

APPENDIX I

Purpose and Need Updates

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UPDATES TO PURPOSE AND NEED: SAFETY, CAPACITY & GEOMETRIC DEFICIENCIES

This document provides additional supporting documentation to the IL Route 31 Purpose and Need Statement submitted for Federal agency concurrence for the Section 404/NEPA merger process. Since the approval of the Purpose and Need Statement, new information has become available. This appendix documents the additional findings to the Safety Deficiencies, Capacity and Mobility Deficiencies, and the Geometric Deficiencies section of the Purpose and Need. The new information presented in this document further supports the Purpose and Need of the project. The table numbers used in this document correspond to the table numbers in the Purpose and Need, except for Table 1.3-A, which is a new table created for this appendix.

Safety Deficiencies

The crash information provided in the Purpose and Need listed the results of a detailed crash study completed for the period between January 1, 2006 and December 31, 2009. Additional crash data was obtained from IDOT for the period between January 1, 2010 and December 31, 2013. A summary of all crashes between 2006 and 2013 is provided below.

The total number of crashes for the 2006 to 2013 study period was 1,759. In addition to 250 crashes in 2006, 253 crashes in 2007, 260 crashes in 2008, and 150 crashes in 2009, there were 233 crashes in 2010, 220 crashes in 2011, 211 crashes in 2012, and 182 crashes in 2013. Table 1.3-A is a new table that was not in the original Purpose and Need. It contains a summary of the crashes by year for total crashes and injury crashes from 2006 to 2013.

Year	Total Crashes		Injury + Fatality Crashes		Injuries + Fatalities		Number of Injuries By Type			
	Total	Frequency	Total	Frequency	Total	Frequency	K	A	B	C
2006	250	14.2%	54	12.2%	84	13.1%	2	9	22	51
2007	253	14.4%	72	16.3%	111	17.3%	4	14	59	34
2008	260	14.8%	48	10.9%	82	12.8%	0	16	32	34
2009	150	8.5%	49	11.1%	73	11.4%	0	15	30	28
2010	233	13.2%	60	13.6%	77	12.0%	0	9	35	33
2011	220	12.5%	53	12.0%	64	10.0%	0	5	28	31
2012	211	12.0%	49	11.1%	69	10.8%	0	6	32	31
2013	182	10.3%	57	12.9%	81	12.6%	0	10	21	50
Total	1759	100.0%	442	100.0%	641	100.0%	6	84	259	292

Table 1.3-A, Total Crashes by Year, Frequency and Injury Severity
Created to show 2010-2013 Crash Data

Of the total crashes, 442 (25.1%) were injury crashes, resulting in 641 injuries. There were 84 incapacitating type “A” injuries, which are the most severe injury type that is not a fatality. There were six fatalities recorded during the study period, all of which occurred between 2006 and 2007. The section of the project between Shady Oaks and Veterans Parkway is where the most fatalities occurred. Both of the existing vertical curve design deficiencies are located within this section. It was previously reported that three of the four existing vertical curve deficiencies were within this section. Lighting conditions, weather, and wet pavement do not appear to contribute substantially to crashes within the IL Route 31 corridor.

The Federal Highway Administration (FHWA) requires states to submit an annual report to the FHWA describing the 5% of highways exhibiting the most safety needs based on crash severity index.

Various segments of the southern project area from IL Route 176 to Veterans Parkway have been identified as top 5% crash locations in Illinois between 2009 and 2012. IL Route 120 in the project area was also listed as a top 5% crash location in 2012 and the intersection of IL Route 120 with Millstream Drive/3rd Street was a top 5% location for all years between 2009 and 2012. The identification of the various portions of the project area as top 5% locations indicates safety concerns.

Capacity and Mobility Deficiencies

Future traffic volume projections were updated since the approval of the project’s purpose and need, and provided by CMAP on September 28, 2011. Since the approval of the purpose and need, the West McHenry Bypass is no longer a planned McDOT project; for that reason, the updated CMAP traffic projections do not take into account the construction of the West McHenry Bypass. Traffic volumes without the bypass are anticipated to be greater between Gracy Road and Grove Avenue than previously projected. Traffic volumes south of Gracy Road and north of Grove Avenue are anticipated to be lower than previously projected.

