CITY OF Westfield INDIANA

WESTFIELD ROAD IMPACT FEE

Zone Improvement Plan

March 28, 2012

WESTFIELD ROAD IMPACT FEE

Zone Improvement Plan

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CERTIFICATION

I certify that this Road Impact Fee Zone Improvement Plan has been developed by me or under my direct supervision and that I have training and experience in the field of traffic and transportation engineering.

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Indiana PE No. 19800428

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1 Introduction

1.1 Purpose

The City of Westfield, Indiana currently assesses a road impact fee on new development to help fund the roadway capital improvements necessary to serve growing traffic demand. The City has commissioned this study to support the update of its road impact fee ordinance to reflect changes in the community since its current ordnance was enacted in 2007.

This report has been prepared to comply with the Indiana Code 36-7-4-1300 Series requirements for impact fees,[1] which are shown in **Appendix A** of this report. The report serves as the as the Zone Improvement Plan for all road impact fee zones designated by the City of Westfield. This Zone Improvement Plan identifies Westfield's anticipated roadway capital improvement needs to serve land-use development expected to occur between 2011 and 2021. It also establishes the road impact fees and assessment rates that can be applied to new development in order to help fund roadway those capital improvements. Specifically, this report:

- Designates geographic "impact zones" for road impact fees to be collected by Westfield.
- Describes the nature and location of existing infrastructure in the impact zones.
- Establishes "community level of service" criteria by which to assess whether roads in the impact zones are providing adequate service to users.
- Estimates the nature and location of development that is expected to occur in the impact zones over the next 10 years.
- Estimates the nature, location, timing and cost of road improvements that are needed to meet community level of service criteria both now and through 2021 with anticipated new development.
- Identifies revenue sources and estimated amounts that Westfield has spent on roads in the previous 5 years and intends to spend on capital improvements through 2021.

Existing and anticipated conditions in Westfield have changed significantly since the previous 10-year Zone Improvement Plan was developed in 2007. In that time, the Town of Westfield has become the City of Westfield and has annexed additional portions of Washington Township. The nationwide economic downturn that began in 2008 has slowed the tremendous pace of growth in Westfield, and several developments that were anticipated in 2007 have been delayed. However, significant new developments are now underway as the economy begins to revitalize. The initial phase of Grand Park, an ambitious mix of sports destination, commercial development and residential community, is now under construction on the northwest side of

[1] IC 36-7-4-1300 Series, Impact Fees

Westfield. Not far away, the City also expects initial implementation of its Grand Junction plan for the re-creation of its downtown. These and other developments will be stimulated by the upgrade of US 31 to a freeway facility through Westfield, which is already underway and expected to be complete by 2017. This upgrade will make new development in Westfield significantly easier to access and will change traffic patterns for those already traveling on Westfield's roads.

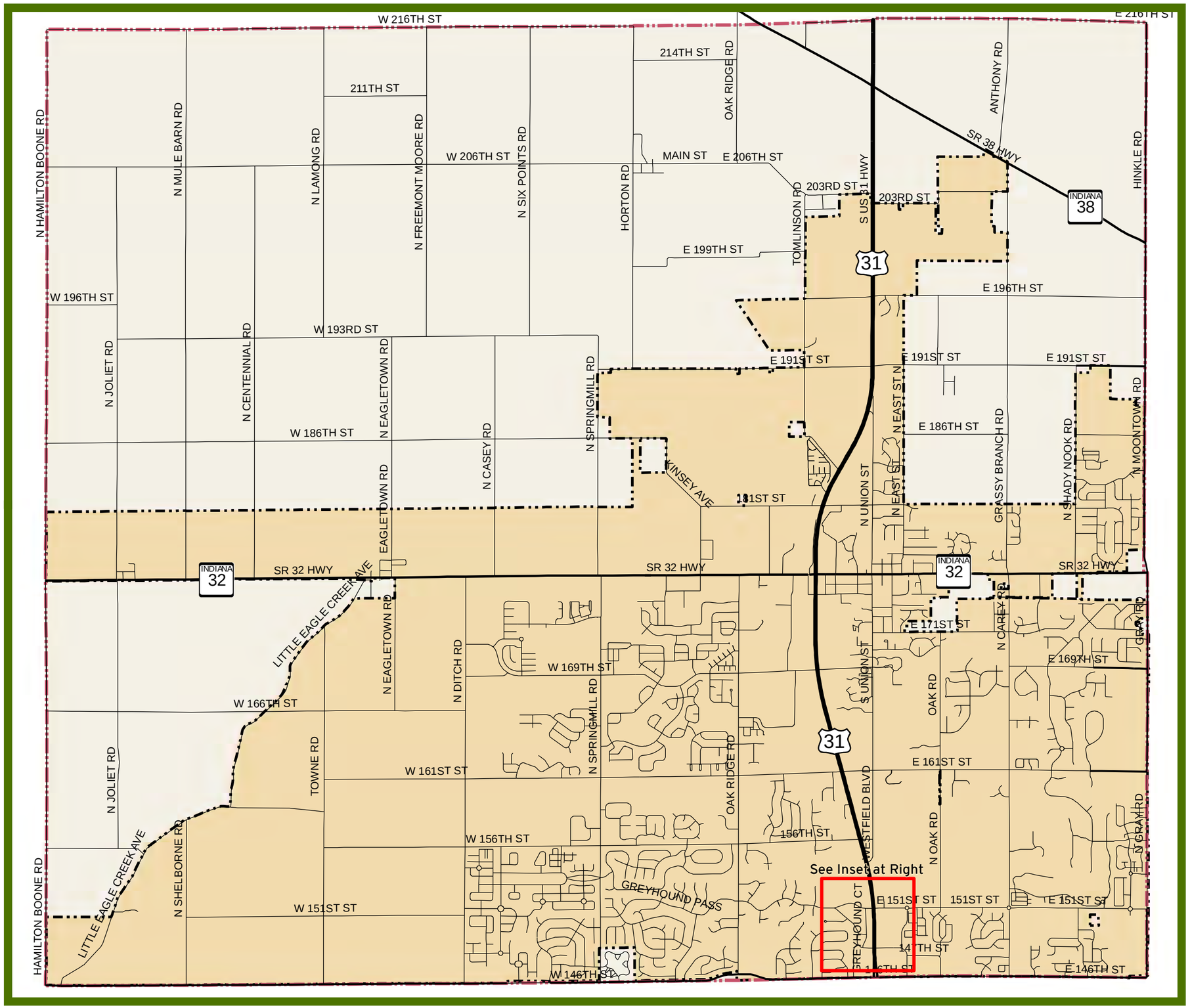
1.2 Study Area and Infrastructure Responsibility

The study area for this Zone Improvement Plan includes all of Washington Township in Hamilton County. The Westfield Advisory Plan Commission has planning and zoning authority for all of Washington Township. **Figure 1-1** is a map of the existing study area road network. **Figure 1-2** shows the current Westfield Thoroughfare Plan, which identifies the intended future roadway network and the relative importance of roads in the study area.

Although it has planning and zoning authority over the entire township, the City of Westfield is not responsible for all roads within the township. The City of Westfield Public Works Department is responsible for construction and maintenance of public roads within the corporate limits of Westfield, with the following exceptions:

- The Indiana Department of Transportation is responsible for construction and maintenance on the federal and state routes—US 31, SR 32 and SR 38
- The Hamilton County Highway Department is responsible for construction and maintenance on 146th Street, which runs along the southern boundary of Westfield
- The City of Noblesville is responsible for construction and maintenance on Moontown Road on the eastern boundary of Westfield

This Zone Improvement Plan includes 10-year capital improvement needs only for arterial and collector roads that are the responsibility of the City of Westfield. Capital improvement needs for roads in the surrounding unincorporated areas of Washington Township were also identified, but are not included in the Zone Improvement Plan. These roads are currently the responsibility of Hamilton County but could become the responsibility of Westfield if they are annexed in the future.



CITY OF Westfield INDIANA

Road Impact Fee Study

Figure 1-1
Existing Study Area Road Network

City of Westfield

Washington Township

0 2,450 4,900 9,800 Feet

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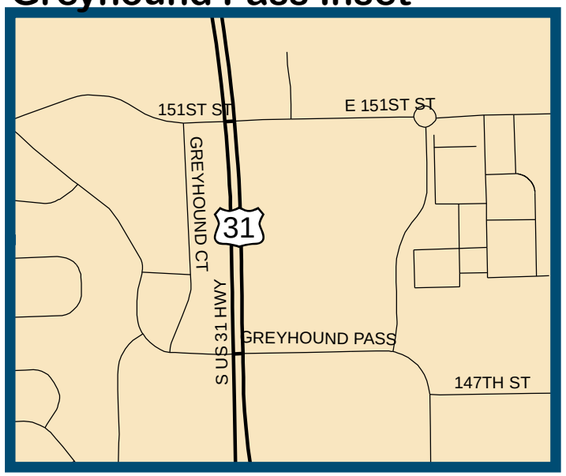
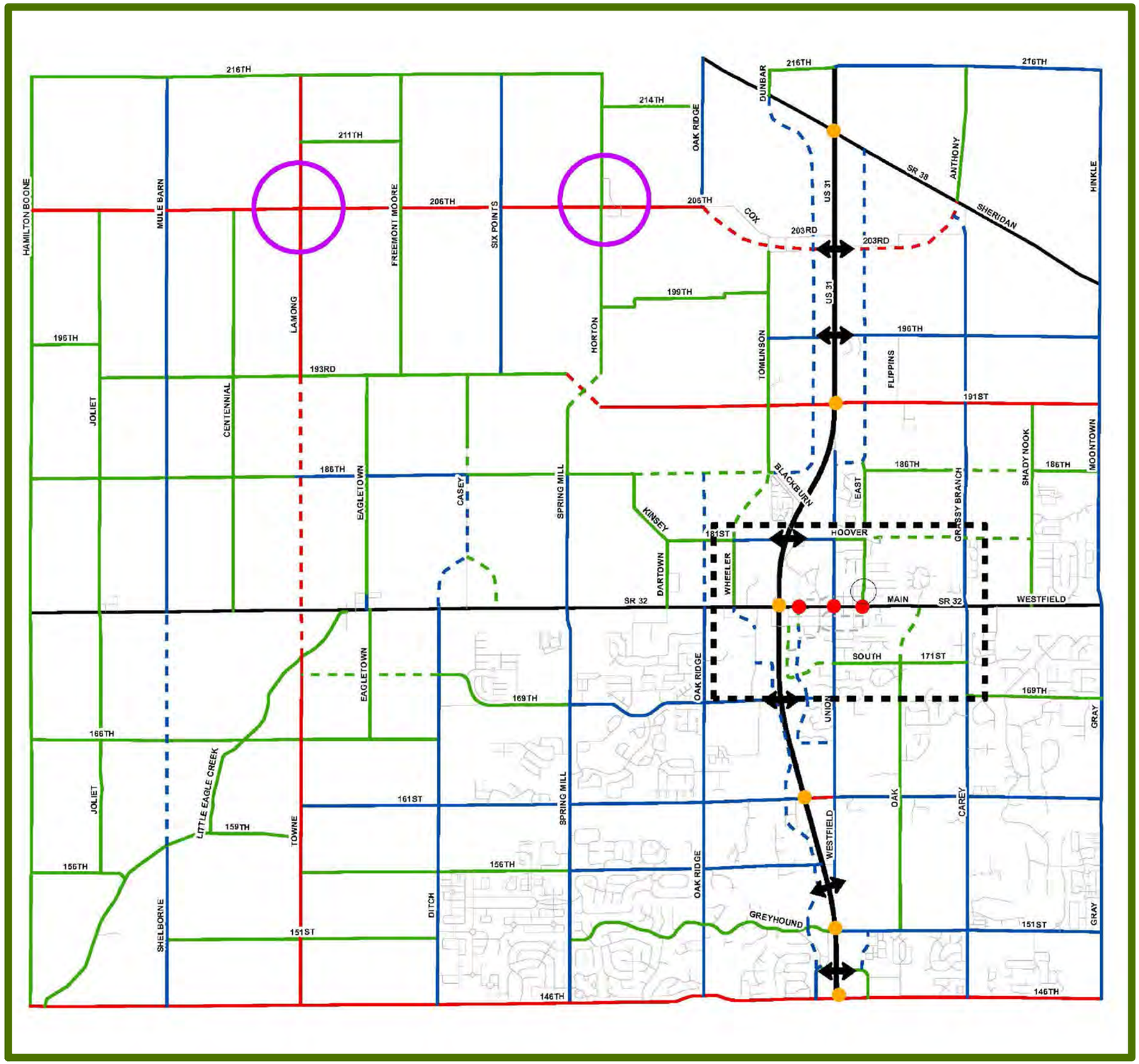
Greyhound Pass Inset



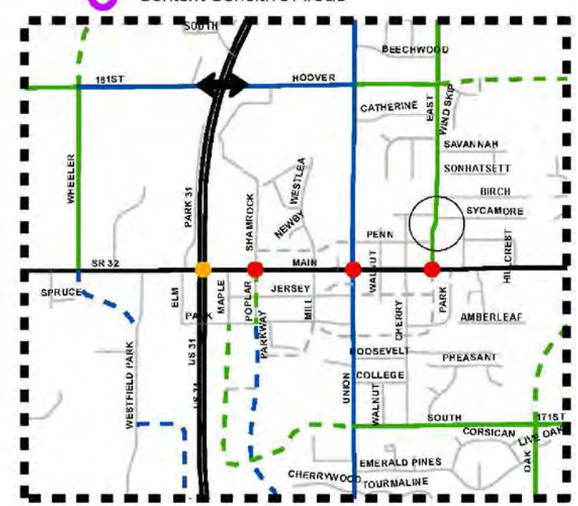


City of Westfield Thoroughfare Plan

Collector System Map
Supersedes Figure 4.7
from 2010 Summer Amendment

Legend

- Local
- Proposed Local
- Collector
- Proposed Collector
- Primary Arterial 1
- Primary Arterial 2
- Proposed Primary Arterial 2
- Secondary Arterial
- Proposed Secondary
- Proposed Full Access Intersections
- Interchanges
- Under/Over Passes
- Safety Improvements
- Context Sensitive Areas



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Maps Are Not To Scale

CITY OF Westfield INDIANA

Disclaimer: The City of Westfield, Indiana has created this map in an attempt to increase the availability of public information and enhance public knowledge. The City is continually collecting, maintaining and updating data. Information for the map themes was obtained from existing, and many times historical documentation. Because of this, the information displayed on this map is not guaranteed to be completely accurate or all inclusive. The City of Westfield retains the right to change the content of this map without prior notice. The City of Westfield assumes no liability for any actions or occurrences that may result from persons viewing the information contained on this map. This map is not meant to take the place of any existing guidelines, rules, regulations or legal procedures. No information displayed on this map should be used in place of legal documentation. Field investigations are still necessary for locating underground facilities, and contact with appropriate departmental staff if still required for determining location-based fees or designations.

Figure 1-2
Westfield Thoroughfare Plan

Westfield
Road Impact Fee Study

1.3 Historical Funding Sources

The City of Westfield has used four sources of funding for road construction and maintenance over the past five years. These include impact fees collected under the current ordinance, state distributions of funds from the Local Road and Street account and the Motor Vehicle Highway account, and tax increment financing (TIF). The TIF funds have been used only for projects in the designated TIF district surrounding the Village Park Plaza shopping center. **Table 1-1** shows the amount of funding expended from each source.

Table 1-1: Disbursements for Road Construction and Maintenance—2007 to 2011

Year	Road Impact Fees	LRS State Distribution	MVH State Distribution	Tax Increment Financing	Total
2007	$432,516	$246,903	$416,423	$1,150,029	$2,245,871
2008	$407,238	$302,404	$731,956	$1,050,595	$2,492,192
2009	$214,012	$387,744	$722,209	$1,146,180	$2,470,145
2010	$380,074	$325,760	$984,771	$869,665	$2,560,269
2011	$310,766	$346,389	$981,861	$2,335,915	$3,974,932
TOTAL	$1,744,606	$1,609,199	$3,837,220	$6,552,384	$13,743,410

2 Community Level of Service Criteria

The term "Community Level of Service" is defined by Indiana Code as "a quantitative measure of the service provided by the infrastructure that is determined by a unit to be appropriate."[1] This section of the plan describes the quantitative measures and methods that are used to determine whether Westfield's road infrastructure is appropriate to serve existing and anticipated future travel demand. Separate community level of service (LOS) criteria have been established to identify the traffic operation adequacy and the geometric adequacy of the road network.

2.1 Traffic Operation Levels of Service

Traffic operation describes the effectiveness and efficiency of movement on the transportation infrastructure. Traffic operation levels of service on the Washington Township roadway network are measured using the methods of the Transportation Research Board *Highway Capacity Manual (HCM)*[2]. That document provides standard methods to quantify the quality of traffic operations perceived by users of many different types of transportation facilities. These methods are commonly used by traffic engineers to plan, design and analyze transportation facilities. The specific LOS criteria and calculation methods differ depending on the type of transportation facility being analyzed. However, a scale of "A" to "F" is established for each facility type, based on the quantitative LOS values. An LOS of "A" represents the best quality of service, while and LOS of "F" represents the worst. An LOS of "D" or better is established by the City of Westfield as its Community Level of Service for traffic operations. Highway Capacity Levels of Service were calculated for all road segments and intersections on the Washington Township study network using the methods summarized below.

Road Segments

The road segments under study in Westfield fall into three separate facility categories as defined by the HCM. Each of the three categories of road segment has separate LOS criteria and calculation methods. Road segments that have a signalized intersection spacing of 2 miles or less are analyzed as urban streets, with LOS measured in terms of average travel speed over a segment. Two-lane highway segments with signal spacing greater than 2 miles are analyzed as rural highways, with LOS measured both by the percent time spent following other vehicles and by the average travel speed over a roadway segment. For multi-lane roadway segments (two or more travel lanes per direction) with signal spacing greater than 2 miles, LOS is measured in terms of average travel speed and the density of traffic flow on the road.

[2] *Highway Capacity Manual 2010*, Transportation Research Board, National Research Council, Washington, DC, 2010.

For this study, Table 1 from the Florida Department of Transportation *Quality/Level of Service Handbook*[3] was used to estimate roadway segment LOS under current and projected conditions. This table is shown in **Appendix B**. It was developed for infrastructure planning purposes by using the methods of the HCM with some default parameters. While the use of this table would not be considered appropriate for facility design or detailed operational analysis, it is appropriate for generalized identification of problem locations, especially under future conditions of uncertain travel demand. This table was used to identify roadway facilities with unacceptable traffic operations LOS based on the facility type, number of through lanes, presence of medians and auxiliary lanes and current or forecast traffic volumes. Daily volumes were used for this analysis, as they are considered to be more reliable than estimates of future hourly volumes. A minimum acceptable LOS of "D" is required for each road segment.

Intersections

As with roadway segment traffic operations, intersection traffic operations LOS was determined based on the procedures of the HCM. A minimum acceptable LOS of "D" is required for each intersection approach and for traffic movements with significant volumes. For each analyzed intersection, the lane configuration necessary to achieve acceptable LOS was determined using the Synchro traffic simulation[4] software, which can evaluate LOS using the HCM methods. In some instances, an LOS of "E" or "F" is tolerated for individual low volume traffic movements if the overall approach LOS is acceptable or the intersection does not warrant additional traffic control. Intersections on proposed new road segments and on existing segments that warrant reconstruction to meet cross section LOS standards (described in Section 2.2) were assumed to include auxiliary lanes per Indiana Department of Transportation and City of Westfield design standards.

In order to identify the roadway improvements required to provide adequate LOS at each intersection, it was also necessary to determine the appropriate traffic control at that intersection. Appropriate intersection traffic control was determined by using the traffic signal and multi-way stop control warrant procedures of the Indiana Manual on Uniform Traffic Control Devices (MUTCD)[5]. **Table 2-1** shows the minimum average daily traffic volumes on the intersecting roads required by the Indiana MUTCD to warrant installation of a traffic signal. Signal warrants based on average daily traffic volumes are provided in the MUTCD to warrant the temporary installation of traffic signals where a new intersection is to be constructed or where existing traffic is expected to change significantly. The use of current or projected daily traffic volumes is

[3] Florida Department of Transportation, *2009 Quality/Level of Service Handbook*, 2009. Available at http://www.dot.state.fl.us/planning/systems/sm/los.
[4] Trafficware, Ltd., *Synchro plus SimTraffic* Version 8 [software], 2011.
[5] Indiana Department of Transportation, *Indiana Manual on Uniform Traffic Control Device*s, November 2011. Available at http://www.in.gov/dot/div/contracts/design/mutcd/mutcd.html

not a substitute for a full warrant analysis with hourly volume data and is used in this analysis only to indicate where new traffic signals are likely to be required.

Table 2-1: Traffic Signal Warrants Based on Daily Volumes

Approach Lanes		Daily Approach Volumes From Both Directions			
		Condition A1 -- Minimum Vehicular Volume		Condition A2 -- Interruption of Continuous Traffic	
Major Street	Minor Street	Major Street	Minor Street	Major Street	Minor Street
1	1	8,300	4,600	12,500	2,300
2	1	10,000	4,600	15,000	2,300
2	2	10,000	6,000	15,000	3,100
1	2	8,300	6,000	12,500	3,100

Source: Indiana MUTCD, Table 4C-2

Table 2-2 shows the minimum average daily traffic volumes used in this study to indicate the need for multi-way stop control at intersection. The MUTCD does not contain multi-way stop warrants based on daily traffic volumes, but they were estimated for this analysis using the same ratio of hourly to daily volumes as was used for traffic signal warrants provided in the MUTCD.

Table 2-2: Multi-way Stop Warrants Based on Daily Volumes

Daily Volumes Approaching From Both Directions			
Each of 8 hours		Estimated Daily*	
Major Street	Minor Street	Major Street	Minor Street
300	200	4,980	3,320

*Not official MUTCD Warrants

The City of Westfield prefers to construct modern roundabouts to control intersection traffic operation where engineering and cost considerations allow. However, there are no standard warrants for the installation of a roundabout at an intersection, as there are for traffic signals or multi-way stop control. In developing this plan, the operation of a roundabout was evaluated at any location where a new traffic signal is anticipated to be warranted. Construction of a new roundabout is recommended rather than a new traffic signal if the roundabout is expected to provide satisfactory traffic operation. A roundabout was also evaluated for intersections where multi-way stop is not warranted, but more than two approach lanes would be required on one or more legs in order to provide acceptable peak hour LOS. The future intersection traffic control

type identified in this plan is preliminary and subject to change during the project development process.

2.2 Roadway Cross Section Level of Service

Traffic operation is not the only measure used to determine whether Westfield's roads provide an appropriate level of service. As traffic volumes in Westfield increase, inadequate road design may have safety and maintenance impacts in addition to congestion impacts. Much of the roadway infrastructure in Washington Township was originally constructed with pavement widths and design appropriate for rural, low volume conditions and not for the current traffic volumes and vehicle loads. According to the American Association of State Highway and Transportation Officials, "Roads with a narrow traveled way, narrow shoulders, and an appreciable traffic volume tend to provide poor service, have a relatively higher crash rate, and need frequent and costly maintenance."[6]

To help minimize traffic crashes and excessive roadway maintenance on 2-lane roadways with inadequate design, a cross section LOS standard is also applied to roadway segments. Acceptable LOS per this standard is that any road segments carrying a volume of at least 5,000 vehicles per day will have a minimum of 11-foot wide travel lanes and 2-foot wide shoulders. Roadway segments identified as having either existing 2011 or projected 2021 daily traffic volumes of at least 5,000 vehicles were measured to determine whether they have a pavement width of at least 22 feet. Those segments with insufficient pavement width are identified for improvement.

[6] American Association of State Highway and Transportation Officials, *A Policy on Geometric Design of Highways and Streets*, 2004, P. 313.

3 2011 Existing Conditions and Needs Assessment

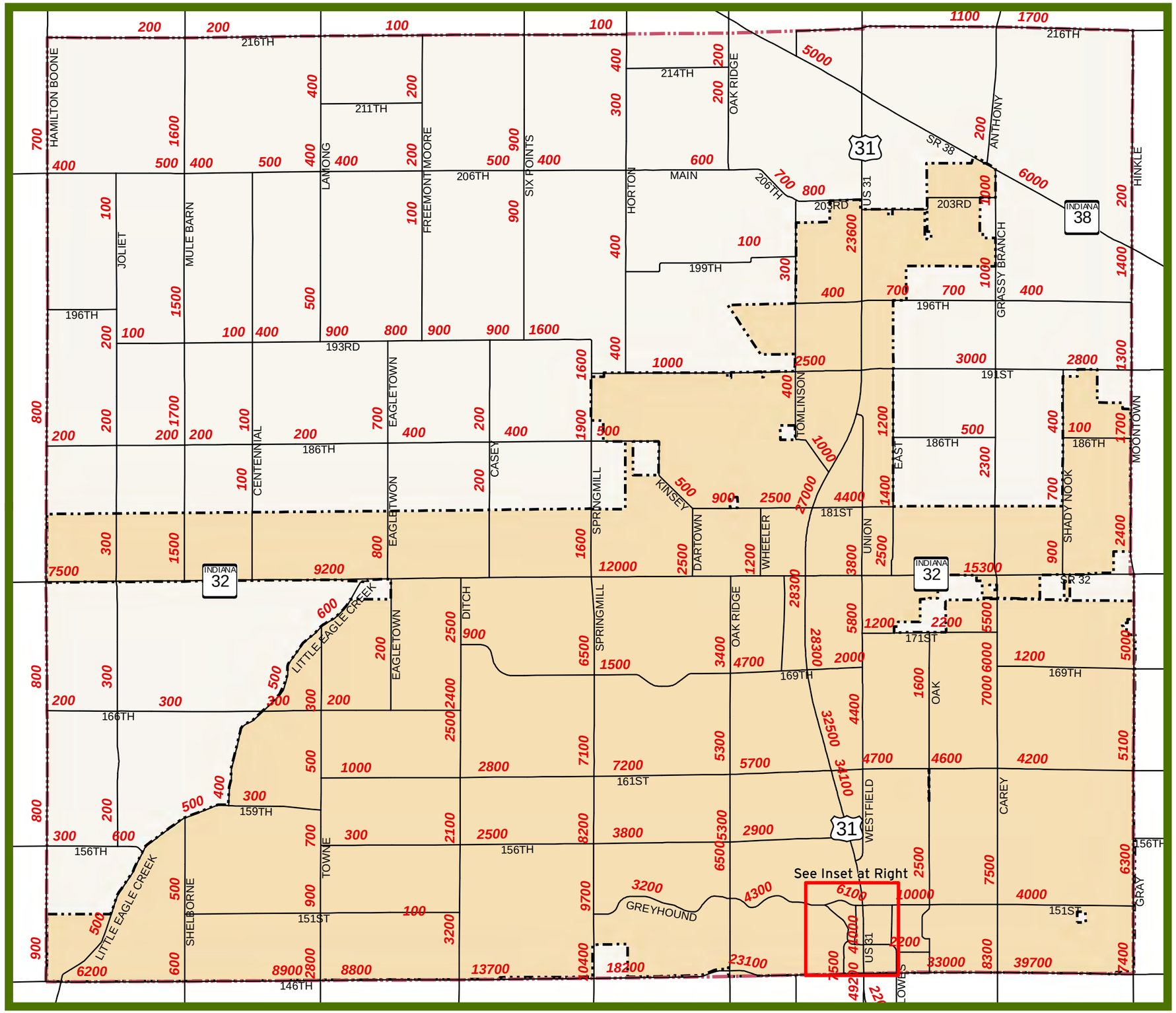
3.1 Traffic Volumes

Recent roadway segment and turning movement counts were obtained from various sources, including the City of Westfield, the Hamilton County Highway Department, The Indiana Department of Transportation, the City of Carmel, and the City of Noblesville. Additional 24-hour segment counts and peak period intersection turning movement counts were collected at key network locations as part of this study.

Where recent road segment counts were not available or collected as part of this study, segment traffic volumes were estimated based on older counts and counts from adjacent segments. Where peak hour turning movement volumes were not available or collected, these volumes were estimated from the volumes on the intersection approach links using methods described in Chapter 8 of National Cooperative Highway Research Project Report 255[7]

Figure 3-1 shows the existing daily traffic volumes on the study area road network segments. Existing peak hour turning movement volumes at intersections are provided in **Appendix C**.

[7] Pederson, N.J., and D.R. Samdahl, *Highway Traffic Data for Urbanized Area Project Planning and Design*, National Cooperative Highway Research Program Report 255, Transportation Research Board, Washington, D.C., 1982.



CITY OF Westfield INDIANA

Road Impact Fee Study

Figure 3-1
Existing Traffic Volumes

City of Westfield

Washington Township

Existing Average Daily Traffic

0 2,600 5,200 10,400 Feet

N

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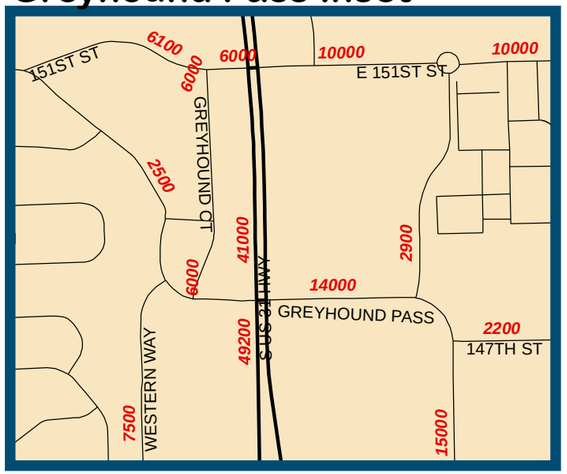
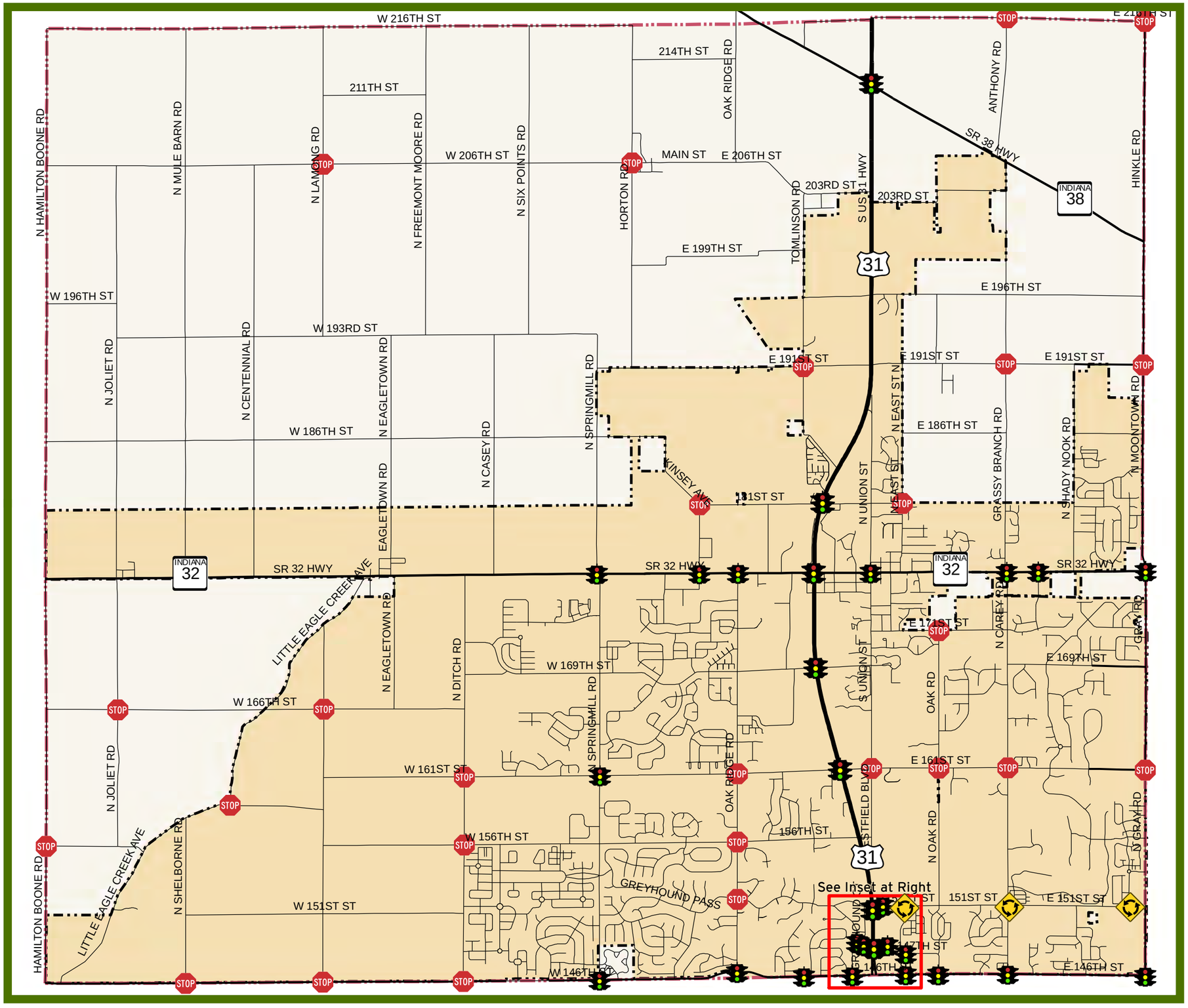


3.2 Intersection Traffic Control

The existing lane configuration and traffic control at each study area intersection were verified through field investigation. The adequacy of existing traffic control at each intersection was evaluated using existing traffic volumes and the warrant criteria for traffic signals and multi-way stop control described in **Section 2, Community Level of Service Criteria**. **Figure 3-2** shows existing and warranted intersection traffic control based on 2011 conditions. Based on existing daily traffic volumes, no intersections in Washington Township were found to warrant the installation of new traffic signals or new multi-way stop control.



Road Impact Fee Study

Figure 3-2
Existing & 2011 Warranted Traffic Control

- City of Westfield
- Washington Township
- Existing All-Way Stop
- Existing Traffic Signal
- Existing Roundabout

NOTE: No intersections warrant additional traffic control

0 2,450 4,900 9,800 Feet

N

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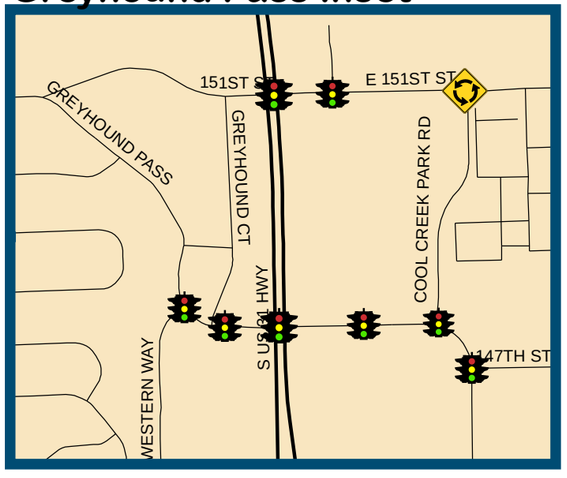


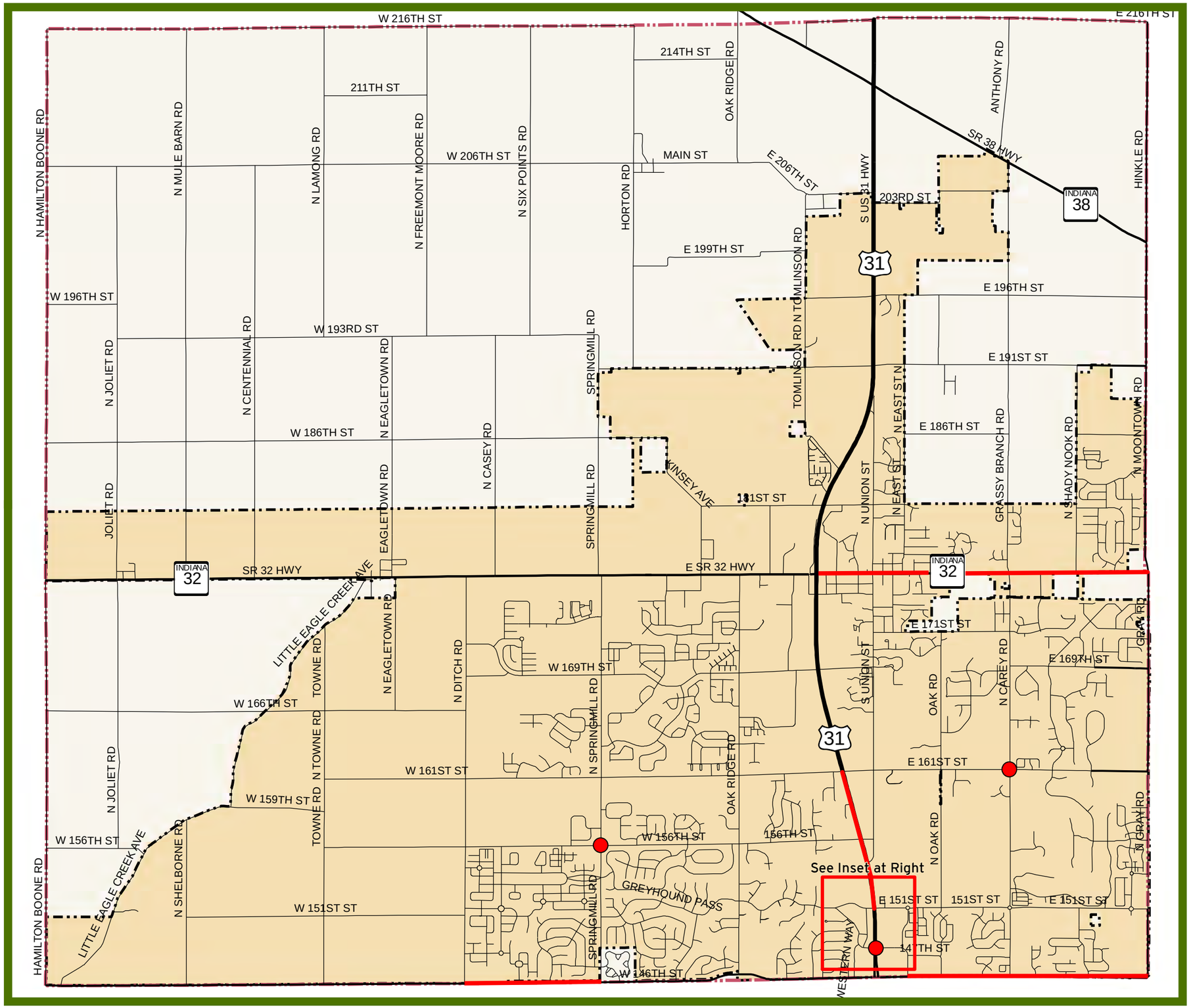
3.3 Levels of Service and Infrastructure Needs

Roadway segment levels of service and intersection levels of service were determined under existing 2011 conditions using the criteria and methods described in **Section 2, Community Level of Service Criteria**. **Table 3-1** lists the roadway segments that currently do not meet the roadway cross section LOS criterion of a 22-foot minimum paved width for segments carrying at least 5,000 vehicles per day. **Figure 3-3** shows the intersections and segments in the study area that do not meet minimum acceptable traffic operations LOS under existing conditions.

Figure 3-4 summarizes the existing roadway improvement needs for roads that are currently the responsibility of the City of Westfield. Widening in order to meet minimum standards for 2-lane road width is needed on Springmill Road, Oakridge Road, Carey Road, Gray Road and 151st Street. Although daily volumes do not warrant a signal at the intersection of 161st and Carey, a new roundabout is necessary to achieve adequate traffic operation LOS. Detailed evaluation could reveal that this intersection meets signal warrants. Analysis of the intersection of 156th and Springmill indicates that new left turn lanes are required on the north and south approaches to achieve adequate traffic operation LOS. While existing operational deficiencies are also indicated on US 31, SR 32 and 146th Street, these facilities are not the responsibility of the City of Westfield.

Table 3-1: 2011 Roadway Segment Cross Section Deficiencies

Road	Begin	End	Average Daily Traffic Volume	Typical Paved Width (feet)
Carey Road	Saddlehorn Drive	151st Street	8,300	21
Carey Road	151st Street	161st Street	7,500	21
Gray Road	Guerin Way	161st Street	6,300	19
Gray Road	161st Street	169th Street	5,100	19
Gray Road	169th Street	Golden Hinde Way	5,000	19
Oakridge Road	Sapphire Way	Greyhound Pass	5,100	20
Oakridge Road	Greyhound Pass	156th Street	6,500	19
Oakridge Road	156th Street	169th Street	5,300	19
Springmill Road	City Limit	Greyhound Pass	10,400	20
Springmill Road	Greyhound Pass	156th Street	9,700	20
Springmill Road	156th Street	161st Street	8,200	20
Springmill Road	161st Street	169th Street	7,100	20
Springmill Road	169th Street	SR 32	6,500	20
151st Street	Carmel Landing	Carey Road	6,300	20



CITY OF Westfield INDIANA

Road Impact Fee Study

Figure 3-3
2011 Traffic Operation Levels of Service

City of Westfield

Washington Township

Intersection Level of Service 'E' or 'F' in either AM or PM Peak Hour

Roadway Segment Level of Service 'E' or 'F' Based on Daily Volumes

0 2,450 4,900 9,800 Feet

N

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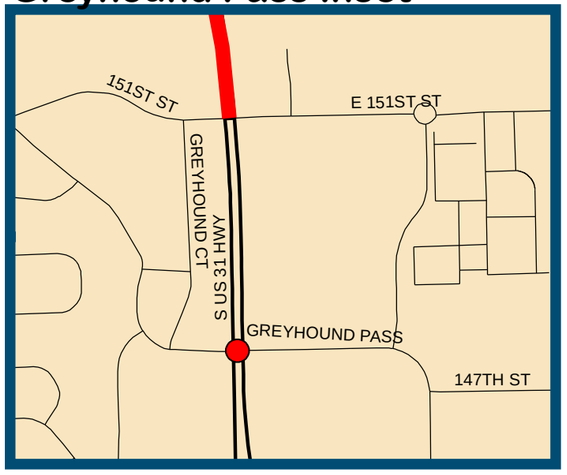

CITY OF Westfield INDIANA

Road Impact Fee Study: Figure 3-4 2011 Roadway Improvement Needs

- City of Westfield
- Washington Township
- Widen & Overlay - 2 Lanes
- Added Intersection Lanes
- New Roundabout

0 2,500 5,000 10,000 Feet

N

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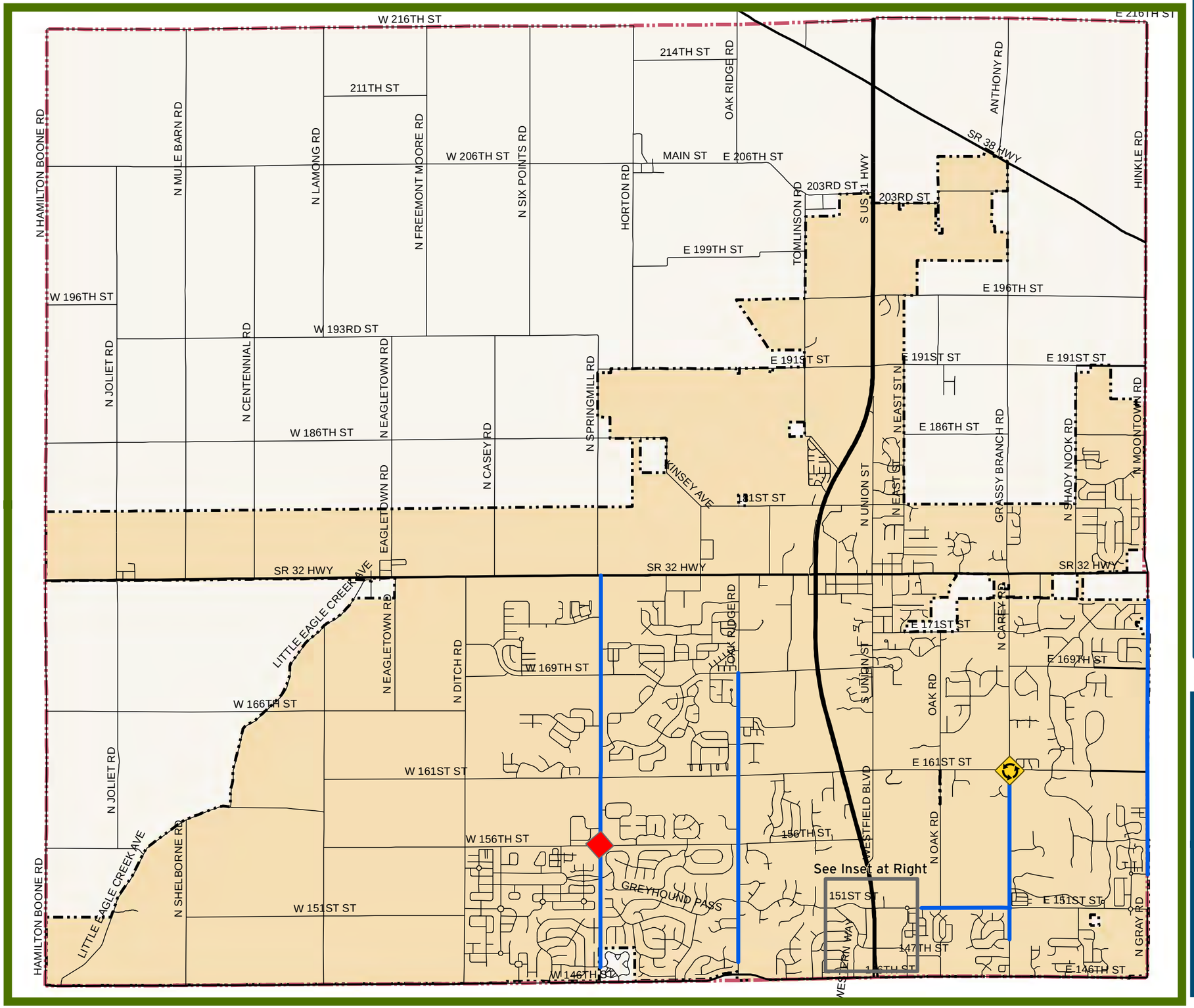

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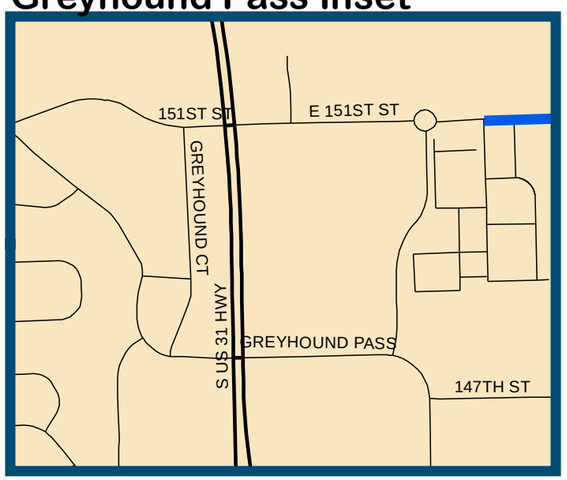


4 2021 Travel Demand Forecast

4.1 Forecast Method Overview

A computerized travel demand model of Westfield and the surrounding area was developed using the TransCAD software package.[8] A travel demand model uses a four-step process of trip generation, trip distribution, mode choice, and route assignment to forecast future traffic volumes based on that identify existing or anticipated socio-economic conditions in the study area. In Westfield, because public transit represents a very small share of total trips, the model excludes the mode choice step and assumes that all trips are made by automobiles and trucks.

To ensure adequate model performance throughout Washington Township, the Westfield travel demand model covers an area larger than Washington Township itself. The modeled area is bounded by Hazel Dell Parkway, Little Chicago Road, and Cammack Road on the east; 236th Street and SR 47 on the north; Boone County Road 1000 East and US 421 on the west; and 131st Street on the south. In addition to Washington Township, this area includes portions of Clay, Noblesville, Jackson, and Adams Townships in Hamilton County and Marion, Union, and Eagle Townships in Boone County. **Figure 4-1** shows the model area in relation to Westfield and Washington Township.

Existing 2011 and forecast 2021 households, employment and school enrollment are the primary socio-economic inputs to the Westfield travel demand model. These characteristics were estimated for each of 128 subareas within the model called Traffic Analysis Zones (TAZs), which are assumed to be reasonably homogeneous in terms of socio-economic characteristics. **Figure 4-2** shows the TAZs for the portions of the model lying in Washington Township.

The other major input to the model is the roadway network. For the Westfield model, this includes all streets classified as a collector or arterial on the Thoroughfare Plan. Data such as facility type classification, number of lanes, type of access control, and existing traffic volumes are included in the model for each roadway in the network. The model can be run to forecast future travel conditions with the existing road network. Proposed new roads can also be included in the model in order to evaluate the impacts that they would have on future travel.

The main output generated by the computerized travel demand model is a forecast of daily traffic volume on each roadway link in the model network. The model also provides forecasts of the morning and afternoon peak hour traffic volume on each roadway link, which were adjusted based on existing traffic count data and anticipated changes in roadway function over the forecast horizon. The adjusted morning and afternoon peak hour link forecasts were used to

[8] Caliper Corporation, *TransCAD Version 5.0* [software], Newton, MA, www.Caliper.com.

develop peak hour intersection turning movement volume forecasts using the turning movement estimation procedures of NCHRP Report 255.

The 2021 travel demand forecast is an input to the 2021 needs analysis discussed in Section 5 of this plan. For more detailed information on the modeling process used in this analysis, refer to **Appendix D**.

