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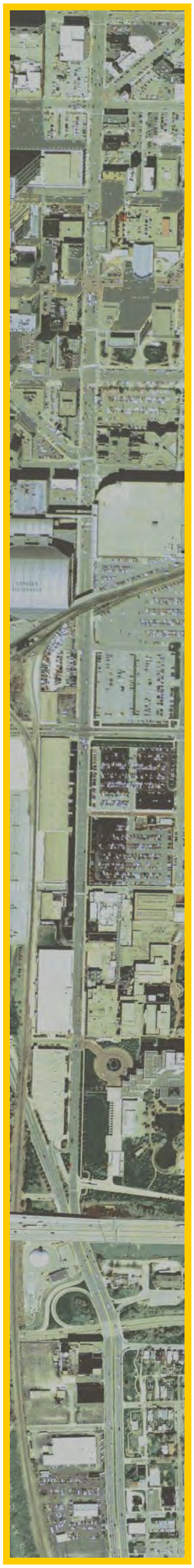

TOWN OF MCCORDSVILLE ROAD IMPACT FEE

ZONE IMPROVEMENT PLAN

NOVEMBER 2024

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CERTIFICATION

I certify that this **ROAD IMPACT FEE ANALYSIS** has been prepared by me and under my immediate supervision and that I have experience and training in the field of traffic and transportation engineering.

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TABLE OF CONTENTS

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TOWN OF MCCORDSVILLE
ZONE IMPROVEMENT PLAN
STUDY AREA ROADWAY NETWORK

FIGURE 1

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TOWN OF MCCORDSVILLE
ZONE IMPROVEMENT PLAN
VACANT LAND PARCELS

FIGURE 2

INTRODUCTION & PURPOSE

The Town of McCordsville has undertaken a project to determine the amount of the road impact fee that can be assessed against future developments that could be constructed within the Town's limits over the next ten years. This analysis will project and evaluate the future impact of these developments on the roadway system. This report will serve as a Zone Improvement Plan for the study area.

In order to develop a meaningful road impact fee study, the Rational Nexus Theory was implemented. The Rational Nexus Theory states that new developments cannot be held responsible for the existing inadequacy of the existing street system. Therefore, this Zone Improvement Plan was developed in two separate parts. The first part determined the existing functionality of the intersections and roadways in the study area. Costs were then assigned to all intersection and roadway improvements that were needed to allow these intersections and roadways to function at the baseline levels of service with the existing traffic volumes. The second part of the analysis determined the traffic volumes that would be generated by the vacant parcels of land within the study area that could be developed over the next 10-year period. The generated traffic volumes were then assigned to the street system within the study area. The projected future traffic volumes were used to analyze the roadway system to determine the intersection and roadway improvements that would be necessary to accommodate the added traffic volumes and achieve the baseline levels of service. Cost estimates were then conducted for the recommended improvements. The road impact fee was then calculated by dividing the estimated cost to mitigate 10-year traffic volumes by the number of 24-hour weekday trips generated by the 10-year proposed developments identified by the Town of McCordsville planning staff. This amount is the cost the development community will be required to fund to meet the future intersection and roadway needs of the Town.

In determining the results of this analysis, A&F Engineering has followed acceptable traffic and transportation engineering methodologies and has completed this Zone Improvement Plan by following the guidelines outlined in IC 36-7-4-1300 Series to their complete understanding.

Study Area

The study area for this Zone Improvement Plan has been determined based on input provided by the Town of McCordsville. **Figure 1**, located at the front of this report, shows the Zone Improvement Plan boundary and the intersections and roadway segments that are included in the study area.

In order to estimate the 10-year traffic volumes, trips must be generated from vacant parcels within the study area. The Town of McCordsville planning staff identified the location of vacant land parcels that might be developed within the next ten years and the potential land use(s) and density of each parcel. **Figure 2** shows the location and land uses of the vacant land parcels in reference to the study area roadway network.

Historical Roadway Funding Sources

Historically, the Town of McCordsville has used various sources to fund road expenditures. These include Local Road & Street Distributions, the Motor Vehicle Highway Distributions, and General Obligation Bonds. **Table 1** is a summary of the funds received from each source over the past five years.

Table 1 – Historical Roadway Funding Sources

Year	LR&S Distribution	MVH Distribution	MVH Restricted Distribution	GO Bonds
2019	$105,212.07	$1,471,397.82	$103,234.09	---
2020	$114,811.41	$1,541,614.64	$91,046.44	---
2021	$118,556.27	$1,557,442.21	$100,623.12	---
2022	$157,326.86	$1,707,696.86	$151,516.37	$1,850,000.00
2023	$182,702.11	$1,606,022.83	$183,098.70	---
Total	**$678,608.72**	**$7,884,174.36**	**$629,518.72**	**$1,850,000.00**

Scope of Work

The scope of work for this analysis is as follows:

Existing Conditions

1. Determine the existing traffic volumes at all intersections and along all roadway segments.
    a. Perform peak hour manual turning movement traffic counts at the existing study area intersections.
    b. Perform 24-hour traffic counts (Annual Daily Traffic Volumes [ADT]) along the existing study area roadway segments.
2. Inventory all existing study area intersections to determine traffic control and intersection geometrics.

3. Inventory all existing roadway segments to determine number of lanes, lane widths, and speed limits.
4. Prepare a capacity analysis for each intersection and each roadway segment using existing geometrics, existing traffic controls and existing traffic volumes. The capacity analysis will provide levels of service for each of the intersections and roadway segments which can be compared to the acceptable baseline level of service standards.
5. Make recommendations to improve the intersections and roadway segments that operate below acceptable baseline levels of service to meet or exceed baseline levels of service.
6. Estimate construction costs based on the corresponding intersection and roadway improvements needed to provide the baseline level of service for the existing traffic volumes.

