

# **APPENDIX A**

## **DETAILED PURPOSE & NEED**

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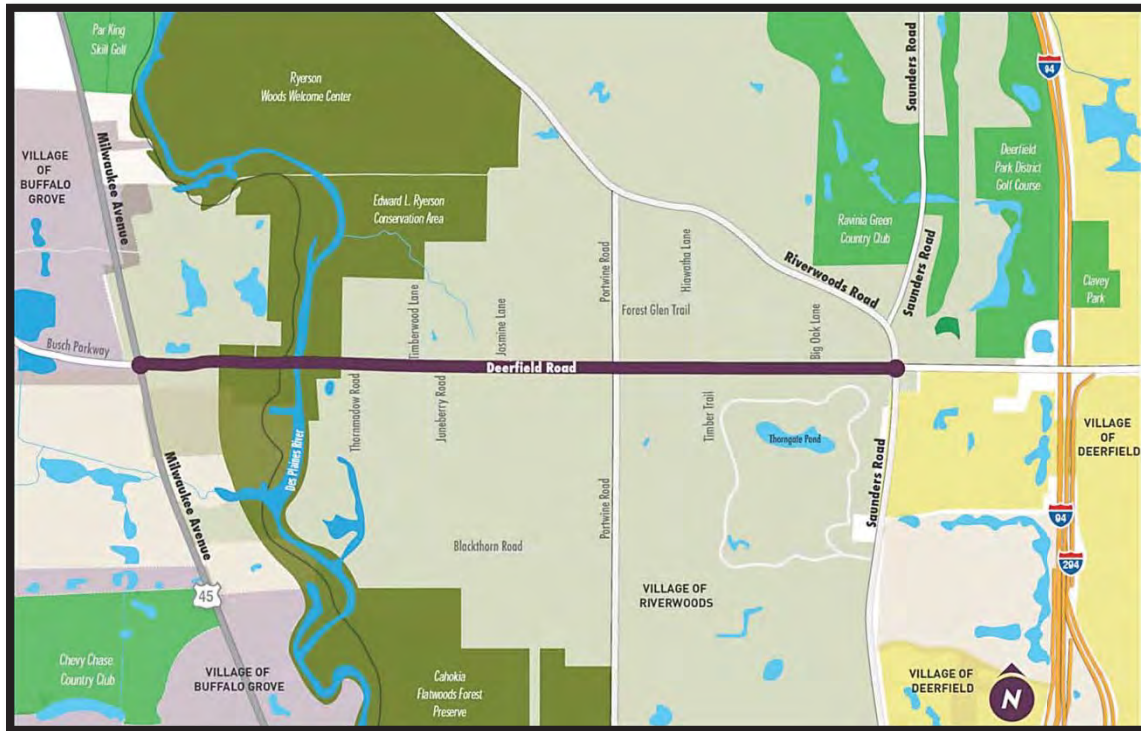
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## 1.0 Purpose and Need

The purpose of the project is to provide an improved transportation system to address capacity, safety, mobility, and operational deficiencies along Deerfield Road and improve non-motorized accommodations from Milwaukee Avenue (US 45/ IL 21) to Saunders/ Riverwoods Road in Lake County, Illinois (See Figure 1-1, below).

**Figure 1-1: Location Map**



### 1.1 Where is the Project Located?

Deerfield Road is County Highway 11 (CH 11) from IL 83 to Wilmot Road, a distance of approximately 5.7 miles. The project location is along Deerfield Road with a western terminus at Milwaukee Avenue and an eastern terminus at Saunders/ Riverwoods Road, a distance of approximately 2.0 miles. Both of the termini intersections are signalized. Deerfield Road is an existing two lane roadway (one 11 to 12 foot wide through lane in each direction) within the project limits typically with variable width paved or gravel shoulders and open ditch drainage as shown in Figure 1-2. The existing ROW varies between 72 feet and 100 feet wide between Milwaukee Avenue and Saunders/ Riverwoods Road. Deerfield Road is a five lane roadway (two through lanes in each direction) both west of Milwaukee Avenue and east of Saunders/ Riverwoods Road with curb and gutter. There is a partial interchange with I-94 (to/from south only) on Deerfield Road located east of Saunders/ Riverwood Road. This project has independent utility and will function without any requirements for additional improvements

elsewhere. The project will not restrict consideration of alternatives for other reasonably foreseeable transportation improvement initiatives to this facility or other adjacent facilities.

Deerfield Road lies within the municipal boundaries of the Village of Riverwoods through a majority of the corridor from Milwaukee Avenue to Saunders/ Riverwoods Road. West of Milwaukee Avenue, Deerfield Road is within the municipal boundaries of Village of Buffalo Grove. East of Saunders/ Riverwoods Road, Deerfield Road is within the Village of Deerfield.

**Figure 1-2: Deerfield Road Between Thornmeadow Road and Juneberry Road Looking East**



### **1.1.1 What is Deerfield Road’s Relationship to the Regional Transportation Network?**

Deerfield Road and Saunders/ Riverwoods Road are classified as Minor Arterials and are under the jurisdiction of the Lake County Division of Transportation (LCDOT). Milwaukee Avenue is classified as an Other Principal Arterial and is under the jurisdiction of the Illinois Department of Transportation (IDOT). Milwaukee Avenue is also a Strategic Regional Arterial (SRA) roadway and is on the National Highway System (NHS), but is not a NHS Connector. These types of roadways are one step below the expressway system that typically carry both local and long distance trips, and higher amounts of truck traffic by virtue of their connection to the regional transportation system. Milwaukee Avenue is a designated Class II Truck Route. Deerfield Road also crosses Portwine Road approximately halfway through the project limits. Portwine Road is classified as a Major Collector and is under the jurisdiction of the Village of

Riverwoods. Deerfield Road, Saunders/ Riverwoods Road, and Portwine Road are not SRA roadways, on the NHS, or designated truck routes. The speed limit along Deerfield Road is 40 mph.

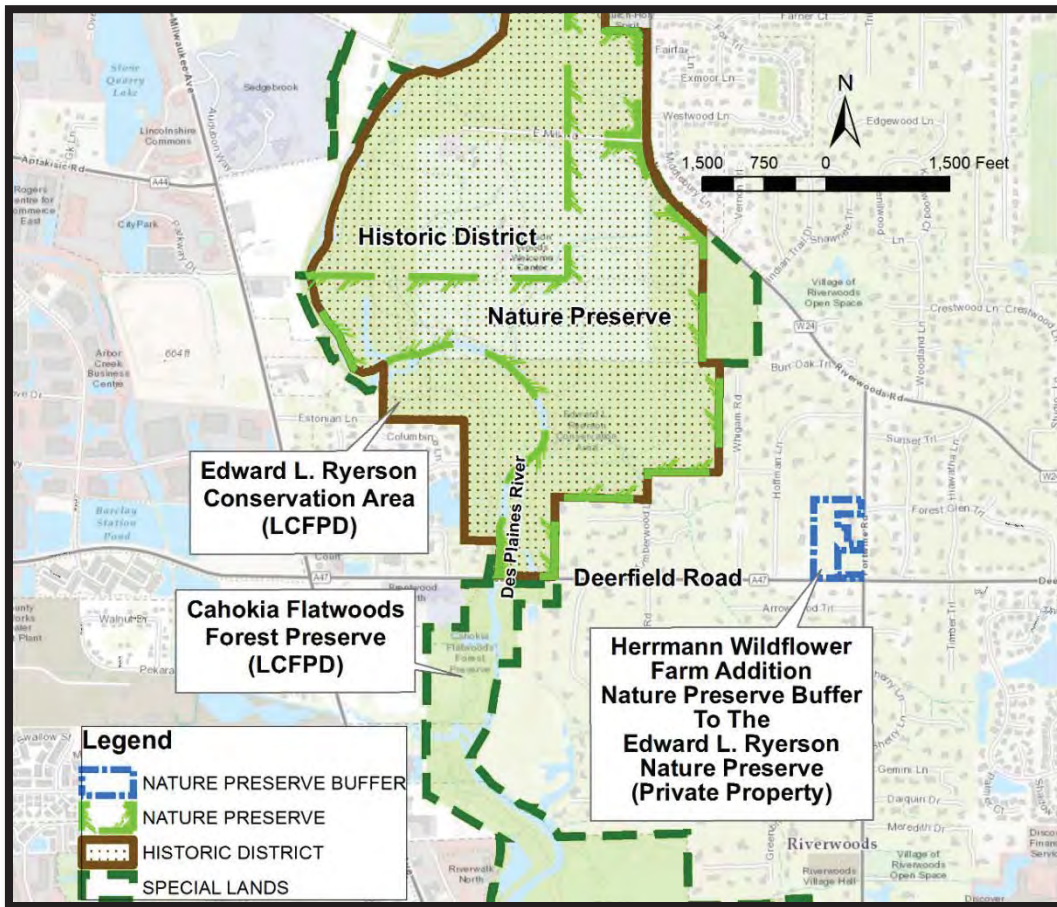
There are three signalized intersections within the project limits at Milwaukee Avenue, Portwine Road, and Saunders/ Riverwoods Road. There are 11 unsignalized intersections which are stop controlled on the cross street.