CITY OF Westfield INDIANA

Road Impact Fee Study

Figure 4-1
Study Modeling Area

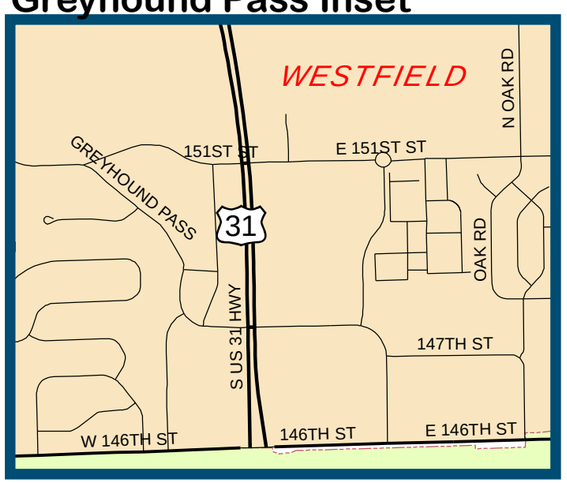
- Model Area Boundary
- Model Network Roads
- Township Boundaries
- City of Westfield
- Washington Township

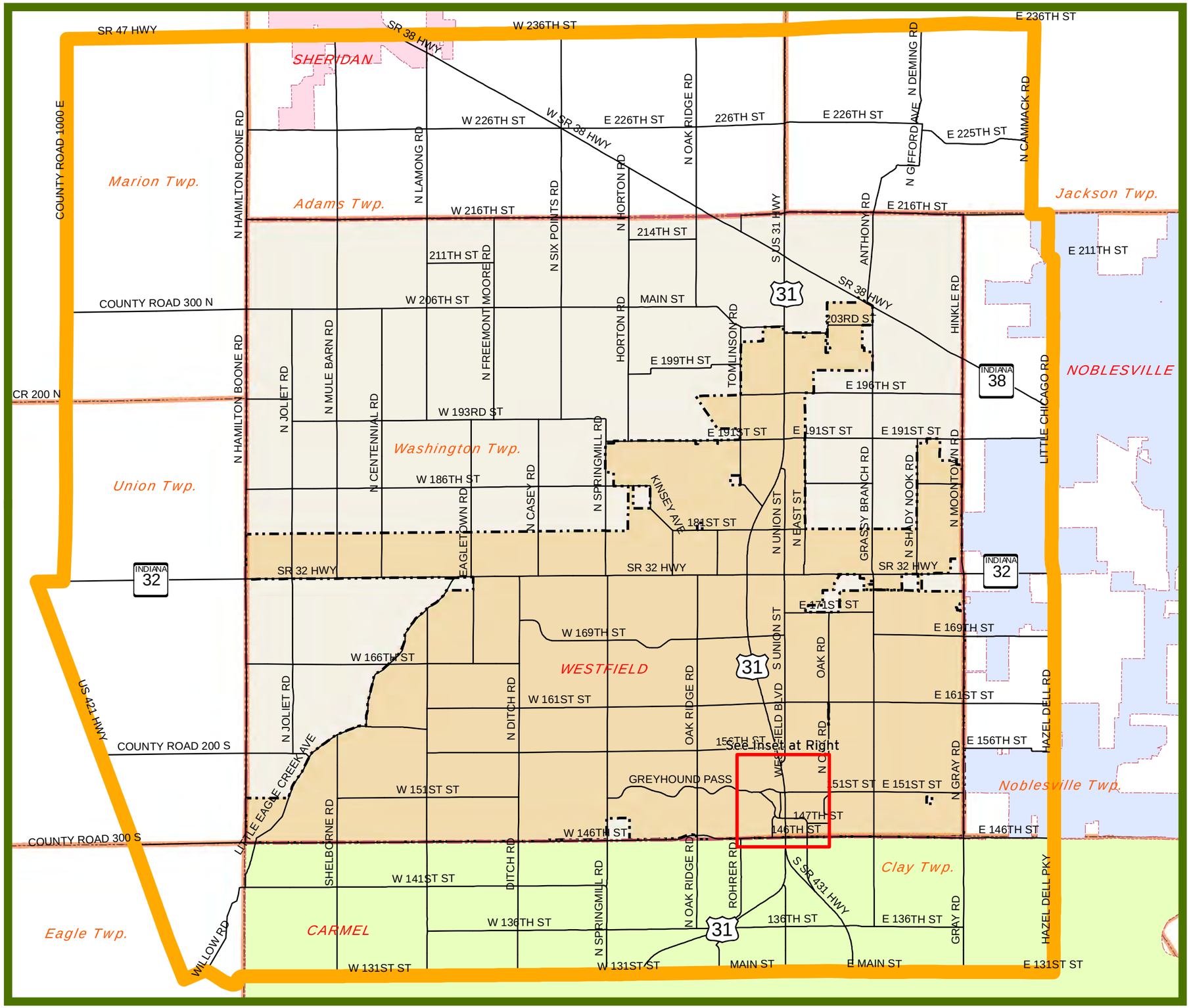
0 3,750 7,500 15,000 Feet

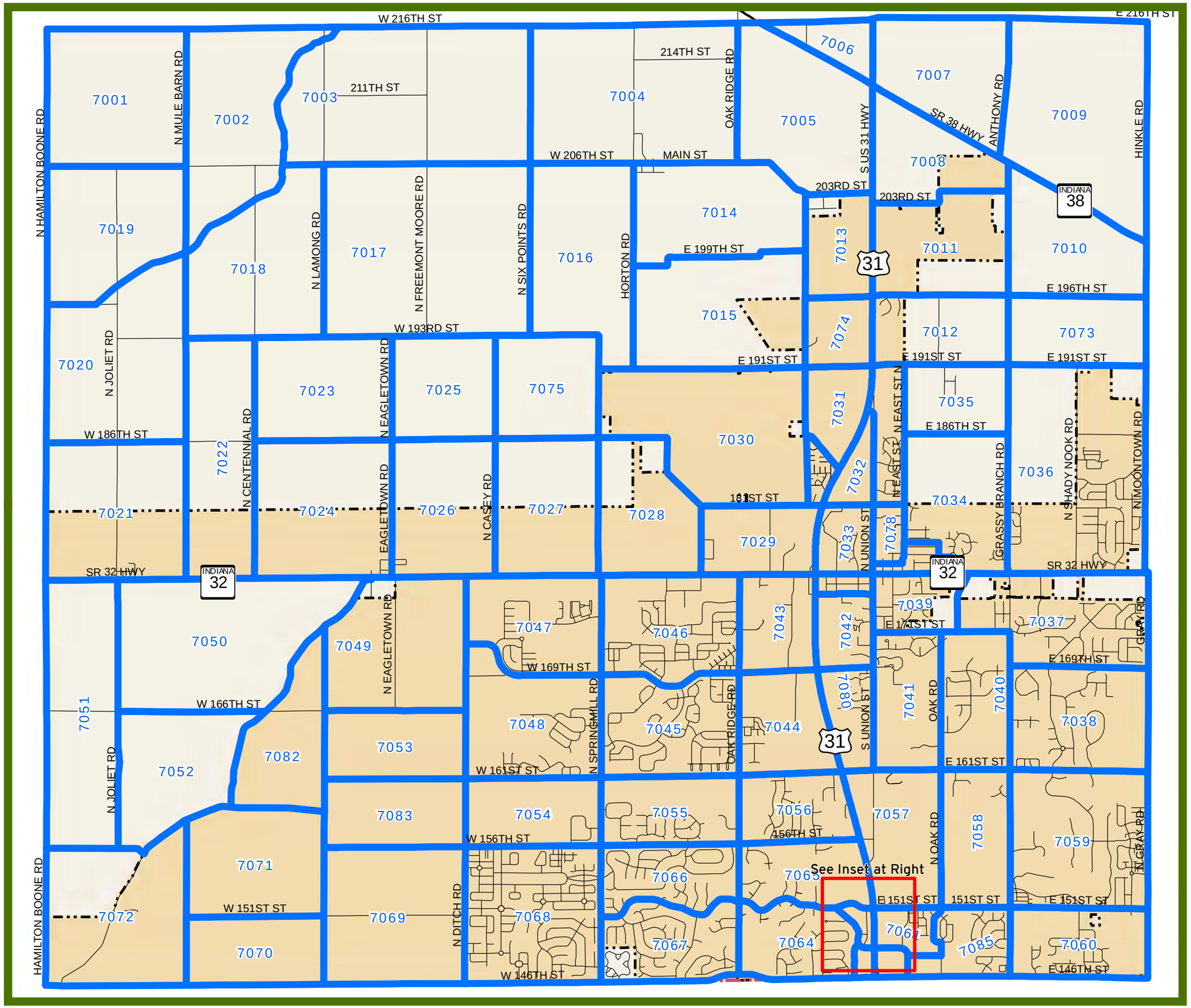
N

HNTB DRAFT - February 2012

Greyhound Pass Inset







CITY OF Westfield INDIANA

Road Impact Fee Study

Figure 4-2
Traffic Analysis Zones

City of Westfield

Washington Township

Traffic Analysis Zones (TAZ)

0 2,450 4,900 9,800 Feet

N

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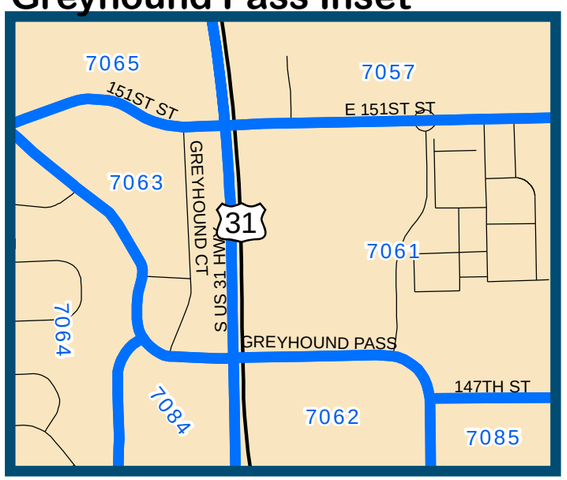
Greyhound Pass Inset



4.2 Travel Demand Model Calibration

A travel demand model should be able to replicate existing traffic patterns when given existing housing, employment, school enrollment and road network inputs. Calibration is the process of modifying the assumptions made about input data and the internal model calculations to ensure that the model is capable of replicating existing conditions within a certain variance. Once the model calibration process produces a model that can replicate existing conditions within this acceptable range, the model is considered to be validated and can be used to forecast future conditions.

For the Westfield model, calibration was performed by adjusting internal model calculations, such as trip generation rates, and by adjusting road network attributes, such as the location of centroid connectors and the facility types of roads. More detailed information on model calibration and validation is provided in **Appendix D**.

4.3 Housing and Employment Growth Forecast

Household data for 2011 was estimated by aggregating block-level household counts from the 2010 Census to the model TAZ level. City of Westfield building permit information was used to estimate the number and location of new households established between the 2010 Census and the middle of 2011. Additional household statistics necessary for modeling—the number of workers, vehicles, and persons per household—were obtained from the 2010 Census and assumed to remain constant throughout the forecast period. Employment data for 2011 was developed based on point-level employment data obtained from Neilson-Claritas. This information was error-checked for major omissions, double-counts, and erroneous business locations, and corrected as necessary.

The forecast of 2021 households and employment was a two-step process. The first step was to use past trends and forecasts to develop target forecasts of 2021 households and employment for Washington Township as a whole. The second step was to use the Westfield Comprehensive Plan and more detailed planning data to identify where within Washington Township the household and employment growth would occur.

Overall 2021 population and housing unit forecasts for Washington Township were developed using the linear growth rates observed during the 2000-2010 time period. This resulted in a 2021 forecast of approximately 48,900 residents and 18,700 housing units, which is consistent with forecasts in the Westfield Comprehensive Plan. An overall 2021 employment forecast of 15,200 for Washington Township was developed by assuming that existing employment would grow at the same overall 3.5% annual rate that was observed for Hamilton County between 2000 and 2010.

The overall township-wide housing and employment forecasts were used as targets for aggregating more specific information about planned development provided by the City of Westfield. Based on this information, development in the next 10 years is expected to focus in three primary areas: Grand Park, Grand Junction and the Springmill Trails Planned Unit Development. Information about anticipated 10-year build-out of these areas and other approved developments was identified in conjunction with the Westfield Community and Economic Development Department. Development in these three areas is expected to account for nearly all of the 10-year employment growth, with the remainder to occur in industrial areas north of 191st Street and east of US 31. Housing development is expected to be less concentrated, with these three primary development areas accounting for approximately 38% of the new housing over the next 10 years. The remaining housing unit growth was distributed through Washington Township based on analysis of available infill residential areas using aerial mapping and on discussions of likely development locations among City of Westfield staff.

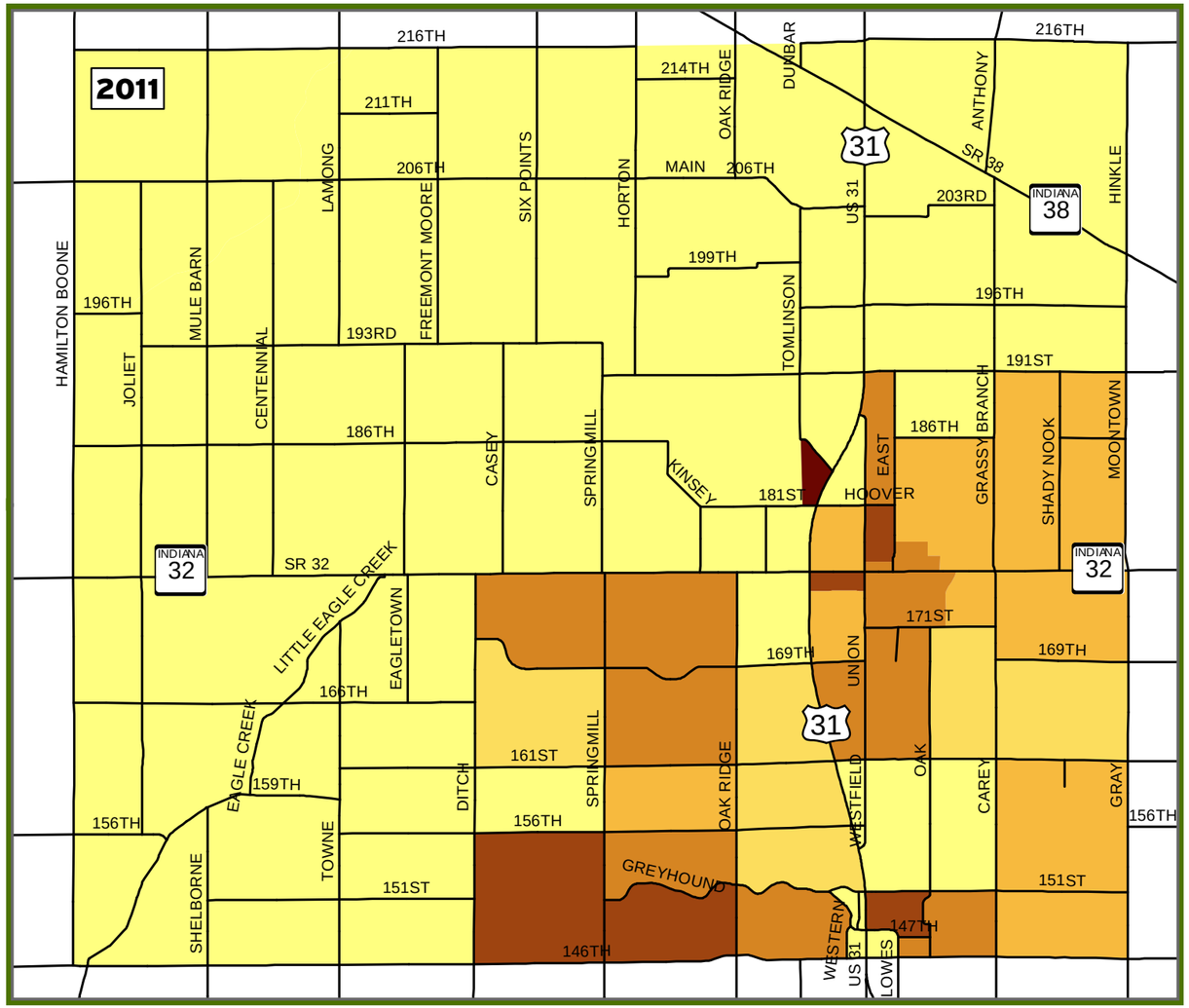
Table 4-1 summarizes the household and employment projections for each TAZ in Washington Township; **Figure 4-3** and **Figure 4-4** show this information in a graphic format. The final analysis resulted in a 2021 Washington Township forecast of 18,149 households (18,149 housing units) and a 2021 Washington Township employment forecast of 16,563. For more detailed information on the assumptions for planned developments, refer to **Appendix E**. For more information on household and employment projections in areas outside Washington Township, refer to **Appendix D.**, which describes travel demand modeling procedures.

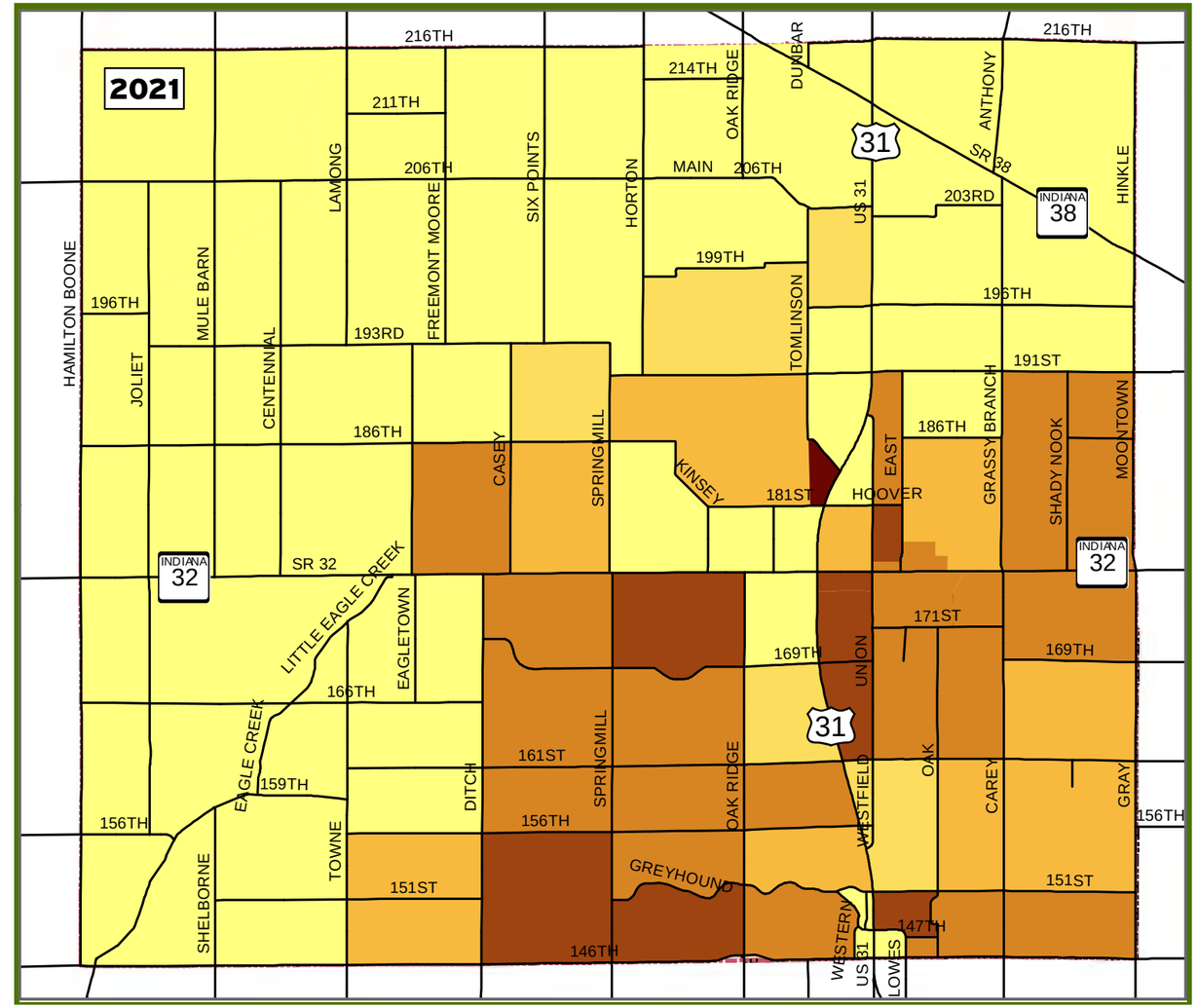
Table 4-1: Household and Employment Projections

TAZ	2011 Households	2021 Households	HH Growth	2011 Employment	2021 Employment	Emp. Growth
7001	16	16	0	0	0	0
7002	13	13	0	4	4	0
7003	40	40	0	27	27	0
7004	55	55	0	3	3	0
7005	33	33	0	0	0	0
7006	8	8	0	12	12	0
7007	22	22	0	5	5	0
7008	13	13	0	3	157	154
7009	24	24	0	0	0	0
7010	18	18	0	27	27	0
7011	13	13	0	350	350	0
7012	35	35	0	0	0	0
7013	8	88	80	0	245	245
7014	50	50	0	1	1	0

TAZ	2011 Households	2021 Households	HH Growth	2011 Employment	2021 Employment	Emp. Growth
7015	36	243	207	0	300	300
7016	144	157	13	0	6	6
7017	30	30	0	6	6	0
7018	33	33	0	9	9	0
7019	6	6	0	3	3	0
7020	31	31	0	2	2	0
7021	62	62	0	46	46	0
7022	13	13	0	6	6	0
7023	17	17	0	13	13	0
7024	43	43	0	11	11	0
7025	23	23	0	0	0	0
7026	58	507	449	9	9	0
7027	63	397	334	170	408	238
7028	13	13	0	122	1443	1321
7029	3	3	0	489	1157	668
7030	29	715	686	6	888	882
7031	10	34	24	38	692	654
7032	0	0	0	145	145	0
7033	90	90	0	506	672	166
7034	236	354	118	247	247	0
7035	54	54	0	14	14	0
7036	655	1017	362	57	57	0
7037	478	564	86	504	504	0
7038	201	282	81	78	78	0
7039	247	247	0	363	379	16
7040	146	412	266	29	29	0
7041	380	524	144	20	20	0
7042	100	349	249	213	218	5
7043	21	21	0	728	728	0
7044	98	98	0	502	502	0
7045	819	904	85	358	358	0
7046	914	1039	125	537	562	25
7047	468	762	294	104	104	0
7048	236	641	405	6	6	0
7049	28	28	0	61	61	0
7050	47	47	0	74	74	0
7051	54	54	0	25	25	0

TAZ	2011 Households	2021 Households	HH Growth	2011 Employment	2021 Employment	Emp. Growth
7052	25	25	0	3	3	0
7053	18	18	0	37	37	0
7054	67	316	249	79	79	0
7055	256	430	174	29	29	0
7056	69	295	226	17	17	0
7057	31	169	138	212	212	0
7058	62	213	151	4	4	0
7059	344	382	38	228	228	0
7060	241	473	232	103	103	0
7061	258	258	0	2000	2000	0
7062	0	0	0	538	538	0
7063	1	1	0	177	177	0
7064	325	406	81	58	58	0
7065	84	190	106	210	210	0
7066	513	513	0	43	43	0
7067	834	834	0	40	40	0
7068	1281	1330	49	160	160	0
7069	11	355	344	0	0	0
7070	7	7	0	6	6	0
7071	23	23	0	1	1	0
7072	69	69	0	3	3	0
7073	5	5	0	4	4	0
7074	38	38	0	0	0	0
7075	6	106	100	0	0	0
7076	222	222	0	95	95	0
7077	178	178	0	286	286	0
7078	158	158	0	64	64	0
7079	91	91	0	194	207	13
7080	286	332	46	75	75	0
7081	78	78	0	87	214	127
7082	19	19	0	0	0	0
7083	6	6	0	2	2	0
7084	0	0	0	409	409	0
7085	367	367	0	496	646	150
Total	12207	18149	5942	11593	16563	4970





CITY OF Westfield INDIANA

Road Impact Fee Study:

Figure 4-3
Household Growth

- Less than 0.25 Households per Acre
- 0.25 - 0.5 Households per Acre
- 0.5 - 1 Households per Acre
- 1 - 2 Households per Acre
- 2 - 3 Households per Acre
- More than 3 Households per Acre
- Washington Township

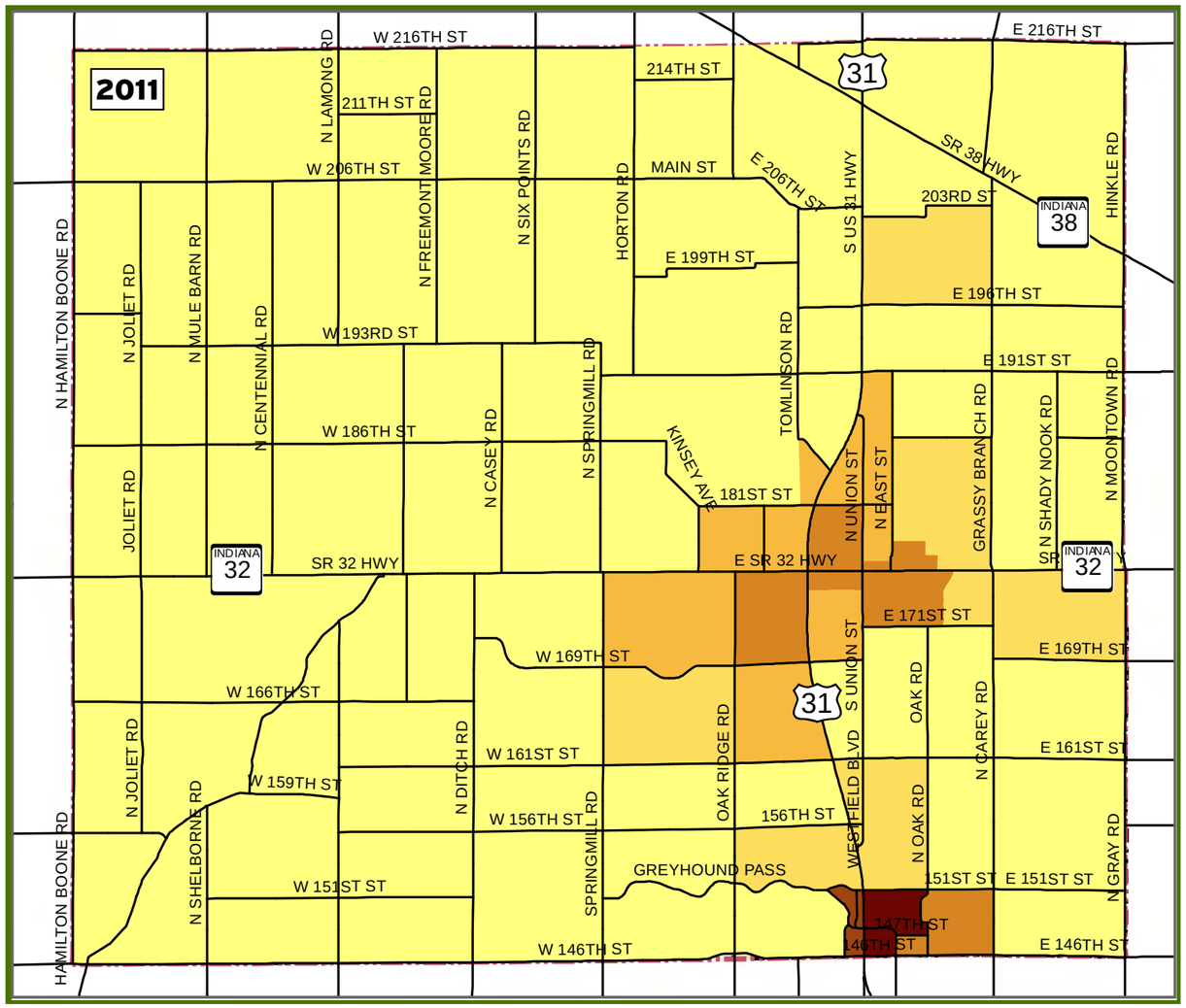
0 0.5 1 2 3 Miles

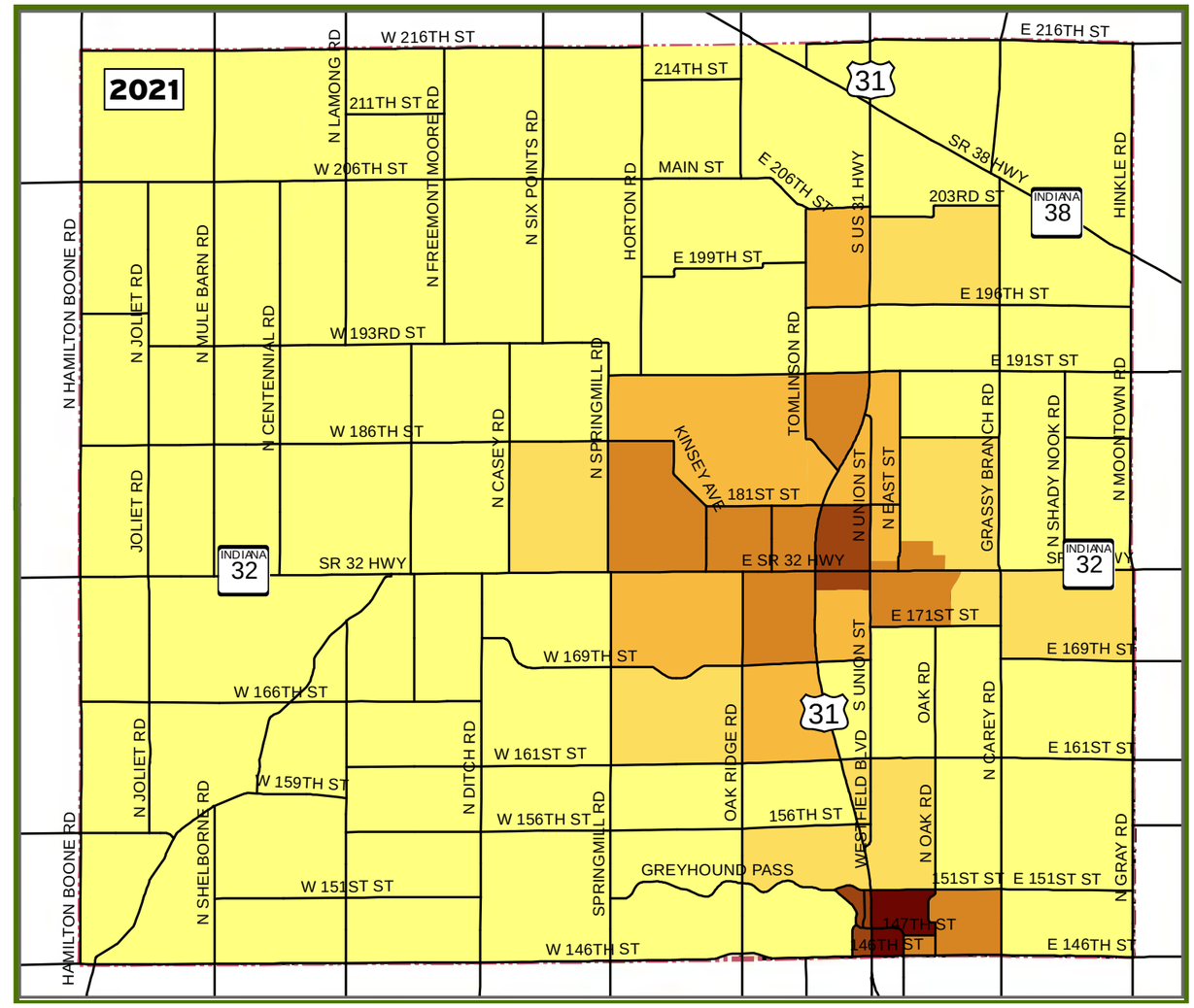
N

February 2012

HNTB

DRAFT - February 2012





CITY OF Westfield INDIANA

Road Impact Fee Study:

Figure 4-4
Employment Growth

- Less than 0.5 Employees per Acre
- 0.5 - 1 Employees per Acre
- 1 - 2 Employees per Acre
- 2 - 5 Employees per Acre
- 5 - 10 Employees per Acre
- More than 10 Employees per Acre
- Washington Township

0 0.5 1 2 3 Miles

N

February 2012

HNTB

DRAFT - February 2012

4.4 Committed Network Improvements

In order to correctly model future roadway conditions, it is necessary to reflect the transportation improvement projects that are already funded and are expected to be in place by 2021. These "committed" projects are coded into the travel demand model. This allows analysis of the future network to focus on areas where there are additional improvement needs that are not currently being addressed. **Table 4-2** lists the committed projects that are included as part of the 2021 roadway network. These projects are either under construction in 2011 or have construction funding identified in the 2012-2015 Regional Transportation Improvement Program maintained by the Indianapolis Metropolitan Planning Organization.

Table 4-2: Committed Network Capacity Improvements in 2021 Travel Demand Model

Road	Location	Description	Responsible
US 31	96th St to 216th St	Upgrade to Freeway. Widen to 6 lanes. Add interchanges, frontage roads, and relocated property access points	INDOT
146th St	Spring Mill Rd to Ditch Rd	Widen to 4 lanes. Roundabout at Ditch.	Hamilton County
156th St	At Springmill Rd	Construct roundabout	Westfield
161st St	At Oakridge Rd	Construct roundabout	Westfield
161st St	At Cool Creek	Replace existing 1-lane bridge #147	Hamilton County
186th St	Tomlinson Road to Grand Park Entrance	New road on new alignment	Westfield
Towne Rd*	131st St to 146th St	Widen to 4 lanes with roundabouts	Carmel

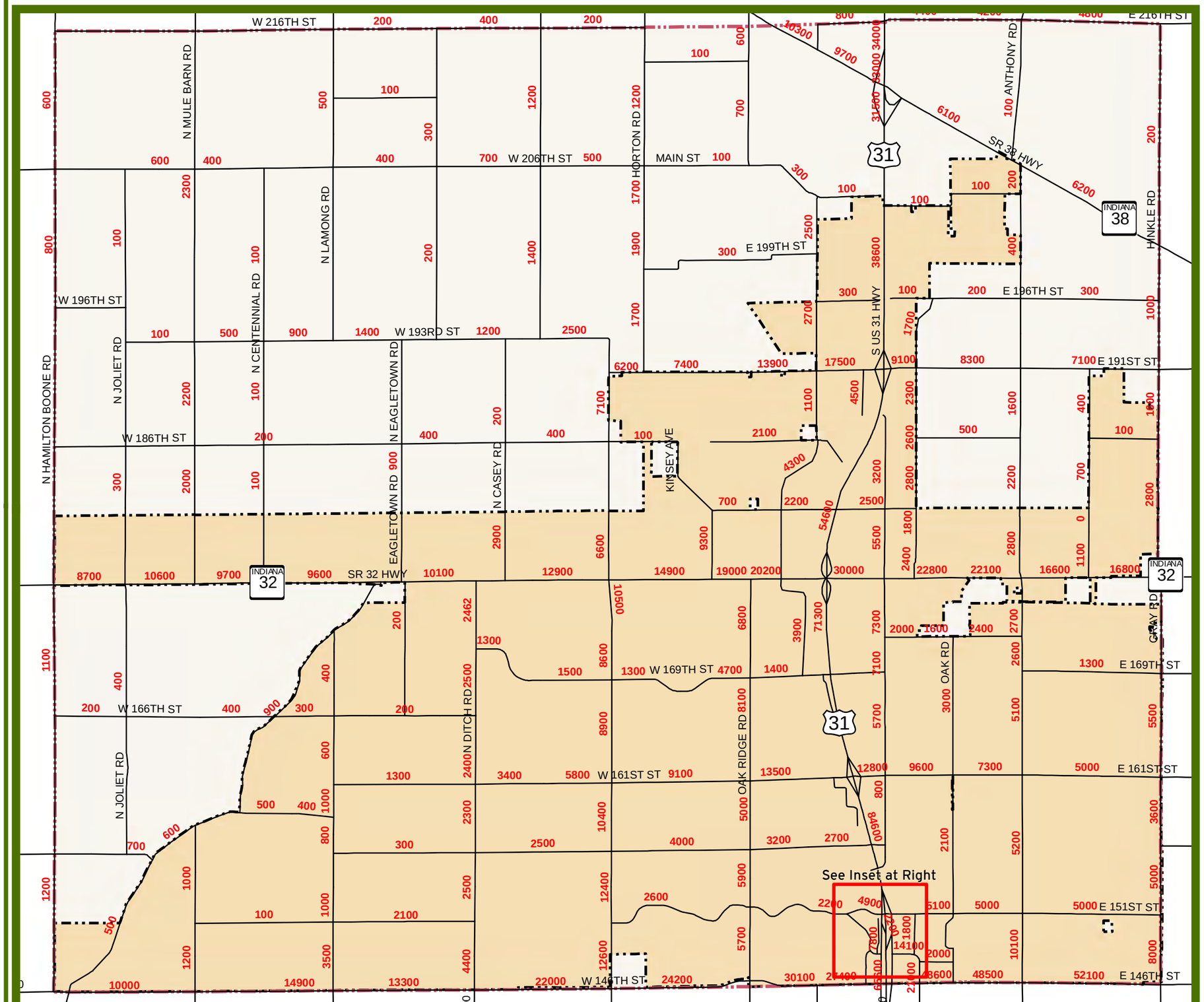
*under construction in 2011

The upgrade of US 31 to a limited access freeway facility from 96th Street to 216th Street will have by far the most significant impact on travel in the Westfield area. Transportation patterns in and around Westfield are expected to shift appreciably when improvements are made to US 31. Within Washington Township, US 31 interchanges are planned for 146th Street, 151st Street, 161st Street, SR 32, 191st Street and SR 38. Many of these east-west roads will experience increased traffic demand from travelers accessing US 31, while many roads parallel to US 31 will experience less growth or possibly a decrease in traffic demand from existing conditions. The US 31 freeway upgrade is expected to be in place through Westfield by 2017

4.5 2021 Travel Demand

The TransCAD travel demand model was used to forecast 2021 network traffic volumes based on anticipated housing and employment and with the committed road network improvements in place. **Figure 4-5** shows the average daily traffic volumes that are forecast for the proposed study area road network in 2021. Because of the planned upgrade of US 31 to a freeway through the study area, traffic patterns through Westfield are expected to change significantly during the 10-year forecast period. Despite the forecast growth in housing and employment, 2021 traffic volumes on some Westfield roads will be only somewhat higher than today. In some cases they may be lower than today's volumes. Other roads, those that directly serve new development or provide access to the US 31 freeway, will experience higher traffic growth.

Morning and afternoon peak hour turning movement volume forecasts were developed using the daily forecasts from TransCAD along with existing and forecast estimates of peak period road link demand and the turning movement estimation procedures of NCHRP Report 255. This is the same method that was used to estimate missing intersection turning movement volumes under existing conditions. 2021 forecast intersection turning movement volumes are provided in **Appendix C.**



CITY OF Westfield INDIANA

Road Impact Fee Study

Figure 4-5
2021 Forecast Traffic Volumes

City of Westfield

Washington Township

Existing Average Daily Traffic

0 2,500 5,000 10,000 Feet

N

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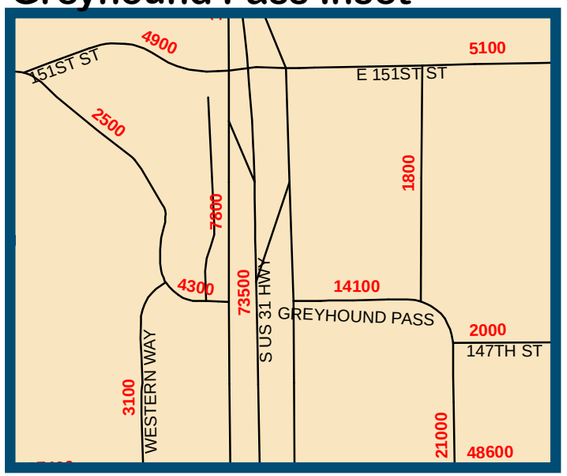
Greyhound Pass Inset



5 2021 Needs Assessment

Roadway capital improvements that will be necessary by 2021 were identified using the forecast 2021 traffic volumes and the same LOS criteria used to identify 2011 improvement needs. These criteria are identified in Section 2, Community Level of Service Criteria

5.1 Intersection Traffic Control

The appropriate traffic control at each intersection under forecast 2021 traffic conditions was determined by using the traffic signal and multi-way stop control warrant procedures of the Indiana MUTCD, as discussed in Section 2.1. **Figure 5-1** shows the existing intersection traffic control and new traffic control that is expected to be warranted by 2021.

CITY OF Westfield INDIANA

Road Impact Fee Study

Figure 5-1
2021 Committed & Warranted Traffic Control

- City of Westfield
- Washington Township
- Existing or Committed All-Way Stop
- Existing or Committed Traffic Signal
- Existing or Committed Roundabout
- Daily Volumes Warrant New Trafic Signal

NOTE: US 31 ramp intersection control not shown

0 2,500 5,000 10,000 Feet

N

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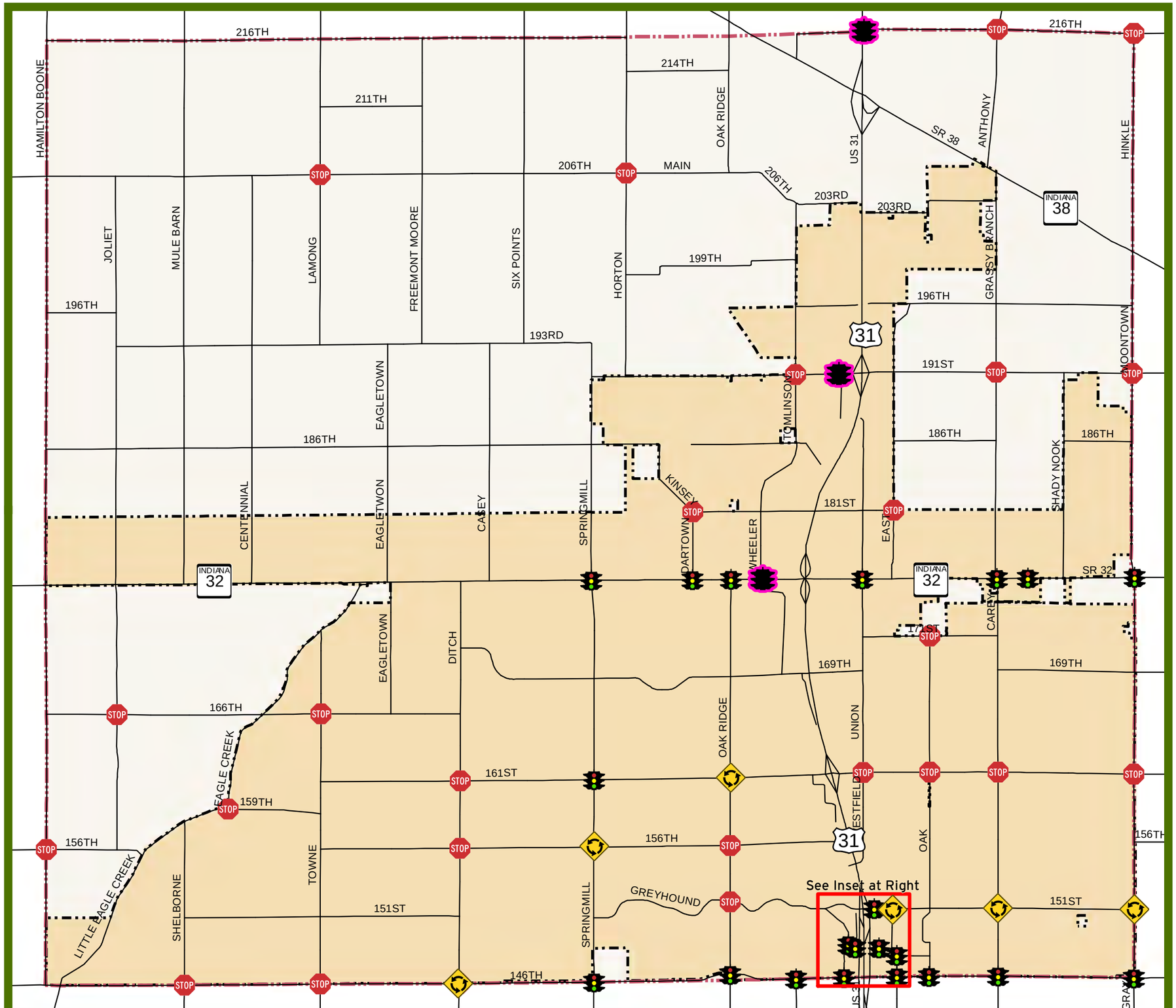
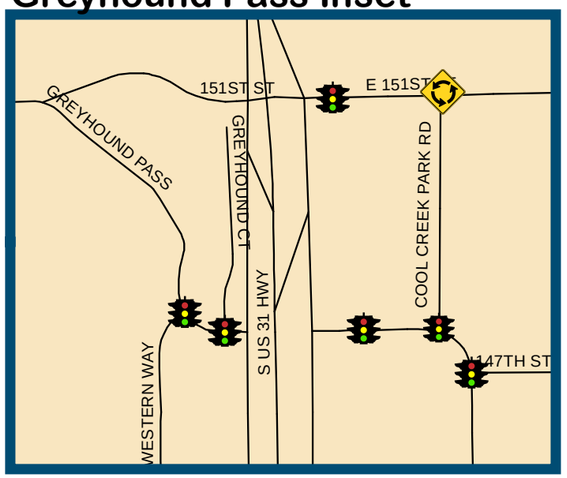


Greyhound Pass Inset



5.2 Levels of Service and Infrastructure Needs

Roadway segment and intersection levels of service were evaluated using the forecast 2021 traffic volumes and assuming that the committed improvements identified in Table 4-2 are in place. These evaluations were conducted using the criteria and methods described in Section 2, Community Level of Service Criteria. **Table 5-1** lists the roadway segments that are not expected to meet the roadway cross section LOS criterion of a 22-foot minimum paved width for segments carrying at least 5,000 vehicles per day by 2021. Beyond those identified as existing 2011 needs, several additional 2-lane road segments are identified for widening by 2021. Segments of Springmill Road and 191st Street are identified as requiring improvement, but are currently outside of the Westfield municipal boundaries. The cost of improving these segments is not included in the impact fee cost calculations, but could be included in future updates if these roads become the responsibility of Westfield.

Figure 5-2 shows the intersections and road segments that are not expected to meet minimum acceptable traffic operations LOS by 2021. The figure includes both Westfield roads and other roads in the study area that are not Westfield responsibility. For Westfield roads, traffic operation LOS problems are forecast on Springmill Road, 161st Street and 191st Street. Construction of the committed roundabout at 156th and Springmill will address the existing improvement need for additional lanes at this intersection, although the road segment between 146th Street and 156th Street is still anticipated to experience unacceptable LOS. Traffic forecasts suggest that the roundabout at 161st and Carey, identified as a 2011 need, might not be necessary for adequate LOS after the US 31 freeway is in place. However, this roundabout will continue to be necessary at least until post-freeway traffic patterns are well-established.

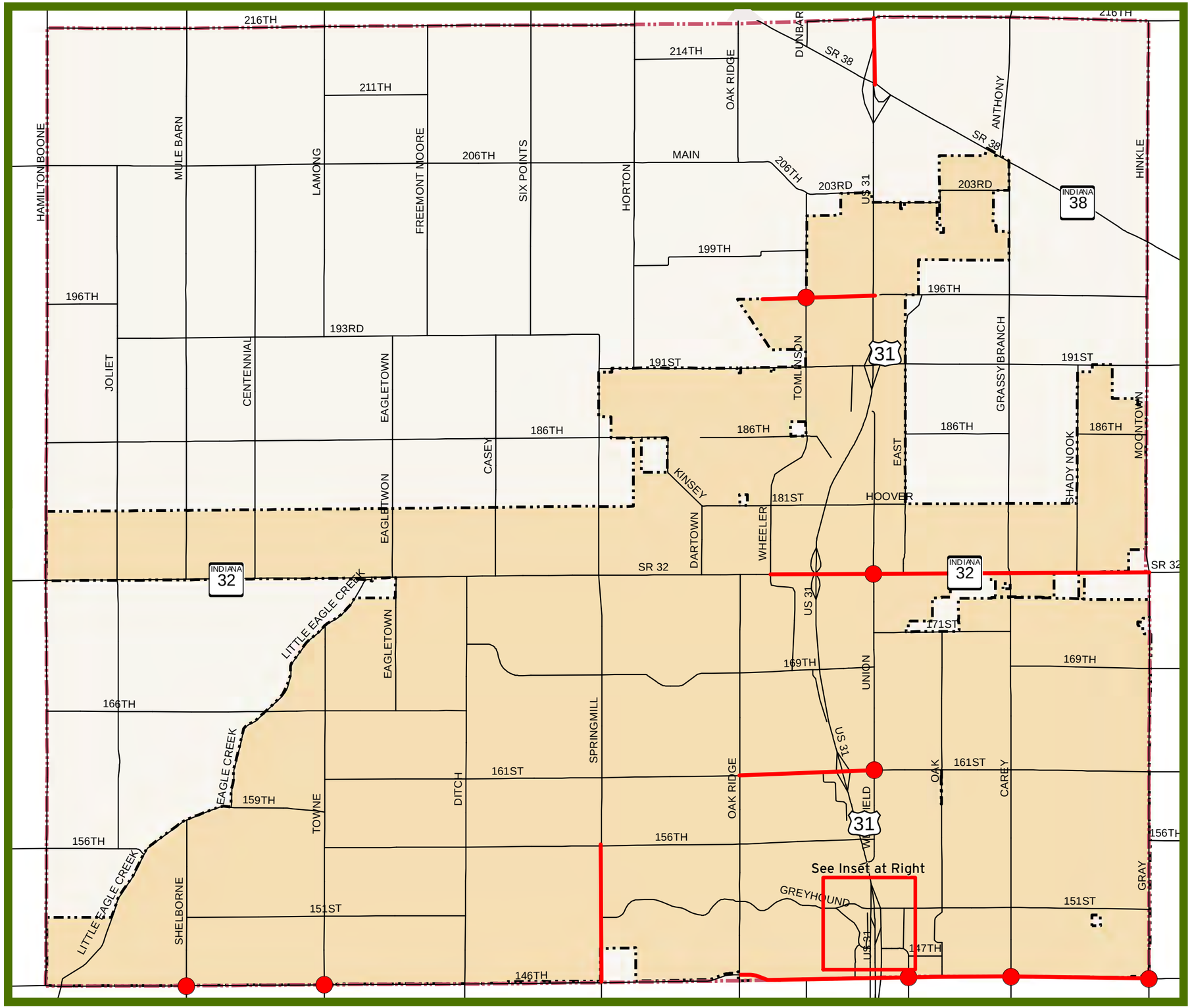
Figure 5-3 shows the expected 2021 roadway improvement needs for roads that are currently the responsibility of the City of Westfield. All identified deficiencies and recommended improvements are based on current expectations of development patterns and traffic demand through 2021. In addition to the 2011 improvement needs shown in Figure 3-4, this figure identifies the need to reconstruct segments of Springmill Road, 161st Street and 191st Street as 4-lane roads. New roundabouts will be needed at 191st and Tomlinson, at 191st and the planned West Access Road, and at 161st and Union Street. **Figure 5-4** identifies the projects that are not needed to provide adequate LOS for existing development but will be required to provide for anticipated development. These projects are eligible for funding with road impact fee receipts.

Changes in the location or timing of land use development could result in some variation in the road network improvement needs identified in Figure 5-3 and should be considered in future updates of the impact fee study.

