	12.8	B	13.1	B	11.8	B
		PM	14.3	B	10.8	B	14.6	B	15.0	B	13.0	B
3 – Cleveland Road (US 6) & Butler Street	2043 Build	AM	19.2	B	11.2	B	19.0	B			16.1	B
		PM	21.4	C	10.0	B	21.4	C			16.3	B
4 – Milan Rd (US 250) & Butler St	2043 Build	AM	11.4	B					11.0	B	11.0	B
		PM	11.7	B					11.6	B	11.6	B
6 – Cleveland Road (US 6) & Cedar Point Drive	2043 Build	AM	17.8	B	16.1	B			18.1	B	16.9	B
		PM	23.9	C	26.2	C			25.9	C	25.4	C
8 – Cleveland Road (US 6) & Remington Avenue	2043 Build	AM	21.5	C	25.7	C	19.7	B	26.7	C	23.7	C
		PM	27.8	C	12.4	B	31.2	C	36.5	D	23.8	C
9 – Cleveland Rd (US 6) & Rye Beach Rd	2043 Build	AM	24.3	C	37.6	D	36.9	D	39.8	D	33.9	C
		PM	42.2	D	26.9	C	42.9	D	43.8	D	40.3	D
10 – Rye Beach Rd & SR 2 WB Ramps	2043 Build	AM			26.0	C	27.0	C	26.1	C	26.2	C
		PM			26.2	C	32.4	C	27.4	C	28.1	C
11 – Rye Beach Rd & SR 2 EB Ramps	2043 Build	AM	33.7	C			34.5	C	26.9	C	30.1	C
		PM	49.6	D			50.6	D	43.7	D	46.6	D
12 – Milan Rd (US 250) & Sycamore Line	2043 Build	AM	23.1	C	29.0	C	29.3	C	29.2	C	28.4	C
		PM	22.7	C	33.2	C	34.0	C	33.2	C	31.7	C

Note the analysis results shown in the table are from HCS7.

Delay units: seconds per vehicle

* Some movements at LOS F

^ Some movements at LOS E

Table 29b: Stop-controlled Intersection LOS Summary – 2043 Build with Proposed Geometry

Intersection	Analysis Year/ Time Period	Approach/ Movement	Eastbound		Westbound		Northbound		Southbound	
			Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
13 - Cleveland Rd (US 6) & Pipe St	2043 AM Build	Approach					29.9	D		
		LT			8.5	A	32.0	D		
		RT					9.6	A		
	2043 PM Build	Approach					55.5	F		
		LT			10.8	B	66.8	F		
		RT					11.8	B		
15 - Cleveland Rd (US 6) & Perkins Ave	2043 AM Build	Approach					25.9	D		
		LT			8.9	A				
	2043 PM Build	Approach					124.1	F		
		LT			12.7	B				
17 - Cleveland Rd (US 6) & Camp Rd	2043 AM Build	Approach					434.5	F	42.5	E
		LT	11.9	B	8.8	A				
	2043 PM Build	Approach					567.6	F	34.6	D
		LT	8.9	A	13.6	B				

Note the analysis results shown in the table are from HCS7.

Delay units: seconds per vehicle

* Some movements at LOS F

^ Some movements at LOS E

Table 30 provides a summary of the Sidra capacity analysis results for the projected year 2043 Build traffic volume condition using the proposed roundabout configurations. See details of the proposed roundabouts in the **Alternatives Analysis** section of this report. Refer to [Appendix J](#) for detailed Sidra output reports.

Table 30: Intersection LOS Summary – 2043 Build with Proposed Roundabout Geometry

Intersection	Time Period	Eastbound	Westbound	Northbound	Southbound	Overall
		LOS	LOS	LOS	LOS	LOS
6 – Cleveland Rd (US 6) & Cedar Point Dr	AM	A	B		A	A
	PM	B	A		B	A
9 – Cleveland Rd (US 6) & Rye Beach Rd	AM	A	B	B	B	B
	PM	A	B	B	B	A
10 – Rye Beach Rd & SR 2 WB Ramps	AM		A	A	A	A
	PM		A	A	A	A
11 – Rye Beach Rd & SR 2 EB Ramps	AM	B		A	A	A
	PM	C		B	A	B
15 - Cleveland Rd (US 6) & Perkins Ave	AM	A	A	A		A
	PM	A	A	B		A
17 - Cleveland Rd (US 6) & Camp Rd	AM	A	A	A	A	A
	PM	A	A	A	A	A

Signal Warrant Analysis

Signal warrant analyses were performed for the twelve (12) existing signalized intersections along Cleveland Road (US 6), Rye Beach Road, and Milan/Sycamore Line Rd (US 250) as noted in **Table 31**. In addition, two (2) existing two-way stop-controlled (TWSC) intersections along US 6 at Perkins Avenue and US 6 at Camp Road were evaluated as a check to determine if signal warrants were met. Although the two locations met warrants, signalized is not recommended given their more rural setting and close proximity to the railroad tracks, given that other more desirable design solutions have been identified through our alternatives evaluation process. The analyses were performed using the PC-Warrants version 1.23.1 software, in accordance with the Ohio Manual of Uniform Traffic Control Devices (OMUTCD) and ODOT’s Traffic Engineering Manual (TEM). ODOT’s standard right turn reduction factors were applied within the PC-Warrants software based on the side street lane configurations. At least one OMUTCD signal warrant must be met to justify retention of traffic signal control. The analyses were performed using existing lane configurations on the major and minor street approaches. Additionally, the speed reduction criteria were applied accordingly where the posted speed limit on Cleveland Road (US 6) is 35 MPH from Sycamore Line to Remington Avenue and exceeds 40 MPH from Sandusky Corporation Limit east to Rye Beach Road. The speed limit on Sycamore Line (US 250)/Milan Road/Butler Road is posted 35 MPH. The 2018 traffic counts were used in these analyses. The findings are as presented in **Table 31**.

Table 31: Year 2018 Signal Warrant Analysis Summary – Existing Signalized Intersections

Intersection	Warrant 1 8-Hour Warrant		Warrant 2 4-Hour Warrant		Warrant 3 Peak Hour Warrant		Warrant Met?	
	YES	NO	YES	NO	YES	NO	YES	NO
1 - Cleveland Rd (US 6) & Sycamore Line	✓		✓		✓		✓	
2 - Cleveland Rd (US 6) & Avondale / McKinley St		✓		✓		✓		✓
3 - Cleveland Rd (US 6) & Butler St		✓		✓	✓*		✓	
4 - Milan Rd (US 250) & Butler St		✓		✓		✓		✓
5 - Cleveland Rd (US 6) & Cowdery St		✓		✓		✓		✓
6 - Cleveland Rd (US 6) & Cedar Point Dr	✓		✓		✓		✓	
7 - Cleveland Rd (US 6) & Harbour Pkwy		✓		✓		✓		✓
8 - Cleveland Rd (US 6) & Remington Ave	✓		✓		✓		✓	
9 - Cleveland Rd (US 6) & Rye Beach Rd	✓		✓		✓		✓	
10 - Rye Beach Rd & SR 2 WB Ramps	✓		✓		✓		✓	
11 - Rye Beach Rd & SR 2 EB Ramps		✓	✓		✓		✓	
12 - Sycamore Line (US 250) & Milan Rd		✓	✓		✓		✓	

* volume criteria is met but marginal on delay based on one-lane approach on minor street

It is noted that per Cedar Point Sports Park Phase 2 TIS (Revised August 24, 2018) by Osborn Engineering, a signal is warranted at the proposed West Access Drive at Sports Force along US 6.

In conclusion, Warrant 1, an eight-hour traffic volume-based warrant was satisfied at:

- ▶ 1 – Cleveland Road (US 6) & Sycamore Line
- ▶ 6 – Cleveland Road (US 6) & Cedar Point Drive
- ▶ 8 – Cleveland Road (US 6) & Remington Avenue
- ▶ 9 – Cleveland Road (US 6) & Rye Beach Road
- ▶ 10 – Rye Beach Road & SR 2 WB Ramps
- ❖ 15 – Cleveland Road (US 6) & Perkins Avenue (TWSC)
- ❖ 17 – Cleveland Road (US 6) & Camp Road (TWSC)

Warrant 2, the four-hour warrant was satisfied at:

- ▶ 1 – Cleveland Road (US 6) & Sycamore Line
- ▶ 6 – Cleveland Road (US 6) & Cedar Point Drive
- ▶ 8 – Cleveland Road (US 6) & Remington Avenue
- ▶ 9 – Cleveland Road (US 6) & Rye Beach Road
- ▶ 10 – Rye Beach Road & SR 2 WB Ramps
- ▶ 11 – Rye Beach Road & SR 2 EB Ramps
- ▶ 12 – Sycamore Line (US 250) & Milan Road
- ❖ 15 – Cleveland Road (US 6) & Perkins Avenue (TWSC)
- ❖ 17 – Cleveland Road (US 6) & Camp Road (TWSC)

Warrant 3, the peak hour warrant was satisfied at:

- ▶ 1 – Cleveland Road (US 6) & Sycamore Line
- ▶ 3 – Cleveland Road (US 6) & Butler Street
- ▶ 6 – Cleveland Road (US 6) & Cedar Point Drive
- ▶ 8 – Cleveland Road (US 6) & Remington Avenue
- ▶ 9 – Cleveland Road (US 6) & Rye Beach Road
- ▶ 10 – Rye Beach Road & SR 2 WB Ramps
- ▶ 11 – Rye Beach Road & SR 2 EB Ramps
- ▶ 12 – Sycamore Line (US 250) & Milan Road
- ❖ 15 – Cleveland Road (US 6) & Perkins Avenue (TWSC)
- ❖ 17 – Cleveland Road (US 6) & Camp Road (TWSC)

It should be noted that Warrant 3 was conditionally met for location 3 (US 6 and Butler Street). This intersection experiences a surge in traffic demand during peak periods, particularly around the opening of Cedar Point Amusement Park in the morning. The intersection marginally meets the criteria for this warrant so further evaluation may be necessary in the future should it be desired to keep Butler Street open under traffic signal control. Due to the presence of reversible lanes at this intersection, Butler Street lane configurations were analyzed separately to replicate operations during the AM and PM time periods.