### **1.1.2 What is Deerfield Road's Environmental Setting?**

The land use within the project area is predominantly residential with larger wooded lots from the Des Plaines River to Saunders/ Riverwoods Road. West of the Des Plaines River and east of Saunders/ Riverwoods, the land use is predominately commercial.

The Lake County Forest Preserve District (LCFPD) has two holdings adjacent to Deerfield Road near the Des Plaines River; the Edward L. Ryerson Conservation Area to the north and Cahokia Flatwoods to the south. Within the Edward L. Ryerson Conservation Area, there is a designated Illinois Nature Preserve (Edward L. Ryerson Nature Preserve, Doc. No. 1996651), and historic district listed on the National Register (Edward L. Ryerson Area Historic District, Ref. No. 201035), as shown in Figure 1-3. Separately located further east at the northwest corner of Deerfield Road and Portwine Road is the privately-owned Herrmann Wildflower Farm Addition Nature Preserve Buffer.

Figure 1-3: LCFPD Holdings Adjacent to Deerfield Road



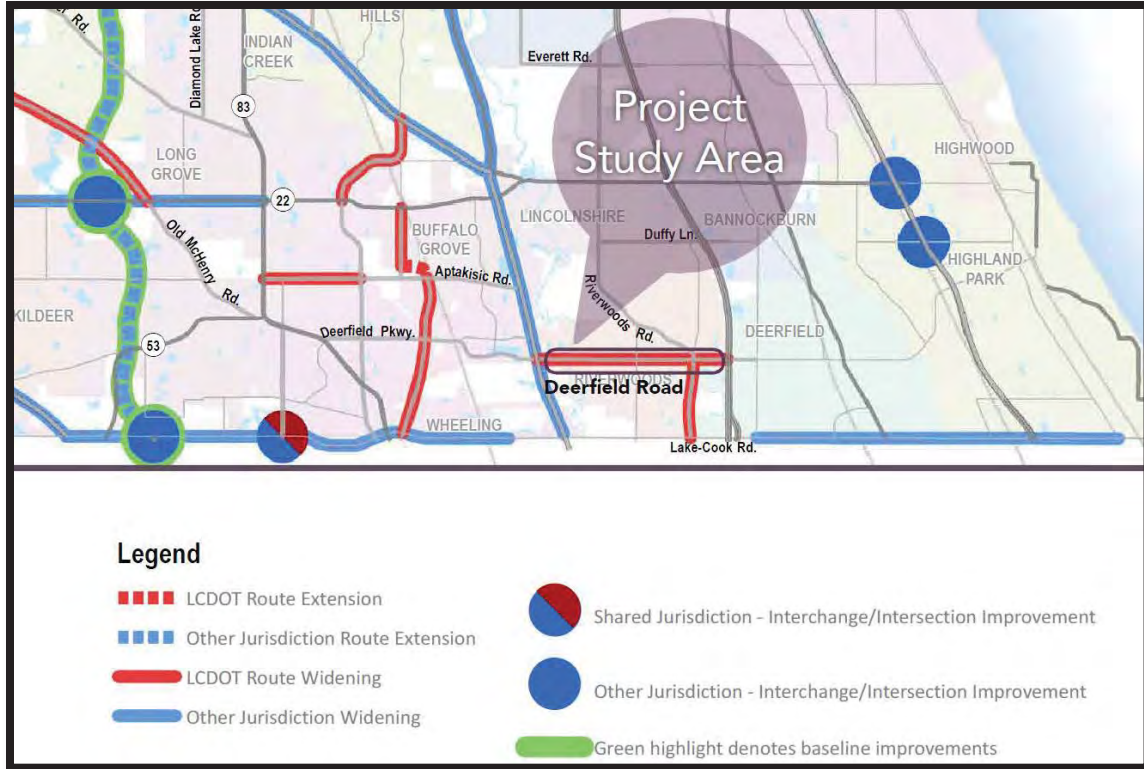
## 1.2 What is the Project's Background?

As previously described, Deerfield Road is a 2-lane roadway within the study area and a 5-lane roadway section east and west of the study area. Improvements to this section of Deerfield Road are being studied due to steady increases in travel demand and congestion during peak AM and PM travel times resulting from growth in population and employment in the area.

### 1.2.1 Regional Planning Context

LCDOT has identified Deerfield Road from Milwaukee Avenue to Saunders/ Riverwood Road in their 2040 Transportation Plan as a route widening, as shown in Figure 1-4. This project is included in the Federal Fiscal Year (FFY) 2019-2024 Transportation Improvement Program (TIP No. 10-03-0005) endorsed by the Policy Committee of the Chicago Metropolitan Agency for Planning (CMAP), the Metropolitan Planning Organization (MPO) for the region in which the project is located. The TIP number for this project is 10-03-0005, and the project has been conformed for air quality. The TIP includes funding for Phase II and ROW acquisition in FFY 2021.

**Figure 1-4: LCDOT 2040 Transportation Plan**



Source: LCDOT

### 1.2.2 How is the Region Anticipated to Grow?

CMAP prepared year 2040 population and employment projections for the northeastern Illinois region as part of the Go To 2040 comprehensive regional plans, based upon 2010 U.S. Census Bureau data and regional land use development information. The data for these projections is represented in a grid system (“zones”) throughout the region. Since municipal boundaries are irregular, they do not directly correlate to CMAP’s zone system. Therefore, CMAP’s municipal forecasts are based upon grouping the zones that have a central point within a municipality and associated planning areas. The zones that are grouped for the Village of Riverwoods versus the actual municipal boundary are shown in Figure 1-5.