Table 5-1: 2021 Roadway Cross Section Deficiencies

Road	Begin	End	2021 Average Daily Traffic Volume	Typical Paved Width (feet)
Carey Road	Saddlehorn Drive	151st Street	10,100	21
Carey Road	151st Street	161st Street	5,200	21
Gray Road	161st Street	Golden Hinde Way	5,500	19
Oakridge Road	Sapphire Way	Greyhound Pass	5,700	20
Oakridge Road	Greyhound Pass	156th Street	5,900	19
Oakridge Road	156th Street	161st Street	5,000	19
Oakridge Road	161st Street	169th Street	8,100	19
Oakridge Road	169th Street	Pine Ridge Drive	6,800	18
Springmill Road	City Limit	Greyhound Pass	12,600	20
Springmill Road	Greyhound Pass	156th Street	12,400	20
Springmill Road	156th Street	161st Street	10,400	20
Springmill Road	161st Street	169th Street	8,900	20
Springmill Road	169th Street	SR 32	8,600	20
Springmill Road*	SR 32	186th Street	6,600	18
Springmill Road*	186th Street	191st Street	7,100	18
Union Street	161st Street	David Brown Drive	5,700	20
Wheeler Road	SR 32	181st Street	9,300	18
151st Street	Carmel Landing	Oak Road	5,100	20
151st Street	Oak Road	Carey Road	5,000	20
151st Street	Carey Road	Setters Road	5,000	21
191st Street	Springmill Road	Horton Road	6,200	17
191st Street	Horton Road	Tomlinson Road	13,900	18
191st Street	Tomlinson Road	US 31	17,500	18
191st Street	US 31	East Street	9,100	20
191st Street*	East Street	Moontown Road	8,300	19

*Portions of this segment are not under City of Westfield jurisdiction but could be by 2021



CITY OF Westfield INDIANA

Road Impact Fee Study
Figure 5-2
2021 Committed Network Traffic Operation Levels of Service

City of Westfield

Washington Township

Intersection Level of Service 'E' or 'F' in either AM or PM Peak Hour

Roadway Segment Level of Service 'E' or 'F' Based on Daily Volumes

0 2,500 5,000 10,000 Feet

N

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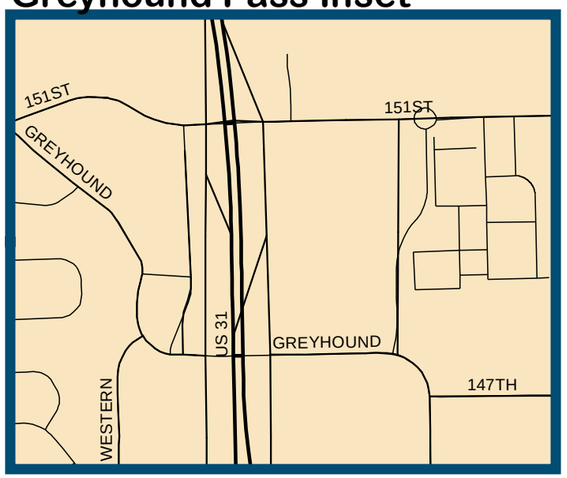

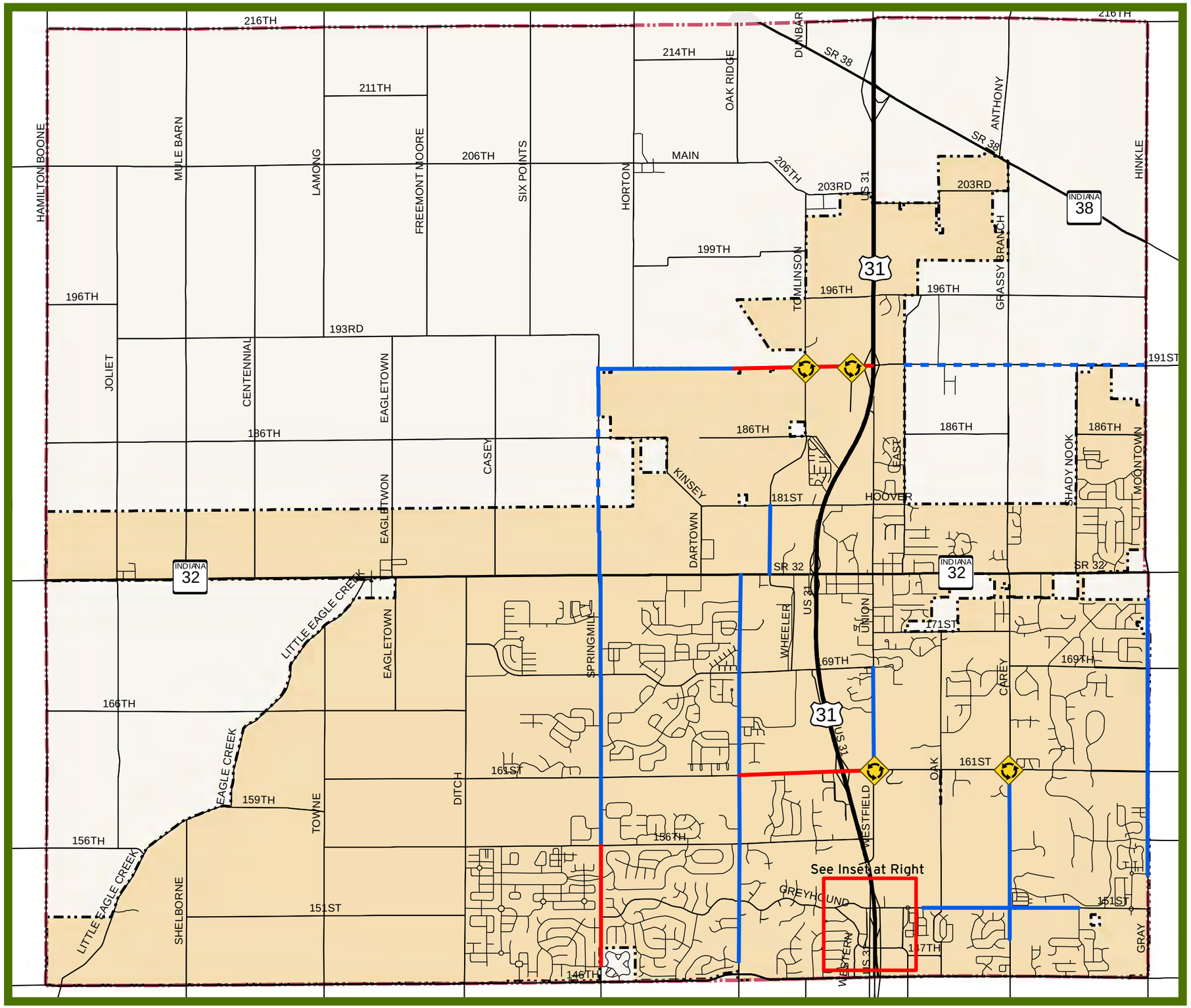

CITY OF Westfield INDIANA

Road Impact Fee Study

Figure 5-3
2021 Roadway Improvement Needs

- City of Westfield
- Washington Township
- Widen & Overlay - 2 Lanes
- Widen & Overlay - 2 Lanes (Potential Future Westfield Road)
- Widen/Reconstruct - 4 Lanes
- New Roundabout

0 2,500 5,000 10,000 Feet

N

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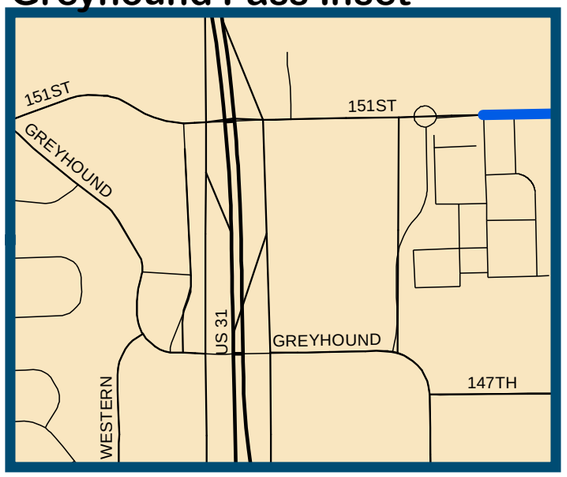
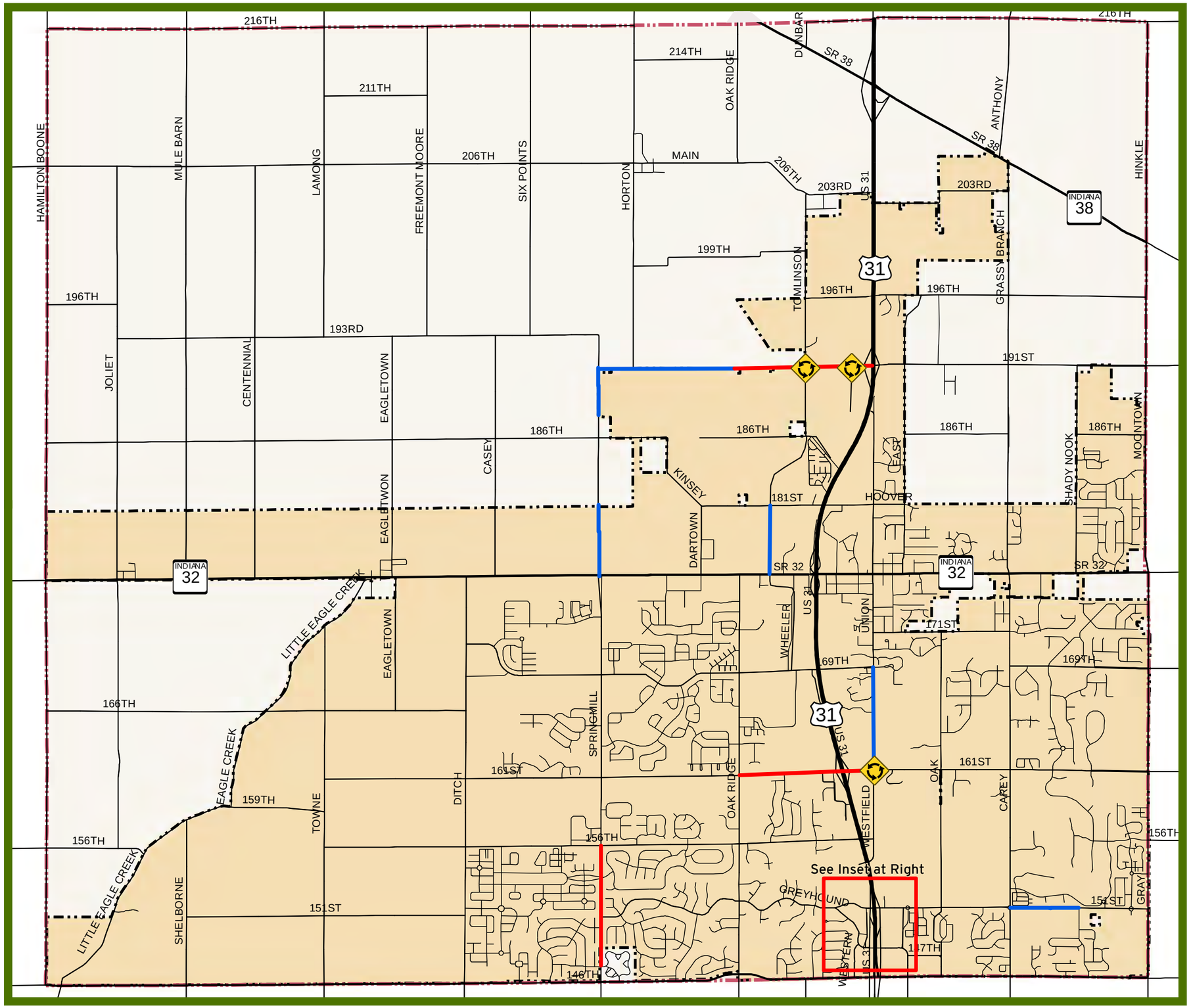
Greyhound Pass Inset





CITY OF Westfield INDIANA

Road Impact Fee Study

Figure 5-4
Projects Eligible for Impact Fee Funding

- City of Westfield
- Washington Township
- Widen & Overlay - 2 Lanes
- Widen/Reconstruct - 4 Lanes
- New Roundabout

0 2,500 5,000 10,000 Feet

N

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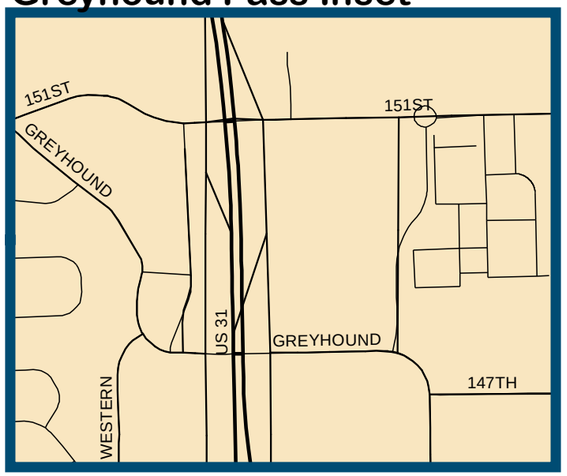
Greyhound Pass Inset



6 Infrastructure Improvement Costs

The estimated costs of the improvement projects required to meet existing 2011 and projected 2021 needs are shown in **Table 6-1** and **Table 6-2**. Detailed project cost estimates are provided in **Appendix G.**

Cost estimates for widening and overlay of existing 2-lane roads that do not currently meet the cross section requirements are based on providing two 12-foot travel lanes with 2-foot asphalt shoulders and open drainage on both sides. Right-of-way acquisition was assumed to be required in locations where the existing available right-of-way width is less than 50 feet, as estimated using Hamilton County Geographic Information System online maps. Right-of-way costs were estimated using average per-acre assessed values of potentially impacted parcels and adding an estimated per-parcel cost for land acquisition fees.

Cost estimates for the reconstruction of existing roads to a 4-lane section are based on providing four 12-foot travel lanes, a 16-foot raised median, curb and gutter and enclosed drainage. An 8-foot asphalt multi-use trail is assumed on each side of the new road in accordance with City of Westfield standards.

The tables identify the portion of the cost of several projects that is necessary to correct existing 2011 deficiencies. These capital costs are the responsibility of the City of Westfield and are not included in the impact fee calculation. The City of Westfield anticipates using several sources of funds to meet these capital improvement obligations. These include the use State MVH and LRS distributions, general obligation bonds, possible federal-aid highway funding, and the possible implementation of new TIF districts. Impact fees collected under the 2007 road impact fee ordinance may also be used to address existing deficiencies on Oakridge Road, Gray Road and at the 156th and Springmill intersection, as these deficiencies did not exist at that time and were identified as improvement needs in the previous Zone Improvement Plan.

The typical roadway features described in this section comply with the design requirements of the City of Westfield, but they were used only to develop improvement cost estimates. These features do no comprise specific design recommendations for the various projects.

Table 6-1: 2011 Improvement Costs

Road	Begin	End	Project	Typical Section	Cost to Meet 2011 LOS			
					Construction	Design, Survey & Inspection (15%)	Right-of-Way Acquisition	Total
Carey Road	Saddlehorn	161st Street	Widen and Resurface. Roundabout at 161st	2-lane with shoulders	$2,451,600	$367,700	$23,000	$2,842,300
Springmill Road	City Limits	156th Street	Widen and Resurface. NB and SB left turn lanes at 156th	2-lane with shoulders	$745,500	$111,800	$22,700	$880,000
Springmill Road	156th Street	161st Street	Widen and Resurface	2-lane with shoulders	$359,000	$53,900	$4,300	$417,200
Springmill Road	161st Street	SR 32	Widen and Resurface	2-lane with shoulders	$1,015,600	$152,300	$26,400	$1,194,300
Gray Road	Guerin Way	161st Street	Widen and Resurface	2-lane with shoulders	$916,500	$137,500	$39,200	$1,093,200
Gray Road	161st Street	Golden Hinde Way	Widen and Resurface	2-lane with shoulders	$1,031,900	$154,800	$59,700	$1,246,400
Oakridge Road	Sapphire Drive	161st Street	Widen and Resurface	2-lane with shoulders	$979,600	$146,900	$65,700	$1,192,200
Oakridge Road	161st Street	169th Street	Widen and Resurface	2-lane with shoulders	$995,800	$149,400	$8,500	$1,153,700
151st Street	Carmel Landing	Carey Road	Widen and Resurface	2-lane with shoulders	$558,100	$83,700	$0	$641,800
				TOTAL:	**$9,053,600**	**$1,358,000**	**$249,500**	**$10,661,100**

Table 6-2: 2021 Improvement Costs

Road	Begin	End	Project	Typical Section	Cost to Meet 2021 LOS				Cost to Meet 2011 LOS	Impact Fee Cost
					Construction	Design, Survey & Inspection (15%)	Right-of-Way Acquisition	Total		
Carey Road	Saddlehorn	161st Street	Widen and Resurface. Roundabout at 161st	2-lane with shoulders	$2,451,600	$367,700	$23,000	$2,842,300	$2,842,300	$0
Springmill Road	City Limits	156th Street	Widen and Reconstruct	4-lane with median, curb & gutter	$4,533,500	$680,000	$144,500	$5,358,000	$880,000	$4,478,000
Springmill Road	156th Street	161st Street	Widen and Resurface	2-lane with shoulders	$359,000	$53,900	$4,300	$417,200	$417,200	$0
Springmill Road	161st Street	SR 32	Widen and Resurface	2-lane with shoulders	$1,015,600	$152,300	$26,400	$1,194,300	$1,194,300	$0
Springmill Road	SR 32	191st	Widen and Resurface	2-lane with shoulders	$669,300	$100,400	$65,800	$835,500	$0	$835,500
Gray Road	Guerin Way	161st Street	Widen and Resurface	2-lane with shoulders	$916,500	$137,500	$39,200	$1,093,200	$1,093,200	$0
Gray Road	161st Street	Golden Hinde Way	Widen and Resurface	2-lane with shoulders	$1,031,900	$154,800	$59,700	$1,246,400	$1,246,400	$0
151st Street	Carmel Landing	Carey Road	Widen and Resurface	2-lane with shoulders	$558,100	$83,700	$0	$641,800	$641,800	$0
151st Street	Carey Road	Setters Road	Widen and Resurface	2-lane with shoulders	$389,600	$58,400	$0	$448,000	$0	$448,000
161st Street	Oakridge Road	US 31	Widen and Reconstruct	4-lane with median, curb & gutter	$4,633,900	$695,100	$1,301,400	$6,630,400	$0	$6,630,400
161st Street	US 31	Union Street	Widen and Reconstruct. Roundabout at Union	4-lane with median, curb & gutter	$2,950,300	$442,500	$131,500	$3,524,300	$0	$3,524,300
Oakridge Road	Sapphire Drive	161st Street	Widen and Resurface	2-lane with shoulders	$979,600	$146,900	$65,700	$1,192,200	$1,192,200	$0
Oakridge Road	161st Street	169th Street	Widen and Resurface	2-lane with shoulders	$995,800	$149,400	$8,500	$1,153,700	$1,153,700	$0
Oakridge Road	169th Street	Pine Ridge Drive	Widen and Resurface	2-lane with shoulders	$448,700	$67,300	$1,700	$517,700	$0	$517,700
Wheeler Road	SR 32	181st Street	Widen and Resurface	2-lane with shoulders	$380,800	$57,100	$40,900	$478,800	$0	$478,800
Union Street	161st Street	David Brown Drive	Widen and Resurface	2-lane with shoulders	$514,400	$77,200	$29,000	$620,600	$0	$620,600
191st Street	Springmill Road	Grand Park Entrance	Widen and Resurface	2-lane with shoulders	$736,700	$110,500	$83,500	$930,700	$0	$930,700
191st Street	Grand Park Entrance	Tomlinson Road	Widen and Reconstruct. Roundabout at Tomlinson	4-lane with median, curb & gutter	$6,176,100	$926,400	$1,034,800	$8,137,300	$0	$8,137,300
191st Street	Tomlinson Road	US 31	Widen and Reconstruct. Roundabout at West Access	4-lane with median, curb & gutter	$4,041,800	$606,300	$2,230,300	$6,878,400	$0	$6,878,400
				TOTAL:	**$33,783,200**	**$5,067,400**	**$5,290,200**	**$44,140,800**	**$10,661,100**	**$33,479,700**

7 Impact Fee Calculation

7.1 Supportable Impact Fee

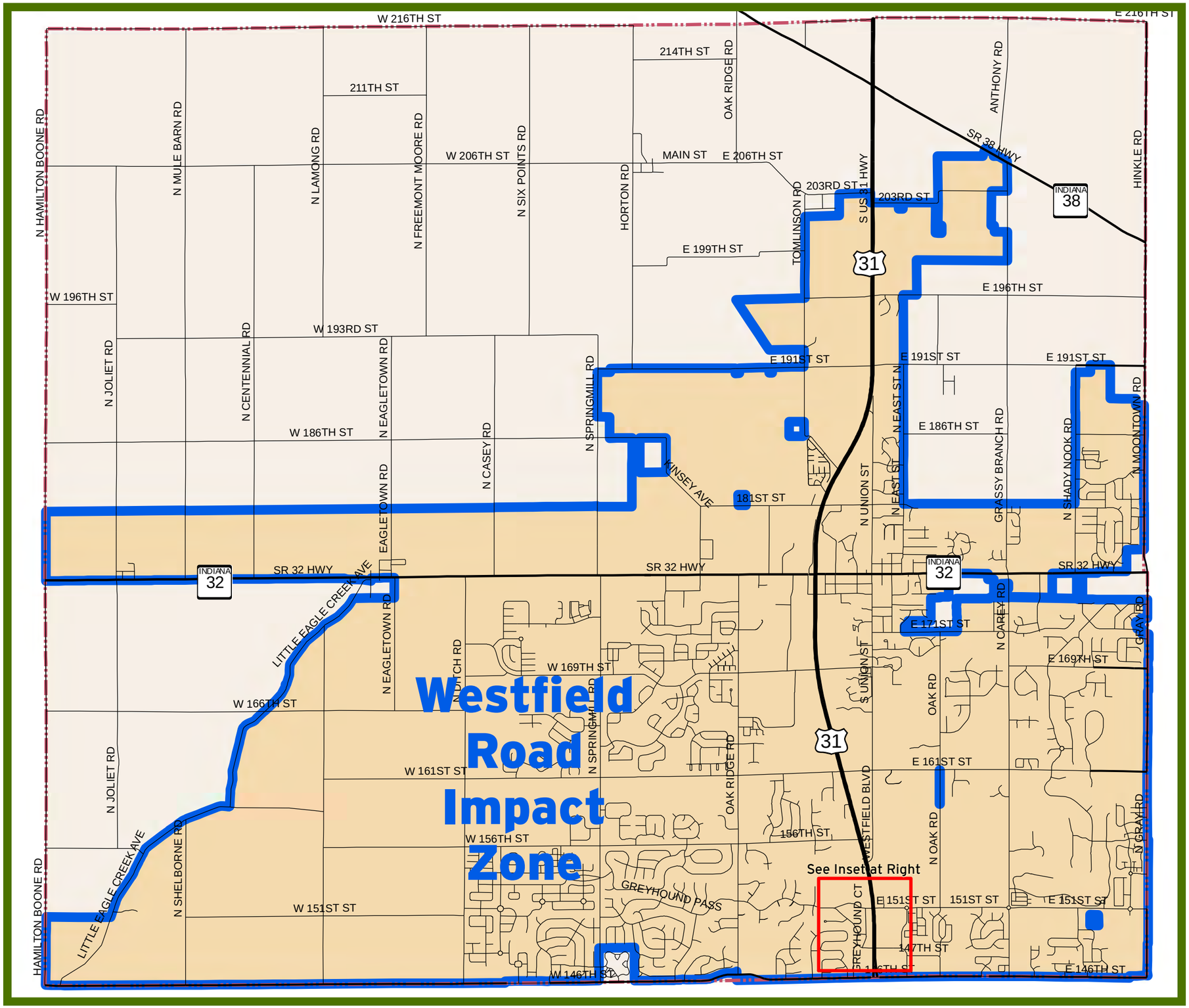
Based on an analysis of trip patterns using the TransCAD travel demand model, a single road impact fee zone is established for Westfield, which is coterminous with the Westfield corporate boundaries. The current impact zone boundaries are shown in **Figure 7-1**. These boundaries may change as property is annexed into the City of Westfield.

Table 7-1 shows the per-trip road impact fee rate that can be supported for new development in the City of Westfield Road Impact Zone. The actual road impact fee rate that the City of Westfield decides to assess could differ from this rate for various reasons. This supportable rate is based on the total cost of improvements in the impact zone divided by the number of new daily trip ends anticipated in the impact zone by 2021. The number of new daily trip ends in the impact zone was determined from the travel demand model.

The cost of projects to bring existing LOS up to Community LOS standards is the responsibility of Westfield. This cost is subtracted from the 2021 needs in determining the total impact cost. No impact deductions or non-local funding sources have been identified at this time to further reduce the total impact cost.

Table 7-1: Calculation of Supportable Impact Fee

	Total
2021 Road Improvement Needs	$44,140,800
Cost to Serve Existing Traffic	($10,661,100)
Cost of Impact Fee Study*	$236,750
Total Impact Cost	**$33,716,450**
New Daily Trip Ends	**84,023**
Impact Fee Per New Daily Trip End	**$401**



CITY OF Westfield INDIANA

Road Impact Fee Study

Figure 7-1
Road Impact Zone
Current Boundaries

City of Westfield

Washington Township

Road Impact Zone

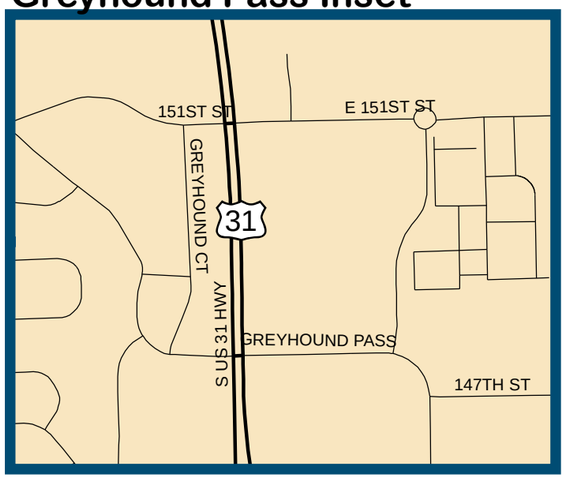
0 2,500 5,000 10,000 Feet

N

HNTB

DRAFT - February 2012

Greyhound Pass Inset



7.2 Impact Fee Assessment

Procedures

The impact fee rates calculated in this study are based on average daily trip ends generated by new development. With the following exceptions and restrictions, the City of Westfield will assess impact fees for individual developments based on a calculation of average weekday trip ends according to the methods and rates provided in the latest editions of *Trip Generation*[9] and the *Trip Generation Handbook*[10], published by the Institute of Transportation Engineers.

1. Independent Variable
    a. The independent variable used to calculate average weekday trip ends shall be as follows:
        - Residential Uses: Dwelling Units
        - Retail Uses: Gross Floor Area or Gross Leasable Area
        - Industrial Uses: Gross Floor Area
        - Office Uses: Gross Floor Area
        - Lodging Uses: Total Number of Rooms
        - Churches: Gross Floor Area
        - Gasoline/Service Stations: Number of Fueling Positions
        - Other Services Uses: Gross Floor Area
    b. For land uses not listed above or for which the above independent variables cannot be used, the independent variable to be used will be approved by the City of Westfield

2. Trip End Calculation
    a. Trip ends for residential uses shall be calculated using the average weekday trip rate provided in *Trip Generation*.
    b. Trip ends for land uses other than residential shall be calculated using either the average weekday trip rate or the weekday fitted curve regression equation provided in *Trip Generation*. The determination of whether to use the average rate or the regression equation shall be based on the recommended procedure in the *Trip Generation Handbook*.

[9] Institute of Transportation Engineers, *Trip Generation, 8th Edition*, Washington, DC, 2008 (or later edition).
[10] Institute of Transportation Engineers, *Trip Generation Handbook, Second Edition, An ITE Recommended Practice*, Washington, DC, 2004 (or later edition).

3. Passby Trip Reduction
    a. The following daily passby trip reduction percentages will be allowed:
        - Free-Standing Discount Superstore (ITE 813): 28%
        - Shopping Center (ITE 820): 34%
        - Home Improvement Superstore (ITE 862): 48%
        - Drive-in Bank (ITE 912): 47%
        - Quality Restaurant (ITE 931): 44%
        - High-Turnover (Sit-Down) Restaurant (ITE 932): 43%
        - Fast Food Restaurant with Drive Through (ITE 934): 50%
        - Gasoline/Service Station with Convenience Market (ITE 945): 62%
    b. Passby reduction for other uses will be allowed only if justification is provided.

4. Internal capture rates for multi-use development, when used, shall be calculated using the procedures of the *Trip Generation Handbook*, using the daily capture rates. Internal capture rates may <u>not</u> be applied to:

    - Shopping centers
    - Office parks or office buildings with retail
    - Hotels with limited retail and/or restaurant space
    - Any development where traffic between the uses crosses a thoroughfare

Examples

1. An example calculation of the impact fee assessment for a 100 home residential development is as follows:

    ITE Trip Generation rate for single-family detached housing (ITE Code 210):

    T = 9.57 (X)

    Where, T = the daily trip ends
    X = the number of dwelling units

    For 100 dwelling units, the number of daily trip ends = 957 trips/day

    957 trips/day * $401/trip = $383,757 impact fee for the entire development
    = $3,838 per home

2. An example calculation of the impact fee assessment for a 400,000 square foot shopping center is as follows:

   ITE Trip Generation rate for a shopping center (ITE Code 820):

   $Ln(T) = 0.65\ Ln(X) + 5.83$

   Where, T = the daily trip ends
   X = 1,000 square feet of gross leasable area

   For a 400,000 SF shopping center, the number of daily trip ends = 16,721 trips/day

   Passby reduction = 34% x 16,721 trips/day = 5,685 trips/day

   Total new trips generated = 16,721 – 5,685 = 11,036 trips/day

   11,036 trips/day * $401/trip = $4,425,436 impact fee for the entire development

7.3 Impact Fee Adjustment

The impact fee calculated in this study was developed based on 2011 construction cost estimates and current forecasts of development. It will be necessary to periodically update the calculations and assumptions used to develop the impact fee to account for cost inflation and changes in development forecasts. In any case, this Zone Improvement Plan will need to be updated within 5 years in order to meet the schedule for replacement of the impact fee ordinance that is dictated by Indiana code.

8 Anticipated Timing of Improvements

Table 8-1 shows an example construction schedule for identified road improvements in Westfield. The schedule is based on estimates of future development patterns over the next ten years. Actual construction should occur as needed to meet evolving system requirements. This schedule is primarily intended to indicate the priority groupings of individual projects. Construction according to this schedule would require the following to occur:

- The full value of supportable impact fees is assessed for all development
- Development occurs as expected and evenly throughout the 10-year impact fee horizon
- Other funding sources are available when needed
- City, contract and consultant staffing resources are sufficient to design and construct all projects within the required time frame

Table 8-1: Example Road Improvements Construction Schedule

Project	Road	Begin	End	Description	Years*
1	Carey Road	Saddlehorn Drive	161st Street	Widen and Resurface. Roundabout at 161st	1-3
2	Springmill Road	at 156th Street		Roundabout (committed project)	1-3
3	Oakridge Road	at 161st Street		Roundabout (committed project)	1-3
4	186th Street	Grand Park Entrance	Tomlinson Road	New 2-lane road (committed project)	1-3
5	Oakridge Road	Sapphire Drive	161st Street	Widen and Resurface	1-3
6	Oakridge Road	161st Street	169th Street	Widen and Resurface	1-3
7	Wheeler Road	SR 32	181st Street	Widen and Resurface	1-3
8	161st Street	US 31	Union Street	Widen and Reconstruct. Roundabout at Union	4-6
9	Springmill Road	City Limits	156th Street	Widen and Reconstruct	4-6
10	Springmill Road	156th Street	161st Street	Widen and Resurface	4-6
11	161st Street	Oakridge Road	US 31	Widen and Reconstruct	4-6
12	191st Street	Springmill Road	Grand Park Entrance	Widen and Resurface	4-6
13	191st Street	Grand Park Entrance	Tomlinson Road	Widen and Reconstruct. Roundabout at Tomlinson	4-6
14	191st Street	Tomlinson Road	US 31	Widen and Reconstruct. Roundabout at West Access	4-6
15	Gray Road	Guerin Way	161st Street	Widen and Resurface	7-10
16	Gray Road	161st Street	Golden Hinde Way	Widen and Resurface	7-10
17	151st Street	Carmel Landing	Carey Road	Widen and Resurface	7-10
18	151st Street	Carey Road	Setters Road	Widen and Resurface	7-10
19	Union Street	161st Street	David Brown Drive	Widen and Resurface	7-10
20	Springmill Road	161st Street	SR 32	Widen and Resurface	7-10
21	Springmill Road	SR 32	191st	Widen and Resurface	7-10
22	Oakridge Road	169th Street	Pine Ridge Drive	Widen and Resurface	7-10

*Illustrative schedule only. See text for assumptions.

CITY OF Westfield INDIANA

WESTFIELD ROAD IMPACT FEE

Zone Improvement Plan

Technical Appendices

WESTFIELD ROAD IMPACT FEE

Zone Improvement Plan

Technical Appendices

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Appendix A:
Indiana State Impact Fee Code

IC 36-7-4-1300
1300 Series—Impact Fees
Sec. 1300. This series (sections 1300 through 1399 of this chapter) may be cited as follows: 1300 SERIES — IMPACT FEES.
As added by P.L.221-1991, SEC.1.
IC 36-7-4-1301
"Community level of service" defined
Sec. 1301. As used in this series, "community level of service" means a quantitative measure of the service provided by the infrastructure that is determined by a unit to be appropriate.
As added by P.L.221-1991, SEC.2.
IC 36-7-4-1302
"Current level of service" defined
Sec. 1302. As used in this series, "current level of service" means a quantitative measure of service provided by existing infrastructure to support existing development.
As added by P.L.221-1991, SEC.3.
IC 36-7-4-1303
"Development" defined
Sec. 1303. As used in this series, "development" means an improvement of any kind on land.
As added by P.L.221-1991, SEC.4.
IC 36-7-4-1304
"Fee payer" and "person" defined
Sec. 1304. (a) As used in this series, "fee payer" means the following:
(1) A person who has paid an impact fee.
(2) A person to whom a person who paid an impact fee has made a written assignment of rights concerning the impact fee.
(3) A person who has assumed by operation of law the rights concerning an impact fee.
(b) As used in this series, "person" means an individual, a sole proprietorship, a partnership, an association, a corporation, a fiduciary, or any other entity.
As added by P.L.221-1991, SEC.5.
IC 36-7-4-1305
"Impact fee" and "capital costs" defined
Sec. 1305. (a) As used in this series, "impact fee" means a monetary charge imposed on new development by a unit to defray or mitigate the capital costs of infrastructure that is required by, necessitated by, or needed to serve the new development.
(b) As used in this section, "capital costs" means the costs incurred to provide additional infrastructure to serve new development, including the following:
(1) Directly related costs of construction or expansion of infrastructure that is necessary to serve the new development, including reasonable design, survey, engineering, environmental, and other professional fees that are directly related to the construction or expansion.
(2) Directly related land acquisition costs, including costs incurred for the following:

(A) Purchases of interests in land.
(B) Court awards or settlements.
(C) Reasonable appraisal, relocation service, negotiation service, title insurance, expert witness, attorney, and other professional fees that are directly related to the land acquisition.
(3) Directly related debt service, subject to section 1330 of this chapter.
(4) Directly related expenses incurred in preparing or updating the comprehensive plan or zone improvement plan, including all administrative, consulting, attorney, and other professional fees, as limited by section 1330 of this chapter.
As added by P.L.221-1991, SEC.6.

IC 36-7-4-1306

"Impact fee ordinance" defined

Sec. 1306. As used in this series, "impact fee ordinance" means an ordinance adopted under section 1311 of this chapter.
As added by P.L.221-1991, SEC.7.

IC 36-7-4-1307

"Impact zone" defined

Sec. 1307. As used in this series, "impact zone" means a geographic area designated under section 1315 of this chapter.
As added by P.L.221-1991, SEC.8.

IC 36-7-4-1308

"Infrastructure" defined

Sec. 1308. As used in this series, "infrastructure" means the capital improvements that:
(1) comprise:
(A) a sanitary sewer system or wastewater treatment facility;
(B) a park or recreational facility;
(C) a road or bridge;
(D) a drainage or flood control facility; or
(E) a water treatment, water storage, or water distribution facility;
(2) are:
(A) owned solely for a public purpose by:
(i) a unit; or
(ii) a corporation created by a unit; or
(B) leased by a unit solely for a public purpose; and
(3) are included in the zone improvement plan of the impact zone in which the capital improvements are located.
The term includes site improvements or interests in real property needed for a facility listed in subdivision (1).
As added by P.L.221-1991, SEC.9.

IC 36-7-4-1309

"Infrastructure type" defined

Sec. 1309. As used in this series, "infrastructure type" means any of the following types of infrastructure covered by an impact fee ordinance:
(1) Sewer, which includes sanitary sewerage and wastewater treatment facilities.

(2) Recreation, which includes parks and other recreational facilities.
(3) Road, which includes public ways and bridges.
(4) Drainage, which includes drains and flood control facilities.
(5) Water, which includes water treatment, water storage, and water distribution facilities.
As added by P.L.221-1991, SEC.10.

IC 36-7-4-1310

"Infrastructure agency" defined

Sec. 1310. As used in this series, "infrastructure agency" means a political subdivision or an agency of a political subdivision responsible for acquiring, constructing, or providing a particular infrastructure type.
As added by P.L.221-1991, SEC.11.

IC 36-7-4-1311

Ordinance; jurisdiction to adopt; impact fees and other charges

Sec. 1311. (a) The legislative body of a unit may adopt an ordinance imposing an impact fee on new development in the geographic area over which the unit exercises planning and zoning jurisdiction. The ordinance must aggregate the portions of the impact fee attributable to the infrastructure types covered by the ordinance so that a single and unified impact fee is imposed on each new development.
(b) If the legislative body of a unit has planning and zoning jurisdiction over the entire geographic area covered by the impact fee ordinance, an ordinance adopted under this section shall be adopted in the same manner that zoning ordinances are adopted under the 600 SERIES of this chapter.
(c) If the legislative body of a unit does not have planning and zoning jurisdiction over the entire geographic area covered by the impact fee ordinance but does have jurisdiction over one (1) or more infrastructure types in the area, the legislative body shall establish the portion of the impact fee schedule or formula for the infrastructure types over which the legislative body has jurisdiction. The legislative body of the unit having planning and zoning jurisdiction shall adopt an impact fee ordinance containing that portion of the impact fee schedule or formula if:
(1) a public hearing has been held before the legislative body having planning and zoning jurisdiction; and
(2) each plan commission that has planning jurisdiction over any part of the geographic area in which the impact fee is to be imposed has approved the proposed impact fee ordinance by resolution.
(d) An ordinance adopted under this section is the exclusive means for a unit to impose an impact fee. An impact fee imposed on new development to pay for infrastructure may not be collected after January 1, 1992, unless the impact fee is imposed under an impact fee ordinance adopted under this chapter.
(e) Notwithstanding any other provision of this chapter, the following charges are not impact fees and may continue to be imposed by units:

(1) Fees, charges, or assessments imposed for infrastructure services under statutes in existence on January 1, 1991, if:
(A) the fee, charge, or assessment is imposed upon all users whether they are new users or users requiring additional capacity or services;
(B) the fee, charge, or assessment is not used to fund construction of new infrastructure unless the new infrastructure is of the same type for which the fee, charge, or assessment is imposed and will serve the payer; and
(C) the fee, charge, or assessment constitutes a reasonable charge for the services provided in accordance with IC 36-1-3-8(6) or other governing statutes requiring that any fees, charges, or assessments bear a reasonable relationship to the infrastructure provided.
(2) Fees, charges, and assessments agreed upon under a contractual agreement entered into before April 1, 1991, or fees, charges, and assessments agreed upon under a contractual agreement, if the fees, charges, and assessments are treated as impact deductions under section 1321(d) of this chapter if an impact fee ordinance is in effect.
As added by P.L.221-1991, SEC.12.

IC 36-7-4-1312

Ordinance; prerequisites to adoption

Sec. 1312. (a) A unit may not adopt an impact fee ordinance under section 1311 of this series unless the unit has adopted a comprehensive plan under the 500 SERIES of this chapter for the geographic area over which the unit exercises planning and zoning jurisdiction.
(b) Before the adoption of an impact fee ordinance under section 1311 of this chapter, a unit shall establish an impact fee advisory committee. The advisory committee shall:
(1) be appointed by the executive of the unit;
(2) be composed of not less than five (5) and not more than ten (10) members with at least forty percent (40%) of the membership representing the development, building, or real estate industries; and
(3) serve in an advisory capacity to assist and advise the unit with regard to the adoption of an impact fee ordinance under section 1311 of this chapter.
(c) A planning commission or other committee in existence before the adoption of an impact fee ordinance that meets the membership requirements of subsection (b) may serve as the advisory committee that subsection (b) requires.
(d) Action of an advisory committee established under subsection (b) is not required as a prerequisite for the unit in adopting an impact fee ordinance under section 1311 of this chapter.
As added by P.L.221-1991, SEC.13.

IC 36-7-4-1313

Other permissible fees and charges of adopting unit

Sec. 1313. This series does not prohibit a unit from doing any of the following:

(1) Imposing a charge to pay the administrative, plan review, or inspection costs associated with a permit for development.
(2) Imposing, pursuant to a written commitment or agreement and as a condition or requirement attached to a development approval or authorization (including permitting or zoning decisions), an obligation to dedicate, construct, or contribute goods, services, land or interests in land, or infrastructure to a unit or to an infrastructure agency. However, if the unit adopts or has already adopted an impact fee ordinance under section 1311 of this chapter the following apply:
(A) The person dedicating, contributing, or providing an improvement under this subsection is entitled to a credit for the improvement under section 1335 of this chapter.
(B) The cost of complying with the condition or requirement imposed by the unit under this subdivision may not exceed the impact fee that could have been imposed by the unit under section 1321 of this chapter for the same infrastructure.
(3) Imposing new permit fees, charges, or assessments or amending existing permit fees, charges, or assessments. However, the permit fees, charges, or assessments must meet the requirements of section 1311(e)(1)(A), 1311(e)(1)(B), and 1311(e)(1)(C) of this chapter.
As added by P.L.221-1991, SEC.14.

IC 36-7-4-1314

Ordinance; application

Sec. 1314. (a) Except as provided in subsection (b), an impact fee ordinance must apply to any development:
(1) that is in an impact zone; and
(2) for which a unit may require a structural building permit.
(b) An impact fee ordinance may not apply to an improvement that does not create a need for additional infrastructure, including the erection of a sign, the construction of a fence, or the interior renovation of a building not resulting in a change in use.
As added by P.L.221-1991, SEC.15.

IC 36-7-4-1315

Ordinance; establishment of impact zones

Sec. 1315. (a) An impact fee ordinance must establish an impact zone, or a set of impact zones, for each infrastructure type covered by the ordinance. An impact zone established for a particular infrastructure type is not required to be congruent with an impact zone established for a different infrastructure type.
(b) An impact zone may not extend beyond the jurisdictional boundary of an infrastructure agency responsible for the infrastructure type for which the impact zone was established, unless an agreement under IC 36-1-7 is entered into by the infrastructure agencies.
(c) If an impact zone, or a set of impact zones, includes a geographic area containing territory from more than one (1) planning and zoning jurisdiction, the applicable legislative bodies and infrastructure agencies shall enter into an agreement under IC 36-1-7

concerning the collection, division, and distribution of the fees collected under the impact fee ordinance.
As added by P.L.221-1991, SEC.16.

IC 36-7-4-1316

Impact zones; geographical area

Sec. 1316. A unit must include in an impact zone designated under section 1315 of this chapter the geographical area necessary to ensure that:
(1) there is a functional relationship between the components of the infrastructure type in the impact zone;
(2) the infrastructure type provides a reasonably uniform benefit throughout the impact zone; and
(3) all areas included in the impact zone are contiguous.
As added by P.L.221-1991, SEC.17.

IC 36-7-4-1317

Ordinance; identification of responsible infrastructure agency

Sec. 1317. A unit must identify in the unit's impact fee ordinance the infrastructure agency that is responsible for acquiring, constructing, or providing each infrastructure type included in the impact fee ordinance.
As added by P.L.221-1991, SEC.18.

IC 36-7-4-1318

Ordinance; zone improvement plan preparation; contents of plan

Sec. 1318. (a) A unit may not adopt an impact fee ordinance under section 1311 of this chapter unless the unit has prepared or substantially updated a zone improvement plan for each impact zone during the immediately preceding one (1) year period. A single zone improvement plan may be used for two (2) or more infrastructure types if the impact zones for the infrastructure types are congruent.
(b) Each zone improvement plan must contain the following information:
(1) A description of the nature and location of existing infrastructure in the impact zone.
(2) A determination of the current level of service.
(3) Establishment of a community level of service. A unit may provide that the unit's current level of service is the unit's community level of service in the zone improvement plan.
(4) An estimate of the nature and location of development that is expected to occur in the impact zone during the following ten (10) year period.
(5) An estimate of the nature, location, and cost of infrastructure that is necessary to provide the community level of service for the development described in subdivision (4). The plan must indicate the proposed timing and sequencing of infrastructure installation.
(6) A general description of the sources and amounts of money used to pay for infrastructure during the previous five (5) years.
(c) If a zone improvement plan provides for raising the current level of service to a higher community level of service, the plan must:
(1) provide for completion of the infrastructure that is necessary

to raise the current level of service to the community level of service within the following ten (10) year period;
(2) indicate the nature, location, and cost of infrastructure that is necessary to raise the current level of service to the community level of service; and
(3) identify the revenue sources and estimate the amount of the revenue sources that the unit intends to use to raise the current level of service to the community level of service for existing development. Revenue sources include, without limitation, any increase in revenues available from one (1) or more of the following:
(A) Adopting or increasing the following:
(i) The county adjusted gross income tax.
(ii) The county option income tax.
(iii) The county economic development income tax.
(iv) The annual license excise surtax.
(v) The wheel tax.
(B) Imposing the property tax rate per one hundred dollars ($100) of assessed valuation that the unit may impose to create a cumulative capital improvement fund under IC 36-9-14.5 or IC 36-9-15.5.
(C) Transferring and reserving for infrastructure purposes other general revenues that are currently not being used to pay for capital costs of infrastructure.
(D) Dedicating and reserving for infrastructure purposes any newly available revenues, whether from federal or state revenue sharing programs or from the adoption of newly authorized taxes.
(d) A unit must consult with a qualified engineer licensed to perform engineering services in Indiana when the unit is preparing the portions of the zone improvement plan described in subsections (b)(1), (b)(2), (b)(5), and (c)(2).
(e) A zone improvement plan and amendments and modifications to the zone improvement plan become effective after adoption as part of the comprehensive plan under the 500 SERIES of this chapter or adoption as part of the capital improvements program under section 503(5) of this chapter. If the unit establishing the impact fee schedule or formula and establishing the zone improvement plan is different from the unit having planning and zoning jurisdiction, the unit having planning and zoning jurisdiction shall incorporate the zone improvement plan as part of the unit's comprehensive plan and capital improvement plan.
(f) If a unit's zone improvement plan identifies revenue sources for raising the current level of service to the community level of service, impact fees may not be assessed or collected by the unit unless:
(1) before the effective date of the impact fee ordinance the unit has available or has adopted the revenue sources that the zone improvement plan specifies will be in effect before the impact fee ordinance becomes effective; and
(2) after the effective date of the impact fee ordinance the unit

continues to provide adequate funds to defray the cost of raising the current level of service to the community level of service, using revenue sources specified in the zone improvement plan or revenue sources other than impact fees.
As added by P.L.221-1991, SEC.19.

IC 36-7-4-1319

Amendment to ordinance or zone improvement plan

Sec. 1319. (a) A unit shall amend a zone improvement plan to make adjustments in the nature, location, and cost of infrastructure and the timing or sequencing of infrastructure installations to respond to the nature and location of development occurring in the impact zone. Appropriate planning and analysis shall be carried out before an amendment is made to a zone improvement plan.
(b) A unit may not amend an impact fee ordinance if the amendment makes a significant change in an impact fee schedule or formula or if the amendment designates an impact zone or alters the boundary of a zone, unless a new or substantially updated zone improvement plan has been approved within the immediately preceding one (1) year period.
As added by P.L.221-1991, SEC.20.

IC 36-7-4-1320

Ordinance; fee schedule and formula

Sec. 1320. (a) An impact fee ordinance must include:
(1) a schedule prescribing for each impact zone the amount of the impact fee that is to be imposed for each infrastructure type covered by the ordinance; or
(2) a formula for each impact zone by which the amount of the impact fee that is to be imposed for each infrastructure type covered by the ordinance may be derived.
(b) A schedule or formula included in an impact fee ordinance must provide an objective and uniform standard for calculating impact fees that allows fee payers to accurately predict the impact fees that will be imposed on new development.
As added by P.L.221-1991, SEC.21.

IC 36-7-4-1321

Fee schedule or formula; requirements; limitations

Sec. 1321. (a) An impact fee schedule or formula described in section 1320 of this chapter shall be prepared so that the impact fee resulting from the application of the schedule or formula to a development meets the requirements of this section. However, this section does not require that a particular methodology be used in preparing the schedule or formula.
(b) As used in this section, "impact costs" means a reasonable estimate, made at the time the impact fee is assessed, of the proportionate share of the costs incurred or to be incurred by the unit in providing infrastructure of the applicable type in the impact zone that are necessary to provide the community level of service for the development. The amount of impact costs may not include the costs of infrastructure of the applicable type needed to raise the current level of service in the impact zone to the community level of service in the impact zone for development that is existing at the time the

impact fee is assessed.
(c) As used in this section, "nonlocal revenue" means a reasonable estimate, made at the time the impact fee is assessed, of revenue that:
(1) will be received from any source (including but not limited to state or federal grants) other than a local government source; and
(2) is to be used within the impact zone to defray the capital costs of providing infrastructure of the applicable type.
(d) As used in this section, "impact deductions" means a reasonable estimate, made at the time the impact fee is assessed, of the amounts from the following sources that will be paid during the ten (10) year period after assessment of the impact fee to defray the capital costs of providing infrastructure of the applicable types to serve a development:
(1) Taxes levied by the unit or on behalf of the unit by an applicable infrastructure agency that the fee payer and future owners of the development will pay for use within the geographic area of the unit.
(2) Charges and fees, other than fees paid by the fee payer under this chapter, that are imposed by any of the following for use within the geographic area of the unit:
(A) An applicable infrastructure agency.
(B) A governmental entity.
(C) A not-for-profit corporation created for governmental purposes.
Charges and fees covered by this subdivision include tap and availability charges paid for extension of services or the provision of infrastructure to the development.
(e) An impact fee on a development may not exceed:
(1) impact costs; minus
(2) the sum of nonlocal revenues and impact deductions.
As added by P.L.221-1991, SEC.22.

IC 36-7-4-1322

Fee assessment date; increase or decrease in fees; developments against which fees may not be assessed; existing contracts

Sec. 1322. (a) Except as provided in subsection (b), an impact fee ordinance must require that, if the fee payer requests, an impact fee on a development must be assessed not later than thirty (30) days after the earlier of:
(1) the date the fee payer obtains an improvement location permit for the development; or
(2) the date that the fee payer voluntarily submits to the unit a development plan for the development and evidence that the property is properly zoned for the proposed development. The plan shall be in the form prescribed by the unit's zoning ordinance and shall contain reasonably sufficient detail for the unit to calculate the impact fee.
(b) An impact fee ordinance may provide that if a proposed development is of a magnitude that will require revision of the zone improvement plan in order to appropriately serve the new development, the unit shall revise the unit's zone improvement plan

and shall assess an impact fee on a development not later than one hundred eighty (180) days after the earlier of the following:
(1) The date on which the fee payer obtains an improvement location permit for the development.
(2) The date on which the fee payer submits to the unit a development plan for a development and evidence that the property is properly zoned for the proposed development. The development plan must be in the form prescribed by the unit's zoning ordinance and must contain reasonably sufficient detail for the unit to calculate the impact fee.
(c) An impact fee assessed under subsections (a) or (b) may be increased only if the structural building permit has not been issued for the development and the requirements of subsection (d) are satisfied. In the case of a phased development, only a portion of an impact fee assessed under subsection (a) or (b) that is attributable to the portion of the development for which a permit has not been issued may be increased if the requirements of subsection (d) are satisfied.
(d) Unless the improvement location permit or development plan originally submitted for the development is changed so that the amount of impact on infrastructure the development creates in the impact zone is significantly increased, an impact fee assessed under:
(1) subsection (a)(1) or (b)(1) may not be increased for the period of the improvement location permit's validity; and
(2) subsection (a)(2) or (b)(2) may not be increased for three (3) years.
(e) An impact fee assessed under subsection (a) or (b) shall be decreased if the improvement location permit or development plan originally submitted for the development is changed so that the amount of impact on infrastructure that the development creates in the impact zone is significantly decreased. If a change occurs in the permit or plan that results in a decrease in the amount of the impact fee after the fee has been paid, the unit that collected the fee shall immediately refund the amount of the overpayment to the fee payer.
(f) If the unit fails to assess an impact fee within the period required by subsection (a) or (b), the unit may not assess an impact fee on the development unless the development plan originally submitted for the development is materially and substantially changed.
(g) Notwithstanding other provisions in this chapter, a unit may not assess an impact fee against a development if:
(1) an improvement location permit has been issued for all or a part of a development before adoption of an impact fee ordinance that is in compliance with this chapter; and
(2) the development satisfies all of the following criteria:
(A) The development is zoned for commercial or industrial use before January 1, 1991.
(B) The development will consist primarily of new buildings or structures. As used in this clause, the term "new buildings or structures" does not include additions or expansions of existing buildings or structures.

(C) The parts of the development for which a structural building permit has not been issued are owned or controlled by the person that owned or controlled the development on January 1, 1991.
(D) A structural building permit is issued for the development not more than four (4) years after the effective date of the impact fee ordinance.
(E) The development is part of a common scheme of development that:
(i) involves land that is contiguous;
(ii) involves a plan for development that includes a survey of the land, engineering drawings, and a site plan showing the anticipated size, location, and use of buildings and the anticipated location of streets, sewers, and drainage;
(iii) if plan approval is required, resulted in an application being filed with an appropriate office, commission, or official of the unit before January 1, 1991, that resulted or may result in approval of any phase of the development plan referred to in item (ii);
(iv) has been diligently pursued since January 1, 1991;
(v) resulted before January 1, 1991, in a substantial investment in creating, publicizing, or implementing the common scheme of development; and
(vi) involved the expenditure of significant funds before January 1, 1991, for the provision of improvements, such as roads, sewers, water treatment facilities, water storage facilities, water distribution facilities, drainage systems, or parks, that are on public lands or are available for other development in the area.
(h) Notwithstanding any other provision of this chapter, this chapter does not impair the validity of any contract between a unit and a fee payer that was:
(1) entered into before January 1, 1991; and
(2) executed in consideration of zoning amendments or annexations requested by the fee payer.
As added by P.L.221-1991, SEC.23.

