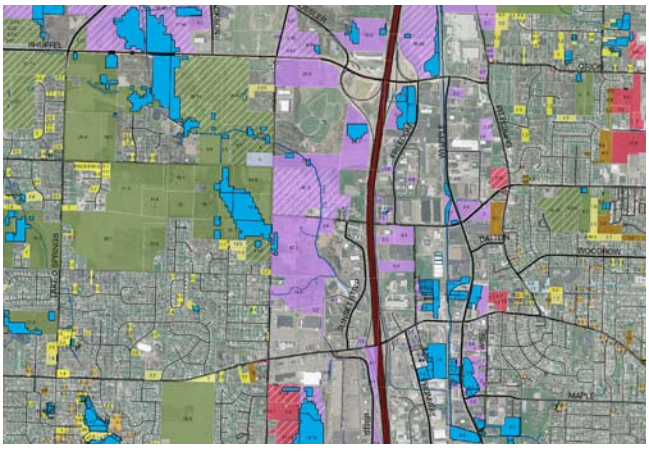
SCATS

TRANSPORTATION AND LAND USE STUDY



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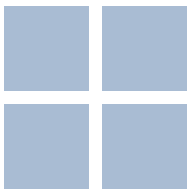
I. INTRODUCTION



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I. INTRODUCTION

Overview

In 2012 the SCATS commissioned a study to evaluate the transportation infrastructure needs within northern Stark County. A unique and innovative approach was taken to complete this project. The approach included a detailed evaluation of the existing and future land use conditions with the study, as well as a careful analysis of likely job creation as a result of planned and anticipated economic development. Through this approach the study team developed a list of transportation recommendations based on a likely development scenario, ensuring planned improvements are balanced with economic growth without overbuilding the transportation network and infrastructure.

This approach provides SCATS and others an opportunity to plan and partner with the development community to provide a transportation network that supports everyone's goals.

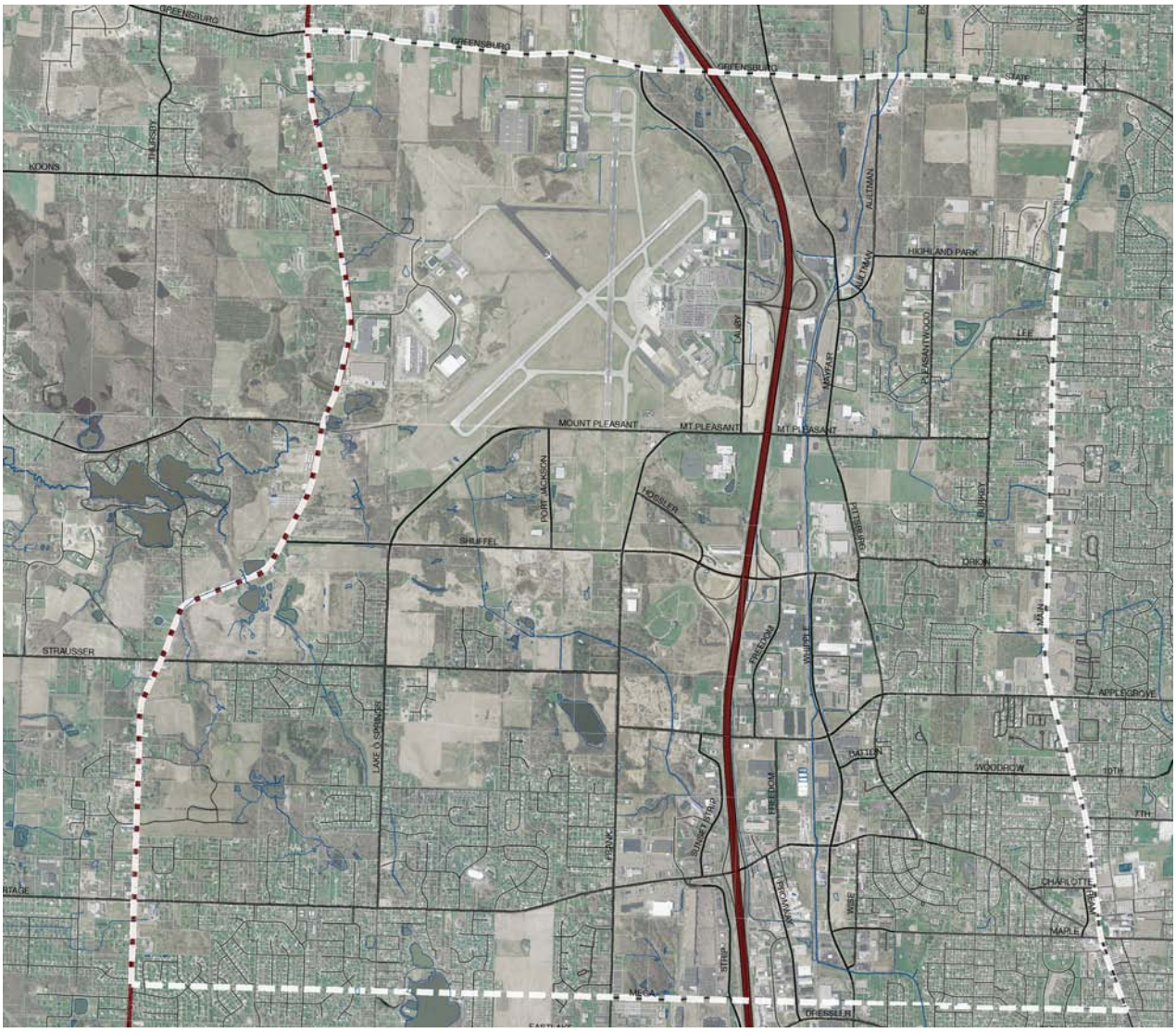
Study Area Description

The study area extends along the I-77 corridor in north Stark County. The area is generally bound by Greensburg Road to the north, Massillon Road/S.R. 241 to the west, just south of Portage St. / S.R. 236 to the south, and Main St. / Cleveland Ave to the east. Map 1 illustrates the study area boundary.

Purpose

The purpose of this study was to evaluate and plan for future transportation improvements within a designated study area in northern Stark County. The study was aimed at balancing future transportation improvements with planned anticipated land use changes via development projects, ensuring the future transportation networks will support economic development, while improving the overall quality and level of service for existing residents and businesses within the area.

MAP 1: PROJECT STUDY AREA



I. INTRODUCTION

Regional Coordination

The project study area includes multiple jurisdictions including two counties, three townships, two municipalities, and the Ohio Department of Transportation. The number of jurisdictions within the project study area required careful coordination between each entity and SCATS, as well as an examination of the land use, economic, and transportation conditions with each area. Map 2 illustrates the jurisdictions within the study area boundary.

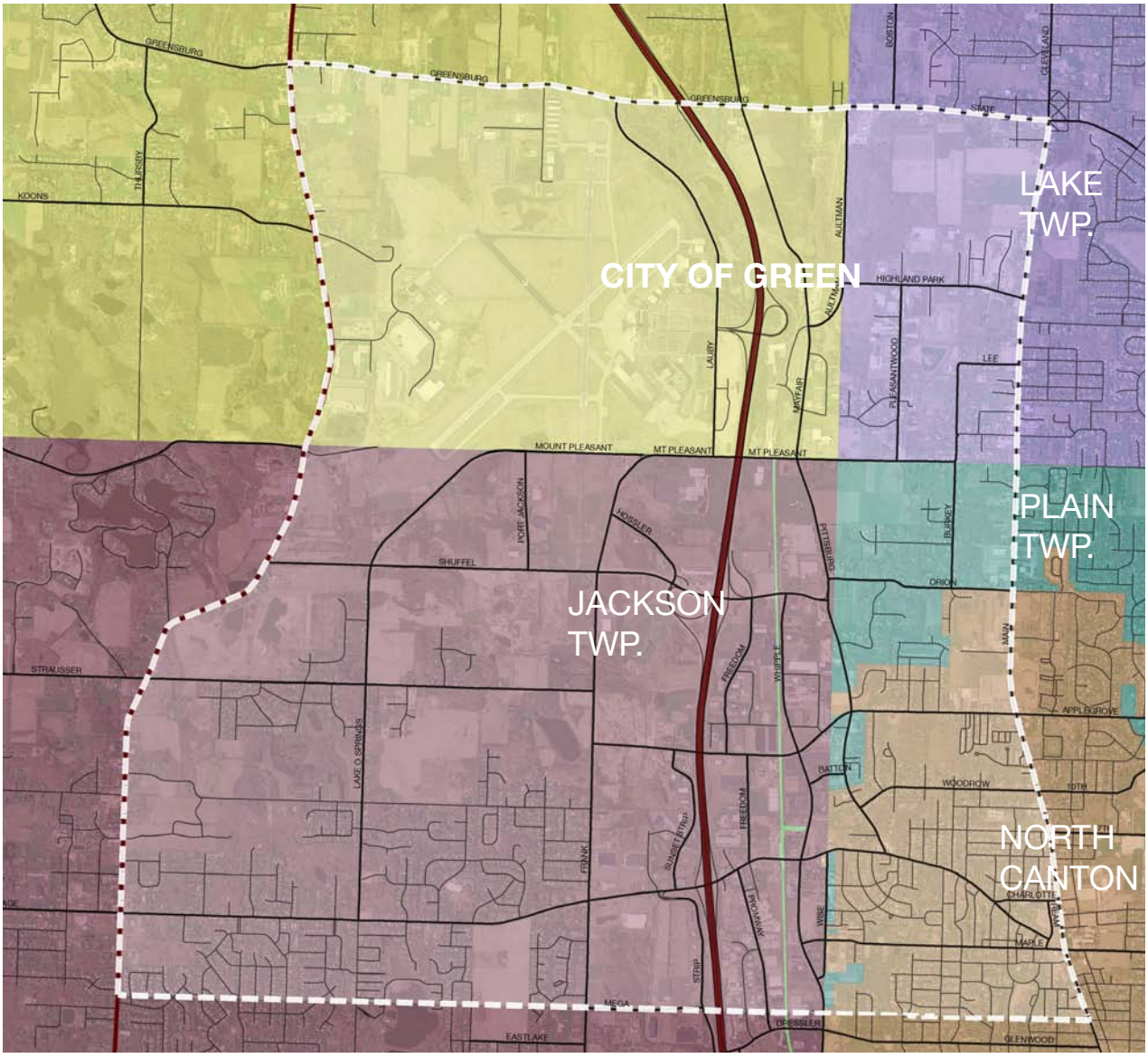
Counties:
- Stark County
- Summit County

Townships:
- Jackson Township
- Lake Township
- Plain Township

Municipalities:
- City of Green
- City of North Canton

Other Agencies and Authorities:
- Stark County Regional Planning Commission (SCRPC)
- Stark County Area Transportation Study (SCATS)
- Ohio Department of Transportation (ODOT)

MAP 2: REGIONAL JURISDICTIONS



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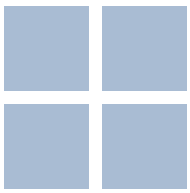
II. DATA COLLECTION



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II. DATA COLLECTION

Overview

The study team worked with SCATS and other stakeholders to gather all available data and plans for the study area.

Review of Land Use Plans

GENERAL OVERVIEW

At the time that each of these various plans were written, the general pattern of development within this region followed that of other Ohio regions. People and employers were tending to move out of the larger urban areas and into undeveloped and sometimes unincorporated areas. The number of people living within each household has been shrinking over the last few decades, meaning that a population of stable or even diminishing size could still see an increase in development. The employment base changed from one that relies heavily upon manufacturing into one that is now primarily service based, and those employers likewise started moving into undeveloped areas. These shifts in both living and employment trends have placed considerable pressure on both the transportation system and the municipalities, forcing them to manage and plan for future growth.

The SCATS study area lies roughly midway between Akron and Canton, and the area has seen considerable development since the early 1990's. All the development occurring within this time is automobile oriented, placing a huge importance on the efficiency of the roadway system.

Land Use Patterns

Because most of the planning documents were produced before the housing crisis of 2008, it may be difficult to forecast the effects the crisis had on land use and development patterns in the area. Regardless, all of the governing entities within the study area are preparing for growth. Some of the population projections have predicted a moderate growth rate, while others forecast a slight loss in population. Even a loss in population would result in an increase in development, as the number of inhabitants per household is continuing to drop. Furthermore, many of the places within the study area are forecasting a boom in employment that will outstrip the local population. This growth of employment without a growth in population would signify that people outside the study area are willing to travel longer and farther to access employment, placing further burden on the transportation system.

A majority of the growth in development has been projected to be in single family residential and commercial activities. Communities are making an effort to attract high tech businesses to the area that would take advantage of the proximity to Ohio's industrial base and the Akron / Canton Airport. Some growth in retail is expected, but communities are making an effort to control the pace, location and character of future retail development. The growth of single family residential has likely tapered off since 2008, but communities in the area are still expecting a rise in residential development influenced in part by the proximity of employment opportunities.

Transportation Patterns

Traffic has been a continuous problem affecting communities within the study area. The Ohio Department of Transportation has published a list of the forecasted transportation improvement projects, which include road widening, general resurfacing and bridge maintenance. The project list did not contain any new roadways or interchanges that would affect the study area. A new freeway management system along I-77 is expected to be installed that will include traffic flow detection, cameras, messaging signs and control equipment along the length of the study area. In addition, the improvement of multiple intersections is expected to occur over the next decade to help increase traffic flow through traffic-prone areas.

OHIO DEPARTMENT OF TRANSPORTATION (ODOT)

Transportation

The projects outlined in the Transportation Improvement Program (TIP) concentrate on maintenance and repair of paving and bridges on Federal and State roadways. ODOT has several repaving and bridge projects planned throughout the next 10 years within and near the SCATS study area, including:

2013 **Bridges** - Maintenance and repair along I-77 at mile 110, near the Canton / North Canton border. Further work scheduled for a bridge at mile 115 within the City of Green. State Route 619 is scheduled to have bridge maintenance near mile 12.

Repaving – Repaving scheduled to occur on I-77 starting at mile 117 and extending north through the City of Green to mile 121. Repaving also scheduled along State Route 619 in the northern portion of Green, from mile 6.5 to mile 12.

2014 **Bridges** – Significant bridge work scheduled in the northern portion of Green, including intersections along I-77 and SR 241, SR 619, and at miles 120 and 121. Bridge work is scheduled at mile 17 within Jackson Township.

Repaving – State Route 241 is scheduled to be

II. DATA COLLECTION

repaved, covering the stretch of roadway starting from the south of Green to the City of Massillon (mile 11.25 – 18)

2017 **Repaving** – Roughly 2 miles of SR 687 (mile 1-2.8) is scheduled for repaving

2018 **Repaving** – Roughly 2 miles of I-77 is scheduled for repaving.

2019 **Repaving** – Miles 107-108 of I-77 is scheduled for repaving

2020 **Repaving** – Miles 112.5 – 115 of I-77 is scheduled for repaving.

STARK COUNTY REGIONAL PLANNING COMMISSION (SCRPC)

Land Use

The Stark County Regional Planning Commission commissioned a study of population trends within the County. Traffic Analysis Zones (TAZ) were used as the geographic zones to estimate the current and future land use trends. The analysis estimates a population of 389,174 for the year 2030, which represents a 2.9% increase from the current population.

- 2.9% increase in population from now to 2030
- Average residents per household continuing to drop
- Population aging
- Employment growth is larger than population growth, especially in service sector
- 145,163 acres of farmland in 2002
- 362,784 acres total within County
- 109,466 acres (30%) of county developed as of 2005

Transportation

Freeways and Expressways - High speed, longer distance trips in and through Stark County and the surrounding region will utilize the freeway and expressway system, which includes I-77, US 30, and parts of US 62 and SR 21. The principal improvements planned for this system, include 122 extensions of US 30, east from Trump Avenue to SR 9 in Columbiana County, and the extension of US 62 east from SR 225 to Salem.

Arterial highways - The Plan proposes other regional highway projects to improve traffic circulation, in, and around other major traffic generators. These projects include widening portions of 12th Street, Applegrove Street, Frank Avenue, Trump Avenue, Whipple Avenue, SR 43, SR 241, SR 619, SR 687, and SR 800. Improvements are also planned to connect the City of Canal Fulton to SR 21.

JACKSON TOWNSHIP

Land Use

The biggest change in land use over the next 20 years is projected to be the addition of roughly 4,000 more acres dedicated to single family development. Jackson Township has also added the High-Technology land use to its future plans, anticipating up to 6% of its total land should be set aside for high-tech. They are also anticipating that rural residential will make up 25% of the land use within the Township. Their current population is near 45,000 people, with their anticipated population at build-out being 75,000 people. Growth is projected to remain steady, with 1,000 people being added roughly every two years.

Current Land Use

Undeveloped	7%	1,486 acres
Agricultural	27%	6,010 acres
Commercial / Office	9%	2,097 acres
Industrial / Mining	3%	633 acres
Public / Inst. / Park	7%	1,660 acres
Private Park / Golf	5%	1,070 acres
Single Family Res	39%	8,681 acres
Multi Family Res	3%	633 acres

Future Land Use

- 55% should be Residential (Single and Multifamily)
- 25% should be Rural Residential
- 7% should be High-Tech
- 6% should be Industrial

Commercial

Neighborhood Commercial Market

- 1,648,145 sf @ 2006
- 1,848,145 sf @ 75,000 residents (build-out)

Community Commercial Market

- 1,613,234 sf @ 2006
- 2,163,234 sf @ 75,000 residents (build-out)

TOTAL MARKET WILL SUPPORT

- 3,261,379 sf of commercial @ 2006
- 4,011,379 sf of commercial @ 75,000 residents (build-out)
- 750,000 sf of additional commercial at build-out

Transportation

The plan provided no specific information regarding transportation projects, but rather a desire to maintain a certain level of efficiency.