<u>Projected 10-Year Conditions</u>

1. Based on input from the Town of McCordsville planning staff, identify all vacant and partially vacant parcels of land within the study area and confirm the potential future land uses and densities for those parcels.
2. Estimate the number of AM peak hour and PM peak hour trips that will be generated by the potential use of each of these parcels.
3. Assign and distribute the generated trips for the AM and PM peak hour periods throughout the street system.
4. Determine the total AM and PM peak hour generated trips from the vacant parcels at each intersection and along each roadway segment within the study area roadway network.
5. Add the generated trips to the existing traffic volumes to develop 10-year traffic volume estimates.
6. Prepare a capacity analysis for each intersection and each roadway segment using the projected 10-year traffic volumes. The capacity analysis will provide levels of service for the roadway segments and intersections which can be compared to the acceptable baseline level of service standards.
7. Make recommendations to improve the intersections and roadway segments that operate below the acceptable baseline levels of service to meet or exceed baseline levels of service.
8. Estimate construction costs based on the corresponding roadway and intersection improvements needed to accommodate the projected 10-year traffic volumes.

Road Impact Fee Calculation

1. Estimate the 24-hour weekday trips that will be generated by the potential use of each vacant parcel.
2. Calculate the total road impact fee cost by subtracting the existing construction const from the 10-year construction cost and then adding the cost to perform the road impact fee study. This yields the total road impact fee cost.
3. Finally, the total road impact fee cost is divided by the total 24-hour weekday trips generated by the identified vacant land parcels to yield the road impact fee per 24-hour weekday trip.

EXISTING TRAFFIC DATA

Peak hour turning movement traffic volume counts were conducted at the study intersections by A&F Engineering Co., LLC. The counts include an hourly total of all "through" traffic and all "turning" traffic at the intersection. The counts were made during the hours of 6:30 AM to 9:00 AM and 3:30 PM to 6:30 PM in year 2022 under good weather conditions and while school was in session. The "Intersection Volumes" tables shown in **Exhibit A** summarize the existing traffic volumes for the peak hours obtained from the manual counts. The raw data sheets for the intersection traffic counts are included in **Appendix A**.

Directional, classified, traffic volume counts were conducted along all major existing public roadway segments in the study area by A&F Engineering Co., LLC in year 2022. These counts were conducted over 24-hours during a typical weekday while school was in session to yield the roadway segment "Average Daily Traffic" (ADT). The "Segment Volumes" tables in **Exhibit B** summarize the existing traffic volumes for the peak hours and the ADT obtained from the roadway segment traffic counts. The raw data sheets for the roadway segment traffic counts are included in **Appendix B.**

EXISTING INTERSECTION INVENTORY

The following characteristics were identified for each study intersection within the study area:

- Traffic Controls
- Intersection Geometrics

EXISTING ROADWAY SEGMENT INVENTORY

Each study roadway within the study area was identified by dividing the roadway into segments to be analyzed. In general, each segment was chosen based on a major change in traffic conditions or roadway characteristics. The characteristics that were included in the roadway segment analyses are:

- Number of Lanes
- Segment Length
- Speed Limits
- Percent No-Passing Zones
- Presence of Median or Passing Lanes

VACANT LAND PARCELS – PROPOSED USES

The vacant parcels of land included in this analysis and identified by the Town of McCordsville planning staff are illustrated on **Figure 2.** In addition, the individual land uses and densities that could be built out in the next 10-years on these parcels were determined based on the information provided by the Town of McCordsville planning staff.

GENERATED TRIPS

An estimate of generated traffic from each of the 10-year vacant parcel developments is a function of the size and character of each land use. The *ITE Trip Generation Manual (11th Edition)*[1] was used to calculate the total number of trips expected to be generated by each land use during the AM peak hour, PM peak hour, and 24-hour weekday period. The *ITE Trip Generation Manual* is a compilation of trip data for various land uses as collected by transportation professionals throughout the United States in order to establish the average number of trips generated by those land uses. Based on the information provided by the Town of McCordsville planning staff as well as data taken from *ITE Trip Generation Manual (11th Edition),* the classifications and descriptions for each of the vacant parcel developments applicable to this study are as follows:

General Light Industrial: A general light industrial facility is typically devoted to a single use with an emphasis on activities other than manufacturing such as printing, material testing, and assembly of data processing equipment and typically has minimal office space.

[1] *Trip Generation Manual,* Institute of Transportation Engineers, Eleventh Edition, 2021.

Business Park: A business park typically consists of flex-type or incubator one- or two-story buildings served by a common roadway system. The tenant space is flexible and lends itself to a variety of uses. The rear side of the building is often served by a garage door. Tenants may be start-up companies or small mature companies that require a variety of space including offices, retail and wholesale store, restaurants, recreational areas and warehousing, manufacturing, light industrial, or scientific research functions.

General Office: General office land uses typically have multiple tenants and are locations where affairs of businesses, commercial or industrial organizations, or professional persons or firms are conducted.

General Retail: The general retail land use includes neighborhood center, regional shopping centers, and area service nodes that are planned, developed, owned and managed as a shopping center.

Single Family:
(Detached) Single family land uses are defined as all single family detached homes on individual lots. A typical example of this land use is a suburban subdivision.

Single Family:
(Attached) Attached Single family land uses are defined as all single family homes that share a wall with an adjoining unit. Typical examples of this land use include townhouses or rowhouses.

Multi-Family: Multi-family housing generally includes apartments and condominiums located within the same building with at least three other dwelling units and that have two or three levels (floors).

INTERNAL TRIPS

Mixed-use developments typically generate internal trips between the individual land uses within the development. These internal trips do not access the public street system; therefore, they are not included in the capacity calculations. For the mixed-use developments considered in this report, the internal trip reduction rates outlined in the *ITE Trip Generation Handbook*[2] were applied.

[2] *Trip Generation Handbook*, Institute of Transportation Engineers, Eleventh Edition, 2021.

Pass-By Trips

The retail land uses considered in this analysis will attract pass-by trips. Pass-by trips are trips already in the existing flow of traffic that enter the development, utilize the development, and then return to the roadway system. *ITE Trip Generation Handbook* provides procedures, methodology, and data that can be used to estimate the number of pass-by trips generated by the retail land uses.