Figure 1-5: CMAP Grouping of Subzones to Approximate Municipal Level for the Village of Riverwoods

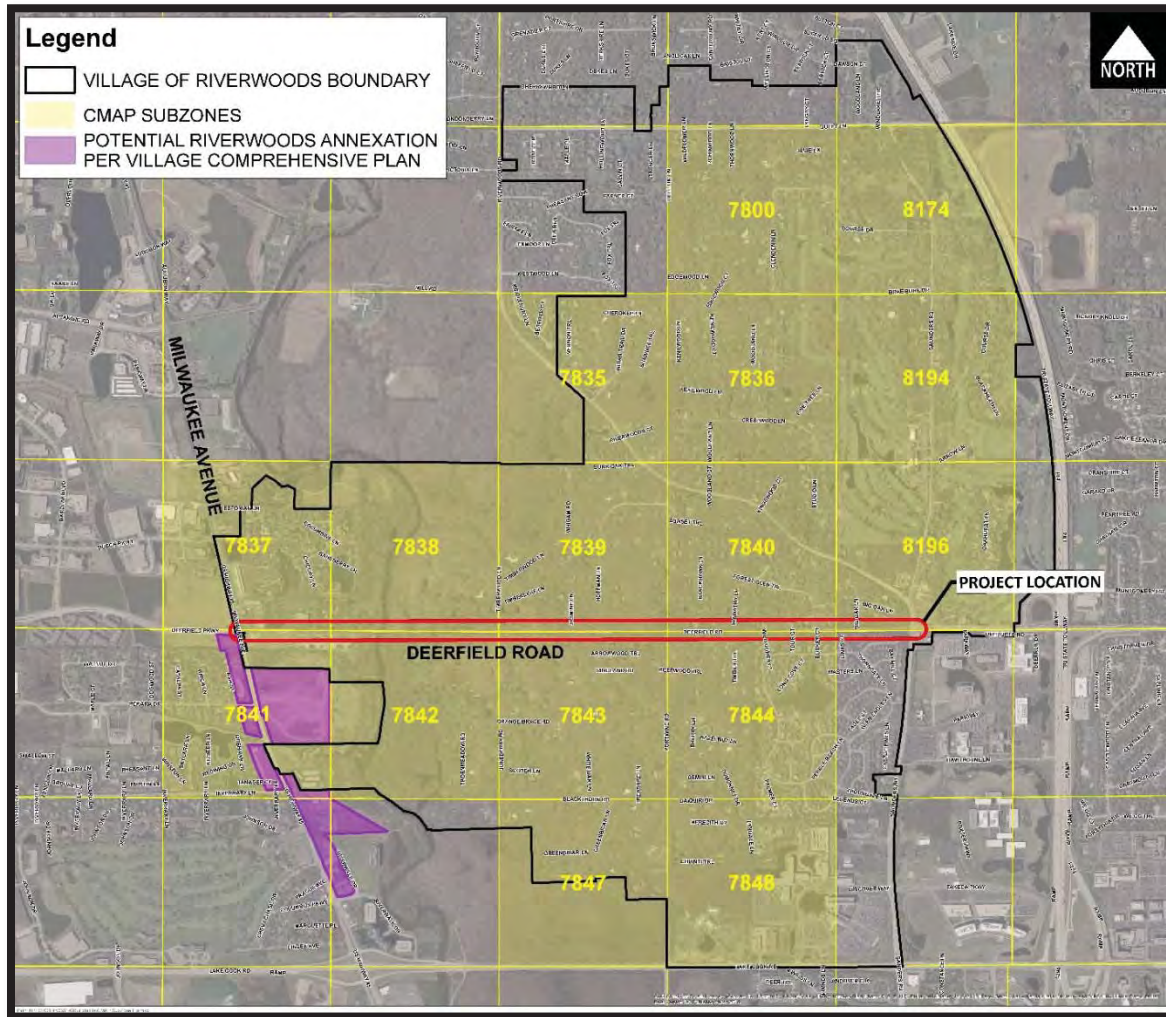


Table 1-1 shows year 2040 population and employment forecasts for Lake County and municipalities adjacent to or near the project study area.

**Table 1-1: Projected Population and Employment Growth**

Location/ Zone Grouping	Population Growth				Employment Growth			
	2010	2040	Growth	% growth	2010	2040	Growth	% growth
Lake County	682,753	896,341	213,588	31.3%	314,717	401,748	87,031	27.7%
Riverwoods	3,108	3,809	701	22.6%	7,370	8,798	1,428	19.4%
Buffalo Grove	42,527	50,475	7,948	18.7%	22,498	23,882	1,384	6.2%
Deerfield	19,082	25,777	6,695	35.1%	20,267	23,280	3,013	14.9%

Note: Employment data are CMAP 2010 estimates.

With respect to population and employment growth, it is the actual raw growth in persons and/or jobs that translates to trip generation. The Village of Riverwoods grouping of subzones is projected to grow by 22.6 percent (701 persons) in population and 19.4 percent (1,428 persons) in employment from the year 2010 to the year 2040. As seen in Figure 1-5, some of the subzones assigned to the Riverwoods grouping are partially outside of the Village municipal limits, which predominantly occurs along Milwaukee Avenue and includes portions of the Village of Buffalo Grove. Table 1-2 shows a comparison of the projected population growth for subzones either fully within or partially within the Riverwoods municipal boundary. The data for subzones fully within the Village of Riverwoods municipal limits may better reflect the projected population growth within the Village of Riverwoods municipal limits.

**Table 1-2: Riverwoods Subzone Grouping for Projected Population Growth**

Subzone	2010 Population	2040 Population	Raw Increase	% Increase
Fully within the Village	1991	2245	254	12.8%
Partially within the Village	1117	1564	447	40.0%
Total	3108	3809	701	22.6%

Although the Village of Riverwoods' population and employment are forecast to increase by 22.6 percent and 19.4 percent, respectively, the raw changes (701 persons and 1,428 persons) are modest. This is consistent with the (modest) forecasted growth in travel demand, which is further discussed in Section 1.3.1. Looking further at the Riverwoods Subzone grouping, for subzones fully within the Village municipal limits the growth decreases to 12.8 percent (254 persons) and for subzones that are partially within the Village municipal limits the growth increases to 40.0 percent (447 persons). For comparison, the percentage versus actual population growth for nearby Buffalo Grove and Deerfield, and the larger Lake County geographical area is 18.7 percent (7,948 persons), 35.1 percent (6,695 persons), and 31.3 percent (213,588 persons) respectively. For a corridor like Deerfield Road with good connectivity to the regional transportation system, the trips served can originate both locally and from adjacent areas. Based on the population and employment growth projected within Riverwoods and