LAKE TOWNSHIP

Land Use

Lake Township contains a significant amount of undeveloped land. Much of the land abutting arterial roadways has been developed with single family residential housing. If growth continues as it has, it seems likely that the majority of land within the township will be developed as housing. A very rough estimate of the amount of developable land within the township showed that around 5,000 acres are currently undeveloped.

PLAIN TOWNSHIP

Land Use

The portion of Plain Township closest to the study area is the Northern Residential, which currently has no sewer access, nor does it have plans to provide access. The township does note that much of the undeveloped land is currently being developed into single family residential, but such residential would have less density due to the necessity of septic systems. The Township is promoting the use of land near the airport and I-77 expansion for economic development purposes. Their plan does note that many areas within the township are under threat from annexation from North Canton and Canton, so the extent of the sewer system may change dependent upon the extent of annexation.

The comprehensive plan drafted by Plain Township gives the impression they are concerned with the potential for over development of suburban housing and commercial areas without proper infrastructure. The Township seems unlikely to pursue policies which encourage explosive growth and over development, but are aware that annexation from neighboring municipalities would likely trigger such growth.

CITY OF CANTON

Land Use

Most of the areas of Canton nearest the study area are existing development, with single family residential as the primary land use. Large undeveloped parcels are unavailable within the northern portion of the city, so any large scale traffic changes due to new development are unlikely.

Transportation

Multiple projects are scheduled around the City of Canton, and most can be described within the ODOT project listings and the SCRPC agencies. Much of the freeway and highway improvements are occurring to the south of the City.

II. DATA COLLECTION

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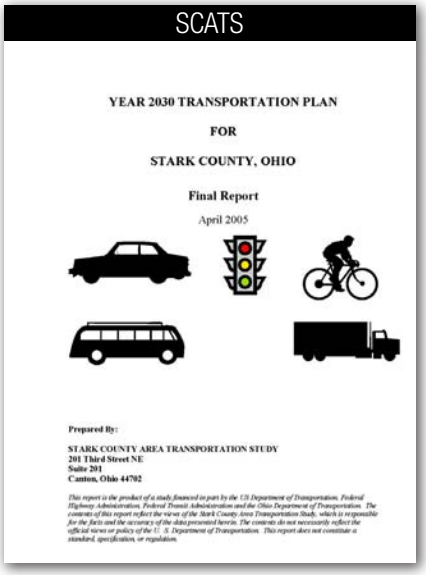

YEAR 2030 TRANSPORTATION PLAN

FOR

STARK COUNTY, OHIO

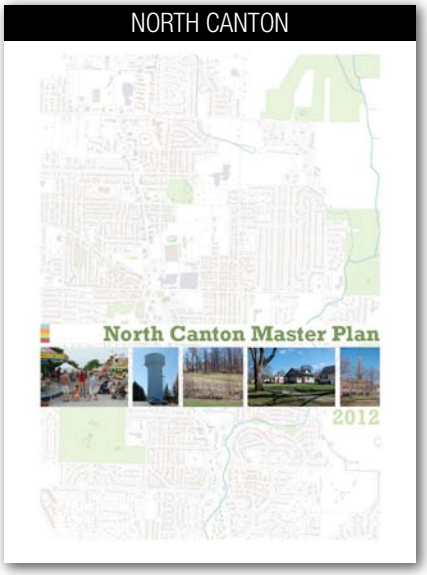
Final Report

April 2005

Prepared By:

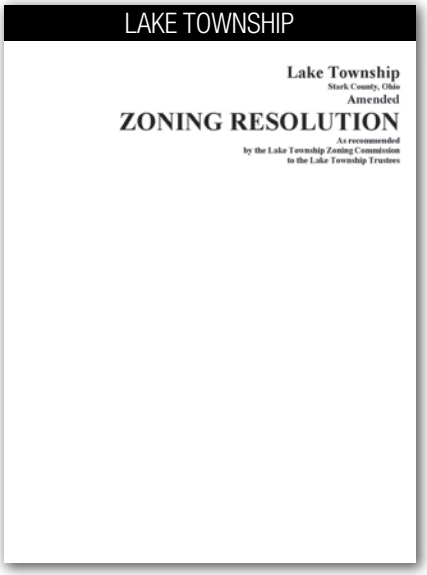
STARK COUNTY AREA TRANSPORTATION STUDY
201 Third Street NE
Suite 201
Canton, Ohio 44702

NORTH CANTON

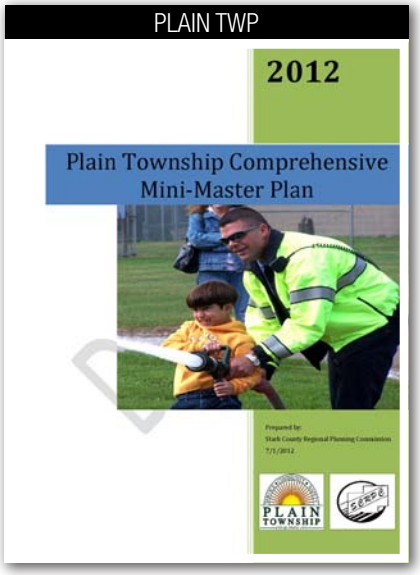


Multiple plans and documents were reviewed during the data collection phase of the project. By carefully reviewing these documents the planning team was able to understand the existing and future land use and transportation plans each jurisdiction and agency envisioned for the project study area.

LAKE TOWNSHIP



PLAIN TWP



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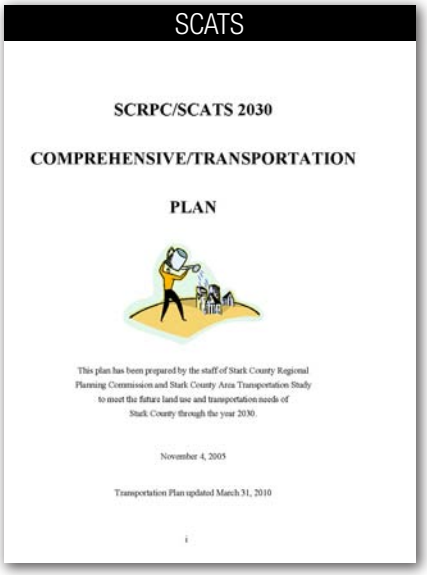

SCRPC/SCATS 2030

COMPREHENSIVE/TRANSPORTATION

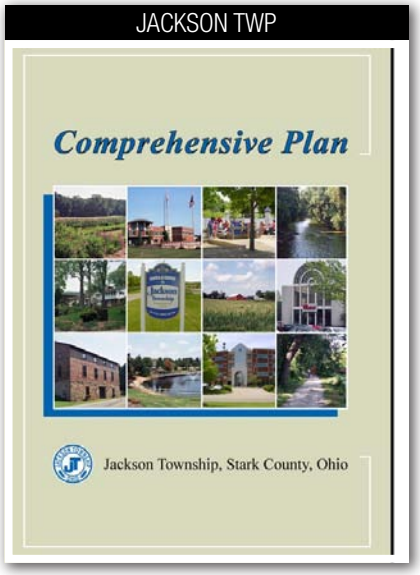
PLAN

This plan has been prepared by the staff of Stark County Regional Planning Commission and Stark County Area Transportation Study to meet the future land use and transportation needs of Stark County through the year 2030.

November 4, 2005

Transportation Plan updated March 31, 2010

JACKSON TWP

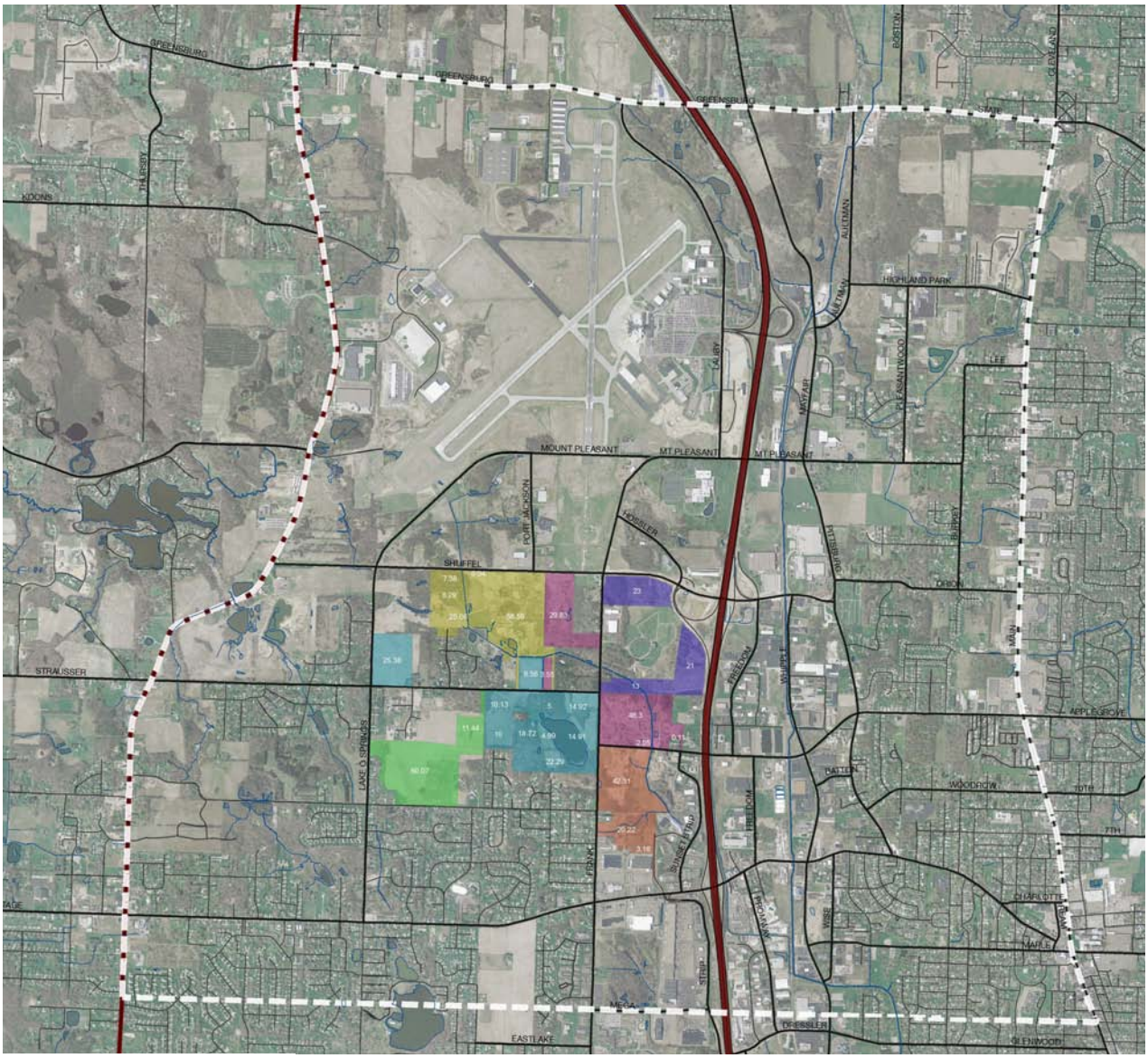


Property Ownership

During the data collection phase, the planning team did a careful evaluation of property ownership within the study area. The purpose of this evaluation was to determine if there is a single ownership over large parcels, or a collection of parcels that if and when developed would have a significant impact on the land use and transportation conditions in the study area.

Once the property ownership was identified, we contacted the larger land owners and encouraged them to take part in the stakeholder interviews. Having these land owners participate was important to better understand what the future development potential was for key development sites in the study area. Map 3 illustrates the identified large parcels shaded by ownership.

MAP 3: PROPERTY OWNERSHIP MAP



II. DATA COLLECTION

Traffic and Safety Data

OHM and SCATS worked together to collect, organize and transfer as much existing traffic and safety data as possible to begin the study. This included existing land use and zoning plans, transportation plans, travel demand models, traffic data and safety data. Once hot spot intersections were identified, SCATS staff collected intersection turning movement data at the identified intersections and provided that data to the study team.

Traffic Volume Modeling

Due to the size and scope of the study area, data from the MPO's travel demand model was utilized for traffic volume generation at the macro level. The output is generally 24 hour average annual daily traffic volumes (AADT) by roadway link. This level of data will allow the study team to make decisions that will narrow the focus of the later analysis and allow for a micro level or intersection level analysis of hot spot locations.

The following steps were taken to create the 2010 and 2035 traffic modeling runs for the SCATS Land Use Transportation Study. This study area is in two different metropolitan planning regions governed by separate Metropolitan Planning Organizations (MPO), the Akron Metropolitan Area Transportation Study (AMATS) and the Stark County Area Transportation Study (SCATS). As such, two different models were used to generate the traffic volumes.

Traffic Volumes - 2010

Counts were gathered from both MPO websites, particularly where the study area would cross over the model boundary. At these locations, some roads had overlapping counts. In each instance, a single count volume was chosen for each road as the calibration parameter for the model. The following steps were taken for each model:

1. The full 2010 model was run using the socio economic data provided by the MPO
2. The subarea external link volumes were compared to count data obtained from the MPO website as described above
3. The 2010 vehicle trip table was modified so that the total INs and OUTs on the identified external zones matched the count data. All other external zone totals were modified so that the total number of external trips in the model stayed the same
4. Highway assignment was then rerun using the updated trip table. The new assignment was compared to the original highway assignment to verify that the volume shifts were logical

Traffic Volumes - 2035 No Build

1. The full 2035 model was run using the socio economic data provided by the MPO
2. The resulting 2035 vehicle trip table was adjusted cell by cell using the 2010 count adjusted trip table and the original 2010 trip table. This process followed the NCHRP 255 guidance for generating link design hour traffic
3. Highway assignment was then rerun using the updated 2035 trip table

Traffic Volumes - 2035 SCATS Land Use

1. Land use provided by OHM was incorporated into the travel demand models at a zone level as growth added into the 2010 socio economic data. For zones outside the study area, the MPO's 2035 unchanged land use was used in the model runs
2. Using the updated land use, a full model run was completed for each model
3. The resulting 2035 vehicle trip table was adjusted cell by cell using the 2010 count adjusted trip table and the original 2010 trip table. This process followed the NCHRP 255 guidance for generating link design hour traffic
4. Because each of the two models operates independently of the other, an additional step was taken to ensure that the new land use trips would be reflected outside each individual model. To do this, the build trip table was compared to the 2035 No Build trip table to see the increase in trips generated by the new land use. This information was used to determine the number of internal trips that should be crossing the border at external zones but were not
5. The incorrect trips were manually adjusted in each trip table.
6. The common external zone locations were then compared between the two models and adjusted so that each trip table had the same number of trips on those common external locations
7. Highway assignment was then rerun using the updated trip table.

PDF's of the model outputs can be found in Map form on the CD accompanying this report (Appendix A). The No Build ADTs and the Build ADTs will be utilized to identify areas of the study area projected to be impacted by future developments or projects. These volumes will then be broken down to the corridor or intersection level in order to analyze any hot spots identified.

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III. STAKEHOLDER INPUT

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III. STAKEHOLDER INPUT SCATS

Process

Interviews were conducted with targeted stakeholders and property owners in the study area. The stakeholders included an assemblage of citizens, business leaders, developers, and appointed/elected officials for jurisdictions within the project study area.

During the stakeholder meetings, the project team led small groups through a roundtable discussion. A series of questions were developed after careful consideration of the study area, local plans and policies, and questions aimed at identifying what projects are planned or in the 'pipeline' within the project study area. Questions were also discussed regarding potential land use and transportation strategies that may be considered as part of the final plan. Meeting sign-in sheets, notes, memos, and presentations can be found in Appendix B.

Key Findings

The stakeholder meetings revealed critical information relative to planning for future transportation improvements within the project study area. Specifically, the outcomes of these meetings uncovered information in two key areas of focus. This included perceived 'hot spots' (areas where traffic is a concern), and planned or pipeline projects that are likely to happen within the next 10 years.

Planned / Pipeline Projects

One of the key discussion items during the stakeholder interviews was identifying what development projects are planned or likely to happen in the near future. The purpose of identifying these projects was to have a clear understanding of the traffic impacts this future development may have on the existing transportation network. The outcome from the stakeholder meetings revealed the following figures for development that was planned or likely to happen in the next 1-5 years.