Assignment & Distribution of Generated Trips

To determine the volume of traffic that will be added to the study area roadway network, the generated traffic must be assigned and distributed by direction to the public roadway at its intersection with the development access points, and then to each of the intersections throughout the study area. For each of the vacant parcels within the study area, the assignment and distribution of the generated trips were based on the existing traffic patterns, the location of population and employment centers in relation to the individual parcels, and the street system (existing and proposed) within the study area. The assignment and distribution of the generated traffic for each parcel was expedited by using *PTV VISUM 24*[3], a state-of-the-art transportation planning software package that utilizes origin-destination pairs and allows for changes in the roadway system and driver behavior to be considered when future traffic flows are determined.

Projected 10-Year Traffic Volumes

Information provided by the Town of McCordsville planning staff was used to develop land use and density determinations for each parcel of vacant land. The generated traffic volumes from each parcel were totaled for both the AM peak hour and the PM peak hour at each of the study intersections and along each of the roadway segments. These generated volumes were then added to the existing traffic volumes at each intersection and roadway segment to obtain the 10-year traffic volumes. The projected 10-year traffic volumes are summarized for the AM peak hour and PM peak hour for each intersection in the "Intersection Volumes" tables in **Exhibit A** and for each roadway segment in the "Segment Volumes" tables in **Exhibit B**.

[3] *PTV VISUM 2024.01-05*, PTV Group, 2024.

Traffic Signal Warrant Analysis

Peak Hour Traffic Signal Warrant analyses were conducted at two-way stop and all-way stop-controlled intersections where the minor streets and/or the intersection as a whole, respectively, have been shown to operate below acceptable baseline levels of service to determine if the installation of a traffic signal or construction of a roundabout should be considered under existing and/or 10-year conditions to improve the levels of service to or above the baseline level of service.

Capacity Analysis

The "efficiency" of an intersection or roadway segment is based on its ability to accommodate the traffic volumes that approach the intersection or that travel along the roadway segment. It is defined by the Level of Service (LOS) of the intersection or roadway segment. The LOS is determined by a series of calculations commonly called a "capacity analysis". Input data into a capacity analysis include traffic volumes, intersection geometry, number and use of lanes, and, in the case of signalized intersections, traffic signal timing. To determine the LOS at each of the study intersections, a capacity analysis has been made using the recognized computer program *Synchro 12*[4]. This program allows multiple intersections to be analyzed and optimized using the capacity calculation methods outlined within the *Highway Capacity Manual (HCM 7th Edition)*[5]. To determine the LOS at each of the roadway segments, a capacity analysis has been performed using the computer program *HIGHPLAN*, which uses the capacity calculation methods outlined within the *Highway Capacity Manual (HCM)* for two-lane and multilane roadway segments.

Description of Level of Service – Intersections

The Level of Service (LOS) for an intersection is based on the control delay (in seconds) that a vehicle would typically experience at the intersection. The following descriptions obtained from the *Highway Capacity Manual (HCM)* outline the delay thresholds related to the levels of service for signalized intersections:

Level of Service A - describes operations with a very low delay, less than or equal to 10.0 seconds per vehicle. This occurs when progression is extremely favorable, and most vehicles arrive during the green phase. Most vehicles do not stop at all.

[4] *Synchro/SimTraffic 12*, Cubic Transportation Systems, 2023.

[5] *Highway Capacity Manual (HCM), 7th Edition*, Transportation Research Board, The National Academies of Sciences, Washington, DC, 2022.

Level of Service B - describes operations with delay in the range of 10.1 to 20.0 seconds per vehicle. This generally occurs with good progression. More vehicles stop than LOS A, causing higher levels of average delay.

Level of Service C - describes operation with delay in the range of 20.1 seconds to 35.0 seconds per vehicle. These higher delays may result from failed progression. The number of vehicles stopping is significant at this level, although many still pass through the intersection without stopping.

Level of Service D - describes operations with delay in the range of 35.1 to 55.0 seconds per vehicle. At level of service D, the influence of congestion becomes more noticeable. Longer delays may result from some combinations of unfavorable progression. Many vehicles stop, and the proportion of vehicles not stopping declines. This is the limit of acceptable delay.

Level of Service E - describes operations with delay in the range of 55.1 to 80.0 seconds per vehicle. These high delay values generally indicate poor progression and long cycle lengths.

Level of Service F - describes operations with delay more than 80.0 seconds per vehicle. This is considered to be unacceptable to most drivers. This condition often occurs with oversaturation, i.e., when arrival flow rates exceed the capacity of the intersection. Poor progression and long cycle lengths may also be major contributing causes to such delay levels.

The following *Highway Capacity Manual (HCM)* tables, show the delays related to the levels of service for unsignalized, signalized, and roundabout intersections:

Level of Service	Control Delay (seconds/vehicle)	
	UNSIGNALIZED	SIGNALIZED/ROUNDABOUT
A	Less than or equal to 10	Less than or equal to 10
B	Between 10.1 and 15	Between 10.1 and 20
C	Between 15.1 and 25	Between 20.1 and 35
D	Between 25.1 and 35	Between 35.1 and 55
E	Between 35.1 and 50	Between 55.1 and 80
F	greater than 50	greater than 80

Description of Level of Service – Roadways

The computer software *HIGHPLAN* was used to determine the Level of Service (LOS) for the two-lane roadway segments (one travel lane in each direction) and multilane roadway segments (more than one travel lane in each direction) in this study. In the *HIGHPLAN* software, the LOS for the two-lane roadway segments for urban/developed areas is based on the percentage free flow speed (the percentage of vehicular speed traveled in relation to the posted speed limit) that can be obtained over the roadway segment. For multilane roadway segments, the LOS is based on the density (passenger cars per mile per lane) of the roadway segment.

HIGHPLAN utilizes the following roadway variables in the determination of the LOS for two-lane and multilane roadway segments:

- Number of Lanes
- Segment Length
- Speed Limit
- Percent No Passing Zone
- Presence of Median or Passing Lanes
- Average Daily Traffic (ADT)
- Directional Split of traffic
- Peak Hour Factor (PHF)
- Heavy Vehicle Percentage

The following tables show the criteria used by *HIGHPLAN* in determining the level of service for two-lane roadway segments and multilane roadway segments.