The following intersections did not meet any of the volume-based traffic signal warrants based on the full 100% criteria.

- ▶ 2 – Cleveland Road (US 6) & Avondale Street/McKinley Street (City of Sandusky)
- ▶ 4 – Milan Road (US 250) & Butler Street (City of Sandusky)
- ▶ 5 – Cleveland Road (US 6) & Cowdery Street (City of Sandusky)
- ▶ 7 – Cleveland Road (US 6) & Harbour Parkway (City of Sandusky)

The locations were also re-evaluated using the 70% threshold criteria per the guidance in the ODOT Traffic Engineering Manual. The 70% threshold analysis produced the same outcome with each of these locations falling short of meeting either of the three volume-based warrants. Retention or removal of these four signals is the responsibility of the maintaining agency (City of Sandusky). Any decisions regarding future traffic control at these locations should be based on a signal removal study and should also take into account potential changes in traffic volumes resulting from the implementation of access management recommendations.

Signal control is justified to be retained at the other eight existing signalized locations. The retention of these eight signals shall be the responsibility of the maintaining agency in the respective jurisdictions as indicated below:

- ▶ 1 – Cleveland Road (US 6) & Sycamore Line (City of Sandusky)
- ▶ 3 – Cleveland Road (US 6) & Butler Street (City of Sandusky)
- ▶ 6 – Cleveland Road (US 6) & Cedar Point Drive (City of Sandusky)
- ▶ 8 – Cleveland Road (US 6) & Remington Avenue (City of Sandusky)
- ▶ 9 – Cleveland Road (US 6) & Rye Beach Road (Huron Township/City of Huron)
- ▶ 10 – Rye Beach Road & SR 2 WB Ramps (Huron Township/City of Huron)
- ▶ 11 – Rye Beach Road & SR 2 EB Ramps (Huron Township/City of Huron)
- ▶ 12 – Sycamore Line (US 250) & Milan Road (City of Sandusky)

Although the following two locations in Perkins Township met warrants, other more desirable design solutions have been identified through our alternatives evaluation process therefore a signal option is not recommended at:

- ❖ 15 – Cleveland Road (US 6) & Perkins Avenue (TWSC)
- ❖ 17 – Cleveland Road (US 6) & Camp Road (TWSC)

Copies of the PC-Warrants output reports are included in [Appendix K](#).

Turn Lane Warrants and Length Calculations

The warrant analyses were based on the ODOT L&D, Vol. 1. The turn lane warrant worksheets are provided in [Appendix L](#).

Turn lane warrant analyses were performed for the intersections along Cleveland Road (US 6) that did not meet any signal warrants. Turn lane warrant analyses were performed using 2018 traffic volumes to determine if a left or right turn lane is warranted. These intersections in the City of Sandusky are:

- ▶ 2 – Cleveland Road (US 6) & Avondale Street/McKinley Street
- ▶ 4 – Milan Road (US 250) & Butler Street
- ▶ 5 – Cleveland Road (US 6) & Cowdery Street
- ▶ 7 – Cleveland Road (US 6) & Harbour Parkway

The two-lane and four-lane left/right turn lane warrant for low speed roadways (≤ 40 mph) was evaluated and is shown in **Table 32**. It is important to note that although Harbour Parkway and US 6 intersection does not meet a signal warrant, it does meet an eastbound left turn lane warrant under the four-lane roadway scenario. Furthermore, since the critical left turn volume was only 25 vehicles in the design hour

volume (DHV), it was concluded that the volume was negligible and the impacts to add a left turn lane would outweigh the use therefore it is not recommended.

Table 32: Turn Lane Warrants – City of Sandusky Intersections

Intersection	Movement	Warrant Met?
2 – Cleveland Rd (US 6) & Avondale / McKinley St	EBR	No
	WBR	No
4 – Milan Rd (US 250) & Butler St	SBR	No
5 – Cleveland Rd (US 6) & Cowdery St	EBL (2L)	Yes
	EBL (4L)	Yes
	EBR (4L)	No
	WBL (4L)	No
	WBR (4L)	No
7 – Cleveland Rd (US 6) & Harbour Pkwy	WBR	No
	EBR	No
	WBL	No
	EBL	Yes

Turn lane warrant analyses were also performed for selected intersections in Huron Township. These are the intersections at Cleveland Road (US 6) and Camp Road (#15) and Cleveland Road (US 6) and Perkins Avenue (#17). The two-lane left or right turn lane warrant for high speed roadway (>40 mph) was evaluated and is shown in **Table 33** below.

Table 33: Turn Lane Warrants – Huron Township Intersections

Intersection	Movement	Warrant Met?
15 – Cleveland Rd (US 6) & Camp Rd	WBL	Yes
	EBR	Yes (PM)
17 – Cleveland Rd (US 6) & Perkins Ave	WBL	Yes
	EBR	Yes

Turn lane lengths were calculated at the study intersections based on ODOT standards using the design year (2043 Build) traffic volumes. **Table 34**, **Table 35**, and **Table 36** provides the summary of the critical design hour volume (DHV), design speed, required turn lane length based on 2043 traffic volumes, and proposed turn lane length in feet. The turn lane length calculation worksheet is provided in [Appendix L](#). These results are based on the Build/Mitigated Alternative geometry. The through lane back up has also been computed and shown in blue text in the table. Given the long queue lengths in the through lanes (relative to the turn lane storage requirements), the no block condition was not typically accommodated.

Table 34: Turn Lane Length Summary – 2043 Condition with Butler Street Closure in City of Sandusky (Signalized Intersections)

Intersection	Critical DHV	Design Speed (MPH)	Required* Turn Lane Length	Existing Available Turn Lane Length
US 6 at Sycamore Line				
Eastbound Through Backup	367	35	475 ft	
Westbound Left Turn Lane	308	35	450 ft	200 ft
Westbound Through Lane Backup	363	35	475 ft	
Northbound Left Turn Lane	56	35	150 ft	120 ft
Northbound Through Lane Backup	485	35	600 ft	
Southbound Left Turn Lane	87	25	200 ft	115 ft
Southbound Through Lane Backup	187	25	275 ft	
US 6 at Remington Street				
Eastbound Left Turn Lane	23	35	100 ft	150 ft
Eastbound Through Backup	648	35	600 ft	
Eastbound Right Turn Lane	195	35	250 ft	
Westbound Left Turn Lane	100	35	200 ft	120 ft
Westbound Through Lane Backup	708	35	625 ft	
Northbound Left Turn Lane	183	25	250 ft	200 ft
Northbound Through Lane Backup	211	25	250 ft	
Southbound Through Lane Backup	97	25	150 ft	

* Calculated based on ODOT L&D Manual (includes 50-foot taper).

Through lane backup is shown per lane under 'Required Turn Lane Length' Column

Table 35: Turn Lane Length Summary – 2043 Cleveland Road (US 6) Perkins and Huron Township (Unsignalized Intersections)

Cleveland Road (US 6) @	Critical DHV	Design Speed (MPH)	Required* Turn Lane Length	Existing Available Turn Lane Length
Perkins Avenue				
Eastbound Left Turn Lane	106	60	345 ft	
Westbound Left Turn Lane	205	60	360 ft	
Camp Road				
Eastbound Left Turn Lane (**)	4	60	345 ft	
Eastbound Right Turn Lane	74	60	345 ft	
Westbound Left Turn Lane	119	50	245 ft	

* Calculated based on ODOT L&D Manual (includes 50-foot taper).

Based on L&D Manual the maximum length should be 800 feet for a right turn lane and 600 feet for a left turn lane.

** EBLT lane not warranted but recommended for opposing WBLT and safety reasons

Table 36: Turn Lane Length Summary – 2043 Rye Beach Road in Huron Township and City of Huron (Signalized Intersections)

Rye Beach Road @	Critical DHV	Design Speed (MPH)	Required* Turn Lane Length	Existing Available Turn Lane Length
Cleveland Road (US 6)			(see notes 1 & 2)	
Eastbound Left Turn Lane	22	50	225 ft	230 ft
Eastbound Right Turn Lane	872	50	1120 ft	140 ft (+)
Eastbound Through Lane Backup	372	50	475 ft	
Westbound Left Turn Lane	148	35	250 ft	175 ft
Westbound Through Lane Backup	237	35	325 ft	
Northbound Left Turn Lane	1052	35	675 ft / 625 ft	175 ft (+)
Northbound Through Lane Backup	32	35	100 ft	
Southbound Left Turn Lane	8	25	100 ft	140 ft
Southbound Through Lane Backup	20	25	50 ft	
SR 2 WB Ramps			(see notes 3 & 4)	
Southbound Left Turn Lane	797	50	562.5 ft / 482.5 ft	245 ft
Southbound Through Lane Backup	310	50	325 ft	
SR 2 EB Ramps			(see notes 5 & 6)	
Westbound Right Turn Lane	997	35	1145 ft	480 ft
Westbound Through Lane Backup	72	35	150 ft	

* Calculated based on ODOT L&D Manual (includes 50-foot taper).

Based on L&D Manual the maximum length should be 800 feet for a right turn lane and 600 feet for a left turn lane.