Planned Development

	Square Feet	Jobs
Commercial/Retail/Rest.	163,000 s.f.	326 (1/500)
Office	300,000 s.f.	750 (1/400)
Hotel	70,000 s.f.	35
Industrial/Man.	160,000 s.f.	480 (known)
Entertainment Facility	-	750
Other		3,540

Other includes job creating at the airport, large manufacturing facility, and development at Kent and Stark State

Potential Job Creation Based on Planned Development

6,200 jobs with large entertainment and gaming facility

5,700 without large entertainment and gaming facility

III. STAKEHOLDER INPUT

Perceived Hot Spots and Planned Improvements

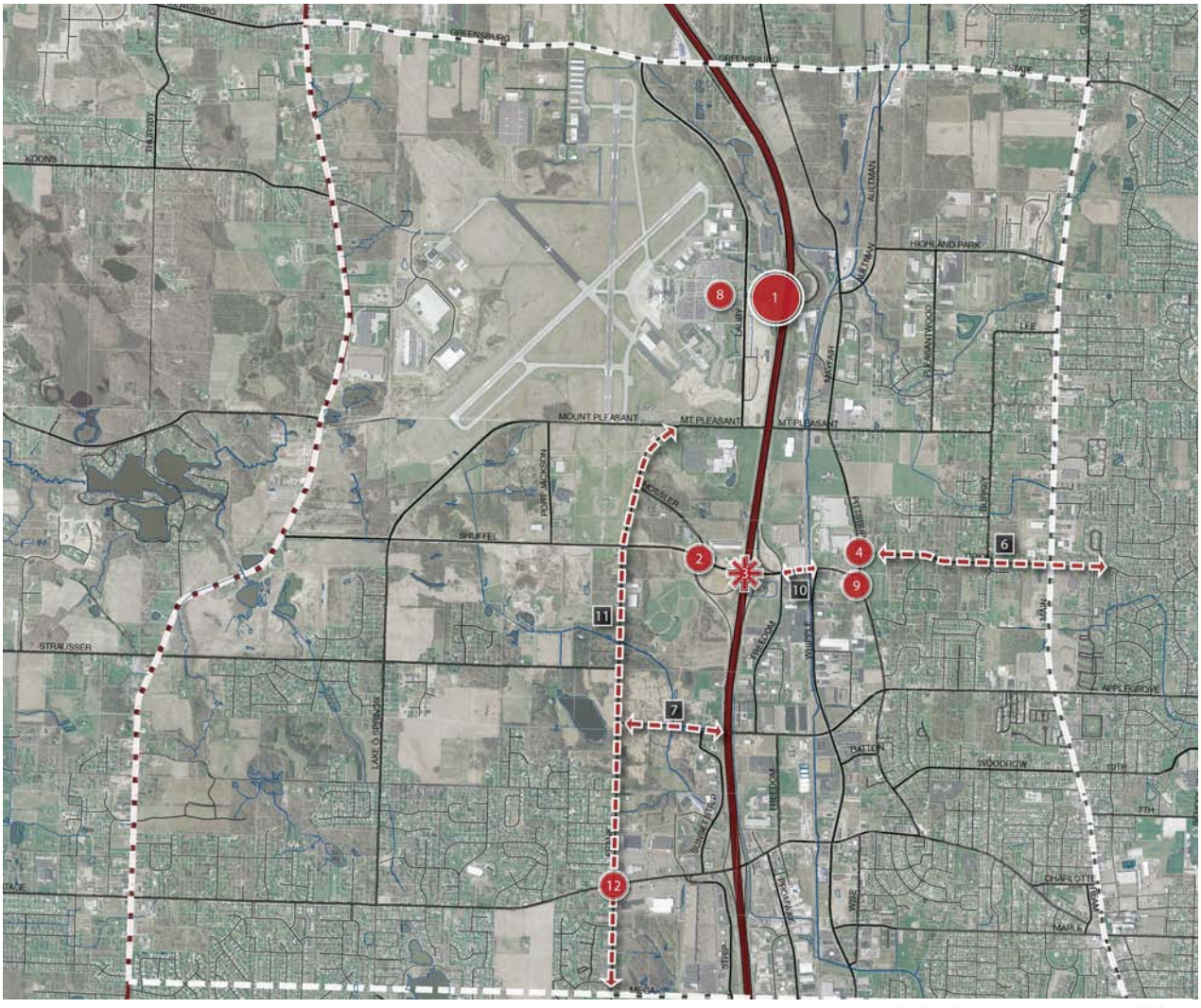
Coming out of the stakeholder meetings, the planning team also identified perceived 'hot spots' and planned transportation improvements. Map 4 depicts the locations mentioned by the stakeholders.

The hot spots were areas identified by the stakeholders where there were perceived delays, safety issues, or general alignment and flow concerns. Understanding these areas was critical in determining what alternatives may be considered as part of the final plan recommendations to improve the overall quality of life in the study area.

Map Key (Descriptions Provided by Stakeholders)

1. Peak issues at the I-77 airport interchange, specifically evening southbound back-ups.
2. Discussion of putting a light at Hossler Dr. and Shuffel St. and connection from light up to Timken.
3. Shuffel interchange ramp has many perceived blind spots causing a perceived safety issue. Stop signs not working, standard intersection may be needed in future.
4. Pittsburg improvement needed; especially near Shuffel and Orion intersection.
5. Orion is becoming a major problem as described by stakeholders, as it is used as a primary east to west cut-through.
6. Applegrove from Frank to I-77 is highly congested and needs improvement.
7. Interest in studying roundabout at Lauby and McKinley Air.
8. Intersection of Pittsburg and Shuffel is a problem area.
9. Shuffel between Freedom Ave and Whipple is a hotspot.
10. Frank Road from Mega to Mt. Pleasant is a hotspot.
11. Portage and Frank intersection is a hotspot.

MAP 4: PERCEIVED TRAFFIC HOT SPOTS



Planned Transportation Projects

The planned transportation improvements represent known transportation projects that were identified in either the TIP or the SCATS Long Range Transportation Plan (LRP). *For the stakeholder discussions the projects from the 2030 LRP were utilized as the planned projects as the 2040 LRP had not been completed at the time this study began.* Map 5 depicts the location of the planned projects in the TIP and 2030 LRP that fall within the study area. As the study progressed, the study team and SCATS coordinated on the 2040 LRP planned projects. These planned projects were not finalized in time to be presented directly to the stakeholders as part of this process. However, they did influence the recommendations for this study. It was important that the recommendations from the two planning efforts align and efforts from each planning process influenced the other. Map 6 and the associated Project Key illustrate the 2040 LRP projects as well as the current TIP projects. The variation in Map 5 and Map 6 is largely due to the completion of projects; however some projects have been removed or pushed beyond 2040 due to other factors.

Map 5 Project Key

TIP Improvements

1. 5-Lane Widening (2012)
   Main; Applegrove to Orion
2. Signal Improvements (2013)
   Main/Everhard to Applegrove
3. Paving SR 241; Massillon to Summit County (2014)
4. Paving Cleveland Ave. (2013)

LRP Improvements

A. 5-Lane Widening (2030)
   Whipple; Applegrove to Shuffel

B. 4-Lane Widening (2030)
   Wales; Portage to Summit County

C. 3-Lane Widening (2020)
   Pittsburg; Applegrove to Shuffel

D. 4-Lane Widening (2014)
   Frank; Mega to Applegrove

E. Intersection Improvements (2030)
   Strausser and Lake O'Springs

F. Streetscape Improvements (2020)
   Maple; Taft to Marquardt

G. Intersection Improvements (2015)
   Strausser intersection improvements

H. New Road (2020)
   Applegrove Realignment

I. New Road (2030)
   Whipple; Shuffel to Mt Pleasant

J. Intersection Improvements (2015)
   Cleveland and Mount Pleasant

K. Streetscape Improvements (2020)
   Main; 7th to Applegrove

L. Streetscape Improvements (2020)
   Main; Applegrove to Orion

Map 6 Project Key

TIP Improvements

1. 5-Lane Widening (2012)
   Main/Applegrove to Orion
2. Signal Improvements (2013)
   Main/Everhard to Applegrove
3. Paving (2014)
   SR 241/Massillon to Summit County

LRP Improvements

A. 5-Lane Widening (2030)
   Whipple; Applegrove to Shuffel

B. 4-Lane Widening (2030)
   Wales; Portage to Summit County

C. 3-Lane Widening (2020)
   Pittsburg; Applegrove to Shuffel

D. 4-Lane Widening (2014)
   Frank; Mega to Applegrove

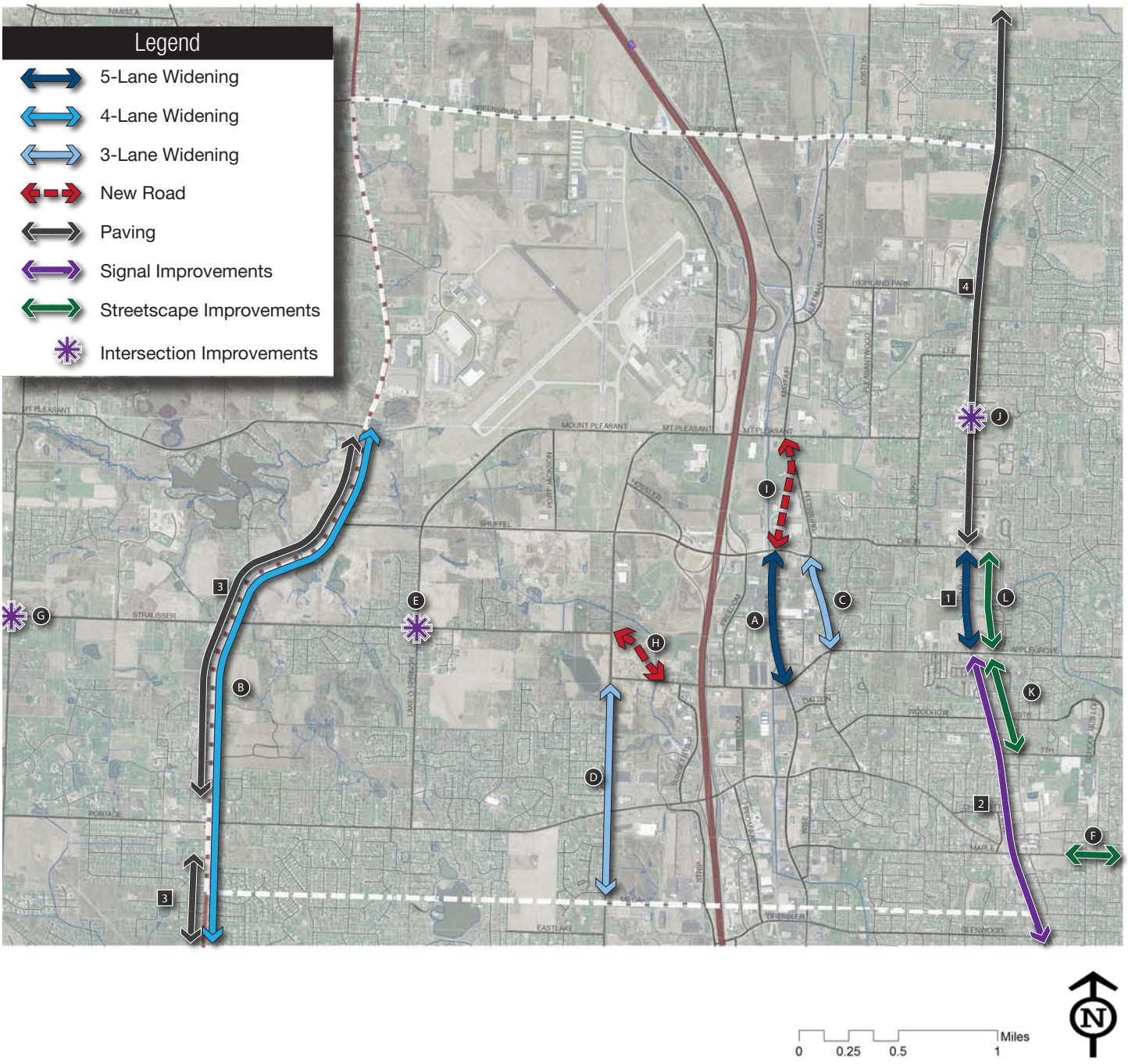
E. Intersection Improvements (2030)
   Strausser and Lake O'Springs

F. Streetscape Improvements (2020)
   Maple; Taft to Marquardt

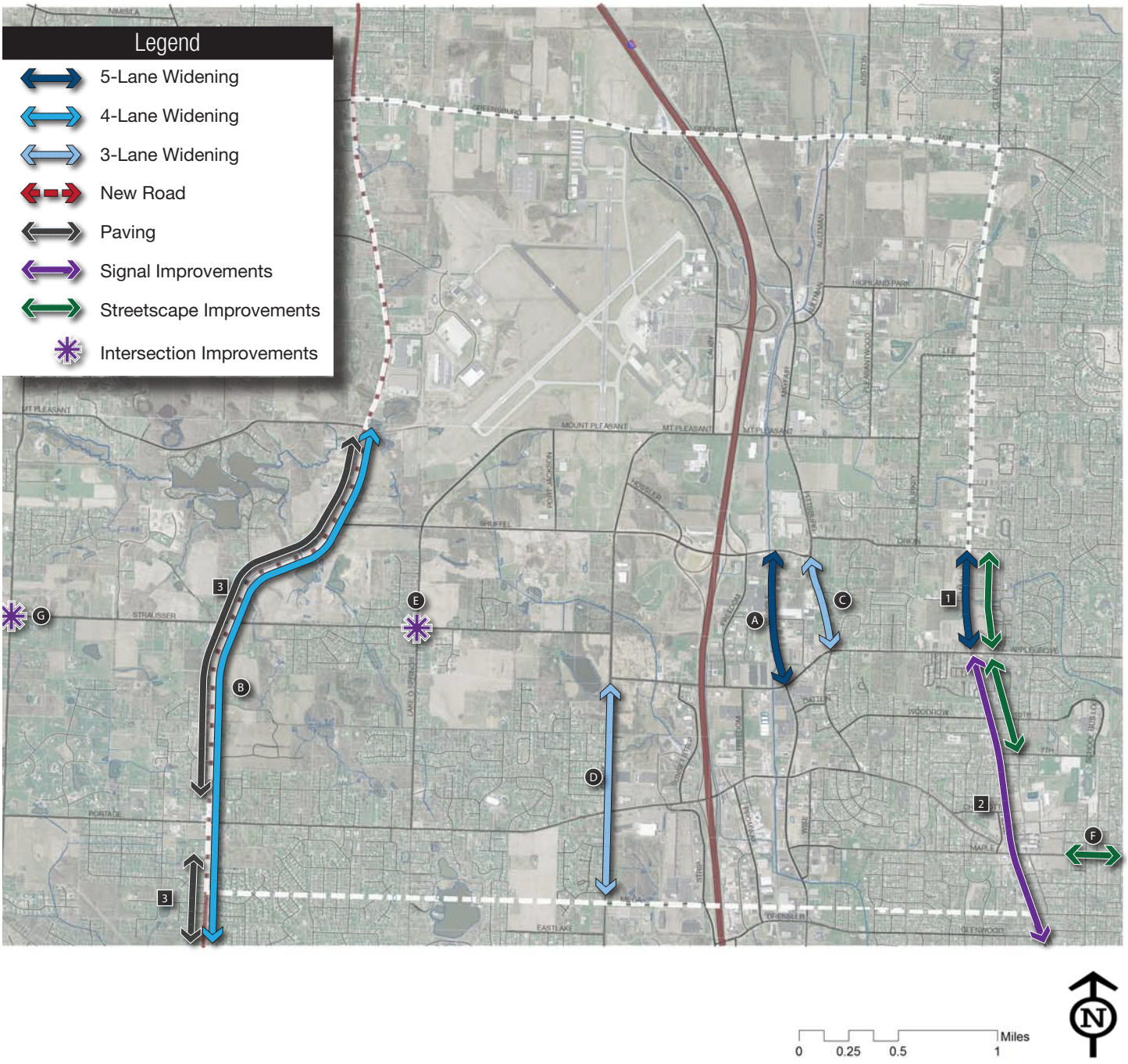
G. Intersection Improvements (2015)
   Strausser intersection improvements

III. STAKEHOLDER INPUT

MAP 5: PLANNED TIP / 2030 LRP PROJECTS



MAP 6: PLANNED TIP / 2040 LRP PROJECTS



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IV. EXISTING CONDITIONS

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The study team performed a thorough existing conditions analysis of the study area utilizing the data collected in Section II. This analysis was performed to assess the current features, uses, needs, and deficiencies. This analysis will also establish a base-line to measure the effectiveness of any proposed alternatives.

Environmental Overview

The following subsections (Ecological Resources, Cultural Resources) are excerpts from the stand alone reports found in Appendix C. All references to figures or sections are in relation to the individual reports in Appendix C and designated by this reports sub section heading.

Ecological Resources

To determine likely ecological resources for the Study Area, a literature review was conducted using available resources, including:

- US Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) Maps (http://www.fws.gov/wetlands/Data/Mapper.html)
- Ohio Department of Natural Resources (ODNR) Ohio Wetlands Inventory Maps (OWI) (http://ohiodnr.com/dnap/wetlands/mapping/tabid/1002/Default.aspx)
- USGS StreamStats (http://water.usgs.gov/osw/streamstats/ohio.html)
- National Hydrology Dataset (http://nhd.usgs.gov/data.html)
- Aerial Imagery (Google Earth v. 6.22.6613, imagery dated 1994-2012)
- 7.5 Minute Series Topographic Map (Terrain Navigator v. 8.71) Kingston, OH Quadrangle (1992)
- ODNR's Ohio Biological Diversity Database
- USFWS Federally Listed Species by County (USFWS 2012a, http://www.fws.gov/midwest/endangered/lists/ohio-cty.html)
- United States Department of the Interior Fish and Wildlife Service Federally Listed Species by Ohio Counties, updated list available for April 5, 2012 (http://www.fws.gov/midwest/ohio/documents/endangered_2012_county_list.pdf)

Twelve (12) mapped NHD streams (approximately 12,682.36 linear feet), approximately 123.02 ac of lakes/ponds, approximately 233.71 ac of mapped wetlands are shown on available mapping for the Study Area (Appendix C- Figures 2, 3, and 4). Additional possible streams, ponds, and wetland areas are likely present within the study area; however, would require field verification to identify the location and size of these resources. Segments of the Study Area lies within the 100-year floodplain, according to FEMA's Map Service Center.