IC 36-7-4-1323

Fee due date; proration; repeal or lapse of ordinance

Sec. 1323. (a) Except as provided in section 1324 of this chapter, an impact fee assessed in compliance with section 1322 of this chapter is due and payable on the date of issuance of the structural building permit for the new development on which the impact fee is imposed.
(b) For a phased development, an impact fee shall be prorated for purposes of payment according to the impact of the parcel for which a structural building permit is issued in relation to the total impact of the development. In accordance with section 1324 of this chapter, only the prorated portion of the assessed impact fee is due and payable on the issuance of the permit.
(c) If an impact fee ordinance is repealed, lapses, or becomes ineffective after the assessment of an impact fee on a development

but before the issuance of the structural building permit for part or all of the development:
(1) any part of the impact fee attributable to the part of the development for which a structural building permit has not been issued is void and is not due and payable, in the case of a phased development; and
(2) the entire impact fee is void and is not due and payable, in the case of a development other than a phased development.
As added by P.L.221-1991, SEC.24.

IC 36-7-4-1324

Ordinance; installment payment plan; fee upon permit issuance; interest; penalty for late payment

Sec. 1324. (a) An impact fee ordinance must include an installment payment plan. The installment payment plan must at least offer a fee payer the option of paying part of an impact fee in equal installment payments if the impact fee is greater than five thousand dollars ($5,000). In an installment plan under this section:
(1) a maximum of five thousand dollars ($5,000) or five percent (5%) of the impact fee, whichever is greater, may become payable on the date the structural building permit is issued for the development on which the fee is imposed;
(2) the first installment may not become due and payable less than one (1) year after the date the structural building permit is issued for the development on which the fee is imposed; and
(3) the last installment may not be due and payable less than two (2) years after the date the structural building permit is issued for the development on which the fee is imposed.
(b) An impact fee ordinance may require an impact fee of five thousand dollars ($5,000) or less to be paid in full on the date the structural building permit is issued for the development on which the impact fee is imposed.
(c) An impact fee ordinance may provide that a reasonable rate of interest, not to exceed the prejudgment rate of interest in effect at the time the interest accrues, may be charged if the fee payer elects to pay in installments. If interest is charged, the ordinance must provide that interest accrues only on the portion of the impact fee that is outstanding and does not begin to accrue until the date the structural building permit is issued for the development or the part of the development on which the impact fee is imposed.
(d) An impact fee ordinance may provide that if all or part of an installment is not paid when due and payable, the amount of the installment shall be increased on the first day after the installment is due and payable by a penalty amount equal to ten percent (10%) of the installment amount that is overdue. If interest is charged under subsection (c), the interest shall be charged on the penalty amount.
As added by P.L.221-1991, SEC.25.

IC 36-7-4-1325

Collection of unpaid fees; lien; receipt for payments

Sec. 1325. (a) A unit may use any legal remedy to collect an impact fee imposed by the unit. A unit must bring an action to collect an impact fee and all penalties, costs, and collection expenses

associated with a fee not later than ten (10) years after the fee or the prorated portion of the impact fee first becomes due and payable.
(b) On the date a structural building permit is issued for the development of property on which the impact fee is assessed, the unit acquires a lien on the real property for which the permit is issued. For a phased development, the amount of the lien may not exceed the prorated portion of the impact fee due and payable in one (1) or more installments at the time the structural building permit is issued.
(c) A lien acquired by a unit under this section is not affected by a sale or transfer of the real property subject to the lien, including the sale, exchange, or lease of the real property under IC 36-1-11.
(d) A lien acquired by a unit under this section continues for ten (10) years after the impact fee or the prorated portion of the impact fee becomes due and payable. However, if an action to enforce the lien is filed within the ten (10) year period, the lien continues until the termination of the proceeding.
(e) A holder of a lien of record on any real property on which an impact fee is delinquent may pay the delinquent impact fee and any penalties and costs. The amount paid by the lien holder is an additional lien on the real property in favor of the lien holder and is collectible in the same manner as the original lien.
(f) If a person pays an impact fee assessed against any real property, the person is entitled to a receipt for the payment that is:
(1) on a form prescribed by the impact fee ordinance; and
(2) issued by a person designated in the impact fee ordinance.
As added by P.L.221-1991, SEC.26.

IC 36-7-4-1326

Ordinance; special reduced rates for affordable housing development

Sec. 1326. (a) An impact fee ordinance may provide for a reduction in an impact fee for housing development that provides sale or rental housing, or both, at a price that is affordable to an individual or a family earning less than eighty percent (80%) of the median income for the county in which the housing development is located. If the housing development comprises more than one (1) residential unit, the impact fee reduction shall apply only to the residential units that are affordable to an individual or a family earning less than eighty percent (80%) of the median income of the county.
(b) If the impact fee ordinance provides for a reduction in an impact fee under subsection (a), the ordinance must:
(1) contain a schedule or formula that sets forth the amount of the fee reduction for various types of housing development specified in subsection (a);
(2) require that, as a condition of receiving the fee reduction, the owner execute an agreement that:
(A) is binding for a period of at least five (5) years on the owner and subsequent owners; and
(B) limits the tenancy of residential units receiving the fee reduction to individuals or families who at the time the tenancy is initiated are earning less than eighty percent

(80%) of the median income of the county;
(3) contain standards to be used in determining if a particular housing development specified in subsection (a) will receive a fee reduction; and
(4) designate a board or an official of the unit to conduct the hearing required by subsection (c).
(c) A fee reduction authorized by this section must be approved by a board or official of the unit at a public hearing.
As added by P.L.221-1991, SEC.27.

IC 36-7-4-1327

Fee reduction; appeal procedures

Sec. 1327. An impact fee ordinance must provide a procedure through which the fee reduction decision made under section 1326 of this chapter may be appealed by the following persons:
(1) The person requesting the fee reduction.
(2) An infrastructure agency responsible for infrastructure of the applicable type for the impact zone in which the impact fee reduction is granted.
As added by P.L.221-1991, SEC.28.

IC 36-7-4-1328

Fee reduction; complementary payment by granting unit

Sec. 1328. A unit that provides a fee reduction under section 1326 of this chapter shall pay into the account or accounts established for the impact zone in which the fee was reduced an amount equal to the amount of the fee reduction.
As added by P.L.221-1991, SEC.29.

IC 36-7-4-1329

Fund for impact fee collections; establishment; management; reports

Sec. 1329. (a) A unit imposing an impact fee shall establish a fund to receive amounts collected under this series.
(b) Money in a fund established under subsection (a) at the end of the unit's fiscal year remains in the fund. Interest earned by the fund shall be deposited in the fund.
(c) The fiscal officer of the unit shall manage the fund according to the provisions of this series. The fiscal officer shall annually report to the unit's plan commission and to each infrastructure agency responsible for infrastructure in an impact zone. The report must include the following:
(1) The amount of money in accounts established for the impact zone.
(2) The total receipts and disbursements of the accounts established for the impact zone.
(d) A separate account shall be established in the fund for each impact zone established by the unit and for each infrastructure type within each zone. Interest earned by an account shall be deposited in that account.
As added by P.L.221-1991, SEC.30.

IC 36-7-4-1330

Use of fees

Sec. 1330. An impact fee collected under this series shall be used

for the following purposes:
(1) Providing funds to an infrastructure agency for the provision of new infrastructure that:
(A) is necessary to serve the new development in the impact zone from which the fee was collected; and
(B) is identified in the zone improvement plan.
(2) In an amount not to exceed five percent (5%) of the annual collections of an impact fee, for expenses incurred by the unit that paid for the consulting services that were used to establish the impact fee ordinance.
(3) Payment of a refund under section 1332 of this chapter.
(4) Payment of debt service on an obligation issued to provide infrastructure described in subdivision (1).
As added by P.L.221-1991, SEC.31.

IC 36-7-4-1331

Infrastructure construction

Sec. 1331. (a) An infrastructure agency shall, within the time described in the zone improvement plan, construct infrastructure for which:
(1) a zone improvement plan has been adopted;
(2) an impact zone has been established; and
(3) an impact fee has been collected.
(b) A unit may amend the unit's zone improvement plan, including the time provided in the plan for construction of infrastructure, only if the amount of expenditures provided for the construction of infrastructure in the original plan does not decrease in any year and the benefit to the overall impact zone does not decrease because of the amendment.
As added by P.L.221-1991, SEC.32.

IC 36-7-4-1332

Impact fee refunds

Sec. 1332. (a) A fee payer is entitled to a refund of an impact fee if an infrastructure agency:
(1) has failed to complete a part of the infrastructure for which the impact fee was imposed not later than:
(A) twenty-four (24) months after the time described in section 1331 of this chapter; or
(B) a longer time as is reasonably necessary to complete the infrastructure if unforeseeable and extraordinary circumstances that are not in whole or in part caused by the unit have delayed the construction;
(2) has unreasonably denied the fee payer the use and benefit of the infrastructure during the useful life of the infrastructure; or
(3) has failed within the earlier of:
(A) six (6) years after issuance of the structural building permit; or
(B) the anticipated infrastructure completion date as specified in the zone improvement plan existing on the date the impact fee was collected;
to make reasonable progress toward completion of the specific infrastructure for which the impact fee was imposed or

thereafter fails to make reasonable progress toward completion.
(b) An application for a refund under subsection (a) must be filed with the unit that imposed the impact fee not later than two (2) years after the right to a refund accrues. A unit shall issue a refund in part or in full or shall reject the application for refund not later than thirty (30) days after receiving an application for a refund.
(c) If a unit approves a refund in whole or in part, the unit shall pay the amount approved, plus interest from the date on which the impact fee was paid to the date the refund is issued. The interest rate shall be the same rate as the rate that the unit's impact fee ordinance provides for impact fee payments paid in installments.
(d) If a unit rejects an application for refund or approves only a partial refund, the fee payer may appeal not later than sixty (60) days after the rejection or partial approval to the unit's impact fee review board established under section 1338 of this chapter by filing with the board an appeal on a form prescribed by the board. The board shall issue instructions for completion of the form. The form and the instructions must be clear, simple, and understandable to a lay person.
(e) An impact fee ordinance shall designate the employee or official of the unit who is responsible for accepting, rejecting, and paying a refund and interest.
(f) A unit's impact fee review board shall hold a hearing on all appeals for a refund under this section. The hearing shall be held not later than forty-five (45) days after the application for appeal is filed with the board. A unit's impact fee review board shall provide notice of the application for refund to the infrastructure agency responsible for the infrastructure for which the impact fee was imposed.
(g) An impact fee review board holding a hearing under subsection (f) shall determine the amount of a refund that shall be made to the fee payer from the account established for the infrastructure for which the fee was imposed. A refund ordered by the board must include interest from the date the impact fee was paid to the date the refund is issued at the same rate the ordinance provides for impact fee payments paid in installments.
(h) A party aggrieved by a final decision of an impact fee review board in a hearing under subsection (f) may appeal to the circuit or superior court of the county in which the unit is located and is entitled to a trial de novo.
As added by P.L.221-1991, SEC.33.

IC 36-7-4-1333

Impact fees; appeal of amount before impact review board; judicial review; effect on pending fee payments

Sec. 1333. (a) A person against whom an impact fee has been assessed may appeal the amount of the impact fee. A unit may not deny issuance of a structural building permit on the basis that an impact fee has not been paid or condition issuance of the permit on the payment of an impact fee. However, in the case of an impact fee of one thousand dollars ($1,000) or less a unit may require a fee payer to:
(1) pay the impact fee; or

(2) bring an appeal under this section;
before the unit issues a structural building permit for the development for which the impact fee was assessed.
(b) A person must file a petition for a review of the amount of an impact fee with the unit's impact fee review board not later than thirty (30) days after issuance of the structural building permit for the development for which the impact fee was assessed. An impact fee ordinance may require a petition to be accompanied by payment of a reasonable fee not to exceed one hundred dollars ($100). A fee payer shall receive a full refund of the filing fee if:
(1) the fee payer prevails;
(2) the amount of the impact fee or the reductions or credits against the fee is adjusted by the unit, the board, or a court; and
(3) the body ordering the adjustment finds that the amount of the fee, reductions, or credits were arbitrary or capricious.
(c) A unit's impact fee review board shall prescribe the form of the petition for review of an impact fee under subsection (b). The board shall issue instructions for completion of the form. The form and the instructions must be clear, simple, and understandable to a lay person. The form must require the petitioner to specify:
(1) a description of the new development on which the impact fee has been assessed;
(2) all facts related to the assessment of the impact fee; and
(3) the reasons the petitioner believes that the amount of the impact fee assessed is erroneous or is greater than the amount allowed by the fee limitations set forth in this series.
(d) A unit's impact fee review board shall prescribe a form for a response by a unit to a petition for review under this section. The board shall issue instructions for completion of the form. The form must require the unit to indicate:
(1) agreement or disagreement with each item indicated on the petition for review under subsection (c); and
(2) the reasons the unit believes that the amount of the fee assessed is correct.
(e) Immediately upon the receipt of a timely filed petition on the form prescribed under subsection (c), a unit's impact fee review board shall provide a copy of the petition to the unit assessing the impact fee. The unit shall not later than thirty (30) days after the receipt of the petition provide to the board a completed response to the petition on the form prescribed under subsection (d). The board shall immediately forward a copy of the response form to the petitioner.
(f) An impact fee review board shall:
(1) review the petition and the response submitted under this section; and
(2) determine the appropriate amount of the impact fee not later than thirty (30) days after submission of both petitions.
(g) A fee payer aggrieved by a final determination of an impact fee review board may appeal to the circuit or superior court of the county in which the unit is located and is entitled to a trial de novo. If the assessment of a fee is vacated by judgment of the court, the

assessment of the impact fee shall be remanded to the board for correction of the impact fee assessment and further proceedings in accordance with law.
(h) If a petition for a review or an appeal of an impact fee assessment is pending, the impact fee is not due and payable until after the petition or appeal is finally adjudicated and the amount of the fee is determined.
As added by P.L.221-1991, SEC.34.

IC 36-7-4-1334

Ordinance; appeal provision for amount of fees

Sec. 1334. An impact fee ordinance must set forth the reasons for which an appeal of the amount of an impact fee may be made. The impact fee ordinance must provide that an appeal of the amount of an impact fee may be made for the following reasons:
(1) A fact assumption used in determining the amount of an impact fee is incorrect.
(2) The amount of the impact fee is greater than the amount allowed under sections 1320, 1321, and 1322 of this chapter.
As added by P.L.221-1991, SEC.35.

IC 36-7-4-1335

Fee payer credits; infrastructure or improvements; amount of credit

Sec. 1335. (a) As used in this section, "improvement" means an improvement under section 1313(2) of this chapter or a site improvement, land, or real property interest as follows:
(1) That is to be used for at least one (1) of the infrastructure purposes specified in section 1309 of this chapter.
(2) That is included in or intended to be used relative to an infrastructure type for which the unit has imposed an impact fee in the impact zone.
(3) That is not a type of improvement that is uniformly required by law or rule for the type of development on which the impact fee has been imposed.
(4) That is or will be:
(A) public property; or
(B) furnished or constructed under requirements of the unit and is or will be available for use by other development in the area.
(5) That is beneficial to existing development and future development in the impact zone and is not beneficial to only one (1) development.
(6) That either:
(A) allows the removal of a component of infrastructure planned for the impact zone;
(B) is a useful addition to the zone improvement plan; or
(C) is reasonably likely to be included in a future zone improvement plan for the impact zone.
(7) That is:
(A) constructed, furnished, or guaranteed by a bond or letter of credit under a request by an authorized official of the:
(i) applicable infrastructure agency; or

(ii) unit that imposed the impact fee; or
(B) required to be constructed or furnished under a written commitment that:
(i) is requested by an authorized official of the applicable infrastructure agency or the unit that imposed the impact fee;
(ii) concerns the use or developing of the development against which the impact fee is imposed; and
(iii) is made under section 613, 614, or 921 of this chapter.
(b) A fee payer is entitled to a credit against an impact fee if the owner or developer of the development constructs or provides:
(1) infrastructure that is an infrastructure type for which the unit imposed an impact fee in the impact zone; or
(2) an improvement.
(c) A fee payer is entitled to a credit under this section for infrastructure or an improvement that:
(1) is constructed or furnished relative to a development after January 1, 1989; and
(2) meets the requirements of this section.
(d) The amount of a credit allowed under this section shall be determined at the date the impact fee is assessed. However, if an assessment is not requested, the amount of the credit shall be determined at the time the structural building permit is issued. The amount of the credit shall be:
(1) determined by the:
(A) person constructing or providing the infrastructure or improvement; and
(B) applicable infrastructure agency; and
(2) equal to the sum of the following:
(A) The cost of constructing or providing the infrastructure or improvement.
(B) The fair market value of land, real property interests, and site improvements provided.
(e) The amount of a credit may be increased or decreased after the date the impact fee is assessed if, between the date the impact fee is assessed and the date the structural building permit is issued, there is a substantial and material change in the cost or value of the infrastructure or improvement that is constructed or furnished from the cost or value determined under subsection (d). However, at the time the amount of a credit is determined under subsection (d), the person providing the infrastructure or improvement and the applicable infrastructure agency may agree that the amount of the credit may not be changed. The person providing the infrastructure or improvement may waive the person's right to a credit under this section.
As added by P.L.221-1991, SEC.36.

IC 36-7-4-1336

Fee payer credits; petition to determine amount; proceeding before impact review board

Sec. 1336. (a) If the parties cannot agree on the cost or fair market value under section 1335(d) of this chapter, the fee payer or the

person constructing or providing the infrastructure or improvement may file a petition for determination of the amount of the credit with the unit's impact fee review board not later than thirty (30) days after the structural building permit is issued for the development on which the impact fee is imposed. A petition under this subsection may be made as part of an appeal proceeding under section 1334 of this chapter or may be made under this section.
(b) An impact fee review board shall prescribe the form of the petition for determination of the amount of a credit under this section. The board shall issue instructions for completion of the form. The form and the instructions must be clear, simple, and understandable to a lay person.
(c) An impact fee review board shall prescribe a form for a response by the applicable infrastructure agency to a petition under this section for determination of a credit amount. The board shall issue instructions for completion of the form.
(d) Immediately after receiving a timely filed petition under this section for determination of a credit amount, an impact fee review board shall provide a copy of the petition to the applicable infrastructure agency. Not later than thirty (30) days after receiving a copy of the petition, the infrastructure agency shall provide to the board a response on the form prescribed under subsection (c). The board shall immediately provide the petitioner with a copy of the infrastructure agency's response.
(e) The impact fee review board shall:
(1) review a petition and response filed under this section; and
(2) determine the amount of the credit not later than thirty (30) days after the response is filed.
(f) A fee payer aggrieved by a final determination of an impact fee review board under this section:
(1) may appeal to the circuit or superior court of the county in which the unit is located; and
(2) is entitled to a trial de novo.
As added by P.L.221-1991, SEC.37.

IC 36-7-4-1337

Ordinance; allocation of credits to fee payer provisions

Sec. 1337. An impact fee ordinance shall do the following:
(1) Establish a method for reasonably allocating credits to fee payers in situations in which the person providing infrastructure or an improvement is not the fee payer.
(2) Allow the person providing infrastructure or an improvement to designate in writing a reasonable and administratively feasible method of allocating credits to future fee payers.
As added by P.L.221-1991, SEC.38.

IC 36-7-4-1338

Impact fee review board; membership; powers and duties

Sec. 1338. (a) Each unit that adopts an impact fee ordinance shall establish an impact fee review board consisting of three (3) citizen members appointed by the executive of the unit. A member of the board may not be a member of the plan commission. An impact fee

ordinance must do the following:
(1) Set the terms the members shall serve on the board.
(2) Establish a procedure through which the unit's executive shall appoint a temporary replacement member meeting the qualifications of the member being replaced in the case of conflict of interest.
(b) An impact fee review board must consist of the following members:
(1) One (1) member who is a real estate broker licensed in Indiana.
(2) One (1) member who is an engineer licensed in Indiana.
(3) One (1) member who is a certified public accountant.
(c) An impact fee review board shall review the amount of an impact fee assessed, the amount of a refund, and the amount of a credit using the following procedures:
(1) The board shall fix a reasonable time for the hearing of appeals.
(2) At a hearing, each party may appear and present evidence in person, by agent, or by attorney.
(3) A person may not communicate with a member of the board before the hearing with intent to influence the member's action on a matter pending before the board.
(4) The board may reverse, affirm, modify, or otherwise establish the amount of an impact fee, a credit, a refund, or any combination of fees, credits, or refunds. For purposes of this subdivision, the board has all the powers of the official of the unit from which the appeal is taken.
(5) The board shall decide a matter that the board is required to hear:
(A) at the hearing at which the matter is first presented; or
(B) at the conclusion of the hearing on the matter, if the matter is continued.
(6) Within five (5) days after making a decision, the board shall provide a copy of the decision to the unit and the fee payer involved in the appeal.
(7) The board shall make written findings of fact to support the board's decision.
As added by P.L.221-1991, SEC.39.

IC 36-7-4-1339

Declaratory relief; challenge of ordinance

Sec. 1339. (a) This section applies to a person having an interest in real property that may be subject to an impact fee ordinance if the development occurs on the property.
(b) A person may seek to:
(1) have a court determine under IC 34-26-1 any question of construction or validity arising under the impact fee ordinance; and
(2) obtain a declaration of rights, status, or other legal relations under the ordinance.
(c) The validity of an impact fee ordinance adopted by a unit or the validity of the application of the ordinance in a specific impact

zone may be challenged under this section on any of the following grounds:
(1) The unit has not provided for a zone improvement plan in the unit's comprehensive plan.
(2) The unit did not prepare or substantially update the unit's zone improvement plan in the year preceding the adoption of the impact fee ordinance.
(3) The unit has not identified the revenue sources the unit intends to use to implement the zone improvement plan, if identification of the revenue sources is required under section 1318(c) of this chapter.
(4) The unit has not complied with the requirements of section 1318(f) of this chapter.
(5) The unit has not made adequate revenue available to complete infrastructure improvements identified in the unit's zone improvement plan.
(6) The impact fee ordinance imposes fees on new development that will not create a need for additional infrastructure.
(7) The impact fee ordinance imposes on new development fees that are excessive in relation to the infrastructure needs created by the new development.
(8) The impact fee ordinance does not allow for reasonable credits to fee payers.
(9) The unit imposed a prohibition or delay on new development to enable the unit to complete the adoption of an impact fee ordinance.
(10) The unit otherwise fails to comply with this series in the adoption of an impact fee ordinance.
As added by P.L.221-1991, SEC.40. Amended by P.L.1-1998, SEC.206.

IC 36-7-4-1340

Ordinance; effective date; duration; replacement

Sec. 1340. (a) An impact fee ordinance may take effect not earlier than six (6) months after the date on which the impact fee ordinance is adopted by a legislative body.
(b) An impact fee may not be collected under an impact fee ordinance more than five (5) years after the effective date of the ordinance. However, a unit may adopt a replacement impact fee ordinance if the replacement impact fee ordinance complies with the provisions of this series.
As added by P.L.221-1991, SEC.41.

IC 36-7-4-1341

Delay of new development pending fee process

Sec. 1341. A unit may not prohibit or delay new development to wait for the completion of all or a part of the process necessary for the development, adoption, or updating of an impact fee.
As added by P.L.221-1991, SEC.42.

IC 36-7-4-1342

Application of 1300 Series to certain towns; expiration of provision

Sec. 1342. The general assembly finds that the powers of a local governmental unit to permit and provide for infrastructure are not

limited by the provisions of this chapter except as expressly provided in this chapter.
As added by P.L.221-1991, SEC.43.

Appendix B:
Road Segment Level of Service Criteria

Road Segment Level of Service Criteria

Table 1 from the Florida Department of Transportation *Quality/Level of Service Handbook* (2009) is shown on the following pages. This table was used to evaluate roadway segment level of service for the Westfield Road Impact Fee Study based on average daily two-way volume, roadway type, number of lanes and left turn treatment. The conditions and assumptions on which these table values are based are considered to be appropriate for infrastructure planning in Westfield. The following road types were used for evaluation:

- US 31 was evaluated as a Class I two-way state arterial.
- SR 32 and SR 38 were evaluated as Class II two-way state arterials.
- All other roads were evaluated as major city/county non-state roadways.

TABLE 1

Generalized **Annual Average Daily** Volumes for Florida's **Urbanized Areas**[1]

10/4/10

STATE SIGNALIZED ARTERIALS

Class I (>0.00 to 1.99 signalized intersections per mile)

Lanes	Median	B	C	D	E
2	Undivided	9,600	15,400	16,500	***
4	Divided	29,300	35,500	36,700	***
6	Divided	45,000	53,700	55,300	***
8	Divided	60,800	71,800	73,800	***

Class II (2.00 to 4.50 signalized intersections per mile)

Lanes	Median	B	C	D	E
2	Undivided	**	10,500	15,200	16,200
4	Divided	**	25,000	33,200	35,100
6	Divided	**	39,000	50,300	53,100
8	Divided	**	53,100	67,300	70,900

Class III/IV (more than 4.5 signalized intersections per mile)

Lanes	Median	B	C	D	E
2	Undivided	**	5,100	11,900	14,900
4	Divided	**	12,600	28,200	31,900
6	Divided	**	19,700	43,700	48,200
8	Divided	**	27,000	59,500	64,700

Non-State Signalized Roadway Adjustments

(Alter corresponding state volumes by the indicated percent.)

Major City/County Roadways	- 10%
Other Signalized Roadways	- 35%

State & Non-State Signalized Roadway Adjustments

(Alter corresponding state volumes by the indicated percent.)

Divided/Undivided & Turn Lane Adjustments

Lanes	Median	Exclusive Left Lanes	Exclusive Right Lanes	Adjustment Factors
2	Divided	Yes	No	+5%
2	Undivided	No	No	-20%
Multi	Undivided	Yes	No	-5%
Multi	Undivided	No	No	-25%
–	–	–	Yes	+ 5%

One-Way Facility Adjustment

Multiply the corresponding two-directional volumes in this table by 0.6.

FREEWAYS

Lanes	B	C	D	E
4	43,500	59,800	73,600	79,400
6	65,300	90,500	110,300	122,700
8	87,000	120,100	146,500	166,000
10	108,700	151,700	184,000	209,200
12	149,300	202,100	238,600	252,500

Freeway Adjustments

Auxiliary Lanes	Ramp Metering
+ 20,000	+ 5%

UNINTERRUPTED FLOW HIGHWAYS

Lanes	Median	B	C	D	E
2	Undivided	7,800	15,600	22,200	27,900
4	Divided	34,300	49,600	64,300	72,800
6	Divided	51,500	74,400	96,400	109,400

Uninterrupted Flow Highway Adjustments

Lanes	Median	Exclusive left lanes	Adjustment factors
2	Divided	Yes	+5%
Multi	Undivided	Yes	-5%
Multi	Undivided	No	-25%

BICYCLE MODE[2]

(Multiply motorized vehicle volumes shown below by number of directional roadway lanes to determine two-way maximum service volumes.)

Paved Shoulder/ Bicycle Lane Coverage	B	C	D	E
0-49%	**	3,200	12,100	>12,100
50-84%	2,400	3,700	>3,700	***
85-100%	6,300	>6,300	***	***

PEDESTRIAN MODE[2]

(Multiply motorized vehicle volumes shown below by number of directional roadway lanes to determine two-way maximum service volumes.)

Sidewalk Coverage	B	C	D	E
0-49%	**	**	5,000	14,400
50-84%	**	**	11,300	18,800
85-100%	**	11,400	18,800	>18,800

BUS MODE (Scheduled Fixed Route)[3]

(Buses in peak hour in peak direction)

Sidewalk Coverage	B	C	D	E
0-84%	>5	≥4	≥3	≥2
85-100%	>4	≥3	≥2	≥1

[1] Values shown are presented as two-way annual average daily volumes for levels of service and are for the automobile/truck modes unless specifically stated. Although presented as daily volumes, they actually represent peak hour direction conditions with applicable K and D factors applied. This table does not constitute a standard and should be used only for general planning applications. The computer models from which this table is derived should be used for more specific planning applications. The table and deriving computer models should not be used for corridor or intersection design, where more refined techniques exist. Calculations are based on planning applications of the Highway Capacity Manual, Bicycle LOS Model, Pedestrian LOS Model and Transit Capacity and Quality of Service Manual, respectively for the automobile/truck, bicycle, pedestrian and bus modes.

[2] Level of service for the bicycle and pedestrian modes in this table is based on number of motorized vehicles, not number of bicyclists or pedestrians using the facility.

[3] Buses per hour shown are only for the peak hour in the single direction of the higher traffic flow.

** Cannot be achieved using table input value defaults.

*** Not applicable for that level of service letter grade. For the automobile mode, volumes greater than level of service D become F because intersection capacities have been reached. For the bicycle mode, the level of service letter grade (including F) is not achievable because there is no maximum vehicle volume threshold using table input value defaults.

Source:
Florida Department of Transportation
Systems Planning Office
605 Suwannee Street, MS 19
Tallahassee, FL 32399-0450

TABLE 1
(continued)

Generalized **Annual Average Daily** Volumes for Florida's

Urbanized Areas

9/4/09

INPUT VALUE ASSUMPTIONS	Uninterrupted Flow Facilities			Interrupted Flow Facilities								
				State Arterials						Class II		
	Freeways	Highways		Class I		Class II		Class III		Bicycle	Pedestrian	Bus
ROADWAY CHARACTERISTICS												
Area type (l,o)	l	l	l	l	l	l	l	l	l	l	l	l
Number of through lanes	4-12	2	4-6	2	4-8	2	4-8	2	4-8	4	4	
Posted speed (mph)	65	50	50	45	50	45	45	35	35	45	45	
Free flow speed (mph)	70	55	55	50	55	50	50	40	40	50	50	
Aux, meter, or accel/decel ≥1500 (n,y)	n											
Median (n, nr, r)		n	r	n	r	n	r	n	r	r	r	
Terrain (l,r)	l	l	l									
% no passing zone		80										
Exclusive left turn lanes /[impact](n, y)		[n]	y	y	y	y	y	y	y	y	y	
Exclusive right turn lanes (n, y)				n	n	n	n	n	n	n	n	
Paved shoulder/bicycle lane (n, y)										n, 50%,y	n	
Outside lane width										t	t	
Pavement condition										t		
Sidewalk (n, y)											n, 50%,y	n,y
Sidewalk/roadway separation (a, t, w)											t	
Sidewalk protective barrier (n, y)											n	
Obstacle to bus stop (n, y)												n
Facility length (mi)	4	5	5	2	2	2	2	2	2	2	2	2
Number of segments	4											
TRAFFIC CHARACTERISTICS												
Planning analysis hour factor (K)	0.092	0.094	0.094	0.097	0.097	0.097	0.097	0.097	0.097	0.097	0.097	
Directional distribution factor (D)	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	
Peak hour factor (PHF)	0.95	0.925	0.925	0.925	0.925	0.925	0.925	0.925	0.925	0.925	0.925	
Base saturation flow rate (pcphpl)		1700	2100	1950	1950	1950	1950	1950	1950	1950	1950	
Heavy vehicle percent	4.0	2.0	2.0	2.0	2.0	2.0	2.0	1.5	1.5	2.0	2.0	
Local adjustment factor	0.98	1.0	0.98									
% left turns				12	12	12	12	12	12	12	12	
% right turns				12	12	12	12	12	12	12	12	
Bus span of service												15
CONTROL CHARACTERISTICS												
Number of signals				2	2	6	6	10	10	6	6	
Arrival type (1-6)				3	3	4	4	4	4	4	4	
Signal type (a, s, p)				a	a	s	s	s	s	s	s	
Cycle length (C)				120	120	120	120	120	120	120	120	
Effective green ratio (g/C)				0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.44	

LEVEL OF SERVICE THRESHOLDS

Level of Service	Freeways	Highway Segments		State & Non-State Signalized Arterials			Bicycle	Pedestrian	Bus
		Two-Lane	Multilane	Class I	Class II	Class III			
	Density	%ffs	Density	ats	ats	ats	Score	Score	Buses per hr.
B	≤17	≥0.833	≤18	> 34 mph	> 28 mph	> 24 mph	≤2.5	≤2.5	≥4
C	≤24	>0.750	≤26	> 27 mph	> 22 mph	> 18 mph	≤3.5	≤3.5	≥3
D	≤31	>0.667	≤35	> 21 mph	> 17 mph	> 14 mph	≤4.5	≤4.5	≥2
E	≤39	>0.583	≤41	> 16 mph	> 13 mph	> 10 mph	≤5.5	≤5.5	≥1

% ffs = Percent free flow speed ats = Average travel speed

Appendix C:
Intersection Turning Movement Volumes

ID	INTERSECTION			YEAR	PEAK	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
	N/S ROAD		E/W ROAD														
83	US 31	&	Greyhound Pass	2011	AM	167	966	104	64	1461	115	103	95	243	203	132	86
83	US 31	&	Greyhound Pass	2011	PM	412	1919	734	138	1403	99	55	185	201	317	154	89
84	US 31	&	151st St	2011	AM	88	1056	86	41	1390	45	54	39	147	230	61	85
84	US 31	&	151st St	2011	PM	95	1294	250	148	1268	61	82	145	133	224	86	139
86	US 31	&	156th St	2011	AM	53	965	6	16	1374	121	82	5	49	4	3	7
86	US 31	&	156th St	2011	PM	92	1262	12	11	1253	88	50	4	53	12	8	11
90	US 31	&	161st St	2011	AM	107	885	20	16	1302	87	105	21	196	86	51	46
90	US 31	&	161st St	2011	PM	69	1223	40	46	1049	77	134	39	100	59	41	79
93	US 31	&	169th St	2011	AM	175	796	49	7	1114	27	14	7	140	93	18	9
93	US 31	&	169th St	2011	PM	138	1012	74	32	908	64	56	35	113	25	15	12
97	US 31	&	SR 32	2011	AM	159	473	78	120	800	239	172	248	190	125	358	113
97	US 31	&	SR 32	2011	PM	212	827	155	121	657	169	215	350	217	138	323	136
98	US 31	&	181st St	2011	AM	56	628	80	96	916	68	63	73	76	118	77	98
98	US 31	&	181st St	2011	PM	53	1016	110	121	902	58	82	81	67	66	38	81
102	US 31	&	Blackburn Rd	2011	AM	8	742			1139	49	33		7			
102	US 31	&	Blackburn Rd	2011	PM	28	972			928	22	27		33			
103	US 31	&	Union St	2011	AM		684	29	57	1192					41		45
103	US 31	&	Union St	2011	PM		925	25	33	966					32		40
107	US 31	&	191st St	2011	AM	23	799	11	15	1372	30	84	10	107	55	12	43
107	US 31	&	191st St	2011	PM	163	1010	89	3	699	7	2	2	46	25	2	1
108	US 31	&	196th St	2011	AM	3	689	17	34	1378	6	10	2	10	11		11
108	US 31	&	196th St	2011	PM	13	1153	15	9	692	8	6	1	6	21	2	21
112	US 31	&	202nd St	2011	AM		708	1	3	1414					4		3
112	US 31	&	202nd St	2011	PM		1177	4	3	706					2		2
113	US 31	&	203rd St	2011	AM	18	691			1316	6	5		31			
113	US 31	&	203rd St	2011	PM	7	1174			722	24	27		5			
115	US 31	&	SR 38	2011	AM	36	567	78	170	1172	75	91	117	88	68	40	70
115	US 31	&	SR 38	2011	PM	120	1046	92	48	594	67	61	48	65	103	98	97
117	US 31	&	216th St	2011	AM	4	688	17	34	1376	7	3	1	3	45	2	44
117	US 31	&	216th St	2011	PM	4	1122	54	33	673	3	5	2	5	32	1	32
117	US 31	&	216th St	2021	AM	17	928	77	98	1884	22	10	8	16	179	18	113
117	US 31	&	216th St	2021	PM	18	1507	176	102	890	11	18	20	18	106	11	105
133	Union St	&	SR 32	2011	AM	30	54	31	91	76	76	63	353	32	46	473	90
133	Union St	&	SR 32	2011	PM	72	69	121	82	69	52	32	517	48	70	431	48
133	Union St	&	SR 32	2021	AM	68	64	30	84	84	169	146	623	72	40	833	81

ID	INTERSECTION N/S ROAD		E/W ROAD	YEAR	PEAK	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
133	Union St	&	SR 32	2021	PM	167	95	121	78	85	118	78	928	114	62	753	43
136	East St	&	SR 32	2011	AM				50		47	56	433			513	58
136	East St	&	SR 32	2011	PM				42		58	106	668			559	52
136	East St	&	SR 32	2021	AM				26		66	80	671			819	32
136	East St	&	SR 32	2021	PM				23		72	126	1062			881	29
143	Carey Rd	&	SR 32	2011	AM	43	16	68	31	50	23	11	402	70	164	547	26
143	Carey Rd	&	SR 32	2011	PM	85	57	232	55	36	24	15	574	39	100	481	40
143	Carey Rd	&	SR 32	2021	AM	47	10	17	24	36	68	39	566	95	43	741	18
143	Carey Rd	&	SR 32	2021	PM	112	44	66	43	24	74	61	798	52	23	625	27
145	Shadynook Rd	&	SR 32	2011	AM				12		37	7	507			762	3
145	Shadynook Rd	&	SR 32	2011	PM				19		18	29	880			592	20
145	Shadynook Rd	&	SR 32	2021	AM				18		43	8	551			835	5
145	Shadynook Rd	&	SR 32	2021	PM				24		22	36	952			647	25
148	Gray Rd	&	SR 32	2011	AM	44	18	37	33	92	46	19	335	105	153	585	28
148	Gray Rd	&	SR 32	2011	PM	102	69	135	39	26	33	48	810	59	50	522	40
148	Gray Rd	&	SR 32	2021	AM	50	21	38	35	105	55	23	361	120	157	634	30
148	Gray Rd	&	SR 32	2021	PM	119	79	137	42	29	40	59	880	69	50	564	43
157	Wheeler Rd	&	SR 32	2011	AM				33		1	1	652			537	78
157	Wheeler Rd	&	SR 32	2011	PM				90		2	1	607			722	50
157	Wheeler Rd	&	SR 32	2021	AM	4	13	95	236	16	6	38	1021	31	221	745	349
157	Wheeler Rd	&	SR 32	2021	PM	8	22	230	557	17	28	9	880	21	142	1281	289
159	Oakridge Rd	&	SR 32	2011	AM	60		70					568	45	39	466	
159	Oakridge Rd	&	SR 32	2011	PM	35		54					506	61	112	615	
159	Oakridge Rd	&	SR 32	2021	AM	100		238					845	97	102	668	
159	Oakridge Rd	&	SR 32	2021	PM	87		124					772	132	297	1017	
163	Springmill Rd	&	SR 32	2011	AM	39	42	279	36	8	6	6	438	14	77	335	40
163	Springmill Rd	&	SR 32	2011	PM	28	21	126	44	53	11	9	375	49	278	485	38
163	Springmill Rd	&	SR 32	2021	AM	158	240	338	78	76	46	47	519	54	86	375	87
163	Springmill Rd	&	SR 32	2021	PM	94	136	138	137	247	70	45	413	149	324	561	100
164	Casey Rd	&	SR 32	2011	AM				6		6	4	437			391	4
164	Casey Rd	&	SR 32	2011	PM				3		9	12	422			465	2
164	Casey Rd	&	SR 32	2021	AM				128		34	41	469			459	84
164	Casey Rd	&	SR 32	2021	PM				121		26	31	489			561	162
165	Ditch Rd	&	SR 32	2011	AM	47		54					309	59	83	349	
165	Ditch Rd	&	SR 32	2011	PM	53		75					356	31	34	398	

ID	INTERSECTION N/S ROAD		E/W ROAD	YEAR	PEAK	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
165	Ditch Rd	&	SR 32	2021	AM	48		81					428	59	80	402	
165	Ditch Rd	&	SR 32	2021	PM	59		78					443	31	98	497	
166	Eagletown Rd (West)	&	SR 32	2011	AM	8							445	17		400	
166	Eagletown Rd (West)	&	SR 32	2011	PM	3		3					457	5	4	380	
166	Eagletown Rd (West)	&	SR 32	2021	AM	8		1					489	17	2	438	
166	Eagletown Rd (West)	&	SR 32	2021	PM	3		3					501	5	4	467	
167	Eagletown Rd (East)	&	SR 32	2011	AM				54		1		347			439	23
167	Eagletown Rd (East)	&	SR 32	2011	PM				13		10	30	412			341	28
167	Eagletown Rd (East)	&	SR 32	2021	AM				59		1	2	384			481	25
167	Eagletown Rd (East)	&	SR 32	2021	PM				14		11	33	456			374	30
169	Washington St	&	SR 32	2011	AM	18							389	73	1	418	
169	Washington St	&	SR 32	2011	PM	32		28					450	12	7	346	
169	Washington St	&	SR 32	2021	AM	19		9					410	71	35	429	
169	Washington St	&	SR 32	2021	PM	44		49					465	16	14	377	
170	Centennial Rd	&	SR 32	2011	AM				4		3	1	461			461	1
170	Centennial Rd	&	SR 32	2011	PM				4		3	4	458			366	3
170	Centennial Rd	&	SR 32	2021	AM				2		2	1	486			481	
170	Centennial Rd	&	SR 32	2021	PM				2		2	2	485			382	2
171	Mule Barn Rd	&	SR 32	2011	AM	2	1	2	44	7	41	13	442	7	7	442	13
171	Mule Barn Rd	&	SR 32	2011	PM	6	7	7	19	2	17	47	412	4	3	329	38
171	Mule Barn Rd	&	SR 32	2021	AM	1		3	30	4	79	25	507	3	5	480	8
171	Mule Barn Rd	&	SR 32	2021	PM	6	7	7	19	2	26	76	456	2	3	356	34
176	Joliet Rd	&	SR 32	2011	AM			5	12				377		14	438	10
176	Joliet Rd	&	SR 32	2011	PM			13	15				377		9	341	19
176	Joliet Rd	&	SR 32	2021	AM	2		5	12		3		434	1	15	506	10
176	Joliet Rd	&	SR 32	2021	PM		2	14	16		1	1	434	1	9	396	20
177	Hamilton Boone Rd	&	SR 32	2011	AM	9	2	9	29	20	28	8	342	26	26	342	8
177	Hamilton Boone Rd	&	SR 32	2011	PM	23	19	24	13	5	13	29	334	13	11	266	24
177	Hamilton Boone Rd	&	SR 32	2021	AM	12	2	14	28	23	25	7	366	33	42	383	9
177	Hamilton Boone Rd	&	SR 32	2021	PM	32	23	37	13	5	11	24	365	17	17	304	25
179	Anthony Rd	&	SR 38	2011	AM				6		5	3	355			177	2
179	Anthony Rd	&	SR 38	2011	PM				3		3	4	175			292	6
179	Anthony Rd	&	SR 38	2021	AM				5		5	3	352			170	1
179	Anthony Rd	&	SR 38	2021	PM				2		3	4	174			279	5
180	Grassy Branch Rd	&	SR 38	2011	AM	32		38					325	33	19	160	

ID	INTERSECTION N/S ROAD		E/W ROAD	YEAR	PEAK	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
180	Grassy Branch Rd	&	SR 38	2011	PM	31		29					163	16	25	273	
180	Grassy Branch Rd	&	SR 38	2021	AM	4		7					337	4	4	183	
180	Grassy Branch Rd	&	SR 38	2021	PM	4		5					169	2	4	307	
181	Moontown Rd	&	SR 38	2011	AM	25	3	27	4	5	5	4	314	40	21	156	2
181	Moontown Rd	&	SR 38	2011	PM	41	6	34	3	3	4	4	158	17	24	269	5
181	Moontown Rd	&	SR 38	2021	AM	18	2	19	4	3	4	4	341	29	15	171	2
181	Moontown Rd	&	SR 38	2021	PM	28	4	26	3	1	3	3	172	11	18	291	5
183	Dunbar Rd	&	SR 38	2011	AM				7		7	6	296			140	2
183	Dunbar Rd	&	SR 38	2011	PM				7		3	2	148			261	12
183	Dunbar Rd	&	SR 38	2021	AM				21		24	19	598			268	7
183	Dunbar Rd	&	SR 38	2021	PM				18		14	15	293			499	29
237	Greyhound Pass	&	146th St	2011	AM	35	99	136	217	33	50	29	417	6	73	1097	340
237	Greyhound Pass	&	146th St	2011	PM	40	227	165	693	80	126	101	798	9	32	595	344
237	Greyhound Pass	&	146th St	2021	AM	52	104	72	242	34	145	107	731	11	40	1802	383
237	Greyhound Pass	&	146th St	2021	PM	51	214	97	867	70	325	288	1401	11	17	1005	409
242	Carey Rd	&	146th St	2011	AM	83	79	76	115	159	104	34	592	35	158	1117	81
242	Carey Rd	&	146th St	2011	PM	86	152	239	104	124	96	80	1245	93	106	748	105
242	Carey Rd	&	146th St	2021	AM	130	75	124	141	168	153	54	811	106	201	1586	103
242	Carey Rd	&	146th St	2021	PM	207	179	273	146	131	119	131	1779	176	144	1086	107
247	Gray Rd	&	146th St	2011	AM	144	34	9	18	66	263	241	551	250	25	1086	25
247	Gray Rd	&	146th St	2011	PM	291	49	33	33	47	290	252	1435	240	15	924	15
247	Gray Rd	&	146th St	2021	AM	229	27	10	11	51	271	243	724	402	27	1431	16
247	Gray Rd	&	146th St	2021	PM	454	39	36	22	37	297	255	1898	378	16	1213	10
262	Rohrer Rd	&	146th St	2011	AM	49		111					637	56	204	952	
262	Rohrer Rd	&	146th St	2011	PM	145		175					810	114	100	593	
262	Rohrer Rd	&	146th St	2021	AM	3		6					901	4	11	1360	
262	Rohrer Rd	&	146th St	2021	PM	18		1					1193	13		822	
265	Oakridge Rd	&	146th St	2011	AM	59	56	137	106	306	39	27	564	43	180	459	36
265	Oakridge Rd	&	146th St	2011	PM	58	242	151	64	68	49	63	722	51	82	650	121
265	Oakridge Rd	&	146th St	2021	AM	48	44	131	213	211	80	25	710	73	197	621	68
265	Oakridge Rd	&	146th St	2021	PM	78	164	157	105	46	50	102	922	43	85	834	201
271	Springmill Rd	&	146th St	2011	AM	111	239	248	197	286	88	51	472	77	122	341	80
271	Springmill Rd	&	146th St	2011	PM	72	366	197	134	285	48	124	601	139	263	394	231
271	Springmill Rd	&	146th St	2021	AM	155	265	250	232	311	148	80	698	101	125	503	99
271	Springmill Rd	&	146th St	2021	PM	96	401	200	161	314	78	187	870	181	280	595	289

ID	INTERSECTION N/S ROAD		E/W ROAD	YEAR	PEAK	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
276	Ditch Rd	&	146th St	2011	AM	11	68	105	65	296	18	5	138	14	112	164	13
276	Ditch Rd	&	146th St	2011	PM	10	260	125	25	93	5	25	205	6	68	149	51
276	Ditch Rd	&	146th St	2021	AM	35	79	127	199	368	56	12	190	35	180	223	61
276	Ditch Rd	&	146th St	2021	PM	41	311	166	89	92	22	52	275	29	90	178	162
278	Towne Rd	&	146th St	2011	AM	30	58	26	73	147	75	46	197	44	37	195	39
278	Towne Rd	&	146th St	2011	PM	50	86	48	30	56	32	51	254	52	38	191	37
278	Towne Rd	&	146th St	2021	AM	49	60	29	82	160	122	74	332	74	41	325	42
278	Towne Rd	&	146th St	2021	PM	73	93	57	37	59	49	82	435	79	42	314	43
279	Shelborne Rd	&	146th St	2011	AM	4	2	27	35	46	7	1	163	22	128	134	6
279	Shelborne Rd	&	146th St	2011	PM	45	67	172	9	4	3	7	172	7	55	278	57
279	Shelborne Rd	&	146th St	2021	AM	8	3	48	68	90	14	2	263	35	225	214	12
279	Shelborne Rd	&	146th St	2021	PM	74	133	302	18	8	6	12	276	12	99	446	110
280	Little Eagle Creek Av	&	146th St	2011	AM	3	1	3	30	16	27	8	167	10	10	168	8
280	Little Eagle Creek Av	&	146th St	2011	PM	10	14	10	10	2	9	24	158	3	5	211	31
280	Little Eagle Creek Av	&	146th St	2021	AM	3	1	3	32	12	30	8	278	12	12	280	8
280	Little Eagle Creek Av	&	146th St	2021	PM	12	11	12	10	1	10	26	268	4	5	358	35
281	Hamilton Boone Rd	&	146th St	2011	AM				33		31	11	174			175	10
281	Hamilton Boone Rd	&	146th St	2011	PM				12		10	27	158			213	34
281	Hamilton Boone Rd	&	146th St	2021	AM				48		37	13	278			283	15
281	Hamilton Boone Rd	&	146th St	2021	PM				16		13	33	258			351	47
404	Moontown Rd	&	216th St	2011	AM	2		7	7	1	2		67	1	12	128	4
404	Moontown Rd	&	216th St	2011	PM	2	2	9	6	1	2	3	115	2	6	87	11
404	Moontown Rd	&	216th St	2021	AM	3	2	3	6	1	5	2	188	4	7	337	4
404	Moontown Rd	&	216th St	2021	PM	5	1	5	5	1	5	10	324	4	3	239	8
407	Anthony Rd	&	216th St	2011	AM			5	10				42		15	100	5
407	Anthony Rd	&	216th St	2011	PM			10	6				74		8	67	11
407	Anthony Rd	&	216th St	2021	AM	2	1	4	8	2		1	165	3	10	325	3
407	Anthony Rd	&	216th St	2021	PM		2	8	5	1			291		5	229	8
410	Dunbar Rd	&	216th St	2011	AM		2	3	4	6					5		2
410	Dunbar Rd	&	216th St	2011	PM		9	8	3	2					4		7
410	Dunbar Rd	&	216th St	2021	AM		3	23	12	4					44		10
410	Dunbar Rd	&	216th St	2021	PM		8	37	18	7					26		13
437	Moontown Rd	&	191st St	2011	AM	67	134	1	2	316	82	10	1	45	8	2	
437	Moontown Rd	&	191st St	2011	PM	31	242	3		164	27	79	2	79	3		
437	Moontown Rd	&	191st St	2021	AM	52	19	19	16	45	44	16	154	47	35	299	14

ID	INTERSECTION N/S ROAD		E/W ROAD	YEAR	PEAK	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
437	Moontown Rd	&	191st St	2021	PM	61	84	54	27	58	34	62	337	83	40	194	29
438	Shadynook Rd	&	191st St	2011	AM	12							22	29		148	
438	Shadynook Rd	&	191st St	2011	PM	28							196	38		38	
438	Shadynook Rd	&	191st St	2021	AM	22		2					186	35	2	365	
438	Shadynook Rd	&	191st St	2021	PM	48							415	49		219	
439	Grassy Branch Rd	&	191st St	2011	AM	23	30	1	5	74	25	7	58	26	20	149	10
439	Grassy Branch Rd	&	191st St	2011	PM	27	106	19	10	64	12	33	161	41	12	39	10
439	Grassy Branch Rd	&	191st St	2021	AM	49	1	1		2	21	9	141	98	6	416	1
439	Grassy Branch Rd	&	191st St	2021	PM	104	11	28	3	5	12	27	498	118	7	135	2
442	East St	&	191st St	2011	AM			28					28		107	126	
442	East St	&	191st St	2011	PM	1		95					109	1	47	26	
442	East St	&	191st St	2021	AM	19	10	26	51	65	37	5	115	15	107	501	33
442	East St	&	191st St	2021	PM	73	21	96	42	28	25	37	460	32	39	115	47
444	Moontown Rd	&	196th St	2011	AM	7	46			58	11	17		15			
444	Moontown Rd	&	196th St	2011	PM	14	66			33	8	8		8			
444	Moontown Rd	&	196th St	2021	AM	5	41			78	7	10		9			
444	Moontown Rd	&	196th St	2021	PM		117			99	16	11					
445	Grassy Branch Rd	&	196th St	2011	AM	9	22	6	5	39	8	10	23	20	5	9	2
445	Grassy Branch Rd	&	196th St	2011	PM	20	55	7	2	31	8	7	7	11	6	14	4
445	Grassy Branch Rd	&	196th St	2021	AM	1	5	3	7	9	2	2	14	2	3	6	4
445	Grassy Branch Rd	&	196th St	2021	PM	3	13	3	3	8	3	2	5	1	3	10	5
451	Grassy Branch Rd	&	203rd St	2011	AM		31			44	6	4					
451	Grassy Branch Rd	&	203rd St	2011	PM	4	59			40				7			
451	Grassy Branch Rd	&	203rd St	2021	AM	1	11			8	2	2		3			
451	Grassy Branch Rd	&	203rd St	2021	PM	8	15			6		4		1			
457	Moontown Rd	&	186th St	2011	AM	4	69			68				10			
457	Moontown Rd	&	186th St	2011	PM	14	132			64				4			
457	Moontown Rd	&	186th St	2021	AM	4	68			66	3	1		10			
457	Moontown Rd	&	186th St	2021	PM	14	129			72	3	4		4			
461	Grassy Branch Rd	&	186th St	2011	AM	14	37			89	8	8		34			
461	Grassy Branch Rd	&	186th St	2011	PM	33	84			67	1	1		22			
461	Grassy Branch Rd	&	186th St	2021	AM	16	34			82	8	7		37			
461	Grassy Branch Rd	&	186th St	2021	PM	35	79			62	1	1		23			
469	East St	&	181st St	2011	AM	76	18			18	81	66	3	63		8	
469	East St	&	181st St	2011	PM	61	45	1	1	34	46	59	11	62		5	