Through lane backup is shown per lane under 'Required Turn Lane Length' Column

(+) storage distance continues since existing lane is a thru lane which drops into a right turn lane

Notes:

- 1) NB/LT required storage lengths exceed the existing intersection spacing of approximately 610 feet (measured from stop bar to stop bar)
- 2) EB/RT required storage lengths exceed ODOT's L&D value of 800 feet for right turn lane, however, providing an EB overlap phase mitigates this issue
- 3) Rye Beach Rd SB posted speed is 45 MPH in the Huron Township; NB posted speed is 35 MPH in City of Huron.
- 4) Existing SBLT storage distance is based on a single left turn lane
- 5) Per Office of Roadway Engineering, calculation based on storage only, decel assumed to occur prior to exit gore
- 6) WB/RT storage available on existing ramp is 1170 feet measured from stop bar to painted nose (theoretical gore point) or 865 feet to physical nose

Access Management

Following guidance from State Highway Access Manual (SHAM) and ODOT L&D Vol. I, existing driveways were analyzed along the study corridor. Observations were made regarding property access and business operation status and traffic circulation. In addition, as discussed previously in the Crash/Safety Analysis section, access management modifications were also proposed based on existing crash types and locations. Proposed combination or shared access driveways were identified and shown in the access management exhibit boards presented at the second public involvement meeting (see the **Public Involvement & Meetings** section and [Appendix N](#) for the full exhibits). Commercial drive widths should be 35 feet maximum while residential drive widths are 12 feet for a single driveway or up to 24 feet if two driveways are combined. Other recommendations include converting existing drives to a Right In/Right Out configuration, potential/full closure, proposed/reconstructed drives by others, converting abandoned drives to a two-way standard commercial drive when redeveloped, installing delineators to prohibit movements/access, redefining wide open driveways/curb cuts to standard design, and restriping existing

parking configurations to enhance traffic flow and increase safety. It should be noted that the existing north drive at Barnes Nursery should be shifted to align opposite Camp Road for safety and traffic improvements, subject to the actual placement and configuration of the improved intersection. Also, proposed delineators should be placed along the south leg of US 6 and Rye Beach Road on the double yellow centerline marking to prohibit vehicles entering/exiting the existing driveway of the Shell gas station. This will effectively convert the access drive to Right In/Right Out only.

Environmental Analysis

Background research was conducted at the desktop level utilizing several environmental databases to identify known environmental conditions/resources. There is the potential for previously undocumented environmental resources within the study corridor, and identification of these resources will result from field studies conducted once preferred alternatives are developed in later phases of the transportation project. A summary of known resources is presented below.

The residential structures located along the western portion of the study area (near Sandusky) will need to be evaluated for historical significance, or possible inclusion on the National Register for Historic Places (NRHP) once the project has been further defined. A database at the Ohio Historic Preservation Office has recorded information on file.

Located adjacent to the current roadway on the eastern and central portions are several parks and nature preserves such as East Sandusky Bay MetroPark which consists of Sheldon Marsh, Putnam Marsh Nature Preserve, Joseph Steinen Wildlife Area, Eagle Point Park and the Wyandot Wetland Meadows Preserve; and Osborn Metro Park and Osborn Metropolitan Recreation area. These parks will need to be evaluated for the presence of ecological resources, endangered species habitat, and for Section 4(f) impacts. Since the Osborn Metro Park received funding from the National Park Service Land and Water Conservation fund, it will also need to be evaluated for Section 6(f) impacts once the project has been defined.

Due to the proximity of Lake Erie, numerous streams and culverts are located throughout the study area. There are some trees that may be considered suitable habitat (roosting or maternity trees) for the Indiana and Northern Long-eared Bat, especially near the parks and preserves listed above. Sites requiring strip right of way or full parcel takes will also need to be evaluated for petroleum contaminated soil. These sites include the service stations such as Shell and Marathon, automotive dealers and maintenance sites (Norcross Automotive) and former service stations such as Jack's Deli/Red Gable Mesquite Grill, which still has evidence of former pump islands adjacent to the existing right of way. There are some former service stations, that are now vacant or demolished, located throughout the corridor that will be further studied once the project has been defined.

Underserved Populations

A review of the existing environmental conditions found that there are low income populations at 60% on the east side of the project near US 6 and Rye Beach Road and on the west side at 57% on the south side of US 6 from US 250 to Cedar Point Drive. There are also minority populations at 57% on the south side of US 6 from US 250 to Cedar Point Drive and 60% on the north side of US 6 from US 250 to Cedar Point Drive. Minority populations are concentrated on the western portion of the study area. Elderly populations (over the age of 64) are located in the central and eastern portions of the study area.

See [Appendix M](#) for the environmental exhibits.

Public Involvement & Meetings

A public involvement plan was prepared and uploaded to Environet. The plan defined a stakeholder group and outlined an approach to updating this group through a series of three (3) stakeholder meetings. The plan also proposed holding two (2) open-house public meetings to gather input from the public. Summaries of those meetings are presented below. The project team used stakeholder and public comments received from the earlier meetings to help generate the preliminary alternatives; these alternatives were presented at the later meetings and further refined from comments received from those meetings.

Stakeholder Meeting #1 was held May 24, 2018 in Sandusky, Ohio, and the notice, agenda, sign-in sheet and presentation have been uploaded to Environet. The purpose of the meeting was to introduce the project to the stakeholder group, outline the study process, and gather preliminary feedback related to transportation issues/challenges in the corridor. The meeting consisted of a presentation followed by a facilitated break-out discussion. The break-out groups were divided based on geography/municipality and focused on three segments of the corridor, after which the group reconvened and the discussion in each break-out was presented to the group at large.

Stakeholder Meeting #2 was held October 25, 2018 in Sandusky, Ohio, and the notice, sign-in sheet and meeting exhibits have been uploaded to Environet. The purpose of the meeting was to present results of preliminary traffic and environmental study, in the form of traffic counts, crash analyses, and preliminary environmental review (screening). The meeting consisted of a presentation followed by an open discussion/comment session. Exhibits for the public involvement meeting were also presented to the stakeholder group.

Public Meeting #1 was held October 25, 2018 at Castaway Bay in Sandusky, Ohio, and the notice, sign-in sheet, meeting exhibits and comment forms have been uploaded to Environet. The purpose of the meeting was to introduce the project to the public, present the preliminary results of traffic and environmental studies, and obtain feedback on the transportation issues, challenges and opportunities within the corridor. The meeting was attended by 61 individuals and the project team received 45 written comments. While the comment forms have been uploaded to Environet, the following section summarizes the comments.

The primary concerns listed include: intersection congestion, safety, emergency services access, availability of pedestrian services such as walks and bike paths, and heavy traffic flow due to limited lane availability. The primary intersections of concern include the intersections of US 6 with Rye Beach Road, Camp Road, Perkins Road, Elizabeth Street, Pipe Street, and Cedar Point access drives. These intersections were mentioned forty-five (45) times on the comment sheets. Congestion and heavy traffic along US 6 were mentioned twenty-five (25) times on the comment sheets. Another concern mentioned three times was the timeliness of emergency services to the homeowners along US 6 and in adjoining neighborhoods.

Suggestions were collected for how to improve the current US 6 corridor. Among these suggestions, the addition of pedestrian crossings and bike paths were mentioned 7 times. Additional lanes along US 6 including center turn lanes were mentioned 9 times. A current concern is the lack of signage along US 6 directing traffic to Cedar Point and to major highways was mentioned 4 times. Another common concern was the access from homes and apartment complexes onto US 6.

A summary of the comments received is included in **Table 37** below.

Table 37: Public Meeting I – Summary of Comments

Comment	Number of Comments
Concerns with Intersections	
Perkins Road & US 6	12
Rye Beach Road & US 6	11
Camp Road & US 6	11
Elizabeth Drive & US 6	3
Pipe Street & US 6	3
Cedar Point access drives on US 6	3
Other	3
Concerns in the Study Area (Checkboxes on Comment Sheet)	
Congestion	22
Access Management	8
Crashes	8
Aesthetics	3
Additional Concerns in the Study Area	
More lanes/Center lane/Turn lane	9
Pedestrian/Sidewalk/Crosswalk/Bike	7
Lighting and signage	4
Congestion/Heavy traffic	3
Emergency Services Access	2
Train/rail tracks	2

Stakeholder Meeting #3 was held May 23, 2019 in Sandusky, Ohio, and the notice, sign-in sheet, presentation and exhibits have been uploaded to Environet. The purpose of the meeting was to update stakeholders on the progress of the study and to present potential alternatives and other recommended improvements for addressing multi-modal mobility and safety deficiencies within the study area. The meeting consisted of a presentation followed by an open discussion/comment session. Preliminary exhibits for the public involvement meeting were also presented to the stakeholder group.

Public Meeting #2 was held July 16, 2019, at the Erie County Services Complex in Sandusky, Ohio, and the notice, sign-in sheet, presentation, exhibits and comment forms have been uploaded to Environet. The general public, residents, business and property owners, and public officials were invited to the meeting to view exhibits on the proposed alternatives and to provide comments on improvement alternatives. A brief presentation about the project was made at the beginning of the meeting. Materials from the meeting (PDF copies of the presentation, display boards, and comment form) were posted on ERPC’s website after the meeting.

A comment form was available at this meeting, and attendees were given the opportunity to fill out a comment form at the meeting or send it in within 30 days. The comment forms asked for attendees’ thoughts on the proposed recommendations for sidewalks/multi-use paths, driveways/access management, and roadway/intersections, as well as other thoughts on the project in general. Ten comments were

received by the project team by the end of the public comment period, including two from business owners in the area and two from local government employees and representatives.