According to correspondence from the OBD, only one database record for a state listed potentially threatened species exists within the study area, for which the location is being developed. No additional records for high quality habitat for threatened and endangered species, unique ecological features, or Indiana bat capture records or hibernacula occur within the study area.

The data reviewed for this report should be considered a preliminary assessment, additional field reconnaissance and surveys should be conducted to determine the presence of streams, wetlands, potential threatened or endangered species or their habitats. The entire report can be found in Appendix C.

Cultural Resources

A cultural resources survey was conducted by the study team regarding history/architecture resources to inform land use and transportation planning for the area. According to the National Park Service who maintains the National Register of Historic Places (NRHP); history/architecture resources are considered any district, building, site, object, or structure that is 50 years or older. The information provided in this report can then be utilized when making decisions regarding transportation projects and possible adverse effects to significant historic resources. The entire report can be referenced in Appendix C.

Study Area

The overall study area for this project has been divided into eleven sub-areas within Stark and Summit Counties. Figure 0 (Overall Areas) shows the overall study area and the locations of the subareas that were studied. Figures 1-11 show the sub-areas. Each sub-area is discussed individually in the Field Observations section of the Cultural Resources report (Appendix C).

IV. EXISTING CONDITIONS

Field Methods

A windshield survey of the study area was completed in August of 2012 by architectural historian, Diana Welling, MHP. Within the study area, all historic architectural resources from the literature review findings and significant resources that have not been previously identified were examined and some were photographed.

Literature Review

A literature review was completed for the study area; this literature review examined the following sources:

- National Historic Landmark listings;
- National Register of Historic Places (NRHP) listings, nomination form files;
- Determination of Eligibility (DOE) files;
- USGS 7.5' and 15' series topographic maps for the area;
- Ohio Historic Inventory (OHI) files;
- Ohio Historic Bridge Inventory;
- Ohio Cemeteries: 1803-2003;
- Previous Cultural Resource Surveys in the study area;
- ODOT Bridge update website: (http://www.buckeyeassets.org)

The literature review established that within the study there are; two (2) properties listed in the National Register of Historic Places (NRHP), seventy (70) properties listed in the Ohio Historic Inventory (OHI), six (6) historic cemeteries, and one (1) historic bridge. For more detailed information on the findings of this literature review, please refer to the appendix of the report in Appendix C of the study. In addition, all of the copies of OHI and NRHP forms for the study area are available at Lawhon & Associates and will be granted upon request.

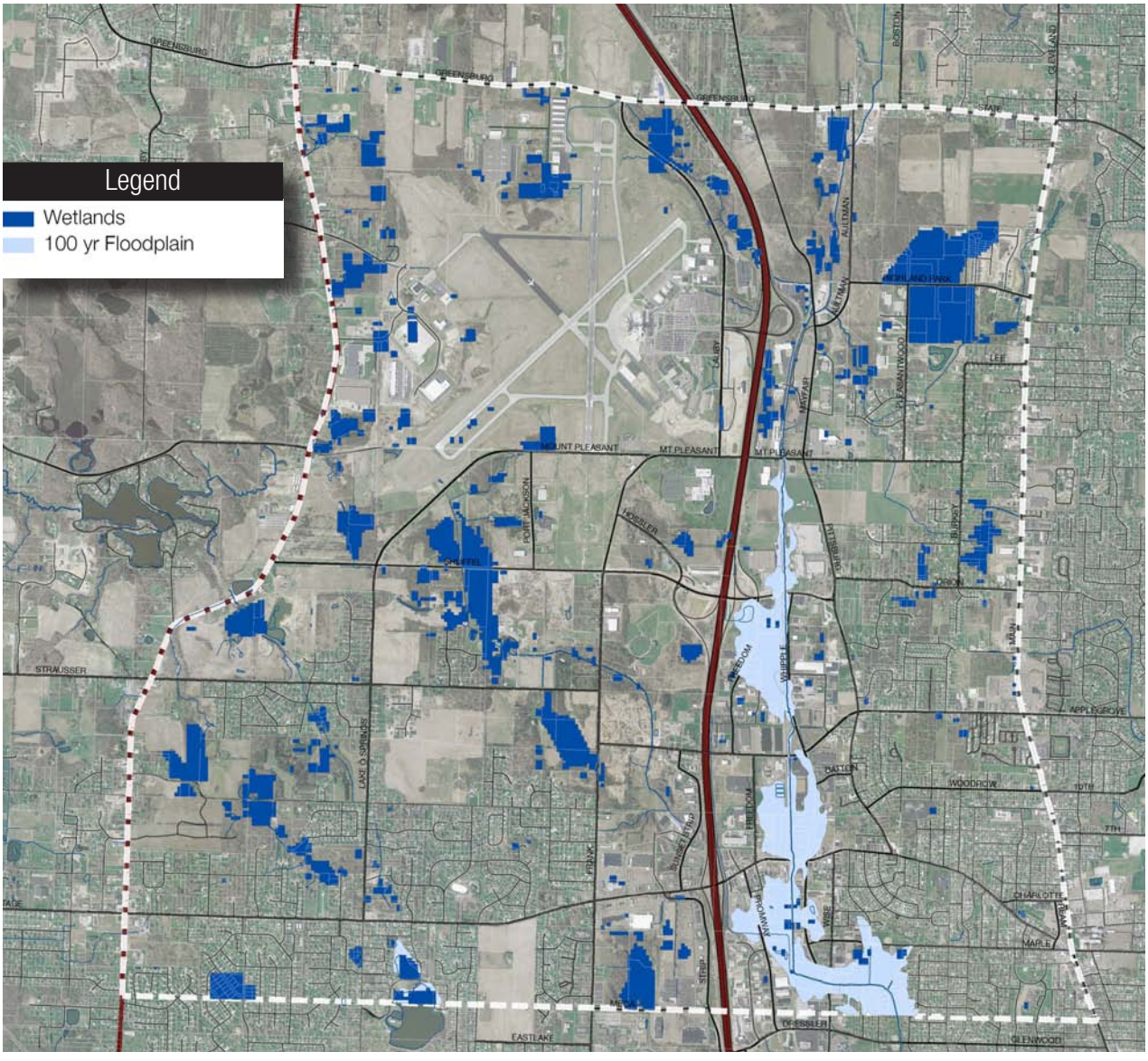
Abandoned Mines

An available mapping search was conducted for abandoned mines in the study area. The maps with the available locations are shown in Appendix C. The data available is minimal and it is understood that it does not represent all of the abandoned mines in the area (located or yet to be located). The mapping shows most of the located mines to be near the Stark/Summit County line in the northeast section of the study area. There is one other location south of Orion, between Pittsburg and Cleveland.

Environmentally Sensitive Areas

An analysis of the environmentally sensitive areas within the project study area was conducted. Specifically an examination of the wetlands and floodplain areas were recorded using County GIS records. The analysis revealed widespread environmentally sensitive areas in the project study area. Understanding where these areas were in the area was critical for two reasons. One, ensure future transportation projects consider the presence of these areas. Secondly, these areas are typically more difficult to develop, and thus were considered when performing land use analysis and buildout scenarios in later project tasks. Map 7 illustrates these locations within the study area.

MAP 7: ENVIRONMENTALLY SENSITIVE AREAS



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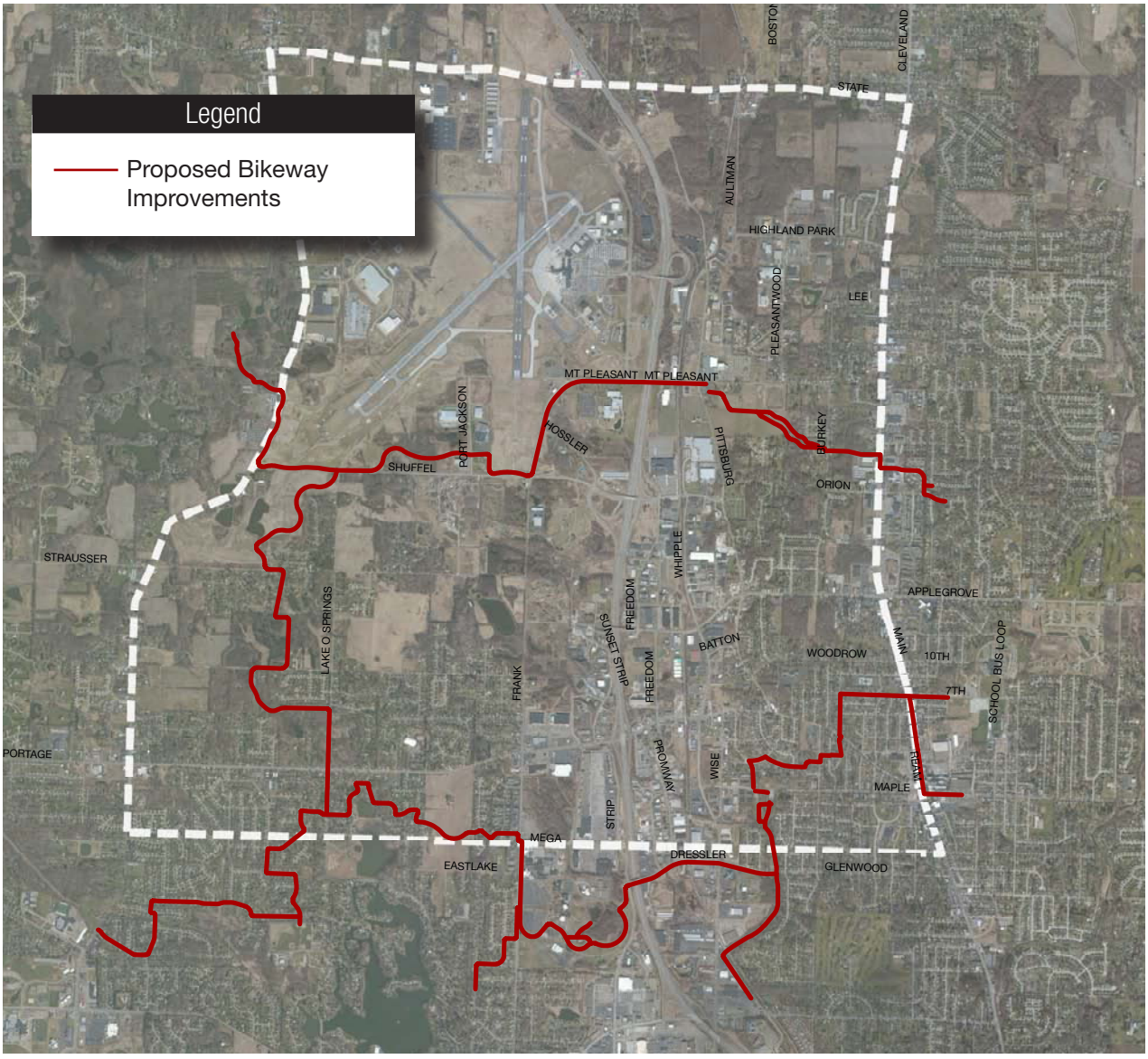
Non-Motorized Network/Plan

Considering alternative modes of transportation was an important consideration when preparing this study.

At the time this study was being conducted, the Stark County Park District was also updating their Trail and Greenway Master Plan.

There was direct coordination between this planning process and the update to the trails and greenway master plan. The plan recommendations from the Trail and Greenway Master Plan were acknowledged, and to the extent possible, the outcomes were coordinated with the transportation recommendations for this planning study. Map 8 illustrates proposed recommendations from the Stark County Trail and Greenway Master Plan.

MAP 8: STARK COUNTY TRAIL AND GREENWAY MASTER PLAN PROPOSED RECOMMENDTATIONS



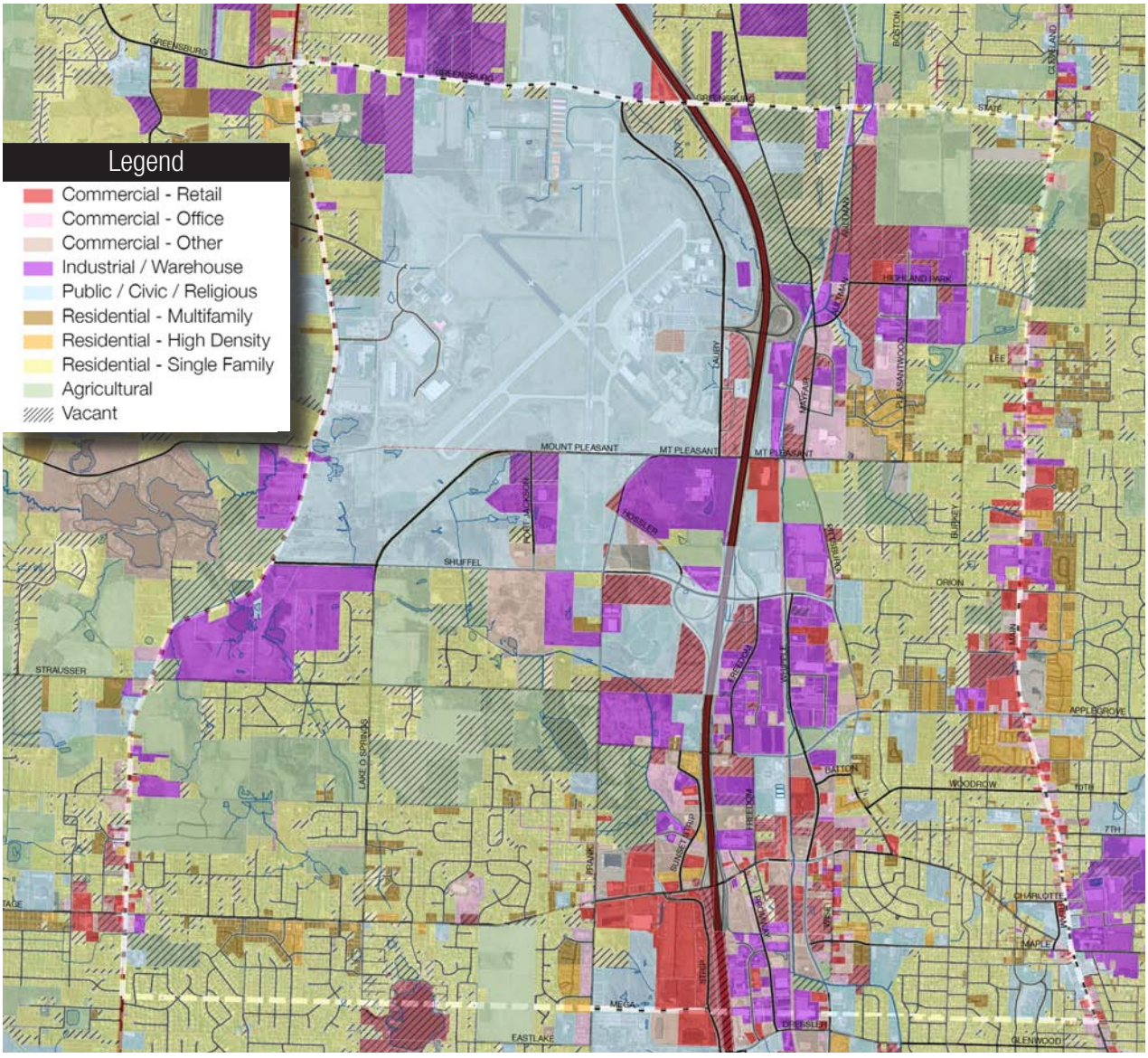
Existing Plans / Land Use Analysis

The planning team performed an analysis of the existing land use in the study area. This land use analysis was a critical component of the project. The results of the analysis revealed how land is currently being used in the study area. The analysis was based on existing long range land use plans, field survey, stakeholder and client input, as well as aerial imagery.

Map 9 below illustrates the existing land use conditions in the study area. For the purposes of this study, land uses were grouped into general categories, however, more than one specific land use category may actually be present.

The results of the analysis were used later in the planning process to create a future development scenario and job projections.