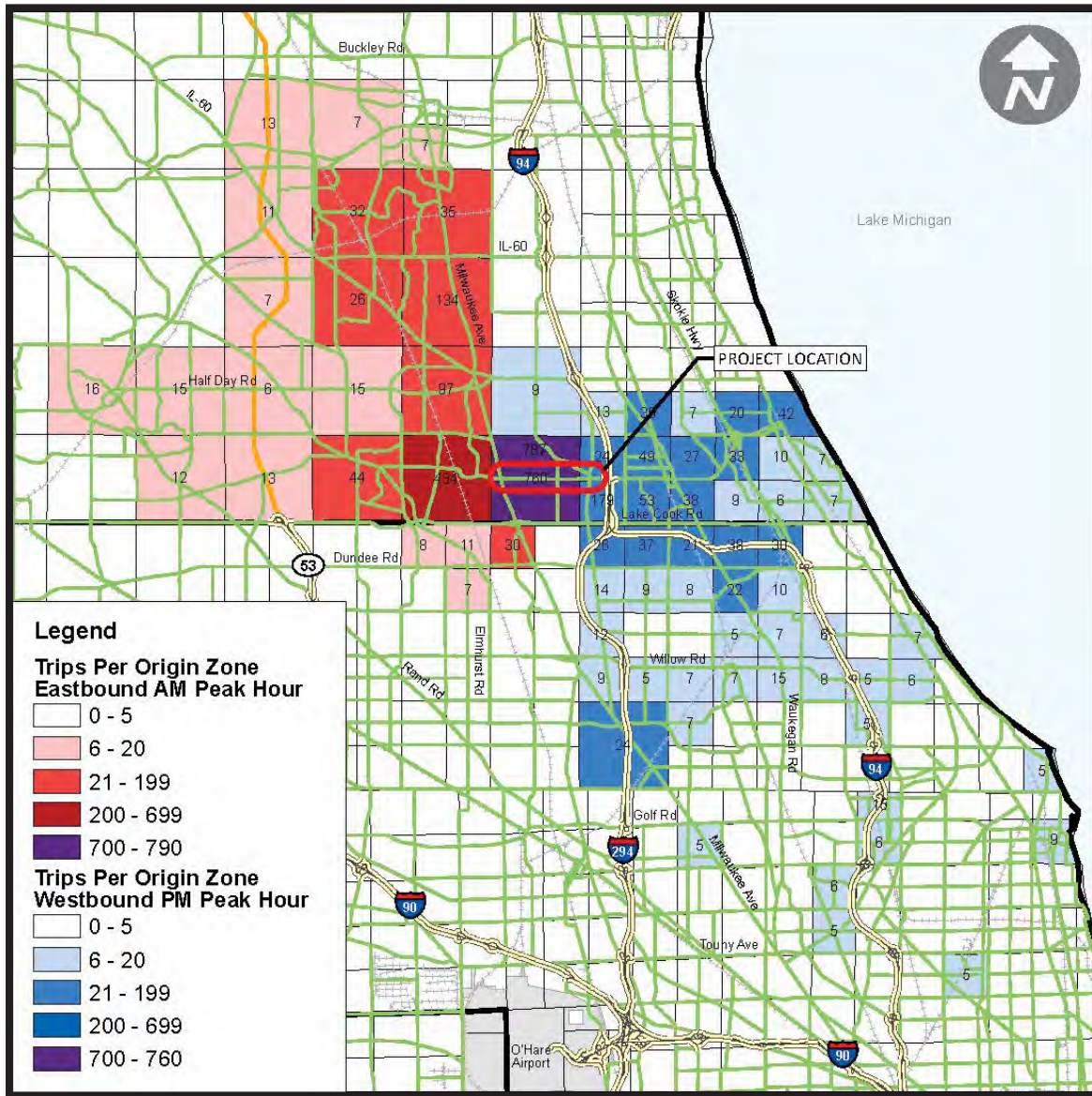
adjacent areas, and based on influences from the larger regional transportation network, travel demand is expected to increase by the year 2040.

### **1.2.3 How does Regional Growth Translate into Travel Demand?**

Deerfield Road is an important link in both the local and regional transportation network with respect to personal travel and the delivery of goods and services. It is designated as County Highway 11 from IL 83 to Wilmot Road, with direct connection to I-94, and is classified as a minor arterial roadway. Deerfield Road also extends east of I-94 through the Village of Deerfield and City of Highland Park, with an interchange connection to US Route 41 (Skokie Highway), an SRA roadway. The roadway also serves larger population centers and connects to the arterial system to the west. This connectivity to the larger regional transportation system has an influence upon travel demand; trips are originating both locally and from adjacent areas, as shown in Figure 1-6, which specifically looks at the trips per origin subzone for eastbound AM peak hour (red) and westbound PM peak hour (blue).

Figure 1-6: CMAP Deerfield Road Trip Origin Zones

2040 No-Build Scenario AM Eastbound & PM Westbound Peak Hours



Deerfield Road is one of a few crossings of the Des Plaines River in southern Lake County, with the other crossings being Half Day Road (IL 22) 2.3 miles to the north and Lake Cook Road 1.0 mile to the south. Half Day Road and Lake Cook Road were previously widened in 2003 and 1994, respectively, and there are no plans to further widen either roadway across the Des Plaines River.

Based on increases in population and employment, as well as the local and regional trips served by Deerfield Road, traffic volumes along Deerfield Road have increased over the past several

decades, and remained steadily high since the 1990's as shown in Table 1-3. The travel trips served along Deerfield Road facilitate the movement of people, goods, and services connecting the nearby residential areas of Buffalo Grove and Riverwoods to the Buffalo Grove business park/office center northwest of the Milwaukee Avenue intersection and Deerfield corporate campuses southeast of the Saunders/Riverwoods intersection and along the Lake-Cook Road corridor, and also connection to commercial and employment areas regionally via interchanges with I-94. This has resulted in increased congestion on the roadway, and increased overall travel times.

**Table 1-3: Deerfield Road Average Daily Traffic (ADT) in Vehicles per Day (VPD)**

Year	ADT (vpd)
1953	1,450
1959	2,050
1963	2,350
1969	2,800
1974	6,500
1979	9,700
1983	9,500
1988	17,300
1992	18,700
1996	20,400
2000	22,000
2011	19,300
2016	19,450

Source: IDOT ADT except 2016 Traffic Count ADT

#### **1.2.4 What Improvements Have Been Completed Recently within the Corridor?**

LCDOT previously designed and constructed a separate bike path bridge over the Des Plaines River south of the existing Deerfield Road bridge structure to connect the Des Plaines River Trail (DPRT) to Thornmeadow Road, shown in Figure 1-7. That project was completed in 2010, and designed with consideration of future Deerfield Road improvements.

**Figure 1-7: Deerfield Road Separated Bike Path Bridge over the Des Plaines River Looking East**



In addition to the constructed bike path bridge, there are two previously approved Phase I Studies for multi-use paths along Deerfield Road, one by the Village of Riverwoods to connect the existing bike path terminus at Thornmeadow Road to Saunders Road, and the other by LCDOT to connect the existing bike path terminus at the DPRT to Milwaukee Avenue. As discussed further in Section 1.3.4, these projects are part of the Lake County 2040 Bike Plan. Further analysis of both projects will be incorporated into the Deerfield Road project to ensure the multi-use paths are designed correctly in consideration of future roadway improvements.

### 1.3 What is the Need for the Proposed Project?

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The needs for the project include capacity, safety, mobility, non-motorized and transit connections, and Operational Deficiencies. Each of these categories is discussed in detail below.

#### 1.3.1 What are the Capacity Needs?

Travel demand along Deerfield Road was evaluated for year 2016 and projected year 2040 conditions to determine existing and future travel performance. The 2016 traffic was obtained by actual field traffic counts in May 2016, and the 2040 traffic projections were prepared by CMAP based on the projected population and employment growth in the project area. A summary of the 2016 ADT and the projected 2040 (No-Build) ADT is included below in Table

1-4. The ADT represents the total traffic in both directions over a 24-hour period at a given location. The 2040 No-Build traffic volumes are the projected traffic volumes for the year 2040 with no improvements made to Deerfield Road. Based on the population and employment growth projected within Riverwoods and adjacent areas, and based on influences from the larger regional transportation network, the average daily traffic (ADT) volume along Deerfield Road within the project limits is projected to increase from approximately 19,550 vehicles per day (vpd) to 20,200 vpd for the year 2040 under the No-Build scenario. This is a relatively modest increase of 650 vpd (3.3%) over the next 22 years, which is consistent with the low growth projections in the area with the highest peak hour trip origins (Riverwoods), and higher growth projections in adjacent areas with lower peak hour trip origins (Buffalo Grove and Deerfield).