Level of Service Thresholds for Two-Lane Roadway Segments

Level of Service	Percentage of Free Flow Speed (%)	Minimum Speed (mph)
A	≥ 92	45
B	83 - 91.9	35
C	75 - 82.9	35
D	67 - 74.9	35
E	≤ 67	35
F	v/c ≥ 1.0	35

Level of Service Thresholds for Multilane Roadway Segments

Level of Service	Density (pc/mi/ln)	Speed (mph)
A	≤ 11	ALL
B	11.1 - 18	ALL
C	18.1 - 26	ALL
D	26.1 - 35	ALL
E	35.1 - 45	45-60
F	> 45	45-60

Acceptable Baseline Level of Service Standards

The Town of McCordsville has established a minimum acceptable baseline level of service (LOS) standard that was used when performing the capacity analyses for the study intersections and roadway segments. Level of service "C" has been selected as the minimum acceptable baseline LOS for intersections and level of service "D" as the minimum acceptable baseline LOS for roadway segments in this Zone Improvement Plan. This standard is used for both existing conditions and projected 10-year conditions.

In some cases, it was not feasible to achieve the baseline level of service for an intersection. For those intersections that operate below acceptable baseline levels of service (LOS D, E, and F), maximum efforts have been made to improve the intersection to a minimum of LOS C. Additionally, it was sometimes the case that a roadway could not be widened to mitigate poor levels of service (LOS E and F). Due to the fact that reasonable designs are not sufficient to achieve acceptable baseline levels of service in some instances, no further mitigations were considered for those intersections and roadway segments. This methodology applies to both the existing and the 10-year analyses.

In addition to the LOS standards for roadway segments, a maximum width standard is considered. In this standard, a 20-foot-wide roadway with a 2-foot shoulder was considered to be the minimum acceptable cross-section of a roadway segment. However, the costs associated with widening any width deficient roadway segments were not considered as it was assumed that the roadway segments will be widened as development occurs along the frontage of these roadways.

Recommended Improvement Criteria

Improvements were recommended for both the existing traffic volumes and the projected 10-year traffic volumes so that each study intersection/roadway segment will meet the minimum acceptable baseline level of service (LOS C/D). The recommended improvements only include those regarding the capacity of each study intersection/roadway segment. Road impact fees are calculated based on the improvements needed to enhance the capacity of each intersection/roadway segment, and the recommendations found in this report are based on improving said capacity. Typical improvements include: the addition of travel lanes, turn lanes, and changes in intersection control.

SUMMARY TABLES FOR INTERSECTIONS

A tabular summary of the capacity analysis results for each study intersection is shown in the following pages. The existing level of service (LOS) results are shown in **Table 1** under the heading “Existing LOS”. The existing LOS results are based on the existing traffic control, existing intersection geometrics and the existing AM peak hour and PM peak hour traffic volumes. The existing intersection traffic volumes for the peak hours can be found in the intersection volume tables in **Exhibit A**.

Level of service “C” has been selected for this study by the Town of McCordsville as the minimum acceptable baseline LOS for intersections. If necessary, mitigated conditions for the existing traffic volumes have been recommended for intersections that currently operate below the minimum acceptable baseline LOS. The resulting levels of service and recommended mitigations are shown in **Table 2** under the headings “Existing Mitigated LOS” and “Existing Mitigation”, respectively.

If necessary, mitigated conditions have been recommended so that the intersections will operate at acceptable baseline levels of service (LOS C) during the peak hours with the projected 10-year traffic volumes. This includes intersection improvements that are planned/proposed by the Town of McCordsville that will be constructed over the next 10 years. The LOS results for the projected 10-year traffic volumes along with the corresponding mitigations are shown in **Table 3** under the headings “10-Year Mitigated LOS” and “10-Year Mitigations”, respectively.

TABLE 2 – EXISTING INTERSECTION LEVEL OF SERVICE RESULTS

Int. ID	Intersection	Existing LOS		Existing Mitigated LOS		Existing Mitigation
		AM	PM	AM	PM	
I.1	96th St & Carroll Rd	B	B	---	---	---
I.2	96th St & Olio Rd	C	C	C	C	Create full length NB RT Lane
I.3	86th St & Carroll Rd	D	D	A	A	Add 1-1 RAB
I.4	CR 600 W & CR 900 N	B	B	---	---	---
I.5	McCord Rd & CR 900 N	A	A	---	---	---
I.6	CR 500 W & CR 900 N	A	A	---	---	---
I.7	CR 700 W & CR 800 N	C	C	---	---	---
I.8	CR 600 W & CR 800 N	C	E	B	C	Add NB and SB Thru Lanes
I.9	US 36 & Shopping Access Drive	D	D	D	D	Add EB RT Lane. Further reasonable mitigations do not improve LOS.
I.10	US 36 & SR 234	B	B	---	---	---
I.11	CR 500 W & SR 234	C	C	---	---	---
I.12	US 36 & CR 600 W	C	C	C	C	Create full length SB RT Lane
I.13	2nd St & CR 600 W	A	A	---	---	---
I.14	CR 700 W & CR 750 N	C	C	---	---	---
I.15	US 36 & CR 750 N	F	F	B	B	Add Traffic Signal*
I.16	CR 600 W & CR 750 N	E	D	B	A	Construct 1-1 RAB with NB LT Lane
I.17	CR 500 W & CR 750 N	A	A	---	---	---
I.18	US 36 & Carroll Rd	C	C	---	---	---
I.19	CR 600 W & CR 700 N	C	C	---	---	---
I.20	65th St & Carroll Rd	A	A	---	---	---
I.21	CR 600 W & CR 650 N	D	D	A	A	Construct 1-1 RAB
I.22	CR 800 W & CR 600 N	C	F	A	A	Construct 1-1 RAB
I.23	CR 700 W & CR 600 N (North Leg)	B	C	---	---	---
I.24	CR 700 W & CR 600 N (South Leg)	B	B	---	---	---
I.25	CR 600 W & CR 600 N	B	B	---	---	---
I.26	CR 500 W & CR 600 N	B	B	---	---	---
I.27	CR 700 W & CR 500 N	A	A	---	---	---
I.28	CR 600 W & CR 500 N	A	A	---	---	---