ID	INTERSECTION N/S ROAD		E/W ROAD	YEAR	PEAK	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
469	East St	&	181st St	2021	AM	1	86		3	82	116	82		1		1	7
469	East St	&	181st St	2021	PM	2	97		25	79	61	78	3	1		2	8
472	East St	&	186th St	2011	AM		32	45	3	91					19		
472	East St	&	186th St	2011	PM		67	15	5	44					26		16
472	East St	&	186th St	2021	AM		143			186							
472	East St	&	186th St	2021	PM		137	15	5	92					29		16
475	Union St	&	181St St	2011	AM	150	29	39	2	32	14	10	88	159	40	112	2
475	Union St	&	181St St	2011	PM	111	20	29	3	41	21	12	112	162	19	68	1
475	Union St	&	181St St	2021	AM	74	180	47	8	104	16	16	35	51	40	45	13
475	Union St	&	181St St	2021	PM	64	110	45	8	137	17	13	42	75	35	30	6
486	Shadynook Rd	&	186th St	2011	AM		21	18		32					4		
486	Shadynook Rd	&	186th St	2011	PM		40	6		24					10		
486	Shadynook Rd	&	186th St	2021	AM		21	18		32					4		1
486	Shadynook Rd	&	186th St	2021	PM		40	6		24					10		
489	Union St	&	David Brown Dr	2011	AM	24	118	4	6	167	35	24	7	24	20	40	20
489	Union St	&	David Brown Dr	2011	PM	8	319	6	43	123	36	124	24	8	2	9	34
489	Union St	&	David Brown Dr	2021	AM	50	134			188	75	42		39			
489	Union St	&	David Brown Dr	2021	PM	6	390	9	48	177	79	224	28	6	4	12	36
491	Union St	&	161st St	2011	AM	9	45	45	137	95	25	4	47	3	37	92	51
491	Union St	&	161st St	2011	PM	53	230	67	49	47	36	35	95	10	10	73	35
491	Union St	&	161st St	2021	AM	11	11	2	40	14	128	81	168	7	2	295	29
491	Union St	&	161st St	2021	PM	10	25	4	89	17	127	228	415	9	3	284	68
493	Oak Rd	&	161st St	2011	AM	32	50	48	27	18	18	28	238	17	13	118	21
493	Oak Rd	&	161st St	2011	PM	36	28	32	30	60	37	15	156	35	60	308	27
493	Oak Rd	&	161st St	2021	AM	29	16	7	17	21	58	33	136	21	8	228	13
493	Oak Rd	&	161st St	2021	PM	28	40	15	38	26	60	103	352	28	9	230	32
495	Carey Rd	&	161st St	2011	AM	24	154	28	26	328	85	30	126	33	92	261	36
495	Carey Rd	&	161st St	2011	PM	21	306	101	34	224	37	97	279	17	31	118	30
495	Carey Rd	&	161st St	2021	AM	37	74	12	22	79	63	53	75	32	16	135	27
495	Carey Rd	&	161st St	2021	PM	45	202	32	50	99	60	96	211	48	19	129	39
498	Gray Rd	&	161st St	2011	AM	17	57	15	70	344	68	25	65	35	61	120	44
498	Gray Rd	&	161st St	2011	PM	46	218	46	53	89	46	83	161	31	13	71	36
498	Gray Rd	&	161st St	2021	AM	8	42	15	165	296	66	24	95	16	70	184	96
498	Gray Rd	&	161st St	2021	PM	19	168	40	108	58	40	82	201	11	11	92	82
501	Gray Rd	&	169th St	2011	AM	21	90	4	3	372	21	6	2	29	49	21	10

ID	INTERSECTION N/S ROAD		E/W ROAD	YEAR	PEAK	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
501	Gray Rd	&	169th St	2011	PM	38	277	51	8	110	8	12	19	27	36	19	16
501	Gray Rd	&	169th St	2021	AM	23	98	5	4	407	22	7	3	33	63	27	14
501	Gray Rd	&	169th St	2021	PM	38	298	63	12	116	9	14	26	26	44	25	24
505	Carey Rd	&	169th St	2011	AM		144	11	24	321					31		32
505	Carey Rd	&	169th St	2011	PM		355	40	19	218					37		29
505	Carey Rd	&	169th St	2021	AM		66	34	5	144					67		5
505	Carey Rd	&	169th St	2021	PM		178	76	1	102					74		2
510	Union St	&	171st St	2011	AM		101	18	57	132					37		85
510	Union St	&	171st St	2011	PM		261	31	78	150					29		119
510	Union St	&	171st St	2021	AM		107	34	98	141					67		140
510	Union St	&	171st St	2021	PM		381	58	129	160					54		197
518	Oak Rd	&	171st St	2011	AM			30					22		99	64	
518	Oak Rd	&	171st St	2011	PM	6		84					42	3	57	36	
518	Oak Rd	&	171st St	2021	AM			40					30		106	71	
518	Oak Rd	&	171st St	2021	PM	22		98					47	14	66	35	
520	Carey Rd	&	171st St	2011	AM	90	94			227	47	12		63			
520	Carey Rd	&	171st St	2011	PM	63	303			155	28	64		76			
520	Carey Rd	&	171st St	2021	AM	58	22			59	77	26		55			
520	Carey Rd	&	171st St	2021	PM	59	99			49	42	91		61			
533	Gray Rd	&	156th St	2011	AM	22	98	6	3	387	14	13	6	83	7	2	1
533	Gray Rd	&	156th St	2011	PM	72	237	7		128	4	5	1	57	9	2	1
533	Gray Rd	&	156th St	2021	AM	23	70	6	3	282	12	10	7	81	7	3	1
533	Gray Rd	&	156th St	2021	PM	68	174	6		92	5	7	2	58	8	3	1
535	Gray Rd	&	151st St	2011	AM	117	81			254	120	31		101			
535	Gray Rd	&	151st St	2011	PM	145	294			137	39	86		167			
535	Gray Rd	&	151st St	2021	AM	137	44			162	131	32		135			
535	Gray Rd	&	151st St	2021	PM	195	207			92	46	103		217			
539	Carey Rd	&	151st St	2011	AM	83	146	42	36	245	75	23	57	44	56	149	29
539	Carey Rd	&	151st St	2011	PM	73	322	87	47	221	44	68	158	83	42	70	35
539	Carey Rd	&	151st St	2021	AM	110	95	54	9	196	17	10	47	117	103	81	8
539	Carey Rd	&	151st St	2021	PM	127	302	179	17	175	13	25	129	153	109	63	16
541	Oak Rd	&	151st St	2011	AM	84					93	65	134	55		274	
541	Oak Rd	&	151st St	2011	PM	68	4	1	1	4	100	160	331	105		170	1
541	Oak Rd	&	151st St	2021	AM	28	19	22	22	12	42	8	120	4	9	184	20
541	Oak Rd	&	151st St	2021	PM	8	19	8	34	25	27	65	274	22	15	150	39

ID	INTERSECTION N/S ROAD		E/W ROAD	YEAR	PEAK	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
554	Union St	&	156th St	2011	AM		92			109	73	15					
554	Union St	&	156th St	2011	PM		262			34	35	15					
554	Union St	&	156th St	2021	AM		20			8	33	22					
554	Union St	&	156th St	2021	PM	11	45			3	12	21		1			
557	US 31	&	S Union St	2011	AM		1029	78	11	1354					11		1
557	US 31	&	S Union St	2011	PM		1279	197	43	1322					14		3
801	Western Way	&	Greyhound Pass	2011	AM	17		222					76	18	148	22	
801	Western Way	&	Greyhound Pass	2011	PM	25		349					77	24	297	102	
801	Western Way	&	Greyhound Pass	2021	AM	8		78					96	12	96	51	
801	Western Way	&	Greyhound Pass	2021	PM	47		123					66	23	131	115	
806	Greyhound Pass	&	151st St	2011	AM	50		2					122	55	3	110	
806	Greyhound Pass	&	151st St	2011	PM	113		12					107	121	15	161	
806	Greyhound Pass	&	151st St	2021	AM	24		25					65	24	26	62	
806	Greyhound Pass	&	151st St	2021	PM	75		48					47	67	64	77	
817	Oakridge Rd	&	Greyhound Pass	2011	AM	12	100	35	61	363	19	20	57	39	114	55	57
817	Oakridge Rd	&	Greyhound Pass	2011	PM	126	353	9	9	181	104	71	16	40	23	122	39
817	Oakridge Rd	&	Greyhound Pass	2021	AM	16	107	15	13	223	16	21	26	50	36	21	16
817	Oakridge Rd	&	Greyhound Pass	2021	PM	49	263	31	30	176	45	35	37	25	14	35	20
825	Springmill Rd	&	Greyhound Pass	2011	AM		280	66	32	426					168		52
825	Springmill Rd	&	Greyhound Pass	2011	PM		481	190	46	362					99		32
825	Springmill Rd	&	Greyhound Pass	2021	AM		377	50	31	540					170		56
825	Springmill Rd	&	Greyhound Pass	2021	PM		646	158	43	447					73		31
831	Oakridge Rd	&	156th St	2011	AM	14	149	15	28	328	26	83	69	86	32	22	28
831	Oakridge Rd	&	156th St	2011	PM	74	365	35	30	206	56	56	51	42	38	90	51
831	Oakridge Rd	&	156th St	2021	AM	22	178	23	20	174	20	77	85	84	29	30	27
831	Oakridge Rd	&	156th St	2021	PM	96	208	33	38	253	109	43	59	46	29	122	28
838	Springmill Rd	&	156th St	2011	AM	12	283	30	56	392	11	64	59	65	97	32	93
838	Springmill Rd	&	156th St	2011	PM	56	306	104	98	353	53	21	64	26	44	59	66
838	Springmill Rd	&	156th St	2021	AM	13	368	27	29	375	14	73	50	70	88	29	92
838	Springmill Rd	&	156th St	2021	PM	61	408	92	101	458	67	26	54	27	38	49	37
843	Ditch Rd	&	151st St	2011	AM	5	105			152				2			
843	Ditch Rd	&	151st St	2011	PM		131			95		3		2			
843	Ditch Rd	&	151st St	2021	AM	78	74			141	30	10		53			
843	Ditch Rd	&	151st St	2021	PM	25	156			96	11	65		93			
846	Ditch Rd	&	156th St	2011	AM	1	51	35	76	67	1	2	19	1	20	3	30

ID	INTERSECTION N/S ROAD		E/W ROAD	YEAR	PEAK	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
846	Ditch Rd	&	156th St	2011	PM	1	61	26	57	42	1	2	8		34	10	96
846	Ditch Rd	&	156th St	2021	AM	1	60	38	70	80	1	3	19	2	20	3	27
846	Ditch Rd	&	156th St	2021	PM	1	72	25	52	51	1	2	8	1	33	9	89
851	Oakridge Rd	&	161st St	2011	AM	16	153	68	46	215	19	19	152	71	44	129	23
851	Oakridge Rd	&	161st St	2011	PM	96	276	39	28	182	23	36	130	26	46	178	65
851	Oakridge Rd	&	161st St	2021	AM	27	133	104	301	102	77	62	433	18	33	218	123
851	Oakridge Rd	&	161st St	2021	PM	26	175	53	133	181	94	109	238	38	105	493	317
855	Oakridge Rd	&	169th St	2011	AM	16	130	44	48	117	18	14	81	21	34	43	22
855	Oakridge Rd	&	169th St	2011	PM	26	104	55	50	102	24	14	75	16	81	157	75
855	Oakridge Rd	&	169th St	2021	AM	86	164	45	1	258	2	2	3	118	24	1	
855	Oakridge Rd	&	169th St	2021	PM	148	242	29	3	226	22	12	10	90	45	30	5
862	Springmill Rd	&	161st St	2011	AM	39	301	54	87	445	39	16	30	37	94	67	58
862	Springmill Rd	&	161st St	2011	PM	50	546	94	42	279	32	86	77	43	151	82	74
862	Springmill Rd	&	161st St	2021	AM	38	300	193	166	306	24	41	249	59	105	77	74
862	Springmill Rd	&	161st St	2021	PM	69	335	98	86	368	63	37	103	46	185	238	171
865	Springmill Rd	&	169th St	2011	AM	13	386	18	6	132	7	42	18	40	42	16	45
865	Springmill Rd	&	169th St	2011	PM	42	321	50	51	414	44	10	18	15	19	18	12
865	Springmill Rd	&	169th St	2021	AM	18	487	13	6	183	8	56	14	46	33	14	40
865	Springmill Rd	&	169th St	2021	PM	36	302	28	59	514	71	17	15	14	11	15	13
867	Ditch Rd	&	161st St	2011	AM	10	81	19	38	111	18	5	12	3	37	57	51
867	Ditch Rd	&	161st St	2011	PM	2	62	13	55	55	7	17	40	4	14	21	63
867	Ditch Rd	&	161st St	2021	AM	12	78	24	41	105	19	5	16	4	45	76	55
867	Ditch Rd	&	161st St	2021	PM	3	59	18	58	52	7	17	57	5	21	30	68
868	Ditch Rd	&	166th St	2011	AM		77			163	10	15					
868	Ditch Rd	&	166th St	2011	PM	6	103			11		2		19			
868	Ditch Rd	&	166th St	2021	AM		77			168	9	13					
868	Ditch Rd	&	166th St	2021	PM	5	105			33	4	1		17			
869	Ditch Rd	&	169th St	2011	AM		73	1	16	130					5		63
869	Ditch Rd	&	169th St	2011	PM		106		25	74							24
869	Ditch Rd	&	169th St	2021	AM		71	5	23	126					28		74
869	Ditch Rd	&	169th St	2021	PM		106	2	32	69					1		35
884	Towne Rd	&	Little Eagle Creek Ave	2011	AM	4		8					8	1	23	43	
884	Towne Rd	&	Little Eagle Creek Ave	2011	PM	3		18					52	6	8	10	
884	Towne Rd	&	Little Eagle Creek Ave	2021	AM	8		7					15	4	22	80	
884	Towne Rd	&	Little Eagle Creek Ave	2021	PM	9		17					107	15	6	22	

ID	INTERSECTION N/S ROAD		E/W ROAD	YEAR	PEAK	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
885	Little Eagle Creek Ave	&	166th St	2011	AM	4	9	6	5	44	4	1	7	6	4	3	1
885	Little Eagle Creek Ave	&	166th St	2011	PM	7	42	5	1	8	2	4	5	3	4	8	6
885	Little Eagle Creek Ave	&	166th St	2021	AM	8	20	14	3	95	2		3	11	7	1	
885	Little Eagle Creek Ave	&	166th St	2021	PM	11	94	8	1	18	2	4	3	5	7	6	6
886	Little Eagle Creek Ave	&	159th St	2011	AM				5		39	13	2			16	4
886	Little Eagle Creek Ave	&	159th St	2011	PM				4		11	61	14			7	3
886	Little Eagle Creek Ave	&	159th St	2021	AM				9		83	27	4			31	9
886	Little Eagle Creek Ave	&	159th St	2021	PM				7		24	128	28			13	7
887	Shelborne Rd	&	Little Eagle Creek Ave	2011	AM	14		6					5	10	29	36	
887	Shelborne Rd	&	Little Eagle Creek Ave	2011	PM	18		46					55	15	6	9	
887	Shelborne Rd	&	Little Eagle Creek Ave	2021	AM	18		22					9	8	84	51	
887	Shelborne Rd	&	Little Eagle Creek Ave	2021	PM	16		111					64	15	21	10	
889	Little Eagle Creek Ave	&	156th St	2011	AM	10	6			41	24	9		28			
889	Little Eagle Creek Ave	&	156th St	2011	PM	20	54			11	9	25		13			
889	Little Eagle Creek Ave	&	156th St	2021	AM	10	6			44	30	13		29			
889	Little Eagle Creek Ave	&	156th St	2021	PM	19	55			12	11	31		11			
890	Joliet Rd	&	156th St	2011	AM				5				19			33	5
890	Joliet Rd	&	156th St	2011	PM				7				19			17	8
890	Joliet Rd	&	156th St	2021	AM				6		1		20			35	7
890	Joliet Rd	&	156th St	2021	PM				9		1	1	20			19	9
891	Hamilton Boone Rd	&	156th St	2011	AM	4	11	4	7	51	7	3	9	7	7	9	3
891	Hamilton Boone Rd	&	156th St	2011	PM	5	54	8	4	17	3	6	8	4	3	5	5
891	Hamilton Boone Rd	&	156th St	2021	AM	5	17	4	8	73	9	4	9	9	8	9	3
891	Hamilton Boone Rd	&	156th St	2021	PM	6	78	8	5	24	4	9	8	5	3	5	6
894	Joliet Rd	&	166th St	2011	AM	1	1		2	3	6	6	18	4		8	1
894	Joliet Rd	&	166th St	2011	PM	1	4	1	2	3	3	2	6	1	1	13	3
894	Joliet Rd	&	166th St	2021	AM	2	2	1	3	5	7	6	17	4	2	8	1
894	Joliet Rd	&	166th St	2021	PM	2	4	1	2	4	3	3	5	1	2	13	4
895	Hamilton Boone Rd	&	166th St	2011	AM		12	4	19	51					5		6
895	Hamilton Boone Rd	&	166th St	2011	PM		60	5	6	22					6		18
895	Hamilton Boone Rd	&	166th St	2021	AM		19	3	21	76					4		7
895	Hamilton Boone Rd	&	166th St	2021	PM		86	4	6	33					5		19
896	Eagletown Rd	&	166th St	2011	AM				8		6	4	7			7	3
896	Eagletown Rd	&	166th St	2011	PM				6		2	2	14			11	4
896	Eagletown Rd	&	166th St	2021	AM				6		8	5	7			7	2

ID	INTERSECTION N/S ROAD		E/W ROAD	YEAR	PEAK	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
896	Eagletown Rd	&	166th St	2021	PM				4		4	4	14			11	2
897	Towne Rd	&	166th St	2011	AM	3	10	5	2	24	2	1	6	8	8	4	1
897	Towne Rd	&	166th St	2011	PM	9	17	8	1	9	2	2	6	5	4	6	1
897	Towne Rd	&	166th St	2021	AM	4	13	6	2	29	2	2	6	8	10	4	2
897	Towne Rd	&	166th St	2021	PM	9	21	10	2	11	2	2	7	5	6	7	2
898	Towne Rd	&	161st St	2011	AM		11	16	4	29					39		3
898	Towne Rd	&	161st St	2011	PM		34	59	5	26					32		8
898	Towne Rd	&	161st St	2021	AM		13	22	5	34					48		5
898	Towne Rd	&	161st St	2021	PM		44	76	8	29					43		8
902	Towne Rd	&	156th St	2011	AM		23	4	13	64					3		4
902	Towne Rd	&	156th St	2011	PM		58	8	1	34					10		3
902	Towne Rd	&	156th St	2021	AM		28	4	14	76					3		4
902	Towne Rd	&	156th St	2021	PM		69	8	1	40					11		2
903	Towne Rd	&	159th St	2011	AM	5	30			79	16	5		3			
903	Towne Rd	&	159th St	2011	PM	4	59			34	7	11		4			
903	Towne Rd	&	159th St	2021	AM	6	35			93	29	9		4			
903	Towne Rd	&	159th St	2021	PM	5	69			40	13	20		5			
905	Shelborne Rd	&	151st St	2011	AM		11		1	50					3		2
905	Shelborne Rd	&	151st St	2011	PM		92	7		16					1		
905	Shelborne Rd	&	151st St	2021	AM		22		1	100					3		2
905	Shelborne Rd	&	151st St	2021	PM		187	7		32					1		
906	Towne Rd	&	151st St	2011	AM	19	102	8		88				2	4		
906	Towne Rd	&	151st St	2011	PM	2	155	12		48				5	1		
906	Towne Rd	&	151st St	2021	AM	15	95	48		103	1		1	2	32		1
906	Towne Rd	&	151st St	2021	PM	2	137	69	1	56			2	5	8	2	1
907	Hamilton Boone Rd	&	186th St	2011	AM	2	14	2	4	69	3	2	2	5	6	2	2
907	Hamilton Boone Rd	&	186th St	2011	PM	5	57	8	4	27	3	3	3	2	4	3	4
907	Hamilton Boone Rd	&	186th St	2021	AM		14	3	6	67	1		1	2	8	1	3
907	Hamilton Boone Rd	&	186th St	2021	PM		58	10	7	26		1	2	1	5		7
908	Hamilton Boone Rd	&	196th St	2011	AM		16		2	63	2	3	1	2	2	1	3
908	Hamilton Boone Rd	&	196th St	2011	PM	5	60	2	1	30	3	3	1	3	1	1	1
908	Hamilton Boone Rd	&	196th St	2021	AM		16		3	62					1		5
908	Hamilton Boone Rd	&	196th St	2021	PM		62	3	1	32					2		2
909	Joliet Rd	&	196th St	2011	AM	3	2			4	2	1		3			
909	Joliet Rd	&	196th St	2011	PM	3	7			6	1	1		3			

ID	INTERSECTION N/S ROAD		E/W ROAD	YEAR	PEAK	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
909	Joliet Rd	&	196th St	2021	AM	3	2			4	2	1		3			
909	Joliet Rd	&	196th St	2021	PM	3	7			6	1	1		3			
910	Joliet Rd	&	193rd St	2011	AM		3	3	2	7					1		
910	Joliet Rd	&	193rd St	2011	PM		9	3	1	9					2		1
910	Joliet Rd	&	193rd St	2021	AM		3	3	2	7					1		
910	Joliet Rd	&	193rd St	2021	PM		9	3	1	9					2		1
911	Joliet Rd	&	186th St	2011	AM	2	4	3	2	6	2	1	5	2	4	8	2
911	Joliet Rd	&	186th St	2011	PM	3	9	5	3	8	2	2	11	3	4	7	2
911	Joliet Rd	&	186th St	2021	AM	2	4	3	2	6	2	1	6	2	4	9	2
911	Joliet Rd	&	186th St	2021	PM	3	8	6	3	7	2	2	13	3	4	8	3
914	Mule Barn Rd	&	193rd St	2011	AM		28	1	2	91	1	3	1	3			1
914	Mule Barn Rd	&	193rd St	2011	PM	1	103	1	2	36	2	4					3
914	Mule Barn Rd	&	193rd St	2021	AM		38	1	8	132	1	5	1	2	1	1	2
914	Mule Barn Rd	&	193rd St	2021	PM		138		9	49	3	6	2	3		2	10
915	Mule Barn Rd	&	186th St	2011	AM	2	21	2	7	78	7	3	3	4	6	5	6
915	Mule Barn Rd	&	186th St	2011	PM	6	81	10	5	31	3	7	7	5	5	4	7
915	Mule Barn Rd	&	186th St	2021	AM	2	28	2	8	107	8	4	3	4	6	4	6
915	Mule Barn Rd	&	186th St	2021	PM	6	111	9	6	42	4	8	7	5	5	4	8
916	Centennial Rd	&	186th St	2011	AM	1		1	2	3	2	1	10	2	2	11	1
916	Centennial Rd	&	186th St	2011	PM	2	3	2	2	3	2	2	18	2	2	13	2
916	Centennial Rd	&	186th St	2021	AM	1	2	2	1	1	1		10	1	1	12	
916	Centennial Rd	&	186th St	2021	PM	2	1	2	1	1	1	1	20	2	1	14	1
917	Centennial Rd	&	193rd St	2011	AM			2	4				3		12	2	2
917	Centennial Rd	&	193rd St	2011	PM	1	2	4	1	3			2		4	2	1
917	Centennial Rd	&	193rd St	2021	AM		2	1	4	2	1	1	10	2	11	17	6
917	Centennial Rd	&	193rd St	2021	PM	1	2	2	4	2			10	1	2	11	4
918	Lamong Rd	&	193rd St	2011	AM				41		2	1	10			18	20
918	Lamong Rd	&	193rd St	2011	PM				21			1	7			6	32
918	Lamong Rd	&	193rd St	2021	AM				42		1		25			39	19
918	Lamong Rd	&	193rd St	2021	PM				21				18			17	41
919	Eagletown Rd	&	193rd St	2011	AM	11		9					15	19	17	15	
919	Eagletown Rd	&	193rd St	2011	PM	25		22					20	14	12	20	
919	Eagletown Rd	&	193rd St	2021	AM	12		16					32	22	29	31	
919	Eagletown Rd	&	193rd St	2021	PM	28		37					39	15	20	40	
920	Eagletown Rd	&	186th St	2011	AM	2	7	4	1	26			9	3	4	5	2

ID	INTERSECTION N/S ROAD		E/W ROAD	YEAR	PEAK	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
920	Eagletown Rd	&	186th St	2011	PM	6	39	6		13			8	7	5	5	1
920	Eagletown Rd	&	186th St	2021	AM	2	9	3	5	30	3	2	6	4	5	3	2
920	Eagletown Rd	&	186th St	2021	PM	6	45	6	1	15	2	4	5	6	4	3	3
923	Casey Rd	&	186th St	2011	AM	8	24	11	3	9	2	4	15	5	6	14	5
923	Casey Rd	&	186th St	2011	PM	6	14	10	4	9	3	4	28	6	8	19	5
923	Casey Rd	&	186th St	2021	AM	2	29	9	4	13	1	1	3	1	6	3	6
923	Casey Rd	&	186th St	2021	PM	1	16	11	7	12	1	1	7	1	8	4	7
924	Casey Rd	&	193rd St	2011	AM	8		24					36	4	13	32	
924	Casey Rd	&	193rd St	2011	PM	7		15					40	5	10	35	
924	Casey Rd	&	193rd St	2021	AM	9		29					46	5	16	42	
924	Casey Rd	&	193rd St	2021	PM	7		19					53	5	13	45	
925	Freemont Moore Rd	&	193rd St	2011	AM				5		2	1	31			30	3
925	Freemont Moore Rd	&	193rd St	2011	PM				5				32			40	6
925	Freemont Moore Rd	&	193rd St	2021	AM				2		9	5	55			42	2
925	Freemont Moore Rd	&	193rd St	2021	PM				3		3	3	57			56	3
926	Six Points Rd	&	193rd St	2011	AM				78		25	16	32			18	15
926	Six Points Rd	&	193rd St	2011	PM				37		6	25	37			37	80
926	Six Points Rd	&	193rd St	2021	AM				124		28	19	43			26	25
926	Six Points Rd	&	193rd St	2021	PM				58		6	27	53			51	131
928	Springmill Rd	&	191st St	2011	AM		54	134		111					45		
928	Springmill Rd	&	191st St	2011	PM		154	62		63					78		1
928	Springmill Rd	&	191st St	2021	AM		31	170	76	97					213		35
928	Springmill Rd	&	191st St	2021	PM		111	225	27	71					202		46
929	Springmill Rd	&	186th St	2011	AM		51		34	154	25	29					11
929	Springmill Rd	&	186th St	2011	PM	7	153	5	13	84	16	30	9	7	3	6	12
929	Springmill Rd	&	186th St	2021	AM	2	162		13	240	30	27	3	3	1	2	3
929	Springmill Rd	&	186th St	2021	PM	2	227	1	11	306	36	44	5	2	2	1	6
933	Dartown Rd	&	Kinsey Ave	2011	AM	12		42					18	10	58	23	
933	Dartown Rd	&	Kinsey Ave	2011	PM	15		57					15	8	40	14	
933	Dartown Rd	&	Kinsey Ave	2021	AM	3		49					7	1	54	10	
933	Dartown Rd	&	Kinsey Ave	2021	PM	14		90					10	7	43	10	
935	Wheeler Rd	&	181st St	2011	AM			61					81		123	85	
935	Wheeler Rd	&	181st St	2011	PM			67					80	1	98	38	
935	Wheeler Rd	&	181st St	2021	AM	20	127	27	28	126	20	16	32	16	19	27	19
935	Wheeler Rd	&	181st St	2021	PM	12	161	33	30	163	11	16	31	17	44	24	40

ID	INTERSECTION N/S ROAD		E/W ROAD	YEAR	PEAK	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
937	Horton Rd	&	191st St	2011	AM				7		13	11	68			37	2
937	Horton Rd	&	191st St	2011	PM				5		11	12	33			61	7
937	Horton Rd	&	191st St	2021	AM				52		18	19	198			151	35
937	Horton Rd	&	191st St	2021	PM				55		24	26	253			309	63
938	Tomlinson Rd	&	191st St	2011	AM	6	18	3	58	14	24	20	46	2		33	75
938	Tomlinson Rd	&	191st St	2011	PM	5	14	1	67	23	11	10	45	5	38	56	1
938	Tomlinson Rd	&	191st St	2021	AM	8	10	38	93	8	29	21	462	4	9	345	49
938	Tomlinson Rd	&	191st St	2021	PM	4	8	50	94	7	13	16	536	4	39	658	145
943	Tomlinson Rd	&	196th St	2011	AM		3	9	7	4					5		4
943	Tomlinson Rd	&	196th St	2011	PM		7	8	8	9					13		10
943	Tomlinson Rd	&	196th St	2021	AM		96	10	10	95					4		4
943	Tomlinson Rd	&	196th St	2021	PM		127	6	7	155					11		11
944	Tomlinson Rd	&	199th St	2011	AM	9	2			5				7			
944	Tomlinson Rd	&	199th St	2011	PM	7	7			10				4			
944	Tomlinson Rd	&	199th St	2021	AM	17	87			74				5			
944	Tomlinson Rd	&	199th St	2021	PM	4	130			148	1	1		2			
946	Tomlinson Rd	&	206th St	2011	AM			1					36	3	2	21	
946	Tomlinson Rd	&	206th St	2011	PM	4		4					29	5	5	25	
946	Tomlinson Rd	&	206th St	2021	AM	3							2	14		1	
946	Tomlinson Rd	&	206th St	2021	PM	22		4					1	14	2	1	
953	Horton Rd	&	206th St	2011	AM	3	5	3	3	10	4	3	12	4	4	13	2
953	Horton Rd	&	206th St	2011	PM	5	10	5	2	5	2	3	12	5	5	13	3
953	Horton Rd	&	206th St	2021	AM	16	34		2	63	8	4	8	17	5	15	2
953	Horton Rd	&	206th St	2021	PM	22	68	2		38		1	2	22	2	3	1
954	Six Points Rd	&	206th St	2011	AM	9	15	9	3	64	4	1	5	11	15	6	1
954	Six Points Rd	&	206th St	2011	PM	20	68	20	1	28	2	2	5	14	14	5	2
954	Six Points Rd	&	206th St	2021	AM	17	21	11	2	93	5	1	4	21	17	6	1
954	Six Points Rd	&	206th St	2021	PM	35	101	24	1	42	1	2	4	26	17	4	1
956	Horton Rd	&	199th St	2011	AM		9	3	3	16					2		2
956	Horton Rd	&	199th St	2011	PM		18	2	2	14					3		4
956	Horton Rd	&	199th St	2021	AM		45	7	15	82					6		7
956	Horton Rd	&	199th St	2021	PM		84	3	11	71					5		18
957	Oakridge Rd	&	214th St	2011	AM	1	4			8	4	2		1			
957	Oakridge Rd	&	214th St	2011	PM	1	9			4	2	4		1			
957	Oakridge Rd	&	214th St	2021	AM	5	16			34	2	1		4			

ID	INTERSECTION N/S ROAD		E/W ROAD	YEAR	PEAK	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
957	Oakridge Rd	&	214th St	2021	PM	5	37			17	1	2		6			
958	Horton Rd	&	214th St	2011	AM		8		4	20							5
958	Horton Rd	&	214th St	2011	PM		19		5	15							3
958	Horton Rd	&	214th St	2021	AM		28	5	9	60					12		10
958	Horton Rd	&	214th St	2021	PM		66	12	7	51					7		6
960	Horton Rd	&	216th St	2011	AM	6	6			16	3	1		4			
960	Horton Rd	&	216th St	2011	PM	4	24			16		1		7			
960	Horton Rd	&	216th St	2021	AM	7	28			58	10	3		5			
960	Horton Rd	&	216th St	2021	PM	4	77			54	3	7		7			
961	Six Points Rd	&	216th St	2011	AM		19		6	87	14	5			1	1	9
961	Six Points Rd	&	216th St	2011	PM		55		9	37	6	10					4
961	Six Points Rd	&	216th St	2021	AM	3	24		7	110	37	13	2	4	2	9	8
961	Six Points Rd	&	216th St	2021	PM		78		14	45	16	32					7
962	Freemont Moore Rd	&	216th St	2011	AM	5	3	3		3			2	5	8	5	
962	Freemont Moore Rd	&	216th St	2011	PM	4	6	8		3			4	3	3	2	
962	Freemont Moore Rd	&	216th St	2021	AM	8	2	15	1	2			3	7	35	7	
962	Freemont Moore Rd	&	216th St	2021	PM	7	2	34	1	2			4	7	15	1	
963	Freemont Moore Rd	&	211th St	2011	AM	5	9			20				2			
963	Freemont Moore Rd	&	211th St	2011	PM	4	21			8				4			
963	Freemont Moore Rd	&	211th St	2021	AM	1	19			41	5	2					
963	Freemont Moore Rd	&	211th St	2021	PM	1	34			16	2	3		1			
964	Freemont Moore Rd	&	206th St	2011	AM		3		12	7	8	5	8		1	13	8
964	Freemont Moore Rd	&	206th St	2011	PM		4	1	6	3	2	6	11		1	8	11
964	Freemont Moore Rd	&	206th St	2021	AM		4	1	22	9	6	4	9		1	15	16
964	Freemont Moore Rd	&	206th St	2021	PM		5	2	12	4	1	4	14		2	8	20
965	Lamong Rd	&	206th St	2011	AM	4	9	3	2	20	4	2	5	6	6	9	2
965	Lamong Rd	&	206th St	2011	PM	8	28	7	2	13	3	5	11	7	3	5	2
965	Lamong Rd	&	206th St	2021	AM	4	9	2	2	21	4	3	6	7	6	10	2
965	Lamong Rd	&	206th St	2021	PM	8	29	7	2	13	3	6	11	7	3	6	2
966	Centennial Rd	&	206th St	2011	AM			1					12	1	3	20	
966	Centennial Rd	&	206th St	2011	PM	2		2					20	2	2	12	
966	Centennial Rd	&	206th St	2021	AM	1		1					13	1	3	21	
966	Centennial Rd	&	206th St	2021	PM	2		2					21	2	2	13	
967	Mule Barn Rd	&	206th St	2011	AM	4	27	2	7	82	12	8	5	7	6	9	7
967	Mule Barn Rd	&	206th St	2011	PM	10	98	13	4	33	3	8	9	9	5	4	4

ID	INTERSECTION N/S ROAD		E/W ROAD	YEAR	PEAK	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
967	Mule Barn Rd	&	206th St	2021	AM	5	42	2	6	125	16	10	4	9	6	7	6
967	Mule Barn Rd	&	206th St	2021	PM	16	153	14	3	52	3	8	6	15	5	3	3
968	Joliet Rd	&	206th St	2011	AM	1		2					16	1	5	20	
968	Joliet Rd	&	206th St	2011	PM	3		4					19	3	4	11	
968	Joliet Rd	&	206th St	2021	AM	1		2					19	1	4	25	
968	Joliet Rd	&	206th St	2021	PM	3		4					23	3	4	14	
969	Hamilton Boone Rd	&	206th St	2011	AM	7	13	5	4	45	6	2	7	8	10	10	2
969	Hamilton Boone Rd	&	206th St	2011	PM	7	48	12	3	22	2	4	9	8	6	4	3
969	Hamilton Boone Rd	&	206th St	2021	AM	7	12	5	5	41	7	2	9	8	10	13	3
969	Hamilton Boone Rd	&	206th St	2021	PM	8	44	13	3	20	2	5	12	8	6	6	4
970	Hamilton Boone Rd	&	216th St	2011	AM		15	2	2	46					3		1
970	Hamilton Boone Rd	&	216th St	2011	PM		47	3	1	23					2		1
970	Hamilton Boone Rd	&	216th St	2021	AM		15	1	3	46					3		2
970	Hamilton Boone Rd	&	216th St	2021	PM		44	4	2	22					2		2
971	Mule Barn Rd	&	216th St	2011	AM	1	31	7	5	78	1	1	1	2	12	1	4
971	Mule Barn Rd	&	216th St	2011	PM	3	85	6	1	34		1	1	3	4		1
971	Mule Barn Rd	&	216th St	2021	AM	2	47	8	5	116	2	1	1	3	14	1	4
971	Mule Barn Rd	&	216th St	2021	PM	4	126	7	1	50		1	1	4	5		1
972	Lamong Rd	&	216th St	2011	AM	3	13	1	3	23	8	6	4	3	2	7	3
972	Lamong Rd	&	216th St	2011	PM	1	28	1	5	15	3	5	2	1		1	3
972	Lamong Rd	&	216th St	2021	AM	3	14	1	4	23	7	6	6	4	3	10	4
972	Lamong Rd	&	216th St	2021	PM	2	28	2	5	15	3	4	3	1	1	2	4
974	Lamong Rd	&	211th St	2011	AM		17	1	1	25					3		2
974	Lamong Rd	&	211th St	2011	PM		28	3	1	16					2		1
974	Lamong Rd	&	211th St	2021	AM		18	1	1	26					2		2
974	Lamong Rd	&	211th St	2021	PM		31	2	1	17					2		1
1089	Lamong Rd	&	211th St	2021	AM	45	48	27	1	48	1	1	2	32	79	2	1
1089	Lamong Rd	&	211th St	2021	PM	111	48	76	3	74	4	3	15	93	31	9	1
1090	Thatcher Ln	&	151st St	2011	AM	67	77	16	22	56	83	127	236	72	35	534	62
1090	Thatcher Ln	&	151st St	2011	PM	256	176	112	20	102	63	103	489	278	51	247	18
1090	Thatcher Ln	&	151st St	2021	AM	155	43	5	5	29	145	209	201	147	10	547	14
1090	Thatcher Ln	&	151st St	2021	PM	434	177	80	12	97	97	160	496	456	31	246	9
1092	Greyhound Pass	&	147th St	2011	AM		423	27	19	281					42		46
1092	Greyhound Pass	&	147th St	2011	PM		582	18	102	798					22		88
1092	Greyhound Pass	&	147th St	2021	AM		568	25	17	374					40		40

ID	INTERSECTION N/S ROAD		E/W ROAD	YEAR	PEAK	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
1092	Greyhound Pass	&	147th St	2021	PM		778	12	97	1075					15		84
1094	Greyhound Ct	&	151st St	2011	AM	52		188					67	43	182	58	
1094	Greyhound Ct	&	151st St	2011	PM	49		191					82	28	155	85	
1321	Greyhound Ct	&	Greyhound Pass	2011	AM	7	44	28	148	63	29	33	228	9	46	235	159
1321	Greyhound Ct	&	Greyhound Pass	2011	PM	115	158	111	41	148	51	58	345	137	131	343	55
1321	Greyhound Ct	&	Greyhound Pass	2021	AM	4	11	64	40	16	3	2	123	5	94	115	43
1321	Greyhound Ct	&	Greyhound Pass	2021	PM	143	57	181	3	51	5	4	98	157	203	94	5
1481	Dartown Rd	&	SR 32	2011	AM	49	28	33	14	29	17	55	564	160	74	407	24
1481	Dartown Rd	&	SR 32	2011	PM	173	55	96	33	43	60	27	438	65	50	593	21
1481	Dartown Rd	&	SR 32	2021	AM	24	28	56	154	33	69	190	727	51	71	487	214
1481	Dartown Rd	&	SR 32	2021	PM	25	25	94	269	23	173	108	534	48	69	796	237
1482	Oakridge Rd	&	206th St	2011	AM				10				18			17	4
1482	Oakridge Rd	&	206th St	2011	PM				5				20			19	9
1482	Oakridge Rd	&	206th St	2021	AM				28		3	2	4			5	9
1482	Oakridge Rd	&	206th St	2021	PM				14		2	2	5			5	11
1497	Western Way	&	146th St	2011	AM	121	172	67	47	164	90	121	413	159	179	842	135
1497	Western Way	&	146th St	2011	PM	126	215	109	103	229	121	177	780	198	103	498	92
1497	Western Way	&	146th St	2021	AM	153	82	204	28	68	27	28	635	159	449	1197	83
1497	Western Way	&	146th St	2021	PM	150	98	301	51	101	33	41	1098	232	302	680	55
1540	Marsh Dr	&	Greyhound Pass	2011	AM	46	28	41	26	23	31	16	201	20	31	357	24
1540	Marsh Dr	&	Greyhound Pass	2011	PM	77	125	94	91	102	73	87	600	73	66	425	78
1540	Marsh Dr	&	Greyhound Pass	2021	AM	6	7	124	52	6	3	1	122	1	95	272	48
1540	Marsh Dr	&	Greyhound Pass	2021	PM	16	65	270	139	53	9	8	376	13	197	245	131
1648	Cool Creek Park Rd	&	Greyhound Pass	2011	AM				29		21	27	253			400	50
1648	Cool Creek Park Rd	&	Greyhound Pass	2011	PM				60		25	100	740			473	127
1648	Cool Creek Park Rd	&	Greyhound Pass	2021	AM	1	2	3	46	1	22		282			501	85
1648	Cool Creek Park Rd	&	Greyhound Pass	2021	PM	3	4	5	104	2	26	1	845	2	1	552	229
1654	Oak Rd	&	147th St	2021	AM	78	3			1	1	1		64			
1654	Oak Rd	&	147th St	2021	PM	78	3			1	1	1		64			
1672	Cool Creek Park Rd	&	151st St	2011	AM	31	21	28	19	10	21	19	223	13	29	559	42
1672	Cool Creek Park Rd	&	151st St	2011	PM	64	119	73	32	25	28	85	470	41	24	242	50
1672	Cool Creek Park Rd	&	151st St	2021	AM	72		20	2	1			170	60	12	328	1
1672	Cool Creek Park Rd	&	151st St	2021	PM	226	4	9	5	3	3	1	414	125	20	158	2
1682	East St Extension	&	196th St	2021	AM	56		11						12	11	1	
1682	East St Extension	&	196th St	2021	PM	37	5	30	1	20				60	12		1

ID	INTERSECTION			YEAR	PEAK	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
	N/S ROAD		E/W ROAD														
1813	West Access Rd	&	191st St	2021	AM	36		123					549	54	125	366	
1813	West Access Rd	&	191st St	2021	PM	29		197					680	21	194	827	

Appendix D:
Travel Demand Modeling Procedures

1 Introduction

This appendix outlines the process used in developing a travel demand model for the City of Westfield, Indiana. A travel demand model is a set of data and mathematical equations that attempt to replicate the trip making behavior of people, specifically, vehicle-oriented trips. This is typically done through the four-step process of trip generation, trip distribution, mode choice and traffic assignment. Through this four-step modeling process, the impacts resulting from land use development, changes to transportation infrastructure, or changes in public policy can be estimated prior to their actual implementation. The travel demand model developed for the City of Westfield provides a tool for investigating the impacts caused by future land use development in the region. Figure 1 shows the model area for the Westfield travel demand model in relation to the Indianapolis metropolitan area.

The Westfield travel demand model was originally developed in 2007 to support road impact fee analysis and other long term transportation planning needs for the City of Westfield. As part of the 2011 update of the road impact fee Zone Improvement Plans, the model has been revised and updated with new data to quantify the total number of trips in the analysis years of 2011 and 2021 and to assess potential transportation improvements to the system in order to maintain an acceptable level of service throughout this analysis period. External data used by the model included trip rate data from the Indiana State Travel Demand Model (ISTDM) and the Travel Demand Model of the Indianapolis Metropolitan Planning Organization (MPO) in order to estimate the number of external trips that would influence the subarea. The outputs from the Westfield travel demand model that were used to help develop the Zone Improvement Plan include:

- Base year (2011) daily traffic volumes
- Base year (2011) peak hour traffic volumes
- Forecast year (2021) daily traffic volumes
- Forecast year (2021) peak hour traffic volumes

The travel demand model is structured to support the analysis of traffic conditions on the existing road network in the study area, along with any committed transportation improvement projects that will be implemented within the forecast horizon. The impacts of additional proposed projects can also be evaluated as needed.

Figure 1 Westfield model area

2 Model Development

The travel demand modeling software used for the Westfield model is TransCAD version 5.0, developed by Caliper Corporation. The TransCAD package uses the traditional four-step modeling concept of trip generation, trip distribution, mode split and traffic assignment to produce traffic demand forecasts. The mode split functionality of TransCAD is not utilized by the Westfield model as the transit ridership within the study area is sufficiently low. Therefore, all forecasts produced by TransCAD are assumed to be vehicle trips only.

This model was originally created for the 2007 Westfield Impact Fee Assessment and has been updated as appropriate for this 2011 assessment.

2.1 Model Network

Identification of which roads to include in the modeled network is an important initial step in the modeling process. Inclusion of more roads in the modeled network can potentially improve the accuracy of the model in replicating trip-making patterns, but it multiplies the amount of base condition information required (e.g., traffic volumes, speeds and lanes) and complicates the model development process. For Westfield, all roads that are functionally classified as arterials or collectors were included in the model network.

Coding the roadway network involved assembling a basic description of each roadway segment, or network link. The roadway network links contain the necessary data to determine the travel impedance for each path, or route. The link attribute information includes:

- segment distance
- highway name
- facility type (functional classification)
- traffic counts for base year
- number of lanes
- surrounding area type
- highway capacity (from lookup table)
- travel time (from lookup table)
- posted speed limit
- cross section type
- signal density factor
- one-way indicator

2.1.1 Network Attributes

Linktype

The Westfield travel demand model requires each roadway link to be classified by four attributes: linkclass, area type, signal density and cross section. These four attributes jointly make up the linktype. The linktype is then used to assign various additional characteristics to the link based on model-wide averages for all links with the linktype. This process ensures that vehicular traffic will react to new roadways added to the Westfield travel demand model in a similar manner as they react to similar facilities already in the roadway system.

The first Linktype attribute is the **Linkclass**, or functional classification. The Linkclass was assigned to each roadway in the Westfield travel demand model network based on the facility's functional classification. The coding nomenclature for Linkclass is as follows:

1 = Interstate
2 = Freeway
3 = Ramp
4 = Expressway
5 = Principal Arterial
6 = Minor Arterial
7 = Major Collector
8 = Minor Collector
9 = Local
99 = Centroid Connectors

The second Linktype attribute is **Area Type**. Area Type was input based on each zone's socio-economic data. The zonal data was then passed to each roadway link within the zone using a GIS function within the TransCAD model script.

The following Area Type values can be assigned to zones and their corresponding road network based on the estimated activity:

1 = Rural
2 = Suburban
3 = Urban
4 = CBD
5 = External Zones

Signal Density is the third Linktype attribute. Signal density was assigned to each network link using the following values:

1 = Unsignalized
2 = Low Signal Density (1 to 2/sq. mile)
3 = Medium Signal Density (2 to 3/sq. mile)
4 = High Signal Density (>3/sq. mile)

The fourth Linktype attribute is **Cross Section**, which defines the median treatment. This attribute was assigned for each roadway link using the following values:

1 = Undivided
2 = Divided
3 = Two-way left turn

The four network attributes described above define the roadway Linktype. This definition is then used to assign each link with the respective attributes used during the travel demand modeling process.

Free flow speed

Free flow speed was derived by averaging the posted speed of all roadways within each Linktype bin. This speed was then adjusted as necessary during model validation to replicate travel characteristics identified through daily traffic counts. The free flow speeds in Westfield were typically altered from the originally estimated speeds by less than five miles per hour.

Link capacity

Link capacity was developed initially as an hourly traffic volume that results in a Level of Service “E “ as calculated by the Highway Capacity Model. The hourly capacities were then expanded using a daily factor. This factor, along with the number of lanes on the facility, inflates the hourly capacity to a representative daily capacity. Theoretically, the daily capacity of a lane is twenty-four times the hourly capacity, however, in practice; the demand for roadway capacity is focused during the peak periods.

Free flow speed and link capacity work in unison to define the relative impedance a vehicle would encounter by traveling along the model link. A very high free flow speed would attract trips from other lower speed facilities. A low capacity roadway would quickly encounter congestion and related reductions in travel speed, causing trips to seek alternative facilities. Care is taken to develop the speed and capacity table to weigh the relative attractiveness of one facility compared to all other facilities. It could be stated that the relative difference in values between Linktypes is as important as the absolute values of any Linktype.

Linktype, free flow speed, link capacity and the daily factor values are summarized in **Appendix D-1.**

Existing, Committed and Projects network

The links in the Westfield network were coded to represent three types of network scenario: Existing, Committed and the Projects scenarios. It was therefore necessary to associate a code with each link so that it could be determined which network scenario it belonged to. Details of the link codes are discussed in Section 5.

2.1.2 Network development

As a starting point for developing the model network, all roads functionally classified as collectors or higher, either on INDOT functional classification maps or on the Westfield Thoroughfare Plan, in addition to several other important links in the current roadway system, were included in the network. Several roads outside Westfield, such as those just across the City limits in Carmel were also added to ensure a realistic approximation of existing conditions. Data about the existing characteristics of these roads were collected by examining aerial photographs, GIS data layers, municipal ordinances, and field observation.

Initially, the facility type for each roadway link was coded based on the functional classification of the road as shown on the INDOT functional classification maps. As part of the model calibration process, the facility types were reconsidered holistically and in some cases reclassified to better match the current use and function of a roadway. This was especially important due to the transition of the area from rural to urban and the lag in updating official functional classification maps to reflect this change.

The roadway network developed for the Westfield demand model is presented in Figure 2.

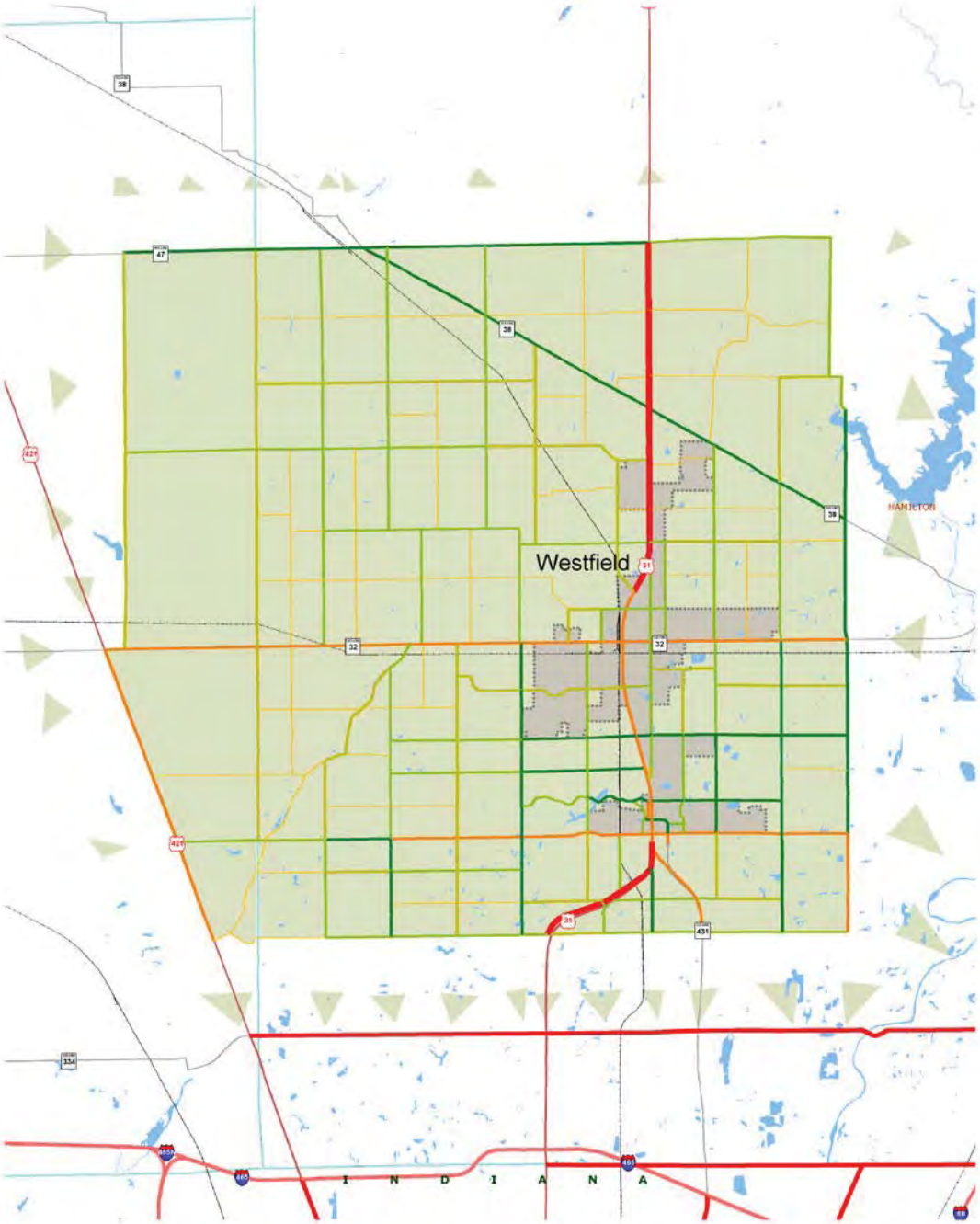


Figure 2: Westfield Network

2.2 Traffic Analysis Zones

Traffic analysis zones (TAZ) represent a geographic area within the travel demand model in which land uses are aggregated to produce the origin or destination of trips.