**Table 1-4: Deerfield Road Traffic Volumes (ADT)**

Location	ADT	
	2016	2040 No-Build
<b>Deerfield Road at Milwaukee Avenue</b>		
North Leg (Milwaukee Ave.)	39,800	40,000
South Leg (Milwaukee Ave.)	38,200	39,000
West Leg (Deerfield Rd.)	15,700	16,300
East Leg (Deerfield Rd.)	19,550	20,200
<b>Deerfield Road at Portwine Road</b>		
North Leg (Portwine Rd.)	1,950	2,000
South Leg (Portwine Rd.)	2,150	2,200
West Leg (Deerfield Rd.)	19,450	20,200
East Leg (Deerfield Rd.)	19,450	20,200
<b>Deerfield Road at Saunders/ Riverwoods Road</b>		
North Leg (Saunders/ Riverwoods Rd.)	11,150	12,600
South Leg (Saunders/ Riverwoods Rd.)	15,450	16,500
West Leg (Deerfield Rd.)	19,450	20,200
East Leg (Deerfield Rd.)	25,150	26,100

Another factor in travel performance is the mix of vehicles utilizing any given roadway. Based on the traffic counts, the percentage of truck traffic utilizing Deerfield Road within the project area, as a combination of single unit (SU) and multi-unit (MU) trucks, ranges from approximately 3.3 percent to 4.7 percent depending on the time of day and the location. The Synchro computer program was used to analyze travel performance at the three existing signalized intersections and the two sections within the project limits, for the peak one-hour morning (AM) and evening (PM) travel periods. Residents have indicated that congestion is largely confined to the peak AM and PM travel periods. The Synchro software provides a measure of congestion called Level of Service (LOS). LOS is a letter grade from A (best) through F (worst) that represents the average amount of delay a single vehicle experiences at an intersection as expressed in seconds per vehicle (see Table 1-5), or the average travel speed as a percentage of base free-flow speed a single vehicle experiences traveling along roadway sections (see Table 1-6).

**Table 1-5: Intersection Level of Service (LOS) Definition**

LOS	Average Delay (Sec/Vehicle)
A	≤ 10
B	> 10 - 20
C	> 20 - 35
D	> 35 - 55
E	> 55 - 80
F	> 80

**Table 1-6: Section Level of Service (LOS) Definition**

LOS	Travel Speed as a Percentage of Base Free-Flow Speed (%)
A	>85
B	> 67 - 85
C	> 50 - 67
D	> 40 - 50
E	> 30 - 40
F	≤ 30

\* If volume-to-capacity ratio at downstream boundary intersection is ≤ 1.0

The IDOT Bureau of Local Roads and Streets requires a LOS C or better for urban two-way arterial reconstruction such as Deerfield Road and Saunders/ Riverwoods Road. Similarly, the IDOT Bureau of Design and Environment (BDE) manual requires a LOS C or better for an SRA roadway reconstruction such as Milwaukee Avenue. In some circumstances, LOS D may be allowed in urban areas based on unavoidable design constraints or substantial potential adverse socio-economic or environmental impacts.

The Synchro analysis was prepared for both year 2016 and projected year 2040 (No-Build) traffic volumes and vehicle mix (passenger cars and trucks), including side streets. Results are tabulated in Table 1-7 and Table 1-8, and are shown graphically in Figure 1-8.



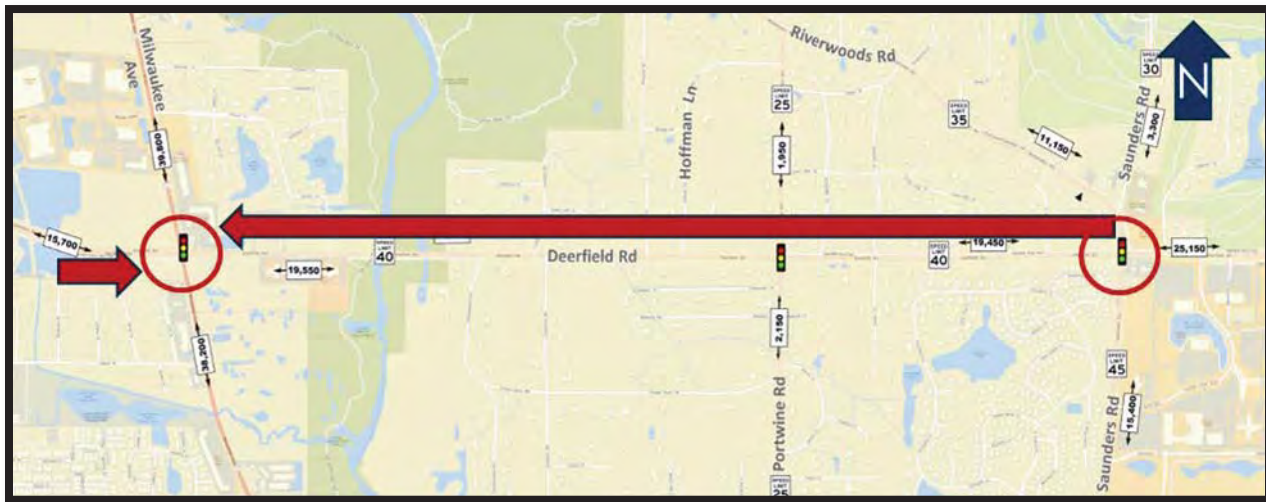
**Table 1-7: Intersection Level of Service (LOS)**

INTERSECTION	2016				2040 (No-Build)			
	LOS		DELAY (sec/vehicle)		LOS		DELAY (sec/vehicle)	
	AM	PM	AM	PM	AM	PM	AM	PM
Milwaukee Ave Intersection with Deerfield Road	E	F	68.8	128.0	E	F	76.7	137.1
Portwine Road Intersection with Deerfield Road	B	C	17.3	21.5	B	C	18.4	21.6
Saunders/ Riverwoods Road Intersection with Deerfield Road	C	C	25.2	31.0	C	D	29.1	37.2

**Table 1-8: Section LOS for AM/PM Peak Hour Volume**

DEERFIELD ROAD SECTION		2016				2040 (No-Build)			
		Travel Time (minutes)		LOS		Travel Time (minutes)		LOS	
		AM	PM	AM	PM	AM	PM	AM	PM
Milwaukee Avenue to Portwine Road (1.3 mi)	Eastbound	2.3	2.3	B	B	2.3	2.3	B	B
	Westbound	2.8	22.7	C	F	2.8	22.7	C	F
Portwine Road to Saunders/ Riverwoods Road (0.7 mi)	Eastbound	1.8	1.8	C	C	1.8	1.8	C	C
	Westbound	1.3	9.6	B	F	1.3	11.6	B	F

**Figure 1-8: Deerfield Road Locations Worse Than LOS C for Year 2040 (No-Build)**



As shown in Table 1-7, Milwaukee Avenue operates at LOS E and F for the AM and PM peak hours for the year 2016. While the 2040 traffic volume does not increase substantially, the intersection LOS and delays will worsen based on projected year 2040 (No-Build) conditions with the Saunders/ Riverwoods Road PM LOS degrading to a LOS D.

The Deerfield Road westbound sections from Saunders/ Riverwoods Road to Portwine Road, and Portwine Road to Milwaukee Avenue have a LOS F in the PM for 2016 and 2040 (No-Build) conditions. The travel pattern along Deerfield Road is predominantly eastbound in the AM and westbound in the PM. Therefore, in addition to the sections located within study area shown in Table 1-8, Figure 1-8 also shows a section LOS F just west of Milwaukee Avenue because the 2016 and 2040 (No-Build) AM eastbound through movement is over capacity with a vehicle to capacity (v/c) ratio greater than 1.0.

On this basis, if no improvements are made to Deerfield Road between Milwaukee Avenue and Saunders/ Riverwood Road, traffic congestion and motorist delay will continue to increase through the year 2040.

### **1.3.2 What are the Safety Needs?**

Crashes that occurred along Deerfield Road within the project limits have been analyzed for the five-year study period from 2014 to 2018. Crashes have been tabulated by year, crash type, fatal and severe injuries, and roadway conditions to ascertain overall trends and determine if any particular statistical overrepresentation exists that would warrant special countermeasure consideration. The crash data is summarized in Table 1-9, and shown graphically in Figure 1-9.