The most recent traffic data available for the project corridor is from the year 2015. However, all traffic analyses conducted for this project were developed using 2009 traffic data as the existing condition, as that was the data available at the time of that work. There is generally little change in traffic volume along the IL Route 31 project corridor between the Year 2009 and Year 2015 datasets. Year 2015 ADTs along IL Route 31 at the south end of the project slightly increased compared to 2009 ADTs (25,300 vpd in 2015 compared to 23,500 vpd in 2009). Year 2015 ADTs at the north end of the project very slightly increased in 2015 compared to the 2009 dataset (17,600 vpd in 2015 to 17,500 vpd in 2009).

Future traffic volumes are anticipated to range from 26,000 vpd at IL Route 176 to 20,000 vpd south of IL Route 120 for the No-Action alternative in the year 2040. These updated 2040 No-Action projections along with the existing and previously presented 2040 No-Action projections are shown in the revised Table 1.3-1.

ROAD SECTION	Average Daily Traffic (ADT)		
	Existing (2009)	Future No - Action (2040) As Shown in Purpose & Need	Future No-Action (2040) Updated Projections
IL Route 31 south of IL Route 176	33,500	46,000	48,000
IL Route 31 between IL Route 176 and Half Mile Trail	23,500	32,000	26,000
IL Route 31 between Half Mile Trail and Ames Road	19,100	32,000	26,000
IL Route 31 between Ames Road and Edgewood Road	19,100	32,000	26,000
IL Route 31 between Edgewood Road and Gracy Road	19,100	31,000	24,000
IL Route 31 between Gracy Road and Albany Street/Prime Parkway	19,100	22,000	24,000
IL Route 31 between Albany Street/ Prime Parkway and Shamrock Lane	19,100	22,000	24,000
IL Route 31 between Shamrock Lane and Bull Valley Road	19,100	22,000	24,000
IL Route 31 between Bull Valley Road and Lillian Street/ Grove Avenue	17,500	21,000	22,000
IL Route 31 between Lillian Street/ Grove Avenue and IL Route 120	17,500	21,000	20,000
Front Street north of IL Route 120	1,750	5,000	5,000

Table 1.3-1, IL Route 31 Traffic Volumes – Existing and Projected 2040
Updated to Show Latest CMAP Projections

The IL Route 31 corridor currently experiences heavy traffic congestion and delay. Increased future traffic volumes will cause more congestion and delay. The existing and projected LOS at intersections has been revised since the approval of the Purpose and Need. Refer to the revised Table 1.3-2 for updated LOS and delay information. The Bull Valley Road intersection has been removed in the revised table since this intersection is no longer part of this project and is being improved as part of the McDOT Bull Valley Road/Charles J. Miller Road project. In the AM peak hour, two of the six intersections currently experience LOS F. By 2040, all six intersections are anticipated to experience LOS F. In the PM peak hour, three of the intersections currently experience LOS E or worse. By 2040, five of the intersections are anticipated to experience LOS F and one LOS D.

INTERSECTION	AM Peak Hour				PM Peak Hour			
	Existing (2009)		No Build (2040)		Existing (2009)		No Build (2040)	
	Delay (seconds/vehicle)	LOS	Delay (seconds/vehicle)	LOS	Delay (seconds/vehicle)	LOS	Delay (seconds/vehicle)	LOS
*Half Mile Trail	353.0	F	11,259	F	339.9	F	3,684	F
*Edgewood Road	108.2	F	7,414	F	49.4	E	2,748	F
Prime Pkwy./Albany St.	25.4	C	326.0	F	30.0	C	220.9	F
Shamrock Lane	16.7	B	380.9	F	12.3	B	113.6	F
Lillian St./Grove Ave.	24.6	C	131.7	F	27.8	C	47.4	D
IL Route 120	29.5	C	136.4	F	65.4	E	163.3	F

* Existing non-signalized intersection.