MAP 9: CURRENT LAND USE CONDITIONS

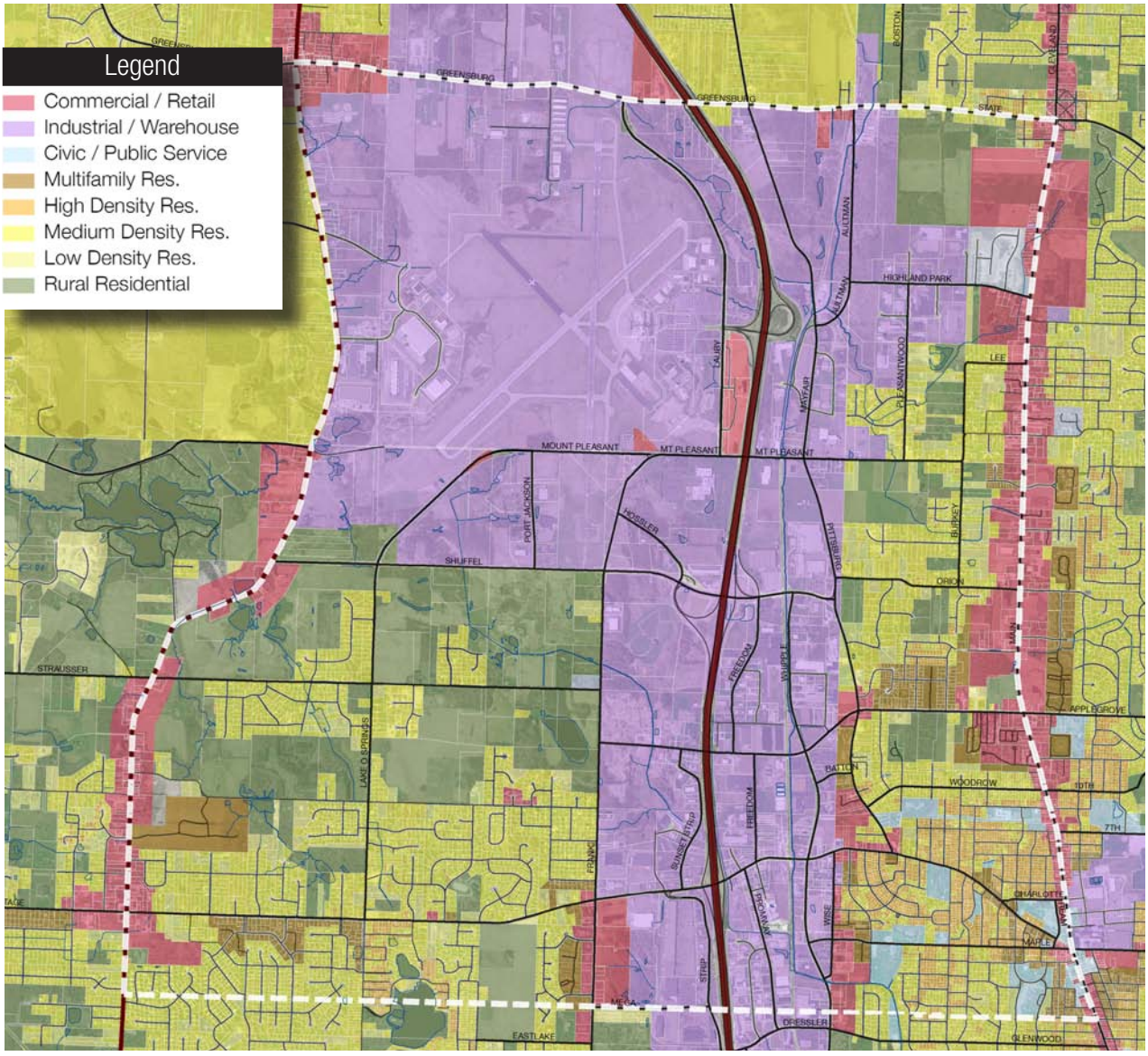


IV. EXISTING CONDITIONS

General Zoning

The planning team conducted a review of the current zoning classifications in the study area. This task was conducted by examining the current zoning standards for each jurisdiction in the study. Some classifications were combined and/or simplified for the ease of interpretation. The outcome was a clear understanding of how land is currently being regulated in the study area. This information was used in later tasks to help build and create the likely future development scenario in the study area. Map 10 illustrates the current general zoning within the study area.

MAP 10: GENERAL ZONING



Traffic Conditions

Existing Conditions Analysis (No Build)

The existing conditions were analyzed utilizing the data collected in Section II. This analysis was performed in order to assess the current level of operations throughout the study area and to identify any current needs or deficiencies. This analysis will also establish a baseline to measure the effectiveness of any proposed alternatives.

Safety Overview

The team investigated the study area for any vehicle and pedestrian related safety concerns through the 2011 Crash Report compiled by SCATS staff. This report is a summarized annual crash analysis that is used by different agencies to prioritize safety improvements on the roadways of Stark County. Within the study area there are currently no hot spot areas for crashes or intersections approaching a level of concern in comparison to areas of Stark County outside the study area (highest ranked was Portage and Strip Drive at 29th overall).

Study Area Analysis

The initial traffic assessment for the study area was performed at an Average Daily Traffic (ADT) volume level. This process involved comparing the travel demand model output and traffic counts for the various corridors and roadway sections through the study area with general capacity rules of thumb.

The general range in ADT for various roadways, as it relates to Level of Service (Capacity) is based on many factors. One of the most influential is the number of access points along a particular roadway section. The more access points per mile the lower in the ADT range the roadway section will need to upgraded. For example, a two lane road with many access points would have a lower LOS when compared to the same roadway with very few access points. This is due to the potential for disruptions in traffic flow and the ability of vehicles to pass through the section in a timely manner.

The general ranges utilized by the study team for assessing the potential need for capacity additions in the future were:

1. 2 lane road: 15,000 ADT or less, depending on the access allowed.
2. 3 lane road: 15,000-20,000 ADT, depending on the access allowed.
3. 4-5 lane road: 20,000 ADT or greater; this may go lower if a three lane section needed the additional thru capacity. Level of access would govern the jump from an existing two or four lane section to five lane section.

A look at the existing traffic counts and 2010 modeling output did not uncover any new roadway sections showing an immediate need for additional corridor capacity. The sections that appeared to have a need either have been identified previously, have capacity adding projects under construction or are programmed for future projects (see Maps 5 and 6. Planned Transportation Projects in the Stakeholder Input Section).

Intersections (Hot spots)

Working with the ADT traffic volumes from the travel demand modeling and input from the stakeholders, "observed" hot spot intersections were identified as part of the existing conditions analysis. These areas, shown on Map 11, will be investigated further as the study progresses. As part of this exercise, eleven intersections were identified for further data collection and analysis. Those intersections were:

1. Pittsburg/Mt. Pleasant
2. Pittsburg/Orion
3. Pittsburg/Shuffel
4. Pittsburg/Applegrove
5. Whipple/Applegrove
6. Whipple/Shuffel
7. Applegrove/Freedom (North)
8. Applegrove/Freedom (South)
9. Applegrove/Sunset Strip
10. Portage/Robin Hill
11. Wales/Shuffel

SCATS staff collected turning movement volumes for each of these intersections in February of 2013. The study team then analyzed the above intersections for existing capacity needs in Synchro.

Planning Level Certified Traffic

The study team developed planning level certified traffic volumes for the above intersections based on the 2010 travel demand model output and the 2013 field counts. The traffic volumes developed for use in the analysis of the above intersections can be found in Appendix A.

Capacity Analysis

Synchro models were built for the 2013 AM and PM peak hour traffic volumes. Synchro provides a model of how traffic signals work and traffic operates in the field. Synchro conducts capacity analysis using the Highway Capacity Manual (HCM) procedures. The HCM intersection procedures calculate an average vehicle delay based on traffic volumes, number of lanes, and traffic signal phasing

IV. EXISTING CONDITIONS

and timing. The average vehicle delay is assigned a level of service (LOS) ranging from A, best, to F, worst. When possible all results were HCM results. HCM results could not be reported for a few locations due to abnormal movements or geometries and therefore Synchro output was reported. All detail capacity results can be found in Appendix D.

Capacity Analysis Results

The existing condition traffic analysis for the studied intersections in Tables 1-2 show no areas of concern for congestion for overall operations in the two peak periods analyzed. LOS worse than C is typically considered congested, however in urbanized areas LOS D can be considered acceptable. There are no intersections that operate at worse than an overall LOS C. Tables 1-2 are a summary of the Synchro results for the 2013 AM and PM peak hours. These results are in Highway Capacity Manual (HCM) format, unless noted, and are close, but not identical to, the results given in the actual Synchro model.

While overall operations seem to be acceptable, there are some internal intersection issues at the Pittsburg/Orion intersection. The westbound approach is operating at a LOS E. Even though the overall intersection LOS is acceptable. The westbound movement shows a need for improvement. The Synchro results also show 95th percentile queuing beyond the northbound and westbound approach links and an over capacity situation for those links.

MAP 11: INTERSECTION HOT SPOTS

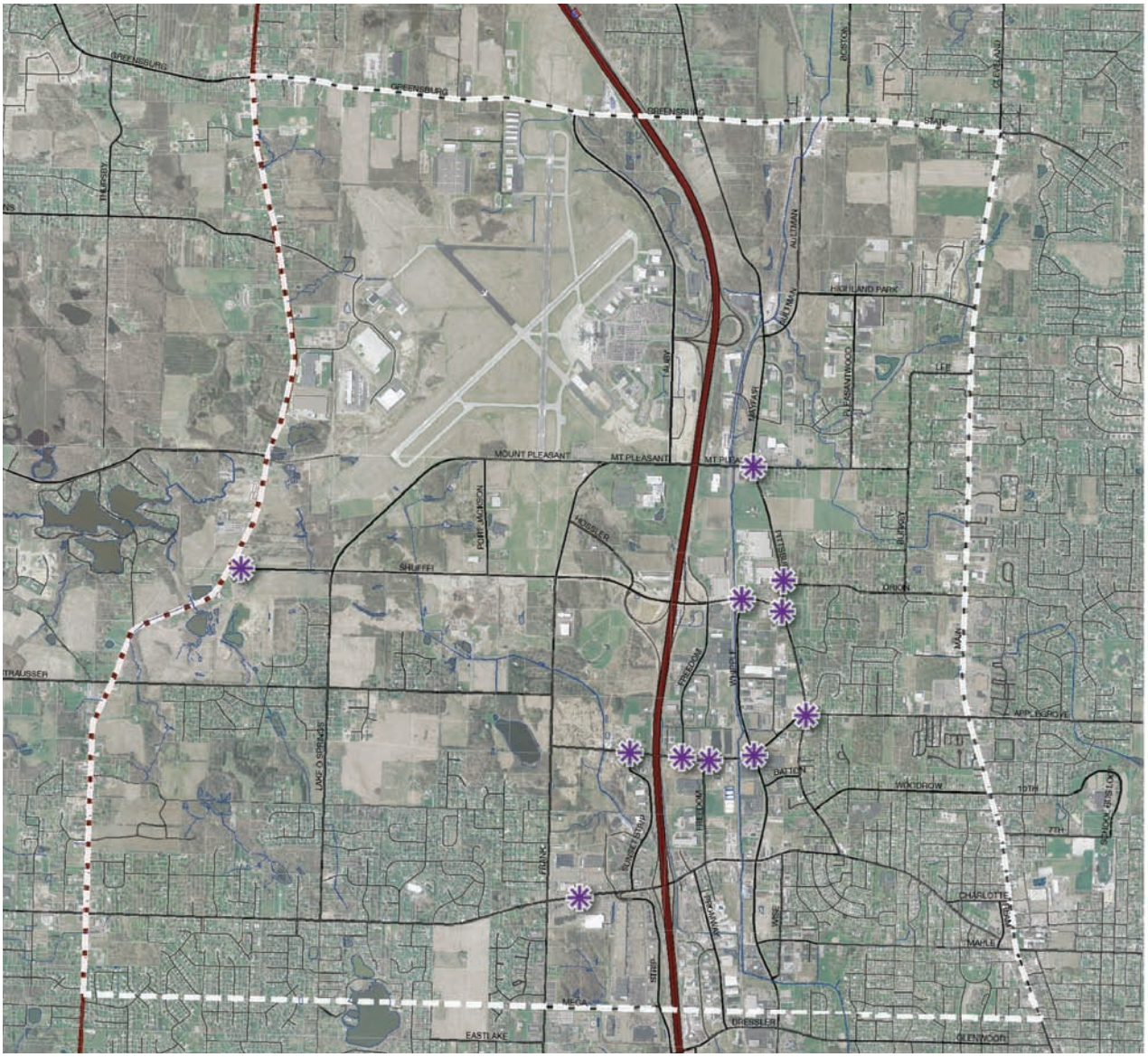


Table 1: 2013 AM Peak Hour LOS Results

2013 AM Peak Hour										
Signalized Results										
Intersection	**EB**		**WB**		**NB**		**SB**		**Overall**	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	**LOS**	**Delay**
Pittsburg Ave & Applegrove St	B	14.2s	B	19.0s	C	31.0s	D	41.7s	**C**	**22.8s**
Pittsburg Ave & Mt. Pleasant St	C	24.8s	C	25.1s	D	42.4s	C	24.2s	**C**	**29.8s**
#Pittsburg Ave & Orion Rd	C	25.0s	E	63.1s	C	29.3s	A	**9.3s**	**C**	**33.3s**
#Pittsburg Ave & Shuffel St	D	40.4s			B	17.7s	B	**12.2s**	**C**	**21.8s**
Portage St & Robin Hill	C	29.0s	B	18.3s	C	28.7s	C	31.9s	**C**	**24.9s**
#Wales Ave & Shuffel St			C	31.7s	B	12.1s	B	13.8s	**B**	**17.6s**
#Applegrove St & Whipple Ave	B	18.8s	D	35.0s	B	15.0s	C	26.2s	**C**	**26.3s**
Whipple Ave & Shuffel St	A	8.0s	A	7.4s	C	33.3s	C	29.2s	**A**	**9.4s**
Unsignalized Results										
Applegrove St & W Freedom Ave							B	12.2s	**A**	**1.7s**
Applegrove St & E Freedom Ave					B	12.5s			**A**	**2.1s**
Applegrove St & Strip Extension					B	11.6s	B	14.9s	**A**	**2.3s**

Synchro output, HCM would not yield results

! Volume exceeds capacity, queues beyond link

IV. EXISTING CONDITIONS

Table 2: 2013 PM Peak Hour LOS Results

2013 PM Peak Hour										
Signalized Results										
Intersection	**EB**		**WB**		**NB**		**SB**		**Overall**	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	**LOS**	**Delay**
Pittsburg Ave & Applegrove St	C	27.0s	C	33.1s	C	20.7s	D	38.8s	**C**	**31.2s**
Pittsburg Ave & Mt. Pleasant St	C	21.9s	B	17.0s	B	18.8s	D	38.1s	**C**	**23.1s**
#Pittsburg Ave & Orion Rd	C	33.0s	E!	60.3s	D!	37.1s	A	5.6s	**C**	**29.5s**
#Pittsburg Ave & Shuffel St	C	34.0s			C	27.3s	A	8.8s	**C**	**23.2s**
Portage St & Robin Hill	C	26.7s	C	23.4s	C	32.4s	D	45.0s	**C**	**26.8s**
#Wales Ave & Shuffel St			C	25.6s	A	6.7s	B	17.1s	**B**	**17.1s**
#Applegrove St & Whipple Ave	B	18.3s	C	33.1s	B	15.2s	C	31.9s	**C**	**23.5s**
Whipple Ave & Shuffel St	B	17.5s	B	12.0s	C	32.1s	C	23.6s	**B**	**17.4s**
Unsignalized Results										
Applegrove St & W Freedom Ave							C	15.6s	**A**	**3.6s**
Applegrove St & E Freedom Ave					B	13.9s			**A**	**2.0s**
Applegrove St & Strip Extension					C	15.6s	C	23.0s	**A**	**4.9s**

Synchro output, HCM would not yield results
! Volume exceeds capacity, queues beyond link

SCATS

V. FUTURE CONDITION

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V. FUTURE CONDITIONS

V.I Land Use

As part of the planning process, the team projected existing conditions into the future (2035). This exercise was performed to identify areas that may have or develop needs in the future. This allows for alternatives to be developed and possibly implemented before the need becomes too great. It also sets a baseline for testing the longevity of project investments through comparative analysis.

Future Land Use Analysis

A thorough land use analysis was conducted as part of this study task. The desired outcome of this task was to accurately predict the future land use conditions in the study area.

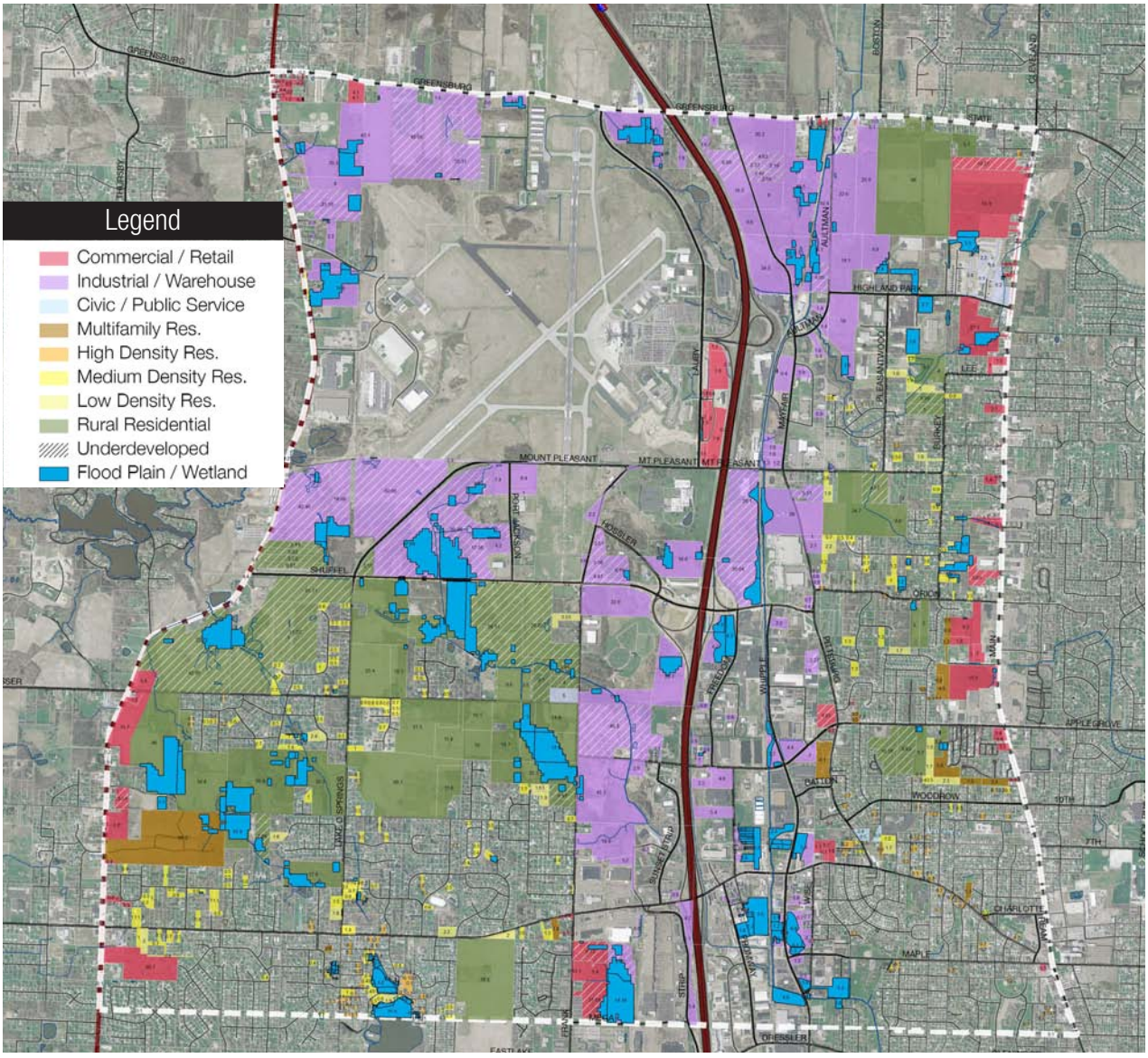
Map 'pipeline' project areas (see Stakeholder Input)

During this task the planning team created a map of the pipeline projects that are planned in the study area.