**Table 1-9: Overall Study Area Crash Summary**  
**Deerfield Road; Milwaukee Avenue to Saunders/ Riverwoods Road**

Year	Crash Type <sup>1</sup>									Total Crashes	Severe Crashes <sup>2</sup>	
	Rear End	Angle	Side swipe	Turning Left	Turning Right	Head On	Animal	Fixed Object	Other		Type K	Type A
2014	33	2	3	13	2	1	1	2	1	58	0	2
2015	26	2	9	31	4	0	3	3	2	80	0	1
2016	31	4	8	8	1	0	1	3	1	57	0	1
2017	33	3	4	20	3	2	3	5	2	75	0	0
2018	43	3	9	19	3	2	2	2	0	83	0	1
<b>Total</b>	<b>166</b>	<b>14</b>	<b>33</b>	<b>91</b>	<b>13</b>	<b>5</b>	<b>10</b>	<b>15</b>	<b>6</b>	<b>353</b>	<b>0</b>	<b>5</b>
<b>%</b>	<b>47.0</b>	<b>4.0</b>	<b>9.3</b>	<b>25.8</b>	<b>3.7</b>	<b>1.4</b>	<b>2.8</b>	<b>4.2</b>	<b>1.7</b>			

<sup>1</sup> Crash Type definitions per Illinois Traffic Crash Report SR-1050.

Rear End: Collision between vehicles where vehicles have either front end damage and/or rear end damage.

Angle: Collision between vehicles at an angle where the intent of both vehicles is to go straight.

Side Swipe: Collision between vehicles approaching each other or traveling in the same direction and the contact results in damage to the sides of both motor vehicles.

Turning: Collision between vehicles with at least one unit performing a turning maneuver.

Head On: Collision between vehicles approaching each other and the contact results in frontal damage to both vehicles.

Animal: Collision involving an animal.

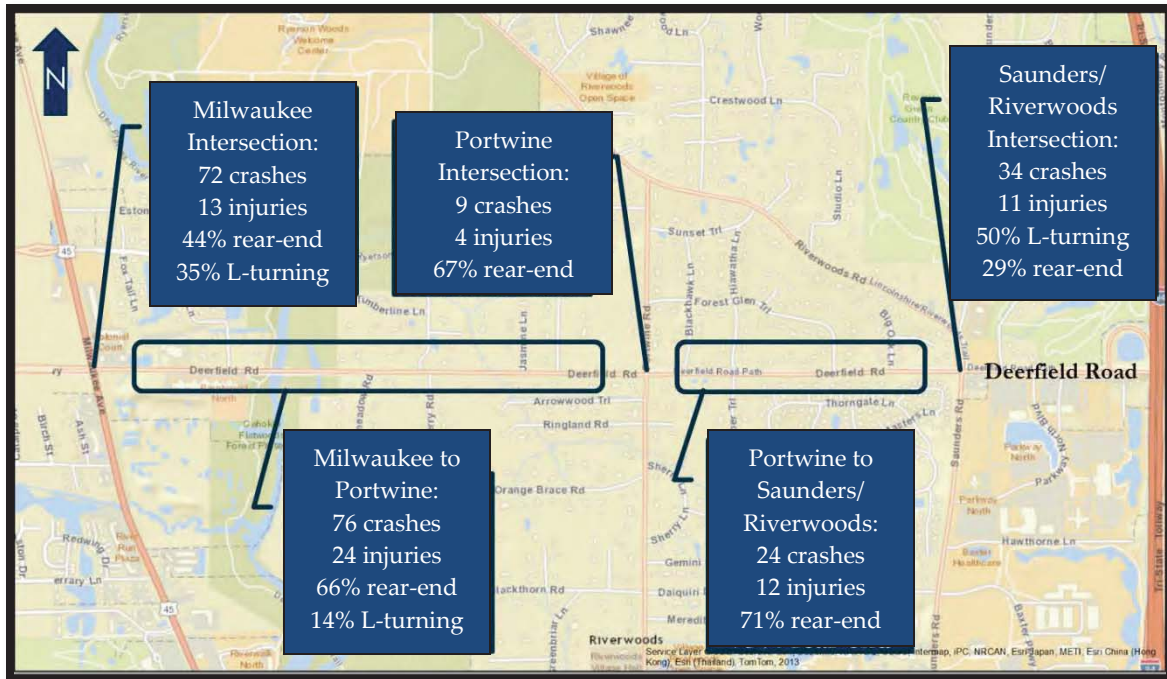
Fixed Object: Collision of a motor vehicle with a fixed object when no other vehicle or object has been struck.

<sup>2</sup> Injury Severity definitions per FHWA

Type K: Crash resulting in a fatality within 30 days due to the injury received in the collision.

Type A: Crash resulting in a non-fatal incapacitating injury.

**Figure 1-9: Deerfield Road 2014-2018 Crash Locations**



The crash data was obtained from the LCDOT Transportation Data Management System. The year 2014-2018 study period included a total of 353 crashes within the study area. Of the 353 total crashes, 128 crashes occurred at signalized intersections and 225 crashes occurred at midblock sections including unsignalized intersections. 72 crashes (20%) occurred at the Milwaukee Avenue signalized intersection, 9 crashes (2%) occurred at the Portwine Road signalized intersection, 34 crashes (10%) occurred at the Saunders/ Riverwoods Road signalized intersection, and 13 crashes (4%) occurred at the Parkway North signalized intersection. Including both unsignalized intersections and midblock sections, there were 15 crashes along Deerfield Road between Barclay Boulevard and Milwaukee Avenue, 76 crashes between Milwaukee Avenue and Portwine Road, 24 crashes between Portwine Road and Saunders/ Riverwoods Road, 7 crashes between Saunders/Riverwoods Road and Parkway North, and 12 crashes between Parkway North and I-94 southbound ramp. 34 crashes occurred just north of the Milwaukee Avenue intersection, 37 crashes occurred just south of the Milwaukee Avenue intersection, 2 crashes occurred just north of the Portwine Road intersection, 2 crashes occurred just south of the Portwine Road intersection, 5 crashes occurred just north of the Saunders/Riverwoods Road intersection, and 7 crashes occurred just south of the Saunders/Riverwoods road intersection.

Predominant crash types, as defined in Table 1-9 footnote 1, within the study area were rear-end (47%) and left turning (26%). For the section of Deerfield Road between Milwaukee Avenue and Portwine Road, and Portwine Road and Saunders/Riverwoods Road (100 total crashes), there is a higher incidence of rear-end crashes (67%) than the total project study area (47%). The higher incidence within this section of the project is an indication of general congestion, excessive queueing from intersection, absence of turning lanes, lack of adequate

gaps for main line and side road left turns, lane drops, and drivers not being aware of access points. No fatal crashes were reported during the study period. Five A-injury crashes were reported. The crash injury severity definitions are defined in Table 1-9 footnote 2.

The IDOT 5% locations are derived from crashes occurring on 5% of the total lane miles showing the greatest potential for safety improvements and focus primarily on fatal and A-injury crashes. 5% location maps are generated yearly with 2015 being the most recent year available. There are no 5% locations within the study area for year 2015. IDOT identified the intersection of Deerfield Road at Saunders/Riverwoods Road as a 5% location for the year 2014. The Saunders/ Riverwoods Road intersection had no fatal crashes, but one A-injury crash. The one A-injury crash was a turning left crash from westbound Deerfield Road to Saunders/Riverwoods Road.

Approximately 16 percent of the crashes occurred when the pavement was wet, 8 percent occurred when there was snowy or icy conditions, and 20 percent of the crashes occurred during night/dark conditions. These percentages are not considered to be an overrepresentation of these types of crash occurrence conditions such that specific countermeasures are warranted.

If no improvements are made to Deerfield Road, and travel demand increases, the annual crash rate is likely to increase. The IDOT Highway Safety Manual Prediction Tool Version 3.0 (IDOT HSM tool) will be utilized to establish a baseline for the predicted average crash frequency and predicted average fatal and injury crash frequency for existing and 2040 No-Build conditions. The IDOT HSM tool uses the FHWA HSM as a starting point and incorporates Illinois-specific calibration factors and crash distribution tables for IDOT District 1, which covers the Chicago Metropolitan area.