*PLANNED INDOT IMPROVEMENT

TABLE 3 – 10-YEAR INTERSECTION LEVEL OF SERVICE RESULTS

Int. ID	Intersection	10-Year LOS		10-Year Mitigated LOS		10-Year Mitigation
		AM	PM	AM	PM	
I.1	96th St & Carroll Rd	B	B	---	---	---
I.2	96th St & Olio Rd	D	D	C	C	Add NB Thru Lane; Add SB Thru Lane
I.3	86th St & Carroll Rd	F	F	B	B	Construct 1-1 RAB
I.4	CR 600 W & CR 900 N	F	F	B	C	Construct 2-2 RAB with EB & NB RT Bypass Lanes; NB & SB Thru Lanes from Segment
I.5	McCord Rd & CR 900 N	B	B	---	---	---
I.6	CR 500 W & CR 900 N	C	F	A	A	Construct 1-1 RAB
I.7	CR 700 W & CR 800 N	D	F	A	A	Construct 1-1 RAB
I.8	CR 600 W & CR 800 N	F	F	B	C	Construct 2-1 RAB; NB & SB Thru Lanes from Segment
I.9	US 36 & Shopping Access Drive	F	F	F	F	Add EB RT Lane; Further reasonable mitigations do not improve LOS
I.10	US 36 & SR 234	C	E	B	C	Add WB RT Lane
I.11	CR 500 W & SR 234	F	F	A	B	Construct 1-1 RAB**
I.12	US 36 & CR 600 W	D	F	D	F	Add NB & SB Thru Lanes
I.13	2nd St & CR 600 W	D	F	B	B	Add NB & SB Thru Lanes
I.14	CR 700 W & CR 750 N	E	F	E	F	Further reasonable mitigations do not improve LOS
I.15	US 36 & CR 750 N	F	F	C	C	Add Traffic Signal**
I.16	CR 600 W & CR 750 N	F	F	B	C	Construct 2-1 RAB; NB & SB Thru Lanes from Segment
I.17	CR 500 W & CR 750 N	C	C	---	---	---
I.18	US 36 & Carroll Rd	D	E	C	D	Add NB and SB RT lanes. Further reasonable mitigations do not improve LOS
I.19	CR 600 W & CR 700 N	F	F	A	A	Construct 2-1 RAB; NB & SB Thru Lanes from Segment
I.20	65th St & Carroll Rd	B	C	---	---	---
I.21	CR 600 W & CR 650 N	F	F	B	A	Construct 2-1 RAB; NB & SB Thru Lanes from Segment
I.22	CR 800 W & CR 600 N	E	F	A	A	Construct 1-1 RAB
I.23	CR 700 W & CR 600 N (North Leg)	C	F	A	A	Construct 1-1 RAB
I.24	CR 700 W & CR 600 N (South Leg)	C	C	---	---	---
I.25	CR 600 W & CR 600 N	F	F	C	B	Construct 2-2 RAB; NB & SB Thru Lanes from Segment
I.26	CR 500 W & CR 600 N	B	C	---	---	---
I.27	CR 700 W & CR 500 N	A	A	---	---	---

Int. ID	Intersection	10-Year LOS		10-Year Mitigated LOS		10-Year Mitigation
		AM	PM	AM	PM	
I.28	CR 600 W & CR 500 N	A	A	---	---	---
I.29*	CR 600 W & Aurora Way	D	D	A	A	Construct 2-1 RAB; NB & SB Thru Lanes from Segment
I.30*	CR 500 W & Aurora Way	A	A	---	---	---

*PROPOSED INTERSECTION

**PLANNED INDOT IMPROVEMENT

SUMMARY TABLES FOR ROADWAY SEGMENTS

A tabular summary of the capacity analysis results for each roadway segment is shown in the following pages. The existing level of service (LOS) results are listed which are based on the existing geometric conditions and existing AM peak hour and PM peak hour traffic volumes along the roadway segment. The existing peak hour traffic volumes as well as the existing average daily traffic volumes (ADT) can be found on the "Roadway Segment Summary" tables in **Exhibit B**.

Level of service "D" has been selected for this study by the Town of McCordsville as the minimum acceptable baseline LOS for roadway segments. If necessary, mitigated conditions for the existing traffic volumes have been recommended for roadway segments that currently operate below the minimum acceptable baseline LOS. The existing mitigated level of service and recommended existing mitigations to meet or exceed the baseline level of service can be found in **Table 4**.

The 10-year traffic volumes for the AM peak hour and PM peak hour have been projected for each roadway segment and can be found on the "Roadway Segment Summary" tables in **Exhibit B**. The 10-year level of service results, 10-year mitigated level of service, and recommended 10-year mitigations to meet or exceed the baseline level of service can be found in **Table 5**.

TABLE 4 – EXISTING ROADWAY SEGMENT LEVEL OF SERVICE RESULTS

Seg. ID	Roadway	Segment	Existing LOS		Existing Mitigated LOS		Existing Mitigation
			AM	PM	AM	PM	
S.1	CR 500 N	CR 500 W - CR 600 W	A	A	---	---	---
S.2	CR 500 N	CR 600 W - CR 700 W	A	A	---	---	---
S.3	CR 700 W	CR 500 N - CR 600 N	A	A	---	---	---
S.4	CR 600 N	County Line Road - Carroll Road	C	C	---	---	---
S.5	CR 600 N	CR 700 W - CR 600 W	B	C	---	---	---
S.6	CR 600 N	CR 600 W - CR 500 W	B	B	---	---	---
S.7	Carroll Road	CR 600 N - CR 650 N	B	C	---	---	---
S.8	CR 650 N	CR 600 W - CR 700 W	A	A	---	---	---
S.9	Carroll Road	CR 650 N - US 36	C	C	---	---	---
S.10	Carroll Road	US 36 - CR 750 N	C	C	---	---	---
S.11	Carroll Road	CR 750 N - CR 800 N	C	C	---	---	---
S.12	Carroll Road	CR 800 N - CR 900 N	C	C	---	---	---
S.13	Carroll Road	CR 900 N - 96th Street	D	D	---	---	---
S.14	CR 700 N	CR 600 W - CR 500 W	A	A	---	---	---
S.15	CR 750 N	CR 600 W - CR 500 W	A	A	---	---	---
S.16	SR 234	US 36 - CR 500 W	B	B	---	---	---
S.17	CR 900 N	McCord Road - CR 500 W	A	A	---	---	---
S.18	CR 500 W	CR 900 N - 96th Street	A	A	---	---	---
S.19	CR 900 N	CR 600 W - McCord Road	B	B	---	---	---
S.20	CR 900 N	CR 600 W - Carroll Road	B	B	---	---	---
S.21	CR 600 W	CR 500 N - CR 600 N	C	C	---	---	---
S.22	CR 600 W	CR 600 N - CR 650 N	C	D	---	---	---
S.23	CR 600 W	CR 650 N - CR 700 N	D	D	---	---	---
S.24	CR 600 W	CR 700 N - CR 750 N	E	E	B	B	Widen from 2 to 4 Lanes
S.25	CR 600 W	CR 800 N - CR 900 N	D	E	B	B	Widen from 2 to 4 Lanes
S.26	CR 800 N	Carroll Road - CR 600 W	B	B	---	---	---
S.27	96th Street	Carroll Road - CR 600 W	D	D	---	---	---
S.28	96th Street	CR 600 W - CR 500 W	C	C	---	---	---
S.29	CR 600 W	CR 900 N - 96th Street	D	E	B	B	Widen from 2 to 4 Lanes
S.30	US 36	Carroll Road - CR 750 N	A	B	---	---	---
S.31	US 36	CR 600 W - Shopping Access Drive	B	B	---	---	---
S.32	CR 600 W	US 36 - CR 800 N	E	E	B	B	Widen from 2 to 4 Lanes
S.33	CR 600 W	2nd Street - CR 750 N	D	D	---	---	---