Identification of environmentally sensitive areas, developed areas, and underutilized areas

The planning team prepared a series of maps as part of this task. This included a map of the environmentally sensitive areas in the study area (Map 7). Identifying these areas was critical to determine what land is undevelopable. The team also identified what areas were underutilized. This included land that was currently zoned and being used for 'some' use. In most cases this was land that was in agricultural production but likely to be developed in the next 10-20

MAP 12: DEVELOPABLE LAND WITH ENVIRONMENTAL OVERLAY



V. FUTURE CONDITIONS

years. This area was considered developable as part of this analysis.

Developable land map

Based on the work performed during the previous two tasks, the planning team created a developable land map (Map 12). The map illustrated where the potential development areas are in the study area. While this step involves the creation of a physical map, it involves the coordination, interpretation, and assessment of the input received regarding planned or 'pipeline' development, environmentally sensitive areas, and intuitive knowledge gathered during the stakeholder interviews.

Future Development Scenario/Projected Job Creation

Based on the results of the land use analysis, a future development scenario was developed that includes all known development that is being planned at the time of the study, as well as preferred land uses for developable areas. In most cases the preferred land use was the underlying zoning, in other cases the land use was based on the reflection and input of the stakeholders and client team, balanced with market trends and opportunities. In essence, the scenario included all existing and planned development, and reflected the highest and best use for all developable land within the study area.

TABLE 3: EXISTING VACANT LAND IN STUDY AREA

General Zoning	Total Acres	Parcels	Wetlands (acres)	Floodplain (acres)	Developable Acerage	Assumed Density	Total S.F/Units Per Acre	20% Buildout	Total Jobs
Commercial	351	104	6	5	315.9	12,000	3,790,800	758,160	1,516
Industrial	734	162	70	55	609	18,000	10,962,000	2,192,400	2,436
Public Service	4	13			4	14,000	56,000	11,200	28
Resid. High	21	155	0.6	0.5	19.9	15	299	60	
Resid. Low	45	23	7	0.6	37.4	0.50	19	4	
Resid. Med	108	177	5	3.5	99.5	4	398	80	
Resid. Multi	95	38	3.8		91.2		-	-	
Resid. Rural	807	38	100	8	699	0.10	70	14	
Total	**2,165**	**710**	**192**	**73**	**1,876**		**14,809,585**		**3,980**

Does not include 24.1 acres of commercial which has been indicated as a pipeline project

TABLE 4: EXISTING UNDERUTILIZED LAND IN STUDY AREA

General Zoning	Total Acres	Parcels	Wetlands (acres)	Floodplain (acres)	Developable Acerage	Assumed Density	Total S.F/Units Per Acre	20% Buildout	Total Jobs
Commercial	44	8	3		41	12,000	492,000	98,400	197
Industrial	510	31	58	6	387.5	18,000	6,975,000	1,395,000	1,550
Public Service	4	2			4	14,000	56,000	11,200	28
Resid. High					0	15	-	-	
Resid. Low					0	0.50	-	-	
Resid. Med					0	4	-	-	
Resid. Multi					0		-	-	
Resid. Rural	345	21	26		319	0.10	32	6	
Total	**903**	**62**	**87**	**6**	**752**	**44,020**	**7,523,032**		**1,775**

Does not include 58.5 acres of industrial which has been indicated as a pipeline project

TABLE 5: EXISTING VACANT AND UNDERUTILIZED LAND IN STUDY AREA

General Zoning	Total Acres	Parcels	Wetlands (acres)	Floodplain (acres)	Developable Acerage	Assumed Density	Total S.F/Units Per Acre	20% Buildout	Total Jobs
Commercial	395	112	9	5	381	12,000	4,572,000	914,400	1,829
Industrial	1244	193	128	61	1055	18,000	18,990,000	3,798,000	4,220
Public Service	8	15	0	0	8	14,000	112,000	22,400	56
Resid. High	21	155	0.6	0.5	19.9	15	299	60	
Resid. Low	45	23	7	0.6	37.4	0.50	19	4	
Resid. Med	108	177	5	3.5	99.5	4	398	80	
Resid. Multi	95	38	3.8	0	91.2		-	-	
Resid. Rural	1152	59	126	8	1018	0.10	102	20	
Total	**3,068**	**772**	**279**	**79**	**2,710**	**44,020**	**23,674,817**		**6,105**

Does not include 24.1 acres of commercial or 58.5 acres of industrial which have been indicated as pipeline projects

Based on this analysis, the planning team conducted a future land use scenario that assumed a 20 percent build-out of the study area over a 20-year planning horizon. The 20 percent build-out was based on recent development trends, and was agreed upon by the client and planning teams, as well as the project advisory group. At the assumed 20 percent build-out it was determined the area could experience the addition of approximately 6,600 new jobs. This estimate did not include the known 'pipeline' jobs as described in the stakeholder input. When combined with the known job creation, the estimated job creation figures are approximately 11,500 to 12,500 new jobs over a 20 year period. Tables 3-5 contains the data that supports the job growth projections.

V.II Future Conditions

To complete the existing and future conditions No Build analysis, the future conditions of the study area were analyzed. This future traffic conditions analysis assumes the only condition changed from the existing No Build condition is the volume of traffic. The analysis is broken into two time frames, near term (2015) to identify any immediate concerns and quick to construct short term projects, and a Design Year (2035) for which any proposed long term project would be designed to meet acceptable operations standards. This analysis will assist in identifying any long term needs related to traffic operations and capacity throughout the study area. It will also set the baseline conditions for comparison of alternatives.

Traffic volumes for the future conditions were based on a combination of intersections count data and output from the travel demand model. The resulting volume plates can be found in Appendix D.

V.II.I Corridor Level Future Analysis

This analysis was utilized to assist SCATS in developing a list of potential future capacity adding projects for air quality analysis. This analysis assesses the future air quality of the MPO region. Proposed future projects are included to assess their impact on air quality. The submitted projects only needed to be at the level of "will add capacity", "improve intersection", etc. They did not need to be detailed project recommendations, and it is better to submit even remotely feasible projects and see where the analysis comes in at then to try and add a project later.

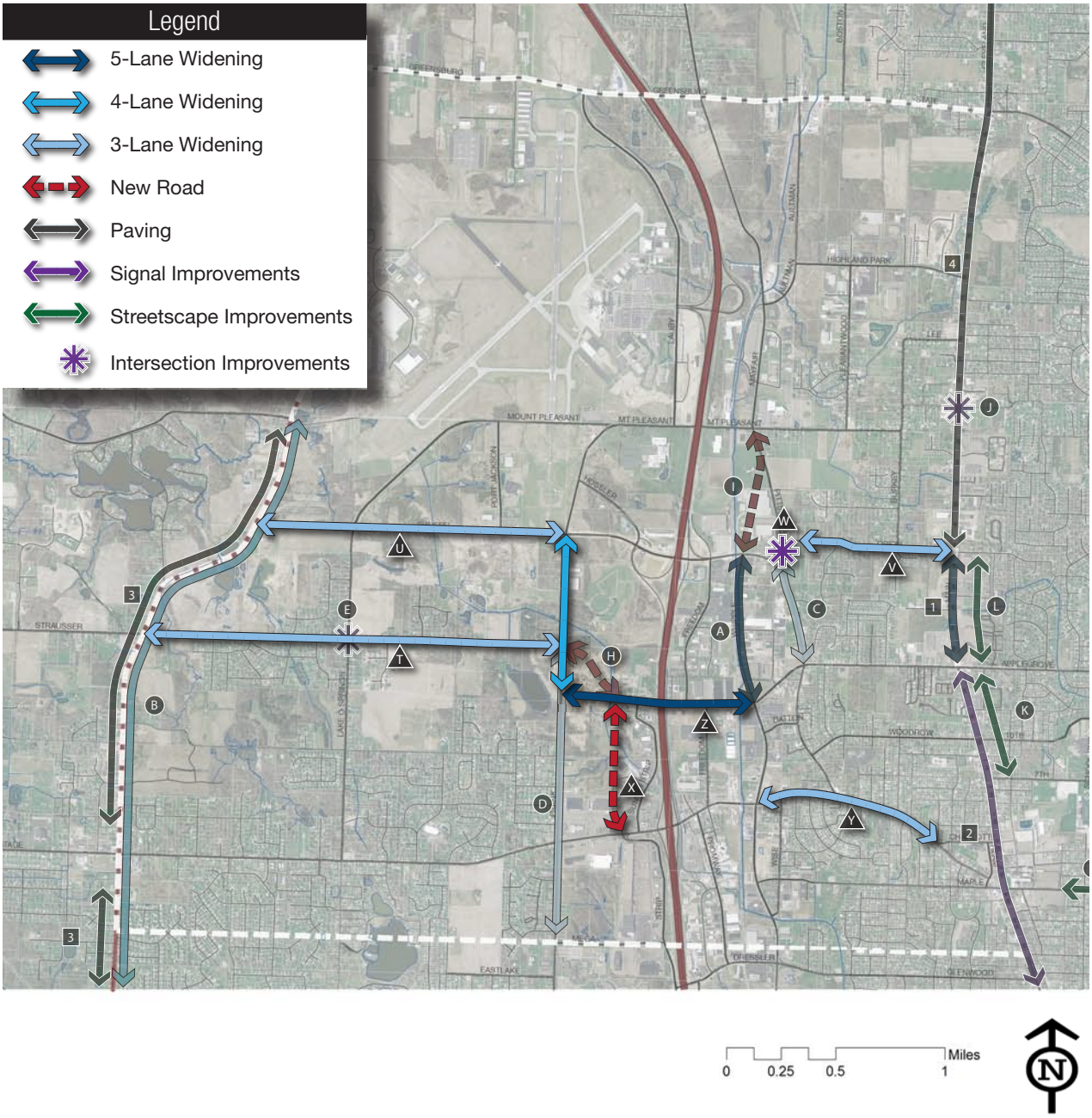
The following roadway sections showed the potential need for added capacity in the future based on projected ADT, number of access points, terrain and discussion with the stakeholders.

- 3-Lane widening of Strausser – Frank to Wales
- 4-lane widening of Frank – Applegrove to Shuffel
- 3-lane widening of Shuffel – Frank to Wales
- 3-Lane widening of Orion – Pittsburg to Cleveland
- 3-Lane widening of Portage – Pittsburg to Charlotte
- 4/5-Lane widening of Applegrove – Whipple to Frank
- 3-Lane - Strip Ave extension to Applegrove

These projects are in addition to the projects already on the long range plan and TIP. Map 13 illustrates all of these projects that fall within the study area.

V. FUTURE CONDITIONS

MAP 13: UPDATED PLANNED TRANSPORTATION PROJECT MAP (INCLUDES AIR QUALITY PROJECTS)



V.II.II 2015: No Build Intersections

No Build traffic analysis was performed utilizing the traffic volumes developed for 2015; the overall and approach analysis results are shown in Tables 6-7. The detailed capacity analysis results showing overall results, approach results and results by movements (not shown in Tables 8-9) can be found in Appendix D.

The results shown in Tables 6-7 indicate a continued loss in operational efficiency at many of the intersections in the study area. Overall LOS is still acceptable but the analysis is showing the beginning of breakdowns at the approach and movement level within the intersections. Going a level deeper, the detailed analysis in Appendix D is also showing breakdowns and failures at the approach (shown) and movement level (not shown) within the intersections.

The Pittsburg/Orion intersection is showing a failing approach (LOS F) westbound as well as an unacceptable LOS E northbound in the PM peak. These two approaches continue to also show queue length beyond the link capacity.

The Pittsburg/Shuffel intersection is showing a LOS E for the eastbound left turn movement in the AM and excessive queuing in both peak hours.

The Portage/Robin Hill intersection is also showing a LOS E for the southbound approach in the PM peak.

The Pittsburg/Mt. Pleasant intersection northbound left turn movement is a LOS E in the PM peak.

Table 6: 2015 AM Peak Hour LOS Results

2015 AM Peak Hour										
Signalized Results										
Intersection	**EB**		**WB**		**NB**		**SB**		**Overall**	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	**LOS**	**Delay**
Pittsburg Ave & Applegrove St	B	15.8s	C	22.0s	C	30.2s	C	34.6s	**C**	**23.7s**
Pittsburg Ave & Mt. Pleasant St	C	26.4s	C	27.1s	D	45.4s	C	25.6s	**C**	**31.9s**
Pittsburg Ave & Orion Rd	C	26.0s	E!	69.6s	D!	37.7s	B	10.0s	**D**	**38.9s**
Pittsburg Ave & Shuffel St	D!	45.1s			B	15.6s	B	13.2s	**C**	**22.8s**
Portage St & Robin Hill	C	30.4s	B	18.9s	C	29.0s	C	32.2s	**C**	**26.0s**
#Wales Ave & Shuffel St			B	15.4s	B	11.3s	B	13.2s	**B**	**12.5s**
#Applegrove St & Whipple Ave	C	23.3s	D	38.0s	B	13.5s	C	26.1s	**C**	**28.1s**
Whipple Ave & Shuffel St	A	7.7s	A	7.7s	D	44.2s	D	38.0s	**B**	**10.9s**
Unsignalized Results										
Applegrove St & W Freedom Ave							B	13.3s	**A**	**1.8s**
Applegrove St & E Freedom Ave					B	13.6s			**A**	**2.2s**
Applegrove St & Strip Extension					B	13.5s	C	16.9s	**A**	**3.0s**

 # Synchro output, HCM would not yield results

! Volume exceeds capacity, queues beyond link

V. FUTURE CONDITIONS

TABLE 7: 2015 PM PEAK HOUR LOS RESULTS

2015 PM Peak Hour										
Signalized Results										
Intersection	**EB**		**WB**		**NB**		**SB**		**Overall**	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	**LOS**	**Delay**
Pittsburg Ave & Applegrove St	C	30.1s	D	37.6s	C	20.5s	C	29.4s	**C**	**31.2s**
Pittsburg Ave & Mt. Pleasant St	C	26.1s	C	20.3s	D	48.0s	D	44.7s	**C**	**32.7s**
Pittsburg Ave & Orion Rd	D	36.0s	F!	83.6s	E!	56.2s	A	6.1s	**D**	**42.5s**
Pittsburg Ave & Shuffel St	D!	35.5s			C	26.7s	B	11.7s	**C**	**24.7s**
Portage St & Robin Hill	C	23.4s	C	20.1s	D	43.8s	E	55.9s	**C**	**25.7s**
#Wales Ave & Shuffel St			C	34.5s	A	6.6s	C	20.7s	**C**	**21.3s**
#Applegrove St & Whipple Ave	C	24.0s	B	18.9s	C	20.3s	C	31.2s	**C**	**22.5s**
Whipple Ave & Shuffel St	C	20.5s	B	14.0s	D	35.4s	C	25.2s	**C**	**20.1s**
Unsignalized Results										
Applegrove St & W Freedom Ave							C	17.5s	**A**	**4.0s**
Applegrove St & E Freedom Ave					B	14.8s			**A**	**2.0s**
Applegrove St & Strip Extension					C	23.2s	D	28.0s	**A**	**7.0s**

 # Synchro output, HCM would not yield results
! Volume exceeds capacity, queues beyond link

V.II.II 2035: No Build Intersections

No Build traffic analysis was performed utilizing the traffic volumes developed for 2035; the overall and approach analysis results are shown in Tables 8-9. The detailed capacity analysis results showing overall results, approach results and results by movements (not shown in Tables 8-9) can be found in Appendix D.

The results shown in Tables 8-9 indicate a continued loss in operational efficiency at many of the intersections in the study area. Overall LOS is still acceptable; however, some of the intersections are approaching the overall LOS E threshold of 55.0 seconds delay. Going a level deeper, the detailed analysis in Appendix D is also showing breakdowns and failures at the approach (shown) and movement level (not shown) within the intersections.