The TAZs in the Westfield model were designed to be relatively small to allow accurate traffic loading on the dense network of modeled roads. In most cases, the boundaries of TAZs in the Westfield model are the network roadways, with each TAZ representing one “block” in the model roadway network. The TAZs are larger in some of the outlying areas of the model, since these areas are largely rural and have relatively few households and jobs. All TAZ boundaries are consistent with census block boundaries and with TAZ boundaries in the Indianapolis MPO Nine County Travel Demand Model—this will make future updates to this model easier to complete.

Centroids represent the point at which all trips going to or from a TAZ interact with the model network. To connect centroids to the network, centroid connectors are added. The centroid connectors typically represent the local streets within the TAZ and were constructed so as to connect with the model network similar to the actual local street intersections. TAZ structure developed for the Westfield model is shown in Figure 3.

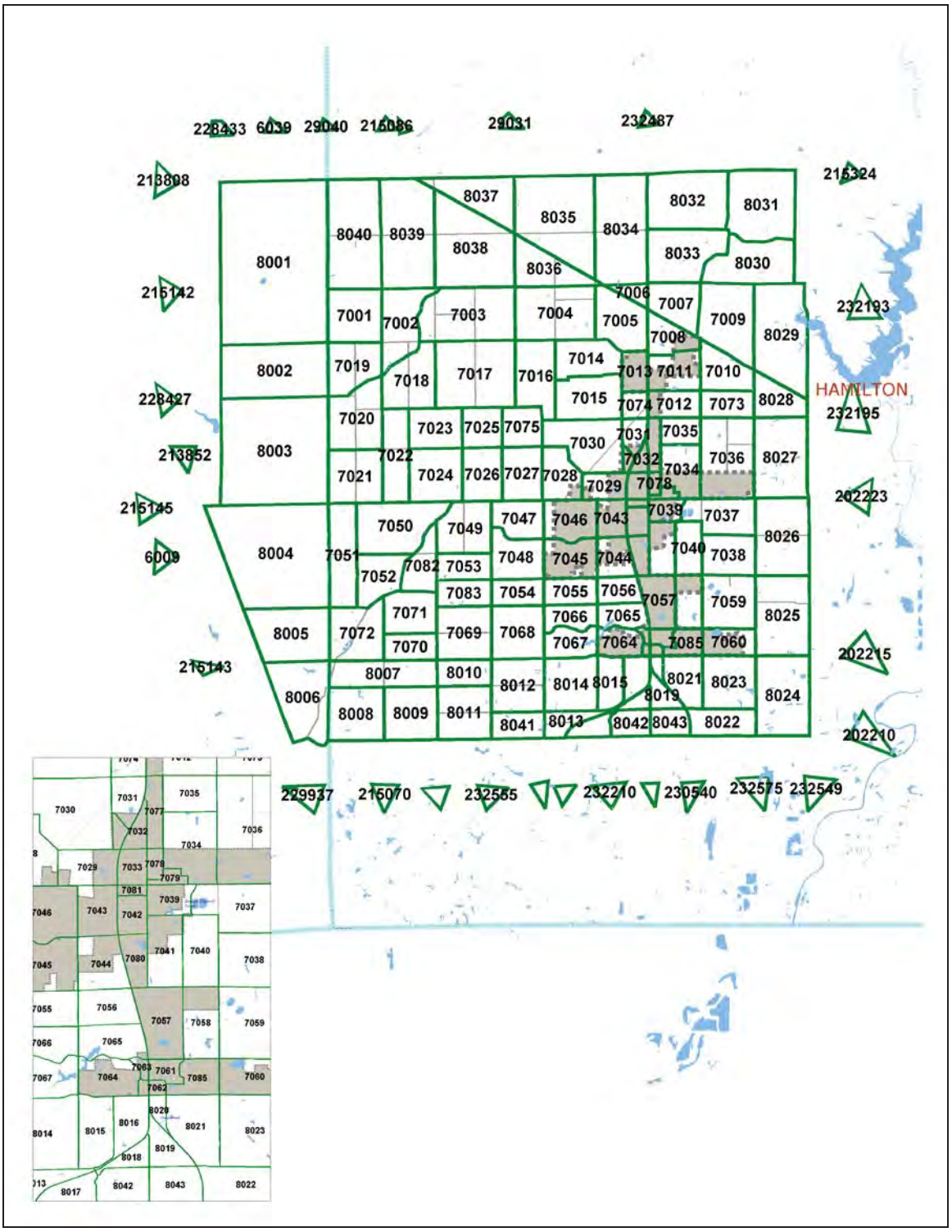


Figure 3 Westfield TAZ structure

2.3 Socio-economic Data

The Westfield TransCAD travel demand model requires accurate socio-economic data as an input into the traffic forecasting process. This socio-economic data is available in many forms and from many sources. Typically, the data must provide at least one source for estimating trip productions and one source for estimating trip attractions. The trip productions are traditionally a function of the number of persons or households within an area. Trip attractions are related to activities outside the house, such as employment, school, shopping or recreation within an area. Socio-economic data are summarized at the TAZ level for both the base year 2011 and the future year 2021. Housing, total employment and school enrollment data (2011, 2021) for each TAZ are summarized in **Appendix D-2**.

2.3.1 2011 Socio-Economic Data

The number of households in the study area was obtained from the 2010 Census block-level data and aggregated for each TAZ. This information was updated to 2011 using parcel/land use GIS data and issued building permit data provided by the City of Westfield. The number of housing units was estimated by using the ratio of housing units to households obtained from Census 2000 data, as this information was not yet available from the 2010 Census.

2011 employment data, including business location, type, and number of employees for all businesses in the model area, was purchased from Neilsen Claritas. This information was checked and corrected for major errors, such as double-listings, incorrect business locations, and newly-opened or recently-closed businesses.

2.3.2 2021 Socio-Economic Data

Socioeconomic information for the year 2021 was developed by two methods—one for Washington Township and one for the outlying portions of the model area. For TAZs outside of Washington Township, the growth in housing units and employment was determined using the 2010-2020 growth rates for the corresponding TAZs in the Indianapolis MPO travel demand model. For the TAZs within Washington Township, information about planned development provided by the City of Westfield was used to generate 2021 totals for housing and employment. The total housing and employment for all Washington Township TAZs was adjusted to be similar to overall township-level target values that were developed by projecting trends observed during the 2000 to 2010 time period.

2.4 Terminal Travel Times

The time required to travel from a trip's true origin, such as a house, to the trip's true destination, such as an office, includes time that is not spent on the modeled transportation network. This is time required to access the vehicle or to park the vehicle. The sum of these additional times is called terminal time, and it is assumed to

be a function of the area type of the respective origin and destination zones. Table 1 shows the terminal times that are added to each end of the trip based on the area type of each end of the trip.

Table 1 Terminal Times by Area Type

TAZ Area Type	Terminal Time (minutes)
Rural	0.5
Suburban	1.0
Urban	1.5
CBD	2.0
External	3.0

3 Model Process

3.1 Trip Generation

Trip generation is the estimation of the number of person trips that occur in the study area. Trip generation is estimated differently by the travel demand model based on whether the trip has both ends within the modeled area, one end within the modeled area, or both ends outside of the modeled area. These methods are described below.

3.1.1 Internal Trips

Internal trips have both trip ends within the study area, with one end identified as a production and one end as an attraction. The number of trip productions is typically estimated by developing per-household trip rates for various household types and trip purposes from household survey data. These rates are then multiplied by the corresponding number of households of that type within each TAZ in the model. Trip attractions are typically estimated by developing different trip rates for each trip purpose based on the type of employment and adding any trips from special generators, such as sports complexes or shopping malls. Trip rates for both productions and attractions developed for the ISTDM were used by the Westfield demand model, with the assumption that the City of Westfield, being a subarea for the ISTDM, would be adequately represented by those trip rates. For the Westfield travel demand model, three types of trip purposes were used: Home-based work, Home-based other and Non-home based.

The trip generation rates for the various production, attraction and trip purposes categories are summarized in **Appendix D-2**.

3.1.2 External Trips

Trips that have one or both trip ends outside of the model study area are called external trips, and the number of these trips must be estimated using a method that is not based on socio-economic activity within the model TAZs. Instead, the number of daily external trips entering and leaving the Westfield study area was estimated from the Indianapolis MPO regional travel demand model. A subarea corresponding to the study area for the Westfield model was extracted from the MPO model, and the trips to, from and through this subarea were recorded for use in the Westfield model assignment process. The MPO model has a base year of 2010 and forecast years of 2020 and 2030, whereas the base year for the Westfield demand model is 2011 and its forecast year is 2021. Therefore the year 2011 and 2021 subarea trip tables were obtained by the interpolation of the year 2010, 2020 and 2030 trip tables from the MPO model.

External trips enter and exit the Westfield model study area through special external TAZs, which are shown as triangles in Figure 3. These are generally established along the roads that lead into and out of the study area. In order to be compatible with the Indianapolis MPO travel demand model, the traffic volumes traveling to and from these external TAZs in the Westfield model was estimated to match the volumes in the MPO model. During the model validation process, which is described later, the volumes at the external TAZs were adjusted somewhat in order to better match actual traffic counts. Although the overall regional trends displayed by the MPO demand model are expected to be accurate, the total trips for a specific roadway may or may not be accurate enough.

A trip with both origin and destination at external centroids only is defined as an External/External trip (EE trip). These trips are only passing through the Westfield study area on their way between an origin and destination outside of the study area. Since EE trips do not interact with the internal centroids, these do not need to be split into the various trip purposes and can be set aside as a fixed number of trips with known origin and destinations that would load the network. The origins and destinations of the EE trips are known from the MPO subarea analysis, and the EE trip table is used directly as an input to the Westfield model.

Any trip having an origin/destination at an external centroid, and a corresponding destination/origin at any internal centroid within the network is defined as an External-Internal or Internal-External trip (EI/IE trip). EI/IE trips are identified by subtracting the known number of EE trips from the volume at each external TAZ:

EI/IE = Counts-EE
where:
Counts = ADT counts (observed, estimated or forecast)
EE = Year 2011 or Year 2021 EE trips from subarea analysis of the statewide model.

Some assumptions were made in order to estimate additional data required for modeling the EI trips. These are summarized below:

- The EI trips interact with internal zones by trip purposes. The percentage of the EI trips for each of the various trip categories was assumed to be equal to the overall percentage for the internal zones of the City of Westfield.
- The external productions and attractions percentages were estimated based on the area types present in external locations in the vicinity of the external centroid and the location of the external zones in relation to the Indianapolis metropolitan area.
- The percentage of the 2021 estimated EI trips for Home based work, Home based other and Non-home based categories was assumed to be equal to the percentages estimated for the base year
- External productions and attractions percentages in 2021 were assumed to be equal to the percentages estimated for the base year.

3.1.3 Trip Balancing

The last step in the trip generation process is balancing of the region's person trip productions and attractions. The balancing of trips is typically done by scaling the region's attractions to match the region's productions by trip purpose. This is done on a TAZ basis, with the revised number of attractions calculated as the original number of attractions times the ratio of the sum of the region's trip productions divided by the sum of the region's attractions. The non-home based trip purpose is additionally modified by setting each TAZ's productions equal to the TAZ's balanced trip attractions. This is done to match the non-home based purpose's definition of trips that do not have the home as a trip end.

A point to note here is that since the EI/IE trips are estimates from the MPO regional model, the scaling of the attractions to match the productions was done such that the number of EI/IE trips remained unchanged.

3.2 Trip Distribution

Trip distribution is the second step in the traditional four step process. Whereas trip generation identifies the number of trips traveling into and out of each TAZ, trip distribution is the process of identifying the production or origin TAZ and the attraction or destination TAZ for each trip. The likelihood of any one production being matched with any other attraction to form a trip is a function of the relative impedance between the particular two trip ends in comparison to all other possible trip end combinations. This impedance is primarily a function of the roadway network connecting the two trip ends, but may also include socio-economic factors such as income stratification. Trip distribution is conducted for each resident trip purpose individually.

3.2.1 Gravity model

The resident trip distribution for the Westfield model is conducted using a gravity model. The formula for the gravity model used for trip distribution uses the same general terms

as Newton's formula for calculating the force of attraction between two masses. The number of trip productions is used in place of the mass of the first body, while the number of trip attractions is used in place of the mass of the second body. An impedance value between the trip production zone and the trip attraction zone, derived from the network travel time and/or travel distance, is used in place of the square of the distance between the two bodies. Additionally, socio-economic and geophysical factors that influence human trip making decisions are implicitly included within the trip distribution gravity model formula.

The equation for the gravity model is given below:

$$Trips_{i,j} = P_i \times \left[\frac{A_j \times F_{i,j} \times K_{i,j}}{\sum_{j=1}^{n} \left(A_j \times F_{i,j} \times K_{i,j} \right)} \right]$$

where

$Trips_{i,j}$ = Number of trips from zone i to zone j
P_i = Total trips produced in zone i
A_j = Total trips attracted by zone j
$F_{i,j}$ = Friction factor from zone i to zone j (section 3.2.2)
$K_{i,j}$ = Correction factor known as the K-factor (section 3.2.3)

3.2.2 Friction-factors

The friction factor gives a measure of the 'attractiveness' for traveling from zone I to zone j. In theory, the attractiveness of a zone has an inverse relation with travel time. However the relation is not linear. The Gamma function is used to model the friction factor, i.e. the relationship between the travel time to a centroid and its attractiveness. The A, B and C parameters for the gamma function (Gamma function coefficients) [1] for the various trip purposes are summarized in Table 2.

Table 2 A, B and C Parameter values for Gamma Function

Purpose	A	B	C
HBW	28507	0.02	0.103
HBO	139173	0.96	0.062
NHB	219113	1.75	0.01

The equation for the friction factor is summarized below:

[1] Gamma function coefficients were adapted from Chapter 4 of the NCHRP Report 365.

$$Friction_Factor = A*(Time^{-B})*e^{(-C*Time)}$$

3.2.3 K-factors

K-factors are correction factors used in the gravity model for two purposes. The primary application of the K-factors is to prevent the 'known' EI/IE trips (from the MPO Model subarea analysis) from having a trip end at another external zone. However the EI/IE trips are allowed to be distributed among internal zones based on the gravity model distribution. The secondary application of the K-factors is to influence the trip ends to some of the locations where the travel pattern is known in order to account for regional behavior factors beyond the extents of the Westfield demand model, which the gravity model cannot replicate. For instance, there is an extensive number of attractions south of the modeled study area due to the commercial activities in the Indianapolis region. As these trip attractions are outside of the Westfield model boundaries, they cannot be properly represented in the Westfield model without the introduction of the K-factors.

3.2.4 External Trips

EE and EI trip tables for base and forecast years are extracted from the subarea analysis and estimated as mentioned under section 3.1.1 and 3.1.2. EE trip tables have known origins and destination and are therefore not subjected to the gravity model. The EI productions and attractions are incorporated into the gravity model with the appropriate K-factors applied to them as discussed under section 3.2.2. External trip tables are vehicle trips, whereas the internal trips described in section 3.2.5 are person trips. In order to combine the trip tables for further processing, it is necessary to have similar units for both trip tables. Therefore auto occupancy factors given in Table 3 are applied to external trip tables in order to convert them into person trips.

3.2.5 Passenger trips to vehicle trips conversion

The internal trip tables (I-I trips) produced by the trip distribution process are person trip tables. Person trips are converted to vehicle trips through the application of auto occupancy factors that are based on trip purpose. The auto occupancy factors used in the Westfield model are consistent with those used by the MPO model for the various trip purposes. Auto occupancy factors used by the Westfield demand model are summarized in Table 3.

Table 3 Auto Occupancy factors across different trip purposes

Trip Purpose	Auto occupancy (persons/vehicle)
HBW	1.153
HBO	1.87
NHB	1.757

3.2.6 Peak hour and daily trip table

The results of the gravity model are productions to attractions tables for a 24 hour period. The productions to attractions tables do not convey directionality as all the production are at the households, whereas only half the trips start at the household and half end at the households. By transposing the production-attraction tables and averaging it with the original production-attraction table the origin-destination trip table is established.

In order to estimate the AM and PM peak hour trip tables, a proportion of the daily production-attraction trip table and a proportion of the daily production-attraction transposed trip table are combined. This is because the AM and PM would both contain a fraction the daily trips. Moreover, the AM and PM trip tables would be expected to have different directionalities. The factors applied for AM and PM trip tables are summarized in Table 4.

Table 4 Directional factors for AM and PM peak

	AM PA Factor	AM AP Factor	PM PA Factor	PM AP Factor
HBW	0.22	0.03	0.0073	0.12
HBO	0.08	0.03	0.08	0.09
NHB	0.45	0.45	0.1	0.1

Note: PA = Production to attraction direction
AP = Attraction to production direction

3.3 Traffic Assignment

Traffic volumes by link are calculated through the traffic assignment process. This process uses the trip table and the roadway network to estimate the number of trips that use each link in the network. Several traffic assignment methods are available within TransCAD, but the user equilibrium method was found to best replicate existing traffic counts through the calibration process.

The user equilibrium method is described in the Travel Demand Modeling with TransCAD 4.0 User's Manual[2] as "...an iterative process to achieve a convergent solution, in which no travelers can improve their travel times by shifting routes. For each iteration, network link flows are computed, which incorporate link capacity restraint effects and flow-dependent travel times." This simply states that each trip is assigned to the route with the shortest travel time when delay due to congestion is considered. The travel times are recalculated using the following formula:

[2] Travel Demand Modeling with TransCAD 4.0 User's Manual, 2001 Caliper Corporation

$$T = T_f\left[1 + \alpha(v/c)^{\beta}\right]$$

where:

$T = Computed\ Travel\ Time$

$T_f = Uncongested\ Travel\ Time$

$\alpha = Alpha$

$v = Assigned\ Volume$

$c = Capacity$

$\beta = Beta$

Alpha and beta parameters were input into the network and were based on functional class. For the peak hour assignment, the hourly capacities estimated for each link were used. For the daily capacity, the hourly capacity for each link was multiplied by a corresponding daily factor in order to estimate a daily capacity as discussed in section 2.1.1. These are summarized in **Appendix D-1**.

In addition to the uncongested travel time, capacity, alpha and beta which are required as inputs for the user equilibrium method, two more input parameters need to be specified. The two parameters are iterations and convergence. Iterations refer to the maximum number of iterations to be performed if a convergent solution is not reached earlier. Convergence refers to the value with which the algorithm determines whether a convergent solution has been reached. If the maximum absolute change in all the link flows between consecutive iterations is less than this value, convergence is achieved and the assignment procedure stops. The convergence parameter was specified as 0.00001 and the maximum number of iterations was set to be 20.

The output of the traffic assignment process is a link by link forecast of traffic volume. Congested travel speeds by link are also output and are used to estimate the amount of delay experienced by vehicles. Volume to capacity ratios indicate the expected level of congestion on each link. The user equilibrium process was also utilized to create turning movements and select link and zone analyses.

3.4 Calibration and Validation

Calibration is the process of adjusting model parameters to better replicate known daily volumes. K-factors were modified to best replicate movements from the regional destinations within the model area. Network inconsistencies were identified and readjusted as necessary during the calibration stage. The validation of the Westfield travel demand model was conducted by comparing the final assignment outputs after the calibration step, with known daily volumes. Several measures were used for model validation- Root Mean Squared Error (RMSE). R squared measures and volume to count ratios. Table 5 summarizes the Volume to Count Ratio, RMSE and R-squared

measures for the Westfield daily and peak hour travel demand model, and the established acceptable ranges. The primary modeling effort was to ensure that the daily volumes for the travel demand model are well within all acceptable ranges for error. The peak hour component, in general, was found to be close to acceptable ranges, but the peak hour component may need to be further calibrated prior to application for any corridor analysis.

Table 5 Model Validation Thresholds and Results

Measure		Westfield Model	Acceptable	Source
Volume to Count Ratio	Total System	4.2%	+/- 5%	1
	Major Arterials	9.5%	+/- 10%	2
	Minor Arterials	6.2%	+/- 15%	2
	Collectors	9.4%	+/- 25%	2
Root Mean Square Error		32.07%	< 30%	2
R Squared		0.962	> 0.88	2

Sources:

1. Calibrating and adjustment of system planning models, Dane Ismart, Federal Highway Administration, December, 1990. http://ntl.bts.gov/DOCS/377CAS.html
2. Model validation and reasonableness checking manual, Travel Model Improvement Program and Federal Highway Administration, Barton-Aschmann Associates, Inc. and Cambridge Systematics, Inc., February 1997. http://tmip.fhwa.dot.gov/clearinghouse/docs/mvrcm/

Screenlines were also used to validate traffic assignment and trip distribution by verifying the total trips between two areas of the model are reasonable compared to traffic count information. Twelve screenlines have been generated for the Westfield travel demand model as shown in Figure 4. The results of the twelve screenlines are shown in Table 6. The acceptable error threshold for screenlines is dependent on the amount of traffic crossing the screenline, as outlined in the Model validation and reasonableness checking manual.

Table 6 Screenline validation

Screenline	Volume	Count	Ratio	Threshold
1	73778	71081	1.037943	0.8-1.2
2	96085	101349	0.948061	0.8-1.2
3	61410	57907	1.060494	0.8-1.2
4	47495	47147	1.007381	0.75-1.25
5	40619	46349	0.876373	0.75-1.25
6	31856	33676	0.945956	0.7-1.3
7	20848	19761	1.055007	0.65-1.35
8	34113	29653	1.150406	0.7-1.3
9	66392	67253	0.987198	0.75-1.25
10	97891	93088	1.051596	0.8-1.2
11	79643	82443	0.966037	0.8-1.2
12	70322	78270	0.898454	0.75-1.25

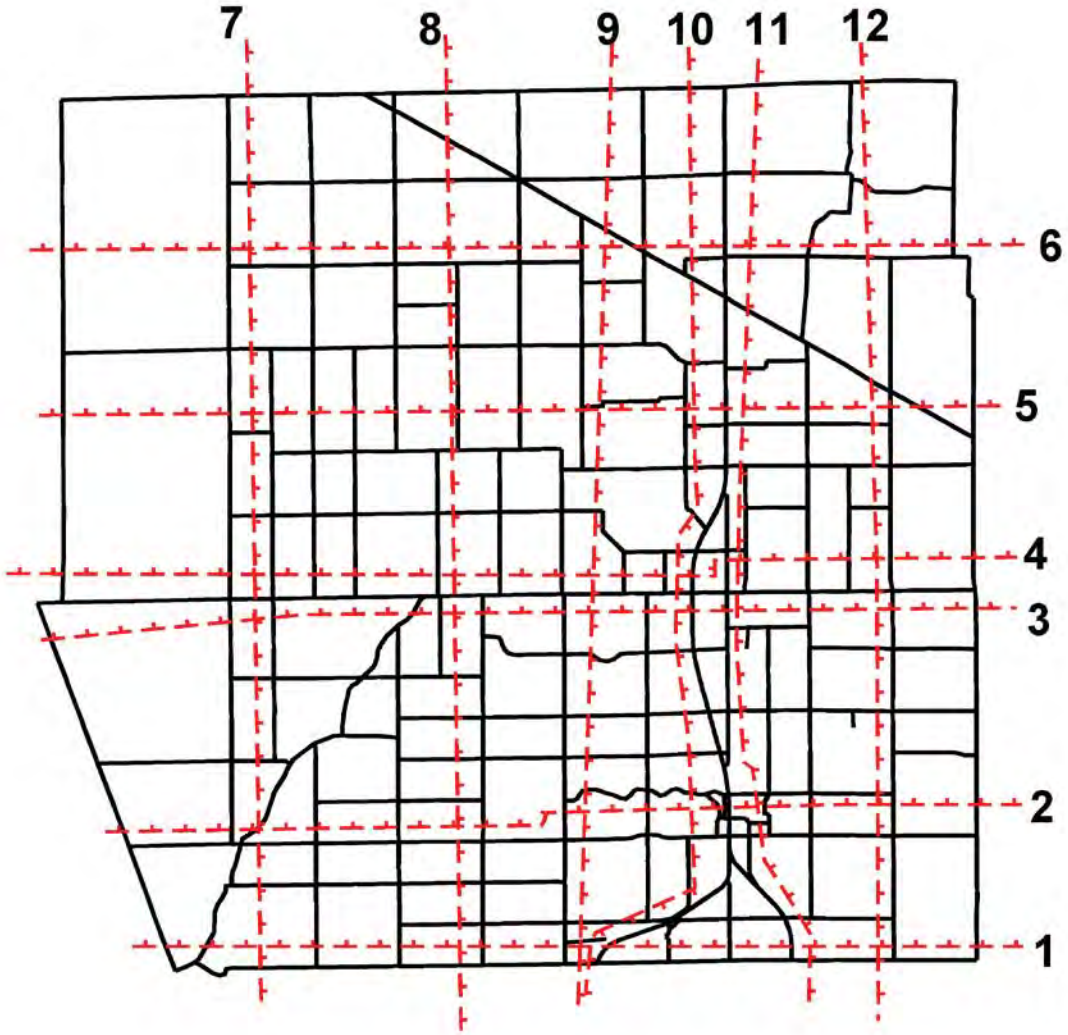


Figure 4 Screenlines in Westfield demand model

4 Model interface

The Westfield travel demand model interface has been programmed to evaluate the Existing, Committed and Projects scenarios. The Projects scenario can evaluate any combination of up to ten different projects.

Before running the interface, a map with the network and TAZ geographic file must be created and active within TransCAD. Details of the interface inputs and model fields are described below.

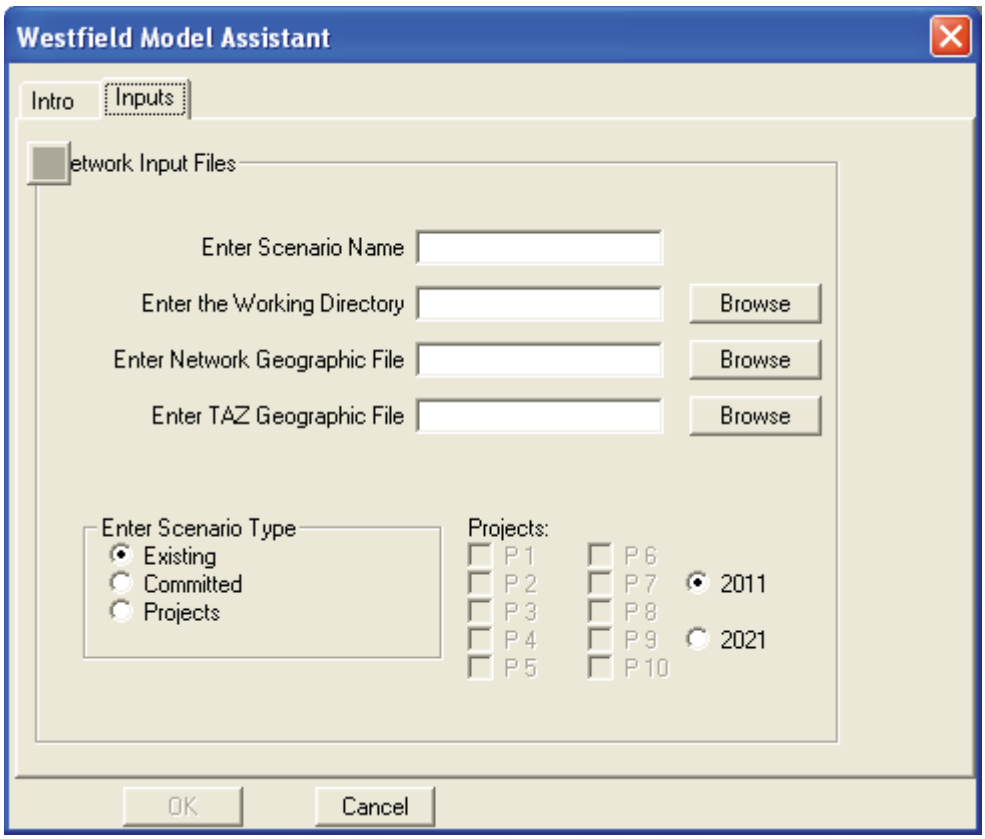


Figure 5 Input screen

Figure 5 shows the input screen for the Westfield demand model interface. The various inputs required are described below:

<u>Enter scenario name</u>: A name for the scenario to be evaluated needs to be specified. A folder with the scenario name is created within the working directory (described below), and all outputs of the scenario are contained within this folder.

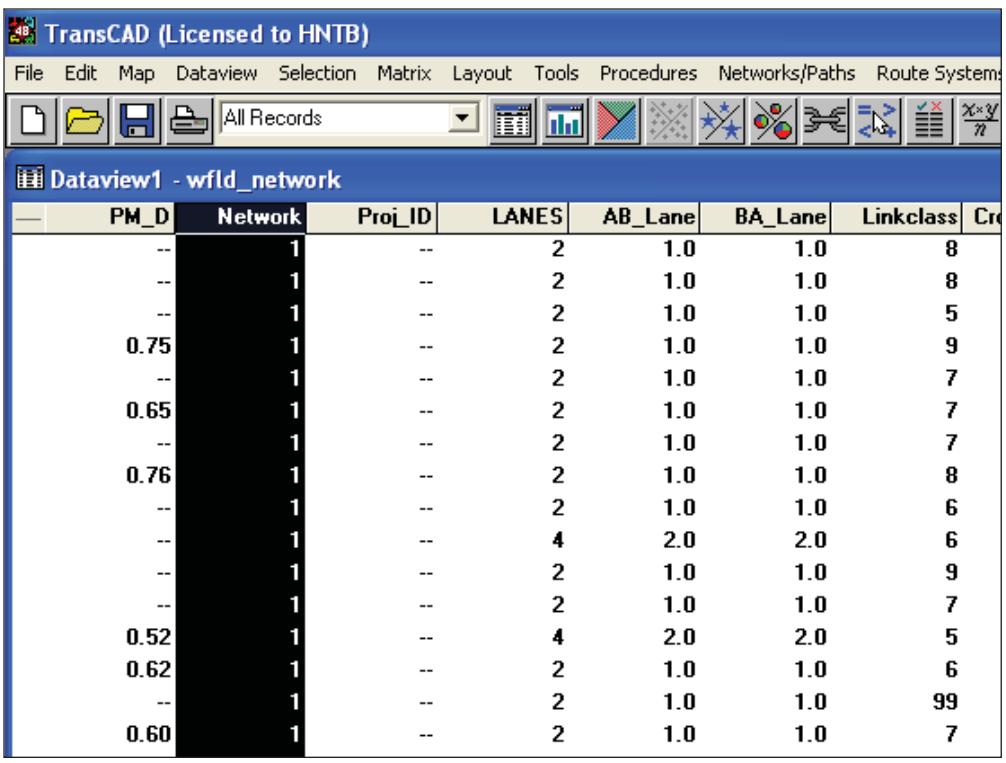
Enter the Working Directory: Working directory must be the parent directory for the Parameters folder. The model searches for the Parameters folder within the working directory.

Enter Network Geographic File: The path for the network geographic file needs to be specified. Network specified here must be the same as the one specified in the TransCAD map.

Enter TAZ Geographic File: The path for the TAZ geographic file needs to be specified. TAZ specified here must be the same as the one specified in the TransCAD map.

Scenario Type: Three types of network scenarios can be evaluated- Existing, Committed and Projects scenario. These scenarios can be evaluated for the base year (2011) as well as forecast year (2021) conditions. If the Projects network is selected, the 'Projects' check boxes become active. Up to 10 different projects can now be selected.

In order to run the model, the fields described below in the Dataview for the network need to be specified.



PM_D	Network	Proj_ID	LANES	AB_Lane	BA_Lane	Linkclass	Cr
--	1	--	2	1.0	1.0	8	
--	1	--	2	1.0	1.0	8	
--	1	--	2	1.0	1.0	5	
0.75	1	--	2	1.0	1.0	9	
--	1	--	2	1.0	1.0	7	
0.65	1	--	2	1.0	1.0	7	
--	1	--	2	1.0	1.0	7	
0.76	1	--	2	1.0	1.0	8	
--	1	--	2	1.0	1.0	6	
--	1	--	4	2.0	2.0	6	
--	1	--	2	1.0	1.0	9	
--	1	--	2	1.0	1.0	7	
0.52	1	--	4	2.0	2.0	5	
0.62	1	--	2	1.0	1.0	6	
--	1	--	2	1.0	1.0	99	
0.60	1	--	2	1.0	1.0	7	

Figure 6 Specifying the *Network* field

The *Network* field (Figure 6) can accept the following values: 1, 2, 3, -2, -3.

- 'Base' scenario evaluates all links where ***Network* = 1, -2 or -3**. As can be seen intuitively, -2 represents all links that are present in the 'Base' Scenario but are not present in the 'Committed' scenario, and -3 represents all links that are present in the 'Base' Scenario but are not present in the 'Projects' scenario.

- ‘Committed’ scenario evaluates all links where ***Network* = 1, 2 or -3**.
- ‘Projects’ scenario evaluates the links where *Network* = **1, 2 and selected 3 links** (explained in detail under Projects scenario).

4.1 Base Scenario

The fields that need to be specified for the base scenario include:
Network: The following integer values are acceptable: **1, -2, -3**.
Base_AB_Lane: Number of lanes in the A-B node direction.
Base_BA_Lane: Number of lanes in the B-A node direction.
Base_Linkclass: The following integer values are acceptable.1 = Interstate; 2 = Freeway; 3 = Ramp; 4 = Expressway; 5 = Principal Artery; 6 = Minor Artery; 7 = Major Collector; 8 = Minor Collector; 9 = Local; 99 = Centroid Connector
Base_Area_type: The following integer values are acceptable. 1 = Rural; 2 = Suburban; 3 = Urban; 4 = Central Business District (CBD)
Base_Signal_Den: The following integer values are acceptable. 1 = Unsignalized; 2 = Low signal density; 3 = Medium signal density; 4 = High signal density.
Base_Cross_Sect: The following integer values are acceptable. 1 = Undivided; 2 = Divided; 3 = Two way left turn lane (TWLTL)

4.2 Committed Scenario

The fields that need to be specified for the committed scenario include:
Network: ‘Committed’ scenario evaluates all links where ***Network* = 1, 2 or -3**. Other fields which need to be specified include *COM_AB_Lane, COM_BA_Lane, COM_Linkclass*, *COM_Area_type, COM_Signal_Den*, *COM_Cross_Sect*. The integer codes accepted by these fields are consistent with the ones specified under base scenario.

4.3 Projects Scenario

The fields that need to be specified for the projects scenario include:
Network: ‘Projects’ scenario evaluates all links where *Network* = **1 or 2, and the links where *Network* = 3 and the Proj_ID is equal to the projects selected in the input screen**.
Proj_ID: This field specifies the ID for a given project. A maximum of 10 projects is permissible, therefore this field can accept any integer value from 1 to 10.
Other fields that need to be specified include *PROJ_AB_Lane, PROJ_BA_Lane, PROJ_Linkclass*, *PROJ_Area_type, PROJ_Signal_Den*, *PROJ_Cross_Sect*. The integer codes accepted by these fields are consistent the ones specified under base scenario.

APPENDIX D-1

Notes:
CODE = Linktype
DFACTOR = Daily Factor
BPRALPHA, BPRBETA = Bureau of Public Roads “alpha” and “beta” factors used in speed/delay curves

LINKNAME	CODE	SPEED	CAPACITY	DFACTOR	BPRALPHA	BPRBETA
Inter_Rural_Unsig_Div	1112	70	2200	14.0	0.070	12.0
Inter_Sub_Unsig_Div	1212	68	2300	14.0	0.070	12.0
Inter_Urb_Unsig_Div	1312	65	2300	14.0	0.070	12.0
Inter_CBD_Unsig_Div	1412	60	2200	14.0	0.070	12.0
Frwy_Rural_Unsig_Div	2112	69	2200	14.0	0.070	12.0
Frwy_Sub_Unsig_Div	2212	67	2300	14.0	0.070	12.0
Frwy_Urb_Unsig_Div	2312	64	2300	14.0	0.070	12.0
Frwy_CBD_Unsig_Div	2412	58	2200	14.0	0.070	12.0
Ramp_Rural_Unsig_Div	3112	40	1400	12.0	0.150	5.5
Ramp_Rural_Low_Div	3122	35	1100	12.0	0.150	5.5
Ramp_Sub_Unsig_Div	3212	40	1400	12.0	0.150	5.5
Ramp_Sub_Low_Div	3222	35	1100	12.0	0.150	5.5
Ramp_Sub_Med_Div	3232	30	1000	12.0	0.150	5.5
Ramp_Sub_High_Div	3242	25	850	12.0	0.150	5.5
Ramp_Urb_Unsig_Div	3312	35	1400	12.0	0.150	5.5
Ramp_Urb_Low_Div	3322	35	1100	12.0	0.150	5.5
Ramp_Urb_Med_Div	3332	30	1000	12.0	0.150	5.5
Ramp_Urb_High_Div	3342	25	850	12.0	0.150	5.5
Ramp_CBD_Unsig_Div	3412	30	1200	12.0	0.150	5.5
Ramp_CBD_Low_Div	3422	30	1000	12.0	0.150	5.5
Ramp_CBD_Med_Div	3432	28	900	12.0	0.150	5.5
Ramp_CBD_High_Div	3442	25	800	12.0	0.150	5.5
Xprswy_Rural_Unsig_Div	4112	54	1900	12.0	0.085	9.0
Xprswy_Rural_Low_Div	4122	53	1250	12.0	0.100	8.0
Xprswy_Rural_Med_Div	4132	52	975	11.0	0.150	7.0
Xprswy_Sub_Unsig_Div	4212	52	1900	12.0	0.085	9.0
Xprswy_Sub_Low_Div	4222	51	1200	12.0	0.100	8.0
Xprswy_Sub_Med_Div	4232	50	930	11.0	0.150	7.0
Xprswy_Urb_Unsig_Div	4312	50	1800	12.0	0.085	9.0
Xprswy_Urb_Low_Div	4322	43	1200	12.0	0.100	8.0
Xprswy_Urb_Med_Div	4332	37	930	10.0	0.150	7.0
Xprswy_CBD_Unsig_Div	4412	40	1400	12.0	0.085	9.0
Xprswy_CBD_Low_Div	4422	40	1175	12.0	0.100	8.0
Xprswy_CBD_Med_Div	4432	35	900	11.0	0.150	7.0
PrinArt_Rur_Unsig_Undi	5111	56	1780	10.0	0.100	7.0
PrinArt_Rur_Unsig_Div	5112	56	1860	10.0	0.100	7.0
PrinArt_Rur_Unsig_TWLT	5113	55	2050	10.0	0.100	7.0
PrinArt_Rur_Low_Undiv	5121	50	1130	10.0	0.120	7.0
PrinArt_Rur_Low_Div	5122	48	1200	10.0	0.120	7.0
PrinArt_Rur_Low_TWLTL	5123	45	1300	10.0	0.120	7.0
PrinArt_Rur_Med_Undiv	5131	45	880	10.0	0.150	7.0

PrinArt_Rur_Med_Div	5132	45	900	10.0	0.150	7.0
PrinArt_Rur_Med_TWLTL	5133	45	1010	10.0	0.150	7.0
PrinArt_Rur_High_Undiv	5141	45	840	10.0	0.200	7.0
PrinArt_Rur_High_Div	5142	48	900	10.0	0.200	7.0
PrinArt_Rur_High_TWLTL	5143	48	970	10.0	0.200	7.0
PrinArt_Sub_Unsig_Undi	5211	45	1780	10.0	0.100	7.0
PrinArt_Sub_Unsig_Div	5212	45	1860	10.0	0.100	7.0
PrinArt_Sub_Unsig_TWLT	5213	45	2050	10.0	0.100	7.0
PrinArt_Sub_Low_Undiv	5221	46	1130	10.0	0.120	7.0
PrinArt_Sub_Low_Div	5222	46	1130	10.0	0.120	7.0
PrinArt_Sub_Low_TWLTL	5223	46	1300	10.0	0.120	7.0
PrinArt_Sub_Med_Undiv	5231	37	880	10.0	0.150	7.0
PrinArt_Sub_Med_Div	5232	38	880	10.0	0.150	7.0
PrinArt_Sub_Med_TWLTL	5233	37	1010	10.0	0.150	7.0
PrinArt_Sub_High_Undiv	5241	35	840	10.0	0.200	7.0
PrinArt_Sub_High_Div	5242	36	860	10.0	0.200	7.0
PrinArt_Sub_High_TWLTL	5243	35	970	10.0	0.200	7.0
PrinArt_Urb_Unsig_Undi	5311	37	1780	11.0	0.100	7.0
PrinArt_Urb_Unsig_Div	5312	39	1860	11.0	0.100	7.0
PrinArt_Urb_Unsig_TWLT	5313	38	2050	11.0	0.100	7.0
PrinArt_Urb_Low_Undiv	5321	41	1130	11.0	0.120	7.0
PrinArt_Urb_Low_Div	5322	41	1130	11.0	0.120	7.0
PrinArt_Urb_Low_TWLTL	5323	38	1300	11.0	0.120	7.0
PrinArt_Urb_Med_Undiv	5331	37	1000	12.0	0.150	7.0
PrinArt_Urb_Med_Div	5332	38	1100	12.0	0.150	7.0
PrinArt_Urb_Med_TWLTL	5333	37	1150	12.0	0.150	7.0
PrinArt_Urb_High_Undiv	5341	32	940	12.0	0.200	7.0
PrinArt_Urb_High_Div	5342	32	980	12.0	0.200	7.0
PrinArt_Urb_High_TWLTL	5343	32	1020	12.0	0.200	7.0
PrinArt_CBD_Low_Undiv	5421	32	880	10.0	0.120	7.0
PrinArt_CBD_Low_Div	5422	33	900	10.0	0.120	7.0
PrinArt_CBD_Low_TWLTL	5423	33	1010	10.0	0.120	7.0
PrinArt_CBD_Med_Undiv	5431	32	840	10.0	0.150	7.0
PrinArt_CBD_Med_Div	5432	33	860	10.0	0.150	7.0
PrinArt_CBD_Med_TWLTL	5433	33	970	10.0	0.150	7.0
PrinArt_CBD_High_Undiv	5441	28	800	10.0	0.200	7.0
PrinArt_CBD_High_Div	5442	28	800	10.0	0.200	7.0
PrinArt_CBD_High_TWLTL	5443	28	920	10.0	0.200	7.0
MinArt_Rur_Unsig_Undiv	6111	42	1410	10.0	0.150	5.5
MinArt_Rur_Unsig_Div	6112	43	1500	10.0	0.150	5.5
MinArt_Rur_Unsig_TWLTL	6113	43	1620	10.0	0.150	5.5
MinArt_Rur_Low_Undiv	6121	39	1130	10.0	0.170	5.5
MinArt_Rur_Low_Div	6122	40	1150	10.0	0.170	5.5
MinArt_Rur_Low_TWLTL	6123	40	1300	10.0	0.170	5.5
MinArt_Rur_Med_Undiv	6131	38	880	10.0	0.200	5.5
MinArt_Rur_Med_Div	6132	40	920	10.0	0.200	5.5
MinArt_Rur_Med_TWLTL	6133	40	1010	10.0	0.200	5.5
MinArt_Sub_Unsig_Undiv	6211	36	1390	10.0	0.150	5.5
MinArt_Sub_Unsig_Div	6212	37	1420	10.0	0.150	5.5
MinArt_Sub_Unsig_TWLTL	6213	37	1600	10.0	0.150	5.5

MinArt_Sub_Low_Undiv	6221	35	1130	10.0	0.170	5.5
MinArt_Sub_Low_Div	6222	37	1200	10.0	0.170	5.5
MinArt_Sub_Low_TWLTL	6223	36	1300	10.0	0.170	5.5
MinArt_Sub_Med_Undiv	6231	34	880	10.0	0.200	5.5
MinArt_Sub_Med_Div	6232	36	920	10.0	0.200	5.5
MinArt_Sub_Med_TWLTL	6233	35	1010	10.0	0.200	5.5
MinArt_Urb_Unsig_Undiv	6311	35	1210	10.0	0.150	5.5
MinArt_Urb_Unsig_Div	6312	36	1250	10.0	0.150	5.5
MinArt_Urb_Unsig_TWLTL	6313	35	1390	10.0	0.150	5.5
MinArt_Urb_Low_Undiv	6321	34	1130	10.0	0.170	5.5
MinArt_Urb_Low_Div	6322	35	1200	10.0	0.170	5.5
MinArt_Urb_Low_TWLTL	6323	34	1300	10.0	0.170	5.5
MinArt_Urb_Med_Undiv	6331	33	880	10.0	0.200	5.5
MinArt_Urb_Med_Div	6332	33	880	10.0	0.200	5.5
MinArt_Urb_Med_TWLTL	6333	33	1010	10.0	0.200	5.5
MinArt_Urb_High_Undiv	6341	32	840	10.0	0.250	5.5
MinArt_Urb_High_Div	6342	32	860	10.0	0.250	5.5
MinArt_Urb_High_TWLTL	6343	32	970	10.0	0.250	5.5
MinArt_CBD_Unsig_Undiv	6411	35	1130	10.0	0.150	5.5
MinArt_CBD_Unsig_Div	6412	35	1150	10.0	0.150	5.5
MinArt_CBD_Unsig_TWLTL	6413	35	1300	10.0	0.150	5.5
MinArt_CBD_Low_Undiv	6421	35	880	10.0	0.170	5.5
MinArt_CBD_Low_Div	6422	36	920	10.0	0.170	5.5
MinArt_CBD_Low_TWLTL	6423	35	1010	10.0	0.170	5.5
MinArt_CBD_Med_Undiv	6431	35	840	10.0	0.200	5.5
MinArt_CBD_Med_Div	6432	36	880	10.0	0.200	5.5
MinArt_CBD_Med_TWLTL	6433	36	970	10.0	0.200	5.5
MinArt_CBD_High_Undiv	6441	35	800	10.0	0.250	5.5
MinArt_CBD_High_Div	6442	36	840	10.0	0.250	5.5
MinArt_CBD_High_TWLTL	6443	35	920	10.0	0.250	5.5
MajCol_Rur_Unsig_Undiv	7111	40	1000	10.0	0.250	4.5
MajCol_Rur_Low_Undiv	7121	38	880	10.0	0.300	4.5
MajCol_Rur_Med_Undiv	7131	29	840	10.0	0.300	4.5
MajCol_Rur_High_Undiv	7141	28	800	10.0	0.300	4.5
MajCol_Sub_Unsig_Undiv	7211	35	1210	10.0	0.250	4.5
MajCol_Sub_Low_Undiv	7221	33	880	10.0	0.300	4.5
MajCol_Sub_Med_Undiv	7231	27	840	10.0	0.300	4.5
MajCol_Sub_High_Undiv	7241	26	800	10.0	0.300	4.5
MajCol_Urb_Unsig_Undiv	7311	32	1060	10.0	0.250	4.5
MajCol_Urb_Low_Undiv	7321	30	880	10.0	0.300	4.5
MajCol_Urb_Med_Undiv	7331	27	840	10.0	0.300	4.5
MajCol_Urb_High_Undiv	7341	26	800	10.0	0.300	4.5
MajCol_CBD_Unsig_Undiv	7411	25	1060	10.0	0.250	4.5
MajCol_CBD_Low_Undiv	7421	25	880	10.0	0.300	4.5
MajCol_CBD_Med_Undiv	7431	25	840	10.0	0.300	4.5
MajCol_CBD_High_Undiv	7441	25	800	10.0	0.300	4.5
MajCol_Rem_Unsig_Undiv	7511	30	925	10.0	0.250	4.5
MinCol_Rur_Unsig_Undiv	8111	43	1130	9.5	0.300	4.0
MinCol_Rur_Low_Undiv	8121	35	880	9.5	0.350	4.0
MinCol_Rur_Med_Undiv	8131	30	840	9.5	0.350	4.0

MinCol_Rur_High_Undiv	8141	28	800	9.5	0.350	4.0
MinCol_Sub_Unsig_Undiv	8211	33	1130	9.5	0.300	4.0
MinCol_Sub_Low_Undiv	8221	29	880	9.5	0.350	4.0
MinCol_Sub_Med_Undiv	8231	24	840	9.5	0.350	4.0
MinCol_Sub_High_Undiv	8241	22	800	9.5	0.350	4.0
MinCol_Urb_Unsig_Undiv	8311	29	1060	9.5	0.300	4.0
MinCol_Urb_Low_Undiv	8321	27	880	9.5	0.350	4.0
MinCol_Urb_Med_Undiv	8331	25	840	9.5	0.350	4.0
MinCol_Urb_High_Undiv	8341	22	800	9.5	0.350	4.0
MinCol_CBD_Unsig_Undiv	8411	24	1060	9.5	0.300	4.0
MinCol_CBD_Low_Undiv	8421	24	880	9.5	0.350	4.0
MinCol_CBD_Med_Undiv	8431	24	840	9.5	0.350	4.0
MinCol_CBD_High_Undiv	8441	22	800	9.5	0.350	4.0
MinCol_Rem_Unsig_Undiv	8511	24	925	9.5	0.300	4.0
Local_Rur_Unsig_Undiv	9111	35	700	9.0	0.250	2.5
Local_Sub_Unsig_Undiv	9211	25	700	9.0	0.250	2.5
Local_Sub_Low_Undiv	9221	25	650	9.0	0.300	2.5
Local_Sub_Med_Undiv	9231	24	650	9.0	0.300	2.5
Local_Urb_Unsig_Undiv	9311	24	700	9.0	0.250	2.5
Local_Urb_Low_Undiv	9321	19	650	9.0	0.300	2.5
Local_Urb_Med_Undiv	9331	19	650	9.0	0.300	2.5
Local_Urb_High_Undiv	9341	19	650	9.0	0.300	2.5
Local_CBD_Unsig_Undiv	9411	18	700	9.0	0.250	2.5
Local_CBD_Low_Undiv	9421	18	650	9.0	0.300	2.5
Local_CBD_Med_Undiv	9431	18	650	9.0	0.300	2.5
Local_CBD_High_Undiv	9441	18	650	9.0	0.300	2.5
Local_Rem_Unsig_Undiv	9511	15	500	9.0	0.250	2.5
CC_Rur	99111	15	9999	10.0	0.150	4.0
CC_Sub	99211	25	9999	10.0	0.150	4.0
CC_Urb	99311	20	9999	10.0	0.150	4.0
CC_CBD	99411	15	9999	10.0	0.150	4.0

APPENDIX D-2

Trip rates across trip purposes and sub categories for different area types

Notes:

1. HBWAB Represents A workers B vehicles- Home Based Work households. Nomenclature is similar across other categories.
2. HBO = Home Based Other
3. NHB = Non Home Based
4. HBWARET = Home Based Work Attractions for Retail
5. HBWASER = Home Based Work Attraction for Service
6. HBWAOTH = Home based Work Attraction for Other
7. HBOARET = Home Based Other Attraction Retail
8. HBOASER = Home Based Other Attraction Service
9. HBOASCH = Home Based Other Attraction School
10. HBOAHH = Home Based Other Attraction Household
11. NHBARET = Non Home Based Attraction Retail
12. NHBASER = Non Home Based Attraction Service
13. NHBAOTH = Non Home Based Attraction Other
14. NHBAHH = Non Home Based Attraction Household

1 = Rural (Density less than 200)
2 = Suburban (Density between 200 and 999)
3 = Urban (Density between 1000 and 8500)
4 = CBD (Density greater than 8500)

AREA	1	2	3	4
HBW10	0.564	0.513	0.574	0.574
HBW11	1.127	1.015	1.149	1.149
HBW12	1.127	1.015	1.149	1.149
HBW13	1.127	1.015	1.149	1.149
HBW20	1.235	1.118	1.262	1.262
HBW21	1.678	1.518	1.703	1.703
HBW22	2.147	1.939	2.185	2.185
HBW23	2.147	1.939	2.185	2.185
HBW30	1.571	1.426	1.600	1.600
HBW31	1.786	1.621	1.826	1.826
HBW32	2.752	2.492	2.800	2.800
HBW33	3.396	3.077	3.457	3.457
HBW40	2.027	1.826	2.062	2.062
HBW41	2.120	1.918	2.154	2.154
HBW42	3.101	2.810	3.159	3.159
HBW43	3.785	3.426	3.857	3.857
HBO10	1.264	1.077	1.036	1.036
HBO11	2.404	2.051	1.969	1.969
HBO12	2.404	2.051	1.969	1.969
HBO13	2.404	2.051	1.969	1.969
HBO20	2.945	2.513	2.421	2.421
HBO21	4.863	4.154	3.980	3.980
HBO22	5.235	4.462	4.287	4.287
HBO23	5.235	4.462	4.287	4.287
HBO30	4.874	4.164	3.990	3.990
HBO31	6.838	5.836	5.600	5.600
HBO32	6.973	5.959	5.713	5.713

HBO33	7.424	6.339	6.082	6.082
HBO40	7.797	6.657	6.390	6.390
HBO41	9.297	7.939	7.621	7.621
HBO42	11.158	9.529	9.149	9.149
HBO43	12.377	10.565	10.134	10.134
NHB10	0.676	0.923	0.656	0.656
NHB11	1.625	2.226	1.600	1.600
NHB12	1.625	2.226	1.600	1.600
NHB13	1.625	2.226	1.600	1.600
NHB20	1.151	1.580	1.139	1.139
NHB21	2.335	3.190	2.287	2.287
NHB22	2.561	3.508	2.523	2.523
NHB23	2.561	3.508	2.523	2.523
NHB30	1.828	2.503	1.795	1.795
NHB31	2.730	3.744	2.687	2.687
NHB32	2.923	4.000	2.872	2.872
NHB33	3.633	4.964	3.569	3.569
NHB40	2.121	2.892	2.082	2.082
NHB41	3.803	5.200	3.734	3.734
NHB42	4.942	6.759	4.852	4.852
NHB43	5.033	6.893	4.944	4.944
HBWARET	1.400	1.400	1.400	1.400
HBWASER	1.400	1.400	1.400	1.400
HBWAOTH	1.120	1.120	1.120	1.120
HBOARET	7.050	7.050	7.050	7.050
HBOASER	3.200	3.200	3.200	3.200
HBOASCH	1.750	1.750	1.750	1.750
HBOAHH	1.650	1.650	1.650	1.650
NHBARET	4.490	4.490	4.490	4.490
NHBASER	1.130	1.130	1.130	1.130
NHBAOTH	0.750	0.750	0.750	0.750
NHBAHH	0.590	0.590	0.590	0.590

Appendix E:
Development Forecasts

Table E-1: Washington Township Population and Housing Forecast Targets

	2000 Census[1]	2010 Census[1]	2011 Estimate[2]	2021 Forecast[3]	2011 to 2021 Growth
Population	18,358	32,884	33,156	48,863	15,707
Housing Units	6,831	12,477	12,749	18,688	5,939

[1] Source: Indiana Business Research Center

[2] Based on 2010 and 2011 residential construction permits

[3] Based on 2000 to 2010 growth rates

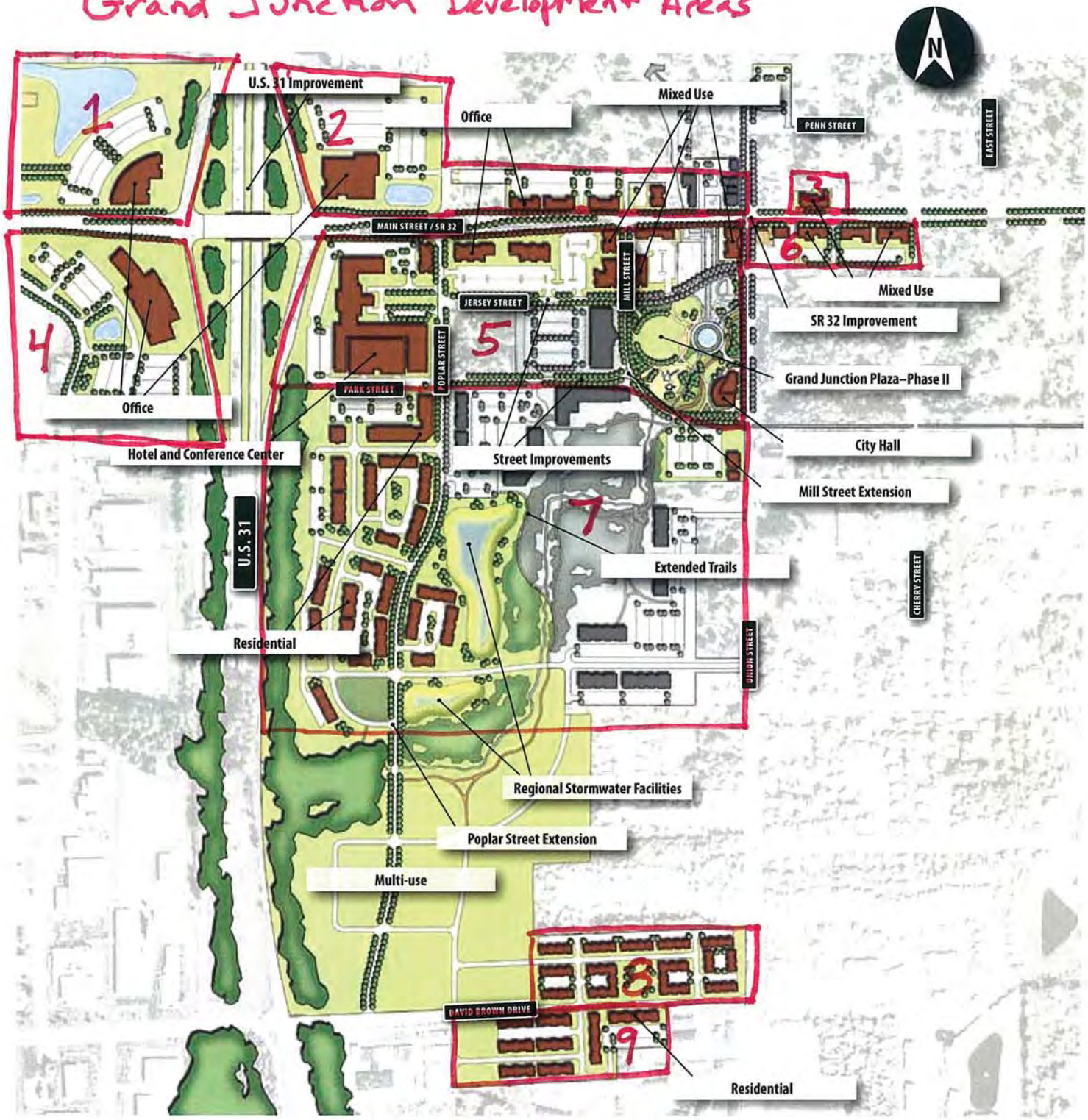
Table E-2: Washington Township Employment Forecast Targets

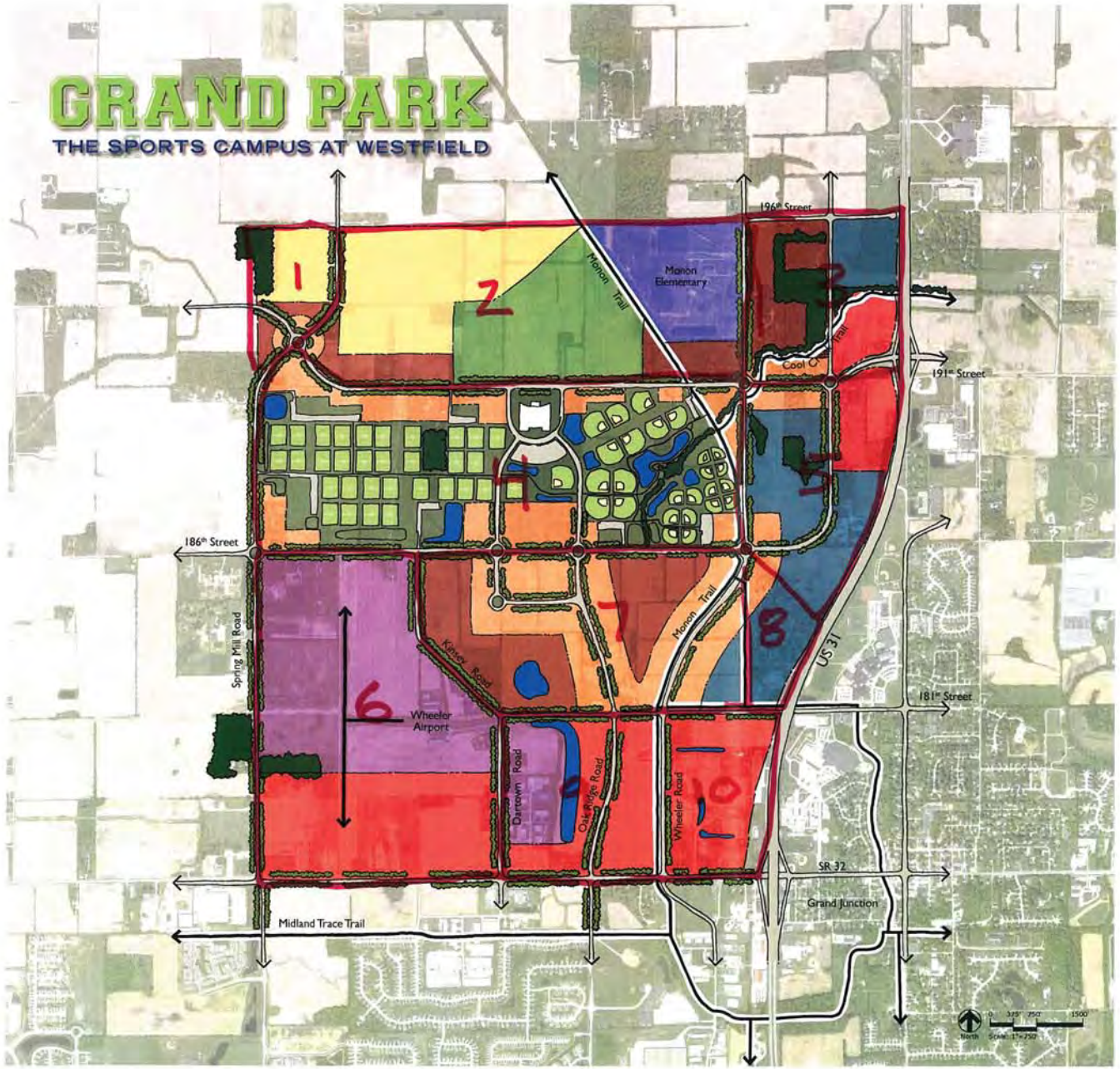
2011 Estimate[1]	Forecast Annual Growth Rate[2]	2021 Forecast	2011 to 2011 Growth
10,762	3.5%	15,181	4,419

[1]2011 employment data from Nielsen-Claritas

[2]Assumed equivalent to the 2000-2010 average annual employment growth rate for Hamilton County, as obtained from the Indiana Business Research Center

Grand Junction Development Areas





Land Use Plan

- Regional Retail & Hospitality
- Sports & Recreation Mixed-Use
- Sports Village Mixed-Use 1
- Sports Village Mixed-Use 2
- Sports Corporate Campus
- Life Science Mixed-Use
- School
- Sports Residential

CONTEXT landscape architecture

CITY OF Westfield INDIANA

Illustrative Site Development Plan

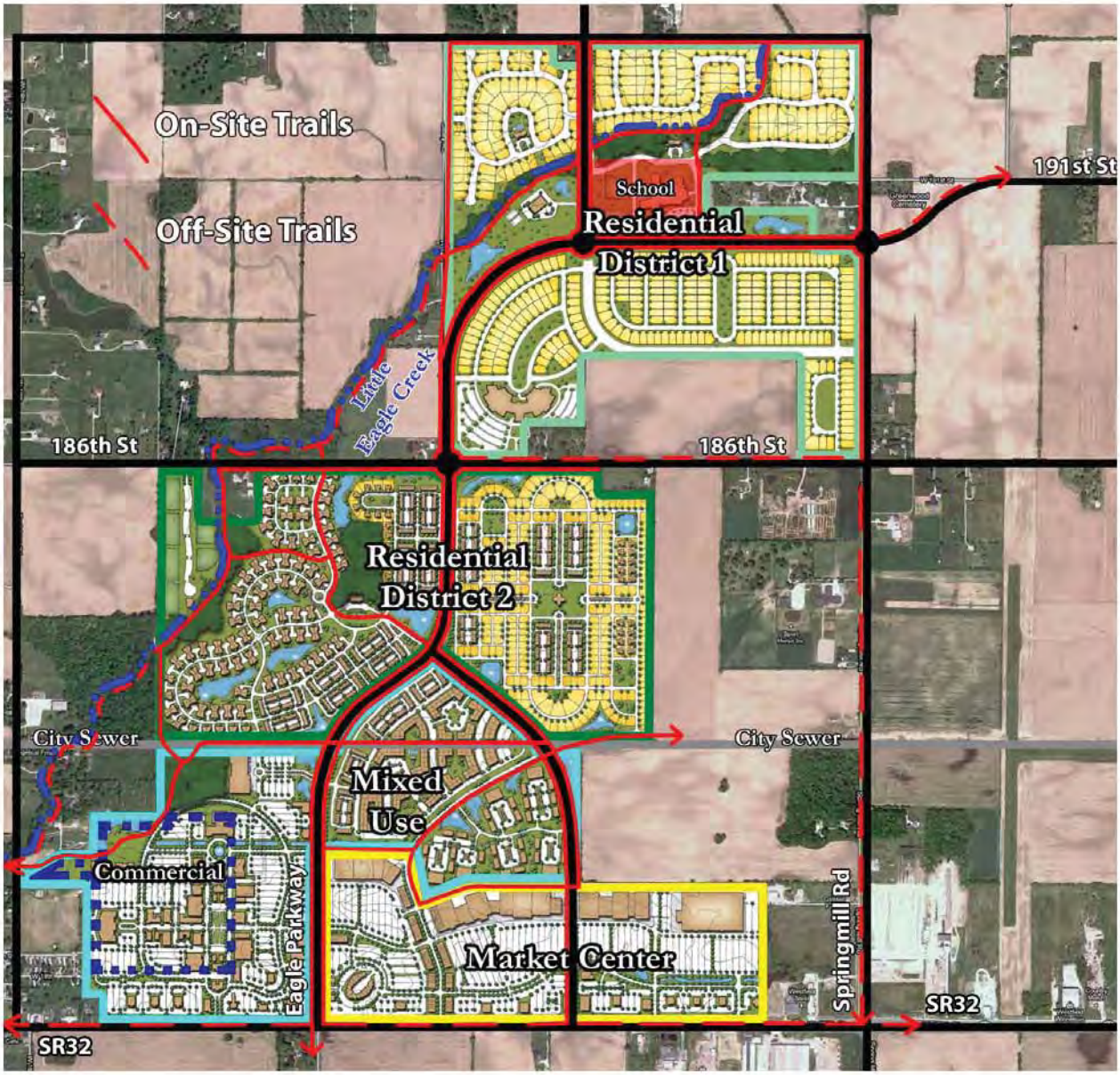


Table E-3: 2011-2021 Washington Township Housing and Employment Growth Forecast by Traffic Analysis Zone

TAZ	Development	Total Housing Growth (# of DU)	Total Employment Growth (# of emp)	Retail Employment Growth (# of emp)	Service Employment Growth (# of emp)	Other Employment Growth (# of emp)	Additional Special Generator Daily Trip Ends	
7008	202nd St Industrial Park	0	154			154		
7013	Grand Park Area 3	80	245	178	67	0		
7015	Grand Park Area 2	207	300	102	198	0		
7016	Grand Park Area 1	13	6	4	2	0		
7026	Springmill Trails Market Center, Mixed-use & Residential District 2	480	164	78	85	0		
7027	Springmill Trails Market Center, Mixed-use & Residential District 2	420	237	36	202	0		
7028	Grand Park Area 6	0	1,264	203	996	65	2,043	250-room hotel
7029	Grand Park Areas 9 &10, Grand Junction Area 1 (incl. Mainstreet)	0	553	320	223	10	4,085	two 250-room hotels
7030	Grand Park Areas 4 and 7	686	882	557	325	0	4,137	58 sports fields
7031	Grand Park Area 5	24	654	124	521	9		
7033	Grand Junction Area 2, plus Library relocation	0	166	13	153	0		
7034	Infill Residential	122	0					
7036	Andover, Section 5 plus infill residential	379	0					
7037	Infill Residential	91	0					
7038	Infill Residential	85	0					
7039	Grand Junction Area 6	0	15	10	6	0		
7040	Oak Manor, Section 4A; other infill residential	266	0					
7041	Infill Residential	148	0					
7042	Grand Junction Areas 7 & 8 (MF Housing, including Union St. Flats)	254	5	0	5	0		
7045		85	0					

Table E-3: 2011-2021 Washington Township Housing and Employment Growth Forecast by Traffic Analysis Zone (Continued)

TAZ	Development	Total Housing Growth (# of DU)	Total Employment Growth (# of emp)	Retail Employment Growth (# of emp)	Service Employment Growth (# of emp)	Other Employment Growth (# of emp)	Additional Special Generator Daily Trip Ends	
7046	CPS Packaging + infill residential	128	25			25		
7047	Maple Village, Section 4; The Commons at Springmill	294	0					
7048	Infill Residential	423	0					
7054	Infill Residential	272	0					
7055	Infill Residential	188	0					
7056	Viking Meadows, Blue Grass 1 and Meadowlands 2	236	0					
7057	Infill Residential	143	0					
7058	Infill Residential	151	0					
7059	Infill Residential	38	0					
7060	Bridgewater Residential Expansion	250	0					
7064	Infill Residential	83	0					
7065	Viking Meadows	110	0					
7068	Infill Residential	51	0					
7069	151st Residential Development	344	0					
7075	Springmill Trails Residential District 1	100	0					
7079	Grand Junction Area 3	0	13	8	5	0		
7080	Grand Junction Area 9	50	0	0	0	0		
7081	Grand Junction Area 5 (hotel & Conference Center, City Hall, Library)	-60	127	28	99	0	2,043	250-room Hotel & Conference Center
7085	Kindred Healthcare	0	150		150			
Total		**6,142**	**4,960**	**1,660**	**3,036**	**263**		

Note: Traffic Analysis Zones with no forecast housing or employment growth are not shown

Table E-4: Washington Township Development Assumptions

Low density residential:	1	d.u. per acre
Medium density residential:	3	d.u. per acre
High density residential:	10	d.u. per acre
Retail density:	750	square feet per employee (= 10.2 Employees per gross acre)
Office density:	450	square feet per employee (= 23.7 Employees per gross acre)
Other density:	2,000	square feet per employee (= 3.8 Employees per gross acre)
Net developable acreage:	70%	(proportion of gross acreage that can be developed)
Commercial/Industrial Floor Area Ratio:	25%	(proportion of floor area to net site size)
Office Floor Area Ratio:	35%	(proportion of floor area to net site size--accounts for 2 story offices)

Retail = Retail employment
Service = Business offices and institutions
Other = Industrial, agricultural and construction

Table E-5: Grand Park Gross Acreage by Plan Designation

Area	TAZ	Grand Park Gross Acres by Plan Designation						
		Retail and Hospitality	Sports & Recreation Mixed-Use	Sports Village Mixed-Use	Sports Corporate Campus	Life Science Mixed Use	Sports Residential	Total
1	7016	0	0	18	0	0	38	56
2	7015	0	155	58	0	0	135	348
3	7013	41	0	80	0	33	0	154
4	7030	0		120	0	0	0	120
5	7031	38	0	16		113	0	167
6	7028	136	0	0	284	0	0	420
7	7030	0	0	297	0	0	0	297
8	7076	0	0	5	0	47	0	52
9	7029	115	0	0	42	0	0	157
10	7029	105	0	0	0	0	0	105
TOTAL		435	155	594	326	193	173	1876

Table E-6: Grand Park Estimated 2021 Build-out

Area	TAZ	Grand Park 2021 Build-Out Estimate					
		Retail and Hospitality	Sports & Recreation Mixed-Use	Sports Village Mixed-Use	Sports Corporate Campus	Life Science Mixed Use	Sports Residential
1	7016			5%			5%
2	7015		10%	10%			30%
3	7013	30%		20%		0%	
4	7030			40%			
5	7031	30%		30%		20%	
6	7028	20%			20%		
7	7030			30%			
8	7076			0%		0%	
9	7029	30%			20%		
10	7029	10%					

Table E-7: Assumed Land Uses for Grand Park Plan Designations

Grand Park Map Designation	Assumed Land Use Proportion by Area					
	Low density Residential (1 DU/Acre)	Medium density Residential (3 DU/Acre)	High density Residential (10 DU/Acre)	Retail Employment	Service Employment (Business offices and institutions)	Other employment (Industrial, agricultural, construction)
Retail and Hospitality				90%	10%	
Sports & Recreation Mixed-Use				50%	50%	
Sports Village Mixed-Use			50%	40%	10%	
Sports Corporate Campus					70%	30%
Life Science Mixed Use					90%	10%
Sports Residential		80%	20%			

Table E-8: 2021 Housing and Employment Forecast for Grand Park

Area	TAZ	Grand Park New Housing by Type				Grand Park New Employment by Type				Special Generator Daily Trip Ends	Notes
		Low density	Medium density	High density	Total	Retail	Service	Other	Total		
1	7016	0	5	8	13	4	2	0	6		
2	7015	0	97	110	207	102	198	0	300		Assumes existing school to remain
3	7013	0	0	80	80	178	67	0	245		
4	7030	0	0	240	240	195	114	0	309	4137	sports complex with 58 fields
5	7031	0	0	24	24	124	521	9	654		
6	7028	0	0	0	0	203	996	65	1264	2043	1 hotel @ 250 rooms
7	7030	0	0	446	446	362	211	0	573		
8	7076	0	0	0	0	0	0	0	0		
9	7029	0	0	0	0	224	198	10	432	4085	2 hotels @ 250 rooms
10	7029	0	0	0	0	96	25	0	121		Assumes existing development to remain
TOTAL		0	102	908	**1010**	1488	2332	84	**3904**		

Table E-9: 2021 Housing and Employment Forecast for Grand Junction

TAZ	Area	Area Size (acres)	Proportion of Land Area by Use					Build Out	New Housing Units	New Employment		
			Office	Mixed Use	MF Residential	Other	Total			Retail	Service	Other
7029	1	16	100%				100%	0%	-	-	-	
7033	2	11	80%	20%			100%	70%	-	13	153	
7079	3	1		100%			100%	100%	-	8	5	
7043	4	14	100%				100%	0%	-	-	-	
7081	5	33	15%	15%		70%	100%	70%	(60)	28	99	
7039	6	3		100%			100%	40%	-	10	6	
7042	7	68			70%	30%	100%	50%	238	-	5	
7042	8	8			100%		100%	20%	16	-	-	
7080	9	5			100%		100%	100%	50	-	-	
TOTAL		159	**Ten-Year Grand Junction Build-out**					**46%**	245	59	267	-

Notes:

1. Full redevelopment in Area 5 will require relocation of approximately 85 residences, as identified through GIS analysis of aerial photography

2. Library and City Hall in Grand Junction Area 5 (44 and 4 employees, respectively) are to be relocated from north of SR 32 (TAZ 7033 and 7038 respectively)

3. Mixed Use assumed to be 80% office and 20% commercial

Table E-10: 2021 Housing and Employment Forecast for Springmill Trails

TAZ	Area	Area Size (acres)	Build Out	New Housing Units	New Employment			
					Retail	Service	Other	Total
7026	Commercial	124	5%		63	-		63
7026	Mixed Use	36	10%		-	85		85
7026	Market Center	30	5%		15	-		15
7026	Res. Dist. 2	120	80%	480	-	-		-
7027	Market Center	70	5%		36	-		36
7027	Mixed Use	85	10%		-	202		202
7027	Res. Dist. 2	105	80%	420	-	-		-
7075	Res. Dist. 1	250	16%	100	-	-		-
TOTAL				1,000	114	287	-	401

Notes:

1. Residential District 1 assumed to be 2.5 DU/Acre per PUD
2. Residential District 2 assumed to be 5 DU/Acre per PUD
3. Mixed Use assumed to be 100% office due to adjacent retail and residential areas

Appendix F:
Capacity Analysis Data

2011 Existing Conditions Intersection Lane Configuration and AM/PM Peak Hour Approach Levels of Service (Unmitigated)

N/S Street		E/W Street	Control Type	EB			WB			NB			SB		
				L	T	R	L	T	R	L	T	R	L	T	R
Moontown Rd	&	216th St	All-way stop		1 A/A			1 A/A			1 A/A			1 A/A	
Anthony Rd	&	216th St	All-way stop		1 A/A			1 A/A			1 A/A			1 A/A	
Dunbar Rd	&	216th St	1-way stop					1			1 NA			1 NA	
Moontown Rd	&	191st St	All-way stop		1 A/A			1 A/A			1 A/B			1 B/A	
Shadynook Rd	&	191st St	1-way stop		1 NA			1 NA			1 A/B				
Grassy Branch Rd	&	191st St	All-way stop		1 A/A			1 A/A			1 A/A			1 A/A	
East St	&	191st St	2-way stop		1 NA			1 NA			1 A/A				
Moontown Rd	&	196th St	2-way stop		1 A/A			1 NA			1 NA			NA	
Grassy Branch Rd	&	196th St	2-way stop		1 A/A			1 A/A			1 NA			1 NA	
Grassy Branch Rd	&	203rd St	1-way stop		1 A/A						1 NA			1 NA	
Moontown Rd	&	186th St	1-way stop		1 A/A						1 NA			1 NA	
Grassy Branch Rd	&	186th St	1-way stop		1 A/A						1 NA			1 NA	
East St	&	181st St	All-way stop		1 A/A			1 A/A			1 A/A			1 A/A	
East St	&	186th St	1-way stop					1 A/A			1 NA			1 NA	
Union St	&	181St St	2-way stop		1 B/B			1 C/C			1 NA			1 NA	
Shadynook Rd	&	186th St	1-way stop					1 A/A			1 NA			1 NA	
Union St	&	David Brown Dr	2-way stop		1 B/C			1 B/B			1 NA	1		1 NA	
Union St	&	161st St	All-way stop		1 A/B			1 A/A			1 A/B			1 B/A	
Oak Rd	&	161st St	All-way stop		1 B/B			1 A/B			1 A/A			1 A/B	
Carey Rd	&	161st St	All-way stop		1 C/F			1 E/C			1 C/F			1 E/D	
Gray Rd	&	161st St	All-way stop		1 B/B			1 B/B			1 B/B			1 C/B	
Gray Rd	&	169th St	2-way stop		1 B/B			1 C/B			1 NA			1 NA	
Carey Rd	&	169th St	1-way stop					1 B/B			1 NA			1 NA	
Union St	&	171st St	1-way stop					1 B/B			1 NA			1 NA	
Oak Rd	&	171st St	All-way stop		1 A/A			1 A/A			1 A/A				
Carey Rd	&	171st St	1-way stop		1 B/B						1 NA			1 NA	

2011 Existing Conditions Intersection Lane Configuration and AM/PM Peak Hour Approach Levels of Service (Unmitigated)

N/S Street		E/W Street	Control Type	EB			WB			NB			SB		
				L	T	R	L	T	R	L	T	R	L	T	R
Gray Rd	&	156th St	2-way stop		1 B/A			1 C/B			1 NA			1 NA	
Gray Rd	&	151st St	1-way stop		1 B/C						1 NA			1 NA	
Carey Rd	&	151st St	Roundabout		1 A/B			1 A/A			1 A/C			1 B/A	
Oak Rd	&	151st St	2-way stop		1 NA	1		1 NA			1 C/E			1 B/B	
Union St	&	156th St	1-way stop		1 B/B						1 NA			1 NA	
Western Way	&	Greyhound Pass	Signal		2 C/C		1+	1 A/A		1		2 A/A			
Greyhound Pass	&	151st St	1-way stop		1 NA			1 A/B			1 NA				
Oakridge Rd	&	Greyhound Pass	All-way stop		1 B/B			1 B/B			1 B/D			1 C/C	
Springmill Rd	&	Greyhound Pass	1-way stop					1 D/E			1 NA			1 NA	
Oakridge Rd	&	156th St	All-way stop		1 B/B			1 B/B			1 B/D			1 C/C	
Springmill Rd	&	156th St	All-way stop		1 C/B			1 C/B			1 C/D			1 E/E	
Ditch Rd	&	151st St	1-way stop		1 A/A						1 NA			1 NA	
Ditch Rd	&	156th St	All-way stop		1 A/A			1 A/A			1 A/A			1 A/A	
Oakridge Rd	&	161st St	All-way stop		1 B/C			1 B/C			1 B/D			1 B/C	
Oakridge Rd	&	169th St	2-way stop	1	1 B/B		1	1 B/C			1 NA		1	1 NA	
Springmill Rd	&	161st St	Signal	1	1 C/C		1	1 B/C	1	1	1 B/C	1	1	1 B/B	
Springmill Rd	&	169th St	2-way stop	1	1 B/C		1	1 B/C			1 NA			1 NA	
Ditch Rd	&	161st St	All-way stop		1 A/A			1 A/A			1 A/A			1 A/A	
Ditch Rd	&	166th St	1-way stop		1 B/A						1 NA			1 NA	
Ditch Rd	&	169th St	1-way stop				1	1 A/A			1 NA			1 NA	
Towne Rd	&	Little Eagle Creek Ave	1-way stop		1 NA			1 NA			1 A/A				
Little Eagle Creek Ave	&	166th St	2-way stop		1 A/A			1 A/A			1 NA			1 NA	
Little Eagle Creek Ave	&	159th St	All-way stop		1 A/A			1 A/A						1 A/A	
Shelborne Rd	&	Little Eagle Creek Ave	1-way stop		1 NA			1 NA			1 A/A				
Little Eagle Creek Ave	&	156th St	1-way stop		1 A/A						1 NA			1 NA	
Joliet Rd	&	156th St	1-way stop		1 NA			1 NA						1 A/A	

2011 Existing Conditions Intersection Lane Configuration and AM/PM Peak Hour Approach Levels of Service (Unmitigated)

N/S Street		E/W Street	Control Type	EB			WB			NB			SB		
				L	T	R	L	T	R	L	T	R	L	T	R
Hamilton Boone Rd	&	156th St	2-way stop		1 A/A			1 A/A			1 NA			1 NA	
Joliet Rd	&	166th St	All-way stop		1 A/A			1 A/A			1 A/A			1 A/A	
Hamilton Boone Rd	&	166th St	1-way stop					1 A/A			1 NA			1 NA	
Eagletown Rd	&	166th St	1-way stop		1 NA			1 NA						1 A/A	
Towne Rd	&	166th St	All-way stop		1 A/A			1 A/A			1 A/A			1 A/A	
Towne Rd	&	161st St	1-way stop					1 A/A			1 NA			1 NA	
Towne Rd	&	156th St	1-way stop					1 A/A			1 NA			1 NA	
Towne Rd	&	159th St	1-way stop		1 A/A						1 NA			1 NA	
Shelborne Rd	&	151st St	1-way stop					1 A/A			1 NA			1 NA	
Towne Rd	&	151st St	2-way stop		1 A/A			1 B/B			1 NA			1 NA	
Hamilton Boone Rd	&	186th St	2-way stop		1 A/A			1 A/A			1 NA			1 NA	
Hamilton Boone Rd	&	196th St	2-way stop		 A/A			1 A/A			1 NA			1 NA	
Joliet Rd	&	196th St	1-way stop		1 A/A						1 NA			1 NA	
Joliet Rd	&	193rd St	1-way stop					1 A/A			1 NA			1 NA	
Joliet Rd	&	186th St	2-way stop		1 A/A			1 A/A			1 NA			1 NA	
Mule Barn Rd	&	193rd St	2-way stop		1 A/A			1 A/A			1 NA			1 NA	
Mule Barn Rd	&	186th St	2-way stop		1 A/A			1 A/A			1 NA			1 NA	
Centennial Rd	&	186th St	2-way stop		1 NA			1 NA			1 A/A			1 A/A	
Centennial Rd	&	193rd St	2-way stop		1 A/A			1 A/A			1 NA			1 NA	
Lamong Rd	&	193rd St	1-way stop		1 NA			1 NA						1 A/A	
Eagletown Rd	&	193rd St	1-way stop		1 NA			1 NA			1 A/A				
Eagletown Rd	&	186th St	2-way stop		1 A/A			1 A/A			1 NA			1 NA	
Casey Rd	&	186th St	2-way stop		1 NA			1 NA			1 A/A			1 A/A	
Casey Rd	&	193rd St	1-way stop		1 NA			1 NA			1 A/A				
Freemont Moore Rd	&	193rd St	1-way stop		1 NA			1 NA						1 A/A	
Six Points Rd	&	193rd St	1-way stop		1 NA			1 NA						1 A/A	

2011 Existing Conditions Intersection Lane Configuration and AM/PM Peak Hour Approach Levels of Service (Unmitigated)

N/S Street		E/W Street	Control Type	EB			WB			NB			SB		
				L	T	R	L	T	R	L	T	R	L	T	R
Springmill Rd	&	191st St	1-way stop					1 B/B			1 NA			1 NA	
Springmill Rd	&	186th St	2-way stop		1 B/B			1 A/B			1 NA			1 NA	
Dartown Rd	&	Kinsey Ave	All-way stop		1 A/A			1 A/A			1 A/A				
Wheeler Rd	&	181st St	1-way stop		1 NA			1 NA			1 A/A				
Horton Rd	&	191st St	1-way stop		1 NA			1 NA						1 A/A	
Tomlinson Rd	&	191st St	All-way stop		1 A/A			1 A/A			1 A/A			1 A/A	
Tomlinson Rd	&	196th St	1-way stop					1 A/A			1 NA			1 NA	
Tomlinson Rd	&	199th St	1-way stop		1 A/A						1 NA			1 NA	
Tomlinson Rd	&	206th St	1-way stop		1 NA			1 NA			1 A/A				
Horton Rd	&	206th St	All-way stop		1 A/A			1 A/A			1 A/A			1 A/A	
Six Points Rd	&	206th St	2-way stop		1 NA			1 NA			1 A/A			1 A/A	
Horton Rd	&	199th St	1-way stop					1 A/A			1 NA			1 NA	
Oakridge Rd	&	214th St	1-way stop		1 A/A						1 NA			1 NA	
Horton Rd	&	214th St	1-way stop					1 A/A			1 NA			1 NA	
Horton Rd	&	216th St	1-way stop		1 A/A						1 NA			1 NA	
Six Points Rd	&	216th St	2-way stop		1 A/A			1 A/A			1 NA			1 NA	
Freemont Moore Rd	&	216th St	2-way stop		1 NA			1 NA			1 A/A			1 A/A	
Freemont Moore Rd	&	211th St	1-way stop		1 A/A						1 NA			1 NA	
Freemont Moore Rd	&	206th St	2-way stop		1 NA			1 NA			1 A/A			1 A/A	
Lamong Rd	&	206th St	All-way stop		1 A/A			1 A/A			1 A/A			1 A/A	
Centennial Rd	&	206th St	1-way stop		1 NA			1 NA			1 A/A				
Mule Barn Rd	&	206th St	2-way stop		1 A/A			1 A/A			1 NA			1 NA	
Joliet Rd	&	206th St	1-way stop		1 NA			1 NA			1 A/A				
Hamilton Boone Rd	&	206th St	2-way stop		1 NA			1 NA			1 A/A			1 A/A	
Hamilton Boone Rd	&	216th St	1-way stop					1 A/A			1 NA			1 NA	
Mule Barn Rd	&	216th St	2-way stop		1 A/A			1 A/A			1 NA			1 NA	

2011 Existing Conditions Intersection Lane Configuration and AM/PM Peak Hour Approach Levels of Service (Unmitigated)

N/S Street		E/W Street	Control Type	EB			WB			NB			SB		
				L	T	R	L	T	R	L	T	R	L	T	R
Lamong Rd	&	216th St	2-way stop		1 A/A			1 A/A			1 NA			1 NA	
Lamong Rd	&	211th St	1-way stop					1 A/A			1 NA			1 NA	
Thatcher Ln	&	151st St	Signal	1	2 B/C		1	2 C/B		1	1 A/B		1	1 B/B	
Greyhound Pass	&	147th St	Signal				1		1		2 A/A		1	2 A/A	
Greyhound Ct	&	151st St	1-way stop		1 NA			1 NA			1 B/B				
Greyhound Ct	&	Greyhound Pass	Signal	1	2 A/A		1	2 B/A		1	1 C/B		1	1 D/B	
Oakridge Rd	&	206th St	1-way stop		1 NA			1 NA						1 A/A	
Marsh Dr	&	Greyhound Pass	Signal	1	2 A/B		1	2 A/B			1 B/B		1	1 B/B	
Cool Creek Park Rd	&	Greyhound Pass	Signal	1	2 A/A		1	2 A/A			1 D/A		1	1 A/C	
Cool Creek Park Rd	&	151st St	Roundabout		1 A/B			1 B/A			1 A/B			1 A/A	
Oak Rd	&	147th St	3-way stop		1 A/A						1 A/A			1 A/A	

Notes:

1. State routes and 146th Street intersections will not become Westfield responsibility and are not shown.
2. Lanes that accommodate shared through and turning traffic are shown as through lanes.
3. A "+" indicates a shared through and turn lane in addition to an exclusive turn lane.
4. NA indicates movements that do not have to stop at an intersection. No LOS is defined.

2021 Committed Conditions Intersection Lane Configuration and AM/PM Peak Hour Approach Levels of Service (Unmitigated)

N/S Street		E/W Street	Control Type	EB			WB			NB			SB		
				L	T	R	L	T	R	L	T	R	L	T	R
Moontown Rd	&	216th St	All-way stop		1 A/B			1 B/A			1 A/A			1 A/A	
Anthony Rd	&	216th St	All-way stop		1 A/A			1 B/A			1 A/A			1 A/A	
Dunbar Rd	&	216th St	1-way stop					1 A/A			1 NA			1 NA	
Moontown Rd	&	191st St	All-way stop		1 B/D			1 B/B			1 A/B			1 A/B	
Shadynook Rd	&	191st St	1-way stop		1 NA			1 NA			1 B/C				
Grassy Branch Rd	&	191st St	All-way stop		1 A/D			1 B/A			1 A/B			1 A/A	
East St	&	191st St	2-way stop	1	1 NA	1	1	1 NA			1 C/D			1 E/D	
Moontown Rd	&	196th St	1-way stop		1 A/A			1 NA			1 NA				
Grassy Branch Rd	&	196th St	2-way stop		1 A/A			1 A/A			1 NA			1 NA	
Grassy Branch Rd	&	203rd St	1-way stop		1 A/A						1 NA			1 NA	
Moontown Rd	&	186th St	1-way stop		1 A/A						1 NA			1 NA	
Grassy Branch Rd	&	186th St	1-way stop		1 A/A						1 NA			1 NA	
East St	&	181st St	All-way stop		1 A/A			1 A/A			1 A/A			1 A/A	
East St	&	186th St	1-way stop					1 A/A			1 NA			1 NA	
Union St	&	181St St	2-way stop		1 B/B			1 C/C			1 NA			1 NA	
Shadynook Rd	&	186th St	1-way stop					1 A/A			1 NA			1 NA	
Union St	&	David Brown Dr	2-way stop		1 B/F			1 A/B			1 NA	1		1 NA	
Union St	&	161st St	All-way stop		1 B/F			1 B/C			1 A/B			1 B/B	
Oak Rd	&	161st St	All-way stop		1 A/C			1 A/B			1 A/B			1 A/B	
Carey Rd	&	161st St	All-way stop		1 A/C			1 A/B			1 A/C			1 A/B	
Gray Rd	&	161st St	All-way stop		1 B/B			1 C/B			1 B/B			1 E/B	
Gray Rd	&	169th St	2-way stop		1 B/B			1 C/C			1 NA			1 NA	
Carey Rd	&	169th St	1-way stop					1 B/B			1 NA			1 NA	
Union St	&	171st St	1-way stop					1 B/C			1 NA			1 NA	
Oak Rd	&	171st St	All-way stop		1 A/A			1 A/A			1 A/A				
Carey Rd	&	171st St	1-way stop		1 A/B						1 NA			1 NA	

2021 Committed Conditions Intersection Lane Configuration and AM/PM Peak Hour Approach Levels of Service (Unmitigated)

N/S Street		E/W Street	Control Type	EB			WB			NB			SB		
				L	T	R	L	T	R	L	T	R	L	T	R
Gray Rd	&	156th St	1-way stop					1 B/B			1 NA			1 NA	
Gray Rd	&	151st St	1-way stop		1 B/C						1 NA			1 NA	
Carey Rd	&	151st St	Roundabout		1 A/A			1 A/A			1 A/C			1 A/A	
Oak Rd	&	151st St	2-way stop		1 NA	1		1 NA			1 B/C			1 B/C	
Union St	&	156th St	1-way stop		1 A/A						1 NA			1 NA	
Western Way	&	Greyhound Pass	Signal		2 A/A		1+	1 A/A		1	C/C	2			
Greyhound Pass	&	151st St	1-way stop		1 NA			1 A/B			1 NA				
Oakridge Rd	&	Greyhound Pass	All-way stop		1 A/A			1 A/A			1 A/B			1 A/B	
Springmill Rd	&	Greyhound Pass	1-way stop					1 F/F			1 NA			1 NA	
Oakridge Rd	&	156th St	All-way stop		1 B/B			1 A/B			1 B/C			1 B/C	
Springmill Rd	&	156th St	Roundabout		1 A/A			1 A/A			2 A/A			2 A/A	
Ditch Rd	&	151st St	1-way stop		1 A/B						1 NA			1 NA	
Ditch Rd	&	156th St	All-way stop		1 A/A			1 A/A			1 A/A			1 A/A	
Oakridge Rd	&	161st St	Roundabout		2 A/A			2 A/B			2 A/A			2 A/A	
Oakridge Rd	&	169th St	2-way stop	1	1 B/B		1	1 C/D			1 NA		1	1 NA	
Springmill Rd	&	161st St	Signal	1	1 C/C		1	1 B/B	1	1	1 C/C	1	1	1 B/C	
Springmill Rd	&	169th St	2-way stop	1	1 C/D		1	1 C/C			1 NA			1 NA	
Ditch Rd	&	161st St	All-way stop		1 A/A			1 A/A			1 A/A			1 A/A	
Ditch Rd	&	166th St	1-way stop		1 B/A						1 NA			1 NA	
Ditch Rd	&	169th St	1-way stop				1	1 A/A			1 NA			1 NA	
Towne Rd	&	Little Eagle Creek Ave	1-way stop		1 NA			1 NA			1 A/A				
Little Eagle Creek Ave	&	166th St	2-way stop		1 A/A			1 A/A			1 NA			1 NA	
Little Eagle Creek Ave	&	159th St	All-way stop		1 A/A			1 A/A						1 A/A	
Shelborne Rd	&	Little Eagle Creek Ave	1-way stop		1 NA			1 NA			1 A/A				
Little Eagle Creek Ave	&	156th St	1-way stop		1 A/A						1 NA			1 NA	
Joliet Rd	&	156th St	1-way stop		1 NA			1 NA						1 A/A	

2021 Committed Conditions Intersection Lane Configuration and AM/PM Peak Hour Approach Levels of Service (Unmitigated)

N/S Street		E/W Street	Control Type	EB			WB			NB			SB		
				L	T	R	L	T	R	L	T	R	L	T	R
Hamilton Boone Rd	&	156th St	2-way stop		1 A/A			1 A/A			1 NA			1 NA	
Joliet Rd	&	166th St	All-way stop		1 A/A			1 A/A			1 A/A			1 A/A	
Hamilton Boone Rd	&	166th St	1-way stop					1 A/A			1 NA			1 NA	
Eagletown Rd	&	166th St	1-way stop		1 NA			1 NA						1 A/A	
Towne Rd	&	166th St	All-way stop		1 A/A			1 A/A			1 A/A			1 A/A	
Towne Rd	&	161st St	1-way stop					1 A/A			1 NA			1 NA	
Towne Rd	&	156th St	1-way stop					1 A/A			1 NA			1 NA	
Towne Rd	&	159th St	1-way stop		1 A/A						1 NA			1 NA	
Shelborne Rd	&	151st St	1-way stop					1 A/A			1 NA			1 NA	
Towne Rd	&	151st St	2-way stop		1 A/A			1 B/B			1 NA			1 NA	
Hamilton Boone Rd	&	186th St	2-way stop		1 A/A			1 A/A			1 NA			1 NA	
Hamilton Boone Rd	&	196th St	2-way stop		 A/A			1 A/A			1 NA			1 NA	
Joliet Rd	&	196th St	1-way stop		1 A/A						1 NA			1 NA	
Joliet Rd	&	193rd St	1-way stop					1 A/A			1 NA			1 NA	
Joliet Rd	&	186th St	2-way stop		1 A/A			1 A/A			1 NA			1 NA	
Mule Barn Rd	&	193rd St	2-way stop		1 A/A			1 A/A			1 NA			1 NA	
Mule Barn Rd	&	186th St	2-way stop		1 A/A			1 A/A			1 NA			1 NA	
Centennial Rd	&	186th St	2-way stop		1 NA			1 NA			1 A/A			1 A/A	
Centennial Rd	&	193rd St	2-way stop		1 A/A			1 A/A			1 NA			1 NA	
Lamong Rd	&	193rd St	1-way stop		1 NA			1 NA						1 A/A	
Eagletown Rd	&	193rd St	1-way stop		1 NA			1 NA			1 A/A				
Eagletown Rd	&	186th St	2-way stop		1 A/A			1 A/A			1 NA			1 NA	
Casey Rd	&	186th St	2-way stop		1 NA			1 NA			1 A/A			1 A/A	
Casey Rd	&	193rd St	1-way stop		1 NA			1 NA			1 A/A				
Freemont Moore Rd	&	193rd St	1-way stop		1 NA			1 NA						1 A/A	
Six Points Rd	&	193rd St	1-way stop		1 NA			1 NA						1 B/B	

2021 Committed Conditions Intersection Lane Configuration and AM/PM Peak Hour Approach Levels of Service (Unmitigated)

N/S Street		E/W Street	Control Type	EB			WB			NB			SB		
				L	T	R	L	T	R	L	T	R	L	T	R
Springmill Rd	&	191st St	1-way stop					1 C/B			1 NA			1 NA	
Springmill Rd	&	186th St	2-way stop		1 B/C			1 B/B			1 NA			1 NA	
Dartown Rd	&	Kinsey Ave	All-way stop		1 A/A			1 A/A			1 A/A				
Wheeler Rd	&	181st St	2-way stop		1 NA			1 NA			1 B/B			1 B/B	
Horton Rd	&	191st St	1-way stop		1 NA			1 NA						1 B/B	
Tomlinson Rd	&	191st St	All-way stop		1 C/E			1 C/F			1 B/B			1 B/B	
Tomlinson Rd	&	196th St	1-way stop					1 A/A			1 NA			1 NA	
Tomlinson Rd	&	199th St	1-way stop		1 A/A						1 NA			1 NA	
Tomlinson Rd	&	206th St	1-way stop		1 NA			1 NA			1 A/A				
Horton Rd	&	206th St	All-way stop		1 A/A			1 A/A			1 A/A			1 A/A	
Six Points Rd	&	206th St	2-way stop		1 NA			1 NA			1 A/B			1 B/A	
Horton Rd	&	199th St	1-way stop					1 A/A			1 NA			1 NA	
Oakridge Rd	&	214th St	1-way stop		1 A/A						1 NA			1 NA	
Horton Rd	&	214th St	1-way stop					1 A/A			1 NA			1 NA	
Horton Rd	&	216th St	1-way stop		1 A/A						1 NA			1 NA	
Six Points Rd	&	216th St	2-way stop		1 A/A			1 A/A			1 NA			1 NA	
Freemont Moore Rd	&	216th St	2-way stop		1 NA			1 NA			1 A/A			1 A/A	
Freemont Moore Rd	&	211th St	1-way stop		1 A/A						1 NA			1 NA	
Freemont Moore Rd	&	206th St	2-way stop		1 NA			1 NA			1 A/A			1 A/A	
Lamong Rd	&	206th St	All-way stop		1 A/A			1 A/A			1 A/A			1 A/A	
Centennial Rd	&	206th St	1-way stop		1 NA			1 NA			1 A/A				
Mule Barn Rd	&	206th St	2-way stop		1 NA			1 NA			1 A/A			1 A/A	
Joliet Rd	&	206th St	1-way stop		1 NA			1 NA			1 A/A				
Hamilton Boone Rd	&	206th St	2-way stop		1 NA			1 NA			1 A/A			1 A/A	
Hamilton Boone Rd	&	216th St	1-way stop					1 A/A			1 NA			1 NA	
Mule Barn Rd	&	216th St	2-way stop		1 A/A			1 A/A			1 NA			1 NA	

2021 Committed Conditions Intersection Lane Configuration and AM/PM Peak Hour Approach Levels of Service (Unmitigated)

N/S Street		E/W Street	Control Type	EB			WB			NB			SB		
				L	T	R	L	T	R	L	T	R	L	T	R
Lamong Rd	&	216th St	2-way stop		1 A/A			1 A/A			1 NA			1 NA	
Lamong Rd	&	211th St	1-way stop					1 A/A			1 NA			1 NA	
Thatcher Ln	&	151st St	Signal	1	2 B/C		1	2 C/B		1	1 B/C		1	1 B/C	
Greyhound Pass	&	147th St	Signal				1		1 C/C		2 A/A		1	2 A/A	
Greyhound Ct	&	Greyhound Pass	Signal	1	2 C/B		1	2 C/C		1	1 A/A		1	1 A/A	
Oakridge Rd	&	206th St	1-way stop		1 NA			1 NA						1 A/A	
Marsh Dr	&	Greyhound Pass	Signal	1	2 A/A		1	2 A/A			1 B/B		1	1 B/B	
Cool Creek Park Rd	&	Greyhound Pass	Signal	1	2 A/A		1	2 A/A			1 C/C		1	1 C/C	
Cool Creek Park Rd	&	151st St	Roundabout		1 A/A			1 A/A			1 A/A			1 A/A	
Oak Rd	&	147th St	3-way stop		1 A/A						1 A/A			1 A/A	
East St Extension	&	196th St	2-way stop		1 NA			1 NA			1 A/A			1 A/A	

Notes:

1. State routes and 146th Street intersections will not become Westfield responsibility and are not shown.
2. Lanes that accommodate shared through and turning traffic are shown as through lanes.
3. A "+" indicates a shared through and turn lane in addition to an exclusive turn lane.
4. NA indicates movements that do not have to stop at an intersection. No LOS is defined.