Comments received were generally supportive of the proposed recommendations. Many respondents were supportive of adding sidewalks and multi-use paths in the project area, and some respondents indicated the need to keep these facilities separated from the roadway. Respondents also commented on the proposed recommendations to the Perkins Avenue and US 6 intersection, noting that the alignment of the intersection needs to be improved and that a grade separation over the railroad tracks would be safer. One of the comments received during the public comment period included a petition in support of the project and the addition of the eastbound turn lane at the Sawmill Creek Drive and Cleveland Road (US 6) intersection, leading to the Sawmill Creek Resort; this petition was signed by 206 people. Comments received from business owners in the area expressed the importance of maintaining appropriate access to businesses (for patrons and vehicles associated with the business) with the proposed access management and intersection improvements.

A summary of the comments received is included in **Table 38** below.

Table 38: Public Meeting 2 – Summary of Comments

Comment	Number of Comments
Comments on Sidewalk/Multi-use Path Recommendations:	
Supportive	5
Should be separated from roadway	2
Consider pedestrian/bicycle interactions at roundabouts	1
Don't support if they impact businesses	1
Include pull-offs for buses/transit	1
Comments on Driveway/Access Management Recommendations:	
Supportive	1
Understand the need for improvements, but make sure necessary access for businesses is maintained	1
Comments on Roadway/Intersection Recommendations:	
Supportive (in general)	2
Cleveland Road/US 6 and Butler Street need to be repaved	1
Understand the need for improvements, but make sure appropriate access for businesses is maintained during construction and in final design	1
Butler – Support closing Butler	1
Butler – Impacts of closing the street need to be studied further	1
Perkins & US 6 – This should be the first intersection improved	1
Perkins & US 6 – Don't support the proposed improvements (due to property impacts)	1
Perkins & US 6 – Recommend Perkins dead-ended before US 6 and traffic be routed elsewhere (i.e. Remington)	1
Perkins & US 6 – Prefer grade separation option over roundabout option	1
Perkins & US 6 – Intersection needs to be better aligned	1
Perkins & US 6 Roundabout – Concern about interaction between trains and vehicles waiting to enter roundabout	1
Perkins & US 6 – Dead-end Perkins at Osborn Park	1
Camp & US 6 – Intersection is dangerous	1

Comment	Number of Comments
Camp & US 6 – Support roundabout if appropriate business access is provided, large vehicles are accounted for in roundabout design, and traffic backup from the railroad crossing is considered	1
Camp & US 6 – Intersection upgrade (Alternative D2) is an improvement from the existing configuration	1
Sawmill Creek & US 6 – Support eastbound turn lane	206
Sawmill Creek & US 6 – Concerned traffic turning into Sawmill Creek Resort will backup (in both directions)	1
Additional Comments:	
Consider impacts to Erie Metro Parks	1

See [Appendix N](#) for the complete meeting information and graphics.

Alternatives Analysis

The following section provides a description of the proposed alternatives to mitigate the roadway geometric and capacity deficiencies as well as intersection traffic control and operational improvements required to meet acceptable level of service and increase safety throughout the study area. Alternatives have been recommended by location throughout the study area and can be done independently or in conjunction with alternatives at other locations in the study area. A planning level cost estimate for each alternative follows the discussion of alternatives. Detailed design was not performed for this level of preliminary analysis, but all alternatives should be built to current design standards. ODOT design criteria were followed in the development of the feasible alternatives presented herein.

Consideration was given to reduce right-of-way impacts, parcel/ownership and land use when developing conceptual layout for the various alternatives. See [Appendix O](#) for a map of the existing parcels and right of way in the study area as well as graphics of the alternatives.

Proposed Alternatives

Cleveland Road (US 6), Sycamore Line (US 250), and Milan Road (US 250)

The proposed improvements in the City of Sandusky limits along the Cleveland Road (US 6), Sycamore Line (US 250), and Milan Road (US 250) corridors (**Alternative A**) recommend signal modernization at the Cleveland Road (US 6)/Sycamore Line (US 250), Sycamore Line (US 250)/Milan Road (US 250), Cleveland Road (US 6)/Cedar Point Drive, and Cleveland Road (US 6)/Remington Avenue intersections; a summary of the specific recommendations is described below. An additional alternative for the Cleveland Road (US 6)/Cedar Point Drive intersection is detailed in the “Cedar Point Drive and Cleveland Road (US 6) intersection” section below. It also identified the locations of unwarranted signals and that further study to determine whether the signal should be retained for other engineering or safety reasons or be removed. For instance, if the proposed access management solutions are implemented for the closure of driveways to Castaway Bay along US 6, the access changes will divert additional traffic to the existing signal at Harbour Parkway, potentially altering the outcome of the signal warrant analysis. The four locations currently not meeting signal warrants are:

- ▶ 2 – Cleveland Road (US 6) & Avondale Street/McKinley Street (City of Sandusky)

- ▶ 4 – Milan Road (US 250) & Butler Street (City of Sandusky)
- ▶ 5 – Cleveland Road (US 6) & Cowdery Street (City of Sandusky)
- ▶ 7 – Cleveland Road (US 6) & Harbour Parkway (City of Sandusky).

Additional recommendations include pavement restriping at the intersections with proposed work, the removal of the reversible lane on Butler Street (additional information on the recommendations for Butler Street are detailed in the “Butler Street” section below), and the addition of an eastbound right turn lane on Cleveland Road (US 6) at the Remington Avenue intersection in the City of Sandusky. Based on the preliminary planning level cost estimates (detailed for all alternatives in **Table 39** below), the total cost associated with this project is approximately \$1,675,000.

Alternative A Summary of Improvements:

Cleveland Road (US 6) & Sycamore Line (Intersection #1)

- ▶ Lengthen SB left turn lane from 140 feet to 200 feet.
- ▶ Lengthen WB left turn lane from 220 feet to 450 feet.

Cleveland Road (US 6) & Butler Street (Intersection #3)

- ▶ Remove reversible lanes.

Cleveland Road (US 6) & Cedar Point Drive (Intersection #6)

- ▶ Modify existing SB lane use to provide one left turn lane and one right turn lane.
- ▶ Remove changeable lane EB to provide one left turn lane and one through lane.
- ▶ Recommend relocating the existing advance Cedar Point farther east to Cedar Point Road.

Cleveland Road (US 6) & Remington Avenue (Intersection #8)

- ▶ Provide WB and NB protected and permitted left turn phases.
- ▶ Provide 250-foot EB right turn lane.
- ▶ Lengthen WB left turn lane from 120 feet to 200 feet.

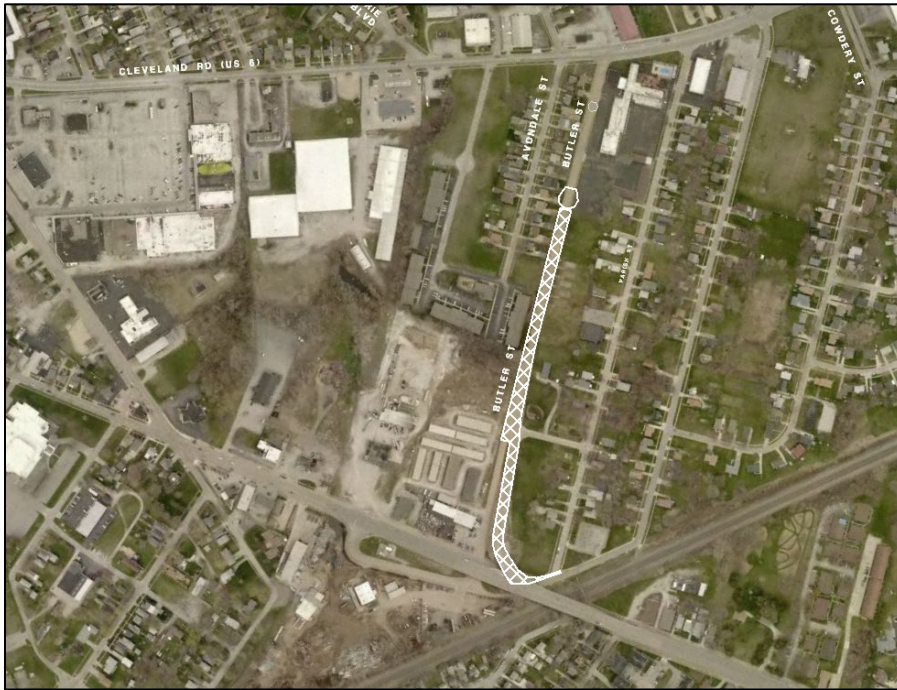
Butler Street

Two primary alternatives are being proposed for Butler Street. **Alternative A1** recommends that Butler Street remain open and the signal at Cleveland Road (US 6) be upgraded, as signal warrants would be met under this Alternative. In order to keep the street open and in a state of good repair, this Alternative would also require the total pavement replacement on Butler Street, as the existing pavement has reached the end of its useful life. This Alternative proposes maintaining the existing US 250 ramp pavement. The cost of this Alternative is estimated to be \$2.94 million and no additional right of way is anticipated for this Alternative.