The Applegrove & Strip extension intersection shows complete failure in the PM peak hour and signalization may need to be considered by 2035.

The Pittsburg/Mt. Pleasant intersection shows a LOS C for the southbound approach in the AM peak but looking deeper the southbound left turn movement is a LOS E. The entire southbound approach is a LOS E in the PM peak with the northbound right turn and southbound left turn movements showing a LOS E.

TABLE 8: 2035 AM PEAK HOUR LOS RESULTS

2035 AM Peak Hour										
Signalized Results										
Intersection	**EB**		**WB**		**NB**		**SB**		**Overall**	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	**LOS**	**Delay**
Pittsburg Ave & Applegrove St	B	19.6s	C	28.3s	C	30.3s	D	46.5s	**C**	**30.0s**
Pittsburg Ave & Mt. Pleasant St	C	29.5s	C	33.6s	D	54.0s	C	30.8s	**D**	**37.6s**
Pittsburg Ave & Orion Rd	C	26.0s	F!	98.2s	C	20.2s	B	12.9s	**D**	**40.2s**
Pittsburg Ave & Shuffel St	D	40.1s			C	26.3s	B!	14.4s	**C**	**25.6s**
Portage St & Robin Hill	C	30.1s	B	19.3s	C	34.5s	D	38.7s	**C**	**26.6s**
#Wales Ave & Shuffel St			B	18.9s	B	10.7s	C	33.1s	**B**	**18.0s**
#Applegrove St & Whipple Ave	B	18.7s	D	37.8s	B	19.6s	C	22.4s	**C**	**27.4s**
Whipple Ave & Shuffel St	B	10.2s	A	8.2s	D	38.5s	C	32.4s	**B**	**11.6s**
Unsignalized Results										
Applegrove St & W Freedom Ave							C	15.4s	**A**	**1.7s**
Applegrove St & E Freedom Ave					C	15.5s			**A**	**2.0s**
Applegrove St & Strip Extension					C	16.7s	C	23.3s	**A**	**4.2s**

 # Synchro output, HCM would not yield results

! Volume exceeds capacity, queues beyond link

V. FUTURE CONDITIONS

The Portage/Robin Hill intersection shows a LOS F for the southbound approach in the PM peak hour.

The northbound and southbound left turn movements are LOS E in the PM peak for the Applegrove/Whipple intersection.

In the PM peak, the eastbound left, westbound thru and westbound right turn movements are all LOS E at the Pittsburg/Applegrove intersection.

The eastbound left turn movement at the Pittsburg/Shuffel intersection is a LOS E in the PM peak.

Queuing at the Pittsburg/Orion/Shuffel intersections continues to be excessive due to capacity issues with links north, west and east bound. Orion/Pittsburg is showing failing approach LOS in both peak hours with excessive queuing.

V.II.III Purpose & Need Statement

After assessing the needs of the study area, a draft purpose and need statement was developed.

Purpose and Need Statement

The purpose of these projects is to improve the roadway capacity and traffic control in the study area to promote safe mobility and support continued economic development. Due to the current and projected operational breakdowns (LOS D & E) and failures (LOS F) at the intersections, there is a need to restore and maintain acceptable LOS through the design year 2035.

TABLE 9: 2035 PM PEAK HOUR LOS RESULTS

2035 PM Peak Hour										
Signalized Results										
Intersection	**EB**		**WB**		**NB**		**SB**		**Overall**	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	**LOS**	**Delay**
Pittsburg Ave & Applegrove St	D	42.7s	E	55.5s	C	20.0s	B	18.7s	**D**	**38.1s**
Pittsburg Ave & Mt. Pleasant St	D	35.1s	C	30.0s	D	44.0s	E	63.7s	**D**	**42.2s**
Pittsburg Ave & Orion Rd	D	37.0s	F!	110.3s	E!	69.7ss	A	7.8s	**D**	**54.0s**
Pittsburg Ave & Shuffel St	D!	48.1s			B	18.3s	B	18.1s	**C**	**30.4s**
Portage St & Robin Hill	C	33.2s	D	44.5s	D	36.3s	F	89.1s	**D**	**43.2s**
#Wales Ave & Shuffel St			D	41.3s	A	6.2s	D	38.2s	**C**	**31.3s**
#Applegrove St & Whipple Ave	C	24.6s	C	35.0s	C	25.2s	C	33.5s	**C**	**29.0s**
Whipple Ave & Shuffel St	C	27.5s	B	18.5s	D	41.1s	C	25.8s	**C**	**26.0s**
Unsignalized Results										
Applegrove St & W Freedom Ave							D	25.8s	**A**	**5.6s**
Applegrove St & E Freedom Ave					C	19.0s			**A**	**2.3s**
Applegrove St & Strip Extension					F	287.5s	F	>300s	**F**	**181.8s**

 # Synchro output, HCM would not yield results

! Volume exceeds capacity, queues beyond link

SCATS

VI. ALTERNATIVES

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VI. ALTERNATIVES

Alternatives

Alternatives were developed and analyzed at a planning level for each of the intersection needs identified in the No Build analysis. These alternatives were analyzed utilizing 2035 traffic volumes and optimized timings when applicable.

The following section represents alternatives that the study team performed detailed capacity analysis on.

Other Influencing Projects

Alternatives were developed for the study area based on the differing levels of data available. Some of the developed alternatives were influenced by projects recommended by other studies or the MPO's long range plan. These projects were incorporated into the alternative set as a given, as they would have influence on the network and thus influence the alternatives proposed by this study. A few of the projects from the MPO's long range plan were omitted after discussion with the stakeholders, as recent developments have made their further development and implementation highly unlikely. Two examples are the 5 lane extension of Whipple from Shuffel to Mount Pleasant and the direct connection of Applegrove and Stausser.

The other planned projects that were taken into account when assessing the future build condition are shown in the previous section.

VI. ALTERNATIVES

Applegrove Corridor

Alternative 1

This alternative involves the widening of Applegrove to a 5-lane roadway section from Whipple to Frank including signalization of the Sunset Strip intersection and necessary adjustments to the signal phasing and timing at the Whipple intersection, see Figure 1.

This also assumes the upgrade of Whipple to a 5-lane section north of Applegrove. If this project is not undertaken, then capacity adjustments will need to be made on the Whipple intersection's north and south approaches.

Planning level cost estimate = $9,270,000

CAPACITY ANALYSIS COMPARISON

AM Period (Whipple)	EB		WB		NB		SB		Overall	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	**LOS**	**Delay**
2035 No Build	B	18.7s	D	37.8s	B	19.6s	C	22.4s	**C**	**27.4s**
2035 Alt 1	C	20.3s	C	21.7s	B	14.3s	C	27.8s	**C**	**20.5s**

PM Period (Whipple)	EB		WB		NB		SB		Overall	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	**LOS**	**Delay**
2035 No Build	C	24.6s	C	35.0s	C	25.2s	C	33.5s	**C**	**29.0s**
2035 Alt 1	B	22.2s	C	32.7s	B	13.8s	C*	25.2s	**C**	**22.6s**

*SBL is LOS E (HCM); NBR, SBL, EBL = LOS E & F (Synchro)

AM Period (Freedom E)	EB		WB		NB		SB		Overall	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	**LOS**	**Delay**
2035 No Build					C	15.5s			**A**	**2.0s**
2035 Alt 1					B	13.6s			**A**	**1.9s**

PM Period (Freedom E)	EB		WB		NB		SB		Overall	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	**LOS**	**Delay**
2035 No Build					C	19.0s			**A**	**2.3s**
2035 Alt 1					C	15.0s			**A**	**1.9s**

AM Period (Freedom W)	EB		WB		NB		SB		Overall	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	**LOS**	**Delay**
2035 No Build							C	15.4s	**A**	**1.7s**
2035 Alt 1							B	13.6s	**A**	**1.6s**

PM Period (Freedom W)	EB		WB		NB		SB		Overall	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	**LOS**	**Delay**
2035 No Build							D	25.8s	**A**	**5.6s**
2035 Alt 1							C	18.2s	**A**	**4.0s**

AM Period (Sunset Strip)	EB		WB		NB		SB		Overall	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	**LOS**	**Delay**
2035 No Build					C	16.7s	C	23.3s	**A**	**4.2s**
2035 Alt 1	A	6.6s	A	3.1s	C	27.0s	C	24.7s	**A**	**8.9s**

PM Period (Sunset Strip)	EB		WB		NB		SB		Overall	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	**LOS**	**Delay**
2035 No Build					F	287.5s	F	>300s	**F**	**181.8s**
2035 Alt 1	C	20.4s	B	15.4s	C	24.2s	C	21.4s	**B**	**18.9s**

VI. ALTERNATIVES

FIGURE 1: APPLEGROVE CORRIDOR


77
77
STRAUSS
FREEDOM
SUPREME
STRAUSSER
FREEDOM

VI. ALTERNATIVES

Pittsburg & Applegrove Intersection

Alternative 1

This alternative involves the addition of a thru-right turn lane southbound, a right turn lane westbound, re-striping of the southbound existing lanes to dual left turn lanes, and traffic signal optimization, see Figure 2 below.

Planning level cost estimate = $360,000

CAPACITY ANALYSIS COMPARISON

AM Period	EB		WB		NB		SB		Overall	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	**LOS**	**Delay**
2035 No Build	B	19.9s	C	29.4s	C	30.3s	D	46.5s	**C**	**30.6s**
2035 Alt 1	B	15.5s	B	17.4s	D	38.2s	C	33.6s	**C**	**23.3s**

PM Period	EB		WB		NB		SB		Overall	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	**LOS**	**Delay**
2035 No Build	D	42.7s	E	55.5s	C	20.0s	B	18.7s	**D**	**38.1s**
2035 Alt 1	C	26.6s	C	28.4s	D	43.5s	C	33.7s	**C**	**30.9s**

FIGURE 2: PITTSBURG & APPLEGROVE - ALTERNATIVE 1

Pittsburg & Applegrove Intersection

Alternative 2

This alternative involves the conversion of the intersection to a 2-lane roundabout with 2 lane approaches on three of the four legs, see Figure 3 below.

Planning level cost estimate = $2,140,000

CAPACITY ANALYSIS COMPARISON

AM Period	EB		WB		NB		SB		Overall	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	**LOS**	**Delay**
2035 No Build	B	19.9s	C	29.4s	C	30.3s	D	46.5s	**C**	**30.6s**
2035 Alt 2	B	13.7s	C	18.1s	A	6.8s	A	9.5s	**B**	**13.7s**

PM Period	EB		WB		NB		SB		Overall	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	**LOS**	**Delay**
2035 No Build	D	42.7s	E	55.5s	C	20.0s	B	18.7s	**D**	**38.1s**
2035 Alt 2	D	33.9s	B	12.6s	C	17.5s	B	14.8s	**C**	**21.1s**

FIGURE 3: PITTSBURG & APPLEGROVE - ALTERNATIVE 2

VI. ALTERNATIVES

Pittsburg & Mt. Pleasant Intersection

Alternative 1

This alternative involves the addition of right turn lanes southbound and eastbound, provision for bicycle and pedestrians as part of the Stark County Parks master plan, and signal optimization, see Figure 4 below.

Planning level cost estimate = $690,000

CAPACITY ANALYSIS COMPARISON

AM Period	EB		WB		NB		SB		Overall	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	**LOS**	**Delay**
2035 No Build	C	29.5s	C	33.6s	D	54.0s	C	30.8s	**D**	**37.6s**
2035 Alt 1	C	29.8s	D	35.4s	B	16.9s	C	23.6s	**C**	**26.8s**

PM Period	EB		WB		NB		SB		Overall	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	**LOS**	**Delay**
2035 No Build	D	35.1s	C	30.0s	D	44.0s	E	63.7s	**D**	**42.2s**
2035 Alt 1	C	27.9s	C	25.7s	D	39.6s	C	30.7s	**C**	**30.3s**

FIGURE 4: PITTSBURG & MT. PLEASANT - ALTERNATIVE 1

Pittsburg & Mt. Pleasant Intersection

Alternative 2

This alternative involves the conversion of the intersection to a roundabout and provision for bicycle and pedestrians as part of the Stark County Parks master plan, see Figure 5 below.

Planning level cost estimate = $2,290,000

CAPACITY ANALYSIS COMPARISON

AM Period	EB		WB		NB		SB		Overall	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	**LOS**	**Delay**
2035 No Build	C	29.5s	C	33.6s	D	54.0s	C	30.8s	**D**	**37.6s**
2035 Alt 2	B	13.1s	C	22.1s	C	15.9s	B	10.8s	**C**	**16.0s**

PM Period	EB		WB		NB		SB		Overall	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	**LOS**	**Delay**
2035 No Build	D	35.1s	C	30.0s	D	44.0s	E	63.7s	**D**	**42.2s**
2035 Alt 2	C	21.2s	C	18.9s	B	11.4s	C	21.5s	**C**	**18.5s**

FIGURE 5: PITTSBURG & MT. PLEASANT - ALTERNATIVE 2

VI. ALTERNATIVES

Pittsburg & Shuffel/Orion Intersection

Alternative 1

Alternative 1 involves the addition of turn lanes at both intersections, as well as coordination of the signals, see Figure 6 below.

Planning level cost estimate = $2,090,000

CAPACITY ANALYSIS COMPARISON

AM Period (Shuffel)	EB		WB		NB		SB		Overall	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	**LOS**	**Delay**
2035 No Build	D	40.1s			C	26.3s	B!	14.4s	**C**	**25.6s**
2035 Alt 1	D!	37.6s			C	20.9s	C	20.5s	**C**	**25.4s**
PM Period (Shuffel)	**EB**		**WB**		**NB**		**SB**		**Overall**	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	**LOS**	**Delay**
2035 No Build	D!	48.1s			B	18.3s	B	18.1s	**C**	**30.4s**
2035 Alt 1	C^	29.3s			B	11.8s	B	11.5s	**B**	**18.8s**

! Volume exceeds capacity, queues beyond link

^LOS E in HCM output – EBR is LOS F vs LOS A in Synchro

AM Period (Orion)	EB		WB		NB		SB		Overall	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	**LOS**	**Delay**
2035 No Build	C	26.0s	F!	98.2s	C!	20.2s	B	12.9s	**D**	**40.2s**
2035 Alt 1	C	23.0s	E!	67.2s	B!	14.2s	B	15.3s	**C**	**29.4s**
PM Period (Orion)	**EB**		**WB**		**NB**		**SB**		**Overall**	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	**LOS**	**Delay**
2035 No Build	D	37.0s	F!	110.3s	E!	69.7s	A	7.8s	**D**	**54.0s**
2035 Alt 1	C	26.0s	D!	48.1s	A!	8.6s	B	15.7s	**B**	**17.6s**

! Volume exceeds capacity, queues beyond link

FIGURE 6: PITTSBURG & SHUFFEL / ORION - ALTERNATIVE 1

VI. ALTERNATIVES

Pittsburg & Shuffel/Orion Intersection

Alternative 2

Alternative 2 involves combining the two intersections with a peanut shaped 2-lane roundabout, see Figure 7 below. This alternative would also require the re-alignment of three of the four approaches.

Planning level cost estimate = $3,060,000

CAPACITY ANALYSIS COMPARISON

AM Period (Shuffel)	**EB**		**WB**		**NB**		**SB**		**Overall**	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	**LOS**	**Delay**
2035 No Build	D	40.1s			C	26.3s	B!	14.4s	**C**	**25.6s**
2035 Alt 2	A	9.4s			C	23.4s	A	1.7s	**B**	**11.1s**
PM Period (Shuffel)	**EB**		**WB**		**NB**		**SB**		**Overall**	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	**LOS**	**Delay**
2035 No Build	D!	48.1s			B	18.3s	B	18.1s	**C**	**30.4s**
2035 Alt 2	C	17.1s			C	21.3s	A	2.5s	**B**	**12.7s**

! Volume exceeds capacity, queues beyond link

AM Period (Orion)	**EB**		**WB**		**NB**		**SB**		**Overall**	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	**LOS**	**Delay**
2035 No Build	C	26.0s	F!	98.2s	C!	20.2s	B	12.9s	**D**	**40.2s**
2035 Alt 2			C	20.5s	B	11.3s	C	15.3s	**B**	**14.2s**
PM Period (Orion)	**EB**		**WB**		**NB**		**SB**		**Overall**	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	**LOS**	**Delay**
2035 No Build	D	37.0s	F!	110.3s	E!	69.7s	A	7.8s	**D**	**54.0s**
2035 Alt 2			A	9.9s	B	11.4s	B	14.4s	**B**	**12.2s**

! Volume exceeds capacity, queues beyond link

FIGURE 7: PITTSBURG & SHUFFEL / ORION - ALTERNATIVE 2

VI. ALTERNATIVES

Portage & Robin Hill (BJ's Signal) Intersection

Alternative 1

This alternative involves the re-alignment of the north and south approaches to eliminate the need for split phasing, addition of an eastbound turn lane and phase and traffic signal optimization. The cost anticipates that most of the re-alignment can be completed within the existing curb lines. See Figure 8 below.

Depending on the growth of the Kent State-Stark campus there may be a need for additional turn lanes if the south leg becomes a formal access to the KSU parking to the south as an alternate to Frank Road.