Appendix G:
Project Cost Estimates

Carey Road From Saddlehorn to 161st Street **2-Lane Widen and Resurface**

QUANTITY SUMMARY

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization and Demobilization	L.S.	1.0	$83,400.00	$83,400.00
2	Excavation	C.Y.	2622.0	$15.00	$39,330.00
3	HMA Surface	TON	1418.0	$65.00	$92,170.00
4	HMA Intermediate	TON	477.0	$55.00	$26,235.00
5	HMA Base	TON	2825.0	$50.00	$141,250.00
6	No. 53 Aggregate Base	TON	2460.0	$38.00	$93,480.00
7	Curb & Gutter	L.F.	0.0	$15.00	$0.00
8	Curb	L.F.	0.0	$25.00	$0.00
9	HMA Trail Pavement	S.Y.	0.0	$36.00	$0.00
10	PCC Driveway Pavement	S.Y.	0.0	$40.00	$0.00
11	No. 11 HAC Driveway Pavement	S.Y.	100.0	$100.00	$10,000.00
12	PCC Sidewalk*	S.Y.	0.0	$90.00	$0.00
13	12" R.C.P.	L.F.	0.0	$25.00	$0.00
14	18" R.C.P.	L.F.	0.0	$35.00	$0.00
15	24" R.C.P.	L.F.	0.0	$45.00	$0.00
16	36" R.C.P.	L.F.	0.0	$55.00	$0.00
17	Inlet Type "B-15"	EA.	0.0	$3,000.00	$0.00
18	Manhole Type "C-4"	EA.	0.0	$3,500.00	$0.00
19	Structure Backfill	C.Y.	0.0	$30.00	$0.00
20	Underdrain**	L.F.	0.0	$10.00	$0.00
21	Earthfill and Topsoil	C.Y.	463.0	$25.00	$11,575.00
22	Seeding & Mulching	S.Y.	5552.0	$3.00	$16,656.00
23	Roundabout	EA.	1.0	$1,200,000.00	$1,200,000.00
24	HMA for Patching	C.Y.	462.0	$80.00	$36,920.80
25	Erosion Control	L.S.	1.0	$16,700.00	$16,700.00
26	Traffic Control	L.S.	1.0	$33,400.00	$33,400.00
27	Construction Staking	L.S.	1.0	$83,400.00	$83,400.00
28	Milling	S.Y.	13719.3	$9.00	$123,474.00
29	Special Project Elements	L.S.	0.0	$35,000.00	$35,000.00
	TOTAL ESTIMATED CONSTRUCTION COST:				**$2,042,990.80**

Contingency	20%	$408,598.16
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED):		**$2,451,600.00**

Springmill Road from City Limit to 156th **2-Lane Widen and Resurface**

QUANTITY SUMMARY					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT PRICE**	**AMOUNT**
1	Mobilization and Demobilization	L.S.	1.0	$17,600.00	$17,600.00
2	Excavation	C.Y.	1960.0	$15.00	$29,400.00
3	HMA Surface	TON	1093.0	$65.00	$71,045.00
4	HMA Intermediate	TON	357.0	$55.00	$19,635.00
5	HMA Base	TON	2112.0	$50.00	$105,600.00
6	No. 53 Aggregate Base	TON	1839.0	$38.00	$69,882.00
7	Curb & Gutter	L.F.	0.0	$15.00	$0.00
8	Curb	L.F.	0.0	$25.00	$0.00
9	HMA Trail Pavement	S.Y.	0.0	$36.00	$0.00
10	PCC Driveway Pavement	S.Y.	0.0	$40.00	$0.00
11	No. 11 HAC Driveway Pavement	S.Y.	75.0	$100.00	$7,500.00
12	PCC Sidewalk*	S.Y.	0.0	$90.00	$0.00
13	12" R.C.P.	L.F.	0.0	$25.00	$0.00
14	18" R.C.P.	L.F.	0.0	$35.00	$0.00
15	24" R.C.P.	L.F.	0.0	$45.00	$0.00
16	36" R.C.P.	L.F.	0.0	$55.00	$0.00
17	Inlet Type "B-15"	EA.	0.0	$3,000.00	$0.00
18	Manhole Type "C-4"	EA.	0.0	$3,500.00	$0.00
19	Structure Backfill	C.Y.	0.0	$30.00	$0.00
20	Underdrain**	L.F.	0.0	$10.00	$0.00
21	Earthfill and Topsoil	C.Y.	346.0	$25.00	$8,650.00
22	Seeding & Mulching	S.Y.	4151.0	$3.00	$12,453.00
23	Roundabout	EA.	0.0	$1,200,000.00	$0.00
24	HMA for Patching	C.Y.	345.0	$80.00	$27,604.89
25	Erosion Control	L.S.	1.0	$3,500.00	$3,500.00
26	Traffic Control	L.S.	1.0	$7,000.00	$7,000.00
27	Construction Staking	L.S.	1.0	$17,600.00	$17,600.00
28	Milling	S.Y.	10658.9	$9.00	$95,930.00
29	Special Project Elements	L.S.	0.0	$10,000.00	$10,000.00
	TOTAL ESTIMATED CONSTRUCTION COST:				**$503,399.89**

Contingency	20%	$100,679.98
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED):		**$604,100.00**

Springmill Road at 156th - North and South Approaches **Added Left Turn Lanes**

QUANTITY SUMMARY

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization and Demobilization	L.S.	1.0	$5,200.00	$5,200.00
2	Excavation	C.Y.	852.0	$15.00	$12,780.00
3	HMA Surface	TON	110.0	$65.00	$7,150.00
4	HMA Intermediate	TON	183.0	$55.00	$10,065.00
5	HMA Base	TON	880.0	$50.00	$44,000.00
6	No. 53 Aggregate Base	TON	679.0	$38.00	$25,802.00
7	Curb & Gutter	L.F.	0.0	$15.00	$0.00
8	Curb	L.F.	0.0	$25.00	$0.00
9	HMA Trail Pavement	S.Y.	0.0	$36.00	$0.00
10	PCC Driveway Pavement	S.Y.	0.0	$40.00	$0.00
11	No. 11 HAC Driveway Pavement	S.Y.	0.0	$100.00	$0.00
12	PCC Sidewalk*	S.Y.	0.0	$90.00	$0.00
13	12" R.C.P.	L.F.	0.0	$25.00	$0.00
14	18" R.C.P.	L.F.	0.0	$35.00	$0.00
15	24" R.C.P.	L.F.	0.0	$45.00	$0.00
16	36" R.C.P.	L.F.	0.0	$55.00	$0.00
17	Inlet Type "B-15"	EA.	0.0	$3,000.00	$0.00
18	Manhole Type "C-4"	EA.	0.0	$3,500.00	$0.00
19	Structure Backfill	C.Y.	0.0	$30.00	$0.00
20	Underdrain**	L.F.	0.0	$10.00	$0.00
21	Earthfill and Topsoil	C.Y.	74.0	$25.00	$1,850.00
22	Seeding & Mulching	S.Y.	889.0	$3.00	$2,667.00
23	Roundabout	EA.	0.0	$1,200,000.00	$0.00
24	HMA for Patching	C.Y.	0.0	$80.00	$0.00
25	Erosion Control	L.S.	1.0	$1,000.00	$1,000.00
26	Traffic Control	L.S.	1.0	$2,100.00	$2,100.00
27	Construction Staking	L.S.	1.0	$5,200.00	$5,200.00
28	Milling	S.Y.	0.0	$9.00	$0.00
29	Special Project Elements	L.S.	0.0	$0.00	$0.00
	TOTAL ESTIMATED CONSTRUCTION COST:				**$117,814.00**

Contingency 20% $23,562.80

TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED): $141,400.00

Springmill Road from 156th to 161st Street **2-Lane Widen and Resurface**

QUANTITY SUMMARY

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization and Demobilization	L.S.	1.0	$10,800.00	$10,800.00
2	Excavation	C.Y.	1104.0	$15.00	$16,560.00
3	HMA Surface	TON	634.0	$65.00	$41,210.00
4	HMA Intermediate	TON	201.0	$55.00	$11,055.00
5	HMA Base	TON	1189.0	$50.00	$59,450.00
6	No. 53 Aggregate Base	TON	1036.0	$38.00	$39,368.00
7	Curb & Gutter	L.F.	0.0	$15.00	$0.00
8	Curb	L.F.	0.0	$25.00	$0.00
9	HMA Trail Pavement	S.Y.	0.0	$36.00	$0.00
10	PCC Driveway Pavement	S.Y.	0.0	$40.00	$0.00
11	No. 11 HAC Driveway Pavement	S.Y.	200.0	$100.00	$20,000.00
12	PCC Sidewalk*	S.Y.	0.0	$90.00	$0.00
13	12" R.C.P.	L.F.	0.0	$25.00	$0.00
14	18" R.C.P.	L.F.	0.0	$35.00	$0.00
15	24" R.C.P.	L.F.	0.0	$45.00	$0.00
16	36" R.C.P.	L.F.	0.0	$55.00	$0.00
17	Inlet Type "B-15"	EA.	0.0	$3,000.00	$0.00
18	Manhole Type "C-4"	EA.	0.0	$3,500.00	$0.00
19	Structure Backfill	C.Y.	0.0	$30.00	$0.00
20	Underdrain**	L.F.	0.0	$10.00	$0.00
21	Earthfill and Topsoil	C.Y.	195.0	$25.00	$4,875.00
22	Seeding & Mulching	S.Y.	2338.0	$3.00	$7,014.00
23	Roundabout	EA.	0.0	$1,200,000.00	$0.00
24	HMA for Patching	C.Y.	194.0	$80.00	$15,546.22
25	Erosion Control	L.S.	1.0	$2,200.00	$2,200.00
26	Traffic Control	L.S.	1.0	$4,300.00	$4,300.00
27	Construction Staking	L.S.	1.0	$10,800.00	$10,800.00
28	Milling	S.Y.	6218.9	$9.00	$55,970.00
29	Special Project Elements	L.S.	0.0	$0.00	$0.00
	TOTAL ESTIMATED CONSTRUCTION COST:				**$299,148.22**

Contingency 20% $59,829.64

TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED): $359,000.00

Springmill Road from 161st Street to SR 32 **2-Lane Widen and Resurface**

QUANTITY SUMMARY

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization and Demobilization	L.S.	1.0	$30,400.00	$30,400.00
2	Excavation	C.Y.	3270.0	$15.00	$49,050.00
3	HMA Surface	TON	1769.0	$65.00	$114,985.00
4	HMA Intermediate	TON	595.0	$55.00	$32,725.00
5	HMA Base	TON	3523.0	$50.00	$176,150.00
6	No. 53 Aggregate Base	TON	3068.0	$38.00	$116,584.00
7	Curb & Gutter	L.F.	0.0	$15.00	$0.00
8	Curb	L.F.	0.0	$25.00	$0.00
9	HMA Trail Pavement	S.Y.	0.0	$36.00	$0.00
10	PCC Driveway Pavement	S.Y.	0.0	$40.00	$0.00
11	No. 11 HAC Driveway Pavement	S.Y.	375.0	$100.00	$37,500.00
12	PCC Sidewalk*	S.Y.	0.0	$90.00	$0.00
13	12" R.C.P.	L.F.	0.0	$25.00	$0.00
14	18" R.C.P.	L.F.	0.0	$35.00	$0.00
15	24" R.C.P.	L.F.	0.0	$45.00	$0.00
16	36" R.C.P.	L.F.	0.0	$55.00	$0.00
17	Inlet Type "B-15"	EA.	0.0	$3,000.00	$0.00
18	Manhole Type "C-4"	EA.	0.0	$3,500.00	$0.00
19	Structure Backfill	C.Y.	0.0	$30.00	$0.00
20	Underdrain**	L.F.	0.0	$10.00	$0.00
21	Earthfill and Topsoil	C.Y.	577.0	$25.00	$14,425.00
22	Seeding & Mulching	S.Y.	6924.0	$3.00	$20,772.00
23	Roundabout	EA.	0.0	$1,200,000.00	$0.00
24	HMA for Patching	C.Y.	576.0	$80.00	$46,047.56
25	Erosion Control	L.S.	1.0	$6,100.00	$6,100.00
26	Traffic Control	L.S.	1.0	$12,200.00	$12,200.00
27	Construction Staking	L.S.	1.0	$30,400.00	$30,400.00
28	Milling	S.Y.	17112.2	$9.00	$154,010.00
29	Special Project Elements	L.S.	0.0	$5,000.00	$5,000.00
	TOTAL ESTIMATED CONSTRUCTION COST:				**$846,348.56**

Contingency 20% $169,269.71

TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED): $1,015,600.00

Springmill Road from City Limit to 156th Street **Reconstruct as 4-lane with median**

QUANTITY SUMMARY

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization and Demobilization	L.S.	1.0	$166,300.00	$166,300.00
2	Excavation	C.Y.	13036.0	$15.00	$195,540.00
3	HMA Surface	TON	2090.0	$65.00	$135,850.00
4	HMA Intermediate	TON	3484.0	$55.00	$191,620.00
5	HMA Base	TON	16068.0	$50.00	$803,400.00
6	No. 53 Aggregate Base	TON	10333.0	$38.00	$392,654.00
7	Curb & Gutter	L.F.	9340.0	$15.00	$140,100.00
8	Curb	L.F.	9340.0	$25.00	$233,500.00
9	HMA Trail Pavement	S.Y.	8302.0	$36.00	$298,872.00
10	PCC Driveway Pavement	S.Y.	0.0	$40.00	$0.00
11	No. 11 HAC Driveway Pavement	S.Y.	75.0	$100.00	$7,500.00
12	PCC Sidewalk*	S.Y.	0.0	$90.00	$0.00
13	12" R.C.P.	L.F.	2242.0	$25.00	$56,050.00
14	18" R.C.P.	L.F.	1557.0	$35.00	$54,495.00
15	24" R.C.P.	L.F.	1557.0	$45.00	$70,065.00
16	36" R.C.P.	L.F.	1557.0	$55.00	$85,635.00
17	Inlet Type "B-15"	EA.	93.0	$3,000.00	$279,000.00
18	Manhole Type "C-4"	EA.	47.0	$3,500.00	$164,500.00
19	Structure Backfill	C.Y.	3407.0	$30.00	$102,210.00
20	Underdrain**	L.F.	9340.0	$10.00	$93,400.00
21	Earthfill and Topsoil	C.Y.	346.0	$25.00	$8,650.00
22	Seeding & Mulching	S.Y.	4151.0	$3.00	$12,453.00
23	Roundabout	EA.	0.0	$1,200,000.00	$0.00
24	HMA for Patching	C.Y.	0.0	$80.00	$0.00
25	Erosion Control	L.S.	1.0	$33,300.00	$33,300.00
26	Traffic Control	L.S.	1.0	$66,500.00	$66,500.00
27	Construction Staking	L.S.	1.0	$166,300.00	$166,300.00
28	Milling	S.Y.	0.0	$9.00	$0.00
29	Special Project Elements	L.S.	0.0	$20,000.00	$20,000.00
	TOTAL ESTIMATED CONSTRUCTION COST:				**$3,777,894.00**

Contingency 20% $755,578.80

TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED): $4,533,500.00

Springmill Road from SR 32 to 191st (Westfield Portions) **2-Lane Widen and Resurface**

QUANTITY SUMMARY

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization and Demobilization	L.S.	1.0	$21,300.00	$21,300.00
2	Excavation	C.Y.	2631.0	$15.00	$39,465.00
3	HMA Surface	TON	968.0	$65.00	$62,920.00
4	HMA Intermediate	TON	532.0	$55.00	$29,260.00
5	HMA Base	TON	2765.0	$50.00	$138,250.00
6	No. 53 Aggregate Base	TON	2245.0	$38.00	$85,310.00
7	Curb & Gutter	L.F.	0.0	$15.00	$0.00
8	Curb	L.F.	0.0	$25.00	$0.00
9	HMA Trail Pavement	S.Y.	0.0	$36.00	$0.00
10	PCC Driveway Pavement	S.Y.	0.0	$40.00	$0.00
11	No. 11 HAC Driveway Pavement	S.Y.	300.0	$100.00	$30,000.00
12	PCC Sidewalk*	S.Y.	0.0	$90.00	$0.00
13	12" R.C.P.	L.F.	0.0	$25.00	$0.00
14	18" R.C.P.	L.F.	0.0	$35.00	$0.00
15	24" R.C.P.	L.F.	0.0	$45.00	$0.00
16	36" R.C.P.	L.F.	0.0	$55.00	$0.00
17	Inlet Type "B-15"	EA.	0.0	$3,000.00	$0.00
18	Manhole Type "C-4"	EA.	0.0	$3,500.00	$0.00
19	Structure Backfill	C.Y.	0.0	$30.00	$0.00
20	Underdrain**	L.F.	0.0	$10.00	$0.00
21	Earthfill and Topsoil	C.Y.	322.0	$25.00	$8,050.00
22	Seeding & Mulching	S.Y.	3867.0	$3.00	$11,601.00
23	Roundabout	EA.	0.0	$1,200,000.00	$0.00
24	HMA for Patching	C.Y.	271.0	$80.00	$21,653.33
25	Erosion Control	L.S.	1.0	$4,300.00	$4,300.00
26	Traffic Control	L.S.	1.0	$8,500.00	$8,500.00
27	Construction Staking	L.S.	1.0	$21,300.00	$21,300.00
28	Milling	S.Y.	7866.7	$9.00	$70,800.00
29	Special Project Elements	L.S.	0.0	$5,000.00	$5,000.00
	TOTAL ESTIMATED CONSTRUCTION COST:				**$557,709.33**
			Contingency	20%	$111,541.87
			TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED):		**$669,300.00**

Gray Road from Guerin Way to 161st Street **2-Lane Widen and Resurface**

QUANTITY SUMMARY

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization and Demobilization	L.S.	1.0	$17,900.00	$17,900.00
2	Excavation	C.Y.	2146.0	$15.00	$32,190.00
3	HMA Surface	TON	924.0	$65.00	$60,060.00
4	HMA Intermediate	TON	422.0	$55.00	$23,210.00
5	HMA Base	TON	2269.0	$50.00	$113,450.00
6	No. 53 Aggregate Base	TON	1877.0	$38.00	$71,326.00
7	Curb & Gutter	L.F.	0.0	$15.00	$0.00
8	Curb	L.F.	0.0	$25.00	$0.00
9	HMA Trail Pavement	S.Y.	0.0	$36.00	$0.00
10	PCC Driveway Pavement	S.Y.	0.0	$40.00	$0.00
11	No. 11 HAC Driveway Pavement	S.Y.	200.0	$100.00	$20,000.00
12	PCC Sidewalk*	S.Y.	0.0	$90.00	$0.00
13	12" R.C.P.	L.F.	0.0	$25.00	$0.00
14	18" R.C.P.	L.F.	0.0	$35.00	$0.00
15	24" R.C.P.	L.F.	0.0	$45.00	$0.00
16	36" R.C.P.	L.F.	0.0	$55.00	$0.00
17	Inlet Type "B-15"	EA.	0.0	$3,000.00	$0.00
18	Manhole Type "C-4"	EA.	0.0	$3,500.00	$0.00
19	Structure Backfill	C.Y.	0.0	$30.00	$0.00
20	Underdrain**	L.F.	0.0	$10.00	$0.00
21	Earthfill and Topsoil	C.Y.	293.0	$25.00	$7,325.00
22	Seeding & Mulching	S.Y.	3511.0	$3.00	$10,533.00
23	Roundabout	EA.	0.0	$1,200,000.00	$0.00
24	HMA for Patching	C.Y.	261.0	$80.00	$20,891.11
25	Erosion Control	L.S.	1.0	$3,600.00	$3,600.00
26	Traffic Control	L.S.	1.0	$7,200.00	$7,200.00
27	Construction Staking	L.S.	1.0	$17,900.00	$17,900.00
28	Milling	S.Y.	8127.8	$9.00	$73,150.00
29	Special Project Elements	L.S.	0.0	$285,000.00	$285,000.00
	TOTAL ESTIMATED CONSTRUCTION COST:				**$763,735.11**

Contingency	20%	$152,747.02
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED):		**$916,500.00**

Gray Road from 161st Street to Golden Hinde Way **2-Lane Widen and Resurface**

QUANTITY SUMMARY

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization and Demobilization	L.S.	1.0	$31,800.00	$31,800.00
2	Excavation	C.Y.	3531.0	$15.00	$52,965.00
3	HMA Surface	TON	1529.0	$65.00	$99,385.00
4	HMA Intermediate	TON	695.0	$55.00	$38,225.00
5	HMA Base	TON	3734.0	$50.00	$186,700.00
6	No. 53 Aggregate Base	TON	3090.0	$38.00	$117,420.00
7	Curb & Gutter	L.F.	0.0	$15.00	$0.00
8	Curb	L.F.	0.0	$25.00	$0.00
9	HMA Trail Pavement	S.Y.	0.0	$36.00	$0.00
10	PCC Driveway Pavement	S.Y.	0.0	$40.00	$0.00
11	No. 11 HAC Driveway Pavement	S.Y.	775.0	$100.00	$77,500.00
12	PCC Sidewalk*	S.Y.	0.0	$90.00	$0.00
13	12" R.C.P.	L.F.	0.0	$25.00	$0.00
14	18" R.C.P.	L.F.	0.0	$35.00	$0.00
15	24" R.C.P.	L.F.	0.0	$45.00	$0.00
16	36" R.C.P.	L.F.	0.0	$55.00	$0.00
17	Inlet Type "B-15"	EA.	0.0	$3,000.00	$0.00
18	Manhole Type "C-4"	EA.	0.0	$3,500.00	$0.00
19	Structure Backfill	C.Y.	0.0	$30.00	$0.00
20	Underdrain**	L.F.	0.0	$10.00	$0.00
21	Earthfill and Topsoil	C.Y.	481.0	$25.00	$12,025.00
22	Seeding & Mulching	S.Y.	5778.0	$3.00	$17,334.00
23	Roundabout	EA.	0.0	$1,200,000.00	$0.00
24	HMA for Patching	C.Y.	430.0	$80.00	$34,377.78
25	Erosion Control	L.S.	1.0	$6,400.00	$6,400.00
26	Traffic Control	L.S.	1.0	$12,700.00	$12,700.00
27	Construction Staking	L.S.	1.0	$31,800.00	$31,800.00
28	Milling	S.Y.	13477.8	$9.00	$121,300.00
29	Special Project Elements	L.S.	0.0	$20,000.00	$20,000.00
	TOTAL ESTIMATED CONSTRUCTION COST:				**$859,931.78**

Contingency	20%	$171,986.36
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED):		**$1,031,900.00**

151st Street from Cool Creek Park Road to Carey Road **2-Lane Widen and Resurface**

QUANTITY SUMMARY

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization and Demobilization	L.S.	1.0	$14,100.00	$14,100.00
2	Excavation	C.Y.	1448.0	$15.00	$21,720.00
3	HMA Surface	TON	1130.0	$65.00	$73,450.00
4	HMA Intermediate	TON	264.0	$55.00	$14,520.00
5	HMA Base	TON	1560.0	$50.00	$78,000.00
6	No. 53 Aggregate Base	TON	1359.0	$38.00	$51,642.00
7	Curb & Gutter	L.F.	0.0	$15.00	$0.00
8	Curb	L.F.	0.0	$25.00	$0.00
9	HMA Trail Pavement	S.Y.	0.0	$36.00	$0.00
10	PCC Driveway Pavement	S.Y.	0.0	$40.00	$0.00
11	No. 11 HAC Driveway Pavement	S.Y.	75.0	$100.00	$7,500.00
12	PCC Sidewalk*	S.Y.	0.0	$90.00	$0.00
13	12" R.C.P.	L.F.	0.0	$25.00	$0.00
14	18" R.C.P.	L.F.	0.0	$35.00	$0.00
15	24" R.C.P.	L.F.	0.0	$45.00	$0.00
16	36" R.C.P.	L.F.	0.0	$55.00	$0.00
17	Inlet Type "B-15"	EA.	0.0	$3,000.00	$0.00
18	Manhole Type "C-4"	EA.	0.0	$3,500.00	$0.00
19	Structure Backfill	C.Y.	0.0	$30.00	$0.00
20	Underdrain**	L.F.	0.0	$10.00	$0.00
21	Earthfill and Topsoil	C.Y.	256.0	$25.00	$6,400.00
22	Seeding & Mulching	S.Y.	3067.0	$3.00	$9,201.00
23	Roundabout	EA.	0.0	$1,200,000.00	$0.00
24	HMA for Patching	C.Y.	255.0	$80.00	$20,393.33
25	Erosion Control	L.S.	1.0	$2,800.00	$2,800.00
26	Traffic Control	L.S.	1.0	$5,700.00	$5,700.00
27	Construction Staking	L.S.	1.0	$14,100.00	$14,100.00
28	Milling	S.Y.	7950.0	$9.00	$71,550.00
29	Special Project Elements	L.S.	0.0	$74,000.00	$74,000.00
	TOTAL ESTIMATED CONSTRUCTION COST:				**$465,076.33**

Contingency 20% $93,015.27

TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED): $558,100.00

151st Street from Carey Road to Setters Run **2-Lane Widen and Resurface**

QUANTITY SUMMARY

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization and Demobilization	L.S.	1.0	$9,000.00	$9,000.00
2	Excavation	C.Y.	902.0	$15.00	$13,530.00
3	HMA Surface	TON	725.0	$65.00	$47,125.00
4	HMA Intermediate	TON	164.0	$55.00	$9,020.00
5	HMA Base	TON	972.0	$50.00	$48,600.00
6	No. 53 Aggregate Base	TON	847.0	$38.00	$32,186.00
7	Curb & Gutter	L.F.	0.0	$15.00	$0.00
8	Curb	L.F.	0.0	$25.00	$0.00
9	HMA Trail Pavement	S.Y.	0.0	$36.00	$0.00
10	PCC Driveway Pavement	S.Y.	0.0	$40.00	$0.00
11	No. 11 HAC Driveway Pavement	S.Y.	75.0	$100.00	$7,500.00
12	PCC Sidewalk*	S.Y.	0.0	$90.00	$0.00
13	12" R.C.P.	L.F.	0.0	$25.00	$0.00
14	18" R.C.P.	L.F.	0.0	$35.00	$0.00
15	24" R.C.P.	L.F.	0.0	$45.00	$0.00
16	36" R.C.P.	L.F.	0.0	$55.00	$0.00
17	Inlet Type "B-15"	EA.	0.0	$3,000.00	$0.00
18	Manhole Type "C-4"	EA.	0.0	$3,500.00	$0.00
19	Structure Backfill	C.Y.	0.0	$30.00	$0.00
20	Underdrain**	L.F.	0.0	$10.00	$0.00
21	Earthfill and Topsoil	C.Y.	159.0	$25.00	$3,975.00
22	Seeding & Mulching	S.Y.	1911.0	$3.00	$5,733.00
23	Roundabout	EA.	0.0	$1,200,000.00	$0.00
24	HMA for Patching	C.Y.	159.0	$80.00	$12,708.89
25	Erosion Control	L.S.	1.0	$1,800.00	$1,800.00
26	Traffic Control	L.S.	1.0	$3,600.00	$3,600.00
27	Construction Staking	L.S.	1.0	$9,000.00	$9,000.00
28	Milling	S.Y.	5205.6	$9.00	$46,850.00
29	Special Project Elements	L.S.	0.0	$74,000.00	$74,000.00
	TOTAL ESTIMATED CONSTRUCTION COST:				**$324,627.89**

Contingency	20%	$64,925.58
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED):		**$389,600.00**

161st Street from Oakridge Road to US 31 **Reconstruct as 4-lane with median**

QUANTITY SUMMARY					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT PRICE**	**AMOUNT**
1	Mobilization and Demobilization	L.S.	1.0	$161,500.00	$161,500.00
2	Excavation	C.Y.	12913.0	$15.00	$193,695.00
3	HMA Surface	TON	2046.0	$65.00	$132,990.00
4	HMA Intermediate	TON	3410.0	$55.00	$187,550.00
5	HMA Base	TON	15775.0	$50.00	$788,750.00
6	No. 53 Aggregate Base	TON	10229.0	$38.00	$388,702.00
7	Curb & Gutter	L.F.	9340.0	$15.00	$140,100.00
8	Curb	L.F.	9340.0	$25.00	$233,500.00
9	HMA Trail Pavement	S.Y.	8302.0	$36.00	$298,872.00
10	PCC Driveway Pavement	S.Y.	0.0	$40.00	$0.00
11	No. 11 HAC Driveway Pavement	S.Y.	325.0	$100.00	$32,500.00
12	PCC Sidewalk*	S.Y.	0.0	$90.00	$0.00
13	12" R.C.P.	L.F.	2242.0	$25.00	$56,050.00
14	18" R.C.P.	L.F.	1557.0	$35.00	$54,495.00
15	24" R.C.P.	L.F.	1557.0	$45.00	$70,065.00
16	36" R.C.P.	L.F.	1557.0	$55.00	$85,635.00
17	Inlet Type "B-15"	EA.	93.0	$3,000.00	$279,000.00
18	Manhole Type "C-4"	EA.	47.0	$3,500.00	$164,500.00
19	Structure Backfill	C.Y.	3407.0	$30.00	$102,210.00
20	Underdrain**	L.F.	0.0	$10.00	$0.00
21	Earthfill and Topsoil	C.Y.	346.0	$25.00	$8,650.00
22	Seeding & Mulching	S.Y.	4151.0	$3.00	$12,453.00
23	Roundabout	EA.	0.0	$1,200,000.00	$0.00
24	HMA for Patching	C.Y.	0.0	$80.00	$0.00
25	Erosion Control	L.S.	1.0	$32,300.00	$32,300.00
26	Traffic Control	L.S.	1.0	$64,600.00	$64,600.00
27	Construction Staking	L.S.	1.0	$161,500.00	$161,500.00
28	Milling	S.Y.	0.0	$9.00	$0.00
29	Special Project Elements	L.S.	0.0	$212,000.00	$212,000.00
	TOTAL ESTIMATED CONSTRUCTION COST:				**$3,861,617.00**

Contingency	20%	$772,323.40
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED):		**$4,633,900.00**

161st Street from US 31 to Union Street **Reconstruct as 4-lane with median**

QUANTITY SUMMARY					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT PRICE**	**AMOUNT**
1	Mobilization and Demobilization	L.S.	1.0	$108,800.00	$108,800.00
2	Excavation	C.Y.	3451.0	$15.00	$51,765.00
3	HMA Surface	TON	669.0	$65.00	$43,485.00
4	HMA Intermediate	TON	1115.0	$55.00	$61,325.00
5	HMA Base	TON	5034.0	$50.00	$251,700.00
6	No. 53 Aggregate Base	TON	3365.0	$38.00	$127,870.00
7	Curb & Gutter	L.F.	2520.0	$15.00	$37,800.00
8	Curb	L.F.	2520.0	$25.00	$63,000.00
9	HMA Trail Pavement	S.Y.	2240.0	$36.00	$80,640.00
10	PCC Driveway Pavement	S.Y.	0.0	$40.00	$0.00
11	No. 11 HAC Driveway Pavement	S.Y.	325.0	$100.00	$32,500.00
12	PCC Sidewalk*	S.Y.	0.0	$90.00	$0.00
13	12" R.C.P.	L.F.	605.0	$25.00	$15,125.00
14	18" R.C.P.	L.F.	420.0	$35.00	$14,700.00
15	24" R.C.P.	L.F.	420.0	$45.00	$18,900.00
16	36" R.C.P.	L.F.	420.0	$55.00	$23,100.00
17	Inlet Type "B-15"	EA.	25.0	$3,000.00	$75,000.00
18	Manhole Type "C-4"	EA.	13.0	$3,500.00	$45,500.00
19	Structure Backfill	C.Y.	919.0	$30.00	$27,570.00
20	Underdrain**	L.F.	0.0	$10.00	$0.00
21	Earthfill and Topsoil	C.Y.	93.0	$25.00	$2,325.00
22	Seeding & Mulching	S.Y.	1120.0	$3.00	$3,360.00
23	Roundabout	EA.	1.0	$1,200,000.00	$1,200,000.00
24	HMA for Patching	C.Y.	0.0	$80.00	$0.00
25	Erosion Control	L.S.	1.0	$21,800.00	$21,800.00
26	Traffic Control	L.S.	1.0	$43,500.00	$43,500.00
27	Construction Staking	L.S.	1.0	$108,800.00	$108,800.00
28	Milling	S.Y.	0.0	$9.00	$0.00
29	Special Project Elements	L.S.	0.0	$0.00	$0.00
	TOTAL ESTIMATED CONSTRUCTION COST:				**$2,458,565.00**
			Contingency	20%	$491,713.00
			TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED):		**$2,950,300.00**

Oakridge Road from Sapphire Drive to 161st Street **2-Lane Widen and Resurface**

QUANTITY SUMMARY

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization and Demobilization	L.S.	1.0	$28,500.00	$28,500.00
2	Excavation	C.Y.	3022.0	$15.00	$45,330.00
3	HMA Surface	TON	1683.0	$65.00	$109,395.00
4	HMA Intermediate	TON	550.0	$55.00	$30,250.00
5	HMA Base	TON	3256.0	$50.00	$162,800.00
6	No. 53 Aggregate Base	TON	2836.0	$38.00	$107,768.00
7	Curb & Gutter	L.F.	0.0	$15.00	$0.00
8	Curb	L.F.	0.0	$25.00	$0.00
9	HMA Trail Pavement	S.Y.	0.0	$36.00	$0.00
10	PCC Driveway Pavement	S.Y.	0.0	$40.00	$0.00
11	No. 11 HAC Driveway Pavement	S.Y.	400.0	$100.00	$40,000.00
12	PCC Sidewalk*	S.Y.	0.0	$90.00	$0.00
13	12" R.C.P.	L.F.	0.0	$25.00	$0.00
14	18" R.C.P.	L.F.	0.0	$35.00	$0.00
15	24" R.C.P.	L.F.	0.0	$45.00	$0.00
16	36" R.C.P.	L.F.	0.0	$55.00	$0.00
17	Inlet Type "B-15"	EA.	0.0	$3,000.00	$0.00
18	Manhole Type "C-4"	EA.	0.0	$3,500.00	$0.00
19	Structure Backfill	C.Y.	0.0	$30.00	$0.00
20	Underdrain**	L.F.	0.0	$10.00	$0.00
21	Earthfill and Topsoil	C.Y.	533.0	$25.00	$13,325.00
22	Seeding & Mulching	S.Y.	6400.0	$3.00	$19,200.00
23	Roundabout	EA.	0.0	$1,200,000.00	$0.00
24	HMA for Patching	C.Y.	532.0	$80.00	$42,560.00
25	Erosion Control	L.S.	1.0	$5,700.00	$5,700.00
26	Traffic Control	L.S.	1.0	$11,400.00	$11,400.00
27	Construction Staking	L.S.	1.0	$28,500.00	$28,500.00
28	Milling	S.Y.	16400.0	$9.00	$147,600.00
29	Special Project Elements	L.S.	0.0	$24,000.00	$24,000.00
	TOTAL ESTIMATED CONSTRUCTION COST:				**$816,328.00**
			Contingency	20%	$163,265.60
			TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED):		**$979,600.00**

Oakridge Road from 161th Street to 169th St **2-Lane Widen and Resurface**

QUANTITY SUMMARY

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization and Demobilization	L.S.	1.0	$29,700.00	$29,700.00
2	Excavation	C.Y.	3157.0	$15.00	$47,355.00
3	HMA Surface	TON	1754.0	$65.00	$114,010.00
4	HMA Intermediate	TON	574.0	$55.00	$31,570.00
5	HMA Base	TON	3401.0	$50.00	$170,050.00
6	No. 53 Aggregate Base	TON	2962.0	$38.00	$112,556.00
7	Curb & Gutter	L.F.	0.0	$15.00	$0.00
8	Curb	L.F.	0.0	$25.00	$0.00
9	HMA Trail Pavement	S.Y.	0.0	$36.00	$0.00
10	PCC Driveway Pavement	S.Y.	0.0	$40.00	$0.00
11	No. 11 HAC Driveway Pavement	S.Y.	400.0	$100.00	$40,000.00
12	PCC Sidewalk*	S.Y.	0.0	$90.00	$0.00
13	12" R.C.P.	L.F.	0.0	$25.00	$0.00
14	18" R.C.P.	L.F.	0.0	$35.00	$0.00
15	24" R.C.P.	L.F.	0.0	$45.00	$0.00
16	36" R.C.P.	L.F.	0.0	$55.00	$0.00
17	Inlet Type "B-15"	EA.	0.0	$3,000.00	$0.00
18	Manhole Type "C-4"	EA.	0.0	$3,500.00	$0.00
19	Structure Backfill	C.Y.	0.0	$30.00	$0.00
20	Underdrain**	L.F.	0.0	$10.00	$0.00
21	Earthfill and Topsoil	C.Y.	557.0	$25.00	$13,925.00
22	Seeding & Mulching	S.Y.	6684.0	$3.00	$20,052.00
23	Roundabout	EA.	0.0	$1,200,000.00	$0.00
24	HMA for Patching	C.Y.	556.0	$80.00	$44,451.56
25	Erosion Control	L.S.	1.0	$5,900.00	$5,900.00
26	Traffic Control	L.S.	1.0	$11,900.00	$11,900.00
27	Construction Staking	L.S.	1.0	$29,700.00	$29,700.00
28	Milling	S.Y.	17075.6	$9.00	$153,680.00
29	Special Project Elements	L.S.	0.0	$5,000.00	$5,000.00
	TOTAL ESTIMATED CONSTRUCTION COST:				**$829,849.56**

Contingency	20%	$165,969.91
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED):		**$995,800.00**

Oakridge Road from 169th Street to Pine Ridge Drive **2-Lane Widen and Resurface**

QUANTITY SUMMARY

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization and Demobilization	L.S.	1.0	$14,000.00	$14,000.00
2	Excavation	C.Y.	1494.0	$15.00	$22,410.00
3	HMA Surface	TON	704.0	$65.00	$45,760.00
4	HMA Intermediate	TON	294.0	$55.00	$16,170.00
5	HMA Base	TON	1580.0	$50.00	$79,000.00
6	No. 53 Aggregate Base	TON	1307.0	$38.00	$49,666.00
7	Curb & Gutter	L.F.	0.0	$15.00	$0.00
8	Curb	L.F.	0.0	$25.00	$0.00
9	HMA Trail Pavement	S.Y.	0.0	$36.00	$0.00
10	PCC Driveway Pavement	S.Y.	0.0	$40.00	$0.00
11	No. 11 HAC Driveway Pavement	S.Y.	400.0	$100.00	$40,000.00
12	PCC Sidewalk*	S.Y.	0.0	$90.00	$0.00
13	12" R.C.P.	L.F.	0.0	$25.00	$0.00
14	18" R.C.P.	L.F.	0.0	$35.00	$0.00
15	24" R.C.P.	L.F.	0.0	$45.00	$0.00
16	36" R.C.P.	L.F.	0.0	$55.00	$0.00
17	Inlet Type "B-15"	EA.	0.0	$3,000.00	$0.00
18	Manhole Type "C-4"	EA.	0.0	$3,500.00	$0.00
19	Structure Backfill	C.Y.	0.0	$30.00	$0.00
20	Underdrain**	L.F.	0.0	$10.00	$0.00
21	Earthfill and Topsoil	C.Y.	204.0	$25.00	$5,100.00
22	Seeding & Mulching	S.Y.	2444.0	$3.00	$7,332.00
23	Roundabout	EA.	0.0	$1,200,000.00	$0.00
24	HMA for Patching	C.Y.	182.0	$80.00	$14,544.44
25	Erosion Control	L.S.	1.0	$2,800.00	$2,800.00
26	Traffic Control	L.S.	1.0	$5,600.00	$5,600.00
27	Construction Staking	L.S.	1.0	$14,000.00	$14,000.00
28	Milling	S.Y.	6394.4	$9.00	$57,550.00
29	Special Project Elements	L.S.	0.0	$0.00	$0.00
	TOTAL ESTIMATED CONSTRUCTION COST:				**$373,932.44**

Contingency	20%	$74,786.49
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED):		**$448,700.00**

Wheeler from SR 32 to 181st **2-Lane Widen and Resurface**

QUANTITY SUMMARY					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT PRICE**	**AMOUNT**
1	Mobilization and Demobilization	L.S.	1.0	$12,200.00	$12,200.00
2	Excavation	C.Y.	1573.0	$15.00	$23,595.00
3	HMA Surface	TON	572.0	$65.00	$37,180.00
4	HMA Intermediate	TON	318.0	$55.00	$17,490.00
5	HMA Base	TON	1652.0	$50.00	$82,600.00
6	No. 53 Aggregate Base	TON	1342.0	$38.00	$50,996.00
7	Curb & Gutter	L.F.	0.0	$15.00	$0.00
8	Curb	L.F.	0.0	$25.00	$0.00
9	HMA Trail Pavement	S.Y.	0.0	$36.00	$0.00
10	PCC Driveway Pavement	S.Y.	0.0	$40.00	$0.00
11	No. 11 HAC Driveway Pavement	S.Y.	75.0	$100.00	$7,500.00
12	PCC Sidewalk*	S.Y.	0.0	$90.00	$0.00
13	12" R.C.P.	L.F.	0.0	$25.00	$0.00
14	18" R.C.P.	L.F.	0.0	$35.00	$0.00
15	24" R.C.P.	L.F.	0.0	$45.00	$0.00
16	36" R.C.P.	L.F.	0.0	$55.00	$0.00
17	Inlet Type "B-15"	EA.	0.0	$3,000.00	$0.00
18	Manhole Type "C-4"	EA.	0.0	$3,500.00	$0.00
19	Structure Backfill	C.Y.	0.0	$30.00	$0.00
20	Underdrain**	L.F.	0.0	$10.00	$0.00
21	Earthfill and Topsoil	C.Y.	193.0	$25.00	$4,825.00
22	Seeding & Mulching	S.Y.	2311.0	$3.00	$6,933.00
23	Roundabout	EA.	0.0	$1,200,000.00	$0.00
24	HMA for Patching	C.Y.	162.0	$80.00	$12,942.22
25	Erosion Control	L.S.	1.0	$2,400.00	$2,400.00
26	Traffic Control	L.S.	1.0	$4,900.00	$4,900.00
27	Construction Staking	L.S.	1.0	$12,200.00	$12,200.00
28	Milling	S.Y.	4622.2	$9.00	$41,600.00
29	Special Project Elements	L.S.	0.0	$0.00	$0.00
	TOTAL ESTIMATED CONSTRUCTION COST:				**$317,361.22**

Contingency	20%	$63,472.24
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED):		**$380,800.00**

Union Street from 161st Street to David Brown Drive **2-Lane Widen and Resurface**

QUANTITY SUMMARY

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization and Demobilization	L.S.	1.0	$15,500.00	$15,500.00
2	Excavation	C.Y.	1818.0	$15.00	$27,270.00
3	HMA Surface	TON	875.0	$65.00	$56,875.00
4	HMA Intermediate	TON	346.0	$55.00	$19,030.00
5	HMA Base	TON	1938.0	$50.00	$96,900.00
6	No. 53 Aggregate Base	TON	1640.0	$38.00	$62,320.00
7	Curb & Gutter	L.F.	0.0	$15.00	$0.00
8	Curb	L.F.	0.0	$25.00	$0.00
9	HMA Trail Pavement	S.Y.	0.0	$36.00	$0.00
10	PCC Driveway Pavement	S.Y.	0.0	$40.00	$0.00
11	No. 11 HAC Driveway Pavement	S.Y.	100.0	$100.00	$10,000.00
12	PCC Sidewalk*	S.Y.	0.0	$90.00	$0.00
13	12" R.C.P.	L.F.	0.0	$25.00	$0.00
14	18" R.C.P.	L.F.	0.0	$35.00	$0.00
15	24" R.C.P.	L.F.	0.0	$45.00	$0.00
16	36" R.C.P.	L.F.	0.0	$55.00	$0.00
17	Inlet Type "B-15"	EA.	0.0	$3,000.00	$0.00
18	Manhole Type "C-4"	EA.	0.0	$3,500.00	$0.00
19	Structure Backfill	C.Y.	0.0	$30.00	$0.00
20	Underdrain**	L.F.	0.0	$10.00	$0.00
21	Earthfill and Topsoil	C.Y.	280.0	$25.00	$7,000.00
22	Seeding & Mulching	S.Y.	3356.0	$3.00	$10,068.00
23	Roundabout	EA.	0.0	$1,200,000.00	$0.00
24	HMA for Patching	C.Y.	264.0	$80.00	$21,140.00
25	Erosion Control	L.S.	1.0	$3,100.00	$3,100.00
26	Traffic Control	L.S.	1.0	$6,200.00	$6,200.00
27	Construction Staking	L.S.	1.0	$15,500.00	$15,500.00
28	Milling	S.Y.	8083.3	$9.00	$72,750.00
29	Special Project Elements	L.S.	0.0	$5,000.00	$5,000.00
	TOTAL ESTIMATED CONSTRUCTION COST:				**$428,653.00**

Contingency	20%	$85,730.60
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED):		**$514,400.00**

191st Street from Springmill Road to Grand Park Entrance **2-Lane Widen and Resurface**

QUANTITY SUMMARY

ITEM NO.	ITEM DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	AMOUNT
1	Mobilization and Demobilization	L.S.	1.0	$23,200.00	$23,200.00
2	Excavation	C.Y.	2964.0	$15.00	$44,460.00
3	HMA Surface	TON	1089.0	$65.00	$70,785.00
4	HMA Intermediate	TON	599.0	$55.00	$32,945.00
5	HMA Base	TON	3114.0	$50.00	$155,700.00
6	No. 53 Aggregate Base	TON	2529.0	$38.00	$96,102.00
7	Curb & Gutter	L.F.	0.0	$15.00	$0.00
8	Curb	L.F.	0.0	$25.00	$0.00
9	HMA Trail Pavement	S.Y.	0.0	$36.00	$0.00
10	PCC Driveway Pavement	S.Y.	0.0	$40.00	$0.00
11	No. 11 HAC Driveway Pavement	S.Y.	175.0	$100.00	$17,500.00
12	PCC Sidewalk*	S.Y.	0.0	$90.00	$0.00
13	12" R.C.P.	L.F.	0.0	$25.00	$0.00
14	18" R.C.P.	L.F.	0.0	$35.00	$0.00
15	24" R.C.P.	L.F.	0.0	$45.00	$0.00
16	36" R.C.P.	L.F.	0.0	$55.00	$0.00
17	Inlet Type "B-15"	EA.	0.0	$3,000.00	$0.00
18	Manhole Type "C-4"	EA.	0.0	$3,500.00	$0.00
19	Structure Backfill	C.Y.	0.0	$30.00	$0.00
20	Underdrain**	L.F.	0.0	$10.00	$0.00
21	Earthfill and Topsoil	C.Y.	363.0	$25.00	$9,075.00
22	Seeding & Mulching	S.Y.	4356.0	$3.00	$13,068.00
23	Roundabout	EA.	0.0	$1,200,000.00	$0.00
24	HMA for Patching	C.Y.	305.0	$80.00	$24,391.11
25	Erosion Control	L.S.	1.0	$4,600.00	$4,600.00
26	Traffic Control	L.S.	1.0	$9,300.00	$9,300.00
27	Construction Staking	L.S.	1.0	$23,200.00	$23,200.00
28	Milling	S.Y.	8844.4	$9.00	$79,600.00
29	Special Project Elements	L.S.	0.0	$10,000.00	$10,000.00
	TOTAL ESTIMATED CONSTRUCTION COST:				**$613,926.11**
			Contingency	20%	$122,785.22
			TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED):		**$736,700.00**

Grand Park Entrance to Tomlinson Road **Reconstruct as 4-lane with median**

QUANTITY SUMMARY					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT PRICE**	**AMOUNT**
1	Mobilization and Demobilization	L.S.	1.0	$225,500.00	$225,500.00
2	Excavation	C.Y.	13032.0	$15.00	$195,480.00
3	HMA Surface	TON	1960.0	$65.00	$127,400.00
4	HMA Intermediate	TON	3267.0	$55.00	$179,685.00
5	HMA Base	TON	16025.0	$50.00	$801,250.00
6	No. 53 Aggregate Base	TON	10774.0	$38.00	$409,412.00
7	Curb & Gutter	L.F.	9800.0	$15.00	$147,000.00
8	Curb	L.F.	9800.0	$25.00	$245,000.00
9	HMA Trail Pavement	S.Y.	8711.0	$36.00	$313,596.00
10	PCC Driveway Pavement	S.Y.	0.0	$40.00	$0.00
11	No. 11 HAC Driveway Pavement	S.Y.	175.0	$100.00	$17,500.00
12	PCC Sidewalk*	S.Y.	0.0	$90.00	$0.00
13	12" R.C.P.	L.F.	2352.0	$25.00	$58,800.00
14	18" R.C.P.	L.F.	1633.0	$35.00	$57,155.00
15	24" R.C.P.	L.F.	1633.0	$45.00	$73,485.00
16	36" R.C.P.	L.F.	1633.0	$55.00	$89,815.00
17	Inlet Type "B-15"	EA.	98.0	$3,000.00	$294,000.00
18	Manhole Type "C-4"	EA.	49.0	$3,500.00	$171,500.00
19	Structure Backfill	C.Y.	3575.0	$30.00	$107,250.00
20	Underdrain**	L.F.	0.0	$10.00	$0.00
21	Earthfill and Topsoil	C.Y.	363.0	$25.00	$9,075.00
22	Seeding & Mulching	S.Y.	4356.0	$3.00	$13,068.00
23	Roundabout	EA.	1.0	$1,200,000.00	$1,200,000.00
24	HMA for Patching	C.Y.	0.0	$80.00	$0.00
25	Erosion Control	L.S.	1.0	$45,100.00	$45,100.00
26	Traffic Control	L.S.	1.0	$90,200.00	$90,200.00
27	Construction Staking	L.S.	1.0	$225,500.00	$225,500.00
28	Milling	S.Y.	0.0	$9.00	$0.00
29	Special Project Elements	L.S.	0.0	$50,000.00	$50,000.00
	TOTAL ESTIMATED CONSTRUCTION COST:				**$5,146,771.00**
			Contingency	20%	$1,029,354.20
			TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED):		**$6,176,100.00**

191st Street from Tomlinson Road to US 31 **Reconstruct as 4-lane with median**

QUANTITY SUMMARY					
ITEM NO.	**ITEM DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT PRICE**	**AMOUNT**
1	Mobilization and Demobilization	L.S.	1.0	$149,000.00	$149,000.00
2	Excavation	C.Y.	6768.0	$15.00	$101,520.00
3	HMA Surface	TON	1005.0	$65.00	$65,325.00
4	HMA Intermediate	TON	1675.0	$55.00	$92,125.00
5	HMA Base	TON	8251.0	$50.00	$412,550.00
6	No. 53 Aggregate Base	TON	5744.0	$38.00	$218,272.00
7	Curb & Gutter	L.F.	5140.0	$15.00	$77,100.00
8	Curb	L.F.	5140.0	$25.00	$128,500.00
9	HMA Trail Pavement	S.Y.	4569.0	$36.00	$164,484.00
10	PCC Driveway Pavement	S.Y.	0.0	$40.00	$0.00
11	No. 11 HAC Driveway Pavement	S.Y.	625.0	$100.00	$62,500.00
12	PCC Sidewalk*	S.Y.	0.0	$90.00	$0.00
13	12" R.C.P.	L.F.	1234.0	$25.00	$30,850.00
14	18" R.C.P.	L.F.	857.0	$35.00	$29,995.00
15	24" R.C.P.	L.F.	857.0	$45.00	$38,565.00
16	36" R.C.P.	L.F.	857.0	$55.00	$47,135.00
17	Inlet Type "B-15"	EA.	51.0	$3,000.00	$153,000.00
18	Manhole Type "C-4"	EA.	26.0	$3,500.00	$91,000.00
19	Structure Backfill	C.Y.	1875.0	$30.00	$56,250.00
20	Underdrain**	L.F.	0.0	$10.00	$0.00
21	Earthfill and Topsoil	C.Y.	190.0	$25.00	$4,750.00
22	Seeding & Mulching	S.Y.	2284.0	$3.00	$6,852.00
23	Roundabout	EA.	1.0	$1,200,000.00	$1,200,000.00
24	HMA for Patching	C.Y.	0.0	$80.00	$0.00
25	Erosion Control	L.S.	1.0	$29,800.00	$29,800.00
26	Traffic Control	L.S.	1.0	$59,600.00	$59,600.00
27	Construction Staking	L.S.	1.0	$149,000.00	$149,000.00
28	Milling	S.Y.	0.0	$9.00	$0.00
29	Special Project Elements	L.S.	0.0	$0.00	$0.00
	TOTAL ESTIMATED CONSTRUCTION COST:				**$3,368,173.00**
			Contingency	20%	$673,634.60
			TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED):		**$4,041,800.00**