Alternative A2 recommends Butler Street be closed with a cul-de-sac south of the existing driveways to maintain access to these properties from the north off of the existing intersection with US 6 (see **Figure 28**). The existing signal at Cleveland Road (US 6) would be removed and not replaced, due to the large decrease in Butler Street traffic volume as a signal would no longer be warranted. Stop sign control would be proposed for Butler Street. The US 250 ramp connection to Butler Street would also be removed. Since US 250 has a median barrier, full closure of Butler Street (and its ramp from US 250) would remove direct access from US 250 WB to the neighborhood to the northeast (including Parrish Street and Huntington Avenue) as well as Sandusky Steel & Supply Co. This would essentially require all inbound and outbound traffic to Sandusky Steel & Supply Co. to enter from the west and exit to the east

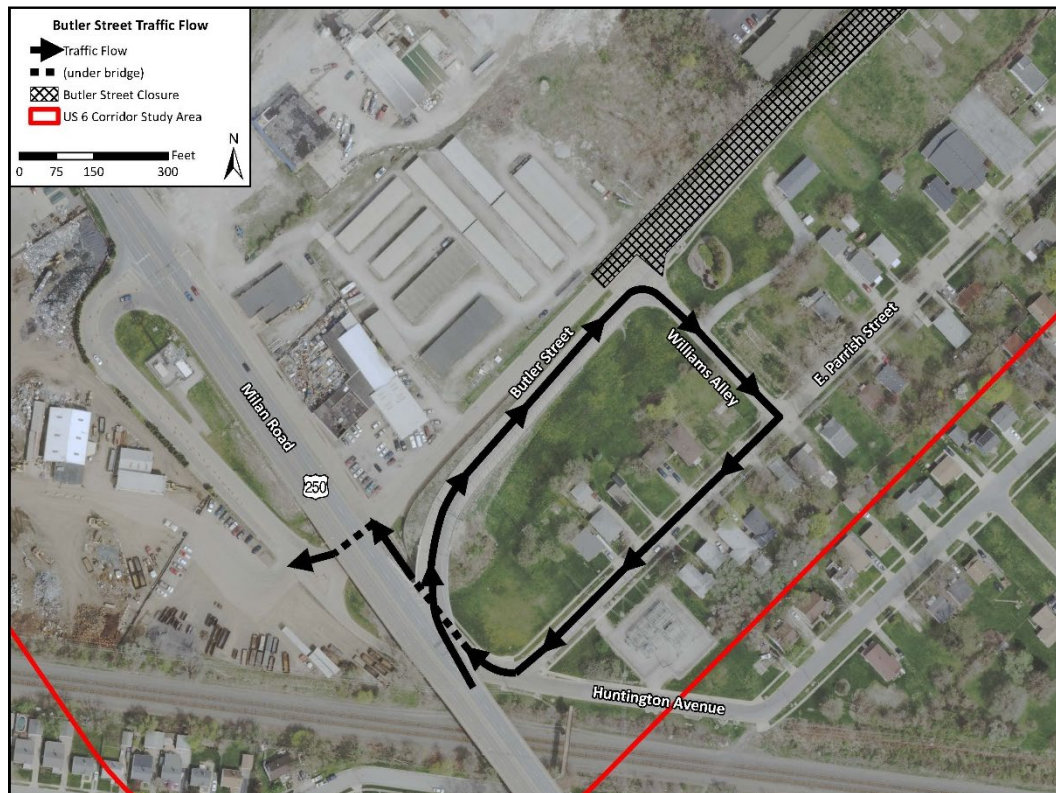
(right-in/right-out). Sandusky Steel & Supply Co. is located immediately north of the railroad tracks and southwest of the connector road running alongside US 250.

Figure 28: Butler Street Alternative A2



A variation of Alternative A2 would be to close Butler Street to through traffic while keeping the ramp open from US 250 westbound (see **Figure 29**). The ramp would only allow access to Williams Alley (located at the bottom of the ramp), which connects Butler Street to Parish Street. By maintaining this connection, it allows inbound traffic to continue accessing Sandusky Steel & Supply Co. from the east; however, outbound traffic would still only be able to head west on US 250. Either variation of Alternative A2 is expected to cost approximately \$90,000, with an additional \$5,000 in right of way costs for construction of the cul-de-sac; for a total project cost for Alternative A2 estimated to be \$95,000.

Figure 29: Butler Street Alternative A2 Variation and Traffic Flow



Based on the traffic analysis performed for this Feasibility Study, either option Alternative A1 (Butler Street remains open) or Alternative A2 (Butler Street closed) will accommodate the anticipated traffic in the design year on the primary routes in the vicinity of this roadway segment, including diverted traffic along US 250, Sycamore Line and US 6 (Cleveland Avenue) under the Butler Street “closed” scenario. All things being equal, project cost will most likely be a prudent contributing factor in recommending which Alternative to advance to design. It should be noted that there was no stakeholder or public feedback, to date, that was persuasive to choose one alternative over the other. The final decision regarding the recommended Butler Street alternative will be the responsibility of the City of Sandusky.

Cedar Point Drive and Cleveland Road (US 6) intersection

The proposed improvements in the City of Sandusky limits at the Cedar Point Drive and Cleveland Road (US 6) intersection both recommend the construction of a modern roundabout at the intersection. **Alternative B1** recommends an eastern alignment for the roundabout while **Alternative B2** recommends a western alignment (see **Figure 30** and **Figure 31**). Preliminary planning level cost estimates for these alternatives are almost the same, with the eastern alignment (Alternative B1) costing approximately \$1,910,000 and the western alignment (Alternative B2) costing approximately \$1,915,000.

Alternative B1 Summary of Improvements:

Cleveland Road (US 6) and Cedar Point Drive (Intersection #6)

- ▶ Multilane roundabout with 135-foot Inscribed Circular Diameter (ICD).

- ▶ Only the southern side has two circulating lanes (EB approach).
- ▶ Dedicated left turn lane SB and EB.
- ▶ Dedicated right turn lane WB.
- ▶ Pedestrian accommodations on the northern side of US 6.
- ▶ Impacts existing sign for Cedar Point and off-street parking.
- ▶ Culvert extension and small retaining wall needed on the eastern side of the northern leg to avoid impacting the Castaway Bay waterway.

Alternative B2 Summary of Improvements:

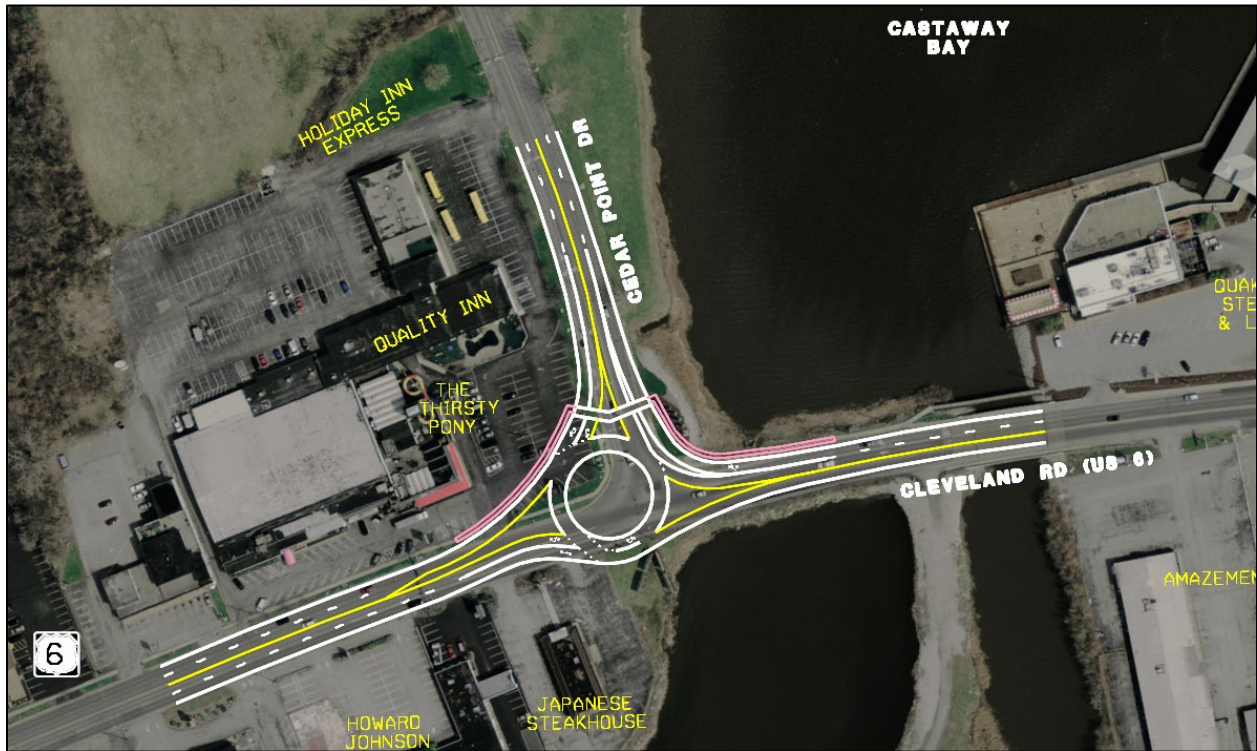
Cleveland Road (US 6) and Cedar Point Drive (Intersection #6)

- ▶ Identical to Alternative B1 with the following exceptions:
 - Center of Roundabout shifted west to minimize impacts to the existing sign for Cedar Point.
 - Additional impacts to the parking lots on the NW and SW corners of the intersection.
 - Culvert extension and retaining wall improvements identified in Alternative B1 would not be required for Alternative B2.

Figure 30: Alternative B1 – Cedar Point Drive Roundabout



Figure 31: Alternative B2 – Cedar Point Drive Roundabout (Shifted West)



Perkins Avenue and Cleveland Road (US 6) intersection

Three alternatives are being proposed in the Perkins and Huron Township limits for the Perkins Avenue and Cleveland Road (US 6) intersection. **Alternative C1** recommends the construction of a modern roundabout at the intersection (see **Figure 32**). **Alternative C2** recommends that Perkins Avenue be realigned at Cleveland Road (US 6) into a new stop-controlled (Perkins Avenue only), at-grade intersection (see **Figure 33**). **Alternative C3** recommends that Perkins Avenue be realigned into a new stop-controlled (Perkins Avenue only) intersection at Cleveland Road (US 6) with a grade-separated bridge over the railroad tracks (see **Figure 34**). Based on preliminary planning level cost estimates, the option to construct a roundabout (Alternative C1) is the lowest cost of the three alternatives at approximately \$2,540,000; the option for an at-grade intersection realignment (Alternative C2) is approximately \$4,750,000 and the grade separated option (Alternative C3) is approximately \$13,660,000.