Planning level cost estimate = $170,000

CAPACITY ANALYSIS COMPARISON

AM Period	EB		WB		NB		SB		Overall	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	**LOS**	**Delay**
2035 No Build	C	30.1s	B	19.3s	C	34.5s	D	38.7s	**C**	**26.6s**
2035 Alt 1	B	17.0s	B	15.3s	C	20.8s	C	20.8s	**B**	**16.7s**

PM Period	EB		WB		NB		SB		Overall	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	**LOS**	**Delay**
2035 No Build	C	33.2s	D	44.5s	D	36.3s	F	89.1s	**D**	**43.2s**
2035 Alt 1	B	14.9s	C	23.8s	D	47.1s	D	45.5s	**C**	**24.1s**

FIGURE 8: PORTAGE AND ROBIN HILL - ALTERNATIVE 1

VI. ALTERNATIVES

Whipple & Applegrove Intersection

Alternative 2

This alternative involves the conversion of the intersection to a 2-lane roundabout, see Figure 9 below.

Planning level cost estimate = $2,110,000

CAPACITY ANALYSIS COMPARISON

AM Period	EB		WB		NB		SB		Overall	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	**LOS**	**Delay**
2035 No Build	B	18.7s	D	37.8s	B	19.6s	C	22.4s	**C**	**27.4s**
2035 Alt 2	A	8.2s	A	8.9s	A	6.2s	A	8.5s	**A**	**8.1s**

PM Period	EB		WB		NB		SB		Overall	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	**LOS**	**Delay**
2035 No Build	C	24.6s	C	35.0s	C	25.2s	C	33.5s	**C**	**29.0s**
2035 Alt 2	B	12.5s	A	8.8s	C	15.2s	B	10.6s	**B**	**12.2s**

FIGURE 9: WHIPPLE & APPLEGROVE - ALTERNATIVE 2

Overall System

The following tables show the analysis results for both 2035 peak periods for all intersection alternatives. The results show acceptable levels of service at each of the locations and for the majority of the approaches. This is meant to illustrate the overall affect the project alternatives could be expected to have on the system when implemented and brings the system back to a LOS similar to 2013.

The signal alternative for the Pittsburg & Shuffel / Orion intersection does not address all of the intersection needs. As can be seen from the results in the tables 10-13, intersection approaches continue to have queuing issues and the 2035 AM westbound approach is a LOS E.

Table 10: 2035 AM Peak Hour LOS Results - Build

2035 AM Peak Hour										
Signalized Results										
Intersection	**EB**		**WB**		**NB**		**SB**		**Overall**	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	**LOS**	**Delay**
Pittsburg Ave & Applegrove St	B	15.7s	B	17.7s	D	38.2s	C	33.6s	**C**	**23.5s**
Pittsburg Ave & Mt. Pleasant St	C	29.8s	D	35.4s	B	16.9s	C	23.6s	**C**	**26.8s**
#Pittsburg Ave & Orion Rd	C	23.0s	E!	67.2s	B!	14.2s	B	15.3s	**C**	**29.4s**
#Pittsburg Ave & Shuffel St	D!	37.6s			C	20.9s	C	20.5s	**C**	**25.4s**
Portage St & Robin Hill	B	17.0s	B	15.3s	C	20.8s	C	20.8s	**B**	**16.7s**
#Wales Ave & Shuffel St			A	8.0s	A	8.9s	B	15.8s	**B**	**10.9s**
#Applegrove St & Whipple Ave	C	20.3s	C	21.7s	B	14.3s	C	27.8s	**C**	**20.5s**
Whipple Ave & Shuffel St	B	13.2s	B	11.3s	C	29.1s	D	36.8s	**B**	**13.7s**
Applegrove St & Strip Extension	A	6.6s	A	3.1s	C	27.0s	C	24.7s	**A**	**8.9s**
Unsignalized Results										
Applegrove St & W Freedom Ave							B	13.6s	**A**	**1.6s**
Applegrove St & E Freedom Ave					B	13.6s			**A**	**1.9s**

Synchro output, HCM would not yield results

! Volume exceeds capacity, queues beyond link

VI. ALTERNATIVES

Table 11: 2035 PM Peak Hour LOS Results - Build

2035 PM Peak Hour										
Signalized Results										
Intersection	**EB**		**WB**		**NB**		**SB**		**Overall**	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	**LOS**	**Delay**
Pittsburg Ave & Applegrove St	C	27.3s	C	29.0s	D	43.5s	C	33.7s	**C**	**31.3s**
Pittsburg Ave & Mt. Pleasant St	C	27.9s	C	25.7s	D	39.6s	C	30.7s	**C**	**30.3s**
#Pittsburg Ave & Orion Rd	C	26.0s	D!	48.1s	A!	8.6s	B	15.7s	**B**	**17.6s**
#Pittsburg Ave & Shuffel St	C^	29.3s			B	11.8s	B	11.5s	**B**	**18.8s**
Portage St & Robin Hill	B	14.9s	C	23.8s	D	47.1s	D	45.5s	**C**	**24.1s**
#Wales Ave & Shuffel St			D	41.3s	A	6.2s	D	38.2s	**C**	**31.3s**
#Applegrove St & Whipple Ave	B	22.2s	C	32.7s	C	13.8s	C	25.2s	**C**	**22.6s**
Whipple Ave & Shuffel St	C	26.9s	B	17.9s	C	25.9s	D	38.7s	**C**	**23.3s**
Applegrove St & Strip Extension	C	20.4s	B	15.4s	C	24.2s	C	21.4s	**B**	**18.9s**
Unsignalized Results										
Applegrove St & W Freedom Ave							C	18.2s	**A**	**4.0s**
Applegrove St & E Freedom Ave					C	15.0s			**A**	**1.9s**

Synchro output, HCM would not yield results

! Volume exceeds capacity, queues beyond link

^LOS E in HCM output – EBR is LOS F vs LOS A in Synchro

Table 12: 2035 AM Peak Hour LOS Results - Build

2035 AM Peak Hour										
Roundabout Results*										
Intersection	EB		WB		NB		SB		Overall	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	**LOS**	**Delay**
Pittsburg Ave & Applegrove St	B	13.7s	C	18.1s	A	6.8s	A	9.5s	**B**	**13.7s**
Pittsburg Ave & Mt. Pleasant St	B	13.1s	C	22.1s	C	15.9s	B	10.8s	**C**	**16.0s**
Pittsburg Ave & Orion Rd			C	20.5s	B	11.3s	C	15.3s	**B**	**14.2s**
Pittsburg Ave & Shuffel St	A	9.4s			C	23.4s	A	1.7s	**B**	**11.1s**
Applegrove St & Whipple Ave	A	8.2s	A	8.9s	A	6.2s	A	8.5s	**A**	**8.1s**

*Analyzed in SIDRA

Table 13: 2035 PM Peak Hour LOS Results - Build

2035 PM Peak Hour										
Roundabout Results*										
Intersection	EB		WB		NB		SB		Overall	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	**LOS**	**Delay**
Pittsburg Ave & Applegrove St	D	33.9s	B	12.6s	C	17.5s	B	14.8s	**C**	**21.1s**
Pittsburg Ave & Mt. Pleasant St	C	21.2s	C	18.9s	B	11.4s	C	21.5s	**C**	**18.5s**
Pittsburg Ave & Orion Rd			A	9.9s	B	11.4s	B	14.4s	**B**	**12.2s**
Pittsburg Ave & Shuffel St	C	17.1s			C	21.3s	A	2.5s	**B**	**12.7s**
Applegrove St & Whipple Ave	B	12.5s	A	8.8s	C	15.2s	B	10.6s	**B**	**12.2s**

*Analyzed in SIDRA

VI. ALTERNATIVES

Cost Estimates

The study team utilized ODOT's procedure for construction budget estimating as well as the 2012 summary of contracts awarded with contingencies and inflation included to develop planning level cost estimates for intersection alternative. These estimates are very preliminary and only meant to lend a sense of cost magnitude and a basis for comparing and prioritizing alternatives. More refined costs will need to be developed as each alternative progresses through development. The estimate for each alternative can be seen below with the supporting spreadsheet inputs and outputs in Appendix F.

1. Mount Pleasant / Pittsburg Roundabout $2,290,000
2. Frank Avenue Phase 3 / $4,200,000
3. Pittsburg / Orion Roundabout $3,060,000
4. Orion 3 lane section $1,550,000
5. Portage 3 lane section $1,220,000
6. Portage and Robin Hill Realignment $170,000
7. Applegrove 5 lane section $9,270,000
8. Applegrove / Pittsburg Roundabout $2,140,000
9. Applegrove / Pittsburg Signal (turn lanes) $360,000
10. Mount Pleasant / Pittsburg Signal (turn lanes) $690,000
11. Pittsburg / Orion Signal $2,090,000
12. Whipple/Applegrove Roundabout $2,110,000

SCATS

VII. CONCLUSION

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VII. CONCLUSION

Transportation

The following is a comparative analysis of alternatives for locations with more than one alternative.

Pittsburg & Mt. Pleasant Intersection

Alternative 1 – add turn lanes

Advantages

- Lower cost
- Faster implementation
- Addresses immediate needs
- Minimal Right of Way impacts
- Good short term solution

Alternative 2 - roundabout

Advantages

- Addresses long term needs
- Has a longer life cycle
- Safer traffic control for higher volumes

Pittsburg & Applegrove Intersection

Alternative 1 – add turn lanes

Advantages

- Lower cost
- Faster implementation
- Addresses immediate needs
- Minimal Right of Way impacts
- Good short term solution

Alternative 2 – roundabout

Advantages

- Addresses long term needs
- Has a longer life cycle
- Safer traffic control for handling heavy left turn movements
- Provides safer roadway geometry at the intersection

Pittsburg & Shuffel / Orion Intersection

Alternative 1 – add turn lanes

Advantages

- Minimal Right of Way impacts
- Avoids environmentally sensitive area
- Traditional traffic control

Disadvantages

- Does not entirely address LOS needs thru 2035
- Costs estimate similar in magnitude to Alternative 2
- Coordination of traffic signals will become increasingly difficult as volumes rise.

Alternative 2 – roundabout

Advantages

- Addresses long term LOS needs
- Has a longer life cycle
- Safer traffic control for handling heavy left turn movements
- Avoids environmentally sensitive area
- Realigns approaches to safer roadway geometries
- No signalization, allows traffic to flow

Disadvantages

- Requires relocation of small business and other Right of Way impacts
- Requires a large amount of earthwork on the west side
- Access issues with northwest big box business' driveway
- Non-traditional traffic control

VII. CONCLUSION

Whipple & Applegrove Intersection

Alternative 1 – add lanes, upgrade signal

Advantages

- Implemented as part of larger project
- Minimal Right of Way impacts

Disadvantages

- SBL is LOS E in 2035 PM peak (HCM)
- NBR, SBL, EBL all LOS E or F in 2035 PM Peak (Synchro)
- Requires widening of Whipple north of Applegrove in order to be feasible

Alternative 2 – roundabout

Advantages

- Addresses long term needs
- Has a longer life cycle
- Safer traffic control for handling heavy left turn movements
- Provides safer roadway geometry at the intersection
- Can be implemented as a standalone project
- Provides excellent LOS in 2035 peak hours

Disadvantages

- Right of Way impacts
- Higher cost

Land Use

There generally appears to be no planned or anticipated multifamily housing within the study area. In 21st century communities, multifamily land uses play an important role in providing alternative housing choices for a variety of demographic cohorts. Choices in housing are particularly attractive to the "Millennial" demographic - the segment of the population quickly rising to the status of young professionals. The "Baby-boomer" generation is also a key target of high-end multifamily housing, becoming empty-nesters looking to down-size in home size or maintenance, but not necessarily in quality, and also interested in staying in their community. Together, these two demographic cohorts are the largest two cohorts to move through the housing market in the history of the United States, totaling more than 160 million individuals.

Thus, multifamily housing options such as apartments and condominiums are critical to maintaining a sustainable population. Within this study area, multifamily housing can be a considerable attraction to students of the Kent State-Stark/Stark State Campuses, and young professionals. Medium to high density developments when combined with a mix of other uses, can create dynamic walkable places. While any increase in housing will increase the number of trips in a given area, by combining uses and enhancing connecting and walkability in a 'place' will encourage more non-motorized travel which can have less of a traffic impact on the current system than a more conventional development pattern, while accommodating equal or higher residential densities.

EXAMPLES OF QUALITY MULTI-FAMILY

SCATS

VIII. RECOMMENDATIONS

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VIII. RECOMMENDATIONS

The following are the recommendations of this study:

Policy

There are two policy related recommendations for the various jurisdictions to discuss as a result of this study and those are an access management policy and a traffic impact study policy.

Access management is a vital tool in preserving not only the capacity of a roadway, which in turn extends the life of that roadway, but also for increasing and in this case preserving safety. As mentioned in this study, safety is not yet an issue. But as volumes rise and congestion increases, as shown in the future volumes, safety may become an issue. A good access management policy will provide the appropriate level of access for each roadway based on purpose and use. It will be something that is implemented over time through new development plan approvals and redevelopment plans. It does not mean that all existing access has to change immediately to conform. So as part of this study's purpose in looking to the future and being proactive instead of reactive to development, the study team and the stakeholders feel this is an appropriate recommendation for the area.

Traffic impact studies are a tool that is used around Ohio in most developed areas. This allows decision makers to have all of the facts regarding a proposed developments impact to the existing transportation network opening day and at full build out. It essentially will continue the work and ideas that this study effort has begun in that it gives the decision makers a chance to discuss with prospective developers the opportunity for partnerships in regard to the transportation needs of the area. This policy does not have to apply to every small development or re-development. Typically a threshold of 200 trip ends generated in the peak hour is sufficient to capture the development that will likely cause the most stress on the network. A vehicle arriving and leaving a site is 2 trip ends. Any development that generates less than 200 trip ends in the peak hour would not have to perform a traffic impact study.

Projects

The study team has developed multiple alternatives for various locations throughout the study area as part of this study. Depending on the particular situation and need at the time any of the described alternatives would serve the communities well, whether it is related to development, finances, public pressure, etc. However, the stakeholders have asked the study team to make recommendations for the best alternatives for each location based on the available information at this time. The projects are broken down into two categories, corridor projects and intersection projects.

Corridor Projects:

1. *4-Lane widening of Frank – Applegrove to Shuffel*

This is recommended in order to complete the upgrade of Frank Ave and provide a consistent number of lanes from Portage to Shuffel. Adding turn lanes and traffic signals at the current unsignalized intersection will also improve safety as traffic volumes grow into the future. This route when complete will provide a high capacity local alternative between the two I-77 interchanges and an alternative route north to the Airport other than I-77. The upgrading of Frank Ave in general may provide some congestion relief to the I-77/Portage interchange in the future.

2. *3-Lane widening of Orion – Pittsburg to Cleveland*

This is recommended based on existing congestion and the number of residential driveway cuts in this section.

3. *4/5-Lane widening of Applegrove – Whipple to Frank*

As development creeps north from the Strip area, this road will be a vital cut across and alternative to Portage. It currently handles a large volume of traffic to the east of I-77 and is constrained by a two lane bridge.

4. *Shuffel – Frank to Wales*

Even though this section was submitted for widening in the Air Quality analysis, the team believes that the best approach to this section is through access management and turn lanes at intersections.

5. *3-Lane widening of Strausser – Frank to Wales*

This is more likely to be needed if the connection to Applegrove is ever made. Until then, monitor the roadway for increases in crashes related to terrain and driveway access.

6. *3-Lane widening of Portage – Pittsburg to Charlotte*

This is recommended based on traffic volume, the number of side street intersections and driveway cuts in the section. It also will continue the widened section to the east and allow for a better intersection at Charlotte.

The study team recommends all improvements described in the Applegrove corridor alternative be considered as part of this project, including the Whipple intersection recommendation below.

VIII. RECOMMENDATIONS

Intersection Projects:

1. Pittsburg & Mt. Pleasant (Alternative 2)

While the turn lanes proposed in Alternative 1 are an inexpensive short term solution, according to the models they have limited longevity; therefore, the recommendation is that a roundabout be explored at this location (Alternative 2). This is due to the fact that the turn lanes seem to max out in 2035 and by comparison the roundabout is still operating at about 60-75% capacity on average, giving it a much longer life cycle.

2. Portage & Robin Hill (Alternative 1)

The recommendation is to implement Alternative 1 as described, with re-alignment of the north and south approaches, elimination of the split phasing and the addition of an eastbound left turn lane/phase.

3. Pittsburg & Applegrove (Alternative 2)

The recommendation is to explore the potential for a roundabout at this location (Alternative 2). Much like the Mt. Pleasant intersection, the turn lanes add in expensive short term relief but begin to reach their max life in 2035, while the roundabout continues to have excess capacity. Considering the heavy southbound left volumes, the team feels the roundabout is the best/safest long term traffic control for handling this demand.

4. Whipple & Applegrove (Alternative 2)

The recommendation is to explore the potential for a roundabout at this location (Alternative 2). This is recommended for two reasons, the likelihood that this intersection will need to be upgraded before a wholesale Applegrove corridor upgrade can be programmed, and its ability to handle the heavy turning movement volumes and still provide a high LOS, especially when compared to Alternative 1.

5. Pittsburg & Shuffel/Orion (Alternative 2)

Based on operations, the recommendation is for Alternative 2, the peanut roundabout. Alternative 1, the signalized option, does not provide adequate LOS in 2035. Alternative 2 will carry higher impacts to the surrounding area, but the team feels this is the best long term solution to this complicated area.

6. All Other Intersections

All other intersections were found to be operating or projected to operate at acceptable LOS in the future. It is recommended that these intersections continue to be monitored as one development or congestion at another intersection could change traffic patterns and shift a problem to an intersection that is currently operating well.