TABLE 5 – 10-YEAR ROADWAY SEGMENT LEVEL OF SERVICE RESULTS

Seg. ID	Roadway	Segment	10-Year LOS		10-Year Mitigated LOS		10-Year Mitigation
			AM	PM	AM	PM	
S.1	CR 500 N	CR 500 W - CR 600 W	A	A	---	---	---
S.2	CR 500 N	CR 600 W - CR 700 W	B	B	---	---	---
S.3	CR 700 W	CR 500 N - CR 600 N	A	B	---	---	---
S.4	CR 600 N	County Line Road - Carroll Road	C	D	---	---	---
S.5	CR 600 N	CR 700 W - CR 600 W	C	C	---	---	---
S.6	CR 600 N	CR 600 W - CR 500 W	C	C	---	---	---
S.7	Carroll Road	CR 600 N - CR 650 N	C	C	---	---	---
S.8	CR 650 N	CR 600 W - CR 700 W	B	B	---	---	---
S.9	Carroll Road	CR 650 N - US 36	C	C	---	---	---
S.10	Carroll Road	US 36 - CR 750 N	C	D	---	---	---
S.11	Carroll Road	CR 750 N - CR 800 N	C	C	---	---	---
S.12	Carroll Road	CR 800 N - CR 900 N	C	D	---	---	---
S.13	Carroll Road	CR 900 N - 96th Street	D	D	---	---	---
S.14	CR 700 N	CR 600 W - CR 500 W	A	D	---	---	---
S.15	CR 750 N	CR 600 W - CR 500 W	A	A	---	---	---
S.16	SR 234	US 36 - CR 500 W	B	B	---	---	---
S.17	CR 900 N	McCord Road - CR 500 W	B	C	---	---	---
S.18	CR 500 W	CR 900 N - 96th Street	B	C	---	---	---
S.19	CR 900 N	CR 600 W - McCord Road	C	C	---	---	---
S.20	CR 900 N	CR 600 W - Carroll Road	C	C	---	---	---
S.21	CR 600 W	CR 500 N - CR 600 N	E	E	B	B	Widen from 2 to 4 Lanes
S.22	CR 600 W	CR 600 N - CR 650 N	F	E	C	B	Widen from 2 to 4 Lanes
S.23	CR 600 W	CR 650 N - CR 700 N	F	E	C	C	Widen from 2 to 4 Lanes
S.24	CR 600 W	CR 700 N - CR 750 N	F	F	C	C	Widen from 2 to 4 Lanes
S.25	CR 600 W	CR 800 N - CR 900 N	F	F	C	D	Widen from 2 to 4 Lanes
S.26	CR 800 N	Carroll Road - CR 600 W	B	C	---	---	---
S.27	96th Street	Carroll Road - CR 600 W	E	E	B	B	Widen from 2 to 4 Lanes
S.28	96th Street	CR 600 W - CR 500 W	C	D	---	---	---
S.29	CR 600 W	CR 900 N - 96th Street	E	E	B	C	Widen from 2 to 4 Lanes

Seg. ID	Roadway	Segment	10-Year LOS		10-Year Mitigated LOS		10-Year Mitigation
			AM	PM	AM	PM	
S.30	US 36	Carroll Road - CR 750 N	B	C	---	---	---
S.31	US 36	CR 600 W - Shopping Access Drive	B	C	---	---	---
S.32	CR 600 W	US 36 - CR 800 N	F	F	C	D	Widen from 2 to 4 Lanes
S.33	CR 600 W	2nd Street - CR 750 N	E	F	C	D	Widen from 2 to 4 Lanes
S.34*	Frontage Road	CR 600 W - 2500' East	A	A	---	---	Construct 2-Lane Road
S.35*	Aurora Way Extension	CR 600 W - 1900' West	B	B	---	---	Construct 2-Lane Road
S.36*	Aurora Way Extension	CR 600 W - CR 500 W	B	A	---	---	Construct 2-Lane Road

* PROPOSED ROADWAY SEGMENT

Schedule of Improvements

The recommended intersection and roadway improvements identified in this study should be reviewed on a yearly basis to determine an implementation schedule that addresses those areas that are most impacted by traffic generated from new development.

Estimated Construction Costs

The year 2024 construction costs were developed using the "Indianapolis MPO Cost Estimate Spreadsheet". The intersection unit construction cost inputs for this sheet were estimated based on 2024 bid documents for various projects within the greater Indianapolis area. The roadway segment unit construction costs were taken from the "INDOT Cost Estimate Sheet".