### **1.3.3 What are the Mobility Needs?**

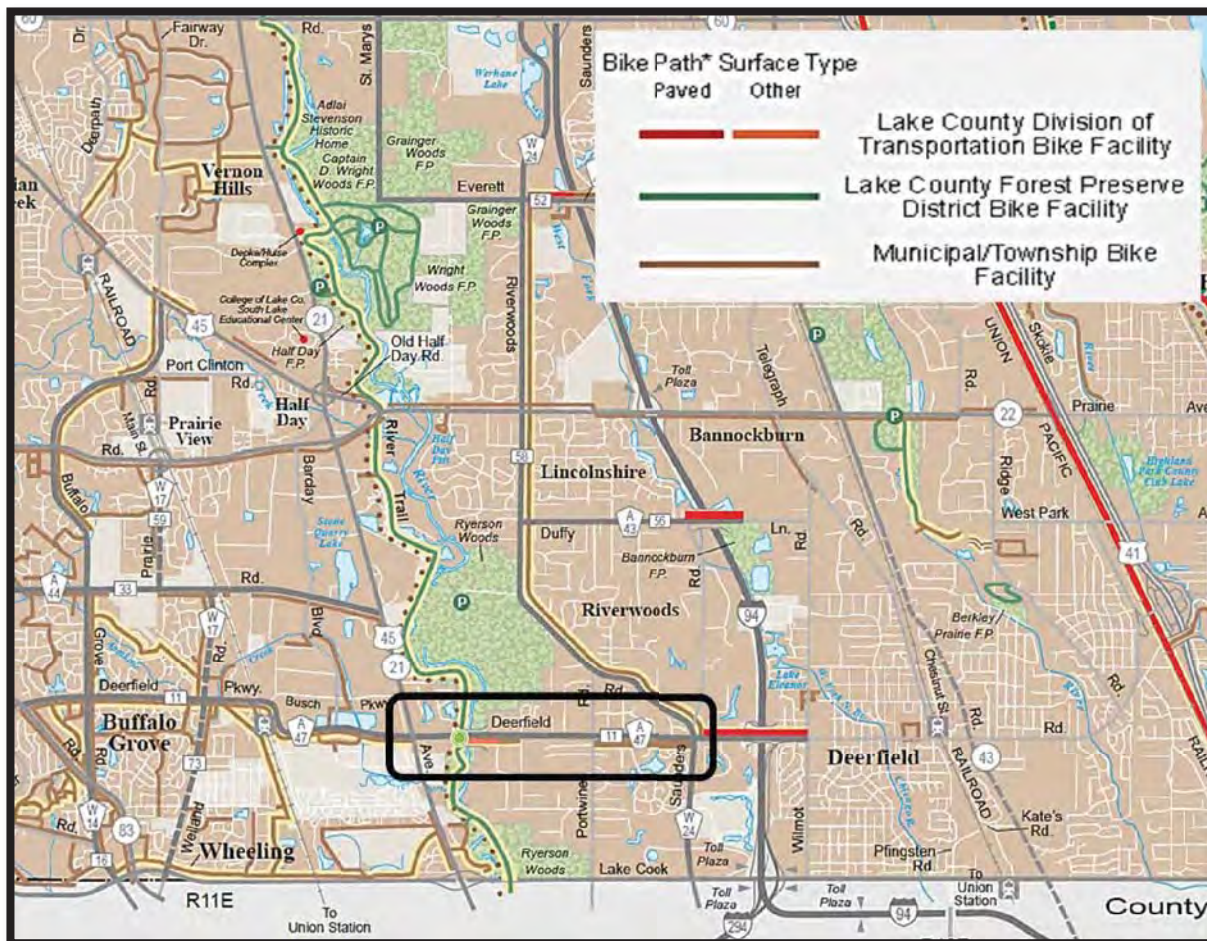
A key concern expressed by adjacent residential and commercial property owners is the poor access (ingress and egress) caused by the heavy congestion in the corridor. This is viewed as a daily quality of life concern, but also a concern with respect to emergency services and other public services that are adversely affected by current conditions.

There are 52 access points off Deerfield Road within the two (2) mile stretch from Milwaukee Avenue to Saunders/ Riverwoods Road. The access points consist of eleven (11) local streets, nine (9) commercial access drives and thirty-two (32) residential driveways. The large number of access points along the 2-lane stretch of roadway, in conjunction with the high travel demand, contributes to excessive wait times to and from side streets and entrances along Deerfield Road. If no improvements are made, with projected travel demand increases, access to adjacent residential and commercial properties will continue to be an issue along this section of Deerfield Road. Vehicular gap acceptance analysis will be utilized to evaluate mobility along Deerfield Road for existing and 2040 No-Build conditions.

### 1.3.4 What are the Non-Motorized and Transit Connections Needs?

Deerfield Road has existing multi-use paths outside of the project study area as described in the project history section and shown in the Lake County Bikeway Map, Figure 1-10. West of the study area, the Village of Buffalo Grove has an existing regional trail along the south side of Deerfield Parkway that terminates at Milwaukee Avenue. East of the study area, LCDOT has an existing regional trail along the north side of Deerfield Road that terminates at Saunders/Riverwoods Road. There is also a regional trail north along Riverwoods Road. Within the study area, Deerfield Road represents a gap in the regional trail network. LCDOT has a separated path over the Des Plaines River, and there is an intermittent existing municipal path in poor condition along the north side of Deerfield Road from Portwine to Saunders/Riverwoods Road. However, these paths are not connected to each other and do not connect to the adjacent regional paths.

Figure 1-10: Lake County Bikeway Map



Source: Lake County

The LCFPD DPRT runs along the west bank of the river and is part of the Grand Illinois Trail (GIT) which is a regional trail. The DPRT crosses under the Deerfield Road Bridge adjacent to

the river as shown in Figure 1-11. The roadway bridge has a low clearance and bicyclists are encouraged to dismount before passing under it. The recently constructed separate bike path bridge was constructed higher than the existing road above the 100-year floodplain, and does not present a clearance issue.

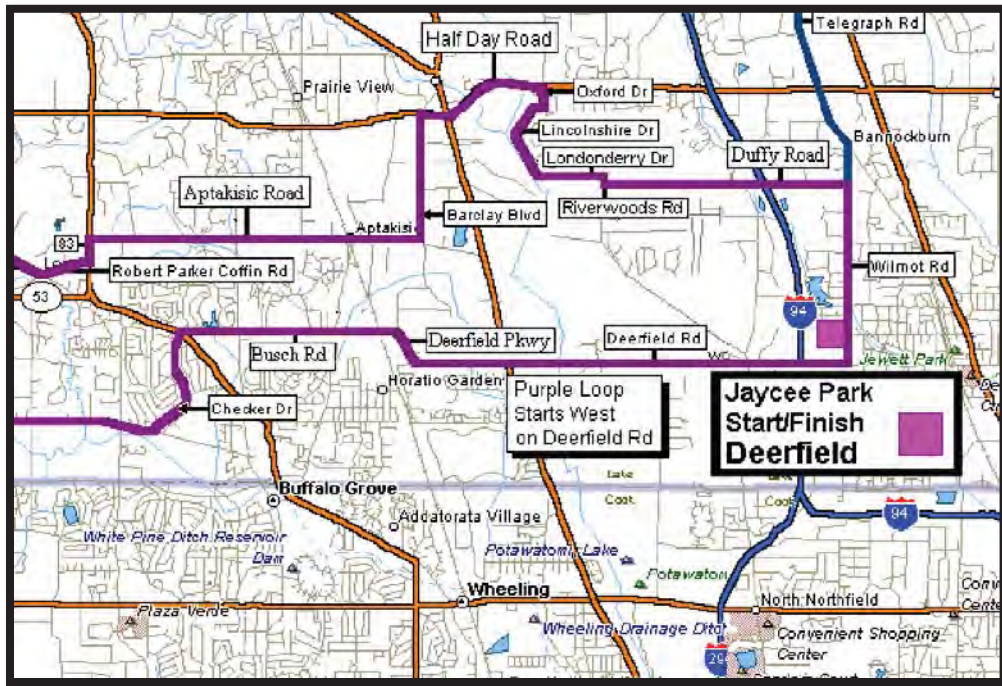
**Figure 1-11: DPRT Underpass at Deerfield Road Looking North**



In addition to the regional significance of the DPRT, Deerfield Road is one of the few Des Plaines River crossings that bicyclists can utilize since Half Day Road (IL 22) is approximately 2.3 miles north of the crossing and Lake Cook Road is approximately 1.0 mile south of the crossing. Vehicles and bicyclists must share the narrow roadway and limited shoulder. As shown in Figure 1-10, neither Half Day Road nor Lake Cook Road have on road bicycle accommodations. There is a separated bike path along the north side of Half Day Road.