Alternative C1 Summary of Improvements:

Cleveland Road (US 6) and Perkins Avenue (Intersection #15)

- ▶ Single lane Roundabout with a 150-foot ICD.
- ▶ All single lane approaches.
- ▶ Maintains existing railroad crossing.
- ▶ Avoids Maples Motel buildings.
- ▶ Avoids major impact to utility poles along the north and south side of US 6.
- ▶ Avoids major impact to potential railroad fiber optic lines south side of US 6.

Alternative C2 Summary of Improvements:

Cleveland Road (US 6) and Perkins Avenue (Intersection #15)

- ▶ Turn Lane Warrants met for an exclusive westbound left turn lane (360 feet) and an exclusive eastbound right turn lane (345 feet) on US 6.
- ▶ Avoids major impact to utility poles along the north and south side of US 6.
- ▶ Avoids major impact to potential railroad fiber optic lines south side of US 6.

Alternative C3

Cleveland Road (US 6) and Perkins Avenue (Intersection #15)

- ▶ Intersection Angle no longer deficient.
- ▶ Profile adjustment removes stopping sight distance (SSD) deficiency.
- ▶ No at-grade railroad conflicts.
- ▶ Cost for bridge and wall (construction and maintenance).
- ▶ Large footprint and right-of-way impacts.
- ▶ Railroad coordination required for new crossing point and overhead bridge.
- ▶ Impact to utility poles along the north and south side of US 6.
- ▶ Impact to potential railroad fiber optic lines south side of US 6.

Figure 32: Alternative CI – Perkins Avenue Roundabout



Figure 33: Alternative C2 – Perkins Avenue Realignment

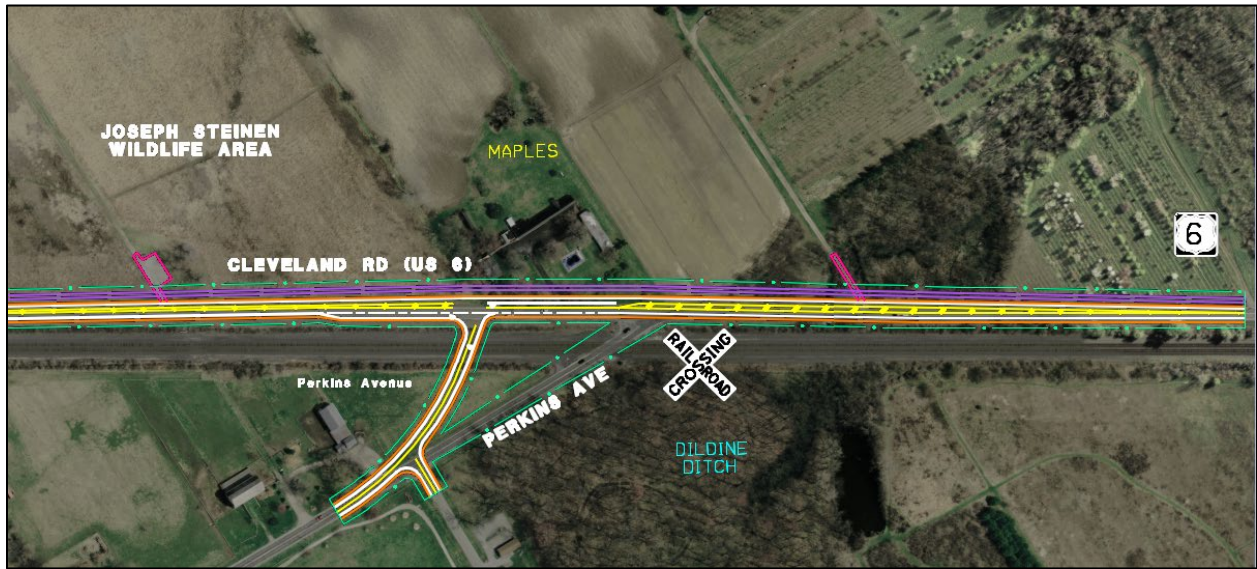


Figure 34: Alternative C3 – Perkins Avenue Grade Separation



Camp Road and Cleveland Road (US 6) intersection

Two alternatives are being proposed for the Camp Road and Cleveland Road (US 6) intersection in the Perkins and Huron Township limits. **Alternative D1** recommends the construction of modern roundabout at the intersection (see **Figure 35**). **Alternative D2** recommends that Cleveland Road (US 6) be widened at the Camp Road intersection and that eastbound and westbound left turn lanes and an eastbound right turn lane be added on Cleveland Road (US 6) at the intersection; the existing stop control

on Camp Road would be maintained (see **Figure 36**). The preliminary planning level cost estimates indicate that the option to widen the intersection (Alternative D2) is slightly lower at approximately \$2,670,000 than the option to construct a roundabout (Alternative D1) at approximately \$3,050,000.

Alternative D1 Summary of Improvements:

Cleveland Road (US 6) and Camp Road (Intersection #17)

- ▶ 165-foot ICD offset to the east of the existing center of intersection.
- ▶ Multi-lane Roundabout with two lanes entering and exiting along US 6 and single lane approaches on Camp Road and the northern driveway.
- ▶ Access management to the commercial properties was investigated. Driveway placement is desired at the roundabout and access management solutions were presented in the second public meeting, which can be found in [Appendix N](#). The solutions included recommendations for closure or modification, but the exact number and location will be determined during the design phase in conjunction with business owner coordination.

Alternative D2 Summary of Improvements:

Cleveland Road (US 6) and Camp Road (Intersection #17)

- ▶ Turn Lane Warrants met for an exclusive westbound left turn lane (245') and an exclusive eastbound right turn lane (345') on US 6.
- ▶ Provide an exclusive eastbound left turn lane (345') to “shadow” warranted westbound left turn and provide access to private business drive to the north. Eastbound left turn length based on high speed deceleration length only is needed (Condition B per L&D Vol. 1).

Figure 35: Alternative D1 – Camp Road Roundabout

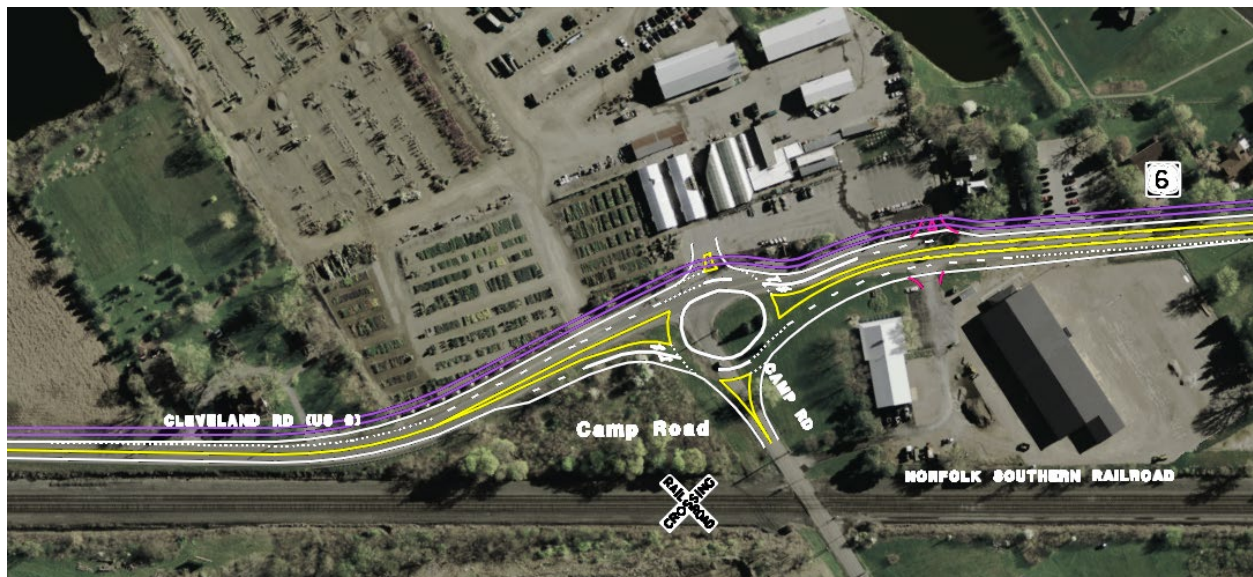
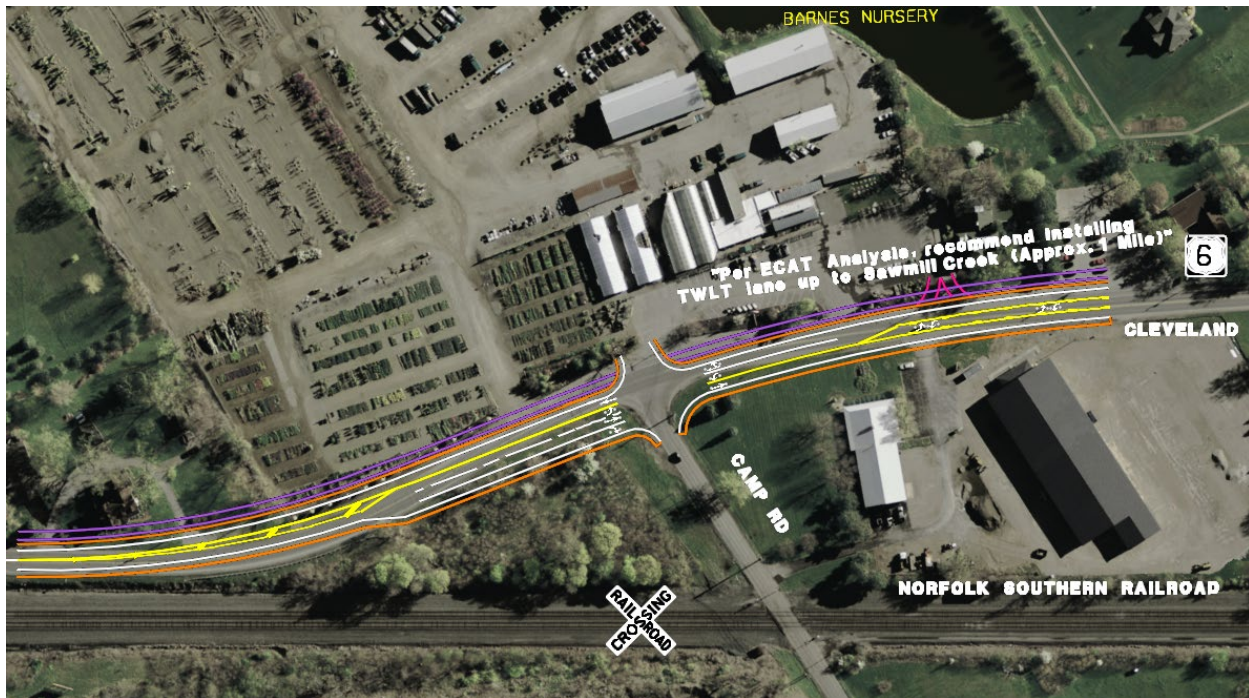