Table 6 is a summary of the estimated construction costs that will be required to bring the intersections up to acceptable baseline level of service standards (LOS C) to accommodate either the existing traffic volumes or the projected 10-year traffic volumes. The table shows the estimated construction costs associated with the improvements recommended to mitigate the existing traffic conditions (Today's Cost) and the projected 10-year traffic conditions (10-Year Cost). All construction estimates are based on year 2024 construction costs.

Table 7 is a summary of the estimated construction costs that will be required to bring the roadways up to an acceptable baseline level of service standards (LOS D) to accommodate either the existing traffic volumes or the projected 10-year traffic volumes. The table shows the estimated construction costs associated with the improvements recommended to mitigate the existing traffic conditions (Today's Cost) and the projected 10-year traffic conditions (10-Year Cost). All construction estimates are based on year 2024 construction costs.

TABLE 6 – ESTIMATED INTERSECTION CONSTRUCTION COSTS

Int. ID	Intersection	Today's Cost	Ten-year Cost
2	96th St & Olio Rd	$0	$0
3	86th St & Carroll Rd	$0**	$0**
4	CR 600 W & CR 900 N	$0	$5,215,000
6	CR 500 W & CR 900 N	$0	$3,370,000
7	CR 700 W & CR 800 N	$0**	$0**
8	CR 600 W & CR 800 N	$0	$3,370,000
9	US 36 & Shopping Access Drive	$0	$0
10	US 36 & SR 234	$0	$0
11	CR 500 W & SR 234	$0†	$0†
12	US 36 & CR 600 W	$0†	$0†
13	2nd St & CR 600 W	$0†	$0†
14	CR 700 W & CR 750 N	$0**	$0**
15	US 36 & CR 750 N	$0†	$0†
16	CR 600 W & CR 750 N	$3,370,000	$3,370,000
18	US 36 & Carroll Rd	$0**	$0**
19	CR 600 W & CR 700 N	$0	$3,370,000
21	CR 600 W & CR 650 N	$3,370,000	$3,370,000
22	CR 800 W & CR 600 N	$0**	$0**
23	CR 700 W & CR 600 N (North Leg)	$0**	$0**
25	CR 600 W & CR 600 N	$0†	$0†
29*	Mt Comfort Rd & Aurora Way	$0	$3,370,000
30*	CR 500 W & Aurora Way	$0	$0
	Total	$6,740,000	$25,435,000

* PROPOSED INTERSECTION

** NO COST; INTERSECTION IS OUTSIDE OF TOWN JURISDICTION

† NO COST; PLANNED IMPROVEMENT TO BE FUNDED BY NON-ROAD IMPACT FEE FUNDS

TABLE 7 – ESTIMATED ROADWAY CONSTRUCTION COSTS

Seg. ID	Street	Location	Today's Cost	Ten-year Cost
21	CR 600 W	CR 500 N - CR 600 N	$0	$7,490,000
22	CR 600 W	CR 600 N - CR 650 N	$0	$3,890,000
23	CR 600 W	CR 650 N - CR 700 N	$0	$3,800,000
24	CR 600 W	CR 700 N - CR 750 N	$3,800,000	$3,800,000
25	CR 600 W	CR 800 N - CR 900 N	$7,580,000	$7,580,000
27	96th Street	Carroll Road - CR 600 W	$0	$3,690,000
29	CR 600 W	CR 900 N - 96th Street	$7,630,000	$7,630,000
32	CR 600 W	US 36 - CR 800 N	$0**	$0**
33	CR 600 W	2nd Street - CR 750 N	$0	$520,000
34*	Frontage Road	CR 600 W - 2500' East	$1,285,000	$2,570,000
35*	Aurora Way Extension	CR 600 W - 1900' West	$830,000	$1,660,000
36*	Aurora Way Extension	CR 600 W - CR 500 W	$1,165,000	$2,330,000
		Total	$22,290,000	$44,960,000

*PROPOSED ROADWAY SEGMENT; COST SPLIT 50/50 BETWEEN TOWN AND DEVELOPMENT

** NO COST; PLANNED IMPROVEMENT TO BE FUNDED BY NON-ROAD IMPACT FEE FUNDS

TOTAL COSTS

Table 8 summarizes the total "Today's Cost" and "10-Year Cost" for the study area intersections and roadways.

TABLE 8 – TOTAL COSTS

	Today's Cost	10-Year Cost	Applicable Road Impact Fee Cost
Intersections (Table 1)	$6,740,000	$25,435,000	$18,695,000
Roadways (Table 2)	$22,290,000	$44,960,000	$22,670,000
Total Cost	**$29,030,000**	**$70,395,000**	**$41,365,000**

"Applicable Road Impact Fee Cost" is equal to the "10-Year Cost" minus "Today's Cost"

GENERATED 24-HOUR TRIPS

The total number of trips that will be generated during a typical 24-hour weekday period for each of the vacant parcel developments has been determined using the 11th Edition of the *ITE Trip Generation Manual*. **Table 9** identifies each of the vacant parcels, the assumed land use, and the 10-year build-out size.

TABLE 9 – SUMMARY OF VACANT LAND PARCELS

Parcel #	Land Use Distribution	ITE Code	Development Size
1	Single Family Residential (Detached)	210	256 DU
2	Retail	820	240,000 SF
3	Single Family Residential (Detached)	210	42 DU
4	Single Family Residential (Detached)	210	287 DU
5	Single Family Residential (Detached)	210	606 DU
6	Single Family Residential (Detached)	210	22 DU
7	Single Family Residential (Detached)	210	47 DU
8	Single Family Residential (Attached)	215	98 DU
9	Retail	820	33,000 SF
10	Multifamily Residential	220	80 DU
10	Single Family Residential (Attached)	215	49 DU
11	Office	710	24,000 SF
12	Retail	820	21,000 SF
13	Business Park	770	20,000 SF
14	Retail	820	4,500 SF
15	Office	710	80,500 SF
15	Retail	820	241,500 SF
15	Multifamily Residential	220	270 DU
16	Single Family Residential (Detached)	210	311 DU
17	Business Park	770	800,000 SF
18	Retail	820	67,000 SF
19	Single Family Residential (Detached)	210	122 DU
20	Retail	820	11,700 SF
21	Retail	820	28,000 SF
22	Office	710	7,200 SF
22	Multifamily Residential	220	4 DU
23	Business Park	770	12,000 SF
24	Retail	820	5,250 SF
25	Retail	820	7,000 SF
26	Office	710	20,000 SF
26	Retail	820	20,000 SF
26	Multifamily Residential	220	40 DU
27	Office	710	80,000 SF
27	Retail	820	120,000 SF
27	Multifamily Residential	220	670 DU
28	Office	710	15,000 SF
28	Retail	820	45,000 SF
28	Multifamily Residential	220	560 DU
29	Single Family Residential (Detached)	210	270 DU
30	Retail	820	12,000 SF