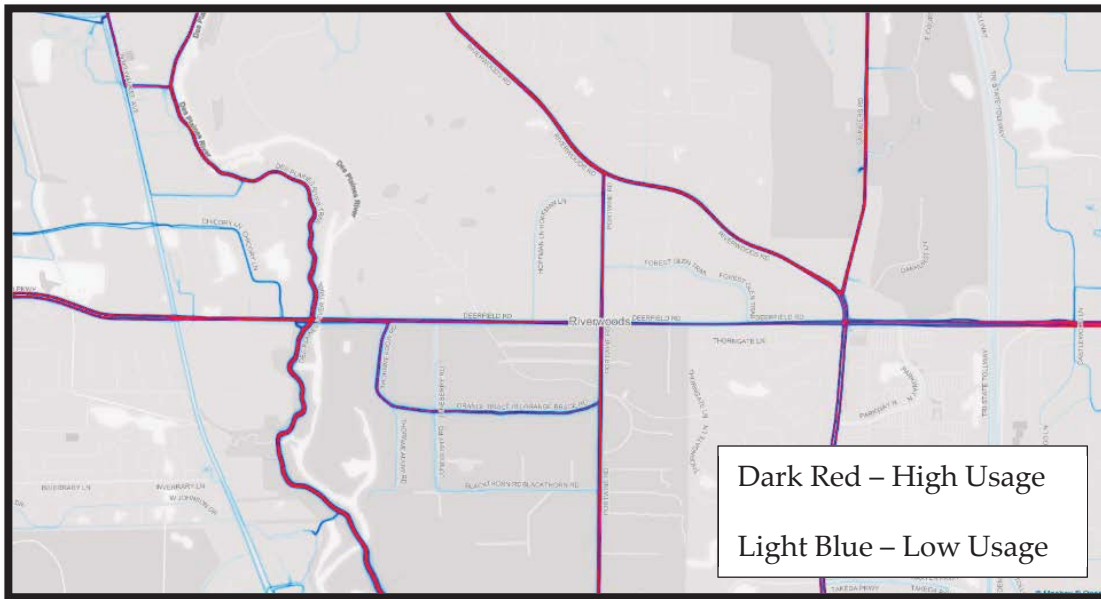
Deerfield Road is significant to on road bicyclists. The Velo Club Roubaix is primarily a road bike club, and their main route starts along Deerfield Road as shown in Figure 1-12. Bike club maps such as these are helpful in determining recommended best-available routes that users would like to use. STRAVA Labs produces “heat maps” indicating how more avid bicyclists and runners are currently using routes. Figure 1-13 shows high usage areas in red and less used areas in light blue. Routes west and east of the study area and along the DPRT are very heavily used, while sections of study area are more poorly used, especially east of the DPRT. This is likely attributed to the safety and connectivity issues previously described. As multi-modal roadway uses increases, conflicts between roadway users are anticipated to increase for projected 2040 (No-Build) conditions.

Figure 1-12: Deerfield Road Utilization by Regional Bike Club



Source: Velo Club Roubaix

Figure 1-13: Strava Bike/ Ped Heat Map



Source: STRAVA Labs Database

Pace Bus operates express service along Deerfield Road between the Buffalo Grove Metra Station and the CTA Yellow Line Dempster-Skokie Station for B-trips on Route 626. Once at the



Dempster-Skokie CTA Station, Route 626 transit users may transfer to the Pace Route 250 or CTA Routes 54A and 97. In addition to the Pace bus route, private shuttles operate from Aon Hewitt and Zebra Technologies (northwest of Deerfield Road and Milwaukee Avenue) to the Deerfield Metra Station or Highland Park Metra Station (both east of I-94) along Deerfield Road. These private shuttles cycle from the Metra stations to the worksite and back again for multiple trips in both the AM and PM peak hours. Moving through the corridor is crucial for these employees to be at work on time in the AM and making train connections in the PM. If no improvements are made, with projected travel demand increases, transit user delay could increase based on the projected increases in travel demand.

### 1.3.5 What are the Operational Deficiencies?

The existing roadway cross section on Deerfield Road from Milwaukee Avenue to Saunders/Riverwoods Road is one through lane in each direction with narrow shoulders and nearby potential roadside hazards. Potential roadside hazards include trees, berms, ditches, and brick mailboxes just off the shoulders on both sides of Deerfield Road, and aerial power lines just off shoulders and side streets along the south side of the roadway. There are approximately 52 driveways and side streets along the 2-lane section of Deerfield Road with steep side slopes or block wall culverts that present potential roadway hazards in close proximity to the pavement. Figure 1-14 shows one example of driveways with ditches, culvert headwalls, mailbox, and powerlines close to the travel way.

**Figure 1-14: Potential Roadside Hazards Example**



The west portion of the roadway near the Des Plaines River and at the Milwaukee Avenue intersection is within the mapped floodplain. A resident noted the Deerfield Road pavement flooded near the Des Plaines River in 1986. The bridge was reconstructed in 1993, however the adjacent roadway approaches were not raised. Based on the Lake County 1-foot topography, portions of the west and east approaches are 1 foot or more below the base flood elevation of 645 feet. The roadway bridge low chord elevation is below the design high water elevation (DHWE), which does not meet the minimum clearance of 1 foot above the DHWE. Lake County Stormwater Management Commission (LCSMC) collects flood problem areas from local municipalities, and there is one recorded just west of Jasmine Lane and north of Deerfield Road near Thorngate Creek. There are no LCSMC recorded citizen flood complaints within the study area. A resident commented that further east, between Forest Glen Trail and Big Oak Lane the culvert under Deerfield Road backs up into adjacent properties. Hoffman Lane just north of Deerfield Road overtops with stormwater sheet flowing east to west.

The underlying pavement was constructed in the 1960's and is nearly 50 years old, with signs of advanced deterioration with more frequent cycles of maintenance required. During a 2014 resurfacing project, the exposed concrete pavement after milling the surface course was deteriorated. The LCDOT pavement management data shows almost 40% of the base/substructure to be in failing condition. There is some correlation with the poor subbase in the testing data and mapped hydric soils. As such, LCDOT views the roadway to be near the end of its life and the most cost-effective pavement management approach is to reconstruct the roadway, which typically requires the evaluation of capacity and safety needs, as well other drainage, non-motorized, and roadway needs.

#### 1.4 What is the Purpose of the Proposed Project?

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The purpose of the project is to provide an improved transportation system to address capacity, safety, mobility, and operational deficiencies along Deerfield Road and improve non-motorized accommodations from Milwaukee Avenue (US 45/ IL 21) to Saunders/ Riverwoods Road in Lake County, Illinois.

The project Purpose and Need received concurrence at the NEPA/404 coordination meeting on June 19, 2017.