Figure 36: Alternative D2 – Camp Road Widening



Cleveland Road (US 6) between Camp Road and Rye Beach Road

The proposed improvements in the Huron Township and City of Huron limits along Cleveland Road (US 6) between Camp Road and Rye Beach Road (**Alternative E**) recommend widening Cleveland Road (US 6) between Camp Road and Rye Beach Road, adding a center turn lane throughout this corridor and adding a westbound right turn lane at the Sawmill Creek Drive intersection (see **Figure 37**). The preliminary planning level cost estimate for this alternative is approximately \$2,550,000.

Alternative E Summary of Improvements:

Cleveland Road (US 6) and Sawmill Creek Drive

- ▶ Based on the ECAT analysis, it is recommended to provide a TWLTL from the east approach of US 6 at Camp Road to Sawmill Creek Drive (approximately 1 mile). The crash analysis revealed a substantial number of the crashes between Camp Road and Sawmill Creek Drive were rear end or left turning crashes due to stopped traffic. At a minimum, consider installing a TWLTL as shown below in Segment I due to existing site conditions including multiple drives and intersecting side streets.

- Segment 1 – TWLTL ~ 0.5 mile:



- Segment 2 – TWLTL ~ 0.5 mile



Curve East of Sawmill Creek Drive

- ▶ SSD deficient for 45 MPH.
- ▶ Horizontal curve meets 45 MPH.
- ▶ The addition of a westbound right turn lane eliminates the intersection sight distance (ISD) issues to the east for vehicles turning out of Sawmill Creek.
- ▶ Short term countermeasure:
 - Tree removal for seeing stopped vehicles.
- ▶ Long term countermeasure:
 - Bridge widening for proper horizontal stopping sight distance (HSSD).

Figure 37: Alternative E – Sawmill Creek Drive Improvements



Rye Beach Road

Two alternatives are being proposed in the Huron Township and City of Huron limits along Rye Beach Road between Cleveland Road (US 6) and Sawmill Parkway. **Alternative F1** recommends the construction of modern roundabouts along Rye Beach Road at the Cleveland Road (US 6) intersection and at the SR 2 interchange, both the eastbound and westbound ramps (see **Figure 38**). **Alternative F2** recommends signal upgrades, interconnect and pavement restriping along Rye Beach Road from Cleveland Road (US 6) to Sawmill Parkway (see **Figure 39**). The lane configurations that would be needed for Alternative F1 (adding roundabouts) would provide enough additional width on the existing structures to provide pedestrian accommodations; a disadvantage to Alternative F2 (restriping) is that the required lane configurations would not allow enough room on the existing structure to include pedestrian accommodations. Based on preliminary planning level cost estimates, the option to upgrade the signals and pavement along Rye Beach Road (Alternative F2) is approximately \$990,000 while the option to add roundabouts (Alternative F1) is approximately \$4,410,000. A diverging diamond interchange (DDI) configuration at SR 2 interchange was also considered, but ultimately dismissed due to significant operational and cost advantages of the double roundabouts discussed in Alternative F1. The DDI required an additional southbound lane and was unable to accommodate a pedestrian pathway through the interchange in either the center or side of the roadway without requiring bridge widening.

Alternative F1 Proposed Improvements:

Cleveland Road (US 6) and Rye Beach Road (Intersection #9)

- ▶ Multilane Roundabout with 165-foot ICD.
- ▶ Dedicated EB right turn lane and NB and WB left turn lanes within the roundabout to accommodate heavier movements.

- ▶ Access management will be incorporated into the design of this intersection as identified in the access management plan recommendations.

SR 2 WB Ramps and Rye Beach Road (Intersection #10) and SR 2 EB Ramps and Rye Beach Road (Intersection #11)

- ▶ Two single lane Roundabouts with an ICD of 150'
- ▶ Dedicated NB right turn lane for southern ramp intersection.
- ▶ Dedicated WB right turn lane for northern ramp intersection.
- ▶ Dedicated SB right turn lane for northern ramp intersection.
- ▶ Pedestrian accommodations and entry geometry will be designed for slow speeds/safety

Alternative F2 Proposed Improvements:

Cleveland Road (US 6) and Rye Beach Road (Intersection #9)

- ▶ Add eastbound right turn overlap (concurrent with northbound left turn phase 3); requires changing existing 3-section head to 5-section w/ right turn arrows.
- ▶ Adjusted green time and balanced delays.
- ▶ Per Turn Lane Length Analysis (based on 2043 volumes):
 - Northbound left turn lane required storage lengths exceed the existing intersection spacing of approximately 610 feet (measured from stop bar to stop bar).
 - Eastbound right turn lane required storage lengths exceed ODOT's L&D value of 800 feet for right turn lane, however, providing an EB overlap phase mitigates this issue.

SR 2 WB Ramps and Rye Beach Road (Intersection #10)

- ▶ Change SB to a (1)-thru and (1)-thru/shared right.
- ▶ Change WB to a (1)-go anywhere lane and (1)-exclusive right.
- ▶ Adjusted WB percent turns in shared lane to 45% for right turn and 0% for left.
- ▶ Calculated westbound right turn lane (1145 feet) required.
 - Note that westbound right turn lane storage available on existing ramp is 1170 feet measured from stop bar to painted nose (theoretical gore point) or 865 feet to physical nose.

SR 2 EB Ramps and Rye Beach Road (Intersection #11)

- ▶ Include (1) additional left turn lane, since dual lefts protected phasing required as well as additional receiving lane.
- ▶ HCS Capacity Analysis was done for two configurations:
 - Option 1 is version with existing (1)-NB Thru and (1)-NB exclusive RT.
 - Option 2 is version with (1)-NB Shared Thru RT (Recommended).
- ▶ Lane configuration and shoulders between the WB and EB ramps is feasible. A three-foot shoulder required.
- ▶ Per recommended Option 2, calculated southbound left dual turn lanes (562.5 feet and 482.5 feet; 1045 feet total) required.
 - Note that existing southbound left turn lane storage distance of 245 feet is based on a single left turn lane.
 - Stop bar to stop bar measurement between ramps is 850 feet.

Figure 38: Alternative F1 – Rye Beach Road Roundabouts

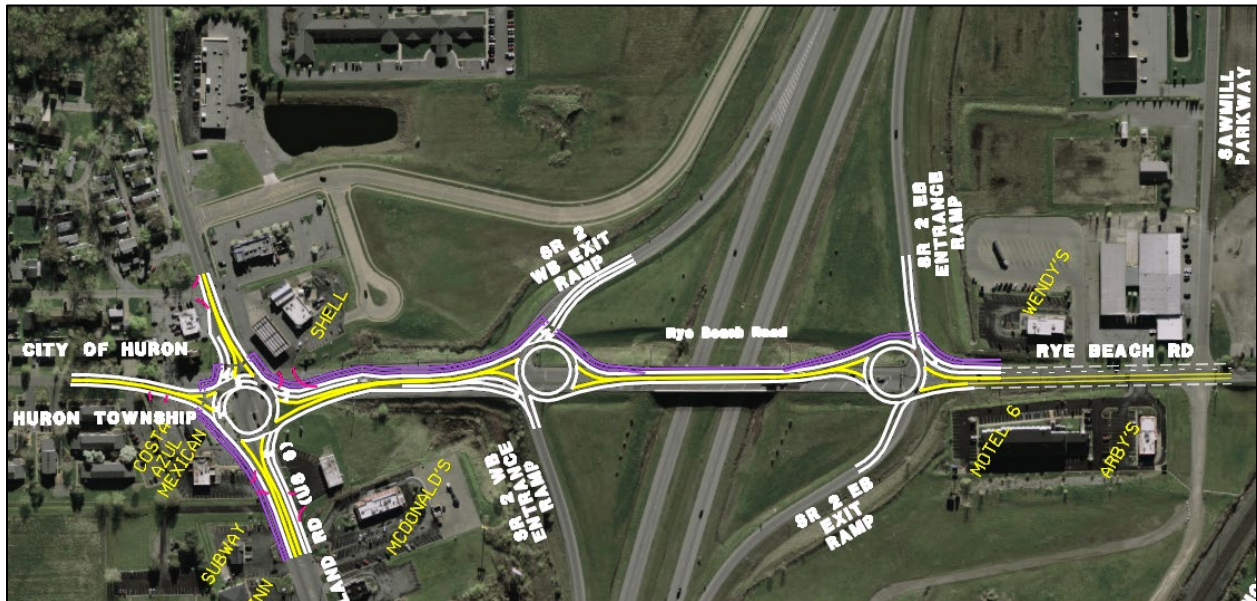
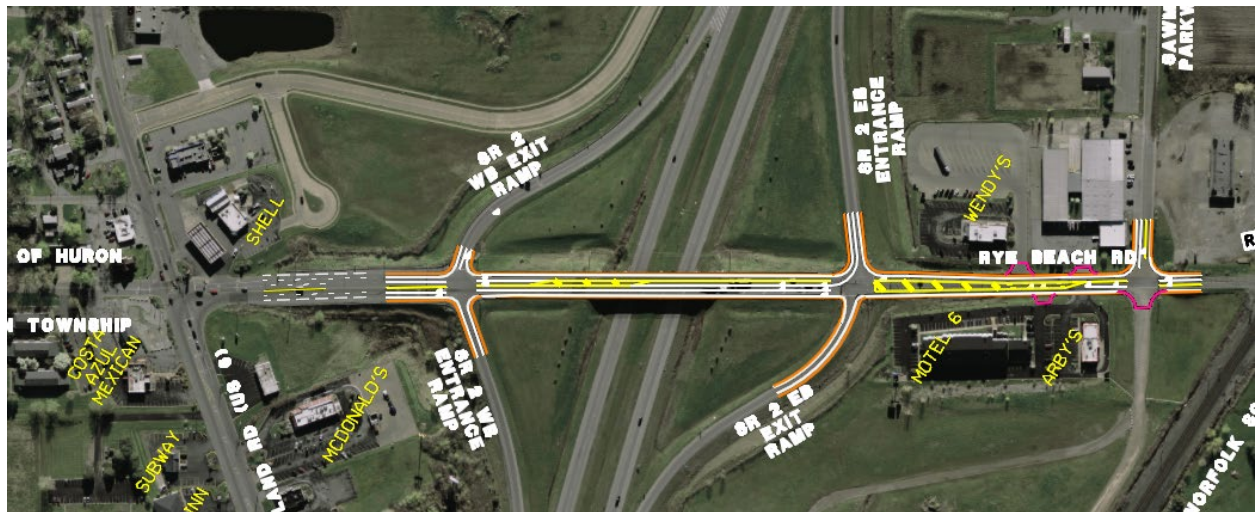