Table 1.3-2, AM and PM Existing and Future No-Action (2040) Level of Service and Delay by Intersection Updated to Reflect LOS for Latest CMAP Projections

Geometric Deficiencies

The vertical curve deficiencies noted in the Purpose and Need have been revised in Table 1.3-3 – Existing Geometric Deficiencies (Vertical Curves). The IL 31 at Drake Drive intersection has been removed from this list because the posted speed limit was previously recorded to be 50 mph while the actual posted speed limit is 45 mph. The change in design speed affects the allowable sharpness of the curve, thus the minimum required K Value is 61 as opposed to the previously presented 84. Since the measured K Value for this vertical curve was 79, which exceeds the minimum requirement, it is no longer considered a design deficiency.

The vertical curve south of Brighton Lane has been removed from this list as well because is not a stopping sight distance deficiency. It was previously recorded as having a K Value of 78. Instead it exceeds the required length of vertical curve and is longer than the recommended design with a K Value of 240. In some cases high K Values pose a drainage deficiency but since both tangents to the vertical curve have a negative slope, this curve is not a drainage deficiency. The two remaining vertical curve deficiencies are shown in Table 1-3.3.

Location	Type	Posted Speed Limit	K Value Req. Max/Min.	K Value Actual
970 feet North of Half Mile Trail on IL 31	Sag	55 mph	167/115	79
350 feet south of Ames Road on IL 31	Crest	55 mph	167/114	92

Table 1.3-3, Existing Geometric Deficiencies (Vertical Curves)
Updated

Various other geometric design deficiencies exist at or near intersections. Turn lane taper lengths, turn lane storage lengths, turning radii, angle of intersection, intersection approach gradients, and commercial driveway slopes are among the horizontal and vertical deficiencies at intersections. Additionally, the existing intersections at John Street and Main Street experience intersection sight distance problems due to existing buildings located at the intersection corners. These buildings block the driver's line of sight for vehicles turning or crossing IL Route 31 from the side streets.

In addition to the drainage deficiency at the Unnamed Tributary to the Fox River mentioned in the Purpose and Need, various other drainage deficiencies exist along the project corridor. Insufficient profile grades can result in areas of poor drainage. Flat profile grades below 0.3% are present along IL Route 31 for 1,000 ft. to 2,000 ft. stretches between Dartmoor Drive and John Street in the City of McHenry. Insufficient profile grades are also present along IL Route 120 between IL Route 31 and the Boone Creek Bridge in the City of McHenry as well.

IL Route 31 has a history of stormwater overtopping the existing pavement near the Gracy Road intersection. The surrounding topography is very flat in this area and the conveyance of the defined channel is insufficient for the amount of runoff.

Drainage Deficiencies

Various drainage deficiencies exist within the project area. Several locations along IL Route 31 have been identified as areas of poor drainage with insufficient floodplain freeboard. IL Route 31 has a history of stormwater overtopping the existing pavement at the culvert crossing north of the Gracy Road intersection. The surrounding topography is very flat in this area, and the conveyance of the defined channel is insufficient for the amount of runoff. Overtopping of the roadway occurs for storm durations greater than a 10-year frequency.

Freeboard is defined as the height difference between the water surface elevation in a drainage facility up to the elevation at which the facility would overflow. The freeboard provides a factor of safety to account for the assumptions made in hydrologic and hydraulic analyses.

Additionally, flooding problems have been identified by the City of McHenry at the IL Route 31 crossing of the Unnamed Tributary to the Fox River, south of Lillian Street/Grove Avenue. Flooding is a result of floodplain development impacts to the property in the vicinity of this crossing, as well as properties both upstream and downstream. The storm sewers downstream from the IL Route 31 crossing, located at the Edgebrook

Elementary School, do not adequately convey the flow of the stream and therefore produce a tailwater influence on the hydraulic performance of the IL Route 31 culverts. IL Route 31 experiences overtopping during rain events more frequently than the 10-year storm. Overtopping of IL Route 31 extends from Anne Street to Meadow Lane during a 100-year storm event.

A Location Drainage Study (LDS) has been prepared for this project, under separate cover. Details regarding the existing drainage system, including additional discussion regarding drainage deficiencies, are contained in the LDS.