Parcel #	Land Use Distribution	ITE Code	Development Size
31	Industrial	110	71,250 SF
32	Retail	820	10,500 SF
32	Multifamily Residential	220	15 DU
33	Multifamily Residential	220	128 DU
33	Single Family Residential (Detached)	210	465 DU
34	Multifamily Residential	220	40 DU
34	Single Family Residential (Detached)	210	358 DU
35	Single Family Residential (Detached)	210	170 DU
36	Single Family Residential (Detached)	210	152 DU
37	Single Family Residential (Detached)	210	48 DU
38	Retail	820	6,000 SF
39	Single Family Residential (Detached)	210	128 DU
40	Single Family Residential (Detached)	210	85 DU
41	Business Park	770	225,000 SF
42	Retail	820	15,000 SF
43	Industrial	110	325,000 SF
44	Business Park	770	650,000 SF

Notes: DU = Dwelling Unit; SF = Square Feet

The *ITE Trip Generation Manual (11th Edition)* was used to generate the number of 24-hour weekday trips generated by the parcels listed above. The total 24-hour generated trips from these parcels that will be used for the road impact fee calculation is 118,514 trips.

Road Impact Fee

The method (outlined below in equation form) used for determining the road impact fee is based on the difference between the ten-year and existing sums of the road impact fee construction costs for all study intersections and roadways added to the cost of performing the road impact fee study. This total road impact fee cost is then divided by the total number of 24-hour trips that will be generated by the 10-year vacant land parcels. **Table 10** is a summary of the road impact fee calculation.

$$Road\ Impact\ Fee/Trip = \frac{Cost^{10-Year} - Cost^{Existing} + Cost^{Impact\ Fee\ Study})}{(Generated\ 24 - Hour\ Trips)}$$

$$\$349.68/trip = \frac{\$70{,}395{,}000 - \$29{,}030{,}000 + \$76{,}480}{118{,}514\ trips}$$

TABLE 10 – CALCULATION OF ROAD IMPACT FEE

Total Applicable Road Impact Fee Cost (10-Year minus Existing)	$41,365,000
Cost of Performing Road Impact Fee Study	$76,480
YTD Road Impact Fee Receipts	$0
Total Road Impact Fee Cost	**$41,441,480**
24-Hour Trips from Vacant Land Parcel Developments	118,514
Road Impact Fee per 24-Hour Generated Trip (Equals Total Road Impact Fee Cost divided by the 24-hour trips)	**$349.68**

ANNUAL ROAD IMPACT FEE EVALUATION

The estimated construction costs that have been used to determine the road impact fee presented in this report are based on year 2024 construction costs. Therefore, it may be necessary to re-evaluate the road impact fee on an annual basis to reflect annual inflation of construction costs, any major changes in the proposed land uses analyzed, or any changes to the planned intersection/roadway segment improvements considered in this study.

EXAMPLES OF TYPICAL ROAD IMPACT FEES COLLECTED

For all land uses, the number of 24-hour weekday trips generated by each new development would need to be determined on a case-by-case basis using the methods and procedures outlined in the most recent edition of the *ITE Trip Generation Manual, ITE Trip Generation Handbook,* and relevant information provided by the developer. The number of generated 24-hour trips for the new development is then multiplied by the road impact fee per trip rate to determine the collected road impact fee. **Table 11** shows typical road impact fees that could be collected for a variety of land uses. For each land use, the table lists the ITE Code classification, a range of typical sizes, the ITE Trip Generation Manual methods used to generate the 24-hour weekday trips, the 24-hour weekday trips generated, and the resulting road impact fee. It should be noted that the land uses listed in the table are only a small sample of the different types of land uses classified by the *ITE Trip Generation* Manual.

TABLE 11 – EXAMPLES OF TYPICAL ROAD IMPACT FEES FOR VARIOUS LAND USES

Land Use	ITE Code	Size	ITE Method	24-Hour Trips	Road Impact Fee per 24-hour Trip	Road Impact Fee Collected
Single Family Residential (Detached)	210	10 DU	Rate	94	$349.68	$32,869.53
		50 DU	Rate	472	$349.68	$165,046.99
		100 DU	Rate	943	$349.68	$329,744.30
Single Family Residential (Attached)	215	10 DU	Equation	26	$349.68	$9,091.57
		50 DU	Equation	331	$349.68	$115,742.70
		100DU	Equation	712	$349.68	$248,969.18
Multifamily Apartments	220	100 DU	Equation	716	$349.68	$250,367.89
		200 DU	Equation	1357	$349.68	$474,510.09
		300 DU	Equation	1998	$349.68	$698,652.29
General Light Industrial	110	100,000SF	Equation	426	$349.68	$148,961.90
		200,000 SF	Equation	802	$349.68	$280,440.01
		300,000 SF	Equation	1178	$349.68	$411,918.11
Business Park	770	200,000 SF	Equation	2840	$349.68	$993,079.33
		300,000 SF	Equation	3902	$349.68	$1,364,435.05
		400,000 SF	Equation	4964	$349.68	$1,735,790.76
General Office	710	50,000 SF	Equation	635	$349.68	$222,044.14
		100,000SF	Equation	1160	$349.68	$405,623.95
		200,000 SF	Equation	2121	$349.68	$741,662.41
General Retail**	822	30,000 SF	Rate	980	$349.68	$342,682.30
	821	100,000SF	Rate	4051	$349.68	$1,416,536.74
	820	200,000 SF	Equation	8647	$349.68	$3,023,646.81

Notes
DU = Dwelling Unit, SF = Square Feet

*Retail land uses attract pass-by trips. Therefore, the trips shown above represent the total number of non-pass-by 24-hour trips.