Figure 39: Rye Beach Road Alternative F2 – Rye Beach Road Restriping



Active Transportation and Transit

For active transportation, sidewalks and multi-use paths are proposed throughout the study area. As referenced earlier in the **Proposed Alternatives** section, exhibits showing the recommended active transportation connections are provided in [Appendix O](#). For ease of reference, the recommendations have been identified as **AT1** through **AT4** on these exhibits to reflect connections by area and type. **AT1** recommends a multi-use path be added along the north side of Cleveland Road (US 6) from E. Shoreway Drive to Rye Beach Road. **AT2** recommends a modal connection (bike path or sidewalk) along the north side of Cleveland Road (US 6) from Cedar Point Drive to E. Shoreway Drive in the City of Sandusky; the facility type needed at this location can be determined in coordination with the City of Sandusky's current

multi-use path project to the north, across Castaway Bay and along Heron Creek Drive. **AT3** recommends the completion of select sidewalk networks along Cleveland Road (US 6) in the City of Sandusky. **AT4** recommends a multimodal connection (bike path or sidewalk) along the east side of Rye Beach Road in the City of Huron. The preliminary planning level cost estimates for each of these options is as follows: multi-use pathway along Cleveland Road (US 6) from E. Shoreway Drive to Rye Beach Road (AT1) is approximately \$1,250,000; modal connection along Cleveland Road (US 6) from Cedar Point Drive to E. Shoreway Drive (AT2) is approximately \$650,000; complete sidewalk connections in the City of Sandusky (AT3) is approximately \$445,000; and multimodal connection along Rye Beach Road (AT4) is approximately \$90,000 (this cost assumes that no work would be done to the existing structure over SR 2).

Accommodations for the transit stops in the study corridor should also be considered. Bus shelters should be provided at stop locations, and pedestrian accommodations are also recommended to connect to bus stops in the area. Additionally, with added bus traffic along US 6 due to the Yellow Line running to the Sports Force complex, bus pull-out stops may be a considerations along US 6. One location that these could be added is both eastbound and westbound on US 6 at the Remington Avenue intersection, a location that would be utilized by both the Yellow and Red Lines.

Planning Level Cost Estimates

Planning level cost estimates for roadway improvements and right of way acquisition (including public utility relocation costs) were developed for each alternative. **Table 39** and **Table 40** show the planning level cost estimates that were determined for each roadway alternative and other recommendations. Additionally, the results of the ECAT calculation of benefit to society (in dollars) is included. Some alternatives were not able to be analyzed in ECAT due to the type of recommendation they included (i.e., signal upgrades, lane restriping, and pedestrian improvements outside of the right-of-way); these are listed as “N/A” in the table. Recommended roadway alternatives are shown in bold in the table.

Table 39: Planning Level Cost Estimates for Roadway Alternatives

Alternative	Description	Construction Costs (in 2024 dollars)	ROW/Utility Costs	Society Safety Benefit
A	Signal modernization, removal of unwarranted signals, pavement restriping, removal of reversible lane, and add EB right turn lane on US 6 at Remington Avenue intersection in the City of Sandusky.	\$1,530,000	\$145,000	N/A
A1	Butler Street remains open with a signal upgrade (includes total pavement replacement).	\$2,940,000	\$0	N/A
A2	Butler Street closed with a cul-de-sac and signal removed.	\$90,000	\$5,000	\$1,360,000
B1	Construction of modern roundabout at Cedar Point Drive intersection (eastern alignment).	\$1,400,000	\$510,000	\$863,500
B2	Construction of modern roundabout at Cedar Point Drive intersection (western alignment).	\$1,380,000	\$535,000	\$863,500
C1	Construction of modern roundabout at Perkins Avenue intersection.	\$2,290,000	\$250,000	\$917,000
C2	Perkins Avenue at-grade intersection realignment.	\$4,390,000	\$360,000	\$157,800
C3	Perkins Avenue grade separation over railroad tracks.	\$12,700,000	\$960,000	\$157,800
D1	Construction of modern roundabout at Camp Road intersection.	\$2,920,000	\$130,000	\$3,020,100
D2	Widen US 6 at Camp Road intersection, add EB and WB left turn lanes and EB right turn lane on US 6 (maintain existing stop control on Camp Road).	\$1,950,000	\$720,000	\$987,300
E	Widen US 6 between Camp Road and Rye Beach Road, add center turn lane throughout and add WB right turn lane at Sawmill Creek Drive.	\$2,390,000	\$160,000	\$1,606,400
F1	Construction of modern roundabouts along Rye Beach Road at US 6 intersection and SR 2 interchange (EB and WB ramps).	\$4,030,000	\$380,000	\$1,234,400
F2	Signal upgrades and pavement restriping along Rye Beach Road from US 6 to Sawmill Parkway.	\$990,000	\$0	N/A

Table 40: Planning Level Cost Estimates for Other Recommendations

Description	Construction Costs (in 2024 dollars)	ROW/Utility Costs	Society Safety Benefit
Multi-use path along the north side of US 6 from E. Shoreway Drive to Rye Beach Road.	\$1,090,000	\$160,000	N/A
Modal connection along the north side of US 6 from Cedar Point Drive to E. Shoreway Drive in the City of Sandusky (bike path or sidewalk to be determined).	\$645,000	\$5,000	N/A
Complete select sidewalk connections along US 6 in the City of Sandusky.	\$365,000	\$80,000	N/A
Multimodal connection along the east side of Rye Beach Road in the City of Huron (bike path or sidewalk to be determined).	\$85,000	\$5,000	N/A

Recommended Alternatives and Groupings for Construction

The following roadway alternatives are recommended to be carried forward for funding consideration and future project development. It is important to note that final decisions regarding the recommended alternatives and project implementation reside with the respective project sponsors.

- ▶ Alternative A – Signal and roadway improvements in the City of Sandusky
 - Alternative A2 – Butler Street closure (*final decision to be made by the City of Sandusky*)
- ▶ Alternative B1 – Cedar Point Drive roundabout (eastern alignment)
- ▶ Alternative C1 – Perkins Avenue roundabout
- ▶ Alternative D1 – Camp Road roundabout
- ▶ Alternative E – Sawmill Creek Drive improvements and US 6 widening
- ▶ Alternative F1 – Rye Beach Road roundabouts

While each of the proposed alternatives presented above can be advanced independently (with the exception of the A-series of alternatives), the proximity and elements of certain options lend themselves to be grouped with an adjacent improvement, as indicated below.

- ▶ Alternatives A and A2 (or A1) – Alternative A must also incorporate either sub-alternate A1 or A2. The Butler Street project should be completed with the signal upgrades/removals in the City of Sandusky to ensure the signal at Butler Street is properly accounted for when the rest of the identified signals/intersections along US 6 in Sandusky are upgraded.
- ▶ Alternatives D1 (or D2) and E – Because Alternative E includes widening of US 6 up to Camp Road, these alternatives can be implemented together so that the widening work can seamlessly tie into the Camp Road intersection improvements. This combination of improvements also lends itself well to the incorporation of the recommended access management changes in this area.

Conclusion

The existing and future conditions presented in this report identified the deficiencies and constraints within the project corridor and set the basis for further analysis. These analyses led to the development of potential alternatives to address safety and congestion issues in the US 6 Corridor, which were presented in the **Alternatives Analysis** section. These alternatives, the technical analysis, and public input have been summarized herein so that ERPC, along with the City of Sandusky, the City of Huron, Perkins Township, Huron Township, and ODOT, can determine their preferred prioritization of alternatives for the US 6 corridor and identify appropriate sources of funding to advance individual projects or project groupings into design and construction.

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